

JLR-41/JLR-4101  
NWZ-1680

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**GNSS COMPASS**

# INSTRUCTION MANUAL



*Japan Radio Co., Ltd.*





## CAUTIONS AGAINST HIGH VOLTAGE

Radio and radar devices are operated by high voltages of anywhere from a few hundred volts up to many hundreds of thousands of volts.

Observe the following precautions to prevent the risk of electric shock.

Avoid contact with the internal parts of these devices.

Only specialized service people should do any maintenance, inspections, or adjustments inside the devices.

Falling after receiving an electric shock may lead to extensive secondary injuries, so be sure you have a safe place to stand when working.

In the event that someone receives an electric shock, immediately implement emergency procedures, such as cardiopulmonary resuscitation.

If you must reach into a device, as in the case of an emergency, you must switch off the devices and ground a terminal in order to discharge the capacitors. After making certain that all the electricity is discharged, only then can you insert your hand into the device. Wearing dry cotton work gloves is another way to reduce risks. One more necessary precaution is to not use both hands at the same time.

Although there is no danger with normal use, it is very dangerous if contact is made accidentally with the internal parts of these devices. There is a very high risk of death by high voltages of tens of thousands of volts. In some cases, you could be fatally electrocuted by voltages of several hundred volts.

## Precautions for rescuing victims from electrocution

If you find an electrocution victim, you must first switch off the machinery that caused the electrocution and ground all circuits.

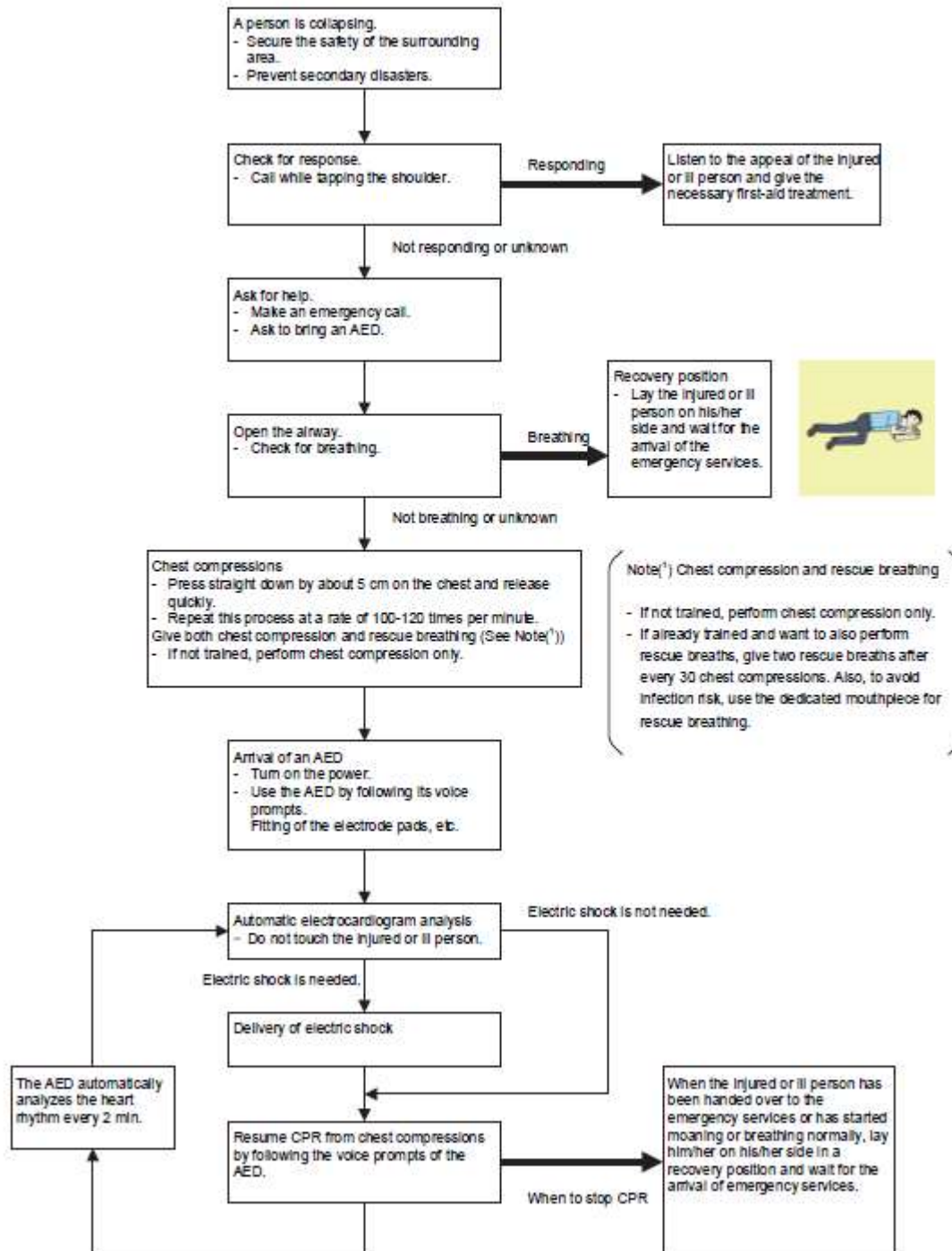
If you are unable to immediately cut off the circuit, do not directly touch the victim. Quickly use a non-conductive material, such as a dry board or cloth, to move the victim away from the device.

If someone receives an electric shock, immediately implement emergency procedures, such as cardiopulmonary resuscitation.

When a person is electrocuted, the current passes through their heart and may cause ventricular fibrillation or cardiac arrest. Also, if the shock is mild, the victim's breathing may be restored by doing artificial respiration. An electrocution victim becomes very pale, their pulse can be very weak or even stop, and they may lose consciousness and become stiff.

## Emergency First Aid Procedure

### Flow of Cardiopulmonary Resuscitation (CPR) using AED



## Procedure for Cardiopulmonary Resuscitation (CPR) using AED

1. Check the scene for safety to prevent secondary disasters
  - a) Do not touch the injured or ill person in panic when an accident has occurred. (Doing so may cause electric shock to the first-aiders.)
  - b) Do not panic and be sure to turn off the power. Then, gently move the injured or ill person to a safe place away from the electrical circuit.
2. Check for responsiveness
  - a) Tap the shoulder of the injured or ill and shout in the ear saying, "Are you OK?"
  - b) If the person opens his/her eyes or there is some response or gesture, determine it as "responding." But, if there is no response or gesture, determine it as "not responding."
3. If responding
  - a) Give first-aid treatment.
4. If not responding
  - a) Ask for help loudly. Ask somebody to make an emergency call and bring an AED.
    - Somebody has collapsed. Please help.
    - Please call an ambulance.
    - Please bring an AED.
    - If there is nobody to help, call an ambulance yourself.
5. Check for breathing
  - a) Look to see if the chest and abdomen are rising and falling.



- b) If the injured or ill person is breathing, place him/her in the recovery position and wait for the arrival of the emergency services.

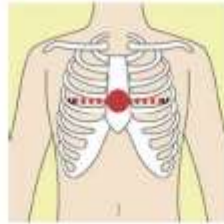


6. Cardiopulmonary resuscitation (CPR) (Combination of chest compressions and rescue breaths)

a) Chest compressions

1) Position of chest compressions

- Position the heel of one hand in the center of the chest, approximately between the nipples, and place your other hand on top of the one that is in position.



2) Perform chest compressions

- Perform uninterrupted chest compressions of 30 at the rate of about 100-120 times per minute. While locking your elbows positioning yourself vertically above your hands.
- With each compression, depress the chest wall to a depth of approximately 5 cm.



b) Combination of 30 chest compressions and 2 rescue breaths

- 1) If not trained, perform the chest compressions only.
- 2) If already trained and want to also perform rescue breaths, give two rescue breaths after every 30 chest compressions.
- 3) To avoid infection risk, use the dedicated mouthpiece for rescue breathing.
- 4) Continuously perform the combination of 30 chest compressions and 2 rescue breaths without interruption.
- 5) If there are two or more first-aiders, alternate with each other approximately every two minutes (five cycles of compressions and ventilations at a ratio of 30:2) without interruption.



7. When to stop cardiopulmonary resuscitation (CPR)
- When the injured or ill person has been handed over to the emergency services
  - When the injured or ill person has started moaning or breathing normally, lay him/her on his/her side in a recovery position and wait for the arrival of emergency services.



8. Arrival and preparation of an AED
- Place the AED at an easy-to-use position. If there are multiple first-aiders, continue CPR until the AED becomes ready.
  - Turn on the power to the AED unit. Depending on the model of the AED, you may have to push the power on button, or the AED automatically turns on when you open the cover.
  - Follow the voice prompts of the AED.



9. Attach the electrode pads to the injured or ill person's bare chest
- Remove all clothing from the chest, abdomen, and arms.
  - Open the package of electrode pads, peel the pads off and securely place them on the chest of the injured or ill person, with the adhesive side facing the chest. If the pads are not securely attached to the chest, the AED may not function. Paste the pads exactly at the positions indicated on the pads. If the chest is wet with water, wipe dry with a dry towel and the like, and then paste the pads. If there is a pacemaker or implantable cardioverter defibrillator (ICD), paste the pads at least 3cm away from them. If a medical patch or plaster is present, peel it off and then paste the pads. If the injured or ill person's chest hair is thick, paste the pads on the chest hair once, peel them off to remove the chest hair, and then paste new pads.
  - Some AED models require to connect a connector by following voice prompts.
  - The electrode pads for small children should not be used for children over the age of 8 and for adults.



10. Electrocardiogram analysis
- The AED automatically analyzes electrocardiograms. Follow the voice prompts of the AED and ensure that nobody is touching the injured or ill person while you are operating the AED.
  - On some AED models, you may need to push a button to analyze the heart rhythm.



#### 11. Electric shock (defibrillation)

- a) If the AED determines that electric shock is needed, the voice prompt saying, "Shock is needed" is issued and charging starts automatically.
- b) When charging is completed, the voice prompt saying, "Press the shock button" is issued and the shock button flashes.
- c) The first-aider must get away from the injured or ill person, make sure that no one is touching him/her, and then press the shock button.
- d) When electric shock is delivered, the body of the injured or ill person may jerk.



#### 12. Resume cardiopulmonary resuscitation (CPR)

- a) Resume CPR by following the voice prompts of the AED.
  - Perform uninterrupted chest compressions at the rate of about 100-120 times per minute.
  - With each compression, depress the chest wall to a depth of approximately 5 cm.



#### 13. Automatic electrocardiogram analysis

- a) When 2 minutes have elapsed since you resumed cardiopulmonary resuscitation (CPR), the AED automatically analyzes the electrocardiogram.
- b) If you suspended CPR by following voice prompts and AED voice prompt informs you that shock is needed, give electric shock again by following the voice prompts.  
If AED voice prompt informs you that no shock is needed, immediately resume CPR.

#### 14. When to stop CPR (Keep the electrode pads on)

- a) When the injured or ill person has been handed over to the emergency services.
- b) When the injured or ill person has started moaning or breathing normally, lay him/her on his/her side in a recovery position and wait for the arrival of emergency services.



## Foreword

Thank you for purchasing the JRC JLR-41 GNSS Compass.  
This equipment measures the ship's heading using GNSS satellite signals.

- Thoroughly read this instruction manual before operating the equipment.
- Keep this manual nearby the equipment to allow ready access to it if necessary. It may provide valuable information on how to deal with a given situation that may arise during the operation.

## Before Commencing the Operation

### Symbols

Several symbols are used in this manual to ensure safety and proper operation of the equipment and to avoid possible human injury or property damage. These symbols and their meanings are shown below. Please read and understand these symbols before proceeding to read this manual.



### WARNING

Instructions shown with this symbol represent what can cause death or serious injury if not observed.



### CAUTION

Instructions shown with this symbol represent what may cause injury or property damage if not observed.

### Examples of the Symbols



The symbols shown in the  $\Delta$  mark represent those that require attention (including potential dangers and warnings). A depiction of the type of caution is shown inside the symbol (the left symbol indicates a general caution).



The symbols shown in the  $\ominus$  mark represent actions which are prohibited. A depiction of the type of prohibited action is shown inside the symbol (the left symbol indicates that disassembly is prohibited).



The  $\bullet$  symbol indicates required actions. A depiction of the type of required action is shown inside the symbol (the left symbol indicates that the power plug must be disconnected from the outlet).

## Precautions Upon the Operation

### **WARNING**



Do not disassemble or modify the equipment. Doing so may result in fire, electric shock, or equipment failure.



Do not allow the display to become wet. Doing so may result in fire, electric shock, or equipment failure.



Operate the equipment only at the indicated voltage. Failure to do so may result in fire, electric shock, or equipment failure.



Install this unit at least 1 m away from any magnetic compasses. Installation near a magnetic compass may result in interference with the magnetic compass, and may result in an accident.



Do not perform internal inspections or modifications of the equipment. Inspection or modification by unauthorized personnel may result in fire, electric shock, or equipment failure.



Please consult with JRC or an affiliate to perform internal inspections or repair.



When disposing of the used lithium battery, place insulating tape over the battery terminals, or otherwise insulate the battery. Failure to do so may result in heating, explosion, or fire due to a shorted battery.



In case you find smoke, unusual odor or extreme high heat coming from the equipment, turn off the power and breaker immediately. After that, please contact your dealer or agency or each branch office / head office / local office. Keeping operation under such condition may cause fire or electric shock.



Because this equipment is designed to be installed on ships for civilian use, do not use it on anything other than civilian ships (e.g., military equipment, aviation equipment).



# CAUTION



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



Do not use the equipment in the environment other than those provided in the specification. Doing so may result in equipment failure, malfunction, or injury.



Do not install the display unit in the location where it may come in contact with water, oil, or chemicals. Doing so may result in equipment failure, malfunction, or injury.



Do not install the equipment in the place subject to vibration or shock. Doing so may result in the equipment falling or collapsing, resulting in equipment failure or injury.



Do not place any item on the top of the equipment.  
Doing so may result in equipment failure, malfunction, or injury.



Please consult with JRC or an affiliate to perform installation. Installation by unauthorized personnel may result in malfunction.



Use only the specified battery. Failure to do so may result in battery leakage or rupture, resulting in fire, injury, or equipment failure.



Do not use benzine, alcohol or thinner when caring this equipment.  
Doing so may result in removing the paint or changing of properties.



Wipe off the grime lightly with a dry soft cloth.  
Wipe with the other than a dry soft cloth may result in a scratch on the equipment.



Use the indicated screws when installing the display unit to a stable wooden surface. Failure to do so may result in the display unit falling over, causing injury or property damage.



Use only the specified fuse.  
Failure to do so may result in fire or equipment failure



Do not use a sharp tip, when tapping the touch panel.  
Doing so may result in screen injury.

# CAUTION



When connecting the cable attached to the equipment, do not bend it acutely, twist it, or impart excessive force. Doing so sometimes causes cracks or damage to the coating, resulting in fire or electrocution.



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



Do not paint the sensor. Doing so may result in reception problems.



Do not install the sensor where temperature exceeds 55 degrees Celsius and there is covered with exhaust gas from funnel. Doing so may result in equipment failure or malfunction.



Use a fitted cable, when connected to junction box. The junction box rubber gaskets (30 f Gland side) fit  $\phi$  18mm – 26mm cables.



Install the sensor where there are no obstacles, 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 with the following characteristics.

1. An open space, which allows uniform reception of satellite signals.
  2. Far away from any high power transmission antennas.
  3. Outside radar beams.
  4. Away from the INMARSAT antenna by at least 5 meters and outside the INMARSAT beam.
  5. Away from the antenna of a VHF transmitter and a direction finder by at least 3 meters.
  6. Away from a Magnetic Compass by at least 1 meter.
  7. Away from amateur radio antennas by at least 3 meters.
- Every time when changing the equipment location, confirm that the proper performance of equipment can be obtained.

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 accuracy may be impaired.



If occurs bad positioning of such as satellite can not be received, please execute the re-start of sensor. If not recover, please consult with JRC or an affiliate.



There are cases when time lags in the GPS navigator and GNSS compass. This is not a malfunction due to the delay in the internal processing.



There are cases when time lags in the main display unit and sub display unit. This is not a malfunction due to the delay in the internal processing.



Note that at high latitudes (89.5 degrees latitude or higher), the heading and ROT movements are different from those at low and mid latitudes.



If jamming or spoofing is detected, check that the position displayed is correct. Using the wrong position may cause stranding.



The printing paper used in this printer (option) is a heat sensitive paper. Take the following precautions when using this paper.

- Store the paper away from heat, humidity, or heat sources.
- Do not rub the paper with any hard objects.
- Do not place the paper near organic solvents.
- Do not allow the paper to come in contact with polyvinyl chloride film, erasers, or adhesive tape for long periods of time.
- Keep away the paper from freshly copied diazo type or wet process copy paper.

## Appearance of the Equipment

### ●NWZ-1680 Display Unit



### ●JLR-4101 GNSS Compass sensor



## Terminology

| Term               | Meaning (Descriptions)                                                                                                                                                                                                                 |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2D (2 dimension)   | Positioning with antenna elevation height in addition to satellite data.                                                                                                                                                               |
| 3D (3 dimension)   | The three dimensional position fix, 4 or more satellites required.                                                                                                                                                                     |
| Active route       | Route that is currently used by a ship                                                                                                                                                                                                 |
| AD-10              | A communication method for ship's heading data.                                                                                                                                                                                        |
| Beacon information | Beacon data which is broadcast by message type 16.                                                                                                                                                                                     |
| BeiDou (BDS)       | BeiDou (BDS) is a satellite positioning system that is managed by China.                                                                                                                                                               |
| CCRP               | Abbreviation of Consistent Common Reference Point. Reference position of the own ship.                                                                                                                                                 |
| CDI                | Abbreviation of Course Deviation Indicator. This indicator shows information on the deviation from the scheduled route and on the direction into which the ship should be steered.                                                     |
| Checksum           | An error detection method to check that the data has been correctly transmitted.                                                                                                                                                       |
| COG                | Course Over Ground.                                                                                                                                                                                                                    |
| Course             | Direction in which the ship is traveling, which is the bearing mainly displayed by the GNSS.                                                                                                                                           |
| Default gateway    | Equipment connected externally from a constructed network.                                                                                                                                                                             |
| DGPS               | Abbreviation of Differential Global Positioning System. GPS satellite error data sent from a reference station whose position is accurately known is received by a beacon sensor via a beacon station, improving positioning accuracy. |
| DR                 | Abbreviation of Dead Reckoning. When the heading cannot be calculated by GNSS due to interruption of GNSS signals, the built-in sensors are used to autonomously determine the heading. (Autonomous navigation)                        |
| FRAM               | Nonvolatile memory using a ferroelectric substance.                                                                                                                                                                                    |
| Galileo            | Galileo is a satellite positioning system managed by EU.                                                                                                                                                                               |
| Geodetic           | Conditions for expressing position via latitude and longitude.                                                                                                                                                                         |
| GLONASS            | GLONASS is a satellite positioning system that is managed by Russia.                                                                                                                                                                   |
| GNSS               | GNSS is an abbreviation of Global Navigation Satellite System. GNSS includes satellite positioning systems such as GPS (United States), Galileo (Europe), GLONASS (Russia), BeiDou (China), and QZSS (Japan).                          |
| GNSS Core (Core)   | The GNSS receiver in the GNSS Compass sensor (JLR-4101).                                                                                                                                                                               |

|                        |                                                                                                                                                                                                                                                                                 |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GPS Satellite (GPS)    | Abbreviation of Global Positioning System. Refers to satellites launched for navigational support of military vessels managed by the United States Department of Defense.                                                                                                       |
| HDOP                   | Abbreviation of Horizontal Dilution of Precision. Indicates accuracy of positioning. The smaller the number, the higher the accuracy. If GPS satellites are unevenly distributed, this number will grow. If GPS satellites are evenly distributed, this number will be smaller. |
| Heaving                | Vertical movement                                                                                                                                                                                                                                                               |
| Heel angle             | Angle of inclination to portside/starboard of the ship                                                                                                                                                                                                                          |
| IEC                    | IEC is the abbreviation of International Electrotechnical Commission. It is an international standard governing electrical and electronic technologies.                                                                                                                         |
| IP address             | ID number assigned to equipment on a constructed network.                                                                                                                                                                                                                       |
| IPXX                   | IPXX is Degrees of protection provided by enclosures (IP Code) 1st numeral: Against ingress of solid foreign objects (0 – 6)                                                                                                                                                    |
| Jamming                | A type of disturbing wave emitted by an attacker or other device that emits strong radio waves in the same frequency band as GPS signals. Jamming can prevent a device from receiving satellite signals in the relevant frequency band and may result in loss of positioning.   |
| LAN                    | Abbreviation of Local Area Network. A network is constructed for transmitting and receiving data.                                                                                                                                                                               |
| LCD Unit (LCD)         | Liquid Crystal Display Unit.                                                                                                                                                                                                                                                    |
| Leg                    | Line between two consecutive waypoints.                                                                                                                                                                                                                                         |
| Log Pulse              | Contact output signal, output in 1 pulse per nm. Expressed in units of "p/nm". mi/h Unit of ship speed.                                                                                                                                                                         |
| MAC address            | ID number assigned to LAN IC                                                                                                                                                                                                                                                    |
| Master reset           | This function changes the settings of the display unit and GNSS compass sensor back to the factory settings. The function clears all the data. To perform the master reset, please consult with JRC or an affiliate                                                             |
| Message Type 0         | SBAS satellite test broadcasting.                                                                                                                                                                                                                                               |
| Multi GNSS             | Positioning using multiple satellite systems at the same time.                                                                                                                                                                                                                  |
| Multipath Wave         | Waves received from multiple directions due to reflection or refraction of an initial wave by obstacles.                                                                                                                                                                        |
| Mutual monitoring mode | When two navigators are installed, they monitor their position fixing status each other by using this function.                                                                                                                                                                 |
| NMEA0183 (NMEA)        | Abbreviation of National Marine Electrical Association 0183. International standard for naval equipment transmission established by the National Marine Electrical Association..                                                                                                |
| NSK                    | JRC radar compatible format.                                                                                                                                                                                                                                                    |
| Pitch                  | Pitching                                                                                                                                                                                                                                                                        |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Positioning                   | Use of GNSS or DGPS receiving functions to determine the current position of a ship.                                                                                                                                                                                                                                                                                                                     |
| PPP                           | Abbreviation of Positioning Precise Point Positioning (PPP), which uses correction data received from the SBAS satellites.                                                                                                                                                                                                                                                                               |
| QZSS                          | QZSS is a Quasi-zenith satellite system that is managed by Japan and complements GPS.                                                                                                                                                                                                                                                                                                                    |
| RAIM Accuracy Standard (RAIM) | Abbreviation of Receiver Autonomous Integrity Monitoring. This (RAIM) system automatically detects failed satellites and deselects their positioning data from calculations. Including data from failed satellites will result in a decrease in positioning accuracy; the RAIM accuracy standard indicates the accuracy degradation base for removal of failed satellites from positioning calculations. |
| Ranging                       | Positioning with the use of SBAS satellite in addition to GPS satellite.                                                                                                                                                                                                                                                                                                                                 |
| Reception Level               | GNSS signal reception level.                                                                                                                                                                                                                                                                                                                                                                             |
| Roll                          | Rolling                                                                                                                                                                                                                                                                                                                                                                                                  |
| ROT                           | Abbreviation of Rate of Turn, which indicates the turning speed. It is indicated in degrees/minute and represents the amount of turning per minute.                                                                                                                                                                                                                                                      |
| Route plan                    | Plan registered with multiple waypoints in the navigation order                                                                                                                                                                                                                                                                                                                                          |
| RS-422                        | Balanced serial transmission standard.                                                                                                                                                                                                                                                                                                                                                                   |
| SBAS                          | Abbreviation of Satellite Based Augmentation System. It is a blanket term for wide scale GPS support systems using fixed position satellites which send GPS error correction data over a wide range.                                                                                                                                                                                                     |
| SBAS Search                   | SBAS reception mode (manual / automatic).                                                                                                                                                                                                                                                                                                                                                                |
| Shared route                  | Function that uses the same route as other functions such as ECDIS do. The route can be updated automatically by sharing the active route.                                                                                                                                                                                                                                                               |
| Smoothing                     | Function for averaging over a specified number of seconds.                                                                                                                                                                                                                                                                                                                                               |
| SOG                           | Speed Over Ground, This is the ship's relative speed to the ground.                                                                                                                                                                                                                                                                                                                                      |
| SPEED                         | The speed mainly measured by the GNSS.                                                                                                                                                                                                                                                                                                                                                                   |
| Spoofing                      | A type of disturbing wave such as a false GPS signal emitted by an attacker. If a false signal is used for positioning, an incorrect position and time may be output.                                                                                                                                                                                                                                    |
| STW                           | Speed Through Water.                                                                                                                                                                                                                                                                                                                                                                                     |
| Subnet mask                   | Value for identifying the network address                                                                                                                                                                                                                                                                                                                                                                |
| Symbol information            | Information of symbols displayed on the plotting screen. The information includes symbol positions, comments, etc.                                                                                                                                                                                                                                                                                       |
| UTC                           | Abbreviation of Coordinated Universal Time.                                                                                                                                                                                                                                                                                                                                                              |

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# Chapter 1 Equipment Overview

## 1.1 Functions

This equipment (JLR-41) determines the ship's heading by measuring the heading between antennas using the carrier waves of GNSS satellites.

By supporting multi-GNSS and increasing the number of satellites used for measurement, it can measure the heading with high accuracy and stability. It also has the spoofing and jamming detection functions for safer navigation.

Because this equipment outputs heading data at high speed, it can be interfaced with our radar to maximize the radar performance.

Using GNSS satellites, this equipment provides highly accurate heading, position, course, and speed measurements in all weather conditions around the world.

## 1.2 Features

- High accuracy and stability (ideal backup for a gyrocompass)
- High visibility 6.5-inchi large colour LCD
- Provided with many graphic display modes
- Short static period (standard 2 minutes or less)
- Improved operability by touch panel and abundant menus
- High reliability by the multi-GNSS receivers (GPS/GLONASS/Galileo/BeiDou/QZSS/SBAS)
- Spoofing/jamming detection function installed\*1
- Enhanced attitude measurement functions (rolling, pitching, heaving)
- Easy-to-understand descriptive display

\*1: A separate license is required to enable the spoofing/jamming detection function.

## 1.3 Configuration

### 1.3.1 Standard Configuration

#### JLR-41

| No  | Name                         | Model            | Q'ty | Note                           |
|-----|------------------------------|------------------|------|--------------------------------|
| 1   | Sensor                       | JLR-4101         | 1    | Main unit                      |
| 1-1 | Cable ties (small)           | BRBP07141        | 1    |                                |
| 1-2 | Cable ties (large)           | BRBP07142        | 4    |                                |
| 2   | Display Unit                 | NWZ-1680         | 1    | Main unit                      |
| 2-1 | Ferrite core                 | 5MBIR00009       | 1    |                                |
| 2-2 | Flush mount                  | P00014607        | 1    |                                |
| 2-3 | Power cable                  | CFQ-5770A        | 1    | 2 m with fuse                  |
| 2-4 | Fuse                         | MF60NR 250V 3.15 | 1    |                                |
| 3   | Data cable                   | CFQ-7248         | 1    | 10m                            |
| 4   | Data cable                   | CFQ-5771B        | 1    | For display unit, 3m, 18 cores |
| 5   | Instruction manual (English) | P00011567        | 1    |                                |
| 6   | Bridge card (English)        | P00022759        | 1    |                                |

#### JLR-4101

| No  | Name                         | Model     | Q'ty | Note |
|-----|------------------------------|-----------|------|------|
| 1   | Sensor                       | JLR-4101  | 1    |      |
| 1-1 | Cable ties (small)           | BRBP07141 | 1    |      |
| 1-2 | Cable ties (large)           | BRBP07142 | 4    |      |
| 2   | Instruction manual (English) | P00011567 | 1    |      |

#### NWZ-1680

| No  | Name                  | Model            | Q'ty | Note          |
|-----|-----------------------|------------------|------|---------------|
| 1   | Display Unit          | NWZ-1680         | 1    | Main unit     |
| 1-1 | Ferrite core          | 5MBIR00009       | 1    |               |
| 1-2 | Flush mount           | P00014607        | 1    |               |
| 1-3 | Power cable           | CFQ-5770A        | 1    | 2 m with fuse |
| 1-4 | Fuse                  | MF60NR 250V 3.15 | 1    |               |
| 1-5 | Bridge card (English) | P00022759        | 1    |               |

### 1.3.2 Option

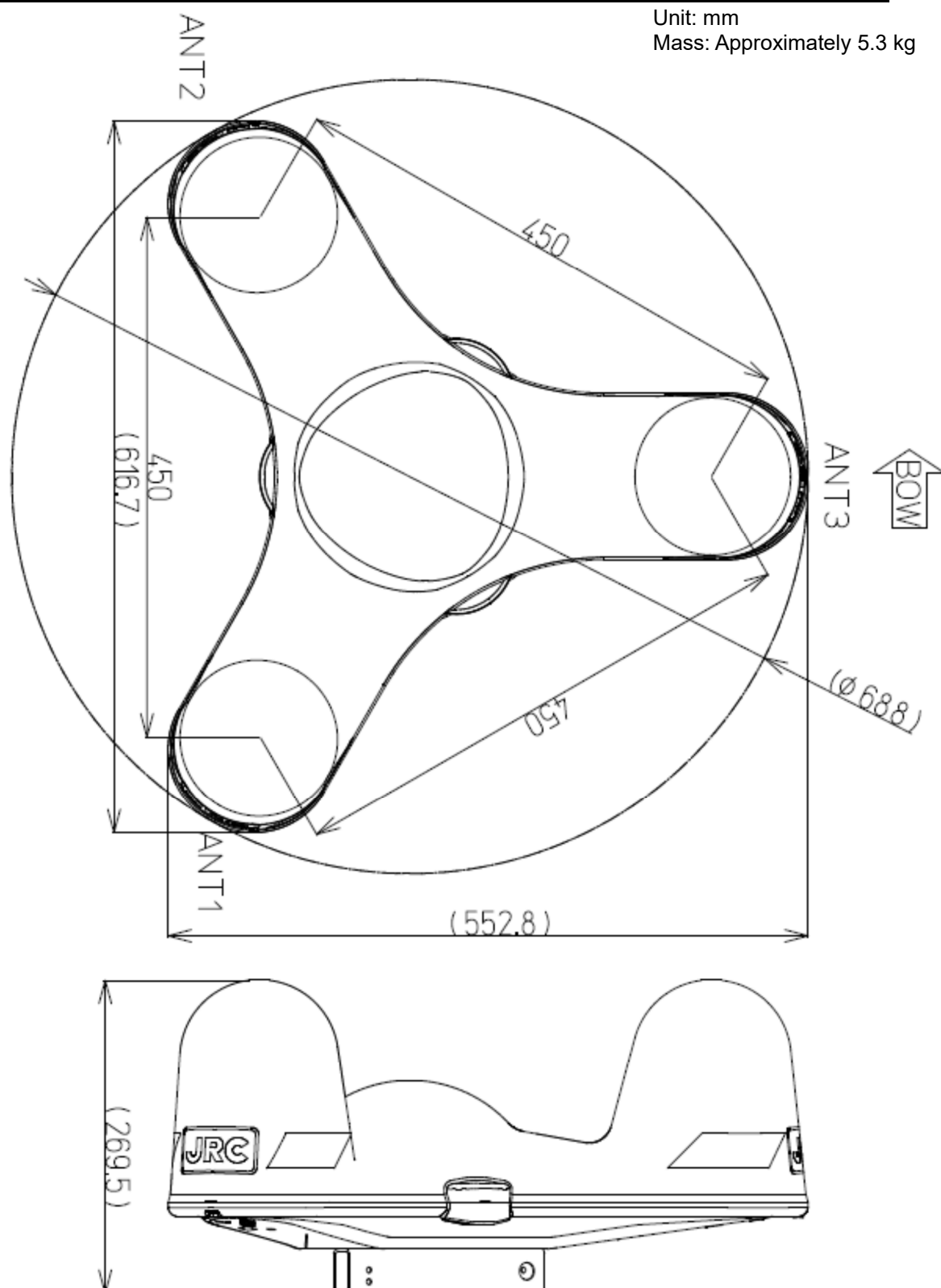
| No   | Name                                       | Model      | Q'ty | Note                                   |
|------|--------------------------------------------|------------|------|----------------------------------------|
| 1    | Data cable                                 | CFQ7248-30 | 1    | For Sensor / 30m / 14 cores            |
| 2    | Data cable                                 | CFQ7248    | 1    | For Sensor / 10m / 14 cores            |
| 3    | Extension cable                            | CFQ-7249   | 1    | For Extension Sensor / 20m / 14 cores  |
| 4    | Extension cable                            | CFQ7249-10 | 1    | For Extension Sensor / 10m / 14 cores  |
| 5    | Junction box                               | NQE-7720   | 1    | For Extension Sensor / 14 terminals    |
| 5-1  | Installation metal fitting of junction box | MPBP31612  | 1    | For NQE-7720                           |
| 6    | Beacon connecting cable                    | CFQ-7250   | 1    | For connecting a beacon receiver       |
| 7    | Installation trestle                       | P00004089  | 1    | For Sensor                             |
| 8    | Bird repellent rod                         | P00015258  | 1    | For Sensor                             |
| 9    | Power cable                                | CFQ-5770D  | 1    | For Display Unit / 10m / 12 cores      |
| 10   | Data cable                                 | CFQ-5771B  | 1    | For Display Unit / 3m / 18 cores       |
| 11   | Data cable                                 | CFQ-5771D  | 1    | For Display Unit / 10m / 18 cores      |
| 12   | Ethernet cable                             | CFQ-7540   | 1    | For Display Unit / 15m                 |
| 13   | Base kits                                  | MPBX50347  | 1    | For Display Unit                       |
| 14   | Select switch                              | NCZ-777    | 1    | N2.5                                   |
| 15   | Select switch                              | NCZ-1537B  | 1    | N2.5                                   |
| 16   | Junction box                               | CQD-10     | 1    | 16 terminals / N2.5                    |
| 17   | Output buffer                              | NQA-4351   | 1    | N2.5                                   |
| 17-1 | Select switch                              | NCZ-1663   | 1    | For NQA-4351 / N2.5                    |
| 18   | Printer                                    | NKG-104    | 1    | N2.5                                   |
| 18-1 | Printer paper                              | 7ZPJD0384  | 1    | For NKG-104                            |
| 19   | Printer                                    | RP-D10     | 1    | For Network                            |
| 19-1 | Printer paper                              | TP-B10CH   | 1    | For RP-D10                             |
| 19-2 | Power supply                               | NBG-980    | 1    | For RP-D10                             |
| 20   | External dimmer unit                       | NCM-227    | 1    | N2.5                                   |
| 21   | AC/DC power supply unit                    | NBD-904    | 1    | AC100/220V,DC24V Input<br>DC24V Output |
| 22   | Conversion cable                           | P00014414  | 1    | For sensor replace                     |
| 23   | Conversion bracket                         | P00029646  | 1    | For display unit replace               |
| 24   | Conversion data cable                      | P00024179  | 1    | For display unit replace               |
| 25   | Y Cable for Sub Display                    | CFQ-7251   | 1    | NWZ-1680 for Remote Display            |

## 1.4 Construction

### JLR-4101 Sensor

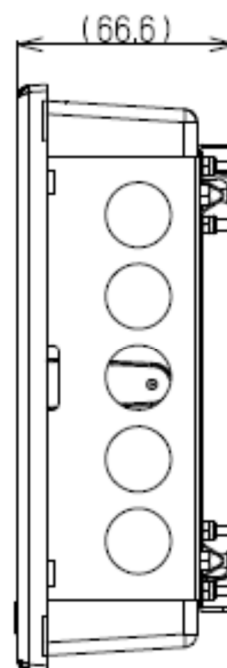
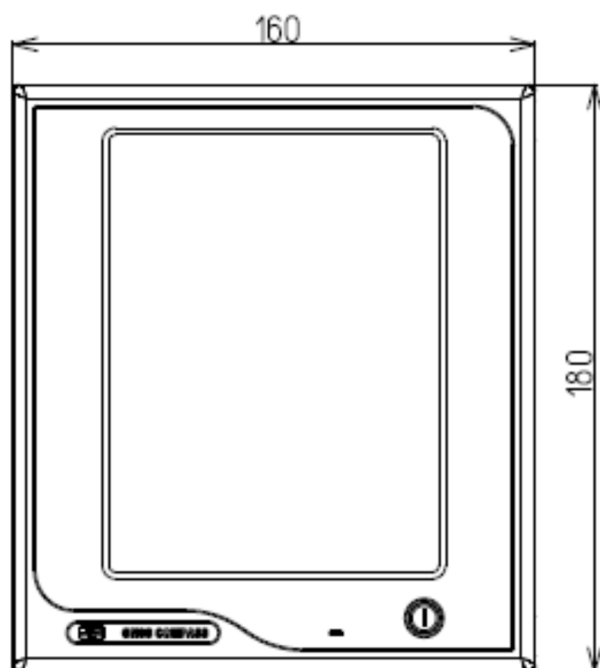
Unit: mm

Mass: Approximately 5.3 kg

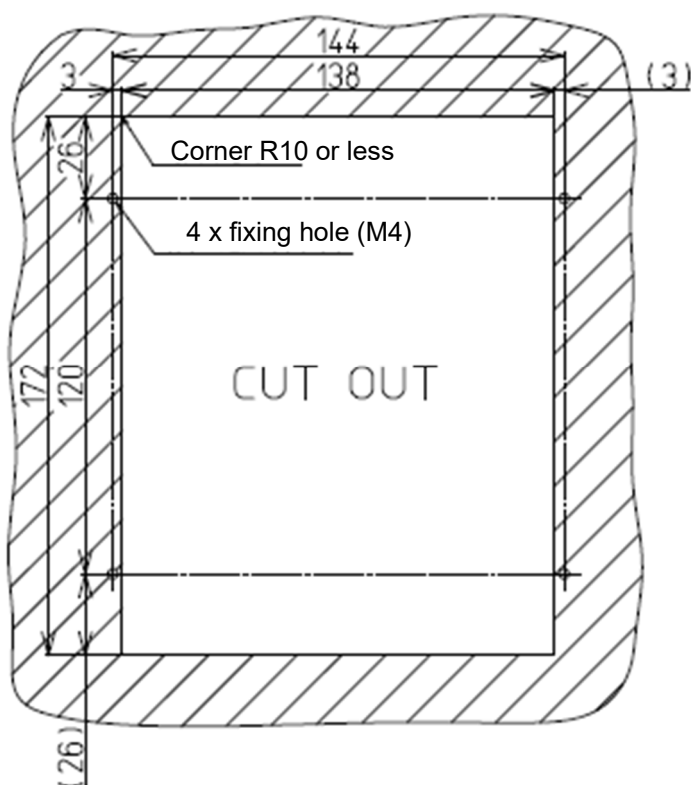


Unit: mm

Mass: Approximately 1.3 kg



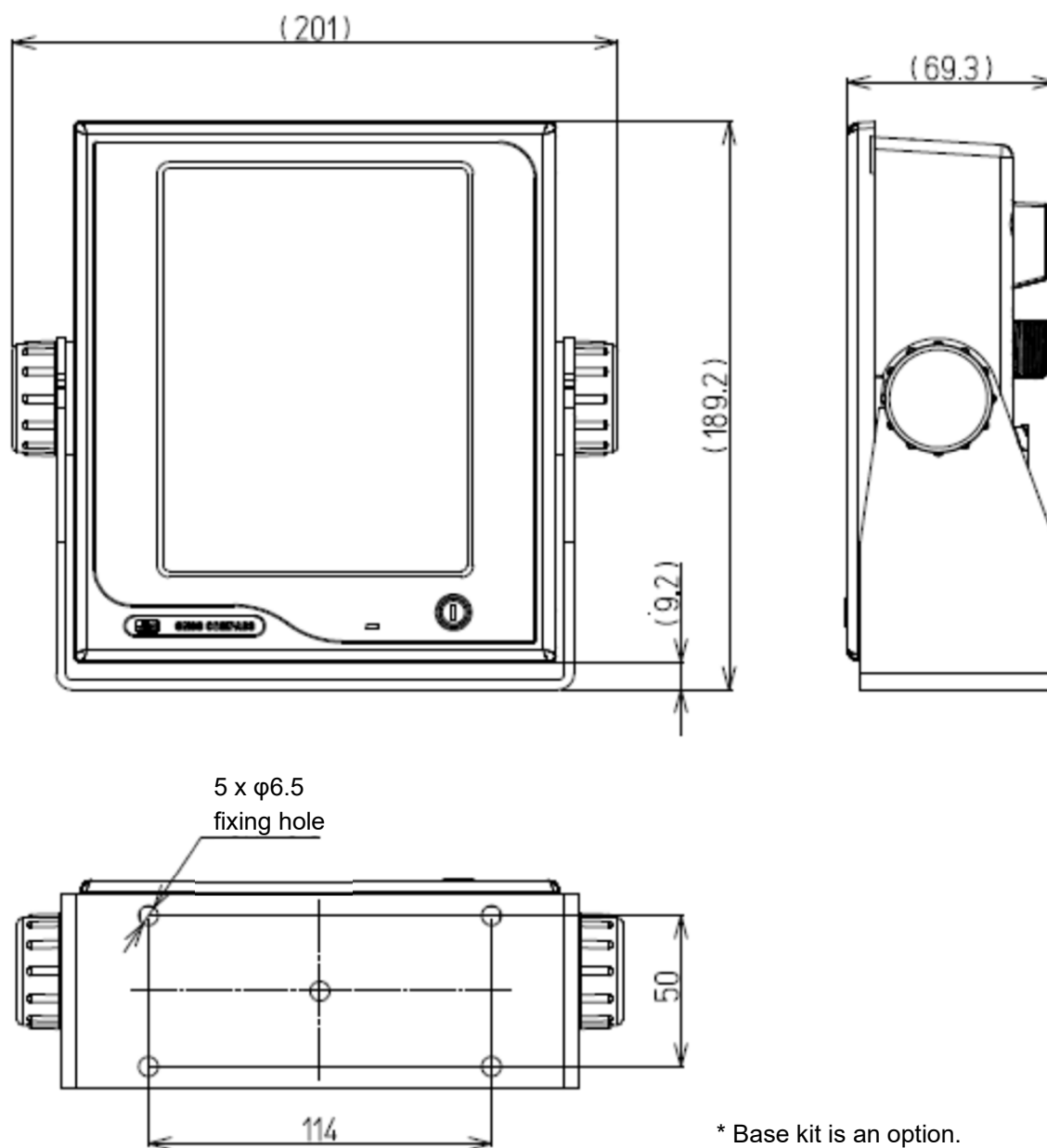
Flush-mount installation  
panel cut holes



**NWZ-1680 Display Unit (Base kit)**

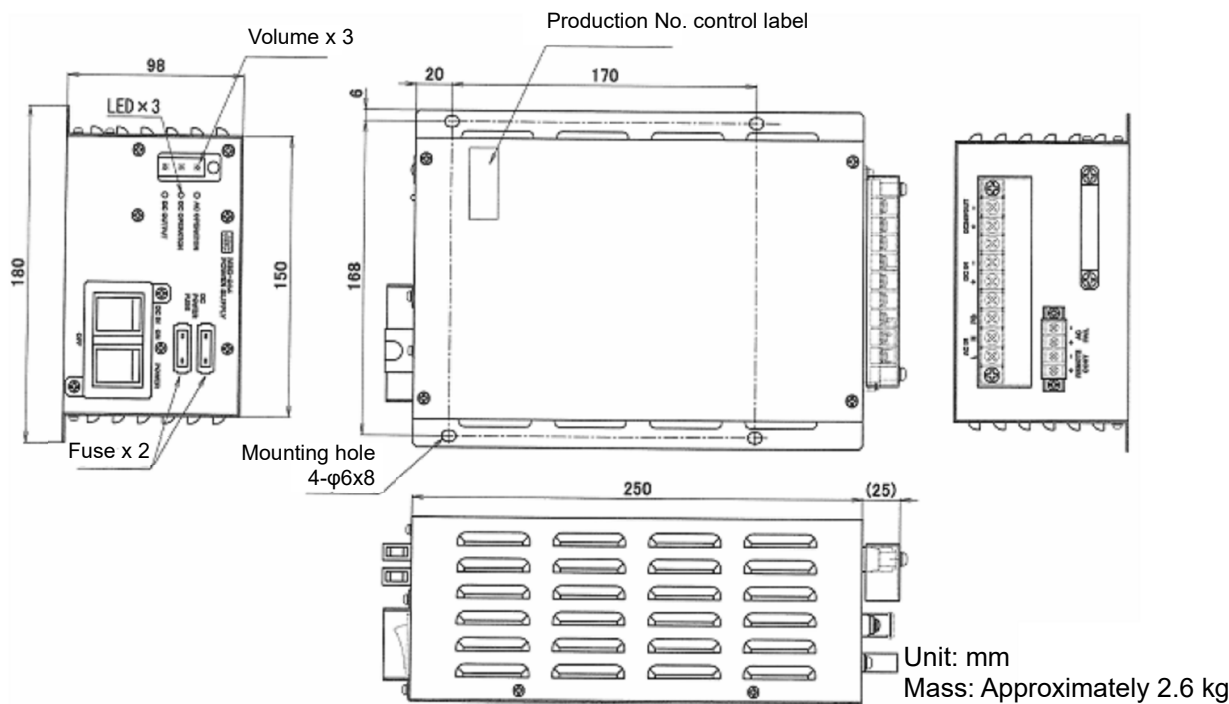
Unit: mm

Mass: Approximately 1.8 kg

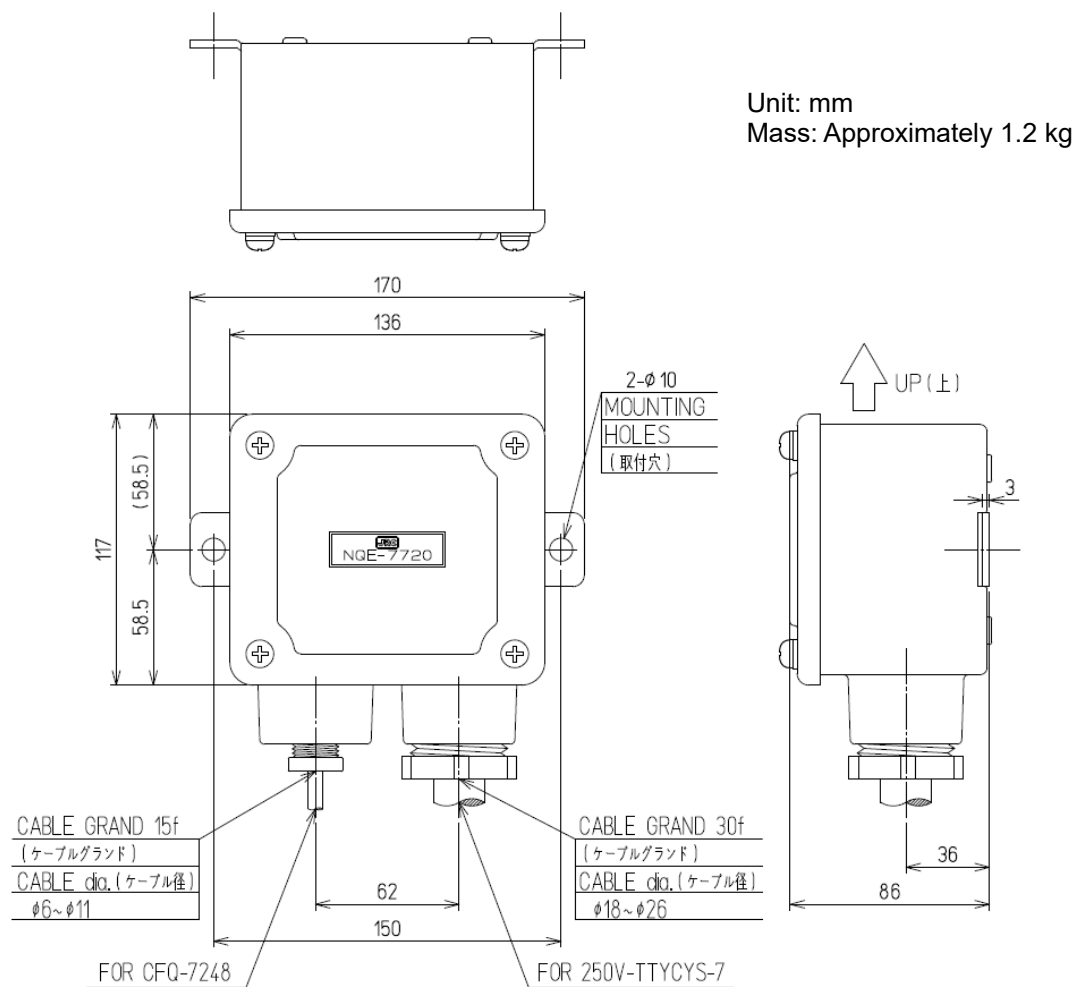


\* Base kit is an option.

