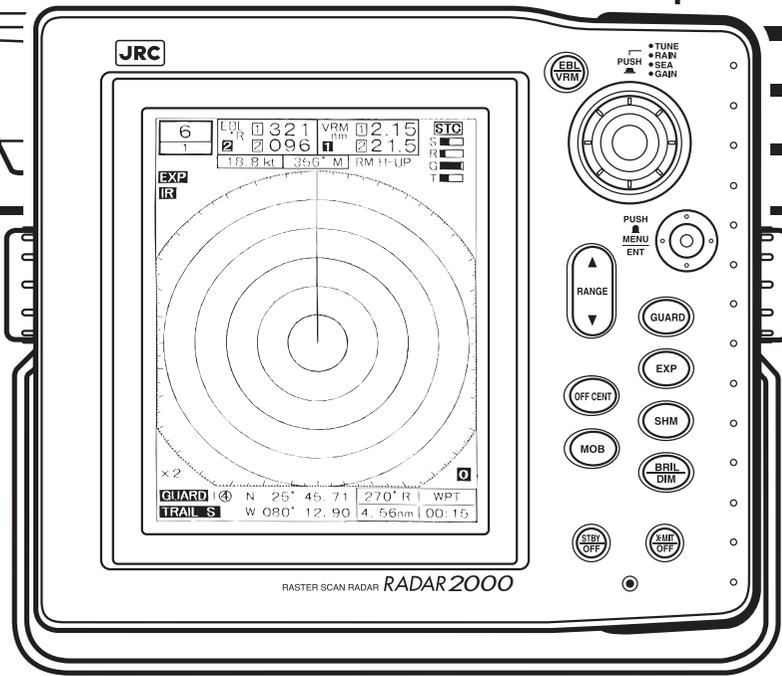




# INSTRUCTION MANUAL



# RASTER SCAN RADAR **RADAR 2000**

**Thank you for purchasing the RADAR 2000 radar.  
It will provide many years of trouble free use when operated properly.**

To use your RADAR 2000 properly, please observe the following precautions:

- Read this manual thoroughly to gain a good understanding of the capabilities and requirements of this equipment.
- Store the manual in a safe location so that it does not become lost or damaged.
- Observe standard storage and handling procedures for electronic equipment.
- If after proper installation RADAR 2000 appears to be defective, please contact your JRC sales or service representative for assistance.

### **Symbols Used In This Manual**

The following symbols are used in this instruction manual and on the product itself to ensure correct handling of the product and to protect your safety. Their meanings are explained below. Please take note of these symbols as you read the manual.

	<b>WARNING</b>	A safety warning to alert you of possible physical harm to you or the equipment.
	<b>CAUTION</b>	Equipment damage precaution to alert you of possible harm and/or failure of equipment.

 Electric shocks	This symbol is intended to alert the user to the presence of dangerous items to be handled with every possible caution. For safe operation, read the instructions carefully.
 Prohibition	These symbols are intended to alert the user to the presence of prohibited items that must never be performed. Read the instructions carefully and do not attempt things prohibited.
 Prohibits disassembly	
 Instruction	This symbol is intended to alert the user to the presence of instructions whose performance is absolutely necessary. Read the instructions carefully and be sure they are executed.

## Operating Precautions

### **WARNING**

 To avoid electrical shock, never touch the inside of the scanner or display unit. Leave protective cover on.

High voltage present inside of these units could cause personal injury. Refer equipment servicing to authorized JRC personnel.

 Avoid routinely entering the nearby vicinity of the scanner unit.

The scanner unit rotates quickly and could cause personal injury. The scanner should be installed in a high place such as the cabin roof, flying bridge, radar mast, or the top base frame of your ship. If the scanner cannot be located out of normal human reach, it should be surrounded with a fence. Prolonged human exposure to radar signals at close range is not recommended.

 Before approaching or removing the scanner unit, turn off the STBY/OFF and X-MIT/OFF keys on the display unit. Cable connector P1 on the display unit should be disconnected before removing the scanner unit from its installed position.

 Never sit on the scanner unit.  
The radome and/or the parts in the scanner unit may be damaged.

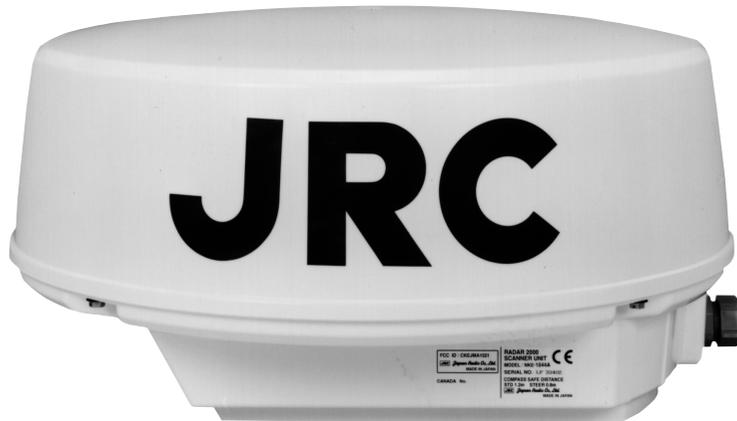
### **CAUTION**

 Use your RADAR 2000 system properly by following the instructions in this manual.

Incorrect operation can detract from optimum system performance.

 This radar unit is only an aid to navigation. Its accuracy can be affected by many factors including equipment failure or defects, environmental conditions, and improper handling or use. It is the user's responsibility to exercise common prudence and navigational judgment. This radar unit should not be relied upon as a substitute for such prudence and judgment.

## *Equipment Photographs*



*SCANNER UNIT NKE-1044A*



*DISPLAY UNIT NCD-3845*

## ***Table of Contents***

Symbols Used In This Manual -----	I
Operating Precautions -----	II
Equipment Photographs -----	III
Radar Glossary of Terms -----	IV
<b>SECTION 1 INTRODUCTION</b>	
1.1 FUNCTION -----	1
1.2 FEATURES -----	1
1.3 COMPONENTS -----	2
1.4 CONSTRUCTION -----	3
<b>SECTION 2 OPERATING CONTROLS AND FUNCTIONS</b>	
2.1 CONTROL PANEL -----	5
<b>SECTION 3 INSTALLATION</b>	
3.1 UNPACKING AND INSPECTION -----	7
3.2 PLANNING THE INSTALLATION -----	7
3.3 MOUNTING THE DISPLAY UNIT -----	9
3.4 MOUNTING THE SCANNER UNIT -----	11
3.5 CONNECTING THE SCANNER UNIT CABLE -----	12
3.6 ELECTRICAL CONNECTIONS -----	12
3.7 INITIAL OPERATION AND CHECK OUT -----	15
<b>SECTION 4 OPERATION</b>	
4.1 LAYOUT OF CONTROLS -----	18
4.2 TURNING THE RADAR ON AND OFF -----	19
4.3 SELECTING A RANGE -----	21
4.4 ADJUSTING RECEIVER SENSITIVITY -----	21
4.5 ADJUSTING TUNING -----	21
4.6 REDUCING SEA CLUTTER -----	22
4.7 ADJUSTING RAIN CLUTTER -----	22
4.8 SETTING CRT BRILLIANCE -----	22
4.9 SETTING DIMMER -----	22
4.10 SETTING OFFSENT -----	23
4.11 RANGE MEASUREMENT -----	23

4.12	BEARING MEASUREMENT-----	24
4.13	SETTING GUARD-----	25
4.14	RINGS-----	26
4.15	SHM-----	26
4.16	POSITION-----	26
4.17	WAYPOINT-----	26
4.18	READ OUT DIMENSION OF BEARING-----	26
4.19	TRAIL-----	27
4.20	TARGETS EXPANSION-----	27
4.21	REDUCING INTERFERENCE REJECTION-----	27
4.22	MOB (Man Over-Board)-----	27
4.23	TIMED-TX MODE-----	27
4.24	SETTING AUTO/MANUAL TUNING-----	28
4.25	IN CASE AN UNUSUAL CONDITION OCCURS DURING OPERATION-----	28
4.26	LANGUAGE-----	28
4.27	OPERATING MENUS-----	29
4.28	DISPLAY OF RADAR TRANSPONDER-----	36
<b>SECTION 5 MAINTENANCE</b>		
5.1	PREVENTIVE MAINTENANCE-----	37
5.2	CLEANING THE SCANNER UNIT-----	38
5.3	CLEANING THE DISPLAY SCREEN-----	38
<b>SECTION 6 AFTER-SALES SERVICE</b>		
	-----	39
<b>SECTION 7 DISPOSAL</b>		
7.1	EQUIPMENT DISPOSAL-----	41
7.2	DISPOSAL OF USED BATTERY-----	41
7.3	DISPOSAL OF USED MAGNETRON-----	41
<b>SECTION 8 SPECIFICATIONS</b>		
8.1	GENERAL-----	42
8.2	SCANNER UNIT-----	43
8.3	DISPLAY UNIT-----	43
<b>APPENDIX</b>		

Fig. 1 RADAR 2000 SCANNER UNIT (NKE-1044A) RADOME TEMPLATE

## ***Radar Glossary of Terms***

The following is a list of abbreviations and acronyms which may be used in the text of the manual.

A/D	Analog to Digital conversion
ALM	Alarm In, also known as the approach alarm. For targets set zone. approaching a preset zone.
CPU	Central Processing Unit
EBL	Electronic Bearing Line
EXP	Expansion
FTC	Fast Time Constant, also known as rain and snow clutter suppression
GPS	Global Positioning System
IR	Interference Rejection
KM	Kilometer
LL	Latitude/Longitude
MH	Modulator High voltage
NM	Nautical Mile
PCB	Printed Circuit Board
PPI	Plan Position Indicator
PW	Pulse Width
RR	Range Rings (fixed)
SHM	Ship's Heading Marker
STBY	Standby
STC	Sensitivity Time Constant, also known as sea surface clutter suppression
TD	Time Difference
TI	Trigger
VD	Video
VOM	Volt-Ohm Meter
VRM	Variable Range Marker
WPT	Waypoint
X-MIT	Transmit

---

# *SECTION 1*

---

## **INTRODUCTION**

### **1.1 FUNCTION**

The JRC RADAR 2000 Radar is compact raster scan radar with a 2 kW transmitter and a 7-inch cathode ray tube. Except for special tubes, they are all made up of solid state device for improved reliability.

### **1.2 FEATURES**

- Improved anti-sea clutter and anti-rain clutter suppression
- Easy control for VRM, EBL, GAIN, anti-sea, and anti-rain, using J-DIAL
- Approach and departure guard zone with audible alarm
- Use of robust material, aluminum die cast
- Easy to understanding other target information for range, bearing and Lat/Long by using cursor
- Destination mark can be displayed
- 2/3 radius off-centering for any direction
- Trail indication
- Man overboard indication
- Intermittent transmission

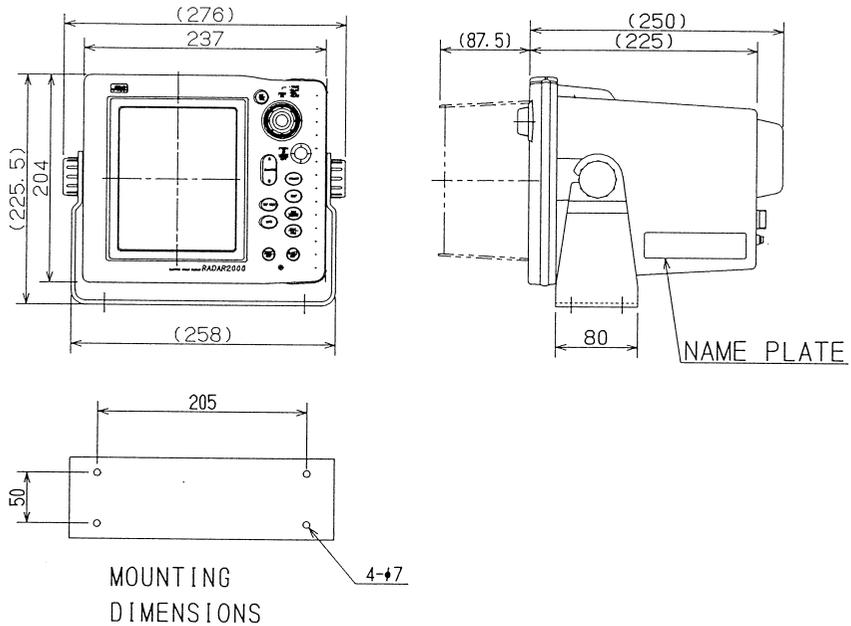
### 1.3 COMPONENTS

Table 1-1 indicates a listing of items that are included with your new radar system.

