

# **KR-1XX8**

## **OPERATOR'S MANUAL**

**For KR-1238, KR-1268, KR-1538, KR-1568**

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***TFT LCD COLOR MARINE RADAR***





# SAFETY INSTRUCTIONS

**"DANGER", "WARNING" and "CAUTION" notices throughout this manual. It is the responsibility of the operator and the installer of the equipment to read, understand and follows these notices. If you have any questions regarding these safety instructions, please contact a ONWA agent or dealer.**

## WARNING



**Do not open the equipment.**

Hazardous voltage which can cause electrical shock, burn or serious injury exists inside the equipment. Only qualified personnel should work inside the equipment.



**Wear a safety belt and hard hat when working on the antenna unit.**

Serious injury or death can result if someone falls from the radar antenna mast.



**Stay away from transmitting antenna.**

The radar antenna emits microwave radiation which can be harmful to the human body, particularly the eyes. Never look directly into the antenna radiator from a distance of less than 1 m when the radar is in operation.



**Turn off the radar power switch before servicing the antenna unit. Post a warning sign near the switch indicating it should not be turned on while the antenna unit is being serviced.**

Prevent the potential risk of someone begin struck by the rotating antenna and exposure to the RF radiation hazard.

**Do not disassemble or modify the equipment.**

Fire electrical shock or serious injury can result.

**Turn off the power immediately if water leaks into the equipment or the equipment is emitting smoke or fire.**

Continued use of the equipment can cause fire or electrical shock.

**Do not place liquid-filled containers on the top of the equipment.**

Fire or electrical shock can result if a liquid spills into the equipment.

# CAUTION

**Use the proper fuse.**

Use of a wrong fuse can result in fire or permanent equipment damage.

**Do not use the equipment for other than its intended purpose.**

Personal injury can result if the equipment is used as a chair or stepping stool, for example.

**Do not place objects on the top of the equipment.**

The equipment can overheat or personal injury can result if the object falls.

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# FOREWORD

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Thank you for your choice of ONWA MODEL KR-12X8/15X8 Marine Radar. The radar is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless properly installed and maintained. Please carefully read and follow the recommended procedures for installation, operation and maintenance. While this unit can be installed by the purchaser, any purchaser who has doubts about his or her technical abilities may wish to have the unit installed by a ONWA representative or other qualified technician. The importance of a through installation can not be overemphasized. We would appreciate hearing from you, the enduser, about whether we are achieving our purposes. Thank you for considering and Purchasing ONWA equipment.

## Features

Your radar has a large variety of functions, all contained in a remarkably small cabinet. The main features of the MODEL KR-12X8/15X8 are.

- Traditional ONWA reliability and quality in a compact, lightweight and low-cost radar.
- Durable brushless antenna motor.
- On-screen alphanumeric readout of all operational information.
- Standard features include EBL (Electronic Bearing Line), VRM (Variable Range Marker), Guard Alarm, Display Off Center, and Echo Trail.
- Watchman feature periodically transmits the radar to check for radar targets which may be entering the alarm zone.
- Ship's position in latitude and longitude and range and bearing to waypoint, and ship's speed/ heading/course can be shown in the right hand side text area. (Requires a navigation aid which can output such data in IEC61162 format.)
- Zoom feature provided.

# KR-1238/1538 SPECIFICATION

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## ANTENNA UNIT

1. Radiator: Slotted waveguide array
2. Radiator length: 55 cm
3. Horizontal beamwidth: 4°
4. Vertical beamwidth: 25°
5. Sidelobe:  
    Within  $\pm 20^\circ$  off mainlobe; less than -18 dB  
    Outside  $\pm 20^\circ$  off mainlobe; less than -23 dB
6. Polarization: Horizontal
7. Antenna rotation speed: 24 rpm ( $\pm 2$ )
8. Wind resistance: Relative wind speed 100 knots (51.5 m/s)

## TRANSCEIVER MODULE (contained in radome)

1. Transmitting tube: MSF1421B or MAF1421B
2. Frequency: 9410 MHz  $\pm$  30MHz
3. Peak output power: 4kW nominal
4. Pulselength & pulse repetition rate:  
    0.08  $\mu$  S, 2100 Hz (0.125, 0.25, 0.5, 0.75, 1.5nm)  
    0.3  $\mu$  S, 1200 Hz (1.5, 2, 3nm)  
    0.8  $\mu$  S, 600 Hz (3, 4, 6, 8, 12, 16, 24, 36nm)
5. Warm up time: 1:30 minutes
6. Modulator: FET switching method
7. I.F.: 60MHz
8. Tuning: Automatic or manual
9. Receiver front end: MIC (Microwave IC)
10. Bandwidth:  
    Tx pulselength 0.3  $\mu$  S and 0.08  $\mu$  S: 25MHz  
    Tx pulselength 0.8  $\mu$  S: 3MHz
11. Duplexer: Circulator with diode limiter



## DISPLAY UNIT

1. Indication system: LCD digital display
2. Display: 12" or 15" LED backlight, 32-bit TFT Color LCD Display
3. Range scale (nm):  
Range, Range interval and no. of Rings:  
0.125(0.0625,2), 0.25(0.125,2), 0.5(0.125,4), 0.75(0.25,3), 1(0.25,4), 1.5(0.25,6),  
2(0.5,4), 3(0.5,6), 4(1,4), 6(1,6), 8(2,4), 12(2,6), 16(4,4), 24(4,6), 36(6,6)
4. Bearing resolution: 4°
5. Bearing accuracy: Within 1°
6. Range discrimination: Better than 30 m
7. Range ring accuracy: 0.9% or range in use or 8 m, whichever is larger
8. Minimum range: Better than 25 m
9. Markers:  
Heading line, Bearing scale, Range ring, VRM, EBL Tuning indicator,  
Cursor, Alarm zone, North mark (heading sensor input required)
10. Alphanumeric indication:  
Range, Range ring interval, Pulselength, Interference rejection (IR), VRM,  
EBL, Stand-by (ST-BY), Radar alarm, Echo stretch (ES), Range to cursor,  
Bearing to cursor, Echo trailing (TRAIL), Trail time, Trail elapsed time,  
Navigation data (navigation input required), heading (HDG, heading sensor  
input required)
11. Vibration:  
Vibration Total amplitude:  
1 to 12.5 Hz  $\pm$  1.6mm  
12.5 to 25 Hz  $\pm$  0.38mm  
25 to 30 Hz  $\pm$  0.10mm
12. Temperature:  
Antenna unit; -25°C to + 70°C  
Display unit; -10°C to + 50°C
13. Humidity:  
Relative humidity 93% or less at + 40°C
14. Power supply & power consumption : 12V, 24V or 32VDC (10.5V to 40  
VDC) 60W
15. Compass safe distance:

	Standard Compass	Steering Compass
Antenna unit	130cm	95cm
Display unit	75cm	60m

# KR-1268/1568 SPECIFICATION

## ANTENNA UNIT

1. Radiator: Slotted waveguide array
2. Radiator length: 120 cm
3. Horizontal beamwidth: 1.9°
4. Vertical beamwidth: 22°
5. Sidelobe:  
Within  $\pm 20^\circ$  off mainlobe; less than -24 dB  
Outside  $\pm 20^\circ$  off mainlobe; less than -30 dB
6. Polarization: Horizontal
7. Antenna rotation speed: 24 rpm
8. Wind resistance: Relative wind speed 100 knots(51.5 m/s)

## TRANSCEIVER MODULE (contained in antenna)

1. Transmitting tube: MAF1422 or MSF1422
2. Peak output power: 6KW nominal
3. Pulselength & pulse repetition rate:  
0.08  $\mu$  S, 2100 Hz (0.125, 0.25, 0.5, 0.75, 1.5nm)  
0.3  $\mu$  S, 1200 Hz (1.5, 2, 3nm)  
0.8  $\mu$  S, 600 Hz (3, 4, 6, 8, 12, 16, 24, 36, 48, 64, 72nm)
4. Bandwidth:  
Tx pulselength 0.3  $\mu$  S and 0.08  $\mu$  S: 25MHz  
Tx pulselength 0.8  $\mu$  S: 3MHz
5. Other: See KR-1238/1538

## DISPLAY UNIT

1. Range scale (nm):  
Range, Range interval and no. of Rings:  
0.125(0.0625,2), 0.25(0.125,2), 0.75(0.25,3), 1(0.25,4), 1.5(0.25,6), 2(0.5,4),  
3(0.5,6), 4(1,4), 6(1,6), 8(2,4), 12(2,6), 16(4,4), 24(4,6), 36(6,6), 48(8,6),  
64(16,4), 72 (12, 6)

2. Compass safe distance:

	Standard Compass	Steering Compass
Antenna unit	130cm	95cm
Display unit	75cm	60cm
Performance Monitor	60cm	35cm

3. Power supply & power consumption: 12V, 24V or 32VDC (10.5V to 40VDC) 60W.

# **INTERFACE IEC61162(NMEA0183)**

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## **Input data sentences:**

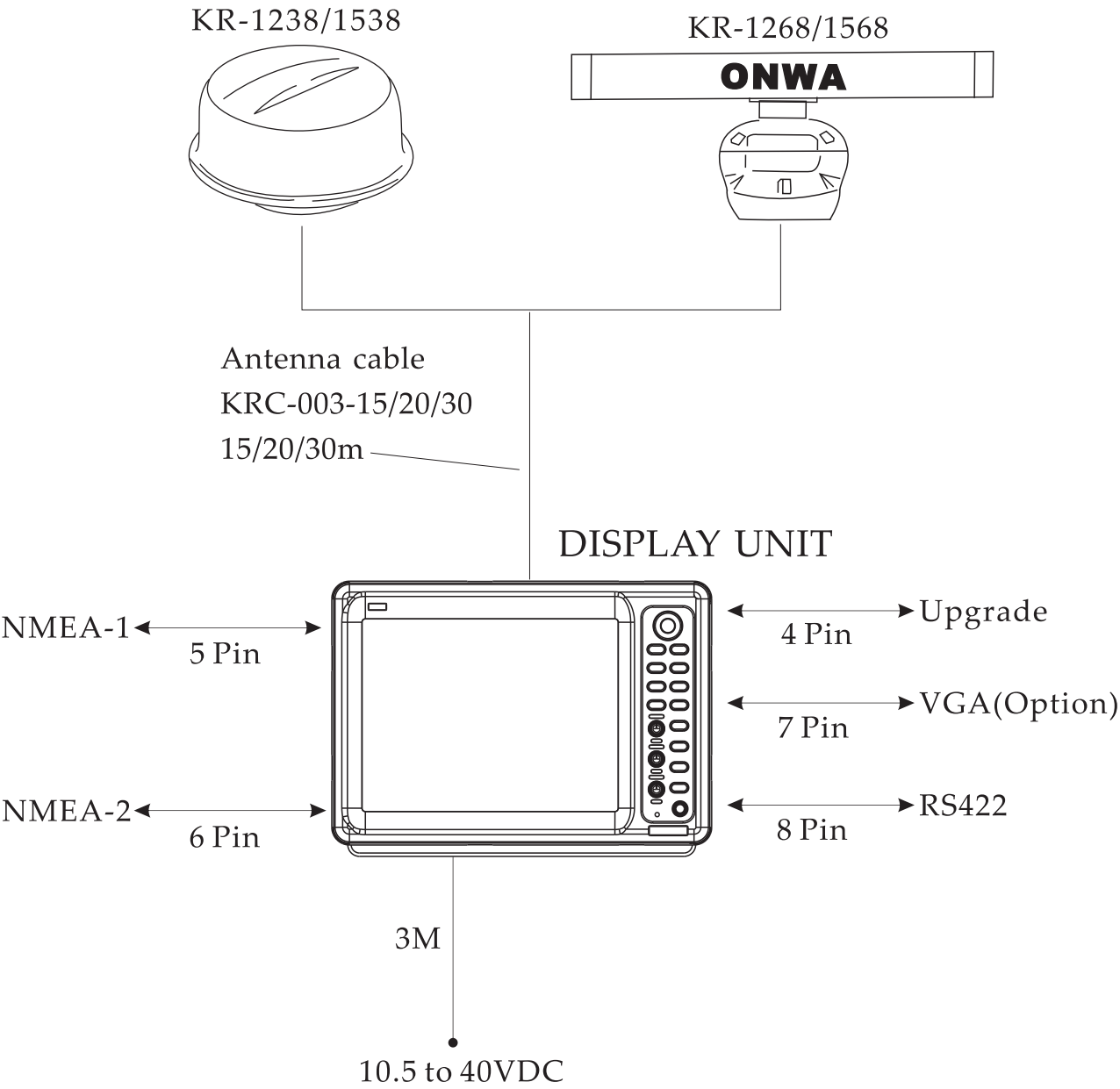
Own ship's position:	GGA>RMA>RMC>GLL
Speed:	RMA>RMC>VTG>VHW
Heading (True):	HDT>HDG*>HDM*>VHW*
Course (True):	RMA>RMC>VTG
Course (Magnetic):	VTG>RMA*>RMC
Waypoint (Range, Bearing):	RMB>BWC>BWR
Loran time difference:	RMA>GLC>GTD
Water depth:	DPT>DBT
Water temperature:	MDA>MTW
XTE:	RMB>XTE>APB
*: Calculated value based Magnetic variation.	
AIS:	VDO>VDM>ACA>ACS>ALR>ACK

## **Output data sentences:**

Own ship data:	OSD
Radar system data:	RSD
Target label:	TLB
Target latitude and longitude:	TLL
Tracked target data:	TTD
Tracked target message:	TTM

# CONFIGURATION OF KR-1238/1268/1538/1568

## ANTENNA UNIT



# 1. PRINCIPLE OF OPERATION

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## 1.1 What is Radar?

The term "RADAR" is an acronym meaning "RAdio Detection And Ranging". Although the basic principles of radar were developed during World War II, echoes as an aid to navigation is not a new development.

## 1.2 How Ships Determined Position Before Radar

Before the invention of radar, when running in fog near a rugged shoreline, ships would sound a short blast on their whistles, fire a shot, or strike a bell. The time between the origination of the sound and the returning of the echo indicated how far the ship was from the cliffs or the shore. The direction from which the echo was heard indicated the relative bearing of the shore.

## 1.3 How Radar Determines Range

Radar determines the distance to the target by calculating the time difference between the transmission of a radar signal and the reception of the reflected echo. It is a known fact that radar waves travel at a nearly constant speed of 162,000 nautical miles per second. Therefore the time required for a transmitted signal to travel to the target and return as an echo to the source is a measure of the distance to the target. Note that the echo makes a complete round trip, but only half the time of travel is needed to determine the one-way distance to the target. This radar automatically takes this into account it making the range calculation.

## 1.4 How Radar Determines Bearing

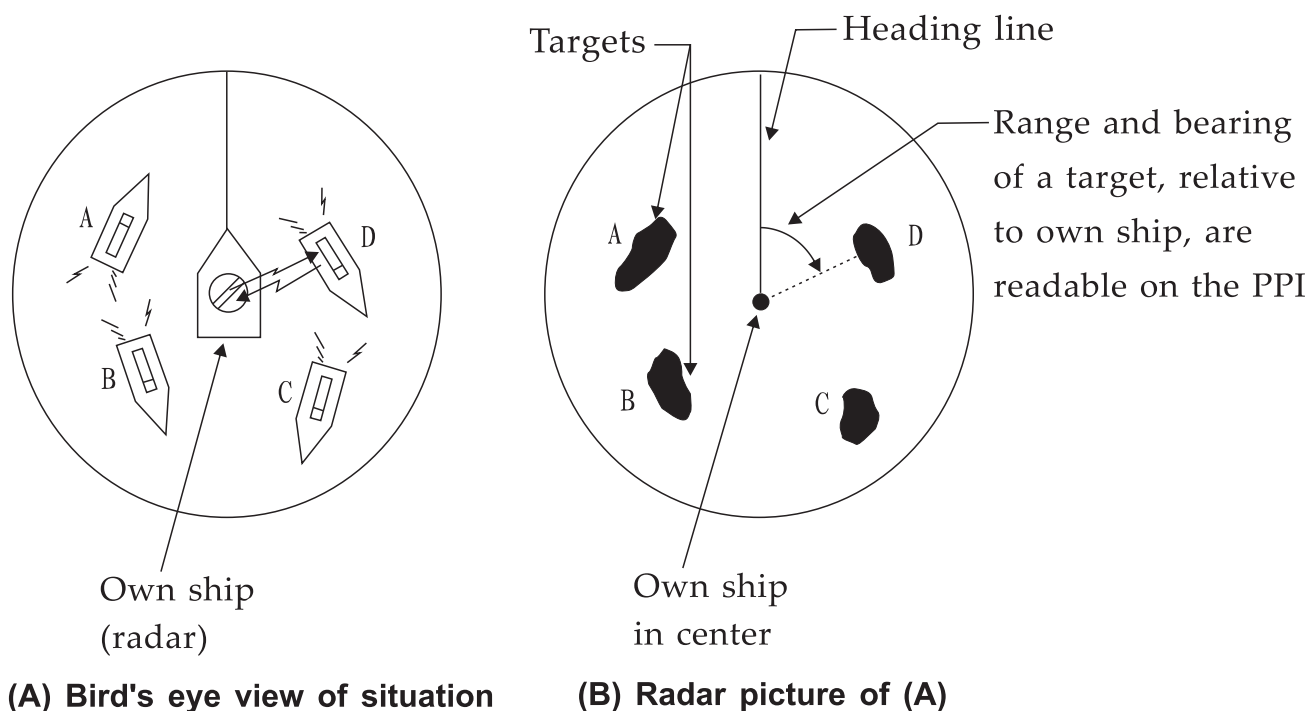
The bearing to a target found by the radar is determined by the direction in which the radar scanner antenna is pointing when it emits an electronic pulse and then receives a returning echo. Each time the scanner rotates pulses are transmitted in the full 360 degree circle, each pulse at a slightly different bearing from the previous one. Therefore, if one knows the direction in which the signal is sent out, one knows the direction from which the echo must return.

## 1.5 Radar Wave Speed and Antenna Rotation Speed

Note that the speed of the radar waves out to the target and back again as echoes is extremely fast compared to the speed of rotation of the antenna. By the time radar echoes have returned to the scanner, the amount of scanner rotation after initial transmitting of the radar pulse is extremely small.

## 1.6 The Radar Display

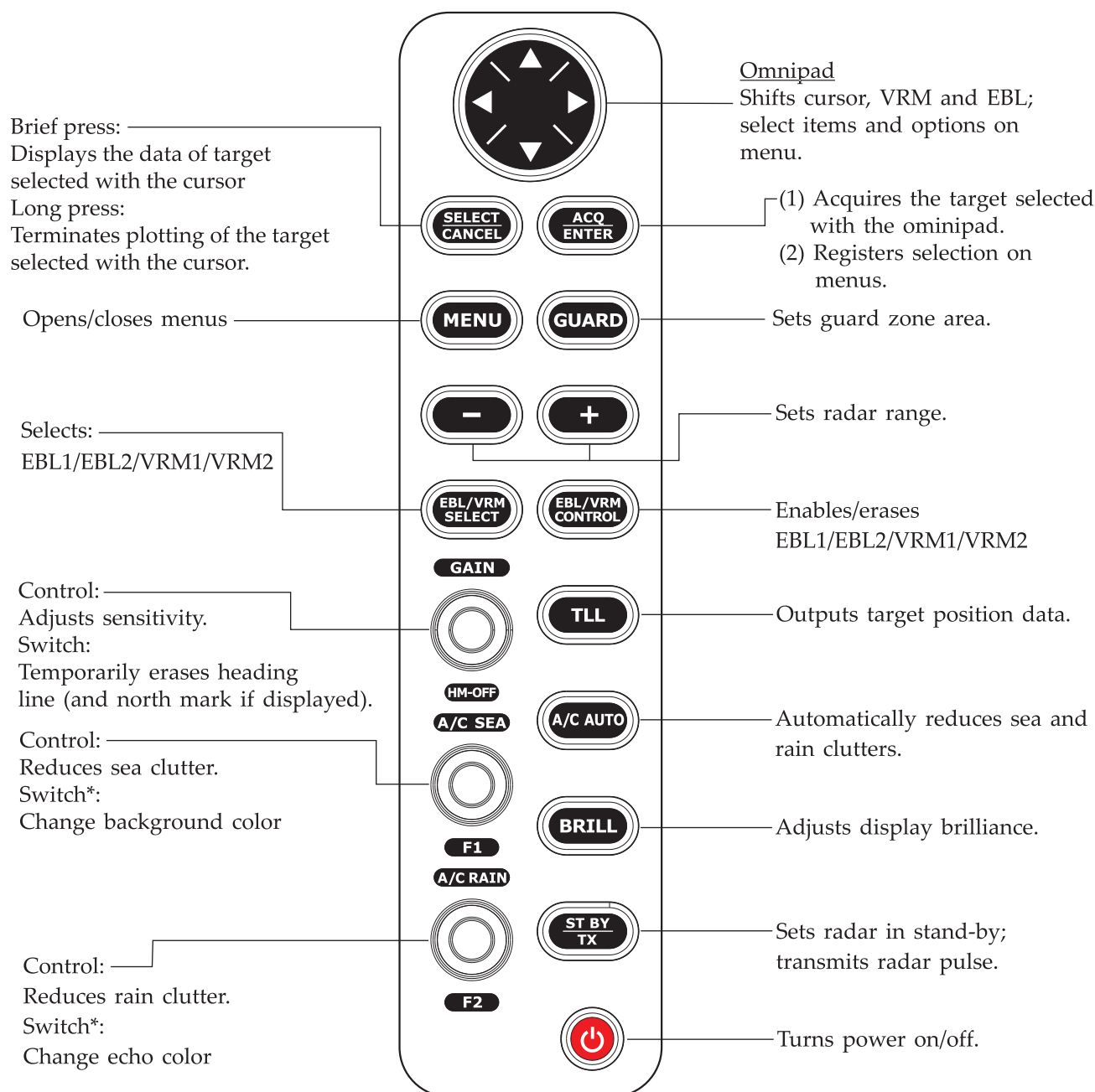
The range and bearing of a target is displayed on what is called a Plan Position Indicator (PPI). This display is essentially a polar diagram, with the transmitting ship's position at the center. Images of target echoes are received and displayed at their relative bearings, and at their distance from the PPI center. With a continuous display of the images of targets, the motion of the transmitting ship is also displayed.



*Figure 1-1 How radar works*

## 2. BASIC OPERATION

### 2.1 Control Description



\*Default switch function.