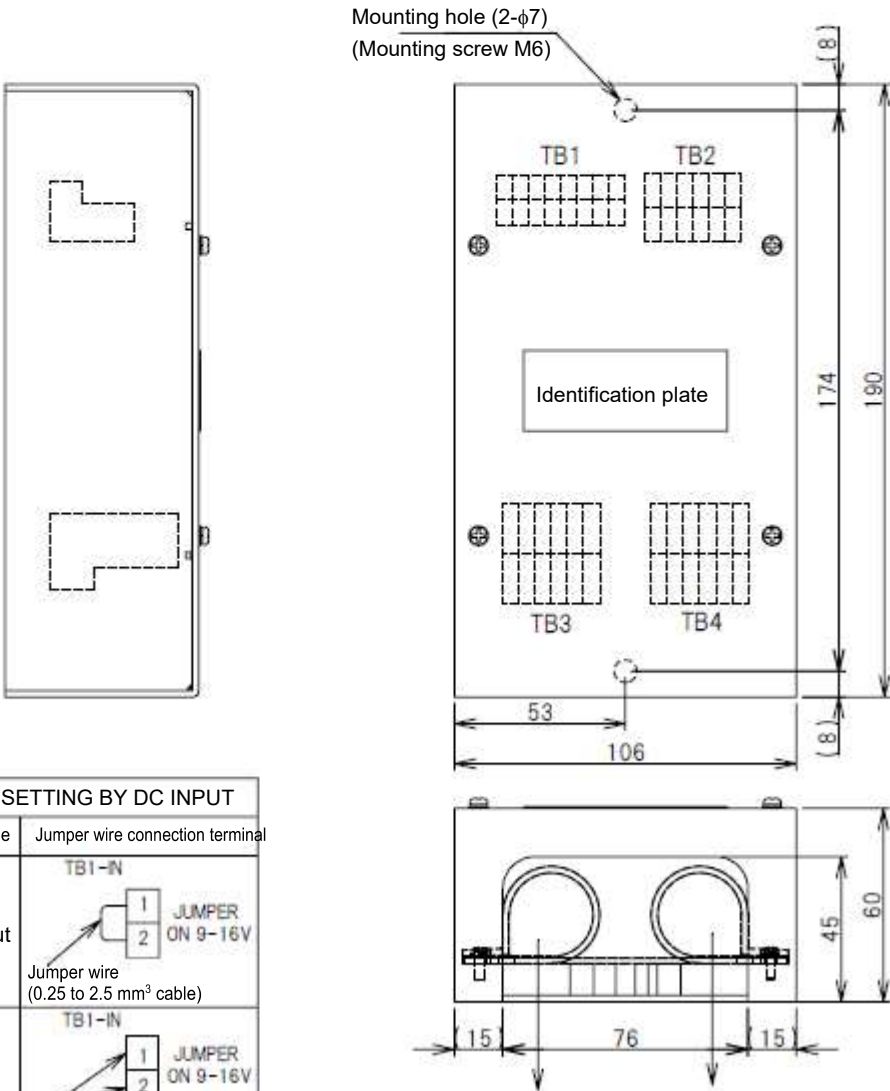
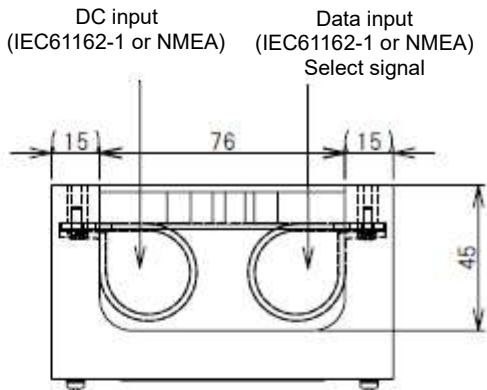
## NBD-904 AC/DC power supply unit



## NQE-7720 Junction box



NQA-4351 Output Buffer

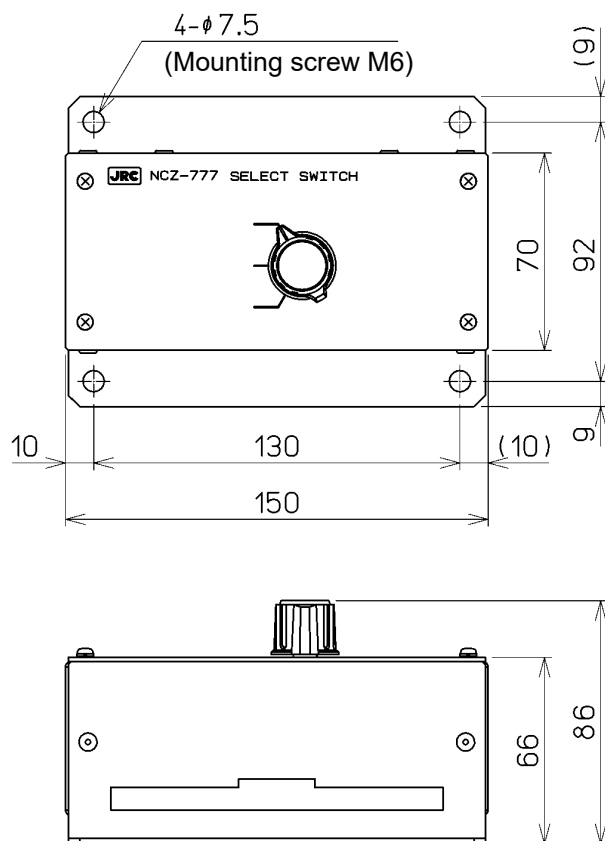


Note:

| JUMPER SETTING BY DC INPUT |                                                                                                                                            |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| DC input voltage           | Jumper wire connection terminal                                                                                                            |
| 12 VDC input               | <div>TB1-IN</div> <div><div>1</div><div>2</div></div> <div>JUMPER ON 9-16V</div> <div>Jumper wire (0.25 to 2.5 mm<sup>3</sup> cable)</div> |
|                            | <div>TB1-IN</div> <div><div>1</div><div>2</div></div> <div>JUMPER ON 9-16V</div>                                                           |

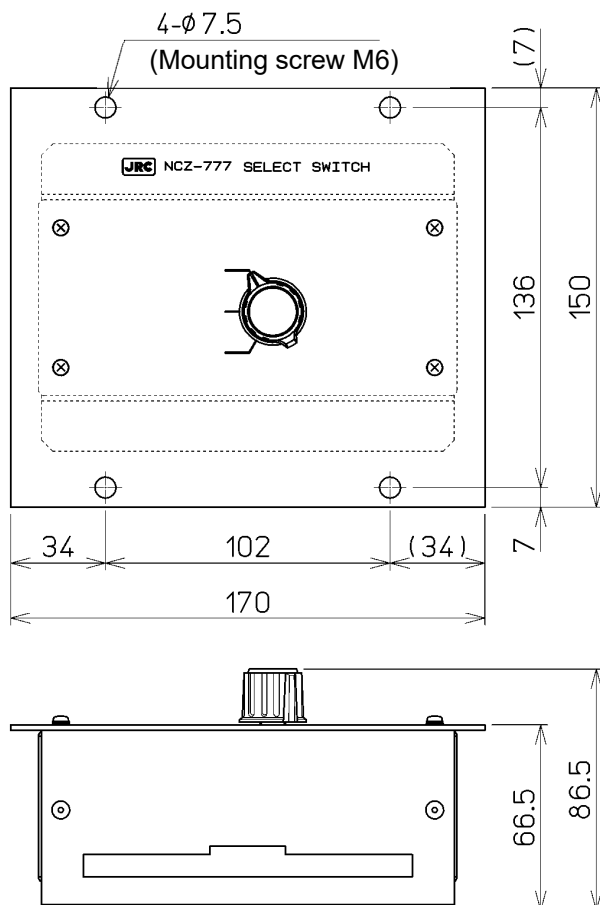
Unit: mm  
Mass: Approximately 0.8 kg

### NCZ-777 Select switch (Stationary)



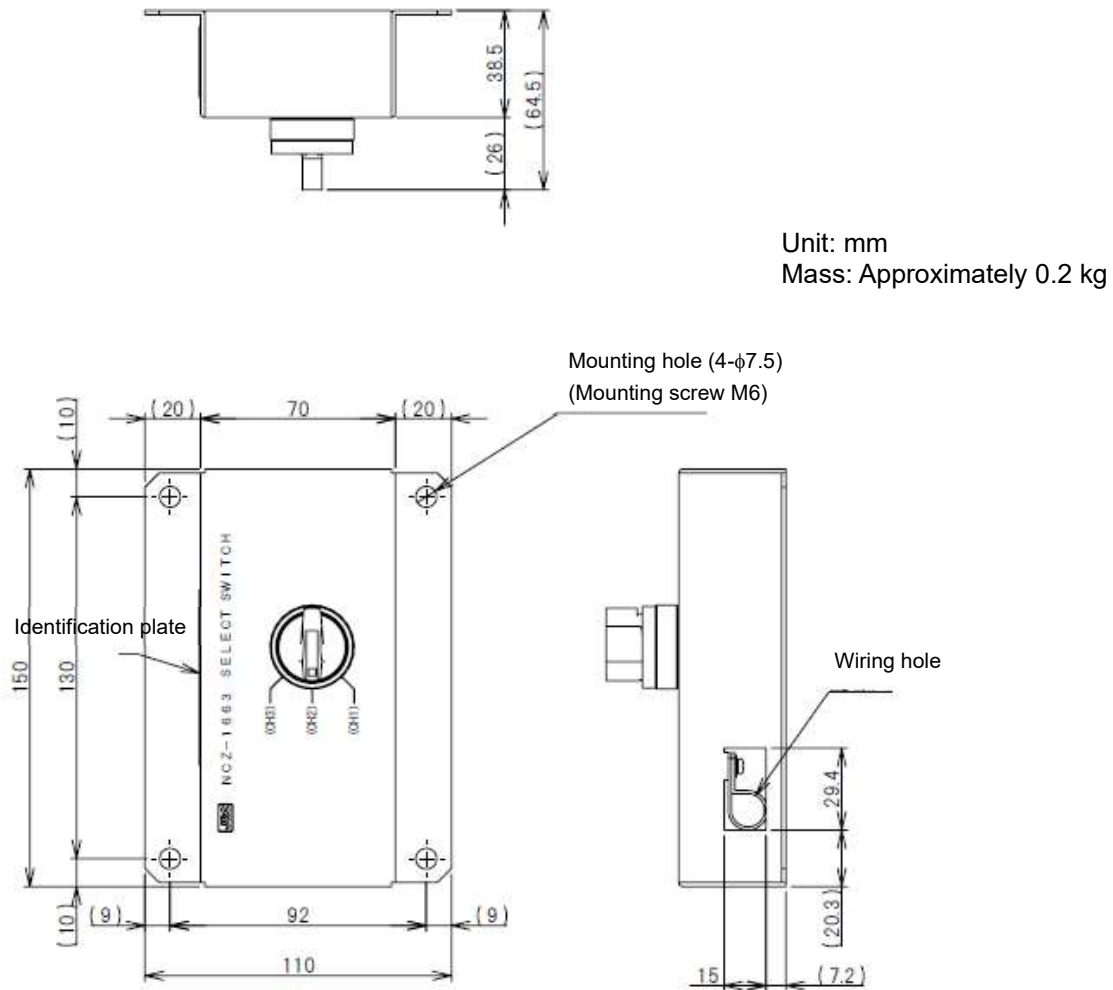
Unit: mm  
Mass: Approximately 0.5 kg

### NCZ-777 Select switch (Flush mount)

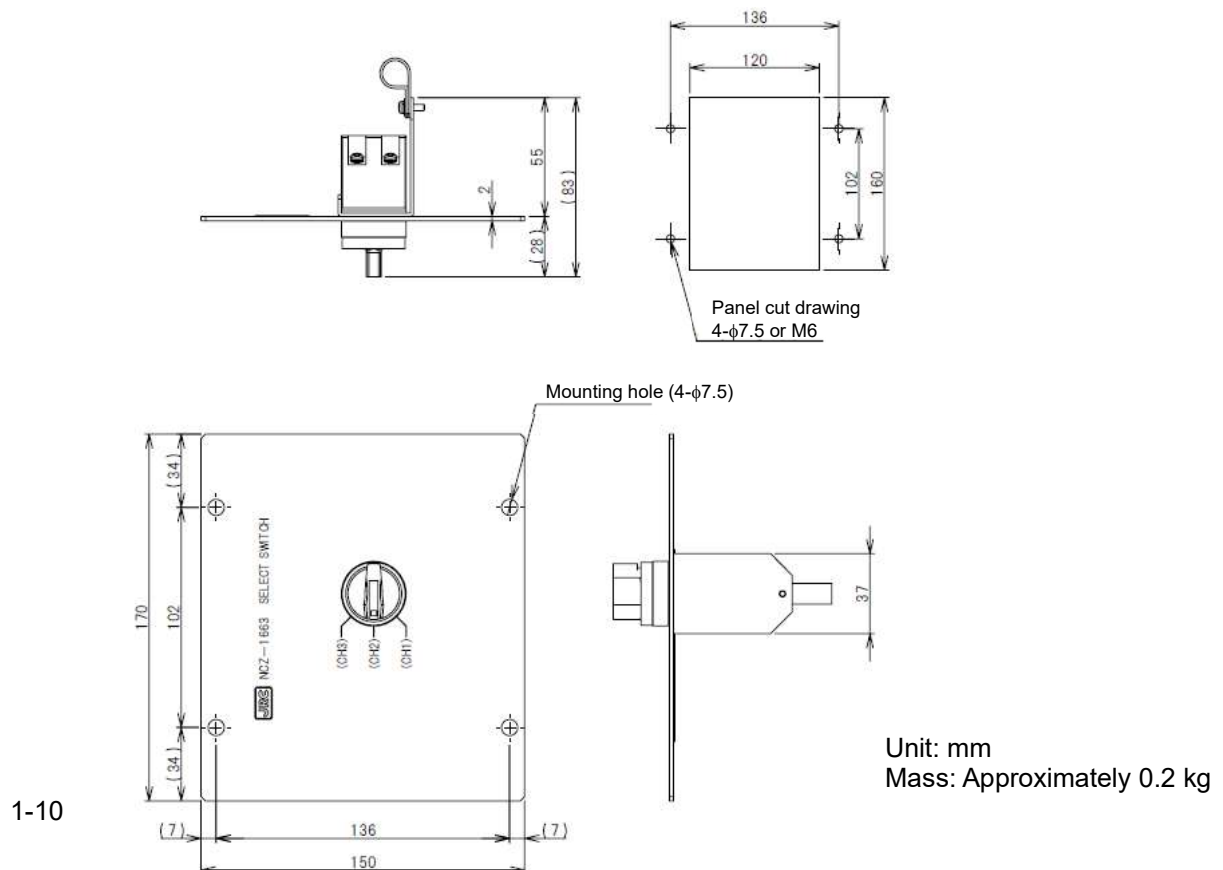


Unit: mm  
Mass: Approximately 0.7 kg

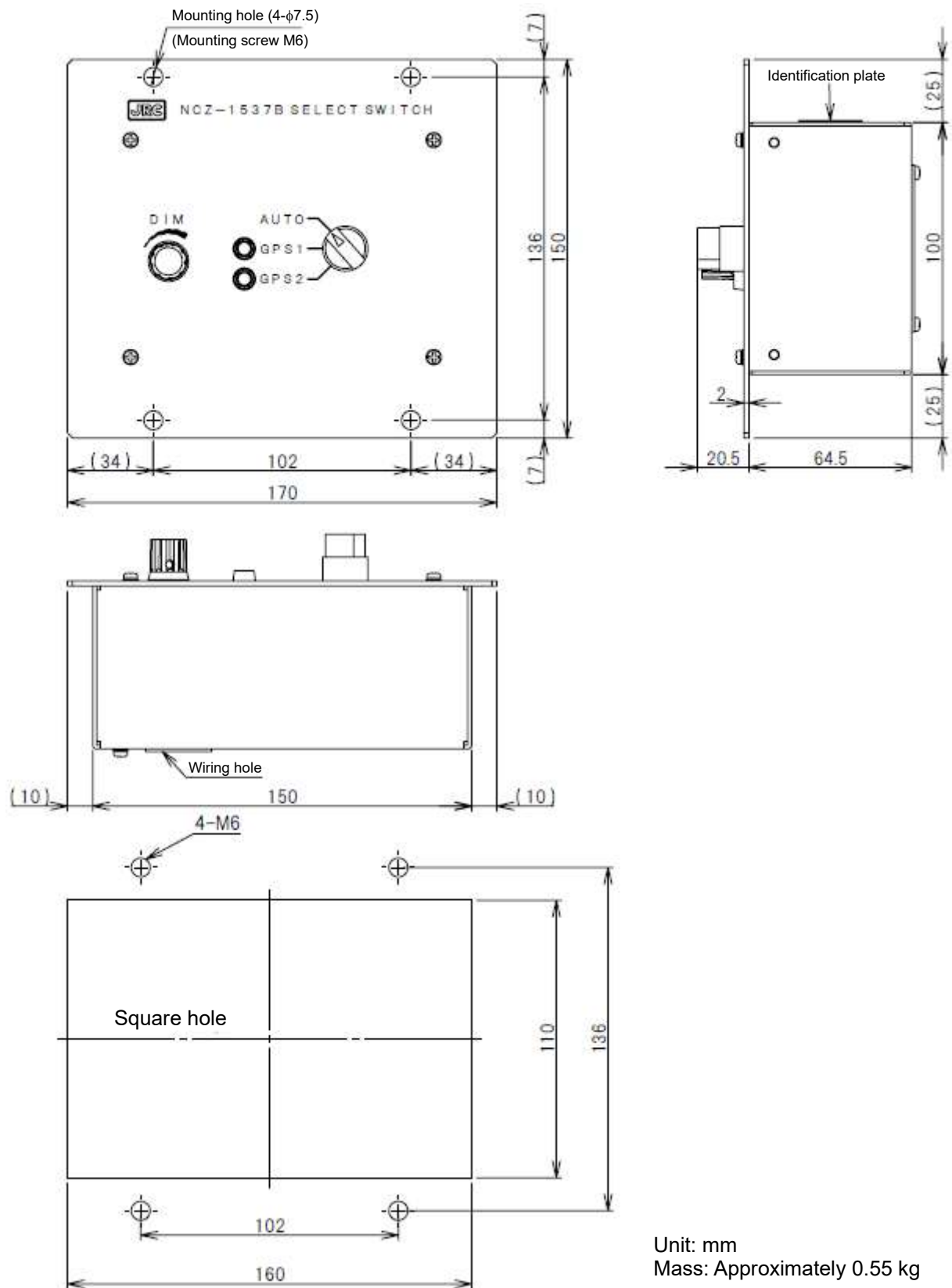
## NCZ-1663 Select switch (Stationary)



## NCZ-1663 Select switch (Flush mount)



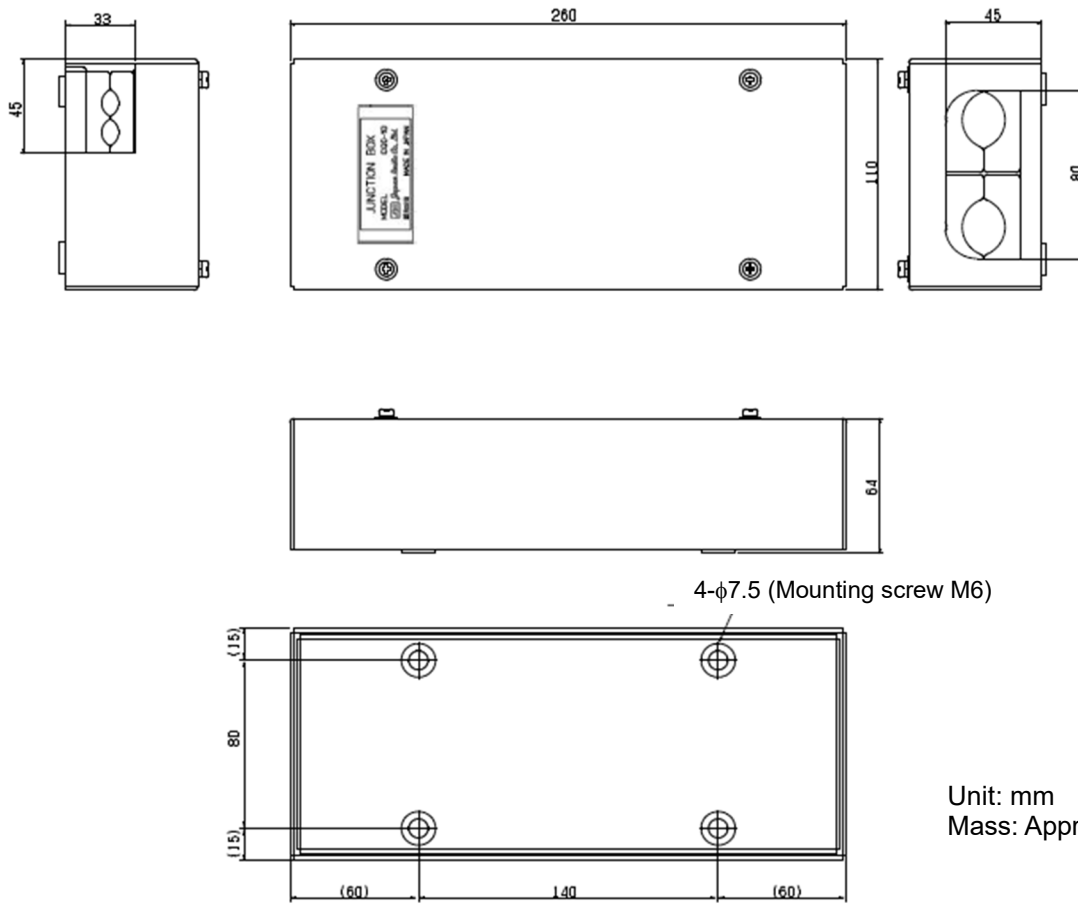
## NCZ-1537B Select switch (Flush mount)



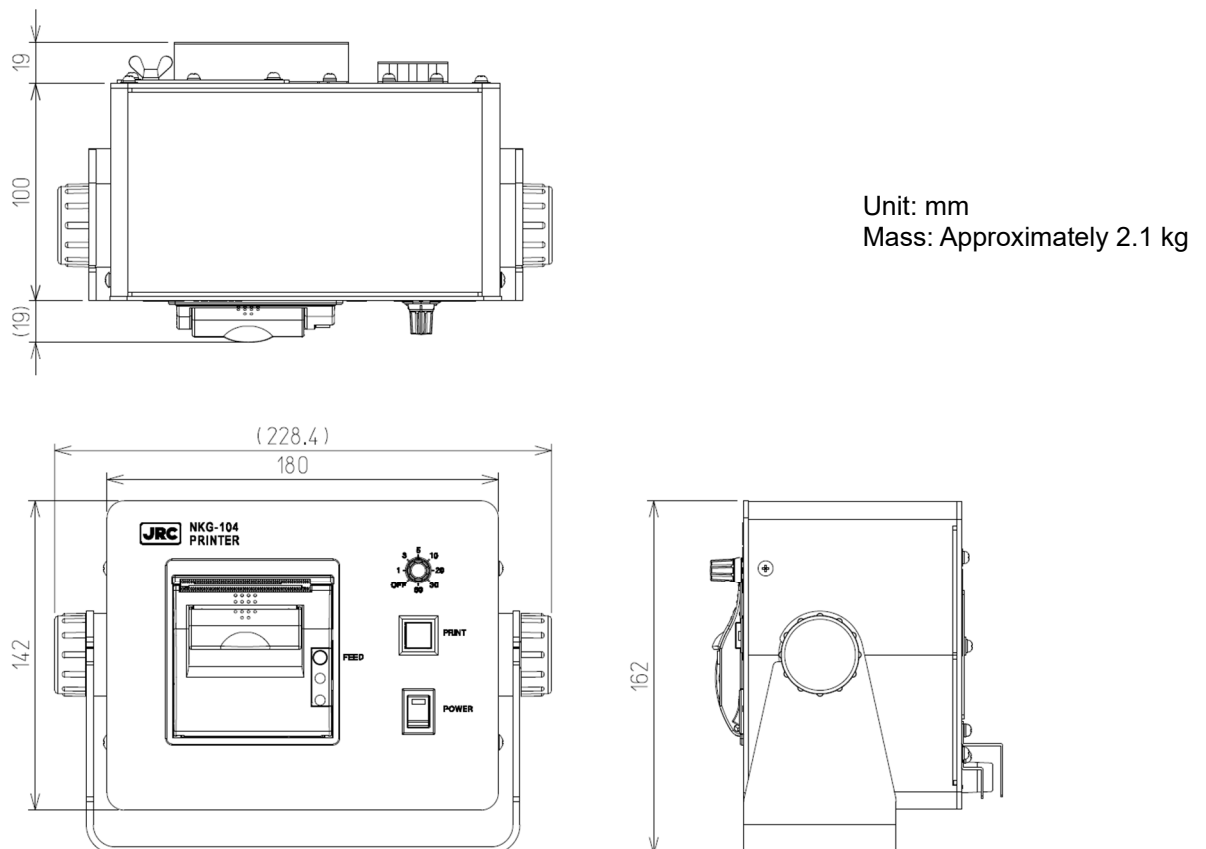
Panel cut drawing

Unit: mm  
Mass: Approximately 0.55 kg

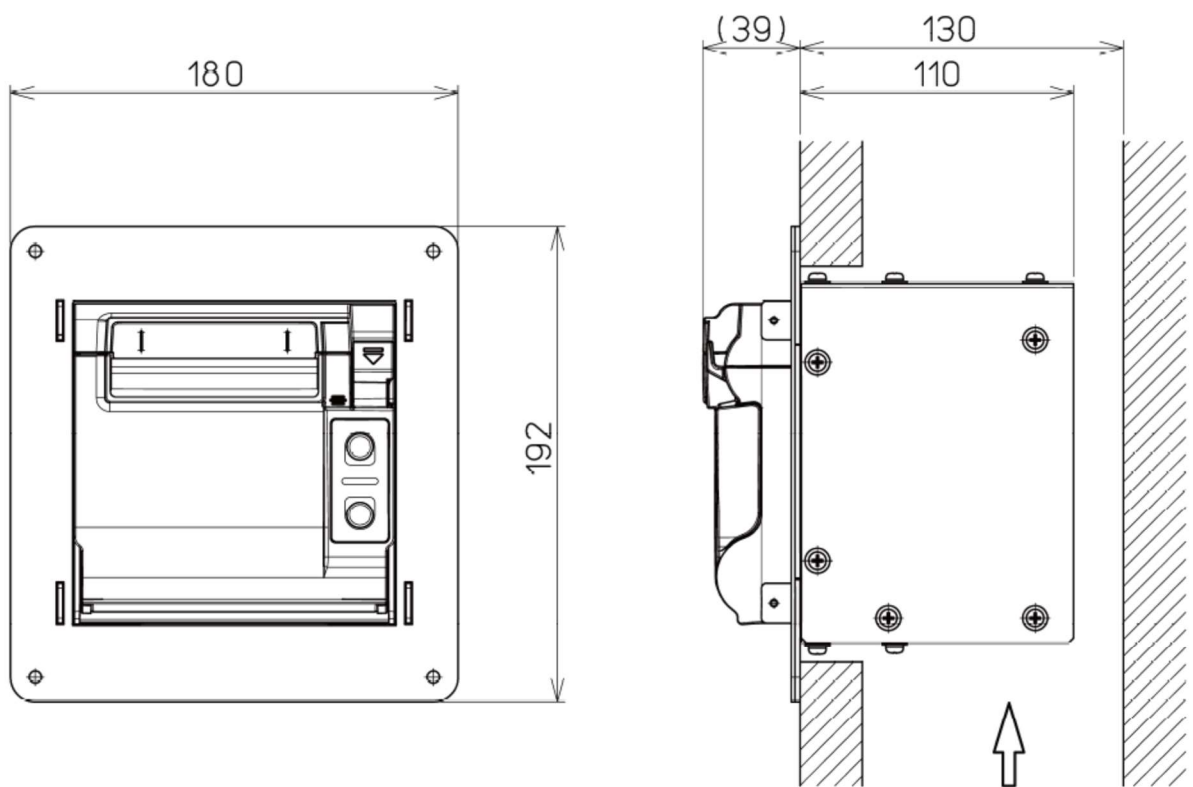
## CQD-10 Junction box



## NKG-104 Printer



## RP-D10 Network printer

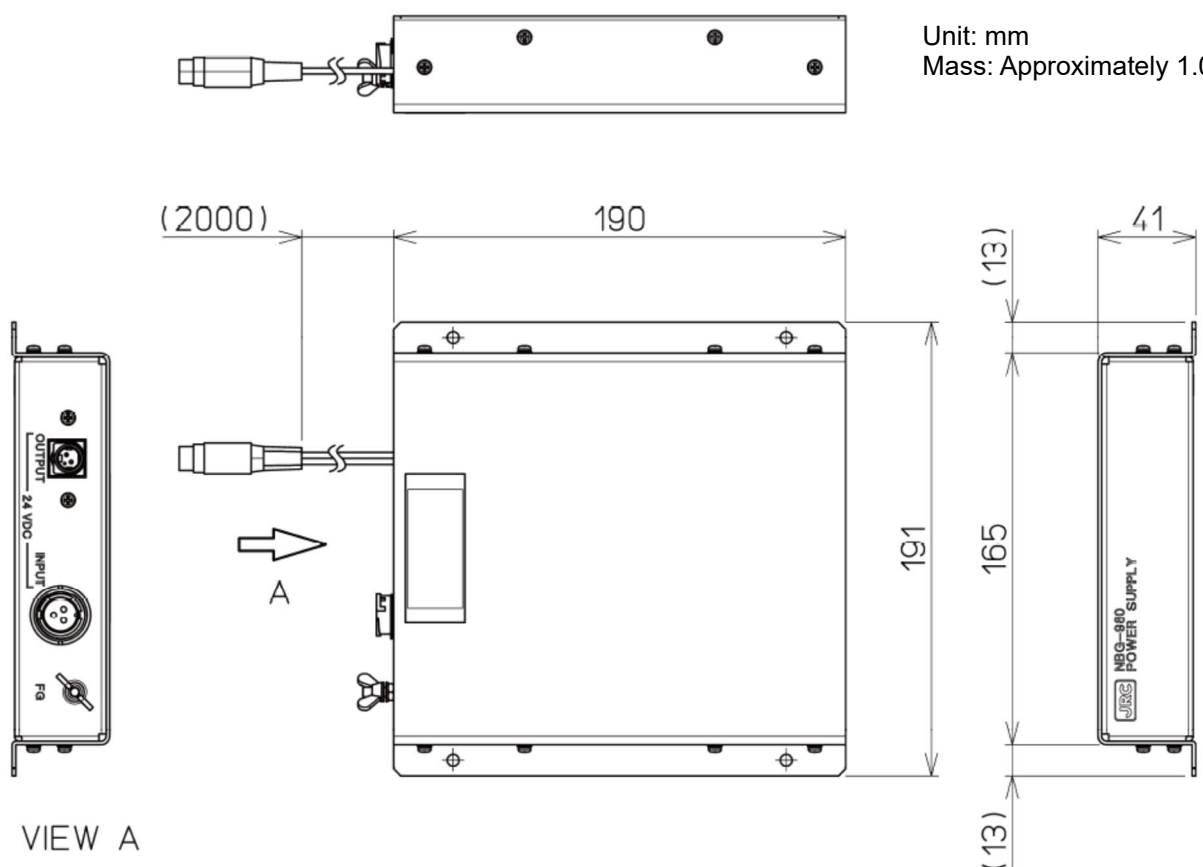


Unit: mm

Mass: Approximately 1.5 kg

\* Excluding printer paper

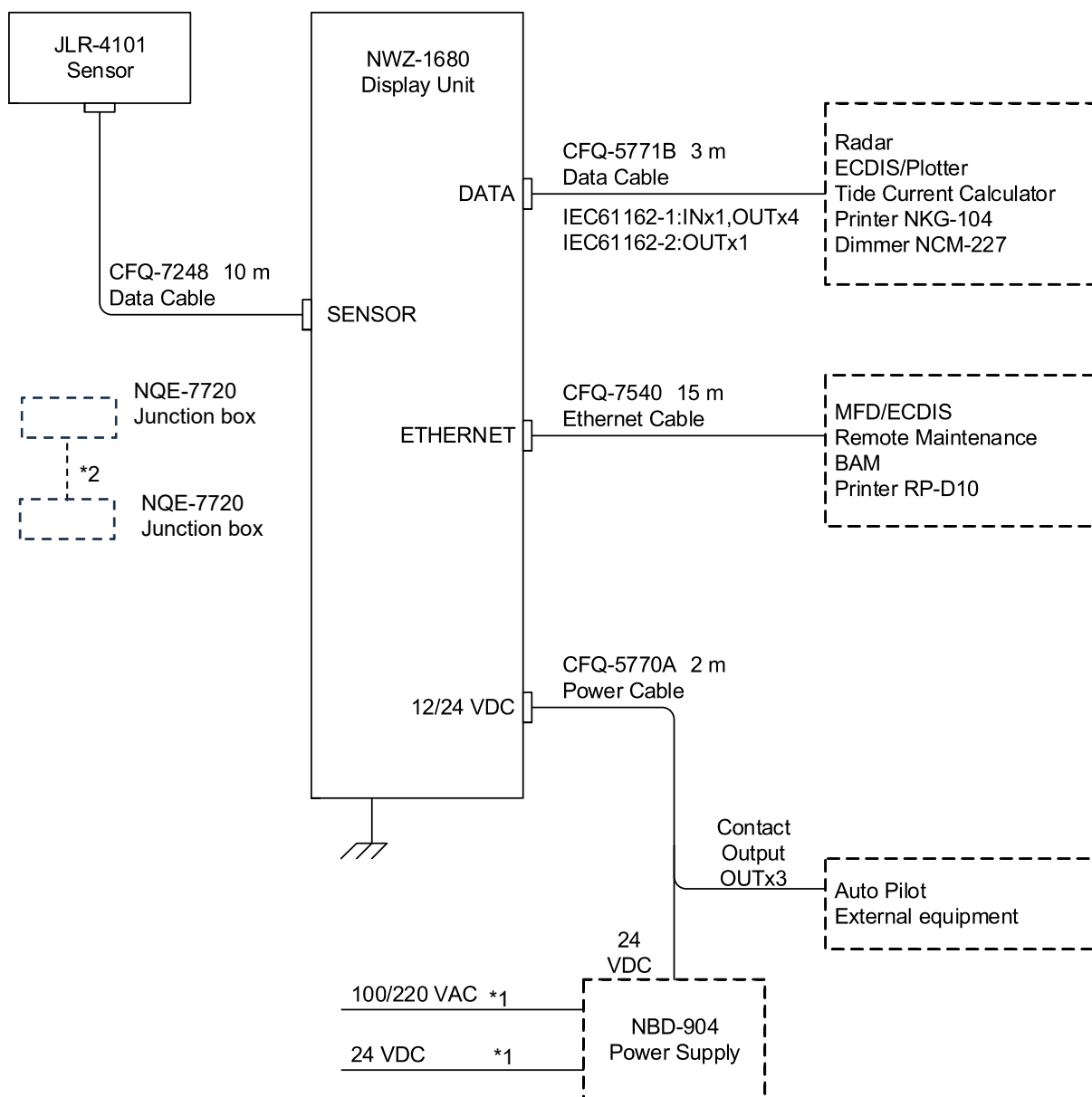
## NBG-980 Power supply



Unit: mm

Mass: Approximately 1.0 kg

## 1.5 System Diagram

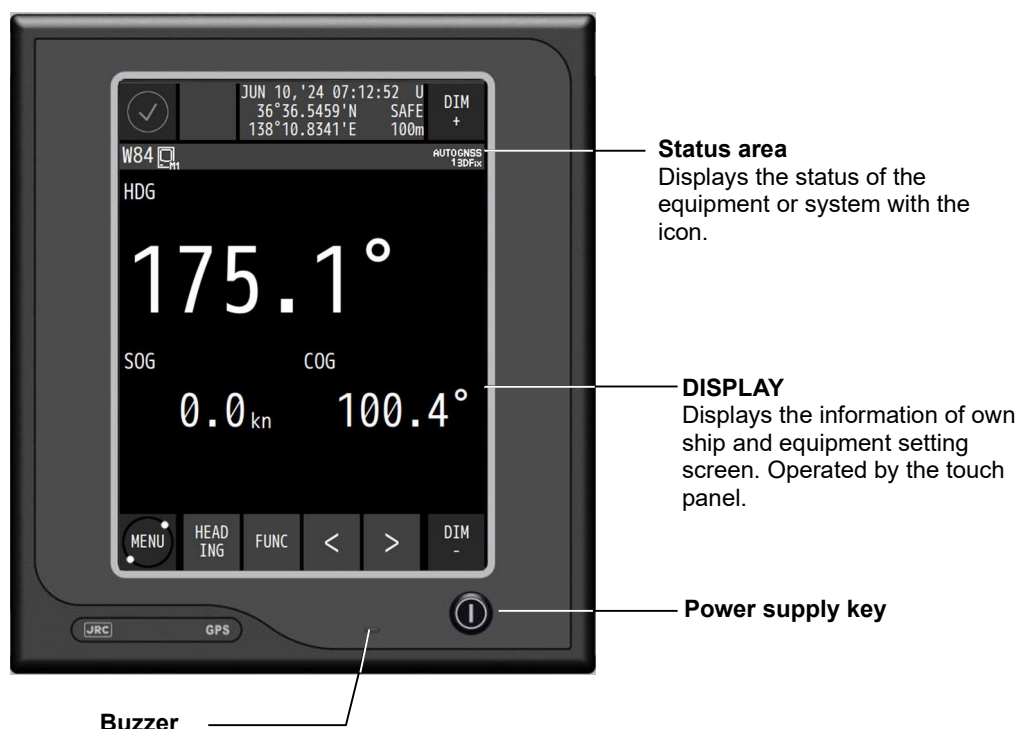


\*1: Arranged by dockyard 0.6/1kV-DPYC-1.5

\*2: Arranged by dockyard 250V-TTYCYS-7

# Chapter 2 Name and Function of Each Unit

## 2.1 NWZ-1680 DISPLAY UNIT



Touch panel

| Key | Name          | Function                                                                                     |
|-----|---------------|----------------------------------------------------------------------------------------------|
|     | Alert         | Displays the icon when an alert is issued.<br>The icon changes according to the alert state. |
|     | DIM UP        | Increases the brightness.                                                                    |
|     | DIM DOWN      | Reduces the brightness.                                                                      |
|     | Menu          | Displays a menu.<br>Displays a freeze indicator.                                             |
|     | Screen        | Switches a main screen. Select from a main screen list.                                      |
|     | Function      | Displays the operation menu on the main screen.                                              |
|     | Screen switch | Switches to a sub screen.                                                                    |
|     | Screen switch | Switches to a sub screen.                                                                    |

## How to read the information on the display

**Geodetic positioning system**

**Status**  
See the status list

**Date and time display (note1)**

- U: UTC
- L: Local

In the 12-hour display, AM/PM is displayed.

**RAIM**  
Displays the currently set accuracy level.

- RAIM operating: 10m, 30m, 50m, 100m
- RAIM OFF: OFF

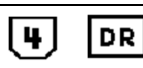
No faulty satellite: SAFE  
RAIM disabled: CAUTION  
Faulty satellite: UNSAFE

**note1**  
Although the displayed time may be out of sync with other display devices, it is because the data output timing is different and it is not a malfunction.

# Status list

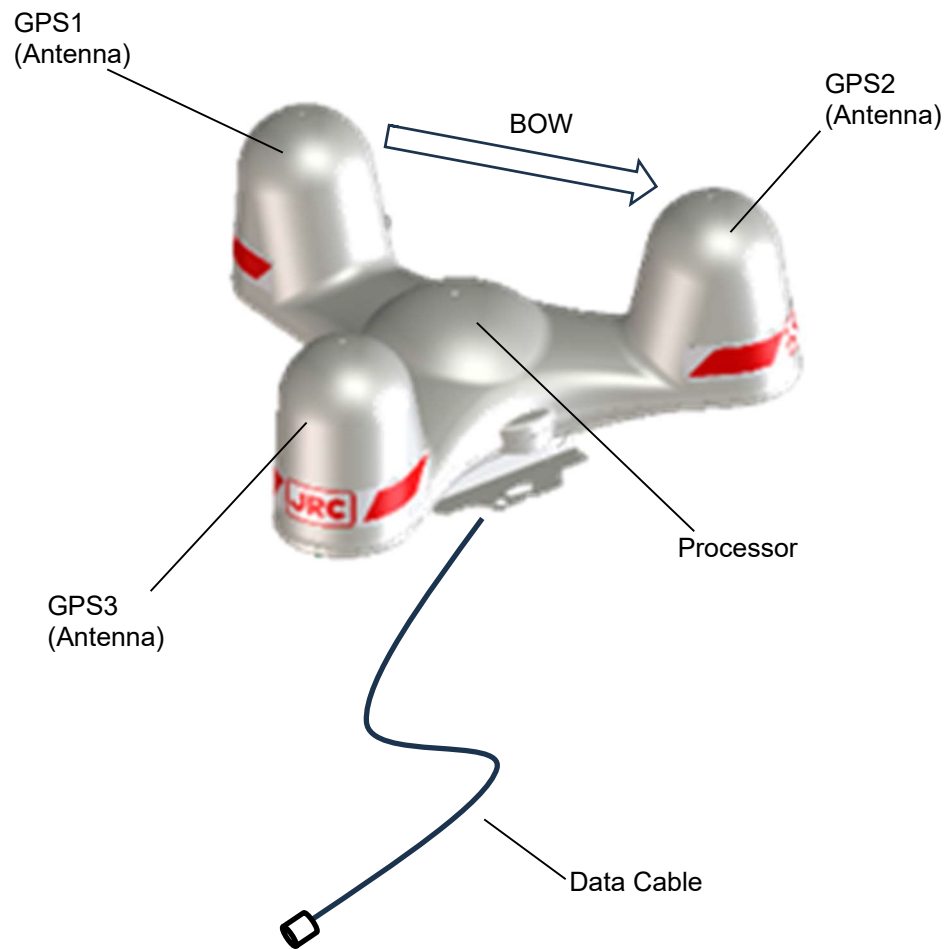
| Status list                                                                       |                                                                                   |                                                                                   |                                                                                   |        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |      |    |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|----|
| 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 |        | 5                                                                                 |                                                                                   | 6                                                                                 | 7                                                                                 |                                                                                    | 8                                                                                   | 9    | 10 |
|  |  |  |  | SPF... |  |  |  |  |  |  | HDOP |    |

| 11          | 12            | 13                |
|-------------|---------------|-------------------|
| <b>EXT1</b> | <b>AUTO 1</b> | <b>GNSS 3DFix</b> |

| No | Icon                                                                                | Description                                                                                                                                                                                                                                                                                                                                                                       |
|----|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  |    | Display unit number<br>M: Main display unit<br>R: Remote display unit                                                                                                                                                                                                                                                                                                             |
| 2  |    | Received beacon information.<br>Displayed when beacon information is received.                                                                                                                                                                                                                                                                                                    |
| 3  |    | Magnetic correction<br>Displayed when magnetic correction is set.                                                                                                                                                                                                                                                                                                                 |
| 4  |    | License for Spoofing/Jamming available.<br>(License required)                                                                                                                                                                                                                                                                                                                     |
|    | <b>SPF...</b>                                                                       | Spoofing/jamming detection (License required)<br>SPF...: Spoofing determination in progress.<br>SPF!: Spoofing alert. Spoofing radio waves may be emitted.<br>SPOO: Spoofing detected.<br>FING<br>JAM: Jamming detected in L1 (GPS/QZSS/Galileo)<br>L1<br>JAM: Jamming detected in GLONASS<br>GLO<br>JAM: Jamming detected in BDS<br>BDS<br>JAM: Jamming detected in GNSS<br>GNSS |
| 5  |  | Heading calculation state 1<br>4: Calculating the heading with 4 satellites or less<br>DR: DR in progress                                                                                                                                                                                                                                                                         |
| 6  |  | Installation mode<br>Displayed in the installation setting mode.                                                                                                                                                                                                                                                                                                                  |
| 7  |  | Heading calculation state 2<br>Displays the heading calculation status in six levels. It disappears when the calculation is finished.                                                                                                                                                                                                                                             |
|    |  | Displayed when calculating the heading with two antennas.                                                                                                                                                                                                                                                                                                                         |
| 8  |  | Demo mode<br>Displayed in demo mode.                                                                                                                                                                                                                                                                                                                                              |
| 9  |  | DGPS switched.<br>Indicates that the mode has just changed from GPS to DGPS.<br>This icon is cleared automatically five minutes after the switch.                                                                                                                                                                                                                                 |
| 10 | <b>HDOP</b>                                                                         | HDOP alert<br>Displayed when the value exceeded the setting value.                                                                                                                                                                                                                                                                                                                |

| No | Icon                              | Description                                                                                                                                                                                                                                                                                                                                                                    |
|----|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | <b>EXT1</b>                       | Display Sensor<br>EXT1 : No1 Sensor<br>EXT2 : No2 Sensor                                                                                                                                                                                                                                                                                                                       |
| 12 | <b>AUTO 1</b> <b>GPS GLO QZSS</b> | Positioning system<br>Indicates the currently used positioning system.<br>The positioning system that is set but cannot be used is displayed in yellow.<br>AUTO1: Select the most appropriate positioning system, including QZSS.<br>AUTO2: Select the most appropriate positioning system, excluding QZSS.<br>GPS/GP: GPS QZSS/QZ: QZSS GLO: GLONASS GAL: Galileo BDS: BeiDou |
| 13 | <b>GNSS 3DFix</b> <b>NoFix</b>    | Position fixing status<br>GNSS: GNSS position fixing<br>GPS: GPS position fixing<br>DGPS: Beacon DGPS position fixing<br>SBAS: SBAS position fixing<br>2D: 2 dimensional position fixing<br>3D: 3 dimensional position fixing<br>No Fix: Non position fixing                                                                                                                   |

## 2.2 JLR-4101 GNSS Compass Sensor





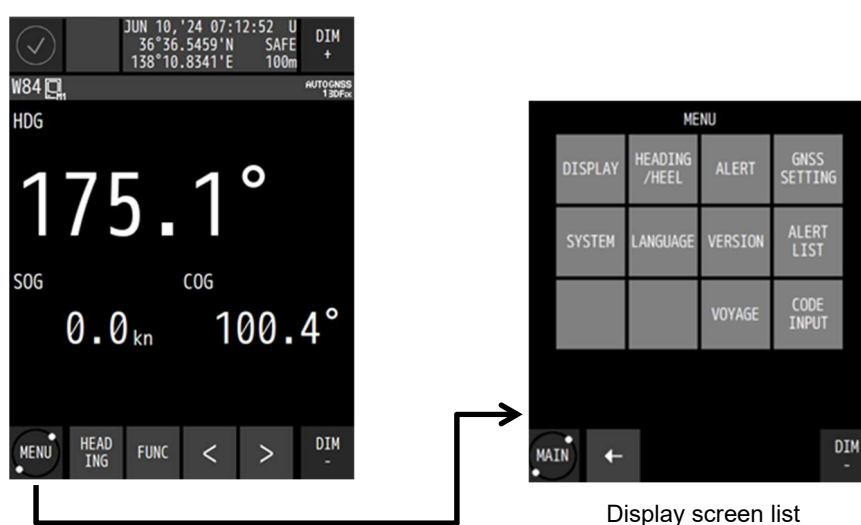
# Chapter 3 Display Screens

## 3.1 Display Screens

### 3.1.1 Switching display

When the screen key **HEAD  
ING** is tapped, a display screen list is displayed. Select a screen to be displayed from the list. The screen name is displayed on the screen key.

