



## INSTRUCTION MANUAL

MARINE RADAR

**MR-1200RII**  
(Radome type)

**MR-1200TII**  
(Open array type; 4 kW)

**MR-1200TIII**  
(Open array type; 6 kW)



## SYSTEM COMPONENTS

MODEL NAME	LCD DISPLAY	SCANNER UNIT
MR-1200RII	SX-3230 (12.1-inch LCD)	EX-2714 (Radome type)
MR-1200TII		EX-2780 (Open array type; 4 kW)
MR-1200TIII		EX-2780 (Open array type; 6 kW)

## SUPPLIED ACCESSORIES

### • EX-2714 (Radome type unit)

	Qty.
① System cable (15 m) .....	1
② Installation bolts (M10×50) .....	4
③ Installation bolts (M10×25) .....	4
④ Installation nuts (M10) .....	4
⑤ Flat washers (M10) .....	4
⑥ Spring washers (M10) .....	4

### • EX-2780 (Open array type unit)

	Qty.
① System cable (20 m) .....	1
② Installation bolts (M10×40) .....	4
③ Installation nuts (M10) .....	4
④ Flat washers (M10) .....	4
⑤ Spring washers (M10) .....	4
⑥ Allen wrench .....	1
⑦ Cap bolts (M8×18 mm) .....	4
⑧ Belleville washers (8L) .....	4
⑨ Sealing washers (T) .....	4
⑩ Flat washers (M8) .....	4
⑪ Flat washers (AW) .....	4
⑫ Ferrite EMI filter .....	1

### • SX-3230 (12.1-inch LCD display unit)

	Qty.
① Front cover .....	1
② NMEA connector (PLT-167-P-R) .....	1
③ NMEA connector (PLT-168-P-R) .....	1
④ Spare fuse (FGB 15 A) .....	1
⑤ Spare fuse (FGB 5 A: for over 24 V power supply) .....	1
⑥ DC power cable .....	1
⑦ Mounting bracket .....	1
⑧ Mounting knob bolts .....	2
⑨ Installation bolts (M6×30) .....	5
⑩ Installation nuts (M6) .....	5
⑪ Spring washers (M6) .....	10
⑫ Flat washers (M6) .....	10
⑬ Instruction manual .....	1
⑭ Operating guide .....	1

The MR-1200RII/TII/TIII are supplemental aids to navigation and are not intended to be a substitute for accurate and current nautical charts.

## FOREWORD

Thank you for purchasing Icom's **MR-1200RII/TII/TIII** MARINE RADAR.

The radar is designed especially for fishing boats. It has powerful transmitting power, a 12.1-inch LCD display and many other advanced features.



If you have any questions regarding the operation of the radar, contact your nearest authorized Icom Inc. dealer.

## IMPORTANT

**READ THIS INSTRUCTION MANUAL CAREFULLY** before attempting to operate the radar.

**SAVE THIS INSTRUCTION MANUAL.** This manual contains important safety and operating instructions for the MR-1200RII/TII/TIII.

## EXPLICIT DEFINITIONS

WORD	DEFINITION
 <b>DANGER!</b>	Personal death, serious injury or an explosion may occur.
 <b>WARNING!</b>	Personal injury, fire hazard or electric shock may occur.
<b>CAUTION</b>	Equipment damage may occur.
<b>NOTE</b>	If disregarded, inconvenience only. No risk of personal injury, fire or electric shock.

## BE CAREFUL!

**SART** signals may not be detected and may not be displayed on the screen depending on the **SEA**, **RAIN** or **IR** settings.

Follow the settings as below to detect the SART signals on the screen.

- ① Select the screen range between 6 NM to 12 NM with **[+/-]**. (p. 1)
- ② Set the **[GAIN]** as high as possible. (p. 2)
- ③ Set the **[SEA]** to minimum. (p. 2)
- ④ Set the **[RAIN]** to minimum. (p. 2)
- ⑤ Turn OFF the **[IR]** function. (p. 11)
- ⑥ Turn OFF the **[STRETCH]** function. (p. 11)

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## PRECAUTIONS

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### *For Display unit:*

⚠ **WARNING! NEVER** let metal, wire or other objects touch any internal part of the display unit. This may result in an electric shock.

⚠ **WARNING! NEVER** apply AC voltage to the DC connector of the display unit. This may pose a fire hazard, result in an electric shock or damage the display unit.

⚠ **WARNING! NEVER** apply more than 42 V DC to the DC connector of the display unit. This may pose a fire hazard or damage the display unit.

⚠ **WARNING! NEVER** touch the display unit with wet hands. This may result in an electric shock or damage the display unit.

⚠ **WARNING! NEVER** open the display unit. There are no user adjustment points. This may result in an electric shock and incorrect reassembly may cause a fire hazard.

**CAUTION: NEVER** connect the display unit to a DC power source using reverse polarity. This will damage the display unit.

**CAUTION: NEVER** remove the fuse holder from the DC power cable. This will damage the display unit.

**DO NOT** place the display unit in excessively dusty environments.

**DO NOT** place the display unit near heating equipment or in direct sunlight or where hot or cold air blows directly onto it.

**DO NOT** use or place the display unit in areas with temperature below  $-15^{\circ}\text{C}$  ( $+5^{\circ}\text{F}$ ) or above  $+55^{\circ}\text{C}$  ( $+131^{\circ}\text{F}$ ).

**DO NOT** use harsh solvents such as benzine or alcohol when cleaning the display unit, as they will damage the display unit's surfaces.

**DO NOT** place the display unit in areas that will block air passage or put anything around the display unit. This will obstruct heat dissipation.

**KEEP** the display unit out of the reach of children.

**KEEP** the display unit away from heavy rain, and never immerse it in the water.

The display unit meets IPX4 requirements for splash resistance when the supplied connection cable, scanner unit are connected.

However, if it is dropped, splash resistance cannot be guaranteed because of possible damage to the case or the waterproof seals.

The LCD display may have cosmetic imperfections that appear as small dark or light spots. This is not a malfunction or defect, but a normal characteristic of LCD display.

### *For Scanner unit:*

⚠ **DANGER: HIGH VOLTAGE! NEVER** open the scanner unit. The scanner unit contains high voltage that could be fatal. And there are no user adjustment points. All repairs and adjustments **MUST** be made by a qualified electronics technician at your Marine Navigation Dealer.

### *For qualified electronics technician only:*

⚠ **DANGER: HIGH VOLTAGE!** High voltages of up to 3,500 volts are used in the scanner unit. Although prudent measures for safety have been adopted, sufficient care must be taken in the operation, maintenance and adjustment of the scanner unit.

Electric shock of 1,000 volts or more may cause electrocution and death; even an electric shock of only 100 volts may be fatal.

⚠ **DANGER: HIGH VOLTAGE!** To prevent an electric shock, turn the radar's power is OFF and do not reach inside the scanner unit until you have:

- discharged the capacitors by disconnecting the system cable from the radar unit for 5 minutes.
- checked that no electric charges remain inside the device.

Also, it is safest to wear dry insulated rubber gloves. **NEVER** use both hands simultaneously; keep one hand in your pocket.

### **⚠ WARNING: RADIATION HAZARD!**

Radiation emitted from the scanner unit can be harmful, particularly to the eyes. To avoid harmful radiation, turn the radar's power is OFF before beginning work on the scanner unit.

**DO NOT** use or place the scanner unit in areas with temperature below  $-25^{\circ}\text{C}$  ( $-13^{\circ}\text{F}$ ) or above  $+70^{\circ}\text{C}$  ( $+158^{\circ}\text{F}$ ).

**NEVER** immerse the scanner unit in the water.

The scanner units meet IPX6\* requirements for high-pressure water jet resistance.

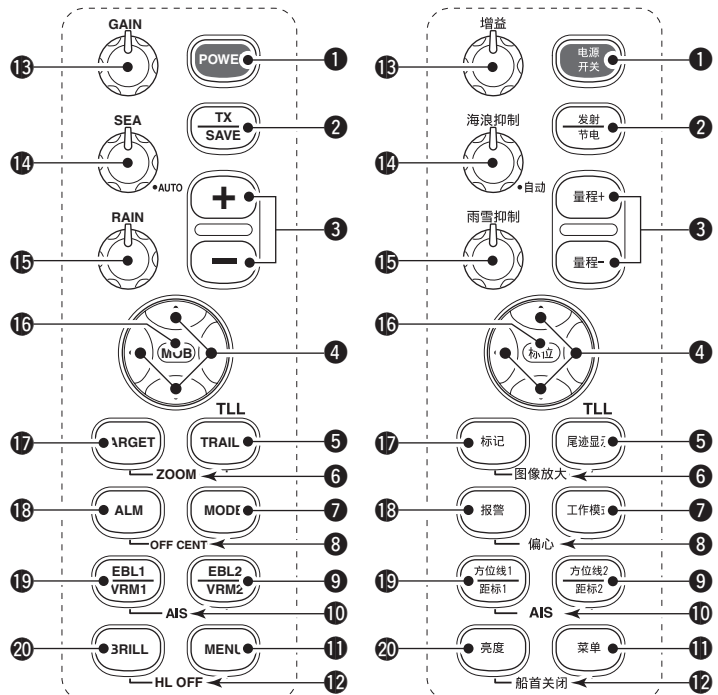
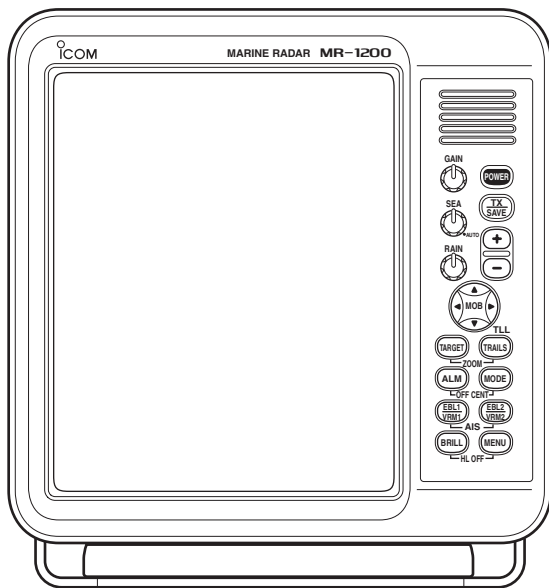
However, if these items are dropped, high-pressure water jet resistance cannot be guaranteed because of possible damage to the cases or the waterproof seals.

\* Except for the cable connectors. They meet IPX4 requirements while connecting to the radar unit.

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		• EX-2714	
		• EX-2780	

## Front panel



Control panel (English)

Control panel (Chinese)

### 1 POWER SWITCH [POWER]/[电源开关] (p. 9)

Push to turn the radar power ON or OFF.

- The standby screen appears for 90 seconds while the magnetron warms up.
- The initial screen appears and a beep sounds after the power has been turned ON.

### 2 TRANSMIT/SAVE SWITCH [TX (SAVE)]/[发射(节电)]

➔ Push to toggle between the TX mode and the standby mode. (p. 9)

➔ Hold down for 1 second to turn ON the power save function. The radar for TX interval scan is fixed at 10 revolutions. (p. 12)

- Select the save time in the INT. SETTING menu.

### 3 RANGE UP/ DOWN SWITCHES [+]/[-]/[量程+]/[量程-] (p. 9)

Push [+] to increase the screen range.

Push [-] to decrease the screen range.

### 4 UP, DOWN, LEFT, RIGHT KEYS [▲] [▼] [◀] [▶]

Set the EBLs, VRMs, alarm area, ATA target, AIS target and so on.

In the Menu screen, push [▲] or [▼] to select the menu items, and then push [◀] or [▶] to select the option or set the value.

In the normal operating mode, push a combination of the [▲]/[◀] or [▲]/[▶], or [▼]/[◀] or [▼]/[▶] to move the cross line cursor to the upper left or right, or lower left or right.

### 5 TRAILS SWITCH [TRAILS]/[尾迹显示] (p. 12)

➔ Push to toggle the trail function ON or OFF. This is useful for watching other ship's tracks, and approximate relative speed.

- Trail Time can be set in the VIDEO menu.

➔ Hold down for 1 second to output the position information where the cursor is placed, to the NMEA output terminals.

- TLL output requires bearing data and position data.

### 6 ZOOM FUNCTION [ZOOM]/[图像放大] (p. 11)

Simultaneously push [TARGET]/[标记] and [TRAILS]/[尾迹显示] to toggle the ZOOM function ON or OFF.

The ZOOM function enlarges the target to two times normal size.

- Move the cursor to the target, then turn ON the function.
- The screen zooms the middle of the screen around your own ship.
- This function is not usable in the 1/8 and the 32 NM or higher ranges.

### 7 MODE SWITCH [MODE]/[工作模式]

Push to select the Head-up (H UP), Course-up (C UP), North-up (N UP) or True motion (TM) screens.

- The North-up and Course-up screens can be selected only when a bearing data input is connected. (pp. 28, 43)
- The TM screen requires bearing data and LOG or position data. (pp. 28, 43)
- The TM screen is not selectable in the 32 NM or higher range.

**8 OFF CENTER FUNCTION [OFF CENT]/[偏心]**

(p. 10)

Simultaneously push [ALM]/[报警] and [MODE]/[工作模式] to turn the OFF CENTER function ON or OFF.

- This function is usable in the 24 NM or less ranges.

**9 EBL2 (VRM2) SWITCH [EBL2 (VRM2)]/**

[方位线2(距标2)] (pp. 15, 16)

Push to display the electronic bearing line 2 (EBL2) and the variable range marker 2 (VRM2), and activate the [◀] or [▶] for the electronic bearing line selector and [▲] or [▼] for the range marker selector.

- When VRM1 and EBL1 (49 52) are displayed, the center of VRM2 appears at the intersection point of VRM1 and EBL1.

**10 AIS OPERATING MODE SELECTION [AIS]**

(p. 24)

➔ Simultaneously push [EBL1(VRM1)]/[方位线1(距标1)] and [EBL2(VRM2)]/[方位线2(距标2)] to toggle between the AIS operating mode and the normal operating mode.

➔ Hold down [EBL1(VRM1)]/[方位线1(距标1)] and [EBL2(VRM2)]/[方位线2(距标2)] for 1 second to toggle between the AIS display ON and OFF.

**11 MENU SWITCH [MENU]/[菜单]** (pp. 5–7)

Push [MENU]/[菜单] to select the VIDEO, FUNCTION, ATA AIS, TARGET, INT. SETTING or SERVICE MAN menus. Push [▲] or [▼] to select the items and push [◀] or [▶] to change the setting.

**12 HEADING LINE OFF FUNCTION [HL OFF]/**

[船首关闭] (p. 9)

While holding down [BRILL]/[亮度] and [MENU]/[菜单], the heading line is temporarily turned OFF.

**13 GAIN CONTROL [GAIN]/[增益]** (p. 9)

Adjusts the receiver amplifier gain.

- Clockwise rotation increases the gain.
- Increased gain may increase screen noise.

**14 SEA CLUTTER CONTROL [SEA]/[海浪抑制]** (p. 10)

This function serves to eliminate echoes from waves in close range.

Reduces the receiver gain for close objects within a radius of approximately 8 nautical miles to eliminate sea clutter.

Rotate the control fully clockwise to activate the automatic SEA control function. The SEA indicator (☼) appears in the upper left of the screen.

- Under normal conditions set the SEA to minimum.
- Use this control with caution when the sea is rough.

**15 RAIN CLUTTER CONTROL [RAIN]/[雨雪抑制]** (p. 10)

This function eliminates echoes from rain, snow, fog, and so on.

Rotate the control fully counter clockwise to deactivate the RAIN function.

The RAIN indicator (☼) disappears.

**16 MAN OVERBOARD [MOB]/[标位]**

Push to mark the man overboard point on the screen. When a crew member falls overboard, hold down [MOB]/[标位] for 1 second to display the MOB symbol (☒) on the screen.

- The MOB readout shows the bearing, distance and estimated time to the MOB point at the current speed.
- Hold down [MOB]/[标位] for 1 second to cancel the function.
- Position and bearing data are necessary.

**17 TARGET SWITCH [TARGET]/[标记]** (pp. 19, 23)**○ Operating in the AIS mode**

- ➔ Push to select a target.
- ➔ Hold down for 1 second to toggle the selected target between activated or sleeping.

**○ Operating in any other mode**

- ➔ Push to select the desired ATA target data (1 to 10, or OFF).
- ➔ Hold down for 1 second to set the target as caught or released.

**18 ALARM SWITCH [ALM]/[报警]** (p. 17)

➔ Push [ALM]/[报警] to toggle the alarm function ON or OFF.

➔ Hold down [ALM]/[报警] for 1 second to enter the alarm area setting mode.

- Push [▲], [▼], [◀] or [▶] to move the cross cursor to the zone starting point, then hold down [ALM]/[报警] for 1 second. The starting ring of the zone is created. Then push [▲], [▼], [◀] or [▶] to fix the finish point, and then push [ALM]/[报警]. The desired alarm zone will automatically form.

**19 EBL1 (VRM1) SWITCH [EBL1 (VRM1)]/**

[方位线1(距标1)] (pp. 15, 16)

Push to display the electronic bearing line 1 (EBL1) and the variable range marker 1 (VRM1) and activate [◀] or [▶] for the electronic bearing line selector, and [▲] or [▼] for the range marker selector.

- EBL1 bearing and VRM1 distance are displayed in the bottom window.
- When EBL1 and VRM1 are displayed, the beginning of EBL2 appears at the intersection point of EBL1 and VRM1.

**20 DISPLAY BRILLIANCE SWITCH [BRILL]/[亮度]**

(p. 9)

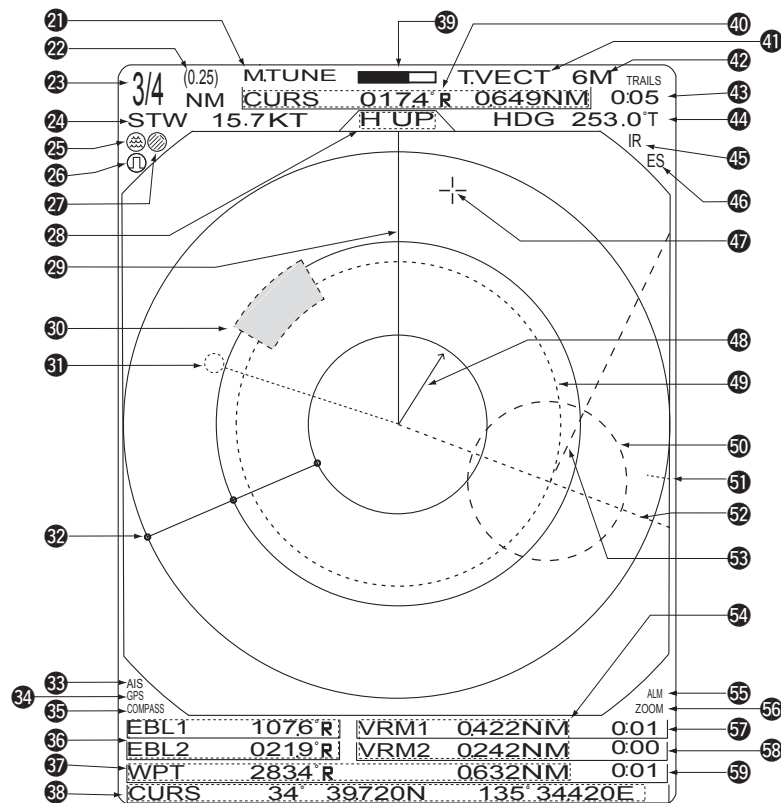
➔ Push to increase or decrease the brilliance of the picture on the display.

➔ Hold down for 1 second to select maximum brilliance.

➔ The display color changes between green and red if you continue to hold down this key after the display is set to maximum brilliance.

The brightness of the symbols, characters and illuminations can be independently adjusted in the "SYMBOL", "CHARACTER" and "KEY ILLUM" of the INT. SETTING menu.

