

NGR-3000

GPS NAVIGATOR

(TSO)

USER'S MANUAL

NEW SUNRISE

NGR-3000 OM E. 20170815-02

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- Please read this manual carefully to ensure proper use before installation and use of the product.
- Please keep the manual for your future reference.

Modify Record

No.	Modify by	Date	Paragraph	Version	Reason
1	Q/A	2017/06/14		01	First edition
2	Q/A	2017/08/15		02	Add navigation function

SAFETY INSTRUCTIONS FOR THE OPERATOR


Warning

Keep away from heat source or direct sunshine.


Prohibition

Don't open the equipment. Only 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.

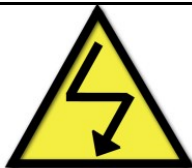
SAFETY INSTRUCTIONS FOR THE INSTALLER


Warning

Connect the earthing cord to 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 qualified personnel should work inside the equipment. Don't disassemble or try to modify the equipment.


Dangerous

Turn off the power at power distribution board before installation.

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1. PRODUCT FEATURES

The NGR-3000 is a GPS NAVIGATOR and consists of a display unit and an antenna unit.

The high sensitive GPS NAVIGATOR tracks up to 50 satellites simultaneously. It ensures optimum accuracy in determination of vessel position, course and speed.

The main features of the NGR-3000 are:

- Comprehensive navigation data displays.
- Alarms: Lost of Position.
- Lost of differential signal, HDOP Exceeded.
- Menu-driven operation.
- 7 inch, color LCD, touch screen operation
- 2 GPS data outputs, 1 INS output, 1 INS input.
- A DGPS beacon receiver (external) may be connected to the NGR-3000 to add DGPS function.

The product meets the requirements of relative IMO and IEC regulation & standards, including IMO MSC112 (73), IEC61108-1, etc.

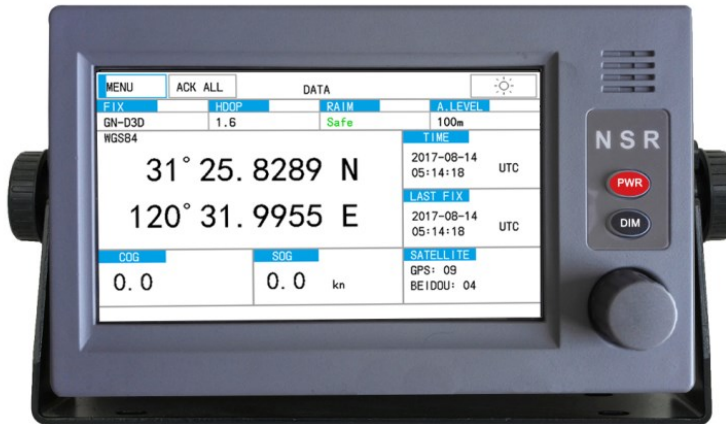
EQUIPMENT LIST:

Scope of Supply			
No.	Name	Quantity	Description
1	NGR-3000 Main Unit	1	
2	GPS Antenna	1	Cable length 10m or 20m
3	Installation Materials		
3.1	Mount Pole	1	
3.2	Steel Tie	2	
3.3	Accessories	1	
4	Options		
4.1	DGPS Beacon		
4.2	Flush Mount Brackets		

2. OPERATIONAL OVERVIEW

2.1 CONTROL DESCRIPTION

The GPS NAVIGATOR can be operated by key & knob on panel or touch-screen.

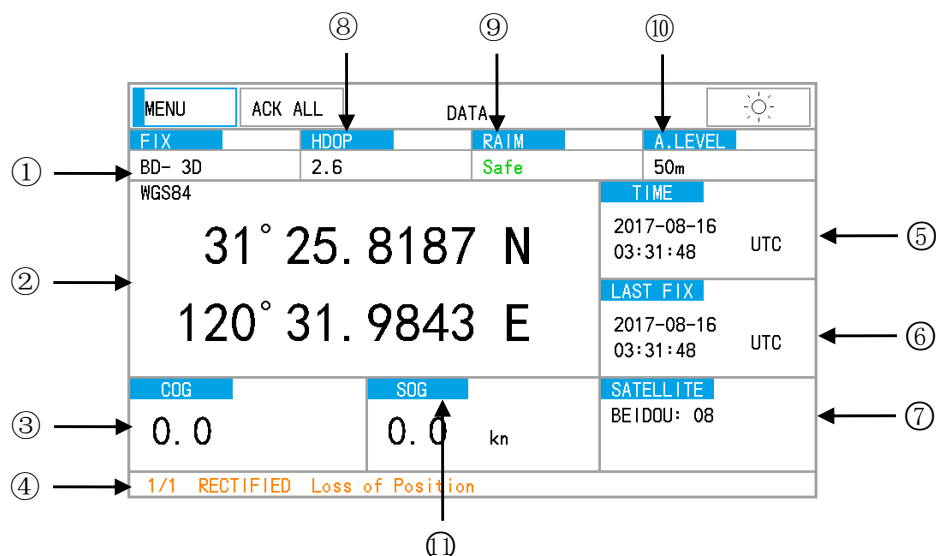


When operating with knob, turn the knob to select an item on screen and press the knob to confirm the selection.

Panel Button	Description
	Turn to select an item. Press down to confirm the selection or input.
PWR	Power ON/OFF. To power OFF, press and hold this key more than 3 seconds.
DIM	Brightness key for LCD brightness control.
Touch-screen Button	Description
MENU	Enter the Menu, and use as delete button in input option.
DATA	Change among four screens: - Plotter display; - Highway display; - Compass display; - Nav data display.
ACK ALL	Acknowledge Alarm.

Panel Button	Description
	Change display mode.

The touch screen shows position in latitude and longitude, course, speed, date and time. The NGR-3000 takes about 60 seconds to find position when turned on for the very first time. Thereafter, it takes about 15 seconds to find position each time the power is turned on. After fixed, the accurate position (in latitude and longitude) appears on the display.



No	Item	Symbol	Remark
①	Fix Mode	GPS/DGPS	
②	Position in Lan & Lon		
③	Course over Ground	COG	
④	Alarm Column		Warning in orange and alarm in red color
⑤	Time	UTC	UTC time
		LMT	Local time
⑥	Final Fixing Time	LAST FIX	
⑦	Quantity of Satellites Being Tracked	SATELLITE	
⑧	Horizontal Dilution Of Precision	HDOP	
⑨	Receiver Autonomous Integrity Monitoring	RAIM	Safe/unsafe/caution
⑩	Accuracy Level		10-100m
⑪	Speed over Ground	SOG	

2.2 TURN ON AND OFF THE POWER

● Turn on the power

Press the **PWR** button to turn on the power.

Usually it will take about one minute to find its position when turned on for the very first time. The equipment shows receiver status at the bottom of the screen.

Indication	Meaning
GP-2D/ GP-3D	GPS fix
GP-D2D/GP-D3D	DGPS fix
BD-2D/BD-3D	BD fix
BD-D2D/BD-D3D	DBD fix
GN-2D/GN-3D	GN fix
GN-D2D/GN-D3D	DGN fix

● Turn off the power

Press and hold down the **PWR** button for 3s until the screen goes blank.

2.3 ADJUST DIMMER AND CONTRAST

There are two ways to adjust the brightness and contrast of the LCD.

- Adjust the brightness in the **[SYSTEM SETTING]**.

[SYSTEM SETTING]			
BD- 3D	31°25.8163 N	120°31.9836 E	UTC 2017-08-16 03:29:15
KEY BUZZER	OFF		
LCD/KEY DIMMER	Level_13		
DISPLAY MODE	DAY		
←			

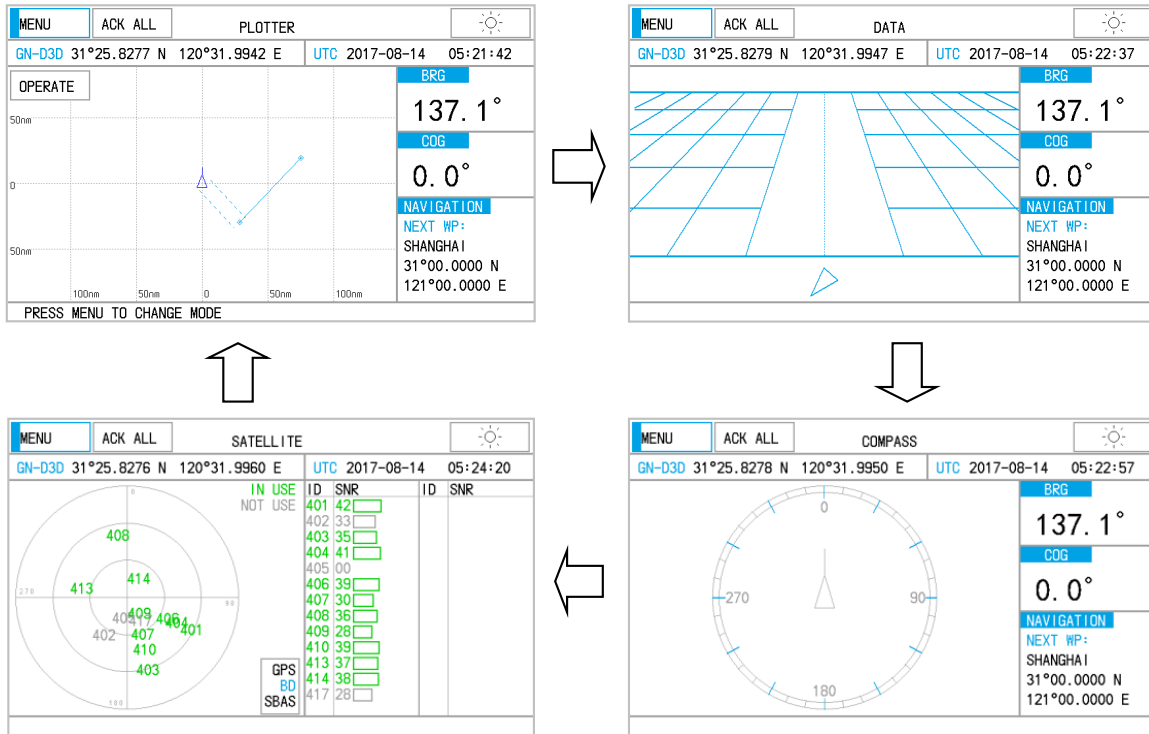
- Press the **DIM** button to adjust the brightness.

