USER MANUAL

ELECTRONIC INCLINOMETER

NEI-3000

NEI-3000 UM.E 20260210-05

NOTICE TO USERS

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iii. Warning

Any attempt to install or execute software not supplied by NSR on this device will result in the warranty being void. Any attempt to modify the software on this device in a way not specified by NSR will result in the warranty being void.

iv. Notice

Please read this manual carefully to ensure proper use before installation and operation of the NEI-3000 Electronic Inclinometer.

MODIFY RECORD

No.	Modify by	Date	Paragraph	Version	Reason
1	Q/A	2023/08/01		01	First edition
2	Q/A	2024/02/23	All	02	General modification
3	Q/A	2024/12/05	All	03	General modification
4	Q/A	2025/07/11	7, Appendix 1	04	Some modification
5	Q/A	2026/02/10	All	05	General modification

VERSION COMPARISON TABLE

Manual Version	Program Version	Remarks
20250711_04	1.0.6	
20260210_05	1.0.14	

SAFETY INSTRUCTIONS FOR THE OPERATOR

	**Warning** Keep away from heat sources or direct sunshine. **After turning off the device, wait 5 seconds before restarting it to avoid malfunctioning due to an instantaneous power surge.** For the safety of the ship, it is prohibited to interrupt or arbitrarily cut off the power supply to the electronic inclinometer during navigation.
	**Prohibition** Don't open the equipment. Only authorized and qualified personnel should work inside the equipment. Don't disassemble or try to modify the equipment.
	**Dangerous** Turn off the power immediately when smoke or fire is emitted.

SAFETY INSTRUCTIONS FOR THE INSTALLER

	**Warning** Connect the earthing cord to the ship's body. Observe the compass safe distance to prevent deviation of an onboard magnetic compass.
	**Prohibited** Don't open the equipment unless you have fully understood the structure and circuits of the equipment. Only authorized and qualified personnel should work inside the equipment. Don't disassemble or try to modify the equipment.
	**Dangerous** Turn off the power at the power distribution board before installation.

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1. OVERVIEW

1.1 Outline

NEI-3000 electronic inclinometer is designed for vessel navigation, which provides heel and pitch measuring functions. It can provide information about roll period, roll amplitude and the heel angle to support the decision-making process on board to avoid dangers, and can also assist in maritime accident investigations.

NEI-3000 adopts high-resolution color LCD, knob + touch screen operation and Android O/S.

NEI-3000 conforms to the standards of IMO MSC.363 (92), IEC 61162-1, IEC 61162-2, IEC 62923-1, IEC 62923-2, IEC 62288 and ISO 19697.

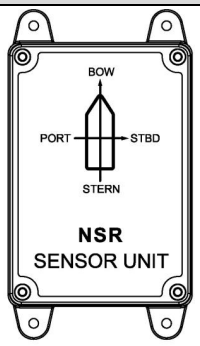
1.2 Product Features

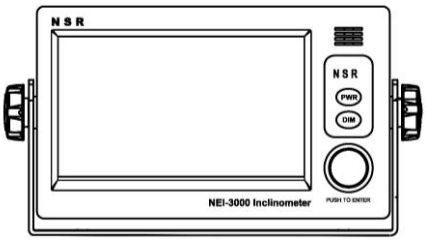
The main features of NEI-3000 are:

- High accuracy and stability.
- Large color LCD, touch screen operation.
- Measures and displays heel angle, roll period, roll amplitude and pith angle, etc.
- Additional log of heel angle for the latest 3 minutes and roll amplitude for the latest 30 minutes.
- Heel Angle alarm function.
- Android O/S for easy operation.
- Ports for BAM system & INS connection.
- DC 24V main/backup input.

1.3 System Configuration

NEI-3000 consists of a display unit and a sensor unit.

No.	Unit Description	
1	**Sensor Unit (NEI-3000S)**	

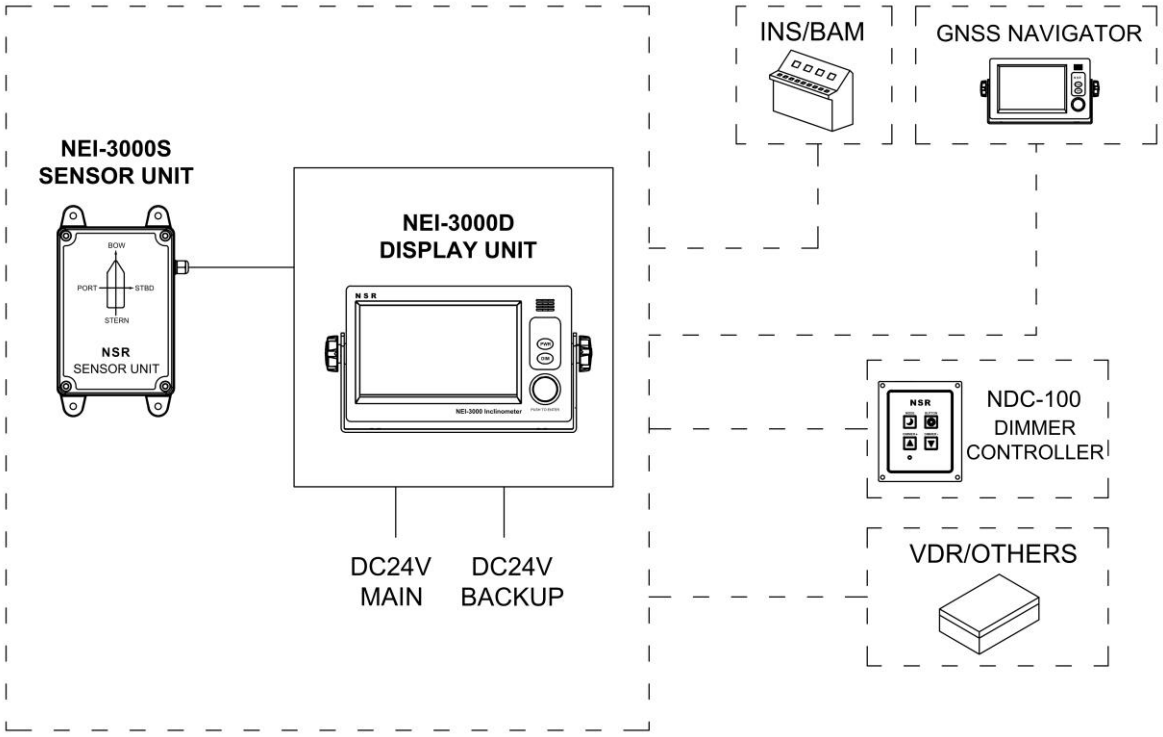
No.	Unit Description	
2	**Display Unit (NEI-3000D)**	

1.4 Equipment List

NEI-3000 Equipment List:

No.	Item	Type	Q'ty	Part No.	Remarks
1	**Standard**				
1.1	Display Unit	NEI-3000D	1	N993230	
1.2	Sensor Unit	NEI-3000S	1		
1.3	Accessories		1		
2	**Optional**				
2.1	Dimmer Controller	NDC-100	1	N503233	

The figure below is for the system diagram.



2. EQUIPMENT DESCRIPTION

2.1 Main Panel

2.2 Function Keys

NEI-3000 can be operated by key & knob on the panel or touch-screen operation.

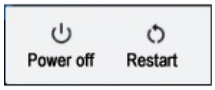
Panel Key	Description
DIM	Brightness key to control LCD brightness.
PWR	Power ON/OFF, Restart. To force the power off, press and hold this key for 8 seconds.
Touch-screen Key	**Description**
	Click to display the NAV data window with GNSS information. Please refer to Section 2.5.
	Click to jump to the alert list directly while an active alert (audible and visual) appears. 1 indicates the current number of alerts, currently 1 alert. Please refer to Section 2.5.
	Click to enter the main menu.
	Click to reset the current Roll Peak Hold to zero.

2.3 Power ON/OFF

- **Power On**

Press **PWR** key shortly to power on the display unit and sensor unit, the main screen appears.

- **Power Off / Restart**

Press and hold **PWR** key until 

appears, and choose **[Power off]** to power off the equipment.

If the system has no response due to mis-operation, etc., choose **[Restart]** to restart the equipment.

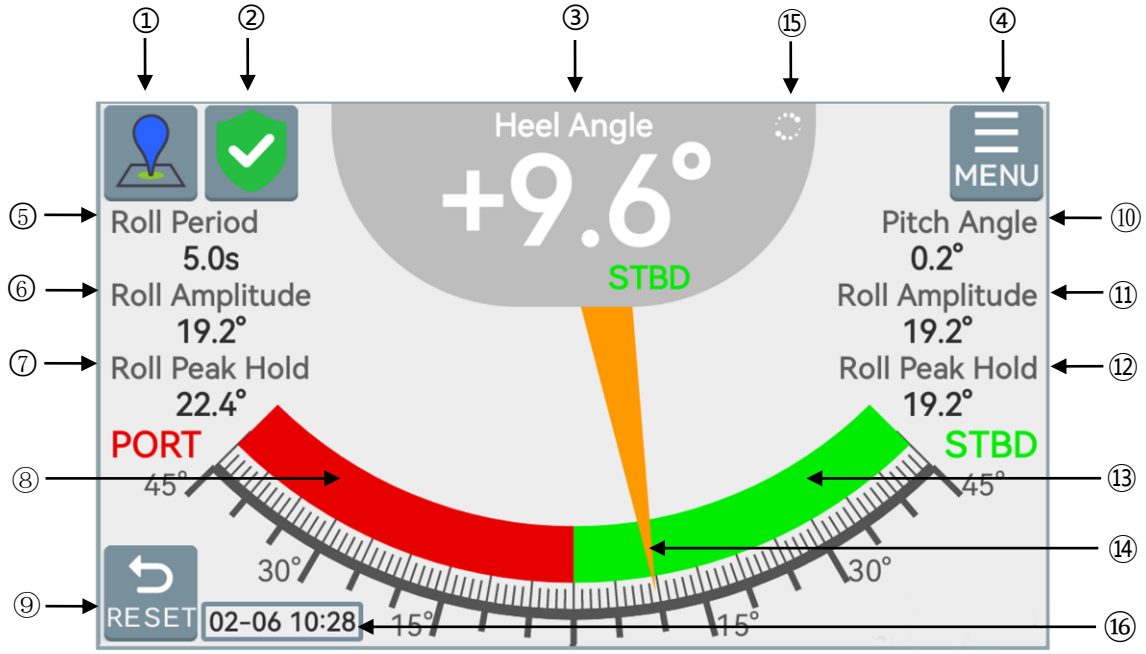
2.4 Brightness Adjustment

There are two ways to adjust the brightness of the screen.

① Press **DIM** key on the panel to adjust the brightness, or

② Adjust the brightness in **[MENU]-[System]-[LCD Display]-[Brightness]**. Please refer to **Section 5.1.3**.

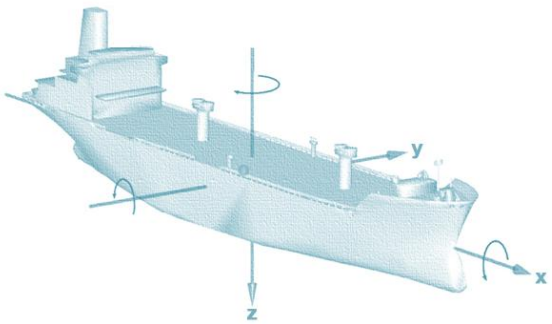
2.5 Main Screen



Description:

No.	Button	Function
1		GNSS, refer to Section 2.2.  : GNSS valid;  : GNSS invalid.
2		Alert, refer to Section 2.2.  : Indicates that the system is normal.
3	Heel Angle (Numeric Display)	Rolling is the motion around the longitudinal axis of the ship. Heel Angle is the momentary angle of roll referenced to a levelled ship to port or starboard side (the X-axis is horizontal); Here, Heel Angle is indicated at the center of the screen by the numeric display. The digital indication range is from 90 degrees port (Negative) to 90 degrees starboard (Positive).
4		Menu, refer to Section 2.2.
5	Roll Period	Roll Period is the time between two successive maximum values of Heel Angle on the same side of the ship, range: 4~40s. When the Roll Period is less than 4 s, the display presents the value as "-" and when the period is greater than 40 s, as "++".
6/11	Roll Amplitude	Roll Amplitude is the maximum value of Heel Angle to port or starboard side.
7/12	Roll Peak Hold	The maximum value of Roll Amplitude before reset.
8	PORT	Port side in red.
9		Reset, refer to Section 2.2.
10	Pitch Angle	Pitching is the motion around the transverse axis of the ship. Pitch Angle is the momentary angle of pitch referenced to a levelled ship to bow or stern side (the Y-axis is horizontal). The digital indication range is from 90 degrees stern (Negative) to 90 degrees bow (Positive).
13	STBD	Starboard side in green.
14	Heel Angle (Analog Display)	Here, Heel Angle is indicated on the screen by the pointer (analog display). For example, 9.6 degrees starboard. **Note**: *When the electronic inclinometer is mounted on the front or rear wall of the bridge, the actual movement direction of the pointer (analog display) should be in line with the ship's rolling track.*
15		Time-varying symbol.
16		Reset time. It appears after clicking  , and disappears after restarting.

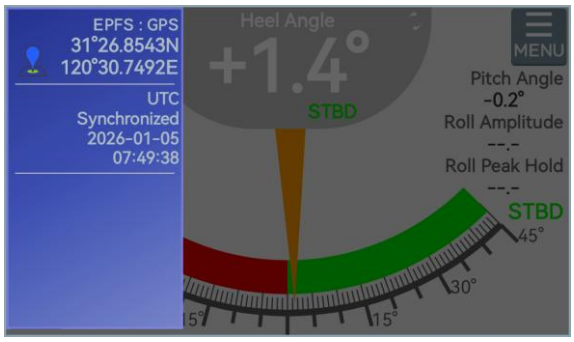
Note: When the sensor fails, or the connection fails, all values are presented as "--.- " on the main display.



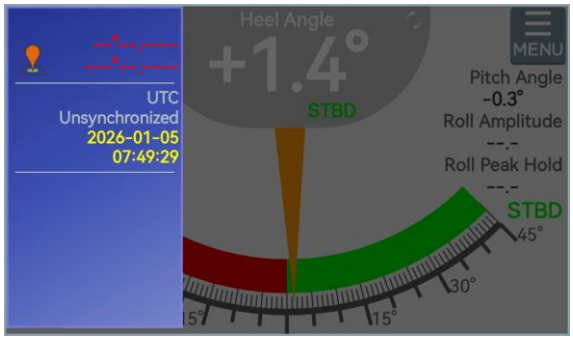
2.6 NAV Data Window

Click  to display the NAV data window with GNSS information. For example:

◆ GNSS, Position valid, Time synchronized:



◆ GNSS, Position lost, Time unsynchronized:



Note: If the input position and time are valid, they are displayed in white. If they are invalid or doubtful, they are displayed in red or yellow.

2.7 Basic Menu Operation

Click 

to open the menu screen, which includes **[Sensor]**, **[Alert]**, **[System]** and **[Service]** items..

Menu Operation		Description
Screen	Swipe left or right	Exit or return to the upper menu.
	Dropdown	Set the Alert List to the top.
Title Column		Click to exit the menu.
		Click to return to the upper menu.

3. SENSOR SETTING

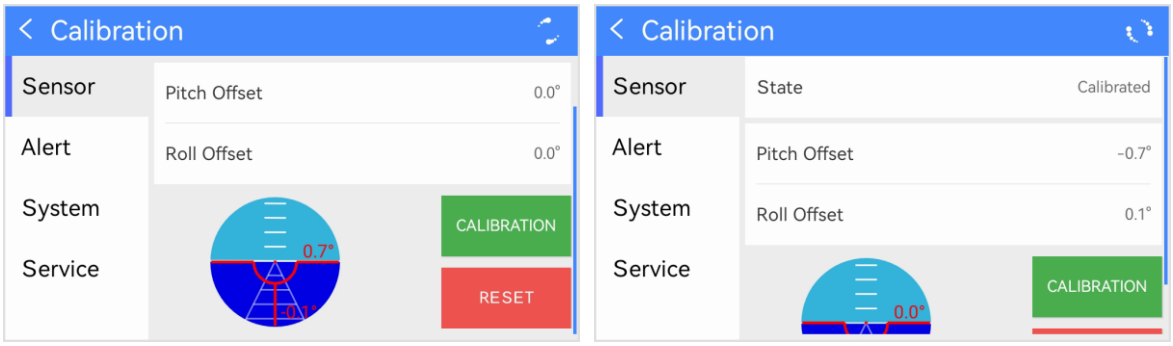
[Sensor] screen includes **[Calibration]**, **[Position]** and **[Log]** items.

3.1 Calibration

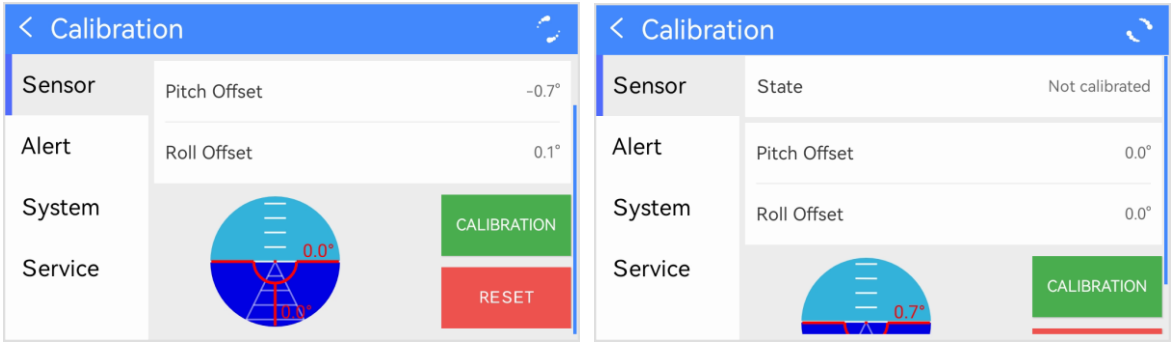
This function is used to set the calibration offset when installing the sensor unit of NEI-3000. The screen is locked by default ( ) and an access password is required to unlock. It will relock after exiting

Note: When you exit, the password becomes invalid. Please re-enter it.

CALIBRATION: Set the current attitude to be 0 (zero), and status = calibrated.



RESET: Clear the calibration settings, status= Not calibrated.

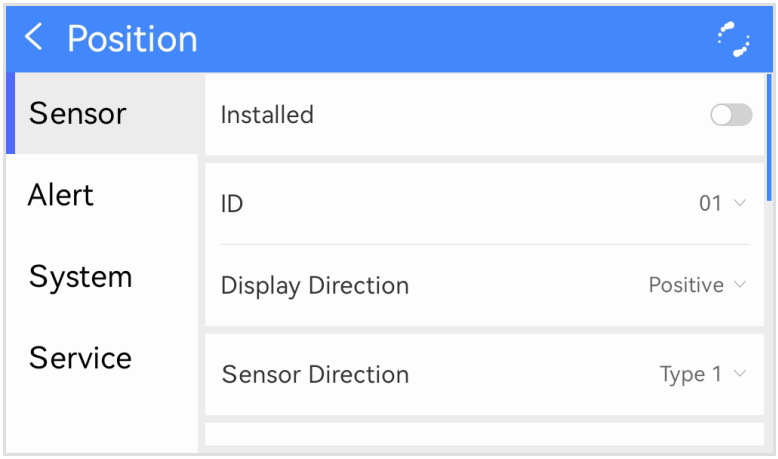


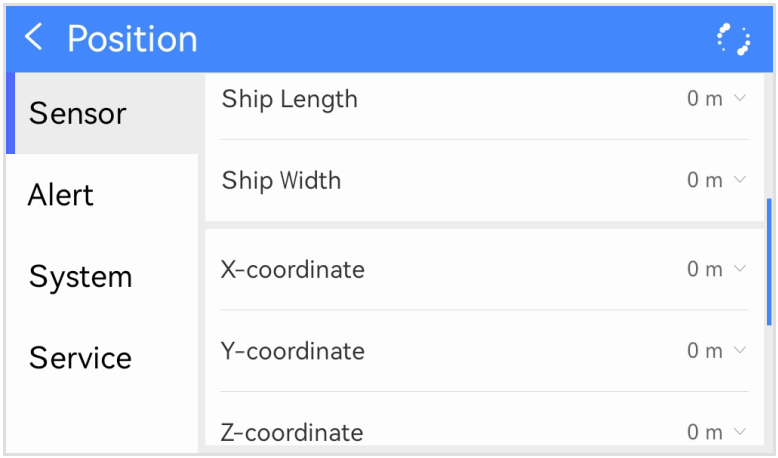
3.2 Position

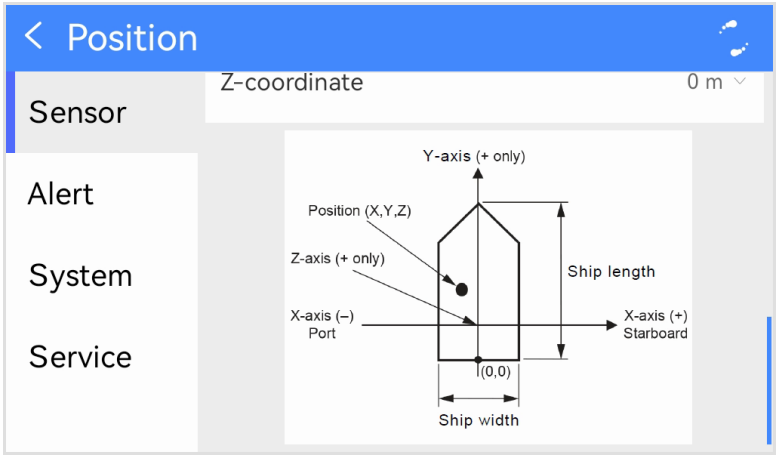
This function is used to set the parameters when installing the sensor unit of NEI-3000. The screen is locked by default ( ) and an access password is required to unlock. It will relock after exiting.