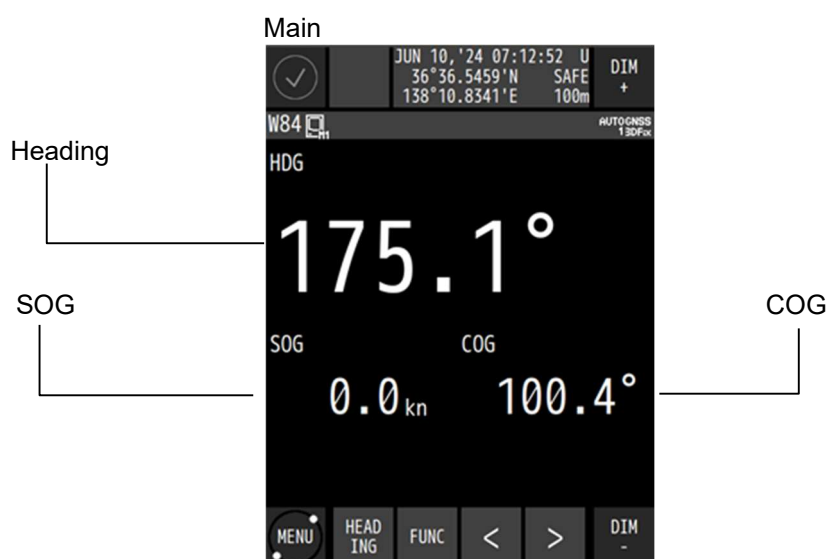
On the navigation information screen, the analogue screen, and the navigation support screen, a sub screen can be displayed by using **<** or **>**.



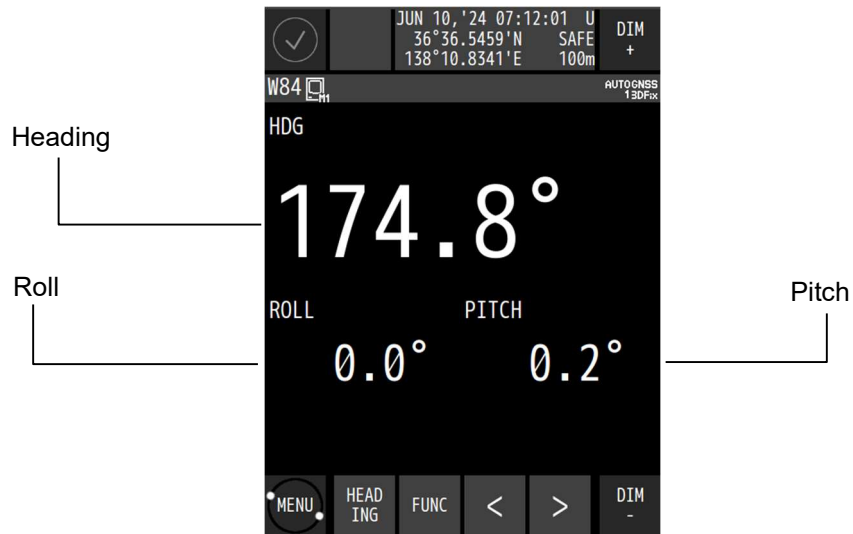
### 3.1.2 Heading information screen

The heading information screen displays the ship's heading, speed, and course.

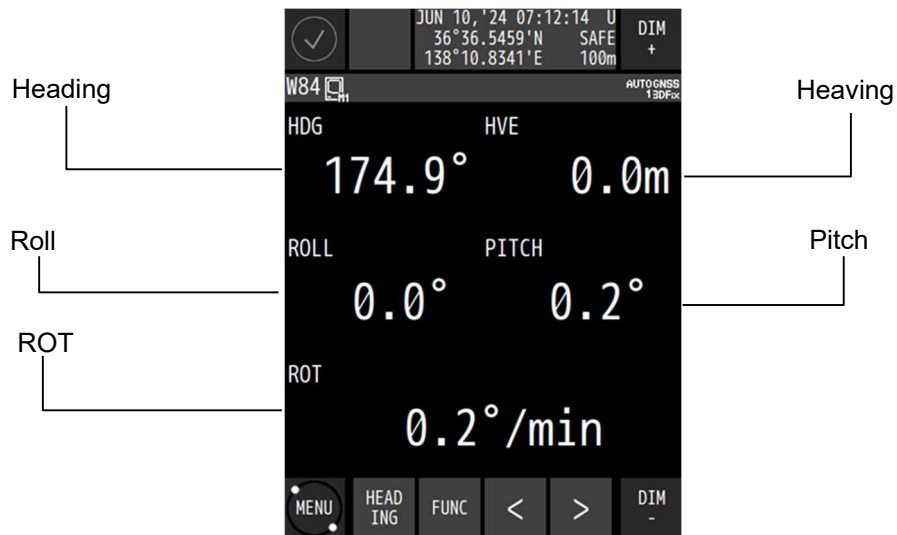
A sub screen can be displayed by using **<** or **>**. The sub screen displays the roll, pitch, heaving, and ROT.



Sub Screen 1 (Ship's heading, roll, pitch)



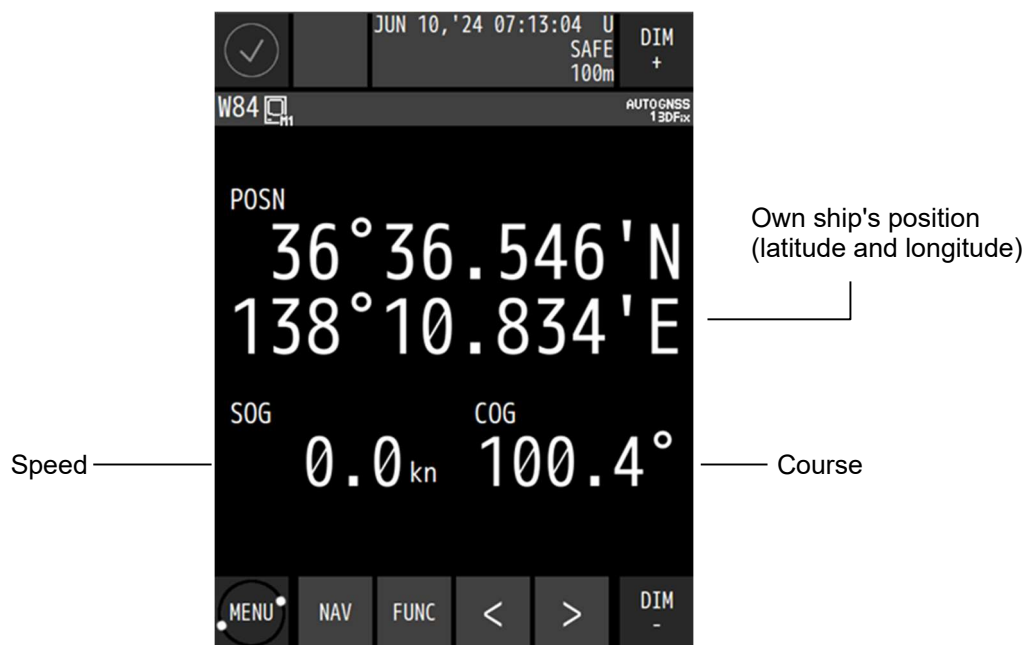
Sub Screen 2 (Ship's heading, heaving, roll, pitch, ROT)



### 3.1.3 Navigation information screen

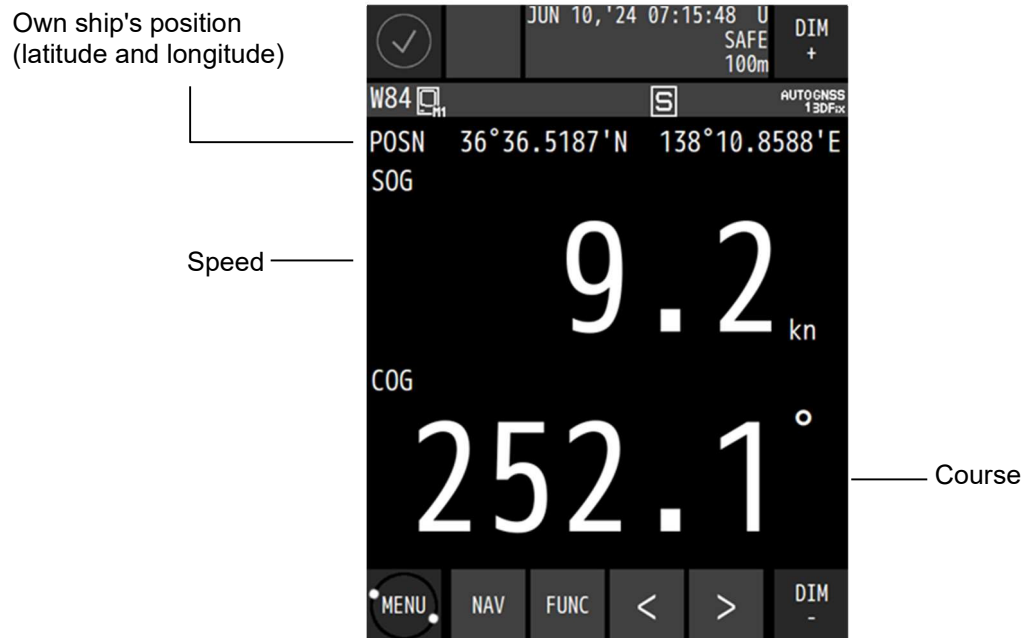
The navigation information screen displays the position, speed, and course of own ship. When a waypoint is available, the waypoint number and estimated time of arrival are also displayed.

A sub screen can be displayed by using  or . The sub screen varies depending on the presence or absence of the waypoint.



Sub screen

Sub Screen 1 (SOG and COG screen)



When a route is available

Number of the waypoint  
for which the ship is  
heading

Speed

Distance from the own  
ship's position to the  
waypoint

Estimated arrival time at  
the waypoint

### Sub Screen 2 (Detail screen)



Route number

Own ship's position  
(latitude and longitude)

Course

Bearing from the present  
position to the waypoint

### 3.1.4 Plotting screen 1

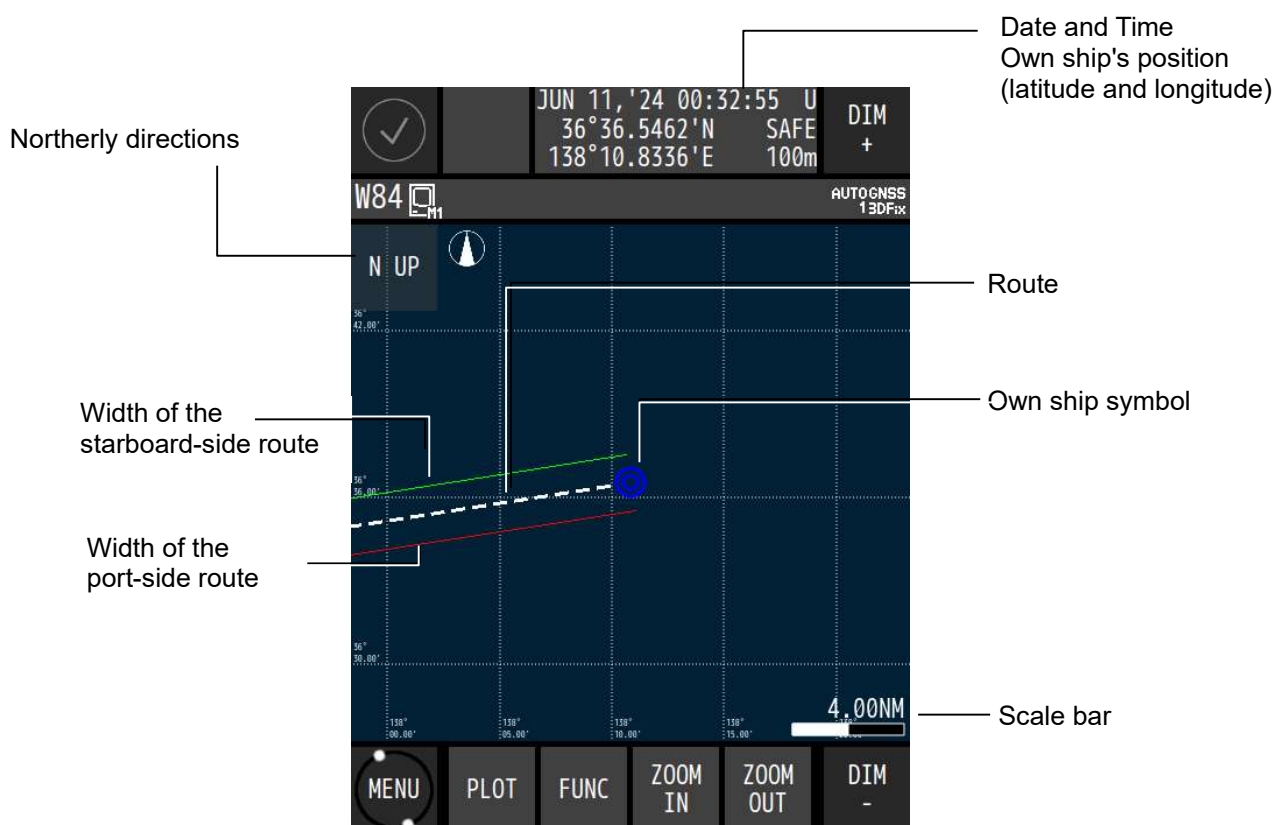


## CAUTION



Plotting function does not officially support navigation of SOLAS ship.

The screen can be enhanced and reduced by using **ZOOM IN** and **ZOOM OUT**.



### 3.1.5 Analogue screen

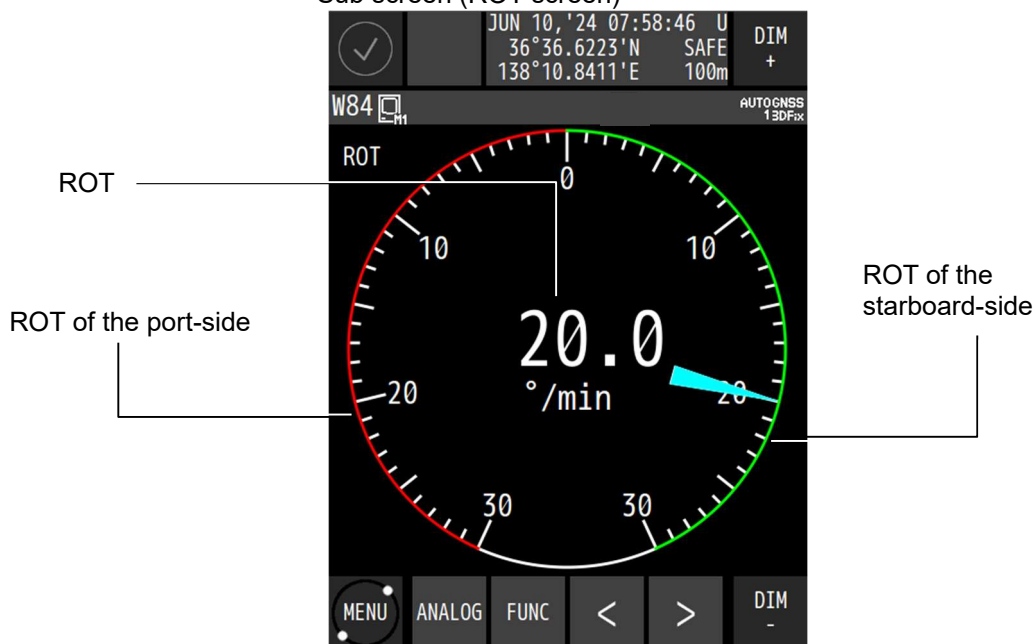
This screen graphically displays the ship's heading, ROT, course, waypoint, CDI, ship speed, and roll. During route execution, the screen displays the off-course and distance to the waypoint.

Use   to display ROT, CDI, ship speed meter, and roll.

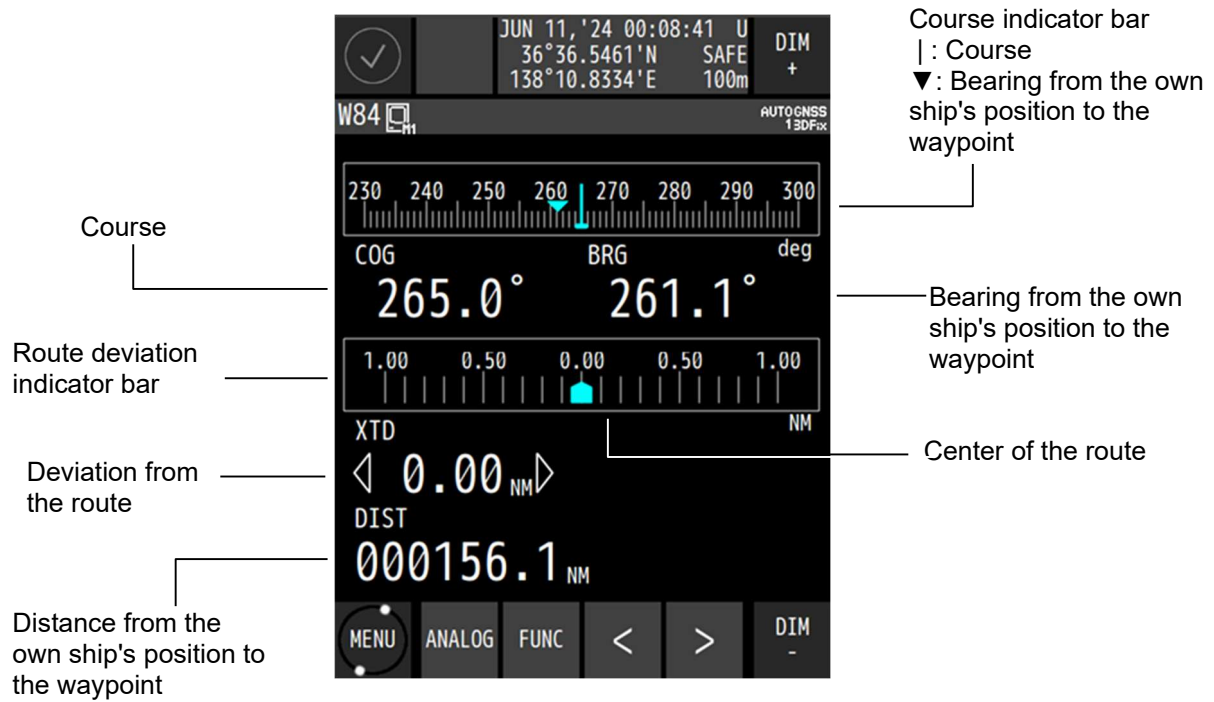
Main screen



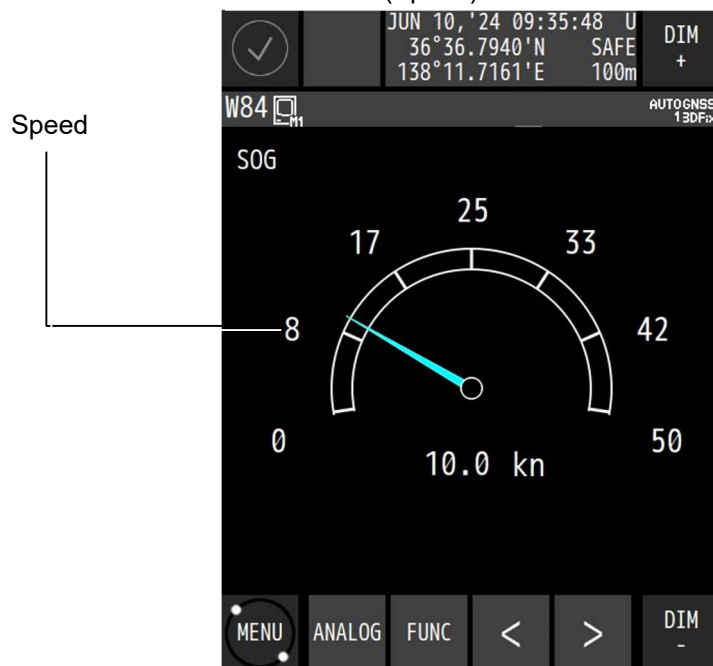
Sub screen (ROT screen)



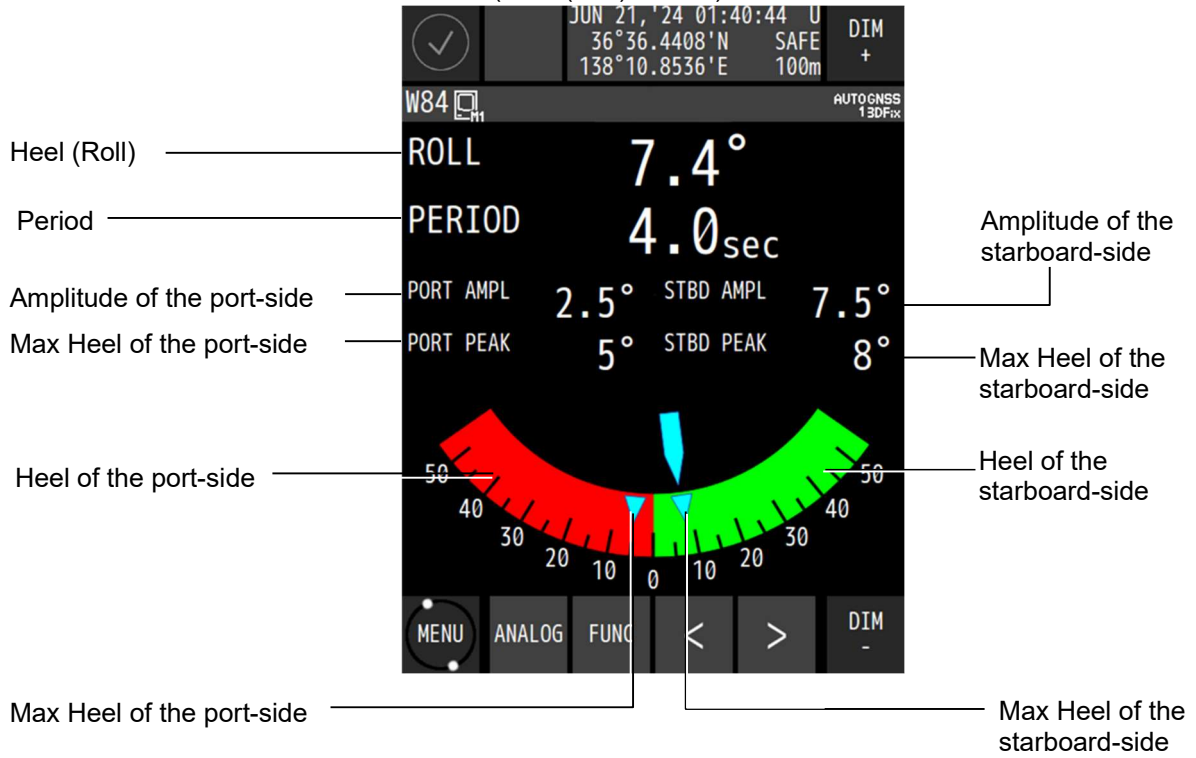
CDI screen



Sub screen (Speed)



Sub screen (Heel (Roll) screen)



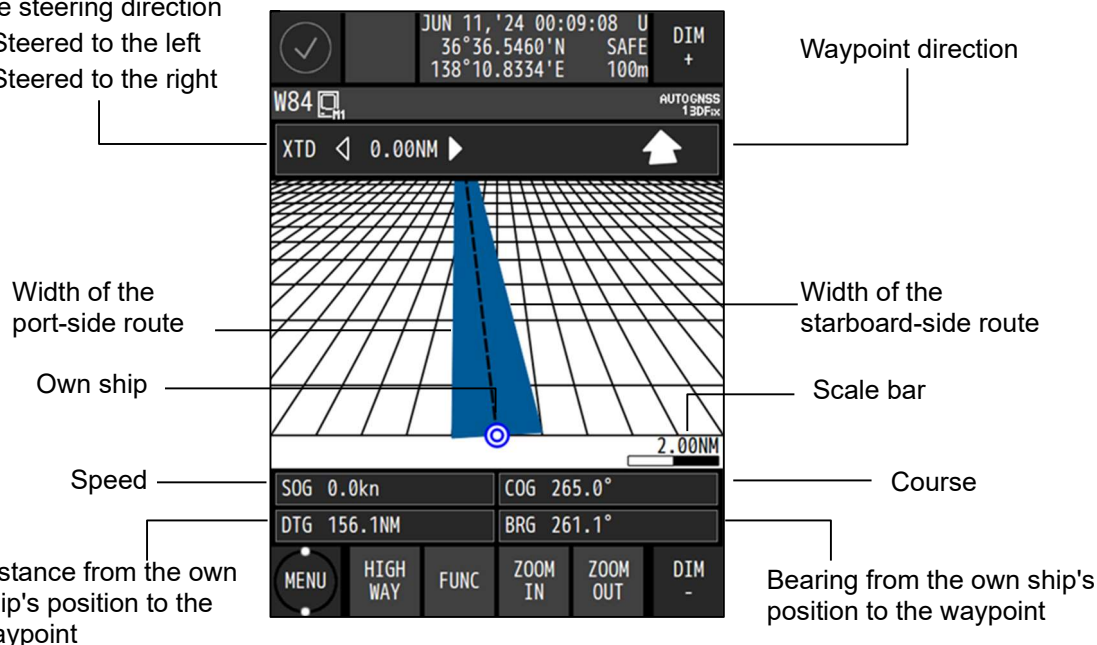
### 3.1.6 Highway screen

The highway screen displays the CDI, course, speed, bearing, and distance.  
The highway screen displays information in Course Up mode while the own ship's position is fixed.

The screen can be enhanced or reduced by using **ZOOM IN** and **ZOOM OUT** respectively.

Deviation from the route and the steering direction

◀ : Steered to the left  
▶ : Steered to the right

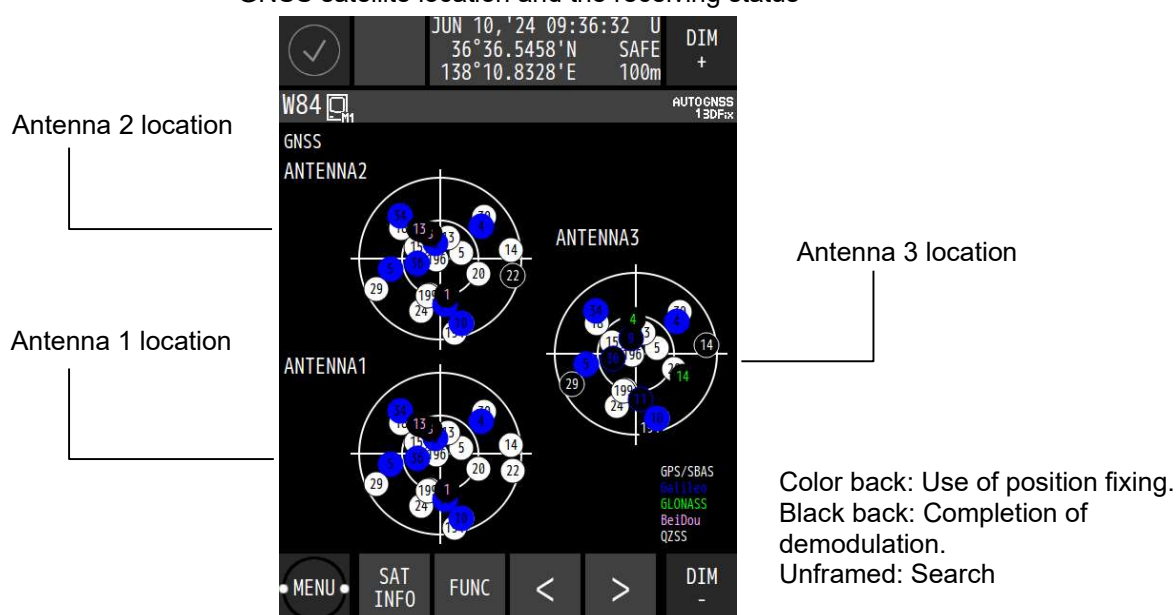


### 3.1.7 Satellite information screen

The satellite information screen displays the GNSS satellite of the 3 antenna and the beacon reception state.

Use **<** **>** to switch to the signal level.

GNSS satellite location and the receiving status

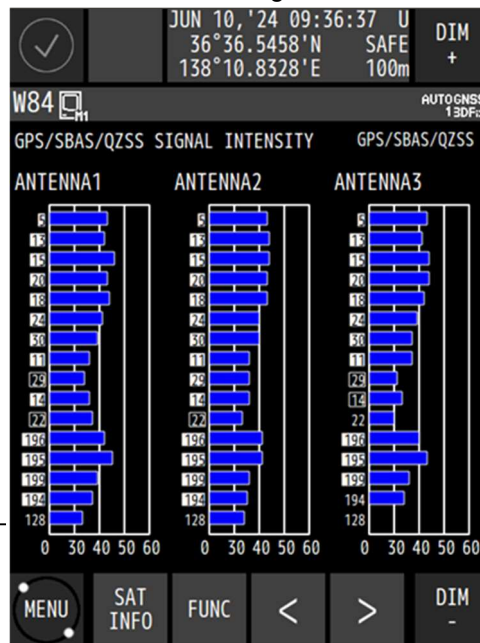


### GPS, SBAS, QZSS signal level

GPS SNR  
(each antenna)

QZSS SNR  
(each antenna)

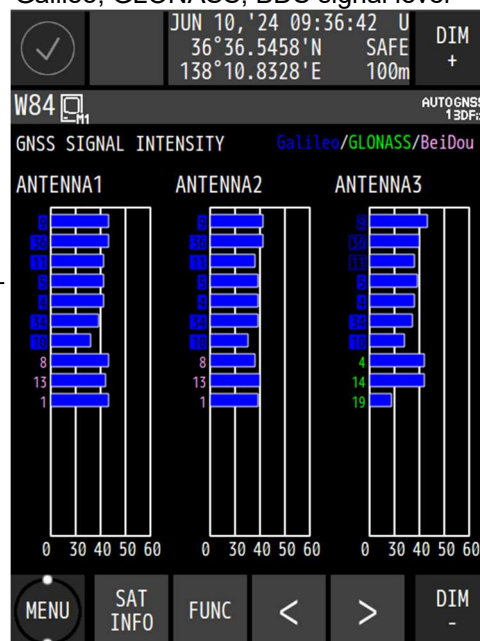
SBAS SNR  
(each antenna)



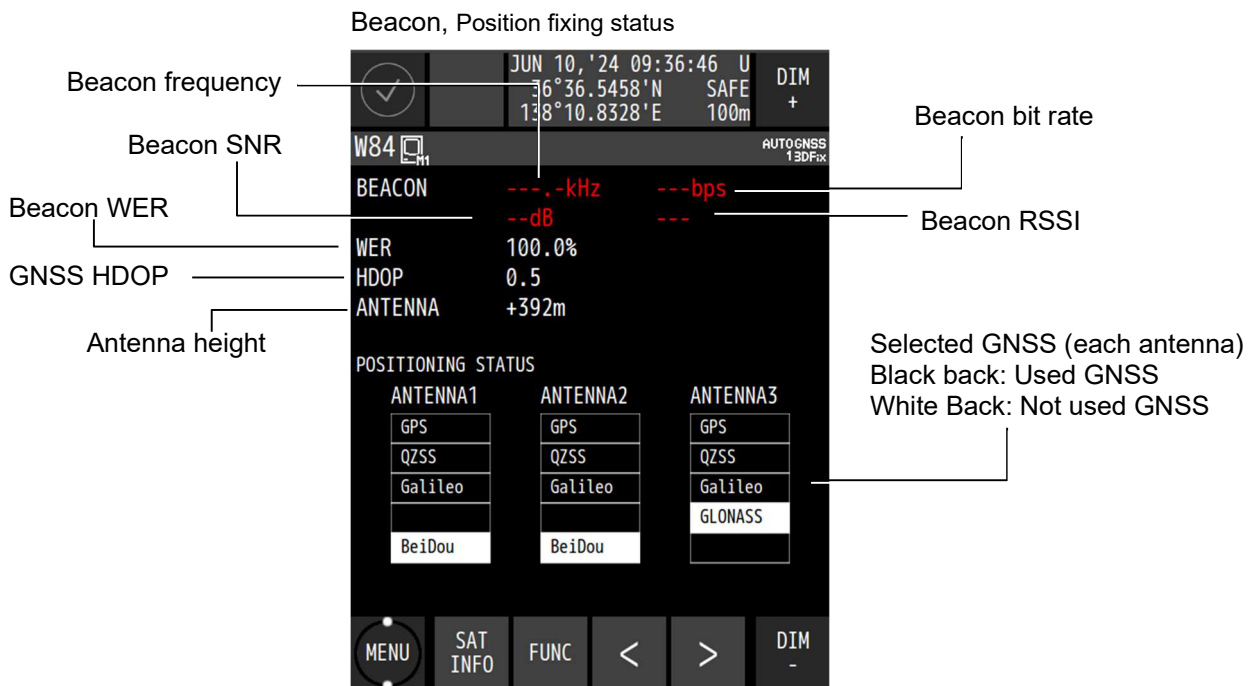
GNSS signal intensity bar  
45 to 55 under normal conditions  
Color back: Completion of  
demodulation  
Black back: Use of position fixing  
Unframed: Search

### Galileo, GLONASS, BDS signal level

Galileo SNR Blue  
GLONASS SNR Green  
BeiDou SNR Pink  
(each antenna)



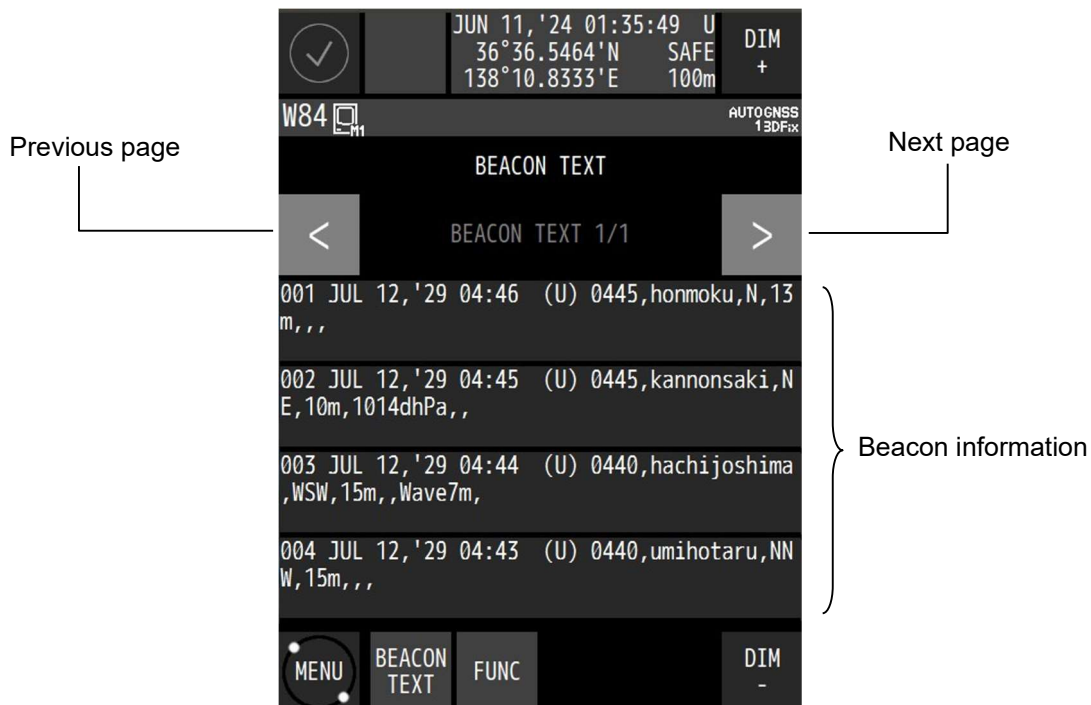
GNSS signal intensity bar  
45 to 55 under normal conditions  
Color back: Use of position fixing.  
Black back: Completion of  
demodulation.  
Unframed: Search



### 3.1.8 Beacon text screen

The beacon text screen displays the beacon text information (Type 16) that is received by the beacon receiver.

Beacon text information can be deleted (FUNK → BEACON DELETE).



### 3.1.9 Navigation aid screen

This screen calculates and displays the trip distance and 3-axis ship speed.

The screen can be switched by using  or .

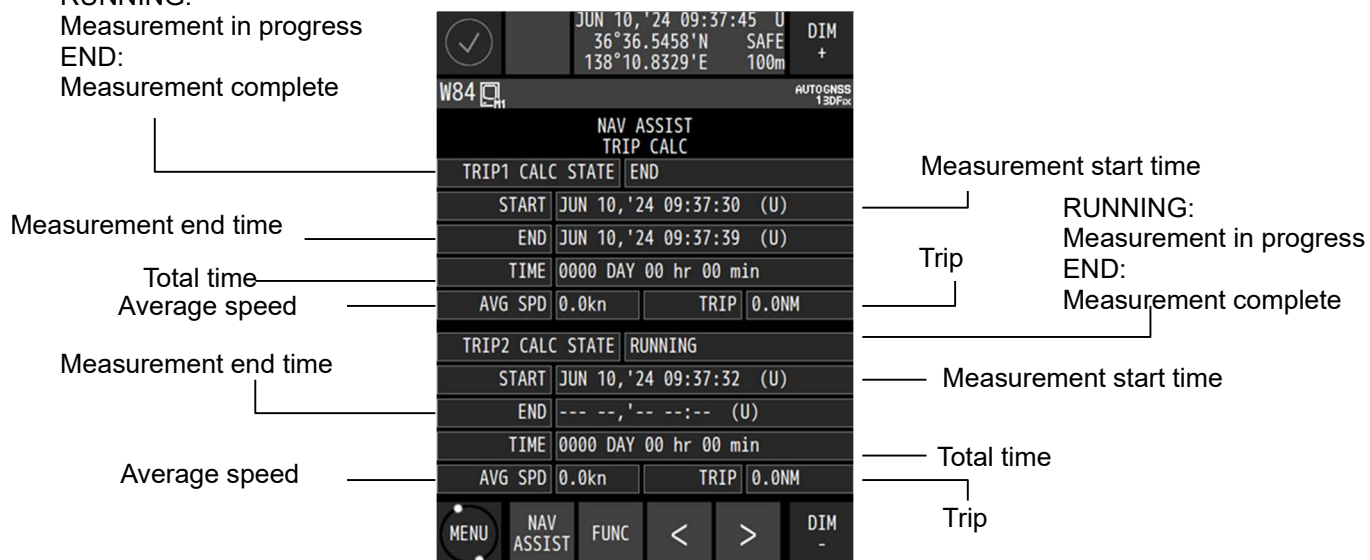
RUNNING:

Measurement in progress

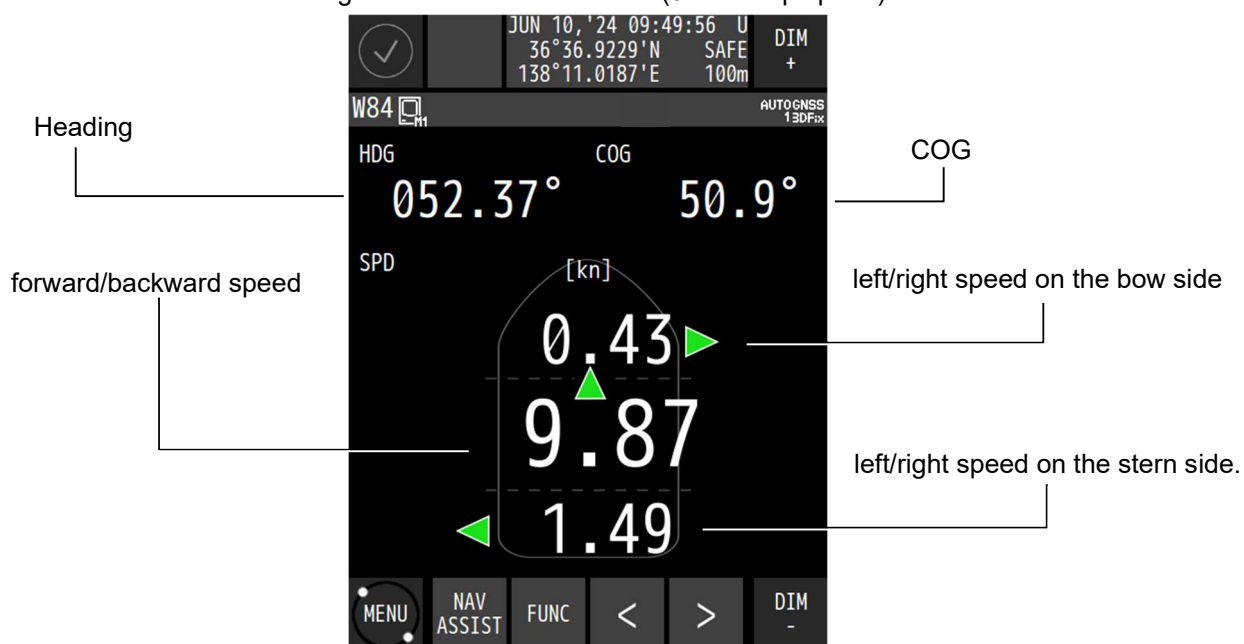
END:

Measurement complete

Navigation assistance screen 1 (measurement for Trip)



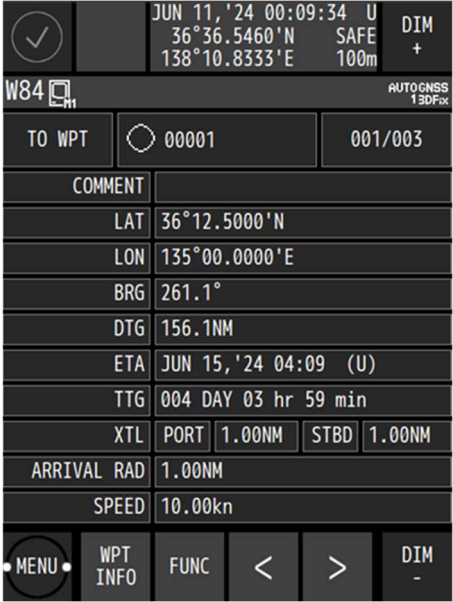
Navigation assistance screen 2 (3-axis ship speed)



### 3.1.10 Waypoint information screen

The waypoint information screen displays waypoint information on the route.

The information can be switched to the next waypoint information by using  or .



The screenshot shows the Waypoint information screen with the following fields and labels:

- Waypoint number:** W84
- Comment on the waypoint:** (Empty field)
- Waypoint position:**
  - LAT: 36°12.5000'N
  - LON: 135°00.0000'E
- Distance from the own ship's position to the displayed waypoint:** DTG: 156.1NM
- Time required for reaching the displayed waypoint:** TTG: 004 DAY 03 hr 59 min
- Arrival-circle radius:** ARRIVAL RAD: 1.00NM
- n-th waypoint / Total number of waypoints:** 001/003
- Bearing from the own ship's position to the displayed waypoint:** BRG: 261.1°
- Expected arrival time at the displayed waypoint:** ETA: JUN 15, '24 04:09 (U)
- Width of the port and starboard-side route:** XTL PORT: 1.00NM, STBD: 1.00NM
- Planned ship speed:** SPEED: 10.00kn

Navigation buttons at the bottom include: MENU, WPT INFO, FUNC, <, >, and DIM.