<b>Description</b>	<b>Model No. or Code No.</b>	<b>Remarks</b>
RADAR 2000 system	JMA-1521	
Scanner Unit	NKE-1044A	
Display Unit	NCD-3845	
Sun Shield	MTV301854A	
Interunit Cable	CFQ8871-10	12-cores composite cables (10 m)
Power Cable	CFQ-2646	(2 m)
Instruction Manual	7ZPRD0437	This Manual
Standard Spares	6ZXRD00181	6.3 A Fuse × 2 3.15 A Fuse × 3
6-Pin connector	5JWHZ00065	For data communication with NMEA
Sun Cover	MTV302115	
Scanner Mounting Hardware	MPTG02246	
Spacer	MPXP31278A	
Overhead Mounting Kit	MPXP31149	
Display Mounting Hardware	MPTG02024	

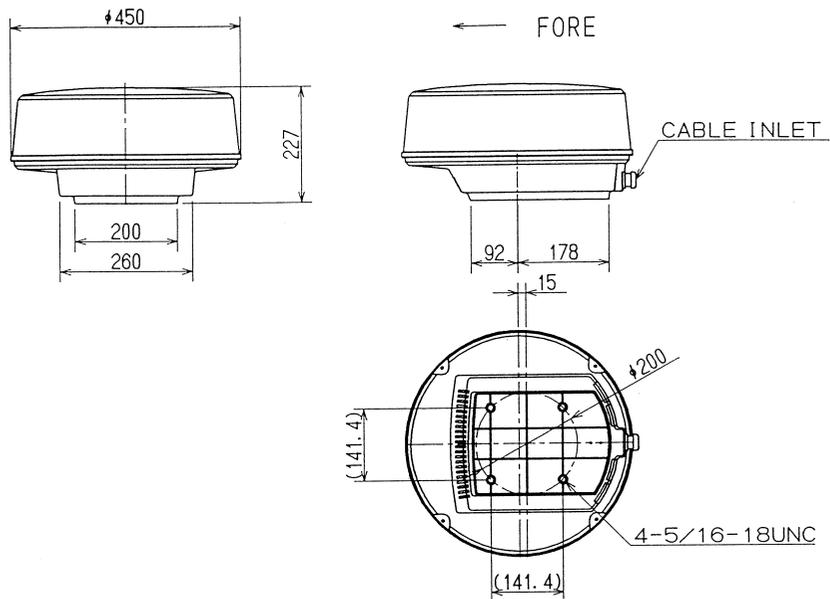
*Table 1-1 EQUIPMENT SUPPLIED*

## 1.4 CONSTRUCTION



COLOR	GRAY	(UNIT: mm)
MASS	APPROX. 6kg	(1 mm = 1/25.4 inch)

FIG. 1-1 DISPLAY MOUNTING DIMENSIONS



COLOR	WHITE	(UNIT: mm)
MASS	APPROX. 5.5kg	(1 mm = 1/25.4 inch)

FIG. 1-2 SCANNER MOUNTING DIMENSION

---

# SECTION 2

---

## OPERATING CONTROLS AND FUNCTIONS

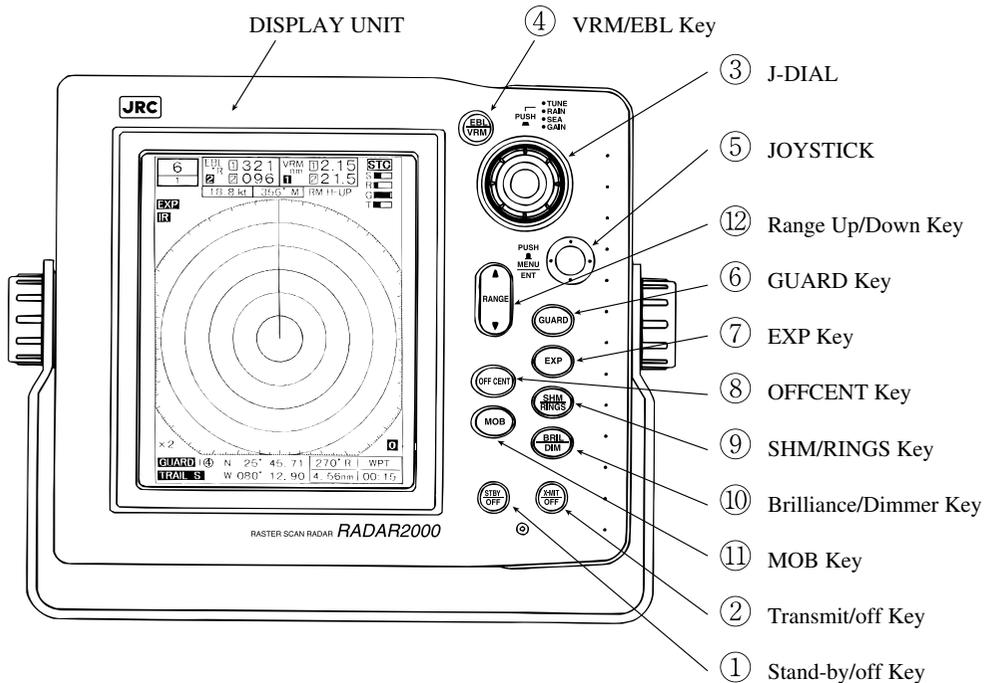


FIG. 2-1 OPERATING CONTROLS

## 2.1 CONTROL PANEL

### ① Stand-by/off Key

- Turn ON power to Display and Scanner and activates 90 second countdown timer.
- Press STBY/OFF key to Stand-by mode while in the Transmitting mode.
- Press STBY/OFF and X-MIT/OFF keys simultaneously to shut off.

### ② Transmit/off Key

- Turn ON transmitter which activates Radome.
- Press STBY/OFF and X-MIT/OFF keys simultaneously to shut off.

### ③ J-DIAL

- Push to select SEA, RAIN, GAIN and TUNE for control.
  - SEA        reduces sea returns.
  - RAIN       reduces rain or snow returns.
  - GAIN       controls strength of target returns.
  - TUNE       manually fine tunes receiver by peaking tuning bar (No tuning bar in AUTO tune).
- Control the SEA, RAIN, GAIN, TUNE, VRM, EBL, Contrast for desire setting.

### ④ VRM/EBL key

- Enable a VRM or EBL for display. A short press to turn on or off selected VRM or EBL. Press and hold, selects VRM or EBL for control by using J-DIAL.

### ⑤ JOYSTICK

- Position cursor setting.
- Enables MENU for setups and selection.

### ⑥ GUARD Key

- Enables or disables Guard Zone alarm as set with the JOYSTICK and I or O operation.

I = In mode alarm    O = Out mode alarm    Blank = OFF

- ⑦ EXP Key
  - Target Expander ON/OFF.
- ⑧ OFFSET Key
  - Places origin at any point on screen up to 2/3 radius. Inop on 24 nm range.
- ⑨ SHM/RINGS Key
  - Enables or disables the fixed range rings alternately.
  - Momentarily disables the Heading Flash while key is held depressed.
- ⑩ Brilliance/Dimmer Key
  - Brilliance level for video, characters, rings and EBL.
  - Sets front panel illumination level.
- ⑪ MOB Key
  - Marks the point where the incident occurred.
- ⑫ Range Up/Down key
  - Increases or decreases the range scale in use.

---

# *SECTION 3*

---

## **INSTALLATION**

This section provides practical guidelines to assist in the planning and installation of the RADAR 2000 aboard your vessel.

### **3.1 UNPACKING AND INSPECTION**

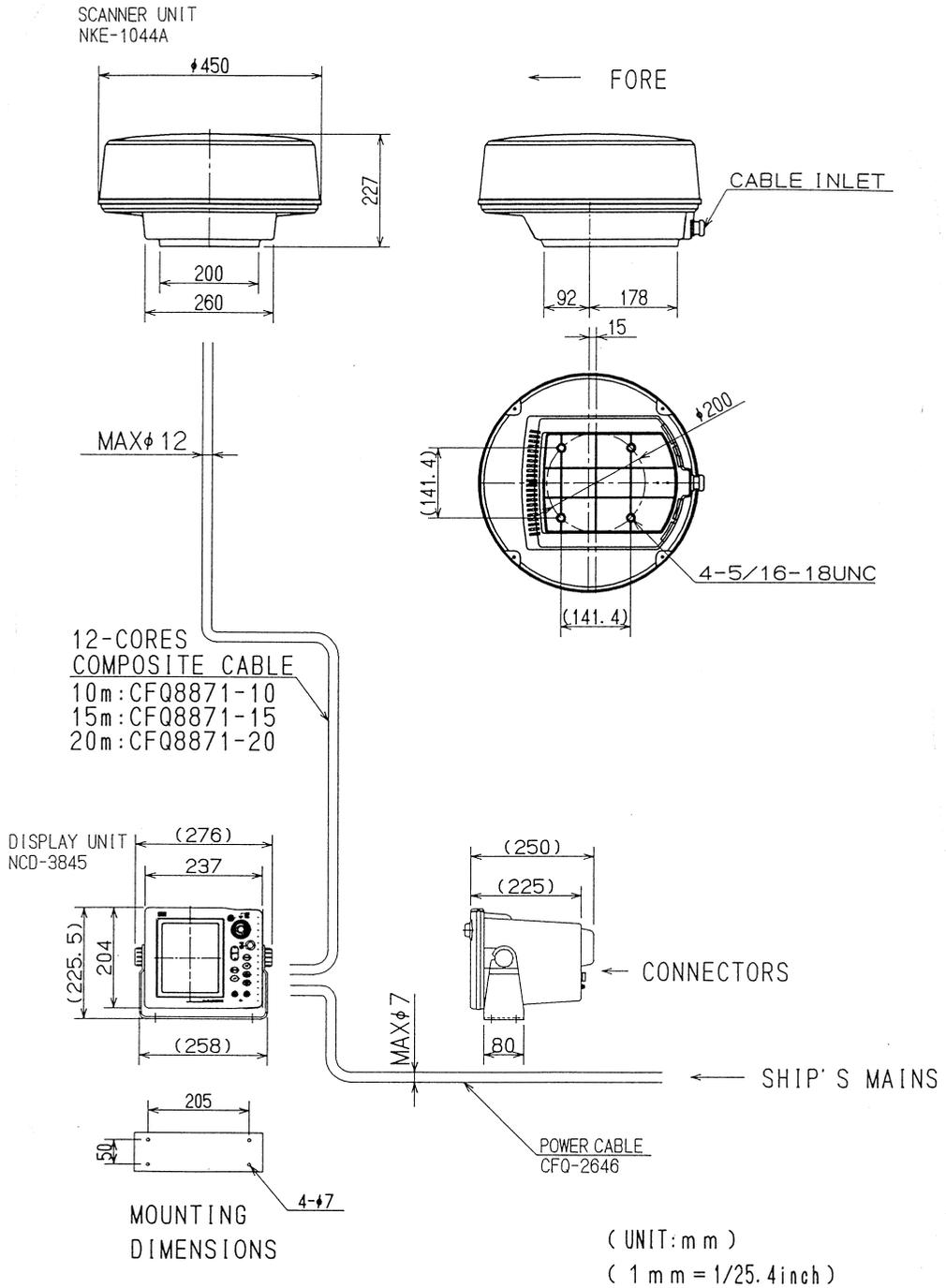
Use care when unpacking the RADAR 2000 radar from the shipping carton to prevent damage to the contents. It is also good practice to save the carton and the interior packing material until the radar has been satisfactorily installed on the vessel. The original packing material should be used in the unlikely event that it is necessary to return the unit for service.

### **3.2 PLANNING THE INSTALLATION**

The layout for installing the RADAR 2000 should be planned to give the best operation and service aboard your particular vessel. In general, the scanner unit should be mounted as high as possible above the waterline. The display unit should be installed in a convenient viewing position near the helm. Keep in mind the optimum viewing angle when installing the display. You may want to apply power in advance of installing the unit as that you can determine a satisfactory viewing angle.

A 10 meter length of interunit cable is furnished for interconnecting the two main units (scanner and display). This length of interunit cable should be sufficient to complete the cable run required on most small vessels. It is recommended that the maximum length of interunit cable not exceed 20 meters.

A general system diagram for the RADAR 2000 is shown on the following page.



