3.3.10 In case of high waves

⚠CAUTION

On short range scales, the setting of the sea surface clutter suppression should not be advanced to an extent that results in complete suppression of all clutter. Such a setting may suppress echoes from targets such as vessels or hazardous objects in addition to echoes from the waves and thus impair detection.
When using the sea surface clutter suppression function, be sure that the suppression level is set at the optimum.

When sea waves become high, echoes from the high waves (sea clutter) appear on the PPI screen making it difficult to see image of echoes from vessels or other objects. Sea clutter is increasingly prominent to the extent that its source is close to the ship.

By using the [SEA] control function or the "automatic sea surface" function, sea surface clutter may be suppressed facilitating monitoring of the targets.

Manual sea surface clutter suppression

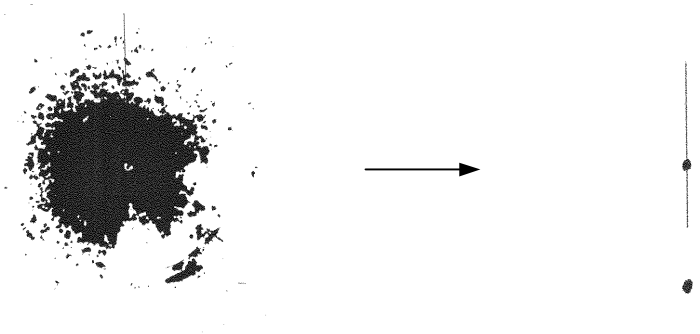
(a) Turn the [SEA] control in the clockwise direction.
As the control is turned in the clockwise direction, suppression of sea surface clutter increases.

Automatic sea surface clutter suppression

(a) Push the soft key [PROCESS].

(b) Push the soft key 1 to select [A−SEA].
Sea surface clutter suppression is enabled depend on the condition of the image.

(c) Push the [MENU] key.
The soft key will return to the initial function display.



Sea clutter being displayed as image due to high waves.

Sea clutter has been suppressed (the image of the echo from the target has also been suppressed).

3.3.11 Measuring the range to the target

To measure the range to the target, the operator may take one of the following actions.

- Use VRM (Variable Range Markers)
- Move the center of the VRM (floating EBL)
- Use the parallel line cursor
- Use the cursor

1. Using VRM

- A VRM is a circle that is displayed on the PPI screen.
- Since the size of the VRM may be change at will using the upper or lower portion of the cross key, the operator is able to measure the range of any desired target.
- This radar equipment is capable of displaying two VRM simultaneously (#1VRM and #2VRM).
- The #1VRM and #2VRM are displayed, selected and erased using the [VRM] key.
- Whether or not the #2VRM is enabled is set at the menu.
- A VRM can take on the following states:
  The VRM is not displayed.
  The VRM is displayed
  The cross key is not in VRM mode.
  The cross key is in VRM mode
  The VRM to be used (#1VRM or #2VRM) is not selected.
  The VRM to be used (#1VRM or #2VRM) is selected.

Measuring the distance from the ship using #1VRM

(a) Select "FIX" in the line "EBL1/VRM1" - the menu "FUNCTION".

The #1VRM value represents the distance from the ship.

The center of #2VRM is always fixed at the position of the ship.

Setting whether or not use of #2VRM is enabled

(a) Select "YES" in the line "VRM2" - the menu "FUNCTION".

Use of #2VRM will be enabled.

If "NO" is selected, use of #2VRM will be disabled.

Operating the #1VRM/#2VRM

(a) Push the [VRM] key.

Each time the VRM key is pushed, the VRM that may be operated using the cross key changes sequentially between #1VRM and #2VRM.

The #1VRM/#2VRM that is currently enabled is the VRM value at the upper left of the screen that is enclosed with dotted lines.

(b) Push the left or right side of the cross key.

This enables operating the VRM selected in (a).

- When the lower portion of the cross key is pushed, the size of the VRM will be reduced.
- When the upper portion of the cross key is pushed, the size of the VRM will be increased.

Erasing the #1VRM and #2VRM

(a) Push the [VRM] key.

- When both #1VRM and #2VRM are displayed.
  Push the VRM key and enclose the value of the #1VRM or #2VRM that is to remain on the screen with dotted lines.
- When either #1VRM or #2VRM is displayed.
  Enclose the displayed #1VRM or #2VRM in dotted lines.

(b) Continue pushing the [VRM] key.

The #1VRM or #2VRM selected in (a) will be erased.

2. Moving the center of the VRM

> ● Please refer to "3.3.14 Floating VRM and EBL" for the method of using the floating EBL.

3. Changing the interval between the parallel line cursors

> ● Please refer to "3.3.15 Using the parallel line cursor" for the method of using the parallel line cursor.

4. Using the cross hair cursor

> ● Please refer to "3.3.18 Simultaneously measuring the bearing, distance, and travel time to the target" for the method of using the cross hair cursor.

3.3.12 Changing the range unit

With this radar equipment, the range unit measured using the VRM or cross hair cursor may be selected from among the following.

NM (nautical miles)
KM (kilometers)
KY (kilo yards)

(a) Select among "NM", "KY", or "KM" in the line "RANGE" - the menu "DISPLAY".

(b) Push the MENU key.
The menu setting has been completed.

3.3.13 Measuring the bearing of a target

To measure the bearing of a target, the operator may select one of the following actions.

- Use EBL (electronic cursor)
- Move and use EBL (floating EBL)
- Use the parallel line cursor
- Use the cursor

There are three modes in displaying the EBL bearing

- Relative bearing display : R
- True bearing display : T
- Magnetic bearing display : M

> ● For details on display of bearing, please refer to "3.3.16 Switching the EBL and cursor bearing display among relative, true and magnetic bearing display mode".

1. Using EBL

- An EBL is a straight line that is displayed on the PPI screen.
- Since the bearing of an EBL can be changed at will using the left and right portion of the cross key, the operator is able to measure the bearing of any desired target.
- This radar equipment is capable of displaying 2 lines of EBL simultaneously (#1EBL, #2EBL).
- The #1EBL and #2EBL are displayed, selected and erased using the [E B L] key.
- Whether or not the #2EBL is enabled is set at the menu.
- An EBL can take on the following states:
  The EBL is not displayed.
  The EBL is displayed
  The cross key is not in EBL mode.
  The cross key is in EBL mode
  The EBL to be used (#1EBL or #2EBL) is not selected.
  The EBL to be used (#1EBL or #2EBL) is selected.

Measuring the distance from the ship using #1EBL

(a) Select "FIX" in the line "EBL1/VRM1" - the menu "FUNCTION".

The #1EBL value represents the bearing of the target with the ship as point of reference.

The point of reference of #2EBL is always fixed at the position of the ship.

Setting whether or not use of #2EBL is enabled

(a) Select "YES" in the line "EBL2" - the menu "FUNCTION".

Use of #2EBL will be enabled.

If "NO" is selected, use of #2EBL will be disabled.

Operating the #1VRM/#2VRM

(a) Push the [E B L] key.

Each time the EBL key is pushed, the EBL that may be operated using the cross key changes sequentially between #1EBL and #2EBL.

The #1EBL/#2EBL that is currently enabled is the EBL value at the upper left of the screen that is enclosed with dotted lines.

(b) Push the left or right side of the cross key.

This enables operating the EBL selected in (a).

- When the left side of the cross key is pushed, the EBL rotates in the counter-clockwise direction.

- When the right portion of the cross key is pushed, the EBL rotates in the clockwise direction.

Erasing the #1EBL and #2EBL

(a) Push the [E B L] key.

- When both #1EBL and #2EBL are displayed.
  Push the EBL switch and enclose the value of the #1EBL or #2EBL that is to remain on the screen with dotted liens
- When either #1EBL or #2EBL is displayed.
  Enclose the displayed #1EBL or #2EBL in dotted lines.

(b) Continue pushing the [E B L] key.

The #1EBL or #2EBL selected in (a) will be erased.

2. Moving the center of the EBL

> ● Please refer to "3.3.14 Floating VRM and EBL" for the method of using the free floating EBL.

3. Changing the interval between the parallel line cursors

> ● Please refer to "3.3.15 Using the parallel line cursor" for the method of using the parallel line cursor.

4. Using the cross hair cursor

> ● Please refer to "3.3.18 Simultaneously measuring the bearing, distance and travel time to target" for the method of using the cross hair cursor.

3.3.14 Floating VRM and EBL

Use the floating EBL function to move a VRM or an EBL.
Only #1EBL and #1VRM may be moved.

Setting the #1EBL and #1VRM to enable moving

(a) Select "FLOAT" in the line "EBL1/VRM1" - the menu "FUNCTION".

The point of reference of #1EBL and center of #1VRM is now movable.

However, the location of the point of reference of #1EBL and the center of #1VRM is always at the same position.

Setting the point of reference and center position

(a) Push the [EBL] key or the [VRM] key.

The cross key will become the floating EBL or floating VRM.

The position information on the mark displayed by the marker is displayed at the lower right of the screen.

The marker information is displayed only until the point of reference and center positions are determined.

(b) Use the cross key and push the [ENTER] key.

The set marker position will be determined as the point of reference of #1EBL and center of #1VRM.

Operating the EBL and VRM

The method of operation is the same as for normal EBL and VRM.

- Only "setting the point of reference/ center position" is operable and if the EBL key had been pushed, the operation is only with #1EBL while if the VRM key had been pushed, the operation is only with #1VRM.
- The point of reference and center position may be moved only for #1VRM and #1EBL. Prior to operation, be sure to select either #1EBL or #1VRM.

● Please refer to "3.3.11 Measuring the range to the target" - "1. Using VRM", "3.3.13 Measuring the bearing of a target" - "1. Using EBL"

Canceling the point of reference or center position

(a) Select "FIX" in the line "EBL1/VRM1" - the menu "FUNCTION".

The floating EBL will be canceled and the point of reference and center position will be fixed to the location of the ship.

3.3.15 Using the parallel line cursor

The parallel line cursor function is set to #1EBL and #1VRM

(a) Select "PLINE 1" or "PLINE 2" in the line "EBL1/VRM1" - the menu "FUNCTION".
When setting to PLINE 1, the parallel line cursor is displayed in half circumference.
When setting to PLINE 2, the parallel line cursor is displayed in a full circumference.

Operating the parallel line cursor

(a) Push the [EBL] key or the [VRM] key.
Depending on the setting at the line "EBL1/EBL2" of the menu "FUNCTION", the parallel line cursor will be displayed in a half circumference or full circumference.
However, it is necessary to set #1EBL or #1VRM to operational mode using the cross key.

(b) Set the bearing and interval of the parallel line cursor by operating the cross key in the up-down and left-right directions.

- When the upper portion of the cross key is pushed, the interval increases.
- When the lower portion of the cross key is pushed, the interval decreases.
- When the left side of the cross key is pushed, the parallel cursor turns in the counterclockwise direction.
- When the right side of the cross key is pushed, the parallel cursor turns in the clockwise direction.

Canceling the parallel line cursor

(a) Select "FIX" in the line "EBL1/VRM1" - the menu "FUNCTION".
The parallel line cursor display is canceled and use of normal #1EBL and #1VRM will be enabled.

3.3.16 Switching the EBL and cursor bearing display among relative, true and magnetic bearing display mode

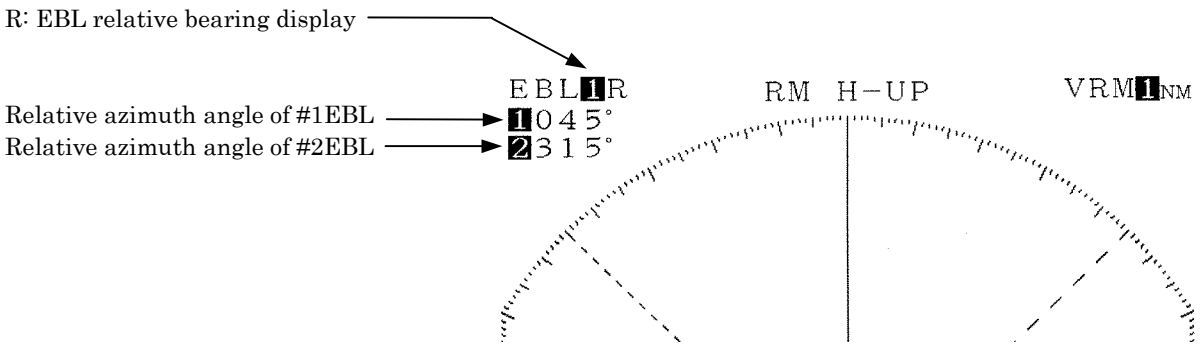
There are three methods of displaying the bearing using EBL and the cursor.

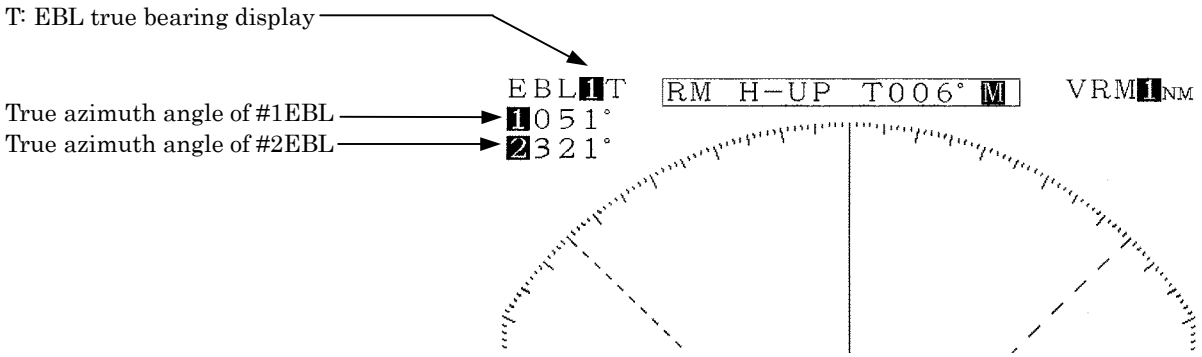
- Relative bearing display:
  This is the bearing of an EBL or cursor displayed with the bearing of the ship's bow (ship's heading marker) taken as 0 degrees.
- True bearing display(Note):
  This is the bearing of an EBL or cursor displayed with the bearing of true north (north pole) taken as 0 degrees.

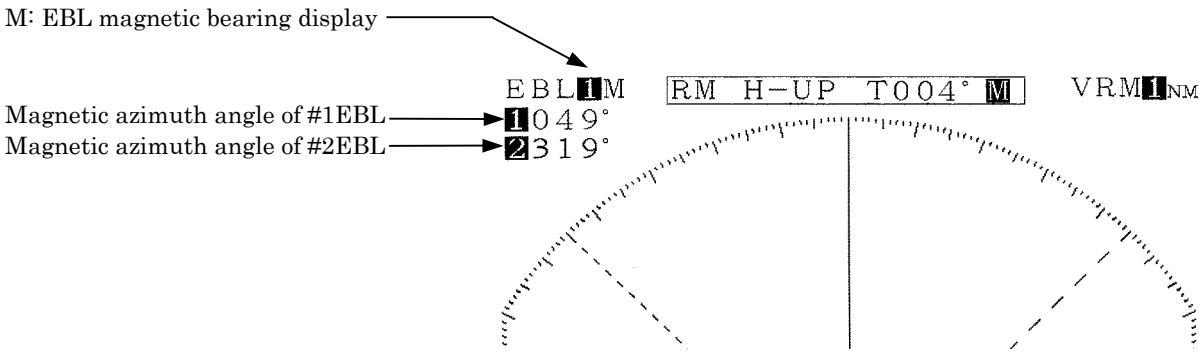
- Magnetic bearing display:
  This is the bearing of an EBL or cursor displayed with the north indicated by a magnetic compass taken as 0 degrees.

(Note): The term "true bearing" and the terms "gyro bearing" or "gyrocompass bearing" used hereafter shall have the same meaning.

● In order to display the true bearing or magnetic bearing, it is necessary to input the bearing information to the display.
Please refer to "3.6.1 Obtaining information on bearing" with respect to bearing information.







Selection of bearing criteria (magnetic bearing, gyrocompass bearing)

Select the bearing criteria as follows.

When the connected device a magnetic compass: MAG

When the connected device is a gyrocompass: TRUE

When GPS or LORAN is connected and the display mode does not become the true bearing display mode even when (a) has been undertaken, switch to the other bearing criterion.

(a) Select "MAG" or "TRUE" in the line "BEARING" - the menu "RADAR SET-UP 1".

(b) Push the MENU key.

The menu setting has been completed.

Selection of the bearing criteria

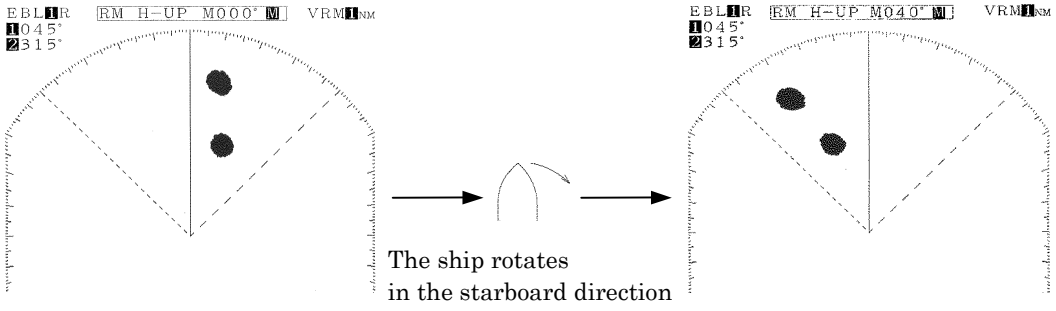
(a) Select "REL" or "TRUE, MAG" in the line "EBL READOUT" - the menu "FUNCTION".

- When "REL" is selected, the bearing of the EBL when the ship's bow (ship's heading marker) bears to 0 degrees is displayed.
- When "TRUE, MAG" is selected, the bearing of the EBL when the device selected under "BEARING" above detects "north" is assumed to be 0 degrees is displayed.

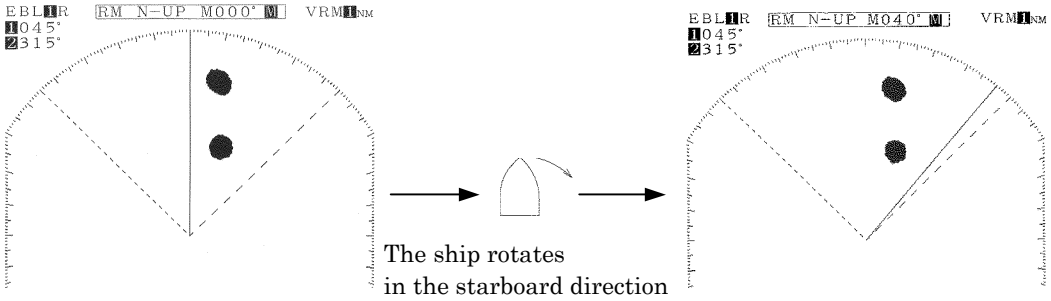
3.3.17 Changing the bearing display method of the PPI screen

The methods of display of the radar PPI screen consist of the following.

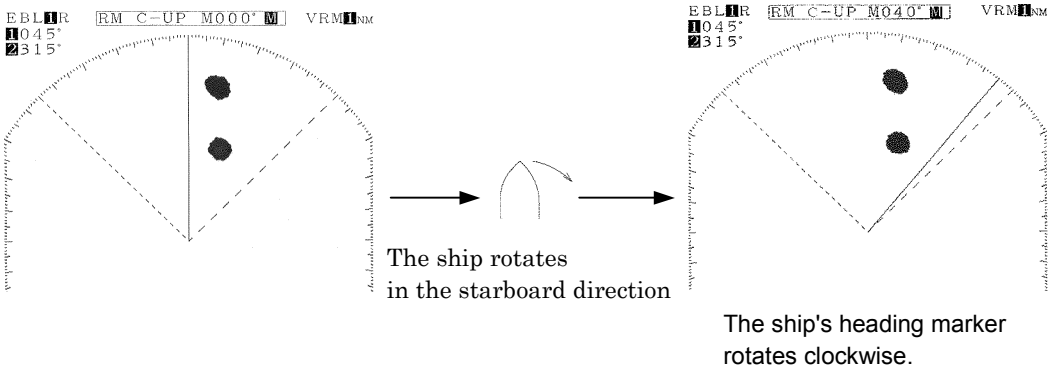
- Relative bearing display (head-up display)
  The ship's bow is displayed directly at the top of the PPI screen (bearing scale 0 degrees).
  When the bearing of the ship's bow changes, the bearing of the echo image on the PPI screen also changes.
  When bearing information cannot be obtained from such navigation devices as gyrocompass, display is by this relative bearing method.

