

SECTION 3

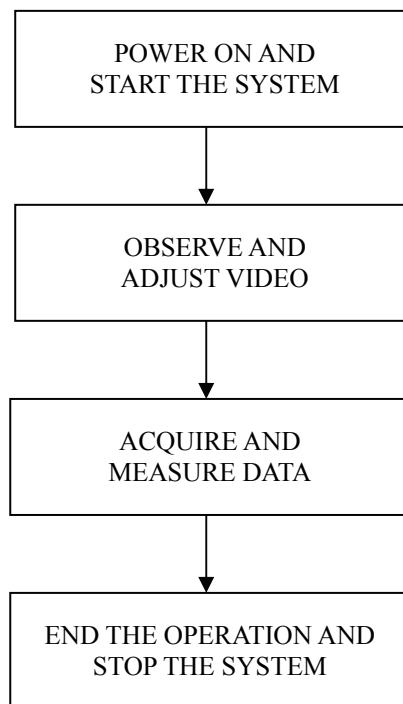
BASIC OPERATION

3.1	FLOW OPERATION.....	3-1	3.5.8	EDITING OWN MARK	3-26
3.1.1	POWER ON AND START THE SYSTEM	3-2	3.5.9	TIME ZONE SETTING	3-34
3.1.2	OBSERVE AND ADJUST VIDEO	3-3	3.5.10	LOCAL TIME SETTING	3-35
3.1.3	ACQUIRE AND MEASURE DATA	3-3	3.5.11	CHANGE THE UNIT OF RATE OF TURN	3-36
3.1.4	END THE OPERATION AND STOP THE SYSTEM	3-4	3.5.12	DISPLAY AIS LABEL	3-37
3.2	MENU COMPOSITION	3-5	3.5.13	ECHO EXPANSION SWITCH	3-37
3.3	PREPARATION	3-9	3.6	DISAPLAY USER MAP	3-38
3.3.1	ADJUST DISPLAY BRILLIANCE [BRILL]	3-9	3.6.1	EDIT USER MAP	3-38
3.3.2	ADJUST OPERATION PANEL BRILLIANCE [PANEL]	3-9	3.6.2	CORRECT POSITION ON USER MAP (SHIFT)	3-41
3.3.3	SWITCH DAY/NIGHT MODE [DAY/NIGHT]	3-9	3.6.3	CORRECT POSITION ON USER MAP (SHIFT CLEAR)	3-41
3.3.4	ADJUST BRILLIANCE OF INFORMATION ON RADAR DISPLAY (BRILLIANCE SETTING)	3-10	3.6.4	SET USER MAP DISPLAY (MARK DISPLAY SETTING)	3-42
3.3.5	ADJUST SOUND VOLUME (BUZZER VOLUME)	3-10	3.6.5	OPERATE USER MAP FILE (FILE OPERATIONS)	3-52
3.3.6	RESET ALARM BUZZER [ALARM ACK]	3-11	3.7	SCREEN CAPTURE	3-63
3.3.7	SET DISPLAY COLOR	3-11	3.7.1	SCREEN CAPTURE SETTING (SELECT CARD SLOT)	3-63
3.4	BASIC OPERATIONS	3-12	3.7.2	SCREEN CAPTURE SETTING (SAVE FILE)	3-65
3.4.1	START TRANSMISSION [TX]	3-12	3.7.3	SCREEN CAPTURE SETTING (ERASE FILE)	3-66
3.4.2	STOP TRANSMISSION [STBY]	3-12	3.7.4	SCREEN CAPTURE SETTING (AUTO CAPTURE)	3-67
3.4.3	CHANGE RANGE (OBSERVATION RANGE SCALE) [+RANGE-]	3-13	3.7.5	SCREEN CAPTURE SETTING (AUTO CAPTURE MODE)	3-68
3.4.4	TUNE	3-13	3.7.6	SCREEN CAPTURE SETTING (AUTO CAPTURE INTERVAL)	3-69
3.4.5	CONTROL SENSITIVITY [GAIN]	3-14	3.7.7	SCREEN CAPTURE SETTING (AUTO FILE ERASE)	3-70
3.4.6	SUPPRESS SEA CLUTTER [SEA]	3-14	3.7.8	SCREEN CAPTURE SETTING (MANUAL CAPTURE)	3-71
3.4.7	SUPPRESS RAIN/SNOW CLUTTER [RAIN]	3-15	3.8	USER SETTING	3-72
3.4.8	REJECT RADAR INTERFERENCE [IR]	3-16	3.8.1	USER SETTING (LOAD USER SETTING)	3-72
3.4.9	HIDE/DISPLAY RANGE RINGS (RINGS)	3-16	3.8.2	USER SETTING (SAVE USER SETTING)	3-73
3.4.10	HIDE SHIP'S HEADING LINE (HL OFF)	3-17	3.8.3	USER SETTING (ERASE USER SETTING)	3-74
3.5	GENERAL OPERATIONS	3-18	3.9	FORMAT CARD	3-75
3.5.1	MOVE CROSS CURSOR MARK BY TRACKBALL	3-18	3.9.1	FORMAT CARD (SELECT CARD SLOT)	3-75
3.5.2	USE EBLs (ELECTRONIC BEARING LINES) [EBL1/EBL2]	3-18	3.10	AIS FUNCTION	3-76
3.5.3	USE VRMS (VARIABLE RANGE MARKERS) [VRM1/VRM2]	3-20	3.10.1	VESSEL NAME LIST	3-76
3.5.4	USE P-LINES (PARALLEL INDEX LINES) [P-LINE]	3-22	3.10.2	VESSEL INFORMATION	3-76
3.5.5	MOVE OWN SHIP'S DISPLAY POSITION [OFF CENT]	3-23	3.10.3	DISPLAY THE VESSEL NAMES ON THE SCREEN	3-77
3.5.6	DISPLAY OTHER SHIPS' TRAILS [TRAILS]	3-23	3.10.4	AIS SETTING MENU	3-77
3.5.7	DISPLAY OWN VECTOR [OWN VECT]	3-25	3.10.5	AIS SYMBOL	3-78

3.1 FLOW OPERATION

Attention

- Do not put anything on the operation panel.
If you put anything hot on it, it may be deformed.
- Do not give any impact to the operation panel,
trackball, or controls.
Otherwise, any failure or damage may result.



Each operation is described in detail below.

3.1.1 Power ON and Start the System



CAUTION



A malfunction may occur if the power in the ship is instantaneously interrupted during operation of the radar. In this case, the power should be turned on again.

3

Attention

- Wait for about 2 seconds before turning on the power again.
- Immediately after the radar is installed, at start of the system after it has not been used for a long time, or after the magnetron is replaced, preheat the equipment in the standby state for 20 to 30 minutes before setting it into the transmit state.
- If the preheating time is short, the magnetron causes sparks, resulting in its unstable oscillation. Start transmission on a short-pulse range and change the range to the longer pulse ranges in turn. If the transmission is unstable in the meantime, immediately place the system back into the standby state and maintain it in the standby state for 5 to 10 minutes before restarting the operation. Repeat these steps until the operation is stabilized.

Procedures

1 Check that the ship's mains are turned on.

2 Press [STBY] key.

The system is turned on, and the preheating time is displayed.
[PREHEAT] is indicated at the upper left of the radar display.

3 Wait until the preheating time is over.

When the preheating time is over, the preheating time screen disappears, and [PREHEAT] at the upper left of the radar display changes to [STANDBY].

4 Press [TX] key.

The radar will start transmission and the antenna will start rotating.
[STANDBY] at the upper left of the radar display changes to [TRANSMIT].

Note: The radar does not start transmission if you press [TX] key while [PREHEAT] is indicated.

3.1.2 Observe and Adjust Video

Procedures

1 Press [+RANGE-] key to set the range to the scale required for target observation.

2 Turn the controls [GAIN], [SEA], and [RAIN] to obtain the clearest targets.

3.1.3 Acquire and Measure Data

For details on data acquisition and measurement, refer to Section 3.4 "BASIC OPERATIONS" and Section 4 "MEASUREMENT OF RANGE AND BEARING."

3.1.4 End the Operation and Stop the System

Exit**1 Press [STBY] key.**

The radar will stop transmission and the antenna will stop rotating.

TRANSMIT at the upper left of the radar display changes to **STANDBY**.

[Maintain the standby state if radar observation is restarted in a relatively short time.
Only pressing the [TX] key starts observation.]

2 Press the [STBY] key and the [TX] key together.

The system will be turned off.

3

WARNING



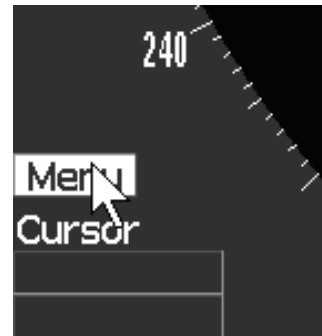
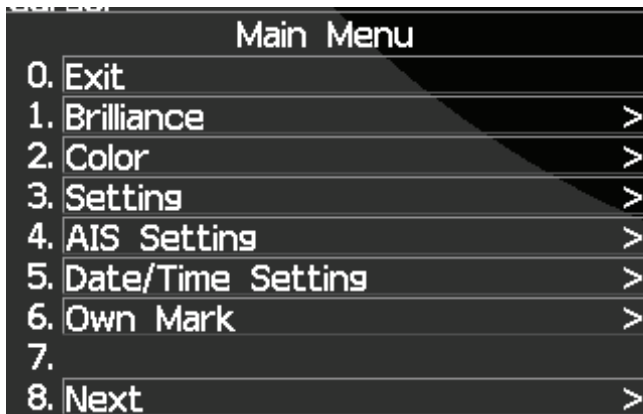
When conducting maintenance work, make sure to turn off the power and unplug the power line of the processor so that the power supply to the equipment is completely cut off.

Some equipment components can carry electrical current even after the power switch is turned off, and conducting maintenance work without unplugging the power connector may result in electrocution, equipment failure, or accidents.

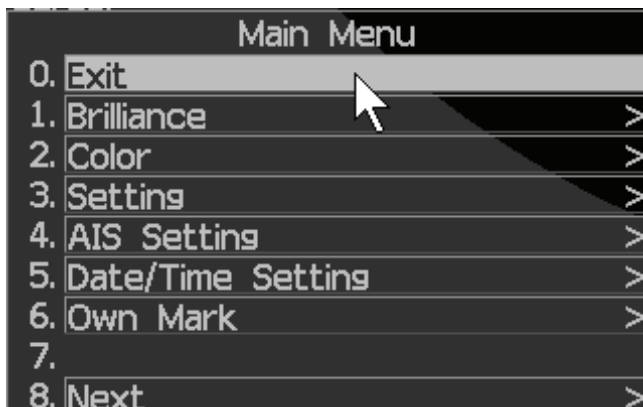
3.2 MENU COMPOSITION

This radar has main menu as following.

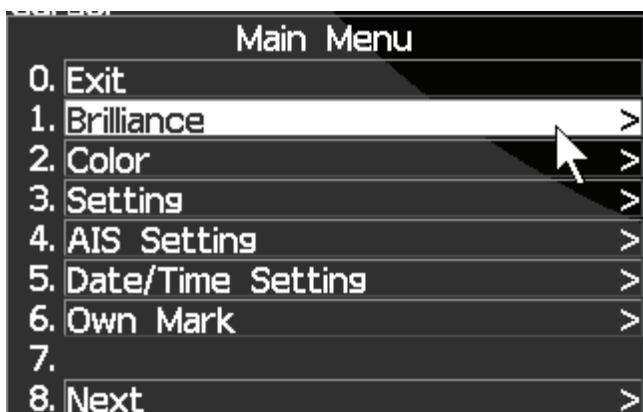
Press [MENU] key on panel switch or select **Menu** icon with trackball and press [ENTER] key.



Select item with trackball and Press [ENTER] key.

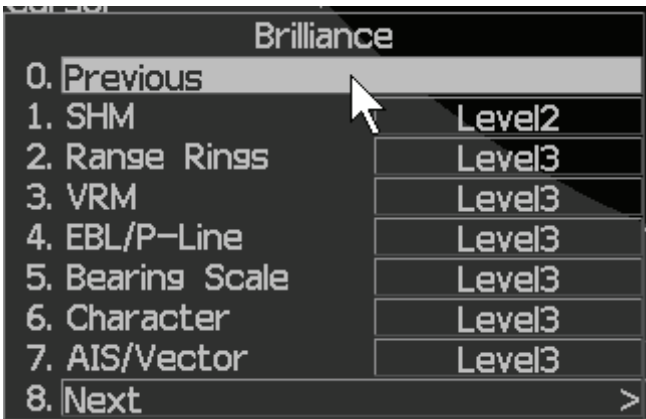


Select item with trackball.



Monochrome reversed character means selected item.
In this case, Brilliance control item is selected.

Select item with trackball.



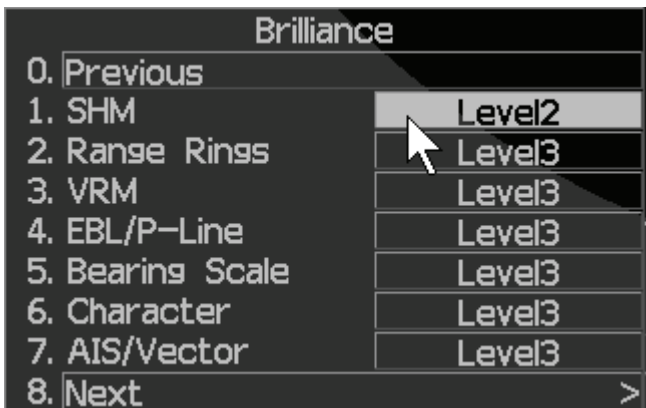
Level selection menu.

Previously selected level

SHM	Level2
Range Rings	Level3
VRM	Level3
EBL/P-Line	Level3
Bearing Scale	Level3
Character	Level3
AIS/Vector	Level3

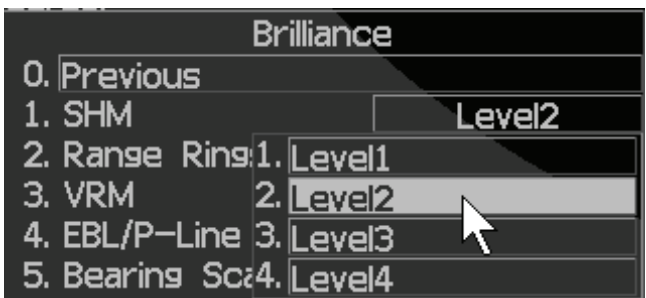
3

Select item with trackball.



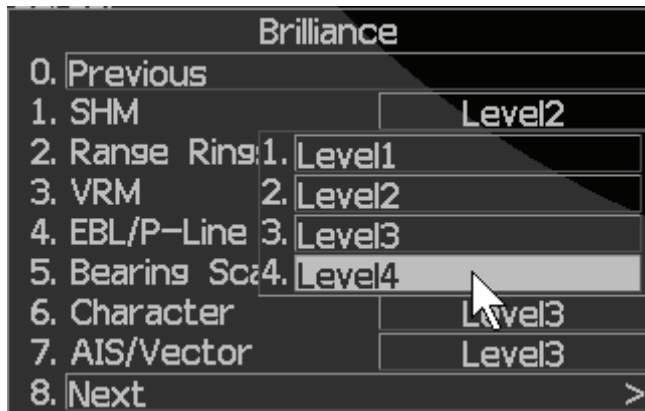
Select SHM Level2

Select item with trackball and Press [ENTER] key.



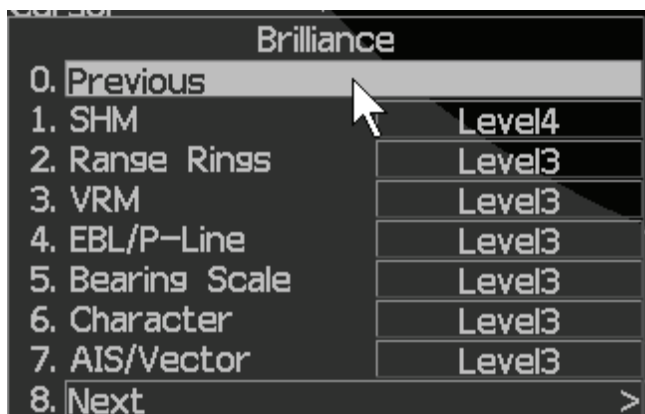
Cursor is on previously selected **level2**

Select item with trackball.



Select Level which you need.
In this case, **Level4** is chosen.

Select item with trackball and Press [ENTER] key.



SHM brilliance level is changed to **level4** from **level2**.

SHM	Level4
Range Rings	Level3
VRM	Level3
EBL/P-Line	Level3
Bearing Scale	Level3
Character	Level3
AIS/Vector	Level3

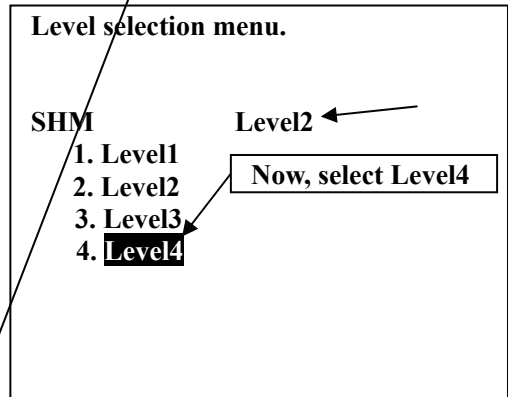
SHM Level setting sequence is finished.

Select next another item if want to change.

The same way ,possible to change follow items.

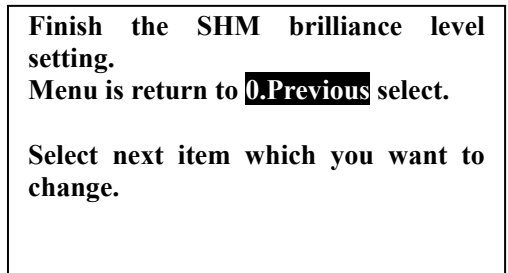
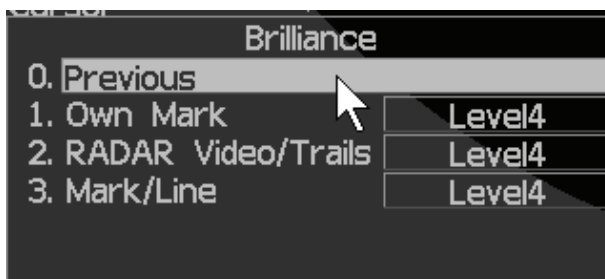
SHM /Range Rings /VRM/ EBL/P-Line/Bearing Scale/Character/AIS/Vector
/Own Mark/RADAR Video/Trails/Mark/Line.

In case of Own Mark/RADAR Video/Trails/Mark/Line, select Next.



3

Select item with trackball and Press [ENTER] key.



Change level is possible in the same way as the above.

To open the menu:

Press [MENU] key.

To close the menu:

Press key [MENU] again

To determine the selected item:

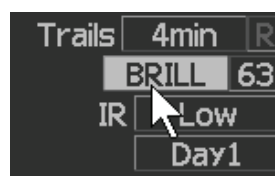
Place the cursor over the selected item with trackball and then press [ENTER] key.

3.3 PREPARATION

3.3.1 Adjust Display Brilliance [BRILL]

Procedures

- 1 Press [BRILL] key or set the cursor on **BRILL**.



- 2 Set the brilliance value with the [JOG DIAL] or [TRACKBALL] and [ENTER] key.
ADJUSTING LEVEL IS 0 (full DARK) TO 63(full BRIGHT).

3.3.2 Adjust Operation Panel Brilliance [PANEL]

Procedures

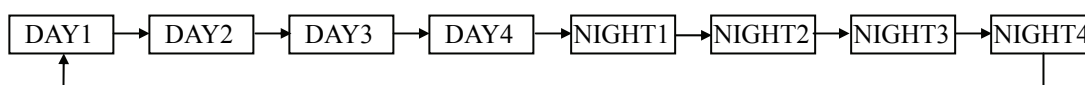
- 1 Press [PANEL] key to adjust the brilliance of the operation panel light.

There are five brilliance levels (include off) , and brilliance increases by one level each time the [PANEL] key is pressed. When it reaches the highest level, it is resumed to the lowest level (off).

In consideration of the ambient brightness, adjust panel brilliance that is high enough to read the characters on the operation panel but does not glare.

3.3.3 Switch Day/Night Mode [DAY/NIGHT]

The day/night mode changes in the following sequence each time the [DAY/NIGHT] key is pressed:
Or set the cursor on **DAY/NIGHT** icon and press [ENTER].



The current mode is indicated at the upper right of the radar display.
The brilliance level and the display color in accordance with the selected mode is saved.

3.3.4 Adjust Brilliance of Information on Radar Display (Brilliance Setting)

Brilliance can be adjusted for each item of information (shown below) on the radar display by operating the menu.

RADAR VIDEO & TRAILS, FIX RANGE RING, VRM, EBL & P-LINE, BEARING SCALE, CHARACTER, AIS/VECTOR, PANEL

Procedures

- 1 Press [MENU] key or set cursor to Menu and press [ENTER] key.

Place the cursor over [1.BRILLIANCE] with trackball and then press [ENTER] key.

The Brilliance Setting menu will appear.

- 2 Select the item with trackball for which brilliance is to be adjusted, pressing [ENTER] key.

The brilliance levels menu will appear.

- 3 Select the brilliance level number to be set with trackball, pressing the [ENTER] key.

The selected brilliance level will be set.

Exit

- 1 Press [MENU] key.

The menu will be closed.

Note: The brilliance levels set here are saved in accordance with the day/night mode.

3.3.5 Adjust Sound Volume (Buzzer Volume)

Procedures

- 1 Press [MENU] key .
Place the cursor over [3.SETTING] with trackball and then press [ENTER] key.

The setting menu will appear.

- 2 Place the cursor over [1.BUZZER LEVEL] with trackball and then press [ENTER] key.

The buzzer levels menu will appear.

- 3 Select the volume number to be set with trackball, and press the [ENTER] key.

The selected volume level will be set.

Exit

- 1 Press [MENU] key.

The menu will be closed.

3.3.6 Reset Alarm Buzzer [ALARM ACK]

When an audible alarm is issued, use ALARM ACK to acknowledge the alarm information, stop the alarm buzzing, and stop the alarm lamp flashing. (If more than one alarm has occurred, press the switch for each alarm indication.) The alarm stops buzzing, but the alarm indication does not disappear.

Procedures

- 1 Press [ALARM ACK] key.

The alarm will stop buzzing.

3.3.7 Set Display Color

Color can be adjusted for each item of information (shown below) on the radar display by operating the menu.

1.ECHO	Adjusts the colors of radar echoes.
2.TRAILS	Adjusts the colors of radar trails.
3.ECHO BACK GROUND	Adjusts the background color inside the bearing scale.
4.DATA BACK GROUND	Adjusts the background color outside the bearing scale.
5.OTHERS	Adjusts the colors of characters and etc.
6. OWN MARK	Adjusts the colors of own ship mark.
7.AIS/VECTOR	Adjusts the colors of the symbol of AIS and own ship's vector.
8.VRM	Adjusts the colors of VRM.

Procedures

- 1 Press [MENU] key .

Place the cursor over [2.COLOR] with trackball and then press [ENTER] key.

The color-setting menu will appear.

- 2 Select the item with trackball for which color is to be adjusted, press [ENTER] key.

The kinds of color menu will appear.

Select the color to be set with trackball, pressing [ENTER] key.

The selected color will be set.

Exit

- 1 Press [MENU] key.

The menu will be closed.

Note: The display color set here are saved in accordance with the day/night mode.

3.4 BASIC OPERATIONS

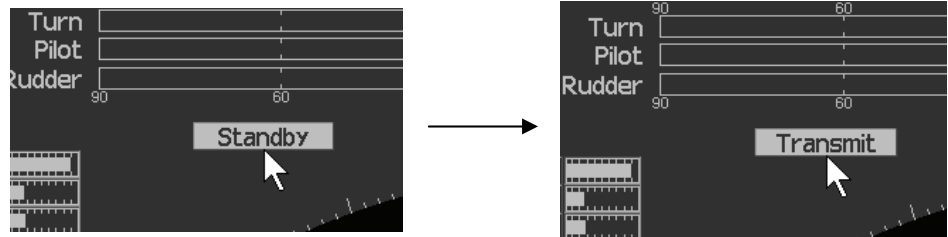
3.4.1 Start Transmission [TX]

Procedures

1 Press [TX] key.

The radar will start transmission and the antenna will start rotating.
The indication **STANDBY** at the upper left of the radar display changes to **TRANSMIT**.

