JLR-7700MK II

GPS NAVIGATOR

INSTRUCTION MANUAL

JRC Japan Radio Co., Ltd.

Foreword

Thank you for choosing the JLR-7700 MKⅡ GPS navigator.
This equipment is a high-performance navigation equipment consisting of a DGPS receiver and navigator, can retrieve the position data using the DGPS receiver to display various navigation information on the display.

- Thoroughly read this instruction manual before commencing the equipment operation.

- We would recommend you to keep this manual nearby the equipment to ensure readily access to it.
  It should give you information how to cope with a given situation that may arise during the equipment operation.

Before Commencing the Equipment Operation

Graphical Symbols

Several graphical symbols are used in this manual to ensure safety and proper operation of the equipment and to avoid possible human injury or property damage. The symbols and their meanings are shown below. We would recommend you to carefully read the manual to obtain a thorough understanding on these symbols.

⚠WARNING Instructions shown with this symbol represent those that can cause death or severe injury, if not observed.

⚠CAUTION Instructions shown with this symbol represent those that can cause injury or property damage, if not observed.

Examples of the Symbols

Electric shock

The symbols shown in the △ mark represent those that require attention (including the potential dangers and warnings).
A tangible instruction is shown in the symbol. For example, the symbol shown to the left indicates that one is likely to get an electric shock.

Don't disassemble

Don't

The circle symbols with a slash from the upper left to the right bottom represent the specific actions prohibited to avoid potential hazards.
A tangible instruction is shown in the symbol. For example, the symbol shown to the left indicates that the disassembly is prohibited.

Disconnect the power supply plug

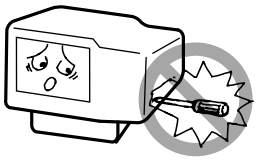
Instruction

The black circle symbols represent the obligatory actions or instructions to avoid potential hazards.
A tangible instruction is shown in the symbol. For example, the symbol shown to the left indicates that the power supply plug needs to be disconnected.

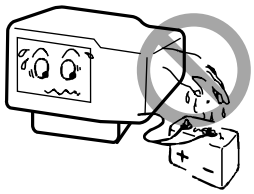
Precautions Upon Equipment Operation

⚠WARNING

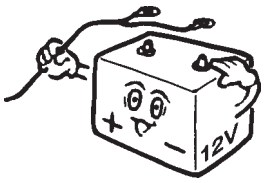
Do not disassemble or modify the equipment. Failure to observe the instruction can cause a fire, electric shock, or equipment failure.



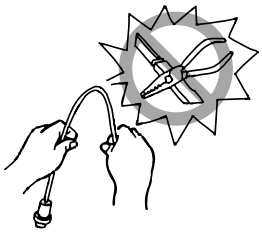
Do not connect or disconnect the power supply cable with a wet hand. Otherwise, you may suffer from an electric shock.



Operate the equipment only at the power supply voltage of 12 or 24 VDC. Failure to observe this instruction can cause a fire, electric shock, or equipment failure.

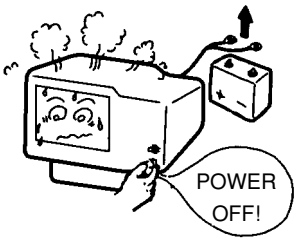


Do not scratch, damage, or modify the power supply and antenna cable. It may be damaged to cause a fire or electric shock if it is loaded with a heavy item, heated, pulled, or excessively bent.



Do not operate the equipment while steering the vessel. It can cause accidents.

Immediately turn the power off and disconnect the power supply cable if the equipment is generating any smoke or odor, or found overheated. Then, promptly inform our local service agent of the symptom to have it corrected. Prolonged equipment operation under such a condition can cause a fire or electric shock.

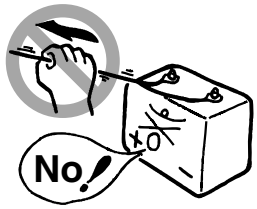


⚠CAUTION

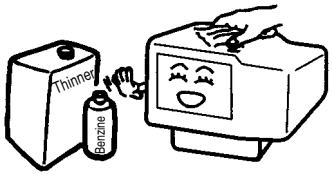
This equipment is not designed to automatically make judgments on the position data. The navigation information including the position data needs to be judged by the user himself.

Do not allow the equipment to fall or immerse in water. The equipment can be damaged.

When removing the power and antenna cord, be sure to remove the cord terminal correctly. If the cord is pulled, the cord may be damaged resulting in a fire or an electrical shock.



When cleaning the surface, do not use any organic solvent such as thinner or benzine. Otherwise, the painting on the surface may be damaged.
For cleaning the surface, remove the dust and refuse and wipe with clean dry cloth.



Appearance of the Equipment

DGPS Receiver

Navigator

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Key Terms

Term	Description
GPS satellites	The term is an acronym that represents the Global Positioning System, which is managed by the US Department of Defense to support its navigation aid system.
DGPS	The term is an acronym that represents the Differential Global Positioning System, which is a system to improve the position fixing accuracy by receiving the correction data with a beacon receiver for a given GPS satellite, which is transmitted by the beacon station with a known position.
Position fixing	The term means to obtain the current position of your vessel with the GPS or DGPS receiver.
2D (Two-dimensional position fixing)	The term 2D means the position fixing with data obtained from the satellites and antenna height information.
3D (Three-dimensional position fixing)	The term 3D means the position fixing with four or more satellites information only.
HDOP	The term is an acronym that represents the Horizontal Dilution of Precision, which reflects the position fixing accuracy. The accuracy increases as the value decreases. The value increases when the satellites are gathered close to each other, and it decreases when the satellites are spattered, which in turn means increased accuracy.
Loran time difference display	This is a method to display the current position using the time difference. (This method is recommended for the experts who have good knowledge on the Loran navigation method.)
TD	The term is an acronym that represents the Time Difference, which is equal to the time difference between the master and secondary Loran signals.
Route plan	This is the plan that consists of the multiple waypoints registered in the order of navigation.
CDI	The term is an acronym that represents the Course Deviation Indicator, which includes information on the deviation from a given planned course and direction to be steered.
Arrival alarm	The alarm notifies that your vessel has arrived at the preset distance from a given destination.

Anchor alarm	The alarm notifies that your vessel has drifted away from the destination by the preset distance.
Off-course alarm	The alarm notifies that your vessel has been deviated from the planned course by the preset distance.
Boundary alarm	The alarm notifies that your vessel has crossed the preset boundary line.
Automatic sequencing mode	The function automatically switches the next destination after your vessel has entered the preset arrival alarm range during the navigation according to the route plan.
Manual sequencing mode	The function allows the operator to manually change to the next leg by operating the keys provided on the equipment during the navigation based on the route plan.
Default values	The values represent the factory settings.
NMEA 0183	This is a standard specified by an international organization called the National Marine Electrical Association (NMEA) to specify the requirements for the communications among various navigator.
Master reset	The function clears all the settings on the equipment and the NNN-4321 DGPS receiver connected to it. Note that all the settings will be cleared if the function is performed.
Initialization	A maximum duration of 2 minutes is required for position fixing if the equipment is to be operated for the first time after the installation or the master reset function has been performed. The initialization can reduce the time for position fixing by manually entering the estimated position, time, and antenna height.
Course	A direction obtained by connecting the positions tracked by the vessel, which is mainly the direction displayed by the GPS.
Bearing	An angle formed between the local meridian and the orientation of the bow during the navigation, which is mainly displayed on the gyro or magnetic compass.
RAIM	Acronym of "Receiver Autonomous Integrity Monitoring." This denotes the function of judging by GPS receiver itself whether the positioning accuracy is within the required accuracy.
WER	Acronym of "Word Error Rate." This indicates the receiving condition of the data transmitted from DGPS base stations. The value decreases when the condition is better.

1. Equipment Overview

1.1 Functions

The JLR-7700 MKⅡ is a DGPS navigation equipment configured by connecting the NNN-4331 DGPS receiver to the NWZ-4570B navigator. The DGPS navigation equipment measures the vessel position all the time with very high accuracy using the data provided by the GPS satellites under any geographical or weather conditions and its measurement accuracy can be further enhanced by receiving compensation data from the DGPS beacon station. The equipment displays the following navigation screens and GPS statuses based on data retrieved by the DGPS receiver.

(1) Navigation screens

These screens display the navigation information to go to the destinations that have been preset to the equipment.

Screen name	Remarks
NAVIGATE screen	The current position is displayed with the latitude and longitude. Information required for navigation, such as the bearing, distance, course, and speed to the destination, can also be displayed. Other navigation information, such as the deviation from the preset navigation course, direction to steer, and estimated time of arrival to the destination can be displayed. In addition, the Loran time difference can also be displayed as well.
COURSE DEVIATION IND. screen	The course deviation can be graphically shown on the display by selecting the CDI on the NAVIGATE screen. In addition, the direction to steer will also be displayed.
PLOT screen	The planned navigation course and actual navigation tracked by your vessel can be graphically displayed. The waypoints can be displayed with symbols and alphabets. The current position can be registered as the waypoint by simply pressing the [1 EVENT] key.

(2) Satellte status screens

Screen name	Remarks
SAT STATUS screen	Which provides the operator with the GPS information (the satellite number, elevation angle, azimuth angle, and signal level).

1.2 Features

- The equipment can be operated with ease by simply selecting the menu displayed on the screen.
- A large LCD ensures simultaneous display of various navigation information required, which in turn eliminates the necessity for frequently switching the display.
- NNN-4331 DGPS receiver for differential position fixing offers a higher accuracy position.
- A maximum of 499 waypoints can be stored.
- Each waypoint can be displayed with alphanumeric.
- Two data outputs are available and either one of the NMEA 0183 versions 1.5, 2.1, or 2.3 (IEC61162-1) can be selected. Note that one of the two outputs is of RS422 level.
- The position information obtained by the GPS can be displayed in the Loran time difference as well.
- The graphically displayed COURSE DEVIATION IND. screen enables the operator to determine the steering direction by simply taking a look at it, which in turn ensures safety and economical navigation. In addition, the symbols attached to the respective waypoints can be displayed on the PLOT screen besides the actual navigation tracked by your vessel.
- The equipment can display information either in Japanese or English.
- Local weather and sea conditions in coastal sea areas of Japan can be displayed.

1.3 Configuration

The equipment consists of the units shown in the table below. Immediately inform our local sales office or your distributor if any one of them is found missing.

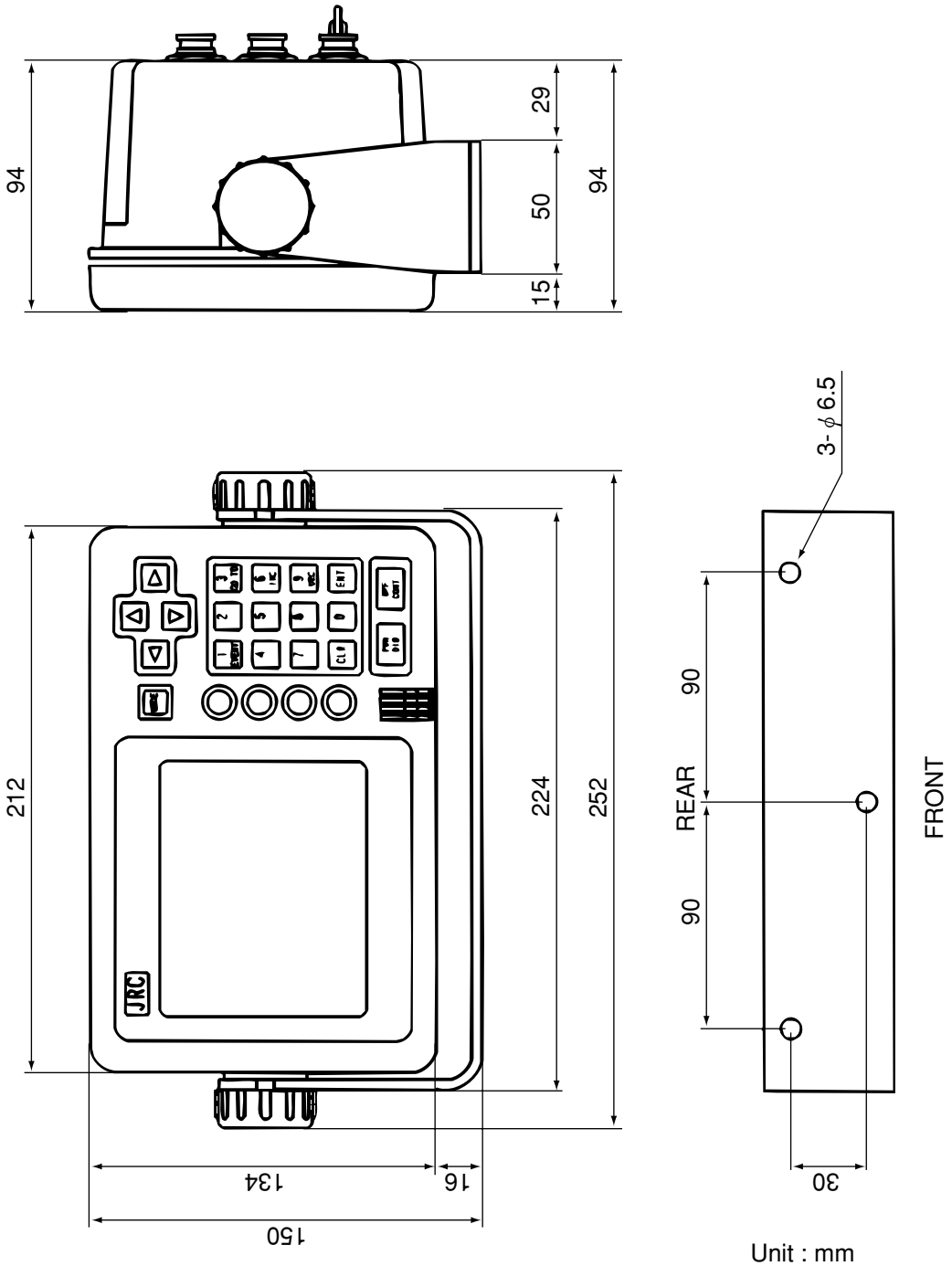
Unit	Model	Quantity	Remarks
Navigator	NWZ-4570B	1	
Bracket	CFQ-8919	1	5m with connector (For navigator)
Power supply cable	CFQ-3598B	1	1.8m with connector (For navigator)
DGPS receiver	NNN-4331	1	With 15m cable
Screw mount	MTV302007	1	(For DGPS receiver)
Fitting belt	MPBP02520	1 set	Include 2 belts (For DGPS receiver)
Connector	6-282-7SG-321	1	(For data output)
Copper plate		1	25W×2000×0.3t (For navigator)
Spare parts		1 set	2A fuse
Suppression ferrite	E04SR200935A or equivalent	1	See the item 3.4.3 "Connection of the DGPS Receiver" for the mounting method
Mounting screws	MPTG02342	1 set	Three self-tapping screws with washers
Instruction manual	7ZPNA4032	1	

In addition, the following items are available as the optional units.

Unit	Model	Uses
Junction box	NQE-7700A	
Pole mounting kit	MPBP30608	
Output buffer	NQA-4251	The buffer can divide the output from the navigator to twelve other external equipment connected in parallel.
AC power supply unit	NBA-3581A	The rectifier converts the AC power (100 or 200 VAC) into the rated power supply voltage of 24 VDC for NWZ-4570B. Further, the 24 VDC power as supplied from the battery may be connected to the navigator to backup the AC power supply.
Printer	NKG-84	Various information displayed on the navigator information, SAT status and so on can be printed out by connecting the DATA OUT connector provided on the rear panel of the navigator to the printer using the optional data cable (CFQ-8921).
Data cable	CFQ-8921	The data cable can used when it is necessary to output data from the DATA OUT connector provided on the rear panel of the navigator.
Extension cable	250V-MPYCYS-5 or 250V-MPYCYS-7	The cable is used to extend the cable for the DGPS receiver, which is recommended as the standard extension cable.

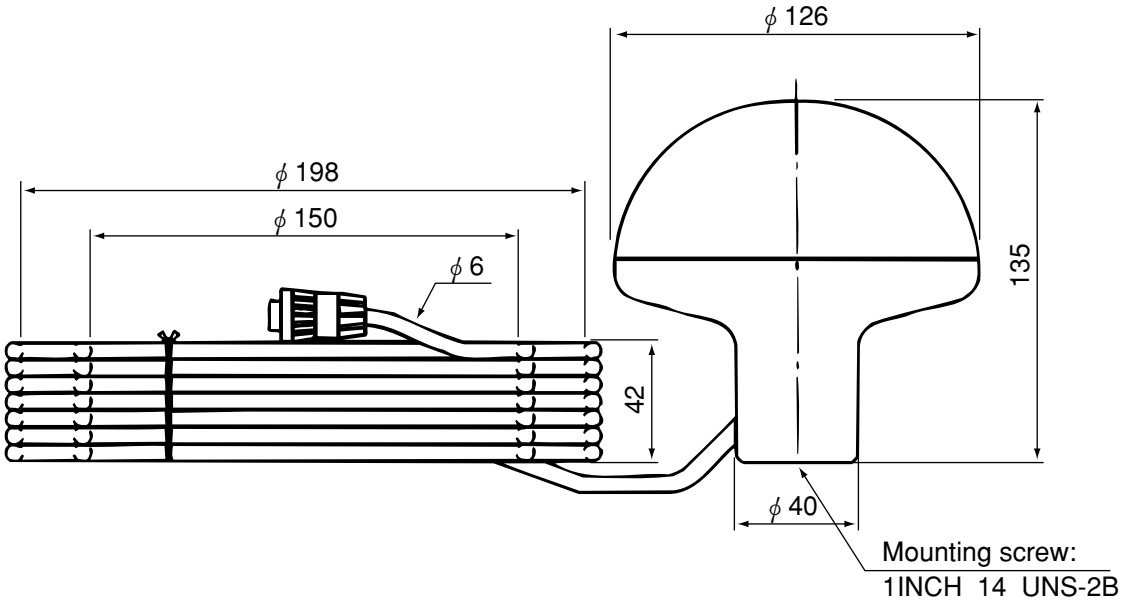
1.4 Construction

(1) Outline drawing of NWZ-4570B navigator



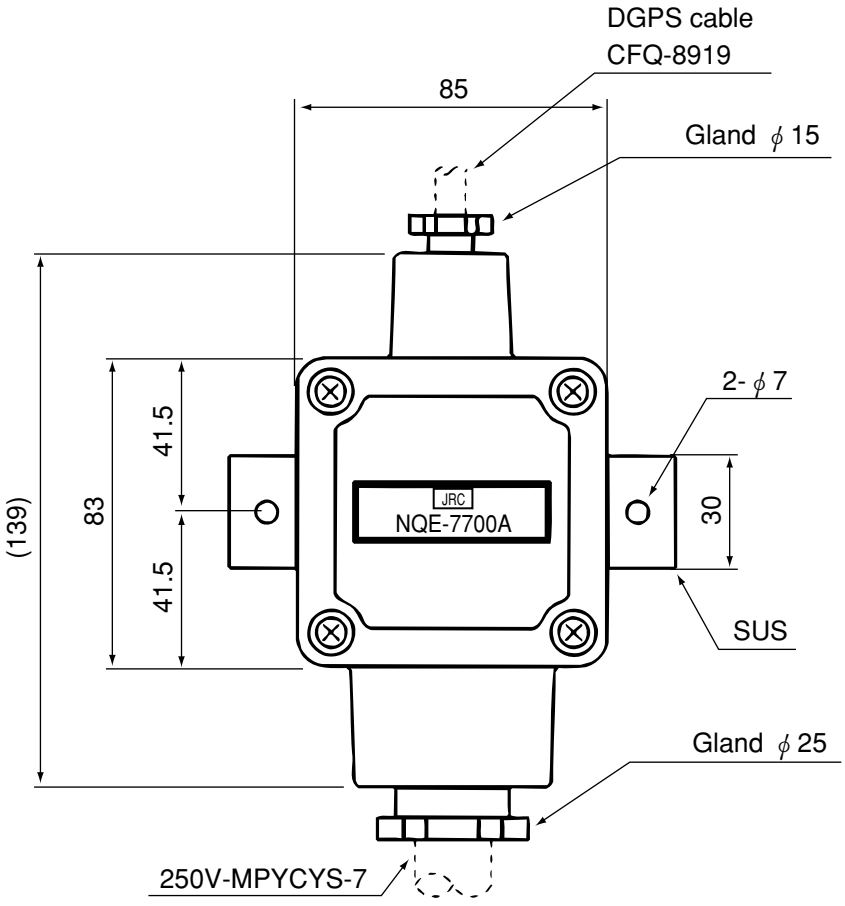
Unit : mm
Weight : less than 1.8Kg

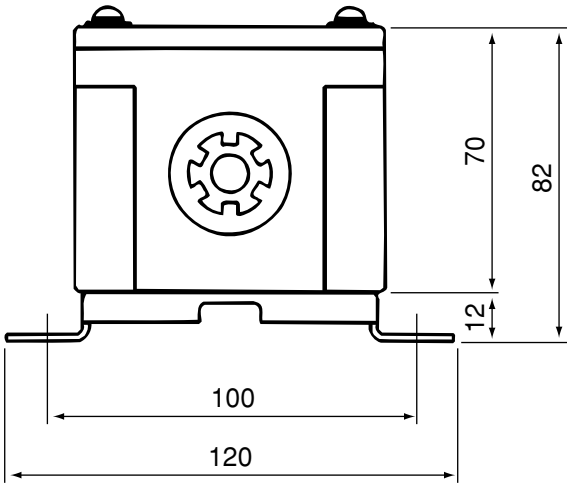
(2) Outline drawing of NNN-4331 DGPS receiver



Unit : mm
Weight : less than 1.7Kg

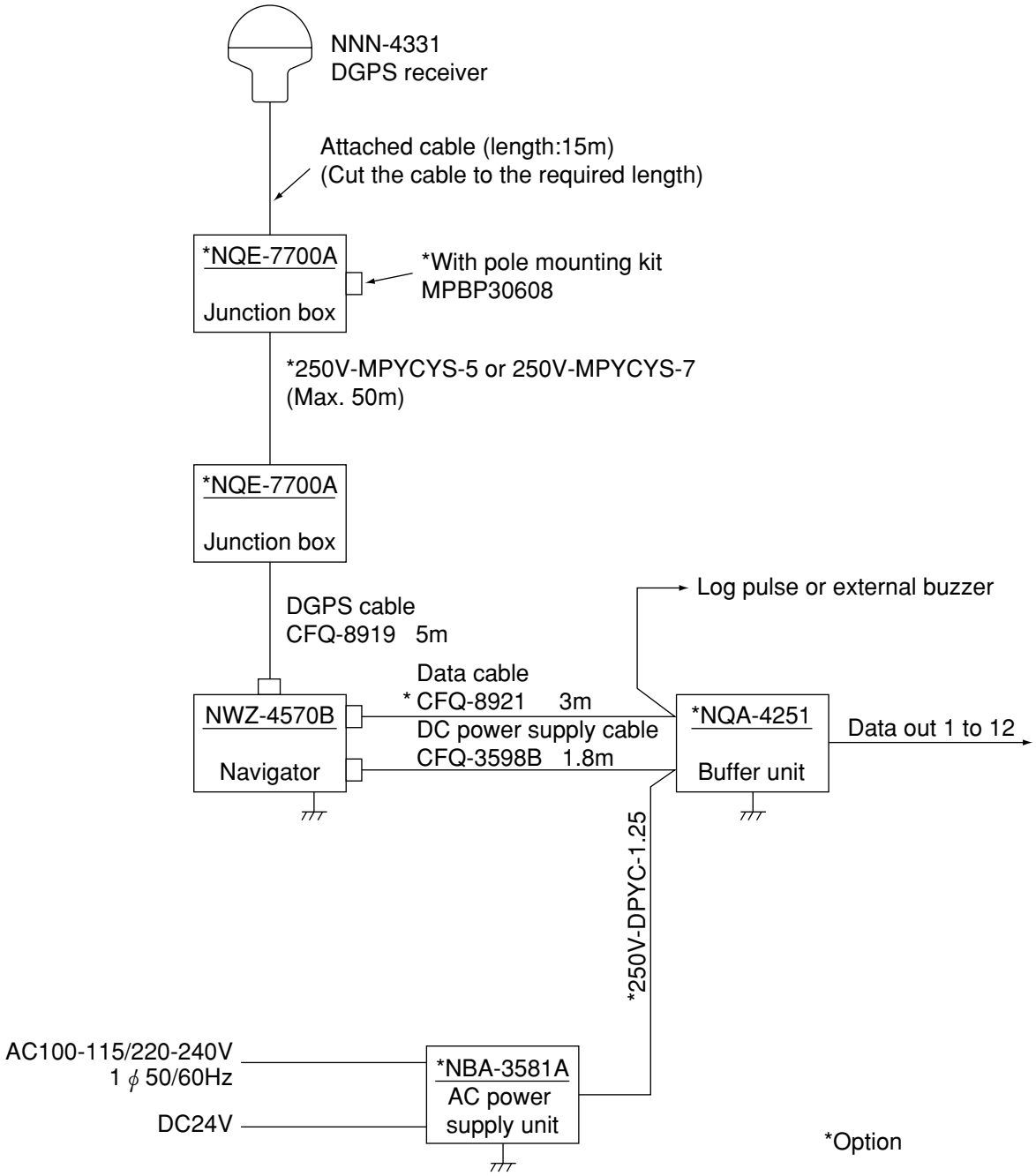
(3) Outline drawing of NQE-7700A junction box





Unit : mm
Weight : less than 0.7Kg

1.5 General System Diagram



2. Unit Descriptions and Functions

2.1 Operation Panel of the Navigator

The following figure shows the keys provided on the operation panel of the navigator and the functions thereof.

