JLR-41/JLR-4101
NWZ-1680

GNSS COMPASS

INSTRUCTION MANUAL

JRC Japan Radio Co., Ltd.

● Safety Precautions ●

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 accidently 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.

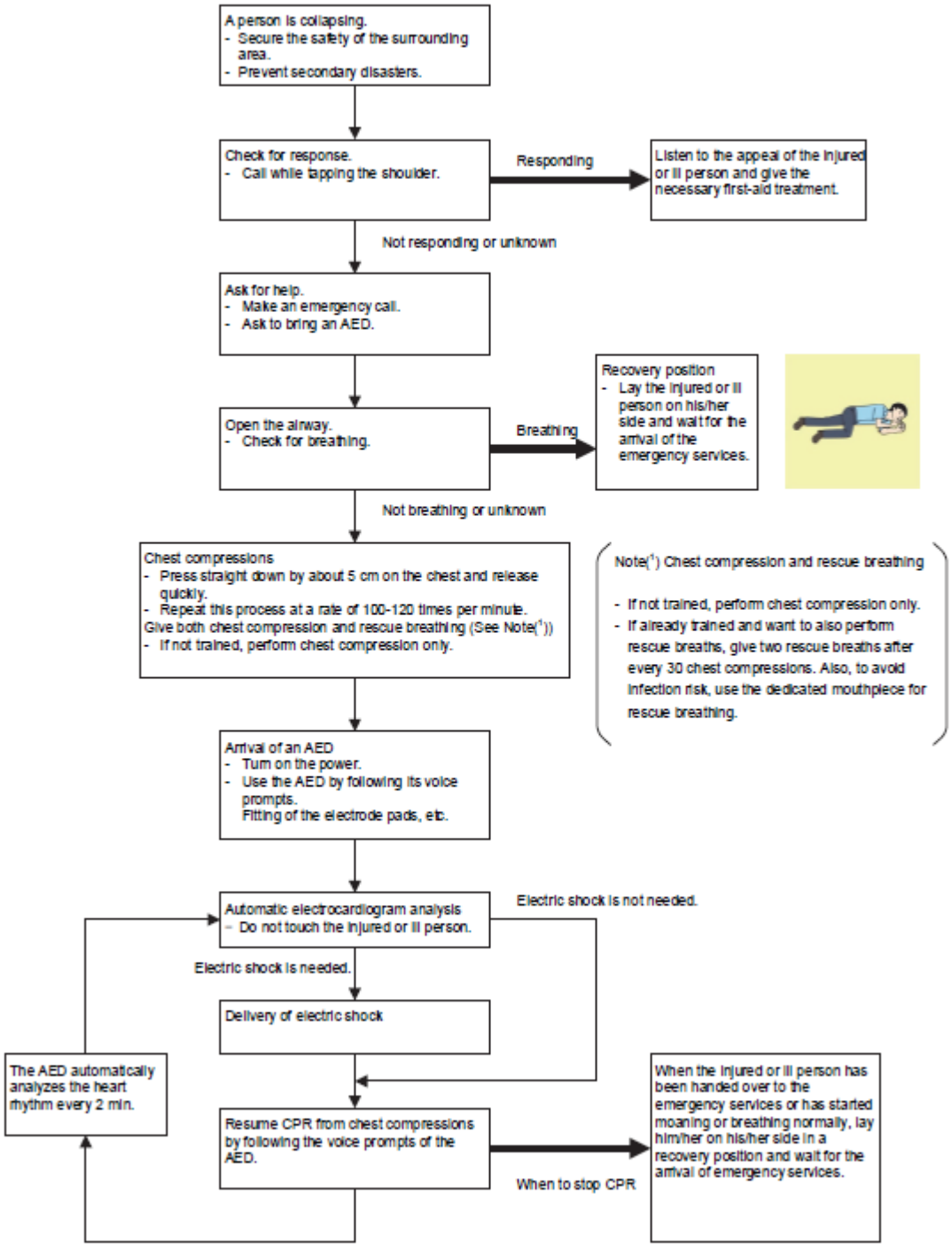
Precautions for rescuing victims from electrocution

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

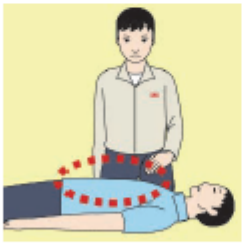
1. Check the scene for safety to prevent secondary disasters
   a) Do not touch the injured or ill person in panic when an accident has occurred. (Doing so may cause electric shock to the first-aiders.)
   b) Do not panic and be sure to turn off the power. Then, gently move the injured or ill person 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.

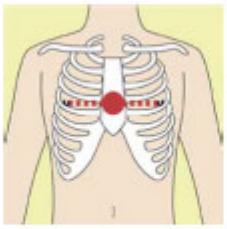
4. If not responding
   a) Ask for help loudly. Ask somebody to make an emergency call and bring an AED.
      - Somebody has collapsed. Please help.
      - Please call an ambulance.
      - Please bring an AED.
      - If there is nobody to help, call an ambulance yourself.

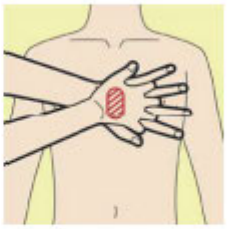
5. Check for breathing
   a) Look to see if the chest and abdomen are rising and falling.



   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.

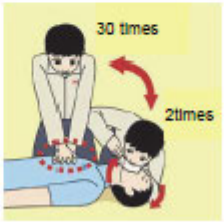
6. Cardiopulmonary resuscitation (CPR) (Combination of chest compressions and rescue breaths)
   a) Chest compressions
      1) Position of chest compressions
         • Position the heel of one hand in the center of the chest, approximately between the nipples, and place your other hand on top of the 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.

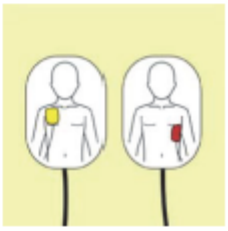
   b) Combination of 30 chest compressions and 2 rescue breaths
      1) If not trained, perform the chest compressions only.
      2) If already trained and want to also perform rescue breaths, give two rescue breaths after every 30 chest compressions.
      3) To avoid infection risk, use the dedicated 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.

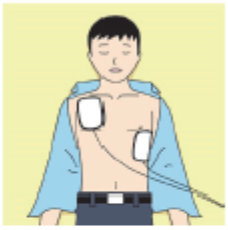


7. When to stop cardiopulmonary resuscitation (CPR)
   a) When the injured or ill person has been handed over to the emergency services
   b) When the injured or ill person has started moaning or breathing normally, lay him/her on his/her side in a recovery position and wait for the arrival of emergency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

8. Arrival and preparation of an AED
   a) Place the AED at an easy-to-use position. If there are multiple first-aiders, continue CPR until the AED becomes ready.
   b) 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.
   c) Follow the voice prompts of the AED.

9. Attach the electrode pads to the injured or ill person's bare chest
   a) Remove all clothing from the chest, abdomen, and arms.
   b) 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.
   c) Some AED models require to connect a connector by following voice prompts.
   d) The electrode pads for small children should not be used for children over the age of 8 and for adults.





10. Electrocardiogram analysis
   a) 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.
   b) 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.


Press the shock button.

12. Resume cardiopulmonary resuscitation (CPR)

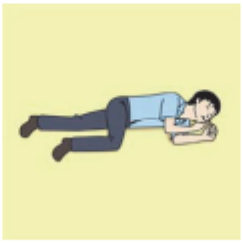
a) Resume CPR by following the voice prompts of the AED.
   - Perform uninterrupted chest compressions at the rate of about 100-120 times per minute.
   - With each compression, depress the chest wall to a depth of approximately 5 cm.

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.

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 △ 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 ⃠ 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 ● 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 φ 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.

Contents

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	

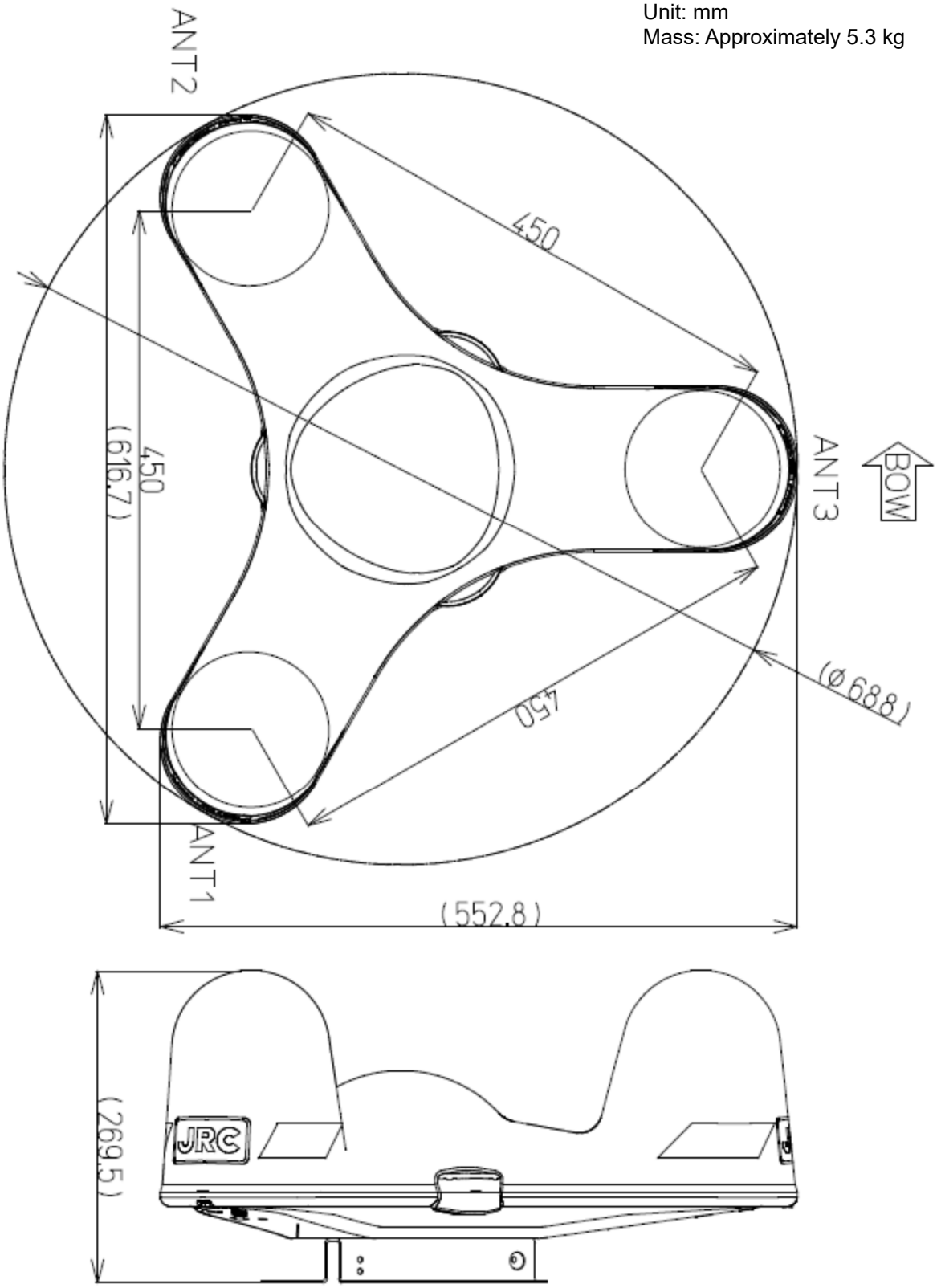
1.3.2 Option

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 DC24V Output
22	Conversion cable	P00014414	1	For sensor replace

1.4 Construction

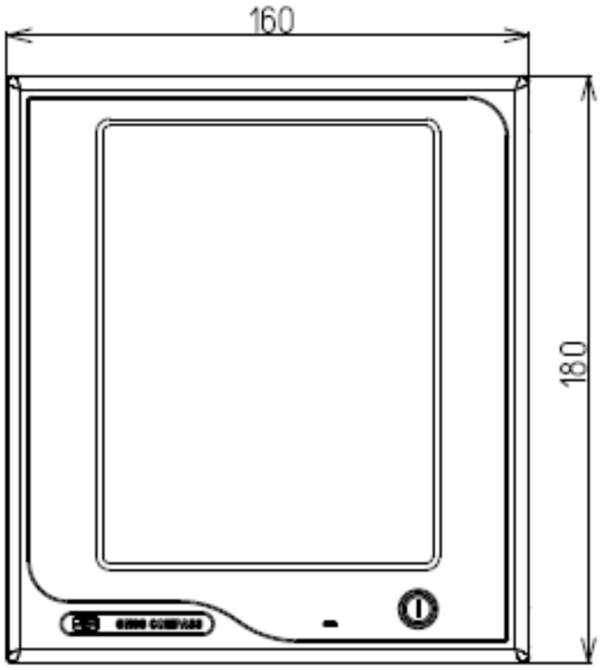
JLR-4101 Sensor

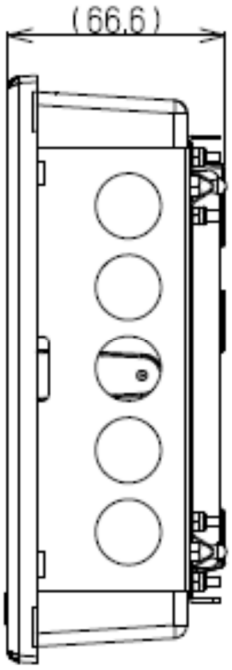
Unit: mm
Mass: Approximately 5.3 kg



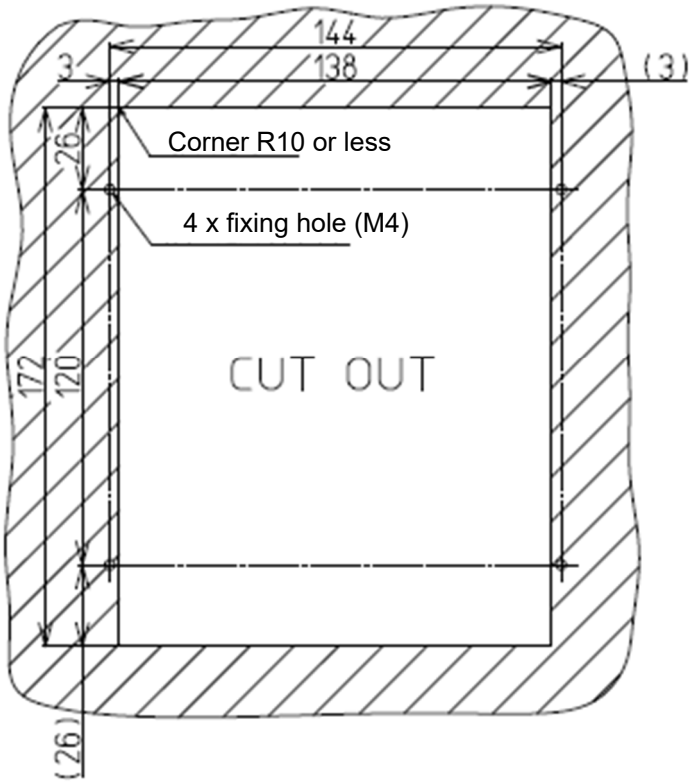
NWZ-1680 Display Unit (Flush mount kit)

Unit: mm
Mass: Approximately 1.3 kg

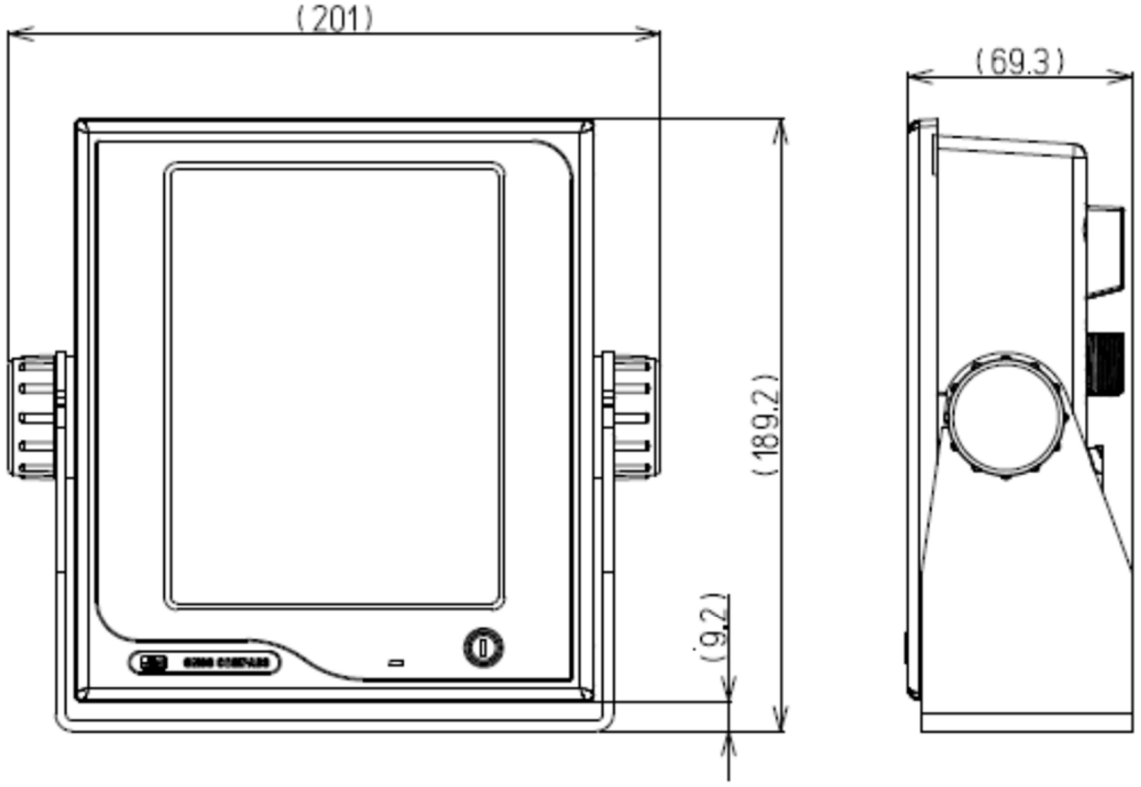


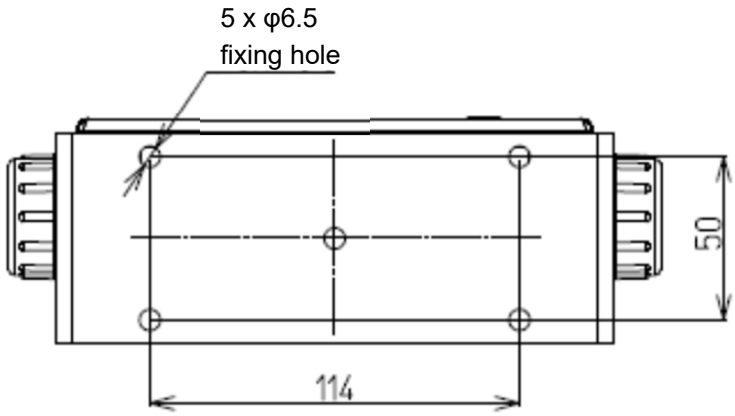


Flush-mount installation
panel cut holes



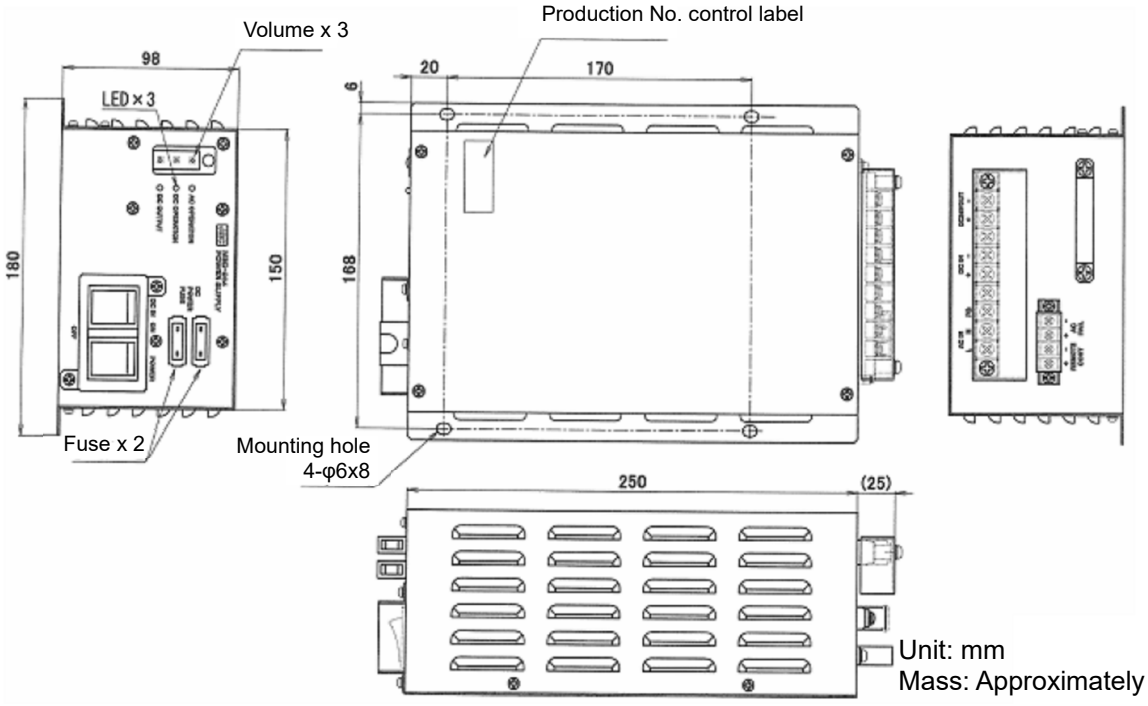
Unit: mm
Mass: Approximately 1.8 kg





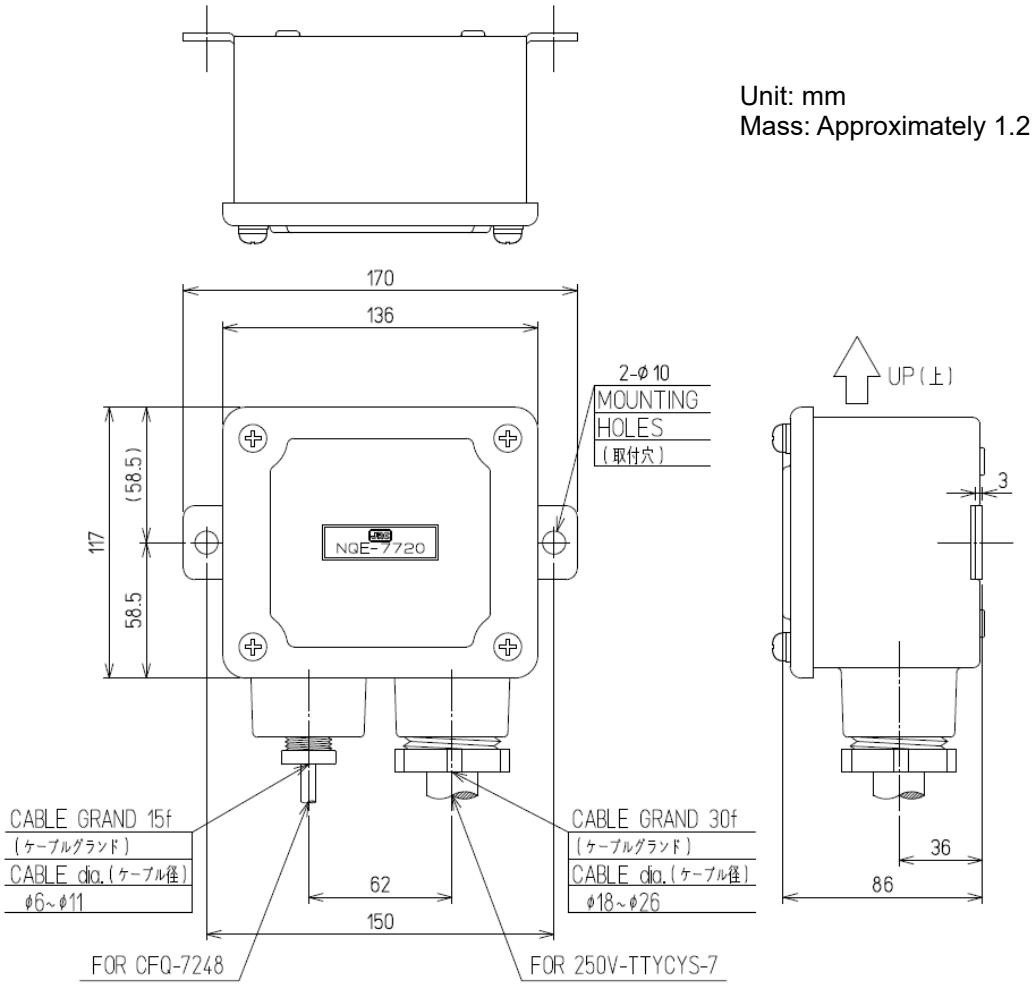
* Base kit is an option.

