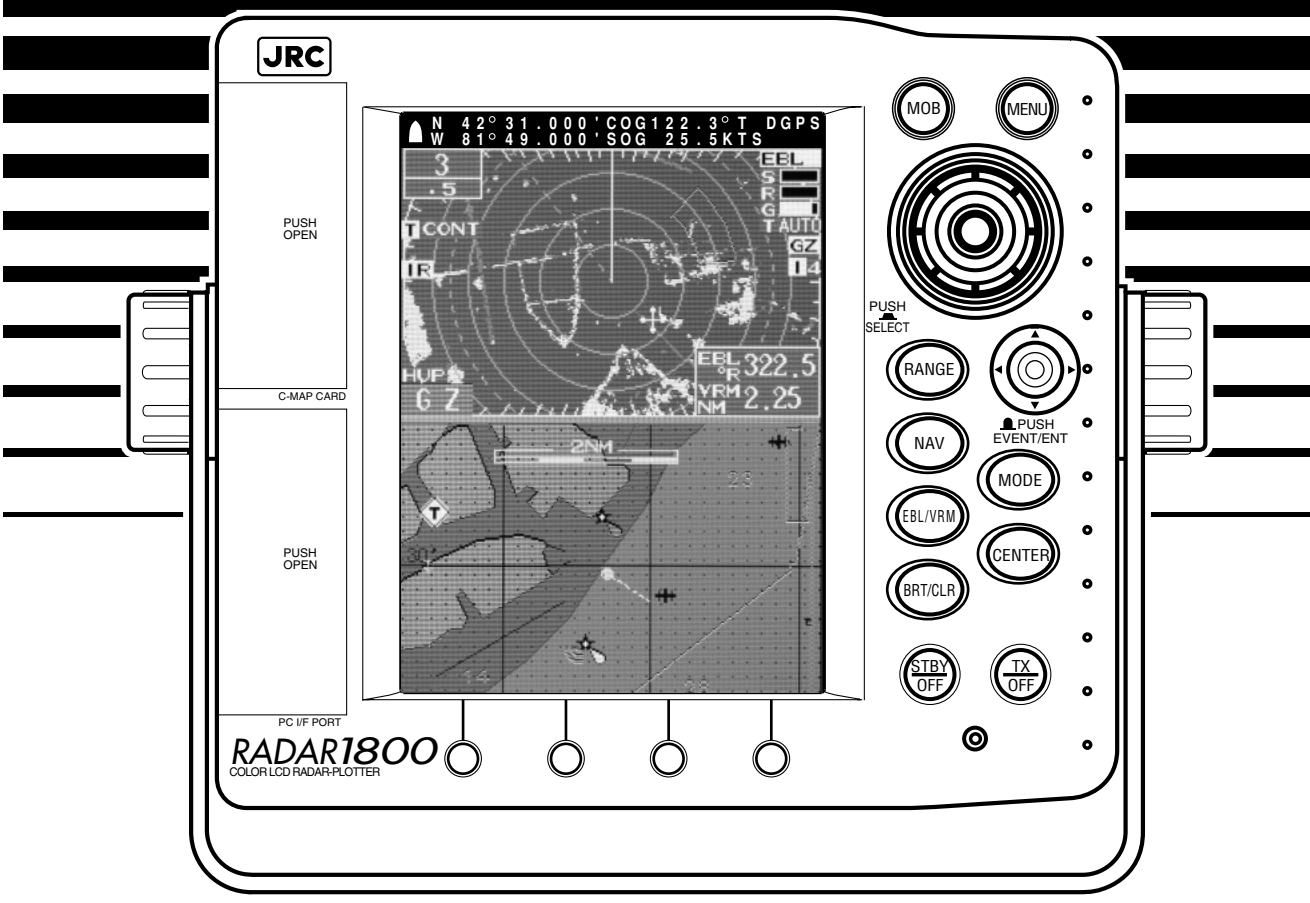
INSTRUCTION MANUAL



Color Radar / Plotter RADAR1800

Color Radar/Plotter

Before You Begin

Thank you for purchasing our RADAR 1800 Color LCD Radar/Plotter.

This unit is a sophisticated and easy to use integrated color radar and color plotter. When the unit is connected to a GPS or Loran navigation system, the color plotter function allows you to continuously display latitude, longitude, scale division and track line of the vessel color.

- This unit is a compact LCD radar with a 2 kw transmitter & 6.5 inch color LCD. Before attempting to operate it, read this instruction manual thoroughly to correctly and safely operate this unit in accordance with the warning instructions and operation procedures in this manual.

- Storing this instruction manual carefully for future reference is highly recommended. In the event that you have an operational problem or malfunction, this manual will provide useful instructions.

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

- The LCD uses 224,000 or more TFTs (Thin Film Transistor). If some pixels on the screen are not clear, the color is different, or the screen is brighter than usual, it is not because of defect, instead it is because of inherent characteristics of the TFT display technology.

Symbols Used In This Manual

Related Symbol Marks

In this manual, and on the equipment, we use several warning signs to call your attention to important items that, if not handled correctly, could present danger to yourself or property. These warning note classifications are as described below.

Please be fully aware of the importance of these items before using this manual.

⚠ **WARNING**	Indicates warning items that, if ignored, may result in serious personal injury or even death.
⚠ **CAUTION**	Indicates cautionary items that, if ignored, may result in personal injury or physical damage.

Examples of Related Symbol Marks Used in this Manual and on the Unit

 Hot Surface	Each △ mark is intended to alert the user to the presence of precautions including danger and warning items. The picture in each △ mark alerts you to operations that should be carefully performed.
 Prohibition  Prohibits disassembly	Each ⃠ mark is intended to alert the user to the presence of prohibited activity. The picture/word in/beside each ⃠ mark alerts you to operations that are prohibited.
 Instruction	Each ● mark is intended to alert the user to the presence of necessary instructions. The picture in each ● mark alerts you to operations that must be performed.

WARNING LABEL

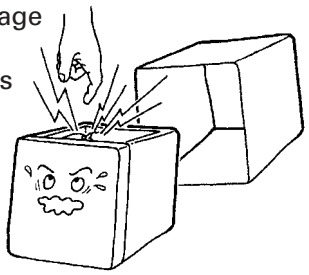
You can see the warning label on the top of the unit.

Do not attempt to remove the warning label from the unit or impair or modify it.

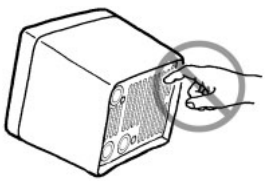
Usage Hints

⚠ WARNING

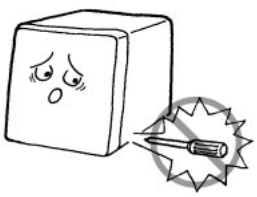
Do not remove the cover of the unit. Doing so may cause an electric shock by high voltage from within the product's enclosure.



Do not touch the radiator fin of the unit. Doing so may cause a burn by high temperature.

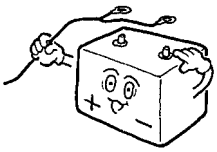


Do not try to disassemble or modify the unit. Doing so may cause a fire, electric shock or malfunction.

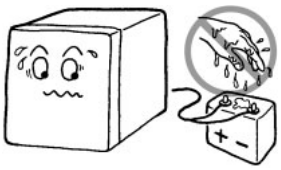


Do not place objects containing liquid or metal fragments on top of the unit, which might be spilled or dropped into the unit. Doing so may cause a fire, electric shock or malfunction.

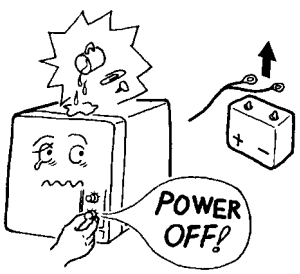
Operate the unit only on 12 VDC. Not doing so may cause fire or electrical shock.



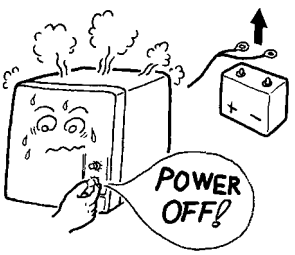
Do not (dis)connect the power cable(from) to the main unit with wet hands, as doing so may cause electrical shock.



In the event that you spill or drop any liquids or metals, etc. inside the unit, turn off the main unit, unplug the power supply terminal, and contact our company, branch, or local office. Continuing operation as is may cause a fire, electric shock or malfunction.

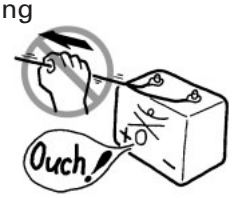


In the event that smoking or burning odors are detected, immediately terminate operation of the unit and contact your dealer. Continuing operation as is may cause a fire or electrical shock. Never attempt to service the interior of the unit.

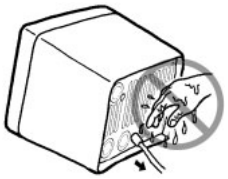


⚠ CAUTION

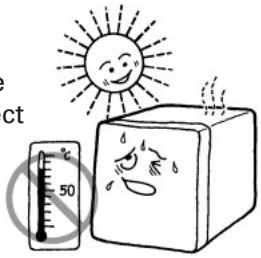
When disconnecting the power cable, be sure to grasp it by the plug. Never pull on the connecting cord itself, as doing so increases the risk of malfunction.



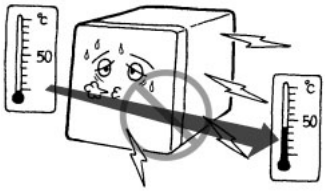
Do not drop the unit into water. When disconnecting the connector on the back side, be sure it does not get wet, as doing so increases risk of electrical shock or malfunction.



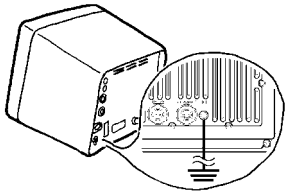
Do not use or install the unit in a place where the LCD is subject to direct sunlight, or in a location near heat sources where the temperature is 50°C (Display Unit), 55°C (Scanner Unit) or more.
Doing so may cause a malfunction or defect.



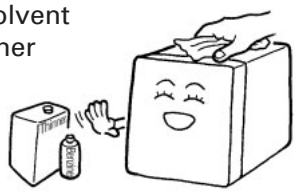
Do not turn on the unit immediately after moving it from a cold place to a warm one. Let the unit stand for around 30 minutes before turn on, until the inside temperature of the unit reaches the same level as that of the room it was moved to.
Not doing so increases risk of malfunction.



Be sure to connect a cable to the grounding terminal when installing. Not doing so may cause an electric shock or excessive noise from/ to other equipment.



Do not use any type of organic solvent such as thinner or benzine when cleaning the surface of the cabinet.
Doing so may damage the coating or the finish of the unit's surface.
Remove any dust and clean the unit's surface with a soft dry cloth.



This device is only an aid to navigation.

- The information displayed by the unit cannot be directly used for navigation purposes.
  It must be used together with the appropriate marine charts.
- The unit does not automatically assess position information.
  It is the user's responsibility to judge position and navigational information.

EMC Installation & Service Guidelines

IMPORTANT NOTE

All JRC equipment and accessories are designed to the highest industry standards for use in a marine environment. Their design and manufacture conforms to the appropriate Electro Magnetic Compatibility (EMC) standards, but good installation is required to ensure that performance is not compromised. Although every effort has been taken to ensure that the equipment will perform under all conditions, it is important to understand what factors could affect operation of the product. Complete installation instructions are provided in SECTION 2 of this manual. Some preliminary suggestions are made below.

Installation

To avoid the risk of operating problems, all JRC equipment and cables connected to it should be:

- At least 1m (3 feet) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios the distance should be increased to 2m (7 ft).
- More than 2 m (7 ft) from the path of a radar beam. A radar beam can normally assume to spread 20 degrees above and below the radiating element.
- The equipment should be supplied from a different battery than the one used for engine start. Voltage drops below 10.2V in the power supply to our products can cause the equipment to reset. This will not damage the equipment, but will cause some loss of information and this can also change the operating mode.
- Genuine JRC Cables should be used at all times. Cutting and rejoining these cables can compromise EMC performance and should therefore be avoided unless doing so is suggested in the installation manual.

Check Before Going to Sea

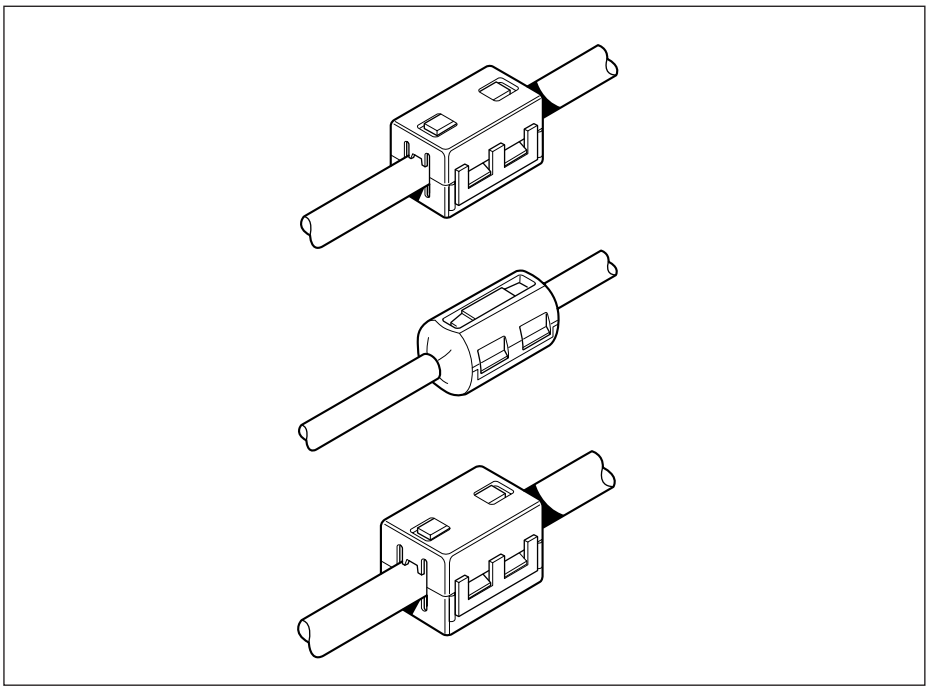
- Always check the installation before going to sea to make sure that it is not affected by radio transmissions, engine starting, low battery voltage, or other problems.
- In some, installations, it may not be possible to prevent the equipment from being affected by external influences. In general this will not damage the equipment but it can lead to it resetting, or momentarily may result in faulty operation. This can then be avoided by turning off the RADAR 1800 prior to starting the boat engines for instance.

Servicing and Safety

- JRC equipment should be serviced only by authorized JRC service engineers. They will ensure that service procedures and replacement parts used will not affect performance. There are no user serviceable parts in any JRC product.
- Some products generate high voltages, and so never handle the cables/connectors when power is being supplied to the equipment.
- Always report any EMC related problem to your nearest JRC dealer. We will use any such information to improve our quality standards.

Suppression Ferrites

The following illustration shows the range of suppression ferrites fitted to JRC equipment.



Notes for Suppression Ferrite Installation

Connections to other equipment

If your JRC equipment is going to be connected to other equipment using a cable not supplied by JRC, a suppression ferrite MUST always be fitted to the cable close to the JRC unit.

Outside View

Scanner Unit

Display Unit

GPS/DGPS Sensor (Option)

GPS-112/GPS-112W

DGPS212/GPS-212W

Contents

Definition on Terms

2D(two- dimensional)..... Position fixing using satellites and height information.

3D(three-dimensional).... Position fixing using satellite information only from four or more satellites.

Anchor alarm ..... An alarm indicating that the vessel has deviated more than the set distance from a waypoint.

Arrival alarm ..... An alarm indicating that the vessel has come within the set distance of a waypoint.

Automatic sequencing mode
..... Function that automatically steps from one waypoint to the next when the arrival perpendicular point has been detected.

Bow ..... The front of a vessel (nautical term)

CDI ..... Course Deviation Indicator. Information that indicates the extent you have strayed from the route intended and the direction to steer.

COG ..... Course over Ground

CUP(Course-UP) ..... An azimuth stabilized display in which a line connecting the centre of own ship with the top of the display is own ship's intended course.

Default value ..... Factory set value

DGPS ..... The process of correcting the inaccuracies of GPS position data from GPS satellites by receiving a beacon Differential Signal from a base station whose exact position is known. And which transmits correction data for the GPS satellites it receives.

EBL(Electric Bearing Line)
..... Electronic Bearing Line – A moveable vector line radiating out from the ship indicating the bearing thereof.

GPS(Global Positioning System)
..... Internationally-used positioning system.

Ground stabilization ..... A mode of display whereby own ship and all targets are referenced to the ground using ground track or set and drift inputs.

GPS satellite ..... GPS stands for "Global Positioning System." Several satellites launched by the US Department of Defense to establish a military navigational aid system.

Guard zone ..... A zone in which an alarm is given when a target is detected.

HDOP ..... Indicates the accuracy of Horizontal position fixing. The smaller the number shows the more accurate the position fixing.
When the satellites are grouped together, HDOP increases and position fixing accuracy is poorer. When the satellites are Farther apart, HDOP decreases and position fixing accuracy is enhanced.

Heading ..... The direction in which the bows of a ship are pointing expressed as an angular displacement from north.

HL ..... Heading Line

Hull ..... The exterior surface of a ship.

HUP(Head-UP) ..... Display mode in which the top of the screen corresponds to the ship's head maker.

Initialization ..... It takes up to 20 minutes for GPS position fixing when it is used for the first time or after a master reset has been performed. This time can be reduced by entering initialization values such as estimated position, time and antenna height.

IR ..... Interference Rejector

Manual sequencing mode
..... The unit sounds the arrival alarm and the operator will manually press key to step to next leg in the route plan when it is safe to do so.

Master reset ..... A function for clearing all settings and returning to the factory set values (default values). Two types of master resets are provided. A soft reset clears all data exept for waypoint and route plan data. A hard reset clears all data.

NM ..... Nautical Mile(1 nm= 1,852 m)

NMEA0183 ..... National Marine Electrical Association 0183. Association establishing international standards for communications between navigational equipment and the standard established by NMEA.

NUP(North-UP) ..... An azimuth stabilized display in which the top of the screen is always North.

Off-course alarm ..... An alarm indicating that the vessel has deviated more than a set distance from a predetermined course.

Port ..... Left (nautical term).

Position fixing ..... The process of deriving the current location of a vessel using GPS or DGPS sensor.

Range ..... The range scale.

Range ring ..... Fixed range ring.

RM(Relative Motion) ..... The combination of relative course and relative speed.

RM display ..... A display on which the position of own ship remains fixed and all targets move relative to own ship.

Relative bearing ..... The direction of a target from own ship expressed as an angular displacement from own ship's heading.

Relative course ..... The direction of motion of a target relative to own ship's position expressed as an angular displacement from north. It is deduced from a number of measurements of target range and bearing on own ship's radar.

Relative speed ..... The speed of a target relative to own ship's position. It is deduced from a number of measurements of target range and bearing on own ship's radar.

Route plan ..... A plan that registers plural waypoints in a navigational path.

Scan CORR ..... Scan Correlation, a method of target processing enhancement using multiple scan information.

Scanner ..... Antenna unit.

Sea stabilization ..... A mode of display whereby own ship and all targets are referenced to the sea, using gyro heading and water speed inputs.

Sensitivity ..... The ability of a receiver to pick up small targets.

SOG ..... Speed over Ground.

Starboard ..... Right (nautical term)

Stern ..... The rear of a vessel (nautical term).

TM(True Motion) ..... The combination of true course and true speed.

TM display ..... A display across which own ship and each target moves with its own true motion.
Stationary targets such as land do not move except occasionaly when the picture display shifts position to keep own ship on the screen.

Trails ..... Tracks left behind radar targets showing the history of previous target positions.

True bearing ..... The direction of a target from own ship or from another target expressed as an angular displacement from True North.

True course ..... The true direction of motion of a target expressed as angular displacement form north. It is obtained by a vector combination of target relative motion and own ship's true motion.

True speed ..... The speed of a target obtained by a vector combination of target relative motion and own ship's true motion.

True vector ..... The predicted true motion of a target as result of own ship's direction and speed input. The true vector may be either displayed with reference to the water or to the ground.

WAAS(Wide Area Augmentation System)
..... WAAS is a system that improve GPS position fixing accuracy.

SECTION 1 Introduction

Function

Congratulations on selecting the JRC RADAR 1800 Color LCD system to assist your navigation.

Whether you purchased this radar because of its compactness, power economy, ease of installation, or long term reliability, one thing is certain;the moment you turn on your RADAR 1800 Display you will know that you are seeing a revolutionary new concept in Radar technology.

You are the proud owner of a radar system unmatched in the marine recreational industry.

Radar signals are shown on a color LCD display with excellent graphic clarity and detail.

A single glance at your Display will give you a complete and accurate 360° radar picture of other vessels, buoys and land surrounding your vessel.

By connecting with JRC's GPS/DGPS sensor, the LCD Display allows you to continuously display latitude, longitude, scale division and track line of the vessel in color.

Since the color of the vessel track line can be displayed in any color and deleted when required, it can be checked at a glance.

In addition to track line, waypoints and transit point(convenient for marking dangerous location, shoals and fishing spots) can be stored and diplayed in color.

The distance and bearing from the ever-changing current position to a waypoint is displayed automatically.

Since displayed sea areas can be magnified, reduced or moved as desired, it can be used for a number of application.

System components

The Color Radar plotter RADAR 1800 consists of a compact display unit connected to scanner unit.
Use of the GPS capabilities requires the optional GPS 112:JRC's GPS sensor.
Use of the DGPS capabilities requires the optional DGPS212:JRC's DGPS sensor.

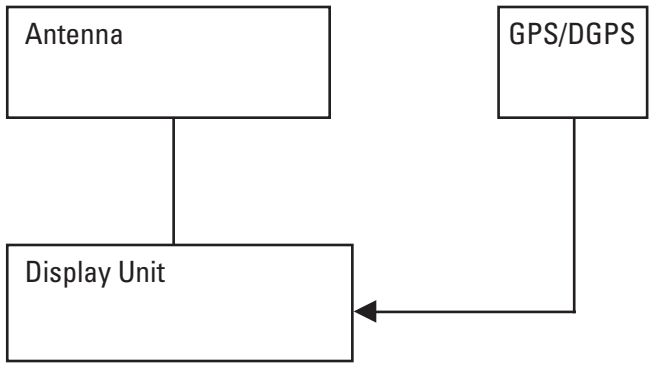


Figure 1-1

Features

Easy To Operate Features

Like the JRC RADAR 1000 and RADAR 1500, the JoyStick and Jog Dial are mounted to provide easy to operate for everyone.

Scan Correlation Feature

The Scan Correlation signal processing function, normally only available in larger commercial radars, is included to provide an enhanced presentation of targets especially in high sea return conditions (false random targets caused by radar signals bouncing back from waves).

Automatic STC Feature

In addition to manual STC adjustment, an Automatic STC setting is also available to help adjust out annoying sea return targets.

Inter Switch Feature

With the optional Inter Switch Kit (NQE-1200), the antenna can be controlled by either one of the two display units installed at the cabin fly bridge, etc. (No simultaneous control by the two units)

Connectable with the JRC GPS Compass

By connecting with the JLR-10 JRC GPS Compass, you can select the heading mode between Head-Up, North-Up, and Course-Up.

Various Navigation Screen Feature

By connecting an optional GPS or DGPS sensor, such information as the position or course of your ship can be displayed on the screen.

By registering WAYPOINT and ROUTE PLAN, it is also possible to display such important information as the distance or bearing to/of a WAYPOINT that ensures safe and economical navigation.

This information can be displayed in the chart plot style, in the intuitive illustration style, or in the numerical style depending on your selection.

Components

When unpacking your RADAR 1800, you should find the following standard equipment in the carton. If any items are missing, please notify your JRC dealer immediately.

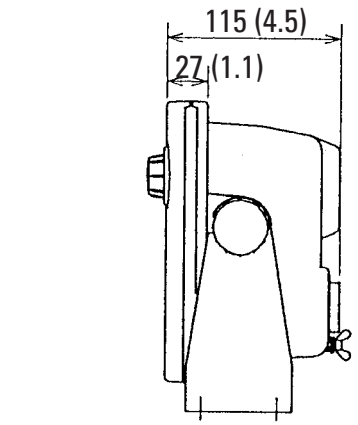
Standard Equipment

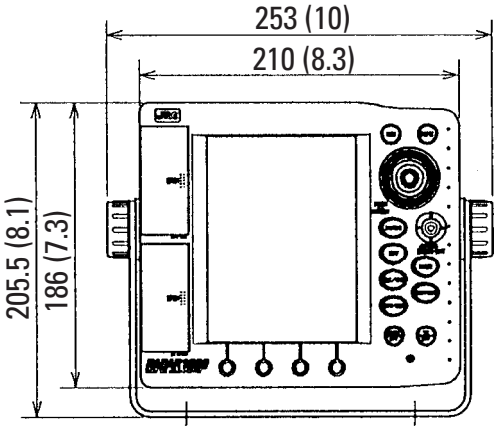
No	Description	Model No.	Qty.	Remarks
1	Display Unit	NCD-4300	1	
2	Scanner Unit	NKE-1065	1	
3	Scanner unit cable (10/15m)	CFQ-6531-10/15	1	Either one
4	Power Cable (2m)	CFQ-6532	1	With Fuse
5	Instruction Manual	7ZPRD0551	1	This Manual
6	Standard Spares	7ZXRD0004	1	10A Fuse × 1 Ferrite Core × 1 NMEA data Connector × 1
7	Sun Cover	MTV303270	1	
8	Flush Mounting Kit	MPTG30914	1	
9	Warranty Card		1	

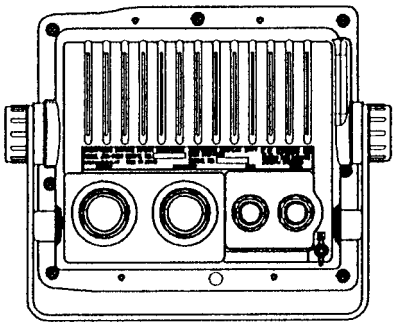
GPS Sensor (Option)

Model Name	Model No.	Remarks
GPS112	JLR-4330E	GPS Sensor
GPS112W	JLR-4330W	GPS Sensor (WAAS capability)
DGPS212	JLR-4331E	DGPS Sensor
DGPS212W	JLR-4331W	DGPS Sensor (WAAS capability)
JLR-10	GPS Compass	

Construction







Unit : mm (inch)

Figure 1-2

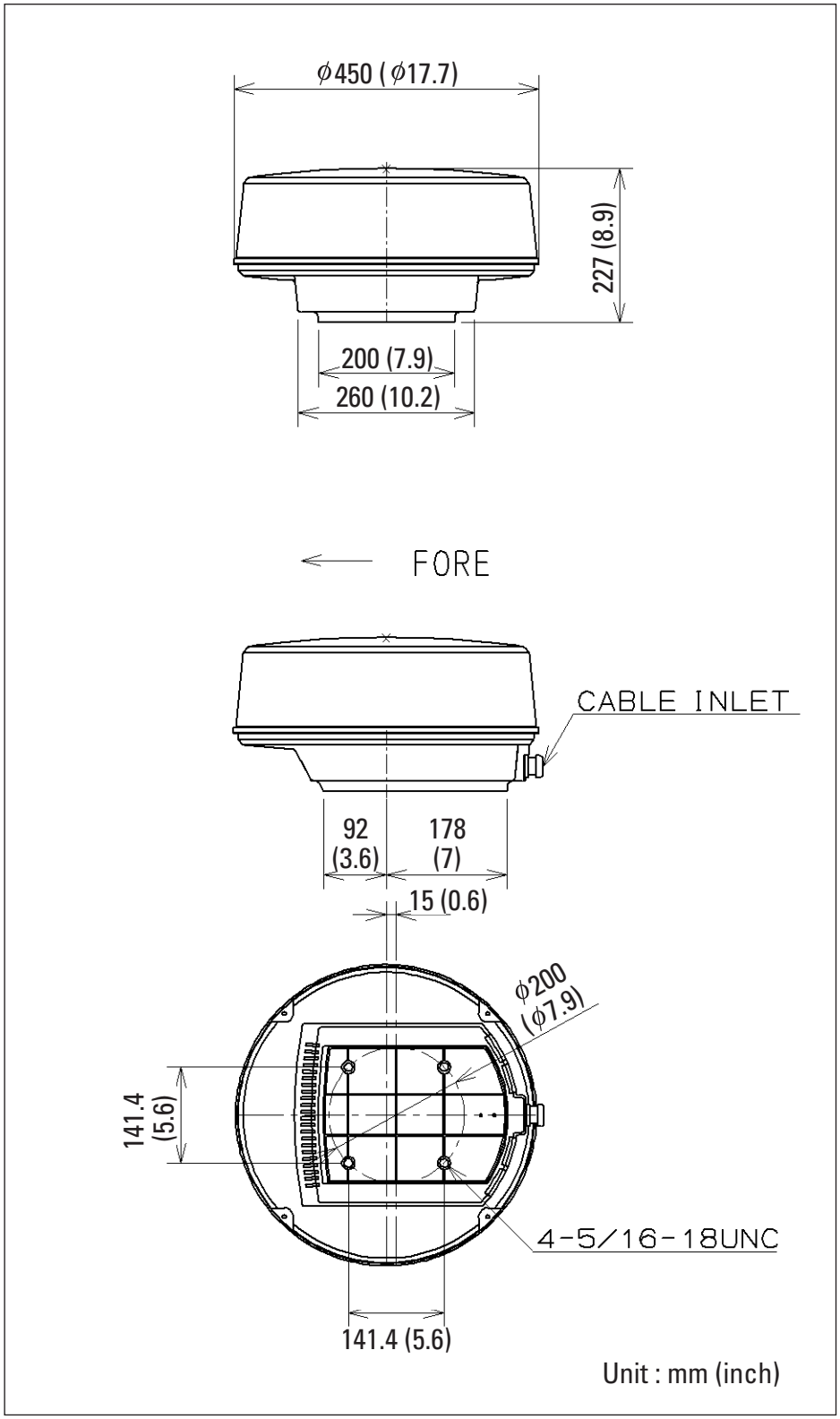

φ450 (φ17.7)
227 (8.9)
200 (7.9)
260 (10.2)
FORE
CABLE INLET
92
(3.6)
178
(7)
15 (0.6)
φ200
(φ7.9)
141.4
(5.6)
4-5/16-18UNC
141.4 (5.6)
Unit : mm (inch)

Figure 1-3

System Configuration

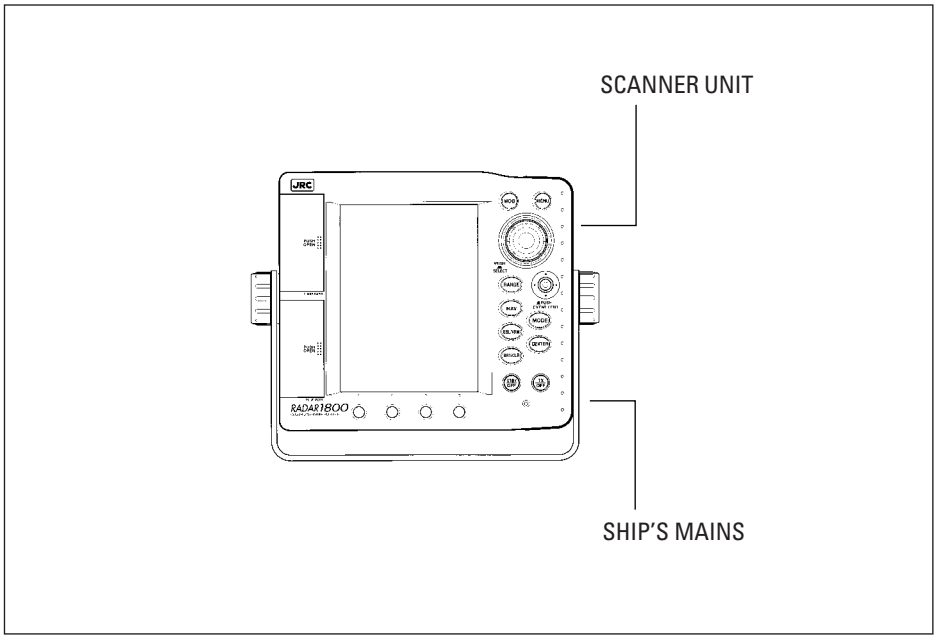


Figure 1-4

SECTION 2 Installation

Installing the Display Unit

Choosing a Location for Installation

⚠ CAUTION

This display unit produces heat. Do not install it in a poorly ventilated or excessively hot area. Doing so may cause burns or defects.