Figure 2-1 Control panel

## 2.2 Display Indication and Markers

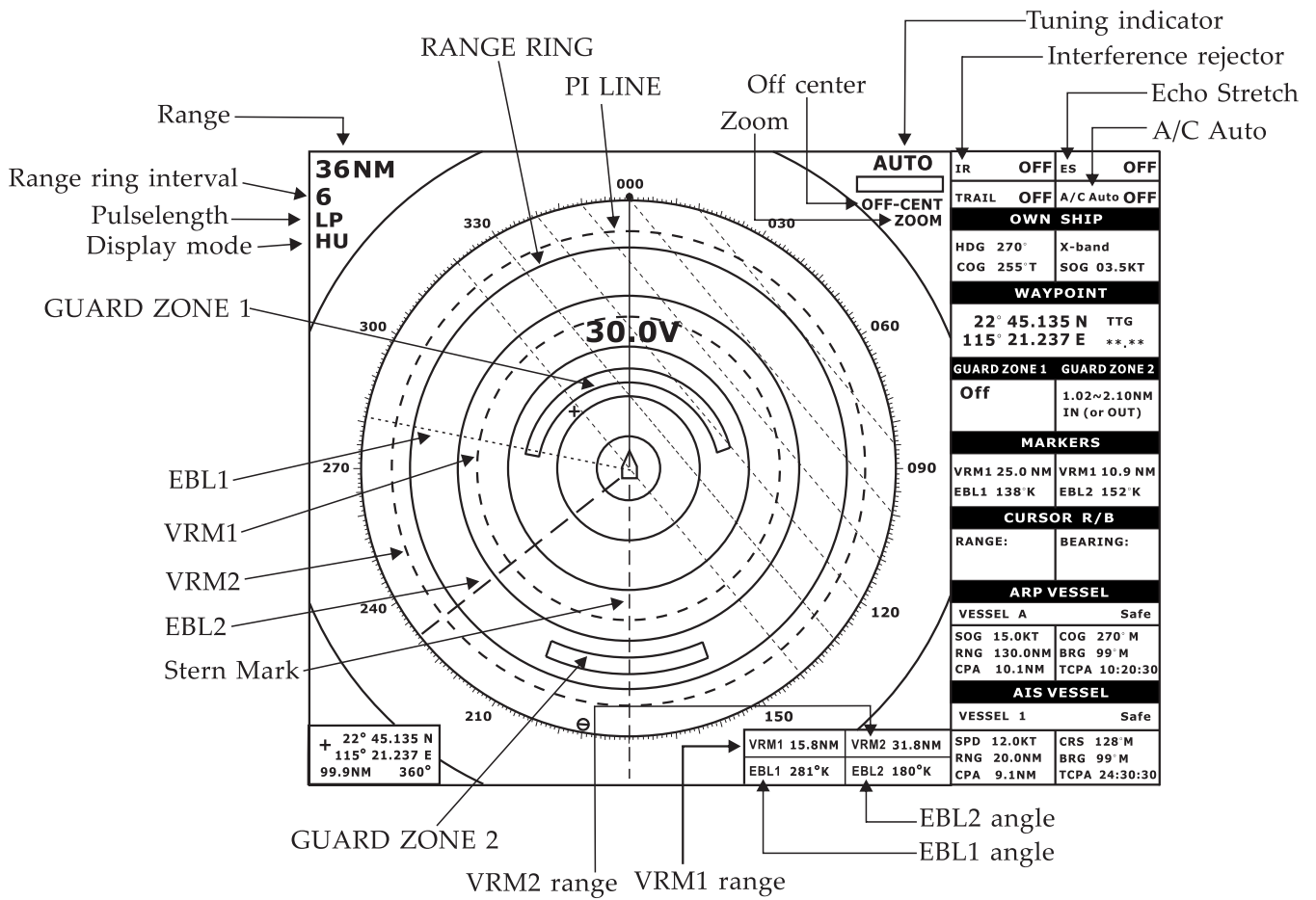


Figure 2-2 Display indications



## 2.3 Turning the Radar On/Off

Press the **[POWER]** key to turn the radar on or off.

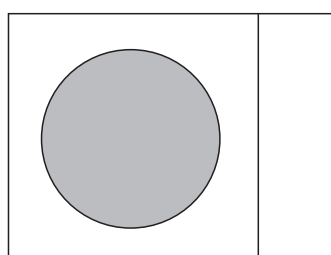
The control panel lights and a timer displays the time remaining for warm up of the magnetron (the device which produces radar pulses), counting down from 1:30 to 0:01.

## 2.4 Transmitting

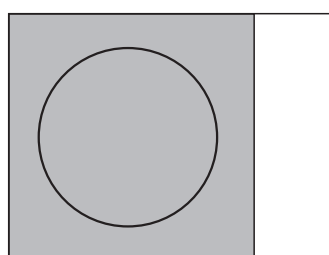
After the power is turned on and the magnetron has warmed up, STAND-BY appears at the screen center. This means the radar is now fully operational. In stand-by the radar is available for use at anytime - but no radar waves are being transmitted. Press the **[ST-BY/TX]** key to transmit. When transmitting, any echoes from targets appear on the display. This radar displays echoes in sixteen tones of green, yellow or colour according to echo strength.

## 2.5 Echo area

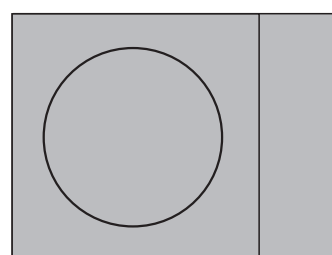
The echo display area for the B, C and W types is available in three configurations: round, wide, and full screen. You can select a configuration with 7 ECHO AREA on the ECHO menu.



Round



Wide



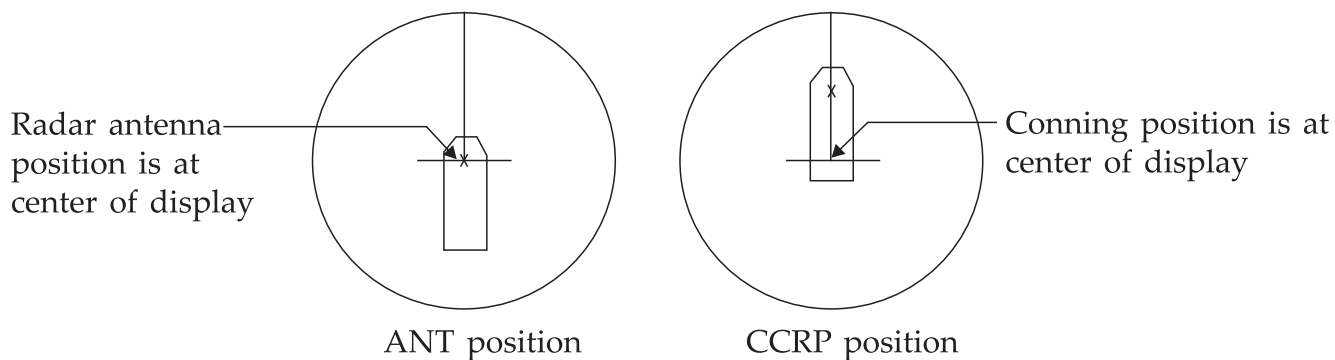
Full

## 2.6 Reference Position

The reference position for measurements (range, bearing, etc.) and markers (heading line, stern mark, etc.) can be antenna position or consistent common reference point (CCRP), which is a location on own ship to which all horizontal measurements, for example range, bearing, relative course, relative speed, closest point of approach (CPA) or time to closest point of approach (TCPA), are normally referenced.

To select reference position, press the **[MENU]** key to open the Main Menu, select "REFERENCE POINT" and press **[ACQ/ENTER]** key, in the pop-up window select "ANT" or "CCRP" and press **[ACQ/ENTER]** key.

The position of the own ship marker changes according to reference position as shown below. If the CCRP is positioned outside of the effective display area, the bearing scale is indicated with the appropriate reduced detail.



Range and bearing are measured and graphics are drawn according to reference position as in the table below.

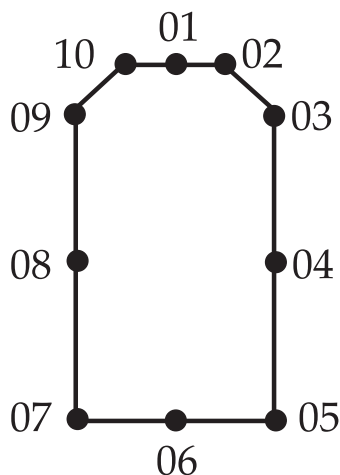
### Marks, measurements and reference point

Category	Item	Reference point	
		CCRP	Antenna position
Range and bearing measurement	EBL	Range and bearing measured from CCRP	Range and bearing measured from antenna position
	VRM		
	Cursor		
	PI line		
	Range ring		
Graphics	Heading line	Drawn from CCRP	Drawn from antenna position
	Stern mark		
	Beam line		
	Own ship vector		
	Own ship track		
Bearing cursor		Drawn with CCRP at center	Drawn with antenna position at center
Course, speed		Calculated with CCRP at center	Calculated with antenna position at center
CPA, TCPA		Calculated with CCRP at center	Calculated with antenna position at center
BCR, BCT		Calculated from bow position	
Own ship data	Heading	Data from sensor, regardless of reference point selected	
	Speed		
	Course over ground		
	Speed over ground		
	Own L/L		

## 2.7 Own Ship Marker

Own ship marker (  ) may be inscribed on the screen as below.

1. Go to "INSTALLATION SETUP" menu;
2. Select the "OWN SHIP SHAPE" and press [ACQ/ENTER] key;
3. Select the "DRAW" and press [ACQ/ENTER] key;
4. Drawing interface pops up on the screen as follows:



5. At this time , the cursor is locked point 1, press the arrow keys to adjust the position of point 1 , while the lower right corner of this screen will show the coordinates of the point , after adjustment Press [ACQ/ENTER] key to confirm;
6. Cursor jumps to the point 2 , according to the actual size of the ship followed by the above method is set to point 10. When finished, press [ACQ/ENTER] key to confirm;
7. Cursor jumps to the CCRP symbols inverted "T word " place, this symbol can only move forward and backward, press the arrow key to the design of the ship with a CCRP coincide , press [ACQ/ENTER] key to confirm;
8. Cursor jumps to the position of the antenna symbol "X" , press the arrow keys to move the symbol to the actual installation of the radar antenna position and press [ACQ/ENTER] key to confirm;
9. Then, in the lower right corner of the interface position you'll be prompted "Save or None", if you choose to save confirm the settings are correct, For reset then choose None , and press the [ACQ/ENTER] key to confirm that the ship silhouette setting ;
10. If you want to display on the radar screen of the ship shape, in the "Own Ship Shape" menu, select "ON" item and press [ACQ/ENTER] key to confirm .

## 2.8 Stand-by

When you won't be using the radar for an extended period, but you want to keep it in a state of readiness, place it in stand-by by pressing the [ST-BY/TX] key. The display shows "STAND-BY," navigation data, or goes into the economy mode depending on menu setting. (More on menu operation later.)

### Economy mode

The LCD display can be set to automatically turn itself off when in stand-by, to reduce power consumption. This feature is called the "economy mode." Power consumption in the economy mode is 28W.

### Navigation data or AIS data display during stand-by

If a navigation aid inputs navigation data to this radar, navigation data can be displayed during stand-by. You can turn the navigation data display on/off through the menu. Figure 2-3 shows a typical navigation data display during standby. Similarly, if the AIS data input case, AIS data can be display during Stand-by.

**Note 1:** Availability of a particular display item depends on incoming data.

**Note 2:** When Range to Waypoint reaches 0.1nm, the WPT mark jumps to dead ahead even though a difference may exist between heading and BRG to WPT.

**Note 3:** When cross track error exceeds 1 nm on either side, the XTE mark Stars Blinking.

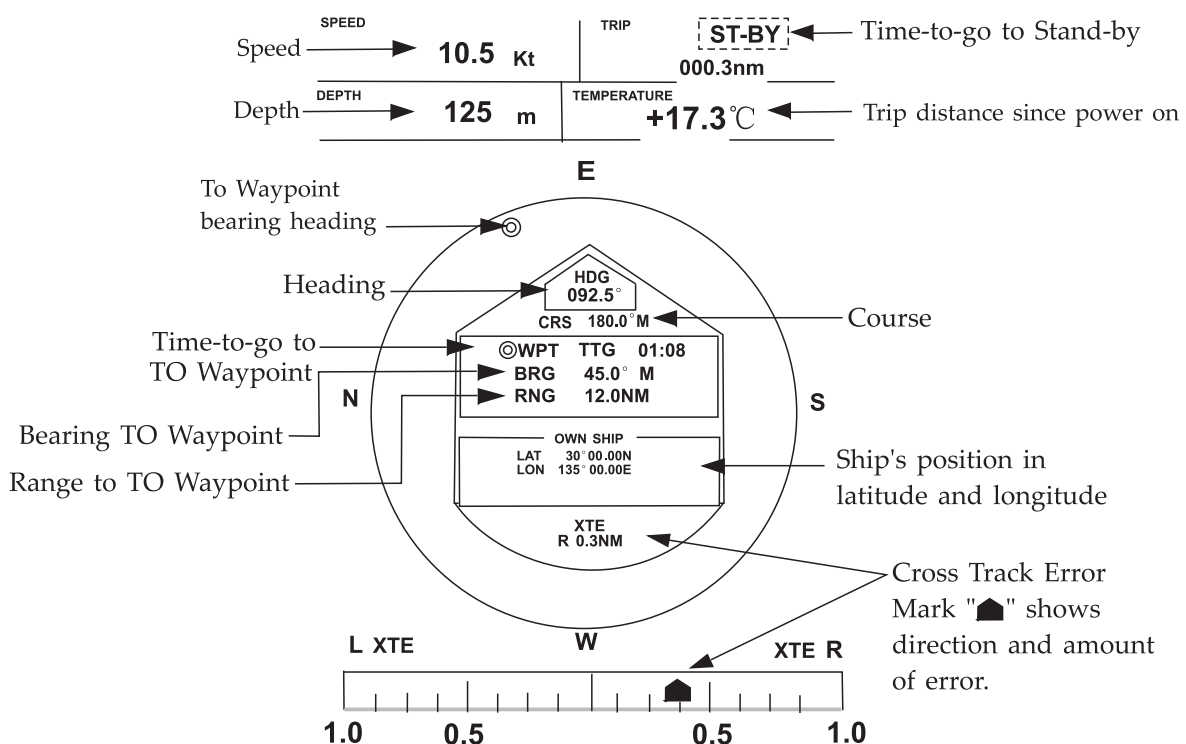


Figure 2-3 Typical navigation data display during stand-by

## 2.9 Selecting the Range

The range selected automatically determines the range ring interval, the number of range rings, pulselength and pulse repetition rate, for optimal detection capability in short to long ranges. You can select which ranges and pulselength (for 1 mile range) to use through the menu. The range, range ring interval and pulselength appear at the bottom left-hand corner of the display.

### To select a range;

- When navigating in or around crowded harbors, select a short range to watch for possible collision situations.
- If you select a lower range while on open water, increase the range occasionally to watch for vessels that may be heading your way.

## 2.10 Adjusting Picture Brilliance

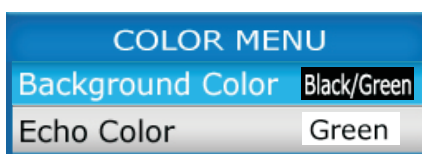
The [BRILL] key adjusts the brilliance of the radar picture in sixteen levels. Press the [BRILL] key to set the brilliance level. The current level momentarily appears on the screen.

## 2.11 Setup display color

In order to adapt to the different environments, the radar echo display the back-ground color and echo color can be set by users themselves, there are five kinds of background colors and three kinds of echo colors available. Setting methods are as follows:

### 1.By menu

- 1) Press [MENU] key open main menu;
- 2) Select "FUNCTION MENU" and press [ACQ/ENTER] key;
- 3) Press [▲]or [▼] key select "COLOR SETTING" & press [ACQ/ENTER] key open the color setup menu;



- 4) Press [▲] or [▼] key select "BACKGROUND COLOR" or "ECHO COLOR" press [ACQ/ENTER] key;
- 5) Press [▲] or [▼] select color desired and press [ACQ/ENTER] key;
- 6) Press [MENU] key to close the menu.

### 2.Using the function key

The function keys [F1] function default setting for "BACKGROUND COLOR" , [F2] key default setting for "ECHO COLOR". Directly on the keyboard you can press these two keys select the desired color setting.

## 2.12 Adjusting Receiver Sensitivity

The [GAIN] control adjusts the sensitivity of the receiver. It works in precisely the same manner as the volume control of a broadcast receiver, amplifying the signals received. The proper setting is such that the background noise is just visible on the screen. If you set up for too little sensitivity, weak echoes may be missed. On the other hand excessive sensitivity yields too much background noise; strong targets may be missed because of the poor contrast between desired echoes and the background noise on the display. To adjust receiver sensitivity, transmit on long range, and adjust the [GAIN] control so background noise is just visible on the screen.

## 2.13 Adjusting the A/C SEA Control (reducing sea clutter)

Echoes from waves can be troublesome, covering the central part of the display with random signals known as "sea clutter." The higher the waves, and the higher the scanner above the water, the further the clutter will extend. Sea clutter appears on the display as many small echoes which might affect radar performance. (See the Figure 2-4.) When sea clutter masks the picture, adjust the A/C SEA control to reduce the clutter.

### How the A/C SEA control works

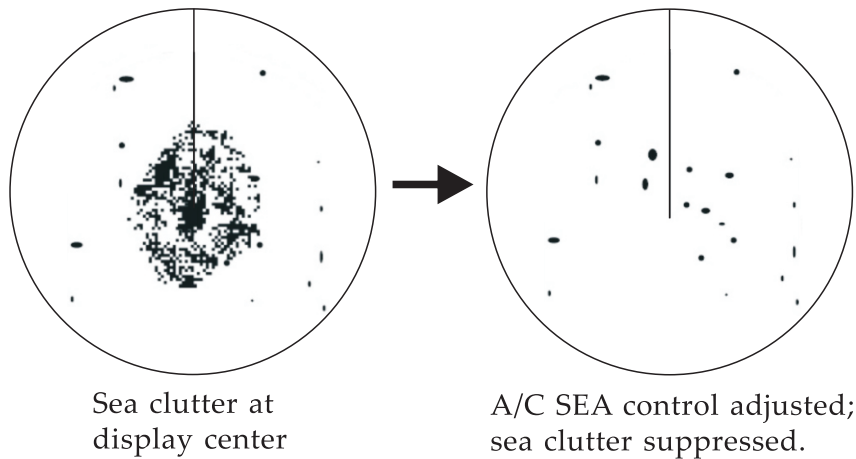
The [A/C SEA] control reduces the amplification of echoes at short ranges (where clutter is the greatest) and progressively increases amplification will be normal at those ranges where there is no sea clutter.

### Adjusting the A/C SEA control

The proper setting of the A/C SEA should be such that the clutter is broken up into small dots, and small targets become distinguishable. If the control is set too low, targets will be hidden in the clutter, while if it is set too high, both sea clutter and targets will disappear from the display. In most cases adjust the control until clutter has disappeared to leeward, but a little is still visible windward.

1. Confirm that the sensitivity is properly adjusted, and then transmit on short range.
2. Adjust the [A/C SEA] control so small targets are distinguishable but some clutter remains on the display.





*Figure 2-4 How to adjust the STC control*

### **Tip for adjusting the A/C SEA**

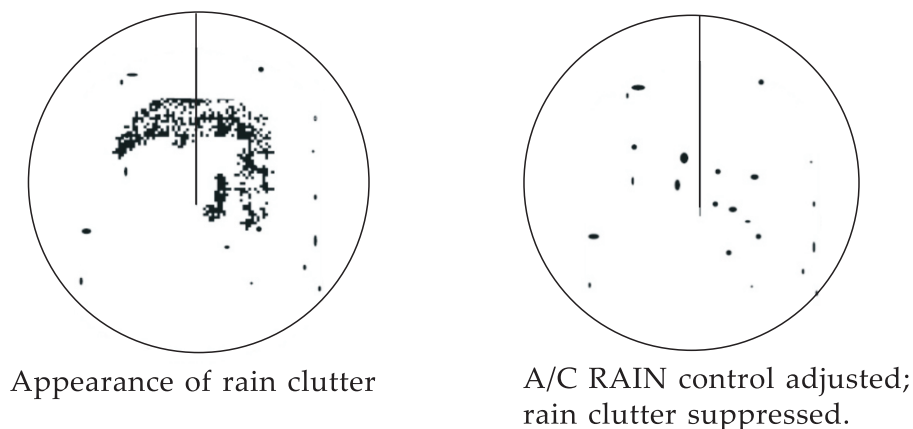
A common mistake is to over-adjust the circuit so all the clutter is removed. As an example set up for maximum STC. You will see how the center of the display becomes dark. This dark zone can be dangerous (targets may be missed), especially if the sensitivity is not properly adjusted. Always leave a little clutter visible on the display to be sure weak echoes will not be suppressed. If there is no clutter visible on the display, turn off the circuit.

## **2.14 Apply the A/C RAIN (reducing rain clutter)**

The vertical beamwidth of the antenna is designed to see surface targets even when the ship is rolling. However, by this design the unit will also detect rain clutter (rain, snow, hail, etc.) in the same manner as normal targets. Figure 2-5 Shows the appearance of rain clutter on the Display.

### **Adjusting A/C RAIN**

When rain clutter masks echoes, adjust the [A/C RAIN] Control, This control splits up these unwanted echoes into a speckled pattern, making recognition of solid targets easier.



*Figure 2-5 Effect of A/C RAIN*

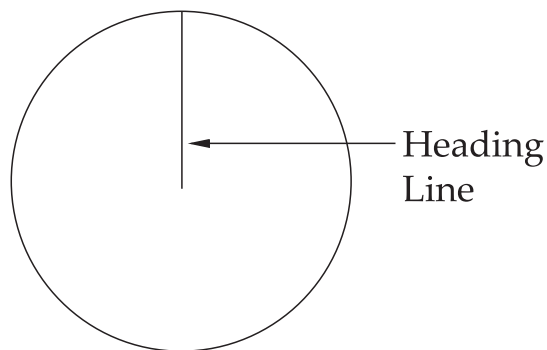
Note: In addition to reducing clutter, the [A/C RAIN] control can be used in fine weather to clarify the picture when navigating in confined waters. However, with the circuit activated the receiver is less sensitive. Therefore, turn off the circuit when its function is not used.

### **Automatic adjustments of A/C SEA and A/C RAIN**

Push the [A/C Auto] key. "A/C AUTO" appears at the bottom lefthand corner of the display when the A/C AUTO circuit is on. You can fine tune by adjusting the [GAIN] controls.

### **2.15 Erasing the Heading Line**

The heading line may occasionally mask a target. To view the target, you can temporarily erase the heading line by pressing and holding down the [GAIN (HM OFF)] control. Release the control to redisplay the marks.



*Figure 2-6 Heading line*

### **2.16 Stern marker**

The stern marker, which is a dot-and-dash line, appears opposite to the heading line. To display or erase this marker do the following:

1. Go to "FUNCTION MENU" ;
2. Select "STERN MARK" item and press [ACQ/ENTER] key ;
3. Select "OFF" or "ON" as appropriate.
4. Push the [MENU] key twice to close the menu.



## 2.17 Measuring the Range

You can measure the range to a target three ways: by the range rings, by the cursor, and by the VRM (Variable Range Marker).

### By range ring

Count the number of rings between the center of the display and the target. Check the range ring interval and judge the distance of the echo from the inner edge of the nearest ring.

### By cursor

Operate the omnipad to place the cursor intersection on the inside edge of the target echo. The range to the target, as well as the bearing, appears at the bottom right-hand corner of the display.

### By VRM

1. Press the [EBL/VRM SELECT] key to circumscribe a VRM readout (at the bottom center). Each press of the key selects the readout of EBL1, EBL2, VRM1 or VRM2 in that order.

VRM1 25.0NM	VRM2 10.9NM
EBL1 138°R	EBL2 152°R

Figure 2-7 Display bottom, showing location of EBL and VRM readouts

2. Press the [EBL/VRM CONTROL] key enable control of the VRM by the omnipad.
3. Operate the omnipad to place the outside edge of the VRM on the inside edge of the target.
4. Check the VRM readout at the bottom right-hand corner of the display to find the range to the target.
5. To anchor the VRM, press the [EBL/VRM CONTROL] key.
6. To erase the VRM, press and hold down the [EBL/VRM CONTROL] key about two seconds.

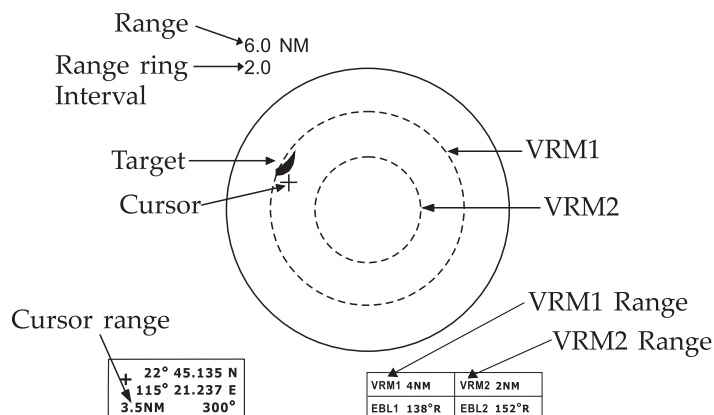


Figure 2-8 Measuring range by the cursor, range rings and VRM

Note: You can display the range readout of the VRM and cursor in nautical miles, statute miles or kilometers. For details see the next chapter

## 2.18 Measuring the Bearing

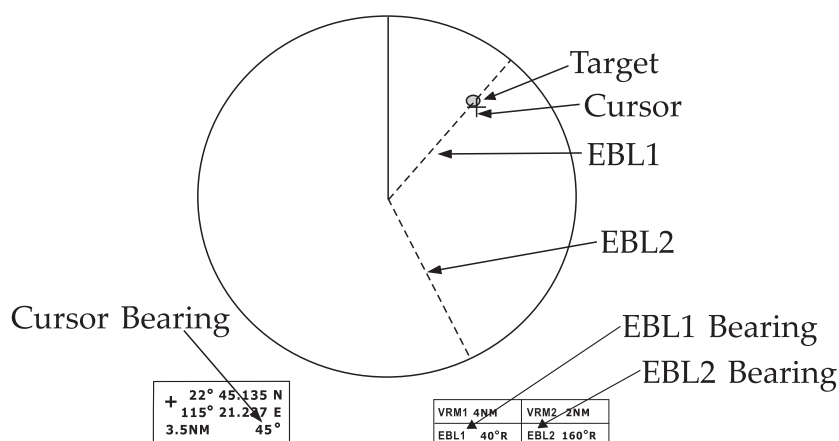
There are two ways to measure the bearing to a target: by the cursor, and by the EBL (Electronic Bearing Line).