## Screen



- 21 TUNING MODE INDICATOR** (p. 9)  
“M.TUNE” appears when the manual tuning function is in use.
- 22 FIXED RING RANGE READOUT** (p. 14)  
Shows the interval range of the fixed ring.  
• This readout appears when “RING” in the FUNCTION menu is turned ON.
- 23 SCREEN RANGE READOUT** (p. 14)  
Shows the maximum range of the displayed screen.  
• The range indicated is nautical miles (NM).
- 24 SHIP SPEED READOUT** (p. 13)  
Shows the ship speed.  
• SOG: When GPS is selected in the INT. SETTING menu.  
• STW: When LOG is selected in the INT. SETTING menu.
- 25 AUTO SEA INDICATOR** (p. 10)  
Appears when the automatic SEA control function is turned ON.
- 26 LONG PULSE INDICATOR** (p. 13)  
Appears when the long pulse is in use.
- 27 RAIN CONTROL INDICATOR** (p. 10)  
Appears when the RAIN function is in use.
- 28 MODE INDICATOR**  
Head-up, Course-up, North-up and True Motion screens are available.  
• N UP and C UP screens require external bearing data.  
• TM screen requires bearing data and LOG or position data.
- 29 HEADING LINE** (p. 9)  
The heading line indicates the ships bow direction.
- 30 ALARM ZONE** (p. 17)  
Shows the alarm zone.  
• Appears when the alarm function is in use.
- 31 WAYPOINT MARKER** (p. 13)  
Shows the waypoint received from navigation equipment.  
• This marker appears when “WPT” in the FUNCTION menu is turned ON.  
• To display the waypoint marker, bearing data and NMEA data in 0183 format is necessary. (p. 43)
- 32 FIXED RANGE RINGS** (p. 14)  
Shows the distance at fixed intervals. The interval distance is indicated by the ring range readout (23).  
• These rings appear when “RING” in the FUNCTION menu is turned ON.
- 33 AIS INDICATOR** (p. 14)  
Appears when a valid VDM sentence is input from the NMEA (AIS) port. If more than the specified AIS signals that is set in the “NUMBER OF AIS” setting of the ATA AIS menu are received, this indicator changes to a reverse display (AIS).  
The indicator disappears if the AIS signal is interrupted for 6 minutes.
- 34 GPS INDICATOR** (p. 28)  
Indicator appears when the NMEA (GPS) is connected.

**35 COMPASS/GYRO INDICATOR** (pp. 28, 43)

- GYRO: NMEA (gyro) is connected.
- COMPASS: NMEA (compass), N+1 or AUX data is connected.

**36 EBL1/ 2 READOUTS** (pp. 15, 16)

Shows the bearing of the displayed Electronic Bearing Lines (EBL1 and EBL2) when EBL is in use.

**37 WAYPOINT/MOB READOUTS** (p. 13)

- ➔ Shows the bearing and distance to the waypoint received from navigation equipment.
  - This readout appears when "WPT" in the FUNCTION menu is turned ON.
  - To display the waypoint/MOB marker, bearing data and NMEA data in 0183 format is necessary. (p. 43)
- ➔ Shows the bearing and distance to the MOB (Man Over Board) event marker.
  - Push [MOB]/[ 标位 ] to cancel the readout and the symbol.

**38 POSITION/CURSOR READOUT** (p. 13)

Shows your own ship or cursor latitude and longitude readout when external NMEA data in 0183 format is connected.

- Select 'SHIP' or 'CURS' in the "POSN DISP" item of the FUNCTION menu.
- To display the POSITION, NMEA 0183 is necessary.
- To display the CURSOR, NMEA 0183 and bearing data are necessary.

**39 TUNING LEVEL INDICATOR** (p. 9)

Shows the receiver tuning level.

**40 CURSOR INDICATOR**

Shows the bearing and distance to the cursor.

- R: Relative bearing, T: True Bearing, M: Magnetic bearing

**41 VECTOR INDICATOR** (p. 19)

Shows the ATA, AIS and OWN vector type.

- T: True vector, R: Relative vector

**42 VECTOR TIME INDICATOR** (p. 19)

Shows the vector time. Select vector time in "VECT TIME" of the TARGET menu.

**43 TRAILS INDICATOR** (p. 12)

Shows the trail time.

- The echo remains, with gradation, during the trail time period on the screen. (Except for the trail time; ∞)
- Progressing time counter starts counting until the timer reaches the trail time.

**44 HEADING INDICATOR**

Shows the heading bearing readout.

- HDG: When "BRG INPUT" in the INT. SETTING menu is selected "NMEA," "N+1" or "AUX."
- COG: When "BRG INPUT" in the INT. SETTING menu is selected "GPS."
- The HDG readout indicates the bow of the ship's bearing in a clockwise direction from north.
- R: Relative bearing, T: True Bearing, M: Magnetic bearing

**45 IR INDICATOR** (p. 11)

Eliminates or reduces interference caused by other radar operating nearby.

- This indicator appears when "IR" in the VIDEO menu is set to 1 or 2.

**46 ECHO STRETCH INDICATOR** (p. 11)

Appears when the echo stretch function is in use.

- This indicator appears when "STRETCH" in the VIDEO menu is turned ON.

**47 CROSS LINE CURSOR**

Used to measure the bearing and distance, setting the alarm zone, selecting the ATA/AIS targets, and so on.

- Push [▲], [▼], [◀] or [▶] one or more times to move the cursor.

**48 OWN SHIP VECTOR INDICATOR**

Shows the vector of your own ship.

**49 VRM 1** (pp. 15, 16)

**50 VRM 2** (pp. 15, 16)

Used to measure distance. When a target is selected, the VRM1/2 readout (54) shows its distance.

**51 NORTH MARK**

The north mark shows the true north direction.

**52 EBL1** (pp. 15, 16)

**53 EBL2** (pp. 15, 16)

Used to measure bearing. When a target is selected, the EBL readout (36) shows its bearing.

**54 VRM1/2 READOUTS** (pp. 15, 16)

Shows the distance of the displayed Variable Range Markers (VRM1 and VRM2) when the VRM is in use.

- Nautical miles (NM) or kilometers (KM) can be selected in the FUNCTION menu as the distance unit.

**55 ALARM INDICATOR** (p. 17)

Appears when the alarm function is in use.

**56 ZOOM INDICATOR** (p. 11)

Appears when the zoom function is in use.

- Push [TARGET]/[ 标记 ] and [TRAILS]/[ 尾迹显示 ] simultaneously to turn the function ON or OFF.

**57 TIME INDICATOR**

**58 TIME INDICATOR**

Shows the estimated time to the marker edge from the center of the marker, at the current speed.

**59 TIME INDICATOR**

Shows the estimated time to the waypoint at the current speed.

The SERVICE MAN MENU is described in 'Section 10 SERVICE MAN MENU.' Please see Section 10 for details.

## VIDEO MENU

VIDEO MENU				
<b>TUNE</b>	<b>AUTO</b>	<b>MANUAL</b>		
D.RANGE	<b>NAR.</b>	MID.	<b>WIDE</b>	
IR	OFF	1	<b>2</b>	
STRETCH	<b>OFF</b>	ON		
PULSE	SP	<b>LP</b>		
SEA	1	<b>2</b>	3	4
TRAIL TIME	6S	15S	30S	1M
	3M	<b>6M</b>	15M	∞

### ◇ TUNE

- **AUTO:** Automatic tuning.
  - "A.TUNE" appears for approximately 2 seconds, instead of the screen display, when first transmitting after turning ON the power. The unit also retunes in some cases.
- **MANUAL:** Manual tuning.
  - 1 Push [▶] to select [MANUAL], then push [▼] to activate the manual tuning slider.
  - 2 Push [◀] or [▶] to adjust the desired tuning level.

### ◇ D.RANGE

Select the dynamic range of the PPI (Plan Position Indicator).

- **NAR.:** Narrow dynamic range. Even weak reflections are displayed as strong reflections.
- **MID.:** Mid dynamic range.
- **WIDE:** Wide dynamic range. You can easily distinguish between weak reflections and strong reflections.

### ◇ IR

- **OFF:** Turn OFF the Interference Reduction function.
- **1 or 2 (ON):** Turn ON the Interference Reduction function 1 (Low) or 2 (High). "IR" appears on the screen.

### ◇ STRETCH

- **OFF:** Turn OFF the echo stretch function.
- **ON:** Turn ON the echo stretch function. "ES" appears on the screen.

### ◇ PULSE

- **SP:** Select the pulse width to short.
- **LP:** Select the pulse width to long. "LP" appears on the screen.

### ◇ SEA

- The SEA knob can be used to fine tune the sea clutter of the display after one of our main levels are selected based on the height of the antenna and sea conditions.

### ◇ TRAIL TIME

- 6S, 15S, 30S, 1M, 3M, 6M, 15M or ∞:  
Select the trail time.

## FUNCTION MENU

FUNCTION MENU		
<b>RING</b>	<b>OFF</b>	<b>ON</b>
WPT	<b>OFF</b>	ON
POSN DISP	<b>SHIP</b>	CURS
DIST UNIT	<b>NM</b>	KM
BRG	<b>TRUE</b>	MAG
DIRECTION	TRUE	<b>360°R</b> PT/SB
ZONE ALARM	<b>IN</b>	OUT
BEEP	<b>OFF</b>	ON
OWN VECT	<b>OFF</b>	ON

### ◇ RING

- **OFF:** Turn OFF the fixed range ring display.
- **ON:** Turn ON the fixed range ring display.

### ◇ WPT

- **OFF:** Do not display the waypoint on the screen.
- **ON:** Display the waypoint on the screen. Waypoint, bearing and position data are required.

### ◇ POSN DISP

- **SHIP:** Display your own ship's position.\*1
- **CURS:** Display the cursor position.\*2

\*1 External latitude/longitude data required.

\*2 External latitude/longitude data and bearing data required.

### ◇ DIST UNIT

- **NM:** Display the distance unit in Nautical Miles.
- **KM:** Display the distance unit in Kilometers.

### ◇ BRG

Select the displayed bearing type, no relation with the bearing data format (NMEA, N+1, AUX or GPS).

- **TRUE:** Select the true North bearing.
- **MAG:** Select the magnetic North bearing.

### ◇ DIRECTION (except HDG and CSE) (p. 15)

- **TRUE:** True or magnetic direction.
- **360°R:** Relative direction
- **PT/SB:** Bow direction

### ◇ ZONE ALARM

- **IN:** An alarm sounds when the target comes into the zone.
- **OUT:** An alarm sounds when the target goes out of the zone.

### ◇ BEEP

- **OFF:** Turn OFF\* the beep tone.
- **ON:** Turn ON the beep tone.

\* Except for the alarm function.

### ◇ OWN VECT

- **OFF:** Do not display your own ship's vector.
- **ON:** Display your own ship's vector. Bearing data, position data and ship speed are required.

## ■ ATA AIS MENU

ATA AIS MENU			
ATA	OFF	ON	
ATA No.DISP	OFF	SEL	ALL
ATA ALARM	OFF	ON	
AIS DISPLAY	OFF	ON	
AIS ALARM	OFF	ON	
AIS RANGE	8.0NM		
AUTO ACTIVATE	1.0NM		
NUMBER OF AIS	100		
SLOW WARN	0.1KT		
LOST AIS TRGT	ERASE		

### ◇ ATA (Automatic Tracking Aid)

- OFF: Turn OFF the ATA function.
- ON: Turn ON the ATA function.

### ◇ ATA No. DISP

Select the target identification number type that appears at the right side of the mark.

- OFF: Do not display any mark number.
- SEL: Display only the selected mark number.
- ALL: Display all mark numbers.

### ◇ ATA ALARM\*

- OFF: Turn OFF the ATA alarm function.
- ON: Turn ON the ATA alarm function.

### ◇ AIS DISPLAY

- OFF: Turn OFF the AIS display.
- ON: Turn ON the AIS display.

### ◇ AIS ALARM\*

- OFF: Turn OFF the AIS alarm function.
- ON: Turn ON the AIS alarm function.

\*An ATA alarm or AIS alarm sounds when the CPA and TCPA reach the limit.

### ◇ AIS RANGE

Set the AIS display range to between 0.1 and 36.0 NM or ∞.

- 0.1 to 36.0NM: Select the range from your vessel.
- ∞: The received AIS information are displayed up to the "NUMBER OF AIS" setting.

### ◇ AUTO ACTIVATE

Set the distance to automatically turn the sleeping AIS target into an activated target.

- OFF: Turn OFF the Auto Activate function.
- 0.1 to 9.9NM: Select the distance from your vessel.

### ◇ NUMBER OF AIS

Select the maximum number of AIS targets that can be displayed on the screen to between 10 and 100 in 10 digit steps.

### ◇ SLOW WARN

The AIS unit calculated COG (Course Over Ground) data of a vessel that is at anchor or drifting is unreliable, and therefore the CPA (Closest Point of Approach) and TCPA (Time to CPA) data may not be correctly calculated. If a vessel is anchored in your alarm zone, the unreliable data can cause the collision alarm to sound many times, even if there is no real danger. To prevent this, when the anchored vessel's SOG (Speed Over Ground) is less than this set value, the Slow Warn function assumes that vessel's COG is fixed towards your vessel and an alarm will sound.

- OFF: Turn OFF the Slow Warn function.
- 0.1 to 4.9KT: Select the vessel's speed.

### ◇ LOST AIS TRGT

Erase all of the Lost targets.

Push [▶] to display the confirmation "SURE?," then push [▶] again to clear all of the Lost targets on the screen.

**About "Lost Target":** A vessel is regarded as a "Lost target" after a specified period of time has passed since the vessel last transmitted data, as described below.

The "Lost target" icon disappears from the screen 6 minutes and 40 seconds after the vessel was regarded as a "Lost target."

### The criteria to become a Lost target:

Vessel type			Except Class B	Class B
1	Except Class B	Vessel is at anchor, moored and moving less than 3 knots	18 min.	—
	Class B	Vessel is moving less than 2 knots	—	18 min.
2		Vessel is at anchor, moored and moving more than 3 knots	1 min.	N/A
3	Except Class B	Vessel is moving between 0 and 14 knots	1 min.	—
	Class B	Vessel is moving between 2 and 14 knots	—	3 min.
4		Vessel is moving between 0 and 14 knots while changing course	1 min.	N/A
5		Vessel is moving between 14 and 23 knots	36 sec.	90 sec.
6		Vessel is moving between 14 and 23 knots while changing course	36 sec.	N/A
7		Vessel is moving more than 23 knots	12 sec.	30 sec.
8		Vessel is moving more than 23 knots while changing course	12 sec.	N/A

## TARGET MENU

TARGET MENU		
<b>VECT MODE</b>	<b>TRUE</b>	REL
VECT TIME	6M	
CPA LIMIT	1.0NM	
TCPA LIMIT	1 M	
TARGET TRACK	1 M	

### ◇ VECT MODE

- **TRUE:** Select the true vector mode.
- **REL:** Select the relative vector mode.

### ◇ VECT TIME

Set the vector length (time) to 15 seconds, 30 seconds or 1 to 15 minutes.

### ◇ CPA\* LIMIT

- 0.1 to 10.0NM: Set the CPA (Closest Point of Approach) limit by pushing [◀] or [▶].

### ◇ TCPA\* LIMIT

- 1 to 60M: Set the TCPA (Time to CPA) limit time by pushing [◀] or [▶].

\*CPA/TCPA: Closest Point of Approach and Time to Closest Point of Approach limits are set to give a warning when a target or targets enter those limits around your own ship.

### ◇ TARGET TRACK

The track data is updated at this specified tracking interval. Select the track interval time between OFF, 15 seconds, 30 seconds and 1 to 15 minutes.

After 5 dots are displayed, the oldest dot disappears at the time when the next dot appears.

## INT. SETTING MENU

INT. SETTING				
<b>MAG VAR</b>	<b>AUTO</b>	MANUAL	0.0° W	
BRG INPUT	NMEA	N+1	AUX	<b>GPS</b>
SPD INPUT	<b>GPS</b>		LOG	
TX INH START		0°		
TX INH ANGLE		0°		
SAVE TIME	1M	<b>6M</b>	15M	30M
SYMBOL	1	<b>2</b>	3	BRILL
CHARACTER	1	<b>2</b>	3	
KEY ILLUM	1	2	3	

### ◇ MAG VAR

- **AUTO:** Automatically revise magnetic variations.  
**NOTE:** NMEA data is required. **NEVER** select "AUTO" without NMEA data; incorrect variation data may entered. (p. 43)
- **MANUAL:** Manually revise magnetic variation.  
① Push [▶] to select [MANUAL], then push [▼].  
② Push [◀] or [▶] to set the revised value.

### ◇ BRG INPUT

- **NMEA:** NMEA0183 bearing data format.
- **N+1:** N+1 data format.
- **AUX:** Other format.
- **GPS:** Reads NMEA0183 COG format data as HDG format. (The course may not match with other HDG format and includes error.)

### ◇ SPD INPUT

- **GPS:** Use the GPS NMEA speed data.
  - **LOG:** Use the speed sensor data.
- When "BRG INPUT" in the INT. SETTING menu is selected "GPS," selectable option is only "GPS."

### ◇ TX INH START

- 0 to 359°: Push [◀] or [▶] to enter the start point of the TX inhibit area.

### ◇ TX INH ANGLE

- 0 to 90°: Push [◀] or [▶] to enter the TX inhibit area.

### ◇ SAVE TIME

- 1M, 6M, 15M or 30M:  
Select the standby time during the save mode.  
• The radar for TX interval scan is fixed at 10 revolutions.

### ◇ SYMBOL

- 1/2/3: Select the symbol brightness. (Includes AIS icons.)

### ◇ CHARACTER

- 1/2/3: Select the character brightness.

### ◇ KEY ILLUM

- 1/2/3/4: Select the key illumination brightness.

## ■ Checking the installation

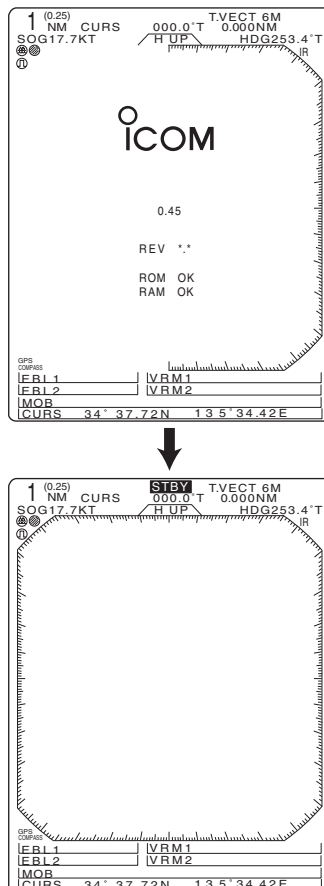
Before turning ON the power, be sure all the connections are complete. The checklist at right may be helpful for necessary confirmation.

**CAUTION:** Connect the scanner unit before turning ON the power. Otherwise the magnetron inside the scanner unit might be damaged.

### ◇ Checklist

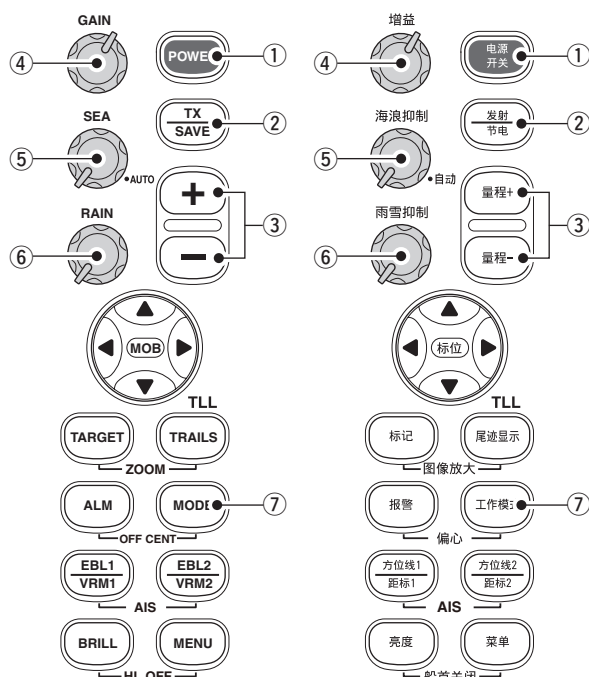
- ① The four bolts securing the scanner unit must be firmly tightened.
- ② Cabling must be securely attached to a mast or mounting material, and must not interfere with the rigging.
- ③ Be sure waterproofing procedures are completed on the system cable.
- ④ The power connections to the battery must be of the correct polarity.
- ⑤ Be sure that the plugs at the rear of the display unit have been connected correctly and securely.  
(See page 28 for details.)