Note:

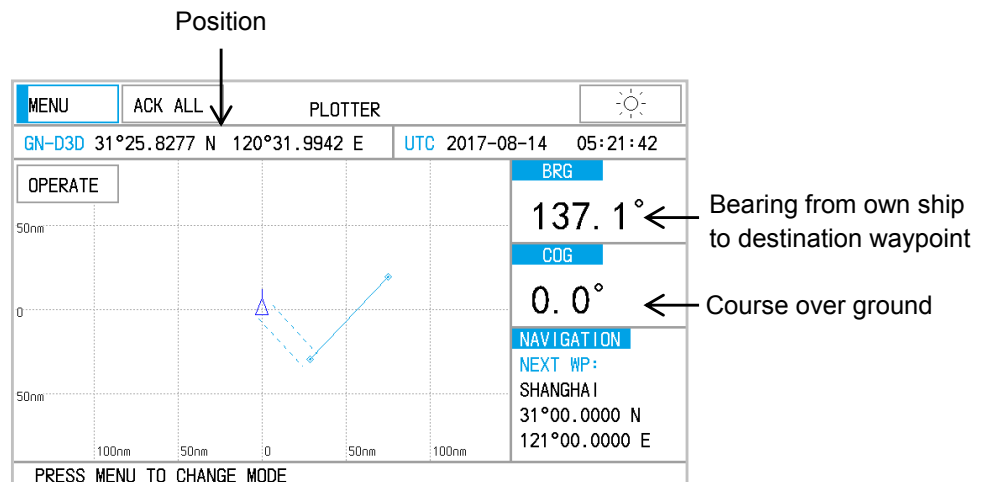
When the power is turned off, the last status of brightness is stored. Therefore when the power is turned on, the screen will display with the last brightness before powered off.

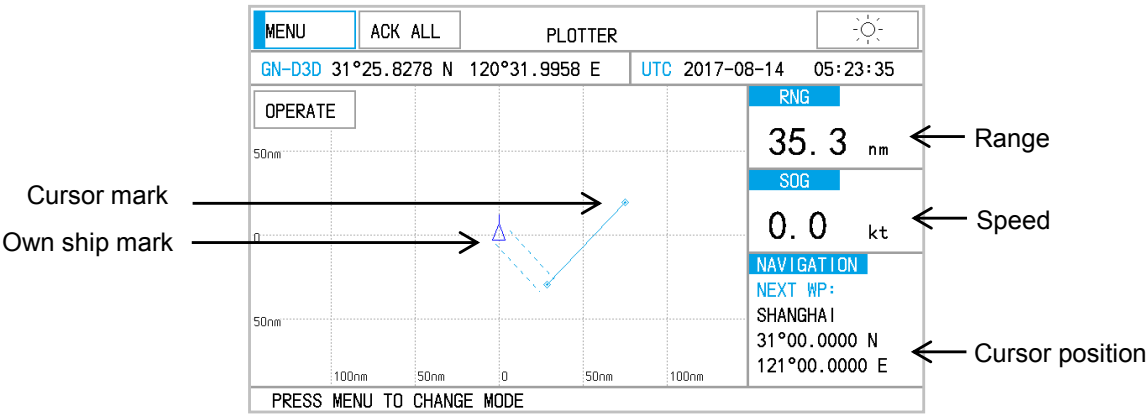
2.4 Display Modes

There are four display modes: Plotter Display, Highway Display, Compass Display, and Nav Data Display. Press the [DISP] key to select a display mode. Each time the mode is clicked, the display mode changes in the sequence shown below.



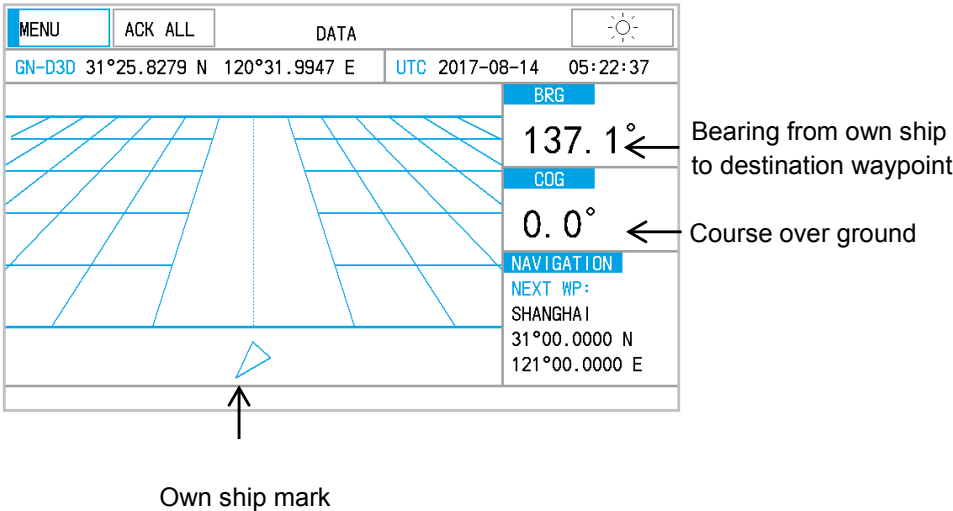
The plotter display traces own ship's track, and shows position, course, speed, and horizontal display range setting.





2.4.2 Highway display

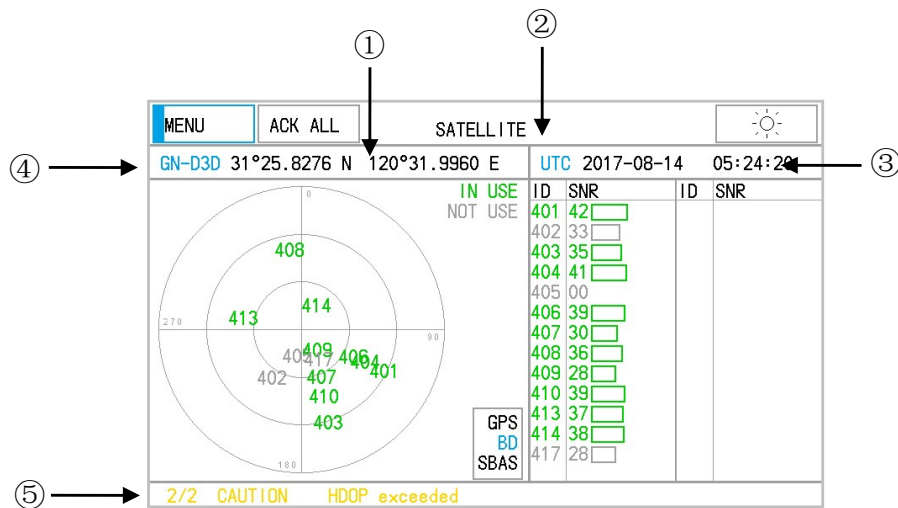
The highway display provides a 3-D view of own ship’s progress toward destination. Nav data is also shown.



2.4.3 Nav data display

The Nav data display shows position in latitude and longitude, course, speed, date and time. The NGR-3000 takes about 120 seconds to find position when turned on for the very first time. Thereafter it takes about 15 seconds to find position each time the power is turned on.

After fixed, the accurate position (in latitude and longitude) appears on the display. If position could not be found, “NO FIX!” appears between latitude and longitude lines.



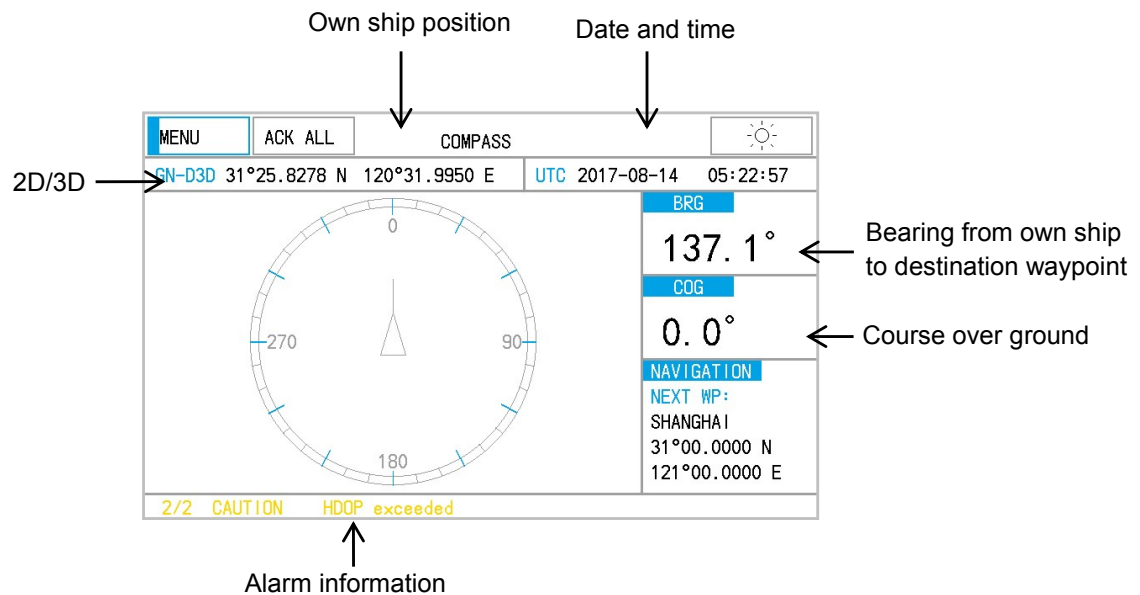
NO	Item	remark
①	Position in Lan & Lon	
②	Number of satellites tracked	
③	Time	
④	2D/3D	D2D/D3D when DGPS
⑤	Alarm Information	Four status: SPEED, XTE ANCHOR and ARRIVE

Note:

④ When PDOP value exceeds 6 in the 3D mode, the position fixing method is automatically changed to 2D.

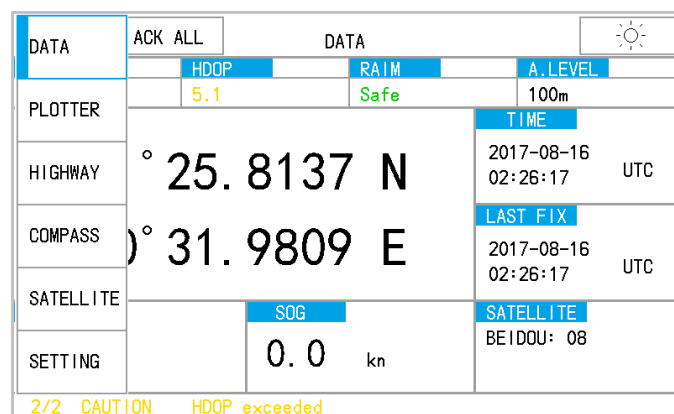
2.4.4 Compass display

The compass display provides course with ship's speed, and position.



2.5 Basic Menu Operation

Most operations of your unit are done through the menu. Below is to introduce how to select a menu and change menu settings. If you get lost in operation, press the [PWR] key to return to the MAIN menu. Please refer to complete MENU TREE in the Appendix.



- 1) Click the [MENU] to display the menu.
- 2) Turn the knob and press the knob to confirm the selection or click directly to select an item on screen.

2.6 How to enter character data

In some instances it is necessary to enter character data. The example below shows how to enter a waypoint by soft keyboard on screen.