Or set the cursor on **STANDBY** icon and press **ENTER**.
Also changes to **TRANSMIT**.



Note: The radar does not start transmission if you press [TX] key while **PREHEAT** is indicated.

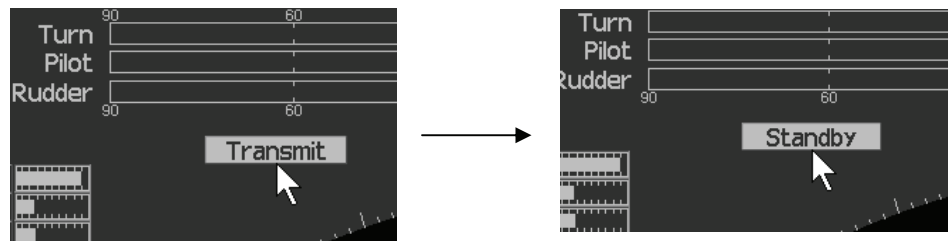
3.4.2 Stop Transmission [STBY]

Procedures

1 Press [STBY] key.

The radar will stop transmission and the antenna will stop rotating.
The indication **TRANSMIT** at the upper left of the radar display changes to **STANDBY**.

Or set the cursor on **TRANSMIT** icon and press **ENTER**.
Also changes to **STANDBY**.



3.4.3 Change Range (Observation Range Scale) [+RANGE-]

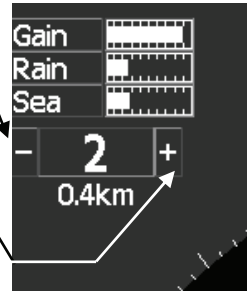
Procedures

- 1 Press [+RANGE-] key or [RANGE-] key to set the range to the scale required for target observation.

To observe long-range targets, press upper side of this key.

To zoom and observe a short-range target near the own ship, press lower side of this key.

Or set the cursor on **RANGE +**, **RANGE -** icon and press **ENTER**.



3.4.4 Tune

This control is used to tune the receiver.

When the tuning does not match, the receiver sensitivity decreases and the operator may miss weak or distant target.

Procedures

- 1 Press [+RANGE-] key to select 16km or 32 m.

- 2 Turn [TUNE] control.

Adjust the video for best presentation.

If radar display does not show a weak target, adjust the control until the tuning bar on the upper left of the screen indicates the maximum.

To use Auto tuning mode

Procedures

- 1 Continue pressing [TUNE] control until the character on the right of the tuning bar changes to "A".

Select auto tuning mode.

- 2 Continue pressing [TUNE] control again.

"A" on the right of tuning bar changes to "M", changes to manual mode.

Note: After tune adjustment with software button once, push [TUNE] knob for tune adjustment with [TUNE] knob.

3.4.5 Control Sensitivity [GAIN]

Procedures

- 1 Control noise on the radar display by turning the [GAIN] control until targets can be easily observed.

Turning [GAIN] control clockwise increases sensitivity.

Turning [GAIN] control counterclockwise decreases sensitivity.

Turning the [GAIN] control clockwise increases receiving sensitivity and extends the radar observation range. If the sensitivity is too high, the receiver noise increases reducing the contrast between the targets and the background video. As a result, the targets become obscure on the radar display.

To observe densely crowded targets or short-range targets, turn the [GAIN] control counterclockwise to reduce the sensitivity so that the targets are easy to observe. However, be careful not to overlook important small targets.

Note: After gain adjustment with software button once, push the [GAIN] knob for gain adjustment with [GAIN] knob.

3

3.4.6 Suppress Sea Clutter [SEA]



CAUTION



When using the [SEA] function, never set the suppression level too high canceling out all image noises from the sea surface at close range.

Detection of not only echoes from waves but also targets such as other ships or dangerous objects will become inhibited.

When using the [SEA] function, make sure to choose the most appropriate image noise suppression level.

Procedures

- 1 Control the sea clutter returns on the radar display by turning the [SEA] control until targets can be easily observed.

Turning [SEA] control clockwise suppresses sea clutter returns.

Turning [SEA] control counterclockwise intensifies sea clutter returns.

The sea clutter suppression function suppresses sea clutter returns by decreasing the receiving sensitivity on a short range.

Turning the [SEA] control clockwise heightens the effect of sea clutter suppression.

However, be careful that excessive suppression causes low signal-strength targets such as buoys and boats to disappear from the radar display.

Note: After STC adjustments with software button once, push the [SEA] knob for STC adjustment with [SEA] knob.

3.4.7 Suppress Rain/Snow Clutter [RAIN]



CAUTION



When using the [RAIN] function, never set the suppression level too high canceling out all image noises from the rain or snow at the close range.

Detection of not only echoes from the rain or snow but also targets such as other ships or dangerous objects will become inhibited.

When using the [RAIN] function, make sure to choose the most appropriate image noise suppression level.

Procedures

- 1 Control the rain/snow clutter returns on the radar display by turning the [RAIN] control until targets can be easily observed.

Turning [RAIN] control clockwise suppresses rain/snow clutter returns.

Turning [RAIN] control counterclockwise intensifies rain/snow clutter returns.

When the [RAIN] control is turned clockwise, the rain/snow clutter suppression function suppresses rain/snow clutter returns and gets targets hidden by rain/snow clutter returns to appear on the radar display. However, be careful that excessive suppression may cause small targets to be overlooked. Since the rain/snow clutter suppression function also has the effect of suppressing sea clutter, the suppression efficiency improves when the [RAIN] control is used with the [SEA] control. In general, turn the [RAIN] control fully to the left.

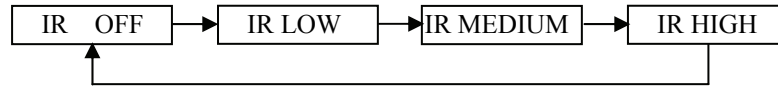
Note: After rain adjustment with software button once, push the [RAIN] knob for rain adjustment with [RAIN] knob.

3.4.8 Reject Radar Interference [IR]

Procedures

- 1 Place the cursor over [IR] icon at the upper right of the radar display with trackball and then press [ENTER] key.

Each time [ENTER] key is pressed, changes in the following sequence.



Rejection levels of the interference rejecter

IR OFF: Interference rejecter off
 IR LOW: Interference rejection level - low
 IR MEDIUM: Interference rejection level - moderate
 IR HIGH: Interference rejection level - high

When a high interference rejection level is selected, the radar's ability of detecting small targets such as buoys and small boats lowers.
 In general, [IR LOW] should be selected.

Attention

- When viewing a radar beacon or SART signal, select IR OFF (Interference Rejector OFF) because IR processing suppresses the video.

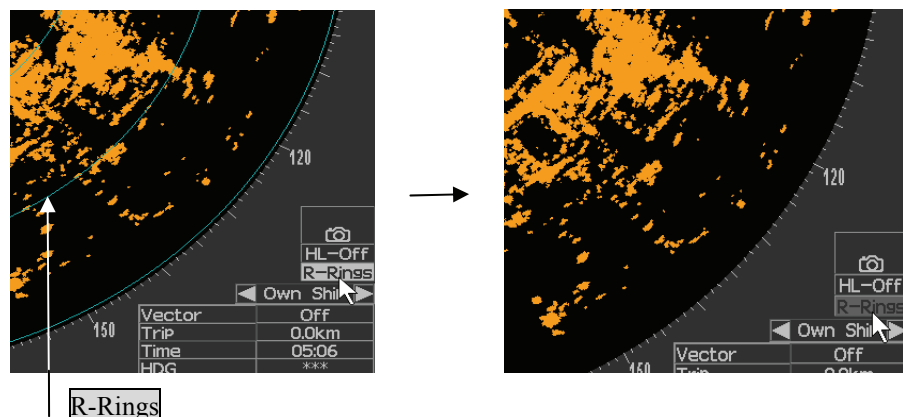
3.4.9 Hide/Display Range Rings (RINGS)

Procedures

- 1 Press [RR] key.

The range rings display switches back and forth between display and non-display each time [RR] key is pressed.

Or set the cursor on [R-Rings] icon and press [ENTER].



3.4.10 Hide Ship's Heading Line (HL OFF)

Procedures

1 Hold down [HL OFF] key.

The ship's heading line is hidden while **[HL OFF]** key is held down.

The ship's heading line (HL) that presents the course of own ship is always shown on the radar display. The heading line is hidden while **[HL OFF]** key is held down, so the targets below the heading line can be easily observed.

Or click hold the **HL-OFF** icon. While click hold ,the ship's heading line is hidden.



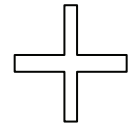
3.5 GENERAL OPERATIONS

3.5.1 Move Cross Cursor Mark by Trackball

The cross cursor mark  is used for position designation and other purposes in various operating procedures. The cross cursor mark  moves in coupling with the trackball. If the trackball is rotated up and down or right and left, the cross cursor mark follows the move of the trackball. Operators must be familiar with trackball operation before running the system.

Operation inside Radar Video PPI

The cross cursor mark as shown at right is displayed inside the radar video PPI.



- 1) The distance and bearing between own ship and the cross cursor mark , and the degrees of latitude and longitude are digitally indicated at the lower left of the radar display.

NOTE: The display of degrees of latitude and longitude needs the connection of GPS and heading sensor.

Operation outside Radar Video PPI

As shown at right, the cursor mark changes into the pointer outside the radar video PPI.



- 1) Use the pointer to operate software buttons.
- 2) Use the pointer to select menu items.

3.5.2 Use EBLs (Electronic Bearing Lines) [EBL1/EBL2]

EBLs (Electronic Bearing Lines) are indispensable to the measurement of bearings. Operators must be familiar with the operation of EBLs beforehand.

EBL1 Operation

If EBL2 is selected or EBL1 is not displayed, press [EBL1/EBL2] key to select EBL1 before starting operation.

(The currently selected EBL is shown in reverse video at the lower left of the radar display.)

Procedures

- 1 **Press [EBL1/EBL2] key to select EBL1.**

EBL1 at the lower left of the radar display will be shown in reverse video, and EBL1 becomes operable.

- 2 **Adjust the bearing of EBL1 with [JOG DIAL] or [TRACKBALL].**

- 3 **Press [ENTER] key.**

The bearing of EBL1 is fixed .

EBL2 Operation

If EBL1 is selected or EBL2 is not displayed, press [EBL1/EBL2] key to select EBL2 before starting operation.

(The currently selected EBL is shown in reverse video at the lower right of the radar display.)

Procedures

- 1 Press [EBL1/EBL2] key to select EBL2.

EBL2 at the lower left of the radar display will be shown in reverse video, and EBL2 becomes operable.

- 2 Adjust the bearing of EBL2 with [JOG DIAL] or [TRACKBALL].

- 3 Press [ENTER] key.

The bearing of EBL2 is fixed.

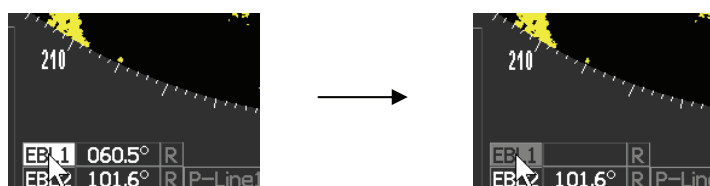
CLEARING EBL

Procedures

- 1 Hold down [EBL1/EBL2] key.

The EBL (current selected EBL) display will disappear.

Or set the cursor [EBL1] / [EBL2] icon and hold press [ENTER].



SETTING EBL DISPLAY

Select EBL true and relative bearing display.

Procedures

- 1 Place the cursor over the position at the bottom left as following figure. Press [ENTER] key.

The bearing mode is switched back and forth between true and relative.

EBL1	123.4°	R
EBL2	123.4°	R

3.5.3 Use VRMs (Variable Range Markers) [VRM1/VRM2]

This function is to display and select variable range markers (VRMs). Two VRMs are available: VRM1 is represented as a broken line, and VRM2 as a dotted line.

VRM1 Operation

If VRM2 is selected or VRM1 is not displayed, press [VRM1/VRM2] key to select VRM1 before starting operation.

(The currently selected VRM is shown in reverse video at the lower right of the radar display.)

Procedures

1 Press [VRM1/VRM2] key to select VRM1.

VRM1 at the lower right of the radar display will be shown in reverse video, and VRM1 becomes operable.

2 Adjust the range of VRM1 with [JOG DIAL] or [TRACKBALL].

3 Press [ENTER] key .

The range of VRM1 is fixed .

VRM2 Operation

If VRM1 is selected or VRM2 is not displayed, press [VRM1/VRM2] key to select VRM2 before starting operation.

(The currently selected VRM is shown in reverse video at the lower right of the radar display.)

Procedures

1 Press [VRM1/VRM2] key to select VRM2.

VRM2 at the lower right of the radar display will be shown in reverse video, and VRM2 becomes operable.

2 Adjust the range of VRM2 with [JOG DIAL] or [TRACKBALL].

3 Press [ENTER] key .

The range of VRM2 is fixed.

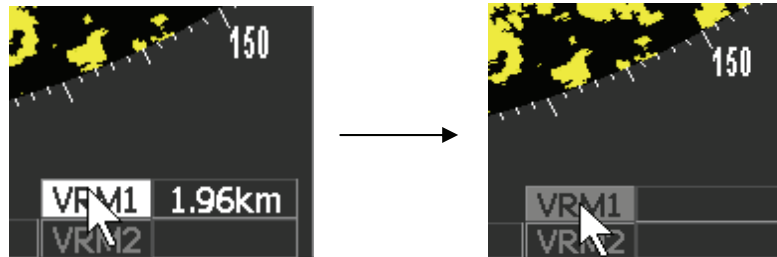
CLEARING VRM

Procedures

- 1 Hold down [VRM1/VRM2] key.

The VRM (current selected VRM) display will disappear.

Or set the cursor [VRM1] / [VRM2] icon and hold press [ENTER].



3.5.4 Use P-LINEs (Parallel Index Lines) [P-LINE]

P-LINE1 Operation

If P-LINE2 is selected or P-LINE1 is not displayed, press **[P-LINE]** key to select P-LINE1 before starting operation.

(The currently selected P-LINE is shown in reverse video at the lower left of the radar display.)

Procedures

- 1 Press **[P-LINE]** key to select P-LINE1.

P-LINE1 at the lower left of the radar display will be shown in reverse video, and P-LINE1 becomes operable.

- 2 Adjust the range from own ship's position of P-LINE1 with **[JOG DIAL]** or **[TRACKBALL]**.

- 3 Press **[ENTER]** key.

The range of P-LINE1 is fixed.

P-LINE2 Operation

If P-LINE1 is selected or P-LINE2 is not displayed, press **[P-LINE]** key to select P-LINE2 before starting operation.

(The currently selected EBL is shown in reverse video at the lower right of the radar display.)

Procedures

- 1 Press **[P-LINE]** key to select P-LINE2.

P-LINE2 at the lower left of the radar display will be shown in reverse video, and P-LINE2 becomes operable.

- 2 Adjust the bearing of EBL1 with **[JOG DIAL]** or **[TRACKBALL]**.

- 3 Press **[P-LINE]** key.

The range of P-LINE2 is fixed.

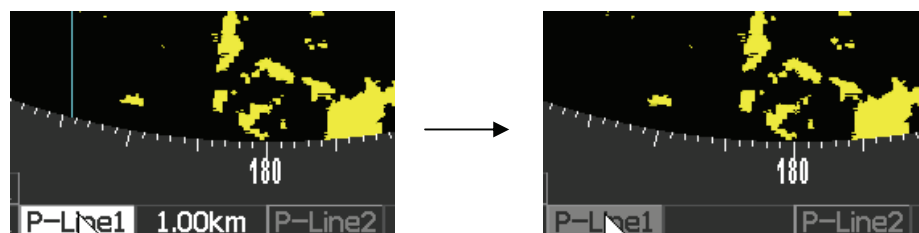
CLEARING P-LINE

Procedures

- 1 Hold down **[P-LINE]** key.

Or set the cursor to **P-Line1** / **P-Line2** icon and hold press **[ENTER]**

The P-LINE (current selected P-LINE) display will disappear.



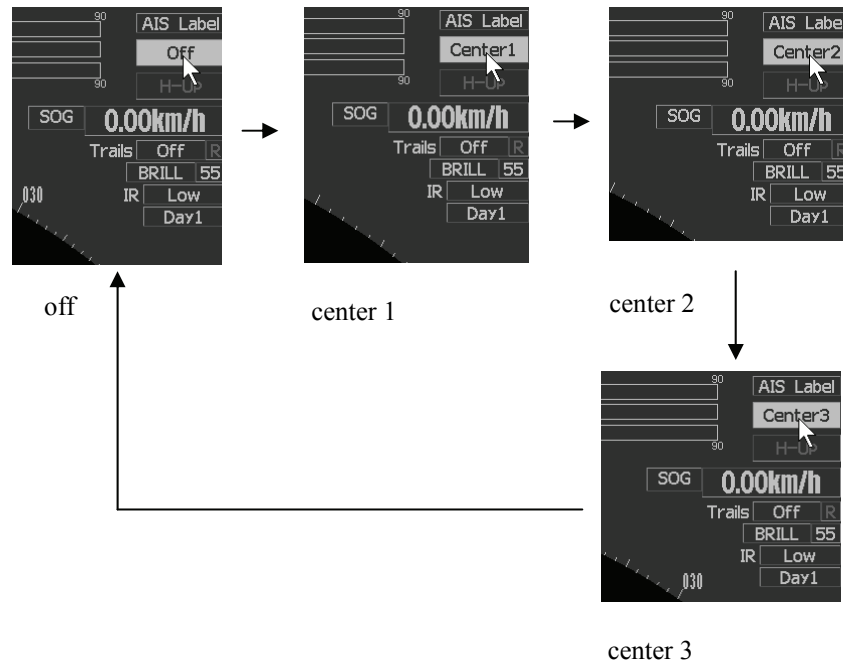
3.5.5 Move Own Ship's Display Position [OFF CENT]

The own ship's position can be moved from the display center to stern or bow direction.

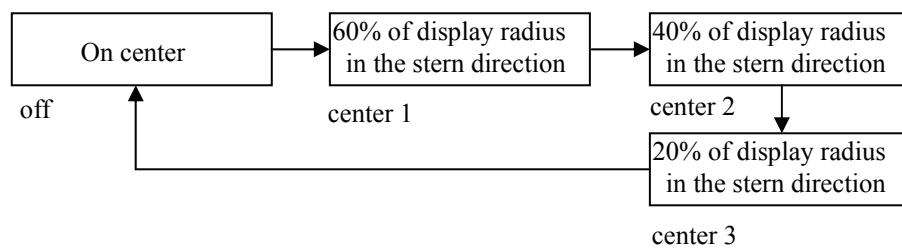
Procedures

- 1 Press [OFF CENT] key.

Or set the cursor to **off** icon and press **ENTER**



The own ship's position will be moved from the display center as following sequence each time the [OFF CENT] key is pressed:



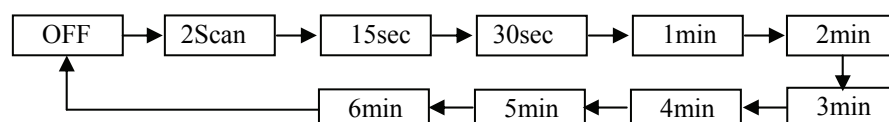
3.5.6 Display Other Ships' Trails [TRAILS]

Other ships' movements and speeds can be monitored from the lengths and directions of their trails, serving for collision avoidance.

Procedures

- 1 Set the cursor to **TRAIL** icon and press **ENTER**.

Trails length will be changed as following sequence .
Each time the **TRAIL** icon is selected and press **ENTER**.



Erasing Trails Data

Procedures

- 1 Set the cursor to **TRAIL** icon and hold press more than 2second.

All the stored trails data will be erased.

Trails Motion Mode

There are two types of trails: relative motion trails and true motion trails.

Relative motion trails: The system plots the trails of a target at a position relative to the own ship. The operator can easily judge whether the target is approaching the own ship.

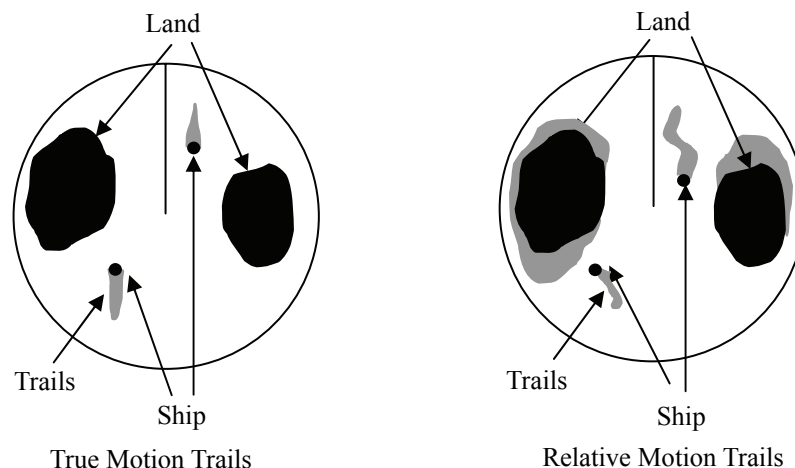
While the own ship is moving, the system also plots the trails of land and other fixed targets.

True motion trails: The system plots the absolute motion trails of a target, irrespective of the own ship's position.

The operator can easily judge the course and speed of the target.

The system does not plot the trails of land and other fixed targets.

NOTE : The display of true motion trail needs the connection of the speed sensor and heading sensor.

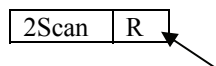


Changing Motion Mode of Trails (Trails mode)

Procedures

- 1 Place the cursor over the position at the upper right as following figure. Press [ENTER] key.

The motion mode of trails is switched back and forth between true and relative.



3.5.7 Display Own Vector [OWN VECT]

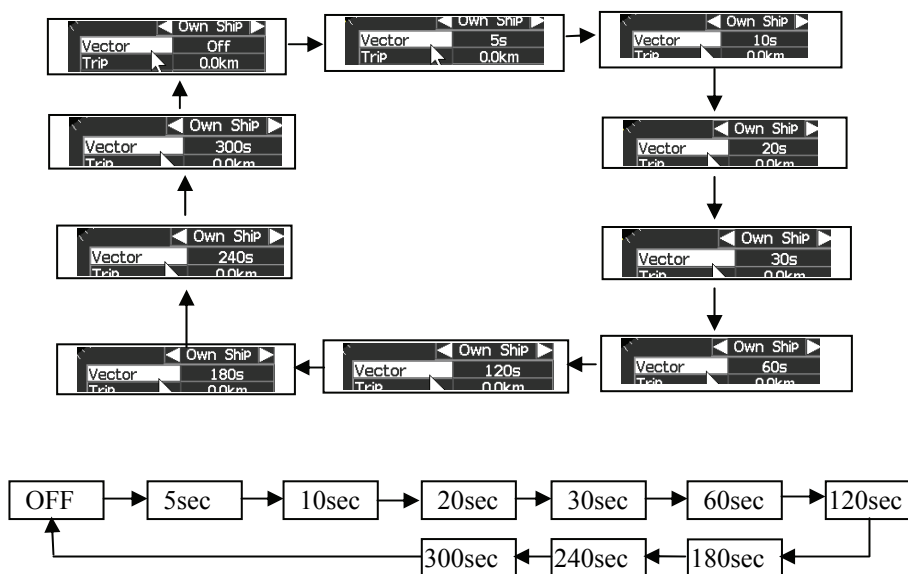
NOTE: The display of own vector need the connection of the speed sensor and the Heading sensor.