Note: When you exit, the password becomes invalid. Please re-enter it.

Click **[MENU]** – **[Sensor]** – **[Position] – enter password**, the **[Position]** screen appears. It includes items such as **[Installed]**, **[ID]**, **[Display Direction]**, **[Ship Length]**, **[Ship Width]**, **[X-coordinate]**, **[Y-coordinate]**, and **[Z-coordinate]**.

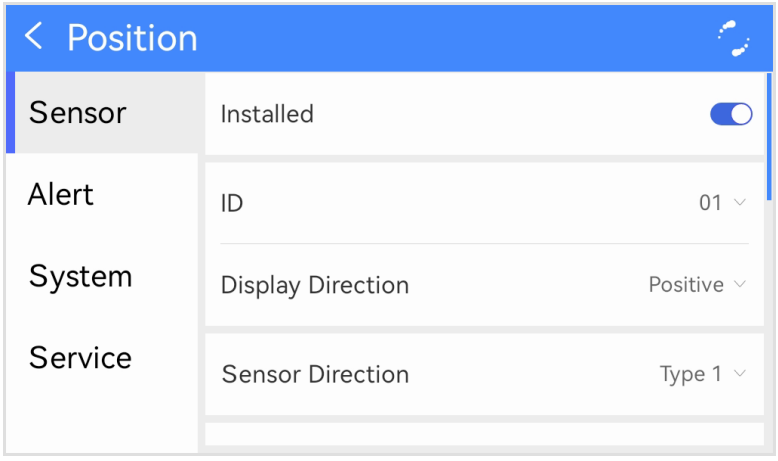






3.2.1 Installed ON/OFF

Installed: ON ( ), enable to output the valid POS sentence after the equipment is installed. The reverse is OFF ( ).

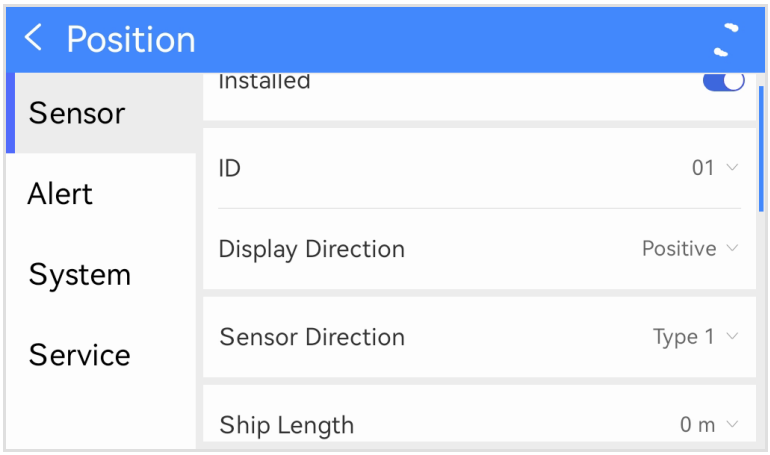


3.2.2 ID

ID: Sensor unit ID.

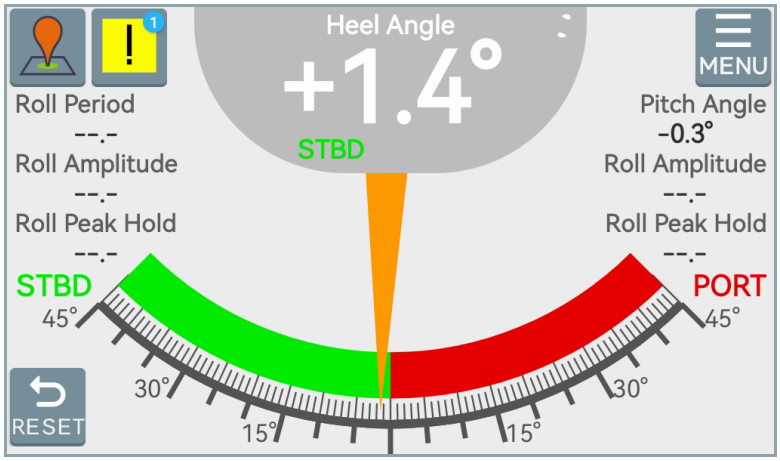
3.2.3 Display Direction

Display Direction: Positive or Reverse.



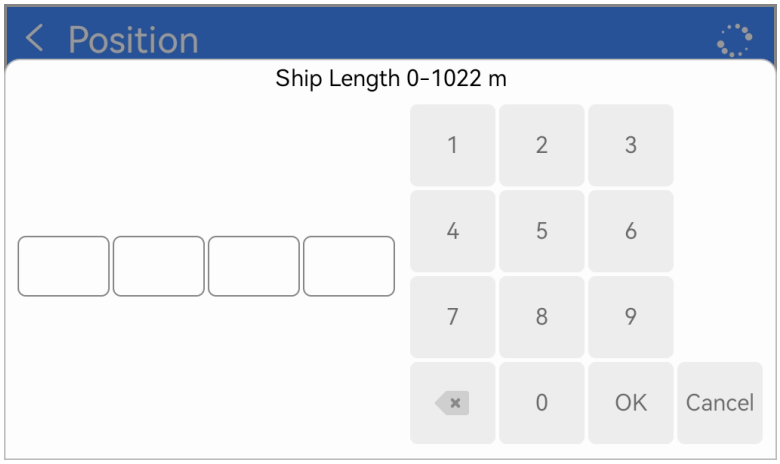
Select "Positive" or "Reverse" from the pull-down menu, as shown below:

For example, reverse display:



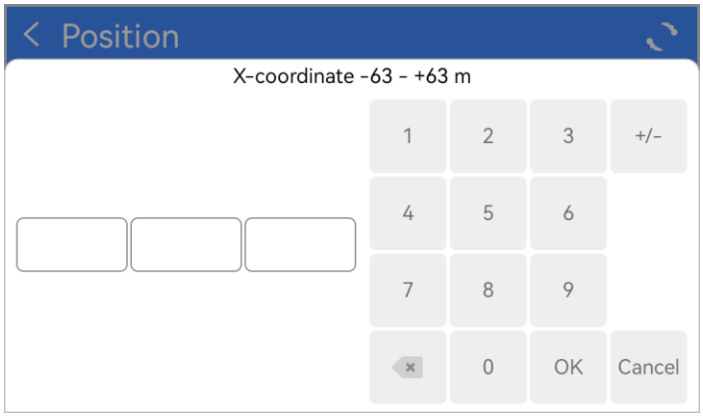
3.2.4 Ship Length & Width

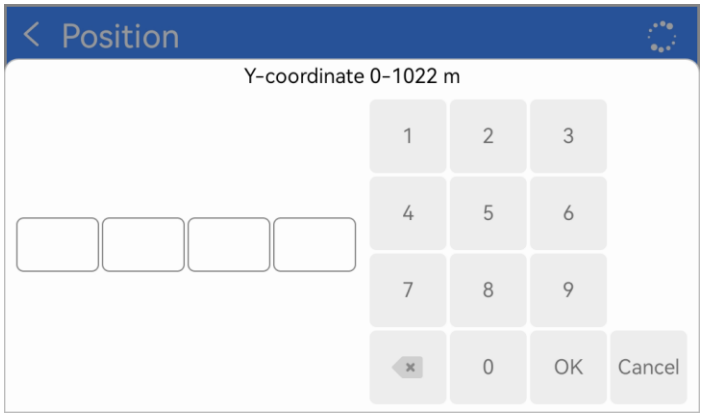
Fill in the actual length and width of the ship on the following screens.

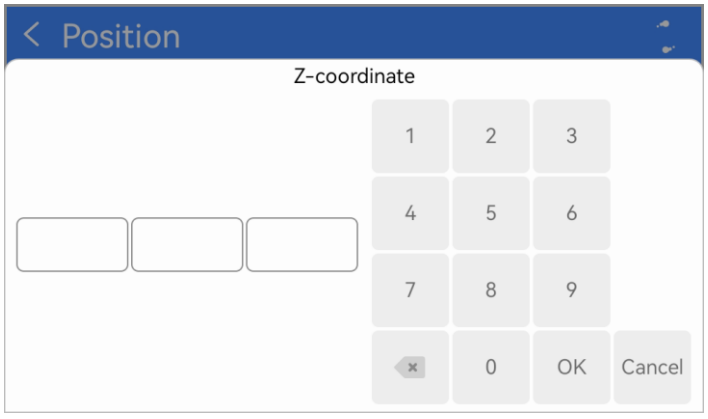


3.2.5 X/Y/Z Coordinate

Set the sensor unit mounting position (X/Y/Z) on the following screens.



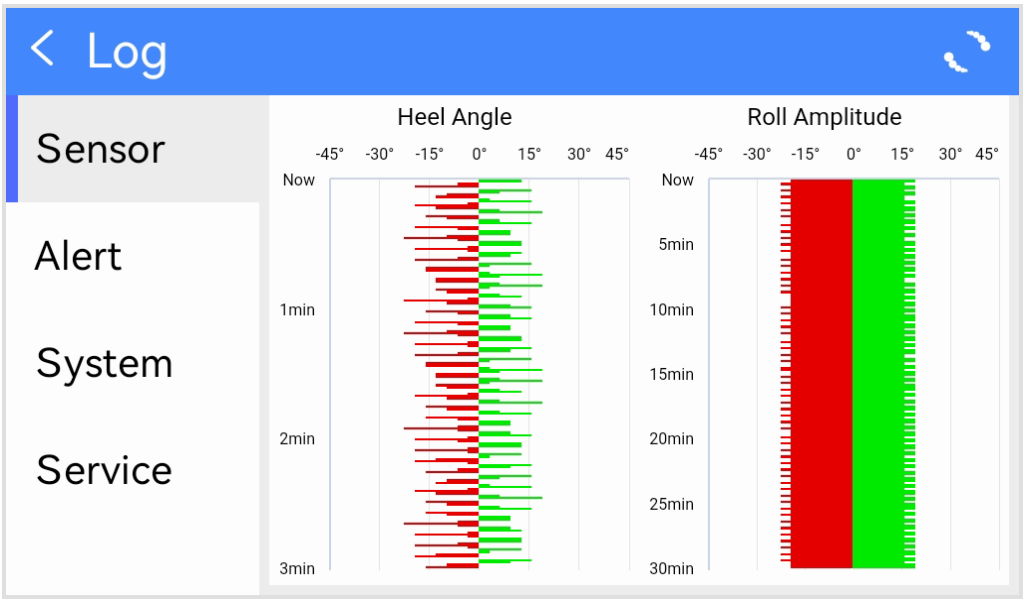




3.3 Log

NEI-3000 provides the additional log of heel angle for the latest 3 minutes and roll amplitude for the latest 30 minutes.

You can check the log by clicking **[MENU]** – **[Sensor]** – **[Log]** as follows.

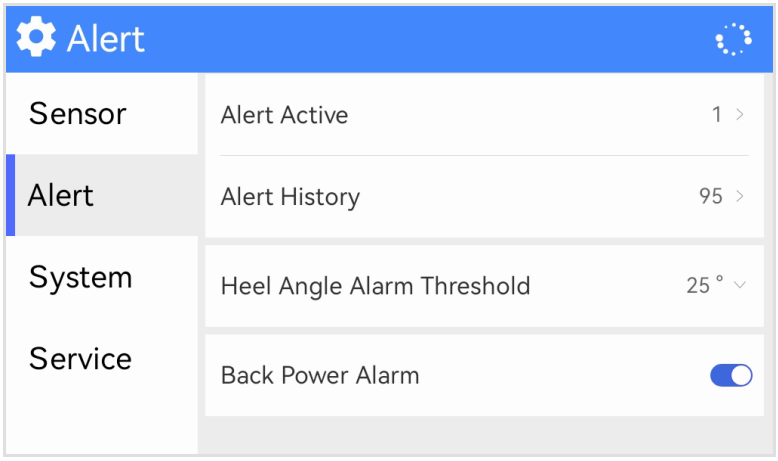


4. ALERT MENU

NEI-3000 will alert in the following situations:

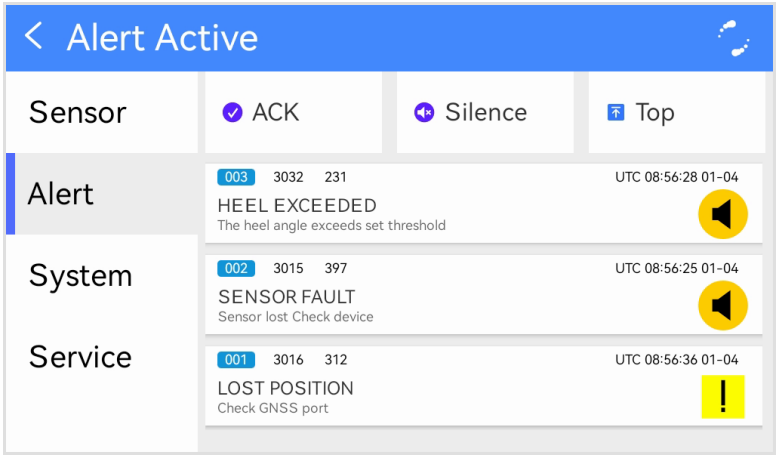
- The heel angle Data is invalid or exceeds the set threshold;
- Sensor malfunction;
- Failure of the main/backup power supply;
- Loss of position, etc.

Click **[MENU]** - **[Alert]**, the **[Alert]** screen appears. It includes **[Alert Active]**, **[Alert History]**, **[Heel Angle Alarm Threshold]**, and **[Back Power Alarm]** items.



4.1 Alert Active

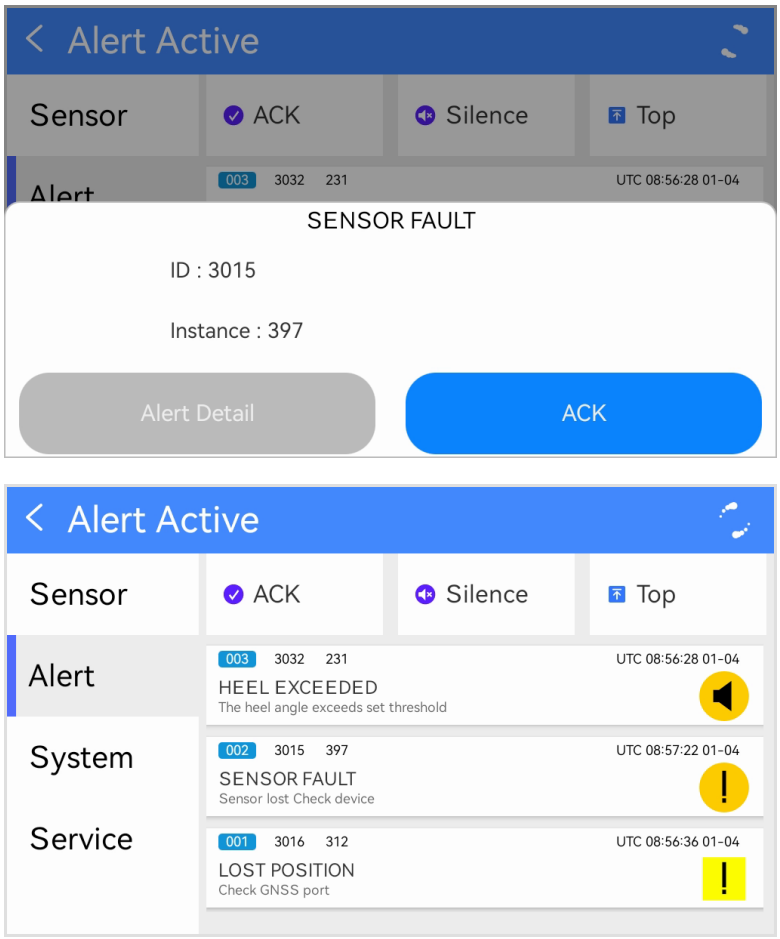
[Alert Active] screen includes:



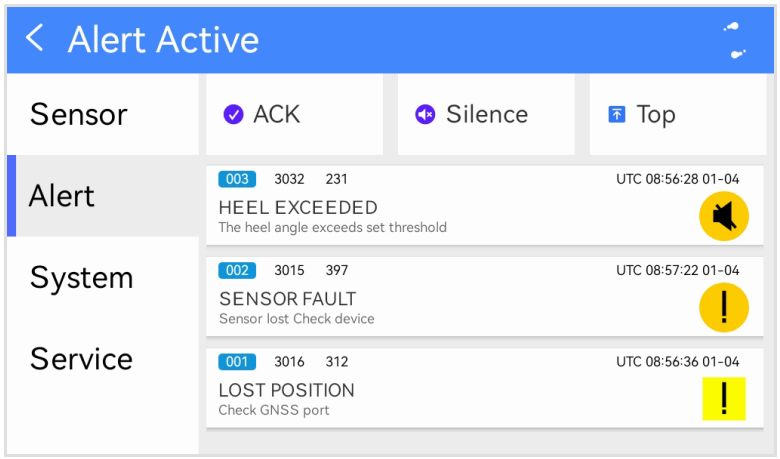
- **Acknowledge**: Press and hold any alert item (such as 002) in the list, and the alert message window appears. Click 

(appears if the alert is not acknowledged) to acknowledge the alert.