TOTAL: 003 PAGE: 1/1		ROUTE: ROUTE - NO.00007	
GN-D3D	31°25.8278' N 120°31.9944' E	UTC	2017-08-14 05:36:05
>>	113 21°25.829' N 110°31.998' E	ADD RENAME DELETE NEXT PREV ←	
	A POINT00113 2017-08-08 08:28		
	114 31°35.829' N 111°31.998' E		
	A POINT00114 2017-08-14 05:33		
	107 31°00.000' N 121°00.000' E		
	SHANGHAI 2017-08-14 05:20		

Operate the menus until the above screen is got. (Please refer to WAYPOINT/ROUTE)

- 1) When the first line is selected, click EDIT to locate the first character to edit.
- 2) Click RENAME to rename the route desired.

TOTAL: 004 PAGE: 1/1		ROUTE: ROUTE - NO.00007	
GN-D3D	31°25.8280' N 120°31.9951' E	UTC	2017-08-14 05:36:56
	113 21°25.829' N 110°31.998' E	ADD RENAME DELETE NEXT	
	A POINT00113 2017-08-08 08:28		
>>	114 31°35.829' N 111°31.998' E		
	A POINT00114 2017-08-14 05:33		
	114 31°35.829' N 111°31.998' E		
	A POINT00114 2017-08-14 05:33		
	107 31°00.000' N 121°00.000' E		
	SHANGHAI		
Q W E R T Y U I O P A S D F G H J K L Z X C V B N M , . ✓			

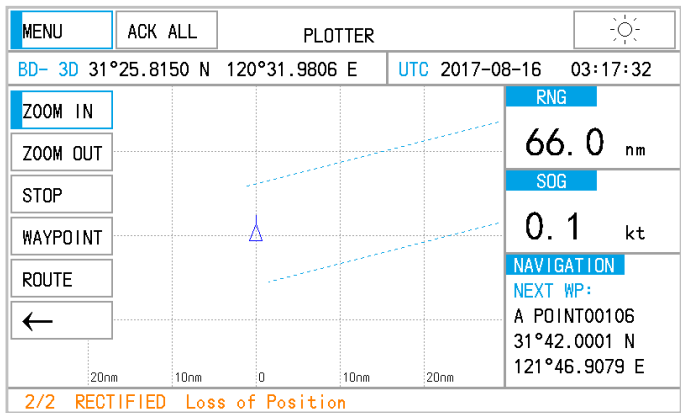
- 3) Click the character among A-Z desired. Turn the knob to select an item on screen and press the knob to confirm the selection.
- 4) Click the [✓] to finish.

3. PLOTTER DISPLAY OVERVIEW

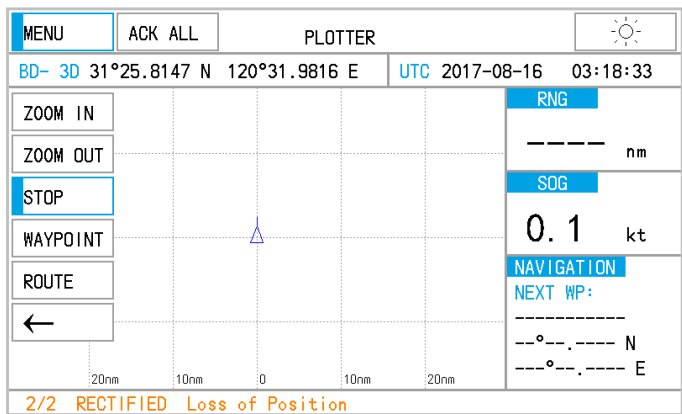
3.1 Enlarg/Shrink the Display Range

You may increase or decrease the display range on the plotter display. The horizontal range in the plotter display is available among 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 40, 80, 160 and 320 nautical miles.

- 1) Click the [OPERATE] key. The pop-up menu appears.
- 2) Click “ZOOM IN” or “ZOOM OUT” to select range desired.
- 3) Click on any blank space to finish.



3.2 Stop the navigation by the current route



Click “STOP” to stop the navigation by the current route.
The route is cleared on the plotter display.

3.3 Add a new waypoint to the route

Click “ADD” to add the current position as new waypoint to the route.
The screen will change to WAYPOINT LIST display.

TOTAL: 009 PAGE: 1/2				[WAYPOINT LIST]	
BD- 3D	31°25.8140 N	120°31.9821 E	UTC	2017-08-16	02:33:23
>>	120	31°25.815'N	120°31.982'E	ADD DELETE EDIT NEXT PREV FORWARD ←	
		A POINT00120	2017-08-16 02:33		
	107	31°00.000'N	121°00.000'E		
		SHANGHAI	2017-08-14 05:20		
	106	31°42.000'N	121°46.907'E		
		A POINT00106	2017-07-27 06:55		
	105	31°42.000'N	121°46.907'E		
		A POINT00105	2017-07-27 06:55		
	104	31°42.000'N	121°46.907'E		
		A POINT00104	2017-07-27 06:55		
	103	31°42.000'N	121°46.907'E		
		A POINT00103	2017-07-27 06:55		

4. WAYPOINT AND ROUTE

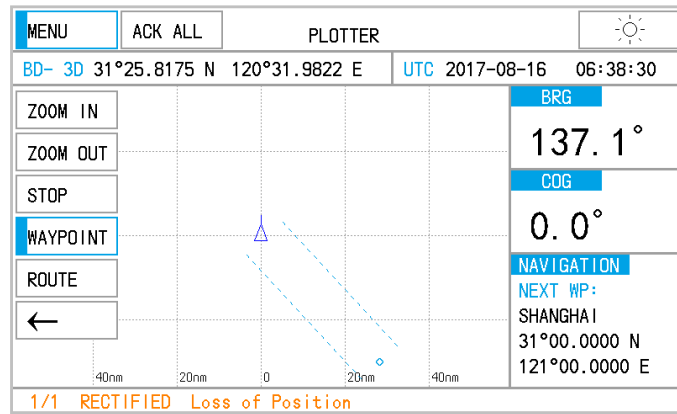
Often a trip from one place to another involves several course changes, requiring a series of waypoints which you navigate to, one after another. The sequence of waypoints leading to the ultimate destination is called a route. The NGR-3000 can automatically advance to the next waypoint on a route, so you do not have to change the destination waypoint repeatedly. The NGR-3000 can store 30 routes and each route may include up to 30 waypoints.

There are two ways to enter Waypoint and Route.

- (1) Click NAVIGATION in SETTINGS to open the menu.

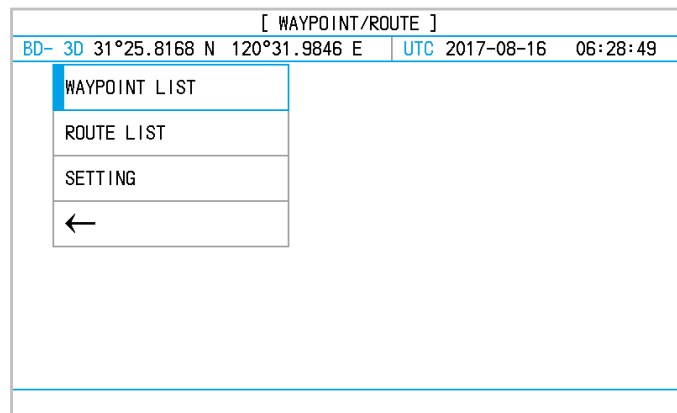
[SETTINGS]			
BD- 3D	31°25.8160 N	120°31.9852 E	UTC 2017-08-16 06:13:29
GNSS SETTING NAVIGATION ALERT SYSTEM SETTING DIAGNOSTICS MAINTENANCE ←			

- (2) Click PLOTTER in MENU, then click WAYPOINT/ROUTE in OPERATE to open the menu.



4.1 Registering waypoints

Click NAVIGATION in SETTINGS to open the list.



TOTAL: 009 PAGE: 1/2		[WAYPOINT LIST]			
BD- 3D	31°25.8182 N	120°31.9838 E	UTC	2017-08-16	06:57:16
>>	120	31°25.815' N	120°31.982' E	ADD DELETE EDIT NEXT PREV FORWARD ←	
	A POINT00120	2017-08-16 02:33			
	107	31°00.000' N	121°00.000' E		
	SHANGHAI	2017-08-14 05:20			
	106	31°42.000' N	121°46.907' E		
	A POINT00106	2017-07-27 06:55			
	105	31°42.000' N	121°46.907' E		
	A POINT00105	2017-07-27 06:55			
	104	31°42.000' N	121°46.907' E		
	A POINT00104	2017-07-27 06:55			
	103	31°42.000' N	121°46.907' E		
	A POINT00103	2017-07-27 06:55			

- 1) Turn the knob to select the waypoint desired.
- 2) Select “ADD”, “DELETE” or “EDIT” desired.

4.1.1 Insert a NEW waypoint

Create a new waypoint with the position as own ship's current position. The new waypoint will be inserted after the waypoint which is selected by the current cursor.

4.1.2 EDIT a waypoint

Edit the selected waypoint.

TOTAL: 008 PAGE: 1/2		[WAYPOINT EDIT]			
BD- 3D	31°25.8201 N	120°31.9850 E	UTC	2017-08-16	07:11:21
>>	107	31°00.000' N	121°00.000' E	LAT LON NAME CONFIRM CANCEL	
	SHANGHAI	2017-08-14 05:20			
	106	31°42.000' N	121°46.907' E		
	A POINT00106	2017-07-27 06:55			
	105	31°42.000' N	121°46.907' E		
	A POINT00105	2017-07-27 06:55			
	104	31°42.000' N	121°46.907' E		
	A POINT00104	2017-07-27 06:55			
	103	31°42.000' N	121°46.907' E		
	A POINT00103	2017-07-27 06:55			
	102	31°42.000' N	121°46.907' E		
	A POINT00102	2017-07-27 06:55			

TOTAL: 008 PAGE: 1/2		[WAYPOINT EDIT]	
BD- 3D	31°25.8180 N 120°31.9855 E	UTC	2017-08-16 07:16:01
>>	107 31°00.000'N 121°00.000'E	LAT	
	SHANGHAI 2017-08-14 05:20	LON	
	106 31°42.000'N 121°46.907'E	NAME	
	A POINT00106 2017-07-27 06:55	CONFIRM	
	105 31°42.000'N 121°46.907'E		
	A POINT00105 2017-07-27 06:55		
	104 31°42.000'N 121°46.907'E		
	A POINT00104 2017-07-27 06:55		
	103 31°42.000'N 121°46.907'E		
	A POINT00103 2017-07-27 06:55		
	102 31°42.000'N 121°46.907'E		
	A POINT00102 2017-07-27 06:55		

- 1) Click “EDIT” to edit the contents of the waypoint.
- 2) Click “LAT” or “LON” to locate the first character to edit, turn the knob to select the character to be edited.
- 3) Turn the knob to change the characters among 0-9 until the desired character is got. Turn the knob to move the cursor to the next digit to edit.
- 4) Turn the knob to select “latitude”, “longitude”.
- 5) Click the [✓] key to finish the waypoint.

4.1.3 DELETE a waypoint

Delete the selected waypoint.