Procedures

1 Press [OWN VECT] switch.

Or set cursor to **Vector** icon and press **ENTER**.

Own vector is switched each time ,the vector length is changed as following.



There are shown 2 vectors, one drawn from the bow and the other one from the stern. The vector will be straight when the vessel doesn't turn and curved when the vessel turns.



CAUTION



The accuracy from the vectors are depending on the accuracy from the (D)GPS sensors.

With longer vectors, the accuracy will be lower.

The vectors are calculated with the situation at that time. When there will be some changed influence from wind, water current etc, are not shown before the vessel is influenced by this.

3.5.8 EDITING OWN MARK

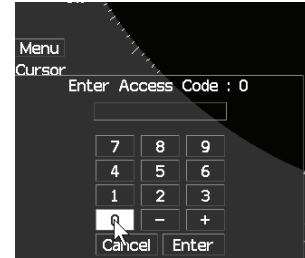
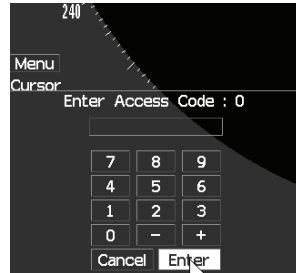
Editing own mark dimension

Procedures

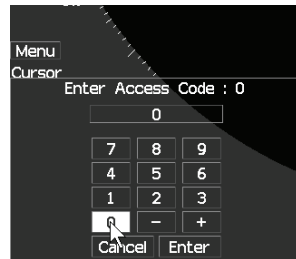
Hold press [MENU] key more than 5 second.

Or set the cursor to the Menu icon and hold press more than 5 second.

Service menu will be displayed.



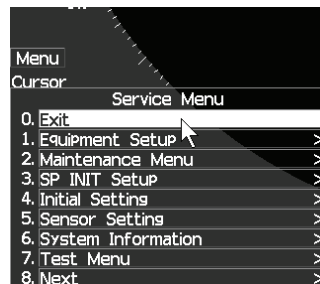
Select "0" .



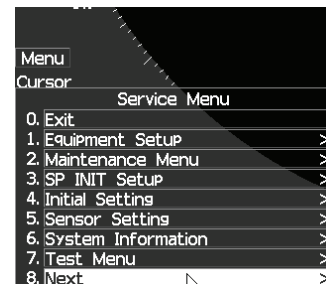
Press ENTER key.



Service menu will be open.



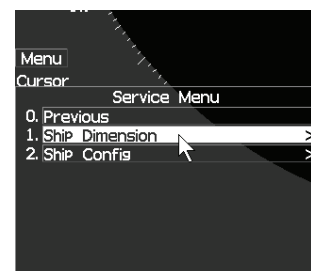
Select 8.Next item.



Service menu (Next page) will be open.

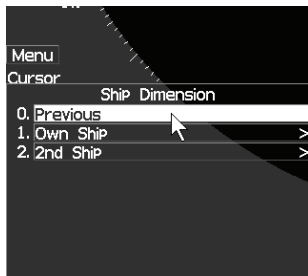


Select 1.Ship Dimension.
And press ENTER.

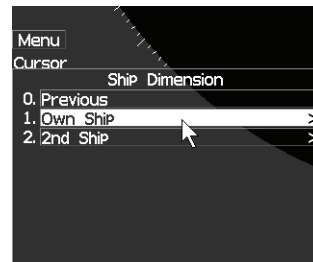


3

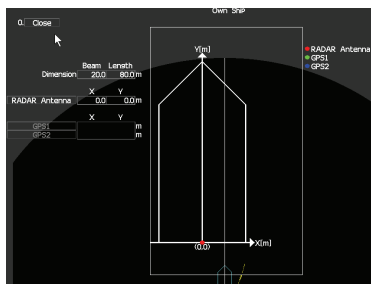
Input Own/ 2nd ship selection menu will be open.



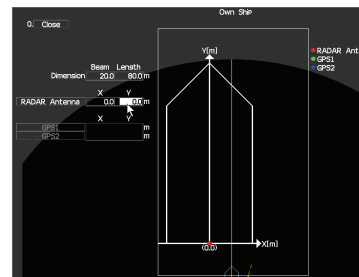
Select 1. Own ship.



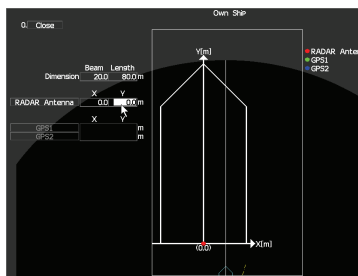
Ship dimension input menu will be open.



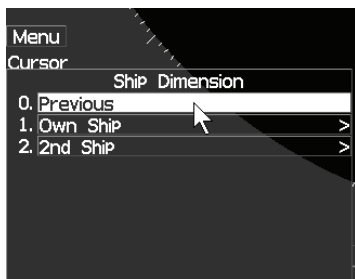
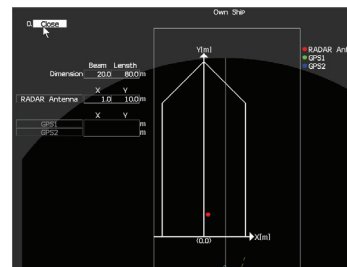
Own ship dimension data input are ready.



Place the cursor over the item to change the dimension with trackball and then press [ENTER] key.



Decide the value with [JOG DIAL] or trackball and then press [ENTER] key.



Own ship dimension data input is finished.
If you want to editing 2nd ship dimension, select 2. 2nd Ship and press **ENTER**.
In case own ship only, press **MENU** to quit.

Editing 2nd ship dimension

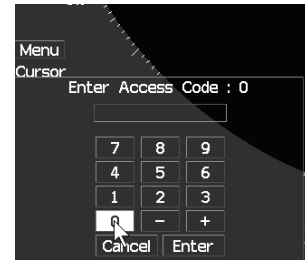
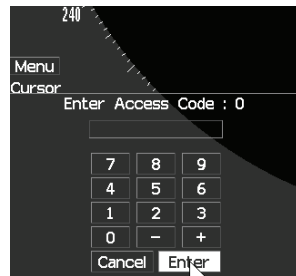
Procedures

Procedure is similar to editing own ship dimension.

Hold press [MENU] key more than 5 second.

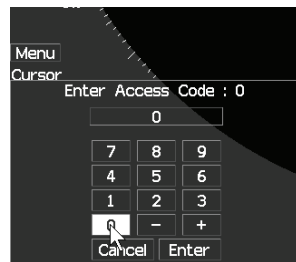
Or set the cursor to the Menu icon and hold press more than 5 second.

Service menu will be displayed.

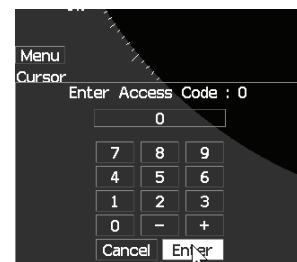


3

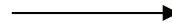
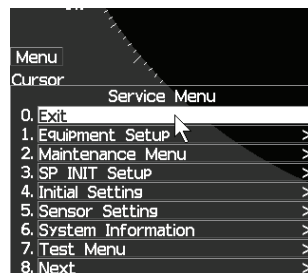
Select "0".



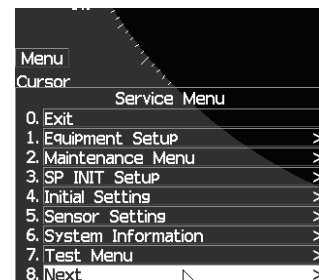
Press ENTER key.



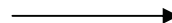
Service menu will be open.



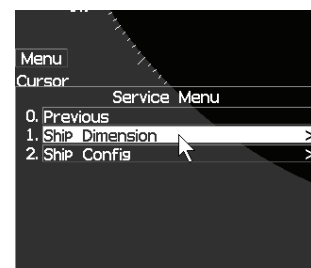
Select 8.Next item.



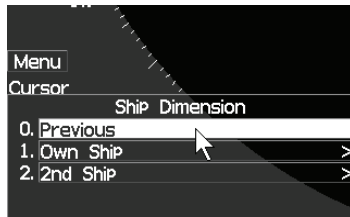
Service menu (Next page) will be open.



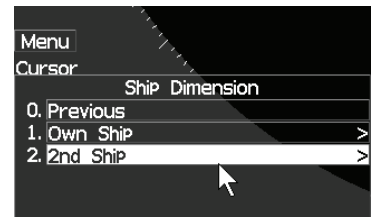
Select 1.Ship Dimension.
And press ENTER.



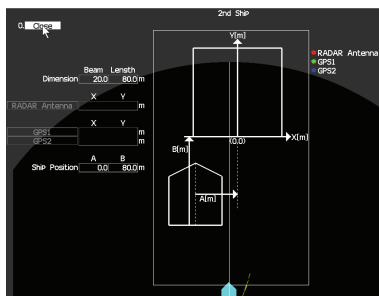
Input ship selection menu will be open.



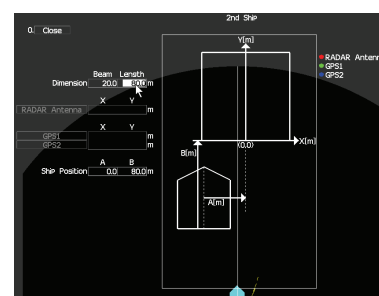
Select 2.2nd ship and press ENTER key.



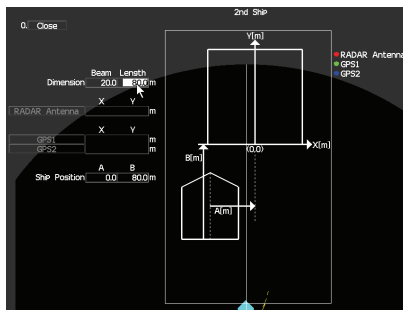
Ship dimension input menu will be open.



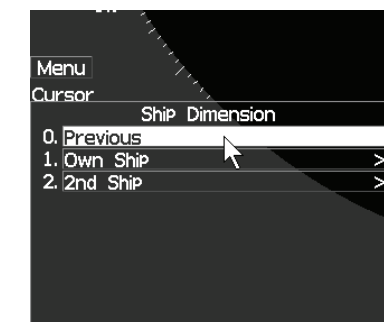
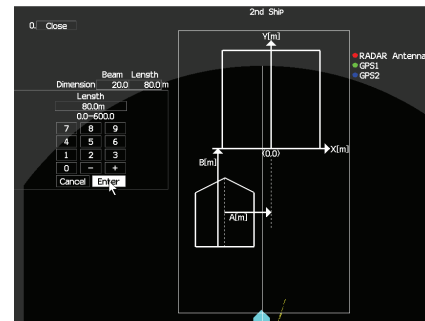
2nd ship dimension data input are ready.



Place the cursor over the item to change the dimension with trackball and then press [ENTER] key.



Decide the value with [JOG DIAL] or trackball and then press [ENTER] key.



2nd ship dimension data input is finished.
Press MENU key to quit.

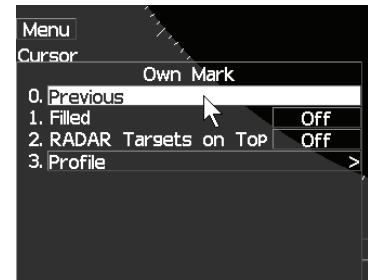
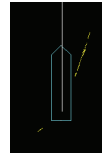
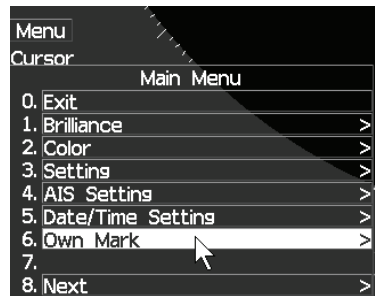
Paint own mark**Procedures**

- 1 Press [MENU] key .

Main menu will appear.

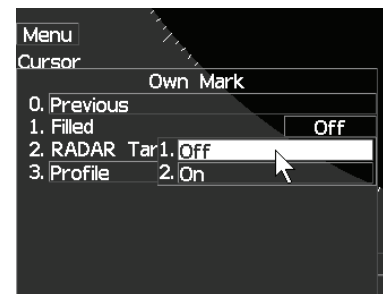
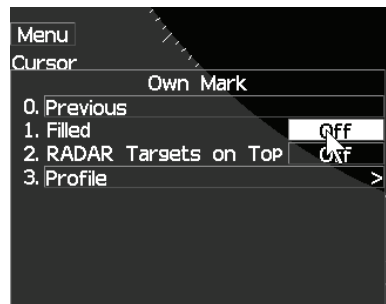
- 2 Place the cursor over [6.OWN MARK] with trackball and then press [ENTER] key.

OWN MARK menu will appear.



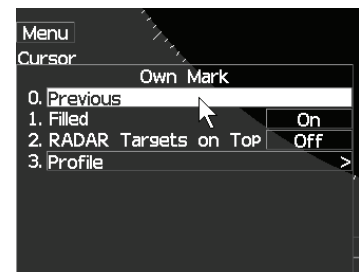
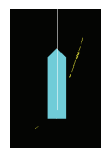
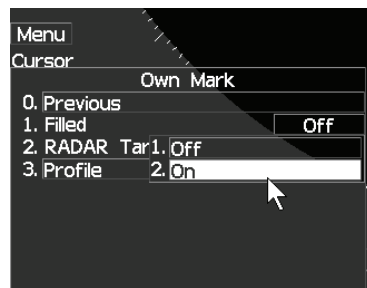
- 3 Place the cursor over [1.FILLED] with trackball and then press [ENTER] key.

ON/OFF menu will appear.



- 4 Place the cursor over [ON] with trackball and then press [ENTER] key.

"OFF" will changes to "ON".



Change own mark's figure

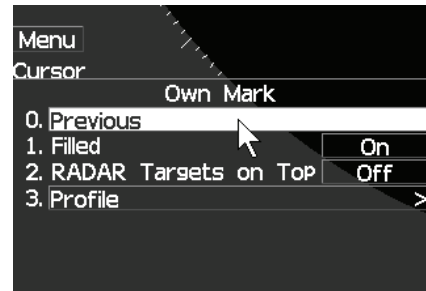
Procedures

- 1 Press [MENU] key.

MAIN MENU will appear.

- 2 Place the cursor over [6.OWN MARK] with trackball and then press [ENTER] key.

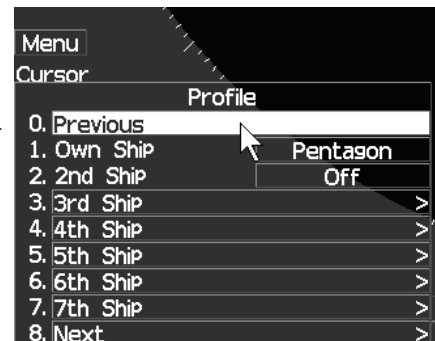
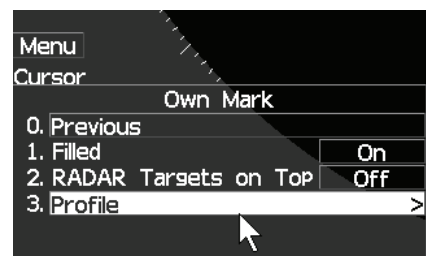
OWN MARK menu will appear.



- 3 Place the cursor over [3. PROFILE] with trackball and then press [ENTER] key.

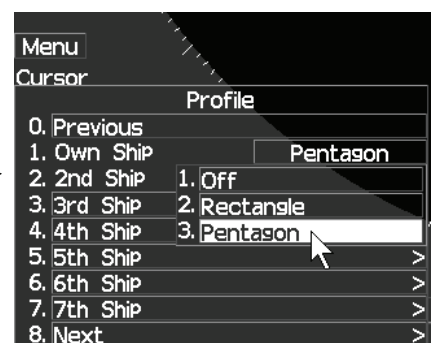
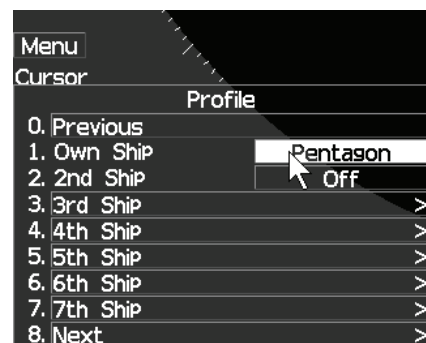
Own ship profile menu will appear.

Select 1.Own Ship.



- 4 Place the cursor over [RECTANGLE] with trackball and then press [ENTER] key.

Own mark's figure will change from "PENTAGON" to "RECTANGLE".



Change the priority of ECHO and OWN MARK

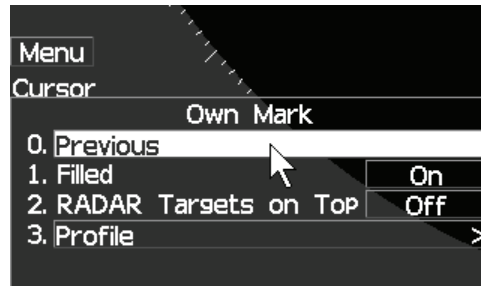
Procedures

- 1 Press [MENU] key .

MAIN MENU will appear.

- 2 Place the cursor over [6.OWN MARK] with trackball and then press [ENTER] key.

OWN MARK menu will appear.

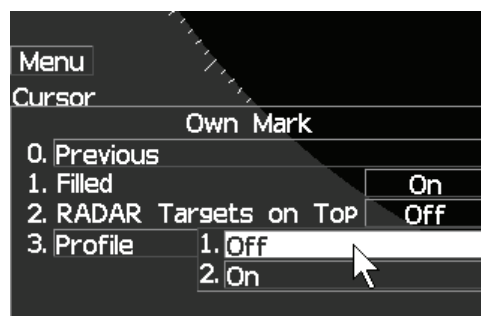


- 3 Place the cursor over [2.RADAR Targets ON Top] with trackball and then press [ENTER] key.

ON/OFF menu will appear.



- 4 Select "ON" or "OFF" with trackball and then press [ENTER] key.



Change 2nd ship figure

Procedures

- 1 Press [MENU] key when radar is standby mode.

MAIN MENU2 will appear.

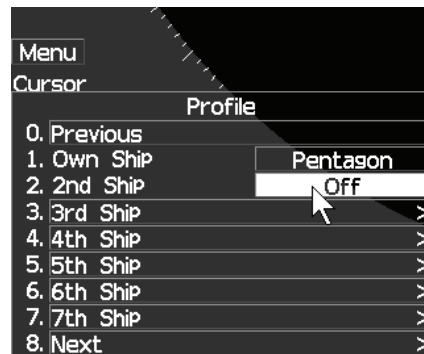
- 2 Place the cursor over [6.OWN MARK] with trackball and then press [ENTER] key.

OWN MARK menu will appear.

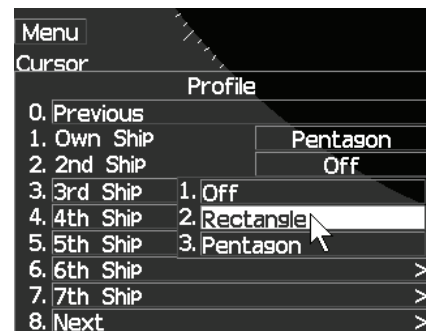
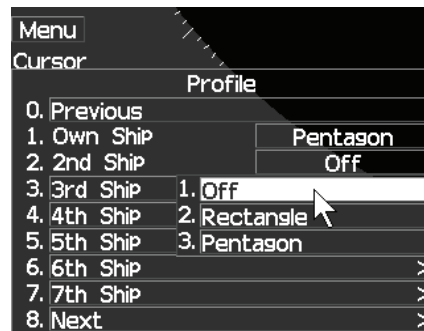
- 3 Place the cursor over [3. PROFILE] with trackball and then press [ENTER] key.

2nd ship profile menu will appear.

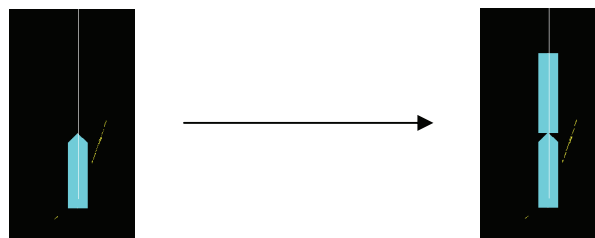
- 4 Place the cursor over [2.2nd SHIP] with trackball and then press [ENTER] key.



- 5 Place the cursor over [RECTANGLE] with trackball and then press [ENTER] key.



2nd ship mark's figure will be appeared as "RECTANGLE".



3.5.9 TIME ZONE SETTING

Local time is displayed at the bottom right. Adjust the time as following.

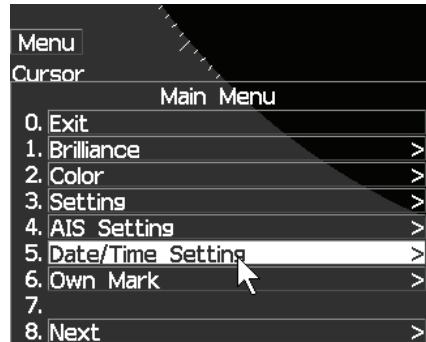
Procedures

- 1 Press [MENU] key.

MAIN MENU will appear.

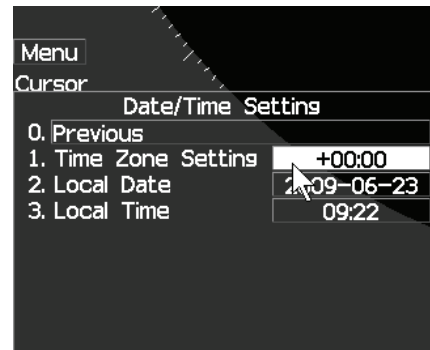
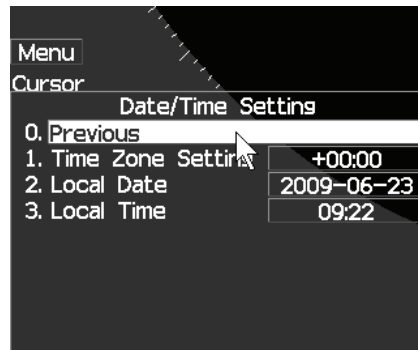
- 2 Place the cursor over [5.Date/Time Setting] with trackball and then press [ENTER] key.

SETTING menu will appear.

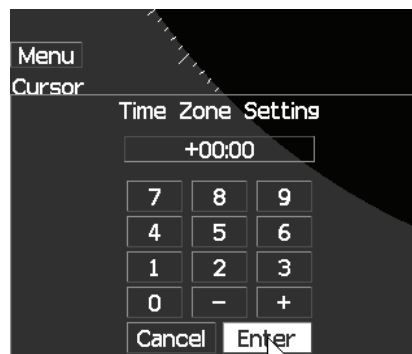


- 3 Place the cursor over [1.TIME ZONE SETTING] with trackball and then press [ENTER] key.

TIME ZONE SETTING menu will appear.



- 4 Adjust the time with [JOG DIAL] or trackball and then press [ENTER] key. If you adjust with [JOG DIAL], set hour, push [JOG DIAL], and set minute.



3.5.10 LOCAL TIME SETTING

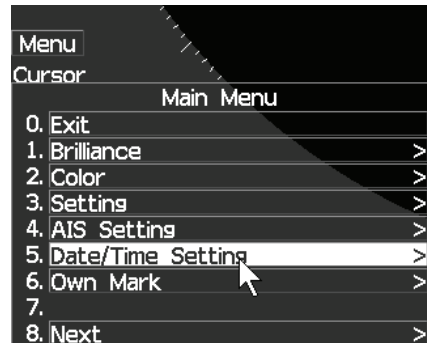
Procedures

- 1 Press [MENU] key.

