

JMA-5204

JMA-5208/HS

JMA-5209

JMA-5212-4/6

JMA-5222-7/9

JMA-5212-4HS/6HS

**MARINE RADAR
EQUIPMENT**

**INSTRUCTION
MANUAL**



Japan Radio Co., Ltd.

◆◆◆PRECAUTIONS BEFORE OPERATION◆◆◆

■Cautions for high voltage

High voltages from hundreds volts to tens of thousands volts are to be applied to the electronic equipment such radio and radar devices. You do not face any danger during normal operation, but sufficient cares are required for maintenance, inspection and adjustment of their internal components. (Maintenance, check-up and adjustment of the inside of the equipment are prohibited except by maintenance specialists.)

High voltages of tens of thousands volts are so dangerous as to bring an instantaneous death from electric shock, but even voltages of hundred volts may sometimes lead to a death from electric shock. To prevent such an accident, make it a rule to turn off the power switch, discharge capacitors with a wire surely earthed on an end make sure that internal parts are no longer charged before you touch any parts inside these devices. At the time, wearing dry cotton gloves ensures you further to prevent such danger. It is also a necessary caution to put one of your hands in the pocket and not to use your both hands at the same time.

It is also important to select a stable foothold always to prevent additional injuries once you were shocked by electricity. If you were injured from electric shock, disinfect the burn sufficiently and get it taken care of promptly.

■What to do in case of electric shock

When finding a victim of electric shock, turn off the power source and earth the circuit immediately.

If it is impossible to turn off the circuit, move the victim away promptly using insulators such as dry wood plate and cloth without touching the victim directly.

In case of electric shock, breathing may stop suddenly if current flows to the respiration center in the brain. If the shock is not so strong, artificial respiration may recover breathing. When shocked by electricity, the victim will come to look very bad with weak pulse or without beating, resulting in unconsciousness and rigidity. In this case, it is necessary to perform an emergency measure immediately.

◆◆◆FIRST-AID TREATMENTS◆◆◆

☆First-aid treatments

As far as the victim of electric shock is not in dangerous condition, do not move him and practice artificial respiration on him immediately. Once started, it should be continued rhythmically.

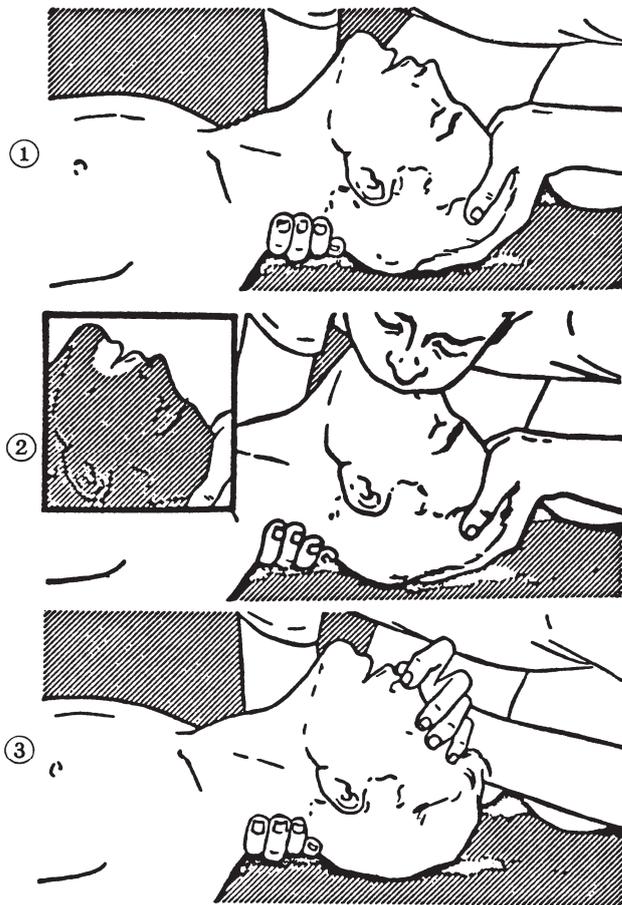
- (1) Do not touch the victim confusedly as a result of the accident, but the rescuer may also get an electric shock.
- (2) Turn off the power source calmly and move the victim away quietly from the electric line.
- (3) Call a physician or ambulance immediately or ask someone to call a doctor.
- (4) Lay the victim on this back and loosen his necktie, clothes, belt, etc.
- (5)
 - a. Examine the victim's pulse.
 - b. Examine his heartbeat bringing your ear close to his heart.
 - c. Examine his breathing bringing the back of your hand or your face close to his face.
 - d. Check the size of the pupils of his eyes.
- (6) Open the victim's mouth and take out artificial teeth, cigarette or chewing gum if any. Keep his mouth open, stretch his tongue and insert a towel or the like in his mouth to prevent the tongue from suffocating. (If it is hard to open his mouth due to set teeth, open it with a screwdriver and insert a towel in this mouth.)
- (7) Then, wipe his mouth so that foaming mucus does not accumulate inside.

☆When pulse is beating but breathing has stopped

(Mouth-to-mouth respiration) Fig. 1

- (1) Tilt the victim's head back as far as this face looks back. (A pillow may be inserted his neck.)
- (2) Push his jaw upward to open his throat wide (to spread his airway).
- (3) Pinch the victim's nostrils and take a deep breath, block his mouth completely with yours and blow into his mouth strongly. Take a deep breath again and blow into his mouth. Continue this 10 to 15 times a minutes (blocking his nostrils).
- (4) Carefully watch that he has recovered his natural breathing and atop practicing artificial respiration.
- (5) If it is difficult to open the victim's mouth, insert a rubber or vinyl tube into one of his nostrils and blow into it blocking the other nostril and his mouth completely.
- (6) When the victim recovers consciousness, he may try to stand up suddenly, but let him lie calmly and serve him with a cup of hot coffee or tea and keep him warm and quiet. (Never give him alcoholic drinks.)

Method of mouth-to-mouth respiration by raising head



- (1) Raise the victim's head. Support his forehead with one of your hand and his neck with the other hand. →①
When you tilt his head backward, the victim, in most cases, opens his mouth to the air. This makes mouth-to mouth respiration easy.
- (2) Cover his mouth as widely as possible with yours and press your cheek against his nose →②
or, pinch his nostrils with your fingers to prevent air from leaking. →③
- (3) Blow into his lungs. Continue blowing into his mouth until his breast swells. Blow into his mouth as quickly as possible for the first 10 times.

Fig. 1 Mouth-to mouth respiration

☆When both pulse and breathing have stopped

Perform the (Cardiac massage) Fig. 2 and (Mouth-to-mouth respiration) Fig. 1

When no pulse has come not to be felt, his pupils are open and no heartbeat is heard, cardiac arrest is supposed to have occurred and artificial respiration must be performed.

- (1) Place your both hands, one hand on the other, on the lower one third area of his breastbone and compress his breast with your elbows applying your weight on his breast so that it is dented about 2cm (Repeat compressing his breast 50 times or so a minutes). (Cardiac massage)
- (2) In case of one rescuer,
Repeat cardiac massages about 15 times and blow into his mouth 2 times quickly, and repeat this combination.
In case of two rescuers,
One person repeats cardiac massages 15 times while the other person blow into his mouth twice, and they shall repeat this combination. (Perform the cardiac massage and mouth-to-mouth respiration)
- (3) Examine his pupils and his pulse sometimes. When the both have returned to normal, stop the artificial respiration, serve him with a cup of hot coffee or tea and keep him warm and calm while watching him carefully. Commit the victim to a medical specialist depending on his condition. (Never give him alcoholic drinks.) To let him recover from the mental shock, it is necessary for persons concerned to understand his situations and the necessary treatment.

①



②



③



④

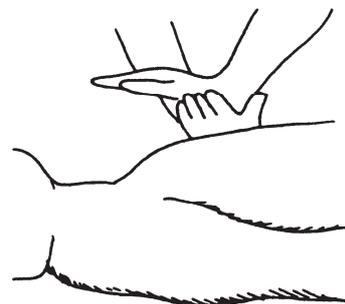


Fig. 2 Cardiac massage

PREFACE

Thank you very much for purchasing the JRC marine radar equipment, JMA-5200MK2 series.
This equipment is a marine radar equipment designed to obtain safe operation of marine ships.
This equipment consists of a radar signal transmitter-receiver unit, a LCD display unit and a scanner unit as its main units.

- Before operating the equipment, be sure to read this instruction manual carefully for correct operation.
- Maintain this instruction manual so that operators can refer to it at anytime.

Refer to this manual when any inconvenience or defect occurs.

● Before Operation ●

Pictorial Indication

Various pictorial indications are included in this manual and are shown on these equipment so that you can operate them safely and correctly and prevent any danger to you and/or to other persons and any damage to your property during operation. Such indications and their meanings are as follows. Please understand them before you read this manual:

 DANGER	This indication is shown where incorrect equipment operation due to negligence may cause death or serious injuries.
 WARNING	This indication is shown where any person is supposed to be in danger of being killed or seriously injured if this indication is neglected and these equipment are not operated correctly.
 CAUTION	This indication is shown where any person is supposed to be injured or any property damage is supposed to occur if this indication is neglected and these equipment are not operated correctly.

Examples of Pictorial Indication



The \triangle mark represents CAUTION (including DANGER and WARNING). Detailed contents of CAUTION (“Electric Shock” in the example on the left.) is shown in the mark.



The \odot mark represents prohibition. Detailed contents of the prohibited action (“Disassembling Prohibited” in the example on the left.) is shown in the mark.



The \bullet mark represents instruction. Detailed contents of the instruction (“Disconnect the power plug” in the example on the left.) is shown in the mark.

Warning Label

There is a warning label on the top cover of the equipment. Do not try to remove, break or modify the label.

●PRECAUTIONS●

DANGER



Never conduct inspection or repair work of equipment components.

Inspection or repair work by uncertified personnel may result in fire hazard or electrocution.

For inspection and repair work of equipment components, consult with our branch office, branch shop, sales office, or our distributor in your district.



When conducting maintenance, make sure to turn the main power off.

Failure to comply may result in electrocution.



Turn off the main power before cleaning the equipment.

Especially when a rectifier is used, make sure to turn it off since voltage is still outputted from the rectifier even after the indicator and the radar are turned off. Failure to comply may result in equipment failure, or death or serious injury due to electric shock.



When conducting maintenance work on the antenna, make sure to turn its main power off.

Failure to comply may result in electrocution or injuries.



Make sure to turn off the antenna operation switch.

Failure to comply may result in injuries caused by physical contact with the rotating antenna.



Do not touch the radiator. Even if the power is turned off, the radiator may be rotated by the wind.

WARNING



Never directly touch the internal components of the antenna, receiver/transceiver, or indicator. Direct contact with these high-voltage components may cause electrocution. For maintenance, inspection, or adjustment of equipment components, consult with our branch office, branch shop, sales office, or our distributor in your district.



Do not get close to the radiant section of the antenna. It is a rotating part, and it may cause injuries if it suddenly starts rotating and consequently hits the body. It is recommended that the radiant section be installed at a high place such as on the roof of the wheelhouse, on the flying bridge, on the trestle, or on the radar mast so that no one can get close to it. When any work must be done on the antenna, make sure to turn the antenna switch off.



Microwave radiation level:
Keep away from a scanner when it is transmitting. The high level of microwave is radiated from the front face of the scanner specified below. The microwave exposure at close range could result in injuries (especially of the eyes).

System	50W/m ²	10W/m ²	2.5W/m ²
NKE-2103	n/a	26cm	123cm
NKE-2254	5cm	81cm	162cm



Make sure to install the antenna at a place higher than human height. Direct exposure to electromagnetic waves at close range will have adverse effects on the human body.

WARNING



Do not change MBS Level/Area unless absolutely necessary.

Incorrect adjustment will result in deletion of nearby target images and thus collisions may occur resulting in death or serious injuries.



When cleaning the display screen, do not wipe it too strongly with a dry cloth. Also, do not use gasoline or thinner to clean the screen. Failure to comply will result in damage to the screen surface.



Direct exposure to electromagnetic waves at close range will have adverse effects on the human body. When it is necessary to get close to the antenna for maintenance or inspection purposes, make sure to turn the indicator power switch to "OFF" or "STBY."

Direct exposure to electromagnetic waves at close range will have adverse effects on the human body.



When conducting maintenance work, make sure to turn off the power and unplug the power connector J1 of the radar process unit so that the power supply to the equipment is completely cut off.

Some equipment components can carry electrical current even after the power switch is turned off, and conducting maintenance work without unplugging the power connector may result in electrocution, equipment failure, or accidents.



When disposing of used lithium batteries, be sure to insulate the batteries by attaching a piece of adhesive tape on the ⊕ and ○ terminals. Failure to comply may cause heat generation, explosion, or fire when the batteries get shorted out.

CAUTION



A malfunction may occur if the power in the ship is instantaneously interrupted during operation of the radar. In this case, the power should be turned on again.



Always use the automatic tuning mode. Use the manual tuning mode only when the automatic tuning mode does not provide the best tuning state due to deterioration of magnetron for example.



If sensitivity is set too high, unnecessary signals such as noises in the receiver and false echoes increase to lower target visibility.

At the same time, if sensitivity is set too low, detection of targets such as ships and dangerous objects may be hindered.

Therefore, sensitivity must always be set to an optimal level.



When using the [AUTO SEA] function, never set the suppression level too high canceling out all image noises from the sea surface at close range.

Detection of not only echoes from waves but also targets such as other ships or dangerous objects will become inhibited.

When using the [AUTO SEA] function, make sure to choose the most appropriate image noise suppression level.



CAUTION



When using the [AUTO RAIN] function, never set the suppression level too high canceling out all image noises from the rain or snow at close range.

Detection of not only echoes from the rain or snow but also targets such as other ships or dangerous objects will become inhibited.

When using the [AUTO RAIN] function, make sure to choose the most appropriate image noise suppression level.



When the chart position is corrected, the display will be shifted away from the actual position. With this in mind, navigate your ship with attention to the surroundings. Otherwise, this may cause accidents.



Compact Flash Cards can be used with this system. The following shows the recommendations in use. However they do not guarantee that CF cards may properly work with this system. Depending on the hardware or software, the cards will not work correctly.

Any damage including loss of data caused by using the data created on this system is out of warranty.

Important files should be backed up therefore.



Use the radar only as a navigation aid. The final navigation decision must always be made by the operator him/herself. Making the final navigation decision based only on the radar display may cause accidents such as collisions or running aground.

CAUTION



Use the target tracking function (TT) only as a navigation aid. The final navigation decision must always be made by the operator him/herself. Making the final navigation decision based only on the target tracking function (TT) information may cause accidents.

The target tracking function (TT) information such as vector, target numerical data, and alarms may contain some errors. Also, targets that are not detected by the radar cannot be acquired or tracked.

Making the final navigation decision based only on the radar display may cause accidents such as collisions or running aground.



Target Tracking Function Test is provided to test if the target tracking function is operating normally. Thus, do not use the function except when you test the target tracking function.

Note especially that, if this function is used during actual navigation, simulated targets are displayed and may become confused with other actual targets. Therefore, never use this function during actual navigation.



When a large value is set as an association condition, a tracked target near an AIS target is identified as the AIS target and may thus disappear from the display.

For example, when a pilot vessel equipped with the AIS function (a small target which is not a tracked target) goes near a cargo vessel which is a tracked target without the AIS function, the tracked target symbol for the cargo vessel may disappear.

CAUTION



When a small value is set as a hysteresis condition, a tracked target near an AIS target is identified as the AIS target and may thus disappear from the display.

For example, when a pilot vessel equipped with the AIS function (a small target which is not a tracked target) goes near a cargo vessel which is a tracked target without the AIS function, the tracked target symbol for the cargo vessel may disappear.



Since these alarms may include some errors depending on the target tracking conditions, the navigation officer himself should make the final decision for ship operations such as collision avoidance.

Making the final navigation decision based only on the alarm may cause accidents such as collisions.



When setting a automatic acquisition zone, make sure to properly adjust gain, sea-surface reflection suppression level, and rain/snow reflection suppression level so that the optimal target images are always on the radar screen. The automatic acquisition zone alarm will not be activated for targets undetected by the radar, and it may result in accidents such as collisions.



Any adjustments must be made by specialized service personnel.

Incorrect settings may result in unstable operation.



Do not make any adjustments during navigation. Failure to comply may result in adverse effects on the radar function which may lead to accidents or equipment failure.



Optimal values have been set for Video Level and Vector Constant; therefore, never change their values unless absolutely necessary. Failure to comply may result in accidents that would lower target tracking performance.

CAUTION



Do not change the quantization level settings unless absolutely necessary. If set at an inappropriate value, the acquisition or tracking function of the target tracking function (TT) deteriorates, and this may lead to accidents.



**Any adjustments must be made by specialized service personnel.
Failure to comply may result in accidents or equipment failure.**



Make sure to shut off the main power before replacing parts. Failure to comply may result in electrocution or equipment failure.



When replacing magnetrons, make sure to shut off the main power and let the equipment stand for more than 5 minutes to discharge the high-voltage circuit. Failure to comply may result in electrocution.



**Make sure to take off your watch when your hand must get close to the magnetron.
Failure to comply may result in damage to the watch since the magnetron is a strong magnet.**



Make sure that two or more staff member work together when replacing the LCD. If only one person attempts to replace the LCD, he/she may drop it and become injured.



**Do not directly touch the inverter circuit of the LCD display with a bare hand since high voltage temporarily remains in the circuit even after the main power is shut off.
Failure to comply may result in electrocution.**

CAUTION

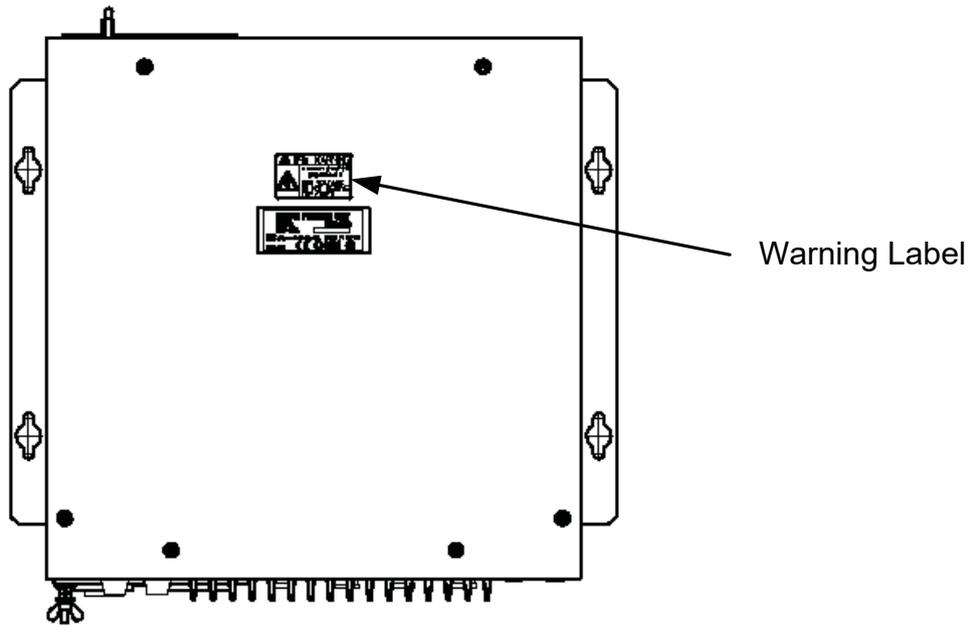


Never changes or modifications the equipment by user with not expressly approved method. Otherwise, the party responsible for compliance could void the user's authority to operate the equipment.

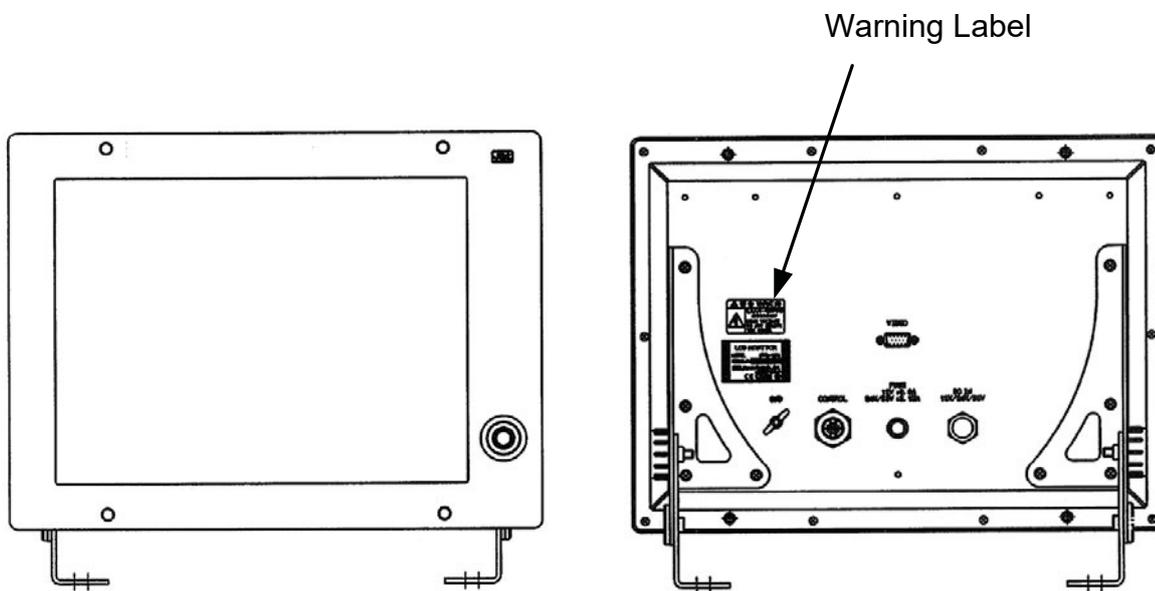


This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The Mounting Point of the Warning Label



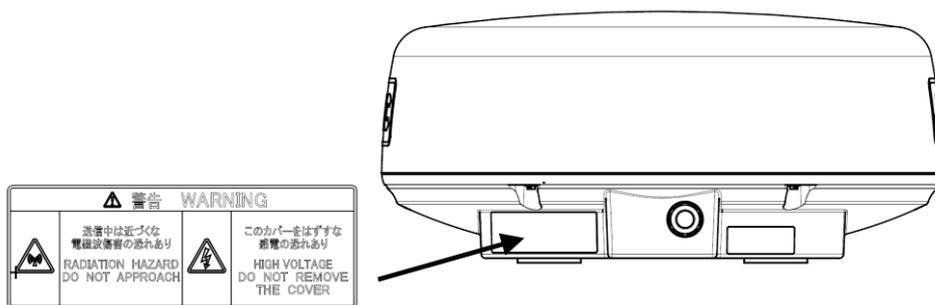
NCD-4380 Radar Process Unit



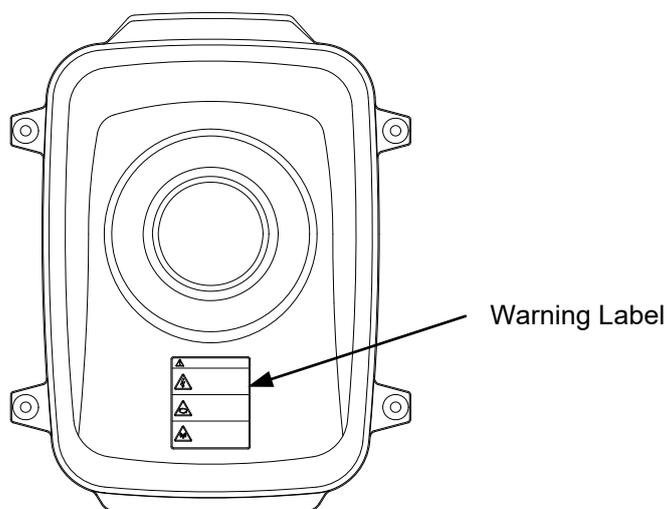
Front face

Back face

NWZ-164 LCD Monitor

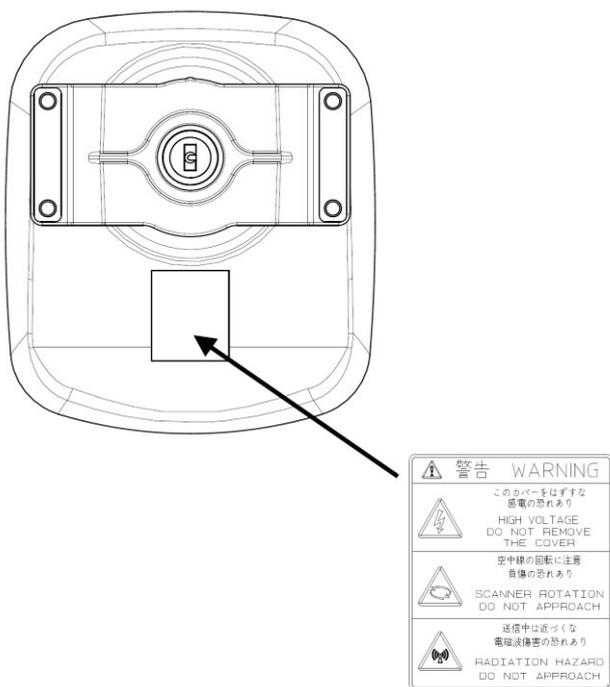


NKE-2043 Scanner Unit

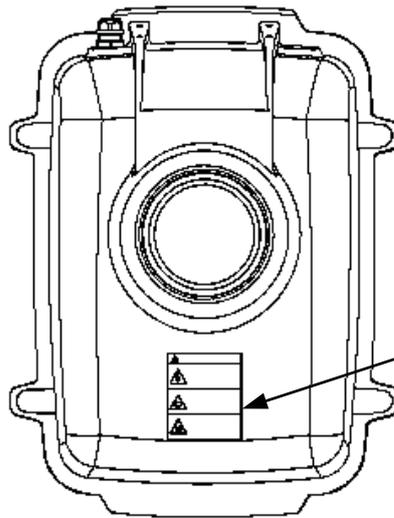


Warning Label

NKE-2062 Scanner Unit

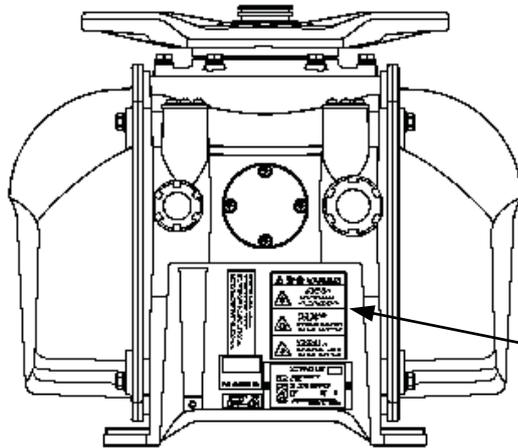


NKE-2063A Scanner Unit



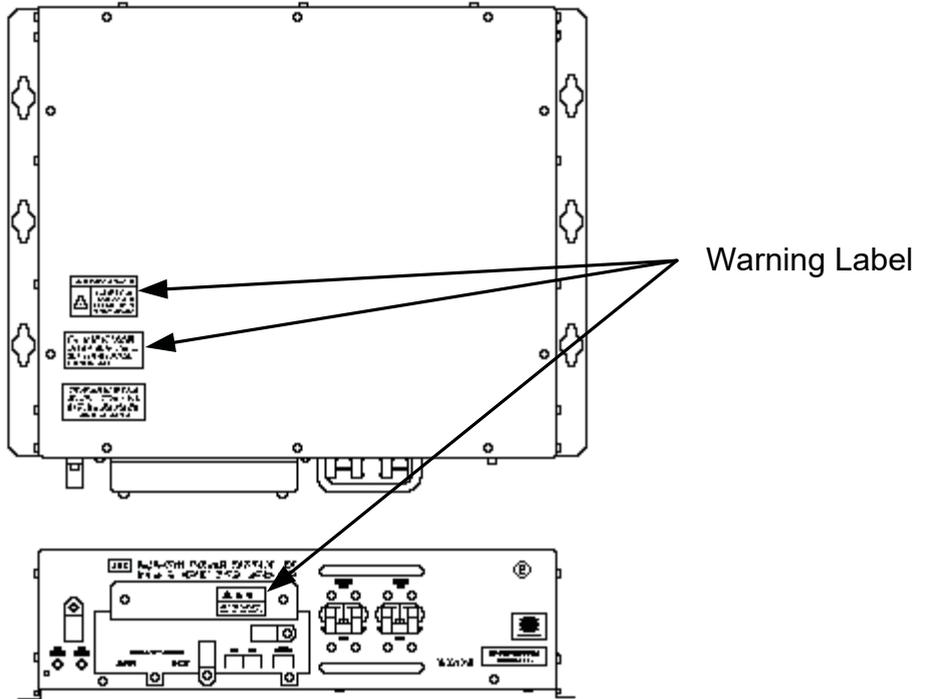
Warning Label

NKE-2103-4/6/4HS/6HS Scanner Unit



Warning Label

NKE-2254-7/9 Scanner Unit



NBA-5111 Power Supply

EQUIPMENT APPEARANCE



Scanner Unit Type NKE-2043



Scanner Unit Type NKE-2062/HS (3.9 feet)



Scanner Unit Type NKE-2063A (3.9 feet)



Scanner Unit Type NKE-2103-4/4HS (4 feet)



Scanner Unit Type NKE-2103-6/6HS (6 feet)



Scanner Unit Type NKE-2254-7 (7 feet)



Scanner Unit Type NKE-2254-9 (9 feet)



NDC-1460 Processor Unit (Desktop Type)



**NWZ-164 Display Unit (Desktop Type)
NCE-7699A Operation Unit (Desktop Type)**

NCD-4380 Display Unit (Desktop Type)

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GLOSSARY

This section describes the main terms used for this equipment and general related maritime terms.

A

- AZ** Acquisition/Activation zone
A zone set up by the operator in which the system should automatically acquire radar targets and activate reported AIS targets when entering the zone.
- Activated target** A target representing the automatic or manual activation of a sleeping target for the display of additional information.
- AIS** Automatic Identification System
A system which enables ships and shore stations to obtain identifying and navigation information about other ships at sea, using an automated transponder.
- Anti-clutter rain** Rain/snow clutter suppression.
- Anti-clutter sea** Sea clutter suppression.
- Associated target** A target simultaneously representing a tracked target and a reported AIS target having similar parameters (position, course, speed) which comply with an association algorithm.
- AZI** AZimuth stabilization mode

B

- BCR/BCT** Bow Crossing Range and Bow Crossing Time

C

- C up** Course up
Own ship's course is pointed to the top center of the radar display.
- CCRP** The Consistent Common Reference Point
A location on own ship, to which all horizontal measurements such as target range, bearing, relative course, relative speed, CPA or TCPA are referenced, typically the conning position of the bridge.
- Clutter** Unwanted reflections on a radar screen, from sea surface, rain or snow.
- COG** Course Over Ground
The direction of the ship's movement relative to the earth, measured on board the ship, expressed in angular units from true north

CORREL	CORRELation
CPA/TCPA	The distance to the Closest Point of Approach and Time to the Closest Point of Approach. Limits are set by the operator and are related to own ship.
CTW	Course Through Water The direction of the ship's movement through the water
D	
DRIFT	The current velocity for manual correction or the current speed on the horizontal axis of the 2-axis log is displayed.
E	
EBL	Electronic Bearing Line An electronic bearing line originated from own ship's position.
ENH	Enhance
ETA	Estimated Time of Arrival
G	
Ground stabilization	A display mode in which speed and course information are referred to the ground, using ground track input data.
H	
HDG	Heading The horizontal direction that the bow of a ship is pointing at any instant, expressed in angular units from a reference direction .
HL	Heading line A graphic line on a radar presentation drawn from the consistent common reference point to the bearing scale to indicate the heading of the ship
HSC	Vessels which comply with the definition in SOLAS for high speed craft
H up	Head up Own ship's heading line is always pointed to the top center of the radar display.
I	
IMO	International Maritime Organization
Interswitch Unit	A device to switch over two or more radar display units and two or more scanners.
IR	radar Interference Rejecter

ISW InterSWitch

L

Lost AIS target A target symbol representing the last valid position of an AIS target before the reception of its data was lost, or its last dead-reckoned position.

Lost tracked target One for which target information is no longer available due to poor, lost or obscured signals.

LP Long Pulse

M

MMSI Maritime Mobile Service Identity

MOB Man OverBoard

MON Performance monitor

MP Medium Pulse

N

nm 1nm=1852m

NSK North Stabilization Kit

N up North up
The north is always pointed to the top center of the radar display.

O

Own track Display function of own ship's track

P

PI Parallel Index line

Past positions Equally time-spaced past position marks of a tracked or AIS target and own ship.

POSN POSitioN

PRF Pulse Repetition Frequency
The number of radar pulses transmitted each second.

PROC PROCess
Radar signal processing function

R

Radar beacon A navigation aid which responds to the radar transmission by generating a radar signal to identify its position and identity

Radar cross-section	Radar cross-section of a target determines the power density returned to the radar for a particular power density incident on the target
Range Rings	A set of concentric circles labeled by distance from CCRP.
Reference target	A symbol indicating that the associated tracked stationary target is used as a speed reference for the ground stabilization
Relative course	The direction of motion of a target relative to own ship motion
Relative speed	The speed of a target relative to own ship's speed data
Relative vector	A predicted movement of a target relative to own ship's motion
RM	Relative Motion A display on which the position of own ship remains fixed, and all targets move relative to own ship.
RM(R)	Relative Motion. Relative Trails.
RM(T)	Relative Motion. True Trails.
ROT	Rate Of Turn Change of heading per time unit.
Route	A set of waypoints.
RR	Range Rings
S	
SART	Search And Rescue Transponder Radar transponder capable of operating in the 9GHz band
Sea stabilization	A display mode in which speed and course information are referred to the sea.
Sea state	Status of the sea condition due to the weather environment, expressed as a sea state 0 for flat conditions with minimal wind, to sea state 8 for very rough sea conditions.
SET	The current direction for manual correction or the current speed on the horizontal axis of the 2-axis log is displayed.
Sleeping AIS target	A target indicating the presence and orientation of a vessel equipped with AIS in a certain location.