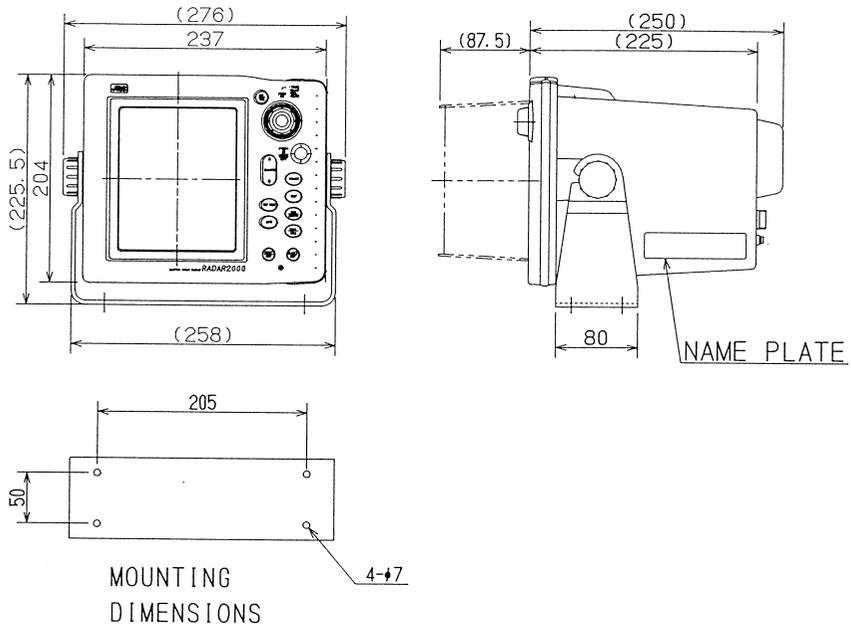
**FIG. 3-1 GENERAL SYSTEM DIAGRAM**

### **3.3 MOUNTING THE DISPLAY UNIT**

When planning the installation for your display unit, the following conditions should be considered to ensure dependable and trouble free operation.

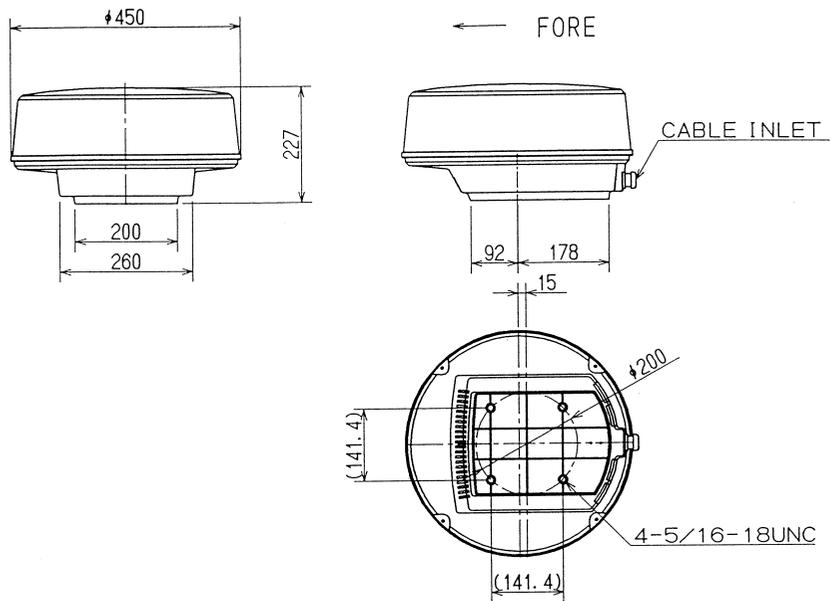
- 1) The mounting location should be easily accessible to allow operation of the front panel controls.
- 2) There should be adequate ventilation.
- 3) There should be sufficient space behind the display unit to allow cable connections to the rear panel connectors.
- 4) The display unit should be located near a DC power source.
- 5) The selected location should be far enough away from device that may cause interference, such as motors and generators.
- 6) Generally, the display unit should be located in a protected area away from prolonged direct exposure to rain and salt spray. It is good practice to protect your valuable electronic equipment as much as possible.

The display unit can be conveniently mounted on a chart table, or bulkhead mounted in a desired location. Using the outline of FIG 3-1 and 3-2 as a guide, install the display unit and secure to the mounting surface.



COLOR GRAY  
 MASS APPROX. 6kg (UNIT: mm)  
 (1 mm = 1/25.4 inch)

**FIG. 3-2 DISPLAY MOUNTING DIMENSIONS**



COLOR WHITE  
 MASS APPROX. 5.5kg (UNIT: mm)  
 (1 mm = 1/25.4 inch)

**FIG. 3-3 SCANNER MOUNTING DIMENSION**

### 3.4 MOUNTING THE SCANNER UNIT

## CAUTION



**When installing an aerial, make a hole for the water pulling-out. The equipment sometimes becomes breaking cause because it is flooded when getting a hole for the water pulling-out without making it.**

Selecting an adequate location for the scanner unit requires careful consideration. On many small vessels, the unit can be installed on a mast platform, on an arch, or on a bridge structure near the ship's center line.

The radiator beam should not be obstructed by nearby large objects. Locate the unit where large structures such as superstructures, searchlight, horns or masts are not in the same horizontal plane, otherwise, blind areas and false targets can appear on the radar screen.

Using the template provided in the front of manual as a guide, prepare the mounting surface with the four mounting holes as required. Install the Radome and secure it to the mounting surface. The correct mounting hardware is stainless steel hexhead bolts  $5/16''$ ,  $1\ 1/4''$  long with 18 UNC thread. A flat and lock washers should be used. The Radome should be parallel to the ship's waterline and oriented so the cable inlet is pointed AFT.

When mounting the Radome to a platform attached to a fly bridge, or superstructure, avoid placing the Radome Unit at eye level. Although the radar transmits a 2.0 kW peak power the average power radiated is less than 0.5 W. Therefore, the hazard from RF radiation levels is virtually nonexistent beyond 2 feet from the Radome Unit.

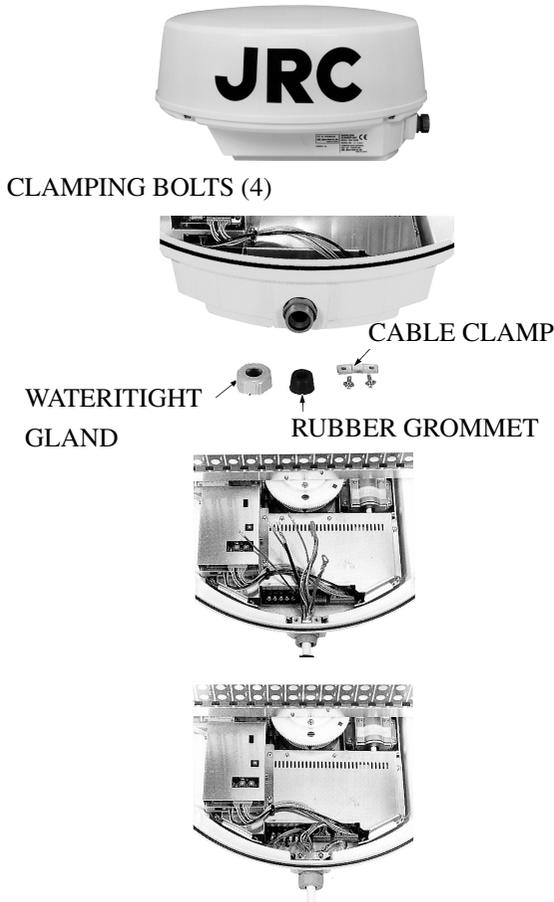
However, due to the sensitivity of the human eye, it is recommended and prudent to install the Radome in a plane above or below the passengers line-of-sight.

When the sickness of the mounting base is more than 0.4 inches, the longer bolts are required. In this case, the bolts length is as follows;

$$\text{Bolt length (inch)} \leq 1.25 + \text{sickness of mounting base (inch)}$$

If the longer bolts are used, the modulator PCB could potentially damaged.

### 3.5 CONNECTING THE SCANNER UNIT CABLE



Step 1. Loosen the 4 clamping bolts securing the radome and remove the radome cover.

Step 2. Remove watertight gland where the interconnect cable enters the scanner. Remove the cable clamp and 2 screws.

Step 3. Add the rubber grommet and insert the connecting cable. Secure the watertight gland.

Step 4. Connect the cable leads to terminal board TB1 and J1. Ground the shield with the lug to cable clamp bolt provided. Dress the wire harness with cable clamps or tie-raps as necessary for neatness.

*FIG. 3-4 SCANNER UNIT CABLE CONNECTION PROCEDURE*

### 3.6 ELECTRICAL CONNECTION

#### 3.6.1 DC POWER CABLE

The RADAR 2000 will work with any ship's mains within the 10.2 to 42 V range, since it contains a power regulator circuit. Connect the power cable to a DC source. The power cable normally should be wired through the circuit breaker. The white lead wire of the power cable should be connected to the positive source terminal and the black lead to negative source terminal. The shielded wire should be connected to the ship's RF ground. Should the power connections be inadvertently reversed, a protective fuse will blow. Recheck the input power leads for correct polarity with a VOM and reconnect the leads observing correct polarity. Replace the fuse.

### 3.6.2 EXTERNAL SYSTEM INTERFACE

## CAUTION



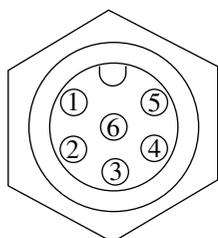
**To connect with NAV-AID and/or compass, make sure pin assignment, if used same connector.**

**In case of different pin assignment, the RADAR 2000 or connected NAV-AID will be damaged.**

The RADAR 2000 will interface with any NAV-AID (GPS or LORAN) and compass that has the standard NMEA0182 or NMEA0183 output. The inputs from NAV-AID will be digital data conforming to the NMEA0183 formats to drive various radar features such as waypoint mode. If more than one data type is present at the radar inputs (for example; compass and NAV-AID), a system priority has been established in the radar's software to respond to the inputs driving the features. The assigned priorities are set in this manner:

- HEADING:      1. Compass (NMEA0183 "HSC,HDM,HDT,VHW")  
                  2. NAV-AID (NMEA0183 "RMC,RMA,VTG")
- POSITION:     1. NAV-AID (NMEA0183 "RMC,RMA,GLL,GTD")
- SPEED:        1. NAV-AID (NMEA0183 "RMC,RMA,VTG")  
                  2. Compass (NMEA0183 "VHW")
- WAYPOINT:    1. NAV-AID (NMEA0183 "RMB,BWC")

Using the outline of FIG 3-5 as a guide, connect the RADAR 2000 to your NAV-AID and compass.



- ① NAV(+) NAV-AID
- ② NAV(-) NAV-AID
- ③ COMPASS(+)
- ④ COMPASS(-)

\* View show wire end of Cable Plug/Socket.

*FIG. 3-5 EXTERNAL INTERFACE*

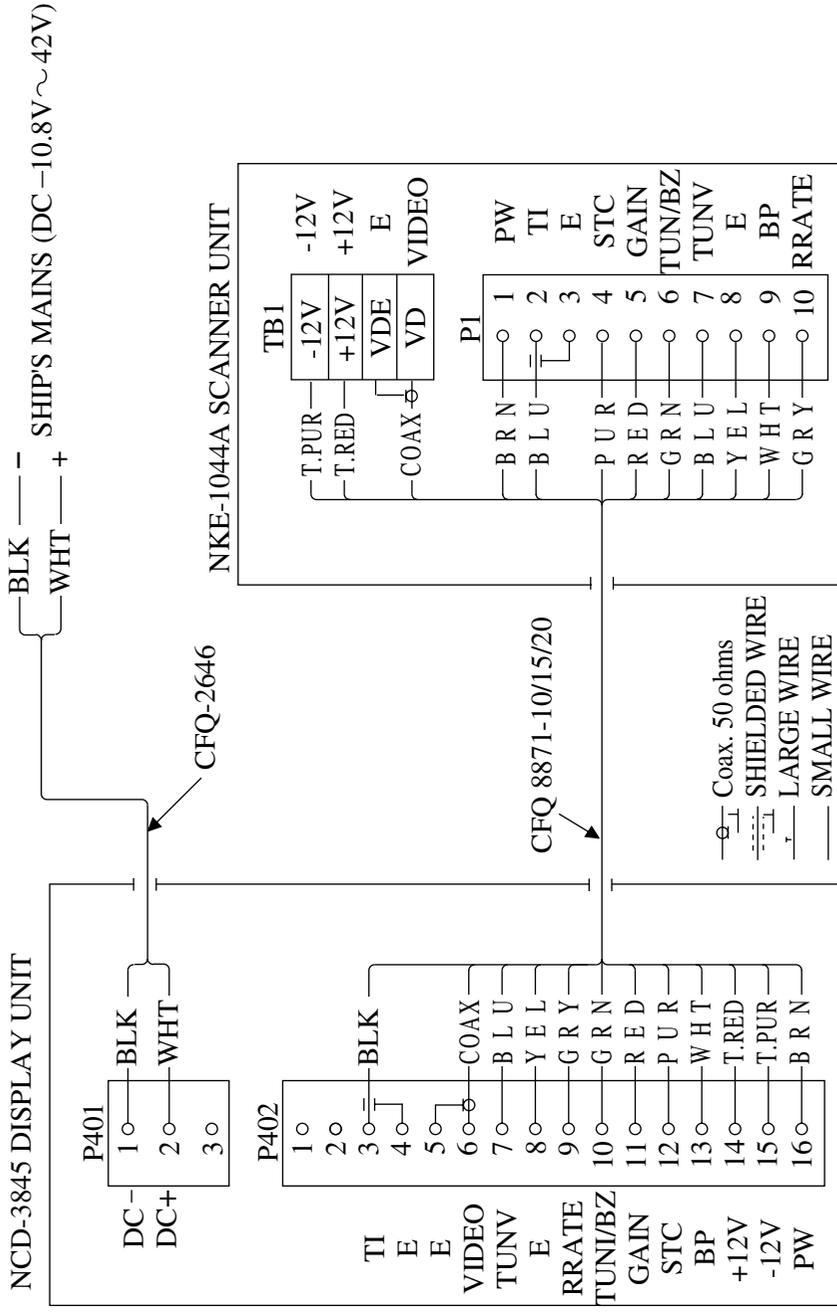


FIG. 3-6 INTERCONNECTION DIAGRAM

## **3.7 INITIAL OPERATION AND CHECK OUT**

### **3.7.1 INSPECTION AFTER THE INSTALLATION**

After completing the installation and prior to energizing the equipment, it is necessary to assure that all the steps of the installation were accomplished in accordance with the instructions.