Do not install the equipment at a location where it is constantly splashed with water. If the equipment is splashed with water, immediately wipe with a dry cloth. Leaving the equipment in this condition may cause electric shock or malfunction.

The two most important considerations for mounting the RADAR 1800 Color Radar/Plotter display unit are:

- Choosing the best location for operating and viewing
- Protecting the unit from the environment

Standard Mounting

⚠ WARNING

Affix the Display Unit to a hard wooden or metal plate with the specified screws when mounting it to a tabeltop or suspending it. Otherwise the Display Unit, weighting 2.8 kg may drop, causing injury or damage.

Typically the unit can be mounted with its yoke assembly to a chart tabletop location. Figure 2-1 shows the recommended clearances for yoke mounting.

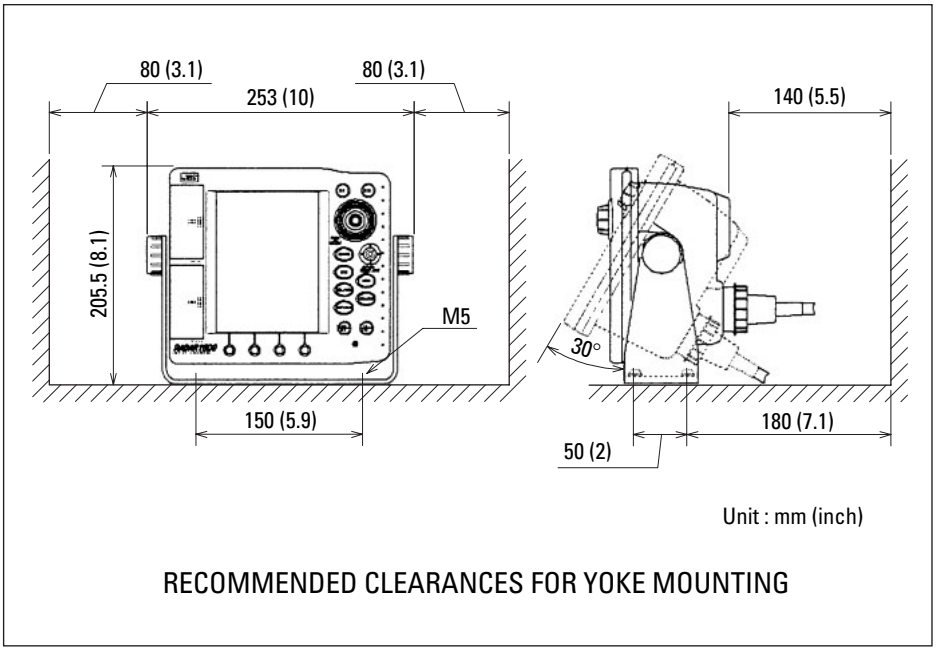


Figure 2-1

To mount the unit, remove the mounting yoke from the unit by loosening the yoke knobs on each side of the RADAR 1800. Attach the bracket to the desired mounting surface with the setting screws (ø5×25mmSUS, 4Qty.) included in the kit, refering to Figure 2-1. Once the bracket has been mounted, slide the unit back into its yoke. Adjust for the optium viewing angle and tighten the yoke knobs.

Console Mounting/ Surface Mounting

ATTENTION

Make sure there are no hidden electrical wires or other items behind the desired location before proceeding. Also check that you have free access for mounting and cabling.

1) Select a mounting location: a clear, flat area of at least 8"(203mm) wide by 8" high, having 5.5"(140mm) depth behind the panel. At that time, make sure that there are no hidden electrical wires or other items behind your selected location before proceeding.
2) Tape the mounting template from the console mounting instruction over your selected location on the panel and trace around the edges.
3) Drill a 1/2"(12.7mm) pilot hole at the top and bottom of the cut-out area.
4) Cut along the outside edge of the cut-out line with an appropriate saw.
5) Drill holes, using a 1/5"(5mm) drill bit, for the four threaded screws, 2 on each side, on the mounting template.
6) Remove the yoke, two knobs, two spacers and two damping rubbers from the unit, then securely attach the threaded screws to the rear cabinet and verify that the unit will fit inside the cut-out area.
7) Complete installation of the DC power, Scanner, GPS, NMEA and ground wiring into the console and make the connections onto the rear of the unit.
8) Place the unit into the cut-out and fit the washers, lock-washers, onto the threaded screws behind the mounting console, and tighten the nut to hold the unit in place.

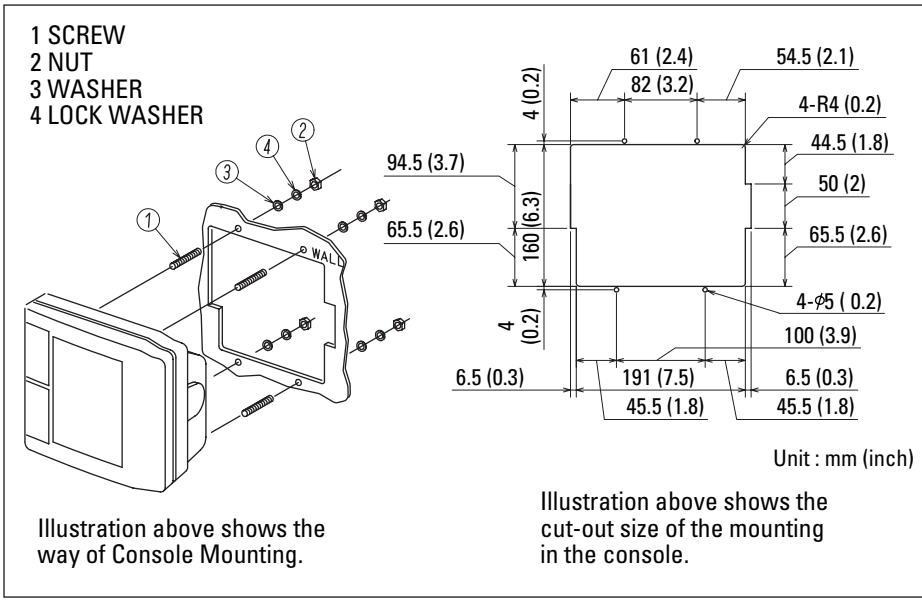


Illustration above shows the way of Console Mounting.

Illustration above shows the cut-out size of the mounting in the console.

Figure 2-2

Installing the Scanner Unit

Connecting the Scanner Unit Cable

Connect the scanner unit cable as follows.

CAUTION

Be careful not to injure your finger or hand by the waterproof cap mounting groove when installing the Display connector.

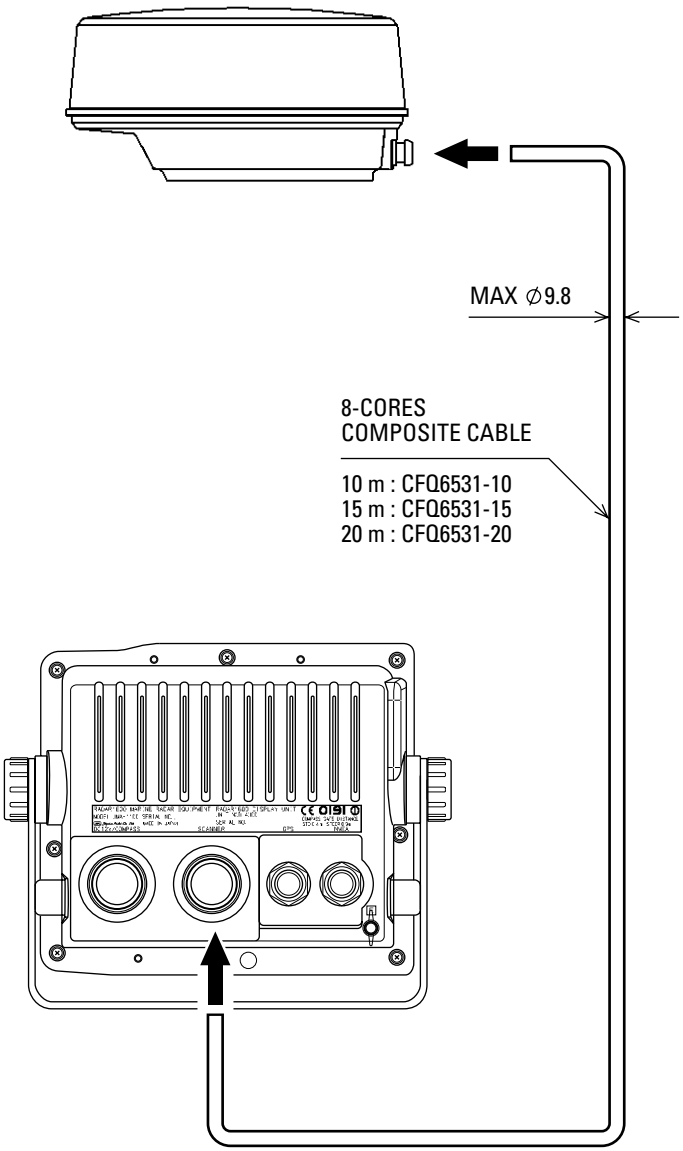


Figure 2-3

Installing the GPS/DGPS Sensor

Selecting the Position for Installation

⚠ CAUTION

When connecting the cable attached to the equipment, do not bend to an acute angle, twist, or impart excessive force. Doing so may damage the cable and cause a fire or an electric shock.

Do not install the equipment in a place with excessive vibration. Doing so may cause the equipment to drop or tip over resulting in injury or defects.

ATTENTION

Install the equipment in a place without any obstacle, in order to ensure that GPS signals can be directly received from satellites without interference or reflection of signals from surrounding objects. If possible, select a place having the following characteristics.

1 An open space that allows uniform reception of satellite signals.
2 Far away from any of high power transmission antennas.
3 Outside the radar beam range.
4 Away from the Inmarsat antenna by not less than 5 meters and below the level of its antenna.
5 Away from the antenna of a VHF, MF/HF transmitter and a direction finder by not less than 5 meters.
6 Away from Magnet Compass by not less than 1 meter.

If it is difficult to find an ideal site, select a place temporarily and install the equipment. Conduct a test to make sure that the proper performance can be obtained and then fix the equipment in position. If it is installed at an improper place, reception may become intermittent, resulting in shorter position fixing time and poorer position accuracy.

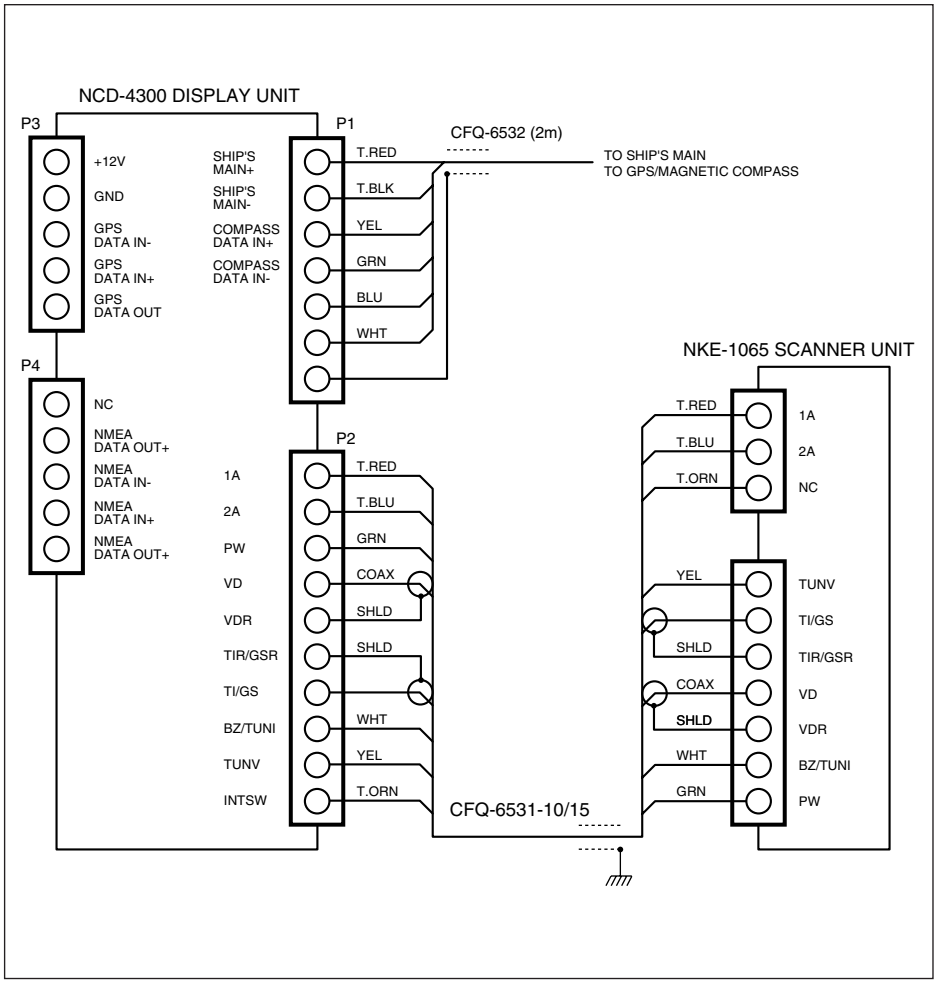


Figure 2-4 Interconnection Diagram

Installation Procedure

Installation

⚠ CAUTION

Insluate the GPS/DGPS sensor case from ground. Without insulation, a considerable amount of current frow from ground to this equipment. A considerable amount of current may cause equipment damage.

The aluminum bottom of the GPS112/DGPS212 are designed so that it can be installed on the navigation antenna mount unit or on an extension mast conforming to 1" x 14 NPT standards. The aluminum casing is negative earth, so a plastic mounting unit should be used to prevent any corrosive activity from developing. The bottom of the receiver is provided with a slot to allow the receiver cable to be pulled out to the side. This eliminates the need of pulling the cable through the center of an extension mast.

When twisting on the receiver be careful not to damage the cable.

Avoid thread damage Grip and turn from the base

Figure 2-5 Installation

When the cable is pulled through the center of the extension mast, it is recommended that RTV silicon sealant be used to seal off the cable slot on the bottom of the receiver to protect it from the environment. When the cable is pulled out through the slot, secure it in position to protect it against damage due to vibration. Then seal the slot on the receiver bottom with the RTV silicon sealant.

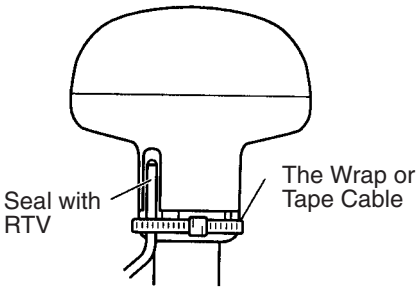
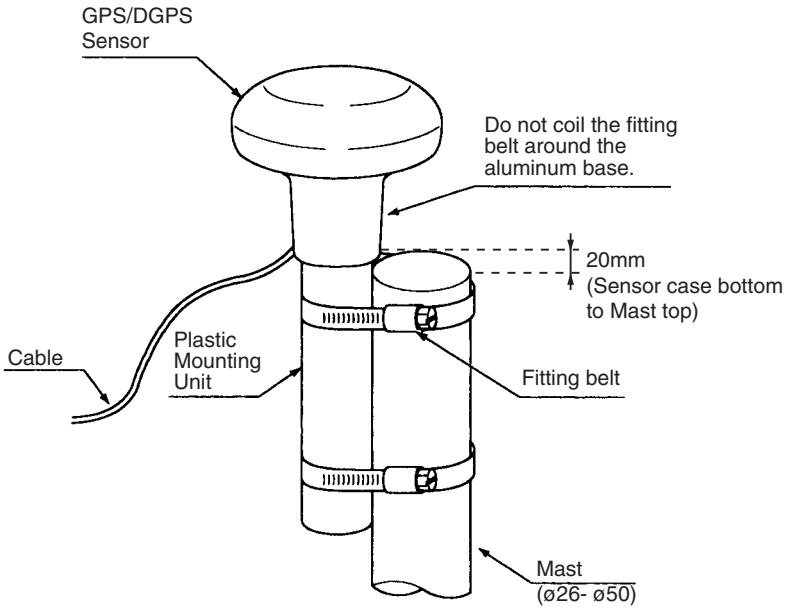


Figure 2-6 Appearance

Belt fitting method



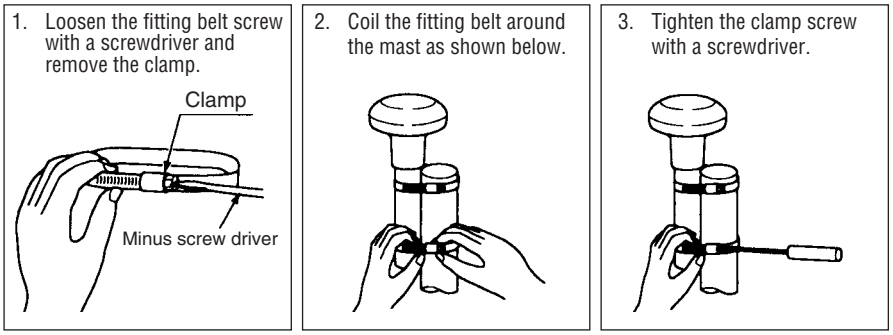


Figure 2-7 Belt Fitting Method

ATTENTION

- **Do not fasten the junction of connectors with the fitting belt.**
  It may cause connector damage.
- **Do not coil the fitting belt around the aluminum base.**
  The aluminum base will be scratched with the belt and may cause corrosion.

Connecting DC Power

⚠ WARNING

Do not touch the ground terminal and vessel ground on the display unit at the same time without the ground terminal earthed. Otherwise, you may suffer an electric shock.

⚠ CAUTION

RED to the positive.
BLACK to the negative.
Do not mistake the colors, as doing so will cause a malfunction.

Your unit is intended for use on vessels with 12 VDC power systems and it can operate as long as the DC supply is maintained between 10.2 and 16.0 VDC.

The supplied 6.5 foot power cable assembly should reach the source of DC power.

➔ On larger boats, route the power leads to the ship's DC power distribution panel. Connect to 10 amp or 10 amp (maximum) circuit breaker, as the unit is fused at 10 amps.
➔ On smaller vessels connect the power leads directly to the main battery isolation switch or breaker.

Avoid grouping the unit's power connections with radar, radio, or Loran-C power leads on the same circuit breaker. Separate the wiring as much as possible from other devices to prevent electrical noise interference.

Although the unit's power consumption is approx. 50 watts, if you need to extend the power cable leads by more than 10 feet, increase the wire size of the leads accordingly to minimize line losses. For runs of 20-35 feet, #10 AWG is recommended.

➔ Connect the RED wire to the positive (+) source terminal as shown in Figure 2-8.
➔ Connect the BLACK wire to the negative (-) source terminal as shown in Figure 2-8.

If the power leads are accidentally reversed, the in-line fuse will blow. If this happens, recheck the polarity of the connections with a volt-meter (VOM) and, if necessary, reverse the leads for proper connection.

Then, replace the fuse.

If the unit will not turn on and you suspect that you may have reversed the power connections, check the DC power lines all the way back to the battery. If the polarity is not correct, properly reconnect the leads and try again.

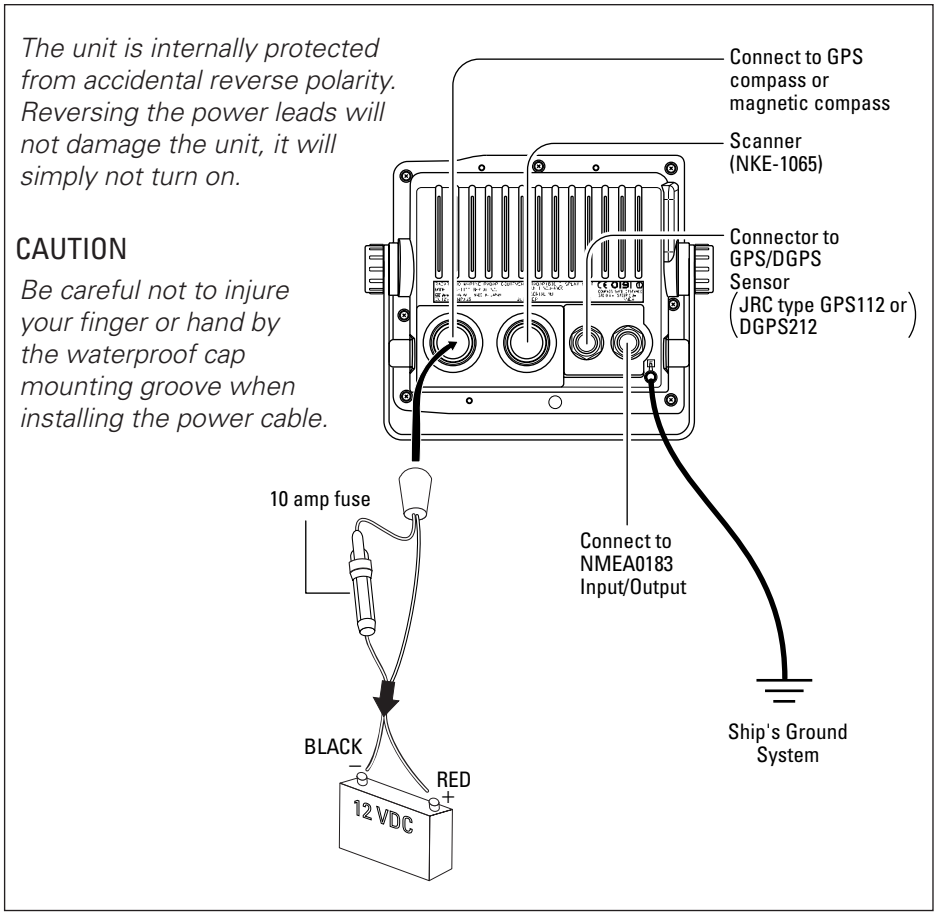


Figure 2-8

Grounding the Display Unit

One very important requirement in installation of shipboard electronics is to obtain the cleanest, noise-free environment possible so each piece of electronic equipment can work to its best performance levels. This requirement is accomplished by assuring a proper connection from each equipment to the ship's RF ground system. The ground provides a drain for shipboard noise transmission and pickup.

A separate ground wire of # 10 or # 12 AWG (# 10 recommended) should be connected from the ground terminal on the rear of the unit to the nearest connection point of the ship's ground system.

Normally, on a steel hull boat, a good clean connection to the hull provides a sufficient ground. On a fiberglass or wood hull, connection to a ground plate or to the engine block and other bonded groundwork should be acceptable.

Connecting GPS/DGPS Sensor or Making NMEA0183 Data Connections (Option)

When displaying the latitude and longitude of your vessel on the screen, or using the NAVIGATION mode, you are required to connect the optional GPS112 or DGPS212 sensor to the RADAR 1800, or input the data of navigational information in the NMEA0183 format from navigation equipment.

Connecting GPS112 or DGPS212 sensor

⚠ CAUTION

Only the GPS/DGPS sensors manufactured by JRC can be connected directly to the GPS connector at the rear panel. If those other than manufactured by JRC are connected, the equipment may be damaged.

When using the GPS112 or DGPS212 sensor, connect the 5-pin antenna connector attached to the signal cable of the sensor to the "GPS" connector at the rear panel of the unit.

With this, it is possible to receive the necessary data of navigational information from the GPS112 or DGPS 212 sensor. It is advisable, however, to perform initial settings according to your conditions using the GPS SETTING, DGPS SETTING menu of the unit for more precise navigational information. Refer to p.91 and p.92 for the information about initial settings for each sensor.

Making NMEA0183 data connections

When receiving navigational data information in the NMEA0183 format from navigation equipment other than this unit, you are required to make a connecting cable using the 5-pin connector (model 6-282-5SG-325, CONXALL) and connect it to the "NMEA" connector at the rear panel of the unit.

Connect the 5-pin connector and the connecting cable as shown in Figure 2-9.

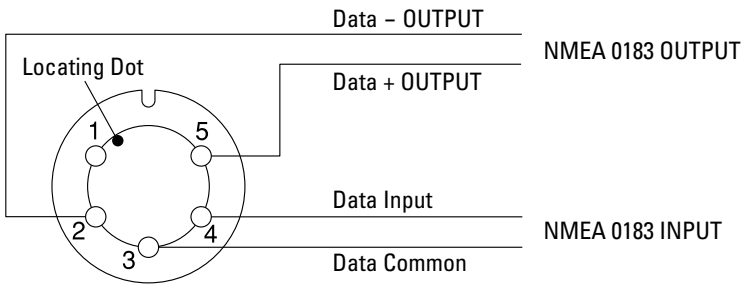


Figure 2-9

The procedure to assemble the connector is as follows. Please refer to Figure 2-11.

① Feed the end of the cable through the backshell, rubber grommet and coupling ring in the order and position drawn.

② Strip the cable as shown in Figure 2-10. Begin soldering the conductors to the connector pins, as shown in the appropriate diagram for the NMEA connectors. Verify that each connector is firmly soldered and that no stray wires are shorting adjacent pins.

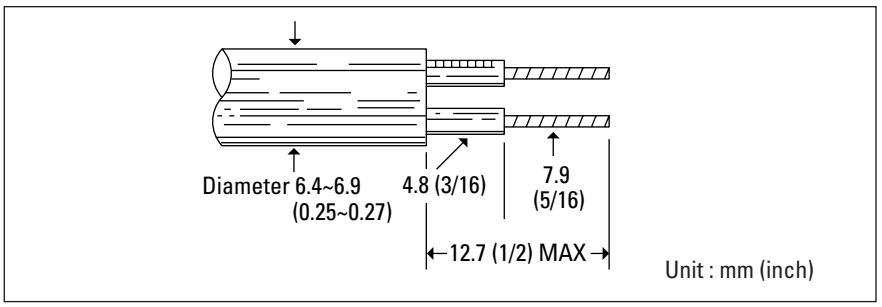


Figure 2-10

③ Slide the coupling ring over the body of the connector and beyond the locking projections on each side, it may be necessary to rotate the ring slightly for it to pass by the locking tabs.

④ Push the rubber grommet forward as far as possible to seat it snugly against the connector body.

⑤ Push the backshell all the way forward. It must first compress the rubber grommet, then be twisted over the (2) locking posts on the connector body. This is a tight connection. For leverage it may be helpful to first insert and lock the connector into its mating plug on the RADAR 1800 back panel.

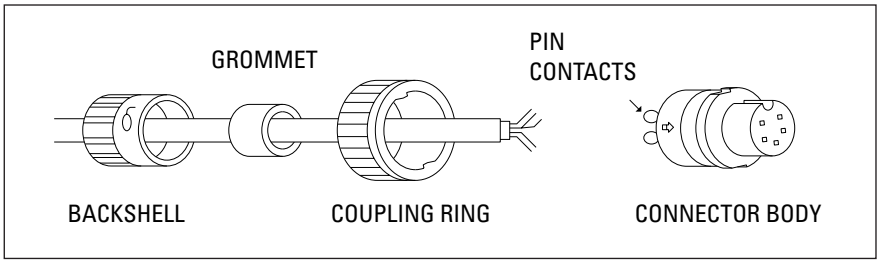


Figure 2-11

Connecting Electronic Compass/ GPS Compass (Option)

By connecting the NMEA-183 formatted output (HDM) or the optional GPS Compass (JLR-10), the realtime and precise course information is input and you can use more precise North-Up or Course-Up mode.

Connection

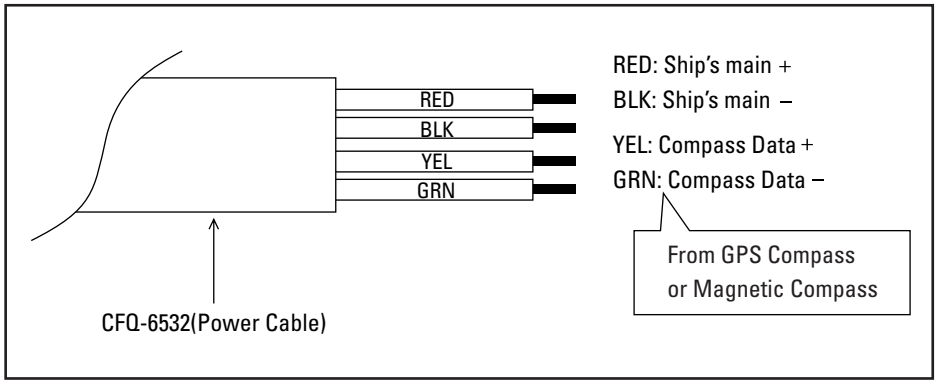


Figure 2-12

Initial Operation and Set-up

Inspection after Installation

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

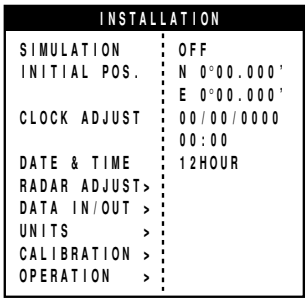
① The cables are not pinched or damaged.

② The allowed voltage is not exceeded and the polarity is correct.

③ All bolts are tight.

④ The power cable shields have been properly connected to Boat Main ground.

Operating the INSTALLATION menu



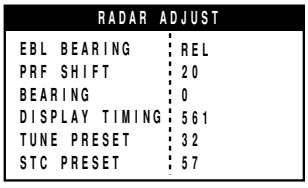
To access this menu:

Press MENU key to display the MAIN menu.

Select INSTALLATION> by Joystick up/down, push Joystick. The INSTALLATION menu is displayed.

This menu includes various settings required for installation, such as the selection of the external data input method and unit, or the initial setting of the radar initial adjustment or the GPS/DGPS antenna. After installing the RADAR1800, use this menu to make your settings.

RADAR SET UP



The RADAR ADJUST menu contains settings which should be done at installation or after any repairs to optimize the performance of the radar system. It is recommended that the radar be run in transmit mode for at least 10 minutes before adjusting the Preset Tuning in order to stabilize the transmitter circuit first. It is also recommended to adjust the Preset Tuning first as the other adjustments will be easier to do after that. If Preset tuning is not correct, then the Auto Tune may not work or may not work correctly and receiving targets will be decreased or eliminated. If Preset STC is up too high the loss of closer in targets will occur. These are the 2 most important adjustments for viewing target echos. Bearing alignment and Range (Timing) adjustments are important for correct picture orientation and safety.

In the INSTALLATION menu, select RADAR ADJUST> menu by Joystick up/down, push Joystick.

The RADAR ADJUST menu is displayed.

TUNE PRESET

From the RADAR ADJUST menu move the Joystick up or down to move the hiliter onto Tune Preset, then press the Joystick one time to select it. The TUNE PRESET popup menu shows the tuning condition. The bar graph in the bottom of the screen shows the relative position of the adjustment control. Move the Joystick right or left while watching the echo targets and the upper bar graph. The upper bar graph should peak to the right at the same point where the targets show as the largest. When you achieve the best adjustment, push the Joystick once to save it.

Perform this step after the radar has been transmitting for 10 minutes.

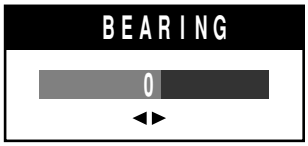
- Set the range scale to 3 NM.
- Turn SEA and RAIN all the way down.
- Turn IR off.
- Set gain to a level just below the level where noise specks show on the screen.
- In the RADAR ADJUST menu, select TUNE PRESET by Joystick up/down, and push Joystick.
  The TUNE PRESET pop-up menu is displayed.
- Move the bar by Joystick right/left to get the strongest signal back.

Note:

There may be 2 positions where the targets are strong. Select the one that has the larger value of "TUNE PRESET".

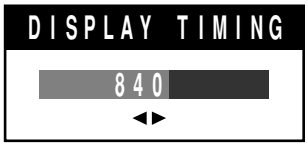
• Push the Joystick to save and exit.

Relative BEARING alignment



This adjustment should be performed after installation or a master reset to avoid incorrect bearing readouts and picture orientation. Using the 1.5 NM range, identify a small target such as a boat or buoy that can be seen both visually and on the radar. Point the boat so the target is visually dead ahead. If the radar target does not also show on the heading line proceed with this adjustment. In the Radar Adjust menu select BEARING by Joystick up/down, moving the hiliter, and selecting by pushing the Joystick. Move the dashed Electronic Bearing Line (EBL) by Joystick left/right to bisect the radar target that should be dead ahead. Push the Joystick once. Move the EBL to dead ahead and push the Joystick again to rotate the picture by the offset just indicated.

