JLR-21/31

GPS COMPASS

INSTRUCTION MANUAL

JRC Japan Radio Co., Ltd.

Foreword

Thank you for purchasing the JRC GPS Compass JLR-21/31.
This unit uses signals from GPS satellites to determine the ship's heading.

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

Before Commencing the Operation

Symbols

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

⚠ **WARNING**	Instructions shown with this symbol represent what can cause death or serious injury if not observed.
⚠ **CAUTION**	Instructions shown with this symbol represent what may cause injury or property damage if not observed.

Examples of the Symbols

The symbols shown in the △ 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.

Precautions Upon the Operation

⚠ CAUTION

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

The dip switches on the unit are all set at the factory, and must not be changed. Doing so may result in equipment failure, malfunction, or injury.

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

Do not place items on 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.

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

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.

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

When suspected of an antenna failure, check the satellite information display for reception from a satellite and exchange the antenna if necessary.

⚠ CAUTION

When used in other than ships, it may not satisfy the desired performance and functionality. Because this product is designed to be installed for the ship.

Heaving function of this product is intended to measure swinging in the vertical direction of the ship.
So, it is not possible to measure something (wave height etc.) other than swinging in the vertical direction of the ship.
It is not possible to measure also the tsunami.

When you install JLR-21/31 in retractable mast, please observe the following strictly.
① An unusual vibration or an unusual shock should not occur.
② When the mast has retracted, please stop use. Because normal operation cannot be performed.
③ A difference should not occur in the position by retracting.

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. **3 meters or more away from amateur radio antennas.**

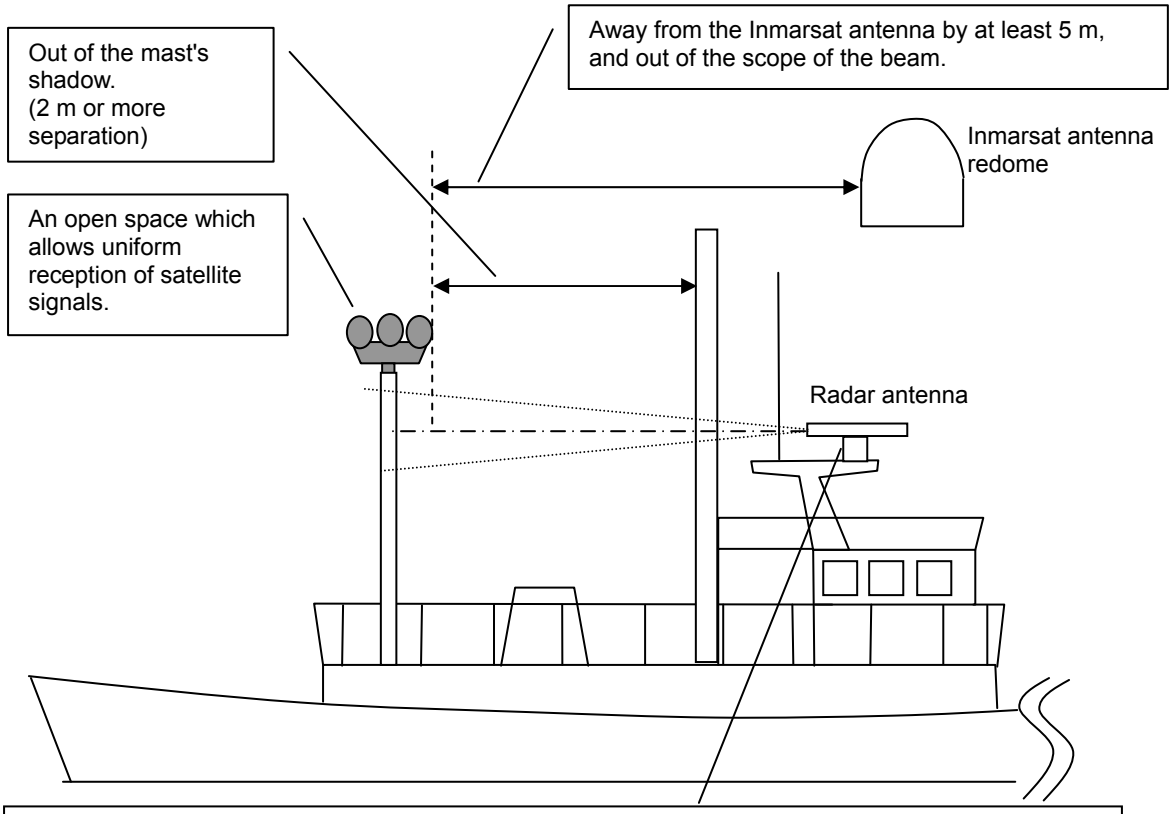
If it is difficult to find an ideal site, select a place temporarily and install the equipment. Conduct a test to make sure that the proper performance can be obtained and then fix the equipment in position. If it is installed at an improper place, reception accuracy may be impaired.

⚠ CAUTION

Do not bend the cables included with this equipment excessively, or twist them or subject them to other strong forces. Doing so may result in damage to the interior or exterior of the cables, and may result in fire or electrocution.

Do not install the equipment in places subject to vibration or shock.
Doing so may result in the equipment failure due to reception problems.

This equipment uses GPS satellite signals to determine the bearing of the ship. Install the sensor where there are no impediments to electrical signal reception, and no signal reflection. If the sensor installation location environment is unsatisfactory, ship bearing calculations is repeatedly interrupted.
If selection of the optimal installation location is difficult, and some concessions must be made, place the sensor in the desired installation location and test the acceptability of the sensor results before permanently installing the sensor. Installing the sensor in an inappropriate location may result in decreased accuracy and equipment failure.
Poor visibility and the high occurrence of reflected waves may result in a decrease in bearing accuracy or the interruption of bearing measurement. Whenever possible, select a place having the following characteristics.



2 m or more outside of any radar beams.
Installation near radar antennas may result in multipath wave interference, which decreases the accuracy of the equipment.
Whenever possible, install the equipment above or below any beams and keep it out of the scope of the beams.

Appearance of the Equipment

● Standard Equipment

NWZ-4701 Display Unit

NNN-21 Sensor Unit

NNN-31 Sensor Unit

Contents

Section 1 Equipment Overview

1.1 Functions

This equipment determines the heading of a ship by measuring the orientation between two antennas using the signal from GPS satellites.
The equipment not only determines the heading with high accuracy anywhere in the world and in all weather conditions using the GPS satellites, but determines the position, course, and speed of the ship. When the DGPS beacon receiver is connected, the accuracy of position fixing can be enhanced by receiving correction data from the DGPS beacon station.
Since this equipment outputs the bearing information at high speed, if the unit is interfaced to a JRC radar unit, it is possible to fully draw the capabilities of the radar and ARPA.

1.2 Features

- High accuracy and high stability (JLR-21:0.5 degree rms , JLR-31:0.25 degree rms)
- Short setting time (less than 2 minutes at warm start fix)
- High speed tracking response (Tracking rate of turn is 45 degree/sec)
- High visibility 5.7-inch FSTN LCD
- Many utility display modes (Compass rose graphics, ROT, NAV, GPS status, etc.)
- Easy installation
- Direct connection to the JRC radars
- SBAS compatible: Differential positioning by receiving correction data from SBAS satellites (MSAS/WAAS/EGNOS)
- Enhanced positioning reliability derived from RAIM function (the sensor itself can judge the positioning accuracy)
- Enhanced attitude measuring functions (rolling, pitching, heaving)

1.3 Configuration

Standard Configuration

JLR-21

No.	Name	Model/Code	Q'ty	Notes
1	Display Unit	NWZ-4701	1	
1-1	Power Cable	CFQ-7257	1	2m / With fuse holder
1-2	Fuse	MF60NR 250V 2	2	2Amps.
1-3	Clamp Filter	TFC-23-11-14	1	5MBAT00002
1-4	Model Identification Plate	MPNN47010	1	
1-5	Model Identification Plate For Panel	MPNN47078	1	
1-6	Installation Screws	MPTG31659	1	4 tapping screws
1-7	Flush Mounting Screw	MPTG31962	1	4 screws（For mount screw from the back）
2	Sensor Unit	NNN-21	1	
2-1	Cable	CFQ-7248	1	10m / 14 cores
2-2	Clamp Filter (Small)	E04SR200935A	2	
2-3	Clamp Filter (Large)	E04SR301334	1	
2-4	Bundling Band (Short)	BRBP07141	1	
2-5	Bundling Band (Long)	BRBP07142	4	
2-6	Self-bonding Tape	BRXP05369	1	
3	Instruction Manual (English)	7ZPNA4224	1	

JLR-31

No.	Name	Model/Code	Q'ty	Notes
1	Display Unit	NWZ-4701	1	
1-1	Power Cable	CFQ-7257	1	2m / With fuse holder
1-2	Fuse	MF60NR 250V 2	2	2Amps.
1-3	Clamp Filter	TFC-23-11-14	1	5MBAT00002
1-4	Model Identification Plate	MPNN47010	1	
1-5	Model Identification Plate For Panel	MPNN47078	1	
1-6	Installation Screws	MPTG31659	1	4 tapping screws
1-7	Flush Mounting Screw	MPTG31962	1	4 screws（For mount screw from the back）
2	Sensor Unit	NNN-31	1	
2-1	Cable	CFQ-7248	1	10m / 14 cores
2-2	Clamp Filter (Small)	E04SR200935A	2	
2-3	Clamp Filter (Large)	E04SR301334	1	
2-4	Bundling Band (Short)	BRBP07141	1	
2-5	Bundling Band (Long)	BRBP07142	4	
2-6	Self-bonding Tape	BRXP05369	1	
3	Instruction Manual (English)	7ZPNA4224	1	

Option

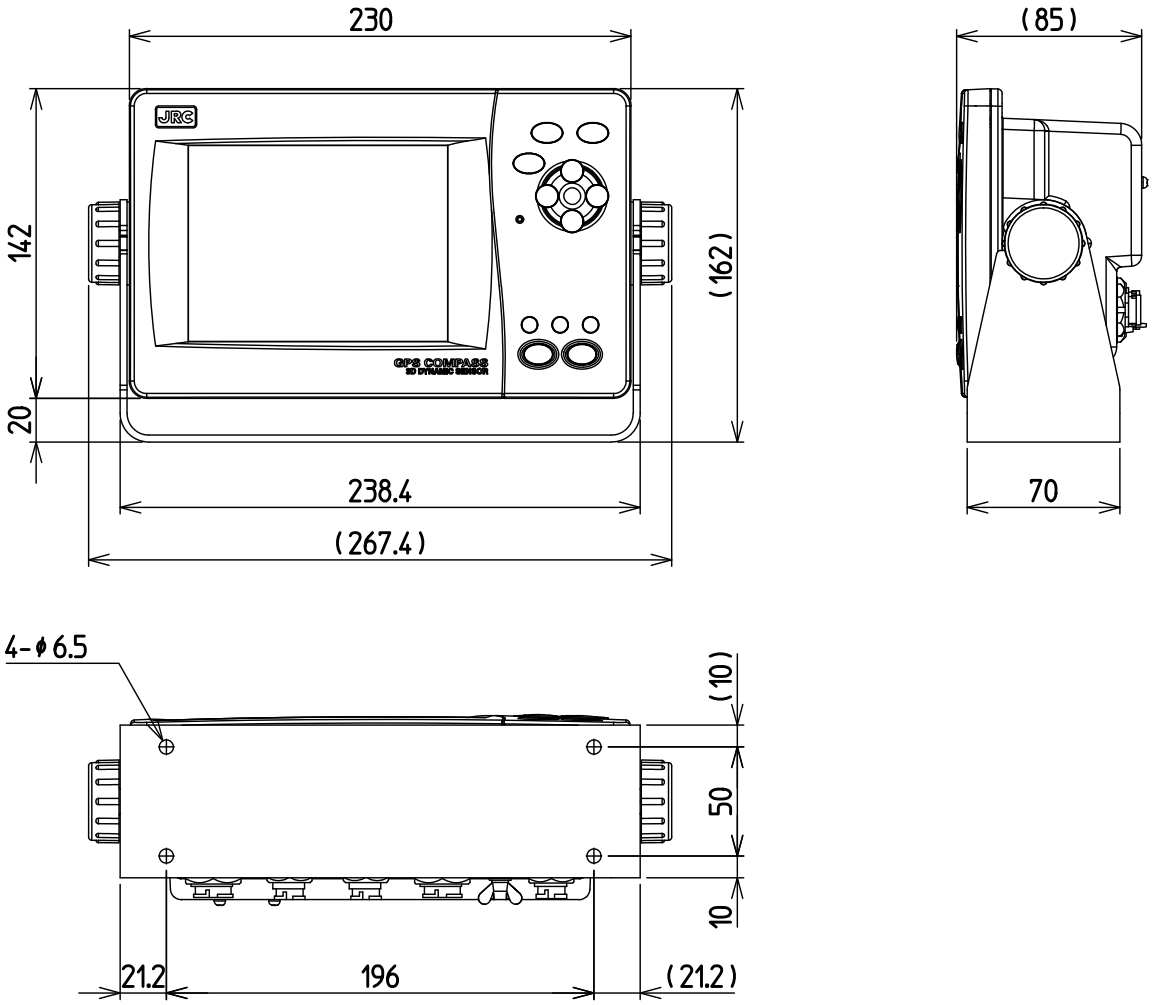
No.	Name	Model/Code	Q'ty	Notes
1	Data Cable	CFQ-5374	1	3m / 12 cores / Serial data transmission
2	Data Cable	CFQ-5404	1	3m / 14 cores / Dry contact signal
3	Data Extension Cable	CFQ-7249	1	20m / 14 cores / For sensor extension
4	Beacon Connecting Cable	CFQ-7250	1	For beacon receiver connection
5	Junction Box	NQE-7720	1	14 connector / for sensor extension
6	GPS Repecon	NQA-4115T	1	Digital/Synchronous Converter
7	DGPS Receiver	JLR-4341	1	Used as a beacon receiver (DGPS position fixing available using the compass)
8	Installation Trestle	MPBX44117	1	For NNN-21
9	Data Extension Cable	CFQ7249-10	1	10m Version of CFQ-7249(20m)
10	Bird Repellent Rod	MPXP34012A	1	For NNN-21/31
11	Y Cable For Sub Display	CFQ-7251	1	NWZ-4701 for Sub Display
12	Data Cable	CFQ-5469	1	For RADAR JMA-5100/5200/5300 Connectors on both sides of the cable(10m)
13	Flush Mount Kit	MPBC43664	1	Panel for Flash Mount
14	Buzzer	CGC-300B	1	Misappropriation for Navtex
15	Data Cable	CFQ5404-15	1	15m Version of CFQ-5404(3m)
16	Data Cable	CFQ5374-15	1	15m Version of CFQ-5374(3m)
17	Installation Metal Fittings Of Junction Box	MPBP31612	1	For Paul installation
18	Data Extension Cable(Exterior Cable)	TTYCYS-7	—	Code：2165411109
19	AC Power Rectifier	NBD-577C	1	AC100 / 220V Misappropriation for AIS
20	AC Power Rectifier	NBG-320	1	[Recommendation] AC100 / 220V Misappropriation for Navtex
21	Power Cable	CFQ-7257-10	1	10m / With fuse holder
22	Power Cable	CFQ-7257-15	1	15m / With fuse holder
23	Cable	CFQ7248-30	1	30m / 14 cores / 30m Version of CFQ-7248(10m)

Attention

When using Power Rectifier (NBG-320), the voltage drops due to cable length, please do not use Power Cable (CFQ-7257-15). By the way, Power Cable (CFQ-7257-15) is available.

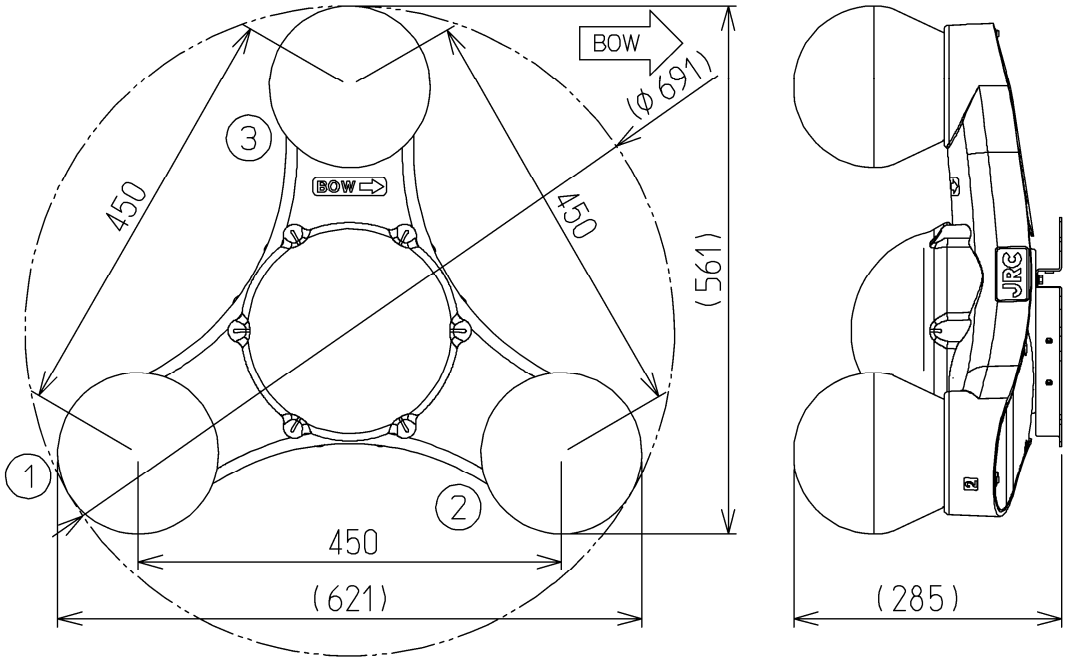
1.4 Construction

- **NWZ-4701 Display Unit**



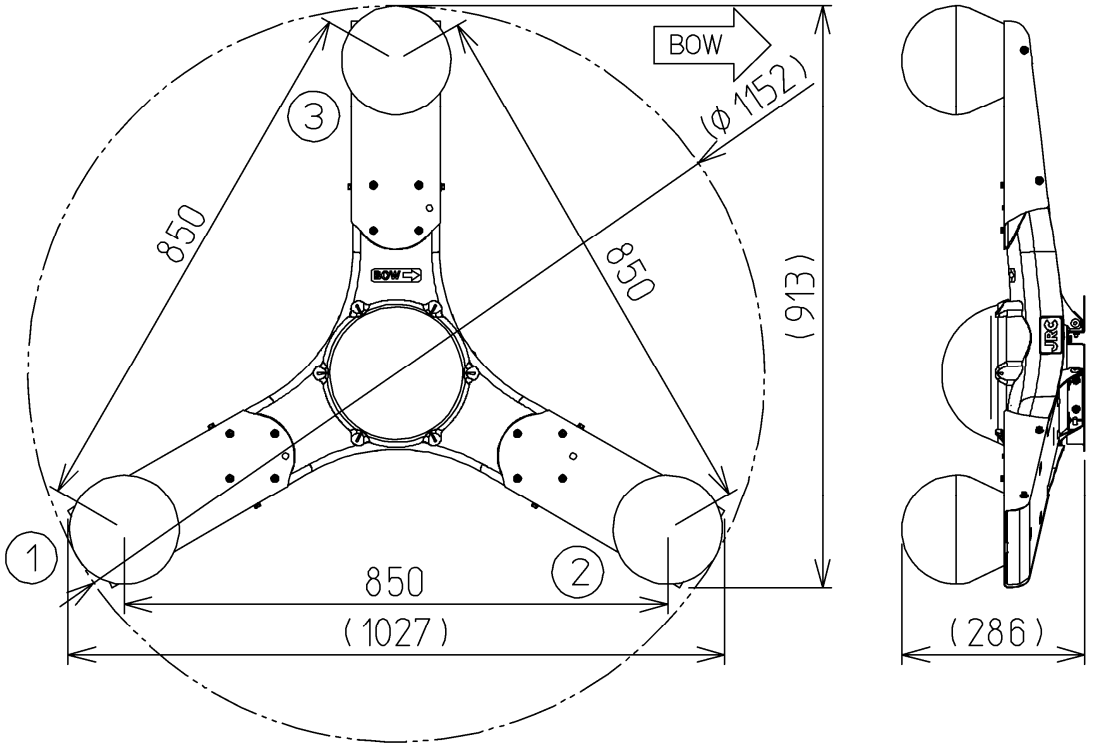
Dimensions: 267.4 x 162 x 85 mm
Mass: Approximately 2.3 kg

NNN-21



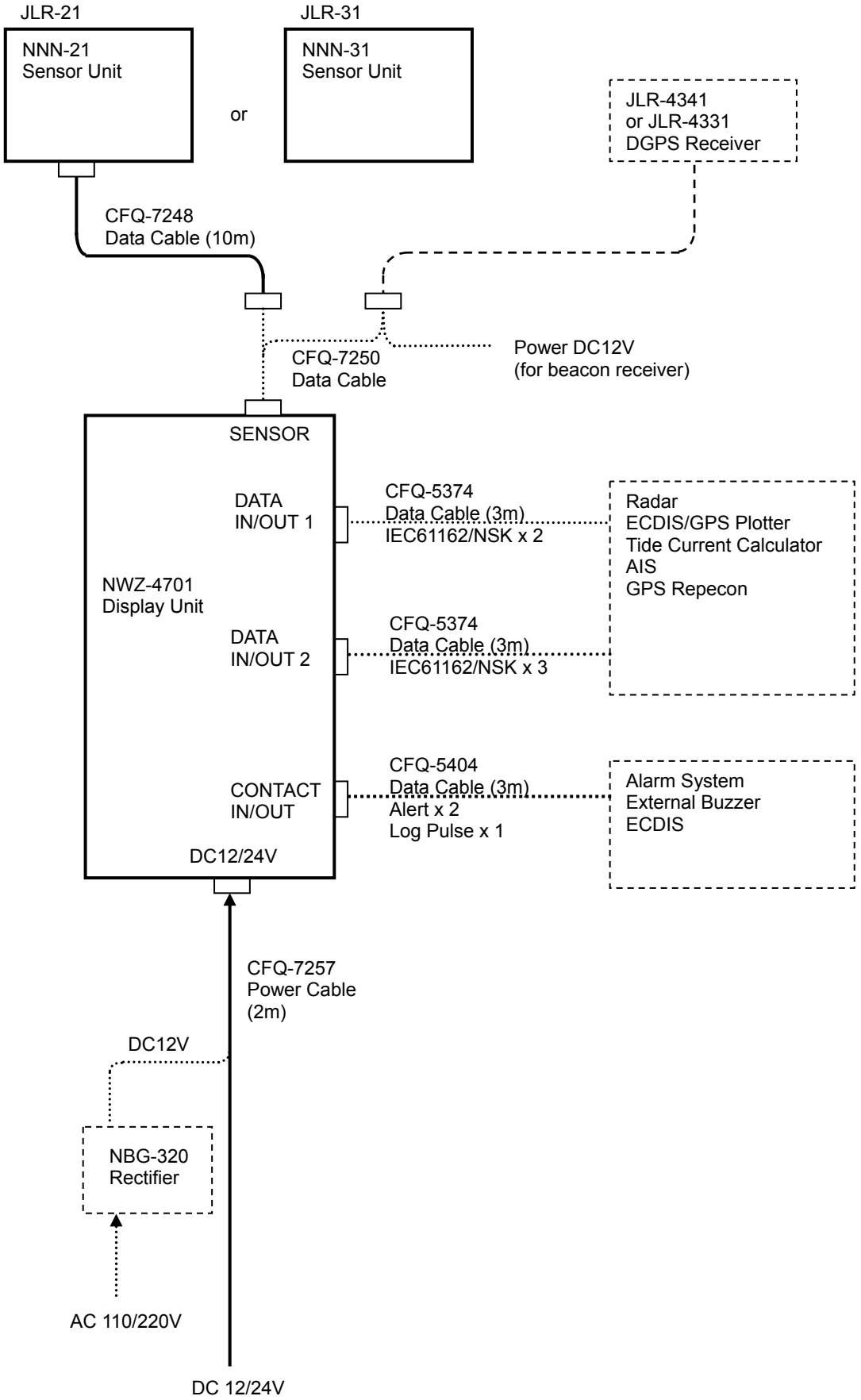
Dimensions: ϕ691 x 285mm
Mass: Approximately 5.9 kg

NNN-31



Dimensions: ϕ1152 x 286 mm
Mass: Approximately 10 kg

1.5 System Diagram



Section 2 Installation

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

2.1 Sensor Installation

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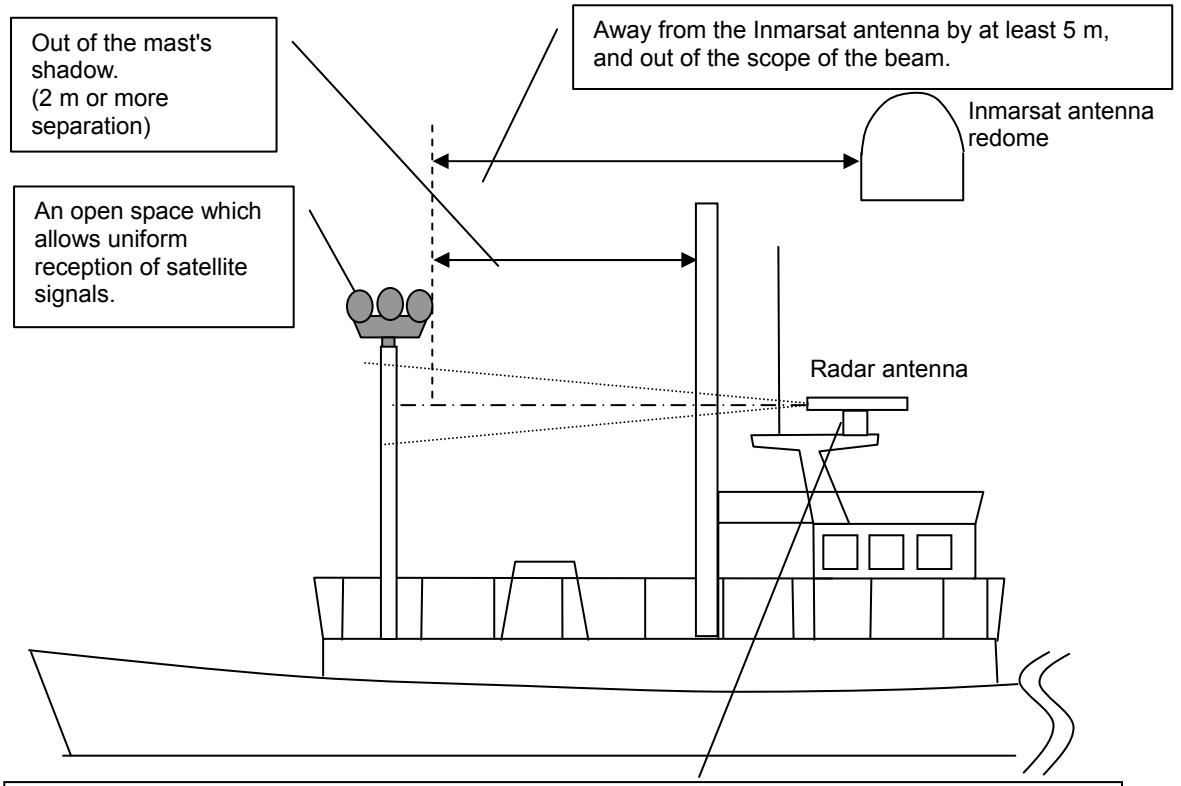

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When you install JLR-21/31 in retractable mast, please observe the following strictly.

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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.

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7. **3 meters or more away from amateur radio antennas.**

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.

Attention

- Be careful not to damage the equipment during loading or installation.

- Do not lift the sensor by the equipment cabling.

1. It is recommended that the sensor be installed midway on a strong pole or mast.
   In order to minimize vibration and improve maintainability, the sensor should not be mounted at an excessive height.

2. Use a sufficiently thick metal base for the sensor mount, and any necessary additional reinforcing materials, to reduce vibration and shock as much as possible. Use stays or wires on the pole or mast on which the mount is connected in order to further reduce vibration or shock to the sensor.
   (Refer to the terms “Installation Procedure” described below)
   Ensure that the mounting surface is as flat as possible. Do not use rubber, resin, or other flexible materials in order to flatten the mounting surface, as this may result in reduced resonance frequency and increased vibration. It may also cause mounting bolt loosening of the material when degraded.

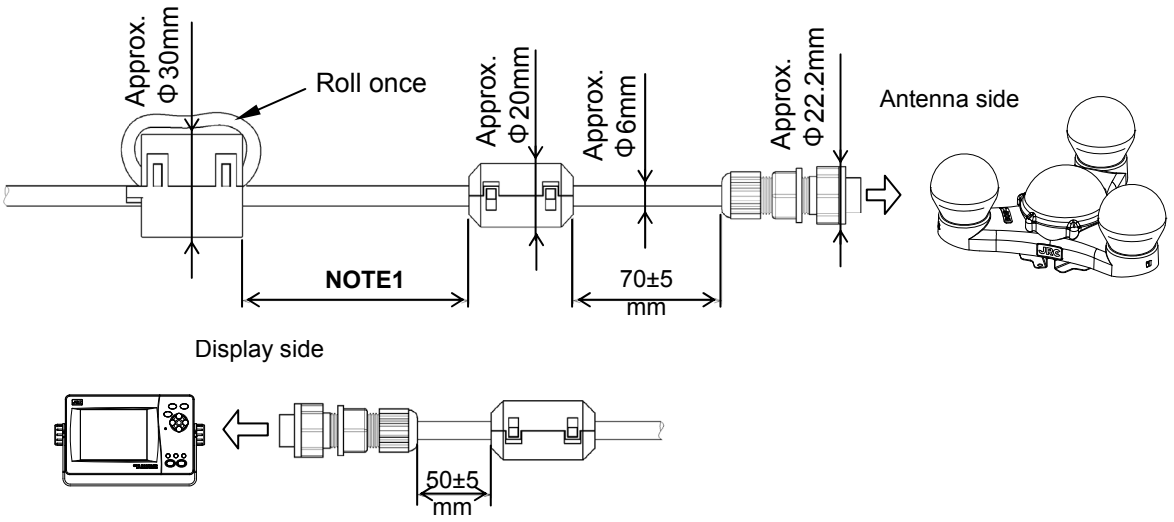
3. Use appropriate bolts for the sensor, and tighten all bolts equally. The length of the mounting bolts varys based on the thickness of the mount, but select bolts of such length that the amount extending past the nut is twice the thickness of the nut.
   Some initial loosening may occur after tightening. Perform a second bolt tightening some time after the initial tightening.
   After installation, check the tightness of the installation bolts periodically. It is especially important to check the bolt tightness after traveling in inclement weather, regardless of how much time has passed since the last check. Continued use of the same bolts may result in decreased strength, bolt degradation, or bolt breakage. If this occurs, replace both the bolt and the nut with a new bolt and nut. If bolt loosening occurs frequently, please consult with a JRC technician.

4. Install the sensor as horizontally to the ship as possible. If it is tilted largely, direction accuracy may be degraded.

● Cable Connection Procedure

The unit shown in the figure is the NNN-21, which is almost identical to the NNN-31. Installing the clamp filter or connecting the extension cable requires a self-bonding tape and vinyl tape. Apply RTV rubber or silicone rubber to waterproof the sensor unit.

1. Install clamp filters (one large and one small) to the antenna side of the included cable. Roll the cable once around the large clamp filter. Also install a clamp filter (small) to the display side. (Refer to the following figures.)

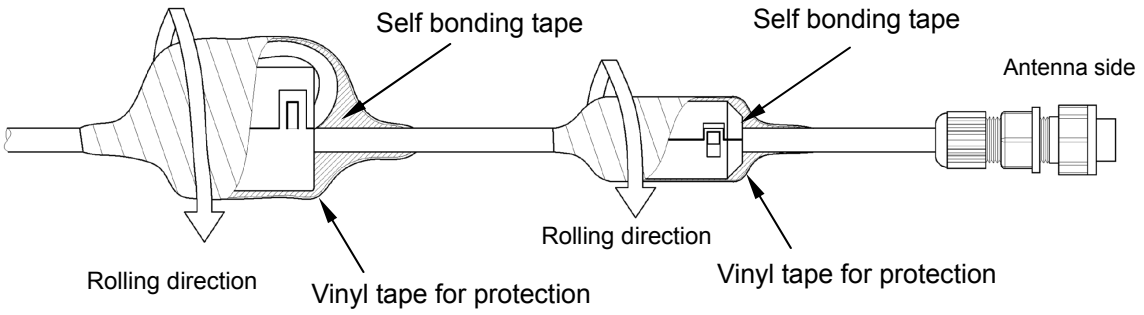


NOTE1: Determine the installation position of the clamp filter (large) by considering the installation condition of the sensor. (Refer to the installation figure on page 2-7.)

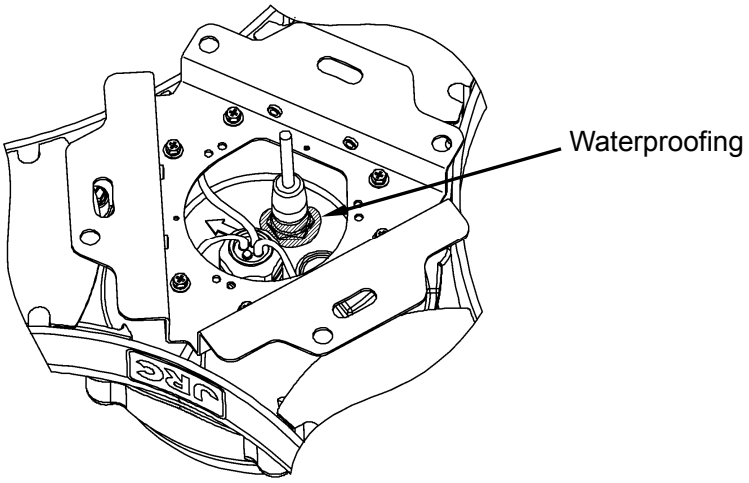
2. Processing Clamp Filter

2.1 Roll up a self bonding tape around the clamp filters in the antenna side. (No need to roll up the one in the display side.)
Roll up the tape by pulling so that the tape will be lengthened by two times. Also, roll up the tape so that the half of it is overlapped. Repeat three times to make it three-layered.
After rolling up, press the tape with the fingers for secure attachment.

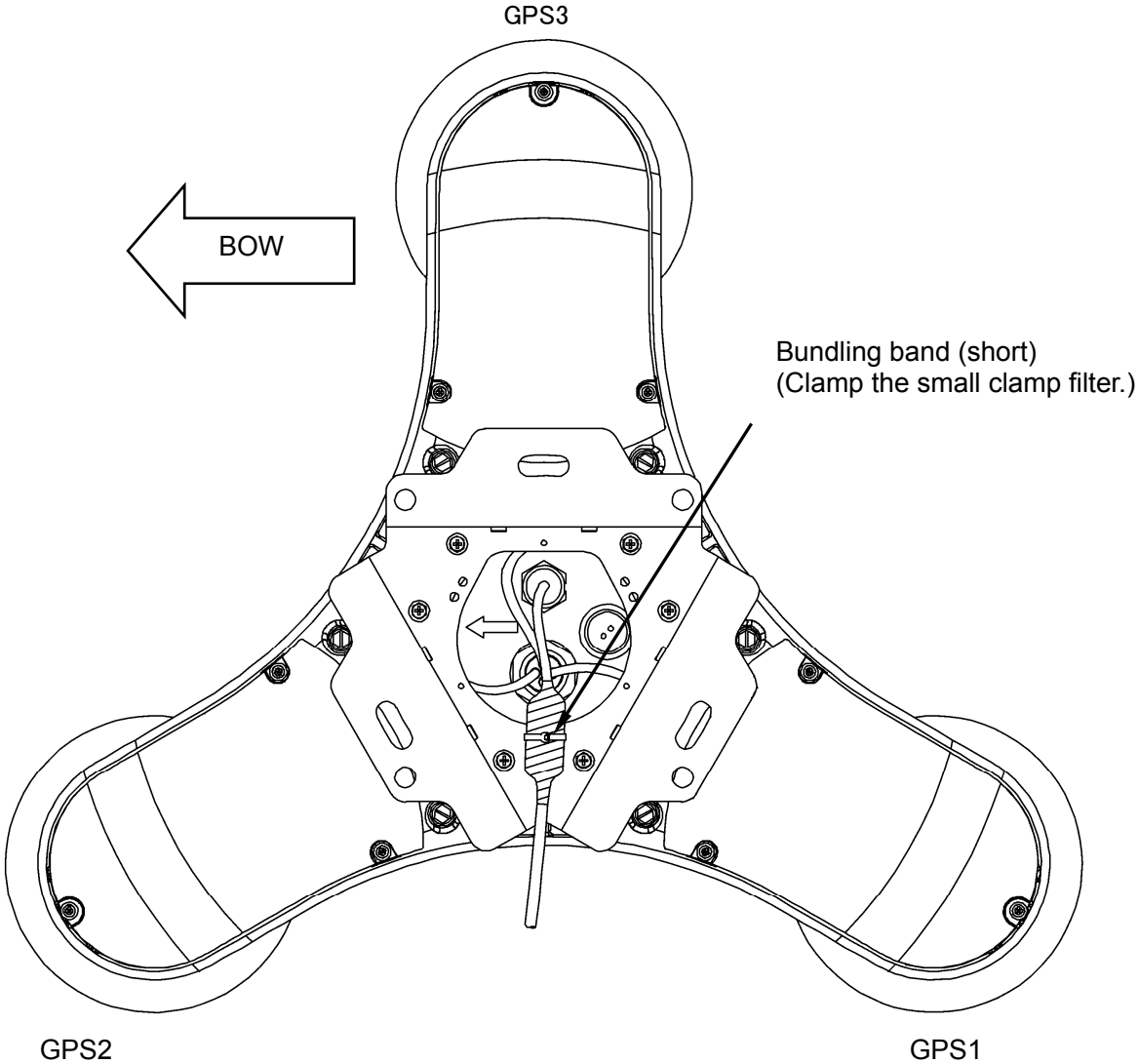
2.2 Wrap by a vinyl tape for protection.
Do not put tensile force to the vinyl tape as much as possible. Roll up the vinyl tape so that the half of it is overlapped. Repeat three times to make it three-layered.
Crimp the end of the rolled tape without tension. Press the whole tape with the fingers for secure attachment



3. Connect the included cable to the sensor unit. Tighten the nut firmly in order to waterproof the connector (a click sounds when plugged in firmly).
   After connecting, apply RTV (Room Temperature Vulcanizing) rubber on the connector for additional waterproofing.



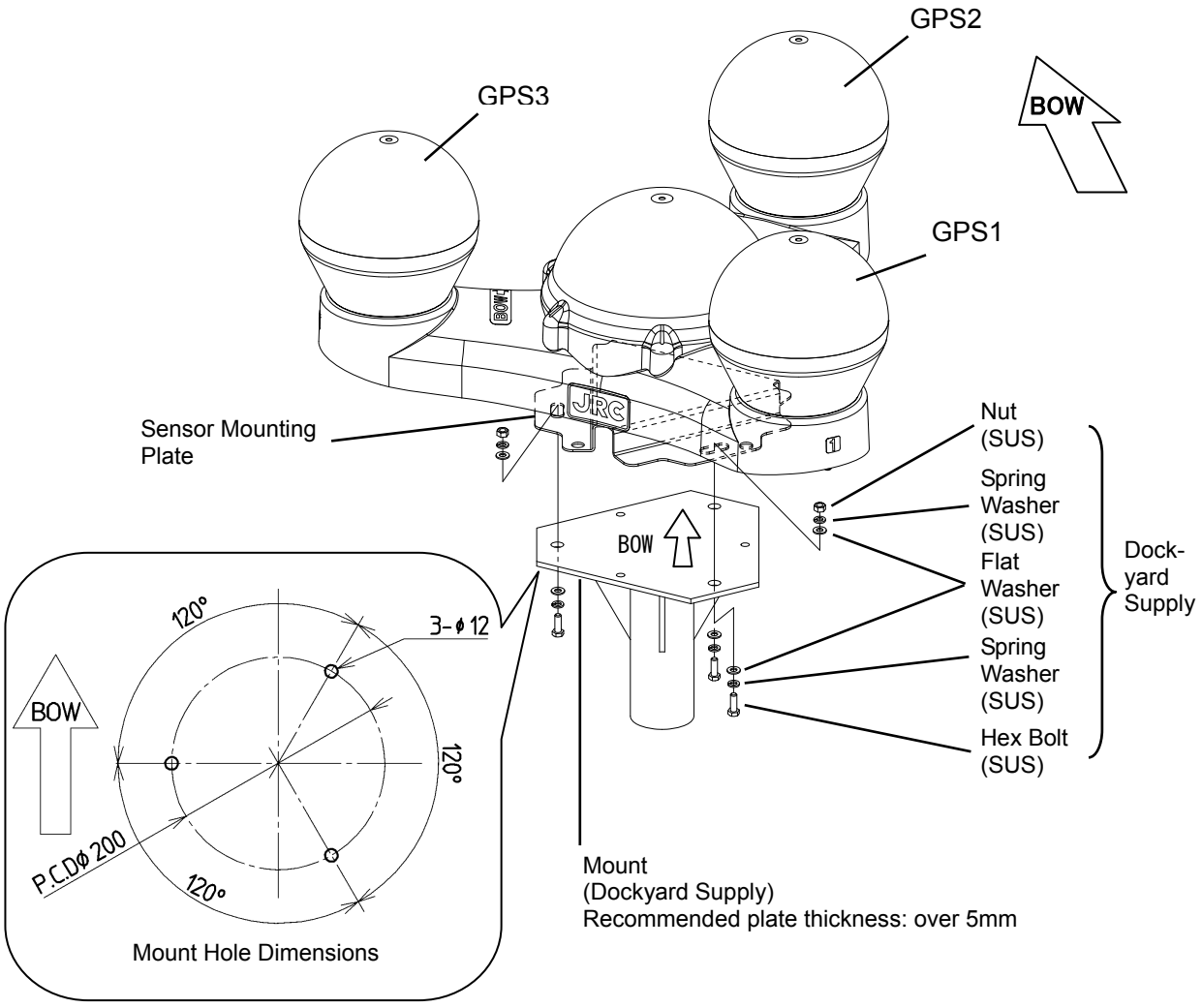
3. With using the included bundling band (short), clamp the cable as shown below. Position should be between GPS1 and GPS2.