- (1) The cables are not crimped or damaged.
- (2) The input voltage connected accurately.
- (3) The securing bolts of all equipment is tightened.
- (4) The connection of the power cable shield is made properly to RF ground.

### **3.7.2 OPERATING INITIAL SETTING MENU**

Press the JOYSTICK, and the initial setting menu will be appear on the screen. The JOYSTICK is used to select a particular menu. The particular menu will be highlighted character, then press the JOYSTICK.

### **3.7.3 RELATIVE BEARING ALIGNMENT**

This alignment should be made when the radar unit is installed. Failure to perform this procedure can result in incorrect target bearing readings.

Proceed as follows:

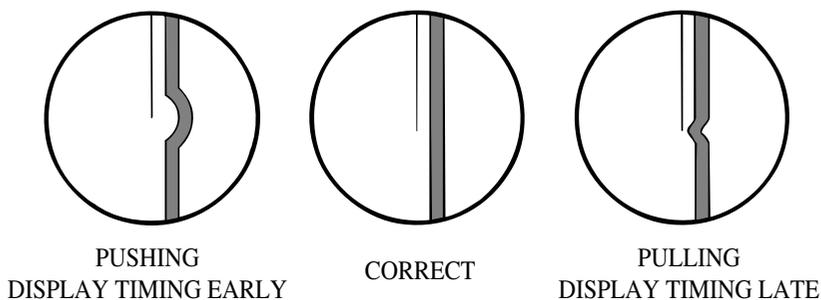
- ① Identify a suitable targets (e.g. buoy, etc.) preferably between 0.5 and 1 NM in range on the screen.
- ② Visually locate the target and line the bow of the vessel up with the target.
- ③ Put the EBL marker on the target.
- ④ Press and hold the JOYSTICK for the initial setting menu.
- ⑤ Select BEARING by using the JOYSTICK, press the JOYSTICK for the bearing adjustment mode.

- ⑥ Put the EBL over the desired target using the J-DIAL, and press the JOYSTICK.
- ⑦ Move the EBL so that the target will be displayed on the SHM.
- ⑧ Press the JOYSTICK to end the bearing adjustment mode.

### 3.7.4 DISPLAY TIMING (ZERO NM ADJUSTMENT)

This alignment must be made when the radar unit is installed. Failure to performed this procedure can result in correct target distance readings. Set the range at 0.25 NM and observe a target at a known (nearest) distance.

- ① Locate a straight dock, sea wall or bridge.  
Press and hold the JOYSTICK for the initial setting menu.
- ② Select DISPLAY TIMING by using the JOYSTICK, and press the JOYSTICK.
- ③ Adjust distance so that the object appears to be straight on the display by using the J-DIAL.
- ④ Press the JOYSTICK to end the display timing adjustment mode.



### **3.7.5 TUNE PRESET**

The tune preset is pre adjusted at the factory for proper operation. Normally further adjustment is not required. If after about 10 minutes of transmit, the tune bar is oriented towards one end or its range for video peak, perform the following steps:

- ① Set the range scale to 3 NM.
- ② Set the gain control to desired level.
- ③ Set the SEA, RAIN and IR to Off.
- ④ Press and hold the JOYSTICK for the initial setting menu.
- ⑤ Select TUNE PRESET by using the JOYSTICK, and press the JOYSTICK.
- ⑥ Adjust using the J-DIAL to maximum targets on the screen.
- ⑦ Press the JOYSTICK when maximum targets are set.

### **3.7.6 STC PRESET**

The STC preset is adjusted at the factory for proper operation. Normally further adjustment is not required.

- ① Set Range to 6 NM.
- ② Set the Gain to maximum (Refer to Section 4.4).
- ③ Press and hold the JOYSTICK for the initial setting menu.
- ④ Select STC PRESET by using the JOYSTICK, and press the JOYSTICK.
- ⑤ Adjust distance so that no background noise appears in range of 0 to 2 NM by using the J-DIAL.
- ⑥ Press the JOYSTICK to end the STC PRESET mode.

### **3.7.7 BUZZER VOLUME**

At the time of shipment, the Buzzer sound has been set to maximum position. When it is necessary to lower the volume.

- ① In the initial setting menu select BUZZER.
- ② Adjust the suitable buzzer sound level using the J-DIAL.
- ③ Press the JOYSTICK to end the buzzer setting mode.

# *SECTION 4*

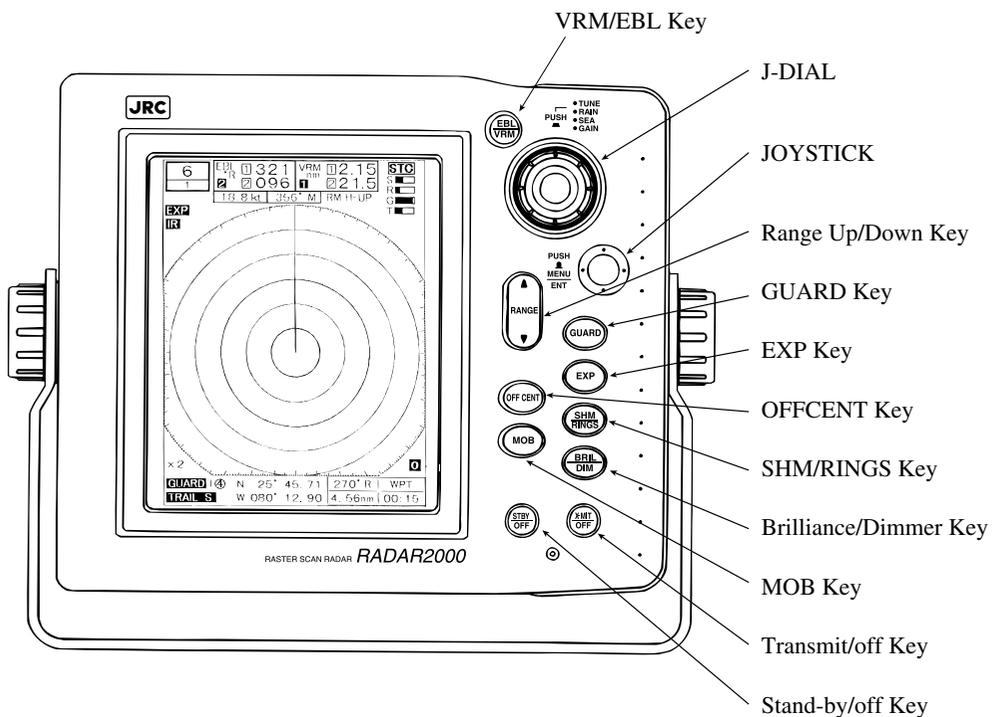
---

## OPERATION

Generally the operation of the RADAR 2000 is easy straight forward. However the navigator who knows the layout and understands the functions of various controls will obtain the best performance from his equipment.

### 4.1 LAYOUT OF CONTROLS

Layout of the control is shown in FIG 4-1.



*FIG. 4-1 OPERATING CONTROLS*

## 4.2 TURNING THE RADAR ON AND OFF

- TO TURN ON** Press the STBY/OFF key.
- TO TRANSMIT** Press the X-MIT/OFF key.
- TO STAND-BY** Press the STBY/OFF key.
- TO TURN OFF** Press the STBY/OFF and X-MIT/OFF key simultaneously.

After pressing the STBY/OFF key, the countdown timer is displayed on the screen. Approximately 90 seconds after, words the displayed prompt “ST-BY” appear.

Pressing the X-MIT/OFF key puts the radar in to transmitting mode.

Pressing the STBY/OFF key while in the transmitting mode, will cause the radar to return to standby condition. This reduces the drain from the ship’s battery. To resume transmitting simply, press the X-MIT/OFF key.

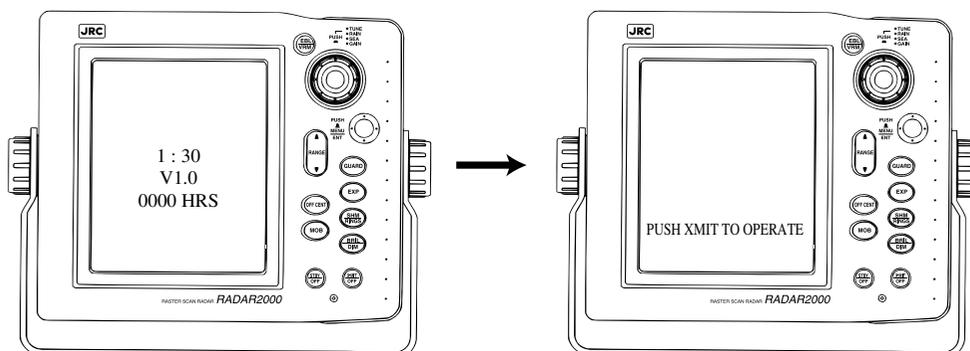


FIG. 4-2 TURN ON/OFF THE RADAR

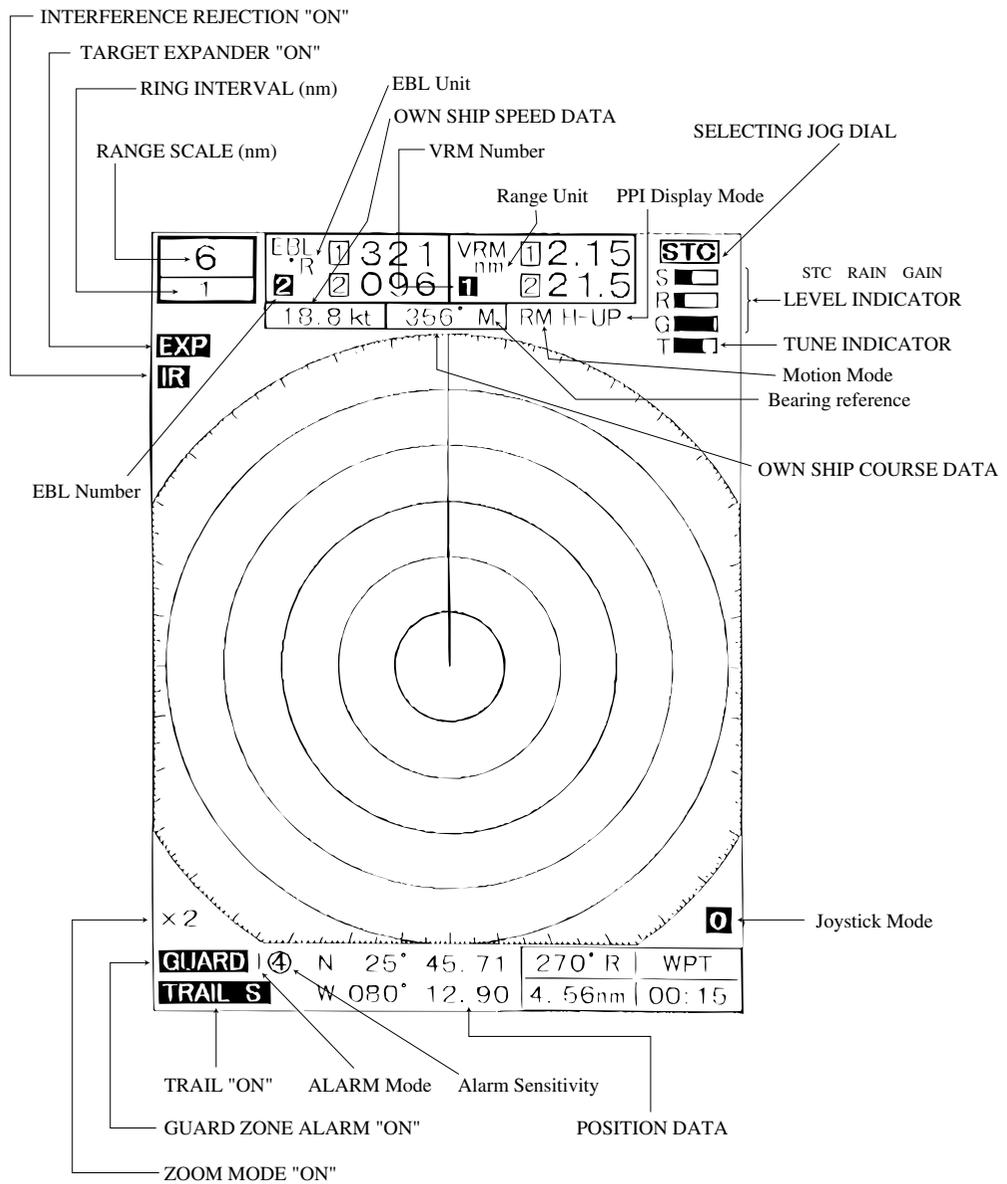


FIG. 4-3 LAYOUT OF THE SCREEN

### **4.3 SELECTING A RANGE**

The actual range scale and range rings interval is shown in the upper left corner of the display. Press the RANGE ▲ key for an increased range scale, or ▼ key for a decreases range scale. The selected range automatically determines the proper number and distance between the range rings.