4.2 Route Planning

[WAYPOINT/ROUTE]	
BD- 3D	31°25.8099 N 120°31.9804 E UTC 2017-08-17 03:32:56
WAYPOINT LIST	
ROUTE LIST	
SETTING	
←	

- 1) Turn the knob to select route desired.

TOTAL: 002 PAGE: 1/1		[ROUTE LIST]		UTC 2017-08-17 03:39:40	
BD- 3D	31°25.8211 N 120°31.9812 E				
ID	NAME	PTS	DISTANCE		
>> 7	ROUTE - NO.00008	1	00.00nm	EDIT	
4	ROUTE - NO.00007	0	00.00nm	FORWARD	
				REVERSE	
				ADD	
				DELETE	
				NEXT	
				PREV	
				←	

- 2) Click “EDIT”, “FORWARD”, “REVERSE”, “ADD”, “DELETE”, “NEXT” or “PREV” desired.

4.2.1 Edit a route

- 1) Click the screen to select a route in ROUTE LIST desired.
- 2) Click the “EDIT” to edit the route.

TOTAL: 001 PAGE: 1/1		ROUTE: ROUTE - NO.00008		UTC 2017-08-17 03:45:31	
BD- 3D	31°25.8240 N 120°31.9823 E				
>>	134252831 223°57.662'N 000°00.006'E			ADD	
	2006-536882542-536905840 06:02			RENAME	
				DELETE	
				NEXT	
				PREV	
				←	

- 3) Select “ADD”, “RENAME”, “DELETE”, “NEXT” or “PREV” to add, rename, or delete a waypoint in the route.

ADD a waypoint

Add a waypoint to route from route list.

Click the “ADD” to display the waypoints registered.

The screen will return to the route and a new waypoint has been added just after the current waypoint.

EDIT a waypoint

Edit a waypoint in the route.

Click the “EDIT” to edit the waypoint.

It's in the same way with editing waypoint in waypoint list.
Please refer to "4.1.2 Edit a waypoint".

RENAME the route

Click the "RENAME", the pop-up menu appears.

TOTAL: 001 PAGE: 1/1		ROUTE: ROUTE - NO.00015	
BD- 3D	31°25.8056 N 120°31.9821 E	UTC	2017-08-17 04:51:27
>>	121 31°25.820'N 120°31.986'E		
	A POINT00121 2017-08-17 03:02		
		ADD	
		RENAME	
		DELETE	
		NEXT	

ABC

Q	W	E	R	T	Y	U	I	O	P	⌂
A	S	D	F	G	H	J	K	L	⌂	
⌂	Z	X	C	V	B	N	M	,	.	✓

The route name can be made of up to 6 characters.

- 1) Click RENAME to rename the route desired.
- 2) Click the character among A-Z desired. Turn the knob to select an item on screen and press the knob to confirm the selection.
- 3) Click the [✓] to finish.

DELETE a waypoint

Click the "DELETE" to delete the selected waypoint from the route.

4.2.2 Navigation by the Route Forward

Click the "FORWARD" in MENU to start navigation forward. The plotter screen is displayed.

TOTAL: 002 PAGE:1/1		[ROUTE LIST]	
BD- 3D	31°25.8129 N 120°31.9866 E	UTC	2017-08-23 06:24:40
ID	NAME	PTS	DISTANCE
>> 12	ROUTE - NO.00015	Fwd 2	1324.19nm
11	ROUTE - NO.00014	0	00.00nm

EDIT

FORWARD

REVERSE

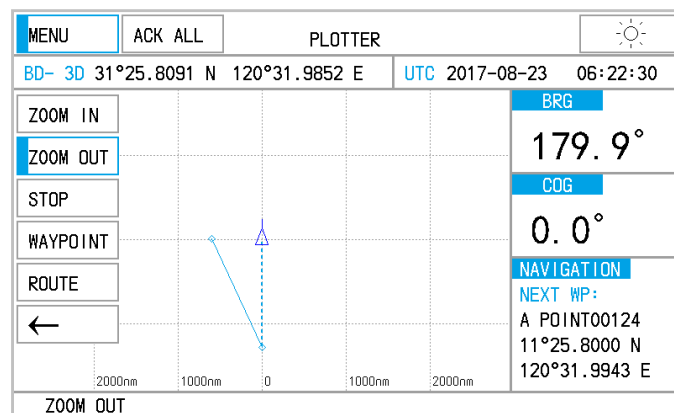
ADD

DELETE

NEXT

PREV

←



4.2.3 Navigation by the Route Reverse

Click the “REVERSE” to start navigation reversely. The plotter screen is displayed.

TOTAL : 002 PAGE:1/1

[ROUTE LIST]

BD- 3D31°25.8208 N120°31.9870 EUTC2017-08-2306:26:40

ID	NAME	PTS	DISTANCE
>> 12	ROUTE - NO.00015	Rev 2	1324.19nm
11	ROUTE - NO.00014	0	00.00nm

EDIT

FORWARD

REVERSE

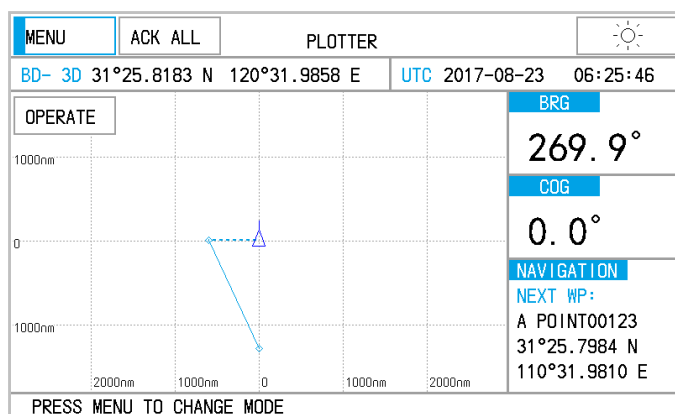
ADD

DELETE

NEXT

PREV

←



4.2.4 Stop navigation

Click the “STOP” to stop navigation and no navigation data is listed on Plotter display.

4.2.5 Create a new route

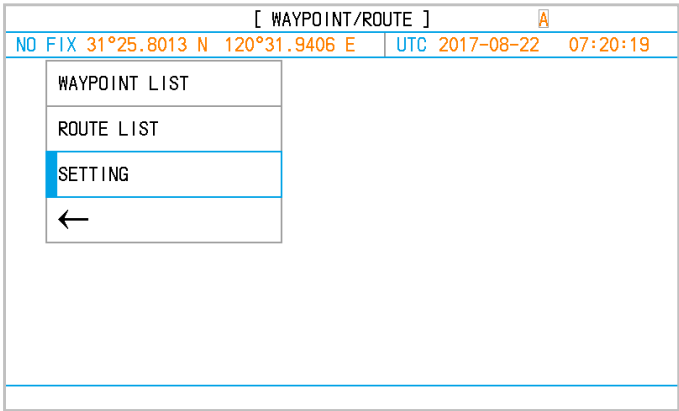
Click the “ADD” to add a new route just after the current route.

4.2.6 Delete a route

Click the “DELETE” to delete the selected route from route list.

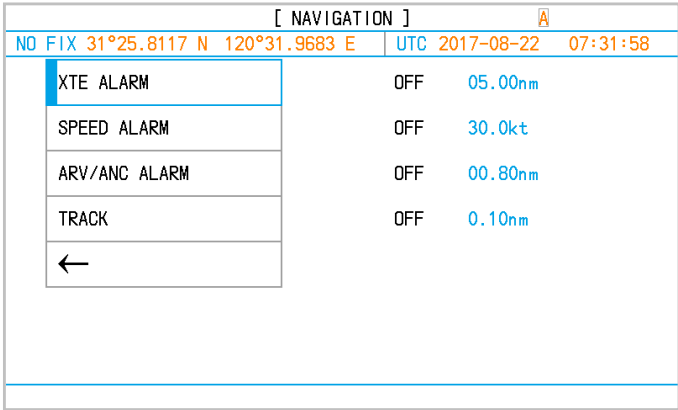
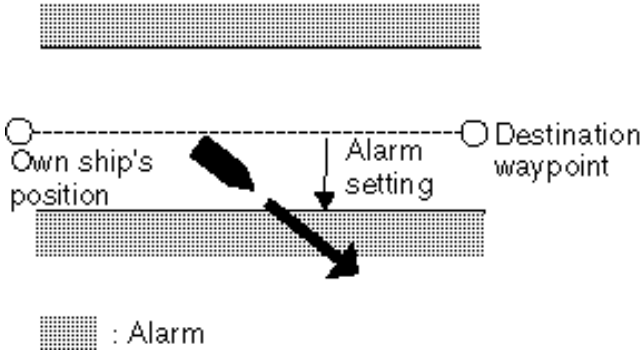
5. NAVIGATION SETTING

Select NAVIGATION SETTING in WAYPOINT/ROUTE to open the menu.



5.1 Setup XTE (Cross Track Error) Alarm

The XTE alarm warns by an internal buzzer you when own ship is off its intended route.



- 1) Click the XTE field ON/OFF.
- 2) Click the submenu to select ON or OFF as appropriate.
- 3) Click the XTE value to edit.
- 4) Click the digits among 0-9 desired until the desired digit is got.
- 5) Turn the knob to move the cursor to the next digit to edit.

5.2 Set up Speed Alarm

The speed alarm is activated when ship's speed is higher (or lower) than the set values.

[NAVIGATION]			
BD- 3D	31°25.8147 N	120°31.9770 E	UTC 2017-08-22 07:34:50
XTE ALARM	OFF	05.00nm	
SPEED ALARM	ON	30.0kt	
ARV/ANC ALARM	OFF	00.80nm	
TRACK	OFF	0.10nm	
←			

- 1) Select SPEED ALARM.
- 2) Click the SPEED ALARM to select OFF, HIGH or LOW as appropriate.
 - OFF:** Disables the speed alarm.
 - LOW:** Alarm is activated when speed is lower than the speed set.
 - HIGH:** Alarm is activated when speed is higher than the speed set.
- 3) Click the SPEED value to edit.
- 4) Click the digits among 0-9 until the desired digit is got.
- 5) Turn the knob to move the cursor to the next digit to edit.

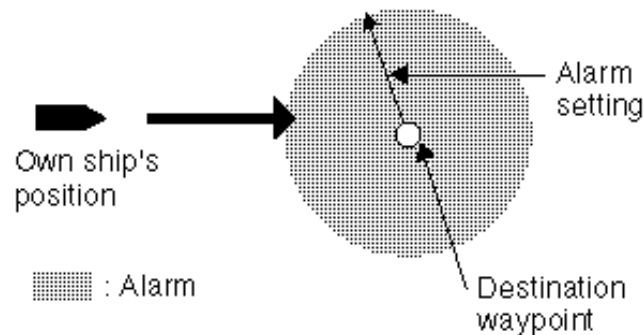
5.3 Set up Arrival Alarm and Anchor Watch Alarm

[NAVIGATION]			
BD- 3D	31°25.8176 N 120°31.9837 E	UTC	2017-08-22 07:35:56
XTE ALARM	OFF	05.00nm	
SPEED ALARM	ON	30.0kt	
ARV/ANC ALARM	OFF	00.80nm	
TRACK	OFF	0.10nm	
←			

You may activate the arrival alarm or the anchor watch alarm while they cannot be activated together.