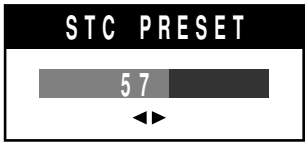
DISPLAY TIMING



This step must be performed. Failure to perform this step may result in incorrect target distance reading.

- Set the range scale to 0.25 NM.
- Locate a pier, a jetty, a bridge (close to water line) or any other straight object. Position the vessel so that it appears on the display. It does not matter which way you are facing.
- In the RADAR ADJUST menu, select DISPLAY TIMING by Joystick up/down, and push Joystick.
  The DISPLAY TIMING pop-up menu is displayed.
- If the bridge, pier or jetty does not appear to be in a straight line on the display, then the DISPLAY TIMING needs to be adjusted.
- Use the Joystick right/left to adjust the timing and make the object appear straight on the display.
- Press Joystick when done.

STC PRESET

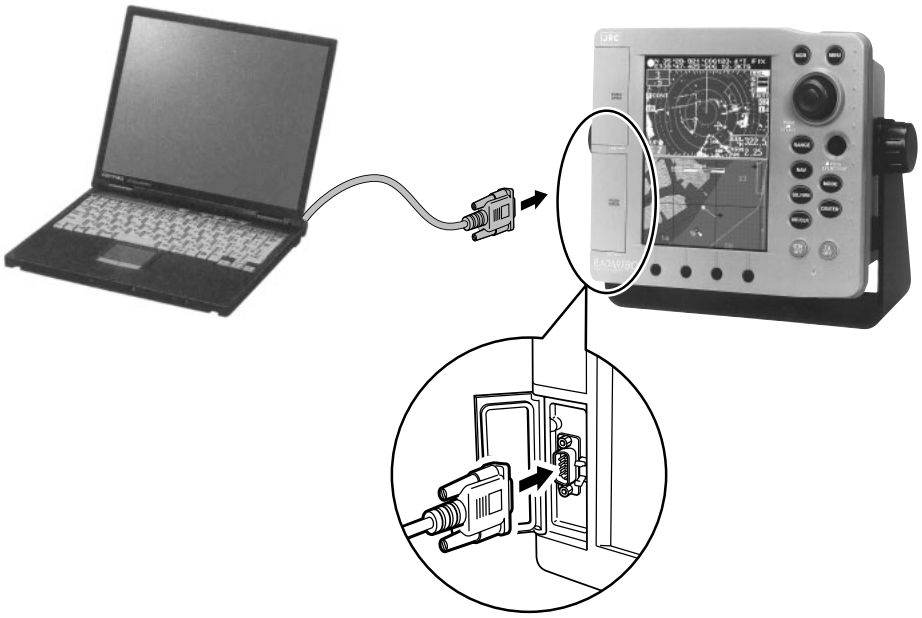


This step must be performed. Failure to perform this step may result in incorrect sea clutter suppressing.

- Set the range scale to 6 NM.
- Turn IR off, STC to maximum, and set gain to maximum.
- In the RADAR ADJUST menu, select STC PRESET by Joystick up/down, and push Joystick.
  The STC PRESET pop-up menu is displayed.
- Use the Joystick to remove all background noise from 0-3 NM.
- Press Joystick when done.

Connecting Personal Computer

Connect the RADAR 1800 to a personal computer as follows in order to transfer data between them.



Cable connection

Personal computer		RADAR 1800
CD (1)		NC (1)
RD (2)		RD (2)
TD (3)		TD (3)
DTR (4)		NC (4)
SG (5)		SG (5)
DSR (6)		NC (6)
RTS (7)		RTS (7)
CTS (8)		CTS (8)
RI (9)		NC (9)

Signal specification

RS-232C

BAUD RATE 38,400 bps

Inserting a Chart Card

① Check that the card is C-MAP NT C-Card with the required chart stored on it.

② Open the card cover, at the higher left of the display front panel.

③ Hold the card with the title label towards the left and upside down, as shown in the illustration.

④ Gently push the card into one of the two slots. It will only go in if it is the correct way round. Push the card in as far as it will go, then move it to the right so that the top is under the retaining pegs. The card will be held in place by the pegs.

⑤ Close the card cover so that it clicks shut, to prevent water from entering the display unit.

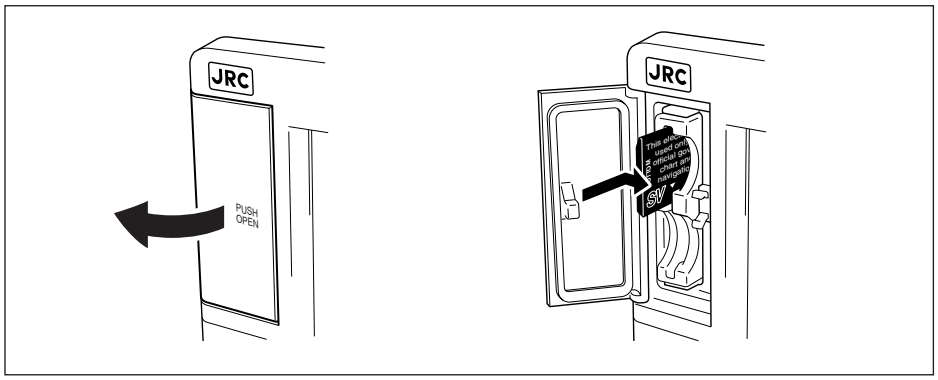


Figure 2-13

Removing a Chart Card

① Open the card cover, at the higher left of the display front panel.

② Push the card in to disengage from the pegs, then remove it.

③ Close the card cover so that it clicks shut, to prevent water from entering the display unit.

Note:

• *Turn off the power when removing the chart card.*
Removing the chart card when the chart is being updated may cause an erroneous chart to be displayed. If an erroneous chart is displayed, do enlarge/reduce and re-display the chart.

Screen Layout

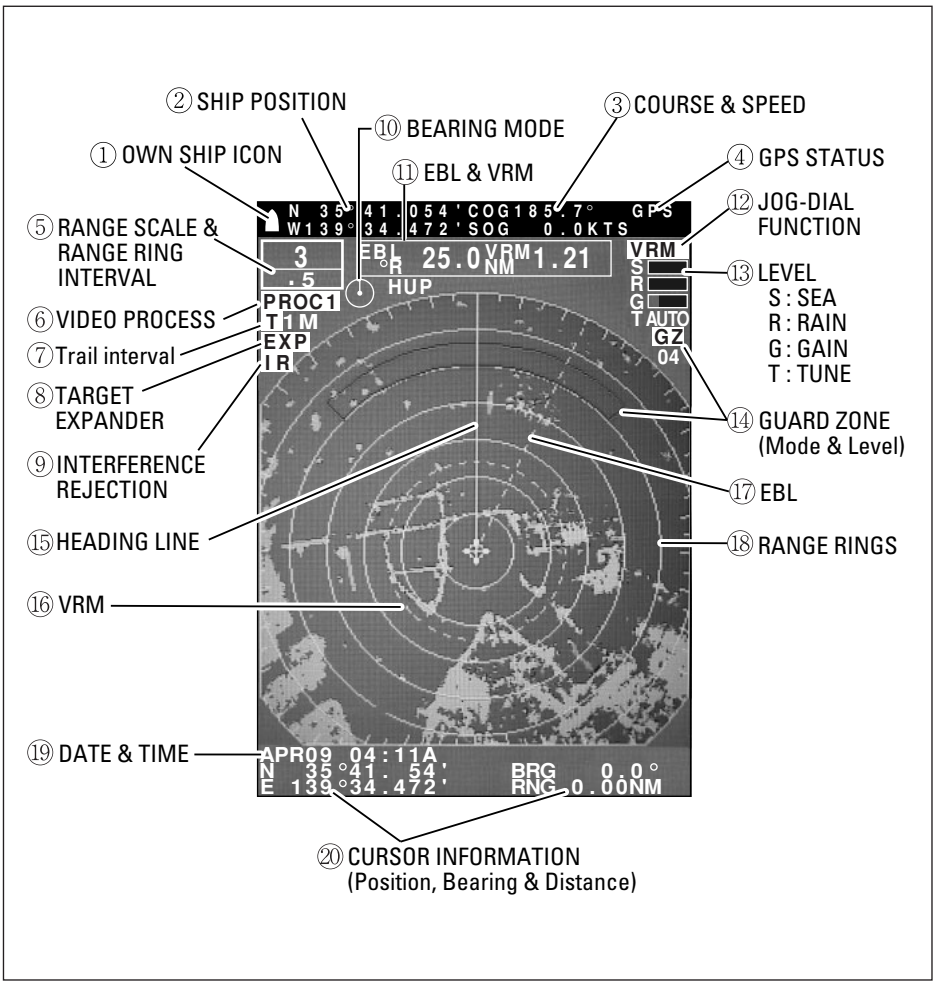


Figure 3-1 Radar mode

No. ITEMS	Displaying symbols
① OWN SHIP ICON	Selected own ship ICON.
② SHIP POSITION	Ship position is available when used with GPS/ DGPS sensors or NMEA0183 format data is received.
③ COURSE & SPEED	COG (the ship's course over the ground) and SOG (the ship's speed over the ground) appears.
④ GPS STATUS	DGPS : Differential GPS fix. DGPS-W : Differential GPS fix (WAAS TYPE) GPS : GPS fix. NO FIX : Fix not available or invalid. NO DATA : No position data input. (NO GPS/DGPS sensor connected)
⑤ RANGE SCALE & RANGE RING INTERVAL	Used range scale and range ring interval.
⑥ VIDEO PROCESS	Radar video processing type. OFF : No process. (No title display) PROC1 : Processing type 1. PROC2 : Processing type 2. PROC3 : Processing type 3.
⑦ TRAIL INTERVAL	Trail interval and condition. OFF : No trail. (no title display) 0.5 - 6 : Trail interval. (Unit: min) CONT : Continuous trail.
⑧ TARGET EXPANDER	Target expander. OFF : No expansion. (No title display) ON : Target expansion.
⑨ INTERFERENCE REJECTION	Radar interference rejection. (IR) OFF : IR off. (No title display) ON : IR on.
⑩ BEARING MODE	Azimuth stabilization mode with symbol. HUP : Head up. NUP : North up. CUP : Course up. (NUP and CUP mode needs heading data)
⑪ EBL & VRM	Numerical display EBL and VRM.
⑫ JOG-DIAL FUNCTION	Selecting JOG-DIAL. (SEA/RAIN/GAIN/TUNE/EBL/VRM)
⑬ LEVEL indicator	"AUTO" is displayed in automatic mode.
⑭ GUARD ZONE	Guard zone. Mode : IN/OUT alarm. Level : Threshold level.
⑮ HEADING LINE	Ship's heading line.
⑯ VRM	VRM display. (Variable Range Marker)
⑰ EBL	EBL display. (Electric Bearing Line)
⑱ RANGE RINGS	Range ring display.
⑲ DATE & TIME	Month/Day Hour/Minute
⑳ CURSOR INFORMATION	LAT/LON of the cursor, the distance between the vessel and the cursor, the bearing of the cursor appear.

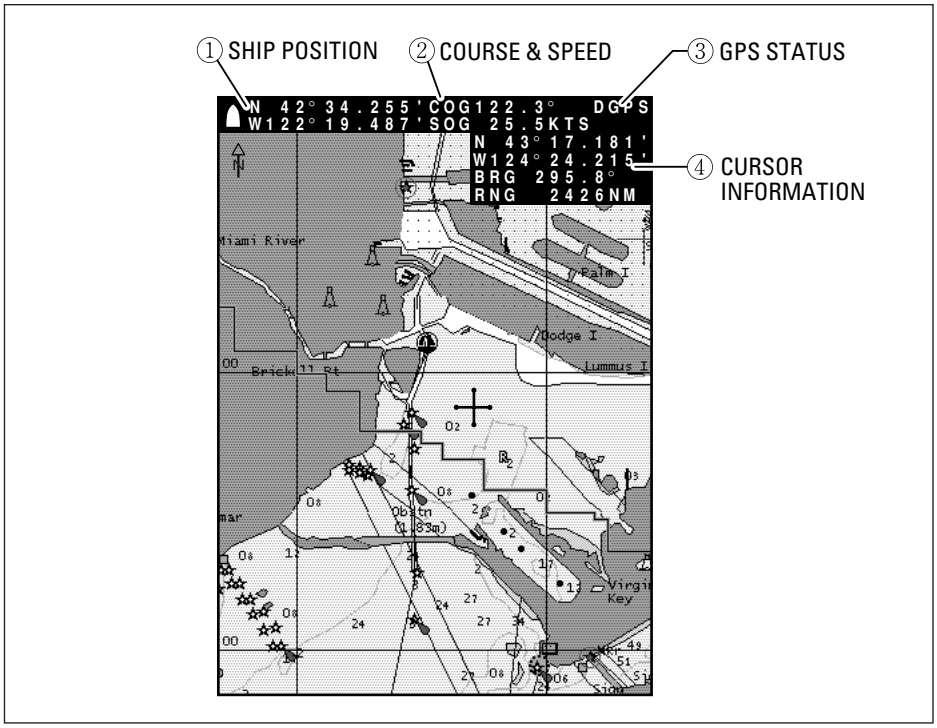


Figure 3-2 Plotter mode

No. ITEMS	Displaying symbols
① SHIP POSITION	Ship position is available when used with GPS/DGPS sensors or NMEA 0183 format data is received.
② COURSE & SPEED	COG (the ship's course over the ground) and SOG (the ship's speed over the ground) appears.
③ GPS STATUS	DGPS : Differential GPS fix. (Beacon TYPE) DGPS-W : Differential GPS fix (WAAS TYPE) GPS : GPS fix NO FIX : Fix not available or invalid NO DATA : No position data input (No GPS/DGPS sensor connected)
④ CURSOR INFORMATION	LAT/LON of the cursor, the distance between the vessel and the cursor, the bearing of the cursor appear. The information about the cursor can be selected whether or not to display. (Refer to "CURSOR INFO" p.91)

Control Panel

Figure 3-3 shows the panel keys and their functions.

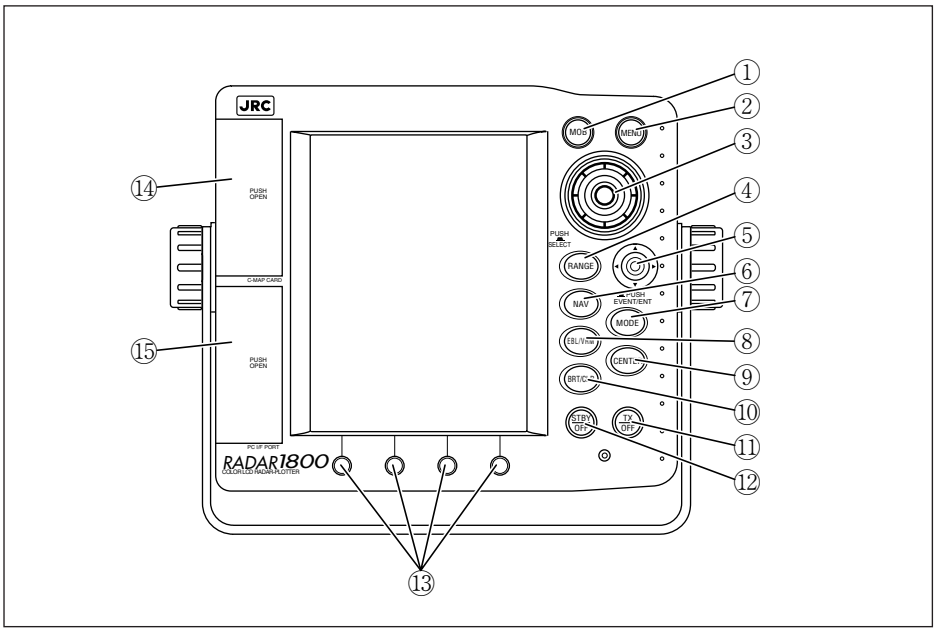


Figure 3-3

Control Panel

No.	Keys	Functions
①	MOB	Man Over Board
②	MENU	Push to display the menu.
③	JOG-DIAL	Push and turn: Select function and adjust level. Push: Select SEA, RAIN, GAIN, TUNE controls repeatedly. In AUTO mode, skip SEA or TUNE control. Turn: SEA: reduces sea clutter. RAIN: reduces rain or snow clutter. GAIN: controls strength of returned echoes. TUNE: manually fine tunes receiver by peaking tuning bar. No tuning bar in AUTO tune mode. EBL: rotate EBL to CW or CCW VRM: increase or decrease VRM BRIGHT: used to adjust display backlighting. CONTRAST: used to change LCD contrast setting for best visual display.

No.	Keys	Functions
④	RANGE	Sets range scale by SOFT Key.
⑤	JOY-STICK	Position cursor setting. Up/Down/Right/Left: Selects and changes an item when each menu is displayed. Push: Fixes the set value when each menu is displayed. Enters a marker when no menu is displayed. Registers EVENT in the NAVIGATION mode.
⑥	NAV	Executes or stops navigation to the desired waypoint or of the planned route.
⑦	MODE	Switches among the Radar and Plotter mode displays.
⑧	EBL/VRM	Activates EBL or VRM on the display. A short press will turn on/off selected EBL/VRM. Press and hold, to select and control the desired EBL or VRM by rotating the (Jog Dial).
⑨	CENTER	To shift own ship on radar screen in Radar mode and Radar/Chart mode.
⑩	BRT/CLR	Press and hold, set the brightness or contrast of the LCD with (Joystick) or (Jog Dial). Acknowledge of alarm. Abort setting value.
⑪	TX/OFF	Turns transmitter ON and activates Radome. Press STBY/OFF and TX/OFF keys simultaneously to turn off.
⑫	STBY/OFF	Turns ON power to Display and Scanner and activates 90 second count-down timer. Press to go into Stand-by mode while in the Transmit mode. Press STBY/OFF and TX/OFF keys simultaneously to turn off.
⑬	Soft Keys	Correspond to Soft Keys displayed at the bottom of the screen. There may appear up to four Soft Keys according to the displayed screen.
⑭	Card Slot (C-MAP Card)	A built-in world map is available on C-MAP electronic chart. Card slot available for more detailed local C-Map charts.
⑮	PC I/F Port	Connect a personal computer for saving and loading navigation data and user settings.

Rear Panel

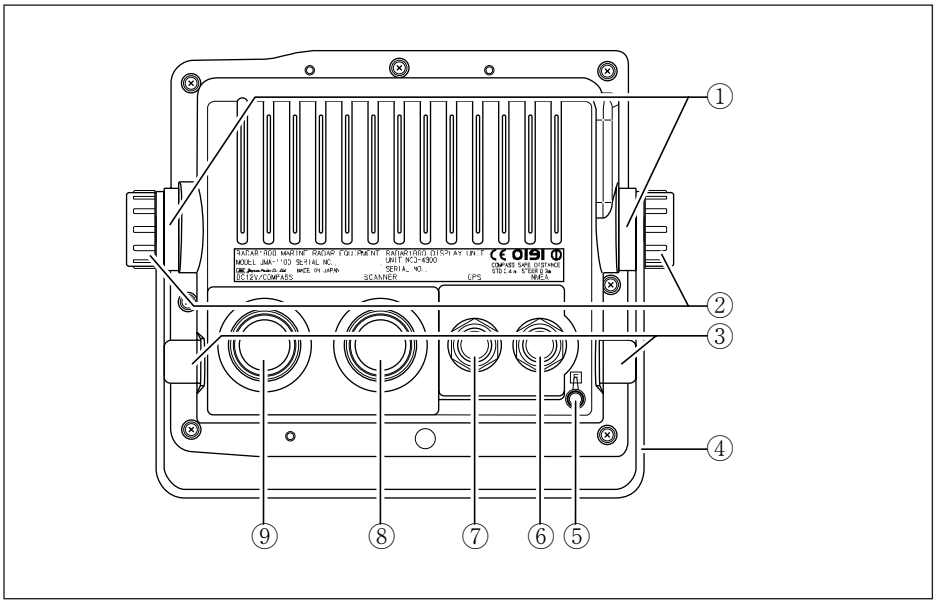


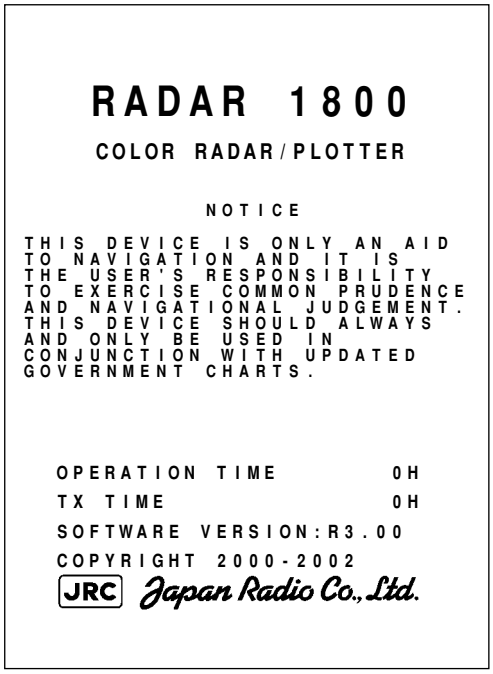
Figure 3-4

Rear Panel

No.	ITEMS	Function
①	Spacers	
②	Yoke Knobs	
③	Damping rubbers	
④	Yoke mount	
⑤	GROUND terminal	Connects GROUND.
⑥	NMEA connector	Connects NMEA0183 format data
⑦	GPS connector	Connect GPS/DGPS SENSOR * Connectable JRC's GPS/DGPS sensor only. (Refer to p.35)
⑧	SCANNER connector	Connects the scanner.
⑨	DC12V / COMPASS connector	Connects power supply and magnetic/GPS compass.

Basic Operations

When you turn the power of the RADAR 1800 on, the initial screen appears.



After approx. 15 seconds, the count down timer appears in Radar full screen.

The Power Control (Turning the Radar ON and OFF)

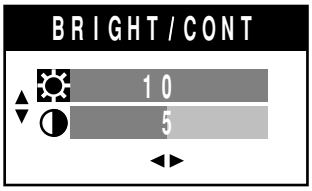
- Push STBY/OFF once to turn the power on.
- Push TX/OFF to transmit.
- Push STBY/OFF to enter the stand-by mode.
- Push STBY/OFF and TX/OFF simultaneously to turn the power off.

When you:

- Push STBY/OFF a 90 second warm-up count down timer is activated.
- Push TX/OFF the radar transmits, the scanner begins to rotate and echoes will appear on the screen.
- Push STBY/OFF the radar returns to stand-by mode to reduce battery drain. The rotator stops.
- Push TX/OFF again, the radar reverts to full transmitting function.

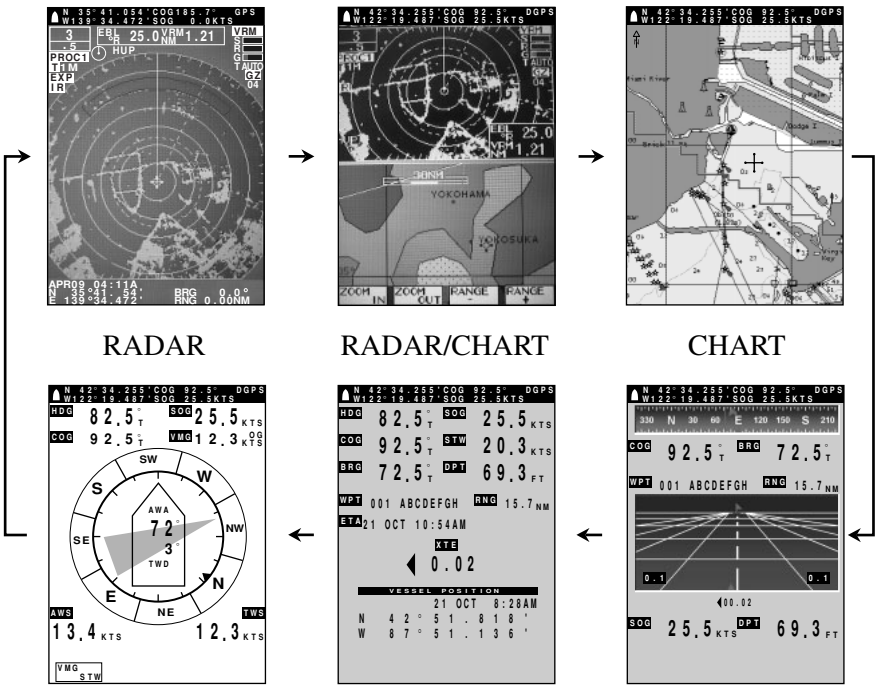
LCD Backlight and Contrast Control

- Push and hold BRT/CLR approximately 2 seconds to display the BRIGHT/CONT menu. Press the Joystick up or down to select brightness or contrast. The selected item is highlighted. Press the Joystick to the left or right to adjust the brightness or contrast level. Push the Joystick to complete the adjustment, and the menu closes. If you make no operation for 7 seconds, the menu closes automatically.



Display Modes

Press MODE to switch among the Plot mode screens.



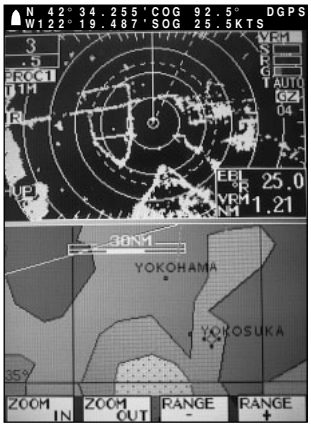
Press Soft Key, there may appear the following Soft Keys.

CHART FULL	Changes the screen to the full chart screen.
RADAR FULL	Changes the screen to the full Radar screen.
DGPS INFO	Changes the screen to the DGPS status screen. Press the Soft Key again to return to the previous screen.
CENTER	Redisplays the screen so that your vessel appears at the center of the chart in the chart screen.

RADAR Mode

Select RADAR to display the radar on the full screen.

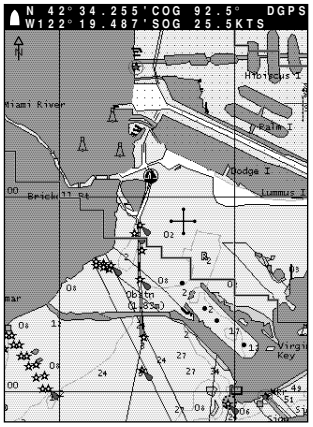
RADAR/CHART Mode



Select RADAR/CHART to display the radar/chart on the split screen.

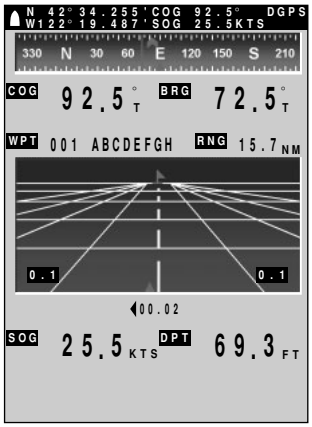
CHART Mode

Select CHART to display the chart on the full screen.



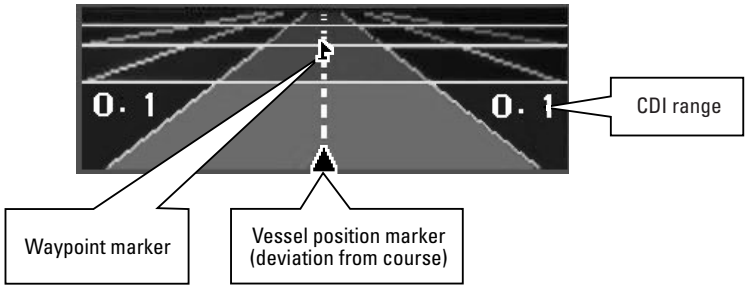
Course Deviation Indicator (CDI)/COMPASS Mode

Select CDI/COMPASS to display the navigation full screen display. The navigation display includes the numerical data, compass window and highway window. Three types of information are displayed at the same time. The numerical data includes such information as water depth, vessel speed, course, and your vessel's position. The compass window indicates the relation between your vessel's course and the destination. The highway window indicates your vessel's position relative to the course. To display the information mentioned above, however, it is necessary to connect a GPS/DGPS sensor (optional) and Navigation.

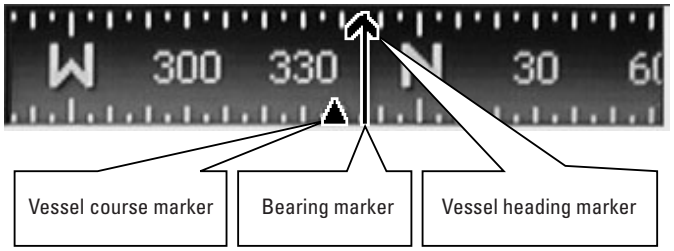


Navigation mode displays data

[Highway window]



[Compass window]



[Numeric Data]

DPT : Depth

SOG : Speed (Over Ground) (unit: KTS=knots, KPH=km/hour, MPH=mile/hour)

WPT: Waypoint ID

COG: Vessel course over ground (unit: degree/ T=true, M=magnetic)

BRG : Bearing to destination (unit: degree/ T=true, M=magnetic)

RNG: Distance to destination (unit:0.1 NM)

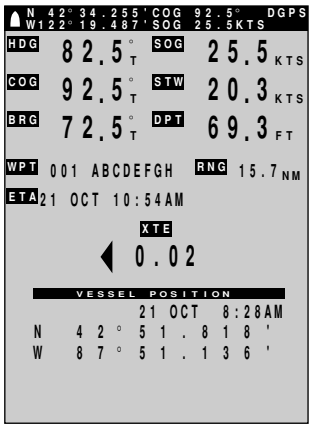
XTE : Cross track error. Deviation from course and direction to steer (unit:0.1 NM)

Steering required to return to the planned course is indicated ◀ (Left) and ▶ (Right)

Notes:

- *To display the vessel heading marker and HDG (Vessel heading), it is necessary to receive the vessel heading data in the NMEA0183 standard format. You need to connect the specified signal line to the NMEA connector or DC12V/ COMPASS connector on the rear panel to receive the vessel heading data.*
- *To display the water depth data, it is necessary to receive the depth data in the NMEA0183 standard format. You need to connect the specified signal line to the NMEA connector on the rear panel to receive the water depth data.*

NUM DATA Mode



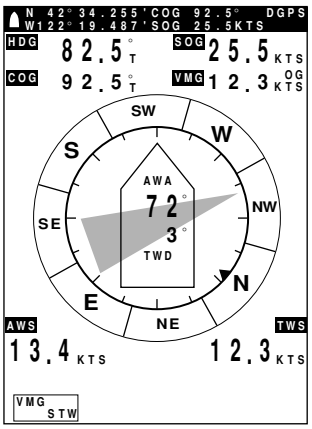
Select NUM DATA to display the numeric display. The numeric display includes the numerical data of various navigation information such as water depth, vessel speed, course, heading direction, deviation from the course, your vessel's position, and so on. To display the information mentioned above, however, it is necessary to connect a GPS/DGPS sensor (optional) and activate Navigational equipment.

Notes:

- *To display the vessel heading marker and HDG (Vessel heading), it is necessary to receive the vessel heading data in the NMEA0183 standard format. You need to connect the specified signal line to the NMEA connector or DC12V/ COMPASS connector on the rear panel to receive the vessel heading data.*
- *To display the water depth data, it is necessary to receive the depth data in the NMEA0183 standard format. You need to connect the specified signal line to the NMEA connector on the rear panel to receive the water depth data.*
- *To display the speed through the water (STW), it is necessary to receive the speed through the water data in the NMEA0183 standard format. You need to connect the specified signal line to the NMEA connector on the rear panel to receive the water speed data.*

WIND DATA Mode

To display the wind display with numerical data, it is necessary to receive the wind direction/speed data and the vessel reading/course data from external navigation aids.



Notes:

- *To display the wind data, it is necessary to receive the wind data in the NMEA0183 standard format. You need to connect the specified signal line to the NMEA connector on the rear panel to receive the wind data.*
- *Skipped WIND Mode if there is no wind data.*

Vessel's Information/Waypoint's Information

- Press MENU to display the following menu. Press soft Key 1 and the status at the top of the screen changes. To change to the next status, push MENU again, and it can be changed by pressing Soft Key 1.