## ■ Turning power ON/OFF



- ① Push [POWER]/[电源开关] to turn ON the power.
  - The initial screen appears and the magnetron warm up time is counted down on the screen.
  - The magnetron inside the scanner unit warms up for 90 seconds.
  - [POWER]/[电源开关] is disabled for 2 seconds after the power is turned OFF.
- ② When the countdown is completed, the Standby screen appears.
- ③ Push [TX]/[发射(节电)] to start scanning and select the Plan Position Indicator (PPI) screen.
  - Targets and heading markers appear.
  - The screen appears approximately 2 seconds after turning ON the power, when 'AUTO' is selected in the "TUNE" item of the VIDEO menu.
- ④ Push [POWER]/[电源开关] to turn OFF the power.

## Basic operation



**CAUTION:** When setting the [SEA]/[海浪抑制] control to a fully clockwise position, close targets are blanked.

- ① Turn ON the power.
- ② Push [TX]/[发射(节电)] after the countdown disappears from the screen.
  - See “Turning power ON/OFF” on page 8.
- ③ Push [+]/[量程+] or [-]/[量程-] one or more times to select the display range.
  - The screen range readout shows the maximum range of the screen.
- ④ Rotate [GAIN]/[增益] to the 1 o'clock position.
  - Clockwise rotation increases the gain.
  - Increased gain may increase screen noise.
- ⑤ Rotate [SEA]/[海浪抑制] to set the sensitivity time control to minimum.
- ⑥ Rotate [RAIN]/[雨雪抑制] to set the rain clutter control to minimum.
- ⑦ Push [MODE]/[工作模式] to select either the Head-up; H UP, Course-up; C UP, North-up; N UP or True Motion; TM screen.
  - C UP, N UP or TM can be selected only when bearing, position or speed data is provided. (See page 43 for details)

**NOTE:** Manual adjustment can be used. (See below.)

### ◇ Heading marker

The heading marker is a line that shows your ship's bow direction. (This marker will appear in the center of the screen when the Head-up screen H UP is selected.) The heading marker can be hidden when the desired target is located under the heading marker.

- ➡ Simultaneously hold down [BRILL]/[亮度] and [MENU]/[菜单] to hide the heading marker.

### ◇ Fixed range rings

The fixed range rings can be used for rough distance measurements. (p. 14)

- ➡ Push [MENU]/[菜单] to open the FUNCTION menu, then push [▼] to select RING. Push [▶] to turn ON the ring.

### ◇ Manual tuning

The receiver tuning can be manually adjusted.

- ➡ Push [MENU]/[菜单] to open the VIDEO menu, then select MANUAL. Push [▼] to activate the manual tuning slider, then push [◀] or [▶] to set the tuning level indicator to the maximum level. (p. 5)
  - “M.TUNE” appears at the top of the display.

### ◇ Brilliance adjustment

The intensity of the screen can be adjusted. When you require continuous operation, but not constant viewing, a lower setting can increase the life of the LCD display.

- ➡ Push [BRILL]/[亮度] to increase or decrease the brilliance of the picture on the display.
- ➡ Hold down [BRILL]/[亮度] for 1 second to select maximum brilliance.

**NOTE:** High intensity will shorten the life of the LCD display.

### • Display color

Two display colors can be selected between green and red.

- ➡ The display color changes between green and red if you continue to hold down [BRILL]/[亮度] after the display is set to maximum brilliance.

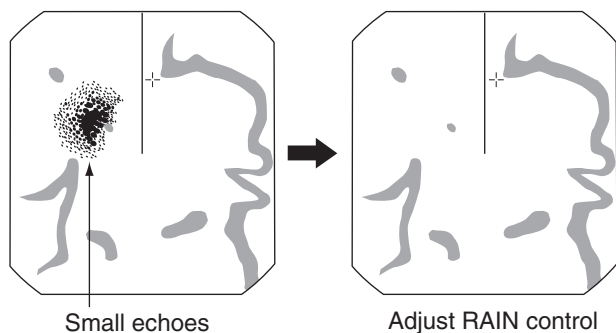
### • Key illumination

The backlighting of the keys can be adjusted for convenient operation. (p. 7)

- ➡ Push [MENU]/[菜单] one or more times to select the INT. SETTING menu. Push [◀] or [▶] to select the illumination level.
  - Key illumination corresponds with [BRILL]/[亮度] control.

The following are typical basic operation examples, which may hinder radar reception (sea clutter, precipitation interference and echoes from other radar).

## ■ RAIN function

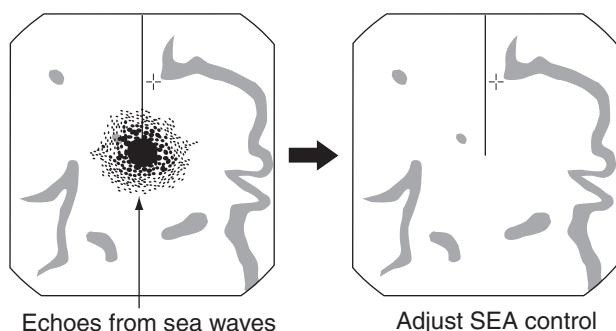


This function eliminates echoes from rain, snow, fog etc.

- Rotate the control fully counterclockwise to deactivate the control function. The RAIN indicator (☉) disappears.

• **NOTE: DO NOT** reduce the echoes too much, otherwise you may miss weaker targets.

## ■ SEA function

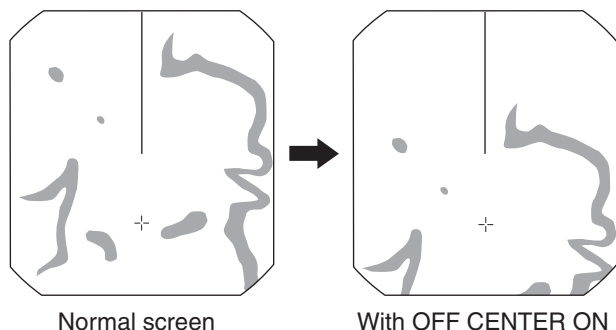


This function serves to eliminate echoes from waves at close range. Reduce the receiver gain for close objects within a radius of 8 NM to eliminate sea clutter.

- Rotate the control fully clockwise to activate the automatic control function. SEA indicator (☉) appears in the upper left corner of the screen.

**WARNING:** The [SEA]/[海浪抑制] control reduces the receiver sensitivity of objects within 8 NM. Therefore, caution and careful adjustment are necessary when using the [SEA]/[海浪抑制] control. Small objects may not be displayed on the screen when strong echoes from rain or islands within 1 NM while the automatic SEA function is activated.

## ■ OFF CENTER function

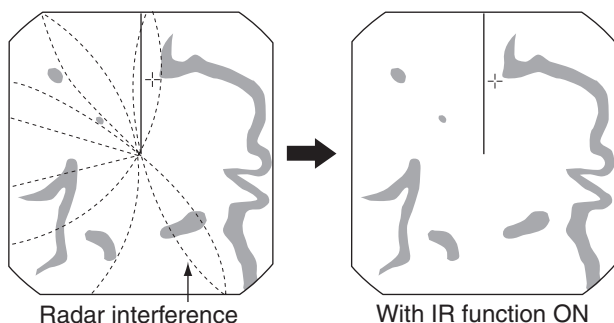


The scanning area can be shifted in a desired direction and can be partially enlarged. This is useful when Head-up\* screen is selected, and you want to enlarge the bow direction display, or the center of the screen shifts in the direction of the intersection.

- This function is selectable in 24 NM or shorter ranges.
- \*This function is not selectable in the TM screen.

- ① Push [▲], [▼], [◀] or [▶] to move the cursor where you want to shift the center of the screen.
  - Maximum offset is up to 75% of the screen.
- ② Push [ALM]/[报警] and [MODE]/[工作模式] simultaneously to shift the screen.
- ③ Push [ALM]/[报警] and [MODE]/[工作模式] simultaneously again to return to the normal screen.

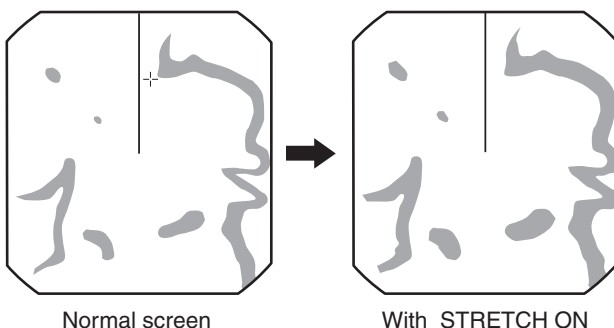
## ■ IR function



Radar interference may appear when another ship's radar is operating on the same frequency band in close proximity. The IR function can eliminate this type of interference. (p. 5)

- ① Push [MENU]/[菜单] to call up VIDEO menu.
- ② Push [▼] to select "IR."
- ③ Push [◀] or [▶] to select IR function 1, 2 or OFF.
  - "IR" appears in the upper right of the screen, when the function is activated.

## ■ STRETCH function

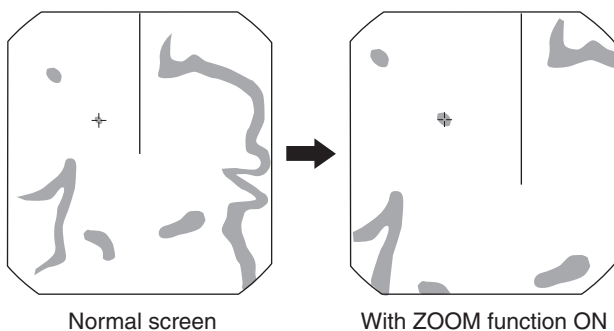


The blips can be magnified electronically for easier viewing of small targets. (p. 5)

- ① Push [MENU]/[菜单] one or more times to select the VIDEO menu.
- ② Push [▼] to select "STRETCH", then push [▶] to turn ON the function.
  - "ES" appears in the upper right of the screen, when the function is activated.

**NOTE:** Turn OFF this function during normal operation.

## ■ ZOOM function

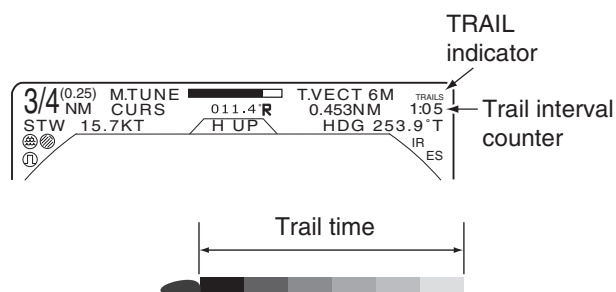


The ZOOM function expands the target to two times normal size.

- This function is selectable up to a 24 NM range or shorter except 1/8 NM.
- ① Push [▲], [▼], [◀] or [▶] to move the cursor to the desired target.
  - ② Push [TARGET]/[标记] and [TRAILS]/[尾迹显示] simultaneously to toggle the ZOOM function between ON and OFF.
    - "ZOOM" appears in the lower right of the screen.

## ■ TRAILS function

The trails function memorizes echoes continuously or at constant intervals. This is useful for watching other ships' tracks, approximately relative speed, etc.



### • Setting the trail interval time

- ① Push [MENU]/[菜单] one or more times to select the VIDEO menu.
  - Push [▼] one or more times to select "TRAIL TIME."
- ② Push [◀] or [▶] to select trail interval time.
  - 6 seconds, 15 seconds, 30 seconds, 1 minute, 3 minutes, 6 minutes, 15 minutes and ∞ (continuous) are selectable.
- ③ Push [MENU]/[菜单] one or more times to exit the menu.

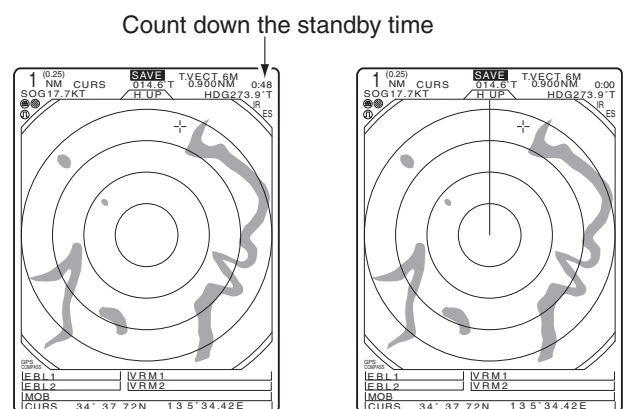
### • Using the TRAILS function

- ① Push [TRAILS]/[尾迹显示] to turn ON the trail function.
  - "TRAILS" and trail interval time appears in the upper right of the screen.
  - Trail interval counter starts to count up to the trail time.
- ② All displayed echoes at the plotted time are memorized and displayed with a graduated intensity together with the current echoes.
  - Echoes are displayed with minimum intensity when "∞" is selected.
- ③ Push [TRAILS]/[尾迹显示] to cancel the trail function and erase the plotted echoes.
  - "TRAILS" and trail interval time disappears.

## ■ Power save function

The power save function conserves the boat's battery power by pausing the transmission. The standby (pausing) times are selectable (rotation number is fixed to 10).

For example, when 1 minute is selected, the scanner rotates 10 revolutions; then stops for 1 minute, and then repeats this sequence while the power save function is activated.



Hold down [TX] for 1 second to turn ON the SAVE function.

Scan and STBY alternates

### ◇ Setting the scanning standby time

- ① Push [MENU]/[菜单] one or more times to select the INT. SETTING menu.
- ② Push [▼] one or more times to select "SAVE TIME."
- ③ Push [◀] or [▶] to select standby time.
  - 1, 6, 15, and 30 minutes are selectable.
- ④ Push [MENU]/[菜单] one or more times to exit the menu.

### ◇ Using the power save function

- ① Hold down [TX (SAVE)]/[发射(节电)] for 1 second to turn ON the power save function.
  - The save indicator appears in the top of the screen.
- ② After the scanning rotations are finished, transmission and rotation are suspended until the selected standby time elapses.
  - The display shows the last scanned echoes until the scanning restarts.
  - "SAVE" and standby time appear in the top of the screen and the standby time is counted down.
- ③ After the selected standby time elapses, transmission and rotation restart.
- ④ Push [TX (SAVE)]/[发射(节电)] to cancel the power save function.
  - The save indicator turns OFF.

**NOTE:** When you use the power save function together with the alarm function, the LCD display is turned OFF until an object enters the programmed alarm zone, therefore, more power saving is possible. (p. 17)

### ■ Ship speed indication

When the ship speed data in NMEA 0183 format is applied, the radar can display the ship speed. Knots (KT) or kilometers/hour (KM/h) are automatically selected in the normal screen (p. 3) by selecting nautical miles (NM) or kilometers (KM) respectively.

- ① Push [MENU]/[菜单] one or more times to select the FUNCTION menu.
- ② Push [▼] one or more times to select "DIST UNIT."
- ③ Push [◀] or [▶] to select the ship speed indication to NM or KM.
- ④ Push [MENU]/[菜单] one or more times to exit the menu.

### ■ Position indication

When latitude/longitude data in NMEA 0183 format is applied, the radar can display the latitude and longitude of your ship's or cursor position in the bottom of the display. (To display the CURSOR position, bearing data is necessary.) (p. 43)

- ① Push [MENU]/[菜单] one or more times to select the FUNCTION menu.
- ② Push [▼] one or more times to select "POSN DISP."
- ③ Push [◀] or [▶] to select the ship position or cursor position.
- ④ Push [MENU] one or more times to exit the menu.

### ■ Waypoint indication

When waypoint data received from navigation equipment in NMEA 0183 format is applied, the radar can display the waypoint. To display the waypoint marker, bearing data is necessary. (p. 43)

- ① Push [MENU]/[菜单] one or more times to select the FUNCTION menu.
- ② Push [▼] one or more times to select "WPT."
- ③ Push [◀] or [▶] to turn the waypoint icon ON or OFF.
- ④ Push [MENU]/[菜单] one or more times to exit the menu.

### ■ Long pulse function

To magnify the blips for easier viewing of small targets, the long pulse and echo stretch (p. 11) functions are usable. When the long pulse is used in the  $\frac{3}{4}$  to 3 NM range, this function magnifies target echoes to the backward direction of the target.

#### • Pulse selection

- ① Push [MENU]/[菜单] one or more times to select the VIDEO menu. (p. 5)
- ② Push [▼] one or more times to select "PULSE."
- ③ Push [◀] or [▶] to select SP (Short Pulse) or LP (Long Pulse).
  - When "LP" is selected, "Ⓛ" appears in the upper left of the screen.
- ④ Push [MENU]/[菜单] one or more times to exit the menu.

**NOTE:** To select SP (Short Pulse) increases the target distance resolution. (p. 27)

### ■ Bearing setting

The radar bearing interface accepts NMEA, N+1, AUX or COG data format and the bearing can use a magnetic or true north type. When a true north type bearing is used, the variation from magnetic north, etc., can be adjusted on 0.1° steps.

#### ◇ Setting the bearing type

- ① Push [MENU]/[菜单] one or more times to select the FUNCTION menu.
- ② Push [▼] one or more times to select "BRG."
- ③ Push [◀] or [▶] to select magnetic or true north type.
  - All displayed bearing readouts show the selected bearing type.

#### ◇ Setting the magnetic variation

- ① Push [MENU]/[菜单] one or more times to select the INT. SETTING menu.
- ② Push [▼] one or more times to select "MAG VAR."
- ③ Push [◀] or [▶] to select an AUTO\* or MANUAL variation.
- ④ When a MANUAL variation is selected, push [▼], then push [◀] or [▶] to set the bearing variation.
- ⑤ Push [MENU]/[菜单] one or more times to exit the menu.

\***NOTE:** NMEA data is required for auto variation. **NEVER** select "AUTO" variation without NMEA data, incorrect variation data may entered.

## Distance measurement

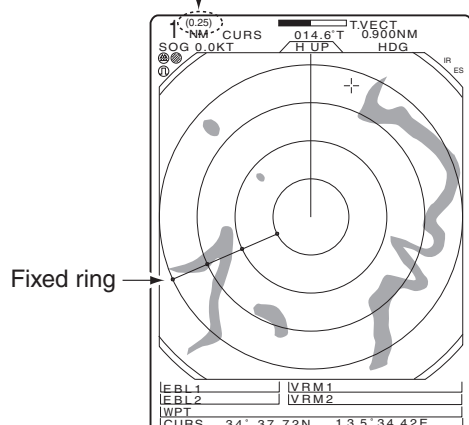
TYPE	DESCRIPTION
RING	Displays fixed rings. Suitable for rough estimations from your own ship to any target.
VRM1	Displays a variable range marker and activated by [▲] or [▼] for the range marker selector. Suitable for accurate measurements from your own ship to a target.
VRM2	Normally functions the same as VRM1. When the VRM1 and EBL1 selects a target, the center of VRM2 appears at the intersection point. Suitable for accurate measurements from target to target.

Two measurement procedures can be used with this radar. Use them separately or jointly is possible.

The distance unit, nautical miles (NM) or kilometers (KM) is selected in the FUNCTION menu (p. 5).

### Using the fixed rings

Ring range readout



- ① Push [MENU]/[菜单] one or more times to select the FUNCTION menu.
- ② Push [▼] one or more times to select "RING."
- ③ Push [▶] to turn ON the RING function and display the fixed rings.
  - The interval range appears on the right of the screen range readout.
  - The ring range is fixed depending on the screen range. (See below.)
- ④ Push [MENU]/[菜单] one or more times to exit the menu.
- ⑤ To clear the fixed rings, push [◀] to turn OFF the function, as described in step ③ above.

