FURUNO

OPERATOR'S MANUAL

MARINE RADAR

MODEL MODEL 1623

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

PRINTED IN JAPAN

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Your Local Agent/Dealer

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PUB.No. OME-35100

MODEL1623

OME35100Z00

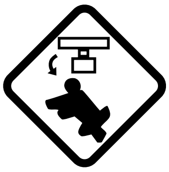
⚠ SAFETY INSTRUCTIONS

Safety Instructions for the Operator

⚠ WARNING

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

Only qualified personnel should work inside the equipment.



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

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

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

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

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

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

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

⚠ WARNING

Use the proper fuse.

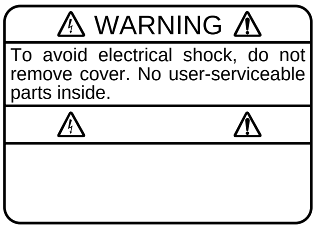
Use of a wrong fuse can damage the equipment and void the warranty.

Keep heater away from equipment.

Heat can alter equipment shape and melt the power cord, which can cause fire or electrical shock.

NOTICE

A warning label is attached to the equipment. Do not remove the label. If the label is missing or damaged, contact a FURUNO agent or dealer.



⚠ WARNING ⚠

To avoid electrical shock, do not remove cover. No user-serviceable parts inside.

⚠ ⚠

Name: Warning Label (1)
Type: 86-003-1011-0
Code No.: 100-236-230

Safety Instructions for the Installer

⚠ WARNING

Do not open the equipment unless totally familiar with electrical circuits and service manual.

ELECTRICAL SHOCK HAZARD

Only qualified personnel should work inside the equipment.

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

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

Construct a suitable service platform from which to install the antenna unit.

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

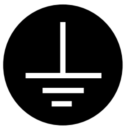
Be sure that the power supply is compatible with the voltage rating of the equipment.

Connection of an incorrect power supply can cause fire or damage the equipment.

Use only the specified power cable.

Fire or equipment damage can result if a different cable is used.

NOTICE



Ground the equipment to prevent mutual interference.

Observe the following compass safe distances to prevent interference to a magnetic compass:

	Standard compass	Steering compass
Display unit	TBA	TBA
Antenna unit	TBA	TBA

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SPECIFICATIONS

OUTLINE DRAWINGS
INTERCONNECTION DIAGRAM
SCHEMATIC DIAGRAMS

FOREWORD

A Word to the Owner of the MODEL 1623

Congratulations on your choice of the MODEL 1623 Marine Radar.

For over 50 years FURUNO Electric Company has enjoyed an enviable reputation for innovative and dependable marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

Your radar is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless installed, operated and maintained properly. Please carefully read and follow the recommended procedures for installation, operation, and maintenance.

We would appreciate hearing from you, the end-user, about whether we are achieving our purposes.

Thank you for considering and purchasing FURUNO equipment.

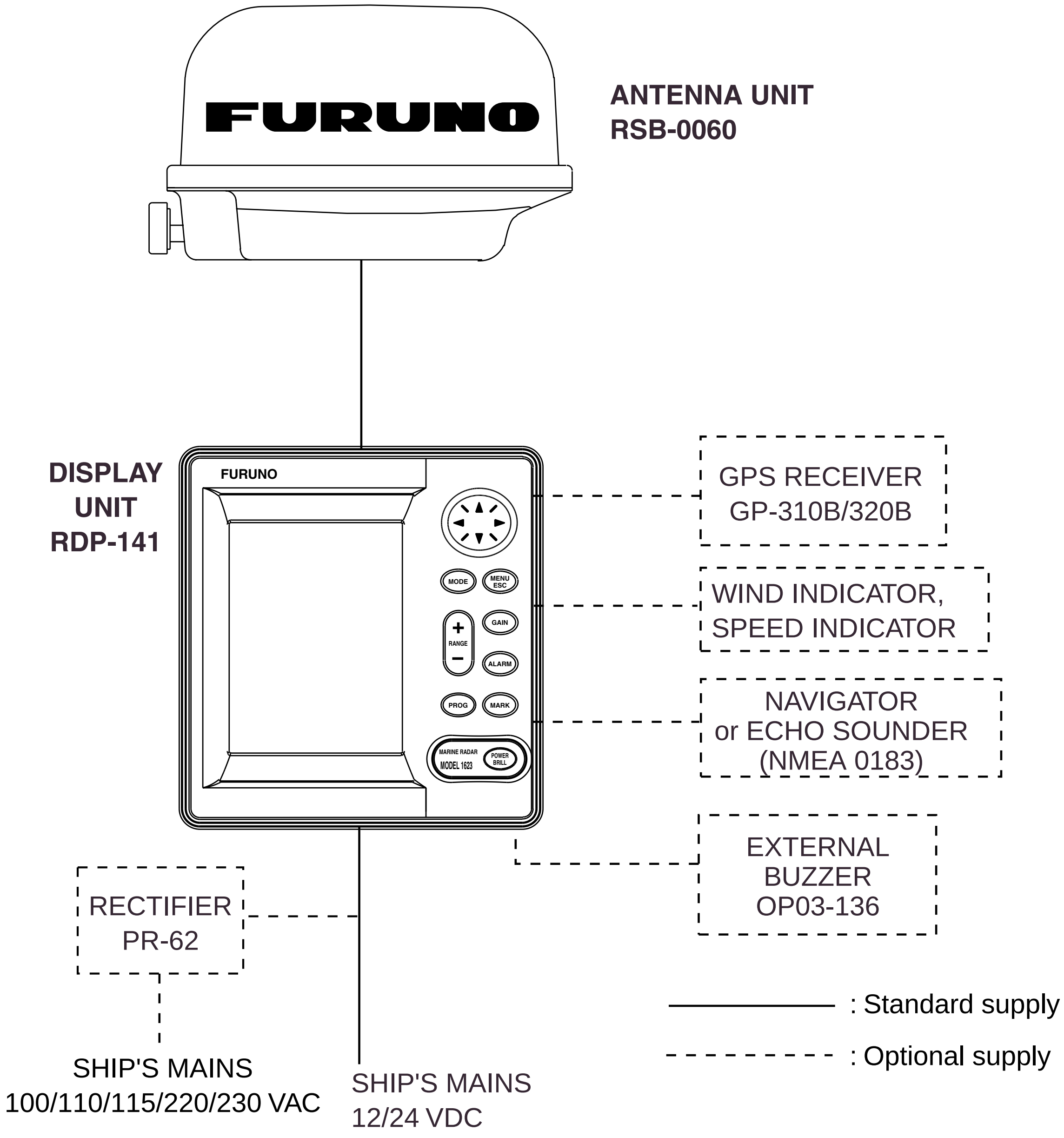
Features

Your radar has a large variety of functions, all contained in a rugged plastic case. All controls respond immediately to the operator’s command and each time a key is pressed the corresponding change can be seen on the screen.

The main features of the MODEL 1623 are

- Daylight viewing radar specially designed for small craft and sailing yachts.
- Traditional FURUNO reliability and quality in a compact, light-weight and low-cost radar.
- Compact and light-weight radome antenna with precision 34 cm center-fed radiator.
- High definition 6-inch monochrome LCD display.
- Automatic control of sensitivity (gain), tuning and A/C SEA for simplified operation.
- Targets can be displayed in grey tones on a white background or vice versa, for optimal viewing under any lighting conditions.
- On-screen alphanumeric readout of all operational information.
- User programmable data displays.
- [PROG] key provides menu shortcut.
- Standard features include Display Shift, EBL, Echo Stretch, Echo Trail, Guard Alarm, Interference Rejector, VRM, Zoom.
- Guard zone watches for targets entering (or exiting) a guard zone.
- Operates on 12 V or 24 V DC power.

SYSTEM CONFIGURATION


FURUNO
ANTENNA UNIT
RSB-0060
DISPLAY
UNIT
RDP-141
FURUNO
MODE
MENU ESC
GAIN
RANGE
ALARM
PROG
MARK
MARINE RADAR
MODEL 1623
POWER BRILL
GPS RECEIVER
GP-310B/320B
WIND INDICATOR,
SPEED INDICATOR
NAVIGATOR
or ECHO SOUNDER
(NMEA 0183)
EXTERNAL
BUZZER
OP03-136
RECTIFIER
PR-62
SHIP'S MAINS
100/110/115/220/230 VAC
SHIP'S MAINS
12/24 VDC
: Standard supply
: Optional supply

EQUIPMENT LISTS

Standard supply

Name	Type	Code No.	Qty	Remarks
Antenna Unit	RSB-0060	–	1	
Display Unit	RDP-141	–	1	
Installation Materials			1 set	
Spare Parts	SP03-09800	000-085-441	1 set	Fuses (2 pcs.)

Installation Materials

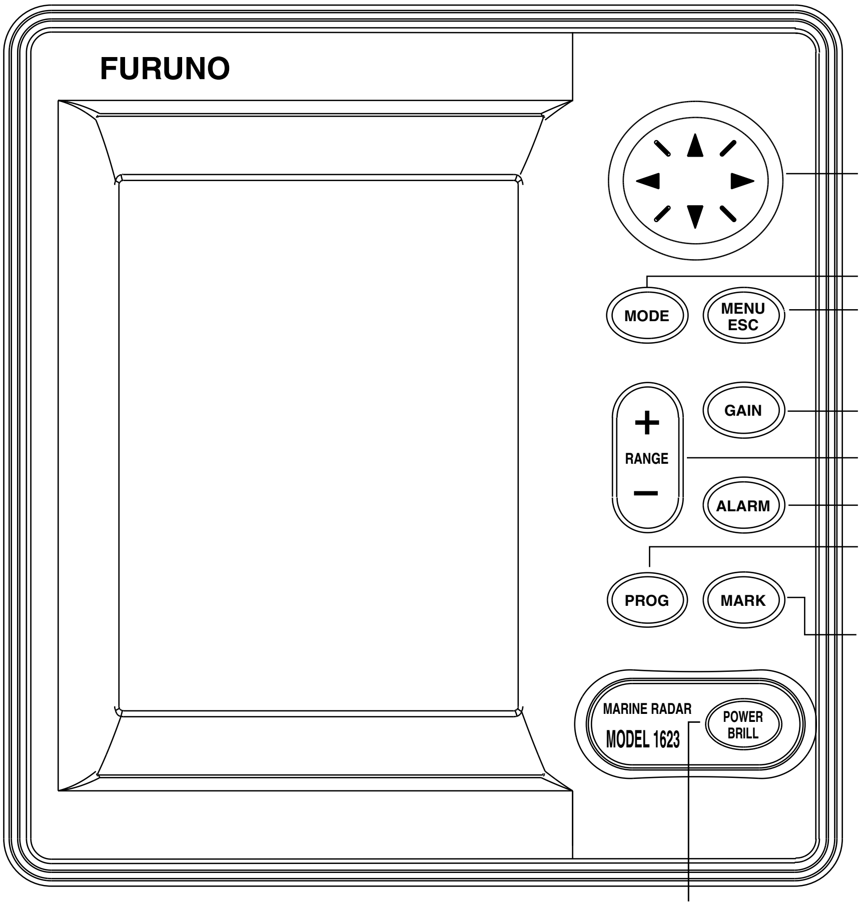
Name	Type	Code No.	Qty	Remarks
Antenna Cable (10 m)	MJ-A10SPF-0003-100		1	
Antenna Cable (15 m)	MJ-A10SPF-0009-150			
Antenna Cable (20 m)	MJ-A10SPF-0009-200			
Power Cable Assy.	MJ-A3SPF-0013-035		1	Connector, fuse, 3.5 m
Hex Head Bolt	M10X25	000-862-308	4	For antenna unit
Dummy Film	03-118-1103-0	100-185-380	1 set	For display unit
Tapping Screw	5X20	000-802-081	4	For display unit
EMI Core	RFC-10	000-141-085	1	For antenna cable
Washer Head Screw	M4X15	000-881-448	1	For antenna cable
Fixing Band	03-146-0101-0	100-277-850	1	For antenna cable

Optional Equipment

Name	Type	Code No.	Qty	Remarks
NMEA Cable Assy.	MJ-A6SPF0003-050	000-117-603	1	Connector at a end, 5 m
NMEA Distribution Cable Assy.	MJ-A15A7F0004-005	000-145-690	1	
Antenna Cable Assy.	03S9175	000-130-034	1	Connector at one end, 24 V spec. only.
Radome Mounting Bracket	OP03-93	008-445-080	1	For sailboat
External Buzzer	OP03-136	000-086-443	1	Connector at one end, 1 m
Rectifier	PR-62	000-013-484	1	100 VAC
	PR-62	000-013-485		110 VAC
	PR-62	000-013-486		220 VAC
	PR-62	000-013-487		230 VAC

1. OPERATION

1.1 Controls


FURUNO
MODE
MENU ESC
GAIN
+
RANGE
−
ALARM
PROG
MARK
MARINE RADAR
MODEL 1623
POWER BRILL

Cursor Pad
Chooses menu items;
adjusts VRM, EBL and cursor.

Chooses display mode.

Opens/closes menu;
escapes from current
operation.

Adjusts gain.

Chooses radar range.

Enables/disables guard alarm.

Displays user-programmed
pop-up window.

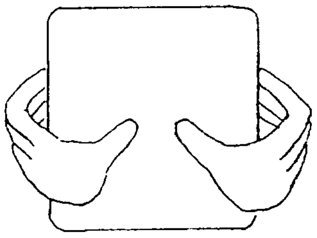
Displays Mark menu to
adjust EBL and VRM;
output cursor latitude and
longitude position to a
navigator.

Long press: Turns power on/off.
Momentary press: Adjusts display contrast and brilliance.

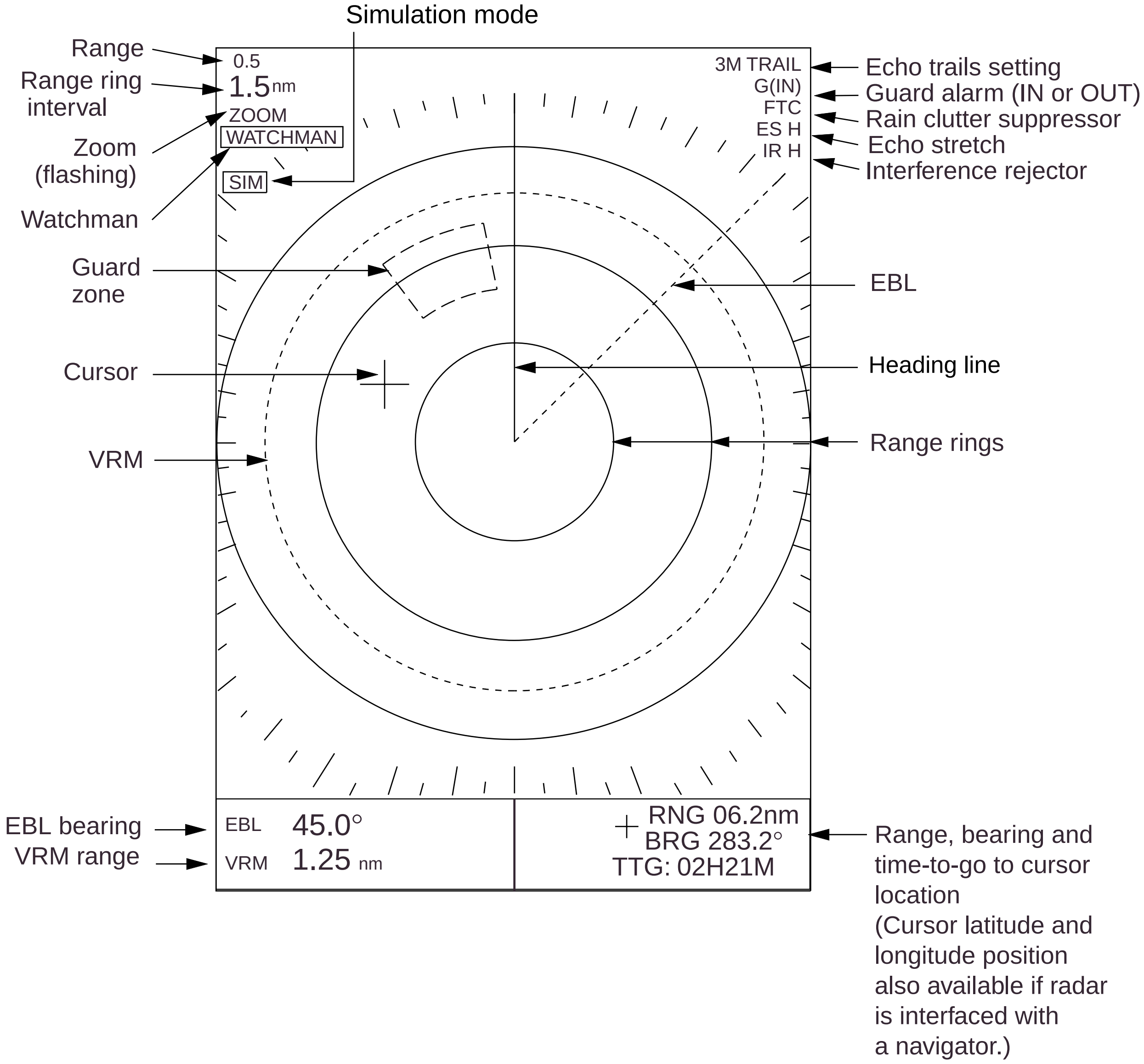
Display unit

How to remove the hard cover

Place your thumbs at the center of the cover, and then lift the cover while pressing it with your thumbs.



1.2 Indications

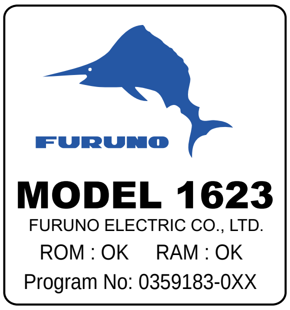

Simulation mode
Range
Range ring interval
Zoom (flashing)
Watchman
Guard zone
Cursor
VRM
0.5
1.5nm
ZOOM
WATCHMAN
SIM
3M TRAIL
G(IN)
FTC
ES H
IR H
Echo trails setting
Guard alarm (IN or OUT)
Rain clutter suppressor
Echo stretch
Interference rejector
EBL
Heading line
Range rings
EBL bearing
VRM range
EBL 45.0°
VRM 1.25 nm
RNG 06.2nm
BRG 283.2°
TTG: 02H21M
Range, bearing and time-to-go to cursor location
(Cursor latitude and longitude position also available if radar is interfaced with a navigator.)