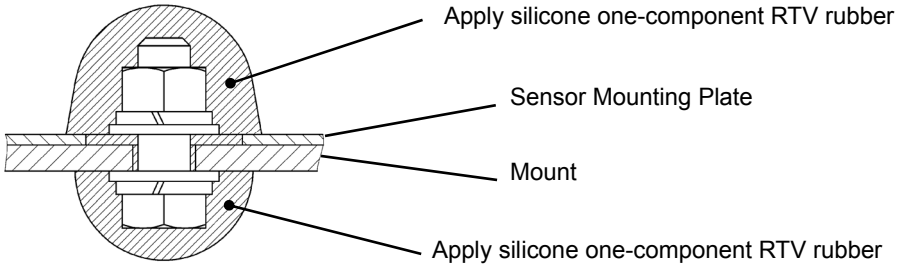
● Installation Procedure

The unit shown in the figure is the NNN-21, which is almost identical to the NNN-31.

1. Provide a mounting plate as shown below, and secure the sensor unit. Use M10 hex bolts, washers, spring washers, and nuts to secure it. Tighten the bolt by 3430 N-cm of torque (350 kg-cm).
   When making holes in the mounting plate, beware of bow direction. Excessively long bolts may reach the sensor unit. For 5 mm (1/5 inch) mounting plate, M10 x 30 mm bolts are just fit. Using double nuts is also effective to fix plate permanently.

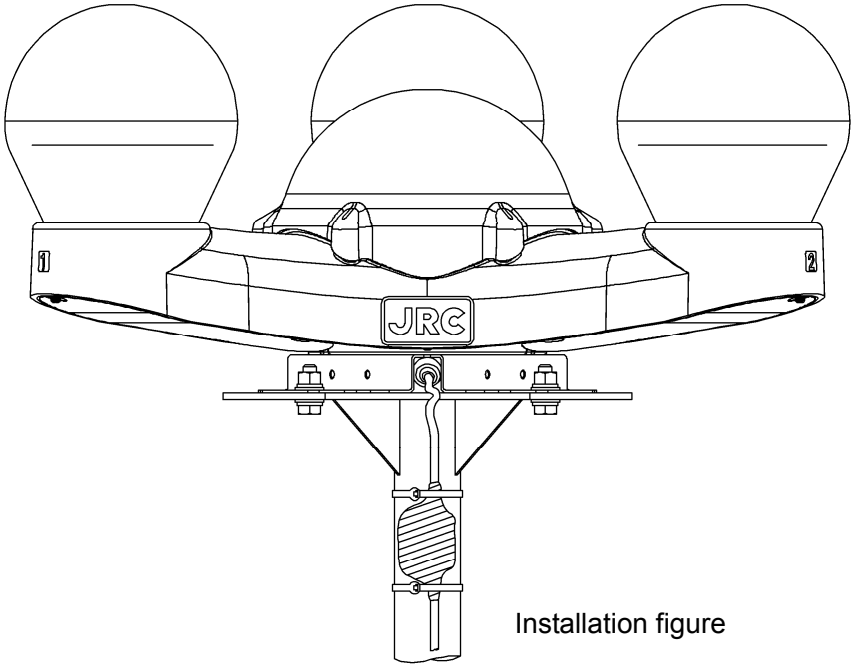


2. Use RTV (Room Temperature Vulcanizing) rubber to cover the hex bolts and nuts.



RTV : Room Temperature Vulcanizing

3. Fix the clamp filter (large) to the installation pole by using a bundling band (long). Fasten both ends of the large clamp filter. Fix it as closer to the antenna as possible.
   If it is impossible to fix to the pole, make holes in the mounting plate for bundling bands to go through, and fix the clamp filter to the mounting plate.

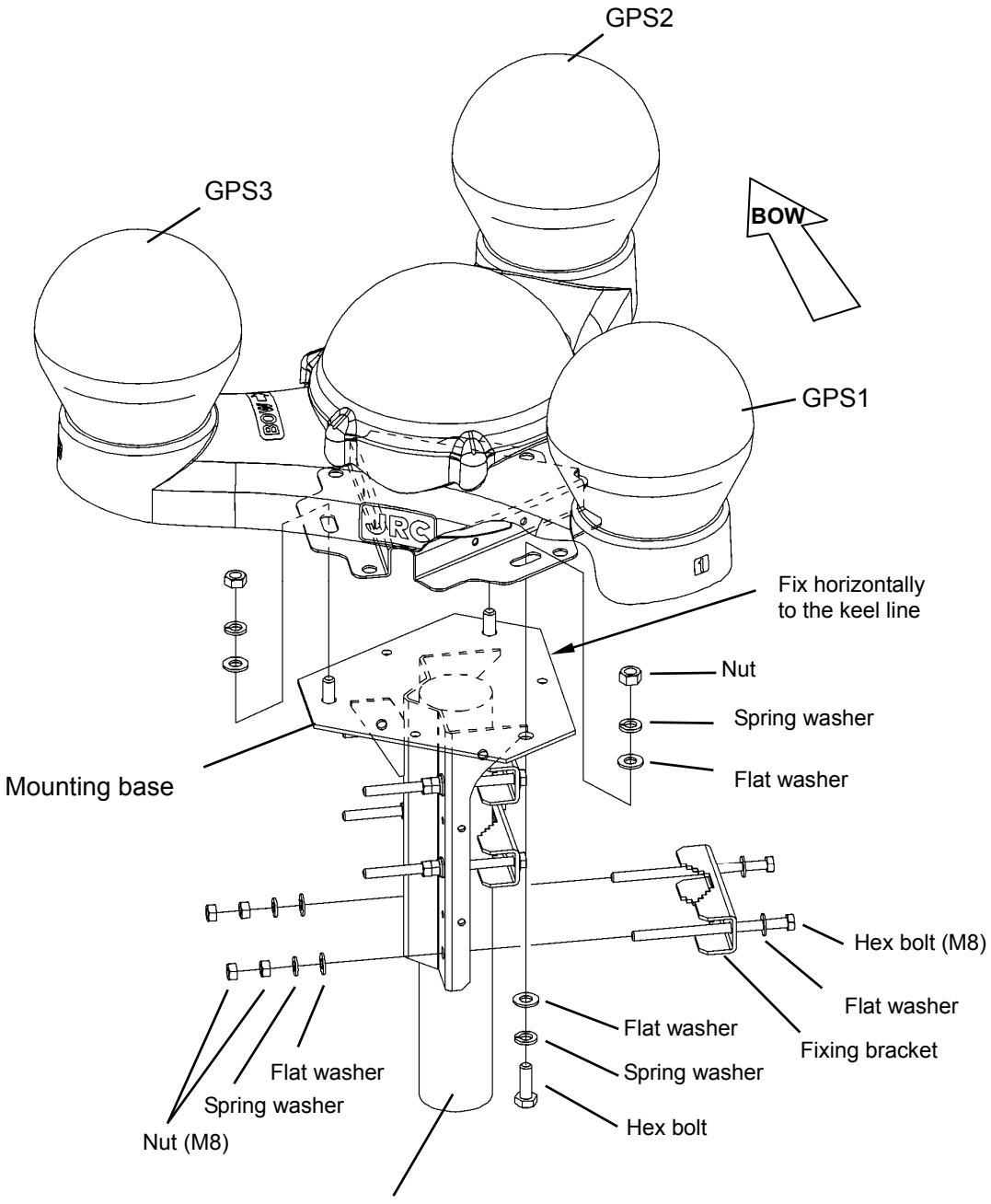


Installation figure

4. Cramp at the preferable position so that the cable weight itself will not be applied to the connector. If some slack is provided for the cable, beware of the influence from wind or sea wave. Arrange the cable so that it will not be hooked by a crane or fishing equipment.

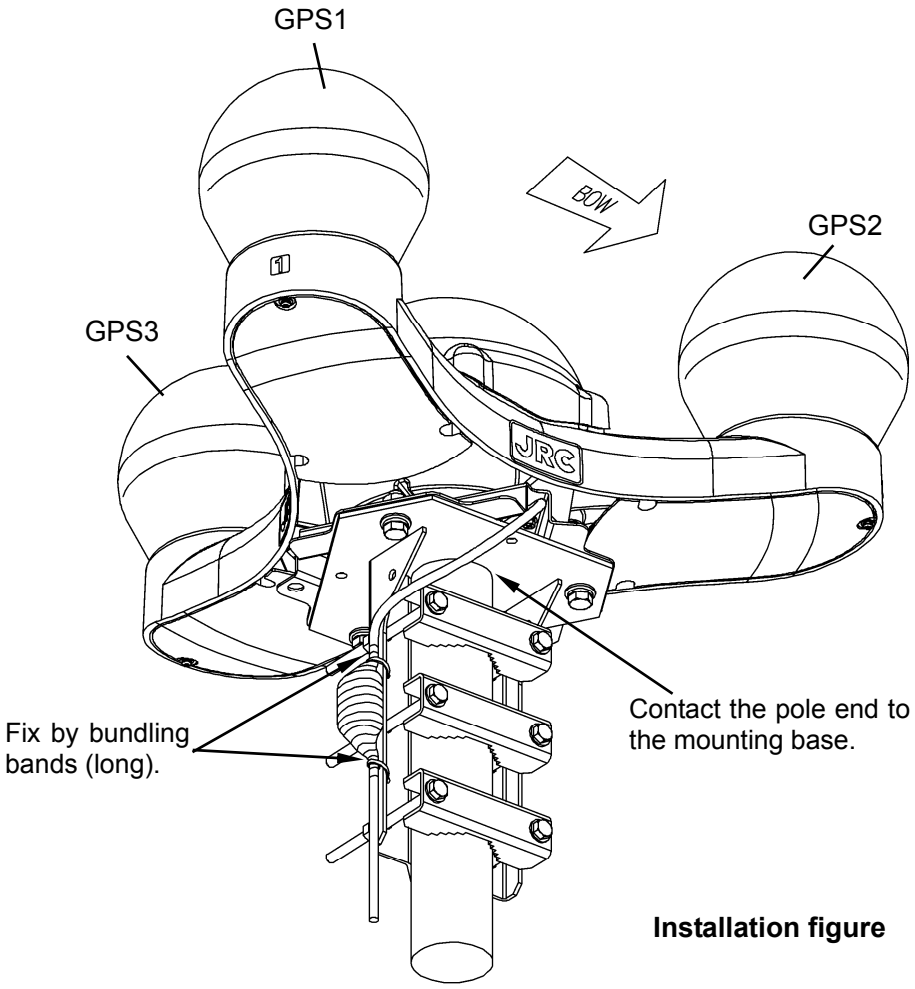
● Installation Procedure for Optional Mount Base for NNN-21

1. Install the mounting base to the pole by using fixing brackets, M8 bolts, flat washers, spring washers, and nuts. Then, secure the sensor to the mounting base. Beware of the bow direction.



Pole (dockyard supply)
Steel pipe is recommended
Outside diameter: Φ60.5mm / Thickness: 5.5 mm
Outside diameter: Φ76.3mm / Thickness: 7 mm
Outside diameter: Φ89.1mm / Thickness: 7.6 mm

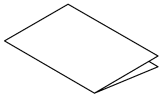
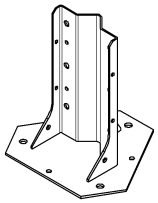
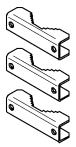
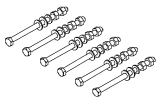
2. Fix both ends of the clamp filter (large) by using bundling bands (long) to secure the cable. Let the bands go through the holes of the mounting base.

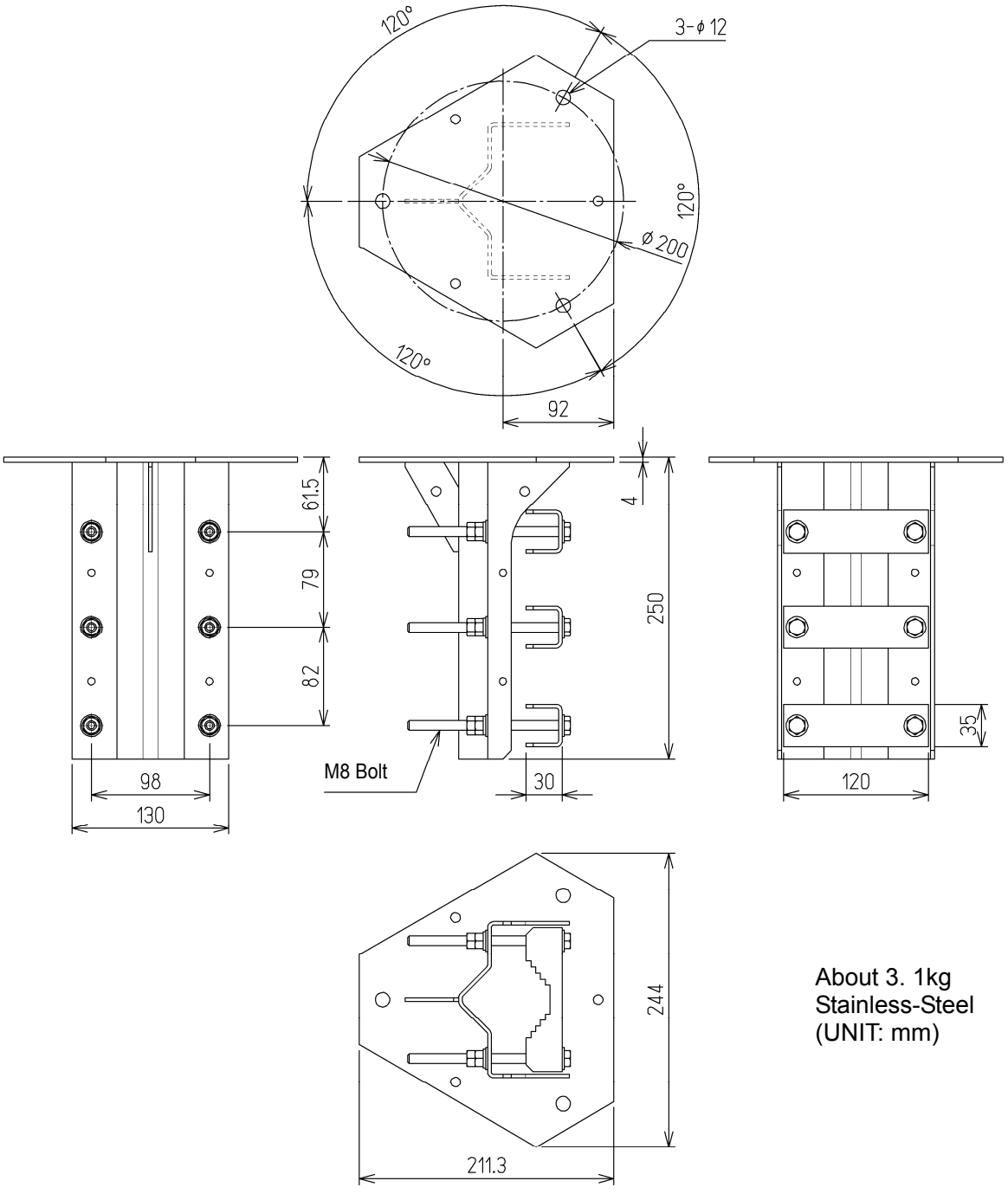


Installation figure

3. Connect the display unit and check the installation condition.
   Check the bow direction on the screen of the display unit. If direction error is found (more than around 5 degrees), adjust the position of the sensor (the sensor mounting plate has slotted holes). Also, for reinforcement, weld the mounting base and the pole as necessary.

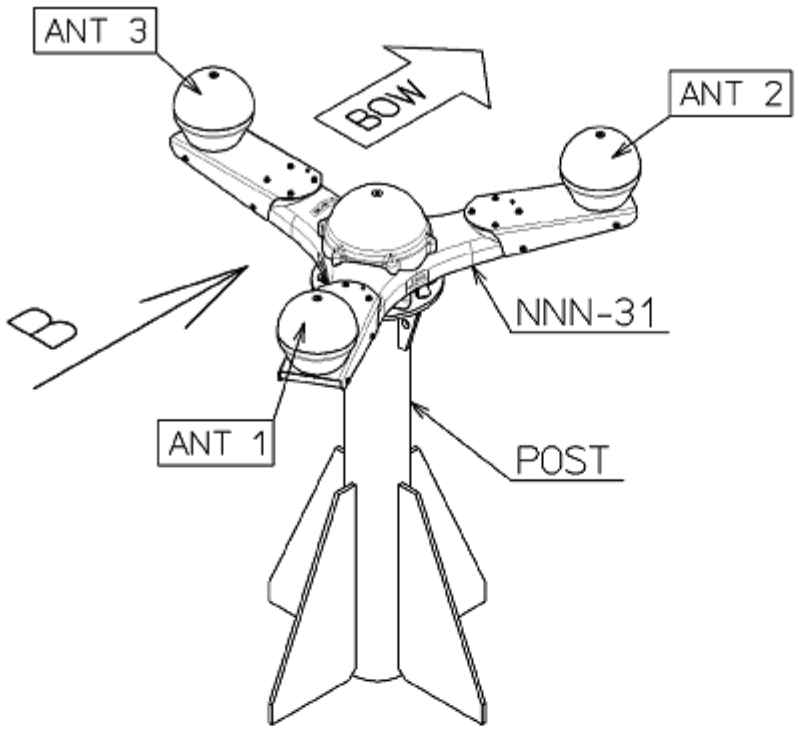
Option installation trestle (MPBX44117) bundle list for NNN-21

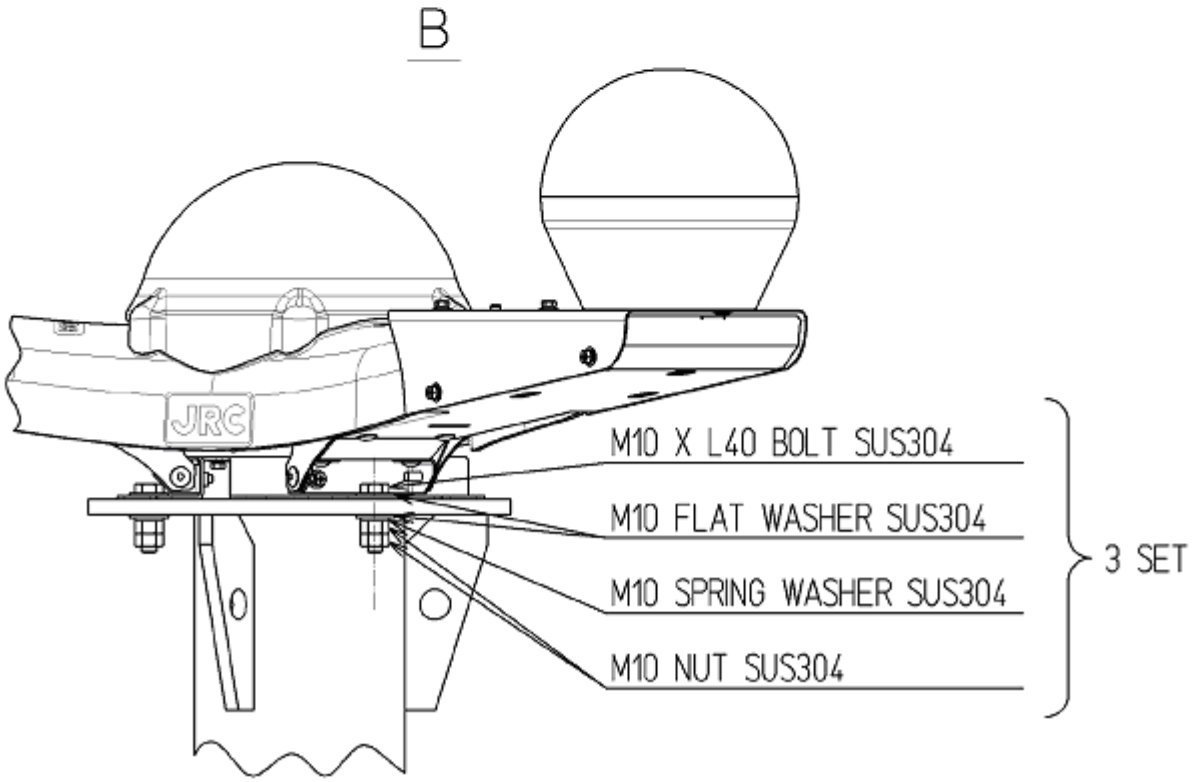
				
Installation manual X 1	Installation trestle X 1	Fixed bracket X 3	M8 Bolts X 6	M10 Bolts X 3



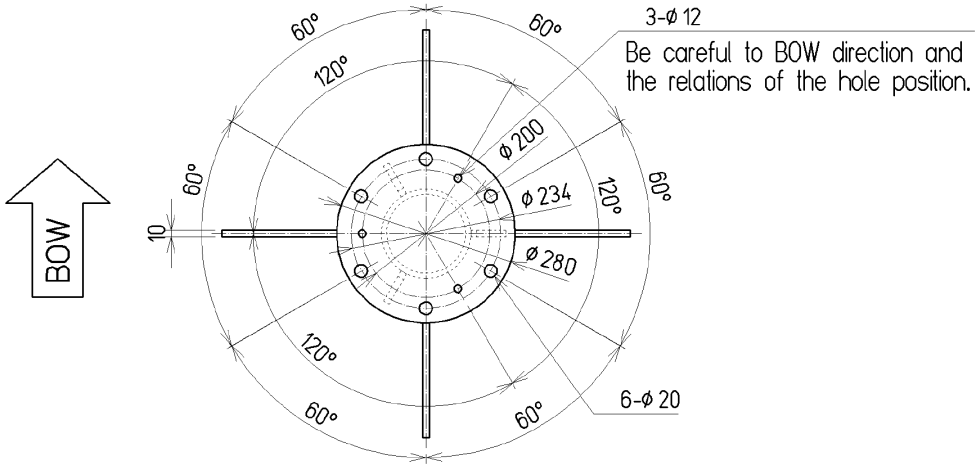
About 3. 1kg
Stainless-Steel
(UNIT: mm)

● About NNN-31


ANT 3
BOW
ANT 2
B
NNN-31
ANT 1
POST


B
JRC
M10 X L40 BOLT SUS304
M10 FLAT WASHER SUS304
M10 SPRING WASHER SUS304
M10 NUT SUS304
3 SET

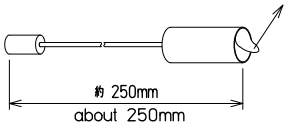
POST Production Example



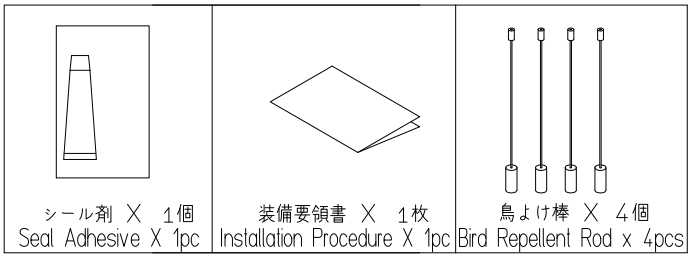
●About Bird Repellent Rod (MPXP34012A)

装備要領 / Installation Procedure

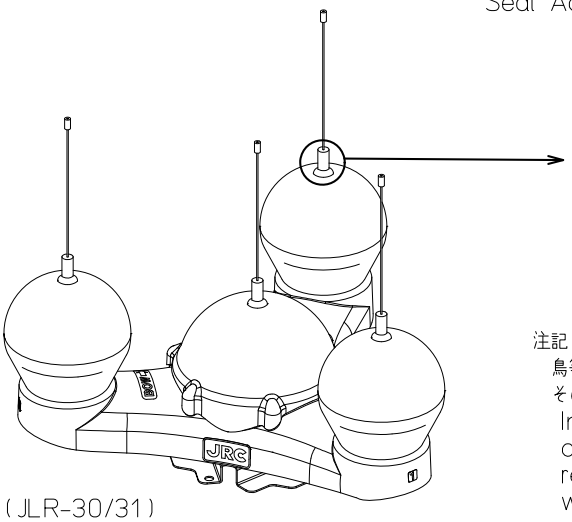
セパレータをはがして下さい。
Peel off the film.



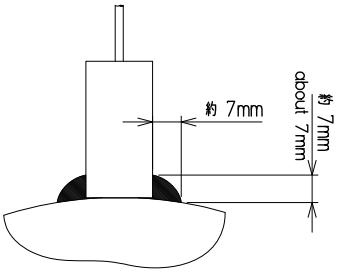
パッキングリスト / Packing List



装備参考例（JLR-20/21）
An Example of Installation on JLR-20/21.



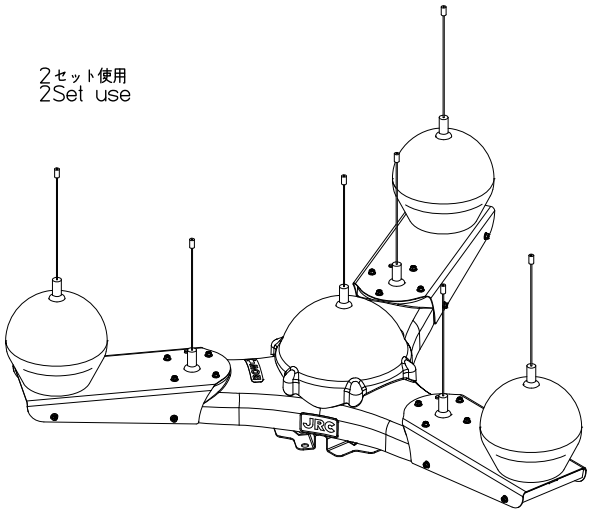
汚れを拭取り、シール剤で補強する。（硬化時間 : 24時間以上）
Wipe off the dirt. Install the rod with the aid of Seal Adhesive.(Cure time : more than 24hr)



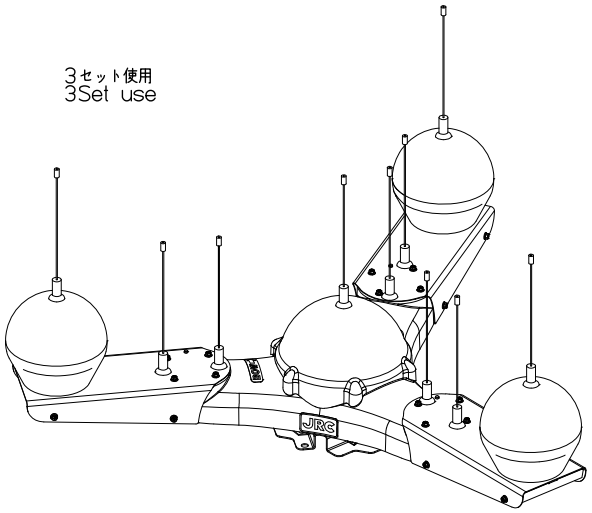
注記 / NOTE
鳥等により力が加わると取れる可能性があります。
その時は新品に交換するか、再度シール剤で補強して下さい。
In case the rod is detached from the antenna by excessive power of blow, replace it by a new one or reinstall it with the aid of seal adhesive.

装備参考例（JLR-30/31）
Examples of Installation on JLR-30/31.

2セット使用
2Set use



3セット使用
3Set use



MPXP34012A

2.2 Display Unit Installation

⚠ WARNING

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.

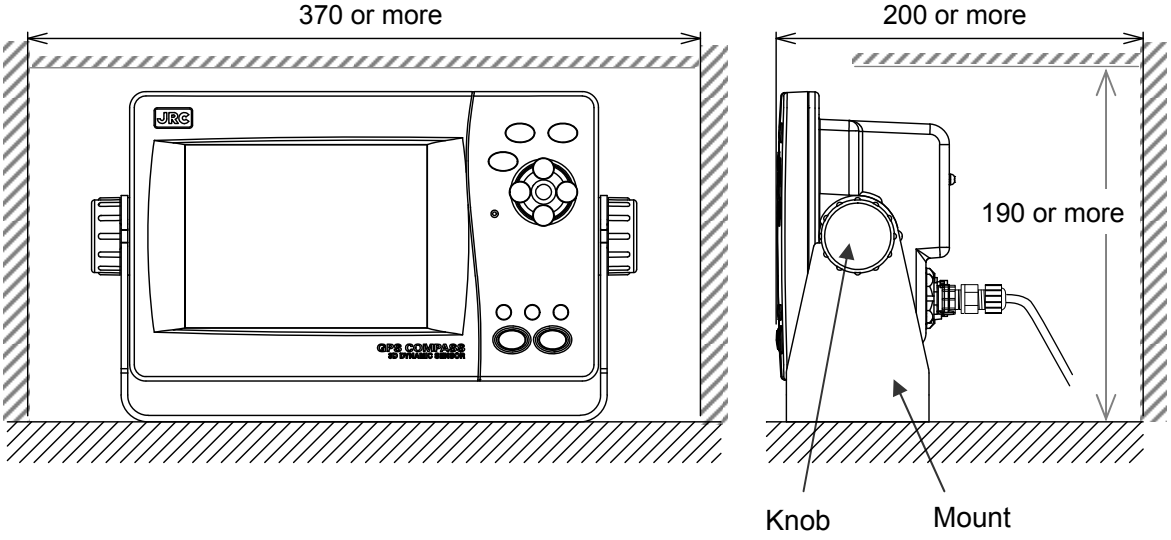
⚠ CAUTION

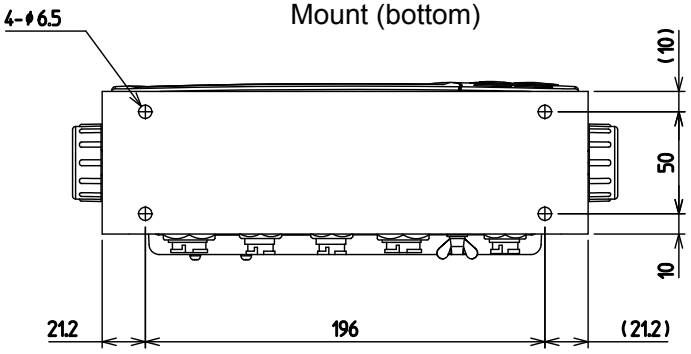
Use the indicated screws when installing the display unit to a stable wooden surface. Failure to do so may result in the display unit falling over, causing injury or property damage.

The installation stand (trestle) is used and this display can be set up in desk-top, the wall, and the ceiling, etc.
Select installation features according to the following standard.

Read the following instructions and mount the unit accordingly.

(1) Loosen the unit knob, and disconnect the mount from the unit.
(2) Use the included screws to secure the mount where desired.
(3) Return the unit to the mount, and tighten it with the knob.





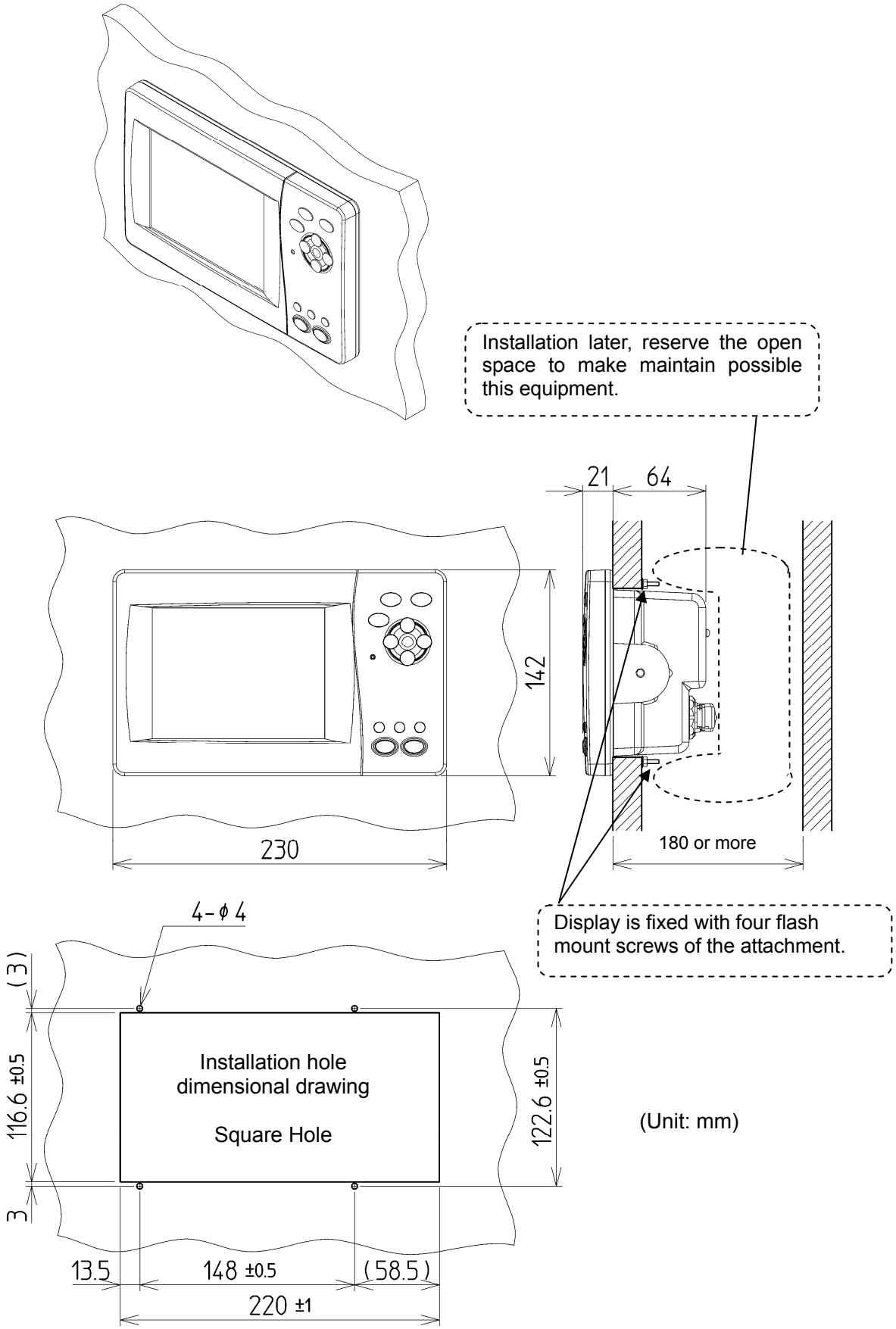
(Unit: mm)

Required Space

●How to Flush Mount the Display

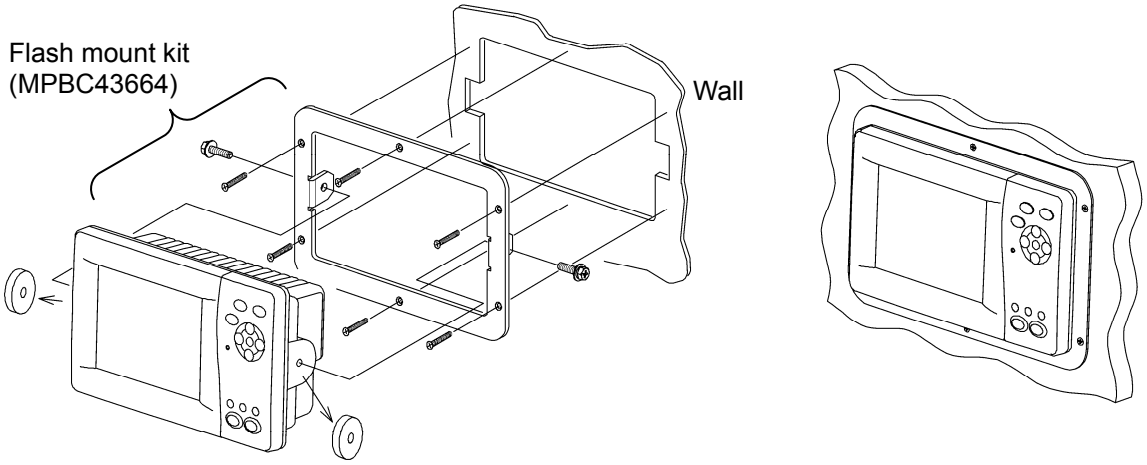
< For fixing the Display from the rear side with four flush mount screws of the option >

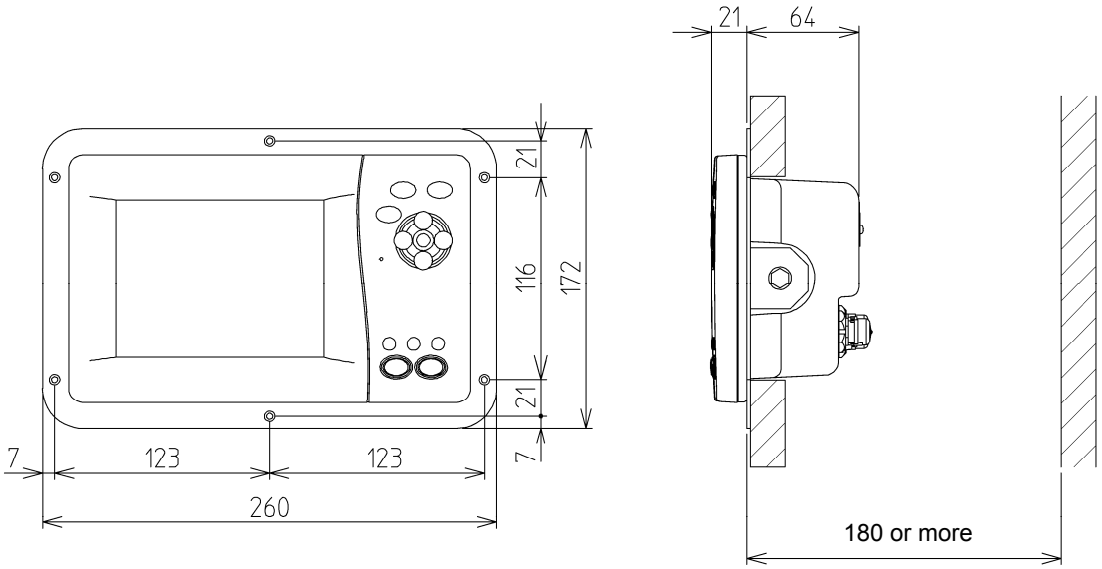
Refer to the diagram shown below for the mount hole and space.

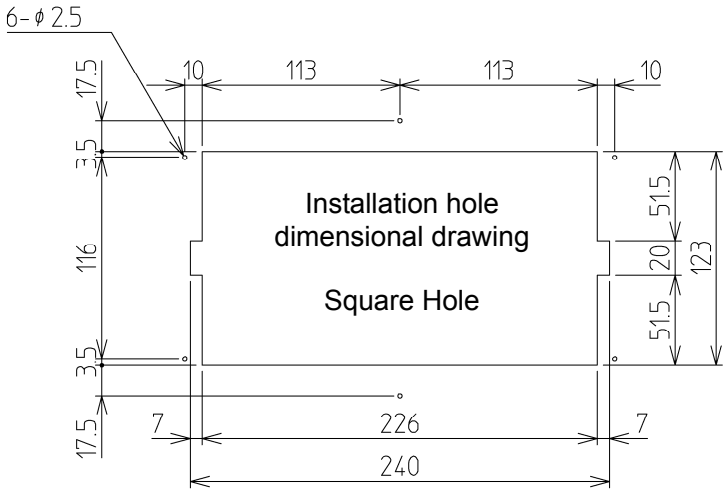


(Unit: mm)

<The Display is fixed from the front side with flash mount kit (MPBC43664) of the option >
Refer to the diagram shown below for mount hole and space.





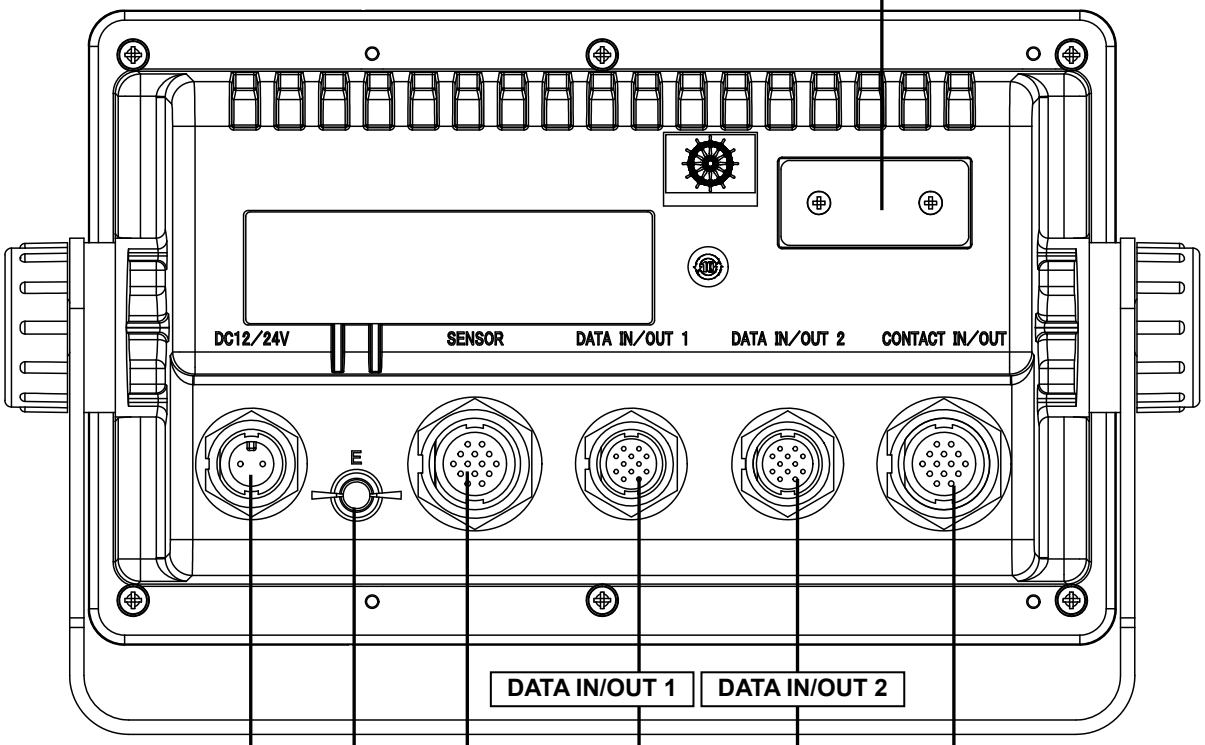


(Unit: mm)

2.3 Cable Connection

● Unit (Rear Connector)

Maintenance Terminal
Used to connect to a computer (RS-232C).
(Shall be used by service engineer only.)