VESSEL INFO 1	GRAPH ON		FIND
(Soft Key 1)	(Soft Key 2)	(Soft Key 3)	(Soft Key 4)

VESSEL INFO 1 Information about your vessel's position, course, speed, and the GPS/DGPS status is displayed.

```
N 42° 34.255'COG122.3° T DGPS
W122° 19.487'SOG  25.5KTS
```

VESSEL INFO 2 Information about your vessel's course, speed, tripped distance, water temperature, and the GPS/DGPS status is displayed.

```
COG122.3° T   TRIP 25.8NMDGPS
SOG  25.5KTS  TEMP 17.5℃
```

Note:

- *Temperature data is displayed when received the water temperature data from an external water temperature gauge.*

VESSEL INFO 3 Information about your vessel's course, speed, water depth, and the GPS/DGPS status is displayed.

```
COG122.3°    DEP 9999.9 FT DGPS
SOG  25.5KTS
```

Note:

- *Information about the depth of the water is displayed when it has been attained.*

WPT INFO 1

Information about the position, direction, and distance of a waypoint and the GPS/DGPS status is displayed.

WPT INFO 2

Information about the name, and distance of a waypoint, the estimated time of arrival, and the GPS/DGPS status is displayed.

Graph Display

GRAPH ON

You can display a one-hour history of changes in the graphs for water temperature, depth, and ship's speed by using these soft keys.

Select the item to display beforehand in GRAPH DISPLAY in THE GRAPH SETTING MENU. (Refer to p.87)

Press the BRT/CLR key to delete the graph.

Finding Function

FIND

By using this function you can easily find your destination as well as the nearest port and tidal station.

Nearest port

- Search for the port that is nearest to your boat or nearest to the cursor.

Port by name

- Search for a port that includes a specified name, a maximum of ten ports are listed.
- By specifying the target port on the list, a chart of that port's surrounding area is displayed.

Tidal station

- Search for the tidal station that is closest to the cursor or to your boats present position, a maximum of ten tidal stations are listed.
- By specifying the target tidal station on the list, that sector's tidal graph is displayed.

Waypoint

- Displays a list of destinations.
- By specifying the target destination on the list, a chart of that destination's surrounding area is displayed.

Using the Jog Dial

• Push and turn: Select function and adjust level.

Push:	Select SEA, RAIN, GAIN, TUNE controls repeatedly. In AUTO mode, skip control.	
	Selected control is displayed highlighted.	
Turn:	SEA:	reduces sea clutter. No bar in Auto mode.
	RAIN:	reduces rain or snow clutter.
	GAIN:	controls strength of returned echoes.
	TUNE:	manually fine tunes receiver by peaking tuning bar. No tuning bar in AUTO tune.
	EBL:	rotate EBL to CW or CCW
	VRM:	increase or decrease VRM
	BRIGHT:	Adjusts display backlighting.
	CONTRAST:	Adjusts the LCD contrast level.

Using the Joy Stick

Normally use the (Joystick) to move the cursor (8 directions) and to use the menus. Or press the (Joystick) to do the following.

• Position cursor setting.

• Up/Down/Right/Left:	Selects and changes an item when each menu is displayed.
• Push:	Fixes the set value when each menu is displayed.
	Enters a marker when no menu is displayed.
	Registers EVENT or WAYPOINT in the CHART mode. (Refer to p.71)

Changing CURSOR Operation in RADAR/CHART Mode

• Press and hold (Joystick) approximately 2 seconds to jump the cursor to another screen in RADAR/CHART mode.

• The color of cursor is white in the RADAR screen and black in the CHART screen.

General MENU Operation

Following the basic operation described below, you can easily perform all menu operations using only the (Joystick) .

Selecting an item:

• Press the (Joystick) up or down to select an item and push it to complete the selection. When you select a normal item, the pull-down menu of the selected item opens. Select an item with '>' mark to display the submenu in the next hierarchy.

Changing settings:

• When settings are specified by numerical values, press the Joystick up or down to change the values. When settings are specified by bar chart or by other items, press the Joystick to the left or right to change the settings.

Entering changes:

• Push the Joystick to enter the change. If you want to cancel the change, push BRT/CLR before completing it.

You can display the top Menu by pressing the MENU key.

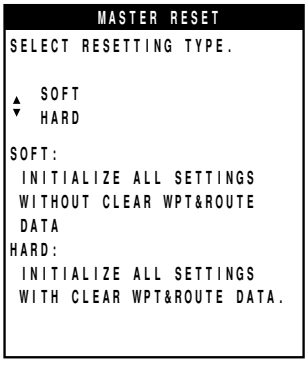
Pressing the MENU again or BRT/CLR closes the menu.

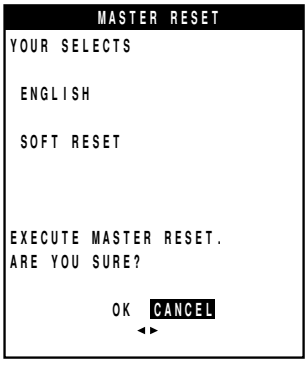
Buzzer ON/OFF

• Press MENU, select the "ALARM SETTING>" and push the Joystick, the "ALARM SETTING" menu is displayed.
Select the "BUZZER" and push the Joystick, the "BUZZER" pop-up menu is displayed.
Change settings to ON/OFF by pressing the Joystick to right or left.

Setting LANGUAGE

• When you push STBY/OFF to turn the power on while pushing MOB and MENU at the same time, the MASTER RESET display and you can select your language. Press the Joystick up or down to select a language and push it in to open MASTER RESET type select display. Press the Joystick up or down to select HARD or SOFT and push it in to select OK or CANCEL for the select language and the reset type.
Press the Joystick to the left or right to select OK and push it in to excute the MASTER reset. After the MASTER reset is executed, the RADAR 1800 is rebooted automatically. To abort the MASTER reset, select CANCEL and push the Joystick.
(Refer to "Master Reset and Language Select Operation" p.110)





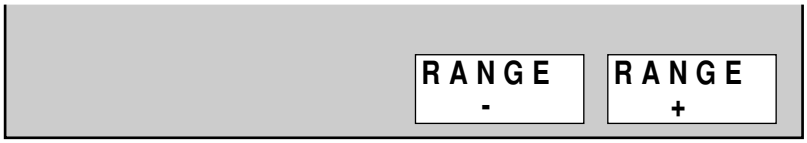
Radar Operation

All radar functions operates only in the RADAR full screen or in the RADAR/CHART screen. If any other screen mode is selected the radar will be put into standby mode.

Selecting a RANGE

[RADAR full screen mode]

• Press RANGE to display two Soft Keys.



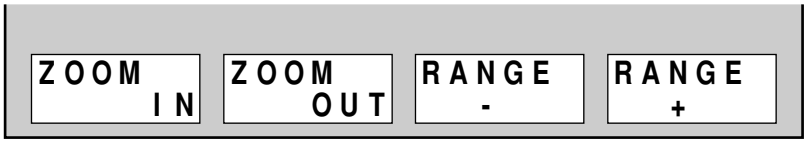
RANGE - Decrease the range scale. The minimum range scale is 0.125NM.

RANGE + Increase the range scale. The maximum range scale is 24nm.

The range rings are automatically set to correspond with this selection.

[RADAR/CHART screen mode]

• Press RANGE to display four Soft Keys.



ZOOM IN Magnify the chart.

ZOOM OUT Reduce the chart.

RANGE - Decrease the range scale. The minimum range scale is 0.125 NM.

RANGE + Increase the range scale. The maximum range scale is 24 nm.

The range rings are automatically set to correspond with this selection.

Adjusting Receiver Sensitivity

- Press the (Jog Dial) until GAIN is highlighted in the upper right corner of the display. Rotate the (Jog Dial) clockwise or counterclockwise, to vary the gain and thus control the strength of echo returns on the radar screen.
  An on-screen bar indicates the gain level selected. The proper setting is when the background noise is just visible on the screen. (i.e. a light speckled effect)

Adjusting TUNING

This procces is for Manual Tuning mode only. Manual Tuning can be selected by MENU, RADAR SETTING, TUNE – Manual or Automatic.

- Press the (Jog Dial) until TUNE is highlighted in the upper right corner of the display. Rotate the (Jog Dial) clockwise or counterclockwise, to maximize the target echo. If there is no large, identifiable target (e.g. big ship or land) within range, select SEA CLUTTER and turn the control to minimum. Use these echoes from wave crests to adjust the tuning bar for fullest attainable deflection. This is best done with the range set to 3 NM or 6 NM. An on-screen bar indicates the manual tune is selected.
  When the radar has warmed up, it may be necessary to make a further fine tune adjustment.

AUTO TUNE

The RADAR 1800 has an automatic tuning feature. In this mode, the radar automatically tunes itself for best efficiency at all ranges. (Refer to p.63)

Reducing SEA CLUTTER

ATTENTION

The SEA CLUTTER control is normally only used on the shorter ranges to suppress the effect of sea clutter formed by breaking wave crests which the radar "sees" as solid objects. An on-screen bar indicates the sea level selected.
If the Sea Clutter reduction is turned up too far, small targets will be lost also.

- Press the (Jog Dial) until SEA is highlighted in the upper right corner of the display. Rotate the (Jog Dial) clockwise or counterclockwise, to vary the sea clutter control and thus control the strength of echo returns from the sea surface. The on-screen bar indicates the selected level.

AUTO SEA

The RADAR 1800 has an automatic sea clutter control feature.
In this mode, the radar automatically suppress the effect of sea clutter. (Refer to p.63)

Adjusting RAIN CLUTTER

• Press the (Jog Dial) until RAIN is highlighted in the upper right corner of the display. Rotate the (Jog Dial) clockwise or counterclockwise, to vary the level and thus control the strength of echoes returned from rain or snow.
An on-screen bar indicates the rain level selected. As you rotate clockwise, the returned echoes will become narrower and the returns from rain or snow will be reduced.

Setting OFFSET

• By pressing the CENTER key, the picture will be offset backwards by 1/3 of the range scale. Pressing CENTER again or switching modes will restore the picture to the original centered display.

Range Measurement

① Count the number of range scale rings in use between the center of the screen and the ring preceding the target. Add to this distance between this nearest ring and the inner edge of the target.

② Using VRM

• Press the EBL/VRM key. If EBL is hilited, press and hold the EBL/VRM key to change the hiliter to VRM mode and activate the dashed circular VRM ring.

Rotate the (Jog Dial) clockwise to expand the VRM ring and increase it's range or counterclockwise to decrease it's range. The actual target distance from the ship appears on the center top of the screen in Radar full screen mode, or on the right side in Radar/Chart screen mode. To turn off the VRM, press EBL/VRM while VRM is hilited.

③ Using cursor

The cross mark can be moved any direction by using the (Joystick). The cursor position (L/L), bearing and distance are displayed in the bottom of the screen in radar full mode, or in the upper right corner of the chart screen in split mode.

Unit of distance

• You can select a pair of speed and distance unit between KTS&NM, KPH&KM, and MPH&SM. (Refer to p.100)

Bearing Measurement

① Using the bearing scale

Using the bearing scale on the screen, visually estimate a line from the center of the display(ship's position) projected through the center of the target, to reach the bearing scale around the perimeter of the display. The bearing which you obtain is the target's relative bearing in degrees.

The bearing scale is not usable in offset mode.

② Using EBL

Press the EBL/VRM key.

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

Rotate the Jog Dial clockwise or counterclockwise to move the electronic bearing line to cut the center of the target. The target bearing (in degrees relative to the ship) then appears at the top center of the screen in full radar screen.

In case of RADAR/CHART screen, it is displayed right side of center.

The bearing may be displayed in relative "R", in true "T", or in magnetic "M" depending menu selection and what other equipment is interfaced to the radar.

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

③ Using cursor

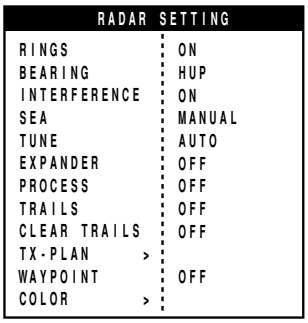
The cross mark can be moved in any direction by using the Joystick. The cursor position (L/L), bearing and distance are displayed in the bottom of the screen in radar full mode, or in the upper right corner of the chart screen in split mode.

Changing CURSOR Operation Mode in RADAR/CHART Screen

- Press and hold Joystick approximately 2 seconds, the cursor jump to another screen in RADAR/CHART mode.
- The color of cursor is white in the RADAR screen and black in the CHART screen.

RADAR Operating Menu

• Press MENU, select the "RADAR SETTING>" and push the Joystick, the "RADAR SETTING" menu is displayed.



RINGS

The fixed rings are used to estimate the distances to the targets. The interval between range rings is displayed at the upper left of the screen just below the range scale indicator.
The range rings can be turned to on or off via this menu.

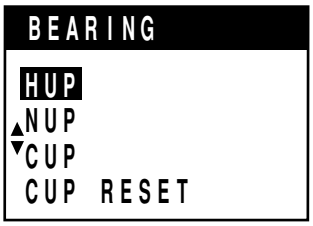
• Select the "RINGS" in RADAR SETTING menu and push the Joystick, the "RINGS" pull-down menu is displayed. Change settings to ON/OFF by Joystick right or left and push Joystick.

DISPLAY MODE (BEARING)

There are three bearing modes.

[HUP]

Most radar operators are familiar with seeing the radar picture aligned with the bow of the vessel. This type of radar display orientation makes it easy to look out the windshield and identify the radar's targets as they are positioned relative to the ship's Heading line.



[NUP]

North up mode means the radar picture is positioned just like your marine chart. 000° on the radar bearing scale is the same as True or Magnetic North.
This mode requires an appropriate Heading input via COMPASS input or NMEA input.

[CUP]

If having the radar picture turned around on the screen in the NUP mode is confusing, you could select the CUP mode. The CUP mode lets you rotate the radar picture so the vessel's basic Course Heading (and the Heading line) point at 000° on the bearing scale, similar to the HUP mode. In CUP mode you can again reference the targets by looking out the front window.
Note however, if the vessel changes direction, the radar picture will not shift on the radar display in sync with the ship's Heading changes. This keeps all target plots stable and also provides a clear visual reference to the operator on the impact of the vessel's Heading shifts to the targets around his vessel.
This mode requires an appropriate Heading input via COMPASS input or NMEA input.

[CUP RESET]

After a course change, you can select CUP RESET so that the Heading line is up at the head of the display.

• Select the "BEARING" in RADAR SETTING menu and push the (Joystick), the "BEARING" pull-down menu is displayed. Select HUP/NUP/CUP/ CUP RESET by (Joystick) up or down and push (Joystick).

INTERFERENCE REJECTION

ATTENTION

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

• Select the "INTERFERENCE" in RADAR SETTING menu and push the (Joystick), the "INTERFERENCE" pull-down menu is displayed. Change settings to ON/OFF by (Joystick) right or left and push (Joystick).

[PRF SHIFT]

• In case of dual radar installed or received other radar's signal, which radar use same PRF (Pulse Repetition Frequency), sometime appeared strong interference as a concentric circle. In this case you can avoid strong interference by PRF shift.

• Select PRF SHIFT at the RADAR ADJUST menu, press the (Joystick), the PRF SHIFT popup menu is displayed. You can change PRF by (Joystick) right or left, after adjusting press (Joystick).

• Press TX/OFF key while transmitting and you will shift the PRF without having to use the PRF SHIFT popup menu.

Setting AUTO/MANUAL SEA Clutter Rejection

The RADAR 1800 has an automatic sea clutter control feature.

In this mode, the radar automatically suppress the effect of sea clutter.

ATTENTION

The AUTO SEA is used to simply suppress sea clutter returns. So no target in the sea clutter can appear on the display clearly. Therefore, use the manual SEA control during normal operating conditions.

- Select the "SEA" in RADAR SETTING menu and push the (Joystick), the "SEA" pull-down menu is displayed. Change settings to ON/OFF by (Joystick) right or left and push (Joystick). "AUTO" appears at a level bar indicator in AUTO SEA mode.

Setting AUTO/MANUAL TUNING

ATTENTION

If the tuning of the receiver is deviated in the AUTO TUNE mode, the best radar video may not be obtained, in this case, adjust TUNE control manually to obtain the best video quality.

The RADAR 1800 can be tuned either automatically or manually. If MANUAL TUNE is selected, a tuning bar indicator is displayed. AUTO TUNE mode will automatically tune the radar for optimum reception whenever the radar is tuned on, even if ranges are changed. "AUTO" appears at a tuning bar indicator in AUTO TUNE mode.

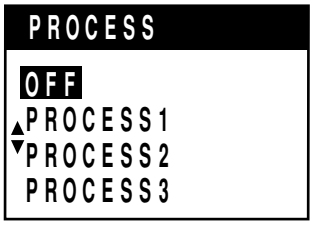
- Select the "TUNE" in RADAR SETTING menu and push the (Joystick), the "TUNE" pull-down menu is displayed. Change settings to AUTO or MANUAL by (Joystick) right or left and push (Joystick).

Target EXPANDER

This function gives the operator the ability to make small targets appear bigger on the screen in depth for better viewing. This function however enlarges all targets, so use of expansion mode should be limited to only certain circumstances. When active, "EXP" is highlighted in the upper left area of the screen.

• Select the “EXPANDER” in RADAR SETTING menu and push the (Joystick), the “EXPANDER” pull-down menu is displayed. Change settings to ON/OFF by (Joystick) right or left and push (Joystick).

PROCESS



This feature allows the operator to detect a weak signal target or to detect a target in the sea clutter.

Selecting “OFF” is no video processing. “PROCESS1” is used to detect a weak echo. “PROCESS2” and “PROCESS3” are used to scan correlation mode for use to detect a target in the sea clutter.

“PROCESS3” is more effective than “PROCESS2” but response is slow.

• Select “PROCESS” in RADAR SETTING menu and push the (Joystick) to display the “PROCESS” pull-down menu. Select setting by (Joystick) up or down and push (Joystick).

Note:

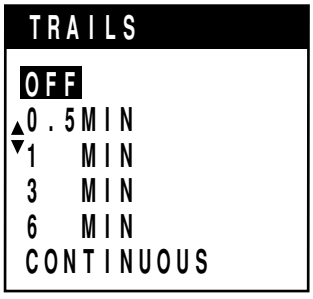
• *When PROCESS2 or PROCESS3 is used, an object moving with a high speed is displayed dimly.*

“PROCESS” is a very useful feature in the North stabilized or Course stabilized heading mode.

Note:

• *Notice that when “PROCESS” is used, a target that is moving with a relatively higher velocity than that of your own ship may provide weaker echoes than actual ones in the display or may provide no echoes of the target itself.*

TRAILS



This feature allows the operator to see the past history of target movement or behind the moving targets. Selecting “OFF” is no trails. The numerical selections, 0.5, 1, 3, and 6, represent the length of the “trail time” in minutes. For example, if 3 minutes is selected as the interval, the trail presents the last 3 minutes of the target movement. This provides a visual indication of a targets relative speed and course. “CONTINUOUS” provides a continuous trail.

If range scale or bearing mode is changed, or offset display position by the offset function, or changed display mode “RADAR” full to “RADAR/CHART”, the trails will be cleared and new trails will be redrawn to the screen.

The trails are drawn for anything that move on screen, including sea gulls, sea clutter, buoys, lobsterpots, and shoreline. In general, it is better to use the trails feature away from harbor and the shoreline to avoid a cluttered display and to concentrate on trails of target vessels.

If own vessel changes the course all trails are influenced in HUP mode, it is better to use the trail feature in NUP mode or CUP mode.

• Select the “TRAILS” in RADAR SETTING menu and push the (Joystick), the “TRAILS” pull-down menu is displayed. Select settings by (Joystick) up or down and push (Joystick).

CLEAR TRAILS

The trails are drawn for anything that move on screen, sometime the screen will be filled by trails. You can clear the screen.

• Select the “CLEAR TRAILS” in RADAR SETTING menu and push the Joystick, the “CLEAR TRAILS” pull-down menu is displayed. Change settings to NO/YES by Joystick right or left and push Joystick.

WAYPOINT

If you are proceeding on waypoint/route navigation, a waypoint symbol can be made to appear on the radar screen by activating the WAYPOINT function in the RADAR SETTING menu.

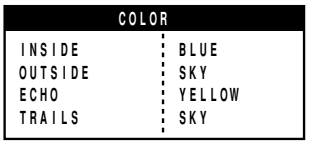
When the waypoint distance is within the selected range scale, the waypoint is displayed as a “◯”.

Numeric information data appear at the Top Status information area. (Refer to Vessel’s Information/Waypoint’s Information p.53)

• Select the “WAYPOINT” in RADAR SETTING menu and push the Joystick, the “WAYPOINT” pull-down menu is displayed. Change settings to ON/OFF by Joystick right or left and push Joystick.

Setting Radar COLOR

In this menu, you can select a color for ECHO , TRAILS, Background of PPI area, and Background of Character area. There may appear the following setting item. After select item, the popup menu may appear, select a color by Joystick up or down and push Joystick.



• Select the “COLOR>” item in RADAR SETTING menu and push the Joystick, the “COLOR” menu is displayed.

[To change a background of the PPI area color]

• Select the “INSIDE” in COLOR menu and push the Joystick, the “INSIDE” pull-down menu is displayed. Change settings by Joystick right or left and push Joystick.

In this menu, you can select a background of the PPI area color in black or blue.

[To change a background of the Character area color]

• Select the “OUTSIDE” in COLOR menu and push the Joystick, the “OUTSIDE” pull-down menu is displayed. Change settings by Joystick right or left and push Joystick.

In this menu, you can select a background of the PPI area color in black or blue.

[To change a echo color]

• Select the "ECHO" in COLOR menu and push the (Joystick), the "ECHO" pull-down menu is displayed. Change settings by (Joystick) right or left and push (Joystick).
In this menu, you can select a echo color in yellow, green, orange, or color.

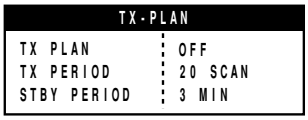
[To change a trails color]

• Select the "TRAILS" in COLOR menu and push the (Joystick), the "TRAILS" pull-down menu is displayed. Change settings by (Joystick) right or left and push (Joystick).
In this menu, you can select a trails color in sky, white, or green.

PLANNED-TX MODE

The PLANNED-TX mode allows the operator to program the radar automatically to transmit for a selected period of time, followed by for a selected stand-by period.

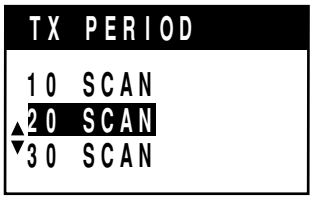
This maintains a radar watch whilst reducing the power consumption experienced during full transmit operation. In PLANED-TX mode press the STBY/OFF and the radar will return to its normal operating mode.



• Select the "TX-PLAN>" in RADAR SETTING menu and push the (Joystick), the "TX-PLAN" menu is displayed.

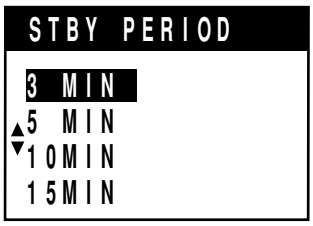
[To turn on or to turn off TX-PLAN mode]

• Select the "TX PLAN" in TX-PLAN menu and push the (Joystick), the "TX PLAN" pull-down menu is displayed. Change settings to ON/OFF by (Joystick) right or left and push (Joystick).



[To set Transmitting Period]

• Select the "TX PERIOD" in TX-PLAN menu and push the (Joystick), the "TX PERIOD" pull-down menu is displayed. Change settings by (Joystick) right or left and push (Joystick).
Each scan represents one revolution (turning) of the antenna.



[To set STBY Period]

• Select the "STBY PERIOD" in TX PLAN menu and push the (Joystick), the "STBY PERIOD" pull-down menu is displayed. Change settings by (Joystick) right or left and push (Joystick).

Note:

• *This function is inoperable in STBY mode.*

Setting GUARD ZONE

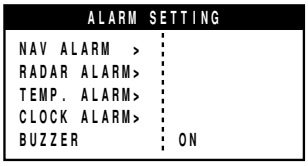
The Guard Zone may be a zone completely surrounding the vessel or a partial trapezoidal zone to monitor targets entering or departing the specified area.

Targets entering or leaving the guard zone will sound audible and visible alerts to the operator. In the "IN" alarm mode, an alarm will sound if a target enter the area. In the "OUT" alarm mode the alarm will sound if a target leaves the prescribed area. This type of alarm is useful for monitoring during an anchor watch, when cruising with other vessels, pair trawling, or towing operation.

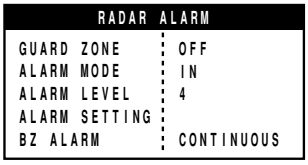
An alarm is sounded when any (apparent) target returning an echo above the noise threshold is detected. If sea clutter, or other incidental echoes trip the alarm, adjust the gain control and/or the sea clutter to avoid this false alarming.

[To open the "RADAR ALARM" menu]

- Press MENU and select "ALARM SETTING>" and push the Joystick, the "ALARM SETTING" menu is displayed.



- Select the "RADAR ALARM>" and push the Joystick, the "RADAR ALARM" menu is displayed.



[To turn on or to turn off GUARD ZONE]

- Select the "GUARD ZONE" in RADAR ALARM menu and push the Joystick, the "GUARD ZONE" pull-down menu is displayed. Change settings to ON/OFF by Joystick right or left and push Joystick.

  The guard zone is appeared that you used.

[To select IN alarm or OUT alarm]

- Select the "ALARM MODE" in RADAR ALARM menu and push the Joystick, the "ALARM MODE" pull-down menu is displayed. Change settings to IN/OUT by Joystick right or left and push Joystick.

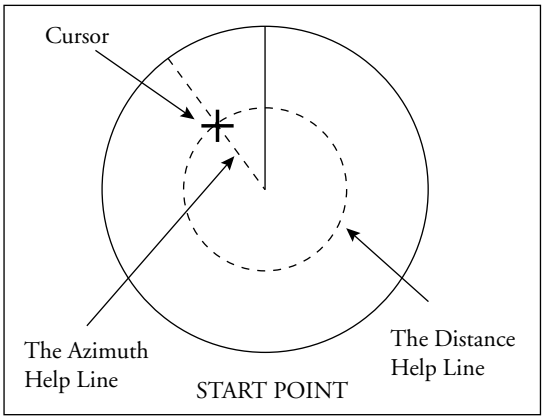
  The "I" or "O" and ALARM LEVEL will be displayed in the upper right corner of the screen.

[Setting alarm sensitivity]

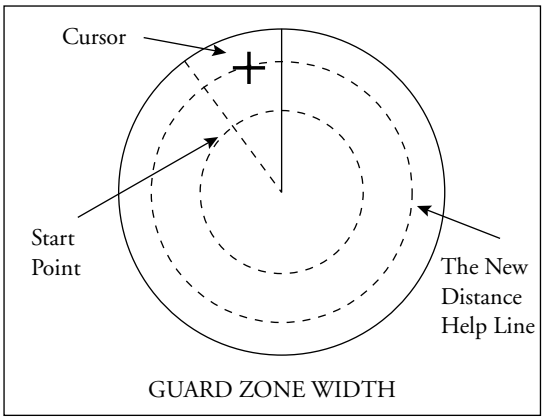
- Select the "ALARM LEVEL" in RADAR ALARM menu and push the (Joystick), the "ALARM LEVEL" pull-down menu is displayed.
  Change settings by (Joystick) right or left and push (Joystick).
  The smaller value of "ALARM LEVEL" is higher sensitivity.
  For example a setting of 2 would activate the alarm for a small target while for the same target a setting of 7 might not activate it.

[Making a ALARM ZONE]

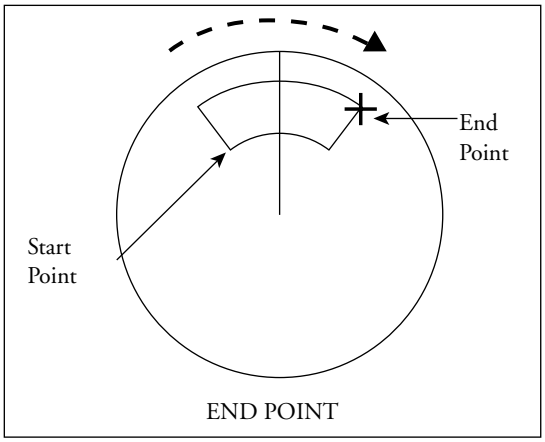
- Select the "ALARM SETTING" in RADAR ALARM menu and push the (Joystick).
  The radar display returns to the normal video presentation.
  Cursor appears on the PPI screen and shows the distance and the azimuth of the Marker.
  It displays the distance help line and the azimuth help line of the dotted line.



- Move the cursor to the desired guard zone start point using the (Joystick) and the press the (Joystick) again.
  The distance help line and the azimuth help line of the dotted line are displayed in the fixation in the start point position at this time.
- Next, move the cursor to the desired guard zone Width point of your Guards zone then press the (Joystick).
  It displays the distance help line of the dotted line which is new at this time.



• Next, move the cursor to the desired end point of your guard zone then press the (Joystick).
A ring in the distance range is displayed by the solid line at this time.



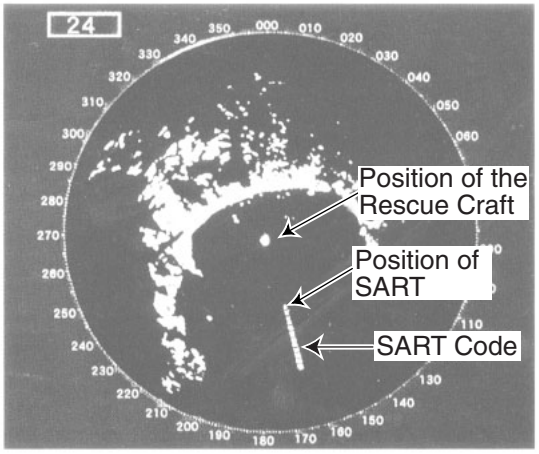
Display of RADAR Transponder

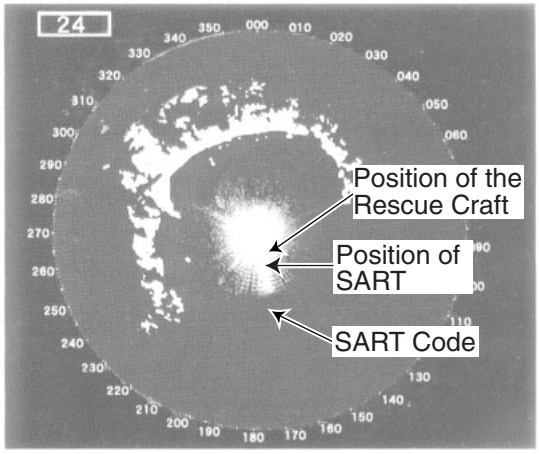
SART (Search and Rescue Radar Transponder) is life preserving device approved by GMDSS which is used for locating survivors in the event of a disaster or distress. SART operates in the 9 GHz frequency band. When it receives a radar signal (interrogating radio wave) of 9 GHz transmitted by a rescue ship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

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

① RANGE SCALE : Select 6 or 12 nm.
② SEA : Set to minimum.
③ TUNE : DETUNED to reduce the clutter.
④ IR : Set IR OFF.
⑤ PROCESS : Set PROCESS OFF.

[EXAMPLE]





ATTENTION

When above settings ① to ⑤ are made to display SART signals, objects around the own ship will not appear on the radar screen, so perform thorough visual monitoring of the sea area around the own ship to avoid any collision or stranding.
Further, when more than one radar systems are mounted, while using a 9 GHz band radar for searching SART signals, be sure to use another radar as an ordinary radar to perform monitoring of object around the own ship to avoid any collision, check of the position of the own ship to avoid any stranding, and so on.
Need to retune the set for normal operation on completion.

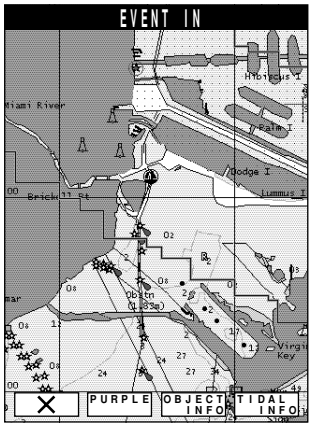
Plotter Operation

Using The Joy Stick in CHART mode

Enter the Event

You can enter the EVENT symbol at the own ship's position.