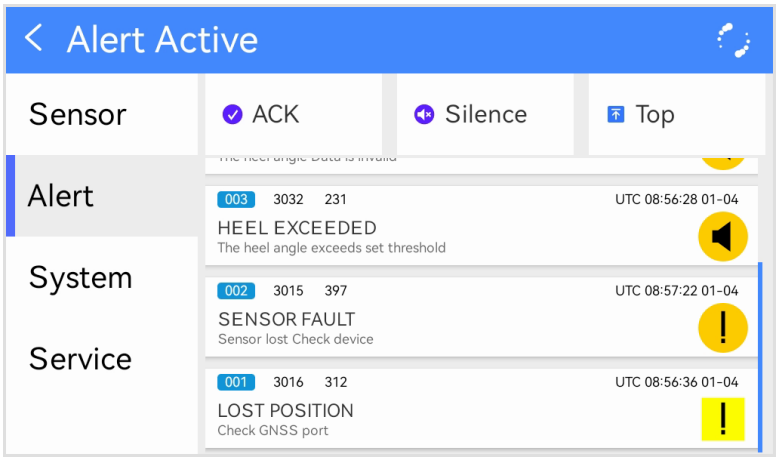
For example:

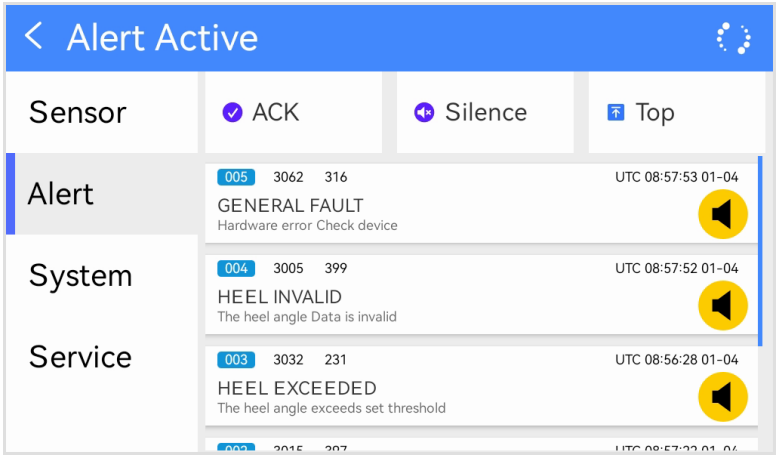


- **Silence**: Click to temporarily silence alerts for 30 seconds. For example:

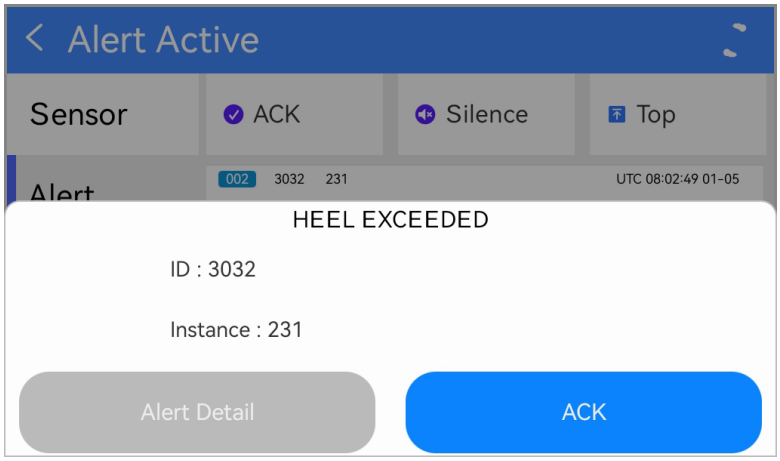


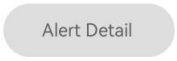
- **Top**: Click to return to the highest priority alert. For example:



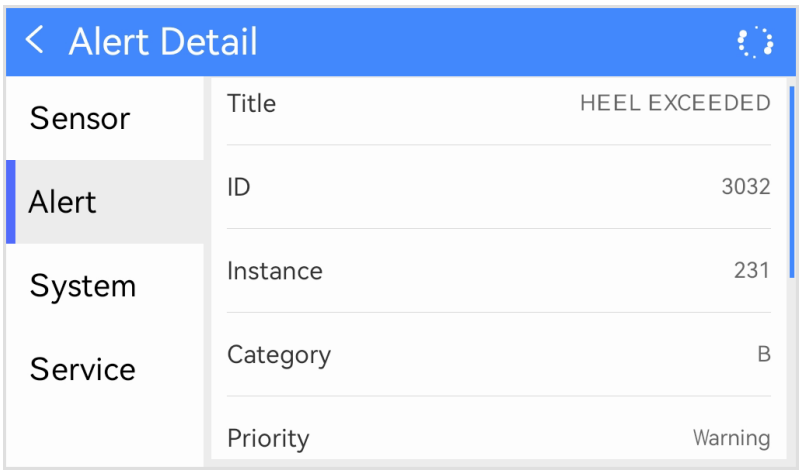


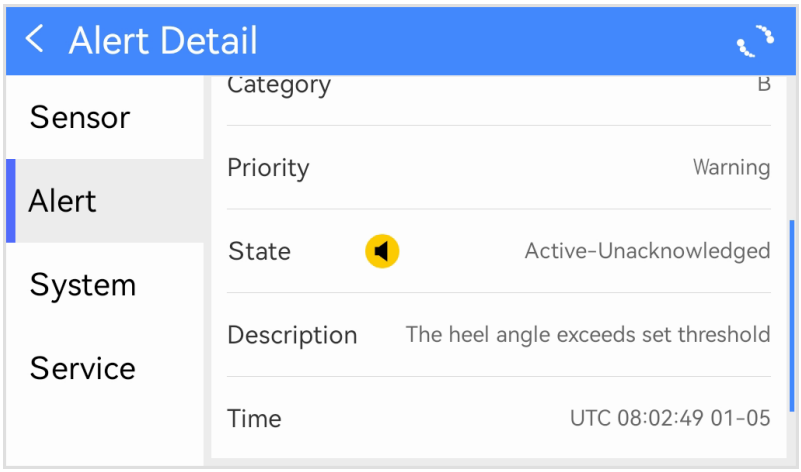
[Alert Detail]: Press and hold any alert item (such as 002) in the list, the alert message window appears. For example:



Click  to view the details.

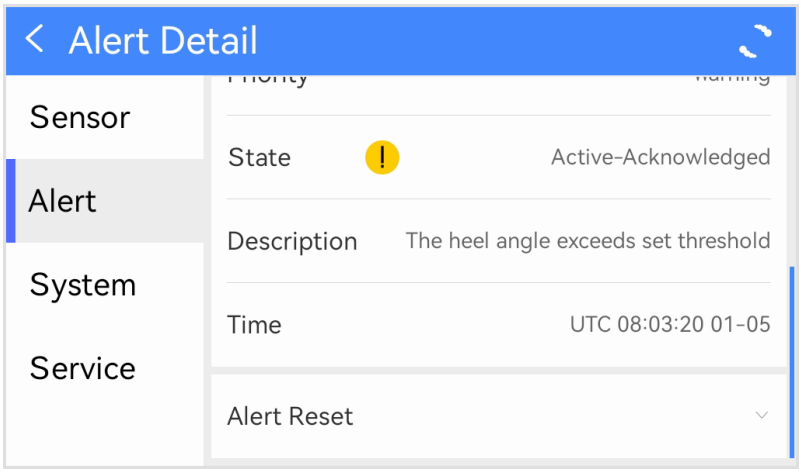
For example, **[Alert Detail]** screen of HEEL EXCEEDED:





Note:

HEEL EXCEEDED alert could only be reset manually by clicking **[Alarm Reset]** in **[Alert Detail]** screen:



Alert Mark Description Table:

MARK	PRIORITY	STATE
	WARNING	ACTIVE-UNACKNOWLEDGED
		ACTIVE-SILENCED
		ACTIVE-ACKNOWLEDGED
		ACTIVE-RESPONSIBILITY TRANSFERRED
		RECTIFIED-UNACKNOWLEDGED
	CAUTION	ACTIVE
	\	NORMAL

Alert Description Table:

ID	Alert Instance	Alert Category	Alert Priority	Alert Title	Additional Description
3032	231	B	WARNING	HEEL EXCEEDED	The heel angle exceeds set threshold
3015	397	B	WARNING	SENSOR FAULT	Sensor lost Check device
3062	316	B	WARNING	GENERAL FAULT	Hardware error Check device
3005	399	B	WARNING	HEEL INVALID	The heel angle Data is invalid
3023	398	B	CAUTION	MAIN POWER FAILURE	Main power Lost Check Power Unit
3023	399	B	CAUTION	BACKUP POWER FAILURE	Backup power Lost Check Power Unit
3016	312	B	CAUTION	LOST POSITION	Check GNSS port

Alert Configuration Table:

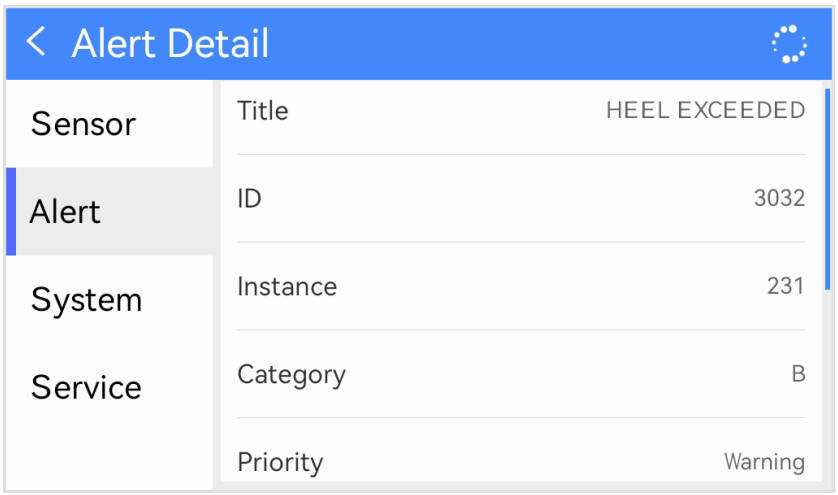
ID	Alert Instance	Alert Category	Alert Priority	Escalation Properties	Permission Acknowledge	Permission Transfer of Responsibility
3032	231	B	WARNING	WARNING	YES	YES
3015	397	B	WARNING	WARNING	YES	YES
3062	316	B	WARNING	WARNING	YES	YES
3005	399	B	WARNING	WARNING	YES	YES

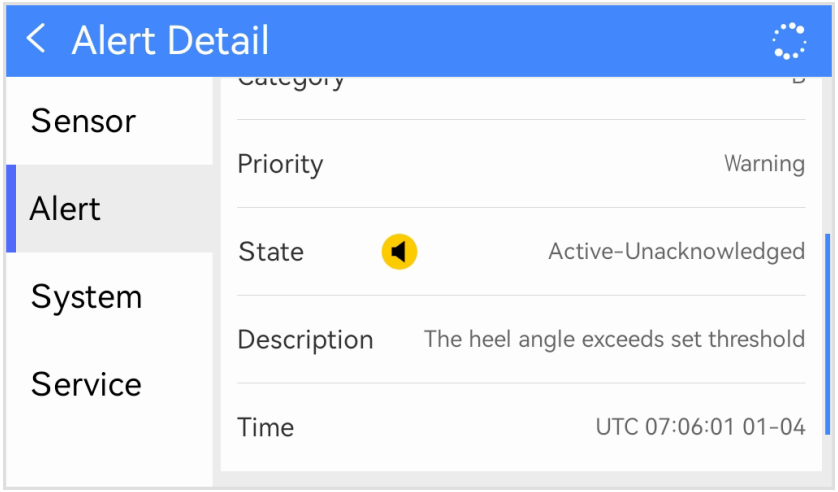
- Responsibility transfer: If CAM sends Valid HBT and Responsibility transfer command ACN,O, and changes the status to Responsibility transferred.
- Cancel Responsibility transfer: If Valid HBT is not received for more than 60s.
- Escalation: An unacknowledged warning will be repeated as a warning after 90s.
- A normally-closed relay contact indicates the loss of main and backup power.

4.2 Alert History

Alert History list is shown as follows (for example), up to 100 records.

Press and hold any alert item (for example, 075) in the list to view the details.

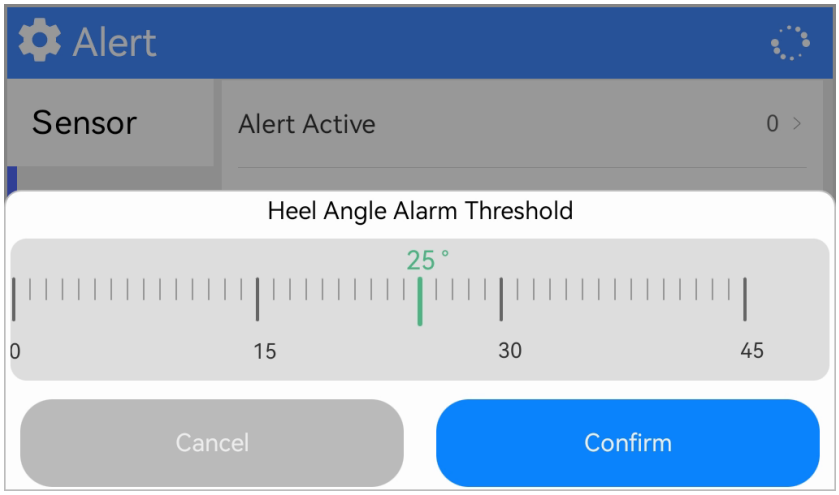




4.3 Heel Angle Alarm Threshold

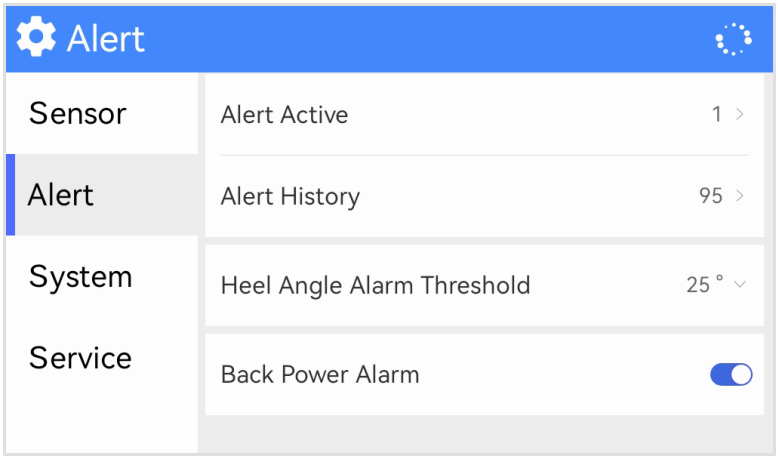
When the heel angle exceeds the preset threshold, the alarm activates.

The default threshold is 25°.



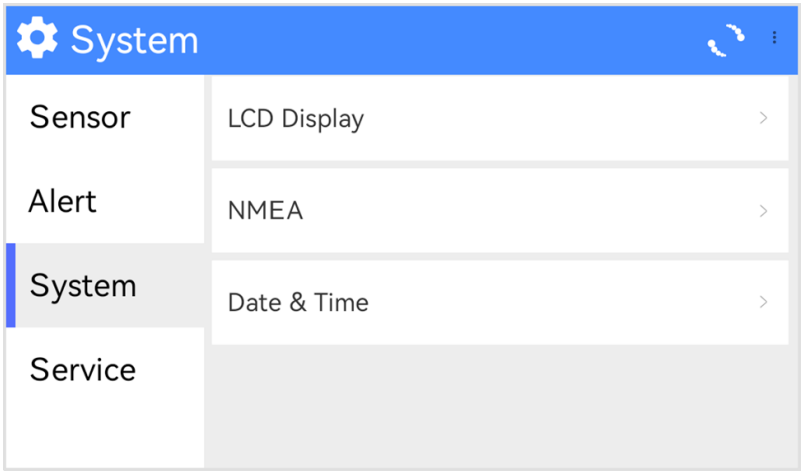
4.4 Back Power Alarm

You can set **[Back Power Alarm]** as ON ( ) or OFF ( ).



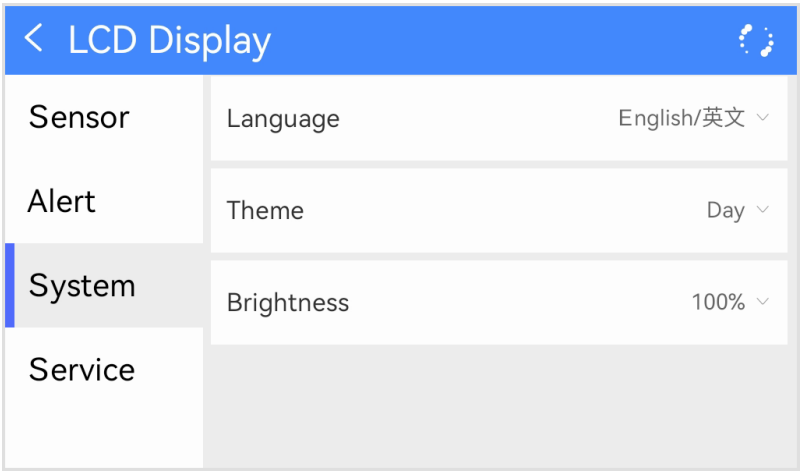
5. SYSTEM SETTING

Click **[MENU]** - **[System]**, the **[System]** screen appears. It includes **[LCD Display]**, **[NMEA]**, and **[Date & Time]** items.



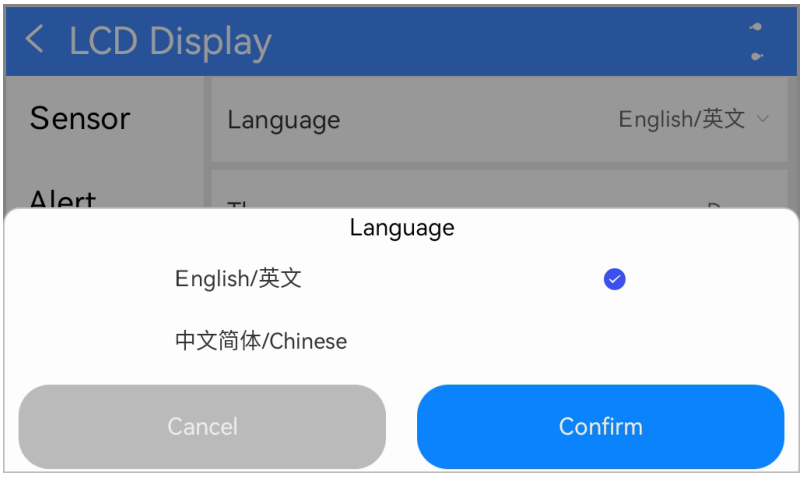
5.1 LCD Display

Click **[MENU]** - **[System]** - **[LCD Display]**, then you can set **[Language]**, **[Theme]** and **[Brightness]** in **[LCD Display]** screen.



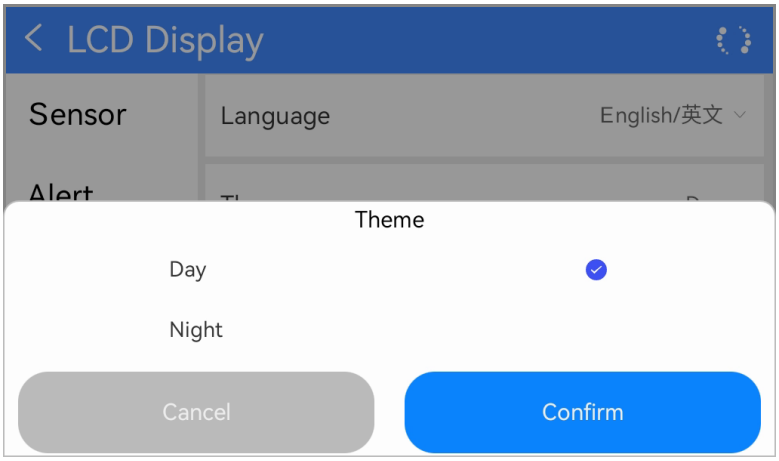
5.1.1 Language

Language: Select the language to be used (**English** or **Chinese**). Please restart the system after selection.

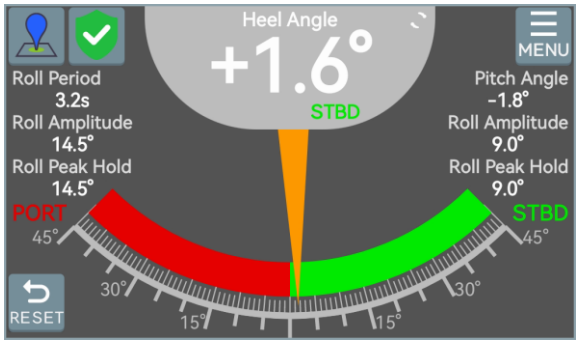


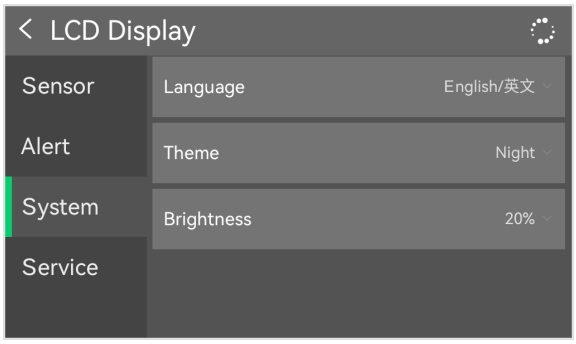
5.1.2 Theme

Theme: Set the display mode (**Day** or **Night**).