### By cursor

Operate the omnipad to bisect the target with the cursor intersection. The bearing to the target appears at the bottom of the display.

### By EBL

1. Press the [ERL/VRM SELECT] key to display an EBL readout (at the bottom right-hand corner). Each press of the key selects the read out of EBL1, EBL2, VRM1 or VRM2 in that order.
2. Press the [EBL/VRM CONTROL] key to enable control of the omnipad.
3. Operate the omnipad to bisect the target with the EBL.
4. Check the EBL readout at the bottom left-hand corner of the display to find the bearing to the target.
5. To anchor the EBL, press the [EBL/VRM CONTROL] key.
6. To erase the EBL and its readout; press and hold down the [EBL/VRM CONTROL] key about three seconds.



*Figure 2-9 How to measure bearing by EBL and cursor*

Note: The bearing readout for the EBL and the cursor can be display in relative or true bearing (true bearing requires heading sensor input). For north up and course up display modes the bearing reference is always true. For details see the next chapter.

## Tips for measuring bearing

- Bearing measurements of smaller targets are more accurate; the center of larger target pips is not as easily identified.
- Bearings of stationary or slower moving targets are more accurate than Bearings of faster moving targets.
- To minimize bearing errors keep echoes in the outer half of the picture by changing the range scale; angular difference becomes difficult to resolve as a target approaches the center of the display.

## 2.19 Using the Offset EBL

The offset EBL provides two functions: predict collision course of radar target and measure the range and the bearing between two targets.

Predicting collision course

1. Press the omnipad to place the cursor on the center of the target.
2. Press the [EBL/VRM SELECT] key to choose EBL1 readout and then press the [EBL/VRM CONTROL] key.
3. Select "EBL OFFSET" on the menu and press the [ACQ/ENTER] key.
4. Press [▲] or [▼] key select "ON" and press [ACQ/ENTER] key.
5. Press the [EBL/VRM CONTROL] key.
6. Operate EBL1 so it passes through the center of the target.

If the target tracks along the EBL towards the center of the display (you vessel's Position), the target may be on a collision course.

To cancel, select "EBL OFFSET" and press the [ACQ/ENTER] key. Press [▲] or [▼] key select "OFF" and press [ACQ/ENTER] key.

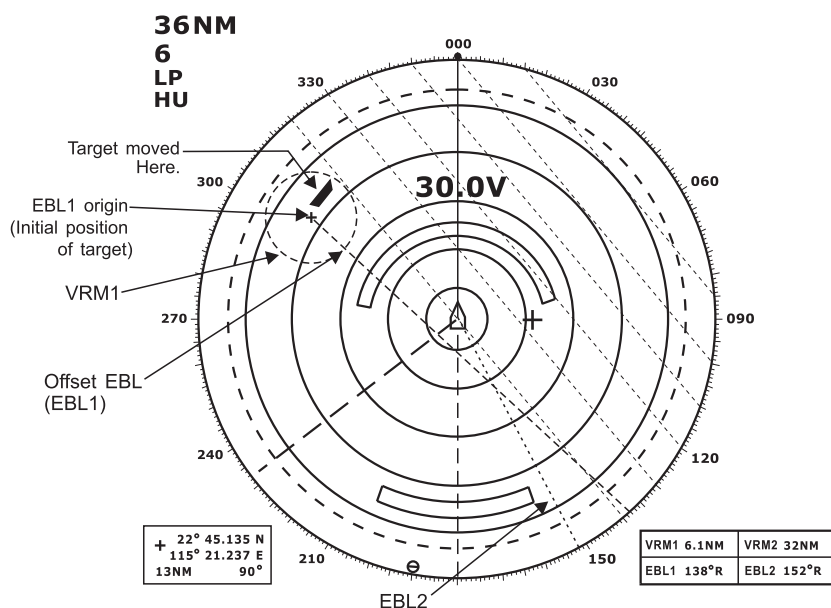
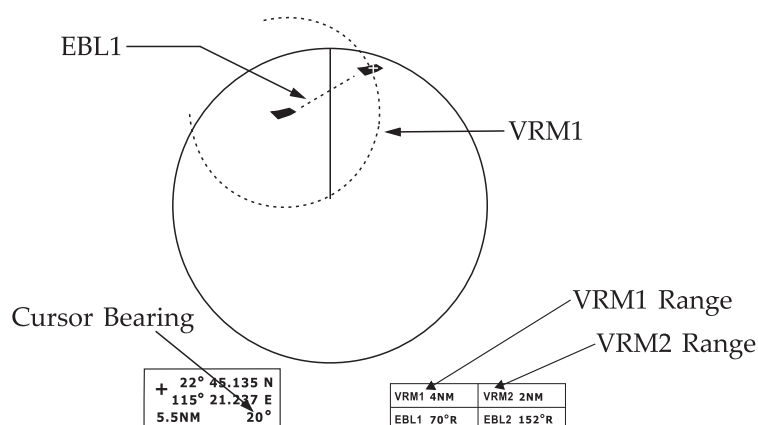


Figure 2-10 Predicting collision course by using the offset EBL

## Measuring range and bearing between two targets

The procedure which follows shows how to measure the range and bearing between target "A" and target "B" in Figure 2-11.

1. Press the omnipad to place EBL1's origin (cursor) on the center of target "A".
2. Press the [EBL/VRM SELECT] key to choose EBL1 readout and then press the [EBL/VRM CONTROL] key.
3. Select EBL OFFSET on the menu and press the [ACQ/ENTER] key. EBL1's origin shifts to cursor.
4. Press the [EBL/VRM CONTROL] key.
5. Press the onnipad to bisect target "B" with EBL1. Check the EBL1 readout to find the bearing between target "A" and target "B".
6. Press the [EBL/VRM SELECT] key to choose VRM1 readout. Press the omnipad to place the outside edge of VRM1 on the inside edge of target "B". Check the VRM1 readout to find the range between target "A" and target "B".
7. To cancel, select EBL OFFSET on the menu and press the [ACQ/ENTER] key.



*Figure 2-11 Measuring the range and bearing between two targets by using the offset EBL*

## 2.20 Point of reference for origin point of offset EBL

The origin point of the offset EBL can be ground stabilized (geographically fixed), north stabilized (true) or referenced to own ship's heading (relative).

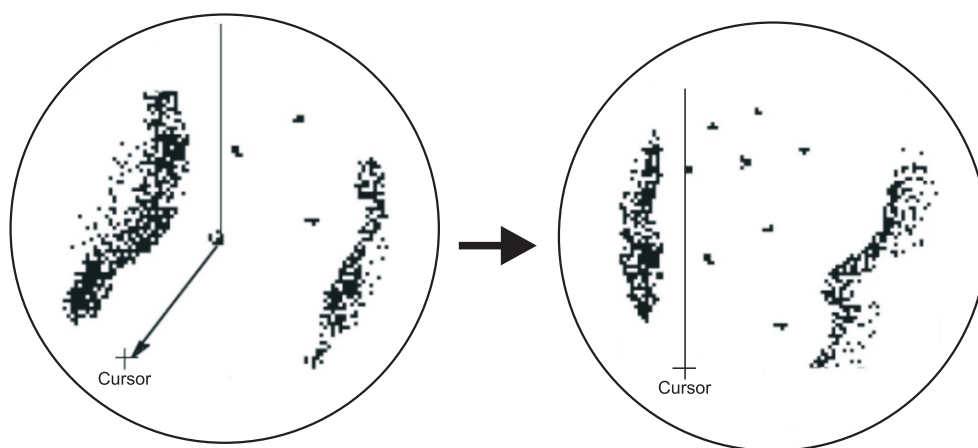
1. Go to "FUNCTION MENU";
2. Select "EBL OFFSET BASE".
3. Select "STAB GND", "STAB HDG" or "STAB NORTH" as applicable.
  - **STAB GND:** Reference to latitude and longitude. Origin position is always fixed regardless of your ship's movement.
  - **STAB HDG:** Reference to heading. The relationship between origin position and own position is kept always.
  - **STAB NORTH:** Reference to North. The origin position changes with North position.
4. Push the [MENU] key twice to close the menu.

## 2.21 Shifting (off centering) the Picture

Your vessel's position can be shifted up to 75% (not available on 48nm range) of the range in use to view the situation around your vessel without changing the range or size of targets.

1. Press the omnipad to set cursor where desired.
2. Press the [MENU] key ,select "SHIFT" and press [ACQ ENTER] key;
3. Press [▲] or [▼] key select "ON" and press [ACQ/ENTER] key.

"OFF-CENT" appears at the top right corner of the display when the picture is shifted.



① Place cursor Where desired

② Press [OFF CENTER] key to off center display

*Figure 2-12 Shifting the picture*

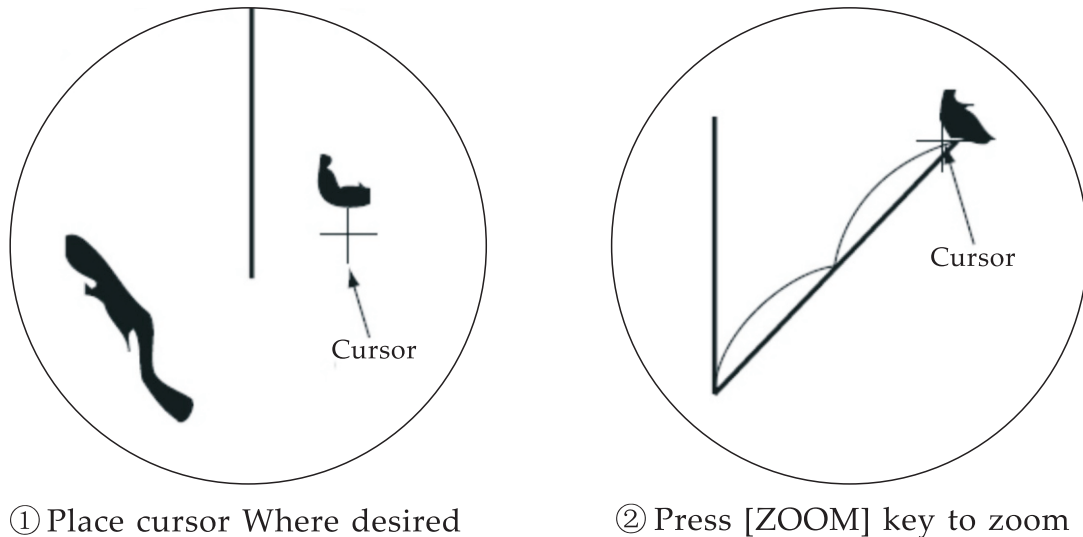
### Cancelling shifted picture

Repeat the above steps and select "OFF"

## 2.22 Zoom

The zoom feature allows you to double the size of the area between your vessel and any location within the current range to take a closer look at an area of interest.

1. Select location with the cursor.
2. Select ZOOM on the menu, ZOOM appears at the top right corner when the ZOOM function is on .



*Figure 2-13 Zoom Function*

Note: Zoom is cancelled when presentation mode is changed.

## Cancelling Zoom

Repeat the above steps and select "OFF"

## 2.23 Outputting Target Position

Target position data can be output to the navaid in IEC61162 format. Press and hold down the [TLL] key to output the data. This function requires position data and heading signal.

## 3. MENU OPERATION

### 3.1 Basic Menu Operation

The menu mostly contains less-often used functions which once preset do not require regular adjustment. To open or close the menu, press the [MENU] key. You can select items on the menu with the omnipad.

1. Press the [MENU] key to display the main menu.

MAIN MENU	
DATA FIELD	
MODE	HU
RING	3
SHIFT	Off
ZOOM	Off
PI LINE	
ECHO TRAIL	Off
ECHO STRETCH	Off
EBL OFFSET	Off
REF POINT	ANT
AIS MENU	
ARP MENU	
FUNCTION MENU	
VIDEO MENU	
SIMULATION	On

Figure 3-1 Main menu

2. Press the omnipad to select the item. For example, select RINGS. A message appears at the right of the menu window.
3. Press the [▲] or [▼] key to select setting below.

MAIN MENU	
DATA FIELD	
MODE	HU
RING	Off
SHIFT	Off
ZOOM	1
PI LINE	2
ECHO TRAIL	3
ECHO STRETCH	4
ECHO STRETCH	Off
EBL OFFSET	Off
REF POINT	ANT
AIS MENU	
ARP MENU	
FUNCTION MENU	
VIDEO MENU	
SIMULATION	On

Figure 3-2 Messages for RING menu

4. Press the [MENU] key to close the menu.



### 3.2 Selecting the presentation mode

This radar provides four presentation modes. Head-up, Course-up, North-up and True motion.

1. Press the [MENU] key.
2. Operate the omnipad to select "MODE".
3. Press the [ACQ/ENTER] key.

With heading sensor connection the display and the display and the display mode indication at the top lefthand corner of the display. Press [▲] or [▼] key select want mode and press [ACQ/ENTER] key. If there is no heading sensor connection, the display mode is always HU.

4. Press the [MENU] key to close the menu.

Note: The radar begins operation with last selected display mode (except course up) whenever the unit is turned on. Note however that head up is selected when course up was the last used mode.

#### Head up

The picture is oriented so the heading line is at the top of the display. This mode is useful for navigation in congested waters.

#### Course up

The course up mode shows Ship's heading by the heading line, at the top of the display. To get heading desired, steer vessel in direction desired, and the show "CU" at the top lefthand corner of the display.

#### North up

North is at the top of the display and the heading line moves with Ship's heading. This mode is useful for determining ship's position and as a navigation monitor on a nautical chart. The picture is stabilized against yaw of vessel, thereby reducing of target echoes.

#### True motion

True motion displays own ship and moving objects in their true motion.

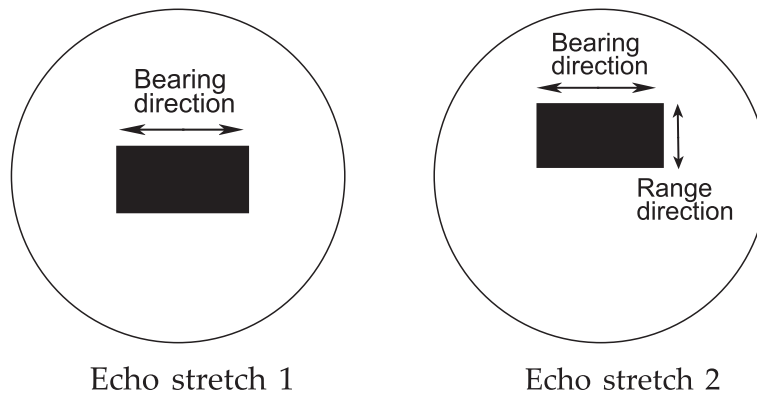
### 3.3 Magnifying long range echoes (echo stretch)

Normally, the reflected echoes from long range target appear on the display as weaker and smaller blips even though they are compensated by the radar's internal circuitry. The echo stretch function magnifies these small blips in all ranges. Two types of echo stretch are available: ES1 which stretches echoes in bearing direction and ES2 which stretches them in both range and bearing directions.

To turn the echo stretch on or off;

1. Press the [MENU] key to open the menu.
2. Select "ECHO STRETCH".
3. Press the [ACQ/ENTER] key.
4. Press [▲] or [▼] Key select ES1, ES2 or Off.





*Figure 3-3 Echo stretch*

Note: This function magnifies not only targets but also sea clutter and radar interference. For this reason be sure the controls for adjustment of sea clutter and radar interference are properly adjusted before activating the echo stretch.

Note: ES1 and ES2 is not available on Short Range.

### 3.4 Echo Trail

You can show the movement of all radar targets relative to your vessel in afterglow vessel in afterglow. This function is useful for alerting you to possible collision situations.

#### Starting echo trail

1. Press the [MENU] key to open the menu.
2. Select "ECHO TRAIL" by the omnipad.
3. Select "ON" by pressing the [ACQ/ENTER] key.



*Figure 3-4 How the echo trail feature work*

TRAIL, the echo trail time selected (on "VIDEO MENU") and elapsed time appear at the top right-hand corner of the display. Then, afterglow starts extending from all target.

Note: Trails are restarted when range or mode is changed or zoom or shift is turned on.

## Fixed time trail

1. When the elapsed time clock counts up to the trail time selected, the elapsed time display freezes.
2. The oldest portions of trails are erased so only the latest trail, equal in length to the trail time selected, is shown.
3. Trail continues.

For example, the one minute trail time is selected. When the elapsed time clock counts up to 60 seconds, the elapsed time clock counts up to 60 seconds, the elapsed time display freezes at "60," but the latest one minute of trail are erased and then trail continuous.

## Continuous trail



The maximum continuous trail time is 99 minutes and 59 seconds. When the elapsed time clock counts up to that time the elapsed time display is reset to zero and trail begins again.

## Cancelling echo trail

Select "OFF(deactivate)" at "ECHO TRAIL" on the menu.

## Changing trail attributes

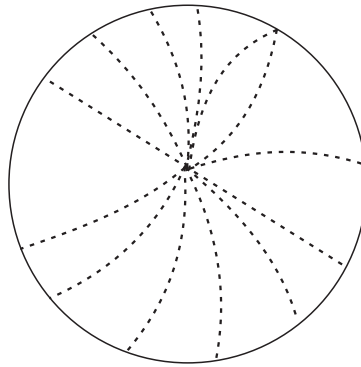
Trail gradation and trail time can be selected on the VIDEO MENU.

Item In OTHERS menu	Description
Trail Tone	Trails can be shown in single or multiple gradations. Multiple paints trails getting thinner with time just like the afterglow on an analog PPI radar. <div><b>Single</b> </div> <div><b>Multiple</b> </div>
Trail Time	Trail time can be set for 15sec, 30sec, 1min, 3min, 6min, 15min, 30min or continuous.

*Table 3-1 Trailing attributes*

## 3.5 Suppressing Radar Interference

Radar interference may occur when near another shipborne radar operating in the same frequency band as you radar. Its on-screen appearance is many bright dots either scattered at random or in the form of dotted lines extending from the center to the edge of the display. Figure 3-5 illustrates interference in the form of curved spokes. Interference effects are distinguishable from normal echoes because they do not appear in the same place on successive rotations of the antenna.



*Figure 3-5 Radar interference*

Four levels of interference are available, including off; IR1, IR2, IR3 and OFF,IR3 provides the highest level of rejection.

1. Press the [MENU] key.
2. Select "VIDEO MENU" and press the [ACQ/ENTER] key.
3. Select "INT REJECT".
4. Select level desired by operation the omnipad.
5. Press the [ACQ/ENTER] key.
6. Press the [MENU] key to close the menu.

VIDEO MENU	
Trail Tone	15S
Int Reject	Off
Noise Reject	Off
Pulse Length	Short
Trail Time	15S
Tune	Auto
D.Range	Nar
Dead Sector	Off

*Figure 3-6 VIDEO MENU*

### 3.6 Selecting Pulse Length

Pulse length is the transmission time of a Single radar pulse. The longer the pulse length the greater the direction range capability, however range accuracy and range resolution are reduced.

1. Press [MENU] key.
2. Select "VIDEO MENU" and press [ACQ/ENTER] key.
3. Select "PULSE LENGTH".
4. Select "SHORT" or "LONG" by operation the omnipad.
5. Press the [ACQ/ENTER] key.
6. Press the [MENU] key to close the menu.

**Note:**

"LONG" : 1.5NM-MP, 3NM-LP, "SHORT" : 3NM-MP, 1.5NM-SP

### 3.7 Guard Alarm

The guard alarm allows the operator to set the desired range and bearing for a guard zone. When ships, islands, landmasses, etc. Violate the guard zone an audible alarm sounds and the offending target brinks to call the operator's attention.

#### Selection of guard zone type

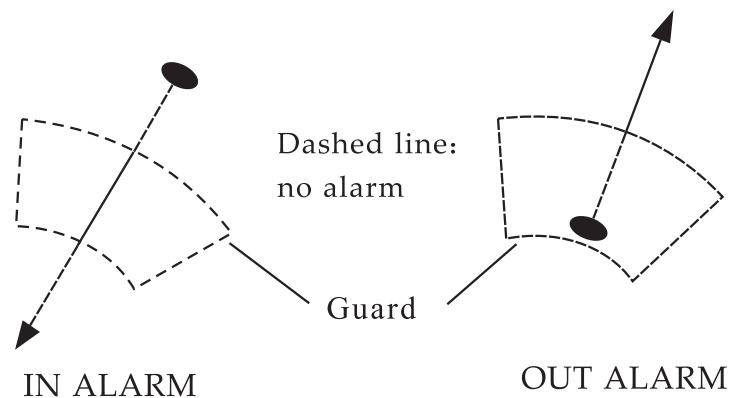
The guard alarm can be set to sound when a target either enters or exits the guard zone. You can select which type of guard alarm you want through the menu.

#### In alarm

The alarm sounds on targets entering the guard zone. "IN" appears in the guard zone data field , the guard zone will flash display.

#### Out alarm

The alarm sounds on targets exiting the guard zone. "OUT" appears in the guard zone data field , the guard zone will flash display.



*Figure 3-7 In and Out alarm*

### Setting a guard zone

#### Preparation

1. Press the [MENU] key, and select the "FUNCTION MENU" and pressing the [ACQ/ENTER] key.
2. Select "GUARD MODE" and "IN" (alarm on target entering zone) or "OUT" (alarm on target exiting zone) by operating the omnipad.
3. Press the [ACQ/ENTER] key.
4. Press the [MENU] key to close the menu.

### To set a guard zone

1. Press the [GUARD] key to open the guard zone setting function.
2. Press [▲] or [▼] key select the guard zone number.
3. Mentally create the guard zone you want to set.
4. Operate the omnipad to set the cursor on point A or B. Press the [ACQ/ENTER] key. See Figure 3-9
5. Operate the omnipad to set the cursor on point C or D. See Figure 3-9 (3).
6. Press the [ACQ/ENTER] key. Alarm zone set, the red dotted line appears on the screen See Figure 3-9 (4).

