Anritsu

RA772UA

Marine Radar

Instruction Manual

■ Read this manual before using the equipment. Keep this manual with the equipment.

RA772UA
Marine Radar
Instruction Manual

6th Edition

- Read this manual before using the equipment.
- Keep this manual.

Communication Systems Division
Information & Communications Group
ANRITSU CORPORATION

Document : E-A772UA-2-05

Safety Symbols

To prevent the risk of personal injury or damage to the equipment, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.

Symbols Used in Manual

⚠ **DANGER**	This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.
⚠ **WARNING**	This indicates a hazardous procedure that could result in serious injury or death if not performed properly.
⚠ **CAUTION**	This indicates a hazardous procedure or danger that could result in light-to-severe injury, or that might damage the equipment, if proper precautions are not taken.

Safety Symbols Used on Equipment

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

This indicates high voltages with a risk of serious electric shock if the part is touched. NEVER touch the part with bare hands, etc.

The ⃠ symbol prohibits the operation shown inside the symbol. (The example in the left prohibits disassembly.)

The ● symbol indicates that the operation inside the symbol is potentially hazardous. (The example on the left indicates that the plug should be held when disconnecting it from the AC outlet.)

This indicates the ground (earth) terminal. If the equipment cannot be grounded via the power cord, connect this terminal to ground. There is a risk of serious electric shock if the equipment is not grounded.

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For Safety

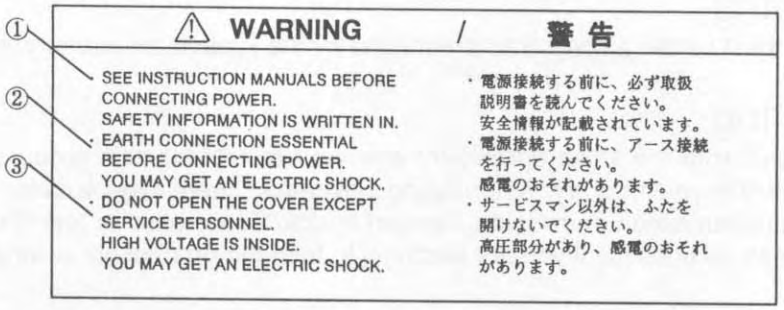
① There is a risk of receiving electric shock if these parts are touched by accident. Only qualified personnel should remove covers on these parts.

② To avoid accidental antenna rotation, turn off ship's main and pull off out the motor fuse during repair inspect, or maintenance.
When repairing or inspecting the scanner unit wear a safety harness and provide a secure platform so that there is no danger of falling even when the vessel lists or when there is an unexpected incident such as an earth quake.

③ Do not approach the antenna while it is transmitting.
In addition, at inspection never look into the wave guide during transmission.

④ When remove the scanner cover etc., do not drop it. It may endanger people below.

⑤ Do not paint the RADOME. Antenna performance will be down.



① See instruction manuals before connecting power. Safety information is written in.

② Earth connection essential before connecting supply.
There is a risk of serious electric shock if the equipment is not grounded.

③ There is a risk of receiving electric shock if these parts are touched by accident.
Only qualified personnel should remove covers on these parts.

Installation

Radio laws dictate that this radar may only be installed by properly licensed personnel.

Licensing

You must obtain a license as prescribed by the Radio Law to operate this unit.

Exporting

According to the sales agreement with your distributor, this product is for use only within your country. When taking it overseas, there may be cases where you must obtain export permission. Contact Anritsu Corporation or one of our dealers as soon as possible if you are planning to take the product out of your country.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment, to meet recognized standards.

Warranty

Anritsu Corporation warrants this equipment to be manufactured in accordance with published specifications and free from defects in materials and/or workmanship.

Anritsu Corporation will repair or exchange any parts except consumable parts proven to be malfunctioning under normal use for a period of two (2) years. This warranty policy shall not cover any labor charge.

Limitation of Warranty

Anritsu Corporation's warranty policy does not apply to product which has been subjected to accident, abuse, or misuse, shipping damage, alterations, corrosion, incorrect and/or unauthorized service or modification, or product which the serial number plate has been altered or removed.

ANRITSU CORPORATION MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, EXCEPT AS PROVIDED HEREIN, INCLUDING WITHOUT LIMITATION PARTICULAR PURPOSE OR USE, OR AGAINST INFRINGEMENT OF ANY PATENT. IN NO EVENT SHALL ANRITSU BE LIABLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE, OR LOSSES OR EXPENSES RESULTING FROM ANY DEFECTIVE PRODUCT OR THE USE OF ANY PRODUCT.

Should you have queries about maintenance, please contact our distributor.

To Customers

* To use this equipment effectively, the operation and maintenance procedure in this manual must be followed properly. Note that this equipment is only a navigational instrument having no warrant for navigation safety. Non-execution of fundamental navigation requirements such as the ship location check or lookout is not allowed.

* If some abnormality occurs in this equipment, immediately turn off the equipment POWER switch and the radar main switch in the power distribution board and notify our maintenance section or dealer.

Contents

CHAPTER 1 OVERVIEW

1.1 Introduction

The RA772UA represents a compact, high-performance marine radar that delivers a peak power output of 2 kW from the antenna and uses an 8-inch monochrome liquid crystal display.

In addition to a microcomputer, it incorporates a video signal processing LSI and a newly developed LSI chip exclusively designed for radars, thus providing versatile functionality and high performance.

Features

1. A thin display unit incorporating a liquid crystal display.
2. Easy operation using only a few keys and menu screens.
3. Semi-3D screen display for easy identification of targets in noise.
4. Capable of continuous distance range changes (Continual variable range).
5. Waterproof construction of display allows installation at any desired location.

1.2 Organization of This Manual

This manual provides a wide range of information necessary to operate the RA772UA radar ranging from the basic knowledge on radars to the methods of operating, installing, and maintaining the RA772UA radar. The manual also provides rather detailed technical information on how to adjust video display to obtain clear images. Anritsu recommends you to read this manual thoroughly from beginning to end in order to understand the various functions of the RA772UA radar so you can take full advantage of its advanced functions. If you are using a radar for the first time, refer to the basic data on radars in CHAPTER 2.

This manual consists of the following chapters:

If you are an experienced user of radars, skip CHAPTER 2 and begin from CHAPTER 3.

CHAPTER 2. USING RADAR FOR THE FIRST TIME

This chapter describes basic information on radars and explains technical terms used in radar operation for those who is using a radar for the first time.

2.1 What is a radar?

A marine radar is one of the navigation equipment installed on a ship. It emits a radio wave in very high frequency called a microwave from its antenna and receives the reflected radio wave from objects on the sea (e.g., other ships, buoys, and lands). The received radio wave is converted into an electric signal which is displayed on a display screen to indicate the presence of such objects. Although it is very difficult to find other ships or the destination coast with human eyes at night or in thick fog, a radar helps you detect objects on the sea helping you avoid danger when sailing. The antenna turns 360 degrees as it radiates waves, allowing you to grasp ambient conditions around your ship at a glance.

The radio wave radiated from the antenna is called a pulse wave and the radar performs transmission and reception alternately. Several hundred to several thousand pulse waves generally are transmitted while the antenna rotates one turn.

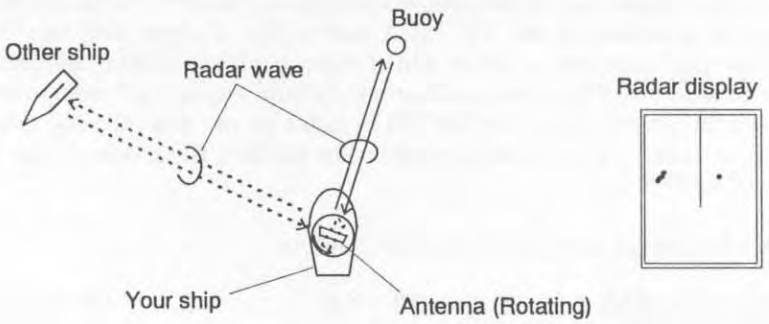


Fig.1 What is a radar?

Antenna

There are many types of antennas generally used for a radar. For example, these include a parabolic antenna and a slotted-array antenna. The performance of the antenna determines that of the radar. The dominant factors are the antenna's beam width and side lobe level. The narrower the beam width, the higher the resolution of the angle direction. The lower the side lobe level, the fewer the effect of a false echo.

Side lobe

A beam in one direction in which the strongest radio wave is radiated from the antenna is called the main lobe and beams in other directions are called "side lobes". The side lobe level refers to the difference in level between the largest side lobe and the main lobe.

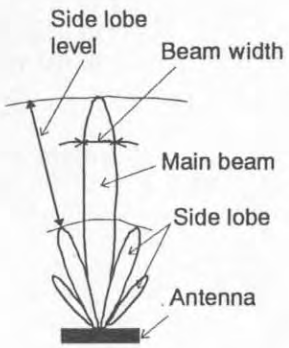


Fig.2 Antenna pattern

Beam width

A beam width is defined as the width of the main lobe at an angle where the radiated power is halved as measured from the position from which the strongest radio wave is radiated.

2.2 Characteristics of Radar Wave

Radio waves from the radar propagate while bending slightly along the terrestrial surface. This characteristic varies dependent on the density of the atmospheric air. The sight distance D of a radar generally is said to be approximately 6% longer than the optical sight distance and is calculated using the equation below :

$$D\ (NM) = 2.22\ (\sqrt{h1} + \sqrt{h2})$$ where, h1= antenna height in meters
h2= target height in meters

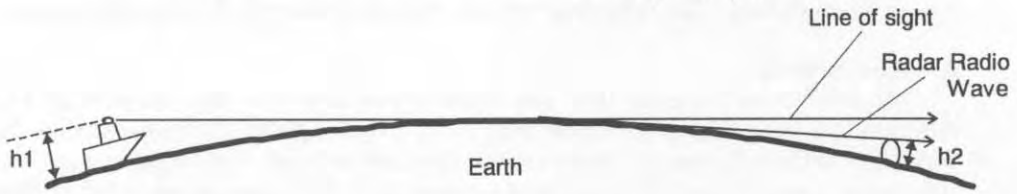


Fig.3 Radar wave

Targets difficult to display on screen

The intensity of the reflected wave from a target depends on the distance, height, and size of the target, as well as its material and shape. Targets constructed with FRP, wood, or other low-reflectance materials or those that have a small incident angle are difficult to display on a screen. Therefore, FRP and wooden ships, sandy beaches, and sandy or muddy shallows all are difficult to catch and require attention when monitoring on the screen. Especially, coast lines on the radar image appear to be present more apart from the ship than they are actually located. Therefore, it is important not to misinterpret the available data.

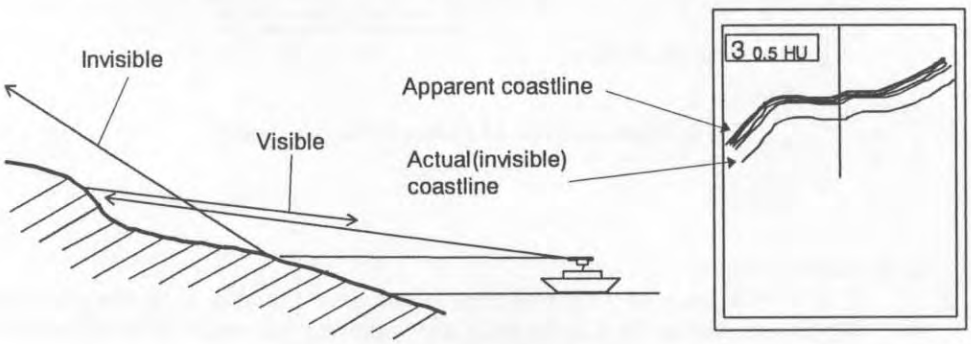


Fig.4 Targets difficult to display on screen

Shadow zones of radar

Radar waves are characteristic in that they propagate straight ahead. Therefore, if the ship's smokestack or mast is located near the antenna or there is a tall ship or mountain at the side of the ship, such an object generates a shadow behind it. In this case, some objects produce a complete shadow and some produce a partial shadow. In an extreme case, the shadow of an object may extend to a position far away and cannot be displayed on the screen at all. Since these shadows can be discovered when installing an antenna, the problem can be avoided by changing the place of antenna installation to minimize the shadow. Targets in shadow zones are difficult to display on the screen.

False echoes

A false echo of an actually nonexistent object may sometimes appear on the screen when sailing. The following explains the cause of each of such phenomena.

A. Ghost echoes

It sometimes happens that one large object near the ship appears at two different bearings. One is the actual echo and other is a ghost echo generated as the wave is re-reflected from the ship's own smokestack or mast. The former appears at the correct distance and bearing on the screen and the latter appears behind the smokestack or mast. This type of false echo is also generated by re-reflection of waves from bridges and quay walls other than the ship itself.

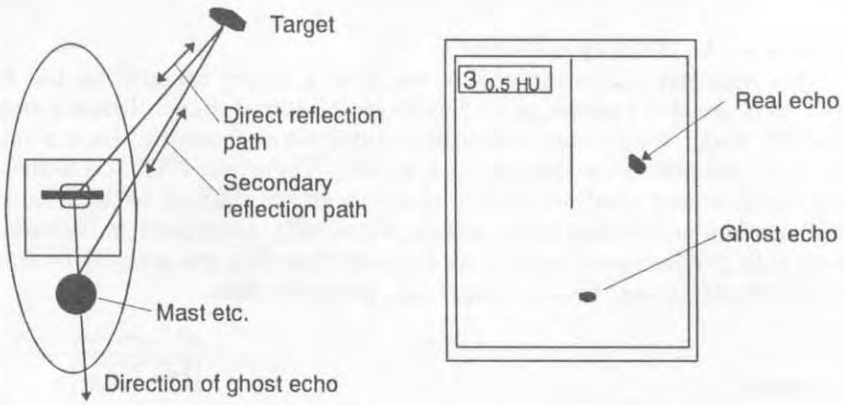


Fig.5 False echoes of radar (Ghost echoes)

B. Multiple echoes

If there is a large vertical reflecting plane near the ship as in the case when your ship passes alongside a large ship, the wave is repeatedly reflected back and forth between your ship and the other object. For this reason, two to four images appear on the screen at equal intervals in the same bearing. A false echo that is generated by such multiple reflections is called multiple echoes. In this case, an image appearing at the nearest position is the real echo. Multiple echoes disappear as the ship

moves away from the reflecting object or its bearing changes. Therefore, it is not difficult to determine the correct image.

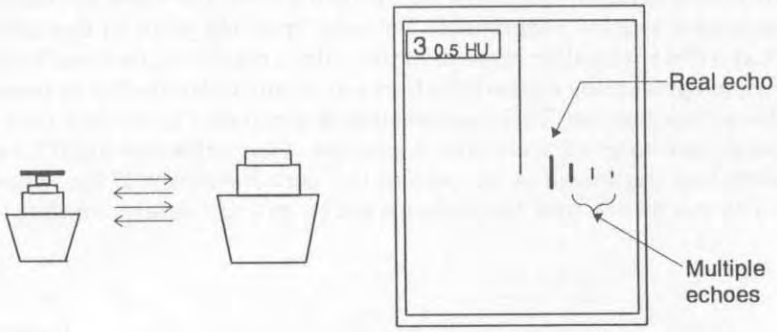


Fig.6 False echoes of radar (Multiple echoes)

C. False echoes caused by side lobe

The radiant beam emitted from an antenna contains side lobes in directions other than that of the main beam. Since the side lobe level is low, it in no way affects distant targets. However, if there is a strong reflecting target near the ship, it sometimes appear as a circular-arc false echo on the screen.

⚠ CAUTION

When located near large targets such as land, the ship's mast, etc. sometimes appears as a false echo of circular-arc shape.

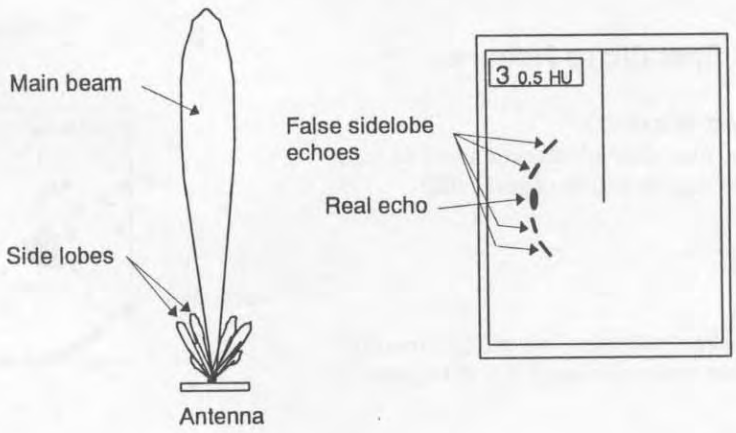


Fig.7 False echoes of radar (Caused by side lobe)

D. Distant false echoes caused by duct phenomenon

Depending on meteorological conditions, duct phenomenon sometimes occurs in temperature inverting layers of air. In such a case, the wave propagates erratically reaching a location surprisingly far away from the ship. In this case, a target present at a distant location more than the radar's maximum distance range appears on the screen presenting a false echo that can be misunderstood to be present nearer than the actual position. This phenomenon is attributed to the fact that since echo from the distant target arrives late, it gets out of the pulse repetition frequency and is displayed on the screen as an echo in the next frequency. If the target distance changes as you switch over the distance range, you can determine that it is a false echo.

Radar interference

If a radar operating in the same frequency exists near your ship, interference noise may appear on the screen that is caused by transmitted waves from that radar. This interference appears in various ways. In most cases, however, it appears as spiral or radial patterns.

The RA772UA radar has a function to eliminate interference. Use of this function helps you minimize interference.

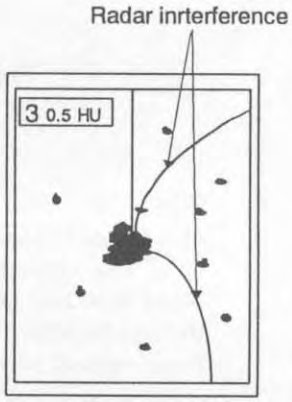


Fig.8 Radar interference

2.3 Terms Specific to Radars

HM (Heading Marker)

This is a line-shaped marker used to indicate the advancing direction of your ship.

North Mark

This marker indicates the north direction. It is a short line approximately 1/6 of the screen size.

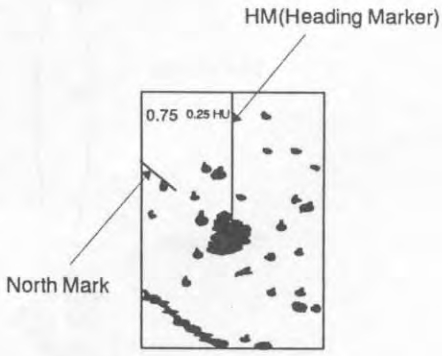


Fig.9 Heading Marker and North Mark

Display modes

This refers to a radar's display modes. There are four display modes depending on the direction in which the top of the screen faces with respect to the ship.

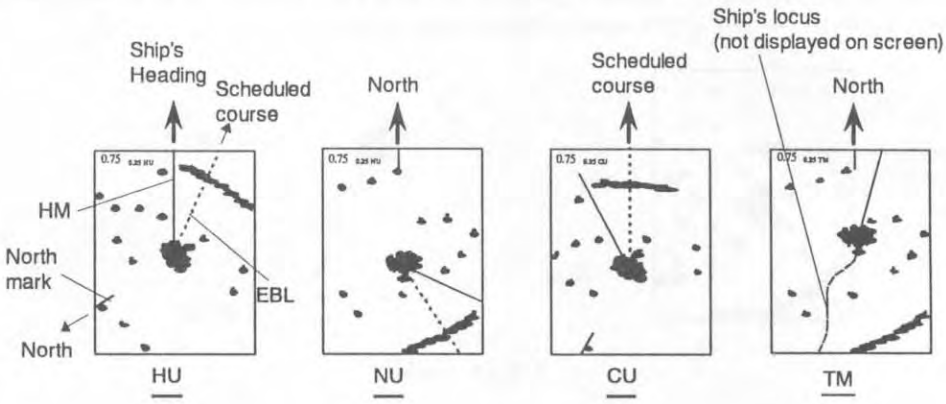


Fig.10 Display modes

Head Up (HU)

In this mode, the ship's heading always indicates the upward direction of the screen. This mode lets you know the relative positions of your ship and other ships or land.

North Up (NU)

In this mode, the north direction always indicates the upward direction of the screen, allowing you to compare your ship position with a marine chart as you navigate.

Course Up (CU)

The ship's heading in a course-up mode always indicates the upward direction of the screen as the bearing toward the destination. In this mode, the ship can be maneuvered to sail the shortest distance to the destination by steering it in such a way that its heading marker always directs to the upward direction of the screen. If the ship drifts due to tidal current, care must be taken because the fixed targets move to other positions.

True Motion (TM)

In this mode, the ship is displayed as if it is moving on a marine chart while the fixed targets such as islands and seashores are fixed in position. When the ship reaches a certain position on the screen (approx. 2/3 of screen size), the ship is placed back to the opposite side on the screen. (The top of the screen faces north.)

Note: Navigation equipment such as a gyrocompass or magnet compass must be connected to your radar system before it can be operated in NU, CU, and TM modes. (Refer to Section 3.8 for details on how to connect your radar to navigation equipment.)

VRM (Variable Range Marker)

This is a circular-shaped marker whose size can be changed as desired. You can use this marker when you want to examine the distance of an echo from your ship.

When measuring the distance of an echo from your ship, be sure to measure at a point close to the center of the echo image on the screen.

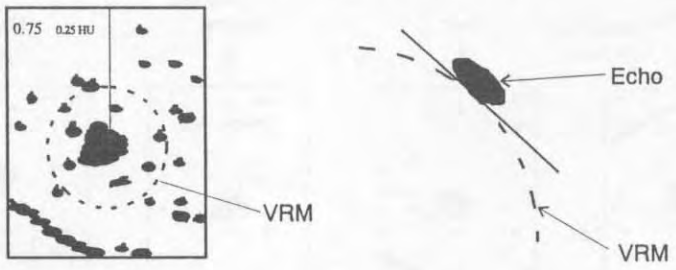


Fig.11 VRM

EBL (Electronic Bearing Line)

This is a marker shaped like a straight line segment that can be changed to any direction centering around the ship position. Use this marker to examine the advancing direction of your ship and its relative angle with an echo. When measuring the angle of an echo, position the marker at the center of the echo.