NBD-904 AC/DC power supply unit

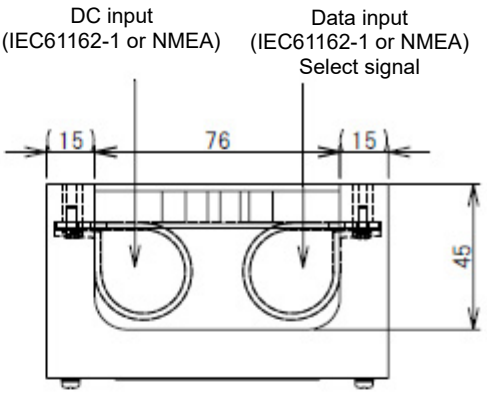


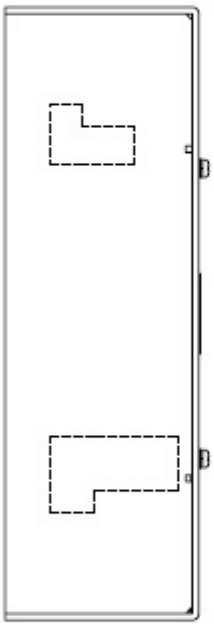
Unit: mm
Mass: Approximately 2.6 kg

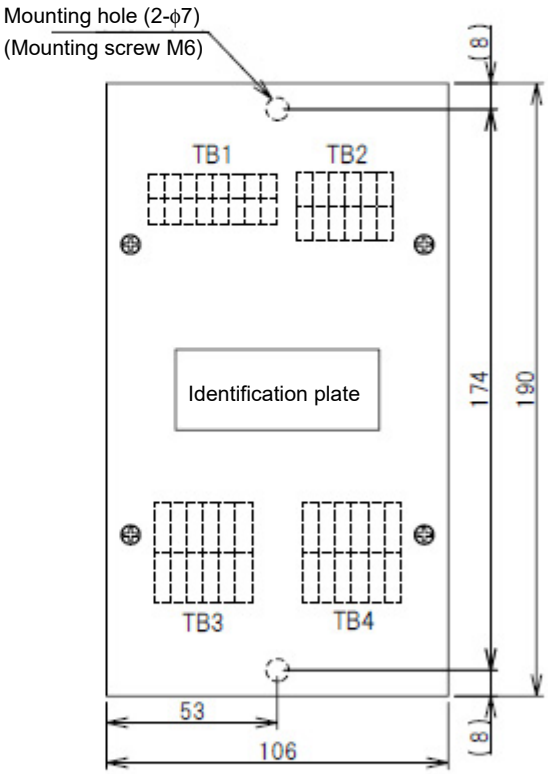
NQE-7720 Junction box



Unit: mm
Mass: Approximately 1.2 kg

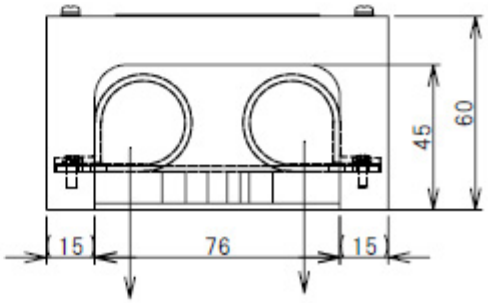






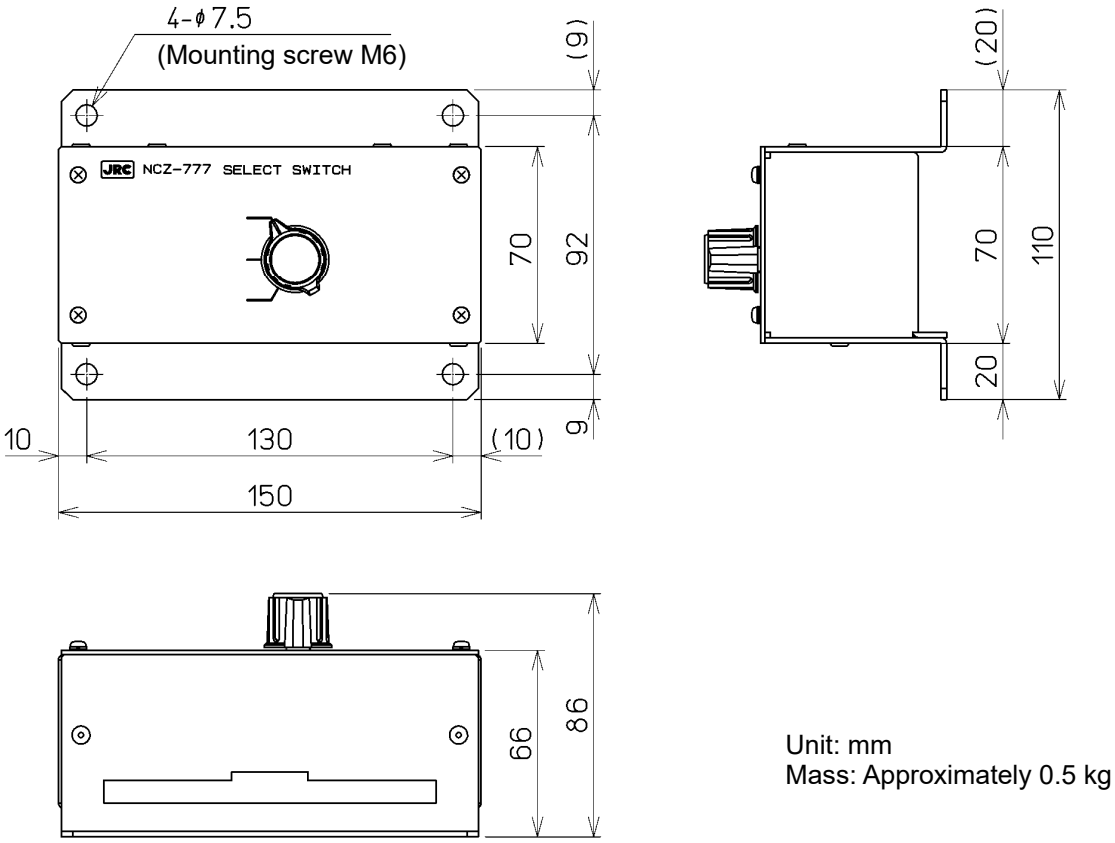
Note:

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



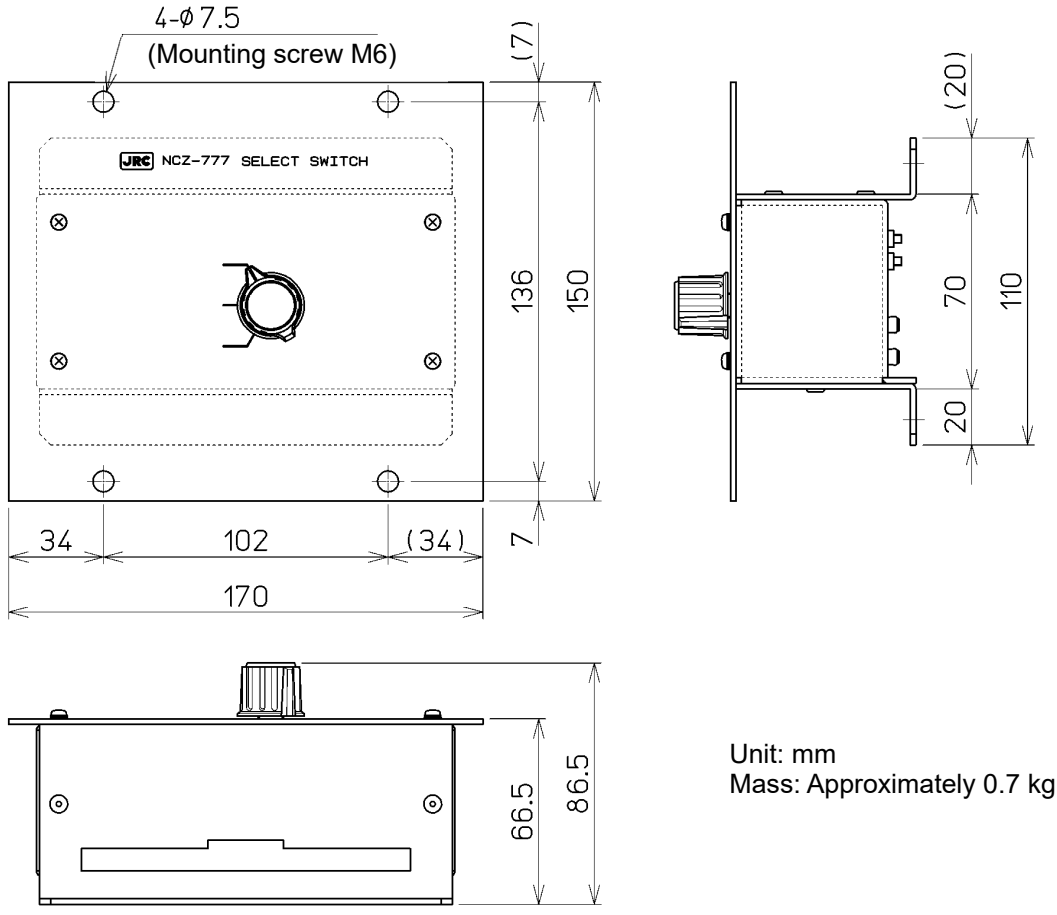
Unit: mm
Mass: Approximately 0.8 kg

NCZ-777 Select switch (Stationary)



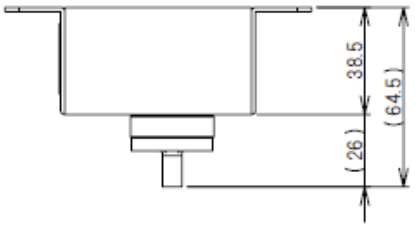
Unit: mm
Mass: Approximately 0.5 kg

NCZ-777 Select switch (Flush mount)

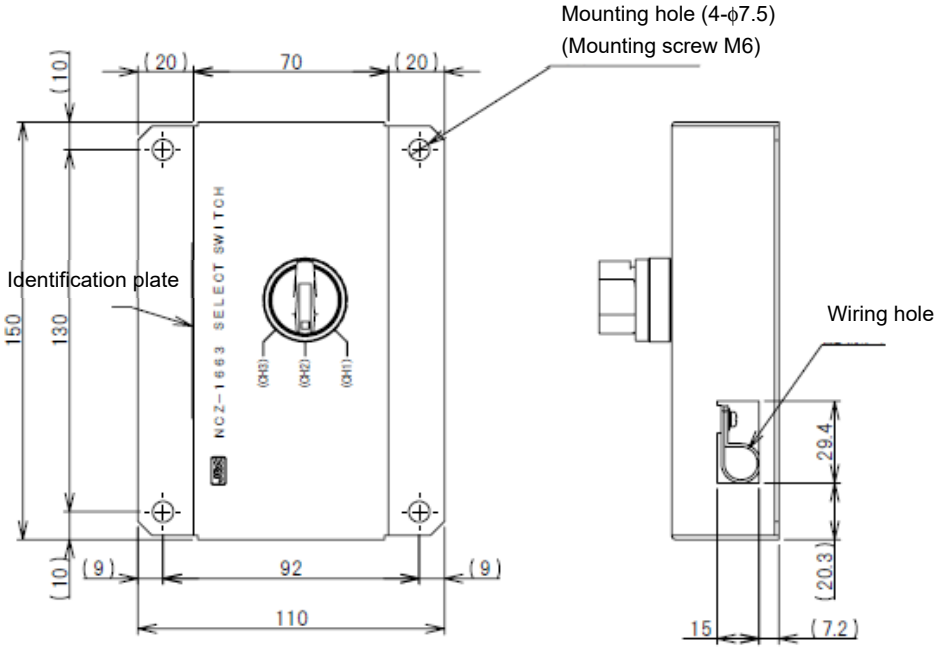


Unit: mm
Mass: Approximately 0.7 kg

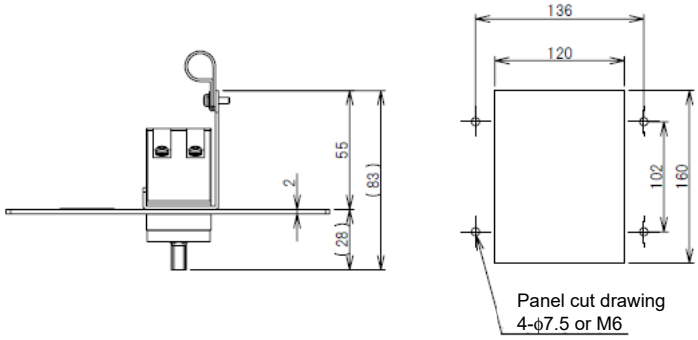
NCZ-1663 Select switch (Stationary)

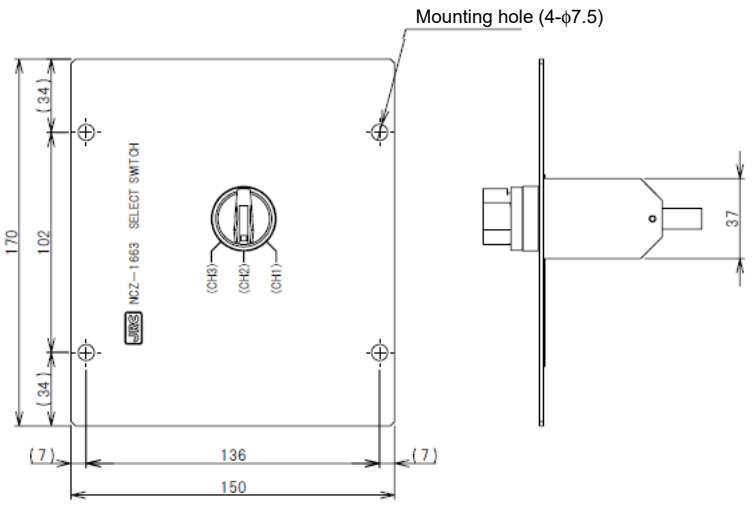


Unit: mm
Mass: Approximately 0.2 kg



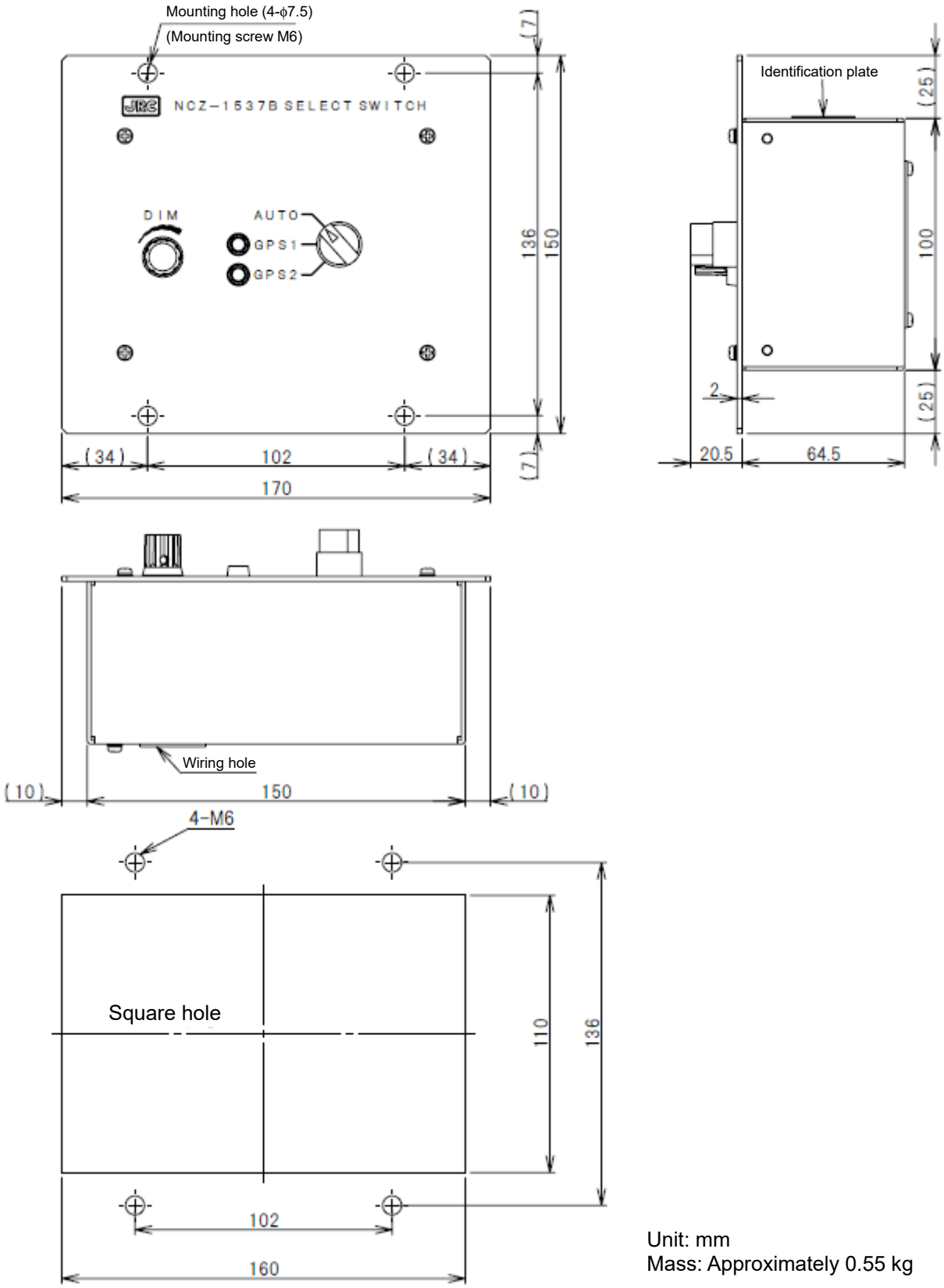
NCZ-1663 Select switch (Flush mount)





Unit: mm
Mass: Approximately 0.2 kg

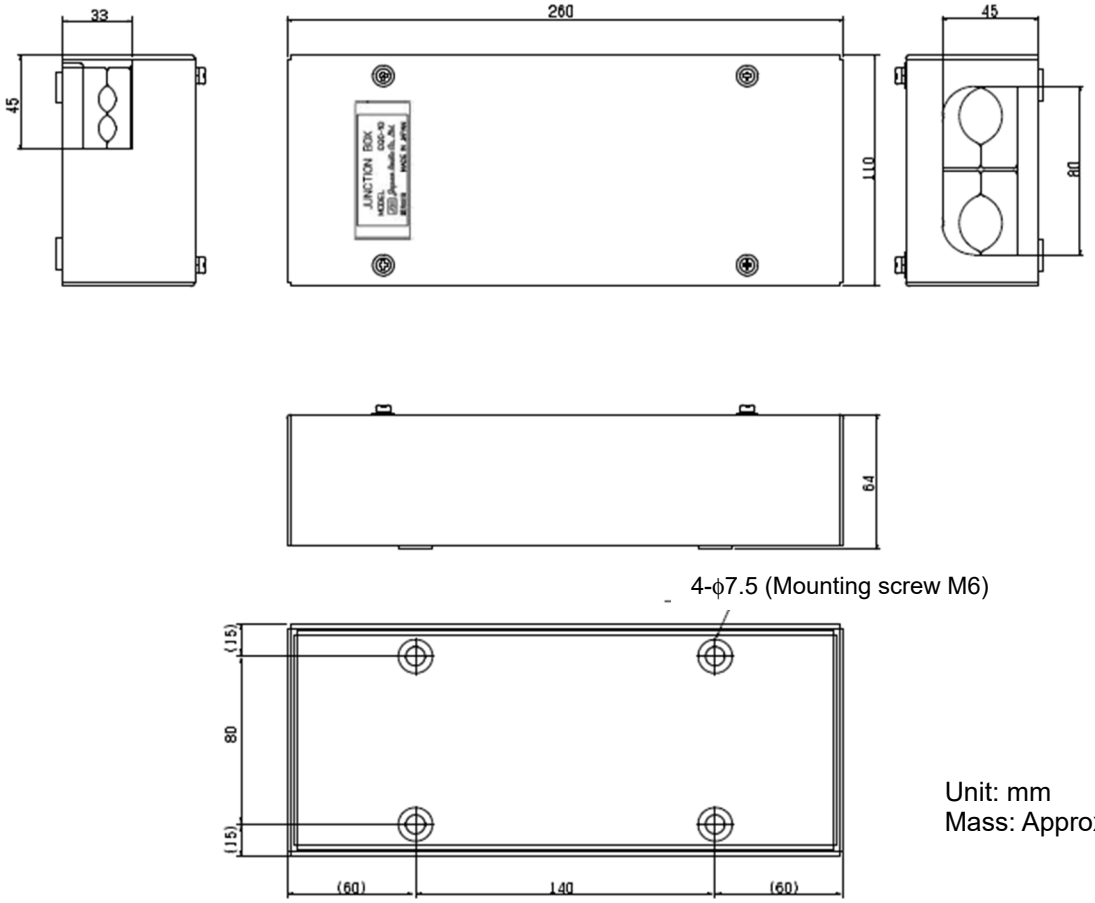
NCZ-1537B Select switch (Flush mount)