# Chapter 4 Operation

## 4.1 Menu List

### 4.1.1 Main Menu

| MENU             | Sub Menu          | Sub Menu | Sub Menu | Range                                      | Reference |
|------------------|-------------------|----------|----------|--------------------------------------------|-----------|
| DISPLAY          | THEME             |          |          | DAY/DUSK/NIGHT                             | 4.3.1     |
|                  | BEEP              |          |          | OFF/ON                                     | 4.3.2     |
|                  | DAY SCREEN        |          |          | OFF/ON                                     | 4.3.3     |
|                  | HEADING           |          |          | OFF/ON                                     | 4.3.4     |
|                  | NAV               |          |          | OFF/ON                                     | 4.3.4     |
|                  | PLOT              |          |          | OFF/ON                                     | 4.3.4     |
|                  | ANALOG            |          |          | OFF/ON                                     | 4.3.4     |
|                  | HIGHWAY           |          |          | OFF/ON                                     | 4.3.4     |
|                  | SAT INFO          |          |          | OFF/ON                                     | 4.3.4     |
|                  | BEACON TEXT       |          |          | OFF/ON                                     | 4.3.4     |
|                  | NAV ASSIST        |          |          | OFF/ON                                     | 4.3.4     |
|                  | WPT INFO          |          |          | OFF/ON                                     | 4.3.4     |
| HEADIN<br>G/HEEL | DR TIME           |          |          | OFF/1~5min                                 | 4.10.1    |
|                  | HEADING<br>SMOOTH |          |          | 0~10                                       | 4.10.2    |
|                  | ROT SMOOTH        |          |          | 0~100                                      | 4.10.2    |
|                  | HEADING OFFSET    |          |          | -180~180                                   | 4.10.3    |
|                  | ROLL OFFSET       |          |          | -30~30                                     | 4.10.3    |
|                  | PITCH OFFSET      |          |          | -30~30                                     | 4.10.3    |
|                  | ROLL SMOOTH       |          |          | 0~100                                      | 4.10.2    |
|                  | PITCH SMOOTH      |          |          | 0~100                                      | 4.10.2    |
|                  | RESTORATION       |          |          | MANUAL/AUTO                                | 4.10.4    |
|                  | INTERRUPT NMEA    |          |          | NULL/STOP                                  | 4.10.5    |
|                  | CHECK SUM         |          |          | OFF/ON                                     | 4.10.6    |
|                  | DOUBLE ENDER      |          |          | FORE/BACK                                  | 4.10.7    |
|                  | MAX PERIOD        |          |          | 30~100                                     | 4.10.8    |
|                  | MIN PERIOD        |          |          | 0.1~5.0                                    | 4.10.8    |
|                  | AVERAGE           |          |          | 1~20                                       | 4.10.8    |
| ALERT            | SYETEM            | SET      |          | OFF/ON                                     | 4.6.1     |
|                  |                   | SOUND    |          | OFF/ON                                     | 4.6.1     |
|                  | HEADING           | SET      |          | OFF/ON                                     | 4.6.1     |
|                  |                   | SOUND    |          | OFF/ON                                     | 4.6.1     |
|                  | DGPS              | SET      |          | OFF/<br>GPS→DGPS/<br>DGPS→GPS/<br>GPS↔DGPS | 4.6.1     |
|                  |                   | SOUND    |          | OFF/ON                                     | 4.6.1     |
|                  | HDOP              | SET      |          | OFF/THRESHOLD                              | 4.6.1     |
|                  |                   | SOUND    |          | OFF/ON                                     | 4.6.1     |
|                  | SPD               | SET      |          | OFF/OVE/UNDER/<br>IN RANGE/<br>OUT RANGE   | 4.6.1     |
|                  |                   | SOUND    |          | OFF/ON                                     | 4.6.1     |
|                  | SPOOFING          | SET      |          | OFF/<br>WARNING MODE<br>1/2/3/4/5          | 4.6.2     |
|                  |                   | SOUND    |          | OFF/ON                                     | 4.6.2     |
|                  | CCRP              | SET      |          | OFF/ON                                     | 4.6.1     |
|                  |                   | SOUND    |          | OFF/ON                                     | 4.6.1     |
|                  | HEEL              | SET      |          | OFF/THRESHOLD                              | 4.6.2     |
|                  |                   | SOUND    |          | OFF/ON                                     | 4.6.2     |

| MENU            | Sub Menu | Sub Menu                   | Sub Menu    | Range                                                                                                                                                                                              | Reference |
|-----------------|----------|----------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| ALERT           | HEAVING  | SET                        |             | OFF/ON                                                                                                                                                                                             | 4.6.1     |
|                 |          | SOUND                      |             | OFF/ON                                                                                                                                                                                             | 4.6.2     |
|                 | SETTING  | ALARM<br>ESCALATION        | POSITION    | OFF/ON                                                                                                                                                                                             | 4.6.4     |
|                 |          |                            | HEADING     | OFF/ON                                                                                                                                                                                             | 4.6.4     |
|                 |          |                            | TIME        | 30/ 60/ 120/ 180/<br>240/ 300                                                                                                                                                                      | 4.6.4     |
|                 |          | HEDER ALERT                | GROUPING    | OFF/ON                                                                                                                                                                                             | 4.6.4     |
|                 |          |                            | AGGREGATION | OFF/ON                                                                                                                                                                                             | 4.6.4     |
|                 |          | TEST MODE                  | TEST MODE   | OFF/ON                                                                                                                                                                                             | 4.6.4     |
| GNSS<br>SETTING | GNSS     | GNSS MODE                  |             | AUTO1/AUTO2/<br>GPS/Galileo/<br>GLONASS/BDS/<br>GPS+Galileo/<br>GPS+Galileo+<br>GLONASS/<br>GPS+Galileo+<br>BDS/<br>GPS+QZSS+<br>Galileo/<br>GPS+QZSS+Galileo+GLONASS/<br>GPS+QZSS+<br>Galileo+BDS | 4.9.1     |
|                 | FIX MODE | FIX MODE                   |             | 2D/3D/AUTO                                                                                                                                                                                         | 4.9.2     |
|                 | ELV MASK | SET ELV MASK(° )           |             | 5~89                                                                                                                                                                                               | 4.9.3     |
|                 | HDOP     | HDOP                       |             | 4/10/20                                                                                                                                                                                            | 4.9.4     |
|                 | SMOOTH   | POSN SMOOTHING(s)          |             | 0~99                                                                                                                                                                                               | 4.9.5     |
|                 |          | SPEED<br>SMOOTHING(s)      |             | 0~99                                                                                                                                                                                               | 4.9.5     |
|                 |          | COURSE<br>SMOOTHING(s)     |             | 0~99                                                                                                                                                                                               | 4.9.5     |
|                 | RAIM     | RAIM ACCURACY<br>LEVEL (m) |             | OFF/10/30/50/100                                                                                                                                                                                   | 4.9.6     |
|                 | DATUM    | DATUM                      |             | WGS-84 etc.                                                                                                                                                                                        | 4.9.7     |
|                 | INIT     | QUADRANT                   |             |                                                                                                                                                                                                    | 4.9.8     |
|                 |          | LAT                        |             |                                                                                                                                                                                                    | 4.9.8     |
|                 |          | LON                        |             |                                                                                                                                                                                                    | 4.9.8     |
|                 |          | ANT HEIGHT(m)              |             |                                                                                                                                                                                                    | 4.9.8     |
|                 |          | YEAR                       |             |                                                                                                                                                                                                    | 4.9.8     |
|                 |          | MONTH                      |             |                                                                                                                                                                                                    | 4.9.8     |
|                 |          | DAY                        |             |                                                                                                                                                                                                    | 4.9.8     |
|                 |          | HOURL(hr)                  |             |                                                                                                                                                                                                    | 4.9.8     |
|                 |          | MINUTE(min)                |             |                                                                                                                                                                                                    | 4.9.8     |
|                 | DGPS     | DGPS                       |             | OFF/AUTO/BEACON/SBAS                                                                                                                                                                               | 4.9.9     |
|                 | BEACON   | AUTO                       |             |                                                                                                                                                                                                    | 4.9.10    |
|                 |          | MANUAL                     | FREQUENCY   |                                                                                                                                                                                                    | 4.9.10    |
|                 |          |                            | BITRATE     |                                                                                                                                                                                                    | 4.9.10    |
|                 | SBAS     | SAT SEARCH                 |             | AUTO/MANUAL                                                                                                                                                                                        | 4.9.11    |
|                 |          | TYPE 0                     |             | OFF/ON                                                                                                                                                                                             | 4.9.11    |

| MENU       | Sub Menu        | Sub Menu                                                     | Sub Menu         | Range                                 | Reference |
|------------|-----------------|--------------------------------------------------------------|------------------|---------------------------------------|-----------|
| SYSTEM     | DATE/TIME       | TIME DIFF                                                    |                  | +00:00~+13:30                         | 4.11.1    |
|            |                 | DATE DISP                                                    |                  | 'YY-MM-DD<br>DD MMM,'YY<br>MMM DD,'YY | 4.11.1    |
|            |                 | TIME DISP (hr)                                               |                  | 12hr / 24hr                           | 4.11.1    |
|            | UNIT            | DIST/SPEED                                                   |                  | NM,km<br>km,km/h<br>mi,mi/h           | 4.11.2    |
|            |                 | HEIGHT/DPTH                                                  |                  | m / ft / fm                           | 4.11.2    |
|            |                 |                                                              | SETTING METHOD   | MANUAL/DEFAULT                        | 4.11.2    |
|            |                 |                                                              | CONVERTED VALUE  | 0.0001~9.9999                         | 4.11.2    |
|            | MAG CORR        |                                                              | MAG CORR         | OFF/AUTO/MANUAL                       | 4.11.3    |
|            |                 |                                                              | EAST/WEST        | E/W                                   | 4.11.3    |
|            |                 |                                                              | CORRECTION VALUE | 0~99                                  | 4.11.3    |
|            | HEAVING OFFSET  | X                                                            |                  | -999.9~999.9                          | 4.11.4    |
|            |                 | Y                                                            |                  | -999.9~999.9                          | 4.11.4    |
|            |                 | Z                                                            |                  | -999.9~999.9                          | 4.11.4    |
|            | 5Hz DISPLAY     |                                                              |                  | OFF/ON                                | 4.11.5    |
|            | SYSTEM LOG      |                                                              |                  |                                       | 4.11.6    |
|            | PASSWD CHANGE   |                                                              |                  |                                       | 4.11.7    |
| LANGUAGE   |                 |                                                              |                  | JAPANESE/ENGLISH                      | 4.13      |
| VERSION    | DISPLAY         | SOFTWARE SECURITY<br>SERIAL NUMBER<br>BARCODE<br>IP          |                  |                                       | 4.16      |
|            | SENSOR          | MODEL<br>SOFTWARE<br>SERIAL NUMBER<br>BARCODE                |                  |                                       | 4.16      |
|            | SENSOR          | GPS1 VERSION<br>GPS2 VERSION<br>GPS3 VERSION                 |                  |                                       | 4.16      |
|            | ROLLOVER        | ROLL OVER<br>SETTING DATE<br>MANUFACTURE<br>SPOOFING LICENSE |                  |                                       | 4.16      |
| ALERT LIST | ALERT HISTORY   |                                                              |                  |                                       | 4.8.2     |
|            | ACTIVE ALERT    |                                                              |                  |                                       | 4.8.1     |
|            | LAN ERROR COUNT |                                                              |                  |                                       | 4.8.3     |
| VOYAGE     | HEADER          | ROUTE No                                                     |                  |                                       | 4.4.2     |
|            |                 | TOTAL WPT                                                    |                  |                                       | 4.4.2     |
|            |                 | COMMENT                                                      |                  |                                       | 4.4.2     |
|            | WPT             | WPT LIST                                                     |                  |                                       | 4.4.3     |

| MENU  | Sub Menu | Sub Menu     | Sub Menu        | Sub Menu        | Range                                              | Reference |
|-------|----------|--------------|-----------------|-----------------|----------------------------------------------------|-----------|
| EQUIP | TYPE     | DISPLAY TYPE |                 |                 | MAIN/<br>REMOTE/<br>REMOTE(LAN)/<br>REMOTE(SERIAL) | —         |
|       |          | DEVICE No.   |                 |                 | No1/No2                                            | —         |
|       |          | SFI          |                 |                 | GP9997/GP9996<br>GP0010/ GP0011                    | —         |
|       | DATA I/O | IN/OUT1      | FORMAT          |                 | NMEA/IEC/NSK/<br>SWITCH                            | —         |
|       |          |              | BITRATE         |                 | 4800/9600/19200/<br>38400/57600                    | —         |
|       |          |              | VERSION         |                 | 1.5/2.1/2.3/4.0                                    | —         |
|       |          |              | TALKER          |                 | GP/GL/GN/GNSS/G<br>A/GB                            | —         |
|       |          |              | HEADING TALKER  |                 | GP/GL/GN/GNSS/G<br>A/GB/HC/HE/HN                   | —         |
|       |          |              | OUTPUT SENTENCE |                 |                                                    | —         |
|       |          | OUT2         |                 |                 | SAME AS<br>IN/OUT1                                 | —         |
|       |          | OUT3         |                 |                 | SAME AS<br>IN/OUT1                                 | —         |
|       |          | LAN          | GNSS OUT        | CONNECT         | MULTICAST/<br>UNICAST/<br>BROADCAST                | —         |
|       |          |              |                 | IP              |                                                    | —         |
|       |          |              |                 | PORT            |                                                    | —         |
|       |          |              |                 | FORMAT          | NMEA/IEC                                           | —         |
|       |          |              |                 | VERSION         | 1.5/2.1/2.3/4.0                                    | —         |
|       |          |              |                 | TALKER          | GP/GL/GN/GNSS/G<br>A/GB                            | —         |
|       |          |              |                 | OUTPUT SENTENCE |                                                    | —         |
|       |          |              | HEADING OUT     | CONNECT         | MULTICAST/<br>UNICAST/<br>BROADCAST                | —         |
|       |          |              |                 | IP              |                                                    | —         |
|       |          |              |                 | PORT            |                                                    | —         |
|       |          |              |                 | HEADING TALKER  | GP/GL/GN/GNSS/G<br>A/GB/HC/HE/HN                   | —         |
|       |          |              |                 | OUTPUT SENTENCE |                                                    | —         |
|       |          |              | ALERT           | TX CONNECT      | MULTICAST/<br>UNICAST/<br>BROADCAST                | —         |
|       |          |              |                 | TX IP           |                                                    | —         |
|       |          |              |                 | TX PORT         |                                                    | —         |
|       |          |              |                 |                 |                                                    | —         |
|       |          |              |                 | RX CONNECT      | MULTICAST/<br>UNICAST/<br>BROADCAST                | —         |
|       |          |              |                 | RX IP           |                                                    | —         |
|       |          |              |                 | RX PORT         |                                                    | —         |
|       |          |              |                 | OUTPUT SENTENCE |                                                    | —         |

| MENU  | Sub Menu | Sub Menu            | Sub Menu           | Sub Menu     | Range                                                          | Reference |
|-------|----------|---------------------|--------------------|--------------|----------------------------------------------------------------|-----------|
| EQUIP | DATA I/O | LAN                 | RMS SEND           | RMS SEND     | OFF/ON                                                         | —         |
|       |          |                     |                    | CONNECT      | MULTICAST/<br>UNICAST/<br>BROADCAST                            | —         |
|       |          |                     |                    | IP           |                                                                | —         |
|       |          |                     |                    | PORT         |                                                                | —         |
|       |          |                     | PRINTER            | INTERVAL     | OFF/ONCE/<br>1min/3min/5min/<br>10min/20min/<br>30min/60min    | —         |
|       |          |                     |                    | CONNECT      | MULTICAST/<br>UNICAST/<br>BROADCAST                            | —         |
|       |          |                     |                    | IP           |                                                                | —         |
|       |          |                     |                    | PORT         |                                                                | —         |
|       |          |                     | ACTIVE ROUTE       | ACTIVE ROUTE | OFF/ON                                                         | —         |
|       |          |                     |                    | CONNECT      | MULTICAST/<br>UNICAST/<br>BROADCAST                            | —         |
|       |          |                     |                    | IP           |                                                                | —         |
|       |          |                     |                    | PORT         |                                                                | —         |
|       |          |                     | MUTUAL             | MUTUAL       | OFF/ON                                                         | —         |
|       |          |                     |                    | CONNECT      | MULTICAST/<br>UNICAST/<br>BROADCAST                            | —         |
|       |          |                     |                    | IP           |                                                                | —         |
|       |          |                     |                    | PORT         |                                                                | —         |
|       |          |                     | SWITCH             | SWITCH       | OFF/ON                                                         | —         |
|       |          |                     |                    | CONNECT      | MULTICAST/<br>UNICAST/<br>BROADCAST                            | —         |
|       |          |                     |                    | IP           |                                                                | —         |
|       |          |                     |                    | PORT         |                                                                | —         |
|       |          |                     | ENABLE<br>DISABLE  | SETTING      | ENABLE/<br>DISABLE                                             | —         |
|       |          | CONTACT 1           | CONTACT OUT        |              | OFF/SYSTEM/<br>HEADING1/<br>HEADING2/<br>200pNM/400pNM/<br>ACK | —         |
|       |          | CONTACT 2           |                    |              | SAME AS<br>CONTACT 1                                           | —         |
|       |          | CONTACT 3           |                    |              | SAME AS<br>CONTACT 1                                           | —         |
|       |          | SENSOR<br>THROUGH 1 | FORMAT             |              | NMEA/NSK/AD-10/<br>IEC                                         | —         |
|       |          |                     | BITRATE            |              | 4800/9600/19200/<br>38400/57600                                | —         |
|       |          |                     | VERSION            |              | 1.5/2.1/2.3/4.0                                                | —         |
|       |          |                     | INTERVAL           |              | 25ms/50ms/100ms<br>/200ms/500ms/1s                             | —         |
|       |          |                     | OUTPUT<br>SENTENCE |              |                                                                | —         |
|       |          | SENSOR<br>THROUGH 2 |                    |              | SAME AS<br>SENSOR<br>THROUGH1                                  | —         |

| MENU  | Sub Menu | Sub Menu       | Sub Menu      | Sub Menu | Range                                                                   | Reference |
|-------|----------|----------------|---------------|----------|-------------------------------------------------------------------------|-----------|
| EQUIP | SWITCH   | CONTROL METHOD |               |          | OFF/MFD /<br>FIX/NOFIX /<br>FIX/NOFIX+DOP /<br>FIX/NOFIX/+DOP+<br>SPOOF | —         |
|       |          | EQUIPMENT      |               |          | GNSS /<br>GNSS COMPASS                                                  | —         |
|       | DIMMER   | SETTINGS       | DIMMER GROUP  |          | 1~10                                                                    | —         |
|       |          |                | DISPLAY       |          | OFF/ON                                                                  | —         |
|       |          |                | NCM-227       |          | OFF/ON                                                                  | —         |
|       |          |                | DIMMER OFFSET |          | -500 ~ +500                                                             | —         |
|       |          |                | DDC           |          | OFF/ON                                                                  | —         |
|       |          |                | GPS           |          | OFF/ON                                                                  | —         |
|       |          |                | GP DDC        |          | OFF/ON                                                                  | —         |
|       |          | DIMMER CAL     |               |          | MIN/MAX                                                                 | —         |
|       | IP       | SETTING        |               |          | JRC STANDARD/<br>MANUAL/<br>DEFAULT                                     | —         |
|       |          | IP ADDRESS     |               |          |                                                                         | —         |
|       |          | SUBNET MASK    |               |          |                                                                         | —         |
|       |          | MAC ADDRESS    |               |          |                                                                         | —         |
|       | CCRP     | BEEM(m)        |               |          | 1~126.0m                                                                | —         |
|       |          | LENGTH(m)      |               |          | 1~1022.0m                                                               | —         |
|       |          | CCRP           | X             |          | -<br>BEAM/2~+BEAM/2m                                                    | —         |
|       |          |                | Y             |          | 0~LENGTHm                                                               | —         |
|       |          |                | Z             |          | 0~50.0m                                                                 | —         |
|       |          | SENSOR         | X             |          | -<br>BEAM/2~+BEAM/2m                                                    | —         |
|       |          |                | Y             |          | 0~LENGTHm                                                               | —         |
|       |          |                | Z             |          | 0~50.0m                                                                 | —         |
|       |          | 3 AXIS SPEED   | X             |          | -<br>BEAM/2~+BEAM/2m                                                    | —         |
|       |          |                | Y             |          | 0~LENGTHm                                                               | —         |
|       |          |                | Z             |          | 0~50.0m                                                                 | —         |
|       |          | 2 AXIS SPEED   | X             |          | -<br>BEAM/2~+BEAM/2m                                                    | —         |
|       |          |                | Y             |          | 0~LENGTHm                                                               | —         |
|       |          |                | Z             |          | 0~50.0m                                                                 | —         |

| MENU  | Sub Menu      | Sub Menu       | Sub Menu                    | Sub Menu                                                                                                                                                 | Range  | Reference |
|-------|---------------|----------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------|
| EQUIP | LOW SPEED COG | OUTPUT         |                             |                                                                                                                                                          | OFF/ON | —         |
|       | MAINTENANCE   |                | DISPLAY                     | eMMC<br>EEPROM<br>RAM<br>SIO SENSOR<br>SIO1<br>SIO2<br>SIO3<br>LAN<br>FRONT BUZZER<br>BACK BUZZER<br>LCD                                                 |        | —         |
|       |               |                |                             | [GPS1]<br>ANTENNA<br>ROM<br>RAM<br>RTC<br>[GPS2]<br>ANTENNA<br>ROM<br>RAM<br>RTC<br>[GPS3]<br>ANTENNA<br>ROM<br>RAM<br>RTC<br>[CONTROLLER]<br>ROM<br>RAM |        | —         |
|       |               | DIAGNOSIS      | SENSOR                      |                                                                                                                                                          |        |           |
|       |               |                |                             |                                                                                                                                                          |        |           |
|       |               |                |                             |                                                                                                                                                          |        |           |
|       |               | MONITOR        | DATA IN                     |                                                                                                                                                          |        | —         |
|       |               |                | LAN                         |                                                                                                                                                          |        | —         |
|       |               |                | SENSOR                      |                                                                                                                                                          |        | —         |
|       |               | OPERATING TIME | SENSOR OPERATING TIME (hr)  |                                                                                                                                                          |        | —         |
|       |               |                | DISPLAY OPERATING TIME (hr) |                                                                                                                                                          |        | —         |
|       |               |                | LCD OPERATING TIME (hr)     |                                                                                                                                                          |        | —         |
|       | RESET         |                |                             |                                                                                                                                                          |        | —         |
|       | DEMO          | DEMO TYPE      |                             |                                                                                                                                                          |        | —         |
|       |               | START/STOP     |                             |                                                                                                                                                          |        | —         |

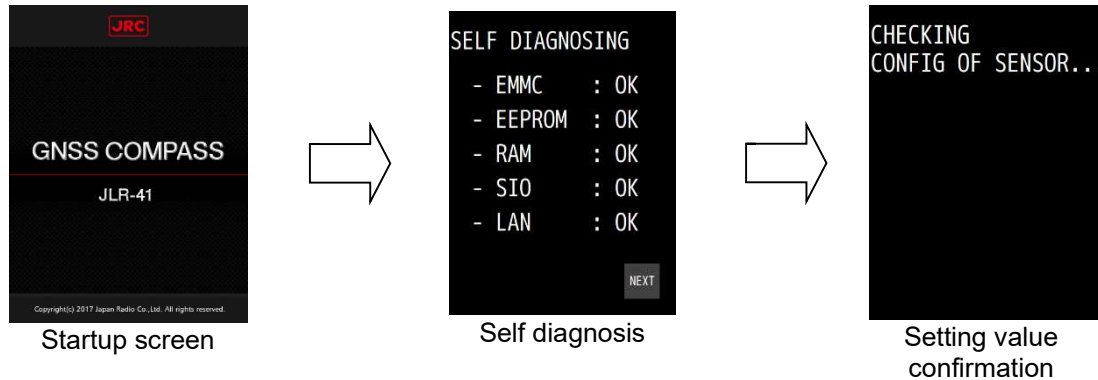
## 4.1.2 Function menu

| DISPLAY     | FUNC                  | Description                                                             |
|-------------|-----------------------|-------------------------------------------------------------------------|
| COMMON      | PRINT                 | Outputs data to a printer.                                              |
|             | INITIALIZE BRIGHTNESS | Resets the brightness setting to the default value.                     |
| HEADING     | HEADING RESOLUTION    | Sets the number of decimal places in the heading display (0.1/0.01).    |
|             | SPEED RESOLUTION      | Sets the number of decimal places in the ship speed display (0.1/0.01). |
| NAV         | SPEED RESOLUTION      | Sets the number of decimal places in the ship speed display (0.1/0.01). |
| PLOT        | CURSOR MODE           | Displays a cursor.                                                      |
|             | HOME                  | Moves own ship to the centre of the screen.                             |
|             | PLOT                  | Sets display/non-display on the plotting screen.                        |
|             | BACK GROUND COLOUR    | Changes the background colour of the plotting screen.                   |
| ANALOG      | SHIP SPEED RESOLUTION | Sets the number of decimal places in the ship speed display (0.1/0.01). |
|             | SPEED METER           | Sets the maximum value of the ship speed meter.                         |
|             | ROT RANGE             | Sets the maximum value of ROT.                                          |
|             | PEAK VALUE RESET      | Resets the peak heel value.                                             |
| HIGHWAY     | SPEED RESOLUTION      | Sets the number of decimal places in the ship speed display (0.1/0.01). |
|             | BACK GROUND COLOUR    | Changes the background colour of the HIGHWAY screen.                    |
| BEACON TEXT | BEACON DELETE         | Deletes the received data.                                              |
|             | BUZZER                | Sets whether to sound a buzzer when TYPE16 is received.                 |
| NAV ASSIST  | TRIP 1 CAL START/END  | Starts/Stops distance calculation of TRIP1.                             |
|             | TRIP 2 CAL START/END  | Starts/Stops distance calculation of TRIP2.                             |
|             | TRIP 1 RESET          | Resets distance calculation of TRIP1.                                   |
|             | TRIP 2 RESET          | Resets distance calculation of TRIP2.                                   |
|             | SHIP SPEED SETTING    | Sets 3-axis ship speed calculation.                                     |

## 4.2 Basic Operation

### 4.2.1 Turning on the power of the unit

When the power of the equipment is turned on by pressing the Power key, the startup screen appears. When installation is completed, self-diagnosis starts and the setting value confirmation screen is changed to the normal screen.



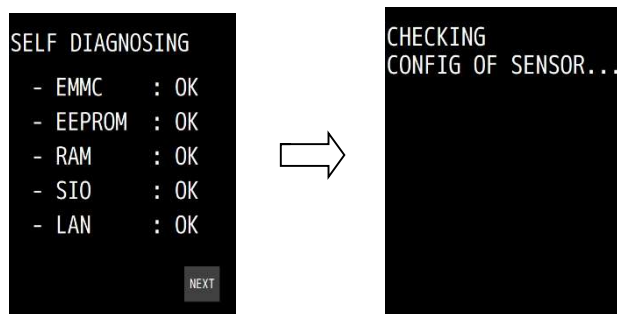
#### Memo

If the power for the equipment is not turned on, check the main power supply of the power board, power cable connection to the processor, or cable connection to the display unit.

### 4.2.2 Startup

#### 1) Normal startup

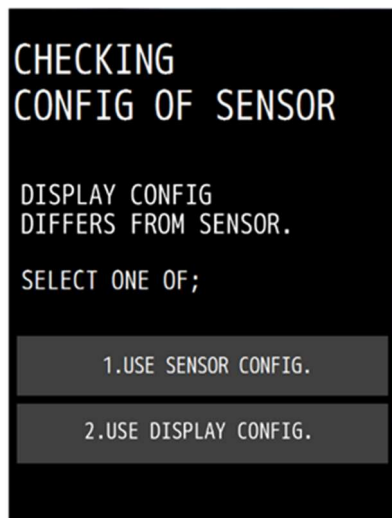
If all the self-diagnosis results are 'OK' and all the settings of the processor and sensor settings match, the screen is switched to the normal screen automatically.



## 2) Error startup 1

The message that is shown below may be displayed in the receiver diagnosis.

This message is displayed when the setting values do not match between the processor and the receiver due to the equipment replacement or other reason.



In this case, select one of the following items.

[USE SENSOR CONFIG.]: The setting value of the processor is rewritten so as to match the setting value of the receiver.

[USE PROCESSOR CONFIG.]: The setting value of the receiver is rewritten so as to match the setting value of the processor.

## 3) Error startup 2

If any one of the diagnosis results is 'NG', the result will be displayed continuously.

The screen is not switched to the normal screen unless "SKIP" is tapped.

### Memo

When there is any error (NG), contact JRC or your distributor.

## 4.2.3 Turning off the power of the unit

When the Power key is pressed, the following message is displayed. When "YES" is selected, the power is turned off.

POWER OFF  
ARE YOU SURE

### Memo

- Even if the message is displayed, the power of the display is turned off forcibly if the Power key is held down for about 8 seconds.
- When the display unit is energised even if the power is Off, the LED of the Power key is lit.

#### 4.2.4 Adjusting the backlight

The brightness can be adjusted to 16 levels by using the DIM key. Even if the brightness is set to OFF, the DIM key alone remains lit

To reset the brightness to the default value, tap  from .

1. Whenever “DIM+” at the top right corner of the screen is pressed, the screen brightness increases.
2. Whenever “DIM-” at the bottom of the screen is pressed, the screen brightness decreases and finally is set to OFF.

#### 4.2.5 Menu operation

When the MENU key is pressed, a menu is displayed.

When the MAIN key is pressed while a menu is displayed, the screen returns to the normal screen.

For the details of the menu, refer to “4.1 Menu List”.

## 4.2.6 Alert and acknowledgment (ACK)

### 1. Notifying the occurrence of an alert

When an alert occurs, an alert icon is displayed at the top left corner of the screen and the occurrence of an alert is notified by a buzzer sound. The alert target value is displayed with blinking.

Icon list

| Icon                                                                                | Priority | Status                     |
|-------------------------------------------------------------------------------------|----------|----------------------------|
|    | Alarm    | Active - Unacknowledged    |
|    |          | Active - Silenced          |
|    |          | Active - Acknowledged      |
|    |          | Rectified - Unacknowledged |
|    |          | Responsibility transferred |
|    | Warning  | Active - Unacknowledged    |
|    |          | Active - Silenced          |
|   |          | Active - Acknowledged      |
|  |          | Rectified - Unacknowledged |
|  |          | Responsibility transferred |
|  | Caution  | Active                     |

When any icon is tapped, an alert list is displayed.

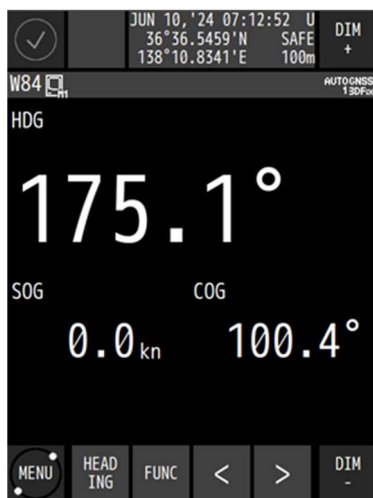
### 2. Alert acknowledgment (ACK)

- 1) Tap the alert detail bar at the center of the screen.
- 2) The alert icon changes to the acknowledged state and the buzzer sound stops. When a NOFIX alert occurs, the alert target value that is displayed is lit in red.

#### Memo

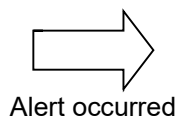
- When multiple alerts occur simultaneously, the alert with the highest priority is displayed first and all the alerts must be acknowledged.
- Even if the alert is rectified before being acknowledged, the “Unacknowledged” state icon is displayed. All the alerts that have occurred must be acknowledged.

# Screen transition at the occurrence of an alert

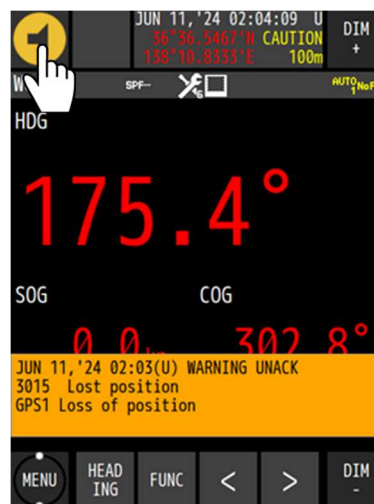


1. Operating normally

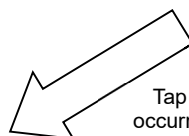
An alert occurrence icon is displayed.



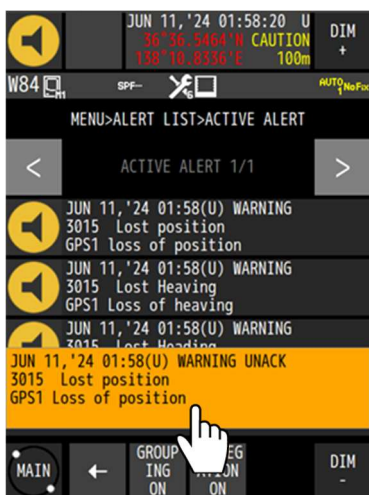
Alert occurred



2. Alert occurred (Non ACK)



Tap the alert occurrence icon.

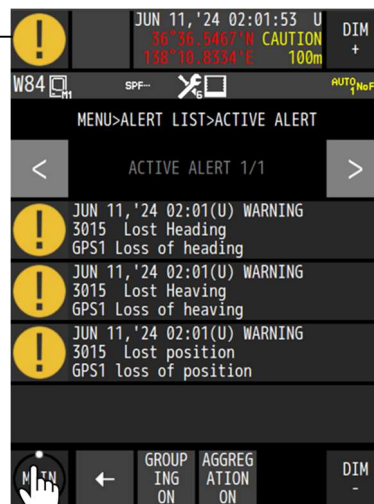


3. Alert is occurring  
The alert list is displayed.

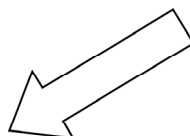
The icon indicating an acknowledged state is displayed.



Acknowledge by tapping the alert contents.



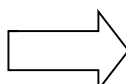
4. Alert occurred (acknowledged)



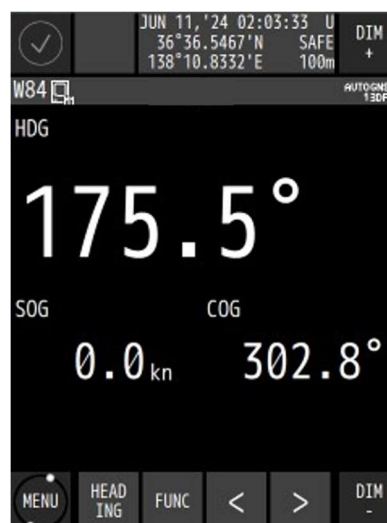
Tap the MAIN key.



5. The MAIN screen is displayed.



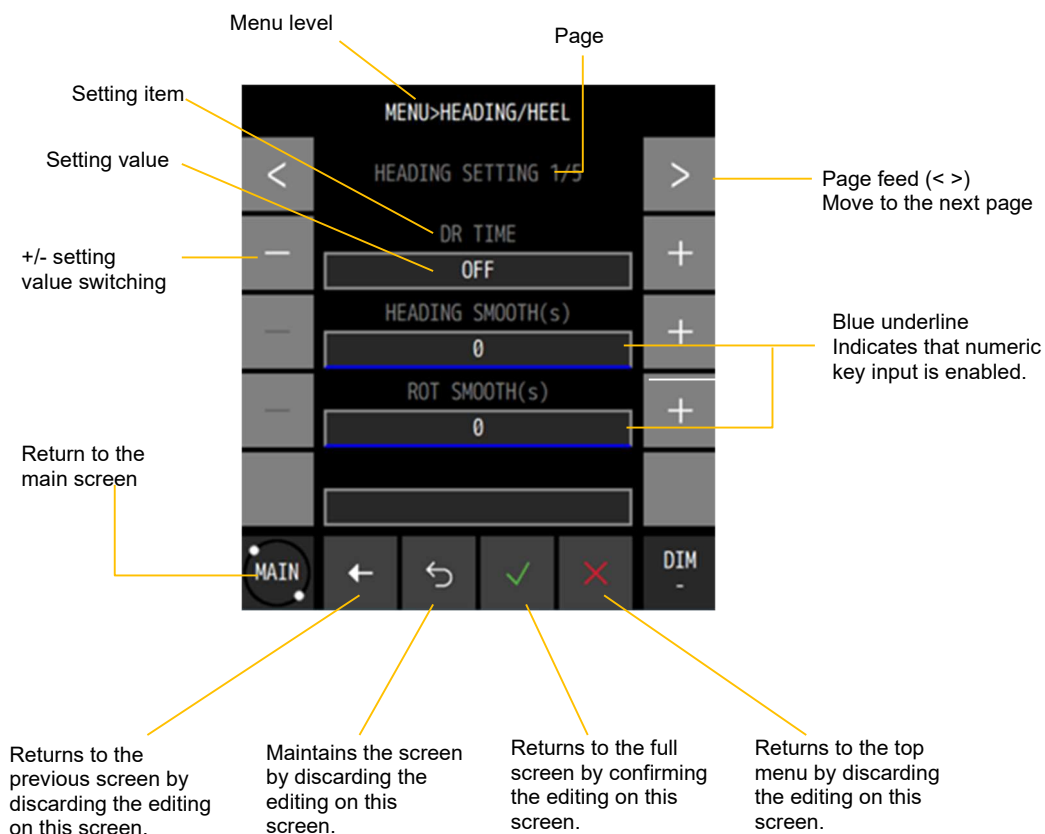
Rectified.



6. Rectified

## 4.2.7 Screen operation

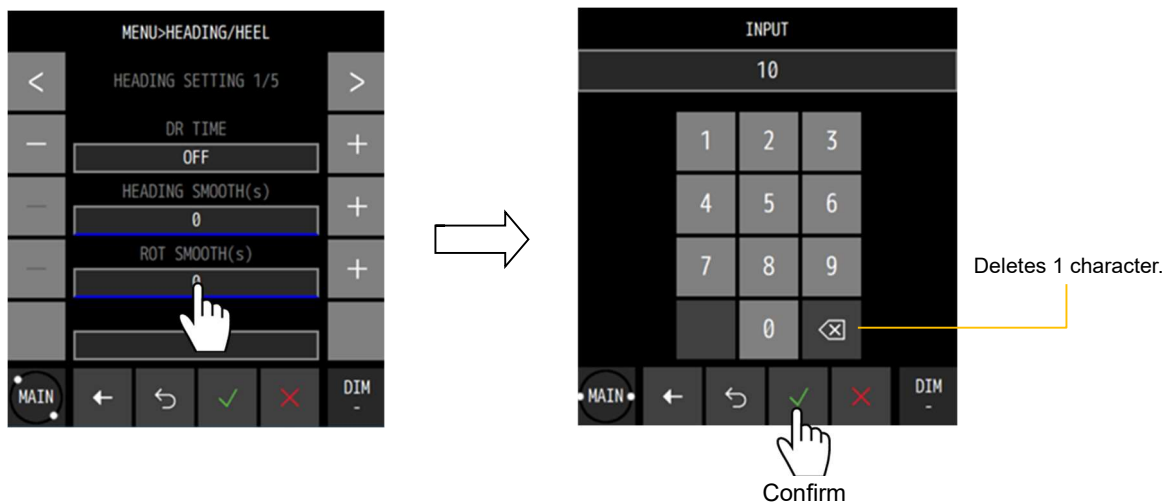
See below for the screen operation.



## 4.2.8 Inputting numeric values

Numeric value input by numeric keys is allowed for the setting values with blue underline. Tap the blue underline of the numeric item to be input.

Enter a numeric value and confirm with .



## 4.2.9 Entering a password in CODE INPUT

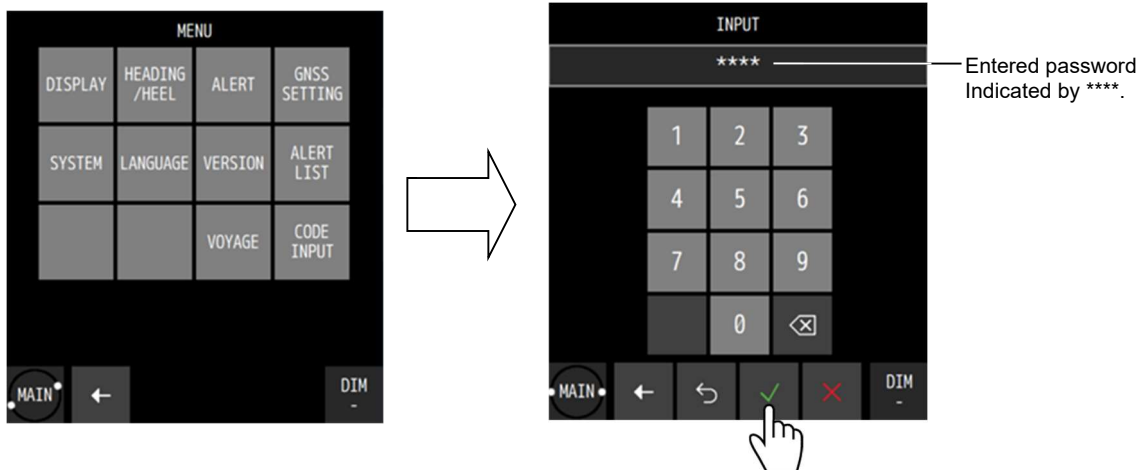
Some setting items are protected by a password to prevent them being changed easily.

If the power is turned off or no operation is performed for five minutes after a password is set, the password is reset.

To set a password, enter a password again in CODE INPUT.

### Procedure

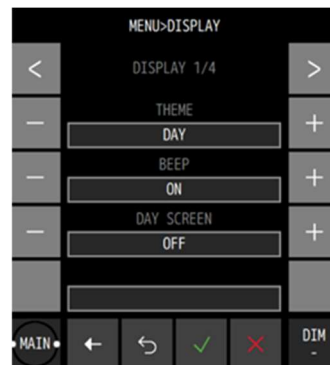
1.  → 
2. Enter a password and confirm it with  .



## 4.3 Setting Display

Set a screen.

Set a THEME, a beep tone, and background colour.



### 4.3.1 Setting a theme

Screen brightness can be adjusted according to the time zone for using this equipment.

Procedure

1.  →  → THEME

| THEME | Description                                           |
|-------|-------------------------------------------------------|
| DAY   | Specify this when using the equipment during daytime. |
| DUSK  | Specify this when using the equipment at dusk.        |
| NIGHT | Specify this when using the equipment at night.       |

### 4.3.2 Setting a beep tone

Set a beep tone ON/OFF when the screen is tapped.

Procedure

1.  →  → BEEP

| BEEP | Description                |
|------|----------------------------|
| ON   | Sets the beep tone to ON.  |
| OFF  | Sets the beep tone to OFF. |

### 4.3.3 Setting reverse video display

Set the background colour to white/black.

Procedure

1.  →  → DAY SCREEN

| DAY SCREEN | Description                          |
|------------|--------------------------------------|
| ON         | Sets the background colour to white. |
| OFF        | Sets the background colour to black. |

#### 4.3.4 Selecting a display screen

A screen to be displayed can be selected.  
It is not possible to set all the screens to non-display.

Procedure

1.  →  →   → Select a display.

| DISPLAY     | Description                                     |
|-------------|-------------------------------------------------|
| HEADING     | ON: Set to Display.<br>OFF: Set to Non-display. |
| NAV         |                                                 |
| PLOT        |                                                 |
| ANALOG      |                                                 |
| HIGHWAY     |                                                 |
| SAT INFO    |                                                 |
| BEACON TEXT |                                                 |
| NAV ASSIST  |                                                 |
| WPT INFO    |                                                 |

## 4.4 Active Route Display

- Received Active routes can be displayed.
- One route can be received and up to 512 waypoints can be displayed.
- Received routes are numbered starting from 101 and waypoints are numbered starting from 10001.
- Received routes cannot be edited.
- Received routes are not saved. Received routes are deleted when the power is turned off.

### 4.4.1 Receiving an Active route

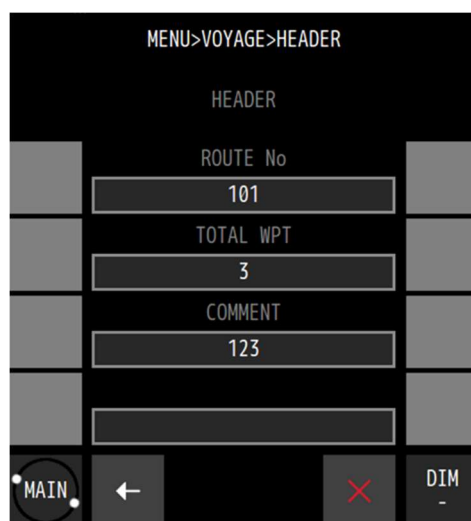
- To receive an Active route, the equipment needs to be connected via LAN.
- The default settings such as the IP address need not be changed to receive Active route. The received Active route is automatically displayed.

### 4.4.2 Displaying the route header

The header of the received route can be displayed.

Procedure

1.  →  →  → The header is displayed.

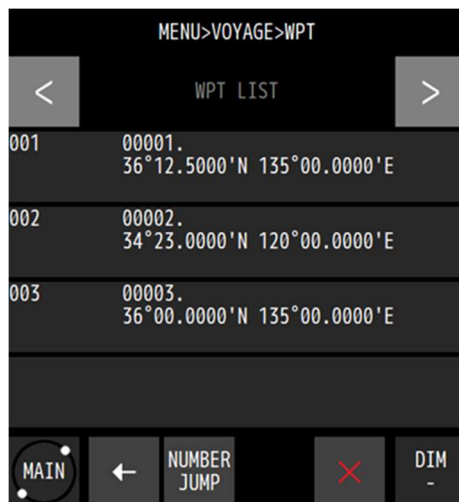


### 4.4.3 Displaying waypoints

Waypoints of the received route can be displayed.

Procedure

1.  →  →  → A waypoint list is displayed.

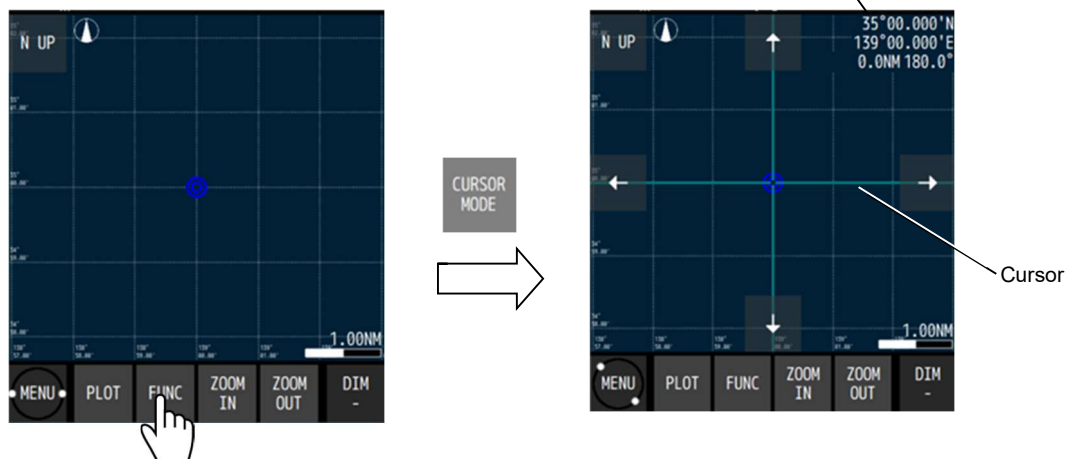


## 4.5 Plotting Screen

### 4.5.1 Operating the cursor

Procedure

1. Display the PLOT screen.
2.  → 
3. Move the cursor by using the Up/Down/Left/Right arrow keys.



## 4.5.2 Changing the cursor size

A cursor size can be selected from LARGE/MIDDLE/SMALL.

Procedure

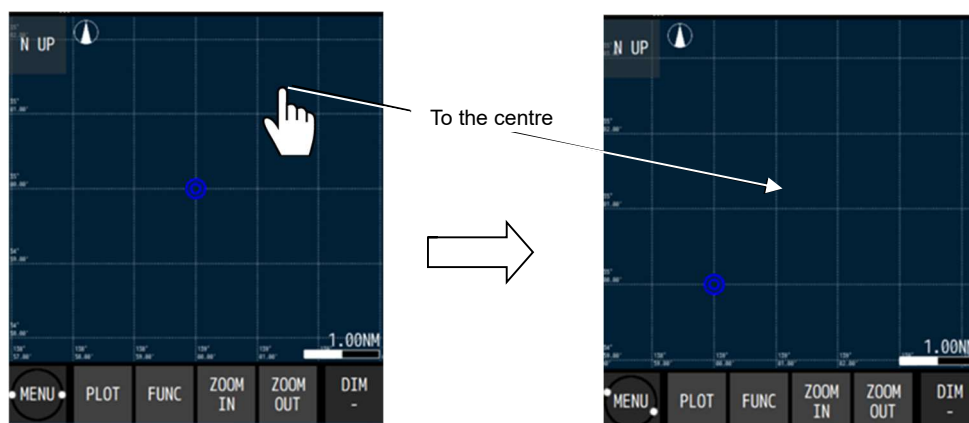
1. Display the PLOT screen.