Indications

1.3 Turning Power On/Off

Press the [POWER/BRILL] key more than one second to turn on the power. The unit beeps, the startup screen appears, and then the equipment checks the ROM and RAM for proper operation and displays program number.

Note: The ROM and RAM check shows OK or NG (No Good). If NG appears, try to press any key except the [POWER/BRILL] key to start operation. However, the equipment may not work properly. Contact your dealer for advice.



MODEL 1623
FURUNO ELECTRIC CO., LTD.
ROM : OK RAM : OK
Program No: 0359183-0XX

XX = Program version no.

Startup screen

After the completion of the startup test, a timer displays the time remaining for warm up of the magnetron (the device which transmits radar pulses), counting down from 1:00 to 0:00.

To turn off the power, press and hold down the [POWER/BRILL] key until the screen goes blank. The time remaining until power is turned off is counted down on the screen.

Quick Start

Provided that the radar was once in use with the magnetron still warm, you can put the radar into TRANSMIT status without the one-minute stand-by.
If the power switch was turned off by mistake and you want to restart the radar promptly do the following:

1. Press the [POWER/BRILL] key not later than five seconds after power-off.
2. Press the [MODE] key to put the radar into TRANSMIT status.

Note: The example screens shown in this manual may not match the screens you see on your display. The screen you see depends on your system configuration and equipment settings.

1.4 Transmitting, Standby

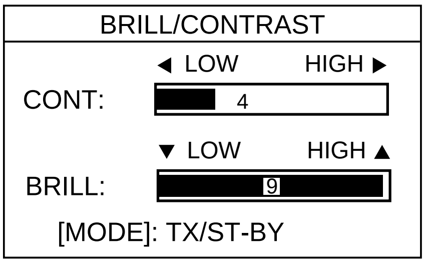
After the power is turned on and the magnetron has warmed up, “ST-BY” (Stand-By) appears at the screen center, indicating the radar is ready to transmit radar pulses.

Use the [MODE] key to toggle between transmit and standby. Echoes appear in four levels of digitized video according to echo strength. When a target is beneath a marker (VRM, EBL, heading line, range ring) the part of the marker where the target lies is displayed in reverse video.

Note: If you press the [MODE] key before ST-BY appears, the buzzer sounds and the radar does not transmit pulses. Wait until ST-BY appears.

1.5 Adjusting Display Contrast, Brilliance

1. Press the [POWER/BRILL] key momentarily to show the brilliance/contrast adjustment window.



BRILL/CONTRAST
◀ LOW HIGH ▶
CONT: 4
▼ LOW HIGH ▲
BRILL: 9
[MODE]: TX/ST-BY

Brilliance/contrast adjustment window

2. Press ◀ or ▶ to adjust contrast.
3. Press ▲ or ▼ to adjust brilliance.
4. Press the [MODE] key to escape.

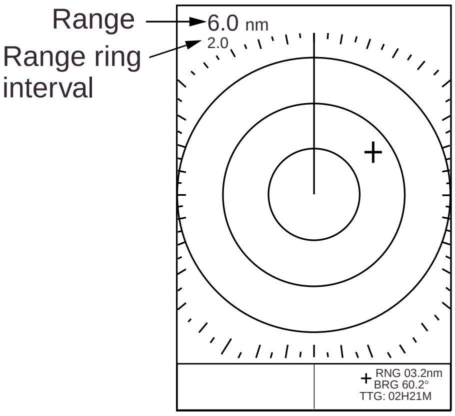
Note 1: Windows other than those on menus are erased when there is no operation within about seven seconds.

Note 2: When the power is reapplied after turning off the equipment with minimum brilliance, the radar starts up with minimum brilliance, after the initial start up. Adjust the brilliance as necessary.

1.6 Choosing the Range

The range selected automatically determines the range ring interval, the number of range rings and pulse repetition rate.

Press the [RANGE+] or [RANGE-] key to select a range. The range and range ring interval appear at the top left corner on the screen.



Location of range and range ring interval indications

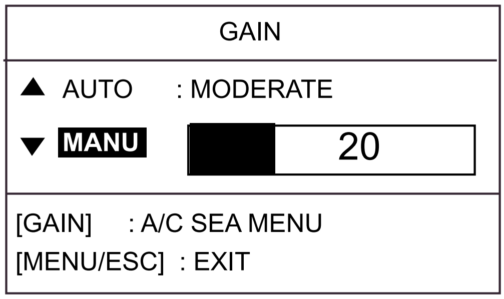
1.7 Receiver Sensitivity

The [GAIN] key adjusts the sensitivity of the receiver. It works in precisely the same manner as the volume control of a broadcast receiver, amplifying the signals received.

You can adjust the sensitivity manually, or let the unit do it automatically. In either case, the proper setting is such that the background noise is just visible on the screen. For manual adjustment, use the highest range since the background noise is clearer.

If you set up for too little sensitivity, weak echoes may be missed. On the other hand excessive sensitivity yields too much background noise; weak targets may be missed because of the poor contrast between desired echoes and the background noise on the display.

1. Press the [GAIN] key once or twice to show the display below.



GAIN

▲ AUTO : MODERATE

▼ MANU 20

[GAIN] : A/C SEA MENU

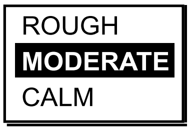
[MENU/ESC] : EXIT

Gain adjustment window

2. Use ▲ or ▼ to choose AUTO or MANU as appropriate.
3. Do one of the following depending on the choice you made at step 2.

Automatic adjustment

a) Press ► to open the automatic gain options window.



ROUGH

MODERATE

CALM

Automatic gain options

b) Choose ROUGH, MODERATE or CALM depending on sea conditions.

c) Press ◄ to close the window.

Manual adjustment

While observing the screen and the tuning bar, use ◄ or ► to set the gain. The setting range is 0-100.

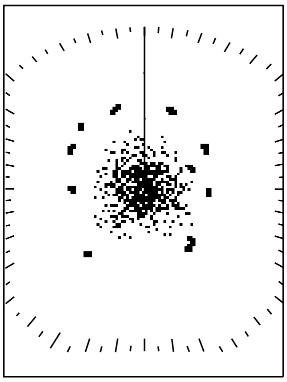
4. Press the [MENU/ESC] key to finish.

1.8 Suppressing Sea Clutter

In rough weather, returns from the sea surface, called sea clutter, are received over several miles around own ship and mask nearby targets. This situation can be improved by properly suppressing the sea clutter with the A/C SEA control.

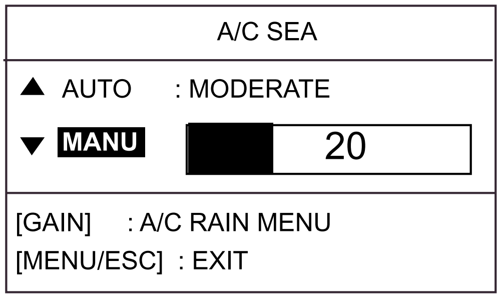
In most cases suppress the clutter until it has disappeared to leeward, but a little is still visible windward. If the setting is too low, targets will be hidden in the clutter, while if it is set too high, both sea clutter and targets will disappear from the display.

A common mistake is too over-suppress sea clutter so that the surface clutter is completely removed. You can see how dangerous this can be by setting up for maximum A/C SEA: A dark zone will be created near the center of the screen, causing a loss of close-in targets. This dark zone is even more dangerous if the sensitivity has not been properly adjusted. Always leave a little sea clutter visible on the screen. If no clutter is observed (on very calm waters), turn off the A/C SEA circuit.



Sea clutter at screen center

1. Press the [GAIN] key once or twice to show the display below.



A/C SEA

▲ AUTO : MODERATE

▼ **MANU** 20

[GAIN] : A/C RAIN MENU

[MENU/ESC] : EXIT

A/C SEA adjustment window

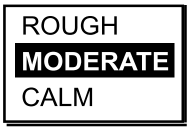
2. Use ▲ or ▼ to choose AUTO or MANU as appropriate.

⚠ **CAUTION**
The auto A/C SEA can erase weak targets.

3. Do one of the following depending on the choice you made at step 2.

Automatic adjustment

a) Press ► to open the automatic A/C SEA options window.



A/C SEA options

b) Choose ROUGH, MODERATE or CALM depending on sea conditions.

c) Press ◄ to close the window.

Manual adjustment

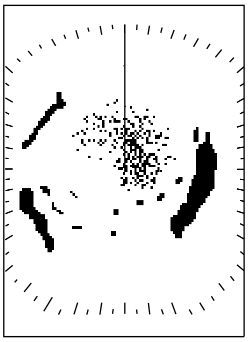
While observing the screen and the tuning bar, use ◄ or ► to set the A/C SEA. The setting range is 0-100.

4. Press the [MENU/ESC] key to finish.

1.9 Suppressing Rain Clutter

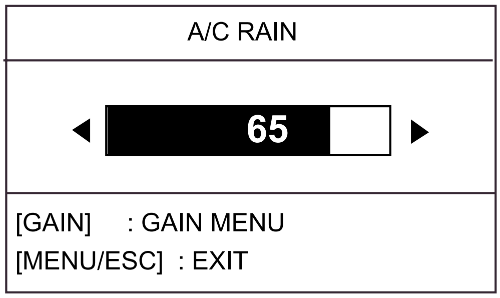
The vertical beamwidth of the antenna is designed to see surface targets even when the ship is rolling. However, by this design the antenna will also pick up rain clutter (rain, snow, or hail) in the same manner as normal targets. The illustration below shows the appearance of rain clutter on the display.

The A/C RAIN control adjusts the receiver sensitivity as the A/C SEA control does but rather in a longer time period (longer range). The higher the setting the greater the anti-clutter effect.



Rain clutter at screen center

1. Press the [GAIN] key once or twice to show the display below.



A/C RAIN

◄ 65 ►

[GAIN] : GAIN MENU
[MENU/ESC] : EXIT

A/C RAIN adjustment window

2. While observing the screen and the tuning bar, use ◄ or ► to adjust the A/C RAIN. The setting range is 0-100.
3. Press the [MENU/ESC] key to finish.

1.10 Measuring the Range

The bearing to a target can be measured by the range rings, by the cursor and by the VRM (Variable Range Marker).

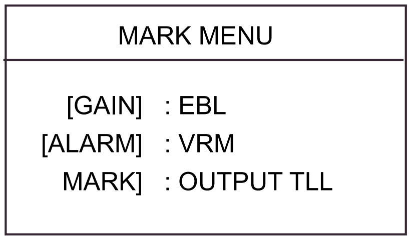
Measuring range by the range rings

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

Note: The range rings can be turned on or off with RINGS on page 1 of the System menu.

Measuring range by VRM

1. Press the [MARK] key to show the Mark menu.



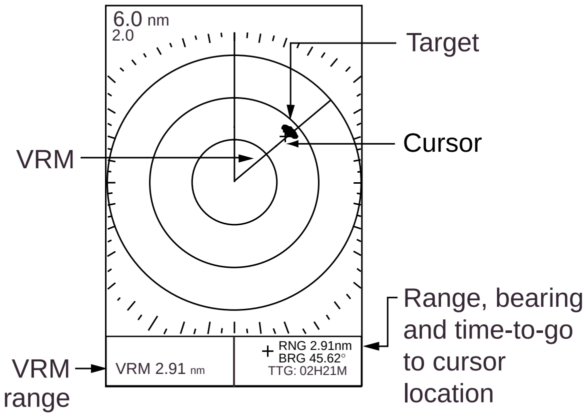
MARK MENU

[GAIN] : EBL
[ALARM] : VRM
MARK] : OUTPUT TLL

Mark menu

2. Press the [ALARM] key to display the VRM, which is a dashed line to distinguish it from the heading line. “VRM,” displayed in reverse video, appears at the bottom left corner.
3. Operate the cursor pad to place the VRM on the inside edge of the target.
4. Check the VRM readout at the bottom left corner on the screen to find the range to the target.

To fix the VRM on the screen, press the [MENU/ESC] key. To erase the VRM, press the [ALARM] key.



How to measure the range with the VRM and cursor

1.11 Measuring the Bearing

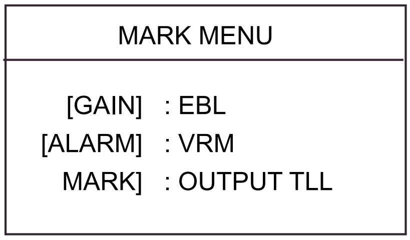
The bearing to a target can be measured with the cursor and the EBL (Electronic Bearing Line).

Measuring bearing with the cursor

Use the cursor pad to place the cursor on the inside edge of the target.

Measuring bearing with the EBL

1. Press the [MARK] key to show the Mark menu.



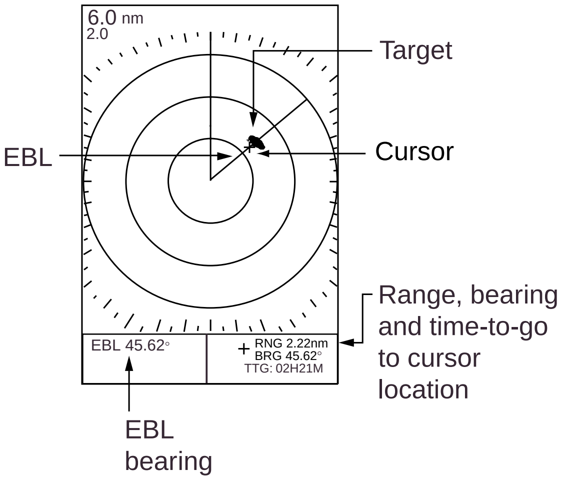
MARK MENU

[GAIN] : EBL
[ALARM] : VRM
MARK] : OUTPUT TLL

Mark menu

2. Press the [GAIN] key to show the EBL.
3. Operate the cursor pad to bisect the target with the EBL.
4. Check the EBL readout at the bottom left corner on the screen to find the bearing to the target.

To fix the EBL on the screen, press the [MENU/ESC] key. To erase the EBL, press the [GAIN] key.

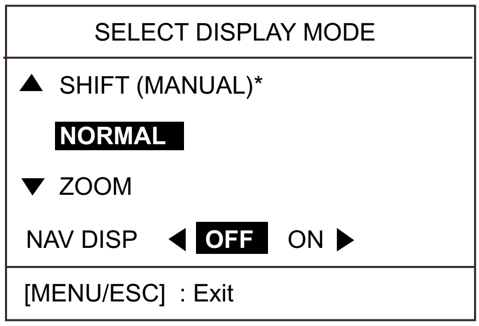


Measuring range by the EBL and cursor

1.12 Shifting the Display

Own ship position, or sweep origin, can be displaced manually or automatically to expand the view filed without switch to a longer range. The default shift method is manual. For automatic shift, see SHIFT MODE on page 16.

1. Use the cursor pad to place the cursor where you want to shift own ship position.
2. Press the [MODE] key to show the Display Mode menu.



SELECT DISPLAY MODE

▲ SHIFT (MANUAL)*
NORMAL
▼ ZOOM
NAV DISP ◀ OFF ON ▶

[MENU/ESC] : Exit

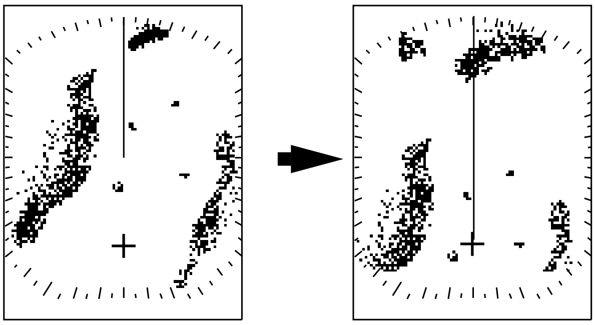
* AUTO may appear instead of MANUAL depending on menu setting.

Display mode menu

3. Use ▲ to choose SHIFT (MANUAL).

   Note: If SHIFT (AUTO) is shown, open the System menu and set SHIFT MODE to MANUAL. For further details, see paragraph 1.30.

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



Select where to shift with the cursor.

Shifted display

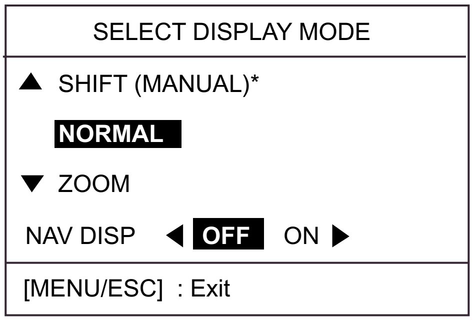
How shift works

To cancel the shifted display, open the Display Mode menu, choose NORMAL and then press the [MENU/ESC] key.

1.13 Zoom

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

1. Use the cursor pad to place the cursor where you want to zoom.
2. Press the [MODE] key to show the display mode menu.



SELECT DISPLAY MODE

▲ SHIFT (MANUAL)*

NORMAL

▼ ZOOM

NAV DISP ◀ OFF ON ▶

[MENU/ESC] : Exit

* AUTO may appear instead of MANUAL depending on menu setting.

Display mode menu

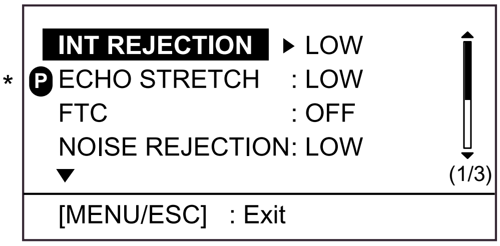
3. Use ▲ or ▼ to choose ZOOM.
4. Press the [MENU/ESC] key to close the menu.

To cancel the shifted display, open the Display Mode menu, choose NORMAL and then press the [MENU/ESC] key.