DATA IN/OUT 1 **DATA IN/OUT 2**

CONTACT IN/OUT

External Device Connection Terminal (For Contact Signal)
Interfaces to optional equipment such as an external buzzer.

External Device Connection Terminal (For Serial Transmission)
Used for connecting equipment such as radar.

SENSOR

Sensor Connection Terminal
Used for connecting the dedicated GPS compass sensor.

E

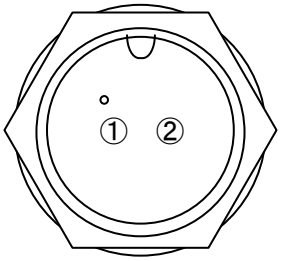
Chassis Ground Terminal
Connect to the ship's ground terminal as needed. Butterfly bolt is M4mm x 10mm.

DC12/24V

Power Supply Terminal
Used to supply power to the equipment.
Use the included power cable.

[Power Supply Connector]

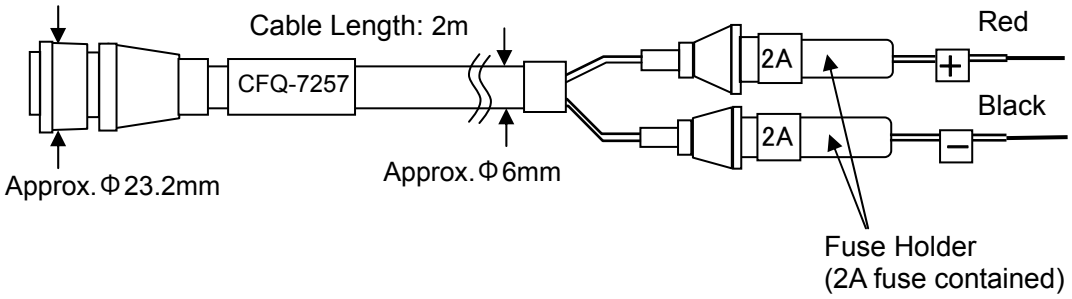
DC12/24V (Label name of the back of Display)



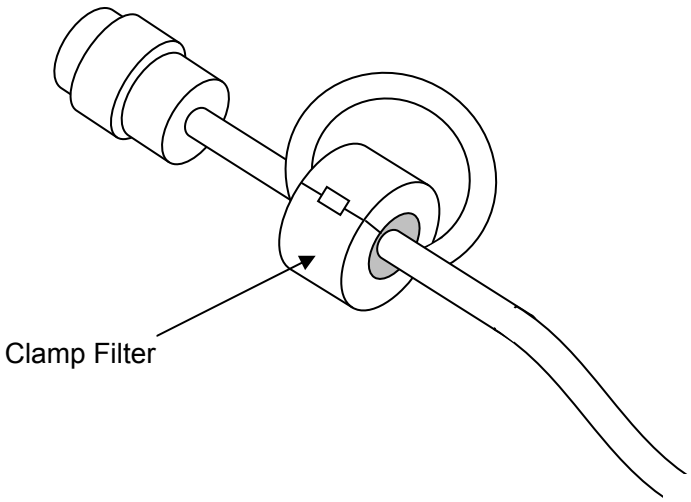
Power Supply Cable: CFQ-7257 (included)

Terminal Number (CFQ-7252)	Name		Explanation
1 (Black)	DC12/24V	DCIN -	Connect the included power supply cable. The voltage shall be 10.8 - 31.2 V DC.
2 (Red)		DCIN +	

Connection Cable Appearance



● Noise Filtering
Make a loop with the cable and clamp it with the included Clamp Filter as shown below.



[Sensor Connector]

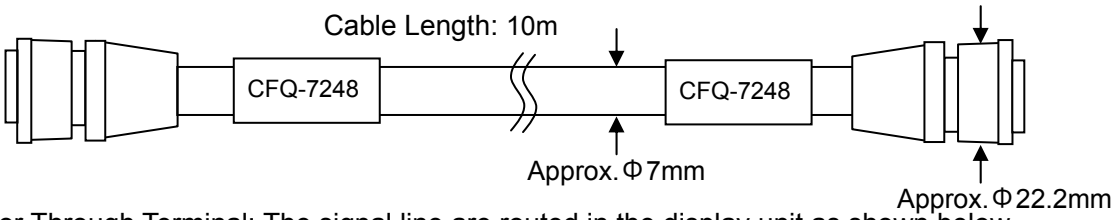
SENSOR (Label name of the back of Display)

Data Cable: CFQ-7248 (included)

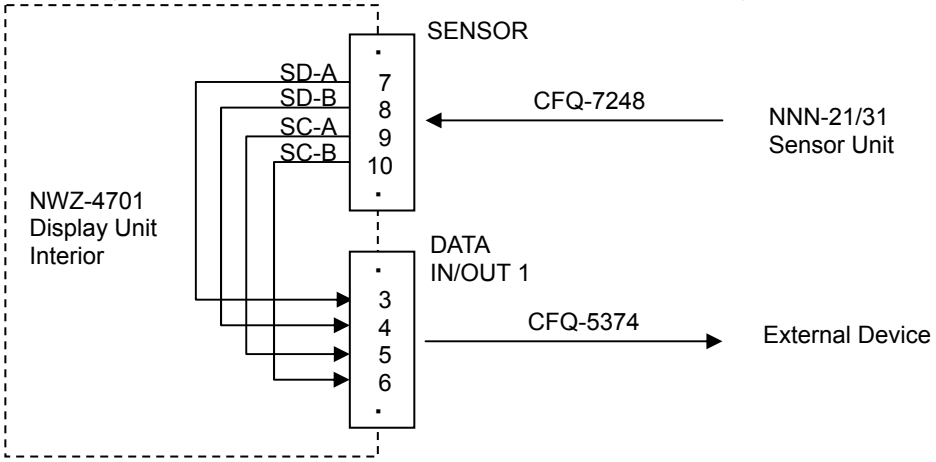
Terminal Number (CFQ-7248)	Name		Explanation
1 (Red Thick)	Sensor Power Supply	13V	Power to the sensor is supplied by the display unit.
2 (Black Thick)		GND	
3 (Orange)	RXD0	A	Receives data from the sensor.
4 (Yellow)		B	
5 (Green)	TXD0	A	Sends configuration data to the sensor.
6 (Blue)		B	
7 (Purple)	Sensor Through	SD-A	Outputs data from the sensor through [DATA IN/OUT 1].
8 (Grey)		SD-B	
9 (White)		SC-A	
10 (Black Thin)		SC-B	
11 (Brown)	TXD4B (*1)	A	Sends configuration data to the beacon receiver. (Option cable required)
12 (Pink)		B	
13 (Light Blue)	Unused		
14 (Light Green)			

*1 : Outputs parallel to the DATA IN/OUT 2 connector 9 and 10 pins. (Refer to page 2-27)

Connection Cable Appearance

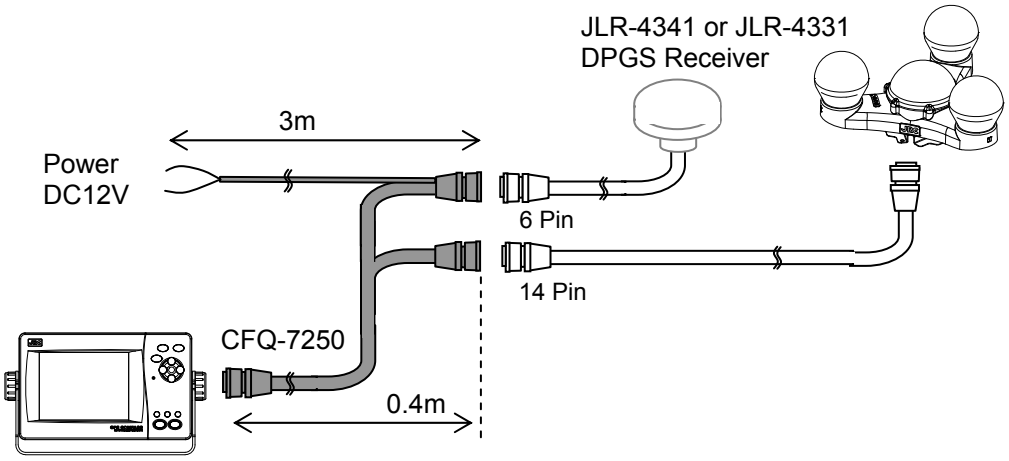


● Sensor Through Terminal: The signal line are routed in the display unit as shown below.



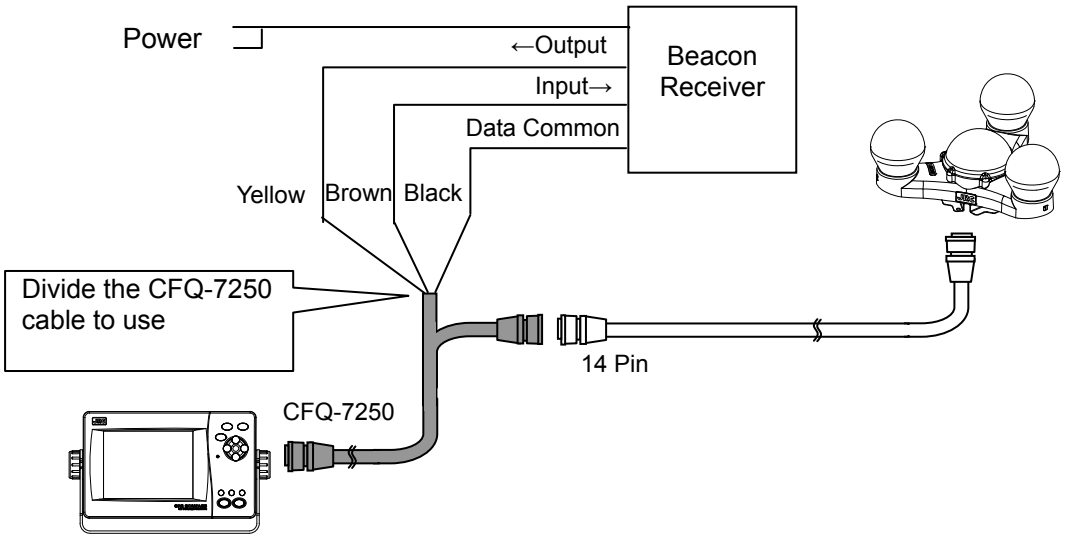
● Beacon Connection

■ JLR-4341 or JLR-4331 (DGPS Receiver) Connection
Use the option cable (CFQ-7250).



* Connecting JLR-4331 does not allow DGPS,
but allows receiving only meteorological information. (Refer to the following table.)

■ Beacon Receiver Connection
Modify the option cable (CFQ-7250).



■ Features and installation procedure for beacon receiver

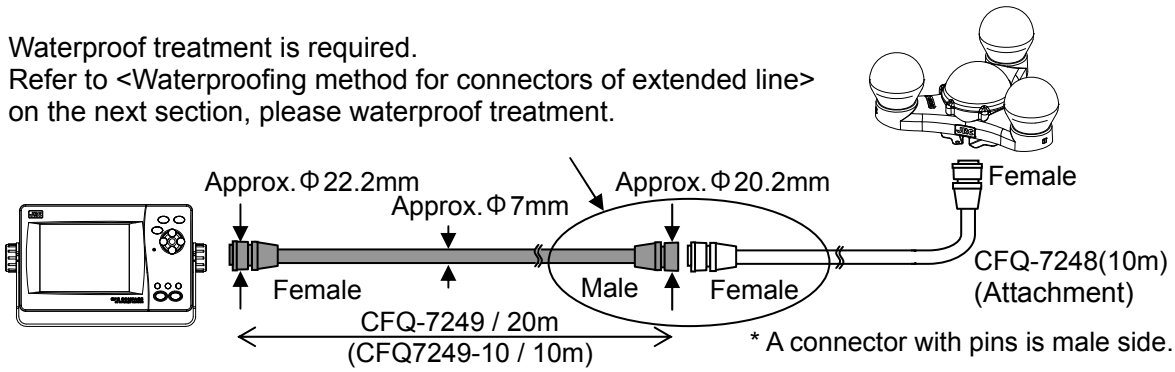
Types of DGPS receivers	Competitor's Beacon receiver	JLR-4331 receiver	JLR-4341 receiver
Enhanced accuracy of The position measured by GPS compass (DGPS conversion)	○	×	○
Receiving weather information	○	○	○
Setting for Data OUT4/IN4	Selecting beacon/**** allows the DGPS receiver to be used as a beacon receiver.		Selecting 4341/**** allows the DGPS receiver to be used as a beacon receiver.

* Refer to "5.3.7. Data I/O Settings (DATA I/O)" for installation.

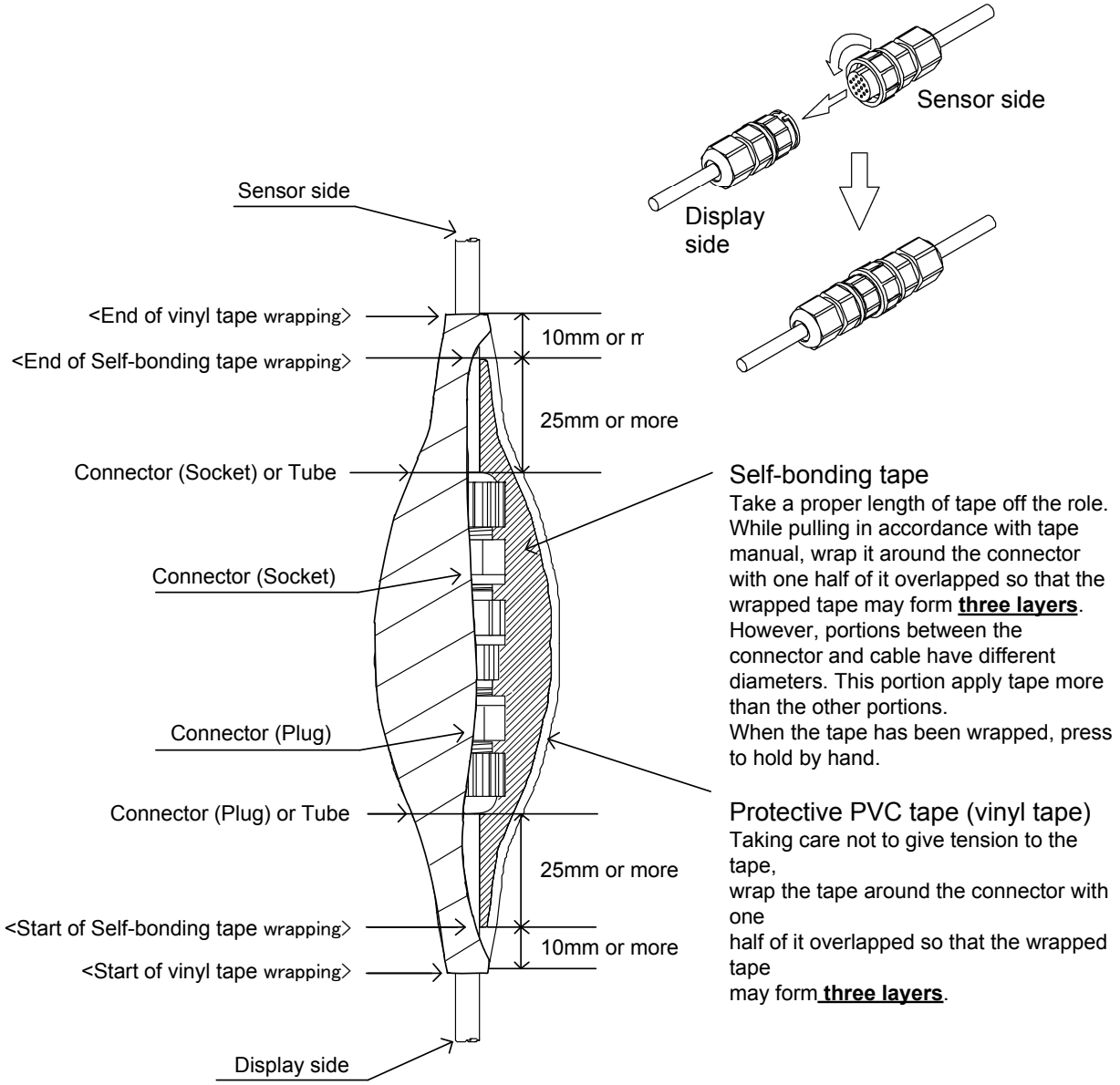
● Cable Length

■ For cable lengths of less than 30 m
Use the option cable (CFQ-7249).

Waterproof treatment is required.
Refer to <Waterproofing method for connectors of extended line> on the next section, please waterproof treatment.



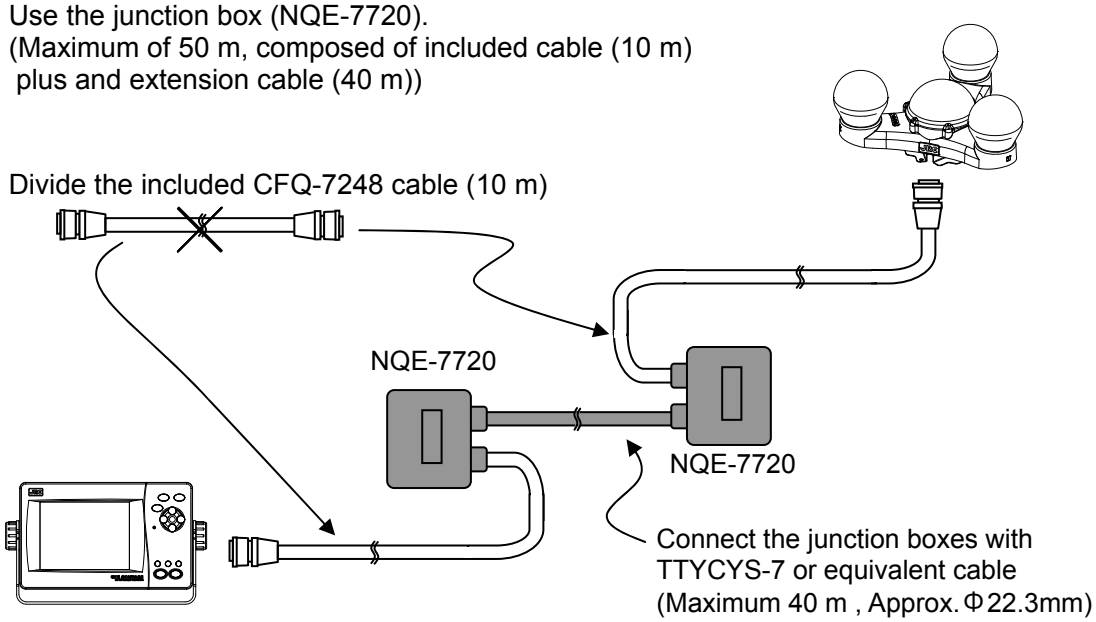
< Waterproofing method for connectors of extended line >



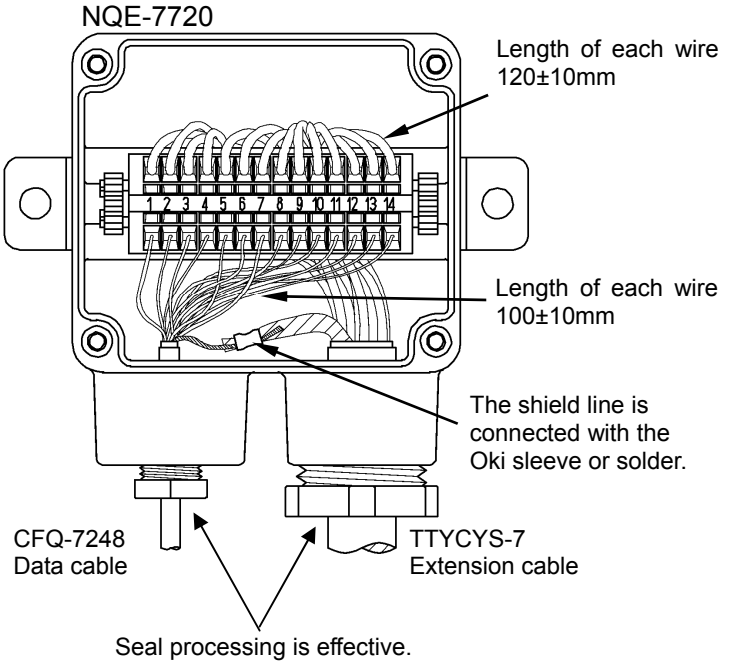
Self-bonding tape
Take a proper length of tape off the role. While pulling in accordance with tape manual, wrap it around the connector with one half of it overlapped so that the wrapped tape may form **three layers**. However, portions between the connector and cable have different diameters. This portion apply tape more than the other portions.
When the tape has been wrapped, press to hold by hand.

Protective PVC tape (vinyl tape)
Taking care not to give tension to the tape,
wrap the tape around the connector with one
half of it overlapped so that the wrapped tape
may form **three layers**.

■ For cable lengths of 30 m or more
Use the junction box (NQE-7720).
(Maximum of 50 m, composed of included cable (10 m)
plus and extension cable (40 m))

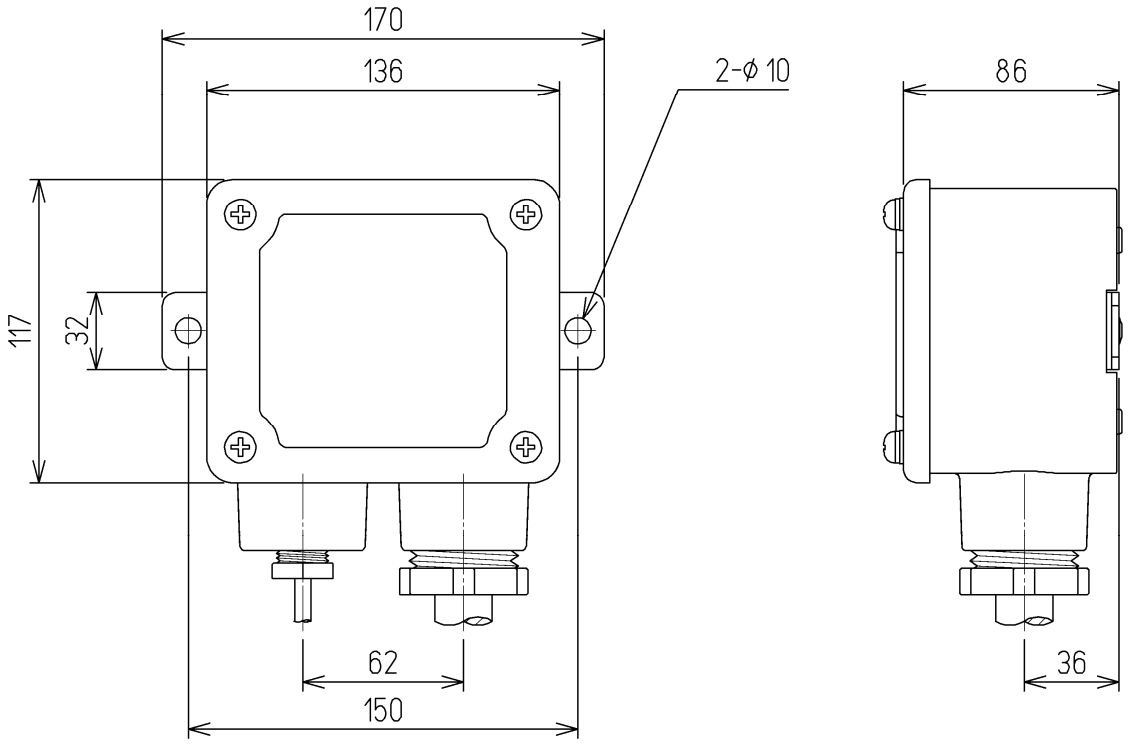


Connect the cut CFQ-7248 cable and junction boxes

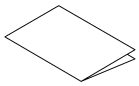
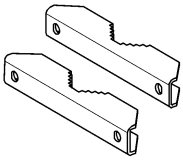


Terminal stand NO	CFQ-7248
1	Red Thick
2	Black Thick
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Grey
9	White
10	Black Thin
11	Brown
12	Pink
13	Light Blue
14	Light Green
Shield	Shield

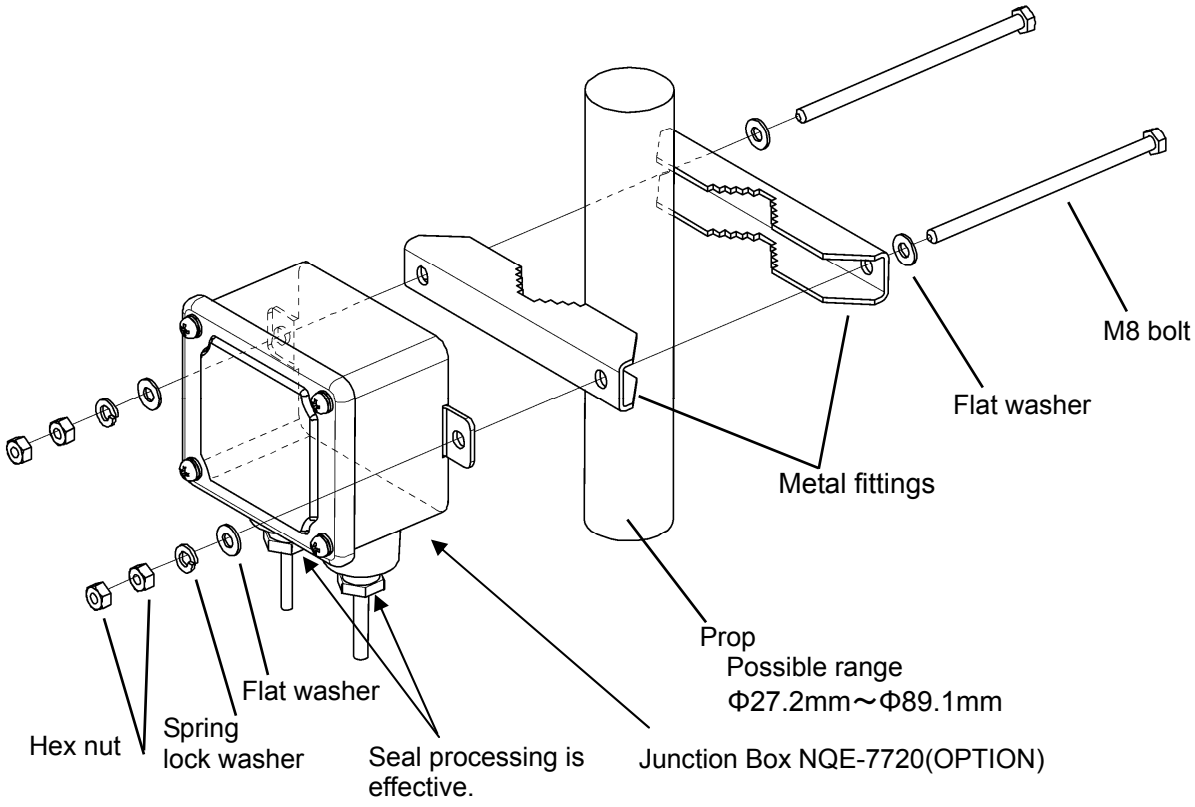
Junction box NQE-7720(Option)　Externals chart
(Installation metal fittings MPBP31612 are not included.)



Option metal fittings (Stainless-steel) MPBP31612 Bundled list

					
Points book X 1	Metal fittings X 2	M 8 Bolt （L=100,150） X 2 pieces for each	Flat washer X 4	Spring lock washer X 2	Hex nut X 4

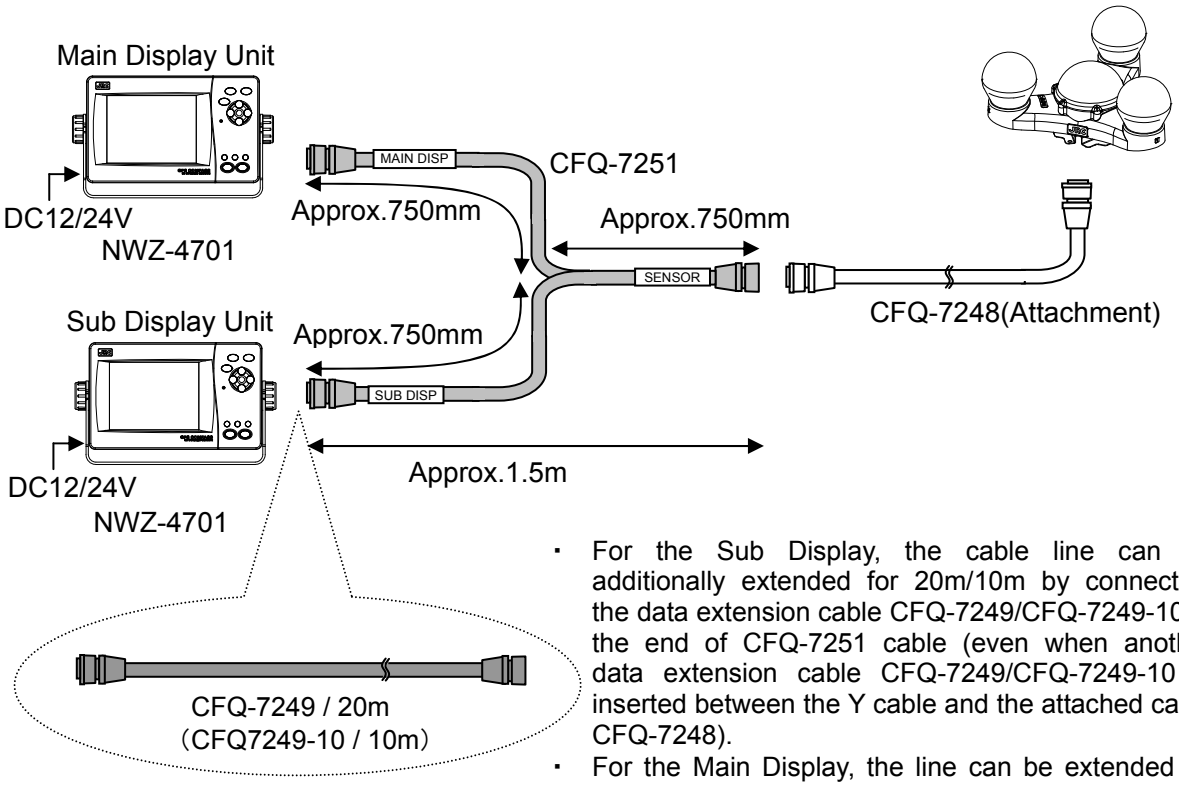
Select one about M8 volt length according to the diameter of the installed prop.



● Connection with Sub Display Unit

Connect by one of the following methods:

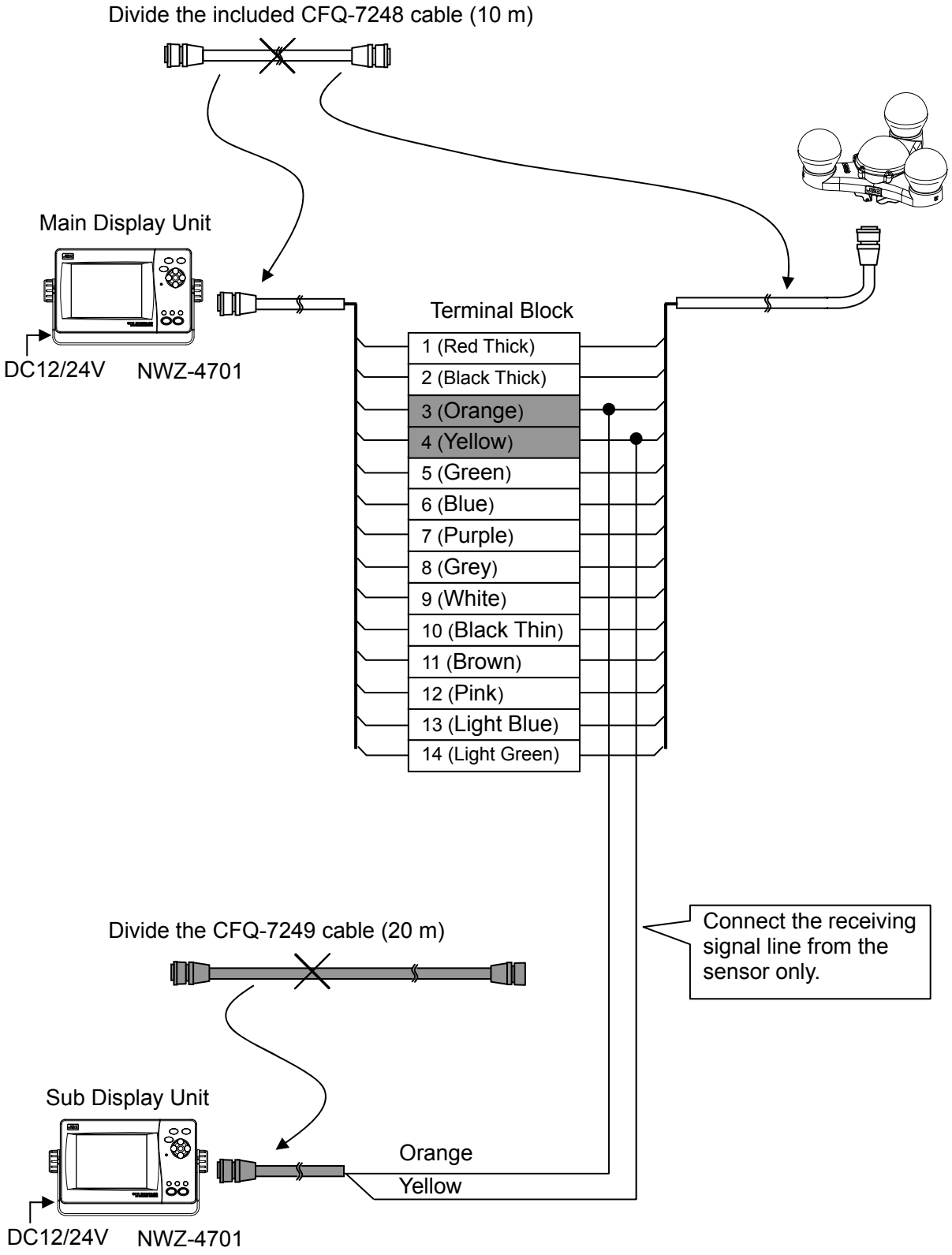
1. Connection with using the optional Y cable (CFQ-7251) – recommended method



- For the Sub Display, the cable line can be additionally extended for 20m/10m by connecting the data extension cable CFQ-7249/CFQ-7249-10 to the end of CFQ-7251 cable (even when another data extension cable CFQ-7249/CFQ-7249-10 is inserted between the Y cable and the attached cable CFQ-7248).
- For the Main Display, the line can be extended by the same way only when CFQ-7249/CFQ-7249-10 is not inserted between the Y cable and the attached cable CFQ-7248.

To select the Sub Display, set “SUB” for DISPLAY TYPE by referring to “5.4.5 Product Type Configuration.” (Factory setting is “MAIN.”)

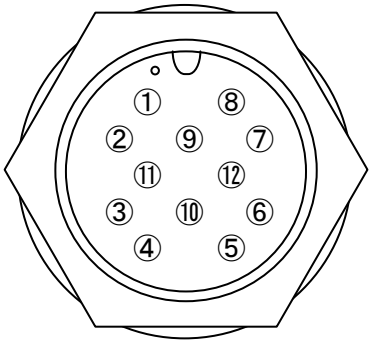
2. Connection with using the optional data extension cable CFQ-7249 and attached CFQ-7248
(Previously mentioned method 1 is recommended.)



To select the Sub Display, set “SUB” for DISPLAY TYPE by referring to “5.4.5 Product Type Configuration.” (Factory setting is “MAIN.”)

[Data IN/OUT 1 Connector]

DATA IN/OUT 1 (Label name of the back of Display)

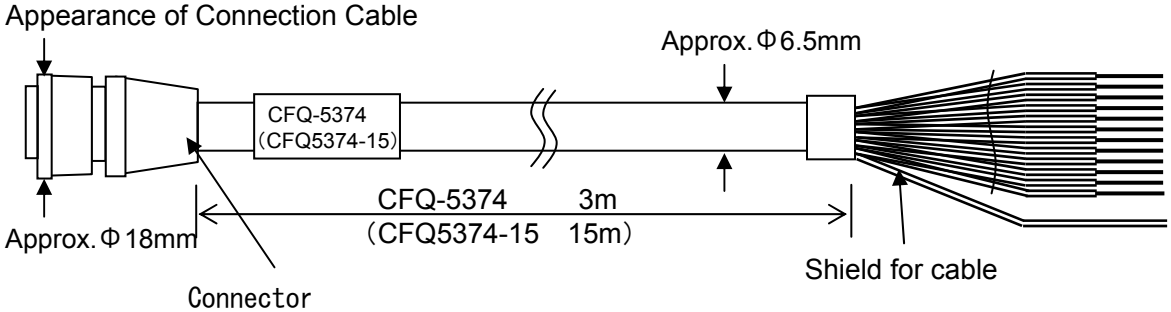


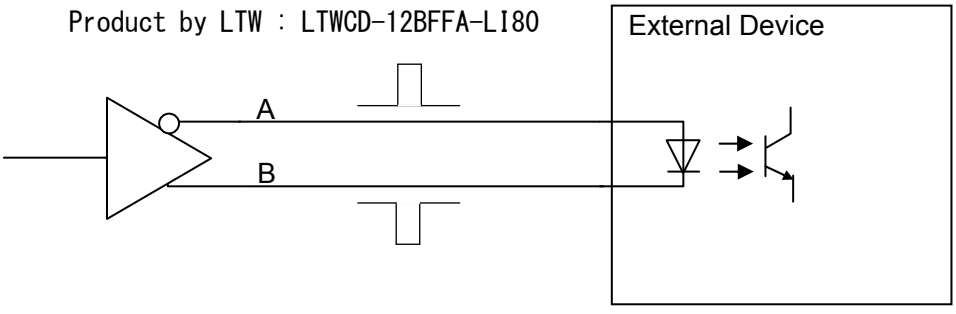
Data Cable: CFQ-5374 (option)

Terminal Number (CFQ-5374)	Name		Explanation
1 (Brown)	Unused		
2 (Red)			
3 (Orange)	Sensor Through	SD-A	Output signal is sent from this terminal by connecting the sensor. Outputs as defined by "Sensor Through" configuration. (Refer to "5.3.7 Data I/O Settings (DATA I/O)")
4 (Yellow)		SD-B	
5 (Green)		SC-A	Outputs clock when AD-10 configuration is performed for "Sensor Through". This port is not used excluding AD-10. (*1)
6 (Blue)		SC-B	
7 (Purple)	DATA OUT3 (TXD3)	A	Outputs as defined by "Data OUT 3" configuration. (Refer to "5.3.7 Data I/O Settings (DATA I/O)")
8 (Grey)		B	
9 (White)	Unused		
10 (Black)			
11 (Pink)		GND ISO	Connects serial transmission cable ground.
12 (Light Blue)		GND	Chassis ground

*1: 4 pins are used for AD-10. Refer to “Output of AD-10 Format” in “5.3.7 Data I/O Settings (DATA I/O)” for details.

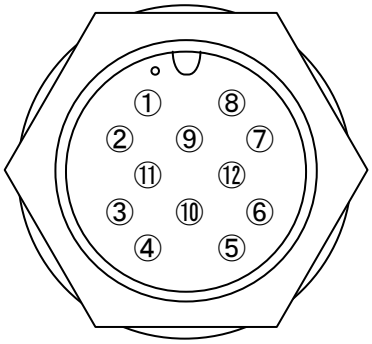
Appearance of Connection Cable





[Data IN/OUT 2 Connector]

DATA IN/OUT 2 (Label name of the back of Display)

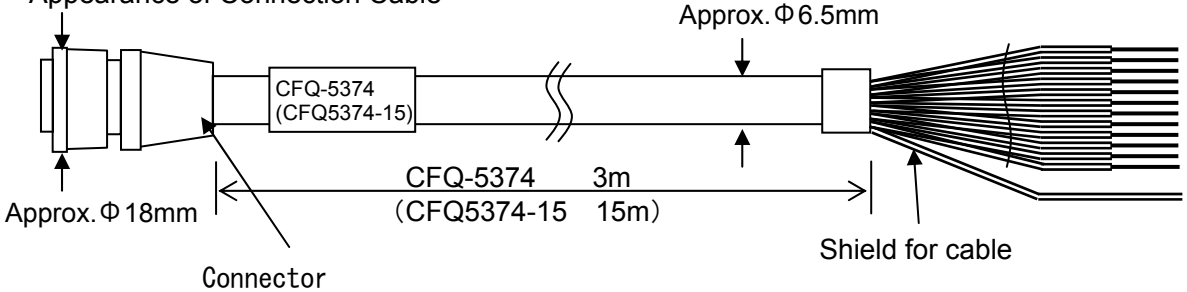


Data Cable: CFQ-5374 (option)

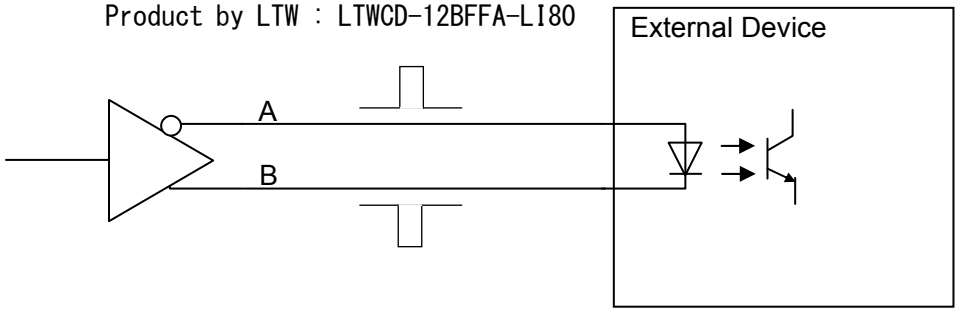
Terminal Number (CFQ-5374)	Name		Explanation
1 (Brown)	DATA IN4 (RXD4)	A	Receives the tide current data (Data IN4). (Refer to "5.3.7 Data I/O Settings (DATA I/O)")
2 (Red)		B	
3 (Orange)	DATA OUT1 (TXD1)	A	Outputs as defined by "Data OUT 1" configuration. (Refer to "5.3.7 Data I/O Settings (DATA I/O)")
4 (Yellow)		B	
5 (Green)	DATA OUT1 (SCK1)	A	Outputs clock when AD-10 configuration is performed for "Data OUT 1". This port is not used excluding AD-10. (*2)
6 (Blue)		B	
7 (Purple)	DATA OUT5 (TXD5)	A	Outputs as defined by "Data OUT 5" configuration. (Refer to "5.3.7 Data I/O Settings (DATA I/O)")
8 (Grey)		B	
9 (White)	DATA OUT4 (TXD4B) (*1)	A	Outputs as defined by "Data OUT 4" configuration. (Refer to "5.3.7 Data I/O Settings (DATA I/O)")
10 (Black)		B	
11 (Pink)		GND ISO	Connects serial transmission cable ground.
12 (Light Blue)		GND	Chassis ground

*1 : Outputs parallel to the SENSOR connector 11 and 12 pins. (Refer to page 2-19)
*2: 4 pins are used for AD-10. Refer to “Output of AD-10 Format” in “5.3.7 Data I/O Settings (DATA I/O)” for details.