SOG Speed Over the Ground
The speed of the ship relative to the earth, measured on board of the ship.

SP Short Pulse

STAB STABILization

STW Speed Through Water
The speed of the ship relative to the water surface.

T

TCPA Time to Closest Point of Approach to own ship

Test target Radar target of known characteristics used for test requirement

TM True Motion
A display across which own ship moves with its own true motion.

Trails Display Radar Trails (Other Ships' Trails)

Trial maneuver A graphical simulation facility used to assist the operator to perform a proposed maneuver for navigation and collision avoidance purposes.

True course The direction of motion relative to ground or to sea, of a target expressed as an angular displacement from north

True speed The speed of a target relative to ground, or to sea

True vector A vector representing the predicted true motion of a target, showing course and speed with reference to the ground or sea

TT Target Tracking.
A computer process of observing the sequential changes in the position of a radar target in order to establish its motion. Such a target is a Tracked Target.

TTG Time To Go.
Time to next waypoint.

TXRX Transceiver Unit

U

UTC Universal Time Coordinated.
The international standard of time, kept by atomic clocks around the world.

V

VRM

Variable Range Marker

An adjustable range ring used to measure the distance to a target.

W

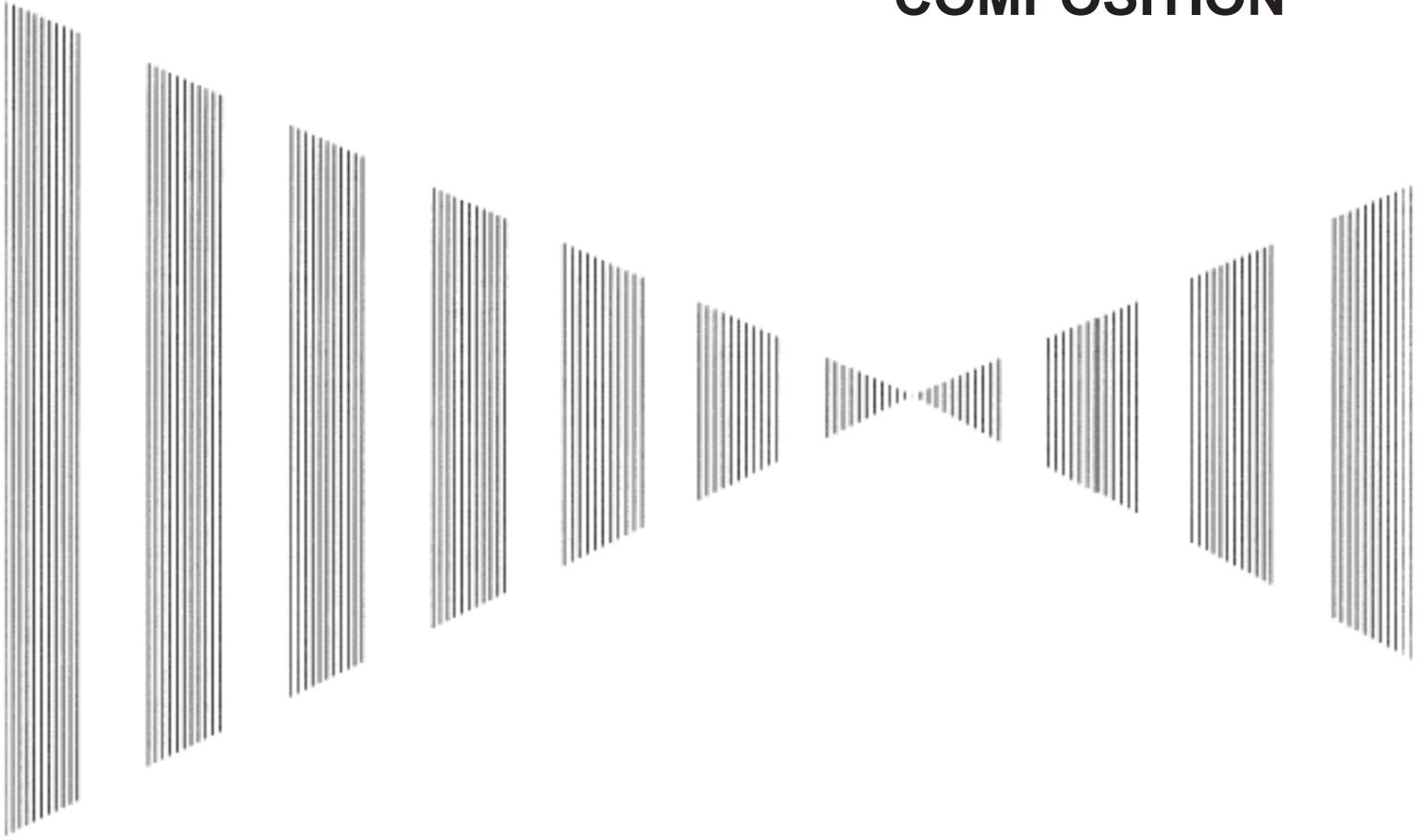
Waypoint

A geographical location on a route indicating a event.

1	GENERAL AND EQUIPMENT COMPOSITION
2	SCREEN DISPLAY AND OPERATION PANEL
3	BASIC OPERATION
4	MEASUREMENT OF RANGE AND BEARING
5	OPERATION OF TT AND AIS
6	TRUE AND FALSE ECHOES ON DISPLAY
7	SETTINGS FOR SYSTEM OPERATION
8	MAINTENANCE AND INSPECTION
9	TROUBLESHOOTING AND AFTER-SALES SERVICE
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APPENDIX

SECTION 1 GENERAL AND EQUIPMENT COMPOSITION



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1.1 FUNCTIONS

This equipment is a high-performance radar equipment consisting of a scanner unit, a transmitter-receiver unit and a high resolution color LCD display unit.

1.1.1 Function of This System

The JMA-5200MK2 series is a color radar system designed to comply with the international standards.

The JMA-5200MK2 series (except JMA-5204/5208/5208HS/5209) meets the requirements of IMO Res. MSC.192(79), MSC.191(79), A.694(17) for SOLAS ships.

JMA-5204/5208/5208HS/5209 meets the general requirements for radio and navigational equipment (IMO Resolution A.694(17)) and IEC 62252 for NON-SOLAS ships.

The main functions include:

- sensitivity adjustment
- sea clutter and rain/snow clutter suppression
- interference rejecter
- bearing and range measurement using a cursor, fixed/variable range markers, and electronic bearing line
- own track display
- NAV line and marker displays
- TM (True Motion) presentation
- self-diagnostic facilities
- radar performance monitoring (Performance Monitor)(option)
- TT functions (manual/automatic, target acquisition and tracking, vector and trail displays and alarm displays) (option)
- simple plotter functions (marker and line display, destination/route setting) (option)

1.2 FEATURES

Realization of Easy-to-see Screen with High Resolution

The 15-inch color LCD with high resolution of 1024×768 pixels can display radar images of 180 mm or more in diameter. Even short-range targets can also be displayed as high-resolution images.

Target Detection by Latest Signal Processing Technology

The system employs the latest digital signal processing technology to eliminate undesired clutter from the radar video signals that are obtained from the receiver with a wide dynamic range, thus improving the target detection.

Advanced Technology Based TT Functions (Option)

The TT target acquisition and tracking performance is enhanced by the use of the fastest DSP and tracking algorithm. So stable operation in target tracking under clutter is ensured.

- Acquisition and tracking of 30 targets.
- Hazardous conditions are represented by shapes and colors of symbols as well as sounds.
- Tracks of up to 20 target ships can be stored with a maximum of 1,500 points for each of them, and displayed distinguished by using seven different colors.

Overlay of Radar Images, Coastlines, and Own Ship's Track

As well as operator-created NAV lines, the data of coastlines, objects such as buoys, and own ship's tracks/TT tracks/AIS tracks, which is stored on the memory card can be superimpose-displayed with radar images and radar trails in all display modes including the head-up mode.

Use of the optional plotter function enables the creation/display of marks and lines and the settings of waypoints/courses.

Easy Operation with GUI

All the radar functions can be easily controlled by simply using the trackball and two switches to operate the buttons shown on the radar display.

Improved Day/Night Mode

Two types of background colors are available in each Day/Dusk/Night mode (total 4 background colors). Each background color can be reproduced to be suited for the user's operating environment by simple key operation. The radar echoes and a variety of graphics can also be represented in different colors, ensuring easy-to-see displays.

Self-diagnostic Program Incorporated

The Self-diagnostic program always monitors all the functions of the system. If any function deteriorates, an alarm message will appear on the radar display and an alarm sounds at the same time. Even when the system is operating, the functionality test can be carried out. (except on some functions)

Performance Monitor (Option)

The radar performance (transmitted output power and receiving sensitivity) can appear on the radar display.

* The PM unit (NJU-85) is needed separately.

* It cannot connect Performance Monitor to JMA-5204/5208/5208HS/5209.

Simplified Inter-switch Operation (Option)

If an simplified inter-switch unit (option) is installed, up to two JMA-5200MK2 radars can be switched over by performing simple operation.

* An simplified inter-switch connection cable (optional) CFQ-5251 (5m) is required separately.

Various Functions

- RADAR TRAILS (Other ship's track display)
- TM (True Motion) display
- Head-up/North-up/Course-up display
- Own ship's track display
- Automatic acquisition and activation area setting function

1.3 CONFIGURATION

Scanners and Transmitted Output Powers

SCANNER TYPE	TRANSMITTED OUTPUT POWER	BAND	RATE OF ROTATION	CATEGORY
JMA-5204 620mm RADOME	4 KW	X	27rpm	
JMA-5208 3.9FT SLOT ANTENNA	6 KW	X	27rpm	
JMA-5209 3.9FT SLOT ANTENNA	6 KW	X	27rpm	
JMA-5212-4 4 FT SLOT ANTENNA	10 KW	X	27rpm	CAT 3
JMA-5212-6 6 FT SLOT ANTENNA	10 KW	X	27rpm	CAT 3
JMA-5222-7 7 FT SLOT ANTENNA	25 KW	X	24rpm	CAT 3
JMA-5222-9 9 FT SLOT ANTENNA	25 KW	X	24rpm	CAT 3
JMA-5208HS 4FT SLOT ANTENNA	6 KW	X	48rpm	
JMA-5212-4HS 4 FT SLOT ANTENNA	10 KW	X	48rpm	
JMA-5212-6HS 6 FT SLOT ANTENNA	10 KW	X	48rpm	

Radar Configuration and Ship's Mains

RADAR MODEL	SCANNER UNIT	PERFORMANCE MONITOR UNIT	DISPLAY UNIT	SHIP'S MAINS
JMA-5204	NKE-2043	-	NCD-4380	12/24/32V DC #1
JMA-5208	NKE-2062	-	NCD-4380	12/24/32V DC #1
JMA-5209	NKE-2063A	-	NCD-4380	12/24/32V DC #1
JMA-5212-4	NKE-2103-4	NJU-85	NCD-4380	24V DC
JMA-5212-6	NKE-2103-6	NJU-85	NCD-4380	24V DC
JMA-5222-7	NKE-2254-7	NJU-85	NCD-4380	24V DC
JMA-5222-9	NKE-2254-9	NJU-85	NCD-4380	24V DC
JMA-5208HS	NKE-2062HS	-	NCD-4380	24V DC
JMA-5212-4HS	NKE-2103-4HS	NJU-85	NCD-4380	24V DC
JMA-5212-6HS	NKE-2103-6HS	NJU-85	NCD-4380	24V DC

Notes:

1. An optional rectifier NBA-5111 is necessary for using Ship's Mains 100/110/115/200/220/230 V AC.
2. The scanner unit except NKE-2043/2062/2063A/2103 series can be equipped with a deicing heater as an option, and '-D' shall be suffixed to the type name. (e.g. NKE-2254-7D, NKE-2254-9D).

3. The display system NCD-4380 has a separate structure consisting of the following:

Monitor unit	NWZ-164
Processor unit	NDC-1460
Keyboard unit	NCE-7699A
4. The ship with radar of IMO conformity must mount a PM unit.
- #1 When the ship's main is 12V DC, the maximum cable length between the display unit and scanner unit is 20 m.

1.4 EXTERIOR DRAWINGS

- Fig. 1.1 Exterior Drawing of Scanner Unit, Type NKE-2043
- Fig. 1.2 Exterior Drawing of Scanner Unit, Type NKE-2062/HS
- Fig. 1.3 Exterior Drawing of Scanner Unit, Type NKE-2063A
- Fig. 1.4 Exterior Drawing of Scanner Unit, Type NKE-2103-4/4HS
- Fig. 1.5 Exterior Drawing of Scanner Unit, Type NKE-2103-6/6HS
- Fig. 1.6 Exterior Drawing of Scanner Unit, Type NKE-2254-7
- Fig. 1.7 Exterior Drawing of Scanner Unit, Type NKE-2254-9
- Fig. 1.8 Exterior Drawing of Monitor Unit, Type NWZ-164
- Fig. 1.9 Exterior Drawing of Processor Unit, Type NDC-1460
- Fig. 1.10 Exterior Drawing of Keyboard Unit, Type NCE-7699A
- Fig. 1.11 Exterior Drawing of NSK Unit, Type NCT-4106A

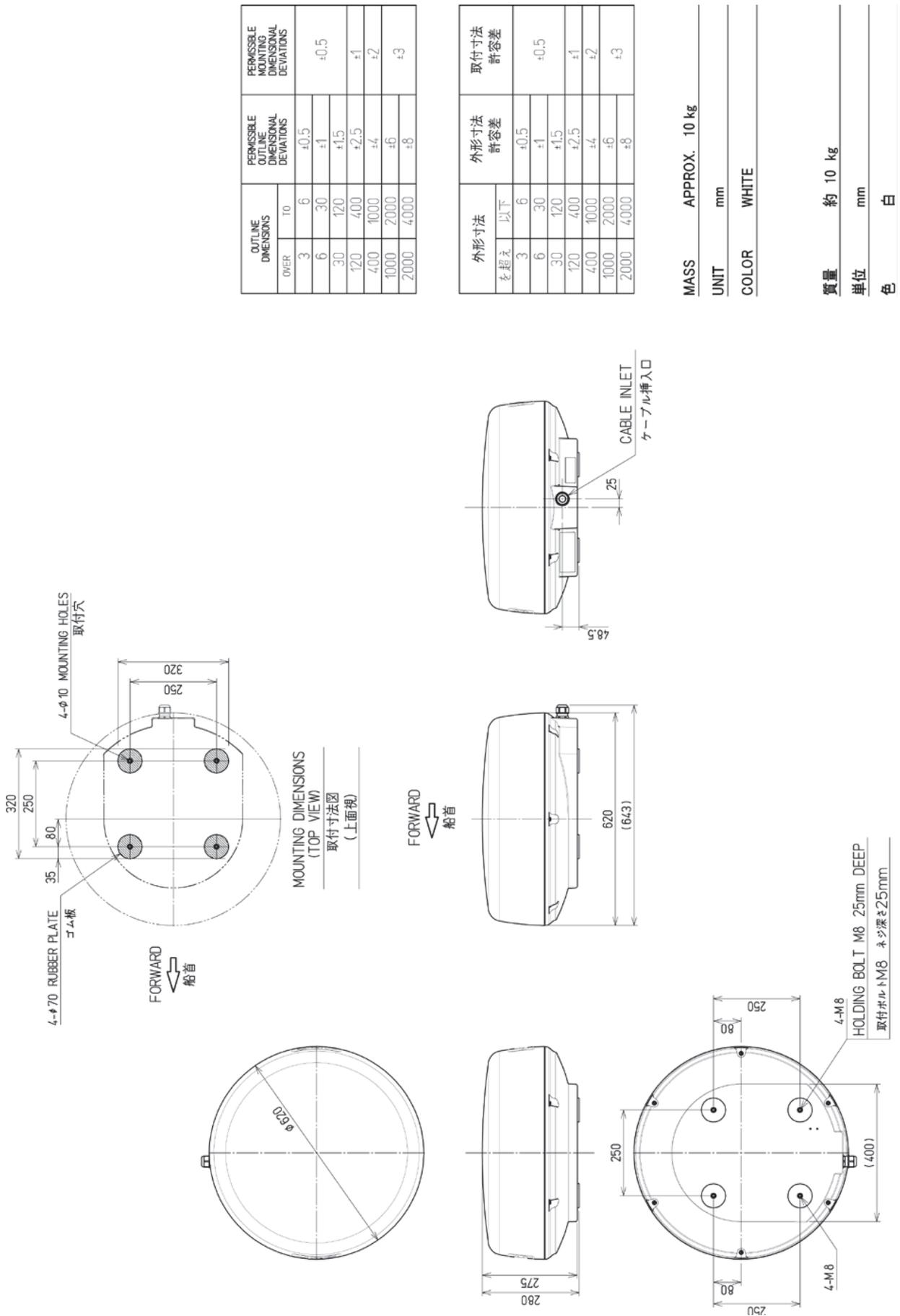


Fig. 1.1 Exterior Drawing of Scanner Unit, Type NKE-2043

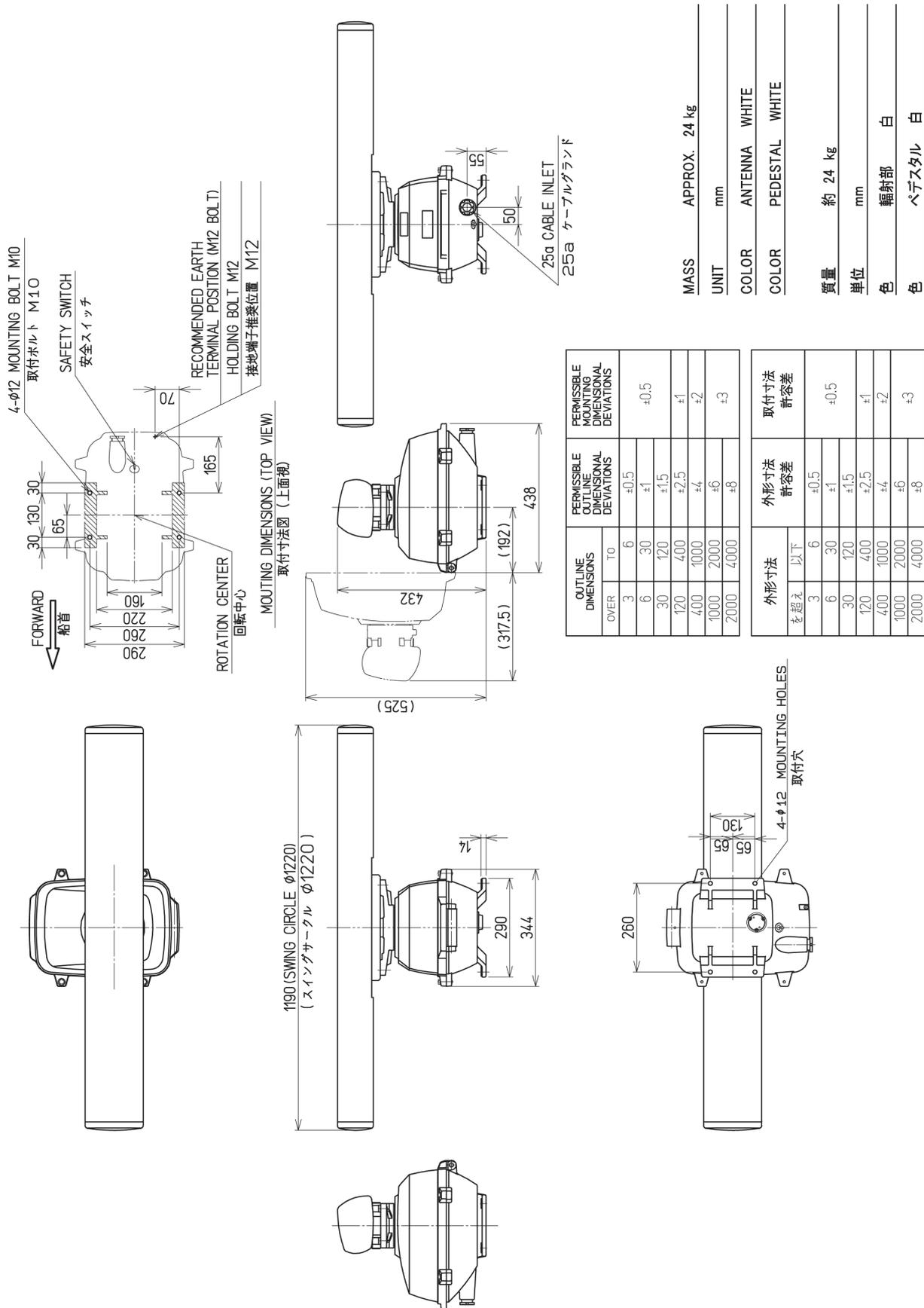


Fig. 1.2 Exterior Drawing of Scanner Unit, Type NKE-2062/HS

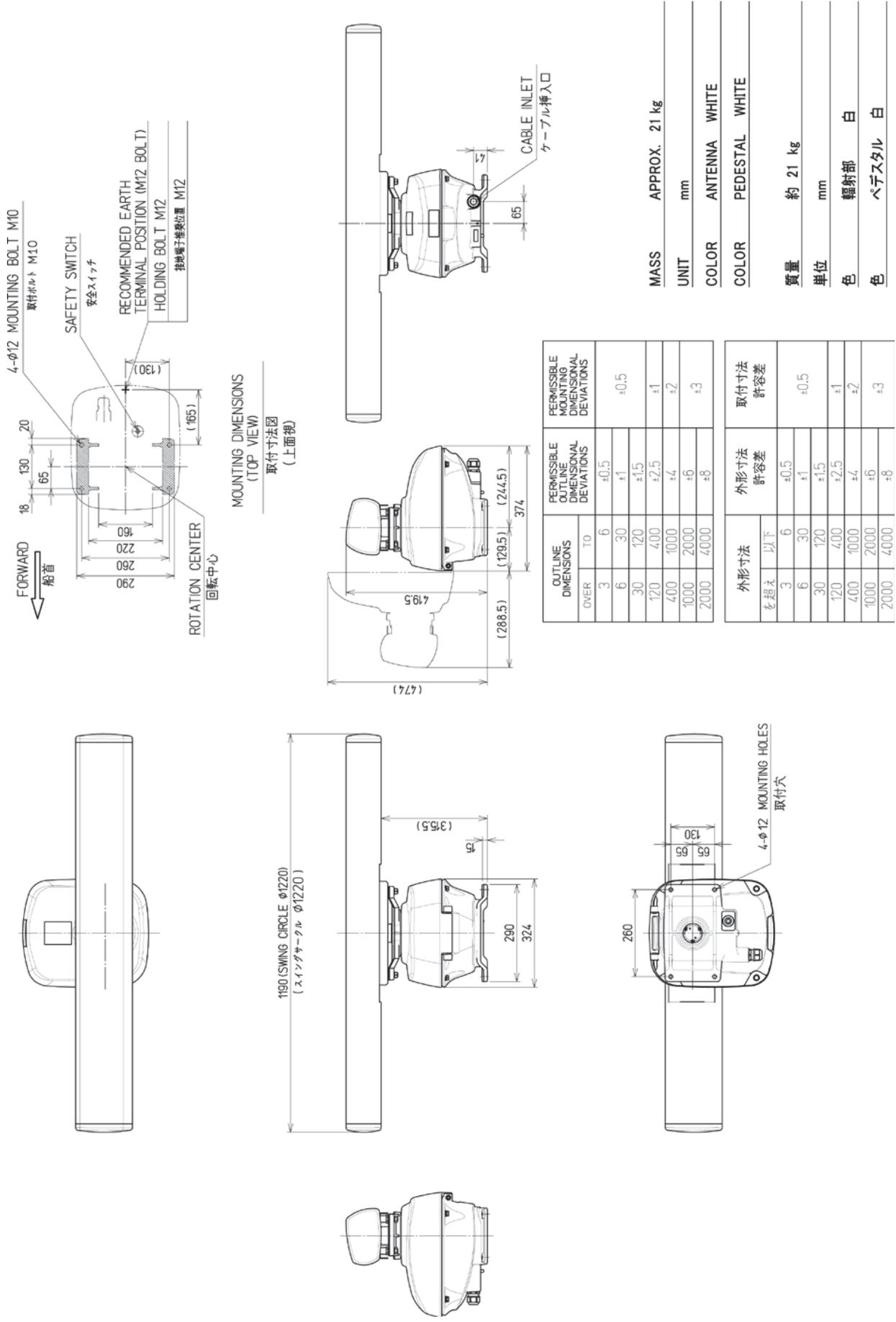


Fig. 1.3 Exterior Drawing of Scanner Unit, Type NKE-2063A

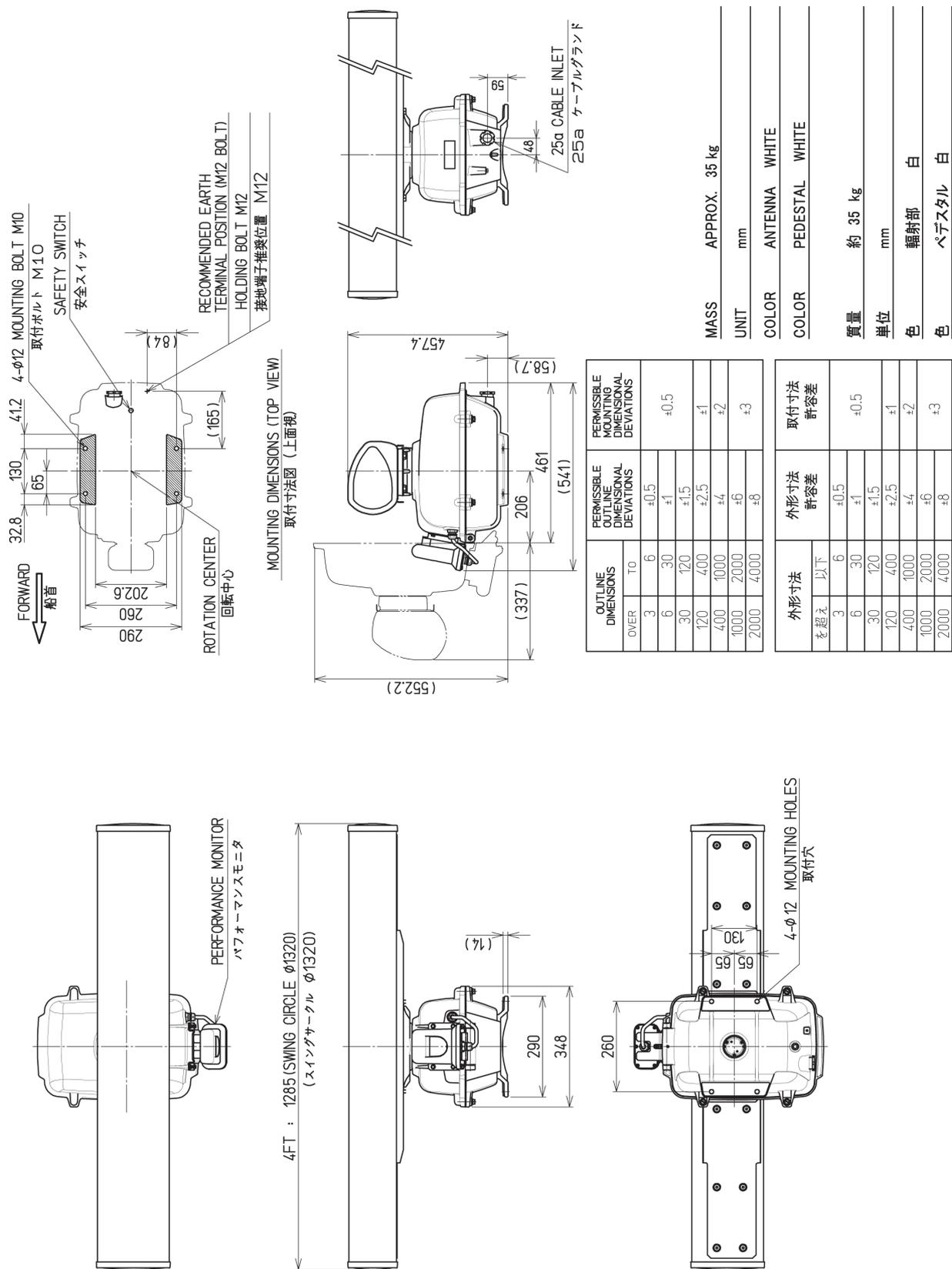
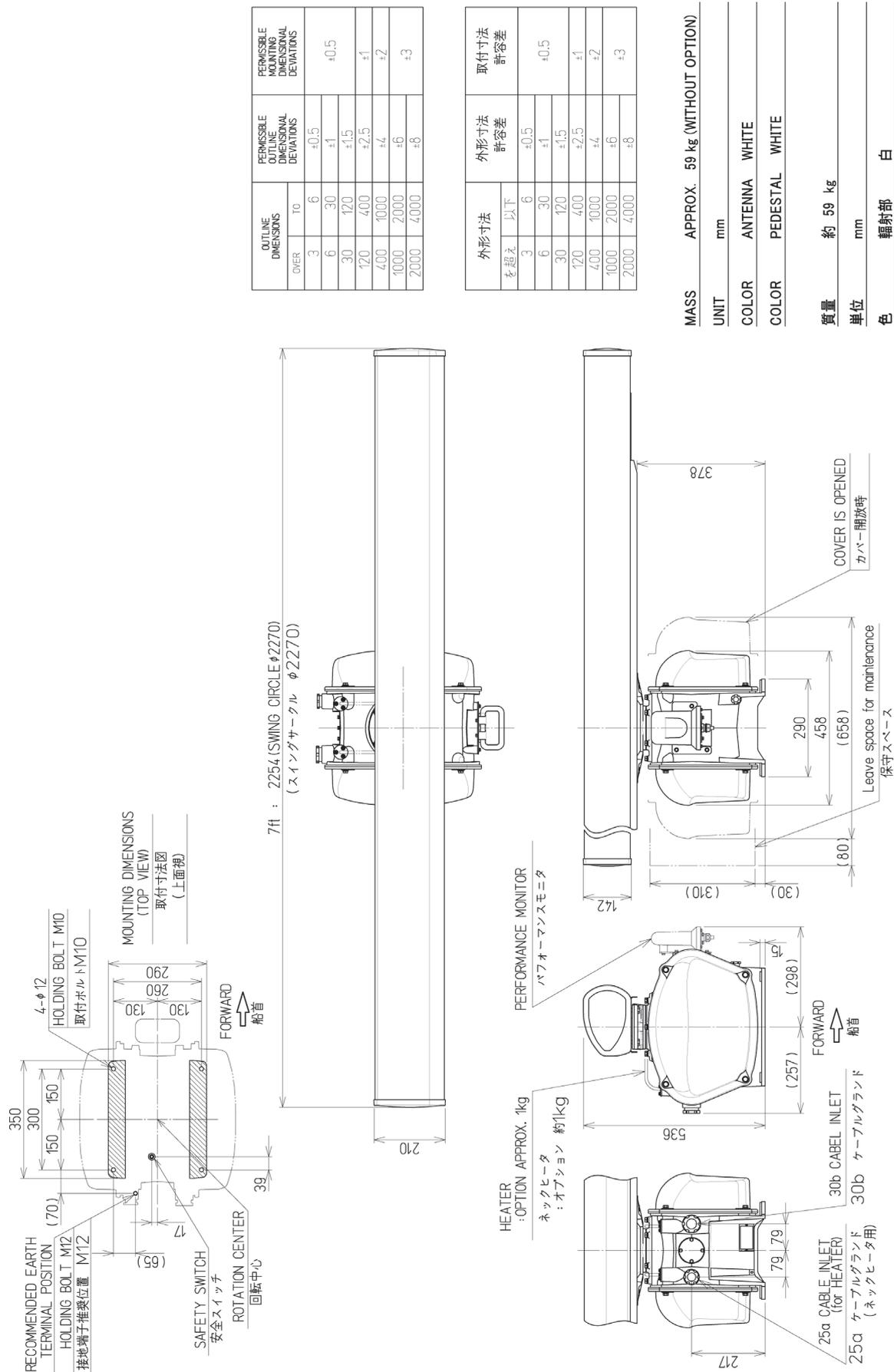


Fig. 1.4 Exterior Drawing of Scanner Unit, Type NKE-2103-4/4HS



OVER	OUTLINE DIMENSIONS		PERMISSIBLE DIMENSIONAL DEVIATIONS
	10		
3	6		±0.5
6	30		±1
30	120		±1.5
120	400		±2.5
400	1000		±4
1000	2000		±6
2000	4000		±8

外形寸法 を 超え	以下		外形寸法 許容差
	3	6	
6	30		±1
30	120		±1.5
120	400		±2.5
400	1000		±4
1000	2000		±6
2000	4000		±8

MASS APPROX. 59 kg (WITHOUT OPTION)

UNIT	mm
COLOR	ANTENNA WHITE
COLOR	PEDESTAL WHITE
質量	約 59 kg
単位	mm
色	輻射部 白
色	ペDESTアル 白