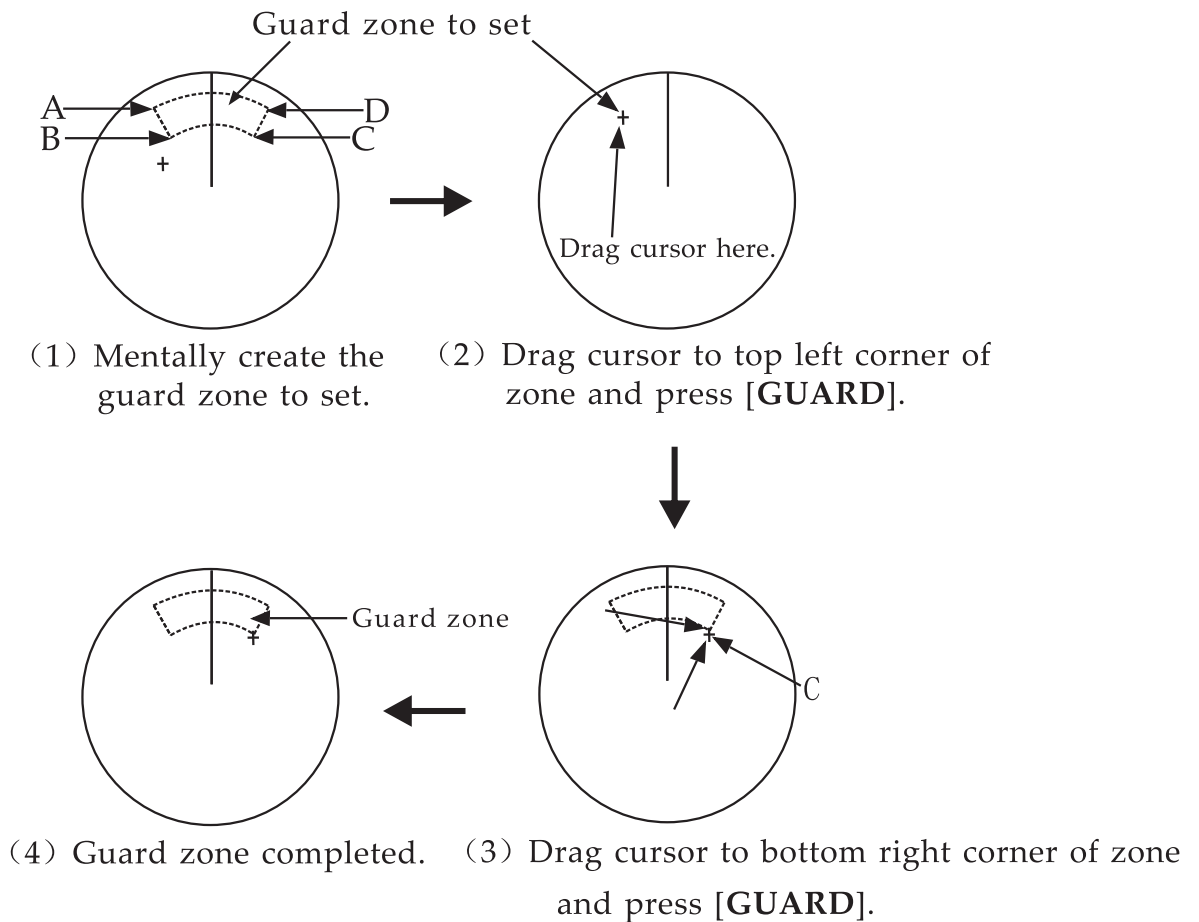
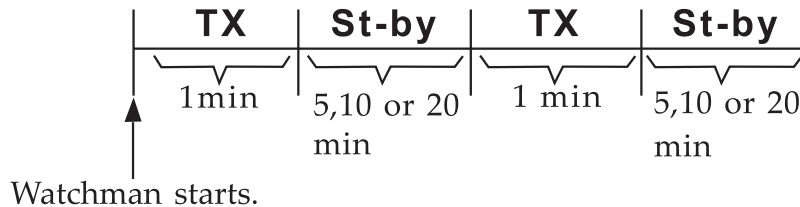


Figure 3-8 How to set the guard zone

### 3.8 Watchman

The watchman function periodically transmits the radar for minute to check for targets in a guard zone. If it finds change in the zone from the previous transmission it sounds the radar continuously. This feature is useful when you do not need the radar's function continuously but want to be alerted to radar targets in a specific area.



*Figure 3-9 How watchman works*

#### How watchman works

When the time selected for the watchman restperiod has elapsed, the radar automatically transmits for one minute to check the condition inside the guard zone. If there is no change, the radar goes into stand-by ("WATCHMAN" appears during stand-by.) If there is change, the radar sounds the audible alarm, cancels the watchman function and transmits continuously.

#### Turning on watchman

1. Create a guard zone (usually 360 degrees) with the guard alarm function.
2. Press the [MENU] key.
3. Select "FUNCTION MENU".
4. Press the [ACQ/ENTER] key.
5. Select "WATCHMAN".
6. Press the omnipad to select watchman rest period; 5 minutes, 10 minutes or 20 minutes.

"WATCHMAN" appears at the top of the screen, the radar transmits for one minute to check for targets inside the guard zone. And the the LCD display shuts off and the radar goes into stand-by.

#### Cancelling watchman

Go into the "FUNCTION MENU", and set "WATCHMAN" for off.

Note 1: Watchman can be used without a guard zone.

Note 2: The alarm sounds just before the radar starts and stops transmitting.

### 3.9 Displaying Navigation Data

Navigation data can be displayed in the data boxes if this radar receives navigation input in IEC 61162 format. Navigation data include

- position in latitude and longitude
- range, bearing and time-to-go to both waypoint selected on the navigator and the cursor
- speed
- AIS information, has been received AIS ship information;

(If the navigation input includes destination data, waypoint position is denoted on the radar display by a dashed ring.)

To turn navigation data on or off;

1. Press the [MENU] key.
2. Select the "DATA FIELD".
3. Press the [ACQ/ENTER] key.
4. Press the [ACQ/ENTER] key to select the message for Navigation display.  
For example:OWN SHIP , POSITION or WAYPOINT etc.
5. Press the [ACQ/ENTER] key to set.
6. Press the [MENU] key to close the menu.

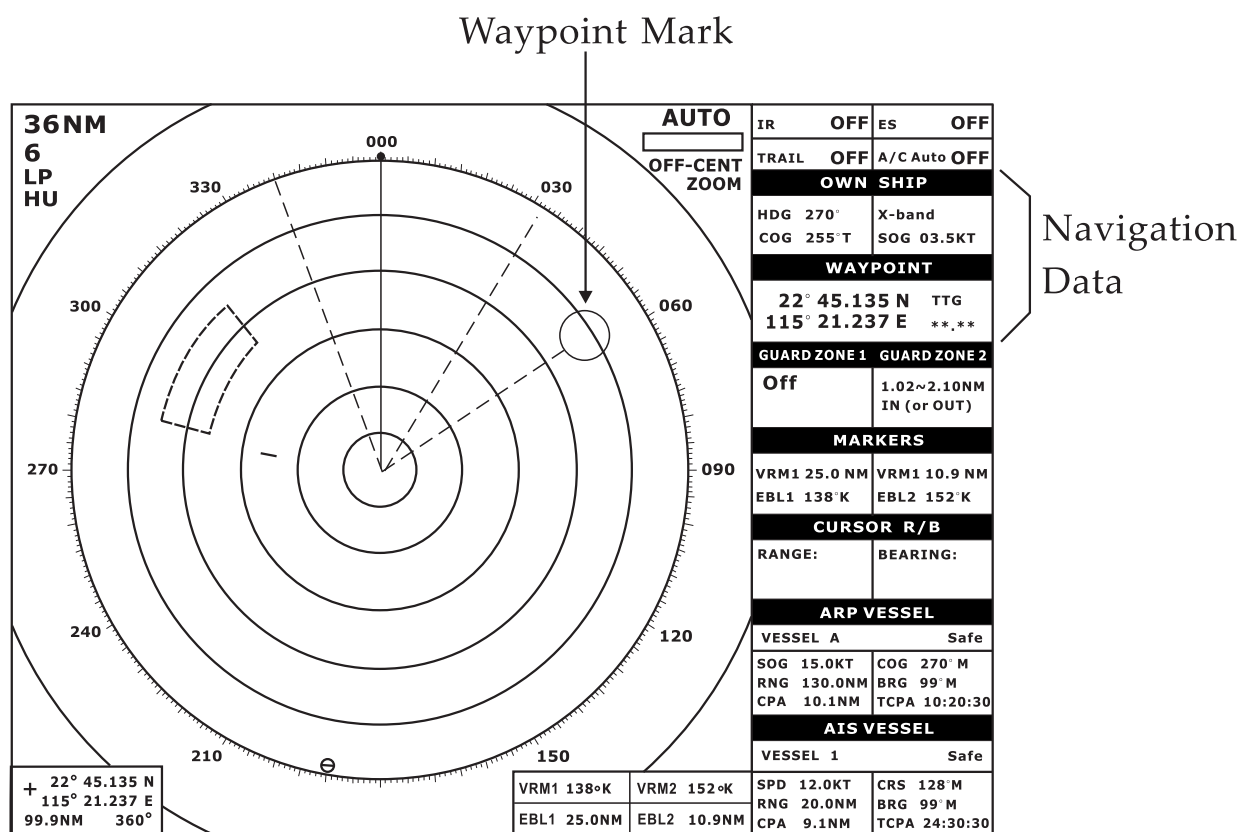


Figure 3-10 Typical navigation data display

### 3.10 FUNCTION MENU Description

Item	Description
Panel Dimmer	Select level of panel backlight.
Mark Brill	Select brilliance of VRM, EBL, cursor, guard zone and WP marks.
HD Mark	Select brilliance of heading mark.
Characters	Select brilliance of characters.
WPT Mark	Select "On" to display the waypoint mark.
Stern Mark	Use for switching stern mark display.
EBL Ref	Select EBL reference for relative or true.
VRM Unit	Select VRM unit.
STBY Disp	Select the display on stand-by; display "STBY" or navigation data, or go into the economy mode.
Guard Mode	Select condition which triggers guard alarm; in or out.
Alm sense LV	Select minimum echo strength which triggers guard alarm.
Alarm List	Used to turn the alarm list.
Watchman	Turn watchman on (set rest period) or off.
EBL Offset Base	Select the EBL offset base.
Color setting	Set background color & Echo color.
Speed Menu	Go to the speed menu.
Range	Select ranges in use.
Self Test	Test keys, ROM and RAM, check antenna rotation speed, and display program number.
Installation Setup	Go to the installation setup menu.

*Table 3-2 FUNCTION MENU Description*



### 3.11 VIDEO MENU Description

Item	Description
Trail Tone	Select brilliance of echo trails.
Int Reject	Select level of interference rejection.
Noise Reject	Select "ON" to reject noise.
Pulse length	Select pulselength for 1.5 and 3 mile ranges.
Trail Time	Select the trail time.
Tune	Select automatic or manual tuning. To tune manually; 1.Select "MANUAL" by the omnipad. 2.Press the [ENTER] key to enable manual tuning. 3.While pressing and holding down the [GAIN] control operate the omnipad. "MANUAL"appears at the top right-hand corner when manual tuning is in effect.
D.Range	Select the video signal sampling ranges.
Dead Sector	Select "ON" to display the dead sector.
Echo Area	Select the echo display area on the screen.

*Table 3-3 VIDEO MENU Description*

### 3.12 Function Keys

The function keys (F1 and F2) work like the auto-dialing feature of a telephone, automatically executing the function assigned to them. The function can be turned off by pressing appropriate function key again.

#### Default settings

F1: Background Color

F2: Echo Color

#### How to register menu items

1. Press the [MENU] key.
2. Press [A/C SEA] (F1) or [A/C RAIN] (F2) to open the function menu.
3. Press [▲] or [▼] key select item, press [▶] or [◀] key page turning; Select function desired.
4. Press the [ACQ/ENTER] key.

5. Press the [MENU] key to close the menu.

SETTING FOR F1 KNOB	SETTING FOR F1 KNOB
SHIFT/ZOOM	FUNCTION MENU
EBL OFFSET	VIDEO MENU
SHIFT	EBL REF
ZOOM	VRM UNIT
RINGS	WPT MARK
MODE	CURSOR POSITN
STBY DISP	VECTOR LENGTH
INTREJECE	VECTOR REF
NOISE REJECT	HISTORY
PULSE LENGTH	AUTO ACQ
ECHO STRTCH	B/GR COLOR
TRAIL ON/OFF	ECHO COLOR
TRAIL TIME	SLEEP ALL
TRAIL TONE	ACTIVATE ALL
TUNE A/M	IN/OUT HARBOUR
GUARD IN/OUT	LOSS ON/OFF
ALARM LEVEL	SPEED MENU
DEAD SECTOR	D.RANGE
WATCHMAN	PI SETTING
PANEL DIMMER	PI BEARING
MARK BRILL	PI QUANTITY
CHARACTERS	PI MODE
Select item by omnipad (Up/Down)	Select item by omnipad (Up/Down)
Select Page by omnipad (Left/Right)	Select Page by omnipad (Left/Right)
Page 1/2	Page 2/2

*Figure 3-11 Function menu*

### 3.13 Suppressing Noise

Electrical noise can be suppressed by turning on "NOISE Reject" on the VIDEO menu.

### 3.14 Adjusting Brilliance of Markers

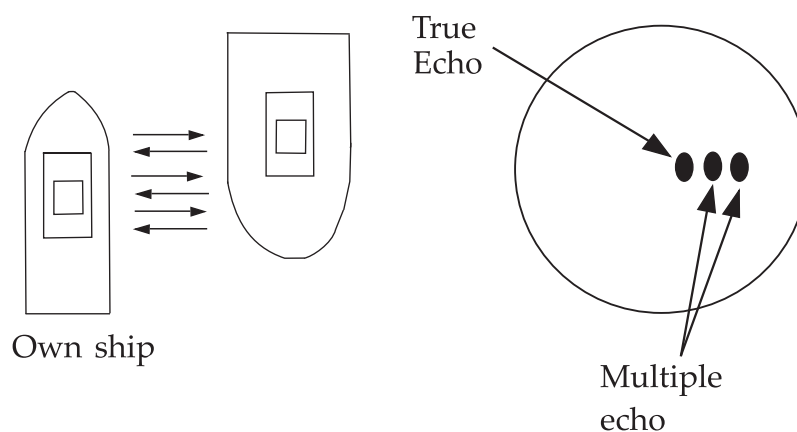
"MARK BRILL" on the FUNCTION menu adjusts the brilliance of markers such as the cursor.

## 4. FALSE ECHOES

Occasionally false echoes appear on the screen at positions where there is no target. In some cases the effects can be reduced or eliminated. The operator should familiarize himself or herself with the appearance and effects of these false echoes, so as not to confuse them with echoes from legitimate contacts.

### 4.1 Multiple Echoes

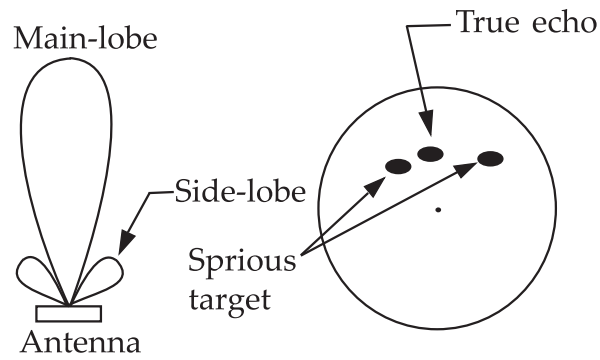
Multiple echoes occur when a short range, strong echo is received from a ship, bridge, or breakwater. A second, a third or more echoes may be observed on the display at double, triple or other multiples of the actual range of the target as shown in Figure 4-1. Multiple reflection echoes can be reduced and often removed by decreasing the sensitivity or properly adjusting the A/C SEA.



*Figure 4-1 Multiple echoes*

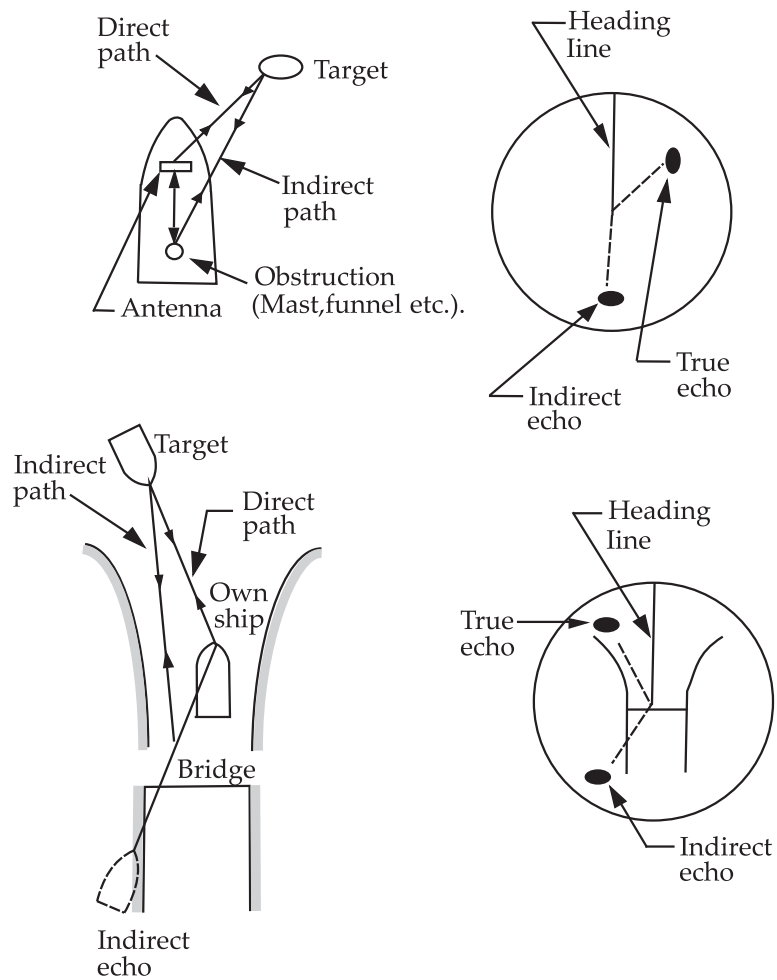
### 4.2 Side-lobe Echoes

Every time the antenna rotates, some radiation escapes on each side of the beam called "side-lobes." If a target exists where it can be detected by the side-lobes as well as the main-lobe, the side-lobe echoes may be represented on both sides of the true echo at the same range, as shown in Figure 4-2. Side-lobes show usually only at short ranges and from strong targets. They can be reduced through careful reduction of the sensitivity or proper adjustment of the A/C SEA.



*Figure 4-2 Side-lobe echoes*

### 4.3 Indirect Echoes



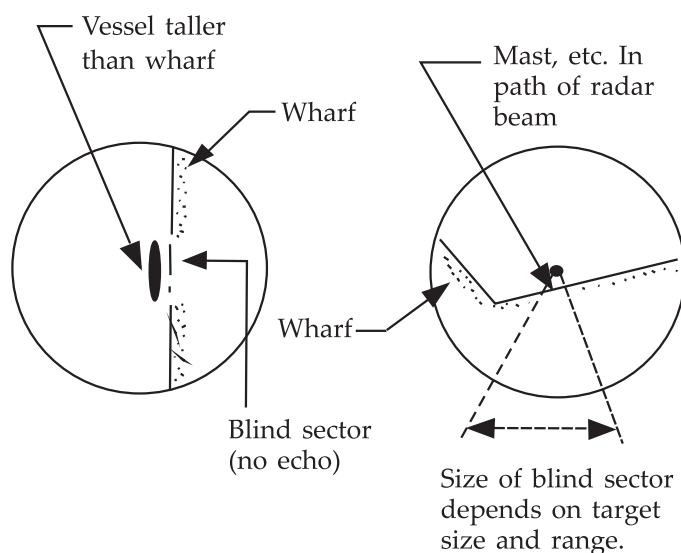
*Figure 4-3 Indirect echoes*

Indirect echoes may be returned from either a passing ship or returned from a reflecting surface on your own ship, for example, a stack. In both cases, the echo will return from a legitimate contact to the antenna by the same indirect path. The echo will appear on the same bearing of the reflected surface, but at the same range as the direct echo. Figure 4-3 illustrates the effect of an indirect echo. Indirect echoes may be recognized as follows :

- they usually occur in a shadow sector
- they appear on the bearing of the obstruction but at the range of the legitimate contact
- when plotted, their movements are usually abnormal, and
- their shapes may indicate they are not direct echoes.

#### 4.4 Blind and Shadow Sectors

Funnels, stacks, masts, or derricks in the path of antenna may reduce the intensity of the radar beam. If the angle subtended at the antenna is more than a few degrees a blind sector may be produced. Within the blind sector small targets at close range may not be detected while larger targets at much greater ranges may be detected. See Figure 4-4.




*Figure 4-4 Blind and shadow sectors*

## 5. MAINTENANCE & TROUBLESHOOTING

This chapter tells you how to keep your radar in good working order. Before reviewing this chapter please read the safety information which follows.


**DANGER**



**Turn off the power before performing any maintenance or troubleshooting procedure.**

Hazardous voltages can shock, burn or cause death. Only qualified personnel totally familiar with electrical circuits should work inside the units.

**RF RADIATION HAZARD**



The radar antenna emits high frequency radio radiation which can be harmful, particularly to your eyes. Never look directly into the antenna from a distance of less than two feet when the radar is in operation as you could injure the cornea of your eyes. Always make sure the radar is set to stand-by or is turned off before starting work on the antenna unit.

Period	Item	Check point	Remarks
3 to 6 months	Exposed nuts and bolts on antenna unit	Check for corroded or loosened nuts and bolts. If necessary, clean and repaint them thickly. Replace them if heavily corroded.	Sealing compound may be used instead of paint. Apply a small amount of grease between nuts and bolts for easy removal in future.
	Radome cover (KR-1238/1538)	Check for wear. Permanent damage to the antenna's internal circuitry will result if water leaks into the radome.	If a crack is found it should be temporarily repaired by using a small amount of sealing compound or adhesive. You should then contact your dealer for service.
6 months to 1 year	Display unit connectors	Check for tight connection and corrosion.	If corroded, contact your dealer for replacement.

*Table 5-1 Recommended maintenance program*

# 5.1 Preventative Maintenance

Regular maintenance is important for good performance. Always keep the equipment as free as possible from dirt, dust, and water splashes. Make sure all screws securing the components are properly tightened. A maintenance program should be established and should at least include the items listed in table 5-1.

# 5.2 Replacing the Fuse

The fuse in the power cable protects the equipment against reverse polarity or ship's mains, over current, and equipment fault. If the fuse blows, find the cause before replacing it. Never use an incorrect fuse - serious damage to equipment may result and void the warranty.

- 12 V : 10 A fuse
- 24/32 V : 5 A fuse

# 5.3 Troubleshooting

Table 5-2 contains simple troubleshooting procedures which you can follow to try to restore normal operation. If you cannot restore normal operation, do not attempt to check inside any unit of the radar system. Any repair work is best left to a qualified technician.

# 5.4 Self Test

The self test facility checks the keyboard, ROM and RAM for proper operation.

1. Press the [MENU] key.
2. Select "FUNCTION MENU".
3. Select "SELF TEST" and press the [ACQ/ENTER] key. The following display appears.

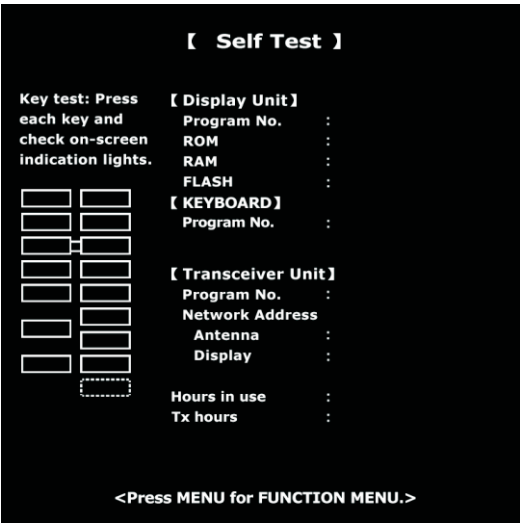


Figure 5-1 Self test screen

If...	But...	Then...
you pressed the [POWER] key to turn on the radar	the control panel does not light	<ul style="list-style-type: none"> <li>• try adjusting the control panel backlighting on the Function menu.</li> <li>• battery may have discharged.</li> <li>• check fuse.</li> </ul>
	nothing appears on the display or display contrast is poor	<ul style="list-style-type: none"> <li>• try adjusting the brilliance.</li> </ul>
	characters are distorted	<ul style="list-style-type: none"> <li>• request service.</li> </ul>
the radar has warmed up and you pressed the [ST-BY/TX] key to transmit	the antenna does not rotate	<ul style="list-style-type: none"> <li>• the problem may be in antenna Unit request service.</li> </ul>
	Characters and indications are abnormal	<ul style="list-style-type: none"> <li>• have a qualified technician check the set.</li> </ul>
you have adjusted the gain with A/C RAIN and A/C SEA off	neither noise nor targets appear (indications and markers do)	<ul style="list-style-type: none"> <li>• check signal cable for damage.</li> </ul>
	neither indications nor markers appear (noise and targets do)	<ul style="list-style-type: none"> <li>• have a qualified technician check the set.</li> </ul>
	the sweep (radial line sweeping around the,display) is not synchronized with antenna rotation	<ul style="list-style-type: none"> <li>• the problem may be in the antenna unit. Request service.</li> </ul>
	there is no change in sensitivity	<ul style="list-style-type: none"> <li>• request service.</li> </ul>
a key is pressed	nothing happens	<ul style="list-style-type: none"> <li>• key may be faulty. Request service.</li> </ul>

*Table 5-2 Troubleshooting table*



4. The ROM and RAM are automatically checked. If NG (No Good) appears to the right of ROM or RAM indication, contact your dealer for advice.
5. To check the keyboard, press any key except the omnipad, ACQ and power keys. Its corresponding location on the display lights in black if the key is operating properly.
6. To escape from the test. Press the [MENU] key.