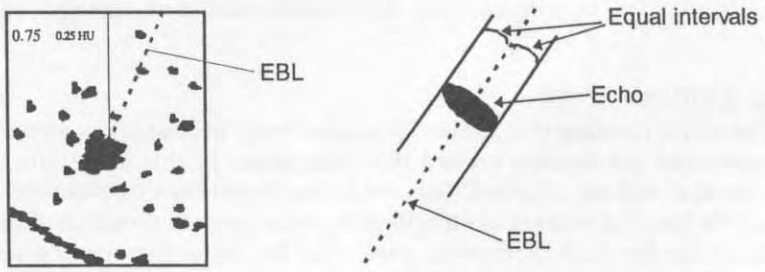


Fig.12 EBL

STC (Sensitivity Time Control)

Since echo signals received by the radar are strong when they are coming from a short distance, it is difficult to compare signal strength between each reflected signal. To overcome this difficulty, signal strength is adjusted in such a way that the received signal levels coming from a short distance are lowered and those from a long distance are raised. This function should prove useful when there are large reflected waves from sea surfaces during rough weather.

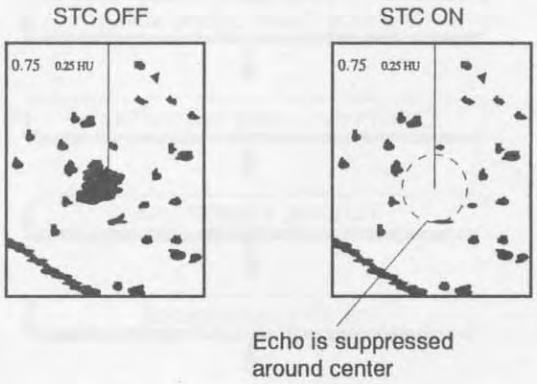


Fig.13 STC

FTC (Fast Time Constant)

When it rains or snows, fine noise may appear over the entire screen, making it difficult to identify echoes. In such a case, echo images on the screen can be made easily distinguishable by adjusting FTC.

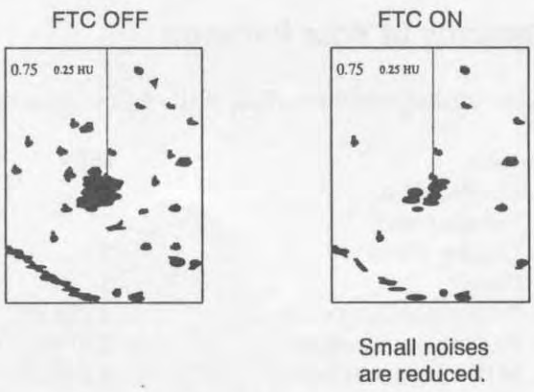
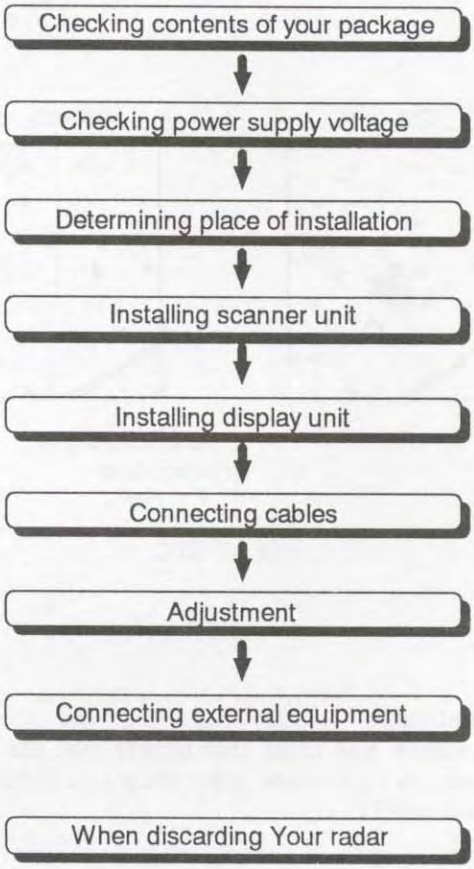


Fig.14 FTC

CHAPTER 3. INSTALLATION

This chapter describes procedures for installing the RA772UA radar in your ship and precautions to be observed during installation. Follow the procedure below to install the radar.



3.1 Checking Contents of Your Package

First, unpack your package and see if all of the following items are included.

Item	QTY
Display unit	1
Scanner unit	1
Display cover	1
Fuse	1
Interconnecting cable	1 (10 m)
Power supply cable	1 (3 m)
M10 hexagonal bolt	4 sets

The package contains a 10m interconnecting cable as an accessory. Longer cable is also available as an option as listed in Tab.1 below.

Tab.1 Optional Interconnecting Cable

Cable length	Ordering Product No.
15m	242J147628B
20m	242J147628C
30m	242J147628D

In addition to the above components included with your package, the following items are also required. Please prepare them separately.

Item	QTY	Remarks
Tapping screw or M5 bolt and nut	4 sets	To install display unit
Grounding wire	1	Earth line for display unit
Grounding wire and crimp terminal	1 set	Earth line for scanner unit

3.2 Checking Power Supply Voltage

For the RA772UA radar to be operated normally, the power supply (battery) detailed in Tab.2 is required. Note also that if the battery is discharged, its voltage may fluctuate greatly, causing the radar to malfunction. Carefully check the power supply system including wiring by using a multi-meter.

Tab.2 Power Supply Requirements

Supply voltage used	Maximum current	Allowable range of voltage
DC12V	3.5A or less	10.2-31.2V
DC24V	1.8A or less	10.2-31.2V

*A.C. power cannot be used

3.3 Determining Place of Installation

(1) Scanner unit

A radar's target detection capacity varies greatly depending on the fitted position of the scanner. An ideal fitting position is a location high above the ship's keel line where there is no obstacle all around the scanner. In an actual ship, such an ideal location is limited by various factors. Therefore, consider the following suggestions when you determine the place to install the scanner:

(a) Install scanner at a position as high as possible.

The higher the installation position, the longer the radio ranging distance. Install the scanner at a position as high as possible after considering the ship's hull structure and radar maintainability.

(b) **Install scanner away from smoke-stack and mast**

If the scanner is installed at the same height as the smoke-stack or mast, radar waves may be blocked, creating shadow zones or generating false echoes. Therefore, do not install the scanner at such a position.

(c) **Install scanner forward away from obstacle.**

To avoid creating shadow zones or generating false echoes, install the scanner at a position nearer to the ship's bow away from obstacles. When installing the scanner on a mast, position it in front of the mast. (If obstacles cannot be avoided for the ship's structural reasons, refer to "Shifting away from obstacles" described Page 13.)

(d) **Do not install the scanner near hot or heat-generating items.**

Do not install the scanner at a position where it may be subjected to smoke or hot air from smokestacks or heat from lamps.

(e) **Install the scanner away from antennas of other equipment.**

Install the scanner as much away from the antennas of a direction finder, radio transceiver, etc. as possible.

> ⚠ **CAUTION**
>
> **To eliminate the interference, install the scanner away from the antenna of radio transceivers.**

(f) **Make the cable length as short as possible.**

Keep the distance from the scanner to the display unit within the standard cable length of 10 m. If you use longer cable for unavoidable reasons, limit the cable length to a maximum of 30 m.

(2) Display unit

The display unit can be installed on desktop, wall surface, or ceiling. Determine the place to install the display unit that is convenient for navigation and radar operation after considering the following suggestions:

(a) A place where you can see the ship's bow when you raise your face from the radar screen.
(b) A place where there is good ventilation and minimum vibration.
(c) A place where the display unit is apart more than the minimum safe distance from a magnet compass as listed in Tab.3 below.

Tab.3 Minimum Safe Distance from Magnetic Compass

	Master compass	Steering compass
Scanner unit	2.0m	1.4m
Display unit	2.0m	1.4m

Shifting away from obstacles

① Shifting from keel line

By shifting the scanner position from the keel line to the starboard side of the ship, it is possible to move shadow zones to the port side which makes it possible to keep clear vision in the bow direction. The distance to be shifted can be obtained by calculation depending on the distance from the scanner to obstacles using the following equation:

Ls=0.4R+D/2 [m] (when R<15m)
Ls=0.025R+D/2 [m] (when R>=15m)

where Ls = distance to be shifted from keel line
D = diameter of obstacle on keel line
R = distance from scanner to obstacle

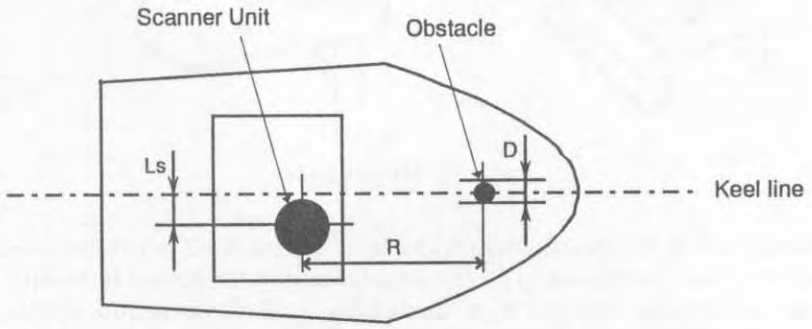


Fig.15 Shifting from keel line

② Obtaining sufficient dip angle

Raise the scanner position so that there is a sufficient dip angle θ available between the line of sight from the scanner to the obstacle and the horizontal line. By raising the dip angle above 5°, it is possible to prevent mid- and long-distance shadow zones. The radar cannot detect objects below the line of sight.

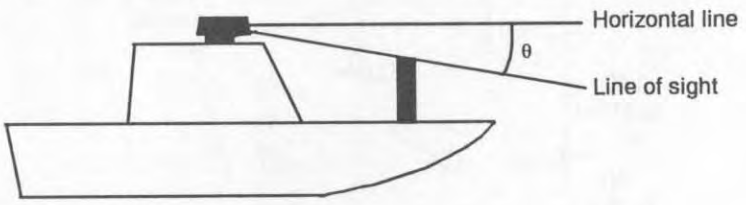


Fig.16 Obtaining sufficient dip angle

3.4 Installing Scanner Unit

When you have decided the place of installation, install the scanner unit. If a mount base like the one shown below is available, it may be easier to install the scanner. If such a mount base is not available in your ship, you may install the scanner directly to the roof, etc. In such a case, pay attention to the water drain tube located at the bottom of the scanner unit during installation.

Note : When the radar mast or mounting bracket has a curvature of more than 2mm, repair it or use spacers.

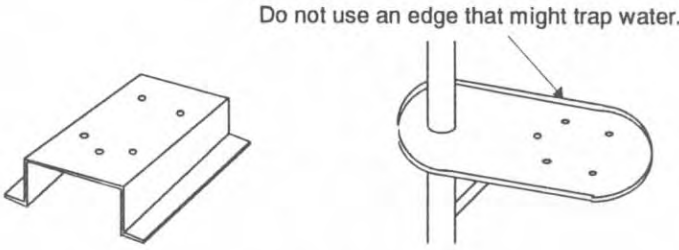


Fig.17 Mount base

Referring to Fig.18, open holes in diameter of 12 mm (0.47 in.) at five locations in the mount base and use these holes to fix the scanner unit to the mount base with hexagonal bolts. (Use the template included with this manual.) The bolts included with your radar equipment will suffice for mount base thickness of 9 to 14 mm (0.35 to 0.55 in.). If the mount base is thicker or thinner than this, prepare bolts listed in Tab.4.

To prevent the bolts from becoming loose, you may use locking putty available on the market. It helps you fix the bolts firmly in place.

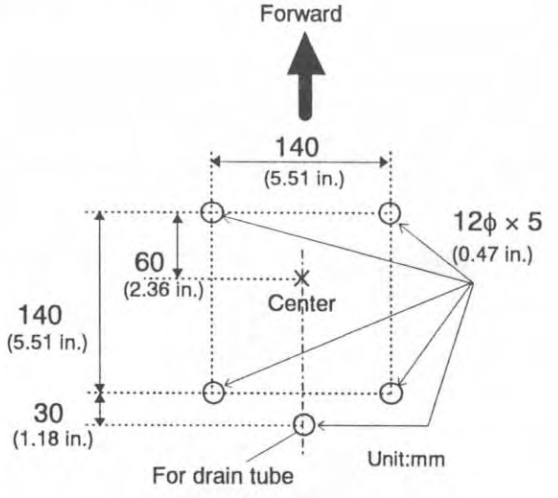


Fig.18 Hole positions for mounting scanner

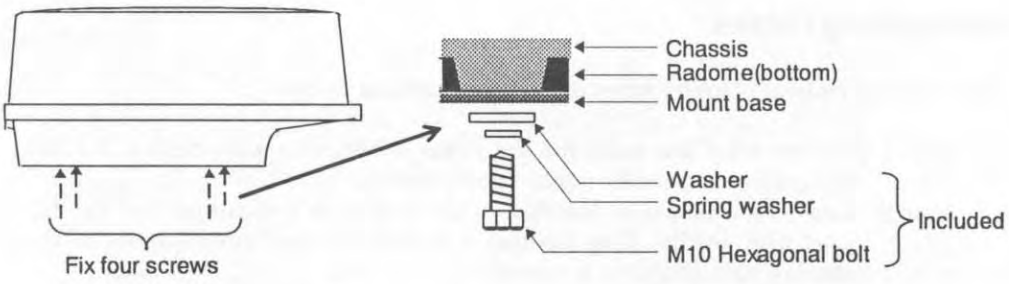


Fig.19 Fixing Scanner Unit

Tab.4 Bolts for Mounting Scanner Unit

Thickness of mount base	Bolts necessary to fix scanner	Material	Remarks
1-4mm(0.04-0.16 in.)	M10 x 15 (1.5mm pitch)	Stainless	
4-9mm(0.16-0.35 in.)	M10 x 20 (1.5mm pitch)	Stainless	
9-14mm(0.35-0.55 in.)	M10 x 25 (1.5mm pitch)	Stainless	Included with radar
14-19mm(0.55-0.75 in.)	M10 x 30 (1.5mm pitch)	Stainless	

3.5 Installing Display Unit

After you have finished installing the scanner unit, install the display unit in the same way. Choose the proper bolt length according to the thickness of the surface on which you are going to install the display unit. Hole diameter is different using bolts from using tapping screw. When using tapping screw, open holes in adequate holes. When using bolts and nuts, open holes in diameter of 6 mm (0.24 in.). When you have opened holes, install the pedestal part first and then the display unit.

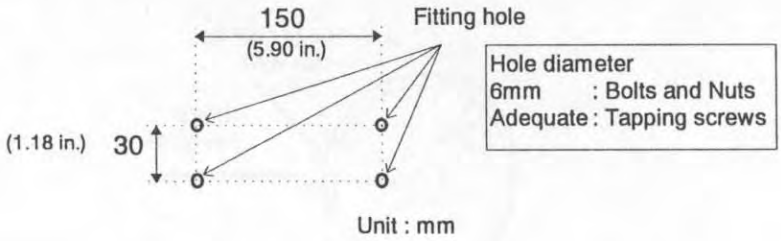


Fig.20 Hole positions for display unit

Note : When you install the display by flush mount, refer to appendix. 2.

3.6 Connecting Cables

Lay cables firmly in place by following the instructions below.

Note 1 Do not bind the cable for the radar collectively with cables of other equipment (especially power supply cable).

Note 2 Leave clearance near the inlet of the display so you can remove the display unit easily. This facilitates installation and maintenance of the display unit. (Refer to Appendix 1.)

Note 3 Because the cable has a connector fitted on the display and scanner side, if it is necessary to pass cable through a narrow path, fix the scanner-side connector vertically using vinyl tape before passing cable through the path.

Note 4 Lay cable along the ship's hull or wall surface and attach it in place at intervals of about 40 cm.

(1) Interconnecting cable (See Fig.22)

① Ensure that the radar is off. Connect the cable to the receptacle labeled "SCANNER" on the rear panel of the display unit.

② Next, remove the upper part of the radome from the scanner unit. Avoid bumping it against the antenna by lifting vertically. (There are three fixing screws.)

③ Remove the tape fixing the antenna.

④ Remove the shield cover located on the astern side. (There are three fixing screws.)

⑤ Remove the cable clamping plate and rubber ring, pass cable through the introduction opening, put the rubber ring from both ends of it, and clamp the cable to the scanner unit with screws via the fixing plate. Plug the connector fitted to the cable into the X1 connector on the PCB.

⑥ Replace the aluminum cover. At this time, attach a cable shield onto a ditch with the aluminum cover. However, be careful that the cable will not be caught up between the main unit and cover.

⑦ Replace the upper part of the radome. Be careful not to bump it against the antenna in the same way as when removing it. Make sure that the cover is fitted in the correct direction as shown in Fig.21. The upper and lower parts of the radome each have three markings indicating screw positions. Align the upper and lower positions as you mount the radome.

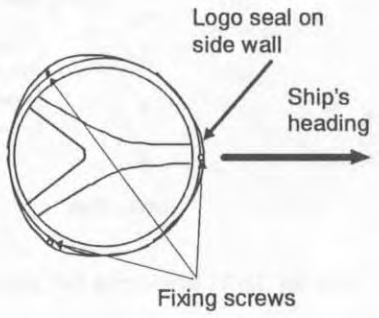


Fig.21 Fitting cover

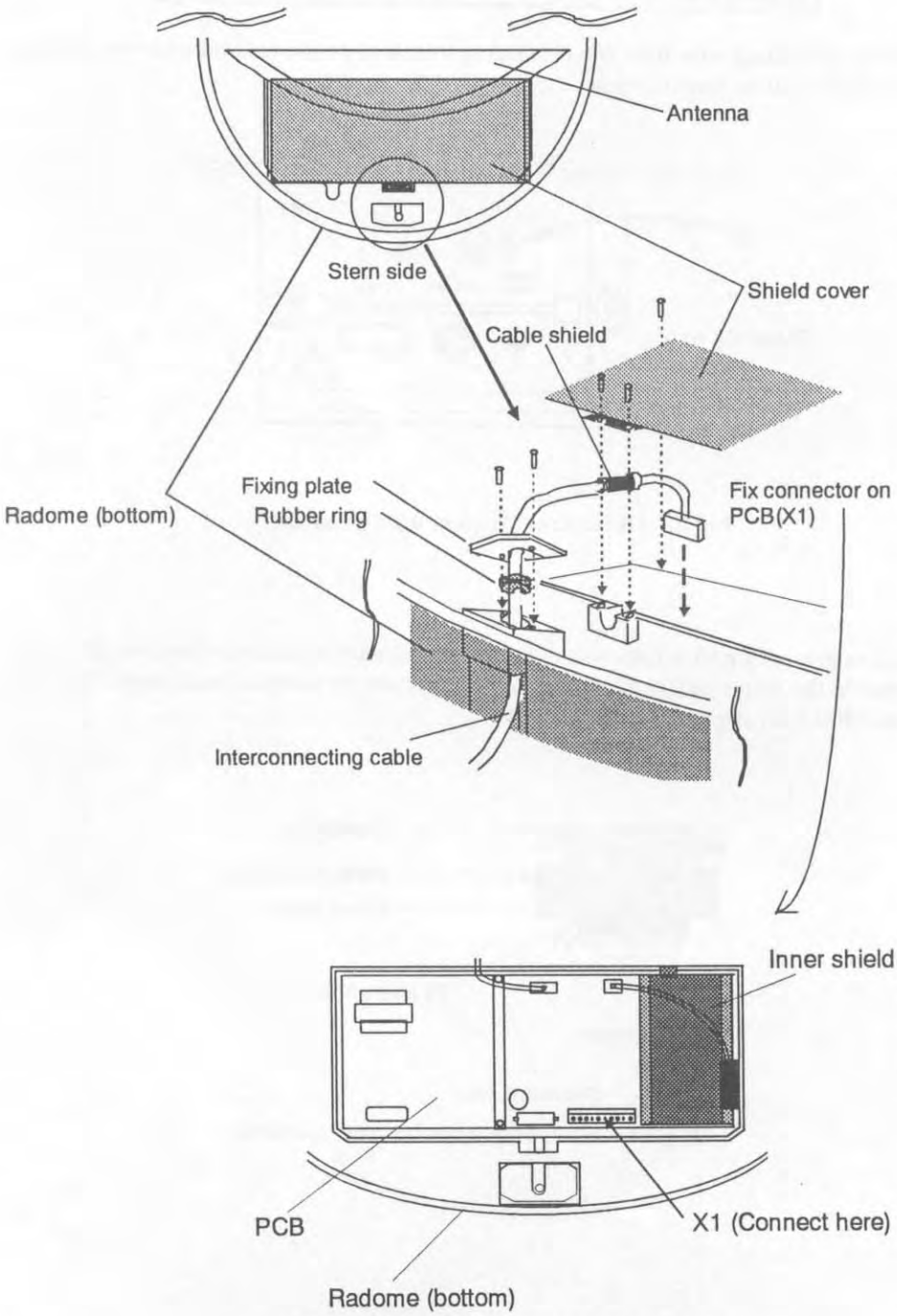


Fig.22 Fitting interconnecting cable

(2) Grounding wire

> ⚠ **WARNING**
>
> **Connect grounding wire before connecting power supply cable. Leakage current is too high.**

Connect grounding wire from the grounding terminal on the rear panel of the display unit to the ship's hull as shown below.

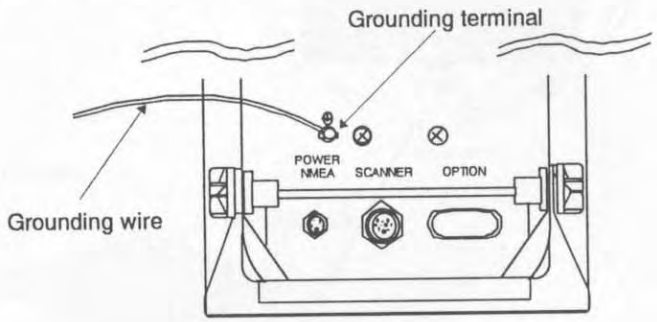


Fig.23 Grounding display unit to earth

Connect grounding wire from one of the bolts you have attached when installing the scanner unit to the ship's hull as shown in Fig.24. (The crimp terminal and grounding wire are not included with the radar equipment.)