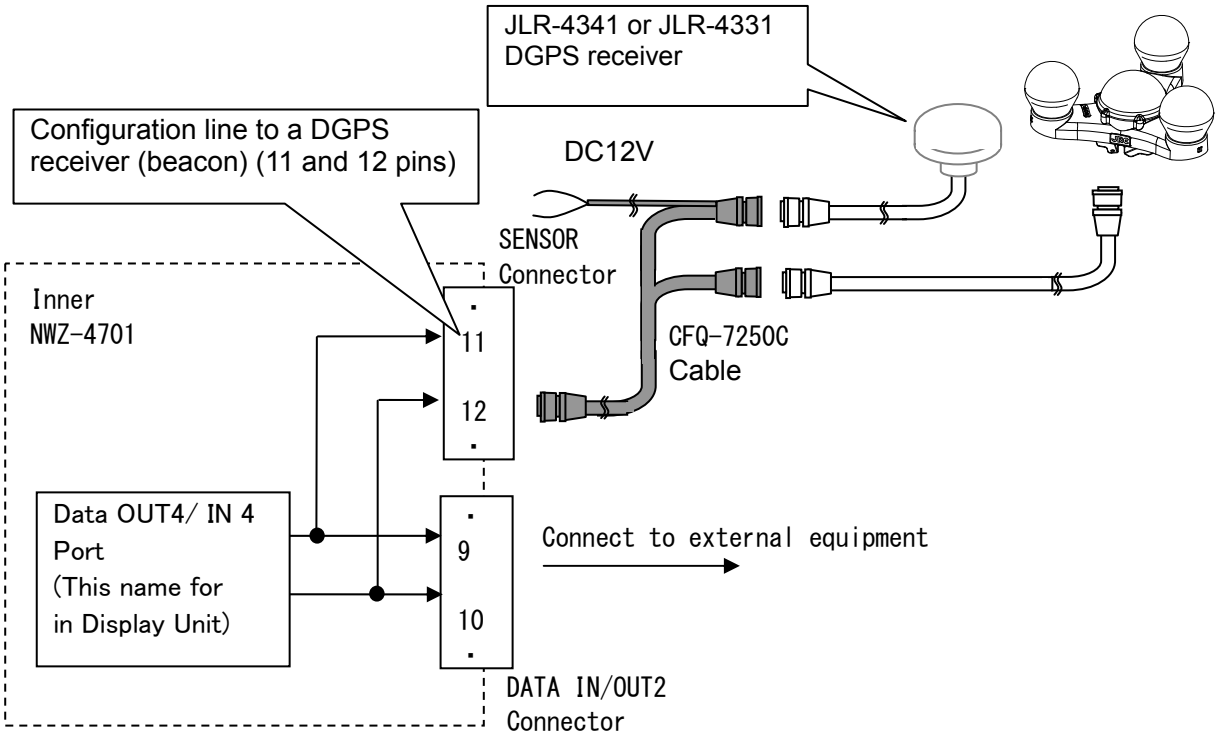
Appearance of Connection Cable



Connector
Product by LTW : LTWCD-12BFFA-LI80



●Output connection of DATA OUT4 (9 and 10 pins of Data IN/OUT2 connector)
DATA OUT4 connects inside the display unit as shown in the following figure.



Attention

When connecting a beacon receiver, Data OUT4/IN4 port is set to beacon/**** and configuration data is sent from the 11 and 12 pins of SENSOR connector to the beacon receiver; however, be aware that, at that time, the same data (the configuration data to the beacon receiver) is also led to the 9 and 10 pins of Data IN/OUT2 connector connected inside.
For this reason, do not connect external equipment to the output of the 9 and 10 pins of the Data IN/OUT2 connector when using the beacon receiver.

[Contact Signal IN/OUT Connector]

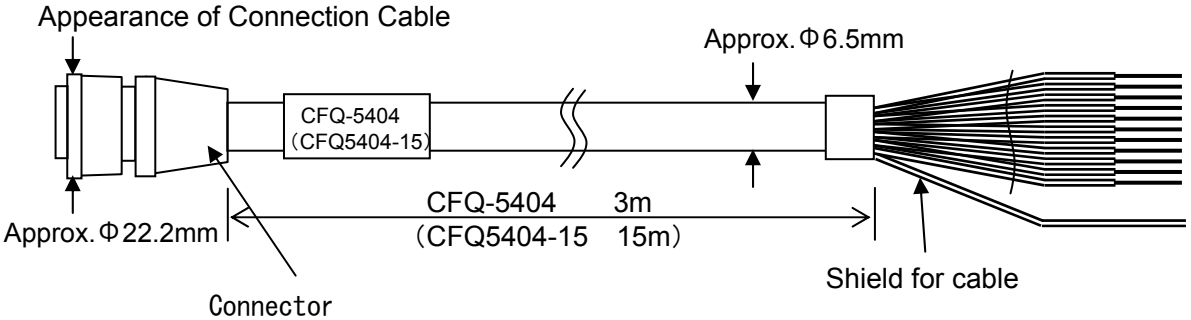
CONTACT IN/OUT (Label name of the back of Display)

Data Cable: CFQ-5404 (option)

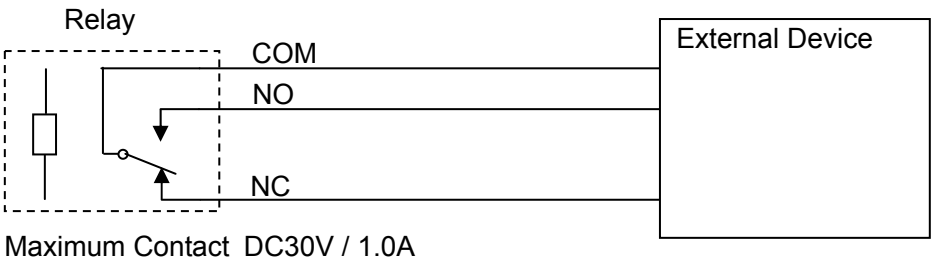
Terminal Number (CFQ-5404)	Name		Explanation
1	Unused		
2			
3			
4 (Yellow)	Contact Output 0	COM	Outputs external buzzer 1. (Outputs when alert is generated) (For special purpose usage)
5 (Green)		NO	
6 (Blue)		NC	
7 (Purple)	Contact Output 1	COM	Outputs contact signal (log pulse). (Refer to "5.3.7 Data I/O Settings (DATA I/O)")
8 (Grey)		NO	
9 (White)		NC	
10 (Black)	Contact Output 2	COM	Outputs external buzzer 2. (Outputs when alert is generated) (For general use. Here is used usually.)
11 (Pink)		NO	
12 (Light Blue)		NC	
13 (Light Green)	Contact Input	ACKIN+	Clears [Contact Output 2]. (by short-circuiting both terminals)
14 (Light Brown)		ACKIN-	

NO: Normally Open NC: Normally Closed

Appearance of Connection Cable



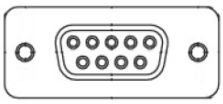
Connector
Product by LTW : LTWCD-12BFFA-LI80



Maximum Contact DC30V / 1.0A

[RS232C Connector]

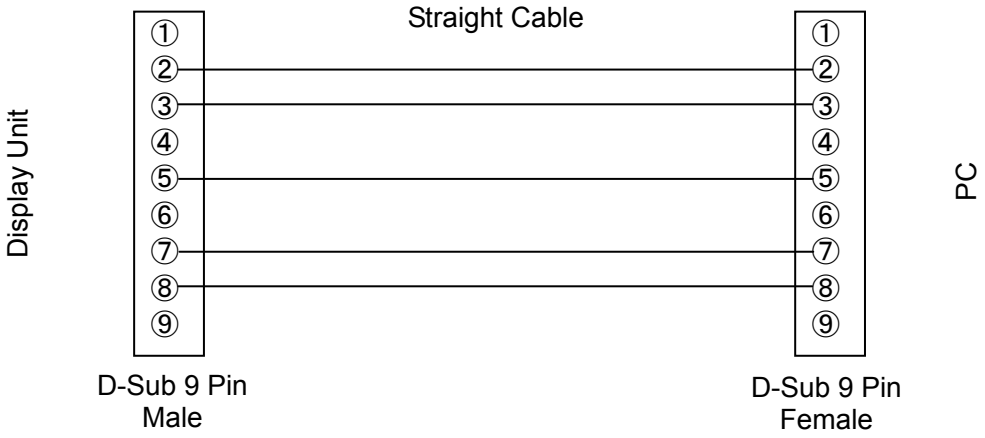
This port is a dedicated port for updates. (For use by service technicians)
Remove the two screws from the rear, remove the cover, and connect the cable.



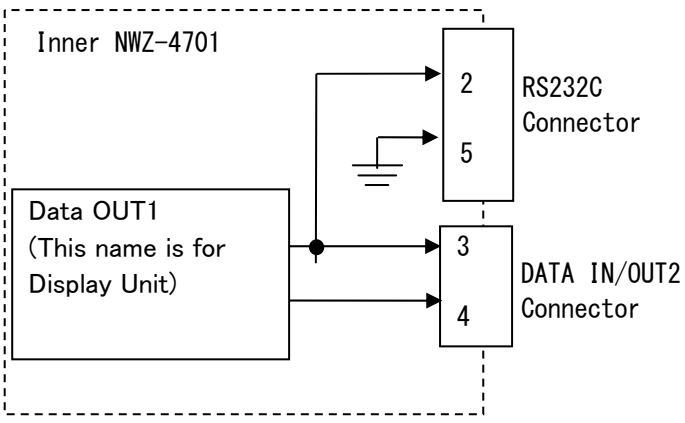
Female (S-type)

Terminal Number	Name	Explanation
1	Unused	
2	TXD	Transmitted data (Being parallel with the Data OUT1 port, outputs the content configured in DATA OUT1.)
3	RXD	Received data
4	Unused	
5	GND ISO	Signal Ground
6	Unused	
7	CTS	Transmission possible
8	RTS	Transmission request
9	Unused	

RS232C Cable



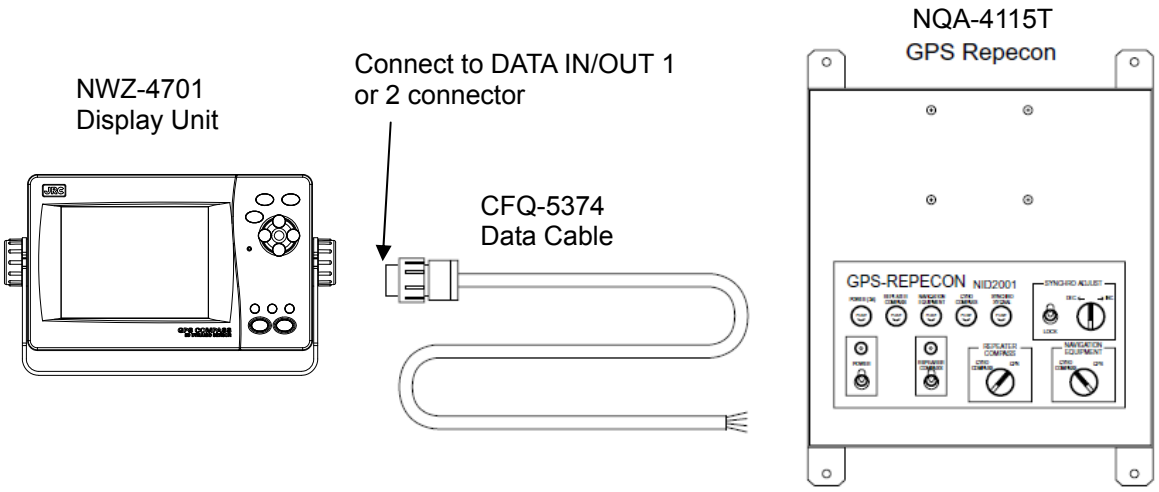
* An all-pin cable can also be used.



● GPS Repecon Connection

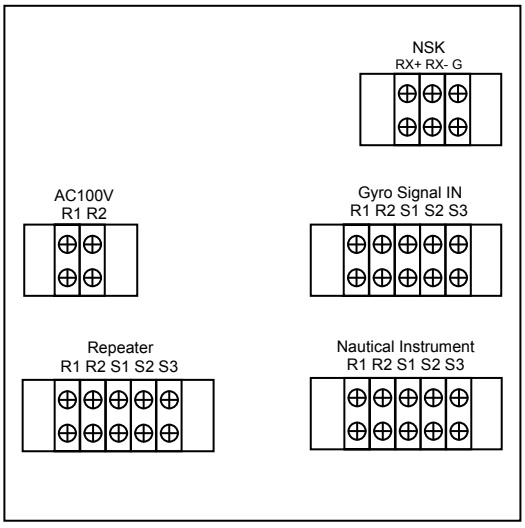
The "NQA-4115T GPS Repecon" option can be connected for repeater (90x) drive.
Use the CFQ-5374 option cable, and connect the DATA IN/OUT 1 or 2 connector to the GPS Repecon.

The data output format is NSK (JRC radar format). (The display unit outputs "NMEA" data as default)
Refer to the "NQA-4115T GPS Repecon" instruction manual for details.



① Connect the AC 100 V power supply to the AC 100 V R1, R2 connectors.
② Connect the terminal configured for NSK format output to the NSK RX+, RX- terminals.

Terminal configured for NSK format output	GPS repecon input terminal
TxD*－A	NSK RX－
TxD*－B	NSK RX＋

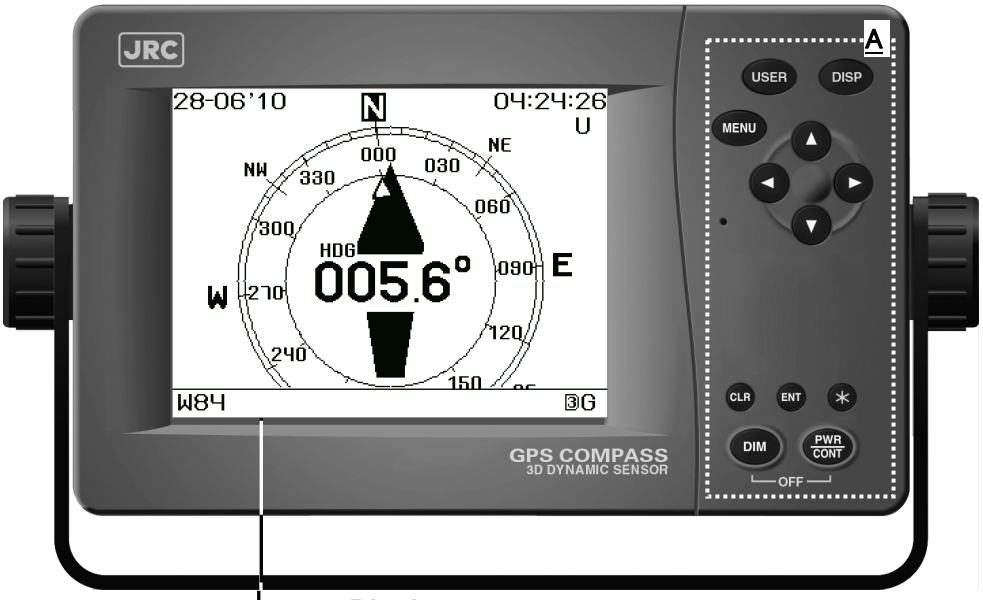


③ Connect the synchronization signal from the gyro compass to the synchronization signal IN terminal.
④ Supply signals from Repeater and Nautical Instrument terminals to each device.

Section 3 Names and Functions of Each Unit

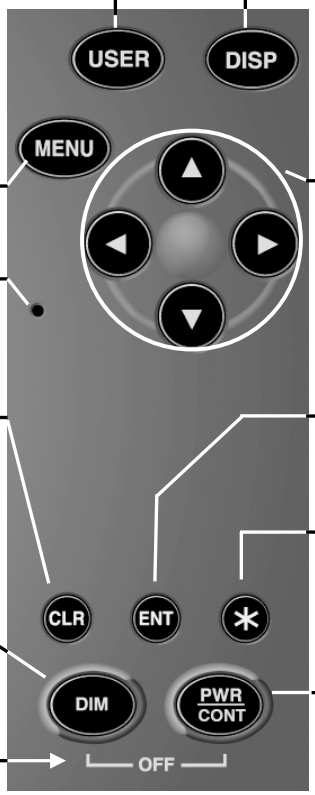
3.1 NWZ-4701 Display Unit

- Unit (Front)



Display
The operator can read the information received from the GPS compass sensor, equipment settings, and soon.
Refer to "● Reading the Display" for details.

A: Control Panel



User Key
Displays satellite information and the like. Also used for setting and clearing anchor watch. Refer to "5.2.9 Anchor Watch Settings" for anchor watch.

Display Key
Changes what is displayed on the screen. Please refer to "Section 4 Display" for details about what is displayed.

Menu Key
Used to display the main menu.

Up, Down, Left, Right Key
Used to select items from the menu, scroll through the screen, and move the cursor.

Buzzer
The buzzer sounds here.

Clear Key
Used to return to the previous screen, and to cancel while making configuration changes. It is also used to silence the buzzer.

Enter Key
Used to set the entries.

Asterisk Key
Displays alert information.

Dimmer Key
Used to change the screen brightness. The brightness level changes each time the button is pressed.

Power / Contrast Key
Used to turn the power on.
When the power is on, this key is used to change the screen contrast. The contrast changes each time it is pressed.

Turning off the Power

Press the DIM and PWR CONT key simultaneously to turn off the power.

- Reading the Display

The symbols and characters that appear in fixed locations on the screen are described below.

Subdisplay Setting
This is displayed when the display unit is configured as a subdisplay. (Refer to "5.4.5 Product Type Configuration")

Time Display
Time is displayed in order of hours: minutes: seconds. (Refer to "5.3.6 System Settings")
In 12 hour display mode, "AM" or "PM" are displayed.
If a time difference is set, "**L**" is displayed. Otherwise, "**U**" is displayed.

Date Display

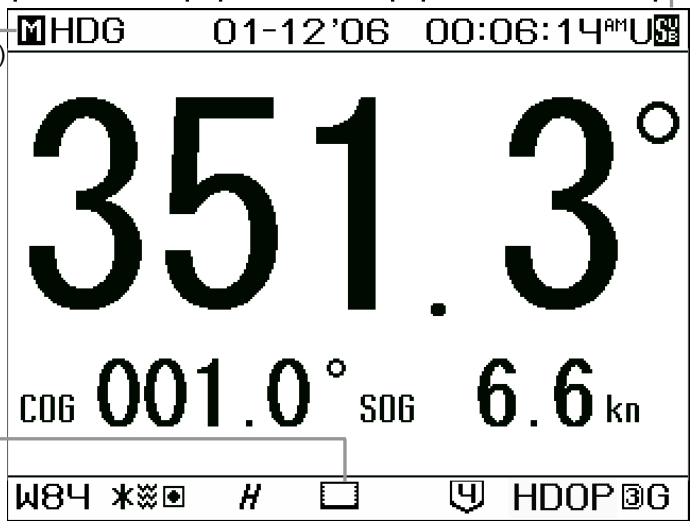
Screen Title
The title of the open screen is displayed.

Maintenance Mode
In maintenance mode, M mark is displayed.
(Refer to "5.4 Maintenance Menu")

Measurement Status Display
The status of the bearing measurement is shown by 6 levels.
(When measurement is completed, the display disappears)

- Measurement ends soon
- Measurement is half-way completed
- Measurement started
- When power has been turned on, or the unit has been reset

Measuring



Geodetic System

Alert Information
This is displayed when alert information messages have been updated.

Beacon Information Reception Display
This is displayed when meteorological information has been received from a beacon. A buzzer is generated when this is displayed.

Anchor Watch Display
: Inner setting range / Outer setting range

Position Correction Configuration
This is displayed when a position correction value has been configured.
(Refer to "5.3.2 Setting the Heading (HEADING)")

Number of Satellites
Not Displayed: 5 or more / 4 : 4 or less / DR : Dead Reckoning

HDOP Alert Display
Displayed when the number exceeds the configured value.
(Refer to "5.3.3 GPS Configuration (GPS)")

Measurement Mode Display
2 : 2 Dimension / 3 : 3 Dimension

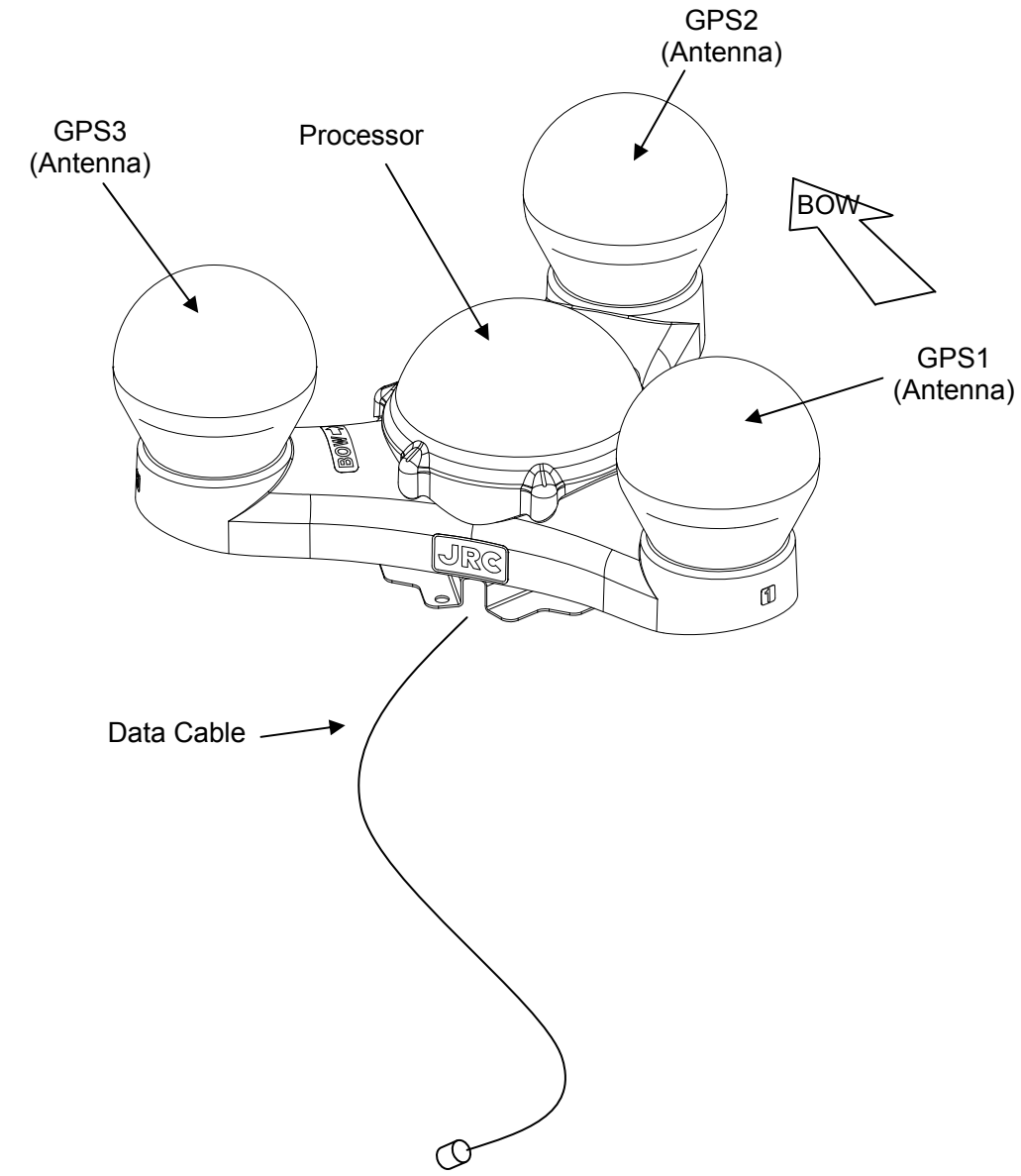
Position Correction Mode Display
G : GPS / **D** : DGPS / **Sb** : SBAS

3.2 NNN-21/31 Sensor Unit

- Unit

The diagram shows the NNN-21, but applies to the NNN-31 as well.

NNN-21

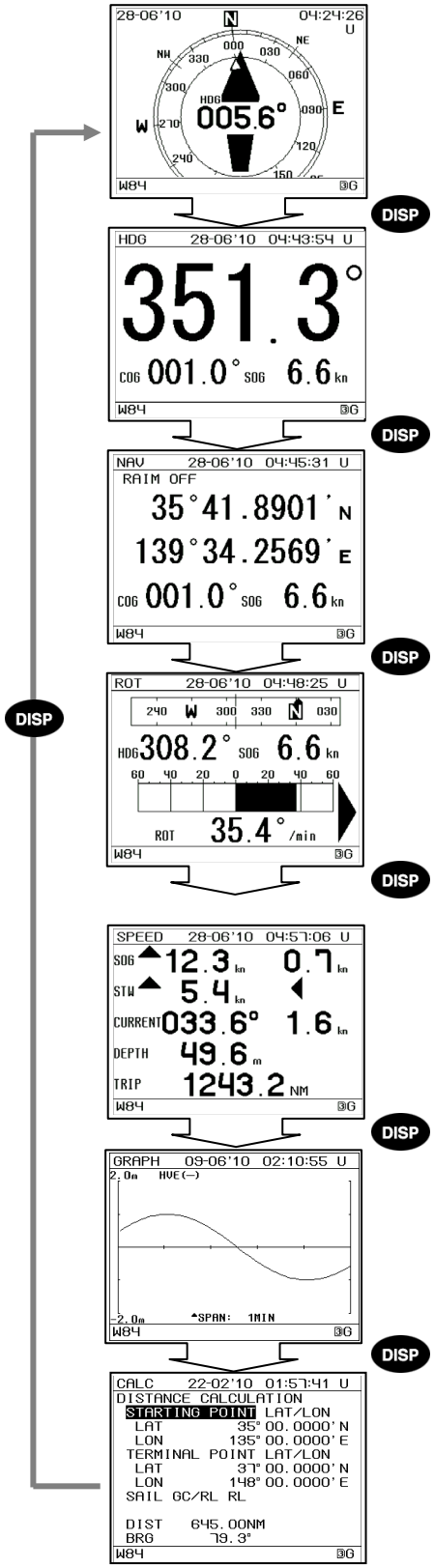


Section 4 Display

Each screen is detailed in this section.

4.1 Display Screen

Pressing the DISP key rotates screens. The unit displays the compass screen immediately after turn on.
There are varieties of Compass Screens, Navigation Screens, and Turn Rate screens, Trend Graph Screens, which can be cycled with the aid of ◀ and ▶ keys.



Compass Screen

The heading of the bow of the ship is graphically displayed.

6 types of displays can be cycled using the ◀ and ▶ keys.

Bow Heading Screen

Several varieties of data are displayed in numerical form.
3 types of displays can be cycled using the ◀ and ▶ keys.

Navigation Screen

The latitude and longitude fixed by GPS are displayed

Cycling between 3 and 4 decimals places can be performed using the ◀ and ▶ keys.

Turn Rate Screen

Ship's rate of turn is displayed.

Graphic and numerical display can be cycled between using the ◀ and ▶ keys.

Water Speed / Ground Speed Screen

The bow and stern speeds, port and starboard speeds, and bearing are displayed
(STW, CURRENT, and DEPTH are displayed when the tide current calculator is connected)

Trend Graph Screen

A trend graph for roll/pitch (ROL/PIT), heaving (HVE), or SOG (SPD) is displayed.
The type of graph can be cycled using the ◀ ▶ keys, and the range of time (the display range of the horizontal axis) using the ▲ ▼ keys.

Calculate Distance Screen

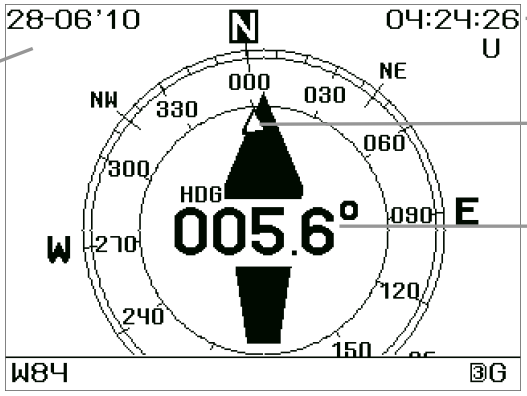
The positions of the starting point and the ending point can be input to calculate the distance between the two points and the bearing of the ending point from the starting point.
The calculation method can be selected in GC/RL.

4.1.1 Compass Screen

The ship's heading is graphically displayed.
4 types of displays (A, B, C, D, E and F) can be cycled between using the ◀ and ▶ keys.

Heading

Compass Screen A



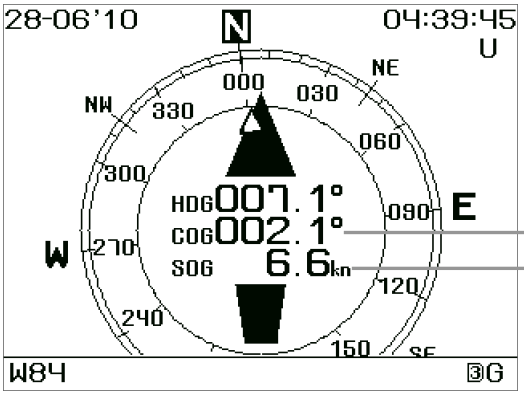
Date

Time (U: UTC, L: Local)

COG:
The course over ground is indicated by △

HDG:
As an example, ship's heading reads 5.6°

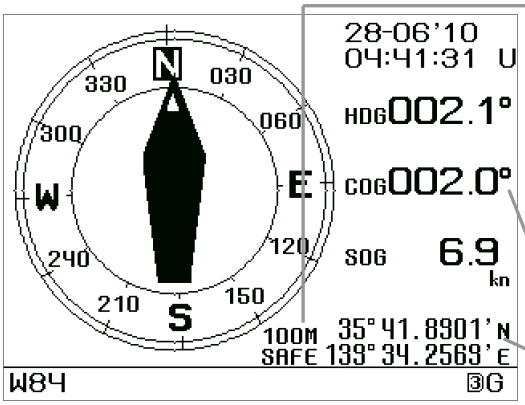
Compass Screen B



COG: Course over ground. "-": less than 1knot.

SOG: Speed over ground

Compass Screen C

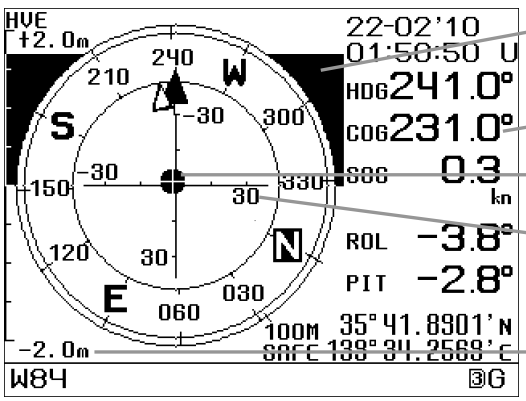


RAIM information:
The following information is displayed in the configured accuracy level. (Refer to 5.3.3. GPS Configuration (GPS).)
RAIM ON: Displays the configured accuracy level (10m 30m 50m 100m)
RAIM OFF: RAIM OFF
No failed satellite: SAFE
Unable to RAIM: CAUTION
Occurrence of a failed satellite: UNSAFE (Check the failed satellite No. in Navigation Screen.)

COG "-": Less than 1 knot.

POS: Present position

Compass Screen D



Heaving (HVE) is displayed, which is a relative displacement in the vertical direction.

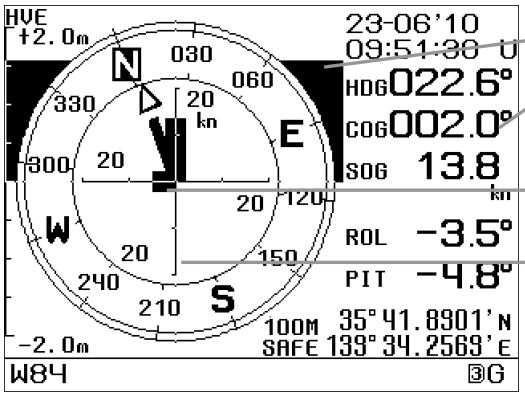
COG "-": Less than 1 knot.

Roll and pitch are indicated with a ✣
The ✣ represents a rolling ball.

The range of roll pitch graph can be switched. (Refer to "5.3.6 System Settings")

The display range of heaving (HVE) can be cycled. (Refer to 5.3.6 System Settings.)

Compass Screen E



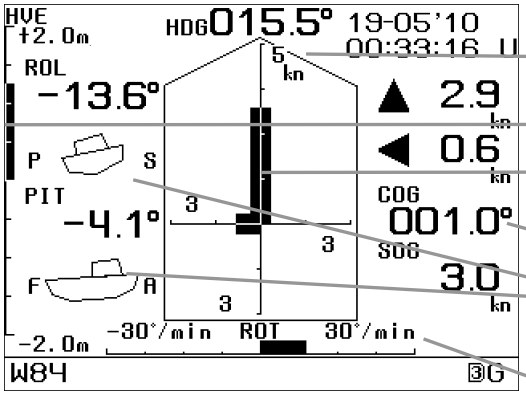
HEAVING(HVE)BAR

COG "-": Less than 1 knot.

The vectors of the velocity in the bow/stern and the port/starboard directions and their resultant vector (diagonal direction) are displayed.

The display range of SOG bar can be switched. (Refer to 5.3.6 System Settings.)

Compass Screen F



SOG BAR. The display range can be switched. (Refer to 5.3.6 System Settings.)

HEAVING(HVE)BAR

The vectors of the velocity in the bow/stern and the port/starboard directions are displayed.

COG "-": Less than 1 knot.

Roll and pitch are displayed graphically.
P: port S: starboard
F: bow A: stern

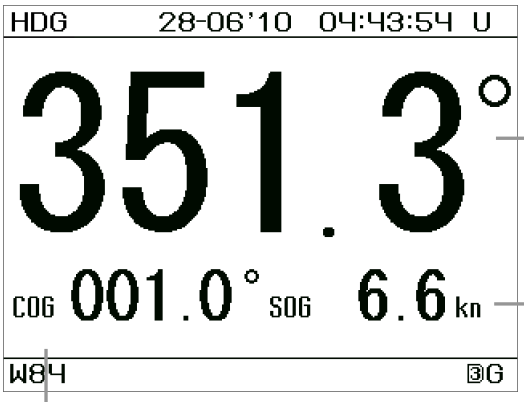
ROT graph. The display range can be switched. (Refer to 5.3.6 System Settings.)

4.1.2 Bow Heading Screen

The Bow Heading, SOG and COG are displayed numerically.

Each screen can be cycled using the ◀ or the ▶ key.

HDG Screen

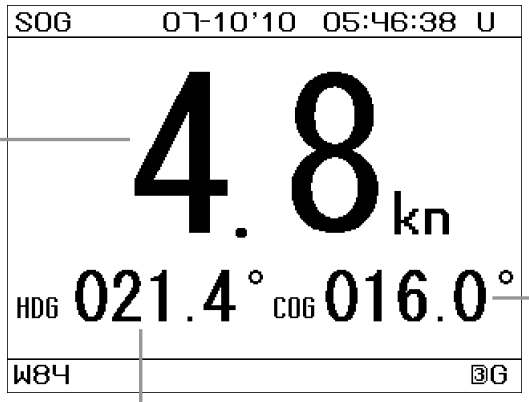


Bow heading (HDG)

SOG: Speed over ground

COG: Course over ground
"-": Less than 1 knot.

SOG Screen



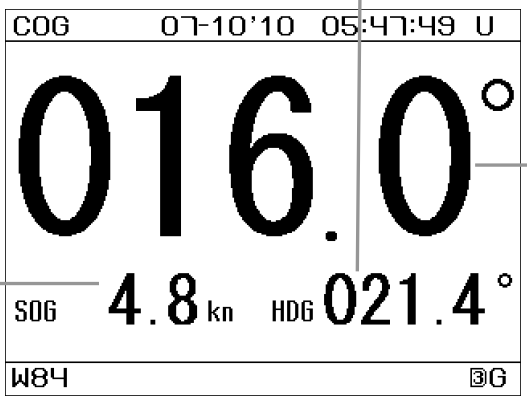
SOG: Speed over ground

COG: Course over ground

"-": Less than 1 knot.

Bow heading (HDG)

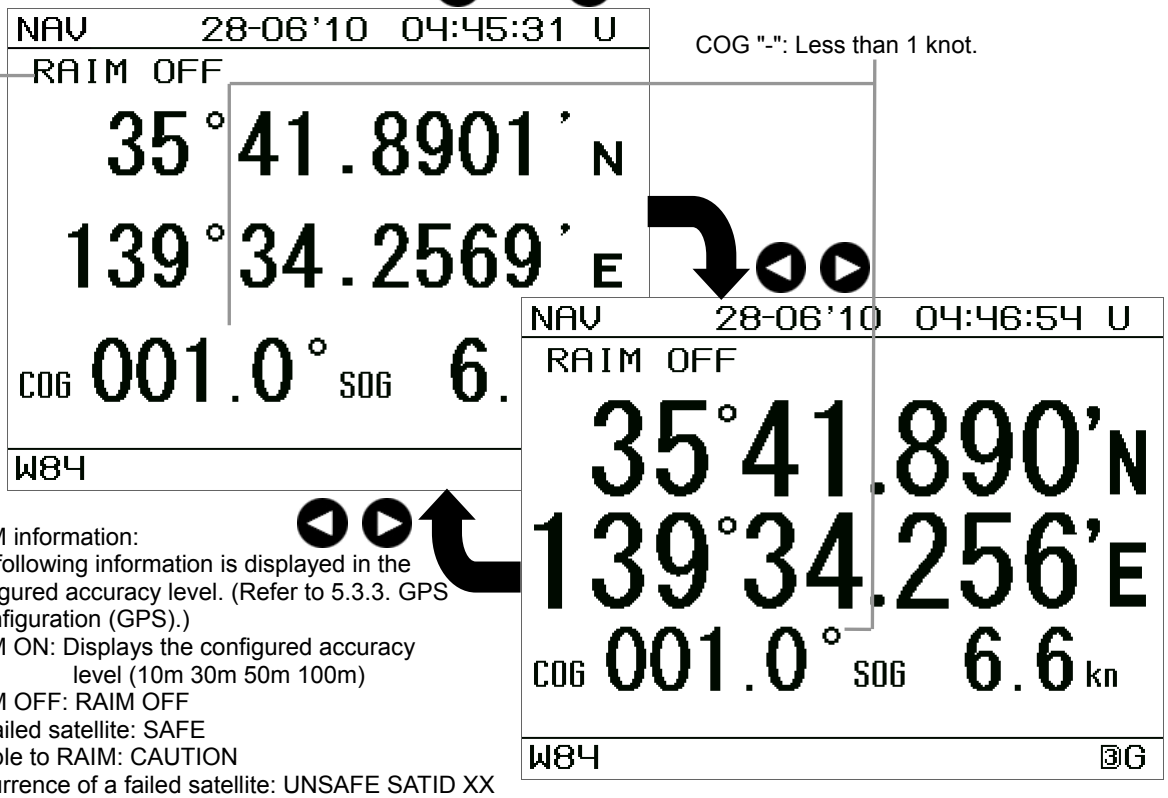
COG Screen



4.1.3 Navigation Screen

The latitude and longitude of the ship's position are displayed.

Latitude and longitude displays (3 decimals or 4 decimals display) can be cycled between using the ◀ and ▶ keys.



COG "-": Less than 1 knot.