Range (nm)	1/8	1/4	1/2	3/4	1	1.5	2	3	4	6	8	12	16	24	32	36	48*	64†	72†
Ring (nm)	1/20	1/20	1/10	1/4	1/4	1/4	1/2	1/2	1	1	2	2	4	4	8	6	8	16	12
	2	5	5	3	4	6	4	6	4	6	4	6	4	6	4	6	6	4	6

**NOTE:** When the screen is shifted, the number of rings may differ.

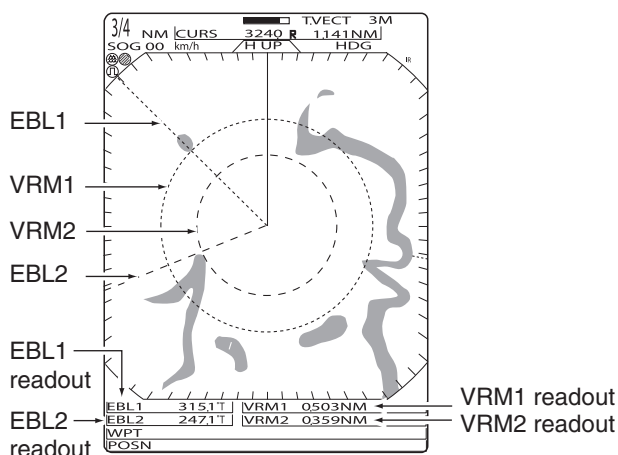
\*Available for the MR-1200TII/TIII. †Available for the MR-1200TIII only.

### Using the variable range marker

- ① Push [EBL1 (VRM1)]/[方位线1(距标1)] to display VRM1 and EBL1; then push [▲] or [▼] to set the marker.
  - The range between the ship and the target is indicated in the VRM readouts.
- ② Push [EBL2 (VRM2)]/[方位线2(距标2)] to display VRM2 and EBL2; then push [▲] or [▼] to set the marker.
  - The range between the ship and the target is indicated in VRM readouts.
  - When VRM1 and EBL1 are displayed, the center of VRM2 appears at the intersection point of VRM1 and EBL1.
  - The VRM2 disappears when [EBL1 (VRM1)] is pushed.
- ③ Push [EBL1 (VRM1)]/[方位线1(距标1)] to exit the menu display.

### ■ Bearing and Distance measurement

#### ◇ Using the EBL and VRM



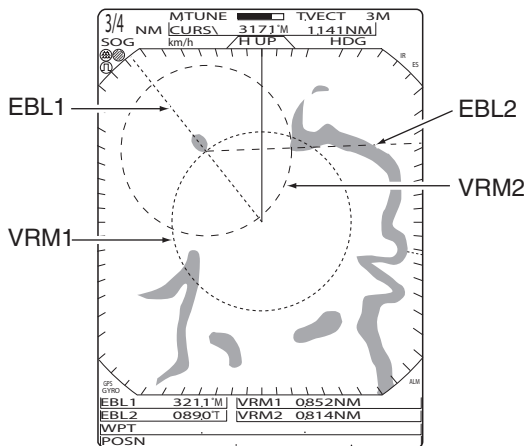
This radar has two Electronic Bearing Lines (EBL) to indicate the target direction from your ship or a target.

- ① Push [▲], [▼], [◀] or [▶] to move the cursor onto the desired target.
- ② Push [EBL1 (VRM1)]/[方位线1(距标1)] to display the EBL1 and VRM1.
  - Push [◀] or [▶] to rotate the electronic bearing line.
  - Push [▶] to rotate clockwise and push [◀] to rotate counterclockwise.
  - Push [▲] or [▼] to increase or decrease the variable range marker ring size.
  - The EBL1 and VRM1 readouts indicate the target bearing and distance.
  - The EBL readouts indicate the target bearing;
    - 0 to 360°R: Relative direction, when '360°R' is selected in the DIRECTION item of the FUNCTION menu. (See page 5)
    - P/S 0 to 180°: Bow direction, when 'PT/SB' is selected in the DIRECTION item of the FUNCTION menu. (See page 5)
    - 0 to 360°T\*: True or magnetic bearing, when selecting 'TRUE' in the DIRECTION item of the FUNCTION menu. (See page 5)
- \*Bearing data is required. (p. 43)
- ③ Push [EBL1 (VRM1)]/[方位线1(距标1)] to clear EBL1 and VRM1.
  - Cursor remains on the display.
- ④ Push [▲], [▼], [◀] or [▶] to move the cursor onto the desired target.
- ⑤ Push [EBL2 (VRM2)]/[方位线2(距标2)] to display EBL2 and VRM2 on the display.
  - When EBL1 and VRM1 are displayed, the beginning of EBL2 and VRM2 appears at the intersection point of EBL1 and VRM1.
  - EBL2 and VRM2 disappear when [EBL1 (VRM1)]/[方位线1(距标1)] is pushed.
- ⑥ To clear EBL1 and VRM1, push [EBL1 (VRM1)]/[方位线1(距标1)].

## ■ Advanced measurements

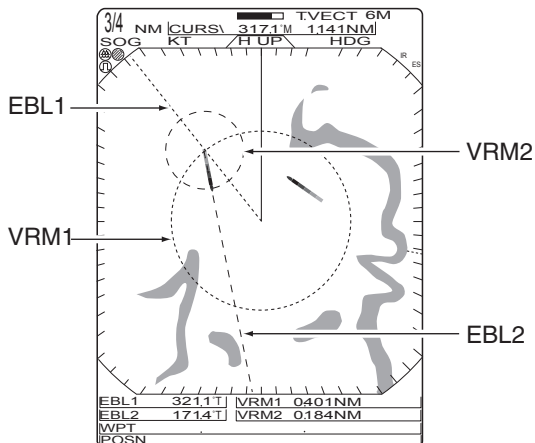
Using both Electronic Bearing Lines (EBL) and both Variable Range Markers (VRM), the following advanced measurements can be made:

### ◇ Measuring the distance and direction between two targets



- ① Push [▲], [▼], [◀] or [▶] to move the cursor onto the desired target.
- ② Push [EBL1 (VRM1)]/[方位线1(距标1)] to display the EBL1 and VRM1.
  - Push [◀] or [▶] to rotate the electronic bearing line.
  - Push [▲] or [▼] to increase or decrease the variable range marker ring size.
- ③ Push [EBL2 (VRM2)]/[方位线2(距标2)] to display the EBL2 and VRM2.
  - The intersection of the EBL1 and VRM1 becomes the center of the EBL2 and VRM2.
- ④ Push [▲], [▼], [◀] or [▶] to move the cursor onto the other target.
  - Push [◀] or [▶] to rotate the electronic bearing line.
  - Push [▲] or [▼] to increase or decrease the variable range marker ring size.
- ⑤ The VRM2 readout shows the distance between the two targets. The EBL2 readout shows the direction from one target to the other.

### ◇ Measuring the relative speed and course of a target



- ① Push [TRAILS]/[尾迹显示] (p. 12) to turn ON the TRAILS function; then wait until the trail time count up reaches to the TRAIL TIME.
- ② Set VRM1 and EBL1 to a previously plotted target as described above.
- ③ Set VRM2 and EBL2 to the current plotted position of the same target, as described above.
- ④ The VRM2 readout is a measure of target movement which can be converted into relative target speed.
  - For example, when a 6 minute trail time is selected, multiplying the distance by ten gives the relative average speed of the target.
  - If your ship is stationary during the plotting time, the converted speed and direction become absolute.
  - The converted speed unit is knots or kilometers/hour when the selected unit in the FUNCTION menu is nautical miles (NM) or kilometers (KM), respectively.
- ⑤ The EBL2 readout shows the course direction of the target.

### • Measuring the distance and course from a waypoint

- ① Display a waypoint. (See page 13)
- ② Set VRM1 and EBL1 to the displayed waypoint targets as described above.
- ③ Set VRM2 and EBL2 to a target (e.g. the next waypoint) as described on page 15.
- ④ The VRM2 readout shows the distance to the target from the waypoint.
  - The distance unit can be selected as nautical miles (NM) or kilometers (KM) in the FUNCTION menu.
- ⑤ The EBL2 readout shows the direction to the target from the waypoint.

The unit has an alarm function to protect your ship from collisions. If other ships, islands or other obstructions come into the pre-programmed alarm zone, the function alerts you with an alarm. You can set the desired range and bearing for an alarm zone. While the alarm function is activated, the power save function turns OFF the LCD until an alarm is given, to conserve power.

## Alarm zone setting

### ◇ Setting and using the alarm function

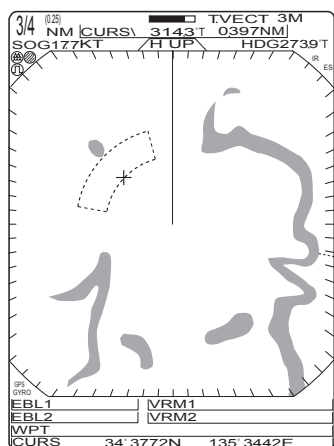


Fig. 1

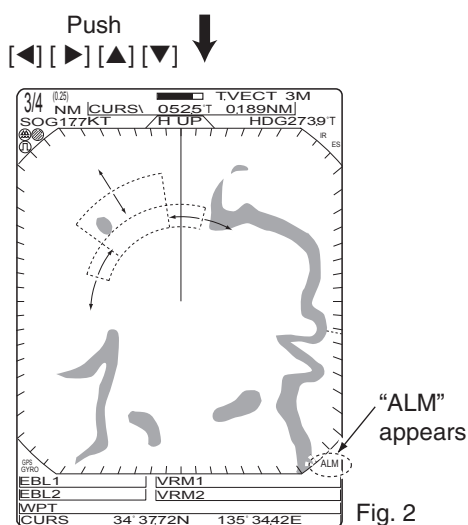


Fig. 2

- ① Push [ + ]/[ 量程+ ] or [ - ]/[ 量程- ] to select the desired range.
- ② Push [ ◀ ], [ ▶ ], [ ▲ ] or [ ▼ ] to set the cursor to the starting point of the alarm zone.
- ③ Hold down [ ALM ]/[ 报警 ] for 1 second to enter the alarm zone setting.
  - The starting zone appears on the screen. (Fig. 1)
- ④ Push [ ◀ ] or [ ▶ ] to adjust an angle and push [ ▲ ] or [ ▼ ] to set the distance of the alarm zone.
  - The selected alarm zone appears.
- ⑤ Push [ ALM ]/[ 报警 ] to set the alarm zone and activate the alarm function.
  - “ALM” appears on the bottom of the screen.
  - The selected alarm zone remains.
- ⑥ If a target comes into or goes out of the alarm zone, an alarm sounds.
  - Push [ ALM ]/[ 报警 ] to cancel the alarm signal and function.
- ⑦ To deactivate the alarm function, push [ ALM ]/[ 报警 ].
  - “ALM” and alarm zone disappear from the screen.
- ⑧ To activate the alarm function again with the same programmed zone, push [ ALM ]/[ 报警 ].
  - “ALM” and the pre-programmed alarm zone appears. (Fig. 2)

### • Using the function with power saver

To activate the power save function, hold down [ TX (SAVE) ]/[ 发射(节电) ] for 1 second while the alarm function is ON.

- The LCD display turns OFF.
- When a target comes into the alarm zone, an alarm sounds, the LCD display turns ON and the power save function is cancelled.

## Zone alarm setting

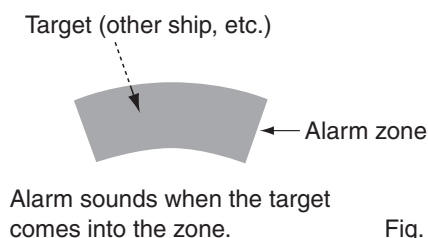


Fig. 3

A zone alarm sounds when the target comes into the zone, or the target goes out of the zone. (p. 5)

- ① Push [ MENU ]/[ 菜单 ] one or more times to select the FUNCTION menu.
- ② Push [ ▼ ] one or more times to select “ZONE ALARM.”
- ③ Push [ ◀ ] or [ ▶ ] to select IN or OUT.
  - IN : Alarm sounds when the target comes into the zone. (see Fig. 3)
  - OUT : Alarm sounds when the target goes out of the zone.

## ■ ATA (Automatic Tracking Aid)

By automatically tracking the target chosen by the cursor key, the closest point of approach (CPA) and the time to closest point of approach (TCPA) limit of your ship and a target are calculated.

ATA function is designed to sound an alarm when the CPA and TCPA fall below a set value (the approach watch area).

Only targets in the 0.25 to 16 NM range that are displayed with a high luminosity (strong return signal) can be selected as ATA targets.

- A maximum of 10 targets can be plotted on the screen.
- Plot positions are identified by an approved symbol mark (p. 20) and associated plot number.
- The target and vector line will move across the screen at the rate and direction defined by the calculated true or relative course and speed.
- The vector line is displayed on the target.

## ■ ATA settings

Set the menu items before using the ATA function.

- ① Push [MENU]/[菜单] one or more times to select the menu.
- ② Push [▲] or [▼] to select the item.
- ③ Push [◀] or [▶] to select the option.
- ④ Push [MENU]/[菜单] one or more times to exit the menu.

### ◇ ATA AIS menu

ATA AIS MENU			
ATA	OFF	ON	ALL
ATA No.DISPLAY	OFF	SEL	
ATA ALARM	OFF	ON	
AIS DISPLAY	OFF	ON	
AIS ALARM	OFF	ON	
AIS RANGE	8.0NM		
AUTO ACTIVATE	1.0NM		
NUMBER OF AIS	100		
SLOW WARN	0.1KT		
LOST AIS TRGT	ERASE		

Select the ATA AIS menu, then set the items.

#### ◆ ATA

Turn ON the ATA function.

#### ◆ ATA No. DISP

Select the target identification number type that appears at the right side of the mark.

- OFF: Do not display any mark number.
- SEL: Display only the selected mark number.
- ALL: Display all mark numbers.

#### ◆ ATA ALARM

Turn the ATA alarm function ON or OFF.

- An ATA alarm sounds when the CPA and TCPA reach the limit.

## ■ ATA settings (Continued)

### ◇ TARGET menu

These settings are commonly used for the ATA operation and AIS operation.

TARGET MENU		
<b>VECT MODE</b>	<b>TRUE</b>	REL
VECT TIME	6M	
CPA LIMIT	1.0NM	
TCPA LIMIT	1 M	
TARGET TRACK	1 M	

\*CPA/TCPA: Closest Point of Approach and Time to Closest Point of Approach limits are set to give a warning when a target or targets enter those limits around your own ship.

Select the TARGET menu, then set the item.

#### ◆ VECT MODE

Select the vector type.

- TRUE (True vector):  
The predicted true motion of a target as the result of your own ship's direction and speed input.
- REL (Relative vector):  
The predicted movement of a target relative to your own ship.

#### ◆ VECT TIME

Set the vector length (time) to 15 seconds, 30 seconds or 1 to 15 minutes.

#### ◆ CPA\* LIMIT

Set the CPA limit distance.

#### ◆ TCPA\* LIMIT

Set the TCPA limit time.

- An ATA or AIS alarm sounds when the CPA and TCPA reach the limit.

#### ◆ TARGET TRACK

The track data is updated at this specified tracking interval. Select the track interval time between OFF, 15 seconds, 30 seconds and 1 to 15 minutes.

After 5 dots are displayed, the oldest dot disappears at the time when the next dot appears.

## ■ ATA operation

ATA	BRG	DIST
No.	CSE	SPD
	CPA	TCPA

Identification No.	Bearing	Course	Distance	Speed
ATA No. 10	BRG	305.7T	DIST	11.43NM
	CSE	081.3T	SPD	12.3KT
	CPA	5.9NM	TCPA	0:50

Passage of time → 0:20  
 Closest Point of Approach  
 Time to Closest Point of Approach

Select a target on the screen which you want to track.

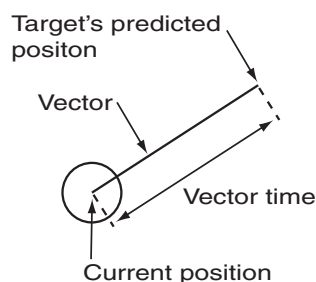
- ① Push [▲], [▼], [◀] or [▶] to move the "+" cursor onto a desired target.
- ② Hold down [TARGET]/[标记] for 1 second to select the target for tracking.
  - A dotted square symbol appears on the cursor.
  - The target identification number, bearing, distance read-out, course (CSE), speed (SPD), CPA and TCPA appear in the information screen.
  - The timer starts to count the progressing time.
  - After 20 seconds progressing time has passed, the vector appears on the target.
  - After 1 minute progressing time has passed, it changes to a solid circle with a vector line, and tracking operation starts.
  - When the target disappears, it changes to a blinked lozenge. And then the mark disappears after 1 minute.
  - When a target advances within the CPA and TCPA limits, a mark changes to a triangle, blinks and sounds an alarm. The alarm will be cancelled if any key is pushed.
  - To cancel the target setting, move the cursor onto the target, then hold down [TARGET]/[标记] for 1 second.
  - [TARGET]/[标记] is pushed for changing the display of EBL/VRM etc. to target information.
  - To select the target which displays information, set the cursor to the target, and then push [TARGET]/[标记].

## ■ Plotting marks

There are 5 kinds of plotting marks.

- : Selected, uncalculated mark.
- : Selected, calculated mark.
- : Normal, calculated mark.
- ⚠ : CPA/TCPA alarm mark. The target is close to within a minimum range and time. Alarm emit indicator. Push [TARGET]/[标记] to cancel the alarm.
- ⚡ : Indicates the tracking of a target disappears.

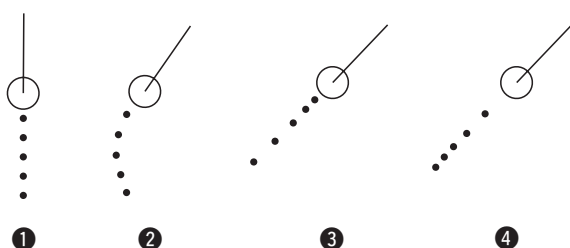
## ■ Course and speed vector



The vector indicates the target's predicted, true or relative course and speed.

- The vector time may change, depending on the VECT TIME setting. (see TARGET menu, pp. 7, 19)
- The tip of the vector shows the target's predicted position after the time selected in the "VECT TIME."

## ■ Plots (ATA)



The plot displays the target's past positions as 5 dots, during each specified tracking interval.

- The target track may change, depending on the TARGET TRACK setting. (see TARGET menu, pp. 7, 19)

- ① Target goes straight.
- ② Target turns right.
- ③ Target reduces speed (dots are closer together behind the target).
- ④ Target increases speed (dots are farther apart behind the target).

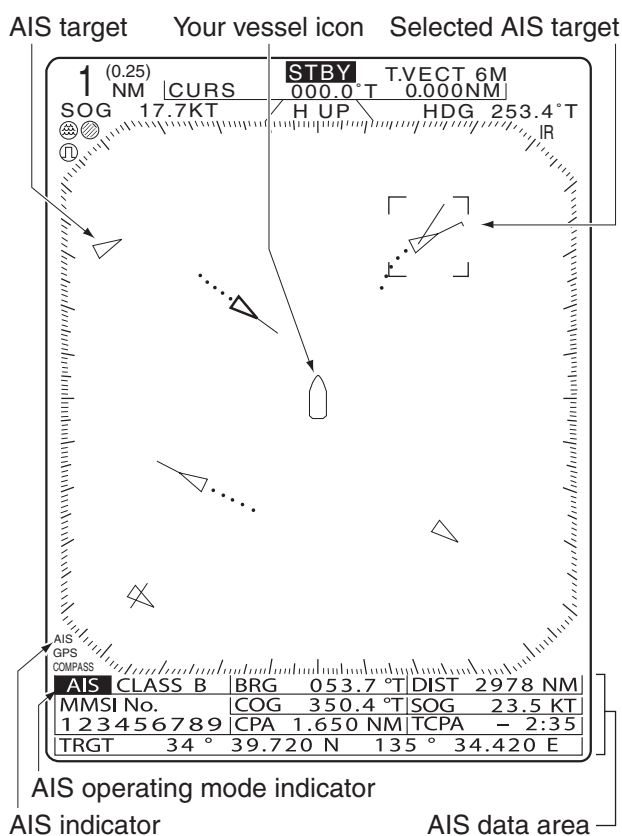
## ■ AIS (Automatic Identification System)

AIS is an acronym for “Automatic Identification System.”

An AIS transponder is a short range data radio unit, used primarily for collision-risk management and navigation safety. It automatically transmits and receives vessel information such as the vessel name, MMSI code, vessel type, position data, speed, course, destination and more. Information is exchanged among the vessels and/or base stations on the VHF maritime mobile band. The information helps to identify other nearby vessels or stations by displaying the received data on a radar screen.