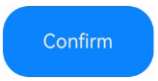


For example, night mode:

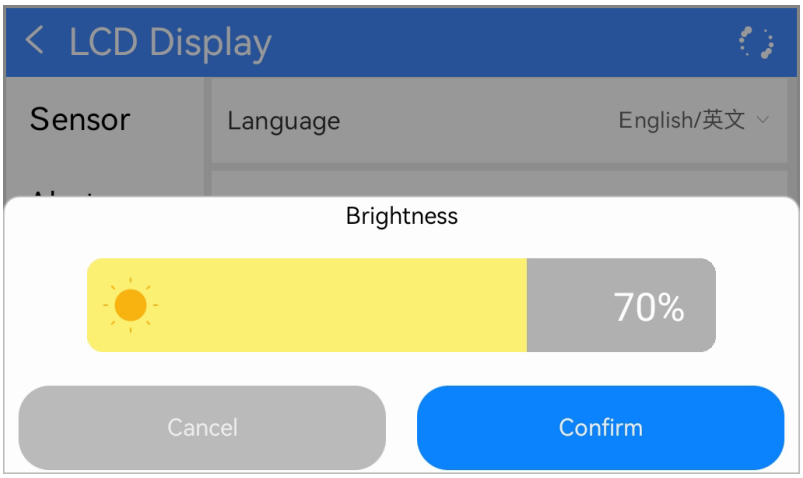




5.1.3 Brightness

Brightness: Slide or pull down to adjust the brightness of the screen. Click 

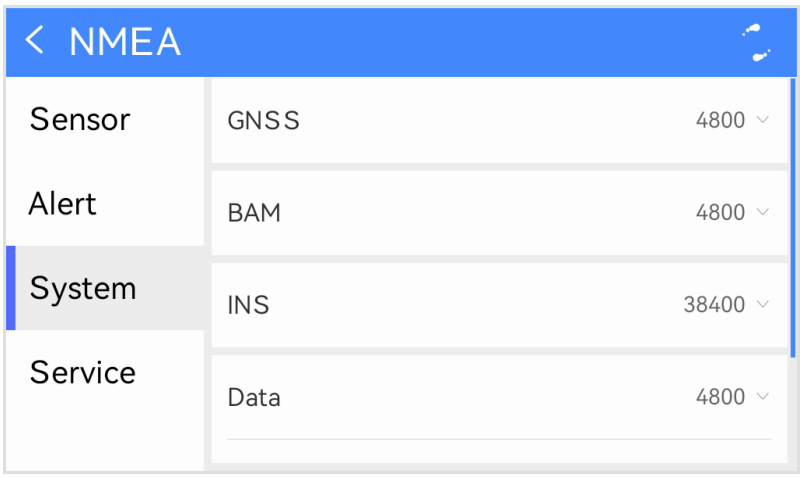
to confirm the setting.

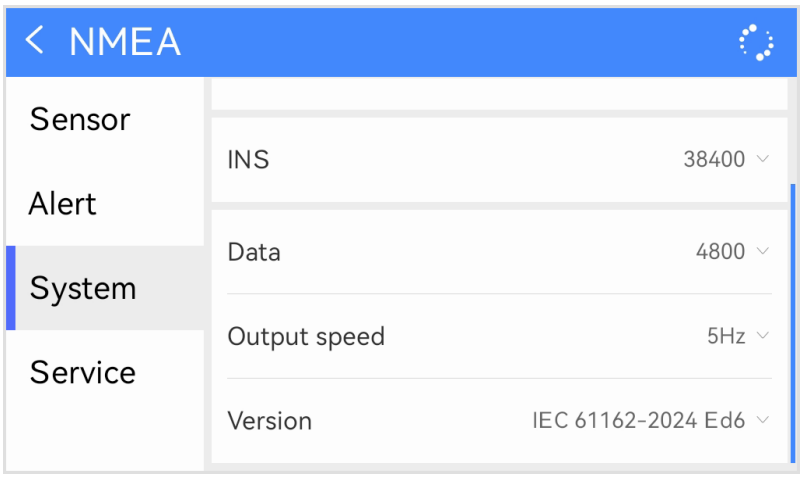


5.2 NMEA

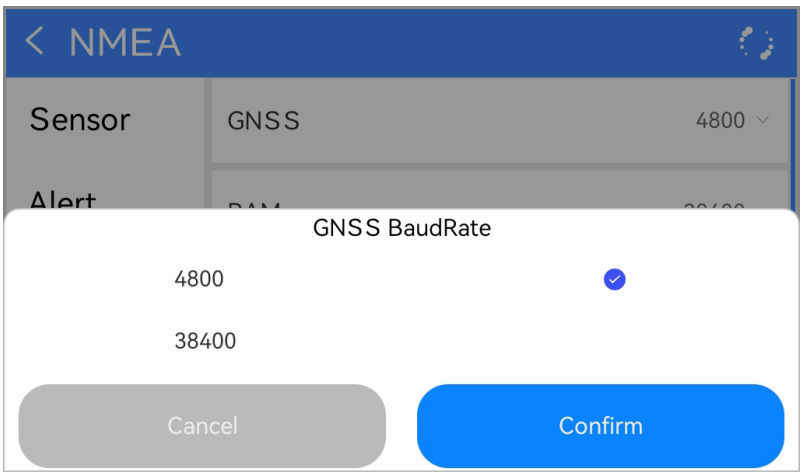
This function is used to set the interface when installing the sensor unit of NEI-3000.

Click **[MENU]** - **[System]** - **[NMEA]**, the **[NMEA]** screen appears, which includes Baud Rate of **[GNSS]**, **[BAM]**, **[INS]**, **[Data]**, **[Output speed]** and **[Version]** items.

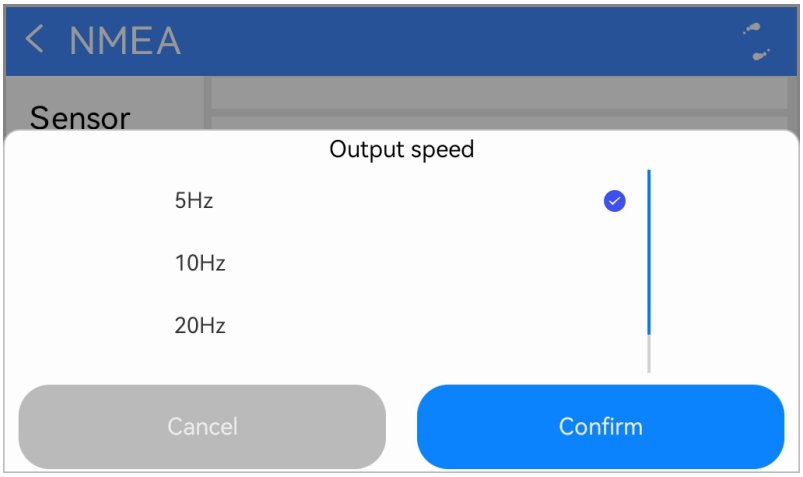




GNSS/BAM/INS/Data: Set Baud Rate of each port as 4800 or 38400 bps.



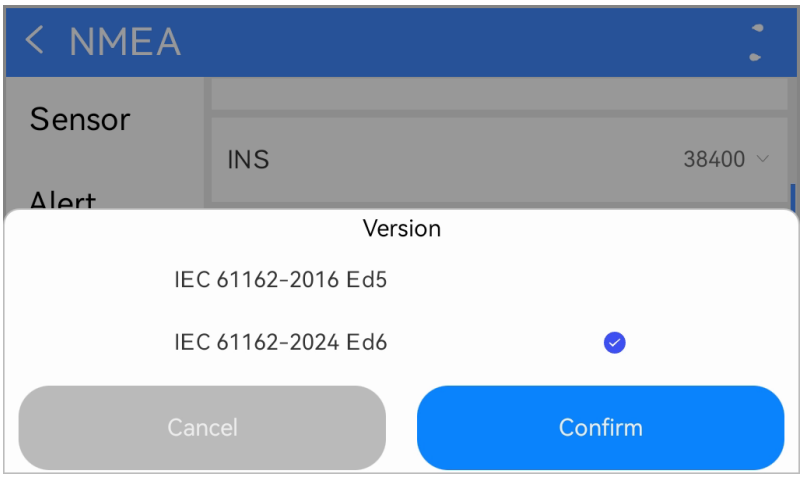
Output speed: Set the output speed as 5Hz, 10Hz, 20Hz or 50Hz.



Version: Set NMEA version as Ed5 or Ed6.

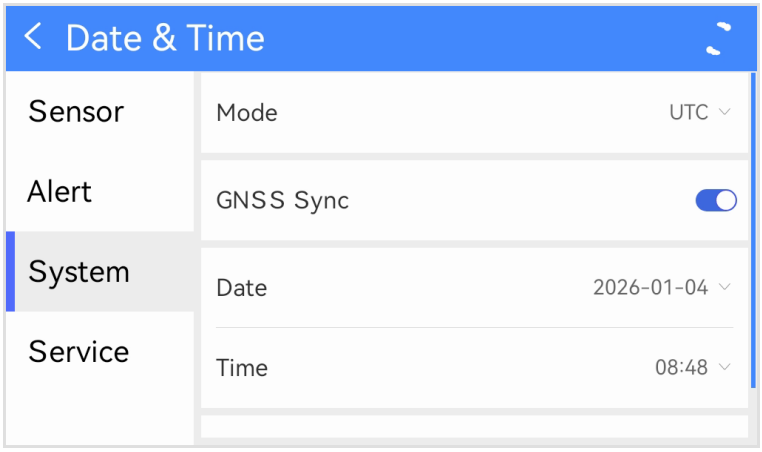
- **IEC 61162-2016 Ed5**: HRM sentence has 10 fields, and POS sentence requires output every 3 seconds.
- **IEC 61162-2024 Ed6**: HRM sentence has 13 fields and can be used as commands to set devices, and POS sentence requires output every 30 seconds.

Note: For details, refer to Appendix D.



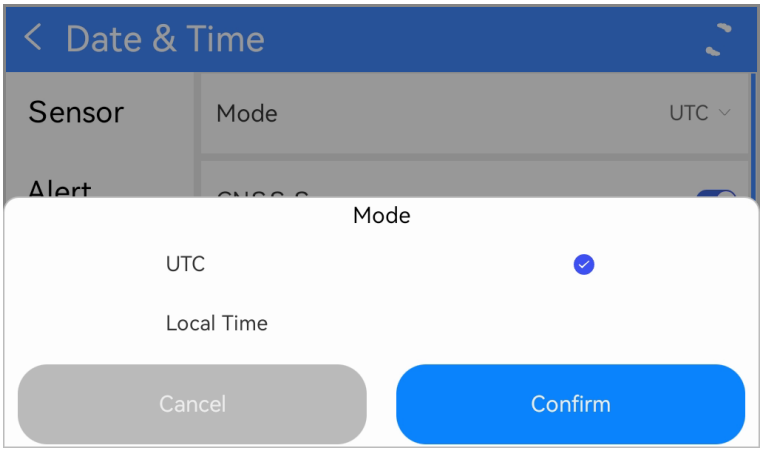
5.3 Date & Time

Click **[MENU]** - **[System]** - **[Date & Time]**, the following screen appears, which includes **[Mode]**, **[GNSS Sync]**, **[Date]**, **[Time]** and **[Local Time Zone]** items.



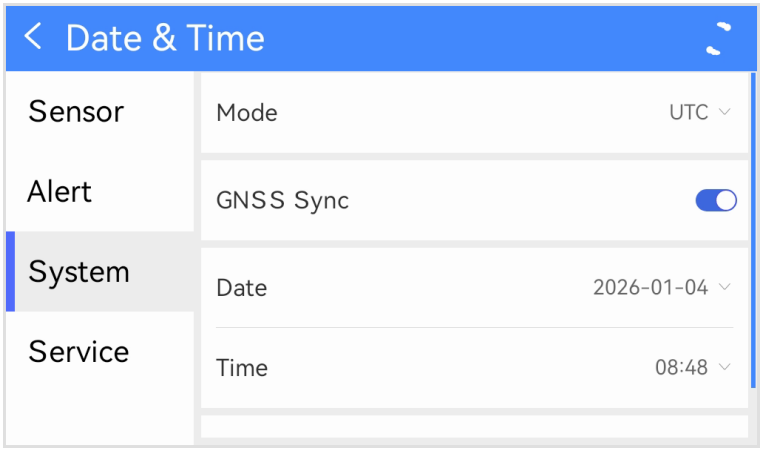
5.3.1 Mode

Mode: The displayed time can be selected between "**UTC**" and "**Local Time**".



5.3.2 GNSS Sync

GNSS Sync: Click  to set "**ON**" or "**OFF**".

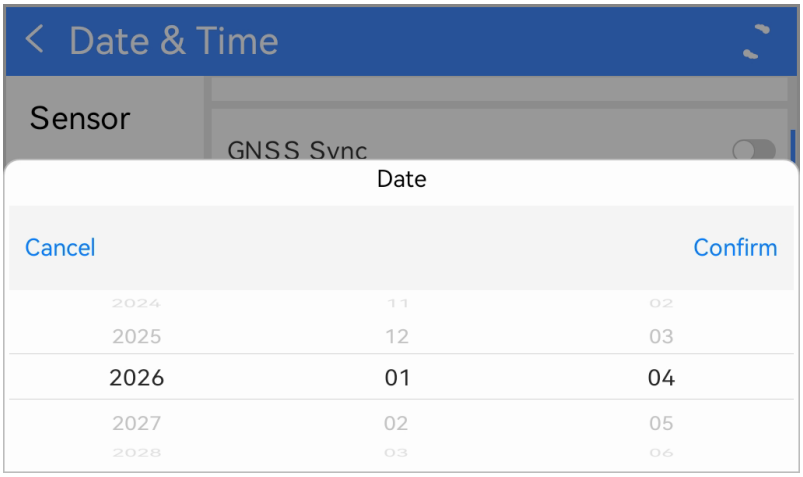


ON ( ): Date and Time is automatically synchronized with GNSS sentence.

OFF ( ): Date and Time can be set manually.

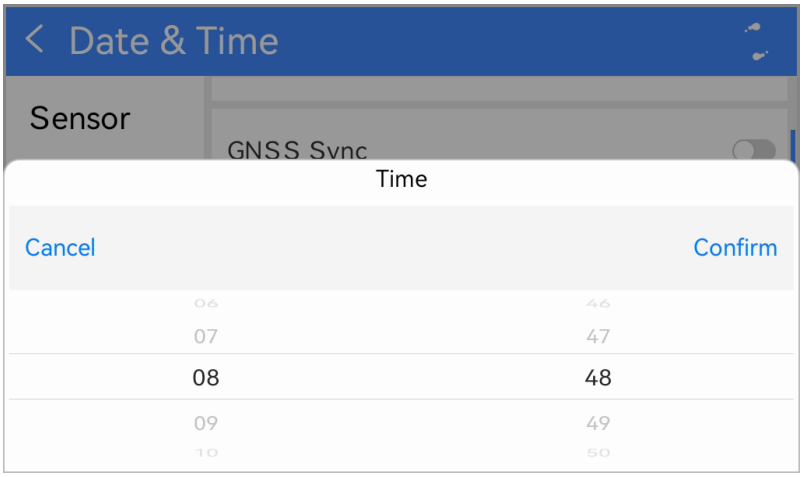
5.3.3 Date

Date: Set the date manually when **[GNSS Sync]** setting is "**OFF**".



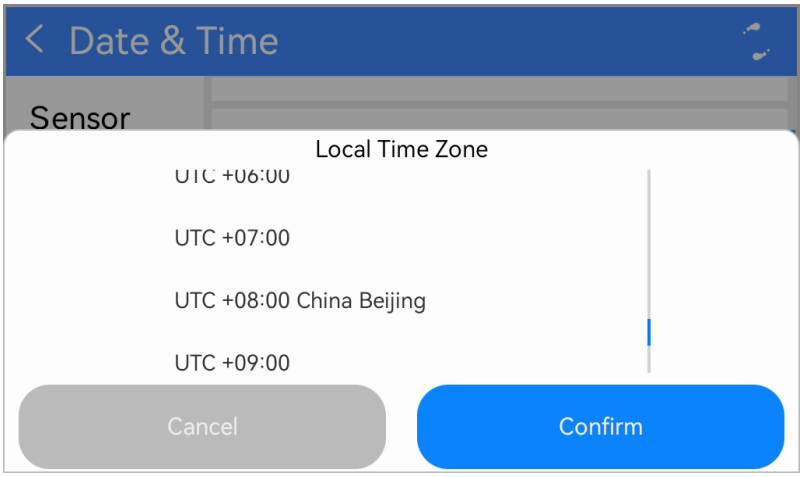
5.3.4 Time

Time: Set the time manually when **[GNSS Sync]** setting is "**OFF**".



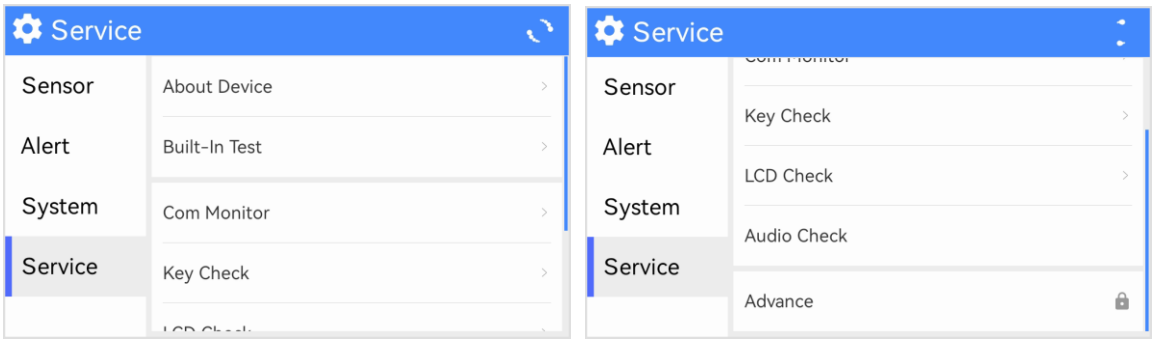
5.3.5 Local Time Zone

Local Time Zone: Pull down to set the local time zone. For example: "**UTC +08:00 China Beijing**".


Date & Time
Sensor
Local Time Zone
UTC +06:00
UTC +07:00
UTC +08:00 China Beijing
UTC +09:00
Cancel
Confirm

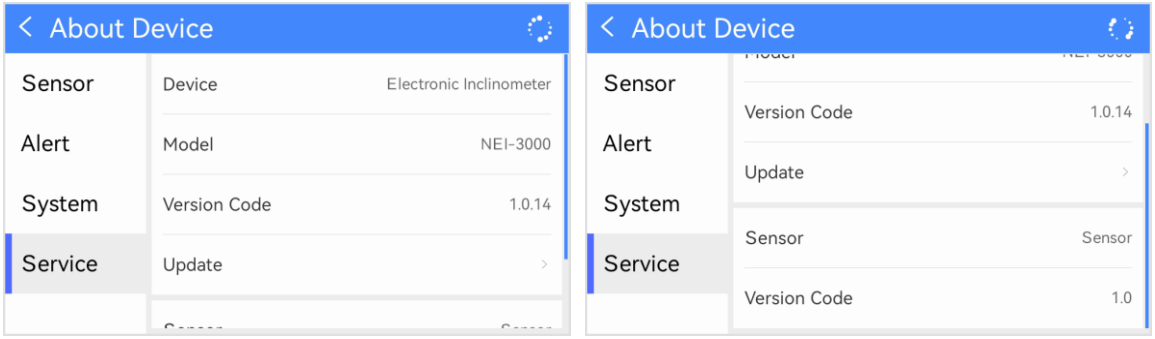
6. SERVICE

Click **[MENU]** - **[Service]**, the following screen appears. It includes **[About Device]**, **[Built-In Test]**, **[Com Monitor]**, **[Key Check]**, **[LCD Check]**, **[Audio Check]** and **[Advance]** items.



6.1 About Device

Click **[MENU]** - **[Service]** -**[About Device]**, the right screen appears, you can check the device name, model, version information, and update the software.



6.1.1 Device Information

As shown above, you can check the following device information:

Device: Device Name (Electronic Inclinometer).

Model: Device Model (NEI-3000).

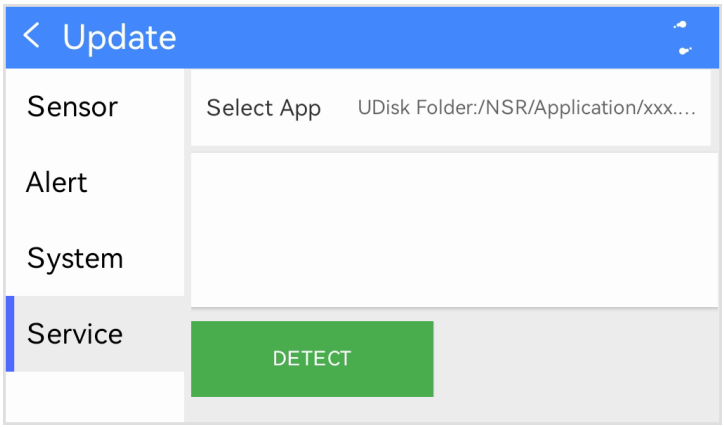
Version Code: Product Version.

Sensor: Module Name (Sensor).

Version Code: Module Version.