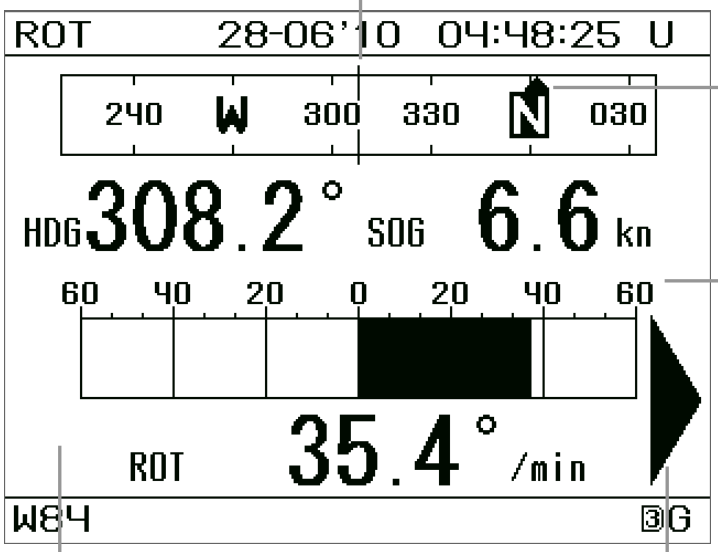
RAIM information:
The following information is displayed in the configured accuracy level. (Refer to 5.3.3. GPS Configuration (GPS).)
RAIM ON: Displays the configured accuracy level (10m 30m 50m 100m)
RAIM OFF: RAIM OFF
No failed satellite: SAFE
Unable to RAIM: CAUTION
Occurrence of a failed satellite: UNSAFE SATID XX (XX is satellite No.)

4.1.4 Turn Rate Screen

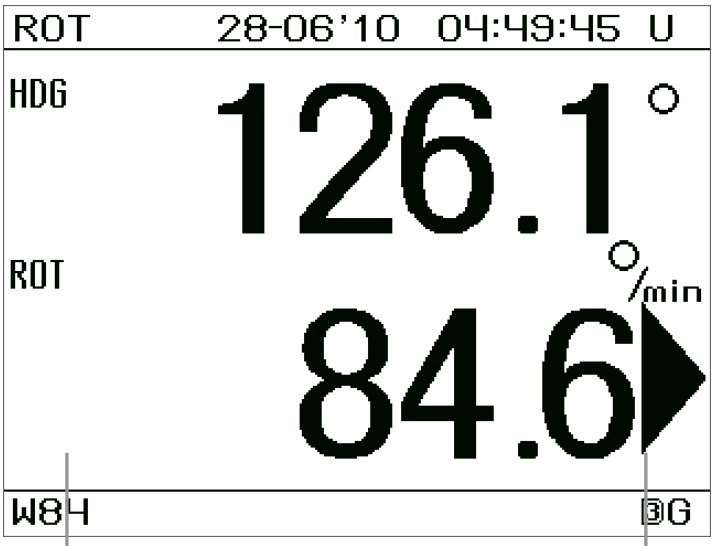
Ship's rate of turn is displayed.

There are two types of turn rate screens (A and B), and they can be cycled between using with the aid of ◀ and ▶ keys.

Turn Rate Screen A

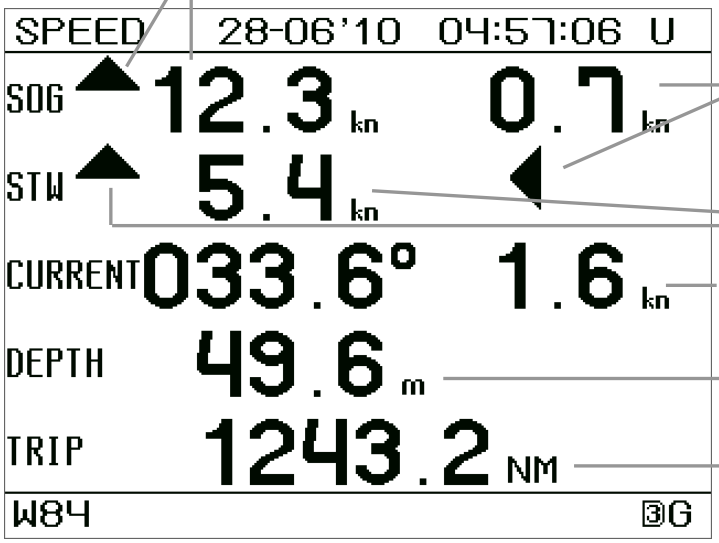


Turn Rate Screen B



4.1.5 Water Speed / Ground Speed Screen

Ship's longitudinal speed(bow-stern), transverse speed(port-starboard), and bearing are displayed.
When the tide current calculator is not connected, the STW, CURRENT, and DEPTH values are not displayed.



Ship's longitudinal speed over ground ▲▼ indicates the bearing.

Ship's transverse speed over ground ◀ ▶ indicates the bearing.

STW: Speed Through Water

CURRENT:
Bearing / speed of tidal current

DEPTH:
Current depth

TRIP: Total travel distance (Over ground)

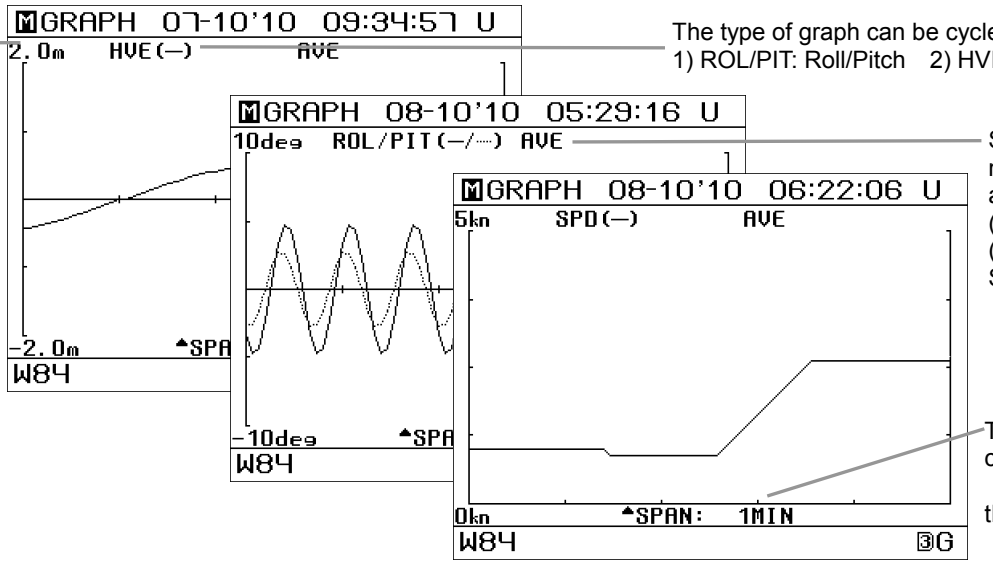
CLR key can be pressed and held for 2 seconds on this screen to reset the value of TRIP.
The value is kept even after the power is turned off until this reset is performed.

4.1.6 Trend Graph Screen

1) Roll/pitch, 2) heaving, and 3) SOG (Speed Over Ground) are displayed in a trend graph.
The right end of the graph shows the newest data.

Each graph of 1) to 3) can be cycled using the ◀ or the ▶ key.
The time range in the horizontal axis can be cycled using the ▲ or the ▼ key.

CLR key can be pressed and held for 2 seconds on the screen of graph 1) to 3) to reset the display data (past history data).
Attention) This reset is applicable all past history data for 1) Roll/pitch, 2) heaving, and 3) SOG.



The type of graph can be cycled using the ◀ ▶ keys.
1) ROL/PIT: Roll/Pitch 2) HVE: Heaving 3) SPD: SOG

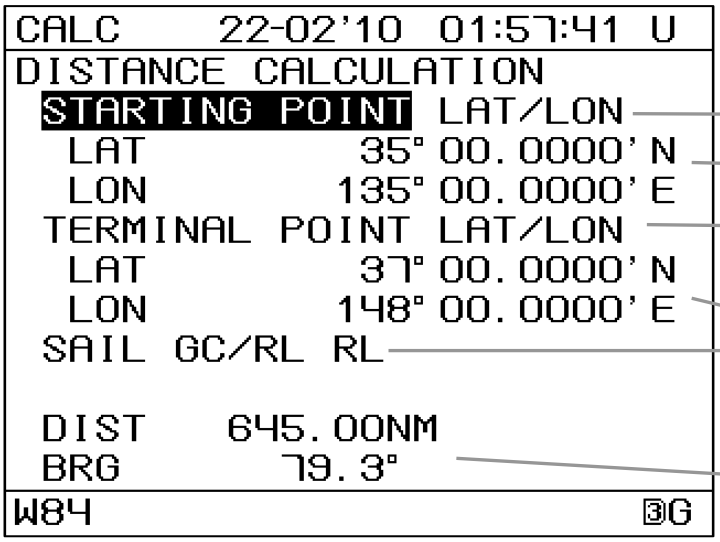
Select a data display method from AVE (the average value) or MAX (the maximum value.) (Refer to 5.3.6 System Settings.)

The time range can be cycled using the ▲ ▼ keys.

The range of the vertical axis for each graph can be cycled. (Refer to 5.3.6 System Settings.)

4.1.7 Calculate Distance Screen

The distance and the bearing between any starting point and ending point are calculated.



Select a starting point from the ship's position or any other positions. When selecting the ship's position, set to THIS SHIP to automatically configure to the ship's current position.

Displayed starting point

Select a terminal point form the ship's position or any other positions.

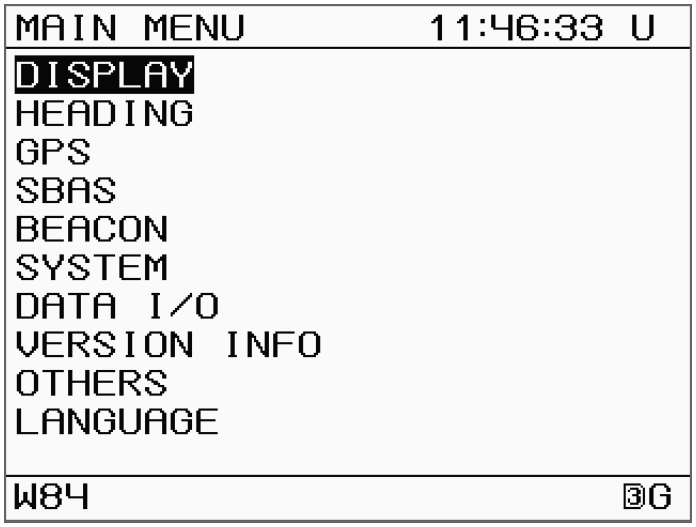
Displayed terminal point

Select sail from
GC: Great circle or
RL: Rhumb line

The distance between the starting point and the ending point and the bearing of the ending point from the starting point are displayed.

4.1.8 Configuration Screen

Press the MENU key to go to the Configuration menu screen. Refer to "5.3 Main Menu" for details.



Section 5 Operation

5.1 Menu List

5.1.1 Menu List

MAIN MENU

DISPLAY	CONTRAST		1～7～13
	DIMMER	MAXIMUM	1～9～10
		TYPICAL	1～6～10
		MINIMUM	1～4～10
	CLICK SOUND		ON/OFF
	REVERSING MODE		NORMAL,REVERSE1,REVERES2
	START SCREEN		COMP-A,-B,-C,-D,-E,-F,HDG,SOG,COG,NAVI-A,-B,ROT-A,-B, SPEED, GRAPH, CALC
	DECIMAL FONT SIZE		LARGE, SMALL
	COMP-C/D POSN DIGIIT		3,4
HEADING	RESTORATION		AUTO,MANUAL
	BACKUP		1,2,3
	INTERRUPT NMEA		NULL,STOP
	HEADING CHECK SUM		ON,OFF
	HEADING OFFSET		`-10.0°～0.0°～+10.0°
	OUTPUT RESOLUTION		0.1,0.01°
GPS	MODE		AUTO,2D,3D
	HDOP		4,10,20
	SMOOTHING	POSITION	0～10～99s
		SPEED(SOG)	0～4～99s
		COURSE(COG)	0～4～99s
	RAIM ACCURACY LEVEL		OFF,10,30,50,100m
	INITIALIZATION	LATITUDE	
		LONGITUDE	
		ANT HEIGHT	
		DATE	DD-MM'YY
		UTC	HH:MM:SS
SBAS	MODE		AUTO,GPS ALONE,SBAS,BEACON
	SBAS SEARCH		AUTO,MANUAL
	TYPE 0 INFORMATION		ON,OFF
	RANGING		ON,OFF
BEACON	STATION SELECT		MANUAL,AUTO
	BIT RATE		50,100,200bps
	FREQUENCY		283.5～325.0kHz
	BEACON INFORMATION		ON,OFF
SYSTEM	TIME DIFF		`-13:00～00:00～+13:00
	DATE DISP		DD-MM'YY,'YY-MM-DD,MM-DD'YY DD MMM,' YY MMM DD,' YY
	TIME DISP		12,24
	DATUM		WGS84,WGS72,JAPAN,……SPK
	SPEED UNIT		kn,km/h,mi/h
	ROT RANGE		±30,60,90,120,150,180, 210,240,270,300,600,900, 1200,1500,1800,2100,2400,2700°/min
	ROT SMOOTHING		0～10～99s
	ROLL/PITCH RANGE		±5,10,15,20,25,30°
	ROLL OFFSET		`-30～0～+30°
	PITCH OFFSET		`-30～0～+30°
	NEXT PAGE		

SYSTEM 2	PREVIOUS PAGE			
	HEAVING BAR RANGE			1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 100
	HEAVING BAR DISP			OFF, DISP1, DISP2, DISP3, DISP4
	TREND GRAPH			AVERAGE, MAXIMUM
	HVE POS OFFSET	X		−999.9～+0.0～+999.9m
		Y		−999.9～+0.0～+999.9m
		Z		−999.9～+0.0～+999.9m
	RMC MAG CORR			AUTO, MANUAL
	GPS 5Hz DRAW			ON, OFF
	SOG BAR RANGE			5, 10, 15, 20, 25, 30, 50, 100
DATA I/O	SENSOR THROUGH			NMEA,NSK,AD-10,IEC
	DATA OUT1			NMEA,NSK,AD-10,IEC
	DATA OUT3			NMEA,NSK,IEC
	DATA OUT4/IN4			NMEA/OFF, NSK/OFF, BEACON/OFF, IEC/OFF, 4341/OFF, NMEA/CURRENT, BEACON/CURRENT, IEC/CURRENT, 4341/CURRENT, NMEA/CCRP, BEACON/CCRP, IEC/CCRP, 4341/CCRP BEACON/CURRENT
	DATA OUT5			NMEA,NSK,IEC
	LOG PULSE			OFF,200p/nm,400p/nm
VERSION INFO				DISPLAY,SENSOR,GPS1,GPS2,GPS3
OTHERS	CURRENT	LAYER		ALL,1～3～999
		DATA No.		ALL,0～1～9
LANGUAGE				ENGLISH,JAPANESE

MAIN MENU(M)

ANT CHECK				
INPUT CHECK	PORT SELECTION	START,STOP		OFF,INPUT0,INPUT4
DIAGNOSIS	DISPLAY			OFF,START
	SENSOR			OFF,START
	LCD			OFF,START
DEMO	DEMO TYPE			OFF,01～99
PRODUCT TYPE	DISPLAY	TYPE		MAIN,SUB
		SERIAL		
	SENSOR	SERIAL		
		BARCODE		
		DEFAULT No.		0
RESET	DISPLAY			NO,YES
	SENSOR			NO,YES
	ALL			NO,YES
SOFT UPDATE	UPDATE AREA			SENSOR,DISPLAY
	BIT RATE FROM PC	SENSOR		AUTO
		DISPLAY		38400,57600,115200bps
CCRP	SHIP			DISABLE, ENABLE
	BEAM			1.0～70.0
	LENGTH			1.0～700.0
	SENSOR			DISABLE, ENABLE
	SENSOR			No.1～No.9
	X			−35.0～0.0～35.0
	Y			0.0～700.0
	CCRP			DISABLE, ENABLE
	X			−35.0～0.0～35.0
	Y			0.0～700.0

* The underlined settings are factory defaults. If the equipment is master-reset, all the parameters are configured to defaults.

* CCRP settings will not be initialized by master reset.

●Default of DATA I/O

Name on Display	Set item	Default
SENSOR THROUGH	NMEA VER	NMEA　Ver2.1
	BIT RATE	38400bps
	INTERVAL(HDT,THS,ROT)	25msec
	SENTENCE	HDT　ROT
DATA OUT1	NMEA VER	NMEA　Ver2.1
	BIT RATE	4800bps
	SENTENCE	—（None）
DATA OUT2	NOT USED	
DATA OUT3	NMEA VER	NMEA　Ver2.1
	BIT RATE	4800bps
	SENTENCE	GGA　VTG　RMC　GLL　(Interval is 1 sec.)
DATA OUT4	NMEA VER	NMEA　Ver2.1
	BIT RATE	4800bps
	SENTENCE	—（None）
DATA OUT5	NMEA VER	NMEA　Ver2.1
	BIT RATE	4800bps
	SENTENCE	—（None）

5.2 Basic Operation

5.2.1 Turning the Unit On

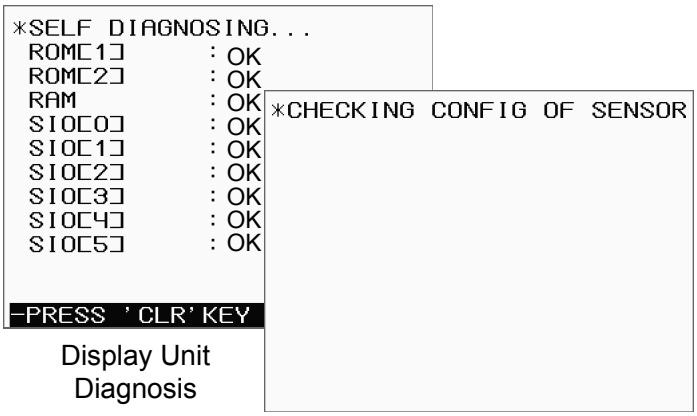
Press the PWR CONT key to turn the power on, the system starts initialization.
Once initialization has been completed, self-diagnosis will run when the equipment condition has been checked, the screen switches to the standard screen.

Attention

If the unit cannot be turned on, check the main power supply and the connection of display unit cable.

Unit Initialization

Self-Diagnosis Screen



Display Unit Diagnosis

Sensor Diagnosis

Memo

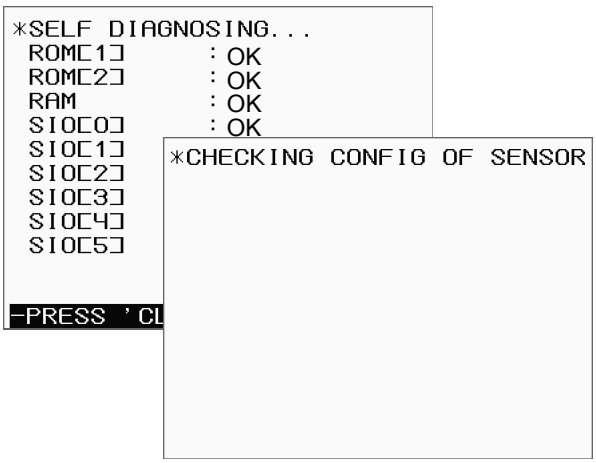
Pressing the CLR key during the initialization of the system moves you to the self-diagnosis screen. (Initialization is still performed in this case.)

Press the CLR key to break the self-diagnosis and display the standard screen.

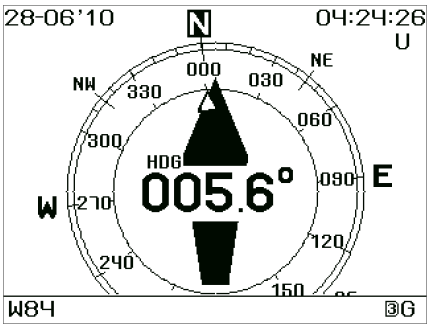
5.2.1.1 Startup (Standard)

If the self-diagnosis results are all "OK", the unit automatically switches to the standard screen.

Self-Diagnosis Screen



Standard Screen

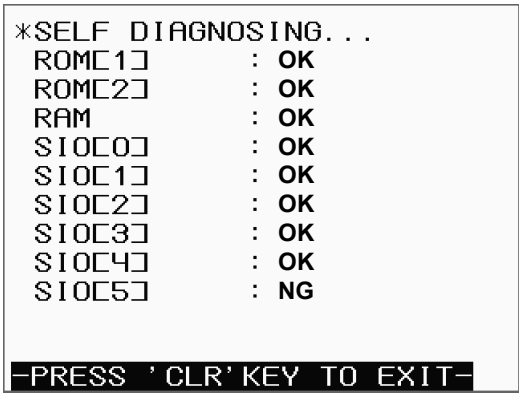


5.2.1.2 Startup (Error-1)

If any of the self-diagnosis results are "NG", the results are displayed.
The unit does not switch to the standard screen unless the CLR key is pressed.

Attention

If any errors (NG) are detected, perform a DIAGNOSIS (self-diagnosis) from the 5.4 Maintenance Menu, and check the details of the failed item. (Refer to "5.4.3 Self-Diagnosis (DIAGNOSIS)").



5.2.1.3 Startup (Error-2)

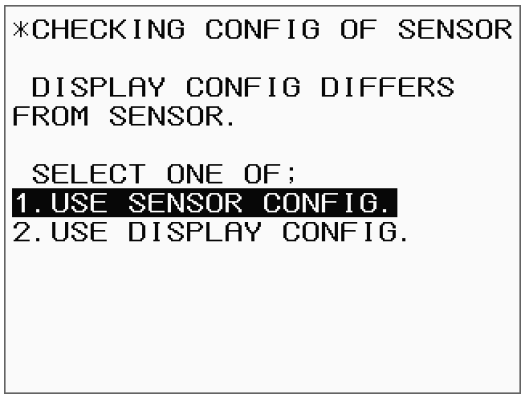
Messages shown below may be displayed during sensor diagnostics.
The message appears when display unit and sensor configuration settings do not match, when equipment has been replaced.

When this occurs, select one of the items, and press the ENT key to perform it.

[1. USE SENSOR CONFIG]: Replaces display configuration with the sensor configuration.
[2. USE DISPLAY CONFIG]: Replaces the sensor configuration with the display configuration.

Attention

Consult with JRC or its affiliate if this is displayed frequently.

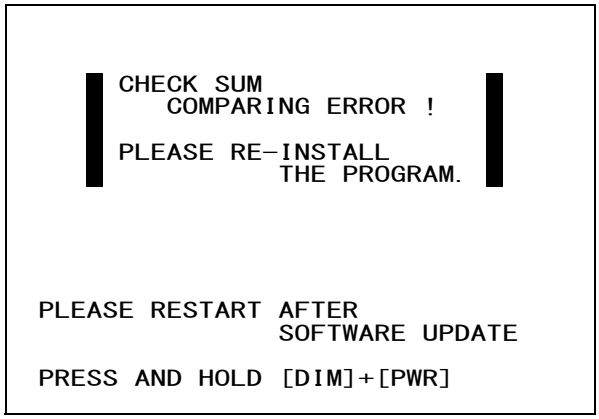


5.2.1.4 Startup (Error-3)

If the following screen is displayed after the unit is turned on, press the PWR CONT key and DIM key simultaneously to turn off the power.

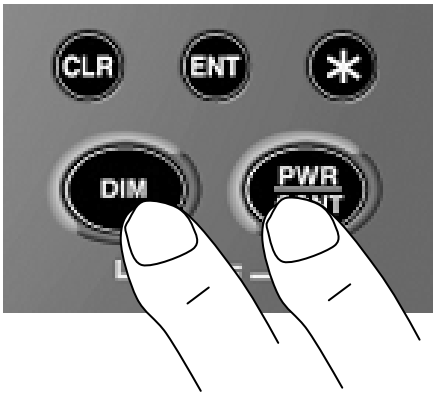
Attention

Contact JRC or its affiliate.



5.2.2 Turning the Unit Off

If the DIM key and PWR CONT key are pressed and held down simultaneously, the power will be turned off and the screen display will be off.



5.2.3 Adjusting the Backlight

The brightness of the display can be set to one of four levels.
The brightness is set to medium when the unit is turned on.

Each time the DIM key is pressed, the brightness of the backlight cycles as below:
Bright (MAXIMUM) → Medium (TYPICAL) → Dark (MINIMUM) → Off → Dark (MINIMUM) → Medium (TYPICAL) → Bright (MAXIMUM)

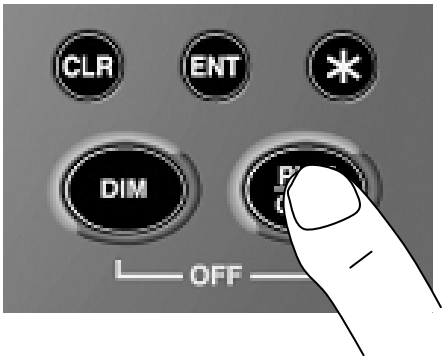
Memo

Level settings can be performed for all brightness levels except "Off". (Refer to "5.3.1 Display Settings")
The key panel brightness changes in accordance with the display brightness.

5.2.4 Adjusting the Contrast

The contrast of the display can be set to one of 13 levels.

Each time the PWR CONT key is pressed, the display contrast decreases, and after the lightest level is reached, the contrast gradually increases back.



5.2.5 Stopping the Buzzer

Pressing the CLR key silence the buzzer.

The buzzer sounds when one of the following occurs.

- Position measurement is interrupted
- Bearing measurement is interrupted
- An error occurs

5.2.6 Changing the Display

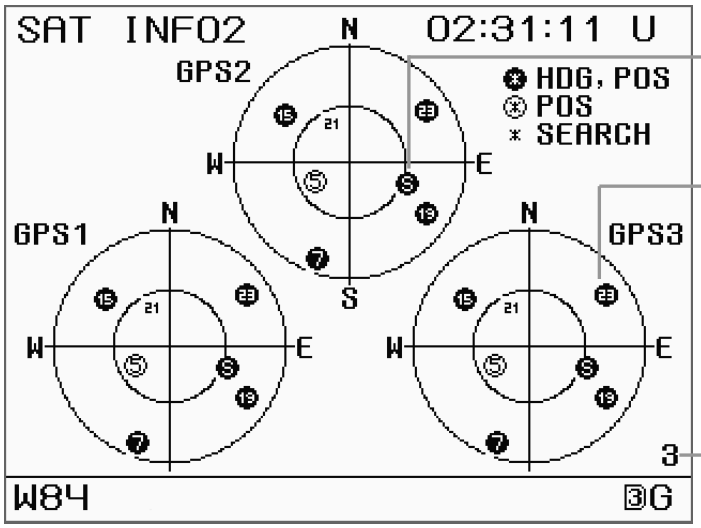
Each time the DISP key is pressed, the screen display changes. (Refer to "4.1 Display Screen")

5.2.7 Displaying Satellite Information

Each time the USER key is pressed, the screen display changes.

SATINFO2: The positions of the GPS satellite(s) can be confirmed.
SATINFO1: The signal levels from individual satellite can be checked.

Satellite Position



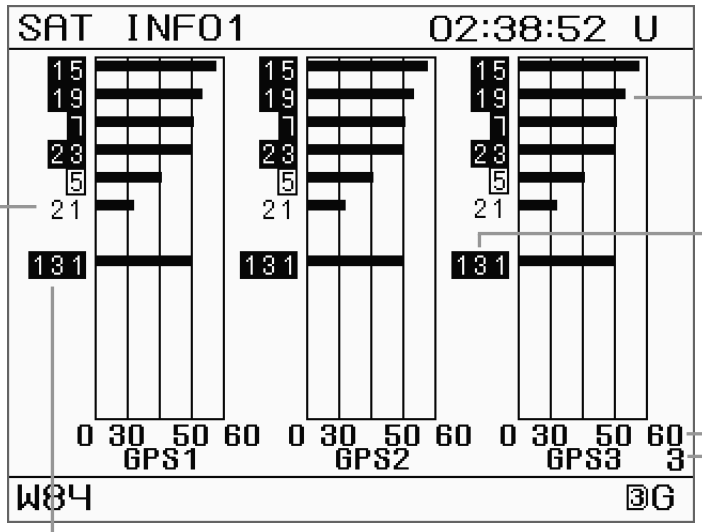
SBAS Satellite (Corresponds to MSAS/WAAS/EGNOS)

Satellite Number
No border: unused
○: Used for position
●: Used for bearing and position

Antenna in use
3: With three antenna
2: With two antenna

USER USER

Signal Level



Reception Level
Standard levels are around 40 - 50

Number of treble: SBAS Satellite (Corresponds to MSAS/WAAS/EGNOS)

Unused satellite

Reception Level Scale

Antenna in use
3: With three antenna
2: With two antenna

Satellite Number
□: Used for position fix
■: Used to determine the bearing and fix the position

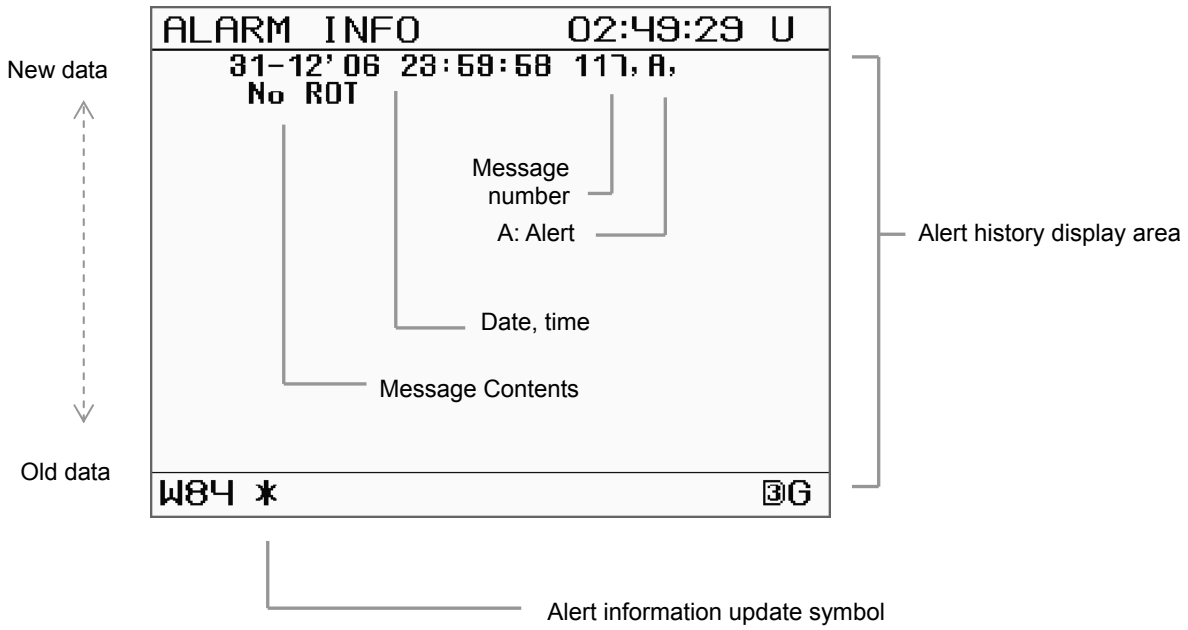
Memo

- If JLR-4331 or a DGPS beacon receiver is connected, Beacon Information will be added to the above. Refer to “5.3.5 Beacon Settings(BEACON)”.
  BEACON INFO Screen → SAT INFO2 Screen → SAT INFO1 Screen

5.2.8 Alert History Display

Each time the * key is pressed, the screen display changes.

When alert information is updated, the ＊symbol appears on the status bar.



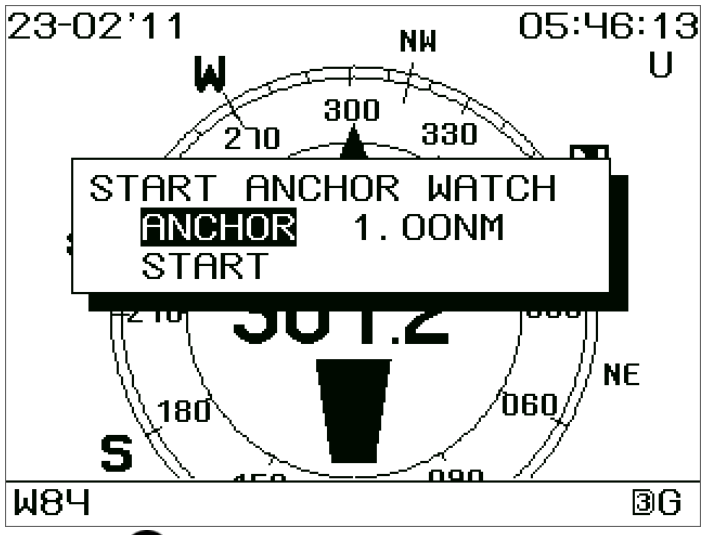
Memo

- If alert has not occurred, "NO ALARMS" is displayed.

5.2.9 Anchor Watch Settings

●Starting the anchor watch

Press and hold the USER key for 2 seconds to set (start) anchor watch.



1. Select ANCHOR using the ENT key, and input a desired range (radius) to watch using the ▲▼ keys.
2. The range can be from 0.01 to 9.99. The unit of range is the unit configured in SPEED UNIT in the System menu. Refer to 5.3.6 System settings for details.
3. Next, enter the input range (radius) using the ENT key.
4. Select START and press the ENT key to start anchor watch.

During anchor watch, the following icons are displayed in a status bar (the bar in the bottom of the screen.)

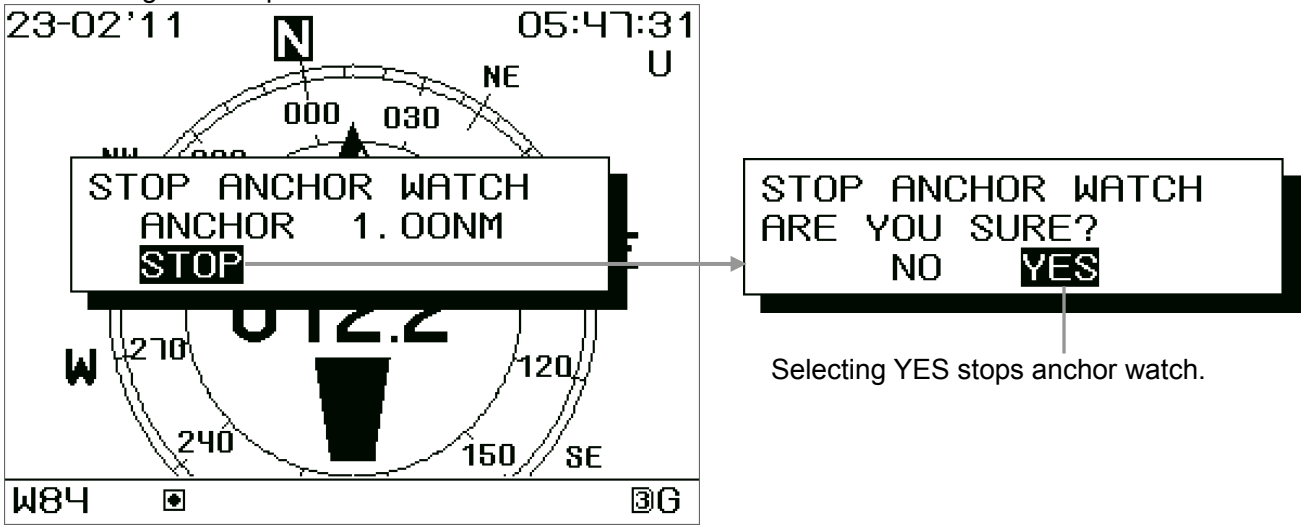
: Inside the set range (radius)

: Outside the set range (radius)

●Stopping the anchor watch

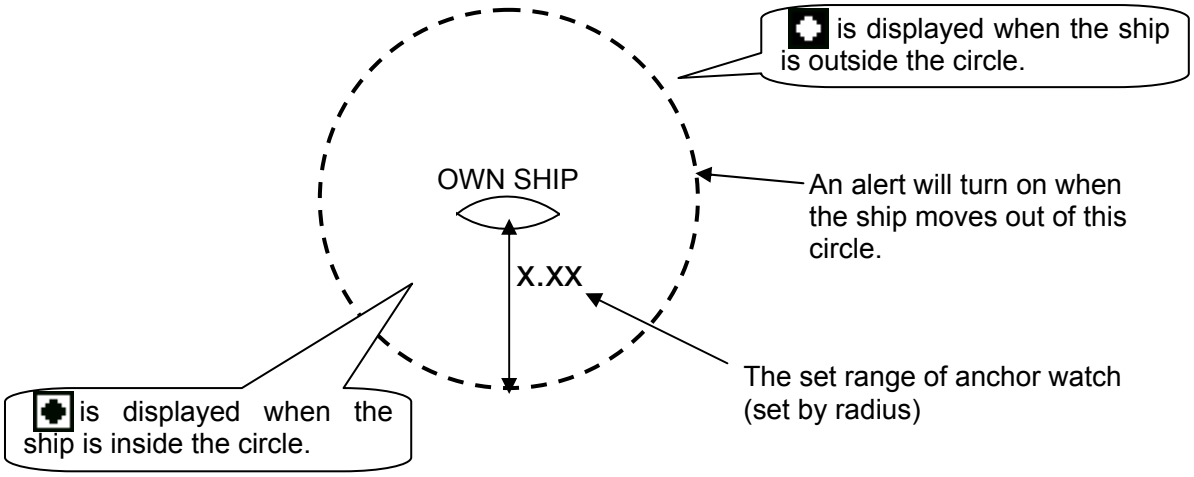
1. Stop the anchor watch by pressing and holding the USER key for 2 seconds again.
2. The following pop-up is displayed, then, select STOP using the ENT key.
   At a confirmation display- "STOP ANCHOR WATCH. ARE YOU SURE?", select YES to stop anchor watch.

Selecting YES stops anchor watch.



Memo

Anchor watch
If the ship moves out of the following dotted circle, an alert will turn on.

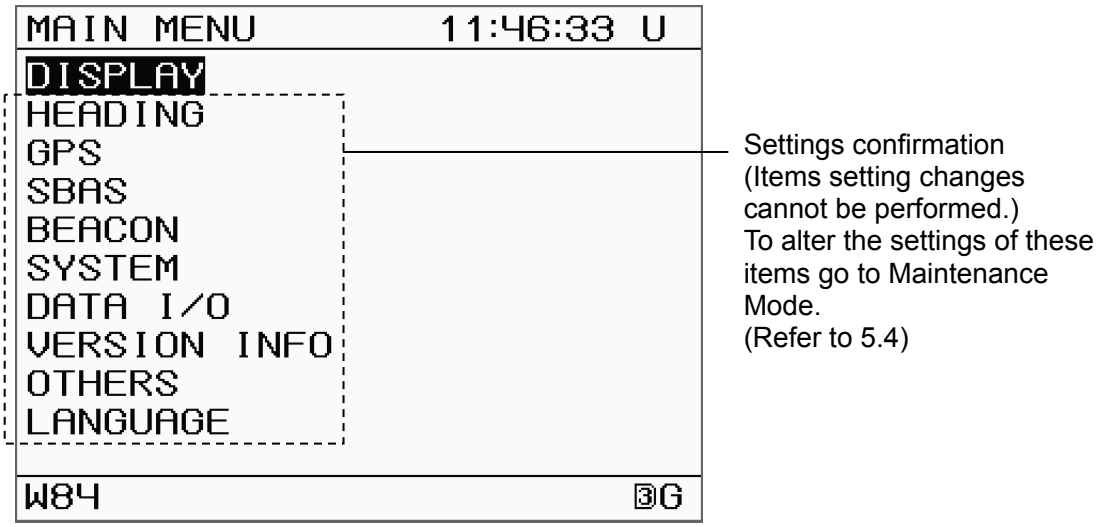


When the ship moves out of the set range, the following pop-up will show and an alert will turn on (Contact points are not coordinated.)

5.3 Main Menu

Open the Main Menu to check or change settings.
The Main Menu can be invoked by pressing the MENU key on any screen.

As delivered the language is English. To change to Japanese, Refer to “5.3.10 Language Settings (LANGUAGE)".



Main Menu

Procedure

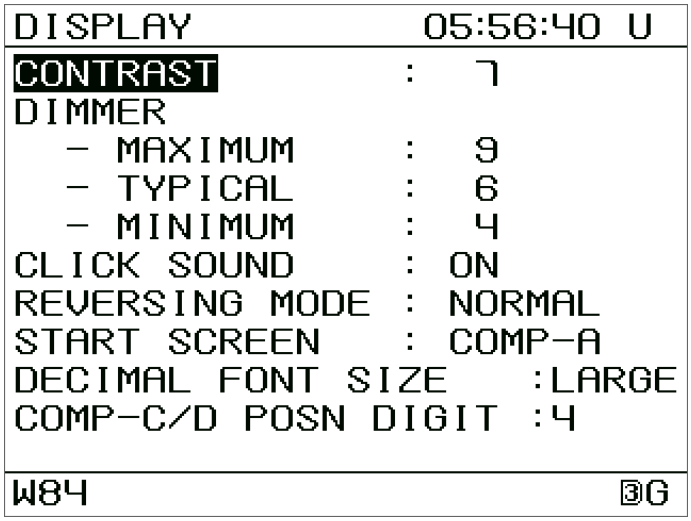
1. Press the ▲▼ keys to move the cursor and select an item.
2. Press the ENT key to display the menu for the selected item.

The following menus are available.

- DISPLAY: Displays settings menu for screen settings such as contrast and brightness. (Refer to 5.3.1)
- HEADING: Displays settings menu for heading alignment related settings. (Refer to 5.3.2)
- GPS: Displays settings menu for GPS related settings. (Refer to 5.3.3)
- SBAS: Displays settings menu for SBAS related settings. (Refer to 5.3.4)
- BEACON: Displays settings menu for beacon related settings. (Refer to 5.3.5)
- SYSTEM: Displays settings menu for system related settings. (Refer to 5.3.6)
- DATA I/O: Displays settings menu for input and output port (data) related settings. (Refer to 5.3.7)
- VERSION INFO: Displays program version of display unit and sensor. (Refer to 5.3.8)
- OTHERS: Displays settings menu for other miscellaneous settings. (Refer to 5.3.9)
- LANGUAGE: Displays Language Settings Menu. (Refer to 5.3.10)

5.3.1 Display Settings

Selecting **DISPLAY** from the "5.3 Main Menu" displays the Setup Menu.
From the Setup Menu you can set the contrast, brightness levels, and change buzzer settings.