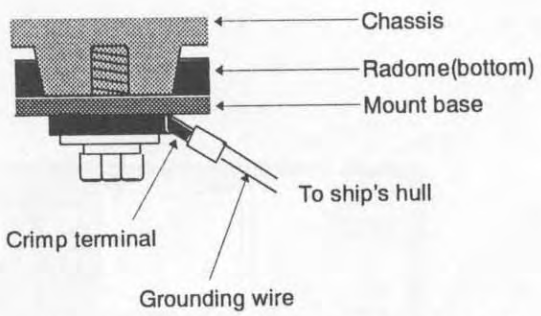


Fig.24 Grounding scanner unit to earth

(3) Power supply cable

Fit the power supply cable (included with your radar) to the receptacle labeled "POWER" on the rear panel of the display unit. And connect to power supply as followings. (When you do not connect external equipment, put tape on red and green wire.)

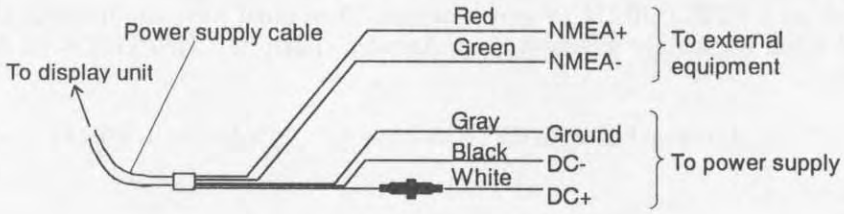


Fig.25 Power supply cable

3.7 Adjustment

> ⚠ **CAUTION**
>
> **Be sure to operate the following adjustment. If this is not adjusted properly, the radar picture does not display true image.**

When you have finished installing the scanner and display units and connecting cables, turn on the power to the display and scanner units and check to see if they operate normally without problem. Then make adjustments as detailed below and check to see if the units operate normally again.

① TUNING	Refer to Adjusting tuning circuit in 5.9
② HEADING DIRECTION	Refer to Adjusting angle in 5.9
③ DISTANCE	Refer to Adjusting distance in 5.9

3.8 Connecting External Equipment to Display Unit

The display unit has two channels of NMEA input. One is standard in power cable. The other is necessary to connect optional parts (Junction box with OPTION cable).

OPTION connector is located at display's rear panel for connecting external equipment such as a GPS, LORAN, or gyro compass. You must have an Junction box with OPTION cable separately available from Anritsu. (Refer to CHAPTER 8 (4) External interface.)

Junction box with OPTION cable (Order No. RZ704A)

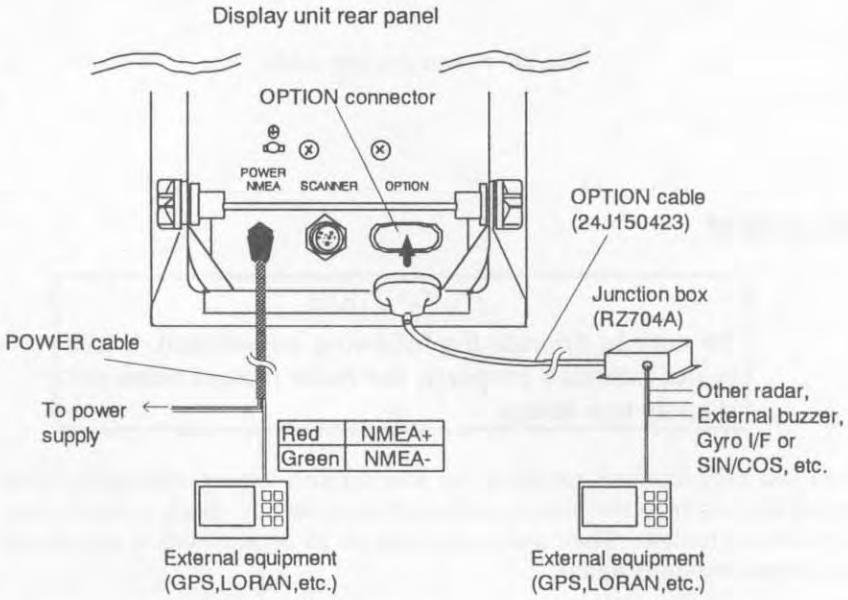


Fig.26 Connecting external equipment to display unit

3.9 When Discarding Your Radar

When discarding your RA772UA radar, consult Anritsu or its distributor to get information on precautions to be followed. Tab.5 below lists the primary component materials of the RA772UA radar for your reference.

Tab.5 Component Materials

Scanner unit	Material	Display unit	Material
Radome	AES	Front panel	ABS
Chassis	ADC12	Rear panel	ADC12
Base	ADC12	Pedestal	ABS+PC
Antenna	ABS+PC		

CHAPTER 4. FUNCTIONS AND NAMES

Function and name of each part

The RA772UA radar consists of a display unit to display video images on a screen and a scanner unit configured with an antenna to radiate radio waves and other components. The display unit has on its front panel five push-switch keys and one cursor key that lets you move a cursor in any desired direction. A combination of these keys allows you to utilize all functions of your radar, providing a comfortable, easy way to operate.

Display unit

The following explains the name and function of each part of the display unit. (See Fig.27)

1. [POWER] POWER key

Use this key to turn the power to the radar on and off, as well as turn transmission on and off. If you press this key while the radar is powered off, a timer will appear on the screen, indicating the remaining time until the radar is ready to transmit. The radar normally requires approximately two minutes until it is ready to transmit. While the radar is in this state, no radio waves are radiated from the antenna; nor does the antenna rotate. If you press this key again after the radar is ready, the radar starts transmitting. If you press this key when the radar is transmitting, it stops transmitting and goes to a standby state. To turn off the power, hold down this key for three seconds.

2. [RANGE] RANGE key

Use this key to change the range on the screen. After pressing this key, press the up or down key on the cursor key to switch over the range. The up key increases range and the down key decreases range on the screen. If the continual variable range (VAR RNG on CUSTOM menu) is turned on, the range can be varied continuously as you press the left or right key on the cursor key after pressing the RANGE key.

3. [CONT] CONTRAST key

This key adjusts the brightness and contrast of the LCD screen. To change the brightness, press the up or down key on the cursor key after pressing the CONT key. To change the contrast, press the left or right key on the cursor key after pressing the CONT key. The LCD display is automatically compensated for temperature because it is affected by changes in ambient temperature. However, you may need to fine adjust brightness or contrast depending on ambient conditions.

4. [MENU] MENU key

Use this key to bring up a menu screen. If you press this key when a menu screen is displayed, the display returns to the radar screen.

5. [ENTER] ENTER key

By pressing this key when the box cursor is displayed on the screen, you can change the set value of a menu item selected by the box cursor. If you press this key when you are at the radar screen, a box cursor appears. When you are at the menu screen, you can use this key to change the set value of an item in the same way.

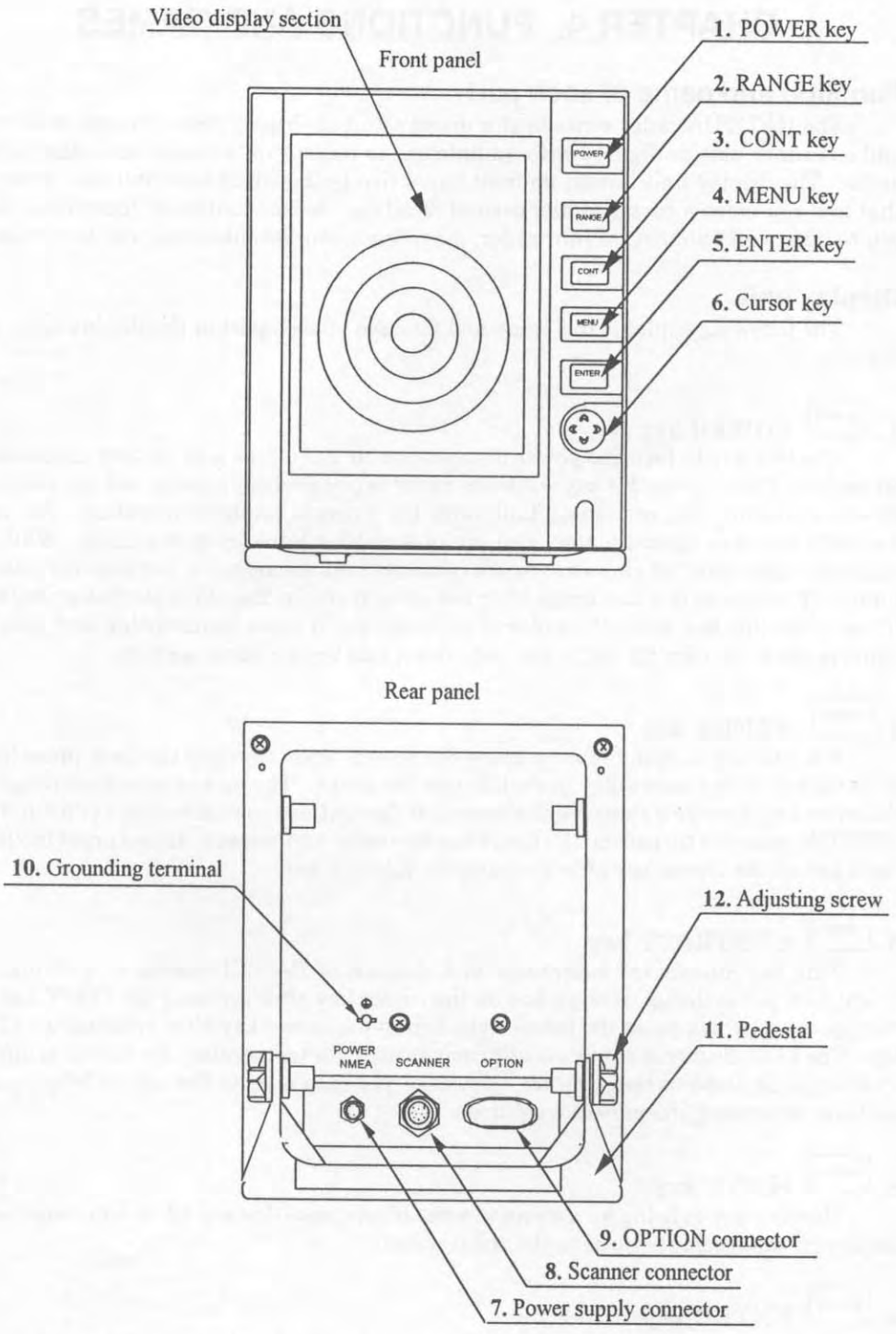


Fig.27 Display unit

6. Cursor key

Use this key to move the box cursor, change the set value of a menu item, move the cross cursor, change the range, or adjust contrast of the LCD display. The cursor moves slow when you press the key lightly. When you press the key strongly, the cursor moves fast. The cross cursor can be moved in any desired direction.

7. Power supply connector

Use this connector to plug in the power supply cable. Standard NMEA interface terminal is included in this connector.

8. Scanner connector

Use this connector to plug in the interconnecting cable to connect the scanner unit.

9. OPTION connector

Use this connector to connect optional NMEA, an external monitor, external buzzer and Gyro I/F. A dedicated cable or dedicated module box is required to connect these pieces of equipment.

10. Grounding terminal

Use this terminal to connect grounding wire. Refer to Section 3.6 "Connecting cables".

11. Pedestal

This supports the display unit. The pedestal can be also fitted at the top of the display unit.

12. Adjusting screw

Use this screw to adjust the tilt of the display unit. When this screw is unfastened, the pedestal comes off.

Scanner unit

The following lists the name and function of each part of the scanner unit. (See Fig.28)

1. Radome (upper)

2. Radome (bottom)

3. Fixing screw

When the fixing screws are removed, the upper and bottom halves of the radome come off.

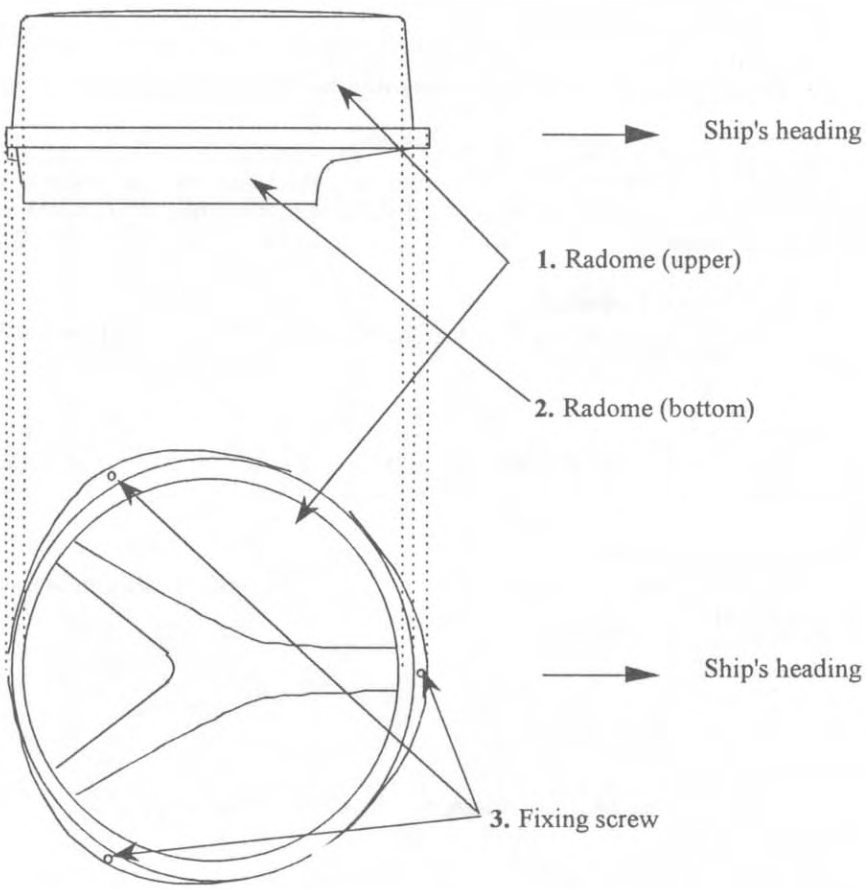


Fig.28 Scanner unit

CHAPTER 5. OPERATION

Basic operation of radar

The RA772UA radar has several display screens that are switched over by pressing the front-panel keys of the display unit. There are three display screens: navigation screen, radar screen and menu screen. The followings explain the configuration of each screen. To switch between screens, use the push key on the display unit. The screens change in the following manner.

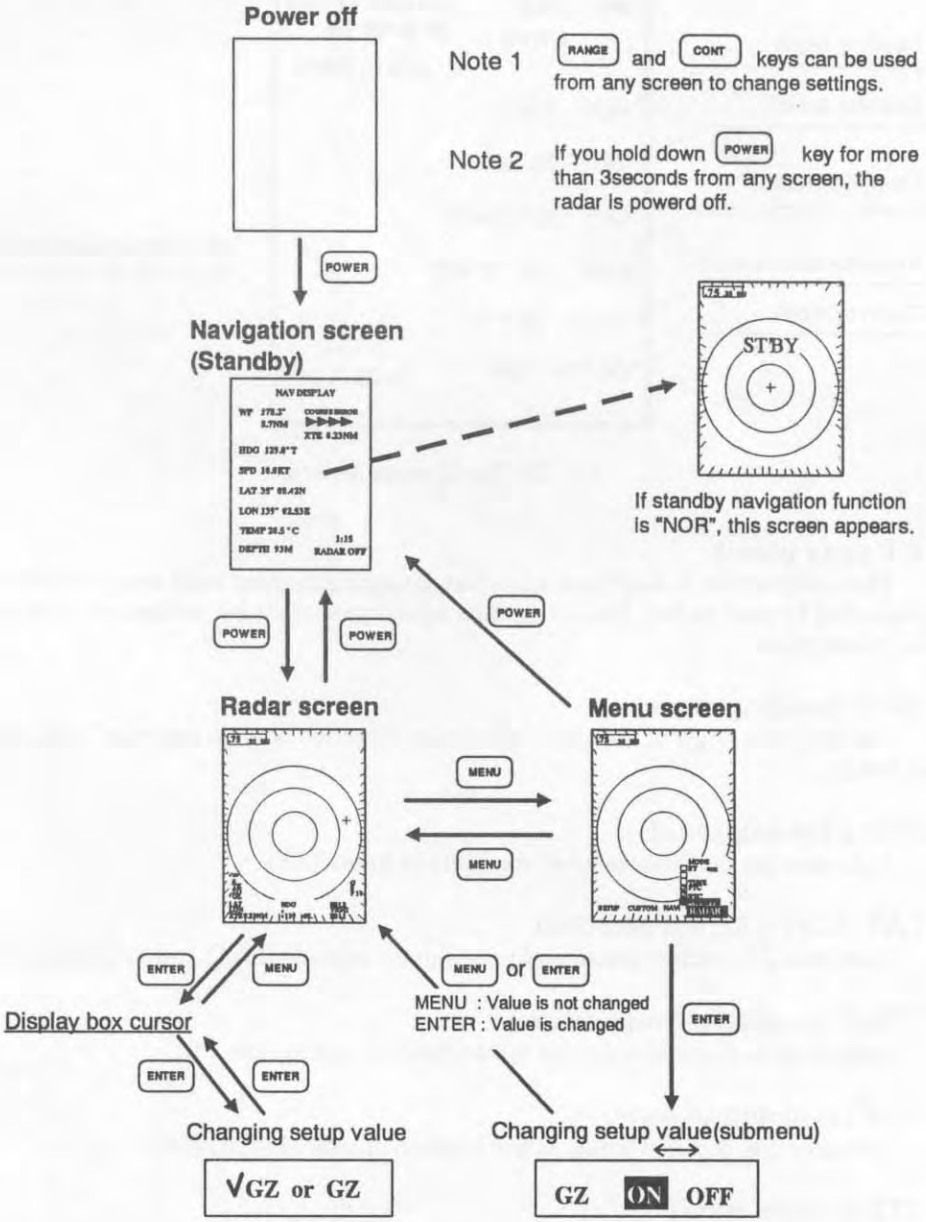


Fig. 29 Basic operation of radar

Navigation screen

When you power on at first. The following screen appears. (It is necessary that navigation equipment such as a GPS is connected to your radar, this screen displays the position and cruising speed of your ship, seawater temperature, and other navigation information.)

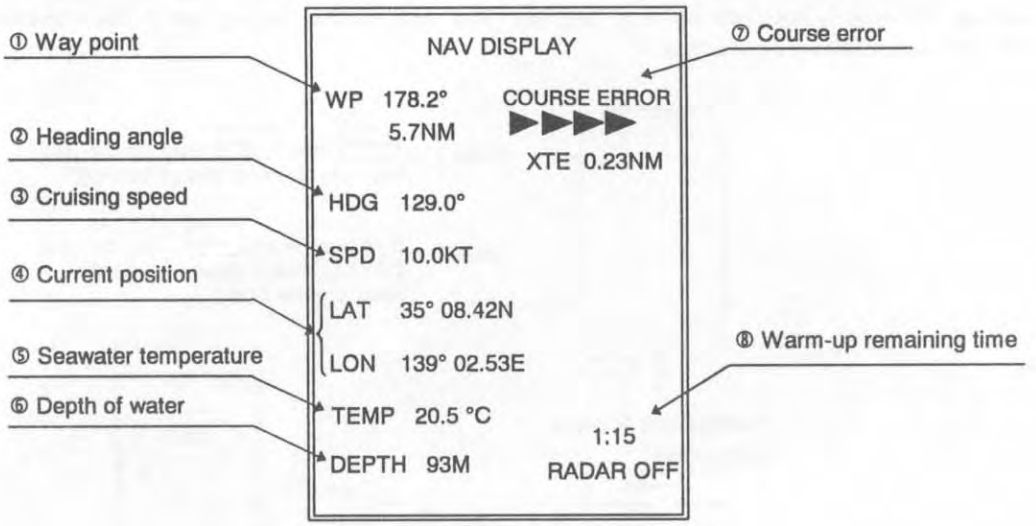


Fig. 30 Navigation screen

① WP (way point)

This information is displayed when navigation equipment such as a LORAN or GPS is connected to your radar. The navigation equipment must be configured to send way-point information.

② HDG (heading angle)

Indicates the angle of the ship's advancing direction when a compass is connected to your radar.

③ SPD (cruising speed)

Indicates the cruising speed of your ship in knots (KT).

④ LAT, LON (current position)

Indicates the current position of your ship in latitude (LAT) and longitude (LON).

⑤ TEMP (seawater temperature)

Indicates the current seawater temperature in centigrade (°C).

⑥ DEPTH (depth of water)

Indicates the depth of water at the position of your ship in meters (m).

⑦ XTE (course error)

Indicates the amount of deviation of your ship from the course heading toward the WP and the direction to be corrected for on the screen.

Tab.6 Indication of deviation from course

Deviation from course	Indication mark
0.00 —	▬
0.02 —	► or ◄
0.04 —	►► or ◄◄
0.08 —	►►► or ◄◄◄
0.16 —	►►►► or ◄◄◄◄

► Indicates starboarding the helm (right)
◄ Indicates porting the helm (left)

⑧ Warm-up remaining time (displayed only when powering on)

To switch between these screens, use the push key and cursor key on the display unit. The screens change in the following manner.

When standby navigation is OFF or HOLD function is ON, Navigation screen changes as following. (Refer to 5.8 about standby navigation and HOLD function.)