● Arrival alarm

The arrival alarm informs you that own ship is approaching a destination waypoint. The area that defines an arrival zone is that of a circle which you approach from the out- side of the circle. The alarm will be activated if own ship enters the circle.

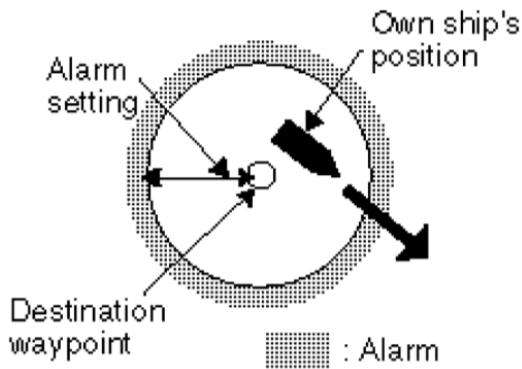


- 1) Select ARV(arrival) from ARV/ANC/OFF.
- 2) Click the ALARM value to edit.
- 3) Click the digits among 0-9 until the desired digit is got.
- 4) Turn the knob to move the cursor to the next digit to edit.

The alarm range is (0.01-99.99 nm).

● Anchor watch alarm

The anchor watch alarm sounds to warn you that own ship is moving beyond the set area.



Before setting the anchor watch alarm, set current position as destination.

- 1) Select ANC (anchor) from ARV/ANC/OFF.
- 2) Click the ALARM value to edit.
- 3) Click the digits among 0-9 until the desired digit is got.
- 4) Turn the knob to move the cursor to the next digit to edit..

[NAVIGATION]

BD- 3D 31°25.8176 N 120°31.9837 E

UTC 2017-08-22 07:35:56

XTE ALARM

OFF05.00nm

SPEED ALARM

ON30.0kt

ARV/ANC ALARM

OFF00.80nm

TRACK

OFF0.10nm

←

The alarm range is (0.01-99.99 nm).

NOTE:

Anchor watch alarm and arrival alarm are combined to serve a route. After a route is finished while the destination is arrived at, keep the navigation on the route while setting ANC. The anchor watch starts.

5.4 Set up the Track record

TRACK is to set the interval of every two recorded dots.

[NAVIGATION]			A
NO FIX	31°25.8176 N 120°31.9970 E	UTC	2017-08-22 07:42:19
XTE ALARM	OFF	05.00nm	
SPEED ALARM	ON	30.0kt	
ARV/ANC ALARM	OFF	00.80nm	
TRACK	OFF	0.10nm	
←			

If OFF is selected, the track will not be recorded.

If DISTANCE is selected, the track will be recorded every certain distance which can be configured.

If AUTO is selected, the track will be recorded every minute or every certain distance which can be configured, whichever is reached first.

6. MAINTENANCE & DIAGNOSTICS

6.1 Maintenance

Check the following points regularly to maintain performance:

- Check that connectors on the rear panel are firmly tightened and free of rust.
- Check that the ground system is free of rust and the ground wire is tightly fastened.
- Check the antenna for damage. Replace if damaged.
- Dust and dirt on the keyboard and display screen may be removed with a soft cloth. Do not use chemical cleaners to clean the equipment; they may remove paint and markings.

6.2 Error alarms displayed

When an error occurs, the alarm will be displaying on the current screen. The meanings of the alarms are stated in below table:

Message	Meaning, Remedy
ANCHOR!	Anchor watch alarm setting violated.
ARRIVAL!	Arrival alarm setting violated.
NO FIX!	No GPS signal. Check antenna cable.
SPEED!	Speed alarm setting violated.
XTE!	XTE alarm setting violated.
OUTPUT ERROR!	Too many sentences selected.

The alarm parameters are set in NAVIGATION SETTING.

6.3 Diagnostic Test

The diagnostic test checks software version, keyboard and LCD for proper operation.

[SETTINGS]			
NO FIX	31°25.8034 N	120°31.9755 E	UTC 2017-08-22 07:45:05
GNSS SETTING NAVIGATION ALERT SYSTEM SETTING DIAGNOSTICS MAINTENANCE ←			

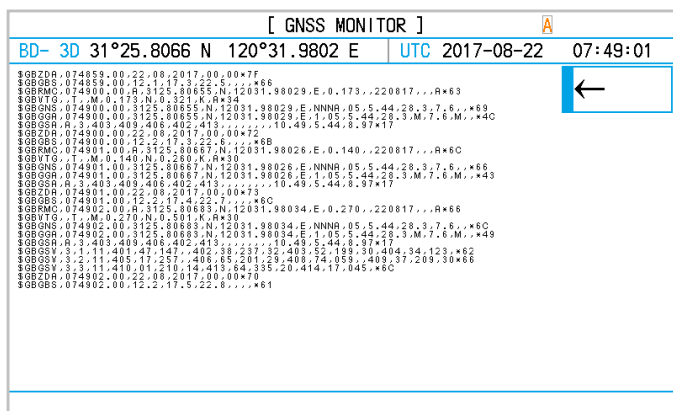
[DIAGNOSTICS]			
NO FIX	31°25.8167 N	120°31.9795 E	UTC 2017-08-22 07:46:07
PROGRAM VERSION LCD TEST KEY TEST FACTORY DEFAULT GNSS MONITOR RTCM MONITOR ←			

6.3.1 Software version

Select SOFTWARE VERSION item and press the [ENT] key to check the software version.

[DIAGNOSTICS]			
NO FIX	31°25.8168 N	120°31.9829 E	UTC 2017-08-22 07:47:17
PROGRAM VERSION LCD TEST KEY TEST FACTORY DEFAULT GNSS MONITOR RTCM MONITOR ←			

It's to check the GPS data appearing on output ports.



[KEY TEST]		A	
NO FIX	31°25.8234 N 120°31.9883 E	UTC	2017-08-22 07:50:54
KEY	BACKUP: DIM :		
KNOB	LEFT : RIGHT: ENT :		
TOUCH	A: B: C:		
←			

Press **DIM** to test the Display Brightness.

6.3.6 Factory default

FACTORY DEFAULT is to return the system to factory default setting.

Select FACTORY DEFAULT item in DIAGNOSTICS menu. Press the [ENT] key to restore the factory default settings.

NOTE:

The navigation settings and GPS settings will restore to factory default while the waypoints and routes registered remain unchanged.

[DIAGNOSTICS]			
BD- 3D	31°25.8211 N	120°31.9870 E	UTC 2017-08-22 07:54:57
PROGRAM VERSION			
LCD TEST			
KEY TEST			
FACTORY DEFAULT			
GNSS MONITOR			
RTCM MONITOR			
←			

[DIAGNOSTICS]			
BD- 3D	31°25.8237 N	120°31.9914 E	UTC 2017-08-22 07:56:34
PROGRAM VERSION			
LCD TEST			
KEY TEST			
FACTORY DEFAULT			
GNSS MONITOR			
RTCM MONITOR			
←			

CONFIRM

NO

YES

7. MENU OPERATION

7.1 BASIC MENU OPERATION

Most operations of your unit are carried out through the menu. Below is a quick introduction to how to select a menu and change menu settings. If you get lost in operation, click the **MENU** button to return to the MAIN menu. Please refer to complete MENU TREE in the Appendix.

MENU	ACK ALL	DATA	
FIX	HDOP	RAIM	A.LEVEL
GN-D3D	1.6	Safe	100m
WGS84	TIME		
31° 25.8289 N	2017-08-14 05:14:18 UTC		
120° 31.9955 E	LAST FIX		
	2017-08-14 05:14:18 UTC		
COG	SOG	SATELLITE	
0.0	0.0 kn	GPS: 09	
		BEIDOU: 04	

- 1) Click the **MENU** button once or twice to display the menu.
- 2) Turn the knob to locate an item and press down to confirm the selection or input. For example, select [MENU] and press the knob to determine the entry.
- 3) Click the [←] to return to previous menu.

7.2 GNSS SETTING

[SYSTEM SETTING]			
BD- 3D	31°25.8143 N	120°31.9749 E	UTC 2017-08-22 08:00:39
GNSS MODE	BD		
GEODETIC DATUM	WGS84		
RAIM	ON		
ACCURACY LEVEL	50m		
BEACON/SBAS	SBAS		
←			

7.2.1 GEODETIC DATUM

Totally there are two systems to be selected among: WGS84, PZ-90.

[SYSTEM SETTING]	
BD- 3D 31°25.8162 N 120°31.9784 E	UTC 2017-08-22 08:02:57
GNSS MODE	BD
GEODETTIC DATUM	PZ-90
RAIM	ON
ACCURACY LEVEL	50m
BEACON/SBAS	SBAS
←	

7.2.2 RAIM

RAIM (Receiver Autonomous Integrity Monitoring) can be set ON or OFF.
When set ON, RAIM will display SAFE, UNSAFE or CAUTION in below conditions:

Conditions for the "safe" state

The result of integrity calculation by means of RAIM will be stated as "safe", if the integrity calculation can be performed with a confidence level above 95 % for the selected accuracy level and RAIM calculates the probable position error to be within the selected accuracy level.

This generally requires at least 5 "healthy" satellites available and in a robust geometry, i.e. the worst 4 satellite geometry is still suitable for navigation.

Conditions for the "caution" state

The "caution" status will be used to indicate:

- insufficient information to reliably calculate with a confidence level above 95 % for the selected accuracy level, or
- the probability of false alarms >5 %, or
- the probability of not detecting an error condition >5 %.

Those conditions may occur if an insufficient number of satellites are available, for example 4 or 5 with 2 satellites "close" together in azimuth and elevation, causing the geometry to degrade to the point that the RAIM calculation becomes unreliable. Note that the resulting accuracy based on 4 or 5 satellites in use may be within the selected accuracy level, but the RAIM algorithm cannot verify it.

Conditions for the "unsafe" state

The "unsafe" status will be used if the integrity calculation is performed with a confidence level above 95 % for the selected accuracy level, and RAIM calculates the probable position error exceeding the selected accuracy level. Note that also here a robust geometry is required to reach this confidence level. The "unsafe" state can be reached when satellite range errors degrade the navigation solution, causing the resulting accuracy to be outside the selected accuracy level.

7.2.3 ACCURACY LEVEL

Accuracy level can be set between 10-100m.

7.2.4 RTCM

RTCM can be set ON or OFF. When set ON, DGPS beacon input will be checked by NGR-3000.

7.3 SYSTEM SETTING

7.3.1 KEY BUZZER

Buzzer can be muted so that operation is not heard.

7.3.2 LCD/KEY DIMMER

Dimmer can be adjusted either by **DIM** button or set in menu.