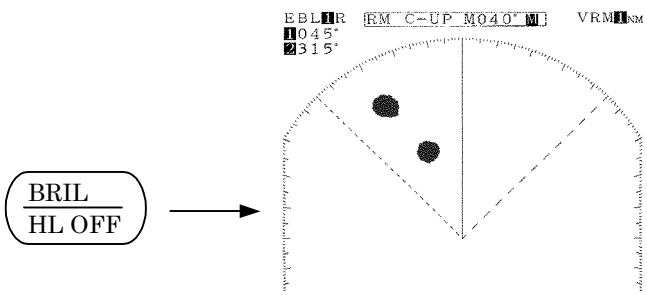


- True bearing display (north-up display)
  "North" is displayed as direct north of the PPI screen.
  Even when the bearing of the ship's bow changes, the bearing of the PPI image does not change.
  (Gyrocompass or other device that provides bearing information is required.)



- Course-up display
  The bearing of the ship's bow is always directly at the top of the PPI screen when the [BRIL/HL OFF] key is continuously pushed (course setting).
  Even when the bearing of the ship's bow changes, the bearing of the echo image on the PPI screen does not change and the ship's heading marker rotates to the extent of the change in the bearing of the ship's bow.
  When the heading changes significantly, the course should be reset by pushing the [BRIL/HL OFF] key continuously.
  (Gyrocompass or other device that provides bearing information is required.)





- In order to change the method of bearing display on the PPI screen, it is necessary to input the bearing information from a navigation device.
  Please refer to "3.6.1 Obtaining information on bearing" with respect to bearing display.

Course setting in course-up mode

(a) Continue to hold down the [BRIL／HL OFF] key.

The course will be set at the top of the PPI screen.

3.3.18 Simultaneously measuring the bearing, distance and travel time to the target

The cursor function is used for this measurement.

The cursor that is used here is indicated by a "+" mark on the PPI screen.

By using this function, in addition to the distance to the cursor, the bearing and travel time to the cursor position may be obtained.

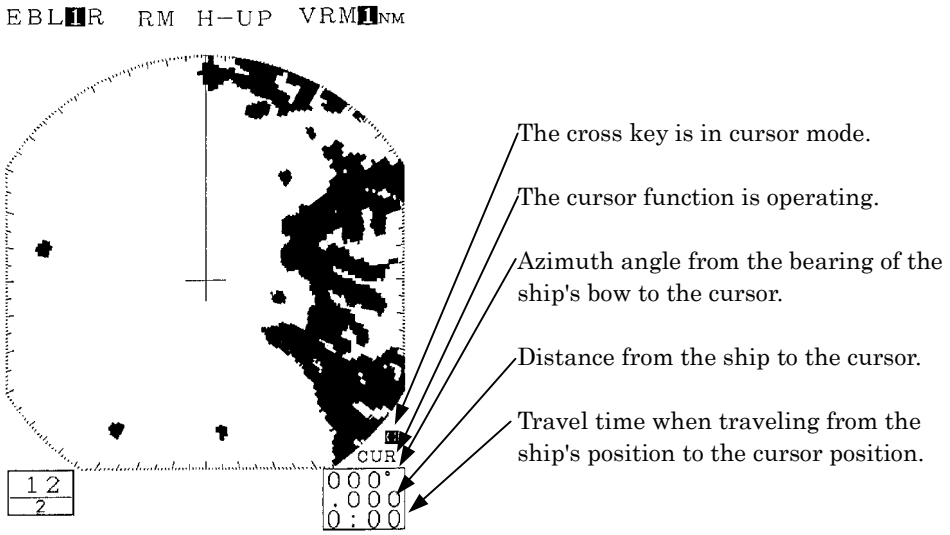
- In order to obtain the travel time, it is necessary to input the ship's speed information from a navigation device.
  Please refer to "3.6.2 Obtaining information on speed".

Displaying the cursor

(a) Push the soft key [D I S P L A Y] .

(b) Push the soft key 4 and select [C U R O N] .

Information will be shown as follows at the lower right of the screen.



- When information on speed is input, the maximum travel time displayed is "9:59".
- The cursor will appear on the PPI screen and the cross key will enter cursor mode.

Moving the cursor

(a) Operating the cross key.

When cursor movement is abandoned, the bearing and distance to that point and the required travel time to that point are displayed.

Erasing the cursor

(a) Push the soft key [D I S P L A Y] .

(b) Push the soft key 4 and select [C U R O F F] .

The cursor, bearing, distance and required travel time will be erased.

3.3.19 L/L display of the cursor

- In order to use this function, it is necessary to input the ship's position information from a navigation device.
  Please refer to "3.6.3 Obtaining information on position " with respect to information on the ship's position.
- Select "TRUE" in the line "BEARING" - the menu "RADAR SET-UP 1".
- If the setting is "MAG" and information for converting magnetic bearing values into gyro bearing values is input from a navigation device, L/L display will be undertaken but when such conversion is not possible, such display will not be made as errors will be generated in the L/L value.

3.3.20 Magnifying the echo images on the PPI screen

The following methods may be used to magnify the echo images that are shown on the PPI screen.

- Use the image expansion function
- Set the transmission pulse width wider
- Use the zoom function

1. Using the image expansion function

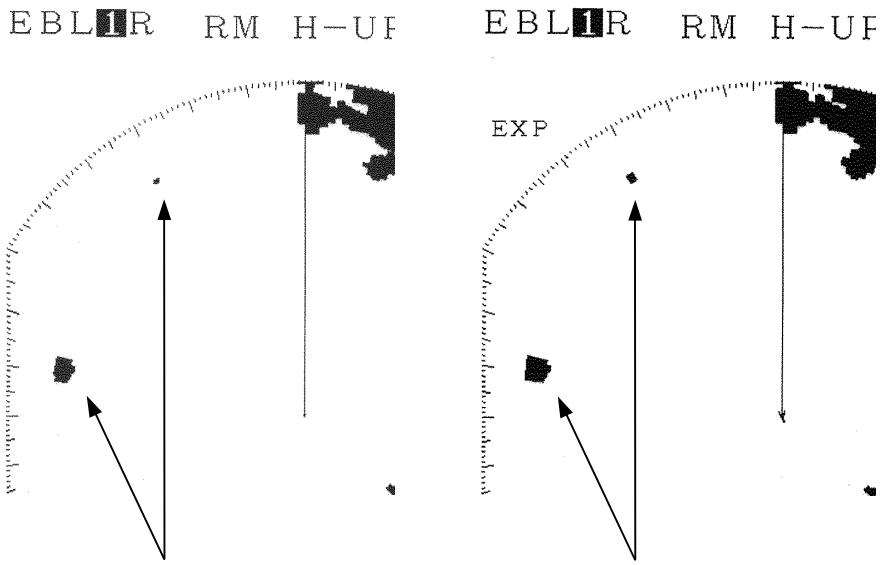
The expansion function enlarges the echo images on the PPI screen in the angle direction and distance direction.

Attention

- When the image expansion function is used, two targets that are in close proximity in the range direction (depth) and angle direction may be shown as one image on the PPI screen.

(a) Push the soft key [D I S P L A Y] .

(b) Push soft key 1 and select [E X P O N.] .



Before magnified　　After magnified

2. Changing the transmission pulse width

With respect to ranges of 1.5 NM, 3 NM and 6 NM, the transmission pulse width may be changed.

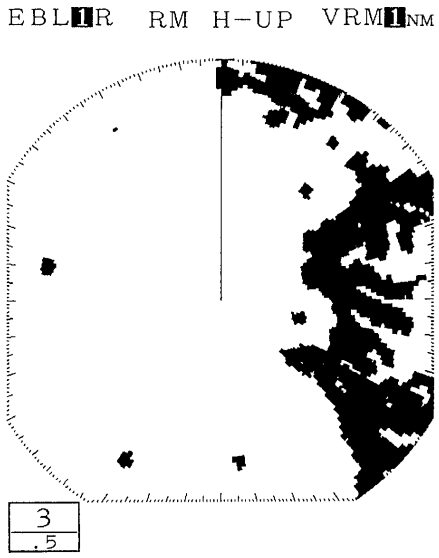
If a wider pulse width is selected, the echo images on the PPI screen will be extended in the range direction. Conversely, when a narrower pulse width is selected, the image is compressed (made shorter) in the range direction.

The difference of this function from the image expansion function is that when the pulse width becomes wider, echoes that had not been visible are sometimes visible as images.

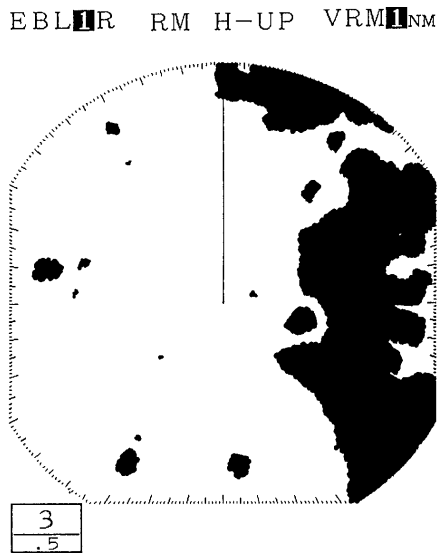
Attention

- When switching to a wide pulse width, two targets that are in proximity in the range direction (depth) may be shown as one echo on the PPI screen.

(a) Select "1.5NM", "3NM", or "6NM" in the line "TX PULSE" - the menu "RADAR SET-UP 1".



Before magnified (narrow pulse width)



After magnified (wider pulse width)

3. Using the zoom function

The zoom function allows any given area on the PPI screen to be enlarged by a factor of two. The area to be enlarged is designated using the marker.

> ● This function is disabled when the 0.125NM range is in use or TM is in use or the floating EBL function is active.

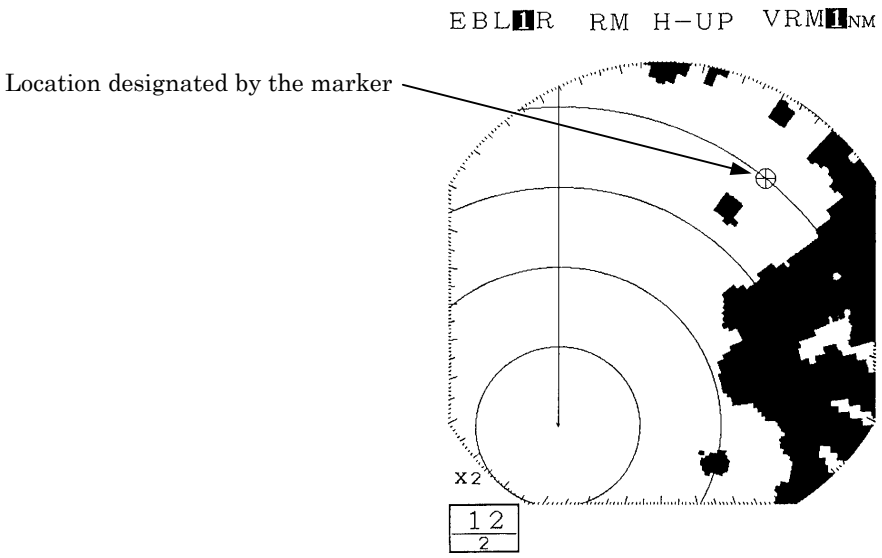
Setting the zoom area

(a) Select "SET" in the line "ZOOM" - the menu "FUNCTION".
The marker "+" will appear on the PPI screen.

(b) Position the marker in the desired location using the cross key.

> ● The marker can be moved within up to 66% of the monitoring range.

(c) Push the ENTER key.
The area with the marker at the center will be enlarged by a factor of two.



Canceling the zoom

(a) Select "OFF" in the line "ZOOM" - the menu "FUNCTION".

The zoom function will be canceled.

3.3.21 Reducing unnecessary noise and emphasizing the target

Attention

- Do not use this function when observing radar beacon, SART signal or a target that moves at high speed across the radar screen.
- This function is optimized in TM mode.
- When using this function in RM mode, please use N-UP or C-UP. If used with H-UP, the image may blur.

Set the image processing

(a) Select "PR1" or "PR2" in the line "PROCESS" - the menu "FUNCTION".

- PR1: This is used when there is a target that is moving at low speed.

  Images of relatively unstable targets are emphasized and displayed in a stable manner.

  This function has the effect of suppressing irregular signals such as sea surface clutter.

  However, images of targets that are moving at high speed will become weak.

  As a rule of thumb, the function should be used at ranges of 1.5NM or less.

- PR2: This function is used in stabilizing unstable images using PR1.
  This function is effective when sea surface clutter is abundant.
  As a rule of thumb, the function should be used at ranges of 3NM or more.

Canceling image processing

(a) Select "OFF" in the line "PROCESS" - the menu "FUNCTION".
The image processing function has been canceled.

3.3.22 Moving the center of the PPI screen

By moving the center of the PPI screen (relocating the center), it is possible to extend the range in any given direction.

> ● This function is disabled when the zoom function is enabled or the maximum Range is in use.

Setting the position to which the center is relocated.

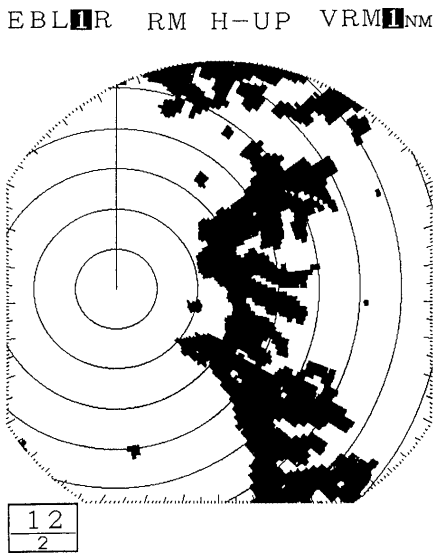
(a) Push the soft key [D I S P L A Y] .

(b) Push the soft key 2 and select first [O F F C E N T] and then [C E N T E R] .
The marker will be displayed on PPI screen.

(c) Use the cross key to position the marker at the center of the desired PPI screen.

> ● The marker may be moved up to within 66% of the monitoring range.

(d) Push the [E N T E R] key.
The center of the PPI screen will move to the designated location.



Canceling center relocation

(a) Push the soft key [D I S P L A Y] .

(b) Push the soft key 2 and select first [C E N T E R] and then [O F F C E N T] .
Center relocation has been canceled.

3.3.23 Controlling power consumption of the radar

In order to control power consumption, the timed transmission function is used.

By using the timed transmission function, the system repeatedly alternates between transmission mode and standby mode.

Setting the transmission time

(a) Select "10", "20", or "30" in the line "TX PERIOD" - the menu "DISPLAY".
The transmission time is designated by the rotation of the scanner unit.

Setting the standby time

(b) Select "3", "5", "10", or "15" in the line "STBY PERIOD" - the menu "DISPLAY".
The standby time is designated as 3 minutes, 5 minutes, 10 minutes or 15 minutes.

Commencing timed transmission

(c) Select "ON" in the line "TIMED TX" - the menu "DISPLAY".
When this is undertaken, timed transmission begins.

(d) Push the MENU key.

The menu setting has been completed.

1. After transmitting to the extent of the number of rotations of the scanner unit designated, the system enters the standby mode for the period designated. During standby mode, the echo from the radar disappears from the screen and a timer that shows the remaining time to the next transmission is shown on the display.
2. After completion of the standby period, the system again transmits to the extent of the designated number of rotations of the scanner unit.
3. This process is repeated.

⚠CAUTION

While timed transmission is in progress, under no circumstances should the scanner unit be approached.
While the scanner unit is stopped during the standby period, after completion of such standby period, the scanner unit will resume rotation and may collide with the body and cause injury.

Canceling timed transmission

(e) Select "OFF" in the line "TIMED TX" - the menu "DISPLAY".

The timed transmission has been canceled.

(f) Push the MENU key.

The menu setting has been completed.

Canceling timed transmission while in standby mode

(g) Push the STBY key.

The timed transmission mode will be canceled and the system will return to normal standby mode.

3.3.24 Locking a fixed target on the radar PPI screen while the ship is navigating

Normally, the PPI image moves as the ship moves.

This method of display is called:

Relative Motion : RM

In contrast to this, the display mode in which the echo images from fixed targets such as land do not move and the location of the ship (center of the PPI) moves according to the course and speed of the ship is called:

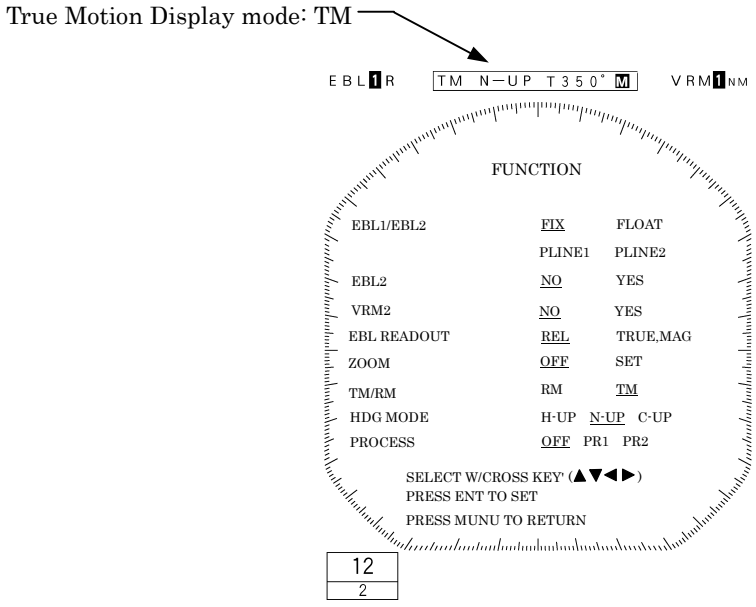
True Motion : TM

- In order to undertake TM display, it is necessary to input bearing information and the ship's speed information from a navigation device.
  Please refer to "3.6.1 Obtaining information on bearing" and "3.6.2 Obtaining information on speed" with respect to information on bearing and on speed.

Commencing True Motion display

(a) Select "TM" in the line "TM/RM" - the menu "FUNCTION".
The motion display on the PPI screen will change to "TM".

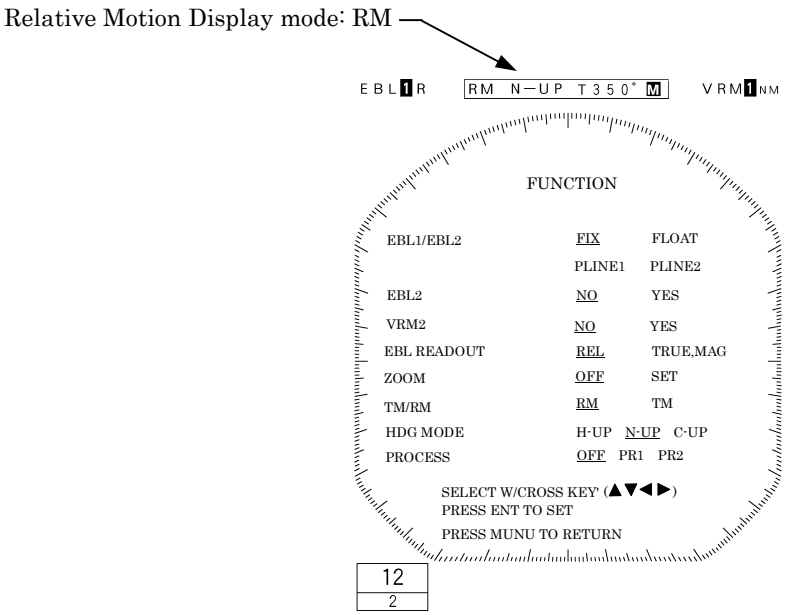
- The bearing display with TM is enabled is only N-UP.