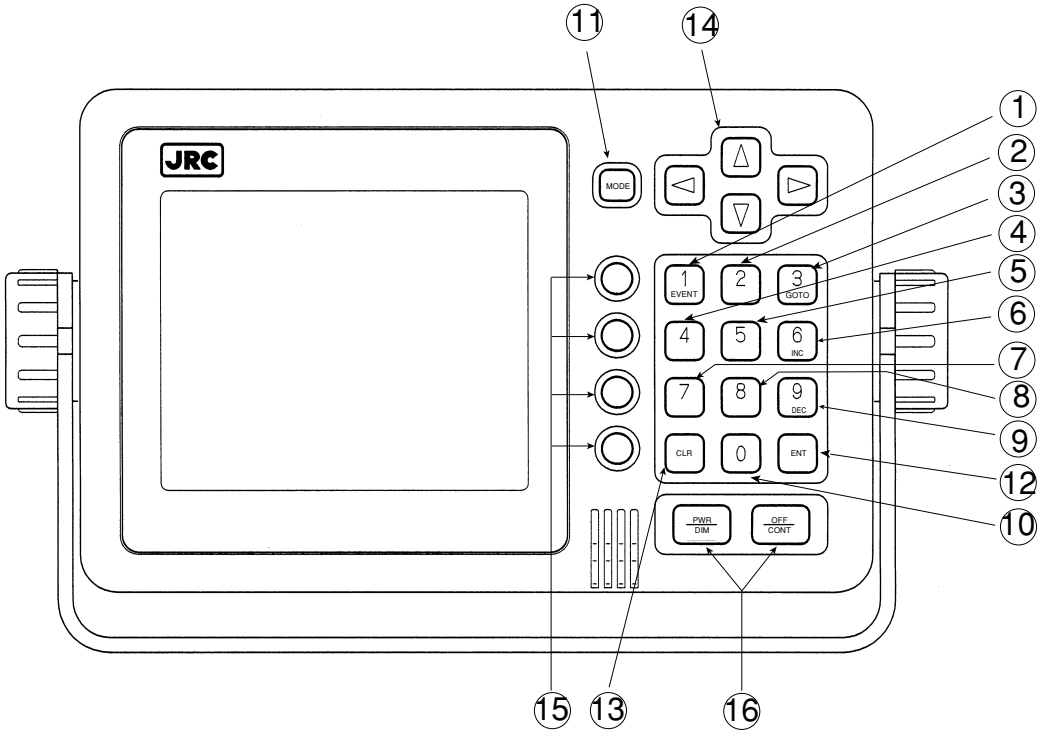


Fig. 2-1 Operation Panel of the Navigator

No.	Description	Function
①	1 EVENT	To enter the numerical value “1” or memorize the event (for the waypoint numbers 400 to 499).
②	2	To enter the numerical value “2”.
③	3 GOTO	To enter the numerical value “3” or to set the one destination.
④	4	To enter the numerical value “4”.
⑤	5	To enter the numerical value “5”.
⑥	6 INC	To enter the numerical value “6”, to magnify the plot scale, or to adjust the contrast.
⑦	7	To enter the numerical value “7”.
⑧	8	To enter the numerical value “8”.
⑨	9 DEC	To enter the numerical value “9”, to reduce the plot scale, or to adjust the contrast.
⑩	0	To enter the numerical value “0”.
⑪	MODE	To the selection screen.
⑫	ENT	To execute a given data input.
⑬	CLR	To erase a wrong input data or to turn off the alarm sound.
⑭	▲ ▼ ◀ ▶	To move the cursor or waypoints on the list.
⑮	○○○○	Selection on the menu.
⑯	PWR/DIM OFF/CONT	To turn on and off the power, to adjust the backlight, or to start or finish the contrast adjustment.

2.2 Rear Panel of the Navigator

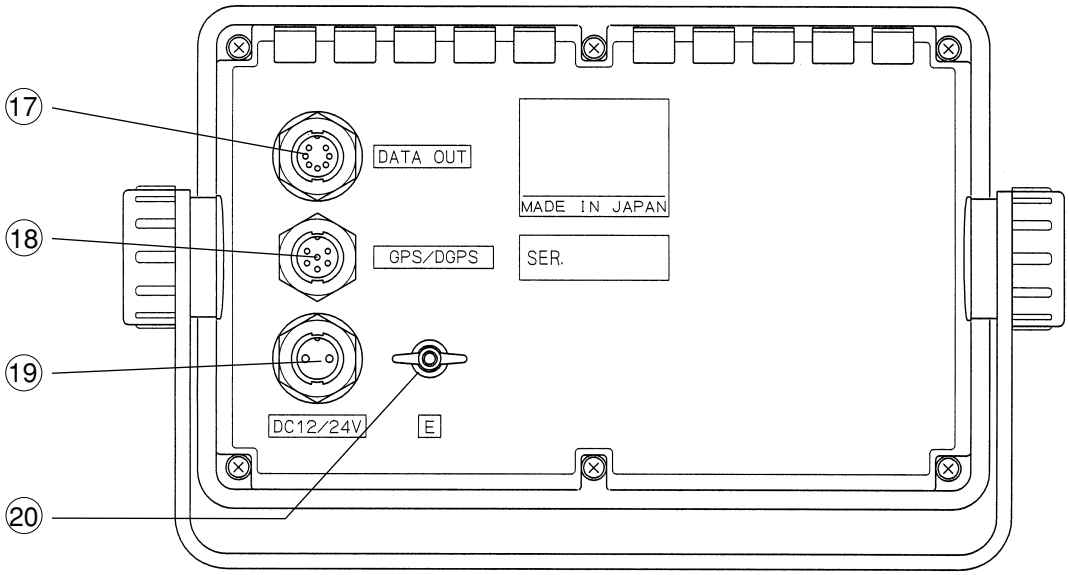
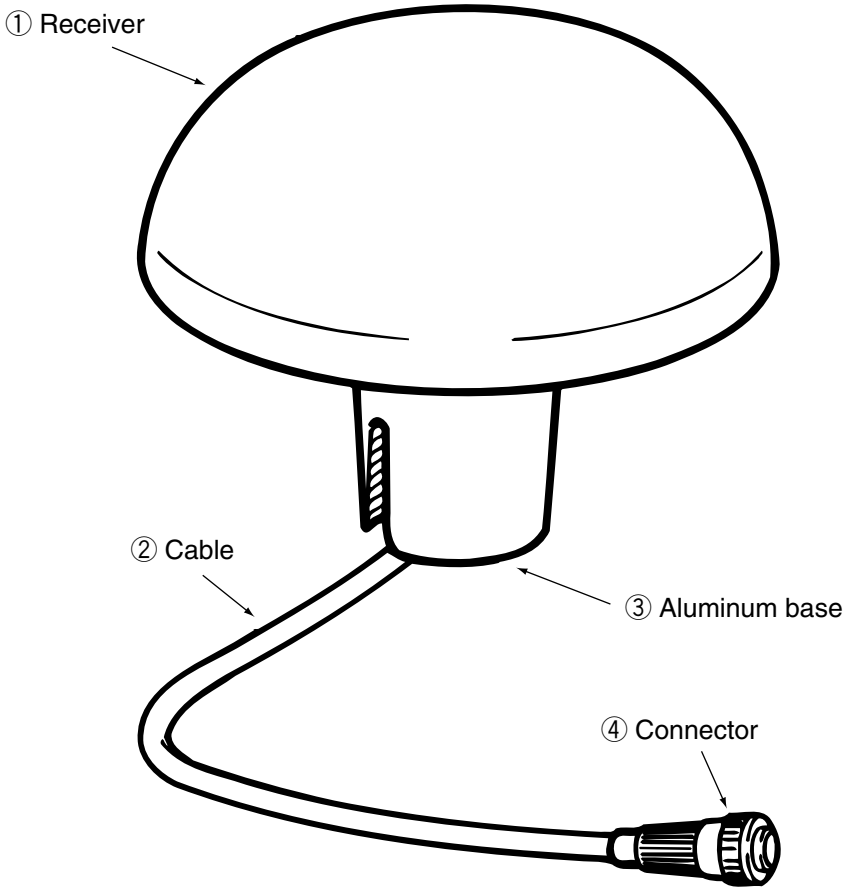


Fig. 2-2 Rear Panel of the Navigator

No.	Description	Function
⑰	DATA OUT connector	This connector outputs various data (DATA 1 and DATA 2) for the plotter, auto pilot, printer, remote display and so on, in addition to the external buzzer or log pulse.
⑱	GPS/DGPS connector	This connector connects the NNN-4331 DGPS receiver.
⑲	12/24 VDC connector	This connector connects the CFQ-3598B power supply cable included in the equipment.
⑳	Terminal E	This connector needs to be connected to the earth of the vessel frame. Use the attached copper tape (25W×2,000×0.3t) to connect it.

2.3 DGPS Receiver



No.	Name	Function
①	Receiver	To provide DGPS position fixing by receiving GPS signals form a maximum of twelve satellites as well as DGPS correction data from ground beacon stations.
②	Cable	To supply DC power for the antenna and input/output a data to a navigation equipment 6 wires cable.
③	Aluminum base	To mount on a navigation antenna mount unit or on an extension mast conforming to 1"×14 NPT standards.
④	Connector	To connect with the navigator 6-pin connector.

3. Installation

3.1 Installation of the DGPS Receiver

3.1.1 Selecting the Position for Installation

⚠CAUTION

When connecting the cable attached to the equipment, do not bend it to an acute angle, twist it, or impart excessive force because this sometimes causes cracks or damage to the coating.

Do not install the receiver where there is excessive vibration.
Vibration may cause receiver failure.

Install the receiver where there is no obstacle, in order to ensure that GPS signals can be directly received from satellites without interference or reflection of signals from surrounding objects.
Whenever possible, select a place having the following characteristics.

1. An open space which allows uniform reception of satellite signals
2. Far away from any of high power transmission antennas
3. Outside radar beam range
4. Away from the inmarsat antenna by not less than 5 meters and below the level of its antenna
5. Away from the antenna of a direction finder by not less than 5 meters
6. Away from the magnet compass by not less than 1 meter

If it is difficult to find an ideal site, select a place temporarily and install the equipment. Conduct a test to make sure that the proper performance can be obtained and then fix the equipment in position. If it is installed at an improper place, reception may become intermittent, resulting in shorter position fixing time and poorer position accuracy.

3.1.2 Installation Procedure of the DGPS Receiver

The aluminum bottom of the DGPS Receiver is designed so that it can be installed on screws, mounting conforming to 1”×14. The bottom of the receiver is provided with a slot to allow the receiver cable to be pulled out to the side.

① Pull out the receiver cable from aluminum base.

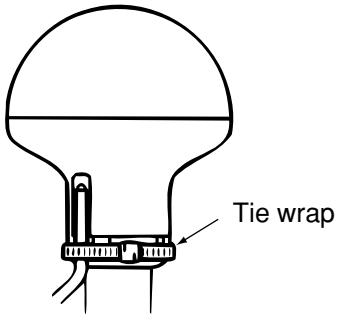
② Screw screws, mounting into the aluminum base. As shown below grip the base. Don’t grip joint between cover and aluminum base.

Don't grip joint　　Grip the aluminum base

Installation of the DGPS receiver

③ When the receiver cable is pulled out through the slot, securer it in position to protect it against damage due to vibration.

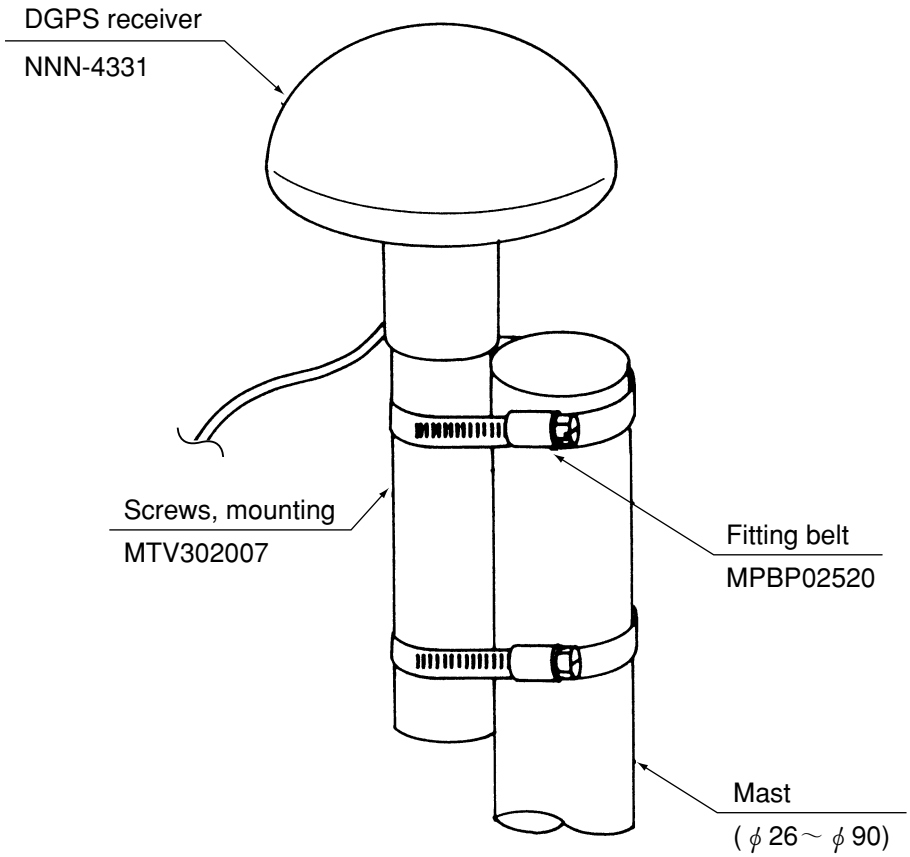
④ Connect extension cable with the DGPS receiver. Those connectors should be sealed with selfbonding tape due to water proofing.



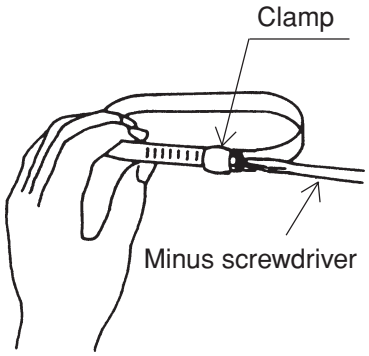
Appearance

3.1.3 Installation of the DGPS Receiver on the Mast

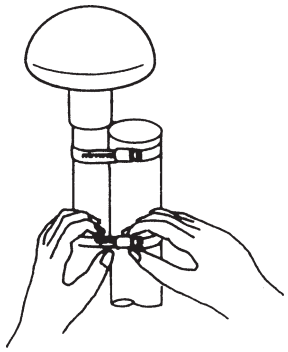
The following figure shows how to install the receiver on the mast.



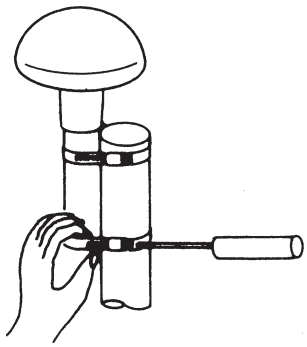
1. Loosen the fitting belt screw with a screwdriver to remove the clamp.



2. Coil the fitting belt around mast as shown below.



3. Tighten the clamp screw with the screwdriver.



How to Install the Receiver on the Mast

3.2 Installation of the Navigator

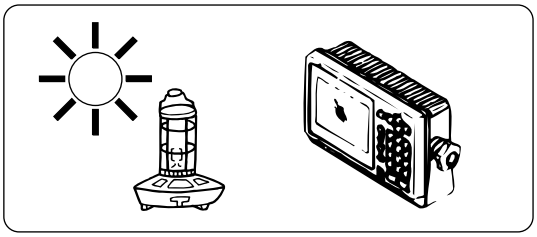
⚠CAUTION

Keep the equipment away from the magnetic compass by a minimum of one meter when installing it. Failure to observe this instruction can cause malfunctioning of the compass.

3.2.1 Selection of the Installation Location

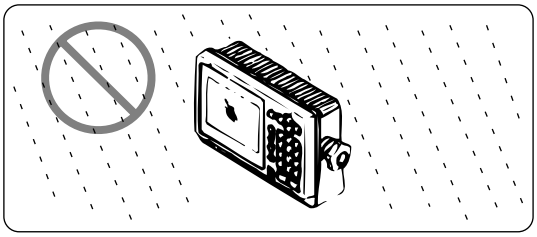
Pay sufficient attention to the following two points when installing the equipment.

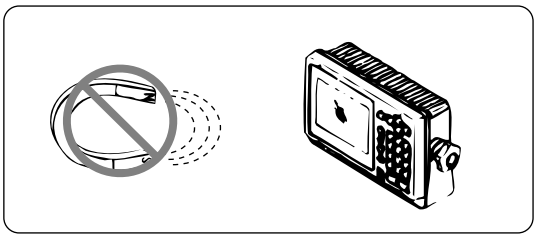
- Select a location that can provide ease in operating the equipment and viewing information displayed on the screen.
- Observe the following instructions.



Do not install the equipment at a location subject to the direct sunlight or nearby the heat source (50℃ or higher).

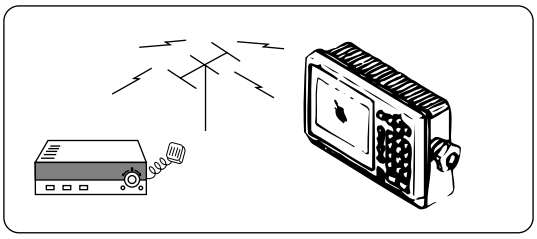
Do not operate the equipment at a location that is subject to water droplets, rainwater, or condensation.





Keep the equipment away from the magnetic sources such as the magnetic compass, speaker, or motor since they can damage the electronic circuit in the equipment.

Keep the equipment away from the radio set, radar, TV set, fluorescent lamp, antenna, etc. to avoid possible radio interference.



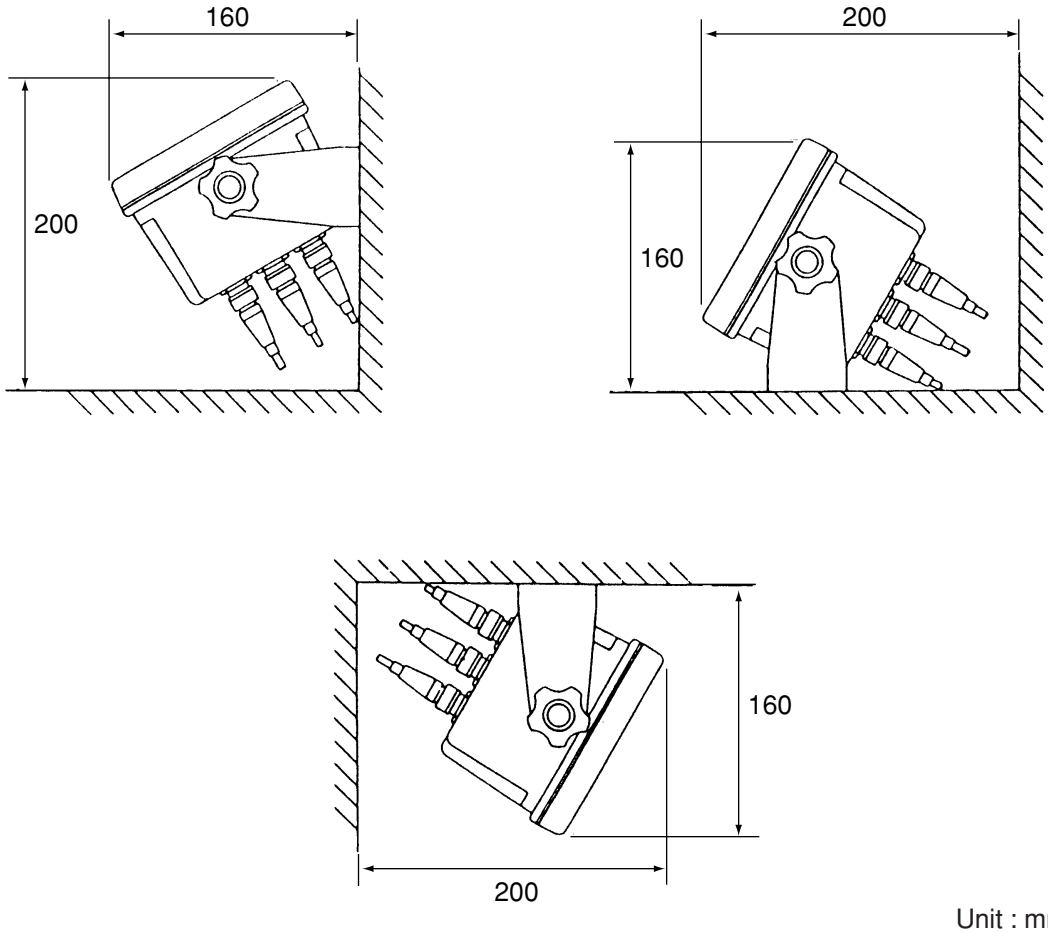
3.2.2 Installation of the Navigator

⚠WARNING

Secure the bracket with the screws provided with the equipment. Failure to observe the instruction can cause injury or property damage since the equipment is likely to drop.

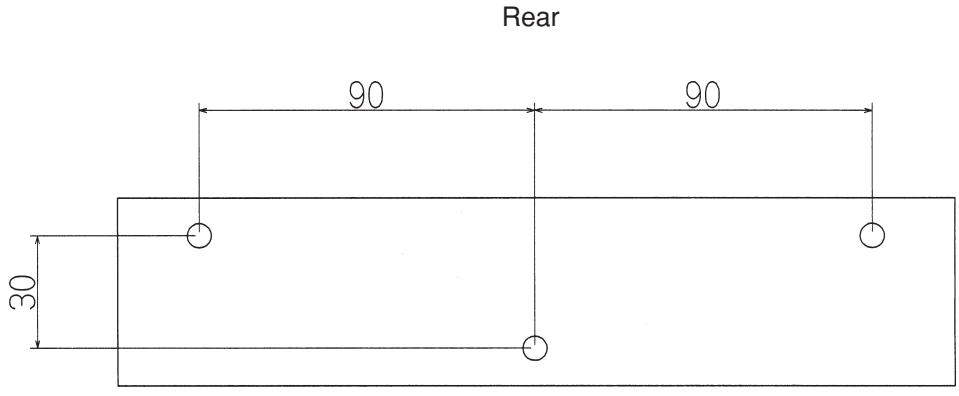
Firstly, secure a space for the mount according to Fig. 3-1. Then, secure the mount by following the procedures shown below.

(1) Determine the location to install the equipment. Mark the three mounting screw positions with a pencil or equivalent. See the Fig. 3-2 for the mounting screw hole size.
(2) Secure the bracket at the installation location using the three self-tapping screws.
(3) Mount the equipment on the bracket and confirm that it is securely mounted.
(4) Adjust the orientation of the equipment to an optimum position.



Unit : mm

Fig. 3-1 Installation Orientation and Spatial Requirements



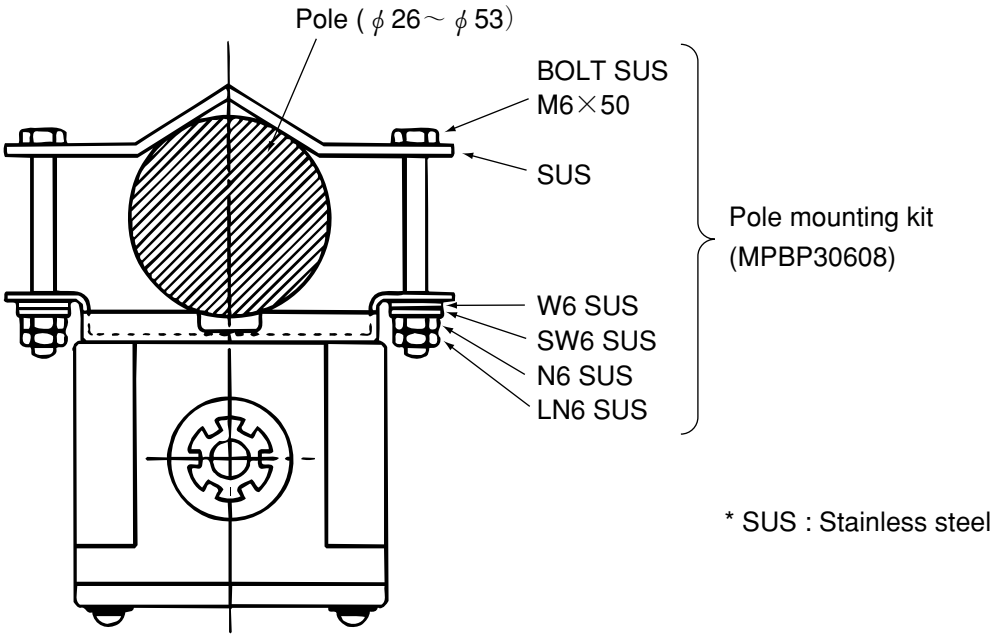
Unit : mm

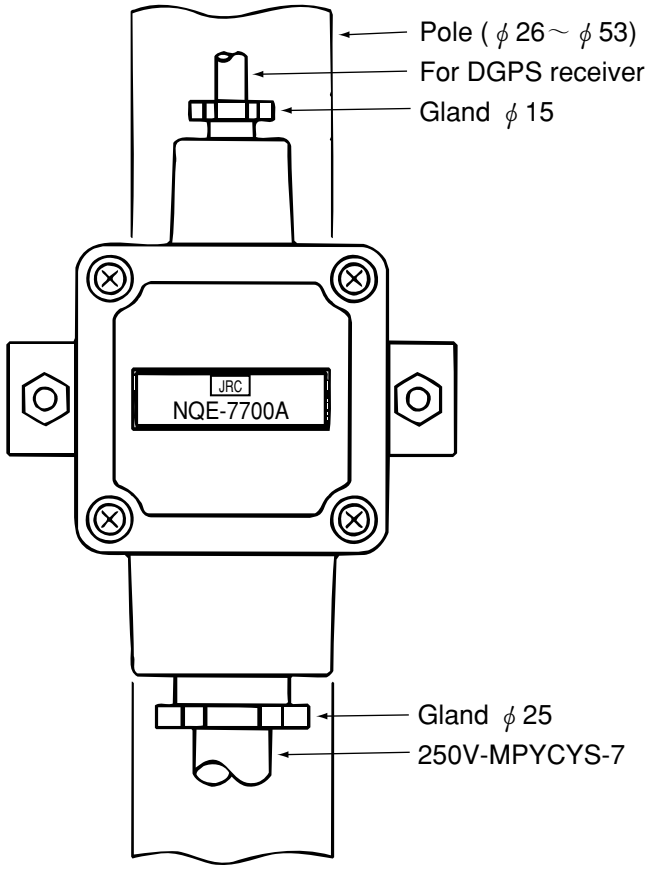
Fig. 3-2 Bracket Mounting Dimensions

3.3 Installation of the Junction Box

3.3.1 How to Mount the Junction Box on the Mast

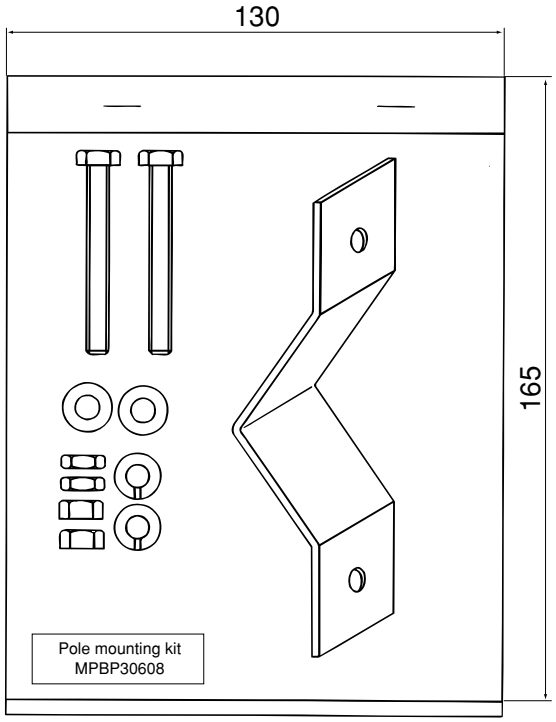
Securely mount the junction box on the mast using the pole mounting kit (See the item 3.2.2 “Pole Mounting Kit” for details.).