2. **FUNC** → **PLOT** → **CURSOR**

3. Select a size and confirm it with .

## 4.5.3 Moving a screen

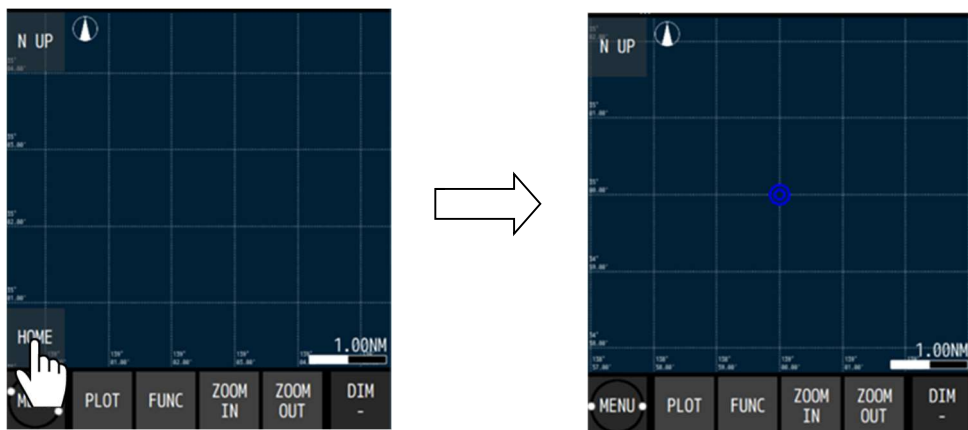
The mouse can be used to move the tapped position to the centre of the screen.



#### 4.5.4 Moving own ship to the centre of the screen

When own ship is within the screen range, the own ship's position can be moved to the centre of the screen by tapping it.

When own ship is moved to the position outside of the screen range, disabling its display, tap "HOME" at the bottom left corner of the screen.

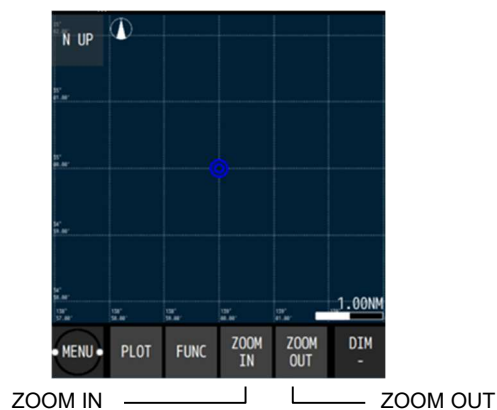


##### Memo

- When own ship is moved to the end of the screen, own ship is returned to the centre of the screen automatically.
- Own ship can also be moved to the centre of the screen by selecting "FUNC" → "HOME".

#### 4.5.5 Screen Zoom In/Out

The plotting screen horizontal width can be set in the following.  
0.04, 0.1, 0.2, 0.4, 1.0, 2.0, 4.0, 10.0, 20.0, 40.0, and 60.0 [NM]



## 4.5.6 Changing North Up/Course Up

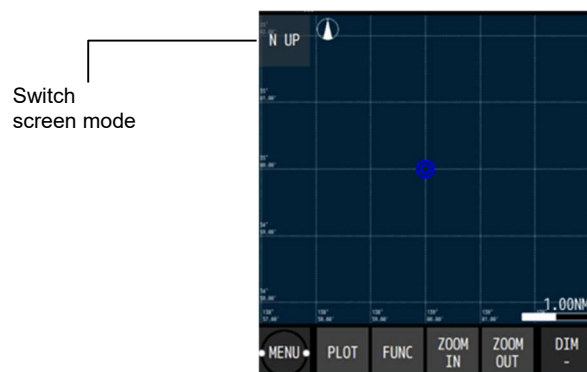
The screen mode can be changed to North Up, Course Up, or Relative North Up.

North Up: Own ship moves on the screen with North Up.

Course Up: The course of own ship is constantly set to the up position on the screen and the surrounding image moves.

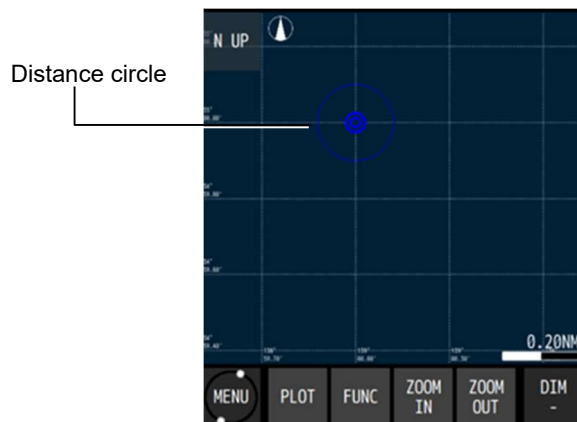
Relative North Up: The top of the screen faces North and own ship's position is fixed and the surrounding image moves.

Whenever screen mode switching is tapped, the screen mode changes.



## 4.5.7 Displaying the ship's distance circle

When a radius is specified, a circle is displayed positioning own ship at the centre. The range that can be set is from 0.1NM to 9.9NM.



### Procedure

1. Display the PLOT screen.

2. **FUNC** → **PLOT** → **OWN SHIP**



| Item       | Description                                                                       |
|------------|-----------------------------------------------------------------------------------|
| OWN CIRCLE | Set a distance circle from own ship.                                              |
| RADIUS(NM) | Displayed when OWN CIRCLE is set to ON.<br>Input a radius of the distance circle. |

3. Set the radius and press  to confirm the setting.

## 4.5.8 Setting symbols to display/non-display

- Symbols that are displayed on a plotting screen can be set to non-display individually.
- Set the symbols that are not to be displayed to "OFF".
- Set the symbols that are to be displayed to "ON".
- The following symbols can be set to display/non-display.  
Waypoint, waypoint number, arrival circle, route width, scale bar, symbol information, cursor position information, grid line, grid latitude, and grid longitude
- Symbols on the Active route cannot be hidden.

### Procedure

1. Display the PLOT screen.

2.  →  → 

3. Set the items to be displayed to "ON".

4. Confirm the setting with  .

## 4.5.9 Changing a background colour

A background colour of a plotting screen can be changed.  
The colors that can be set are DARK BLUE and WHITE.

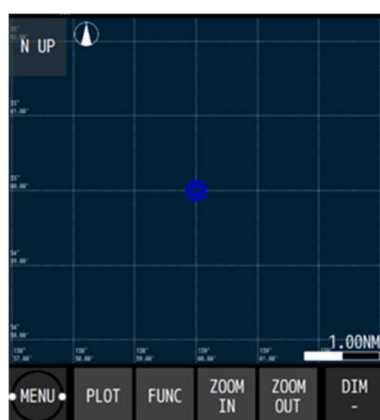
### Procedure

1. Display the PLOT screen.

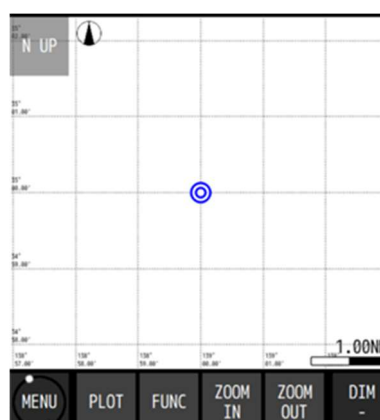
2.  → 

3. Select a background colour.

4. Confirm the selection with  .



DARK BLUE



WHITE

## 4.6 Setting Alerts

Fifteen types of alerts can be set. ON/OFF setting and buzzer ON/OFF can be set individually.  
The alerts that can be set are outlined below.  
If sound is set to OFF, a buzzer sound is not emitted.

### -Alerts for SOLAS ship-

- (1) SYSTEM: The alert is issued at the occurrence of non-position fixing.
- (2) HEADING: The alert is issued if the heading cannot be calculated.
- (3) DGPS: The alert is issued when position fixing is changed from GPS to DGPS or from DGPS or GPS.
- (4) HDOP: The alert is issued when the HDOP value exceeds the setting value.
- (5) SPD: The alert is issued when the speed is in the set range.
- (6) CCRP: The alert is issued if the CCRP position set by this equipment and the CCRP value received from another device do not match.

### -Alerts for non-SOLAS ship-

|                                                                                                  |                                                                |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
|  <b>CAUTION</b> |                                                                |
|                 | Set the HEEL alert OFF on SOLAS ship. (Default setting is OFF) |

- (7) HEEL: The alert is issued when the heel angle exceeds the set value.

### -SPOOFING/JAMMING notification

- (8) SPOOFING: The user is notified when spoofing/jamming is detected. \*1

\*1: A license is required to enable the spoofing/jamming detection function.

## 4.6.1 Setting alert/buzzer sounds for SOLAS ship

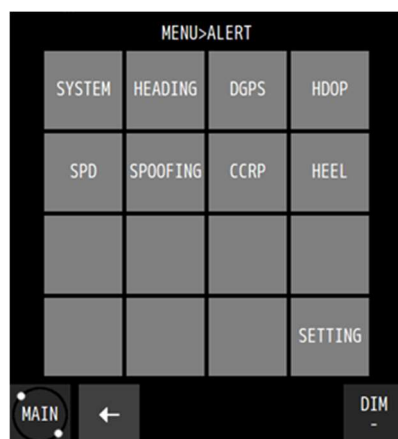
To set an alert, a password is necessary. For the input method, refer to “4.2.9 Entering a password with CODE INPUT”.

### Procedure

1. Enter a password by referencing “4.2.9. Entering a password with CODE INPUT”.

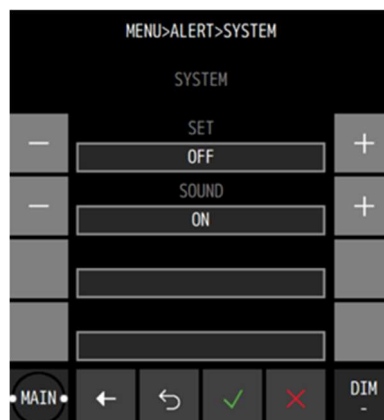
Password: 1680

2.  →  → An alert list is displayed.



### (1) Setting the SYSTEM alert

- a) Tap  .



| Item  | Description                                                                                                                                                                                                  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET   | Sets alert notification to ON/OFF.<br>ON: Notifies the occurrence of an alert.<br>OFF: Sets alert to OFF.                                                                                                    |
| SOUND | Sets the buzzer sound upon the issuance of an alert to ON/OFF.<br>ON: When an alert is issued, the alert is notified with a buzzer sound.<br>OFF: Even if an alert is issued, a buzzer sound is not emitted. |

## (2) Setting the HEADING alert

a) Tap  .

| Item  | Description                                                                                                                                                                                                  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET   | Sets alert notification to ON/OFF.<br>ON: An alert is issued when heading measurement is not possible.<br>OFF: Sets the alert to OFF.                                                                        |
| SOUND | Sets the buzzer sound upon the issuance of an alert to ON/OFF.<br>ON: When an alert is issued, the alert is notified with a buzzer sound.<br>OFF: Even if an alert is issued, a buzzer sound is not emitted. |

## (3) Setting the DGPS alert

a) Tap  .

| Item  | Description                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET   | Sets alert notification to ON/OFF.<br>GPS→DGPS: The buzzer sounds when the positioning system is changed from GPS to DGPS.<br>DGPS→GPS: The alert is issued when the positioning system is changed from DGPS to GPS.<br>GPS↔DGPS: The alert is issued when the positioning system is changed from DGPS to GPS.<br>Or the buzzer sounds when the positioning system is changed from GPS to DGPS.<br>OFF: Sets the alert to OFF. |
| SOUND | Sets the buzzer sound upon the issuance of an alert to ON/OFF.<br>ON: When an alert is issued, the alert is notified with a buzzer sound.<br>OFF: Even if an alert is issued, a buzzer sound is not emitted.                                                                                                                                                                                                                   |

## (4) Setting the HDOP alert

a) Tap  .

| Item      | Description                                                                                                                                                                                                  |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET       | Sets alert notification to ON/OFF.<br>THRESHOLD: The alert is issued when HDOP exceeded the threshold value.<br>OFF: Sets the alert to OFF.                                                                  |
| THRESHOLD | Sets a HDOP threshold value.<br>This item is not displayed when SET is OFF.                                                                                                                                  |
| SOUND     | Sets the buzzer sound upon the issuance of an alert to ON/OFF.<br>ON: When an alert is issued, the alert is notified with a buzzer sound.<br>OFF: Even if an alert is issued, a buzzer sound is not emitted. |

## (5) Setting the SPEED alert

a) Tap



| Item                       | Description                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET                        | Sets alert notification to ON/OFF.<br>OVER: An alert is issued at or above the set ship speed.<br>UNDER: An alert is issued at or below the set ship speed.<br>IN RANGE: An alert is issued when the ship speed is within the set range.<br>OUT RANGE: An alert is issued when the ship speed is out of the set range.<br>OFF: Sets the alert to OFF. |
| THRESHOLD<br>OVER<br>UNDER | When SET is set to OVER/UNDER, set the ship speed threshold.                                                                                                                                                                                                                                                                                          |
| IN RANGE<br>OUT RANGE      | When SET is set to IN RANGE/OUT RANGE, set the upper and lower limits of the ship speed range.                                                                                                                                                                                                                                                        |
| SOUND                      | Sets the buzzer sound upon the issuance of an alert to ON/OFF.<br>ON: When an alert is issued, the alert is notified with a buzzer sound.<br>OFF: Even if an alert is issued, a buzzer sound is not emitted.                                                                                                                                          |

## (6) Setting the CCRP alert

a) Tap



| Item  | Description                                                                                                                                                                                                  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET   | Sets alert notification to ON/OFF.<br>ON: An alarm is issued when a CCRP mismatch occurs.<br>OFF: Sets the alert to OFF.                                                                                     |
| SOUND | Sets the buzzer sound upon the issuance of an alert to ON/OFF.<br>ON: When an alert is issued, the alert is notified with a buzzer sound.<br>OFF: Even if an alert is issued, a buzzer sound is not emitted. |

## (7) Setting the heaving alert

a) Tap



| Item  | Description                                                                                                                                                                                                  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET   | Sets alert notification to ON/OFF.<br>ON: An alert is issued when heaving measurement is not possible.<br>OFF: Sets the alert to OFF.                                                                        |
| SOUND | Sets the buzzer sound upon the issuance of an alert to ON/OFF.<br>ON: When an alert is issued, the alert is notified with a buzzer sound.<br>OFF: Even if an alert is issued, a buzzer sound is not emitted. |

## 4.6.2 Setting alert/buzzer sounds for non-SOLAS ship



### CAUTION



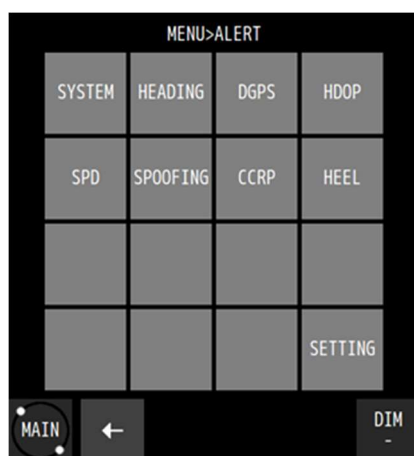
Set the following alerts OFF on SOLAS ship. (Default setting is OFF)

To set an alert, a password is necessary. For the input method, refer to “4.2.9 Entering a password with CODE INPUT”.

#### Procedure

1. Enter a password by referencing “4.2.9. Entering a password with CODE INPUT”.  
Password: 1680

2.  →  → An alert list is displayed.



#### (8) Setting the HEEL ANGLE alert

- a) Tap .

| Item      | Description                                                                                                                                                                                                  |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET       | Sets alert notification to ON/OFF.<br>THRESHOLD: An alert is issued when the heel angle is at or above the threshold value.<br>OFF: Turns off the alert.                                                     |
| THRESHOLD | Sets the heel angle threshold.<br>It is not displayed when the SET is OFF.                                                                                                                                   |
| SOUND     | Sets the buzzer sound upon the issuance of an alert to ON/OFF.<br>ON: When an alert is issued, the alert is notified with a buzzer sound.<br>OFF: Even if an alert is issued, a buzzer sound is not emitted. |

3. Tap  to confirm the setting.

### 4.6.3 SPOOFING/JAMMING notification

A license is required to enable the spoofing/jamming notification function.

|                                                                                                  |                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>CAUTION</b> |                                                                                                                                                                                                                                                                                         |
|                 | The higher the setting value of the alert mode, the higher the detection rate of spoofing, but in an environment without spoofing, the over-detection rate increases and the positioning rate decreases. Therefore, be very careful when changing the setting values of the alert mode. |

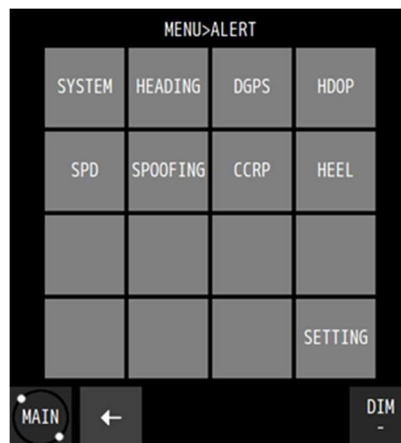
When spoofing/jamming is detected, the user is notified via a pop-up, icon, or buzzer, but no alert is output.

To set an alert, a password is necessary. For the input method, refer to “4.2.9 Entering a password with CODE INPUT”.

Procedure

1. Enter a password by referencing “4.2.9. Entering a password with CODE INPUT”.  
Password: 1680

2.  →  → An alert list is displayed.



#### (9) Setting the SPOOFING notification

- a) Tap .

| Item              | Description                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET <sup>*1</sup> | The higher the setting value of the alert mode, the higher the detection rate of spoofing, but in an environment without spoofing, the over-detection rate increases and the positioning rate decreases. Therefore, be very careful when changing the setting values of the alert mode.<br>In areas with little or no spoofing/jamming, ALERT MODE2 (default) is recommended.<br>ALERT MODE1:<br>~<br>ALERT MODE5: <sup>*2</sup> |
| SOUND             | Sets spoofing/jamming detection buzzer sound on/off.<br>ON: A buzzer sounds when spoofing/jamming is detected.<br>OFF: No buzzer sounds when spoofing/jamming is detected.                                                                                                                                                                                                                                                       |

\*1: Changing this setting should be done under conditions where there is no effect of spoofing (no false position or false time).

\*2: The equipment can detect even weaker spoofing than ALERT MODE1-4, but over-detection results in a lower positioning rate (confirmed example 0.1% reduction in positioning rate).

3. Tap  to confirm the setting.

#### 4.6.4 Alert setting

The available settings are as follows.

- ALARM ESCALATION: Select whether the "No positioning" warning will escalate to an alarm.
- HEADER ALERT: Select whether to display the aggregation, grouping in the alert list.
- TEST MODE: Select whether to return the ALF of all alerts for "Q" of ACN for wildcard.

To set an alert, a password is necessary. For the input method, refer to "4.2.9 Entering a password with CODE INPUT".

##### (1) ALARM ESCALATION

Select whether the "No positioning" warning will escalate to an alarm

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  →  → 

| Item     | Description                                                                                                                |
|----------|----------------------------------------------------------------------------------------------------------------------------|
| POSITION | Sets alarm escalation to ON/OFF.<br>ON: Enable the escalation.<br>OFF: Disable the escalation.                             |
| HEADING  | Sets on/off the alarm escalation of missing heading warning.<br>ON: Enable the escalation.<br>OFF: Disable the escalation. |
| TIME(s)  | Set the time until escalation.                                                                                             |

## (2) HEADER ALERT

Select whether to display the aggregation, grouping in the alert list.

### Procedure

1. Enter a password by referencing “4.2.9. Entering a password with CODE INPUT”.  
Password: 1680



| Item        | Description                                                                                                                                                  |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GROUPING    | Displays common alerts as a group in the alert list.<br>ON: Enable the grouping.<br>OFF: Disable the grouping.                                               |
| AGGREGATION | Displays common alert ID, category, and priority alerts as an aggregation in the alert list.<br>ON: Enable the aggregation.<br>OFF: Disable the aggregation. |

## (3) TEST MODE

Select whether to return the ALF of all alerts for “Q” of ACN for wildcard.

### Procedure

1. Enter a password by referencing “4.2.9. Entering a password with CODE INPUT”.  
Password: 1680



| Item      | Description                                                                                                                                                                               |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TEST MODE | Select whether to return the ALF of all alerts for “Q” of ACN for wildcard.<br>ON: Returns ALF of all alerts (include normal condition).<br>OFF: Returns ALF other than normal condition. |

## 4.7 Spoofing/Jamming Detection Function

When spoofing or jamming is detected, the user can be notified by a pop-up window, icon, or buzzer.  
A license is required to access this function.  
To obtain a license, please contact us or your distributor.

### 4.7.1 Operation when Spoofing/Jamming Is Detected

#### (1) Operation when spoofing is detected

When spoofing is detected, the user is notified by a pop-up window, icon<sup>\*1</sup>, or buzzer.

The sensor will attempt to calculate the positioning and heading using only the remaining correct satellites, excluding the spoofed satellites. If the number of remaining correct satellites is sufficient, the sensor outputs a correct position/heading, but if the number of satellites is insufficient, the sensor outputs a Non position fixing/Heading missing measurement. This prevents output of the wrong position/heading.

#### (2) Operation when jamming is detected

When jamming is detected, the user is notified by a pop-up window, icon, or buzzer.

When subjected to jamming, signals can no longer be received from satellites, and so the result is a Non position fixing/Heading missing measurement. However, if the jamming has little effect (reception can be continued), positioning and heading can be output.

<sup>\*1</sup>: Even if spoofing is not detected, a notification icon will appear when spoofing is suspected or while spoofing is being determined.

### 4.7.2 License

A license is required to access this function.

There are two types of licenses: a free trial version and a paid regular version.

When the license is activated, a  icon appears on the display unit.

A regular version license allows you to use the spoofing/jamming detection feature indefinitely.

#### About the Trial License

Trial licenses have an expiration date and cannot be used after the expiration date.

One month prior to the expiration date, a pop-up window will appear at power-on to notify you of the expiration date.

TRIAL SPOOFING LICENSE  
EXPIRY DATE: MMM DD,'YYYY

IF YOU NEED REGULAR LICENSE,  
PLEASE CONTACT JRC.

OK

Tap OK to close the pop-up window.

To check the license expiration date during regular usage, see "4.16. Displaying the version/rollover date" and check the expiration date shown on the VERSION display screen.

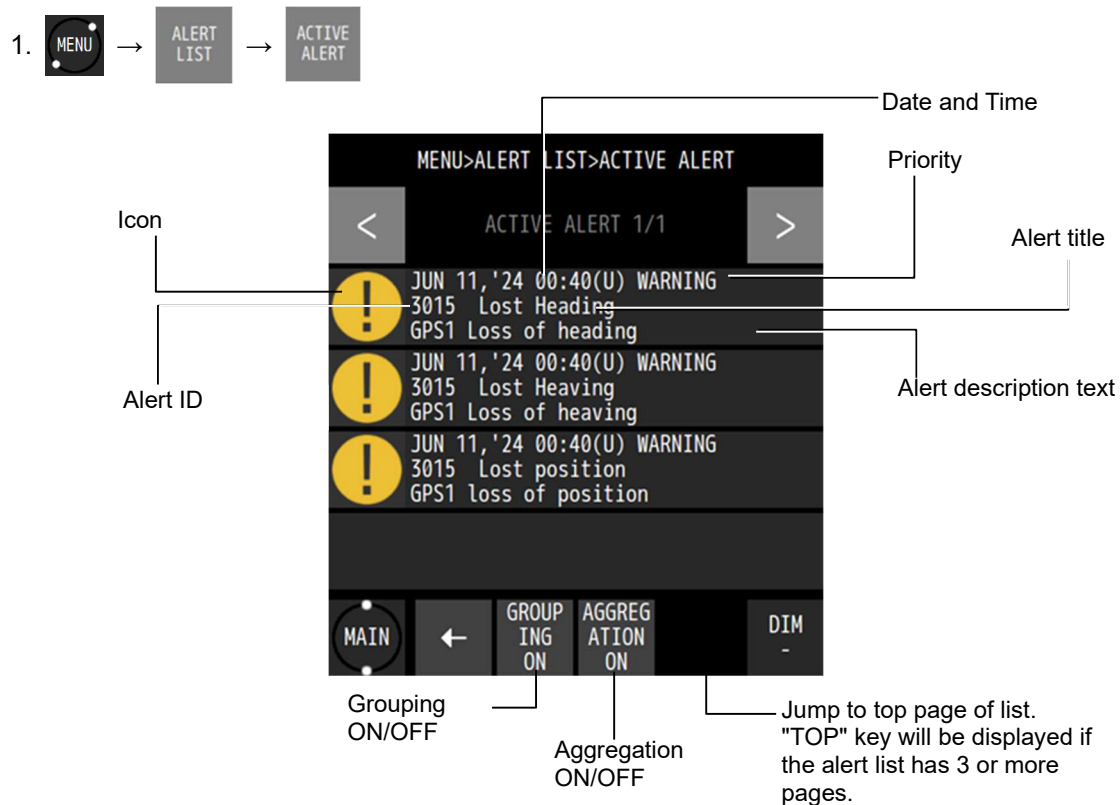
## 4.8 Alert List

The alerts that have occurred so far and the alert that is occurring, and the alerts that occurred in LAN can be displayed.

### 4.8.1 Displaying the alert that is occurring

The alert that is occurring can be displayed. They are displayed in order of priority. After the alert is resolved, the alert is deleted from the alert list.

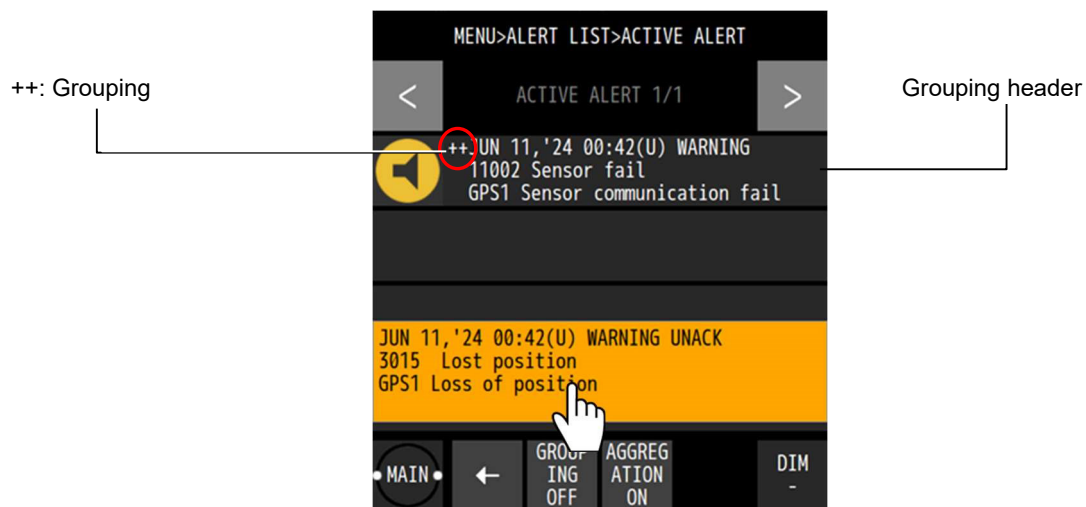
Procedure



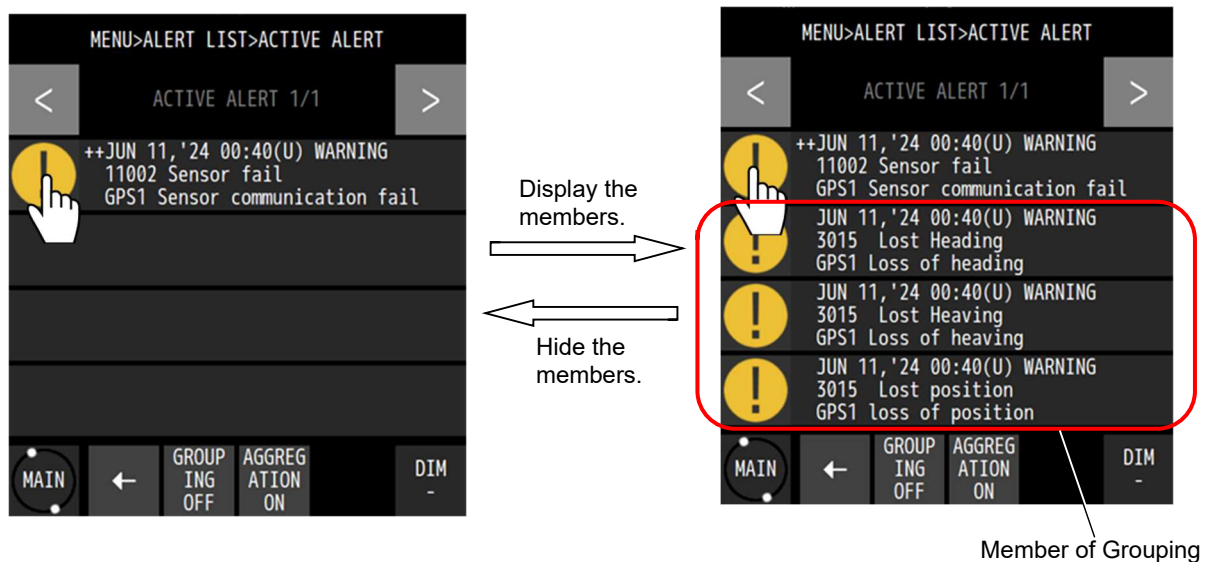
| Priority | Icon                                                                                | Status                     | Icon                                                                                | Status                   |
|----------|-------------------------------------------------------------------------------------|----------------------------|-------------------------------------------------------------------------------------|--------------------------|
| Alarm    |  | Active-Unacknowledged      |  | Active-Silenced          |
|          |  | Active-Acknowledged        |  | Rectified-Unacknowledged |
|          |  | Responsibility transferred | -                                                                                   | -                        |
| Warning  |  | Active-Unacknowledged      |  | Active-Silenced          |
|          |  | Active-Acknowledged        |  | Rectified-Unacknowledged |
|          |  | Responsibility transferred | -                                                                                   | -                        |
| Caution  |  | Active                     | -                                                                                   | -                        |

### (1) Grouping

Displays common alerts as a group in the alert list.  
Member of grouping can be displayed.



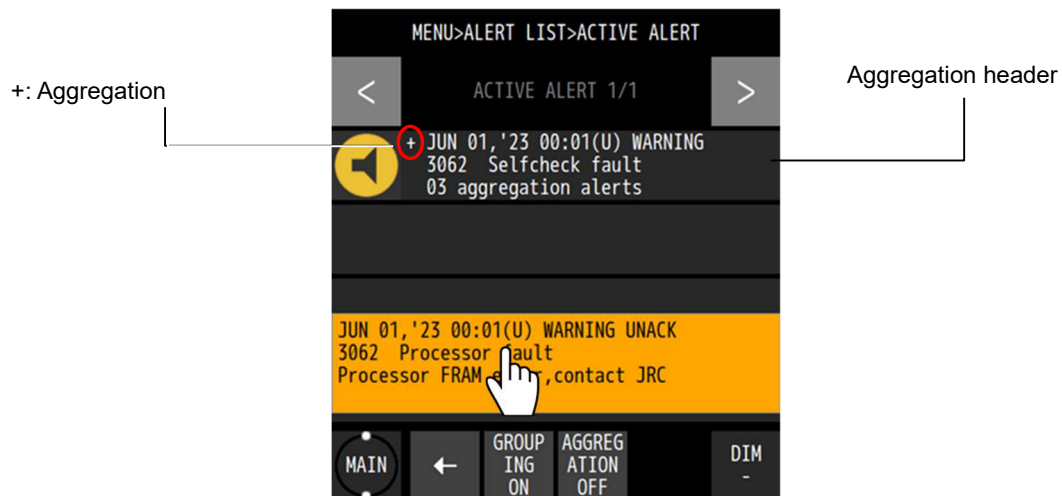
Tap the pop-up (alert description) of all alert, and acknowledge.



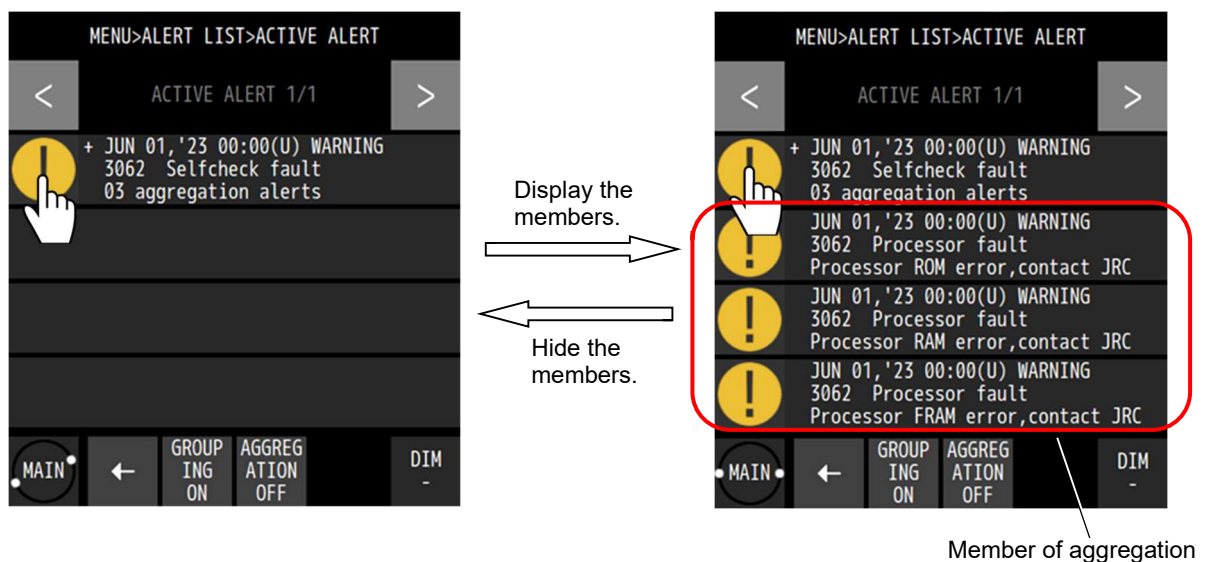
Tap the icon of grouping header, the members of grouping are displayed.  
Tap again, the members of grouping are hidden.

## (2) Aggregation

Displays common alert ID, category, and priority alerts as an aggregation in the alert list.  
Member of aggregation can be displayed.



Tap the pop-up (alert description) of all alert, and acknowledge.



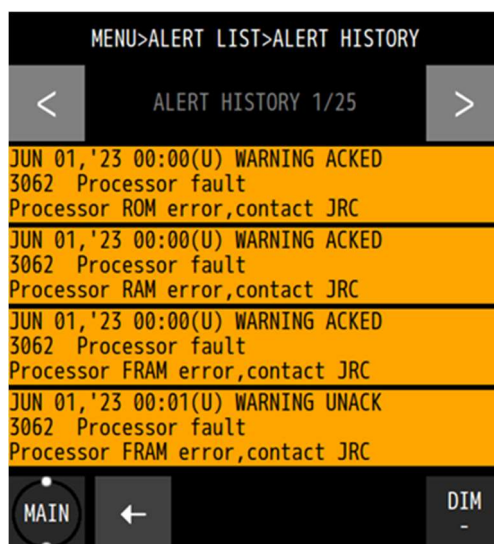
Tap the icon of aggregation header, the members of aggregation are displayed.  
Tap again, the members of aggregation are hidden.

## 4.8.2 Displaying alert history

The alerts that have occurred so far can be displayed.

Up to 100 alerts can be displayed. If the number of alerts exceeds 100, the existing alerts are overwritten from the oldest one.

Procedure



Rad : Alarm  
Orange : Warning  
Yellow : Caution

UNACK : Unacknowledged  
ACKED : Acknowledged  
RESPONSIBILITY : Responsibility transferred  
RECTIFIED : Rectified  
NORMAL : Normal

### 4.8.3 Displaying the alerts that occurred in LAN

The number of errors that occurred in LAN1/LAN2 is displayed.  
The error count is cleared when the power is turned off.

Procedure

1.  → 

#### (1) Displaying the error count of LAN

- a) Tap .

| MENU>ALERT LIST>LAN ERROR COUNT                                                                                                                                                                                                                                                                                                                                                                                                      |   |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|
| LAN ERROR COUNT                                                                                                                                                                                                                                                                                                                                                                                                                      |   |   |
| - DATAGRAM HEADER                                                                                                                                                                                                                                                                                                                                                                                                                    | : | 0 |
| - TAG FORMAT                                                                                                                                                                                                                                                                                                                                                                                                                         | : | 0 |
| - TAG CHECKSUM                                                                                                                                                                                                                                                                                                                                                                                                                       | : | 0 |
| - TAG SYNTAX                                                                                                                                                                                                                                                                                                                                                                                                                         | : | 0 |
| - TAG FRAMING                                                                                                                                                                                                                                                                                                                                                                                                                        | : | 0 |
| - NMEA CHECKSUM                                                                                                                                                                                                                                                                                                                                                                                                                      | : | 0 |
| - NMEA SYNTAX                                                                                                                                                                                                                                                                                                                                                                                                                        | : | 0 |
| - NMEA LENGTH                                                                                                                                                                                                                                                                                                                                                                                                                        | : | 0 |
| - NMEA CRP                                                                                                                                                                                                                                                                                                                                                                                                                           | : | 0 |
|      |   |   |

#### Clearing an alert

1. Enter a password by referencing “4.2.9 Entering a password in CODE INPUT”.  
Password: 1680

2.  →  →  → 

## 4.9 Initial Settings of GNSS/Beacon/SBAS

Set the GNSS compass sensor.

The available GNSS system combinations are as follows.

- a) AUTO1 Uses the three GNSS cores of the JLR-4101 in an optimal combination.
    - Core 1: GPS+QZSS+Galileo+BeiDou
    - Core 2: GPS+QZSS+Galileo+BeiDou
    - Core 3: GPS+QZSS+Galileo+GLONASS
  - b) AUTO2 Uses the three GNSS cores of the JLR-4101 in an optimal combination (when QZSS is not required).
    - Core 1: GPS+Galileo+BeiDou
    - Core 2: GPS+Galileo+BeiDou
    - Core 3: GPS+Galileo+GLONASS
  - c) GPS
  - b) GLONASS
  - e) Galileo
  - f) BeiDou
  - g) GPS+Galileo
  - h) GPS+Galileo+GLONASS
  - i) GPS+Galileo+BeiDou
  - j) GPS+QZSS+Galileo+GLONASS
  - k) GPS+QZSS+Galileo+BeiDou
- For c) to k), the three GNSS cores of the JLR-4101 are in the same combination.

DGalileo, DGLONASS, DBeiDou are not supported.

When set to "Galileo", "GLONASS", or "BeiDou", DGPS positioning by SBAS/beacon is not available.

A separate beacon receiver is required for DGPS to use a beacon.

In multi-GNSS mode also, position fixing is performed without using the systems that cannot be received by the satellites.

GLONASS is not used for heading calculation. It is used only for position fixing.

### Memo

GPS: Global Positioning System. Positioning system that is operated by the U.S.A.  
Galileo: Positioning system that is operated by EU.  
QZSS: Quasi-Zenith Satellite System (Michibiki). Positioning system that is operated by Japan.  
GLONASS: Global Navigation Satellite System. Positioning system that is operated by Russia.  
BeiDou: Positioning system that is operated by China.  
QZSS may not be received due to future broadcast plans.

### 4.9.1 Setting a positioning system

Select a GNSS system to be used.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680

2.  →  → 

| GPS MODE                 | Description                                                                                                                                                                                                                                     |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AUTO1                    | Uses the three GNSS cores of the JLR-4101 in an optimal combination.<br>(Recommended)<br>Core 1: GPS+QZSS+Galileo+BeiDou<br>Core 2: GPS+QZSS+Galileo+BeiDou<br>Core 3: GPS+QZSS+Galileo+GLONASS<br>GLONASS is not used for heading calculation. |
| AUTO2                    | Uses the three GNSS cores of the JLR-4101 in an optimal combination.<br>(When QZSS is not required)<br>Core 1: GPS+Galileo+BeiDou<br>Core 2: GPS+Galileo+BeiDou<br>Core 3: GPS+Galileo+GLONASS<br>GLONASS is not used for heading calculation.  |
| GPS                      | Operates in GPS mode. Only GPS is used.                                                                                                                                                                                                         |
| Galileo                  | Operates in Galileo mode. Only Galileo is used.                                                                                                                                                                                                 |
| GLONASS                  | Operates in GLONASS mode. Only GLONASS is used.<br>Heading calculation is not possible with GLONASS alone                                                                                                                                       |
| BDS (BeiDou)             | Operates in BeiDou mode. Only BeiDou is used.                                                                                                                                                                                                   |
| GPS+Galileo              | Operates in multi-GNSS mode.<br>GPS and Galileo are used concurrently.                                                                                                                                                                          |
| GPS+Galileo+GLONASS      | Operates in multi-GNSS mode.<br>GPS, Galileo, and GLONASS are used concurrently.<br>GLONASS is not used for heading calculation.                                                                                                                |
| GPS+Galileo+BDS          | Operates in multi-GNSS mode.<br>GPS, Galileo, and BeiDou are used concurrently.                                                                                                                                                                 |
| GPS+QZSS+Galileo+GLONASS | Operates in multi-GNSS mode.<br>GPS, QZSS, Galileo, and GLONASS are used concurrently.<br>GLONASS is not used for heading calculation.                                                                                                          |
| GPS+QZSS+Galileo+BDS     | Operates in multi-GNSS mode.<br>GPS と QZSS と Galileo と BeiDou are used concurrently.                                                                                                                                                            |

### Memo

GLONASS cannot be used for heading calculation. It is used only for position fixing.  
When set to GLONASS alone, heading data cannot be output.

## 4.9.2 Setting a position fixing mode

A position fixing mode can be selected from Automatic, 3-dimensional position fixing, and 2-dimensional position fixing.

### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680

2.  →  → 

| FIX MODE | Description                                                                                                                              |
|----------|------------------------------------------------------------------------------------------------------------------------------------------|
| AUTO     | Switches to the optimum position fixing mode automatically from the 3-dimensional position fixing or 2-dimensional position fixing mode. |
| 2D       | Positions in 2-dimensional position fixing mode.                                                                                         |
| 3D       | Positions in 3-dimensional position fixing mode.                                                                                         |

### 4.9.3 Setting an elevation mask

Set an elevation mask.

When an elevation mask is set, the satellites of the elevations lower than the set value are not used for position fixing.

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| ELV MASK     | Description                                                                       |
|--------------|-----------------------------------------------------------------------------------|
| SAT ELV MASK | Set an elevation mask.<br>Set an elevation within the range from 5 to 89 degrees. |

### 4.9.4 Setting HDOP

Set a HDOP limit of the sensor. When HDOP exceeded the set value, the system is set to a non-position fixing mode.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| HDOP | Description                                              |
|------|----------------------------------------------------------|
| HDOP | Set the threshold value of HDOP.<br>Select 4, 10, or 20. |

### 4.9.5 Setting position, speed, and course smoothing

Smoothing can be applied to the position that is fixed, speed, and course for the smooth changes.

If the smoothing value is increased, processing becomes smoother, however, the trackability deteriorates. If the smoothing value is reduced, changes increase, however, the trackability improves.

Set the optimum value according to the purpose.

JLR-41 supports individual smoothing of position, speed, and course.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| SMOOTH           | Description                                                                                   |
|------------------|-----------------------------------------------------------------------------------------------|
| POSN SMOOTHING   | Applies smoothing to position changes.<br>A value between 0 second and 99 seconds can be set. |
| SPEED SMOOTHING  | Applies smoothing to speed changes.<br>A value between 0 second and 99 seconds can be set.    |
| COURSE SMOOTHING | Applies smoothing to course changes.<br>A value between 0 second and 99 seconds can be set.   |

### Memo

When the smoothing value is increased, the trackability of quick turning and sudden speed change deteriorates.

Normally, the setting of 10 seconds or less is recommended. The default value of POSN SMOOTHING is 10 seconds and the default value of SPEED/COURSE SMOOTHING is 4 seconds. When setting a higher value, adequate caution is necessary.

## 4.9.6 Setting RAIM

RAIM (Receiver Autonomous Integrity Monitoring) checks the accuracy of GPS with the accuracy level and displays the status.

When the reliability of the error that was obtained is 95% or higher, the state is displayed as "SAFE" or "UNSAFE". When the reliability is 95% or lower, "CAUTION" is displayed.

SAFE: The position error is within the set accuracy level.

CAUTION: Cannot calculate with the set accuracy level.

UNSAFE: The position error exceeded the set accuracy level.

An accuracy level of RAIM can be set.

An accuracy level can be selected from OFF, 10m, 30m, 50m, and 100m.

To perform GPS independent position fixing, set 30m or more. If GPS independent position fixing is performed by setting 10m, the reliability 95% is not satisfied and this may result in "CAUTION".

When OFF is set, "RAIM OFF" is displayed on the screen, and the RAIM function stops. Therefore, when RAIM is OFF, the system cannot perform calculation as to whether the reliability is within the accuracy level.

### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| RAIM                | Description                                                                 |
|---------------------|-----------------------------------------------------------------------------|
| RAIM ACCURACY LEVEL | Set an accuracy level of RAIM.<br>Select from OFF, 100m, 50m, 30m, and 10m. |

### Memo

#### RAIM

RAIM is the abbreviation of Receiver Autonomous Integrity Monitoring and checks, in the receiver, if the position accuracy that was fixed by GNSS is within the necessary accuracy.

## 4.9.7 Setting a geodetic system

A geodetic system of the position that was fixed can be set.

For the geodetic systems that can be set, refer to "Appendix 1 List of Geodetic System".

### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| DATUM | Description                                                                                                        |
|-------|--------------------------------------------------------------------------------------------------------------------|
| DATUM | Set a geodetic system.<br>For the geodetic systems that can be set, refer to "Appendix 1 List of Geodetic System". |

## 4.9.8 Initialising sensors

Initialise sensors.

Set a general position and current date and time (UTC) of the sensor.

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| INIT       | Description                                                                                                 |
|------------|-------------------------------------------------------------------------------------------------------------|
| QUADRANT   | Select North latitude/South latitude/East latitude/West latitude of the sensor position.                    |
| LAT        | Enter a general position (latitude) of the sensor.                                                          |
| LON        | Enter a general position (longitude) of the sensor.                                                         |
| ANT HEIGHT | Enter a general position (height) of the sensor.<br>For 2-dimensional position fixing, this height is used. |
| YEAR       | Enter the current year (UTC).                                                                               |
| MONTH      | Enter the current month (UTC).                                                                              |
| DAY        | Enter the current day (UTC).                                                                                |
| HOURL      | Enter the current hour (UTC).                                                                               |
| MINUTE     | Enter the current minute (UTC).                                                                             |

## 4.9.9 Setting a DGPS correction mode

A DGPS correction mode can be selected.

JLR-41 does not support DGalileo, DGLONASS and DBeiDou. Correction data of QZSS cannot be received.

When set to "Galileo", "GLONASS", or "BeiDou", DGPS positioning by SBAS/beacon is not available.

A separate beacon receiver is required for DGPS to use a beacon.

### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| DGPS   | Description                                                                                                                                                                                               |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AUTO   | Selects beacon or SBAS automatically.<br>When both a beacon and SBAS can be received, priority is given to a beacon.<br>If both a beacon and SBAS cannot be received, multi-GNSS/GPS positioning is used. |
| BEACON | Performs DGPS by using a beacon.<br>If a beacon cannot be received, multi-GNSS/GPS positioning is used.                                                                                                   |
| SBAS   | Performs DGPS by SBAS.<br>If SBAS cannot be received, multi-GNSS/GPS positioning is used.                                                                                                                 |
| OFF    | DGPS positioning is not performed.                                                                                                                                                                        |

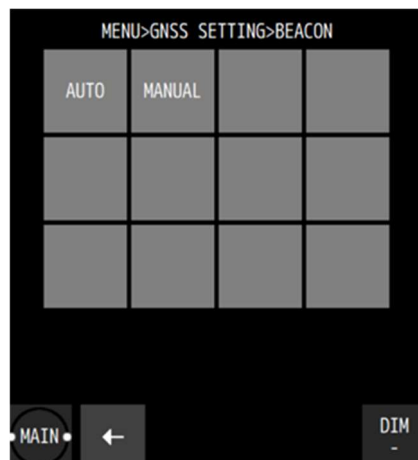
### Memo

- When the DGPS correction mode is not set to OFF, only DGPS-capable satellites are used preferentially, which reduces the number of positioning satellites and often results in performance degradation. Therefore, it is recommended that the DGPS correction mode be set to OFF.
- When setting SBAS, it takes time to SBAS positioning because it searches SABS satellites.