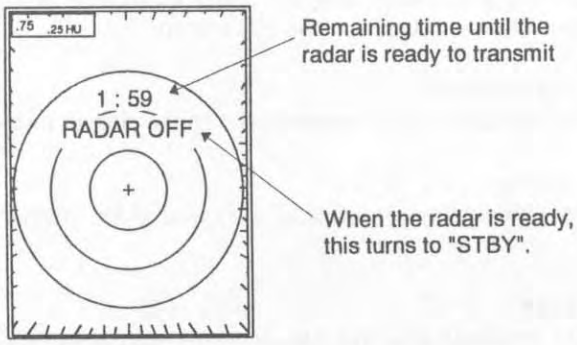


Fig. 31 Standby screen (when standby navigation is OFF)

Radar screen

This screen is the one that is normally displayed on the LCD when displaying radar images.

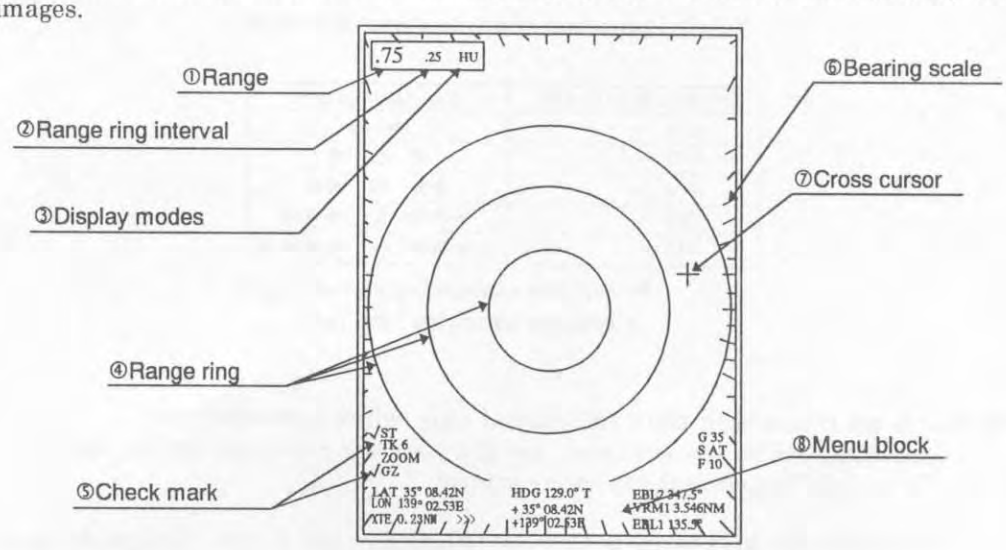


Fig. 32 Radar screen

① Range

Indicates the distance in nautical miles (NM) from the position of your ship to the outermost circumference displayed on the screen.

② Range ring interval

Indicates the distance intervals of the range ring in nautical miles (NM).

③ Display modes

Indicates the display condition of the radar video image. (Refer to Section 2.3 for details)

④ Range rings

Indicates locations at equal distance from your ship using concentric circles.

⑤ Check mark

Indicates that the function of the marked item is currently effective.

⑥ Bearing scale

Indicates azimuth angles centering around your ship. Short scale is at intervals of 1 deg. and long scale is at intervals of 5 deg.

⑦ Cross cursor

This can be moved in any desired direction by using the cursor key.

⑧ Menu block

You can choose desired menu item and display it in this area (called the menu block). The menu block consists of three vertical by three horizontal blocks, allowing you to display up to nine menu items. Refer to Section 5.5 for details on how to set menu items in this menu block.

Menu screen

This screen is one that you use to change the set value of some menu item or change the menu items you want to be displayed in the menu block of the radar screen.

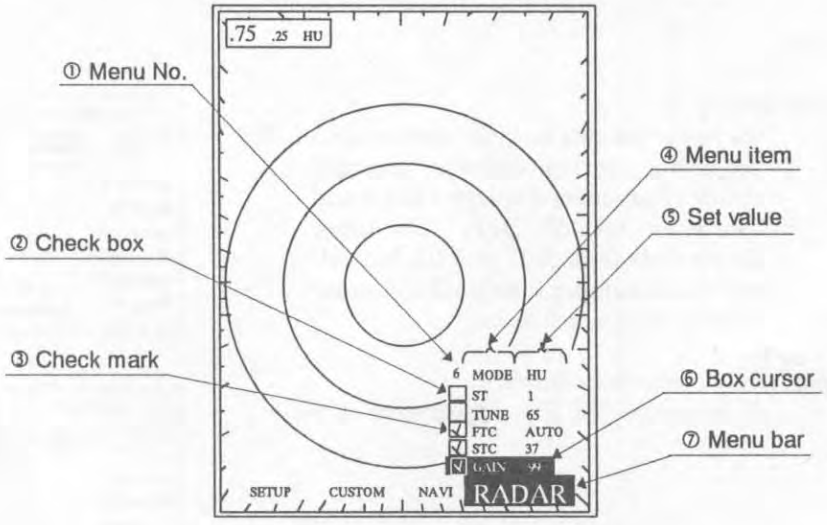


Fig. 33 Menu screen

5

① Menu No.

Indicates the place where the menu item to be displayed in the menu block of the radar screen is set.

② Check box

Indicates the menu items displayed in the function setup display area. The items not indicated by the check mark are not displayed on the radar screen.

③ Check mark

Indicates whether menu item is displayed on the radar screen .

④ Menu item

Indicates items of various functions.

⑤ Set value

Indicates the current set condition (or value) of the menu item in ④.

⑥ Box cursor

Indicates the currently selected menu item and its set value in reverse video. (In the above screen, GAIN is selected.) The set menu can be changed by pressing the ENTER key when in this state.

⑦ MENU bar

As you press the MENU key, four MENU bars appear at the bottom of the screen: RADAR, NAVI, CUSTOM, and SETUP. The currently selected menu is displayed in reverse video. (In the above screen, RADAR is selected.)

5.1 Powering On and Off

This section explains how to turn the power to your radar on and off.

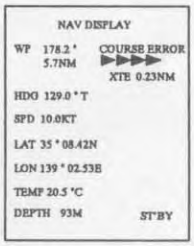
Powering on

Press the POWER key.

As you press this key, the radar starts preparing for transmission (standby state). The screen displays a timer and characters RADAR OFF. The timer decrements from 2:00 to 0:00, indicating the remaining time until the radar is ready for transmission.

When approximately 2 minutes elapsed

A message "ST'BY" appears on the screen.



Press the POWER key.

As you press this key, the radar starts transmitting and a video image appears on the screen.

Each time you press the POWER key thereafter, the screen alternately changes the stand-by state and the radar screen.

Note 1 : If the screen is not clearly visible, use the CONT key to adjust the contrast of the LCD screen. (Refer to section 5.3)

Note 2 : If you press this key before two minutes elapse after the radar is powered up, the radar does not transmit.

Powering off

Hold down the POWER key for three seconds .

The radar is powered off. The radar retains its setup conditions (range, etc.) that become effective when you power up the radar next time.

5.2 Changing Distance Range

This section explains how to change the distance range of a video image shown on the screen.

Press the RANGE key.

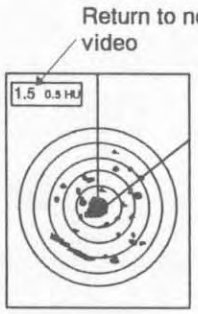
The range displayed at the upper left corner of the screen appears in reverse video, indicating that it can be changed.

Press the cursor key .

As you press the up or down keys on the cursor key, the range displayed on the screen varies. If you press the up key, the range is extended so you can look out to objects far away from your ship. If you press the down key, the range is reduced, displaying objects near from your ship.

Press the RANGE key.

The range displayed in reverse video returns to normal display and your setting is completed. (MENU or ENTER key can also be used to complete your setting.)



Note 1 : If continual variable range (VAR RNG) is on, the range can be varied continuously by pressing the left and right keys on the cursor key. (Refer to "Enabling continual variable range" in section 5.8)

5.3 Adjusting Contrast and Brightness

This section explains how to adjust the contrast and brightness of the LCD screen.

Press the CONT key.

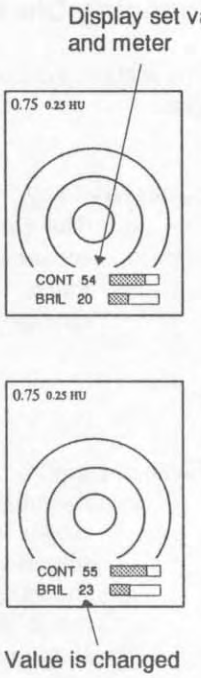
The current brightness and contrast are numerically displayed at the center of the screen.

Press the cursor key .

Use the left/right cursor keys to adjust contrast and the up/down keys to adjust the brightness.

Press the CONT key.

When you have finished adjusting, press the CONT key again. (the MENU or ENTER key can also be used to complete your adjustment.)



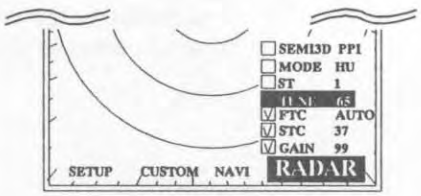
5.4 Changing settings

The RA772UA radar allows you to turn on the power, change the range, or adjust the screen contrast and brightness by pressing the push-button keys on the front panel. For other functions, however, you use the MENU and ENTER keys to change the current settings. This section explains how to operate the RA772UA menus. Settings can be changed indirectly via the menu screen or directly from the radar screen. The following shows an example of how tuning (TUNE) is adjusted.

From menu screen

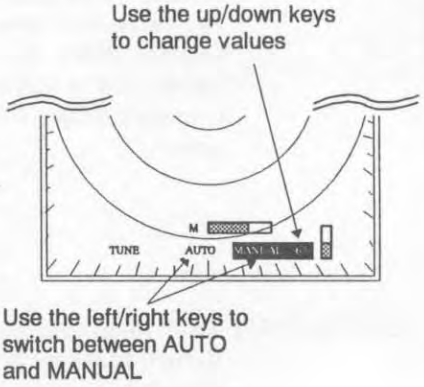
Press the MENU key.

A menu screen appears on the screen. By pressing the left or right key on the cursor key, choose the menu that contains the item whose setting you want to change. When items appear, choose your desired item by pressing the up/down cursor keys. The selected item is displayed in reverse video.



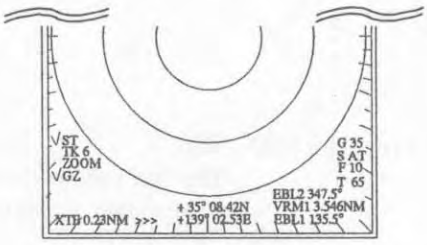
Press the ENTER key.

A setup change menu appears at the bottom of the screen. Use the cursor key to change the setting of your selected item as you want. (Normally use the left/right keys to turn the function of an item ON or OFF and switch between AUTO and MANUAL and the up/down keys to change numeric values.)



Press the ENTER key (to complete your settings)

The radar screen returns .

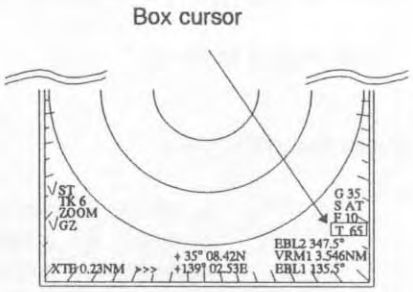


From radar screen

For the items displayed on the radar screen, you can change their set values from the radar screen. (Refer to "Setting up menu items" described later for details on how to set up the items you want to be displayed on the radar screen.)

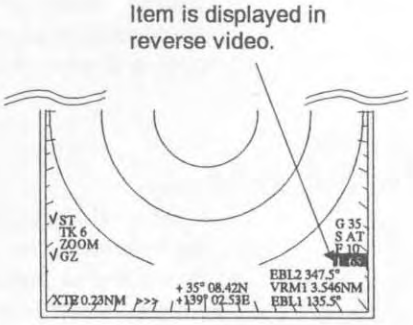
Press the ENTER key.

The cross cursor disappears and a box cursor (square box) appears in the menu block area of the screen. Using the left/right or up/down cursor keys, move the box cursor to the item whose setting you want to change.



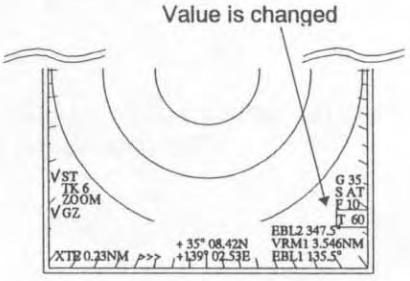
Press the ENTER key.

The selected item is displayed in reverse video, indicating that its set value can now be changed. Use the cursor key to change set values in the same way as when changing settings from the menu screen.



Press the ENTER key (to complete your settings)

Return to Radar screen. Value is changed.



Press the MENU key

The box cursor disappears and a cross cursor appears.

5.5 Set Menu Items in Menu Block

This section explains how to set Menu items in menu block.
Radar screen has menu block which has two areas (Fixed and Selectable). In Fixed menu block you can display on or off. In Selectable menu block it is divided nine parts and you can display menu items on any part which you like.

According to menu item it is displayed in Fixed menu block or Selectable menu block. (Refer "LIST of MENU")

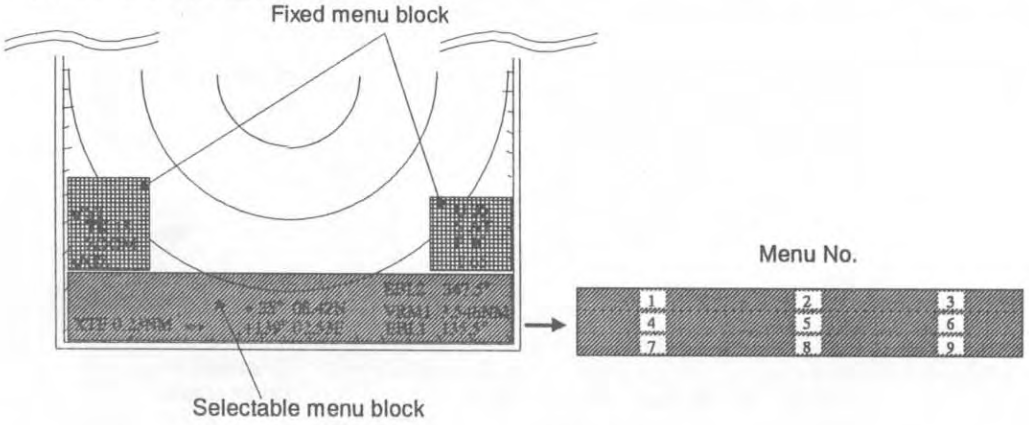


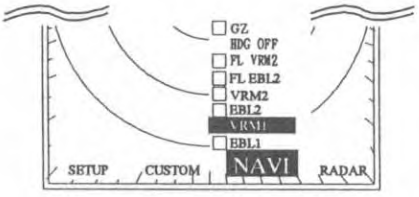
Fig. 34 Set menu items in menu block

5

How to set menu item (Selectable)

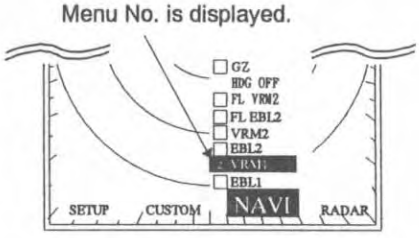
Press the MENU key

A menu screen appears on the screen. By pressing the cursor key, set menu item in reverse video which you want to set in Selectable menu block .



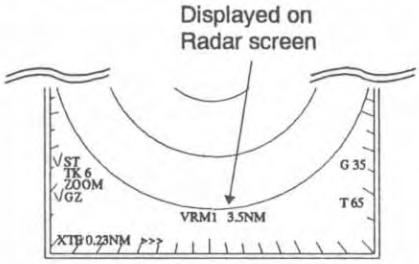
Press the CONT key

Menu No. is displayed. As you press the CONT key, it is changed 1->2->3->...->9->□ -> 1
(Menu No. used already is passed by.)



Press the MENU key

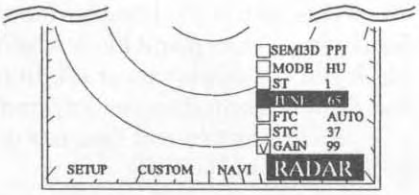
Return to Radar screen. The menu item is displayed where you selected.



How to set menu item (Fixed)

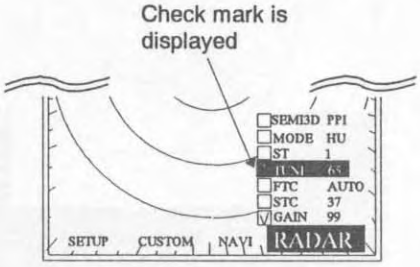
Press the MENU key

A menu screen appears on the screen. By pressing the cursor key, set menu item in reverse video which you want to set in fixed menu block.



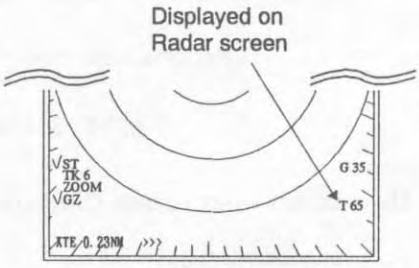
Press the CONT key

Check mark is displayed in check box .



Press the MENU key

Return to Radar screen. The menu item is displayed which you select.



LIST of MENU

RADAR
(For displaying echo)

Item	Function	Factory setting	Display position
S/L	Change pulse width	L	Selectable
PICTURE	Reverse screen display	DAY	Selectable
SEMI3D	Change to Semi 3D display	PPI	Selectable
MODE	Change display modes	HU	Selectable
ST	Enlarge echo	OFF	Fixed
TUNE	Adjust TUNE	AUTO	Fixed
FTC	Adjust FTC	0	Fixed
STC	Adjust STC	HABR	Fixed
GAIN	Adjust GAIN	AUTO	Fixed

NAVI
(For supporting navigation)

Item	Function	Factory setting	Display position
HEAD	Change HM mode	TRUE	Selectable
WAY P	Way point	—	Selectable
XTE	Cross track error	—	Selectable
POS LON	Ship's position(longitude)	—	Selectable
POS LAT	Ship's position(latitude)	—	Selectable
RINGS	Range rings	ON	Fixed
SPEED	Set your ship's speed	0.0 KT	Selectable
TRACK	Locus of target	OFF	Fixed
+MK POS	Cross cursor position	—	Selectable
ZOOM	Zoom	OFF	Fixed
OFF-C	Off-center	OFF	Fixed
GZ MODE	Change Guard zone mode	IN	Selectable
GZ	Guard zone	OFF	Fixed
HDG OFF	Erase Heading marker	OFF	Selectable
FL VRM2	FLT VRM	OFF	Selectable
FL EBL2	FLT EBL	OFF	Selectable
VRM2	VRM No.2	OFF	Selectable
EBL2	EBL No.2	OFF	Selectable
VRM1	VRM No.1	OFF	Selectable
EBL1	EBL No.1	OFF	Selectable

CUSTOM

(For changing status or value)

Item	Function	Factory setting	Display position
SLEEP	Sleep mode	OFF	—
EXT BUZ	Change external buzzer	OFF	—
P TABLE	Change pulse table	1	—
PNL BRT	Panel brightness	4	—
NORTH M	Display north mark	OFF	—
ST'BY	Change standby navigation	NAVI	—
SPD SET	Set your ship's speed mode	NMEA	—
WP BRG	Change Way point mode	TRUE	—
EBL BRG	Change EBL mode	REL	—
STERN M	Stern marker	OFF	—
HM FLSH	HM blink	OFF	—
HOLD	Hold	OFF	—
BUZ VOL	Change buzzer volume	HIGH	—
VAR RNG	Continual variable range	OFF	—
///CSR	Parallel cursor	OFF	Selectable
RM UNIT	Change units of VRM	NM	Selectable
+MK LON	Cursor position(longitude)	—	Selectable
+MK LAT	Cursor position(latitude)	—	Selectable
GZ LVL	Change guard zone level	6	—
TUNE M	Tune meter	—	Selectable

SETUP

(For maintenance)

Item	Function	Factory setting	Display position
ANT TYPE	Antenna type	RDM	—
AZIP IN	Set azimuth pulse input	1080	—
AZIP OUT	Set azimuth pulse output	1080	—
DISPLAY	Monitor mode	RDR	—
DEFAULT SET	Default menu	1	—
LANGUAGE	Language	ENG	—
AUTO STC	Adjust automatic STC	5	—
AUTO GAIN	Adjust automatic GAIN	11	—
ANTENNA	Adjust Antenna height	5	—
TUNING CAL	Adjust tuning	—	—
HEAD ADJ	Adjust angle	—	—
TIMING ADJ	Adjust distance	—	—
SYSTEM CHECK	Self-check	—	—

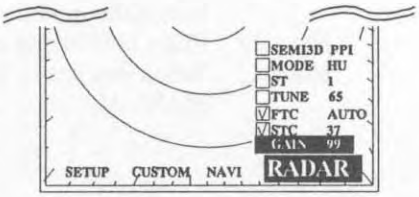
5.6 Adjusting Echo Display (RADAR menu)

This section explains how to change the settings related to echo display.

Adjusting sensitivity (GAIN)

Press the MENU key.

A menu screen appears. A menu bar is displayed in reverse video, with its menu items listed on the screen.

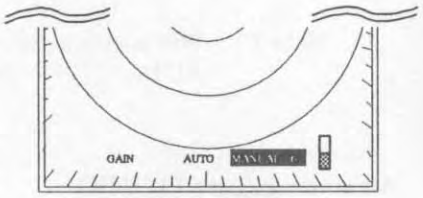


Press the left or right key on the cursor key .

Move the highlighted menu bar to "RADAR" to display its menu items .

Press the up or down key on the cursor key.

Move the menu cursor to "GAIN". (When adjusting STC, FTC or TUNE, point at STC, FTC or TUNE accordingly.)



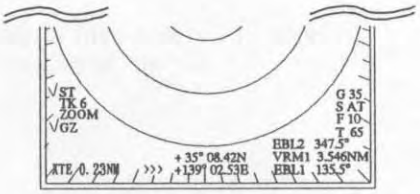
Press the ENTER key.

"GAIN" appears at the bottom of the screen, indicating that the value can be changed. Press the left/right cursor keys and set the characters highlighted which you want to set.

AUTO : Automatic gain
MANU : Manual gain

Press the ENTER key.