1.14 User Menu Overview

The User menu contains 11 items which the user may set according to conditions.

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



INT REJECTION ▶ LOW

* Ⓟ ECHO STRETCH : LOW

FTC : OFF

NOISE REJECTION: LOW

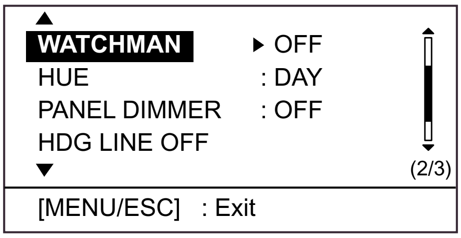
▼ (1/3)

[MENU/ESC] : Exit

* = "P" shows current function of PROG key

User menu, page 1

2. Use ▲ or ▼ to scroll the menu to display desired item in reverse video.



▲

WATCHMAN ▶ OFF

HUE : DAY

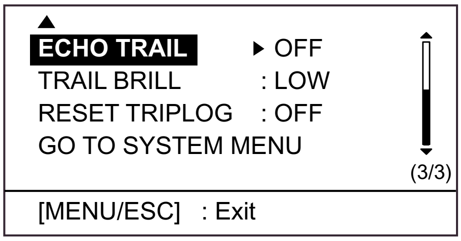
PANEL DIMMER : OFF

HDG LINE OFF

▼ (2/3)

[MENU/ESC] : Exit

Page 2



▲

ECHO TRAIL ▶ OFF

TRAIL BRILL : LOW

RESET TRIPLOG : OFF

GO TO SYSTEM MENU

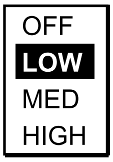
(3/3)

[MENU/ESC] : Exit

Page 3

User menu, page 2 and page 3

3. Press ▶ to show the options window for the item selected. For example, the illustration below shows the options window for the interference rejector.



OFF

LOW

MED

HIGH

Interference rejector options

4. Use ▲ or ▼ to select option desired.
5. Press ◀ to continue menu operation, or press the [MENU/ESC] key to register your selection and close the User menu.

User menu description

Item	Description
INT REJECTION	Rejects radar interference.
ECHO STRETCH	Stretches echoes in range direction or range and bearing direction.
FTC	Reduces rain clutter.
NOISE REJECTION	Rejects noise.
WATCHMAN	Periodically checks for targets in guard zone.
HUE	Chooses picture color.
PANEL DIMMER	Adjusts panel backlighting.
HDG LINE OFF	Temporarily turns the heading line off.
ECHO TRAIL	Shows echo movement.
TRAIL BRILL	Adjusts trail brilliance.
RESET TRIP LOG	Resets distance run.

1.15 Heading Line

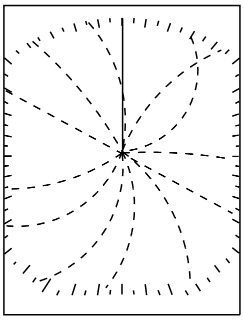
The heading line indicates the ship’s heading and it is the solid line which appears at zero degrees on the bearing scale.

To temporarily erase the heading line to look at targets existing dead ahead of own ship, do the following:

1. Press the [MENU/ESC] key to open the User menu.
2. Choose HDG LINE OFF from page 2.
3. Press ► to turn the heading line off. The line stays off while ► is pressed.
4. Press the [MENU/ESC] key to close the menu.

1.16 Interference Rejector

Mutual radar interference may occur in the vicinity of another shipborne radar operating in the same frequency band (9 GHz). It is seen on the screen as a number of bright spikes either in irregular patterns or in the form of usually curved spoke-like dotted lines extending from the center to the edge of the picture. This type of interference can be reduced by activating the interference rejector circuit. "IR” and the rejection level indicator “L, M or H” appear at the top right corner when the interference rejector circuit is on.



Appearance of interference

Turn off the interference rejector when no interference exists, to avoid missing small targets.

1. Press the [MENU/ESC] key to open the User menu.
2. Choose INT REJECTION from page 1.
3. Press ► to open the options window.
4. Choose OFF, LOW, MED or HIGH as appropriate.
5. Press the [MENU/ESC] key to finish.

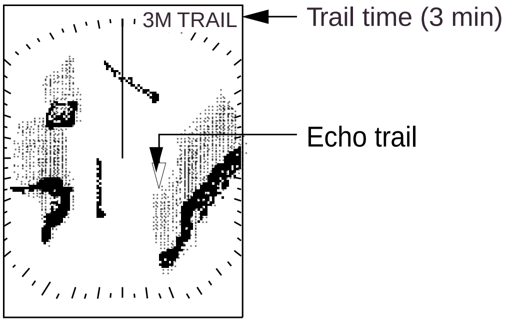
1.17 Noise Rejector

The noise rejector suppresses white noise, which appears on the screen as many dots scattered randomly over the display.

1. Press the [MENU/ESC] key to open the User menu.
2. Choose NOISE REJECTION from page 1.
3. Press ► to open the options window.
4. Choose OFF, LOW, MED or HIGH as appropriate.
5. Press the [MENU/ESC] key to close the menu.

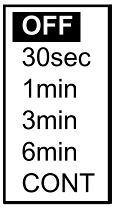
1.18 Echo Trail, Trail Brilliance

Echo trails are simulated afterglow of target echoes that represent their movements relative to own ship.



Echo trails

1. Press the [MENU/ESC] key to open the User menu.
2. Choose ECHO TRAIL from page 3.
3. Press ► to open the options window.



OFF
30sec
1min
3min
6min
CONT

Echo trail options

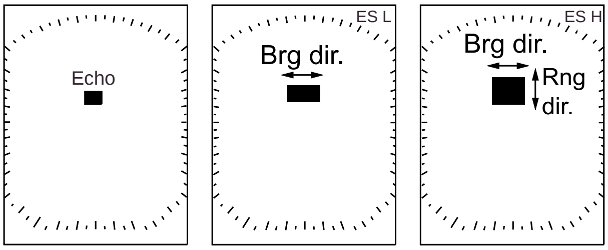
4. Choose appropriate time.

5. Press ◄ to close the options window.
6. Press ▼ to choose TRAIL BRILL.
7. Press ► to open the options window.
8. Choose LOW or HIGH as appropriate.
9. Press the [MENU/ESC] key to close the menu.

1.19 Echo Stretch

On long ranges target echoes tend to shrink in the range direction, making them difficult to see. On short and medium ranges such as 1.5, 3 and 6 nm range scales, the same sized targets get smaller on screen as they approach own ship. This is due to the inherent property of the radiation pattern produced by the antenna. To enhance target video, use the echo stretch feature.

1. Press the [MENU/ESC] key to open the User menu.
2. Choose ECHO STRETCH from page 1.
3. Press ► to open the options window.
4. Choose OFF, LOW or HIGH as appropriate. LOW stretches echoes in the bearing direction; HIGH stretches echoes in the range and bearing directions. The display shows “ES L” or “ES H” depending on your selection.
5. Press the [MENU/ESC] key to close the menu.



Echo Stretch OFF

Echo Stretch LOW

Echo Stretch HIGH

How echo stretch works

1.20 Guard Alarm

The guard alarm allows the operator to set the desired range and bearing for a guard zone. When ships, islands, landmasses, etc. violate the guard zone, the audio alarm sounds to call your attention. The alarm will sound on targets entering or exiting the zone depending on zone status after setting the alarm.

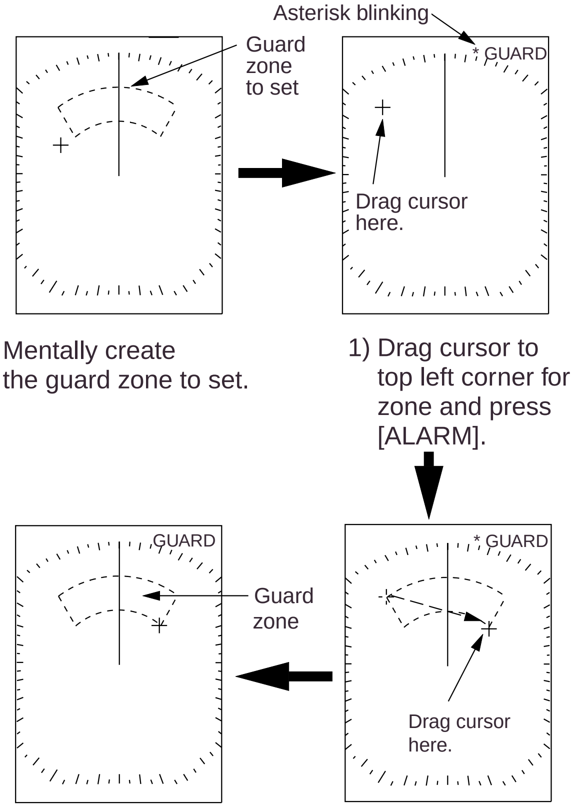
NOTICE

* The alarm should not be relied upon as the sole means for detecting possible collision situations.

* A/C SEA, A/C RAIN, FTC and GAIN controls should be properly adjusted to be sure the alarm system does not overlook target echoes.

Setting a guard zone

1. Operate the cursor pad to place the cursor at the top left corner for the zone and then press the [ALARM] key.
2. Operate the cursor pad to place the cursor at the bottom right corner for the zone and then press the [ALARM] key.



Mentally create the guard zone to set.

1) Drag cursor to top left corner for zone and press [ALARM].

Guard zone completed.

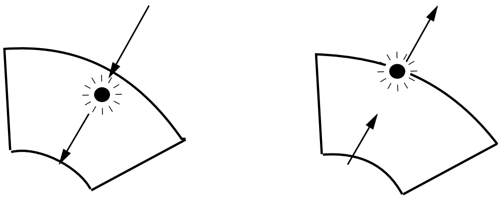
2) Drag cursor to bottom right corner for zone and press [ALARM].

How to set a guard zone

How guard zone type is determined

After the guard zone is set, the system checks for the existence of targets inside the guard zone, which takes about 8 to 12 seconds. When the check is completed, “G(IN)” or “G(OUT)” replaces GUARD at the top right corner.

G(IN): When no target exists in the zone, "G(IN)" appears. The audio alarm sounds to targets which enter the guard zone.
G(OUT): If there are targets in the guard zone, "G(OUT)" appears. The audio alarm sounds on all targets which exit from the guard zone.


(a) Inward target alarm (b) Outward target alarm

Inward and outward alarms

Note: When the radar range is less than one half of the guard zone range, the guard zone disappears and the indication "UP RNG" replaces G(IN) or G(OUT). If this happens, raise the range to redisplay the guard zone.

Silencing the audio alarm

When a target violates the guard zone, the target flashes and the audio alarm sounds. You can silence the audio alarm with the [ALARM] key. When this is done, GUARD (displayed in reverse video) replaces G(IN) or G(OUT) and the guard zone is displayed in reverse video. This means the guard alarm is temporarily deactivated. Press the key again to reactivate the guard alarm.

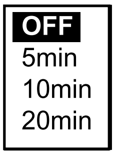
Canceling the guard zone and guard alarm

Press and hold down the [ALARM] key until the guard zone is erased.

1.21 Watchman

The watchman function periodically transmits the radar for about one minute to check for targets in a guard zone. If change is found in the zone from the previous transmission, the audio alarm sounds, watchman is canceled and the radar transmits. This feature is useful when you do not need to observe the radar continuously but want to be alerted to radar targets in a specific area, namely, the guard zone. When the radar starts transmitting, the buzzer sounds to alert you.

1. Press the [MENU/ESC] key to open the User menu.
2. Choose WATCHMAN from page 2.
3. Press ► to open the options window.



Watchman time options

4. Choose appropriate time out, that is, the amount of time the radar is in stand-by, among 5, 10 and 20 minutes.
5. Press the [MENU/ESC] key to close the menu.

1.22 Suppressing Long-range Rain Clutter

In adverse weather, clouds, rain or snow produce spray-like spurious echoes which impair target detection over a long distance. These echoes can be suppressed by turning on the FTC.

1. Press the [MENU/ESC] key to open the User menu.
2. Choose FTC from page 1.
3. Press ► to open the options window.
4. Choose OFF or ON as appropriate.
5. Press the [MENU/ESC] key to close the menu.

1.23 Panel Backlighting

You may adjust panel backlighting as follows:

1. Press the [MENU/ESC] key to open the User menu.
2. Choose PANEL DIMMER from page 2.
3. Press ► to open the options window.
4. Choose OFF, LOW, MED or HIGH as appropriate.
5. Press the [MENU/ESC] key to close the menu.

1.24 Hue

The default hue setting (DAY) displays echoes in tones of grey on a white background, which is most suitable for daytime viewing. For nighttime viewing you may reverse this arrangement. Note that the default hue setting is restored when the power is turned off.

1. Press the [MENU/ESC] key to open the User menu.
2. Choose PANEL DIMMER from page 2.
3. Press ► to open the options window.
4. Choose DAY or NIGHT as appropriate.
5. Press the [MENU/ESC] key to close the menu.

1.25 Resetting Distance Run

You may reset distance run to zero as below. You need a navigator or speed log to display distance run.

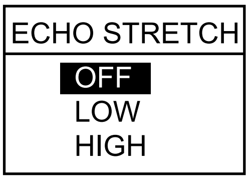
1. Press the [MENU/ESC] key to open the User menu.
2. Choose RESET TRIPLOG from page 3.
3. Press ► to open the options window.
4. Press ▲ to reset distance run.
5. Press the [MENU/ESC] key to close the menu.

1.26 PROG Key

The [PROG] key provides a shortcut key for functions on the User menu. You may use any User menu item except RESET TRIPLOG.

Using the PROG key

1. Press the [PROG] key. The options window corresponding to the item programmed appears. In the example below, the options window for the echo stretch feature is shown.



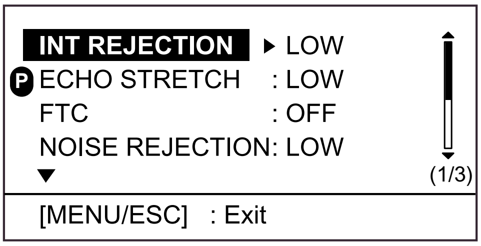
ECHO STRETCH
OFF
LOW
HIGH

Echo stretch options window

2. Use the cursor pad to choose appropriate option.
3. Press the [MENU/ESC] key to close the options window.

Programming the PROG key

1. Press the [MENU/ESC] key to open the User menu. “P” marks the current function of the [PROG] key.



INT REJECTION ▸ LOW
P ECHO STRETCH : LOW
FTC : OFF
NOISE REJECTION: LOW
▼ (1/3)
[MENU/ESC] : Exit

User menu, page 1

2. Choose the item you wish to use. (RESET TRIPLOG cannot be used.)
3. Press and hold down the [PROG] key (about three seconds) until you hear a beep. The “P” moves to the item selected.
4. Press the [MENU/ESC] key to close the menu.

1.27 Turning Navigation Data On/Off

You may turn the navigation data display, which appears on the lower part of the screen, on or off as below. The amount and type of information displayed depends on user settings. For further details, see the following:

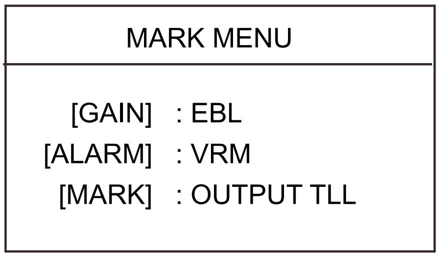
Type of data:	Paragraph 1.29
Amount of data:	“NAV DATA” in paragraph 1.30

1. Press the [MODE] key.
2. Press ▼ to select NAV DISP.
3. Press ► to choose ON; ◄ to choose OFF.
4. Press the [MENU/ESC] key to close the menu.

1.28 Outputting Cursor Position to Navigator

If the radar is interfaced with a navigator you can output cursor position to the navigator, and show that position on the navigator’s screen with the TLL (Target Latitude and Longitude) mark. This function requires position and heading data.

1. Use the cursor pad to position the cursor where desired.
2. Press the [MARK] key to show the Mark menu.



MARK MENU

[GAIN] : EBL
[ALARM] : VRM
[MARK] : OUTPUT TLL

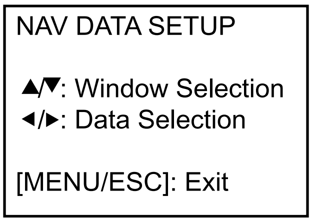
Mark menu

4. Press the [MARK] key again to output cursor position.
5. Press the [MENU/ESC] key to close the menu.

1.29 Setting up Nav Data Displays

The user may arrange the nav data display as desired. You may display between two and four items in the nav data display and choose the item and order to display them. For how to choose the number of items to display, see “NAV DATA” in paragraph 1.30.

1. With the nav data display showing, press the cursor pad to display the NAV DATA SETUP window.



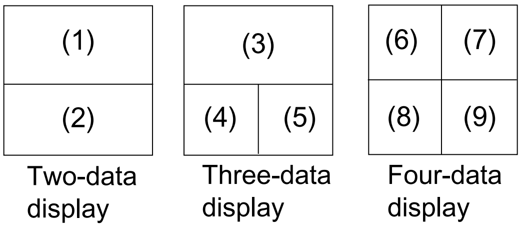
NAV DATA SETUP

▲/▼: Window Selection
◄/►: Data Selection

[MENU/ESC]: Exit

Nav data setup window.

3. Use ▲ or ▼ to choose a data display window desired. A dashed-rectangle circumscribes your selection.
4. Use ◄ or ► to choose item to display. See the illustration below for the data availability. A description of the nav data displays appears on the next page.