### **4.4 ADJUSTING RECEIVER SENSITIVITY**

Press the J-DIAL until GAIN appears highlighted on the upper right corner of the display. Rotate the J-DIAL clockwise or counterclockwise, to vary the gain and thus control the strength of echo returns on the radar screen. An on-screen bar indicates the gain level selected for display. The proper setting is when the background noise is just visible on the screen.

### **4.5 ADJUSTING TUNING**

The RADAR 2000 is setting Auto Tune mode at the power ON. If wish to manual tuning, required to select Manual Tune mode by using menu (Refer to 4.27).

Press the J-DIAL until the TUNE appears highlighted on the upper right corner of the display. Rotate the J-DIAL clockwise or counterclockwise, to maximize the target echo. If land targets are not within the radar's range, adjust the control for maximum sea clutter. The on-screen tuning indicator will shown the strength of tuning peak conditions is turned for maximum deflection. Normally, tuning is performed on the 3 NM range scale or higher. Minor readjustment may be necessary after the radar has warmed up 10 minutes.

## 4.6 REDUCING SEA CLUTTER

### **CAUTION**

 **On short range scales, the setting of the sea clutter control should never be advanced so high as to completely obliterate all clutter, since this setting could prevent the detection of close-in target echoes.**

The sea clutter control is normally used on the shorter ranges to suppress the effect of sea clutter close to own's ship.

Press the J-DIAL until the SEA appears highlighted on the upper right corner of the display. Rotate the J-DIAL clockwise or counterclockwise to vary the sea clutter control and thus control the strength of echo returns from sea surface clutter. There is an on-screen bar indication of the sea clutter control level in use.

## 4.7 ADJUSTING RAIN CLUTTER

Press the J-DIAL until the RAIN appears highlight on the upper right corner of the display. Rotate the J-DIAL clockwise or counterclockwise, to vary the rain clutter control and thus control the strength of echo returns from rain or snow. As you rotate clockwise, the return echoes will become narrow and the returns from rain or snow will be reduced. An on-screen bar indicates the selected rain clutter level.

## 4.8 SETTING CRT BRILLIANCE

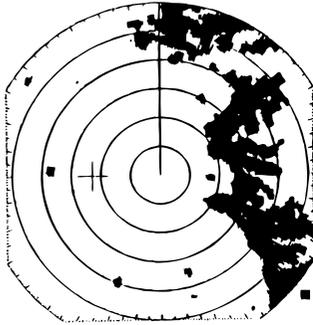
Press the BRIL/DIM key, and then rotate the J-DIAL clockwise or counterclockwise to change the display brilliance.

## 4.9 SETTING DIMMER

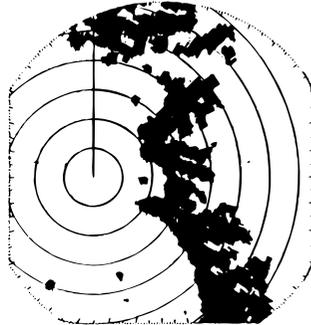
By pressing the BRIL/DIM key, the back light for the panel illumination can be varied in intensity. Dimmer level is reached at maximum brightness, and the next level returns the dimmer level to the lowest level (OFF).

#### 4.10 SETTING OFFCENT

By pressing the OFFCENT key, the display is into off-center mode by 2/3 radius, expanding the display area in the direction instructed by JOYSTICK. Press the key a second time to return the display to normal.



Off-center mode off



Off-center mode on

#### 4.11 RANGE MEASUREMENT

(1) Consider the range scale in use and count the number of rings between the center of the screen and the target. Add to this a visually estimate of the distance between the inner edge of the target and the nearest ring.

(2) Using #1 VRM

Press the EBL/VRM key.

If EBL is highlighted, press and hold the EBL/VRM key to change to VRM mode.

Rotate the J-DIAL clockwise for outer direction or counterclockwise for inner direction to move the variable range marker. The actual target distance appears on the center top of the screen in selecting unit.

To turn off the VRM, press the EBL/VRM key while VRM is highlighted.

(3) Using #2 VRM

① Press the JOYSTICK.

② Selects FUNCTION menu, then press the JOYSTICK.

③ Selects #2 VRM-SET, then press the JOYSTICK. The VRM2 appears highlight on the upper right corner of the display.

- ④ Rotate the J-DIAL clockwise for outer direction or counterclockwise for inner direction to move the #2 variable range marker. The actual target distance appears on the center top of the screen in selecting unit. To turn off the #2 VRM, selects the FUNCTION-#2 VRM-OFF on the menu sheet.

(4) Using cursor

Touch the JOYSTICK, cross cursor appears on the screen. The cross mark will be move any direction by using the JOYSTICK and the range and bearing Time-To-Go data and Lat/Loug of the cursor position will be displayed on the lower right corner on the display.

The cross cursor and cursor data will disappear in approximately 15 seconds.

## 4.12 BEARING MEASUREMENT

(1) Using the bearing scale

Using the bearing scale on the screen, visually estimate the bearing where the radial line of the bearing scale would pass through the center of the target. The bearing you obtain will be the target's relative bearing in degrees.

(2) Using #1 EBL

Press the EBL/VRM key.

If VRM is highlighted, press and hold the EBL/VRM key to change to EBL mode.

Rotate the J-DIAL clockwise or counterclockwise to move the electronic bearing line to the center of the target. Target bearing appears on the center top of the screen in degrees. Bearing may be displayed in relative "R", true "T", or magnetic "M" depending on the menu selection.

To turn off the EBL, press the EBL/VRM key while EBL is highlighted.

(3) Using #2 EBL

① Press the JOYSTICK.

② Selects FUNCTION menu, then press the JOYSTICK.

③ Selects #2 EBL-SET, then press the JOYSTICK. The EBL2 appears highlight on the upper right corner of the display.

④ Rotate the J-DIAL clockwise or counterclockwise to move the #2 EBL

on the center of the target. The actual target bearing appears on the center top of the screen in selecting unit.

To turn off the #2 EBL, selects the FUNCTION-#2 EBL-OFF on the menu sheet.

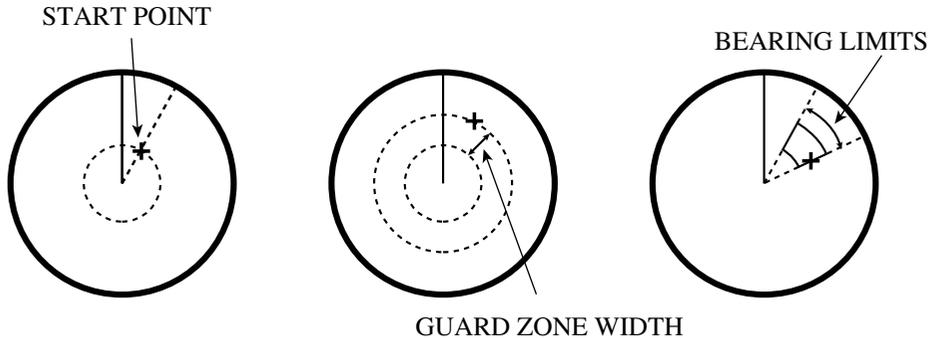
### 4.13 SETTING GUARD

The Guard Zone may be zone completely surrounding the vessel or a partial trapezoidal zone to monitor targets entering or departing the specified area. The guard zone will sound audible and visual alerts to the operator. In the IN mode, an alarm will sound if a target enters the area. The IN alarm is effective for alerting the operator to targets approaching his vessel. In the OUT mode, the alarm will sound if a target leaves the prescribed area. This type of alarm is useful for monitoring as an anchor watch, or pair trawling.

- ① Press the GUARD key.
- ② Set the cross cursor to the start point using the JOYSTICK and press the JOYSTICK.
- ③ To determine the Guard Zone width, set the cross cursor using the JOYSTICK and press the JOYSTICK.
- ④ To determine the bearing limits of the Guard Zone, set the cross cursor using the JOYSTICK and press the JOYSTICK. We now have a sector zone which alarm if any target enters the zone with the guard zone alarm indicator “GUARD I 4” which indicates IN alarm mode is in operation and the alarm target sensitivity is set at 4.
- ⑤ Press the GUARD key again and the symbol will change to “GUARD O 4” indicating that the OUT alarm will sound for targets leaving the guard zone.
- ⑥ Pressing the GUARD key again will turn off the Guard Zone.

To memorize an alarm zone, press and hold the GUARD key until the display beeps and the alarm character “GUARD I” turn into highlight at IN mode alarm. At this time the zone will have been memorized for use at any time.

To activate the memorized alarm zone, just press and hold the GUARD key until the display beeps. Your memorized zone will reappear. The zone will be displayed as an IN mode alarm. If you want to change to an OUT mode alarm, press the GUARD key.



#### 4.14 RINGS

Press the SHM/RINGS key to set rings on/off.

#### 4.15 SHM

Momentarily disables the Ship's Heading Flash while SHM/RINGS key is held depressed.

#### 4.16 POSITION

This allows selection of latitude/longitude (LL), time difference (TD) position or off displays. In addition you may display waypoint (WPT) as a LL position in place of your own position data.

#### 4.17 WAYPOINT

When the waypoint mode is turned on, and the radar is connected to a LORAN or GPS with the necessary data output, a waypoint symbol appears on the radar screen. Numeric data, showing the waypoint's bearing, range, and time-to-go appears at the bottom right corner on the screen.

#### 4.18 READ OUT DIMENSION OF BEARING

This selects the bearing for heading flush, EBL, cursor and waypoint to work in either magnetic or true bearings. When magnetic bearing is selected, displayed character "M" appears. When true bearing is selected, displayed character "T" appears. This bearing displays only numeric data. The ship's heading marker is displayed as 0° direction.

#### 4.19 TRAIL

This feature allows the operator to see the past history of target movement as an after-glow or trail behind the moving targets. The selecting “short” enables trail, placing a short after-glow behind the moving targets. Selecting the “long” enables trail with a longer after-glow.

#### 4.20 TARGETS EXPANSION

Target expand mode can be set to on or off. Target expand mode gives the operator the ability to make small targets appear larger on the display for better viewing. When active, “EXP” is highlighted in the upper left area of the screen.

#### 4.21 REDUCING INTERFERENCE REJECTION

 <b>CAUTION</b>	
	<b>If you'll watch the RADAR BEACON and the SART, set the process as follows.</b> <b>IR OFF</b>

Interference Rejection (IR) mode can be set to on or off. The IR reduces noise on the display caused by other radars. When active, the “IR” is highlighted on the upper left of the screen. If you are navigating in a port area serviced by a RACON, you should turn off the IR mode to see the RACON signals.

#### 4.22 MOB (Man Over-Board)

Pressing the MOB key, will locate a MOB mark over own ship's present location and the range, bearing and TTG to MOB point be displayed in the lower position of the display.

#### 4.23 TIMED-TX MODE

The TIMED-TX mode allows the operator to program the radar to automatically transmit for a programmed period followed by a standby period. This permits the user to maintain a radar watch while reducing the power consumption experienced during full transmit operation. In TIMED-TX mode press the STBY/OFF key and the radar will return to its normal operating mode.

#### 4.24 SETTING AUTO/MANUAL TUNING

The tuning control can be selected either automatically or manually. If the manual tuning control is selected, the tuning bar indicator is present. The auto tune mode will automatically tune the radar for optimum reception whenever the radar is turned on, even if ranges changed.

#### 4.25 IN CASE AN UNUSUAL CONDITION OCCURS DURING OPERATION

If the operator encounters unusual conditions, such as:--

- The screen is disturbed.
- The machine accepts no key input.

While manipulating, initialize RADAR 2000 by following the steps given below.