### ◇ Description of the AIS display

Push [EBL1 (VRM1)]/[方位线1(距标1)] and [EBL2 (VRM2)]/[方位线2(距标2)] to toggle between the AIS operating mode and the normal operating mode.



### ◆ AIS target

The AIS targets are displayed the icons described below.

#### • AIS icons

Icon	Description
	AIS target: Vessel The tip of the target triangle automatically points in the direction it's heading.
	AIS target: Base Station
	AIS target: Search and Rescue (SAR)
	AIS target: Aids to Navigation (AtoN)
	AIS target: Virtual Aids to Navigation (Virtual AtoN)
	AIS target: Search and Rescue Transponder (SART)

### ◆ Your vessel icon

Appears in the center of the standby screen when a valid VDM sentence is input from the NMEA (AIS) port.

### ◆ Selected AIS target

A square of only four corners appears when the target is selected. The selected AIS target's information is displayed in the data area.

### ◆ AIS indicator

Appears when a valid VDM sentence is input from the NMEA (AIS) port.

If more than the specified AIS signals that is set in the “NUMBER OF AIS” setting of the ATA AIS menu are received, this indicator changes to a reverse display (**AIS**).

The indicator disappears if the AIS signal is interrupted for 6 minutes.

### ◆ AIS operating mode indicator

Appears when the AIS operating mode is selected.

## ■ AIS settings

### ◇ ATA AIS menu

ATA AIS MENU			
ATA	OFF	ON	
ATA No.DISPLAY	OFF	SEL	ALL
ATA ALARM	OFF	ON	
AIS DISPLAY	OFF	ON	
AIS ALARM	OFF	ON	
AIS RANGE	8.0NM		
AUTO ACTIVATE	1.0NM		
NUMBER OF AIS	100		
SLOW WARN	0.1KT		
LOST AIS TRGT	ERASE		

- ① Push [MENU]/[菜单] one or more times to select the menu.
- ② Push [▲] or [▼] to select the item.
- ③ Push [◀] or [▶] to select the option.
- ④ Push [MENU]/[菜单] one or more times to exit the menu.

Select the ATA AIS menu, then set the items.

#### ◆ AIS DISPLAY

Turn the AIS display ON or OFF.

#### ◆ AIS ALARM

Turn the AIS alarm function ON or OFF.

- An AIS alarm sounds when the CPA and TCPA reach the limit.

#### ◆ AIS RANGE

Set the AIS display range to between 0.1 and 36.0 NM or ∞.

- 0.1 to 36.0 NM: Select the range from your vessel.
- ∞: The received AIS information are displayed up to the "NUMBER OF AIS" setting.

#### ◆ AUTO ACTIVATE

Set the distance to automatically turn the sleeping AIS target into an activated target.

- OFF: Turns OFF the Auto Activate function.
- 0.1 to 9.9 NM: Select the distance from your vessel.

#### ◆ NUMBER OF AIS

Select the maximum number of AIS targets that can be displayed on the screen to between 10 and 100.

#### ◆ SLOW WARN

The AIS unit calculated COG (Course Over Ground) data of a vessel that is at anchor or drifting is unreliable, and therefore the CPA (Closest Point of Approach) and TCPA (Time to CPA) data may not be correctly calculated. If a vessel is anchored in your alarm zone, the unreliable data can cause the collision alarm to sound many times, even if there is no real danger. To prevent this, when the anchored vessel's SOG (Speed Over Ground) is less than this set value, the Slow Warn function assumes that vessel's COG is fixed towards your vessel and an alarm will sound.

- OFF: Turn OFF the Slow Warn function.
- 0.1 to 4.9 KT: Select the vessel's speed.

#### ◆ LOST AIS TRGT

Erase all of the Lost targets.

Push [▶] to display the confirmation "SURE?," then push [▶] again to clear all of the Lost targets on the screen.

## ■ AIS settings (Continued)

### ◇ TARGET menu

You can change the target settings for AIS operation same as ATA operation. See pages 7 or 19 for TARGET menu details.

## ■ AIS operation

<b>AIS</b>	BRG	DIST
MMSI No.	COG	SOG
	CPA	TCPA
TRGT		

AIS Classes/target type		Course Over Ground		Speed Over Ground	
Bearing		Distance			
AIS CLASS B		BRG	053.7 °T	DIST	2978 NM
MMSI No.		COG	350.4 °T	SOG	23.5 KT
1 2 3 4 5 6 7 8 9		CPA	1.650 NM	TCPA	- 2:35
TRGT		34 °	39.720 N	135 °	34.420 E
Target Position/Vessel name		Closest Point of Approach		Time to Closest Point of Approach	
MMSI number					

Select a target whose information you want to display on the screen.

- ① Push [EBL1 (VRM1)]/[方位线1(距标1)] and [EBL2 (VRM2)]/[方位线2(距标2)] to select the AIS operating mode.
- ② Push [▲], [▼], [◀] or [▶] to move the “+” cursor onto a desired target.
- ③ Push [TARGET]/[标记] to select the target.
  - A square of only four corners appears on the cursor.
  - The target information appear in the AIS data area.
    - AIS Class, MMSI number, bearing, distance, Course Over Ground (COG), Speed Over Ground (SOG), CPA and TCPA appear.
    - The position information and Vessel name are alternately displayed.
  - If several targets are overlapped on the screen, push [TARGET]/[标记] to sequentially select a target.
  - Hold down [TARGET]/[标记] for 1 second to toggle the selected target between activated and sleeping.
  - Push [EBL1 (VRM1)]/[方位线1(距标1)] and [EBL2 (VRM2)]/[方位线2(距标2)] to toggle between the AIS operating mode and the normal operating mode.

## ■ Status of the vessel icon

There are 5 kinds of target vessel status.

### Sleeping target:

- ✎ The AIS signal has been updated (received), but the distance from your vessel is far, or you set it as 'sleeping.' The target is displayed as just a triangle without a heading or vector line.

### Activated target:

- ✎ The target is displayed with the heading line, SOG (Speed Over Ground), COG (Course Over Ground) vector and ROT (Rate of Turn).

### Dangerous target:

- ✎ Even if the target's status is sleeping or activated, when it enters your CPA and TCPA limit settings, the target is displayed with a thick line.

### Selected target:

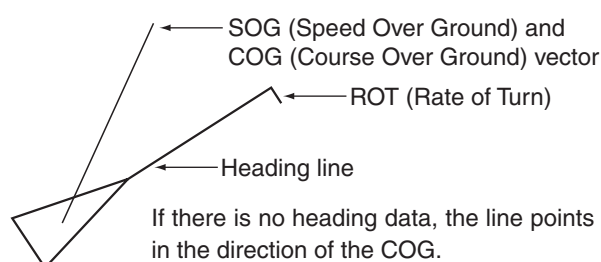
- ✎ The target's information is displayed in the data area.

### Lost target\*:

- ✎ When the AIS signal has not been updated (received) for a specific time period, the target triangle is marked with a diagonal line.
- If the AIS signal has still not been updated (received) for 6 minutes and 40 seconds, the target icon disappears.

\*A vessel is regarded as a "Lost target" after a specified period of time has passed since the vessel last transmitted data. (p. 6)

### • Activated target



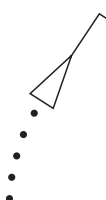
## ■ Plots (AIS)

The plot displays the activated vessel or SART's past positions as 5 dots, during each specified tracking interval.

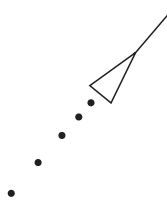
- The target track may change, depending on the TARGET TRACK setting. (see TARGET menu, pp. 7, 19)



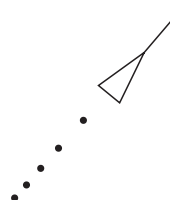
Target goes straight.



Target turns right.



Target reduces speed.



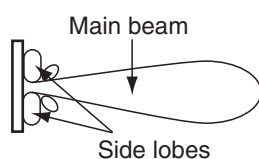
Target increases speed.

Radar uses a form of electromagnetic radiation which, like light, can be reflected. Because of this property, some objects may cause false echoes on the screen where in fact no targets actually exist.

These echoes may appear if a large vessel, bridge, or other metal object is in proximity. Operators should be familiar with the effect of this phenomena. In some cases, echoes can be reduced.

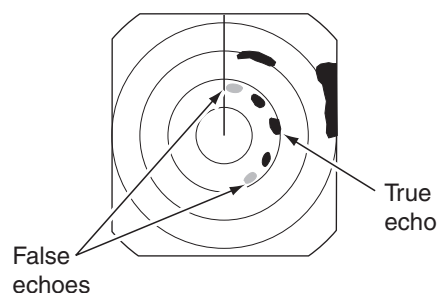
## ■ Side-lobe echoes

Radiation can escape on each side of the beam inside the lobes. If a target reflects this radiation, it will be displayed on the screen as an echo.



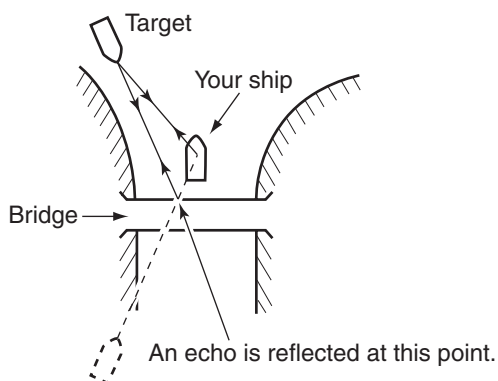
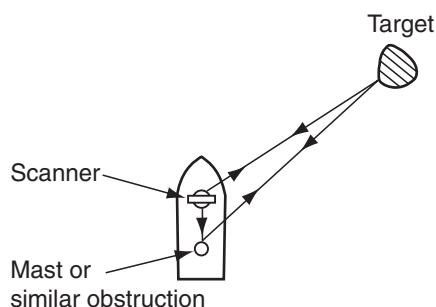
Side-lobe echoes usually occur at short ranges and as a result of large (strongly reflective) targets. They can be reduced with proper adjustment of the [SEA]/[海浪抑制] control.

See page 9 for the [SEA]/[海浪抑制] control.

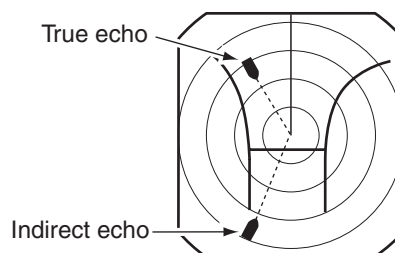
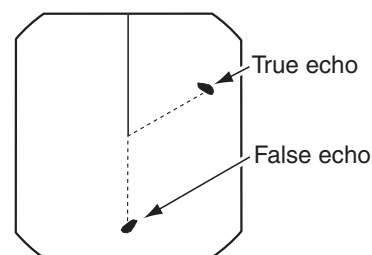


## ■ Indirect echoes

Indirect echoes may be returned from either a passing ship, or returned from a reflecting surface, such as a mast on your own ship.

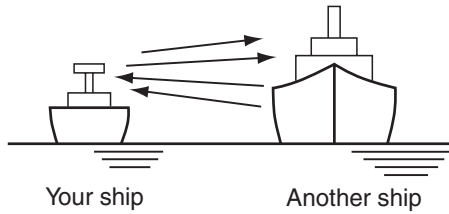


An indirect echo from a reflective surface will appear on a different bearing from the direct (true) echo, but the distance will be approximately the same for both.



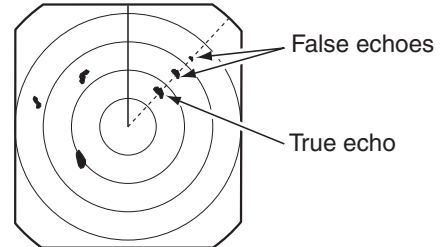
## ■ Multiple echoes

Multiple echoes may appear when a short-range and strong echo is received from a ship, bridge, or break-water.



Multiple echoes will appear beyond the target's true echo point on the same bearing of a large target. They can be reduced with proper adjustment of the [SEA]/[海浪抑制] control.

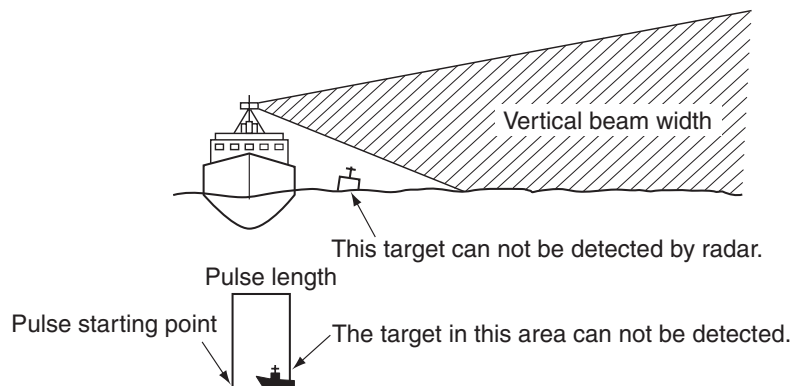
See page 10 for the [SEA]/[海浪抑制] control.



## ■ Minimum range

Detection at short range is very important. Minimum range is determined primarily by transmitter pulse length, vertical beam width and height of the scanner unit. The shorter the transmission time, the quicker the return echoes can be received and their distance measured.

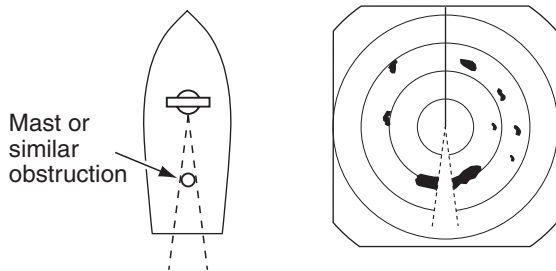
The ability to see targets very close to the ship is decreased if the scanner is mounted too high off the water, because the bottom of the vertical beam of the scanner overshoots nearby targets.



## ■ Blind and Shadow sectors

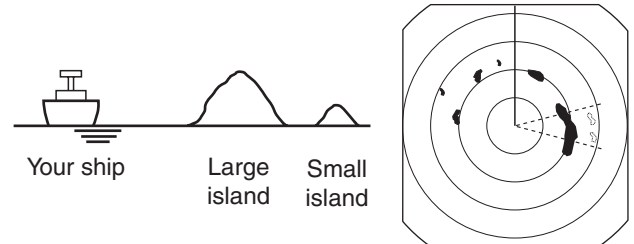
Blind or Shadow sectors may exist because of obstructions such as masts, derricks or other metal objects. An obstruction may throw either a complete or partial shadow as shown in the diagram below. If a target is in a shadow sector, target echoes may not appear on the screen.

**Shadow sector**



When tall and massive targets such as a large island are located at close range also shadowed without producing any echoes. This phenomenon is called blind sector. It is very important to know the bearings and widths of all shadow sectors caused by your own ship's obstructions.

**Blind sector**



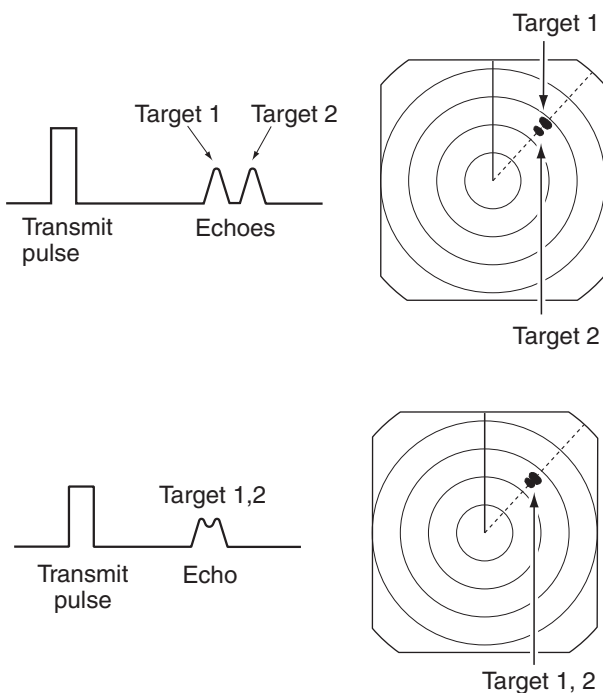
## ■ Target resolution

Target resolution is determined by the horizontal beam width and transmit pulse width. Sometimes it is difficult to detect two targets which are separated by short distances or which are in the same direction.

### ◇ Distance resolution

When two targets are separated by more than the pulse width, they appear as two echoes.

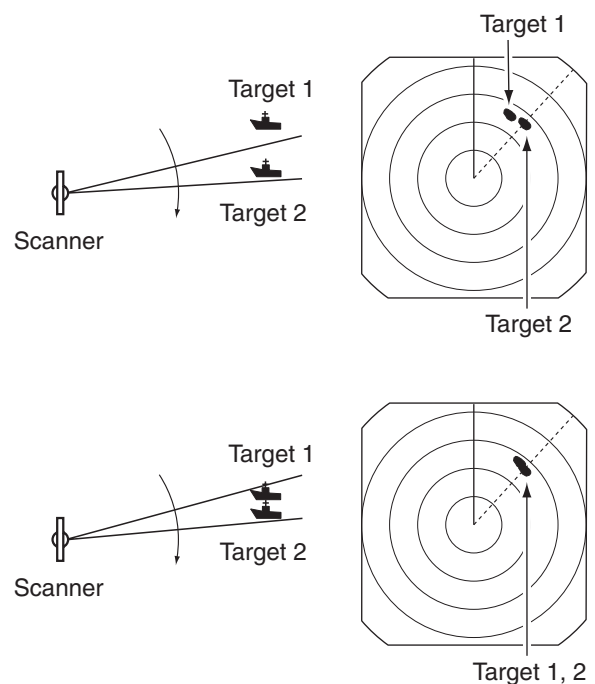
When two targets are not separated by more than the pulse width, they appear as 1 echo.



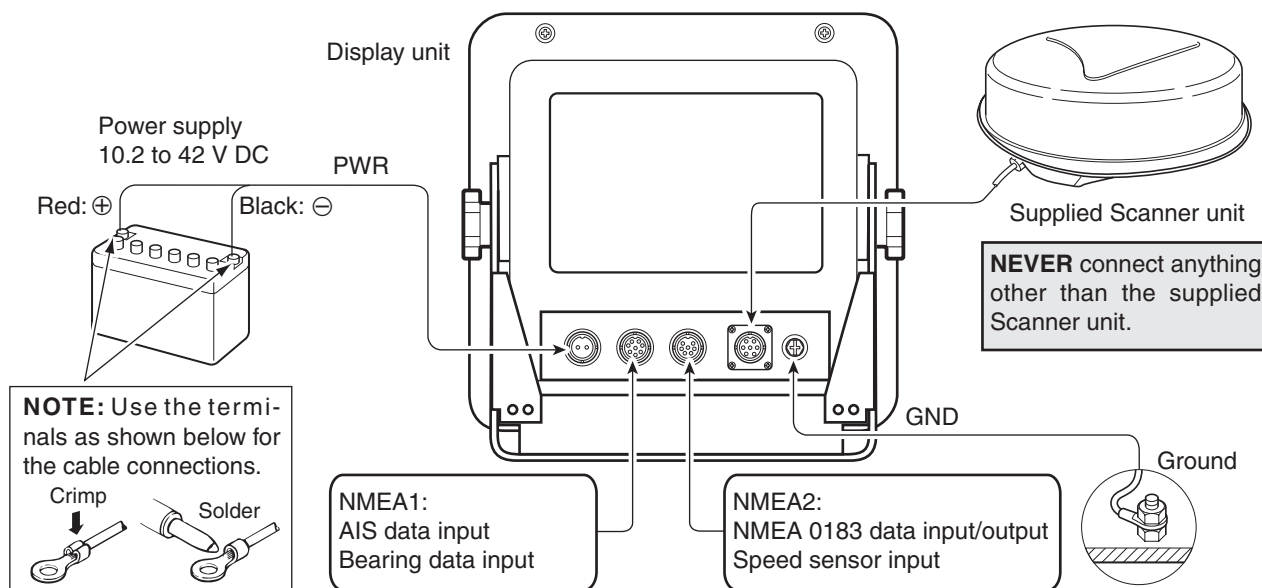
### ◇ Direction resolution

When two targets are separated by more than the horizontal beam width, they appear as two echoes.