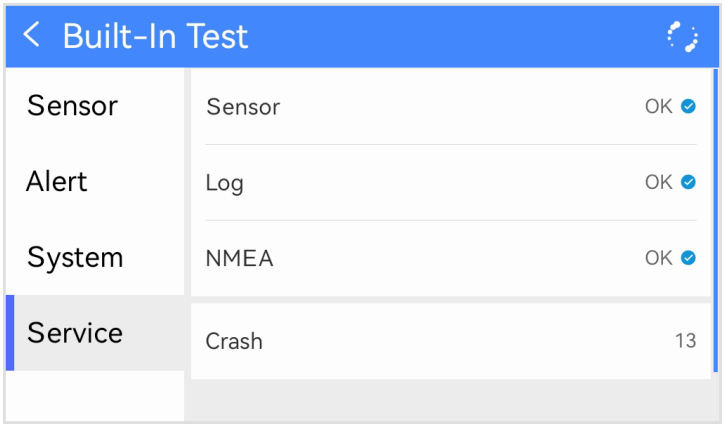
6.1.2 Software Update

Update: Click to update the software. Please refer to the upgrade guide for the detailed procedures.



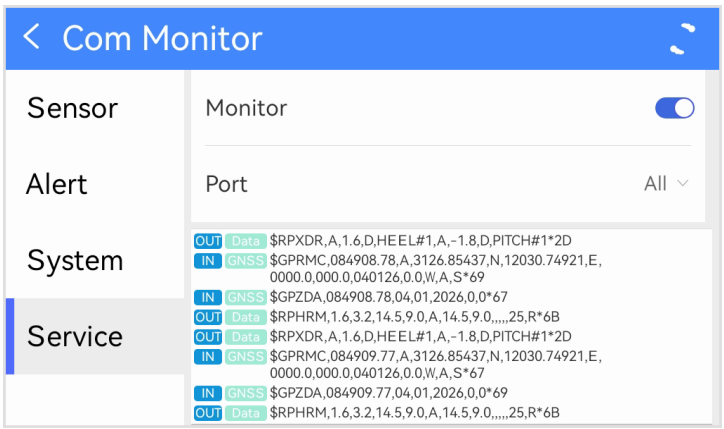
6.2 Built-In Test

Click **[MENU]** - **[Service]** - **[Built-In Test]**, the following screen appears. It includes: **[Sensor]**, **[Log]**, **[NMEA]** and **[Crash]** items. You can check OK or not.



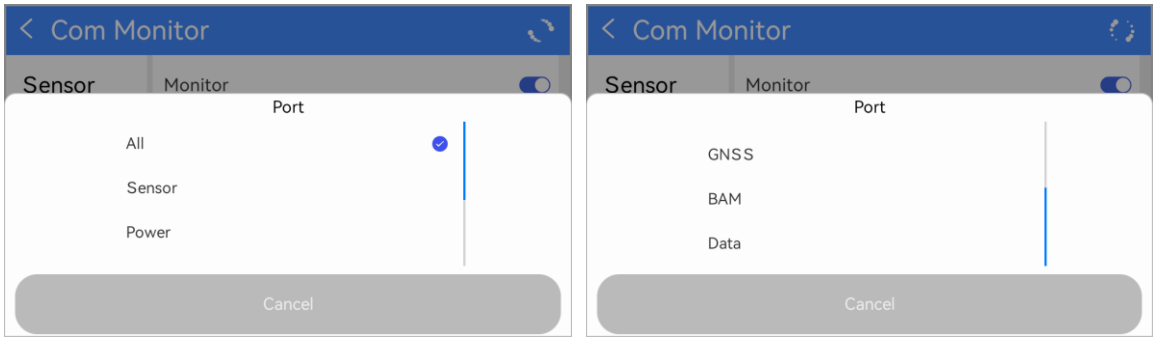
6.3 Com Monitor

It's to check the communication sentences on the I/O ports. Click **[MENU]** - **[Service]** - **[Com Monitor]**, the following screen appears:



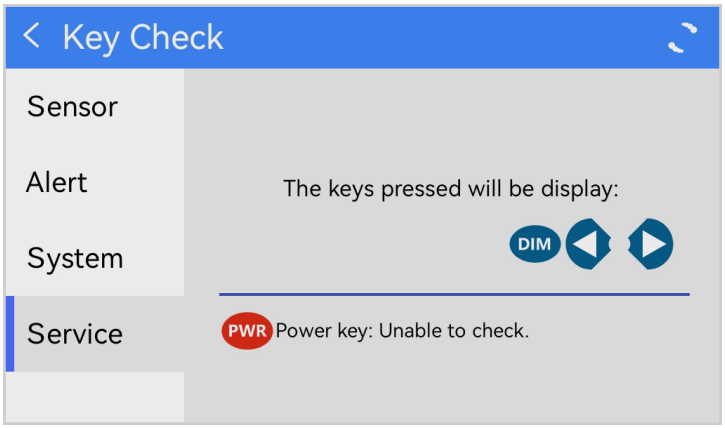
Monitor: Click to set "**ON**" ( ) or "**OFF**" ( ).

Port: Pull down to select the ports.



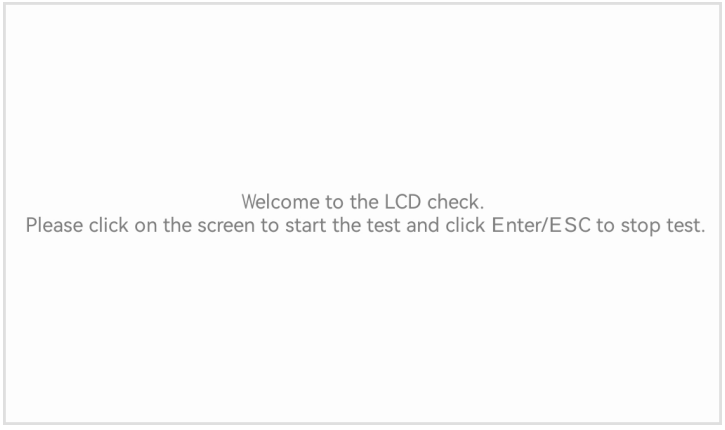
6.4 Key Check

Click **[MENU]** - **[Service]** - **[Key Check]**, the keys pressed will be displayed (except **PWR** key).



6.5 LCD Check

Click **[MENU]** - **[Service]** - **[LCD Check]**, the following screen appears. Click on the screen to start the test and press **PWR** key twice to stop the test (the first acts as ESC, the second exits the LCD check).

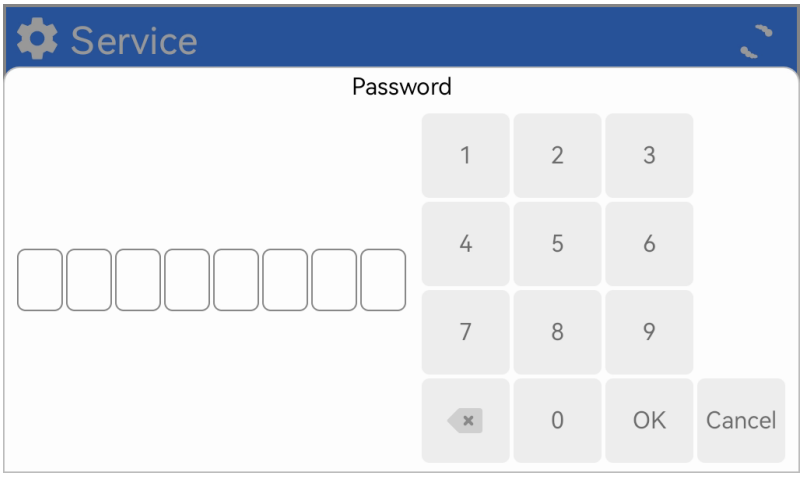


6.6 Audio Check

Click **[MENU]** - **[Service]** - **[Audio Check]**, alarm sounds 3 times.

6.7 Advanced

Access to **[MENU]** - **[Service]** - **[Advance]** is only for authorized service engineers and a password is required. Please contact NSR or the local agent.



7. INSTALLATION

7.1 Installation of Display Unit

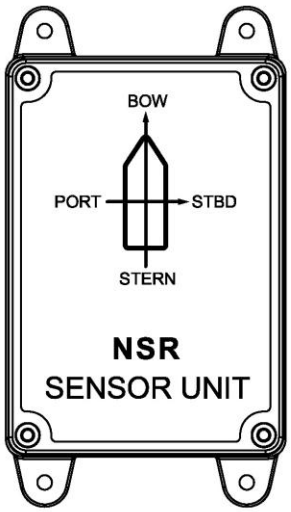
The display unit can be installed on a tabletop, on the overhead, or in a panel (optional flush mounting brackets required). Refer to the outline drawings at the end of this manual for installation instructions. When selecting a mounting location, keep in mind the following points:

- Locate the unit away from exhaust pipes and vents.
- The mounting location should be well-ventilated.
- Mount the unit where shock and vibration are minimal.
- Locate the unit away from equipment that generates electromagnetic fields, such as a motor or generator.
- Allow sufficient maintenance space at the sides and rear of the unit and leave sufficient slack in cables, to facilitate maintenance and servicing.
- Observe the compass safe distance to prevent deviation of a magnetic compass.

7.2 Installation of Sensor

Refer to the outline drawings at the end of this manual for sensor unit installation instructions. When selecting a mounting location, keep in mind the following points:

- The sensor unit should be installed on a horizontal surface and aligned with the ship's axis according to the following figure. Improper installation may seriously affect the sensor accuracy.

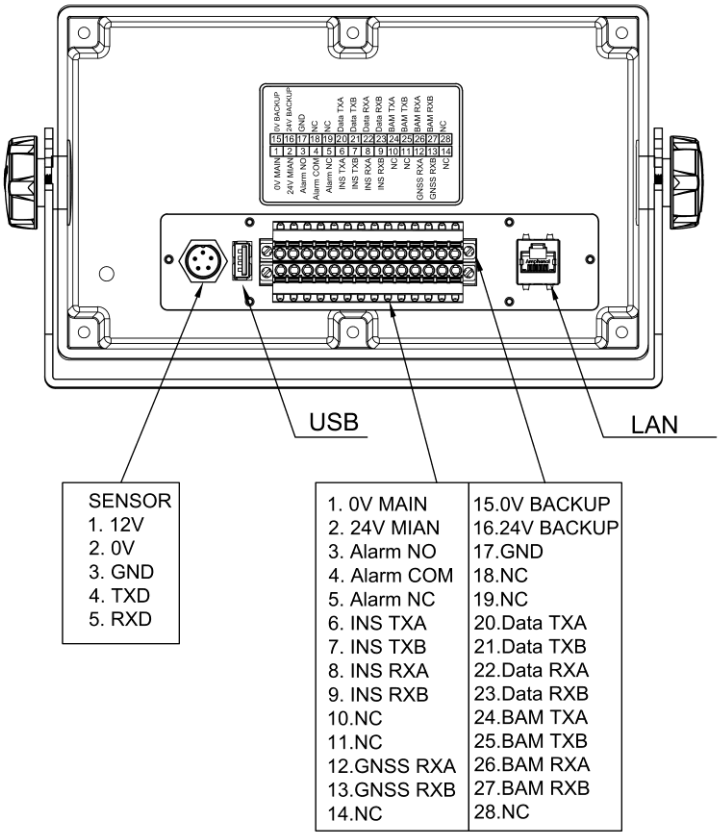


- Reduces the impact of dynamics and acceleration on the sensor unit.
- Care must be taken when mounting the sensor unit to ensure that there is sufficient space for cables and connectors. The cables should not be laid near or in parallel with other power cables.

- After installation, the coordinate parameters of the sensor unit should be measured according to the hull drawing and saved in the display unit.
- Observe the compass safe distances to prevent deviation of a magnetic compass.

7.3 Cable Connection

The port descriptions is as follows. Please refer to the installation drawings for cable connection.



- **Digital Interface**

GNSS: IEC 61162-1 (4800 bps) or IEC 61162-2 (38400 bps).
BAM: IEC 61162-1 (4800 bps) or IEC 61162-2 (38400 bps).
INS: IEC 61162-1 (4800 bps) or IEC 61162-2 (38400 bps).
DATA: IEC 61162-1 (4800 bps) or IEC 61162-2 (38400 bps).

- **Relay output**

Normal open and normal close.

7.4 Function Verification

Please do the following procedures:

- Rotate the sensor unit along its X-axis and confirm the heel angle reading varies accordingly.
- Rotate the sensor unit along its Y-axis and confirm the Pitch Angle reading varies accordingly.
- Shake the sensor unit on its Y-axis and confirm the Roll Amplitude reading varies accordingly.

8. MAINTENANCE

When an unrecoverable alert such as sensor failure, general failure, etc., please enter the device information menu as well as the built-in test menu to provide the firmware information and fault codes to NSR.

8.1 ROUTINE MAINTENANCE

In order to keep the system functioning, routine maintenance is necessary. Check below once a month.

Item	Description	Item
Cable	Cables are not damaged and exposed.	Replace the damaged parts.
Sensor unit	Check cable connections.	Tighten loosened connections.
	Check the mounting location.	The sensor unit should be installed on a horizontal surface and aligned with the ship's axis according to the figure.
Display Unit	Check cable connections.	Tighten loosened connections.
	Remove dust from the display unit with a soft cloth. ***Note: Do not use chemical cleaners to clean the display unit; they can remove paint or markings and deform the equipment.***	Wipe the LCD carefully to prevent scratching, using tissue paper and an LCD cleaner. To remove dirt or salt deposits, use an LCD cleaner, wiping slowly with tissue paper so as to dissolve the dirt or salt. Change tissue paper frequently so the salt or dirt does not scratch the LCD.
Power Supply	Check cable connections.	Tighten loosened connections.
	Check that the supply voltage is within the rated range.	If not within the range, check the power source. Low or over voltage may cause abnormal operation.

8.2 TROUBLESHOOTING

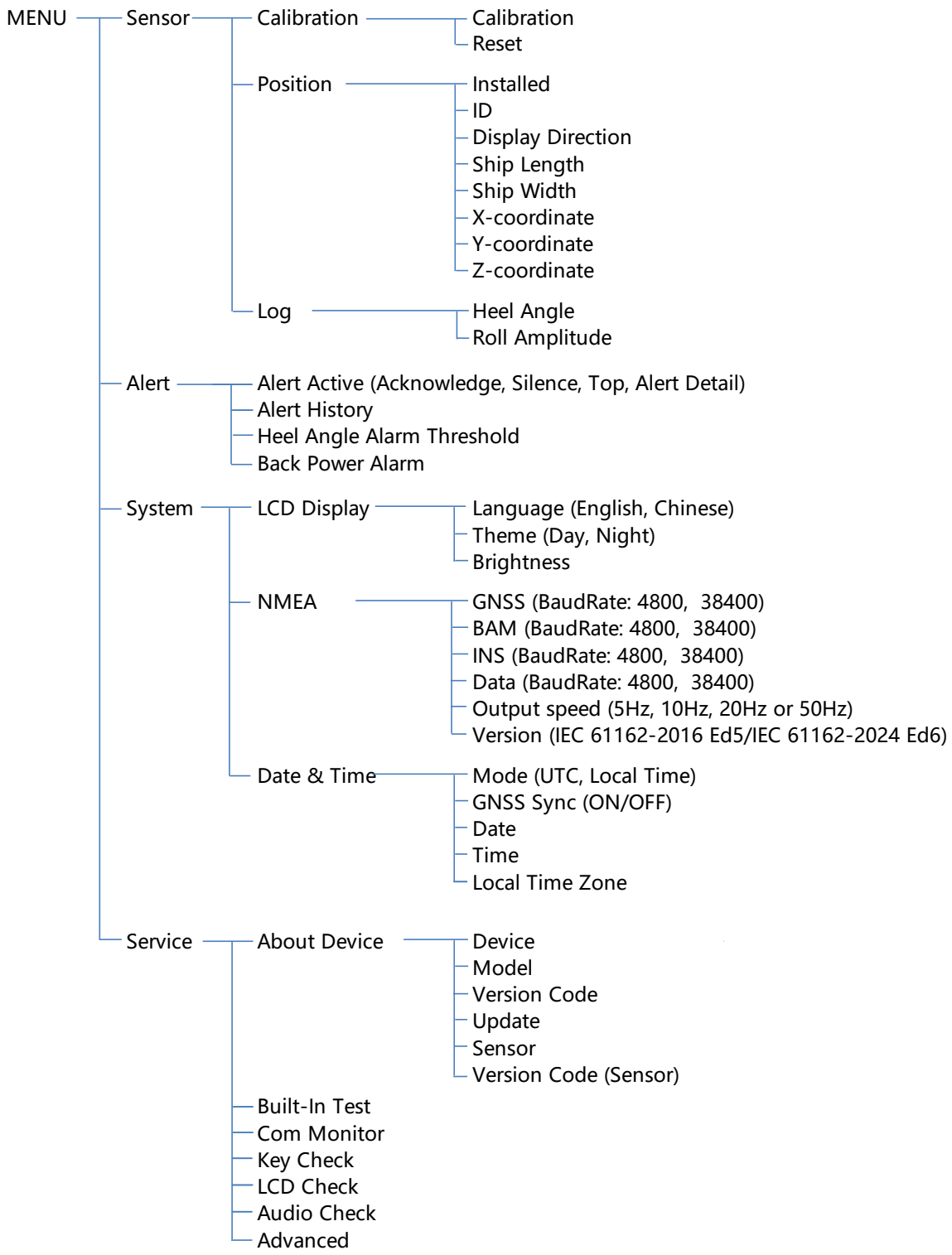
Below are common problems and possible solutions. If the problem cannot be recovered, please contact your local dealer or the manufacturer.

Problem	Probable cause	Remedy
Cannot power on	Check the power cable and connectors.	Replace damaged parts.
	Check cable connections.	Tighten loosened connections.
	Voltage is not suitable.	Check supply voltage.
	Check the fuses. If a fuse is broken, find the cause before replacing it.	Replace the designated fuses.
Missing data	Check the sensor cable and connectors.	Replace damaged parts.
	Check cable connections.	Tighten loosened connections.
	Check the sensor unit for damage.	Repair/Replace the sensor unit.
	Invalid data.	Adjust the mounting location of the sensor unit.
Dark display	Check the cable and connectors.	Replace damaged parts. Tighten loosened connections.
	The display brightness is too low.	Press the **DIM** button to adjust the display brightness.

APPENDIX A TECHNICAL SPECIFICATIONS

- **Heel Angle**: Range: ± 90°, Accuracy: ±1°
- **Roll Amplitude**: Range: ± 90°, Accuracy: ±1°
- **Roll Period**: Range: 4~ 40s, Accuracy: ±1s
- **Pith Angle**: Range: ± 90°, Accuracy: ±1°
- **O/S**: Android
- **LCD Display**: Touch screen operation
  - Size: 7 inch
  - Resolution: 1024×600
  - Visible distance: 1m
- **Interface**
  - I/O sentence: IEC 61162-1 & IEC 61162-2
  - External alarm: Relay output
  - USB: Software update
- **Power Supply**: DC 24V (9V ~ 36V), main / backup
- **Power Consumption**: <10W
- **Size**: 145 (H) × 264 (W) × 83 (D) mm (Display Unit)
  206 (H) × 114.8 (W) × 71 (D) mm (Sensor Unit)
- **Weight:** 1.3 kg (Display Unit)
  0.7 kg (Sensor Unit)
- **Environmental Conditions**
  - Ambient Temperature: -15°C ~ +55°C
  - Relative Humidity: ≤93%RH (40°C)
  - Compass Safe Distance: Display Unit
    Standard Compass: 0.25m, Steering Compass: 0.15m
    Sensor Unit
    Standard Compass: 0.20m, Steering Compass: 0.10m
  - IP Grade: IP22

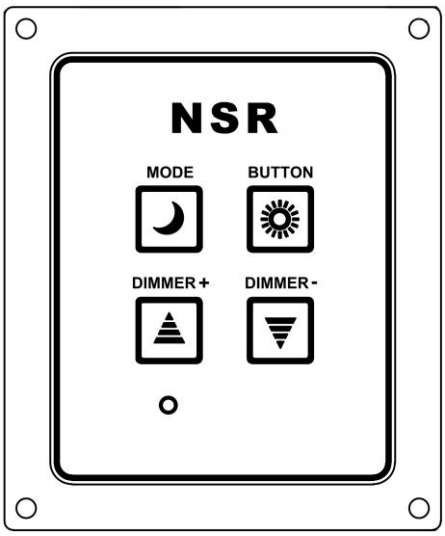
APPENDIX B MENU TREE



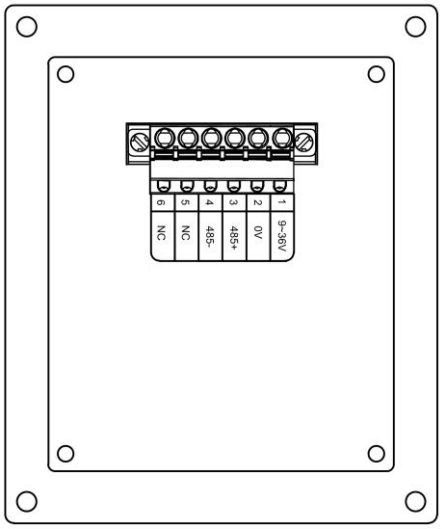
APPENDIX C INSTRUCTIONS ON DIMMER CONTROLLER

NDC-100 Dimmer Controller is an optional part which mainly used for remote brightness control. When the Display Unit is installed up the bridge, in which case, panel operation is impossible, a Remote Dimmer Controller is necessary to operate the Display Unit.