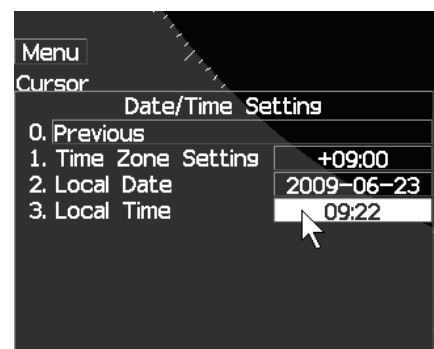
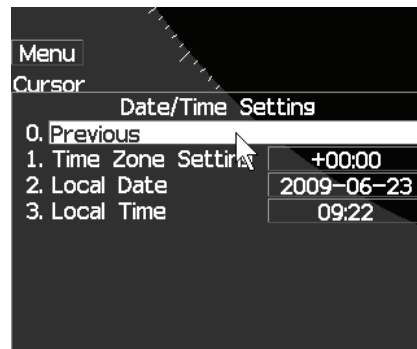
MAIN MENU will appear.

- 2 Place the cursor over [5.Date/Time Setting] with trackball and then press [ENTER] key.

LOCAL TIME SETTING menu will appear.



- 3 Place the cursor over [1.TIME ZONE SETTING] with trackball and then press [ENTER] key.



- 4 Adjust the time with [JOG DIAL] or trackball and then press [ENTER] key. If you adjust with [JOG DIAL], set hour, push [JOG DIAL], and set minute.

3.5.11 CHANGE THE UNIT OF RATE OF TURN

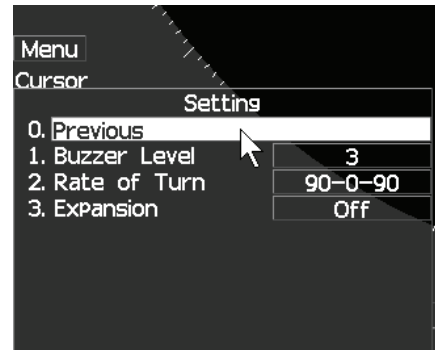
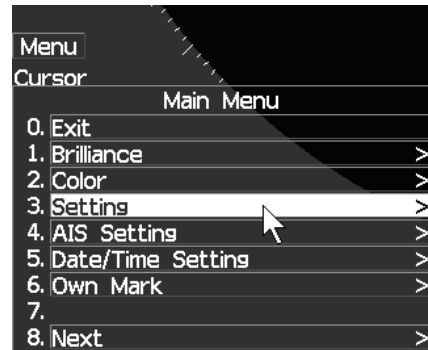
Procedures

- 1 Press [MENU] key.

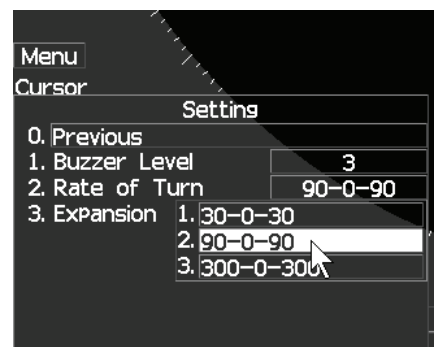
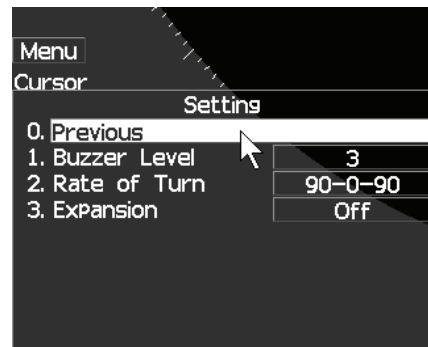
MAIN MENU will appear.

- 2 Place the cursor over [3.SETTING] with trackball and then press [ENTER] key.

SETTING menu will appear.

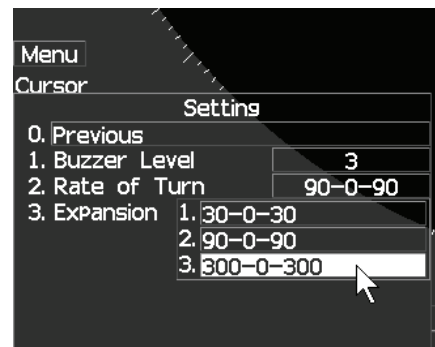
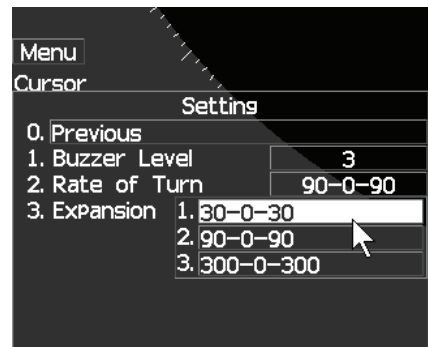


- 3 Place the cursor over [2.RATE OF TURN] with trackball and then press [ENTER] key.



The unit of RATE OF TURN will appears.

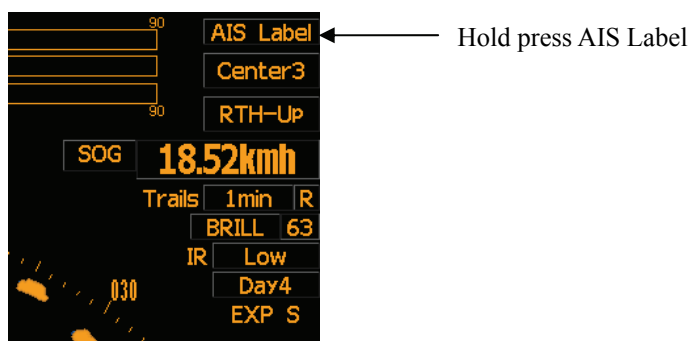
- 4 Select the unit with trackball and then press [ENTER] key.



3.5.12 DISPLAY AIS LABEL

Procedures

- 1 Press [AIS LABEL] key or set cursor to **AIS Label** on screen.

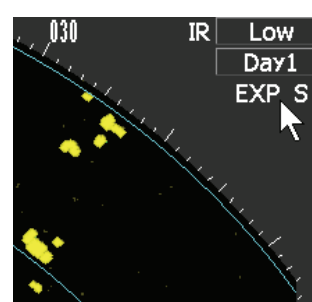
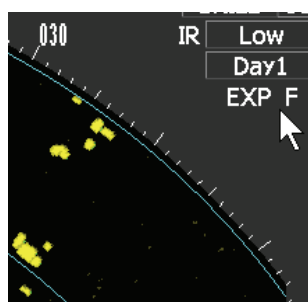
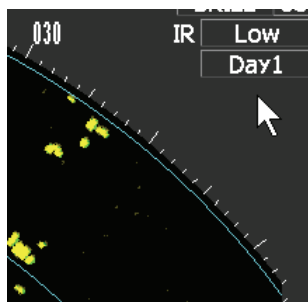


While hold press [AIS LABEL] key or ,while hold press **AIS Label** on screen icon,display the AIS target ship's name.

3.5.13 ECHO EXPANSION SWITCH

Procedures

- 1 Press [EXP] key .





3.6

DISPLAY USER MAP

Navigation information such as a maximum of 256 points of NAV lines, coastlines, depth contours, and NAV marks can be displayed, created, read, saved, corrected, and deleted. (This function is available only when navigation equipment is connected with the system.)

Marks that can be used : 29 types
 Lines that can be used : 3 types (solid, broken, and dashed-dotted line)
 Color of mark and line that can be used : 7 colors

If radar video is poor visibility caused by user map function, press the [DATA OFF] key to map displays temporarily off.

3

3.6.1 Edit User Map

In this system, when the radar is in the transmission state, the user map is displayed all the time. However, valid latitude / longitude data and true bearing data must be entered into the system. The user map can be created and edited by performing the following operation.

Plotting a mark

Procedures

- 1 Press [MENU] key .
 Select 8.Next and press [ENTER] key.
 Select 4.NAV Information and press [ENTER] key.
 Select 1.Make with cursor and press [ENTER] key.
 Select 1.Type and press s [ENTER] key.
- 2 Put the cursor on mark font switching  , and press [ENTER] key.
 The mark fonts are switched.
- 3 Put the cursor mark on mark 2.Color, and press [ENTER] key.
 The mark colors are switched.
- 4 Put the cursor on a location of the display at which you want to plot the mark, and press [ENTER] key.
 The specified mark is displayed in the specified shape and color.
 To create another mark, repeat the above procedures.

Plotting a line

Procedures

- 1 Press [MENU] key .
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.
Select 1.Make with cursor and press [ENTER] key.
Select 1.Type and press s [ENTER] key.
- 2 Put the cursor on line pattern switching  , and press [ENTER] key.

Line patterns are switched.
- 3 Put the cursor on line 2.Color, and press [ENTER] key.

Line colors are switched.
- 4 Put the cursor on a location of the display at which you want to start plotting a line, and press [ENTER] key.

The start point of the specified line will be displayed.
- 5 Move the cursor to a location of the display at which you want to finish plotting the line, and press [ENTER] key.

A line is plotted between the previous point and the end point.
Repeat this procedure so that sequential lines can be plotted.
- 6 When you want to finish plotting the line, press [ENTER] key at the previous point.

Line plotting will be terminated.
To plot another line, repeat procedures 4 to 6.



Plotting a mark / line make with latitude and longitude

Procedures

- 1 Open the Edit User Map menu by performing the following menu operation.

Press [MENU] key .

Select 8.Next and press [ENTER] key.

Select 4.NAV Information and press [ENTER] key.

Select 1.Edit User Map and press [ENTER] key.

- 2 Select 2.Make with L/L and press [ENTER] key.

The Make with L/L menu will appear.

- 3 Put the cursor on line 5. New Mark Input or New Line Input and press [ENTER] key.

The Mark Input menu and the Line Input menu are switched.

- 4 Select Mark or Line and press ENTER.

The desired mark font or line pattern is selected.

To add a line, select midpoint .

- 5 Select 1.Type and select the color of mark or line to be created.

The desired mark or line color is selected.

- 6 Select 3.L/L to input the latitude / longitude and press [ENTER] key.

- 7 Select 4.Enter and press [ENTER] key.

Mark / Line plotting will be terminated.

To create another mark or line, repeat procedures 4 to7.

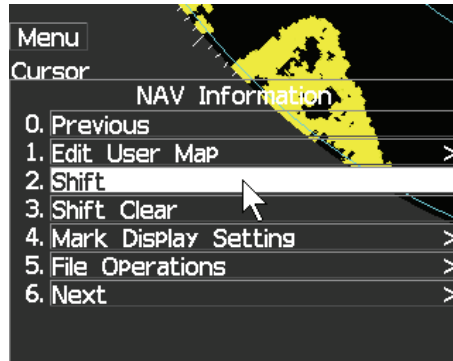
3.6.2 Correct Position on User Map (Shift).

If the display position on the user map is different from an actual position, it can be changed to the correct position in manual mode.

Correcting the display position on the user map (Shift).

Procedures

- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.



- 2 Select 2.Shift and press [ENTER] key
- 3 Put the cursor on a mark or end of a line, and press [ENTER] key.
- 4 Put the cursor on the point to be corrected, and press [ENTER] key.

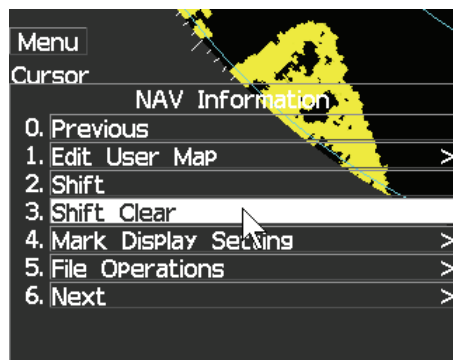
Positions of all marks and lines currently displayed will be corrected.

3.6.3 Correct Position on User Map (Shift Clear).

Clearing the corrected user map to its original state (Shift Clear)

Procedures

- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.



- 2 Select 3.Shift Clear and press [ENTER] key.

3.6.4 Set User Map Display (Mark Display Setting)

The user map can be individually displayed (on) or hidden (off).

Setting by type : Setting can be made by mark font and line pattern.

Setting by color : Setting can be made by color of mark or line.

The mark font display size can be selected.

Normal : The mark is displayed in normal size.

Small : The mark is displayed in a size smaller than usual.

Setting display by type

Procedures

- 1 Press [MENU] key.

Select 8.Next and press [ENTER] key.

Select 4.NAV Information and press [ENTER] key.

Select 4.Mark Display Setting and press [ENTER] key.

The Mark Setting display will appear.

- 2 Open the Display Mark Type menu by performing the following menu operation.

Select 1.Display Mark Type and press [ENTER] key.

- 3 Select 1.ALL and press [ENTER] key.

Selected items for will be displayed.

- 4 Select 3.Individual and press[ENTER]key.

: All types are not displayed.

: All types are displayed.

: Setting by type is activated.

- 5 Select each mark font / line pattern display and press [ENTER].

: Displayed.

: Not Displayed.

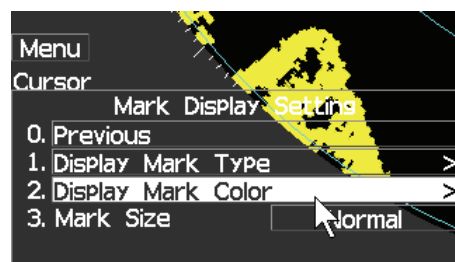
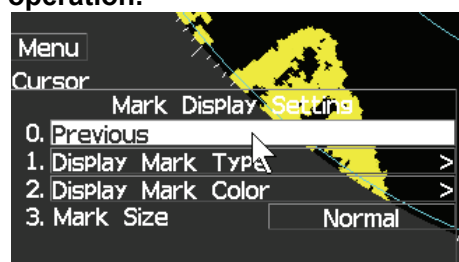
Setting display by color

Procedures

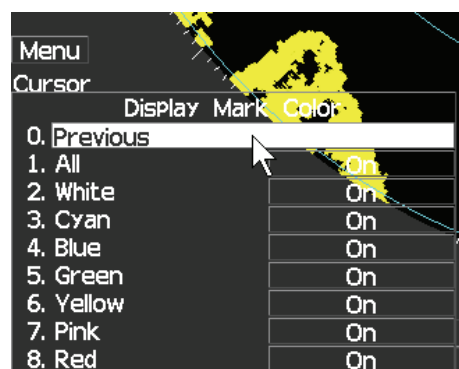
- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.

The Mark Setting menu will appear.

- 2 Open the Display Mark Color menu by performing the following menu operation.



Select 2.Display Mark Color and press [ENTER] key.



- 3 Select 1.ALL and press [ENTER] key.

Selected items for will be displayed.

- 4 Select 3.Individual and press [ENTER] key.

Off	: All colors are not displayed.
On	: All colors are displayed.
Individual	: Setting by color is activated.

- 5 Select each mark font / line pattern display.

On	: Displayed.
Off	: Not Displayed.

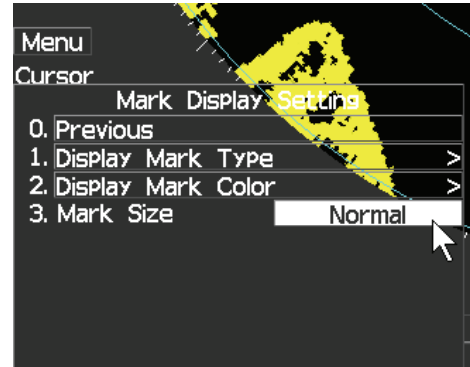
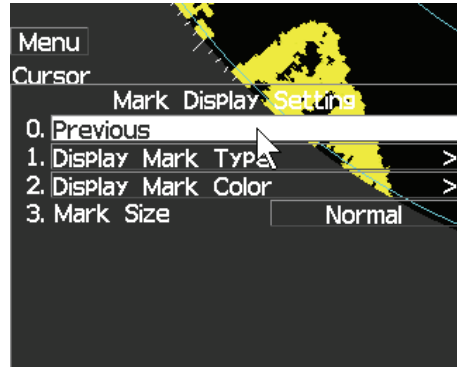
Setting the mark font size

Procedures

- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.

The Mark Setting display will appear.

- 2 Open the Select Mark Size menu by performing the following menu operation.



4. Select Mark Size

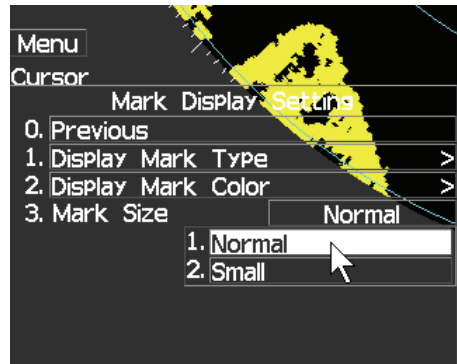
- 3 Select mark font size to be set and press [ENTER]key.

Normal

: The mark is displayed in normal size.

Small

: The mark is displayed in a size smaller than usual.

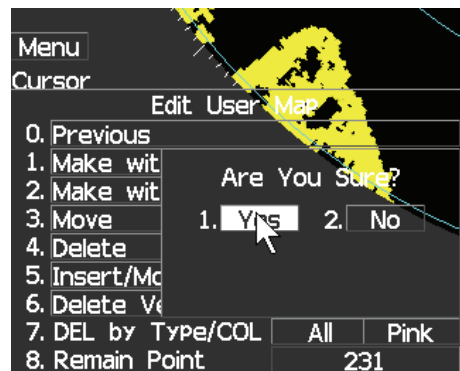


Clearing mark / line data (Clear Mark / Line Data)

The mark / line data saved in the process unit is cleared.

Procedures

- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.
Select 1.Edit User Map and press [ENTER] key.
Select 4.Delete and press [ENTER] key.
- 2 Put the cursor on a location where you want to delete line or mark and press [ENTER] key.



Confirmation Window will appear.

- 3 Select 1.Yes and press [ENTER] key.

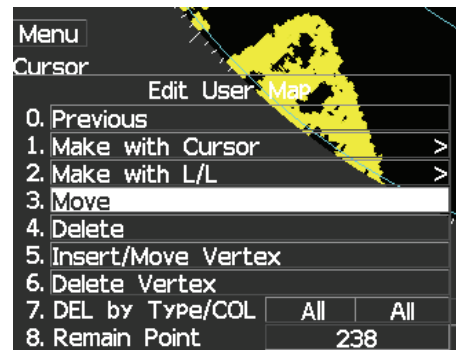
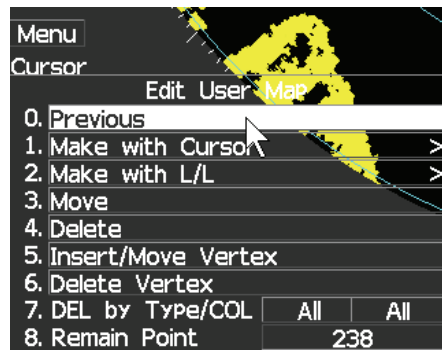
The mark / line data is deleted.

Moving a mark or line (Move)

With regard to the created user map, a mark or line is moved individually.

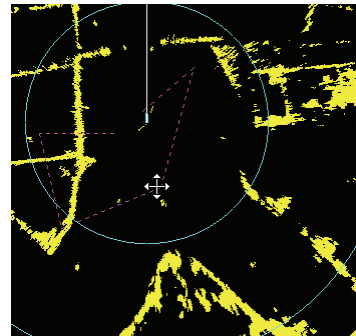
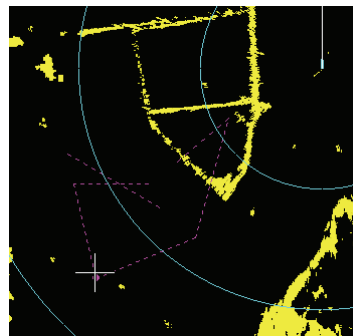
Procedures

- 1 **Presse [MENU] key.**
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.
Select 1.Edit User Map and press [ENTER] key.



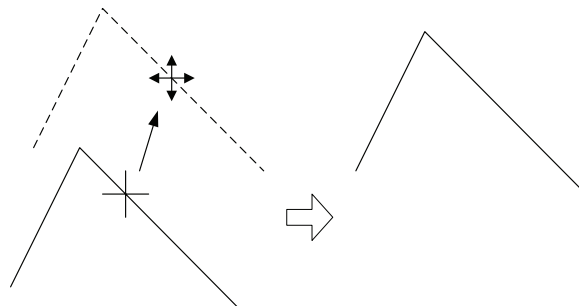
3

- 2 **Select 3.Move and press [ENTER] key.**
The user map move mode is selected.
- 3 **Put the cursor on a mark or line, and press [ENTER] key.**
When a mark or line to be moved is selected, the cross cursor mark will appear.



- 4 **Move the cursor mark to the destination, and press [ENTER] key.**
The selected mark or line is moved to the destination.
To move another mark or line, repeat procedures 3 and 4.
- 5 **When finished with the correction of lines and marks, press [MENU] key.**
The cursor mode changes to the normal operation mode, terminating the user map move mode.

(Example)



Deleting a mark or line (Delete)

With regard to the created user map, a mark or line is deleted individually.

Procedures

- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.
Select 1.Edit User Map and press [ENTER] key.
- 2 Select 4.Delete and press [ENTER] key.

The user map delete mode is selected.
- 3 Put the cursor on a mark or line, and press [ENTER] key.

The selected mark or line is deleted.
To delete another mark or line, repeat procedures 3.
- 4 When finished with the correction of lines and marks, press [MENU] key.

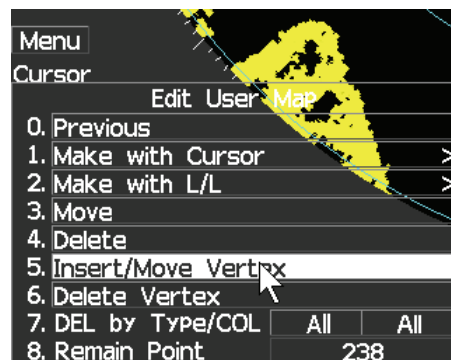
The cursor mode changes to the normal operation mode, terminating the user map delete mode.

Inserting a vertex into a line (Insert / Move Vertex)

With regard to the created user map, a vertex is inserted into a line.

Procedures

- 1 Press the [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.
Select 1.Edit User Map and press [ENTER] key.
- 2 Select 5.Insert/Map Vertex and press [ENTER] key.



The user map insert / move mode is selected.

- 3 Put the cursor to a side line into which a vertex will be inserted, and press the [ENTER] key.

A vertex is inserted into the selected line, and the cross cursor mark will be displayed.



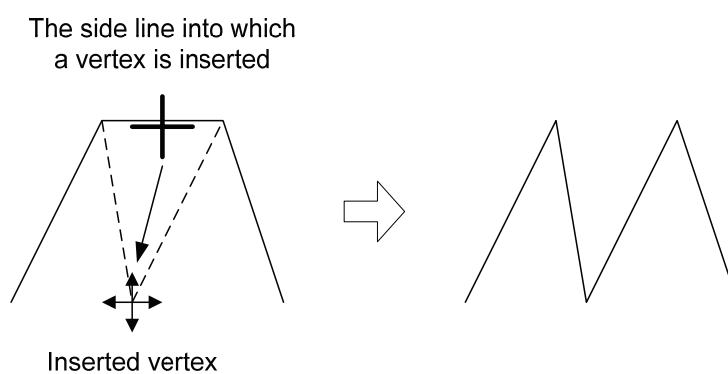
- 4 Move the cross cursor mark to the newly inserted vertex, and press [ENTER] key.**

To insert another vertex, repeat procedures 3 and 4.

- 5 When finished with the insertion of all vertices, press [MENU] key.**

The cursor mode changes to the normal operation mode, terminating the user map insert / move mode.

(Example)



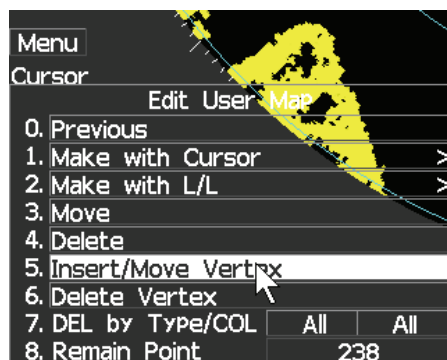
3

Correcting the mark or vertex of a line (Insert / Move Vertex)

With regard to the created user map, a mark or line is corrected.

Procedures

- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.
Select 1.Edit User Map and press [ENTER] key.
- 2 Select 5.Insert /Move Vertex and press [ENTER]key.