## 4.9.10 Setting a beacon

Set DGPS by using a beacon.

A separate beacon receiver is required for DGPS to use a beacon.



Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680



3. Set a beacon station selection method.

The selection method is outlined below.

- (1) AUTO: Selects an optimum beacon station from the GPS position.
- (2) MANUAL: Set a frequency and a baud rate of the beacon station manually.

### (1) AUTO

a) Tap  .

### (2) MANUAL

a) Tap  .

|           |                  |
|-----------|------------------|
| MANUAL    | Description      |
| FREQUENCY | Set a frequency. |
| BITRATE   | Set a bit rate.  |

b) Tap  to confirm the setting.

## 4.9.11 Setting SBAS

Set DGPS by SBAS.

### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680

2.  →  → 

|            |                                                                                  |
|------------|----------------------------------------------------------------------------------|
| SBAS       | Description                                                                      |
| SAT SEARCH | AUTO: Selects an optimum SBAS satellite.<br>MANUAL: Set a SBAS satellite number. |
| SBAS       | When SAT SEARCH is set to MANUAL, set a SBAS satellite number.                   |
| TYPE 0     | Set the use of TYPE 0 data (test data) to ON/OFF.<br>Normally, set to "OFF".     |

## 4.10 Heading Settings

Settings related to HEADING and HEEL can be made.

### 4.10.1 Setting the DR time

If the GNSS signal is interrupted for some reason and GNSS heading measurement is no longer possible, the built-in sensors are used to autonomously calculate the heading. The DR time can be set in the range of 1 to 5 minutes.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680

2.  → 

| Item    | Description                                                                                                                                                                                                                            |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DR TIME | OFF: The heading is disabled immediately after the GNSS signal is interrupted.<br>1 minute: The heading obtained by autonomous navigation is output until the set time elapses after the GNSS signal is interrupted.<br>~<br>5 minutes |

3. Tap  to confirm the setting.

### 4.10.2 Setting the heading/ROT/roll/pitch smoothing

Smoothing can be applied to smooth changes in the heading, ROT, roll, and pitch. If the smoothing value is increased, processing becomes smoother, however, the trackability deteriorates. If the smoothing value is reduced, changes increase, however, the trackability improves. Set the optimum value according to the purpose.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680

2.  → 

| Item           | Description                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------|
| HEADING SMOOTH | Applies smoothing to the heading change.<br>A value between 0 second and 10 seconds can be set. |
| ROT SMOOTH     | Applies smoothing to the ROT change.<br>A value between 0 second and 100 seconds can be set.    |
| ROOL SMOOTH    | Applies smoothing to the roll change.<br>A value between 0 second and 100 seconds can be set.   |
| PITCH SMOOTH   | Applies smoothing to the pitch change.<br>A value between 0 second and 100 seconds can be set.  |

3. Tap  to confirm the setting.

### 4.10.3 Setting the heading/roll/pitch offset

The heading, roll, and pitch can be corrected (offset).

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680

2.  → 

| Item           | Description                                      |
|----------------|--------------------------------------------------|
| HEADING OFFSET | Offsets the heading.<br>±180 degrees can be set. |
| ROLL OFFSET    | Offsets the roll.<br>±30 degrees can be set.     |
| PITCH OFFSET   | Offsets the pitch.<br>±30 degrees can be set.    |

3. Tap  to confirm the setting.

### 4.10.4 Setting the heading check mode

The measured heading can be output to a connected external device after it is confirmed.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680

2.  → 

| Item        | Description                                                                                                                                                                                                                                                                                                                |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RESTORATION | <b>MANUAL:</b> When the heading calculation is complete, a buzzer sounds and a pop-up appears. Tap the pop-up to stop the buzzer and output the heading to the external device.<br><b>AUTO:</b> When the heading calculation is complete, the heading is automatically output to the external device.<br>No buzzer sounds. |

3. Tap  to confirm the setting.

When the heading calculation is complete, the following pop-up appears.

MEASUREMENT HEADING 175.0°  
PLEASE TAP TO SEND DATA

#### 4.10.5 Setting NMEA output in case of heading interruption

Set the processing of HDT (or THS) sentence when the heading measurement is interrupted.  
Set this according to the specifications of the device to be connected.

##### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  → 

| Item           | Description                                                                                                                                                                                    |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INTERRUPT NMEA | NULL: When the heading value is invalid, the heading value of HDT (THS) sentence is set to NULL and output<br>STOP: When the heading value is invalid, the output of HDT (THS) sentence stops. |

3. Tap  to confirm the setting.

#### 4.10.6 Setting the checksum of heading data

Enable/disable the checksum of HDT (or THS) sentence in NMEA Ver1.5.  
Set this according to the specifications of the device to be connected.

##### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  → 

| Item      | Description                                                                                                      |
|-----------|------------------------------------------------------------------------------------------------------------------|
| CHECK SUM | ON: Outputs with checksum for HDT (or THS) sentence.<br>OFF: Outputs without checksum for HDT (or THS) sentence. |

3. Tap  to confirm the setting.

## 4.10.7 Setting the bow direction

The heading can be offset 180 degrees. The roll and pitch are also reversed in direction. This makes easy to change the bow direction in the case of double-ended.

### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  → 

| Item         | Description                                                                                |
|--------------|--------------------------------------------------------------------------------------------|
| DOUBLE ENDER | FRONT: Outputs the heading in forward direction.<br>REAR: Offsets the heading 180 degrees. |

3. Tap  to confirm the setting.

## 4.10.8 Setting the heel angle

### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  → 

| Item       | Description                                                                                                                                                                  |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAX PERIOD | Sets the maximum roll period to be detected.<br>It can be set in the range of 30 to 100 seconds.                                                                             |
| MIN PERIOD | Sets the minimum roll period to be detected.<br>It can be set in the range of 0.1 to 5 seconds.                                                                              |
| AVERAVE    | Applies smoothing to the roll period. Increasing the value will make the processing smoother, but the display will be delayed.<br><br>It can be set in the range of 1 to 20. |

3. Tap  to confirm the setting.

## 4.11 Configuring a System

### 4.11.1 Setting time difference/date display

A time difference between UTC and the local time can be set.

In the case of a Japan time, enter +9:00 since the time difference is +9 hours.

When a time difference is set, the local time ("L") is displayed.

A date/time display format can be selected.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| Item      | Description                                                                                    |
|-----------|------------------------------------------------------------------------------------------------|
| TIME DIFF | Set a time difference.                                                                         |
| DATE DISP | Select a date display format from the following:<br>'YY-MM-DD / DD MMM, 'YY / MMM DD, 'YY.     |
| TIME DISP | 24hr: Displays a time from 00:00 to 23:59.<br>12hr: Displays a time from AM/PM 00:00 to 11:59. |

3. Confirm the setting with .

### 4.11.2 Setting units

Set units of ship speed, distance, height, and depth.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| Item             | Description                                                                                                                                    |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| DIST/SPEED       | Select a unit of a distance and a ship speed from NM, kn / km, km/h / mi, mi/h.                                                                |
| HEIGHT/DPTH      | Select a unit of a height and a depth from m / ft / fm.                                                                                        |
| SETTING METHOD   | Case where fm is selected<br>MANUAL: A converted value between fm and m can be set.<br>DEFAULT: A converted value between fm and m is 1.8288m. |
| CONVERTED VALURE | Set a converted value between fm and m.                                                                                                        |

3. Confirm the setting with .

### 4.11.3 Setting magnetic correction

Magnetic correction of the course determined by GNSS is possible.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680

2.  →  → 

| MAG CORR | Description                                                                                                                                                         |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AUTO     | Automatically calculates the correction value based on the GNSS position and corrects the course.                                                                   |
| MANUAL   | Performs correction with the correction value that was input.<br>EAST/WEST: Select East longitude or West longitude.<br>CORRECTION VALUE: Enter a correction value. |
| OFF      | Does not perform correction.                                                                                                                                        |

3. Confirm the setting with .

### 4.11.4 Setting the heaving offset

Heaving is measured at the position where the antenna is installed. By setting the offset from the antenna position, the heaving value can be obtained at any position.

Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".  
Password: 1680

2.  →  → 

| Item | Description                                                                                                                                                                                                                                                                         |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| X    | Sets the offset along the X-axis.<br>With the antenna position as the origin, the starboard direction is positive and the portside direction is negative.                                                                                                                           |
| Y    | Sets the offset along the Y-axis.<br>With the antenna position as the origin, the bow direction is positive and the stern direction is negative.<br>* The bow direction of double-ended vessels is forward (forward direction), independent of "4.10.7. Setting the bow direction". |
| Z    | Sets the offset along the Z-axis.<br>With the antenna position as the origin, the upward direction is positive and the downward direction is negative.                                                                                                                              |

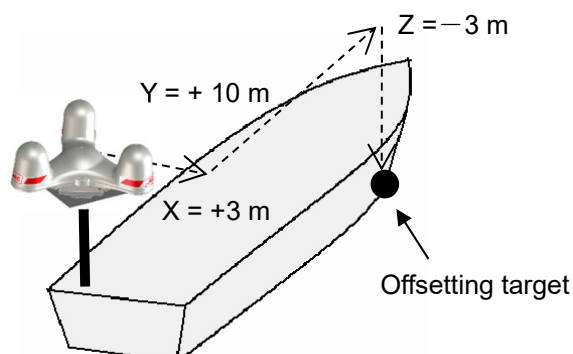
3. Confirm the setting with .

An example of the offset value

X-direction: 3 m rightward (enter +3 m)

Y-direction: 10 m forward (enter +10 m)

Z-direction: 3 m downward (enter -3 m)



### 4.11.5 Displaying at 5Hz

Latitude, longitude, speed, and course can be displayed in a 5 Hz (200 msec) cycle. The normal display cycle is 1 Hz (1 second).

#### Procedure

1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  →  → 

| Item        | Description                                    |
|-------------|------------------------------------------------|
| 5Hz DISPLAY | ON: Displays at 5 Hz.<br>OFF: Displays at 1Hz. |

3. Confirm the setting with  .

## 4.11.6 Displaying the system log

It displays security-related logs, such as network configuration changes and logging in with authorized crew authority. It can store up to 200 logs, and once this limit is reached, the oldest logs will be overwritten.

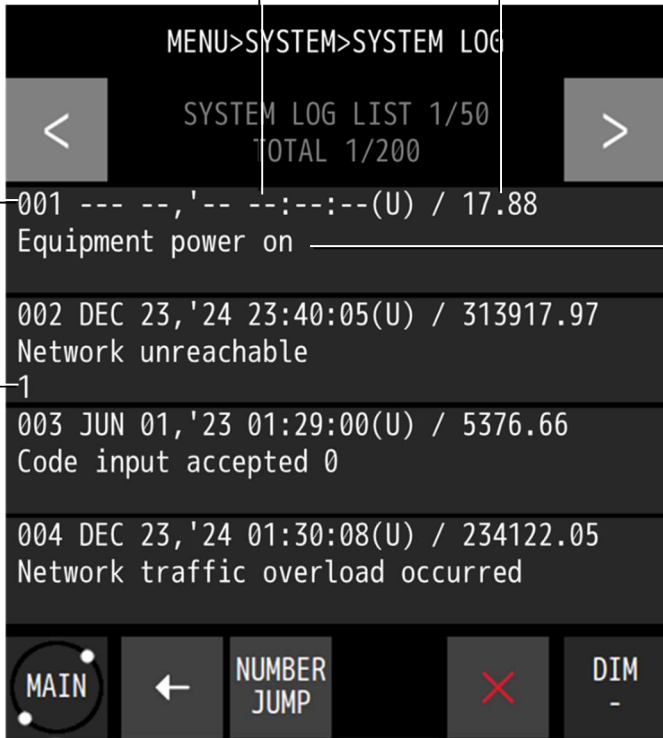
Some logs are assigned error codes. When contacting your dealer or our sales office, please also provide us with the error code so that we can identify the cause of the problem.

that identify the cause of the error. Refer to the "System Log List" in this document for details.

Note: The system log cannot be displayed if the display unit's software version is R57.00.024 or lower.

### Procedure

1.  →  → 



The screenshot shows the 'MENU>SYSTEM>SYSTEM LOG' screen. The title bar indicates 'SYSTEM LOG LIST 1/50' and 'TOTAL 1/200'. The log entries are as follows:

| Occurrence number | Error code | Date and time of condition occurrence (date and time of satellite acquisition) | Condition occurrence time (counted up from device startup. Unit: sec) | Log description text              |
|-------------------|------------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------|
| 001               |            | --- --, '--- --:--(U)                                                          | 17.88                                                                 | Equipment power on                |
| 002               | 1          | DEC 23, '24 23:40:05(U)                                                        | 313917.97                                                             | Network unreachable               |
| 003               |            | JUN 01, '23 01:29:00(U)                                                        | 5376.66                                                               | Code input accepted 0             |
| 004               |            | DEC 23, '24 01:30:08(U)                                                        | 234122.05                                                             | Network traffic overload occurred |

Annotations on the screenshot:

- Occurrence number:** Small number: New log; Large number: Old log.
- Error code:** Indicated by a small number (e.g., 1) next to the log entry.
- Date and time of condition occurrence (date and time of satellite acquisition):** Indicated by the date and time in the log entry.
- Condition occurrence time (counted up from device startup. Unit: sec):** Indicated by the time value in the log entry.
- Log description text:** Indicated by the text description of the log entry.

At the bottom of the screen, there are buttons: **MAIN**, **←**, **NUMBER JUMP**, **×**, and **DIM**.

Enter the occurrence number and move to the page

#### 4.11.7 Changing the authorized crew password

This equipment has a password for the authorized crew.

\*It cannot be set if the software version of the display unit is R57.00.024 or lower.

The authorized crew password is required when performing the following operations.

- Activating a sensor license
- Allowing/denying the recovery of settings backed up by the Remote Maintenance System (RMS) (backup and recovery are performed by the service engineer).

The default password is set to "00000000". Please change it when using the equipment.

For enhanced security, set the password as complex as possible.

##### Procedure

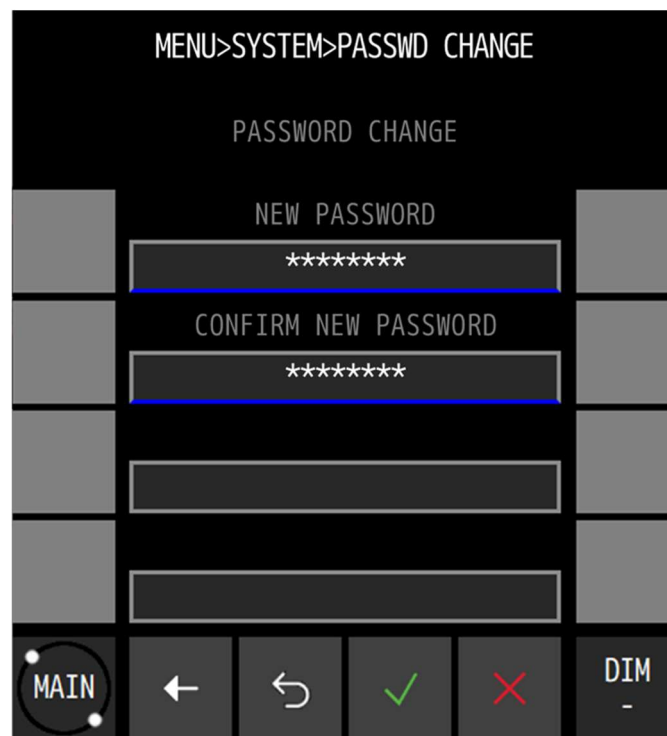
1. See 「4.2.9 Entering a password in CODE INPUT」 and enter the password.

Default password: 00000000

2.  →  → 

The password to be set must meet the following conditions

- Must be 8 digits.
- Must be the same as the confirmation password.
- The last character must not be a 1.
- The new password must not be 00000000.



If you have forgotten your password, please contact your dealer or our sales office.

## 4.12 Printing

When a network printer is connected, data is transmitted to the printer.

### Procedure

1.  → 

Whenever  is tapped, printing data is transmitted.

### Memo

- To perform printing, a port must be set in the installation.
- To print regularly, the port setting in the instruction manual is required. Please ask our service personnel for the setting.

## 4.13 Setting a Language

Select a display language.

Japanese and English can be selected as the language.

Procedure

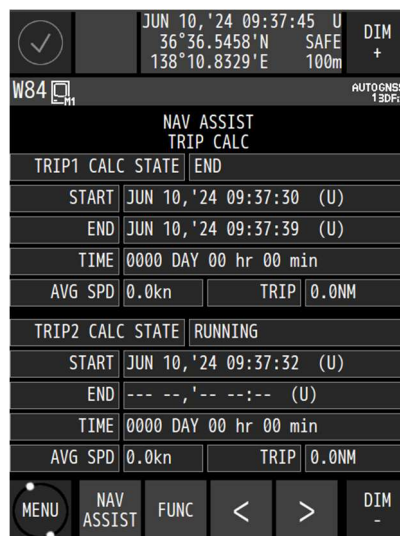
1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".

Password: 1680

2.  → 

## 4.14 Measuring a trip distance

The trip distance can be measured on the navigation assist information screen.  
Two trip distances can be measured simultaneously in this equipment.



### 4.14.1 Starting/stopping measurement

The measured distance is retained even when the power is turned off and on.  
When the measurement is restarted, the measurement continues from the previous measured value.

Procedure

1. Tap  →  several times to display the navigation assist information screen.
2.  → 

Measurement of trip distance 1 starts.

To start measurement of trip distance 2, tap .

To stop measurement, do the following.

3. Tap  →  to display the navigation assist information screen.
4.  → 

Measurement of trip distance 1 stops.

To stop measurement of trip distance 2, tap .

#### 4.14.2 Resetting a trip distance

A trip distance can be reset.  
Once a trip distance is reset, it is set to zero.

##### Procedure

1. Display navigation aid information screen 3 by selecting  and tapping  several times.

2.  → 

Trip distance 1 is reset.

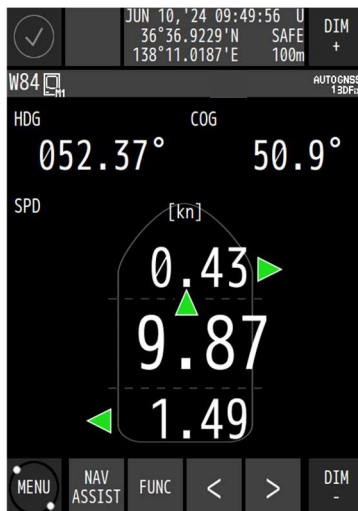
To reset trip distance 2, tap  .

## 4.15 Displaying 3-axis ship speed (SOLAS not supported)

The ship speed can be broken down into forward/backward speed, left/right speed on the bow side, and right/left speed on the stern side.

It is necessary to input the sensor positions and the positions to calculate the left/right speed on the bow side or the left/right speed on the stern side.

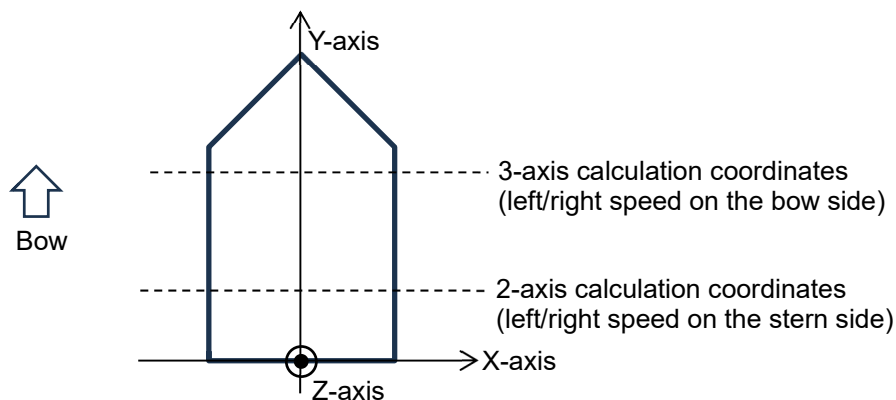
Please ask our service personnel to input the positions.



### Procedure

1. Tap **NAV ASSIST** → **>** to display the 3-axis speed navigation information screen.

The positions to be calculated need to be entered in the following coordinate system. Please ask our service personnel to input the positions.

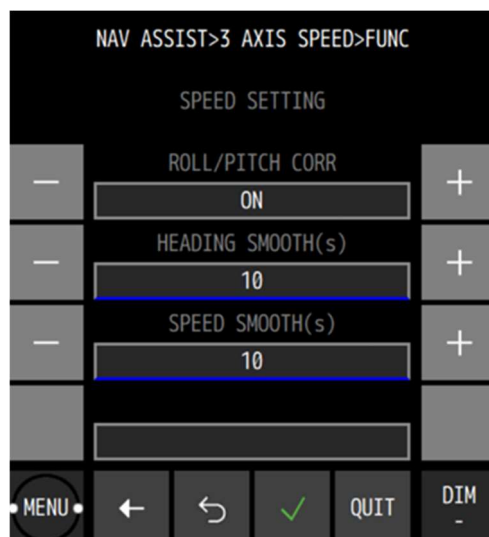


### 4.15.1 Correcting the roll/pitch

The roll/pitch angle can be corrected when measuring 3-axis ship speed.

1. Display the 3-axis ship speed screen.

2. **FUNC** → **SPEED SETTING**



Roll/pitch correction

| Item            | Description                                                            |
|-----------------|------------------------------------------------------------------------|
| ROLL/PITCH CORR | ON: Corrects the roll/pitch angle.<br>OFF: No correction is performed. |

3. Confirm the setting with .

### 4.15.2 Setting the heading time constant

Smoothing can be applied to smooth the change in the ship's heading, breaking the speed into forward/backward and left/right.

Increasing the smoothing value will make the processing smoother, but slows down the tracking. Conversely, decreasing the smoothing value will increase the change but improve tracking performance. Therefore, set the optimum value according to the intended use. Normally, it is recommended that the default setting be left unchanged.

1. Display the 3-axis ship speed screen.

2. **FUNC** → **SPEED SETTING**

Heading time constant

| Item           | Description                                                                       |
|----------------|-----------------------------------------------------------------------------------|
| HEADING SMOOTH | It can be set in the range of 0 to 99 seconds.<br>0 sec: No smoothing is applied. |

3. Confirm the setting with .

### 4.15.3 Setting the speed time constant

Smoothing can be applied to smooth changes in the speed broken down into forward/backward and left/right.

If the smoothing value is increased, processing becomes smoother, however, the trackability deteriorates. If the smoothing value is reduced, changes increase, however, the trackability improves. Set the optimum value according to the purpose. Normally, it is recommended that the default setting be left unchanged.

1. Display the 3-axis ship speed screen.

2.  → 

Speed time constant

| Item   | Description                                    |
|--------|------------------------------------------------|
| SPEED  | It can be set in the range of 0 to 99 seconds. |
| SMOOTH | 0 sec: No smoothing is applied.                |

3. Confirm the setting with  .

## 4.16 Displaying the version/rollover date

The serial number and software version of the sensor and display unit can be displayed.

The rollover date of this equipment can be displayed. The rollover is determined based on the production date or the initial setup date.

The expiry date of the spoofing/jamming detection function trial license is displayed.

### Procedure

1.  → 

| Item               | Description                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DISPLAY            | Displays the software version, security version, serial number, barcode, and IP.                                                                                                                                                                                                            |
| SENSOR             | Displays the model name, version, serial number, and barcode number.                                                                                                                                                                                                                        |
| SENSOR (GNSS core) | Displays the GNSS core software version.                                                                                                                                                                                                                                                    |
| ROLLOVER           | ROLLOVER DATE: Date of rollover<br>STARTING DATE:<br>The starting date of the rollover The default value is the production date.<br>When initialized, the initialized date is used as the starting date.<br>PRODUCTION DATE: Date of production<br>SPOOFING LICENSE: Expiry date of license |

### Display of the expiry date of license

| License                | Display                              |
|------------------------|--------------------------------------|
| Before the expiry date | Displays the expiry date. yyyy.mm.dd |
| Expiry date end        | 2000'.01.01                          |
| Unlimited license      | 2099'.12.31                          |
| No license             | ----'.--.--                          |

# Chapter 5 Maintenance and Inspection

Proper maintenance may greatly affect the lifespan of the equipment. In order to maintain the equipment in peak state, perform the following regularly.

**WARNING**



Do not perform internal inspections or modifications of the equipment. Inspection or modification by unauthorized personnel may result in fire, electric shock, or equipment failure.



Please consult with JRC or an affiliate to perform internal inspections or repair.

**CAUTION**



Do not use benzine, alcohol or thinner when caring this equipment. Doing so may result in removing the paint or changing of properties.



Wipe off the grime lightly with a dry soft cloth.  
Wipe with the other than a dry soft cloth may result in equipment injury.



Use only the specified fuse.  
Failure to do so may result in fire or equipment failure.



Use only the specified batteries.  
Failure to do so may result in equipment failure or malfunction.

## 5.1 General Maintenance and Inspection

- Operate the equipment under standard power voltage levels (DC 10.8 - 31.2 V).
- The following shows general maintenance and inspection methods using standard tools.

| No. | Item           | Maintenance and Inspection                                                                                                           |
|-----|----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Cleaning       | Clean the panel screen, knobs, and switches with a soft cloth.<br>There are no gears in the unit, so oil lubrication is unnecessary. |
| 2   | Parts Securing | Check for loose screws, nuts, and connectors, and connect securely any that have loosened.                                           |

Perform inspection of the displayed items when the equipment is functioning normally. Compare operating results to the normal operation values in order to det

## 5.2 Alerts

Refer to "4.7 Alert Lists" and check if any alert is given or not. If it is, check the details referring to the list shown below.

| Alert ID      | Alert title      | Alert description text               | Alert causes                                                  | Category | Priority*1 | Instance |
|---------------|------------------|--------------------------------------|---------------------------------------------------------------|----------|------------|----------|
| 3056          | Quality reduce   | GPSn HDOP exceeded                   | HDOP setting value or higher                                  | B        | C          | 1        |
| 3015/<br>3014 | Lost Heading     | GPSn Lost of heading                 | Bearing Calculation Error, Unable to Obtain Data              | B        | W/A        | 2        |
| 3055          | Not differential | GPSn Differential CORR not applied   | No DGPS positioning                                           | B        | W          | 1        |
| 3015          | Lost Pitch       | GPSn Loss of Pitch                   | Pitch cannot be measured                                      | B        | W          | 3        |
| 3015          | Lost Heaving     | GPSn Loss of heaving                 | Heaving cannot be measured                                    | B        | W          | 4        |
| 3015          | Lost Roll        | GPSn Loss of Roll                    | Roll cannot be measured                                       | B        | W          | 5        |
| 3062          | Core fault       | GPSn corex Antenna open,contact JRC  | Sensor antenna open                                           | B        | W          | 1        |
| 3062          | Core fault       | GPSn corex Antenna short,contact JRC | Sensor antenna short                                          | B        | W          | 2        |
| 3062          | Core fault       | GPSn corex ROM error,contact JRC     | Core memory error                                             | B        | W          | 3        |
| 3062          | Core fault       | GPSn corex RAM error,contact JRC     | Core memory error                                             | B        | W          | 4        |
| 3062          | Core fault       | GPSn corex RTC error,contact JRC     | Core RTC error                                                | B        | W          | 5        |
| 3006          | Invalid ID No    | GPSn Suspected dead battery          | Error in serial number or barcode number received from sensor | B        | C          | 1        |
| 3065<br>3065  | Lost core IF     | GPSn core1 error,contact JRC         | No data received from core 1                                  | B        | W          | 1        |
| 3065          | Lost core IF     | GPSn core2 error,contact JRC         | No data received from core 2                                  | B        | W          | 2        |
| 3065          | Lost core IF     | GPSn core3 error,contact JRC         | No data received from core 3                                  | B        | W          | 3        |
| 3065          | Rapid motion     | GPSn x gyro input error              | X-axis gyro output error                                      | B        | W          | 4        |
| 3065          | Rapid motion     | GPSn y gyro input error              | Y-axis gyro output error                                      | B        | W          | 5        |
| 3065          | Rapid motion     | GPSn z gyro input error              | Z-axis gyro output error                                      | B        | W          | 6        |
| 3065          | Rapid motion     | GPSn g sensor input error            | Acceleration sensor output error                              | B        | W          | 7        |
| 3065          | Rapid change     | GPSn temperature input error         | Temperature sensor output error                               | B        | W          | 8        |
| 10002         | GPS malfunction  | GPSn error,restart the equipment     | Sensor Internal Error                                         | B        | W          | 14-52    |
| 3055          | Quality reduce   | GPSn excessive vibration             | Excessive Vibration                                           | B        | W          | 2-5      |
| 3062          | Processor fault  | Processor ROM error,contact JRC      | Processing unit ROM error                                     | B        | W          | 6        |
| 3062          | Processor fault  | Processor RAM error,contact JRC      | Processing unit RAM error                                     | B        | W          | 7        |
| 3062          | Processor fault  | Processor FRAM error,contact JRC     | Processing unit FRAM error                                    | B        | W          | 8        |
| 3062          | Processor fault  | Processor RTC error,contact JRC      | Processing unit RTC error                                     | B        | W          | 9        |
| 3015/<br>3014 | Lost position    | GPSn Loss of position                | GNSS non-position fixing                                      | B        | W/A        | 1        |

All alerts grant a responsibility transfer.

\*1) W/A: Escalate from warning to alarm.

A: Alarm, W: Warning, C: Caution

| Alert ID | Alert title      | Alert description text        | Alert causes                              | Category | Priority <sup>*1</sup> | Instance |
|----------|------------------|-------------------------------|-------------------------------------------|----------|------------------------|----------|
| 3062     | Display fault    | eMMC error,contact JRC        | Display unit eMMC error                   | B        | W                      | 41       |
| 3062     | Display fault    | EEPROM error,contact JRC      | Display unit EEPROM error                 | B        | W                      | 42       |
| 3062     | Display fault    | RAM error,contact JRC         | Display unit RAM error                    | B        | W                      | 43       |
| 3062     | Display fault    | SIO1 error,contact JRC        | Display unit SIO1 error                   | B        | W                      | 44       |
| 3062     | Display fault    | SIO2 error,contact JRC        | Display unit SIO2 error                   | B        | W                      | 45       |
| 3062     | Display fault    | SIO3 error,contact JRC        | Display unit SIO3 error                   | B        | W                      | 46       |
| 3062     | Display fault    | LAN error,contact JRC         | Display unit LAN error                    | B        | W                      | 47       |
| 10005    | CCRP             | CCRP is different             | Received CCRP and set CCRP mismatch       | B        | W                      | 1        |
| 3065     | DoS detected     | LAN IO is blocked             | Received excess traffic.                  | B        | W                      | 9        |
| 3002     | Lost sensor IF   | GPSn not received from sensor | No data received from sensor              | B        | W                      | 11       |
| 3008     | Lost mutual IF   | Check another GPS Navigator   | Mutual monitoring data cannot be received | B        | W                      | 61       |
| 3032     | Threshold exceed | SOG alert                     | Ship speed is at or above the set value   | B        | W                      | 14       |
| 3031     | Threshold exceed | heel angle alert              | Heel angle is at or above the set value   | B        | W                      | 11       |

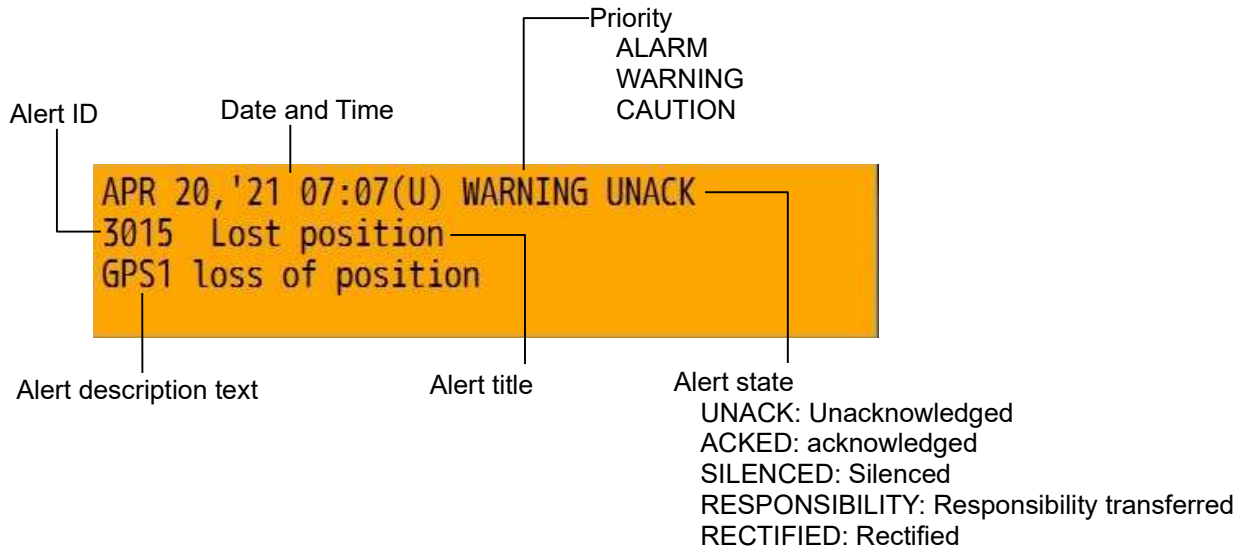
All alerts grant a responsibility transfer.

\*1 W/A: Escalate from warning to alarm.

A: Alarm, W: Warning, C: Caution

When an alert occurs, a pop-up will be displayed.

Alert pop-up example



#### Grouping list

| Alert ID        | alert title | alert description text         | Group member* <sup>2</sup>   |                     | category | Priority          |
|-----------------|-------------|--------------------------------|------------------------------|---------------------|----------|-------------------|
|                 |             |                                | Alert description for member | Alert ID for member |          |                   |
| 11002/<br>11001 | Sensor fail | GPSn Sensor communication fail | Lost position                | 3015/3014           | B        | W/A* <sup>1</sup> |
|                 |             |                                | Lost Heading                 | 3015/3014           |          |                   |
|                 |             |                                | Lost sensor IF               | 3002                |          |                   |
|                 |             |                                | Lost Pitch                   | 3015                |          |                   |
|                 |             |                                | Lost Heaving                 | 3015                |          |                   |
|                 |             |                                | Lost Roll                    | 3015                |          |                   |

\*1 Escalate from waring to alarm.

\*2 Refer to Alert list for the cause of alert

n: GPS number

# Aggregation list

| Alert ID | alert title     | alert description text | Aggregation member*1         |                     | category | priority |
|----------|-----------------|------------------------|------------------------------|---------------------|----------|----------|
|          |                 |                        | Alert description for member | Alert ID for member |          |          |
| 3062     | Selfcheck fault | xx aggregation alerts  | GPSn corex Antenna open      | 3062                | B        | W        |
|          |                 |                        | GPSn corex Antenna short     |                     |          |          |
|          |                 |                        | GPSn corex ROM error         |                     |          |          |
|          |                 |                        | GPSn corex RAM error         |                     |          |          |
|          |                 |                        | GPSn corex RTC error         |                     |          |          |
|          |                 |                        | Processor ROM error          |                     |          |          |
|          |                 |                        | Processor RAM error          |                     |          |          |
|          |                 |                        | Processor FRAM error         |                     |          |          |
|          |                 |                        | Processor RTC error          |                     |          |          |
|          |                 |                        | eMMC error,contact JRC       |                     |          |          |
|          |                 |                        | EEPROM error,contact JRC     |                     |          |          |
|          |                 |                        | RAM error,contact JRC        |                     |          |          |
|          |                 |                        | SIO1 error,contact JRC       |                     |          |          |
|          |                 |                        | SIO2 error,contact JRC       |                     |          |          |
|          |                 |                        | SIO3 error,contact JRC       |                     |          |          |
|          |                 |                        | LAN error,contact JRC        |                     |          |          |
| 3065     | System fault    | xx aggregation alerts  | GPSn core1 error,contact JRC | 3065                | B        | W        |
|          |                 |                        | GPSn core2 error,contact JRC |                     |          |          |
|          |                 |                        | GPSn core3 error,contact JRC |                     |          |          |
|          |                 |                        | GPSn x gyro input error      |                     |          |          |
|          |                 |                        | GPSn y gyro input error      |                     |          |          |
|          |                 |                        | GPSn z gyro input error      |                     |          |          |
|          |                 |                        | GPSn g sensor input error    |                     |          |          |
|          |                 |                        | GPSn temperature input error |                     |          |          |
|          |                 |                        | LAN IO is blocked            |                     |          |          |

\*1 Refer to Alert list for the cause of alert.

xx: Number of alerts issued, n: GPS number

## 5.3 System log list

The following is a list of logs obtained by the equipment.

Please check it together with the alert history when an abnormality occurs in the equipment.

| Display log                       | Description                                                    | Error code | Error description                            |
|-----------------------------------|----------------------------------------------------------------|------------|----------------------------------------------|
| Code input accepted 0             | CODE INPUT success (level0)                                    | -          |                                              |
| Code input accepted 1             | CODE INPUT success (level1)                                    | -          |                                              |
| Code input accepted 2             | CODE INPUT success (level2)                                    | -          |                                              |
| Code input accepted 3             | CODE INPUT success (level3)                                    | -          |                                              |
| Code input accepted 4             | CODE INPUT success (level4)                                    | -          |                                              |
| Code input accepted 5             | CODE INPUT success (level5)                                    | -          |                                              |
| Code input failed                 | -                                                              | 1          | Failure to authenticate code.                |
| Code Input time out 0             | Automatic logout(level0)                                       | -          |                                              |
| Code Input time out 1             | Automatic logout(level1)                                       | -          |                                              |
| Code Input time out 2             | Automatic logout(level2)                                       | -          |                                              |
| Code Input time out 3             | Automatic logout(level3)                                       | -          |                                              |
| Code Input time out 4             | Automatic logout(level4)                                       | -          |                                              |
| Code Input time out 5             | Automatic logout(level5)                                       | -          |                                              |
| Logout accepted 0                 | Manual logout(level0)                                          | -          |                                              |
| Logout accepted 1                 | Manual logout(level1)                                          | -          |                                              |
| Logout accepted 2                 | Manual logout(level2)                                          | -          |                                              |
| Logout accepted 3                 | Manual logout(level3)                                          | -          |                                              |
| Logout accepted 4                 | Manual logout(level4)                                          | -          |                                              |
| Logout accepted 5                 | Manual logout(level5)                                          | -          |                                              |
| Equipment power on                | Equipment power on                                             | -          |                                              |
| Equipment power off               | Equipment power off                                            | -          |                                              |
| Display software update completed | Display software update completed                              | -          |                                              |
| Display software update failed    | Display software update failed                                 | 1~40       |                                              |
| Sensor software update completed  | Sensor software update completed                               |            |                                              |
| Sensor software update failed     | Sensor software update failed                                  | 1~200      |                                              |
| IP address changed                | Record when IP address is changed.                             | -          |                                              |
| MAC address changed               | Record when MAC address is changed.                            | -          |                                              |
| Subnet mask changed               | Record when subnet mask is changed.                            | -          |                                              |
| Time source changed               | Record when the time setting is changed from the display unit. | -          |                                              |
| Network unreachable               | -                                                              | 1          | Record when the ethernet cable is unplugged. |
| Service communication error       | -                                                              | 1          | Sentence transmission timeout occurred       |
|                                   |                                                                | 2          | HBT Sentence received timeout occurred.      |
| Network enabled                   | Record when the network function is enabled.                   | -          |                                              |
| Network disabled                  | Record when the network function is disabled.                  | -          |                                              |

| Display log                        | Description                                       | Error code | Error description                                                |
|------------------------------------|---------------------------------------------------|------------|------------------------------------------------------------------|
| Network traffic overload occurred  | Record when the excessive traffic is detected.    | -          |                                                                  |
| Network traffic overload rectified | Record that excessive traffic has been rectified. | -          |                                                                  |
| Backup start                       | Backup start                                      | -          |                                                                  |
| Backup completed                   | Backup completed                                  | -          |                                                                  |
| Backup failure                     | Backup failure                                    | 10~17      |                                                                  |
| Recovery start                     | Recovery start                                    | -          |                                                                  |
| Recovery completed                 | Recovery completed                                | -          |                                                                  |
| Recovery failure                   | Recovery failure                                  | 20~31      |                                                                  |
| License activation completed       | License activation completed                      | -          |                                                                  |
| License activation failed          | License activation failed                         | 1          | Record of failed sensor license activation via the display unit. |
|                                    |                                                   | 2          | License file error                                               |
|                                    |                                                   | 3          | License file error No.3                                          |
|                                    |                                                   | 4          | License file error No.4                                          |
|                                    |                                                   | 99         | Time out                                                         |

## 5.4 Troubleshooting

### WARNING



Do not perform internal inspections or modifications of the equipment. Inspection or modification by unauthorized personnel may result in fire, electric shock, or equipment failure.



Please consult with JRC or an affiliate to perform internal inspections or repair.

For your reference, the guideline for detecting faulty sections is provided below.

| Fault symptom                                                                      | Possible cause/cause of failure                                            | Action to be taken                                               |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------|
| The power is not supplied even if the power switch of the display unit is pressed. | The power is not supplied from the on-board power panel.                   | Check if the breaker and the power board are wired correctly.    |
|                                                                                    | The power is not supplied from the power supply unit, which is the option. | Check if the power supply unit is wired correctly.               |
|                                                                                    | The display is faulty.                                                     | Contact us or your distributor.                                  |
|                                                                                    | The fuse on the cable is blown.                                            | After checking if the wiring is correct and replace the fuse.    |
| LCD does not display a screen.                                                     | The display unit is faulty                                                 | Contact us or your distributor.                                  |
|                                                                                    | Power is not supplied to the display unit.                                 | Check the cable connection.                                      |
| The brightness is not changed.                                                     | The display unit is faulty                                                 | Contact us or your distributor.                                  |
| No buzzer sound is emitted.                                                        | The buzzer is faulty.                                                      | Contact us or your distributor.                                  |
|                                                                                    | The buzzer is set to OFF.                                                  | Set buzzer sound on for each alert setting.                      |
| No key-tone is emitted.                                                            | The buzzer is faulty.                                                      | Contact us or your distributor.                                  |
|                                                                                    | The key-tone is set to OFF.                                                | Refer to "4.3.2 Setting a beep tone" for the setting.            |
| Symbols on the plot screen are not displayed.                                      | The display of the symbols on the plot screen is set to OFF.               | Refer to "4.8.9 Setting a DGPS correction mode" for the setting. |

| Fault symptom                                            | Possible cause/cause of failure                           | Action to be taken                                                                                                                                                                                                                    |
|----------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Does not perform position fixing                         | The sensor is faulty.                                     | Contact us or your distributor.                                                                                                                                                                                                       |
|                                                          | The sensor is hidden behind the obstacle.                 | Move the sensor to the location free from obstacles.                                                                                                                                                                                  |
|                                                          | Noise is entered.                                         | Move the sensor from the noise generating source.                                                                                                                                                                                     |
|                                                          | Power is not supplied to the sensor.                      | Check the cable connection.<br>Check the output power from the display.                                                                                                                                                               |
| Data is not received from the sensor to the display.     | The sensor cable is disconnected.                         | Check the cable connection.                                                                                                                                                                                                           |
|                                                          | The connection terminal on the junction box is incorrect. | Check the cable connection.                                                                                                                                                                                                           |
|                                                          | Power is not supplied to the sensor.                      | Check the output power from the display.                                                                                                                                                                                              |
|                                                          | Over-detection of Spoofing/Jamming                        | Change the alert mode in "4.6.3 SPOOFING/JAMMING notification" to "OFF" or "1".<br>Changing this setting should be done under conditions where there is no effect of spoofing (no false position or false time).<br>(license require) |
| Data is not displayed.                                   | The display is faulty.                                    | Contact us or your distributor.                                                                                                                                                                                                       |
|                                                          | The sensor cable is disconnected.                         | Check the cable connection.                                                                                                                                                                                                           |
| Output to the external equipment does not function.      | The setting of the output port is incorrect.              | Check the port setting.                                                                                                                                                                                                               |
|                                                          | Incorrect connection                                      | Check the cable connection.                                                                                                                                                                                                           |
| Reception from the external equipment does not function. | The setting of the input port is incorrect.               | Check the port setting.                                                                                                                                                                                                               |
|                                                          | Incorrect connection terminal                             | Check the cable connection.                                                                                                                                                                                                           |
|                                                          | The display is faulty.                                    | Contact us or your distributor.                                                                                                                                                                                                       |
| The route cannot be shared.                              | The port setting is incorrect.                            | Check the port setting.                                                                                                                                                                                                               |
| The printer does not function.                           | The setting of the printer is incorrect.                  | Check the printer setting.                                                                                                                                                                                                            |

## 5.5 Replacement Parts

### 5.5.1 Repair units

The following table shows the repair unit replacement units.

| No. | Name            | Model      | Remarks                  |
|-----|-----------------|------------|--------------------------|
| 1   | Antenna unit    | CAY-300    | Sencer<br>JLR-4101       |
| 2   | Processing unit | CMJ-601-U  |                          |
| 3   | LCD panel unit  | CCN-1680-U | Display Unit<br>NWZ-1680 |
| 4   | Processing unit | CMJ-636-1  |                          |

### 5.5.2 Regular replacement parts

| No. | Name           | Model      | Replacement time | Remarks                                          |
|-----|----------------|------------|------------------|--------------------------------------------------|
| 1   | LCD panel unit | CCN-1680-U | 40,000 hours     | About 5 years in continuous use as the guideline |

# Chapter 6 After-Sales service

## 6.1 Warranty

- Specific periods may vary based on our warranty policies, but the standard warranty period is **one year** from the date of purchase.

## 6.2 Repair parts stocking Period

- We keep functional repair parts for this equipment (parts necessary for the functioning of this equipment) in stock for 10 years from the discontinuation of production.

## 6.3 When Requesting Service

When you think the equipment is not operating properly, please read "5.3 Troubleshooting" carefully, and inspect the equipment again. If the problem persists, stop using the equipment, and consult your dealer, or a JRC branch or affiliate.

- **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 is repaired free of charge during the warranty period by JRC or another location specified by your dealer. However, any repair for failures resulting from misuse, negligence, or natural disasters, fire, or other Acts of God is charged.
- **Repairs after the warranty period**  
Repairs to restore the proper equipment operation can be made at a specified rate with the user's consent. In this case, the equipment can either be sent to JRC or an affiliate, or on-ship repairs can be performed at a location specified by JRC or a sales affiliate. Repairs which cannot be performed on-board the ship needs to be performed in a repair plant.
- **Information that needs to be provided when requesting service**
  - Name, model, production date, and serial number
  - Detailed description of the malfunction (alert number, etc.)
  - Name, address, and telephone number of your company or organization

## 6.4 Recommended Checks Inspection

Equipment performance is subject to degradation due to age and change of component conditions over time. In addition to your own routine check, additional inspection and maintenance is recommended. Please consult with your dealer or one of our local offices. Note that this inspection and maintenance is not free of charge.