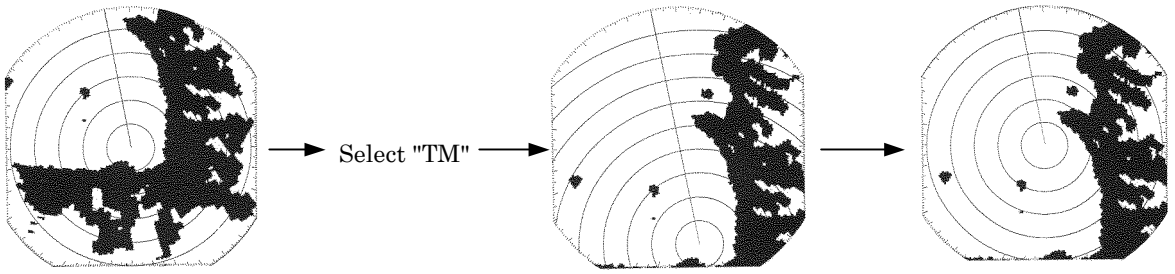
Canceling true motion display

(a) Select "RM" in the line "TM/RM" - the menu "FUNCTION".

The TM is canceled and the mode is now N-UP of RM.



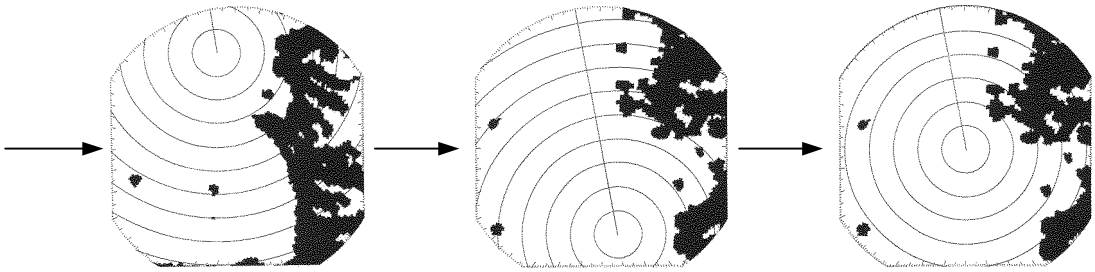
- The following is an example of switching from relative motion display (RM) to true motion display (TM)



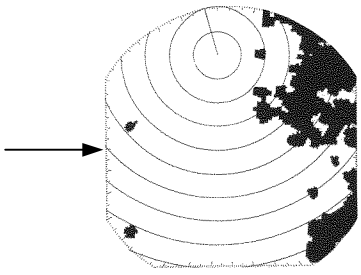
Relative motion display

The center of the PPI moves to a location within 66% of the radius.

The center of the PPI moves together with the movement of the ship.



When the center of the PPI moves to a location within 66% of the radius, the center of the PPI automatically resumes movement to a location 66% of the radius in the diagonal direction.



3.3.25 Monitoring the motion of other ships (Targets)

One of the following functions is used to monitor the movement of other ships (targets)

- Wakes (set using the soft key)
- Lookout alarm (set using the soft key)

1. Radar display of wake

It is possible to confirm the movement of other ships through the length and direction of the wake and this can be utilized to avoid collisions.

The length of a wake may automatically be selected among 15 seconds, 30 seconds, 1 minute, 3 minutes, 6 minutes, 15 minutes, 30 minutes and continuous.

Commencing radar display of a wake

(a) Push the soft key [PROCESS] .

(b) Push the soft key 4 and set the wake time to other than [WKS OFF] .
Radar display of the wake will begin.

Ending radar display of a wake

(a) Push the soft key [PROCESS] .

(b) Push the soft key 4 and set the wake time to [WKS OFF] .
Display of the wake will be discontinued.

2. Using the lookout alarm

The guard zone may be defined using the lookout alarm.

The guard zone refers to an "area" defined on the PPI screen.

When a target enters this "area" or exits the "area" an alarm is sounded.

The alarm mode that is activated when a target enters a guard zone is called the IN mode.

The alarm mode that is activated when a target exits a guard zone is called the OUT mode.

Setting the guard zone

(a) Push the soft key [GUARD] .
The marker "+" appears on the PPI screen and a dotted distance help line and dotted azimuth help line that indicates the distance and azimuth of the marker will be displayed.

(b) Push the soft key 1 [MAKE] .

(c) Move the marker using the cross key.

Move the marker to the initial point of reference of the zone to be designated.

(d) Push the ENTER key.

The initial point of reference of the guard zone has been designated.

The dotted distance help line and dotted azimuth help line have been fixed.

(e) Move the marker using the cross key.

Move the marker to the distance range of the guard zone to be designated.

A new dotted distance help line will be displayed.

(f) Push the ENTER key.

The distance of the guard zone has been set.

A ring around the distance range will be displayed as a continuous line.

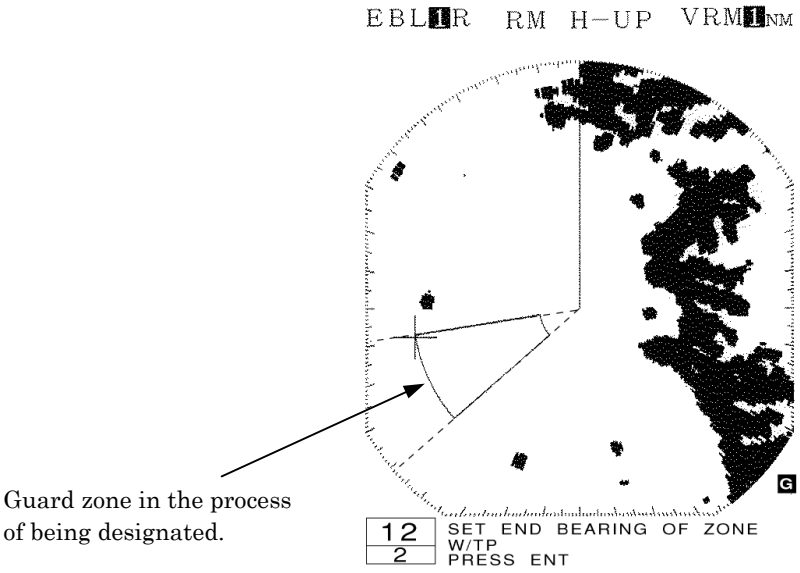
(g) Move the marker using the cross key.

Move the marker to change the shape of the guard zone to any desired shape.

The form will change in the manner of a fan opening (or closing).

(h) Push the ENTER key.

The extremity of the guard zone has been designated and the process has been completed.



Changing the alarm mode

(a) Push the soft key [GUARD] .

(b) Push the soft key 4 to switch the wake time between [ALM IN] and [ALM OUT] .
The selected alarm mode is activated.

Eradicating the guard zone

(a) Push the soft key [GUARD] .

(b) Push the soft key 2 to designate [ALM OFF] .
The guard zone that had been produced will disappear from the PPI screen and the lookout alarm function will be disabled.

Calling a guard zone

(a) Push the soft key [GUARD] .

(b) Push the soft key 2 to designate [ALM ON] .
The guard zone previously produced will be displayed on the PPI screen and the lookout alarm function will be enabled.

Changing the sensitivity of the alarm

(a) Push the soft key [GUARD] .

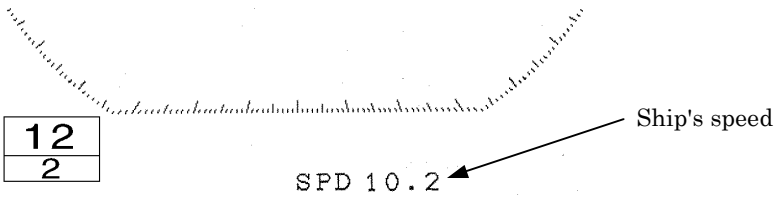
(b) Push the soft key 3 repeatedly to select the alarm sensitivity.
Alarm sensitivity "1" through "7" indicates the level of the image (strength of the echo) at which the alarm is sounded.
[SENS 1] most readily causes the alarm to sound while [SENS 7] is least sensitive.

- The alarm may sound as a result of noise.

3.4 Other Convenient Functions

3.4.1 Displaying the ship's speed on the display unit

When speed information is input to the display unit, the ship's speed is automatically displayed.



- In order to use this function, it is necessary to input ship's speed information from a navigation device.
  Please refer to "3.6.2 Obtaining information on speed".

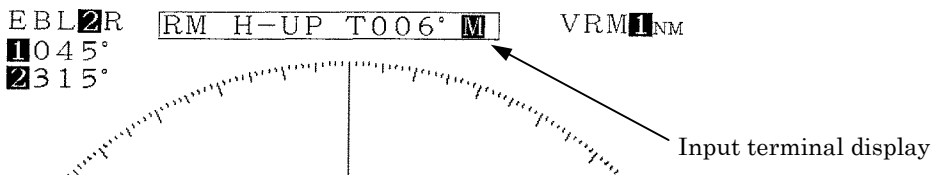
3.4.2 Displaying the ship's heading on the display unit

When ship's heading information is input to the display unit, the ship's heading is automatically displayed.

- In order to use this function, it is necessary to input ship's bearing information from a navigation device.
  Please refer to "3.6.1 Obtaining information on bearing".

This radar equipment is capable of inputting bearing information from the following two input connectors at the back of the display unit.

- CMPS+ and CMPS- terminals of the EXT1(J3) connector
- NAVRX and NAVCOM terminals of the GPS(J4) connector.



M : Bearing information input from CMPS+ and CMPS- terminals of the EXT1(J3) connector

L : Bearing information input from NAVRX and NAVCOM terminals of the GPS(J4) connector

The order of priority in utilizing bearing information is as follows.

M		L
CMPS+, CMPS- terminals	>	NAVRX, NAVCOM terminals
(priority: high)		(priority: low)

3.4.3 Displaying position information (latitude/longitude, LORAN C time difference) of the ship and waypoint information (latitude/longitude)

Display of position information

(a) Select among "L/L", "TD", "CUR L/L", or "WPT L/L" in the line "POSITION" - the menu "DISPLAY".

- When displaying latitude/longitude : "L/L"
- When displaying LORAN C time difference : "TD"
- When displaying L/L of the cursor : "CUR L/L"
- When displaying the latitude and longitude of the waypoint : "WPT L/L"

Erasing location information

(b) Select "NO" in the line "POSITION" - the menu "DISPLAY".
The location information is erased.

- When "L/L" is selected, it is necessary to input the ship's position (latitude and longitude) information from a navigation device.
- When "TD" is selected, it is necessary to input the ship's position (LORAN C time difference) information is a navigation device.
- When "CUR L/L" is selected, it is necessary to input the ship's position (latitude and longitude) information from a navigation device.
- When WPT "L/L" is selected, it is necessary to input the waypoint's position (latitude and longitude) information from a navigation device.
  Please refer to "3.6.3 Obtaining information on position" for details.

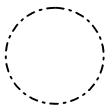
3.4.4 Displaying the waypoint

- In order to use this function, it is necessary to input of the following information to the display unit:
  Information on the bearing of the waypoint
  Information on the distance to the waypoint
  Information on the ship's speed.
  Please refer to:
  "3.6.1 Obtaining information on bearing"
  "3.6.2 Obtaining information on speed"
  "3.6.4 Obtaining information on the distance to the waypoint"

Display of the waypoint

(a) Select "ON" in the line "WAYPOINT" - the menu "DISPLAY".

- The bearing, distance and required travel time (when ship speed information has been input) will be displayed.
- The route from the ship to the waypoint will be displayed with the following marker.



Circle : Position of the waypoint
Refer to "2.2 Explanation of Screen Readout"

Erasing the waypoint

(a) Select "OFF" in the line "WAYPOINT" - the menu "DISPLAY".

The waypoint mark, the bearing, distance and required travel time to the waypoint will disappear.

3.5 Miscellaneous Considerations

3.5.1 Replacing the battery (BT1)

In order to maintain the information that has been set, the battery (BT1) needs to be replaced at regular intervals.

(a) Replacing the battery (BT1) [Type: CR2032-FT6-1, SANYO Electric Co, Ltd.]

- Please call the dealer servicing your locality for a replacement battery.

(b) Reinitializing

- The lithium battery maintains the content of the setting of the menu and soft key even when the power is shut off allowing use under the conditions of the last use.
- If this battery runs down, all conditions including the menu will automatically be reset.
  For this reason, initializing is required after replacement of the battery.

Attention

- When the battery wears down, distance and bearing may become inaccurate.
  In such cases, the battery should immediately be replaced and initialization undertaken.

- In the event immediate replacement of the battery is not feasible, initialization should be undertaken each time the power is turned on as an emergency measure. However, each time the power is shut off, the content that has been set is reset.

- Please refer to "9.8 Initial Setting" with respect to details on initialization.

3.5.2 In cases of abnormality during operations

In the event such phenomena as the screen becoming disturbed or the machine not accepting switch input occurs during use of the radar, initialize using the procedures outlined below.

Attention

- When initialization is undertaken, all setting excluding the menu “INITIAL SETTING 1” and “INITIAL SETTING 2” will be reset and the ex-factory shipment conditions.

(a) Push the [STBY/OFF] key and [X-MIT/OFF] key simultaneously.
Power is turned off.

(b) Push the [MENU] key, [ENTER] key and [STBY/OFF] key simultaneously.
Power will be turned on as in normal operation for turning on power.

3.6 External Navigation Devices

> ● Please refer to "9.3.4 Display unit rear panel" on connections.

This radar equipment has the following busses at the rear of the display unit.

・NMEA
- CMPS+ and CMPS- terminals of the EXT1(J3) connector
- NAVRX and NAVCOM terminals of the GPS(J4) connector

An external navigation device with either of these busses may be connected for input and output of information.

3.6.1 Obtaining information on bearing

In order to obtain information on the bearing of the ship, one of the following needs to be connected to the display unit.

- Magnet compass
- GPS gyro

Bearing information is input from either the CMPS or NAVRX terminals.

3.6.2 Obtaining information on speed

In order to obtain information on the speed of the ship, one of the following devices need to be connected to the display unit.

- GPS
- LORAN C

Speed information is input from either the CMPS or NAVRX terminals.

3.6.3 Obtaining information on position

In order to obtain information on the ship's position in terms of latitude and longitude, one of the following devices need to be connected to the display unit.

- GPS
- LORAN C

In order to obtain the ship's position information using LORAN C time difference, the following needs to be connected to the display unit.

- LORAN C

In order to obtain information on the L/L of the waypoint, one of the following devices need to be connected to the display and the waypoint set in such device.

- GPS
- LORAN C

Information on position is input from either the CMPS or NAVRX terminals.

3.6.4 Obtaining information on distance to the waypoint

In order to obtain information on distance to the waypoint, one of the following devices need to be connected to the display unit, and it is necessary that the waypoint set in the navigation device is displayed on screen.

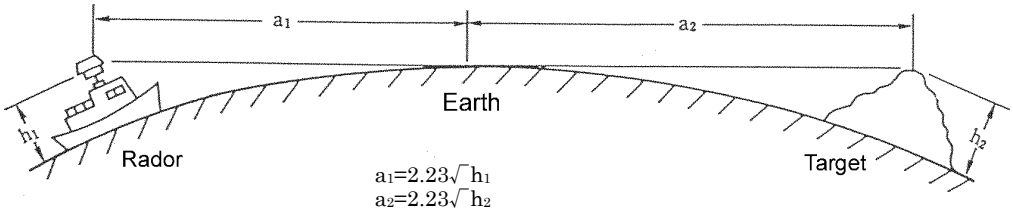
- GPS
- LORAN C

Information on distance is input from either the CMPS or NAVRX terminals.

4 How to Interpret the PPI Screen

4.1 Height of and the Distance to the Target

The maximum distance to a target that can be observed with a radar depends not only on the power of the radar's transmitter, beam width of the scanner unit, and the receiver's sensitivity but also on height of a target, distance to a target and height of scanner unit line etc. This is because the radio wave emitted by a radar runs straight, undergoing no influence by the curvature of the earth surface.



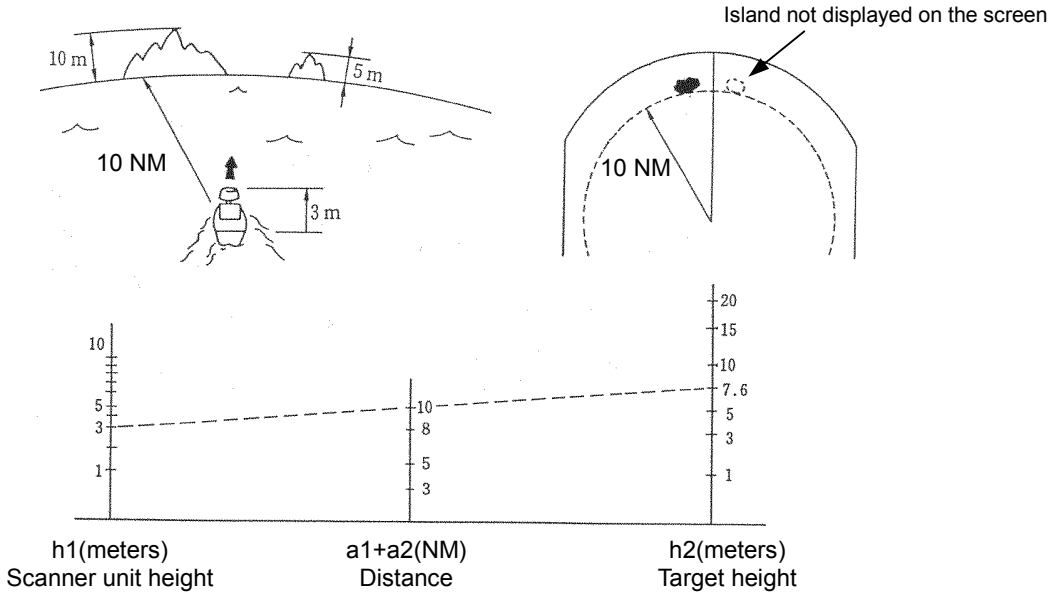
$a_1=2.23\sqrt{h_1}$
$a_2=2.23\sqrt{h_2}$
$a_1 + a_2=2.23\ (\sqrt{h_1} + \sqrt{h_2})$
a_1, a_2 : Unit [Nautical miles]
h_1, h_2 : Unit [Meters]

[Distance and Target]

For example, when the scanner unit lies 3 meters above the sea level, the radar can detect and display an island with a height of 10 meters at a distance 10 NM away from the scanner unit position but cannot detect and display an island with a height of 5 meters at the same distance. This is theoretically true but does not always hold, depending on weather conditions.

For a target located 10 NM away to be displayed on a radar, it theoretically needs to be 7.6 meters or higher. Any targets lower than 7.6 meters cannot be displayed on a radar.

● The target may be unable to be observed when the height of a scanner unit or an target is low.