The user map insert / move mode is selected.

- 3 Put the cursor on the mark or vertex of a line, and press [ENTER] key.

When the mark or vertex of a line to be corrected is selected, the cross cursor mark will appear.

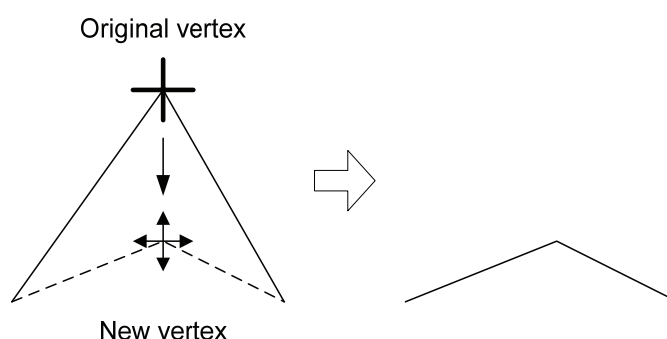
- 4 Move the cross cursor mark to the destination, and press [ENTER] key.

The vertex of the selected mark or vertex of a line is moved to the destination.
To correct another mark or vertex of a line, repeat procedures 3 and 4.

- 5 When finished with the correction of all vertices, press [MENU] key.

The cursor mode changes to the normal operation mode, terminating the user map insert / move mode.

(Example)

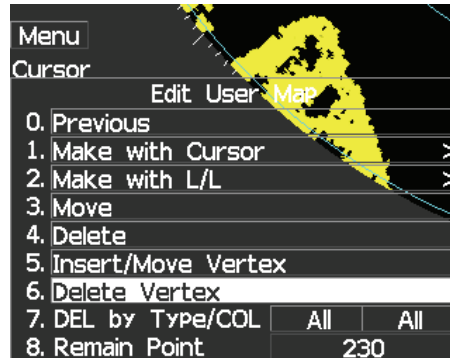


Deleting a mark or vertex of a line (Delete Vertex)

With regard to the created user map, a vertex is deleted individually from a mark or line.

Procedures

- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.
Select 1.Edit User Map and press [ENTER] key.
- 2 Select 6.Delete Vertex.



The user map delete mode is selected.

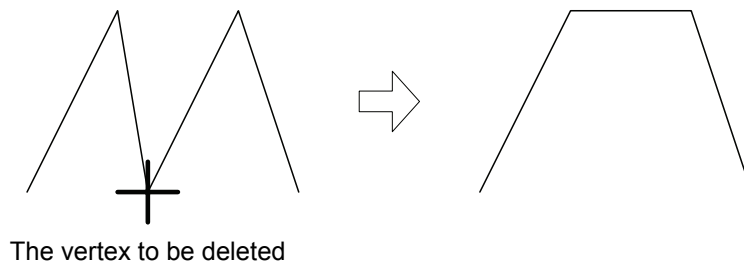
- 3 Put the cursor on the mark or vertex of a line, and press [ENTER] key.

The vertex of the selected mark or vertex of a line is deleted.
All of the lines drawn by joining two points are deleted.
To delete another mark or vertex of a or line, repeat procedure 3.

- 4 When finished with the correction of all vertices, press [MENU] key.

The cursor mode changes to the normal operation mode, terminating the user map delete mode.

(Example)

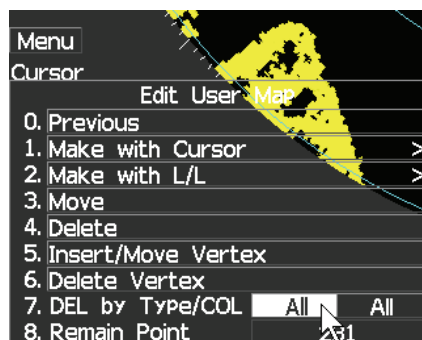


Batch clearing marks or lines (Clear by Type / Color)

With regard to the created user map, marks or lines are batch cleared by type or by color.

Procedures

- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.
Select 1.Edit User Map and press [ENTER] key.
- 2 Select 7.Del by Type/Col and press [ENTER] key.



Select the type of marks or lines to be deleted.

To select all types, select .

For example, to delete "red ○" marks, select .

- 3 Select the color of the marks or lines to be deleted.

Select the color of marks or lines to be deleted.

To select all colors, select .

For example, to clear "red ○" marks, select .

After the items have been selected, Confirmation Window will appear.

- 4 Press [ENTER] key.

Selected marks or lines will be batch cleared.

Note: If data is not copied on the flash memory card (option), the data is not be reloaded.

3.6.5 Operate User Map File (File Operations)

[I] Loading navigation data (Load User Map)

Procedures

- 1 Insert a flash memory card into the card slot.

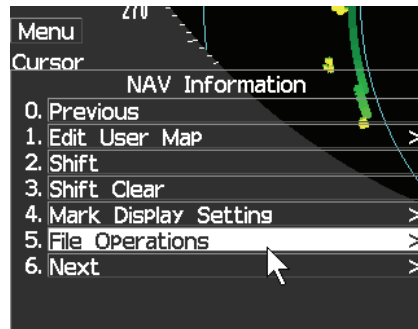
Flash memory card (option) is necessary.

- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

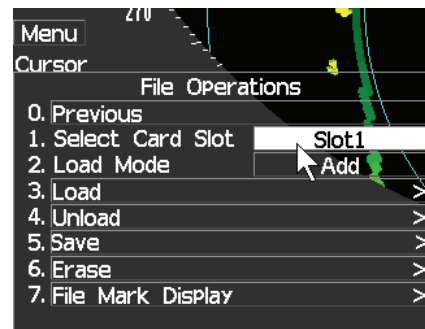
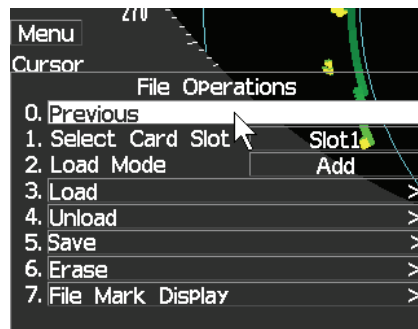
Select 4.NAV Information and press [ENTER] key.

Select 5.File Operations and press [ENTER] key.

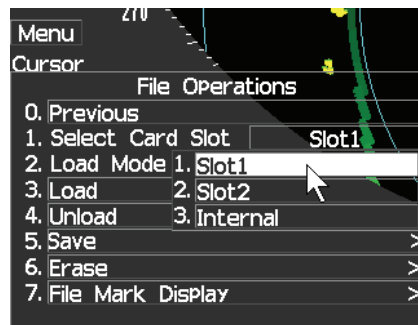


- 3 Select Card Slot.

Select 1.Select Card Slot and press [ENTER] key.

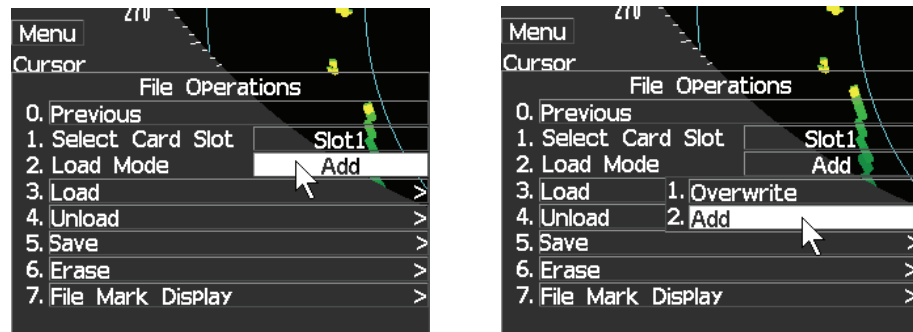


- 4 Select 1.Slot1 and press [ENTER] key. (In case of memory card is slot1).



Slot1 and Slot2 Internal of the Select Card Slot items are switched.

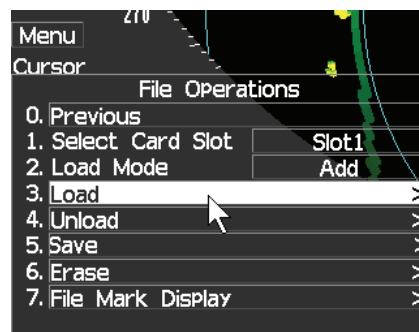
5 Select Add or Overwrite and press [ENTER] key.



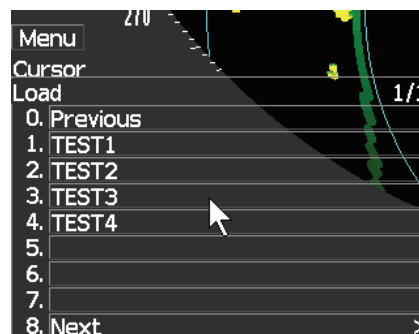
Add and Overwrite of the Load Mode items are switched.

When **Add** is selected, new data is added to the saved data. When **Overwrite** is selected, the saved data is overwritten.

6 Select 3.Load and press [ENTER] key.

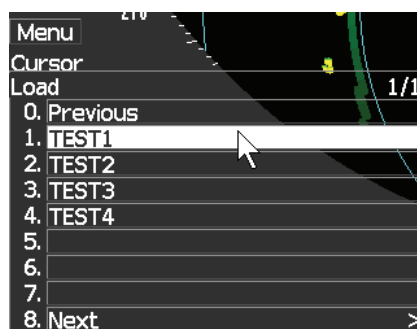


The list of navigation data saved in the system will be displayed.

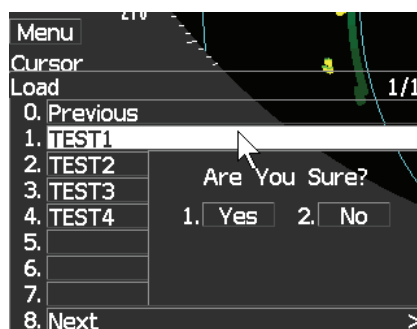




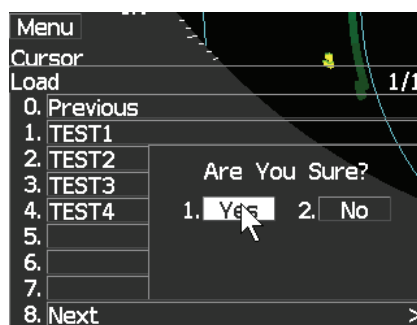
7 Select numeric icon corresponding to the file to be loaded.



Confirmation Window will appear.



8 Select 1.Yes and press [ENTER] key.

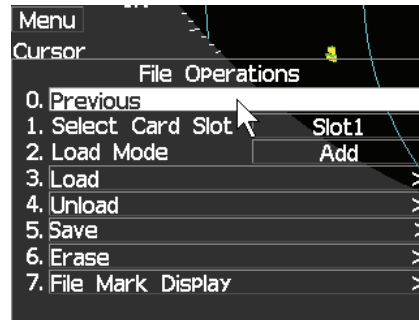


The selected navigation data will be loaded and displayed of the display.

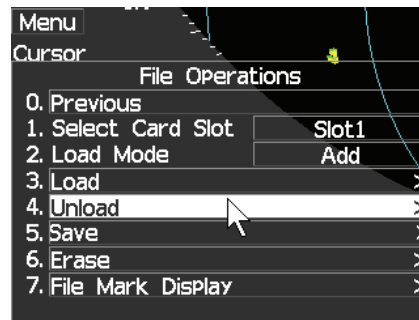
[III] Discarding navigation data (Unload).

Procedures

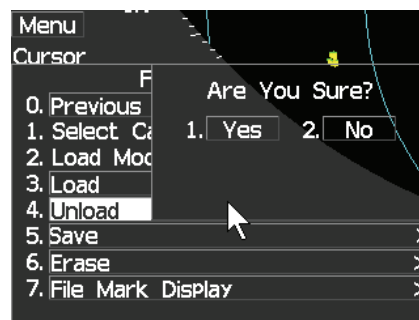
- 1 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 4.NAV Information and press [ENTER] key.
Select 5.File Operations and press [ENTER] key.



- 2 Select 4.Unload and press [ENTER] key.



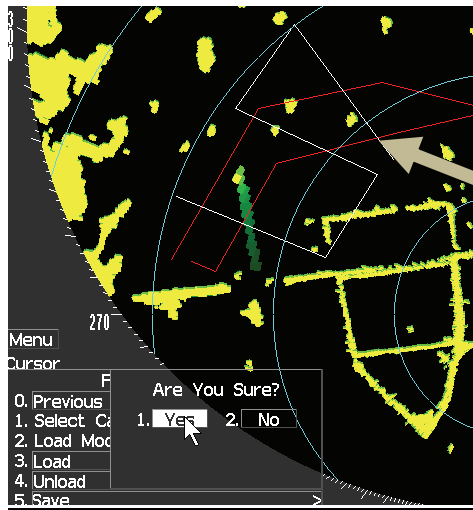
Unload Confirmation Window will appear.



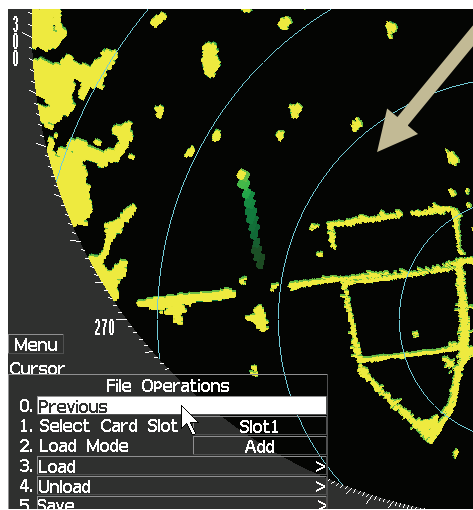


3 Select 1.Yes and press [ENTER] key.

The navigation line and mark will be disappeared.



Unloaded the navigation line s and marks.



3

[III] Saving navigation data (Save).

Navigation data can be saved when navigation equipment is connected, or the own ship position on the user map is entered in the manual mode.

Procedures

1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.

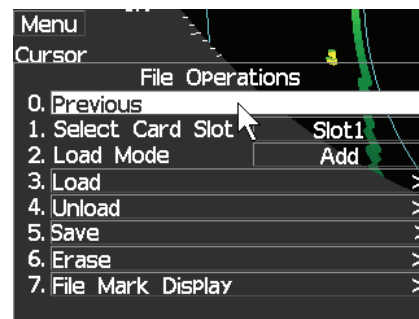
For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Press [MENU] key.

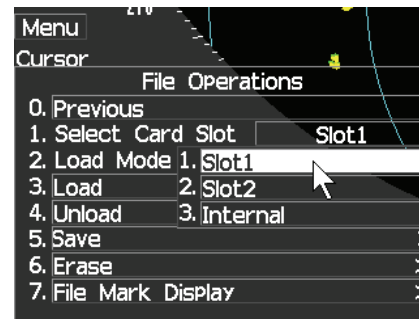
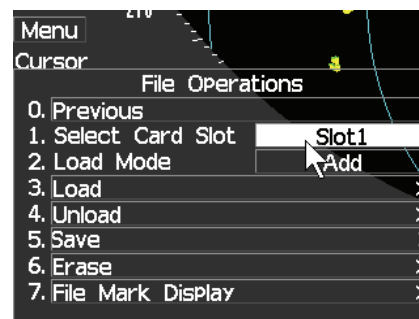
Select **8.Next** and press [ENTER] key.

Select **4.NAV Information** and press [ENTER] key.

Select **5.File Operations** and press [ENTER] key.



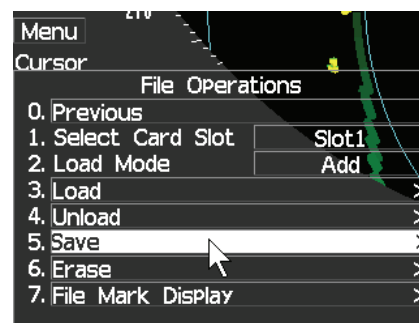
3 Select Card Slot.

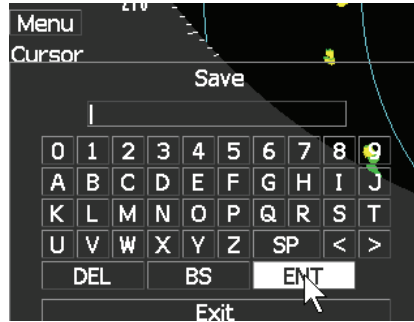


4 Select Card Slot and press [ENTER] key.

Slot1 and Slot2 Internal of the Select Card Slot items are switched.

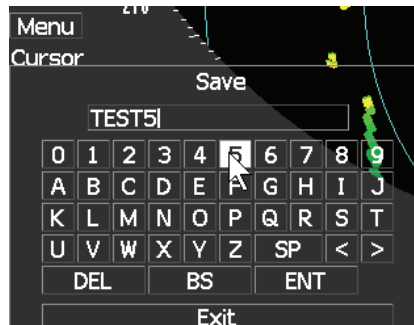
5 Select 5.Save and press [ENTER] key.





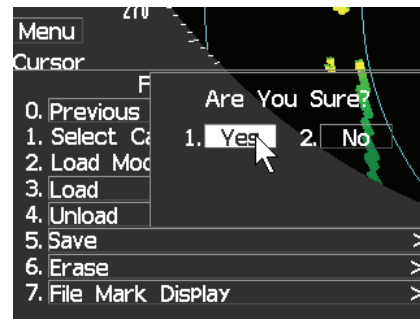
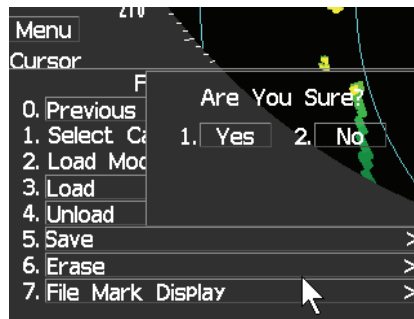
The Input File Name menu will appear.

6 Enter the file name to be saved.



Up to 10 characters can be entered.

After the data has been entered, Confirmation Window will appear.



7 Press [ENTER] key.

Navigation data currently being displayed is saved.

[IV] Clearing the saved navigation data (Erase)

Procedures

1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.

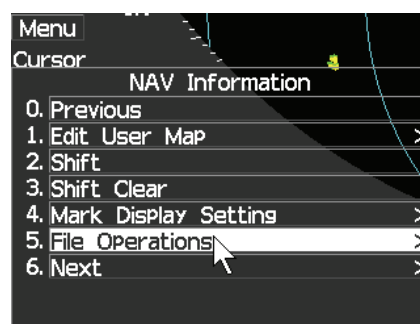
For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Press [MENU] key.

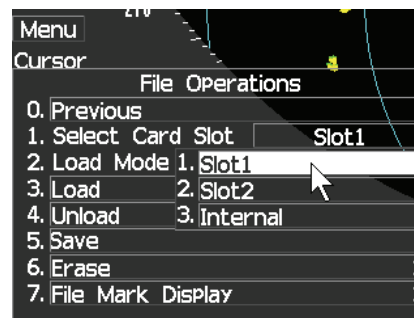
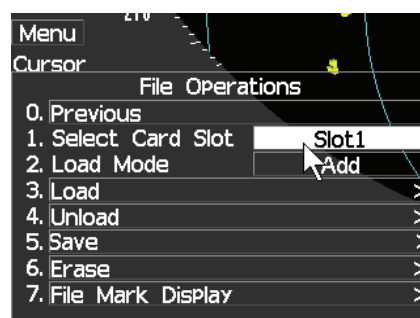
Select **8.Next** and press [ENTER] key.

Select **4.NAV Information** and press [ENTER] key.

Select **5.File Operations** and press [ENTER] key.

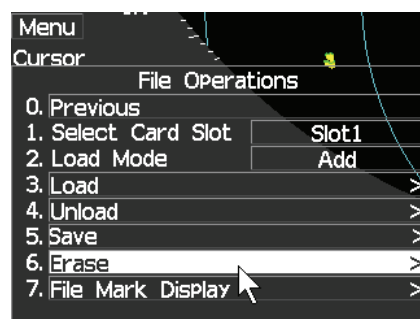


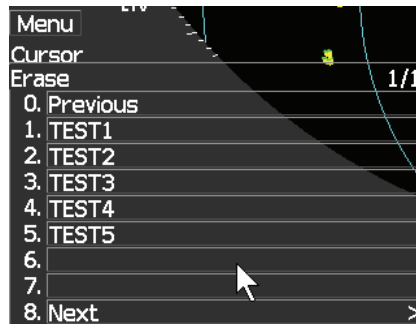
3 Select Card Slot and press [ENTER] key.



Slot1 and Slot2 of the Select Card Slot items are switched.

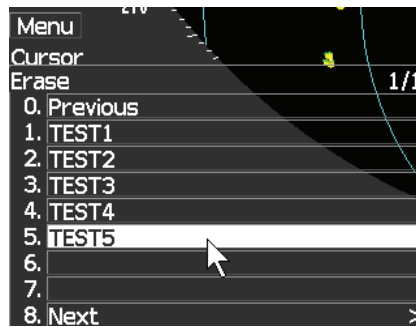
4 Select **6.Erase and press [ENTER] key.**





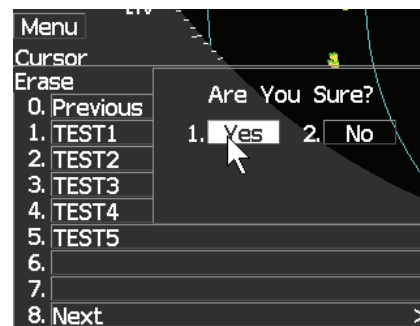
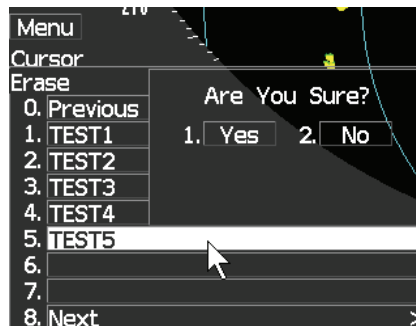
The Erase screen will appear.
The list of navigation data saved in the card will be displayed.

- 5 Select the number of the file to be erased and press [ENTER]key.**

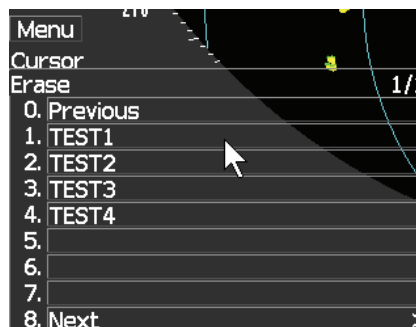


Confirmation Window will appear.

- 6 Select 1.Yes and press [ENTER] key.**



The selected navigation data is erased and the name of the file is deleted from the list.



TEST5 was deleted.

[V] Displaying saved navigation data (File Mark Display)

Procedures

1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.

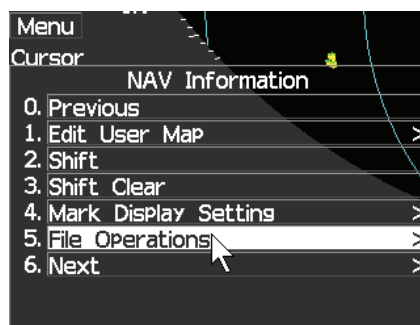
For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Press [MENU] key.

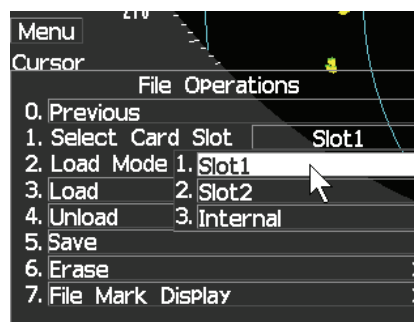
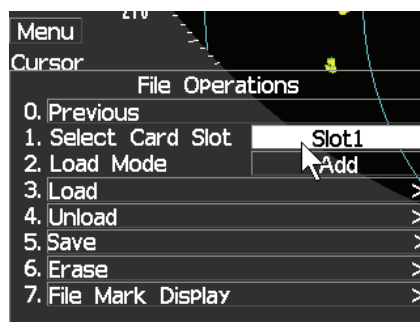
Select 8.Next and press [ENTER] key.