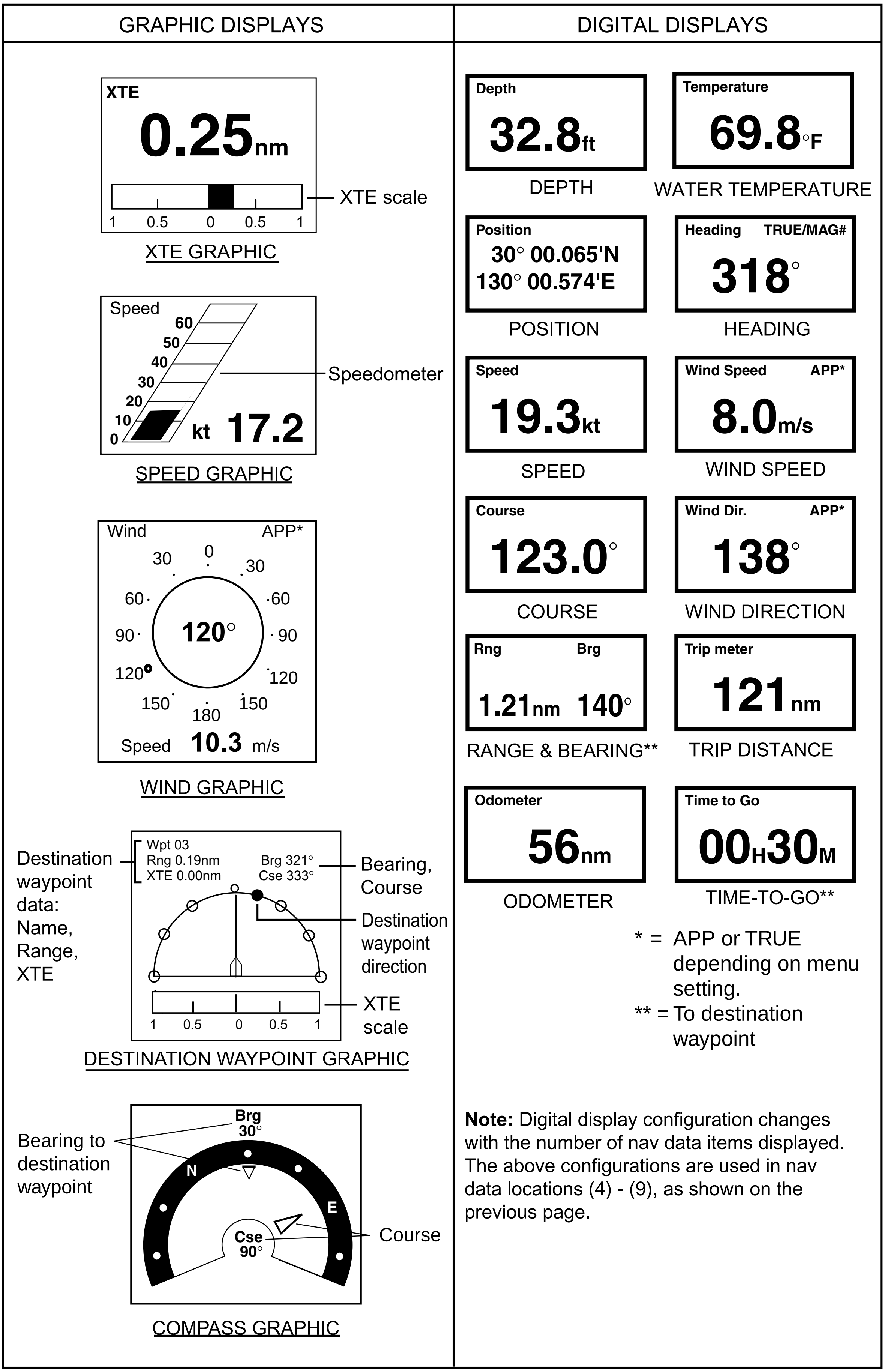


Items displayable in (1) - (3): depth, position, course, range and bearing, trip distance, odometer distance, water temperature, heading, time-to-go to destination waypoint, XTE*, speed*, wind speed and direction*, destination waypoint data*, compass*
Items displayable in (4) - (9): depth, position, course, range and bearing, trip distance, odometer distance, water temperature, heading, air pressure, time-to-go to destination waypoint, XTE*, wind speed and direction

* = Graphic display

Nav data window and item displayable

5. Press the [MENU/ESC] key to finish.


GRAPHIC DISPLAYS
DIGITAL DISPLAYS
XTE
0.25nm
1 0.5 0 0.5 1
XTE scale
XTE GRAPHIC
Speed
60
50
40
30
20
10
0
kt 17.2
Speedometer
SPEED GRAPHIC
Wind
APP*
0
30
30
60
60
90
90
120
120
150
150
180
120°
Speed 10.3 m/s
WIND GRAPHIC
Destination waypoint data: Name, Range, XTE
Wpt 03
Rng 0.19nm
XTE 0.00nm
Brg 321°
Cse 333°
Bearing, Course
Destination waypoint direction
XTE scale
1 0.5 0 0.5 1
DESTINATION WAYPOINT GRAPHIC
Bearing to destination waypoint
Brg 30°
N
E
Cse 90°
Course
COMPASS GRAPHIC
Depth
32.8ft
DEPTH
Temperature
69.8°F
WATER TEMPERATURE
Position
30° 00.065'N
130° 00.574'E
POSITION
Heading TRUE/MAG#
318°
HEADING
Speed
19.3kt
SPEED
Wind Speed APP*
8.0m/s
WIND SPEED
Course
123.0°
COURSE
Wind Dir. APP*
138°
WIND DIRECTION
Rng Brg
1.21nm 140°
RANGE & BEARING**
Trip meter
121nm
TRIP DISTANCE
Odometer
56nm
ODOMETER
Time to Go
00H30M
TIME-TO-GO**

* = APP or TRUE depending on menu setting.

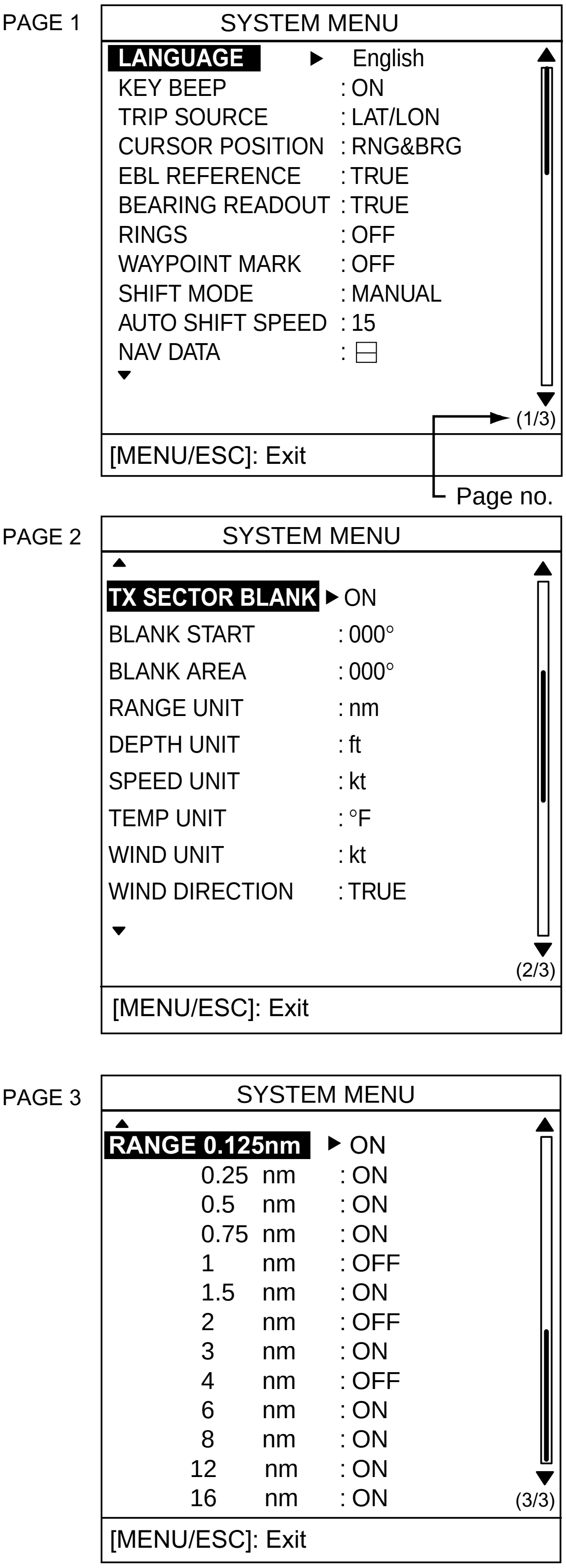
** = To destination waypoint

Note: Digital display configuration changes with the number of nav data items displayed. The above configurations are used in nav data locations (4) - (9), as shown on the previous page.

Graphic and digital displays

1.30 System Menu

The System menu mainly contains items which once set do not require frequent adjustment. You may display this menu by choosing “GO TO SYSTEM MENU” on page 3 of the User menu and then pressing ▶.



```
PAGE 1          SYSTEM MENU
  LANGUAGE          ▶ English
  KEY BEEP          : ON
  TRIP SOURCE       : LAT/LON
  CURSOR POSITION   : RNG&BRG
  EBL REFERENCE     : TRUE
  BEARING READOUT   : TRUE
  RINGS             : OFF
  WAYPOINT MARK     : OFF
  SHIFT MODE        : MANUAL
  AUTO SHIFT SPEED  : 15
  NAV DATA          : ⊟
                                      (1/3)
  [MENU/ESC]: Exit
                                   Page no.
```

```
PAGE 2          SYSTEM MENU
  TX SECTOR BLANK ▶ ON
  BLANK START       : 000°
  BLANK AREA        : 000°
  RANGE UNIT        : nm
  DEPTH UNIT        : ft
  SPEED UNIT        : kt
  TEMP UNIT         : °F
  WIND UNIT         : kt
  WIND DIRECTION    : TRUE
                                      (2/3)
  [MENU/ESC]: Exit
```

```
PAGE 3          SYSTEM MENU
  RANGE 0.125nm     ▶ ON
          0.25  nm  : ON
          0.5   nm  : ON
          0.75  nm  : ON
          1     nm  : OFF
          1.5   nm  : ON
          2     nm  : OFF
          3     nm  : ON
          4     nm  : OFF
          6     nm  : ON
          8     nm  : ON
         12     nm  : ON
         16     nm  : ON                (3/3)
  [MENU/ESC]: Exit
```

System menu

System menu description

Page 1

LANGUAGE: The system language is available in English, several European languages and Japanese. To change the language, choose language desired, and then press the [MENU/ESC] key.

KEY BEEP: A beep sounds to confirm valid and invalid operation. You can turn this beep on or off.

TRIP SOURCE: Chooses the criteria for calculating distance run: latitude and longitude or speed. Requires navigator or speed log.

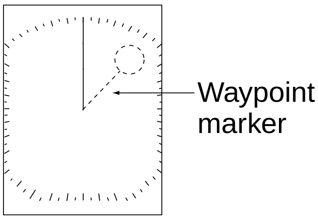
CURSOR POSITION: Chooses the information to show for the cursor position: latitude and longitude or range and bearing from own ship. Latitude and longitude position requires a navigator.

EBL REFERENCE: The EBL readout may be chosen from relative (relative to own ship’s heading) or true (referenced to the North). Gyrocompass required for true bearing.

BEARING READOUT: Course indication may be shown in true or magnetic (magnetic compass) degrees. Gyrocompass required for true bearing.

RINGS: Turns the range rings on or off.

WAYPOINT MARK: If the radar is interfaced with a navigator, you may show the location of the destination waypoint (set on the navigator) on the radar, with the waypoint marker. You can turn this marker on or off as desired.



Waypoint marker

SHIFT MODE: Own ship position, or sweep origin, can be displaced manually or automatically. For automatic displacement, the amount of shift is calculated with ship speed, and the amount is limited to 60% of the range in use. For example, if the "Auto Shift Speed" setting is 15 knots and the ship is running at 10 knots, the amount of shift will be about 40%. The formula for determining shift amount is as below. Requires speed data.

$$\frac{\text{Ship's speed}}{\text{Shift speed setting}} \text{ X } 0.6 = \text{Amount of shift(\%)}$$

AUTO SHIFT SPEED: Sets the automatic shift maximum speed. The setting range is 0-99.

NAV DATA: Chooses the amount of nav data to display among two, three and four items. Requires appropriate sensors.

Page 2

TX SECTOR BLANK: In some installations it may be unavoidable to locate the antenna where an object (mast, etc.) will prevent transmission within its breadth. You should disable transmission within this area by turning on this feature and setting the area with BLANK START and BLANK AREA below.

BLANK START: Sets the starting point of the TX sector blanking area.

BLANK AREA: Sets the end point of the TX sector blanking area.

RANGE UNIT: Chooses the unit of range measurement among nautical miles, kilometers and statute miles.

DEPTH UNIT: Chooses the unit of depth measurement among meters, feet, fathoms and Passi/Braza. Requires depth data.

SPEED UNIT: Chooses the unit of speed measurement among knot, mile per hour and kilometer per hour. Requires speed data.

TEMP UNIT: Chooses the unit of water temperature measurement from Celsius and Fahrenheit. Requires water temperature data.

WIND UNIT: Chooses the unit of wind measurement among mile per hour, kilometer per hour and meters per second. Requires wind data.

WIND DIRECTION: Choose the wind direction reference from true and apparent. **True** is the speed and direction (in relation to ship's bow) of the wind felt or measured when stationary. **Apparent** is the direction (in relation to ship's bow) and speed of the wind as it appears to those on board, relative to the speed and direction of the boat; combination of the true wind and the wind caused by the boat's movement. Requires wind data.

Page 3

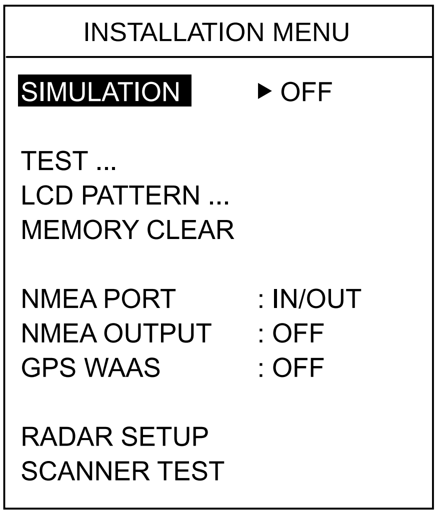
RANGE: Chooses the ranges to use. Minimum of two ranges must be turned on. When the range unit is km, "0.125" replaces "0.125" and "24" newly appears.

1.31 Installation Menu

The Installation menu contains installation-related items and diagnostics.

Opening the installation menu

1. Turn on the power while pressing and holding down the [MENU/ESC] key. Continue pressing the [MENU/ESC] key until the Installation menu appears.



```
INSTALLATION MENU

SIMULATION        ▶ OFF

TEST ...
LCD PATTERN ...
MEMORY CLEAR

NMEA PORT         : IN/OUT
NMEA OUTPUT       : OFF
GPS WAAS          : OFF

RADAR SETUP
SCANNER TEST
```

Installation menu

2. To escape from the Installation menu, turn off the power.

Installation menu description

SIMULATION: The simulation mode provides simulated operation of the equipment, to help you become acquainted with the features of your radar. Antenna connection is not required and all controls are operative. SIM appears at the top left corner when the simulation mode is active.

TEST: Conducts the diagnostic test. For further details, see paragraph 2.4.

LCD PATTERN: Tests the LCD. For further details, see paragraph 2.5.

MEMORY CLEAR: Restores all default menu settings. Choose YES to clear the memory and then turn off the power.

NMEA PORT, NMEA OUTPUT, GPS WAAS, RADAR SETUP: Sets up the radar at installation. For further details see the chapter on installation.

SCANNER TEST: Tests the antenna unit. For further details, see paragraph 2.4.

2. MAINTENANCE, TROUBLESHOOTING

⚠ **WARNING**

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

Only qualified personnel should work inside the equipment.

2.1 Maintenance

Regular maintenance is important for good performance. A maintenance program should be established and should at least include the items listed in the table below.

Maintenance program

Period	Item	Check point	Action
3 to 6 months	Fixing bolts for antenna unit	Check for corrosion and if tightly fastened.	Replace corroded bolts. Coat new bolts with anticorrosive sealant.
	Antenna unit cleanliness	Check for foreign material. (Foreign material on the antenna unit can cause a considerable drop in sensitivity.)	Clean the antenna unit with a freshwater-moistened cloth. Alcohol may be used. Do not use commercial cleaners to clean the antenna unit; they can remove paint and markings.
	Antenna unit cover	Check for cracks. Permanent damage to the unit's circuitry will result if water leaks inside.	If a crack is found, it should be temporarily repaired by using a small amount of sealing compound or adhesive. The unit should then be brought to your dealer for permanent repairs.
	Display unit case, LCD	The LCD will, in time, accumulate a coating of dust which tends to dim the picture.	Wipe the LCD gently with a soft cloth. Do not use excess pressure since the LCD is easily scratched. Do not use commercial cleaners to clean the LCD or display unit case; they can remove paint and markings.
6 months to 1 year	Display unit connectors	Check for tight connection and corrosion.	If corroded, ask your dealer about replacement.

2.2 Replacing the Fuse

The fuse (5 A) in the power cable protects the equipment against reverse polarity of ship’s mains, overcurrent, and equipment fault. If the fuse blows, find the cause before replacing it. **Never use a fuse rated for more than 5 A, since overfusing can cause serious damage to the equipment and void the warranty.**

2.3 Troubleshooting

The table below provides simple troubleshooting procedures which the user can follow to restore normal operation. If you cannot restore normal operation contact your dealer for advice.

Troubleshooting

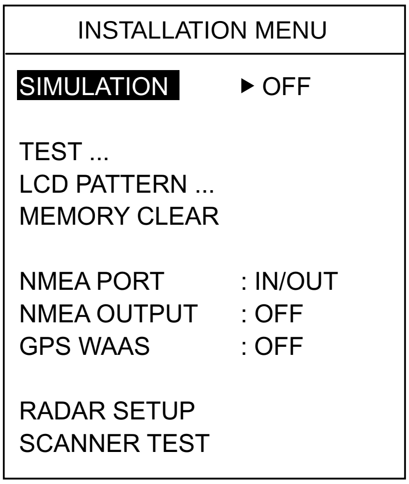
If…	But…	Then…
you pressed the [POWER/BRILL] key to turn on the radar	the control panel does not light	• adjust PANEL DIMMER on the User menu. • battery may have discharged. • check if fuse has blown.
	nothing appears on the display (panel lights) or display contrast is poor	try adjusting LCD contrast.
the radar has warmed up and you pressed the [MODE] key to transmit	the message “NO HEADING PULSE” or “NO BEARING PULSE” appears	Check that the antenna cable is firmly connected.
you adjusted sensitivity (with the FTC switched OFF)	neither noise or targets appear (characters and markers do)	check signal cable for damage.
	neither indications or markers do (noise and targets do)	check signal cable for damage.
a key is pressed	nothing happens	key may be faulty. Contact your dealer.