Setup Menu

Procedure

1. Press the ▲▼ keys to move the cursor and select an item.
2. Press the ENT key to display the menu for the selected item.

Memo

- Press CLR to return to the Main Menu.

The following submenus are available.

- CONTRAST: Adjusts LCD contrast. (Refer to 5.3.1.1)
- DIMMER: Adjusts LCD brightness. (Refer to 5.3.1.2)
- CLICK SOUND: Turns click sound on or off. (Refer to 5.3.1.3)
- REVERSING MODE: Reverses black and white of display screen. (Refer to 5.3.1.4)
- START SCREEN First screen after power up is selected. The Screen allocated in the DISP key can be selected. (Refer to 5.3.1.5)
- DECIMAL DISP SIZE: Select the display size of decimal numbers on the screen. (Refer to 5.3.1.6)
- COMP-C/D POSITION DIGIT: Select 3 or 4 digits for displaying the current position on the Compass screens C/D. (Refer to 5.3.1.7)

5.3.1.1 Adjusting the Contrast

Select **CONTRAST** to adjust the contrast. Press the ▲▼ keys to adjust the contrast, and press the ENT key to set the adjustment.

```
CONTRAST          :  7
```

The lowest contrast is 1, and the highest is 13.
The default is 7.

5.3.1.2 Brightness Settings (DIMMER)

The brightness can be set to bright, medium, dark, and off by pressing the DIM key. From this menu, you can set the values for each of these brightness levels.

Select **MAXIMUM** (**TYPICAL** , **MINIMUM**), and press the ENT key to move the cursor to the right.

Pressing the ▲▼ keys increments or decrements the value by one, and the screen brightness changes accordingly. Press the ENT key to set the selection. (TYPICAL and MINIMUM values can be set in the same way)

```
DIMMER
  - MAXIMUM     :  9
  - TYPICAL     :  6
  - MINIMUM     :  4
```

Memo

- Set the largest value for MAXIMUM, and the smallest value for MINIMUM.
- The maximum/minimum level adjustable by key-brightness are the ones set here DIMMER settings.

5.3.1.3 Click Sound Settings (CLICK SOUND)

Select **CLICK SOUND** to turn on or off the key click sound.

Pressing the ▲▼ keys cycles the buzzer on and off. Press the ENT key to confirm the selection.

```
CLICK SOUND       :  ON
```

ON: Buzzer on
OFF: Buzzer off

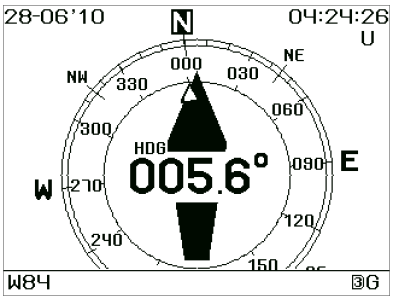
Memo

The buzzer cannot be deactivated.

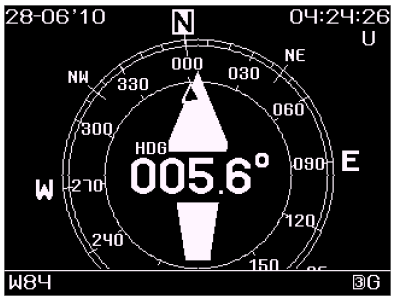
5.3.1.4 Display Reversing Setting (REVERSING MODE)

Select **REVERSING MODE** to reverse the black and white of the display screen.
Pressing the ▲ ▼ keys will rotate the settings. Press the ENT key to confirm the selection.

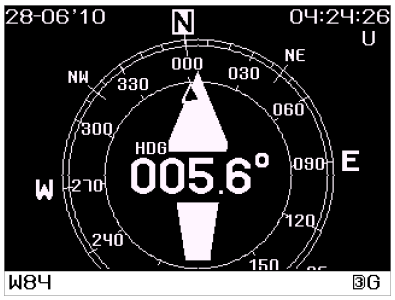
NORMAL: The letters are black. (Background is white)
REVERSE 1: The letters are white. (Background is black)
REVERSE 2: The letters are white, and the letters on the status bar are black.



NORMAL



REVERSE1

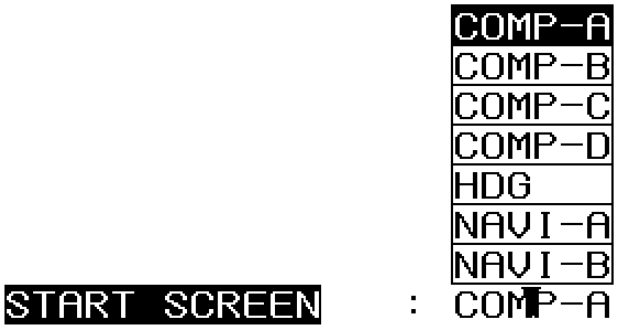


REVERSE2

Reversed Screens

5.3.1.5 First Screen Setting (START SCREEN)

The first screen after power up can be selected.
The screen allocated in the DISP key (Refer to 4.1 Display Screen) can be selected.



5.3.1.6 Decimal Display Size Setting (DECIMAL DISP SIZE)

The display size of decimals on the screen assigned to the DISP key (refer to 4.1 Display Screen) can be selected.

LARGE: The display size of decimal numbers is large. Ex. 3.2
SMALL: The display size of decimal numbers is small. Ex. 3.2

Applicable screens are Compass Screens A to F, Bow Heading Screen, Navigation Screen, Turn Rate Screen, and Water Speed/Ground Speed Screen.

5.3.1.7 Current Position Display Digit Setting on Compass Screens C/D (COMP-C/D POSITION DIGIT)

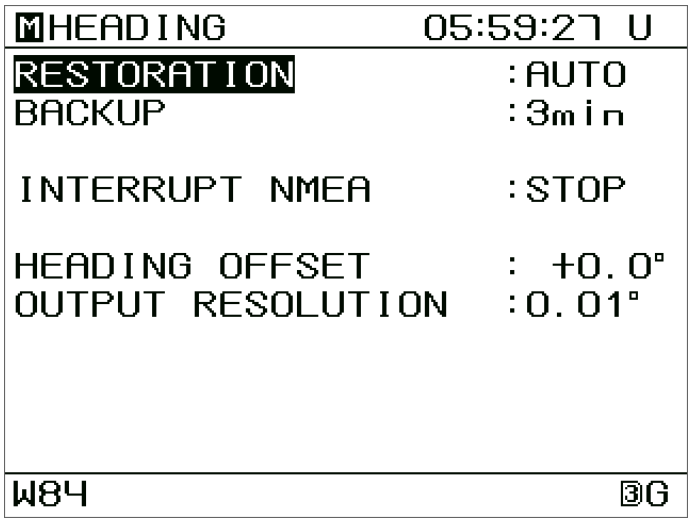
The number of digits for displaying the current position on the Compass screens C/D can be selected.

3: The current position is displayed with 3 decimals. Ex. 35°41.890'N 139°34.256'E

4: The current position is displayed with 4 decimals. Ex. 35°41.8901'N 139°34.2569'E

5.3.2 Setting the Heading (HEADING)

Selecting **HEADING** from the "5.3 Main Menu" displays the Heading Settings Screen.
From this screen, the bow heading settings can be checked.



HEADING Settings Screen

Procedure

1. Press the ▲ ▼ keys to move the cursor and select an item.
2. Press the ENT key to display the menu for the selected item.

The following submenus are available.

- RESTORATION: After initially checking the measured heading, to input it to a connected external device, select MANUAL. When the heading measurement has been completed, a buzzer sounds, and heading data is not output to the external device until the buzzer is stopped by pressing CLR.
  If AUTO is selected, when heading measurement has been completed, heading data is output automatically to the external device.
- BACKUP: If the GPS signal is interrupted for some reason and the equipment cannot determine the ship's heading with the fixed position, the bearing will be reckoned with the aid of internal roll and pitch sensors.
  The user can set the time of reckoning from 1 and 3 minutes.
- INTERRUPT NMEA: Sets HDT sentence (or THS sentence) processing when heading measurement cannot be performed.
  In case the ship's heading cannot the specified BACKUP time, the following part of $GPHDT (or $GPTHS) shall be either blank or the last determined ship's heading, Or the output of sentence can be halted.
  (Applies to output HDT sentence (or THS sentence).)

  STOP: Stops the output of HDT sentence.
  NULL: Blanks will follow $GPHDT or $GPTHS.
  $GPHDT, , ← NULL
  ($GPTHS, , ← NULL

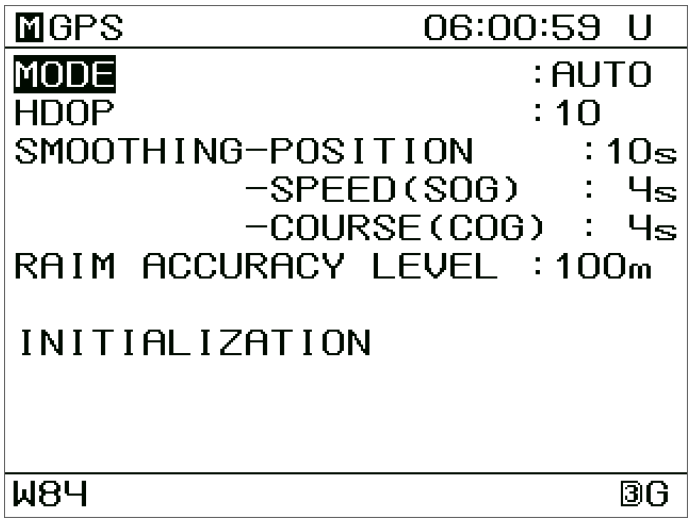
- HEADING OFFSET: The heading can be offset from -10.0º to +10.0º.
  The output heading to external devices is also offset.
  If an offset value is entered (any value other than 0), "H" will appear in the status bar at the bottom of the screen.
  The sensor shall always be installed parallel to the keel, but in the event that this is impossible, the error can be aligned here.
- OUTPUT RESOLUTION: Sets the resolution of the HDT (THS) sentence output.
  0.1 or 0.01 can be selected.
  (Normally, select the default value of 0.1)

Memo

- Press CLR to return to the Main Menu.
- In Maintenance Mode settings can be changed press and hold both MENU and * for 3 seconds or more to go to the mode.

5.3.3 GPS Configuration (GPS)

Selecting GPS from the "5.3 Main Menu" displays the **GPS** Settings Screen.
From this screen, the parameters for the sensor can be confirmed.



GPS Settings Menu

Procedure

1. Press the ▲ ▼ keys to move the cursor and select an item.
2. Press the ENT key to display the menu for the selected item.

The following submenus are available.

- MODE — AUTO: 2D and 3D position fix automatically switched. Normally, the setting should be left AUTO.
  - 2D: The position is fixed in two-dimensional measurement.
  - 3D: The position is fixed in three-dimensional measurement.
- HDOP: 4, 10, or 20 can be selected. Normally, the setting should be left 10.
- SMOOTHING
  - POSITION: Can be set between 0 and 99.
  - SPEED: Can be set between 0 and 99.
  - COURSE: Can be set between 0 and 99.
- RAIM ACCURACY LEVEL: Off, 10, 30, 50, or 100 can be selected.
- INITIALIZATION: Displays the Initial Settings Screen. This is used for initial settings for the GPS receiver. This item is not normally used.

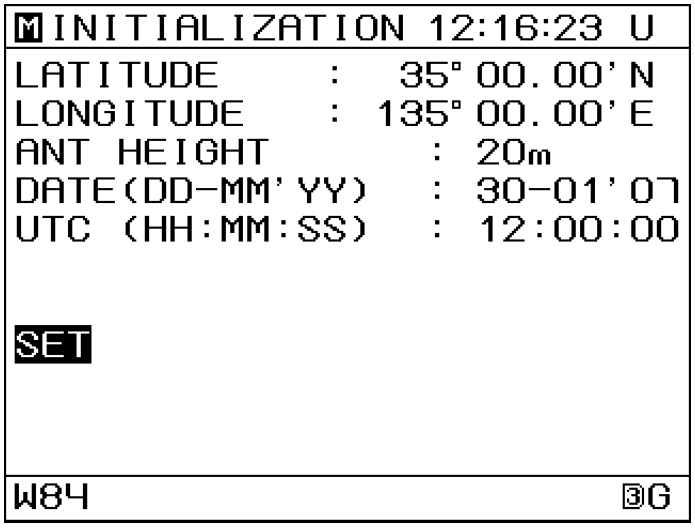
Memo

- Press CLR to return to the Main Menu.
- In Maintenance Mode settings can be change press and hold both MENU and ✱ for 3 seconds or more to go to the mode.

5.3.3.1 Initial Settings (INITIALIZATION)

The parameters of GPS receiver can be set in INITIALIZATION.

With ▲ ▼ keys select an item, and press the ENT key.



GPS Initial Settings Menu

Procedure

1. Press the ▲ ▼ keys to move the cursor and select an item.
2. Press the ENT key to display the menu for the selected item.
3. Values can be selected with the ▲ ▼ keys, and the cursor position can be changed with the ◀ ▶ keys.
4. Press the ENT key at the SET.

The following submenus are available.

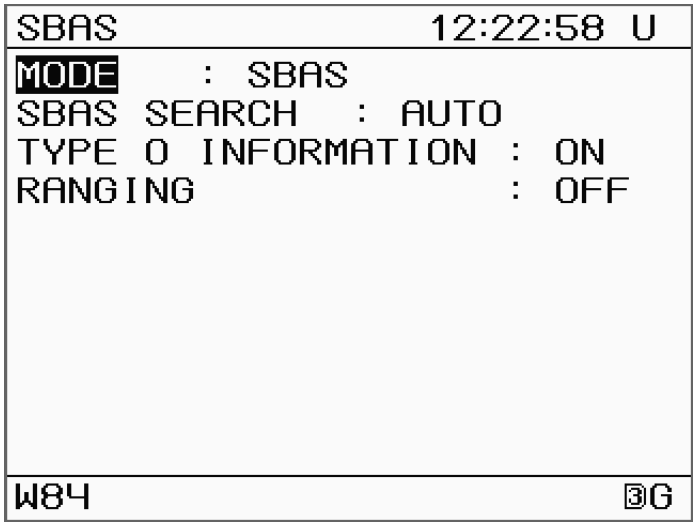
- LATITUDE: Enter the approximate ship's latitude.
- LONGITUDE: Enter the approximate ship's longitude.
- ANT HEIGHT: Enter the sensor height above the waterline. 2D positioning needs the height for calculation. The height is not used in 3D positioning.
- DATE: Enter today's date in UTC.
- UTC: Enter the present time in UTC.
- SET: Send the value to the sensor.

Memo

- Press CLR to return to the Main Menu.
- In Maintenance Mode settings can be changed press and hold both MENU and * for 3 seconds or more to go to the mode.

5.3.4 SBAS Settings (SBAS)

Selecting SBAS from the "5.3 Main Menu" displays the **SBAS** Settings Screen.
From this screen, the parameters for the sensor can be confirmed.



SBAS Settings Menu

Procedure

1. Press the ▲ ▼ keys to move the cursor and select an item.
2. Press the ENT key to display the menu for the selected item.

The following submenus are available.

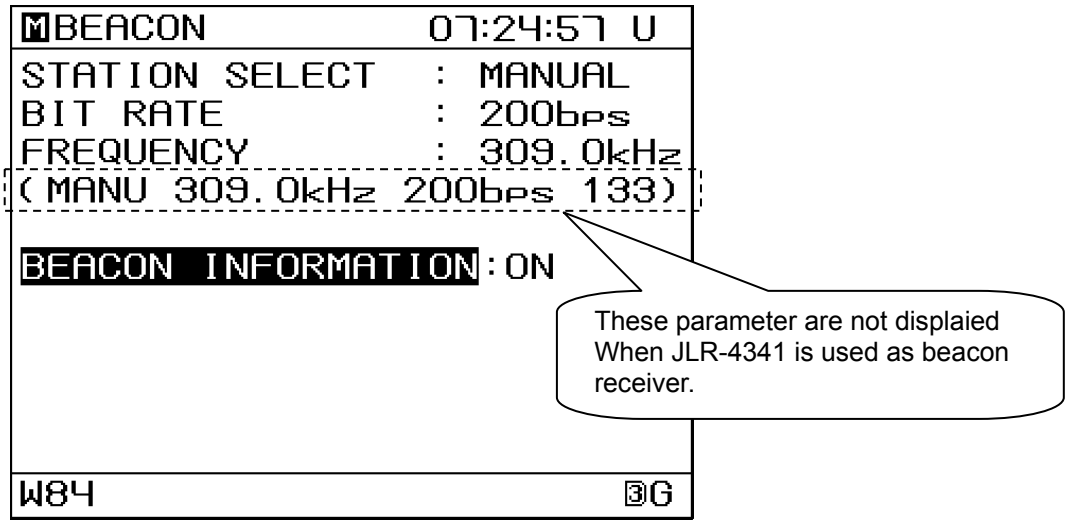
- MODE: Select the position correction mode.
  - AUTO: Beacon, SBAS, or GPS Only will be selected automatically for measurement according to the status of signal reception. (In order of : Beacon → SBAS → GPS only)
  - GPS ALONE: Position is fixed by GPS only. SBAS or beacon measurement will not be performed.
  - SBAS: SBAS takes the priority of measurement. Switched automatically to “GPS Only” when SBAS information is not obtained.
  - BEACON: The beacon takes the priority of measurement. Switchied automatically to “GPS Only” when Beacon information is not obtained.
- SBAS SEARCH: AUTO or MANUAL can be selected. When MANUAL is selected, the following TYPE 0 INFORMATION must be set.
- TYPE 0 INFORMATION: Test broadcast data can be turned on (for use) or off (when not in use). (When broadcasting starts, the broadcast data overrides, and this item is disabled)
- RANGING: ON or OFF can be selected. Used when an SBAS satellite is used with a GPS satellite. Normally, the setting should be left ON.

Memo

- Press CLR to return to the Main Menu.
- In Maintenance Mode settings can be changed press and hold both MENU and ✱ for 3 seconds or more to go to the mode.

5.3.5 Beacon Settings (BEACON)

Selecting **BEACON** from the "5.3 Main Menu" displays the Beacon Settings Screen.
From this screen, the parameters can be confirmed.



Beacon Settings Menu

Procedure

1. Press the ▲ ▼ keys to move the cursor and select an item.
2. Press the ENT key to display the menu for the selected item.

The following submenus are available.

- STATION SELECT: Select either manual or automatic selection of beacon station.
- BIT RATE: Select the bit rate of received data.
  (Available only when STATION SELECT is set to manual mode)
- FREQUENCY: Select the frequency of received data.
  (Available only when STATION SELECT is set to manual mode)
- BEACON INFORMATION: When set to ON, received data is displayed as is.

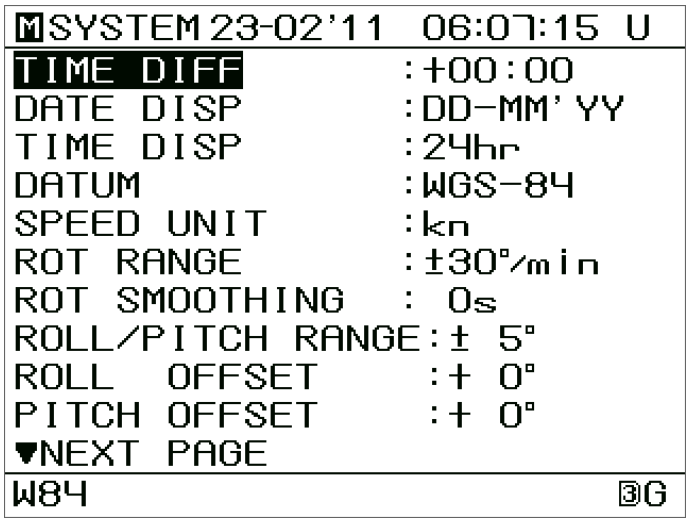
Memo

- Press CLR to return to the Main Menu.
- In Maintenance Mode settings can be changed press and hold both MENU and ✱ for 3 seconds or more to go to the mode.
- This setting, even if changed, is disabled if a beacon receiver is not connected.
- If BEACON INFORMATION is set to ON, pressing the USER key cycles through the following screens.

BEACON INFO Screen → SAT INFO2 Screen → SAT INFO1 Screen

5.3.6 System Settings

Selecting **SYSTEM** from the "5.3 Main Menu" displays the System Settings Screen.



System Settings Screen

Procedure

1. Press the ▲ ▼ keys to move the cursor and select an item.
2. Press the ENT key to display the menu for the selected item.

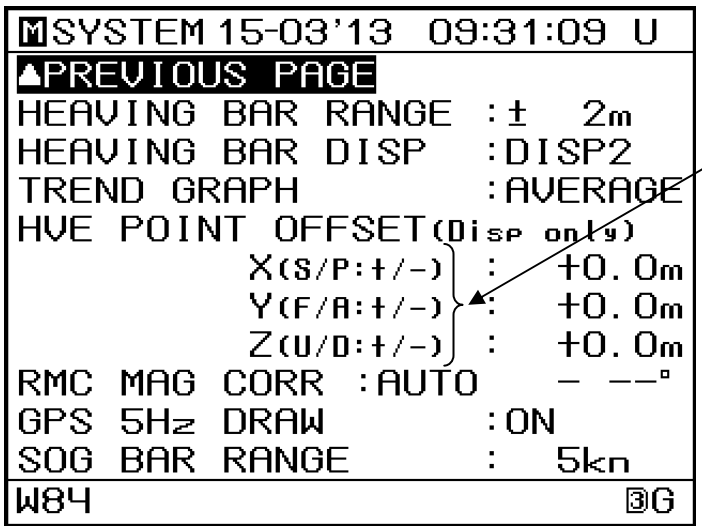
The following submenus are available.

- TIME DIFF: Enter the time difference from UTC in order to display the local time. Japanese Standard Time is UTC +9 hours, so enter "+9:00". If this is set, local time (indicated with an "L") is displayed.
- DATE DISP: Select among DD-MM'YY, 'YY-MM-DD, MM-DD'YY, DD MMM,'YY or MMM DD,'YY date display types.
- TIME DISP: Select 24 hour or 12 hour time display.
- DATUM: Select from the Geodetic System Table (Appendix 1).
- SPEED UNIT: Select from kn, km/h, or mi/h.
- ROT RANGE: Select one of the following based on the turn rate of the ship. (30,60,90,120,150,180,210,240,270,300,600,900,1200,1500,1800, 2100, 2400, 2700)
- ROT SMOOTHING: Select from 0 to 99 seconds.
- ROLL/PITCH RANGE: Select the maximum value for the roll/pitch graph shown on Compass Screen D. Normally, this should be left at the default value of 10º.
- ROLL OFFSET / PITCH OFFSET: Used when the roll / pitch graph shown on Compass Screen D is to be centered around the ✛ symbol. (Roll and pitch data output to external devices is also offset)

Memo

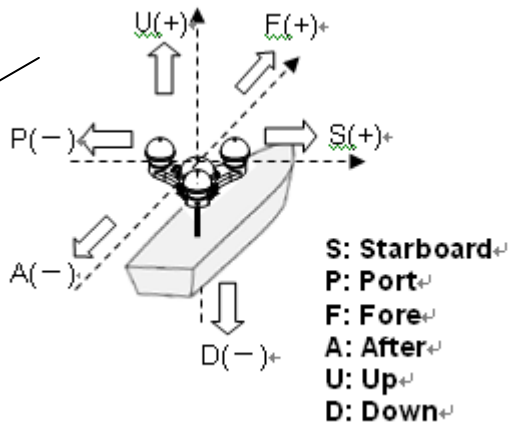
- Press CLR to return to the Main Menu.
- In Maintenance Mode settings can be changed press and hold both MENU and ✱ for 3 second or more seconds), settings can be changed.

Selecting NEXT in “5.3.6 System” allows you to continue system settings.



System Settings Screen

< Polarity Illustration for Inputting Offset >



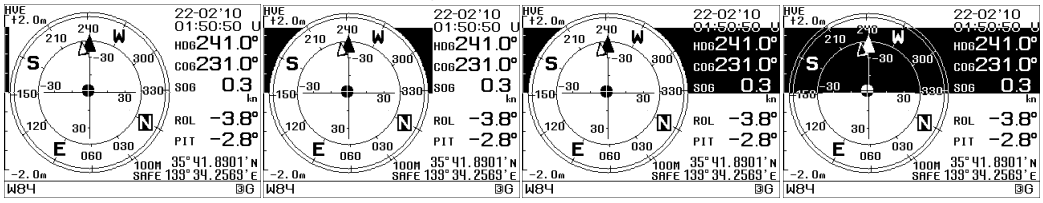
Procedure

1. Press ▲ ▼ to move the cursor and select an item in the menu.
2. Press ENT to display menu for the selected item.

The following submenus are available.

- RPEVIOUS: Goes to the previous page (Refer to the previous page.)
- HVE BAR RANGE: Set the maximum value for the heaving bar graph, displayed on the Compass screens D, E, and F, and the Trend Graph screen (Select from 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, or 100m.)
- HVE BAR DISPLAY: Select the type of heaving bar displayed on the Compass screens D and E.
  - ・OFF Heaving bar is not displayed.
  - ・DISPLAY 1 - 4 Refer to the following figure.

  (The Compass screen F turns the display off when OFF is selected, otherwise, displays the DISP1.)

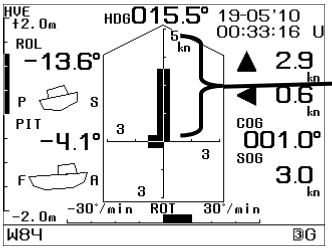


DISP 1 DISP2 DISP3 DISP4

- TREND GRAPH : AVERAGE: Displays the average value of each sampling zone.
  MAXIMUM: Displays the maximum value of the absolute value of each sampling zone.
- HVE POSITION OFFSET : Applicable to a heaving bar display and a trend graph display only, excluding any external output. A desired offsetting position is specified by the following polarities on the basis of the installation position of the sensor unit of the device.
  X: + for offsetting to the starboard side, - for offsetting to the port side.
  Y: + for offsetting to the bow side, - for offsetting to the stern side.
  Z: + for offsetting upward, - for offsetting downward.
  Refer to the above “Polarity Illustration for Inputting Offset” for details.

- RMC MAG CORR: You can select automatic or manual magnetic correction.
  When you select automatic, correction is automatically calculated for the correction value from the GPS position and output the data (except sensor through port in Data IN/OUT 1 connector).
  When you select manual, correction is performed using a manually entered value.
- 5Hz DISPLAY: Turning ON will change a display-updating cycle for the Latitude/Longitude, SOG, and COG displays to every 5Hz (200msec). Turning OFF will change a display-updating cycle back to the normal setting of every 1 sec.
  However, the updating cycle of the Latitude/Longitude, SOG, and COG output data for external devices is set in Data I/O Menu regardless of this setting. (Refer to 5.3.7 Data I/O Settings (DATA I/O) for details.)
- SOG BAR RANGE : Set the maximum value for the SOG bar range from the following. Applicable to the Compass screens E and F, and the Trend Graph screen.

Unit of measure configured in SPEED UNIT in the SYSTEM menu	Available range
kn	5,10,15,20,25,30,50,100
km/h	9,19,28,37,46,56,93,185
mi/h	6,12,17,23,29,35,58,115



SOG bar range is set to this axis (vertical axis) on this screen. (Compass F screen)

Memo

- Press CLR to return to the system settings.
- Settings can be changed in Maintenance Mode (Press and hold both MENU and ✱ for about 3 seconds to go to the mode.)

Memo

●Plot interval of the trend graph

The display range of X-axis (time axis) in the trend graph can be changed by the ▲,▼ keys. (Select from 1 min, 5 min, 30 min, 1 hr, 3 hrs, 5 hrs, or 12 hrs.)

The plot interval of each display range is shown in the following table. The longer the display range, the longer the plot interval, and a change in the period of time shorter than this interval is not displayed (plotted.)

<Plot Interval>

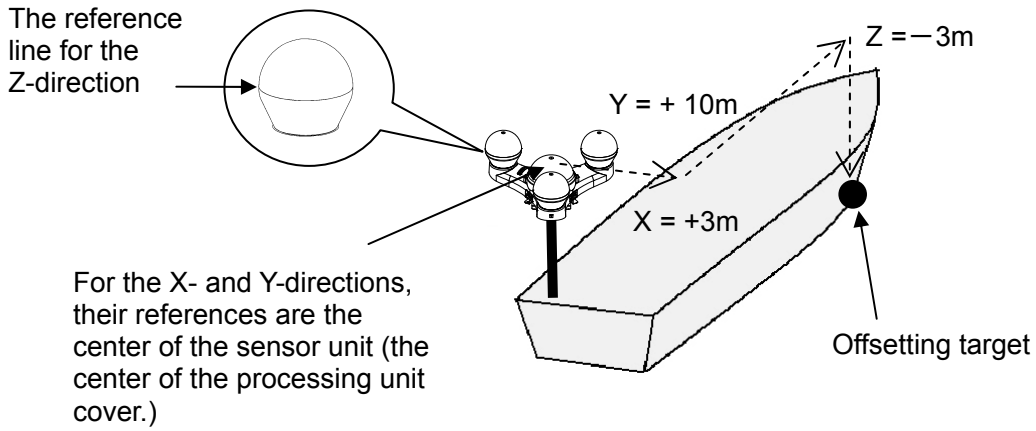
Display range of X-axis	1min.	5min.	30min.	1hour.	3hour.	5hour.	12hour.
Plot interval	every 1sec.	every 4sec.	every 24sec.	every 48sec.	every 144sec.	every 240sec.	every 576sec.
Average	The average in each plot interval						
Maximum	The maximum of the absolute value in each plot interval						

Memo

●Offset function for a heaving measuring position displayed on the display unit
All defaults in “HVE POINT OFFSET” are 0; in this case, the heaving measuring position is the installation position of the sensor unit. The measuring position can be offset to another position by the following procedure (as an example.)

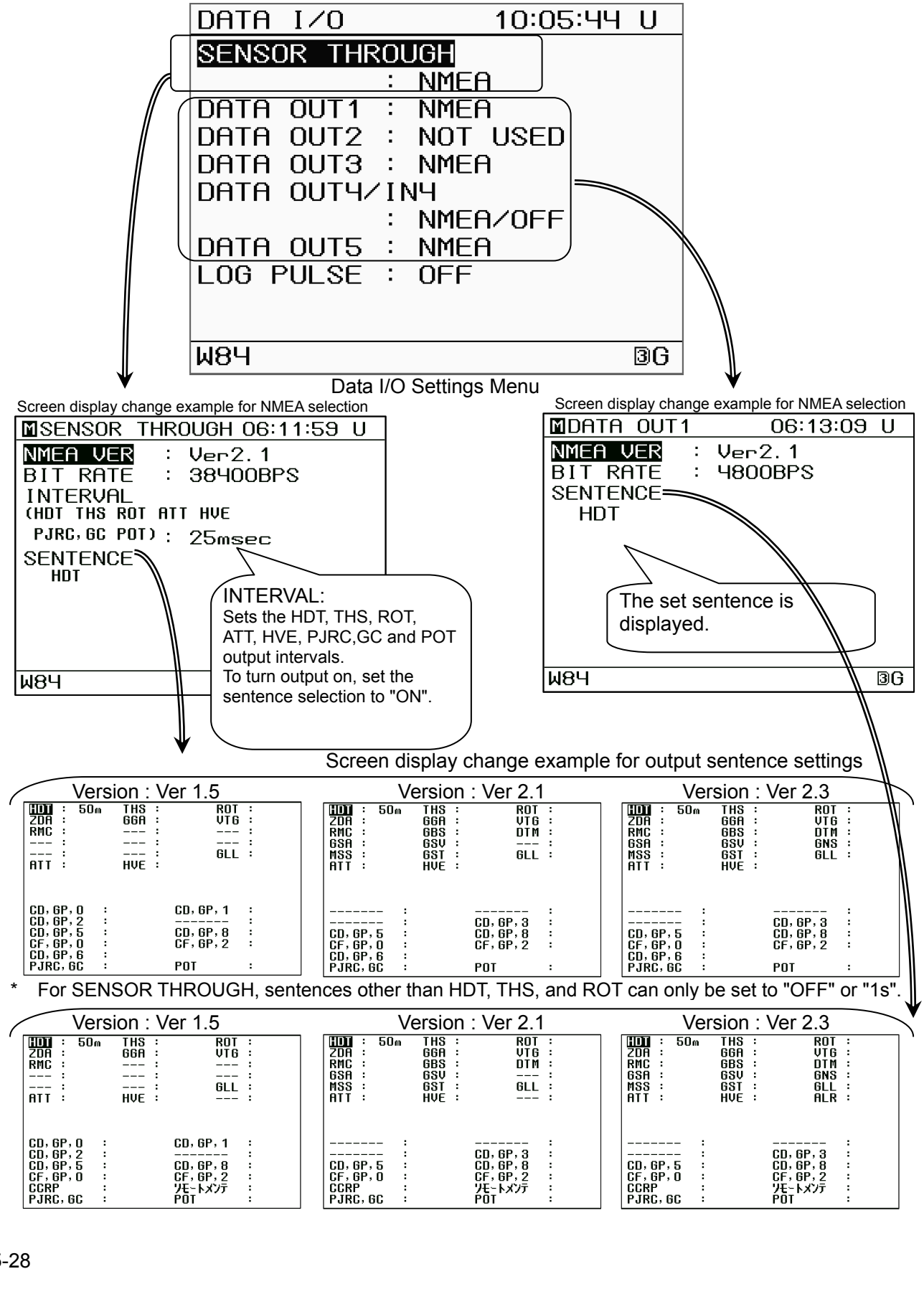
1. Set offset values in “HVE POINT OFFSET” in “SYSTEM MENU”.
2. An example of the offset values (Refer to the following figure.)
   - X-direction: 3m rightward (enter +3m)
   - Y-direction: 10m forward (enter +10m)
   - Z-direction: 3m downward (enter -3m)
3. The heaving display on the display unit will be the display at the offset position (● in the following figure.)

(The offset setting is not applicable to the heaving data delivered to external devices.)



5.3.7 Data I/O Settings (DATA I/O)

Selecting **DATA I/O** from the "5.3 Main Menu" displays the DATA I/O Settings Screen.
The DATA I/O Settings Screen can be used to confirm connection settings for external devices.



Procedure

1. Press the ▲ ▼ keys to move the cursor and select an item.
2. Press the ENT key, and select the data I/O type. (Depending on the type, the screen change flow may vary)
3. Select the NMEA VER, BIT RATE, and SENTENCE.

The following submenus are available.

- SENSOR THROUGH: Outputs through data from the sensor. Connects to equipment requiring high speed output (radar, etc.). (Select from NMEA, NSK, AD-10 or IEC)
- DATA OUT1: Select from NMEA, NSK, AD-10 or IEC.
- DATA OUT3: Select NMEA, NSK or IEC.
- DATA OUT4/IN4: Select from NMEA, NSK, BEACON, IEC or 4341.
  CCRP data can be entered for CCRP. (CCRP sentence)
  Current data can be entered for CURRENT. (CUR and VBW sentences)
  Both input and output settings can be set by this port (DATA OUT4/IN4).
  Select from the following:
  Even if the input setting is "OFF", the ACK, ACN and HBT sentence can be received.

Selection	Output (DATA IN/OUT2 9,10 pins of connector)	Input (DATA IN/OUT2 1,2 pins of connector)	Purpose
NMEA/OFF	NMEA	Off	For outputting NMEA
NSK/OFF	NSK	Off	For outputting NSK
BEACON/OFF	Dedicated setting for beacon (4800bps)	Off	For connecting beacon receiver
IEC/OFF	IEC	Off	For outputting IEC
4341/OFF	Dedicated setting for JLR-4341(4800bps)	Off	For connecting JLR-4341
NMEA/CURRENT	NMEA (4800bps)	Dedicated setting for tidal current meter (4800bps)	For inputting current meter and outputting NMEA simultaneously
BEACON/CURRENT	Dedicated setting for beacon (4800bps)	Dedicated setting for tidal current meter (4800bps)	For connecting beacon receiver and inputting current meter simultaneously
IEC/CURRENT	NMEA (4800bps)	Dedicated setting for tidal current meter (4800bps)	For inputting current meter and outputting IEC simultaneously
4341/CURRENT	Dedicated setting for JLR-4341(4800bps)	Dedicated setting for tidal current meter (4800bps)	For connecting JLR-4341 and inputting current meter simultaneously.
NMEA/CCRP	NMEA	Dedicated setting for CCRP	For inputting CCRP and outputting NMEA simultaneously
BEACON/CCRP	Dedicated setting for beacon (4800bps)	Dedicated setting for CCRP (4800bps)	For connecting beacon receiver and inputting CCRP simultaneously.
IEC/CCRP	NMEA	Dedicated setting for CCRP	For inputting CCRP and outputting IEC simultaneously
4341/CCRP	Dedicated setting for JLR-4341(4800bps)	Dedicated setting for CCRP (4800bps)	For connecting JLR-4341 and inputting CCRP simultaneously.

- DATA OUT5: Select NMEA, NSK or IEC.
- LOG PULSE: Select from OFF, 200p/NM, or 400p/NM.

Memo

- In Maintenance Mode settings can be changed press and hold both MENU and ✱ for 3 seconds or more to go to the mode.
- HDT and THS sentences cannot both be set at the same time for sensor throughput.
- Cannot be set for some bit rates (high rates) and output intervals (short intervals). If this is the case, decrease the bit rate, increase the output interval, and decrease the output sentences.
- Refer to "2.3 Cable Connection" for details regarding connecting external devices.

Attention

・Starting-up the display unit (turning the power on) while the sensor unit is unconnected initializes HVE sentence (heaving sentence) settings. (The output cycle setting returns to OFF.)

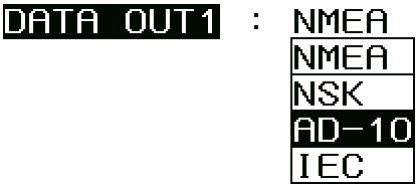
● Output of AD-10 format

AD-10 receiver (FR-14**, etc.) can be connected.
AD-10 format can be output from the following two ports (refer to p2-18,19 for detail).
INTERVAL (cycle) can be selected from 25msec and 200msec.

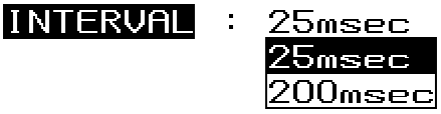
・DATA IN / OUT 1 connector: 3 thru 6 pin (Select “AD-10” in SENSOR THROUGH.)
・DATA IN / OUT 2 connector: 3 thru 6 pin (Select “AD-10” in DATA OUT1.)

Setting method (same as in SENSOR THROUGH)

1. Set “AD-10” for the data format.



2. Select 25msec or 200sec in INTERVAL.
   For connecting to RADAR, select 25msec (Default is 25msec.)



Connecting method

DATA IN/OUT1 Connector or DATA IN/OUT2 Connector				Radar	Note
3 (Orange)	SENSOR THROUGH or DATA OUT1 (TXD1,SCK1)※1	SD-A	→	DATA-H	Select AD-10 in the connection port setting (SENSOR THROUGH or DATA OUT1) and select 25msec or 200msec for the output interval (Refer to the above.)
4 (Yellow)		SD-B	→	DATA-C	
5 (Green)		SC-A	→	SHIFT-H(CLK-H)	
6 (Blue)		SC-B	→	SHIFT-C(CLK-C)	

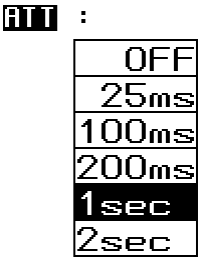
*1 AD-10 can output through the following 2 ports: Sensor Through port and Data OUT1 port (TXD1).
*2 Use CFQ-5374 (3m) or CFQ5374-15 (15m) for the cable (Refer to 2-26 and 2-27.)

● Adjust(Adj) function for ATT and HVE sentence
ATT and HVE sentence have adjust function.
An Adj value is determined after choosing an output cycle. The more an adj value is large, the more an output is delayed.
(Usually default settings don't need to change.)

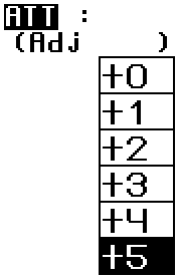
Setting method for ATT
1. Choose Output cycle

In the case of sensor through

In the case of not sensor through



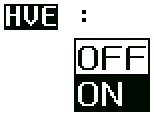
2. And, Choose adjust Value between +0 and +10. (Default is +5)



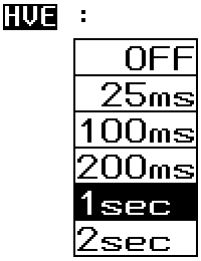
Setting method for HVE

1. Choose Output cycle

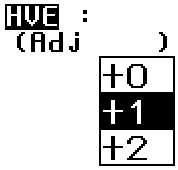
In the case of sensor through



In the case of not sensor through

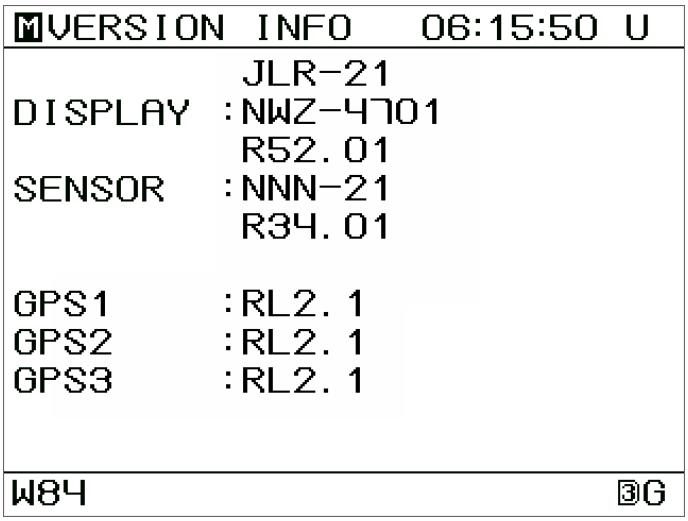


2. And, Choose adjust Value between +0 and +2. (Default is +1)



5.3.8 Checking the Version

Selecting **VERSION INFO** from the "5.3 Main Menu" displays the Version Confirmation Screen.