Fig. 1.6 Exterior Drawing of Scanner Unit, Type NKE-2254-7

NOTE: Diameter of cable gland is not able to change.
注) ケーブルグランド径は変更できません。

1.5 GENERAL SYSTEM DIAGRAMS

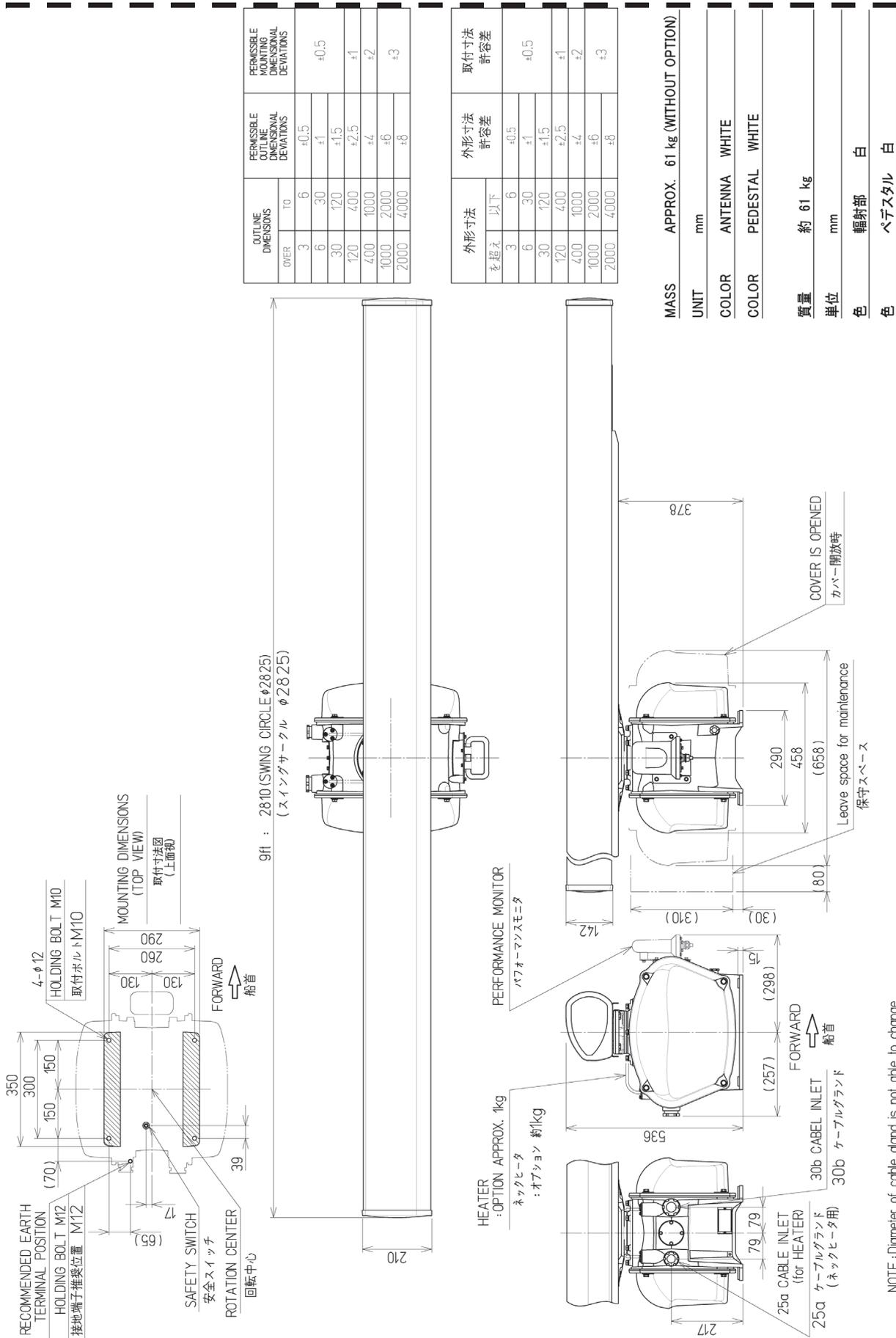
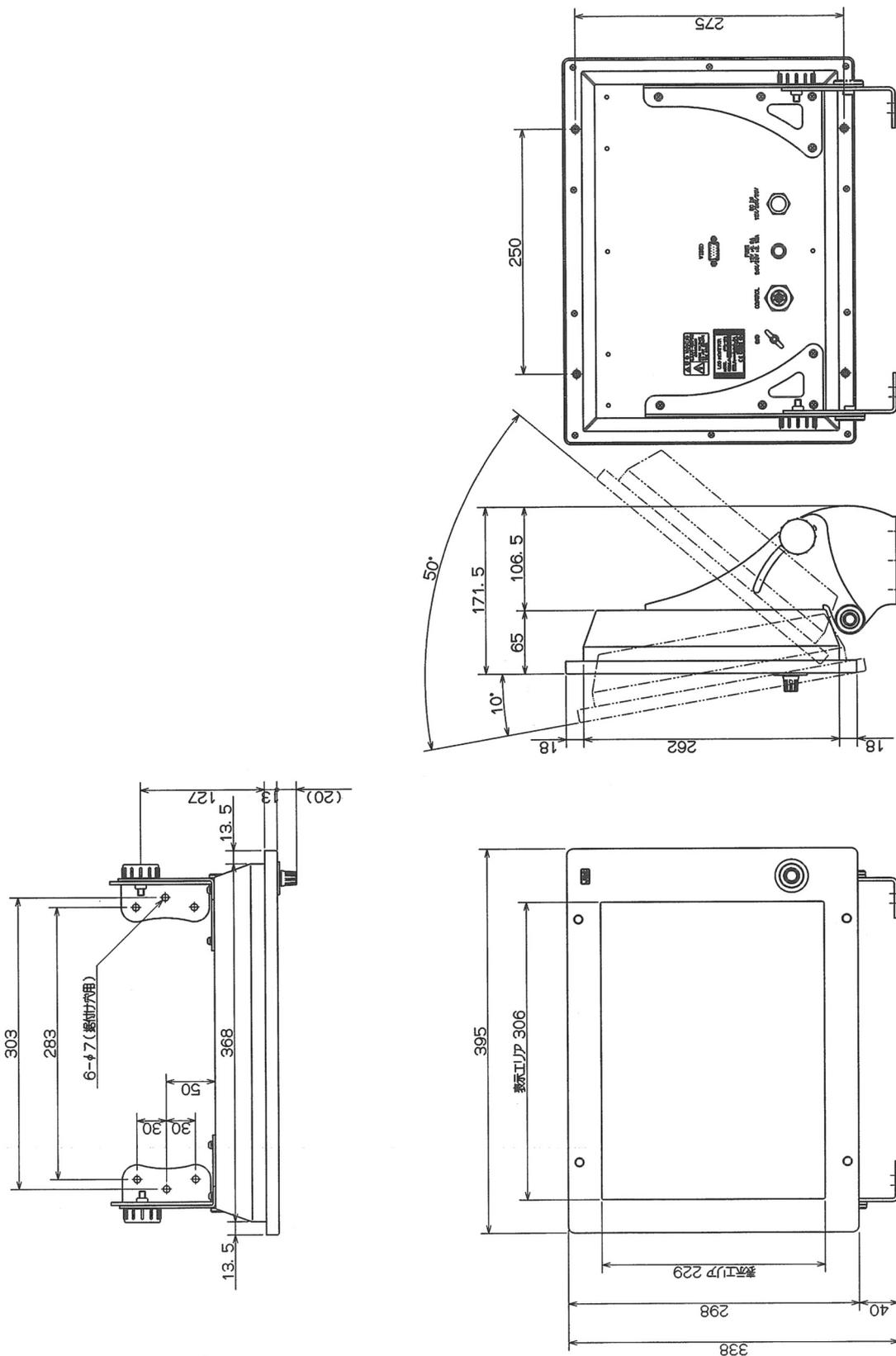


Fig. 1.7 Exterior Drawing of Scanner Unit, Type NKE-2254-9

NOTE : Diameter of cable gland is not able to change.
注) ケーブルグラント径は変更できません。



NWZ-164

Fig. 1.8 Exterior Drawing of Monitor Unit, Type NWZ-164

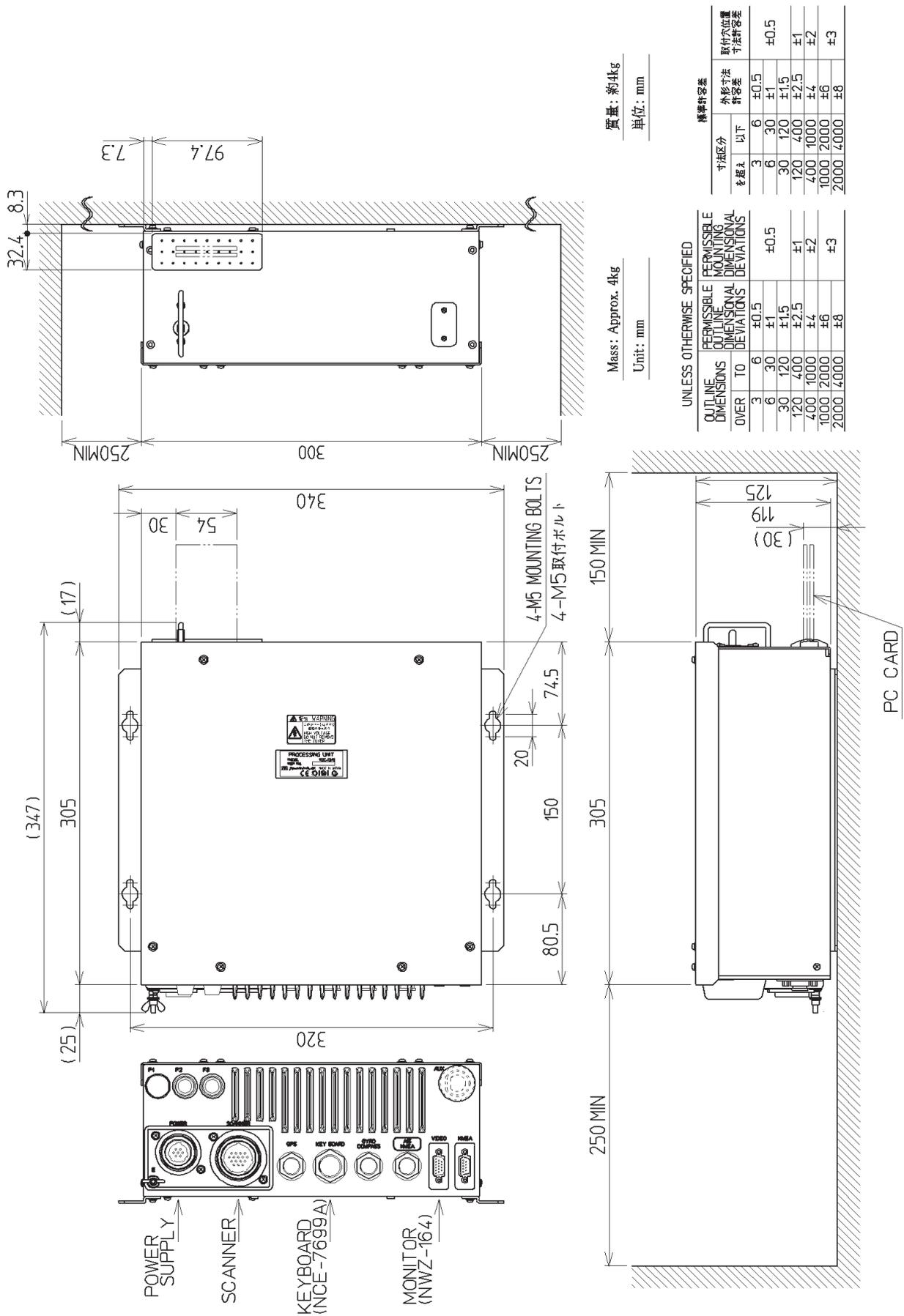


Fig. 1.9 Exterior Drawing of Processor Unit, Type NDC-1460

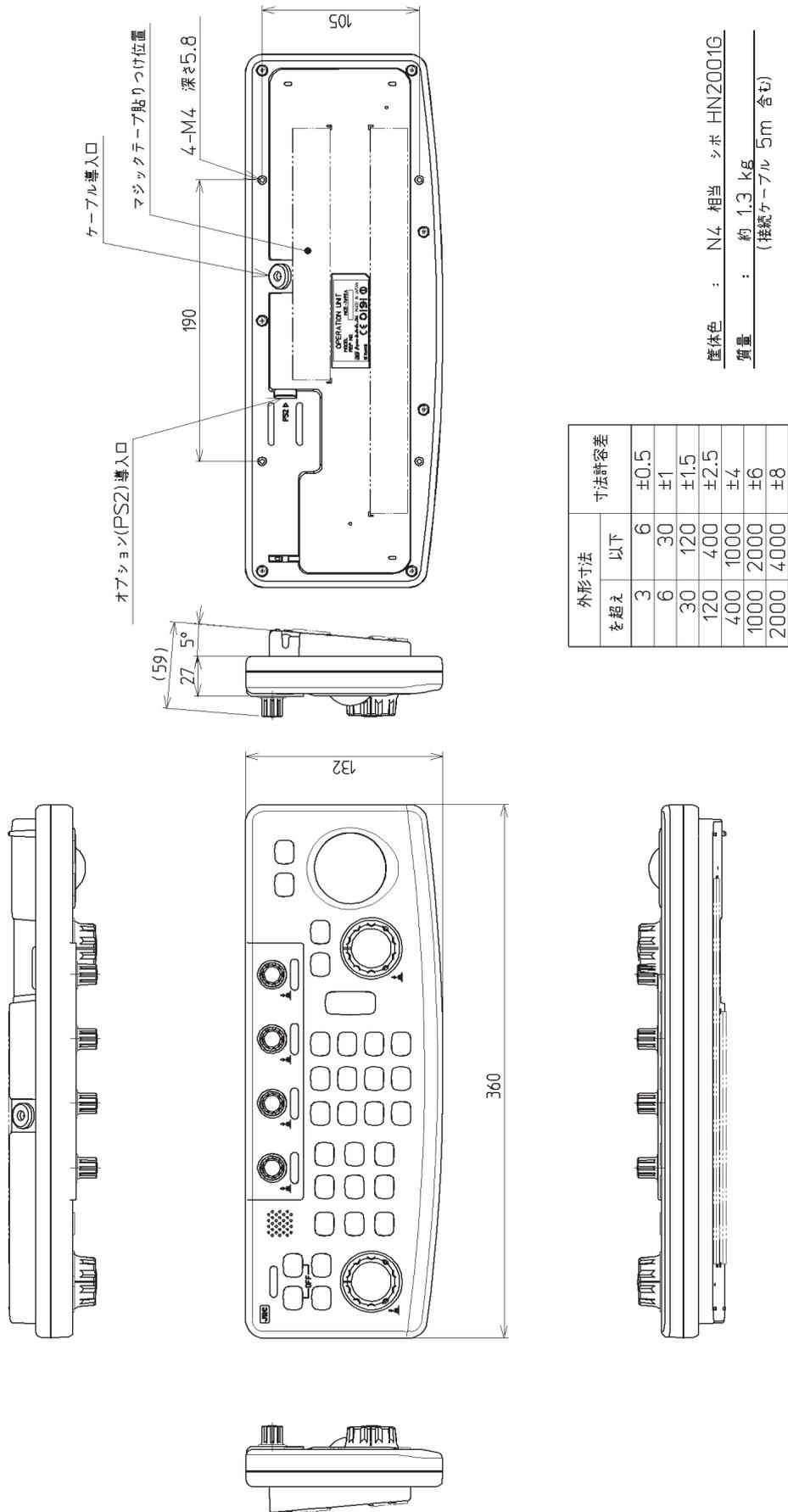
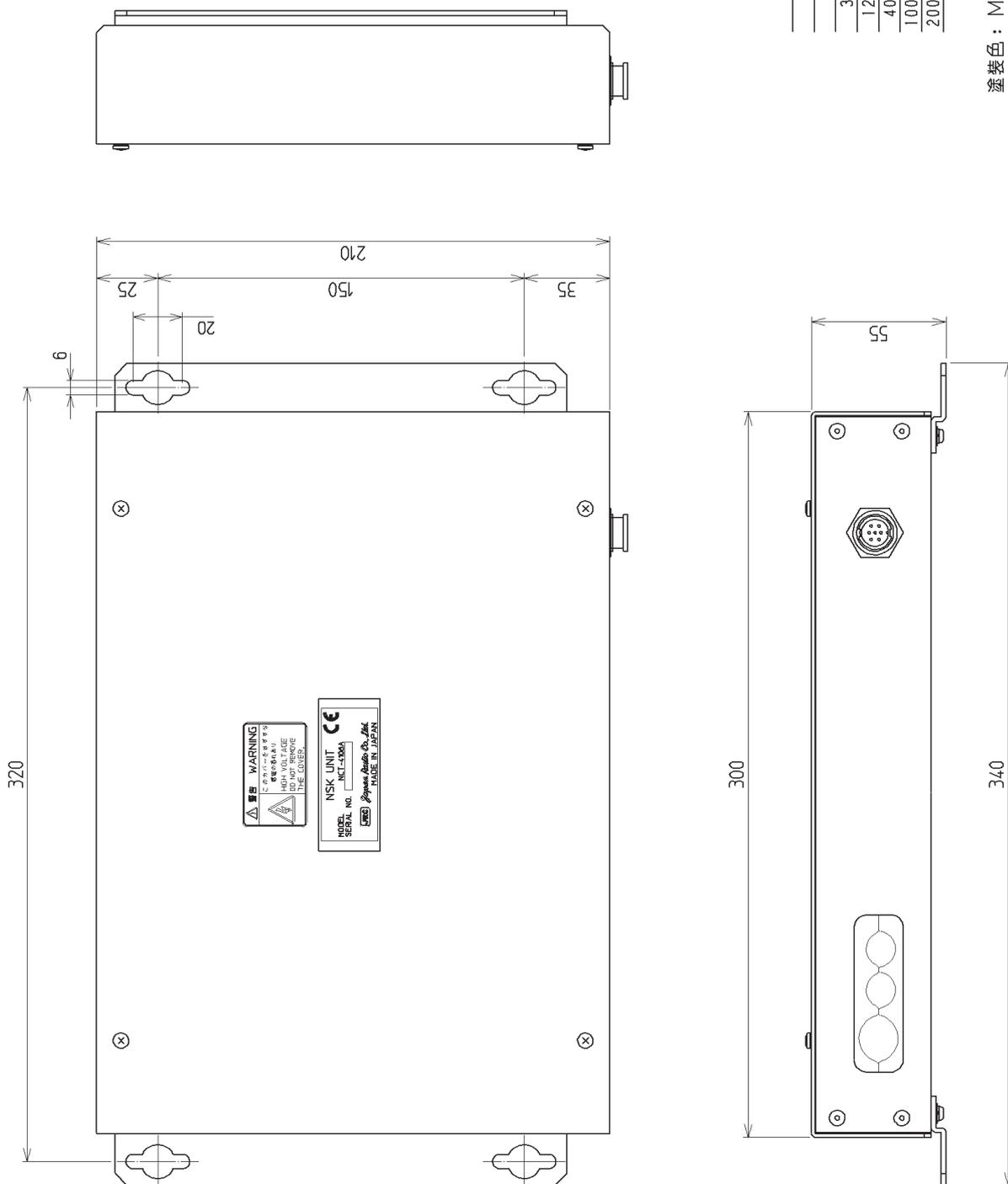


Fig. 1.10 Exterior Drawing of Keyboard Unit, Type NCE-7699A



標準許容差

区分	外形寸法
30を越え	30以下 ±1
120を越え	120以下 ±1.5
400を越え	400以下 ±2.5
1000を越え	1000以下 ±4
2000を越え	2000以下 ±6
3000を越え	3000以下 ±8

塗装色: M3-N4 ハンツヤ シボNo.1

質量: 約 2 kg

Fig. 1.11 Exterior Drawing of NSK Unit, Type NCT-4106A

1.5 GENERAL SYSTEM DIAGRAMS

Fig. 1.12 General System Diagram of Radar, Type JMA-5204

Fig. 1.13 General System Diagram of Radar, Type JMA-5208/HS

Fig. 1.14 General System Diagram of Radar, Type JMA-5209

Fig. 1.15 General System Diagram of Radar, Type JMA-5212-4/6/4HS/6HS

Fig. 1.16 General System Diagram of Radar, Type JMA-5222-7/9

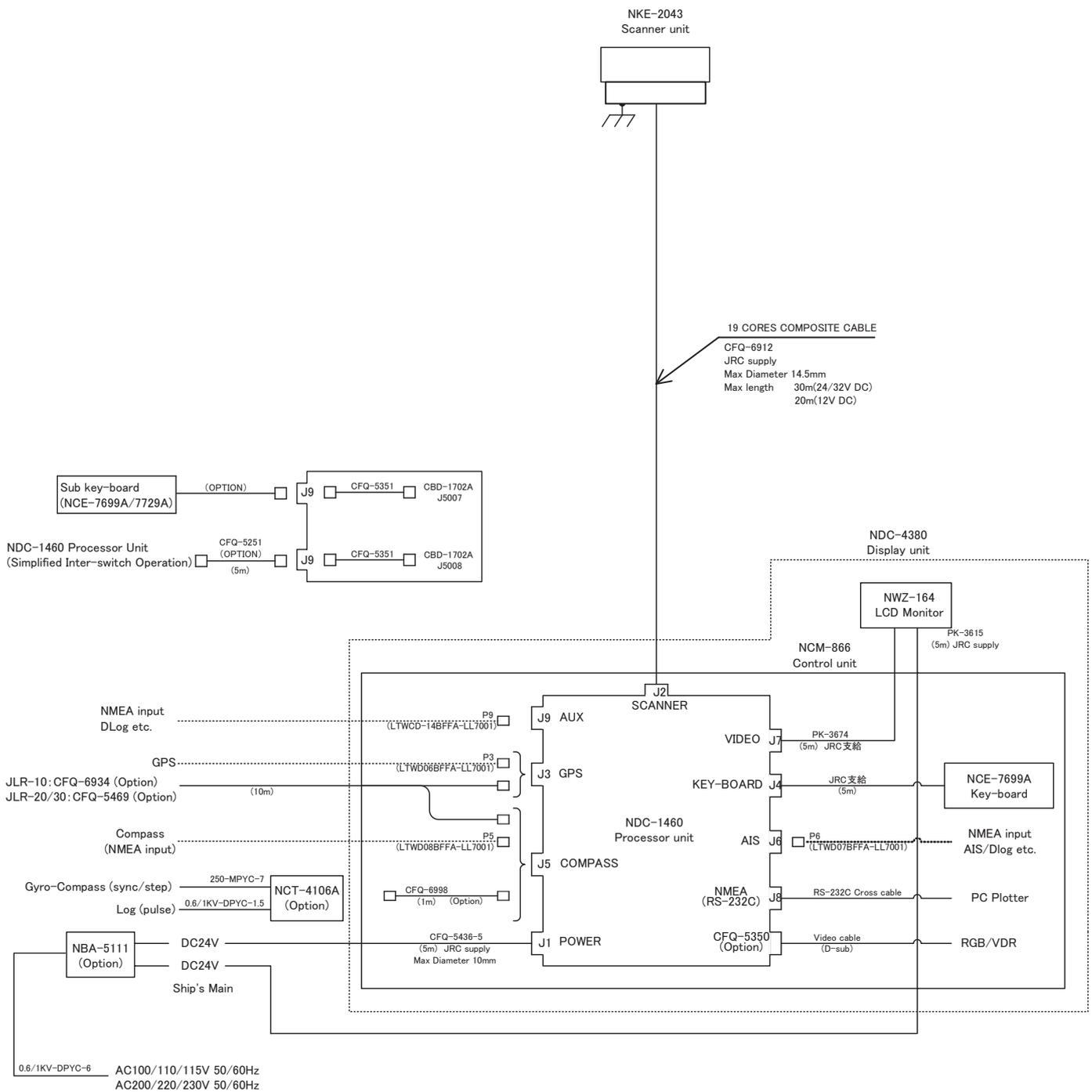


Fig. 1.12 General System Diagram of Radar, Type JMA-5204

Note: Install the radar cable as far as from the cables of other radio equipment in order to prevent other radio equipment from interfering with the radar operations. In particular, do not install the antenna cable parallel to the cables of other radio equipment.

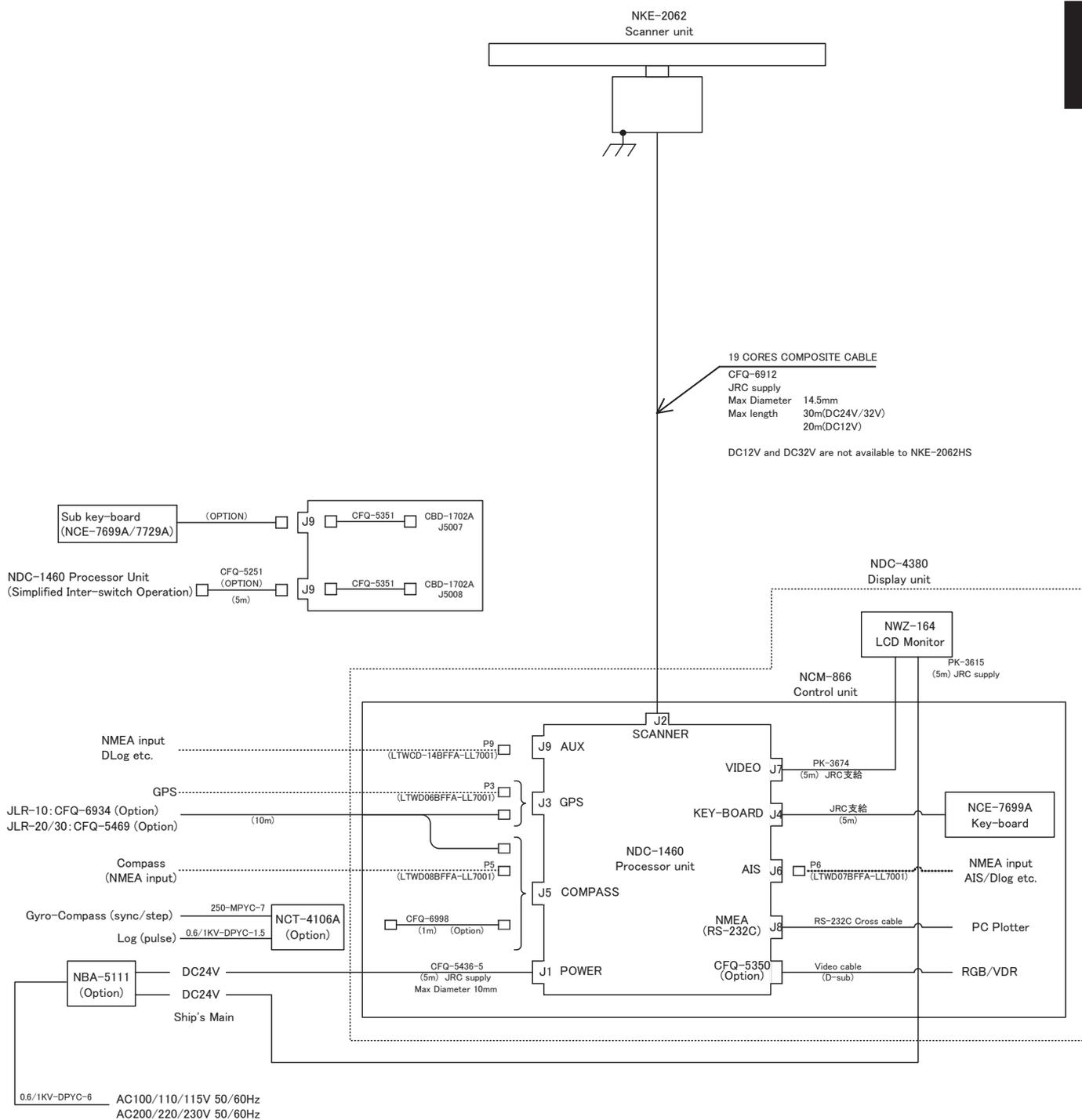


Fig. 1.13 General System Diagram of Radar, Type JMA-5208/HS

Note: Install the radar cable as far as from the cables of other radio equipment in order to prevent other radio equipment from interfering with the radar operations. In particular, do not install the antenna cable parallel to the cables of other radio equipment.

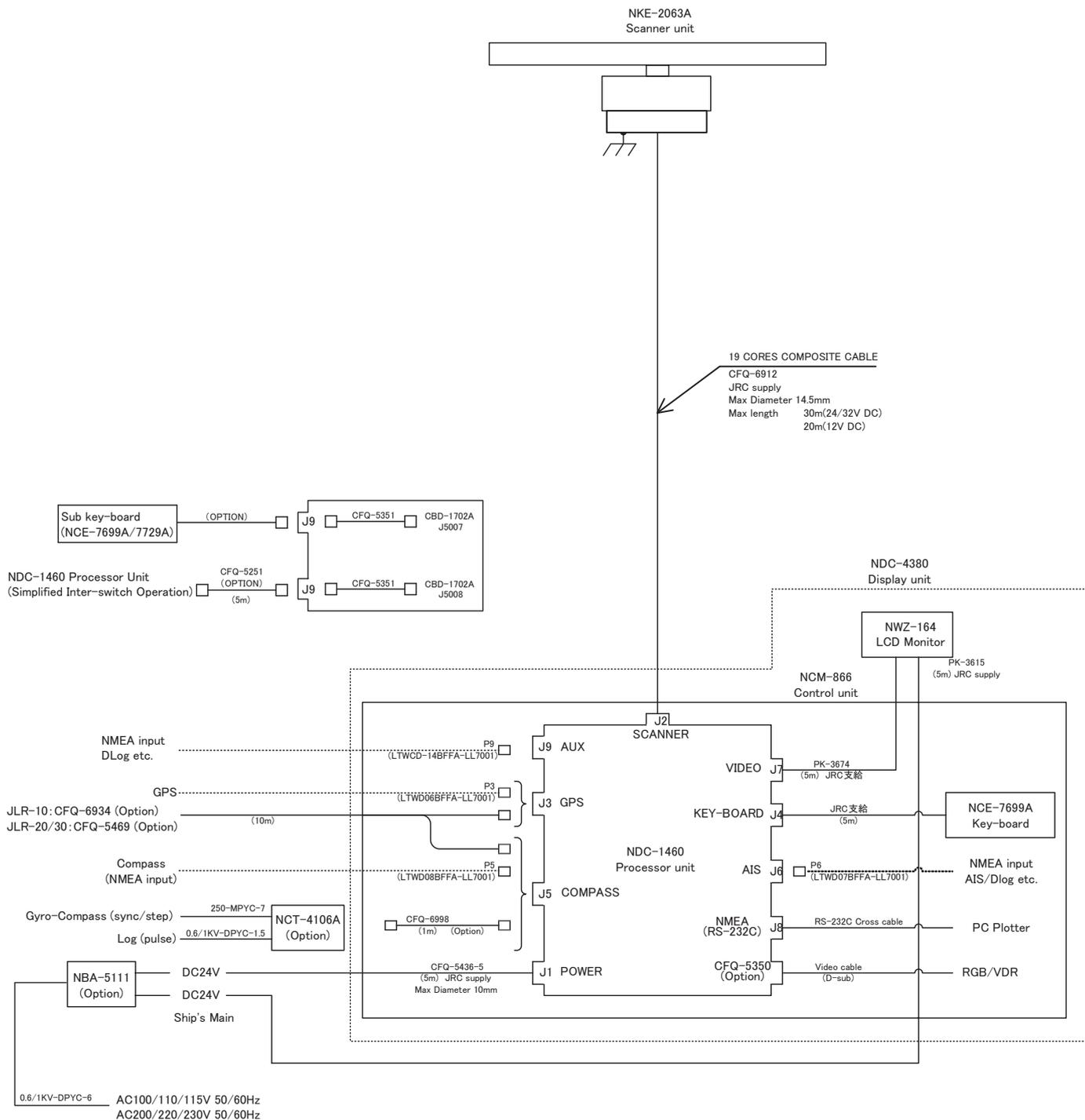


Fig. 1.14 General System Diagram of Radar, Type JMA-5209

Note: Install the radar cable as far as from the cables of other radio equipment in order to prevent other radio equipment from interfering with the radar operations. In particular, do not install the antenna cable parallel to the cables of other radio equipment.