2.4 Diagnostics

If you feel that your unit is not working properly, conduct the appropriate diagnostic test, display unit or antenna unit, to find the possible cause. If you cannot restore normal operation, contact your dealer for advice.

Display unit

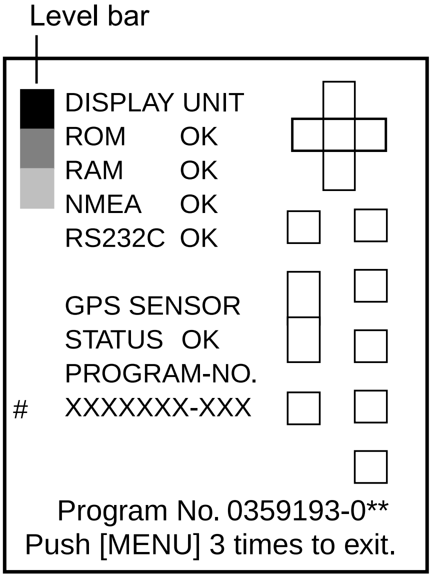
1. Turn on the power while pressing and holding down the [MENU/ESC] key. Continue pressing the [MENU/ESC] key until the Installation menu appears.



```
INSTALLATION MENU

SIMULATION        ▶ OFF

TEST ...
LCD PATTERN ...
MEMORY CLEAR

NMEA PORT         : IN/OUT
NMEA OUTPUT       : OFF
GPS WAAS          : OFF

RADAR SETUP
SCANNER TEST
```

Installation menu

2. Press ▼ to choose TEST.
3. Press ▶ to start the test. In a few moments the results will appear.



```
   DISPLAY UNIT
   ROM     OK
   RAM     OK
   NMEA    OK
   RS232C  OK

   GPS SENSOR
   STATUS  OK
   PROGRAM-NO.
#  XXXXXXX-XXX

  Program No. 0359193-0**
 Push [MENU] 3 times to exit.
```

** = Program version no.
# = Number depends on equipment connected.

Diagnostic test results

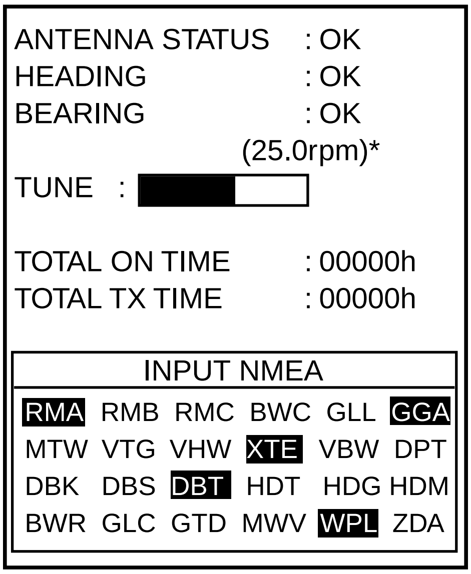
Interpreting test results

Item	Results
ROM, RAM	OK: Normal NG: No Good
NMEA	OK: Normal 01: NMEA input 1 is abnormal 02: NMEA input 2 is abnormal - -: NMEA input 1 and 2 are abnormal
RS232C	Used for updating software. Normally blank.
GPS SENSOR	OK: Normal NG: No Good

4. The squares at the right side of the test results display are for checking controls. Press each key and the arrows on the cursor pad one by one. A control’s corresponding on-screen square “lights” in black if the control is working properly.
5. To return to the Installation menu, press the [MENU/ESC] key three times.
6. To restore normal operation, turn off the power and then turn it on again.

Antenna unit

1. Turn on the power while pressing and holding down the [MENU/ESC] key. Continue pressing the [MENU/ESC] key until the Installation menu appears.
2. Press ▼ to choose SCANNER TEST.
3. Press ► to start the test. In a few moments the results will appear.



```
ANTENNA STATUS    : OK
HEADING           : OK
BEARING           : OK
             (25.0rpm)*
TUNE  :

TOTAL ON TIME     : 00000h
TOTAL TX TIME     : 00000h

          INPUT NMEA
RMA  RMB  RMC  BWC  GLL  GGA
MTW  VTG  VHW  XTE  VBW  DPT
DBK  DBS  DBT  HDT  HDG  HDM
BWR  GLC  GTD  MWV  WPL  ZDA
```

* 25.0 = Long range
31.0 = Medium range
41.0 = Short range

Antenna test results

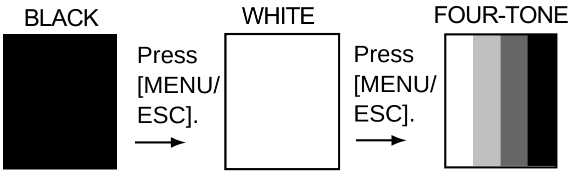
The antenna unit and heading and bearing signals are checked, and the results shown as OK or NG (No Good). For any NG, contact your dealer for advice.

“TUNE” shows, by tuning bar, radar receiver tuning status. Total on time and total TX times appear below the tuning bar. Data sentences currently input to the radar are highlighted in the “INPUT NMEA” window.

2.5 Test Pattern

This feature tests for proper display of tones.

1. Turn on the power while pressing and holding down the [MENU/ESC] key. Continue pressing the [MENU/ESC] key until the Installation menu appears.
2. Press ▼ to choose LCD PATTERN.
3. Press ► to start the test. The entire screen is black.
4. Press the [MENU/ESC] key and the screen turns white.
5. Press the [MENU/ESC] key again and the screen shows a four-tone display.
6. Press the [MENU/ESC] key again to return to the Installation menu.
7. To restore normal operation, turn off the power and turn it on again.



Test patterns

2.6 Replacing the Magnetron

When the magnetron has expired, distant targets cannot be seen on the display. When you feel long range performance has decreased, contact a FURUNO agent or dealer about replacement of the magnetron. (Type: E3588, Code No: 000-142-270)

2.7 Replacing the Synchro Belt

When the synchro belt has worn out, the sweep is not synchronized with antenna rotation, which results in an abnormal picture. When you suspect that the synchro belt has worn out, contact a FURUNO agent or dealer about replacement. (Type: 40 S2M 266UG, Code No: 000-808-743)

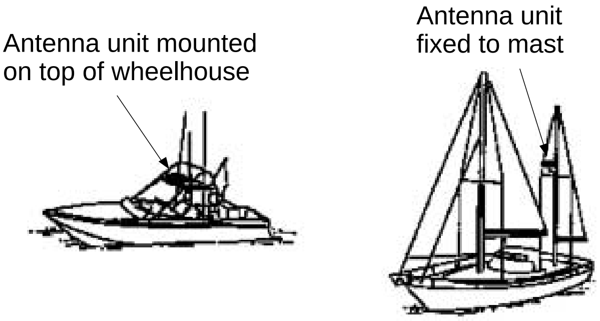
3. INSTALLATION

3.1 Antenna Unit Installation

Mounting considerations

When selecting a mounting location for the antenna unit keep in mind the following points:

- Install the antenna unit on the hardtop, radar arch or on a mast on an appropriate platform. (For sailboats, a mounting bracket is optionally available.) It should be placed where there is a good all-round view with, as far as possible, no part of the ship's superstructure or rigging intercepting the scanning beam. Any obstruction will cause shadow and blind sectors. A mast, for instance, with a diameter considerably less than the width of the antenna unit, will cause only a small blind sector. However, a horizontal spreader or crosstrees in the same horizontal plane would be a much more serious obstruction; place the antenna unit well above or below it.

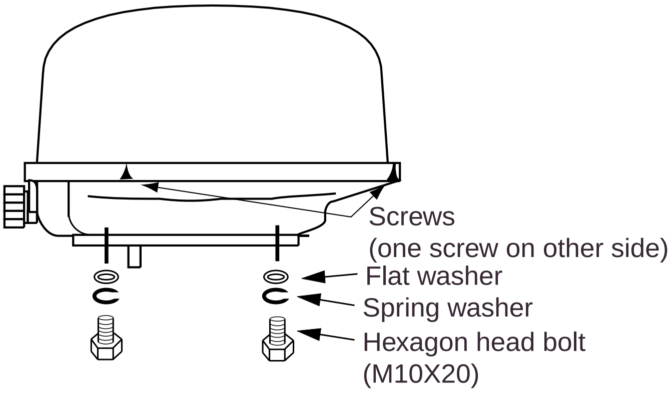

Antenna unit mounted on top of wheelhouse
Antenna unit fixed to mast

Typical antenna unit placement on powerboat and sailboat

- In order to minimize the chance of picking up electrical interference, avoid where possible routing the antenna cable near other electrical equipment onboard. Also, avoid running the cable in parallel with power cables.
- Observe the compass safety distances noted on page ii to prevent interference to a magnetic compass.

Mounting on a platform

1. Remove mounting hardware at the bottom of the antenna unit; four each of hexagon head bolts (M10X20), spring washers and flat washers. Save mounting hardware to use it to fix the antenna unit to the mounting platform later on.

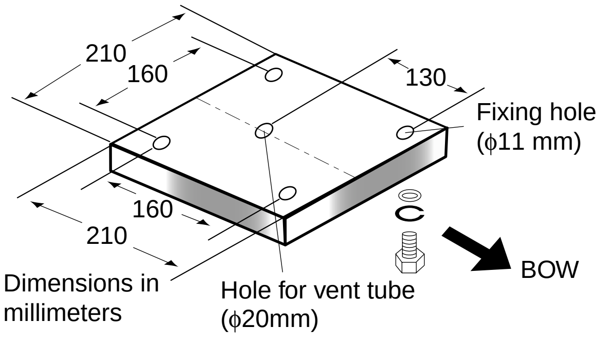


Antenna unit, showing location of mounting hardware

2. Unfasten three screws to remove the cover.
3. Construct a platform (wood, steel, or aluminum) of 5–10 mm in thickness whose dimensions are as shown in the illustration at the top of the next page. Fasten the platform to the mounting location. Next, position the base on the platform so the cable entrance faces the stern direction and the vent tube is extending downward through the hole for the vent tube.

Note 1: If corrosive material is used for the platform, be sure to take appropriate anti-corrosion measures.

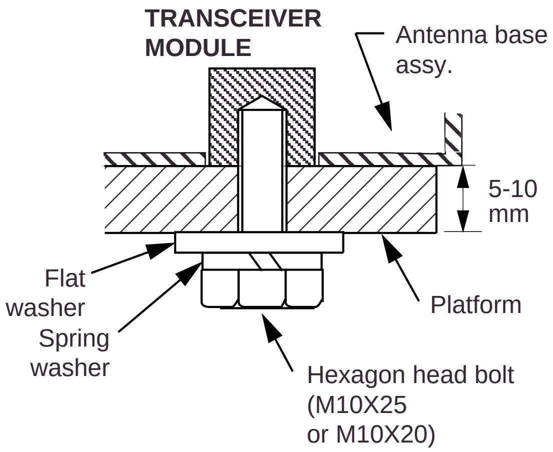
Note 2: When drilling holes in the platform, be sure they are parallel with the fore and aft line.


210
160
130
Fixing hole
(ϕ11 mm)
160
210
BOW
Dimensions in
millimeters
Hole for vent tube
(ϕ20mm)

Dimensions of antenna platform

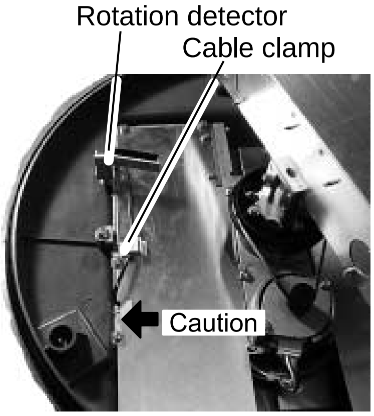
4. Using the hexagon head bolts, flat washers and spring washers removed at step 1, fasten the base to the platform. **The torque should be 19.6-24.5 N•m.**

Note: Longer hexagon head bolts (M10X25) are supplied with the installation materials. Use them instead of the hexagon head bolts removed earlier if the mounting platform is very thick.


TRANSCEIVER
MODULE
Antenna base
assy.
5-10
mm
Flat
washer
Spring
washer
Platform
Hexagon head bolt
(M10X25
or M10X20)

How to fasten the base to the platform

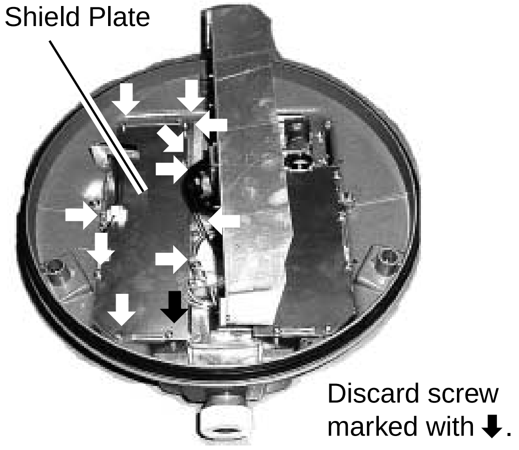
5. Unfasten the cable of the rotation detector from the cable clamp.


Rotation detector
Cable clamp
Caution

Antenna unit, inside view

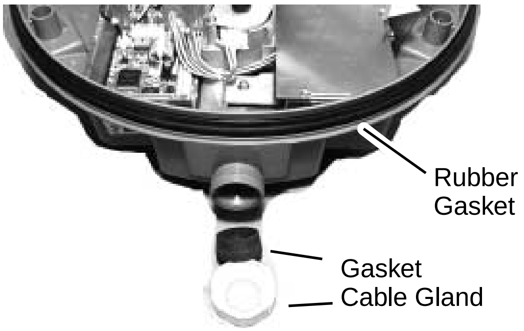
Caution: Be careful not to pinch the rotation detector cable when remounting the shield plate.

6. Unfasten 11 screws to dismount the shield plate.


Shield Plate
Discard screw
marked with ⬇.

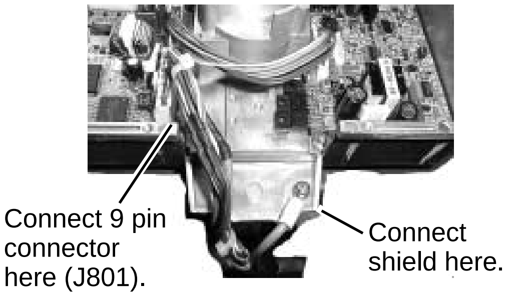
Antenna unit, inside view

7. Pass the antenna cable with connector through the gasket and cable clamp, and then tighten cable gland. Be sure the shrink tubing on the antenna cable is not covered by the gasket.


Rubber
Gasket
Gasket
Cable Gland

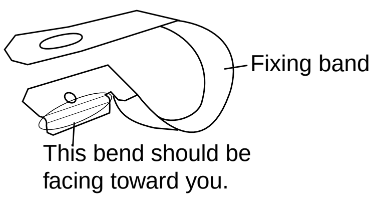
Antenna unit, inside view

8. Referring to the figure below, fasten the shield cable to a screw (M4X10) on the chassis to ground the unit.


Connect 9 pin
connector
here (J801).
Connect
shield here.

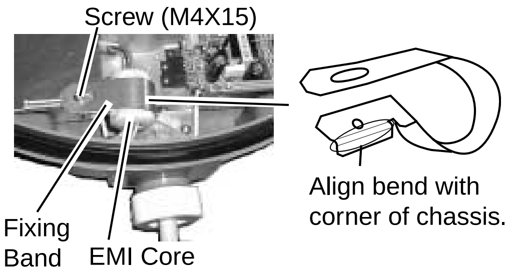
How to connect the antenna cable to the antenna unit

9. Attach the EMI core to the antenna cable. Set the fixing band to the EMI core.


Fixing band
This bend should be facing toward you.

Fixing band

10. Connect the 9-pin connector of the antenna cable to J801. See the figure at the bottom of the previous page for location.
11. Refasten the shield plate with 10 screws. Be sure not to pinch the cable from the rotation detector with the shield plate. See “Caution” on previous page for details.
12. Fasten the fixing band with screw (supplied).


Screw (M4X15)
Fixing Band
EMI Core
Align bend with corner of chassis.

How to fix the EMI core

13. Confirm that the rubber gasket is properly positioned and then tighten the fixing screws for the cover.

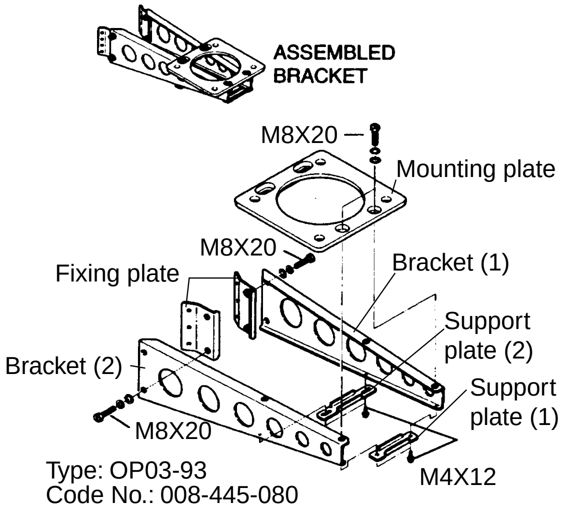
Mounting using the optional mounting bracket

A mounting bracket for fastening the antenna unit to a mast on a sailboat is optionally available (Type OP03-93, Code 008-445-080).