3.3.2 Pole Mounting Kit

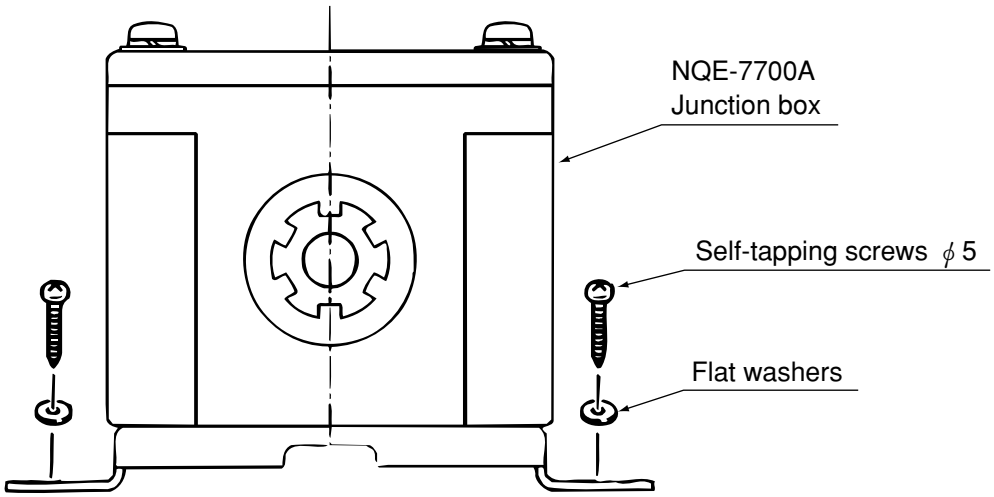
The following figure shows the items included in the pole mounting kit.



Unit : mm

3.3.3 How to Mount the Junction Box on a Flat Surface

Securely mount the junction box on a given flat surface using the self-tapping screws and flat washers.



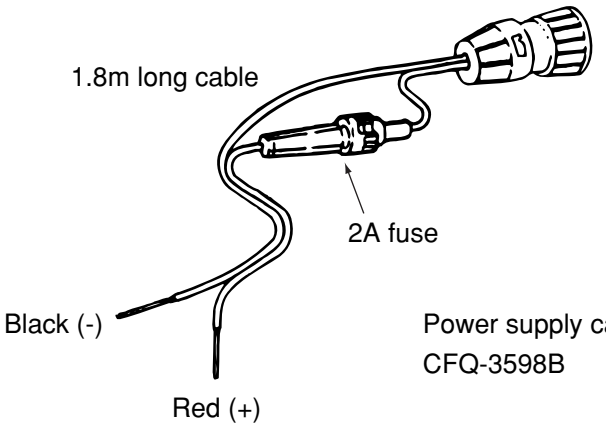
Memo

The self tapping screws and flat washers in the figure above are not accessories of this equipment.

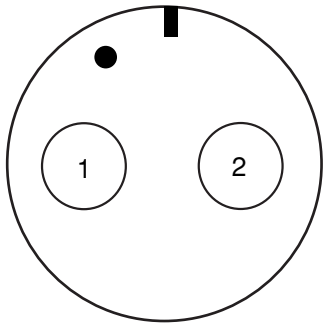
3.4 Connection of the Navigator

3.4.1 Connection of the Power Supply Cable

A 1.8m long DC power supply cable is included in the equipment, which needs to be securely inserted all the way into the 12/24 VDC connector provided on the rear panel of the navigator.



Pin No.	Remarks
1	DC −
2	DC +



12/24 VDC connector

Connect the red cable to the plus terminal of the battery or power distribution panel and the black cable to the minus terminal.

The equipment needs to be connected to the DC power supply source having the voltage range of 10 to 35 VDC. The power consumption by the equipment is 10 W or less with the GPS or DGPS receiver connected to it. Use an AWG #17 cable or greater if the attached CFQ-3598B power supply cable (1.8m long) needs to be extended.

3.4.2 Connection of the Grounding Line

The navigator needs to be grounded to protect it from the static electricity and to avoid possible noise generation. Connect the terminal “E” provided on the rear panel of the navigator to the nearest vessel frame with the copper plate (25Wx2,000x0.3t) included in the equipment.

3.4.3 Connection of the DGPS Receiver

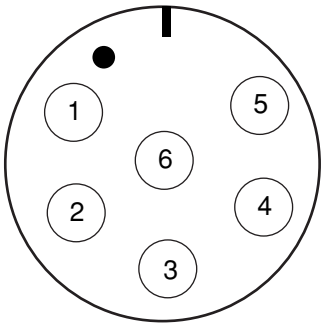
See the description under the item 2.2 " Rear Panel of the Navigator" for the connectors provided on the rear panel of the navigator.

⚠CAUTION

Keep the excessive DGPS connection cable away from the navigator by a minimum of 30 cm after connecting it. Failure to observe the instruction can cause interference to other radio equipment.

The navigator supplies the 12 VDC power to the DGPS receiver. The DGPS receiver is activated when the equipment is turned the power on to receive information from the satellites and transmit it to the navigator.

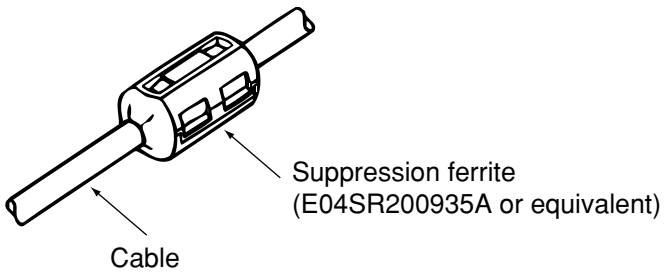
① Securely insert the CFQ-8919 DGPS cable plug into the "GPS/DGPS" connector provided on the rear panel of the navigator.



GPS/DGPS connector

Pin No.	Remarks
1	12 VDC output
2	Ground
3	Data common (Ground)
4	GPS data input
5	GPS setting data output
6	Open

② Then, mount the suppression ferrite included in the package on the cable at a position closest to the GPS/DGPS connector to eliminate any unwanted noise.



3.4.4 Data Output

The “DATA OUT” connector provided on the rear panel of the navigator can output data for the plotter, automatic pilot, printer, remote display unit, fishfinder, radar and so on.

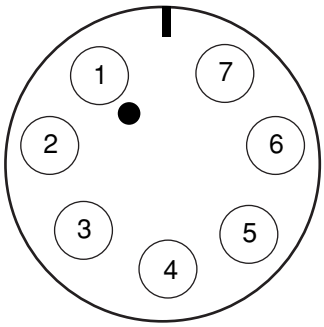
The format of data to be output can be selected from the following four types. Two each peripheral units can be connected to the DATA 1 or DAT 2 output.

Output format available for data 1 and 2	Number of external equipment that can be connected
NMEA0180	2 units each
NMEA0183Ver1.5	2 units each
NMEA0183Ver2.1	2 units each
NMEA0183Ver2.3 (IEC61162-1)	2 units each
JRC format	2 units each
NMEA0183Ver2.3/SEC	2 units each

⚠CAUTION

If select “NMEA0183 output per second” at DATA1 (or DATA2), the output of DATA2 (or DATA1) is fixed to “NMEA0183 output per second” automatically, and other data format can not be selected.

See the item 4.3.3.3 “Selection of the Data Output Format” to switch the data format.



DATA OUT connector

Pin No.	Remarks
1	Data 1 output (TTL level)
2	Data 1 common (GND) (TTL level)
3	Data 2 output (＋) (RS-422 level)
4	Data 2 output (－) (RS-422 level)
5	NC
6	Relay output (Log pulse), ＋ output
7	Relay output (Log pulse), － output

3.4.5 Relay Output

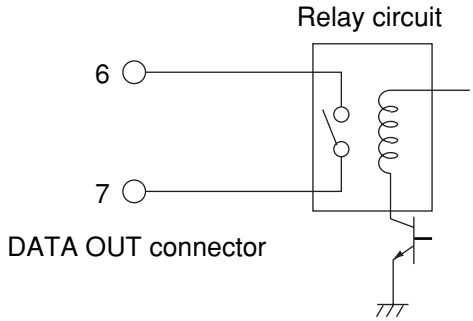
The relay circuit of the navigator can output either the external buzzer or log pulse.

The relay circuit outputs the signals shown in the table below via the pin numbers 6 and 7 of the DATA OUT connector described under the item 3.4.4 “Data Output”.

Note that the maximum loading capacity of the connector pins is 200 mA at 24 VDC.

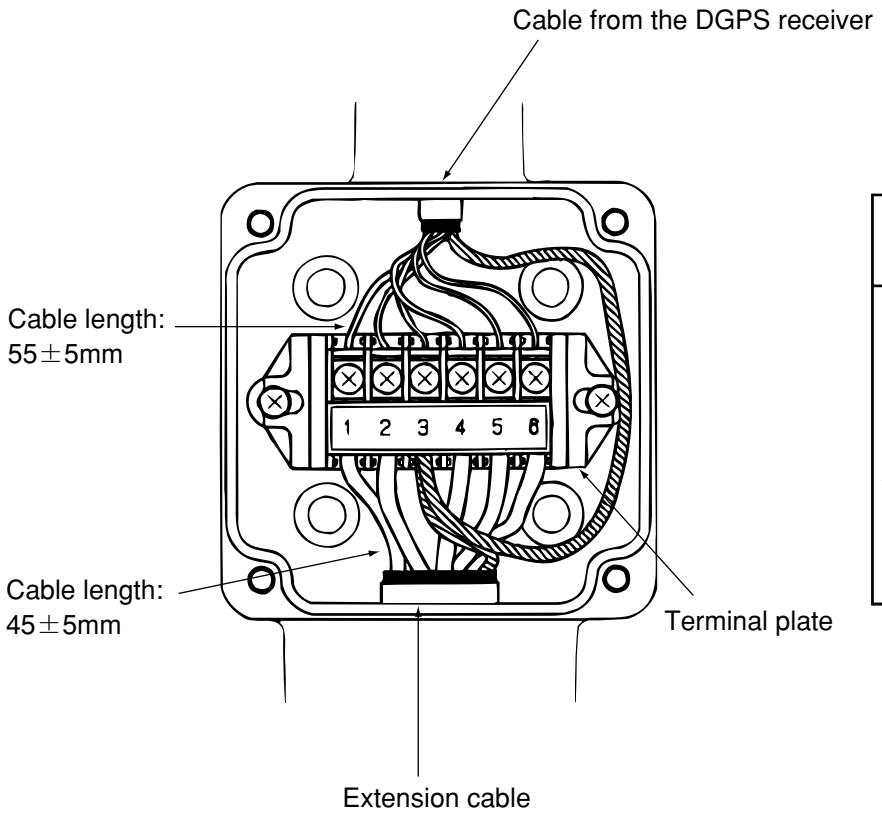
Output	Screen display	Description
External buzzer	EXT BUZZER	An external buzzer can activate any sound alarms described in the Attachment 2-A. Pressing the CLR key can stop the alarm sound in the same manner as that with the navigator.
Log pulse	LOG PULSE	The log pulse is calculated and output at a rate of 200 pulses per nm based on the vessel speed, which is mainly fed to a radar or equivalent.

Press the MODE PLOT> and AUX> keys.
Then, press the BUZZER/LOG> to select a desired data output (either the external buzzer or the log pulse).
The screen returns to the PLOT screen when the ENT key is pressed.



3.4.6 Connection of the Junction Box

Connect the respective cables (cable from the DGPS receiver and extension cable) to the terminals provided in the junction box as shown in the following figure.



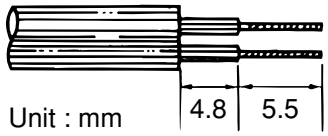
Cable from the DGPS receiver	Terminal in the junction box
Red	1
Black	2
White	3
Green	4
Yellow	5
Brown	6
Shield cable	3

⚠CAUTION

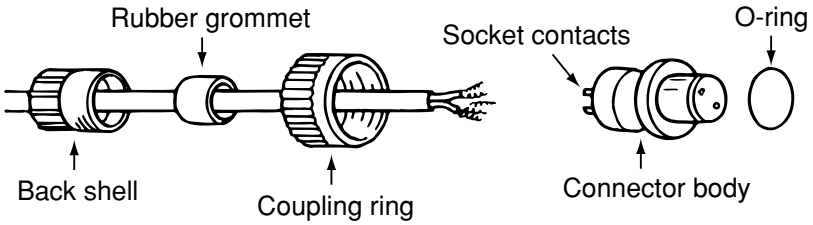
The rubber gasket is suitable for the cable of size ϕ10 to ϕ20.

3.4.7 Connection of the Waterproof Connectors (2, 6, or 7-pin Connector)

(1) Strip the cable end as shown in the figure below.
(2) Put the respective parts through the cable as shown in the assembly drawing.
(3) Solder the cable ends to the socket contacts, and cap the socket contact with the rubber grommet by allowing it to slide on the contact body surface so that it will be securely covered.
(4) Put the O-ring through the connector body all the way to the end.
(5) Secure the back shell on the connector body.
(Align the notch provided on the back shell with the tab on the body and press them each other, then, turn them to secure. It is recommended to insert the connector body into the navigator connector if the above approach is found difficult.)



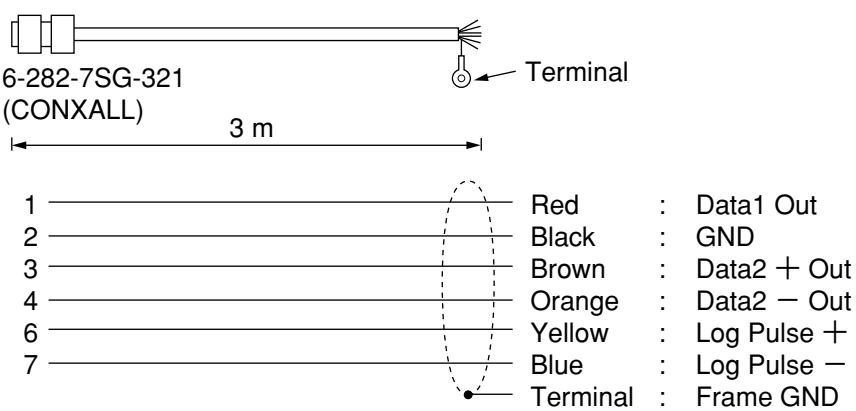
Stripping Dimensions on the Cable End



Assembly Drawing

3.4.8 Connection Cable (Optional Unit)

It is necessary to use the optional data cable shown in the table below if data needs to be output from the [DATA OUT] connector described under the item 3.4.4 “Data Output”.

Unit	Model	Remarks
Data cable	CFQ-8921	

3.5 Measures for the Electromagnetic Interference

The equipment needs to be installed properly in order to ensure its successful operation even though it has been designed to satisfy the requirements stipulated by the electromagnetic compativility (EMC).

Several factors that can affect the equipment performance are shown below.

3.5.1 Checks before the Connection

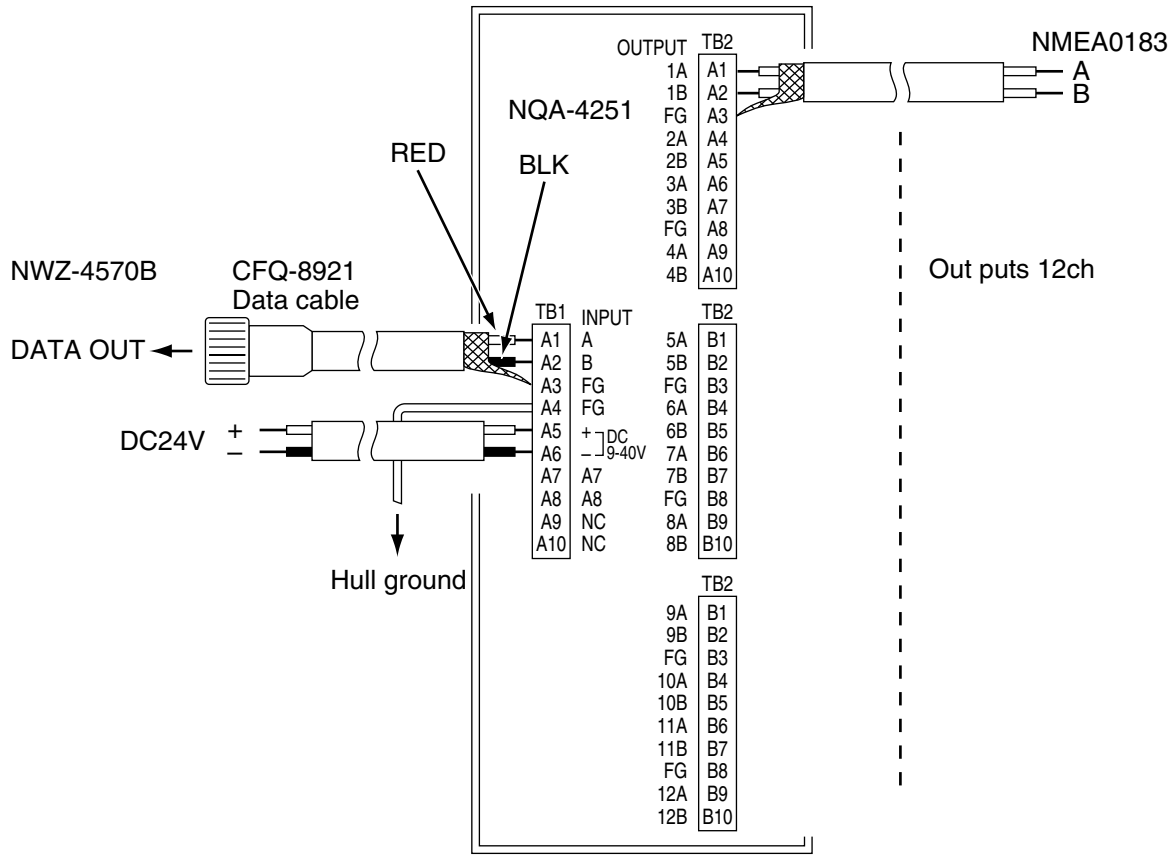
Observe the following instructions to avoid possible electromagnetic interference when connecting a cable (DGPS receiver, power supply, or data output cable) to the equipment.

- Keep the equipment away from another equipment by a minimum of 1 meter that is transmitting the high frequency signals or the cable transmitting such signals. Some examples of such equipment include the VHF transmitter and receiver and cable antenna. Secure the minimum distance of 2 meters in case the equipment needs to be installed nearby the SSB transmitter and receiver.
- Keep the equipment away from the radar beam by a minimum of 2 meters.
  In general, the radar beam is understood to be diverging from its source in the range of 30 degrees above and below its center axis (a total of 60 degrees).
- Do not use the power supply to start the engine as the power supply for the equipment.
  The equipment may be reset if its power supply voltage drops below 10 VDC, which in turn may result in the loss of some data or change in the operation mode even though the equipment itself will not be damaged.
- Use only the cables specified by us. The cable may fail to satisfy the EMC performance requirements if it is cut or reconnected after cutting. Thus, the cable should never be tampered unless otherwise specified in the instruction manual.

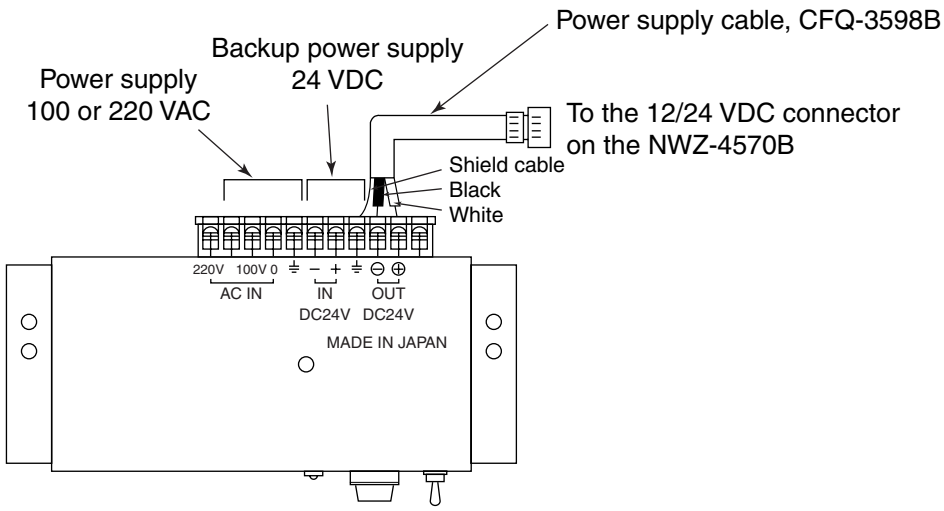
3.5.2 Checks before the Navigation

- Check the equipment before starting the navigation that it is free from any problems related to the radio communication, starting the engine, battery voltage, and so on.
- The equipment may be affected by the external factors. In general, the equipment will not be damaged due to such external factors, however, it may be reset or malfunction momentarily.

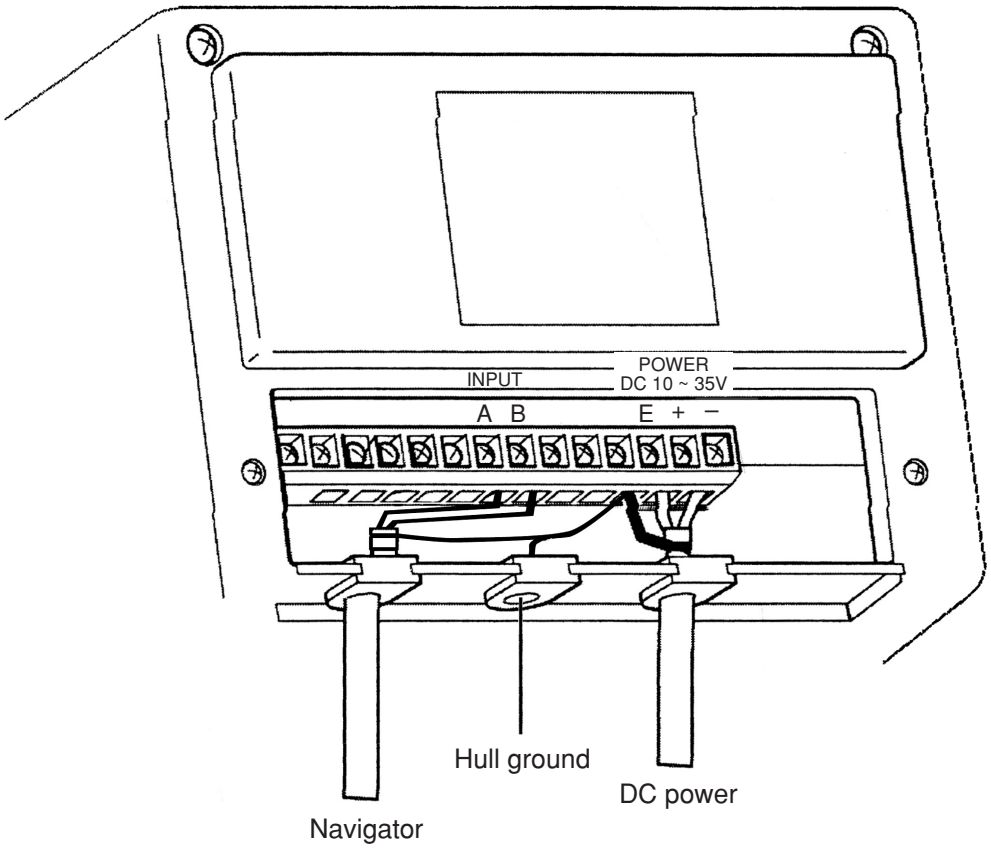
3.6 How to Connect the NQA-4251 Buffer Unit (Optional Unit)



3.7 Connection of the NBA-3581A AC Power Supply Unit (Optional Unit)



3.8 Connection of the NKG-84 Printer (Optional Unit)



4. Operation Method

This equipment can be probated operated using on the operation panel of the navigator.