C.1 PRODUCT LAYOUT



Front View



Back View

C.2 BASIC OPERATION

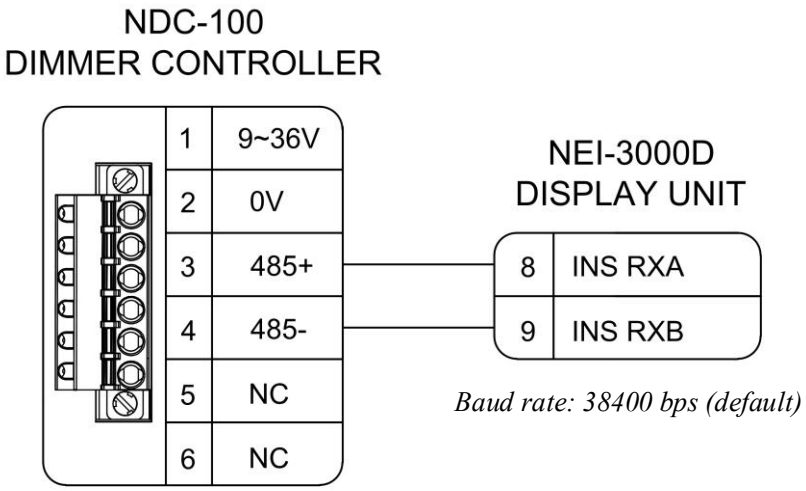
Panel Key	Description
	Press the key shortly to switch between Day and Night mode.
	Press the key shortly to adjust NDC-100 key backlight.
	Short-press: Increase brightness; Long-press: Switch to maximum (99) brightness.
	Short-press: Reduce brightness; Long-press: Switch to minimum (49/50) brightness.

C.3 TECHNICAL SPECIFICATIONS

Power supply:	DC24V (range: 9V~36V)
Brightness level:	1/10/20/30/40/50/60/70/80/90/99
Interface:	RS485 (default) / RS422
Baud rate:	4800 bps
Operating temp:	-15℃～+55℃
Size:	100 (W) × 120 (H) × 19.5 (D) mm

C.4 INSTALLATION

NDC-100 is a flush mount type. Make a cutting area as shown in the attached drawings.

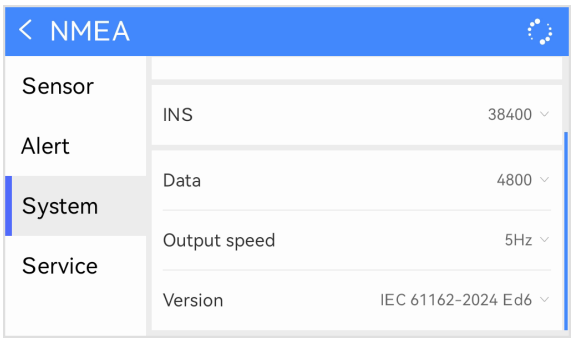


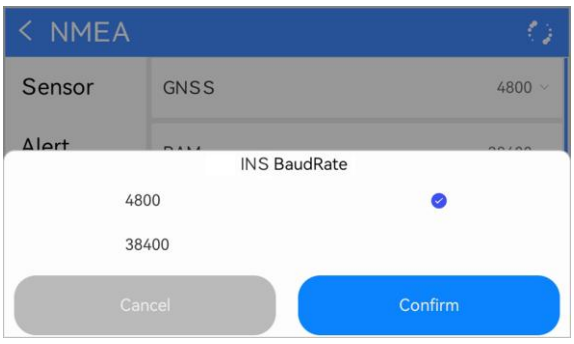
Baud rate: 38400 bps (default)

Baud rate: 4800 bps (default)

Note: Please check the INS baud rate of NEI-3000D while install NDC-100. If the baud rate is different from the default baud rate of NDC-100, set NEI-3000D baud rate as follows:

Click **[MENU] - [System] - [NMEA] - [INS]**, set Baud Rate of INS port as 4800. Please refer to Section 5.2.





APPENDIX D SENTENCE DESCRIPTION

I/O Sentences

Input sentences (IEC 61162-1 & IEC 61162-2)	Output sentences (IEC 61162-1 & IEC 61162-2)
GNSS port: GGA, GLL, RMC, ZDA BAM port: ACN, HBT Data port: HRM	BAM port: ALC, ALF, ARC, TXT Data port: HRM, POS, TXT, XDR

Manufacturer's mnemonic code: NSC

ACN – Alert command

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

1. Time
2. Manufacturer's mnemonic code
3. Alert Identifier
4. Alert Instance, 0 to 999999
5. Alert command, A, Q, O or S
6. Sentence status flag

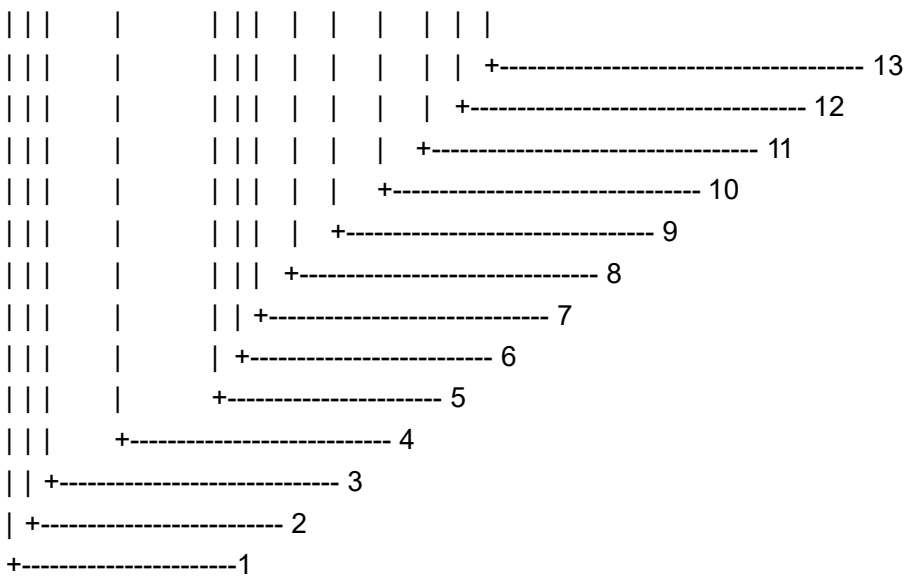
ALC - Cyclic alert list

```
$--ALC,xx,xx,xx,x.x,aaa,x.x,x.x,x.x,.....,aaa,x.x,x.x,x.x*hh <CR><LF>
       | | |  |   |   |   |  |   | |  |         |
       | | |  |   |   |   |  |   | |  +---------+----------------- 7
       | | |  |   |   |   |  |   |  +--+-------------------------- 6
       | | |  |   +---+---+---+----------------------------- 5
       | | |  +-------------------------------------------- 4
       | |  +------------------------------------------- 3
       |  +------------------------------------------ 2
       +------------------------------------------ 1
```

1. Total number of sentences for this message, 01 to 99
2. Sentence number, 01 to 99
3. Sequential message identifier, 00 to 99
4. Number of alert entries
5. Alert entry 1
6. Additional Alert entries
7. Alert entry n

ALF - Alert sentence

$--ALF,x,x,x,hhmmss.ss,a,a,a,aaa,x.x,x.x,x.x,x,c--c*hh <CR><LF>

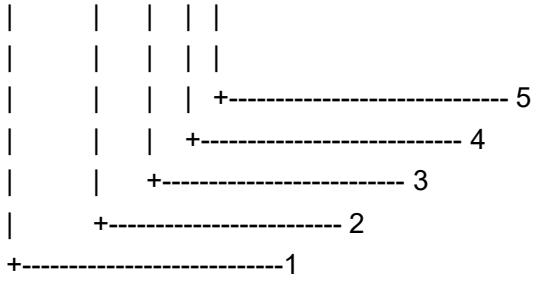


1. Total number of ALF sentences for this message, 1 to 2
2. Sentence number, 1 to 2
3. Sequential message identifier, 0 to 9
4. Time of last change, see NOTE A
5. Alert category, A, B or C
6. Alert priority, E, A, W or C
7. Alert state, A, S, N, O, U or V
8. Manufacturer's mnemonic code
9. Alert identifier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

NOTE A: If the system time is out of sync with valid ZDA sentence, this filed is NULL.

ARC - Alert command refused

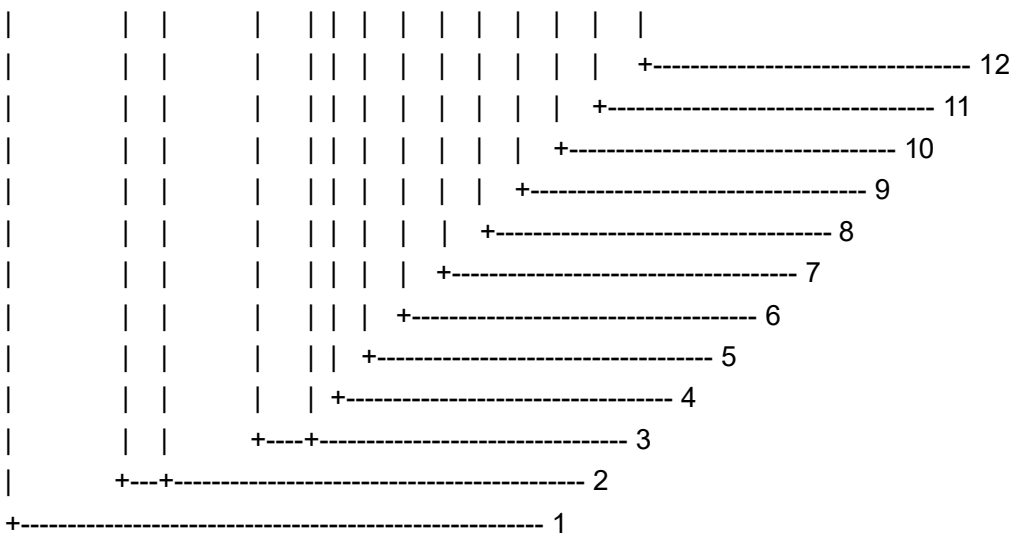
$--ARC,hhmmss.ss,aaa,x.x,x.x,c*hh <CR><LF>



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

GGA -Global positioning system (GPS) fix data

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

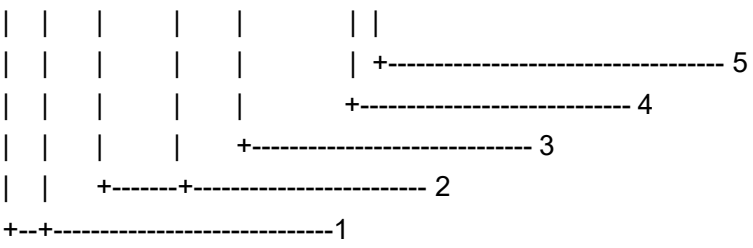


1. UTC of position
2. Latitude, N/S
3. Longitude, E/W
4. GPS quality indicator
5. Number of satellite in use, 00-12, may be different from the number in view
6. Horizontal dilution of precision
7. Antenna altitude above/below
8. Unit of Antenna altitude, m
9. Geoidal separation

10. Unit of geoidal separation, m
11. Age of differential GPS data
12. Differential reference station ID, 0000-1023

GLL – Geographic position – Latitude/longitude

$--GLL,llll.ll,a,yyyyy.yy,a,hhmmss.ss,A,a*hh<CR><LF>

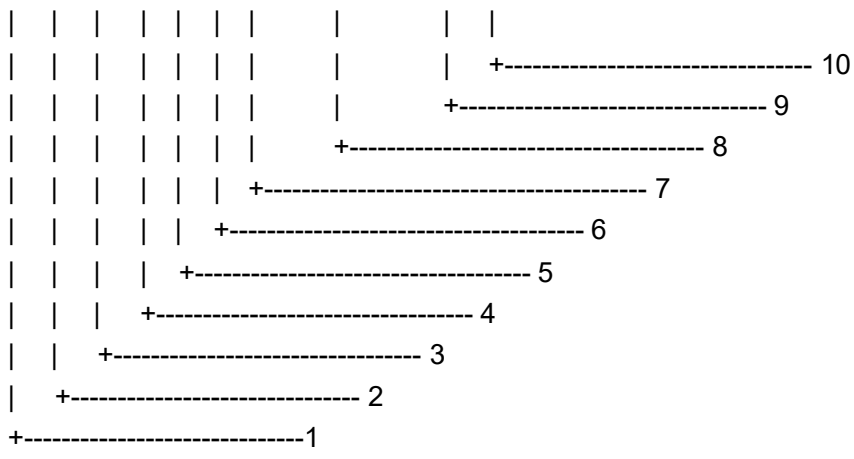


1. Latitude, N/S
2. Longitude, E/W
3. UTC of position
4. Status A=data valid V=data invalid
5. Mode indicator

HRM - heel angle, roll period and roll amplitude measurement device

IEC 61162-2016 Ed5:

$--HRM,x.x,x.x,x.x,x.x,A,x.x,x.x,hhmmss.ss,xx,xx*hh<CR><LF >

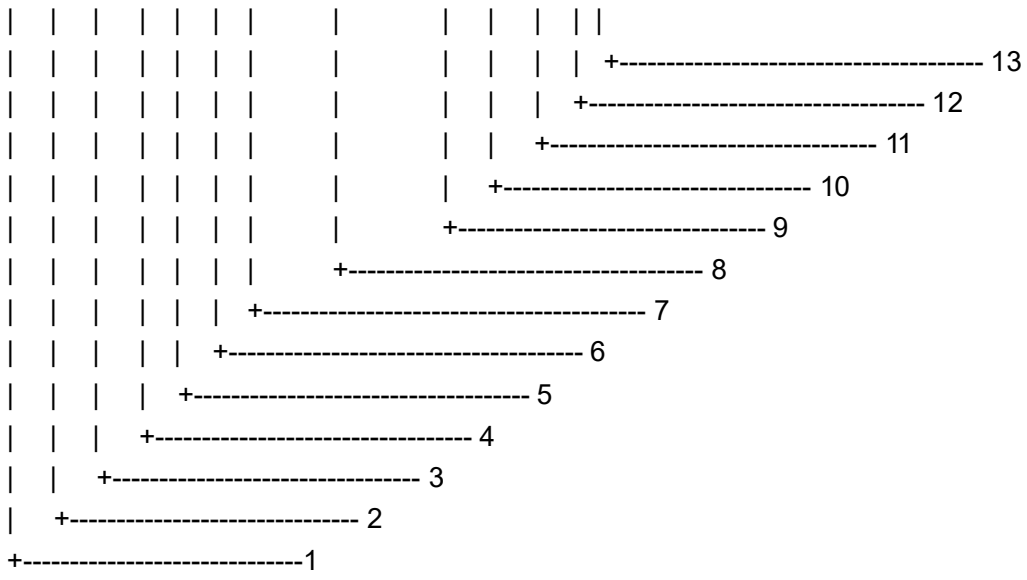


1. Actual heel angle, degrees
2. Roll period, seconds
3. Roll amplitude, port side, degrees
4. Roll amplitude, starboard side, degrees
5. Status
6. Roll peak hold value, port side, degrees

7. Roll peak hold value, starboard side, degrees
8. Peak hold value reset time
9. Peak hold value reset day, 01 to 31
10. Peak hold value reset month, 01 to 12

IEC 61162-2024 Ed6:

$--HRM,x.x,x.x,x.x,x.x,A,x.x,x.x,hhmmss.ss,xx,xx,xxxx,x,x*hh<CR><LF >



1. Actual heel angle, degrees
2. Roll period, seconds
3. Roll amplitude, port side, degrees
4. Roll amplitude, starboard side, degrees
5. Status
6. Roll peak hold value, port side, degrees
7. Roll peak hold value, starboard side, degrees
8. Peak hold value reset time
9. Peak hold value reset day, 01 to 31
10. Peak hold value reset month, 01 to 12
11. Peak hold value reset year
12. Heel angle alert threshold value
13. Sentence status flag

NOTE: When sentence status flag is “C”, you can set heel angle alert threshold and reset peak hold by HRM sentence. You can also set them together.

Reset peak hold	Peak hold reset time=0(time, day, month, year), others = null	$RPHRM,,,,,,0,0,0,0,0,0,,C*3A
Set heel angle alert threshold	Heel angle alert threshold value = n (n = 0~45°), others = null	$RPHRM,,,,,,,,,,,30,C*39

HBT – Heartbeat supervision sentence

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

1. Configured repeat interval
2. Equipment status
3. Sequential sentence identifier

POS – Device position and ship dimensions report or configuration command

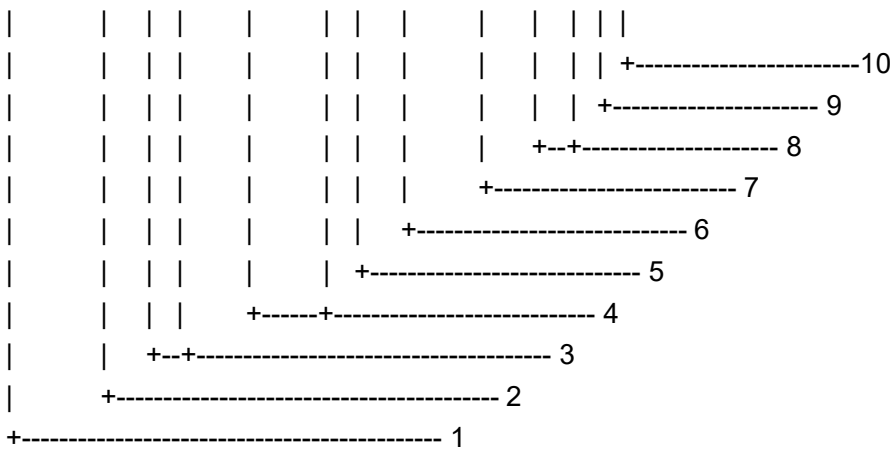
```
$- - POS,cc,xx,a,x.x,x.x,x.x,a,x.x,x.x,x.x,a*hh<CR><LF>
            |  |  |  |    |   |   |  |    |   |
            |  |  |  |    |   |   |  |    |   +------------------------- 10
            |  |  |  |    |   |   |  |    +------------------------- 9
            |  |  |  |    |   |   |  +--------------------------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

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

IEC 61162-2016 Ed5: Output once every 3 seconds
IEC 61162-2024 Ed6: Output once every 30 seconds

RMC- Recommended minimum specific GNSS data

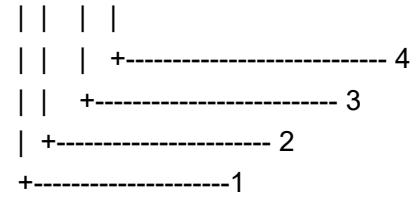
$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yyy,a,x.x,x.x,xxxxxx,x.x,a,a,a*hh<CR><LF>



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

TXT – Text transmission

$--TXT,xx,xx,xx,c--c*hh<CR><LF>



1. Total number of sentences, 01 to 99
2. Sentence number, 01 to 99
3. Text identifier
4. Text message

Identifier	Message	Output conditions
01	EI_RollThresholdAngle_25_deg	Startup
01	EI_SetRollThresholdAngle_25_deg	Threshold setting
01	EI_RPHVReset_2022_08_18_23_06_33	Roll Peak Hold value reset
01	EI_ChangeToNormalState	Heel Angle Exceeded alert recovery

XDR – Transducer measurements