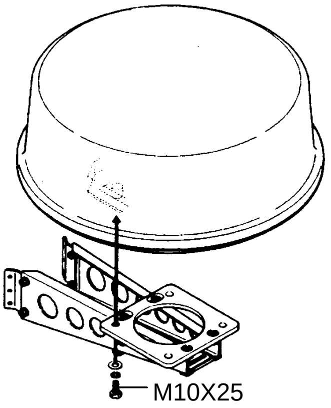
Contents of mounting bracket kit

Name	Type	Code No.	Qty
Bolt	M4X12	000-804-725	4
Bolt	M8X20	000-805-707	8
Mounting plate	03-018-9001-0	100-206-740	1
Support plate (1)	03-018-9005-0	100-206-780	1
Support plate (2)	03-018-9006-0	100-206-790	1
Bracket (1)	03-028-9101-0	100-206-810	1
Bracket (2)	03-028-9102-0	100-206-820	1
Fixing plate	03-028-9103-0	100-206-830	2

1. Remove mounting hardware at the bottom of the antenna base. You may discard the hardware.
2. Assemble the mounting bracket as below and fasten it to a mast.
3. Fasten the antenna unit to the mounting bracket with M10X25 hexagon head bolts.


ASSEMBLED BRACKET
M8X20
Mounting plate
M8X20
Fixing plate
Bracket (1)
Support plate (2)
Bracket (2)
Support plate (1)
M8X20
M4X12
Type: OP03-93
Code No.: 008-445-080

(A) Assembling the mounting bracket



(B) Fastening antenna to mounting bracket

How to assemble the optional mounting bracket and mount the antenna

4. Unfasten three screws to open the cover.
5. Follow steps 5-13 in "Mounting on a platform".

3.2 Display Unit Installation

Mounting considerations

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

- Keep the display unit out of direct sunlight.
- The temperature and humidity should be moderate and stable.
- Locate the unit away from exhaust pipes and vents.
- The mounting location should be well ventilated.
- Mount the unit where shock and vibration are minimal.
- Keep the unit away from electromagnetic field-generating equipment such as motors and generators.
- For maintenance and checking purposes, leave sufficient space at the sides and rear of the unit and leave slack in cables.
- Observe the compass safety distances noted on page ii to prevent interference to a magnetic compass.
- Be sure the mounting location is able to support the weight of the unit under the continued vibration normally experienced on the boat.

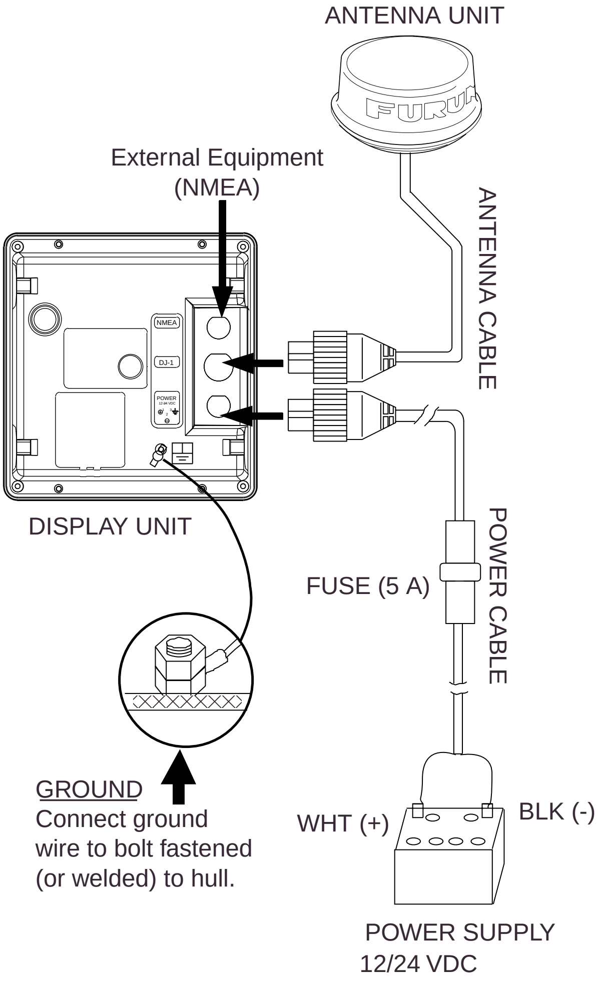
Mounting

The display unit can be mounted on a desktop or on the overhead.

1. Fix the hanger to the mounting location with four tapping screws (supplied).
2. Fit the knob bolts to the display unit.
3. Set the display unit to the hanger. Tighten the knob bolts securely.

3.3 Wiring

Connect the antenna cable, the power cable and the ground wire as shown below.


ANTENNA UNIT
FURUNO
External Equipment (NMEA)
ANTENNA CABLE
NMEA
DJ-1
POWER
DISPLAY UNIT
FUSE (5 A)
POWER CABLE
GROUND
Connect ground wire to bolt fastened (or welded) to hull.
WHT (+)
BLK (-)
POWER SUPPLY 12/24 VDC

Connections

Connecting external equipment

A video sounder, navaid, wind indicator or GPS receiver GP-310(320B) can be connected to the display unit. You will need an NMEA cable to make the connection.

To connect a wind indicator, use the optional cable MJ-A15A7F0004-005. Connect it referring to the schematic diagram at the back of this manual.

Input sentences

NMEA 0183 Version 1.5/2.0/3.0, 4800 bps

Name	Sentences
Ship's Speed	VTG>RMC>RMA>VBW>VHW
Depth	DPT>DBK>DBS>DBT
Heading (T)*	HDT>HDG>HDM
Heading (M)	HDM>HDG>HDT
Course (T)	RMC>RMA>VTG
Course (M)	VTG>RMA
Waypoint	RMB>WPL>BWR>BWC
Own Ship Pos.	GGA>RMC>RMA>GLL
Time Diff..	RMA>GLC>GTD
Water Temp.	MTW
Time	ZDA>RMC
Wind data	MWV
Cross-track Error	XTE
Target L/L	TLL (NMEA 0183 Ver.3 only)

*Requires magnetic variation.

Output sentence

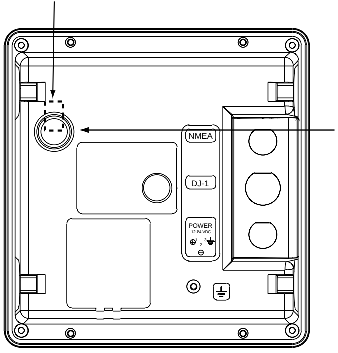
NMEA 0183 Version 3.0, 4800 bps

Name	Sentences
Target L/L	TLL

Connecting the external buzzer

Use a hammer and an appropriate metal rod to punch out a hole of ø16 at the location shown in the illustration below. Plug in the connector of the external buzzer to J6 on the DU Board. Seal the hole with sealing compound. Fix the buzzer to the location desired with two tapping screws.

J6 is located behind the rear panel.



Make a hole of ϕ16. Seal hole with sealing compound after connecting cable.

Display unit, rear view

3.4 Adjustments

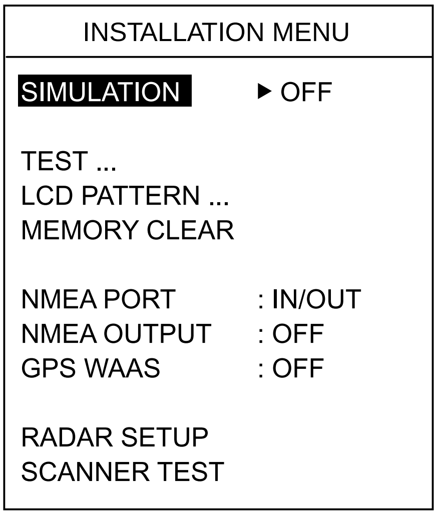
After you have installed the radar, do the heading alignment and timing adjustment. If you are connecting external equipment, do "NMEA port setup, GPS WAAS setup" (for GP-320B) as appropriate.

Heading alignment

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

In practice, you will probably observe some small error on the display because of the difficulty in achieving accurate initial positioning of the antenna unit. The following adjustment will compensate for this error, up to ±30°.

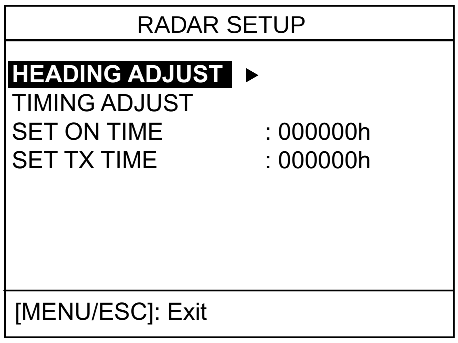
1. Identify a suitable target (for example, ship or buoy) at a range between 0.125 to 0.25 miles, preferably near the heading line. To minimize error, keep echoes in the outer half of the picture by changing the range.
2. Turn on the power while pressing and holding down the [MENU/ESC] key. Continue pressing the [MENU/ESC] key until the Installation menu appears.



```
INSTALLATION MENU

SIMULATION     ▶ OFF

TEST ...
LCD PATTERN ...
MEMORY CLEAR

NMEA PORT      : IN/OUT
NMEA OUTPUT    : OFF
GPS WAAS       : OFF

RADAR SETUP
SCANNER TEST
```

Installation menu

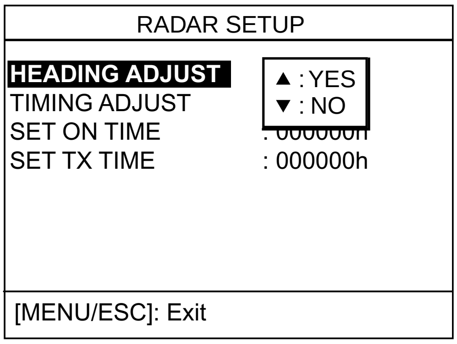
3. Choose RADAR SETUP and then press ► to show the Radar Setup menu.



```
RADAR SETUP
HEADING ADJUST ►
TIMING ADJUST
SET ON TIME          : 000000h
SET TX TIME          : 000000h

[MENU/ESC]: Exit
```

Radar setup menu

4. Choose HEADING ADJUST.
5. Press ► to show the options window.



```
RADAR SETUP
HEADING ADJUST       ▲ : YES
TIMING ADJUST        ▼ : NO
SET ON TIME          : 000000h
SET TX TIME          : 000000h

[MENU/ESC]: Exit
```

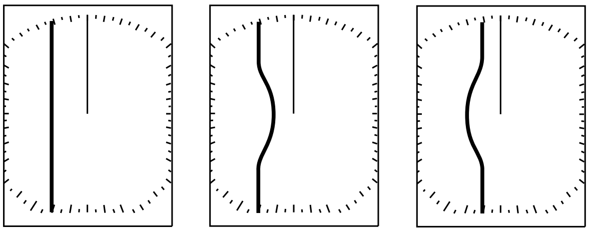
Radar setup menu (heading adjust)

6. Press ▲ to select YES.
   The heading adjustment display appears.
7. Press ◄ or ► to bisect the target selected at step 1 with the heading line.
8. Press the [MODE] key.
9. As a final test, move the boat towards a small buoy and confirm hat the buoy shows up dead ahead on the radar when it is visually dead ahead.

Timing adjustment

This adjustment ensures proper radar performance, especially on short ranges. The radar measures the time required for a transmitted echo to travel to the target and return to the source. The received echo appears on the display based on this time. Thus, at the instant the transmitter is fired, the sweep should start from the center of the display (sometimes called sweep origin.)

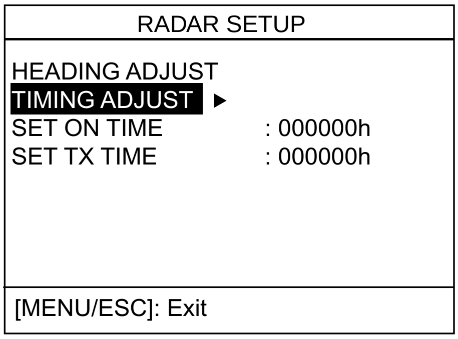
A trigger pulse generated in the display unit goes to the antenna unit through the antenna cable to trigger the transmitter (magnetron). The time taken by the signal to travel up to the antenna unit varies, depending largely on the length of signal cable. During this period the display unit should wait before starting the sweep. When the display unit is not adjusted correctly, the echoes from a straight local object (for example, a harbor wall or straight pier) will not appear with straight edges – namely, they will be seen as pushed out or pulled in near the picture center. The range of objects will also be incorrectly shown.



Correct　Target pushed inward　Target pushed outward

Improper and correct sweep timing

1. Transmit on a range between 0.125 and 0.5 nm and adjust the sensitivity and A/C SEA. (See page 4 and 5, respectively.)
2. Visually select a straight echo (harbor wall, straight pier).
3. Select TIMING ADJUST from the Radar Setup menu.



```
RADAR SETUP
HEADING ADJUST
TIMING ADJUST ►
SET ON TIME          : 000000h
SET TX TIME          : 000000h

[MENU/ESC]: Exit
```

Radar setup menu (timing adjust)

4. Press ►, ▲ in order to select YES.
   The timing adjustment display appears.
5. While looking at the target selected at step 2, straighten it by pressing ▲ or ▼.
6. Press the [MODE] key.

NMEA port setup, GPS WAAS setup

The NMEA port can function as an input port or input/output port. If you are using the GP-320B turn on the GPS WAAS feature.

1. Show the Installation menu, choose NMEA PORT, and then press ► to display the NMEA port options window.
2. Use ▲ or ▼ to choose IN/OUT or IN/IN as appropriate.

   IN/OUT: Input and Output. Choose this setting when connecting the GP-310B or GP-320B.
   IN/IN: Input only. Choose this setting when connecting the GP-310B or GP-320B and a wind sensor.
3. Press ◄, choose NMEA OUTPUT, and then press ► to display the NMEA OUTPUT options window.
4. Use ▲ or ▼ to choose OFF or ON. Choose ON to output input data. Choose OFF to not output data or if the GP-310B or GP-320B is connected.
5. If you have the GP-320B, press the [MENU/ESC] key to return to the Installation menu and then go to step 6. Otherwise, turn off the power.
6. Choose GPS WAAS and then press ►.
7. Choose ON.
8. Turn off the power.

3.5 Magnetron Heater Voltage

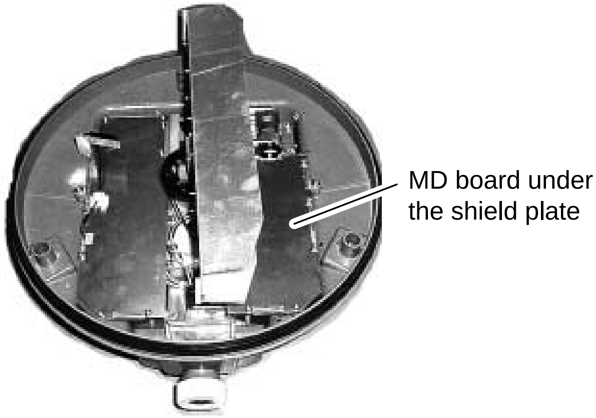
Magnetron heater voltage is formed at the MD Board of the antenna unit and preadjusted at the factory for use with any length of signal cable. Therefore, no adjustment is required. However, verify heater voltage as below.

⚠ WARNING

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

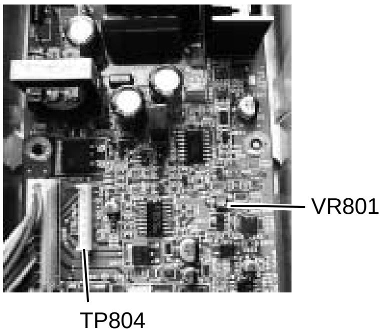
DO NOT attempt the procedure below unless totally familiar with electrical circuits.

1. Open the antenna cover and dismount the shield plate.



Antenna unit, inside view

2. Turn on the power. **DO NOT transmit.**
3. Connect a multimeter, set to 10 VDC range, between #6 (+) and #4 (-) of test point TP804 on the MD Board in the antenna unit.
4. Confirm that the multimeter shows 8.0 V ±0.1 V. If it does not, adjust potentiometer VR801 on the MD Board.



MD board

5. Turn off the power.
6. Close the antenna cover.

SPECIFICATIONS OF MARINE RADAR
MODEL 1623

1 GENERAL

1.1	Indication System	PPI Daylight display, raster scan, 4 tones in monochrome

1.2 Range, Pulselength (PL) & Pulse Repetition Rate (PRR)

Range (nm)	0.125, 0.25, 0.5, 0.75	1, 1.5, 2	3, 4, 6, 8, 12, 16
Pulse Length	0.08 µs (short)	0.3 µs (medium)	0.8 µs (long)
Pulse Repetition Rate	3000 Hz nominal	1200 Hz nominal	600 Hz nominal

1.3	Range Resolution	Better than 37.5 m
1.4	Bearing Discrimination	Within 6.7°
1.5	Minimum Range	27 m
1.6	Bearing Accuracy	Within 1°
1.7	Range Ring Accuracy	1.0 % of range or 8 m, whichever is the greater

2 SCANNER UNIT

2.1	Radiator	Micro-strip
2.2	Polarization	Horizontal
2.3	Antenna Rotation Speed	25/31/41 rpm nominal (auto-select according to range)
2.4	Radiator Length	34 cm
2.5	Horizontal Beamwidth	Less than 6.2°
2.6	Vertical Beamwidth	25°
2.7	Sidelobe Attenuation	Less than -20 dB

3 TRANSCEIVER MODULE

3.1	Frequency	9410 MHz ±30MHz (X band)
3.2	Modulation	P0N
3.3	Peak Output Power	2.2 kW
3.4	Modulator	FET Switching Method
3.5	Intermediate Frequency	60 MHz
3.6	Tuning	Automatic
3.7	Receiver Front End	MIC (Microwave IC)
3.8	Bandwidth	7 MHz
3.9	Duplexer	Circulator with diode limiter
3.10	Time of Heat-up	1-min. approx.