Select 4.NAV Information and press [ENTER] key.

Select 5.File Operations and press [ENTER] key.

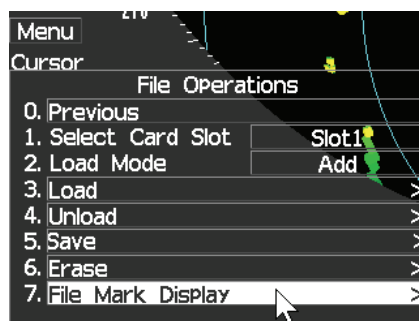


3 Select Card Slot and press [ENTER] key.

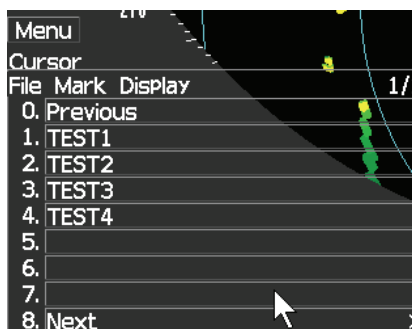


Slot1 and Slot2 of the Select Card Slot items are switched.

4 Select 7.File Mark Display and press [ENTER] key.



The Card Mark Display menu will appear.



The list of navigation data saved in the card will be displayed.

3.7 SCREEN CAPTURE

3.7.1 SCREEN CAPTURE SETTING (Select Card Slot).

Procedures

- 1 Insert a flash memory card into the card slot.

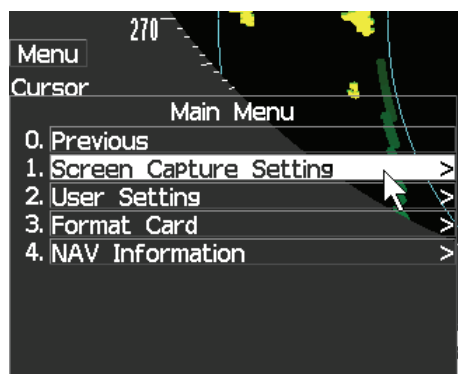
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

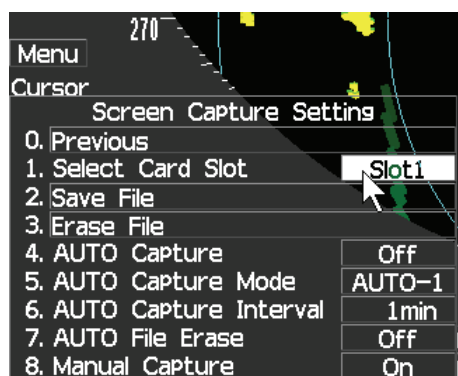
- 2 Press [MENU] key.

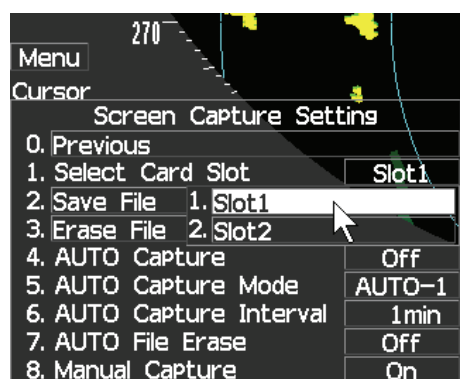
Select 8.Next and press [ENTER] key.

Select 1.Screen Capture Setting and press [ENTER] key.



- 3 Select Card Slot and press [ENTER] key.





Slot1 and Slot2 of the Select Card Slot items are switched.

- 4 Select 1.Slot1 or 2.Slot2 and press [ENTER] key.

3.7.2 SCREEN CAPTURE SETTING (SAVE FILE).

Procedures

- 1 Insert a flash memory card into the card slot.

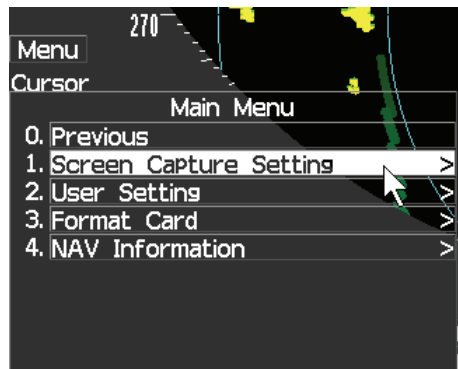
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

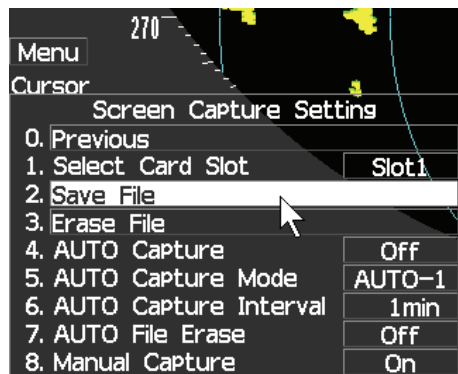
- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

Select 1.Screen Capture Setting and press [ENTER] key.



- 3 Select 2.Save File and press [ENTER] key.



3.7.3 SCREEN CAPTURE SETTING (Erase File).

Procedures

- 1 Insert a flash memory card into the card slot.

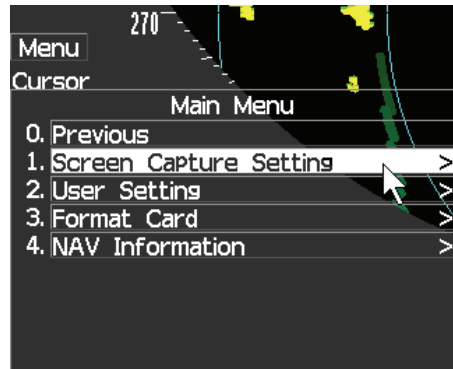
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

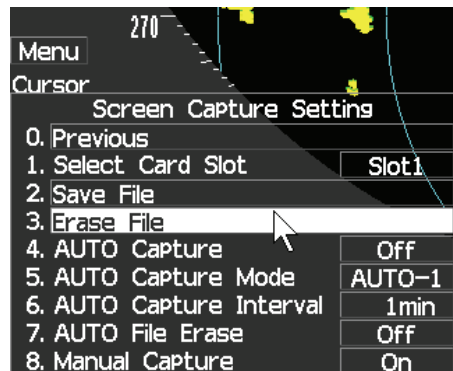
- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

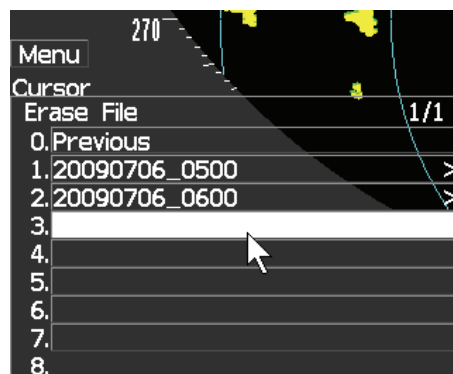
Select 1.Screen Capture Setting and press [ENTER] key.



- 3 Select 3.Erase File and press [ENTER] key.



- 4 Select erasing file and press [ENTER] key.



3.7.4 SCREEN CAPTURE SETTING (AUTO Capture).

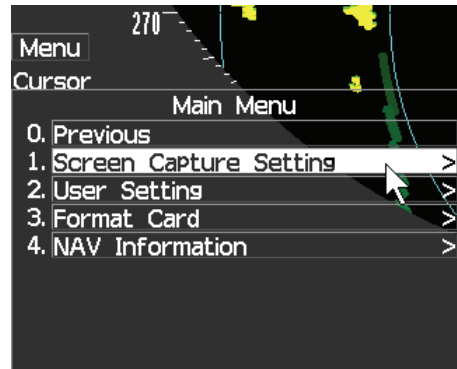
Procedures

- 1 Insert a flash memory card into the card slot.

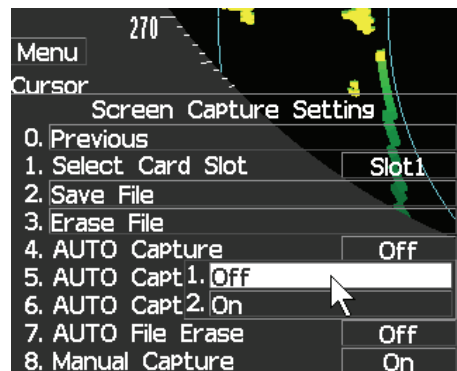
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 1.Screen Capture Setting and press [ENTER] key.



- 3 Select 4.AUTO Capture and press [ENTER] key.



- 4 Select off or on and press [ENTER] key.

3.7.5 SCREEN CAPTURE SETTING (AUTO Capture Mode).

Procedures

- 1 Insert a flash memory card into the card slot.

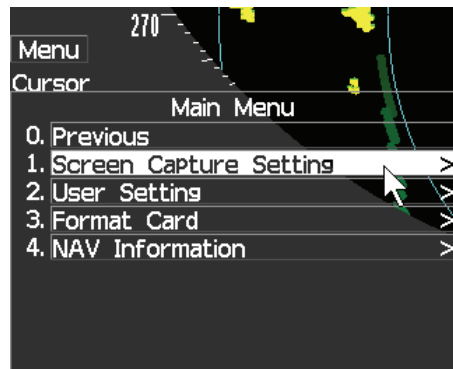
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

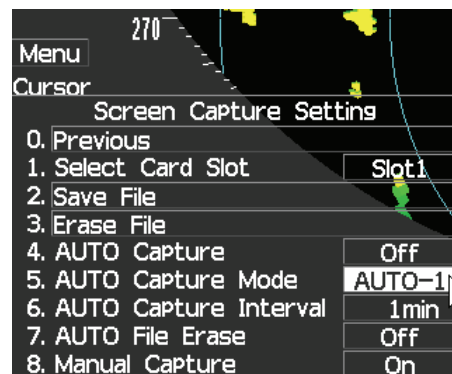
- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

Select 1.Screen Capture Setting and press [ENTER] key.



- 3 Select 5.AUTO Capture Mode and press [ENTER] key.



- 4 Select AUTO-1 or AUTO-2 and press [ENTER] key.

3.7.6 SCREEN CAPTURE SETTING (AUTO Capture Interval).

Procedures

- 1 Insert a flash memory card into the card slot.

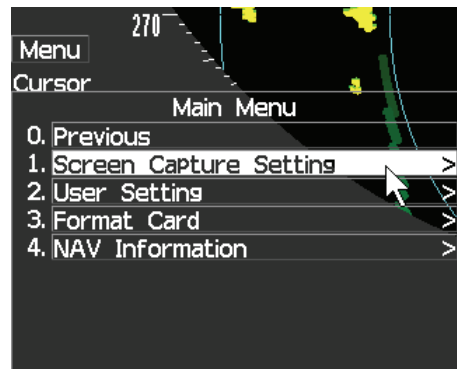
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

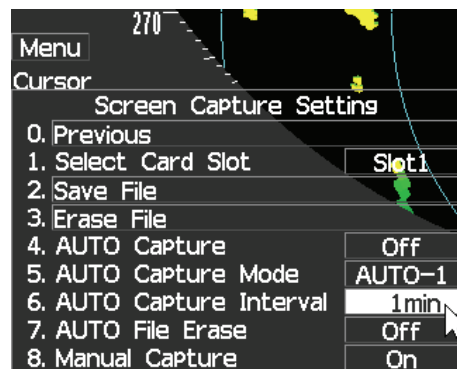
- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

Select 1.Screen Capture Setting and press [ENTER] key.



- 3 Select 6.AUTO Capture Interval and press [ENTER] key.



- 4 Input interval time and press [ENTER] key.



3.7.7 SCREEN CAPTURE SETTING (AUTO File Erase).

Procedures

- 1 Insert a flash memory card into the card slot.

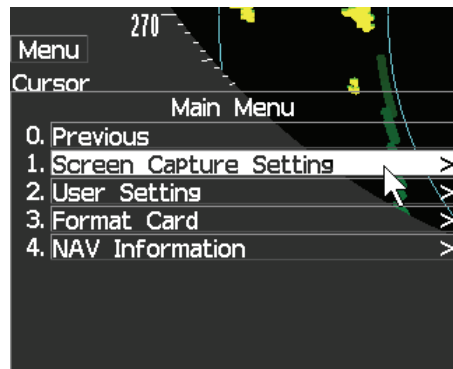
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

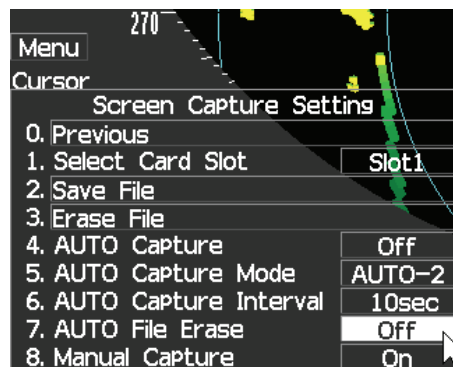
- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

Select 1.Screen Capture Setting and press [ENTER] key.



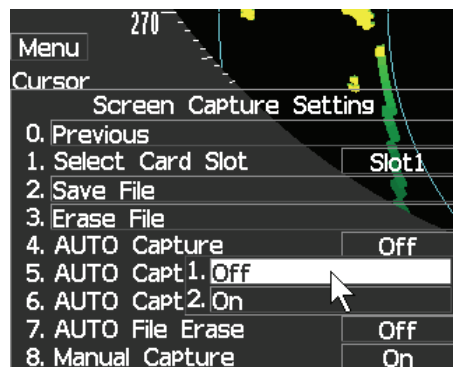
- 3 Select 7.AUTO File Erase and press [ENTER] key.



- 4 Select off or on and press [ENTER] key.

off : no empty card can't save new file.

on: old file is elased automatically.



3.7.8 SCREEN CAPTURE SETTING (Manual Capture).

Procedures

- 1 Insert a flash memory card into the card slot.

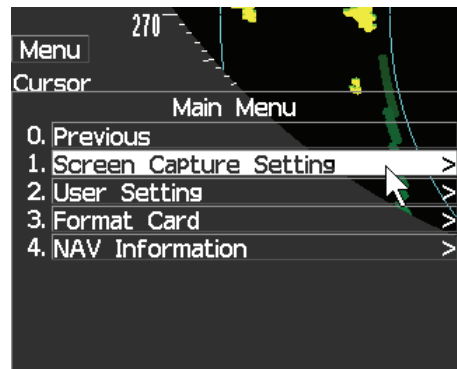
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

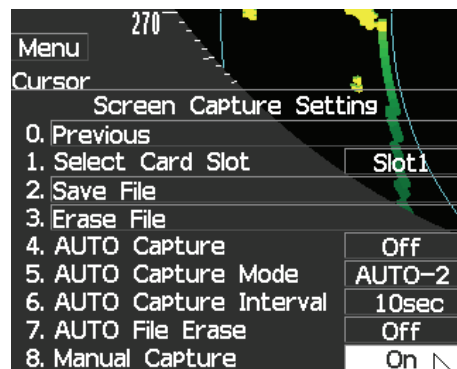
- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

Select 1.Screen Capture Setting and press [ENTER] key.



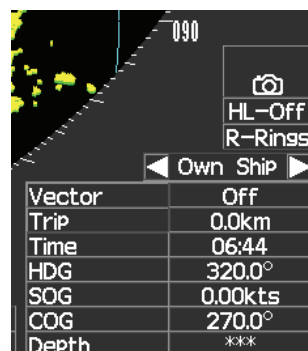
- 3 Select 8.Manual Capture and press [ENTER] key.



- 4 Select off or on and press [ENTER] key.

off : no action for pressing capture key.

on: when pressed capture key,screen capture file is downloaded automatically to the card.



3.8 USER SETTING

3.8.1 USER SETTING (Load User Setting).

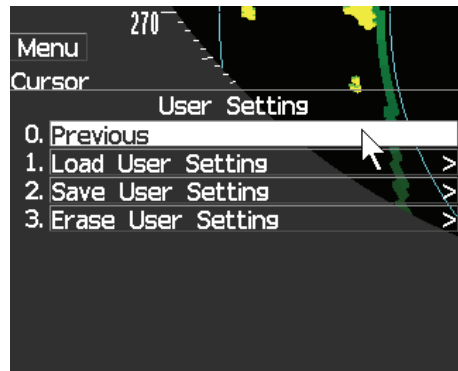
Procedures

- 1 Insert a flash memory card into the card slot.

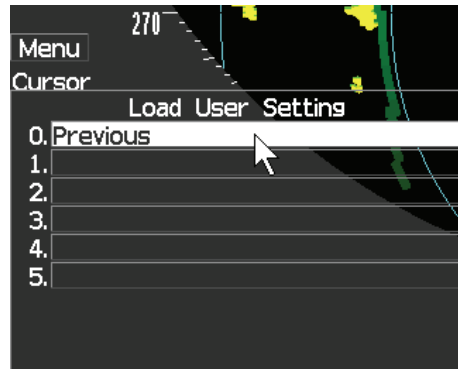
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Press [MENU] key.
Select 8.Next and press [ENTER] key.
Select 2.User Setting and press [ENTER] key.



- 3 Select 1.Load User Setting and press [ENTER] key.



- 4 Select user setting file and press [ENTER] key.

3.8.2 USER SETTING (Save User Setting).

Procedures

- 1 Insert a flash memory card into the card slot.

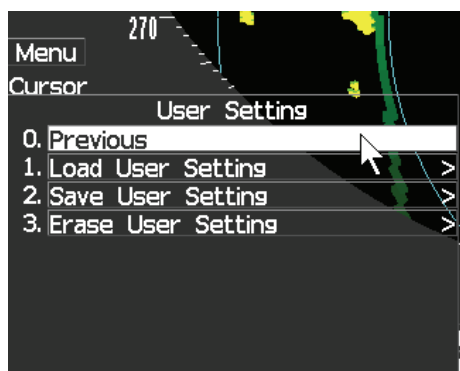
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

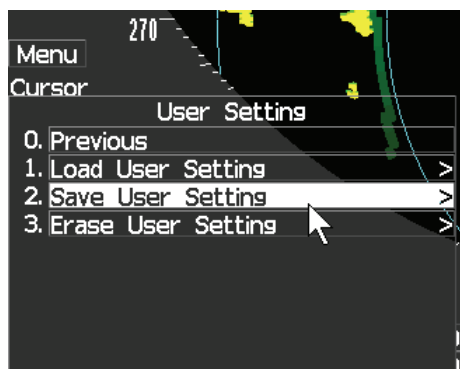
- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

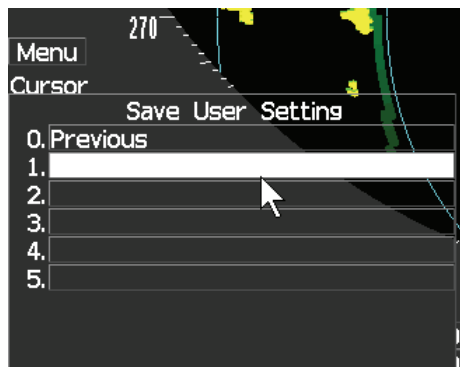
Select 2.User Setting and press [ENTER] key.



- 3 Select 2.Save User Setting and press [ENTER] key.



- 4 Select user setting file and press [ENTER] key.



3.8.3 USER SETTING (Erase User Setting).

Procedures

- 1 Insert a flash memory card into the card slot.

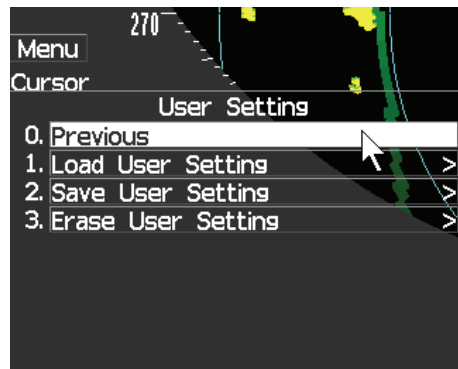
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

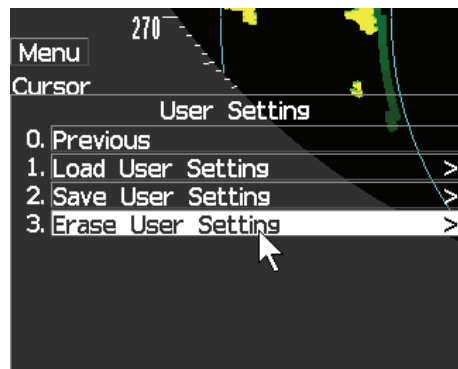
- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

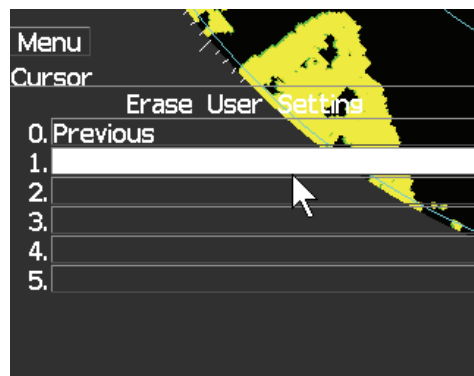
Select 2.User Setting and press [ENTER] key.



- 3 Select 3.Erase User Setting and press [ENTER] key.



- 4 Select user erasing file and press [ENTER] key.



3.9 FORMAT CARD

3.9.1 FORMAT CARD (Select Card Slot).

Procedures

- 1 Insert a flash memory card into the card slot.

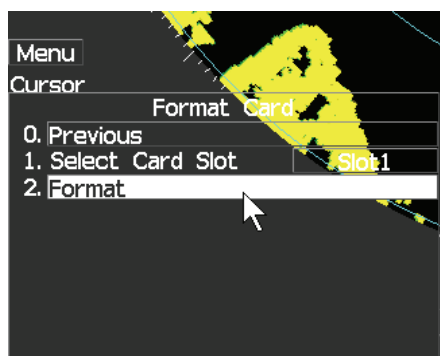
Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

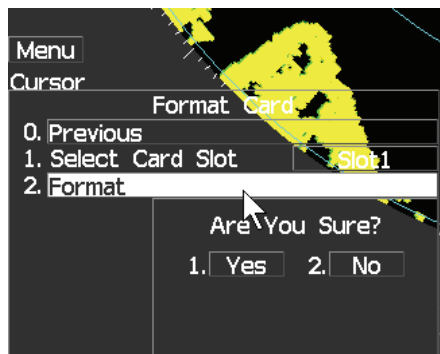
- 2 Press [MENU] key.

Select 8.Next and press [ENTER] key.

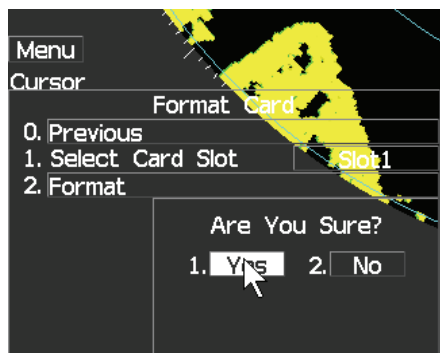
Select 3.Format Card and press [ENTER] key.



Confirmation Window will appear.



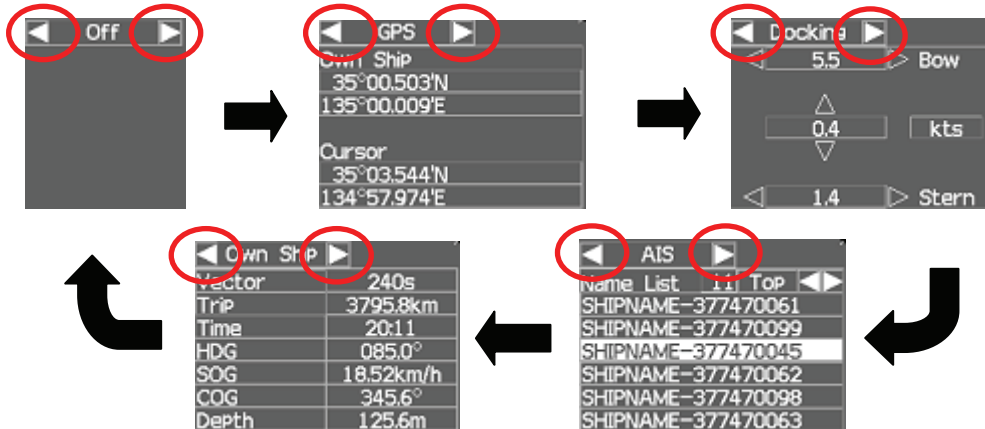
- 3 Select 1.Yes or No and press [ENTER] key.