4.1 Basic Operations

4.1.1 Turning the Power ON and OFF

- Turning the power on
  Press the PWR key to turn the power on, which will display the following screen and start the self-checks automatically.

```
ROM CHECK ..... OK
RAM CHECK..... OK
SENSOR CHECK ..... OK
GPS CHECK ..... OK
      ANY  KEY  TO  CLR
```

Memo

- A maximum period of 2 minutes is required before fixing the position if turn the power on for the first time after connecting the DGPS receiver or performing the master reset function. (Time required to make the position fixing will be approx. 1 minute for the next operation and after.) Entering the initial settings can reduce the time required for position fixing. See the itme 4.6.1.1 “Setting the Initial Data”.
- See the Attachment 2-A “List of messages” if any one of the check results is found faulty (i.e., when NG is displayed).

- Turning the power off
  The equipment can be turned the power off by simultaneously pressing the PWR and OFF keys.

4.1.2 Selection of the Language

The language used for the display can be selected from either Japanese or English.

- Press the PWR key to turn the equipment on while pressing the ◀ key to switch the language.
  The language switches from one to another each time when the above operation is made.

4.1.3 Contrast Adjustment

Press the CONT key and INC key to increase the contrast, which will darken the screen. Pressing the DEC key reduces the contrast to lighten the screen.

Caution

The contrast on the LCD varies depending on the ambient temperature. The contrast is set to the center level (tenth level of the 19 levels) after turning the power on. The display may appear too light depending on the ambient temperature, which may make it difficult to see the screen displayed. In this case, adjust the contrast.

4.1.4 Backlight Adjustment

The intensity of the backlight for the LCD and key panel can be selected among which can be changed each time when the DIM key is pressed. Note that the intensity is set to the “Low” position after turning the power on.

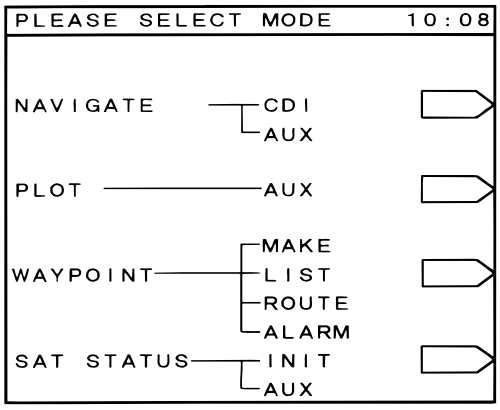
→ Low → High → Off →

Caution

An EL plate is used for the backlight of which service life is limited. Thus, it is recommended not to overuse it to extend its service life.

4.1.5 Return to the SELECT MODE Screen

A given operation will be interrupted and the screen will return to the SELECT MODE screen whenever the MODE key is pressed.



4.2 Screens

The key screens and functions for the equipment are shown in the next page.

Pressing the ▷ key will display a given menu, which will provide ease in operating the navigator. You will be able to seize the overall operation flow by simply looking at the figure shown on the next page.

You will be able to freely operate the navigator by simply looking at the figure if you are once get accustomed to it.

⚠CAUTION

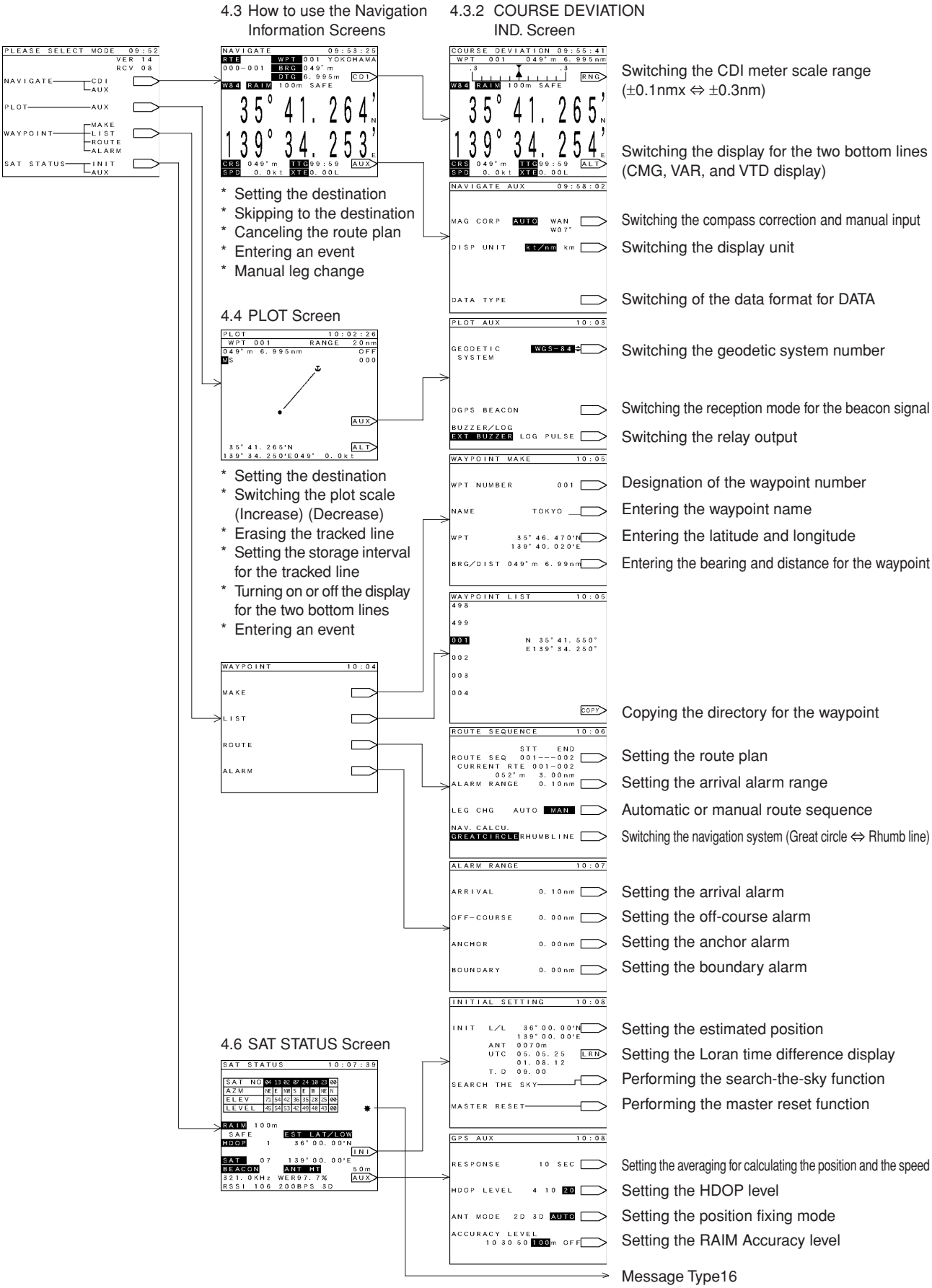
The password is needed to enter the setting screens on this navigator in order to comply with IMO requirement that any non-essential operation activities are not readily available from controls and to avoid changing the settings by mishandling.

The password is as follows.

press the AUX▷, then input ▲ ◀ 1 0 ENT .

password

4.2.1 Display and Operation List for the NWZ-4570B Navigator



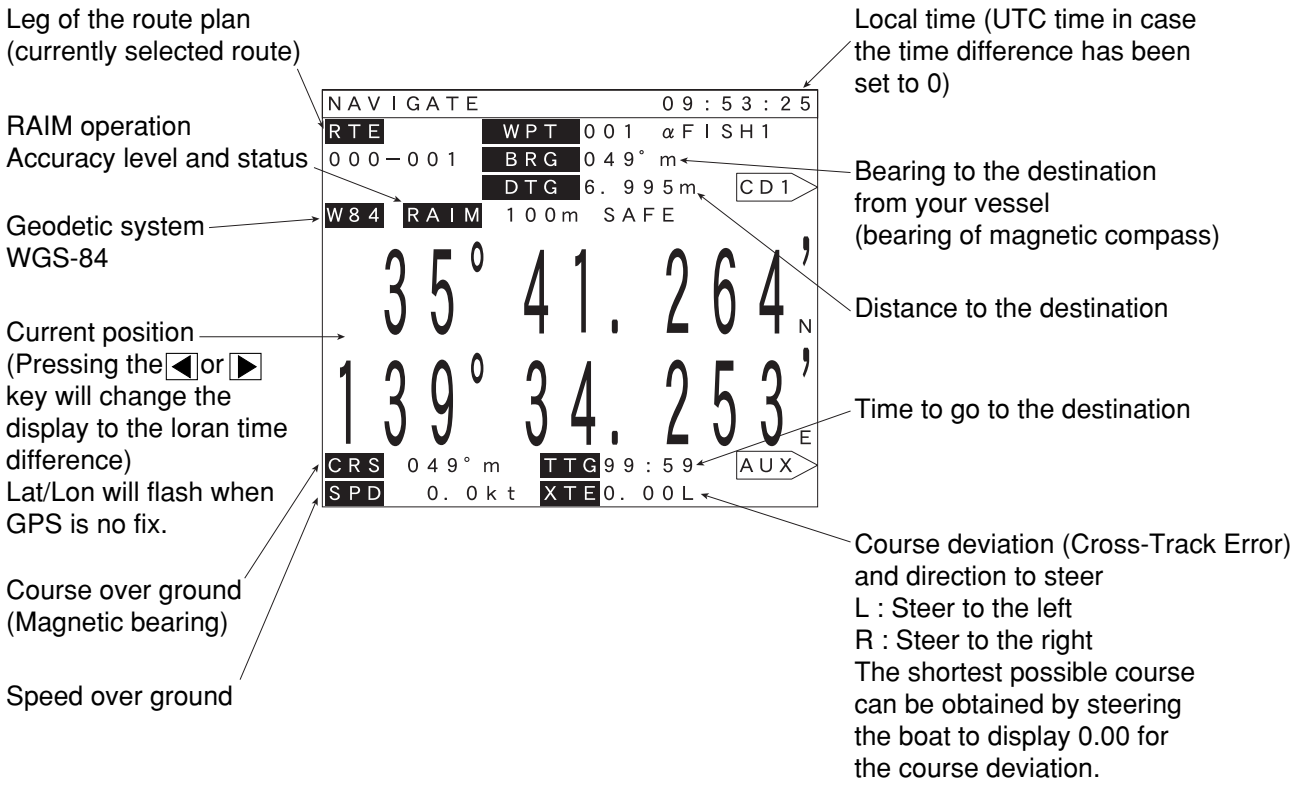
4.3 How to use the Navigation Information Screens

The navigation information screens provide you with a variety of information you require to steer the vessel. The screens consist of the following three screens.

Screen	Key functions
NAVIGATE	This screen mainly informs you on the bearing and distance to the next destination along the route and the position of your vessel.
COURSE DIVIATION IND.	This screen mainly informs you of the deviation from a planned course.
NAVIGATE AUX	This screen enables you to select the operating mode of the equipment among compass correction, display unit, and data output format.

4.3.1 NAVIGATE Screen

The screen automatically changes to the NAVIGATE screen if the first position fixing was finished after turning the power on.



The following operations can be made on the NAVIGATE screen.

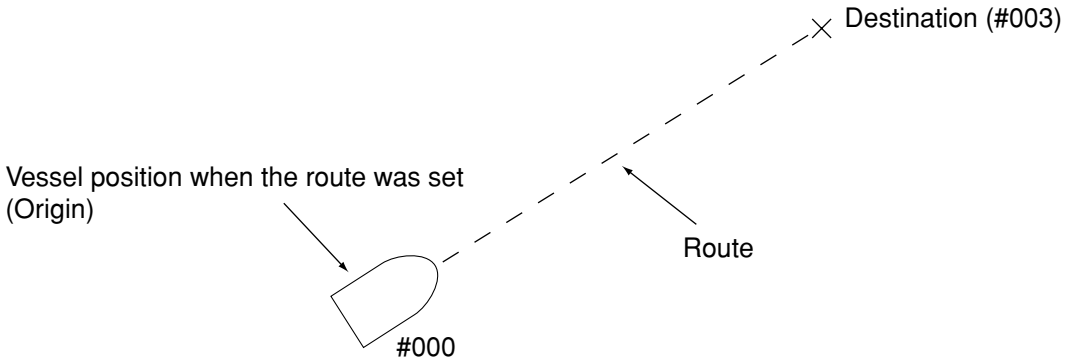
4.3.1.1 Setting a Destination

Operate as follows in case it is necessary to set a route, from the current vessel position to a destination (#003), if no route plan has been set according to the description stated under the item 4.5.3.1 “Setting the Route Plan”.

Press the GOTO , 0 , 0 , 3 , and ENT keys.

This operation will set the route from the current position to a destination #003.

“000 - 003” displayed in the RTE column on the upper left corner of the screen (NAVIGATE) represents the route thus set.



* Note that the vessel position #000 does not represents a current position, but starting point (origin) when the route was set.

Note that setting a destination stated above can be set even when the route plan has already been set.
The setting method is shown below.

- Resumption of a route

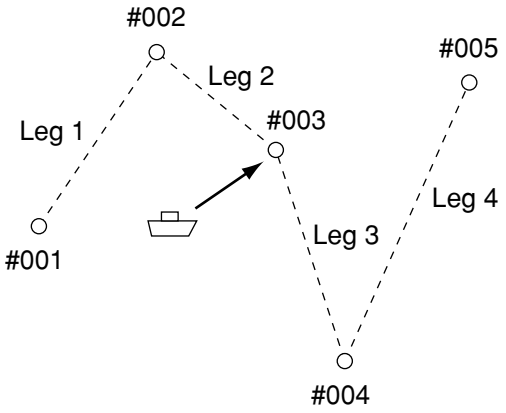
  Let’s assume a case when it is necessary to navigate the vessel to another destination by skipping a planned destination if the vessel is found deviated from the route.

  In this case, enter the new destination by making the GOTO operations. The navigation can be resumed according to the preset route if any one of the waypoints included in the preset route plan is entered as the new destination. However, it is not possible to resume the navigation according to the original route if a new destination is not included in the preset route plan has been set.

Caution

The preset route plan will be canceled if a new destination is entered.

Route plan #001 - #005

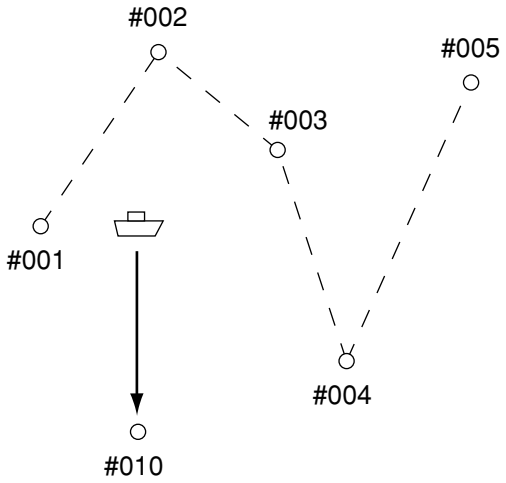


In case the next destination is changed to a given waypoint included in the route plan.

↓

The navigation can be resumed according to the route plan.

Route plan #XXX - #XXX



In case a new waypoint is set as the next destination which is not included in the route plan.

↓

The route plan is erased.

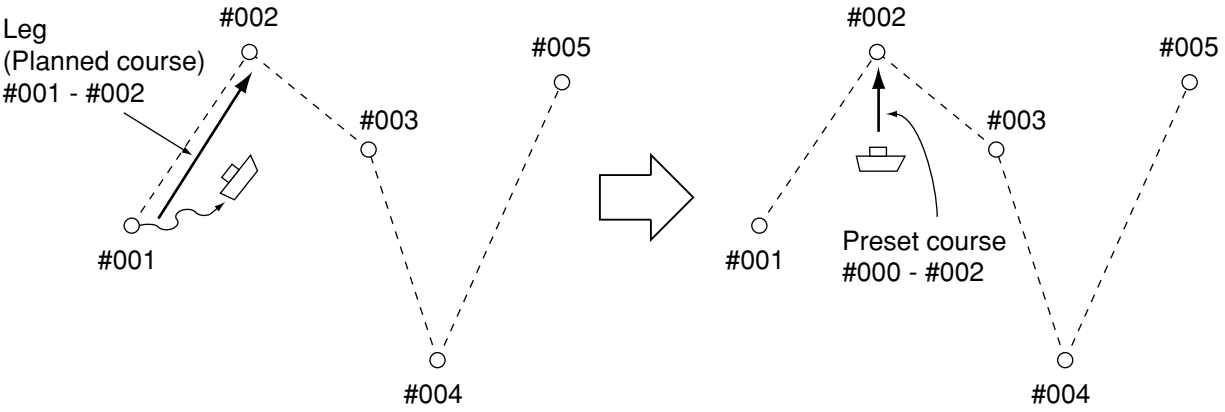
If the vessel was deviated from the route and does not return to the preset route, you can go to the destination along the shortest course.

Make the following operations to set the waypoint #002 as the next destination.

Press the [GOTO] , [0] , [0] , [2] , and [ENT] keys.

Now the leg of route plan display on the NAVIGATE screen will change from #001- #002 to #000 - #002.

Resume the route plan from #002.

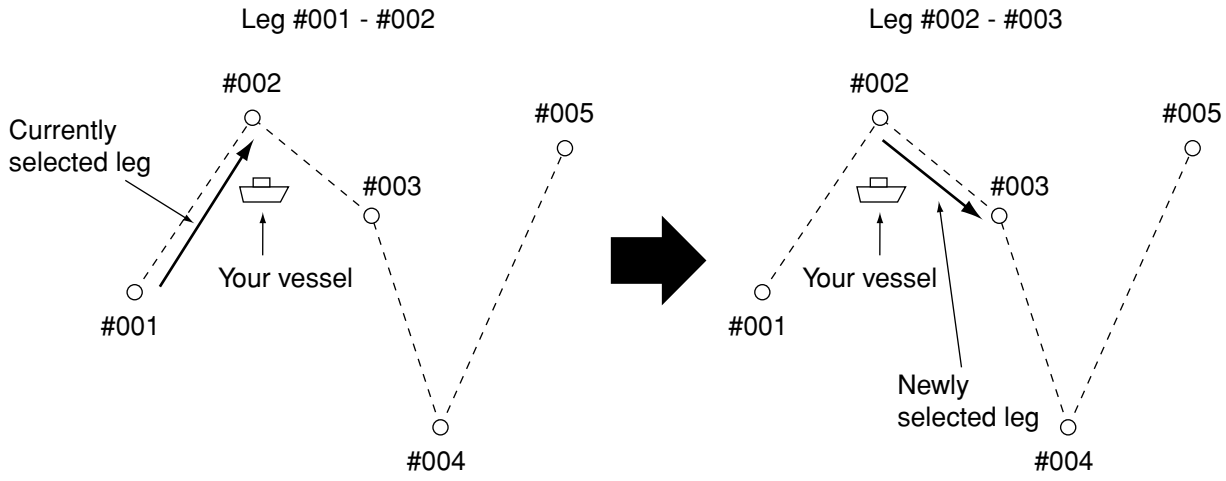


4.3.1.2 To Change the Leg (Manual Leg Change)

Let's assume a case that the current leg (#001 - #002) needs to be changed to the next leg (#002 - #003) provided that the route plan has been set to #001 - #005 since your vessel has entered the preset arrival alarm range. In this case, operate as follows.

Press the DEC and ENT keys.

The leg displayed on the NAVIGATE screen will change from #001 - #002 to #002 - #003. Note that the function can be used also when the automatic route sequencing mode is selected.



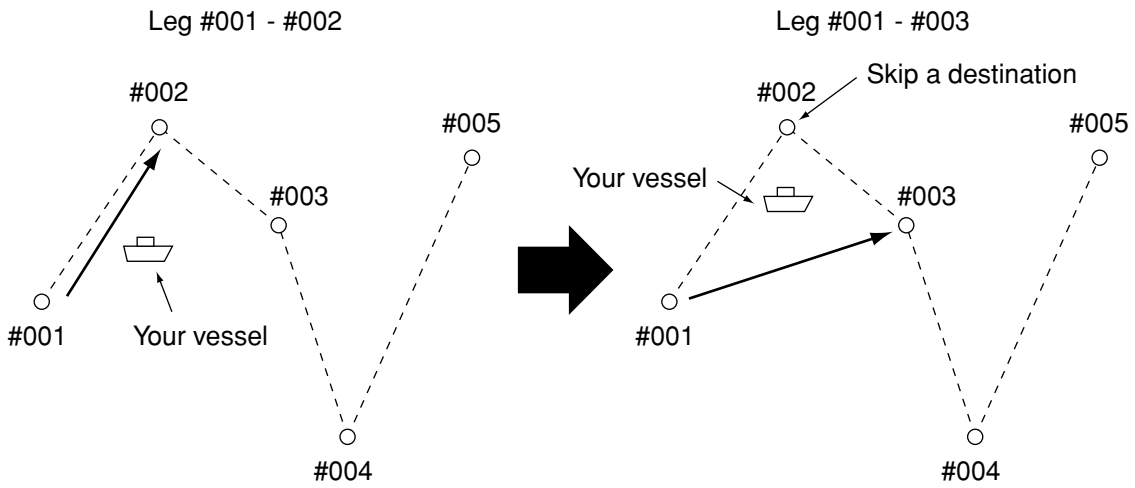
4.3.1.3 To Skip (Omit) a Destination

Let's assume a case when your vessel is navigating along the current leg between the destinations #001 and #002 according to the preset route plan, which is set to the waypoints #001 - #005. This function can be used in case it is necessary to skip the next destination and to navigate the vessel toward another destination #003, for example.

The next destination can be skipped if a given route plan has been set and your vessel is not navigating along the last leg. In this case, make the following operations.

Press the INC and ENT keys.

The leg displayed on the NAVIGATE screen will change from #001 - #002 to #001 - #003.



4.3.1.4 Canceling the Route

Entering “X X X” for a destination can cancel the route plan.

The following operations can cancel a given preset route. Note that they will also cancel the route plan. (See the item 4.5.3 “Route Plan” for details.) Note that the route plan can also be cancelled by the other methods. See the item 4.5.3.2 “Canceling the Route Plan” for details.

Press the GOTO and CLR keys, which will highlight the X X X . Then, pressing the ENT key under this condition will enter the X X X. Now, the preset route plan is canceled.

Change the input status for the destination as follows.

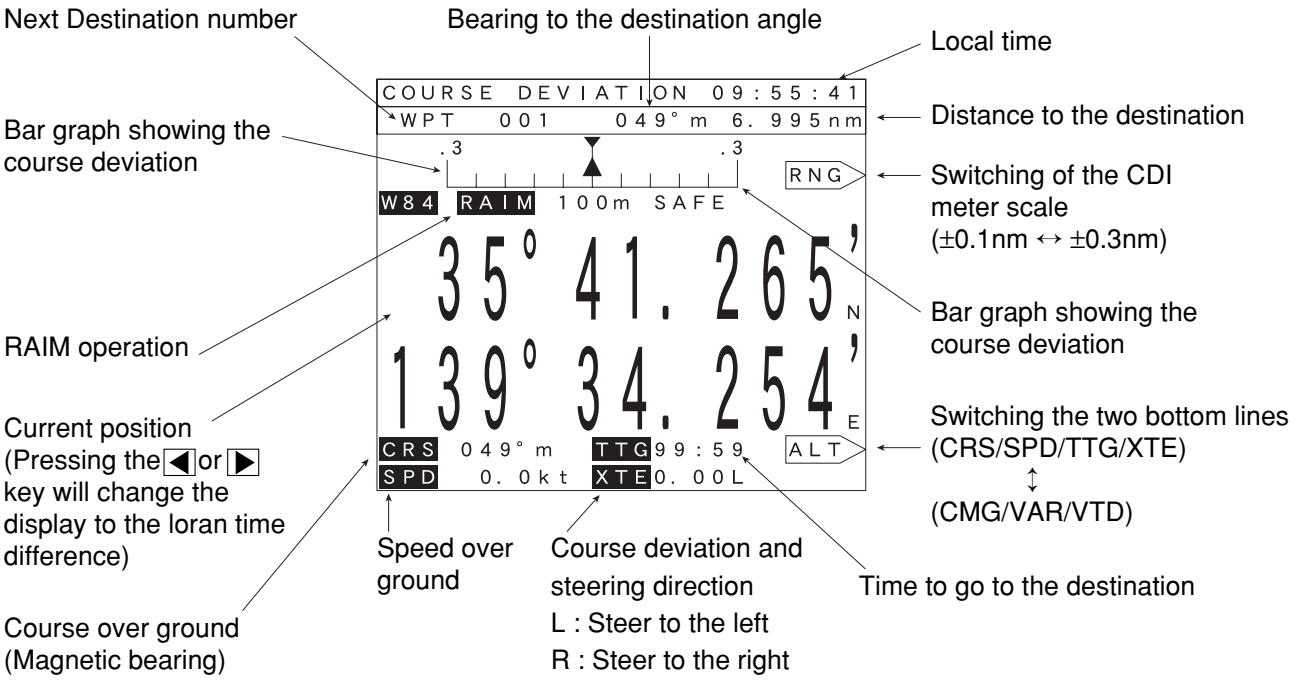
Press the GOTO key	_ _ _	(This is the status that is waiting for the input.)
	↓	
Press the CLR key	X X X	(The route will be canceled.)
	↓	
Press the CLR key	0 0 2	(The display returns to the original mode before commencing the cancel operation.)

4.3.1.5 Storing the Current Position (Event)

- Press the EVENT key to store the current position at a waypoint number in the range of #400 to #499. The current position thus stored is displayed with the ◇ mark on the PLOT screen.
- Press the GOTO key to display the stored number on the PLOT screen. The stored number is displayed on the right hand side of the ◇ mark. Press the CLR key if the number does not need to be displayed.

4.3.2 COURSE DEVIATION IND. Screen

The following operations can be made on the COURSE DEVIATION IND. screen besides those under the items 4.3.1.1 "Setting a Destination" and 4.3.1.5 "Storing the Current Position".



4.3.2.1 Switching the CDI Meter Scale

The CDI meter scale can be switched by pressing the RNG key.
(Switching from 0.1 NM to 0.3 NM and vise versa.)