## 5.5 Life Expectancy of Magnetron

The following table shows the life expectancy of the magnetron.

Model	Type	Code no.	Life expectancy
KR-1238/1538	MSF1421B	V801	2, 000 - 3,000 hours (Including stand-by)
	MAF1421B		
KR-1268/1568	MAF1422B		
	MSF1422		

*Table 5-2 Life expectancy of magnetron*

## 6. ARPA



### WARNING

This auto plotter is not designed to replace the human eye nor make decisions for the navigator. It is intended for use as an aid to navigation. Always maintain a watch while underway. Data obtained from this auto plotter should always be double checked against other sources to verify the reliability of the data.

This auto Plotter automatically tracks a acquired radar target and calculates its course and speed. Indicating it by a vector, Since the data generated by this unit are based on what radar targets are selected, the radar must always be optimally tuned for use with it to ensure that required targets will not be lost or unwanted targets such as sea returns and noise will not be acquired and tracked.

A target echo does not always mean a landmass, reef, ships or other surface objects but can imply returns from sea surface or precipitation. As the level of these returns varies with environment, the operator is required to properly adjust the STC (ant-clutter sea), FTC (anti-clutter rain) and GAIN controls to ensure that target echoes within the affected area are not eliminated from the radar screen. The optimum settings of these controls may slightly differ between the normal radar operation and plotting, and it is recommended to readjust them in accordance with the operating mode selected.

### NOTICE

The installation must be done by a ONWA representative or suitably qualified radar technician. Authorities require this.

**Keep magnets and magnetic fields away from the equipment.**

Magnetic fields will distort the picture and can cause equipment malfunction. Be sure the unit is well away from equipment which gives off magnetic fields (speaker, power transformer, etc.).

The following items affect calculation accuracy.

- echo intensity
- radar transmission pulsewidth
- radar bearing error
- gyrocompass error
- own vessel or other vessel course change

Data for CPA, TCPA, ect. Are approximations only. Always use data obtained prudently.

## 6.1 Operation of ARPA

### General

The Auto Plotter permits manual or automatic acquisition and automatic tracking of up to 20 radar targets. An internal microprocessor calculates target data such as speeds and courses and display the results in alphanumeric and by vectors. To ensure the reliability of the displayed target data, the radar must be properly adjusted for minimum sea returns and noise.

### Principal Specifications

Acquisition and tracking:

- Acquisition of up to 20 targets between 0.2 and 16 nm
- Automatic tracking of up to 20 acquired targets between 0.1 and 16 nm

Vectors:

Vector length; 30s, 1,3,6,15,30 min.

Orientation; True velocity or relative velocity

Past positions: 5 past positions at intervals of 15,30s,1,2,3,6 min.

Alarm: Visual and audible alarms against targets violating CPA/TCPA limits,  
Visual alarm against lost targets

Target discrimination: A target measuring about 800 m or more in the radial or circumferential direction is regarded as a landmass and not acquired or tracked.

Echoes smaller than about 800 m are regarded as true targets.

### Key Used Auto Plotter

The Auto plotter utilizes the following touchpad keys. Given below is a brief description of these keys.

**MENU:** Display/Erase the main menu.

#### **SELECT/CANCEL:**

(Long press) Terminates plotting of the target selected with the cursor.

(Brief press) Displays the data of target selected with the cursor.

**ACQ/ENTER:** Acquires the target selected with the cursor.

## 6.2 ARPA MENU Operation

The ARPA MENU operation includes the followings;

**Display:** Turns on/off the plot symbols, past positions and target data.

**All Cancel:** Cancels the tracking of all targets.

**Vector Ref:** Selects relative vector or true vectors. To select your choice, open the ARPA menu, and the legend Rel and True appear on the "3. Vector Ref" line. Operate the omnipad. When your selection is in the reverse video, press the [ACQ/ENTER] key.

**Vector Length:** Selects vector time.

**History:** Selects past position plot interval.

**CPA Set:** Selects CPA alarm limit, When a target is predicted to come within this limit, an aural alarm sounds and at the same time the corresponding target symbol changes to a blinking triangle.

Note: If the preset CPA limit is set at OFF, a target which is on collision course will not produce an alarm.

**TCPA Set:** Selects TCPA alarm limit.

**Auto ACQ:** Turns on/off Auto Acquisition Area.

### Activating the Auto plotter

To activate the Auto Plotter, follow the steps shown below:

1. Adjust the GAIN, A/C SEA and A/C RAIN controls for proper radar picture.
2. Press the [MENU] key to open the main menu.
3. Operate the omnipad to select "ARP MENU".
4. Press the [ACQ/ENTER] key.
5. Operate the omnipad to select the menu item "DISPLAY".
6. Operate the omnipad to select "ON".
7. Press the [ACQ/ENTER] key.
8. Press the [MENU] key to close the menu.

ARP MENU	
Display	Off
All Cancel	
Vector Ref	Rel
Vector Length	30S
History	Off
CPA Set	Off
TCPA Set	30S
Auto ACQ	Off

Figure 6-1 ARP Menu

Target under auto tracking but not selected for cursor data reading

Target selected for data reading

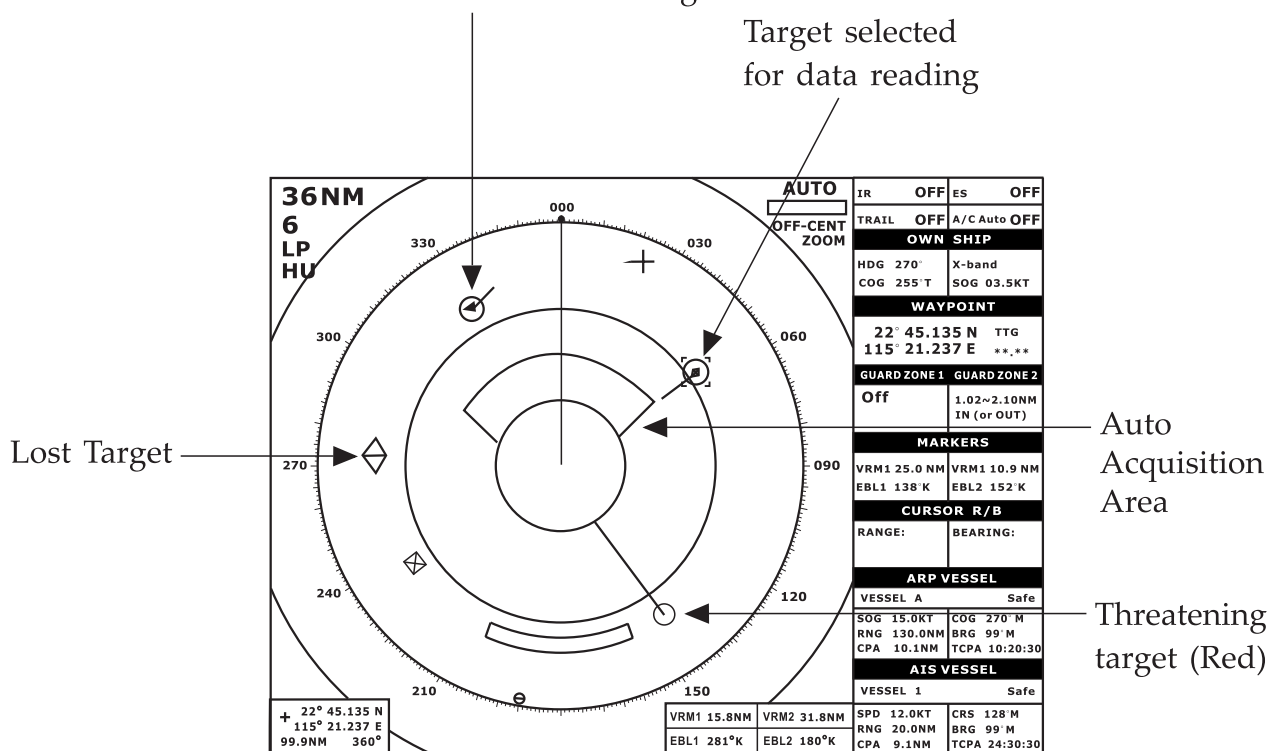


Figure 6-2 ARPA Display

## Deactivation the Auto Plotter

To deactivate the Auto Plotter.

1. Open the "ARP MENU".
2. Operate the omnipad to select the "DISPLAY".
3. Operate the omnipad to select "OFF".
4. Press the [ACQ/ENTER] key.
5. Press the [MENU] key to close the menu.

## 6.3 Acquiring targets

### Manual Acquisition

Follow the steps below to manually acquire a target. Up to 20 target can be manually acquired.

1. Place the cursor(+) on a target of interest by operating the omnipad.
2. Press the [ACQ/ENTER] key.

The plot symbol changes its shape according to the status as below. A vector appears in about one minute after acquisition indicating the target's motion trend. If the target is consistently detected for three minutes, the plot symbol changes to a solid mark. If acquisition fails, the target symbol blinks and disappears shortly.



**CIRCLE** (dotted)

Immediately after acquisition - Plot symbol shown in broken lines.



**CIRCLE** (dotted with a vector)

One minute after acquisition - Vector still unreliable.



**CIRCLE**(Solid with a vector)

3 minutes after acquisition - Plot symbol changes to a solid circle indicating the stable tracking condition.



**FRAME CIRCLE**

The plot symbol of a target under tracking becomes a circle with a discontinuous outline when the target is selected for data reading.

Note 1: The target to be acquired should be within 0.2 to 16 nm from own ship and not obscured by sea or rain clutter for successful acquisition.

Note 2: When you want to acquire 21th target, cancel tracking one of less important target.

Note 3: When auto acquisition mode (Auto ACQ) is on, up to 10 target can be acquired. For detail, see next section titled Automatic Acquisition.



## WARNING

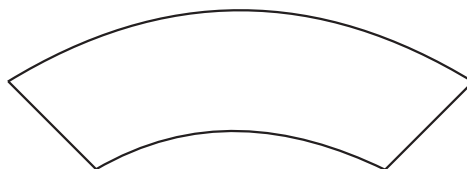
When a tracked target nears another tracked target the targets may be "swapped." When two target come close to each other, one of the two can become a "lost targets." Should this happen, reacquisition of the "lost target" is required after the two targets have separated.

### Automatic Acquisition

The Auto plotter APRA can acquire up to 10 targets automatically by setting the Auto Acquisition area predefined in the system. If Auto ACQ is selected after more than 10 targets have been manually acquired, only the remaining capacity of targets can be automatically acquired. Example; when 15 targets acquired manually, then the Auto ACQ is switched on only 5 targets can be acquire automatically, When ten targets have been automatically acquired, "AUTO TARGET FULL" message appears at top left corner on the display.

#### Setting Auto Acquisition Area

Auto acquisition area is predefined between 2.0 and 2.5 nm in range and 45° on either side of the heading line in bearing. If a target come into this area, it is acquired automatically.



*Figure 6-3 Auto acquisition area*

Follow the steps shown below to activate the auto acquisition area;

1. Open the "ARP MENU".
2. Select "AUTO ACQ" by operating the omnipad.
3. Operate the omnipad to select "ON".
4. Press the [ACQ/ENTER] key.
5. Press the [MENU] key to close the menu.

## Terminating Tracking of Targets

When the Auto Plotter has acquired 20 targets, no more acquisition occurs unless targets are lost. Should this happen, cancel tracking of individual target or all targets by the procedure described below.

### Individual Targets

Place the cursor (+) on a target which you do not want to be tracked any longer by operating the omnipad and press and hold down the [SELECT/CANCEL] key.

### All Targets

All targets can be canceled from "ARPA MENU" at a time.

1. Open the "ARP MENU".
2. Select "ALL CANCEL".
3. Press the [ACQ/ENTER] key.

### Displaying Target Data

The Auto Plotter calculates motion trends (range, bearing, course, speed, CPA and TCPA) of all targets under tracking at the ARP Data area.

#### CAUTION

At the speed under 5 kts the target data is displayed with a delay because of the filtration

Place the cursor on a wanted target and press the [SELECT/CANCEL] key. Data on the selected target is displayed at the bottom of the screen. The symbol of the selected target gets surrounded by a broken square frame. The data includes the follows;

**RNG/BRG (Range/Bearing):** Range and bearing from own ship to the last-plotted or selected target position with suffix "T"(True) or "M"(Magnetic). For true bearings suffix "T" is used in case of gyrocompass input and suffix "M" is used in case of magnetic compass input.



### **COURSE/SPEED (Course/Speed):**

Course and speed are displayed for the last plotted or selected target with suffix "T"(True) or "M"(Magnetic). For true bearings suffix "T" is used in case of gyrocompass input and suffix "M" is used in case of magnetic compass input.

CPA (Closest Point of Approach) is the closest range a target will approach to own ship. Do not mix it with the operator preset CPA alarm limit.

TCPA is the time to CPA measured with present speeds of own ship and the targets. Both CPA and TCPA are automatically calculated. When a target ship has passed clear of own ship, the CPA is displayed and the TCPA appears as "\*\*\*". TCPA is counted up to 99.9 min. And beyond this it is indicated as TCPA>99.9 min.

## **6.4 Mode and Length of Vectors**

### **True or Relative Vector**

Target vectors are displayed in relative or true mode. Own ship does not have a vector in relative mode.

### **Vector Length**

From the ARPA MENU, Vector Length can be set to 30 seconds, 1, 3, 6, 15 or 30 minutes and the selected vector time is indicated on the screen.

The vector tip shows an estimated position of the target after the selected vector time elapses. It can be valuable to extend the vector length to evaluate the risk of collision with any target.

### **Past position Display**

The Auto Plotter displays equally time-spaced dots (maximum 5 dots) marking the past positions of any targets being tracked.

If a target changes its speed, the spacing will be uneven. If it changes the course, its plotted course will not be a straight line in TM mode.

### **Operational Warnings**

There are two main situations which cause the Auto plotter to trigger visual and audible alarms.

- CPA/TCPA alarm
- Lost target alarm

### CPA/TCPA Alarm

Visual and audible alarm are generated when the predicted CPA and TCPA of any target become less than their preset limits. The audible alarm continues for 10 seconds.

The Auto plotter ARPA continuously monitors the predicted range at the Closest Point of Approach (CPA) and predicted time to CPA(TCPA) of each tracked target to own ship.

When the predicted CPA of any target becomes smaller than a preset CPA alarm range and its predicted TCPA less than a preset TCPA alarm limit, the ARPA releases an audible alarm. In addition, the target plot symbol changes to a triangle and flashes together with its vector.

Provided that this feature is used correctly, it will help prevent the risk of collision by alerting you to threatening targets, It is important that GAIN, A/C SEA, A/C RAIN and other radar controls are properly adjusted and the Auto Plotter is set up so that it can track targets effectively.

CPA/TCPA alarm ranges must be set up properly taking into consideration the size, tonnage, speed, turning performance and other characteristics of own ship.



### WARNING

The CPA/TCPA alarm feature should never be relied upon as a sole means for detecting the risk of collision. The navigator is not relieved of the responsibility to keep visual lookout for avoiding collisions, whether or not the radar or other plotting aid is in use.

Follow the steps shown below to set the CPA/TCPA alarm ranges:

1. Open the "ARP MENU".
2. On the "CPA SET" line, select a CPA limit desired.(Off,0.5,1,2,3,5,6nm).
3. Press the [ACQ/ENTER] key.
4. On the "TCPA SET" line, select a TCPA limit desired.(30s,1,2,3,4,5,6,12M).
5. Press the [ACQ/ENTER] key.
6. Press the [MENU] key to close the menu.

The flashing of the triangle plot symbol and vector remain on the screen until the dangerous situation is no longer present or you intentionally terminate tracking of the target by using the [SELECT/CANCEL] key.

### **Lost Target Alarm**

When the system detects a loss of a tracked target, the target symbol becomes a flashing diamond.

## 7. AIS

### 7.1 How AIS Works

Automatic Identification System (AIS) is a reporting system used in the identification of marine vessels and its location. Vessels equipped with this system allows each other to communicate automatically, dynamically and regularly update their position, speed, course and information such as vessel identity.

### 7.2 How does AIS function as a radar?

The AIS radar function does not refer to its own AIS system and its features such as the VHF T/R and Letter Machine but by serial interface through (NMEA) which will be received by the AIS and sent to the radar on a real time displayed on the radar screen.

### 7.3 How to start the AIS radar feature?

1. Press [MENU] key to open the main menu.

MAIN MENU	
DATA FIELD	
MODE	HU
RING	3
SHIFT	Off
ZOOM	Off
PI LINE	
ECHO TRAIL	Off
ECHO STRETCH	Off
EBL OFFSET	Off
REF POINT	ANT
AIS MENU	
ARP MENU	
FUNCTION MENU	
VIDEO MENU	
SIMULATION	On

Figure 7-1 Main menu

2. Select [ **AIS MENU** ] & press [ **ACQ/ENTER** ] key, Select "DISPLAY", press [▲] or [▼] key select "ON" & press [MENU] key to return. Now if "AIS" word appears on the upper screen of the display, The AIS symbol is shown in the radar echo area.











AIS MENU	
Display	Off
Sleep All Targets	
Activate All Targets	
AIS Ship Listing	
Vector Length	30S
History	Off
CPA Set	Off
TCPA Set	30S
In/Out Harbour	IN
Loss Target Alarm	Off
OWN Ship Data	

*Figure 7-2 AIS menu*

NOTE: If the AIS signal is received, the AIS function is still at work even when the signal does not appear and still continues to ensure real time AIS information.

## 7.4 How to check the information received from Ships with AIS?

In the AIS menu, select "AIS SHIP LISTING" and press [ACQ/ENTER]. The AIS tabulation will appear and demonstrate the other ships basic information.

AIS SHIP LIST		
Nation	MMSI	Type
	012345678	A
	012345678	A
	012345678	A
	012345678	A
	012345678	A
	012345678	A
	012345678	A
	012345678	A
	012345678	A
	012345678	A
Select item by omnipad (Up/Down)		
Select Page by omnipad (Left/Right)		
AIS Capacity:190/200		
Page: 1/20		

*Figure 7-3 AIS Ship Listing*

## 7.5 How to determine the target ships detailed information?

There are two methods by which we can view a ships sailing detailed information:

### 1. By keyboard

From the list of AIS information, select the direction key and press [ACQ/ENTER] , on Figure 3 , the detailed data of the current selected ship information shall be displayed.

### 2. By cursor

When the cursor is moved to the target ship and press [ENTER] key, the selected ship will appear as shown in Figure 4 and the AIS data shall appear as shown in Figure 5.

Note: If the display setting of the radar screen is at "ALL" mode, it will briefly display the AIS information as shown in Figure 6.

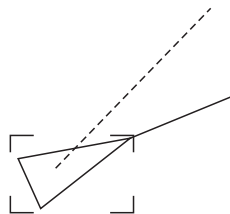


Figure 7-4 Selected target display

SHIP DATA	
AIS B	MMSI 012345678
ONWA	
BRG 208.6°T	34°37.912N
RNG 12.3NM	135°21.569E
TCOG 9.0°T*	
TSOG 8.2kn#	
CPA 5.32NM	
TCPA 33:31	
BCR 5.65NM	HDG 048.0°T
BCT 25:30	0.0°/min

Figure 7-5 AIS Detailed data frame

AIS VESSEL	
VESSEL 1	Safe
SPD 12.0KT	CRS 128°M
RNG 20.0NM	BRG 99°M
CPA 9.1NM	TCPA 24:30:30

Figure 7-6 AIS brief information

## 7.6 How to view your ships AIS information?

Press AIS menu, select "OWN SHIP DATA" then AIS detailed information will appear as shown in Figure 7.

OWN SHIP DATA	
Name:	001
MMSI:	000000001
L/L:	22°45.123 N 115°21.369 E
Depth:	5m
Height:	12m
COG:	120.0
SOG:	10kt

Figure 7-7 Own Ship data

## 7.7 Setting vector length of time

This function is used to set your ship and target ships vector length. The mark represents the vector in accordance with the present voyage. This value is just an estimate and it will follow the ships movement. However it can help simplify the radar operators intuitive navigation judgement.

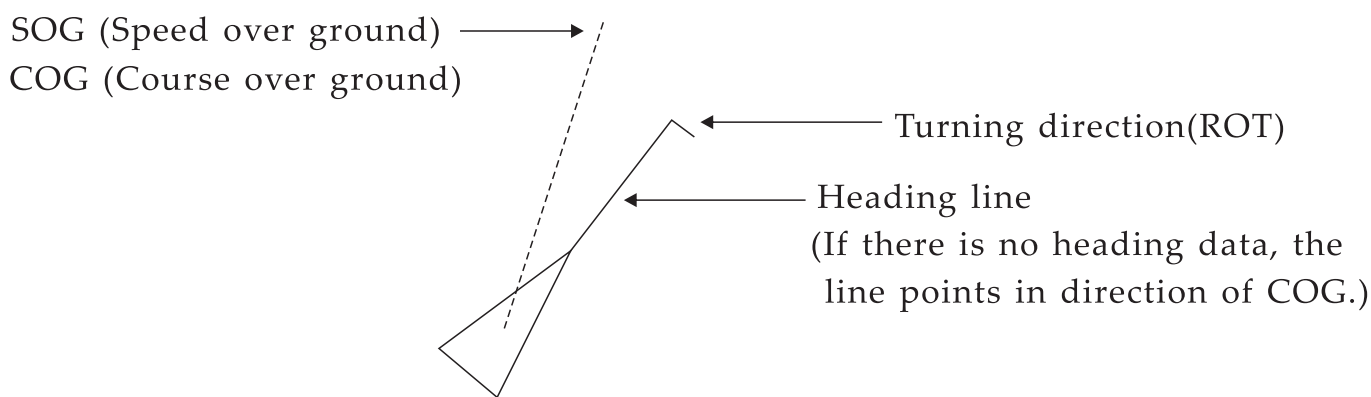


Figure 7-8 Activated target

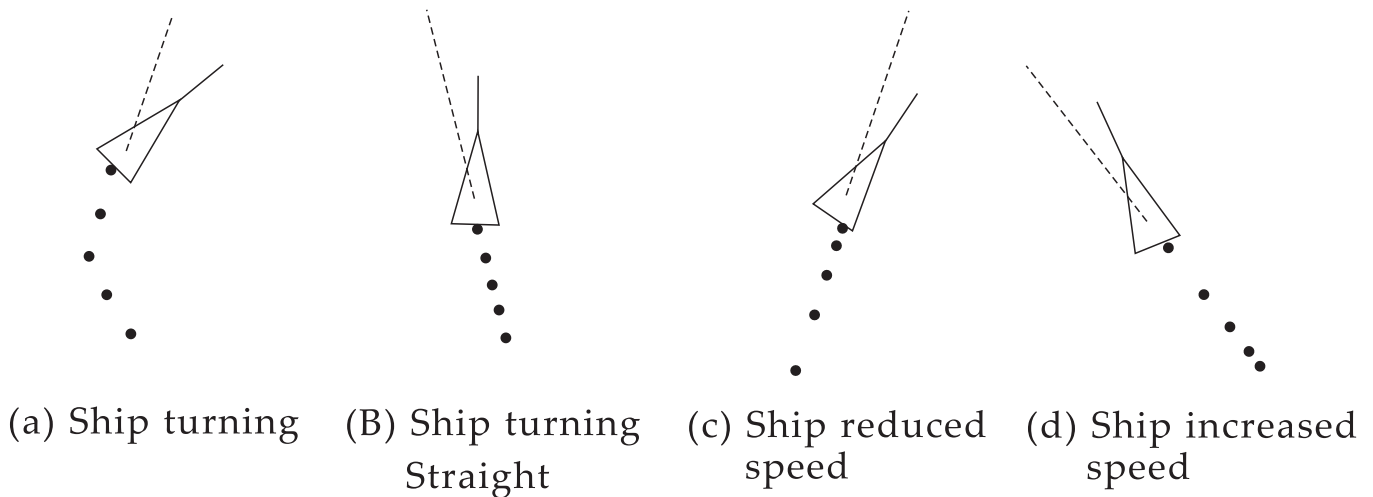
### Setting method:

Enter AIS menu, select "VECTOR LENGTH" and press [ACQ/ENTER] key, then use the direction key choose corresponding time, and press the [ACQ/ENTER] key.