Panel cut drawing

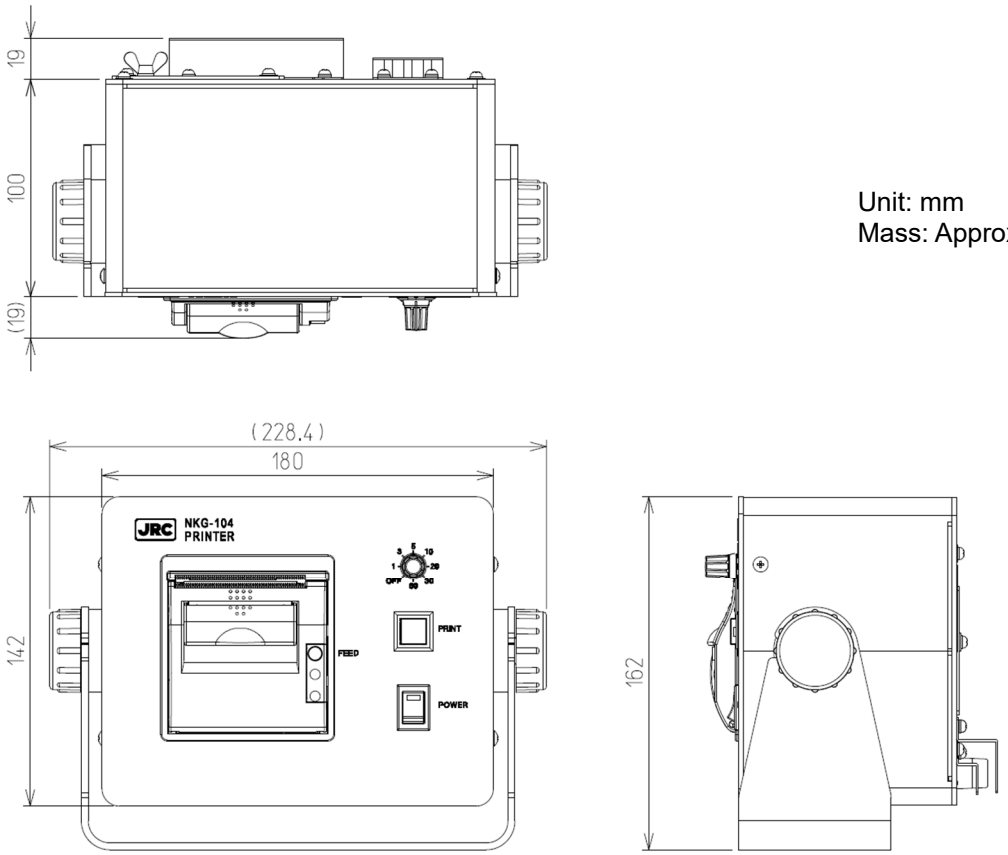
Unit: mm
Mass: Approximately 0.55 kg

CQD-10 Junction box



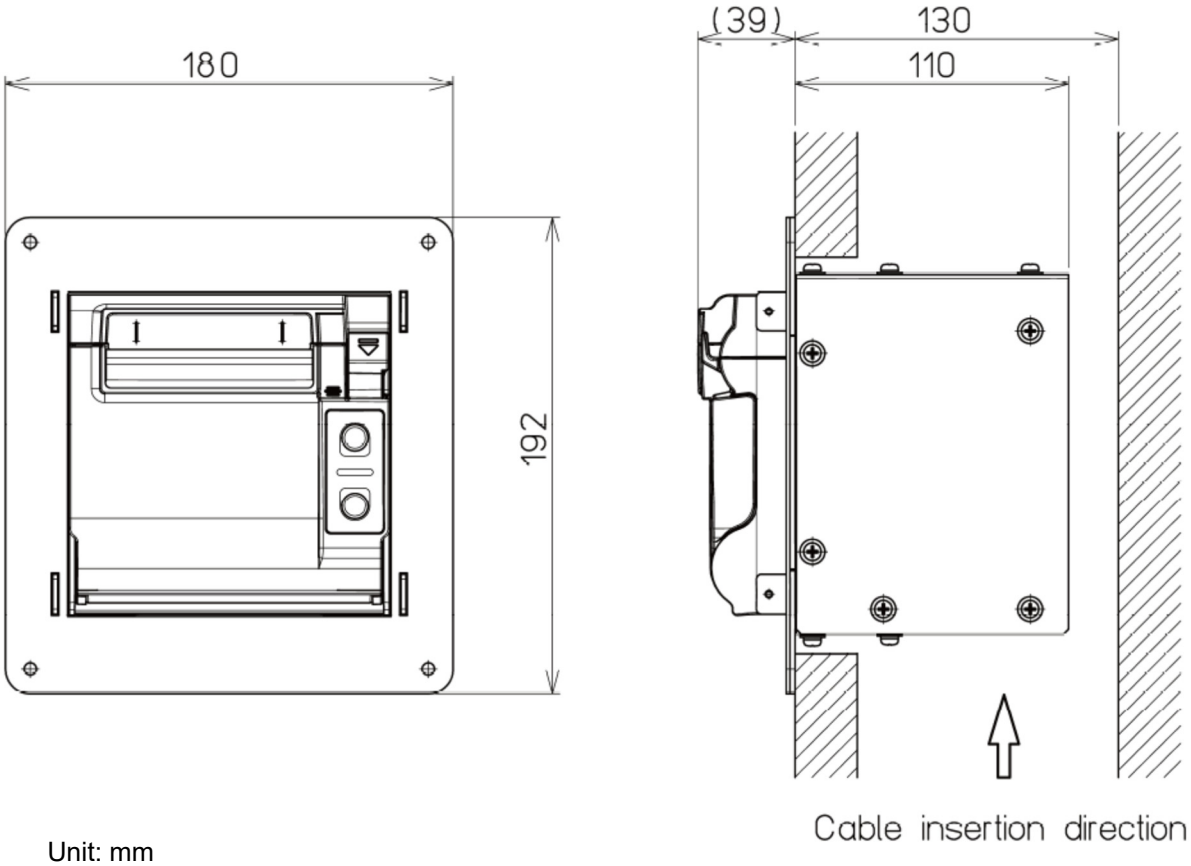
Unit: mm
Mass: Approximately 1.1 kg

NKG-104 Printer



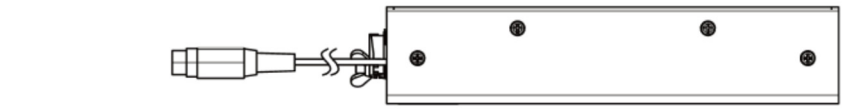
Unit: mm
Mass: Approximately 2.1 kg

RP-D10 Network printer

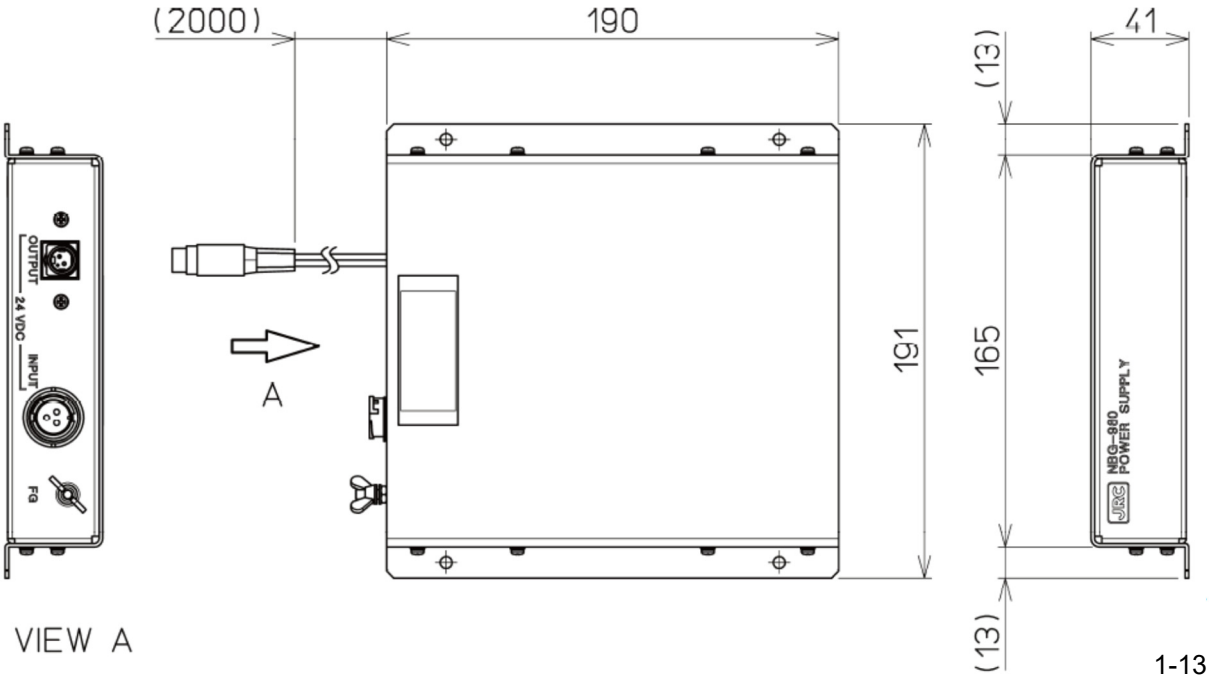


Unit: mm
Mass: Approximately 1.5 kg
* Excluding printer paper

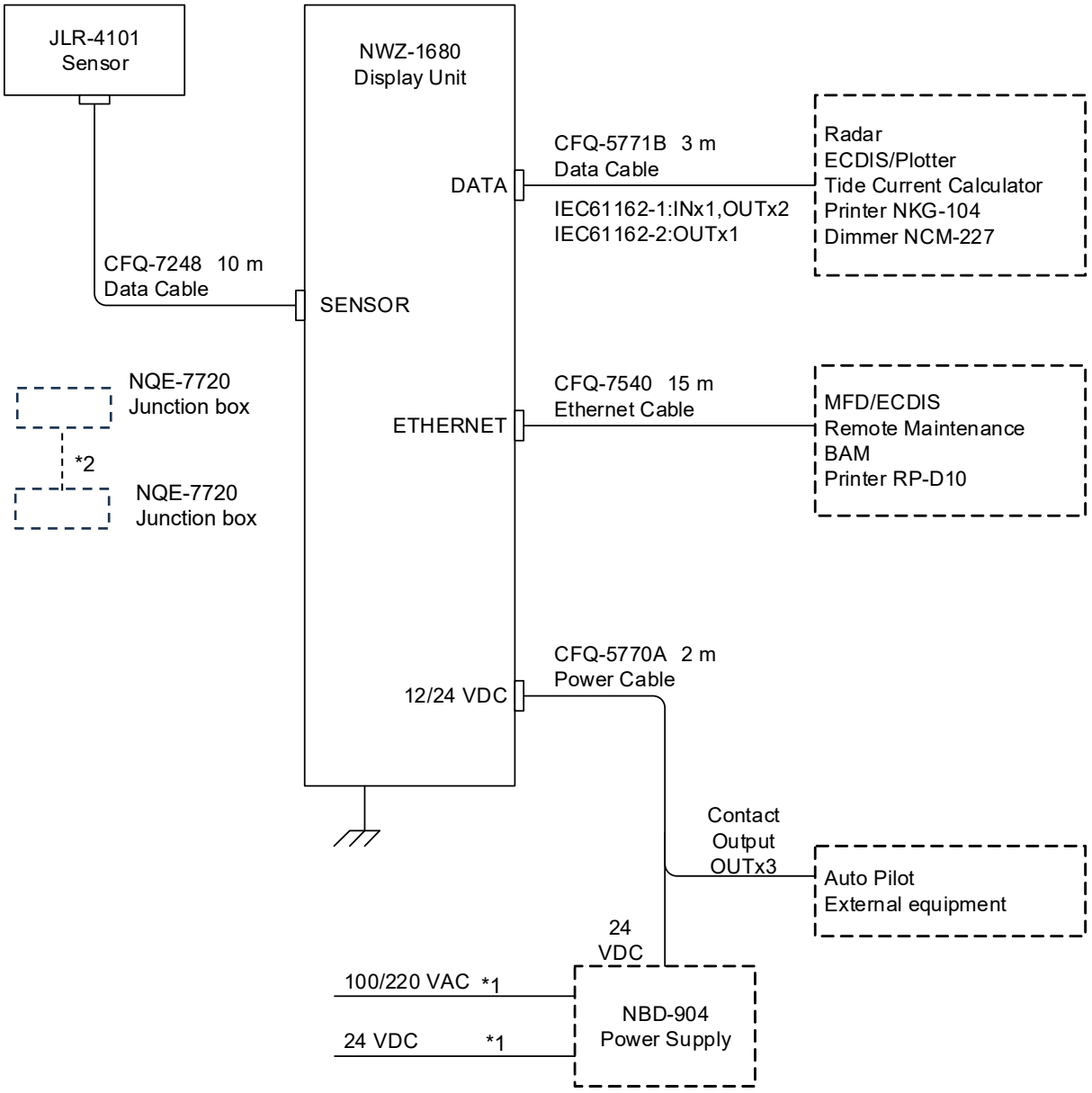
NBG-980 Power supply



Unit: mm
Mass: Approximately 1.0 kg



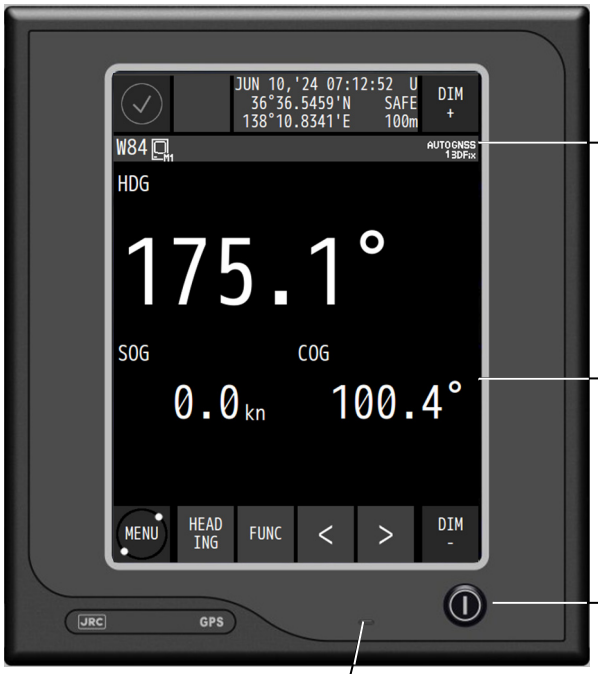
1.5 System Diagram



*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



Status area
Displays the status of the equipment or system with the icon.

DISPLAY
Displays the information of own ship and equipment setting screen. Operated by the touch panel.

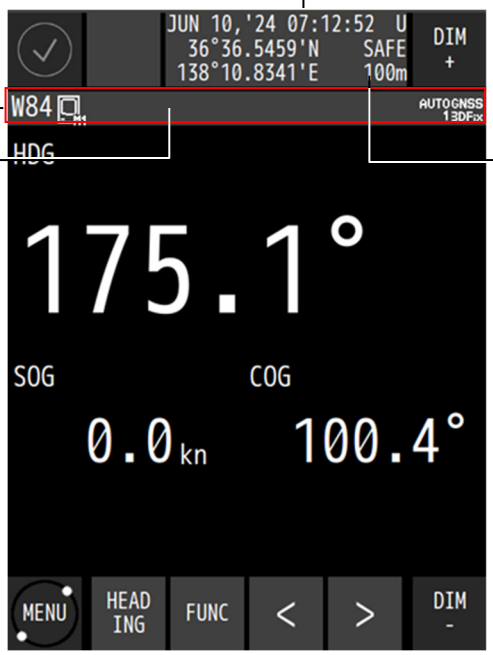
Power supply key

Buzzer

Touch panel

Key	Name	Function
	Alert	Displays the icon when an alert is issued. The icon changes according to the alert state.
	DIM UP	Increases the brightness.
	DIM DOWN	Reduces the brightness.
	Menu	Displays a menu. 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

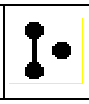
Status
See the status list

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

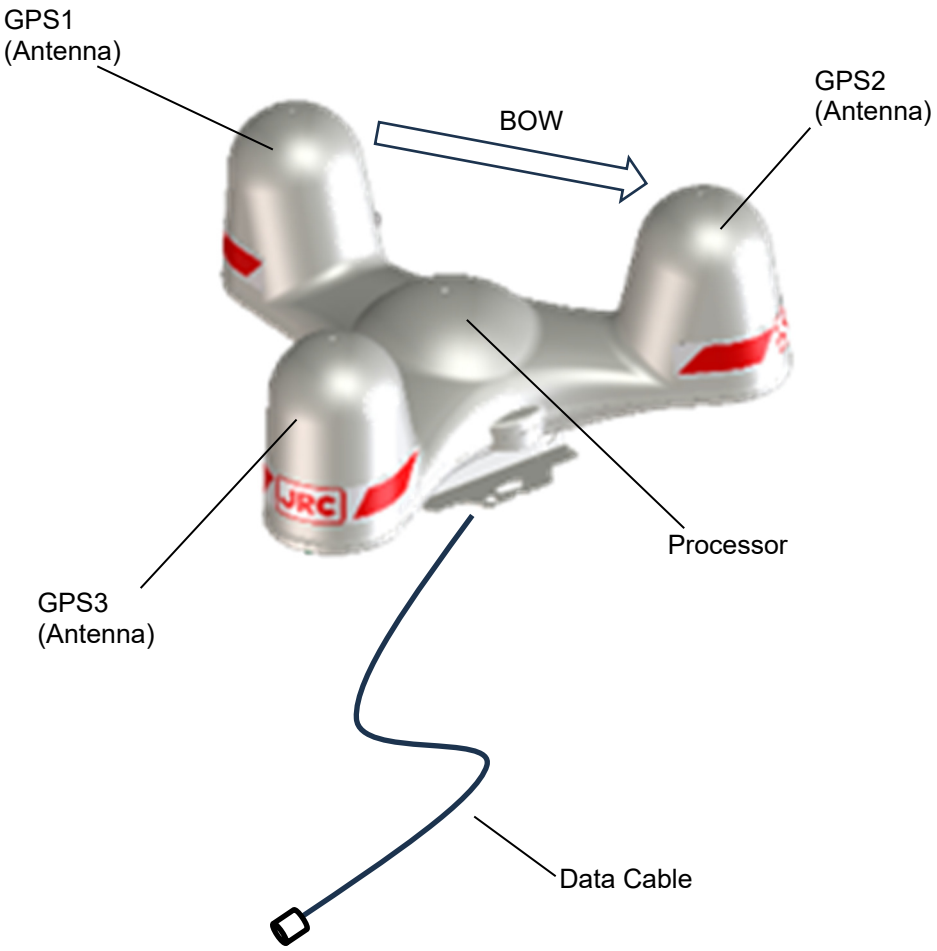
1	2	3	4		5		6	7		8	9	10
												HDOP

11	12	13
EXT1	AUTO 1	GNSS 3DFix

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

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

2.2 JLR-4101 GNSS Compass Sensor

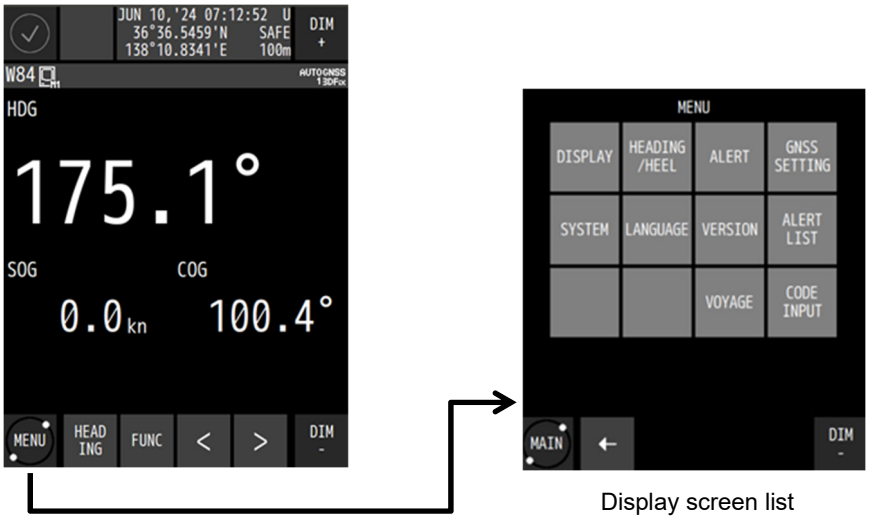


Chapter 3 Display Screens

3.1 Display Screens

3.1.1 Switching display

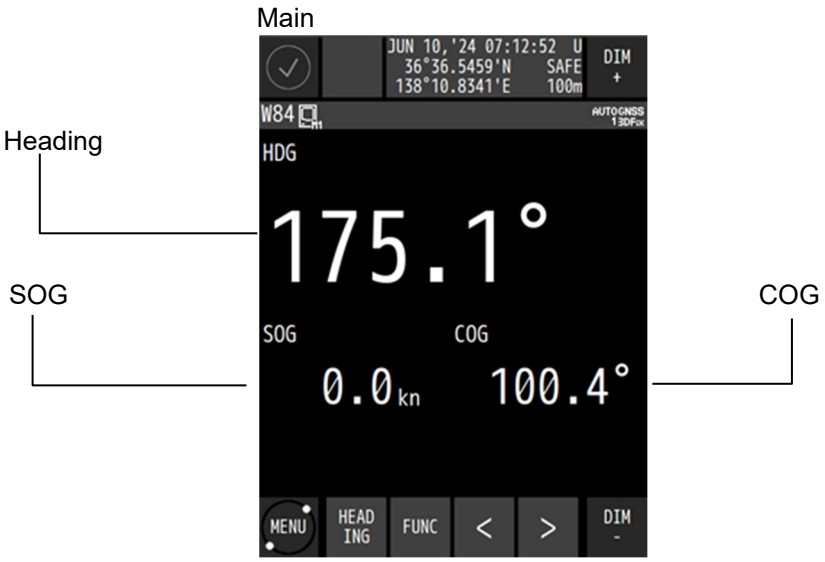
When the screen key [HEAD ING] is tapped, a display screen list is displayed. Select a screen to be displayed from the list. The screen name is displayed on the screen key.
On the navigation information screen, the analogue screen, and the navigation support screen, a sub screen can be displayed by using [<] or [>].



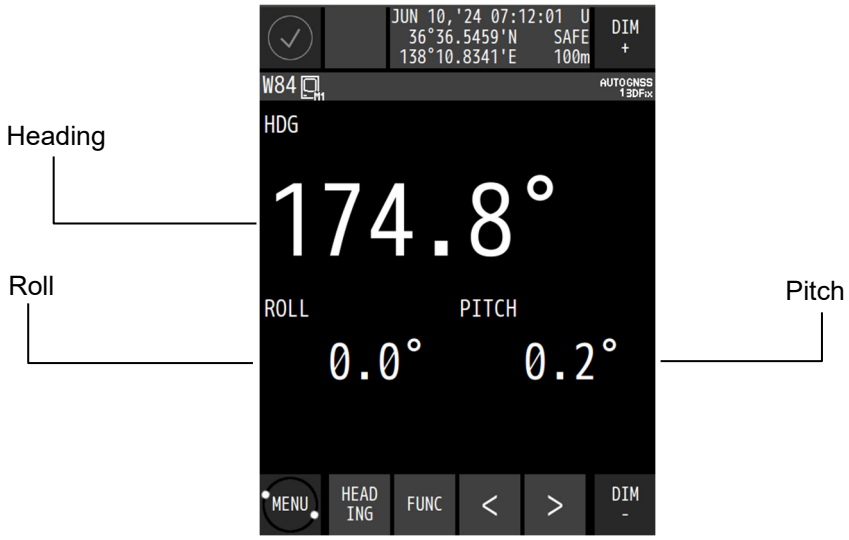
Display screen list

3.1.2 Heading information screen

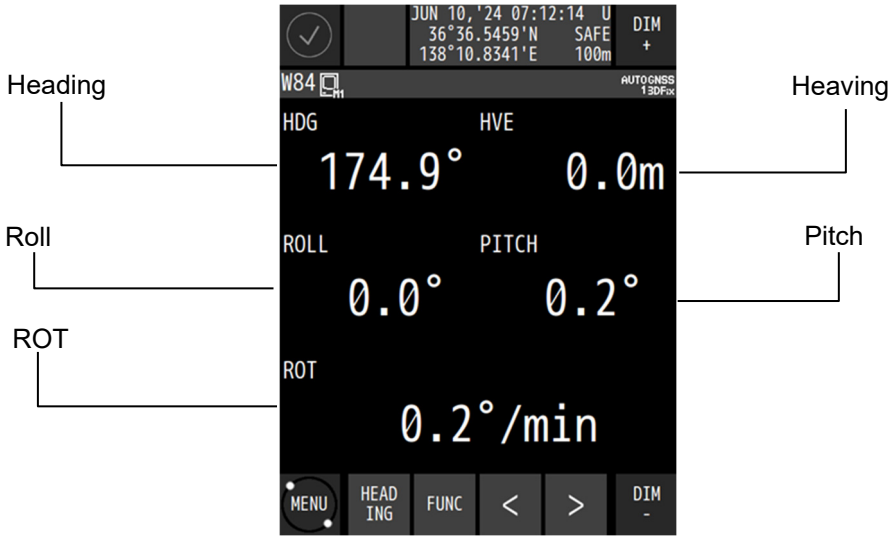
The heading information screen displays the ship's heading, speed, and course.
A sub screen can be displayed by using [<] or [>]. The sub screen displays the roll, pitch, heaving, and ROT.