- (a) Press the **STBY/OFF** and **X-MIT/OFF** keys simultaneously.  
The RADAR 2000 is turned off.
- (b) Press the **EBL/VRM** and **STBY/OFF** keys simultaneously.  
All settings except the initial settings established through the “INITIAL SETTING” menu are reset to their factory-set values.

#### 4.26 LANGUAGE

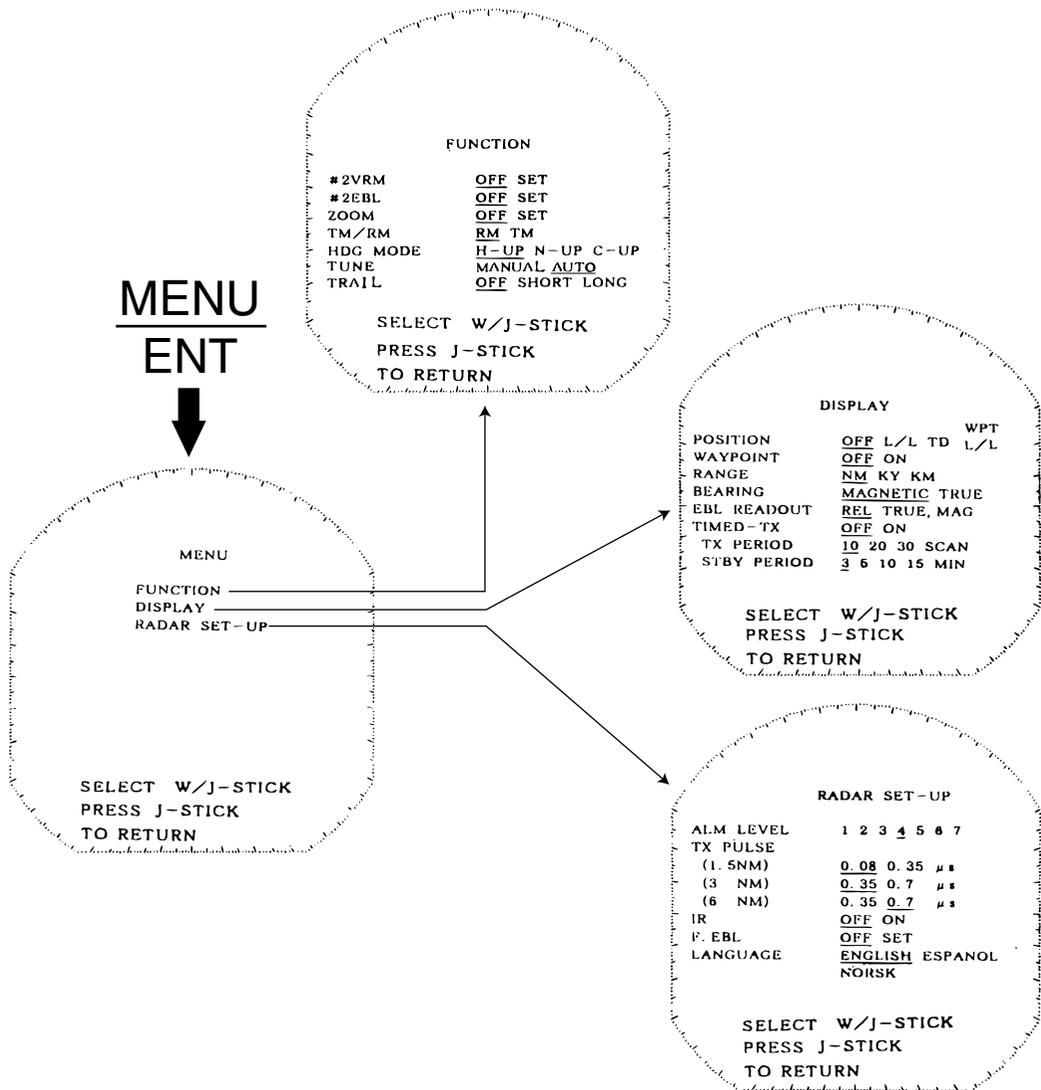
The radar menu can be displayed in one of six languages. They are English, Spanish, French, German, Norwegian and Italian. After selecting any language, the menu and the oper. prompts will also change to that language. A master reset will return the display setting to English.

- ① Press the JOYSTICK.
- ② Select the “LANGUAGE” from the “RADAR SET-UP” menu.
- ③ Select desired language.
- ④ Press the JOYSTICK to exit the language setting mode.

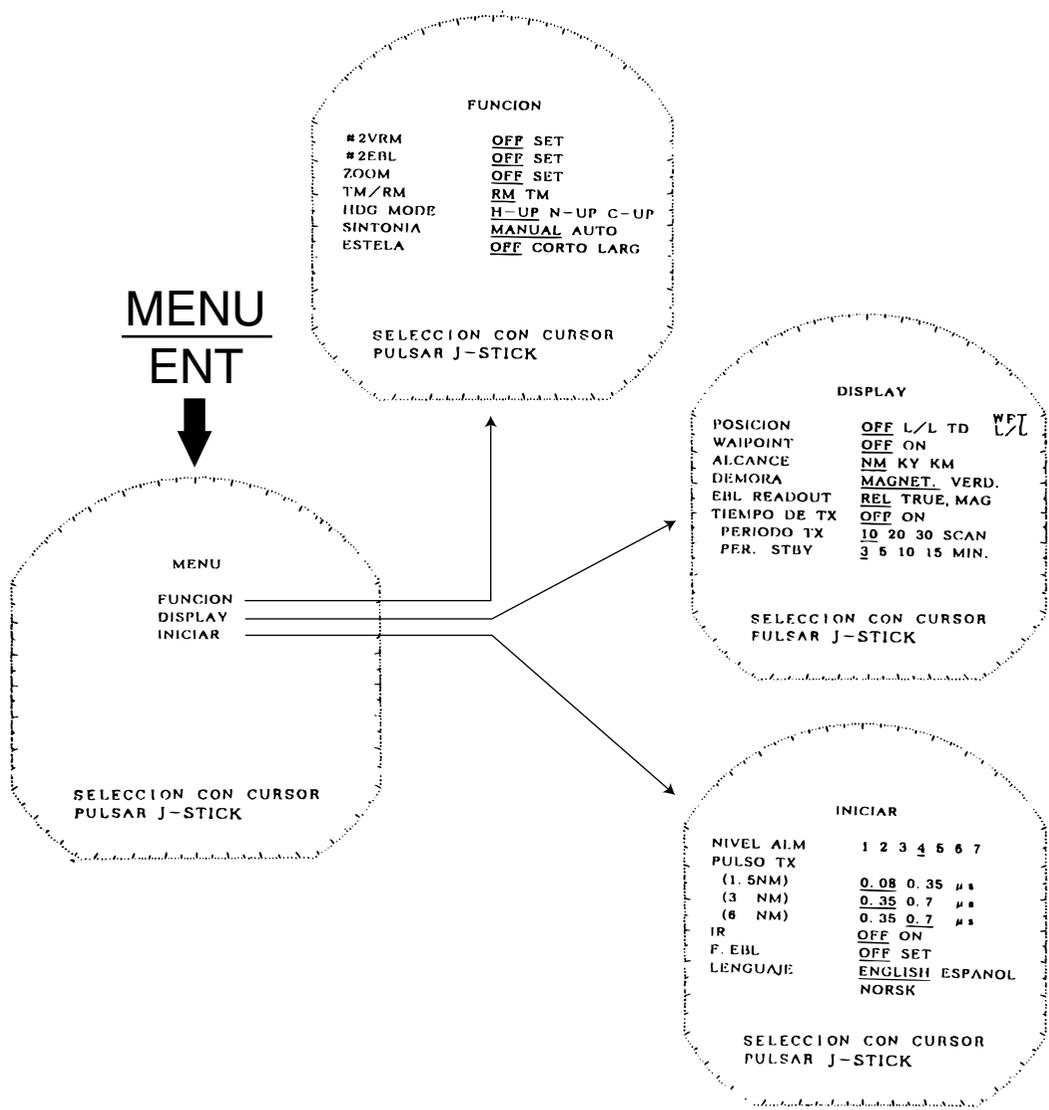
## 4.27 OPERATING MENUS

Press the JOYSTICK (MENU/ENT), and the first menu sheet will be appear. The JOYSTICK is used to select a particular menu. The particular menu will be highlighted character. Pressing the JOYSTICK (MENU/ENT) again will return the display to the normal video presentation.