## 7.8 Past Position Display

The past position display shows equally time-spaced dots marking past positions of activated AIS targets. A new dot is added at preset time intervals until the preset number is reached. If a target changes its speed, the spacing will be uneven. If it changes course, its plotted course will not be a straight line.

Below are sample past position displays.



*Figure 7-9 Sample past position displays*

### Past position plot interval

Enter AIS menu, select "HISTORY" to select plot interval desired: Off, 15s, 30s, 1, 2, 3 or 6 min. Select OFF to erase all past position points and turn off the past position display.

## 7.9 AIS Collision Alarm (CPA, TCPA)

The AIS continuously monitors the predicted range at the Closest Point of Approach (CPA) and predicted time to CPA (TCPA) of each AIS target. When the predicted CPA of an AIS target becomes smaller than a preset CPA range and its predicted TCPA less than a preset TCPA limit, the audio alarm sounds and the symbol of the offending AIS target becomes red, hold 2 times and flashes together with its vector.

CPA/TCPA alarm ranges must be set up properly taking into consideration the size, tonnage, speed, turning performance and other characteristics of own ship.



## Setting the CPA and TCPA ranges

Enter AIS menu, select "CPA. SET" & "TCPA. SET", then press direction key choose the value you want.

Below are CPA & TCPA can be setup value

CPA. Set: Off, 0.5, 1, 2, 3, 5, 6 nm

TCPA. Set: 30 s, 1, 2, 3, 4, 5, 6, 12 min

## In/Out harbour

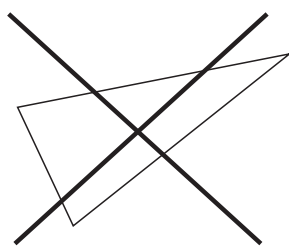
This function is used to avoid ships in the harbour because too many AIS boats nearby may cause continuous alarm. Upon entering the port you may select "ON", CPA and TCPA alarm will be disabled.

## Setting IN/OUT harbour

Enter AIS menu, select "IN/OUT HARBOUR", use direction key to set.

## 7.10 Loss target alarm function

If the current range of AIS targets within the information given by the maximum update interval had not yet received, will be loss target alarm function is triggered, in this case, the target becomes the symbol shown below loss target mark, symbol color is red and flash, while the radar alarm will sound to remind the operator out to pay attention. To manually stop the audible alarm, press the [SELECT/CANCEL] key once.



*Figure 7-10 Loss target display symbol*

## 7.11 How to open the loss target alarm function




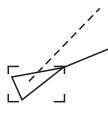


Did not turn this function on the LOSS target symbol will still be displayed, but does not trigger the alarm. Start as follows:

1. Into the AIS menu and select "LOST TARGET ALARM";
2. Press the arrow keys to select "ON" and press the [ACQ/ENTER];
3. Press [MENU] key 2 times to exit.

## 7.12 Prompts of data processing

The radar system can access a variety of NMEA data, including AIS / GPS, direction and water depth data. At boot time, if not turned on AIS, the radar will appear on-screen prompts such as: "No AIS device." To know there are many, such as "AIS signal loss" etc. To turn off the prompt, press the [ACQ/ENTER] key.






### AIS ship symbol status description

SYMBOL	STATUS	REMARKS
	Sleeping target	An isosceles, acute-angled triangle should be used with its centroid representing the target's reference position. The most acute apex of the triangle should be aligned with the heading of the target, or with its COG, if heading information is not available. The symbol of the sleeping target may be smaller than that of the activated target.
	Activated target	All AIS symbols shown with thick line.
	ROT higher than preset ROT	Displayed for turning ship.
	Target selected for data display	Broken square is overlaid on target selected to display its data.
	Dangerous target	Displayed when CPA/TCPA is within CPA/TCPA LIMIT. Red in color. Flashing .until acknowledged.
	Lost target	"X" overlaid on a lost target. Erased after acknowledged.

*Figure7-11 AIS ship symbol description*

## Other symbol description

Other AIS symbols that may appear are shown in the table below.

SYMBOL	Meaning
	Real AIS AtoN
	Virtual AIS AtoN
	Base Station
	Airborne SAR aircraft
	AIS SARTS

*Figure 7-12 Other symbol*

NO.	TYPE	COLOR	REMARK
1	Military	Gray	
2	Yacht/Fishing/Class B	Pink	
3	Tanker/Cargo	Orange	
4	Cruise ship	Violet	
5	Tug/Pilot	White	
6	Unknowns	Blue	When blue background is Black
7	ATON	Red	
8	SART	Red	
9	Selected target frame	With the selected target color	
10	Loss Target	Red	
11	Danger Target	Red	

*Figure 7-13 AIS Icon Color Description*

## 8. INSTALLATION

This chapter provides the procedures necessary for installation.

Installation mainly consists of the following:

- sitting and mounting the display unit and antenna unit
- connection of the signal cable and the power cable
- establishing the ground
- checking the installation, and
- adjustments.

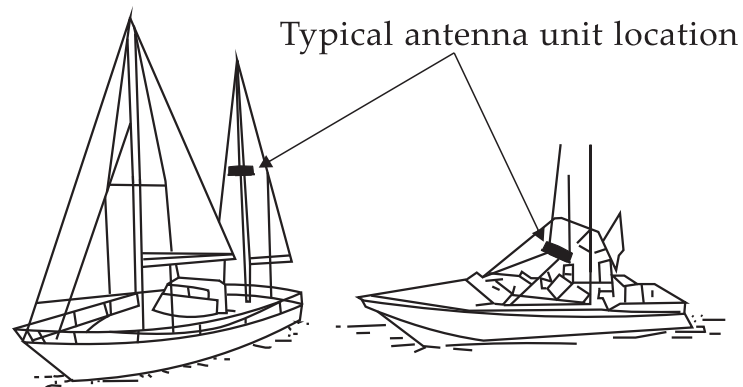
### 8.1 Antenna Unit Installation Sitting, handling considerations

- The antenna unit is generally installed either on top of the wheelhouse or on the radar mast on a suitable platform. Locate the antenna unit where there is a good all-round view rigging intercepting the scanning beam. Any obstruction will cause shadow and blind sectors. A mast for instance, with a diameter considerably less than the width of the radiator, will cause only a small blind sector, but a horizontal spreader or crosstrees in the same horizontal plane as the antenna unit would be a much more serious obstruction; you would need to place the antenna unit well above or below it.
- It is rarely possible to place the antenna unit where a completely clear view in all direction is available. Thus, you should determine the angular width and relative bearing of any shadow sectors for their influence on the radar at the first opportunity after fitting. (The method of determining blind and shadow sectors appears later in this chapter.)
- If you have a radio direction finder on your boat, local its antenna clear of the antenna unit, to prevent interference to the direction finder. A separation of more than two meters is recommended.
- To lessen the chance of picking up electrical interference, avoid where possible routing the signal cable near other onboard electrical equipment. Also avoid running the cable in parallel with power cables.
- The compass safe distance should be observed to prevent deviation of the magnetic compass.

Model	Standard compass	Steering compass
KR-1238/1538	1.3m	0.7m

# Mounting of KR-1X38 antenna(KRA-1004)

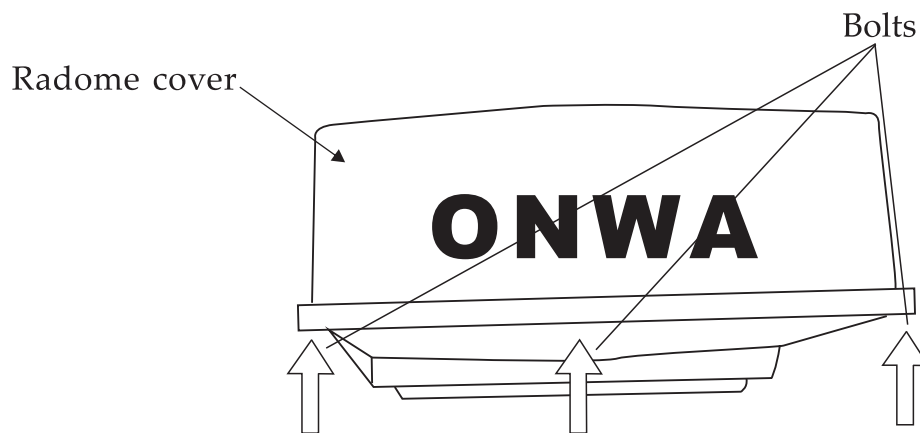
---



*Figure 8-1 Typical antenna unit location*

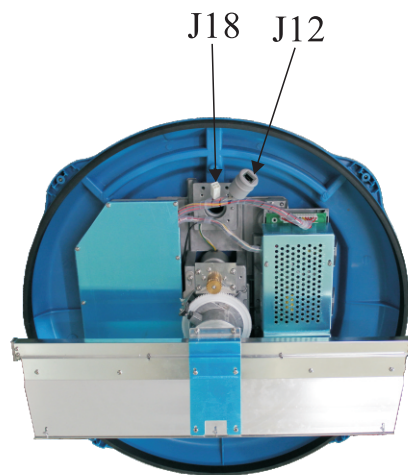
## Unpacking the antenna unit

1. Open the antenna unit packing box carefully.
2. Unbolt the four bolts at the base of the radome to remove the radome cover.



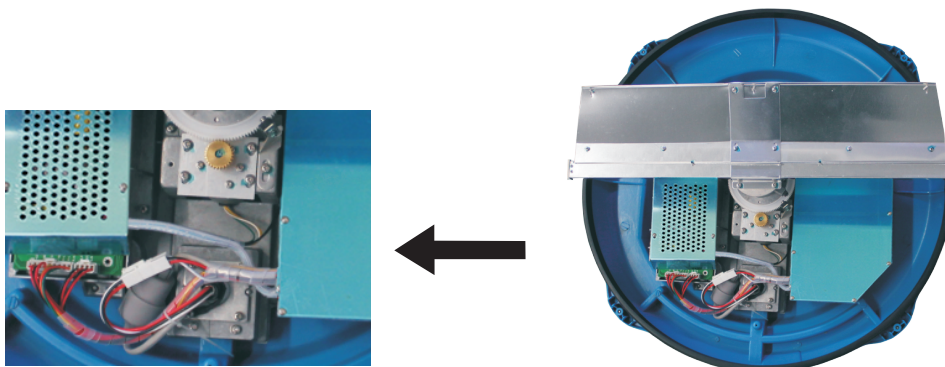
*Figure 8-2 Antenna unit*

3. Drill holes in the antenna mounting platform in accordance with the previous removal of the base mounting map.  
**Note: the hole is arranged in parallel with the center line of the ship.**
4. Loosen the antenna cover and the base of the 4 screws, carefully remove the cover.
5. Remove the cable clamping plate by unfastening four screws and removing a gasket.
6. Pass the cable through the hole at the bottom of the radome base.
7. Secure the cable with the cable clamping plate and gasket. Ground the shield and vinyl wire by one of the screws of the cable clamping plate.
8. Connect the wire to the Video Processing unit.
  - (1) 4-pin connector to J18
  - (2) RJ45 connector to J12



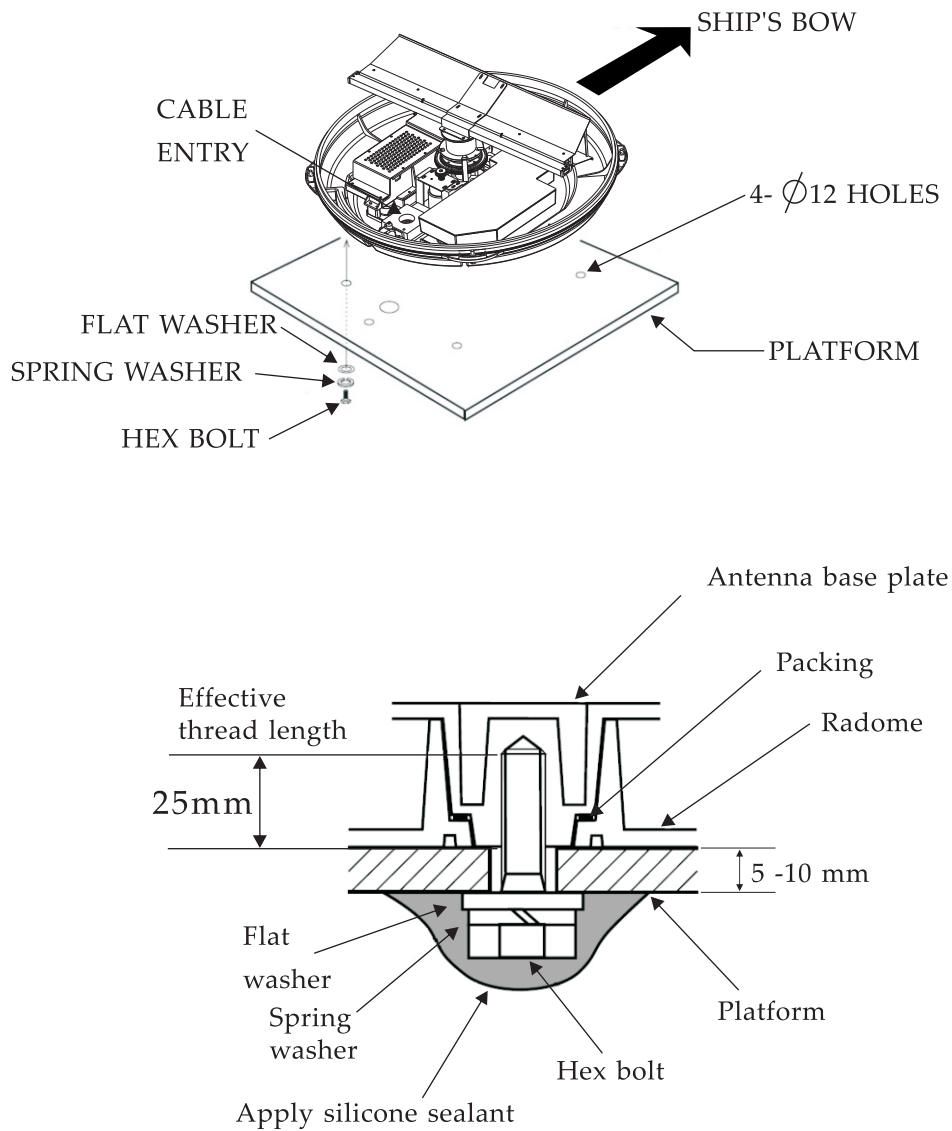
*Figure 8-3 Location of J18/J12*

10. Fix the shield cover. Do not pinch the cable.



*Figure 8-4 Antenna Cable Wiring*

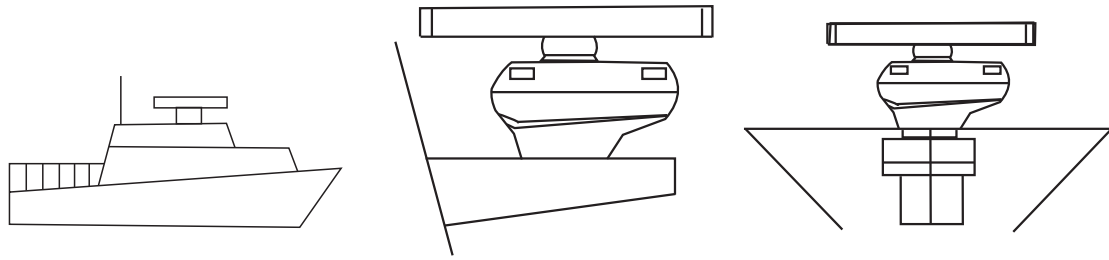
11. Loosely fasten the radome fixing bolts. You will tighten them after confirming the unit is working normally.



*Figure 8-5 How to fasten the radome base to the mounting platform*

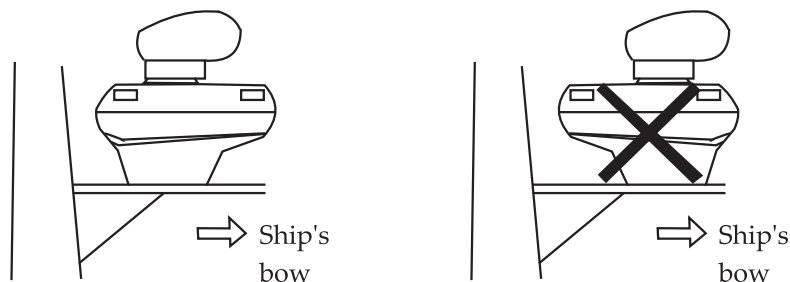
## Mounting of KR-1X68 antenna (KRA-2004)

---



*Figure 8-6 Typical antenna unit mounting locations*

1. Drill four fixing bolt holes (13 millimeters dia.), In the mounting platform. See the outline drawing.
2. Detach the antenna housing cover from the antenna housing by loosening four fixing bolts. The antenna housing cover fitted with the transceiver module can be stored in a convenient place until the wiring to the antenna unit is done.
3. Place the antenna housing on the mounting platform and orient it as shown in Figure 8-7.

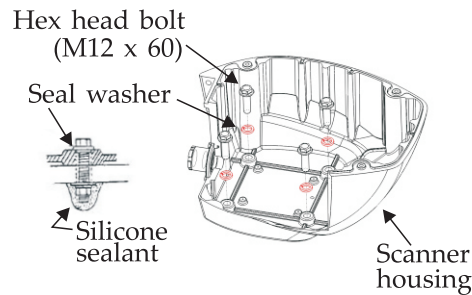


*Figure 8-7 How to orient the antenna unit*

4. Insert four M12× 60 hex head bolts with the seal washers from inside the antenna housing, to prevent the bolts from contacting the transceiver module. Install the seal washer with the larger diameter next to the head of the bolt. Coat flat and spring washers and nuts and then use them to fasten the antenna housing to the mounting platform. Finally, coat exposed parts of nuts, bolts and Flat and spring washers as shown in Figure 8 -8.



Note: Tighten the bolts by their nuts to prevent damage to the seal washer.  
Do not turn the bolts to secure the antenna housing.



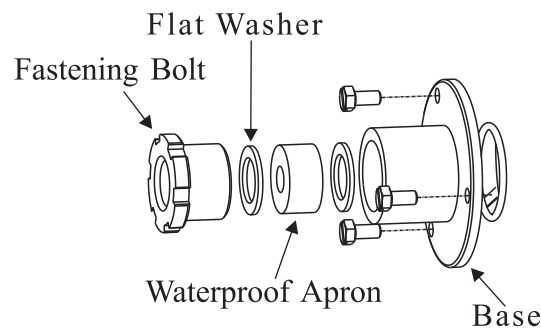
*Figure 8-8 How to mount the antenna housing*

## Connections

Only one signal cable runs from the display unit to the antenna unit. Make the hole for passing the cable through the bulkhead or deck at least 20 millimeters diameter. In order to minimize the chance of picking up electrical interference, avoid routing the signal cable near other onboard electrical equipment. Also, avoid running the cable in parallel with power cables. Pass the cable through the hole and apply sealing compound around the hole for waterproofing.

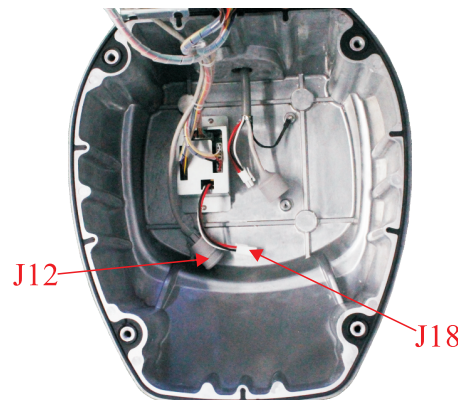
The procedure for connecting the signal cable to the antenna unit is as follows:

1. Through a pipe or waterproof cable gland fitted on the wheelhouse top or bulkhead.
2. Unfasten fastening bolts at rear of the scanner tail to remove the cable gland assembly.
3. Pass the signal cable sequentially through the fastening bolt, the washer, waterproof apron, under the washer, and then through the mounting hole into the base of the antenna inside (removed in step 2.)



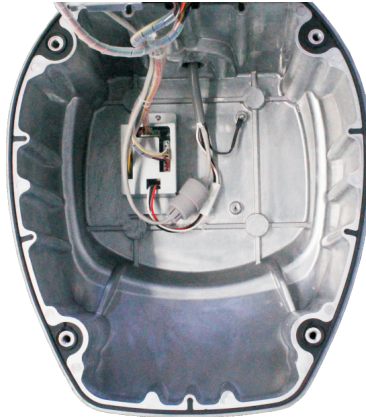
*Figure 8-9 Passing the signal cable through the antenna housing*

4. Tighten the screws



*Figure 8-10 Antenna Cable Wiring*

5. Plug in the RJ45 network of the signal cable to the corresponding RJ45 socket J12;
6. Connect the 4 core plug of the signal cable to the corresponding 4 core socket J18, as shown in figure 8-11;

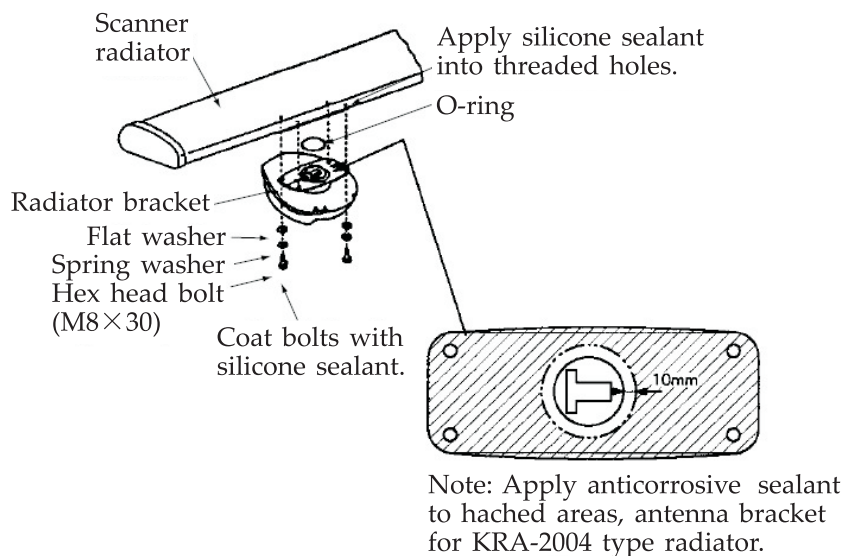


*Figure 8-11 Connection in the antenna housing*

7. Cover the antenna cover, check the waterproof apron.

### **Installation of Waveguide:**

8. The antenna is placed in the arm, and the packing of the antenna is opened;
9. Take out the antenna base waveguide filler;
10. Install the waterproof rubber ring.
11. To check the position of the antenna base guide, and to load the antenna waveguide port with the alignment. As shown below:



*Figure 8-12 Fastening the radiator to the radiator bracket*

12. Open antenna cover;
13. Check the internal connection of signal cable is correct;
14. The grounding of the earth wire in the signal cable to the chassis;
15. Loosely fasten the cover screws. You will tighten them after confirming the unit is working normally.

## 8.2 Display Unit Installation Mounting considerations

When selecting a mounting location for the display unit keep in mind the following points.

- Even though the display unit is waterproof, it is recommended that the display unit must be mounted inside an enclosed cabinet.
- Provide adequate space behind and around the unit to permit circulation of air and to provide convenient access to the rear connectors.
- Even though the picture is quite legible even in bright sunlight, keep the display unit out of direct sunlight or at least shaded because of heat that can build up inside the cabinet.
- Locate the display unit in a position where you can view and operate it conveniently but where there is no danger of salt or fresh water spray or immersion.
- The orientation of the display unit should be so the radar screen is viewed while the operator is facing in the direction of the bow. This makes determination of your position much easier.
- Make sure you allow enough clearance both to get to the connectors behind the unit and to allow you to get your hands in on both sides to loosen or tighten the mounting knobs. Make sure you leave at least a foot or so of "service loop" of cables behind the unit so it can be pulled forward for servicing or easy removal of the connectors.
- The compass safe distance of 0.8 meters (standard compass) and 0.6 meters (steering compass) should be observed to prevent deviation of the magnetic compass.