- Confirm the shape of cursor mark as "◇". (Don't move the cursor mark)
- Press the (Joystick) to display the four soft keys and press the [×] or [PURPLE] soft key to select the shape or color of the symbol.
- Press the (Joystick) and the EVENT symbol appears at own ship position.



Enter the WAYPOINT or the MARK

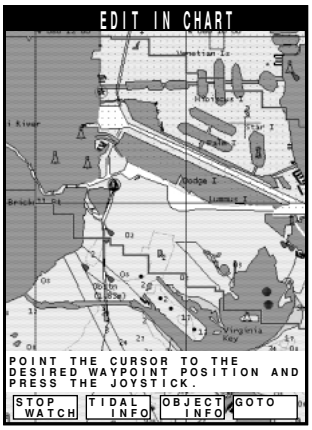
You can enter the WAYPOINT or MARK by moving the cursor and them pressing the (Joystick). (Confirm the shape of the cursor is "+") You can also use various functions such as Direct Navigation (GOTO) and Object Information with the four soft keys displayed on the bottom of the display. These functions can be changed by selecting them in the MENU-INSTALLATION-OPERATION-J-STICK PUSH operation modes.

Enter the WAYPOINT

You can enter the WAYPOINT on pointed position by cursor while selected the Joystick operation mode was "WAYPOINT".

Storing a waypoint

- Select a point you want to store as a waypoint. Press the (Joystick) to move the cursor to select a point and push it in to complete the selection.
- Press the (Joystick) to the left or right to select an item
  Name: You can enter up to eight characters.
  Comment: You can enter up to 23 characters.
- Press the (Joystick) to store the waypoint, to cancel, press CLR/OFF.



Notes:

- *The smallest number is selected among unoccupied numbers.*
- *If there is no more memory to store a waypoint, the following message appears.*
- *Press any key to delete the message, or it goes off automatically in about seven seconds.*

Modify / Erase / Move / Goto a waypoint

• You can edit a stored waypoint same as EDIT IN CHART function. (Refer to p.81)

Soft Keys at the WAYPOINT Mode

By selecting WAYPOINT in the above menu you can display the following four soft keys by pressing on the joystick.

GOTO

• Press the Soft Key to start the Navigation to pointed position by cursor.

Notes:

• *Not active the key while working other navigation.*

OBJECT INFO

• Press the Soft Key to display the OBJECT INFO. (Refer to p.79)

TIDAL INFO

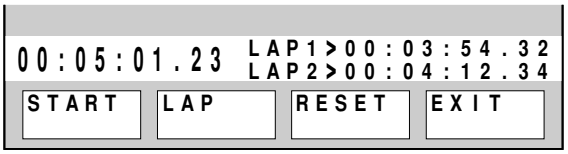
• Press the Soft Key to display the TIDAL INFO. (Refer to p.79)

STOP WATCH

• Press the Soft Key to display the STOP WATCH window.

• Press the STOP WATCH Soft Key to display the STOP WATCH window and four Soft Keys START, LAP, RESET, and EXIT.

• You can use the STOP WATCH function in either the FF or PLOT display mode.



Press the START Soft Key to start/stop the timer.

Press the LAP Soft Key to display the lap time.

Press the RESET Soft Key to reset the timer count.

Press the EXIT Soft Key to turn off the STOP WATCH window.

Enter the MARK Mode

You can enter the MARK symbol at pointed position by cursor while selected the Joystick operation mode was “MARK”.

• Press the (Joystick) to display the four soft keys and press the ✕ or PURPLE soft key to select the shape or color of the symbol.

• Press the (Joystick) and the MARK symbol appears at own ship position.

Man Overboard

- Press the MOB key to place the marker at the own ship's position.
- Press the Joystick to the left or right to select YES or NO and push it to complete the selection.

Notes:

- *Each time you press the MOB key, the memory data of the MOB's position is updated.*
- *When navigation begins toward the MOB, the alarm of MOB is displayed.*
  Cancel the navigation in order to terminate the alarm display.
  (Refer to "Stop Navigation" p.79)
- *Requires NMEA position/heading inputs.*

Range Setting

In the CHART display

- Press RANGE to display two Soft Keys ZOOM IN and ZOOM OUT .

ZOOM IN — Press the ZOOM IN Soft Key to magnify the chart.

ZOOM OUT — Press the ZOOM OUT Soft Key to reduce the chart.

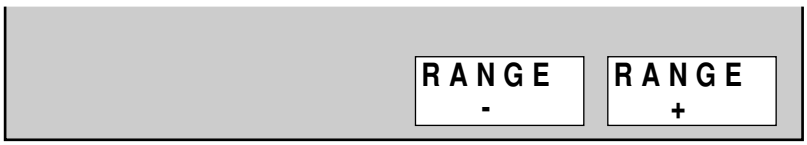
In the CDI/COMPASS display

- Press RANGE to display the CDI RANGE popup menu.
- You can set the display range of the highway window displayed in CDI/COMPASS.
- Press the Joystick to the left or right to select 0.1 NM, 0.3 NM, or 0.5 NM.

In the RADAR display

[RADAR full screen mode]

- Press RANGE to display two Soft Keys.



RANGE - — Decrease the range scale. The minimum range scale is 0.125NM.

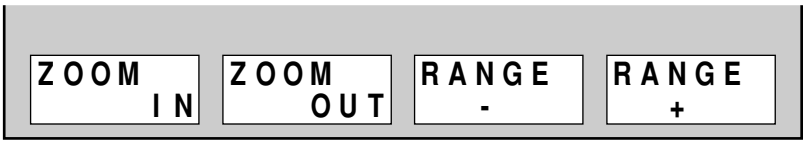
RANGE + — Increase the range scale. The maximum range scale is 24nm.

The range rings are automatically set to correspond with this selection.

In the RADAR/CHART display

[RADAR/CHART screen mode]

• Press RANGE to display four Soft Keys.



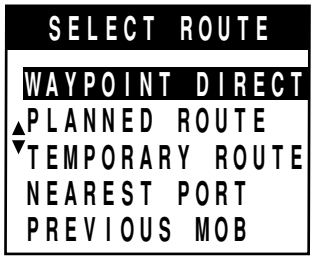
ZOOM IN	Magnify the chart.
ZOOM OUT	Reduce the chart.
RANGE -	Decrease the range scale. The minimum range scale is 0.125NM.
RANGE +	Increase the range scale. The maximum range scale is 24nm.

The range rings are automatically set to correspond with this selection.

Navigation Setting

• While not navigating to a waypoint or following a route, press NAV to display four Soft Keys SELECT ROUTE, SEQUENCE, WPT STEP, and TEMP ROUTE.

• While proceeding on waypoint/route navigation, press NAV to display four Soft Keys NEXT WPT, PREV. WPT, STOP NAV, and TEMP ROUTE.



SELECT ROUTE

(Selecting Navigation)

Press the SELECT ROUTE Soft Key to display the SELECT ROUTE menu.

WAYPOINT DIRECT (Selecting a waypoint)

• Select WAYPOINT DIRECT to display the WAYPOINT LIST screen and two Soft Keys NEW WPT and JUMP.

• Select a waypoint and press the Joystick to start the navigation to the selected waypoint.

• To make registration of a new waypoint, press the NEW WPT. (Refer to "Storing a waypoint" p.80)

• To search a waypoint in waypoint lists, press the JUMP and set page number by popup menu.

PLANNED ROUTE (Navigating according to a planned route)

- Select PLANNED ROUTE to display the ROUTE LIST screen and two Soft Keys [NEW ROUTE] and [ALL ERASE] .
- Select a route and press the (Joystick) to start the navigation by the selected route.
- To make registration of a new route, press the [NEW ROUTE] . (Refer to "Storing a new Route" p.83)
- To delete all registrations, press the [ALL ERASE] . (Refer to "Erasing all routes" p.84)

TEMPORARY ROUTE (Navigating according to a temporary route)

Select TEMPORARY ROUTE to enter the Temporary Route Mode. And press [TEMP ROUTE] key to enter the mode directly.
Create a temporary route in the chart and start the navigation along the route. The following four soft keys appear.

[ALL ERASE] Erasing all temporary waypoints.
If you erase one waypoint then point the one and push (Joystick).

[MOVE] Moving a waypoint that pointed by cursor.
1. Point the waypoint by cursor and press this key.
2. Move cursor to desire position and press (Joystick).

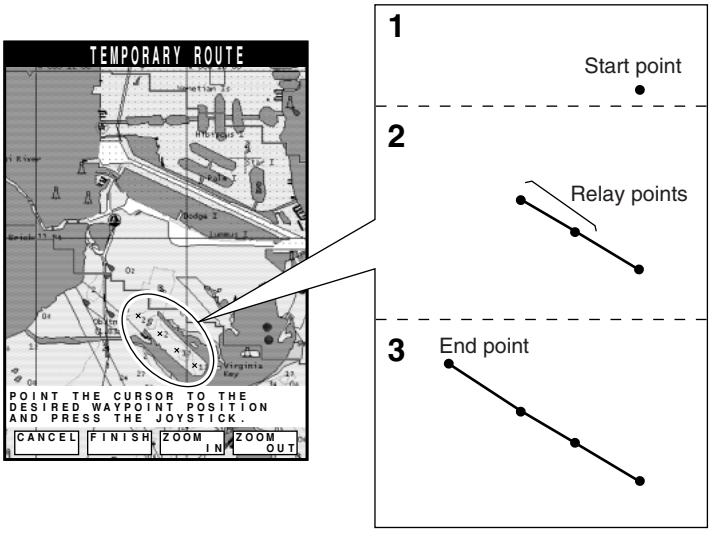
[INS] Inserting a new waypoint into created temporary route.
1. Point the waypoint of Leg (: A part of route) that inserts it by cursor.
2. Press this key.
3. Move cursor to desire position and press (Joystick).

[FINISH] Finish making a temporary route.

Planning a temporary route and starting navigation

- You can make a temporary route consisting of waypoints specified arbitrarily and temporarily. The temporary route is not stored in the list unless you purposely do so.
- Specify a waypoint in the chart as the start point by pressing (Joystick) to move the cross cursor and pushing it. Do the same procedure to specify temporal waypoints you want to go. You can specify up to 100 waypoints in a route. After specifying all waypoints you want to go, press [FINISH] key. Two soft keys [START NAV] and [MEMORY] are displayed.
- Press the [START NAV] key to display the START NAVIGATION popup, select YES and press Joystick then begin the navigation.

• Press the START NAV Soft Key to display the START NAVIGATION popup menu, after confirmation the specified waypoints are connected to each other by lines to begin the navigation.



Storing the temporary route to the List

• Press MEMORY key to display the NEW ROUTE popup in which you can store the route.

• Enter a name (up to eight characters) and a comment (up to 23 characters) and press Joystick.
• If the memory for the route or the waypoints is not enough, the MEMORY FULL message disappears.
Press any key or wait about seven seconds to delete the message.

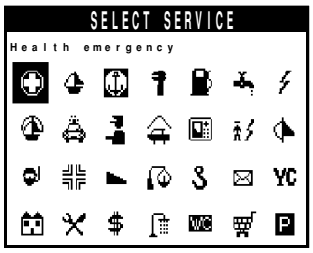
NEAREST PORT (Searching for and navigating to a nearest port)

- Select NEAREST PORT to display the full chart and four Soft Keys [VESSEL], [CURSOR], [ZOOM IN], and [ZOOM OUT].

Note:

- *The Nearest Port information may not be stored in some chart cards. In such a case, this feature is not available.*

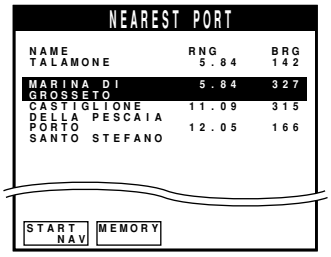
- Press the [VESSEL] Soft Key to specify the current position of your vessel as the original point from which search is made, or press the [CURSOR] Soft Key to specify the point at which the cursor is positioned as the original point.



- When an original point is specified, the SELECT SERVICE list containing icons for various services appears.
- Select an icon and press the (Joystick) to show the nearest 10 ports/marinas where the selected service is available.

Note:

- *When the Nearest Port information is not stored in the chart card, the message "NO DATA IN THE CARD!" appears.*

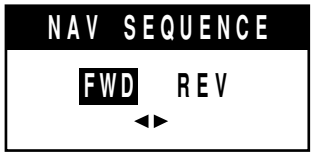


- Select a desired port/marina and press the (Joystick) to display the details of the service.
- Press the [START NAV] Soft Key to navigate to the selected port/marina. (Refer to [START NAV] previous page)
- Press the [MEMORY] Soft Key to store the selected port/marina in the Waypoint List. (Refer to [NEW WPT] p.82)

PREVIOUS MOB (Setting a waypoint to the MOB)

- Select PREVIOUS MOB to resume the navigation to the Man Overboard point when the navigation selected from the MAN OVERBOARD menu is canceled by the [STOP NAV] Soft Key or the navigation is canceled from the menu.

[SEQUENCE] (Selecting the order of waypoint navigation)



Press the [SEQUENCE] Soft Key to display the NAV SEQUENCE popup menu in which you can select the order of navigation between FWD (ascending order) and REV (descending order).

WPT STEP (Selecting the method to switch the waypoint)

Press the WPT STEP Soft Key to display the WPT STEP popup menu to select the method to update a waypoint between AUTO (automatically) and MANUAL (manually).

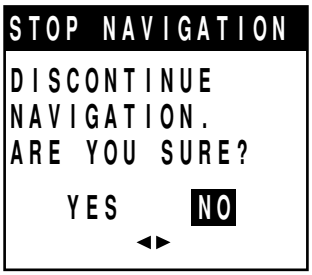
While navigating according to route NEXT WPT and PREV. WPT are displayed.

NEXT WPT (Skipping to the next waypoint)

Press the NEXT WPT Soft Key to skip to the next waypoint.

PREV. WPT (Skipping to the previous waypoint)

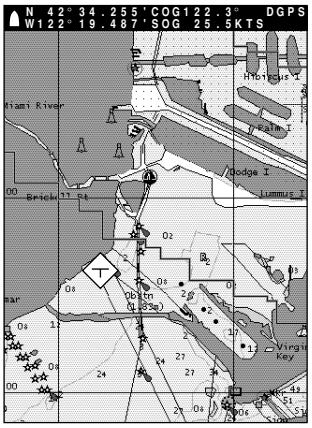
Press the PREV. WPT Soft Key to skip to the previous waypoint.



STOP NAV Press the STOP NAV Soft Key to display the STOP NAV popup menu.

TIDAL INFO (Displaying tide height graph of a specified point)

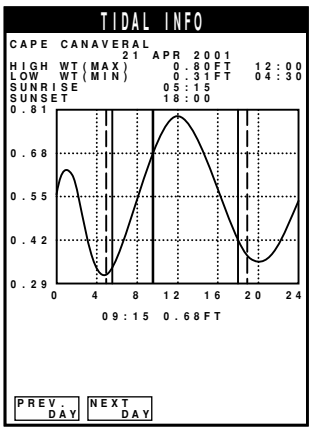
This feature can display the Tide Height Graph of a specified point based on the tidal information stored in the chart card. The change of sea level can be forecast with the help of this feature.



Note:

- *The Tide Height Graph can be displayed only at the points where the Tidal Icon ⊕ appears on the chart. If the version of the chart card is too former, this feature may not be supported. (The Tidal Icon ⊕ does not appear.)*

- Align the cursor with ⊕ and press the (Joystick) and then the TIDAL INFO Soft Key to display the Tide Height Graph during 0:00 to 24:00 of the day, the maximum/minimum sea levels, and the times of sunrise/sunset.
- Turn the (Jog Dial) to move the cursor to the left or right to select a point on the graph and display its time and sea level at the bottom of the screen.
- Press the PREV DAY or NEXT DAY Soft Key to switch to the tidal information of the previous or next day.
- Press BRT/CLR to return to the chart screen.



OBJECT INFO (Displaying detailed information of a specified point)

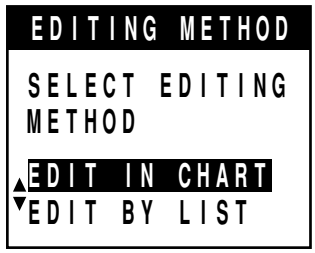
This feature can display the detailed information (stored in the chart card such as the flashing frequency of a lighthouse or the color of light) of a specified point in text.

- Align the cursor with a point of which information you want to get and press the (Joystick) and then the OBJECT INFO Soft Key to display the detailed information of the point.
- Press BRT/CLR to return to the chart screen.

EDIT

• Press MENU , select EDIT> , and press Joystick to display the four Soft Keys: WAY POINT, ROUTE PLAN, TRACK CONV., and CONST-RUCT .

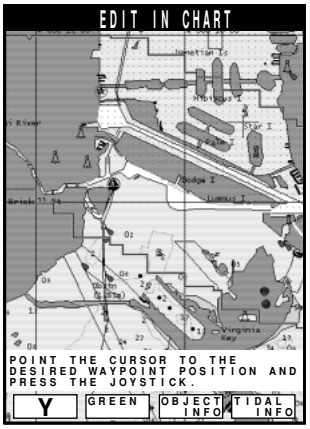
WAY POINT (Editing a waypoint)



• Press the WAY POINT Soft Key to display the EDITING METHOD menu.

• You can edit a waypoint in chart or by list. Press the Joystick up or down to select EDIT IN CHART or EDIT BY LIST and push it in to complete the selection.

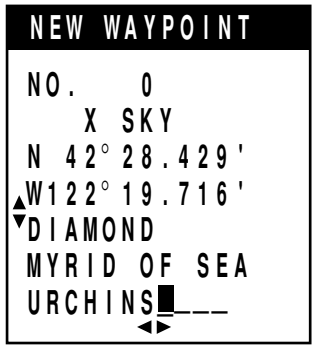
EDIT IN CHART



• By selecting EDIT IN CHART, the full chart is displayed and 4 soft keys are displayed.

• Select an icon with the soft keys, and you can select colors with the soft keys.

Storing a waypoint



• Select a point you want to store as a waypoint. Press the Joystick to move the cursor to select a point and push it in to complete the selection.

• Press the Joystick to the left or right to select an item
Name: You can enter up to eight characters.
Comment: You can enter up to 23 characters.

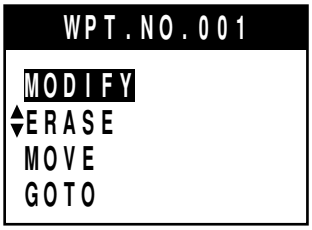
• Press the Joystick to store the waypoint, to cancel, press BRT/CLR.

Notes:

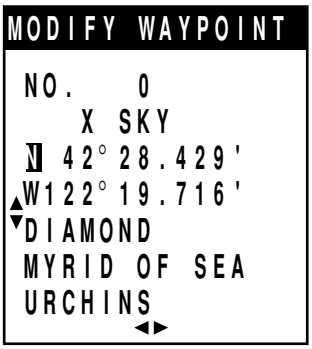
- *The smallest number is selected among unoccupied numbers.*
- *If there is no more memory to store a waypoint, the following message appears.*
- *Press any key to delete the message, or it goes off automatically in about seven seconds.*

Modifying a waypoint

- Select a stored waypoint you want to modify. Press the Joystick to move the cursor to select an icon of the waypoint and push it in to complete the selection.

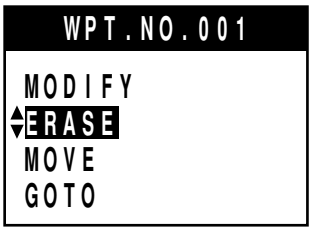


- Press the Joystick up or down to select MODIFY and push it in to complete the selection.
- Press the Joystick to the left or right to select an item and press it up or down or the Jog Dial to the left or right to modify each item.



Erasing a waypoint

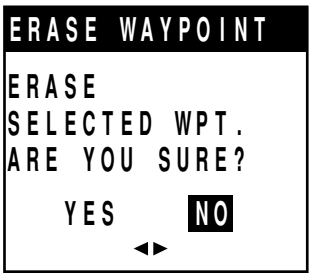
- Select a stored waypoint you want to erase. Press the Joystick to move the cursor to select an icon of the waypoint and push it to complete the selection.



- Press the Joystick up or down to select ERASE and push it in to complete the selection.
- Press the Joystick to the left or right to select YES or NO and push it in.

  Select YES to erase the selected waypoint.

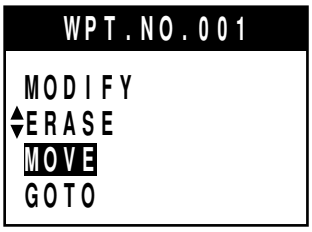
  If you select NO to cancel, the popup menu goes off without erasing the selected waypoint.



Moving a waypoint

- Select a stored waypoint you want to move.

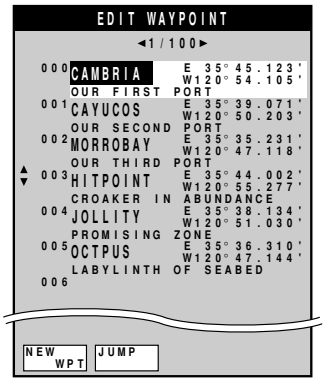
  Press the Joystick to move the cursor to select an icon of the waypoint and push it to complete the selection.
- Press the Joystick up or down to select MOVE and push it into complete the selection, move the selected waypoint.



Go to a waypoint

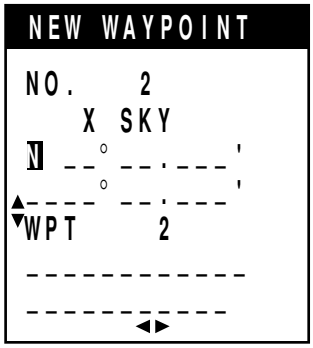
- Select a stored waypoint you want to start navigation go to the point.
- Press Joystick to point a waypoint icon by cursor.
- Press Joystick down to select GOTO and push it. Then appear the START NAVIGATION popup, select YES and press Joystick then begin the navigation.

EDIT BY LIST



- When you select EDIT BY LIST, the waypoint list and two Soft Keys NEW WPT and JUMP appear.

NEW WPT (Storing a waypoint)

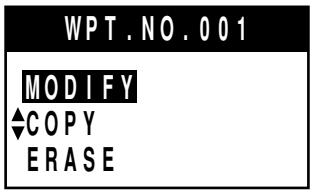


- Select an unregistered number or press the NEW WPT Soft Key to store a waypoint.
- Press the Joystick to the left or right to select an item.
  Name: You can enter up to eight characters.
  Comment: You can enter up to 23 characters.
- Press the Joystick to store the waypoint, to cancel, press BRT/CLR.

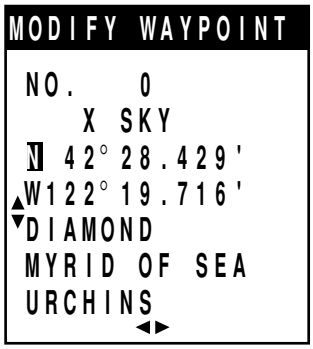
Notes:

- *The smallest number is selected among unoccupied numbers.*
- *If there is no more memory to store a waypoint, the following message appears.*
- *Press any key to delete the message, or it goes off automatically in about seven seconds.*

Modifying a waypoint



- Select a stored waypoint you want to modify.
- Press the Joystick up or down to select MODIFY and push it in to complete the selection.



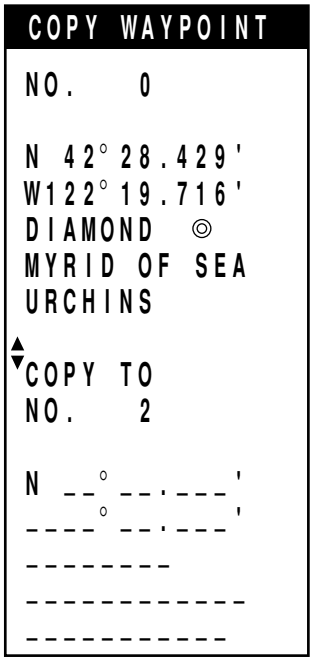
- Press the Joystick to the left or right to select an item and press it up or down or the Jog Dial to the left or right to modify each item.

Copying a waypoint

- Select a waypoint number you want to copy.
- Press the Joystick up or down, or press the Jog Dial to the left or right to select a number to which you want to copy the waypoint.

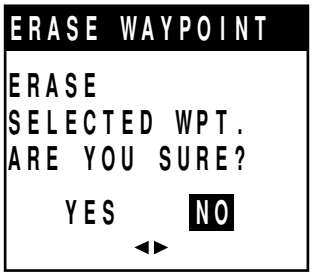
Note:

- *If the selected number to which you copy the waypoint is already used, the contents are overwritten.*



Erasing a waypoint

- Select a stored waypoint you want to erase. Press the Joystick to move the cursor to select an icon of the waypoint and push it to complete the selection.
- Press the Joystick to the left or right to select YES or NO and push it in.
  Select YES to erase the selected waypoint.
  If you select NO to cancel, the popup menu goes off without erasing the selected waypoint.



JUMP **(Jumping to a waypoint list page)**

- Press the JUMP Soft Key and set page in the menu.

ROUTE PLAN (Planning a route)

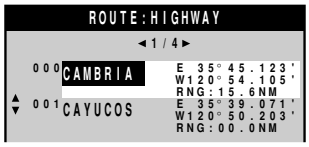
Press the ROUTE PLAN Soft Key to display the EDIT ROUTE PLAN list and two Soft Keys NEW ROUTE and ALL ERASE.

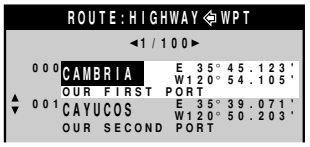
NEW ROUTE (Storing a new route)

- Press the NEW ROUTE Soft Key or select a vacant route number to display the NEW ROUTE popup menu.
- Enter a name (up to eight characters) and a comment (up to 23 characters).
- Press the Joystick to complete the entry.
- Press BRT/CLR to cancel the entry.

Notes:

- *If the maximum number of routes is stored already, the following message appears.*
- *Press any key or wait about seven seconds to delete the message.*





Editing a route

• Select a route you want to edit from the EDIT ROUTE PLAN list and press the (Joystick) to display the window of the selected route.

Adding a new waypoint

• Select an unoccupied waypoint number in the EDIT ROUTE PLAN list and press the (Joystick).
The waypoint list is displayed to select the additional waypoint. (the title: ROUTE:NNNNNNNNN⇦WPT)

• Select a waypoint and press the (Joystick). Register a new waypoint.

Note:

• *Be sure to sort the waypoints so that unregistered waypoint is inserted in the route.*

Editing a waypoint

• Select a registered waypoint you want to edit in the EDIT ROUTE PLAN list and press the (Joystick).
The WPT NO. XXX popup menu is displayed.

CHANGE

• Select CHANGE and press the (Joystick) to display the ROUTE: NNNNNNNNN⇦WPT list.

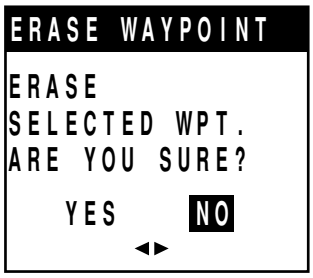
• Change the waypoint.

INSERT

• Select INSERT and press the (Joystick) to display the ROUTE: NNNNNNNNN⇦WPT list.

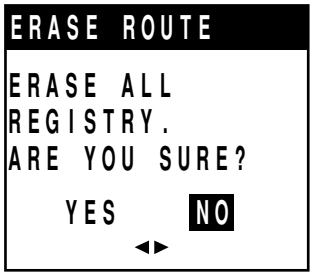
• Insert the waypoint.

ERASE



• Select ERASE and press the (Joystick) to delete the waypoint.

• The following message appears.
Select YES to delete the waypoint.
Select NO to cancel the selection.



(Erasing all registry)

• Press the [ALL ERASE] Soft Key to delete all registry at one time.

• The following message appears.
Select YES to delete all registry.
Select NO to cancel the deletion.

TRACK CONV. (Converting a track to a planned route)

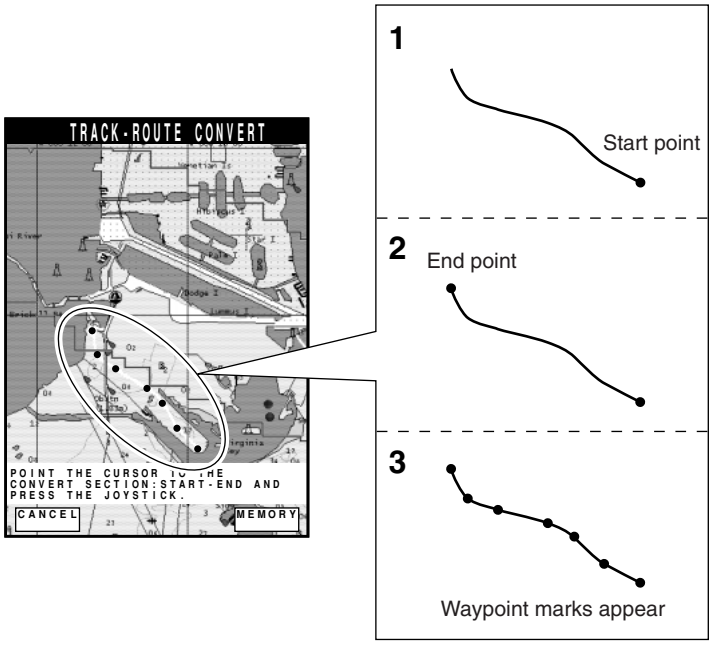
- You can convert an arbitrary part of a track into a route plan.
- Press the TRACK CONV. Soft Key to display the TRACK-ROUTE CONVERT chart and three Soft Keys CANCEL, FINISH, and DIVIDE .

Selecting a new route

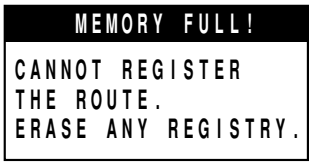
- Move the cursor to select a point on a track as the start point and press the (Joystick). Similarly, select a point as the end point and press the (Joystick).

  Press the CANCEL Soft Key to cancel the selection.

  Press the FINISH Soft Key to display the calculated waypoints on the track and the MEMORY Soft Key.

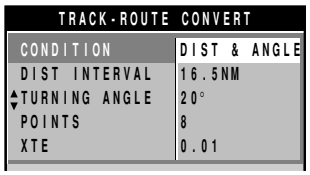


- Press the MEMORY Soft Key to display the NEW ROUTE popup menu.
- Enter a name (up to eight characters) and a comment (up to 23 characters).



Notes:

- *The same names as the waypoint is automatically set and no comment is entered.*
- *If memory is not enough, the following message appears.*
- *Press any key or wait about seven seconds to delete the message.*



DIVIDE

Press the DIVIDE Soft Key to display the DIVIDE menu.

You can set the condition for the calculation of the waypoints.

CONDITION: DIST, ANGLE, DIST & ANGLE or POINT, XTE

DIST INTERVAL: 0.1 - 99.9 NM

TURNING ANGLE: 10 - 180 °

POINTS: 1 - 98

XTE: 0.01 - 1.00

CONST-RUCT

(Constructing a Line/Rectangle)

- Press the CONST-RUCT Soft Key to display the LINE and RECT. Soft Keys.

Construction

Constructing a line

- You can construct a line in the chart.
- Press the LINE Soft Key to enter the LINE mode and display the COLOR, END, and DELETE Soft Keys. Move the cursor to the start point and press the Joystick, and move the cursor to end point and press the Joystick again. While you are moving the cursor after you press the Joystick once, a dotted line appears and it changes to a solid line when you press the Joystick. In the similar way, you can construct another line.
- Press the END Soft Key to complete the construction.

Note:

- *To delete a constructed line, move the cursor to the start point, a turning point, or the end point and press the DELETE Soft Key.*

Constructing a rectangle

- You can construct a rectangle in the chart.
- You can use the rectangle you have constructed as the Alarm Area by specifying it in the ZONE (Danger Zone Alarm). (Refer to p.101)
- Press the [RECT.] Soft Key to enter the RECTANGLE mode and display the [COLOR] and [DELETE] Soft Key. Move the cursor to the top left vertex of a rectangle you are going to construct and press the (Joystick), and move the cursor along the diagonal line of the rectangle to the bottom right vertex and press the (Joystick) again. While you are moving the cursor after you press the (Joystick) once, a rectangle appears in dotted line and it changes to a solid line when you press the (Joystick). In the similar way, you can construct another rectangle.