4 DISPLAY UNIT

4.1	Picture Tube	6 inch rectangular monochrome LCD

4.2 Display Pixels 240(H) x 320(V) dots,
Effective radar display area: 240 x 240 dots

4.3 Range, Range Interval, Number of Rings

Range (nm/km)	0.125	0.25	0.5	0.75	1	1.5	2	3	4	6	8	12	16	24
Ring Interval	0.0625	0.125	0.125	0.25	0.25	0.5	0.5	1	1	2	2	3	4	6
Number of Rings	2	2	4	3	4	3	4	3	4	3	4	4	4	4

Range unit: nm/sm/km selectable, 0.125: nm/sm only, 24: km only

4.4 Markers Heading Line, Bearing Scale, Range Rings,
Variable Range Marker (VRM), Electronic Bearing Line (EBL),
Tuning Bar, Cursor, Parallel Cursor, Alarm Zone,
Waypoint Mark (navigation input required),
North Mark (heading sensor input required)

4.5 Alphanumeric Indications Range, Range Ring Interval, Display Mode (HU),
Interference Rejection (IR), Variable Range Marker (VRM),
Electronic Bearing Line (EBL), Stand-by (ST-BY),
Guard Alarm (G (IN), G (OUT), UP RANGE), Echo Stretch (ES),
Range and Bearing to Cursor, Bearing or L/L Position,
Echo Tailing (TRAIL), Trailing Time, Trailing Elapsed Time,
Watchman (WATCHMAN), Zoomed Display (ZOOM),
Navigation Data (navigation input required),
Heading (HDC, heading sensor input required)

4.6 Input Sentences IEC61162, NMEA0183 (Ver1.5/2.0)
Own ship's position: GGA>RMC>RMA>GLL
Speed: VTG>RMC>RMA>VBW>VHW
Heading (True): HDT>HDG^{*1}>HDM^{*1}
Heading (Magnetic): HDM>HDG^{*1}>HDT^{*1}
Course (True): RMC>RMA>VTG
Course (Magnetic): VTG>RMA
Waypoint (range/bearing): RMB>BWR>BWC
Loran time difference: RMA>GLC>GTD
Water depth: DPT>DBK>DBS>DBT
Water temperature: MTW
Time ZDA>RMC
Wind bearing/speed MWV
Cross track error XTE
*1: calculate by magnetic drift.

4.7 Output Sentences IEC61162, NMEA0183 (Ver3.0)
Target L/L TLL (by key operation)

5 ENVIRONMENTAL CONDITION

5.1	Ambient Temperature	Scanner Unit: -25°C to +70°C Display Unit: -15°C to +55°C
5.2	Relative Humidity	95 % or less at +40°C
5.3	Waterproofing	
	Scanner Unit	IPX6
	Display Unit	IPX5 (IPX0 when an external buzzer installed)
5.4	Bearing Vibration	IEC60945

6 POWER SUPPLY

12-24 VDC: 4.2-1.4 A

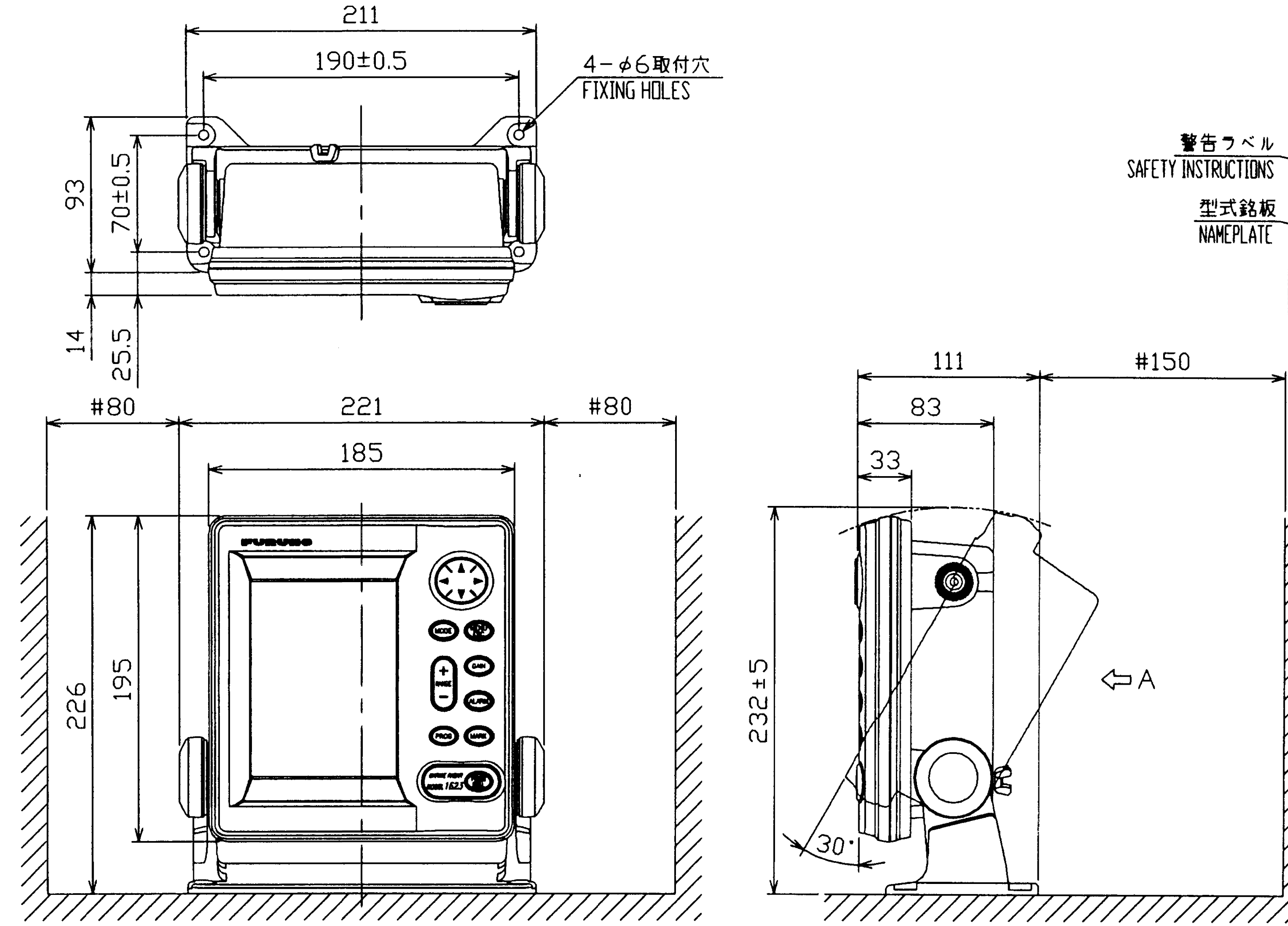
7 COATING COLOR

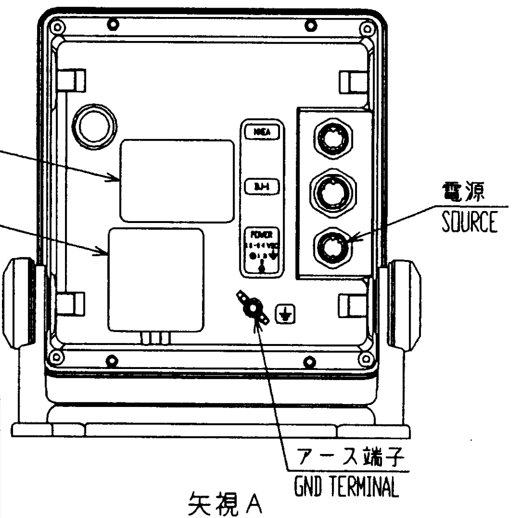
7.1	Display Unit	Panel: N3.0, Chassis: 2.5GY5/1.5
7.2	Scanner Unit	Cover: N9.5, Bottom: 2.5PB 3.5/10

8 COMPASS SAFE DISTANCE

8.1	Display Unit	Standard: 0.65 m	Steering: 0.50 m
8.2	Scanner Unit	Standard: 1.25 m	Steering: 0.95 m

FURUNO


211
190±0.5
4−φ6取付穴
FIXING HOLES
93
70±0.5
14
25.5
#80
221
#80
185
226
195
111
#150
83
33
232±5
30°
⇦A


警告ラベル
SAFETY INSTRUCTIONS
型式銘板
NAMEPLATE
電源
SOURCE
アース端子
GND TERMINAL

矢視A
VIEW A

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

表1　TABLE 1

TENTATIVE
暫定

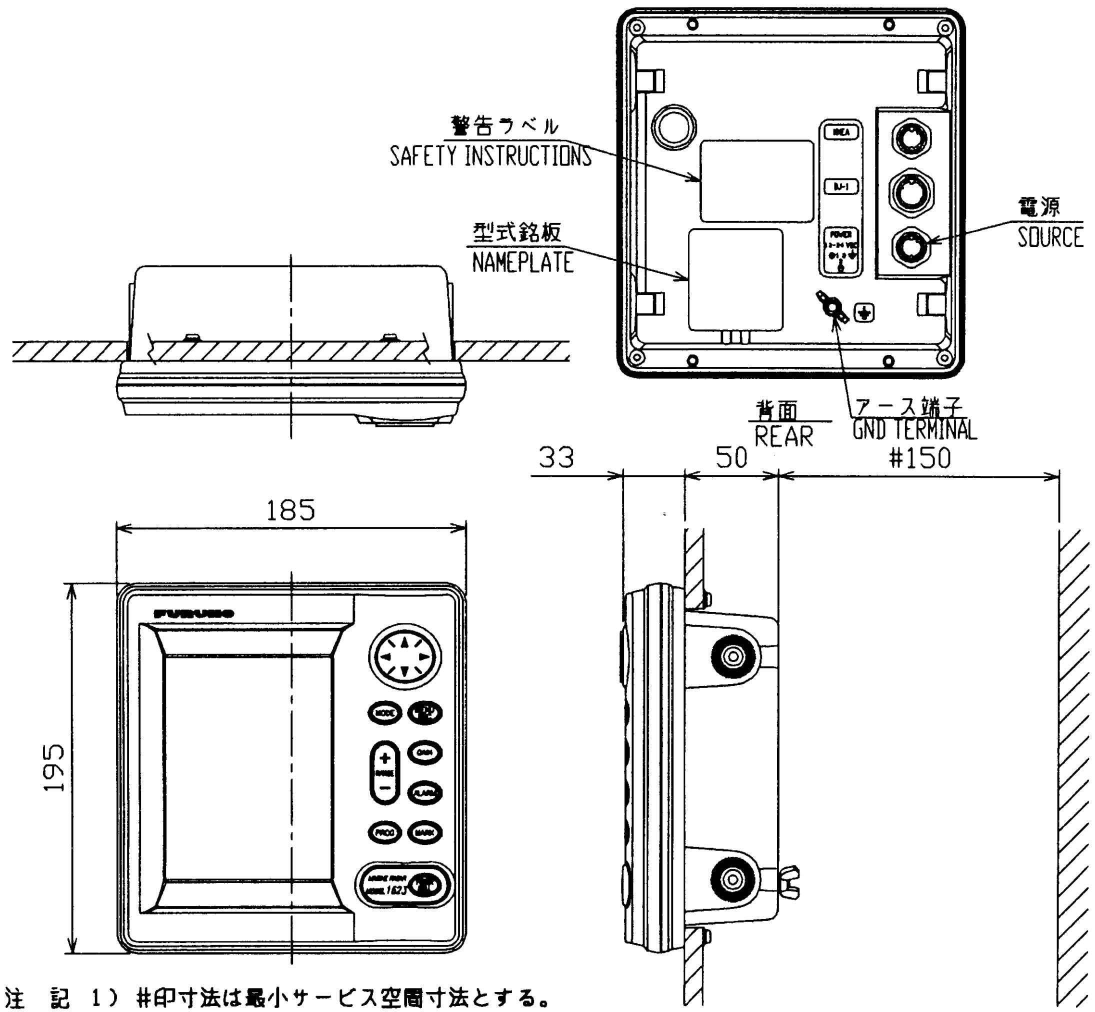
注　記　1）＃印寸法は最小サービス空間寸法とする。
2）指定外の寸法公差は表１による。
3）取付用ネジはトラスタッピングネジ呼び径５×２０を使用のこと。

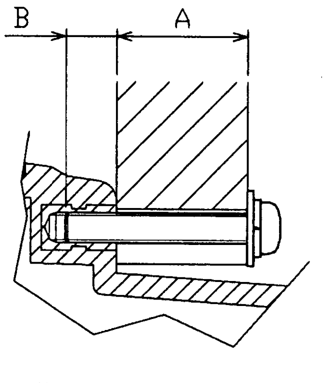
NOTE
1. #: RECOMMENDED SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
3. USE TAPPING SCREWS 5 x 20 FOR FIXING THE UNIT.

DRAWN May. 10 '02 T. YAMASAKI		TITLE	RDP-141
CHECKED 02/5/14 Y.K		名称	指示部（卓上装備）
APPROVED 02/5/14 Y.K	MODEL 1623		外寸図
SCALE 1/4	MASS 1.5 ±10% kg 質量は付属カバーを含みます。 MASS W/O ACCESSORY COVER.	NAME	DISPLAY UNIT (DESKTOP MOUNT)
DWG No. C3510-G01-1			OUTLINE DRAWING

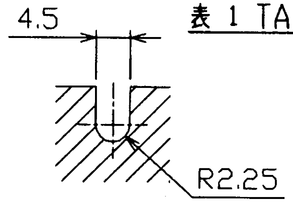
D-1

FURUNO ELECTRIC CO., LTD.


警告ラベル
SAFETY INSTRUCTIONS
型式銘板
NAMEPLATE
電源
SOURCE
背面
REAR
アース端子
GND TERMINAL
33
50
#150
185
195



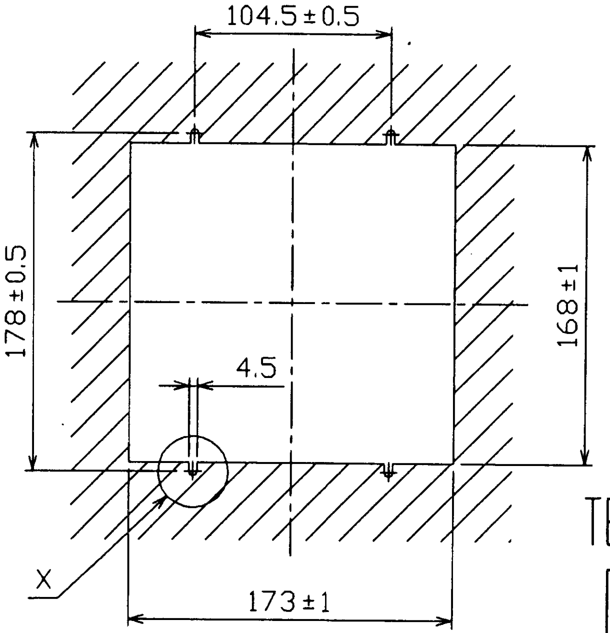
取付ネジ部断面（尺度１／１）
DETAIL OF FASTENING (SCALE: 1/1)



X部詳細（尺度１／１）
DETAIL X (SCALE: 1/1)

寸法区分（ｍｍ） DIMENSIONS	公差（ｍｍ） TOLERANCE
Ｌ≦５０	±１．５
５０＜Ｌ≦１００	±２．５
１００＜Ｌ≦５００	±３

表 1 TABLE 1


104.5±0.5
178±0.5
168±1
4.5
X
173±1

取付穴寸法図
CUTOUT DIMENSIONS

TENTATIVE

暫定

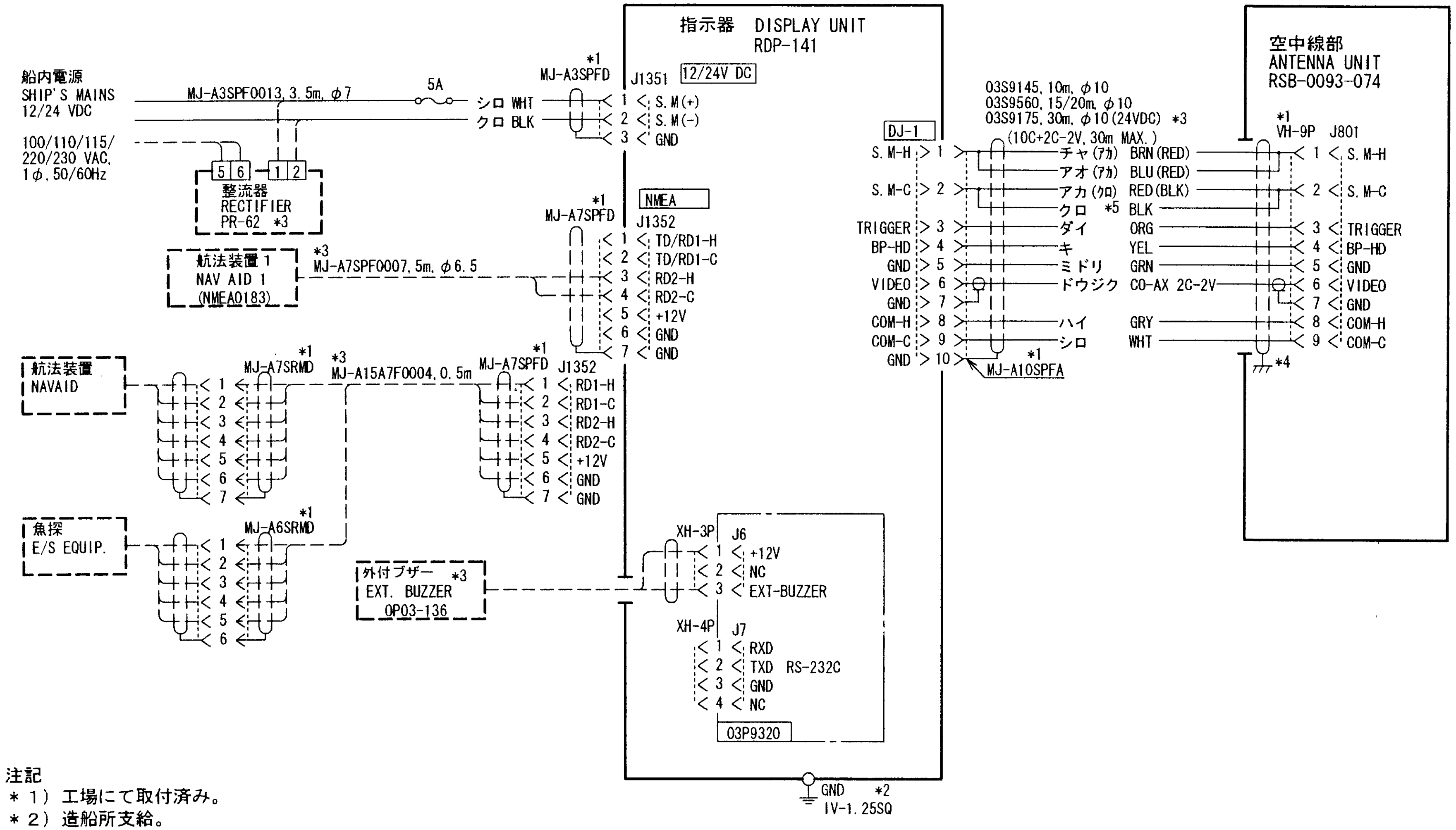
注　記　１）＃印寸法は最小サービス空間寸法とする。
２）指定外の寸法公差は表１による。
３）取付用ネジは、セムスネジＢ Ｍ４×２０を使用のこと。
壁の厚さ（Ａ）は１１≦Ａ≦１４とする。それ以外の壁に
装備する場合、使用するネジ長さは（Ａ＋７．８）±２とする。
筐体にはネジ部（Ｂ）を８ｍｍ以上入れないこと。