```
$--XDR,a,x.x,a,c--c,.....a,x.x,a,c--c*<CR><LF>
          | |   |   |  |          | |          |
          | |   |   | |          |  +---------+------------ 6
          | |   |   |  +---------+---------------------- 5
          | |   |    +----------------------------- 4
          | |   +------------------------- 3
          |  +----------------------- 2
          +--------------------- 1
```

1. Transducer type, transducer No. 1
2. Measurement data, transducer No. 1
3. Units of measure, transducer No. 1
4. ID, transducer No. 1
5. Data, variable number of transducers
6. Transducer "n"

Type	Data	Unit	ID
'A'	Value	'D'	"Roll#X"
'A'	Value	'D'	"Pitch#X"

ZDA - Time and date

```
$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>
               |        |  |    |    | |
               |        |  |    |    |  +---------------------------------- 6
               |        |  |    |    +-------------------------------- 5
               |        |  |    +------------------------------ 4
               |        |  +---------------------------- 3
               |        +-------------------------- 2
               +------------------------------ 1
```

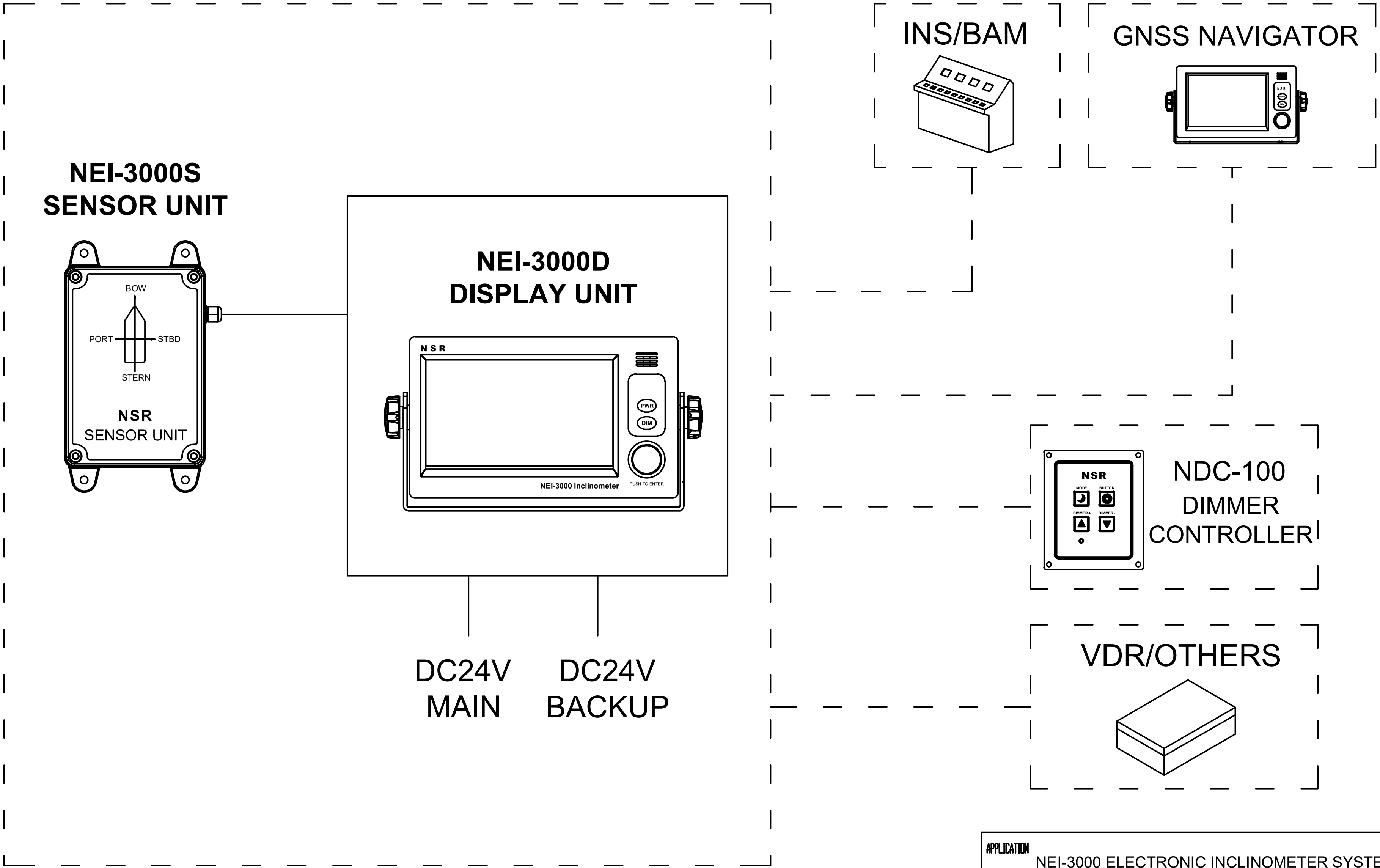
1. UTC
2. Day, 01 to 31 (UTC)
3. Month, 01 to 12 (UTC)
4. Year (UTC)
5. Local zone hours, 00h to ±14h
6. Local zone minutes, 00 to +59

APPENDIX E ABBREVIATIONS

Abbreviation	Term	Abbreviation	Term
ACK	Acknowledge	NMEA	National Marine Electronics Association
BAM	Bridge Alert Management	PORT	Port
E	East	PWR	Power
EPFS	Electronic Position Fixing System	RESET	Reset
GNSS	Global Navigation Satellite System	S	South
GPS	Global Positioning System	STBD	Starboard
MENU	Menu	UTC	Coordinated Universal Time/Universal Time, Coordinated
N	North	W	West

APPENDIX F INSTALLATION DRAWINGS

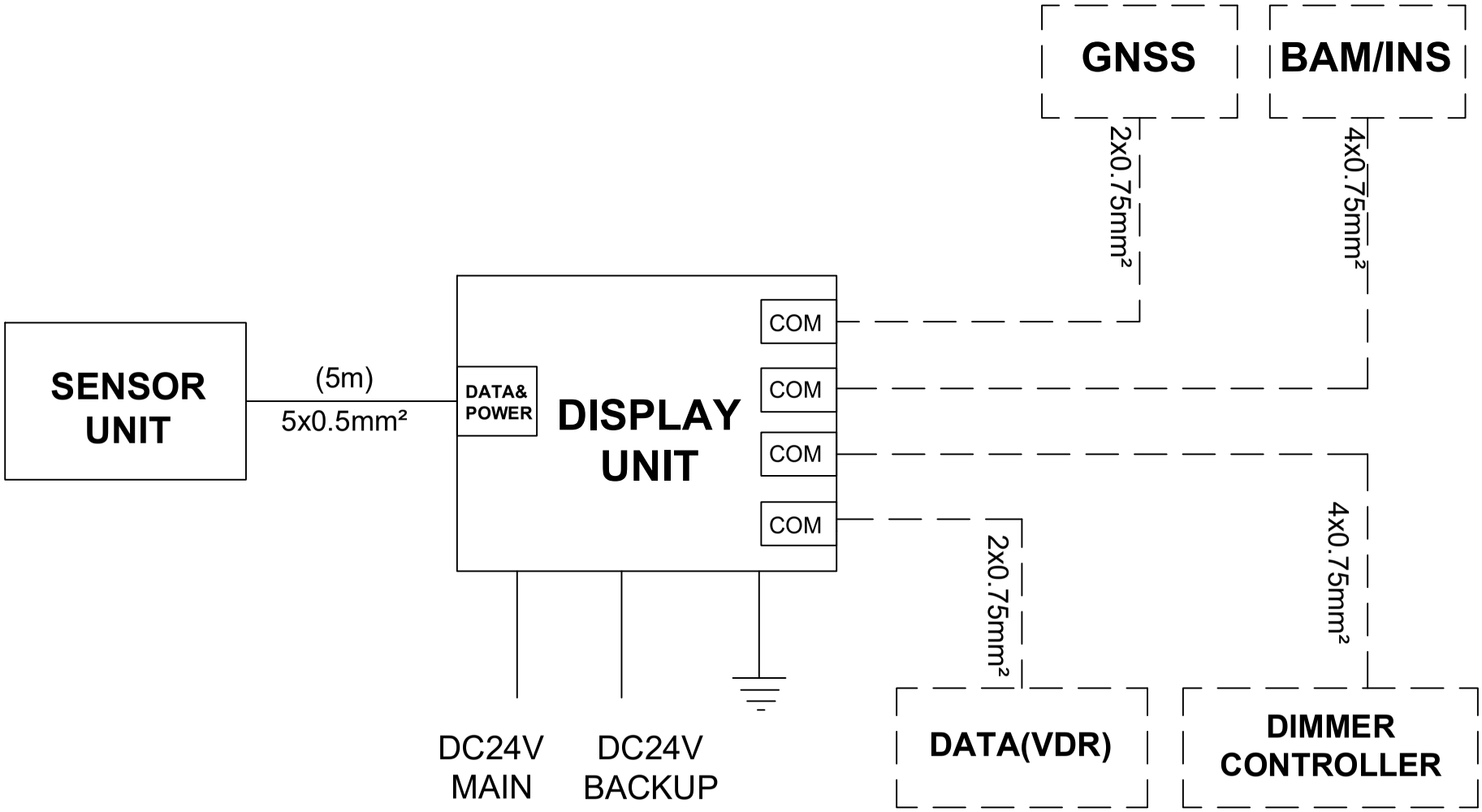
Drawing No.	Description
NEI3000-ID-001	NEI-3000 ELECTRONIC INCLINOMETER SYSTEM DIAGRAM
NEI3000-ID-002	NEI-3000 ELECTRONIC INCLINOMETER SYSTEM CONNECTION DIAGRAM
NEI3000-ID-003	NEI-3000 INTERFACE DEFINITION DIAGRAM
NEI3000-ID-004	NEI-3000 DISPLAY UNIT SIZE DRAWING
NEI3000-ID-005	NEI-3000 DISPLAY UNIT MOUNTING DRAWING (TABLE TYPE)
NEI3000-ID-006	NEI-3000 DISPLAY UNIT MOUNTING DRAWING (FLUSH TYPE)
NEI3000-ID-007	NEI-3000 SENSOR UNIT SIZE DRAWING
NEI3000-ID-008	NEI-3000 SENSOR UNIT MOUNTING DRAWING
NEI3000-ID-009	NDC-100 DIMMER CONTROLLER SIZE DRAWING



NO.	DATE	REVISION & DESCRIPTION	REVIEWED SIGNATURE	CHECKED
0				

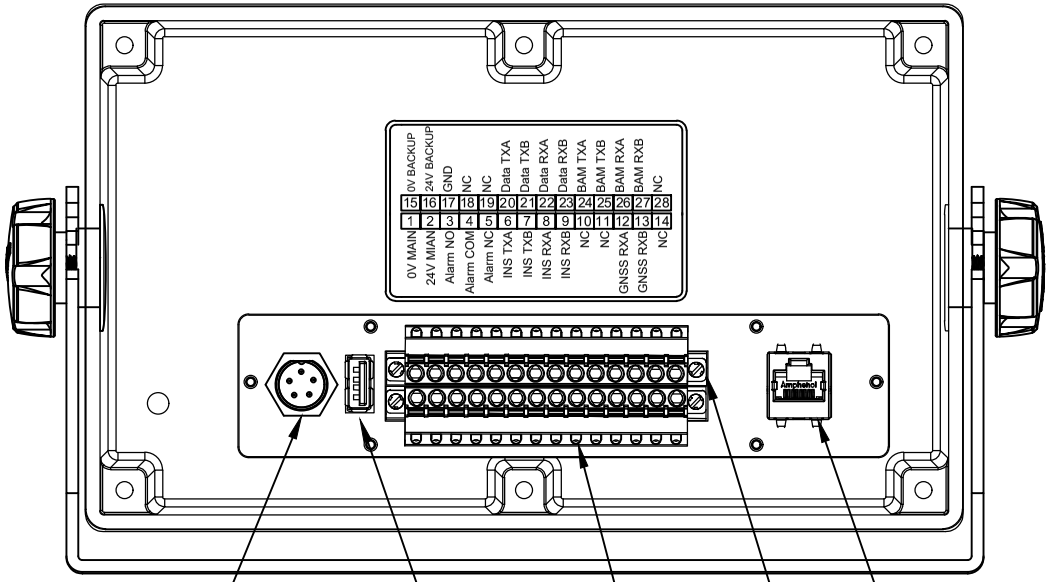
APPLICATION	NEI-3000 ELECTRONIC INCLINOMETER SYSTEM DIAGRAM			
DATE		ITEM	NEI-3000 ELECTRONIC INCLINOMETER	SIZE A4
APPROVAL		SCALE N/S	UNIT mm	PRO-JECTION
CHECKED		NEW SUNRISE CO., LTD.		
DRAWING				
DWG. NO.	NEI3000-ID-001			

NO.	DATE	REVISION & DESCRIPTION	REVIEWED / CHECKED SIGNATURE
0			



APPLICATION	NEI-3000 ELECTRONIC INCLINOMETER SYSTEM CONNECTION DIAGRAM		
DATE		ITEM	NEI-3000 ELECTRONIC INCLINOMETER SIZE A4
APPROVAL		SCALE N/S UNIT	
CHECKED			
DRAWING			NSR marine NEW SUNRISE CO., LTD.
DWG NO.	NEI3000-ID-002		

NO.	DATE	REVISION & DESCRIPTION	REVIEWED	CHECKED
0			SIGNATURE	



SENSOR
1. 12V
2. 0V
3. GND
4. TXD
5. RXD

1. 0V MAIN	15.0V BACKUP
2. 24V MIAN	16.24V BACKUP
3. Alarm NO	17.GND
4. Alarm COM	18.NC
5. Alarm NC	19.NC
6. INS TXA	20.Data TXA
7. INS TXB	21.Data TXB
8. INS RXA	22.Data RXA
9. INS RXB	23.Data RXB
10.NC	24.BAM TXA
11.NC	25.BAM TXB
12.GNSS RXA	26.BAM RXA
13.GNSS RXB	27.BAM RXB
14.NC	28.NC

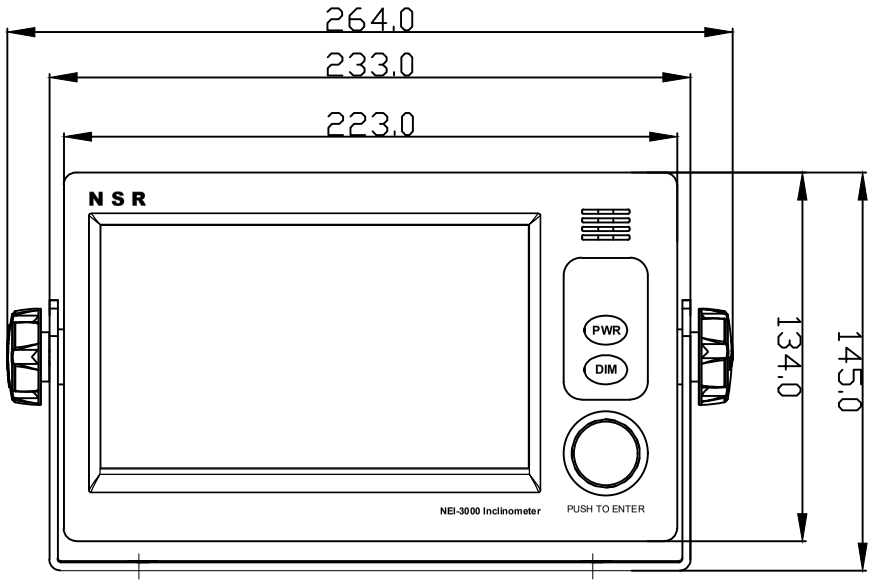
APPLICATION

NEI-3000 INTERFACE DEFINITION DIAGRAM