The radar screen returns.



Note 1 : In manual gain, when you press the up cursor keys to change the value, gain increases as you press the up key.

Note 2 : If you want to change gain for default value, refer to "Setting automatic gain circuit" in section 5.9.

Removing sea clutter (STC)

You can select STC function from Automatic, Manual, and Harbar. The harbar mode is more effective when your ship is in a bay, inlet, or a harbar. Refer to the section, "Adjusting sensitivity"

AUTO : Automatic STC
MANU : Manual STC
HABR : Harbar STC

Note 1 : When you select AUTO mode close to land (ex. in a bay, inlet and a harbar), echo may be displayed weakly.
Note 2 : Refer to "Setting automatic STC circuit" in section 5.9.
Note 3 : When you select MANUAL of STC, FTC function becomes automatically MANUAL.

Removing rain and snow reflections (FTC)

Refer to the section, "Adjusting sensitivity"

AUTO : Automatic FTC
MANU : Manual FTC

Note 1 : When you select AUTO of FTC, STC function becomes automatically AUTO.

Adjusting tune (TUNE)

Refer to the section, "Adjusting sensitivity"

AUTO : Automatic tuning
MANU : Manual tuning

Note 1 : If you want to change TUNE for default value, refer to "Adjusting tuning circuit" in section 5.9.

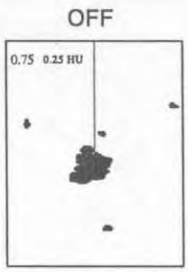
Enlarging echo display (ST)

This function allows you to stretch the target displayed on the screen in the distance direction. This helps you discriminate the target from noise.

Press the MENU key .

Press the cursor key.
Move the menu bar to "RADAR" and the box cursor to "ST".

Press the ENTER key.
Use the cursor keys to highlight "OFF", "ST1" or "ST2".



OFF : Stretch off
ST1 : Stretch 1
ST2 : Stretch 2

Stretch 2 is higher contrast of echo than Stretch 1.

Press the ENTER key.

The target displayed on the screen will be enlarged in the distance direction.

Echoes stretch along the arrow direction

Changing display modes (MODE)

The following explains how to change display modes. (The screen shown below is changed from HU to NU.)

Press the MENU key.

Press the cursor key.

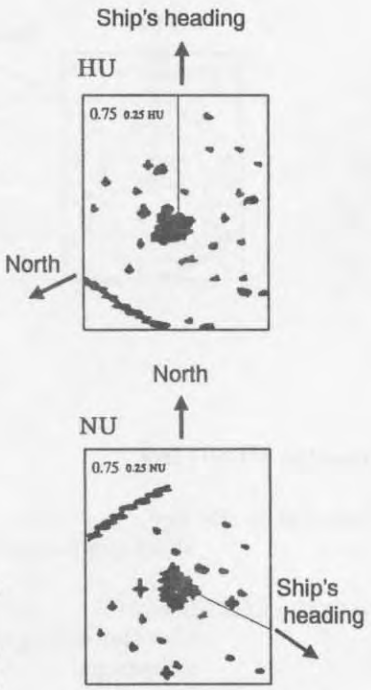
Move the menu bar to "RADAR" and the box cursor to "MODE".

Press the ENTER key.

Use the cursor keys to change display modes.

HU : Head up
NU : North up
CU : Course up
TM : True motion
HS : Head set

Refer to Section 2.3 for details about display modes.
If you select HS here, ship's heading is indicated toward the direction selected by EBL 1 .



Note 1 : Navigation equipment (gyrocompass, magnet compass, or GPS) must be connected to your radar in NU, CU and TM modes.

Note 2 : In TM modes it is necessary to setup as follows ① or ②.

① Input of speed information from NMEA.
Refer to "Setting cruising speed data" in section 5.8 and select "NMEA" for speed mode.

② Set your ship's speed manually.

Refer to "Setting cruising speed data" in section 5.8 and select "MANU" for speed mode.
Refer to "Setting cruising speed data" in section 5.8 and set your ship's speed.

Note 3 : When NMEA signal is used for heading information, heading marker may shows the direction of ship's movement (not direction of ship's heading)

Changing to semi-3D display (SEMI3D)

Since echo intensity in normal display is determined by brightness, it may sometimes be difficult to discriminate between noise and small targets. In such a case, use the semi-3D display function. Because echo intensity is represented by height, it becomes easier to discriminate targets from noise.

There are three types to choose from: normal display (PPI), semi-3D display (SEMI3D), and simultaneous display (SEMI3D/PPI).

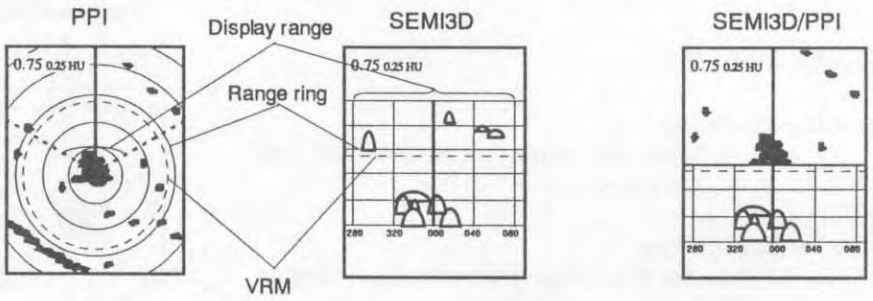


Fig. 35 Semi 3D

Press the MENU key.

Press the cursor key .
Move the menu bar to "RADAR" and the box cursor to "SEMI3D".

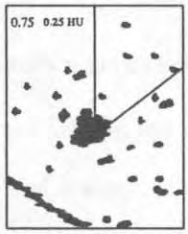
Press the ENTER key.
Use the left/right cursor keys to choose your desired display type from followings.

PPI	: Normal display
SEMI3D	: Semi-3D display overall
SEMI3D/PPI	: PPI in the upper half of the screen and semi-3D display in the lower half

Press the ENTER key.
The display changes to your selected display type after disappearing temporarily.

Reversing screen display (PICTURE)

The LCD display is affected by weather, temperature, and day/night environment conditions. In some cases, you may find the LCD display is easier to view when the entire screen is reversed.



Press the MENU key.

Press the cursor key.
Move the menu bar to "RADAR" and the box cursor to "PICTURE".

Press the ENTER key.
Use the left/right cursor keys to highlight "DAY" or "NIGHT".

DAY : Normal display
NIGHT : Reversed display

Press the ENTER key.
Your setting is completed.

5

Increasing sensitivity (S/L)

The pulse width is automatically changed as you change the range. However, if you want to increase sensitivity, you can choose sensitivity from two pulse widths. The short pulse (SHORT) gives you sharp images with high distance resolution. The long pulse (LONG) provides high sensitivity and shows targets in large size for easy identification although distance resolution is reduced.

Press the MENU key.

Press the cursor key.
Move the menu bar to "RADAR" and the box cursor to "S/L".

Press the ENTER key.
Use the left/right cursor keys to change the width of pulses to be transmitted.

S : Short pulse
L : Long pulse

Press the ENTER key.
Your setting is completed.

Note 1 : Refer to "5.8 Modifying transmit pulse table".

5.7 Setting Up Navigation Parameters (NAVI menu)

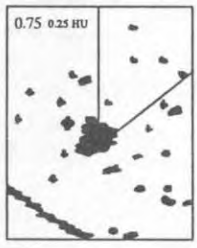
Here, you set up markers and other parameters that assist you during navigation.

Distance measurement (RINGS, VRM)

There are two methods to measure distance; one using range rings and one using VRM.

① Measuring distance using range rings (RINGS)

Range rings OFF



Press the MENU key.

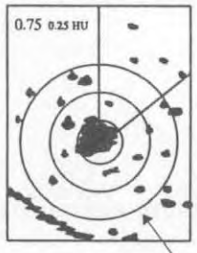
Press the cursor key.

Move the menu bar to "NAVI" and the box cursor to "RINGS".

Press the ENTER key.

Use the left/right cursor keys to highlight the characters "ON".

Range rings ON



Press the ENTER key.

Range rings are displayed on the screen. Estimate an approximate distance from the positional relationship between range rings and targets. You will have different number of range rings and different intervals of range ring distance depending on range settings.

Range rings

Tab.7 Range ring

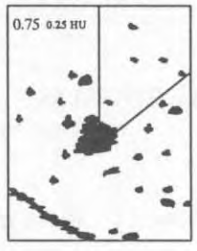
Range[NM]	0.125	0.25	0.5	0.75	1.5	3	6	12	24
Number of rings	2 (3)	2 (3)	2 (3)	3 (4)	6 (8)	6 (8)	6 (8)	6 (8)	6 (8)
Range ring interval	0.0625	0.125	0.25	0.25	0.25	0.5	1	2	4

() : Included outside of range

② Measuring distance using VRM

You can display two VRM lines simultaneously.

VRM OFF



Press the MENU key.

Press the cursor key.

Move the menu bar to "NAVI" and the box cursor to "VRM1" or "VRM2".

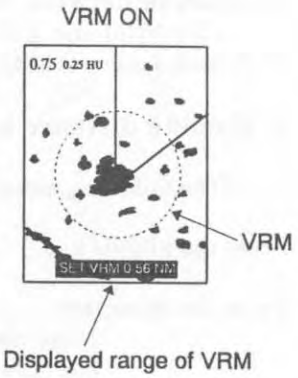
Press the ENTER key.

Use the left/right cursor keys to highlight the characters "ON".

Press the ENTER key.

VRM will be displayed. The VRM size can be changed by pressing the up/down cursor keys. Place VRM over a target and a numeric value will appear on the screen. It indicates the distance from your ship to the target.

Note 1 : VRM2 is not displayed in SEMI3D or SEMI3D/PPI.



Bearing measurement (EBL)

You can display two EBL lines simultaneously.

Press the MENU key .

Press the cursor key.

Move the menu bar to "NAVI" and the box cursor to "EBL1" or "EBL2".

Press the ENTER key.

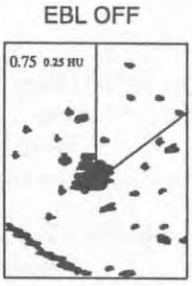
Use the up/down cursor keys to highlight the characters "ON".

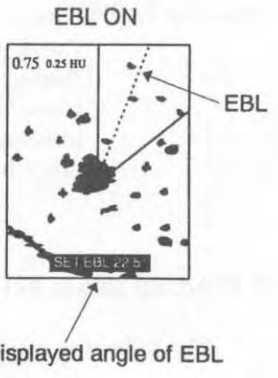
Press the ENTER key.

EBL will be displayed. The EBL angle can be changed by pressing the left/right cursor keys. Point EBL at a target and an angle will be displayed on the screen.

Note 1 : EBL2 is not displayed in SEMI3D or SEMI3D/PPI.

Note 2 : The angle is represented differently depending on EBL mode. (Refer to "Changing EBL bearing mode" in section 5.8.)





Measuring between two spots (FL VRM ,FL EBL)

FLT VRM and FLT EBL allow you to find distance and angle between two spots. FLT(float) means that the origin is other than your ship.

① Finding distance between two spots (FL VRM)

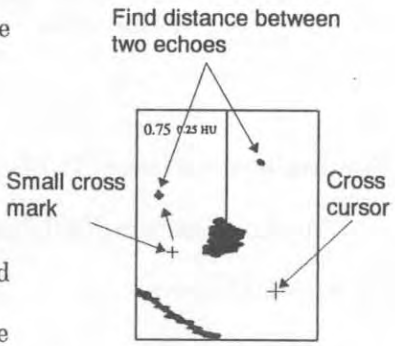
The following must first be set before you can find distance.

Press the MENU key.

Press the cursor key .
Move the menu bar to "NAVI" and the box cursor to "FL VRM2".

Press the ENTER key.
Submenu appears.
Use the cursor key to select "ON".

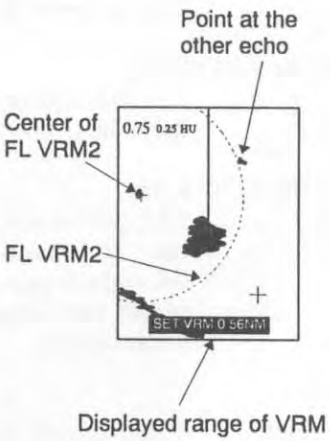
Press the ENTER key.
"SET START POINT" is displayed and a small cross mark appears.
Place the small cross mark at one of the two echoes for which you want to find the distance.



Press the ENTER key.
The center of VRM 2 is set up .

Press the MENU key.
Press the cursor key .
Move the menu bar to "NAVI" and the box cursor to "VRM2".

Press the ENTER key.
Submenu appears.
Use the cursor key to select "ON".



Press the ENTER key.
Press up/down cursor key and VRM is displayed from the small cross mark. Place the VRM on the other echo. The indicated distance represents the distance between the two echoes.

② Finding angle between two spots (FL EBL)

The following must first be set before you can find the angle.

Press the MENU key.

Press the cursor key.

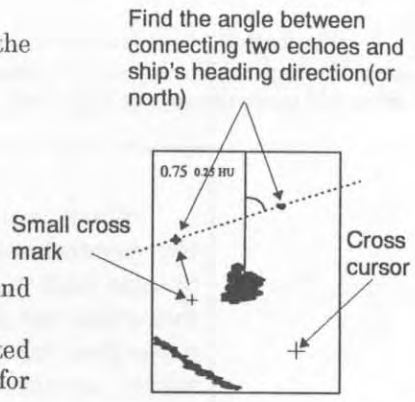
Move the menu bar to "NAVI" and the box cursor to "FL EBL2".

Press the ENTER key.

Submenu appears.
Use the cursor key to select "ON".

Press the ENTER key.

"SET START POINT" is displayed and a small cross mark appears.
Place the cross cursor (with dotted EBL2 line) at one of the two echoes for which you want to find the angle.



Press the ENTER key.

The origin of EBL 2 is set up.

Press the MENU key.

Press the cursor key .

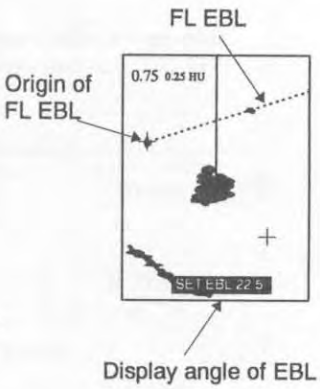
Move the menu bar to "NAVI" and the box cursor to "EBL2".

Press the ENTER key.

Submenu appears.
Use the cursor key to select "ON".

Press the ENTER key.

Press left/right cursor key and place the EBL on the other echo.



Note 1 : The angle is represented differently depending on EBL mode. (Refer to "Changing EBL bearing mode" in section 5.8.)

Erasing heading marker temporarily (HDG OFF)

To erase the heading marker temporarily for a while, follow the procedure below.

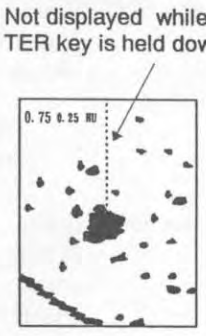
Press the MENU key.

Press the cursor key.

Move the menu bar to "NAVI" and the box cursor to "HDG OFF".

Press the ENTER key

The heading marker is not displayed as long as you hold it down.



Setting up guard zone around your ship (GZ)

You can set up a guard zone in sector form at any desired distance with any desired angular width. Then you can generate an alarm tone when an echo gets into the guard zone (IN mode) or moves out of the guard zone (OUT mode).

> **⚠ WARNING**
>
> **When you have set up a guard zone, the system generates an alarm tone when there is an echo greater than the preset level in this zone. However, this does not mean that the alarm tone is always generated for other ships and islands. You must adjust sensitivity and set STC/FTC properly after considering the effects of sea surface conditions and meteorological conditions (rain and snow). Note also that this function does not eliminate the need for maintaining a watch in your ship.**

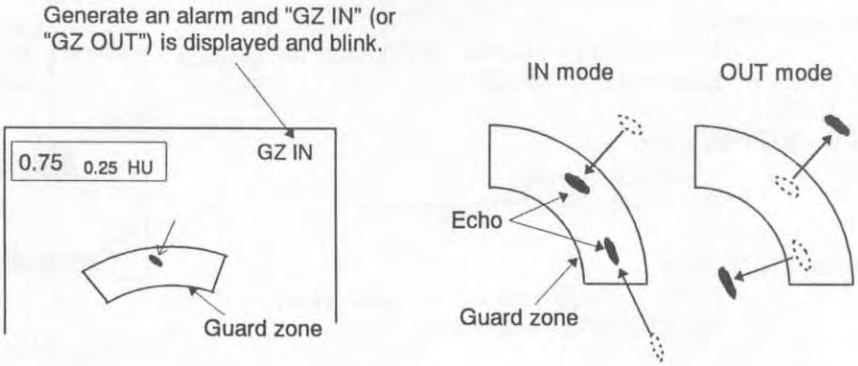


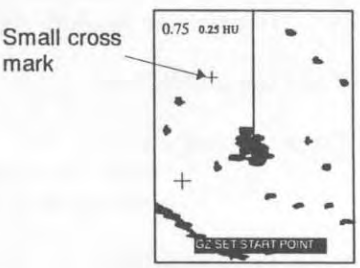
Fig. 36 Guard zone

Setting up guard zone

Press the MENU key.

Press the cursor key.

Move the menu bar to "NAVI" and the box cursor to "GZ".



Press the ENTER key.

Use the cursor keys to highlight the characters "ON" or "OFF".

ON : Setup GZ
OFF : Clear GZ

Press the ENTER key.

When you select "ON", a small cross mark appears and "SET START POINT" is displayed. Use the cursor

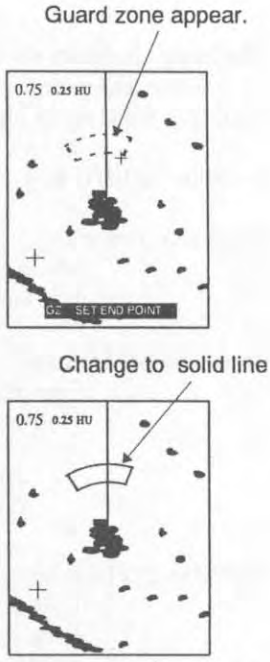
key to move the small cross cursor to a position where you want to set up a guard zone.

Press the ENTER key.

Next "SET END POINT" is displayed. Point the cursor at the size and angle of the guard zone you want. (The size of the guard zone is determined by a sector form configured with START POINT at the upper left and END POINT at the lower right.)

Press the ENTER key.

Lines change to solid line. The guard zone will be set up.



Note 1 : To switch the IN or OUT mode, refer to "Switch to guard zone mode" in section 5.7.

Note 2 : To set the guard zone level, refer to "Changing guard zone detection level" in section 5.8.

Note 3 : The guard zone is not displayed in SEMI3D.

Note 4 : The guard zone function is controlled only in PPI mode.

Note 5 : The signal can also be connected to an external buzzer to sound an alarm tone. (OPTION cable is required.)

5

Switching guard zone mode (GZ MODE)

Here You can switch guard zone mode "IN" or "OUT". (Refer to "Setting up guard zone around your ship" in section 5.7).

Press the MENU key.

Press the cursor key.

Move the menu bar to "NAVI" and the box cursor to "GZ MODE".

Press the ENTER key.

Use the cursor keys to highlight the characters "IN" or "OUT".

IN : IN mode
OUT : OUT mode

Press the ENTER key.

Guard zone mode is changed.

Note 1 : On OUT mode, alarm is generated when all echoes are out from Guard zone.

Shifting display in specific direction (OFF-C)

Since the point specified with the cross cursor is displayed as the position of your ship, this function is effective when you want to look ahead in some specific direction.

Press the MENU key.

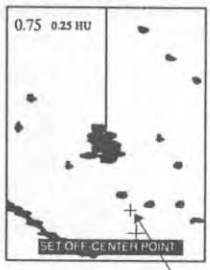
Press the cursor key.

Move the menu bar to "NAVI" and the box cursor to "OFF-C".

Press the ENTER key.

Use the cursor keys to highlight the characters "ON" or "OFF".

ON : Enable OFF-C
OFF : Disable OFF-C



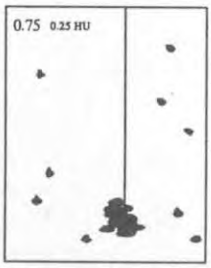
Move the cross cursor.

Press the ENTER key.

Using the cursor key, move the cross cursor to where you want to move the position of your ship.

Press the ENTER key.

The position of your ship will be displayed as the cursor position.



Ship's position is moved to the point.

Note 1 : OFF-C function is unusable in ZOOM.

Enlarging display in specific range (ZOOM)

The video image centering around the cross cursor is doubled as it is displayed on the screen.

Press the MENU key.

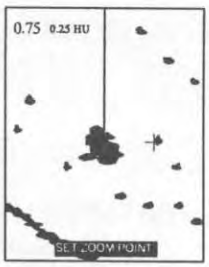
Press the cursor key.

Move the menu bar to "NAVI" and the box cursor to "ZOOM".

Press the ENTER key.

Use the cursor keys to highlight the characters "ON" or "OFF".

ON : Enable ZOOM
OFF : Disable ZOOM

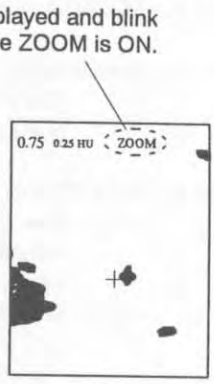


Press the ENTER key.

Using the cursor key, move the cross cursor to the target you want to be enlarged.

Press the ENTER key.

The target will be doubled centering around the cross cursor as it is displayed on the screen.



Note 1 : ZOOM function is unusable in 3D or 3D/PPI.
Note 2 : ZOOM function is unusable in OFF-C.
Note 3 : Normal screen returns when you change the range scale.
Note 4 : Center of ZOOM can be set any desired position within the set range.

Displaying position data of cross cursor (+MK POS)

You can display position data of cross cursor in menu block. The data format is an angle from heading marker and a length from your ship .

Press the MENU key.

Press the cursor key.
Move the menu bar to "NAVI" and the box cursor to "+MK POS".