Notes:

- *To delete a constructed rectangle, move the cursor to one of the vertices and press the [DELETE] Soft Key.*
- *You can select a color for a line or rectangle from the menu that appears when you press the [COLOR] Soft Key.*

Menu Operations

General

Following the basic operations described below, you can easily perform all menu operations using only the Joystick.

Selecting an item:

- Press the Joystick up or down to select an item and push it to complete the selection. When you select a normal item, the pull-down menu of the selected item opens. Select an item with the >> mark to display the submenu in the next hierarchy.

Changing settings

- When settings are specified by numerical values, press the Joystick up or down to change the values. When settings are specified by bar chart or by other items, press the Joystick to the left or right to change the settings.

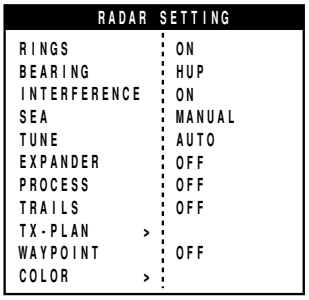
Entering changes

- Push the Joystick to enter the change. If you want to cancel the change, push BRT/CLR before completing it.

Top Menu

You can display the Top Menu by pressing the MENU key. Pressing the MENU again or BRT/CLR, the menu closes.

RADAR SETTING



- Press MENU, select the “RADAR SETTING>” item and push the joystick, the “RADAR SETTING” menu is displayed.

RINGS

The range rings can be turned to on or off via this menu. (Refer to “RINGS” p.61)

BEARING

You can select a bearing mode among three bearing mode. (Refer to “DISPLAY MODE” p.61)

INTERFERENCE REJECTION

The Interference Rejection (IR) can be turned to on or off via this menu. (Refer to “INTERFERENCE REJECTION” p.62)

SEA

The automatic sea clutter suppress mode can be turned to on or off via this menu. (Refer to “Setting AUTO/MANUAL SEA Clutter Rejection” p.63)

TUNE

The AUTO TUNE mode can be turned to on or off via this menu. (Refer to “Setting AUTO/MANUAL TUNING” p.63)

EXPANDER

The target EXPANDER mode can be turned to on or off via this menu. (Refer to “Target EXPANDER” p.63)

PROCESS

The radar signal processing mode can select via this menu. (Refer to “PROCESS” p.64)

TRAILS

This feature allows the operator to see the past history of target movement or behind the moving targets. The trail interval can select via this menu. (Refer to “TRAILS” p.64)

CLEAR TRAILS

You can clear the screen. (Refer to “CLEAR TRAILS” p.65)

WAYPOINT

The WAYPOINT mark display can be turned to on or off via this menu. (Refer to “WAYPOINT” p.65)

COLOR

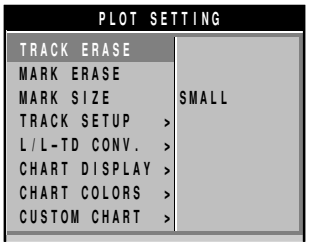
In this menu, you can select a color for ECHO, TRAILS, Background of PPI area, and Background of Character area. (Refer to “Setting radar COLOR” p.65)

TX-PLAN

In this menu, you can program transmitting time and STBY time. (Refer to “PLANNED-TX MODE” p.66)

PLOT SETTING

TRACK ERASE (Erasing a track)



- In this menu, you can delete the currently displayed tracks by each color or all.

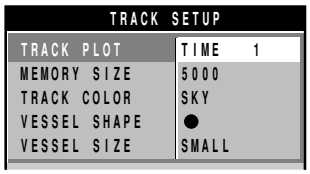
MARK ERASE (Erasing a mark)

- In this menu, you can delete the currently displayed marks.

MARK SIZE (Selecting a size)

- In this menu, you can select the mark size between LARGE and SMALL.

TRACK SETUP



- In this menu, you can select a plotting method, a number of EVENTs or MARKs, a color for the track, and your vessel’s shape, and size.

TRACK PLOT (Selecting memory intervals)

- In this menu, you can select TIME or DIST (distance) for the track memory interval.
  TIME: 0 - 3600 seconds
  DIST: 0.00 - 99.99 NM

MEMORY SIZE (Selecting a number of points)

- In this menu, you can select the number of track points (1000 - 8000) stored in memory, along with marks.

TRACK COLOR (Selecting a color)

- In this menu, you can select the track color. The track color is selectable from among white, yellow, purple, red, sky, green, and blue.

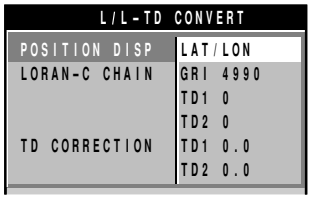
VESSEL SHAPE (Selecting a mark for your vessel)

- In this menu, you can select a mark for your vessel between circle and ship-shape.

VESSEL SIZE (Selecting a size of your vessel’s mark)

- In this menu, you can select your vessel’s mark between LARGE and SMALL.

L/L - TD CONVERT



- In this menu, you can display the position in L/L (Latitude/ Longitude) or TD (Time Difference), select a setting for Loran-C, and perform TD correction.

POSTION DISPLAY (Selecting a format of position display)

- In this menu, you can select the position display with Latitude/ Longitude or Time Difference.

LORAN-C CHAIN (Selecting a format of LORAN-C CHAIN)

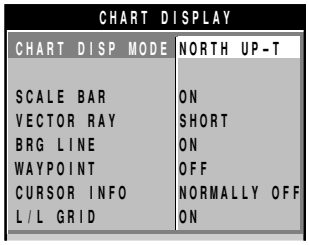
- In this menu, you can select GRI, TD1, TD2 for LORAN-C CHAIN.

TD CORRECTION (Selecting a format of time difference)

- In this menu, you can select the time difference between TD1 and TD2.

CHART DISPLAY

CHART DISP MODE (Selecting a chart display mode)



- In this menu, you can select from among NORTH UP-R, NORTH UP-T, COURSE UP-R, COURSE UP-T, and WPT UP-T, and an angle between 10°, 15°, and 20°.

SCALE BAR (Turning the scale bar ON/OFF)

- In this menu, you can select to turn the scale bar ON or OFF.

VECTOR RAY (Selecting a type of direction display)

- In this menu, you can select a vector ray of the direction to a waypoint between OFF, SHORT, and LONG.

BRG LINE (Turning the direction line ON/OFF)

- In this menu, you can select to turn the direction line your vessel navigates ON or OFF.

WAYPOINT (Selecting a waypoint display)

- In this menu, you can select a waypoint display between ALL, MARK, and OFF.

CURSOR INFO (Turning the cursor information ON/OFF)

- In this menu, you can select whether or not to display information about the cursor between DISP ALWAYS and NORMALLY OFF.

L/L GRID (Turning the grid ON/OFF)

- In this menu, you can select whether or not to display the grid.

CHART COLORS

• In this menu, you can select a color for LAND, SEA and L/L GRID.

LAND (Selecting a color for the land)

• In this menu, you can select a color for the land.

SEA (Selecting a color for the sea)

• In this menu, you can select a color for the sea.

L/L GRID (Selecting a color for the grid)

• In this menu, you can select a color for the longitude/latitude grid.

CUSTOM CHART

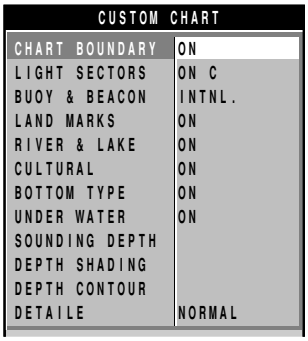


CHART BOUNDARY

• In this menu, you can enable visualization of zone boundaries indicating chart coverage for each level.

LIGHT SECTORS

• In this menu, you can enable visualization of light sector and setting the level.

BUOY & BEACON

• In this menu, you can select navaid symbology styles.
international : same as official INT1 standard paper chart
us : same as NOAA paper chart
simple : minimum visual visual clutter on-screen

NAMES (Turning the geographic names display ON/OFF)

• In this menu, you can enable visualization of the geographic names.

LAND MARKS

• In this menu, you can enable visualization of the landmark objects.

RIVER & LAKE

• In this menu, you can enable visualization of the river and lake object.

CULTURAL

• In this menu, you can enable visualization of the cultural land features object.

BOTTOM TYPE

• In this menu, you can enable visualization of a nature of the seabottom.

UNDER WATER

• In this menu, you can enable visualization of the underwater rock object.

SOUNDING DEPTH (Turning the display of sounding depth ON/OFF)

• In this menu, you can select whether or not to sound the depth.

DEPTH SHADING

• In this menu, you can select the lifht of a lighthouse between ON, OFF, and LEVEL.

DEPTH CONTOUR

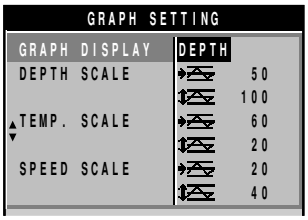
• In this menu, you can enable visualization of depth contour and setting range.

DETAILED

• In this menu, you can select the detaile about chart presentation.
Normal : normal detaile
high : high detaile

GRAPH SETTING

• In this menu, you can set the scale of the water depth, temperature, and speed graphs.



Notes:

- *To display the water depth graph, it is necessary to receive the depth data in the NMEA0183 standard format. You need to connect the specified signal line to the NMEA connector on the rear panel to receive the water depth data.*
- *To display the water temperature graph, it is necessary to receive the depth data in the NMEA0183 standard format. You need to connect the specified signal line to the NMEA connector on the rear panel to receive the water temperature data.*
- *Graphs are not displayed in the Radar Full screen and the Radar/Chart screen.*

GRAPH DISPLAY (Selecting what to display)

• In this menu, you can select what to display from among temperature, depth, and speed.

DEPTH SCALE (Setting a display range of the water depth graph)

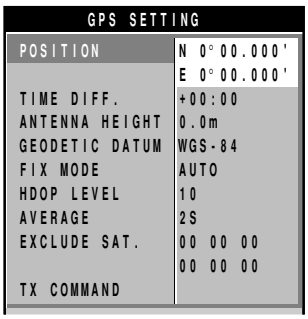
• In this menu, you can select the scale center and scale range. The scale center indicates the center value in the water depth graph scale, and the scale range indicates the width.

TEMP. SCALE (Setting a display range of the temperature graph)

• In this menu, you can select the scale center and scale range. The scale center indicates the center value in the temperature graph scale, and the scale range indicates the width.

SPEED SCALE (Setting a display range of the speed graph)

• In this menu, you can select the scale center and scale range. The scale center indicates the center value in the speed graph scale, and the scale range indicates the width.



GPS SETTING

• In this item, you can perform the initial settings when JRC's GPS/DGPS sensor GPS112 or DGPS212 is connected to the RADAR 1800. The menu includes both basic settings and initial settings. The basic settings reflect the general GPS/DGPS sensors and the initial settings reflect the beacon module of the DGPS sensor. Before setting, you need to set the clock built in the plotter using CLOCK ADJUST.

> ***Note:***
> • *Use TX COMMAND to send the values set in the following settings.*

VESSEL POSITION (Setting the vessel position)

• In this menu, you can set your vessel's current position. It will take about 20 minutes to complete the positioning through the GPS/DGPS when you turn the power on for the first time or after you perform the master reset. You can save time, however, by setting your vessel's position, as well as time difference and antenna height described below.

TIME DIFFERENCE (Setting the time difference)

• In this menu, you can set the time difference between UTC (Universal Time Coordinate) and the local time.

ANTENNA HEIGHT (Setting the antenna height)

• In this menu, you can set the antenna height (from the sea level) of the GPS/DGPS sensor.

GEODETIC DATUM (Setting a geodetic system)

• In this menu, you can set the data type of the Geodetic System the GPS/DGPS sensor uses. In preparing charts or maps, cartographers rely on a particular geodetic datum or scaling system (Geodetic System) on which to calibrate the Latitude/Longitude coordinate structure onto their charts. The GPS/DGPS sensor also calculates the vessel's position using the same Geodetic System. If the data type used in the Geodetic System by cartographers and the GPS/DGPS differ, the positions calculated by the GPS/DGPS may be considerably different, up to 200 m, from those in the charts. Therefore, it is necessary to set this item so that both sides use the same data type. The data type used is normally listed in the margin on the chart. Set the same data type.

There are 46 types of data available currently. (Refer to "Geodetic System Table" p.140)

FIX MODE (Setting the fixing mode)

• In this menu, you can set the geodetic mode of the GPS/DGPS sensor. When the GPS is connected, 3D provides more precise data than 2D. When the DGPS212 is connected, the AUTO mode is selected regardless of this setting.

HDOP LEVEL (Setting the HDOP level)

• In this menu, you can set the upper limit of the HDOP level using this item. The HDOP level indicates the geodetic precision determined by the constellation of the GPS satellites. Precision is increased as this level decreases and vice versa. The constellation of the GPS satellites changes constantly and the HDOP level changes accordingly. The GPS/DGPS sensor stops positioning when the HDOP level exceeds the upper level specified in this item. Therefore, if you set a smaller value as the upper limit, the precision is improved, but the possibility of interrupting positioning becomes larger.

AVERAGE (Setting an interval to average the data)

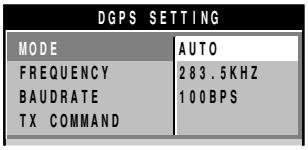
• In this menu, you can set an interval to average the positioning data. If you set a longer interval, the positioning data becomes more stable. If you set a shorter interval, you can reflect your vessel's movement changes more quickly, though the positioning data becomes less stable.

EXCLUDE SAT (Setting the satellite number not used)

• In this menu, you can set the satellite numbers so that excluded satellites are not used for positioning. The GPS/DGPS sensor does not use these excluded satellites for positioning.
The satellite number not used cannot be set by GPS112/DGPS212 themselves.

DGPS SETTING

• In this menu, you can perform the basic settings of the beacon module of the DGPS sensor.



> ***Note:***
> • *Use TX COMMAND to send the values set in the following settings.*

MODE (Setting the reception mode of the beacon)

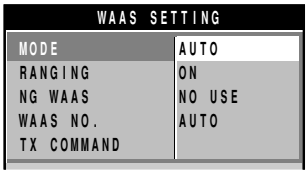
• In this menu, you can set the reception mode of the beacon.

FREQUENCY (Setting the beacon frequency)

• In this menu, you can set the beacon frequency. The frequencies range from 283.5 kHz to 325.5 kHz and you can set it in increments of 0.5 kHz.

BAUDRATE (Setting the beacon baud rate)

• In this menu, you can set the baud rate used by the beacon.



WAAS SETTING

• In this menu, youcan perform the basic settings of the WAAS module of the DGPS sensor.

> ***Note:***
> • *Use TX COMMAND to send the values in the following setting.*

MODE: AUTO/MANUAL

• Select a method to input differential data, either beacon receiver/ WASS satellite or some other automatic method.

RANGING: ON/OFF

• Select whether the differential data transmission satellite to also be used as the positioning satellite.

NG WAAS: NO USE/USE

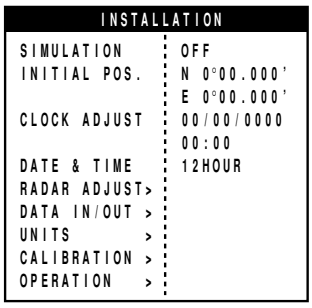
• Select whether to use the test satellite or the disable satellite.

WAAS NO.: AUTO/120 to 138

• Select whether to input the number of the satellite to be used or do it automatically.

INSTALLATION

• This menu includes various settings required for installation, such as the selection of the external data input method and unit, or the initial setting of the GPS/DGPS antenna. After installing the RADAR 1800, use this menu to make your settings.



SIMULATION (Turning the simulator ON/OFF)

• In this menu, you can turn on or off the simulator.

• The simulator provides navigation information such as radar echo, vessel position, vessel speed, course using the dummy data stored initially in the RADAR 1800. While the simulator is activated, you can simulate almost all operations except the operation of the INSTALLATION menu and radar control.

INITIAL POSITION (Setting the standard position of the chart display)

• In this menu, you can set the standard position of the chart display when no navigation aid is connected.

CLOCK ADJUST (Adjusting the date and time)

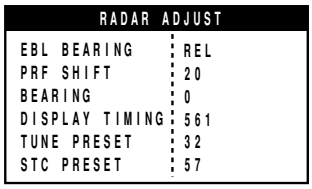
• In this menu, you can adjust the date and time displayed on the screen.

DATE & TIME (Selecting a system of time)

• In this menu, you can select 12-hour or 24-hour system and display OFF.

RADAR ADJUST (Adjusting the radar)

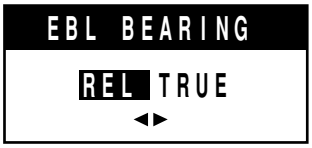
• In this menu, you can set operation condition and adjust the tuning, the relative alignment, and the display timing of RADAR 1800.

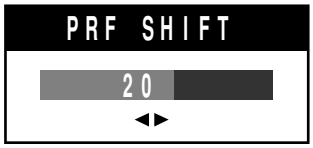


[EBL BEARING]

• You can select the EBL bearing reading relative or true.

(Refer to “Bearing Measurement” p.60)





[PRF SHIFT]

- In case of dual radar installed or received other radar's signal, which radar use same PRF (Pulse Repetition Frequency), sometime appeared strong interference as a concentric circle. In this case you can avoid strong interference by PRF shift.
- Select PRF SHIFT at the RADAR ADUST menu, press the (Joystick), the PRF SHIFT popup menu is displayed. You can change PRF by (Joystick) right or left, after adjusting press (Joystick).

(Refer to "INTERFERENCE REJECTION" p.62)

[BEARING] (Relative BEARING alignment)

Refer to "Relative BEARING alignment" p.39.

[DISPLAY TIMING]

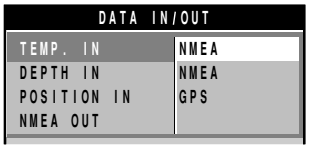
Refer to "DISPLAY TIMING" p.39.

[TUNE PRESET]

Refer to "TUNE PRESET" p.38.

[STC PRESET]

Refer to "STC PRESET" p.39.



DATA IN/OUT

- In this menu, you can set the RADAR 1800 so that you can get the data such as water temperature or vessel's speed, or issue the data in the specified format.

TEMP. IN (Selecting temperature input)

- In this menu, you can select the water temperature data input from the external NMEA source or OFF. When NMEA is selected, the water temperature input from the external water temperature gauge is displayed.

Note:

- *When you input the water temperature data from an external water temperature gauge, you need to connect the specified signal line to the NMEA connector on the rear panel. In addition, be sure to check that the NMEA0183 sentences of $xxMTW are output from the connected water temperature gauge. (You can check this easily using the self test mode of the RADAR 1800.)*

DEPTH IN (Selecting depth data input)

- In this menu, you can select the depth data input from the external NMEA source or OFF. When NMEA is selected, the depth data input from the external depth gauge is displayed.

Note:

- *When you input the depth data from an external water temperature gauge, you need to connect the specified signal line to the NMEA connector on the rear panel. In addition, be sure to check that the NMEA0183 sentences of $xxDPT or $xxDBT are output from the connected water depth gauge. (You can check this easily using the self test mode of the RADAR 1800.)*

COURSE IN (Selecting course data input)

- In this menu, you can select the vessel's course data input from GPS, GPS compass, or magnetic compass. When GPS is selected, the course data is inputted from GPS.

Notes:

- *When you select input source to GPS and you use an external NMEA source (select NMEA at POSITION IN menu), you need to connect the specified signal line to the NMEA connector on the rear panel. In addition, be sure to check that the NMEA0183 sentences of $xxHDT, $xxHDG, $xxRMC, or $xxVTG are output from the connected GPS. (You can check this using the self test mode.)*
- *When you select input source to GPS COMPASS, you need to connect the specified signal line to the DC12V/COMPASS connector on the rear panel. In addition, be sure to check that the NMEA0183 sentences of $xxHDT is output from the connected GPS compass. (You cannot check this using the self test mode.)*
- *When you select input source to MAG, you need to connect the specified signal line to the DC12V/COMPASS connector on the rear panel. In addition, be sure to check that the NMEA0183 sentences of $xxHDT, $xxHDG, $xxHDM, or $xxVHW are output from the magnetic compass. (You cannot check this using the self test mode.)*

POSITION IN (Selecting position input)

- In this menu, you can set the source of the navigation information data such as position, course, geodetic information, etc. The RADAR 1800 provides the GPS/DGPS connector which allows a direct connection of the DGPS212 or GPS112, and the NMEA connector to input the NMEA0183 formatted navigational information data from the external navigation aids. The navigational information input from the connector selected in this item is displayed on the screen. When GPS is selected, the navigational information input from the GPS112 or DGPS212 connected to the GPS/DGPS connector on the rear panel is displayed. When NMEA is selected, the navigational information input from the external navigation aids is displayed.

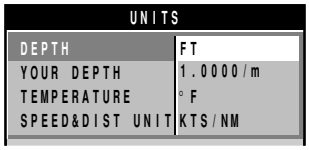
Note:

- *When you input the navigational information data from the GPS/DGPS or the external navigation aids, you need to connect the specified signal line to the GPS/DGPS connector or the NMEA connector on the rear panel. In addition, after connecting the external navigation aids, be sure to check that the NMEA0183 sentences of $xxGGA or $xxRMC are output from the connected external navigation aids. (You can check this easily using the self test mode of the RADAR 1800.)*

NMEA OUT (Putting out data)

- In this menu, you can issue the data in the specified format.
- If you press the (Joystick) when the Radar screen is displayed in the Radar mode and the Radar/Chart mode, the position of the cursor ($RDRSD) is output.

UNITS



- In this menu, you can select the unit of depth, temperature, speed, and distance.

DEPTH (Selecting depth units)

- In this menu, you can select from among MT (meter), FT (feet), FM (fathom), and SP (special). When SP is selected, the depth is displayed with the unit you set.

YOUR DEPTH (Setting custom depth units)

- In this menu, you can specify a meter-covered value for your own depth (SP). The unit ranges between 0.3000/m and 1.9999/m, and you can specify it in increments of 0.1 millimeter.

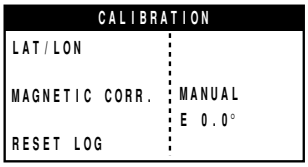
TEMPERATURE (Changing temperature units)

- In this menu, you can select the unit of water temperature between Centigrade (°C) or Fahrenheit (°F).

SPEED & DIST UNIT (Changing speed and distance units)

- In this menu, you can select a pair of speed and distance units between KTS & NM (knots/nautical miles), KPH & KM (kilometers per hour/kilometers), and MPH & SM (miles per hour/statute miles).

CALIBRATION



- In this menu, you can set a calibration value for each data described below.

LAT/LON (Calibrating the longitude/latitude)

- In this menu, you can set a calibration value for the longitude and the latitude.

MAGNETIC CORR. (Correcting the magnetic compass)

- In this menu, you can set a correction value for the magnetic variation automatically (AUTO) or manually (MANUAL). The readout of the bearing will be the sum of the input bearing data and the correction value. You can select AUTO or MANUAL for setting the correction value. For example, enter E7.0° as the correction value when the magnetic variation currently listed in the marine chart is W7.0°. The correction range from 0.0 to W99.9° or E99.9°, and you can set it in increments of 0.1°. To disable correction, select MANUAL and set the correction value to 0.0°.

Note:

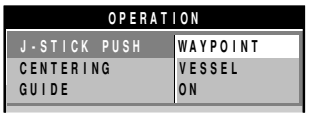
- *A magnetic variation value set with AUTO is a rough value calculated based on the current date and time, and the ship's current position. You cannot set it with AUTO if the data of the current date & time and the current ship's position is not stored. When it is necessary to set a more precise value or when the abovementioned data is not stored, set it with MANUAL.*

RESET LOG (Resetting the trip log)

- In this menu, you can reset the LOG value to "0". The LOG is the sum of the navigated distances and displayed at the top of the screen in the NAVIGATION mode. The value of the LOG is maintained after the RADAR 1800 is turned OFF.

OPERATION

- This menu is used to set the Joystick mode, the CENTER soft key mode, and operation guides appears or disappears.

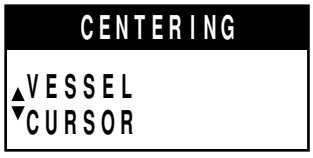


J-STICK PUSH

- Set the joystick mode. By selecting MARK, the joystick is set as MARK (EVENT MARK) input mode. By selecting WAYPOINT, the WAYPOINT (EVENT WAYPOINT) input mode is set.

CENTERING

- When centering the chart screen, select the center standard.
  By selecting VESSEL, the middle of the boat is used for centering; by selecting CURSOR, the cursor is used for centering.



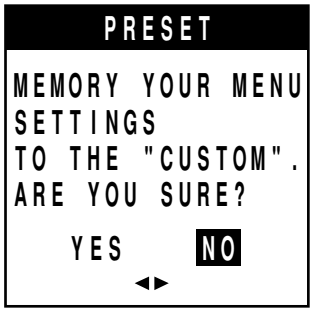
GUIDE

- By selecting ON, the operation guides display at many functions; by selecting OFF, the guides not display.

CUSTOM SETUP

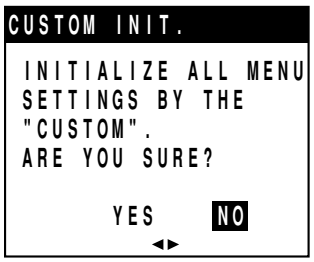
• You can use this function to store your customized menu setting to a memory position which can be reloaded later. Press MENU and select CUSTOM SETUP from the menu.

PRESET



• Using this function will store all current menu setting to the Custom memory.

CUSTOM INITIALIZE

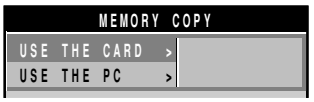


• This function initializes the menu settings to those saved by the PRESET function.

Note:

• *Waypoint and Route information are not stored in Custom memory. If a Master Reset is done the Custom memory is replaced by factory default values.*

MEMORY COPY



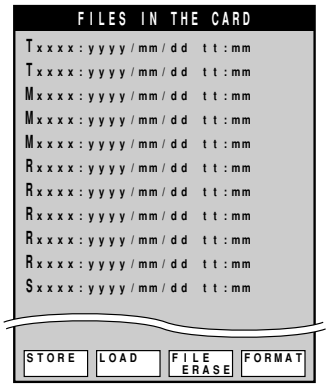
• In this menu, you can store internally set data of such as routes, waypoints, tracks, marks, and settings into the C-MAP User C-Card, or transfer the data to the RADAR 1800. You can also transfer the data to a personal computer.

• This menu includes two submenus USE THE CARD and USE THE PC.

USE THE CARD

Note: *The C-MAP User C-Card should insert to an upper slot.*

- Select USE THE CARD to display the FILES IN THE CARD list that contains various stored files.
- The alphabets R, T, M, and S, which precede the administrative number xxxx, stand for as follows.
  R : ROUTE/WAYPOINT
  T : TRACK
  M : MARK
  S : SETTING
- Turn the (Jog Dial) to scroll the FILES IN THE CARD list.

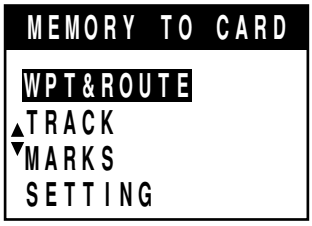


Note:

- *If the message "NO CARD!" appears even if the C-MAP User C-Card is inserted correctly, the data stored in the card may not be compatible with the RADAR 1800 or the card is not initialized. Execute CARD FORMAT before use.*

Storing data in the card

- Press the STORE Soft Key and press the (Joystick) up or down to specify a type of the data to store, and press the (Joystick) to store the data.

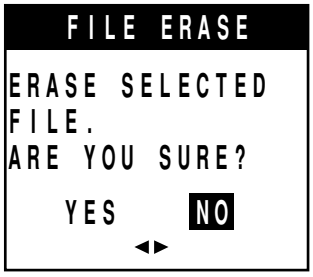


Loading data from the card

- Press the (Joystick) up or down to specify the file to transfer and press the LOAD Soft Key to transfer the file.

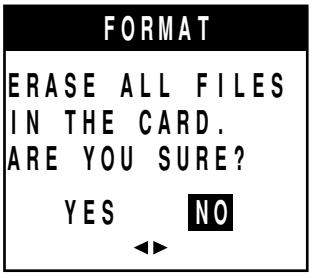
Erasing data file

- Press the (Joystick) up or down to specify the file to erase and press the FILE ERASE Soft Key. After you confirm the message "ARE YOU SURE?", the file is erased.



Formatting a card

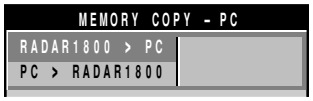
- Press the FORMAT Soft Key to format a card. After you confirm the message, the card is formatted.



Note:

- *When you format a card including data stored by MEMORY COPY, all these data are deleted.*

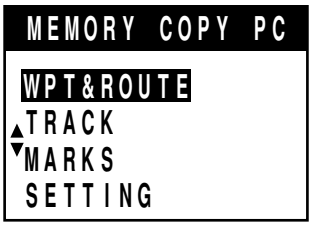
USE THE PC



• Select USE THE PC to display the MEMORY COPY - PC menu.

Notes:

- *To use this function, it is necessary to install the communication tool exclusive for the PC. This communication tool is not attached to the RADAR 1800. Please download it from our Internet site. (URL is found on the backside of the manual). This communication tool is free.*
- *Use an RS-232C cable (9-pin cross type) sold commercially to connect the RADAR 1800 and the PC. (Refer to p.40)*
- *This function cannot be used while Navigation is active.*



Transferring data to a PC

You can upload data from the RADAR 1800 to PC.
Follow the procedure described below.
Refer to the manual attached to the communication tool for detailed information about how to operate the communication tool.

① Set the PC communication tool to the reception status.

② Select RADAR1800 > PC and press (Joystick).

The data select menu appears.

③ Select the data to send and press (Joystick) to start transmmision..

④ When the transmission is completed, the message “COMPLETE!” appears.

Note:

- *If the transmission is terminated due to the line failure, the message “ERROR!” appears. In this case check again whether the cable is broken, a proper cable is used, and so on.*

Receiving data from a PC

You can download data from the PC to the RADAR 1800.
Follow the procedure deserib ed below.
Refer to the manual attached to the communication tool for detailed information about how to operate the communication tool.

① Select PC > RADAR1800 and press (Joystick).

The RADAR 1800 gets ready to receive data from the PC.
The RADAR 1800 enters the standby mode during transmission.

② After selecting the data to send using the communcation tool, start transmission.

③ When reception of data from the PC is completed, the message “COMPLETE!” appears.

To abort reception, press and hold BRT/CLR for more than three seconds.

Note:

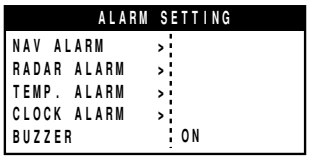
• *If invalid data are received, the message "ERROR!" appears. In this case, check again whether the data are broken.*

ATTENTION

While receiving data, the transmission and reception to/from GPS and that of the NMEA data are terminated.

ALARM

• Press MENU, select "ALARM SETTING>", and press Joystick, the "ALARM SETTING" menu is displayed.

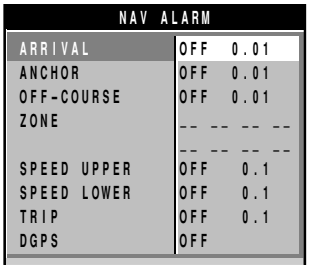


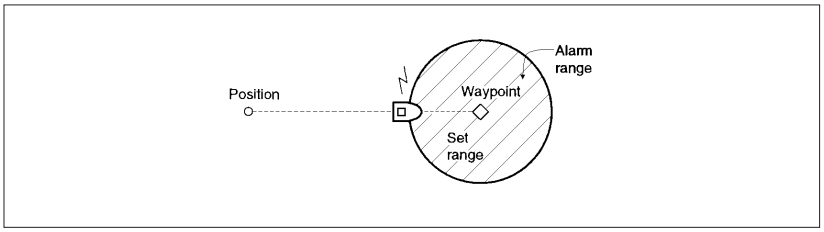
NAV ALARM (Navigation alarms)

• Select "NAV ALARM>", and press Joystick, the "NAV ALARM" menu is displayed.