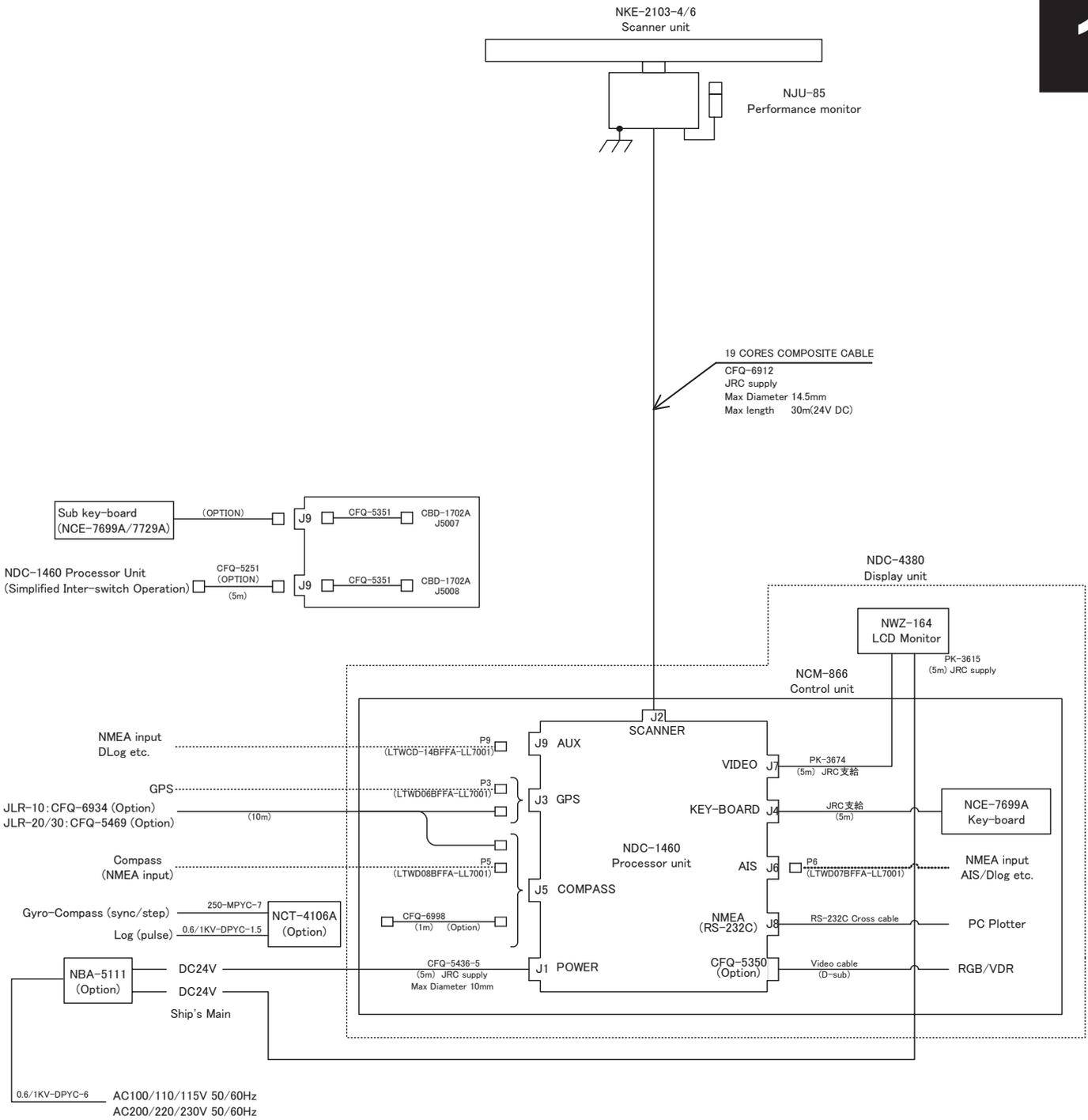


Fig. 1.15 General System Diagram of Radar, Type JMA-5212-4/6/4HS/6HS

Note: Install the radar cable as far as from the cables of other radio equipment in order to prevent other radio equipment from interfering with the radar operations. In particular, do not install the antenna cable parallel to the cables of other radio equipment.

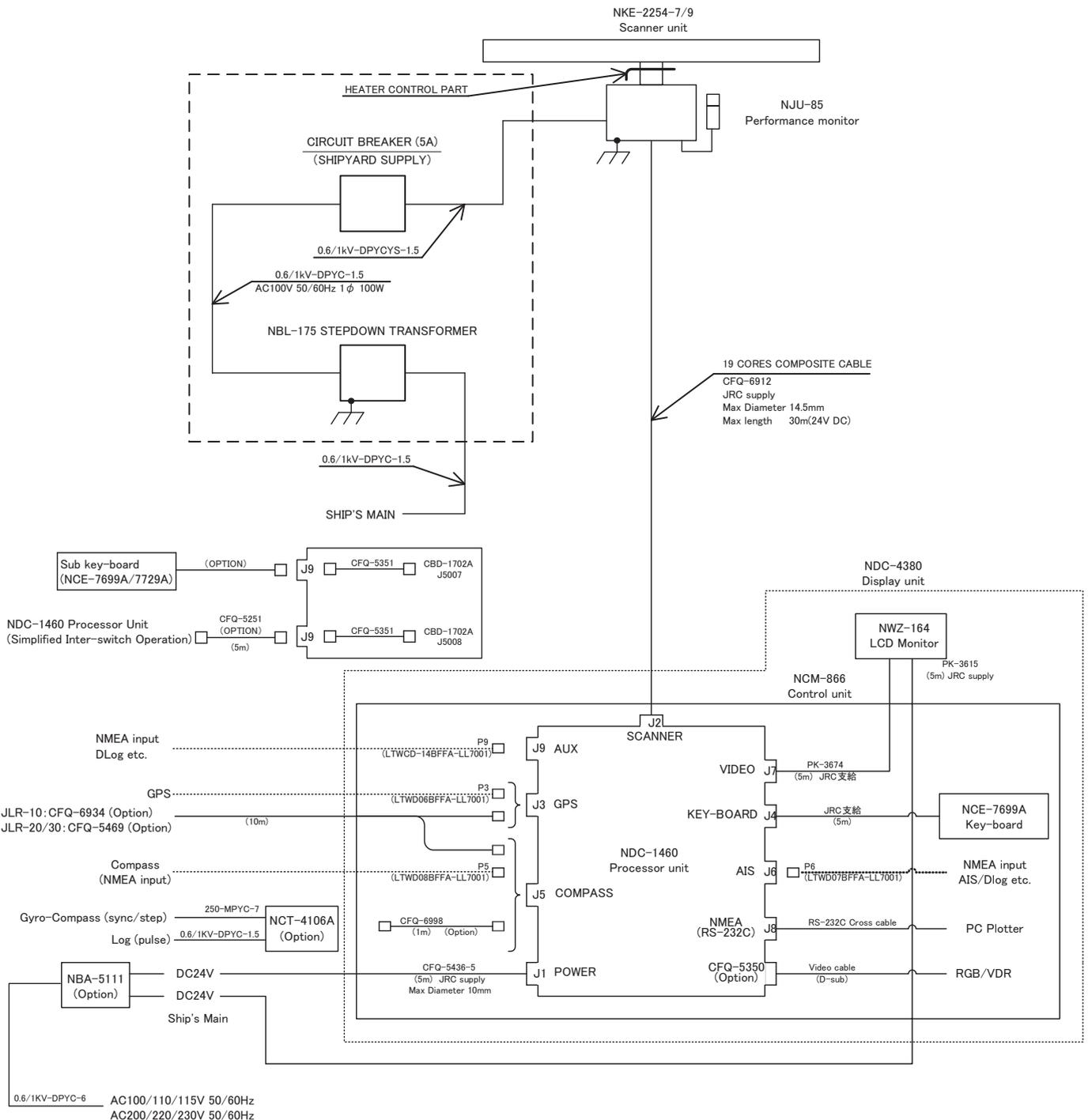
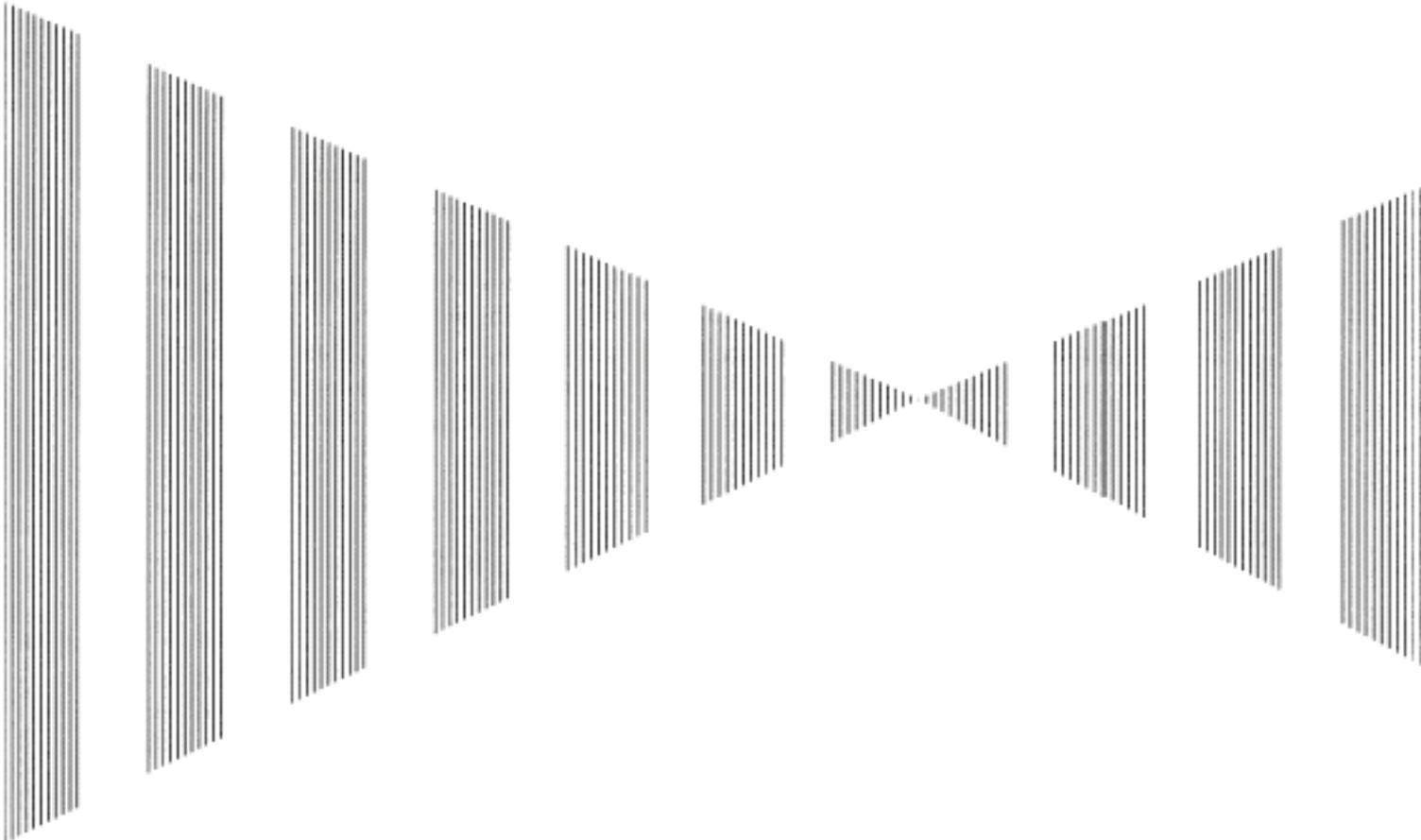


Fig. 1.16 General System Diagram of Radar, Type JMA-5222-7/9

Note: Install the radar cable as far as from the cables of other radio equipment in order to prevent other radio equipment from interfering with the radar operations. In particular, do not install the antenna cable parallel to the cables of other radio equipment.

SECTION 2

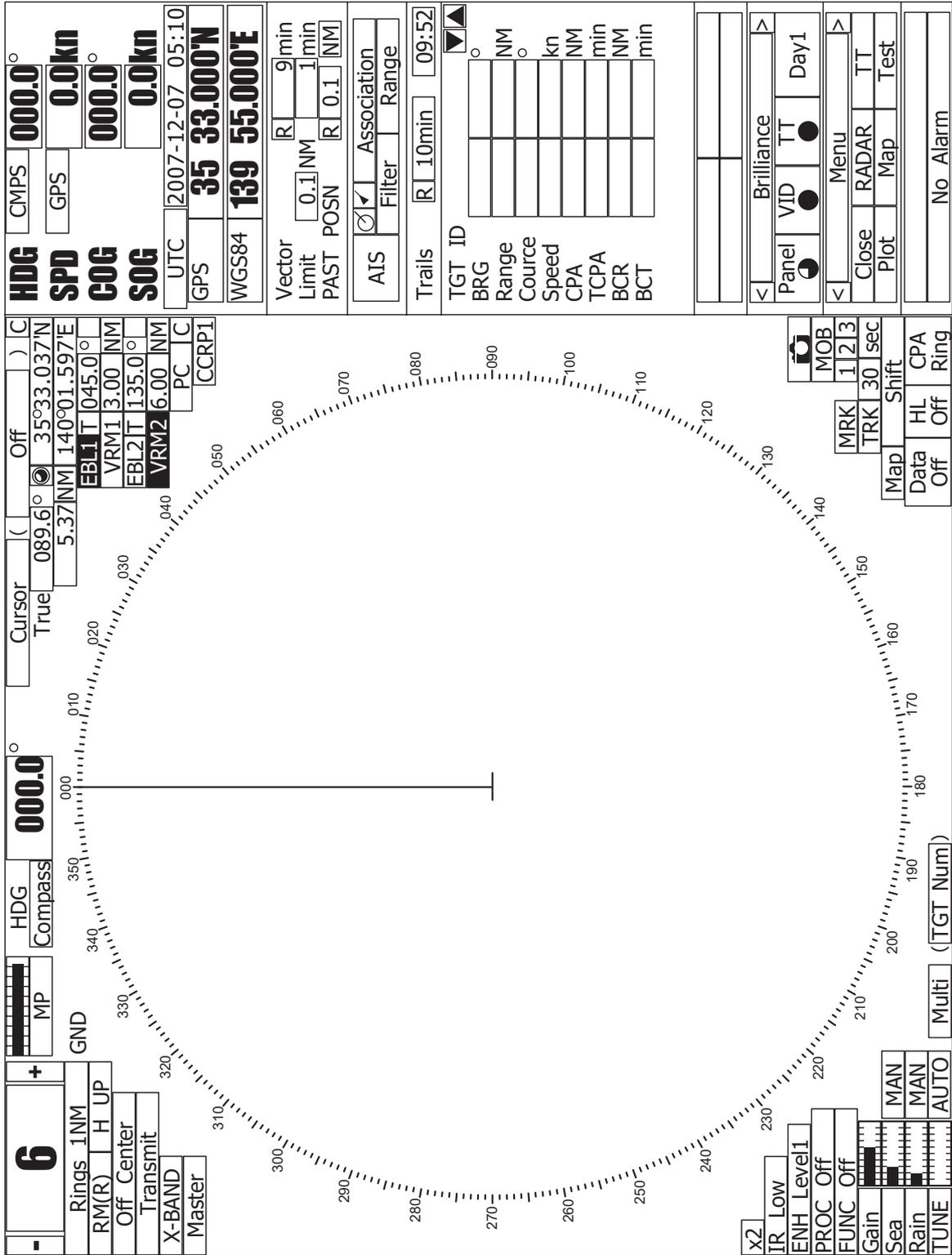
SCREEN DISPLAY AND OPERATION PANEL



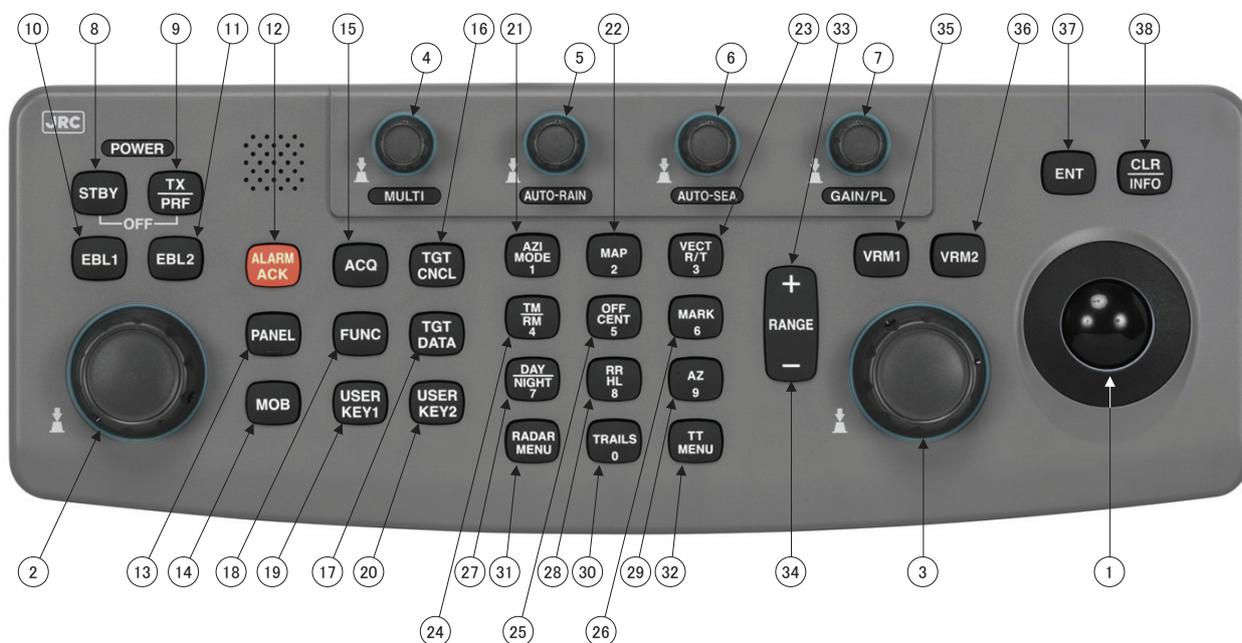
2.1	Example of Display	2-1
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2.1

EXAMPLE OF DISPLAY



2.2 NAMES AND FUNCTIONS OF CONTROL PANEL KEYS



The following page describe name of buttons.

-
- ① **Trackball**
Use this trackball to move the cursor mark to an arbitrary point. The trackball can be used for setting in each mode.
For example, use it to specify the center of a floating EBL or the off-center position.
→For setting cursor, see section 3.9.3.
- ② **[EBL] (Electric Bearing Line) Control**
Rotates the bearing of an EBL.
The selected EBL status switches back and forth between “center fixed” and “floating” each time the control is pressed.
→See section 3.5.2.
- ③ **[VRM] (Variable Range Marker) Control**
Changes the range of a VRM.
→See section 3.5.4.
- ④ **[MULTI] (Multi-function) Control**
Each time you press this control, you can change items registered in the multi-function control function.
An item to switch to is shown put in parentheses in the lower left area of the screen. Give a long press of the control to open the setup screen for registering items. Give a long press of the control button again to close this setup screen.
→See section 3.5.18.
- ⑤ **[AUTO-RAIN] (Rain/Snow Clutter Suppression) Control**
Suppresses the clutter echo from rain or snow.
To heighten a suppressing effect, turn the control clockwise.
The clutter suppression mode switches back and forth between MANUAL and AUTO each time the control is pressed.
→See section 3.4.7.
- ⑥ **[AUTO-SEA] (Sea Clutter Suppression) Control**
Suppresses the clutter echo from the sea surface.
To heighten a suppressing effect, turn the control clockwise.
The clutter suppression mode switches back and forth between MANUAL and AUTO each time the control is pressed.
→See section 3.4.6.
- ⑦ **[GAIN/PL] (Receiving Sensitivity/Pulse Width) Control**
Controls the radar’s receiving sensitivity.
To get higher sensitivity, turn the control clockwise.
To change the transmitter pulse width, press the control.
→For sensitivity, see section 3.4.5.
→For pulse width, see section 3.5.11.
- ⑧ **[STBY] (Standby) Key**
Use this key to change the power-off state to the power-on state, or the transmission state to the standby state.
To turn off the power, press the **[STBY]** key and **[TX/PRF]** key together.
→See section 3.4.2.

- ⑨ **[TX/PRF] (Transmit/Transmitting Repetition Frequency) Key**
 [PREHEAT] at the upper left of the radar display changes to [STANDBY] about three minutes after the power is turned on.
 Then, press this key to start transmission.
 To fine-tune the transmitting repetition frequency, press the key during transmission.
 Use of this function with the interference rejection function heightens an interference suppressing effect.
 →See section 3.4.1.
- ⑩ **[EBL1] (Electric Bearing Line 1) Key**
 Use this key to display and select EBL1.
 Holding down the key for two seconds or more displays the menu for EBL1 setting.
 →See section 3.5.2.
 →For EBL1 setting, see section 3.5.3.
- ⑪ **[EBL2] (Electric Bearing Line 2) Key**
 Use this key to display and select EBL2.
 Holding down the key for two seconds or more displays the menu for EBL2 setting.
 →See section 3.5.2.
 →For EBL2 setting, see section 3.5.3.
- ⑫ **[ALARM ACK] (Alarm Acknowledgment) Key**
 Use this key to acknowledge a failure, target's approach, or collision alarm.
 Press the key to stop an audible alarm.
 If more than one alarm has occurred, the key needs to be pressed the number of times equivalent to the number of alarms.
 →See section 3.3.7.
- ⑬ **[PANEL] (Operation Panel Brilliance) Key**
 Controls the brilliance for the controls and Keys on the operation panel.
 The brilliance changes cyclically each time the key is pressed.
 →See section 3.3.3.
- ⑭ **[MOB] (Marker) Key**
 A marker is set to the latitude and longitude of the own ship's position at the point of pressing this key.
 For example, use the key to store the own ship's position at the moment when somebody falls from the ship.
 Holding down the key for two seconds or more erases the marker.
 →See section 3.5.15.
- ⑮ **[ACQ] (Manual Acquisition) Key**
 Enables the manual TT acquisition mode for the target on which the cursor sits.
 →See section 5.2.1.
- ⑯ **[TGT CNCL] (Tracking Target Cancel) Key**
 Cancels the symbol and vector of a target under tracking, and stops tracking the target.
 Holding down the key for two seconds or more erases all the acquisitions of TT.
 →See section 5.2.2.
- ⑰ **[TGT DATA] (Target Data Setup) Key**
 Use this key to view the numeric data of the TT under tracking or the currently displayed AIS.
 →See section 5.2.3.

⑱ **[FUNC] (Function Call) Key**

Calls predefined signal processing setting when pressed.

The selection changes in the following sequence each time the key is pressed:

Function Off → Function 1 → Function 2 → Function 3 → Function 4 →
Function Off

Holding down the key for two seconds or more displays the function setting menu.

→See section 3.10.

⑲ **[USER KEY1] (User Registration 1) Key**

Directly displays a pre-registered menu position when pressed.

→See section 3.5.19.

⑳ **[USER KEY2] (User Registration 2) Key**

Directly displays a pre-registered menu position when pressed.

→See section 3.5.19.

㉑ **[AZI MODE] [1] (Bearing Mode Select/1) Key**

Selects the North-up (true bearing), Head-up (relative bearing), or Course-up bearing display mode.

This key serves as the numeric key **[1]** during menu operation.

→See section 3.5.7.

㉒ **[MAP] [2] (Map Display/2) Key**

Selects whether to display charts, shorelines or depth contours on the radar map.

This key serves as the numeric key **[2]** during menu operation.

→For displaying charts, see section 3.7.

㉓ **[VECT R/T] [3] (Vector Mode/3) Control**

Selects the TT vector display mode (true/relative).

This key serves as the numeric key **[3]** during menu operation.

→See section 5.1.7.

㉔ **[TM/RM] [4] (True Motion/Relative Motion) Key**

Switches back and forth between the TM display mode and RM display mode.

This key serves as the numeric key **[4]** during menu operation.

→See section 3.5.8.

㉕ **[OFF CENT] [5] (Off Center/5) Key**

Shifts the own ship's position within a desired direction (within 66% of the scope's radius) from the scope's center to expand the display portion.

This key serves as the numeric key **[5]** during menu operation.

→See section 3.5.9.

㉖ **[MARK] [6] (Mark/6) Key**

Displays a mark at an arbitrary position or erases the mark on the display.

This key serves as the numeric key **[6]** during menu operation.

→See section 3.5.16.

㉗ **[DAY/NIGHT] [7] (Day/Night Mode Select/7) Key**

Selects a preset color and brilliance of the display screen.

This key serves as the numeric key **[7]** during menu operation.

→See section 3.3.4.

- ⑳ **[RR/HL] [8] (Fixed Range Marker/Heading Line Off/8) Key**
The ship's HL (heading line) is erased while this key is held down.
The fixed range marker display switches back and forth between display and non-display each time the key is pressed.
This key serves as the numeric key **[8]** during menu operation.
→For displaying Fixed Range Marker, see section 3.4.9
→For Heading Line Off, see section 3.4.10.
- ㉑ **[AZ/9] (Guard Zone/9) Key**
Sets a guard zone on the radar display.
This key serves as the numeric key **[9]** during menu operation.
→See section 3.5.20 and section 3.5.21.
- ㉒ **[TRAILS] [0] (Radar Trails/0) Key**
The radar trails time length is switched each time the key is pressed.
This key serves as the numeric key **[0]** during menu operation.
→See section 3.5.10.
- ㉓ **[RADAR MENU] (Radar Menu) Key**
Displays the radar menu when pressed.
- ㉔ **[TT MENU] (TT Menu) Key**
Displays the TT menu when pressed.
- ㉕ **[RANGE+] (Range Scale +) Key**
Expands the observation range scale when pressed.
→See section 3.4.3.
- ㉖ **[RANGE-] (Range Scale -) Key**
Shrinks the observation range scale when pressed.
→See section 3.4.3.
- ㉗ **[VRM1] (Variable Range Marker 1) Key**
Use this key to display and select VRM1.
Holding down the key for two seconds or more displays the menu for VRM1 setting.
→See section 3.5.4.
- ㉘ **[VRM2] (Variable Range Marker 2) Key**
Use this key to display and select VRM2.
Holding down the key for two seconds or more displays the menu for VRM2 setting.
→See section 3.5.4.
- ㉙ **[ENT] (Enter) Key**
Use this key to determine menu selection or value input.
Pressing the key has the same effect as left-clicking the trackball.
- ㉚ **[CLR/INFO] (Clear/Information) Key**
Use this key to cancel menu selection or value input.
Pressing the key has the same effect as right-clicking the trackball

2.3

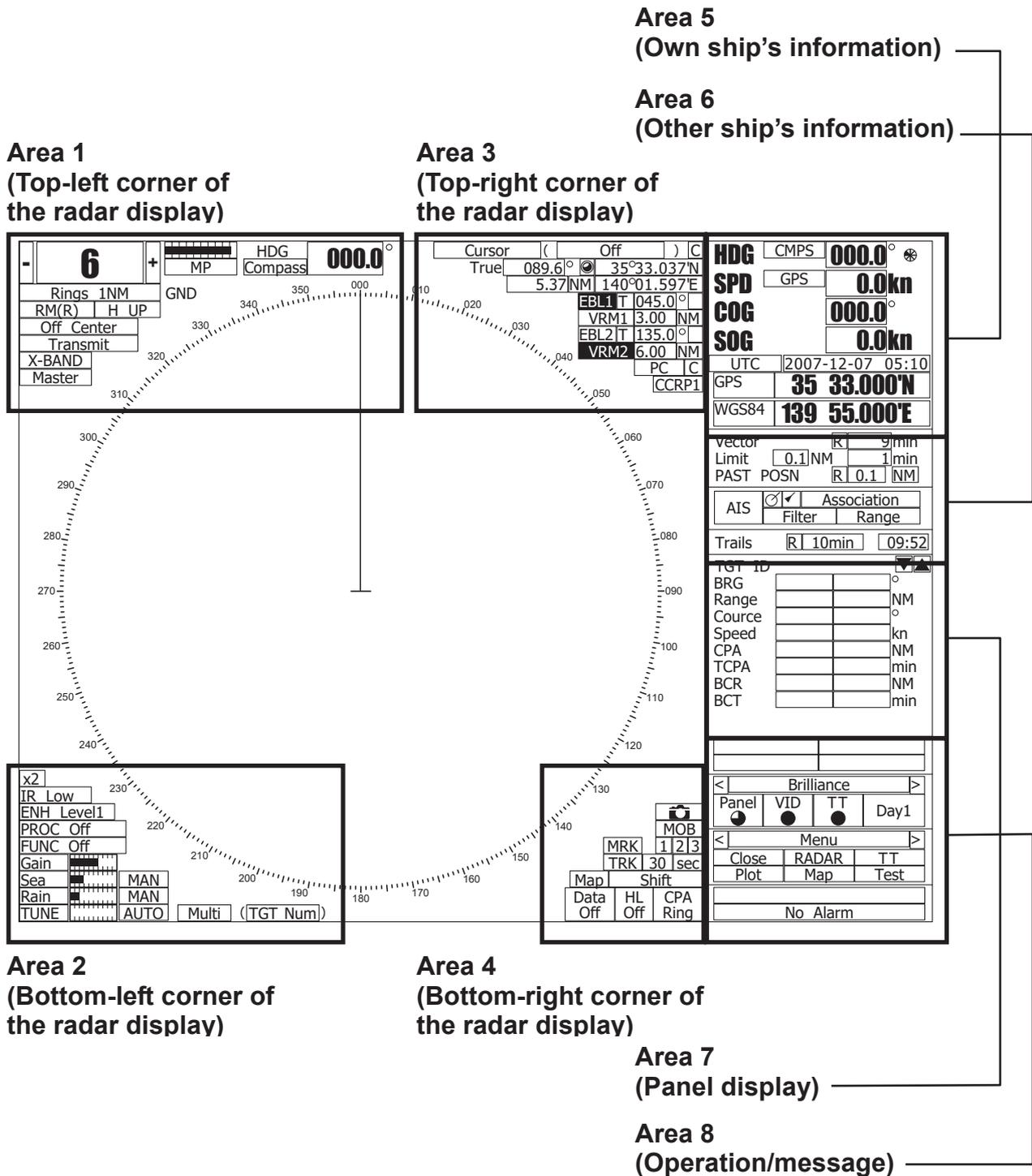
FUNCTIONS OF SOFTWARE BUTTONS

This radar provides the software buttons on the display which can be used to set several important functions directly and swiftly from the display without opening the corresponding menu.

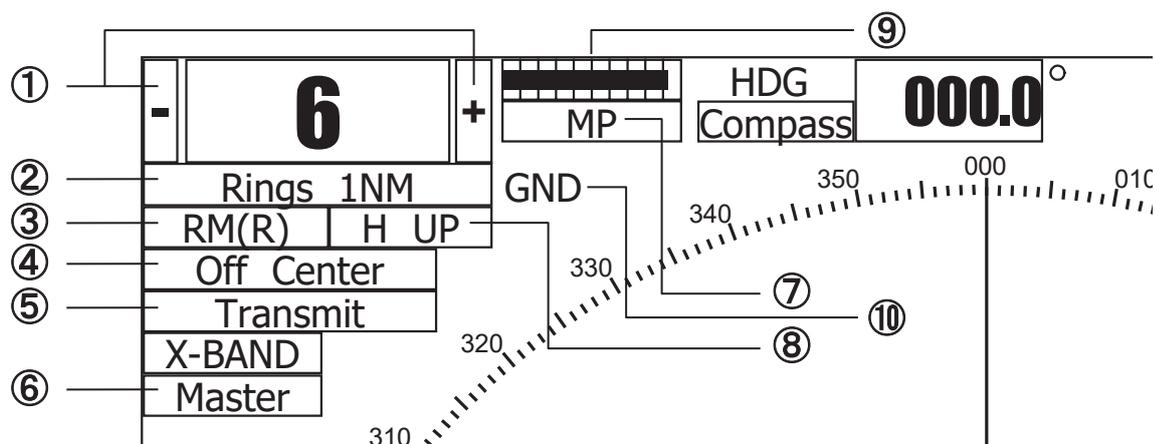
The names of buttons are described on the following pages.

By positioning the arrow cursor to a button in the figure above and then clicking the left button of the trackball, the setting can be changed as shown below.

Note : Latitude and longitude in Area 5 is the value of CCRP.



2.3.1 Software Buttons for Area 1 (Top-Left Corner of the Radar Display)



① : Range scale switching

To increase the observation range scale (maximum 96NM), click and to reduce the range (minimum 0.125NM), click .

② : Range rings display On / Off

The display of range rings are set to On / Off whenever this button is clicked. When the display is set to On, the interval of the fixed range marker is displayed.

③ : Motion mode true / relative switching

The screen motion mode is switched whenever the button is clicked.

(true motion) ⇒ (relative motion)
⇒

indicates that the radar trails is a relative trail.

indicates that the radar trails is a true trail.

④ : Off center switching

If this button is clicked, the cursor is moved, and the [ENT] key is pressed, the ship's position can be moved to the cursor position. The moving range is within 66% of the radius.

If the button is clicked for 2 seconds, the off-center is set to Off and the ship's position is returned to the center of the screen.

⑤ : Transmission / standby switching

At expiration of the pre-heat time after the power is turned on, changes to .

: Indicates a standby state. If this button is clicked in this state, the equipment is set to a transmission state.

: Indicates a transmission state. If this button is clicked in this state, the equipment is set to a standby state.

⑥ : Interswitch connection change

This button is displayed when the interswitch is connected. This button indicates the connection status of the scanner unit that is connected to the indicator.

If the button is clicked in the transmission standby state, the menu for changing the connection state between the scanner unit and the indicator is displayed. The connection state of the scanner unit and indicator cannot be changed unless the master indicator is in a standby state.

→ Refer to the Interswitch (Optional) Instruction Manual that is attached for the setting method. This button is not displayed if the interswitch is not connected.

⑦ : Transmission pulse length switching

The transmission pulse length is switched whenever this button is clicked. Three types of pulses are available, short pulse (SP), middle pulse (MP), and long pulse (LP). The pulse length and repetition frequency vary even for the same short pulse, according to the range that is used and it is displayed as , .

⑧ : Azimuth display mode switching

The azimuth display is switched whenever this button is clicked.

(Head Up) ⇒ (North Up) ⇒

(Course Up) ⇒

If the button is clicked for 2 seconds, the GYTO Setting menu is displayed.

⑨ : Tuning state gauge

The tuning state is indicated.

Increased gauge means better tuning, and high quality images will be displayed.