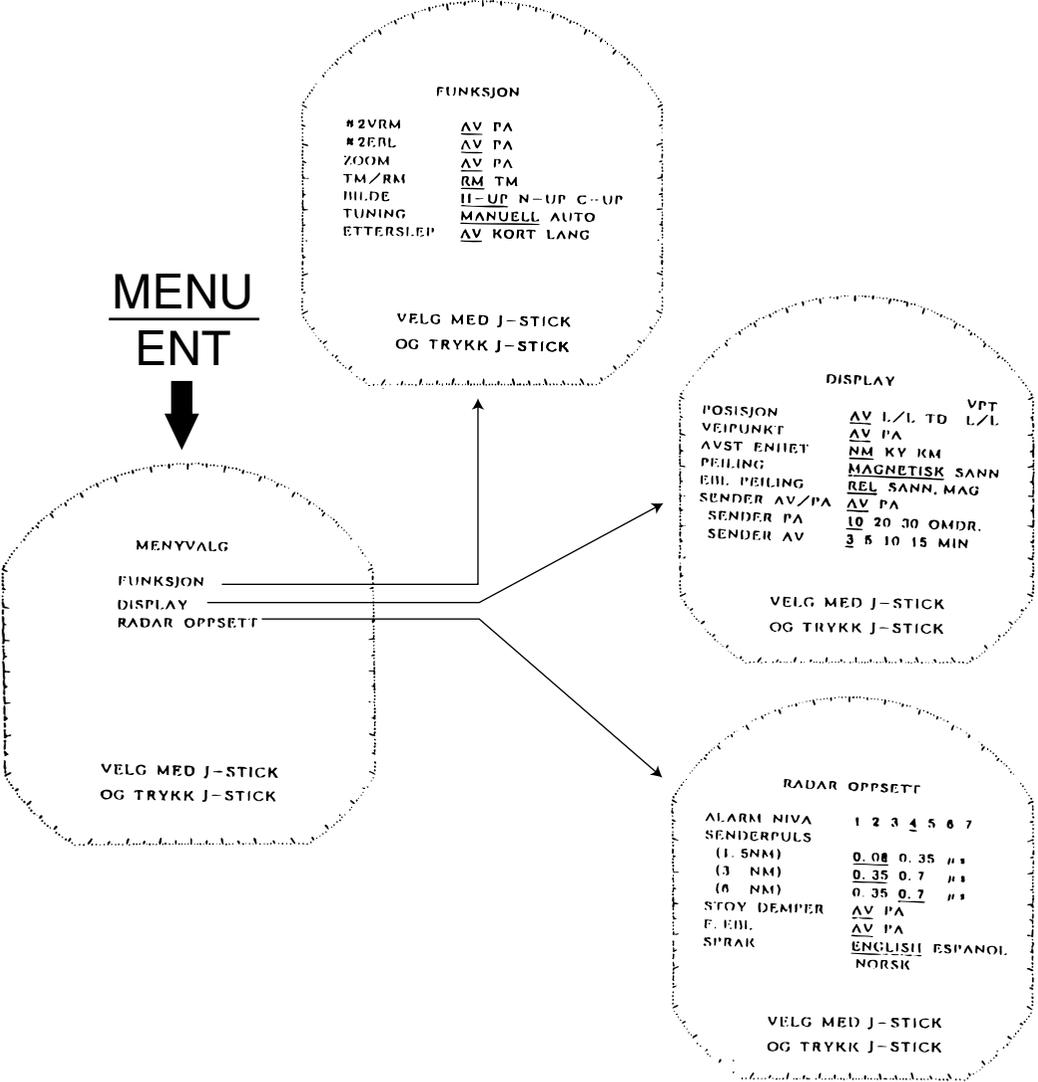
### English Menus



Spanish Menus

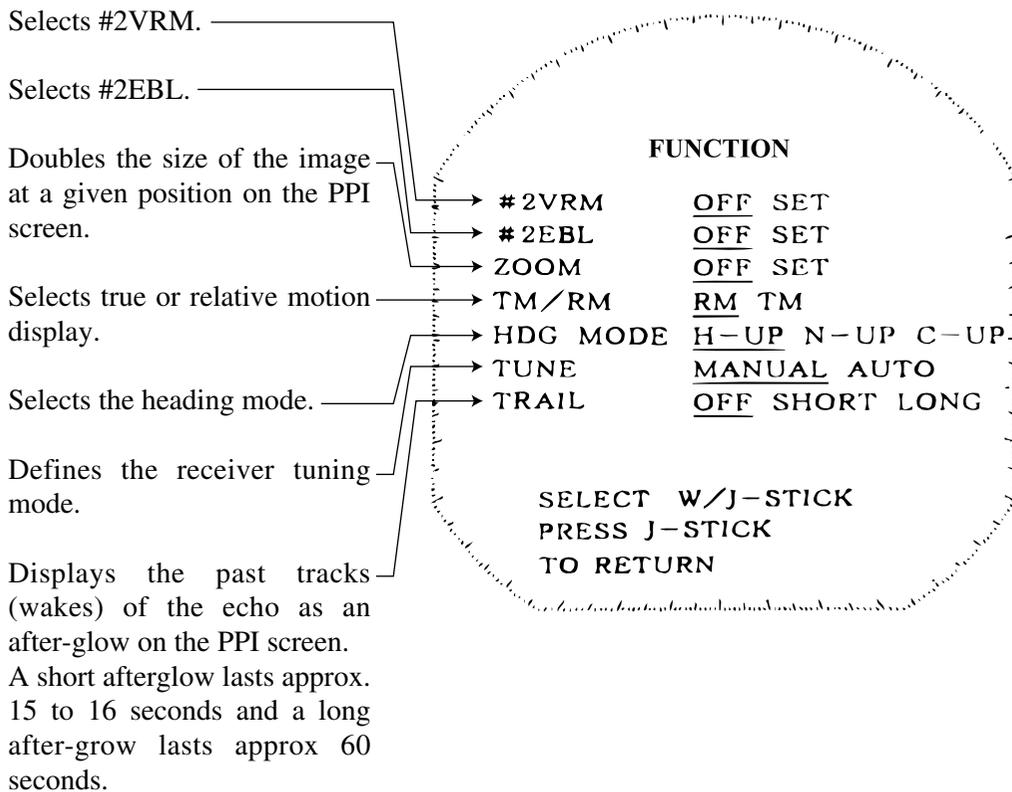


Norwegian Menus



## Menu Item Description

### FUNCTION



# DISPLAY

\* Displays the position of the own ship, or waypoint in latitude and longitude (L/L) or time difference (TD).

\* Display the waypoint on the PPI.

Selects the unit of VRM and cursor range from NM (nautical miles), KY (kiloyards), and KM (kilometers).

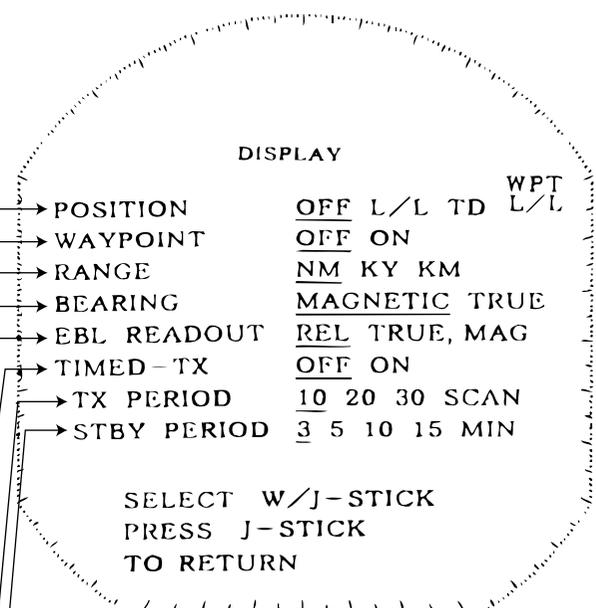
\* Selects the type of bearing information to be used.

Selects EBL bearing

Alternates between the transmission and standby (sleep) mode, for power saving.

Specifies the transmission time in terms of the rotational scans.

Specifies the standby (sleep) time.



Functions identified by an "\*" require an optional unit, or an external device.

## RADAR SET-UP

Sets the guard zone sensitivity threshold for echo.

Sets the width of the transmitter pulses.

- The narrower the pulse width, the better the range resolution is.
- The wider the pulse width, the better the sensitivity is.

Selects the language for the text displayed on the screen.

**RADAR SET-UP**

		1	2	3	<u>4</u>	5	6	7
ALM LEVEL								
TX PULSE								
(1.5NM)					<u>0.08</u>	0.35		μs
(3 NM)					<u>0.35</u>	0.7		μs
(6 NM)					0.35	<u>0.7</u>		μs
IR					<u>OFF</u>	ON		
F. EBL					<u>OFF</u>	SET		
LANGUAGE					<u>ENGLISH</u>	ESPAÑOL		
					NORSK			

SELECT W/J-STICK  
PRESS J-STICK  
TO RETURN

## INITIAL SETTING

MENU  
ENT (LONG PRESS)



Adjusts the bearing on the PPI screen.

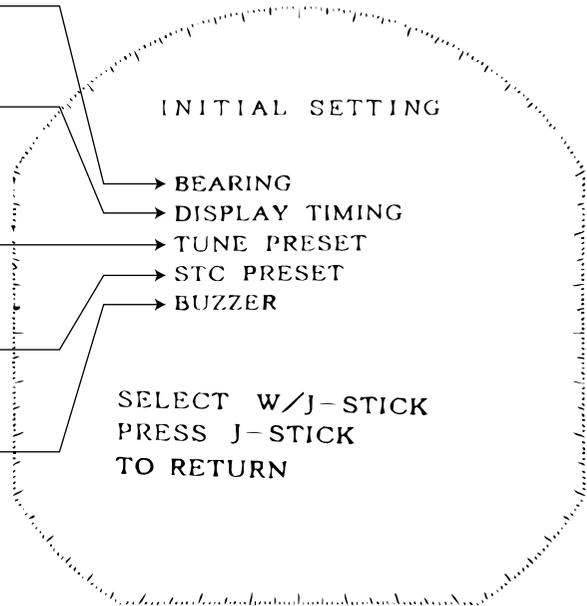
Adjusts the range of the echo image on the PPI screen and the range of the actual target.

Makes coarse tuning of the receiver.

Adjusts the intensity of the sea clutter.

Adjusts the volume of the alarm buzzer.

- The volume must normally be set to its maximum.

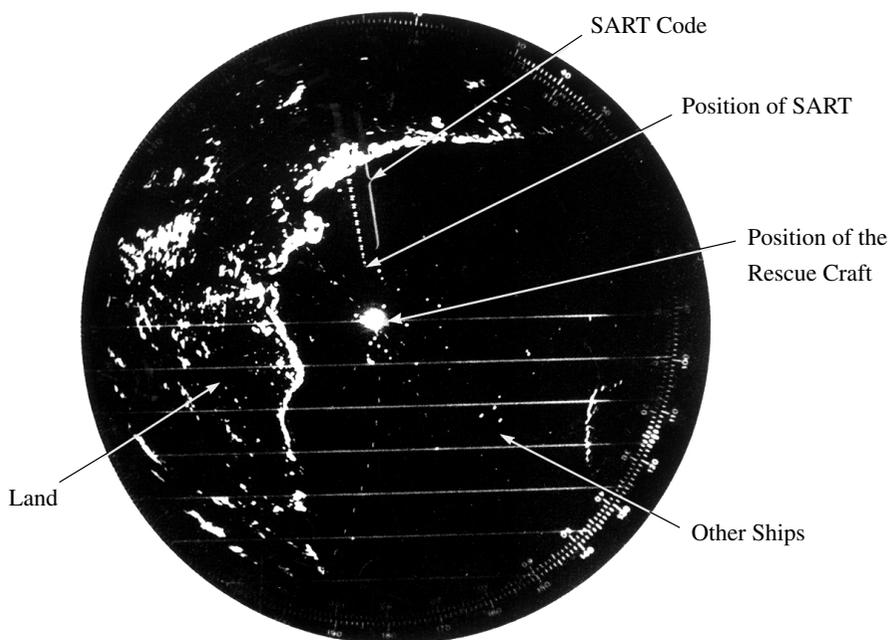


## 4.28 DISPLAY OF RADAR TRANSPONDER

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

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

- ① RANGE SCALE : Select 6 or 12 nm.
- ② STC : Set to minimum.
- ③ TUNE : DETUNED to reduce the clutter.
- ④ IR : Set IR OFF.



[EXAMPLE]

### Attention

When above settings ① to ④ are made to display SART signals, objects around the own ship will not appear on the radar screen, so perform thorough visual monitoring of the sea area around the own ship to avoid any collision or stranding.

Further, when more than one radar systems are mounted, while using a 9 GHz band radar for searching SART signals, be sure to use another radar as an ordinary radar to perform monitoring of objects around the own ship to avoid any collision, check of the position of the own ship to avoid any stranding, and so on.

Need to retune the set for normal operation on completeion.

---

# *SECTION 5*

---

## **MAINTENANCE**

The purpose of this section is to provide servicing instructions for the service technician. The RADAR 2000 is designed to provide long periods of trouble free operation. However, environmental and other factors may require this equipment to be serviced.

### **WARNING**



**This radar equipment contains high voltage. Adjustments require specialized service procedures and tools only available to qualified service technicians. There are no user serviceable parts or adjustments. The operator should never remove the radar unit cover nor attempt to service this equipment. When servicing this equipment, it is important that the technician comply with all safety precautions set forth in this manual.**

**The high voltage can cause a severe personal injury by the electric shock.**

### **5.1 PREVENTIVE MAINTENANCE**

Continuous satisfactory operation of the radar can depend on how well it is treated. The following maintenance tips can save you time and money, and will help avoid premature equipment failure.

1. Always keep the equipment as clean as possible. Remove dirt, dust, or water-spray from the display and scanner during the boat clean up. These units are “water resistant” but not “water proof”. Do not immerse.
2. During routine ship’s maintenance, inspect the radar system for the following points:
  - (1) Check all hardware for tightness.

- (2) Check for evidence of any corrosion of the scanner unit, display unit, or its cable and connectors. Clean as required.
- (3) Check that the cable connector is secure.

## **5.2 CLEANING THE SCANNER UNIT**

Wash the exterior of the scanner unit with fresh water. But do not immerse the unit. A heavy deposit of dirt or caked salt on the surface of the scanner may cause a considerable drop in the radar performance. Clean the face of the display unit with a clean, soft, lint-free cloth slightly dampened with fresh water.

## **5.3 CLEANING THE DISPLAY SCREEN**

Dust on the screen tube will reduce the glass transparency and make the video image dim. Wipe the screen surface with a soft lint-free cloth (made of flannel or cotton). A cloth moistened with an antistatic agent will not cause a problem. When using it, wipe softly; never rub the screen surface with excessive force.

---

# SECTION 6

---

## AFTER-SALES SERVICE

### ★ When asking for repair

When a system failure is suspended, read Section 3 carefully and re-check the abnormal part.

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

### ● **Repair within the warranty period**

To verify ownership and warranty registration, you should take a few minutes and fill out your warranty registration card in the front of the manual. It is very important that you take time to fill out this card.

The warranty registration card should be returned to the nearest JRC service center immediately after your purchase in order to receive full warranty benefits.

Read attached the warranty card contains important information on warranty limitations.

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

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

### ● **Items to be identified**

- ☆ Product name, model name, manufacturing date and serial number
- ☆ Failure condition (as detailed as possible: see the Radar Failure Checklist on Page 40.)
- ☆ Your company/organization name, location and telephone number

### ★ **Recommendation of maintenance inspection**

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

We recommend maintenance inspection, apart from the normal maintenance work. For maintenance inspection, consult with the dealer you purchased the product, our sales department, or your nearest branch or business office.

Note that this maintenance inspection will be charged.

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

# **RADAR FAILURE CHECKLIST**

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

Ship name: \_\_\_\_\_ Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Radar general model name: JMA-1521 Serial No.: \_\_\_\_\_

(1) Check the following items in the order of the number, and circle the applicable answer between YES or NO.

If the item cannot be determined as YES or NO, explain in detail in the item (15), Others.

(2) If any of the items (1) through (4) is marked as NO, check the fuse of the product.

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

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

No.	Check Item	Result	
(1)	Power can be turned on. (The lamp on the operation panel is lit.)	YES	NO
(2)	A few minutes after powering-on, it will become stand-by status (TX Ready).	YES	NO
(3)	When powering-on (or TX ON), the CRT displays something (CRT is lit).	YES	NO
(4)	The scanner unit rotates at the transmission (TX) ON. (Check the following items while transmission is ON.)	YES	NO
(5)	Tuning is enabled. (Check with the range of 6NM or more.)	YES	NO
(6)	Fixed marker is displayed.	YES	NO
(7)	VRM is displayed.	YES	NO
(8)	White noise is displayed while set at SEA, RAIN minimum, GAIN maximum, IR-OFF and range 24 NM.	YES	NO
(9)	Target reflection echo is displayed.	YES	NO
(10)	Sensitivity of reflection echo is normal.	YES	NO
(11)	EBL is displayed.	YES	NO
(12)	Cursor mark moves.	YES	NO
*(13)	GYRO course can be set and normally displayed.	YES	NO
*(14)	LOG speed can be normally displayed.	YES	NO

(15) Others (Error message, etc.)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

---

# *SECTION 7*

---

## **DISPOSAL**

### **7.1 EQUIPMENT DISPOSAL**

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

### **7.2 DISPOSAL OF USED BATTERY**

#### **CAUTION**



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

On this equipment, lithium battery is used for:

BT1 in the CPU control circuit (PC1) (Sanyo electric CR2032-FT6-1.)