ARRIVAL (Arrival Alarm)

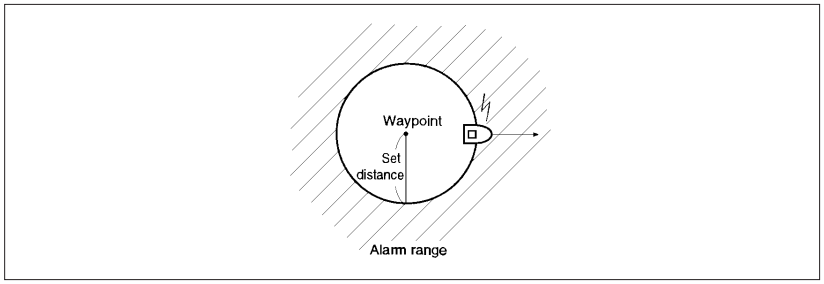
• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the distance between your vessel and the waypoint displayed in the NAVIGATION window becomes equal to or less than the operator's preset value.





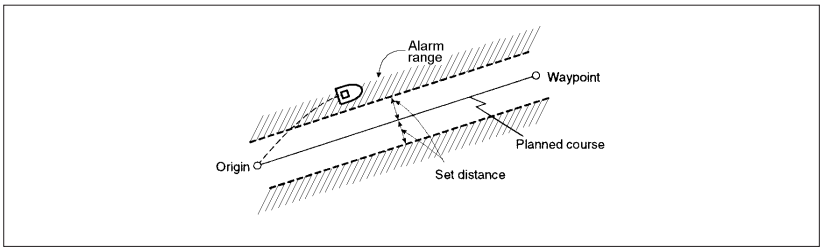
ANCHOR (Anchor Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the distance your vessel and the waypoint displayed (usually anchor drop point) in the NAVIGATION window becomes equal to or greater than the operator's preset value.



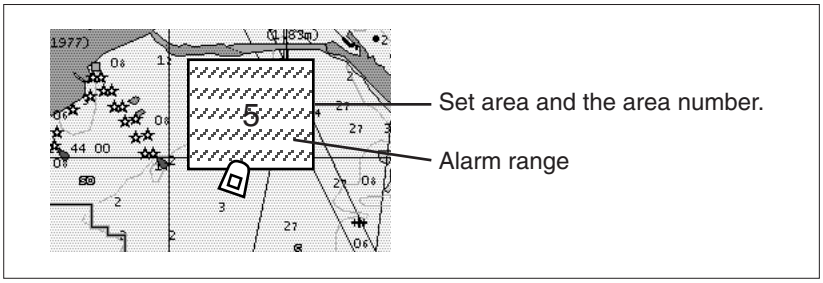
OFF-COURSE (Off Course Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the deviation from the intended course becomes equal to or greater than the operator's preset value.



ZONE (Danger Zone Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when your vessel comes into a zone selected by the operator in advance.



Note:

• *To use the ZONE (Danger Zone Alarm), it is necessary to construct a rectangle in advance to the area where you want to issue an alarm. (Refer to p.87)*

DGPS (DGPS Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the positioning mode of DGPS changes to other than the differential positioning mode.

SPEED UPPER (Speed Upper Limit Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the speed of your vessel is greater than the operator's preset upper speed value.

SPEED LOWER (Speed Lower Limit Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the speed of your vessel is less than the operator's preset lower speed value.

TRIP

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the predetermined distance is navigated.

RADAR ALARM

There are three kind of radar alarms, guard zone alarm, scanner rotation stop alarm, and communication line alarm for external heading sensor.

G Z	Guard Zone IN/OUT alarm.
B Z	Scanner rotation stop alarm. (No Bearing Zero signal alarm)
C O M	Communication line alarm. (No signal input from heading sensor)

[Setting Guard Zone]

- Select “RADAR ALARM>”, and press (Joystick), the “RADAR ALARM” menu is displayed.
  Refer to “Setting GUARD ZONE”. (Refer to p.67)

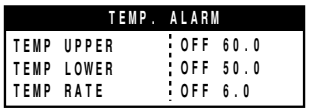
BZ ALARM

- This function sets the time that the alarm sounds when the rotation signal, (hereafter BZ signal) is discontinued.
  Normally the time for the BZ signal error alarm is continuous.
  It will continue to sound continuously as long as the user does not push the "CLR" key.
  The time setting can be from 10 seconds to 60 seconds or continuous.
  When the Interswitch kit is installed. And, a limited value is set.
  When the antenna access is taken over from the other display unit and the display unit is using the antenna in transmission status. Then, after the specified time, the BZ signal error occurs when the rotation signal from the antenna is cut off, which should be used only when automatically turned OFF.
  In the normal case (No Interswitch kit), be sure to set it to "CONTINUOUS".

⚠ WARNING

Perform BZ alarm settings with the owner's authority.
When the BZ setting time is limited, monitor the alarm constantly. If the antenna is stopped, and the alarm function stops with out being noticed, it could be dangerous, be careful.

TEMP. ALARM (Temperature alarms)



• Select “TEMP. ALARM>”, and press (Joystick), the “TEMP. ALARM” menu is displayed.

TEMP UPPER (Temperature Upper Limit Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the temperature value sensed is greater than the operator’s preset upper temperature value.

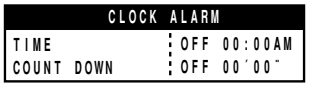
TEMP LOWER (Temperature Lower Limit Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the temperature value sensed is less than the operator’s preset lower temperature value.

TEMP RATE (Temperature Variation Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the temperature value changes by more than the operator’s preset rate value for a minute.

CLOCK ALARM



Select “CLOCK ALARM>”, and press (Joystick), the “CLOCK ALARM” menu is displayed.

TIME (Just Time Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the time is same as the operator’s preset time.

COUNT DOWN (Count Down Alarm)

• When turned on, this alarm shows a message on the screen and also sounds the buzzer when the count down time is zero.

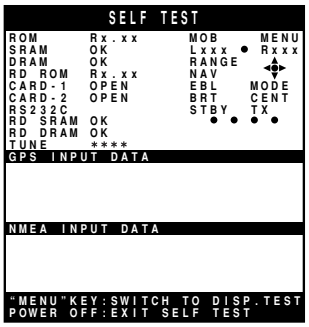
BUZZER (Alarm buzzer)

• Select “BUZZER”, and press (Joystick), the “BUZZER” on/off popup menu is displayed.

You can set the buzzer to sound or not whenever an alarm message is displayed.

Select OFF to show just an error message without the buzzer.

Self Test Operation



- The RADAR 1800 has a built-in self test function with which you can check the operating status of the RADAR 1800 automatically. Also a function of monitoring input NMEA0183 formatted sentences is attached to the self test function, and you can easily check various data input from external equipment.
- The self test function has the following four functions.

  Internal checking function:
  Checks DPU and shows OK or NG as the result.

  Input data monitoring function:
  Displays various input data including GPS/DGPS sensor and NMEA0183 sentences on the screen.

  Panel checking function:
  Displays the status of the panel key that has been pushed.

  Display checking function:
  Displays test patterns such as character font or color pattern.
- When you push **STBY/OFF** to turn the power on while pushing **BRT/CLR** and **CENTER** at the same time, the RADAR 1800 enters the SELF TEST mode and the SELF TEST display appears. Then ROM and RAM are checked automatically and various data as well as the result (OK or NG) appear. Push any panel key to change the corresponding indicator from red to blue on the screen. When all indicators change to blue, the panel check is completed. After the panel check is completed, push **BRT/CLR** to pause the input data display temporarily. Push **BRT/CLR** again to resume the display. When you want to check the NMEA0183 input sentences, stop the display with this procedure to make checking easier. Push **MENU** to switch the display to test pattern. Each time you push **MENU**, the test pattern changes as long as the power is on.
- Turn the power off to end the self test.

Master Reset and Language Select Operation

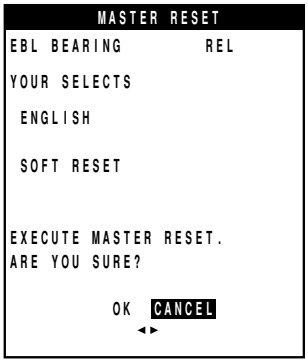
RESET

There are two type of reset: MASTER RESET and CUSTOM SETUP. (Refer to p.102)

MASTER RESET

- A MASTER RESET can be performed by either the SOFT Reset or HARD Reset. The SOFT Reset restores all set values except the WAYPOINT data and ROUTE PLAN data to the original factory set-up values. The HARD Reset restores all set values to the original factory-set values and deletes the WAYPOINT and ROUTE PLAN data. When you want to keep the WAYPOINT and ROUTE PLAN data, execute the SOFT Reset. When the MASTER RESET is executed, The CUSTOM PRESET is initialized to the factory-set defaults.
- When you push STBY/OFF to turn the power on while pushing MOB and MENU at the same time, the LANGUAGE SELECT display appear. Press the Joystick up or down to select a language and push it in to open MASTER RESET type select display. Press the Joystick up or down to select HARD or SOFT and push it in to select OK or CANCEL for the select language and the reset type. Press the Joystick to the left or right to select OK and push it in to executed the MASTER RESET.

  After the MASTER RESET is executed, the RADAR 1800 is rebooted automatically. To abort the MASTER RESET and language select, select CANCEL and push the Joystick.



Note:

- *When a backup error occurs, the RADAR 1800 enters the MASTER RESET mode automatically, and language select menu opens. In this case, you cannot abort the MASTER RESET. Be sure not to turn the power off during the MASTER RESET.*

Item			Master Reset Condition English, Italian	Other language
MENU RADAR SETTING	RINGS		ON	←
	BEARING		HUP	←
	INTERFERENCE		ON	←
	REJECTION		ON	←
	SEA		MANUAL	←
	TUNE		AUTO	←
	EXPANDER		OFF	←
	PROCESS		OFF	←
	TRAILS		OFF	←
	TX-PLAN	TX-PLAN	OFF	←
		TX PERIOD	10 SCAN	←
		STBY PERIOD	3 MIN	←
	WAYPOINT		OFF	←
	COLOR	INSIDE	BLUE	←
		OUTSIDE	SKY	←
		ECHO	YELLOW	←
		TRAILS	SKY	←
PLOT SETTING	MARK SIZE		SMALL	←
	TRACK SETUP	TRACK PLOT	TIME 1	←
		MEMORY SIZE	5000	←
		TRACK COLOR	SKY	←
		VESSEL SHAPE	●	←
		VESSEL SIZE	SMALL	←
	L/L-TD CONV.	POSITION DISP	LAT/LON	←
		LORAN-C CHAIN	GRI 4990, TD1 0, TD2 0	←
		TD CORRECTION	TD1 0.0, TD2 0.0	←
	CHART DISPLAY	CHART DISP MODE	NORTH UP-T	←
		SCALE BAR	ON	←
		VECTOR RAY	SHORT	←
		BRG LINE	ON	←
		WAYPOINT	MARK	←
		CURSOR INFO	NORMALLY OFF	←
		L/L GRID	ON	←
	CHART COLORS	LAND	4	←
		SEA	3	←
		L/L GRID	RGB 0 0 0	←

CUSTOM CHART	CHART BOUNDARY	ON	←
	LIGHT SECTORS	ON, C	←
	BUOY & BEACON	INTNL.	←
	LAND MARKS	ON	←
	NAMES	ON	←
	RIVER & LAKE	ON	←
	CULTURAL	ON	←
	BOTTOM TYPE	ON	←
	UNDER WATER	ON	←
	SOUNDING DEPTH	ON	←
		UPPER 0FT	←
		LOWER 100FT	←
	DEPTH SHADING	OFF	←
		UPPER 30FT	←
		LOWER 1000FT	←
	DEPTH CONTOUR	ON	←
		UPPER 0FT	←
		LOWER 3000FT	←
	DETAILED	NORMAL	←
GRAPH SETTING	GRAPH DISPLAY	DEPTH	←
	DEPTH SCALE	TIME 50	TIME 15
		CENTER 100	CENTER 30
	TEMP. SCALE	TIME 60	TIME 15
		CENTER 20	CENTER 10
	SPEED SCALE	TIME 20	←
		CENTER 40	←
GPS SETTING	POSITION	N 35° 35.000’	←
		E 139° 46.000’	←
	TIME DIFF.	+00:00	←
	ANTENNA HEIGHT	10MT	←
	GEODETIC DATUM	WGS-84	←
	FIX MODE	AUTO	←
	HDOP LEVEL	10	←
	AVERAGE	MANUAL 2S	←
	EXCLUDE SAT	00 00 00 00 00 00	←
DGPS SETTING	MODE	AUTO	←
	FREQUENCY	288.0 KHZ	←
	BAUDRATE	200 BPS	←
WASS SETTING	MODE	AUTO	←
	RANGING	ON	←
	NG WAAS	NO USE	←
	WAAS NO.	AUTO	←
	TX COMMAND		

INSTALLATION	SIMULATION		OFF	←
	INITIAL POS.		Preserved (Customer's setting)	←
	CLOCK ADJUST		Preserved (Customer's setting)	←
	DATE & TIME		12 HOUR	←
	RADAR ADJUST	EBL BEARING	RELATIVE	←
		PRF SHIFT	20	←
		BEARING	512	←
		DISPLAY TIMING	840	←
		TUNE PRESET	38	←
		STC PRESET	31	←
	DATA IN/OUT	TEMP. IN	NMEA	←
		DEPTH IN	NMEA	←
		COURSE IN	GPS	←
		POSITION IN	GPS	←
		NMEA OUT	See NMEA Setting List	←
	UNITS	DEPTH	FT	MT
		YOUR DEPTH	1.0000 MT	←
		TEMPERATURE	°F	°C
		SPEED & DIST UNIT	KT & NM	←
	CALIBRATION	LAT/LON	N 00.000' E 00.000'	←
		MAGNETIC CORR.	MANUAL, E 0.0°	←
	OPERATION	J-STICK PUSH	WAYPOINT	←
		CENTERING	VESSEL	←
		GUIDE	ON	←
ALARM SETTING	NAV ALARM	ARRIVAL	OFF, 0.01	←
		ANCHOR	OFF, 0.01	←
		OFF-COURSE	OFF, 0.01	←
		ZONE	-- -- -- -- -- --	←
		SPEED UPPER	OFF, 0.1	←
		SPEED LOWER	OFF, 0.1	←
		TRIP	OFF, 0.1	←
		DGPS	OFF	←
	RADAR ALARM	GUARDE ZONE	OFF	←
		ALARM MODE	IN	←
		ALARM LEVEL	4	←
		BZ ALARM	CONTINUOUS	←
	TEMP. ALARM	TEMP UPPER	OFF, 60.0	OFF, 15.6
		TEMP LOWER	OFF, 50.0	OFF, 10.0
		TEMP RATE	OFF, 0.5	OFF, 0.2
	CLOCK ALARM	TIME	OFF, 00:00 AM	←
		COUNT DOWN	OFF, 00'00"	←
	BUZZER		ON	←

	EDIT	WAYPOINT	EDIT IN CHART	←
		ROUTE PLAN	00	←
STICK	CURSOR		CENTER	←
MOB	MOB		NO	←
NAV	NAV	SELECT ROUTE WAYPOINT DIRECT	000	←
		PLANNED ROUTE	00	←
		SEQUENCE	FWD	←
		STEP	AUTO	←
		STOP WATCH	00:00:00.00	←
EBL/VRM			EBL	←
MODE			RADAR	←
CENTER			CENTER	←
BRT/CLR		BRIGHT	10	←
		CONTRAST	5	←

SECTION 4 Maintenance

General

It is necessary to perform the maintenance services listed below to keep the RADAR 1800 in good working conditions.

Proper maintenance of the RADAR 1800 minimizes the possibility of machine failures.

The maintenance operations that are common to all components of the RADAR 1800 are listed below.

① Cleaning

Remove dirt, dust, or water-spray from the RADAR 1800 enclosure and keep it as clean as possible. Use a dry lint-free cloth.

② Screw inspection

Check the screws used to assemble and secure the components of the RADAR 1800 for loose connection.

③ Cabling check

Check the cables connecting between the components (between the scanner unit and display unit, display unit and power supply, and display unit and optional devices) for poor connection.

⚠ CAUTION

When servicing the RADAR 1800, be sure to turn it off to prevent electric shock. If a rectifier unit is used, in particular, turn off power to the display unit. Note that voltages from the rectifier unit are always present even if the radar is stopped.

Scanner Unit

When inspecting the scanner unit of the RADAR 1800, be sure to turn off power to the display unit.

Keep watches or magnetic cards away from the modulator block as it contains a magnetron having a strong magnetic force.

Radome Scanner Unit

① Radome

A radome surface contaminated by smoke, dust, or paint would cause attenuation or reflections of radio waves, resulting in reduced radar performance. Periodically check the radome scanner unit. If it proves dirty, wipe the radome surface with a soft lint-free cloth moistened with alcohol or damped cloth.

*Never use solvents such as thinner, gasoline, benzene, trichlene, and ketone.

② Lubricating gears

- Apply grease to gears evenly using a knife or brush. This lubrication needs to be performed at least semiannually. The shorter the lubrication period, the longer the gears will endure.
  Use Mobilux No.2 from Mobile Oil Co,. ltd. Or equivalent.
- Check the mounting bolts for loose connection occasionally.

Display Unit

Cleaning the Display Unit Screen

Dust on the LCD would reduce the transparency and make the video image dim.

Wipe the screen surface with a soft lint-free cloth (made of flannel or cotton).

A cloth moistened with an antiseptic agent would cause little problem. When using it, wipe softly; never rub the screen surface with force.

SECTION 5 Principle

Radar Basics

The role of radar operator is to analyze the echos on the screen to assist in proper navigation and safety of the vessel. To do the best job it is imperative to understand the operation including advantages and weaknesses of radar. The best way to learn is in good visibility conditions so proper comparisons can be made between visual sightings and the representations presented on the radar display. Some of the advantages and uses of radar are: the monitoring of other vessels in order to avoid collisions, recognizing buoys and navigation marks for assistance in entering and leaving port, establishing own ships position by measurement of bearing and distance to land/islands and comparing to charts, and recognizing heavy rain clouds. The following sections explain the screen representations.

Strength of Reflection from the Targets

The strength of a radar target depends on several conditions including distance from you, size of the target, the height of your radar antenna, height of the target, and the radar reflective properties of the target surface towards you. Especially coastlines can be deceiving as a higher perpendicular surface will reflect the radar beams back better than a beach which is sloping up and has no surface to bounce the beams back. As shown in the illustration the closer beach may not show as a returned echo while the mountain furthur back does show.

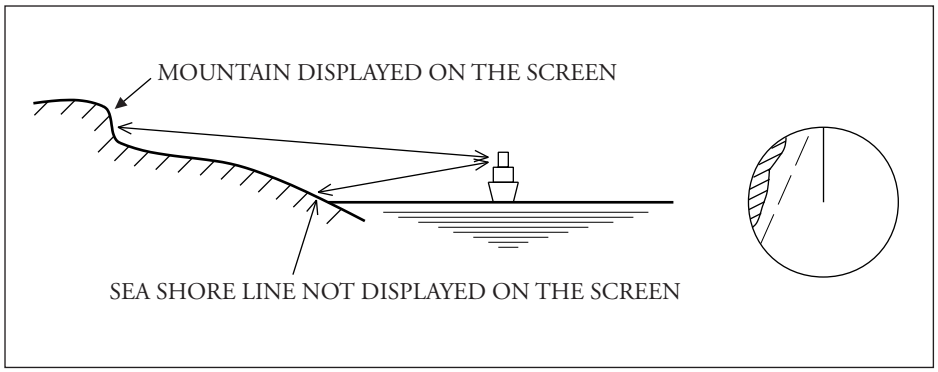


Figure 5-1

Sea Clutters

When the sea is rough, bright noise is reflected from the wave tops especially closer in around the center of the screen. The higher the waves, the stronger the noises. Sometimes breakers or even ships wakes may show on the screen.

False Echoes

Shadows

Owing to the location of a scanner, surrounding masts and structures may block the propagation of radar waves in those directions. This can be noticed by thin or weak shadow sectors in the nearby sea clutter returns. Since these shadows are fixed due to the physical surroundings on the vessel, it is necessary for the operator to be aware of them and realize that targets in those sectors may be weaker or blanked out.

Side lobe

The radar beam has a main beam and weaker side lobes to either side of the main beam. Because of the side lobers, a series of weaker targets in an arc the same distance as the real target can show as in the Figure 5-2. This usually occurs mostly with stronger target returns and it is usually easy to pick out the stronger echo in the arc as the real target.

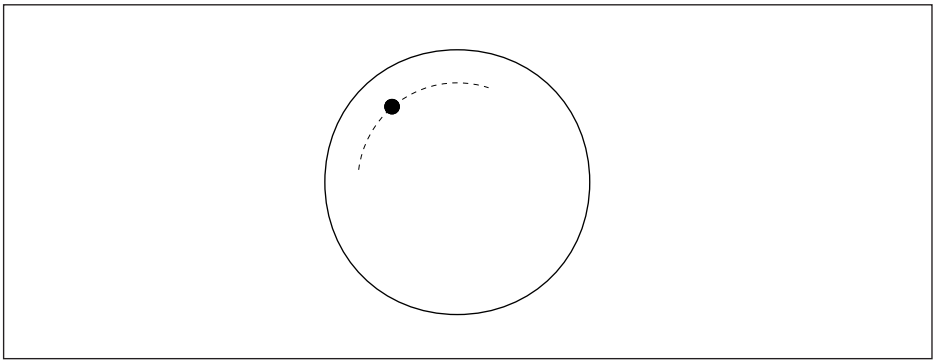


Figure 5-2

False Echo by Secondary Reflection

When an object is in the vicinity of own ship and in some occasion, 2 echoes appear on he screen that one is true echo and another is a false echo resulted from secondary reflection of radar beam from ship's structure such as funnel or mast. In this case, false echo appears in the direction of funnel or mast from the radar scanner as Figure 5-3.

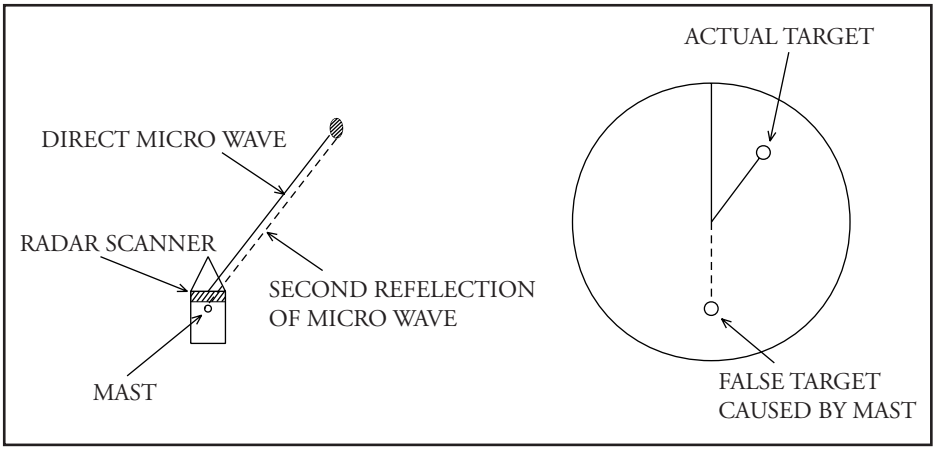


Figure 5-3

False Echo by Multiple Reflection

As Figure 5-4, when the own ship is in side by side with a large ship or building, evenly spaced plural echoes appear in one direction. In this case, echo is the nearest echo to the own ship.

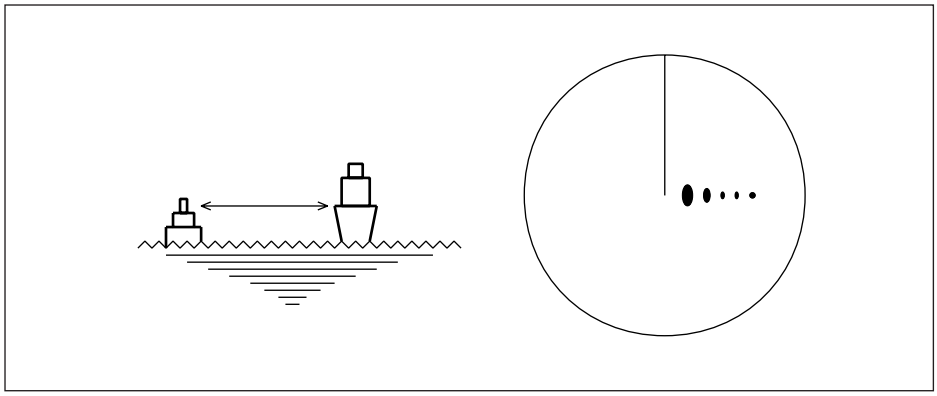


Figure 5-4

Radar Interference

When other ship's radar operated in same frequency is the vicinity of own ship, Radar interference pattern appears on the screen as the Figure 5-5. As interference pattern appears in a form of dotted stripes and moves around the screen but the pattern is not stationary, discrimination from the true target is rather easy.

The IR control will help reduce or eliminate this noise. In severe cases shifting the PRF may also be necessary.

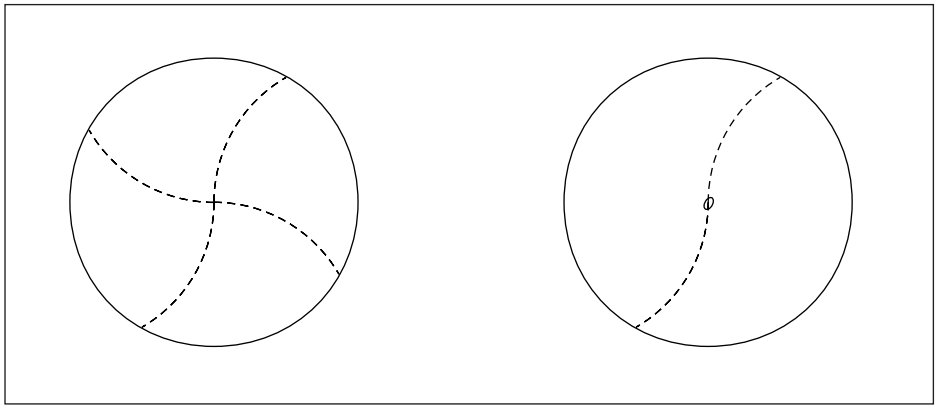


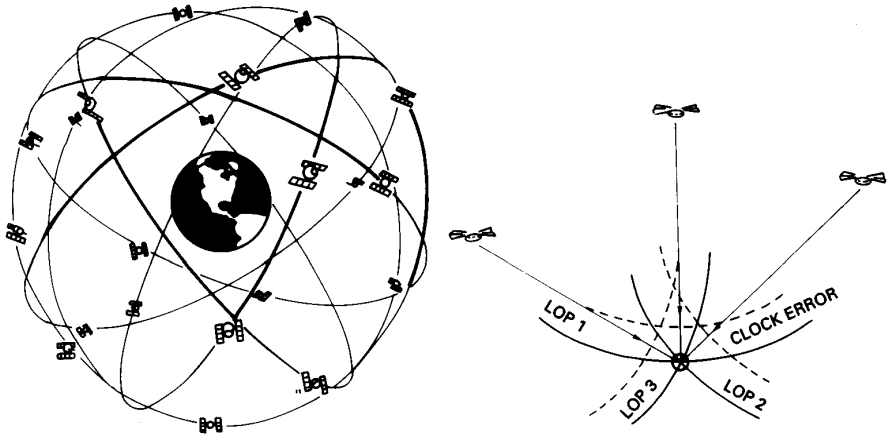
Figure 5-5

GPS/DGPS Basics

GPS

The Navstar/GPS system is a satellite-based radio navigation system designed to provide global, continuous 24 hour-per-day, all weather, accurate position data for navigators. The GPS(Global Positioning System) is based on a GPS sensor's ability to accurately measure the propagation time of signals transmitted from orbiting satellites in your sensor.

The satellites transmit accurately timed signals along with a navigation message which includes the satellite's position (orbit or ephemeris data), precise time (clock) correction signals, and almanac data for the complete constellation of satellites.



GPS System

Figure 5-6

The complete constellation will consist of 24 satellites (3 spare satellites) in 6 orbital planes. Four satellites are equally spaced in each plane.

The four satellites equally spaced in each plane circle the globe once every 12 hours at a distance of approximately 20,000Km from the Earth.

The satellites continuously broadcast their navigation messages at a frequency of 1575.42MHz (for civilian use). The message is repeated every 30 seconds. Superimposed on the navigation message is a high rate C/A (coarse/acquisition) code used for precise positioning measurements and positive satellite identification. The C/A ID code permits the user to determine and select the "best satellites" to use in position calculations.

If it were possible to measure "true satellite ranges" directly, it would only be necessary to track data from any two satellites to obtain a vessel's latitude/longitude. In actual practice, for marine navigation, a minimum of three satellites are normally tracked in order to reduce the sensor's own internal clock timing bias error.

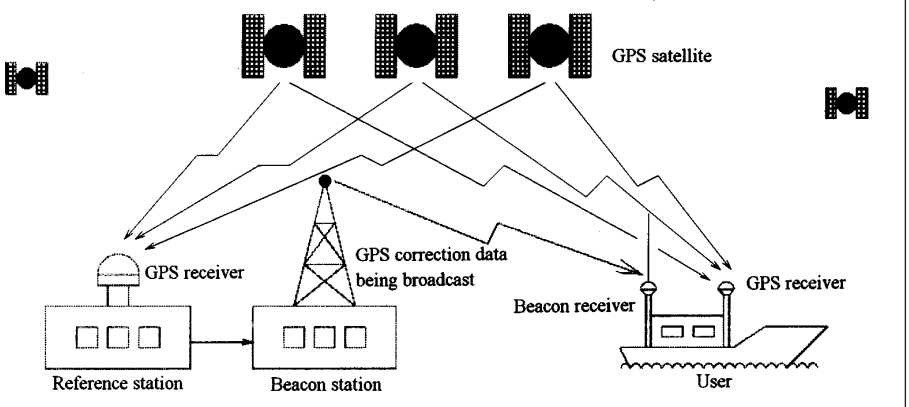
By calculating the ranges of four satellites, the clock timing bias error can be eliminated and the vessel's three dimensional position can be determined.

Differential GPS (DGPS)

The differential GPS comprises a reference station with its position(latitude and longitude) accurately known, a beacon station for radio broadcasting of DGPS correction data, and user-owned GPS sensor equipped with a differential correcting function.

The GPS sensor is used to fix the position of the reference station whose position is accurately known and to compare this with the actual reference station position to get range errors. The range errors are transmitted to the beacon station as the DGPS correction data and are broadcast from the beacon station to the user. This DGPS correction data is received by the user-owned beacon receiver, and is sent to the GPS sensor. The GPS sensor calculates its own position by adding the correction data to the actual data transmitted from the satellites.

Compared with the fixed positioning provided by existing GPS sensors, the DGPS system calculates the position with a very small error not exceeding 10% of the measure.



DGPS System

Figure 5-7

Wide Area Augmentation System (WAAS)

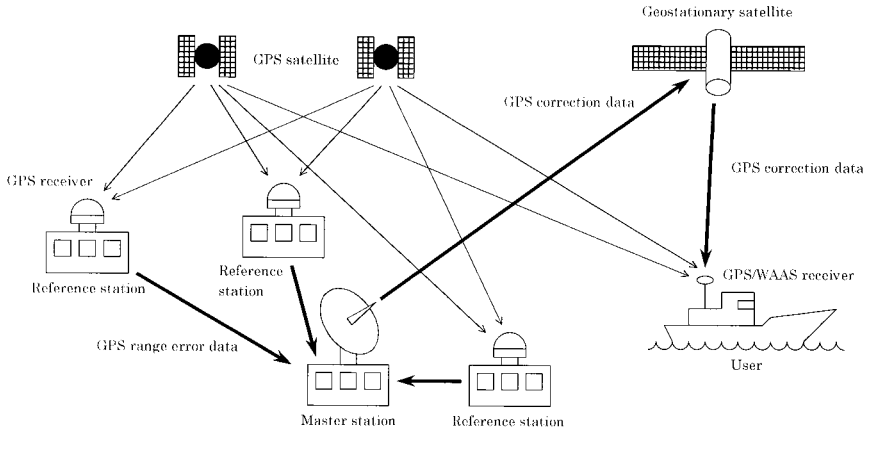
Wide Area Augmentation System (WAAS) is a system that improve GPS position fixing accuracy. GPS signal errors are observed at multiple ground based reference stations. The data are gathered to the master station, then correction values are comprehensively calculated. The correction values are transmitted to a geostationary satellite, then they are broadcasted to ground based users. Ground based differential GPS system, similar to a beacon differential GPS, supports 300km in radius around the beacon station, but the WAAS vastly expands the service area to mountainous and off-shore regions. The WAAS covers the Eastern Southern and Mid-western United States with INMARSAT Atlantic ocean region-west satellite, and covers the Western United States, Alaska and Hawaii with INMARSAT Pacific ocean region satellite.