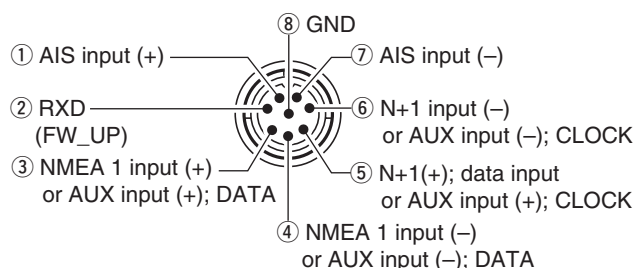
When two targets are not separated by more than the horizontal beam width, they appear as one echo.



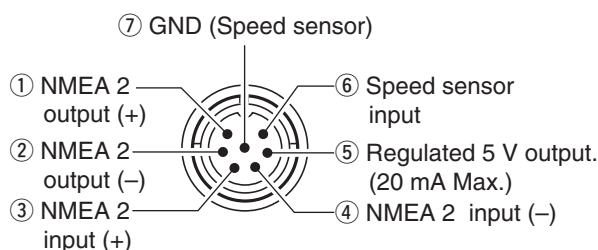
## ■ Connecting the units



### NMEA1 connection (Rear panel view)



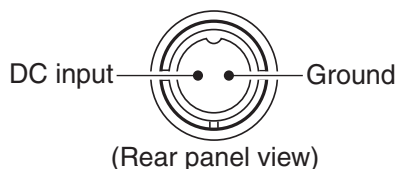
### NMEA2 connection (Rear panel view)



NMEA 1/2 inputs/NMEA 2 output: 4800 bps, AIS input: IEC61162-2 38400 bps

## ■ Power source requirement

### ◇ DC power source



**CAUTION:** Incorrect cable connection will damage the display unit.

The display unit is designed for connection to any power source if the voltage is 10.2–42 V DC, so that a 12, 24, or 32 V DC battery can be used without a DC-DC converter, or any internal modifications.

### • DC power cable connection

Connect the supplied DC power cable as shown in the diagram.

## ■ Ground connection

To prevent electrical shocks and other problems, ground the display unit through the [GND] terminal. For best results, connect a heavy gauge wire or strap to the nearest grounding point on the boat. The distance between the [GND] terminal and the ground point should be as short as possible.

## ■ Installing the display unit

### ◇ Location

Select a place for installation which meets the following important conditions:

- The display unit should be placed near the wheel in the cabin so that an operator may easily view the radar screen while facing the bow.
- To minimize interference, **KEEP** the unit **AT LEAST** THE COMPASS SAFE DISTANCE stated in the serial number label on the rear panel away from the compass and navigation receiver.
- Select a position where there is no danger of salt or fresh water spray or immersion.
- Select a location where it is easy to perform maintenance or adjustment after installation.
- Select a location which can support the weight of the display unit.
- **DO NOT** select areas subject to extreme heat, cold, vibrations or direct sunlight.

### • SX-3230 Mounting Bracket

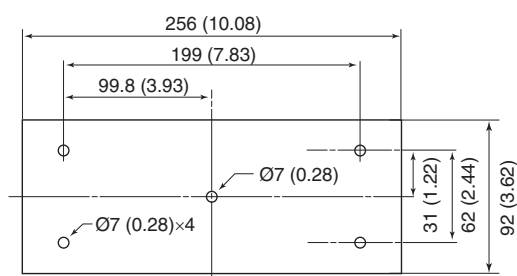


Fig. 1

### ◇ Mounting

The mounting bracket supplied with the display unit allows “dashboard” or “overhead” mounting.

- ① Hold the mounting bracket up to the selected location and mark pilot holes for the five installation holes using the template.
  - The template is provide on page 44.
- ② Drill five holes, 7 mm (0.28 in) in diameter as shown in the diagram. (Fig. 1)
- ③ Install the bracket using the knob bolts, bolts, nuts or washers with the supplied accessories. (Fig. 2)
- ④ Adjust the display unit to an adequate view angle.

### • Mounting Bracket installation

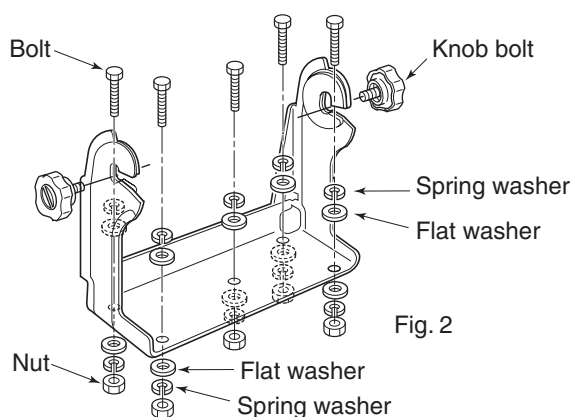
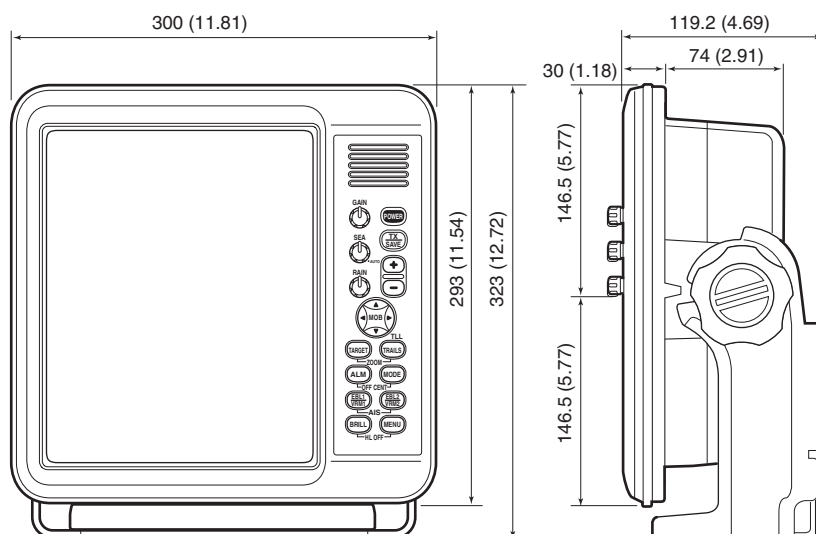
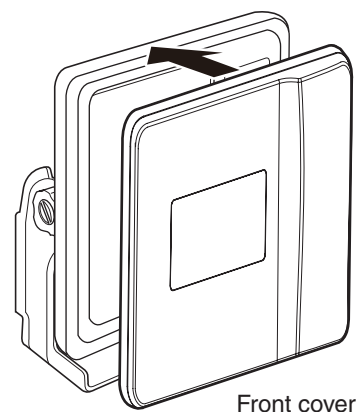


Fig. 2

### • SX-3230



### • Front cover attachment



Front cover

## ■ Mounting the EX-2714 scanner unit

### ◇ Location

The scanner unit is designed for high-pressure water jet resistance (except for the cable connectors). Select a place for installation which meets the following important conditions.

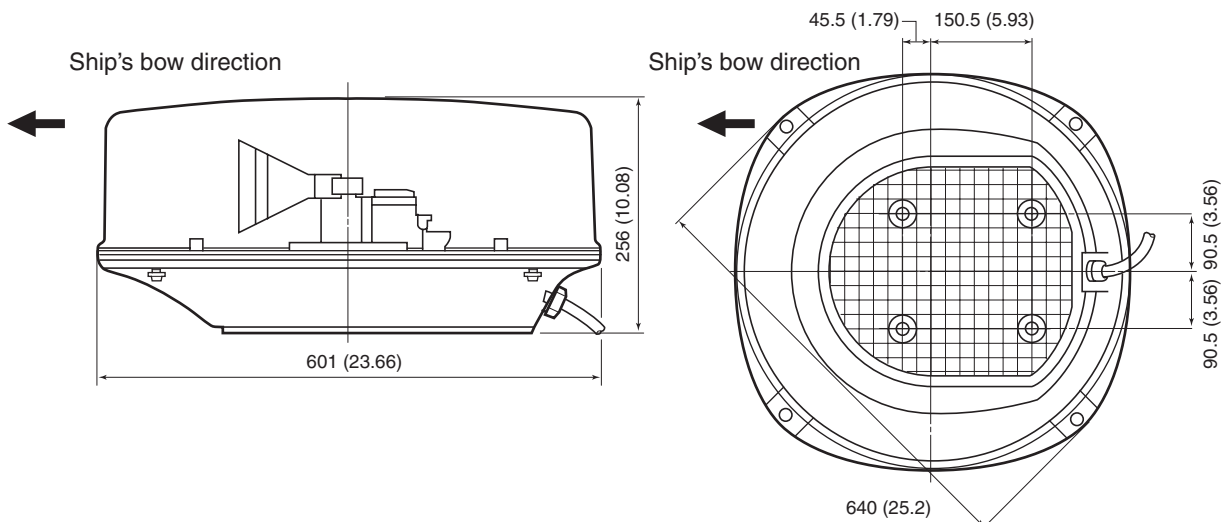
- ➔ The scanner unit must be near the boat's center line and have a good view in every direction. Be sure there are no objects in the surrounding area which will interfere with the scanning beam.
- ➔ Keep the scanner unit away from any exhaust pipes. Exhaust gas can damage the unit.
- ➔ When the boat is equipped with a Radio Directional Finder (RDF) system, keep the scanner unit at least 2 m (6.6 ft) away from any RDF antenna.
  - Radiation from the scanner unit can affect the measurement data of RDF equipment.
- ➔ The unit should be placed as high as possible on the boat to obtain best performance with maximum range.
- ➔ If you install two or more radar in one boat, install one above, and the other(s) below.
- ➔ The mounting surface must be parallel with the boat's waterline.
- ➔ If the height is insufficient to install the scanner unit, build a special frame for installation.

### ◇ Mounting

⚠ **WARNING! BE SURE** [POWER]/[电源开关] is **OFF** whenever you are working with the scanner unit.

- ① Drill four holes, 12 mm (0.47 in) in diameter using the supplied template.
- ② If the mounting surface or platform is metal, apply a sealing compound around the holes to prevent corrosion and to waterproof the unit.
- ③ Attach the scanner unit to the selected position with the supplied bolts (M10×50 mm or M10×25 mm; depending on your installation needs), flat and spring washers.

⚡ **CAUTION: SECURE** the four bolts firmly.



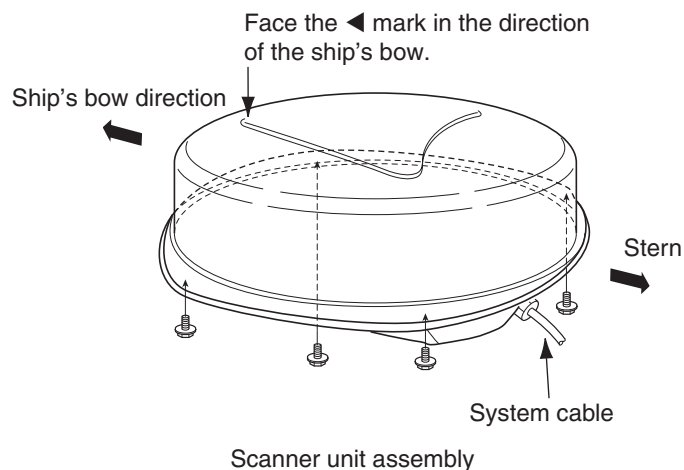
Unit: mm (in)

## ■ Wiring the EX-2714 system cable

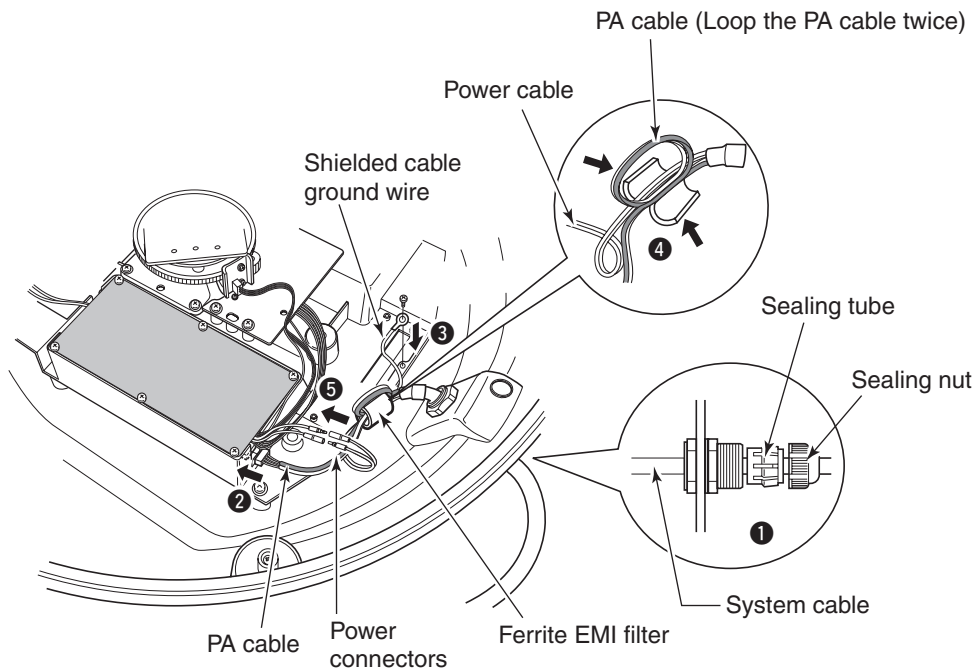
**CAUTION: NEVER** cut the supplied system cable.

- ① Using a hex head wrench\*, loosen the four bolts on the bottom of the scanner unit, and open the unit.  
\* A Phillips head or flat head screwdriver is also usable.
- ② Loosen the sealing nut on the scanner unit and pass the system cable through the sealing nut and sealing tube. (①)
- ③ Insert the black and white PA cable connector into the PA unit connector J1. (②)
- ④ Connect the shielded cable ground wire to the ground plate with the screw. (③)
- ⑤ Clamp the system cable with the ferrite EMI filter attached near the sealing connector.  
Be sure to clamp it tightly. (④)
- ⑥ Connect the power cable (black and red) to the power connector. (⑤)
- ⑦ Tighten the sealing nut, then replace the radome cover over the scanner unit.  
**DO NOT** stretch the system cable too much, otherwise a miss contact of the connector may occur.
- ⑧ Tighten the four bolts on the bottom of the scanner unit. (Use a torque wrench until the scale on the wrench reads 5.0 N•m; 3.69 lbf•ft.)  
• The four projections around the circumference of the radome cover show the positions of the bolt receptacles.

### • Scanner unit assembly (cover removed)



### • Connect the system cable



## ■ Mounting the EX-2780 scanner unit

### ◇ Location

The scanner unit is designed for high-pressure water jet resistance (except for the cable connectors). Select a place for installation which meets the following important conditions.

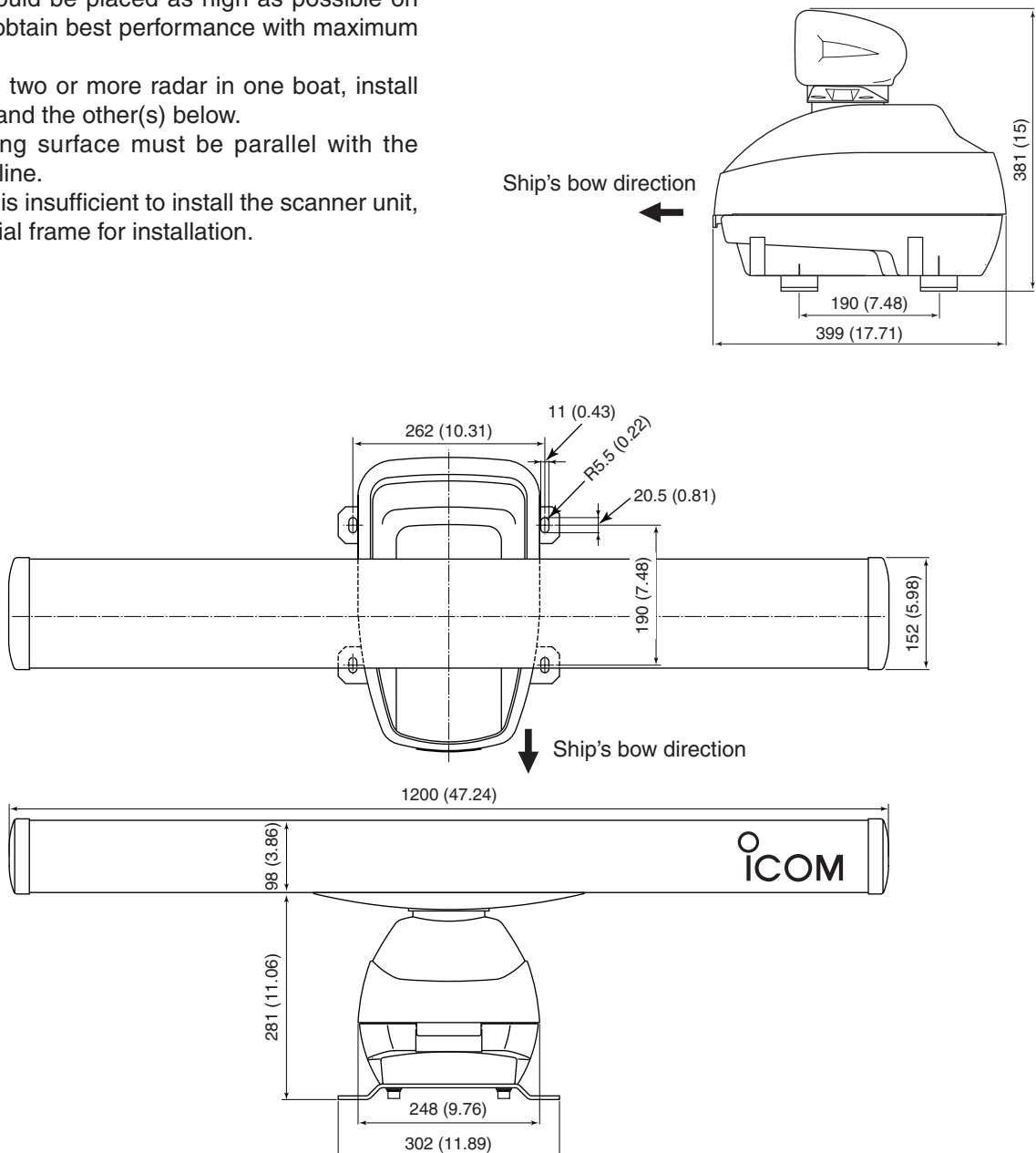
- ➔ The scanner unit must be near the boat's center line and have a good view in every direction. Be sure there are no objects in the surrounding area which will interfere with the scanning beam.
- ➔ Keep the scanner unit away from any exhaust pipes. Exhaust gas can damage the unit.
- ➔ When the boat is equipped with a Radio Directional Finder (RDF) system, keep the scanner unit at least 2 m (6.6 ft) away from any RDF antenna.
  - Radiation from the scanner unit can affect the measurement data of RDF equipment.
- ➔ The unit should be placed as high as possible on the boat to obtain best performance with maximum range.
- ➔ If you install two or more radar in one boat, install one above, and the other(s) below.
- ➔ The mounting surface must be parallel with the boat's waterline.
- ➔ If the height is insufficient to install the scanner unit, build a special frame for installation.