Version Confirmation Menu

The following items are displayed.

- JLR-21/31: Displays model.
- DISPLAY: Displays display unit model and version.
- SENSOR: Displays sensor model and version.
- GPS1: Displays GPS receiver 1's version.
- GPS2: Displays GPS receiver 2's version.
- GPS3: Displays GPS receiver 3's version.

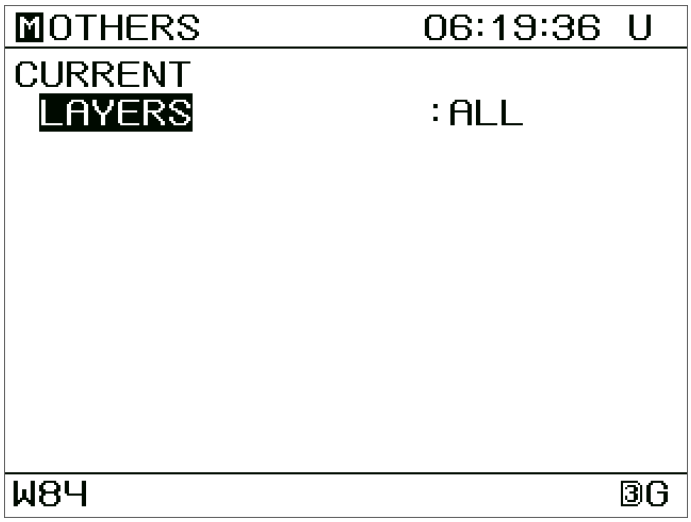
Memo

- Press CLR to return to the Main Menu.

5.3.9 Others Settings

When the current meter is connected, the layer to be displayed can be selected by the following method:

Selecting **OTHERS** from the "5.3 Main Menu" displays the Others Settings Screen.



Others Settings Menu

Procedure

1. Press the ENT key.
2. Press the ▲ ▼ keys to move the cursor and select an item.
3. Press the ENT key to display the menu for the selected item.

The following items are displayed.

CURRENT

- LAYER: Select the layer number for displayed.
- DATA NO.: Select the data set number of received data.

Memo

- Press CLR to return to the Main Menu.
- In Maintenance Mode settings can be changed press and hold both MENU and ✱ for 3 seconds or more to go to the mode.

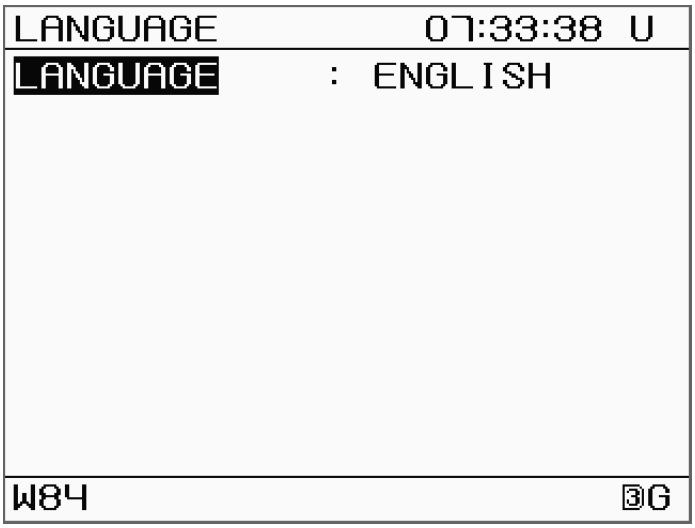
● For connection of a current meter

When a current meter is connected, STW (speed through water), CURRENT (current set and speed of tidal stream), and DEPTH (depth of tidal stream) can be displayed.
(For the screen, refer to 4.1.5.)

1. Connect the current data to 1 and 2 pins of DATA IN/OUT2 connector. (Format is VBW and CUR sentence, 4800bps. There is no setting item for inverval. Outputting in every 1 - 1.5 seconds from the output side is favourable.)
2. Select NMEA/CURRENT or BEACON/CURRENT in the DATA OUT4/IN4 menu in the DATA I/O screen. (IN4 port will be set for CURRENT input.) By this procedure, the data of VBW, CUR sentence, and 4800bps can be received.
3. Select the LAYER and DATA NO.

5.3.10 Language Settings (LANGUAGE)

Selecting **LANGUAGE** from the "5.3 Main Menu" displays the Language Settings screen.



Language Settings Menu

Procedure

1. Press the ENT key.
2. Press the ▲ ▼ keys to move the cursor and select the language.
3. Press the ENT key to confirm the language selection.

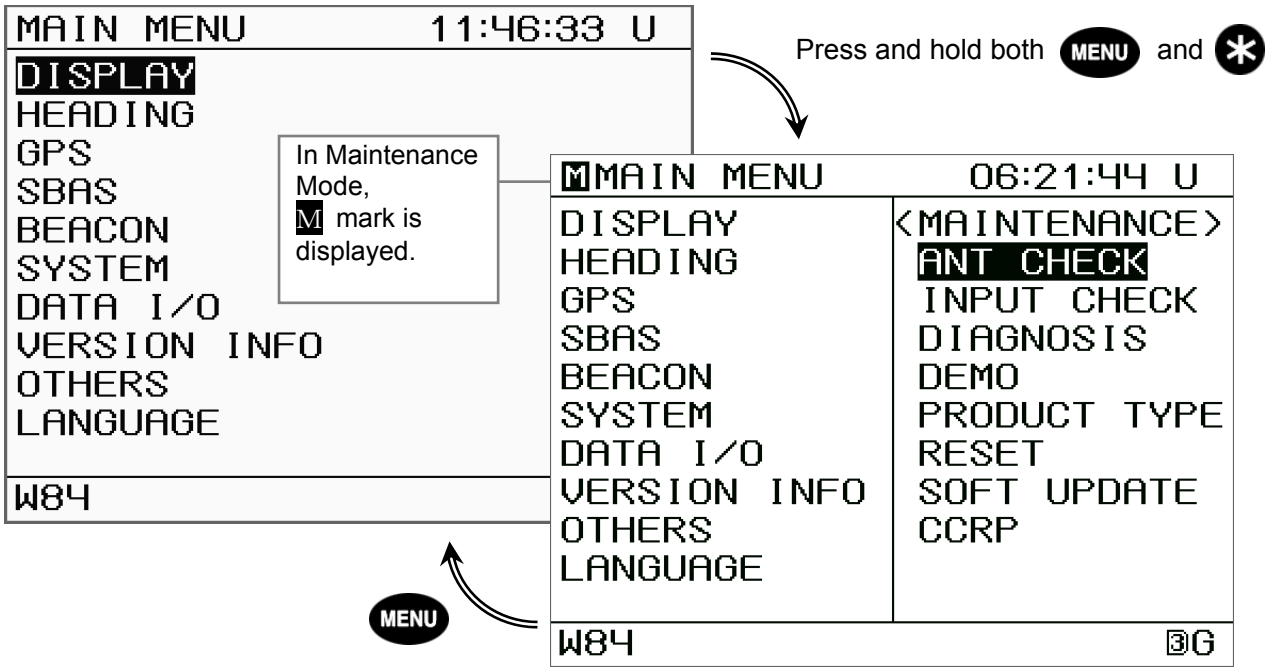
Memo

- Press CLR to return to the Main Menu.
- In Maintenance Mode settings can be changed press and hold both MENU and ✱ for 3 seconds or more to go to the mode.

5.4 Maintenance Menu

Use the Main Menu to confirm or change function settings.

Press and hold both MENU and ✱ for 3 seconds or more to display the Maintenance Main Menu.



Maintenance Main Menu

Procedure

1. While holding down the MENU key, press and hold the ✱ key for 3 seconds or more.
2. Use the ▲▼◀▶ keys to select an item, and press the ENT key.

Memo

The Maintenance Menu disappears if one of the following is done. (be canceled)

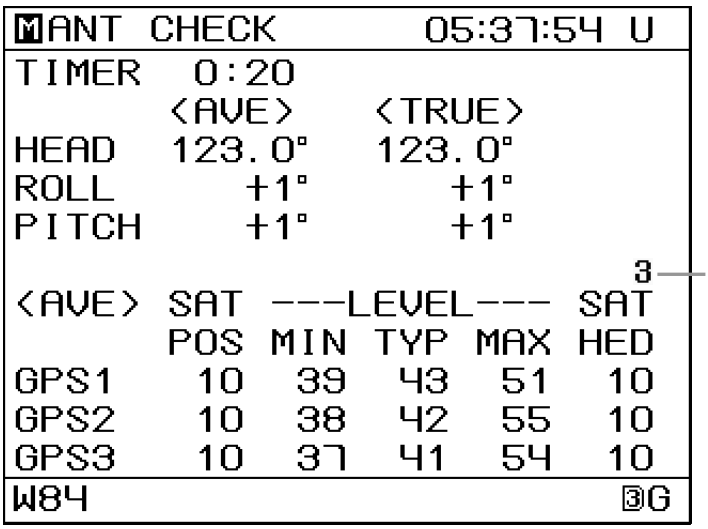
- The MENU key is pressed.
- The power is turned off.
- A screen other than the Settings menu is displayed for 3 min or more.

The following submenus are available.

- ANT CHECK: (Refer to 5.4.1) Displays sensor information.
- INPUT CHECK: (Refer to 5.4.2) Displays input information.
- DIAGNOSIS: (Refer to 5.4.3) Performs self-diagnosis on equipment.
- DEMO: (Refer to 5.4.4) Initiates equipment demonstration.
- PRODUCT TYPE: (Refer to 5.4.5) Sets unit as subdisplay, confirm the equipment number.
- RESET: (Refer to 5.4.6) Restores all settings to their factory defaults.
- SOFT UPDATE: (Refer to 5.4.7) Updates software.
- CCRP: (Refer to 5.4.8) Allows CCRP settings.

5.4.1 Antenna Check

Selecting **ANT CHECK** from the "5.4 Maintenance Menu" displays information about the sensor.
This allows confirmation of the sensor status, and can be used to determine if the equipment is faulty.



Antenna Check Screen

The following items are displayed.

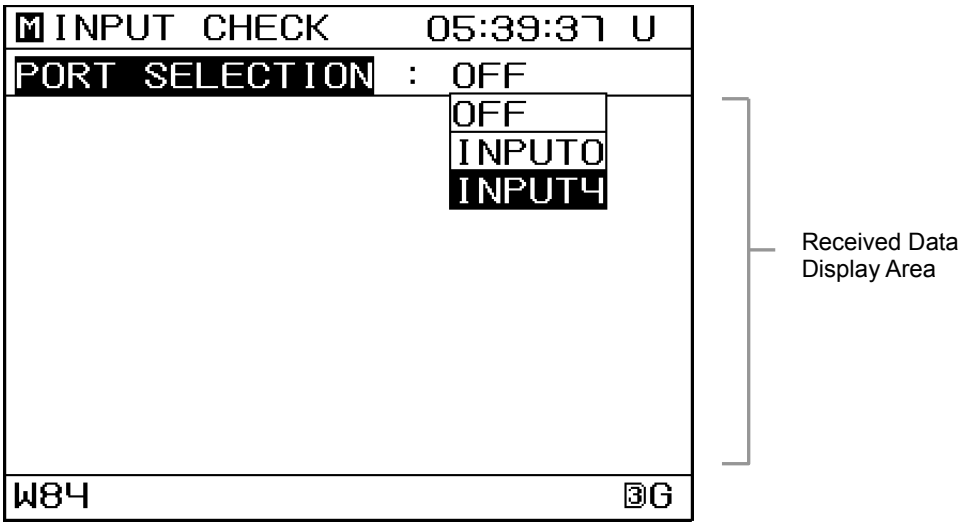
- TIMER: Time is counted from when this screen is displayed.
- HEAD: Average bow heading (AVE) and current measured heading value (TRUE) are displayed.
  Check that the displayed heading is correct.
- ROLL: Average roll (AVE) and measured roll value (TRUE) are displayed.
  Confirm the indication matches to the ship's rolling.
- PITCH: Average pitch (AVE) and measured pitch value (TRUE) are displayed.
  Confirm the indication matches to the ship's rolling.
- GPS1 - 3: Reception status of each GPS receiver is displayed.
  SAT POS: Average number of satellites used for position measurement.
  LEVEL: MIN (minimum), TYP (average), and MAX (maximum) signal levels
  SAT HED: Average number of satellites used for bearing measurement.
  Confirm the values of GPS1 thru GPS3 are almost the same. Also confirm the level (TYP) is around 40 to 50.
- Antennas in use:
  3 (If it is not "3", the antenna installation position may not be suitable. Relocate the sensor to the place with clear view.)

Memo

- Press CLR to return to the Main Menu.

5.4.2 Input Check

Selecting **INPUT CHECK** from the "5.4 Maintenance Menu" displays input data information.



Input Check Screen

Procedure

1. Press ENT on the PORT SELECTION item.
2. Select the port you wish to confirm with the ▲ ▼ keys, and press ENT to confirm.
3. Press the ENT key to start data display. (Data is displayed in the received data display area)

Pressing the CLR key when data is displayed stops the display.

Pressing the ENT key again restarts the data display.

The following items are displayed.

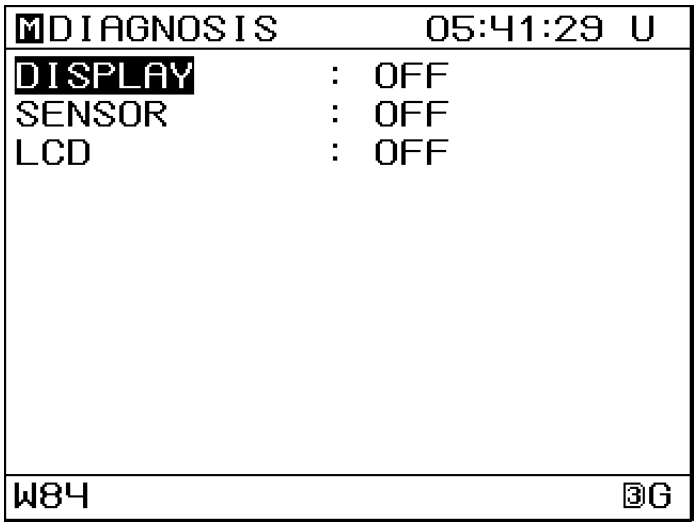
- INPUT0: Displays data from the sensor.
  However, the data is not readable, because it uses a specialized data format.
- INPUT4: Displays data from DATA IN4.
  Perform this only after making sure that the input and output bit rates are equal.
  (Refer to "5.3.7Data I/O Settings (DATA I/O)" for details on setting the bit rate)

Memo

- Press CLR to return to the Main Menu.

5.4.3 Self-Diagnosis (DIAGNOSIS)

Selecting **DIAGNOSIS** displays the Self-Diagnosis Screen.
This screen can be used to perform self-diagnosis by the equipment.



Self-Diagnosis Menu Screen

Procedure

1. Use the ▲ ▼ keys to select an item for self-diagnosis.
2. Press the ENT key, select START, and press the ENT key again to start self-diagnosis.

The following submenus are available.

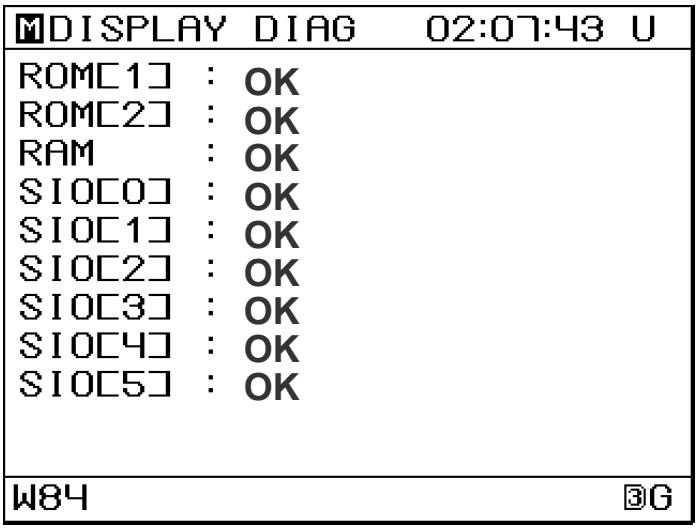
- DISPLAY: Performs self-diagnosis of display unit. (Refer to a)
- SENSOR: Performs self-diagnosis of sensor. (Refer to b)
- LCD: Performs self-diagnosis of LCD display. (Refer to c)

Memo

- Press CLR to return to the Main Menu.

a. Display Unit Self-Diagnosis (DISPLAY UNIT)

Once each item in the self-diagnosis is completed, the results for that item is displayed.



Display Unit Self-Diagnosis Screen

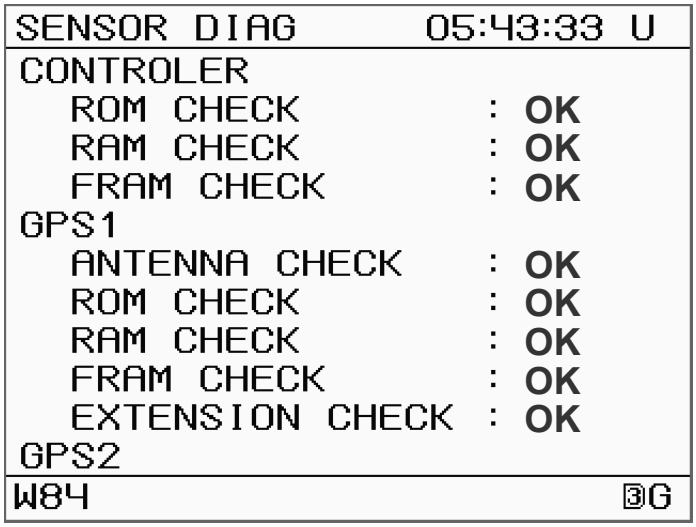
Attention

If any problems are detected, please contact JRC or an affiliate.

Self-Diagnosis Items

Self-Diagnosis Item	Self-Diagnosis Contents
ROM	Checks program memory and data memory operation. If errors are detected, a [1] indicates a program memory problem, and a [2] indicates a data memory error.
RAM	Checks temporary storage memory.
SIO	Checks serial interface operation. The number in brackets indicates the port channel number. If errors are detected, the displayed port channel has experienced an error.
Buzzer test	Checks if the buzzer sounds.

b. Sensor Self-Diagnosis (SENSOR)



Sensor Self-Diagnosis Screen

Attention

If any problems are detected, please contact JRC or an affiliate.

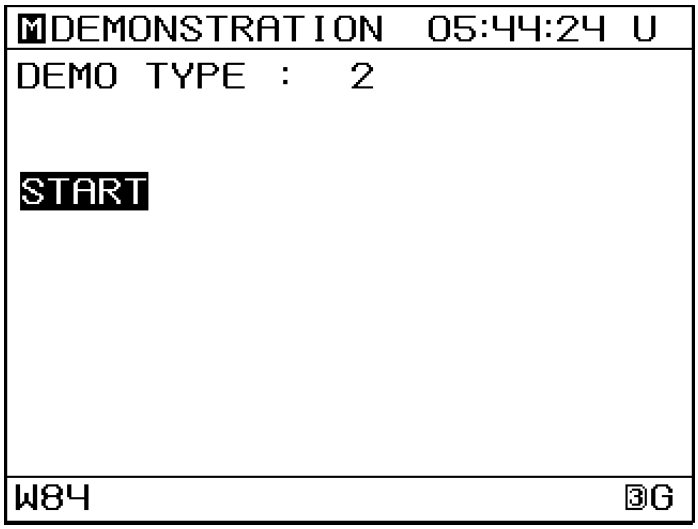
c. Screen Self-Diagnosis (LCD)

This self-diagnosis repeatedly alternates the screen from black → white → black → ... Please check if there are any dead pixels.

Press the CLR key to stop the test.

5.4.4 Demo

Selecting **DEMO** from the "5.4 Maintenance Menu" displays the settings screen.



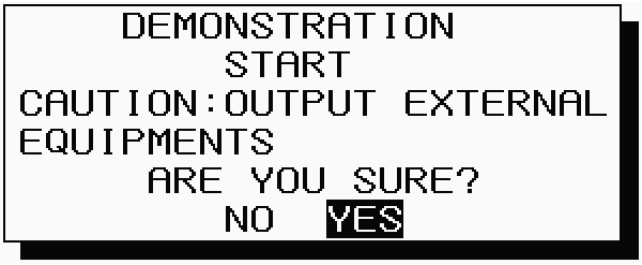
Demo Type
1: Right turn
2: Left turn
3: Manual
4: Meandering

5 and over are disabled

Demo Settings Menu

Procedure

1. Press the ENT key, and use the ▲ ▼ keys to enter a value.
2. Pressing the ENT key displays **START**. Press the ENT key again.
3. A message is displayed. Select **YES**, and press the ENT key.



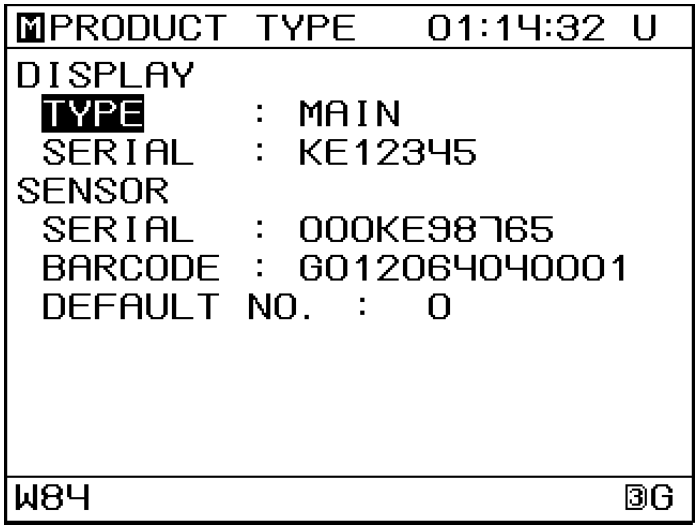
Note that if an external device is connected, demo data is sent to the external device.

Memo

- Press CLR to return to the Main Menu.
- A demonstration is performed by the sensor, and the data received from the sensor is displayed, so the demo cannot be run unless the sensor is connected.
- During the demo, S blinks at the bottom of whichever screen is displayed.
- To stop the demo:
  a) Turning the unit off restores the unit to normal operation when the power is turned back on.
  b) Select STOP on the demo settings screen.

5.4.5 Product Type Settings

Selecting **PRODUCT TYPE** from the "5.4 Maintenance Menu" displays the settings screen.



Product Type Settings Menu

The following submenus are available.

DISPLAY

- TYPE: If any additional display units are connected, set any units besides the primary unit to "SUB".
  When a display unit is set to "SUB", an SUB symbol appears in the upper right of the screen.
- SERIAL : The equipment number can be entered. (This value is already entered when the unit is manufactured)

SENSOR

- SERIAL: Displays the equipment number. (Can not enter)
- BARCODE: Displays the internal circuit board number. (Can not enter)
- DEFAULT NO.: Normally, Displays at “0”.

Memo

- Press CLR to return to the Main Menu.
- The SERIAL is not erased even if a master reset is performed.

Attention

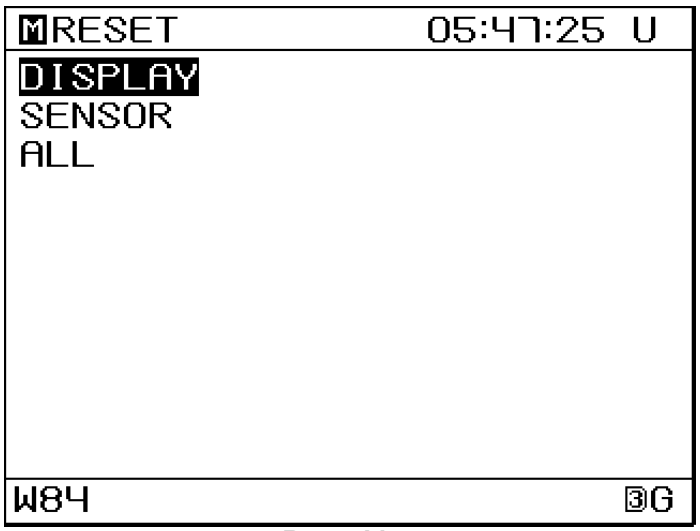
- If the display unit is set to "SUB", sensor settings cannot be performed by that display unit.
- Do not change the SERIAL.
  (If the serial number is accidentally erased, enter the serial number that appears on the plate on the back of the display unit)

5.4.6 Master Reset (RESET)

Selecting **RESET** from the "5.4 Maintenance Menu" displays the reset selection screen.

Make notes of setting values before performing the master reset. (Write to the last pages)

DISPLAY: All internal settings on the display unit are erased.
SENSOR: All internal settings on the sensor are erased.
ALL: All internal settings on the display unit and sensor are erased.



Reset Menu

Procedure

1. Use the ▲ ▼ keys to select the item to be reset, and press the ENT key.
2. A confirmation message is displayed. Select **YES**, and press the ENT key to perform the reset.

Memo

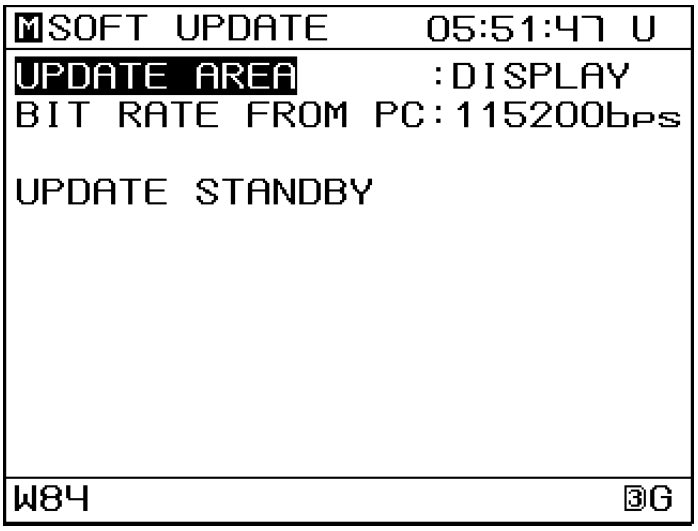
- Press CLR to return to the Main Menu.

Attention

- Performing a reset erases all display unit and/or sensor settings.
  (All values returns to factory defaults)

5.4.7 Software Update (SOFT UPDATE)

Selecting **SOFT UPDATE** from the "5.4 Maintenance Menu" displays the software update selection screen.



Software Update Menu

Procedure

1. Press the ENT key, use the ▲▼ keys to select the area to be written to, and press the ENT key to confirm.
2. Select the transmission speed (bit rate). (Selection is automatic for sensor)
3. Press the ▲▼ keys to move the cursor to **UPDATE STANDBY**, and press the ENT key.

   Displayed when preparation is complete:

   ```
   STANDBY OK
   CONTROL A PC, TRANSMIT SOFTWARE!!
   CAN USE ONLY “DIM” + “PWR” KEY
   ```

   * Once the preparation completed message is displayed, you cannot return to the standard screen. If you do not intend to update the software, reboot the system.

4. Connect a computer, and transfer the program.

The following submenus are available.

- UPDATE AREA: Select the area for the update (DISPLAY/SENSOR).
- BIT RATE FROM PC: Select the update transfer speed.

Memo

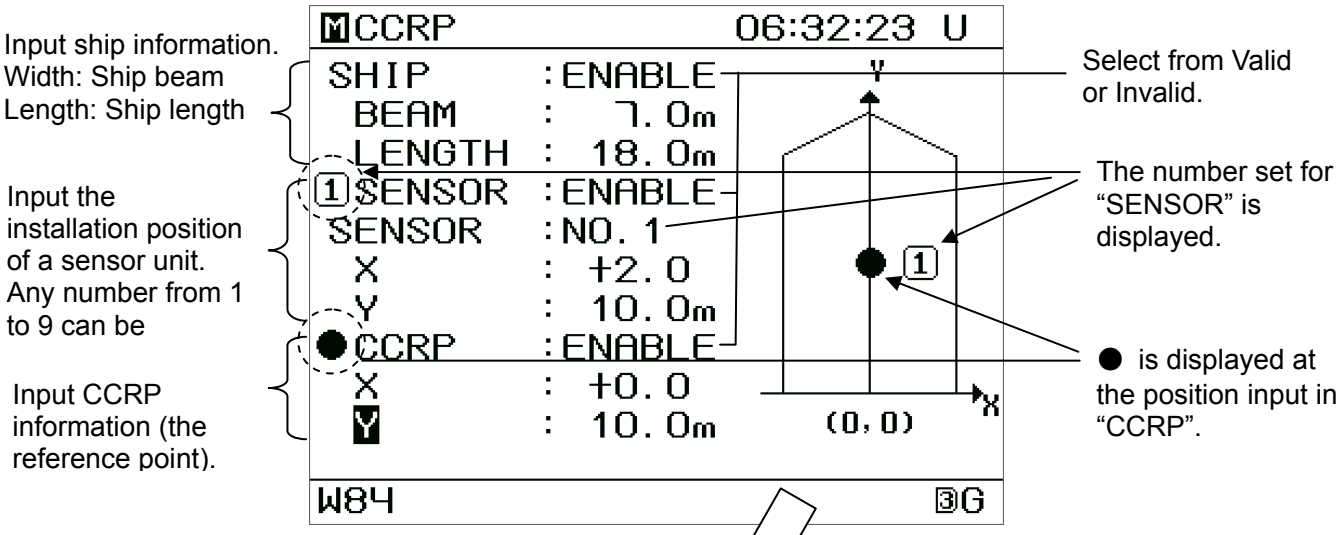
- Press CLR to return to the Main Menu.
- Please contact JRC or an affiliate regarding software updates.

5.4.8 CCRP Settings

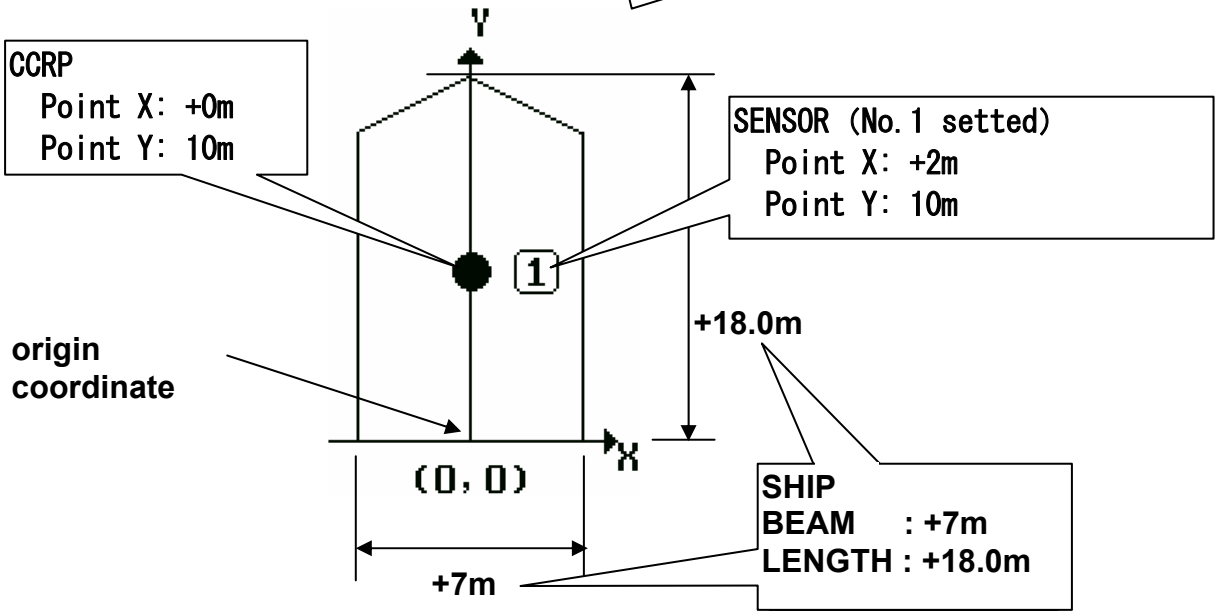
Selecting CCRP in “5.4 Maintenance Main Menu” displays a CCRP setting screen.
CCRP stands for Consistent Common Reference Point, and is a reference point for defining the positional relationship of equipment installed outdoors using a common coordinate system.
(Only CCRP settings are allowed in this device, and a measurement conversion process to CCRP is not available.)

[CCRP Settings]

- “Ship Information”, “Sensor Unit Installation Position”, and “CCRP Information” are set.
- “Sensor Unit Installation Position” and “CCRP Information” are set in the coordinate system having the center of stern as the origin (The unit of measure is m.)
- CCRP settings are not allowed when the display is set to the Sub Display setting (secondary display setting); set CCRP in the main display unit (primary display unit.)



Example for setting

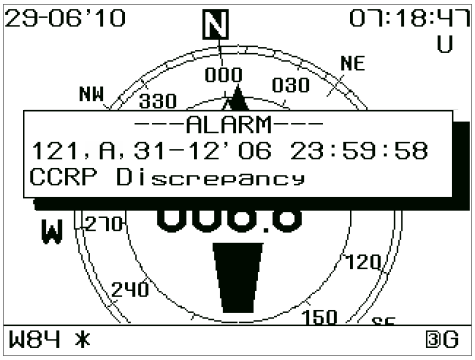


[CCRP Output]

The configured CCRP information can be output to external devices. When doing so, select “CCRP” in the Output sentence by referring to “5.3.7 Data I/O Settings (DATA I/O)”.
In order to utilize CCRP data, a function compatible with CCRP transmission/reception must be connected.

[CCRP Input]

CCRP information (including ship information) can be received from external devices.
When doing so, set DATA OUT4/IN4 to one of NMEA/CCRP, beacon/CCRP, IEC/CCRP, and 4341/CCRP (Refer to “5.3.7 Data I/O Settings (DATA I/O)”), and connect the signal to DATA IN4 of the Data IN/OUT2 connector (Refer to P2-27.)
When the data configured in this device is different from the data received from an external device, the following warning is displayed.
In this case, reset in this device.
* will be displayed in the status bar until the completion of the reset.
Press the CLR key to return to the Main menu.



The following submenus are available.

- SHIP: Select from Valid or Invalid for Ship information.(set invalid if don’t use information)
- BEAM : Ship’s BEAM(0~70.0m)
- LENGTH: Ship’s LENGTH(0~700.0m)
- SENSOR: Select from Valid or Invalid for SENSOR(set invalid if don’t use information)
- SNESOR: Select SENSOR number (No.1~9)
- X Set point X for the installation position of a sensor unit. (unit is m)
- Y Set point Y for the installation position of a sensor unit. (unit is m)
- CCRP Select from Valid or Invalid for CCRP (set invalid if don’t use information)
- X Set point X for CCRP (unit is m)
- Y Set point Y for CCRP (unit is m)

Memo

- Press CLR to return to the Main Menu.
- If the installation position of the sensor unit is off the ship, the sensor unit installation position (SENSOR) will be “Invalid”.
  In this case, change the position setting onto the ship and reset the SENSOR to “Valid”.
  The same applies to CCRP.

Section 6 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

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.

6.1 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 detect problems quickly.

6.2 Alerts

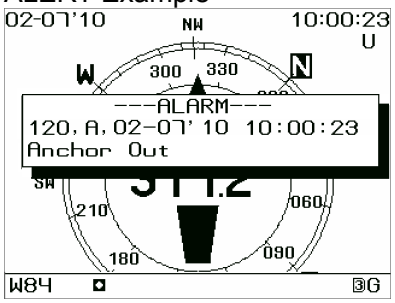
Refer to 5.2.8 and check if any alert is given or not. If it is, check the details referring to the list shown below.
Regarding the troubleshooting, Refer to "6.3 Troubleshooting".

Alert List

Message Number	ALF Number	Message Contents	Alert Causes
001	10903	GPS1 Error	GPS Core 1 Error (Sensor)
002	10904	GPS2 Error	GPS Core 2 Error (Sensor)
003	10905	GPS3 Error	GPS Core 3 Error (Sensor)
005	10906	X Gyro Error	X Axis Gyroscope Error (Sensor)
006	10907	Y Gyro Error	Y Axis Gyroscope Error (Sensor)
007	10908	Z Gyro Error	Z Axis Gyroscope Error (Sensor)
008	10909	G Sensor Error	Tiltmeter Error (Sensor)
009	10910	Temp Sensor Error	Temperature Sensor Error (Sensor)
010	10911	Mag Sensor Error	Magnetic Sensor Error (Sensor)
011	10912	FRAM Error	Memory Error (Sensor)
012	10913	SRAM Error	Memory Error (Sensor)
013	10914	ROM Error	Memory Error (Sensor)
014-025,28	10915	Task Error	Sensor Internal Error
29	10916	Port1 Output Data Error	Port1 heading error (Sensor)
30	10917	Port2 Output Data Error	Port2 heading error (Sensor)
31-33, 35-47,52	10918	Inner Error	Sensor Internal Error
48	10919	GPS1 No Program	GPS1 No Program(Sensor)
49	10920	GPS2 No Program	GPS2 No Program(Sensor)
50	10921	GPS3 No Program	GPS3 No Program(Sensor)
053-056	10922	Excessive Vibration	Excessive Vibration

Message Number	ALF Number	Message Contents	Alert Causes
101	10923	DIAG Error(Display)	One or more errors detected during display unit self-diagnosis
102	10924	Flash ROM Access Error	Flash ROM Deletion, Write Error (ROM[1][2])
103	10925	RAM Access Error	RAM Read, Write Error
104	10926	SIO(0) Error	SIO[0] Error
105	10927	SIO(1) Error	SIO[1] Error
106	10928	SIO(2) Error	SIO[2] Error
107	10929	SIO(3) Error	SIO[3] Error
108	10930	SIO(4) Error	SIO[4] Error
109	10931	SIO(5) Error	SIO[5] Error
110	10902	No Heading	Bearing Calculation Error, Unable to Obtain Data
111	10901	No Fix	Position Calculation Error, Unable to Obtain Data
112	10932	DIAG Error(Sensor)	Sensor Self-Diagnosis Error
113	10933	Sensor Interface Error	Sensor Unconfigurable (Configuration Not Possible)
114	10934	No Sensor Data	Sensor Periodic Input Not Possible (Position Measurement Data Unobtainable)
115	10935	No Roll	Roll Calculation Error, Unable to Obtain Data
116	10936	No Pitch	Pitch Calculation Error, Unable to Obtain Data
117	10937	No ROT	ROT Calculation Error, Unable to Obtain Data
118	10938	Sensor No Program	Sensor No Program
120	10939	Anchor Out	Exceeding the anchor watch setting range.
121	10940	CCRP Discrepancy	CCRP Discrepancy
122	10941	HDOP	HDOP Value has been exceeded setting level
131	10942	SIO(1) HBT Error	SIO(1) HBT Error
134	10943	SIO(4) HBT Error	SIO(4) HBT Error

ALERT Example



120 : Message Number
A : Threshold exceeded
02 - 07'10 : 2010/07/02
10 : 00 : 23 : 10h 00min 23sec
Anchor Out : Exceeding the anchor watch setting

6.3 Troubleshooting

6.3.1 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.

The following is reference information concerning identification of problems.

Problem Behavior	Possible Causes	Troubleshooting Measures
The power does not turn on when the power switch is pressed.	Power is not being supplied by the ship junction box.	Check the cabling from the junction box.
	Power is not being supplied by the power supply equipment (option).	Check the power supply unit cabling.
	The fuse connected to the power cable has blown.	If there are no problems in the cabling, replace the fuse.
	The power supply equipment (option) fuse has blown.	If there are no problems in the cabling, replace the fuse.
	The display unit switch is broken.	Consult with JRC or an affiliate.
The LCD display does not display anything.	The LCD display is broken.	Consult with JRC or an affiliate.
The display does not light up.		
The buzzer sound. Is not generated	The buzzer is broken.	Consult with JRC or an affiliate.
The click does not sound.	The key press sound is turned off.	Refer to 5.3.1.3 for setting the key press sound.
There is no reception. (from sensor)	The sensor connection cable is cut.	Check the connection cable.
	The sensor is broken.	Consult with JRC or an affiliate.
There is no reception. (from external devices)	The polarity of the serial cable is incorrect.	Check the polarity of the cable.
	The interface does not match.	Check the interface.
	An unsupported sentence has been entered.	Check the entered commands and version.
There is no transmission. (to external devices)	Output settings have not been configured.	Refer to 5.3.7 for setting the key press sound.
	The configured channel is incorrect.	Refer to 5.3.7 for setting the key press sound.
	The DISP-DPU or connector board is broken.	Consult with JRC or an affiliate.

6.3.2 Repair Unit

Repair units and their models are shown below.

	Name	Model	Notes
1	DISP-DPU	CMJ-501C1	For NWZ-4701 Display Unit
2	LCD Unit	CCN-392A	For NWZ-4701 Display Unit
3	Keyboard Unit	CMD-953A	For NWZ-4701 Display Unit
4	Connector Board	CMH-2192C	For NWZ-4701 Display Unit
5	Processing Unit	CMJ-497-U	For NNN-21/31 Sensor Unit
6	Antenna Unit	CAY-62	For NNN-21/31 Sensor Unit

Fuse

	Name	Model	Notes
1	2A Fuse	MF60NR 250V 2	For NWZ-4701 Display Unit

6.3.3 Regular Replacement Parts

Parts which should be regularly replaced are shown below.
Contact JRC or an affiliate to order.

	Name	Model	Life	Notes
1	LCD Unit (Inside display unit)	CCN-392A	40000 hours	Approximately 5 years of continuous use
2	Lithium Battery (Inside sensor)	BR-2/3AGE2P	Approximately 10 years	Reception is possible even without battery power. (It will takes 30 to 60 seconds longer to fix the position)

Section 7 After-Sales Service

7.1 Warranty

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

7.2 Repair Parts Stocking Period

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

7.3 When Requesting Service

When you think the equipment is not operating properly, please read "6.3 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

7.4 Recommended Checks and Inspections

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".