4.3.2.2 Switching the Display on the Two Bottom Lines

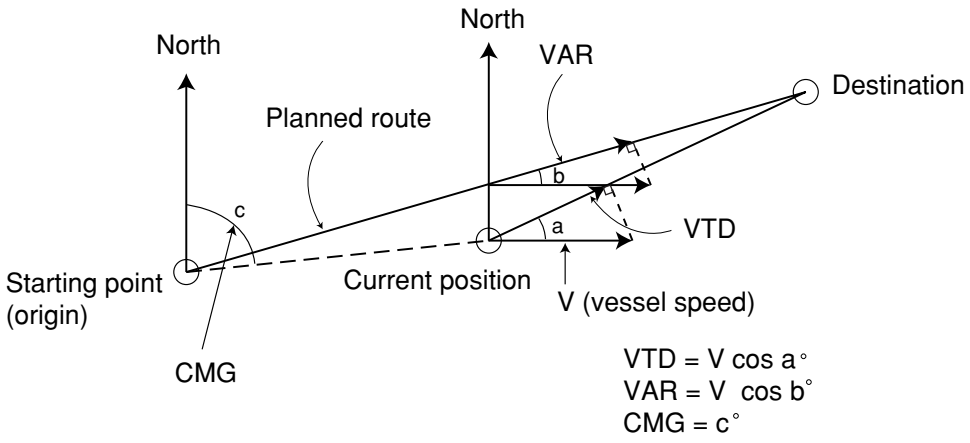
The contents of the display in the two bottom lines can be switched by pressing the ALT key.
Switching between “CRS/SPD/TTG/XTE” and “CMG/VAR/VTD”. (See the terminology shown below)

Terminology

- VTD (Speed of the destination component)
  VTD (An acronym of “Velocity Toward destination”)
  This in an index that shows how fast the boat is approaching toward the destination in the unit of knot when it is navigating at a given bearing angle and speed.

- VAR (Speed of the COG component)
  VAR (An acronym of “Velocity Along Route”)
  This in an index that shows how fast the vessel is approaching along the planned route in the unit of knot when it is navigating at a given course and speed.

- CMG (Average bearing)
  CMG (An acronym of “Course Made Good”)
  The bearing angle to the current position when viewed from the starting point.



4.3.3 NAVIGATE AUX Screen

The magnetic compass correction, display unit, and data output format can be set using the NAVIGATE AUX screen.

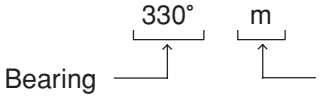
Pressing the AUX key on the NAVIGATE screen and inputting the password can set the following items.

4.3.3.1 Magnetic Compass Correction

It is convenient to display the bearing (true bearing) on the GPS navigator in the magnetic compass mode if the vessel is to be steered with the magnetic compass.

The variation of the magnetic compass can be corrected either automatically or manually. The correction value needs to be entered if the variation is to be manually corrected. However, no value needs to be entered if the variation is to be automatically corrected since the equipment automatically corrects the value by itself.

The relationship between the true bearing and magnetic bearing is as follows.



Symbol “m” (magnetic)	Type of bearing
When no symbol is displayed	True bearing
When the symbol “m” is displayed	Magnetic bearing

⚠CAUTION

The magnetic correction value represents an approximate value. Thus, it is necessary to manually enter a proper value by reading the magnetic variation from the chart if it is necessary to accurately display the bearing with the magnetic correction.

(1) To automatically correct the magnetic variation

- Press the key provided on the right hand side of the MAG CORR to highlight the AUTO display.
- The correction value for the current vessel position will be displayed after a while.

(2) To manually correct the magnetic variation

- Press the key provided on the right hand side of the MAG CORR to highlight the MAN display.
- Then, enter the correction value.

  Example) Read the magnetic variation from the chart. Operate as follows if the magnetic variation is found deviated by 6 degrees or more toward west from the true bearing.

  Press the 0 , 6 , and ENT keys.

  Press the 0 , 6 , E/W , and ENT keys if the vessel has deviated toward east (E).

Memo

- All the bearing angles will be displayed in the magnetic compass mode if a correction value other than zero is set.
- The display will be in the magnetic compass mode (the symbol “m” will be shown after a given value) if the magnetic variation is automatically corrected.
- The correction value may change from one sea area to another. In this case, a new correction value needs to be entered after coming the new area.

4.3.3.2 Setting the Display Unit

The distance can be displayed in either one of the two units, nm or km. The speed will be displayed in the unit of knot (kt) if nm is selected, or in the unit of km/h (KH will be displayed on the display) if km is selected. The unit is factory set to nm, press the ▷ key provided on the right hand side of the DISP UNIT to select the desired unit.

4.3.3.3 Selection of the Data Output Format

Select the data format that was selected under the item 3.4.4 "Data Output".

Any one of the following six data formats can be output, which are output from the DATA OUT connector provided on the rear panel. (See the item 3.4.4 "Data Output".)

Data format	Display on the screen
NMEA0180	0180
NMEA0183 version 1.5	0183 V1.5
NMEA0183 version 2.1	0183 V2.1
NMEA0183 version 2.3 (IEC61162-1)	0183 V2.3
JRC format	JRC
NMEA0183 version 2.3/SEC	0183 1SEC

To set the data format that the connection equipment is receivable, press MODE, NAVIGATE ▷, AUX ▷, then enter password and press DATA TYPE ▷.

Press Data 1 ▷ to set the desired output format of Data 1.

Press Data 2 ▷ to change the type of output format of Data 2.

If "NMEA0183 version 2.3 (IEC61162-1) output per second" is selected, the output sentences can be selected among the following:

ZDA, GGA, RMC, GNS, VTG, DTM, GLL, GRS, GSA, GST, GSV, MSS, APB, BWC, RMB, XTE, GBS, PJRCDGP8 (___ : Default)

Memo

It is impossible to select all the sentences at a time.

To display the data select menu, press Data Select [ ] and then [SEL].
Highlighted letters : Output sentence
Normal letters : Output stopped sentence (deleted sentence from output)
Press [DATA2] (or [DATA1]) to select the output sentence from Data 2 (or Data 1).
After pressing [SEL], the cursor blinks.

(1) Adding the output sentence
Move the cursor onto the desired sentence to add by using [▲] [▼] [◀] [▶] keys and press [ENT].
Note that if the data volume exceeds the set value, "Data Capacity Over, Delete Data 1,2" is displayed. Then, delete the unneeded sentences by following the "Deleting the sentence to output" below. Both Data 1 and 2 need to be deleted.

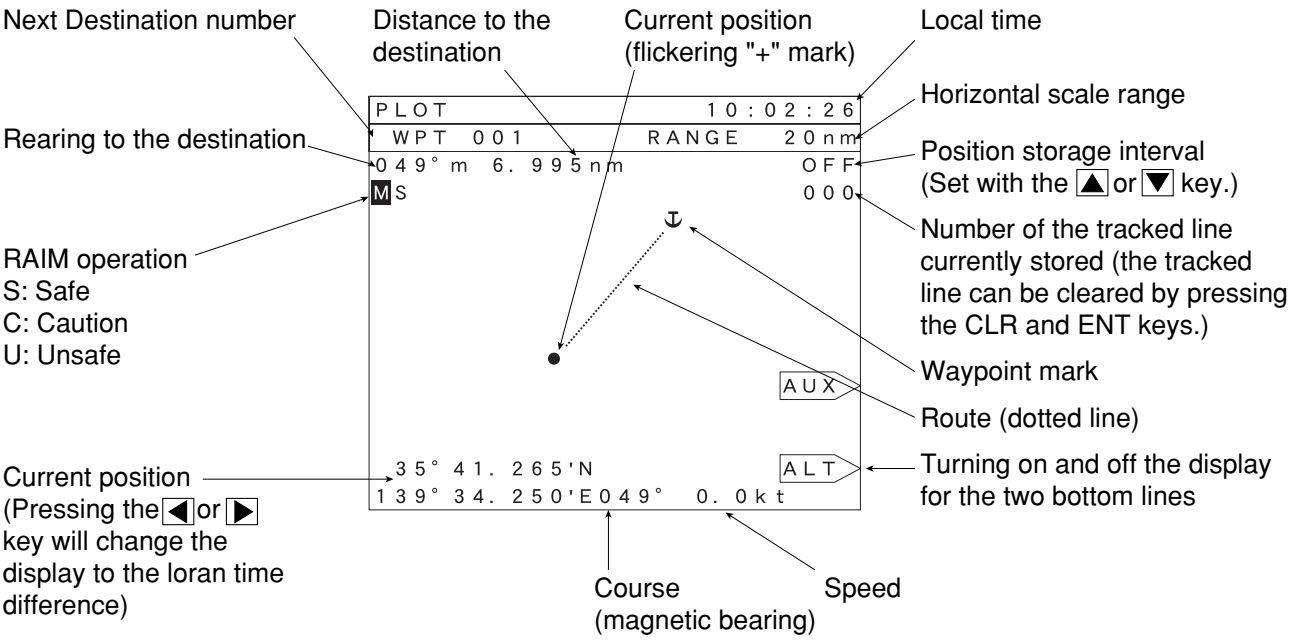
(2) Deleting the sentence to output
Move the cursor onto the desired sentence to delete by using [▲] [▼] [◀] [▶] keys and press [ENT].

The data format is factory set to "NMEA0183 version 2.3 (IEC61162-1) output per second" and "Output sentence
ZDA, GGA, RMC, GNS, VTG, DTM."

⚠CAUTION

If select “NMEA0183 output per second” at DATA1 (or DATA2), the output of DATA2 (or DATA1) is fixed to “NMEA0183 output per second” automatically, and other data format can not be selected.

4.4 PLOT Screen (Tracked Line Screen)



4.4.1 PLOT Screen

The following operations can be made on the PLOT screen.

4.4.1.1 Setting the Horizontal Scale Range

The term range means the horizontal length on the PLOT screen. In other words, the distance between the leftmost and rightmost end of the PLOT screen will be 5 nm if the range is set to 5 nm. The ranges of 1, 2, 5, 10, 20, 50 and 100 nm are available, which can be selected by pressing either the INC or DEC key.

When the INC key is pressed the range will increase.

When the DEC key is pressed the range will decrease.

4.4.1.2 Setting the Plot Interval

The equipment can store a maximum of 300 points of tracked positions.

The memory continues to store the tracked points at a preset interval, and the latest 300 tracked point data are maintained at any time. This means that the old position data will be erased in the chronological order if the tracked position data has exceeded 300 points.

- Set the storage interval with ▲ or ▼ key (scroll key).

Available plot intervals	Position storage interval	Position storage time
OFF	No tracked point data	No tracked point data
30 s	Every 30 seconds	150 minutes
1 m	Every one minute	5 hours
3 m	Every three minutes	15 hours
5 m	Every five minutes	25 hours
10 m	Every 10 minutes	50 hours
30 m	Every 30 minutes	Approx. 6 days
0.2	Every 0.2 nm	Approx. 60 nm
0.5	Every 0.5 nm	Approx. 150 nm

Memo

A short storage interval will assure storage of accurate tracked line; however, the overall duration of time that can be stored will be limited. On the contrary, the overall duration of time that can be stored will be extended if a longer storage interval is selected although the tracked line will tend to become rough (like a line graph).

4.4.1.3 Erasing the Tracked Line

Press the CLR and ENT keys on the PLOT screen to erase all the 300 tracked line. (The destination and route data remain without being erased.)

4.4.1.4 Setting a Destination

Example) In case it is necessary to set a route from the current position to a destination (002).

Press the GOTO , 0 , 0 , 2 and ENT keys. Now the route from the current position (000) to the destination (002) has been set. See the item 4.3.1.1 “Setting a Destination”.

4.4.1.5 To Store the Current Position

Pressing the EVENT key will store the current position. See the item 4.3.1.5 “Storing the Current Position”.

4.4.1.6 Turning ON and OFF the Display for the Two Bottom Lines

Pressing the ALT > key will turn the display on and off for the current position, course, and speed displayed at the bottom of the screen.

4.4.1.7 To Display the Current Position at the Center of the Screen

Press the ENT key to display the current position at the center of the display.

4.4.2 PLOT AUX Screen

Pressing the AUX key on the PLOT screen and inputting the password can make the following settings.

4.4.2.1 Setting the Geodetic System

⚠CAUTION

Confirm that the same geodetic system is used for both the chart and the navigator to be used before starting the navigation. Use of unmatched geodetic systems will result in wrong vessel position even at the same latitude and longitude, which in turn can cause an accident.

The latitude and longitude for a given position measured with the DGPS receiver is based on WGS-84 geodetic system and can be converted into the some of another geodetic system. A total of 46 geodetic systems are stored in the equipment, any one of them can be easily selected.

- Press the key provided on the right hand side of the GEODETIC SYSTEM or ▲ or ▼ key to select a desired geodetic system. Note that the names of the geodetic systems will be displayed only for the first nine systems. (The rest are only numbered. See the Attachment 2-B “List of Geodetic Systems” for the details.) The geodetic system is factory set to WSG-84.

4.4.2.2 Setting the DGPS BEACON

- Press the ⇨ key provided on the right hand side of the DGPS BEACON.

① In case the needs to be automatically selected
- Press the ⇨ key to highlight the AUTO.
- The equipment will automatically select and receive a frequency and baud rate for the beacon station that is closest to the GPS position measured with the DGPS receiver.

② In case the needs to be manually selected
- Press the ⇨ key to highlight the MANUAL. Then, manually enter the frequency and baud rate of the beacon station that needs to be selected.

Example)

When selecting the beacon station with the frequency of 320.0 kHz and baud rate of 200 BPS.

(1) Press the ⇨ key provided on the right hand side of the FREQ and set the frequency to 320.0 kHz by pressing either ▲ or ▼ key.

(2) Press the ⇨ key provided on the right hand side of the BPS and set the baud rate to 200 by pressing either ▲ or ▼ key.

The value shown under the term RSSI displayed at the bottom of the screen represents the level of the signals being received from the beacon station.

4.5 Registration the Waypoint

⚠CAUTION

When creating the destination by the use of the bearing and distance data in (3) below, be sure to select great circle navigation in 4.5.3.5 “Switching between Great-circle and Rhumb-line”.
If lhumb-line navigation is selected, it is impossible to enter the destination using the methods in (3) below.

The equipment has a memory to store a total of 499 waypoints. The registered waypoints will not be erased even when the equipment power supply is shutoff because they are backed up with the built-in battery. Therefore, all the important position data such as the route or fishery data can be maintained under any circumstances. Each waypoint can be identified and managed with the numbers of 001 to 499. Note that the waypoint memory for 400 to 499 is used commonly with the event memory.

Following any one of the three steps described below can set the waypoint.

(1) Method to directly store to current position (event)
- Pressing the [EVENT] key directly stores the current position when passing by a fishery or buoy. The waypoints entered with the event function are stored starting from #400 to #499 in the chronological order. Note that the used memory locations will be skipped.

(2) Method to enter the latitude and longitude
- Directly enter the values read from the chart or the latitude and longitude obtained from other navigation information.

(3) Method to enter the bearing and distance from the current position
- Only when great circle navigation “4.5.3.5” is selected for navigational calculations, the destination can be enter using the bearing and distance.
  The equipment will automatically calculate the latitude and longitude of the waypoint if the bearing and distance from the current position have been entered to it.

Memo

We would recommend you to take a note on the waypoint numbers since there are as many as 499 waypoints available with the equipment. Attachment 2-D “Table of Waypoints” will provide ease in accessing to it.

4.5.1 WAYPOINT Screen

Make the following operations (1) to (3) to register a waypoint.

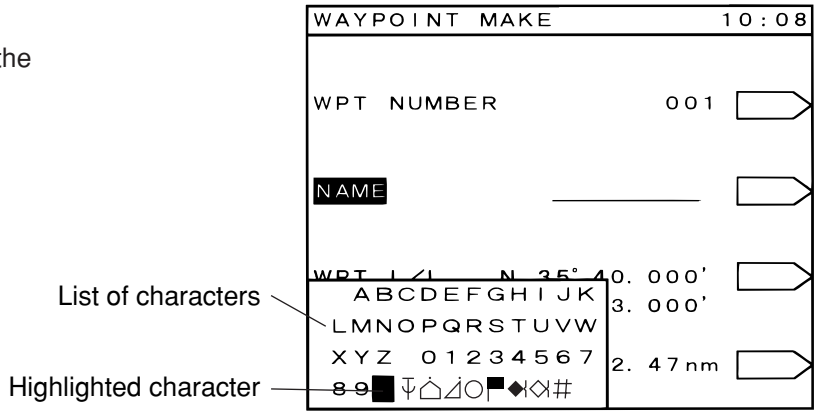
(1) Registering the Waypoint Number
Firstly specify a waypoint number when registering it.

- Press the [▷] key provided on the right hand side of the WPT NUMBER to enter a desired waypoint number.

Example) In case it is necessary to register the waypoint 010.
- Press the [▷] key provided on the right hand side of the WPT NUMBER, and [0], [1], [0], and [ENT] keys.
  If a wrong input is made, repeat the operations stated above once again.

(2) Entering the Waypoint Name
Next, enter the waypoint name.

- Press the [▷] key provided on the right hand side of the NAME.



- Then, a list of characters will be displayed at the lower left corner of the screen.
- Move the highlighted position to the desired character with the [▲] [▼] [◀] [▶] key, then, press the [ENT] key.

Pressing the [ENT] key upon completion of the character input will register the name and automatically return the screen to the original mode. Note that the input of a given waypoint name with less than eight characters can be completed by pressing the [INC] or [DEC] and [ENT] keys.

Memo

- Press the [CLR] key and [▷] key provided on the right hand side of the NAME if a wrong character has been entered. Then, repeat the operations stated above to register a correct name.
- The first character of the waypoint name will be displayed on the PLOT screen as the symbol for the waypoint. Therefore, it is recommended to select an appropriate symbol or character at the beginning of a given waypoint when naming it.

  ⚓ _ MINATO
  ⚓ This symbol is displayed on the PLOT screen.

(3) Entering the position
The position needs to be entered either with latitude and longitude, or bearing and distance.

① Entering the latitude and longitude
The equipment accepts direct inputs of the latitude and longitude for the waypoint.

Example) To register the latitude 35 degrees 41.935 minutes north and longitude 139 degrees 14.562 minutes east as the waypoint.

- Press the [▷] key provided on the right hand side of the WPT L/L, then the [3], [5], [4], [1], [9], [3], [5], [N/S ▷], and [ENT] keys to register the latitude.
- Then, press the [1], [3], [9], [1], [4], [5], [6], [2], [E/W ▷], and [ENT] keys to register the longitude.
- Pressing the [ENT] key after entering the longitude will execute the latitude and longitude inputs.
- It is not necessary to press either the [N/S ▷] or [E/W ▷] key if the display is correct.

② Entering the bearing and distance from the current position

The equipment accepts direct input of a desired waypoint position with the bearing and distance from the current position. This function can be used when it is necessary to enter the waypoint on the radar screen with the bearing and distance to the specified landmark.

Example) Operate as follows to enter 45 degrees and 7.0 nm. Note that the true bearing needs to be entered in the true bearing display mode, or the magnetic bearing in the magnetic bearing display mode.

- Press the [▷] key provided on the right hand side of the BRG/DIST, then the [0], [4], [5], [ENT], [0], [7], [0], and [ENT] keys. This operation will execute the bearing and distance inputs.

4.5.2 WAYPOINT LIST Screen

4.5.2.1 Copying the Waypoint Data

The waypoint position stored at a given number in the equipment can be copied to another number. This is a convenient function when it is necessary to edit the destinations stored with the [EVENT] key or to rearrange the waypoint numbers for a given route plan.

- Firstly select a waypoint number that needs to be copied with the [▲] or [▼] key.
  The waypoint number can be easily and quickly located by pressing the [GOTO] key before the desired waypoint number input.
- Press the [COPY ▷] key after selecting a waypoint that needs to be copied.
- Enter the waypoint number to be copied to when [COPY FROM 003 TO _ _ _] and [COPY ▷] messages are displayed.

4.5.2.2 Erasing the Waypoint Data

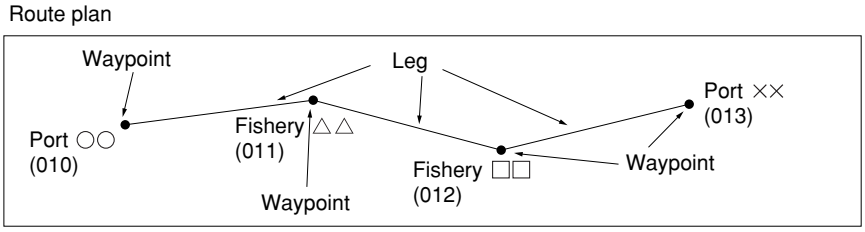
A registered waypoint data can be erased with the equipment by implementing the following operations.

- Select a waypoint number that needs to be erased on the WAYPOINT LIST screen.
  Select the number with the [▲] or [▼] key, or [GOTO] key before waypoint number input.
- Then, press the [CLR] and [ENT] keys to erase the waypoint data.

4.5.3 ROUTE SEQUENCE Screen

How to use the route plan

A route plan consists of multiple legs obtained by connecting multiple waypoints.



For example, let's assume a case when navigating from a port ○○ (010) to a fishery △△ (011), to another fishery □□ (012), and then to another port ×× (013).
The route plan consists of a series of leg obtained by connecting the multiple waypoints starting from the port ○○ (010) to the fisheries (011 and 012) and then to the port ×× (013).

The equipment has a function to automatically switch the current leg to the next leg after the vessel has entered the preset arrival alarm range if the vessel is being navigated based on the preset route plan. See the item 4.5.3.3 "Setting the Arrival Alarm Range" and 4.5.3.4 "Switching between the Automatic and Manual Leg Change".

4.5.3.1 Setting the Route Plan

Press the ▷ key provided on the right hand side of the ROUTE SEQ to enter the starting waypoint number 010 to set the route plan 010 to 013, for example.

Press the [0], [1], and [0] keys.

Next, enter the last waypoint number 013.

Press the [0], [1], [3] and [ENT] keys.

Memo

- The route plan needs to be registered in the order of memory number under any circumstances; however, the numbers for the starting and last waypoint do not need to be registered in the chronological order. For example, the route plan can be set to navigate the vessel from the port ○○ (010) to the port ×× (013) and then back to the port ○○ (010) from the port ×× (013).
- Enter XXX-XXX for the route plan if a given preset route plan needs to be canceled. The route plan can also be erased by pressing the [GOTO] key on the NAVIGATE screen, COURSE DEVIATION IND. screen, or PLOT screen to enter "XXX".
  XXX denotes the state ready for input and can be selected by pressing the [CLR] key.

4.5.3.2 Canceling the Route Plan

Any one of the following four methods can cancel the preset route plan. Note that "XXX" needs to be entered as the waypoint to cancel the route plan, which is common to all the four methods. XXX denotes the state ready for input and can be selected by pressing the [CLR] key. (See the item 4.3.1.4 "Canceling the Route".) The display of "_ _ _" (three hyphens) will appear in the column after the route plan has been canceled. Note that the information related to the waypoint (bearing, distance, time, and deviations) is not displayed in other columns since canceling the route plan means that no destination needs to be set.

(1) Enter "XXX - XXX" to the route plan on the ROUTE SEQUENCE screen.
(2) Press the [GOTO] key on the NAVIGATE screen to enter "XXX" as the waypoint.
(3) Press the [GOTO] key on the COURSE DEVIATION IND. screen to enter "XXX" as the waypoint.
(4) Press the [GOTO] key on the PLOT screen to enter "XXX" as the waypoint.

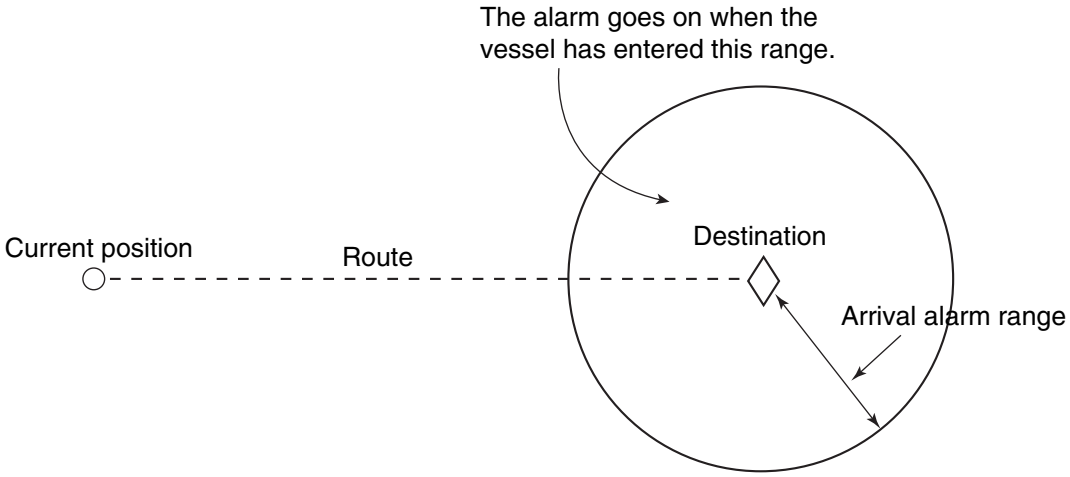
4.5.3.3 Setting the Arrival Alarm Range

Operate as follows after registering the route plan. None of the following operation is necessary if the arrival alarm range has already been set under the item 4.5.4.1 “Setting the Arrival Alarm Range”.

For example, operate as follows to set the alarm range to 0.10 nm.

- Press the ▷ key provided on the right hand side of the ARARM RANGE, then, the 0 , 1 , 0 , and ENT keys.

  Now, the alarm range has been set. The alarm will go on if the vessel has entered the circle with the radius of 0.1 nm from the destination.



Memo

The arrival alarm and anchor alarm functions can not be set simultaneously since they contradict to each other. Setting one function will automatically cancel the other.

4.5.3.4 Switching between the Automatic and Manual Leg Change

The equipment has a function to automatically change the leg from one to another (automatic leg change) when the vessel has entered the area within the preset distance from a given destination, which has been set with the arrival alarm function, while it is navigating according to the route plan. In addition, the leg can also be changed manually. Follow the steps described below to switch the change mode.