⑩ : Stabilization mode display

Sea : Stabilization with respect to the water

GND : Stabilization with respect to the ground

About ground and sea stabilization

• Speed sensor source is , ,

If Set/Drift Setting menu is on :

GND (Ground stabilization)

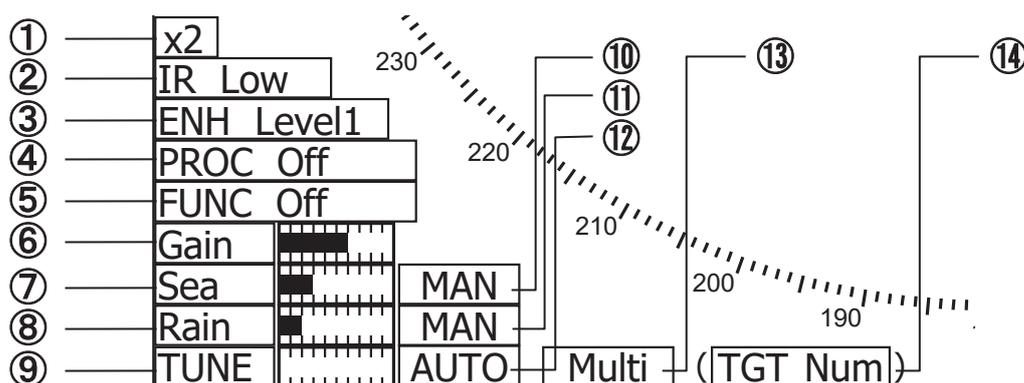
If Set/Drift Setting menu is off :

Sea (Sea stabilization)

• Speed sensor source is , :

GND (Ground stabilization)

2.3.2 Software Buttons for Area 2 (Bottom-Left Corner of the Radar Display)



① : Double zoom switching

Use this function to enlarge to double the size the display screen of the position specified by the cursor. If this button is clicked, the zoom mode is set. When the cursor is moved to the radar screen and the [ENT] key is pressed, the screen is enlarged to double the size so that the middle of the cursor and the own ship's position is set to the center of the screen. This function cannot be used when the range is 0.125NM.

② : Interference rejection (IR) mode switching

The interference rejection mode is switched whenever this button is clicked.

IR Off ⇒ IR Low ⇒ IR Medium ⇒ IR High ⇒ IR Off

③ : Target enhance (ENH) mode switching

The target enhance mode is switched whenever this button is clicked.

ENH Off ⇒ ENH Level1 ⇒ ENH Level2 ⇒ ENH Level3 ⇒ ENH Off

④ : Radar video processing (PROC) mode switching

The radar video processing mode is switched whenever this button is clicked.

PROC Off ⇒ 3Scan COREL ⇒ 4Scan COREL ⇒ 5Scan COREL ⇒ Remain ⇒ Peak Hold ⇒ PROC Off

⑤ : Function (FUNC) mode switching

The function mode is switched whenever this button is clicked.

FUNC Off ⇒ Coast ⇒ Deep Sea ⇒ Fishnet ⇒ Storm ⇒ FUNC Off

If the button is clicked for 2 seconds, the function registration menu (User Function Setting) is opened.

⑥, ⑦, ⑧, and ⑨ : Gain, Sea clutter suppression (Sea), Rain / snow clutter suppression (Rain), Tune adjustment

Adjust the gain, sea clutter suppression, rain and snow clutter suppression and tune using the track ball.

If the button is clicked on, the adjustment value is shown at the upper-right of the cursor. Make adjustments by moving the track ball to the left and right. Determine the adjustment by pressing the [ENT] key.

⑩, ⑪, and ⑫ : Sea clutter suppression (Sea) mode, Rain / snow clutter suppression (Rain) mode, and Tune mode switching

Use these functions to switch to the manual or automatic mode of sea clutter suppression, rain / snow clutter suppression and tune. The bar on the left side indicates the position of the dial.

The mode is switched to [MAN] (manual) / [AUTO] (automatic) whenever the button is clicked. If rain / snow clutter suppression is switched to an automatic mode, sea clutter suppression is switched to an automatic mode also.

⑬ : Multi-dial mode switching

The function that is registered in the multi-dial is switched whenever the button is clicked.

Vector ⇒ Trails ⇒ TGT No. ⇒
Course ⇒ Track ⇒ Mark ⇒
⇒ Tune ⇒ Vector

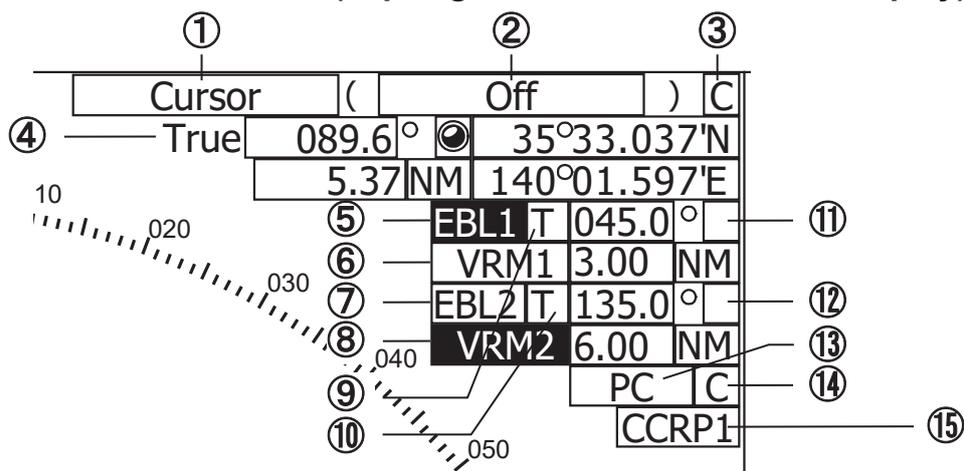
The switched function is displayed in ().

If the button is clicked for 2 seconds, the Multi Dial Setting menu is opened. If this button is clicked again for 2 seconds, this setting menu is closed.

⑭ : Multi-dial mode

The currently selected multi-dial mode described in ⑬ is displayed.

2.3.3 Software Buttons for Area 3 (Top-Right Corner of the Radar Display)



① : Cursor mode switching

The mode of the function that uses the cursor is switched whenever this button is pressed.

AUTO ⇒ ACQ TT ⇒ ACT AIS ⇒
 TGT DATA ⇒ CNCL TT ⇒
 DEACT AIS ⇒ CNCL Data ⇒
 (Mark) ⇒ (Line) ⇒
 Property ⇒ AUTO

② : Cursor mode: mark font / line pattern switching

The currently selected cursor mode is indicated. When the cursor is in the mark or line mode, use this button to change the mark font pattern or line pattern. If this button is clicked while the cursor mode is (mark) or (line), the mark font / line pattern is changed.

③ : Mark color / line color switching

This function switches a mark color / line color. If this button is clicked while the cursor mode is (mark) or (line), the mark color / line color is changed.

④ : Cursor bearing numeric value display true / relative switching

The bearing numeric value display T (true bearing) / R (relative bearing) of the cursor is switched whenever this button is clicked.

⑤, ⑥, ⑦, and ⑧ : EBL1 / 2 and VRM1 / 2 adjustment

These functions set the EBL1, VRM1, EBL2, and VRM2 displays to On / Off and acquire the operation right.

If the button is clicked on, the operation right is acquired. Make adjustments by moving the track ball to the left and right. Determine the adjustment by pressing the [ENT] key.

⑨ and ⑩ : EBL1, EBL2 numeric value true / relative switching

The EBL1 / 2 bearing numeric value display T (true bearing) / R (relative bearing) is switched whenever the button is clicked.

If the button is clicked for 2 seconds, the EBL / Cursor Setting menu is displayed.

⑪ and ⑫ : EBL1 / EBL2 starting point mode switching

The EBL starting point is set to CCRP or any position on the radar screen whenever this button is clicked.

⇒ C ⇒ D ⇒

: Center :The starting point is fixed to the CCRP position.

C : Screen Fix :The starting point is set to the cursor position. If the [ENT] key is pressed subsequently, the starting position is fixed to the cursor position.

D : L/L Fix :The starting point is set to the cursor position. If [ENT] key is pressed subsequently, the starting position is fixed to the latitude / longitude of the cursor. (Connection of a navigator is necessary.)

If the starting point is moved outside of the screen, the operation is reset automatically and the starting point returns to the CCRP position.

* D is enabled only when a navigator is connected.

⑬ : Parallel index line setting

This function sets the parallel index line display to On / Off and acquires the operation right.

If this button is clicked, the operation right is acquired and the menu is opened. After setting, determine the setting by pressing the [ENT] key.

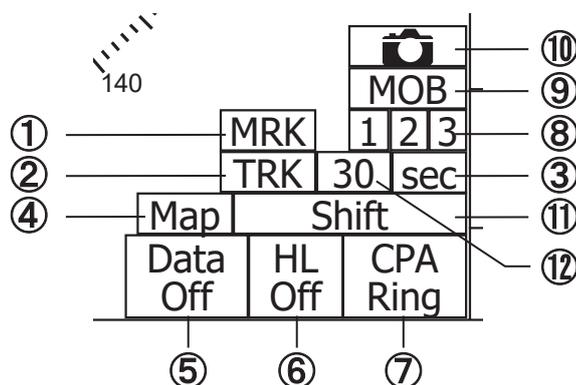
⑭ : Parallel index line starting point mode switching

The parallel index line starting point is set to CCRP or any position on the radar screen whenever this button is clicked.

In the same way as for the EBL starting point, three options are available, : Center, C : Screen Fix, and D : L/L Fix.

⑮ Consistent Common Reference Point (CCRP)

2.3.4 Software Buttons for Area 4 (Bottom-Right Corner of the Radar Display)



① : Mark color switching

The color of the mark is switched whenever this button is clicked.

If the button is clicked for 2 seconds, the Mark Setting menu is opened.

② : Own ship's track interval switching

The own ship's track interval is switched whenever this button is clicked.

③ : Own ship's track interval unit switching

The unit of the own ship's track interval is switched whenever this button is clicked.

⇒ ⇒ ⇒

④ : Map display On / Off

The map display is set to On / Off whenever this button is clicked.

Map information must be inserted in the card slot of the radar process unit in advance.

If the button is clicked for 2 seconds, the Map Setting menu is opened.

⑤ : Graphic display Off

While the button is clicked, the graphic display other than VRM, EBL, HL, a cursor, and range rings on the radar screen is cleared temporarily.

⑥ : Ship's heading line Off

The ship's heading line (HL) display is set to Off while this button is clicked.

Since the ship's heading line is cleared while the button is clicked, the target in the ship's heading bearing can be clearly seen.

⑦ : CPA ring display On / Off

The CPA ring display is switched to On / Off whenever the button is clicked.

When the target vector display mode is (true vector), the CPA ring cannot be set to On.

⑧ : Event mark input

When the event mark button is pressed, an event mark is displayed on the current location of the own ship.

To delete the event mark, set the cursor to the mark mode, move the cursor to the event mark, and press the Delete / Information key.

⑨ : Marker

Press the Marker button to place a marker at the current lat/long coordinates of the own ship.

The marker function is used to quickly memorize the location of the own ship when for example someone falls from the ship. The marker will be deleted when the button is held down for 2 seconds.

⑩ : Screenshot function

When this button is pressed, an image of the current screen can be saved as a bitmap data in the memory card.

Note: The system becomes slower while the screenshot function is in use.

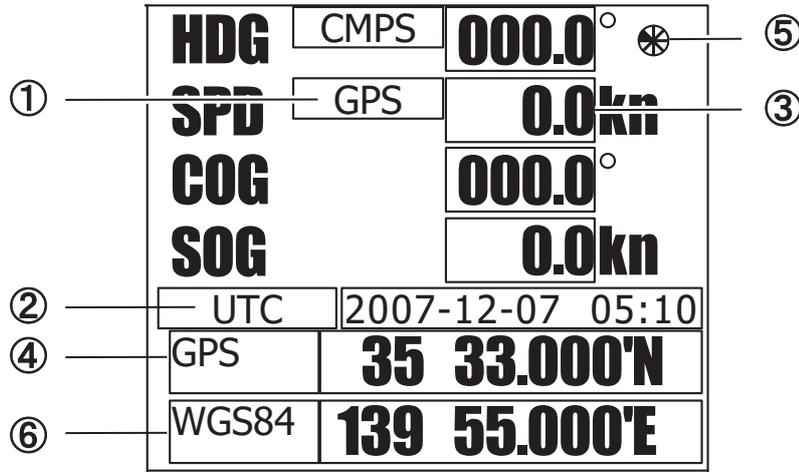
⑪ : Map location correction On / Off

Map location correction is activated or deactivated every time this button is pressed.

⑫ : Memory intervals for own ship's track display

Selects track data memory intervals for own ship. The setting changes each time the button is pressed.

2.3.5 Software Buttons for Area 5 (Own Ship Information Area) (Right Side of the Radar Display)



① : Speed sensor switching

The speed sensor is switched whenever the button is clicked.

MAN (Manual) ⇒ LOG (Single-axis log) ⇒
 2AXW (Double-axes to water) ⇒
 2AXG (Double-axes to ground) ⇒
 GPS ⇒ MAN

If you selected the 2AXW, the value of forward-backward direction is indicated.

If ships in shallow water, when the accuracy of the dual-axis log may be decreased.

If ships in deep sea area, when the accuracy of the dual-axis log error may be occurred.

The accuracy of GPS's COG is $\pm 3^\circ$ when own ships speed no fewer than 1kn, no more than 17kn. The accuracy of GPS's COG is $\pm 1^\circ$ when own ships speed over 17kn.

② : Time display mode switching

The time display mode UTC (universal time clock) / LMT (local mean time) is switched whenever this button is clicked.

③ : Manual own ship's speed setting

When selection of the speed sensor is set to MAN, enter the own ship's speed manually.

If this button is clicked, the numeric value input screen is opened. After setting a value, determine the entry by clicking ENT.

④ : Positioning system (example: GPS, DGPS)

Displays the type of the position fixing equipment that contains the own ship's information.

LRNA : LORAN A
 LRNC : LORAN C
 GPS : GPS
 DGPS : DGPS (SBAS also included)
 JG : JRC format (G)
 JC : JRC format (C)
 JN : JRC format (N)
 JZ : JRC format (Z)
 MAN : MANUAL

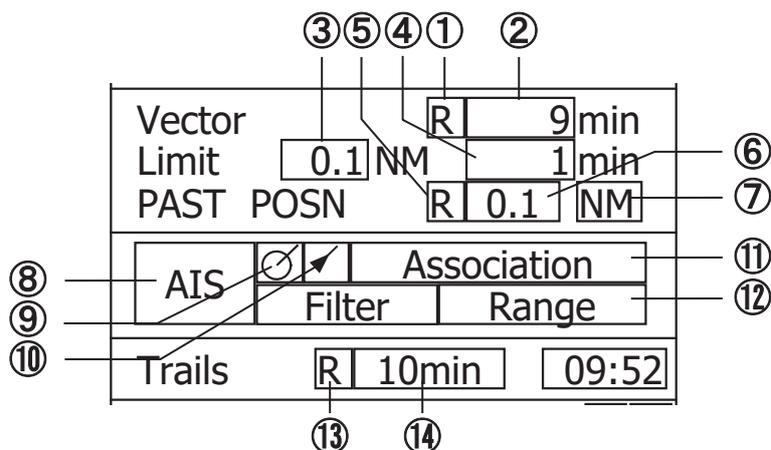
⑤ : When a picture freeze occurs, the turn of this symbol stops.

⑥ : Geodetic System

The geodetic system used with the position fixing system is displayed.

The display items on the Geodetic System List screen in 3.8.5 "Set and Display Geodetic System" are displayed.

2.3.6 Software Buttons for Area 6 (Other Ship Information Area) (Right Side of the Radar Display)



① : Target vector display true / relative switching

The tracked target / AIS target vector display is switched to T (true vector) / R (relative vector) whenever this button is clicked.

This setting is switched together with the past position display true / relative switching.

② : Target vector length setting

Set a vector length of the tracked target / AIS target.

If this button is clicked, the numeric value input screen is opened. After setting the length, determine the setting by clicking .

③ : CPA limit setting

Set a CPA limit.

If this button is clicked, the numeric value input screen is opened. After setting the limit, determine the setting by clicking .

④ : TCPA limit setting

Set a TCPA limit.

If this button is clicked, the numeric value input screen is opened. After setting the limit, determine the setting by clicking .

⑤ : Past position display true / relative switching

The tracked target / AIS target past position display is switched to T (true past position) / R (relative past position) whenever the button is clicked.

This setting is switched together with the target vector display true / relative switching.

⑥ : Past position display interval switching

The past position display interval is switched whenever the button is clicked.

⑦ : Past position display interval unit switching

The past position display interval unit is switched whenever the button is clicked.

⇒ ⇒

⑧ : AIS On / Off

The AIS display is switched to On / Off whenever the button is clicked.

⑨ : Tracked target symbol display On / Off

The tracked target symbol display is switched to On / Off whenever the button is clicked. Use this function to avoid confusion with the AIS symbol.

⑩ : AIS target symbol display On / Off

The AIS target symbol display is switched to On / Off whenever the button is clicked. Use this function to avoid confusion with the tracked target symbol.

⑪ : Association On / Off

The tracked target / AIS target association is switched to On / Off whenever the button is clicked.

⑫ : AIS filter mode switching

The AIS filter is switched whenever the button is clicked.

⇒ ⇒ ⇒

⑬ : Radar trails display true / relative switching

Radar trails are switched to T (true motion trail) / R (relative motion trail) whenever this button is clicked.

This setting is restricted by the radar display motion mode.

In relative motion display mode (RM), switching to T / R is possible.

In true motion display mode (TM), only T can be set.

⑭ : Radar trails display time switching

The radar trails display time is switched whenever the button is clicked.

If the time does not reach the radar trails time that was set, the remaining time is displayed on the right-hand side.

If the button is clicked for 2 seconds, the RADAR Trails Setting menu is opened.

2.3.7 Software Buttons for Area 7 (Panel Display Area) (Right Side of the Radar Display)

AIS ID		◀▼▲▶
DEST		
<input type="text"/>		
ETA	<input type="text"/>	
POSN	<input type="text"/>	
<input type="text"/>		
EPFS		
<input type="text"/>		
RAIM	<input type="text"/>	
POSN Accuracy	<input type="text"/>	

AIS ID		◀▼▲▶
BRG	<input type="text"/>	°
Range	<input type="text"/>	NM
COG	<input type="text"/>	°
SOG	<input type="text"/>	kn
CPA	<input type="text"/>	NM
TCPA	<input type="text"/>	min
HDG	<input type="text"/>	°
ROT	<input type="text"/>	°/min

AIS ID		◀▼▲▶
Name		
<input type="text"/>		
Call SIGN	<input type="text"/>	
MMSI	<input type="text"/>	
IMO Number	<input type="text"/>	
NAV Status	<input type="text"/>	
<input type="text"/>		

AIS ID		◀▼▲▶
AtoN Real/Virtual	<input type="text"/>	
AtoN Type		
<input type="text"/>		

AIS target information

Information of the selected AIS target can be shown in numerical values.
 Only one ship can be selected as an AIS target.
 4-page AIS target information is provided.

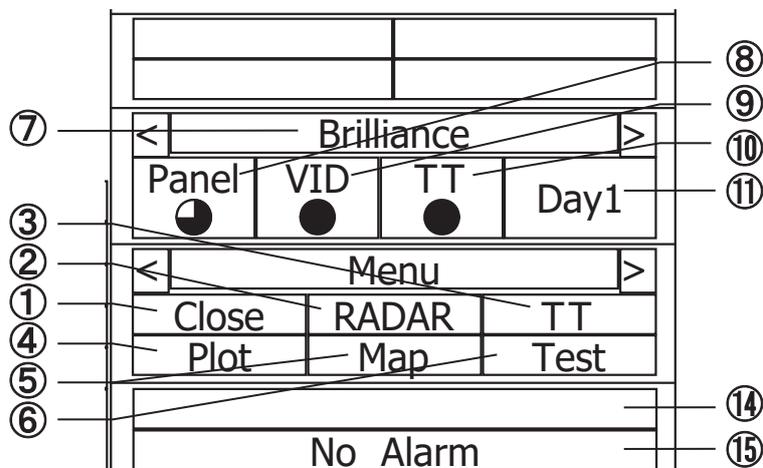
2.3.8 Software Buttons for Area 7 (Panel Display Area) (Right Side of the Radar Display)

TT ID			▼▲
BRG			○
Range			NM
Course			○
Speed			kn
CPA			NM
TCPA			min
BCR			NM
BCT			min
BCR			NM
BCT			min

Tracked target information

Information of the selected tracked target can be shown in numerical values.
Two ships can be selected as tracked targets.

2.3.9 Software Buttons for Area 8 (Operation and Message Area) (Right Side of the Radar Display)



① : Exit button

Click this button to exit the menu screen.

② : Main menu / Radar menu

Single-click this button to call up Main Menu.
Double-click this button to call up Radar Menu.

③ : TT menu (target menu)

Click this button to call up TT Menu.

④ : Plotter menu

Click this button to call up Plot (Plotter) Menu.

⑤ : Map menu

Click this button to call up Map Setting.

⑥ : Test menu

Click this button to call up Test Menu.

⑦ : Screen switch

Click this button to switch the screen between the brilliance adjustment screen and the screen information setting screen.

⑧ : Panel brightness setting

Brightness of the operation panel can be changed.
Click this button to adjust brightness. It can be set in 5 levels.

⑨ : Radar image brightness setting

Brightness of the radar image (echo) can be adjusted.
Click this button to change brightness. It can be set in 4 levels.

⑩ : Tracked target / AIS target brightness setting

Brightness of the tracked target / AIS target can be adjusted.

Click this button to adjust brightness. It can be set in 5 levels.

⑪ : Day/Night mode switch

Click this button to change the day/night mode in the following order:

Day1 ⇒ Day2 ⇒ Dusk ⇒ Night ⇒ Day1

⑫ : User map menu

Click this button to call up a menu screen for loading a map created by a user.

⑬ : User setting menu

Click this button to call up a menu screen for loading the user setting.

⑭ : Alarm display

Click this button to stop the alarm buzzer and the flashing of the alarm display.

When multiple alarms go off simultaneously, the alarm that must be acknowledged first is indicated.

The top line shows an alarm to be acknowledged by clicking.

The bottom line shows the current alarms one by one.

⑮ : Alarm indication

The system alarm indicated in red.

Other information indicated in blue or yellow.



SECTION 3

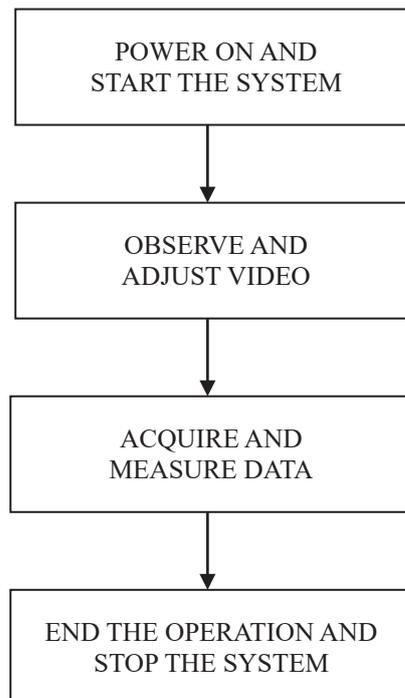
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3.1 FLOW OPERATION

Attention

- Do not put anything on the operation panel.
If you put anything hot on it, it may be deformed.
- Do not give any impact to the operation panel,
trackball, or controls.
Otherwise, any failure or damage may result.



Each operation is described in detail below.

3.1.1 Power ON and Start the System

Caution



A malfunction may occur if the power in the ship is instantaneously interrupted during operation of the radar. In this case, the power should be turned on again.

3

Attention

- Wait for about 2 seconds before turning on the power again.
- Immediately after the radar is installed, at start of the system after it has not been used for a long time, or after the magnetron is replaced, preheat the equipment in the standby state for 20 to 30 minutes before setting it into the transmit state.
- If the preheating time is short, the magnetron causes sparks, resulting in its unstable oscillation. Start transmission on a short-pulse range and change the range to the longer pulse ranges in turn. If the transmission is unstable in the meantime, immediately place the system back into the standby state and maintain it in the standby state for 5 to 10 minutes before restarting the operation. Repeat these steps until the operation is stabilized.

Procedure

- 1 Check that the ship's mains are turned on.
- 2 Press [STBY] key.

The system is turned on, and the preheating time is displayed. **PREHEAT** is indicated at the upper left of the radar display.

- 3 Wait until the preheating time is over.

When the preheating time is over, the preheating time screen disappears, and **PREHEAT** at the upper left of the radar display changes to **STANDBY**.

- 4 Press [TX/PRF] key.

The radar will start transmission and the antenna will start rotating. **STANDBY** at the upper left of the radar display changes to **TRANSMIT**.

Note: The radar does not start transmission if you press [TX/PRF] key while **PREHEAT** is indicated.

3.1.2 Observe and Adjust Video

Procedure

- 1 Press [RANGE+] key or [RANGE-] key to set the range to the scale required for target observation.
- 2 Turn the controls [AUTO-GAIN], [AUTO-SEA], and [RAIN] to obtain the clearest targets.

Refer to
[GAIN]→Section 3.4.5 “Control Sensitivity [GAIN/PL]”
[SEA]→Section 3.4.6 “Suppress Sea Clutter [AUTO-SEA]”
[RAIN]→Section 3.4.7 “Suppress Rain/Snow Clutter [AUTO-RAIN]”
for how to use each control.

3.1.3 Acquire and Measure Data

For details on data acquisition and measurement, refer to Section 3.4 “BASIC OPERATIONS” and Section 4 “MEASUREMENT OF RANGE AND BEARING.”

3.1.4 Display and Measure with Reference to CCRP

The radar video, range, bearing, Target Tracking and AIS data display etc... are displayed with reference to CCRP (Consistent Common Reference Point).

If scanner is switched, these data are measured from CCRP.

If some kind of functions (for example off center, true motion, bearing scale, etc.) set scanner position to 75% outside of the PPI range, these data except Target Tracking and AIS data are displayed with reference to scanner position.

For how to setting CCRP, refer to Section 7.1.6 “Setting of CCRP/Antenna/GPS Antenna Position (CCRP Setting).”

3.1.5 End the Operation and Stop the System

Exit

- 1 Press [STBY] key.

The radar will stop transmission and the antenna will stop rotating.

TRANSMIT at the upper left of the radar display changes to **STANDBY**.

(Maintain the standby state if radar observation is restarted in a relatively short time.
Only pressing the [TX/PRF] key starts observation.)

- 2 Press the [STBY] key and the [TX/PRF] key together.

The system will be turned off.

Warning



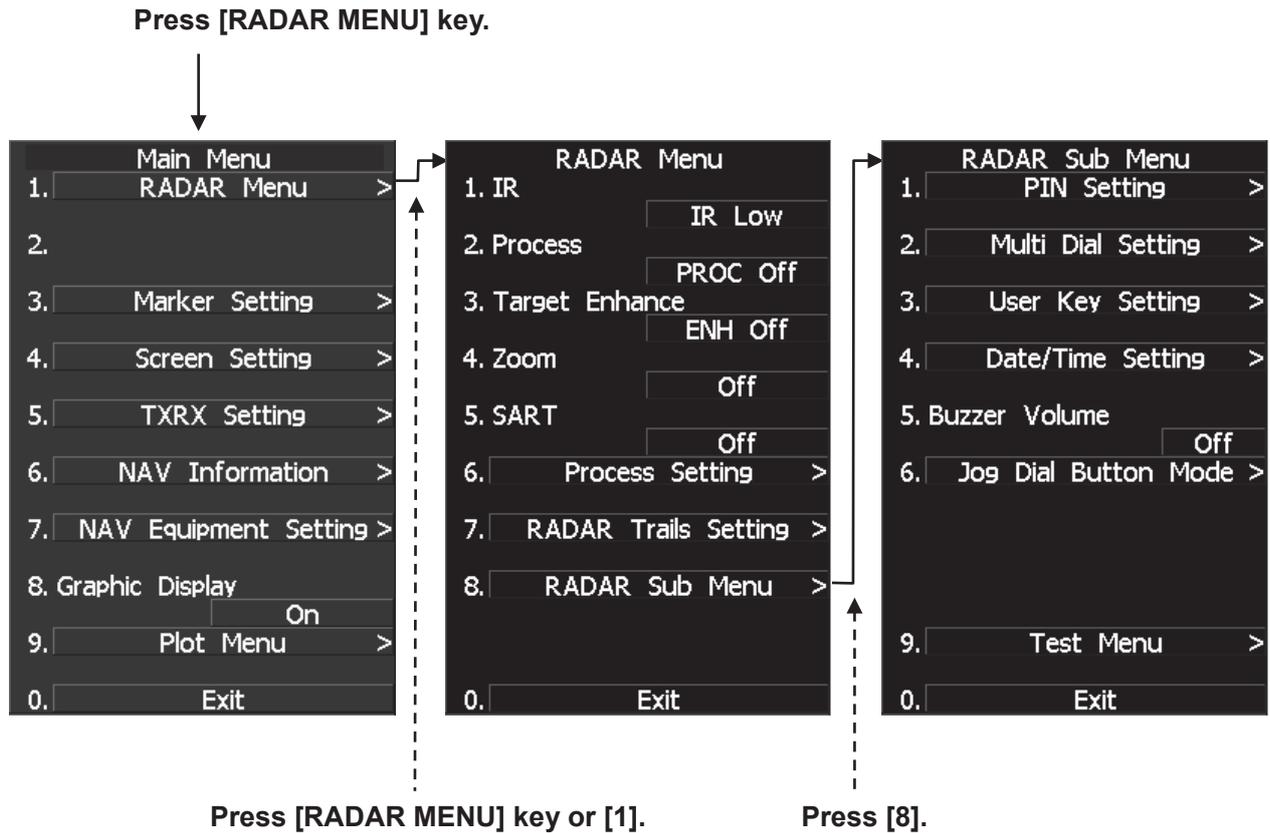
When conducting maintenance work, make sure to turn off the power and unplug the power connector J1 of the radar process unit so that the power supply to the equipment is completely cut off.

Some equipment components can carry electrical current even after the power switch is turned off, and conducting maintenance work without unplugging the power connector may result in electrocution, equipment failure, or accidents.

3.2 MENU COMPOSITION

The Menu system of this radar equipment consists of the main menu and the submenus up to the lower 2 levels. You can jump to each menu by pressing the menu button at the lower right of the radar display or the switch on the operation panel.

3.2.1 Overview of Menu Structure



Use the RADAR Menu to change the settings of signal processing functions, use the Main Menu to change the settings of other detailed information, and use the Radar Submenus to change the less frequently used settings or run the system's self-diagnostic program.

3.2.2 Basic Menu Operation

To open the menu:

Press [RADAR MENU] key.

To close the menu:

Press [RADAR MENU] key.

Alternatively, hold down [0] key until the menu closes.

* Software button ② located at the operation/message area in Section 2.3.9 also available to switch between ON and OFF.

To move to a lower level of the menu:

The menu is in hierarchical structure. Press the numeric keys [1]-[9] corresponding to the desired menu item number. Control will move to the lower level.

Alternatively, place the cursor over the item and then press [ENT] key.

is shown at the right end of a menu item having a lower level.

To move to a higher level of the menu:

Press [0] key while the menu is open. Control will return to the higher level from the lower level.

Alternatively, place the cursor over the item and then press [ENT] key.

To determine an item:

Press the numeric keys [1]-[9] corresponding to the desired item number. The selected item will be displayed. Alternatively, place the cursor over the item you want to change, and then press [ENT] key.

To determine the selected item:

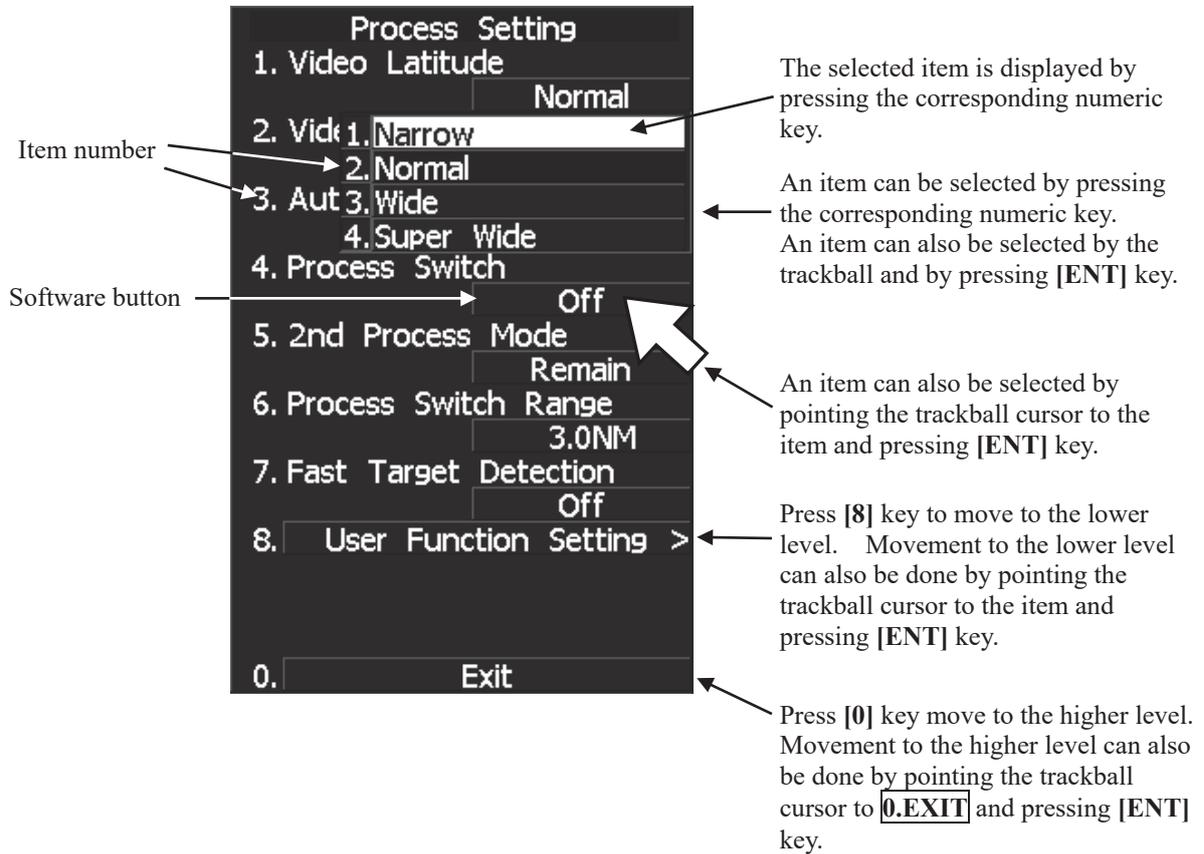
Press the numeric keys [1]-[9] corresponding to the selected item number. Alternatively, place the cursor over the selected item and then press [ENT] key. If you do not change the setting of the selected item, press [CLR/INFO] key.