### ◇ Mounting

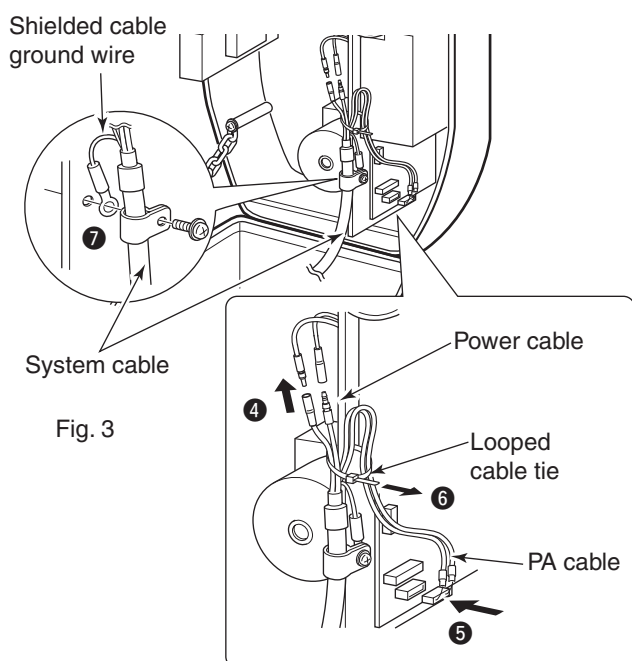
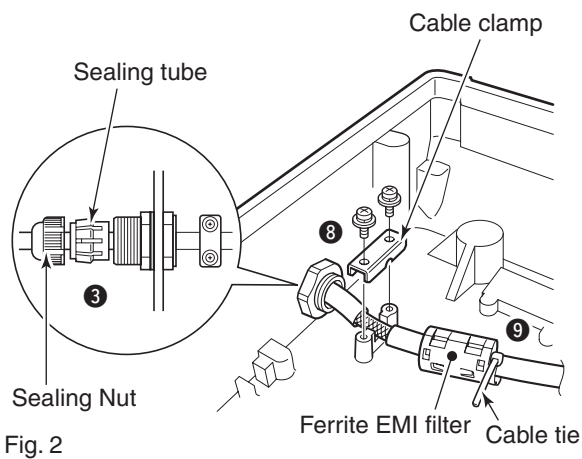
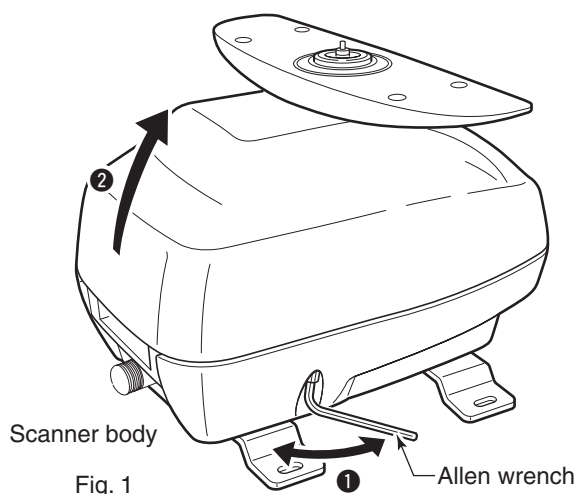
⚠ **WARNING! BE SURE** [POWER]/[電源开关] is **OFF** whenever you are working with the scanner unit.

- ① Drill four holes, 12 mm (0.47 in) in diameter using the supplied template.
- ② If the mounting surface or platform is metal, apply sealing compound around the holes to prevent corrosion, and to waterproof the unit.
- ③ Attach the scanner unit to the selected position with the supplied bolts (M10×40 mm), flat and spring washers.

⚡ **CAUTION: SECURE** the four bolts firmly.



## ■ Wiring the EX-2780 system cable



**CAUTION: NEVER** cut the supplied system cable.

- ① Loosen the four bolts on the bottom of the scanner unit body using the supplied allen wrench (①), and open the top cover. (②)
- ② Loosen the sealing nut on the scanner unit and pass the system cable through the sealing nut and sealing tube. (③)
- ③ Connect the power cable (black and red) connectors to the power unit connectors through the looped cable tie. (④)
- ④ Insert the PA cable (black and white) connector into the PA unit connector. Be sure to follow the diagram below carefully. (⑤)
  - Secure the looped PA cable with the looped cable tie. (⑥)
- ⑤ Connect the shielded cable ground wire to the chassis with the screw, as shown in the diagram. (⑦)
- ⑥ Clamp the system cable with the cable clamp metal fitting using a screw near the sealing connector. (⑧)
  - Be sure to clamp it tightly.
- ⑦ Clamp the system cable with the ferrite EMI filter attached near the sealing connector. (⑨)
  - Be sure to clamp it tightly.
  - Secure the ferrite EMI filter with cable tie.
- ⑧ Tighten the sealing-nut, then close the top cover.
- DO NOT** stretch the system cable too much, otherwise a miss contact of the connector may occur.
- ⑨ Tighten the four bolts on the bottom of the scanner body. (Use a torque wrench until the scale on the wrench reads 9.8 N•m; 7.23 lbf•ft.)

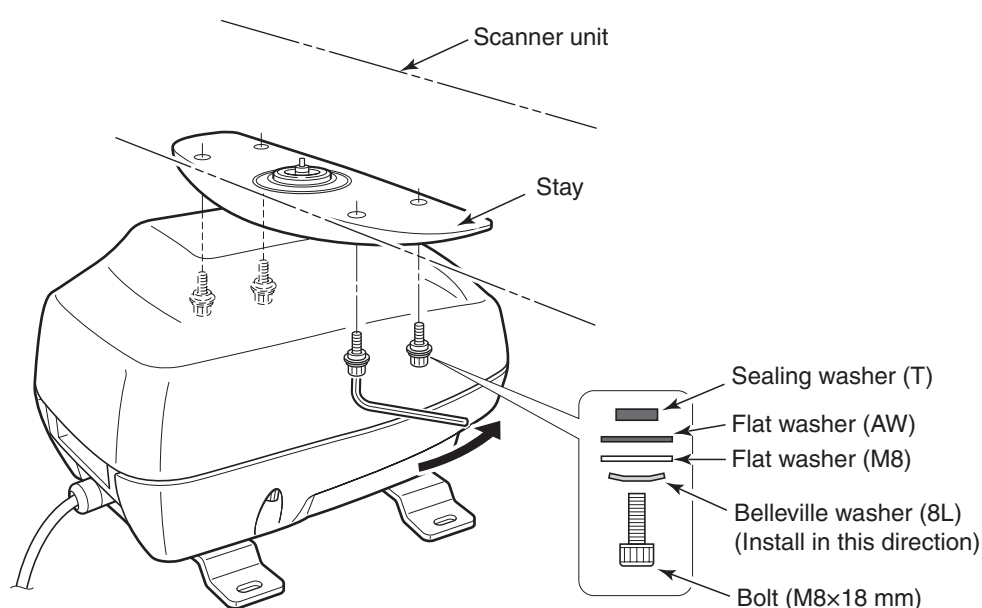
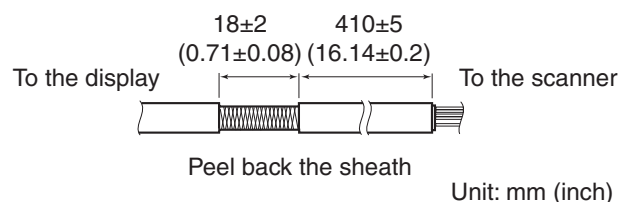
## ■ Attaching the EX-2780 scanner unit

- ① Put the scanner unit on the stay.
- ② Attach the antenna rotor with the supplied bolts (M8×18 mm), flat and belleville washers and a sealing washer.

Be sure to install the belleville washer in the direction shown below.

**NOTE: When using the optional system cable.**  
 Peel back the outer sheath of the system cable when using the optional **OPC-2340** system cable.

**BE CAREFUL! DO NOT** cut the inner shield wire when peeling back the outer sheath.



**◇ Antenna rotation speed**

The antenna rotation speed can be selected between 36 rpm and 24 rpm. (Default: 36 rpm)

Hold down [-]/[量程-] for 1 second to select 24 rpm, hold down [+]/[量程+] for 1 second to select 36 rpm.

**◇ Test pattern indication**

To check the LCD display, a test pattern can be displayed.

While holding down [MENU]/[菜单], turn ON the power to display the test pattern.

To return to normal operating mode, turn OFF the power, then turn it ON again.

**◇ Simulator screen**

The MR-1200RII/TII/TIII has simulator screen capability.

- ① While holding down [BRILL]/[亮度], push [POWER]/[电源开关] to turn ON the power.
- ② After the count down ends, the standby screen appears.
- ③ Push [TX (SAVE)]/[发射(节电)] to display the simulator screen.
- ④ To return to normal operating condition, turn OFF the power, then ON again.

**◇ All reset**

- ① While holding down [TARGET]/[标记], [EBL1 (VRM1)]/[方位线1(距标1)] and [EBL2 (VRM2)]/[方位线2(距标2)], turn ON the power.
- ② Follow the guidance.

## Service man menu

**CAUTION:** The SERVICE MAN MENU is available for service purposes only. **DO NOT** change any setting on the menu, otherwise the equipment may not operate at its original performance.

To open the "SERVICE MAN" menu.

Push [MENU]/[菜单] one or more times to show the "SERVICE MAN" menu.

## Select the language

Menu screens can be displayed in ENGLISH and 中文 (CHINESE).\*

\* Depending on version, menu screen can be displayed in English and Korean.

After opening the "SERVICE MAN" menu;

- ① Push [▲] to show the present language.
- ② Push [◀] or [▶] to select the desired language, then push [▼] to continue the setting.
- ③ Push [MENU]/[菜单] to exit the "SERVICE MAN" menu.

SERVICE MAN	
中文	ENGLISH
<b>TIMING ADJ.</b>	OUTPUT VOLTAGE 30.0
HDG ADJ. 0.0°	HV 340
SPD ADJ. 24000	MONITOR 75
SETUP MEMORY RECALL	HEATER 0.55
SAVE	MG 3.0
	TX TIME
	5731.0H
RANGE	1/8 3/4 2 6 16 36 72
	1/4 1 3 8 24 48
	1/2 1.5 4 12 32 64

### ◇ TIMING ADJ.

- Corrects the distance.

### ◇ HDG ADJ.

- Adjusts the electronic heading line adjustment.

### ◇ SPD ADJ.

- Enter the pulse rate of the speed sensor.

### ◇ RANGE

- 1/8, 1/4, 1/2, 3/4, 1, 1.5, 2, 3, 4, 6, 8, 12, 16, 24, 32, 36, 48\*, 64†, 72† : Choose the selectable screen range.

\*MR-1200TII/TIII

†MR-1200TIII only

### ◇ SETUP MEMORY

- The present value is displayed by pushing [▶], then select the desired item from "RECALL" and "SAVE" using [▼].

- ① Push [▶] to display "RECALL" and "SAVE".
- ② Push [▲] or [▼] to select "RECALL" or "SAVE".
- ③ Push [▶].
  - "SURE ?" is displayed.
- ④ Push [▶] to perform.
- ⑤ Push [▶] to cancel.

- When recall is performed without saving a setup, it will become an initial value at the time of factory shipments.

### ◇ Other readouts

- OUTPUT VOLTAGE:

Shows the voltage level for the scanner unit from the display unit.

- HV (High voltage): Shows the voltage level in the high-voltage unit in the scanner unit.

- MONITOR: Shows the voltage level for checking the receiver unit operation.

- HEATER: Shows the heater current.

- MG: Shows the current level for the Magnetron.

- TX TIME: Shows the total transmitted time.

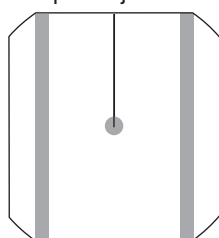
## ■ TIMING adjustment

The system cable length affects the sweep timing. When the cable length adjustment is not correct, a straight target is shown as a curved echo. Thus, a cable length adjustment is necessary.

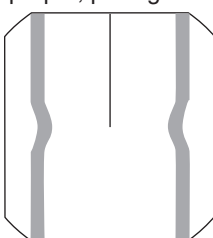
- ① Position your boat near a straight target such as breakwater, wharf, etc.
- ② Push [–]/[量程–] one or more times to select  $\frac{1}{8}$  or  $\frac{1}{4}$  NM range.

- ③ Push [TX (SAVE)]/[发射(节电)] to display the target on the screen.
- ④ Push [MENU]/[菜单] one or more times to select the “SERVICE MAN” menu.
- ⑤ Push [▼] one or more times to select “TIMING ADJ.”
- ⑥ Push [▶] to adjust the echo until it becomes straight. (see below)
- ⑦ Push [MENU]/[菜单] to return to the normal screen.

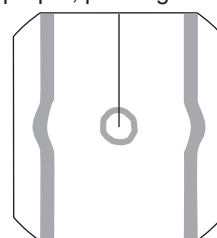
Proper adjustment



Improper, pulling inward



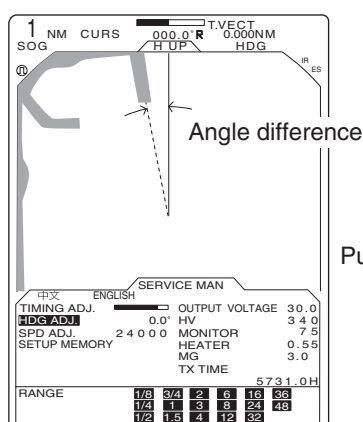
Improper, pushing outward



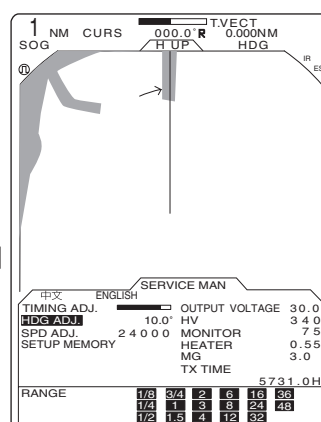
## ■ HDG adjustment

If the heading marker line differs from the exact bow direction, correct the heading marker line as follows. This function may be helpful when the scanner has not been mounted exactly in the line with the bow.

- ① Line up the bow of the boat with an identifiable target.
- ② Push [TX (SAVE)]/[发射(节电)] to display the target on the screen.
- ③ Push [MENU]/[菜单] one or more times to select the “SERVICE MAN” menu.
- ④ Push [▼] one or more times to select “HDG ADJ.”
- ⑤ Push [◀] or [▶] to adjust, until the target matches the heading marker. (the difference can be read out on the menu screen)
- ⑥ Push [MENU]/[菜单] to return to the normal screen.



Push [◀] or [▶]



■ SPD adjustment

- ① Push [MENU]/[菜单], [▼] and [▶] one or more times to display the “SERVICE MAN” menu.
- ② Hold down [▼] until the “SPD ADJ.” section becomes highlighted.
- ③ Push [◀] or [▶] to enter the pulse rate of the speed sensor unit (pulse numbers per one nautical mile).
- ④ Push [MENU]/[菜单] to return to the normal screen.

■ RANGE selection

中文		ENGLISH		SERVICE MAN	
TIMING ADJ.				OUTPUT VOLTAGE	30.0
HDG ADJ.		0.0°		HV	3 4 0
SPD ADJ.	2 4 0 0 0			MONITOR	7 5
SETUP MEMORY				HEATER	0.55
				MG	3.0
				TX TIME	
					5 7 3 1.0 H
RANGE	1/8	3/4	2	6	16 36 72
	1/4	1	3	8	24 48
	1/2	1.5	4	12	32 64

\*1/4 NM range will be skipped.

- ① Push [MENU]/[菜单], [▼] and [▶] to display the “SERVICE MAN” menu.
- ② Hold down [▼] until the “RANGE” section becomes highlighted.
- ③ Push [▲] or [▼] to choose the selectable screen ranges with [ + ]/[量程+] or [ - ]/[量程-] on the display.
- ④ Push [◀] to skip from the range selection, or push [▶] to cancel skipping.
- ⑤ Push [MENU]/[菜单] to return to the normal screen.

Selectable ranges: 1/8, 1/4, 1/2, 3/4, 1, 1.5, 2, 3, 4, 6, 8, 12, 16, 24, 32, 36, 48\*, 64†, 72† (NM)

\*48 NM range is available for the MR-1200TII/TIII.

†64 and 72 NM ranges are available for the MR-1200TIII only.

# 11 ERROR MESSAGE

## ■ Error message list

Message	Condition
BRG INPUT FAIL * <sup>1</sup> 输入包围不良	• The Azimuth signal is interrupted. An alarm sounds within 5 seconds and the display reverts to H UP mode in approximately 1 minute.
TRIG SIGNAL FAIL * <sup>1</sup> 触发信号不良	• If the TRIGGER signal is interrupted for more than 15 seconds, an alarm sounds.
SHM SIGNAL FAIL * <sup>2</sup> 船首线信号不良	• If the SHM signal is interrupted for more than 15 seconds, an alarm sounds.
POSN INPUT FAIL * <sup>1</sup> 船位输入不良	• If the position signal is interrupted for more than 15 seconds, an alarm sounds.
CHECK SCANNER CONNECTION * <sup>4</sup> 检查天线接触	• The system cable may not be properly connected.

\*<sup>1</sup> Push any key to cancel the error message and beep tone. Turn OFF the power, then check the external data cable connection.

\*<sup>2</sup> An electricity failure may occur, turn OFF the power, then consult your dealer or service person.

\*<sup>3</sup> Push any key to cancel the error message and beep tone.

\*<sup>4</sup> Turn OFF the power, then check the system cable connections.

## ■ AIS error message list

An error message is displayed when a system error is received from the AIS unit.  
See the AIS unit instructions for details.

(Some examples)

Message contents
AIS: TX MALFUNCTION
AIS: ANTENNA VSWR EXCEEDS LIMIT
AIS: RX CHANNEL 1 MALFUNCTION
AIS: RX CHANNEL 2 MALFUNCTION
AIS: RX CHANNEL 70 MALFUNCTION
AIS: GENERAL FAILURE
AIS: MKD CONNECTION LOST
AIS: EXTERNAL EPFS LOST
AIS: NO SENSOR POSITION IN USE
AIS: NO VALID SOG INFORMATION
AIS: NO VALID COG INFORMATION
AIS: HEADING LOST/INVALID
AIS: NO VALID ROT INFORMATION

Only the first 29 digits of the error message are displayed. If the message is longer than 30 digits, “...” is displayed after the 29th digit.

Continued, reliable operation of the radar depends on how you care for it. The simple maintenance tips that follow can help you save time and money, and avoid premature equipment failure.

## ■ Periodic maintenance

⚠ **WARNING! BE SURE** [POWER]/[电源开关] is **OFF** before performing any maintenance.

- ① Keep the equipment as clean as possible.
  - Use a soft cloth to remove dirt, dust and water.
- ② Check all hardware for loose screws, bolts, etc.
- ③ Check cables and terminal connections.

## ■ Scanner unit maintenance

⚠ **WARNING! BE SURE** [POWER]/[电源开关] is **OFF** whenever you are working with the scanner unit.

### ◇ Cleaning

- ① Wipe the surface of the scanner with a clean soft cloth.
  - **DO NOT** use harsh solvents such as benzine or alcohol.
- ② Check that there is no dirt or caked-on salt.
  - A heavy deposit of dirt or caked-on salt on the painted surface of the upper scanner unit will cause a considerable drop in radar performance.
- ③ Check for cracks or deterioration of the rubber packing and replace it if necessary.

### ◇ Painting (MR-1200TII/TIII)

To prevent the corrosion, paint the surface of the scanner body (except the antenna unit) twice a year or more.

### ◇ Mounting

Check the mounting bolts of the scanner unit and tighten if necessary.

## ■ Display unit maintenance

⚠ **WARNING! BE SURE** the power is **OFF** before working on the radar.

### ◇ Cleaning

Dirt on the LCD will, in time, leave a film of contaminants which tend to dim the picture.

- ① Wipe the surface of the display unit with a clean soft cloth.
  - **DO NOT** use strong solvents such as benzene or alcohol.
- ② If the picture is still dim, clean the LCD screen.

## ■ Options

- **OPC-2339 SYSTEM CABLE** (for only MR-1200RII)  
Allows you to install the display unit and scanner up to 20 m (65.6 ft) apart.
- **OPC-2340 SYSTEM CABLE**  
Allows you to install the display unit and scanner up to 30 m (98.4 ft) apart.