Section 8 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.

8.1 Disposal of the Equipment

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

8.2 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.

Section 9 Specifications

9.1 Display Unit (NWZ-4701)

9.1.1 Panel

(1)	Display Unit:	5.7 inch FSTN LCD, 320 x 240 dots
(2)	Operating Keys:	12 keys
(3)	Backlight (LED):	LCD and key lighting
(4)	Dimmer Levels:	Bright, medium, dark, off

9.1.2 Power Supply

(1)	Power Supply Voltage:	12/24 VDC (+30%, -10%)
(2)	Power Consumption:	Maximum 12W (including sensor) Maximum 6W (except sensor)

9.1.3 Environment

(1)	Operating Temperature:	-15ºC to +55ºC
(2)	Storage Temperature:	-25ºC to +70ºC
(3)	Waterproofing:	correspond to IP44
(4)	Vibration:	IEC60945 ed.4 conformant
(5)	EMC:	IEC60945 ed.4 conformant
(6)	Compass Safe Distance	1.35m(STD)、0.75m(STEER)

9.1.4 Dimensions and Mass

(1)	Dimensions:	267.4mm (W) X 162mm (H) X 85mm (D) Except projections
(2)	Mass:	Approximately 2.3 kg

9.1.5 External Interfaces

◇Serial Transmission

Name	Specifications	I/O	Format	Notes
Sensor Through	RS422	Output	NMEA / NSK / AD-10 / IEC	
DATA OUT1	RS422	Output	NMEA / NSK / AD-10 / IEC	
	RS232	Input /Output		Dedicated port for updating. Not usually use.
DATA OUT3	RS422	Output	NMEA / NSK / IEC	
DATA OUT4	RS422	Output	NMEA / NSK / BEACON/ IEC/4341	
	RS422	Input	CURRENT/CCRP	CUR, VBW sentence
DATA OUT5	RS422	Output	NMEA / NSK / IEC	

(1) NMEA

Specification:	NMEA0183
Version:	Ver. 1.5 / 2.1 / 2.3
Transmission Speed:	Based on setting (4800 / 9600 / 19200 / 38400 / 57600 bps)
Data bit:	8 bit / parity: none / stop bit: 1 bit
Output Interval:	Based on setting (20ms / 25ms / 50ms / 100ms / 200ms / 500ms / 1s / 2s / 3s / 4s / 5s / 6s / 7s / 8s / 9s)
Sentence:	HDT / THS / ROT / ZDA / GGA / VTG / RMC / GBS / DTM / GSA / GSV / GNS / MSS / GST / GLL/ ALR/ ATT/ HVE

1 : The sensor through selects either HDT or THS sentence, but not both.
2 : Selectable sentences depends on the version.
3 : Some combinations of output sentences, bit rates, and output intervals may not be possible.
4 : ATT and HVE sentences can be set from output cycles of 25ms/100ms/200ms/1s/2s only. The both sentences are not a complete guarantee at present.

(2) IEC

Specification: IEC61162

(3) JRC Sentence(Only for service):

PJRCD,GP,0 / PJRCD,GP,1 / PJRCD,GP,2 / PJRCD,GP,3/ PJRCD,GP,5 / PJRCD,GP,8 / PJRCF,GP,0 / PJRCF,GP,2 / PJRCD,GP,6 / CCRP / REMOTE MAINTENANCE

(4) NSK

Fixed

(5) AD-10

Period: 25ms / 200ms

◇Contact Signal

Name	Specifications	Notes
Contact Output 0	External Buzzer 1	For special purpose usage
Contact Output 1	Log Pulse	Off, 200p/NM , 400p/NM
Contact Output 2	External Buzzer 2	For general use
Contact Input	External Buzzer 2 Release	

9.2 Sensor Unit (NNN-21/31)

9.2.1 Electrical Specifications

(1)	Reception Method:	Multichannel all in view (12CH + SBAS 1CH)
(2)	Reception Frequency:	1575.42MHz ± 1MHz (C/A code)
(3)	Positional Accuracy:	0.25º RMS (NNN-31) 0.5º RMS (NNN-21)
(4)	Tracking Rate of Turn:	45º / sec.
(5)	Tracking Acceleration:	1G
(6)	Roll/Pitch Output:	-60° ～ +60°

9.2.2 Environment

(1)	Operating Temperature:	-25ºC ～ +55ºC
(2)	Storage Temperature:	-25ºC ～ +70ºC
(3)	Waterproofing:	correspond to IP56
(4)	Vibration:	IEC60945 ed.4 conformant
(5)	EMC:	IEC60945 ed.4 conformant
(6)	Compass Safe Distance	0.30m(STD/STEER)

9.2.3 Dimensions and Mass

(1)	Dimensions:	NNN-31 ϕ1152 x 286 mm NNN-21 ϕ691 x 285 mm
(2)	Mass:	NNN-31 Approximately 10 kg NNN-21 Approximately 5.9 kg
(3)	Cable:	10 m

Appendix

Appendix 1 List of Geodetic Systems

Screen 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)
008	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)
024	024	24	Hayford 1910 (Finland)
HJO	HJO	25	Hjorsey 1955 (Iceland)
IND	IND	26	Indian (India, Napal)
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)
SPK	SPK	48	SK-42(Pulkovo 42)

Appendix 2 Data Formats

[1] Output Data
[1-1] Data Sentences

1. Sentences are not necessarily output in the order shown below. Make sure that sentences can be received in any order.
2. The length of each sentence is variable. Make sure that sentences of any length can be received.

NMEA0183 Output Sentences

HDT	-	Heading true
THS	-	True heading and status
ROT	-	Rate of turn
ZDA	-	Time and date
GGA	-	Global positioning system (GPS) fix data
VTG	-	Course over ground and ground speed
RMC	-	Recommended minimum specific GNSS data
GBS	-	GNSS satellite fault detection
GNS	-	GNSS fix data
DTM	-	Datum reference
GSA	-	GNSS DOP and active satellites
GSV	-	GNSS satellites in view
MSS	-	MSK beacon receiver signal status
GST	-	GNSS pseudorange noise statistics
GLL	-	Geographic position – latitude/longitude
ATT	-	Attitude information
HVE	-	Heaving information
ALR	-	Set Alert State

JRC Output Sentences (Only for service)

PJRCD, GP, 0	PJRCD, GP, 1	PJRCD, GP, 2	PJRCD, GP, 3
PJRCD, GP, 5	PJRCD, GP, 8	PJRCF, GP, 0	PJRCF, GP, 2
PJRCD, GP, 6			

[1-2] Protocols

NMEA Protocols(JRC Protocols, IEC Protocols)

Bit Rate:	4800, 9600, 19200, 38400, 57600bps (Select one)
Data Bits:	8 bits
Parity:	None
Start Bit:	1 bit
Stop Bit:	1 bit
Transmission Interval:	20ms, 25ms, 50ms, 100ms, 200ms, 500ms 1s, 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s (Select one)

Some combinations of bit rate, transmission interval, and number of sentences are not possible. In such a case, increase the transmission interval or configure the equipment to output the minimum required sentences only.

[1-3] Data Format

■ HDT - Heading true

$GPHDT,xxx.x,T*hh<CR><LF>
1 2

1: Heading, degrees true
2: Checksum (Version 2.1, 2.3)

■ THS - True heading and status

$GPTHS,xxx.x,x*hh<CR><LF>
1 2 3

1: Heading, degrees true
2: Mode indicator
A = Autonomous
E = Estimated (dead reckoning)
S = Simulator mode
V = Data not valid (including standby)
3: Checksum

■ ROT - Rate of turn

$GPROT,uxxxx.x,A*hh<CR><LF>
1 2 3

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

■ ZDA - Time and date

Version 1.5
$GPZDA, hhmmss,xx,xx,xxxx,xx,xx<CR><LF>
1 2 3 4 5 6
Version 2.1,2.3,IEC
$GPZDA, hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>
1 2 3 4 5 6 7

1: UTC
2: Day, 01 to 31 (UTC)
3: Month, 01 to 12 (UTC)
4: Year (UTC)
5: Local zone hours, 00h to ±13h (+: Not indicate)
6: Local zone minutes, 00 to +59 (+: Not indicate)
7: Checksum

■ GGA - Global positioning system (GPS) fix data

Version 1.5

$GPGGA,hhmmss,ddmm.mmm,a,dddmm.mmm,a,x,x,xx,uxxxx,M,uxxx,M,xx,xxxx<CR><LF>

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

Version 2.1

$GPGGA,hhmmss,ddmm.mmmm,a,dddmm.mmmm,a,x,xx,xx,uxxxx,M,uxxx,M,xx,xxxx*hh<CR><LF>

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

Version 2.3

$GPGGA,hhmmss.ss,ddmm.mmmm,a,dddmm.mmmm,a,x,xx,xx,uxxxx,M,uxxx,M,xx,xxxx*hh<CR><LF>

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

1: UTC of position (Version 1.5, 2.1)

1: UTC of position (1/100 sec) (Version 2.3)

2, 3: Latitude (deg, min), N / S

4, 5: Longitude (deg, min), E / W

6: GPS quality indicator

0 = fix not available or invalid

1 = GPS SPS mode

2 = differential GPS, SPS mode

8 = Simulator mode (Version 2.3 only)

7: Number of satellites in use, 00-12, may be different from the number in view

8: Horizontal dilution of precision, 00-20

9, 10: Antenna altitude above/below mean sea level (geoid) (m)

11, 12: Geoidal separation (m)

13: Version 1.5: Age of differential GPS data (NULL if not performing DGPS positioning)
Version 2.1:Age of differential GPS data (00 if not performing DGPS positioning)
Version 2.3:Age of differential GPS data (NULL if not performing DGPS positioning)

14: Version 1.5:Differential reference station ID, 0000-1023
Version 2.1:Differential reference station ID (0000 if not performing DGPS positioning
Version 2.3: Differential reference station ID (NULL if not performing DGPS positioning)

15: Checksum

Note For version 1.5, when the position is not fixed, outputs last measured position data.
For version 2.3, when the position is not fixed, outputs last measured position data, and time.
For version 2.3, when power is turned on, or master reset is performed, the initial time, and position settings are NULL.

■ VTG - Course over ground and ground speed

Version 1.5

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

1 2 3 4

Version 2.1

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

1 2 3 4 5 6 7

Version 2.3, IEC

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

1 2 3 4 5 6 7 8

1, 2: Course over ground, degrees true

3, 4: Speed over ground, knots

5, 6: Speed over ground, km/h

7: Checksum (Version 2.1)

7: Mode indicator (Version 2.3, IEC)

A = Autonomous mode

D = Differential mode

N = Data not valid

S = Simulator mode

P = SBAS mode (IEC only)

8: Checksum (Version 2.3, IEC)

■ RMC - Recommended minimum specific GNSS data

Version 1.5

$GPRMC, hhmmss,A,ddmm.mm,a,dddmm.mm,a,xxx.x,xxx.,xxxxxx,xx,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12

Version 2.1

$GPRMC, hhmmss,A,ddmm.mmmm,a,dddmm.mmmm,a,xxx.x,xxx.,xxxxxx,xx.,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12

Version 2.3

$GPRMC,hhmmss.ss,A,ddmm.mmmm,a,dddmm.mmmm,a,xxx.x,xxx.x,xxxxxx,xx.,a,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13

IEC

$GPRMC,hhmmss.ss,A,ddmm.mmmm,a,dddmm.mmmm,a,xxx.x,xxx.x,xxxxxx,xx.x,a,a,a *hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14

1: UTC of position fix (Version 1.5, 2.1)
1: UTC of position fix (1/100 sec) (Version 2.3,IEC)

2: Status
A = data valid
V = navigation receiver warning
3, 4: Latitude (deg, min), N / S
5, 6: Longitude (deg, min), E / W
7: Speed over ground, knots
8: Course over ground, degrees true
9: Date: dd/mm/yy
10,11: Magnetic variation value, E/W
12: Checksum (Version 1.5, 2.1)
12: Mode indicator (Version 2.3,IEC)
A = Autonomous mode
D = Differential mode
N = Data not valid
S = Simulator mode
P = SBAS mode (IEC only)
13: Checksum (Version 2.3)
13: Navigational status
S = Safe
C = Caution
U = Unsafe
V = Not Valid
14: Checksum

Note For version 1.5, when not performing positioning, outputs last measured position data.
For version 2.3,IEC when not performing positioning, outputs last measured position data,
date, and time.
For version 2.3,IEC when power is turned on, or master reset is performed, the initial time, date, and position settings are NULL.

■ GBS - GNSS satellite fault detection

Version 2.1, 2.3 only
$GPGBS,hhmmss.ss,uxxx.x,uxxx.x,uxxx.x,xx,x.xxxxx,uxxxx.x,xxxx.x*hh<CR><LF>
1 2 3 4 5 6 7 8 9
IEC
$GPGBS,hhmmss.ss,uxxx.x,uxxx.x,uxxx.x,xx,x.xxxxx,uxxxx.x,xxxx.x,1,1*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11

1: UTC time of the GGA or GNS fix associated with this sentence
2: Expected error in latitude (m)
3: Expected error in longitude (m)
4: Expected error in altitude (m)
5: ID number (see Note 1) of most likely failed satellite
GPS: 1-32
SBAS satellites 120 to 138 are represented by 33 to 51.
33 to 64 are reserved for SBAS satellite use.
6: Probability of missed detection for most likely failed satellite
(0.00000 to 1.00000)
7: Estimate of bias on most likely failed satellite (m)
8: Standard deviation of bias estimate (m)
9: Checksum (Version 2.1,2.3)
9: GNSS System ID 1: fixed
10: GNSS Signal ID 1: fixed
11: Checksum

■ GNS - GNSS fix data

Version 2.3 only
$GPGNS, hhmmss.ss,ddmm.mmmm,a,dddmm.mmmm,a,x,xx,xx,uxxxx,uxxx,xx,xxxx*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13
IEC
$GPGNS, hhmmss.ss,ddmm.mmmm,a,dddmm.mmmm,a,x,xx,xx,uxxxx,uxxx,xx,xxxx,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14

1: UTC of position (1/100 sec)
2, 3: Latitude (deg, min), N / S
4, 5: Longitude (deg, min), E / W
6: Mode indicator
N = No fix. Satellite system not used in position fix, or fix not valid.
A = Autonomous. Satellite system used in non-differential mode in position fix.
D = Differential. Satellite system used in differential mode in position fix.
S = Simulator mode.
P = SBAS (IEC only)
7: Total number of satellites in use
8: HDOP (0 - 20)
9: Antenna altitude, m, mean-sea-level (geoid)
10: Geoidal separation, m
11: Age of differential data (NULL if not performing DGPS positioning)
12: Differential reference station ID (NULL if not performing DGPS positioning)
13: Checksum (Version 2.3)
13: Navigational Status indicator
S = Safe
C = caution
U = Unsafe
V = Not valid
14: Checksum

Note When not performing position fixing, outputs last measured position data, and time.
When power is turned on, or master reset is performed, the initial time, and position settings are NULL

■ DTM - Datum reference

Version 2.1, 2.3 only
$GPDTM, ccc,,x.x,a,x.x,a,ux.x,ccc*hh<CR><LF>
1 2 3 4 5 6 7 8

1: Local datum
W84 = WGS84
W72 = WGS72
IHO = datum code (Version 2.1: JRC proprietary value)
IHO = datum code (Version 2.3: IHO datum code)

2, 3: Lat offset, min, N/S (see Note)
4, 5: Lon offset, min, E/W (see Note)
6: Altitude offset, m (see Note)
7: Reference datum, W84 = WGS84
8: Checksum

Note 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:

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

■ GSA - GNSS DOP and active satellites

Version 2.1 only
$GPGSA, a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx.x,xx.x,xx.x*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Version 2.3 only
$GPGSA, a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx.x,xx.x,xx.x*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Version 2.3 only
$GPGSA, a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx.x,xx.x,xx.x,1*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

1: Mode
M = manual, forced to operate in 2D or 3D mode
A = automatic, allowed to automatically switch 2D/3D
2: Positioning dimensions
1 = fix not available
2 = 2D
3 = 3D
3 - 14: ID numbers of satellites used in solution
(For less than 12 satellites, the field are "00".) (Version 2.1)
15: PDOP (4 digit fixed length) (Version 2.1)
16: HDOP (4 digit fixed length) (Version 2.1)
17: VDOP (4 digit fixed length) (Version 2.1)
18: Checksum (Version 2.1)

3 - 14: ID numbers of satellites used in solution
(For less than 12 satellites, the fields are NULL.) (Version 2.3, IEC)
SBAS satellites 120 to 138 are represented by 33 to 51.
33 to 64 are reserved for SBAS satellite use.
If there are 12 or more GPS satellites when positioning, even if there are SBAS satellites, the output gives priority to GPS.
15: PDOP (4 digit fixed length) (Version 2.3, IEC)
16: HDOP (4 digit fixed length) (Version 2.3, IEC)
17: VDOP (4 digit fixed length) (Version 2.3, IEC)
18: Checksum (Version 2.3)
18: GNSS System ID 1: fixed
19: Checksum

■ GSV - GNSS satellites in view

Version 2.1, 2.3 only
$GPGSV, x,x,xx,xx,xx,xxx,xx,xx,xx,xxx,xx,xx,xx,xxx,xx,xx,xx,xxx,xx*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
IEC
$GPGSV, x,x,xx,xx,xx,xxx,xx,xx,xx,xxx,xx,xx,xx,xxx,xx,xx,xx,xxx,xx,1*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

1: Total number of GSV messages (1 - 3) (Version 2.1)
2: GSV message number (1 - 3) (Version 2.1)

1: Total number of GSV messages (1 - 4) (Version 2.3, IEC)
2: GSV message number (1 - 4) (Version 2.3, IEC)

3: Total number of satellites in view

4: 1st Satellite ID number (01 - 32)
SBAS satellites 120 to 138 are represented by 33 to 51. (Version 2.3, IEC)
33 to 64 are reserved for SBAS satellite use. (Version 2.3, IEC)
5: 1st satellite Elevation, degrees, 90° maximum
6: 1st satellite Azimuth, degrees true, 000 to 359
7: 1st satellite SNR (C/No) 00-99 dB-Hz, null when not tracking

8 - 11: 2nd satellite information (same as 4 - 7)
12 - 15: 3rd satellite information (same as 4 - 7)
16 - 19: 4th satellite information (same as 4 - 7)
20: Checksum (Version 2.1, 2.3)
20: Signal ID 1: fixed
21: Checksum

Note1 Each GSV sentence includes 4 satellites, so the number of GSV sentences varys based on the number of satellites detected.

■ MSS - MSK beacon receiver signal status

Version 2.1
$GPMSS, I I I,SSS,FFF.F,BBB*hh<CR><LF>
1 2 3 4 5
Version 2.3
$GPMSS, I I I,SSS,FFF.F,BBB,x*hh<CR><LF>
1 2 3 4 5 6

1: Signal strength (SS), dB/1 µV/m
2: Signal-to-noise ratio (SNR), dB
3: Beacon frequency, kHz
4: Beacon bit rate, bits/s
5: Checksum (Version 2.1)
5: Channel Number "1" or null (Version 2.3)
6: Checksum (Version 2.3)

■ GST - GNSS pseudorange noise statistics

Version 2.1, 2.3 only
$GPGST,hhmmss.ss,xxxx.x,xxxx.x,xxxx.x,xxx,xxxx.x,xxxx.x,xxxx.x*hh<CR><LF>
1 2 3 4 5 6 7 8 9

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. (m)
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)
9: Checksum

■ GLL - Geographic position – latitude/longitude

Version 1.5
$GPGLL,ddmm.mm,a,dddmm.mm,a<CR><LF>
1 2 3 4
Version 2.1
$GPGLL,ddmm.mmmm,a,dddmm.mmmm,a,hhmmss.ss,A*hh<CR><LF>
1 2 3 4 5 6 7
Version 2.3
$GPGLL,ddmm.mmmm,a,dddmm.mmmm,a,hhmmss.ss,A,x*hh<CR><LF>
1 2 3 4 5 6 7 8

1, 2: Latitude (deg, min), N / S
3, 4: Longitude (deg, min), E / W

5: UTC of position (1/100 sec fixed at 00) (Version 2.1)
5: UTC of position (1/100 sec) (Version 2.3)

6: Status
A=data valid
V=data invalid

7: Checksum (Version 2.1)

7: Mode indicator (Version 2.3)
A = Autonomous
D = Differential
N = Data not valid
S = Simulator
8: Checksum (Version 2.3)

Note For version 1.5, when not performing positioning, outputs last measured position data.
For version 2.3, when not performing positioning, outputs last measured position data, and time.
For version 2.3, when power is turned on, or master reset is performed, the initial time, and position settings are NULL.

■ PFEC, GPatt - ATTITUDE INFORMATION

Version 1.5

$PFEC, GPatt,xxx.x,uxx.x,uxx.x<CR><LF>

1 2 3 4 5

Version 2.1~

$PFEC, GPatt,xxx.x,uxx.x,uxx.x*hh<CR><LF>

1 2 3 4 5

1: Data format (att)
2: YAW 000.0～359.9 deg.
3: PITCH -90.0～90.0 deg. u:sign(+※,-)
4: ROLL -90.0～90.0 deg. u:sign(+※,-)
5: Checksum
※: Sensor Through port only

■ PFEC, GPhve - HEAVING INFORMATION

Version 1.5

$PFEC, GPhve,xxx.x,X<CR><LF>

1 2 3

Version 2.1~

$PFEC, GPhve,xxx.x,X*hh<CR><LF>

1 2 3

1: Data format (att)
2: HVEAVING -99.999m～99.999m sign(+,-)
3: A(Data valid)/V(Data invalid)

■ ALR - Set Alert State

Version 2.3 only

$GPALR, hhmmss.ss, xxx, A, A, c--c *hh<CR><LF>

1 2 3 4 5

1: Time of alert condition change, UTC
2: Local alert number (identifier)
3: Alert condition (A= threshold exceeded, V= not exceeded)
4: Alert's acknowledge state, A= acknowledged, V= unacknowledged
5: Alert's description text

■ ALC - Cyclic alert list

$GPALC, 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 10 11 12 13

1: Total number of sentences for this massage, 01-99
2: Sentence number, 01-99
3: Sequential message identifier, 00-99
4: Number of alert entries
5: Manufacturer mnemonic code, "JRC": fixed
6: Alert identifier
7: Alert instance
8: Revision counter
9～12: Alert entry n
13: Checksum

■ ALF - Alert sentence

$GPALF, x,x,x,hhmmss.ss,a,a,a,JRC,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 14

1: Total number of ALF sentence for this massage, 1-2
2: Sentence number, 1～2
3: Sequential message identifier, 0-9
4: Time of last change
5: Alert category, A,B,C
6: Alert priority
A: Alarm (Alarm)
W: Warning (Warning)
C: Caution (Caution)
7: Alert status
V: active - unacknowledged
S: active - silenced
A: active - acknowledged or active
O: active - responsibility transferred
U: rectified - unacknowledged
N: normal
8: Manufacture mnemonic code, "JRC": fixed
9: Alert identifier
10: Alert instance, 1-999999
11: Revision counter, 1-99
12: Escalation counter, 0-9
13: Alert text
14: Checksum

■ HBT - Heartbeat supervision sentence

$GPHBT, x.x,A,x*hh<CR><LF>
1 2 3 4

1: Configured repeat interval
2: Equipment status
A: yes
V: no
3: Sequential sentence identifier, 0-9
4: Checksum

[2] Input Data

[2-1] Data Sentences

NMEA0183 Input Sentences

VBW	-	Dual ground/water speed
CUR	-	Water current layer
ACK	-	Acknowledge alert
HBT	-	Heartbeat supervision sentence

DGPS correction data

RTCM SC-104 Version2.0

[2-2] Protocols

NMEA Protocol

Bit Rate:	4800bps
Data Bits:	8 bits
Parity:	None
Start Bit:	1 bit
Stop Bit:	1 bit
Receiving interval:	Auto (Automatic receive)

[2-3] Data Formats

■ VBW - Dual ground/water speed

$VDVBW , uxx.xx , uxx.xx , A , uxx.xx , uxx.xx , A , uxx.xx , A , uxx.xx , A * hh <CR><LF>
1 2 3 4 5 6 7 8 9 10 11

1: Longitudinal water speed (see Note), knots
2: Transverse water speed (see Note), knots
3: Status: water speed
A = data valid
V = data invalid
4: Longitudinal ground speed (see Note), knots
5: Transverse ground speed (see Note), knots
6: Status: ground speed
A = data valid
V = data invalid
7: Stern transverse water speed (see Note), knots
8: Status: stern water speed
A = data valid
V = data invalid
9: Stern transverse ground speed (see Note), knots
10: Status: stern ground speed
A = data valid
V = data invalid
11: Checksum

Note Transverse speed: "-" = port,
Longitudinal speed: "-" = astern.

■ CUR - Water current layer – Multi-layer water current data

$VDCUR , A , x , x , x.x , x.x , T ,x.x , x.x , x.x , T , B * hh <CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12

1: Validity of the data
A = Valid
V = not valid
2: Data set number, 0 to 9
3: Layer number
4: Current depth in metres
5: Current direction in degrees
6: Direction reference in use, True/Relative T/R
7: Current speed in knots
8: Reference layer depth in metres
9: Heading in degrees
10: Heading reference in use, True/Magnetic T/M
11: Speed reference
B = Bottom track
W= Water track
P= Positioning system
12: Checksum

■ ACK - Acknowledge alert

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

1: Unique alert number (identifier) at alert source

■ HBT - Heartbeat supervision sentence

$GPHBT, x.x,A,x*hh<CR><LF>
1 2 3 4

1: Configured repeat interval
2: Equipment status
A: yes
V: no
3: Sequential sentence identifier, 0-9
4: Checksum

Appendix 3 Terminology

Term	Meaning
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.
AD-10	Transmission method for handling bow heading data.
ARPA	Automatic Radar Plotting Aids, equipment for automatic collision avoidance.
ANCHOR WATCH	Function for monitoring a shift in position while the ship is at anchor.
Bow Heading	Angle between the ship's bow and meridian.
CCRP	Abbreviation of Consistent Common Reference Point. A common reference point for controlling a ship is defined so that all the measurements including the range, the bearing, the relative course, and the velocity to the target can be measured on the basis of CCRP. (Only CCRP settings are allowed in this device. Conversion of measured values to the CCRP reference point is not available.)
Checksum	An error detection method to check that the data has been correctly transmitted.
COG	Course Over Ground.
CURRENT	Sea and ocean currents, expressed in speed and direction.
DISP-DPU	The main circuitry of display unit.
DGPS	Abbreviation of Differential Global Positioning System. GPS satellite error data sent from a reference station whose position is accurately known is received via beacon from a beacon station, improving positioning accuracy.
DR	Abbreviation of Dead Reckoning. Reckoning of course and distance with the aid of Gyro and ship's speed.
FRAM	Nonvolatile memory using a ferroelectric substance.
Geodetic	Conditions for expressing position via latitude and longitude.
GPS Repecon	Device for synchro / step conversion of true bearing signal output by GPS compass.
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.
HDG	Abbreviation of Heading, indicating heading of ship's bow.
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	The up and down of the ship
IEC60945	IEC is the abbreviation of International Electrotechnical Commission. It is an international standard governing electrical and electronic technologies.
IPX	IPX is a standard of waterproofing, there are nine grades (0 - 8). (IPX4: splash-proof, IPX6: waterproof)
LCD Unit (LCD)	Liquid Crystal Display Unit.
Log Pulse	Contact output signal, output in 1 pulse per nm. Expressed in units of "p/nm".
mi/h	Unit of ship speed.
Multipath Wave	Waves received from multiple directions due to reflection or refraction of an initial wave by obstacles.
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 supported format.
Pitch	Medial rotation
Positioning	Use of GPS or DGPS receiving functions to determine the current position of a ship.
RAIM Accuracy Standard (RAIM)	Abbreviation of Receiver Autonomous Integrity Monitoring. This 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.
Rate of Turn	Same as ROT
Reception Level	GPS signal reception level.
Roll	Lateral rotation
ROT	Rate of Turn, the rate at which the ship turns, expressed by "deg/min".
RS232	Serial data transmission standard. It is unbalanced, and hence can only be used for short distance transmission.
RS422	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).
Smoothing	Function for averaging over a specified number of seconds.
SOG	Speed Over Ground, This is the ship's relative speed to the ground.
STW	Speed Through Water.
Type 0 Information	SBAS satellite test broadcast.
UTC	Abbreviation of Universal Time Coordinated. Successor to Greenwich Standard Time.

Appendix 4 Memo

MENU			SETTING
DISPLAY	CONTRAST		1 2 3 4 5 6 7 8 9 10 11 12 13
	DIMMER	MAXIMUM	1 2 3 4 5 6 7 8 9 10
		TYPICAL	1 2 3 4 5 6 7 8 9 10
		MINIMUM	1 2 3 4 5 6 7 8 9 10
	CLICK SOUND		ON OFF
	REVERSING MODE		NORMAL REVERSE1 REVERSE2
HEADING	RESTORATION		AUTO MANUAL
	BACKUP		1 2 3 4 5
	INTERRUPT NMEA		NULL LAST STOP
	HEADING CHECK SUM		ON OFF
	HEADING OFFSET		(-10～+10)
	OUTPUT RESOLUTION		0.1 0.01
	MAGNET		ON OFF
GPS	MODE		AUTO 2D 3D
	HDOP		4 10 20
	SMOOTHING	POSITION	(0～99)
		SPEED	(0～99)
		COURSE	(0～99)
	RAIIM ACCURACY LEVEL		OFF 10 30 50 100
	INITIALIZATION	LATITUDE	
		LONGITUDE	
		ANT HEIGHT	
SBAS	MODE		AUTO GPS ALONE SBAS BEACON
	SBAS SEARCH		AUTO MANUAL
	TYPE 0 INFORMATION		ON OFF
	RANGING		ON OFF
BEACON	STATION SELECT		MANUAL AUTO
	BIT RATE		50 100 200
	FREQUENCY		(275.0～325.0)
	BEACON INFORMATION		ON OFF
SYSTEM	TIME DIFF		(-13:00～+13:00)
	DATE DISP		DD-MM'YY 'YY-MM-DD MM-DD'YY DD MMM,'YY MMM DD,'YY
	TIME DISP		12 24
	DATUM		
	SPEED UNIT		kn km/h mi/h
	ROT RANGE		30 60 90 120 150 180 210 240 270 300 600 900 1200 1500 1800 2100 2400 2700
	ROT SMOOTHING		(0～99)
	ROLL/PITCH RANGE		5 10 15 20 25 30
	ROLL OFFSET		(-30～+30)
	PITCH OFFSET		(-30～+30)
SYSTEM2	HEAVING BAR RANGE		1 2 3 4 5 10 20 30 40 50 100
	HEAVING BAR DISP		OFF DISP1 DISP2 DISP3 DISP4
	TREND GRAPH		AVERAGE MAXIMUM
	HVE POINT OFFSET X		
	HVE POINT OFFSET Y		
	HVE POINT OFFSET Z		
	RMC MAG CORR		AUTO MANUAL
	GPS 5Hz DRAW		ON OFF
	SOG BAR RANGE		5 10 15 20 25 30 50 100

MENU			SETTING		
DATA I/O	SENSOR THROUGH	NMEA			
		VER	Ver1.5 Ver2.1 Ver2.3		
		BIT RATE	4800 9600 19200 38400 57600		
		INTERVAL	20m 25m 50m 100m 200m 500m 1		
		SENTENCE	HDT :	THS :	ROT :
			ZDA :	GGA :	VTG :
			RMC :	GBS :	DTM :
			GSA :	GSV :	GNS :
			MSS :	GST :	GLL :
			ATT	HVE	ALR
			CD,GP,0 :	CD,GP,1 :	
			CD,GP,2 :	CD,GP,3 :	
			CD,GP,5 :	CD,GP,8 :	
			CF,GP,0 :	CF,GP,2 :	
			CD,GP,6 :		
		NSK			
		AD-10	25 200		
		IEC			
	DATA OUT1	NMEA			
		VER	Ver1.5 Ver2.1 Ver2.3		
		BIT RATE	4800 9600 19200 38400 57600		
		SENTENCE	HDT :	THS :	ROT :
			ZDA :	GGA :	VTG :
			RMC :	GBS :	DTM :
			GSA :	GSV :	GNS :
			MSS :	GST :	GLL :
			ATT	HVE	ALR
			-	-	
			-	CD,GP,3 :	
			CD,GP,5 :	CD,GP,8 :	
			CF,GP,0 :	CF,GP,2 :	
			CCRP :	REMOTE :	
		NSK			
		AD-10	25 200		
		IEC			
	DATA OUT3	NMEA			
		VER	Ver1.5 Ver2.1 Ver2.3		
		BIT RATE	4800 9600 19200 38400 57600		
		SENTENCE	HDT :	THS :	ROT :
			ZDA :	GGA :	VTG :
			RMC :	GBS :	DTM :
			GSA :	GSV :	GNS :
			MSS :	GST :	GLL :
			ATT :	HVE :	ALR :
			-	-	
			-	CD,GP,3 :	
			CD,GP,5 :	CD,GP,8 :	
			CF,GP,0 :	CF,GP,2 :	
			CCRP :	REMOTE :	
		NSK			
		IEC			
	DATA OUT4/IN4	NMEA	NMEA/OFF NMEA/CURRENT NMEA/CCRP		
		VER	Ver1.5 Ver2.1 Ver2.3		
		BIT RATE	4800 9600 19200 38400 57600		
		SENTENCE	HDT :	THS :	ROT :
			ZDA :	GGA :	VTG :
			RMC :	GBS :	DTM :

			GSA :	GSV :	GNS :
			MSS :	GST :	GLL :
			ATT :	HVE :	ALR :
			-	-	
			-	CD,GP,3 :	
			CD,GP,5 :	CD,GP,8 :	
			CF,GP,0 :	CF,GP,2 :	
			CCRP :	REMOTE :	
		NSK	NSK/OFF		
		BEACON	BEACON/OFF BEACON/CURRENT BEACON/CCRP		
		IEC	IEC/OFF IEC/CURRENT IEC/CCRP		
		4341	4341/OFF 4341/CURRENT 4341/CCRP		
	DATA OUT5	NMEA			
		VER	Ver1.5 Ver2.1 Ver2.3		
		BIT RATE	4800 9600 19200 38400 57600		
		SENTENCE	HDT :	THS :	ROT :
			ZDA :	GGA :	VTG :
			RMC :	GBS :	DTM :
			GSA :	GSV :	GNS :
			MSS :	GST :	GLL :
			ATT :	HVE :	ALR :
			-	-	
			-	CD,GP,3 :	
			CD,GP,5 :	CD,GP,8 :	
			CF,GP,0 :	CF,GP,2 :	
			CCRP :	REMOTE :	
		NSK			
		IEC			
	LOG PULSE		OFF 200 400		
VERSION INFO	DISPLAY				
	SENSOR				
	GPS1				
	GPS2				
	GPS3				
OTHERS	CURRENT	LAYER	(1～999)		
		DATA NO.	(0～9)		

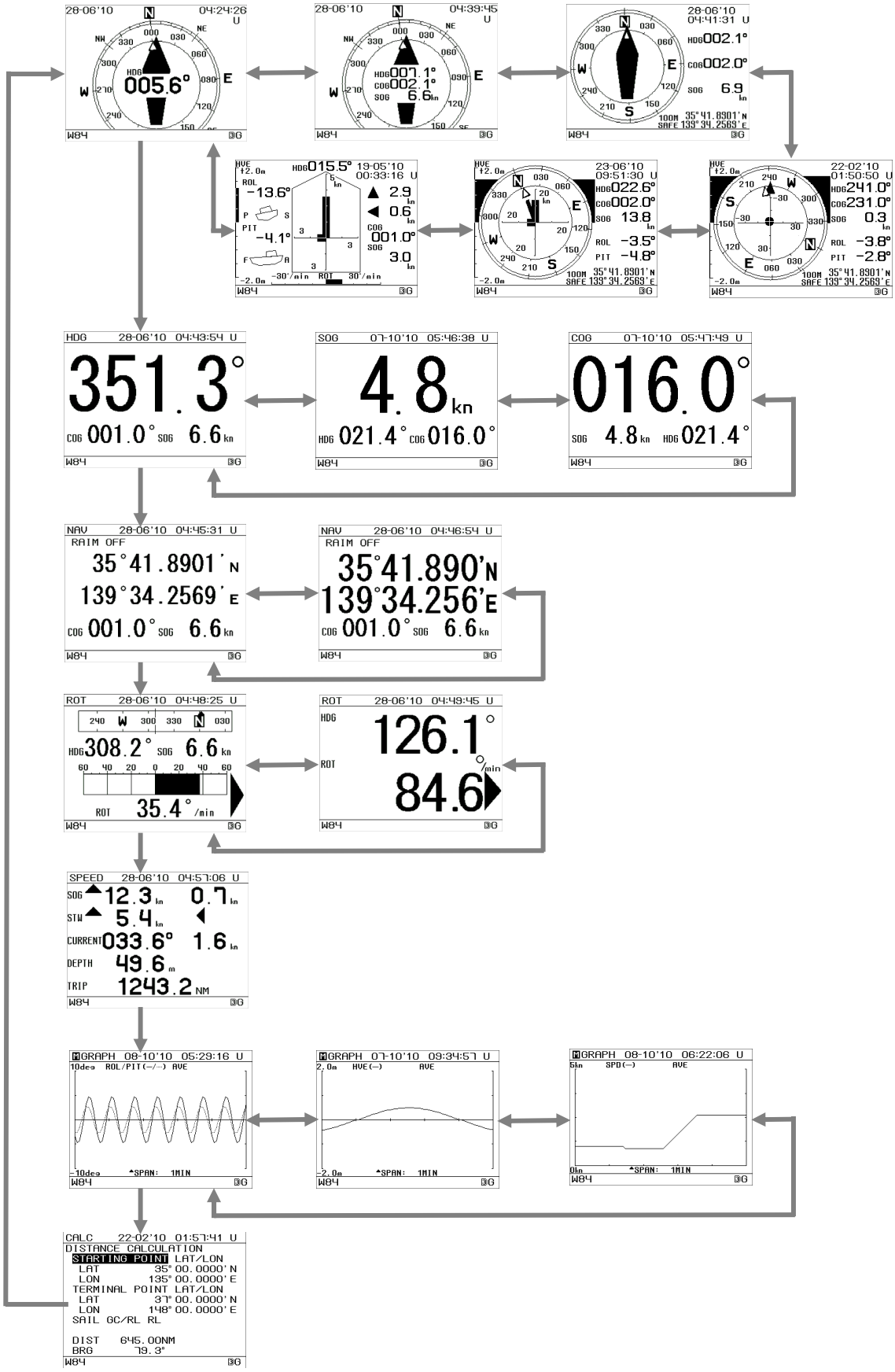
MENU		SETTING
CCRP	SHIP	ENABLE DISABLE
	BEAM	
	LENGTH	
	SENSOR	ENABLE DISABLE
	SENSOR	No.
	X	
	Y	
	CCRP	ENABLE DISABLE
	X	
	Y	

Appendix 5 Main Screen List

・List of screens assigned to DISP

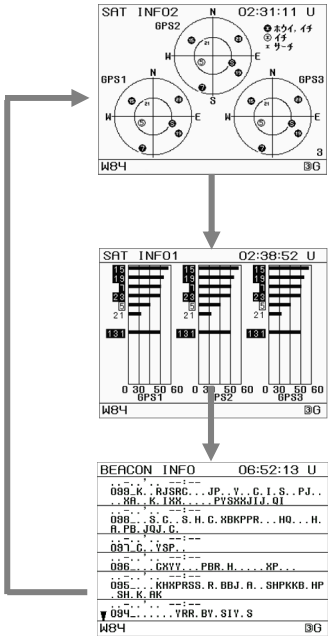
Vertical direction: Can be switched by the DISP key

Horizontal direction: Can be switched by the ◀ ▶key



・List of screens assigned to USER

Can be switched by the USER key



A beacon information screen is displayed only when the beacon Information Display is ON.
To display beacon information, connect an optional beacon receiver.

Appendix 6 List of standard terms and abbreviations

Term	Abbreviation
Acknowledge	*ACK*
Acquire, Acquisition	*ACQ*
Acquisition Zone	*AZ*
Adjust, Adjustment	*ADJ*
Aft	*AFT*
Alarm	*ALARM*
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*
Bearing	*BRG*
Bearing Waypoint To Waypoint	*BWW*
Bow Crossing Range	BCR
Bow Crossing Time	*BCT*
Brilliance	*BRILL*
Built in Test Equipment	*BITE*

Term	Abbreviation
Calibrate	*CAL*
Cancel	*CNCL*
Carried (for example, carried EBL origin)	*C*
Central Processing Unit	CPU
Centre	*CENT*
Change	*CHG*
Circularly Polarised	*CP*
Clear	*CLR*
Closest Point of Approach	*CPA*
Compact Disk Read Only Memory	CDROM
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*
Cross Track Distance	*XTD*
Cursor	*CURS*
Dangerous Goods	*DG*
Date	*DATE*
Day	*DAY*
Dead Reckoning, Dead Reckoned Position	*DR*
December	*DEC*
Decrease	*DECR*
Delay	*DELAY*
Delete	*DEL*
Departure	*DEP*
Depth	*DPTH*

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*

JRC Japan Radio Co., Ltd.

电子信息产品有害物资申明
日本无线株式会社

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

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

形式名(Type): JLR-21/31　　名称(Name): GPS COMPASS

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

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

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

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

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Not use the asbestos

For further information,contact:

JRC Japan Radio Co., Ltd.
Since 1915

URL Head office : http://www.jrc.co.jp/eng/
Marine Service Department
1-7-32 Tatsumi, Koto-ku, Tokyo 135-0053, Japan
e-mail : tmsc@jrc.co.jp
One-call : +81-50-3786-9201

ISO 9001, ISO 14001 Certified

CODE No.7ZPNA4224 FEB. 2017 Edition 5