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



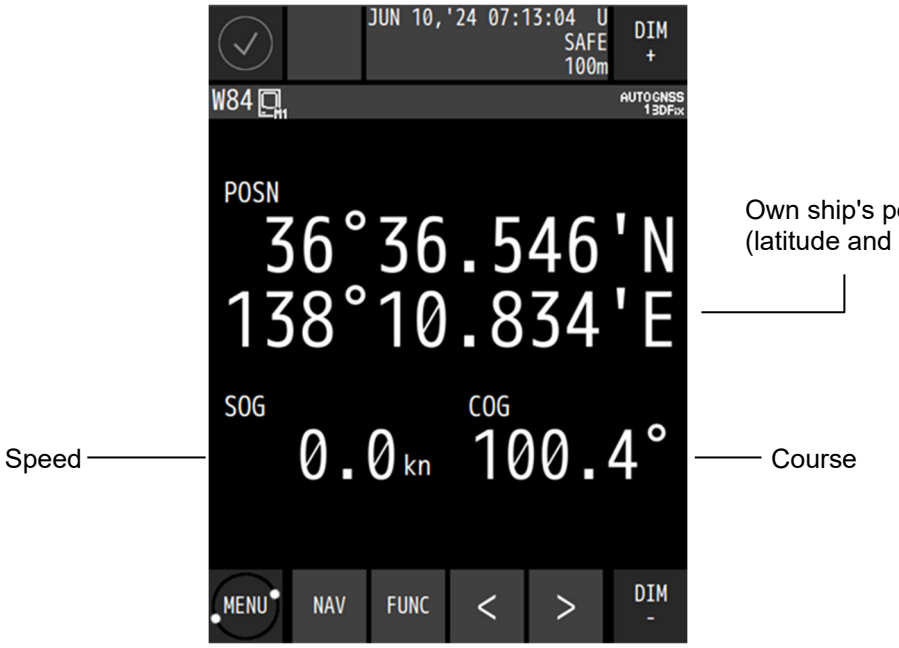
Sub Screen 2 (Ship's heading, heaving, roll, pitch, ROT)



3.1.3 Navigation information screen

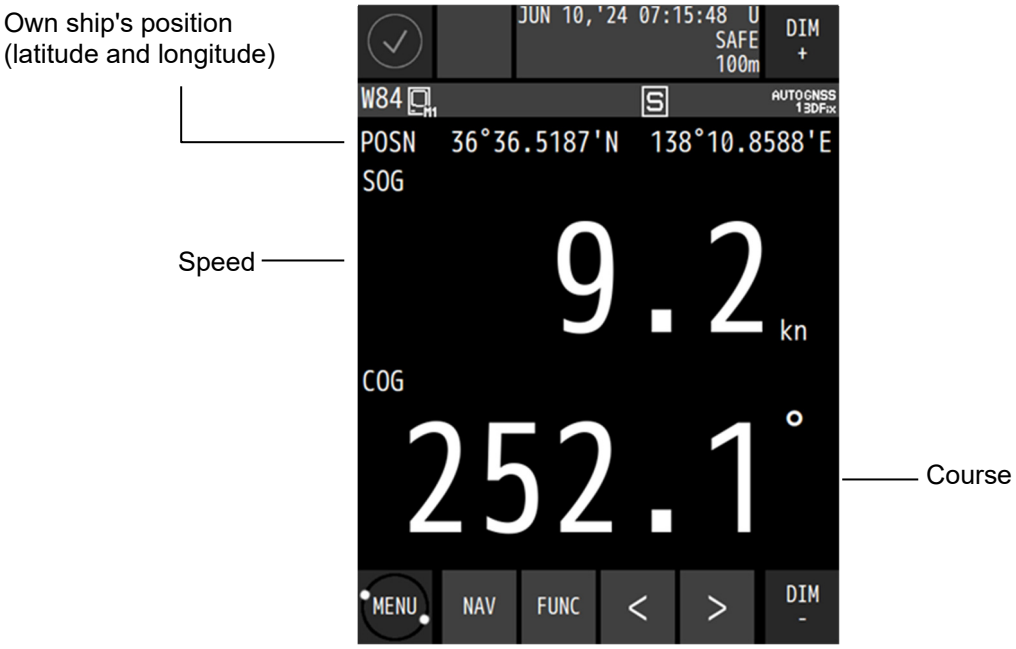
The navigation information screen displays the position, speed, and course of own ship. When a waypoint is available, the waypoint number and estimated time of arrival are also displayed.

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

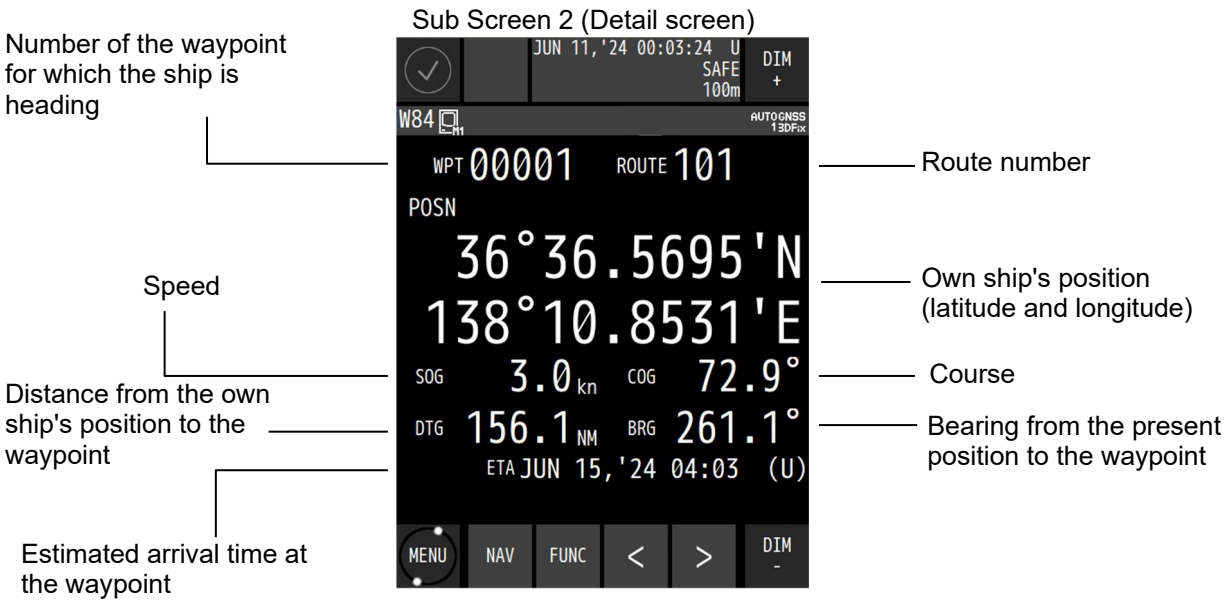


Sub screen

Sub Screen 1 (SOG and COG screen)



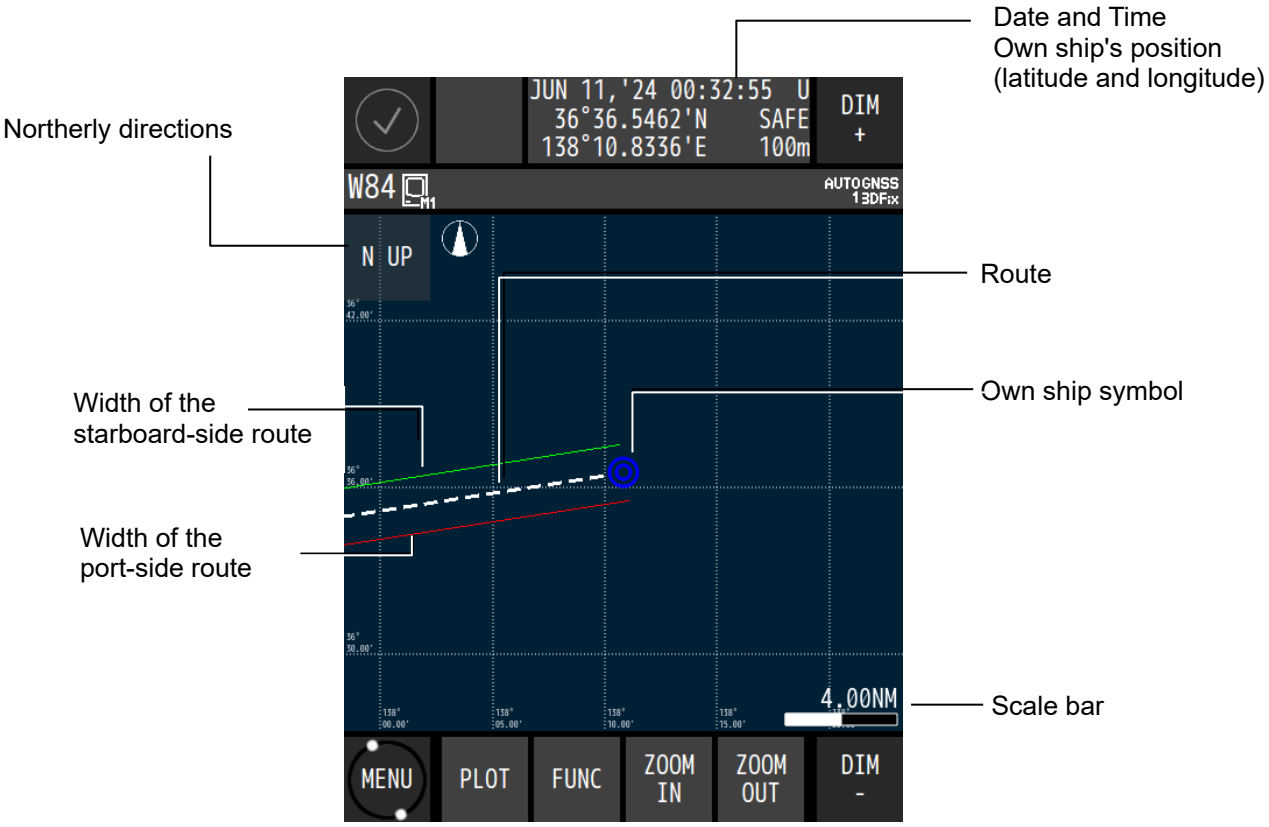
When a route is available



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 .



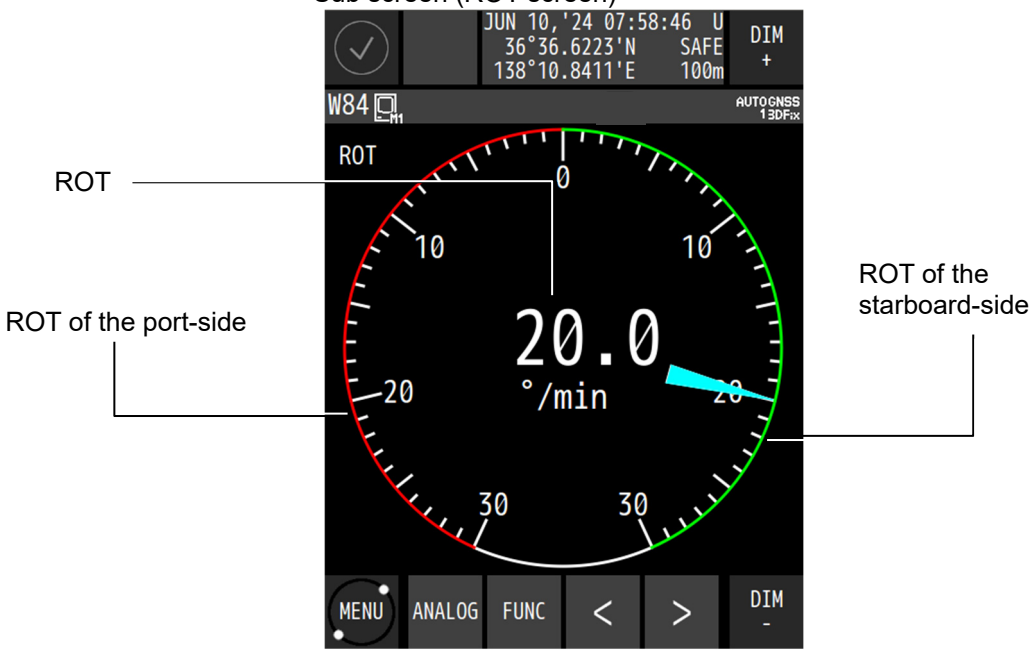
3.1.5 Analogue screen

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.

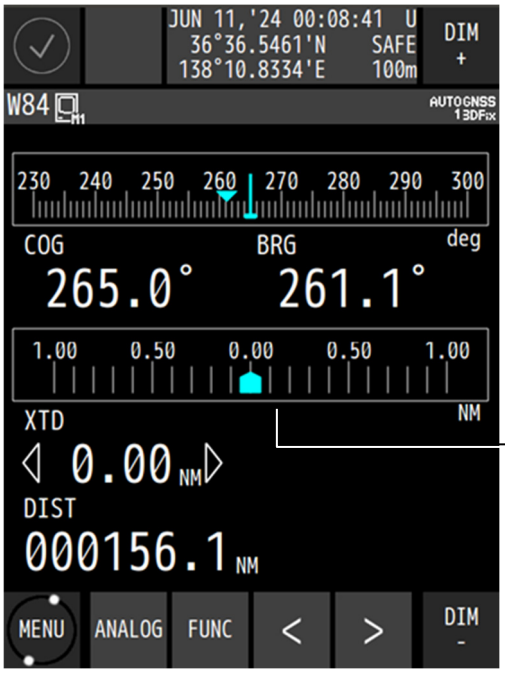
Use < > to display ROT, CDI, ship speed meter, and roll.

Main screen

Sub screen (ROT screen)



CDI screen



Course indicator bar
| : Course
▼: Bearing from the own ship's position to the waypoint

Course

Bearing from the own ship's position to the waypoint

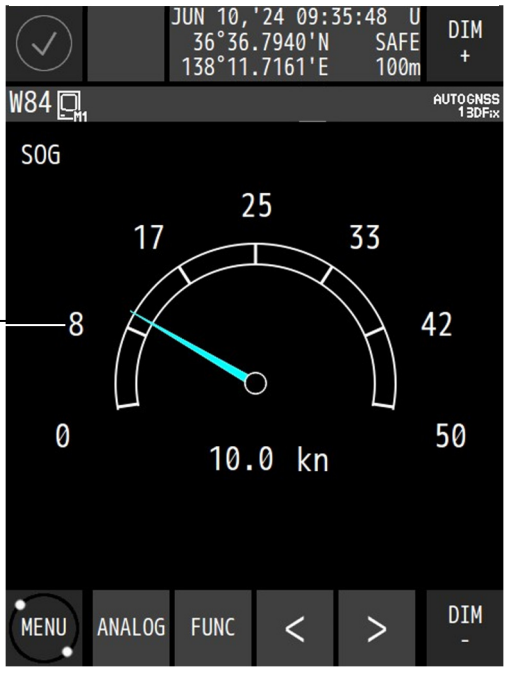
Route deviation indicator bar

Center of the route

Deviation from the route

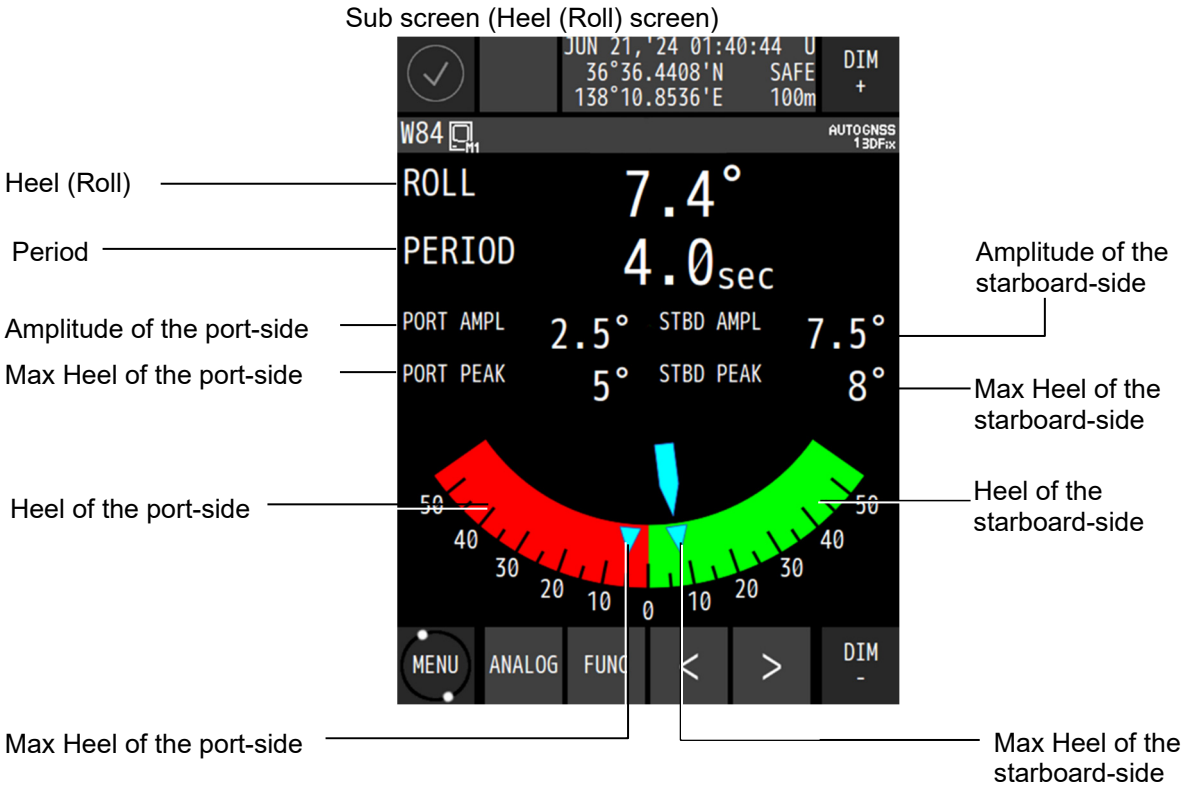
Distance from the own ship's position to the waypoint

Sub screen (Speed)



Speed

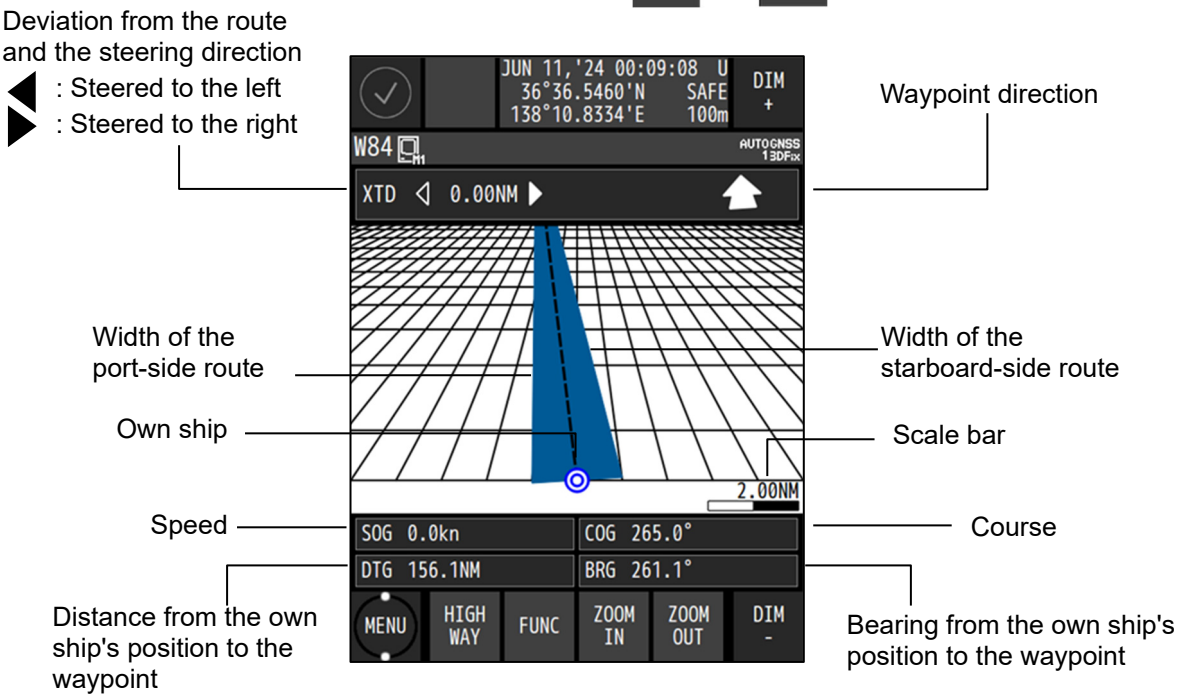
Sub screen (Heel (Roll) screen)



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.