# 13 SPECIFICATIONS

## ◇ General

- Minimum range: 25 m; 82 ft (when measurement range is  $\frac{1}{8}$  NM)
- Maximum range: 36 NM (MR-1200RII; when measurement range is 36 NM)  
48 NM (MR-1200TII; when measurement range is 48 NM)  
72 NM (MR-1200TIII; when measurement range is 72 NM)
- Measurement range:  $\frac{1}{8}$ ,  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1, 1.5, 2, 3, 4, 6, 8, 12, 16, 24, 32, 36, 48\*, 64<sup>†</sup>, 72<sup>†</sup> (NM) \*only MR-1200TII/TIII, <sup>†</sup>MR-1200TIII
- Preheat time: 90 seconds
- Connection length between display and scanner unit: 15 m; 49.2 ft (MR-1200RII),  
20 m; 65.6 ft (MR-1200TII/TIII, optional for MR-1200RII),  
30 m; 98.4 ft (optional)

## ◇ Display unit

- LCD display: 12.1-inch TFT LCD display
- Pixels: 600×800 dot
- LCD mounting: Vertical
- Input: NMEA 0183 format (for navigation receiver),  
N+1 format (fluxgate compass sensor),  
AUX,  
IEC61162-2 format (for AIS unit)
- Output: NMEA 0183 format
- Power supply requirement: 10.2 to 42 V DC
- Power consumption (at zero wind velocity): Approximately 60 W (MR-1200RII)  
Approximately 70 W (MR-1200TII)  
Approximately 80 W (MR-1200TIII)
- Usable temperature range: -15°C to +55°C; +5°F to 131°F
- Dimensions (Mounting bracket is included): 300 (W)×323 (H)×119.2 (D) mm,  
(Projections are not included) 11.8 (W)×12.7 (H)×4.7 (D) in
- Weight (Mounting bracket is included): Approximately 4.3 kg; 9.5 lb

## ◇ Scanner unit

### ◆ EX-2714 (Radome)

- Type: 60 cm (2 ft.) Slotted Waveguide Array, enclosed in a radome.
- Rotation speed (typical): 24 rpm, 36 rpm
- Beam width (typical): Horizontal beam 4°  
Vertical beam 22°
- Side lobe (typical): -22 dB
- Polarization: Horizontal
- Transmission frequency: 9410 MHz  $\pm$ 30 MHz P0N
- Peak output power: 4 kW
- Pulse width: 80 ns/2160 Hz, 80 ns/1440 Hz, 250 ns/1440 Hz, 350 ns/1440 Hz, 350 ns/720 Hz, 900 ns/720 Hz
- Mixer and Local Oscillator: Microwave Integrated Circuit
- Transmitting Tube: Magnetron MAF1421B
- Modulator: FET switching
- Duplexer: Circulator
- Tuning system: Automatic/manual selectable
- Intermediate frequency: 60 MHz
- IF Band width: 10 MHz, 3 MHz
- Dimensions: 640 (W) $\times$ 256 (H) $\times$ 640 (D) mm, 25.2 (W) $\times$ 10.1 (H) $\times$ 25.2 (D) in
- Usable temperature range: -25°C to +70°C; -13°F to 158°F
- Relative Humidity: Less than 95% at 40°C (+104°F)
- Weight: Approximately 8 kg; 17.5 lb (without cable)

### ◆ EX-2780 (Open array)

- Type: 120 cm (4 ft.) Slotted Waveguide Array
- Rotation speed (typical): 22 rpm (MR-1200TIII only), 24 rpm, 36 rpm
- Beam width (typical): Horizontal beam 2°  
Vertical beam 25°
- Side lobe (typical): -24 dB
- Polarization: Horizontal
- Transmission frequency: 9410 MHz  $\pm$ 30 MHz P0N
- Peak output power: 4 kW (MR-1200TII), 6 kW (MR-1200TIII)
- Pulse width: 80 ns/2160 Hz, 80 ns/1440 Hz, 250 ns/1440 Hz, 350 ns/1440 Hz, 350 ns/720 Hz, 900 ns/720 Hz, 900 ns/660 Hz\*  
\*only MR-1200TIII
- Mixer and Local Oscillator: Microwave Integrated Circuit
- Transmitting Tube: Magnetron MAF1421B (MR-1200TII)  
MAF1422B (MR-1200TIII)
- Modulator: FET switching
- Duplexer: Circulator
- Tuning system: Automatic/manual selectable
- Intermediate frequency: 60 MHz
- IF Band width: 10 MHz, 3 MHz
- Diameter of rotation/height: 1205/381 mm; 474/15 in
- Usable temperature range: -25°C to +70°C; -13°F to 158°F
- Relative Humidity: Less than 95% at 40°C (+104°F)
- Weight: Approximately 17 kg; 37.4 lb (without cable)

# 14 EXTERNAL DATA LIST

The following external bearing, speed, position and waypoint data is (are) required , when you use the radar functions.

			EXTERNAL DATA INPUT				
			[NMEA1]*2 connector		[NMEA2]*2 connector		
			"HDG", "HDM", "HDT"	"VDM", "ALR"*3	"RMC", "GGA", "GLL", "GNS", "VTG", "WPL", "BWC"		
			N+1, AUX		LOG		
FUNCTION		DISPLAY	BEARING	AIS	SPEED	POSITION	WAYPOINT
HEAD UP		HU					
COURSE UP		CU	Required				
NORTH UP		NU	Required				
TRUE MOTION	OG*1	TM	Required			"RMC", "GGA", "GLL" or "GNS"	
	TW*1	TM	Required		LOG		
SPEED DISPLAY	OG*1	SOG			"RMC" or "VTG"		
	TW*1	STW			LOG		
HEADING BEARING		HDG	Required				
WAYPOINT		WPT	Required			"RMC", "GGA", "GLL" or "GNS"	"WPL" or "BWC"
OWN VECTOR	OG*1		Required		"RMC" or "VTG"		
	TW*1		Required		LOG		
MOB		MOB	Required			"RMC", "GGA", "GLL" or "GNS"	
ATA	OG*1	ATA	Required		"RMC" or "VTG"		
	TW*1	ATA	Required		LOG		
VRM/WPT/MOB estimated time of arrival	OG*1				"RMC" or "VTG"		
	TW*1				LOG		
MAGNETIC VARIATION (AUTO)					"RMC" or "VTG"		
TLL			Required			"RMC", "GGA", "GLL" or "GNS"	
AIS (Display only)		AIS	Required	"VDM"		"RMC", "GGA", "GLL" or "GNS"	
AIS (CPA/TCPA Alarm)	OG*1	AIS	Required	"VDM"	"RMC" or "VTG"	"RMC", "GGA", "GLL" or "GNS"	
	TW*1	AIS	Required	"VDM"	LOG	"RMC", "GGA", "GLL" or "GNS"	
Alarm status*4				"ALR"			

			EXTERNAL DATA OUTPUT			
					[NMEA2]*2 connector	
					"RMC", "GGA", "GLL", "VTG", "TTM" "TLL", "RSD"	

\*1 G; Over ground, TW; Through the water

\*2 [NMEA1] and [NMEA2] connectors; see page 28.

\*3 AIS input also receives "RMC", "GGA", "GLL", "VTG" and "GNS" sentences.

If the NMEA2 input does not receive these, the sentences from the AIS input are used.

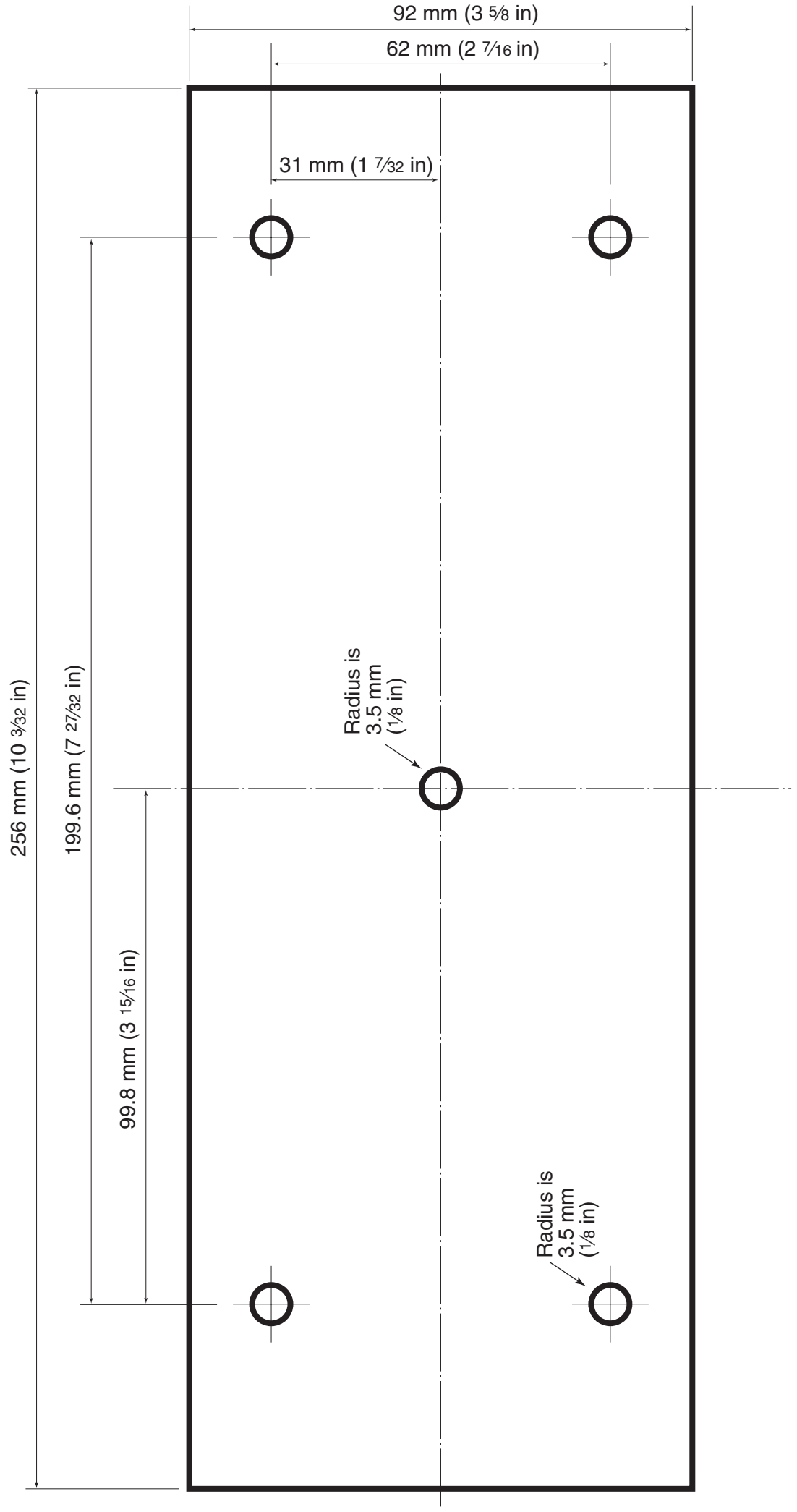
\*4 The system error is displayed from the AIS unit.

- "HDG", "HDM", "HDT", "RMC", "GGA", "GLL", "GNS", "VTG", "WPL", "BWC", "TTM", "TLL" and "RSD" are SENTENCES of the NMEA0183.

- If BRG INPUT is set to "GPS", "RMC" of [NMEA2] connector or COG (Course Over the Ground) of "VTG" a bow it receives as a direction, even if there is no direction information (compass etc.) in [NMEA1] connector, the screen display of the North rise etc. is possible.

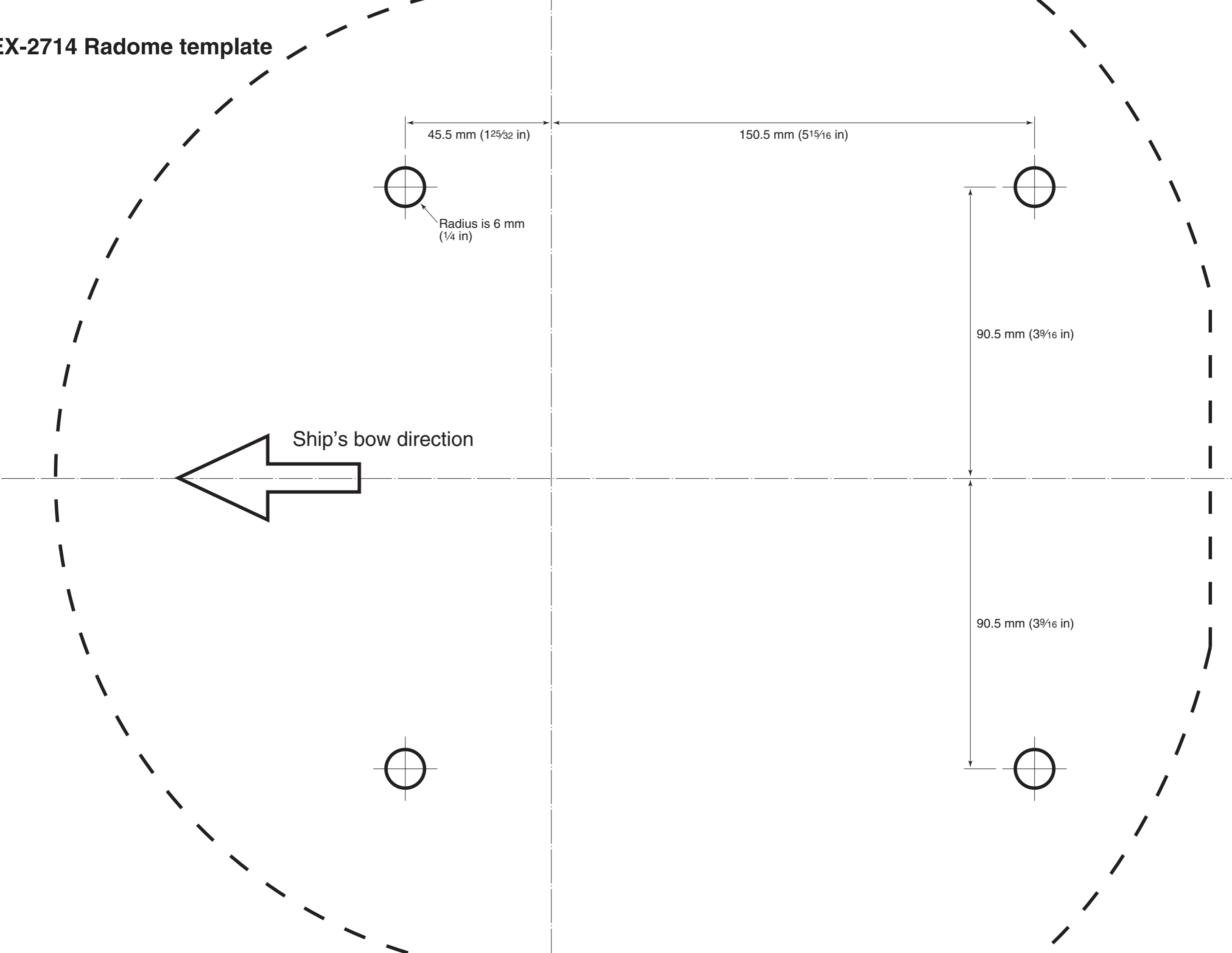
However, direction accuracy falls when the speed of a ship is set to 2 knots or less, or when exceeding 3 knots a bow it does not receive as direction data. Moreover, the influence of measurement position accuracy or a current an actual bow it may differ from a direction.

- SX-3230**  
**Display mounting bracket template**



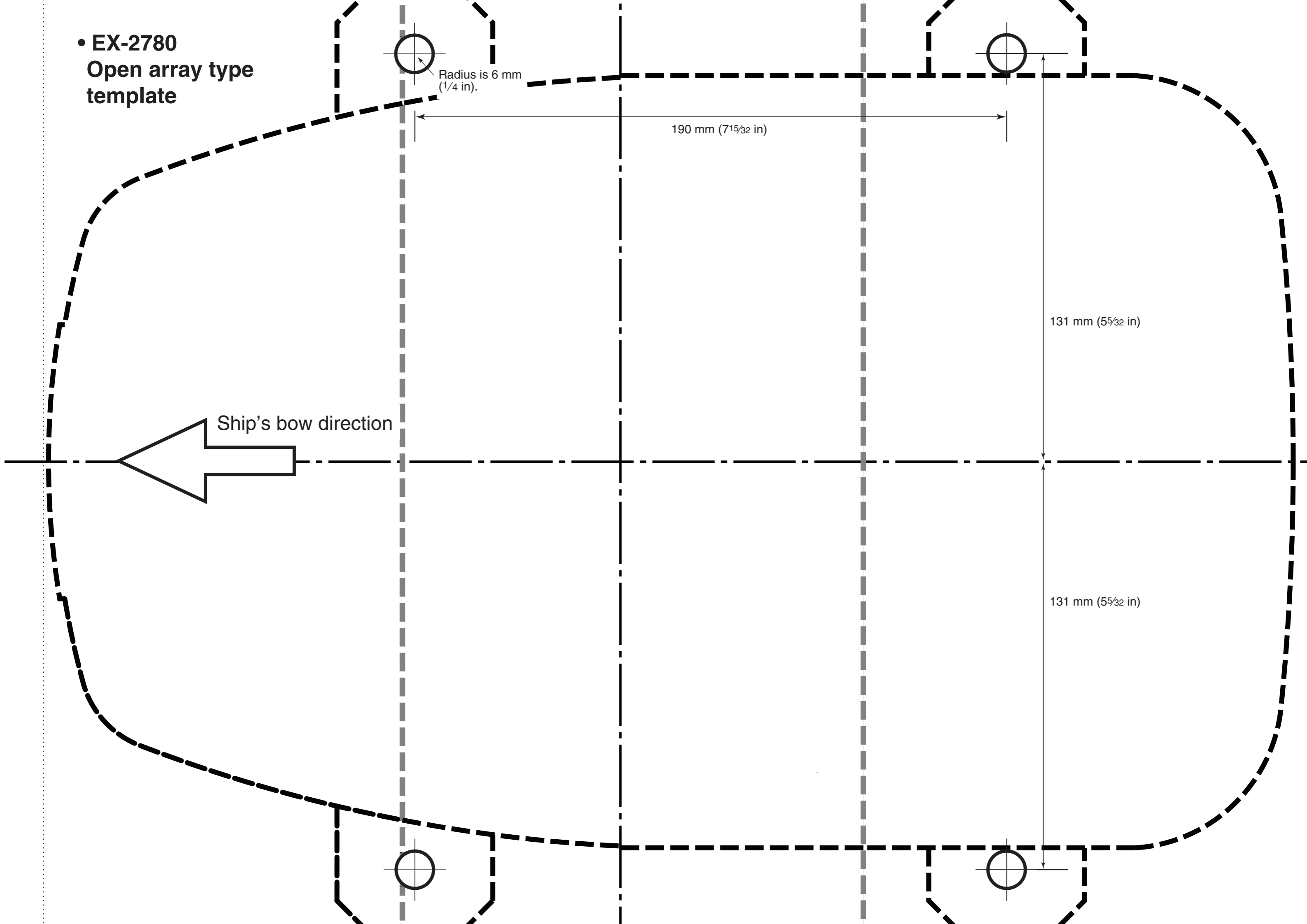


• EX-2714 Radome template





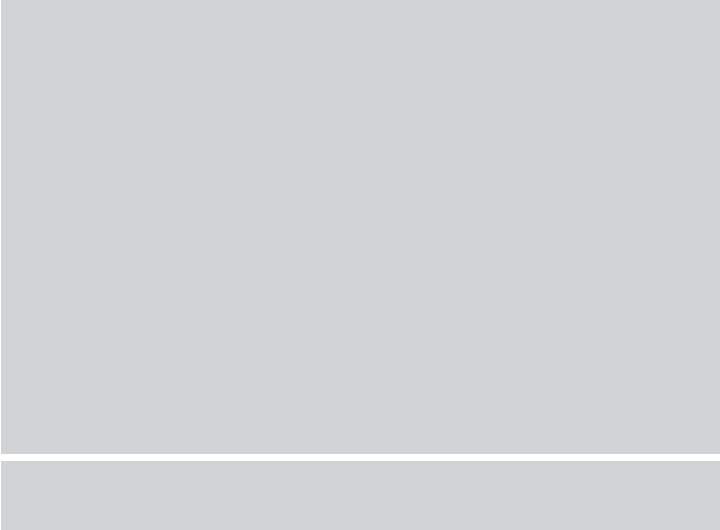
• EX-2780  
Open array type  
template







Count on us!



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