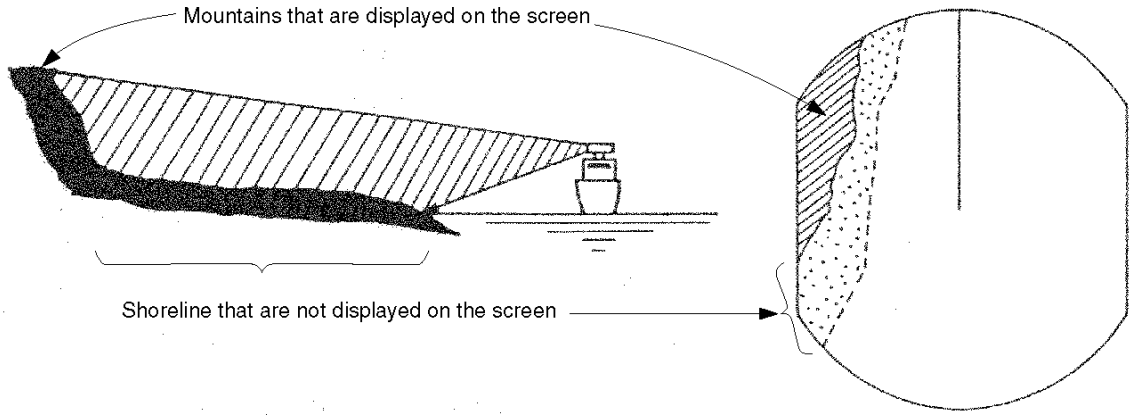


4.2 Returns from a Target

The intensity of returns from a target is related not only to the size of the target but also to the materials and shape of the components making up the target. Accordingly, larger objects do not necessarily develop strong returns.

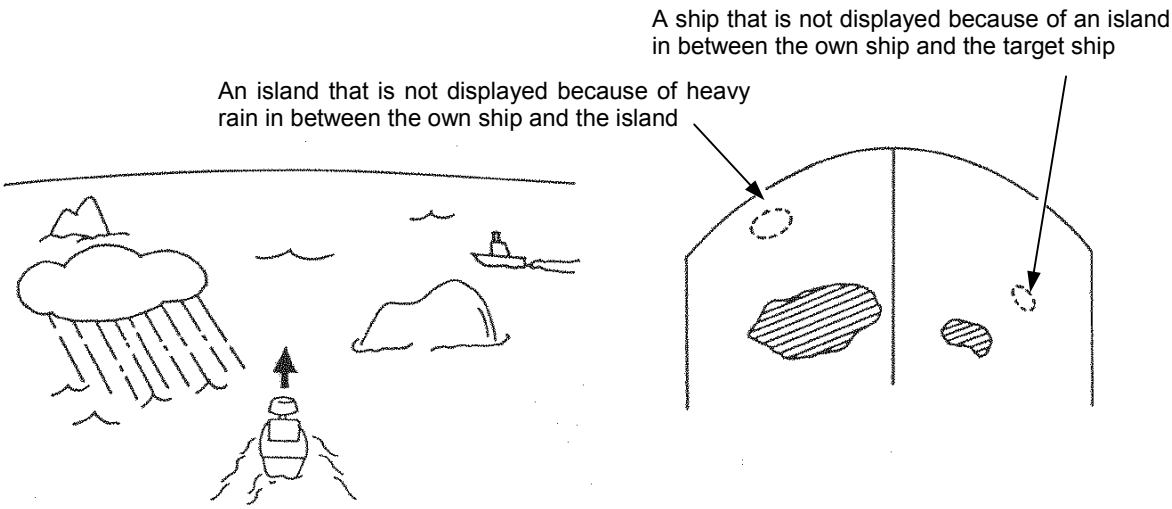
On coastlines, in particular, the intensity of returns is dependent on their physiographic features. For a coastline with a fairly gradual ascent, only inland mountains areas may be displayed as echoes. This fact needs to be kept in mind when measuring the distance to a coastline.

- Since the echo which returns from a coastline with a fairly gradual ascent is weak, observation of such land may not be able to be performed.



4.3 Propagation Path of Radio Waves

- Radio waves may be shielded if there is a large intercepting obstacle (e.g., mountains, rain, snow, etc.) in their propagation path and any targets behind the obstacle cannot be observed.



4.3.1 Sea returns

On a wavy sea surface, an echo appears on the PPI screen as a bright defused image at the center of the screen. This echo is developed by returns from the sea surface. The features of the echo depend on the size and range of the wave, and the wind direction.

4.3.2 False echoes

There are cases in which nonexistent targets appear as echoes or in which existing targets do not appear as echoes on the PPI screen. These echoes are called false echoes.

False echoes are produced by the factors explained below.

● Please observe carefully in consideration of there being always false echoes.

(a) Ghost

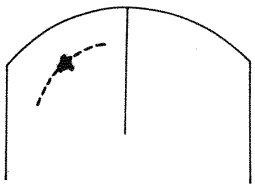
Depending on the location where the scanner unit is installed, radio waves are emitted from nearby chimney stacks or masts, developing ghosts. Consequently, targets that are located in those direction may not appear as echoes on the PPI screen.

The presence of these ghosts can be identified by observing sea returns and checking the returns for dim areas or voids.

If a ghost is detected, remember the direction in which it appears and observe the target carefully.

(b) Side echo

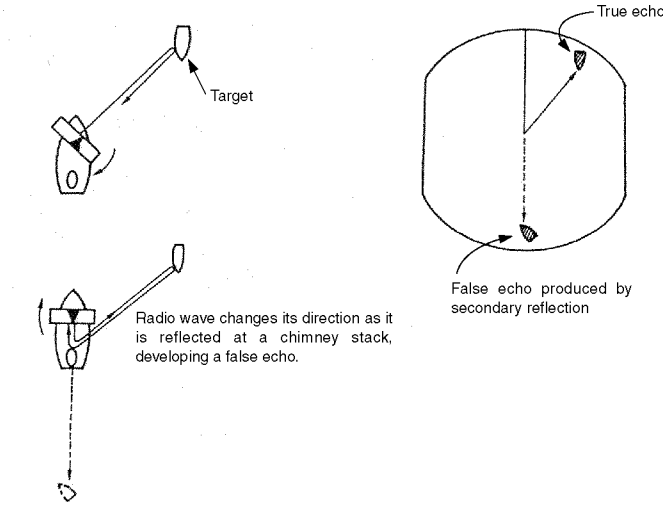
There are cases in which an arc-shaped broken line appears over the same range as the echo from the target. This image is caused by the side lobes of the beam emitted from the scanner unit. This type of false echoes can easily be identified if the target stands alone.



(c) Indirect echo

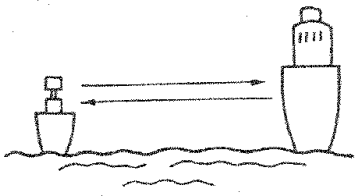
The direction of the radio wave from the radar may be changed by a reflection (secondary reflection) at a chimney stack or mast of a ship, developing a false echo in a direction in which there should be no target.

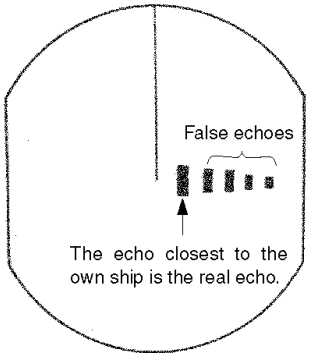
The indirect echo developed by the secondary reflection appears in the direction of the chimney stack or mast that reflected the radio wave.



(d) Multiple echo

Multiple echoes are developed by multiple reflections caused by a building or large vessels that has large vertical surfaces. These echoes are spaced at an equal interval, with the one that is closest to the own ship being the true echo.

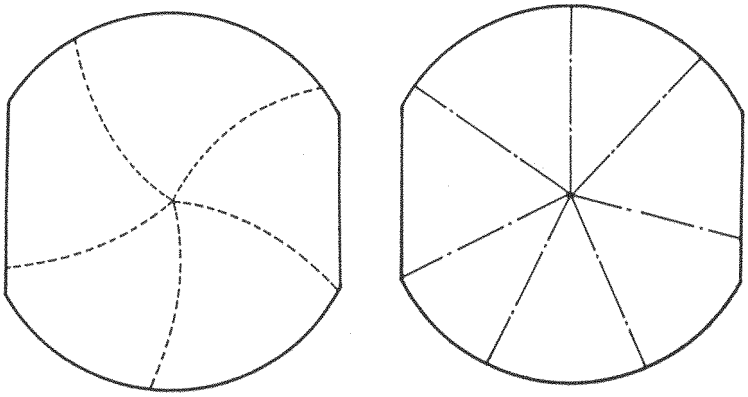




(e) Radar interference

If there is a radar that uses the same frequency as that of the own ship near the own ship, interferences caused by that radar appear on the PPI screen. These interferences appear as clusters of spots of varying patterns. Since they do not occur at the same location with time, they can easily be distinguished from true echoes.

Radar interferences can be reduced or eliminated by choosing "ON" from "FUNCTION"-"IR".



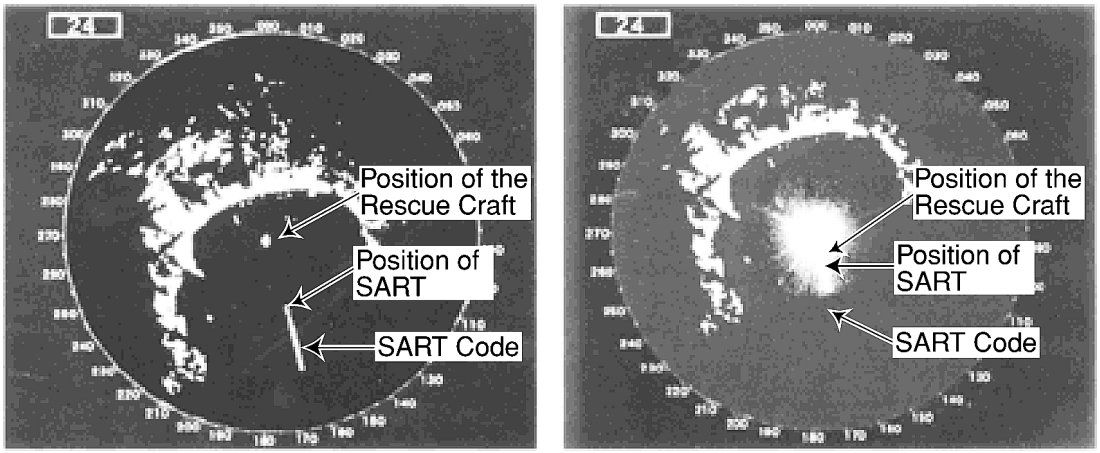
【Examples of radar interferences】

4.4 Display of Radar Transponder

SART (Search and Rescue Radar Transponder) is life preserving device approved by GMDSS which is used for locating survivors in the event of a disaster or distress. SART operates in the 9GHz frequency band. When it receives a radar signal (interrogating radio wave) of 9GHz transmitted by a rescue ship or aircraft radar, SART transmits a series of respouse signals to the searchers to indicate the distress position.

In order to see the SART or radar beacon mark on the radar screen.

①	RANGE SCALE	:	Select 6 or 12 nm
②	SEA CLUTTER control	:	Set to minimum
③	AUTO SEA	:	OFF
④	TUNE control	:	DETUNED to reduce the clutter
⑤	IR	:	Set IR OFF
⑥	PROCESS	:	Set PROCESS OFF



【Example】

Attention

- When above settings ①to ⑥ are made to display SART signals, objects around the own ship will not appear on the radar screen, so perform thorough visual monitoring of the sea area around the own ship to avoid any collision or stranding. Further, when more than one radar systems are mounted, while using a 9GHz band radar for searching SART signals, be sure to use another radar as an ordinary radar to perform monitoring of objects around the own ship to avoid any collision, check of the position of the own ship to avoid any stranding, and so on. Need to return the set for normal operation on completion.

5 Maintenance and Inspection

5.1 General Maintenance

⚠WARNING

The customer should refrain from inspecting or repairing the internal parts of this equipment.
Inspection or repair other than by specialized service personnel may result in fire or severe electric shock.
Please contact the sales department of Japan Radio Co., Ltd. or your local branch, outlet or sales office with respect to maintenance and repair.

When performing maintenance in increment weather, please be sure to shut the main power off. Maintenance work performed without shutting the main power off may result in severe electric shock.

⚠CAUTION

When cleaning the surface, please refrain from using organic solvents such as thinner or benzene.
Use of such organic solvents may damage the surface coating.
When cleaning the surface, remove dust and grime and wipe with a clean dry cloth.

The following maintenance steps are required to ensure that the radar always operates in the optimal condition. Since breakdowns will be reduced through maintenance, periodic maintenance is recommended.

General maintenance steps common to all equipment are as follows.

Cleaning

Remove dust, grime and sea water that has adhered to the unit. Use dry cloth to clean the unit. In particular, use a brush to clean the ventilating opening to ensure smooth flow of air.

5.2 Scanner Unit

⚠WARNING

When performing maintenance or inspection of the scanner unit, be sure to shut off the main power source. Sudden movement of the scanner may cause collision and injury to the human body.

Be sure to shut off the main power source when approaching the scanner unit for the purposes of maintenance or inspection. Exposure to electric waves at proximate distances may negatively affect the human body.

(1) Radiation unit

If the front of the radiation unit is soiled with soot, salt, paint specks, bird excrement or other alien matter, electric waves may become attenuated and reflection may occur thus causing degradation in the performance of the radar.

The radiation unit should be inspected and always kept clean by wiping with cloth soaked in alcohol or water in the event of soiling.

Solvents such as gasoline, benzene, trichlene or ketone should never be used for this purpose.

(2) Pedestal

The pedestal and attachment bolts of the scanner unit should be inspected periodically for erosion and maintained to ensure safety. Painting is the best measure for preventing erosion and it is recommended that this be undertaken once in half a year.

5.3 Display Unit

Cleaning the cathode-ray tube

When dust adheres to the cathode-ray tube, transparency degrades and the images become dark.

Cleaning is performed using cloth soaked in water (flannel or cotton). Wiping vigorously with dry cloth or the use of gasoline or thinner should be avoided.

⚠CAUTION

Vigorous wiping with dry cloth or the use of gasoline or thinner should be avoided in cleaning the cathode-ray tube.

Such action may cause scratches and deterioration.

5.4 Special Parts

JMA-2343

Model Number	Name	Type	Manufacturer	Location of use	JRC Code
V201	Magnetron	MSF1421B	New JRC	Scanner unit	5VMAA00049
A101	Circulator	H-6AJRD00001	Toshiba	Scanner unit	6AJRD00001
A102	Diode limiter	NJS6930	New JRC	Scanner unit	5EZAA00024
E301	Front end	NJT1028	New JRC	Scanner unit	5EZAA00039

JMA-2344

Model Number	Name	Type	Manufacturer	Location of use	JRC Code
V201	Magnetron	MSF1422B	New JRC	Scanner unit	5VMAA00051
A101	Circulator	H-6AJRD00001	Toshiba	Scanner unit	6AJRD00001
A102	Diode limiter	NJS6930	New JRC	Scanner unit	5EZAA00024
E301	Front end	NJT1969	New JRC	Scanner unit	5EZAA00037

5.5 Circuit Blocks for Repair

NKE-249

Name	Unit/ type of circuit	Remarks
Modulator circuit	CME-307	
Receiver	NRG-140	

NKE-250

Name	Unit/ type of circuit	Remarks
Modulator circuit	CME-308	
Receiver	NRG-141	
Motor unit	CBP-153	With rotating pulse generation circuit
Motor brush	BRXP05247	Containing 2

NCD-4170

Name	Type	Remarks
Main control circuit	CMC-1156	
Power supply circuit	CBD-1596	
Main panel circuit	CCK-873	
Soft key panel circuit	CCK–872	
Interior of the monitor unit	CKJ-159	CRT + deflecting coil
CRT monitor control unit	CCN-366	With socket circuit

5.6 Actions to Deal with Abnormalities and Breakdown

In the case of semiconductor circuits, except in cases of problems in the design or inspection of such circuits or causes that are external or caused by humans, breakdown or deterioration of the circuit does not often occur. In general, the causes of breakdown that are relatively frequently found are wire cut in the high resistance device due to high humidity, defect in the variable resistance and defective contact of switches and relays.

Moreover, in many cases the cause for breakdown is not a defect in parts but rather poor adjustment (particularly inadequate tuning adjustment) or poor maintenance (particularly defect in cable contact) and inspecting or readjusting these aspects is often effective in the case of perceived abnormality or breakdown. The following table should be taken into consideration in the case of abnormalities or breakdown.

There is always a cause for blown fuse and after replacing the fuse, it is necessary to investigate the related circuits even when no abnormality remains. However, consideration should be given to the fact that there is significant variance in the characteristics of fuse. Please refer to the list on the fuses used given in Section 9.4.

No.	Condition of the Breakdown	Conceivable Cause
1	Nothing appears on the CRT.	a. Breakdown in the power supply unit (CBD-1596) b. Fuse F1 has blown c. Breakdown of the monitor d. Breakdown of the main control circuit (CMC-1156) e. The electric power of the ship is inadequate.
2	The scanner unit does not rotate.	a. Fuse F2 has blown b. Breakdown in the motor unit (JMA-2343: CML-645 H-7BDRD0023 inside the scanner unit, JMA-2344: CBP-153) c. Breakdown of the safety switch of the scanner unit (JMA-2344 only)
3	The scanner unit rotates but no radar image appears (characters and markers are, however, displayed).	a. Breakdown of the receiver (JMA-2343: CAE-457, JMA2344: CAE-457-1) b. Breakdown of the main control circuit (CMC-1156). What is the condition of the transmission trigger (TI)? c. Breakdown of the motor unit (JMA-2343: CML-645 H-7BDRD0023 inside the scanner unit, JMA-2344: CBP-153)
4	The operation switches do not work.	a. If the switches do not work even after turning the power on again, breakdown in the main control circuit (CMC-1156). b. Breakdown in the main operation panel circuit (CCK-873) or soft key panel circuit (CCK-872) c. Cut in the cable connecting the operation unit.

No.	Condition of the Breakdown	Conceivable Cause
5	Only noise is displayed and no radar image is displayed (characters and markers are, however, displayed).	a. Modulator (JMA-2343: CME-307, JMA2344: CME-308) b. Defective magnetron c. Breakdown in the main control circuit (CMC-1156) d. Defective tuning voltage
6	While radar images are displayed, the characters and markers are not displayed.	a. Breakdown in the main control circuit (CMC-1156).
7	Reception is poor.	a. Deterioration or fault in the magnetron b. Breakdown in the modulator (JMA-2343: CME-307, JMA-2344: CME-308). Defect in the pulse width switching? c. Breakdown in the receiver (JMA-2343: CAE-457, JMA-2344: CAE-457-1) d. Water damage to the radiation unit or cables between equipment (soiling of the radiation unit, adherence of ice or snow, internal erosion of the cable between equipment) e. Defective tuning voltage f. Interruption in the pulse switching signal (PW)
8	The image is warped or drifts.	a. Breakdown or defective adjustment of the monitor b. Interruption in the synchronizing signal for horizontal signal (HS) and vertical signal (VS) c. Breakdown in the CRT monitor circuit (CNN-366)
9	Nothing happens on the screen when the fixed distance marker, variable distance marker, electronic cursor or panel lighting switches are pushed.	a. The brightness adjustment is at the minimum level. b. Breakdown in the main control circuit (CMC-1156)
10	The screen returns to the initial state during operation.	a. The electric power of the ship is inadequate. b. Breakdown in the main control circuit (CMC-1156) c. Breakdown in the power supply unit
11	The alarm does not activate.	a. Breakdown in the main control circuit (CMC-1156)
12	The radar wake does not operate.	a. Breakdown in the main control circuit b. The image brightness is too low.
13	The display does not change to true bearing (north-up) or course up.	a. There is no data being received from the bearing sensor (NMEA).

6 After-sales Service

★ **When asking for repair**

When a system failure is suspended, read Chapter 4, 5 and 9 carefully and re-check the abnormal part.

If it is still considered to be a failure, stop the operation at once and consult with the dealer you purchased the product, our sales department or your nearest branch or business office.

● **Repair within the warranty period**

If the failure occurred under proper operation in accordance with the instruction manual, the dealer or JRC shall repair the product without charging. In case of any other failure occurred due to mis-operation or natural disaster, the repair work will be charged.

● **Repair after the warranty period has expired**

If the product is recoverable by repairing, we will repair it upon your request.

● **Items to be identified**

☆ Product name, model name, manufacturing date and serial number

☆ Failure condition (as detailed as possible: see the Radar Failure Checklist on Page 219.)