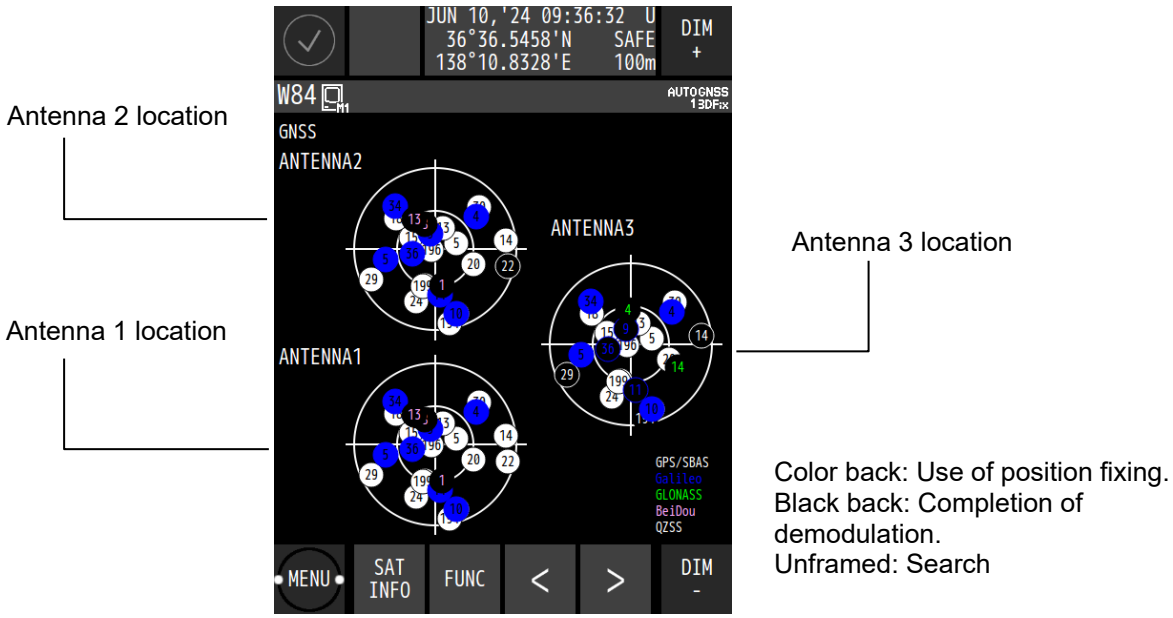


3.1.7 Satellite information screen

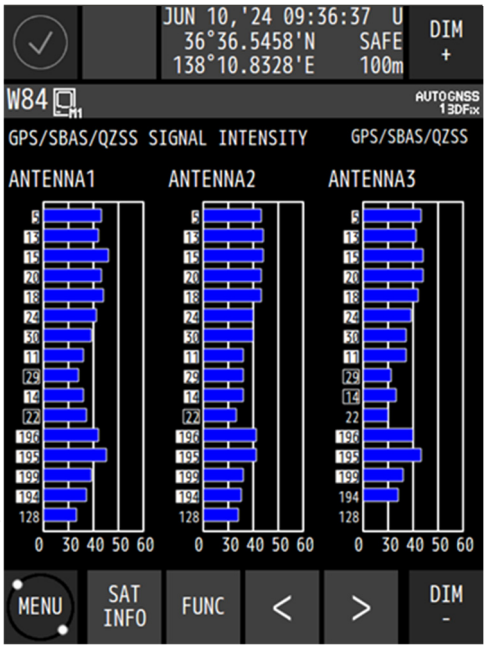
The satellite information screen displays the GNSS satellite of the 3 antenna and the beacon reception state.

Use < > to switch to the signal level.

GNSS satellite location and the receiving status



GPS, SBAS, QZSS signal level



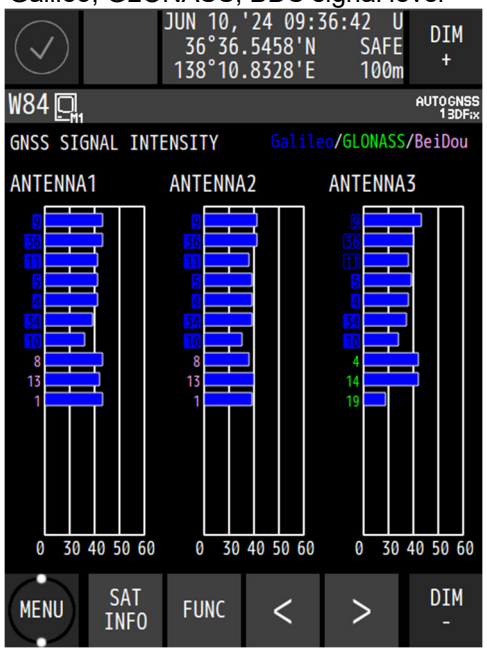
GPS SNR
(each antenna)

QZSS SNR
(each antenna)

SBAS SNR
(each antenna)

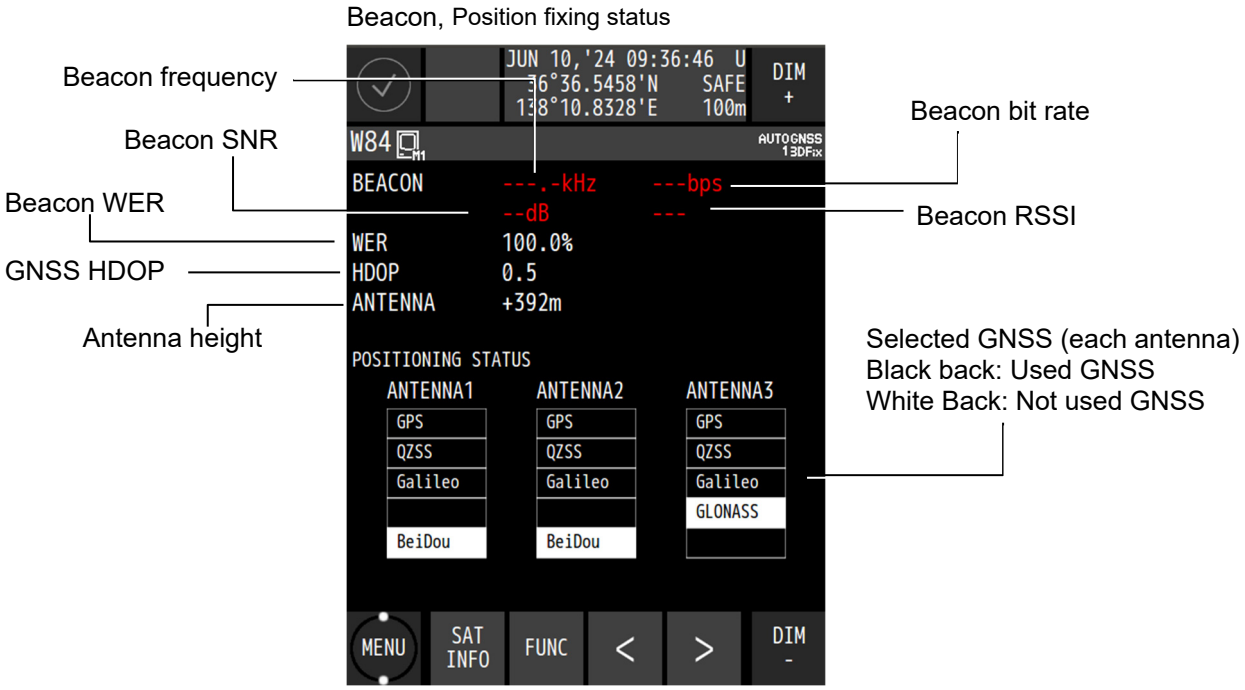
GNSS signal intensity bar
45 to 55 under normal conditions
Color back: Completion of demodulation
Black back: Use of position fixing
Unframed: Search

Galileo, GLONASS, BDS signal level



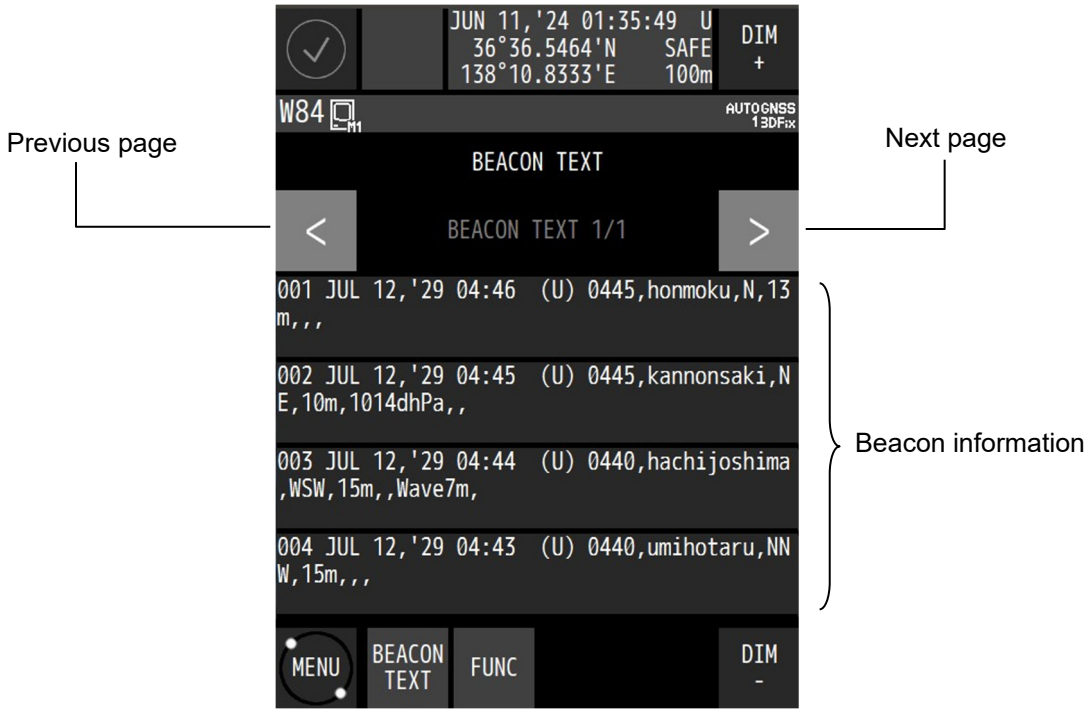
Galileo SNR Blue
GLONASS SNR Green
BeiDou SNR Pink
(each antenna)

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).

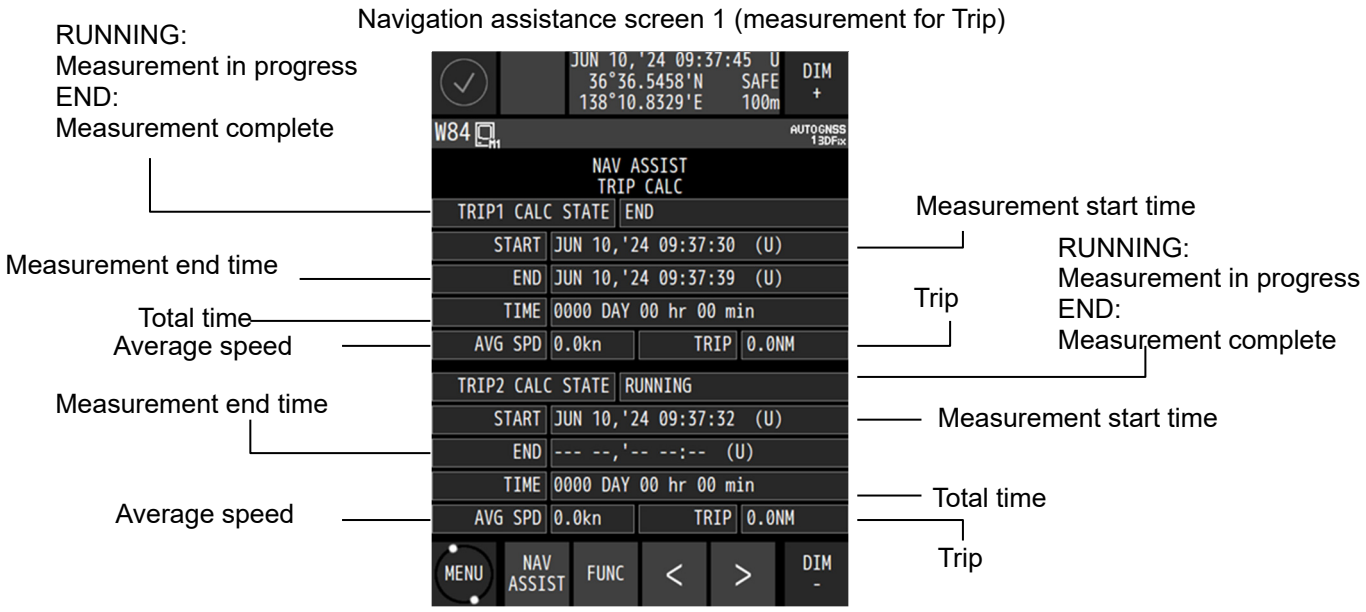


3.1.9 Navigation aid screen

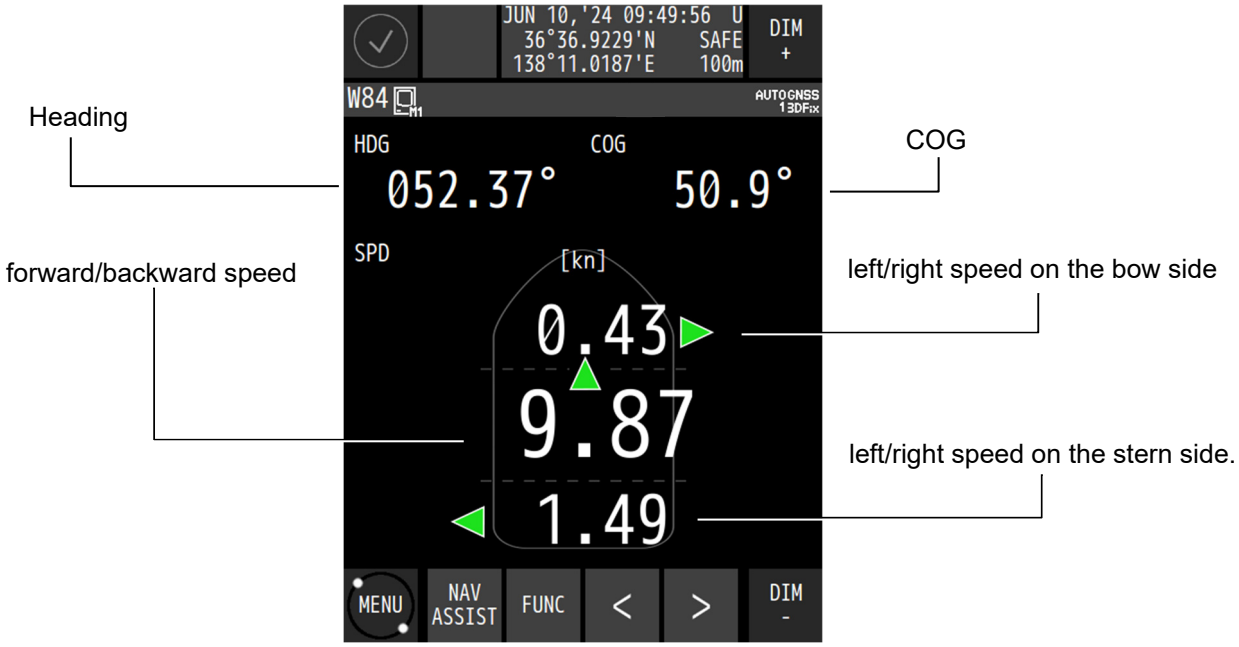
This screen calculates and displays the trip distance and 3-axis ship speed.

The screen can be switched by using < or > .

Navigation assistance screen 1 (measurement for Trip)



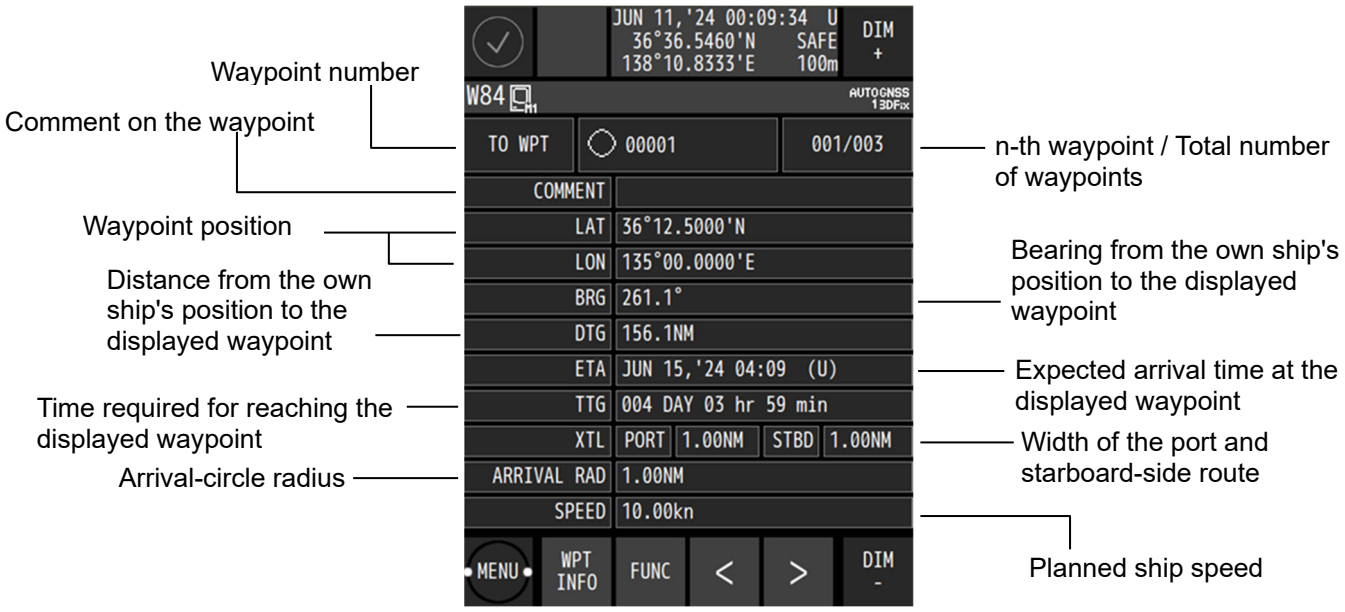
Navigation assistance screen 2 (3-axis ship speed)



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 > .



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
HEADING/HEEL	DR TIME			OFF/1~5min	4.10.1
	HEADING 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
	PITCG 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/ GPS→DGPS/ DGPS→GPS/ 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/ IN RANGE/ OUT RANGE	4.6.1
		SOUND		OFF/ON	4.6.1
	SPOOFING	SET		OFF/ WARNING MODE 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	SETTING	ALARM ESCALATION	POSITION	OFF/ON	4.6.4
			HEADING	OFF/ON	4.6.4
			TIME	30/ 60/ 120/ 180/ 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 SETTING	GNSS	GNSS MODE		AUTO1/AUTO2/ GPS/Galileo/ GLONASS/BDS/ GPS+Galileo/ GPS+Galileo+ GLONASS/ GPS+Galileo+ BDS/ GPS+QZSS+ Galileo/ GPS+QZSS+Galil-eo+GLONASS/ GPS+QZSS+ 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 SMOOTHING(s)		0~99	4.9.5
		COURSE SMOOTHING(s)		0~99	4.9.5
	RAIM	RAIM ACCURACY 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
		HOUR(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 DD MMM,'YY MMM DD,'YY	4.11.1
		TIME DISP (hr)		12hr / 24hr	4.11.1
	UNIT	DIST/SPEED		NM,kn km,km/h 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
LANGUAGE				JAPANESE/ENGLISH	4.13
VERSION	DISPLAY	VERSION SERIAL NUMBER BARCODE IP			4.16
	SENSOR	MODEL VERSION SERIAL NUMBER BARCODE			4.16
	SENSOR	GPS1 VERSION GPS2 VERSION GPS3 VERSION			4.16
	ROLLOVER	ROLL OVER SETTING DATE MANUFACTURE			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/ REMOTE(LAN)/ REMOTE(SERIAL)	—
		DEVICE No.			No1/No2	—
		SFI			GP9997/GP9996	—
	DATA I / O	IN/OUT1	FORMAT		NMEA/IEC/NSK/ SWITCH	—
			BITRATE		4800/9600/19200/ 38400/57600	—
			VERSION		1.5/2.1/2.3/4.0	—
			TALKER		GP/GL/GN/GNSS/GA/GB	—
			HEADING TALKER		GP/GL/GN/GNSS/GA/GB/HC/HE/HN	—
			OUTPUT SENTENCE			—
		OUT2			SAME AS IN/OUT1	—
		OUT3			SAME AS IN/OUT1	—
		LAN	GNSS OUT	CONNECT	MULTICAST/ UNICAST/ BROADCAST	—
				IP		—
				PORT		—
				FORMAT	NMEA／IEC	—
				VERSION	1.5/2.1/2.3/4.0	—
				TALKER	GP/GL/GN/GNSS/GA/GB	—
				OUTPUT SENTENCE		—
			HEADING OUT	CONNECT	MULTICAST/ UNICAST/ BROADCAST	—
				IP		—
				PORT		—
				HEADING TALKER	GP/GL/GN/GNSS/GA/GB/HC/HE/HN	—
				OUTPUT SENTENCE		—
			ALERT	TX CONNECT	MULTICAST/ UNICAST/ BROADCAST	—
				TX IP		—
				TX PORT		—
						—
				RX CONNECT	MULTICAST/ UNICAST/ 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/ UNICAST/ BROADCAST	—
				IP		—
				PORT		—
			PRINTER	INTERVAL	OFF/ONCE/ 1min/3min/5min/ 10min/20min/ 30min/60min	—
				CONNECT	MULTICAST/ UNICAST/ BROADCAST	—
				IP		—
				PORT		—
			ACTIVE ROUTE	ACTIVE ROUTE	OFF/ON	—
				CONNECT	MULTICAST/ UNICAST/ BROADCAST	—
				IP		—
				PORT		—
			MUTUAL	MUTUAL	OFF/ON	—
				CONNECT	MULTICAST/ UNICAST/ BROADCAST	—
				IP		—
				PORT		—
			SWITCH	SWITCH	OFF/ON	—
				CONNECT	MULTICAST/ UNICAST/ BROADCAST	—
				IP		—
				PORT		—
		CONTACT 1	CONTACT OUT		OFF/SYSTEM/ HEADING1/ HEADING2/ 200pNM/400pNM/ ACK	—
		CONTACT 2	CONTACT OUT		SAME AS CONTACT 1	—
		CONTACT 3	CONTACT OUT		SAME AS CONTACT 1	—
		SENSOR THROUGH 1	FORMAT		NMEA/NSK/AD-10/ IEC	—
			BITRATE		4800/9600/19200/ 38400/57600	—
			VERSION		1.5/2.1/2.3/4.0	—
			INTERVAL		25ms/50ms/100ms /200ms/500ms/1s	—
			OUTPUT SENTENCE			—
		SENSOR THROUGH 2			SAME AS SENSOR THROUGH1	—

MENU	Sub Menu	Sub Menu	Sub Menu	Sub Menu	Range	Reference
EQUIP	SWITCH	CONTROL METHOD			OFF/MFD / FIX/NOFIX / FIX/NOFIX+DOP / FIX/NOFIX/+DOP+ SPOOF	—
		EQUIPMENT			GNSS／ 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/ MANUAL/ DEFAULT	—
		IP ADDRESS				—
		SUBNET MASK				—
		MAC ADDRESS				—
		DEFAULT GATEWAY				—
	CCRP	BEEM(m)			1~126.0m	—
		LENGTH(m)			1~1022.0m	—
		CCRP	X		-BEAM/2~+BEAM/2m	—
			Y		0~LENGTHm	—
			Z		0~50.0m	—
		SENSOR	X		-BEAM/2~+BEAM/2m	—
			Y		0~LENGTHm	—
			Z		0~50.0m	—
		3 AXIS SPEED	X		-BEAM/2~+BEAM/2m	—
			Y		0~LENGTHm	—
			Z		0~50.0m	—
		2 AXIS SPEED	X		-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	DIAGNOSIS	DISPLAY	eMMC EEPROM RAM SIO SENSOR SIO1 SIO2 SIO3 LAN FRONT BUZZER BACK BUZZER LCD		—
			SENSOR	[GPS1] ANTENNA ROM RAM RTC [GPS2] ANTENNA ROM RAM RTC [GPS3] ANTENNA ROM RAM RTC [CONTROLLER] ROM RAM		—
		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				—

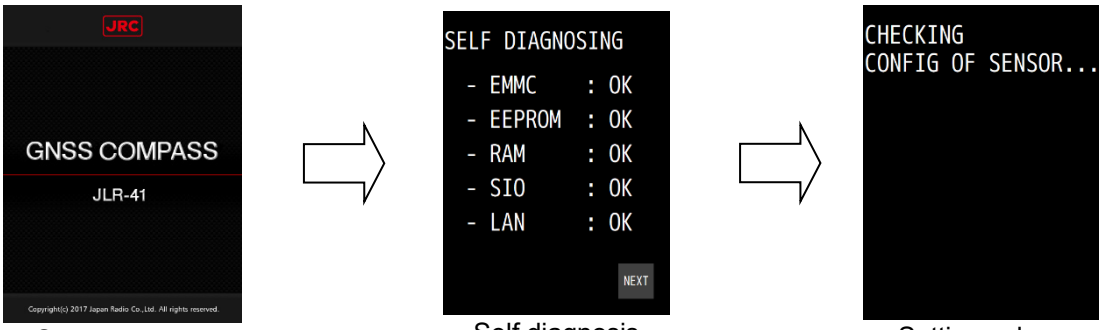
4.1.2 Function menu

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.