Menu Operation with the Trackball

The menu items are software buttons that can be operated with the trackball.

An item can be selected by pointing the trackball cursor to the item and pressing [ENT] key, instead of using the numeric key.

Example of menu display



3.3 PREPARATION

3.3.1 Adjust Display Brilliance [BRILL]

Procedure

- 1 Obtain the best-to-see display with optimum brilliance by turning the [BRILL] control at the lower right of the display unit.

Turning the [BRILL] control clockwise increases the brilliance of the entire display. Conversely, turning the [BRILL] control counterclockwise decreases the brilliance of the entire display.

In consideration of the ambient brightness, adjust display brilliance that is high enough to easily observe the radar display but does not glare.

3.3.2 Adjust Contrast

Adjust the contrast of the radar video display.

Procedure

- 1 Point the trackball to the **VID** button (software button ⑨ located at the operation/message area in Section 2.3.9) at the lower right of the radar display, press [ENT] key, and then make adjustment to obtain the best-to-see video.

Point the trackball to the **VID** button at the lower right of the radar display and then press [ENT] key to adjust the contrast of the radar video display at four levels. Each time the **VID** button is clicked, the contrast level changes in the following sequence: 

Adjust the **VID** button to obtain the best-to-see video with optimum contrast.

3.3.3 Adjust Operation Panel Brilliance [PANEL]

Brilliance of the operational panel can be adjusted in accordance with the ambient illuminance conditions.

Procedure

1 Press [PANEL] key to adjust the brilliance of the operation panel light.

Brilliance increases as the [PANEL] key is pressed. When it reaches the highest level, it returns to the lowest level.

In consideration of the ambient brightness, adjust panel brilliance that is high enough to read the characters on the operation panel but does not glare.

The [PANEL] key lamp lights up irrespective of panel brilliance adjustment.

* Software button ⑧ located at the operation/message area in Section 2.3.9 is also available for switching.

3

3.3.4 Switch Day/Night Mode [DAY/NIGHT]

Display color arrangement can be easily changed using combinations of colors and brilliance in accordance with the ambient illuminance conditions.

The day/night mode changes in the following sequence each time the [DAY/NIGHT] key is pressed:

[DAY1] → [DAY2] → [DUSK] → [NIGHT] → [DUSK] → [DAY2] → [DAY1] → [DAY2]

The current mode is indicated at the lower right of the radar display.

The brilliance level in accordance with the selected mode is saved. For brilliance adjustment, refer to next page. For day/night mode switching, refer to Section 3.3.8 “Set Display Color.”

* Software button ⑩ located at the operation/message area in Section 2.3.9 is also available for switching.

3.3.5 Adjust Brilliance of Information on Radar Display (Brilliance Setting)

Brilliance can be adjusted for each item of information on the radar display by operating the menu.

RADAR Video	Adjusts the brilliance of radar echoes.
RADAR Trails	Adjusts the brilliance of radar trails.
TT/AIS	Adjusts the brilliance of TT symbols and AIS symbols.
FIX Marker	Adjusts the brilliance of fixed range markers.
EBL/VRM	Adjusts the brilliance of variable range markers (VRM1 and VRM2) and electronic bearing lines (EBL1 and EBL2).
Character	Adjusts the brilliance of characters.
Panel	Adjusts the brilliance of operation panel.
Own Ship	Adjusts the brilliance of the own ship symbol.

Procedure

- 1 Press [RADAR MENU] key.

Press [4] key.

Press [2] key.

The Brilliance Setting Menu will appear.

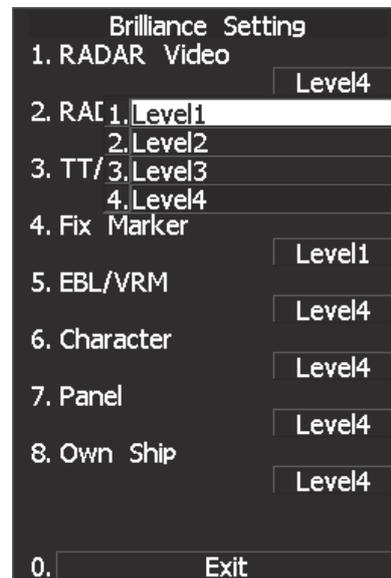
- 2 Select the item for which brilliance is to be adjusted, pressing the numeric keys [1] to [8].

The pull-down menu will appear showing the brilliance levels.

- 3 Select the brilliance level number to be set, pressing the numeric key.

The selected brilliance level will be set.

To change the setting of another item, repeat steps 2 and 3.



Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

Note: The brilliance levels set here are saved in accordance with the day/night mode.

3.3.6 Adjust Sound Volume (Buzzer Volume)

When an alarm goes off, the operation panel of the equipment produces a sound to notify users of state changes. Adjust the sound volume as follows:

Procedure

- 1 Press [RADAR MENU] key twice.

Press [8] key.

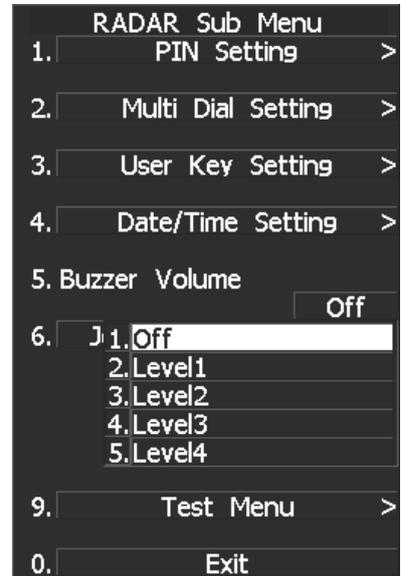
The RADAR Sub Menu will appear.

- 2 Press [5] key to select Buzzer Volume.

The pull-down menu will appear showing the volume levels.

- 3 Select the volume level number to be set, pressing the numeric keys [1] to [5].

The selected volume level will be set.



Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

3.3.7 Reset Alarm Buzzer [ALARM ACK]

When an audible alarm is issued, use ALARM ACK to acknowledge the alarm information, stop the alarm buzzing, and stop the alarm lamp flashing. (If more than one alarm has occurred, press the switch for each alarm indication.) The alarm stops buzzing, but the alarm indication does not disappear.

Procedure

- 1 Press [ALARM ACK] key.

The alarm will stop buzzing.

* Software button  located at the operation/message area in Section 2.3.9 is also available to stop buzzing the alarm.

3.3.8 Set Display Color

For each day/night mode, set the colors of the background outside the bearing scale, the background inside the bearing scale, characters, radar echoes, and radar trails.

Color Adjustment by Menu Operation

Day/Night	Registers the switching of a day/night mode.
Own Ship	Adjust the colors of the ship's heading marker, own ship symbol, and a vector of the own ship.
Outer PPI	Adjusts the background color outside the bearing scale.
Inner PPI	Adjusts the background color inside the bearing scale.
Character	Adjusts the colors of characters and bearing scales.
RADAR Echo	Adjusts the colors of radar echoes.
RADAR Trails	Adjusts the colors of radar trails.
Time: Display interval time is selected.	
All: Continuous display	
TT/AIS	Adjusts the colors of TT symbols, AIS symbols.

Selecting a Day/Night Mode (Day/Night)

Select the mode for which color setting is to be changed.

Procedure

- 1 Press [RADAR MENU] key.**

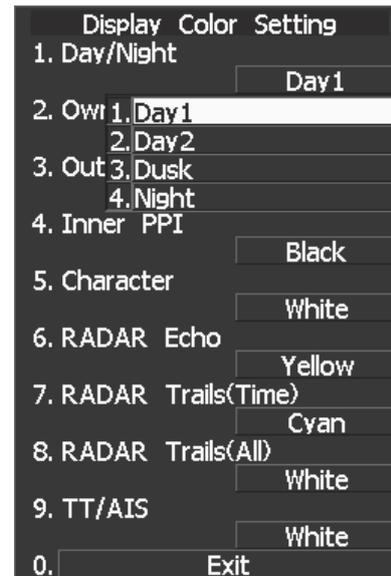
Press [4] key.

Press [1] key.

The Display Color Setting Menu will appear.
- 2 Press [1] key.**

The Day/Night mode selection screen will appear.
- 3 Select the mode number for color adjustment, pressing the numeric keys [1] to [4].**

The mode will be selected.



Setting Colors of Items

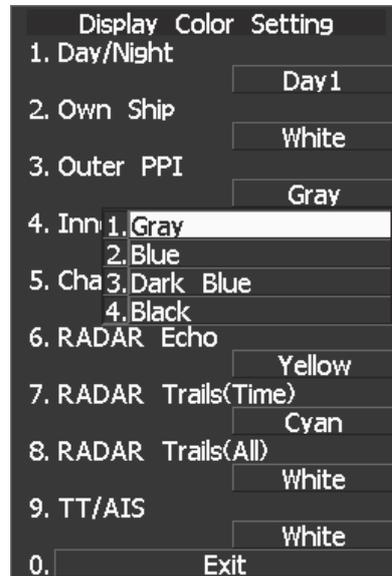
Set the display color of each item.

Procedure

- 1 While the Display Color Setting Menu is open, select the item number for color setting, pressing the numeric keys [3] to [9].

The color selection screen will appear.

- | | |
|---------------------|--|
| 2. Own Ship: | Adjust the colors of the ship's heading marker, own ship symbol, and a vector of the own ship. |
| 3. Outer PPI: | Adjusts the background color outside the bearing scale. |
| 4. Inner PPI: | Adjusts the background color inside the bearing scale. |
| 5. Character: | Adjusts the colors of characters and bearing scales. |
| 6. RADAR Echo: | Adjusts the colors of radar echoes. |
| 7. 8. RADAR Trails: | Adjusts the colors of radar trails. |
| Time: | Display interval time is selected. |
| All: | Continuous display |
| 9. TT/AIS: | Adjusts the colors of TT, and AIS. |



3

- 2 Select the color number to be set, pressing the numeric key.

The selected color will be set.

To set more than one color, repeat steps 1 and 2.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

3.4 BASIC OPERATIONS

3.4.1 Start Transmission [TX/PRF]

Procedure

- 1 Press [TX/PRF] key.

The radar will start transmission and the antenna will start rotating.
The indication **STANDBY** at the upper left of the radar display changes to **TRANSMIT**.

Note: The radar does not start transmission if you press [TX/PRF] key while **PREHEAT** is indicated.

3.4.2 Stop Transmission [STBY]

Procedure

- 1 Press [STBY] key.

The radar will stop transmission and the antenna will stop rotating.
The indication **TRANSMIT** at the upper left of the radar display changes to **STANDBY**.

* Software button ⑤ located at the top left corner of the radar display described in Section 2.3.1 is also available to start/stop transmission.

3.4.3 Change Range (Observation Range Scale) [RANGE+/-]

Procedure

- 1 Press the [RANGE +] key to expand the observation range.

A larger observation range allows observation of a wider area.
However, objects are shown smaller as the range expands, and objects near own ship are less likely to be detected. Therefore, use a lower-level observation range to observe the area around own ship.

- 2 Press the [RANGE -] key to reduce the observation range.

Area around own ship can be observed in detail as the observation range is reduced.
Note, however, distant images cannot be displayed.

* Software button ① located at the top left corner of the radar display described in Section 2.3.1 is also available to switch the range.

3.4.4 Tune

 <h1 style="font-size: 2em; margin: 0;">Caution</h1>	
	<p>Always use the automatic tuning mode.</p> <p>Use the manual tuning mode only when the automatic tuning mode does not provide the best tuning state due to deterioration of magnetron for example.</p>

There are automatic tuning mode and manual tuning mode. In the automatic tuning mode, transmission and receiving frequencies are tuned and adjusted automatically. In the manual tuning mode, tuning is carried out using the dial on the operation panel. The currently selected mode is indicated on the tune mode button (software button ⑫) located at the bottom left corner of the radar display described in Section 2.3.2).

Using the automatic tuning mode

Procedure

- 1 Move the cursor to the Tune mode button (software button ⑫) located at the bottom left corner of the radar display described in Section 2.3.2) and press the [ENT] key.

Automatic tuning mode is activated, and AUTO is displayed on the Tune mode button. The equipment carries out tuning automatically. Tuning is adjusted when transmission starts, the observation range is changed, or when the pulse width is changed. Tuning takes only a few seconds.

Using the manual tuning mode

Procedure

- 1 Move the cursor to the Tune mode button (software button ⑫) located at the bottom left corner of the radar display described in Section 2.3.2), press the [ENT] key, and set the mode to the manual tuning mode.

Automatic tuning mode is cancelled, and MAN is displayed on the Tune mode button.

- 2 Turn the [MULTI] dial to set the dial mode to (Tune).

The multi-dial mode button (⑭) located at the bottom left corner of the radar display described in Section 2.3.2) shows (Tune).

- 3 Turn the [MULTI] dial to adjust tuning.

Turn the dial until the tuning state gauge (⑨) located at the top left corner of the radar display described in Section 2.3.1) reaches maximum.

3.4.5 Control Sensitivity [GAIN/PL]



Caution



If sensitivity is set too high, unnecessary signals such as noises in the receiver and false echoes increase to lower target visibility.

At the same time, if sensitivity is set too low, detection of targets such as ships and dangerous objects may be hindered.

Therefore, sensitivity must always be set to an optimal level.

Procedure

- 1 Control noise on the radar display by turning the [GAIN/PL] control until targets can be easily observed.

Turning [GAIN/PL] control clockwise increases sensitivity.

Turning [GAIN/PL] control counterclockwise decreases sensitivity.

Turning the [GAIN/PL] control clockwise increases receiving sensitivity and extends the radar observation range. If the sensitivity is too high, the receiver noise increases reducing the contrast between the targets and the background video. As a result, the targets become obscure on the radar display.

To observe densely crowded targets or short-range targets, turn the [GAIN/PL] control counterclockwise to reduce the sensitivity so that the targets are easy to observe. However, be careful not to overlook important small targets.

3.4.6 Suppress Sea Clutter [AUTO-SEA]

Caution



When using the [AUTO SEA] function, never set the suppression level too high canceling out all image noises from the sea surface at close range.

Detection of not only echoes from waves but also targets such as other ships or dangerous objects will become inhibited.

When using the [AUTO SEA] function, make sure to choose the most appropriate image noise suppression level.

3

When using the manual sea clutter suppression function

Procedure

- 1 Control the sea clutter returns on the radar display by turning the [AUTO-SEA] control until targets can be easily observed.

Turning [AUTO-SEA] control clockwise suppresses sea clutter returns.

Turning [AUTO-SEA] control counterclockwise intensifies sea clutter returns.

The sea clutter suppression function suppresses sea clutter returns by decreasing the receiving sensitivity on a short range.

Turning the [AUTO-SEA] control clockwise heightens the effect of sea clutter suppression.

However, be careful that excessive suppression causes low signal-strength targets such as buoys and boats to disappear from the radar display.

Using AUTO SEA (automatic sea clutter suppression function)

Sea clutter suppression can be performed in accordance with the level of sea clutter. Use this function when the clutter level changes with the direction.

Procedure

- 1 Press the [AUTO-SEA] control.

AUTO SEA is selected, and SEA AUTO is indicated at the lower left of the radar display. If AUTO SEA is selected, rotating the AUTO RAIN control and AUTO SEA control can make fine adjustments manually.

Note: When AUTO SEA is selected, AUTO RAIN is switched to the manual mode. AUTO SEA and AUTO RAIN cannot be selected at the same time. Use the AUTO RAIN mode to set both the AUTO SEA and AUTO RAIN to automatic mode simultaneously.

Cancellation**1 Press the [AUTO-SEA] control.**

AUTO SEA is deselected, SEA at the lower left of the radar display changes to SEA , and AUTO SEA is cancelled.

* Software button ⑩ located at the bottom left corner of the radar display described in Section 2.3.2 is also available to switch AUTO/MANUAL.

3.4.7 Suppress Rain/Snow Clutter [AUTO-RAIN]



Caution



When using the [AUTO RAIN] function, never set the suppression level too high canceling out all image noises from the rain or snow at the close range.

Detection of not only echoes from the rain or snow but also targets such as other ships or dangerous objects will become inhibited.

When using the [AUTO RAIN] function, make sure to choose the most appropriate image noise suppression level.

3

When using the manual rain/snow clutter suppression function

Procedure

- 1 Control the rain/snow clutter returns on the radar display by turning the [AUTO-RAIN] control until targets can be easily observed.

Turning [AUTO-RAIN] control clockwise suppresses rain/snow clutter returns.

Turning [AUTO-RAIN] control counterclockwise intensifies rain/snow clutter returns.

When the [AUTO-RAIN] control is turned clockwise, the rain/snow clutter suppression function suppresses rain/snow clutter returns and gets targets hidden by rain/snow clutter returns to appear on the radar display. However, be careful that excessive suppression may cause small targets to be overlooked. Since the rain/snow clutter suppression function also has the effect of suppressing sea clutter, the suppression efficiency improves when the [AUTO-RAIN] control is used with the [AUTO-SEA] control. In general, turn the [AUTO-RAIN] control fully to the left.

Using AUTO RAIN (automatic rain/snow clutter suppression function):

Rain/snow clutter suppression can be performed in accordance with the level of rain/snow clutter. Use this function when the clutter level changes with the direction.

Procedure

- 1 Press the [AUTO-RAIN] control.

AUTO RAIN is selected, and RAIN AUTO is indicated at the lower left of the radar display. Rotating the AUTO RAIN control and AUTO SEA control can make fine adjustments manually.

Note: When AUTO RAIN is selected, AUTO SEA is switched to the manual mode. AUTO SEA and AUTO RAIN cannot be selected at the same time. Use the AUTO RAIN mode to set both the AUTO SEA and AUTO RAIN to automatic mode simultaneously.

Cancellation**1 Press the [AUTO-RAIN] control.**

AUTO RAIN is deselected, RAIN at the lower left of the radar display changes to RAIN , and AUTO RAIN is cancelled.

* Software button ⑪ located at the bottom left corner of the radar display described in Section 2.3.2 is also available to switch AUTO/MANUAL.

3.4.8 Reject Radar Interference [IR]

Use this function to eliminate interference waves from other radars.

Attention

- **When viewing a radar beacon or SART signal, select IR OFF (Interference Rejector OFF) because IR processing suppresses the video.**

3

Procedure

- 1 Press [RADAR MENU] key twice.

Radar Menu will appear.

- 2 Press [1] key.

The IR Menu will appear.

- 3 Select the level number to be set, pressing the numeric keys [1] to [4].

The selected level will be set.

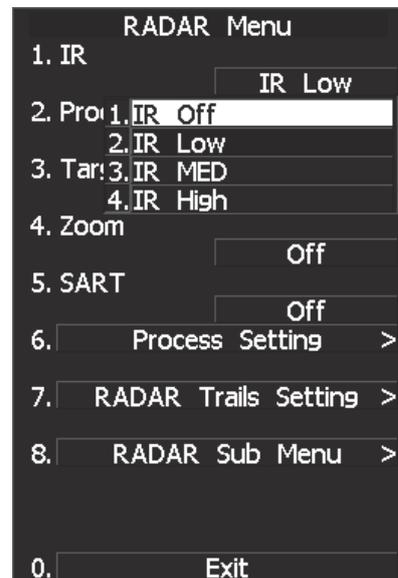
Rejection levels of the interference rejector

IR OFF: Interference rejector off

IR LOW: Interference rejection level - low

IR MEDIUM: Interference rejection level - moderate

IR HIGH: Interference rejection level - high



When a high interference rejection level is selected, the radar's ability of detecting small targets such as buoys and small boats lowers.

In general, [IR LOW] should be selected.

* Software button ① located at the bottom left corner of the radar display described in Section 2.3.2 is also available to switch IR settings.

3.4.9 Hide/Display Range Rings (RINGS)

Procedure

- 1 Press [RR/HL] key.

The range rings display switches back and forth between display and non-display each time [RR/HL] key is pressed.

The scale unit is shown on the Range rings display On / Off button (software button ② located at the top left corner of the radar display described in Section 2.3.1).

Assess the distance to the target based on the location of the target on the range ring scale. Refer to Section 3.3.5 “Adjust Brilliance of Information on Radar Display (Brilliance Setting)” for how to change the brilliance of range rings.

* Software button ② located at the top left corner of the radar display described in Section 2.3.1 is also available to switch between ON and OFF.

3.4.10 Hide Ship’s Heading Line (HL OFF)

Procedure

- 1 Hold down [RR/HL] key.

The ship’s heading line is hidden while [RR/HL] key is held down.

The ship’s heading line (HL) that presents the course of own ship is always shown on the radar display. The heading line is hidden while [RR/HL] key is held down, so the targets on the heading line can be easily observed.

* Software button ⑥ located at the bottom-right corner of the radar display described in Section 2.3.4 is also available to switch between ON and OFF.

3.4.11 Hide Graphics Information on Radar Display (Graphic Display)

Procedure

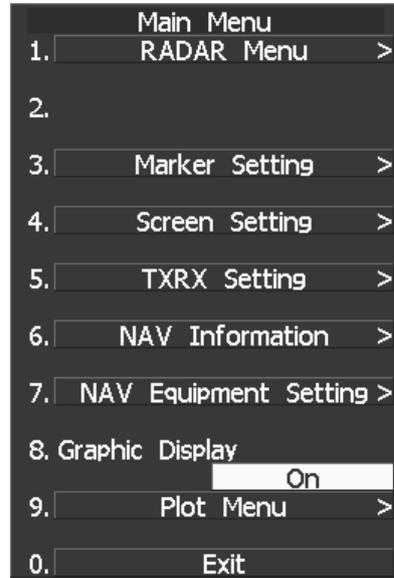
- 1 Press [RADAR MENU] key.

The Main Menu will appear.

- 2 Press [8] key.

The setting of Graphic Display will be changed to **ON**.

Graphics information other than VRMs, EBLs, HL, cross cursor mark, and range rings on the radar display is temporarily hidden.

**Cancellation**

- 1 Press [RADAR MENU] key.

The Main Menu will appear.

- 2 Press [8] key.

The setting of Graphic Display will be changed back to **OFF**.

Temporarily hidden graphics information is displayed again.

Various graphics information such as TT/AIS symbols, NAV lines, and MAP information is shown on the radar display of this system, and may make it difficult to view the radar video. In this case, use this function to temporarily hide unnecessary graphics information.



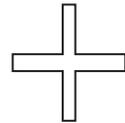
3.5 GENERAL OPERATIONS

3.5.1 Move Cross Cursor Mark by Trackball

The cross cursor mark  is used for position designation and other purposes in various operating procedures. The cross cursor mark  moves in coupling with the trackball. If the trackball is rotated up and down or right and left, the cross cursor mark follows the move of the trackball. Operators must be familiar with trackball operation before running the system.

Operation inside Radar Video PPI

The cross cursor mark as shown at right is displayed inside the radar video PPI.



- 1) The distance and bearing between own ship and the cross cursor mark , and the degrees of latitude and longitude are indicated at the upper right of the radar display.
- 2) When moving the current center position, use the cross cursor mark to designate a new center position.
- 3) Use the cross cursor mark to create marks and lines.
- 4) When the TT function is installed as an option, use the cross cursor mark to acquire targets in manual mode.

Operation outside Radar Video PPI

As shown at right, the cursor mark changes into the pointer outside the radar video PPI.



- 1) Use the pointer to operate software buttons.
- 2) Use the pointer to select menu items.

* The EBL/VRL dial is available for operating the cursor mark. Each time the EBL dial is pressed, either operation using the EBL/VRM control or cursor operation using the track ball can be selected. For details, refer to Section 3.9.3 “Set Cursor (Cursor Setting).”

3.5.2 Use EBLs (Electronic Bearing Lines) [EBL1/2]

EBLs (Electronic Bearing Lines) are indispensable to the measurement of bearings. Operators must be familiar with the operation of EBLs beforehand.

EBL1 Operation

If EBL2 is selected or EBL1 is not displayed, press [EBL1] key to select EBL1 before starting operation. (The currently selected EBL is shown in reverse video at the lower right of the radar display.)

Procedure

1 Press [EBL1] key.

EBL1 at the lower right of the radar display will be shown in reverse video, and EBL1 becomes operable.

2 Press [EBL1] key again.

The EBL1 display will disappear.

* Software button ⑤ located at the top right corner of the radar display described in Section 2.3.3 is also available to switch EBL1 between ON and OFF.

EBL2 Operation

If EBL1 is selected or EBL2 is not displayed, press [EBL2] key to select EBL2 before starting operation. (The currently selected EBL is shown in reverse video at the lower right of the radar display.)

Procedure

1 Press [EBL2] key.

EBL2 at the lower right of the radar display will be shown in reverse video, and EBL2 becomes operable.

2 Press [EBL2] key again.

The EBL2 display will disappear.

* Software button ⑦ located at the top right corner of the radar display described in Section 2.3.3 is also available to switch EBL2 between ON and OFF.

Operation procedures are described on the following pages. For how to measure distance and bearing, see Section 4.

EBL Bearing Display

The bearing values of EBL1 and EBL2 currently displayed on the PPI are indicated at the upper right of the radar display.

The currently operable EBL1 or EBL2 is shown in reverse video beside the bearing value.

Starting Point of EBL

The starting point of the currently operating EBL can be switched from the center of the radar display (Floating Off) to any floating position.

Note: The floating position of the EBL's starting point can be fixed on the radar display or at specific latitude and longitude. (For details, refer to Section 3.5.3 [III] "Setting the mode to move the starting point of EBL1 (EBL1 Floating).")

[I] Floating the starting point of EBL1 while EBL1 is operating:

Procedure

1 Press the [EBL] control.

The indicator on the right hand side of the EBL value at the top right corner of the screen shows C, and the EBL starting point is fixed on the screen (Screen Fix).

* If the indicator does not show C, press the [EBL] control repeatedly such that the indication changes as follows:

→ C → D → ...

* EBL1 floating mode can be changed with software button ⑪ located at the top right corner of the radar display described in Section 2.3.3.

* EBL2 floating mode can be changed with software button ⑫ located at the top right corner of the radar display described in Section 2.3.3.

2 Move the starting point of EBL1 with the trackball.

3 Press [ENT] key at the starting point of EBL1 you want to move.

The starting point of EBL1 will be determined.

If EBL2 is operating, the starting point of EBL2 is floating.

EBL modes

: Floating Off mode

EBL with the own ship position as the starting point is displayed.

C : Screen Fix mode

EBL with the specified floating point as the starting point is displayed.

The floating point is set relative to the own ship position and changes as own ship travels.

D : LL fix (Dropped) mode

EBL with the specified floating point as the starting point is displayed.

The floating point is set as an LL position irrespective of the own ship position, and does not change even though own ship travels.

Note: The floating function will not work even though the [EBL] control is pressed unless the EBL control mode is set to the Floating EBL mode.

To switch to the floating mode by pressing the [EBL] control, set the floating EBL as the left jog dial mode while holding down the EBL control.

[III] Moving the starting point of EBL1 to the own ship's position while EBL1 is operating:**Procedure****1 Press the [EBL] control twice.**

The letter on the right hand side of the EBL value at the top right corner of the screen disappears.

* If the letter on the right hand side of the EBL value does not disappear, press the [EBL] control repeatedly such that the indication changes as follows:

→ C → D → ...

* EBL1 starting point can be changed with software button ⑪ located at the top right corner of the radar display described in Section 2.3.3.

* EBL2 starting point can be changed with software button ⑫ located at the top right corner of the radar display described in Section 2.3.3.

If EBL2 is operating, the starting point of EBL2 moves to the own ship's position.

3.5.3 Set EBL Operation (EBL1 /2 Setting)

[I] Setting the bearing display mode of EBL1 (EBL1 Bearing REF)

Determine whether to display EBLs (Electronic Bearing Lines) in true bearing mode or relative bearing mode.

Procedure

- 1 Press [RADAR MENU] key.

Press [3] key

Press [1] key.

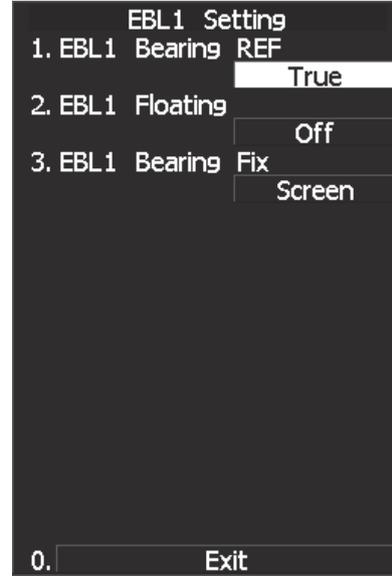
The EBL1 Setting Menu will appear.

- 2 Press [1] key.

The setting of EBL1 Bearing REF will be switched between and .

: EBL1 is displayed in true bearing mode.

: EBL2 is displayed in relative bearing mode.



* Software button ⑨ located at the top right corner of the radar display described in Section 2.3.3 is also available to switch the display mode of EBL1.

[II] Setting the bearing display mode of EBL2 (EBL2 Bearing REF)

Procedure

- 1 Press [RADAR MENU] key.

Press [3] key.

Press [2] key.

The EBL2 Setting Menu will appear.

Subsequently, set the bearing display mode of EBL2 performing the same operation as explained in [I].

* Software button ⑩ located at the top right corner of the radar display described in Section 2.3.3 is also available to switch the display mode of EBL2.

[III] Setting the mode to move the starting point of EBL1 (EBL1 Floating)

When this function is set to **L/L FIX** and the starting point of an EBL is moved to a position, the starting point can be fixed at the latitude and longitude of that position. The function is effective when the bearing from a certain point is repeatedly measured.

When the function is set to **SCREEN FIX**, the starting point of an EBL is fixed on the radar display. The starting point is always indicated at the same position on the radar display even when the own ship has moved.

Procedure

- 1 Press **[RADAR MENU]** key.

Press **[3]** key

Press **[1]** key.

The EBL1 Setting Menu will appear.

- 2 Press **[2]** key.

The EBL1 Floating Setting Menu will appear.

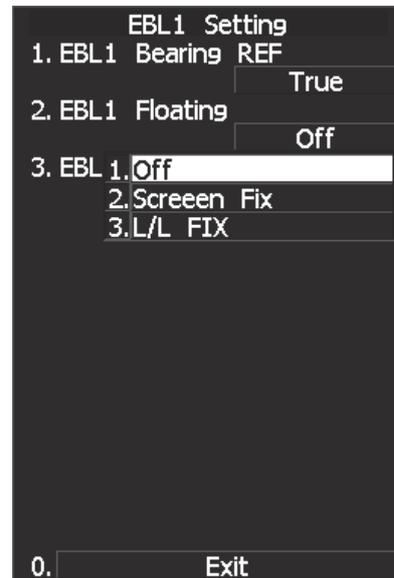
- 3 Select the mode number to be set, pressing the numeric keys **[1]** to **[3]**.

The selected mode will be set.

OFF: Floating mode off

SCREEN FIX: The starting point of EBL1 is fixed on the radar display.

L/L FIX: The starting point of EBL1 is fixed at specific latitude and longitude.

**3**

* Software button ⑪ located at the top right corner of the radar display described in Section 2.3.3 is also available to switch the Screen Fix and L/L Fix of EBL1.

[IV] Setting the mode to move the starting point of EBL2 (EBL2 Floating)**Procedure**

- 1 Press **[RADAR MENU]** key.

Press **[3]** key.

Press **[2]** key.

The EBL2 Setting Menu will appear.

Subsequently, set the EBL2's starting point move mode performing the same operation as explained in [III].

* Software button ⑫ located at the top right corner of the radar display described in Section 2.3.3 is also available to switch the Screen Fix and L/L Fix of EBL2.

- Notes:**
- The course data and the own ship's latitude and longitude data are required for activating the L/L Fix mode.
 - While the L/L Fix mode is active, the starting point of an EBL will be returned to the center if it disappears from the radar display when moved.

[V] Setting the EBL1 bearing fix mode (EBL1 Bearing FIX)

While this function is set to **ANGLE**, an EBL is fixed to the preset bearing. For example, if the true bearing 020° is preset, the EBL is fixed to the true bearing 020° even when the own ship turns.

While the function is set to **SCREEN**, the EBL is fixed on the radar display.

Procedure

- 1 Press **[RADAR MENU]** key.

Press **[3]** key

Press **[1]** key.