### Mounting

The display unit is designed to be mounted on a tabletop or bulkhead.

1. Using the hanger as a template, mark screw locations in the mounting location.
2. Fix the hanger to the mounting location with five M6 tapping screws(supplied).
3. Fit the knob bolts to the display unit. Install the display unit in the hanger.  
Tighten the knob bolts securely.

### 8.3 Exchange of Fuse for 24/32V Power Supply

The power cable comes with a 10A fuse in the fuse holder. This fuse is for use with a 12V DC power supply. For 24V/32V DC power supply, replace the fuse with the 5A fuse (supplied) to fuse holder.

### 8.4 Checking the Installation

After completing the installation, it is a good idea to recheck it to be sure all steps were correctly done. Use the table 6-1 to check the installation.

#### Tick box (Table 6-1)

- The signal cable is securely retained against the mast or mounting platform and is free of interference from running rigging
- The cable gland or entry on the deck, if provided, is waterproofed
- The power connections to the battery are of correct polarity
- The plugs at the rear of the display unit are tightly fastened
- The fuse in the power cable is 10A (12V) or 5A (24V/32V DC)

### 8.5 Adjustments

This section covers adjustment of the radar after installation.

You will need to

- adjust tune/video amplifier level input
- enter antenna height
- adjust tuning level
- adjust sweep timing
- adjust main bang suppression
- setting a blanking area

These adjustment are done through the radar install menus.

#### Preparation

1. Turn off the radar. While pressing and holding down the [GAIN] control press the [POWER] key.
2. Release [GAIN] control knob when you see "ONWA" logo and wait for finish standby (finish count down).
3. Press the [MENU] key, and select "FUNCTION MENU" by using the omnipad, and pressing [ACQ/ENTER] key.
4. Select "INSTALLATION SETUP".

Press the [ACQ/ENTER] key to open the installation setup menu.


Installation Setup	
Depth Unit	m
Temp Unit	°C
Key Beep	Off
Ant on TX	Rotate
Dead Sector	000 000
STC Range	1
Tune/Video Adjustment	
Heading Alignment	
Sweep Timing Adjustment	
MBS Adjustment	
Hours Use	2.9
TX Hours	17.2

*Figure 8-15 Installation setup menu*

### Adjusting tune/video

Do the following to adjust tune and video amplifier level input.

1. Press the [ST BY/TX] key to transmit.

 **WARNING**

Before transmitting the radar make sure no one is near the antenna unit, to prevent the potential risk of being struck by the rotation antenna and exposure to radiation hazard.

2. On the Installation setup menu, select "TUNE/VIDEO ADJUSTMENT" and press the [ACQ/ENTER] key.
3. The unit automatically adjusts, displaying the following message.

[Tune/Video Auto Adjustment]

Now under correction.

Return to installation setup menu after the correction.

*Figure 8-16 Tune/Video Auto Adjustment messages*

4. When adjustment is completed, the messages disappears.

### Entering STC range

1. Select "STC RANGE" on the installation setup menu and press the [ACQ/ENTER] key.
2. Operate the omnipad to select 1 (about 6NM), 2 (about 4NM), 3 (about 3NM), 4 (about 2NM)
3. Press the [ACQ/ENTER] key.

### Aligning heading (Adjustment sector:0~359.90)

You have mounted the antenna unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually should appear on the heading line (zero degrees).

In practice, you will probably observe some small error on the display because of the difficulty in achieving accurate initial positioning of the antenna unit. The following adjustment will compensate for this error.

1. Identify a suitable target (for example, ship or buoy) at a range between 0.125 to 0.25 nautical miles, preferably near the heading mark. To lessen error, keep echoes in the outer half of the picture by changing the range. Also, be sure the zoom and off center functions are off.
2. Select "HEADING ALIGNMENT" on the installation setup menu and press the [ACQ/ENTER] key. The following message appears on the display.

[ Heading alignment ]

Set EBL1 to center of target  
dead ahead and press ENTER.

Correction    0.0°

<Press MENU for inst setup>

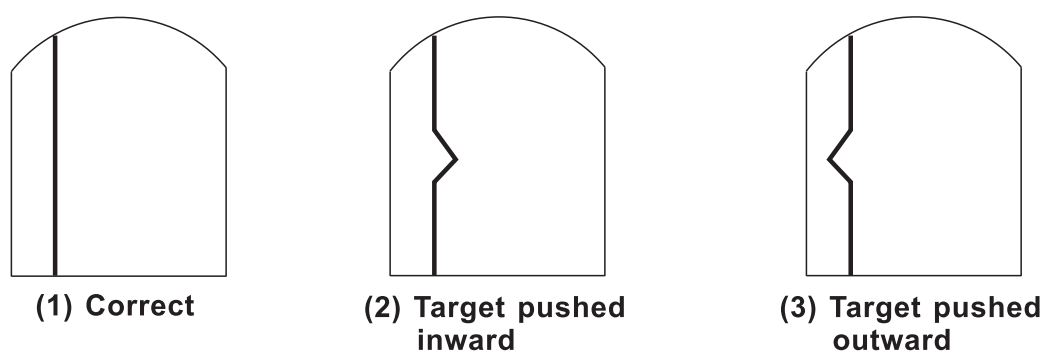
*Figure 8-17 Heading alignment message*

3. Operate the omnipad to bisect target selected at step 1 with the heading line.
4. Press the [ACQ/ENTER] key.
5. As a final test, move the boat towards a small buoy and confirm that the buoy shows up dead ahead on the radar when it is visually dead ahead.



### Adjusting sweep timing(Adjustment range:0.000~4.266nm)

This adjustment ensures proper radar performance, especially on short ranges. The radar measures the time required for a transmitted echo appears on the display based on this time. Thus, at the instant the transmitter is fired, the sweep should start from the center of the display (sometimes called sweep origin.) A trigger pulse generated in the display unit goes to the antenna unit through the signal cable to trigger the transmitter (magnetron). The time taken by the signal to travel up to the antenna unit varies, depending largely on the length of signal cable. During this period the display unit should wait before starting the sweep. When the display unit is not adjusted correctly, the echoes from a straight local object (for example, a harbor wall or straight pier) will not appear with straight edges - namely, they will be seen as "pushed out" or "pulled in" near the picture center. The range of objects will also be incorrectly shown.



*Figure 8-18 Examples of improper and correct sweep timing*

1. Transmit on the shortest range and confirm that the [GAIN] and [STC] controls are properly adjusted.
2. Visually select a target which forms straight line (harbor wall, straight pier).
3. Select "SWEEP TIMING ADJUSTMENT" on the installation setup menu and press the [ACQ/ENTER] key. The message appears.

[ Sweep Timing Adjustment ]  
Use omnipad to straighten  
Target and press ENTER key.  
  
Correction    0.000 nm  
  
<Press MENU for inst setup>

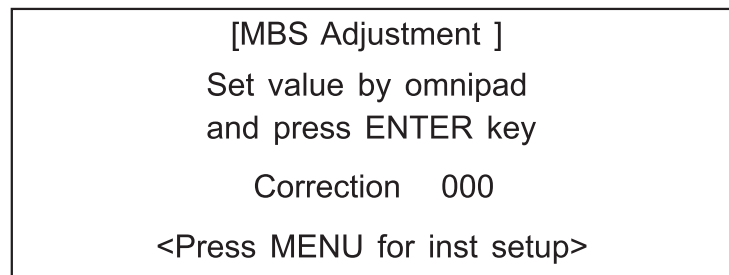
*Figure 8-19 Sweep timing adjustment message*

4. Operate the omnipad to straighten the target selected at step 2, and then press the [ACQ/ENTER] key.

### Adjusting MBS (Main Ban Suppression) (Adjustment: 0.00~0.25)

Main bang (black hole), which appears at the display center on short ranges, can be suppressed as follows.

1. Transmit on long range about 10 minutes.
2. Adjust the gain to show a small amount of noise on the display.
3. Change to the 0.125 nautical mile range and adjust the [A/C SEA] control.
4. Select "MBS ADJUSTMENT" on the installation setup menu.
5. Press the [ACQ/ENTER] key. The following message appears.



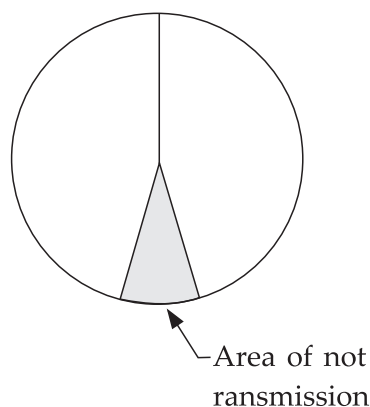
*Figure 8-20 MBS Adjustment message*

6. Operate the omnipad to suppress main bang.(Left: low, right, between 0 and 25)
7. Press the [ACQ/ENTER] key.

### Setting a blanking area

When the antenna is installed at a close distance in front of the wheelhouse, the radar should be set not to transmit within that area. No echoes appear in the blanking areas.

1. Select "DEAD SECTOR".
2. Press the [ENTER] key.
3. Operate the omnipad to enter starting point of area (in figures).
4. Press the [ENTER] key.
5. Operate the omnipad to enter ending point of area (in figures).
6. Press the [ENTER] key.



*Figure 8-21 Blank areas where transmission is suspended*



This area can be turned on/off on the VIDEO MENU.

Note: This setting should be done after other adjustment are finished.

#### Magnetron heater voltage

Magnetron heater voltage is formed at the MOD Board of the antenna unit and preadjusted at the factory for use with any length of signal cable. Therefore no adjustment is required. However, verify heater voltage by following the procedure below.

1. Turn on the radar(if it is not already on) and set it in stand-by.
2. Open the antenna housing (radome) cover. Connect a multitester, set to 10V DC range.

Model	Check point	Rating	Adjustment Point
KR-1238/1538	Tp803 #4,#6 on MD Borad	7.4~7.6V	VR801
KR-1268/1568	Tp803 #4,#6 on MD Borad	7.4~7.6V	VR801

3. Close the antenna housing cover and tighten the fixing bolts.

## 9. CONNECTIONS

1. Connect the power cable to the power cable connector on the rear of the display unit.
2. Connect the signal cable to connector on the rear of the display unit.
3. Run a ground wire (local supply) between the ground terminal on the rear of the display unit and the ship's superstructure.

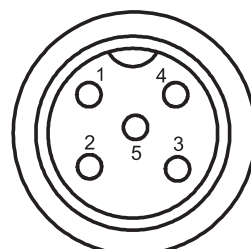
Navigation aid, video sounder connection

If your navigation aid can output data in IEC61162(NMEA0183) data format, your vessel's position in latitude and longitude, the range and bearing to waypoint, speed and course may be input to this radar, and be seen on the screen.

Further if your video sounder can output depth in IEC 61162(NMEA 0183) data format, depth can be displayed on the radar screen.

1. NMEA1 (5 pins connector):Use for AIS

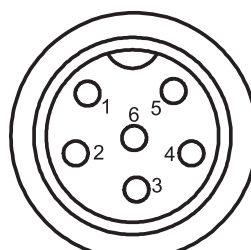
PIN No.	Function
1	GND
2	3.3V
3	NMEA1 Input+
4	NMEA1 Input-
5	Not used



socket side

2. NMEA2 (6 pins connector):Use for other navigation device

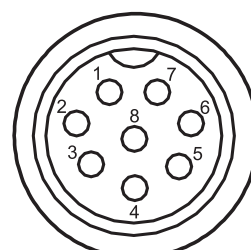
PIN No.	Function
1	NMEA2+
2	NMEA2-
3	+12V
4	NMEA3+
5	NMEA3-
6	GND



socket side

3. Reserve: Currently not in use
4. UPGRADE (4 pins connector): used to upgrade the interface and firmware.  
You will need to use a special upgrade cable .
5. RS-422 and External Alarm Switch(8 pins connector):

PIN No.	Function
1	Not Use
2	OUTPUT+
3	OUTPUT-
4	INPUT-
5	INPUT+
6	GND
7	EX-ALARM SWITCH(+12V)
8	Not Use



socket side

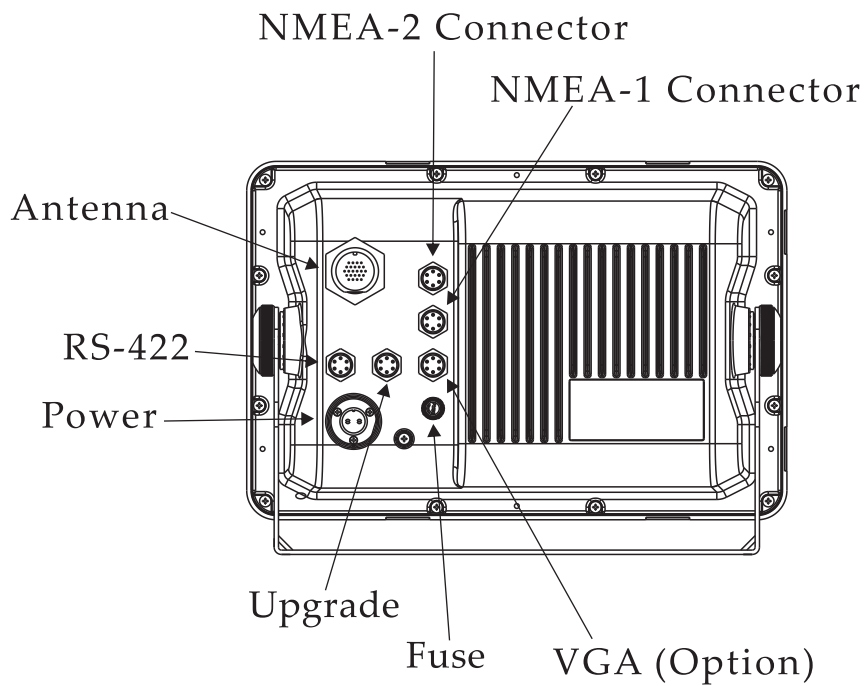


Figure 6-14 KR-1238/1268 Display connectors

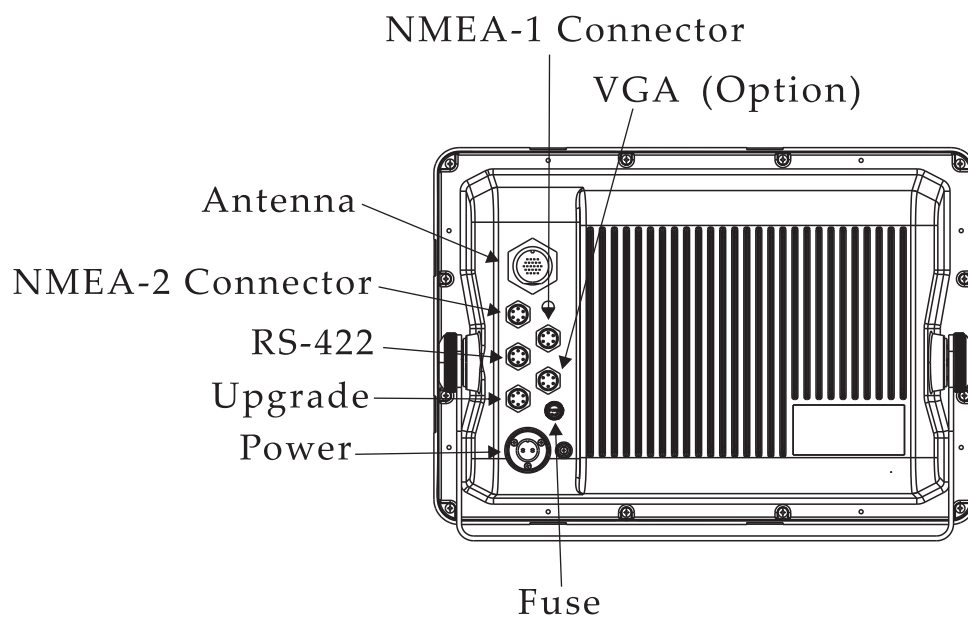
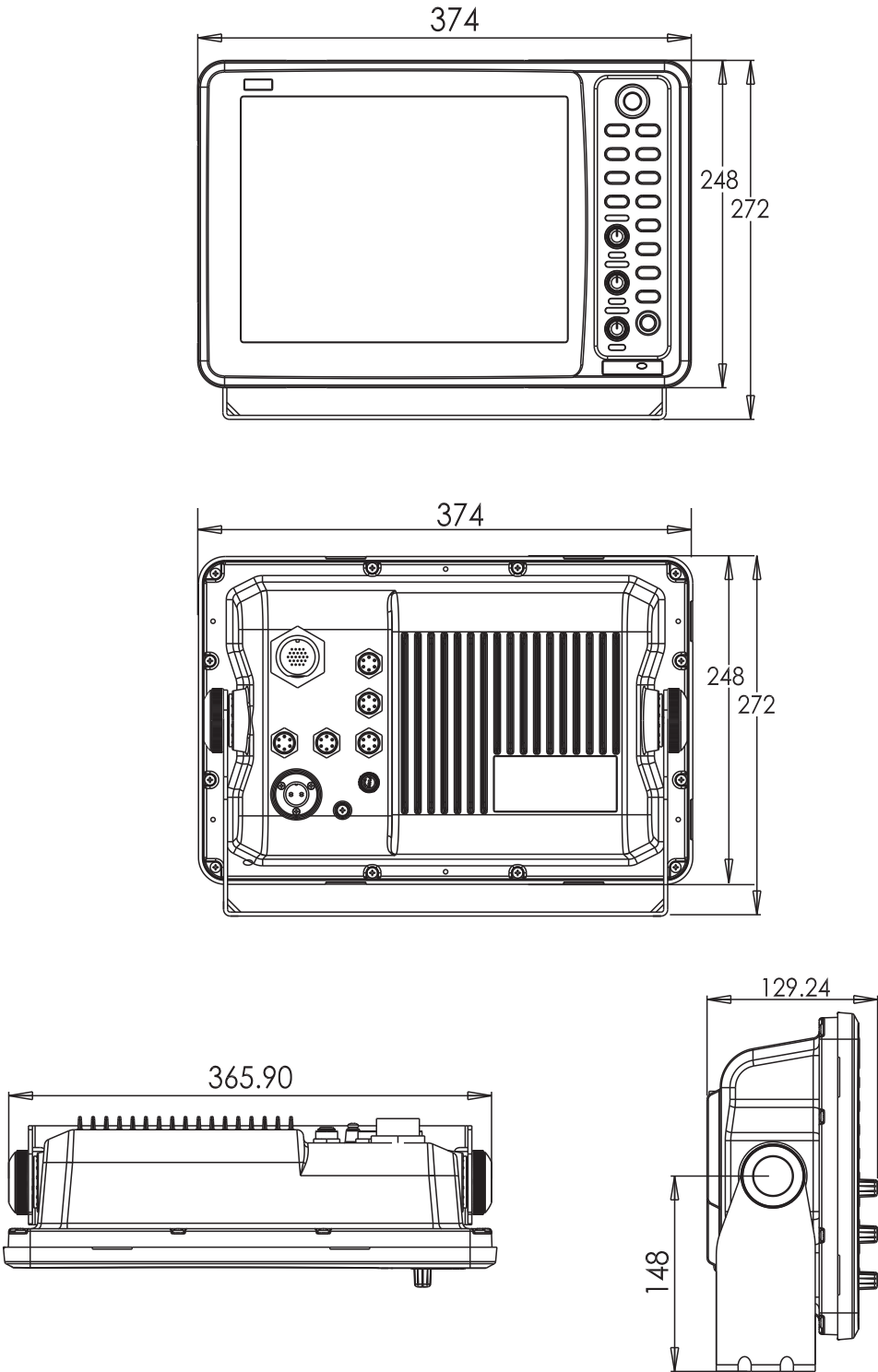


Figure 6-15 KR-1538/1568 Display connectors

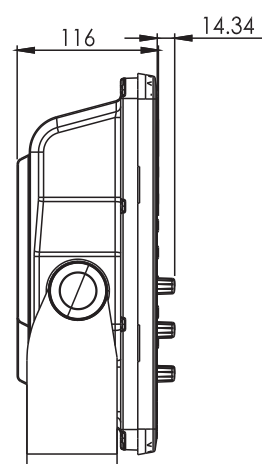
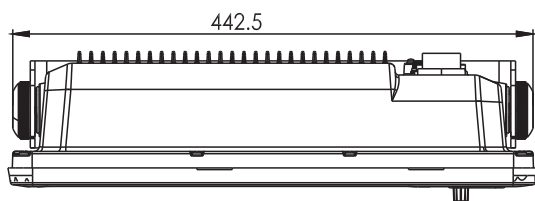
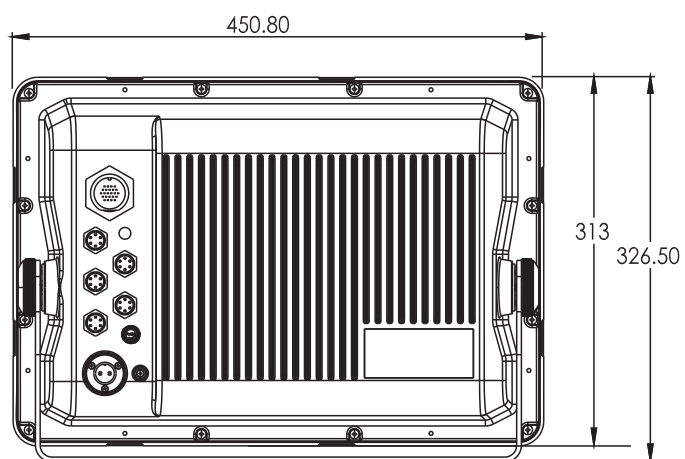
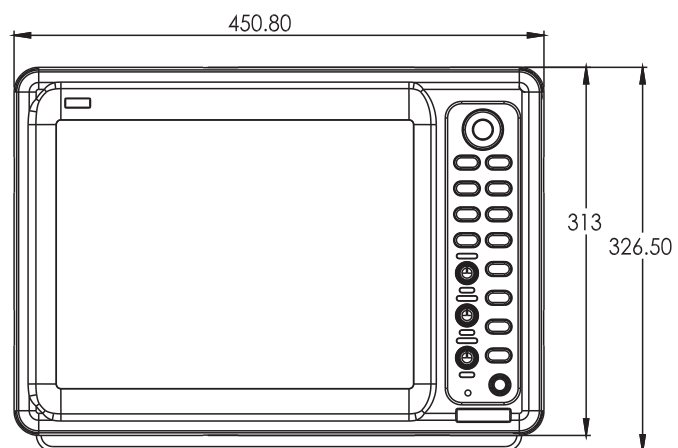
CAUTION
Ground the equipment. Ungrounded equipment might emit or receive electromagnetic interference or cause electrical shock.

CAUTION
Replace ther fuses to 5A for 24/32VDC operation.