Startup screen　　Self diagnosis　　Setting value confirmation

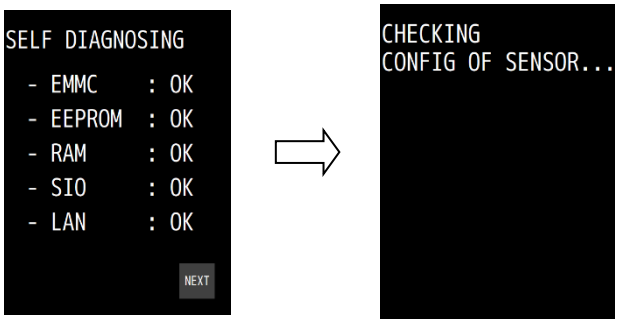
Memo

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

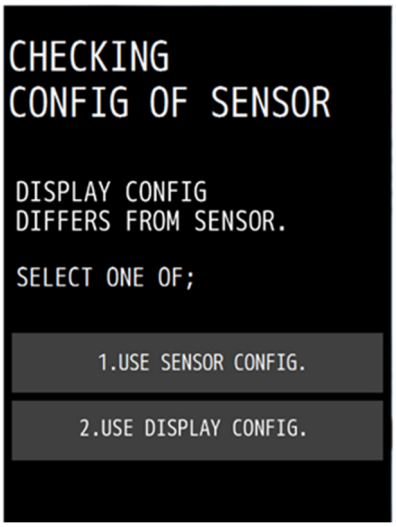
1) Normal startup

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 Nippon Signal 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.

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.

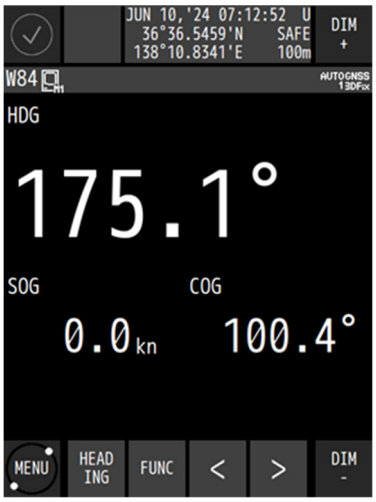
2. Alert acknowledgment (ACK)

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.

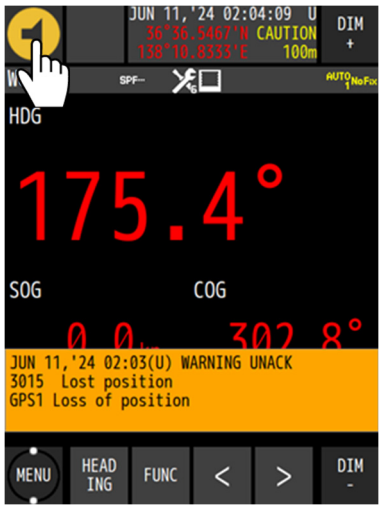
Screen transition at the occurrence of an alert



1. Operating normally

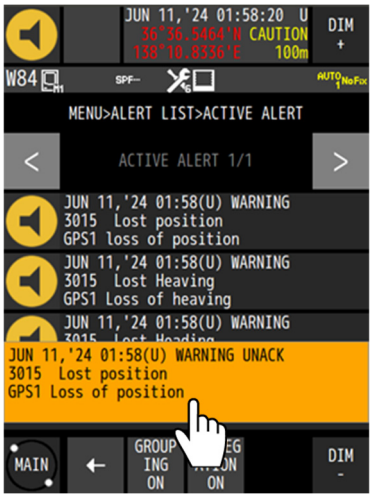
Alert occurred

An alert occurrence icon is displayed.



2. Alert occurred (Non ACK)

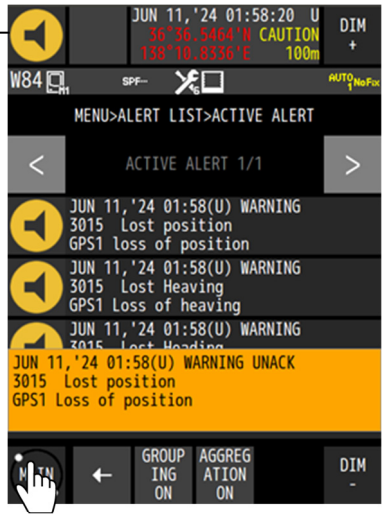
Tap the alert occurrence icon.



3. Alert is occurring
The alert list is displayed.

The icon indicating an acknowledged state is displayed.

Acknowledge by tapping the alert contents.

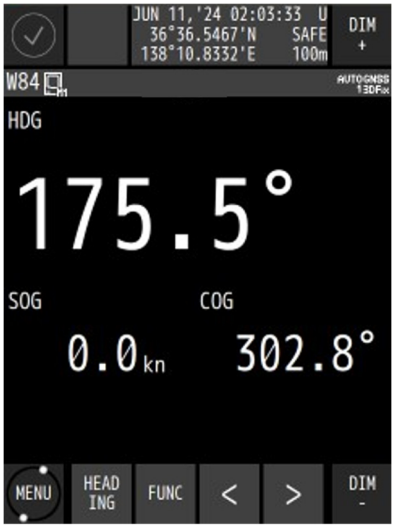


4. Alert occurred (acknowledged)

Tap the MAIN key.

5. The MAIN screen is displayed.

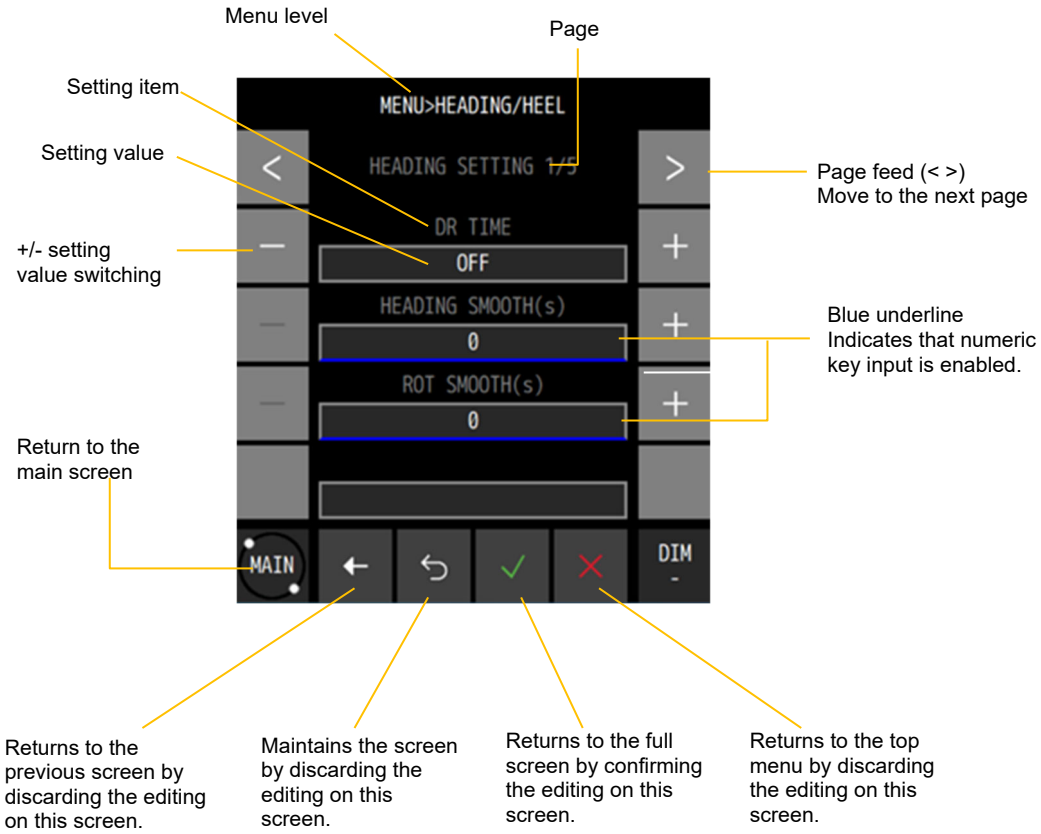
Rectified.



6. Rectified

4.2.7 Screen operation

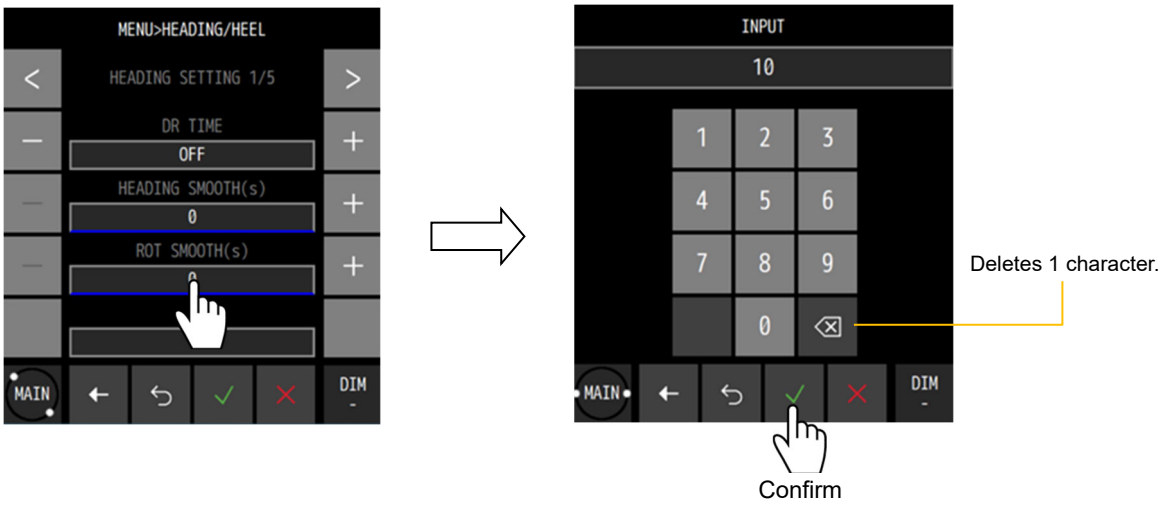
See below for the screen operation.



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 ✓ .

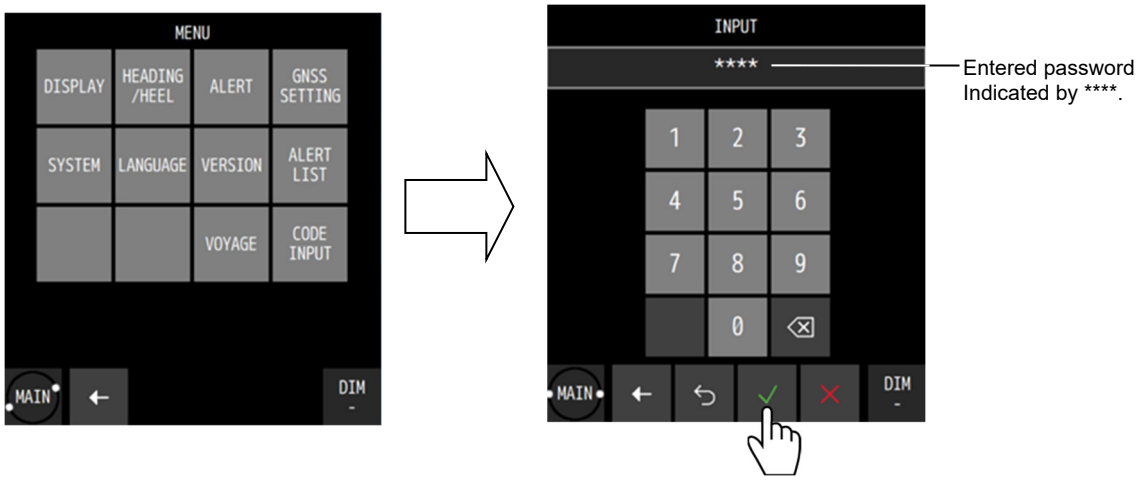


4.2.9 Entering a password in CODE INPUT

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.

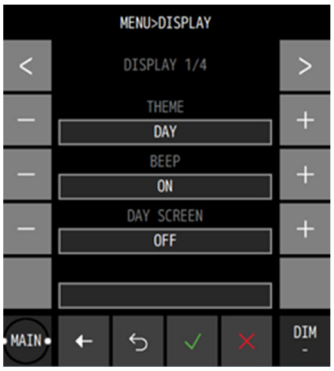
Procedure

1. MENU → CODE INPUT
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. MENU → DISPLAY → 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. MENU → DISPLAY → 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. MENU → DISPLAY → 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. 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

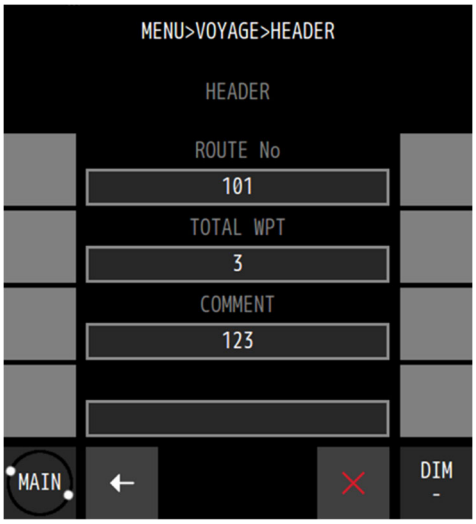
- To receive an Active route, the equipment needs to be connected via LAN.
- The default settings such as the IP address need not be changed to receive Active route. The received Active route is automatically displayed.

4.4.2 Displaying the route header

The header of the received route can be displayed.

Procedure

1. MENU → VOYAGE → HEADER → The header is displayed.

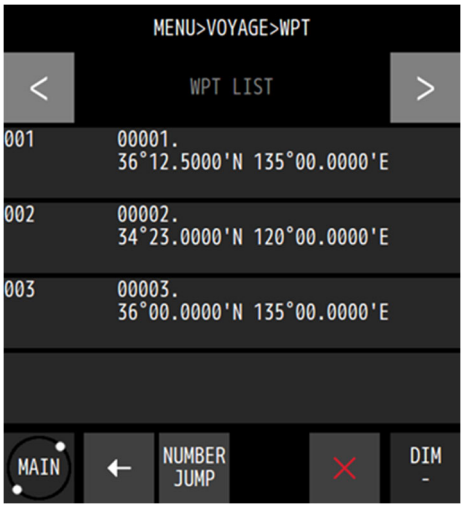


4.4.3 Displaying waypoints

Waypoints of the received route can be displayed.

Procedure

1. MENU → VOYAGE → WPT → A waypoint list is displayed.



4.5 Plotting Screen

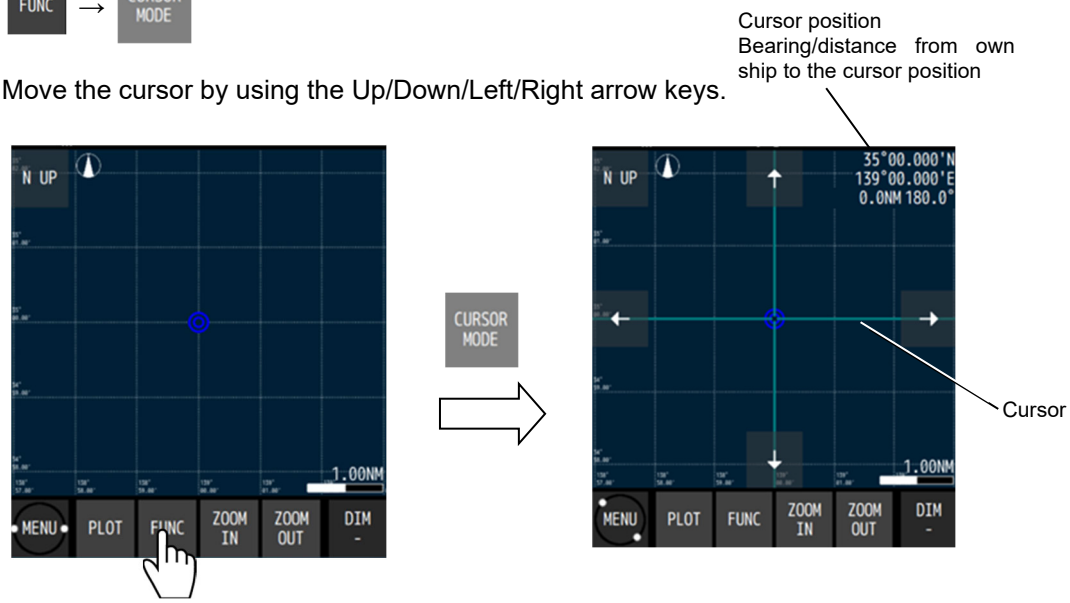
4.5.1 Operating the cursor

Procedure

1. Display the PLOT screen.

2. FUNC → CURSOR MODE

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.

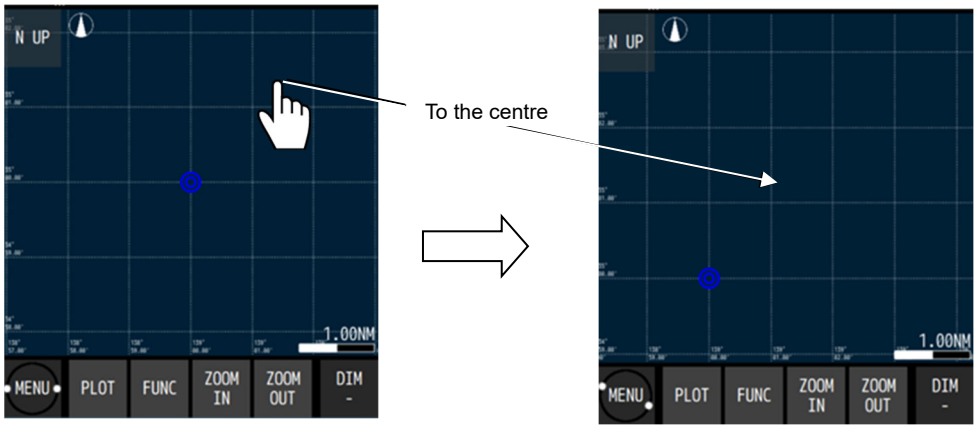
Procedure
1. Display the PLOT screen.

2. FUNC → PLOT → CURSOR

3. Select a size and confirm it with ✓.

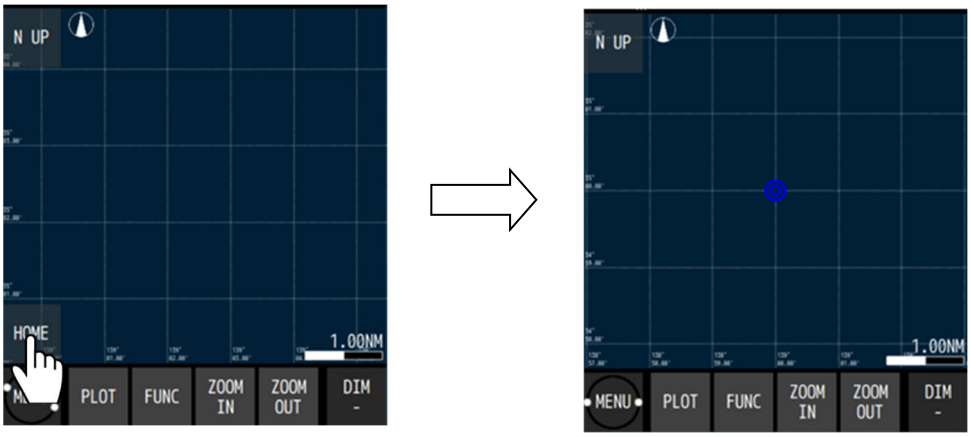
4.5.3 Moving a screen

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.

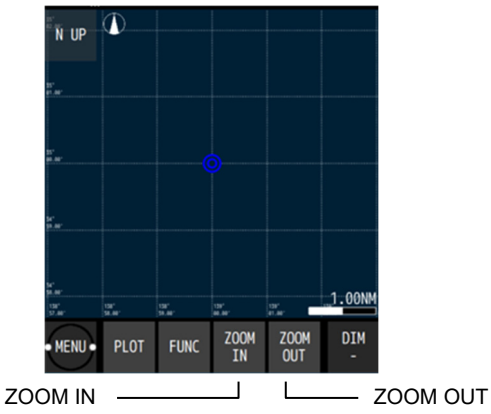


Memo

- 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".

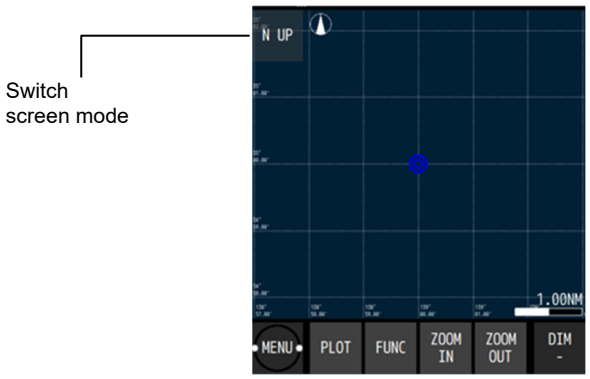
4.5.5 Screen Zoom In/Out

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]



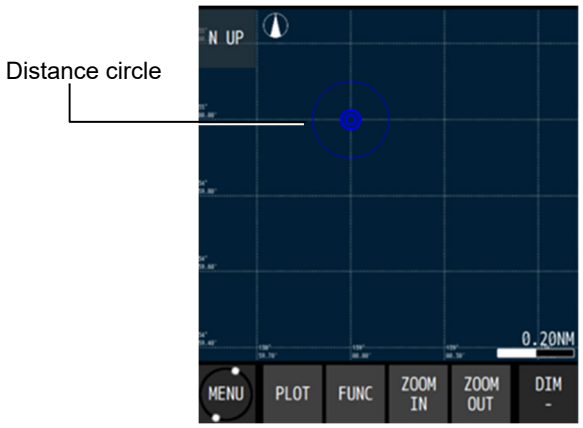
4.5.6 Changing North Up/Course Up

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

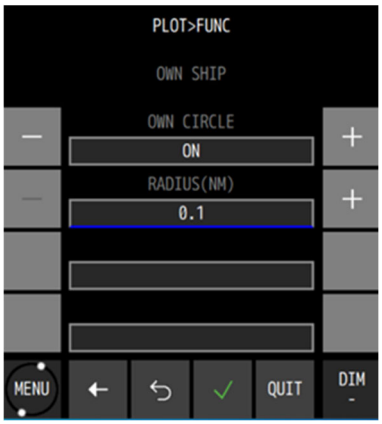
When a radius is specified, a circle is displayed positioning own ship at the centre. The range that can be set is from 0.1NM to 9.9NM.