If you have any other questions about after-sales service, please direct your inquiries to your dealer or nearest local office.

A list of branches is provided at the end of the "Contact List".



# Chapter 7 Disposal



## WARNING



When disposing of the used lithium battery, place insulating tape over the battery terminals, or otherwise insulate the battery. Failure to do so may result in heating, explosion, or fire due to a shorted battery.

### 7.1 Disposal of Equipment

- Observe all rules and regulations of the local authorities when disposing of this equipment.

### 7.2 Disposal of Used Batteries

This equipment contains a lithium battery.

- When disposing of the used lithium battery, place insulating tape over the battery terminals, or otherwise insulate the battery. Dispose of the battery properly as directed by the local authorities. Consult your dealer, our sales office, or the local authorities for further details on disposal methods.



# Chapter 8 Specification

## 8.1 NWZ-1680 DISPLAY UNIT

### 8.1.1 Basic

- Display Unit 6.5 inch Color LCD 640×480 dots
- Touch Screen Available
- Brightness 800cd/m<sup>2</sup>(Typical)
- Viewing Angle 80 degree at all angle
- Backlight LCD and Key lighting
- Dimmer Levels 16 steps
- Data Input/Output LAN × 1  
IEC61162-1 output x 2 input x 1  
IEC61162-2 output x 1
- Power Supply Voltage DC12/24V (+30%,-10%)
- Power Consumption less than 14W (including sensor)  
less than 12.5W (excluding sensor)
- Dimension 160(W)×180(H)×66.6(D)mm (Not include Base)
- Mass Approximately 1.2 kg (Not include Base)
- Software version R57.00
- Viewing Distance 1m
- Compass safe distance standard: 0.8 m Steering: 0.6 m

### 8.1.2 Environment

- Operating Temperature -15°C~+55°C
- Storage Temperature -25°C~+70°C
- Vibration IEC60945 Ed.4 conformant
- EMC IEC60945 Ed.4 conformant
- Waterproofing IP56  
Permanent installation in an exposed section requires a waterproof cover.

## 8.2 JLR-4101 Sensor

### 8.2.1 Basic

- GNSS\*<sup>1</sup> GPS/Galileo/GLONASS/BeiDou/SBAS/QZSS  
Can not receive GLONASS and BeiDou at the same time.\*<sup>2</sup>
- Maximum Number of Tracked Satellites\*<sup>1</sup> GPS+QZSS: 15ch, SBAS: 1ch  
Galileo+GLONASS or Galileo+BeiDou: 10ch
- Positioning accuracy Multi-GNSS (PPP positioning): 1.8 m (2DRMS) (HDOP≤4 without SA)  
Multi-GNSS (non-PPP positioning): 4 m (2DRMS)  
DGPS: 4 m (2DRMS)  
SBAS: 4 m (2DRMS)  
GPS or GPS+QZSS: 5 m (2DRMS)  
GLONASS: 10 m (2DRMS)  
Galileo: 6 m (2DRMS)  
BeiDou: 10 m (2DRMS)
- Heading Accuracy 0.25 degrees (RMS)
- Turn Tracking 45 degrees/second
- SBAS WAAS, MSAS, EGNOS
- Spoofing/Jamming Can be detected (License require)
- Geodetic datum Selection among 48 geodetic data (Default: WGS-84)
- Power Supply Voltage DC12/24V (+30%,-10%)
- Power Consumption less than 2.8W
- Dimensions 688(φ)×270(H) mm
- Mass Approximately 5.3kg
- Software version Processor R35.00  
GNSS Core RM7.00
- Compass safe distance standard: 1.1 m Steering: 0.9 m

\*1: Specifications of the GNSS core in the GNSS compass sensor (JLR-4101).

\*2: By selecting AUTO1 or AUTO2 in the positioning system settings, BeiDou can be assigned to GNSS cores 1 and 2 and GLONASS to GNSS core 3, so that the GNSS compass sensor receives GLONASS and BeiDou simultaneously.

### 8.2.2 Environment

- Operating Temperature -25°C~+55°C
- Storage Temperature -25°C~+70°C
- Vibration IEC60945 Ed.4 conformant
- EMC IEC60945 Ed.4 conformant
- Waterproofing IP56

## 8.2.3 Interface

### 1) Serial Transmission

| Channel | Signal | Input / Output | Format              | Notes                                                     |
|---------|--------|----------------|---------------------|-----------------------------------------------------------|
| IN/OUT1 | RS-422 | Output         | NMEA/IEC/NSK/SWITCH | IEC61162-1<br>Isolation by photocoupler                   |
|         |        | Input          | NMEA/IEC            |                                                           |
| OUT2    | RS-422 | Output         | NMEA/IEC/NSK/SWITCH | IEC61162-1<br>Isolation by photocoupler                   |
|         |        | Input          | NMEA/IEC            |                                                           |
| OUT3    | RS-422 | Output         | NMEA/IEC/NSK/SWITCH | IEC61162-2                                                |
|         |        | Input          | NMEA/IEC            |                                                           |
| OUT4    | RS-422 | Output         | NMEA/IEC/NSK/AD-10  | Sensor through<br>IEC61162-1<br>Isolation by photocoupler |
| OUT5    |        |                |                     |                                                           |

Sensor through: There is no delay because no display unit is involved.  
AD-10: Both OUT4 and OUT5 are used.

#### 1-1) NMEA

- Specification NMEA0183
- Version Ver1.5,2.1,2.3,4.0
- Bit Rate 4800,9600,19200,38400,57600bps
- Data Bit 8bit
- Parity None
- Start Bit 1bit
- Stop Bit 1bit
- Output Sentence GGA,RMC,LL,VTG,GSA,GSV,DTM,GBS,GRS,GST,ZDA,GNS,  
MSS,ALR,ALC,ALF,HBT,ARC,AGL,HDT,THS,ROT,POS,DDC,HRM,ATT,  
HVE
- Output Interval 20ms,25ms,50ms,100ms,200ms,500ms,1s,2s,3s,4s,5s,6s,7s,8s,9s,OFF  
For 1 second or less, the attitude/position sentences are applicable.  
The output interval that can be set varies depending on the sentence.
- Input Sentence ACK,ACN,HBT,POS,DDC

Note) Some combinations of output sentence, bit rates, and output intervals may not be possible.

#### 1-2) IEC

- Specification IEC61162-1 Ed.5

#### 1-3) NSK

- Specification NSK (JRC proprietary heading data)
- Bit Rate 9600bps
- Data Bit 8bit
- Parity Even number
- Start Bit 1bit
- Stop Bit 2bit

#### 1-4) AD-10

- Period : 25ms/200ms

### 2) Dry Contact

| Channel   | Input / Output | None                                               |
|-----------|----------------|----------------------------------------------------|
| Contact 1 | Output         | Alert: Special applications<br>200p/NM,400p/NM,ACK |
| Contact 2 | Output         | Alert,200p/NM,400p/NM,ACK                          |
| Contact 3 | Input          | ACK                                                |

### 4) LAN

- Specification IEC61162-450/JRC
- Standard IEEE 802.3
- Bit Rate 10/100Mbps
- Received route JRC Format
- Data output NMEA,IEC

- Datagram type                   UdPbC
- Cluster                           Nav
- Transmission group           NAVD,SATD,BAM1,CAM1,NETA,VDRD

| Transmission group | Category                                                         | Multicast address | Send port |
|--------------------|------------------------------------------------------------------|-------------------|-----------|
| SATD               | Output of heading and attitude data                              | 239.192.0.3       | 60003     |
| NAVD               | Output of navigation data other than SATD                        | 239.192.0.4       | 60004     |
| VDRD               | Data output to VDR                                               | 239.192.0.5       | 60005     |
| BAM1               | Output of BAM-compliant alert to CAM                             | 239.192.0.17      | 60017     |
| CAM1               | Input of BAM-compliant alert                                     | 239.192.0.19      | 60019     |
| NETA               | Output SRP sentence to assist detection of collision of the SFI. | 239.192.0.56      | 60056     |

# Appendix

## Appendix 1 Lost of Geodetic System

| Display | Setting   |    | Geodetic System                                                     |
|---------|-----------|----|---------------------------------------------------------------------|
| W84     | WGS-84    | 0  | WGS-84                                                              |
| W72     | WGS-72    | 1  | WGS-72                                                              |
| TOY     | JAPAN     | 2  | Tokyo Datum                                                         |
| NAS     | NAD27 USA | 3  | North American 1927 (USA)                                           |
| NAS     | NAD27 CAN | 4  | North American 1927 (Canada, Alaska)                                |
| EUR     | EUROPE 50 | 5  | Europe 1950 (Europe)                                                |
| AUA     | AUSTRA 66 | 6  | Australian geodetic 1966 (Australia)                                |
| OGB     | OSGB-36   | 7  | Ordnance Survey of Great Britain (England)                          |
| NAR     | NAD-83    | 8  | NAD-83                                                              |
| ADI     | ADI       | 11 | Adindan (Ethiopia, Sudan)                                           |
| ARF     | ARF       | 12 | ARC 1950 (Botswana)                                                 |
| AUG     | AUG       | 13 | Australian Geodetic 1984 (Australia)                                |
| BER     | BER       | 14 | Bermuda 1957 (Bermuda islands)                                      |
| BOO     | BOO       | 15 | Bogota Observatory (Columbia)                                       |
| CAI     | CAI       | 16 | Compo Inchauspe (Argentine)                                         |
| CHI     | CHI       | 17 | Chatham 1971 (Chatham Islands)                                      |
| CHU     | CHU       | 18 | Chua Astro (Paraguay)                                               |
| COA     | COA       | 19 | Corrego Alegre (Brazil)                                             |
| BAT     | BAT       | 20 | Djakarta (Vatavia) (Sumatra)                                        |
| EUR     | EUR       | 21 | European 1979 (Europe)                                              |
| GEO     | GEO       | 22 | Geodetic Datum 1949 (New Zealand)                                   |
| GUA     | GUA       | 23 | Guam 1963 (Guam)                                                    |
| GRA     | GRA       | 24 | Hayford 1910 (Finland)                                              |
| HJO     | HJO       | 25 | Hjorsey 1955 (Iceland)                                              |
| IND     | IND       | 26 | Indian (India, Nepal)                                               |
| IRL     | IRL       | 27 | Ireland 1965 (Ireland)                                              |
| KEA     | KEA       | 28 | Kertau 1948 (West Malaysia, Singapore)                              |
| LCF     | LCF       | 29 | L.C.5 Astro (Cayman Brac island)                                    |
| LIB     | LIB       | 30 | Liberia 1964 (Liberia)                                              |
| LUZ     | LUZ       | 31 | Luzon ( <b>Philippines</b> )                                        |
| MER     | MER       | 32 | Merchich (Morocco)                                                  |
| MIN     | MIN       | 33 | Minna (Cameroon)                                                    |
| NAH     | NAH       | 34 | Nahrwan (Oman)                                                      |
| NAP     | NAP       | 35 | Naparima, BWI (Trinidad and Tobago)                                 |
| OEG     | OEG       | 36 | Old Egyptian (Egypt)                                                |
| OHA     | OHA       | 37 | Old Hawaiian (Hawaiian Islands )                                    |
| PLN     | PLN       | 38 | Pico de las Nieves (Canary Islands)                                 |
| PRP     | PRP       | 39 | Provisional south American 1956 (South America)                     |
| HIT     | HIT       | 40 | Provisional south Chilean 1963 (South Chile)                        |
| PUR     | PUR       | 41 | Puerto Rico ( <b>Puerto Rico</b> , Virgin Islands)                  |
| QUO     | QUO       | 42 | Qornoq (South Greenland)                                            |
| 043     | 043       | 43 | RT90 (Sweden)                                                       |
| SAO     | SAO       | 44 | Santa Braz (San Miguel, Santa Maria islands)                        |
| SAN     | SAN       | 45 | South American 1969 (South America)                                 |
| 046     | 046       | 46 | Southwest Base (Faial, Gracinao, Pico, San Jorge, Terceira islands) |
| TIL     | TIL       | 47 | Timbalai 1948 (Brunei, Malaysia)                                    |
| 048     | 048       | 48 | PZ-90.02                                                            |
| SPK     | SPK       | 49 | SK-42 (Pulkovo 42)                                                  |

## Appendix 2 List of standard terms, units and abbreviations

| Term                                                                   | Abbreviation     | Term                                             | Abbreviation        |
|------------------------------------------------------------------------|------------------|--------------------------------------------------|---------------------|
| <i>Acknowledge</i>                                                     | <i>ACK</i>       | <i>Bearing Waypoint To Waypoint</i>              | <i>BWW</i>          |
| <i>Acquire, Acquisition</i>                                            | <i>ACQ</i>       | <i>Bow Crossing Range</i>                        | <i>BCR</i>          |
| <i>Acquisition Zone</i>                                                | <i>AZ</i>        | <i>Bow Crossing Time</i>                         | <i>BCT</i>          |
| <i>Additional Military Layer</i>                                       | <i>AML</i>       | <i>Built in Test Equipment</i>                   | <i>BITE</i>         |
| <i>Adjust, Adjustment</i>                                              | <i>ADJ</i>       | <i>Calibrate</i>                                 | <i>CAL</i>          |
| <i>Aft</i>                                                             | <i>AFT</i>       | <i>Cancel</i>                                    | <i>CNCL</i>         |
| <i>Alarm</i>                                                           | <i>ALARM</i>     | <i>Cancel All</i>                                | <i>CNCL ALL</i>     |
| <i>Alert Setting</i>                                                   | <i>ALERT SET</i> | <i>Carried (for example, carried EBL origin)</i> | <i>C</i>            |
| <i>Altitude</i>                                                        | <i>ALT</i>       | <i>Central Processing Unit</i>                   | <i>CPU</i>          |
| <i>Amplitude Modulation</i>                                            | <i>AM</i>        | <i>Centre</i>                                    | <i>CENT</i>         |
| <i>Anchor Watch</i>                                                    | <i>ANCH</i>      | <i>Change</i>                                    | <i>CHG</i>          |
| <i>Antenna</i>                                                         | <i>ANT</i>       | <i>Chart Display Settings</i>                    | <i>CHT DISP SET</i> |
| <i>Anti Clutter Rain</i>                                               | <i>RAIN</i>      | <i>Chart Management</i>                          | <i>CHT MGMT</i>     |
| <i>Anti Clutter Sea</i>                                                | <i>SEA</i>       | <i>Chart Safety Settings</i>                     | <i>CHT SF SET</i>   |
| <i>April</i>                                                           | <i>APR</i>       | <i>Circularly Polarised</i>                      | <i>CP</i>           |
| <i>Audible</i>                                                         | <i>AUD</i>       | <i>Clear</i>                                     | <i>CLR</i>          |
| <i>August</i>                                                          | <i>AUG</i>       | <i>Closest Point of Approach</i>                 | <i>CPA</i>          |
| <i>Automatic</i>                                                       | <i>AUTO</i>      | <i>Compact Disk Read Only Memory</i>             | <i>CDROM</i>        |
| <i>Automatic Frequency Control</i>                                     | <i>AFC</i>       | <i>Conning</i>                                   | <i>CONN</i>         |
| <i>Automatic Gain Control</i>                                          | <i>AGC</i>       | <i>Consistent Common Reference Point</i>         | <i>CCRP</i>         |
| <i>Automatic Identification System</i>                                 | <i>AIS</i>       | <i>Consistent Common Reference System</i>        | <i>CCRS</i>         |
| <i>Automatic Identification System – Search and Rescue Transmitter</i> | <i>AIS-SART</i>  | <i>Contrast</i>                                  | <i>CONT</i>         |
| <i>Automatic Radar Plotting Aid</i>                                    | <i>ARPA</i>      | <i>Coordinated Universal Time</i>                | <i>UTC</i>          |
| <i>Autopilot</i>                                                       | <i>AP</i>        | <i>Correction</i>                                | <i>CORR</i>         |
| <i>Auxiliary System/Function</i>                                       | <i>AUX</i>       | <i>Course</i>                                    | <i>CRS</i>          |
| <i>Available</i>                                                       | <i>AVAIL</i>     | <i>Course Over the Ground</i>                    | <i>COG</i>          |
| <i>Azimuth Indicator</i>                                               | <i>AZI</i>       | <i>Course Through the Water</i>                  | <i>CTW</i>          |
| <i>Background</i>                                                      | <i>BKGND</i>     | <i>Course To Steer</i>                           | <i>CTS</i>          |
| <i>BeiDou Navigation Satellite System</i>                              | <i>BDS</i>       | <i>Course Up</i>                                 | <i>C UP</i>         |
| <i>Bearing</i>                                                         | <i>BRG</i>       |                                                  |                     |

| Term                                                   | Abbreviation    |
|--------------------------------------------------------|-----------------|
| <i>Destination</i>                                     | <i>DEST</i>     |
| <i>Deviation</i>                                       | <i>DEV</i>      |
| <i>Differential GLONASS</i>                            | <i>DGLONASS</i> |
| <i>Differential GNSS</i>                               | <i>DGNSS</i>    |
| <i>Differential GPS</i>                                | <i>DGPS</i>     |
| <i>Digital Selective Calling</i>                       | <i>DSC</i>      |
| <i>Display</i>                                         | <i>DISP</i>     |
| <i>Distance</i>                                        | <i>DIST</i>     |
| <i>Distance Root Mean Square</i>                       | <i>DRMS</i>     |
| <i>Distance To Go</i>                                  | <i>DTG</i>      |
| <i>Drift</i>                                           | <i>DRIFT</i>    |
| <i>Dropped (for example, dropped EBL origin)</i>       | <i>D</i>        |
| <i>East</i>                                            | <i>E</i>        |
| Echo Reference                                         | REF             |
| <i>Electronic Bearing Line</i>                         | <i>EBL</i>      |
| <i>Electronic Chart Display and Information System</i> | <i>ECDIS</i>    |
| Electronic Chart System                                | ECS             |
| <i>Electronic Navigational Chart</i>                   | <i>ENC</i>      |
| <i>Electronic Position Fixing System</i>               | <i>EPFS</i>     |
| <i>Electronic Range and Bearing Line</i>               | <i>ERBL</i>     |
| Emergency Position Indicating Radio Beacon             | EPIRB           |
| Emergency Position Indicating Radio Beacon – AIS       | EPIRB-AIS       |
| <i>Enhance</i>                                         | <i>ENH</i>      |
| <i>Enter</i>                                           | <i>ENT</i>      |
| <i>Equipment</i>                                       | <i>EQUIP</i>    |
| <i>Error</i>                                           | <i>ERR</i>      |
| <i>Estimated Position</i>                              | <i>EP</i>       |
| <i>Estimated Time of Arrival</i>                       | <i>ETA</i>      |
| <i>Estimated Time of Departure</i>                     | <i>ETD</i>      |
| European Geo-Stationary Navigational Overlay System    | EGNOS           |
| <i>Event</i>                                           | <i>EVENT</i>    |
| <i>Exclusion Zone</i>                                  | <i>EZ</i>       |
| <i>External</i>                                        | <i>EXT</i>      |
| F-Band (applies to radar)                              | F-Band          |
| <i>February</i>                                        | <i>FEB</i>      |
| Foreword                                               | FWD             |
| <i>Fishing Vessel</i>                                  | <i>FISH</i>     |

| Term                                               | Abbreviation   |
|----------------------------------------------------|----------------|
| <i>Fix</i>                                         | <i>FIX</i>     |
| <i>Forward</i>                                     | <i>FWD</i>     |
| <i>Frequency</i>                                   | <i>FREQ</i>    |
| <i>Frequency Modulation</i>                        | <i>FM</i>      |
| <i>Full</i>                                        | <i>FULL</i>    |
| <i>Gain</i>                                        | <i>GAIN</i>    |
| Geographics                                        | GEOG           |
| <i>Geometric Dilution Of Precision</i>             | <i>GDOP</i>    |
| <i>Global Maritime Distress and Safety System</i>  | <i>GMDSS</i>   |
| <i>Global Navigation Satellite System</i>          | <i>GNSS</i>    |
| <i>Global Orbiting Navigation Satellite System</i> | <i>GLONASS</i> |
| <i>Global Positioning System</i>                   | <i>GPS</i>     |
| <i>Great Circle</i>                                | <i>GC</i>      |
| <i>Grid</i>                                        | <i>GRID</i>    |
| <i>Ground</i>                                      | <i>GND</i>     |
| Grounding Avoidance System                         | GAS            |
| <i>Group Repetition Interval</i>                   | <i>GRI</i>     |
| <i>Guard Zone</i>                                  | <i>GZ</i>      |
| <i>Gyro</i>                                        | <i>GYRO</i>    |
| <i>Harmful Substances (applies to AIS)</i>         | <i>HS</i>      |
| <i>Head Up</i>                                     | <i>H UP</i>    |
| <i>Heading</i>                                     | <i>HDG</i>     |
| <i>Heading Control System</i>                      | <i>HCS</i>     |
| <i>Heading Line</i>                                | <i>HL</i>      |
| <i>High Frequency</i>                              | <i>HF</i>      |
| <i>High Speed Craft</i>                            | <i>HSC</i>     |
| <i>Horizontal Dilution Of Precision</i>            | <i>HDOP</i>    |
| <i>Identification</i>                              | <i>ID</i>      |
| <i>In</i>                                          | <i>IN</i>      |
| <i>Increase</i>                                    | <i>INCR</i>    |
| <i>Indication</i>                                  | <i>IND</i>     |
| <i>Information</i>                                 | <i>INFO</i>    |
| <i>Infrared</i>                                    | <i>INF RED</i> |
| <i>Initialisation</i>                              | <i>INIT</i>    |
| <i>Input</i>                                       | <i>INP</i>     |
| <i>Input/Output</i>                                | <i>I/O</i>     |
| Integrated Navigation System                       | INS            |
| <i>Integrated Radio Communication System</i>       | <i>IRCS</i>    |
| <i>Interference Rejection</i>                      | <i>IR</i>      |

| Term                                            | Abbreviation    | Term                                    | Abbreviation  |
|-------------------------------------------------|-----------------|-----------------------------------------|---------------|
| <i>Interswitch</i>                              | <i>ISW</i>      | Not Less Than                           | NLT           |
| <i>Interval</i>                                 | <i>INT</i>      | Not More Than                           | NMT           |
| <i>January</i>                                  | <i>JAN</i>      | Not Under Command                       | NUC           |
| <i>July</i>                                     | <i>JUL</i>      | <i>November</i>                         | <i>NOV</i>    |
| <i>June</i>                                     | <i>JUN</i>      | <i>October</i>                          | <i>OCT</i>    |
| Label                                           | LBL             | <i>Off</i>                              | <i>OFF</i>    |
| <i>Latitude</i>                                 | <i>LAT</i>      | <i>Officer On Watch</i>                 | <i>OOW</i>    |
| Latitude/Longitude                              | L/L             | <i>Offset</i>                           | <i>OFFSET</i> |
| Leeway                                          | LWY             | <i>On</i>                               | <i>ON</i>     |
| <i>Limit</i>                                    | <i>LIM</i>      | <i>Out/Output</i>                       | <i>OUT</i>    |
| <i>Line Of Position</i>                         | <i>LOP</i>      | <i>Own Ship</i>                         | <i>OS</i>     |
| <i>Log</i>                                      | <i>LOG</i>      | <i>Panel Illumination</i>               | <i>PANEL</i>  |
| <i>Long Pulse</i>                               | <i>LP</i>       | <i>Parallel Index Line</i>              | <i>PI</i>     |
| <i>Long Range</i>                               | <i>LR</i>       | Past Positions                          | PAST POSN     |
| <i>Longitude</i>                                | <i>LON</i>      | <i>Passenger Vessel</i>                 | <i>PASSV</i>  |
| <i>Loran</i>                                    | <i>LORAN</i>    | <i>Performance Monitor</i>              | <i>MON</i>    |
| <i>Lost Target</i>                              | <i>LOST TGT</i> | <i>Permanent</i>                        | <i>PERM</i>   |
| <i>Low Frequency</i>                            | <i>LF</i>       | <i>Person Overboard</i>                 | <i>POB</i>    |
| <i>Magnetic</i>                                 | <i>MAG</i>      | <i>Personal Identification Number</i>   | <i>PIN</i>    |
| Man Overboard                                   | MOB             | <i>Pilot Vessel</i>                     | <i>PILOT</i>  |
| <i>Manoeuvre</i>                                | <i>MVR</i>      | <i>Port/Portside</i>                    | <i>PORT</i>   |
| <i>Manual</i>                                   | <i>MAN</i>      | <i>Position</i>                         | <i>POSN</i>   |
| <i>Map(s)</i>                                   | <i>MAP</i>      | <i>Positional Dilution Of Precision</i> | <i>PDOP</i>   |
| <i>March</i>                                    | <i>MAR</i>      | <i>Power</i>                            | <i>PWR</i>    |
| <i>Maritime Mobile Services Identity number</i> | <i>MMSI</i>     | <i>Predicted</i>                        | <i>PRED</i>   |
| <i>Maritime Pollutant (applies to AIS)</i>      | <i>MP</i>       | <i>Predicted Area of Danger</i>         | <i>PAD</i>    |
| <i>Maritime Safety Information</i>              | <i>MSI</i>      | <i>Predicted Point of Collision</i>     | <i>PPC</i>    |
| <i>Marker</i>                                   | <i>MKR</i>      | <i>Pulse Length</i>                     | <i>PL</i>     |
| <i>Master</i>                                   | <i>MSTR</i>     | <i>Pulse Modulation</i>                 | <i>PM</i>     |
| <i>Maximum</i>                                  | <i>MAX</i>      | <i>Pulse Repetition Frequency</i>       | <i>PRF</i>    |
| <i>May</i>                                      | <i>MAY</i>      | <i>Pulse Repetition Rate</i>            | <i>PRR</i>    |
| <i>Medium Frequency</i>                         | <i>MF</i>       | <i>Pulses Per Revolution</i>            | <i>PPR</i>    |
| <i>Medium Pulse</i>                             | <i>MP</i>       | <i>Racon</i>                            | <i>RACON</i>  |
| <i>Menu</i>                                     | <i>MENU</i>     | <i>Radar</i>                            | <i>RADAR</i>  |
| <i>Minimum</i>                                  | <i>MIN</i>      | Radar Plotting                          | RP            |
| <i>Missing</i>                                  | <i>MISSING</i>  | Radar Transponder                       | TPR           |
| <i>Mute</i>                                     | <i>MUTE</i>     | <i>Radius</i>                           | <i>RAD</i>    |
| <i>Navigation</i>                               | <i>NAV</i>      | <i>Rain</i>                             | <i>RAIN</i>   |
| <i>Night</i>                                    | <i>NT</i>       | <i>Range</i>                            | <i>RNG</i>    |
| <i>Normal</i>                                   | <i>NORM</i>     | <i>Range Rings</i>                      | <i>RR</i>     |
| <i>North</i>                                    | <i>N</i>        | <i>Raster Chart Display System</i>      | <i>RCDS</i>   |
| <i>North Up</i>                                 | <i>N UP</i>     |                                         |               |

| Term                                                     | Abbreviation  | Term                                    | Abbreviation  |
|----------------------------------------------------------|---------------|-----------------------------------------|---------------|
| <i>Raster Navigational Chart</i>                         | <i>RNC</i>    | <i>Synchronised/<br/>Synchronous</i>    | <i>SYNC</i>   |
| <i>Rate Of Turn</i>                                      | <i>ROT</i>    | System Electronic<br>Navigational Chart | SENC          |
| <i>Real-time Kinematic</i>                               | <i>RTK</i>    | <i>Target</i>                           | <i>TGT</i>    |
| <i>Receive</i>                                           | <i>RX</i>     | <i>Target Tracking</i>                  | <i>TT</i>     |
| <i>Receiver</i>                                          | <i>RCDR</i>   | <i>Test</i>                             | <i>TEST</i>   |
| <i>Receiver Autonomous<br/>Integrity Monitoring</i>      | <i>RAIM</i>   | <i>Time</i>                             | <i>TIME</i>   |
| <i>Reference</i>                                         | <i>REF</i>    | <i>Time Difference</i>                  | <i>TD</i>     |
| <i>Relative</i>                                          | <i>REL</i>    | <i>Time Dilution Of Precision</i>       | <i>TDOP</i>   |
| <i>Relative Motion</i>                                   | <i>RM</i>     | <i>Time Of Arrival</i>                  | <i>TOA</i>    |
| <i>Revolutions per Minute</i>                            | <i>RPM</i>    | <i>Time Of Departure</i>                | <i>TOD</i>    |
| Rhumb Line                                               | RL            | <i>Time to CPA</i>                      | <i>TCPA</i>   |
| <i>Roll On/Roll Off Vessel</i>                           | <i>RoRo</i>   | <i>Time To Go</i>                       | <i>TTG</i>    |
| <i>Root Mean Square</i>                                  | <i>RMS</i>    | <i>Time to Wheel Over Line</i>          | <i>TWOL</i>   |
| <i>Route</i>                                             | <i>ROUTE</i>  | <i>Track</i>                            | <i>TRK</i>    |
| <i>Safety Contour</i>                                    | <i>SF CNT</i> | <i>Track Control System</i>             | <i>TCS</i>    |
| <i>Sailing Vessel</i>                                    | <i>SAIL</i>   | Tracking                                | TRKG          |
| <i>Satellite</i>                                         | <i>SAT</i>    | <i>Trail(s)</i>                         | <i>TRAIL</i>  |
| <i>S-Band</i>                                            | <i>S-BAND</i> | <i>Transmit and Receive</i>             | <i>TXRX</i>   |
| <i>Scan to Scan</i>                                      | <i>SC/SC</i>  | <i>Transceiver</i>                      | <i>TCVR</i>   |
| Search And Rescue                                        | SAR           | <i>Transferred Line Of<br/>Position</i> | <i>TPL</i>    |
| <i>Search And Rescue<br/>Transponder</i>                 | <i>SART</i>   | Transmit                                | TX            |
| <i>Search And Rescue<br/>Vessel</i>                      | <i>SARV</i>   | <i>Transmitter</i>                      | <i>TMTR</i>   |
| <i>Select</i>                                            | <i>SEL</i>    | <i>Transmitting Heading<br/>Device</i>  | <i>THD</i>    |
| <i>September</i>                                         | <i>SEP</i>    | <i>Trial</i>                            | <i>TRIAL</i>  |
| <i>Sequence</i>                                          | <i>SEQ</i>    | <i>Trigger Pulse</i>                    | <i>TRIG</i>   |
| <i>Set (i.e., set and drift, or<br/>setting a value)</i> | <i>SET</i>    | <i>True</i>                             | <i>T</i>      |
| <i>Ship's Time</i>                                       | <i>TIME</i>   | <i>True Motion</i>                      | <i>TM</i>     |
| <i>Short Pulse</i>                                       | <i>SP</i>     | <i>Tune</i>                             | <i>TUNE</i>   |
| <i>Signal to Noise Ratio</i>                             | <i>SNR</i>    | <i>Ultrahigh Frequency</i>              | <i>UHF</i>    |
| <i>Simulation</i>                                        | <i>SIM</i>    | Uninterruptible Power<br>Supply         | UPS           |
| <i>Slave</i>                                             | <i>SLAVE</i>  | <i>Universal Time,<br/>Coordinated</i>  | <i>UTC</i>    |
| <i>South</i>                                             | <i>S</i>      | Universal Transverse<br>Mercator        | UTM           |
| <i>Speed</i>                                             | <i>SPD</i>    | <i>Unstabilised</i>                     | <i>UNSTAB</i> |
| <i>Speed and Distance<br/>Measuring Equipment</i>        | <i>SDME</i>   | <i>Variable Range Marker</i>            | <i>VRM</i>    |
| <i>Speed Over the Ground</i>                             | <i>SOG</i>    | <i>Variation</i>                        | <i>VAR</i>    |
| <i>Speed Through the Water</i>                           | <i>STW</i>    | <i>Vector</i>                           | <i>VECT</i>   |
| <i>Stabilized</i>                                        | <i>STAB</i>   | <i>Very High Frequency</i>              | <i>VHF</i>    |
| <i>Standby</i>                                           | <i>STBY</i>   | <i>Very Low Frequency</i>               | <i>VLF</i>    |
| <i>Starboard/Starboard Side</i>                          | <i>STBD</i>   | <i>Vessel Aground</i>                   | <i>GRND</i>   |
| <i>Station</i>                                           | <i>STN</i>    | <i>Vessel at Anchor</i>                 | <i>ANCH</i>   |
| <i>Symbol(s)</i>                                         | <i>SYM</i>    |                                         |               |

| <b>Term</b>                                                | <b>Abbreviation</b> |
|------------------------------------------------------------|---------------------|
| <i>Vessel Constrained by Draught</i>                       | <i>VCD</i>          |
| <i>Vessel Engaged in Diving Operations</i>                 | <i>DIVE</i>         |
| <i>Vessel Engaged in Dredging or Underwater Operations</i> | <i>DRG</i>          |
| <i>Vessel Engaged in Towing Operations</i>                 | <i>TOW</i>          |
| <i>Vessel Not Under Command</i>                            | <i>NUC</i>          |
| <i>Vessel Restricted in Manoeuvrability</i>                | <i>RIM</i>          |
| <i>Vessel Traffic Service</i>                              | <i>VTs</i>          |
| <i>Vessel Underway Using Engine</i>                        | <i>UWE</i>          |
| <i>Video</i>                                               | <i>VID</i>          |

| <b>Term</b>                  | <b>Abbreviation</b> |
|------------------------------|---------------------|
| Visual Display Unit          | VDU                 |
| <i>Voyage</i>                | <i>VOY</i>          |
| <i>Voyage Data Recorder</i>  | <i>VDR</i>          |
| <i>Warning</i>               | <i>WARNING</i>      |
| <i>Water</i>                 | <i>WAT</i>          |
| <i>Waypoint</i>              | <i>WPT</i>          |
| Waypoint Closure Velocity    | WCV                 |
| <i>West</i>                  | <i>W</i>            |
| <i>Wheel Over Line</i>       | <i>WOL</i>          |
| Wheel Over Point             | WOP                 |
| <i>Wheel Over Time</i>       | <i>WOT</i>          |
| <i>World Geodetic System</i> | <i>WGS</i>          |
| <i>X-Band</i>                | <i>X-BAND</i>       |

## Appendix 3 List of Symbols

| Symbol name                  | Symbol graphic                                                                                         |
|------------------------------|--------------------------------------------------------------------------------------------------------|
| Own ship - simplified symbol | Double circle<br>     |
| Waypoint                     | Circle<br>            |
| Route                        | Long-dashed line<br> |
| Cursor                       | Cross line<br>        |

## Appendix 4 List of Default Setting Values

| MENU             | Sub Menu          | Sub Menu            | Sub Menu    | DEFAULT        |
|------------------|-------------------|---------------------|-------------|----------------|
| DISPLAY          | THEME             |                     |             | DAY            |
|                  | BEEP              |                     |             | ON             |
|                  | DAY SCREEN        |                     |             | OFF            |
|                  | HEADING           |                     |             | ON             |
|                  | NAV               |                     |             | ON             |
|                  | PLOT              |                     |             | ON             |
|                  | ANALOG            |                     |             | ON             |
|                  | HIGHWAY           |                     |             | ON             |
|                  | SAT INFO          |                     |             | ON             |
|                  | BEACON TEXT       |                     |             | ON             |
|                  | NAV ASSIST        |                     |             | ON             |
|                  | WPT INFO          |                     |             | ON             |
| HEADIN<br>G/HEEL | DR TIME           |                     |             | 5 min          |
|                  | HEADING<br>SMOOTH |                     |             | 0 s            |
|                  | ROT SMOOTH        |                     |             | 0 s            |
|                  | HEADING OFFSET    |                     |             | 0 °            |
|                  | ROLL OFFSET       |                     |             | 0 °            |
|                  | PITCH OFFSET      |                     |             | 0 °            |
|                  | ROLL SMOOTH       |                     |             | 0 s            |
|                  | PITCG SMOOTH      |                     |             | 0 s            |
|                  | RESTORATION       |                     |             | AUTO           |
|                  | INTERRUPT NMEA    |                     |             | NULL           |
|                  | CHECK SUM         |                     |             | ON             |
|                  | DOUBLE ENDER      |                     |             | FORE           |
|                  | MAX PERIOD        |                     |             | 50 s           |
|                  | MIN PERIOD        |                     |             | 2 s            |
|                  | AVERAGE           |                     |             | 5              |
| ALERT            | SYETEM            | SET                 |             | ON             |
|                  |                   | SOUND               |             | ON             |
|                  | HEADING           | SET                 |             | ON             |
|                  |                   | SOUND               |             | ON             |
|                  | DGPS              | SET                 |             | OFF            |
|                  |                   | SOUND               |             | OFF            |
|                  | HDOP              | SET                 |             | 4              |
|                  |                   | SOUND               |             | ON             |
|                  | SPD               | SET                 |             | OFF            |
|                  |                   | SOUND               |             | OFF            |
|                  | SPOOFING          | SET                 |             | WARNING MODE 2 |
|                  |                   | SOUND               |             | ON             |
|                  | CCRP              | SET                 |             | OFF            |
|                  |                   | SOUND               |             | OFF            |
|                  | HEEL              | SET                 |             | OFF            |
|                  |                   | SOUND               |             | OFF            |
|                  | HEAVING           | SET                 |             | OFF            |
|                  |                   | SOUND               |             | OFF            |
| ALERT            | SETTING           | ALARM<br>ESCALATION | POSITION    | ON             |
|                  |                   |                     | HEADING     | ON             |
|                  |                   |                     | TIME        | 30 s           |
|                  |                   | HEDER ALERT         | GROUPING    | OFF            |
|                  |                   |                     | AGGREGATION | OFF            |
|                  |                   | TEST MODE           | TEST MODE   | OFF            |

| MENU            | Sub Menu       | Sub Menu                                     | Sub Menu                   | DEFAULT          |
|-----------------|----------------|----------------------------------------------|----------------------------|------------------|
| GNSS<br>SETTING | GNSS           | GNSS MODE                                    |                            | AUTO1            |
|                 | FIX MODE       | FIX MODE                                     |                            | AUTO             |
|                 | ELV MASK       | SET ELV MASK(° )                             |                            | 5 °              |
|                 | HDOP           | HDOP                                         |                            | 10               |
|                 | SMOOTH         | POSN SMOOTHING(s)                            |                            | 10 s             |
|                 |                | SPEED SMOOTHING(s)                           |                            | 4 s              |
|                 |                | COURSE SMOOTHING(s)                          |                            | 4 s              |
|                 | RAIM           | RAIM ACCURACY<br>LEVEL (m)                   |                            | 100m             |
|                 | DATUM          | DATUM                                        |                            | WGS-84           |
|                 | INIT           | QUADRANT                                     |                            | N/E              |
|                 |                | LAT                                          |                            | 36 00.00         |
|                 |                | LON                                          |                            | 136 00.00        |
|                 |                | ANT HEIGHT(m)                                |                            | 50m              |
|                 |                | YEAR                                         |                            | 2000             |
|                 |                | MONTH                                        |                            | 1                |
|                 |                | DAY                                          |                            | 1                |
|                 |                | HOURL(hr)                                    |                            | 0                |
|                 |                | MINUTE(min)                                  |                            | 0                |
|                 | DGPS           | DGPS                                         |                            | OFF              |
|                 | BEACON         | AUTO                                         |                            | -                |
|                 |                | MANUAL                                       | FREQUENCY<br>BITRATE       | 309kHz<br>200bps |
|                 | SBAS           | SAT SEARCH                                   |                            | AUTO             |
|                 |                | TYPE 0                                       |                            | OFF              |
| SYSTEM          | DATE/TIME      | TIME DIFF                                    |                            | +00:00           |
|                 |                | DATE DISP                                    |                            | DD MMM,'YY       |
|                 |                | TIME DISP (hr)                               |                            | 24hr             |
|                 | UNIT           | DIST/SPEED                                   |                            | NM,km            |
|                 |                | HEIGHT/DPTH                                  | SETTING METHOD             | DEFAULT          |
|                 |                |                                              | CONVERTED<br>VALUE(1fm=Xm) | 1.8288           |
|                 |                |                                              | MAG CORR                   | OFF              |
|                 | MAG CORR       |                                              | EAST/WEST                  | W                |
|                 |                |                                              | CORRECTION<br>VALUE        | 0                |
|                 |                |                                              |                            |                  |
|                 | HEAVING OFFSET | X                                            |                            | 0m               |
|                 |                | Y                                            |                            | 0m               |
|                 |                | Z                                            |                            | 0m               |
|                 | 5Hz DISPLAY    |                                              |                            | OFF              |
|                 | SYSTEM LOG     |                                              |                            | -                |
|                 | PASSWD CHANGE  |                                              |                            | 00000000         |
| LANGUAGE        |                |                                              |                            | ENGLISH          |
| VERSION         | DISPLAY        | VERSION<br>SERIAL NUMBER<br>BARCODE<br>IP    |                            | -                |
|                 | SENSOR         | MODEL<br>VERSION<br>SERIAL NUMBER<br>BARCODE |                            | -                |
|                 | SENSOR         | GPS1 VERSION<br>GPS2 VERSION<br>GPS3 VERSION |                            | -                |
|                 | ROLLOVER       | ROLL OVER<br>SETTING DATE<br>MANUFACTURE     |                            | -                |

| MENU       | Sub Menu        | Sub Menu  | Sub Menu | DEFAULT |
|------------|-----------------|-----------|----------|---------|
| ALERT LIST | ALERT HISTORY   |           |          | -       |
|            | ACTIVE ALERT    |           |          | -       |
|            | LAN ERROR COUNT |           |          | -       |
| VOYAGE     | HEADER          | ROUTE No  |          | -       |
|            |                 | TOTAL WPT |          | -       |
|            |                 | COMMENT   |          | -       |
|            | WPT             | WPT LIST  |          | -       |

| MENU  | Sub Menu | Sub Menu     | Sub Menu        | Sub Menu        | DEFAULT                                                        |
|-------|----------|--------------|-----------------|-----------------|----------------------------------------------------------------|
| EQUIP | TYPE     | DISPLAY TYPE |                 |                 | MAIN                                                           |
|       |          | DEVICE No.   |                 |                 | No1                                                            |
|       |          | SFI          |                 |                 | GP9997                                                         |
|       | DATA I/O | IN/OUT1      | FORMAT          |                 | IEC                                                            |
|       |          |              | BITRATE         |                 | 4800bps                                                        |
|       |          |              | VERSION         |                 | 2.3                                                            |
|       |          |              | TALKER          |                 | GNSS                                                           |
|       |          |              | HEADING TALKER  |                 | GNSS                                                           |
|       |          |              | OUTPUT SENTENCE |                 | GNS,RMC,VTG,DTM,Z DA 1s                                        |
|       |          | OUT2         |                 |                 | IEC 38400bps 2.3 GNSS/GNSS THS,ROT 25msec                      |
|       |          | OUT3         |                 |                 | IEC 38400 2.3 GNSS/GNSS GNS,RMC,VTG,DTM,Z DA 1s THS,ROT 25msec |
|       |          | LAN          | GNSS OUT        | CONNECT         | MULTICAST                                                      |
|       |          |              |                 | IP              | 239.192.000.004                                                |
|       |          |              |                 | PORT            | 60004                                                          |
|       |          |              |                 | FORMAT          | IEC                                                            |
|       |          |              |                 | VERSION         | 2.3                                                            |
|       |          |              |                 | TALKER          | GNSS                                                           |
|       |          |              |                 | OUTPUT SENTENCE | GNS,RMC,VTG,DTM,Z DA 1s                                        |
|       |          |              | HEADING OUT     | CONNECT         | MULTICAST                                                      |
|       |          |              |                 | IP              | 239.192.000.003                                                |
|       |          |              |                 | PORT            | 60003                                                          |
|       |          |              |                 | HEADING TALKER  | GNSS                                                           |
|       |          |              |                 | OUTPUT SENTENCE | THS,ROT                                                        |
|       |          |              | ALERT           | TX CONNECT      | MULTICAST                                                      |
|       |          |              |                 | TX IP           | 239.192.000.017                                                |
|       |          |              |                 | TX PORT         | 60017                                                          |
|       |          |              |                 |                 | -                                                              |
|       |          |              |                 | RX CONNECT      | MULTICAST                                                      |
|       |          |              |                 | RX IP           | 239.192.000.019                                                |
|       |          |              |                 | RX PORT         | 60019                                                          |
|       |          |              |                 | OUTPUT SENTENCE |                                                                |
|       |          |              | RMS SEND        | RMS SEND        | OFF                                                            |
|       |          |              |                 | CONNECT         | MULTICAST                                                      |
|       |          |              |                 | IP              | 239.192.0.5                                                    |
|       |          |              |                 | PORT            | 60005                                                          |

| MENU  | Sub Menu | Sub Menu            | Sub Menu          | Sub Menu     | DEFAULT                                              |
|-------|----------|---------------------|-------------------|--------------|------------------------------------------------------|
| EQUIP |          |                     | PRINTER           | INTERVAL     | OFF                                                  |
|       |          |                     |                   | CONNECT      | UNICAST                                              |
|       |          |                     |                   | IP           | 172.016.060.181                                      |
|       |          |                     |                   | PORT         | 9100                                                 |
|       |          |                     | ACTIVE ROUTE      | ACTIVE ROUTE | OFF                                                  |
|       |          |                     |                   | CONNECT      | MULTICAST                                            |
|       |          |                     |                   | IP           | 239.000.096.001                                      |
|       |          |                     |                   | PORT         | 6203                                                 |
|       |          |                     | MUTUAL            | MUTUAL       | OFF                                                  |
|       |          |                     |                   | CONNECT      | MULTICAST                                            |
|       |          |                     |                   | IP           | 239.000.000.001                                      |
|       |          |                     |                   | PORT         | 5101                                                 |
|       |          |                     | SWITCH            | SWITCH       | OFF                                                  |
|       |          |                     |                   | CONNECT      | MULTICAST                                            |
|       |          |                     |                   | IP           | 239.000.000.001                                      |
|       |          |                     |                   | PORT         | 5101                                                 |
|       |          |                     | ENABLE<br>DISABLE |              | ENABLE                                               |
|       |          | CONTACT 1           | CONTACT OUT       |              | HEADING1                                             |
|       |          | CONTACT 2           | CONTACT OUT       |              | HEADING2                                             |
|       |          | CONTACT 3           | CONTACT OUT       |              | SYSTEM                                               |
|       |          | SENSOR<br>THROUGH 1 | FORMAT            |              | NMEA                                                 |
|       |          |                     | BITRATE           |              | 38400bps                                             |
|       |          |                     | VERSION           |              | 2.3                                                  |
|       |          |                     | INTERVAL          |              | 25msec                                               |
|       |          |                     | OUTPUT SENTENCE   |              | THS,ROT                                              |
|       |          | SENSOR<br>THROUGH 2 |                   |              | 4800bps NMEA V2.3<br>GGA,VTG,RMC,GLL,Z<br>DA,DTM 1 秒 |
|       | SWITCH   | CONTROL<br>METHOD   |                   |              | OFF/MFD                                              |
|       |          | EQUIPMENT           |                   |              | GNSS COMPASS                                         |
|       | DIMMER   | SETTINGS            | DIMMER GROUP      |              | 1                                                    |
|       |          |                     | DISPLAY           |              | OFF                                                  |
|       |          |                     | NCM-227           |              | OFF                                                  |
|       |          |                     | DIMMER OFFSET     |              | 0                                                    |
|       |          |                     | DDC               |              | OFF                                                  |
|       |          |                     | GPS               |              | OFF                                                  |
|       |          |                     | GP DDC            |              | OFF                                                  |
|       |          | DIMMER<br>CAL       |                   |              | MIN                                                  |
|       | IP       | SETTING             |                   |              | JRC STANDARD                                         |
|       |          | IP ADDRESS          |                   |              | 172.016.060.183                                      |
|       |          | SUBNET<br>MASK      |                   |              | 255.255.000.000                                      |
|       |          | MAC<br>ADDRESS      |                   |              | -                                                    |
|       | CCRP     | BEEM(m)             |                   |              | 1m                                                   |
|       |          | LENGTH(m)           |                   |              | 1m                                                   |
|       |          | CCRP                | X                 |              | 0m                                                   |
|       |          |                     | Y                 |              | 0m                                                   |
|       |          |                     | Z                 |              | 0m                                                   |
|       |          | SENSOR              | X                 |              | 0m                                                   |
|       |          |                     | Y                 |              | 0m                                                   |
|       |          |                     | Z                 |              | 0m                                                   |
|       |          | 3 AXIS<br>SPEED     | X                 |              | 0m                                                   |
|       |          |                     | Y                 |              | 0m                                                   |
|       |          |                     | Z                 |              | 0m                                                   |
|       |          | 2 AXIS<br>SPEED     | X                 |              | 0m                                                   |
|       |          |                     | Y                 |              | 0m                                                   |
|       |          |                     | Z                 |              | 0m                                                   |
|       |          |                     | Z                 |              | 0m                                                   |

| MENU  | Sub Menu      | Sub Menu       | Sub Menu                    | Sub Menu                                                                                                                                                 | DEFAULT |
|-------|---------------|----------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| EQUIP | LOW SPEED COG | OUTPUT         |                             |                                                                                                                                                          | OFF     |
|       | MAINTENANCE   |                | DISPLAY                     | eMMC<br>EEPROM<br>RAM<br>SIO SENSOR<br>SIO1<br>SIO2<br>SIO3<br>LAN<br>FRONT BUZZER<br>BACK BUZZER<br>LCD                                                 |         |
|       |               |                |                             |                                                                                                                                                          |         |
|       |               | DIAGNOSIS      | SENSOR                      | [GPS1]<br>ANTENNA<br>ROM<br>RAM<br>RTC<br>[GPS2]<br>ANTENNA<br>ROM<br>RAM<br>RTC<br>[GPS3]<br>ANTENNA<br>ROM<br>RAM<br>RTC<br>[CONTROLLER]<br>ROM<br>RAM |         |
|       |               |                |                             |                                                                                                                                                          |         |
|       |               |                |                             |                                                                                                                                                          |         |
|       |               | MONITOR        | DATA IN                     |                                                                                                                                                          |         |
|       |               |                | LAN                         |                                                                                                                                                          |         |
|       |               |                | SENSOR                      |                                                                                                                                                          |         |
|       |               | OPERATING TIME | SENSOR OPERATING TIME (hr)  |                                                                                                                                                          |         |
|       |               |                | DISPLAY OPERATING TIME (hr) |                                                                                                                                                          |         |
|       |               |                | LCD OPERATING TIME (hr)     |                                                                                                                                                          |         |
|       | RESET         |                |                             |                                                                                                                                                          | DISPLAY |
|       | DEMO          | DEMO TYPE      |                             |                                                                                                                                                          | STATIC  |
|       |               | START/STOP     |                             |                                                                                                                                                          | START   |

## Appendix 5 Data Format

### Output Sentence

#### • GGA – Global positioning system (GPS) fix data

\$--GGA, hhmmss.ss, llll.ll, a, yyyyy.yy, a, x, xx, x.x, x.x, M, x.x, M, x.x, xxxx\*hh<CR><LF>  
1 2 3 4 5 6 7 8 9 10 11 12

- 1 : UTC of position
- 2 : Latitude N/S
- 3 : Longitude E/W
- 4 : GPS quality indicator (see Note 1)
- 5 : Number of satellites in use, 00-12, maybe different from the number in view
- 6 : Horizontal dilution of precision
- 7 : Antenna altitude above/below mean sea level (geoid)
- 8 : Units of antenna altitude, m
- 9 : Geoidal separation (see Note 3)
- 10 : Units of geoidal separation, m
- 11 : Age of differential GPS data (see Note 2)
- 12 : Differential reference station ID, 0000-1023

NOTE 1 All GPS quality indicators in headings 1 through 8 are considered "valid". The heading "0" is the only "invalid" indicator. The GPS quality indicator field should not be a null field.