7.4 ALARM SETTING

When an error occurs, the alarm will be displaying on the current screen. The meanings of the alarms are stated in below table:

When one of below three conditions met, an audible alarm will be generated:

1. GPS not fixed.
2. HDOP greater than 4.
3. DGPS input not detected when RTCM is set ON.

7.4.1 ALARM LIST

It's to check current alarm events.

7.4.2 ALARM PERIOD

Alarm period can be set between 1-5 minutes.

When an alert occurs, a warning will be displayed at the bottom of screen and can be heard as a warning tone.

If an alert lasts for above set period, an alarm will be displayed at the bottom of screen and can be heard as an alarm tone.

Either a warning tone or an alarm tone can be muted by pressing the alert on screen or being set in menu.

7.4.3 ALARM HISTORY

All history alarms will be displayed here.

8. INSTALLATION

8.1 INSTALLATION OF MAIN UNIT

The main unit can be installed on a table-top, 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 which 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 following compass safe distances to prevent deviation of a magnetic compass. Standard compass, 0.5 m, Steering compass, 0.3 m.

8.2 INSTALLATION OF ANTENNA UNIT

Install the antenna unit referring to the antenna installation diagram at the end of this manual. When selecting a mounting location for the antenna unit, keep in mind the following points:

- Do not shorten the antenna cable.
- Select a location out of the radar beam. The radar beam will obstruct or prevent reception of the GPS signal.
- The location should be well away from a VHF/UHF antenna. A GPS NAVIGATOR is interfered by a harmonic wave of a VHF/UHF antenna.
- There should be no interfering object within the line-of-sight to the satellites. Objects within line-of-sight to a satellite, for example, a mast, may block reception or prolong acquisition time.
- Mounting the antenna unit as high as possible keeps it free of interfering objects and water spray, which can interrupt reception of GPS satellite signal if the water freezes.
- If the antenna cable is to be passed through a hole which is not large enough to pass the connector, you may unfasten the connector. Refasten it after running the cable through the hole.

8.3 CABLING

8.3.1 POWER CONNECTION

PIN NO	DESCRIPTION
13	PWR (+ 24V)
14	PWR (0V)

The power cable with a rated capacity of 3A should be used. Pin definition for the connector is showed above.

Suggest using the 3A DC Power Supply Unit (DC 24V output).

8.3.2 GPS DATA OUTPUT

There are totally 2 RS422 GPS data ports. The output data format is NMEA0183, as IEC61162-1 standard.

PIN NO	DESCRIPTION
5	GPS OUT 1+
6	GPS OUT 1-
7	GPS OUT 2+
8	GPS OUT 2-
9	INS OUT+
10	INS OUT+
11	INS IN+
12	INS IN+

The default baud rate is 4800 bps, which can also be reset into among 9600 / 19200 / 38400 bps.

8.3.3 GROUNDING

The display unit contains a CPU. While it is operating, it radiates noise, which can interfere with radio equipment. Ground the unit as follows to prevent interference:

- The ground wire should be 1.25sq or larger.
- The ground wire should be as short as possible.

8.4 INITIAL SETTINGS

This equipment can output navigation data to external equipment, in NMEA 0183 format. For example, it can output position data to a radar or echo sounder for display on its display screen.

8.4.1 SENTENCE SETTING

For each port, up to five sentences can be selected to output. If the selected sentences exceed 5 items, OVERFLOW will be indicated in the relative column. In this case, OUTPUT ERROR will also be shown in displayed screens.

Move the cursor to the item and click it to select it or deselect a sentence.

[MAINTENANCE]			
BD- 3D	31°25.8139 N	120°31.9947 E	UTC 2017-08-22 08:16:09
SENTENCE SETTING			
EXTEND GNSS		OFF	
←			

[OUTPUT SENTENCE]			
BD- 3D	31°25.8166 N	120°31.9998 E	UTC 2017-08-22 08:18:26
GPS OUT 1 & BEACON IN		NMEA 1.5	9600 BPS
GPS OUT 2		IEC61162 Ed5	4800 BPS
INS OUT		IEC61162 Ed5	4800 BPS
INS IN		IEC61162 Ed5	4800 BPS
←			

[SENTENCE SETTING]			
BD- 3D	31°25.8054 N	120°31.9881 E	UTC 2017-08-22 08:20:56
SENTENCE		GNS GBS GGA RMC VTG ZDA DTM	
BAUDRATE		4800 BPS	
VERSION		IEC61162 Ed5	
←			

Data sentence description

- ACN: Equipment is operating normally, or for supervision of a connection between two units.
- ALC: Cyclic alert list. The cyclic alert list transmission shall never stop. When all alerts are in normal state the cyclic alert list is empty i.e. number of alert entries is 0.
- ALF: Report an alert condition and the alert state of a device. An ALF message shall be published for an alert each time the alert information in this sentence changes and on alert request (see ALC – Cyclic alert list).
- GNS: Fix data for GPS, GLONASS.
- GBS: Support Receiver Autonomous Integrity Monitoring (RAIM).
- GGA: GPS position fixing condition (time of fix, latitude, longitude, receiving condition, number of satellites used, DOP).
- HBT: The sentence is transmitted at regular intervals specified in the corresponding equipment standard. The repeat interval may be used by the receiving unit to set the time-out value for the connection supervision.
- RMC: Generic navigational information (UTC time, latitude, longitude, ground speed, true course, day, month, year).
- VTG: Actual track and ground speeds.
- ZDA: UTC time (day, month, year).
- DTM: Datum reference.
- GSA: GNSS receiver operating mode, satellites used in the navigation solution reported by the GGA 2148 or GNS sentences, and DOP values.

NOTE: *As default, GNS, GBS, GGA, RMC, ZDA and DTM are selected.*

8.1.2 BAUD RATE SETTING

Select each of four outputs to configure the baud rate.

Default baud rate of all ports is 4800bps.

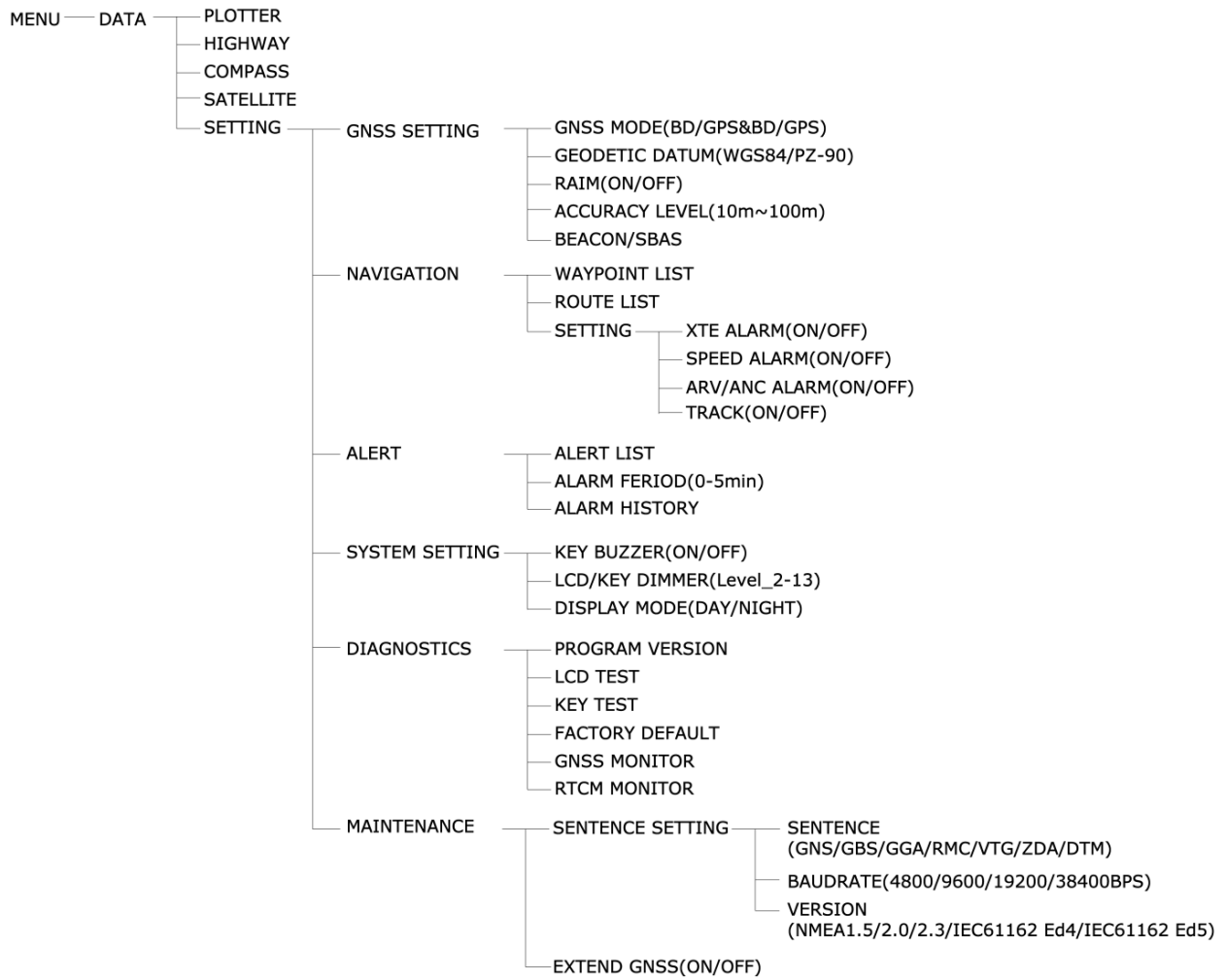
Move the cursor to the output and click it continuously until a desired rate is shown.

[SENTENCE SETTING]	
BD- 3D 31°25.8206 N 120°31.9880 E	UTC 2017-08-23 06:52:53
SENTENCE	ALC HBT ALF
BAUDRATE	4800 BPS
VERSION	NMEA 1.5
←	
Set Uart baudrate	

[SENTENCE SETTING]	
BD- 3D 31°25.8206 N 120°31.9880 E	UTC 2017-08-23 06:52:53
SENTENCE	ALC HBT ALF
BAUDRATE	4800 BPS
VERSION	NMEA 1.5
←	
Set output sentence version	

- 1、 The baud rate can be selected among 4800/ 9600/ 19200/ 38400bps.
- 2、 The NMEA Version can be selected among 1.5/ 2.0/ 2.3/IEC61162 Ed4/IEC61162 Ed5.