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. 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. FUNC → PLOT → VISIBLE

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.

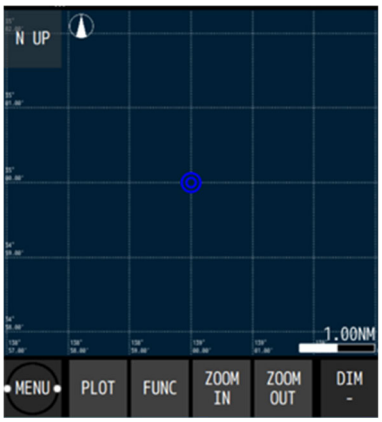
Procedure

1. Display the PLOT screen.

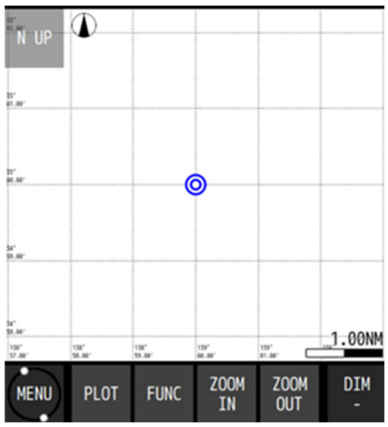
2. FUNC → BACK GROUND COLOUR

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-

⚠ CAUTION	
	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.

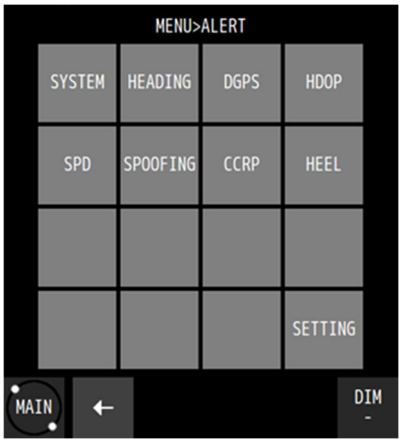
4.6.1 Setting alert/buzzer sounds for SOLAS ship

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

Procedure

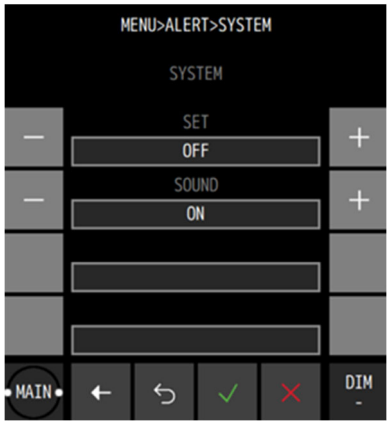
1. Enter a password by referencing “4.2.9. Entering a password with CODE INPUT”.
   Password: 1680

2. MENU → ALERT → An alert list is displayed.



(1) Setting the SYSTEM alert

a) Tap SYSTEM .



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

(2) Setting the HEADING alert

a) Tap HEADING .

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

(3) Setting the DGPS alert

a) Tap DGPS .

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

(4) Setting the HDOP alert

a) Tap HDOP .

Item	Description
SET	Sets alert notification to ON/OFF. THRESHOLD: The alert is issued when HDOP exceeded the threshold value. OFF: Sets the alert to OFF.
THRESHOLD	Sets a HDOP threshold value. This item is not displayed when SET is OFF.
SOUND	Sets the buzzer sound upon the issuance of an alert to ON/OFF. ON: When an alert is issued, the alert is notified with a buzzer sound. 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. OVER: An alert is issued at or above the set ship speed. UNDER: An alert is issued at or below the set ship speed. IN RANGE: An alert is issued when the ship speed is within the set range. OUT RANGE: An alert is issued when the ship speed is out of the set range. OFF: Sets the alert to OFF.
THRESHOLD OVER UNDER IN RANGE OUT RANGE	When SET is set to OVER/UNDER, set the ship speed threshold. 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. ON: When an alert is issued, the alert is notified with a buzzer sound. 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. ON: An alarm is issued when a CCRP mismatch occurs. OFF: Sets the alert to OFF.
SOUND	Sets the buzzer sound upon the issuance of an alert to ON/OFF. ON: When an alert is issued, the alert is notified with a buzzer sound. OFF: Even if an alert is issued, a buzzer sound is not emitted.

4.6.2 Setting alert/buzzer sounds for non-SOLAS ship

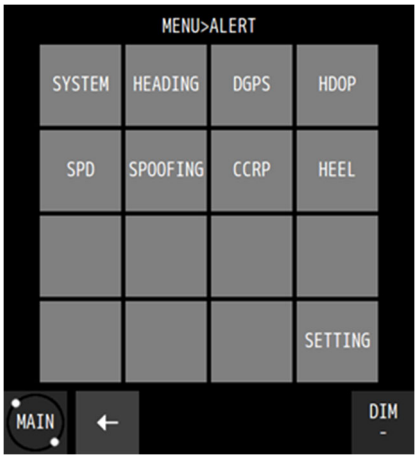
⚠ CAUTION	
❗	Set the following alerts OFF on SOLAS ship. (Default setting is OFF)

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. MENU → ALERT → An alert list is displayed.



(7) Setting the HEEL ANGLE alert

a) Tap HEEL .

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

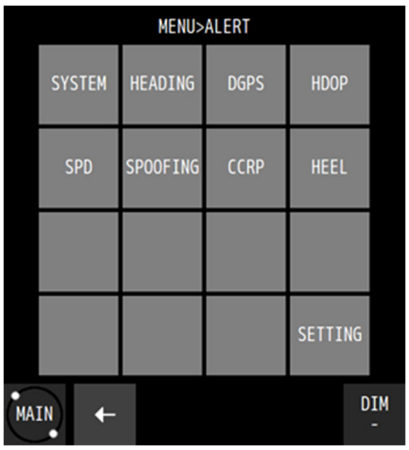
⚠ CAUTION	
❗	The higher the setting value of the alert mode, the higher the detection rate of spoofing, but in an environment without spoofing, the over-detection rate increases and the positioning rate decreases. Therefore, be very careful when changing the setting values of the alert mode.

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. MENU → ALERT → An alert list is displayed.



(8) Setting the SPOOFING notification

a) Tap SPOOFING .

Item	Description
SET *1	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. In areas with little or no spoofing/jamming, ALERT MODE2 (default) is recommended. ALERT MODE1: ~ ALERT MODE5: *2
SOUND	Sets spoofing/jamming detection buzzer sound on/off. ON: A buzzer sounds when spoofing/jamming is detected. 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. ON: Enable the escalation. OFF: Disable the escalation.
HEADING	Sets on/off the alarm escalation of missing heading warning. ON: Enable the escalation. 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
2. 

Item	Description
GROUPING	Displays common alerts as a group in the alert list. ON: Enable the grouping. OFF: Disable the grouping.
AGGREGATION	Displays common alert ID, category, and priority alerts as an aggregation in the alert list. ON: Enable the aggregation. 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
2. 

Item	Description
TEST MODE	Select whether to return the ALF of all alerts for “Q” of ACN for wildcard. ON: Returns ALF of all alerts (include normal condition). 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[*1], 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.

*1: 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

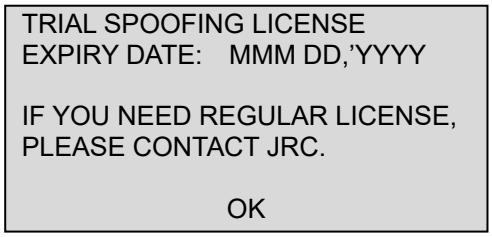
A license is required to access this function.
There are two types of licenses: a free trial version and a paid regular version.

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.



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

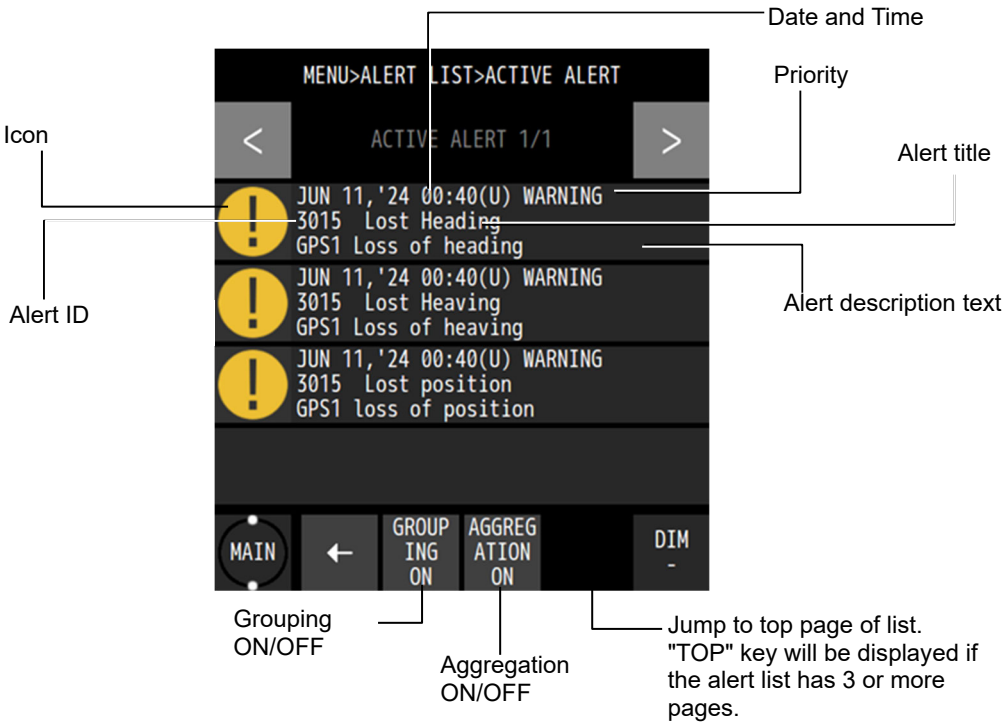
The alerts that have occurred so far and the alert that is occurring, and the alerts that occurred in LAN can be displayed.

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.

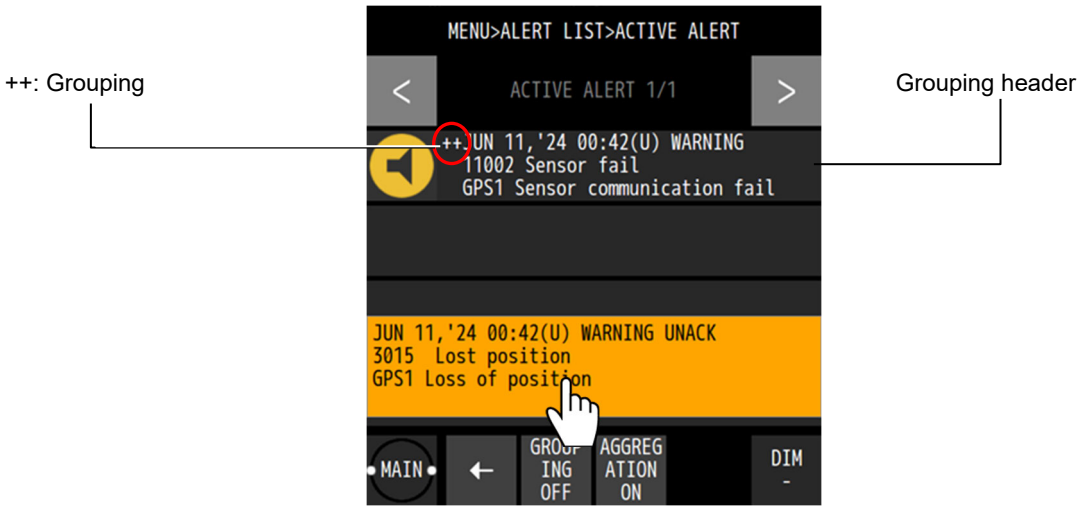
Procedure

1. MENU → ALERT LIST → ACTIVE ALERT

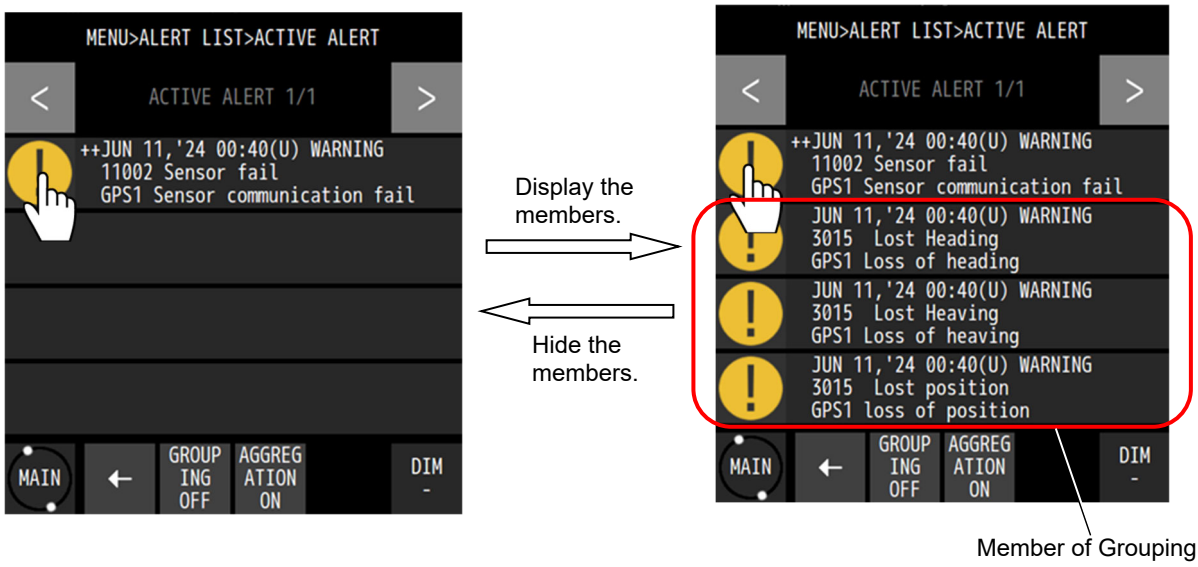


Priority	Icon	Status		Icon	Status
Alarm		Active-Unacknowledged			Active-Silenced
		Active-Acknowledged			Rectified-Unacknowledged
		Responsibility transferred		-	-
Warning		Active-Unacknowledged			Active-Silenced
		Active-Acknowledged			Rectified-Unacknowledged
		Responsibility transferred		-	-
Caution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

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

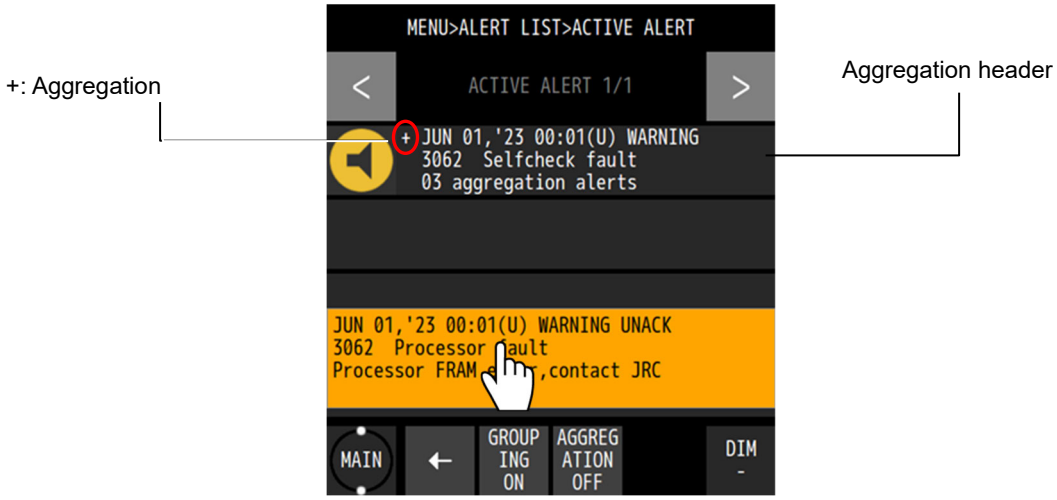


Tap the pop-up (alert description) of all alert, and acknowledge.

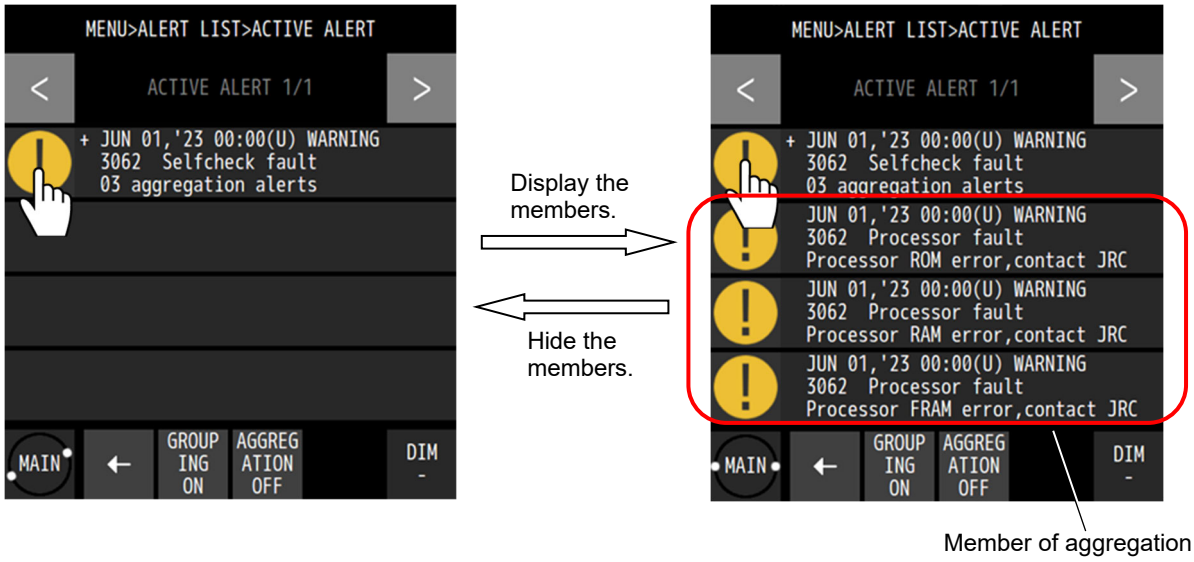


Tap the icon of grouping header, the members of grouping are displayed.
Tap again, the members of grouping are hidden.

(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.



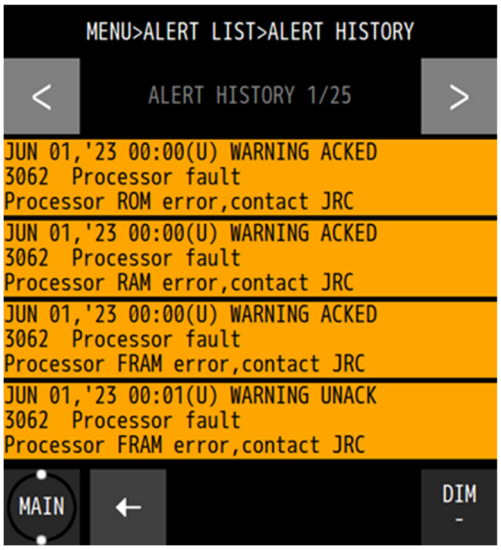
Tap the icon of aggregation header, the members of aggregation are displayed.
Tap again, the members of aggregation are hidden.

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

1. MENU → ALERT LIST → ALERT HISTORY



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

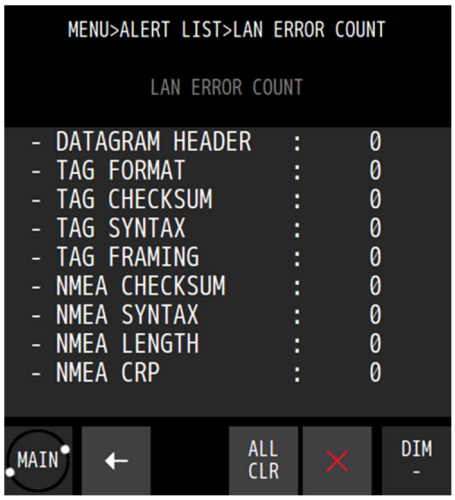
The number of errors that occurred in LAN1/LAN2 is displayed.
The error court is cleared when the power is turned off.

Procedure

1. MENU → ALERT LIST

(1) Displaying the error count of LAN

a) Tap LAN ERROR COUNT .



Clearing an alert

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

2. MENU → ALERT LIST → LAN ERROR COUNT → ALL CLR

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. (Recommended) Core 1: GPS+QZSS+Galileo+BeiDou Core 2: GPS+QZSS+Galileo+BeiDou Core 3: GPS+QZSS+Galileo+GLONASS GLONASS is not used for heading calculation.
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 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. 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. GPS and Galileo are used concurrently.
GPS+Galileo+GLONASS	Operates in multi-GNSS mode. GPS, Galileo, and GLONASS are used concurrently. GLONASS is not used for heading calculation.
GPS+Galileo+BDS	Operates in multi-GNSS mode. GPS, Galileo, and BeiDou are used concurrently.
GPS+QZSS+Galileo+ GLONASS	Operates in multi-GNSS mode. GPS, QZSS, Galileo, and GLONASS are used concurrently. GLONASS is not used for heading calculation.
GPS+QZSS+Galileo+ BDS	Operates in multi-GNSS mode. 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. 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. 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. A value between 0 second and 99 seconds can be set.
SPEED SMOOTHING	Applies smoothing to speed changes. A value between 0 second and 99 seconds can be set.
COURSE SMOOTHING	Applies smoothing to course changes. 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. 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. 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. 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).
HOUR	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. 

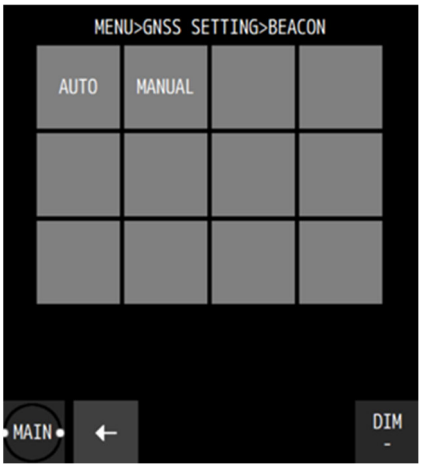
DGPS	Description
AUTO	Selects beacon or SBAS automatically. When both a beacon and SBAS can be received, priority is given to a beacon. If both a beacon and SBAS cannot be received, multi-GNSS/GPS positioning is used.
BEACON	Performs DGPS by using a beacon. If a beacon cannot be received, multi-GNSS/GPS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

2. MENU → GNSS SETTING → BEACON

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. 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. 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. 1 minute: The heading obtained by autonomous navigation is output until the set time elapses after the GNSS signal is interrupted. ~ 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. A value between 0 second and 10 seconds can be set.
ROT SMOOTH	Applies smoothing to the ROT change. A value between 0 second and 100 seconds can be set.
ROOL SMOOTH	Applies smoothing to the roll change. A value between 0 second and 100 seconds can be set.
PITCH SMOOTH	Applies smoothing to the pitch change. 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. MENU → HEADING /HEEL

Item	Description
HEADING OFFSET	Offsets the heading. ±180 degrees can be set.
ROLL OFFSET	Offsets the roll. ±30 degrees can be set.
PITCH OFFSET	Offsets the pitch. ±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. MENU → HEADING /HEEL

Item	Description
RESTORATION	MANUAL: 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. AUTO: When the heading calculation is complete, the heading is automatically output to the external device. No buzzer sounds.