Press the CONT key.
Menu No. is added to left of the character "+MK POS".

Press the or MENU key.
Position data is displayed in menu block.

Displaying locus of target (TRACK)

Since moving targets are displayed by a trailing locus, you can easily track the movement of other ships.

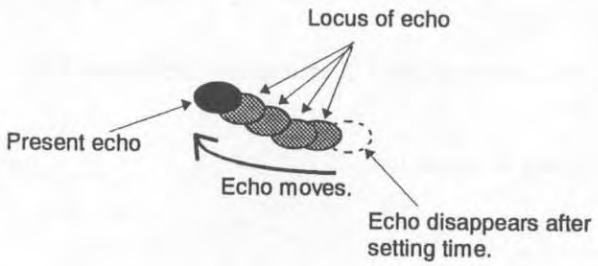


Fig.37 TRACK

Press the MENU key.

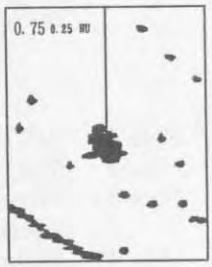
Press the cursor key.
Move the menu bar to "NAVI" and the box cursor to "TRACK".

Press the ENTER key .
Use the cursor keys to set the time at which you want the locus to be displayed. If you choose "OFF," the system does not display the locus.

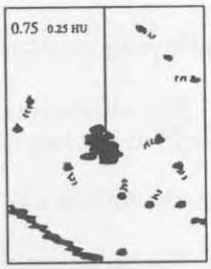
OFF : Not display the locus
15SEC : 15seconds
30SEC : 30seconds
1MIN : 1 minute
3MIN : 3 minutes
6MIN : 6 minutes
CONT : Continuous

Press the ENTER key.
Your setting is completed. (The system begins displaying the locus of targets.)

TRACK OFF



TRACK ON



Note 1 : A locus of echo is displayed when echo is above guard zone detection level. (Refer to "Changing guard zone detection level" in section 5.8.)

Setting cruising speed of ship (SPEED)

Here, you set up your ship's speed manually. This is necessary to display modes of "TM" if speed data is not provided from navigation equipment.

Press the MENU key.

Press the cursor key.
Move the menu bar to "NAVI" and the box cursor to "SPEED".

Press the ENTER key.
Enter your cruising speed of your ship using cursor key.

Press the ENTER key.
Your setting is completed.

Displaying your ship's position in LL (POS LAT / LON)

You can display position data of your ship in menu block. The data format is latitude or longitude.

Press the MENU key.

Press the cursor key.
Move the menu bar to "NAVI" and the box cursor to "POS LAT" or "POS LON".

Press the CONT key.
Menu block No. is added to left of the character "POS LAT" or "POS LON".

Press the MENU key.
Position data is displayed in menu block.

Displaying course error (XTE)

You can display course error (XTE) in menu block .

Press the MENU key.

Press the cursor key.
Move the menu bar to "NAVI" and the box cursor to "XTE".

Press the CONT key.
Menu No. is added to left of the character "XTE".

Press the MENU key.
Course error is displayed in menu block.

Displaying way point (WAY P)

You can display way point in menu block.

Press the MENU key.

Press the cursor key.
Move the menu bar to "NAVI" and the box cursor to "WAY P".

Press the CONT key.
Menu No. is added to left of the character "WAY P".

Press the MENU key.
Way point is displayed in menu block.

Setting up heading information (HEAD)

The following explains how to set up the mode of heading information.

Press the MENU key.

Press the cursor key.
Move the menu bar to "NAVI" and the box cursor to "HEAD".

Press the ENTER key.
Use the left/right cursor keys to highlight "MAG" or "TRUE".

TRUE : True bearing
MAG : Magnetic bearing

Press the ENTER key.
Your setting is completed.

Note 1 : This function requires to connect navigation equipment and detects for NMEA heading information.

5.8 Modifying Settings and Operation Method (CUSTOM menu)

Displaying tuning meter (TUNE M)

You can display tuning meter in menu block.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "TUNE M".

Press the CONT key.
Menu No. is added to left of the character "TUNE M".

Press the MENU key.
Tuning meter is displayed in menu block.

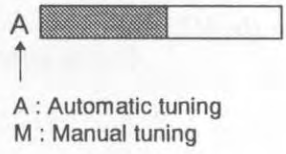


Fig. 38 Tuning meter

Changing guard zone detection level (GZ LVL)

Here, you modify the set value of the echo level at which a guard zone alarm is generated and which echo generates locus in track function.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "GZ LVL".

Press the ENTER key.
Use the up/down cursor keys to choose your desired set value from 1 to 7. The smaller the value, the lower the echo level at which the system responds.

Press the ENTER key.
Your setting is completed.

Note 1 : This set value is effective as both locus level for TRACK function and guard zone detection level.

Displaying position data of cross cursor in LL (+MK LAT / LON)

You can display position data of cross cursor in latitude or longitude.

Press the MENU key.
Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "+MK LAT" or "+MK LON".

Press the CONT key.
Menu No. is added to left of the character "+MK LAT" or "+MK LON".

Press the MENU key.
Position data of cross cursor is displayed in menu block.

Changing the unit of VRM (RM UNIT)

Here, you set the unit of VRM to nautical mile (NM), kilometer (KM) or statute mile (SM).

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "RM UNIT".

Press the ENTER key.
Use the cursor keys to choose your desired set value from NM/KM/SM.

NM : Nautical mile
KM : Kilometer
SM : Statute mile

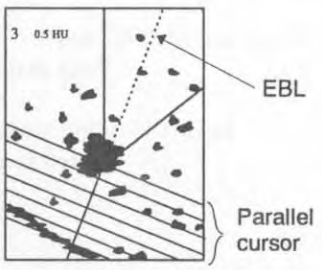
Press the ENTER key.
Your setting is completed.

Using parallel cursors (///CSR)

Normally EBL is used to measure the exact bearing from the position of your ship to a target. However, you can also use parallel cursors.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "///CSR".



Press the ENTER key .
Use the cursor keys to highlight the characters "ON" or "OFF".

ON : **Parallel cursor ON**
OFF : **Parallel cursor OFF**

Press the ENTER key.
Parallel cursors will appear on the screen. As you move EBL, the parallel cursors also move.

Enabling continual variable range (VAR RNG)

The distance range normally changes stepwise from 0.5 -> 0.75 -> 1.5 -> 3.0, and so on. However, using this function you can change the range continuously from 0.5 -> 0.6 -> 0.7 -> 0.8, and so on. To change the range continuously, press the left/right cursor keys after pressing the RANGE key.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "VAR RNG".

Press the ENTER key.
Use the cursor keys to highlight the characters "ON" or "OFF".

ON : **Enable continual variable range**
OFF : **Disable continual variable range**

Press the ENTER key.
Your setting is completed. (The continual variable range function is enabled or made effective).

Note 1 : To change the range stepwise, press the up/down cursor keys after pressing the RANGE key.

Setting sound volume of buzzer (BUZ VOL)

Here, you set the sound volume of the buzzer.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "BUZ VOL".

Press the ENTER key.
Use the left/right cursor keys to highlight the characters.

OFF : Volume Off
LOW : Volume Low
HIGH : Volume High

Press the ENTER key.
Your setting is completed.

Holding current screen on (HOLD)

HOLD is the function which you want to hold the currently displayed screen conditions while standby state. After about 30 seconds, the screen return to navigation (standby) screen.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "HOLD".

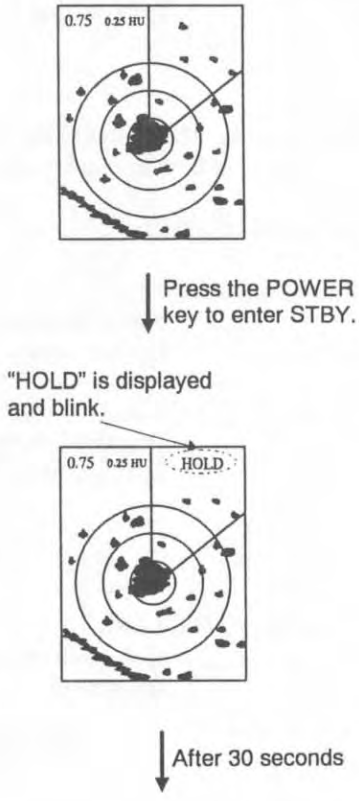
Press the ENTER key .
Use the cursor keys to highlight the characters "ON" or "OFF".

ON : Enable HOLD
OFF : Disable HOLD

Press the ENTER key .
Your setting is completed .

If you press the POWER key (to enter ST'BY).
The screen holds the currently displayed condition for 30 seconds

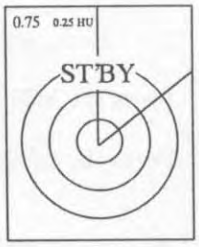
During this state, EBLs and VRMs can be used for measuring target data.



After 30 seconds

The standby screen returns.

or



Making heading marker blink (HM FLSH)

The heading marker will blink each time the antenna rotates one turn for checking the echo under the heading marker.

Press the MENU key.

Press the cursor key.

Move the menu bar to "CUSTOM" and the box cursor to "HM FLSH".

Press the ENTER key.

Use the left/right cursor keys to highlight the characters "ON" or "OFF".

ON : **Blink heading marker**
OFF : **Not blink heading marker**

Press the ENTER key.

Your setting is completed.

Displaying stern marker (STERN M)

Here is how to display the stern marker.

Press the MENU key .

Press the cursor key.

Move the menu bar to "CUSTOM" and the box cursor to "STERN M".

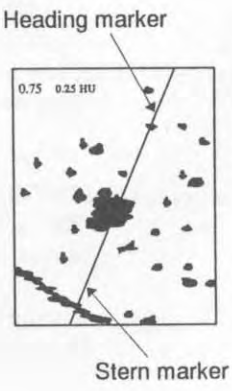
Press the ENTER key.

Use the left/right cursor keys to highlight the characters "ON" or "OFF".

ON : **Stern marker ON**
OFF : **Stern marker OFF**

Press the ENTER key.

The stern marker will be displayed on the screen.



Changing EBL bearing mode (EBL BRG)

Here, you set the mode of EBL bearings when you have set EBL.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "EBL BRG".

Press the ENTER key.
Use the left/right cursor keys to highlight the characters "REL", "TRUE" or "MAG".

REL : Relative bearing from HM
TRUE : True bearing
MAG : Magnetic bearing

Press the ENTER key .
Your setting is completed.

Note 1 : Refer to "Bearing measurement" in section 5.7.

Changing WP bearing mode (WP BRG)

Here, you set the mode of way point bearings.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "WP BRG"

Press the ENTER key.
Use the left/right cursor keys to highlight the characters "TRUE" or "MAG".

TRUE : True bearing
MAG : Magnetic bearing

Press the ENTER key.
Your setting is completed.

Setting cruising speed data (SPD SET)

Here, you specify whether your ship's speed data is input from the NMEA interface or manually.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "SPD SET"

Press the ENTER key.
Use the left/right cursor keys to highlight the characters "MANU" or "NMEA"

MANU : Manual speed
NMEA : NMEA input

Press the ENTER key.
Your setting is completed.

Note 1 : Refer to "Setting cruising speed of ship" in section 5.7 and "Changing display modes" in section 5.6.

Using standby navigation (ST'BY)

This specifies to the system that the navigation screen be displayed when in standby state.

Press the MENU key .

Press the cursor key .
Move the menu bar to "CUSTOM" and the box cursor to "ST'BY".

Press the ENTER key.
Use the left/right cursor keys to highlight the characters "NOR" or "NAVI".

NOR : Normal screen in standby
NAVI : Navigation screen in standby

Press the ENTER key.
Your setting is completed. (The navigation screen will be displayed when the system is in standby state.)

NOR

NAVI

Displaying north mark (NORTH M)

Here, you display the north mark on the screen.

Press the cursor key.

Move the menu bar to "CUSTOM" and the box cursor to "NORTH M".

Press the ENTER key.

Use the left/right cursor keys to highlight the characters "ON" or "OFF".

ON : North mark ON
OFF : North mark OFF

Press the ENTER key.

Your setting is completed.

Note 1 : It is necessary to connect with navigation equipment.

Adjusting panel brightness (PNL BRT)

Here, you adjust the back light brightness of front-panel keys on the display unit.

Press the MENU key.

Press the cursor key.

Move the menu bar to "CUSTOM" and the box cursor to "PNL BRT".

Press the ENTER key.

Use the up/down cursor keys to set a value from 1 to 4. The larger the value, the brighter the panel.

Press the ENTER key.

Your setting is completed.

Modifying transmit pulse table (P TABLE)

Here, you set the width of transmit pulses for each distance range from 0.5NM to 6NM. You can choose it from three types.

Press the MENU key.

Press the cursor key.

Move the menu bar to "CUSTOM" and the box cursor to "P TABLE".

Press the ENTER key.

Use the cursor keys to set Pulse table 0-2. At this time, you will see the range and pulse width table displayed on the screen.

Press the ENTER key.

Your setting is completed.

Table. 8 Pulse table

Pulse table 0

Pulse type	0.5NM	0.75NM	1.5NM	3NM	6NM
SHORT	0	0	0	0	1
LONG	0	0	1	1	2

Pulse table 1

Pulse type	0.5NM	0.75NM	1.5NM	3NM	6NM
SHORT	0	0	0	1	1
LONG	0	1	1	2	2

Pulse table 2

Pulse type	0.5NM	0.75NM	1.5NM	3NM	6NM
SHORT	0	0	1	1	1
LONG	1	1	2	2	2

Pulse width 0 : 0.12uS, 1 : 0.3uS, 2 : 0.8uS

Note 1 : Pulse width is 0.12uS in 0.125 and 0.25 NM range.
Note 2 : Pulse width is 0.8uS in 12 and 24 NM range.
Note 3 : Refer to "Increasing sensitivity" in section 5.6.

Setting external buzzer (EXT BUZ)

Here, you set whether you want an external buzzer to be a continuous or an intermittent tone.

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "EXT BUZ".

Press the ENTER key.
Use the cursor keys to highlight either "OFF", "CONTINUOUS", or "INTERMITTENT".

OFF : Buzzer off
CONTINUOUS : Continuous tone
INTERMITTENT : Intermittent tone

Press the ENTER key.
Your setting is completed.

Note 1 : This function is available when external buzzer connects with the radar.

Placing radar in power-save mode (SLEEP)

When in this mode, transmission is alternately enabled and disabled at certain time intervals. The power consumption of the radar is saved in this way.

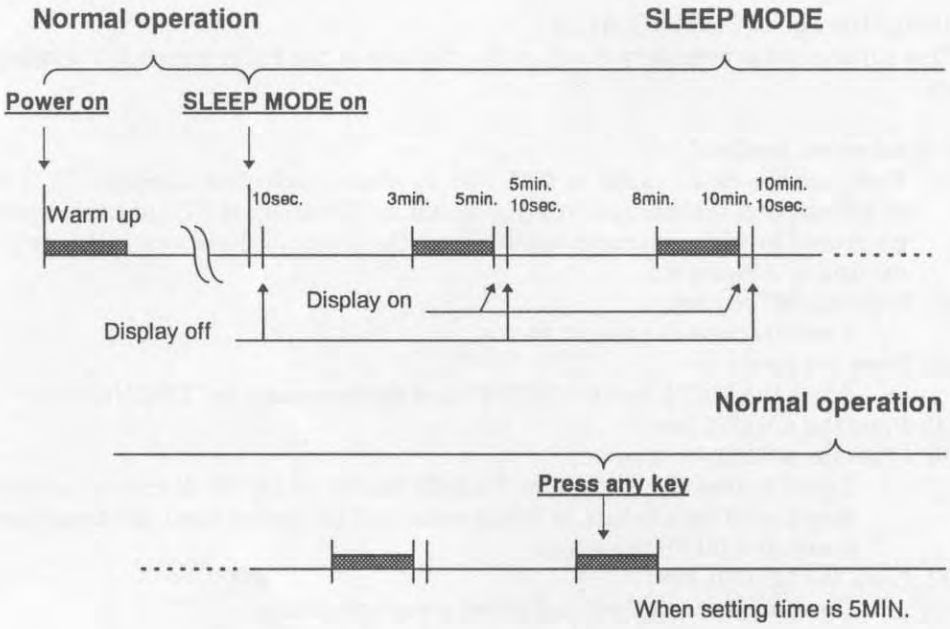


Fig.39 SLEEP MODE

Press the MENU key.

Press the cursor key.
Move the menu bar to "CUSTOM" and the box cursor to "SLEEP".

Press the ENTER key.
Use the left/right cursor keys to highlight the characters.

OFF	: Normal mode
5M	: Power save mode (5min. interval)
10M	: Power save mode (10min. interval)
15M	: Power save mode (15min. interval)

Press the ENTER key.
Your setting is completed.

5.9 Maintaining Your Radar (SETUP menu)

Performing self-check (SYSTEM CHECK)

Refer to Section 7.1, "Fault diagnosis by self-check."

Adjusting distance (TIMING ADJ)

This adjustment is necessary to adjust the distance on the radar screen to the actual distance.

Adjustment method

(1) First, set the radar range to 0.25 NM, rain/snow reflection removal (FTC) to minimum, and sensitivity (GAIN) to optimum. Then adjust STC until the pulse generated by your own radar appearing at the center of the screen is clearly recognized as a round dot.
(2) Press the MENU key.
A menu screen is brought up.
(3) Press the cursor key.
Move the MENU bar to "SETUP" and the box cursor to "TIMING ADJ."
(4) Press the ENTER key.
(5) Press the left/right cursor key.
Adjust timing until the center dot looks like (b). in Fig.40. If there is a linear target such as a bridge or breakwater, adjust timing until the target appears straight on the screen.
(6) Press the ENTER key.
The state is memorized and the radar screen returns.

Fig.40 Timing adjustment

Adjusting angle (HEAD ADJ)

This adjustment is necessary to adjust the head direction on the screen to the actual direction of the ship.

Determining and measuring target

(1) Find one small target within a 0.5 to 1.5 NM range which, lying in the bow direction, can be detected with eyes and is clearly visible on the radar screen.

(2) Measure the bearing of this target from the bow direction using a compass. Let it be θc.
(3) Measure the bearing of the above target in head up (HU) mode using EBL. Let it be θr.
(4) Calculate the following:

θc - θr	: if θc is greater than θr
360 - (θr - θc)	: if θr is greater than θc

This is the azimuth error of your radar at installation. If θc and θr are equal, the adjustment described below is unnecessary.

Adjustment method

(1) Press the MENU key.
A menu screen is brought up.
(2) Press the cursor key.
Move the MENU bar to "SETUP" and the box cursor to "HEAD ADJ."
(3) Press the ENTER key.
(4) Press the left/right cursor key
Set a value to the azimuth error you have calculated above.
(5) Press the ENTER key
The state is memorized and the radar screen returns.

5

Adjusting tuning circuit (TUNING CAL)

Normally you do not need to make this adjustment. This adjustment may necessary to ensure that the automatic tuning circuit operates at its best operating point. However, if sensitivity is poor or there is any symptom suggesting improper tuning, you may need to adjust this circuit following the procedure below.

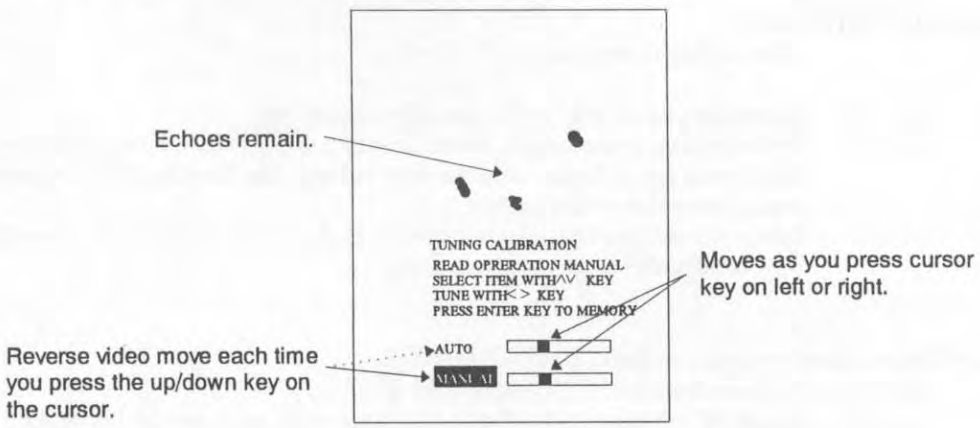


Fig.41 Tuning calibration

Adjustment method

(1) Choose several stable video images in the 3 NM range or more.
(2) Press the MENU key.
A menu screen is brought up.

(3) Press the cursor key.
Move the menu bar to "SETUP" and the box cursor to "TUNING CAL".
(4) Press the ENTER key.
The screen shown in Fig.41 will appear.
(5) Press the up/down key
Position the reverse video at "AUTO".
(6) Press the left/right cursor key.
While watching video images, adjust until echoes are clearly visible.
(7) Press the up/down key.
Position the reverse video at "MANUAL".
(8) Press the left/right key.
Adjust until echoes are clearly visible. This set status is middle value of manual tuning.
(9) Press the ENTER key.
The state is memorized and the radar screen returns.

Adjusting antenna height (ANTENNA)

Depending on the position at which the antenna is installed, it may be necessary to make the following correction. (Consult Anritsu or an Anritsu distributor for details.)

Press the MENU key.

Press the cursor key.
Move the menu bar to "SETUP" and the box cursor to "ANTENNA".
Press the ENTER key.
Use the up/down cursor keys to choose your desired value from 1 to 9. (The factory setting is 5.)

Press the ENTER key.
Your setting is completed.

Note 1 : Normally you do not need to modify this setting.
Note 2 : Setting value is the larger, the sea clutter is suppressed more effectively closer area around your ship. Setting value is the smaller, the sea clutter is suppressed in wider area.
Note 3 : Select the setting that the sea clutter is distributed uniformly when the STC is adjusted in the best condition.

Setting automatic gain circuit (AUTO GAIN)

Here, you set the automatic and manual gain level.