3.10 AIS FUNCTION

When an AIS transceiver is connected with the radar and also a (D)GPS and heading sensor is connected, AIS target will be drawn on the screen on the position of this target. Also there will be a name list at the bottom left and right side of the screen.

The information in windows at the left and right side bottom can be selected from “OFF”, “GPS”, “Docking”, “AIS information”, and “Own Ship Data” as follow.



By pressing on the arrow button, the information in window will be changed.

3.10.1 VESSEL NAME LIST

The list is sorted on the distance from the target, the vessel that is on top is the vessel with the smallest distance from the own vessel. By pressing on the arrow button, the user can scroll through the name list. When a name is selected in the list, the target will be highlighted on the screen.

3.10.2 VESSEL INFORMATION

When an AIS symbol is selected on the screen, extra information from this vessel will be shown at the window.



By pressing on the arrow button, the user can change the information.

3.10.3 DISPLAY THE VESSEL NAMES ON THE SCREEN

By pressing [AIS LABEL] key or pressing AIS Label at the right top on the screen, the vessel names will be displayed beside the AIS symbol on the screen.

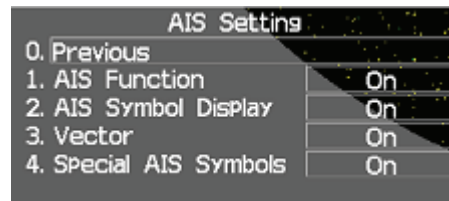


Example of vessel name displaying

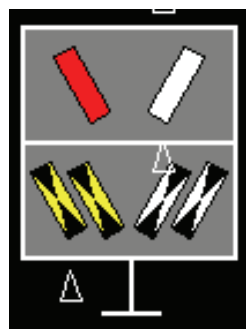
3.10.4 AIS Setting Menu

Procedures

- 1 Press [MENU] key.
- 2 Select 4.AIS Setting and press [ENTER] key.



1. AIS Function
 - On : AIS function is effective.
 - Off : AIS function is invalid.
2. AIS Symbol Display
 - On : AIS symbols are displayed on the screen.
 - Off : AIS symbols are not displayed on the screen.
3. Vector
 - On : AIS vector is displayed on the screen.
 - Off : AIS vector is not displayed on the screen.
4. Special AIS Symbols
 - On : AIS signal symbol is displayed on the screen.
 - Off : AIS signal symbol is not displayed on the screen.



Example of AIS signal symbol

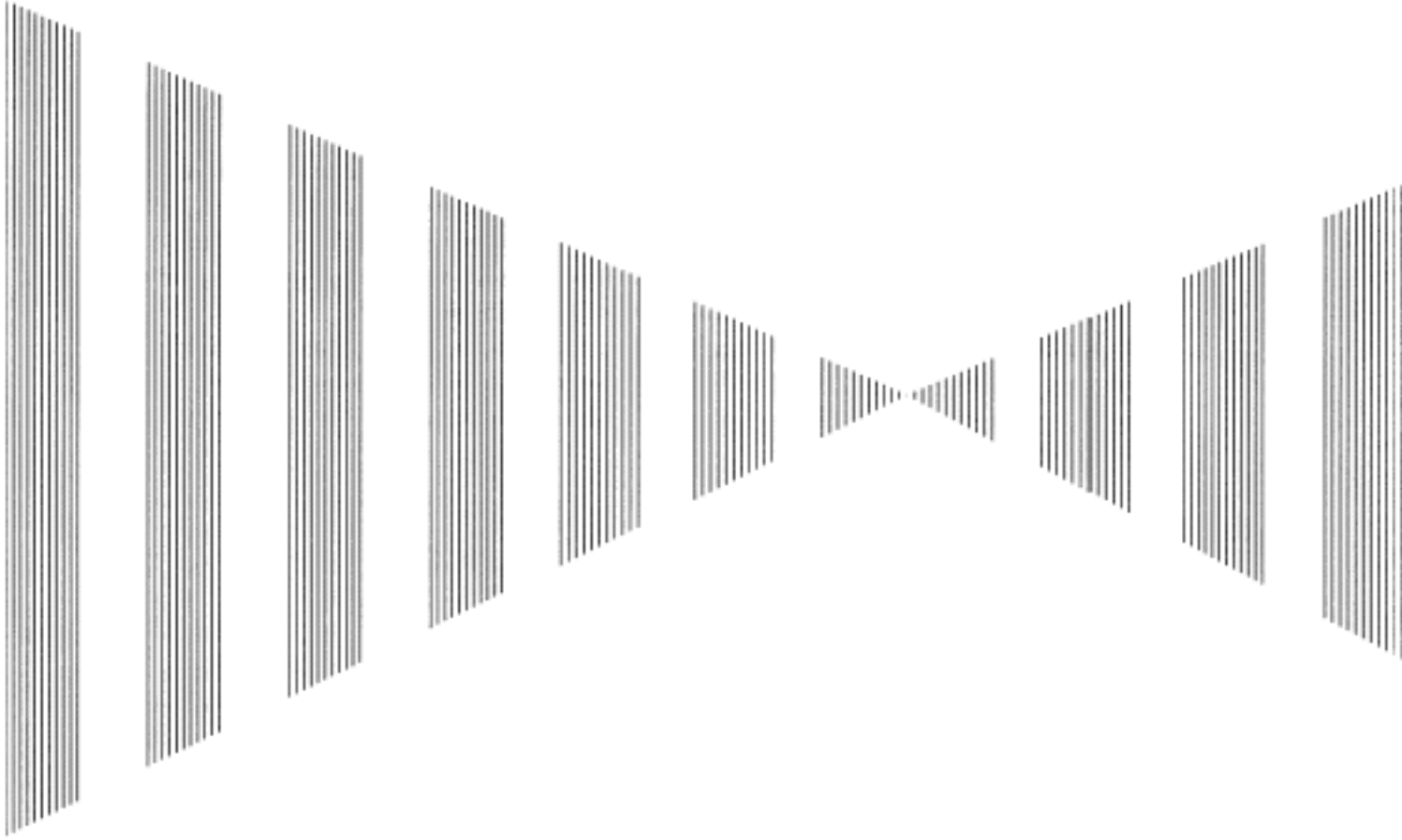
3.10.5 AIS SYMBOL

On the screen, the following symbols can be found:

Description	Symbol	AIS information window
AIS target without heading		Name List 11 Top ◀▶ SHIPNAME-377470060 SHIPNAME-377470099 SHIPNAME-377470061 SHIPNAME-377470098 SHIPNAME-377470062 SHIPNAME-377470097
AIS target		Name List 11 Top ◀▶ SHIPNAME-377470060 SHIPNAME-377470099 SHIPNAME-377470061 SHIPNAME-377470098 SHIPNAME-377470062 SHIPNAME-377470097
AIS target with blue sign		Name List 11 Top ◀▶ SHIPNAME-377470060 SHIPNAME-377470099 SHIPNAME-377470061 SHIPNAME-377470098 SHIPNAME-377470062 SHIPNAME-377470097
AIS target with speed		Name List 11 Top ◀▶ SHIPNAME-377470060 SHIPNAME-377470099 SHIPNAME-377470061 SHIPNAME-377470098 SHIPNAME-377470062 SHIPNAME-377470097
AIS target which is selected in the left or right bottom side window		Name List 11 Top ◀▶ SHIPNAME-377470045 SHIPNAME-377470099 SHIPNAME-377470061 SHIPNAME-377470098 SHIPNAME-377470062 SHIPNAME-377470097
AIS target which is selected on the screen		Name SHIPNAME-377470022 Call Sign Missins MMSI 377470022 COG 0.0 ° SOG 0.0 km/h

SECTION 4

MEASUREMENT OF RANGE AND BEARING



4.1	MEASUREMENT BY TRACKBALL.....	4-1
4.2	MEASUREMENT BY RANGE RINGS ...	4-2
4.3	MEASUREMENT BY EBLs AND VRMS	4-3

4.1

MEASUREMENT BY TRACKBALL

Procedures

- 1 Check the target echoes on the radar display.
- 2 Move the cursor mark to a target by the trackball.

The **CURSOR** on the radar display indicates the bearing and range of the target. The range is a distance from own ship's position.

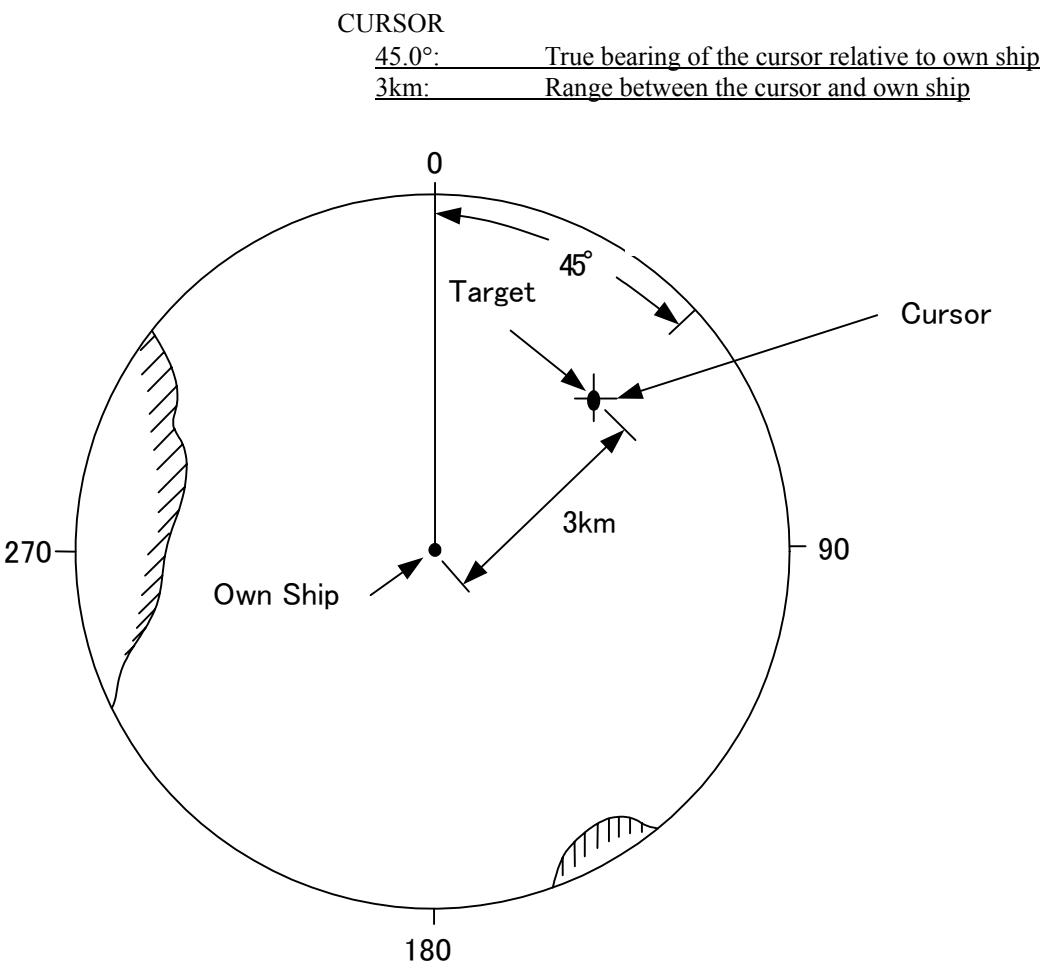


Figure 4.1



4.2

MEASUREMENT BY RANGE RINGS

Procedures

1 Press [RR] key.

The Range Rings will appear on the radar display.

The range between the target and own ships can be determined by visually measuring the target's position that lies between two range rings.

4.3

MEASUREMENT BY EBLs AND VRMS

Procedures

- 1 Press [EBL1/EBL2] key to select EBL1 display and operation.

The EBL1 indication at the lower left of the radar display will be selected and the EBL1 will appear as a broken-line on the PPI display.

- 2 Turn the [JOG DIAL] to put EBL1 on a target.

The bearing of the EBL1 will appear at the lower left of the radar display. The EBL1 bearing represents the target's bearing.

- 3 Press [VRM1/VRM2] key to select VRM1 display and operation.

The VRM1 indication at the lower right of the radar display will be selected and the VRM1 will appear as a broken-line circle on the PPI display.

- 4 Move the broken-line VRM1 to the target by using the [JOG DIAL] control.

The range of the VRM1 from own ship will appear at the lower right of the radar display. The range of VRM1 signifies a distance between the target and own ship.

Refer to **Figure 4.2** in the next page.

In this Figure 4.2, the range and bearing are;

Range: 3km

Bearing: 45.0°

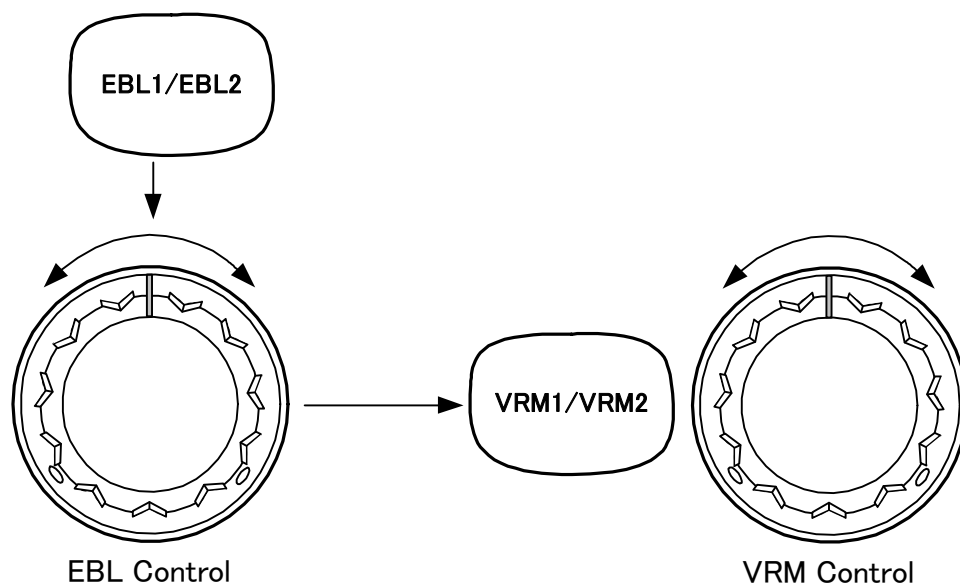
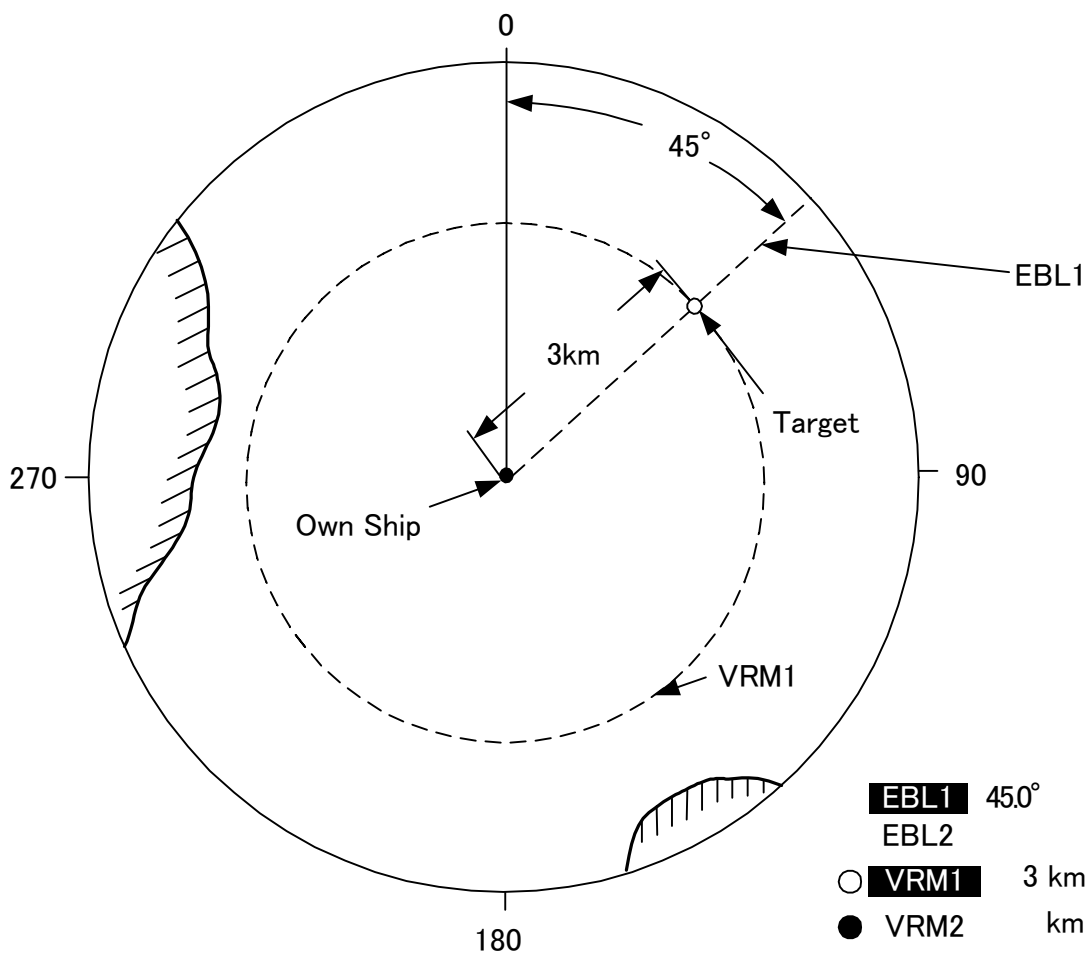
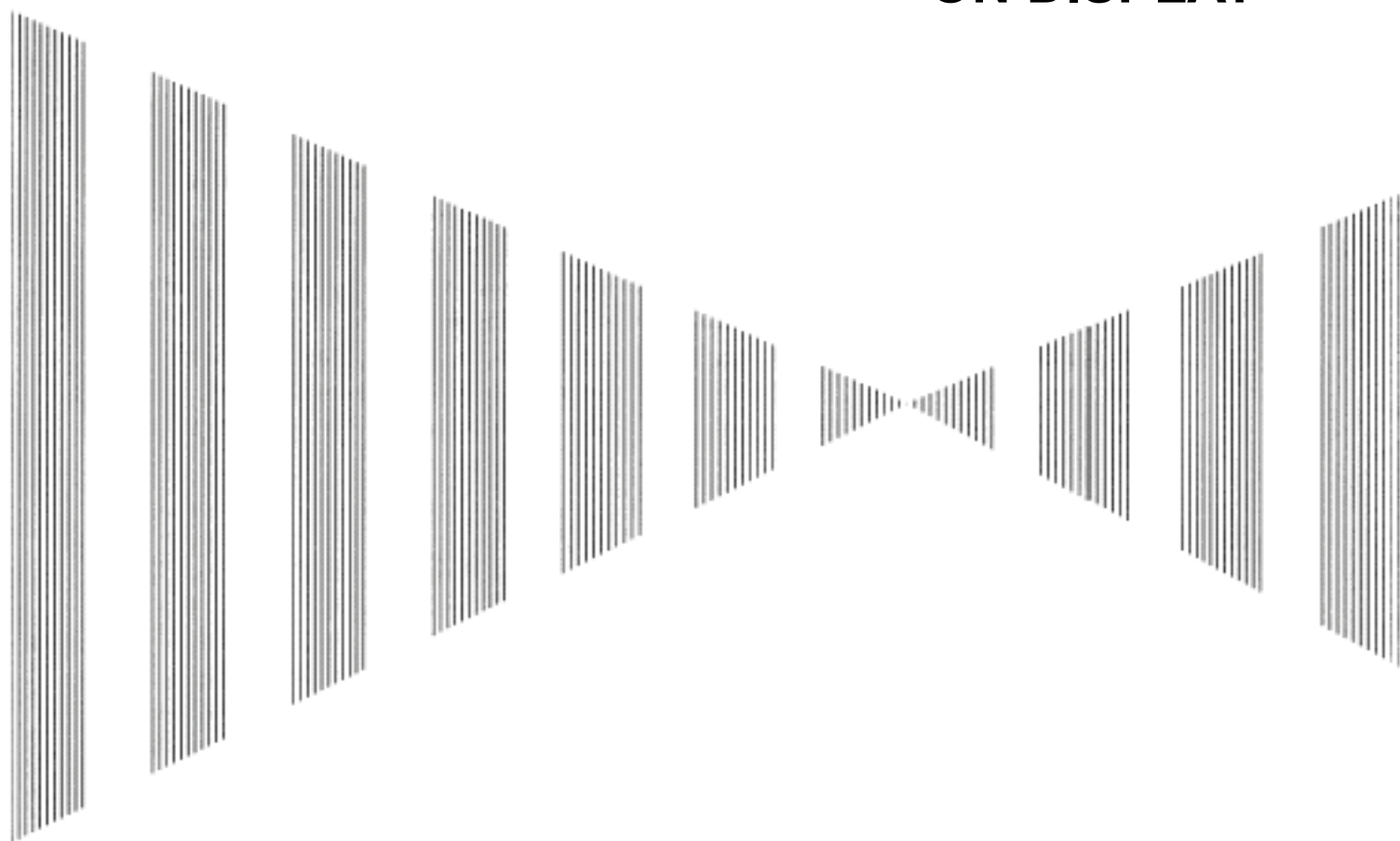


Figure 4.2

SECTION 5

TRUE AND FALSE ECHOES

ON DISPLAY



5.1	Radar Wave with the Horizon	5-2
5.2	Strength of Reflection from the Target	5-4
5.3	Sea Clutters	5-5
5.4	False Echoes	5-6
5.5	Display of Radar Transponder (SART)	5-9

The radar operator has a role of interpreting the radar displays to provide his best aid in maneuvering the ship. For this purpose, the operator has to observe the radar displays after fully understanding the advantages and disadvantages that the radar has. For better interpretation of radar display, it is important to gain more experiences by operating the radar equipment in fair weathers and comparing the target ships watched with the naked eyes and their echoes on the radar display.

The radar is mainly used to monitor the courses of own ship and other ships in open seas, to check buoys and other nautical marks when entering a port, to measure own ship's position in the coastal waters relative to the bearings and ranges of the shore or islands using a chart, and to monitor the position and movement of a heavy rain if it appears on the radar display.

Various types of radar display will be explained below.

5.1 RADAR WAVE WITH THE HORIZON

Radar beam radiation has the nature of propagating nearly along the curved surface of the earth. The propagation varies with the property of the air layer through which the radar beam propagates. In the normal propagation, the distance (D) of the radar wave to the horizon is approximately 10% longer than the distance to the optical horizon. The distance (D) is given by the following formula:

$$D = 2.23(\sqrt{h_1} + \sqrt{h_2}) \text{ (nm)}$$

h_1 : Height (m) of radar scanner above sea level

h_2 : Height (m) of a target above sea level

Figure 5. is a diagram for determining the maximum detection range of a target that is limited by the curve of the earth surface in the normal propagation.