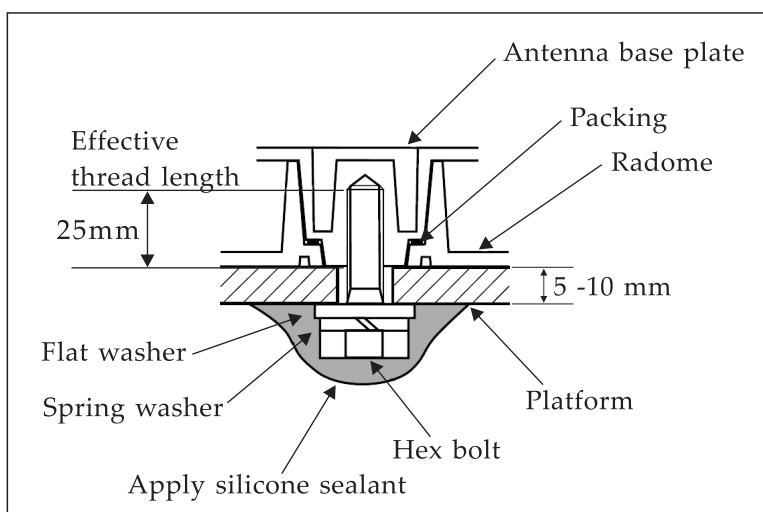
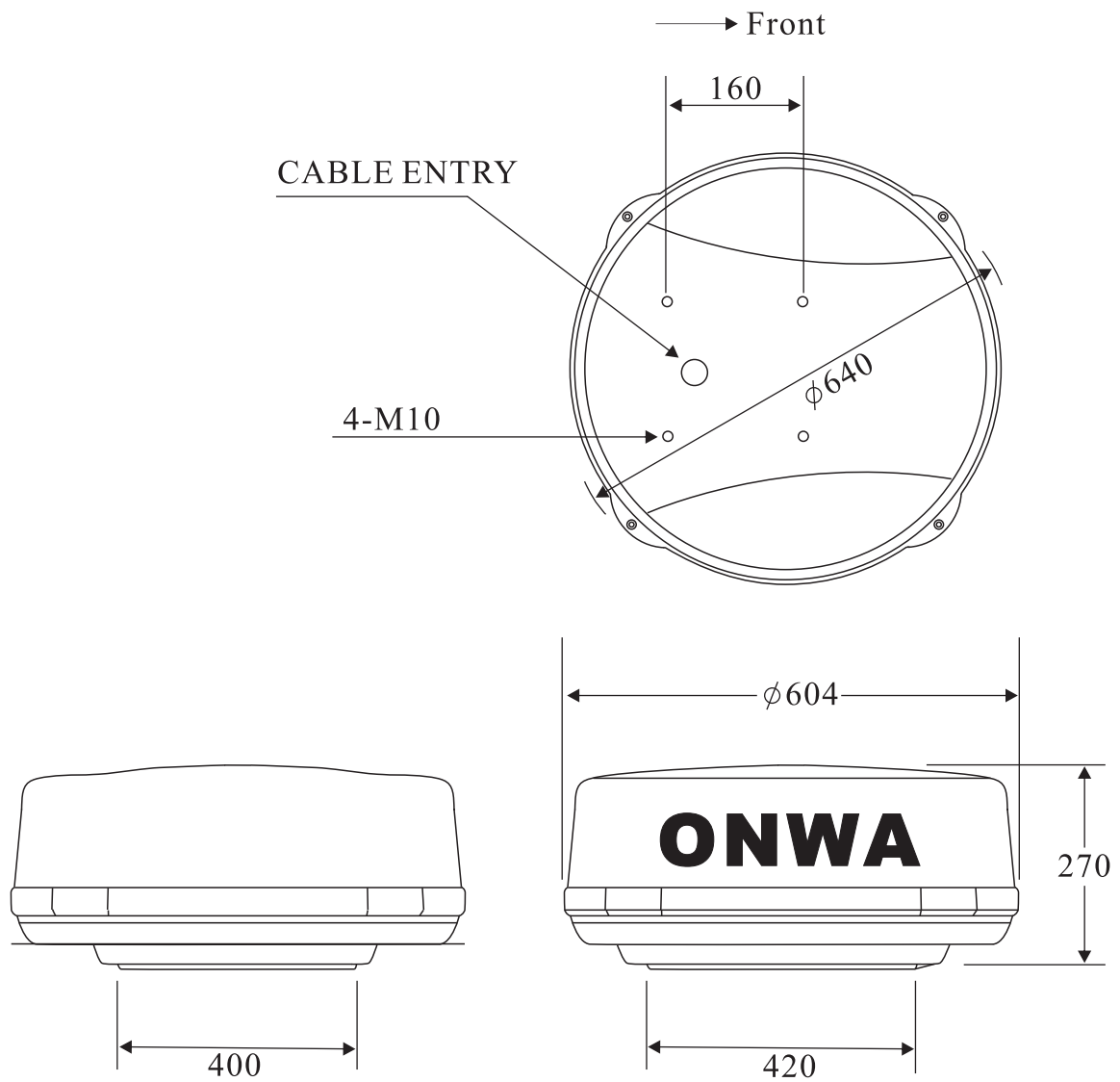
# 10. DISPLAY UNIT AND ANTENNA UNIT SIZE



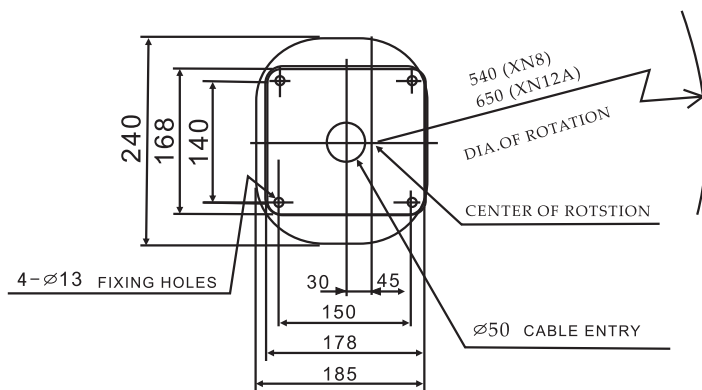
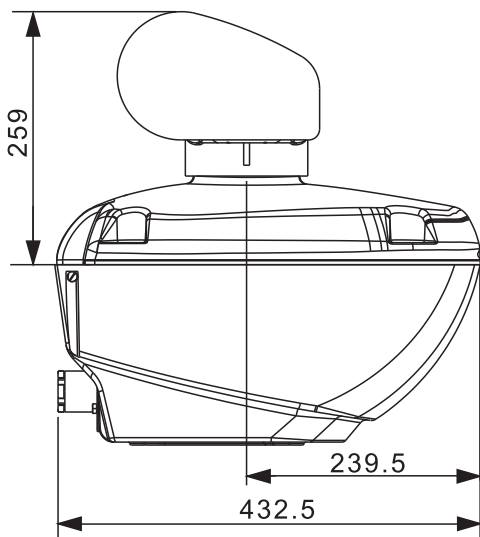
	TYPE:	KRD-1005
KR-1238	NAME:	DISPLAY UNIT
KR-1268		



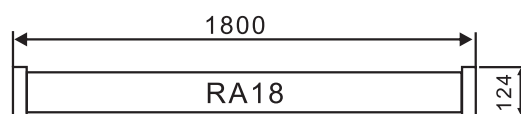
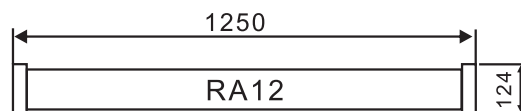
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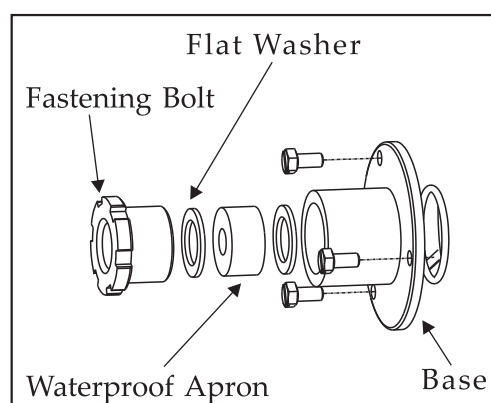
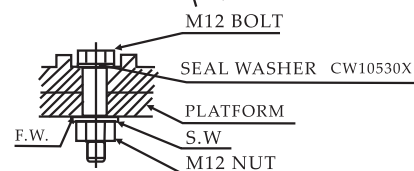
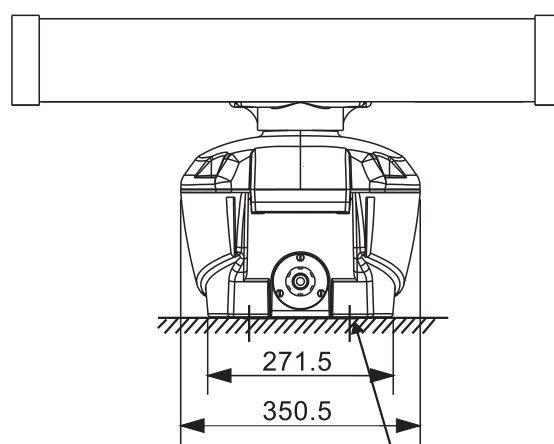
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MOUNTING DIMEENSIONS



RADIATOR (S=1/25)



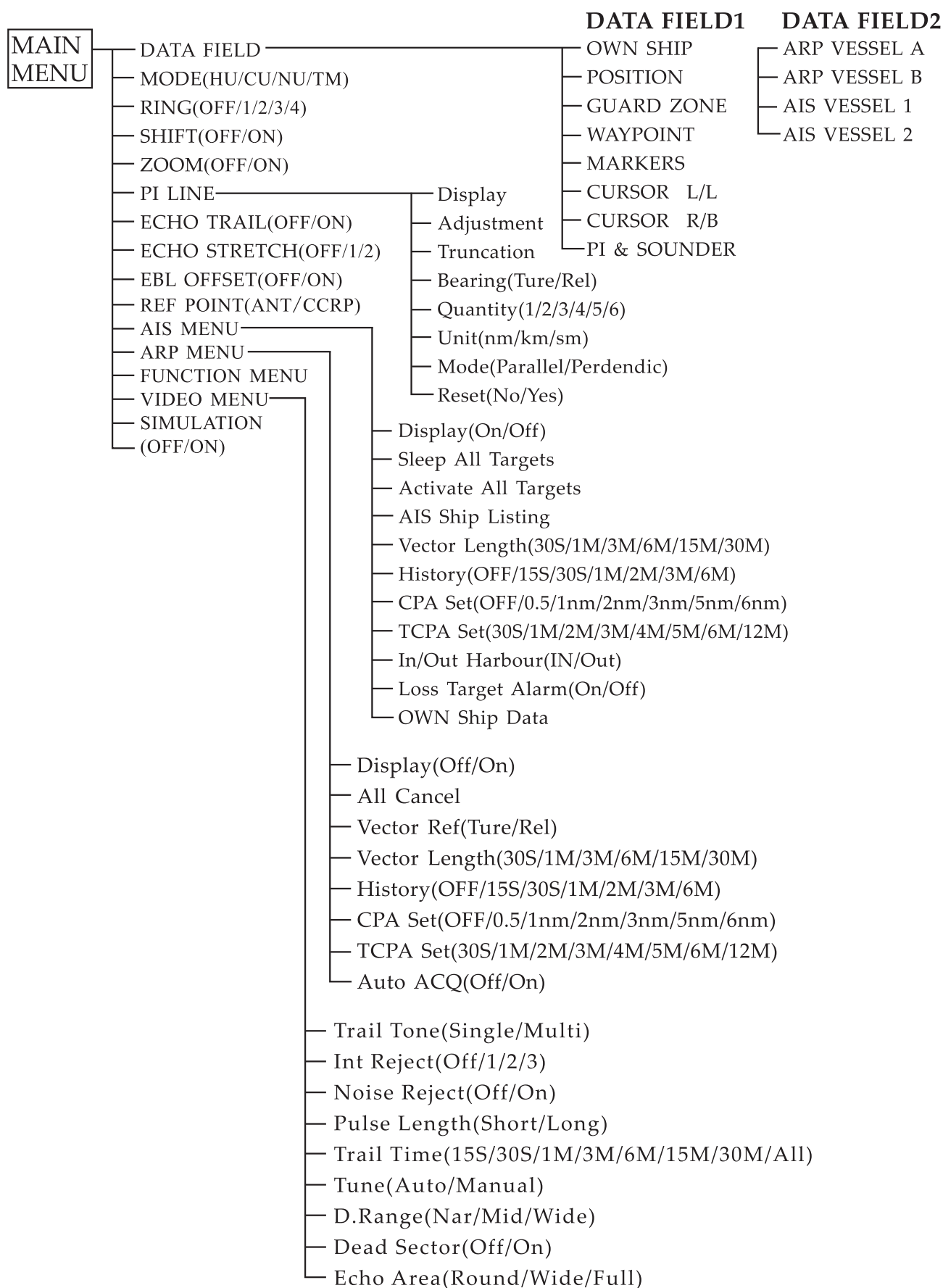
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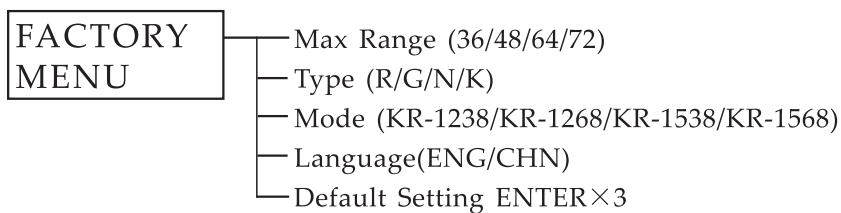
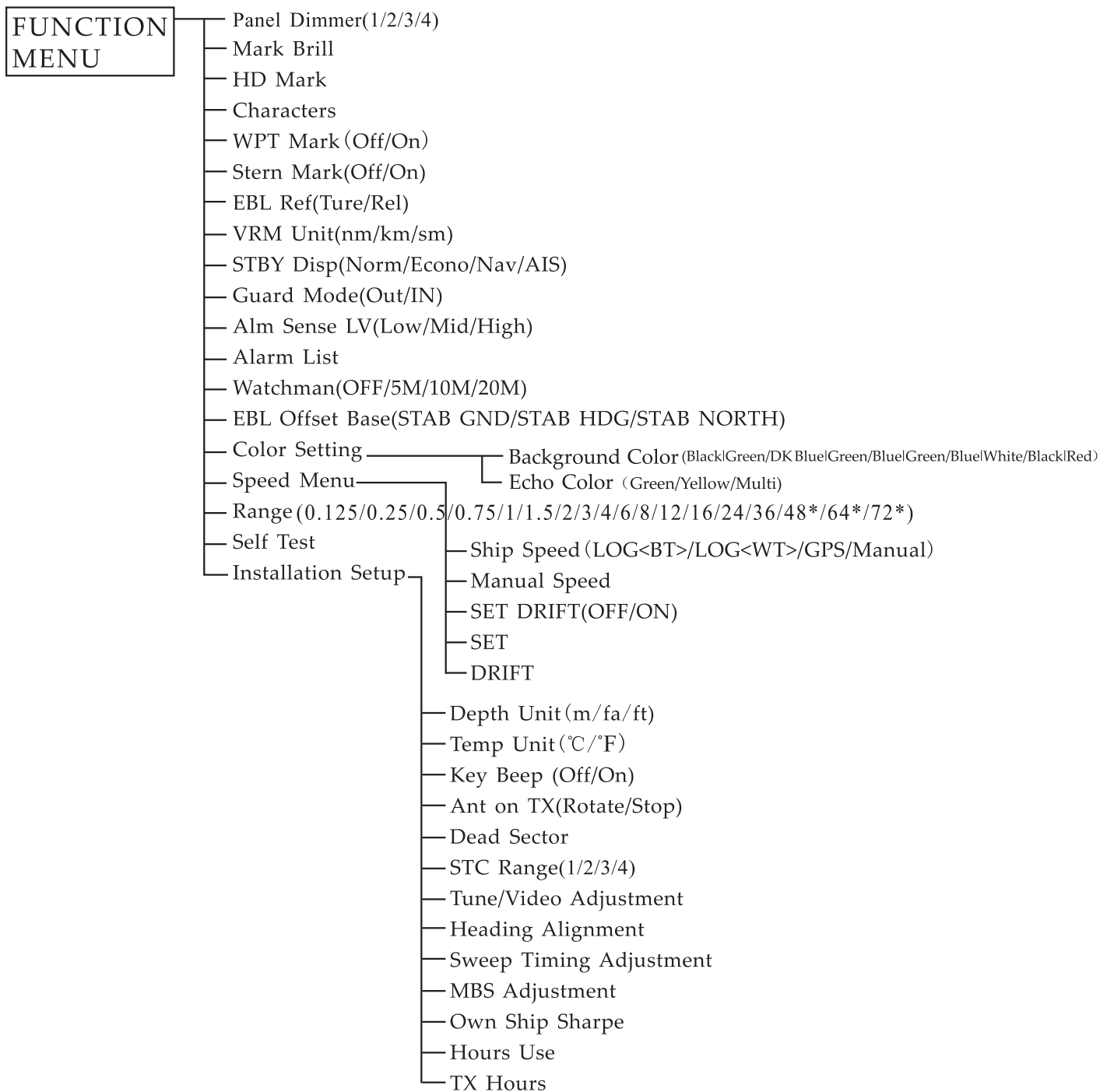
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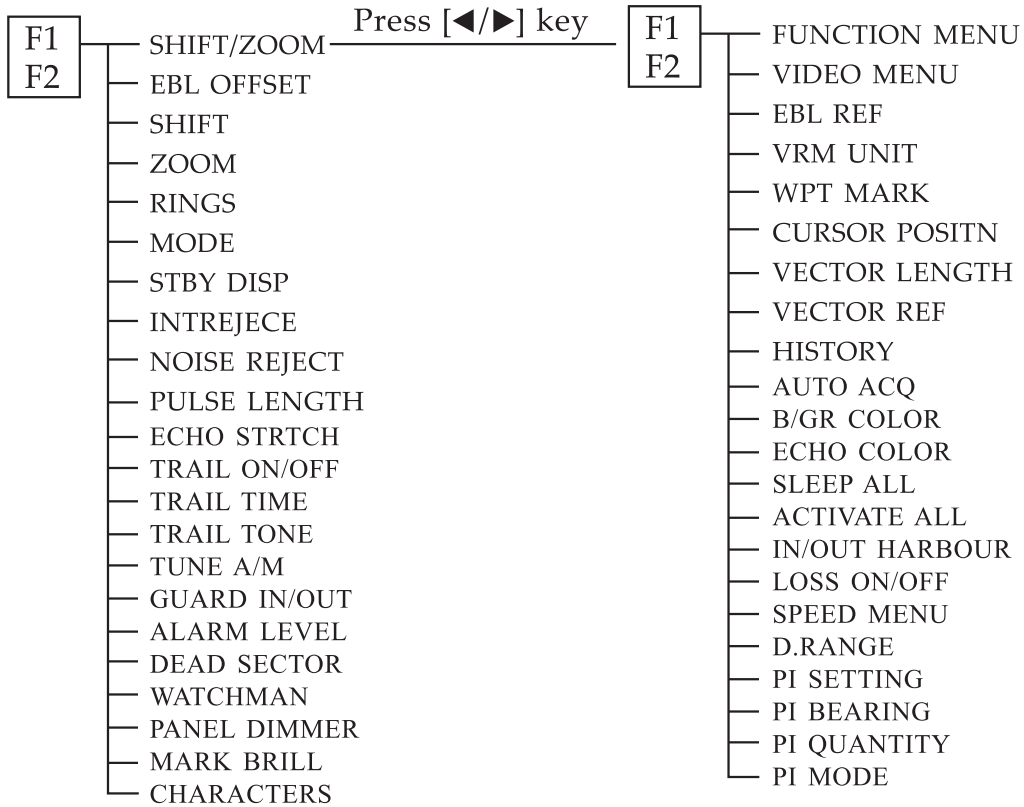
NAME: SCANNER UNIT

# 11. MENU TREE









# 12. ABBREVIATIONS

Word	Abbreviations	Word	Abbreviations
Acknowledge	ACK	Maximum	MAX
Acquire, Acquisition	ACQ	Medium Pulse	MP
Adjust, Adjustment	ADJ	Menu	MENU
Alarm	ALARM	Minimum	MIN
Anchor Watch	ANCH	Minute(s)	Min
Antenna	ANT	Nautical Mile(s)	NM
Anti Clutter Rain	RAIN	Navigation	NAV
Anti Clutter sea	SEA	Normal	NORM
Automatic	AUTO	Normal	NORMAL
Automatic Identification System	AIS	North	N
Bearing	BRG	North	NORTH
Bow Crossing Range	BCR	North Up	N UP
Bow Crossing Time	BCT	Off	OFF
Brilliance	BRILL	Offset	OFFSET
Clear	CLR	On	ON
Closest Point of Approach	CPA	Out/Output	OUT
Consistent Common Reference Point	CCRP	Own Ship	OS
Contrast	CONT	Panel Illumination	PANEL
Course	CRS	Parallel Index Line	PI
Course Up	CUP	Past Positions	PAST POSN
Course Over the Ground	COG	Performance Monitor	PM
Course Through the Water	CTW	Port/Portside	PORT
Cursor	CURS	Position	POSN
Delete	DEL	Power	PWR
Depth	DEPTH	Rain	RAIN
Depth	DPTH	Range Rings	RR
Differential GPS	DGPS	Rate Of Turn	ROT
Drift	DRIFT	Reference	REF
East	E	Relative	REL
Echo Reference	REF	Map(s)	MAP
Electronic Bearing Line	EBL	Maritime Mobile Services Identity number	MMSI
Enter	ENT	Relative Motion	RM
Enter	ENTER	Revolutions Per Minute	RPM

<b>Word</b>	<b>Abbreviations</b>	<b>Word</b>	<b>Abbreviations</b>
Error	ERR	Route	ROUTE
Error	ERROR	S-Band	S-BAND
Estimated Time of Arrival	ETA	Search And Rescue Transponder	SART
Fathom(s)	Fm	Second(s)	SEC
Feet/Foot	ft	Select	SEL
Full	FUL	Short Pulse	SP
Full	FULL	Speed	SPD
Gain	GAIN	Speed Over the Ground	SOG
Global Positioning System	GPS	Speed Through the Water	STW
Ground	GND	Stabilized	STAB
Guard Zone	GUARD	Standby	STBY
Gyro	GYRO	Starboard/Starboard Side	STBD
Head Up	H UP	Symbol(s)	SYM
Head Up	HEAD UP	Symbol(s)	SYMBOL
Heading	HDG	Target	TGT
Heading Line	HL	Target Tracking	TT
Indication	IND	Test	TEST
Interference Rejection	IR	Time	TIME
Interval	INT	Time to CPA	TCPA
Interval	INTERVAL	Time To Go	TTG
Kilometre	Km	Track	TRK
Knot(s)	Kn	Tracking	TRKG
Latitude	LAT	Trail(s)	TRAIL
Latitude/Longitude	L/L	Transmit	TX
Log	LOG	Trigger Pulse	TRIGGER
Long Pulse	LP	Tune	TUNE
Longitude	LON	True	T
Lost Target	LOST TGT	True Motion	TM
Magenta	MAG	Variable Range Marker	VRM
Man Overboard	MOB	Vector	VECT
Manual	MAN	Voyage Data Recorder	VDR
Manual	MANUAL	Warning	WARNING
Marker	MKR	Waypoint	WPT
Marker	MARK	X-Band	X-BAND
Master	MASTER		

## 13. GLOSSARY

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ACA	(AIS) Regional Assignment Channel Assignment Message
ACK	Acknowledgement
ACS	(AIS) Channel management information source messages
AFSK	Auto frequency-shift keying
ALR	(AIS) Alarm Message
A to N	Aid to Navigation
AIS	Automatic Identification System
BIIT	Built In Integrity Testing
BNC	Bayonet fitting type Therefore connector
COG	Course over Ground
CR	Carriage Return
CS	Carrier Sense
CSTDMA	Carrier Sense Time Division Multiple Access
DC	Direct Current
DGNSS	Differential Global Navigation Satellite System
DSC	Digital Selective Calling
GLONASS	Global Navigation Satellite System
GNSS	Global Navigation Satellite System
GMSK	Gaussian Minimum Shift Keying
GPS	Global Positioning Satellite / System
HF	High Frequency
IMO	International Maritime Organization
IEC	International Electrotechnical Commission
LED	Light Emitting Diode
LF	Line Feed
LNA	Low-noise Amplifier
MF	Medium Frequency
MKD	Minimum Keypad and Display

MMSI	Maritime Mobile Service Identity
MPE	Maximum Permissible Exposure
NMEA	National Marine Electronics Association
PC	Personal Computer
PI	Presentation Interface
RF	Radio Frequency
RTCM	Radio Technical Commission for Maritime Services Commission
RX	Receive or Receiver
RFI	Radio Frequency Interference
SAR	Specific Absorption Rate
SELV	Separated Extra Low Voltage
SMS	Short Message System
SOG	Speed over Ground
SRM	Safety Related Message
TDMA	Time-division Multiple Access
TNC	Threaded type RF connector
TX	Transmit or Transmitter
UTC	Universal Time Coordinated
VDM	(AIS) VHF Data Link Messages
VDO	(AIS) VHF Data link own vessel messages
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