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

For detail, consult your local distributor, our sales office or your local government.

### **7.3 DISPOSAL OF USED MAGNETRON**

The scanner unit in this radar use a magnetron (NKE-1044A).

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

For detail, ask your local distributor or our sales office.

---

# *SECTION 8*

---

## SPECIFICATIONS

### 8.1 GENERAL

1. Maximum range: 24 NM
2. Minimum range: Less than 30 m on the 0.125 NM range
3. Range scales:

Range (NM)	Number of Rings	Range ring Interval(NM)
0.125	2	0.0625
0.25	2	0.125
0.5	2	0.25
0.75	3	0.25
1.5	6	0.25
3.0	6	0.5
6.0	6	1.0
12.0	6	2.0
24.0	6	4.0
4. Range discriminations: Less than 35 m
5. Range ring accuracy: Better than  $\pm 0.9\%$  of maximum range of the scale in use, or 8 m, whichever is the greater.
6. Bearing accuracy:  $\pm 1$  degree
7. Display device: (CRT: 7" 640  $\times$  480 dots)
8. Environmental conditions:

Scanner unit	Temperature	– 15°C to + 50°C
	Humidity	Up to 95% at 35°C
Display unit	Temperature	– 10°C to + 50°C
	Humidity	Up to 95% at 35°C
9. Input power: 10.2 V to 42 V
10. Power consumption: Approx. 40 W
11. AVR: Floating AVR system

## 8.2 SCANNER UNIT

1. Dimensions:	Diameter	450 mm
	Height	227 mm
2. Mass:	Approx. 5.5 kg	
3. Polarization:	Horizontal	
4. Beam width:	Horizontal	6° nominal
	Vertical	25°
5. Sidelobes:	Less than —	21 dB
6. Rotation:	Approx. 24 rpm	
7. Transmitter frequency:	9445 ± 30 MHz	
8. Peak power output:	2 kW	
9. Pulse length/PRF:	0.08 μs/2250 Hz	
	(0.125, 0.25, 0.5, 0.75 NM)	
	0.35 μs/1500 Hz (1.5, 3, 6 NM)	
	0.7 μs/750 Hz (3, 6, 12, 24 NM)	
10. Duplexer:	T-junction with diode Limiter	
11. Mixer:	MIC frontend	
12. IF amplifier:	Center frequency	60 MHz
	Bandwidth	3/10 MHz
13. Noise figure	Less than 6 dB	
14. Characteristic	Semi-Log	

## 8.3 DISPLAY UNIT

1. Dimensions:	Width	276 mm
	Depth	250 mm
	Height	204 mm
2. Mass:	Approx. 6 kg	
3. Mounting:	Table, Overhead or Flush mount	
4. Video:	8 levels quantitized	
5. Tuning:	Auto/ Manual	
6. Bearing scale:	360° scale graduated at intervals of 1°	
7. VRM:	3 digit readout	
8. EBL:	3 digit readout	

- |                     |  |
|---------------------|--|
| 9. Alarm:           | Audible alarm with zone mark   |
| 10. Off Center:     | 2/3 radius   |
| 11. Planned TX:     | Rotation period 10, 20 or 30 scans<br>Repetition period 3, 5, 10, 15 min.  |
| 12. Language:       | English, Spanish, Norwegian  |
| 13. Features:       | VRM(2), EBL(2), Cursor with LL,<br>Interference rejection, Target expansion,<br>Target alarm, LL or TD readout, Waypoint<br>with LL, Offset, Timed TX, Target Trail,<br>Auto tune, Man Overboard, floating EBL/<br>VRM |
| 14. External input: |  |
| NAV-AID             | NMEA0183 (RMA, RMB, RMC, GLL,<br>GTD, VTG, BWC sentence)   |
| Compass             | NMEA0183 (HDM, HDT, VHW or HSC<br>sentence)  |

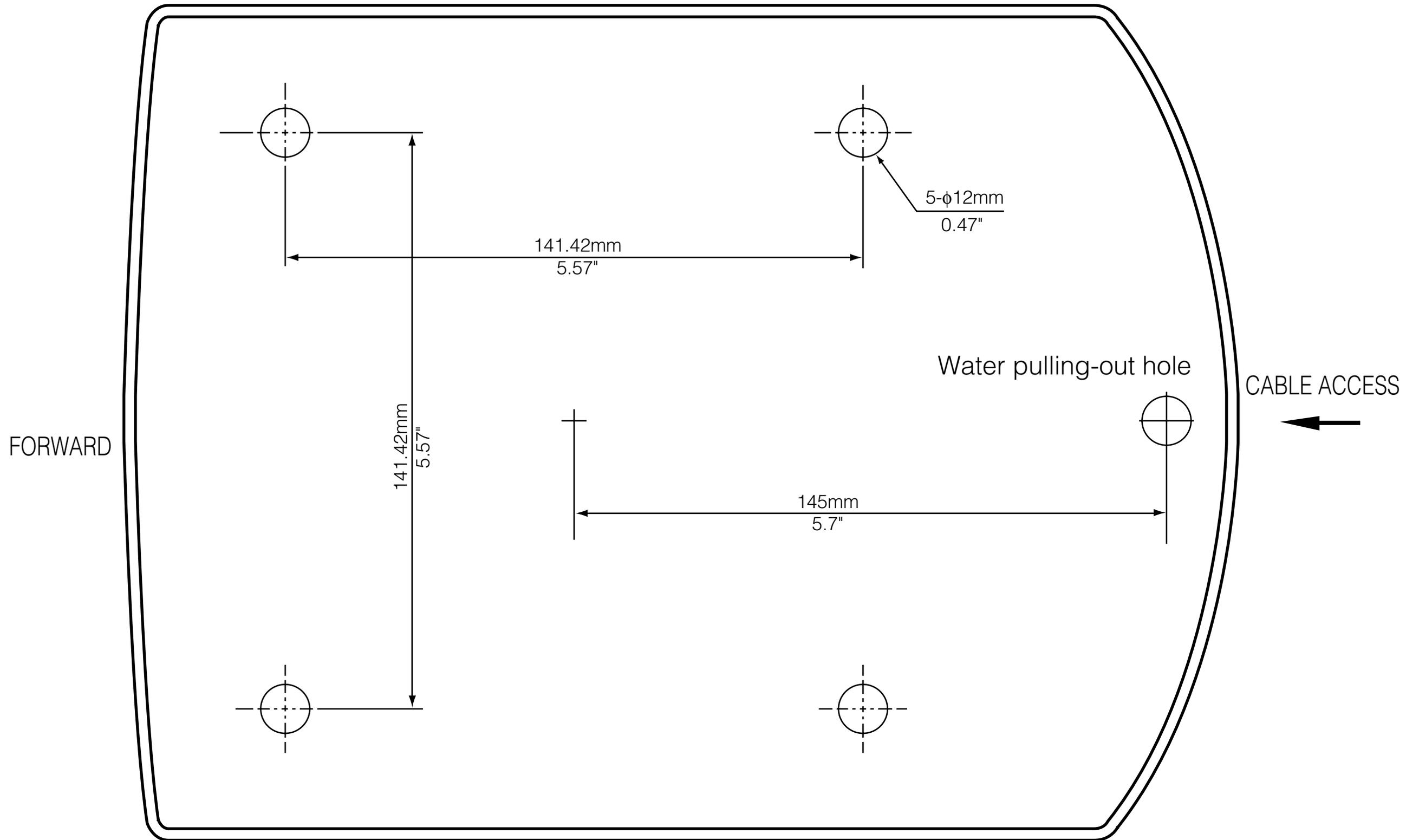


Fig.1 RADAR 2000 SCANNER UNIT (NKE-1044A) RADOME TEMPLATE

## Main Office & Plants

●Main Office  
Akasaka Twin Tower(Main)  
17-22,Akasaka 2-chome  
Minato-ku,Tokyo 107-8432 JAPAN  
Maritime Sales Department  
Phone:+81-3-3584-8833  
Fax :+81-3-3584-8757  
International Business Department  
Phone:+81-3-3584-8836  
Fax :+81-3-3584-8878  
Communications Equipment Marketing  
Department  
Phone:+81-3-3584-8845  
Fax :+81-3-3584-8879

●Mitaka Plant  
1-1,Shimorenjaku 5-chome,Mitaka  
Tokyo 181-8510 JAPAN  
Phone:+81-422-45-9111  
Fax :+81-422-45-9110

## Overseas Subsidiaries

●JRC (UK) Limited  
136, 1st Floor, Friars House,  
157/168 Blackfriars Road,  
London SE18 EZ, U.K.  
Phone:+44-20-7261-1188  
Fax :+44-20-7803-0996

## Overseas Branch Offices

●U.S.A.  
Japan Radio Co.,Ltd./Seattle Branch  
1011 SW Klickitat Way  
Bldg.B, Suite 100  
Seattle, WA 98134 U. S. A.  
Phone:+1-206-654-5644  
Fax :+1-206-654-7030

●Netherlands  
Japan Radio Co.,Ltd. Amsterdam Branch  
Cessnalaan 40-42,1119NL Schiphol-Rijk  
The NETHERLANDS  
Phone:+31-20-658-0750  
Fax :+31-20-658-0755

## Overseas Liaison & Service Offices

●U.S.A.  
Japan Radio Co.,Ltd.  
Nisshin Foods Building, Suite 208  
2125 Center Avenue, Fort Lee N. J. 07024, U. S. A.  
Phone:+1-201-242-1822  
Fax :+1-201-242-1885

●Taiwan  
Japan Radio Co.,Ltd.  
7F No.146,Sung Chiang Road  
Taipei TAIWAN,R.O.C.  
Phone:+886-2-2571-3100  
Fax :+886-2-2571-2999

●Indonesia  
Japan Radio Co.,Ltd.  
Graha Surya Internusa 7th F1. (suite 703A)  
J1. H.R. Rasuna Said Kav. X-O.  
Jakarta 12950, INDONESIA  
Phone:+62-21-527-3010  
Fax :+62-21-527-3013

●Spain  
Japan Radio Co.,Ltd.  
Calle Luis Doreste Silva, 50-1-B De Las  
Palmas De Gran Canaria SPAIN  
Phone:+34-928-290076  
Fax :+34-928-293755

●Philippines  
Japan Radio Co.,Ltd.  
2320 Taft Avenue  
Malate,Manila PHILIPPINES  
Phone:+63-2-524-8565·525-3589  
Fax :+63-2-521-5049

●Singapore  
Japan Radio Co.,Ltd.  
c/o CODAR(PTE.)LTD.  
315 Outram Road #11-06/07 Tan Boon Liat  
Building Singapore 169074 SINGAPORE  
Phone:+65-2229190  
Fax :+65-2229398

●Thailand  
Japan Radio Co.,Ltd.  
Charturong Arphon Building  
457 Phra Sumaru Street  
Bangkok 10200 THAILAND  
Phone/Fax:+66-2-280-0401

●Greece  
Japan Radio Co.,Ltd.  
57, Akti Miaouli Piraeus GREECE  
Phone:+30-1-429-3304·429-3305  
Fax :+30-1-429-3306

●India  
Japan Radio Co.,Ltd.  
Best Western Surya Hotel, Business Centre  
New Friends Colony, New Delhi 110065, INDIA  
Phone:+91-11-691-9294·691-9297  
Fax :+91-11-691-9305

●Korea  
Japan Radio Co.,Ltd.  
Room 202, Whadong Bldg. 84-18, 4-GA  
Chungang-Dong, Chung-Ku, Pusan, KOREA  
Phone:+82-51-441-0035  
Fax :+82-51-464-0695

For further information contact :



*Japan Radio Co., Ltd.*

**TOKYO MAIN OFFICE**

Akasaka Twin Tower 17-22,  
Akasaka 2-chome, Minato-ku, Tokyo,  
107-8432, JAPAN  
Phone : +81 (3) 3584-8833  
Fax : +81 (3) 3584-8757  
<http://www.jrc.co.jp/index-e.html>

**SEATTLE BRANCH OFFICE**

1011 SW Klickitat Way, Bldg. B,  
Suite 100, SEATTLE, WA98134 U.S.A.  
Phone : +1 (206) 654-5644  
Fax : +1 (206) 654-7030  
<http://www.jrcamerica.com>

**AMSTERDAM BRANCH OFFICE**

Cessnalaan 40-42 1119 NL Schiphol-Rijk  
THE NETHERLANDS  
Phone : +31- (0) 20-658-0750  
Fax : +31- (0) 20-658-0755