① In case it is necessary to automatically change
Press the ▷ key provided on the right hand side of the LEG CHG to highlight AUTO .

Caution

The setting mode will automatically switch to the manual mode after the route plan has been canceled according to the procedures described under the item 4.5.3.2 “Canceling the Route Plan”. In this case, it is necessary to change the leg each time after arriving at a given destination.

② In case it is necessary to manually change
Press the ▷ key provided on the right hand side of the LEG CHG to highlight MAN .
Pressing the DEC and ENT key on the NAVIGATE screen can also change the leg.

4.5.3.5 Switching between Great-circle and Rhumb-line

The following two types of navigation calculation methods can be adoped with the equipment, which should be selected depending on the application.

- Great circle
- Rhumb line

The characteristics of the great circle and rhumb line

The vessel can navigate by the shortest possible distance from the current position to the destination with the great circle. However, the steersman find the bearing which continuously changes as the vessel navigates, which differs from the bearing obtained with the ordinary chart.

The vessel can navigate without changing the bearing from the current position to the destination with the rhumb line. The rhumb line bearing coincides with the line obtained by connecting the current position and destination on the ordinary chart.

In general, the great circle is often used for the long route plans and the other for relatively short route plans.

The navigation mode can be switched between the great circle and rhumb line as described below.

Press the  key provided on the right hand side of the NAV. CALCU. on the ROUTE SEQUENCE screen to select either one of the two.

4.5.4 Setting the Navigation Alarms

The following four navigation alarms can be set with the equipment.

① Arrival alarm
② Off-course alarm
③ Anchor alarm
④ Boundary alarm

4.5.4.1 Setting the Arrival Alarm Range

An alarm can be activated when the vessel has approached to the destination.

Example) Operate as follows when the alarm needs to be activated at a distance of 0.10 nm from the destination.

- Press the ▷ key provided on the right hand side of the ARRIVAL, then, [0], [1], [0], and [ENT] keys.

Memo

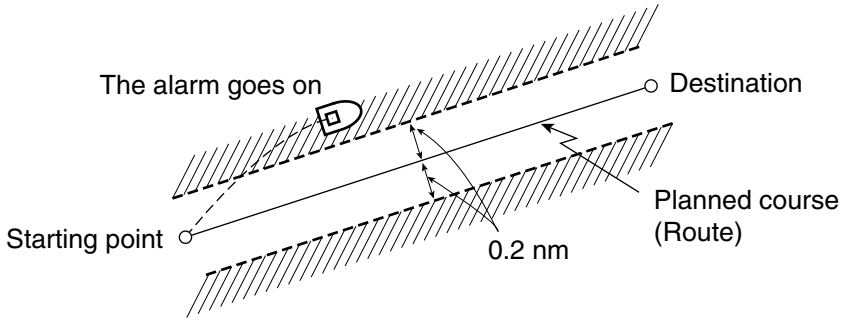
- This setting is not required if the arrival alarm has already been set according to the instructions stated under the item 4.5.3.3 “Setting the Arrival Alarm Range”.
- The alarm sound goes off when the [CLR] key is pressed, however the alarm display will remain turned on either the vessel has crossed the borderline or the setting is changed to exclude the current position.
- No alarm will go off if the range is set to zero nm.
- The arrival alarm and anchor alarm functions can not be set simultaneously since they contradict to each other. Setting one function will automatically cancel the other.

4.5.4.2 Setting the Off-Course Alarm Range

An alarm can be activated when the vessel has deviated from the preset course.

Example) In case it is necessary to activate the alarm when the vessel has deviated by 0.2 nm or more from the planned course (See the figure shown below).

- Press the ▷ key provided on the right hand side of the OFF-COURSE, and then the [0], [2], [0], and [ENT] keys.



Memo

- The alarm sound goes off when the [CLR] key is pressed. However, the alarm display remains turned on unless the vessel has returned to a position within the preset range or the set range is changed.
- No alarm goes off if the range has been set to zero nm.
- The off-course alarm and boundary alarm functions can not be set simultaneously since they contradict to each other. Setting one function will automatically cancel the other.

4.5.4.3 Setting the Anchor Alarm Range

An alarm can be activated when the vessel has drifted out of the preset destination range.

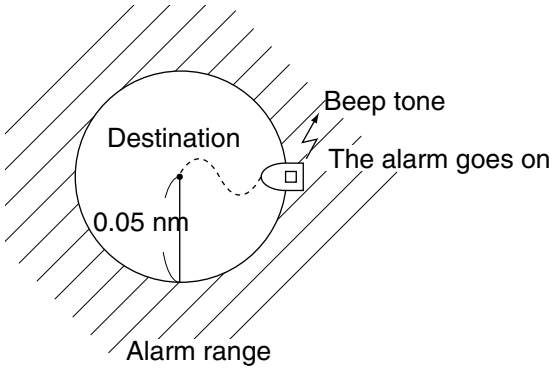
Normally, the anchor alarm is set to the anchor point being as the destination and to inform the steersman that the vessel has drifted beyond a preset distance from the destination.

At first, set a given position that needs to be maintained as the destination by following the steps described under the item 4.3.1.1 “Setting a Destination”.

In case it is necessary to register the current position as the destination, use the event function to set a destination number to it. (See the item 4.3.1.5 “Storing the Current Position”)

Example) In case it is necessary to activate the alarm when the vessel has drifted by 0.05 nm or more from the anchor point. (See the figure shown below.)

- Press the ▷ key provided on the right hand side of the ANCHOR, and then the [0], [0], [5], and [ENT] keys.



Memo

- Pressing the [CLR] key will turn off the alarm sound, however, the alarm display will remain turned on unless the vessel has returned back into the preset alarm range or the a new setting range is entered.
- No alarm goes off when the alarm range is set to zero nm.
- The arrival alarm and anchor alarm function can not be set simultaneously since they contradict each other. Setting one alarm will automatically cancel the other.

4.5.4.4 Setting the Boundary Alarm Range

An alarm can be activated when the vessel has crossed the borderline for the planned course.

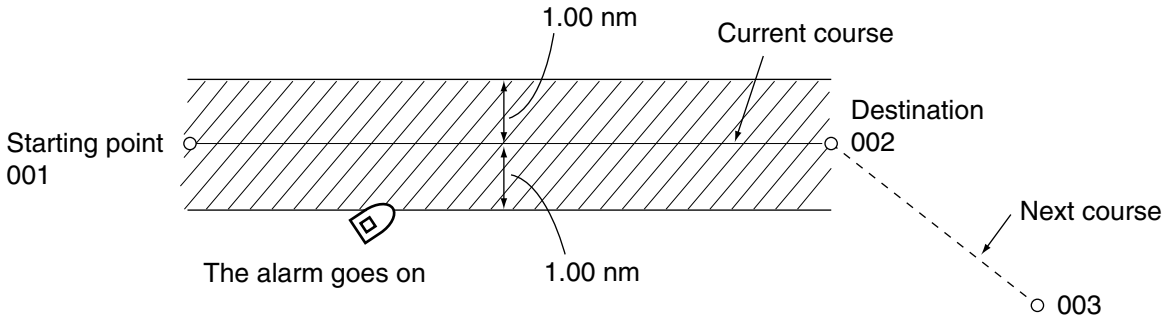
The boundary alarm informs the steersman that the vessel has entered the preset area along a given course, which is defined with two given points.

The alarm can also be activated when the vessel has crossed a borderline (planned course), such as 200 nm from the coastal line or fishery agreement line, or so on.

Example) In case it is necessary to activate the alarm when the vessel has crossed the borderline for the planned course, which has been set 1.00 nm away from it. (See the figure below.)

- Press the [▷] key provided on the right hand side of the BAUNDARY, and then the [1], [0], [0], and [ENT] keys.

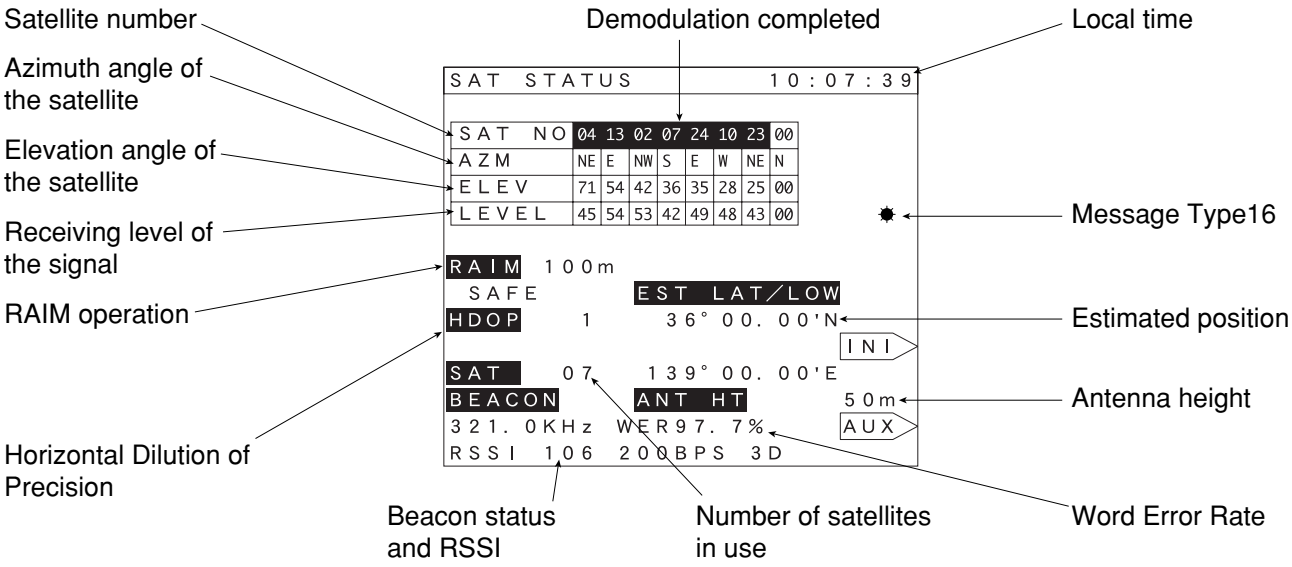
In case the vessel is navigating from the destination 001 to 002 based on the route plan set to the destination 001 to 003. (See the figure shown below.)



Memo

- Pressing the [CLR] key will turn off the alarm sound, however, the alarm display will remain turned on unless the vessel has returned back into the preset alarm range or a new alarm range is entered.
- No alarm goes off when the alarm range is set to zero nm.
- The off-course alarm and boundary alarm function can not be set simultaneously since they contradict each other. Setting one alarm will automatically cancel the other.

4.6 SAT STATUS Screen



4.6.1 INITIAL SETTING Screen

4.6.1.1 Setting the Initial Data

> Caution
>
> The initial settings will be registered on the DGPS receiver after the time difference between the universal time coordinated (UTC) and local time is enter (when the ENT key is pressed after entering the numerical values). The settings will be invalid if the setting operation is terminated before entering the time difference.

Enter the initial settings to the navigator if any one of the following conditions apply.

(1) The first position fixing is to be made after installing the DGPS receiver.

(2) The master reset function has been performed.

The navigator will automatically make settings that are required to properly operate it, which is connected to the GPS or DGPS receiver.

Entering the initial settings can reduce the time required for position fixing since they will help the equipment to locate the satellites that are required to position your vessel.

- Press the INI key on the SAT STATUS screen to display the INITIAL SETTING screen. Then, operate the keys in the following sequence.
  - ① Enter the vessel position latitude and lognqitude within the tolerance of ± one degree.
  - ② Enter the antenna height (from the mean sea level) of the vessel.
  - ③ Enter the UTC (universal time coordinated).
  - ④ Enter the time difference between the UTC and local time.

Example) When setting the following:
Vessel position (N 35 ° 33.00' and E 139 ° 50.00')
Antenna height : 9 meters
UTC : 15:48 on January 11, 1999
Time difference : +09:00 = +9 hours

- Press the [ ] key provided on the right hand side of the INIT L/L.
  - [3], [5], [3], [3], [0], [0], [N/S], and [ENT] keys.
  - [1], [3], [9], [5], [0], [0], [0], [E/W], and [ENT] keys.
  - [9] and [ENT] keys.
  - [9], [9], [0], [1], [1], [1], and [ENT] keys.
  - [1], [5], [4], [8], and [ENT] keys.
  - [0], [9], [0], [0], [+/-], and [ENT] keys.

(The time difference needs to be obtained by subtracting the UTC from the local time and pressing the [+/-] key to select the unit (either positive or negative) for the value thus obtained.)

4.6.1.2 Setting the Loran Station

Settings related to the Loran station can be made on this screen. See the item 4.7.1 “Loran Time Difference Display” for details.

4.6.1.3 Search the Sky

This function may be performed if the equipment has repeatedly failed to position your vessel for a prolonged period of time and no initial settings can be made due to the unavailability of information on the approximate vessel position. (Entering the initial settings can reduce the time required for position fixing, if it is feasible.)

Normally, the approximate position of your vessel and UTC time information need to be set to the DGPS receiver in order to enable the equipment to properly position your vessel with the GPS satellites. However, this function enables the equipment to position your vessel without requiring such information inputs to it. The equipment will accurately position your vessel if it is properly installed and connected the DGPS receiver although a longer period of time would be required in this mode to position your vessel than that in the normal position fixing mode.

The function will be automatically performed if any one of the following conditions apply.

① After performing the master reset function
② When the equipment failed to position your vessel for one hour or more after turning its power on.
③ The position fixing is interrupted for 30 hours or more.

4.6.1.4 Master Reset

This function clears all the user settings and to reset the equipment to the factory settings, which will clear all data for navigator, and DGPS receiver as well. Thus, we would recommend you to enter the initial settings to the equipment after performing this function. Entering the initial settings can reduce the time to complete the position fixing of your vessel with the GPS satellites.

Leave the equipment as is without making any operations after performing the master reset function, if the initial setting values are unknown. By doing so, the equipment will automatically perform the search-the-sky function and fix the accurately position your vessel although the time required for it will be longer than that in the normal position fixing mode as stated above.

Perform the master reset function by following either the step (1) or (2) described below after replacing the ROM IC or lithium battery mounted in the equipment, or DGPS receiver connected to the equipment.

(1) Turn off the equipment first. Then, turn it on again by simultaneously pressing the [1] and [PWR] keys.
(2) Press the [ ] key provided on the right hand side of the MASTER RESET and [ENT] key to perform the master reset function.

Caution

All the waypoint data will be cleared after performing the master reset function. Therefore, we would recommend you to take notes on the key waypoint before performing the master reset function.

4.6.2 GPS AUX Screen

Pressing the [AUX] key on the SAT STATUS screen and inputting the password can make any one of the following settings.

4.6.2.1 Setting the Averaging for Position Display

The DGPS receiver calculates the vessel position, speed, and course based on the signals received from the GPS satellites. However, the calculation results thus obtained are subject to errors depending on the satellite positions and receiving conditions of the signals. Therefore, the averaging function is provided to average the errors, which can be selected in the range of 1 to 99 seconds with one-second increment.

Selection of a greater averaging duration will reduce the errors, but increase the responce time and a smaller value will increase the errors, which in turn offers an opportunity for the steersman to promptly cope with a given situation faced by the vessel.

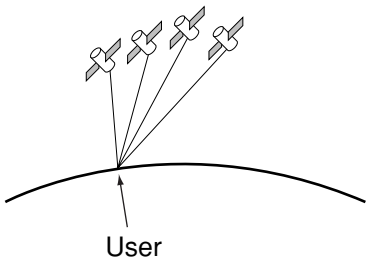
(1) Press the [ ] key provided on the right hand side of the RESPONSE to enter a desired value.

4.6.2.2 Setting the HDOP Level

HDOP level

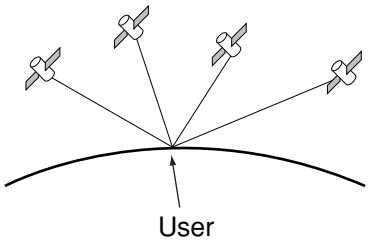
The term HDOP is an acronym of “Horizontal Dilution Of Precision”, which represents the positioning accuracy on the horizontal plane for the signals being received from the GPS satellites. In other words, the value is determined by the satellite layout, which will be one (1) under the ideal condition. A larger value represents a lower precision. Normally, no particular problem would be expected during the equipment operation if the value remains within the range of or less. Note that the reception quality of the signal depends on the volume of a polyhedron obtained by connecting the four satellites from which the signals are being received. The reception quality increases as the volume increases, which in turn reduces the HDOP value toward one (1).

GPS satellites currently in communication



Allocation of satellites with a great HDOP value and insufficient accuracy

GPS satellites currently in communication



Allocation of satellites with a small HDOP value and sufficient accuracy

HDOP alarm is indicated when a given HDOP level is higher than set value.
To select the HDOP level, press HDOP LEVEL key.

HDOP setting	Value displayed on the screen
4 or less	4
10 or less	10
20 or less	20

Memo

- The HDOP level is factory set to "20."
- The navigator indicates the following warning messages if a given HDOP level is higher than the set value.
  ① The HDOP value shown on the SAT STATUS screen will begin to flicker.
  ② A flickering HDOP message will appear at the bottom of the screen in any operating mode.
- No position data will be displayed or output if the HDOP level is higher than 20 regardless of the set value.

4.6.2.3 Setting the Antenna Mode

Position fixing mode	Display on the screen	Description
Automatic 3D/ 2D selection	AUTO	The equipment offers the following two position fixing modes, which can be selected on an as required basis. The position fixing mode will be automatically selected either from the vise versa depending on the GPS satellite conditions if the equipment is set to the automatic mode. The equipment will fix the vessel position in the three-dimension (3D) mode (latitude, longitude, and height) if the three-dimension position fixing The equipment will fix the vessel position in the two-dimension (2D) mode (latitude and longitude) if the two-dimension position fixing requirements for the DGPS receiver are satisfied when the signals are received from three satellites. Note that the last antenna height measured in the three-dimension mode will be used for the subsequent position fixing in the two-dimension mode.
2D only mode	2D	The position fixing will be made only in the based on the antenna height, which was input on the initial setting screen.
3D only mode	3D	The equipment will fix the vessel position in the three-dimension (3D) mode only.

Memo

During DGPS position fixing, “AUTO” is used regardless of selection in ANT MODE.

(1) Press the ▷ key provided on the right hand side of the ANT MODE to select a desired mode. Note that the equipment is factory set to [AUTO].

Memo

Entering an accurate antenna height will ensure a more accurate position fixing in the two-dimension (2D) mode than the other (automatic) in the three-dimension mode if the equipment is used for marine applications.

4.6.2.4 Setting the RAIM Accuracy Level

RAIM

Receiver autonomous integrity monitoring (RAIM) is an integrity monitoring which determine if GPS accuracy is within the performance standards to provide an integrity indication.

The integrity indications with a confidence level above 95% for different position accuracy levels are expressed in two states: safe and unsafe. In the case of the confidence level under 95%, the indication is expressed caution.

Safe: position error is within the selected accuracy level.

Caution: insufficient information to reliably calculate for the selected accuracy level - the probability of false alarms is large or the probability of not detecting an error condition is large.

Unsafe: position error exceeds the selected accuracy level.

Accuracy Level	Display on the screen	
10m	NAVIGATE SAT STATUS	RAIM 10m SAFE, CAUTION or UNSAFE
	PLOT	M S, C or U
30m	NAVIGATE SAT STATUS	RAIM 30m SAFE, CAUTION or UNSAFE
	PLOT	M S, C or U
50m	NAVIGATE SAT STATUS	RAIM 50m SAFE, CAUTION or UNSAFE
	PLOT	M S, C or U
100m	NAVIGATE SAT STATUS	RAIM 100m SAFE, CAUTION or UNSAFE
	PLOT	M S, C or U
OFF	NAVIGATE SAT STATUS	RAIM OFF
	PLOT	No indication

In the case of UNSAFE displayed on SAT STATUS screen, fault satellite number is also displayed as follows:

UNSAFE 07
→ fault satellite number

Press Accuracy Level key to select a desired accuracy level.

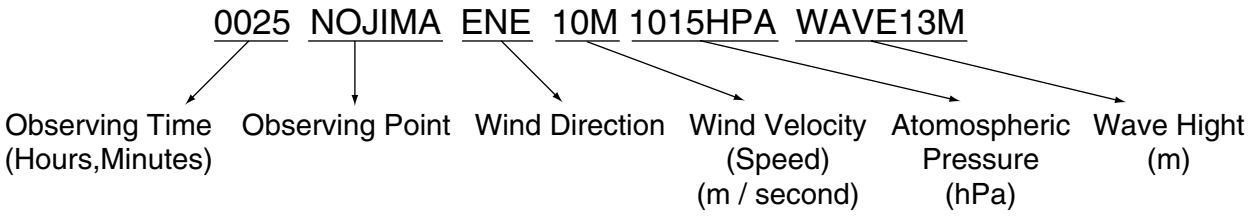
The accuracy level is factory set to 100m.

4.6.3 Weather Information

Local weather and sea conditions in coastal sea areas of Japan are observed.

Pressing the ＊ menu key on the SAT STATUS screen.

Example of NOJIMAZAKI in CHIBA prefecture



4.7 Special Functions

4.7.1 Loran Time Difference Display

Caution

Set the geodetic system to WGS-72 for the Loran C, and to Japan for the Loran A (See the item 4.4.2.1 “Setting the Geodetic System”) if the Loran time difference display function is to be used. The displayed time difference tends to become erratic if other geodetic system is selected.

The equipment can convert the latitude and longitude measured with the GPS into the Loran A or C time difference if the Loran A station, Loran C station, or secondary station has been set.

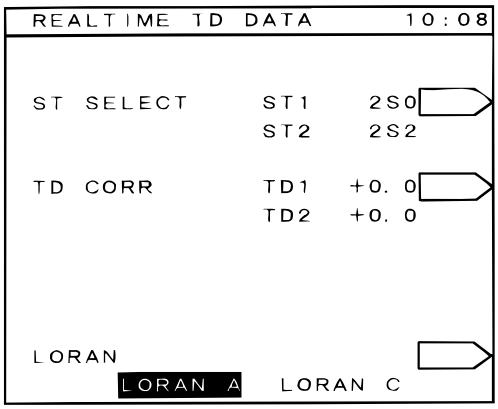
Pressing the ◀ or ▶ key on the NAVIGATE screen, COURSE DEVIATION IND. screen, or PLOT screen can convert the latitude and longitude into the time difference either by the Loran A or C.

4.7.1.1 Setting the Loran A Station

- Press the INI key on the SAT STATUS screen to display the INITIAL SETTING screen.
  Next, press the LRN key to display the REALTIME TD DATA screen (Loran station selection screen).

(1) Setting the Loran A station

- Press the key provided on the right hand side of the LORAN A or LORAN C to highlight the LORAN A as shown in the figure below.



- Press the key provided on the right hand side of the ST SELECT to select a value for a desired Loran A station by operating the ◀ or ▶ key.
  Then, press the ENT key to select another Loran A station in the same manner.

Memo

Any one of the following 10 Loran A stations can be set.
2S0, 2S1, 2S2, 2S3, 2S4, 2S5, 2S6, 2S7, 2H5, and 2H6

(2) Correction for the Loran A time difference

- The time difference for the Loran A can be corrected.
  Press the [▷] key provided on the right hand side of the TD CORR to enter a correction value.

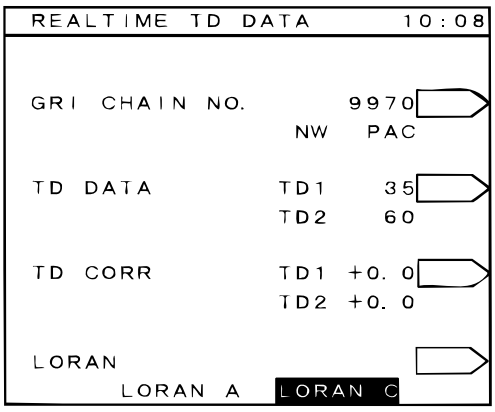
Example) Operate as described below in case it is necessary to correct the TD1 by +0.5 μ s and TD2 by -1.1 μ s.
Press the [0] , [5] and [ENT] keys.
Then, press the [+/- ▷] , [1] , [1] and [ENT] keys.

4.7.1.2 Setting the Loran C Station

Press the [LRN ▷] key on the INITIAL SETTING screen to display the REALTIME TD DATA screen (Loran station setting screen).

(1) Setting the Loran C station

- Press the [▷] key provided on the right hand side of the LORAN A and LORAN C to highlight the LORAN C as shown in the figure below.



- Press the [▷] key provided on the GRI CHAIN NO. to enter a value for the Loran C station to be used.
  Example) In case it is necessary to enter the chain number of 9970.
  Press the [9] , [9] , [7] , [0] , and [ENT] keys. (Or the setting can be made by operating the [◀] or [▶] key.)

(2) Setting a secondary station

- Enter the first two digits for the secondary station to be used. The operation needs to be made in the following sequence.
  Press the [▷] key provided on the right hand side of the TD DATA, then, enter the first two digits for the secondary station to be used.
  Example) In case it is necessary to set 46,000 μ s for the TD1 and 60,000 μ s for the TD2.
  Press the [4] , [6] , and [ENT] keys.
  Then, press the [6] , [0] , and [ENT] keys.

(3) Correction to the Loran C time difference

- The Loran C time difference to be displayed can be corrected.
  Press the [▷] key provided on the right hand side of the TD CORR, then, enter the correction value.
  Example) In case it is necessary to correct the TD1 by +0.5 μs and TD2 by -1.1 μs.
  Press the [0] , [5] , and [ENT] keys.
  Then, press the [+/- ▷] , [1] , [1] , and [ENT] keys.

5. Maintenance and Inspection

⚠WARNING

No attempt shall be made by the user to inspect or repair the equipment.
Inspections or repairs carried out by unauthorized personnel can cause a fire or electric shock.
Consult our local sales office or your distributor nearby your location for any inspection or repair that requires the equipment disassembly.