0 = fix not available or invalid

1 = GPS SPS mode

2 = differential GPS, SPS mode

8 = Simulator mode

NOTE 2 Time in seconds since last SC104 type 1 or 9 update, null field when DGPS is not used.

NOTE 3 Geoidal separation: the difference between the WGS-84 earth ellipsoid surface and mean sea level (geoid) surface, "–" = mean sea level surface below the WGS-84 ellipsoid surface.

#### • RMC – Recommended minimum specific GNSS data

\$--RMC, hhmmss.ss, A, llll.ll, a, yyyyy.yy, a, x.x, x.x, xxxxxx, x.x, a, a, a\*hh<CR><LF>  
1 2 3 4 5 6 7 8 9 10 11 12 13

- 1 : UTC of position fix
- 2 : Status (see Note 3) A = data valid V = navigation receiver warning
- 3 : Latitude, N/S
- 4 : Latitude, N/S
- 5 : Longitude, E/W
- 6 : Longitude, E/W
- 7 : Speed over ground, knots
- 8 : Course over ground, degrees true
- 9 : Date: dd/mm/yy
- 10 : Magnetic variation, degrees, E/W (see Note 1)
- 11 : Magnetic variation, degrees, E/W (see Note 1)
- 12 : Mode indicator (see Notes 2 and 3)
- 13 : Navigational status (see Note 4)

NOTE 1 E = Easterly variation subtracts from True course

W = Westerly variation adds to True course

NOTE 2 Positioning system Mode Indicator:

A = Autonomous. Satellite system used in non-differential mode in position fix;

D = Differential. Satellite system used in differential mode in position fix;

N = No fix. Satellite system not used in position fix, or fix not valid;

P = Precise. Satellite system used in precision mode. Precision mode is defined as: no deliberate degradation (such as selective availability) and higher resolution code (P-code) is used to compute position fix. P is also used for satellite system used in multi-frequency, SBAS or Precise Point Positioning (PPP) mode;

S = Simulator mode.

NOTE 3 The positioning system mode indicator field supplements the positioning system status field, the status field should be set to V = Invalid for all values of indicator mode except for A= Autonomous and D = Differential. The positioning system mode indicator and status fields should not be null fields.

NOTE 4 The navigational status indicator is according to IEC 61108 requirements on 'Navigational (or Failure) warnings and status indications'. This field should not be a NULL field and the character should take one of the following values:

S = Safe when the estimated positioning accuracy (95 % confidence) is within the selected accuracy level corresponding to the actual navigation mode, and/or integrity is available and within the requirements for the actual navigation mode, and/or a new valid position has been calculated within 1 s for a conventional craft and 0,5 s for a high speed craft.

C = Caution when integrity is not available.

U = Unsafe when the estimated positioning accuracy (95 % confidence) is less than the selected accuracy level corresponding to the actual navigation mode, and/or integrity is available but exceeds the requirements for the actual navigation mode, and/or a new valid position has not been calculated within 1 s for a conventional craft and 0,5 s for a high speed craft.

V = Navigational status not valid, equipment is not providing navigational status indication.

## • GLL – Geographic position – Latitude/longitude

\$--GLL, llll.ll, a, yyyyy.yy, a, hhmmss.ss, A, a \*hh<CR><LF>  
           1   2   3      4      5      6  7

1 : Latitude, N/S

2 : Latitude, N/S

3 : Longitude, E/W

4 : Longitude, E/W

5 : UTC of position

6 : Status (see Note 2) A=data valid V=data invalid

7 : Mode indicator (see Notes 1 and 2)

NOTE 1 Positioning system mode indicator:

D = Differential

S = Simulator

N = Data not valid

NOTE 2 The mode indicator field supplements the status field (field 6). The status field should be set to V = invalid for all values of operating mode except for A = Autonomous and D = Differential. The positioning system mode indicator and status fields should not be null fields.

## • VTG – Course over ground and ground speed

\$--VTG, x.x, T, x.x, M, x.x, N, x.x, K,a\*hh<CR><LF>  
           1  2  3  4  5  6  7  8  9

1 : Course over ground, degrees true

2 : Course over ground, degrees true

3 : Course over ground, degrees magnetic

4 : Course over ground, degrees magnetic

5 : Speed over ground, knots (see Note 1)

6 : Speed over ground, knots (see Note 1)

7 : Speed over ground, km/h (see Note 1)

8 : Speed over ground, km/h (see Note 1)

9 : Mode indicator (see Note 2)

NOTE 1 The speed over the ground should always be non-negative.

NOTE 2 The mode indicator provides status information about the operation of the source device (such as positioning systems, velocity sensors, etc.) generating the sentence, and the validity of data being provided. The possible indications are as follows:

A = Autonomous mode;

D = Differential mode;

P = Precise. Satellite system used in precision mode. Precision mode is defined as: no deliberate degradation (such as selective availability) and higher resolution code (P-code) is used to compute position fix. P is also used for satellite system used in multi-frequency, SBAS or Precise Point Positioning (PPP) mode;

S = Simulator mode;

N = Data not valid.

The mode indicator field should not be a null field.

## • GSA – GNSS DOP and active satellites

\$--GSA, a, x, xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x,h\*hh<CR><LF>  
                   1 2                                  3                                  4 5 6 7

- 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 : ID numbers (see Note 1) of satellites used in solution
- 4 : PDOP
- 5 : HDOP
- 6 : VDOP
- 7 : GNSS System ID (see Note 2)

NOTE 1 Satellite ID numbers. To avoid possible confusion caused by repetition of satellite ID numbers when using multiple satellite systems, the following convention has been adopted.

- a) GPS satellites are identified by their PRN numbers, which range from 1 to 32.
- b) The numbers 33 to 64 are reserved for WAAS satellites. The WAAS system PRN numbers are 120 to 138. The offset from WAAS SV ID to WAAS PRN number is 87. A WAAS PRN number of 120 minus 87 yields the SV ID of 33. The addition of 87 to the SV ID yields the WAAS PRN number.
- c) The numbers 65 to 96 are reserved for GLONASS satellites. GLONASS satellites are identified by 64+satellite slot numbers. The slot numbers are 1 through 24 for the full GLONASS constellation of 24 satellites, thus giving a range of 65 through 88. The numbers 89 through 96 are available if slot numbers above 24 are allocated to on-orbit spares.

NOTE 2 GNSS System ID identifies the GNSS System ID according to the Table below.

## • GSV – GNSS satellites in view

\$--GSV, x, x, xx, xx, xx, xxx, xx....., xx, xx, xxx, xx, h\*hh<CR><LF>  
                   1 2 3 4 5 6 7 8                                  9 10

- 1 : Total number of messages (see Note 1), 1 to 9
- 2 : Message number (see Note 1), 1 to 9
- 3 : Total number of satellites in view
- 4 : Satellite ID number (see Note 3)
- 5 : Elevation, degrees, 90° maximum
- 6 : Azimuth, degrees true, 000 to 359
- 7 : SNR (C/No) 00-99 dB-Hz, null when not tracking
- 8 : Second and third SVs (see Note 2)
- 9 : Fourth SV (see Note 2)
- 10 : Signal ID (see Note 4)

NOTE 1 Satellite information may require the transmission of multiple sentences all containing identical field formats when sending a complete message. The first field specifies the total number of sentences, minimum value 1. The second field identifies the order of this sentence (sentence number), minimum value 1. For efficiency it is recommended that null fields be used in the additional sentences when the data is unchanged from the first sentence.

NOTE 2 A variable number of "Satellite ID-Elevation-Azimuth-SNR" sets are allowed up to a maximum of four sets per sentence. Null fields are required for unused sets when less than four sets are transmitted.

NOTE 3 Satellite ID numbers. To avoid possible confusion caused by repetition of satellite ID numbers when using multiple satellite systems, the following convention has been adopted:

- a) GPS satellites are identified by their PRN numbers, which range from 1 to 32.
- b) The numbers 33 to 64 are reserved for WAAS satellites. The WAAS system PRN numbers are 120 to 138. The offset from WAAS SV ID to WAAS PRN number is 87. A WAAS PRN number of 120 minus 87 yields the SV ID of 33. The addition of 87 to the SV ID yields the WAAS PRN number.
- c) The numbers 65 to 96 are reserved for GLONASS satellites. GLONASS satellites are identified by 64+satellite slot number. The slot numbers are 1 through 24 for the full GLONASS constellation of 24 satellites, this gives a range of 65 through 88. The numbers 89 through 96 are available if slot numbers above 24 are allocated to on-orbit spares.

NOTE 4 Signal ID see Table below.

## • DTM – Datum reference

\$--DTM,ccc,a,x.x,a,x.x,a, x.x,ccc\*hh<CR><LF>  
 1 2 3 4 5 6 7 8

1 : Local datum(see Note 1)

WGS84 = W84 / WGS72 = W72 / SGS85 = S85 / PE90 = P90

User defined = 999 / IHO datum code (see Note 4)

2 : Local datum subdivision code (see Note 2)

3 : Lat offset, min, N/S (see Note 3)

4 : Lat offset, min, N/S (see Note 3)

5 : Lon offset, min, E/W (see Note 3)

6 : Lon offset, min, E/W (see Note 3)

7 : Altitude offset, m (see Note 3)

8 : Reference datum (WGS84 = W84 / WGS72 = W72 / SGS85 = S85 / PE90 = P90)

NOTE 1 Three character alpha code for local datum. If not one of the listed earth-centred datums, or 999 for user defined datums, use IHO datum code from International Hydrographic Organisation Publication S-60, Appendices B and C. Null field if unknown. This field should be set to 999 when manual offsets are entered and in use by the position fixing device.

NOTE 2 One character subdivision datum code when available or user defined reference character for user defined datums, null field otherwise. Subdivision character from IHO Publication S-60, Appendices B and C.

NOTE 3 Latitude and longitude offsets are positive numbers, the altitude offset may be negative. Offsets change with position: position in the local datum is offset from the position in the reference datum in the directions indicated:

$$P_{\text{local datum}} = P_{\text{ref datum}} + \text{offset}$$

When field 1 contains a value of 999, these fields may not be null, and should contain the manually entered or user defined offsets.

NOTE 4 Users should be aware that chart transformations based on IHO S60 parameters may result in significant positional errors when applied to chart data.

## • GBS – GNSS satellite fault detection

\$--GBS, hhmmss.ss, x.x, x.x, x.x, xx, x.x, x.x, x.x, h, h \*hh <CR><LF>  
 1 2 3 4 5 6 7 8 9 10

1 : UTC time of the GGA or GNS fix associated with this sentence

2 : Expected error in latitude (see Note 1)

3 : Expected error in longitude (see Note 1)

4 : Expected error in altitude (see Note 1)

5 : ID number (see Note 2) of most likely failed satellite

6 : Probability of missed detection for most likely failed satellite

7 : Estimate of bias on most likely failed satellite(in metres)

8 : Standard deviation of bias estimate

9 : GNSS System ID (see Note 3)

10 : GNSS Signal ID (see Note 4)

NOTE 1 Expected error in metres due to bias, with noise = 0.

NOTE 2 Satellite ID numbers. To avoid possible confusion caused by repetition of satellite ID numbers when using multiple satellite systems, the following convention has been adopted (these legacy systems remain in effect for new systems see NOTE 3):

a) GPS satellites are identified by their PRN numbers, which range from 1 to 32.

b) The numbers 33-64 are reserved for WAAS satellites. The WAAS system PRN numbers are 120-138.

The offset from WAAS SV ID to WAAS PRN number is 87. A WAAS PRN number of 120 minus 87 yields the SV ID of 33. The addition of 87 to the SV ID yields the WAAS PRN number.

c) The numbers 65-96 are reserved for GLONASS satellites. GLONASS satellites are identified by 64+ satellite slot number. The slot numbers are 1 through 24 for the full GLONASS constellation of 24 satellites; this gives a range of 65 through 88. The numbers 89 through 96 are available if slot numbers above 24 are allocated to on-orbit spares.

NOTE 3 System ID identifies the GNSS System ID according to the Table below. Note that legacy numbering system as above should remain in effect.

NOTE 4 GNSS Signal ID identifies the GNSS Signal ID according to the Table below.

- **GRS – GNSS range residuals**

```
$--GRS, hhmmss.ss,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,h,h *hh<CR><LF>
```

- 1 : UTC time of the GGA or GNS fix associated with this sentence
- 2 : Mode: 0 = residuals were used to calculate the position given in the matching GGA or GNS sentence  
1 = residuals were re-computed after the GGA or GNS position was computed
- 3 : Range residuals for satellites used in the navigation solution (see Notes 1 and 2)  
Order should match order of satellite ID (see Note 3) numbers in GSA.  
When GRS is used, GSA and GSV are generally required. Null for unused fields
- 4 : GNSS System ID (see Note 3)
- 5 : Signal ID (see Note 4)

NOTE 1 If the range residual exceeds  $\pm 99.9$  m, then the decimal part is dropped, resulting in an integer ( $-103.7$  becomes  $-103$ ). The maximum value for this field is  $\pm 999$ .

NOTE 2 The sense or sign of the range residual is determined by the order of parameters used in the calculation. The expected order is as follows: range residual = calculated range - measured range.

NOTE 3 When multiple GRS sentences are being sent then their order of transmission should match the order of corresponding GSA sentences. Listeners should keep track of pairs of GSA and GRS sentences and discard data if pairs are incomplete.

NOTE 4 Signal ID identifies the actual ranging signal according to the Table below.

NOTE 5 System ID, see Table below.

- **GST – GNSS pseudorange noise statistics**

```
$--GST, hhmmss.ss, x.x, x.x, x.x, x.x, x.x, x.x, x.x*hh<CR><LF>
```

- 1 : UTC time of the GGA or GNS fix associated with this sentence
- 2 : RMS value of the standard deviation of the range inputs to the navigation process. Range inputs include pseudoranges and DGPS corrections
- 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 (degrees from true north)
- 6 : Standard deviation of latitude error (m)
- 7 : Standard deviation of longitude error (m)
- 8 : Standard deviation of altitude error (m)

- **ZDA – Time and date**

```
$--ZDA, hhmmss.ss, xx, xx, xxxx, xx, xx*hh<CR><LF>
```

- 1 : UTC  
2 : Day, 01 to 31 (UTC)  
3 : Month, 01 to 12 (UTC)  
4 : Year (UTC)  
5 : Local zone hours(see Note), 00 h to  $\pm 13$  h  
6 : Local zone minutes (see Note), 00 to +59

NOTE Local time zone is the magnitude of hours plus the magnitude of minutes added, with the sign of local zone hours, to local time to obtain UTC. Local zone is generally negative for East longitudes with local exceptions near the international date line.

Example: At Chatham Is. (New Zealand) at 1230 (noon) local time on June 10, 1995:

Example: 7 At Chatham Is. (New Zealand) at 1200 (M)  
\$GPZDA,234500.09,06,1995.-12.45\*6C<CR><LF>

In the Cook Islands at 1500 local time on June 10, 1995:

\$GPZDA,013000.11,06,1995.10,30\*4A<CR><LF>

## • GNS – GNSS fix data

\$-- GNS, hhmmss.ss, llll.ll, a, yyyyy.yy, a, c--c,xx,x.x,x.x,x.x,x.x,x.x,a \*hh<CR><LF>  
                   1                  2  3      4          5  6      7  8  9  10 11 12 13

- 1 : UTC of position
- 2 : Latitude, N/S
- 3 : Latitude, N/S
- 4 : Longitude, E/W
- 5 : Longitude, E/W
- 6 : Mode indicator (see Note 1)
- 7 : Total number of satellites in use, 00-99
- 8 : HDOP (see Note 3)
- 9 : Antenna altitude, m, re: mean-sea-level (geoid)
- 10 : Geoidal separation, m (see Note 4)
- 11 : Age of differential data (see Note 2)
- 12 : Differential reference station ID (see Note 2)
- 13 : Navigational status indicator (see Note 5)

NOTE 1 Mode indicator. A variable length valid character field type with the first three characters currently defined. The first character indicates the use of GPS satellites, the second character indicates the use of GLONASS satellites and the third indicate the use of Galileo satellites. If another satellite system is added to the standard, the mode indicator will be extended to four characters, new satellite systems should always be added on the right, so the order of characters in the mode indicator is: GPS, GLONASS, Galileo, other satellite systems in the future. The characters should take one of the following values:

A = Autonomous. Satellite system used in non-differential mode in position fix

D = Differential. Satellite system used in differential mode in position fix

N = No fix. Satellite system not used in position fix, or fix not valid

P = Precise. Satellite system used in precision mode. Precision mode is defined as: no deliberate degradation (such as selective availability) and higher resolution code (P-code) is used to compute position fix. P is also used for satellite system used in multi-frequency, SBAS or Precise Point Positioning (PPP) mode

S = Simulator mode

The mode indicator should not be a null field.

NOTE 2 Age of differential data and Differential Reference Station ID:

a) When the talker is GN and more than one of the satellite systems are used in differential mode, then the "Age of differential data" and "Differential reference station ID" fields should be null. In this case, the "Age of differential data" and "Differential reference station ID" fields should be provided in following GNS sentences with talker IDs of GP, GL, etc. These following GNS messages should have the latitude, N/S, longitude, E/W, altitude, geoidal separation, mode, and HDOP fields null. This indicates to the listener that the field is supporting a previous \$GNGNS sentence with the same time tag. The "Number of satellites" field may be used in these following sentences to denote the number of satellites used from that satellite system.

Example: A combined GPS/GLONASS receiver using only GPS differential corrections has the following GNS sentence sent.

\$GNGNS,122310.2,3722.425671,N,12258.856215,W,DA,14,0.9,1005.543,6.5,5.2,23\*59<CR><LF>

Example: A combined GPS/GLONASS receiver using both GPS differential corrections and GLONASS differential corrections may have the following three GNS sentences sent in a group.

\$GNGNS,122310.2,3722.425671,N,12258.856215,W,DD,14,0.9,1005.543,6.5,\*74<CR><LF>

\$GPGNS,122310.2,,,,,7,,,,,5.2,23\*4D<CR><LF>

\$GLGNS,122310.2,,,,,7,,,,,3.0,23\*55<CR><LF>

The Differential Reference station ID may be the same or different for the different satellite systems.

b) Age of Differential Data

For GPS Differential Data:

This value is the average age of the most recent differential corrections in use. When only RTCM SC104

Type 1 corrections are used, the age is that of the most recent Type 1 correction. When RTCM SC104

Type 9 corrections are used solely, or in combination with Type 1 corrections, the age is the average of the most recent corrections for the satellites used. Null field when Differential GPS is not used.

For GLONASS Differential Data:

This value is the average age of the most recent differential corrections in use. When only RTCM SC104

Type 31 corrections are used, the age is that of the most recent Type 31 correction. When RTCM SC104

Type 34 corrections are used solely, or in combination with Type 31 corrections, the age is the average of the most recent corrections for the satellites used. Null field when differential GLONASS is not used.

For Galileo Differential Data:

This value is the average age of the most recent differential corrections in use. When only RTCM SC104

Type 41 corrections are used, the age is that of the most recent Type 41 correction. When RTCM SC104

Type 42 corrections are used solely, or in combination with Type 41 corrections, the age is the average of the most recent corrections for the satellites used. Null field when differential Galileo is not used.

NOTE 3 HDOP calculated using all the satellites (GPS, GLONASS, Galileo and any future satellites) used in computing the solution reported in each GNS sentence.

NOTE 4 Geoidal Separation: the difference between the earth ellipsoid surface and mean-sea-level (geoid) surface defined by the reference datum used in the position solution, "-" = mean-sea-level surface below ellipsoid. The reference datum may be specified in the DTM sentence.

NOTE 5 The navigational status indicator is according to IEC 61108 requirements on 'Navigational (or Failure) warnings and status indications'. This field should not be a NULL field and the character should take one of the following values:

S = Safe when the estimated positioning accuracy (95 % confidence) is within the selected accuracy level corresponding to the actual navigation mode, and integrity is available and within the requirements for the actual navigation mode, and a new valid position has been calculated within 1 s for a conventional craft and 0,5 s for a high speed craft

C = Caution when integrity is not available

U = Unsafe when the estimated positioning accuracy (95 % confidence) is less than the selected accuracy level corresponding to the actual navigation mode, and/or integrity is available but exceeds the requirements for the actual navigation mode, and/or a new valid position has not been calculated within 1 s for a conventional craft and 0,5 s for a high speed craft

V = Navigational status not valid, equipment is not providing navigational status indication.

#### • MSS – MSK receiver signal status

\$--MSS,x.x,x.x,x.x,x.x,x\*hh<CR><LF>  
1 2 3 4 5

- 1 : Signal strength (SS), dB/1 mV/m
- 2 : Signal-to-noise ratio (SNR), dB
- 3 : Beacon frequency, 283,5 kHz to 325,0 kHz
- 4 : Beacon bit rate (25, 50, 100, 200) bits/s
- 5 : Channel number (see Note)

NOTE Set equal to "1" or null for single channel receivers.

#### • ALR – Set alarm state

\$--ALR,hhmmss.ss,xxx,A,A,c--c\*hh<CR><LF>  
1 2 3 4 5

- 1 : Time of alarm condition change, UTC
- 2 : Unique alarm number (identifier) at alarm source
- 3 : Alarm condition (A = threshold exceeded, V = not exceeded)
- 4 : Alarm's acknowledge state, A = acknowledged / V = unacknowledged
- 5 : Alarm's description text

#### • ALF – Alert sentence

\$--ALF, x, x, x, hhmmss.ss, a, a, a, aaa, x.x, x.x, x.x, x, c---c\*hh <CR><LF>  
1 2 3 4 5 6 7 8 9 10 11 12 13

- 1 : Total number of ALF sentences for this message, 1 to 2
- 2 : Sentence number, 1 to 2
- 3 : Sequential message identifier, 0 to 9
- 4 : Time of last change
- 5 : Alert category, A or B
- 6 : Alert priority, A, W or C
- 7 : Alert state, A, S, N, O, U or V
- 8 : Manufacturer mnemonic code
- 9 : Alert identifier
- 10 : Alert instance, 1 to 999999
- 11 : Revision counter, 1 to 99
- 12 : Escalation counter, 0 to 9
- 13 : Alert text

### • ALC – Cyclic alert list

\$--ALC, xx, xx, xx, x.x, aaa, x.x, x.x, x.x,.....,aaa, x.x, x.x, x.x\*hh <CR><LF>  
                   1  2  3  4   5   6   7   8                  9

- 1 : Total number of sentences for this message, 01 to 99
- 2 : Sentence number, 01 to 99
- 3 : Sequential message identifier, 00 to 99
- 4 : Number of alert entries
- 5 : Manufacturer mnemonic code
- 6 : Alert identifier
- 7 : Alert instance
- 8 : Revision counter
- 9 : Additional Alert entries 5~8

### • ARC – Alert command refused

\$--ARC, hhmmss.ss, aaa, x.x, x.x, c\*hh <CR><LF>  
                   1                  2   3   4   5

- 1 : Time
- 2 : Manufacturer mnemonic code
- 3 : Alert identifier
- 4 : Alert instance, 1 to 999999
- 5 : Refused alert command, A, Q, O or S

### • AGL – Alert group list

\$--AGL, xx, xx, xx, c---c, ccc, x.x, x.x, ...,c---c, ccc, x.x, x.x\*hh<CR><LF>  
                   1  2  3   4   5   6   7                  8

- 1 : Total number of sentences for this message
- 2 : Sentence number
- 3 : Sequential message identifier, 00 to 99
- 4 : SFI of alert source
- 5 : Manufacturer mnemonic code
- 6 : Alert identifier
- 7 : Alert instance
- 8 : Additional alert entries 4~7

### • HBT – Heartbeat supervision sentence

\$--HBT, x.x, A, x\*hh<CR><LF>  
                   1   2  3

- 1 : Configured repeat interval
- 2 : Equipment status
- 3 : Sequential sentence identifier

### • HDT – Heading true

\$--HDT, x.x, T\*hh<CR><LF>  
                   1   2

- 1 : Heading, degrees true
- 2 : Heading, degrees true

### • THS – True heading and status

\$--THS,x.x,a\*hh<CR><LF>  
1 2

- 1 : Heading, degrees true
- 2 : Mode indicator (see Note)

NOTE Mode indicator. This field should not be null.

A = Autonomous

S = Simulator mode

V = Data not valid (including standby)

### • ROT – Rate of turn

\$--ROT, x.x, A\*hh<CR><LF>  
1 2

- 1 : Rate of turn, °/min, "-" = bow turns to port
- 2 : Status: A = data valid  
V = data invalid

### • POS – Device position and ship dimensions report or configuration command

This sentence is used to report the device position (X, Y, and Z) of the equipment such as GNSS and radar antenna installed on board a ship and the ship dimensions. The consistent common reference position (CCRP) data may also be provided. This sentence can be used to configure or report the status and can be queried. This is a command sentence.

Usage is defined in equipment standards. Possible application may be to transmit this sentence at power up and repeatedly at 3 s interval.

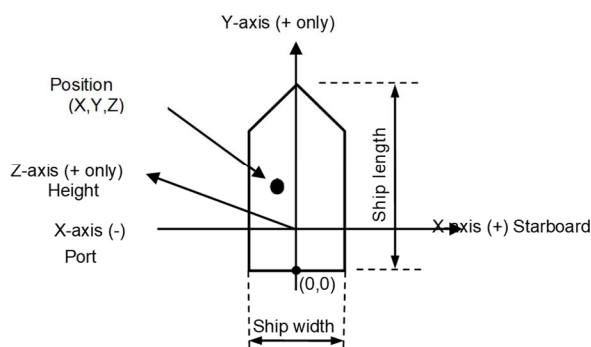
\$--POS,cc,xx,a,x.x,x.x,x.x,a,x.x,x.x,a\*hh<CR><LF>  
1 2 3 4 5 6 7 8 9 10

- 1 : Equipment identification 1)
- 2 : Equipment number 00 to 99 2)
- 3 : Position validity flag 3)
- 4 : Position X-coordinate (m) 4)
- 5 : Position Y-coordinate (m) 4)
- 6 : Position Z-coordinate (m) 4)
- 7 : Ship's width/length) Valid/Invalid 3)
- 8 : Ship's width (m) 4)
- 9 : Ship's length (m) 4)
- 10 : Sentence status flag 5)

Comments:

- 1) Equipment Identification is the talker ID
- 2) Equipment number starts from one to maximum same equipment number. (e.g. 1 = Radar 1, 2 = Radar 2 ) Equipment number "0" is used for CCRP position (see IMO MSC.252(83)).
- 3) A (Valid) is used for configured device. V (Invalid) is for testing or unconfigured device. This field should not be NULL.
- 4) X , Y and Z coordination system.
  - a) Origin (0,0) is located at the centre of the ship's aft most point.
  - b) X-component: positive value (starboard), negative value (port) or zero (centre).
  - c) Y-component: positive value or zero (forward distance from the ship's stern).
  - d) Z-component: positive value (height from IMO summer load line, see IMO International Convention on Load Lines).
- e) The ship's length corresponds to maximum overall length.

- 5) This field is used to indicate a sentence that is a status report of current settings or a configuration command changing settings. This field should not be null.  
 R = Sentence is a status report of current settings (use for a reply to a query).  
 C = Sentence is a configuration command to change settings. A sentence without "C" is not a command.



### •DDC – Display dimming control

The DDC sentence provides controls for equipment display dimming presets and a display brightness percentage.

\$--DDC,a,xx,a,a\*hh<CR><LF>  
 1 2 3 4

- 1 : Display dimming preset 1)
- 2 : Brightness percentage 00 to 99 2)
- 3 : Colour palette 3)
- 4 : Sentence Status Flag 4)

Comments:

1) The display dimming preset field contains an indicator that may be associated with a preset dimmed level on an electronic device.

D = Day time setting K = Dusk setting

N = Night time setting

O = Backlighting off setting

Actual display brightness levels for the display dimming preset indicators above are dependant upon the capabilities provided by the manufacturer of the equipment. Proper use of this field would be as follows. A device provides the operator or user with the ability to set a brightness level to be associated with day, dusk night, etc. Upon receipt of the DDC sentence, the device would switch its display brightness to the preset value the operator had determined for the corresponding indicator value. If the equipment had no brightness or dimming preset capability this field would be ignored.

2) The brightness percentage field contains a value from zero to ninety nine. The value zero, provided as 00, indicates that the display's brightness should be set to its most dimmed level, as determined by the capabilities of the equipment. The value ninety nine, provided as 99, indicates that the display brightness should be set to the brightest level, as determined by the capabilities of the equipment. Values between 0 and 99 correspond to some percentage of brightness, as determined by the equipment receiving this sentence.

3) The colour palette preset field contains an indicator that may be associated with a preset dimmed level on an electronic device.

D = Day time setting K = Dusk setting

N = Night time setting

O = Backlighting off setting

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

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

C = Sentence is a configuration command to change settings. A sentence without "C" is not a command.

## •HRM – heel angle, roll period and roll amplitude measurement device

This sentence is used to provide the actual heel angle, roll period and roll amplitude of an electronic inclinometer to VDRs and other systems. Update rate for this message should be at least 5 Hz.

This sentence optionally provides roll peak hold values and their reset time as well. Roll peak hold value is the value indicated by friction pointers of conventional pendulum inclinometers.

In addition to the requirements of the IMO performance standard of electronic inclinometers, roll peak hold values may also be indicated on the displays of an electronic inclinometer. Roll peak hold value is the maximum absolute value of roll amplitude of port side and starboard side from the last reset time of peak hold value. The roll peak hold values are indicated as the value of the friction pointers of pendulum inclinometers and used for decision making in case of sailing under a severe weather condition. The optional values are provided for indicating information on roll peak hold values on dedicated displays or the other displays of integrated bridge systems.

\$--HRM,x,x,x,x,x,x,x,x,A,x,x,x,hhmmss.ss,xx,xx\*hh<sup>1</sup>CR<sup>2</sup><sup>3</sup><sup>4</sup>LF >  
1 2 3 4 5 6 7 8 9 10

- 1 : Actual heel angle, degrees 1)
- 2 : Roll period, seconds 2)
- 3 : Roll amplitude, port side, degrees 3)
- 4 : Roll amplitude, starboard side, degrees 4)
- 5 : Status 5)
- 6 : Roll peak hold value, port side, degrees 6)
- 7 : Roll peak hold value, starboard side, degrees 7)
- 8 : Peak hold value reset time 8)
- 9 : Peak hold value reset day, 01 to 31 9)
- 10 : Peak hold value reset month, 01 to 12 10)

### Comments:

- 1) Actual heel angle, momentary angle of roll referenced to a levelled ship to port or starboard side, (positive value starboard, negative value port).
- 2) Roll period, time between successive maximum values of heel angle to port over starboard and back to port (or the other way round).
- 3) Roll amplitude of port side as positive value, maximum value of heel angle to port side of the latest motion.
- 4) Roll amplitude of starboard side, maximum value of heel angle to starboard side of the latest motion.
- 5) Status, A=data valid, V=data invalid
- 6) Roll peak hold value of port side, maximum value of heel angle to port side of the motions measured from the last reset with a minimum resolution of 1 degree. This shall be a null field when data is not available.
- 7) Roll peak hold value of starboard side, maximum value of heel angle to starboard side of the motions measured from the last reset with a minimum resolution of 1 degree. This shall be a null field when data is not available.
- 8) Peak hold value reset time, time when the peak hold values are reset, UTC hour, minute and second. Decimal point and fractions of the seconds shall not be used. This shall be a null field when data is not available.
- 9) Peak hold value reset day, day when the peak hold values are reset, UTC day. This shall be a null field when data is not available.
- 10) Peak hold value reset month, month when the peak hold values are reset, UTC month. This shall be a null field when data is not available.

## Input Sentence

### • HBT – Heartbeat supervision sentence

\$--HBT, x.x, A, x\*hh<CR><LF>  
1 2 3

- 1 : Configured repeat interval
- 2 : Equipment status
- 3 : Sequential sentence identifier

### • ACK – Acknowledge alarm

\$--ACK,xxx\*hh<CR><LF>  
1

- 1 : Unique alarm number (identifier) at alarm source

### • ACN – Alert command

\$--ACN, hhmmss.ss, aaa, x.x, x.x, c, a\*hh <CR><LF>  
1 2 3 4 5 6

- 1 : Time
- 2 : Manufacturer mnemonic code
- 3 : Alert Identifier
- 4 : Alert Instance, 1 to 999999
- 5 : Alert command, A, Q, O or S
- 6 : Sentence status flag, fixed C

### • POS – Device position and ship dimensions report or configuration command

Refer to input sentence.

\$--POS,cc,xx,a,x.x,x.x,x.x,a,x.x,x.x,a\*hh<CR><LF>  
1 2 3 4 5 6 7 8 9 10

- 1 : Equipment identification
- 2 : Equipment number 00 to 99
- 3 : Position validity flag
- 4 : Position X-coordinate (m)
- 5 : Position Y-coordinate (m)
- 6 : Position Z-coordinate (m)
- 7 : Ship's width/length) Valid/Invalid
- 8 : Ship's width (m)
- 9 : Ship's length (m)
- 10 : Sentence status flag

- DDC – Display dimming control

Refer to input sentence

```
$--DDC,a,xx,a,a*hh<CR><LF>  
  1 2  3 4
```

- 1 : Display dimming preset
- 2 : Brightness percentage 00 to 99
- 3 : Colour palette
- 4 : Sentence Status Flag

## Appendix 6 Compass Safe Distance

| No | Name          | Model     | Compass Safe Distance [m] |          |
|----|---------------|-----------|---------------------------|----------|
|    |               |           | Standard                  | Steering |
| 1  | Dimmer        | NCM-227   | 0.1                       | 0.1      |
| 2  | Printer       | NKG-104   | 0.8                       | 0.5      |
| 3  | Select Switch | NCZ-777   | 0.2                       | 0.1      |
| 4  | Select Switch | NCZ-1663  | 0.1                       | 0.1      |
| 5  | Select Switch | NCZ-1537B | 0.2                       | 0.1      |
| 6  | Junction Box  | NQE-7700A | 0.2                       | 0.1      |
| 7  | Output Buffer | NQA-4251A | 0.1                       | 0.1      |
| 8  | Output Buffer | NQA-4351  | 0.1                       | 0.1      |
| 9  | Junction box  | CQD-10    | 0.3                       | 0.2      |

## **Appendix 7   Precautions for Galileo**

1. This product has the Galileo receiver function. "JLR-41/JLR-4101 powered by Galileo."
2. Products using Galileo must comply with "Annex H: Authorisation Concerning the OS SIS ICD" of the Galileo signal specifications "The European GNSS (Galileo) Open Service Signal-In-Space Interface Control Document Issue 2.1".

For the latest information on Galileo signal specifications, refer to the URL (<https://www.gsc-europa.eu/electronic-library/programme-reference-documents>).

3. Do not export this product to EU sanctioned or embargoed countries.  
Ensure that the same consideration is taken when agents and distributors of the export destination countries further export the product to other countries.

## **Appendix 8 Open Source Restrictions**

### **• RTKLIB 2.4.3**

This product uses open source software (RTKLIB 2.4.3).

Therefore, the customer must also comply with the following license conditions under the copyright law. The following is the rights notice (Copyright (c) 2007-2013, ...) and the original license conditions as of March 23, 2018. For the latest information, check the URL (<http://www.rtklib.com/>)

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- (deleted) (2014/01/29)

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电器电子产品有害物资申明  
日本无线株式会社

Declaration on hazardous substances  
of Electrical and electronic Products  
Japan Radio Company Limited

有害物质的名称及含量  
(Names & Content of hazardous substances)

形式名(Type): JLR-41

名称(Name): GNSS Compass

| 部件名称<br>(Part name)                                                                      | 有害物质<br>(Hazardous Substances) |           |           |                 |               |                 |
|------------------------------------------------------------------------------------------|--------------------------------|-----------|-----------|-----------------|---------------|-----------------|
|                                                                                          | 铅<br>(Pb)                      | 汞<br>(Hg) | 镉<br>(Cd) | 六价铬<br>(Cr(VI)) | 多溴联苯<br>(PBB) | 多溴二苯醚<br>(PBDE) |
| 室外装置<br>(Extanally Mounrted Equipment)                                                   | ○                              | ○         | ○         | ○               | ○             | ○               |
| 室内装置<br>(Internally Mounted Equipment)                                                   | ×                              | ○         | ○         | ○               | ○             | ○               |
| 外部设备(Peripherals)<br>▪ 打印机(Printer)<br>▪ 选择(Options)<br>▪ 电线类(Cables)<br>▪ 手册(Documents) | ×                              | ×         | ×         | ×               | ×             | ×               |

本表格依据SJ/T 11364 的规定编制。

(This table is prepared in accordance with the provisions of SJ/T 11364.)

○：表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572 标准规定的限量要求以下。

(Indicates that this hazardous substance contained in all of the homogeneous materials for this part is below the requirement in GB/T 26572.)

×

表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572 标准规定的限量要求。

(Indicates that this hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in GB/T 26572.)

RE：中华人民共和国电器电子产品有害物质限制使用管理办法  
Measures for the Administration of the Restricted Use of the Hazardous Substances Contained in Electrical and Electronic Products of the People's Republic of China

## Appendix 10 Guidelines for Cybersecurity

### 1. Security Configuration Guideline

This chapter provides security configuration guidelines for the target equipment to ensure its secure installation. It outlines both the internal security configuration of the target equipment and external security considerations, enabling the application and maintenance of a defense-in-depth strategy. These measures are designed to enhance the overall security state of the equipment and protect it against threats.

#### 1.1. Equipment Security Configuration

This section outlines the security-related configurations of the target equipment.

##### 1.1.1. General

The security-related configurations of the target equipment are designed to be minimal to simplify setup and ensure robust protection. Security features without configurable options are enabled by default to provide a secure state upon installation.

##### 1.1.2. Network Configuration

###### 1.1.2.1. Network Interface Configuration

- Network interface can be enabled and disabled by the service engineer.

###### 1.1.2.2. IP Address

The IP address is configured by an authorized service engineer. Crew members are not permitted to change the IP address. If changes are necessary, contact the responsible sales representative.

##### 1.1.3. User Authentication

Authentication codes for ship crew members are as follows:

| Account         | Default Password | Change Method                                                                                                                       |
|-----------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Authorized crew | 00000000         | 1) Open "MENU -> CODE INPUT" and input the password for authorized crew.<br>2) Open "MENU -> SYSTEM" and push PASSWD CHANGE button. |

Change the default password and manage it according to the ship's security policy.

##### 1.1.4. Software Management

The equipment software is updated to the latest version by an authorized service engineer during installation. For software updates after the ship's delivery, refer to the document "Security Maintenance and Verification (Rev.1.0)".

### 1.2. External Security Considerations

This chapter outlines the external security considerations for the target equipment. Implementing these measures will help ensure enhanced security. Any external security requirements that are essential for compliance with IACS UR E27 will be explicitly stated.

#### 1.2.1. Installation Location

The target equipment should be installed in an access-controlled area to prevent unauthorized physical access.

#### 1.2.2. Network Connection

The target equipment should be connected to a managed network. Direct connection to unmanaged networks, such as the internet, should be avoided to ensure the security of the network.

## **2. Security Maintenance and Verification**

This chapter provides procedures for maintaining and verifying the security functions of the target equipment. It supports secure and reliable operations of the target equipment.

### **2.1. Maintenance Procedures**

#### **2.1.1. Software Version Check**

The current software version installed on the equipment can be verified by following the procedures:

- Open [MENU]>[VERSION] and confirm software version.

#### **2.1.2. Software Update Check**

To ensure the equipment operates with the latest security capabilities, check the latest software version available for the target equipment. This information will be available on the JRC's official website at the beginning of 2026.

If the installed version does not match the latest version listed on the website, review the update information and perform the necessary software update.

#### **2.1.3. Alert Status Check**

The target equipment is designed to comply with performance standards and will generate an alert if an essential function is compromised. Regularly review any active alerts to ensure that no critical issues are occurring with the equipment.

If any alerts cannot be resolved or if there are unresolved issues, contact JRC for further assistance. Providing detailed information about the alerts and any observations will help ensure a prompt response.

#### **2.1.4. System and Data Backup**

In case of a cyber incident, an authorized service engineer will restore the target equipment to its previous safe state. Backup operations by ship crew members are not required.

### **2.2. Verification Procedures**

This chapter describes the verification procedures for representative security functions of the target equipment, assuming that the verification will be carried out by crew members during normal operation.

#### **2.2.1. The password strength**

- 1) Open "MENU -> CODE INPUT" and input the password for authorized crew.
- 2) Open "MENU -> SYSTEM -> PASSWD CHANGE" and input the password with less than 8 characters.
- 3) Confirm that pop-up displays and fails to change password.

#### **2.2.2. Protection for unused LAN ports**

If the LAN port is unused, the LAN port is set to disabled when equipped. If equipped with a LAN port blocker, see "Physical Security Check".

- 1) Connecting to a disabled LAN port.
- 2) Confirm that the network does not link.

#### **2.2.3. Physical Security Check**

If the LAN port blocker has been equipped, please ensure that it is securely locked.

### **3. Incident Response and Recovery**

This chapter provides procedures and instructions for responding to suspected security incidents with the target equipment. It outlines actions such as network isolation, forensic analysis, and controlled shutdown to ensure the equipment's integrity in case of a cyber incident.

#### **3.1. Procedures and Instructions**

##### **3.1.1. Local Independent Control**

The target equipment can continue to use the essential functions specified in the performance standards even if the network connection is lost.

Note that the following functions, which require network connectivity, will become unavailable when the network is disconnected:

- IEC 61162-450 sentence transmit and reception

##### **3.1.2. Network Isolation**

To isolate the network, disconnect the LAN cable of the display unit.

##### **3.1.3. Forensics and Audit Records**

The security logs of the target equipment can be accessed and reviewed by all users. In case of suspected security incidents on the target equipment, follow the steps below to check the security log. For any uncertainties or questions, contact JRC for assistance.

1. Open "MENU>SYSTEM>SYSTEM LOG".
2. Check the logs for the required period.

Note that the target equipment complies with its performance standards and generates an alert if an essential function is compromised.

##### **3.1.4. Deterministic Output**

###### **3.1.4.1. Traffic-Based Network Link Control**

When high traffic is detected at the LAN port, the equipment will automatically disable the network link for a minute, effectively stopping network output.

When the LAN port is unavailable, allowing operations to continue on other functions.

###### **3.1.4.2. Shutdown to Disable Network Output**

If a cyber incident is suspected, shutting down the equipment will stop network output. This guarantees that no unexpected behavior occurs during power loss or shutdown.

##### **3.1.5. Backup and Restore**

Backup and restore operations are performed by an authorized service engineer. If equipment restoration is required, contact JRC to request the service.

##### **3.1.6. Controlled Shutdown, Reset, Roll-back, and Restart**

For controlled shutdown and restart, perform the shutdown and startup operations according to the instruction manual of the target equipment. This procedure ensures a safe shutdown and restart.

For reset and roll-back, the software is stored in ROM, ensuring that the legitimate software always starts after a reboot. Note that only an authorized service engineer is permitted to rewrite the ROM.

#### **3.2. Reporting Security Incidents**

If a cyber incident is suspected for the equipment, contact JRC. Providing detailed information about the incident and any observations will help ensure a prompt response.



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*Since 1915*

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ISO 9001, ISO 14001 Certified

CODE No. P00011567A

NOV. 2025 Edition 2