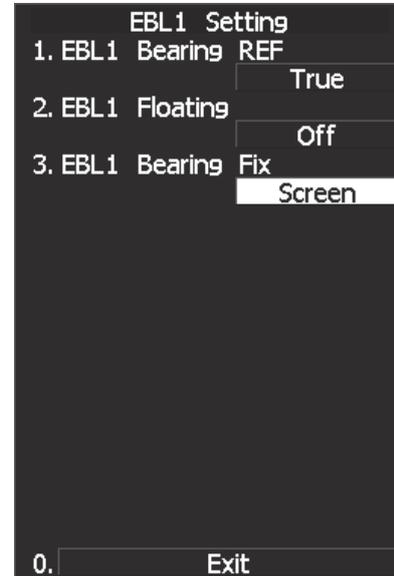
The EBL1 Setting Menu will appear.

- 2 Press **[3]** key.

The setting of EBL1 Bearing Fix will be switched between **ANGLE** and **SCREEN**.

ANGLE: EBL1 bearing is fixed to the preset value.

SCREEN: EBL1 bearing is fixed on the radar display.



[VI] Setting the EBL2 bearing fix mode (EBL2 Bearing Fix)

Procedure

- 1 Press **[RADAR MENU]** key.

Press **[3]** key.

Press **[2]** key.

The EBL2 Setting Menu will appear.

Subsequently, set the EBL2 bearing fix mode performing the same operation as explained in [V].

Note: The course data is required for activating this function.

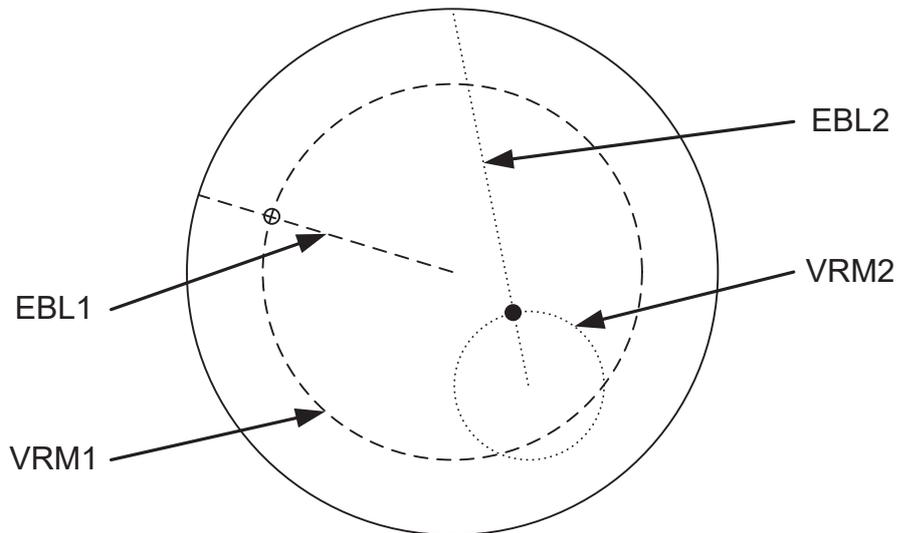
3.5.4 Display Variable Range Markers [VRM1/VRM2]

This function is to display and select variable range markers (VRMs). Two VRMs are available: VRM1 is represented as a broken line, and VRM2 as a dotted line. When EBL1 is displayed, VRM1 marker appears on the EBL1. When EBL2 is displayed, VRM2 marker appears on the EBL2. If the starting point of an EBL is offset, the center of a VRM marker is positioned at the starting point of the EBL.

VRM markers displayed on EBL1/EBL2

○ mark: VRM1

● mark: VRM2



3

VRM1 Operation

If VRM2 is selected or VRM1 is not displayed, press [VRM1] to select VRM1 before starting operation. (The currently selected VRM is shown in reverse video at the upper right of the radar display.)

Procedure

1 Press [VRM1] key.

VRM1 at the upper right of the radar display will be shown in reverse video, and VRM1 becomes operable.

2 Press [VRM1] key again.

The VRM1 display will disappear.

* Software button ⑥ located at the top right corner of the radar display described in Section 2.3.3 is also available to switch VRM1 between ON and OFF.

VRM Operations

The variable range markers are displayed centering around own ship. Turning the [VRM] control clockwise makes the VRM larger. Turning the [VRM] control counterclockwise makes the VRM smaller.

VRM2 Operation

If VRM1 is selected or VRM2 is not displayed, press **[VRM2]** key to select VRM2 before starting operation.

(The currently selected VRM is shown in reverse video at the upper right of the radar display.)

Procedure

1 Press [VRM2] key.

VRM2 at the upper right of the radar display will be shown in reverse video, and VRM2 becomes operable.

2 Press [VRM2] key again.

The VRM2 display will disappear.

* Software button ⑧ located at the top right corner of the radar display described in Section 2.3.3 is also available to switch VRM2 between ON and OFF.

3.5.5 Display Parallel Cursors (Parallel Cursor)

Parallel cursors can be displayed.

Procedure

- 1 Hold down [VRM] control.

Jog Dial Button Mode opens.

- 2 Select 3 PC Menu in the Right Jog Dial menu, and set the parallel index lines as the right jog dial mode.

- 3 After setting the parallel index lines as the right jog dial mode, press the [VRM] control.

The Parallel Cursor menu opens.

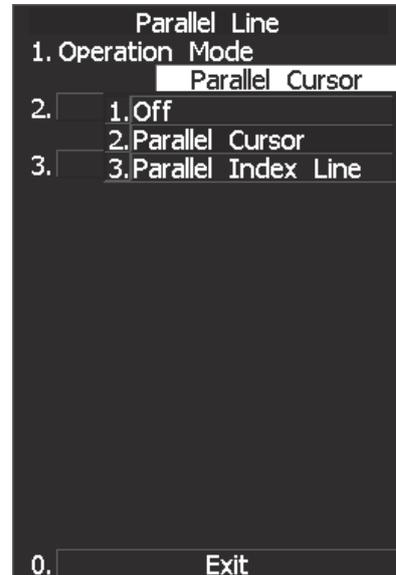
To change the direction of parallel cursors, turn the [EBL] control.

To change the line intervals, turn the [VRM] control.

The bearing and interval of parallel cursors are displayed in the menu area.

- 4 Press the [VRM] control again.

The parallel cursor will be fixed.



3

Cancellation

- 1 Press the [VRM] control again.

The parallel cursors display will disappear.

Note: Parallel cursors can be operated only while the parallel cursor menu is open. After the menu closes, the parallel cursors display remains, but the settings of the bearing and interval cannot be adjusted any more. To adjust the bearing or interval in this case, press the [VRM] control twice to open the parallel cursor menu.

Parallel Cursor menu will not open even though the [VRM] control is pressed unless the VRM control mode is set to Parallel cursor.

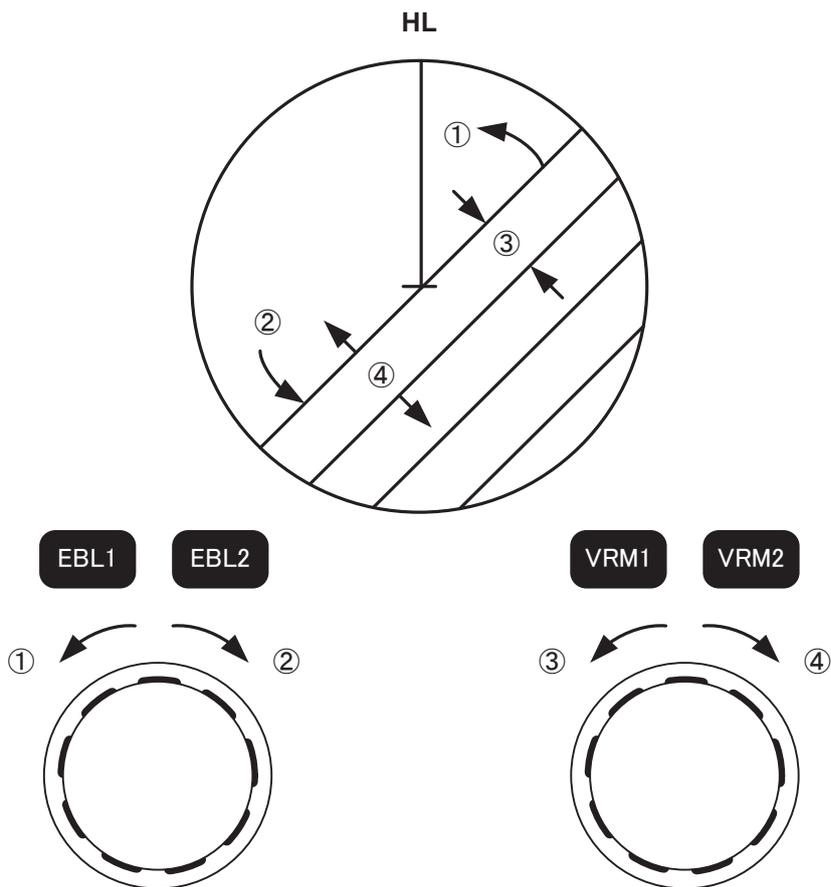
To switch to the parallel index line mode by pressing the [VRM] control, set the parallel index lines as the right jog dial mode while holding down the [VRM] control.

* Software button ⑬ located at the top right corner of the radar display described in Section 2.3.3 is also available to switch the parallel cursors between ON and OFF.

Operation of Parallel Cursors

- ⊙ Parallel cursors rotate in the same direction as you turn the [EBL] control.
(①, ②)
- ⊙ The intervals of parallel cursors narrow when you turn the [VRM] control counterclockwise (③), and widen when you turn the [VRM] control clockwise (④).

Display of Parallel Cursors



- ⊙ When [RADAR MENU] key is pressed, the parallel cursor menu closes and the parallel cursors are fixed.

While the Parallel Cursor menu opens, the parallel cursor can be operated by using the EBL or VRM control. When the Parallel Cursor menu closes, the EBL control performs general EBL operation and the VRM control performs general VRM operation.

Setting of Parallel Cursors (Parallel Cursor)

[I] Parallel Cursor Range Link (Range Scale Link)

When a range is switched, parallel cursors links to a radar range scale and displayed.

Procedure

- 1 Press [RADAR MENU] key.

Press [3] key.

Press [5] key.

Press [2] key.

The Parallel Cursor Menu will appear.

- 2 Press [1] key.

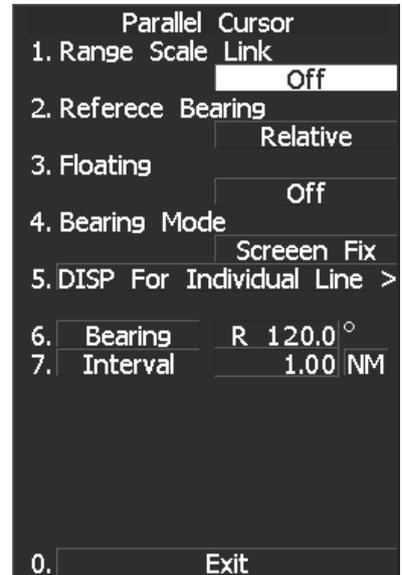
Range Scale Link is switched between ON and OFF each time you press [1] key.

Range Link ON:

If the range is switched, the width between parallel cursors changes in accordance with the radar range scale.

Range Link OFF:

If the range is switched, the width between parallel cursors remains fixed.



[III] Parallel Cursor Bearing (Reference Bearing)

Parallel cursor bearing mode can be switched.

Procedure

- 1 Press [RADAR MENU] key.

Press [3] key.

Press [5] key.

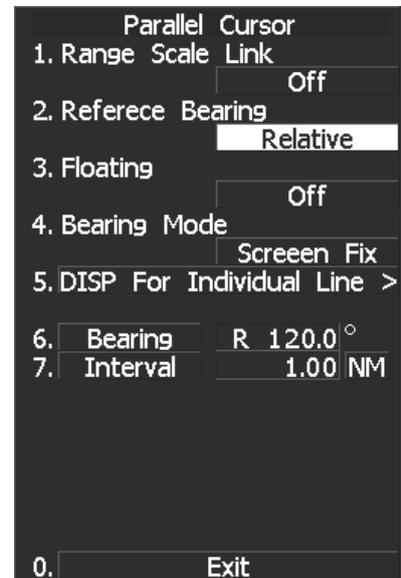
Press [2] key.

The Parallel Cursor Menu will appear.

- 2 Press [2] key.

The Reference Bearing mode is switched between true bearing and relative bearing each time you press [2] key.

* Bearing in the parallel cursor menu will show which is selected, true bearing or relative bearing.



[III] Parallel Cursor Start Point Display Mode (Floating)

If this function is set to **L/L FIX**, and the start point of parallel cursor moves, the start point of the parallel cursor can be fixed to the latitude/longitude of the start point. If the function is set to **SCREEN FIX**, the start point of parallel cursor is fixed within the radar display, and the start point is fixed to the same place on the display even after the own ship moves.

Procedure

- 1 Press **[RADAR MENU]** key.

Press **[3]** key.

Press **[5]** key.

Press **[2]** key.

The Parallel Cursor Menu will appear.

- 2 Press **[3]** key.

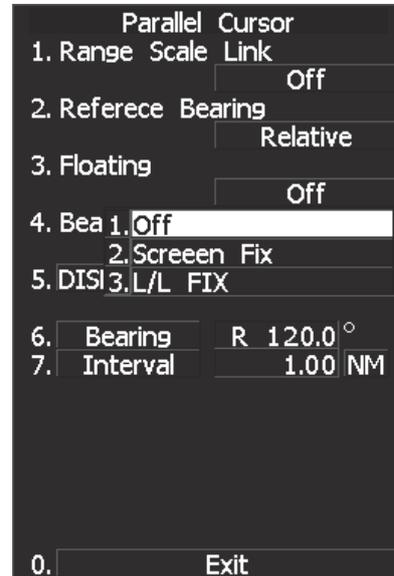
The Floating Setting Menu will appear.

- 3 Select the item you want to display, pressing the numeric keys **[1]** to **[3]**.

OFF: Floating mode OFF

SCREEN FIX: Fixes the start point of parallel cursor to the radar display.

L/L FIX: Fixes the parallel cursor with latitude and longitude.

**3**

* Software button  located at the top right corner of the radar display described in Section 2.3.3 is also available for switching.

Note: Setting the function to the L/L Fix mode needs course data and latitude/longitude data.

[IV] Parallel Cursor Bearing Fix Mode (Bearing Mode)

If this function is set to **ANGLE**, the parallel cursor also rotates in accordance with the bearing while the own ship is turning. If the function is set to **SCREEN FIX**, the parallel cursors are fixed within the radar display even while the own ship is turning. The parallel cursors are displayed at the same place even while the own ship is turning.

Procedure

1 Press [RADAR MENU] key.

Press [3] key.

Press [5] key.

Press [2] key.

The Parallel Cursor Menu will appear.

2 Press [4] key.

The Bearing Mode Setting Menu will appear.

Angle Fix : The angle of the parallel cursors is set in true bearing. For NUP and CUP, the cursors are displayed in true bearing irrespective of changes in the course of own ship.

For HUP, the angle of the parallel cursors changes as the course of own ship changes.

Screen Fix : Parallel cursors are fixed on the radar screen.

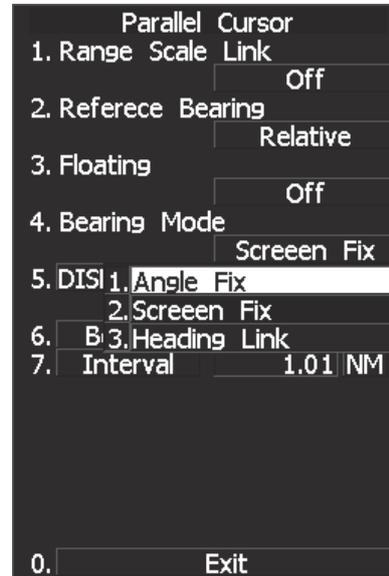
For HUP, NUP, and CUP, the angle of the parallel cursors stays the same on the screen.

When own ship is engaged in TM motions, the parallel cursors move as own ship moves.

Heading Fix : The parallel cursors are displayed while the relative angle of the ship's heading bearing line stays the same.

For HUP, the ship's heading bearing line does not change even though the course of own ship changes; therefore, the parallel cursors do not move.

For NUP, the ship's heading bearing line changes as the course of own ship changes; therefore, the parallel cursors also change as the course of own ship changes.



[V] Individual Display of Parallel Cursor (PI Individual)

Individual parallel cursors can be switched between ON and OFF.

Procedure

- 1 Press [RADAR MENU] key.

Press [3] key.

Press [5] key.

Press [2] key.

The Parallel Cursor Menu will appear.

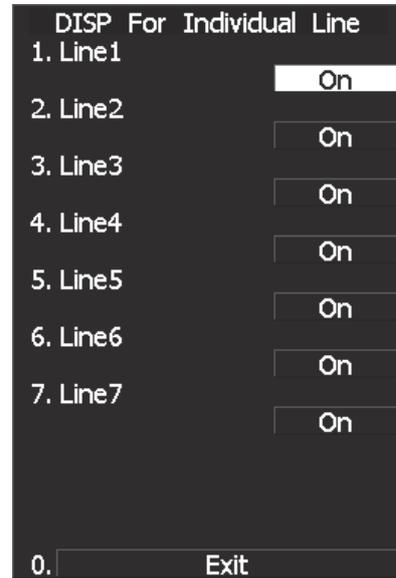
- 2 Press [5] key.

DIPS For Individual Line Setting Menu will appear.

- 3 Select the item for which you want to display or not to display, pressing the numeric keys [1] to [7].

Individual setting is switched between ON and OFF each time you press each numeric keys.

ON: Displayed
OFF: Not displayed



* The line nearest to the own ship is specified as Line1.

3.5.6 Display Parallel Index Lines (Parallel Index Line)

Parallel index lines can be displayed.
Up to 4 parallel index lines can be set.
For each line, angle, distance to own ship, and length can be specified.

Changing the angle of parallel index lines

Procedure

- 1 Hold down [VRM] control.**
Jog Dial Button Mode opens.
- 2 Select 3 PC Menu in the Right Jog Dial menu, and set the parallel index lines as the right jog dial mode.**

- 3 Press the [VRM] control.**

The Parallel Index Line menu will open and the parallel index line mode will be turned on, so operation can be performed in the mode.

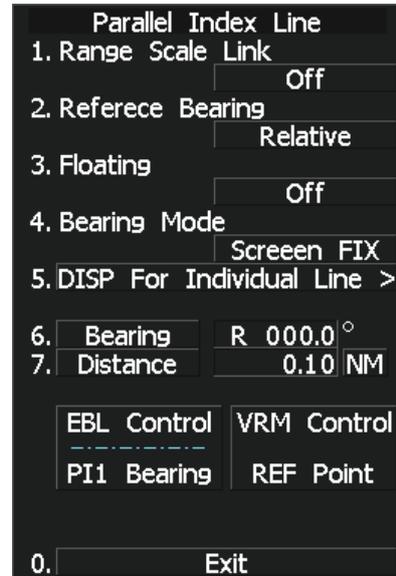
(*) These steps are not required if the mode is already on.

- 4 Press the [EBL] while the Parallel Index Line mode is on.**

Press the jog dial to scroll target parallel index lines.
A parallel index line currently in use is shown as follows:
EBL Control
PI 1 Bearing

- 5 Turn the [EBL] control.**

Turn the control to change the parallel index line angle.



Changing the interval (distance from own ship) and length of parallel index lines

Procedure

1 Press the [VRM] control.

- **Turn the mode on using the jog dial.**
Press the jog dial to turn the mode on.
- **Turn the mode on from the menu screen.**
Turn the mode on by following the steps below:
Press the [Radar Menu] key.
 - 3 Marker Setting
 - 5 Parallel Line
 Press the [1] key to set the Operation Mode to Parallel Index Line mode.

(*) These steps are not required if the mode is already on.

2 Press the [EBL] while the Parallel Index Line mode is on.

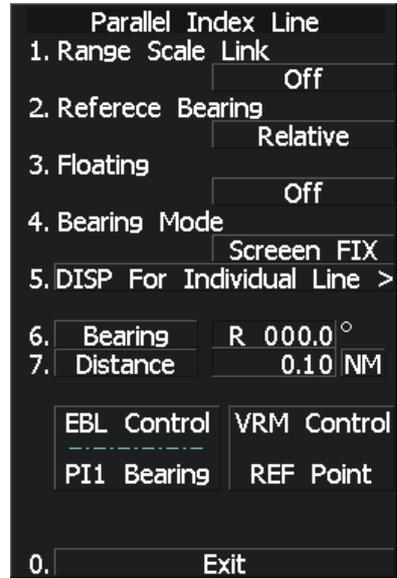
Press the jog dial to scroll target parallel index lines.
A parallel index line currently in use is shown as follows:
EBL Control
PI 1 Bearing

3 Press the [EBL] control.

Press the jog dial to change the VRM target in the following order:
Interval setting → end point 1 setting → end point 2 setting → interval setting ...
Length of the index line changes as the position of end point 1 or end point 2 changes.

When the jog dial is turned...

Interval of index lines, distance to end point 1, and distance to end point 2 are changed.



Setting of Parallel Index Lines (Parallel Index Line)

[1] Parallel Index Line Range Link (Range Scale Link)

When a range is switched, parallel index lines links to a radar range scale and displayed.

Procedure

- 1 Press [RADAR MENU] key.

Press [3] key.

Press [5] key.

Press [3] key.

The Parallel Index Line Menu will appear.

- 2 Press [1] key.

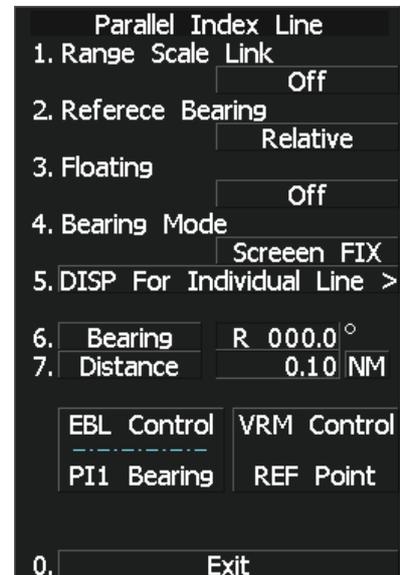
Range Scale Link is switched between ON and OFF each time you press [1] key.

Range Scale Link ON:

If the range is switched, the width between parallel index lines changes in accordance with the radar range scale.

Range Scale Link OFF:

If the range is switched, the width between parallel index lines remains fixed.



III] Parallel Index Line Bearing (Reference Bearing)

Parallel index line bearing mode can be switched.

Procedure

- 1 Press [RADAR MENU] key.

Press [3] key.

Press [5] key.

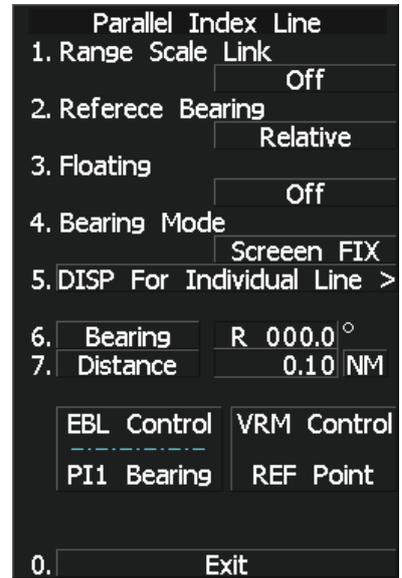
Press [3] key.

The Parallel Index Line Menu will appear.

- 2 Press [2] key.

The Reference Bearing mode is switched between true bearing and relative bearing each time you press [2] key.

* Bearing in the parallel index line menu will show which is selected, true bearing or relative bearing.



[III] Parallel Index Line Start Point Display Mode (PI Floating)

If this function is set to **L/L FIX**, and the start point of parallel index line moves, the start point of the parallel index line can be fixed to the latitude/longitude of the start point. If the function is set to **SCREEN FIX**, the start point of parallel index line is fixed within the radar display, and the start point is fixed to the same place on the display even after the own ship moves.

Procedure

- 1 Press **[RADAR MENU]** key.

Press **[3]** key.

Press **[5]** key.

Press **[3]** key.

The Parallel Index Line Menu will appear.

- 2 Press **[3]** key.

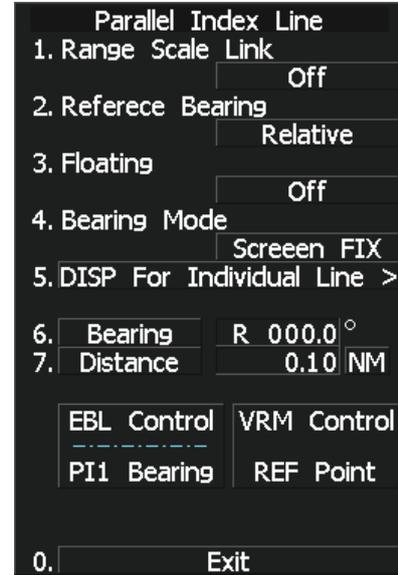
The PI Floating Setting Menu will appear.

- 3 Select the item you want to display, pressing the numeric keys **[1]** to **[3]**.

OFF: Floating mode OFF

SCREEN FIX: Fixes the start point of parallel index line to the radar display.

L/L FIX: Fixes the parallel index line with latitude and longitude.



* Software button **⑭** located at the top right corner of the radar display described in Section 2.3.3 is also available for switching.

Note: Setting the function to the L/L Fix mode needs course data and latitude/longitude data.

[IV] Parallel Index Line Bearing Fix Mode (PI Bearing Mode)

If this function is set to **ANGLE**, the parallel index line also rotates in accordance with the bearing while the own ship is turning. If the function is set to **SCREEN FIX**, the parallel index lines are fixed within the radar display even while the own ship is turning. The parallel index lines are displayed at the same place even while the own ship is turning.

Procedure**1 Press [RADAR MENU] key.**

Press [3] key.

Press [5] key.

Press [3] key.

The Parallel Index Line Menu will appear.

2 Press [4] key.

The PI Bearing Mode Setting Menu will appear.

Angle Fix: The parallel index line angle (bearing) will be fixed as specified.
(The parallel index line will not be interlocked with the azimuth line.)

For NUP and CUP, the on-screen bearing is fixed while azimuth line changes, therefore parallel index line angle remains fixed.

For HUP, the on-screen bearing changes as azimuth line changes, and is interlocked with parallel index line that turns as bearing moves.

Screen Fix: The on-screen degree (angle) of parallel index line is always fixed.
(It will not be interlocked with either alteration of azimuth line or bearing.)

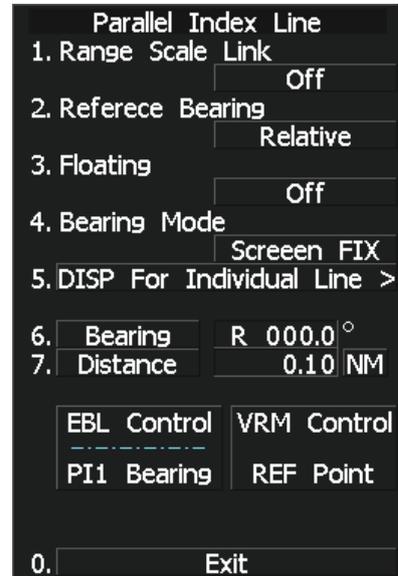
For NUP, CUP, and HUP, the on-screen angle will not be affected by bearing alteration. The parallel index line remains fixed.

Heading Link: The parallel index line moves as bearing changes.

(The parallel index line is interlocked with the bearing line.)

For NUP and CUP, the bearing line turns as bearing changes, and the interlocked parallel index line turns as well.

For HUP, bearing can change while bearing line remains fixed. The parallel index line is interlocked with the bearing line, and remains fixed as well.



[V] Individual Display of Parallel Index Line (PI Individual)

Individual parallel index lines can be switched between ON and OFF.

Procedure

- 1 Press [RADAR MENU] key.**

Press [3] key.

Press [5] key.

Press [3] key.

The Parallel Index Line Menu will appear.

- 2 Press [5] key.**

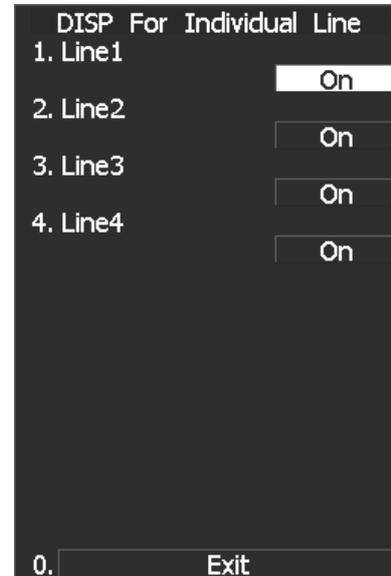
The PI Individual Setting Menu will appear.

- 3 Select the item for which you want to display or not to display, pressing the numeric keys [1] to [7].**

Individual setting is switched between ON and OFF each time you press each numeric keys.

ON: Displayed

OFF : Not displayed



* The line nearest to the own ship is specified as Line1.

3.5.7 Switch Bearing Display Mode [AZI MODE]

Select the azimuth for the radar video to be displayed of the display.

The bearing display mode is switched in the sequence of [NORTH UP] (true bearing), [HEAD UP] (relative bearing), and [COURSE UP] (course-up bearing) each time [AZI MODE] key is pressed.

The indication at the upper left of the radar display changes in sequence of **HUP** → **NUP** → **CUP**.

* Software button ⑧ located at the top left corner of the radar display described in Section 2.3.1 is also available to switch the radar bearing display.

3

True Bearing Mode [North Up]

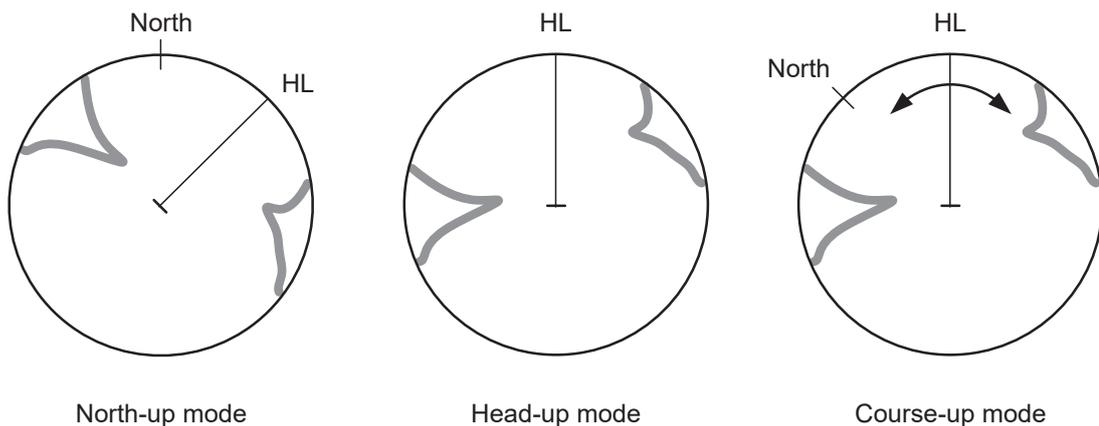
The video is displayed so that the zenith of the PPI (0° on range rings) points to the due north. Fixed targets do not flicker and are easily identified on the chart, and the true bearing of a target can easily be read out.

Relative Bearing Mode [Head Up]

The video is displayed so that the ship's heading line points to the zenith of the PPI (0° on range rings). Since targets are displayed in their directions relative to the ship's heading line, the operator can view the video in the same field of view as in operating the ship at sea. This mode is suitable for watching over other ships.

Course-up Bearing Mode [Course Up]

By pressing [AZI MODE] key, the own ship's course is fixed pointing to the zenith of the PPI (0° on range rings) points to the due north. In the same way as in the North-up mode, fixed targets do not flicker, and are stabilized even if the ship is yawing. The bearing of the heading line varies by the same shift of own ship's course. To change the course, press [AZI MODE] key several times to select the Course-up mode, and set a new course.



3.5.8 Switch True/Relative Motion Display Mode [TM/RM]

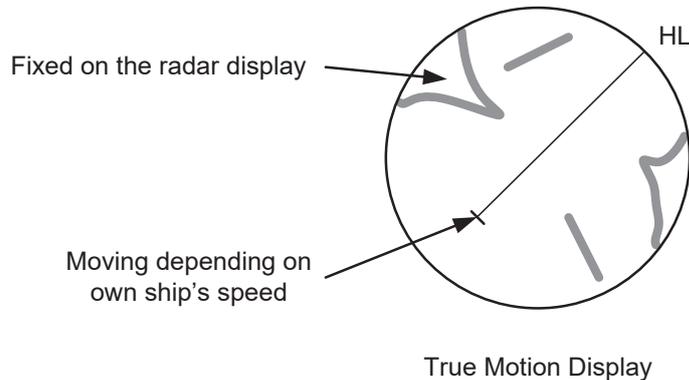
Note: If the CCRP is outside the display area due to resetting of the own ship position in true motions, the CCRP becomes the antenna location.

Switching Relative Motion (RM) Mode to True Motion (TM) Mode

Procedure

- 1 Press [TM/RM] key.

The true motion mode will be selected. In the true motion mode, the own ship's position on the radar display moves depending upon its speed and course and the influence of the current. Land and other fixed targets are fixed on the radar display and only actually moving targets move on the radar display. When the true motion mode is selected, the own ship's position is set to about 60% of the display radius in the opposite direction to its course allowing for the influence of the current. Own ship starts moving depending upon its speed and course and the influence of the current. Subsequently, when own ship arrives at the position of about 66% of the display radius, it is automatically reset to its initial position at about 60% of the display radius in the opposite direction to its course allowing for the influence of the current.



Resetting Own Ship to its Initial Position in True Motion (TM) Mode

Procedure

- 1 Press [TM/RM] key for 2 seconds.

Own ship will be reset to its initial position as established when the relative motion mode is changed to the true motion mode. The ship starts moving from that position.