⚠CAUTION

Use only the specified fuse.
Failure to observe the instruction can cause a fire or equipment failure.

Model : MF60NR 250V 2

Do not use the unspecified battery.
Failure to observe the instruction can cause equipment failure or malfunction.
The navigator and the DGPS receiver is equipped with a lithium battery to back up the RAM in the event of a power failure. The lithium battery has an average life of approx. five years, however, scheduled replacement is recommended before it is completely depleted to ensure proper equipment operation. Consult our local sales office or your distributor to have the battery replaced.

Model : CR2032-THD JRC code : 5ZBBJ00006 (NWZ-4570B)
Model : CR2354-1VC JRC code : 5ZBAB00108 (NNN-4331)

Daily maintenance and inspections will keep your navigator in good working conditions and prolong its service life. We would recommend you to make the following inspections before commencing the equipment operation.

- Is the equipment properly secured or any one of the mounting screws loosened? → Secure it as required.
- Are the connecting cables securely connected? → Connect them securely.
- Is the fuse blown? → Replace the fuse with a specified one.
- Is the equipment damaged? → Consult our local sales office or your distributor if the equipment malfunction is noted.
- Is any connecting cable damaged? → Use of damaged cables can cause a fire, electric shock or equipment failure. Consult our local sales office or your distributor for repair or replacement.

6. Measures for the Operating Environment

Do not install the equipment in any one of the following environments. Failure to observe the instruction can cause equipment failure or reduced service life.

- Locations that are subject to direct sunlight

  Failure to observe the instruction can cause erratic contrast of the screen display. In addition, the service life of the LCD will be reduced.

- Locations nearby the equipment that is generating a magnetic field

  Failure to observe the instruction can cause equipment malfunction or display noise.

- Locations with poor ventilation

  Failure to observe the instruction can cause equipment over-heating, which in turn can cause failure of the power supply unit.

7. After-the-sale Services

■ When asking for service

When you think the equipment is not operating properly, consult our local sales office or your distributor nearby.

● Repairs during the warranty period

Should a malfunction or failure occur when the equipment is operated according to the descriptions and instructions contained herein, it will be repaired free of charge. However, any repair for the failures resulting from the misuse, abuse, fire, or other unforeseeable incident will be charged.

● Repairs after the warranty period

Repairs to restore the proper equipment operation can be made at a specified rate based on the user's consent.

● Information that needs to be provided when you ask for the service

- ○ Name, model and manufacturing number of the equipment
- ○ Description of the malfunction (as detailed as possible)
- ○ Name, address, and phone number of your company or organization

■ Recommended checks and inspections

The equipment performance is subject to decay due to the secular change although the decay rate varies depending on the frequency of use. Thus, it is recommended to consult with our local sales office or your distributor for the periodic inspection and maintenance in addition to your routine inspection and maintenance.

Note that, however, the user needs to pay for such a periodic inspection and maintenance.

Direct your inquiries to any one of our local sales offices or your distributors listed at the end of this manual.

8. Disposal

⚠WARNING

Insulate the used lithium battery, such as placing a piece of insulation tape both on the anode and cathode terminals of the battery before disposing of it. Failure to observe the instruction can cause a fire, explosion, or other hazards due to shorted battery.

8.1 Disposal of the Equipment

- Observe all the applicable acts and regulations specified by the local authority.

8.2 Disposal of the used Battery

A lithium battery is mounted in the navigator and DGPS receiver to back up data.

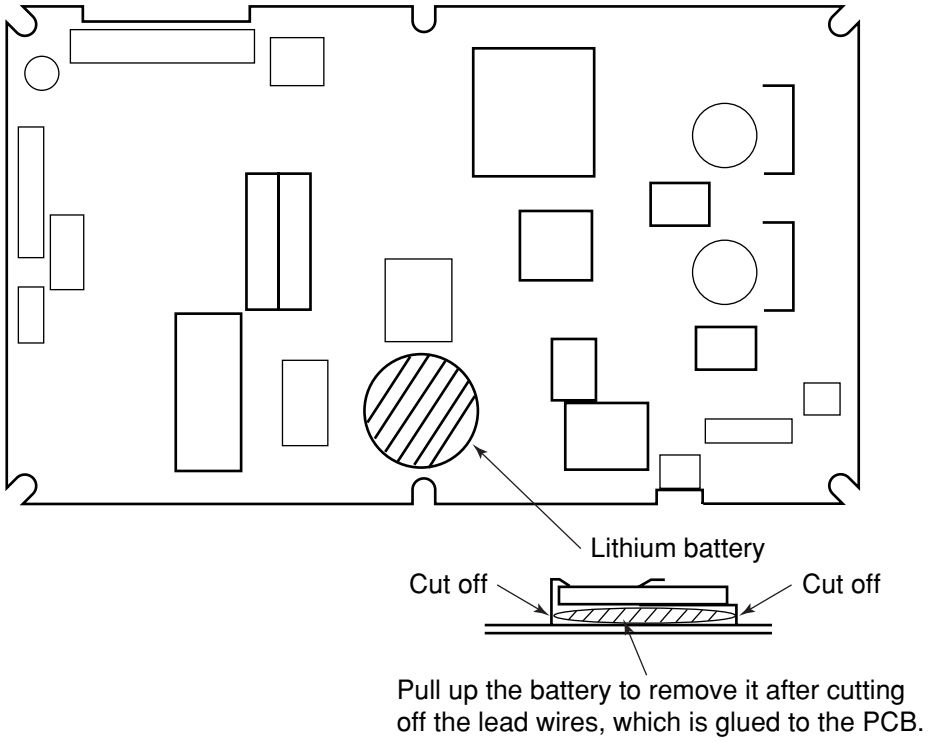
- Dispose of the used lithium battery each time as a piece of non-combustible garbage without storing it.
- Insulate the used lithium battery, such as placing a piece of insulation tape both on its anode and cathode terminals before disposing of it. Note that the battery needs to be disposed of according to the rules specified by the applicable local authority, if any. (See the procedures shown on the next page how to remove the lithium battery.)
  Consult our local sales office, your distributor, or local authority for further details on the disposal method.

How to remove the lithium battery (In the case of the NWZ-4570B navigator)

(1) Remove the six screws provided on the rear panel of the navigator to disassemble it.

(2) Cut the terminal wires connected to the lithium battery at the position shown in the figure below with a nipper or equivalent.

(3) The lithium battery is glued to the equipment, which needs to be pulled up to remove.



Consult your local dealer or our sales office to remove the lithium battery mounted in the DGPS receiver.

9. Specifications

(1) General functions

Type of display		:	5-inch STN LCD, 160 x 128 dots
Backliting		:	EL for LCD and lamps for keyboard
Dimmer control		:	High, low, or off (To be selected with a keyboard)
Waypoint memories		:	499 points maximum (including the event memory for the point No. 400 to 499) Naming with 8 characters
Waypoint entry		:	latitude, longitude, bearing and distance, and event
Track memories		:	A maximum of 300 points
Route plan		:	One route plan with 499 waypoints total
Position correction		:	Selection among 46 geodetic systems and manual entering of latitude and longitude
Magnetic variation		:	Automatic or manual
Navigation calculation		:	Great circle or Rhumb line selectable
Alarms		:	Arrival alarm, off-course alarm, anchor alarm, boundary alarm, or no position fix
Plot function	Plot scale	:	1 to 100 NM (with the ranges of 1, 2, 5, 10, 20, 50, and 100 NM)
	Plot interval	:	Every 30 seconds, 1, 3, 5, 10, or 30 minutes, or 0.2 or 0.5 NM
Data output		:	Two output ports (one RS422 output) NMEA 0180, NMEA 0183, or JRC format Version 1.5, 2.1 or 2.3 (IEC61162-1) for NMEA 0183
Relay output		:	External buzzer output or Log pulse output selectable
Selectable unts		:	NM/KTS or KM/KPH
Memory backup		:	Built-in lithium battery
Loran conversion function		:	latitude and longitude can be converted into the Loran time difference.
Display language		:	English or Japanese
Power supply		:	12/24VDC, or less 10W
		:	100 or 220 VAC (with optional AC power supply unit)

(2) GPS receiving

Receiving frequency		:	1575.42MHz ± 1MHz (C/A code)
Sensitivity		:	-130dBm
Dynamic range		:	25dB
Signal acquisition		:	Automatic by computer controlled
Maximum No. of tracked satellites		:	12
Fix update rate		:	Every 1 second
Accuracy	GPS position fixing	:	15m 2DRMS (L1, C/A code, HDOP ≦ 4)
	DGPS position fixing	:	5m 2DRMS (L1, C/A code, HDOP ≦ 4)

(3) Beacon receiving

Receiving frequency	:	283.5KHz to 325KHz	
Frequency step	:	500Hz	
Selection of beacon station	:	Automatic or manual	
Demoduration	:	Minimum shift keying (MSK)	
RF bit rate	:	50/100/200bps	

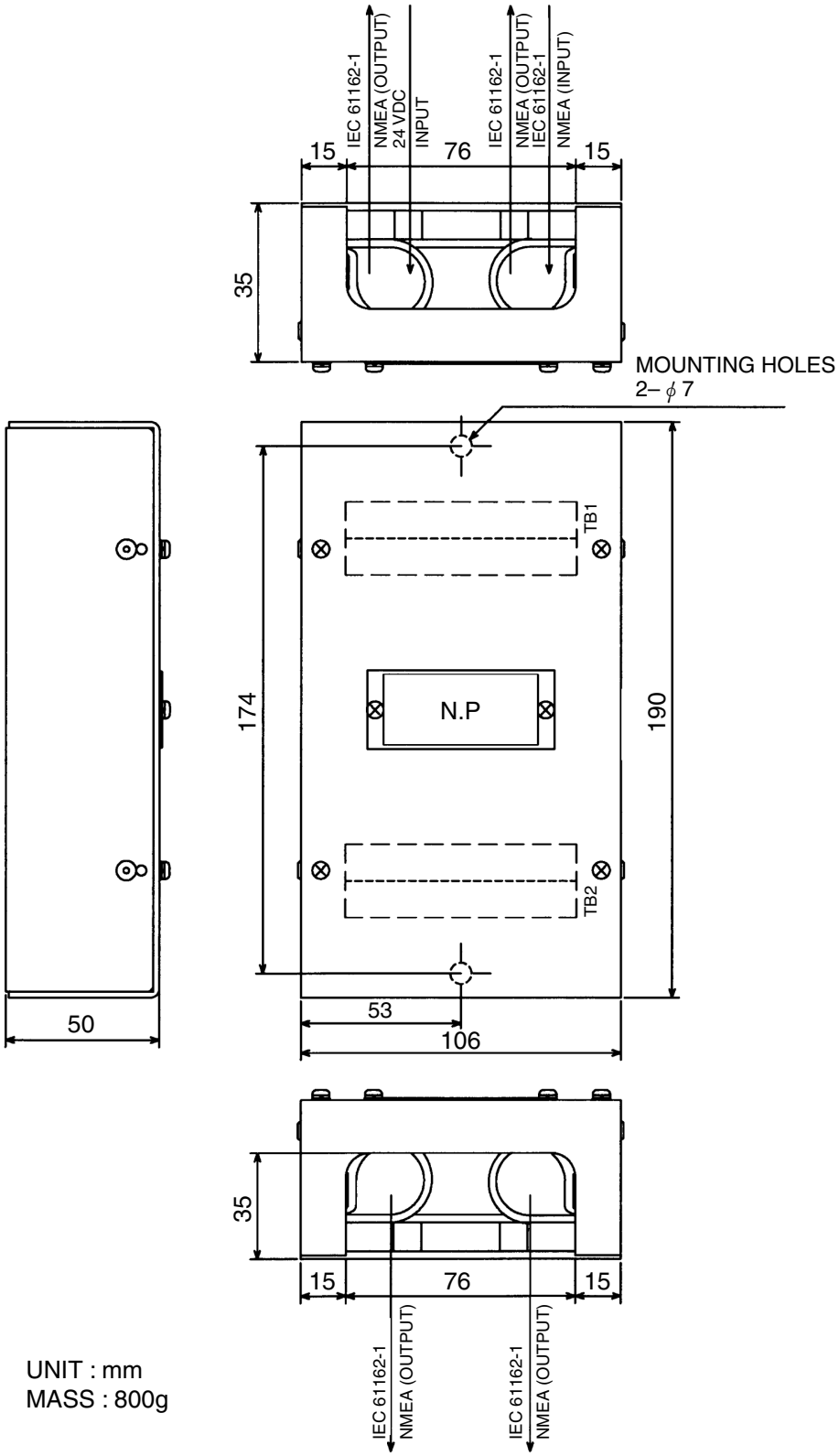
(4) Environmental

Operating temperature range	:	DGPS Receiver	-25 to 55℃
		Navigator	-15 to 55℃
Waterproof	:	DGPS Receiver	USCG CFR46 standard
		Navigator	JIS IPX4 standard
EMC	:	IEC60945 standard and CE mark	

Attachments

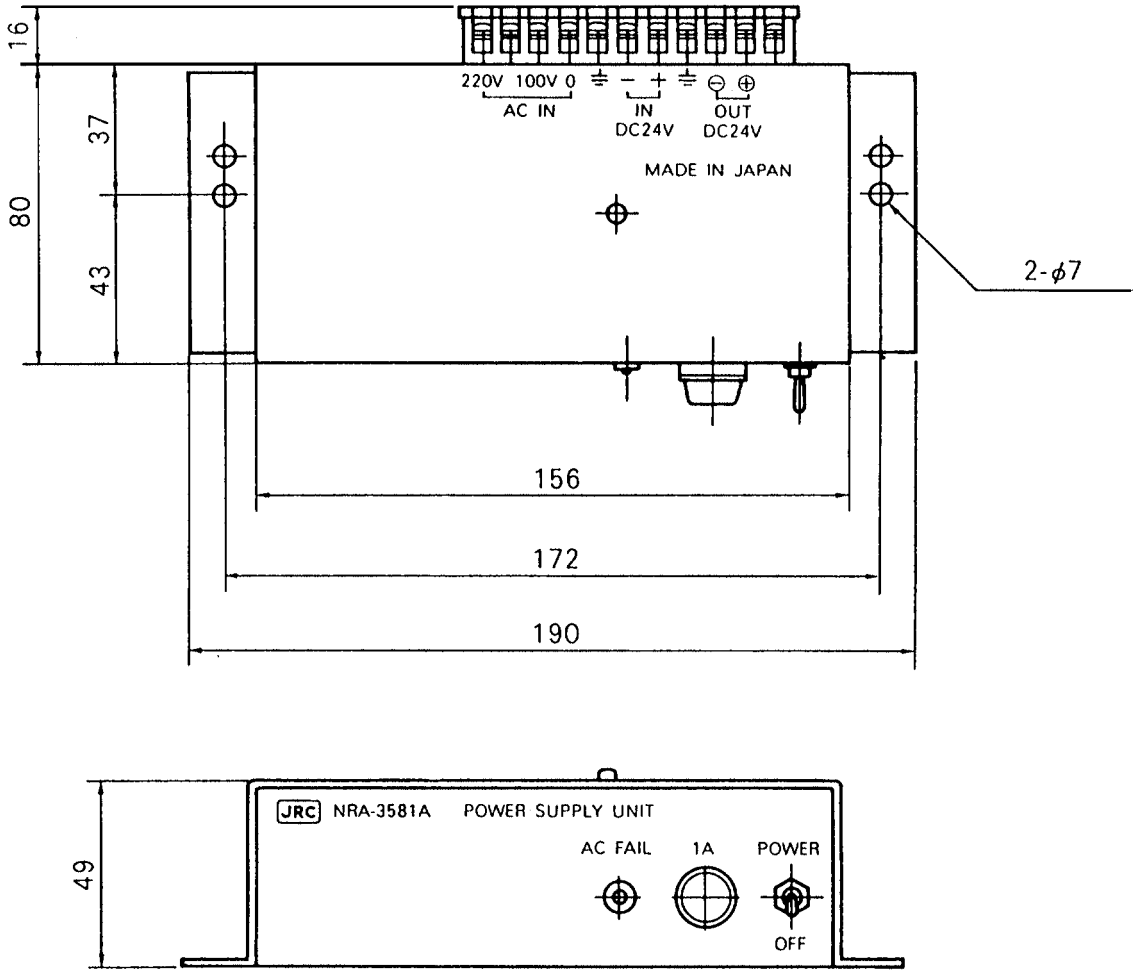
Attachment 1 Optional Units

(1) Outline drawing of NQA-4251 buffer unit



UNIT : mm
MASS : 800g

(2) Outline drawing for the NBA-3581A AC power supply unit



Unit : mm
Weight : Less than 1.5kg

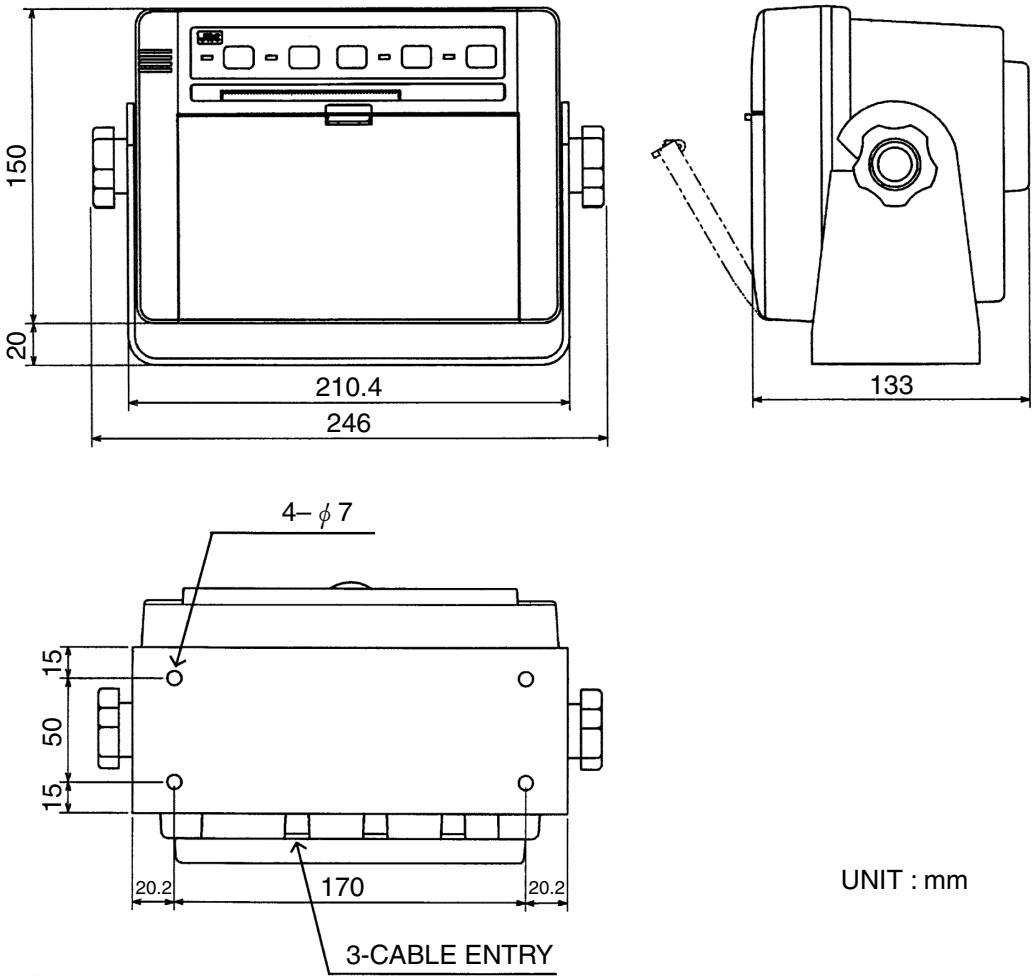
The 24 VDC IN terminal is provided for the backup purpose in case of the AC power failure. The cable needs to be connected with the crimp terminals.

(3) NKG-84 printer specifications

● Key specifications

Printout method	:	Thermal type
Recording paper	:	80 x 60 (approx. 40 meters long), JRC code 7ZPJD0044
Operating temperature range	:	-15 ℃ to 55 ℃
Power supply	:	DC 10 to 35 V 7W
Mass	:	2.0 kg (Including Base)

● Outline drawing



(4) Extension cable

As the extension cable for the DGPS receiver, the following model of cable is recommended as standard equipment in order to assure the waterproof structure of the junction box.

Extension calbe Model : 250V-MPYCYS-7 Outer diameter: 15.9 ± 0.6mm

⚠CAUTION

The rubber gasket is suitable for the cable of size ϕ10 to ϕ20.

When any cable other than the above is used, it will leave a gap that may cause waterproof measures such as applying putty.
Any water intrusion into the junction box may cause a fault.

Attachment 2

Attachment 2-A List of Messages

● Error message

Message	Description
RAM NG	The display RAM (an IC to store data) has failed. Contact our local sales office or your distributor.
ROM NG	The display ROM (an IC to store the operating program for the equipment) has failed. Contact our local sales office or your distributor.
SENSOR NG	No DGPS receiver is connected to the equipment, or it has failed if connected. Confirm that the receiver is properly connected. Contact our local sales office or your distributor, if the message remains as is even after properly connecting the receiver.

● Navigation alarm

Message	Tone	Description
ARV	Beep tone	Arrival alarm. The vessel has entered the preset range. Pressing the CLR key will stop the alarm sound. Setting the range to 0.00 nm can erase the display.
ANC	Same as above	Anchor alarm. The vessel has drifted away from the preset range. Pressing then CLR key will stop the alarm sound. Setting the range to 0.00 nm can erase the display.
XTE	Same as above	Off-course or boundary alarm. The vessel has crossed the preset borderline for the course. Pressing the CLR key will stop the alarm sound. Setting the off-course range to 0.00 nm can erase the display.
S	Repeated beep tone with a short interval	This alarm goes off if the navigator has failed to fix the vessel position. Note that no alarm will go off until the first position fixing is completed after turning the power on or performing the master reset function.
SS	Same as above	This alarm goes off if the navigator has failed to fix the vessel position during the Search the sky mode. Note that no alarm will go off until the first position fixing is completed after turning the power on or performing the master reset function.
R	Same as above	This alarm goes off when no data is entered from the DGPS receiver.
HDOP	No tone	This alarm goes off when the HDOP value is below the setting level.

● Navigation message

Message	Description
D	This indication is given during the position fixing in the differential GPS mode.
3D	This indication is given during the 3D GPS position fixing mode. (The indication is displayed only on the SAT STATUS screen.)
2D	This indication is given during the 2D GPS position fixing mode. (The indication is displayed only on the SAT STATUS screen.)

● Various answer tones

The following will provide an answer tone alone with no message displayed.

Answer tone	Occurrence conditions
Repeated beep tone with a short interval	The alarm goes off when the equipment has rejected a given input such as when a wrong value is entered or equivalent.
One short beep tone	The alarm goes off when the equipment has accepted a given input.
Two or one short beep tone	The alarm goes off during the first position fixing after turning the equipment on or performing the master reset function.

Attachment 2-B List of Geodetic Systems

● Geodetic systems that are displayed by the respective names (Nos. 1 to 9)

Table 1

Names displayed on the screen	Geodetic systems
WGS-84	WGS-84
WGS-72	WGS-72
JAPAN	Japanese geodetic system
NAD27 USA	North American 1927 (USA)
NAD27 CAN	North American 1927 (Canada and Alaska)
EUROPE 50	Europe 1950 (Europe)
AUSTRA 66	Australian geodetic 1966 (Australia)
OSGB-36	Ordnance Survey of Great Britain (UK)
NAD-83	NAD-83

● Geodetic systems that are displayed in numbers

Table 2

Names displayed on the screen	Geodetic systems
11	Adindan (Ethiopia and Sudan)
12	ARC 1950 (Botswana)
13	Australian Geodetic 1984 (Australia)
14	Bermuda 1957 (Bermuda islands)
15	Bogota Observatory (Columbia)
16	Compo Inchauspe (Argentina)
17	Chatham 1971 (Chatham islands)
18	Chua Astro (Paraguay)
19	Corrego Alegre (Brazil)
20	Djakarta (Batavia) (Sumatra)
21	European 1979 (Europe)
22	Geodetic Datum 1949 (New Zealand)
23	Guam 1963 (Guam)
24	Hayford 1910 (Finland)
25	Hjorsey 1955 (Iceland)
26	Indian (India and Nepal)
27	Ireland 1965 (Ireland)
28	Kertau 1948 (West Malaysia and Singapore)
29	L.C.5 Astro (Cayman Black Islands)
30	Liberia 1964 (Liberia)
31	Luzon (Philippines)
32	Merchich (Morocco)
33	Minna (Cameroon)
34	Nahrwan (Oman)
35	Naparima, BWI (Trinidad and Tobago)
36	Old Egyptian (Egypt)
37	Old Hawaiian (Hawaii Islands)
38	Pico de las Nieves (Canary islands)
39	Provisional South American 1956 (South America)
40	Provisional South Chilean 1963 (Southern Chili)
41	Puerto Rico (Puerto Rico and Virgin Islands)
42	Qornoq (Southern Greenland)
43	RT90 (Sweden)
44	Santa Braz (San Miguel and Santa Maria Islands)
45	South American 1969 (South America)
46	Southwest Base (Faial, Graciosa, Pico, Sao Jorge, and Terceira Islands)
47	Timbalai 1948 (Brunei and East Malaysia)

Attachment 2-C NMEA0183 Output Sentence Data Format

Caution

1. The sentences may not always be output in the order stated below. Therefore, it is necessary to adopt a method that can ensure its positive retrieval regardless of its order if it is to be received.
2. It is necessary to adopt a method that can ensure retrieval of data with variable length since the length of each sentence is variable.