NOTE
1. #: RECOMMENDED SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
3. USE M4x20 SCREWS FOR FIXING THE UNIT.
THICKNESS A: 11≦A≦14 OR SCREW LENGTH: (A+7.8)±2.
DO NOT FASTEN SCREWS INTO UNIT MORE THAN 8 mm (B≦8)

DRAWN May 14 '02 T. YAMASAKI			TITLE	RDP-141
CHECKED 02/5/14 Y. K			名称	指示部（埋込装備）
APPROVED 02/5/14 Y. K		MODEL 1623		外寸図
SCALE 1/4	MASS 1.3 ±10% kg	質量は付属カバーを含みます。 MASS W/O ACCESSORY COVER	NAME	DISPLAY UNIT (FLUSH MOUNT)
DWG No. C3510-G02-1				OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO


船内電源
SHIP'S MAINS
12/24 VDC
100/110/115/
220/230 VAC,
1φ, 50/60Hz
MJ-A3SPF0013, 3.5m, φ7
5A
シロ WHT
クロ BLK
5 6
1 2
整流器
RECTIFIER
PR-62 *3
航法装置 1
NAV AID 1
(NMEA0183)
*3
MJ-A7SPF0007, 5m, φ6.5
航法装置
NAVAID
魚探
E/S EQUIP.
*1
MJ-A7SRMD
*1
MJ-A6SRMD
*3
MJ-A15A7F0004, 0.5m
*1
MJ-A7SPFD
外付ブザー *3
EXT. BUZZER
OP03-136
*1
MJ-A3SPFD
*1
MJ-A7SPFD
指示器 DISPLAY UNIT
RDP-141
J1351
12/24V DC
1 S.M(+)
2 S.M(-)
3 GND
NMEA
J1352
1 TD/RD1-H
2 TD/RD1-C
3 RD2-H
4 RD2-C
5 +12V
6 GND
7 GND
J1352
1 RD1-H
2 RD1-C
3 RD2-H
4 RD2-C
5 +12V
6 GND
7 GND
XH-3P
J6
1 +12V
2 NC
3 EXT-BUZZER
XH-4P
J7
1 RXD
2 TXD
3 GND
4 NC
RS-232C
03P9320
GND *2
IV-1.25SQ
DJ-1
S.M-H 1
S.M-C 2
TRIGGER 3
BP-HD 4
GND 5
VIDEO 6
GND 7
COM-H 8
COM-C 9
GND 10
*1
MJ-A10SPFA
03S9145, 10m, φ10
03S9560, 15/20m, φ10
03S9175, 30m, φ10 (24VDC) *3
(10C+2C-2V, 30m MAX.)
チャ (アカ) BRN (RED)
アオ (アカ) BLU (RED)
アカ (クロ) RED (BLK)
クロ *5 BLK
ダイ ORG
キ YEL
ミドリ GRN
ドウジク CO-AX 2C-2V
ハイ GRY
シロ WHT
空中線部
ANTENNA UNIT
RSB-0093-074
*1
VH-9P
J801
1 S.M-H
2 S.M-C
3 TRIGGER
4 BP-HD
5 GND
6 VIDEO
7 GND
8 COM-H
9 COM-C
*4

注記
＊１）工場にて取付済み。
＊２）造船所支給。
＊３）オプション。
＊４）空中線部のシールドは完全にアースする。
＊５）（ ）：03S9560の芯線色を示す。

NOTE
*1. FITTED AT FACTORY.
*2. SHIPYARD SUPPLY.
*3. OPTION.
*4. GROUND EFFECTIVELY AT SCANNER UNIT.
*5. ( ): WIRE COLOR OF 03S9560.

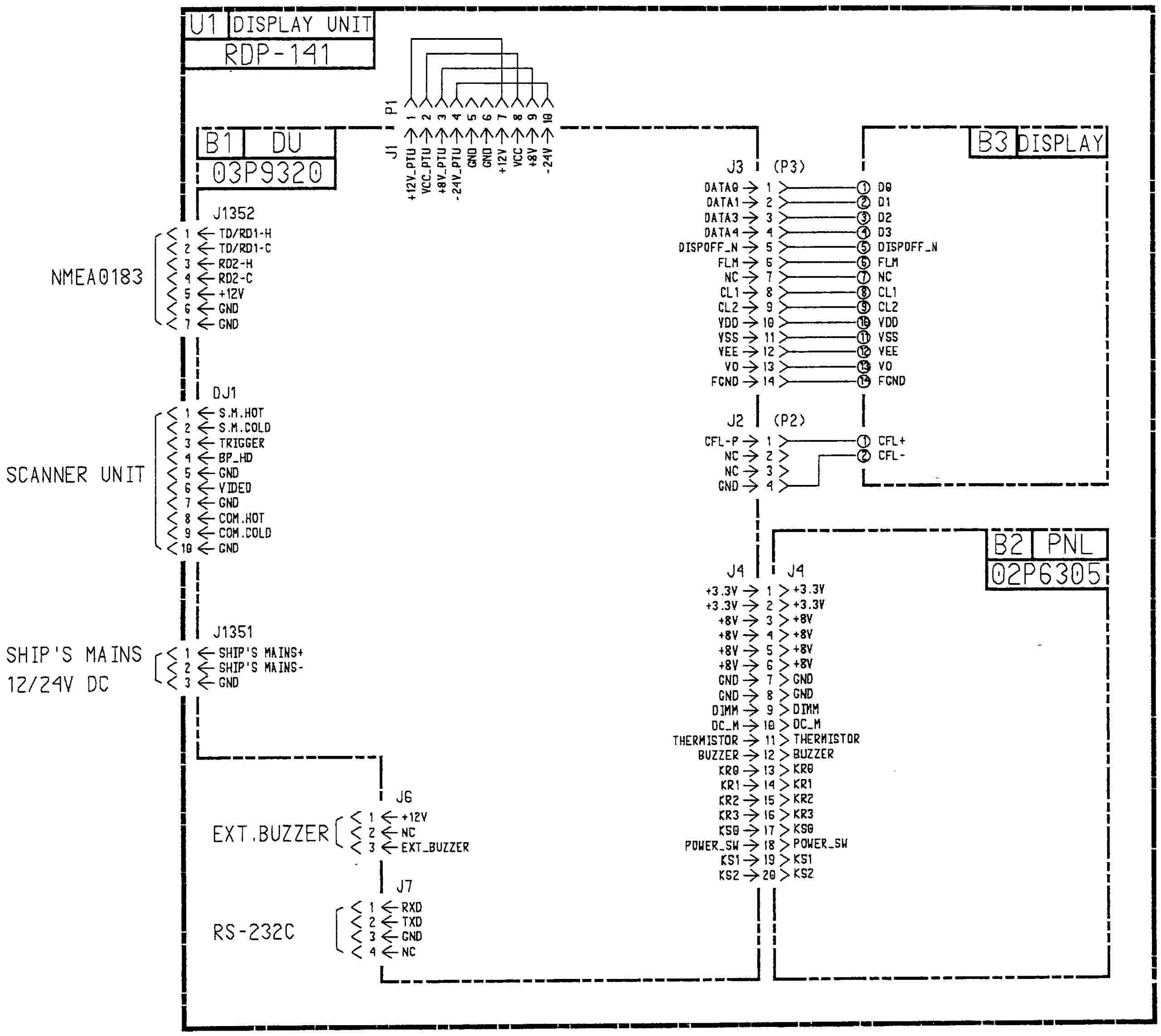
DRAWN May. 8 '02	T. YAMASAKI		TITLE	MODEL 1623
CHECKED 02/5/15	Y.K		名称	船舶用レーダー
APPROVED 02/5/15	Y.K			相互結線図
SCALE	MASS kg		NAME	MARINE RADAR
DWG. No.	C3510-C01- A	03-160-6001-0		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

S-1

FURUNO

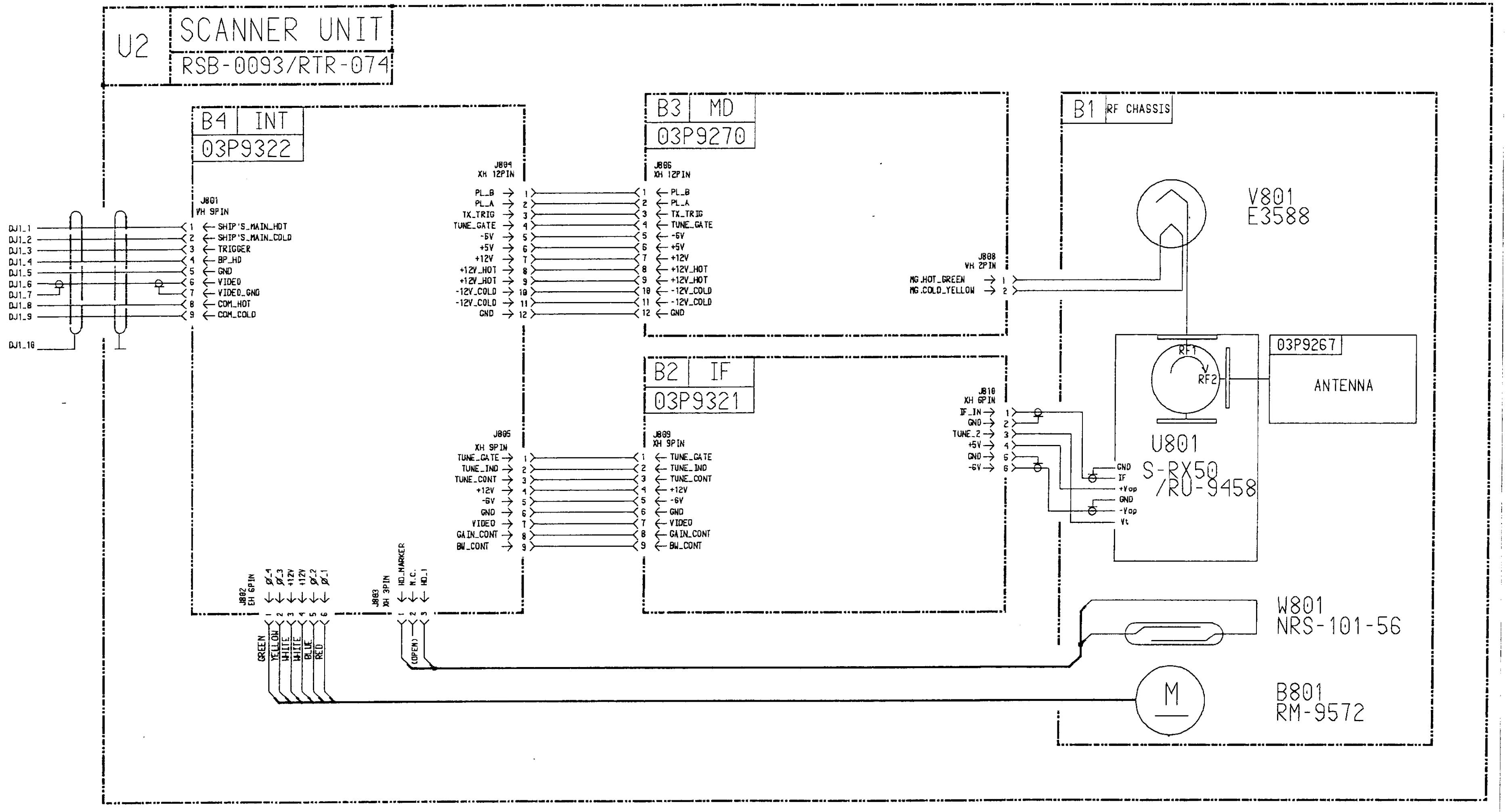
S-2


U1 DISPLAY UNIT
RDP-141
B1 DU
03P9320
P1
J1
1 +12V_PTU
2 VCC_PTU
3 +8V_PTU
4 -24V_PTU
5 GND
6 GND
7 +12V
8 VCC
9 +8V
10 -24V
J1352
NMEA0183
1 TD/RD1-H
2 TD/RD1-C
3 RD2-H
4 RD2-C
5 +12V
6 GND
7 GND
DJ1
SCANNER UNIT
1 S.M.HOT
2 S.M.COLD
3 TRIGGER
4 BP_HD
5 GND
6 VIDEO
7 GND
8 COM.HOT
9 COM.COLD
10 GND
J1351
SHIP'S MAINS 12/24V DC
1 SHIP'S MAINS+
2 SHIP'S MAINS-
3 GND
J6
EXT.BUZZER
1 +12V
2 NC
3 EXT_BUZZER
J7
RS-232C
1 RXD
2 TXD
3 GND
4 NC
J3 (P3)
DATA0 1 ① D0
DATA1 2 ② D1
DATA3 3 ③ D2
DATA4 4 ④ D3
DISPOFF_N 5 ⑤ DISPOFF_N
FLM 6 ⑥ FLM
NC 7 ⑦ NC
CL1 8 ⑧ CL1
CL2 9 ⑨ CL2
VDD 10 ⑩ VDD
VSS 11 ⑪ VSS
VEE 12 ⑫ VEE
VO 13 ⑬ VO
FGND 14 ⑭ FGND
B3 DISPLAY
J2 (P2)
CFL-P 1 ① CFL+
NC 2 ② CFL-
NC 3
GND 4
B2 PNL
02P6305
J4 J4
+3.3V 1 +3.3V
+3.3V 2 +3.3V
+8V 3 +8V
+8V 4 +8V
+8V 5 +8V
+8V 6 +8V
GND 7 GND
GND 8 GND
DIMM 9 DIMM
DC_M 10 DC_M
THERMISTOR 11 THERMISTOR
BUZZER 12 BUZZER
KR0 13 KR0
KR1 14 KR1
KR2 15 KR2
KR3 16 KR3
KS0 17 KS0
POWER_SW 18 POWER_SW
KS1 19 KS1
KS2 20 KS2

DRAWN 02/05/08 T. YAMASAKI		TYPE	RDP-141
CHECKED 02/5/8 Y. Kimi		名称	指示部
APPROVED 02/5/8 Y. Kimi	MODEL 1623		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	DISPLAY UNIT
Dwg No. C3510-K02- A	03-160-6003-0		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.

S-3


U2
SCANNER UNIT
RSB-0093/RTR-074
B4 INT
03P9322
J801
VH 9PIN
DJ1_1
DJ1_2
DJ1_3
DJ1_4
DJ1_5
DJ1_6
DJ1_7
DJ1_8
DJ1_9
DJ1_10
1 SHIP'S_MAIN_HOT
2 SHIP'S_MAIN_COLD
3 TRIGGER
4 BP_HD
5 GND
6 VIDEO
7 VIDEO_GND
8 COM_HOT
9 COM_COLD
J804
XH 12PIN
PL_B 1
PL_A 2
TX_TRIG 3
TUNE_GATE 4
-6V 5
+5V 6
+12V 7
+12V_HOT 8
+12V_HOT 9
-12V_COLD 10
-12V_COLD 11
GND 12
J805
XH 9PIN
TUNE_GATE 1
TUNE_IND 2
TUNE_CONT 3
+12V 4
-6V 5
GND 6
VIDEO 7
GAIN_CONT 8
BW_CONT 9
J802
EH 6PIN
Ø_4
Ø_3
+12V
+12V
Ø_2
Ø_1
GREEN
YELLOW
WHITE
WHITE
BLUE
RED
J803
XH 3PIN
HD_MARKER
N.C.
HD_1
(OPEN)
B3 MD
03P9270
J806
XH 12PIN
1 PL_B
2 PL_A
3 TX_TRIG
4 TUNE_GATE
5 -6V
6 +5V
7 +12V
8 +12V_HOT
9 +12V_HOT
10 -12V_COLD
11 -12V_COLD
12 GND
J808
VH 2PIN
MG.HOT_GREEN 1
MG.COLD_YELLOW 2
B2 IF
03P9321
J809
XH 9PIN
1 TUNE_GATE
2 TUNE_IND
3 TUNE_CONT
4 +12V
5 -6V
6 GND
7 VIDEO
8 GAIN_CONT
9 BW_CONT
J810
XH 6PIN
IF_IN 1
GND 2
TUNE_2 3
+5V 4
GND 5
-6V 6
B1 RF CHASSIS
V801
E3588
RF1
RF2
03P9267
ANTENNA
U801
S-RX50
/RU-9458
GND
IF
+Vop
GND
-Vop
Vt
W801
NRS-101-56
M
B801
RM-9572

DRAWN 02/05/08 T. YAMASAKI		TYPE	RSB-0093-074
CHECKED 02/5/18 Y.K		名称	空中線部
APPROVED 02/5/18 Y.K	MODEL 1623		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	ANTENNA UNIT
Dwg No. C3510-K01- A	03-158-6002-0		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.