APPEDIX I MENU TREE



APPEDIX II TECHNICAL SPECIFICATIONS

1. GPS NAVIGATOR

- | | |
|------------------------------|--|
| (1) Receiving System | 50 channels parallel (GPS) |
| (2) Rx Frequency | 1575.42 MHz(GPS) |
| (3) Rx Code | C/A code |
| (4) Position Accuracy | Approx. 10m (GPS), 95% of the time, horizontal
dilution of position (HDOP) ≤ 4 |
| (5) Tracking Velocity | 999 kts |
| (6) Position-fixing Time | Warm start: 15 seconds, Cold start: 120 seconds |
| (7) Position Update Interval | 1 second |

2. DISPLAY SECTION

- | | |
|--------------|---|
| (1) Display | 7 inch, color LCD, touch screen operation |
| (2) Fix Mode | GPS |
| (3) Alerts | Lost of Position, HDOP > 4, DGPS lost |

3. INPUT/OUTPUT DATA

- | | |
|-----------------|---|
| (1) Output Data | NMEA0183, totally 2 ports, baud rate 4800/9600/19200 bps
Sentences: ACN, ALC, ALF, DTM, GBS, GNS, GGA, GSA,
HBT, RMC, VTG, ZDA, |
| (2) Input Data | DGPS RTCM 10402.3 |

4. POWER SUPPLY

12-24 VDC: 0.25-0.50 A

5. ENVIRONMENT CONDITION

- | | |
|-------------------------|--|
| (1) Ambient Temperature | Antenna Unit: -25°C to +70°C
Display Unit: -15°C to +55°C |
| (2) Relative Humidity | 95% at 40°C |
| (3) Water Proofing | Antenna Unit: IEC60529 IPX6
Display Unit: IEC60529 IPX5 |

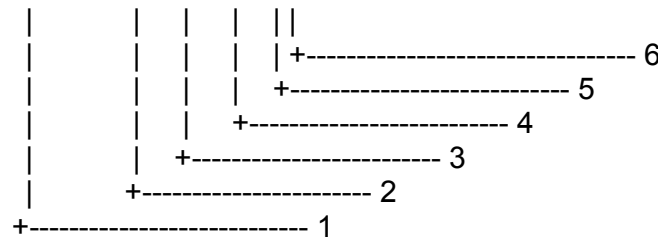
6. OTHERS

- | | |
|------------|----------------------------|
| (1) Size | 145(H) x 264(W) x 80(D) mm |
| (2) Weight | abt 2 kg (main unit) |

APPEDIX III SENTENCE DISCRIPTION

ACN – Alert command

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



1. Time (see Note 1)
2. Manufacturer mnemonic code (see Note 2)
3. Alert Identifier (see Note 3)
4. Alert Instance, 1 to 999999 (see Note 4)
5. Alert command, A, Q, O or S (see Note 5)
6. Sentence status flag (see Note 6)

NOTE 1: Release time of the alert command. (e.g. for VDR purposes), optional can be a null field. Sender is allowed to use all alternatives defined in Table 5 Field type summary. Receiver is allowed to ignore content of this field. If receiver does not ignore this field it should support all alternatives defined in Table 5 Field type summary.

NOTE 2: Used for proprietary alerts defined by the manufacturer. For standardized alerts this should be a null field.

NOTE 3: The alert identifier is unique within a single alert source. The alert identifier is a variable length integer field of maximum 7-digit integer. It identifies the type of the alert e.g. a “lost target” alert. Standardized alerts use unique alert identifiers described in equipment standards. Number range 10000-9999999 is reserved for proprietary alerts. Alert Identifier examples: “001”, “2456789”, “245” .

NOTE 4: The alert instance identifies the current instance of an alert to distinguish alerts of the same type (Alert identifier) and from the same source (e.g. dangerous target). Alert instance is maximum 6-digit integer from 1 to 999999. The number of alert instance can be freely defined by the manufacturer as long as it is unique for one type of alert (alert identifier). It is not permitted to modify the alert instance within a life cycle of a distributed alert (from ‘active & unacknowledged’ state until ‘normal’ state is reached). It can be also a null field, when there is only one alert of that type.

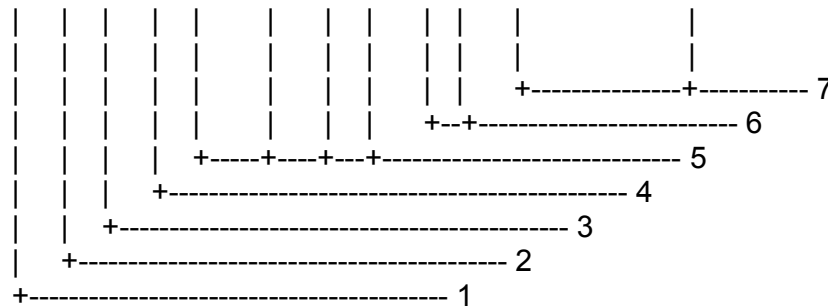
NOTE 5: This should not be null field

acknowledge :	A
request / repeat information :	Q
responsibility transfer:	O
silence :	S

NOTE 6: This field should be “C” and should not be null field. This field indicates a command. A sentence without “C” is not a command.

ALC - Cyclic alert list

\$--ALC, xx, xx, xx, x.x, aaa, x.x, x.x, x.x,, aaa, x.x, x.x, x.x*hh <CR><LF>



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

NOTE 1: The first field specifies the total number of sentences used for a message, minimum value 1. The second field identifies the order of this sentence in the message, minimum value 1, These cannot be null fields.

NOTE 2: The sequential message identifier relates all sentences that belong to a group of multiple sentences (i.e. message). Multiple sentences (see Note 1) with the same sequential message identifier, make up one message.

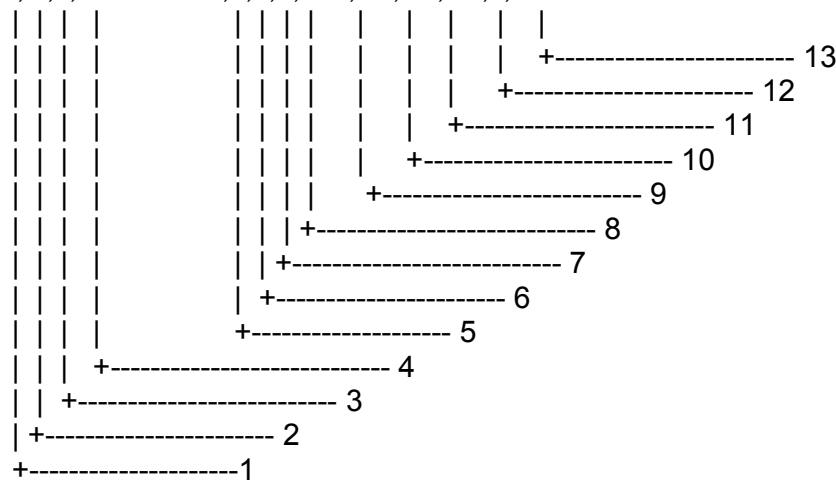
NOTE 3: Contains the number of alert entries transported within this sentence.

NOTE 4: Alert entry 0 – n: Each alert entry consists of four fields:

- Manufacturer Identifier (see ALF Manufacturer Identifier)
- Alert Identifier (see ALF Alert Identifier)
- Alert instance (see ALF Alert instance)
- Revision Counter (see ALF Revision Counter)

Each entry identifies a certain alert with a certain state. It is not allowed that an alert entry is split between two ALC sentences.

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



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

NOTE 1: The first field specifies the total number of sentences used for a message, minimum value 1. The second field identifies the order of this sentence in the message, minimum value 1, These cannot be null fields. When the sentence number is 2, the following Alert category, Alert priority and Alert state can be null fields.

NOTE 2: The sequential message identifier relates all sentences that belong to a group of multiple sentences (i.e. message). Multiple sentences (see Note 1) with the same sequential message identifier, make up one message.

NOTE 3: Time should represent the last time the data within the alert message has changed. For example changing the alert text by in-/decrementing a contained counter or count down should cause a revision of alert message and a new time. Time is an optional field. The time-field is additional information about when this happened and not used for decision making. There is no mandatory requirement for time synchronization between the equipment. It should be either a null field (if not used) or UTC (if used). Sender is allowed to use all alternatives defined in Table 5 Field type summary. Receiver is allowed to ignore content of this field. If the receiver

does not ignore this field it should support all alternatives defined in Table 5 Field type summary.

NOTE 4: The alert category is in compliance with the category definition as described in INS Performance Standard (MSC.252(83)) and Bridge Alert Management Performance Standard (MSC.302(87)):

A, Category A: Alerts where information at operator unit directly assigned to the function generating the alert is necessary, as decision support for the evaluation of the alert-related condition, e.g. graphical information of danger of collision or graphical information of danger of grounding.

B, Category B: Alerts where no additional information for decision support is necessary besides the information which can be presented using alert source and alert description text.

C, Category C: Alerts that cannot be acknowledged on the bridge but for which information is required about the status and treatment of the alerts, e.g., certain alerts from the engine.

NOTE 5: Alert priority: Emergency Alarm: E, for use with Bridge alert management
Alarm: A
Warning: W
Caution: C

NOTE 6: The alert state transition is defined in Annex J
active – unacknowledged: V
active – silenced: S
active – acknowledged or active: A
active – responsibility transferred: O
rectified – unacknowledged: U
normal: N

NOTE 7: Used for proprietary alerts defined by the manufacturer. For standardized alerts this should be a null field.

NOTE 8: The alert identifier is unique within a single alert source. The alert identifier is a variable length integer field of maximum 7-digit integer. It identifies the type of the alert e.g. a “lost target” alert. Standardized alerts use unique alert identifiers described in equipment standards. Number range 10000-9999999 is reserved for proprietary alerts. Alert Identifier examples: “001”, “2456789”, “245”.

NOTE 9: The alert instance identifies the current instance of an alert to distinguish alerts of the same type (Alert identifier) and from the same source (e.g. dangerous target). Alert instance is maximum 6-digit integer from 1 to 999999. The number of alert instance can be freely defined by the manufacturer as long as it is unique for one type of alert (alert identifier). It is not permitted to modify the alert instance within a life cycle of a distributed alert (from ‘active & unacknowledged’ state until ‘normal’ state is reached). It can be also a null field, when there is only one alert of that type.

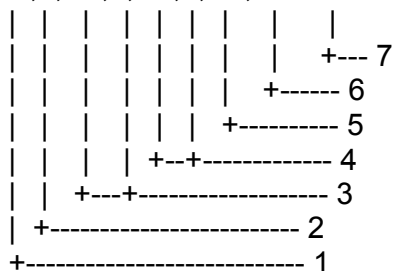
NOTE 10: The revision counter is the main method to follow up-to-date status. Revision counter is also unique for each instance of alert. Revision counter starts with 1 and the step for increment is 1. The count resets to 1 after 99 is used. Revision counter increments on each change of content of any field of the alert.

NOTE 11: The escalation counter is presenting the number of alert escalations after time expiration during the state active-unacknowledged. The escalation counter starts with 0 and the step for increment is 1. The count resets to 1 after 9 is used. The alert escalation can be the escalation from warning into warning (activation of audible signal only), the escalation from warning to alarm or the escalation from alarm to alarm with activation of back-up navigator alarm

NOTE 12: This field is used for Alert title which is mandatory and for additional alert description which is optional.