3. Tap ✓ to confirm the setting.

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

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 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. 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. 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. It can be set in the range of 30 to 100 seconds.
MIN PERIOD	Sets the minimum roll period to be detected. 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. 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. MENU → SYSTEM → DATE/TIME

Item	Description
TIME DIFF	Set a time difference.
DATE DISP	Select a date display format from the following: 'YY-MM-DD / DD MMM, 'YY / MMM DD, 'YY.
TIME DISP	24hr: Displays a time from 00:00 to 23:59. 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, depth, and temperature.

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

2. MENU → SYSTEM → UNIT

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 MANUAL: A converted value between fm and m can be set. 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. MENU → SYSTEM → MAG CORR

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. EAST/WEST: Select East longitude or West longitude. 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.

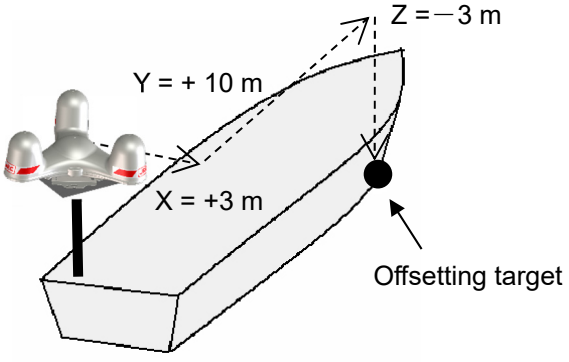
Procedure
1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT".
   Password: 1680

2. MENU → SYSTEM → HEAVING OFFSET

Item	Description
X	Sets the offset along the X-axis. 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. With the antenna position as the origin, the bow direction is positive and the stern direction is negative. * 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. 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. OFF: Displays at 1Hz.

3. Confirm the setting with  .

4.12 Printing

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

Procedure

1. FUNC → PRINT

Whenever PRINT 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.

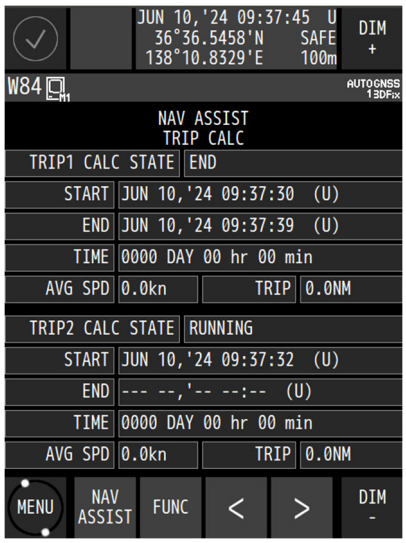
Procedure
1. Enter a password by referencing "4.2.9. Entering a password with CODE INPUT”.
   Password: 1680

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 NAV ASSIST → > several times to display the navigation assist information screen.

2. FUNC → TRIP1 CALC START

Measurement of trip distance 1 starts.

To start measurement of trip distance 2, tap TRIP2 CALC START.

To stop measurement, do the following.

3. Tap NAV ASSIST → > to display the navigation assist information screen.

4. FUNC → TRIP1 CALC END

Measurement of trip distance 1 stops.

To stop measurement of trip distance 2, tap TRIP2 CALC END.

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 NAV ASSIST and tapping > several times.

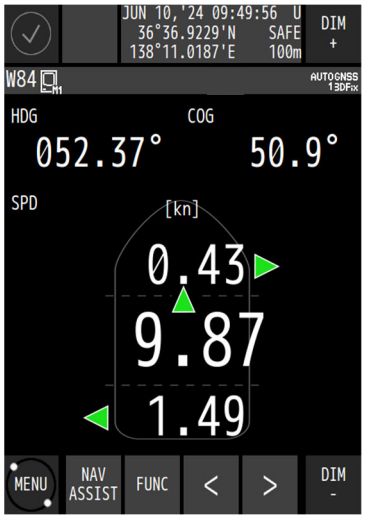
2. FUNC → TRIP1 RESET

Trip distance 1 is reset.

To reset trip distance 2, tap TRIP2 RESET .

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

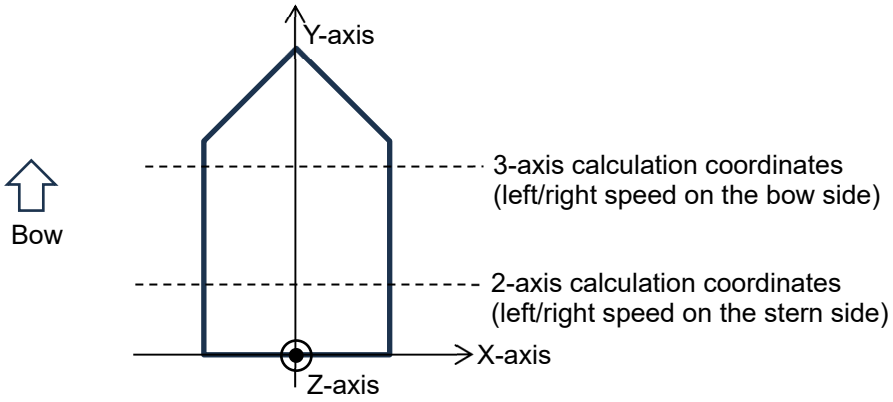
The ship speed can be broken down into forward/backward speed, left/right speed on the bow side, and right/left speed on the stern side.
It is necessary to input the sensor positions and the positions to calculate the left/right speed on the bow side or the left/right speed on the stern side.
Please 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.

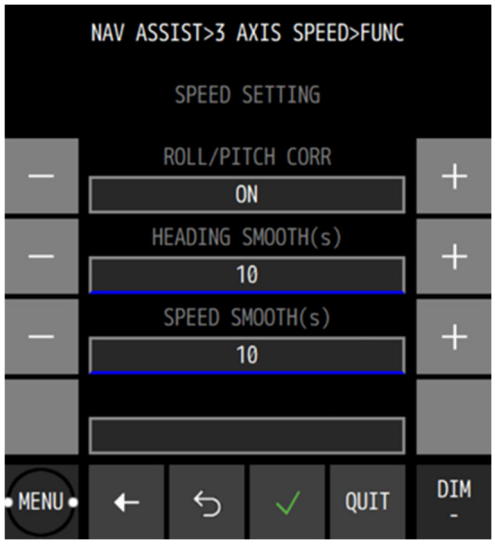


4.15.1 Correcting the roll/pitch

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. 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. 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 SMOOTH	It can be set in the range of 0 to 99 seconds. 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 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 STARTING DATE: The starting date of the rollover The default value is the production date. When initialized, the initialized date is used as the starting date. PRODUCTION DATE: Date of production 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. 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/ 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 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/ 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 waring to alarm.

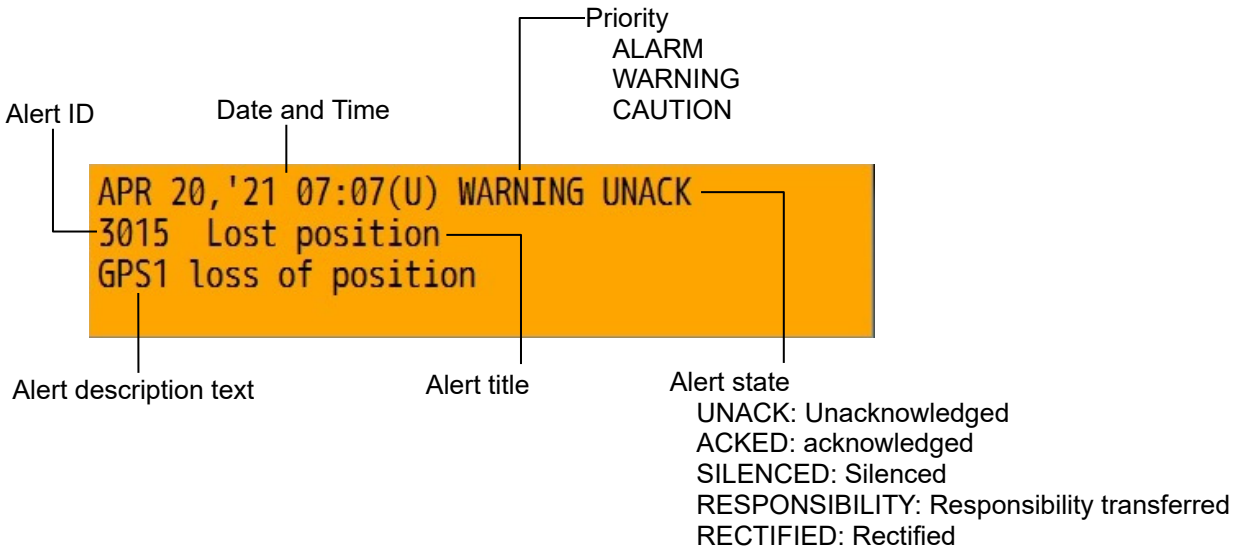
A: Alarm, W: Warning, C: Caution

Alert ID	Alert title	Alert description text	Alert causes	Category	Priority*1	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
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 waring 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*2		category	Priority
			Alert description for member	Alert ID for member		
11002/ 11001	Sensor fail	GPSn Sensor communication fail	Lost position	3015/3014	B	W/A*1
			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			

*1 Refer to Alert list for the cause of alert.
xx: Number of alerts issued, n: GPS number

5.3 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. 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”. Changing this setting should be done under conditions where there is no effect of spoofing (no false position or false time). (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.

5.4 Replacement Parts

5.4.1 Repair units

The following table shows the repair unit replacement units.

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

5.4.2 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^2(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[*1]	GPS/Galileo/GLONASS/BeiDou/SBAS/QZSS Can not receive GLONASS and BeiDou at the same time.[*2]
• Maximum Number of Tracked Satellites[*1]	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 Isolation by photocoupler
		Input	NMEA/IEC	
OUT2	RS-422	Output	NMEA/IEC/NSK/SWITCH	IEC61162-1 Isolation by photocoupler
		Input	NMEA/IEC	
OUT3	RS-422	Output	NMEA/IEC/NSK/SWITCH	IEC61162-2
		Input	NMEA/IEC	
OUT4 OUT5	RS-422	Output	NMEA/IEC/NSK/AD-10	Sensor through IEC61162-1 Isolation by photocoupler

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,GLL,VTG,GSA,GSV,DTM,GBS,GRS,GST,ZDA,GNS,
  MSS,ALR,ALC,ALF,HBT,ARC,AGL,HDT,THS,ROT,POS,DDC,HRM
- 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 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 (**Philippines**)
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 (**Puerto Rico**, 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
Acknowledge	*ACK*
Acquire, Acquisition	*ACQ*
Acquisition Zone	*AZ*
Additional Military Layer	*AML*
Adjust, Adjustment	*ADJ*
Aft	*AFT*
Alarm	*ALARM*
Alert Setting	*ALERT SET*
Altitude	*ALT*
Amplitude Modulation	*AM*
Anchor Watch	*ANCH*
Antenna	*ANT*
Anti Clutter Rain	*RAIN*
Anti Clutter Sea	*SEA*
April	*APR*
Audible	*AUD*
August	*AUG*
Automatic	*AUTO*
Automatic Frequency Control	*AFC*
Automatic Gain Control	*AGC*
Automatic Identification System	*AIS*
Automatic Identification System – Search and Rescue Transmitter	*AIS-SART*
Automatic Radar Plotting Aid	*ARPA*
Autopilot	AP
Auxiliary System/Function	*AUX*
Available	*AVAIL*
Azimuth Indicator	AZI
Background	*BKGND*
BeiDou Navigation Satellite System	*BDS*
Bearing	*BRG*

Term	Abbreviation
Bearing Waypoint To Waypoint	*BWW*
Bow Crossing Range	BCR
Bow Crossing Time	*BCT*
Built in Test Equipment	*BITE*
Calibrate	*CAL*
Cancel	*CNCL*
Cancel All	*CNCL ALL*
Carried (for example, carried EBL origin)	*C*
Central Processing Unit	CPU
Centre	*CENT*
Change	*CHG*
Chart Display Settings	*CHT DISP SET*
Chart Management	*CHT MGMT*
Chart Safety Settings	*CHT SF SET*
Circularly Polarised	*CP*
Clear	*CLR*
Closest Point of Approach	*CPA*
Compact Disk Read Only Memory	CDROM
Conning	CONN
Consistent Common Reference Point	*CCRP*
Consistent Common Reference System	*CCRS*
Contrast	*CONT*
Coordinated Universal Time	UTC
Correction	*CORR*
Course	*CRS*
Course Over the Ground	*COG*
Course Through the Water	*CTW*
Course To Steer	*CTS*
Course Up	*C UP*

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

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

Term	Abbreviation
Interswitch	*ISW*
Interval	*INT*
January	*JAN*
July	*JUL*
June	*JUN*
Label	LBL
Latitude	*LAT*
Latitude/Longitude	L/L
Leeway	LWY
Limit	*LIM*
Line Of Position	*LOP*
Log	*LOG*
Long Pulse	*LP*
Long Range	*LR*
Longitude	*LON*
Loran	*LORAN*
Lost Target	*LOST TGT*
Low Frequency	*LF*
Magnetic	*MAG*
Man Overboard	MOB
Manoeuvre	*MVR*
Manual	*MAN*
Map(s)	*MAP*
March	*MAR*
Maritime Mobile Services Identity number	*MMSI*
Maritime Pollutant (applies to AIS)	*MP*
Maritime Safety Information	*MSI*
Marker	*MKR*
Master	*MSTR*
Maximum	*MAX*
May	*MAY*
Medium Frequency	*MF*
Medium Pulse	*MP*
Menu	*MENU*
Minimum	*MIN*
Missing	*MISSING*
Mute	*MUTE*
Navigation	*NAV*
Night	*NT*
Normal	*NORM*
North	*N*
North Up	*N UP*

Term	Abbreviation
Not Less Than	NLT
Not More Than	NMT
Not Under Command	NUC
November	*NOV*
October	*OCT*
Off	*OFF*
Officer On Watch	*OOW*
Offset	*OFFSET*
On	*ON*
Out/Output	*OUT*
Own Ship	*OS*
Panel Illumination	*PANEL*
Parallel Index Line	*PI*
Past Positions	PAST POSN
Passenger Vessel	*PASSV*
Performance Monitor	*MON*
Permanent	*PERM*
Person Overboard	*POB*
Personal Identification Number	*PIN*
Pilot Vessel	*PILOT*
Port/Portside	*PORT*
Position	*POSN*
Positional Dilution Of Precision	*PDOP*
Power	*PWR*
Predicted	*PRED*
Predicted Area of Danger	*PAD*
Predicted Point of Collision	*PPC*
Pulse Length	*PL*
Pulse Modulation	*PM*
Pulse Repetition Frequency	*PRF*
Pulse Repetition Rate	*PRR*
Pulses Per Revolution	*PPR*
Racon	*RACON*
Radar	*RADAR*
Radar Plotting	RP
Radar Transponder	TPR
Radius	*RAD*
Rain	*RAIN*
Range	*RNG*
Range Rings	*RR*
Raster Chart Display System	*RCDS*

Term	Abbreviation
Raster Navigational Chart	*RNC*
Rate Of Turn	*ROT*
Real-time Kinematic	*RTK*
Receive	*RX*
Receiver	*RCDR*
Receiver Autonomous Integrity Monitoring	*RAIM*
Reference	*REF*
Relative	*REL*
Relative Motion	*RM*
Revolutions per Minute	*RPM*
Rhumb Line	RL
Roll On/Roll Off Vessel	*RoRo*
Root Mean Square	*RMS*
Route	*ROUTE*
Safety Contour	*SF CNT*
Sailing Vessel	*SAIL*
Satellite	*SAT*
S-Band	*S-BAND*
Scan to Scan	*SC/SC*
Search And Rescue	SAR
Search And Rescue Transponder	*SART*
Search And Rescue Vessel	*SARV*
Select	*SEL*
September	*SEP*
Sequence	*SEQ*
Set (i.e., set and drift, or setting a value)	*SET*
Ship's Time	*TIME*
Short Pulse	*SP*
Signal to Noise Ratio	*SNR*
Simulation	*SIM*
Slave	*SLAVE*
South	*S*
Speed	*SPD*
Speed and Distance Measuring Equipment	*SDME*
Speed Over the Ground	*SOG*
Speed Through the Water	*STW*
Stabilized	*STAB*
Standby	*STBY*
Starboard/Starboard Side	*STBD*
Station	*STN*
Symbol(s)	*SYM*

Term	Abbreviation
Synchronised/ Synchronous	*SYNC*
System Electronic Navigational Chart	SENC
Target	*TGT*
Target Tracking	*TT*
Test	*TEST*
Time	*TIME*
Time Difference	*TD*
Time Dilution Of Precision	*TDOP*
Time Of Arrival	*TOA*
Time Of Departure	*TOD*
Time to CPA	*TCPA*
Time To Go	*TTG*
Time to Wheel Over Line	*TWOL*
Track	*TRK*
Track Control System	*TCS*
Tracking	TRKG
Trail(s)	*TRAIL*
Transmit and Receive	*TXRX*
Transceiver	*TCVR*
Transferred Line Of Position	*TPL*
Transmit	TX
Transmitter	*TMTR*
Transmitting Heading Device	*THD*
Trial	*TRIAL*
Trigger Pulse	*TRIG*
True	*T*
True Motion	*TM*
Tune	*TUNE*
Ultrahigh Frequency	*UHF*
Uninterruptible Power Supply	UPS
Universal Time, Coordinated	*UTC*
Universal Transverse Mercator	UTM
Unstabilised	*UNSTAB*
Variable Range Marker	*VRM*
Variation	*VAR*
Vector	*VECT*
Very High Frequency	*VHF*
Very Low Frequency	*VLF*
Vessel Aground	*GRND*
Vessel at Anchor	*ANCH*

Term	Abbreviation
Vessel Constrained by Draught	*VCD*
Vessel Engaged in Diving Operations	*DIVE*
Vessel Engaged in Dredging or Underwater Operations	*DRG*
Vessel Engaged in Towing Operations	*TOW*
Vessel Not Under Command	*NUC*
Vessel Restricted in Manoeuvrability	*RIM*
Vessel Traffic Service	*VTS*
Vessel Underway Using Engine	*UWE*
Video	*VID*

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

Appendix 3 List of Symbols

Symbol name	Symbol graphic
Own ship - simplified symbol	Double circle ◎
Waypoint	Circle ○
Route	Long-dashed line ○ ▬ ▬ ▬ ▬ ▬ ▬ ○
Cursor	Cross line ＋

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
HEADING/HEEL	DR TIME			5 min
	HEADING 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
ALERT	SETTING	ALARM 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 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 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
		HOUR(hr)		0
		MINUTE(min)		0
	DGPS	DGPS		OFF
	BEACON	AUTO		-
		MANUAL	FREQUENCY	309kHz
			BITRATE	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,kn
		HEIGHT/DPTH		m
			SETTING METHOD	DEFAULT
			CONVERTED VALUE(1fm=Xm)	1.8288
	MAG CORR		MAG CORR	OFF
			EAST/WEST	W
			CORRECTION VALUE	0
	HEAVING OFFSET	X		0m
		Y		0m
		Z		0m
	5Hz DISPLAY			OFF
LANGUAGE				ENGLISH
VERSION	DISPLAY	VERSION SERIAL NUMBER BARCODE IP		-
	SENSOR	MODEL VERSION SERIAL NUMBER BARCODE		-
	SENSOR	GPS1 VERSION GPS2 VERSION GPS3 VERSION		-
	ROLLOVER	ROLL OVER SETTING DATE 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,ZDA 1s
		OUT2			IEC 38400bps 2.3 GNSS/GNSS THS,ROT 25msec
		OUT3			IEC 38400 2.3 GNSS/GNSS GNS,RMC,VTG,DTM,ZDA 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,ZDA 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
		CONTACT 1	CONTACT OUT		HEADING1
		CONTACT 2	CONTACT OUT		HEADING2
		CONTACT 3	CONTACT OUT		SYSTEM
		SENSOR THROUGH 1	FORMAT		NMEA
			BITRATE		38400bps
			VERSION		2.3
			INTERVAL		25msec
			OUTPUT SENTENCE		THS,ROT
		SENSOR THROUGH 2			4800bps NMEA V2.3 GGA,VTG,RMC,GLL,ZDA,DTM 1 秒
	SWITCH	CONTROL 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 CAL			MIN
	IP	SETTING			JRC STANDARD
		IP ADDRESS			172.018.001.169
		SUBNET MASK			255.255.000.000
		MAC ADDRESS			-
		DEFAULT GATEWAY			000.000.000.000
	CCRP	BEEM(m)			1m
		LENGTH(m)			1m
		CCRP	X		0m
			Y		0m
			Z		0m
		SENSOR	X		0m
			Y		0m
			Z		0m
		3 AXIS SPEED	X		0m
			Y		0m
			Z		0m
		2 AXIS SPEED	X		0m
			Y		0m
			Z		0m

MENU	Sub Menu	Sub Menu	Sub Menu	Sub Menu	DEFAULT
EQUIP	LOW SPEED COG	OUTPUT			OFF
	MAINTENANCE	DIAGNOSIS	DISPLAY	eMMC EEPROM RAM SIO SENSOR SIO1 SIO2 SIO3 LAN FRONT BUZZER BACK BUZZER LCD	
			SENSOR	[GPS1] ANTENNA ROM RAM RTC [GPS2] ANTENNA ROM RAM RTC [GPS3] ANTENNA ROM RAM RTC [CONTROLLER] ROM 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,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 : L o cal 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:

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

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 : P r o bability 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.x,x.x,x.x,x.x,x.x,x.x,h,h *hh<CR><LF>
1 2 3 4 5

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 ±99,9 m, then the decimal part is dropped, resulting in an integer (–103,7 becomes –103). The maximum value for this field is ±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 2 3 4 5 6 7 8

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 2 3 4 5 6

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 ±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:
$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. W hen 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. W hen 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. W hen 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.

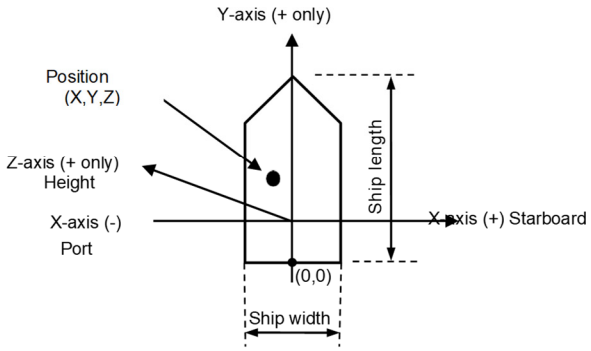
Usage is defined in equipment standards. Possible application may be to transmit this sentence at power up and repeatedly at 3 s interval.

$--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.x,x.x,hhmmss.ss,xx,xx*hh□CR□□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

This product uses open source software (RTKLIB 2.4.3).
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Appendix 9 About Chinese version RoHS

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 (Part name)	有害物质 (Hazardous Substances)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
室外装置 (Extanally Mounrted Eqipment)	○	○	○	○	○	○
室内装置 (Internally Mounted Equipment)	×	○	○	○	○	○
外部设备(Peripherals) ・打印机(Printer) ・选择(Options) ・电线类(Cables) ・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

アスベストは使用しておりません
Not use the asbestos

For further information,contact:

JRC Japan Radio Co., Ltd.

Since 1915

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ISO 9001, ISO 14001 Certified

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