☆ Your company/organization name, location and telephone number

★ **Recommendation of maintenance inspection**

Although it depends on your operating condition, the performance of the product may be lowered due to parts wear.

We recommend maintenance inspection, apart from the normal maintenance work.

For maintenance inspection, consult with the dealer you purchased the product, our sales department, or your nearest branch or business office.

Note that this maintenance inspection will be charged.

For detail of after-sale service, contact the dealer you purchased the product, our sales department, or your nearest branch or business office.

☞Contact： See the list at the end of the manual.

RADAR FAILURE CHECKLIST

When ordering for repair, check the following items, fill in the sheet and send it to us.
If there is any uncertain items, contact your ship and give us correct information on the product.

Ship name : _____ Phone : _____ Fax : _____

Radar general model name : JMA—_____ Serial No. : _____
(Write the full model name correctly)

(1) Check the following items in the order of the number, and circle the applicable answer between YES or NO.
If the item cannot be determined as YES or NO, explain in detail in the item (15), Others.

(2) If any of the items (1) through (4) is marked as NO, check the fuse of the product (refer to Section 5.6 and 9.4).

(3) Check the items (4) through (14) while the transmission (TX) is ON.

* Functions mentioned in the items (13) through (14) may be optional. If the function is optional, answer is not necessary.

No.	Check Item	Result	
(1)	Power can be turned on. (The lamp on the operation panel is lit.)	YES	NO
(2)	A few minutes after powering-on, it will become stand-by status (TX Ready).	YES	NO
(3)	When powering-on (or TX ON), the CRT displays something (CRT is lit).	YES	NO
(4)	The scanner unit rotates at the transmission (X-MIT) ON. (Check the following items while transmission is ON.)	YES	NO
(5)	Tuning is enabled. (Check with the range of 6NM or more.)	YES	NO
(6)	Fixed marker is displayed.	YES	NO
(7)	VRM is displayed.	YES	NO
(8)	White noise is displayed while set at SEA, RAIN minimum, GAIN maximum, IR-OFF and maximum range.	YES	NO
(9)	Target reflection echo is displayed.	YES	NO
(10)	Sensitivity of reflection echo is normal.	YES	NO
(11)	EBL is displayed.	YES	NO
(12)	Cursor mark moves.	YES	NO
*(13)	GYRO course can be set and normally displayed.	YES	NO
*(14)	LOG speed can be normally displayed.	YES	NO

(15) Others (Error message, etc) _____

_____

7 Disposal

7.1 Equipment Disposal

Dispose of this equipment by following the ordinances or regulations of the local authorities in charge of the disposal site.

7.2 Disposal of Used Batteries

⚠WARNING

Before disposing of used lithium batteries, insulate by affixing tape to the positive and negative terminals or by other means. Otherwise, short-circuiting may occur, resulting in heat generation, bursting or ignition.

On this equipment, lithium batteries are used for:

BT1 in the CPU control circuit (CMC-1156) (Sanyo electric CR2032-FT6-1).

- Do not keep used lithium batteries but dispose of them immediately after as non-combustible waste.
- Before disposing of used lithium batteries, insulate by affixing tape to the positive and negative terminals or by other means. In the area where used batteries are separated from other waste, dispose of them by following the local regulations.

7.3 Disposal of Used Magnetron

The scanner unit in this radar use a magnetron.

- After replacing it, return the used one to your local distributor or our sales office.
  For detail, ask your local distributor or our sales office.

8 Specifications

8.1 General

(1) Scanning mode	Raster scanning, PPI
(2) Display unit	10-inch square monochrome CRT
(3) Display color	Green
(4) Ranges	
JMA-2343	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 36, 48 NM
JMA-2344	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 36, 48, 64 NM
(5) Range resolution	25m maximum
(6) Minimum range	25m maximum
(7) Bearing accuracy	±1° maximum
(8) Bearing discrimination	
JMA-2343	4.2°
JMA-2344	2.2°
(9) Bearing measurement mode	True/Relative bearing
(10) Environmental condition	
・ Temperature Scanner unit	−15°C to +55°C
Display unit	−15°C to +50°C
・ Relative humidity	93% maximum at 40°C
・ Relative wind velocity	
Scanner unit	36.0m/sec (70 knots)
(11) Power consumption	
・ DC input (12,24,32V)	
JMA-2343	Approx. 60W
JMA-2344	Approx. 65W
・ AC input (Note)	Approx. 100VA
	(100/110/115/200/220/230V, 50/60Hz single phase)
(12) Input power range	DC10.8V to DC42V
(13) Preheating time	Approx. 90 seconds
(14) Warm-up time	Approx. 3 seconds maximum

(Note) The following rectifiers need be used when AC input is to be used : NBA-797A

8.2 Scanner Unit (NKE-249/250)

(1) Dimensions	
NKE-249	
・ Diameter	620mm
・ Height	275mm
NKE-250	
・ Swing circle	1220mm
・ Height	432mm
(2) Mass	
NKE-249	Approx. 10.5kg
NKE-250	Approx. 24kg
(3) Polarization	Horizontal
(4) Directivity characteristics	
NKE-249	
・ Horizontal beam width	4˚
・ Vertical beam width	25˚
・ Side lobe level	−21dB maximum (less than ±10˚ from main lobe)
NKE-250	
・ Horizontal beam width	2˚
・ Vertical beam width	30˚
・ Side lobe level	−23dB maximum (less than ±10˚ from main lobe) −26dB maximum (other than ±10˚ from main lobe)
(5) Rotation	
NKE-249/250	Approx. 27 rpm
(6) Transmitter frequency	9410±30MHz
(7) Peak power	
NKE-249	4kw
NKE-250	6kw
(8) Transmitter tube	
NKE-249	Magnetron：MSF1421B
NKE-250	Magnetron：MSF1422B
(9) Pulse length/PRF	
NKE-249	0.08μs /2250Hz (0.125, 0.25, 0.5, 0.75, 1.5NM) 0.25μs/1700Hz (1.5, 3 NM) 0.5μs/1200Hz (3, 6 NM) 1.0μs/650Hz (6, 12, 24, 36, 48 NM)

NKE-250	0.08 μ s/2250Hz (0.125, 0.25, 0.5, 0.75, 1.5 NM) 0.25 μ s/1700Hz (1.5, 3 NM) 0.5 μ s/1200Hz (3, 6 NM) 1.0 μ s/650Hz (6, 12, 24, 36, 48, 64 NM)
(10) Modulator	Solid state modulator driver
(11) Duplexer	Circulator and diode limiter
(12) Mixer	MIC front-end
(13) IF amplifier	
・ Intermediate frequency	60MHz
・ Band width	20/6/3MHz
・ Characteristic	Semi-log characteristic
(14) Noise figure	6dB maximum

8.3 Display Unit (NCD-4170)

(1) Dimensions	
・ Width	278mm
・ Height	242mm
・ Depth	275mm
(2) Mounting	Table-top mounting
(3) Mass	Approx. 9kg
(4) Cathode-ray tube	10-inch square monochrome CRT
(5) Range scales	

Range (NM)	Range ring interval (NM)	Number of rings (NM)
0.125	0.0625	2
0.25	0.125	2
0.5	0.25	2
0.75	0.5	3
1.5	0.25	6
3	0.5	6
6	1	6
12	2	6
24	4	6
36	6	6
48	8	6
64	16	4

Only JMA-2344	
(6) Range ring accuracy	±0.9% of selected range or ±8m, which is greater.
(7) VRM	VRM1/VRM2
JMA-2343	0 to 48 NM, digital numeric display of 3 figures
JMA-2344	0 to 64 NM, digital numeric display of 3 figures
(8) EBL	EBL1/EBL2 0° to 359°, digital numeric display of 3 figures
(9) Tuning mode	Manual or automatic
(10) Bearing scale	360° scale graduated at intervals of 1°
(11) Ship's heading marker	Electronic
(12) Sea surface clutter suppression	Manual or automatic
(13) Rain and snow clutter suppression	Manual or automatic
(14) Radar wakes display	15 sec/30 sec/1 min/3 min/6 min/15 min/30 min/ continuous
(15) Center move	66% maximum of PPI's radius

(16) Keys/Controls

・Main panel

STBY/OFF 

key

X-MIT/OFF 

key

[TUNE] control

[GAIN] control

[SEA] control

[RAIN] control

RANGE 

key

VRM 

key

EBL 

key

BRIL/HL OFF 

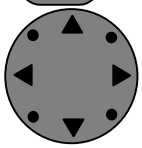
key

MENU 

key

ENTER 

key

Cross key 

・Software key panel

Software key : 4

(17) Software key function

・DISPLAY Screen expansion [EXP]
Center move [CENTER]
Fixed range rings [RR]
Cursor [CUR]

・PROCESS Clutter suppression
[AUTOOFF/A-SEA/A-RAIN]
Interference rejection [IR]
Tune mode [TUNE]
Radar wakes [WKS]

・GUARD Zone make [MAKE]
Alarm setting [ALM]
Sensitivity [SENS]
Alarm mode [ALM]

(18) Menu

・FUNCTION	EBL1/VRM1 mode setting [EBL1/VRM1]
	(Fix [FIX]/Float [FLOAT]/Parallel line [PLINE])
	EBL2 setting [EBL2]
	VRM2 setting [VRM2]
	EBL read out [EBL READOUT]
	Zooming of echo image on PPI [ZOOM]
	True motion/Relative motion [TM*/RM]
	Heading mode [HDG MODE]
	(Head-up [H-UP]/North-up [N-UP]*/
	Course-up [C-UP]*)
	Image process [PROCESS]
・DISPLAY	Position display [POSITION]
	(Own ship [L/L or TD]/Cursor [CUR L/L]/
	Waypoint [WPT L/L])*
	Waypoint display [WAYPOINT]
	Range unit [RANGE]
	(NM/KY/KM)
	Timed transmission [TIMED TX]
	(Transmission period [TX PERIOD]/
	Stand-by period [STBY PERIOD])
・RADAR SET-UP 1	Buzzer volume [BUZZER]
	Panel dimness [DIMMER]
	Transmitter pulse width [TX PLSE]
	(1.5NM/3NM/6NM)
	Bearing reference [BEARING]
	(Magnetic bearing [MAG]/True bearing [TRUE])*
	Multi display unit setting [MULTI DISPLAY]
・RADAR SET-UP 2	Language
	(English/Japanese/Chinese/Francais/ Espanol/
	Italiano/Norsk/Deutsch/Korea)

(19) Input from external device	GPS (NMEA0183) Electric compass or GPS compass (NMEA0183) NMEA0183 version : v1.5, v2.1, v2.3 Latitude/Longitude : GGA, RMA, RMC, GLL Waypoint : RMB, BWC Speed : VTG, RMA, RMC, VHW Course : VTG, RMA, RMC Ship's head : HDT, VHW, HDM, HDG VARIATION : HDG, RMA, RMC TD (LoranC time difference) : GLC, GTD, RMA
(20) Output to external device	Cursor data (Bearing/Range) NMEA0183 RSD sentence** Sub monitor (Vertical/Horizontal synchronous signal, video signal)

* You need a connection with navigation device or bearing sensor.

** Data output only when pushing ENTER key.

8.4 Rectifier Unit (NBA-797A)

(1) Dimensions	
・Width	270mm
・Height	430mm
・Depth	175mm
(2) Mounting	Wall type, drip proof structure
(3) Mass	Approx. 18kg
(4) Input power	AC 100/110/115/200/220/230V±15%
	50/60Hz, Single phase
(5) Power consumption	200VA
(6) Output	DC 26V, 7A

8.5 Unit-to-unit Spacing

	Maximum Cable Length	Standard Cable Length
Scanner to display	20m	15m
Display to rectifier	(Note)	2m

(Note) About power cable length between display to rectifier, see "9.5.3 Selecting a Long Cable"

Attention

- Install each equipment so that the length of the cable between a snanner unit and a display unit does not exceed 20m. If the regular length is exceeded, it may become the cause of causing poor adjustment and the defect of a system of operation.

・The standard cables are provided with connectors and plugs.

9 Installation

This chapter has been written for the service technicians to read in case of installation.

⚠WARNING

Only specialized personnel shall perform installation work.
Installation work performed by personnel other than specialized personnel may cause breakdown of the equipment, poor performance, fire, severe electric shock and other property and human damages.

9.1 General

Proper installation of a radar unit is essential for extracting full capability of the unit reliably and for facilitating troubleshooting and maintenance. Follow the guidelines given below when installing the radar unit.

(a) Install the scanner unit as high as possible while taking its weight into consideration.

(b) Install the display unit in the wheel house for comfortable observation.

(c) The scanner unit and display unit are connected by 10 to 20 m compound cable with 20 conductors with an internal shield. The maximum permissible cable length is 20 m. Cables larger than 20 m would deteriorate the radar performance of the radar unit.

9.2 Installing the Scanner Unit

9.2.1 Selecting the installation location

⚠CAUTION

The scanner unit shall be installed where there are not large obstacles in the direction of the ship's heading line in the same plane.
If there is a large impediment in the same plane as the scanner unit, this may cause the generation of folse echoes. In particular, if such folse echoes appear at the ship's heading line, monitoring will be difficult and this may cause inadequate forecasting of danger.

Do not install the scanner unit near chimney's or the exhaust of chimneys.
Soot will cause the performance of the radar to decrease and heat may cause breakdown.

Do not install direction antenna or VHF antenna in the vicinity of the scanner unit. Doing so may cause noise in the antenna reception.

Consideration should be given to separating the radar cable from the cables for the direction antenna and VHF antenna.
These cables should never be bundled into one. Doing so may cause noise in the antenna reception.

9.2.2 Installation procedure

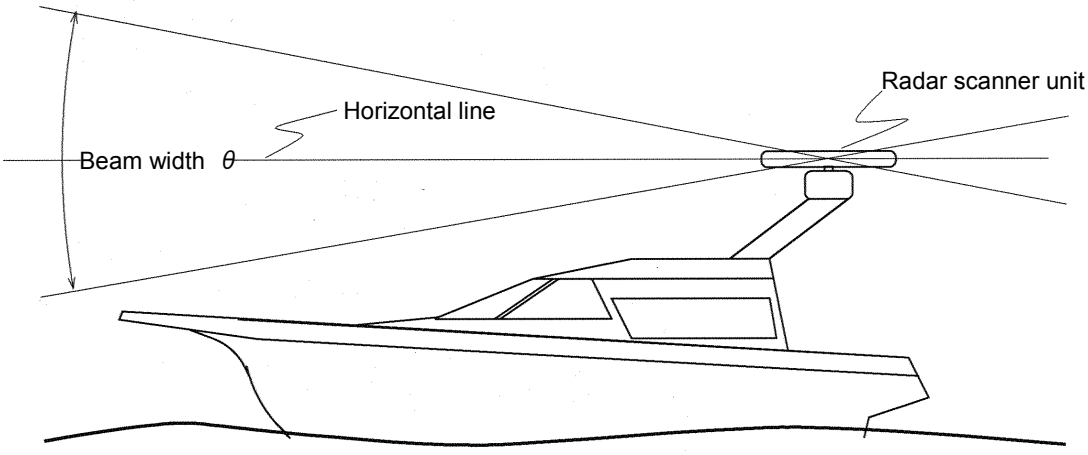
(a) If it is found that there is no height above the roof of the wheel house enough to directly accommodate a scanner unit, install a pedestal or radar mast.

(b) In addition to a pedestal or radar mast, it is necessary to provide an appropriate staging for convenience in installation, maintenance, adjustment, and repair of the scanner unit.

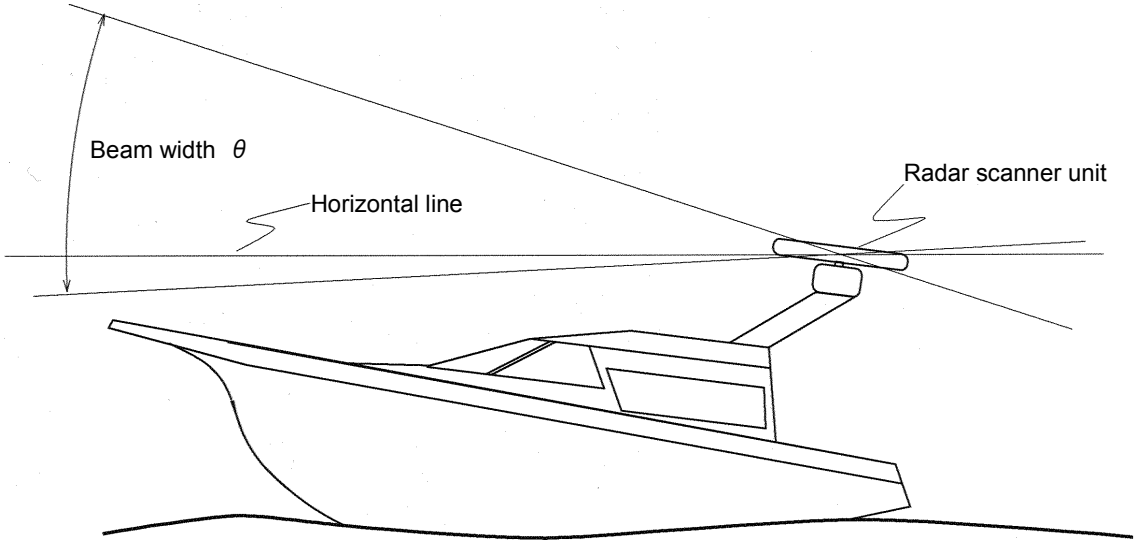
(1) Precautions to be observed when installing the scanner unit on a power boat

- The bow of a power boat is kept in a raised position when it is running at a high speed. Consequently, if the radar's scanner unit is installed horizontally when the boat is stopped, the following conditions will occur if the trim (elevation angle of the ship's bow at run time) exceeds 1/2 of the vertical beam width (θ):
  - On the front side, the water surface lies outside the beam, weakening the radio wave that is incident to the target on the water surface. Consequently, the echo generated by this target is will hardly be visible on the radar screen.

  Conversely, on the rear side:
  - Since the radio wave that is incident to the water surface is stronger, strong sea clutter will develop. For vessels on which the trim is 1/2 or greater than the vertical beam width (θ), it is recommended that the scanner unit be installed in such an orientation that it is tilted forwards.



[When the ship is stopped or running at a slow speed]

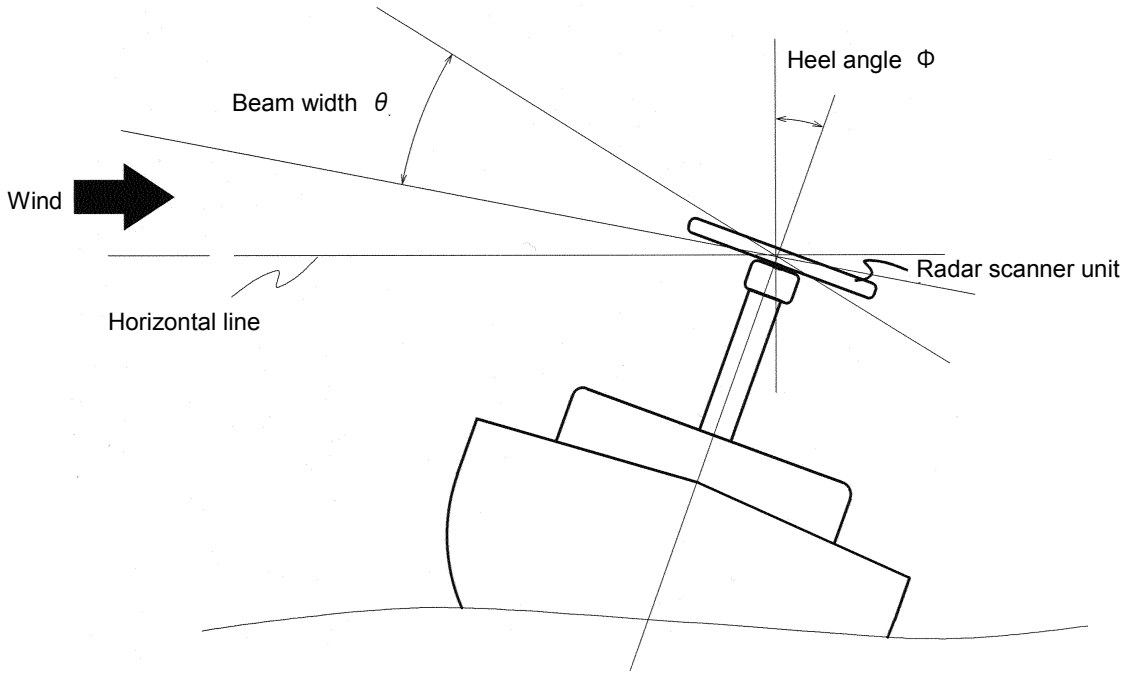


[High speed run: the lower part of the beam is almost horizontal.]