DTM - Datum reference

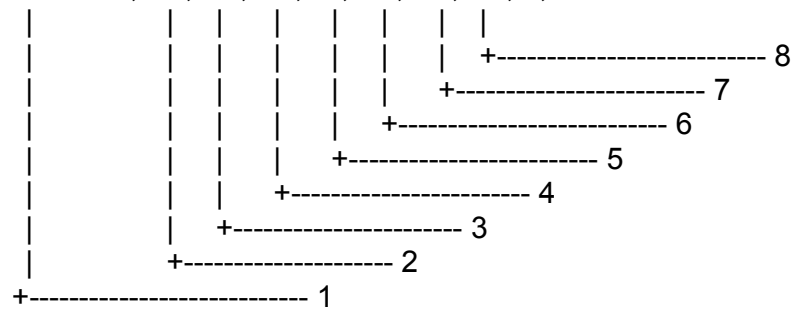
\$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc*hh<CR><LF>



1. Local datum W84 - WGS84
W72 - WGS72
S85 - SGS85
P90 - PE90
999 - User defined
IHO datum code
2. Local datum subdivision code
3. Lat offset, min, N/S
4. Lon offset, min, E/W
5. Altitude offset, m
6. Reference datum W84 - WGS84
W72 - WGS72
S85 - SGS85
P90 - PE90
7. Checksum

GBS – GNSS satellite fault detection

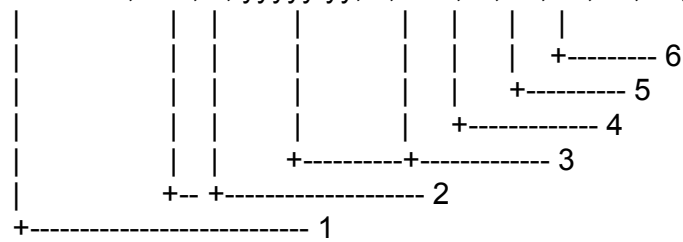
\$--GBS, hhmmss.ss, x.x, x.x, x.x, xx, x.x, x.x, x.x, h, h *hh <CR><LF>



1. UTC time of the GGA or GNS fix associated with this sentence
2. Expected error in latitude (see Note 1)
3. Expected error in longitude
4. Expected error in altitude
5. ID number (see Note 2) of most likely failed satellite
6. Probability of missed detection for most likely failed satellite
7. Estimate of bias on most likely failed satellite
8. Standard deviation of bias estimate

GNS - GNSS fix data

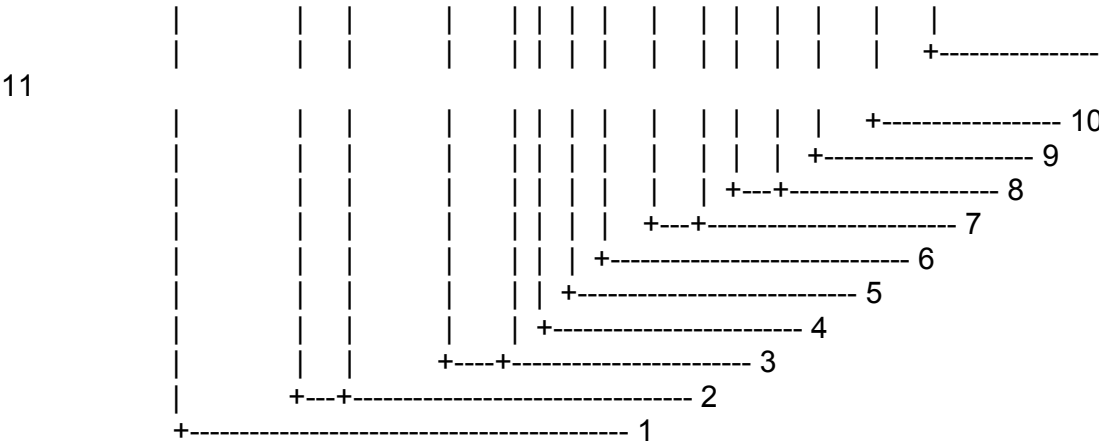
\$-- GNS, hhmmss.ss, llll.ll, a, yyyyy.yy, a, c--c,xx,x.x,x.x,x.x,x.x,x.x,x.x,a *hh<CR><LF>



1. UTC of position
2. Latitude, N/S
3. Longitude, E/W
4. Mode indicator
5. Total number of satellites in use, 00-99
6. HDOP

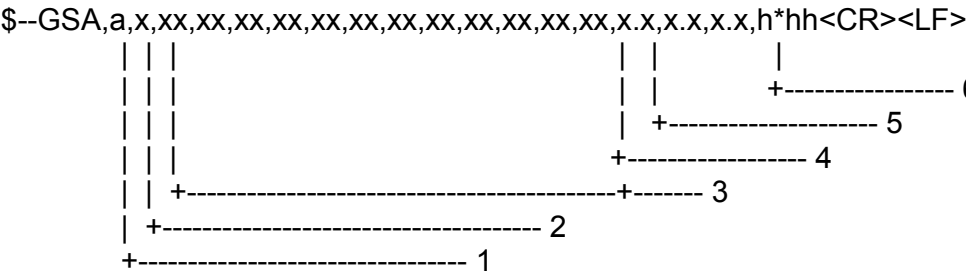
GGA -Global positioning system fix data

\$--GGA,hhmmss.ss,lll.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 (0: No fix, 1: GPS, 2: Differential, 8: Demo mode)
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 mean sea level, m
8. Geoidal separation, m
9. Age of differential GPS data
10. Differential reference station ID, 0000-1023
11. Checksum

GSA - GNSS DOP and active satellites



1. M = manual, forced to operate in 2D or 3D mode 2165
A = automatic, allowed to automatically switch 2D/3D
2. 1 = fix not available, 2 = 2D, 3 = 3D
3. ID numbers (see Note 1) of satellites used in solution
4. PDOP
5. HDOP
6. VDOP

NOTE 1:Satellite ID numbers. To avoid possible confusion caused by repetition of satellite ID

numbers when using multiple satellite systems, the following convention has been adopted.

- a) GPS satellites are identified by their PRN numbers, which range from 1 to 32.
- b) The numbers 33 to 64 are reserved for WAAS satellites. The WAAS system PRN numbers are 120 to 138. 2171 The offset from WAAS SV ID to WAAS PRN

number

is 87. A WAAS PRN number of 120 minus 87 yields 2172 the SV ID of 33. The addition of 87 to the SV ID yields the WAAS PRN number.

- c) The numbers 65 to 96 are reserved for GLONASS satellites. GLONASS satellites

are

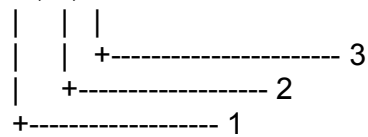
identified by 64+ satellite slot numbers. The slot numbers are 1 through 24 for the

full

GLONASS constellation of 24 satellites, thus giving a range of 65 through 88. The numbers 89 through 96 are available if slot numbers above 24 are allocated to on-orbit spares.

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

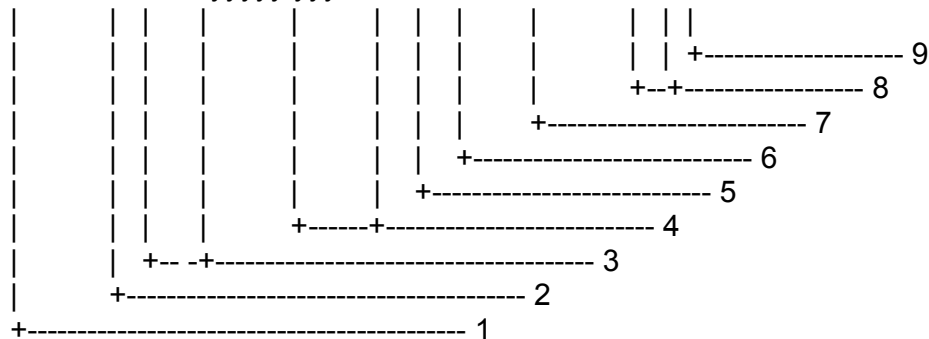
```
$--HBT, x.x, A, x*hh<cr><lf>
```



- NOTE 3:** The sequential sentence identifier provides a message identification number from 0 to 9 that is sequentially assigned and is incremented for each new sentence. The count resets to 0 after 9 is used.

RMC- Recommended minimum specific GPS/TRANSIT data

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



1. UTC of position fix
2. Status(see Note 3): 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(see Note 1)
9. Mode indicator (see Notes 2 and 3)

NOTE 1: E = Easterly variation subtracts from True course
W = Westerly variation adds to True course

NOTE 2: Positioning system mode Indicator

A = Autonomous. Satellite system used in non-differential mode in position fix;
D = Differential. Satellite system used in differential mode in position fix;
E = Estimated (dead reckoning) mode;
F = Float RTK. Satellite system used in real time kinematic mode with floating integers;
M = Manual input mode;
N =No fix. Satellite system not used in position fix, or fix not valid;
P = Precise. Satellite system used in precision mode. Precision mode is defined as: no deliberate degradation (such as selective availability) and higher resolution code (P-code) is used to compute position fix. P is also used for satellite system used in multi-frequency, SBAS or Precise Point Positioning

(PPP)

mode;

R = Real time kinematic. Satellite system used in RTK mode with fixed integers;
S = Simulator mode.

NOTE 3 :The positioning system mode indicator field supplements the positioning system status field. The status field should be set to V = Invalid for all values of the mode indicator except for A= Autonomous, D = Differential, F = Float RTK, P = Precise and R = Real time kinematic. The positioning system mode indicator and status fields should not be null fields.

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

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

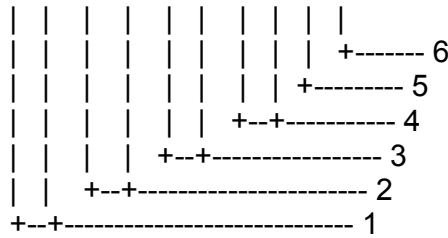
C = Caution when integrity is not available.

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

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

VTG - Course over ground and ground speed

\$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>



1. Course over ground, degrees true
2. Course over ground, degrees magnetic
3. Speed over ground, knots
4. Speed over ground, km/h
5. Mode indicator(see note)
6. Checksum

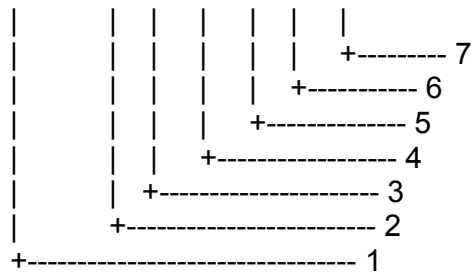
NOTE Positioning system Mode indicator:

- A = Autonomous
- D = Differential
- S = Simulator
- N = Data not valid

The positioning system Mode indicator field shall not be a null field.

ZDA - Time and date

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



1. UTC
2. Day, 01 to 31 (UTC)
3. Month, 01 to 12 (UTC)
4. Year (UTC)
5. Local zone hours, 00h to +-13h
6. Local zone minutes, 00 to +59
as local hours
7. Checksum

APPEDIX IV INSTALLATION DRAWINGS