The WAAS service is free of charge because The WAAS is operated by the Federal Aviation Administration that is governmental entities.

Availability of WAAS

Currently, the WAAS is doing broadcast tests. Full-scale operations of the system is scheduled to the end of 2003. During test operations the WAAS can be used with almost no time-lapse problems, but it causes infrequent transmission stoppage and some degraded accuracy correction. Further, some functions of the GPS112W may be not available for use during the test transmission period due to system upgrades carried out to improve performance.

JRC is not liable for any loss while using the WAAS satellites during test transmissions, or any malfunction of the GPS112W by the upgrades of WAAS system.



WAAS System

Figure 5-8

SECTION 6 Interswitch (option)

Outline

Interswitch is a device used to switch the antenna between two display units.

The configuration is as shown on the attachment: Set the standard display unit and antenna to plus; this is then the junction box and two Interswitch cables and specified sub-unit.

In standard operation, the display unit that is powered up can use the antenna.

When the display unit that is powered up is using the antenna, and the other display unit is turned ON, that display unit can access the antenna. The display unit that can not use the antenna is turned OFF by a function that automatically cuts the power.

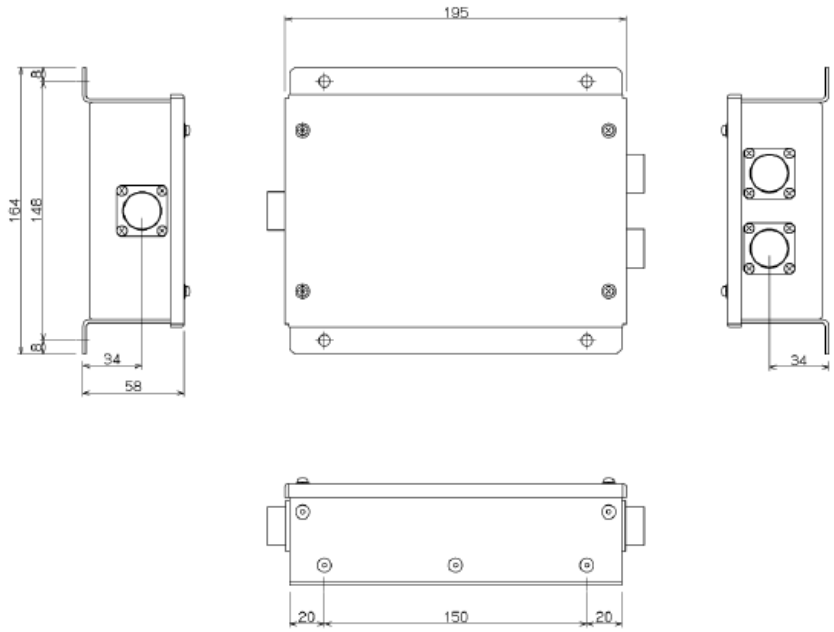
The length of the cables between each unit is shown below.

- Between the antenna and the junction box (10 m)
- Between the junction box and the display unit (10 m)

Components

No.	Description	Model No.	Qty.	Remarks
1	Junction Box	NCZ-1432	1	
2	Interswitch cable	CFQ-6550	2	10m
3	Display Unit	NCD-4300	1	
4	Power Cable	CFQ-6532	1	2m
5	Fuse(10A)		1	
6	Sun cover	MTV303270	1	
7	Flush Mounting Kit	MPTG30914	1	

Construction



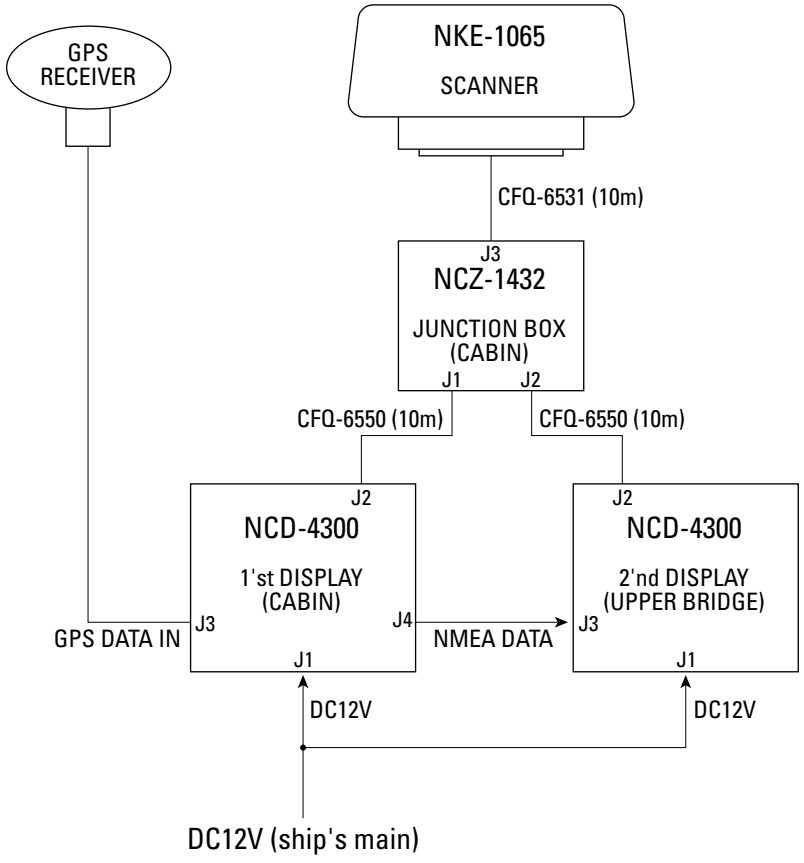


Figure 6-1 Interswitch system diagram (NQE-1200)

Setting Jumpers

Table 1 is a summary of the operation of the display unit when the jumpers in the switchbox have been set. The mode for setting 1 or 2 can be selected depending on the jumper settings in the Interswitch box. The factory default setting is 2 (settings 3 and 4 are prohibited).

In setting 1, operation is standard as noted above. The last unit to be turned ON can use the antenna, the display unit that is already powered up can not use the antenna and has its power turned OFF at the same time.

Setting 2, (factory default setting: initialization setting) is applicable when display unit 1 is installed in the cabin or someplace similar, and when display unit 2 is installed on the upper bridge or someplace similar.

In this setting, the power to display unit 1 is not turned OFF even if display unit 2 is turned ON, however, display unit 2 can use the antenna.

However, while the display unit 2 is turned ON, and power is turned ON to display unit 1, then display unit 2 is turned OFF and display unit 1 can use the antenna. (Display unit 1 controls the power to display unit 2.)

Therefore, even if display unit 2 on the upper bridge is ON, by turning ON the power to display unit 1 in the cabin, the power to display unit 2 is remotely turned OFF. Which then makes it possible to turn OFF power to both units from the cabin by turning of the power to display unit 1.

Table 6-1 Switchbox TB 1, 2 setting table

Jumper Condition	TB1	TB2	Operation
Setting 1 (Recommended when power is not supplied to the GPS receiver.)	1-2	1-2	Both display unit 1 and display unit 2 can not be turned ON at the same time. When display unit 1 is turned ON, and then display unit 2 is turned ON, display unit 1 is turned OFF. The reverse is the same. Access to the antenna goes to the display unit that is powered up.
Setting 2 (Recommended when power is supplied to the GPS receiver.)	1-2	1-2	The power to display unit 1 remains ON even if display unit 2 is turned ON. However, priority access to the antenna goes to display unit 2 if display unit 2 is turned ON. When display unit 2 is turned ON, and then display unit 1 is turned ON, display unit 2 is automatically turned OFF, and display unit 1 takes priority access to the antenna.
Setting 3	2-3	1-2	Prohibited setting
Setting 4	2-3	2-3	Prohibited setting

Setting 2 is the factory default setting.

Unit Connecting Cable

Be sure that the positive and negative polarity for the power connected to both display units is the same.

It is necessary to connect the 12 V connector and GND connector to the same terminal. The voltage is 12 V.

Also, the switchbox is not sealed against leaks, be sure to install it indoors where it will not be splashed with seawater or liquids.

In the default setting (setting 2), the settings are made for display unit 1 to be installed in the cabin, and display unit 2 to be installed in the upper bridge or a similar place. (TB 1: Jumper between 1 - 2; TB 2: Jumper between 2 - 3)

The following setting example is written as if display unit 1 (the display unit that is normally ON when under way) is in the cabin, and display unit 2 is installed in the upper bridge or someplace similar.

(1) Connect both display unit 1 and display unit 2 to the J1 power cable, be careful to connect each power cable as noted, connect the "RED" line to the 12 V power positive side, and in the same way connect the "BLACK" to the negative.
(2) Connect the J2 of display unit 1 to the CFQ-6550 cable, connect one side to the "MASTER (CABIN)" of NCZ-1432 (switchbox below).
(3) In the same way, connect the J2 of display unit 2 to one of the CFQ-6550 cables, connect one side to the "SLAVE (UPPER BRIDGE)" in the switchbox.
(4) Connect cable CFQ-6531, which runs between the antenna and the display unit, to "TO SCANNER" in the switchbox. At this time, cut off the black waterproof cap with a razor knife or box cutter.

Read the following only if you are entering NMEA data for GPS or similar kinds of receivers.

(5) Connect the cable from the GPS receiver (DGPS200 etc.) to the J3 (GPS) of display unit 1.
(6) Connect the connectors attached to the display unit to the cables in the following way, connect the J4 of display unit 1 to the J3 of display unit 2.

In this case, power to the GPS receiver is provided from display unit 1, and the GPS receiver will not operate, and NMEA data will not be input, if display unit 1 is not turned ON.

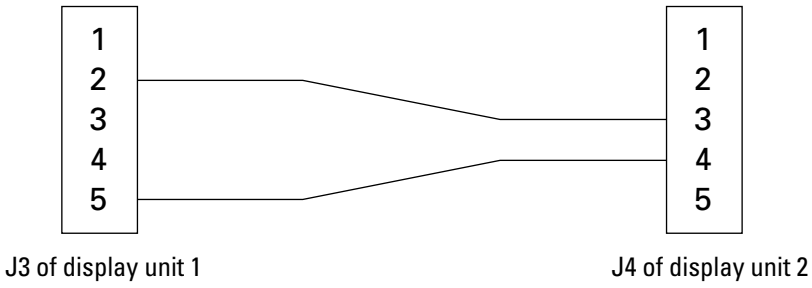


Figure 6-2 NMEA cable connections

⚠ CAUTION

Be sure to do connections to the same battery terminal even if it is a 12 volt boat.
Particularly, when doing an in-line connection to a 12 volt battery on a 24 volt boat, be sure to connect both display units to only one battery. Connecting both display unit 1 and 2 to separate batteries by cause a serious accident.

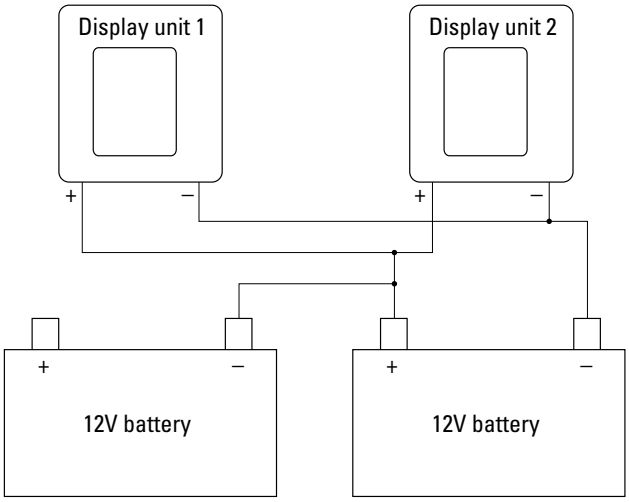


Figure 6 - 3 Correct example of connection to a 24 volt boat.
(The display units are connected to the +12 V and GND from the same battery.)

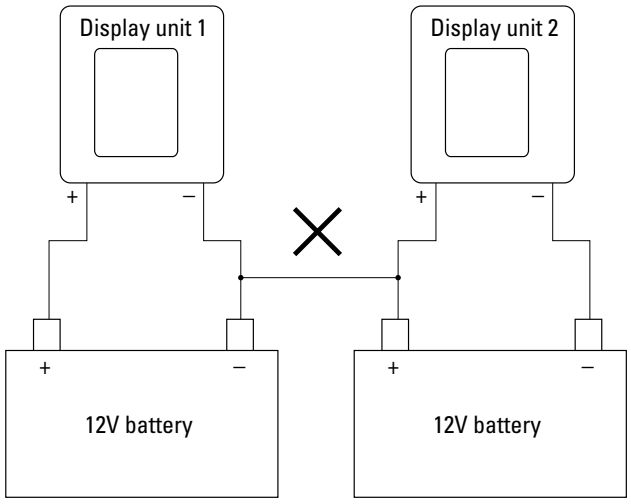


Figure 6 - 4 Incorrect example of connection to a 24 volt boat.
(The display units are connected to the +12 V and GND from separate batteries.)

Operation

The following is for the jumpers in the junction box. (Setting 1)

TB1 = 1 - 2, TB2 1 - 2

Display unit 1 and display unit 2 can alternately use the antenna each time they are turned ON, whichever display unit is already ON is turned OFF.

Example:

Turning ON display unit 2 while display unit 1 is ON turns OFF the power to display unit 1. After display unit 2 has been running for 1 minute and 30 seconds the magnetron is finished pre-heating, allowing it to use the antenna for transmission.

In the same way, turning ON display unit 1 while display unit 2 is ON turns OFF the power to display unit 2, allowing it to use the antenna.

The following is for the jumpers in the junction box. (Setting 2)

TB1 = 1 - 2, TB2 = 2 - 3

The power to display unit 1 stays on even when the power to display unit 2 is turned ON.

However, access to the antenna is given to display unit 2 if display unit 2 is turned ON.

When display unit 2 is turned ON, and display unit 1's power is turned ON, the power of display unit 2 is automatically turned OFF, and display unit 1 is allowed access to the antenna.

Example:

Display unit 1, which is normally ON and used when underway, from departure to arrival, also provides the electric power to operate the GPS receiver, it is used to store and display the ship's route.

By turning ON display unit 1, while display unit 2 is operating, display unit 2's power can be turned OFF, and display unit 1 gets priority access to the antenna.

By turning ON display unit 2 while display unit 1 is transmitting, because the priority access to the antenna moves from display unit 1 to display unit 2 an antenna rotation error (BZ error) occurs at display unit 1.

Therefore, to turn ON display unit 2's power, first put display unit 1 into standby, then put display unit 1 into standby status, and then turn ON display unit 2.

⚠ CAUTION

While one display unit is transmitting, and another display unit is turned ON, depending on the settings the power may be turned OFF. In cases like this, be sure that transmission status has changed to standby status, then turn ON the power to the other display unit.
Immediately after turning OFF the power to the display unit, and the turning ON the power again, absolutely wait at least five seconds before turning it ON. The machine may not operate normally.

BZ ALARM Setting

Refer to p.107

SECTION 7 After-Sales Service

When Asking for Service

When you think the RADAR 1800 is not operating normally, consult your dealer, our agent, branch, sales department or subsidiary for advice.

Repair during warranty period

Should a malfunction occur when the RADAR 1800 has been operated according to descriptions and instructions in the instruction manual, it will be repaired free of charge during the warranty period. However breakdowns resulting from abuse, negligence, natural disaster, fire or other unforeseeable incident due to manufacturing defect will be chargeable.

Repair after warranty period

Repairs that restore normal operation made after the warranty period have to be paid in full by the client.

Product data that should be provided when you ask for service

- Name of product, model and serial number
- Description of malfunction (as detailed as possible)
- Company address or name of organization, address and telehpone number

Checks and Inspection

Product performance gradually declines with long use resulting in inaccurate measurements, although the rate of this decline varies with frequency of use. To prevent this, periodic maintenance is required in addition to regular inspections. For information on maintenance, contact your dealer. Note that maintenance is charged for.

Inquiries should be directed to JRC. Addresses and telephone numbers are listed on the back cover of this manual.

SECTION 8 Disposal

Disposal of LCD Module

⚠ WARNING

If the LCD module breaks and the internal liquid that flows out touches your skin, rinse it off with flowing water for more than 15 minutes. If any symptom develops, immediately see a doctor. If the liquid enters your eye, rinse it with flowing water for more than 15 minutes and see a doctor without delay.

The fluorescent lamp built in the LCD module contains mercury. When disposing of the LCD module, you need to observe the ordinances or regulations of your local government.

Disposal of RADAR 1800

Observe all national laws and regulations when you dispose of RADAR 1800.

Handling Used Lithium Batteries

⚠ WARNING

Before you dispose of a lithium battery, place a piece of adhesive tape across the plus and minus terminals to prevent electric shorts that could result in fire, explosions or other hazards.

The RADAR 1800 contains a lithium battery for battery backup.

- Dispose of used lithium batteries as non-combustible garbage.
- Insulate the + and - terminals by placing a piece of adhesive tape over them before disposal.

  Observe all local regulations concerning the disposal of batteries.

  For details, consult your dealer, our agent or sales department, or local authority.

SECTION 9 Specification

General

Type of emission	PON	
Display type	Raster scan, PPI method, vertically long display	
Display panel	6.5-inch high contrast color LCD	
Range scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24nm	
Range resolution	25m max.	
Minimum detective range	25m max.	
Range scale accuracy	1.5% of the maximum operating range or 70m, whichever larger.	
Bearing accuracy	±1 degree max.	
Bearing display mode	Head-up, North-up, Course-up	
Ambient conditions	Temperature	
	Scanner	-15°C + 55°C
	Equipment other than scanner: -10°C ~ +50°C	
	Relative humidity	
	All equipment:	+35°C, 95% RH
	Vibration	
	All equipment:	
	Amplitude	3 mm (0 to 500cpm)
	Amplitude	0.75mm (500 to 1500cpm)
	Amplitude	0.2 mm (1500 to 3000cpm)
Power consumption	approx. 50W at DC12V	
Power supply input fluctuation	DC10.2 ~ 16V	
Pre-heating time	approx. 90 sec	
EMC	FCC/IC/R&TTE	
Illumination of LCD	330 cd/m^2	
Control of brightness	10 step	
Control of contrast	10 step	

Scanner

Outside dimensions	approx. height 227mm × diameter 450mm (1.5ft)	
Mass	approx. 5kg	
Plane of polarization	Horizontal polarization	
Beam width	Horizontal beam width	5.2 degrees
	Vertical beam width	30 degrees
	Side lobe level	-21dB max.
Antenna rotation	Approx. 32 rpm	
Transmission output	2kW	
Transmission frequency	9445±30MHz	
Transmission tube	Magnetron	
Transmission pulse length/PRF	0.125nm	0.08μs/2250Hz
	0.25nm	0.08μs/2250Hz
	0.5nm	0.08μs/2250Hz
	0.75nm	0.08μs/2250Hz
	1.5nm	0.3μs/1200Hz
	3nm	0.8μs/600Hz
	6nm	0.8μs/600Hz
	12nm	0.8μs/600Hz
	24nm	0.8μs/600Hz
Duplexer	T-junction with diode Limiter	
Mixer	MIC front end	
Intermediate frequency amplifier	Intermediate frequency	60MHz
	Band width	10MHz (0.08μs)
		3MHz (0.3μs, 0.8μs)
	Gain	90dBmin.
	Receiver characteristic	linear receiver
Overall noise figure	7dB (average)	
Timed TX mode	TX time	10, 20, 30, all rotation
	STBY time	3, 5, 10, 15 minutes

Display Unit

Mounting	Table, Bulkhead, or Flush mount
Outside dimension	Approx. W253 × H205.5 × D115mm
Mass	Approx. 2.8kg
Display	Vertical 6.5-inch color LCD
Number of pixels	320 × 234 (1/4VGA)
Display area	Approx. 133mm × 97mm
Display mode	RADAR
	CHART
	RADAR/CHART horizontal split
	CDI
	DATA
	WIND
Language	English, French, German, Spanish, Norwegian, Italian
Simulator	Built-in

Radar

Color/Graduation	Radar video		
	Graduation:	4	
	Color:	4 (Yellow, Green, Amber, Color (Red/Yellow/Green))	
	Trail		
	Graduation:	1	
	Color:	3 (Sky, White, Green)	
	Fix marker, VRM, EBL		
	Color:	1 (Cyan)	
	Letter, dial		
	Color:	1 (White)	
	SHM, Cursor		
	Color:	1 (White)	
Background color	Dark blue/Black		
Range/Scale spacing	Range	Scale spacing	Number of scales
	0.125nm	0.0625nm	2
	0.25nm	0.125nm	2
	0.5nm	0.25nm	2
	0.75nm	0.25nm	3
	1.5nm	0.25nm	6
	3nm	0.5nm	6
	6nm	1nm	6
	12nm	2nm	6
	24nm	4nm	6
Screen display mode	Radar mode		
	RM/HUP, NUP, CUP		
	*NUP and CUP need magnetic compass or GPS compass		
	Split mode		
	Radar part:	HUP/NUP/CUP	
	Chart part:	NUP/CUP/Angle UP	
Variable range scale	Range display unit:	0.01nm	
	4 digit digital display		
Electronic cursor	Bearing display unit:	0.5degree	
	Relative/True		

Cursor	Displays the range, bearing and L/L.
	Moved using the joy-stick
Tuning method	Manual/Auto
Sea clutter restraint	Manual/Auto
Rain clutter restraint	Manual
Radar interference rejection	Built-in
Bearing scale	5-degree scale, 360 degrees
Ship's heading display	Electronic
Guard zone alarm	"IN" and "OUT"
	Buzzer sound available.
	Memorize function and available
	Covering range: 1.5 times at used range scale
Offset	Up to 33% of radius.
Trail	Relative trail
	Interval: 30sec, 1min, 3min, 6min, continuous

Plotter

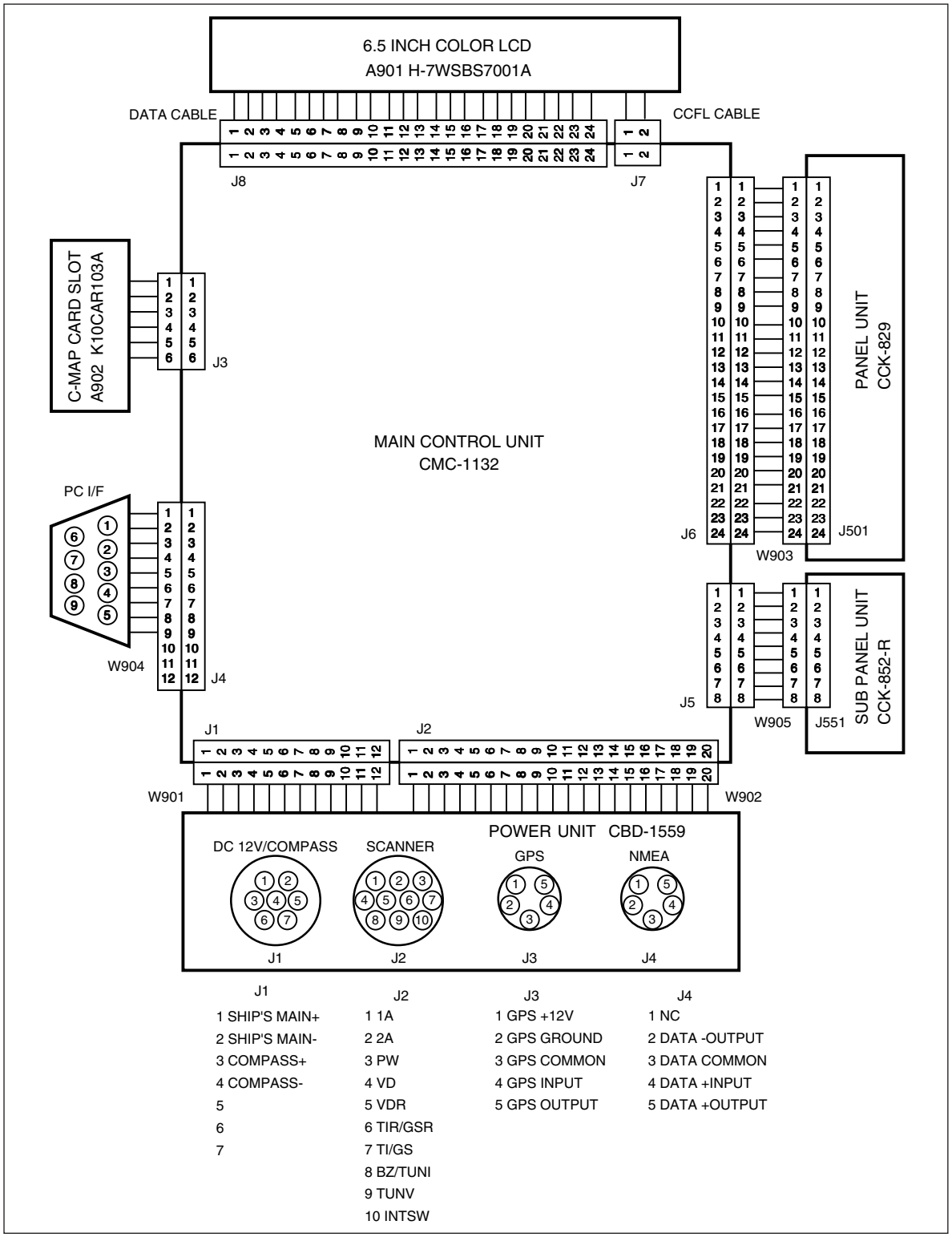
Display method	Mercator projection (Latitude 70 maximum).
Display mode	Chart,CDI (Compass), DATA, Wind (Direction/Velocity)
Chart data	C-MAP card
Waypoint	Number of waypoint: 1000point
Number of Icon:	24 icon
	Length of waypoint name: 8 characters
	Display color: 7 colors (work with icon)
Route	Number of route: 40 route
Segment of route:	100 waypoint
	Length of waypoint name: 8-characters
	Display color: 7 colors
Port service	Available
Track	Display color: 7 colors
	Interval: 0 - 3600sec 0.00 - 99.99NM
	Memory capacity: 1000 - 8000 point
Registration route	Available
Mark	Display color: 7 colors
	Memory capacity: 2000 - 9000 point (including waypoint data)
	Number of mark 24 (same as WPT)
	Input: Cursor position/Own ship position
MOB	Available
Construction	Dot. Line, Rectangular
Tide graph	Available
Alarm	Arrival, Anchor, Off-course, Danger zone, Trip
Graph display	Temperature/Depth/Speed (When temperature data and/or depth data are inputted.)

Input/Output Signal

GPS Receiver (JRC)	GPS112(JRC), DGPS212 (JRC)
NMEA data	IN: GGA, GLL, VTG, RMC, HDG, HDT, HDM, MTW, VHW, MWV, VWR, VWT, DPT, DBT (V2.0)
	OUT: APB, BOD, GGA, GLL, RMB, RMC, VTG, XTE, BWC, OSD, RSD (Ver 1.5 or 2.0)
Compass input data	Electronic compass: NMEA (HDT, HDM, HDG, VHW) (Ver 2.0)
	GPS Compass: JLR-10 (JRC): NMEA (HDT)
PC interface	RS-232C

APPENDICES

Wiring Diagram



J1
1 SHIP'S MAIN+
2 SHIP'S MAIN-
3 COMPASS+
4 COMPASS-
5
6
7

J2
1 1A
2 2A
3 PW
4 VD
5 VDR
6 TIR/GSR
7 TI/GS
8 BZ/TUNI
9 TUNV
10 INTSW

J3
1 GPS +12V
2 GPS GROUND
3 GPS COMMON
4 GPS INPUT
5 GPS OUTPUT

J4
1 NC
2 DATA -OUTPUT
3 DATA COMMON
4 DATA +INPUT
5 DATA +OUTPUT

Figure Appendices-1

Geodetic System Table

No.	NAME
0	WGS-84
1	WGS-72
2	Japan
3	North American 1927 (America)
4	North American 1927 (Canada, Alaska)
5	European 1950 (Europe)
6	Australian geodetic 1966 (Australia)
7	Ordnance Survey of Great Britain (England)
8	NAD-83
9	No Use
10	No Use
11	Adindan (Ethiopia and Sudan)
12	ARC 1950 (Botswana)
13	Australian Geodetic 1984 (Australia)
14	Bermuda 1957 (Bermuda Islands)
15	Bogota Observatory (Colombia)
16	Campo Inchauspe (Argentina)
17	Chatham 1971 (Chatham Island)
18	Chua Astro (Paraguay)
19	Corrego Alegre (Brazil)
20	Djakarta (Vatavia) (Sumatra)
21	European 1979 (Europe)
22	Geodetic datum 1949 (New Zealand)
23	Guam 1963 (Guam)
24	Hayford 1910 (Finland)
25	Hjorsey 1955 (Iceland)
26	Indian (India and Nepal)
27	Ireland 1965 (Ireland)
28	Kertau 1948 (West Malaysia and Singapore)
29	L.C.5 Astro (Cayman Brac Island)
30	Liberia 1964 (Liberia)
31	Luzon (Philippines)
32	Merchich (Morocco)
33	Minna (Cameroon)
34	Nahrwan (Oman)
35	Naparima, BWI (Trinidad and Tobago)
36	Old Egyptian (Egypt)
37	Old Hawaiian (Hawaiian Islands)
38	Pico de las Nieves (Canary Islands)
39	Provisional south American 1956 (South America)
40	Provisional south 1963 (Southern Chile)
41	Puerto Rico (Puerto Rico and Virgin Islands)
42	Qornoq (South Greenland)
43	RT90 (Sweden)
44	Santa Braz (Sao Maguel, Santa Maria Islands)
45	South American 1969 (South America)
46	Southwest Base (Faial, Graciosa, Pico, Sao Jorge and Terceira Island)
47	Timbalai 1948 (Brunei and East Malaysia)

NMEA0183 Standard Input/Output Sentences

Input Sentences

NORMAL INPUT	
$xxGGA	Global Positioning System Fix Data
$xxGLL	Geographic Position-Latitude/Longitude
$xxVTG	Course Over Ground and Ground Speed
$xxRMC	Recommended Minimum Specific GPS data
$xxHDG	Heading, Deviation & Variation
$xxHDT	Heading-True
$xxHDM	Heading-Magnetic
$xxMTW	Water Temperature
$xxVHW	Water Speed and Heading
$xxMWV	Wind speed and angle
$xxVWR	Wind relative Bearing and Velocity
$xxVWT	Wind true Bearing and Velocity
$xxDBT	Depth Below Transducer
$xxDPT	Depth
HIGH RATE INPUT (Use only Heading information)	
$xxHDG	Heading, Deviation & Variation
$xxHDM	Heading-Magnetic
$xxHDT	Heading-True
$xxVHW	Water Speed and Heading

Output Sentences

$INAPB	Heading/Track Controller (Autopilot) Sentence “B” **Necessary to connect the GPS112 or DGPS212**
$IIAPB	Heading/Track Controller (Autopilot) Sentence “B” **Necessary to connect the GPS112 or DGPS212**
$INBOD	Bearing-Origin to Destination **Necessary to connect the GPS112 or DGPS212**
$GPGGA	Global Positioning System Fix Data **Necessary to connect the GPS112 or DGPS212**
$GPGLL	Geographic Position-Latitude/Longitude **Necessary to connect the GPS112 or DGPS212**
$GPRMC	Recommended Minimum Specific GPS data **Necessary to connect the GPS112 or DGPS212**
$INRMB	Recommended Minimum Navigation Information **Necessary to connect the GPS112 or DGPS212**
$GPVTG	Course Over Ground and Ground Speed **Necessary to connect the GPS112 or DGPS212**
$INXTE	Cross-Track Error, Measured **Necessary to connect the GPS112 or DGPS212**
$INBWC	Bearing & Distance to Waypoint **Necessary to connect the GPS112 or DGPS212**
$RAOSD	Own Ship Data
$RARSD	Radar System Data

Waypoint List

Waypoint no.	Waypoint name	Remarks

Waypoint no.	Waypoint name	Remarks

Waypoint no.	Waypoint name	Remarks

Waypoint no.	Waypoint name	Remarks

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