Normally, adjust this setting to be slight the noise echo appears on the screen in AUTO mode

Setting automatic STC circuit (AUTO STC)

Here, you set the automatic STC and automatic FTC level.

Adjust this setting to be the slight sea clutter appears on the screen, when you observe a small target (ex. Small buoy).

Changing display language (LANGUAGE)

Here, you modify the language in which the menu and radar screens are displayed.
Press the MENU key.

Press the cursor key.
Move the menu bar to "SETUP" and the box cursor to "LANGUAGE"

Press the ENTER key.
Submenu appears. Use the up/down cursor keys to choose your desired display language.

Tab. 9 Language

Display	Language	Display	Language
CHI	Chinese	KOR	Korean
DEN	Danish	NOR	Norwegian
ENG	English	POR	Portuguese
FRE	French	RUS	Russian
GER	German	SPA	Spanish
GRE	Greek	SWE	Swedish
ITA	Italian	TUR	Turkish
JPN	Japanese		

Press the ENTER key.
Your setting is completed.

5

Store user menu (DEFAULT SET)

You can store the current menu display or recall the menu block which you set up as you like in radar screen. The menu you have setup is automatically recalled when powered on, you do not need to select recall operation.

Press the MENU key.

Press the cursor key.
Move the menu bar to "SETUP" and the box cursor to "DEFAULT SET".

Press the ENTER key.
Use the left/right cursor keys to highlight "STORE" or "RECALL".

STORE : **Store the menu block to memory (Memory No. 0)**
RECALL : **Recall a menu block from memory**

There are 10 menu blocks in the inner memory. No.0 is what you have stored. No.1-9 are sample menu block.(Refer to Tab.10) You can not modify No.1-9 sample menu.

Press the ENTER key.
When selected "STORE", your menu block is stored to No.0 memory.

Tab. 10 Menu block of default set

Character	Function	Menu block	Memory No.								
			1	2	3	4	5	6	7	8	9
G	GAIN	F		O		O	O	O	O	O	O
S	STC	F		O		O	O	O	O	O	O
F	FTC	F		O		O	O	O	O	O	O
RR	Range Ring	F							O	O	O
ST	Stretch	F						O	O	O	
TK	Track	F						O	O	O	
ZM	Zoom	F							O	O	
GZ	Guard zone	F							O	O	O
OFF-C	Off center	F								O	
LAT	Position of ship (LAT.)	S			4		4		1	1	1
LON	Position of ship (LON.)	S			7		7		4	4	4
VRM1	VRM 1	S				6	6	6	3	6	3
EBL1	EBL 1	S				9	9	9	6	9	6
XTE	XTE	S						7		7	
TUNE M	Tune meter	S						8	9		9
WP	Way point	S							8	8	
+LAT	Position of cross marker (LAT.)	S								2	
+LON	Position of cross marker (LON.)	S								5	
+MK POS	Position of cross marker(angle,distance)	S									8

Note 1 : Memory No. O : Display on
Number : Display position in selectable menu block

Note 2 : Menu block S : Selectable menu block
F : Fixed menu block

Note 3: Memory No.1 is no menu in radar screen. Memory No. 9 is for demonstration.

Switching to monitor operation (DISPLAY)

Make this setting when you want to operate the radar in monitor mode.

Press the MENU key.

Press the cursor key.
Move the menu bar to "SETUP" and the box cursor to "DISPLAY".

Press the ENTER key.
Submenu appears. Use the cursor keys to highlight either "RADAR" , "MONITOR" or "NAVIDISPLAY".

RADAR	: Radar mode (normal mode).
MONITOR	: Monitor mode
NAVIDISPLAY	: Navigation mode

Press the ENTER key.
Your setting is completed .

Connecting an other radar (AZIP OUT, AZIP IN)

Make this setting when you connect to an other radar. This radar's azimuth pulse input and azimuth pulse output are 1080, 1024, 2048, 4096, 360 (pulse / rotation). It is necessary to select input or output azimuth pulse as to connecting with the other radar. Please contact your dealer for more detail information.

Switching to antenna type (ANT TYPE)

It is necessary to select ANT TYPE as to scanner type (Radome type or Open type) in monitor operation.

Note 1 : Normally you do not need to modify this setting.

Setting PASSWORD

You can set password for this radar when you power on.

Confirm that the radar is power off.

Press the POWER key with keep pressing both RANGE and ENTER keys.
Password setting menu appears. (Refer to Fig. 42)

Press the cursor key.
Set new password.(5 characters)

Press the ENTER key.

Password is setup.
ST'BY screen appears.
When you power on next time, password entering menu appears at first.

Note 1 : If you forget your password, begin this setting from first.
Note 2 : When you select "00000", password is not set up.

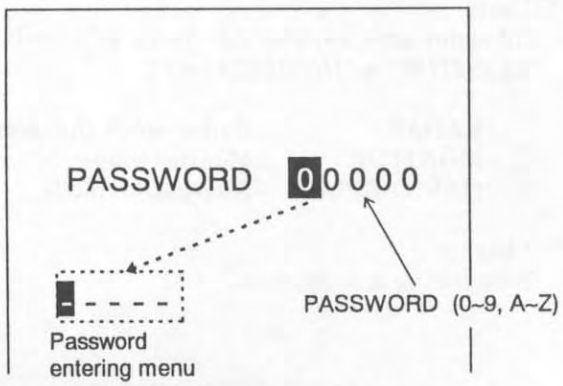


Fig. 42 Password setting menu

CHAPTER 6. MAINTENANCE AND INSPECTION

Most of maintenance of this radar should be referred to qualified personnel. If radar has any problem, contact your dealer and tell us that problem.

> **⚠ WARNING**
>
> **There are high voltage circuit inside of this radar. Do not attempt to open the rear cover of display unit or disassemble internal parts. When you open the radome, power must be off.**
> **Even power switch is OFF, this radar is still supplied power inside.**

The followings table shows the maintenance by user. Please check periodically.

Tab. 11 Maintenance

Inspection Interval	Inspection Item	Method of Inspection and Maintenance
3-6 months	Rust and looseness in scanner unit	Check whether the scanner's fitting bolts are corroded or less.
	Display screen of LCD display	Clean filter and LCD screen surfaces with a soft and wet cloth.
6-12 months	Grease application to antenna drive gear	Apply an even coating of grease to the entire surface of the antenna drive gear with a spatula or brush.
	Check for contact of connectors	Check whether connectors are contacted properly. If any connector is improperly contacted or stained, correct it by using a contact restoring chemical agent or by polishing or replace with a new one if necessary.

Concerning Consumable

The radar uses consumable as listed below that require periodic replacement.

(1) Magnetron

This part is mounted in the scanner unit. If distant echo images have become less visible, the magnetron probably may have degraded. In such a case, replace it. Consult your distributor for replacement of this part.

Period of the replacement : 3000hour(typ.) (500hour guarantee)

(2) LCD back-light

This part is mounted in the display unit. If the display screen is extremely dark and its illumination cannot be corrected by adjusting brightness, the LCD back-light may be faulty or may have burnt out. In such a case, replace it. Consult your distributor for replacement of this part.

Period of the replacement : 10000hour(typ.)

(3) Fuse

The fuse is built in the power supply cable. If the fuse appears to be blown, check the fuse. If blown, replace it following the procedure shown in Fig.43.

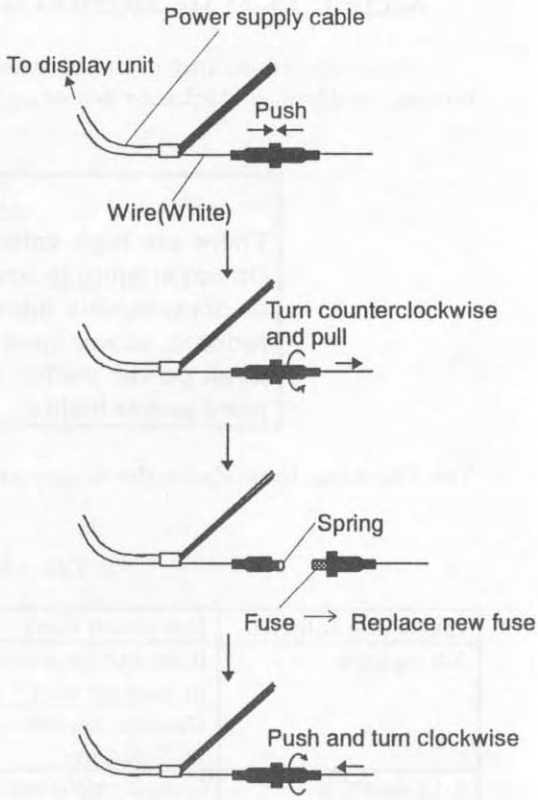


Fig. 43 Method for replacing fuse

CHAPTER 7. TROUBLESHOOTING

This chapter explains how to identify trouble locations when the radar is found faulty and how to request repair.

If you find the radar is faulty, check it the following procedure described below. If you find as a result of inspection that the fault cannot be repaired on board, contact your distributor or Anritsu for repair.

For faster service, please let us know about followings when you request repair:

(1) Ship's name, place of anchorage, allowable repair period or time
(2) Radar type (This radar is RA772UA.)
(3) Manufacturing number (indicated on the back of the display unit)
(4) Fault symptoms and inspection results

⚠ WARNING

There are high voltage circuit inside of this radar. Do not attempt to open the rear cover of display unit or disassemble internal parts. When you open the radome for installation, power must be off.
Even power switch is OFF, this radar is still supplied power inside.

This chapter explains how to identify trouble locations when the radar is found faulty and how to request repair.

7.1 Fault Diagnosis by Self-check

The radar incorporates a failure diagnostic function (called "self-check") to diagnose faults by the equipment itself. Use this self-check function following the procedure described below to check whether there is any fault in your radar.

Running self-check

(1) Press the MENU key to bring up a menu screen.
(2) Using the cursor key, move the menu bar to "SETUP" and the box cursor to "SYSTEM CHECK".
(3) Press the ENTER key. The screen shown in Fig.44 will appear.
(4) While watching the screen, check the following:
    ① Whether all items are marked "OK". (If any item is marked "NG", the indicated location may be faulty.)
    ② Press a front-panel key and see if the corresponding display on the screen is highlighted.
(5) Press the POWER key to return to the previous screen.

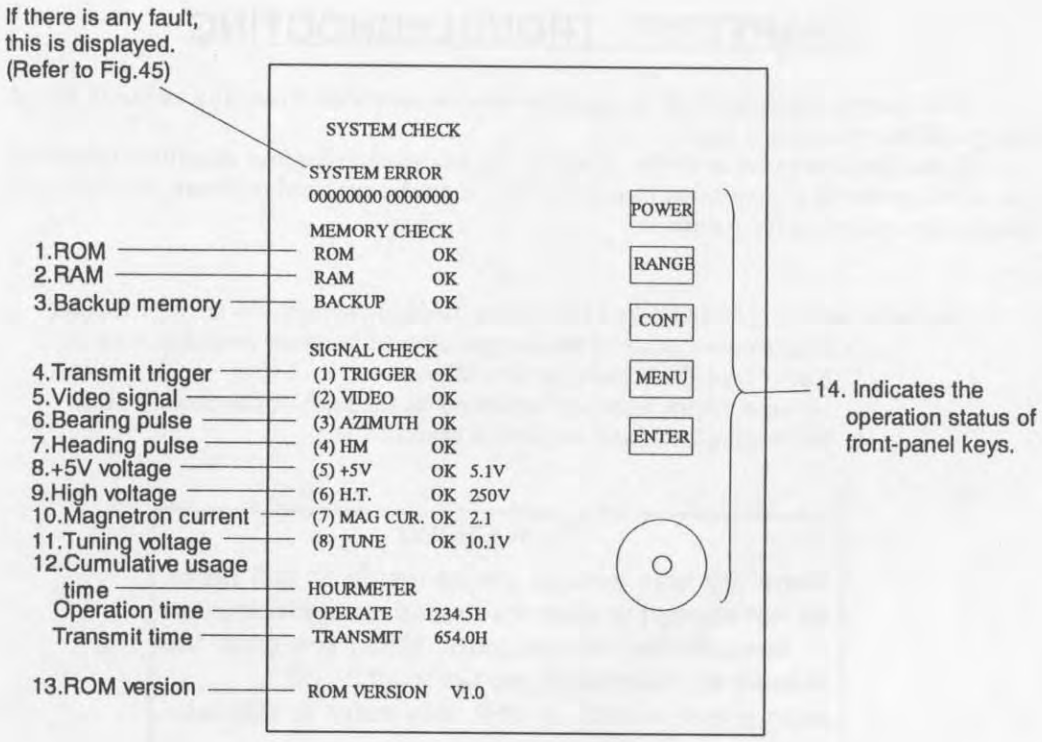


Fig. 44 Self-check screen

1. ROM

Indicates the ROM status.

2. RAM

Indicates the RAM status.

3. Backup memory

Indicates the backup memory status.

4. Transmit trigger

Indicates the signal line status for the trigger signal sent from the scanner unit.

5. Video signal

Indicates the signal line status for the video signal sent from the scanner unit.

6. Bearing pulse

Indicates the signal line status for the bearing signal sent from the scanner unit.

7. Heading pulse

Indicates the signal line status for the bow signal sent from the scanner unit.

8. +5V voltage

Indicates the reference voltage status of the electric circuit and its voltage value (normally about 5 V).

9. High voltage (At scanner)

Indicates the status of the high voltage supplied from the display unit to the scanner unit and its voltage value (normally about 250 V) at scanner unit.

10. Magnetron current

Indicates the status of the anode current flowing in the magnetron and its current value.

11. Tuning voltage

Indicates the status of the voltage used for tuning and its voltage value.

12. Cumulative usage time

Indicates the cumulative time your radar is used.

OPERATE : Duration of time during which the power supply is turned on.
TRANSMIT : Duration of time transmitting.

13. ROM version

Indicates the ROM software version .

14. Indicates the operation status of front-panel keys

As you press any front-panel key when the screen in Fig.45 is on, the corresponding key is highlighted on the screen by displaying it in reverse video.

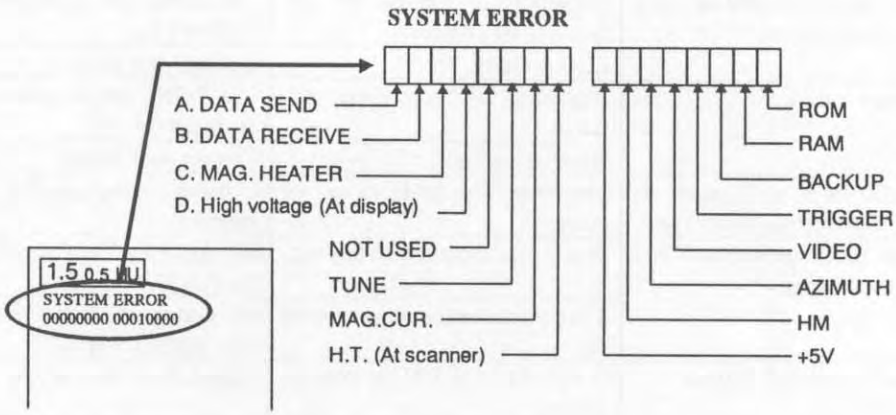


Fig. 45 SYSTEM ERROR

A. DATA SEND

Indicates the status of sending data from display to scanner.

B. DATA RECEIVE

Indicates the status of receiving data from scanner.

C. MAG HEATER

Indicates the status of heater voltage to magnetron in scanner.

D. High voltage (At display)

Indicates the status of the high voltage supplied from the display unit to the scanner unit at display unit.

7.2 Inspecting Each Part

When you have finished self-check, inspect each part of the radar according to Tab.12.

Tab. 12 Troubleshooting

Symptom	Cause	Corrective action
(1) Radar cannot be powered on.	Power cable is disconnected.	Connect power cable correctly.
	Power supply voltage is off specified value	Use Specified power supply. (See Section 3.2)
	Fuse in power cable is blown.	Replace fuse. (See Chapter 6)
(2) Nothing is displayed although radar is powered on.	Brightness or contrast are improperly adjustment.	Use CONT key to adjust. (See Section 5.3.)
	LCD is faulty.	Contact your dealer.
(3) Screen is dark.	Brightness is improperly adjusted.	Use CONT key to adjust. (See Section 5.3.
	Backlight is faulty.	Contact your dealer.
(4) Video does not appear although characters are displayed.	Interconnecting cable is out of place.	Connect interconnecting cable correctly.
(5) Echo image on screen differs from actual image.	Ship's heading is incorrectly set.	Set ship's heading correctly. (See Section 5.9)
	Timing adjustment is incorrectly set.	Set timing adjustment correctly. (See Section 5.9)
(6) Echo images are blurred.	GAIN, STC, or FTC is improperly set.	Adjust. (See Section 5.6)
	Magnetron has degraded.	Contact your dealer.
(7) Too much noise.	Radar is not tuned correctly	Adjust TUNE. (See Section 5.6)
	Radar is not grounded to earth.	Connect grounding wire. (See Section 3.6.)
(8) Not responded when key is pressed.	Panel keys are not contacting.	Contact your dealer.
	Power supply circuit is faulty.	Contact your dealer.
(9) "SYSTEM ERROR" is displayed on screen.	See Fig.44.	Contact your dealer.

CHAPTER 8. PRODUCT SPECIFICATIONS

(1) General

Type:		RA772UA
Power supply voltage and power consumption		
Power supply voltage:		10.2 to 31.2 Vdc
Power consumption:		35 W or less
Distance range:		0.125 to 24 NM, 9 ranges (Continual variable range also possible)
Distance resolution:		Within 30 m
Distance accuracy:		0.9% or 8 m or less
Minimum detecting distance:		Within 30 m
Bearing resolution:		Within 7.5°
Bearing accuracy: 1° or less		
Warm-up time:		2 minutes
Environment conditions		
Ambient temperature range	(S/U):	-25 to 55 °C
	(D/U):	0 to 55 °C
Humidity:		95% RH at +35 °C
Vibration:		1 G (0 to 3,000 rpm)
Wind resistance:		100 knots (max.)
Waterproof standard:		CFR-46
Interconnecting cable:		30 m (max.)

(2) Scanner Unit

Type: RB714A

Antenna type: Parabolic

Antenna characteristics
Beam width (horizontal): 6.0 ±1.0°
Beam width (vertical): 25° (typ.)
Side lobe level: -20 dB or less

Pulse width and peak power output:

Pulse width (uS)	Peak power (kW)
0.12 ± 0.02	1.5(±50%)
0.3 ± 0.05	2.0(±50%)
0.8 ± 0.1	2.0(±50%)

Radio wave type and frequency: P0N, 9445 ± 30 MHz

Antenna revolution: 24 rpm ± 20%

Transmit/receive switching: Magic T and limiter type

Intermediate frequency: 60 MHz (logarithmic amplifier)

Noise figure: 10 dB (typ.)

(3) Display Unit

Type: RF717A

Indication system: PPI, semi-3D, PPI+semi-3D

Indicator: 8-inch monochrome LCD
640 x 480 dots
Monochrome 4 gray levels

Cursor Control: Analog cursor key

VRM: 2 lines (One line can be offset.)
Unit of distance can be selected from NM, KM, and SM.

EBL: 2 lines (One line can be offset.)

Display modes: HU, HS, NU, CU, and TM

Off-center: Can be 100% off-centered over

	the full range.
Guard zone:	Can be set at any desired distance and angle in any desired width. IN and OUT modes are available.
Stretch:	2 modes
Echo track:	15, 30 sec, 1, 3, 6 min. and Continuous.
Other functions:	Interference rejection(built-in), Zoom, Sleep mode, Hold mode, Course error display, Parallel cursors, Stern marker, and Navigation mode
Panel brightness:	4 levels
Language support	Chinese, Danish, English, French, German, Greek, Italian, Japanese, Korean, Norwegian, Portuguese, Russian, Spanish, Swedish, and Turkish

(4) External Interface

NMEA0183: 2 channels (One standard channel;
Optional cable is required for 2-channel connections)

L / L	GGA, GLL, RMA, RMC
Heading	HDT, HDG, HDM, HSC, VHW, VTG
Speed	VTG, RMA, RMC, VHW
Way point	BEC, BWC, BWR, BER, BPI
Depth	DBT, DPT
Course error	XTE
Seawater temperature	MTW

Others (using optional cable):
External buzzer control output, Auxiliary indicator connecting signal output and input, Bow direction signal input(SIN/COS signals), and compass interface (10/12 bits serial)*
* Note : DISPLAY UNIT modification is required.