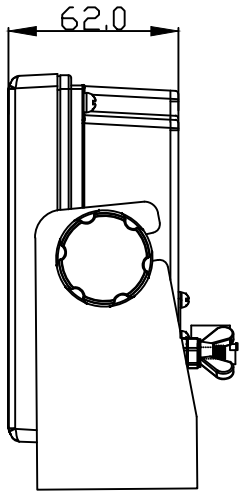
DATE		ITEM	NEI-3000 ELECTRONIC INCLINOMETER
APPROVAL		SCALE	N/S
CHECKED		UNIT	mm
DRAWING			
DWG NO.	NEI3000-ID-003		

NSR marine NEW SUNRISE CO., LTD.

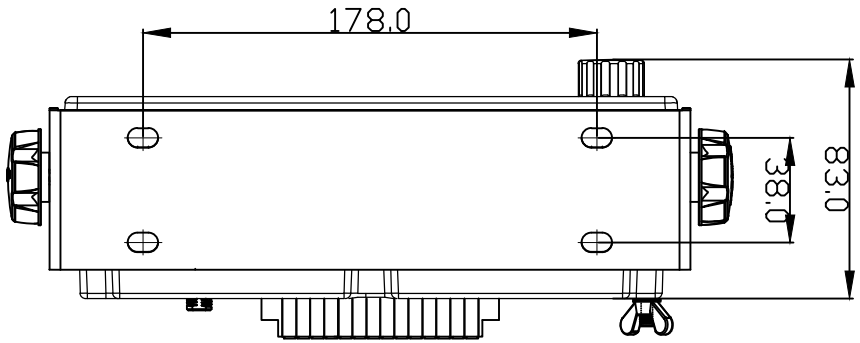
NO.	DATE	REVISION & DESCRIPTION	REVIEWED / SIGNATURE	CHECKED
0				



FRONT VIEW



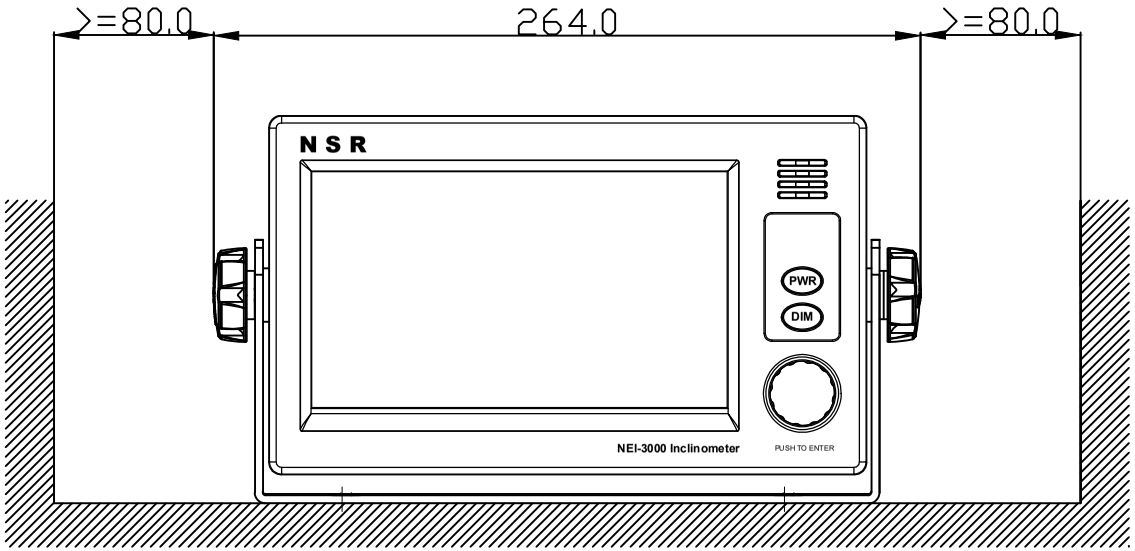
SIDE VIEW

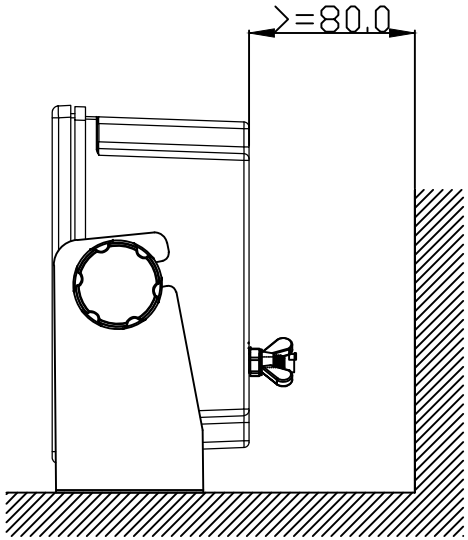


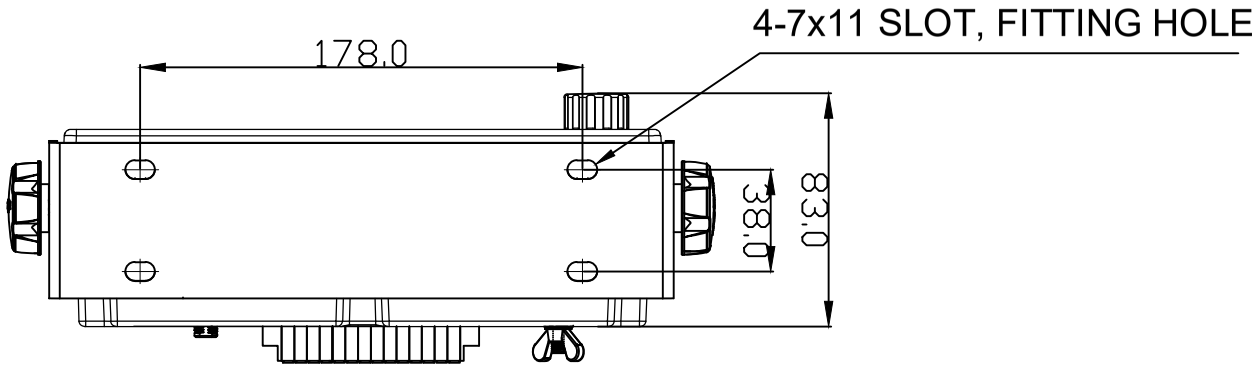
BOTTOM VIEW

APPLICATION	NEI-3000 DISPLAY UNIT SIZE DRAWING		
DATE		ITEM	NEI-3000 ELECTRONIC INCLINOMETER SIZE A4
APPROVAL		SCALE N/S UNIT mm PROJECTION	▽▽▽▽ 100 ▽▽▽ 6.3S ▽▽ 12S ▽ 100S
CHECKED			
DRAWING			NSR NEW SUNRISE CO., LTD.
DWG NO.	NEI3000-ID-004		

NO.	DATE	REVISION & DESCRIPTION	REVIEWED / CHECKED SIGNATURE
0			







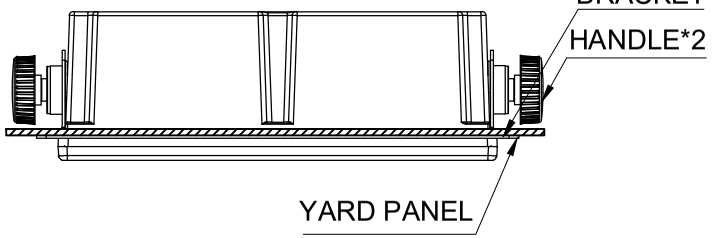
NOTE: TABLE TYPE

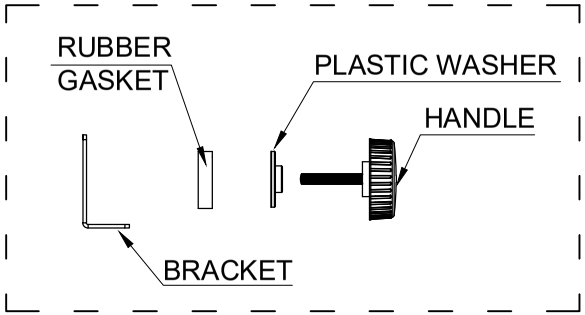
1.USE SELF-TAPPING SCREWS M5X20 FOR FIXING THE UNIT.

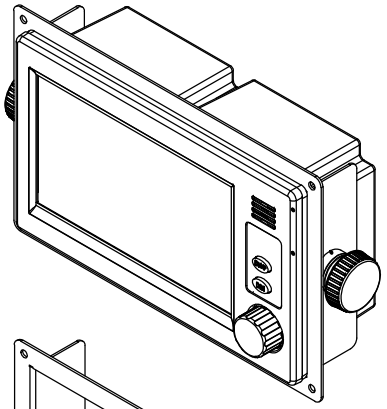
2.80MM IS MINIMUM SPACE FOR OPERATION AND CABLING.

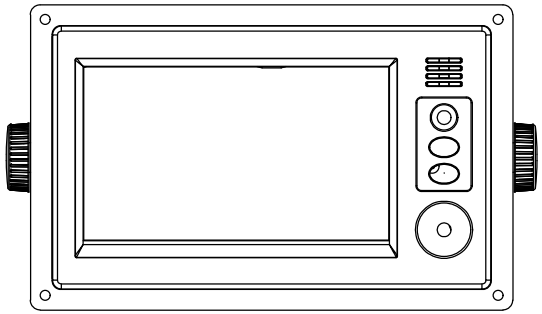
APPLICATION	NEI-3000 DISPLAY UNIT MOUNTING DRAWING (TABLE TYPE)		
DATE		ITEM	NEI-3000 ELECTRONIC INCLINOMETER
APPROVAL		SCALE N/S	UNIT mm
CHECKED		NSR marine	NEW SUNRISE CO., LTD.
DRAWING			
DWG NO.	NEI3000-ID-005		

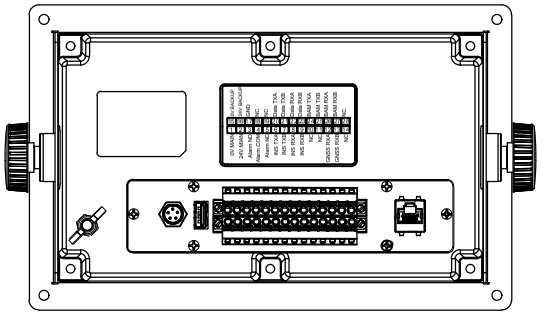
NO.	DATE	REVISION & DESCRIPTION	REVIEWED / CHECKED SIGNATURE
1			

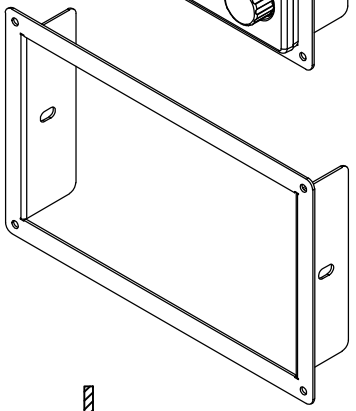


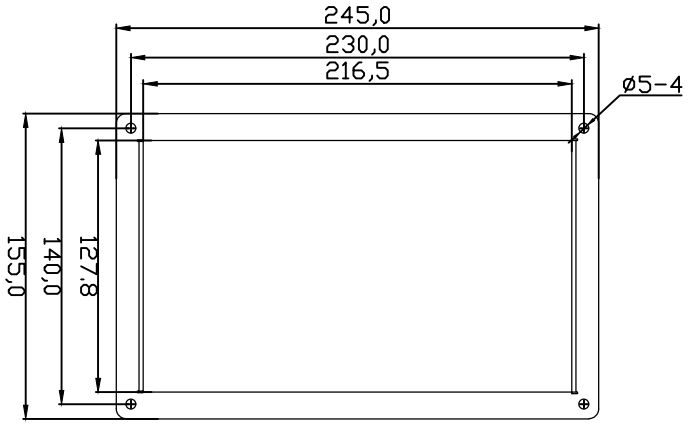




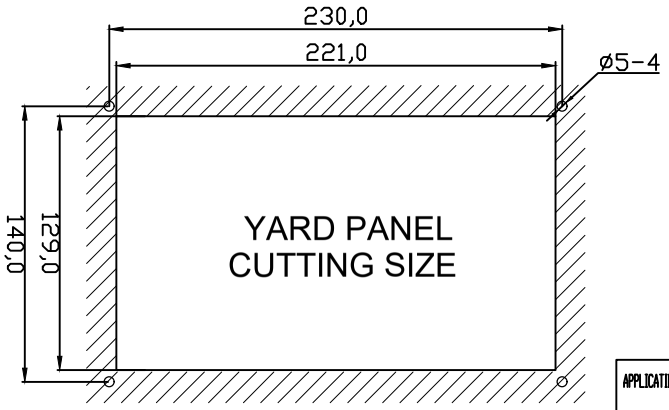


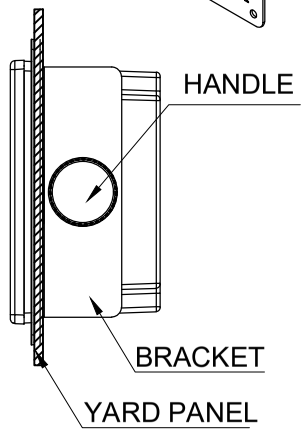






MOUNTING BRACKET SIZE

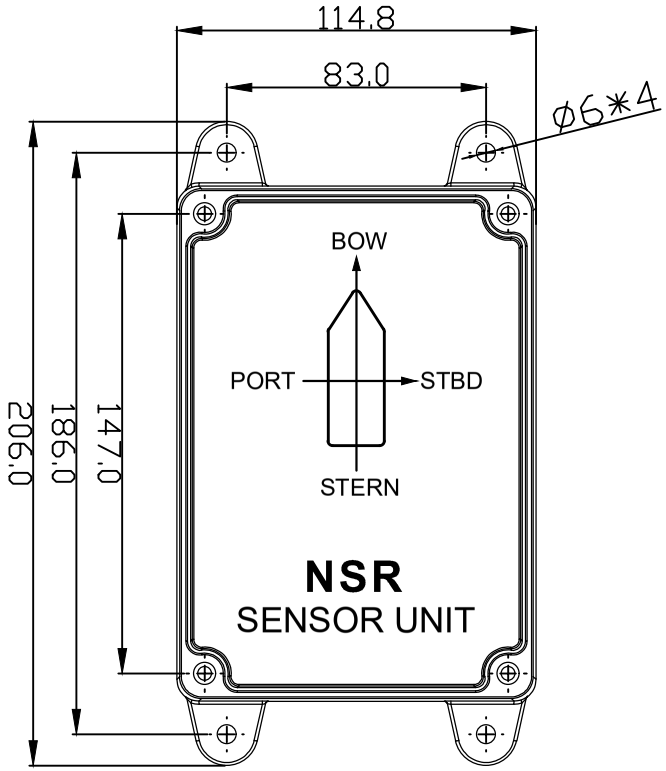




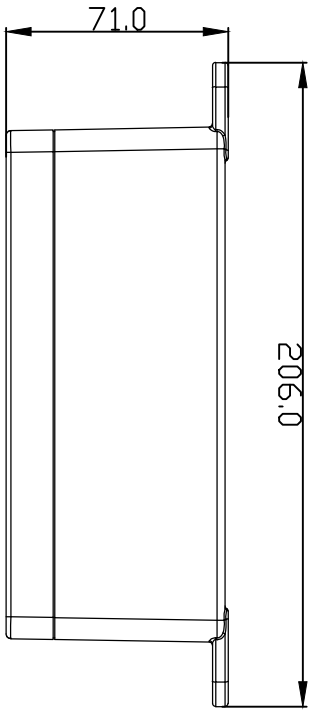
APPLICATION	NEI-3000 DISPLAY UNIT MOUNTING DRAWING(FLUSH TYPE)
DATE	
APPROVAL	
CHECKED	
DRAWING	
DWG NO.	NEI3000-ID-006
ITEM	
SCALE N/S UNIT mm	SIZE A4

NSR marine NEW SUNRISE CO., LTD.

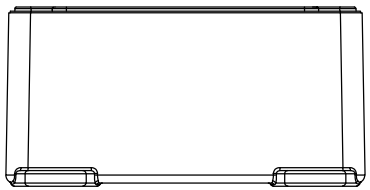
NO.	DATE	REVISION & DESCRIPTION	REVIEWED / SIGNATURE	CHECKED
0				



FRONT VIEW



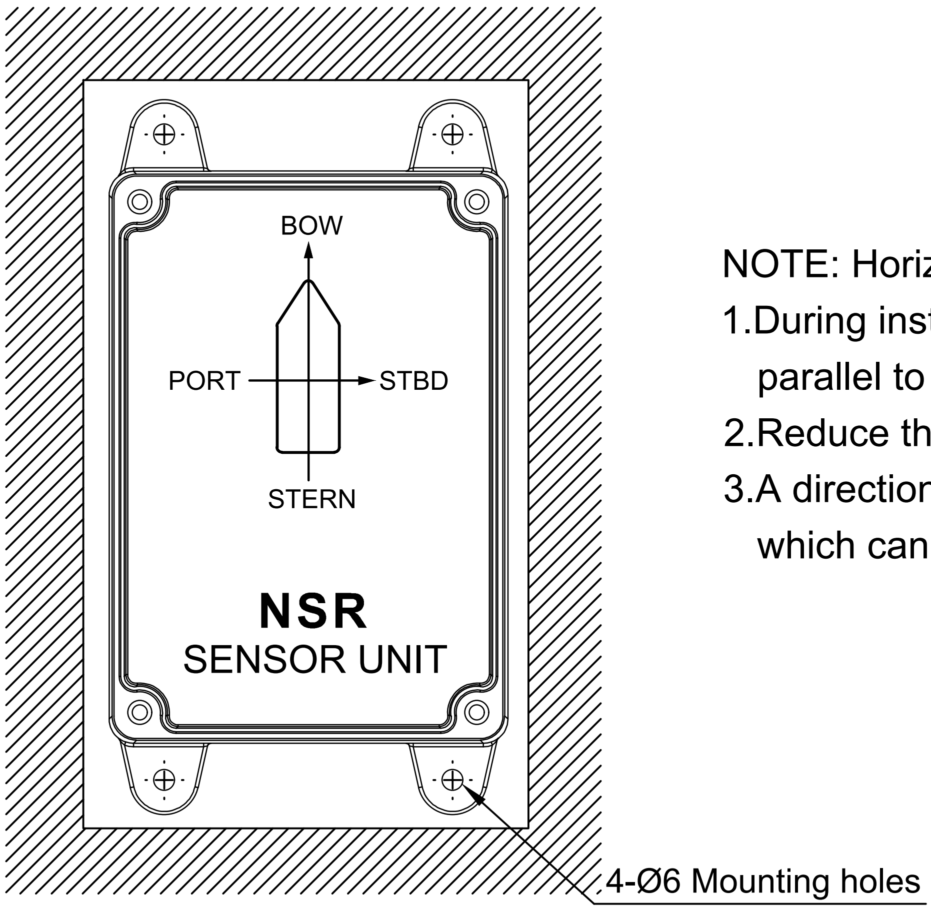
SIDE VIEW



BOTTOM VIEW

APPLICATION	NEI-3000 SENSOR UNIT SIZE DRAWING		
DATE		ITEM	NEI-3000 ELECTRONIC INCLINOMETER
APPROVAL		SCALE N/S	UNIT mm
CHECKED			
DRAWING		NEW SUNRISE CO., LTD.	
DWG NO.	NEI3000-ID-007		

NO.	DATE	REVISION & DESCRIPTION	REVIEWED	CHECKED
△				



NOTE: Horizontal installation

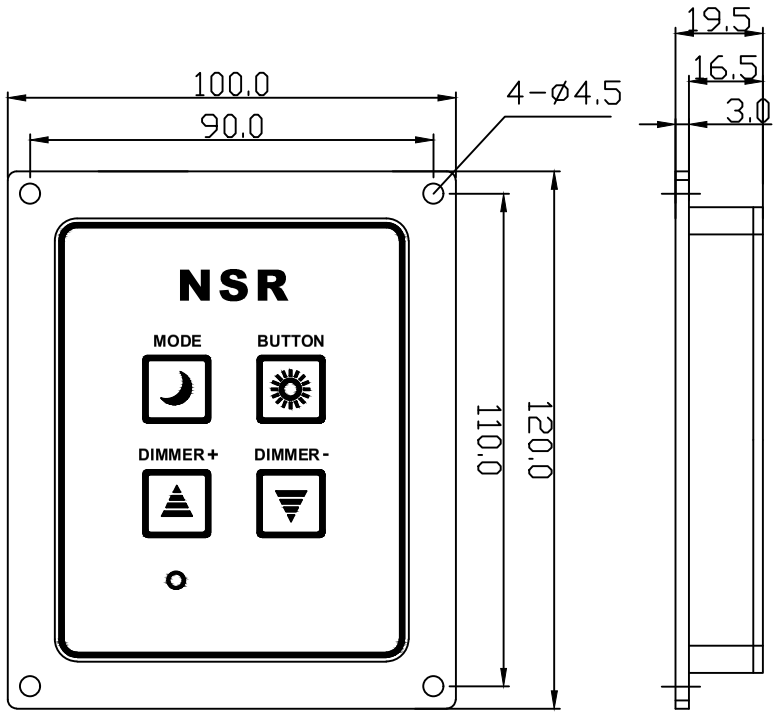
1.During installation, keep the mounting surface of the sensor parallel to the measured surface.

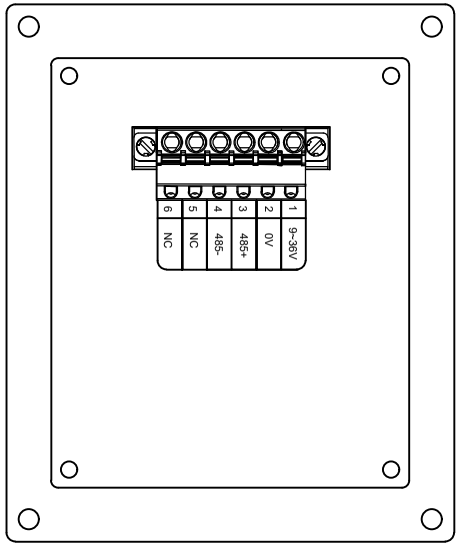
2.Reduce the impact of dynamics and acceleration on the sensor.

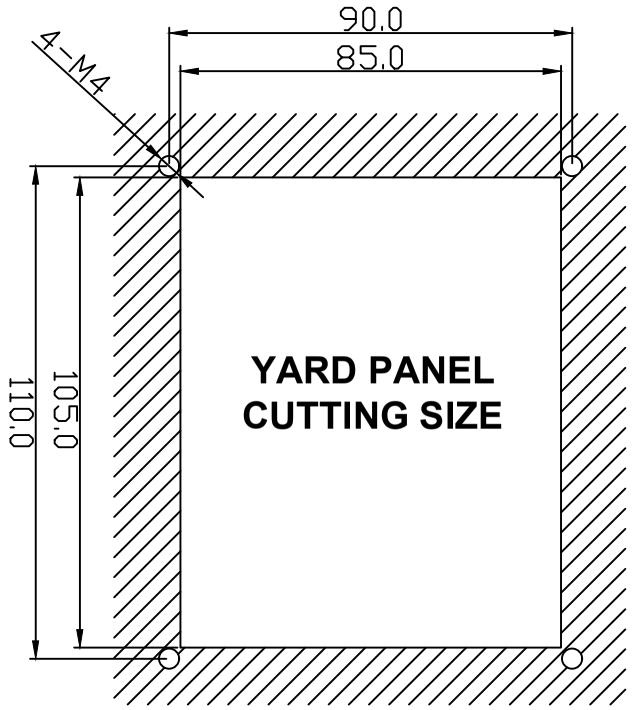
3.A direction indicator sticker is marked on the front, which can be referred to during installation.

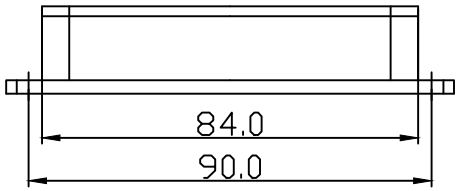
APPLICATION	NEI-3000 SENSOR UNIT MOUNTING DRAWING		
DATE		ITEM	NEI-3000 ELECTRONIC INCLINOMETER
APPROVAL		SCALE N/S	SIZE A4
CHECKED		NEW SUNRISE CO., LTD.	
DRAWING			
DWG NO.	NEI3000-ID-008		

NO.	DATE	REVISION & DESCRIPTION	REVIEWED / SIGNATURE	CHECKED
0				

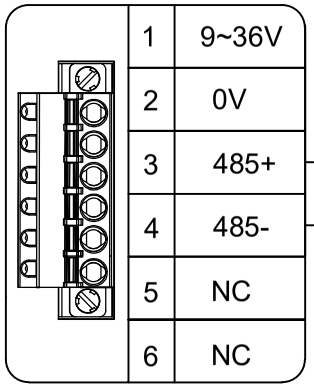








NDC-100
DIMMER CONTROLLER



1	9~36V
2	0V
3	485+
4	485-
5	NC
6	NC

NEI-3000D
DISPLAY UNIT

8	INS RXA
9	INS RXB

APPLICATION	NDC-100 DIMMER CONTROLLER SIZE DRAWING		
DATE		ITEM	NEI-3000 ELECTRONIC INCLINOMETER
APPROVAL		SCALE N/S UNIT mm PROJECTION	SIZE A4
CHECKED			
DRAWING			
DWG NO.	NEI3000-ID-009	NSR marine	NEW SUNRISE CO., LTD.

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February, 2026