(2) Precautions to be observed when installing the scanner unit on a yacht

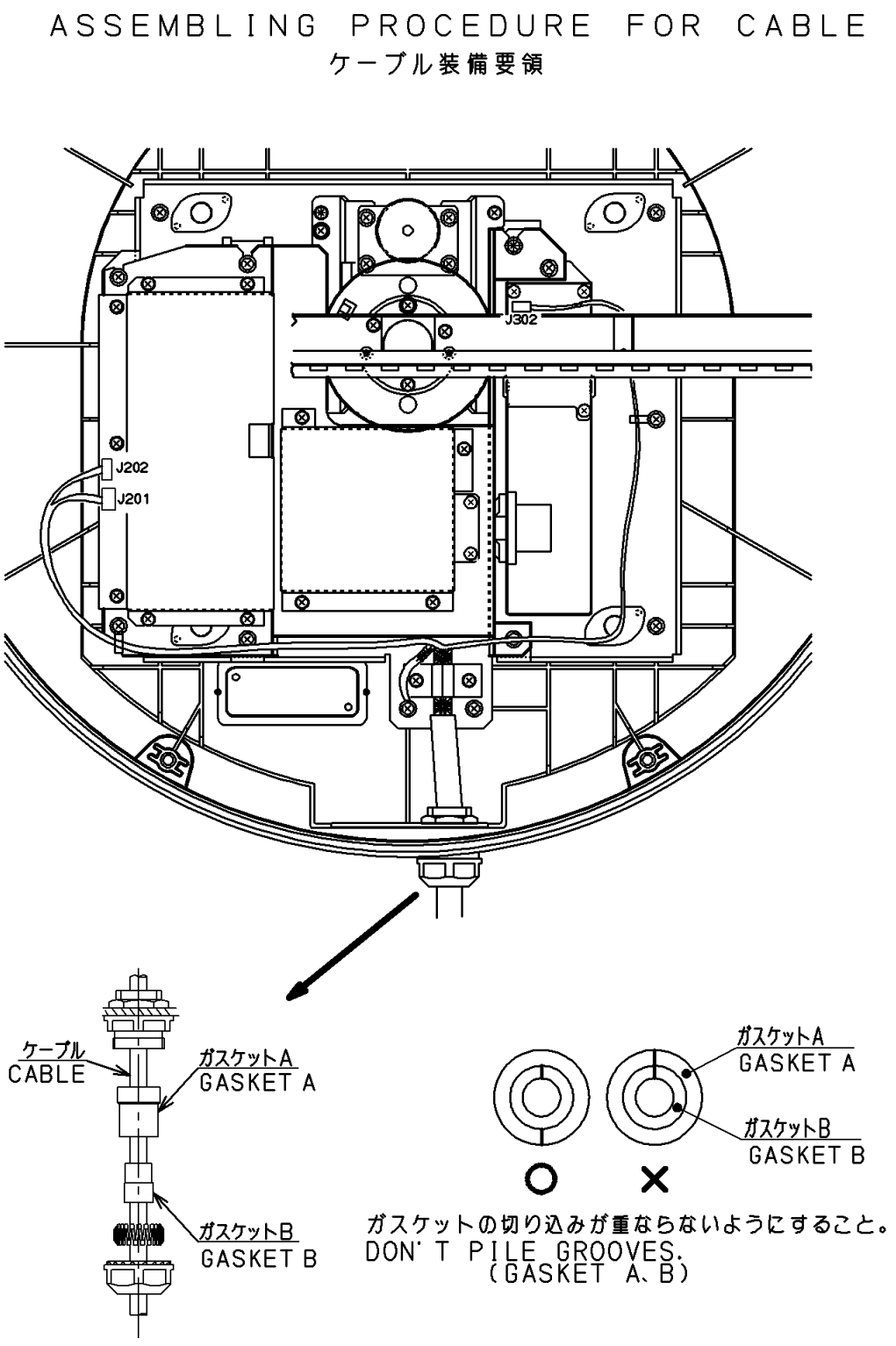
- A yacht heels on the lee side when a wind with a certain level of force blows.
  The following condition occurs if the heel angle exceeds 1/2 of the beam width:
  - On the windward side, the water surface lies outside the beam, weakening the radio wave that is incident to the target on the water surface. Consequently, the echo generated by this target is will hardly be visible on the radar screen.

  Conversely, on the lee side:
  - Since the radio wave that is incident to the water surface is stronger, strong sea clutter will develop. For yachts on which the heel is 1/2 or greater than the vertical beam width (θ) , it is recommended that the scanner unit be installed on a mounting base so that the scanner unit can be tilted on the left and right sides according to the heel angle.



9.2.3 Connection of cables to be assembled

(1) Radome scanner unit (NKE-249)

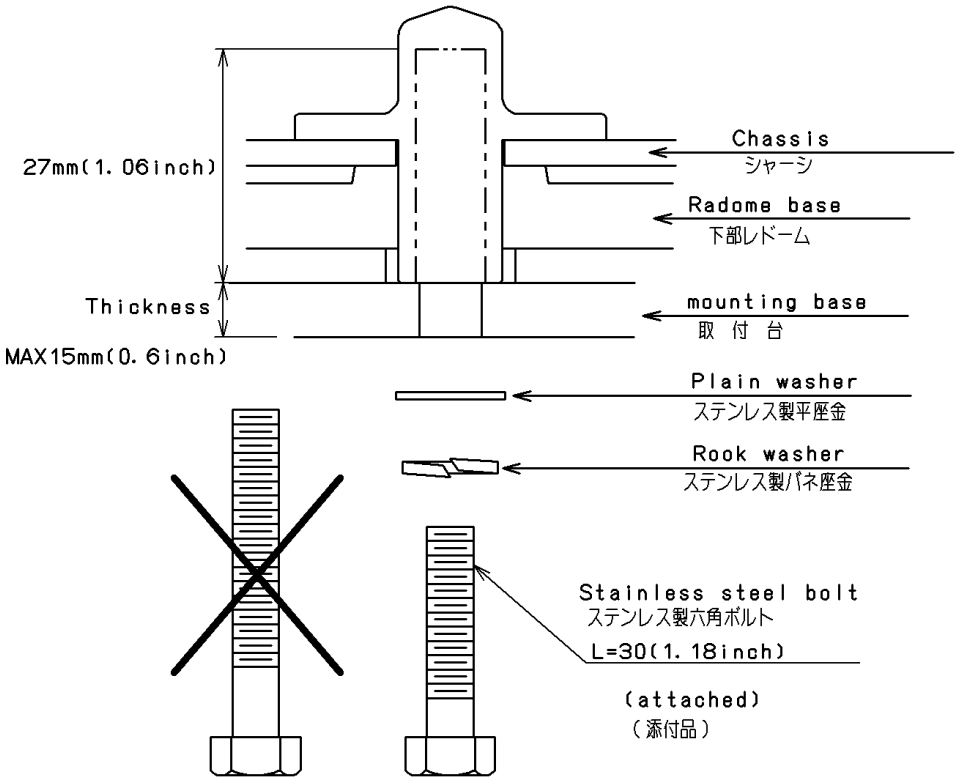


CAUTION
注意

When mounting the scanner unit, please check the maximum length of the holding bolts.
If the bolts are too long, it gives severe damage to inside of the scanner.
When mounting the scanner unit, please use the attached bolts.
The mounting base thickness must not exceed 15mm(0.6inch).

装備に対する注意

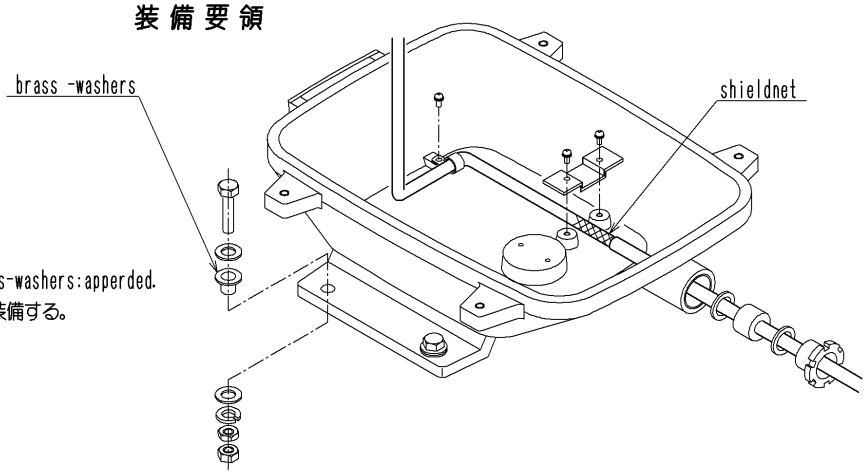
空中線を装備する際は、装備用ボルトの最大長さを確認して下さい。
装備用ボルトが長すぎると、空中線内部に損傷を与えます。
空中線を装備する際は、添付のボルトを使用して下さい。
ベース板厚は15mm(0.6inch)以下を使用して下さい。



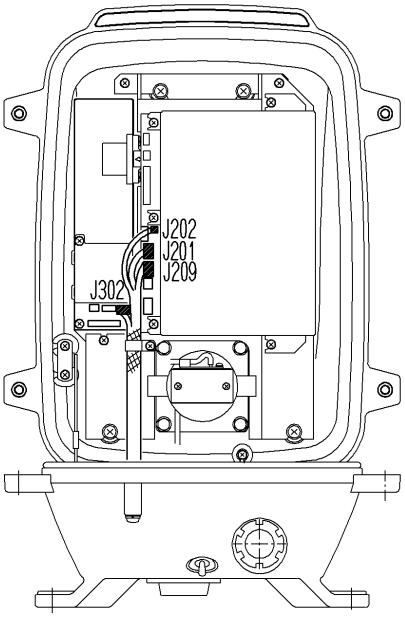
※FIX THE BOLTS BY USING A STANDARD WRENCH(LENGTH135mm)
(TORQUE 2058N-cm)
通常のレンチ(長さ=135mm トルク=2058N−cm)でボルトを固定。

(2) Rotary scanner unit (NKE-250)

Instruction for equipment
装備要領



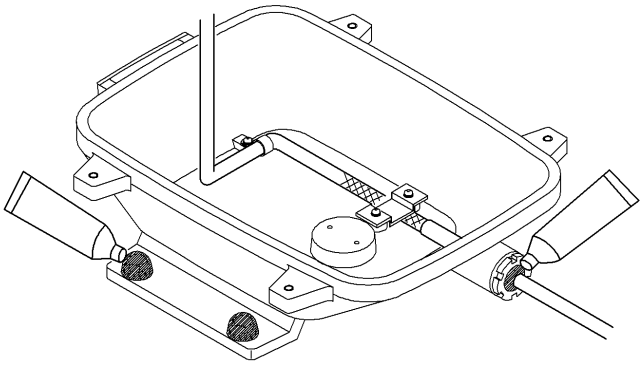
1. Equip the scannerunit with brass-washers:apperded.
黄銅製ワッシャを用い、空中線を装備する。



2. First, check the cable length, remove outersleeve.
ケーブルの適性長を確認の上、ケーブル外皮を剥ぐ。

3. Clump the cable, and conect 4 connecters.
ケーブルを各部でクランプし、コネクタを接続する。

4. Apply silcone sealant around the bolts and into the cableinlet.
ボルトの周辺部とケーブルグランド部をシールする。



9.3 Installing the Display Unit

9.3.1 Selecting the installation location

Attention

- The display unit should be installed at least 1 meter from the magnet compass. If the display unit is installed in the vicinity of the magnet compass, the compass may be affected.

Consider the following points when determining the location of the display unit:

(a) Install the display unit in a location that provides the operator with a convenient viewing position.

(b) Take after-installation maintenance into consideration.

9.3.2 Installation procedure

(a) Install the display unit by drilling holes using the exterior dimension drawings of the display unit as reference. Monitoring will be facilitated if the display is positioned so that the operator faces the ship's heading line (the CRT faces astern).

(b) Wherever possible, select a location that is free of vibration.

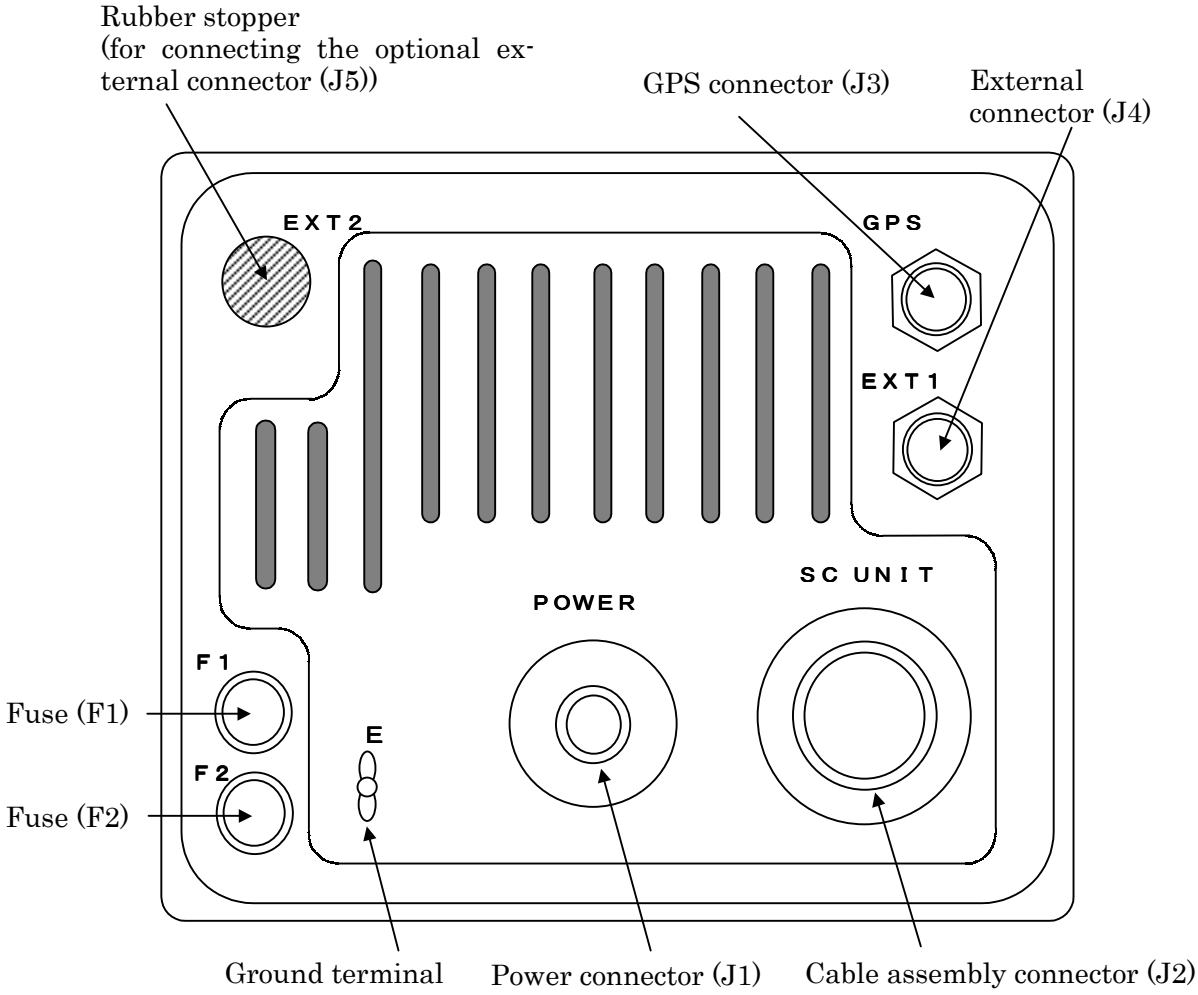
9.3.3 Connecting the power cable

(a) Connect the power cable plug to the J1(POWER) connector on the rear panel of the display unit.

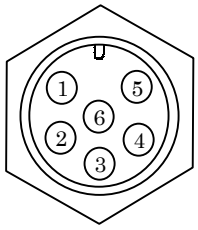
(b) Connect the plug of the cable from the scanner unit to the J2(SC UNIT) connector on the rear panel of the display unit.

- Use an adequately heavy earth cable when connecting the earth terminal of the display unit to the ship body.

9.3.4 Display unit rear panel

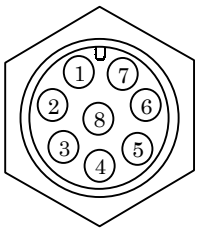


GPS connector (J3)



① +12V
② GND
③ NAVCOM
④ NAVRX
⑤ NAVTX
} To GPS or LORAN

External connector (J4)



① DATA+
② DATA- } To cursor data input device
③ CMPS+
④ CMPS- } To electromagnetic compass/ GPS compass
⑤ SVD (Image signal)
⑥ SHS (Horizontal synchronization signal)
⑦ SVS (Vertical synchronization signal) } To sub-monitor
⑧ GND

※ The following should be used as the plug side connector for connecting to J3 and J4

Connector	Type	JRC Code
For J3	LTWD-06BFFA-L180	5JCAS00031
For J4	LTWD-08BFFA-L180	5JCAS00027

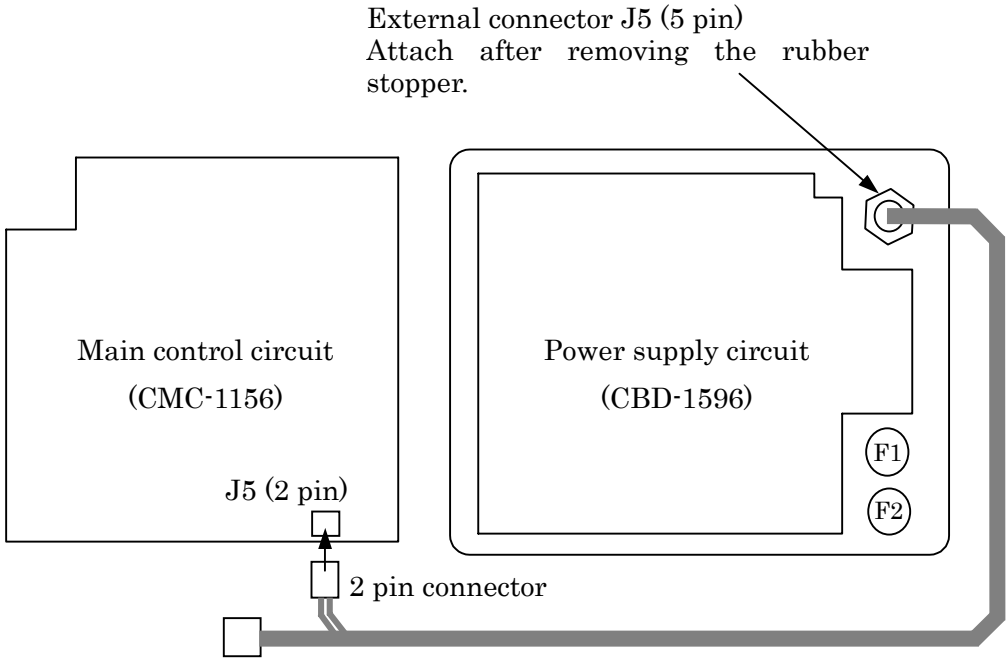
9.3.5 Connection of the external buzzer

⚠CAUTION

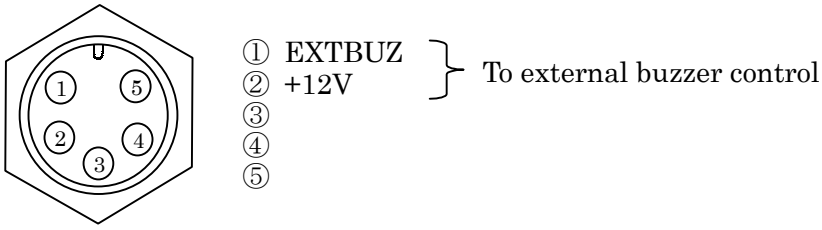
Only qualified service personnel should perform external buzzer cabling work.
Erroneous connection may cause breakdown or defective operation.