(5) Standard set

Display unit	1

23W68738

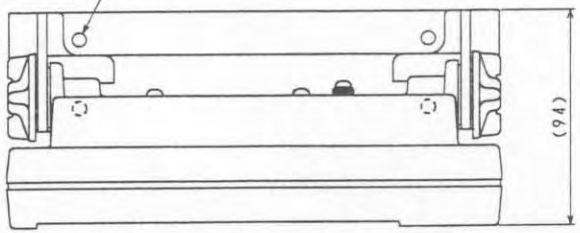
APPLICATION

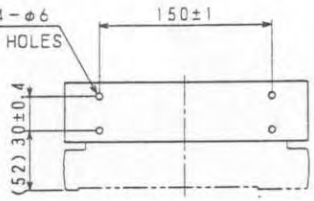
REVISIONS

2

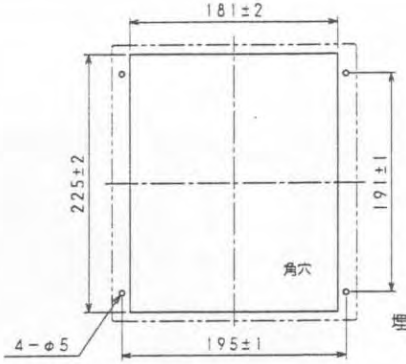
(4−φ6)
(FIXING HOLES)

5mmネジ穴または 4−φ6
FIXING HOLES

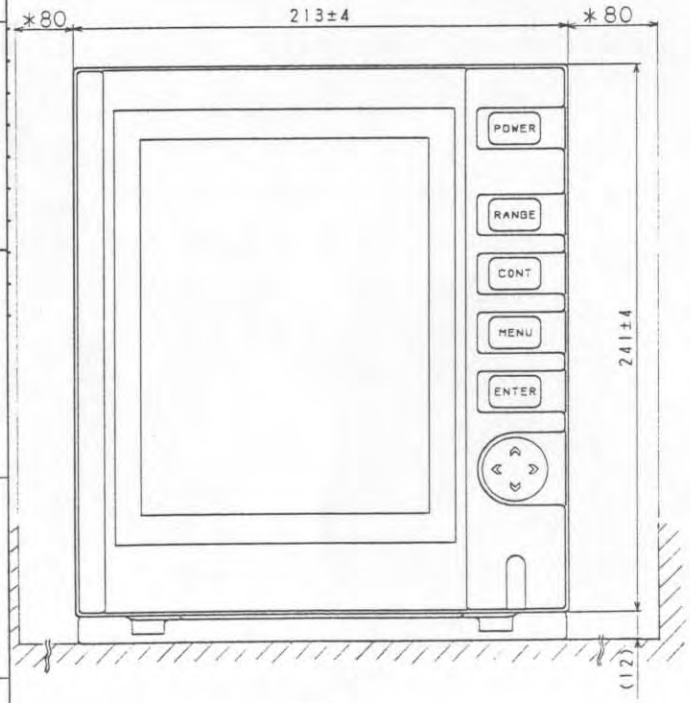


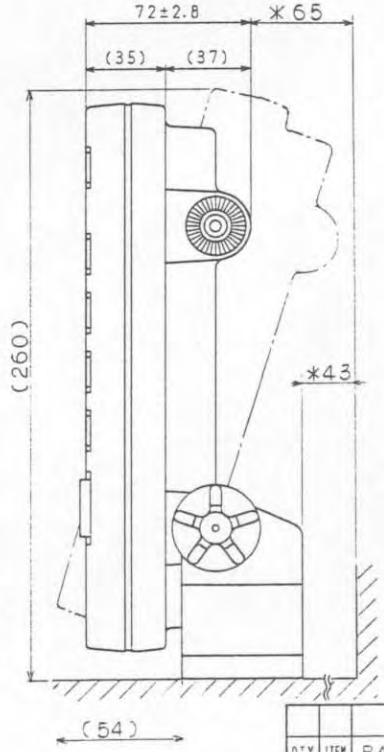


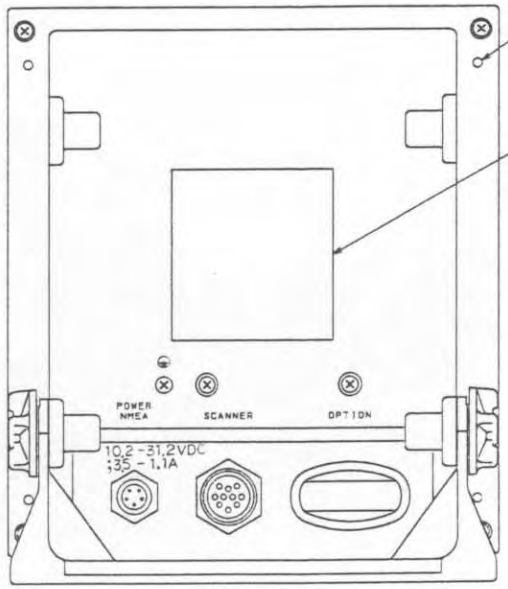
卓上設置 穴アケ図 (1:4)
DESK MOUNT TYPE



埋込ミ設置 穴アケ図(1:4)
WALL BURIED TYPE







*印: 推奨サービス空間
*MARK: RECOMMENDED SERVICE CLEARANCE

MASS: MAX 2.2kg

QTY	ITEM	PART No.	DESCRIPTION	MATERIAL	FINISH	NOTE

CHECKED BY Apr.8'96 M.Kitayama	TRACED BY Apr.8'96 S.Tsuchi	SCALE	
APPROVED BY Apr.8'96 K.Takahashi	DRAWN BY Apr.8'96 Y.Nimura	1:2	
TITLE OUTLINE DRAWING ディスプレイ ユニット DISPLAY UNIT 外観図		DRAWING No. 23W68738-02	1/1

ANRITSU CORP.

G_05_3DE

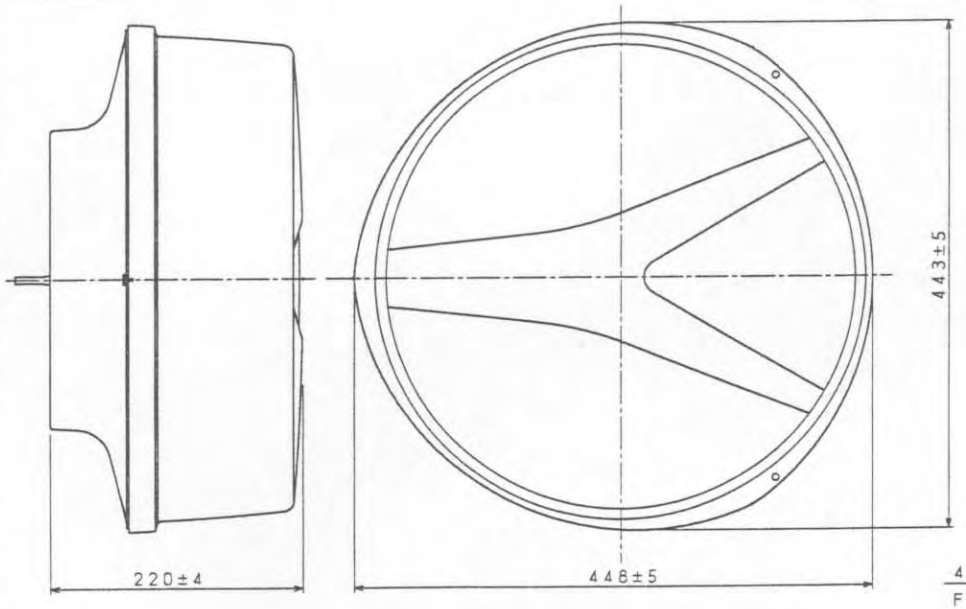
DEP

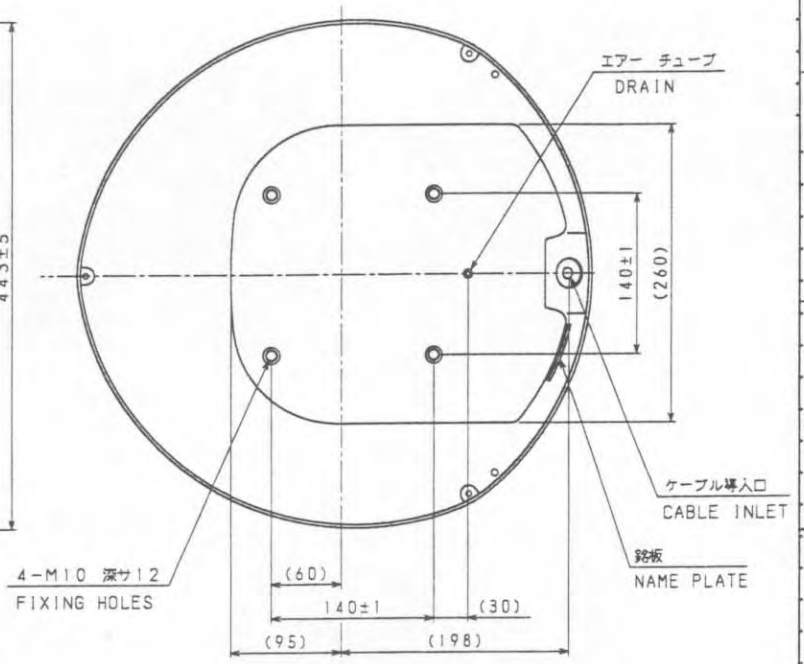
A 96.4.-3

23W68739

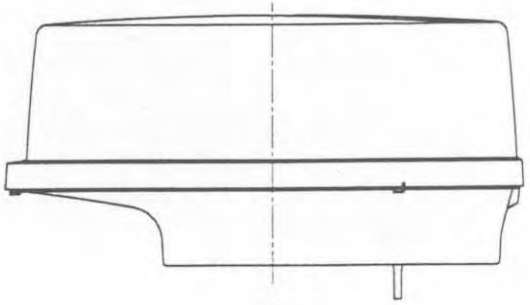
APPLICATION

REVISIONS





取付面
BOTTOM VIEW



船首方向
SHIP'S HEAD

取付面
BOTTOM

MASS :MAX 6kg

QTY	ITEM	PART No.	DESCRIPTION	MATERIAL	FINISH	NOTE

CHECKED BY Apr. 8'96 M. Kitayama
TRACED BY Apr. 8'96 S. Taguchi
SCALE 1 : 4
APPROVED BY Apr. 8'96 K. Takahashi
DRAWN BY Apr. 8'96 Y. Murata

TITLE
OUTLINE DRAWING
SCANNER UNIT
スキャナ ユニット
外観図

DRAWING No.
23W68739-00

ANRITSU CORP.

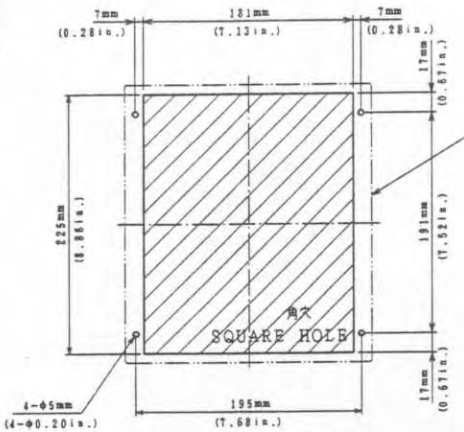
G_06_3SU

DEP

23W69214

APPLICATION

REVISIONS



フラッシュ・マウント 穴アケ図 (1:4)
HOLES FOR FLUSH MOUNT

ディスプレイ・ユニット外形線
OUTLINE OF DISPLAY UNIT

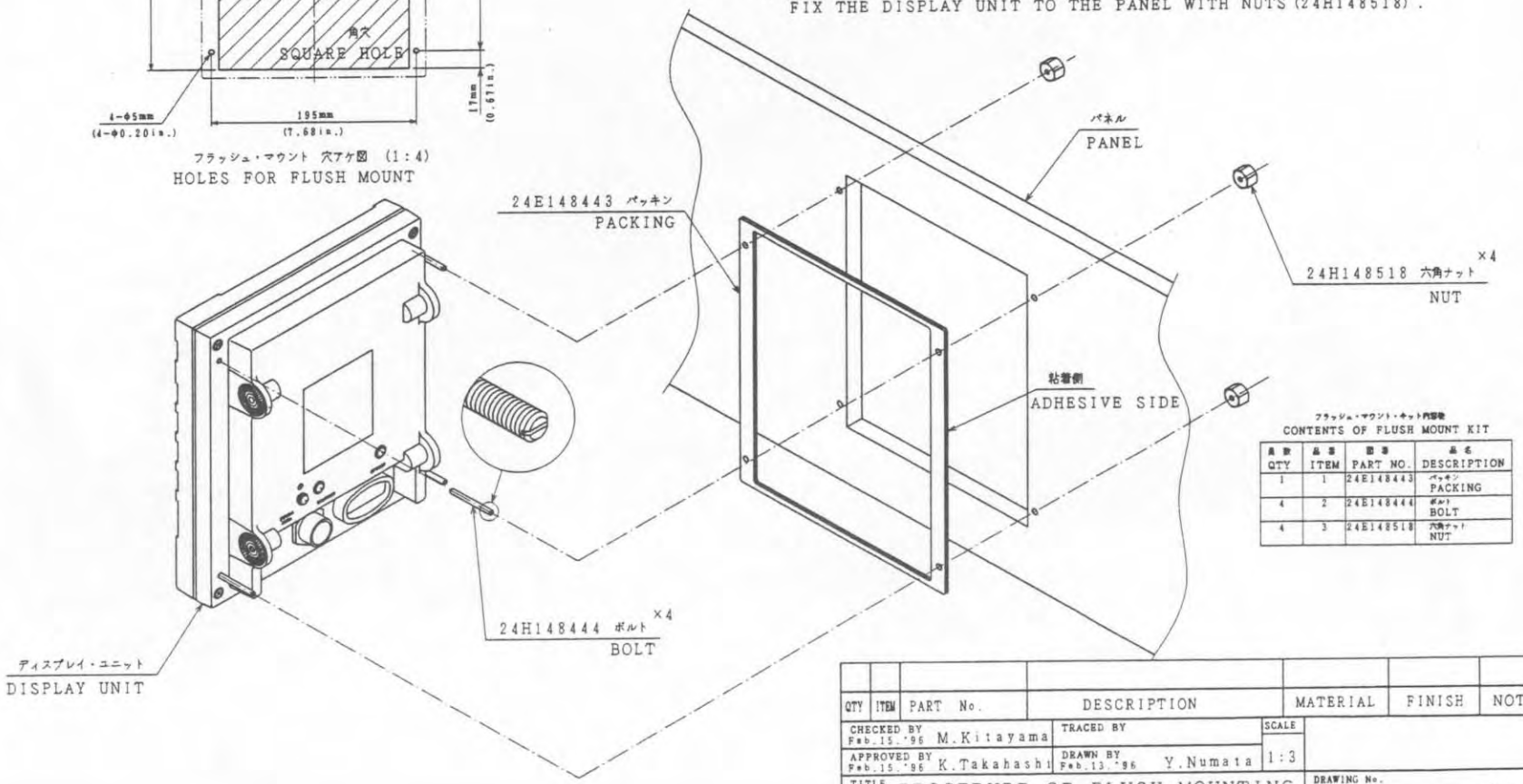
フラッシュ・マウント 要領
PROCEDURE OF FLUSH MOUNTING

(1) 左図に示す寸法に従い、パネルにディスプレイ・ユニット取り付け用の穴を空ける。
ACCORDING TO THE FIGURE (HOLES FOR FLUSH MOUNT).
MAKE HOLES TO THE PANEL FOR INSTALLING THE DISPLAY UNIT.

(2) パッキン (24E148443) をパネルに貼り付ける。
STICK THE PACKING (24E148443) TO THE PANEL.

(3) ボルト (24H148444) (4個) をディスプレイ・ユニットに取り付ける。
INSTALL BOLTS (24H148444) (4PIECES) TO THE DISPLAY UNIT.

(4) ディスプレイ・ユニットを六角ナット (24H148518) でパネルに固定する。
FIX THE DISPLAY UNIT TO THE PANEL WITH NUTS (24H148518).



フラッシュ・マウント・キット内容物
CONTENTS OF FLUSH MOUNT KIT

員数 QTY	品番 ITEM	図番 PART NO.	品名 DESCRIPTION
1	1	24E148443	パッキン PACKING
4	2	24E148444	ボルト BOLT
4	3	24E148518	六角ナット NUT

QTY	ITEM	PART No.	DESCRIPTION	MATERIAL	FINISH	NOTE

CHECKED BY Feb.15.'96 M.Kitayama
TRACED BY
SCALE 1:3
APPROVED BY Feb.15.'96 K.Takahashi
DRAWN BY Feb.13.'96 Y.Numata

TITLE PROCEDURE OF FLUSH MOUNTING
フラッシュ・マウント 要領図

DRAWING No. 23W69214 -01

ANRITSU CORP.

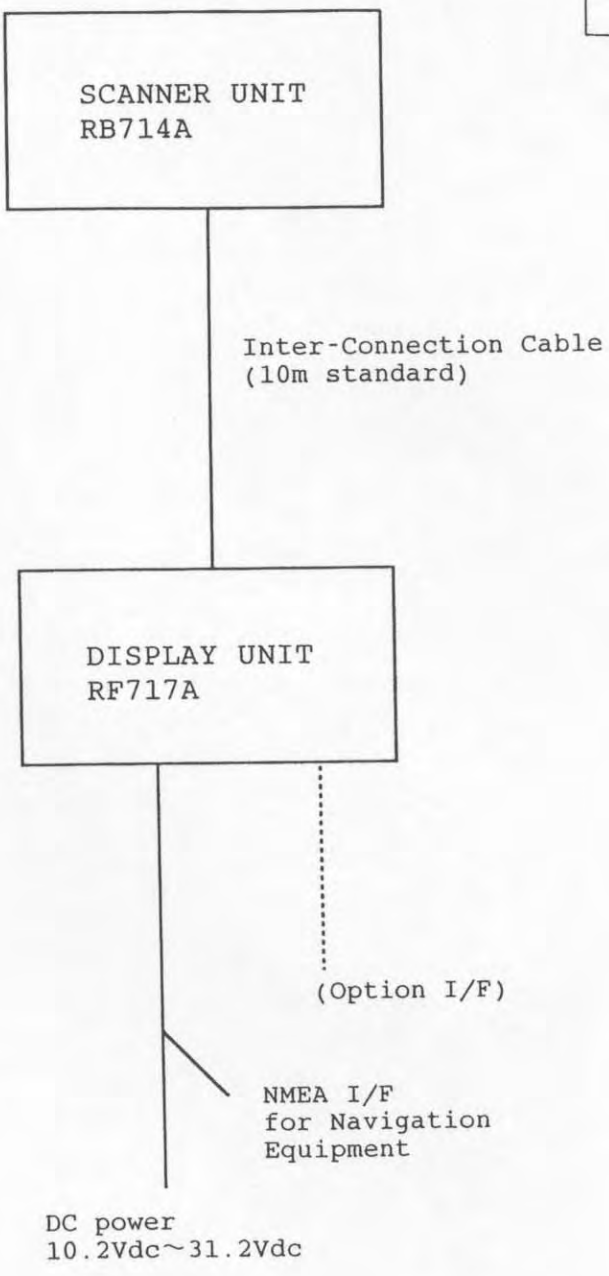
W-01-3FM

原図

DEP 96.5.31

24W149873 /

APPLICATION	REVISIONS



RA772UA
GENERAL SYSTEM DIAGRAM

QTY	ITEM	PART NO.	DESCRIPTION	MATERIAL	FINISH	NOTE

CHECKED BY 24Nov'95 M. Ojida	TRACED BY	SCALE	
APPROVED BY 24 Nov'95 T. Hidai	DRAWN BY 24.Nov.'95. T. Konno	/	

DEP
96.3.13

TITLE: RA772UA GENERAL SYSTEM DIAGRAM

DRAWING NO. 24W149873-00 /

ANRITSU CORP

24W151642

APPLICATION

REVISIONS

242J147628 CABLE

SCAN PCB X1	CORE CONDUCTOR and COLOR	FUNCTION	DISP PCB X3
1	17/0.16 VIOLET	+250V	1
2	17/0.16 BLUE	+24V	2
3	43/0.16 ORANGE	+12V	3
4	17/0.16 YELLOW and BRAID OF CABLE	GND	4
5	SHIELD RED	DAT	5
6	BRAID OF RED	DAT-R	6
7	SHIELD BROWN	BP/SHF	7
8	BRAID OF BROWN	BP/SHF-R	8
9	CX GRAY	V/TRG	9
10	BRAID OF CX	V/TRG-R	10

SCANNER UNIT

DISPLAY UNIT

原図

QTY	ITEM	PART NO.	DESCRIPTION	MATERIAL	FINISH	NOTE

CHECKED BY 27 June '96 H. Ishida

TRACED BY

SCALE /

APPROVED BY 27 Jun. '96 T. Hidai

DRAWN BY 27th Jun. '96 K.Hikizaki

DEP

TITLE

RA772UA 相互結線図

INTERCONNECTION DIAGRAM

DRAWING NO. 24W151642-00

A4

ANRITSU CORP.

List of Terms

Box cursor

This cursor is used to select menu items. This cursor is displayed in reverse video when it appears on the menu screen or as a square box when it appears on the radar screen.

Course error (XTE)

When navigation equipment is installed in the ship, deviation of the ship's heading from its scheduled course is indicated on the screen.

Cross cursor

This means a crosshair cursor that moves on the radar screen as you move a key on the display unit.

Display modes

This refers to display modes of the radar screen. Display modes are classified depending on which direction the top of the radar screen faces. (Refer to CHAPTER 2 for details about display modes.)

EBL

This is a cursor that looks like a line segment. It is used to measure an angle between a target and the ship's advancing direction.

Echo track

This is a function to display the residual images of targets on the radar screen. It helps to identify moving targets.

False echo

Bridges, large ships or even masts on the ship sometimes cause an actually nonexistent target to appear on the screen as an echo. Such an echo is called a false echo.

FTC

When it rains or snows, noise appears over the entire screen, making echoes less visible. This function is used to suppress noise in such a case.

Interconnecting cable

This cable is used to connect the scanner unit and display unit.

Interference rejection (IR)

Spiral patterns appear on the screen if there is some other radar operating near the ship (radar interference).

Magnetron

This means a vacuum tube used to generate transmit waves for the radar.

Menu bar

This bar represents the content of menu classification.

Menu screen

This screen is one that you use to modify settings such as when adjusting.

Navigation screen

When navigation equipment is installed in the ship, sailing information on the ship's position (longitude and latitude), cruising speed, and atmospheric temperature is displayed on a screen. This screen is called the navigation screen.

Pedestal

This means a stand used to support the display unit.

Radar screen

This screen is what you see when the radar is in operation.

Radome

This is a cover to protect the antenna against rain and wind. It is constructed with materials that allow waves to pass through.

Standby state

This means an operating state of a radar in which the radar stands by without transmitting waves (displayed as "ST'BY" on the screen.) If the navigation function is turned on, the navigation screen is displayed instead.

STC

This is a function to suppress reflected waves from sea surfaces as displayed on the screen. Reception sensitivity is lowered for reflections from near spots and raised for reflections from distant spots.

Stretch (ST)

This function allows you to stretch the size of a target in the distance direction to enlarge its display on the screen. This is effective when reflected waves from targets are weak and echoes are not clearly visible.

TUNE

This means tuning for reception of radar waves reflected from targets.

Units of distance

NM (Nautical Mile)	1NM = 1,852 m
KM (Kilometer)	1KM=0.54NM
SM (Statute Mile)	1SM=1,609m

VRM

This is a round-shaped cursor used to measure the distance from the ship to targets.

Way point (WPT)

This refers to the destination places and course change points that are preset in a GPS, etc. They are used to assist in navigation.

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