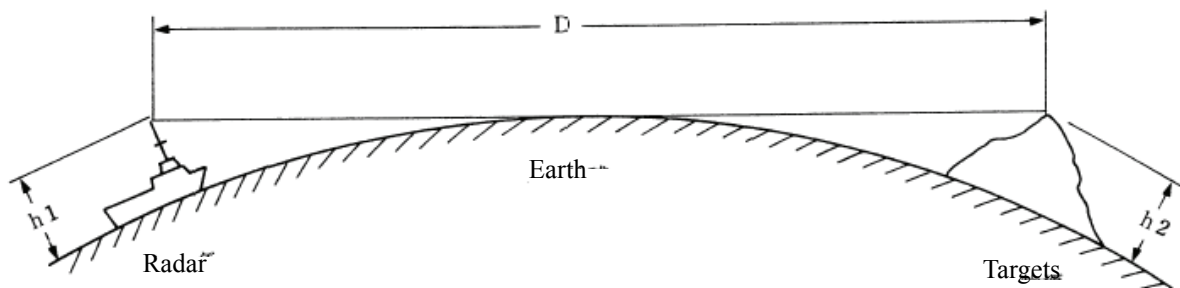


Figure 5.1

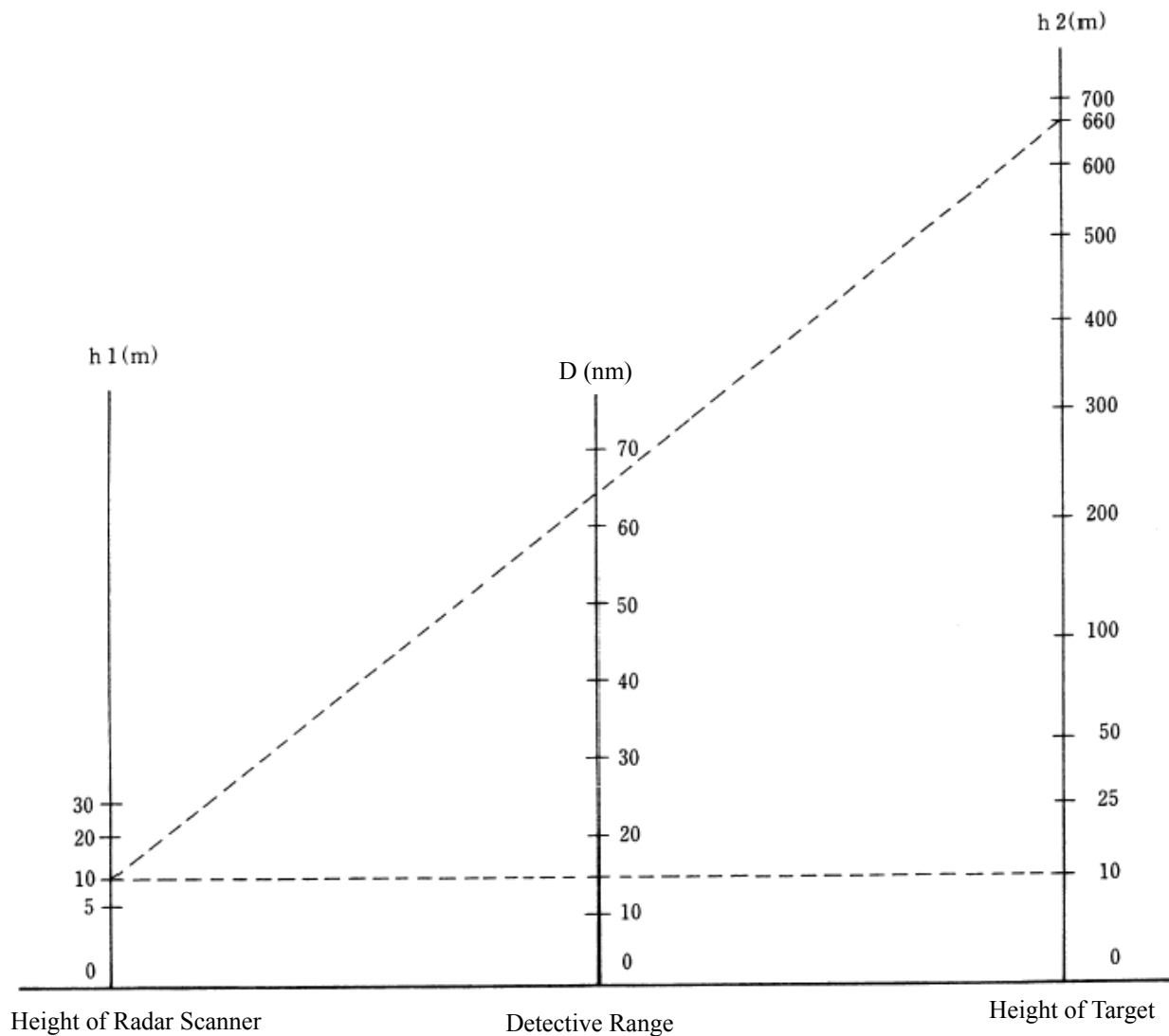


Figure 5.2

When the height of own ship's scanner is 10 m for instance,

- A target that can be detected at the radar range of 64 nm on the radar display is required to have a height of 660 m or more.
- If the height of a target is 10 m, the radar range has to be approx. 15 nm. However, the maximum radar range at which a target can be detected on the radar display depends upon the size of the target and the weather conditions, that is, the radar range may increase or decrease depending upon those conditions.

5.2 STRENGTH OF REFLECTION FROM THE TARGET

The signal intensity reflected from a target depends not only on the height and size of the target but also on its material and shape. The echo intensity from a higher and larger target is not always higher in general. In particular, the echo from a coast line is affected by the geographic conditions of the coast. If the coast has a very gentle slope, the echo from a mountain of the inland appears on the radar display. Therefore, the distance to the coast line should be measured carefully.

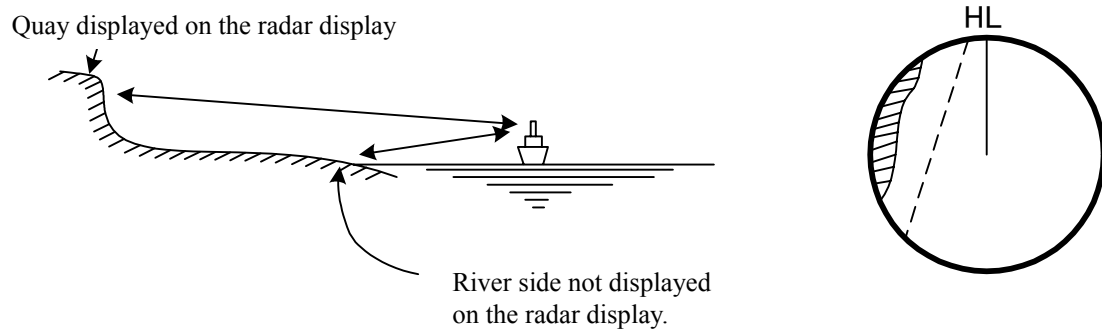


Figure 5.3

5.3 SEA CLUTTERS

When the sea surface ruffles, bright echo returns spread around the center of the radar display.
The higher the waves are, the echo returns are larger.
Swirling currents may appear as a smooth line like a coastal line.

5.4 FALSE ECHOES

The radar observer may be embarrassed with some echoes that do not exist actually. These false echoes appear by the following causes that are well known:

[I] Shadow

When the radar scanner is installed near a funnel or mast, the echo of a target that exists in the direction of the funnel or mast cannot appear on the radar display because the radar beam is reflected on the funnel or mast. Whether there are some false echoes due to shadows can be checked monitoring the sea clutter returns, in which there may be a part of weak or no returns.

Such shadows appear always in the same directions, which the operator should have in mind in radar operation.

[II] Side Lobe Effect

A broken-line circular arc may appear at the same range as the main lobe of the radar beam on the radar display. This type of false echo can easily be discriminated when a target echo appears isolated. (See Figure 5.4)



Figure 5.4

[III] False Echo by Secondary Reflection

When a target exists near own ship, two echoes from the single target may appear on the radar display. One of those echoes is the direct echo return from the target and the other is the secondary reflection return from a mast or funnel that stands in the same direction as shown in Figure 5.5.

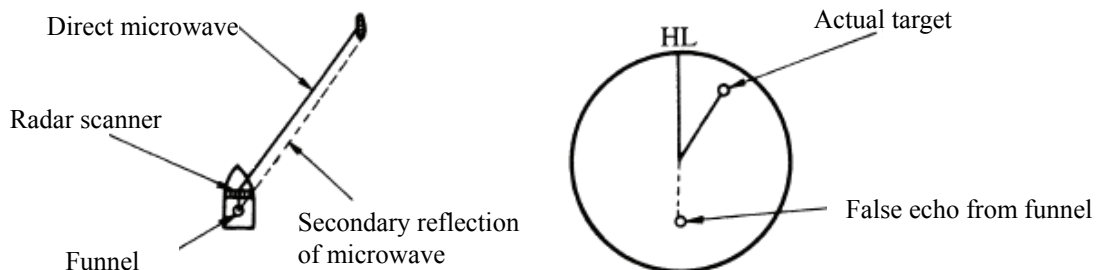


Figure 5.5

[IV] False Echo by Multiple Reflection

When there is a large structure or ship with a high vertical surface near own ship as shown in Figure 5., multiple reflection returns may appear on the radar display. These echoes appear in the same intervals, of which the nearest echo is the true echo of the target.

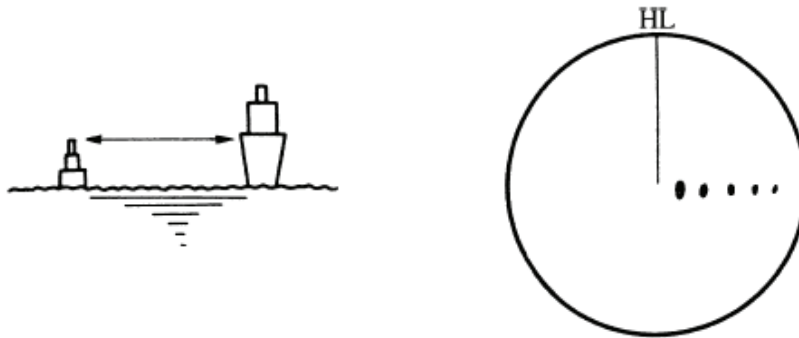


Figure 5.6

[V] Abnormal Propagation

The maximum radar detection range depends upon the height of the scanner and the height of a target as described in the section of “The Horizon for Radar Beam Radiation”. If a so-called “duct” occurs on the sea surface due to a certain weather condition, however, the radar beam may propagate to an abnormally long distance, at which a target may be detected by the radar.

For instance, assuming that the radar range is 4 km (on the repetition frequency of 4000 Hz), the first pulse is reflected from a target at about 37.5 km or more and received during the next pulse repetition time. In this case, a false echo appears at a position that is about 37.5 km shorter than the actual distance.

If the false echo appears at 5 NM on the radar display, the true distance of the target is $2+37.5=39.5$ km.

This type of false echo can be discriminated by changing over the range scale (the repetition frequency), because the distance of the target changes accordingly.

[VI] Radar Interference

When another radar equipment using the same frequency band as that on own ship is near own ship, a radar interference pattern may appear on the radar display. This interference pattern consists of a number of spots which appear in various forms. In many cases, these spots do not always appear at the same places, so that they can be discriminated from the target echoes. (See Figure 5.7)

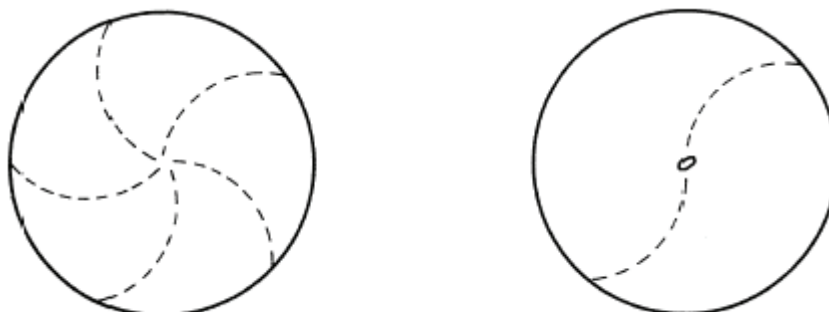


Figure 5.7

If radar equipment causing an interference pattern and this radar are of the same model, their transmitting repetition frequency is nearly the same. As a result, interference patterns may be displayed concentrically.

In this case, the interference patterns cannot be eliminated by using only the interference reflector function, so press **[TX/PRF]** several times to fine-tune the transmitting repetition frequency.

An interference suppressing effect can be heightened by applying a different transmitting repetition frequency to the interference pattern source radar and this radar.

5.5

DISPLAY OF RADAR TRANSPONDER (SART)

The SART (Search and rescue Radar Transponder) is a survival device authorized by the GMDSS (Global Maritime Distress and Safety System), which is used for locating survivors in case that a distress accident occurs at sea. The SART is designed to operate in the 9 GHz frequency band.

When receiving the 9 GHz radar signal (interrogating signal) transmitted from the radar equipment on a rescue ship or search aircraft, the SART transmit a series of response signals to inform the distress position to the rescue and search party.

The setting for SART signal reception

- | | |
|---|--------------------------------------|
| (1) Sea clutter control: | Minimum (Most counterclockwise) |
| (2) AUTO SEA function: | OFF |
| (3) Rain and Snow Clutter Control (RAIN): | minimum |
| (4) Auto Rain and Snow Clutter Yesterday (AUTO RAIN): | minimum |
| (5) TUNE control: | No tuning (to weaken clutter echoes) |
| (6) Interference rejector (IR): | OFF |

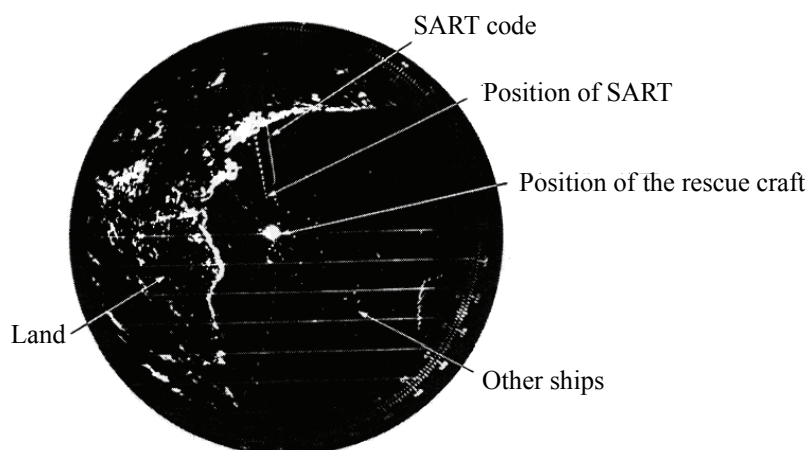


Figure 5.8 [Example of Display]

Attention

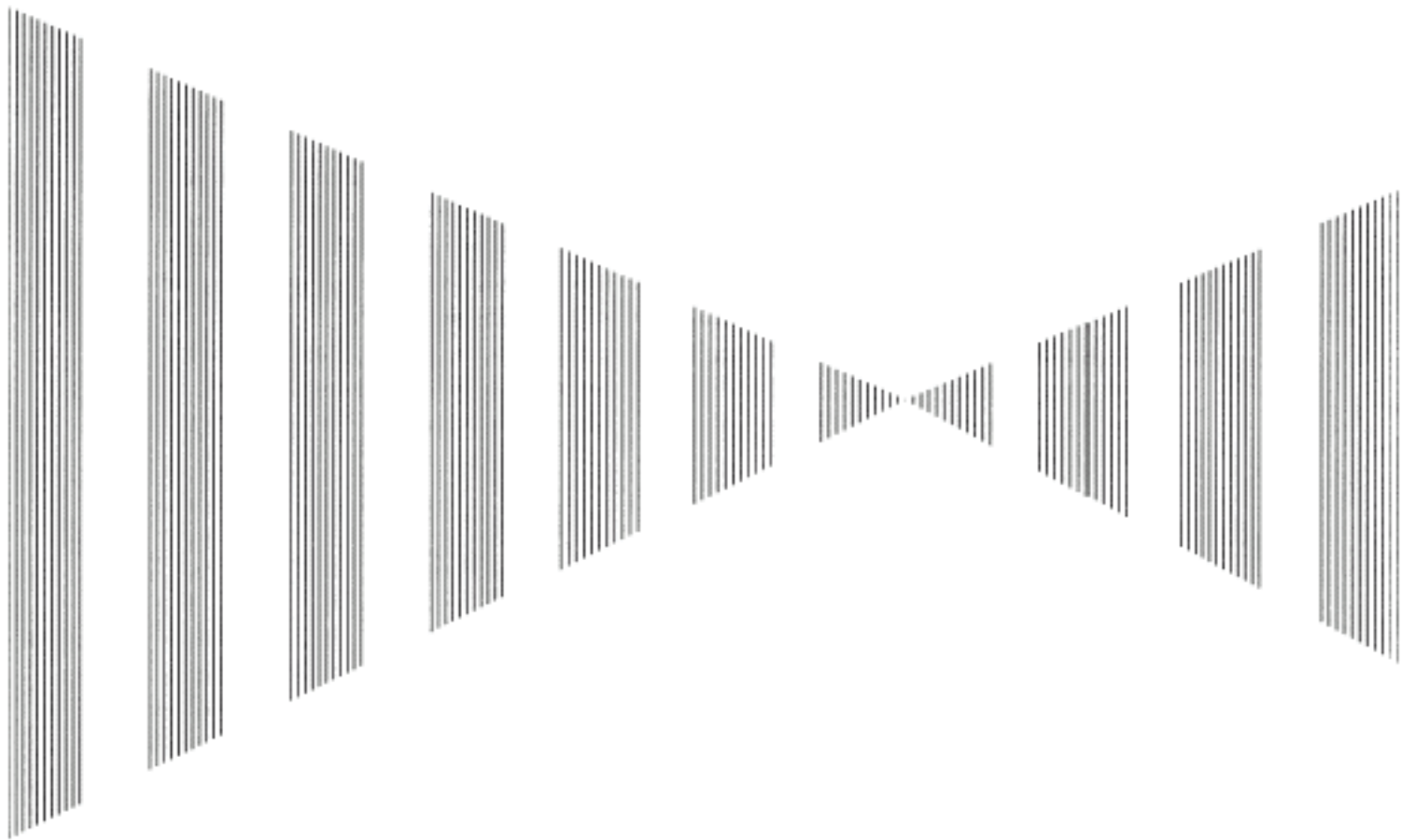
- When you set the radar to detect the SART signal, small targets around own ship will disappear from the radar display. So it is necessary to exercise full surveillance over the conditions around own ship by visual watch in order to avoid any collision or stranding.

If two or more sets of radar equipment are installed on own ship, use one set of 9 GHz band radar for detection of the SART signal and operate others as normal radars for avoiding collision, monitoring targets around own ship, and checking on own ship's position and avoidance of stranding.

After end of detecting the SART signal, adjust the radar normally again. Then the radar returns normally to the nautical mode.

SECTION 6

MAINTENANCE



6.1	Routine Maintenance	6-1
6.2	Maintenance on each Unit	6-2
	Scanner Unit NKE-316	6-2
	Display Unit NCD-1486	6-7

6.1 ROUTINE MAINTENANCE



WARNING



Never carry out internal inspection or repair work of the equipment by users.

Inspection or repair work by unauthorized personnel may result in fire hazard or electric shock.

Ask the nearest branch, business office or a dealer for inspection and repair.



Turn off the main power before maintenance work. Otherwise, an electric shock may result.



Turn off the main power before cleaning the equipment. Especially, make sure to turn off the indicator if a rectifier is used. Otherwise, equipment failure, or death or serious injury due to electric shock may result, because voltage is outputted from the rectifier even when the radar is not operating.

For operating the radar equipment in the good conditions, it is necessary to make the maintenance work as described below. If maintenance is made properly, troubles will reduce. It is recommended to make regular maintenance work.

Common points of maintenance for each unit are as follow:

Clean the equipment.

Remove the dust, dirt, and sea water rest on the equipment cabinet with a piece of dry cloth. Especially, clean the air vents with a brush for good ventilation.



6.2 MAINTENANCE ON EACH UNIT

Scanner Unit NKE-316



WARNING



Turn off the main power source before starting maintenance.

Otherwise, an electric shock or injury may be caused.



Turn off the main power if you need to be near the scanner unit for maintenance or inspection purposes. Direct exposure to electromagnetic waves at close range in death or serious injury.



Set the safety switch for stopping the scanner unit to the OFF position.

Otherwise, an accidental contact with the rotating scanner unit may cause injury.



CAUTION



Do not put watches, clocks, or magnetic cards close to the modulator unit since this unit holds magnetrons having strong magnetic force. Failure or data destruction of the above devices may result.

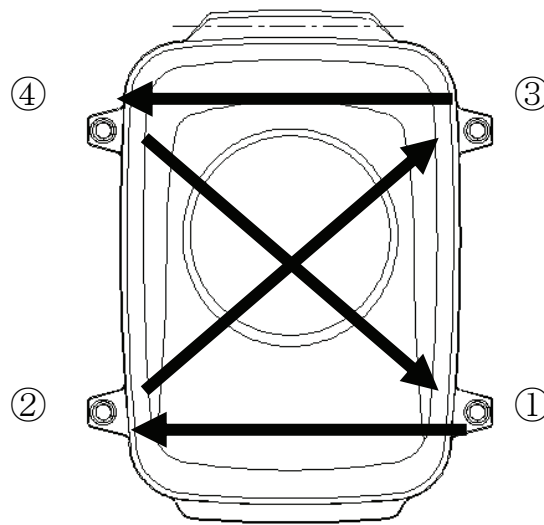
After finishing the maintenance work, reset the safety switch to the ON position.

Precautions in Mounting the Cover

When the cover is removed for regular checkup and replacement of parts and refitted after such work, the procedures of fastening bolts shall be taken with the following precautions:

- (a) The proper fastening torque of the fitting bolts (M8) is 1176 to 1470 N•cm (120 to 150kgf•cm) (which makes the inside water-tight and protects the packings against permanent compressive strain).
The packings start producing from the cover at a torque of approximately 1470N•cm (150kgf•cm).
Do not fasten the bolts with a torque exceeding the specified value. Otherwise, the screws may be broken.
- (b) Use an offset wrench of 11 mm × 13 mm or a double-ended wrench of 13 mm × 17 mm (not longer than 200 mm).
- (c) Screw all the bolts by hand first to prevent them playing, then fasten them evenly in order not to cause one-sided fastening. (Fasten the bolts with 25% of the required torque at the first step.)

*: Fasten the bolts in the diagonal order.



Top View of NKE-316

Figure 6.1 Bolt Tightening Procedure of NKE-316 Cover

(1) Radiator

Attention

- **If the radiator front face (radiation plane) is soiled with smoke, salt, dust, paint or birds' droppings, wipe it with a piece of soft cloth wetted with alcohol or water and try to keep it clean at all times. Otherwise, radar beam radiation may attenuate or reflect on it, resulting in deterioration of radar performance.**
- **Never use solvents of gasoline, benzine, trichloroethylene and ketone for cleaning. Otherwise, the radiation plane may deteriorate.**

Check up and clean the radiator.



(2) Rotating section

(a) Supply Oil Seal

When there is not a grease nipple, the replenishment of grease oil is unnecessary.

Remove the cap on the grease nipple located on the side of the X band radar or on the front of S band radar at which the radiator is supported, and grease with a grease gun.

Make the oiling every six months. The oil quantity shall be approximately 100 g, which is as much as the grease comes out of the oil seal. Use the grease of Mobilux 2 of Mobil Oil.

(b) Oiling gears

Apply grease evenly to the tooth surfaces of the main shaft drive gear and the encoder drive gear with a spreader or brush. Oiling in short intervals is more effective to prevent the gears from wear and tear and extend their service life, but oil at least every six months.

Use Mobilux2 of Mobile Oil.

(c) Mounting legs

Check the mounting legs and mounting bolts of the scanner unit case for corrosion at intervals and maintain them to prevent danger. Apply paint to them once a half year because painting is the best measure against corrosion.

Display Unit NCD-1486

 WARNING	
	When cleaning the screen, do not wipe it too strongly with a dry cloth. Also, do not use gasoline or thinner to clean the screen. Otherwise the screen surface may be damaged.

Dust accumulated on the screen will reduce clarity and darken the video. For cleaning it, wipe it with a piece of soft cloth (flannel or cotton). Do not wipe it strongly with a piece of dry cloth nor use gasoline or thinner.