The 5 pin connector side of the cable equipped with connector (7ZCRD0749) should be attached to EXT2 on the rear panel of display unit after removing the rubber stopper. The 2 pin connector side should be connected to J5 of the display unit main control circuit (CMC-1156). The 3 pin connector need not be.

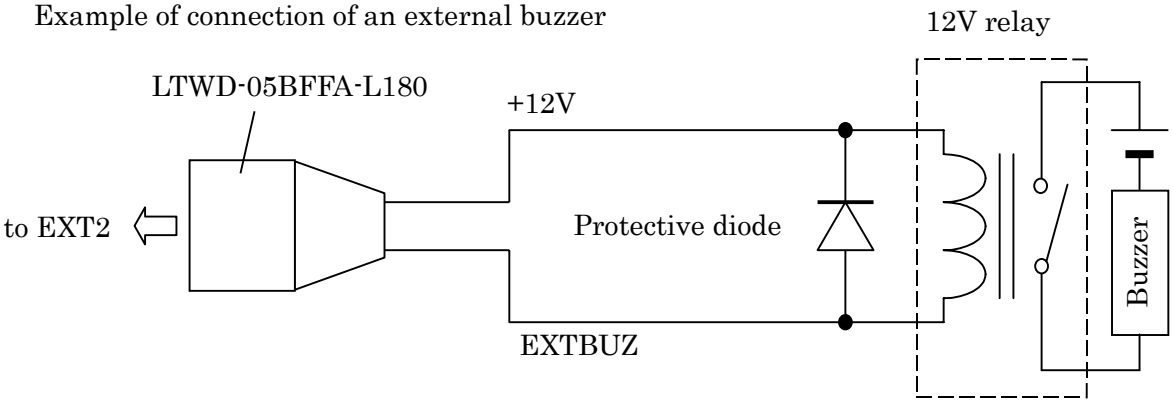
Use the 5 pin connector (Type: LTWD-05BFFA-L180, JRC code: 5JCAS00030) for the plug side connector connected to EXT2.



EXT2 Connector (J5)



Example of connection of an external buzzer



Example of Parts

Name	Manufacturer	Type	JRC Code
Relay	Takamizawa	LZ12H	5KLAC00033
Diode	Hitachi	V06C	5TXAE00016

9.3.6 Connecting an electromagnetic compass

Attention

- Ensure that the output of the inboard power supply and rectifier unit and connection to the power cable is correct.
  Erroneous connection or voltage may cause breakdown.

It is possible to input information on bearing to the radar display unit if you use the electromagnetic compass with a NMEA0183 output terminal.
(It is impossible to connect if you use the electromagnetic compass without a NMEA0183 output terminal.)

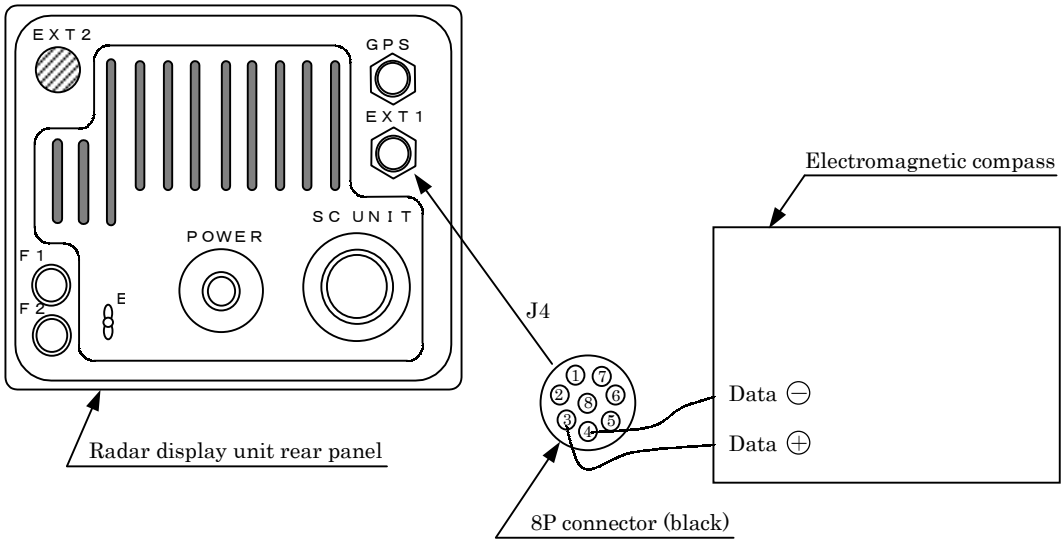
(1) Solder the data cable of electromagnetic compass (with NMEA0183 output) to the 8 pin connector. The polarity is as shown below and care should be taken in making this connection.

8 pin connector (pin 3) ◄——► Electromagnetic compass data (+)
8 pin connector (pin 4) ◄——► Electromagnetic compass data (-)

Type of LTWD-08BFFA-L180 (JRC code: 5JCS00027) should be used as the 8 pin connector.

- Unless the connection between the 8 pin connector and data cable is correct, correct data will not be obtained.

(2) Connect the 8 pin connector to J4 (EXT1) on the rear panel of the display unit.



This completes the cabling of the electromagnetic compass.

9.4 Modifications to be Made to the Inboard Power Supply

Attention

- Be sure to use the correctly rated fuse. In the event incorrectly rated fuse is used, this may cause breakdown in the equipment.

- Make modifications as shown below based on the inboard power supply.
  (Fuse for 24V is incorporated upon shipment of the equipment)

1. Display unit

Fuse rating

Inboard power supply	F1		F2	
	Rating	JRC Code	Rating	JRC Code
DC12V	6.3A	5ZFAD00336	10A	5ZFAD00539
DC24/32V	3.15A	5ZFAD00227	5A	5ZFAD00364

2. Scanner unit

No modifications need to be made with respect to the scanner unit.

9.5 Cable Assemblies

9.5.1 Inter-unit cable (CFQ6774-10/15/20, CFQ6882-10/15/20)

(a) This cable is used to connect the display unit to the scanner unit.

(b) Use the following cables with connectors for this radar equipment.

Cable length	JRC Code for JMA-2343	JRC Code for JMA-2344	Remarks
15m	CFQ6774-15	CFQ6882-15	Standard
10m	CFQ6774-10	CFQ6774-10	Option
20m	CFQ6774-20	CFQ6882-20	Option

Color		Number of Conductors/Diameter (mm)	Signal Name	
Shielded wire (conductor) : Black		7/0.20	TI	
Shielded wire (shield)			TIE	
Co-axial cable (conductor)		7/0.20	VD	
Co-axial cable (shield)			VDE	
Red (Thick)		50/0.18	1A	
Yellow (Thick)		50/0.18	1A	
Blue (Thick)		50/0.18	2A	
Purple (Thick)		50/0.18	2A	
Green (Thick)		50/0.18	1A	Only JMA-2344
Pink (Thick)		50/0.18	1A	
Gray (Thick)		50/0.18	2A	
Brown (Thick)		50/0.18	2A	
Orange (Middle thick)		34/0.18	BP	
Green		7/0.20	BZ	
Yellow	Twisted pair	7/0.20	COM+	
White		7/0.20	COM-	

※The outside diameter size of the cable :11.5±0.5 [mm]

9.5.2 Power cable (CFQ-6776)

The radar unit is provided with a 2 m power cable with connectors

Color	Number of Conductors /Diameter	Cross Section (mm^2)	Polarity
White	50/0.18	1.25	+
Black	50/0.18	1.25	−

Attention

- Ensure that the output of the inboard power supply and rectifier unit and connection to the power cable is correct.
  Erroneous connection or voltage may cause breakdown.

9.5.3 Selecting a long cable

- The effective voltage of the input to the radar is the voltage at the inboard power supply minus the voltage drop caused by the power cable. Too thin or long a power cable incurs a large voltage drop and may not be able to supply adequate power to the radar. In is recommended that the following guidelines be observed when selecting the power cable for your radar:

(a) Consider the possible voltage regulation of the inboard power supply (Vs).

(b) Use the following equation to calculate the voltage drop:

V=2LRKI

L : represents the cable length.
R : represents the direct-current resistance (<Ω>/m) at 20<℃>
K : represents the conductor resistance temperature coefficient (= 1.22)
I : Maximum peak current (A)

(c) The table below lists the direct-current resistance (R) and permissible current (Imax) of several cables.

Cable Type	R (20℃)	Imax (45℃, continuous)
CVVS2×1.25	16.7 Ω.km	13A
CVVS2×2.0	9.42 Ω/km	19A
CVVS2×3.5	5.30 Ω/km	26A

The cable to be used must possess a sufficient permissible current (Imax) characteristic.

9.6 After-installation Adjustments

9.6.1 Installation-time check

(a) After completing the installation procedure, it is necessary to check the radar unit to verify that all installation steps have been conducted as instructed. In particular, check for correct cabling, for normal component operating state, for water leakage in the scanner unit, and for proper grounding of braided shielding cable.

9.6.2 Functional checks

(a) After completing the installation-time check and before checking the operation of the radar, make sure that the output voltages of the inboard power supply fall within their permissible range.

(b) Read "3 Basic Operation" carefully and thoroughly and make sure that the radar functions normally. Then, manipulate all controls and menu functions to ensure that they function normally.

(c) If it becomes necessary to make an adjustment though the radar unit is normal, read "9.7 Adjustment Procedures" carefully and follow the instructions given in that section.

9.6.3 Adjustment items

(a) Radar's bearing adjustment is mandatory.

(b) If the control is not positioned near the center of the scale during tuning or if tuning fails, make a coarse tuning from the "TUNE PRESET" menu.

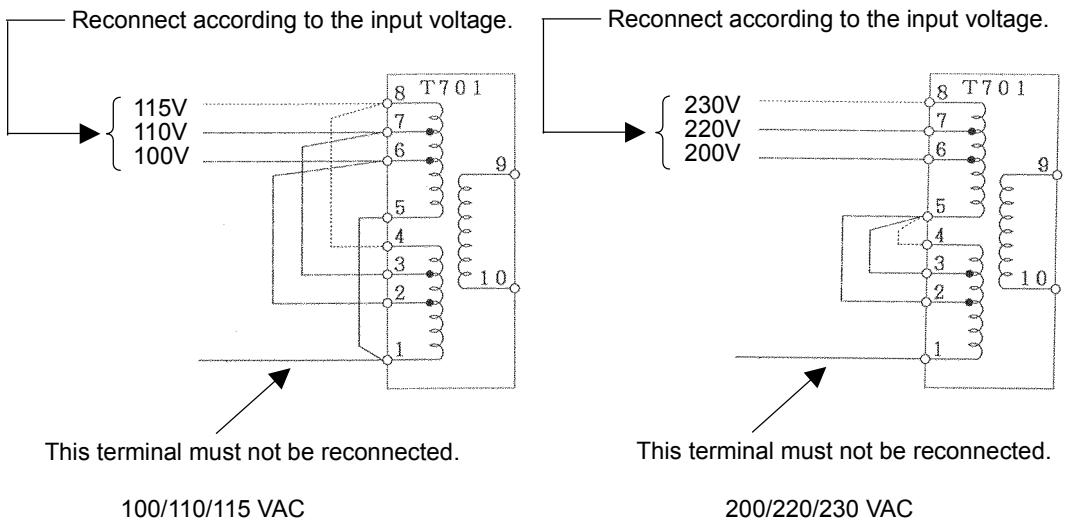
(c) If there is a difference between the range displayed on the radar's PPI screen and the actual range, adjust the range from the "DISPLAY TIMING" menu.

(d) The "BUZZER" menu can be used to adjust the volume of the alarming buzzer.

(e) The "STC PRESET" menu can be used to adjust the STC.

9.6.4 Rectifier unit

● The rectifier unit can run on inboard voltages of 100/110/115 VAC and 200/220/230 VAC provided that connections at the input terminals on the NBA-797A T701 are changed. The figures below show how to change the connections at the input terminals.



[Reconnecting the NBA-797A input terminals]

9.7 Adjustment Procedures

9.7.1 General adjustments

1. Adjustments to be made when a part is replaced

Adjustments need to be performed when major parts of the radar unit. are replaced.

(a) When the V101 magnetron is replaced → Tuning

(b) When the E101 front end is replaced → Tuning

(c) When the V901 Cathod-ray tube is replaced* → Off center adjustment
When the CRT monitor PCB is replaced → Brilliance level adjustment
→ Focus adjustment

*: When exchanging V901 (CRT), the Direction coil implement in the stuck condition. Incidentally, It is possible to arrange in cathode-ray tube monitor chassis (CKJ-159)

2. CRT monitor off center adjustment

(a) This adjustment must be performed on the centering magnet (permanent magnet) located immediately behind the deflection coil. This permanent magnet is made up of two doughnut-like disks.

(b) Turn the centering knob so that the neck of the Cathod-ray tube is in alignment with the center of the PPI screen.

3. Adjusting the brilliance level of the CRT monitor screen.

(a) Set the brilliance level of the CRT monitor screen to its maximum from the menu.

> ● Please refer to "3.2.1 Changing the brightness of the screen" for the method of adjustment.

(b) Turn potentiometer R451 on the CRT monitor PCB so that no raster appears in the non-displayable area. (Turn the potentiometer slowly since the circuit's sensitivity is very high.)

4. Adjusting the focus of the CRT monitor screen

(a) Turn potentiometer R951 on the neck PCB in the display unit so that the range rings and video images appear most clearly.

9.7.2 Adjusting the scanner unit

The scanner unit has several locations that need adjustment. They are factory set and normally need not be adjusted by the user. If it is necessary to make functional checks during inspection or repair, make the adjustments that are explained below.

⚠WARNING

Hi-voltage Caution

High-tension voltages of 4,000 volts or higher are present at the modulator units (CME-307 or CME-308). The modulator unit must be accessed only by qualified service engineers.
Inadvertent manipulation may result in severe electric shock.

1. Adjusting the AVR output voltage from the modulator

(a) Place the radar unit into the transmission state (the range scale set to 12NM), connect a VOM across J203-14PIN on the CME-307 or CME-308 and the GND terminal, and adjust RV2 so that the output voltage reads +8 volts.

2. Adjusting the tuning indicator level of the receiver

(a) If the tuning mode is set to "AUTO", reset it to "MANUAL".

(b) Tune the receiver with the range scale set to 12 NM.

9.7.3 Adjusting the display unit

The display unit has several locations that need adjustment. They are factory set and normally need not be adjusted by the user. If it is necessary to make functional checks during inspection or repair, make the adjustments that are explained below.

1. Adjusting the brilliance level

(a) Set the brilliance level of the screen to its maximum from the [BRIL] key.

(b) Turn potentiometer R451 on the CRT monitor PCB so that no raster appears in the non-displayable area. (Turn the potentiometer slowly since the circuit's sensitivity is very high.)

2. Adjusting the focus of the CRT monitor screen

(a) Turn potentiometer R951 on the neck PCB in the display unit so that the range rings and video images appear most clearly.

3. Adjusting the tilt angle of the display unit

(a) The angle of the screen can be adjusted by loosening the lock screw on the deflection coil assembly at the neck of the CRT tube and turning the entire screen. The user can also adjust the screen position using the centering magnet.

4. Adjusting the CRT display

In addition to adjustment steps 1. to 3. explained above, CRT monitor adjustments include the following:

(a)	Horizontal level adjustment	CCN-366, L400
(b)	Vertical size adjustment	CCN-366, R353 (V. SIZE)
(c)	Contrast adjustment	CCN-366, R451 (CONT)
(d)	Focus adjustment	CCN-366, R951

⚠WARNING

Hi-voltage Caution

The CRT monitor (CCN-366) generates high electric voltage about 10kV and on service personnel should touch parts inside the display.
Inadvertent manipulation may result in severe electric shock.

5. Adjusting the AVR output voltage

(a) Connect a high-precision voltmeter across pin TP1+3.3V on the CBD-1596 power supply and the chassis, adjust potentiometer +3.3ADJ so that the output voltage reads +3.3± 0.02V.

Attention

- Be sure to connect the scanner unit when making this adjustment.

9.8 Initial Settings

This section will explain the method of initial setting of the radar unit. Initial setting needs to be undertaken prior to initial use.

Initial setting includes:

(a) INITIAL SETTING 1

- Tuning preset (TUNE PRESET)
- Bearing adjustment (BEARING)
- 0 NM adjustment (DISPLAY TIMING)
- Main bang suppression level (MBS LEVEL)
- Main bang suppression range (MBS RANGE)
- Sensitivity preset (GAIN PRESET)
- Comparator preset (COMPARATOR PRESET)
- Sea surface clutter preset (STC PRESET)
- Antenna height preset (ANTENNA HEIGHT)
- GPS preset (GPS PRESET)

(b) INITIAL SETTING 2

- Setting the TD reception number (SET TD NUMBER)
- Simulator image display (SIMULATOR)

Attention

- Be sure to undertake initial setting prior to initial use.
- Unless initial setting has been undertaken, it is not possible to display the target or measure the distance or bearing of a target correctly.

- INITIAL SETTING 1, the initial setting menu that is used here, is displayed by pushing the [E N T E R] key and [M E N U] key simultaneously.

9.8.1 Adjustment of the receiver

- This adjustment need not be changed in general as the equipment is adjusted ex-factory.
- If the adjustment is changed inadvertently, it will not be possible to obtain the optimum tuning even when the TUNE control is operated.

1. Tune preset

Here, rough adjustment of the tune will be undertaken.

(a) Set the range to 12NM pushing the "▲(up)" or "▼ (down)" on the [RANGE] key.

(b) Push the soft key [PROCESS] .

(c) Push the soft key 3 and select [M−TUNE] .
The method of tuning has been set to "manual".
(If the mode is already in manual tuning, this operation is not required.)

(d) Push the [MENU] key and close the soft key menu.

(e) Push the [X−MIT／OFF] switch and wait for 10 minutes or more.
Transmission will begin.
After about 10 minutes, the transmission frequency will stabilize.

(f) Turn the [TUNE] control to the mid position.

(g) Select "TUNE PRESET" in the line "RECEIVER ADJUST" - the menu "INITIAL SETTING 1".

(h) Pushing the "▲ (up)" or "▼ (down)" on the [RANGE] key, adjust so that the PPI image becomes the maximum size.

(i) Push the [ENTER] key.
The adjustment has been completed.

2. Adjusting the central frequency

Adjustment is undertaken so that the image is largest when the deflection of the tune level indicator is at the maximum.

(a) Undertake operations (a) through (e) of "1.Tune Preset".

(b) Adjust the image to the maximum using the [TUNE] control.

(c) Select "TUNE FREQUENCY" in the line "RECEIVER ADJUST" - the menu "INITIAL SETTING 1".

(d) Adjust to maximize the deflection of the tune level indicator pushing the "▲ (up)" or "▼ (down)" on the [RANGE] key.

(e) Push the [ENTER] key.
The adjustment has been completed.

3. Adjusting the level of the tune level indicator

Adjust the scale to correspond to the maximum deflection of the tune level indicator bar.

(a) Undertake operations (a) through (e) of "1.Tune Preset".

(b) Using the [TUNE] control, adjust to maximize the deflection of the tune level indicator.

(c) Select "TUNE LEVEL IND" in the line "RECEIVER ADJUST" - the menu "INITIAL SETTING 1".

(d) Adjust so that the deflection of the tune level indicator is 80% to 90% of the indicator area pushing the "▲ (up)" or "▼ (down)" on the [RANGE] key.