1. Output sentences

RMC	:	Minimum specific GPS data
RMB	:	Minimum navigation information
APB	:	Autopilot sentence B
GLL	:	Geographic position latitude/longitude
GGA	:	GPS fix data
VTG	:	Course over ground and ground speed
XTE	:	Cross-track error, measured
ZDA	:	Time and date
DTM	:	Datum reference
GNS	:	GNSS fix data
GBS	:	GNSS satellite fault detection
GRS	:	GNSS Range Residuals
GSA	:	GNSS DOP and active satellites
GST	:	GNSS pseudorange error statistics
GSV	:	GNSS satellites in view
MSS	:	MSK receiver signal

2. Output timing

< Version 2.3 (IEC61162-1) 1sec> (Factory setting)

ZDA/GGA/RMC/VTG/DTM/RMB:	Every one second
The following sentences are selectable.	
APB/BWC/XTE:	Every one second
GSV/GRS/GSA/GBS/GNS/GST/MSS/GLL:	Every four seconds
PJRCDGP8:	When it received

< Version 2.1/2.3 (IEC61162-1) >

RMB/GGA/RMC:	Every two seconds
GLL/VTG/APB/DTM /XTE/ZDA:	Every four seconds

< Version 1.5>

RMB/GGA/RMC:	Every two seconds
GLL/VTG/APB/BWC/XTE /ZDA:	Every four seconds

3. Serial format

Baud rate	:	4,800 bps
Data bit	:	8 bits
Parity	:	None
Start bit	:	1 bit
Stop bit	:	1 bit

4. Data format

<Version 1.5>

RMC sentence

$GPRMC,hhmmss,A,llll.ll,a,yyyyy.yy,a,xx.x,xxx,ddmmyy,xx,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 101112

1	:	UTC time (hour, minute, and second)
2	:	Status, A = Valid, V = Invalid
3 and 4	:	Latitude (degree and minute), N/S
5 and 6	:	Longitude (degree and minute), E/W
7	:	Speed (knot)
8	:	True course (degree)
9	:	UTC (day, month, and year)
10 and 11	:	Magnetic variation value, E/W
12	:	Checksum

RMB sentence

$GPRMB,A,x.xx,a,cccc,cccc,llll.ll,a,yyyyy.yy,a,xxx.xx,xxx,uxx.x,A*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 1314

1	:	Status, A = Valid, V = Invalid
2	:	Cross-track error (NM)
3	:	Direction to steer, L = Left, R = Right
4	:	Origin waypoint ID
5	:	Destination waypoint ID
6 and 7	:	Latitude of the destination, N/S
8 and 9	:	Longitude of the destination, E/W
10	:	Distance to destination (NM)
11	:	True bearing to the destination (degree)
12	:	VTD (knot), (u : "-" is output in case the speed is at a negative value and no output in case it is at a positive value or zero)
13	:	Arrival alarm, A = Arrived, V = Not arrived
14	:	Checksum

APB sentence

$GPAPB,A,,x.xx,a,N,A,,xxx,M,cccc,xxx,M,,<CR><LF>

1 2 3 4 5 6 7 8 9 10

1	:	Status, A = Valid, V = Invalid
2	:	Cross-track error (NM)
3	:	Direction to steer, L = Left, R = Right
4	:	XTE unit N (nautical mile), fixed
5	:	Arrival alarm, A = Arrived, V = Not arrived
6 and 7	:	Bearing origin to destination, M = Magnetic, T = True
8	:	Destination waypoint ID
9 and 10	:	Bearing of current position to destination, M = Magnetic, T = True

BWC sentence

$GPBWC,hhmmss,llll.ll,a,yyyyy.yy,a,xxx,T,xxx,M,xxx.x,N,cccc<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12

1	:	UTC time (hour, minute, and second)
2 and 3	:	Latitude of the destination, N/S
4 and 5	:	Longitude of the destination, E/W
6 and 7	:	True bearing to the destination (degree)
8 and 9	:	Magnetic bearing to the destination (degree)
10 and 11	:	Distance to the destination, the unit is fixed to N (nautical mile)
12	:	Waypoint ID

GLL sentence

$GPGLL,llll.ll,a,yyyyy.yy,a<CR><LF>

1 2 3 4

1 and 2	:	Latitude (degree and minute), N/S
3 and 4	:	Longitude (degree and minute), E/W

GGA sentence

$GPGGA,hhmmss,llll.lll,a,yyyyy.yyy,a,x,x,xxx,uxxxx,M,uxxx,M,xx,xxxx<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 1213 14

1	:	UTC time (hour, minute, and second)
2 and 3	:	Latitude (degree and minute), N/S
4 and 5	:	Longitude (degree and minute), E/W
6	:	GPS quality indicator, 0 = Fix is not available, 1 = Fix with GPS mode, 2 = Fix with DGPS mode
7	:	Number of satellites in use
8	:	Horizontal dilution of precision (HDOP)
9 and 10	:	Antenna height above or below the mean sea level (m), the unit is fixed to M (m), (u : “+” is output in case the height is at a positive value and “-” is output in case it is at a negative value)
11 and 12	:	Geoidal separation, (the difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface, “-” = mean-sea-level surface below WGS-84 ellipsoid surface), the unit is fixed to M (m)
13	:	Age of differential GPS data
14	:	Differential reference station ID

VTG sentence

$GPVTG,xxx,T,xxx,M,xx.x,N,,<CR><LF>

1 2 3 4 5 6

1 and 2	:	True course (degree)
3 and 4	:	Magnetic course (degree)
5 and 6	:	Speed (knot)

XTE sentence

$GPXTE,A,,x.xx,a,N<CR><LF>

1 2 3 4

1 : GPS status, A = Valid, V = Invalid
2 : Cross-track error (NM)
3 : Direction to steer (L or R)
4 : Unit is fixed to N (nautical mile)

ZDA sentence

$GPZDA,hhmmss,xx,xx,xxxx,xx,xx<CR><LF>

1 2 3 4 5 6

1 : UTC time (hour, minute, and second)
2 : Day (UTC)
3 : Month (UTC)
4 : Year (UTC)
5 : Hour (local zone)
6 : Minute (local zone)

<Version 2.1>

RMC sentence

$GPRMC,hhmmss,A,llll.lll,a,yyyyy.yyy,a,xx.x,xxx.,ddmmyy,xx.,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12

1 : UTC time (hour, minute, and second)
2 : Status, A = Valid, V = Invalid
3 and 4 : Latitude (degree and minute), N/S
5 and 6 : Longitude (degree and minute), E/W
7 : Speed (knot)
8 : True course (degree)
9 : UTC (day, month, and year)
10 and 11 : Magnetic variation value, E/W
12 : Checksum

RMB sentence

$GPRMB,A,x.xx,a,cccc,cccc,llll.lll,a,yyyyy.yyy,a,xxx.xx,xxx.,uxx.x,A*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 : Status, A = Valid, V = Invalid
2 : Cross-track error (NM)
3 : Direction to steer, L = Left, R = Right
4 : Origin waypoint ID
5 : Destination waypoint ID
6 and 7 : Latitude of the destination, N/S
8 and 9 : Longitude of the destination, E/W
10 : Distance to destination (NM)
11 : True bearing to the destination (degree)
12 : VTD (knot), (u : "-" is output in case the speed is at a negative value and no output in case it is at a positive value or zero)
13 : Arrival alarm, A = Arrived, V = Not arrived
14 : Checksum

APB sentence

$GPAPB,A,,x.xx,a,N,A,,xxx,a,cccc,xxx,a,,*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11

1	:	Status, A = Valid, V = Invalid
2	:	Cross-track error (NM)
3	:	Direction to steer, L = Left, R = Right
4	:	XTE unit N (nautical mile), fixed
5	:	Arrival alarm, A = Arrived, V = not arrived
6 and 7	:	Bearing origin to destination, M = Magnetic, T = True
8	:	Destination waypoint ID
9 and 10	:	Bearing of current position to destination, M = Magnetic, T = True
11	:	Checksum

GLL sentence

$GPGLL,llll.lll,a,yyyyy.yyy,a,hhmmss,A*hh<CR><LF>

1 2 3 4 5 6 7

1 and 2	:	Latitude (degree and minute), N/S
3 and 4	:	Longitude (degree and minute), E/W
5	:	UTC time (hour, minute, and second)
6	:	Status, A = Valid, V = Invalid
7	:	Checksum

GGA sentence

$GPGGA,hhmmss,llll.lll,a,yyyyy.yyy,a,x,xx,xx.x,uxxxx,M,uxxx,M,xx,xxxx*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1	:	UTC time (hour, minute, and second)
2 and 3	:	Latitude (degree and minute), N/S
4 and 5	:	Longitude (degree and minute), E/W
6	:	GPS quality indicator, 0 = Fix is not available, 1 = Fix with GPS mode, 2 = Fix with DGPS mode
7	:	Number of satellites is use
8	:	Horizontal dilution of precision (HDOP)
9 and 10	:	Antenna height above or below the mean sea level (m), (u : "-" is output in case the height is at a negative value and "+" is output in case it is at a positive value)
11 and 12	:	Geoidal separation, (the difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface, "-" = mean-sea-level surface below WGS-84 ellipsoid surface), the unit is fixed to M (m)
13	:	Age of the differential GPS data
14	:	Differential reference station ID
15	:	Checksum

VTG sentence

$GPVTG,xxx,T,xxx,M,xx.x,N,xx.x,K*hh<CR><LF>

1 2 3 4 5 6 7 8 9

1 and 2	:	True course (degree)
3 and 4	:	Magnetic course (degree)
5 and 6	:	Speed (knot), the unit is fixed to N (knot)
7 and 8	:	Speed (km/h), the unit is fixed to K (km)
9	:	Checksum

XTE sentence

$GPXTE,A,,x.xx,a,N*hh<CR><LF>

1 2 3 4 5

1	:	Status, A = Valid, V = Invalid
2	:	Cross-track error (NM)
3	:	Direction to steer (L or R)
4	:	Unit is fixed to N (nautical mile)
5	:	Checksum

ZDA sentence

$GPZDA,hhmmss,xx,xx,xxxx,xx,xx*hh<CR><LF>

1 2 3 4 5 6 7

1	:	UTC time (hour, minute, and second)
2	:	Day (UTC)
3	:	Month (UTC)
4	:	Year (UTC)
5	:	Hour (local zone)
6	:	Minute (local zone)
7	:	Checksum

DTM sentence

$GPDTM,ccc, a, , , , , , ccc*hh<CR><LF>

1 2 3 4

1	:	Local datum W84 — WGS84, W72 — WGS72, ccc — another datum number (see Attachment 2-B table 1 and 2)
2	:	Null (Local datum subdivision code)
3	:	W84 (Reference datum)
4	:	Checksum

<Version 2.3 (IEC61162-1) > Every two / four seconds

RMC sentence

$GPRMC,hhmmss.ss,A,IIII.III,a,yyyyy.yyy,a,xx.x,xxx.,ddmmyy,xx.,a,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 111213

1	:	UTC time (hour, minute, and second)
2	:	Status, A = Valid, V = Invalid
3 and 4	:	Latitude (degree and minute), N/S
5 and 6	:	Longitude (degree and minute), E/W
7	:	Speed (knot)
8	:	True course (degree)
9	:	UTC (day, month, and year)
10 and 11	:	Magnetic variation value, E/W
12	:	Mode indicator, A = Automonomous mode, D = Differential mode, N = Data not valid
13	:	Checksum

RMB sentence

$GPRMB,A,x.xx,a,cccc,cccc,llll.lll,a,yyyyy.yyy,a,xxx.xx,xxx.,uxx.x,A,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 131415

1	:	Status, A = Valid, V = Invalid
2	:	Cross-track error (NM)
3	:	Direction to steer, L = Left, R = Right
4	:	Origin waypoint ID
5	:	Destination waypoint ID
6 and 7	:	Latitude of the destination, N/S
8 and 9	:	Longitude of the destination, E/W
10	:	Distance to destination (NM)
11	:	True bearing to the destination (degree)
12	:	VTD (knot), (u :"-" is output in case the speed is at a negative value and no output in case it is at a positive value or zero)
13	:	Arrival alarm, A = Arrived, V = Not arrived
14	:	Mode indicator, A = Automonomous mode, D = Differential mode, N = Data not valid
15	:	Checksum

APB sentence

$GPAPB,A,,x.xx,a,N,A,,xxx,a,cccc,xxx,a,,,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 1112

1	:	Status, A = Valid, V = Invalid
2	:	Cross-track error (NM)
3	:	Direction to steer, L = Left, R = Right
4	:	XTE unit N (nautical mile), fixed
5	:	Arrival alarm, A = Arrived, V = not arrived
6 and 7	:	Bearing origin to destination, M = Magnetic, T = True
8	:	Destination waypoint ID
9 and 10	:	Bearing of current position to destination, M = Magnetic, T = True
11	:	Mode indicator, A = Automonomous mode, D = Differential mode, N = Data not valid
12	:	Checksum

GLL sentence

$GPGLL,llll.lll,a,yyyyy.yyy,a,hhmmss.ss,A,a*hh<CR><LF>

1 2 3 4 5 6 7 8

1 and 2	:	Latitude (degree and minute), N/S
3 and 4	:	Longitude (degree and minute), E/W
5	:	UTC time (hour, minute, and second)
6	:	Status, A = Valid, V = Invalid
7	:	Mode indicator, A = Automonomous mode, D = Differential mode, N = Data not valid
8	:	Checksum

GGA sentence

$GPGGA,hhmmss.ss,llll.lll,a,yyyyy.yyy,a,x,xx,xx.x,uxxxx,M,uxxx,M,xx,xxxx*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1	:	UTC time (hour, minute, and second)
2 and 3	:	Latitude (degree and minute), N/S
4 and 5	:	Longitude (degree and minute), E/W
6	:	GPS quality indicator, 0 = Fix is not available, 1 = Fix with GPS mode, 2 = Fix with DGPS mode
7	:	Number of satellites is use
8	:	Horizontal dilution of precision (HDOP)
9 and 10	:	Antenna height above or below the mean sea level (m), (u :"-" is output in case the height is at a negative value and "+" is output in case it is at a positive value)
11 and 12	:	Geoidal separation, (the difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface, "-" = mean-sea-level surface below WGS-84 ellipsoid surface), the unit is fixed to M (m)
13	:	Age of the differential GPS data
14	:	Differential reference station ID
15	:	Checksum

VTG sentence

$GPVTG,xxx,T,xxx,M,xx.x,N,xx.x,K,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10

1 and 2	:	True course (degree)
3 and 4	:	Magnetic course (degree)
5 and 6	:	Speed (knot), the unit is fixed to N (knot)
7 and 8	:	Speed (km/h), the unit is fixed to K (km)
9	:	Mode indicator, A = Automonomous mode, D = Differential mode, N = Data not valid
10	:	Checksum

XTE sentence

$GPXTE,A,,x.xx,a,N*hh<CR><LF>

1 2 3 4 5

1	:	Status, A= Valid, V = Invalid
2	:	Cross-track error (NM)
3	:	Direction to steer (L or R)
4	:	Unit is fixed to N (nautical mile)
5	:	Checksum

ZDA sentence

$GPZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>

1 2 3 4 5 6 7

1 : UTC time (hour, minute, and second)
2 : Day (UTC)
3 : Month (UTC)
4 : Year (UTC)
5 : Hour (local zone)
6 : Minute (local zone)
7 : Checksum

DTM sentence

$GPDTM,ccc, a, , , , , , ccc*hh<CR><LF>

1 2 3 4

1 : Local datum W84 — WGS84, W72 — WGS72,
ccc — another datum number (see Attachment 2-B table 1 and 2)
2 : Null (Local datum subdivision code)
3 : W84 (Reference datum)
4 : Checksum

<Version 2.3 (IEC61162-1) > Every one / four seconds

RMC sentence

$GPRMC,hhmmss.ss,A,IIII.III,a,yyyyy.yyy,a,xx.x,xxx.,ddmmyy,xx.,a,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 111213

1 : UTC time (hour, minute, and second)
2 : Status, A = Valid, V = Invalid
3 and 4 : Latitude (degree and minute), N/S
5 and 6 : Longitude (degree and minute), E/W
7 : Speed (knot)
8 : True course (degree)
9 : UTC (day, month, and year)
10 and 11 : Magnetic variation value, E/W
12 : Mode indicator, A = Automonomous mode, D = Differential mode, N = Data not valid
13 : Checksum

RMB sentence

$GPRMB,A,x.xx,a,cccc,cccc,llll.lll,a,yyyyy.yyy,a,xxx.xx,xxx.,uxx.x,A,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 131415

1	:	Status, A = Valid, V = Invalid
2	:	Cross-track error (NM)
3	:	Direction to steer, L = Left, R = Right
4	:	Origin waypoint ID
5	:	Destination waypoint ID
6 and 7	:	Latitude of the destination, N/S
8 and 9	:	Longitude of the destination, E/W
10	:	Distance to destination (NM)
11	:	True bearing to the destination (degree)
12	:	VTD (knot), (u :"-" is output in case the speed is at a negative value and no output in case it is at a positive value or zero)
13	:	Arrival alarm, A = Arrived, V = Not arrived
14	:	Mode indicator, A = Automonomous mode, D = Differential mode, N = Data not valid
15	:	Checksum

APB sentence

$GPAPB,A,A,x.xx,a,N,A,,xxx,a,cccc,xxx,a,,,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 1112 13

1 and 2	:	Status, A = Valid, V = Invalid
3	:	Cross-track error (NM)
4	:	Direction to steer, L = Left, R = Right
5	:	XTE unit N (nautical mile), fixed
6	:	Arrival alarm, A = Arrived, V = not arrived
7 and 8	:	Bearing origin to destination, M = Magnetic, T = True
9	:	Destination waypoint ID
10 and 11	:	Bearing of current position to destination, M = Magnetic, T = True
12	:	Mode indicator, A = Autonomous mode, D = Differential mode, N = Data not valid
13	:	Checksum

GLL sentence

$GPGLL,llll.lll,a,yyyyy.yyy,a,hhmmss.ss,A,a*hh<CR><LF>

1 2 3 4 5 6 7 8

1 and 2	:	Latitude (degree and minute), N/S
3 and 4	:	Longitude (degree and minute), E/W
5	:	UTC time (hour, minute, and second)
6	:	Status, A = Valid, V = Invalid
7	:	Mode indicator, A = Automonomous mode, D = Differential mode, N = Data not valid
8	:	Checksum

GGA sentence

$GPGGA,hhmmss.ss,llll.lll,a,yyyyy.yyy,a,x,xx,xx.x,uxxxx,M,uxxx,M,xx,xxxx*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1	:	UTC time (hour, minute, and second)
2 and 3	:	Latitude (degree and minute), N/S
4 and 5	:	Longitude (degree and minute), E/W
6	:	GPS quality indicator, 0 = Fix is not available, 1 = Fix with GPS mode, 2 = Fix with DGPS mode
7	:	Number of satellites is use
8	:	Horizontal dilution of precision (HDOP)
9 and 10	:	Antenna height above or below the mean sea level (m), (u :"-" is output in case the height is at a negative value and "+" is output in case it is at a positive value)
11 and 12	:	Geoidal separation, (the difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface, "-" = mean-sea-level surface below WGS-84 ellipsoid surface), the unit is fixed to M (m)
13	:	Age of the differential GPS data
14	:	Differential reference station ID
15	:	Checksum

VTG sentence

$GPVTG,xxx,T,xxx,M,xx.x,N,xx.x,K,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10

1 and 2	:	True course (degree)
3 and 4	:	Magnetic course (degree)
5 and 6	:	Speed (knot), the unit is fixed to N (knot)
7 and 8	:	Speed (km/h), the unit is fixed to K (km)
9	:	Mode indicator, A = Automonomous mode, D = Differential mode, N = Data not valid
10	:	Checksum

XTE sentence

$GPXTE,A,A,x.xx,a,N,a*hh<CR><LF>

1 2 3 4 5 6 7

1 and 2	:	Status, A = Valid, V = Invalid
3	:	Cross-track error (NM)
4	:	Direction to steer (L or R)
5	:	Unit is fixed to N (nautical mile)
6	:	Mode indicator, A = Autonomous mode, D = Differential mode, N = Data not valid
7	:	Checksum

ZDA sentence

$GPZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>

1 2 3 4 5 6 7

1 : UTC time (hour, minute, and second)
2 : Day (UTC)
3 : Month (UTC)
4 : Year (UTC)
5 : Hour (local zone)
6 : Minute (local zone)
7 : Checksum

DTM sentence

$GPDTM,ccc, a, , , , , , ccc*hh<CR><LF>

1 2 3 4

1 : Local datum W84 — WGS84, W72 — WGS72,
ccc — another datum number (see Attachment 2-B table 1 and 2)
2 : Null (Local datum subdivision code)
3 : W84 (Reference datum)
4 : Checksum

GNS sentence

$GPGNS,hhmmss.ss,llll.llll,a,yyyyy.yyyy,a,a,xx,xx,uxxxx,uxxx,xx,xxxx*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13

1 : UTC time (hour, minute, and second)
2 and 3 : Latitude (degree and minute), N/S
4 and 5 : Longitude (degree and minute), E/W
6 : GPS quality indicator, N = Fix is not available, A = Fix with GPS mode, D = Fix with DGPS mode
7 : Number of satellites in use
8 : Horizontal dilution of precision (HDOP)
9 : Antenna height above or below the mean sea level (m), (u :"-" is output in case the height is at a negative value and "+" is output in case it is at a positive value)
10 : Geoidal separation, (the difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface, "-" = mean-sea-level surface below WGS-84 ellipsoid surface), the unit is fixed to M (m)
11 : Age of the differential GPS data
12 : Differential reference station ID
13 : Checksum

GBS sentence

$GPGBS,hhmmss.ss,uxxx.x,uxxx.x,uxxx.x,xx,x.xxxxx,uxxxx.x,xxxx.x*hh<CR><LF>

1 2 3 4 5 6 7 8 9

1 : UTC time (hour, minute, and second)
2 : Expected error in latitude (m), (u:"-" is output in case of a negative value and "+" is output in case of a positive value.)
3 : Expected error in longitude (m), (u:"-" is output in case of a negative value and "+" is output in case of a positive value.)
4 : Expected error in altitude (m), (u:"-" is output in case of a negative value and "+" is output in case of a positive value.)
5 : ID Number of most likely failed satellite
6 : Probability of missed detection for most likely failed satellite
7 : Estimate of bias in meters on most likely failed satellite (m)
8 : Standard deviation of bias estimate
9 : Checksum

GRS sentence

$GPGRS,hhmmss.ss,1,uxxx,uxxx,uxxx,uxxx,uxxx,uxxx,uxxx,uxxx,uxxx,uxxx,uxxx,uxxx*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1 : UTC time (hour, minute, and second)
2 : 1 (fixed)
3 to 14 : Range residuals in meters for satellites used in the navigation solution (m), (u:"-" is output in case of a negative value and "+" is output in case of a positive value.)
15 : Checksum

GSA sentence

$GPGSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx.x,xx.x,xx.x*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

1 : Mode M = Manual, forced to operate in 2D or 3D mode
A = Automatic, allowed to automatically switch 2D/3D
2 : Mode 1 = Fix not available, 2 = 2D, 3 = 3D
3 to 14 : ID numbers of satellites used in solution
15 : PDOP
16 : HDOP
17 : VDOP
18 : Checksum

GST sentence

$GPGST,hhmmss.ss,xxx.x,xxx.x,xxx.x,xxx,xxx.x,xxx.x,xxx.x*hh<CR><LF>

1 2 3 4 5 6 7 8 9

1	:	UTC time (hour, minute, and second)
2	:	RMS value of the standard deviation of the range inputs to the navigation process (m)
3	:	Standard deviation of semi-major axis of error ellipse (m)
4	:	Standard deviation of semi-minor axis of error ellipse (m)
5	:	Orientation of semi-major axis of error ellipse (degree)
6	:	Standard deviation of latitude error (m)
7	:	Standard deviation of longitude error (m)
8	:	Standard deviation of altitude error (m)
9	:	Checksum

GSV sentence

$GPGSV,x,x,xx,xx,xx,xxx,xx,xx,xx,xxx,xx,xx,xx,xxx,xx,xx,xx,xxx,xx*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1	:	Total number of messages, 1 to 9
2	:	Message number, 1 to 9
3	:	Total number of satellites in view
4	:	Satellite ID number
5	:	Elevation angle of the satellite (degree)
6	:	Azimuth angle of the satellite (degree)
7	:	SNR of the satellite (dB)
8 to 11	:	Second satellite data (same as 4 to 7)
12 to 15	:	Third satellite data (same as 4 to 7)
16 to 19	:	Fourth satellite data (same as 4 to 7)
20	:	Checksum

MSS sentence

$GPMSS,xxx,xxx,xxx.x,xxx*hh<CR><LF>

1 2 3 4 5

1	:	Signal strength (dB)
2	:	Signal-to-Noise ratio (dB)
3	:	Beacon frequency (KHz)
4	:	Beacon baud rate (bps)
5	:	Checksum

Attachment 2-D Table of Waypoints

Waypoint No.	Waypoint name	Remarks

Waypoint No.	Waypoint name	Remarks

Waypoint No.	Waypoint name	Remarks

JRC Japan Radio Co., Ltd.

电子信息产品有害物资申明
日本无线株式会社

Declaration on toxic & hazardous substances or elements
of Electronic Information Products
Japan Radio Company Limited

有毒有害物质或元素的名称及含量
(Names & Content of toxic and hazardous substances or elements)

形式名(Type): JLR-7700MkII　　**名称(Name): GPS Navigator**

部件名称 (Part name)	有毒有害物质或元素 (Toxic and Hazardous Substances and Elements)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr^{6+})	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
DGPS 接收器 (DGPS Receiver)	×	×	○	×	×	×
显示装置 (Display Unit)	×	×	○	×	×	×
外部设备(Peripherals) ・选择(Options) ・电线类(Cables) ・手册(Documents)	×	×	×	×	×	×

○：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11306-2006标准规定的限量要求以下。
(Indicates that this toxic, or hazardous substance contained in all of the homogeneous materials for this part is below the requirement in SJ/T11363-2006.)

×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求。
(Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials fused or this part is above the limit requirement in SJ/T 11363-2006.)

JRC Code No.:　7ZPNA4032

RE: 中华人民共和国电子信息产品污染控制管理办法
Management Methods on Control of Pollution from Electronics Information Products of the People's Republic of China

アスベストは使用しておりません
Not use the asbestos

CODE No.7ZPNA4032

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Since 1915

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