(e) Push the [ENTER] key.
The adjustment has been completed.

9.8.2 Adjusting the noise level

This operation adjusts the basic level of the echo that is displayed on the PPI screen.

Attention

- This adjustment need not be changed in general as the equipment is adjusted ex factory.
- If the adjustment is changed inadvertently, it will not be possible to obtain optimum images as a phenomenon causing reduction in sensitivity may be generated.

(a) Select "COMPARATOR PRESET" in the menu "INITIAL SETTING 1".

(b) Adjust the noise level pushing the "▲ (up)" or "▼ (down)" on the RANGE key.

(c) Push the ENTER key.
The noise level adjustment has been completed.

9.8.3 Adjusting the bearing

This operation adjusts the bearing on the PPI screen.

(a) Select "RM" in the line "TM/RM" - the menu "FUNCTION".
If the mode is already in RM, this operation is not required.

(b) Select "H-UP" in the line "HDG MODE" - the menu "FUNCTION".
If the mode is already in H-UP, this operation is not required.

(c) Determine the target.
Select an image of a target within 1NM to 2NM that can be seen with the naked eye and that is not moving.

(d) Measure the bearing of the target from the ship's bow using the ship's compass.
For example, assume the target is stationary at a bearing of 25 degrees from the ship's bow.

(e) Select "BEARING" in the menu "INITIAL SETTING 1".
The EBL for bearing adjustment will be displayed.
This EBL is different from #1EBL or #2EBL.

(f) Push the cross key, and align the EBL to the image of target's echo.

(g) Push the ENTER key.

(h) Using the cross key, align the EBL to the bearing of the target measured in (d).
The PPI screen also rotates with the EBL.

(i) Push the ENTER key.
The bearing adjustment has been completed.

9.8.4 0 NM adjustment (Initial setting of distance)

This operation is for calibrating distance on the PPL screen.

(a) Select "RM" in the line "TM/RM" - the menu "FUNCTION".
If the mode is already in RM, this operation is not required.

(b) Select "H-UP" in the line "HDG MODE" - the menu "FUNCTION".
If the mode is already in H-UP, this operation is not required.

(c) Adjust the range to 0.125NM pushing the "▲ (up)" or "▼ (down)" on the RANGE key.

(d) Determine the target.
Select a target from among echo image on the PPI with respect to which the distance from the ship is known.
In this case, it is assumed that a stationary target 0.08NM from the ship has been selected.

(e) Push the VRM key.
#1VRM/#2VRM will be displayed.
In the event #1VRM is to be used, select "FIX" in the line "EBL1/VRM1" - the menu "FUNCTION".

(f) Using the up and down functions of the cross key, adjust the VRM to the distance to the target.
Adjust to the actual distance to the target.

(g) Push the ENTER key.

(h) Select "DISPLAY TUNING" in the menu "INITIAL SETTING 1".

(i) Adjust the proximate perimeter of the target to the distance to the VRM pushing the "▲ (up)" or "▼ (down)" on the RANGE key.

(j) Push the ENTER key.
The 0 NM adjustment has been completed.

Reference: When there is no target with known distance from the ship.

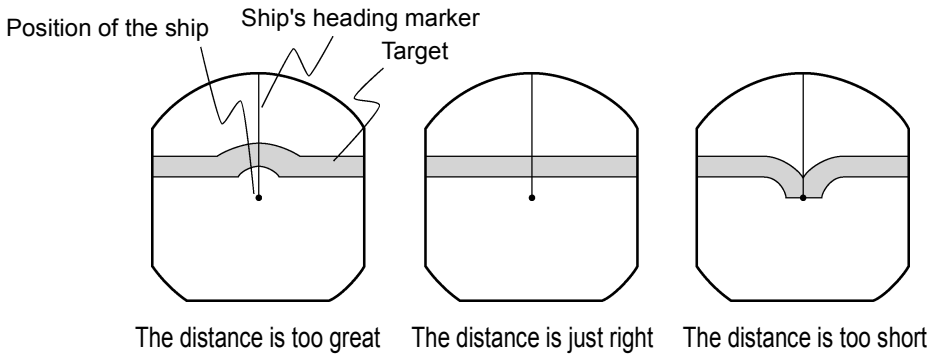
If there is no target with known distance from the ship, it is possible to undertake 0 NM adjustment using the following simplified method.

(A) Steps (a) through (c) are the same as with a target of known distance.

(B) Select a target that represents a long linear line such as the shoreline or embankment.

(C) Same as in (h) with a target of known distance.

(D) Adjust so that the target becomes a straight line on the PPI screen pushing the "▲ (up)" or "▼ (down)" on the RANGE key.



(E) Push the ENTER key.
The 0 NM adjustment has been completed.

9.8.5 Setting the antenna height

This operation sets the height of the antenna from the sea surface.

(a) Select "ANTENNA HEIGHT" in the menu "INITIAL SETTING 1".

(b) Select the height of the radar antenna among "UNDER 5m", "5m TO 10m", and "MORE THAN 10m".

9.8.6 Presetting the sensitivity

This operation sets the maximum sensitivity when [GAIN] control is turned.
This adjustment should not be undertaken without reason.
When undertaking this adjustment, also undertake "9.8.2. Adjustment of the Noise Level".

(a) Push the soft key [D I S P L A Y] .

(b) Push the soft key 1 and select [E X P O F F] .

(c) Turn the [RAIN] control to the minimum (turn to maximum counterclockwise).

(d) Turn the [SEA] control to the minimum (turn to maximum counterclockwise).

(e) Turn the [GAIN] control to the maximum (turn to maximum clockwise).
This maximizes the strength of the echo on the PPI screen.

(f) Select "GAIN PRESET" in the menu "INITIAL SETTING 1".

(g) Adjust the sensitivity level pushing the "▲ (up)" or "▼ (down)" on the [R A N G E] key.

(h) Push the [E N T E R] key.
The maximum level of gain has been set.

9.8.7 Presetting the sea clutter

This operation sets the maximum level of suppression when the [SEA] control is turned.
This adjustment should not be undertaken without reason.

(a) Set the range to 0.125NM pushing the "▼ (down)" on the [R A N G E] key.

(b) Undertake tuning adjustment using the [TUNE] control.

(c) Push the soft key [D I S P L A Y] .

(d) Push the soft key 1 and select [EXP OFF] .

(e) Turn the [GAIN] control to the maximum (turn to maximum clockwise).

(f) Turn the [RAIN] control to the minimum (turn to maximum counterclockwise).

(g) Turn the [SEA] control to the maximum (turn to maximum clockwise).
The strength of the echo on the PPI screen is maximized with sea surface clutter suppression maximized.

(h) Select "STC PRESET" in the menu "INITIAL SETTING 1".

(i) Adjust the level of suppression pushing the "▲ (up)" or "▼ (down)" on the [RANGE] key.
The PPI screen near the center adjusts to the grade projected slightly.

(j) Push the [ENTER] key.
Suppression of sea surface clutter has been set at the maximum level.

9.8.8 Suppression of main bang

This adjustment is undertaken to suppress main bang that is the reflected signal from three dimensional circuits such as the wave guide that normally appears at the center of the radar display as a circle.

Optimum adjustment is achieved when the main bang image remains lightly on the screen.

Attention

- This adjustment should not be undertaken without reason. Erroneous adjustment may cause targets that are proximate to be erased from the screen.

(a) Set the range to 0.125NM pushing the "▼ (down)" on the the [RANGE] key.

(b) Select "OFF" in the line "PROCESS" - the menu "FUNCTION".

(c) Push the soft key [DISPLAY] .

(d) Push the soft key 1 and select [EXP OFF] .

(e) Push the the soft key [PROCESS] .

(f) Push the soft key 1 and select [AUTO OFF] .

(g) Turn the [GAIN] control to the maximum (turn to maximum clockwise).

(h) Turn the [SEA] control to the mid position.

(i) Turn the [RAIN] control to the minimum (turn to maximum counterclockwise).

(j) Select "MBS LEVEL" in the menu "INITIAL SETTING 1".

(k) Adjust the suppression level pushing the "▲ (up)" or "▼ (down)" on the [RANGE] key.

(l) Push the [ENTER] key.
The suppression level of the main bang has been determined.

(m) Select "MBS RANGE" in the menu "INITIAL SETTING 1".

(n) Adjust the suppression range pushing the "▲ (up)" or "▼ (down)" on the [RANGE] key.

(o) Push the [ENTER] key.
Adjustment of the suppression range of the main bang has been completed.

9.8.9 Display of simulator image

By activating this function, it is possible to display a demonstration screen on the PPI screen.

● To make the setting of this function effective, the power must be once switched off.

(a) Push the [STBY／OFF] key.
The display will enter the standby mode.

(b) Select "INITIAL SETTING 2" in the menu "INITIAL SETTING 1".

(c) Select "ON" in the line "SIMULATOR" - the menu "INITIAL SETTING 2".

9.8.10 Setting the TD reception number

This operation is for selecting the number of the TD (LORAN C time difference) to be received.

(a) Select "INITIAL SETTING 2" in the menu "INITIAL SETTING 1".

(b) Move the cursor to the extent of the value shown in the "SET TB NUMBER" - the menu "INITIAL SETTING 2".

(c) Move the location for input by operating the left and right keys of the cross key.

(d) Select the TD number to be received pushing the "▲ (up)" or "▲ (down)" on the RANGE key.

When the numbers are selected, the following field data of NMEA is displayed.

1: TD1 field of the GTD/GLC sentence.
2: TD2 field of the GTD/GLC sentence.
3: TD3 field of the GTD/GLC sentence.
4: TD4 field of the GTD/GLC sentence.
5: TD5 field of the GTD/GLC sentence.
A: A field of the RMA sentence
B: B field of the RMA sentence

9.8.11 GPS/DGPS

1. Initial setting of GPS

This operation is for undertaking initial setting of GPS. The GPS receiver measures position without initial setting but 10 or more minutes may be required after initial setting.

● Content of settings

Ship position	:	Approximate latitude and longitude is sufficient
Exclusion satellite	:	When unhealth satellite is used, precision may deteriorate. The satellite number input here is not used for measuring the position.
Geodetic system	:	Japan is "02"
Antenna height	:	Input the height of the antenna from the sea surface.
Fix mode	:	Since the height of the antenna is fix in the case of an ocean going vessel, greater stability in position is obtained in 2D (two dimensions).
DOP level	:	If only position results with high precision are intended to be used, designate 10 or less or 5 or less.
Position average	:	When variance in position needs to be minimized, select [LONG]. When response needs to be maximized select [NONE]. However, with this latter setting, variance will increase.

(a) Select "GPS" in the line "GPS PRESET" - the menu "INITIAL SETTING 1".
The menu "GPS" will be displayed.

(b) Select the items in the cross key and change the set value using the [RANGE] key.
In order to change the ship's "N/S" or "E/W" position using the left and right keys of the cross key.

(c) Push the [ENTER] key.
The setting has been determined.

(d) Select "SEND DATA" in the menu "GPS".
The GPS setting will be implemented.

2. Initial setting of DGPS

In the event high precision position determination is intended using DGPS, it is necessary to set the beacon receiver.

● Setting mode

MANUAL : This operation sets the frequency and baud rate of the beacon receiver. This allows receipt of DGPS at an early stage but receipt is not possible unless the ship is in the beacon receipt area that is set.

AUTO : Automatic search of the beacon transmission station is undertaken for receipt. Time is required for this search.

(a) Select "DGPS" in the line "GPS PRESET" - the menu "INITIAL SETTING 1".
The menu "DGPS PRESET" will appear.

(b) Select the items in the cross key and change the set value using the [RANGE] key.
Changing "N/S" and "E/W" of the ship's position is also set pushing the "▲ (up)" or "▼ (down)" on the [RANGE] key.

(c) Push the [ENTER] key.
The setting has been determined.

(d) Select "SEND DATA" in the menu "DGPS PRESET".
The DGPS setting will be implemented.

3. Status of reception of GPS and DGPS

This operation displays the status of reception of the GPS receiver and DGPS receiver.

(a) Select "CONDITION" in the line "GPS PRESET" - the menu "INITIAL SETTING 1".
The status of reception of the GPS receiver and DGPS receiver will be displayed.

The display of the reception status of GPS will display the conditions of the following items only when the sensor type receiver such as JLR-4310 is connected and operating normally.

● Items

Ship position : When the ship's position is determined, the latitude and longitude of the position will be displayed.

GPS internal time : The world time as measured by the GPS receiver will be displayed.

Altitude : The altitude of the ship will be displayed. However, when the fix mode is 2D (two dimension), the height of the antenna that was input at initial setting will be displayed.

DOP : The precision of the results of the measurement will be displayed. If the value is 20 or above, the precision is poor.

Reception satellite : The number of the satellite used for the measurement will be displayed.

Bearing, elevation angle : The bearing and elevation angle of the satellite will be displayed.

Signal strength : The strength of the signal of the satellite from which signals are being received will be displayed. If the value is 20 or less, the satellite may not be usable for measurements.

The following items will be displayed only when a beacon receiver is connected and operating normally.

● Items

Frequency : The frequency of the beacon station from which signals are being received will be displayed.

Baud rate : The baud rate of the beacon station from which signals are being received will be displayed.

RSSI : The reception strength of the beacon station from which signals are being received will be displayed. If the value is 100 or less, the beacon may be not possible to receive signals.

List of Geodetic Systems

No.	Name
0	WGS-84
1	WGS-72
2	Japan
3	North American 1927 (U.S)
4	North American 1927 (Canada & Alaska)
5	European 1950 (Europe)
6	Australian geodetic 1966 (Australia)
7	Ordance Survery of Great Britain (England)
8	NAD-83
9	－ (no use)
10	－ (no use)
11	ADINDAN (Etiopia & Sudan)
12	ARC 1950 (Botswana)
13	AUSTRALIAN GEODETIC 1984 (Australia)
14	BERMUDA 1957 (the Bermudas)
15	BOGOTA　OBSERVATORY (Columbia)
16	CAMPO INCHAUSPE
17	CHATHAM 1971
18	CHUA ASTRO (Paraguay)
19	CORREGO ALEGRE (Brazil)
20	DJAKARTA (VATAVIA) (Sumata)
21	EUROPEAN 1979 (Europe)
22	GEODETIC DATUM 1949 (New Zealand)
23	GUAM 1963 (Guam)
24	HAYFORD 1910 (Finland)
25	HJORSEY 1955 (Ice land)
26	INDIAN (India & Nepal)
27	IRELAND
28	KERTAU 1948 (West Malaysia)
29	L.C.5 ASTRO (Cayman Black Island)
30	LIBERIA 1964 (Liberia)
31	LUZON (Philippines)
32	MERCHICH (Morocco)
33	MINNA (Cameroon)

34	NAHRWAN (Oman)
35	NAPARIMA, BWI (Trinidad and Tobago)
36	OLD EGYPTIAN (egypt)
37	OLD HAWAIIAN (the Hawaii Island)
38	PICO DE LAS NIEVES (the Canary Island)
39	PROVISIONAL SOUTH AMERICAN 1956 (South America)
40	PROVISIONAL SOUTH CHILEAN 1963 (Southern Chile)
41	PUETRO RICO (Puerto Rico and V irgin Island)
42	QORNOQ (South Greenland)
43	RT90 (Sweden)
44	SANTA BRAZ (Sao Maguel, Santa Maria Island)
45	SOUTH AMERICAN 1969 (South America)
46	SOUTHWEST BASE (Faial,Graciosa,Pico,Jorge and terceira Island)
47	TIMBALAI 1948 (Brunei and East Malaysia)

9.9 Returning to the Initial Setting Conditions

In the event such phenomena as the distorted screen or the keys becoming inoperable occurs while the radar is in use, the following procedures shall be taken to initialize the system.

Attention

- When initialization is undertaken, all setting excluding the menu "INITIAL SETTING 1" and "INITIAL SETTING 2" will be reset to the ex-factory shipment conditions.

(a) Push the [STBY／OFF] key and [X－MIT／OFF] key simultaneously.
Power is turned off.

(b) Push the [MENU] key, [ENTER] key and [STBY／OFF] key simultaneously.
Power will be turned on as in normal operation for turning on power.

9.10 Maintenance

9.10.1 General maintenance

It is necessary to perform the maintenance services listed below to keep the radar unit in good working conditions. Proper maintenance of the radar unit minimizes the possibility of machine failures. The maintenance operations that are common to all components of the radar unit are listed below.

1. Cleaning

Remove dirt, dust, or water-spray from the radar unit enclosure and keep it as clean as possible. Use a dry lint-free cloth.

2. Screw inspection

Check the screws used to assemble and secure the components of the radar unit for loose connection.

3. Cabling check

Check the cables connecting between the components (between the scanner unit and display unit, display unit and power supply, and display unit and optional devices) for poor connection.

⚠WARNING

Before starting maintenance work, be sure to turn off the main power source. If a rectifier unit is used, in particular, turn off power to the display unit. Note that voltages from the rectifier unit are always present even if the radar is stopped. It may result in sereve electric shock or breakdown.

9.10.2 Scanner unit

⚠WARNING

When performing maintenance or inspection of the scanner unit, be sure to shut off the safety switch of the scanner unit after turning off the power of the display unit. Failure to do this may cause severe electric shock or breakdown or the sudden movement of the scanner unit may cause bodily injury or breakdown.

⚠CAUTION

Since the magnetron in the modulator circuit emits strong magnetism, watches or magnetic cards should not be brought into close proximity of the modulator circuit. Doing so may cause breakdown and destruction of data contained in such items.

1. Radiation unit

(a) A radiation surface of radiation unit (JMA-2343: Whole surface of the radome cover / JMA-2344: Front side of radiation unit) contaminated by smoke, dust, or paint would cause attenuation or reflections of radio waves, resulting in reduced radar performance. Periodically check the radome scanner unit. If it proves dirty, wipe the radome surface with a soft lint-free cloth moistened with alcohol or damped cloth.

⚠CAUTION

Never use such solvent as Thinner, Gasoline, Benzen, Trichlene or Kentene for cleaning. Those solvents deteriorate the surface.

2. Rotary drive block (JMA-2344)

(a) Lubricating gears

Apply grease to gears evenly using a knife or brush. This lubrication needs to be performed at least semiannually. The shorter the lubrication period, the longer the gears will endure.

Use Mobilux 2 from Mobile Oil Co., Ltd. or equivalent.

(b) Drive motor (JMA-2344)

(α) Reduction gears

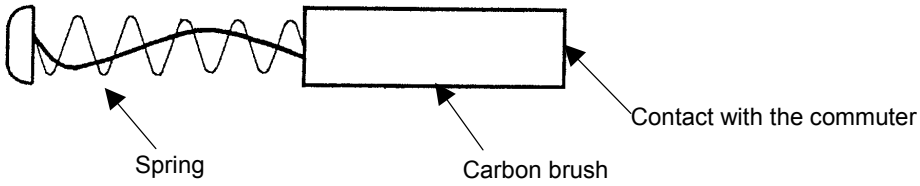
The reduction gears need no lubrication unless it is subject to oil leakage. If they are disassembled for overhaul, replenish lubricant "Beacon 325" from Esso Standard.

(β) Motor

The life time of the brush unit is 2,000 hours. The brush needs to be replaced if 1/2 of the overall length is worn.

The commuter needs to be kept clean. If any carbon power fixed on the commuter cannot be removed with a dry cloth, burnish it with a sand paper # 150 to #400.

The carbon brush can be removed by removing the caps located on both sides of the bottom portion of the motor.



Description	Type	JRC code	Quantity
Carbon Brush	54531-01	BRXP05247	2

(c) Pedestal

Check the scanner unit mounting molts occasionally and apply paint semiannually to protect them from corrosion.

9.10.3 Display unit

Cleaning the Display Unit Screen

- Dust on the CRT tube would reduce the glass transparency and make the vide image dim. Wipe the screen surface with a soft lint-free cloth (made of flannel or cotton). A cloth moistened with an antistatic agent would cause little problem. When using it, wipe softly; never rub the screen surface with force.