Switching True Motion (TM) Mode to Relative Motion (RM) Mode

Procedure

- 1 Press [TM/RM] key.

The relative motion mode will be selected. Own ship returns to the center of the radar display.

* Software button ③ located at the top left corner of the radar display described in Section 2.3.1 is also available to switch between true motion and relative motion. Keep pressing the button for two seconds can reset the position of the own ship during true motion.

3.5.9 Move Own Ship's Display Position [OFF CENT]

The own ship's position can be moved from the display center to any position within 66% of the display radius. This function is convenient for observing a wide coverage in any direction.

Note: This function is not available on the 96 NM range. If the CCRP is outside the display area due to off-centering, the CCRP becomes the antenna location.

Procedure

1 Press [OFF CENT] key.

The cross cursor mark  will appear at the own ship's position on the radar display.

* Software button ④ located at the top left corner of the radar display described in Section 2.3.1 is also available to activate OFF Center.

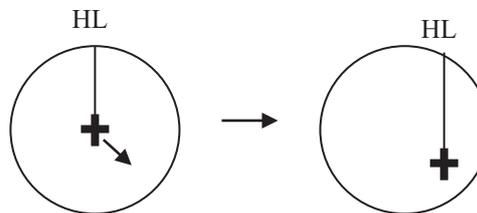
2 Move the cross cursor mark (own ship's display position) to a desired position by using the trackball.

While the cross cursor mark is moving, the own ship's display position moves following the cross cursor mark.

When it moves to a position outside 66% of the display radius, the center position is limited to a position within 66% of the display radius.

3 Press [ENT] key.

The own ship's display position will be fixed to the cross cursor mark .



Move the cross cursor mark  to a desired position.

Press [ENT] key. The own ship's display position will be fixed.

Returning Own Ship's Position to the Center

Procedure

1 Press [OFF CENT] key for 2 seconds.

Note: Close the menu before using this function. While the menu is open, the function cannot be used.

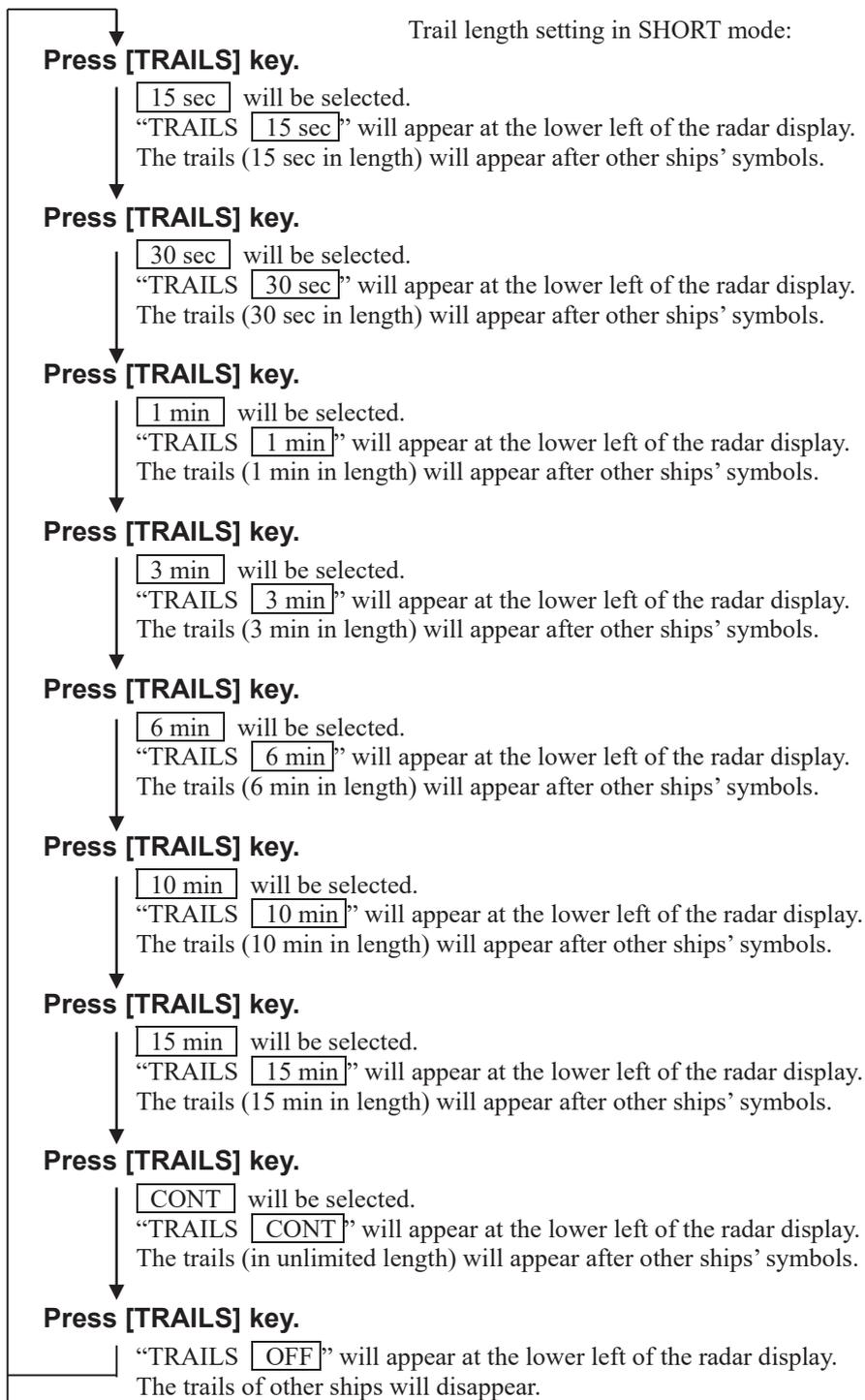
* You can keep pressing software button ④ located at the top left corner of the radar display described in Section 2.3.1 for two seconds to return the own ship position to the center.

3.5.10 Display Radar Trails (Other Ships' Trails) [TRAILS]

Other ships' movements and speeds can be monitored from the lengths and directions of their trails, serving for collision avoidance. The trail length varies according to setting. The setting is described on the next page.

Changing the trail length

Procedure



SHORT mode:	15 sec, 30 sec, 1 min, 3 min, 6 min, 10 min, 15 min, and CONT
MID mode:	30 sec, 1 min, 3 min, 6 min, 10 min, 15 min, 30 min, and CONT
LONG mode:	1 min, 3 min, 6 min, 10 min, 15 min, 30 min, 60 min, and CONT
SUPER LONG mode:	30 min, 1 hr, 2 hr, 3 hr, 4 hr, 5 hr, 6 hr, 7 hr, 8 hr, 9 hr, 10 hr, 11 hr, 12 hr and CONT

A trail length can also be changed by using the multi-function control. (Refer to Section 3.5.18 “Operate Multi-Function Control [MULTI].”)

Stored trails cannot be erased even when the trail lengths are changed by using [TRAILS] key. Even after the trails display is turned off, the past trails can be displayed traced back by setting a desired time. The system is plotting trails even while the trails display is off.

If the transmit time is short, the indicated trails duration may not have achieved the specified time. The radar trails remaining time is indicated at the right of the trails length setting.

* Software button ⑭ located at the other ship's information area in Section 2.3.6 is also available to change trail length.

Erasing Trails Data

Procedure

1 Hold down [TRAILS] key for 5 seconds.

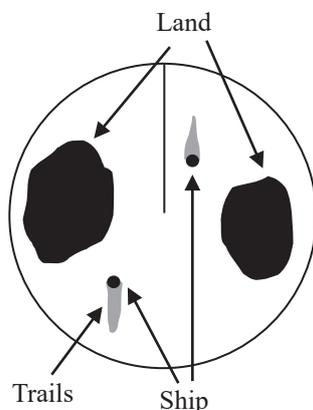
All the stored trails data will be erased. The system starts plotting trails in initial state. When [TRAILS] key is pushed for 2 seconds, a RADAR Trails Setting menu will be displayed. Furthermore, data will be erased if it continues pushing.

Trails Motion Mode

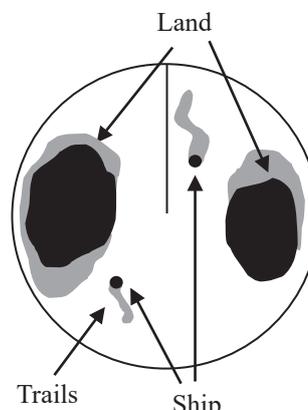
There are two types of trails: relative motion trails and true motion trails.

Relative motion trails: The system plots the trails of a target at a position relative to the own ship. The operator can easily judge whether the target is approaching the own ship. While the own ship is moving, the system also plots the trails of land and other fixed targets.

True motion trails: The system plots the absolute motion trails of a target, irrespective of the own ship's position. The operator can easily judge the course and speed of the target. The system does not plot the trails of land and other fixed targets.



True Motion Trails



Relative Motion Trails

Trails modes provided with this system vary depending on the motion mode.
 With true motion (TM) mode: Only the true motion trails mode is available.
 With relative motion (RM) mode: The relative motion trails mode or true motion trails mode is selectable.
 RM(R) is indicated while the relative motion trails mode is active.
 RM(T) is indicated while the true motion trails mode is active.

While the true motion trails mode is active, this system enables the continuous use of true motion trails even if any of the following operations is performed:

- Motion display mode change [TM/RM] key
- TM reset [TM/RM] key
- Bearing display mode change [AZI MODE] key
- Center move [OFF CENT] key
- MAP display on/off [MAP] key
- * Software button  located at the other ship's information area in Section 2.3.6 is also available to change trial motion mode.

Note: Accurate true bearing signals and speed signals are necessary for using the true motion trails mode.

Changing Motion Mode of Trails (Trails mode)

Procedure

- 1 Press [RADAR MENU] key twice.

Press [7] key.

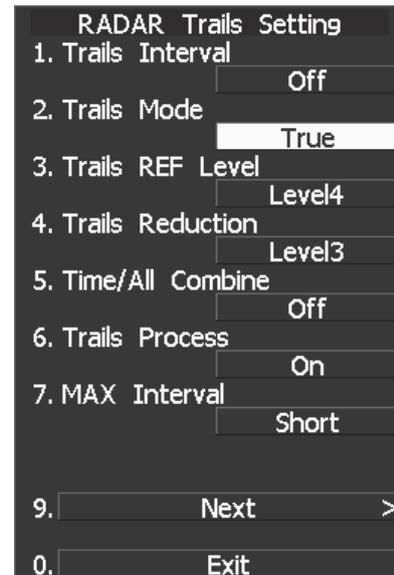
The RADAR Trails Setting Menu will appear.

- 2 Press [2] key.

The setting of radar trails display mode will be switched between TRUE and RELATIVE.

TRUE: True motion trails
 RELATIVE: Relative motion trails

→ For other settings, see Section 3.9.2 “Set Radar Trails (RADAR Trails Setting).”



3.5.11 Switch Pulse Length (GAIN/PL)

Procedure

1 Press the [GAIN / PL] dial.

Values of the transmitter pulse length are switched.

Example MP1 \Rightarrow MP2 \Rightarrow LP1 \Rightarrow LP2 \Rightarrow MP1

Effects of transmitter pulse length

With SP selected:

The transmitter pulse becomes shorter, and the range resolution improves.

The effect of suppressing sea clutter returns and rain / snow clutter returns heightens.

Recommended condition for selection:

In bays / harbors where targets are densely crowded

Rough sea state due to torrential rain or stormy weather

With MP selected:

The normal transmitter pulse length is set.

Both range resolution and gain are appropriately set.

Recommended condition for selection:

General navigation

With LP selected:

The transmitter pulse becomes longer, and gain improves.

Small targets are zoomed and are easy to observe.

When the sea state is bad, detection performance decreases.

Recommended condition for selection:

Detection of small targets in good weather conditions

Usable transmitter pulse length differs according to the type of scanner unit being used and the observation range being used. For usable pulse length, see Section 11 "SPECIFICATIONS".

3.5.12 Expand Targets (Target Enhance)

The dimension of video display is enlarged to enhance a target.

Procedure

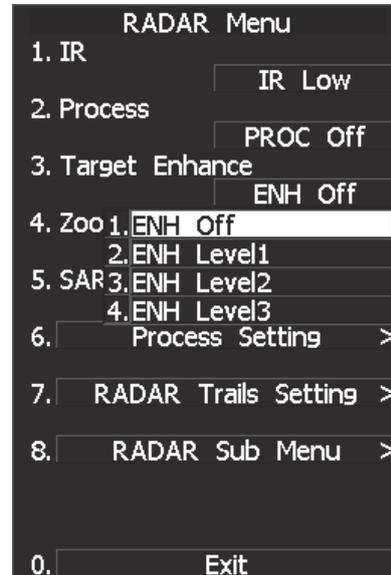
- 1 Press [RADAR MENU] key twice.

The Radar Menu will appear.

- 2 Press [3] key.

The Target Enhance Selection Menu will appear.

- 3 Select the mode number to be set, pressing the numeric keys [1] to [4].



Target expansion modes

ENH OFF	Expansion off:	Select this mode particularly when resolution is required.
ENH LEVEL1	Expansion - small:	Select this mode in general. Radar echoes are expanded by 1 scale in all directions.
ENH LEVEL2	Expansion - medium:	Select this mode to easily view the radar video. Radar echoes are expanded by 2 scales in all directions on the display.
ENH LEVEL3	Expansion - large:	Select this mode to detect small targets such as buoys. The expansion near a screen center is added to ENH LEVEL2.

Note: When ENH LEVEL3 is selected, sea clutter returns and rain/snow clutter returns are apt to be expanded. When using this expansion mode, operate [AUTO-SEA] control and [AUTO-RAIN] control to suppress sea clutter returns and rain/snow clutter returns. In general, ENH LEVEL1 or ENH LEVEL2 should be selected.

* Software button ③ located at the bottom left corner of the radar display described in Section 2.3.2 is also available to switch the target enhance mode.

3.5.13 Use Video Process (Process)

This function reduces unnecessary noise to highlight targets.

Attention

- When viewing a radar beacon, SART signal, or fast moving target on the radar display, select PROC Off (video processing off).
- If video processing mode is set to **CORREL**, it may be difficult to detect high speed target.

3

Procedure

- 1 Press [RADAR MENU] key twice.

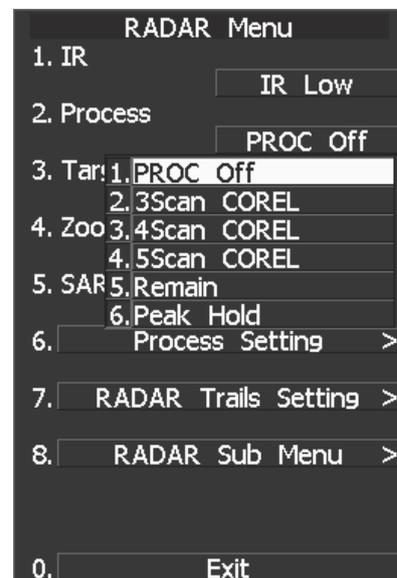
The Radar Menu will appear.

- 2 Press [2] key.

The Process Selection Menu will appear.

- 3 Select the mode number to be set, pressing the numeric keys [1] to [6].

The selected mode will be set.



Video process modes

PROC OFF	Video process off:	Select this mode in general.
3SCAN COREL	Correlative process 1:	Select this mode when many rain/snow clutter returns are detected.
4SCAN COREL	Correlative process 2:	Select this mode to highlight targets while suppressing sea clutter returns.
5SCAN COREL	Correlative process 3:	Select this mode to detect small targets hidden by sea clutter returns.
REMAIN	Video process 4:	Select this mode when own ship yaws wildly.
PEAK HOLD	Video process 5:	Select this mode to detect small targets of which detection probability is low.

* Software button ④ located at the bottom left corner of the radar display described in Section 2.3.2 is also available for switching video process modes.

3.5.14 Zoom

This function doubles the size of radar video near a specified position.

Note: If the range is 0.125 NM , this function is not available.
If the true motion mode is selected, this function is not available.

Procedure

- 1 Press [RADAR MENU] key twice.

The Radar Menu will appear.

- 2 Press [4] key.

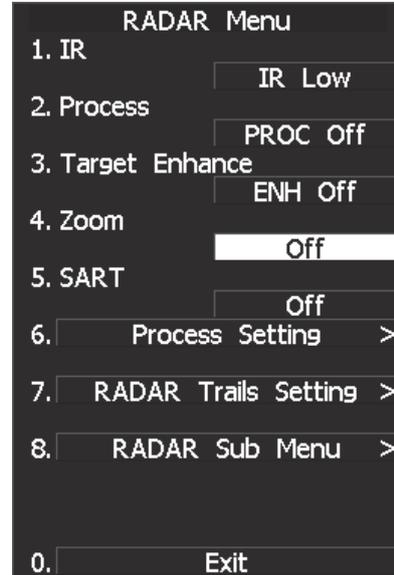
The setting of the zoom mode will be switched between ON and OFF.

OFF : Not zoomed
ON : Zoomed

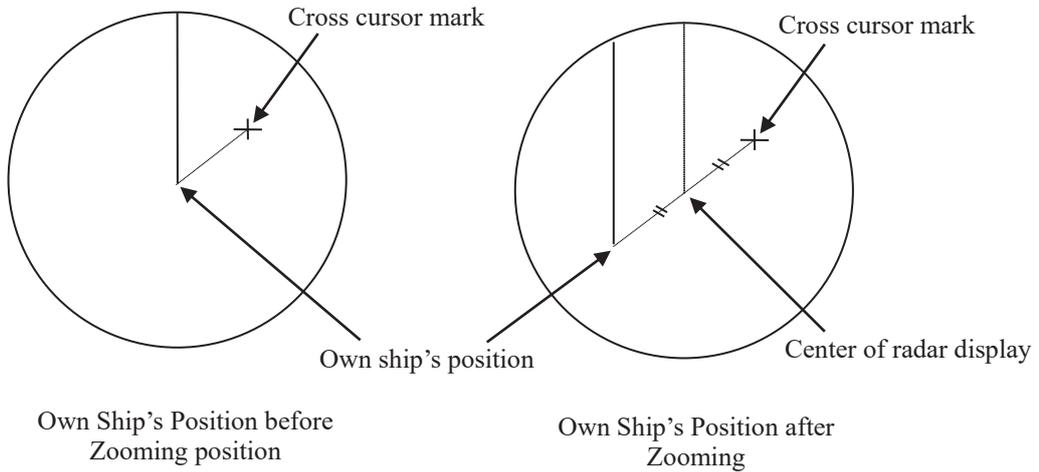
This function is not available at places where the size exceeds 66% of the radius of the display.

- 3 With **ZOOM ON** selected, move the cross cursor mark to the position to be zoomed, and press [ENT] key.

The position will be zoomed.



Using the cross cursor mark as reference, the zoom function doubles the size of a radar video with the midpoint between the cursor mark and own ship's position being set to the center of radar display.



* Software button ① located at the bottom left corner of the radar display described in Section 2.3.2 is also available to switch the zoom function between ON and OFF.

3.5.15 Use Marker [MOB]

The marker function displays a dotted line from the marker input position to the own ship's position, and indicates the range, bearing, and required time from the own ship to the marker.

Procedure

1 Press [MOB] key.

A marker will be displayed at the own ship's position on the radar display at the moment when [MOB] key is pressed.

The own ship and the marker are connected with a dotted line.

Even when the own ship moves, the marker is fixed at the latitude and longitude. Thus, if a marker is put to an important position, the ship can return to the position regarding the marker as a target.

3

Cancellation

1 Hold down [MOB] key for 2 seconds.

The marker will disappear.

3.5.16 Marking [MARK]

A maximum of 20 marks can be indicated at arbitrary positions on the radar display.
A mark created on the radar display holds the latitude and longitude.

[I] Creating Marks

Procedure

- 1 Press [MARK] key.

[□] will appear in the CURSOR field at the upper right of the radar display.

- 2 Put the cross cursor mark on the position where a mark is to be created, and press [ENT] key.

The cross cursor mark will be changed into the [□] mark and fixed on the radar display. To enter more [□] marks, repeat step 2.

Up to 20 marks can be entered.

Note: If more than 20 marks are created, the oldest mark is cleared and the newly created mark is displayed.

[II] Clearing Marks

Procedure

- 1 Press [MARK] key.

The [□] mark will appear in the CURSOR field at the upper right of the radar display.

- 2 Put the cross cursor mark on the mark to be cleared.

The [□] mark will disappear. To clear another [□] mark, repeat step 2.

To clear all [□] marks, press [MARK] key and then hold down [CLR] key.

* Software button ① located at the top right corner of the radar display described in Section 2.3.3 changes the cursor mode. When "□" appears, the cross cursor is available to create "□" mark.

3.5.17 Operate EBL Maneuver Function (EBL Maneuver)

[I] Initial Setting (Reach, Turn Mode, Turn Set)

Procedure

- 1 Press [RADAR MENU] key.

Press [3] key.

Press [7] key.

The EBL Maneuver Setting Menu will appear.

- 2 Press [2] key.

The CODE INPUT Menu will appear.
Enter the Reach value and select the software button ENT.

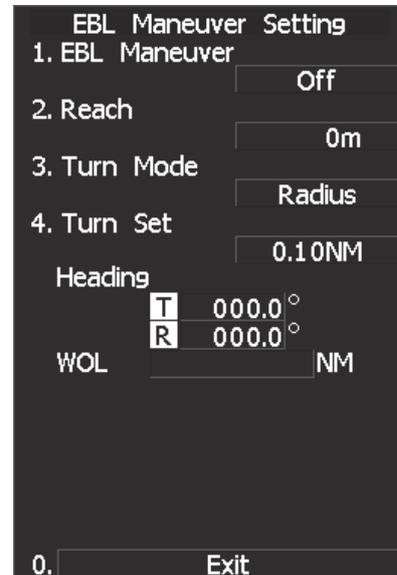
- 3 Press [3] to select Turn Mode.

The setting of turn mode will be switched between RADIUS and RATE.

RADIUS: Constant turn diameter (NM)
RATE: Constant turn speed (deg/min)

- 4 Press [4] key.

The CODE INPUT Menu will appear.
Enter the Turn Set value and select the software button ENT.



3

Note: If the initial setting is not correct, the maneuver curve is affected.

[II] Creating Maneuver Curve (EBL Maneuver)

Procedure

- 1 Press [1] key while the EBL Maneuver menu is open.

EBL Maneuver will be set to ON.

A supplemental line, a maneuver curve, and WOL will appear on the radar display.

- 2 Set the starting point of the supplemental line using the trackball, and set the bearing of the supplemental line using the [EBL] control.

The bearing of the supplemental line will be the final bearing in which the own ship is to move.

The position of WOL will change depending on the bearing of the supplemental line.

If the WOL is behind the own ship's position, the line color of WOL will change.

- 3 Press [ENT] key.

The setting will be determined. However, if the WOL is behind the own ship's position at this point, the pressing of [ENT] key is rejected, and the setting is not determined.

Cancellation

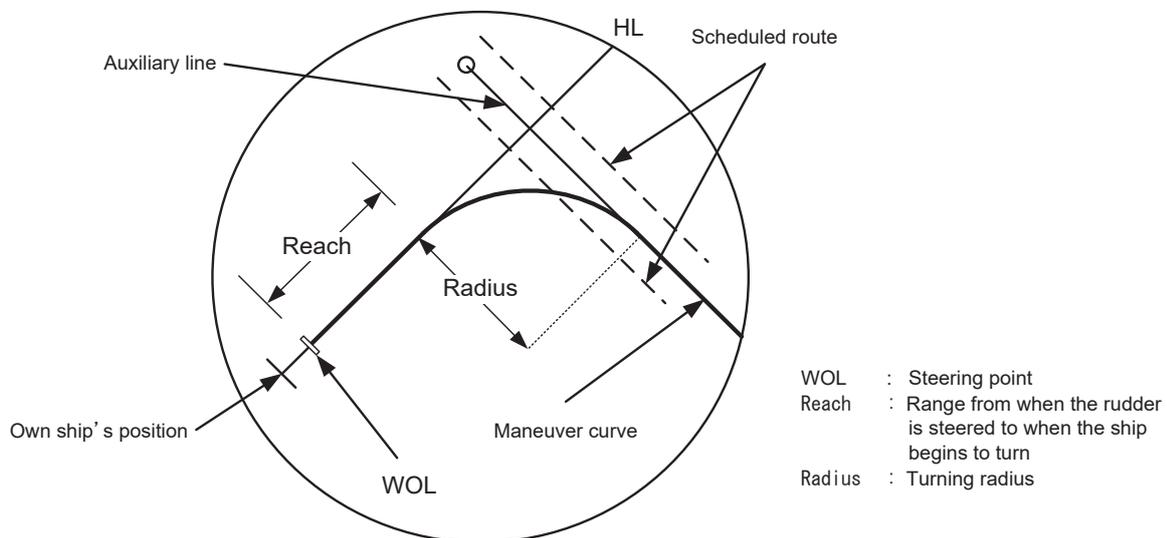
- 1 Press [1] key.

The EBL Maneuver function will be set to OFF.

Exit

- 1 Press [RADAR MENU] key.

The EBL Maneuver Menu will close.



WOL: Steering point

REACH: Distance from when the wheel is steered to when the ship begins to turn

R: Turning radius

3.5.18 Operate Multi-Function Control [MULTI]

The multi-function control [MULTI] is provided to change the settings of parameters such as the length of radar trails. Turn the control to select a parameter. Radar operation is simplified by using the control.

[I] Initial Setting (Multi Dial Setting)

Set parameters that can be operated with the multi-function control.
A parameter set to ON can be called by turning [MULTI] control.

Procedure

- 1 Press [RADAR MENU] key twice.

Press [8] key.

Press [2] key.

The Multi Dial Setting Menu will appear.

- 2 Press the numeric key of the number of the parameter whose setting is to be changed.

The setting will be switched between ON and OFF .

ON: Can be operated with the multi-function control.

OFF: Cannot be operated with the multi-function control.



Parameters

- | | |
|------------------------|---|
| 1. Vector Length: | Vector length of TT |
| 2. Trails Length: | Length of radar trails |
| 3. TT TGT Display No.: | TT target number for which values are to be displayed |
| 4. C-UP Angle: | Course in course-up mode bearing mode |
| 5. Own Track Color: | Available with plotter option. |
| 6. Mark/Line Color: | Available with plotter option. |

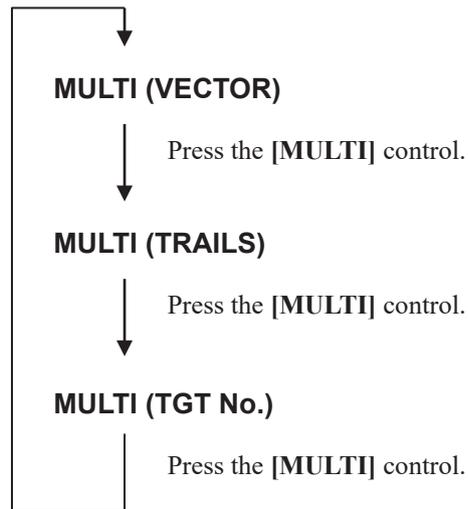
[II] Using Multi-function Control

Procedure

- 1 Press the [MULTI] control to select the parameter whose setting is to be changed.

Parameters will be selected sequentially each time the [MULTI] control is pressed. The currently selected parameter is indicated at the lower left of the radar display.

For example, if three parameter 1-3 are initially set to ON, they are selected in the following sequence each time the [MULTI] control is pressed:



- 2 Turn the [MULTI] control to change the setting.

The preset values of the selected parameter will change sequentially. Stop turning the control when the desired value appears.

* Software button ⑬ located at the bottom left corner of the radar display described in Section 2.3.2 is also available for switching the settings.

3.5.19 Operate User Key Switches [User Key 1/2]

Users can freely make settings with [USER KEY1] key and [USER KEY2] key.
By using the switches, users can open a frequently used menu by only single operation, or assign special functions, which are not on the standard operation panel, to the user key switches.

[I] Initial Setting (User Key Setting)

Set functions that can be performed with the user key switches.

Procedure

- 1 Press [RADAR MENU] key twice.

Press [8] key.

Press [3] key.

The User Key Setting Menu will appear.

- 2 Press the numeric keys [1] or [2] to select the user key switch whose setting is to be changed.

The pull-down menu will appear showing the functions.

User Key1: [1] key

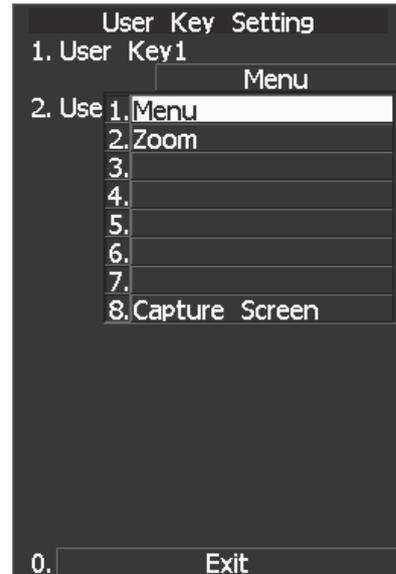
User Key2: [2] key

- 3 Press the numeric key to select the function that is to be assigned to the user key switch.

The function will be selected.

Pull-down menu items

1. MENU: Directly displays a specified menu.
2. ZOOM: Sets the zoom function to ON/OFF.



[II] Using User Key Switches (Directly displaying a specified menu)

Preset the menu that is to be displayed with the user key switch.

Setting the menu that is to be displayed with User Key 1:

Procedure

- 1 Perform the general menu open procedure to open the menu that is to be directly displayed with User Key 1.
- 2 While the menu is open, hold down [USER KEY1] key for 2 seconds.

The menu will be assigned to [USER KEY1] key.

Setting the menu that is to be displayed with User Key 2:

Procedure

- 1 Perform the general menu open procedure to open the menu that is to be directly displayed with User Key 2.
- 2 While the menu is open, hold down [USER KEY2] key for 2 seconds.

The menu will be assigned to [USER KEY2] key.

Directly displaying the menus assigned to the User Keys:

Procedure

- 1 Press [USER KEY1] key.

The menu assigned to [USER KEY1] key will appear.
Subsequently, general menu operation can be performed.

Procedure

- 1 Press [USER KEY2] key.

The menu assigned to [USER KEY2] key will appear.
Subsequently, general menu operation can be performed.

3.5.20 Automatic Acquisition

Note: If the number of targets being tracked has reached the allowable maximum and other targets (not being tracked) go into the acquisition/activation zone, automatically acquired targets are canceled in ascending order of danger.

Turning On / Off the automatic acquisition and AIS activation (AZ Menu)

Procedure

1 Press the [TT Menu] key.

TT Menu opens.

2 Press the [5] key.

Press the [1] key.

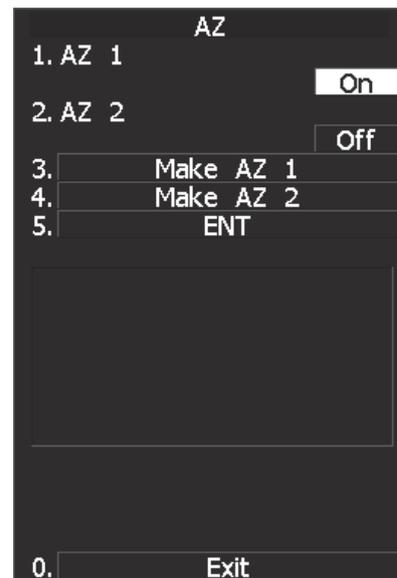
Acquisition / activation zone setting menu (AZ) opens.

3 Press the [1] or [2] key.

The acquisition / activation zone 1 (AZ1) or acquisition / activation zone 2 (AZ2) will be set to on or off.

On :The acquisition / activation zone is turned on. The mark "  " and target ID number are put to an acquired target and move with the target. The vectors are displayed within 1 minute. AIS targets are activated.

Off :The acquisition/activation zone is turned off. The acquisition/activation zone will disappear from the radar display, but the system continues to track the acquired target. The activated AIS targets remain activate.



Creating the automatic acquisition and AIS activation Zone

Procedure

- 1 Press the [TT Menu] key.

TT Menu opens.

- 2 Press the [5] key.

Press the [1] key.

Acquisition / activation zone setting menu (AZ) opens.

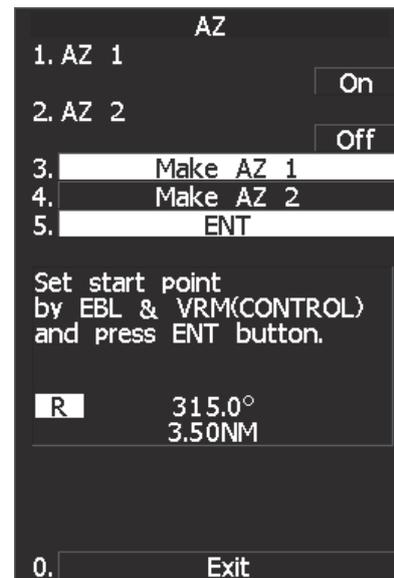
- 3 Press the [3] or [4] key.

The range setting of the acquisition / activation zone 1 (AZ1) or acquisition / activation zone 2 (AZ2) will be started.

- 4 Set the starting azimuth and range by turning the [EBL] dial and [VRM] dial, and press the [ENT] key.

- 5 Set the ending azimuth and range by turning the [EBL] dial and [VRM] dial, and press the [ENT] key.

The acquisition / activation zone will be determined.



Setting the [AZ] key allocation (Set AZ Key)

A generally used acquisition / activation zone can be turned on / off by simply pressing the [AZ] key.

Procedure

1 Press the [TT Menu] key.

TT Menu opens.

2 Press the [5] key.

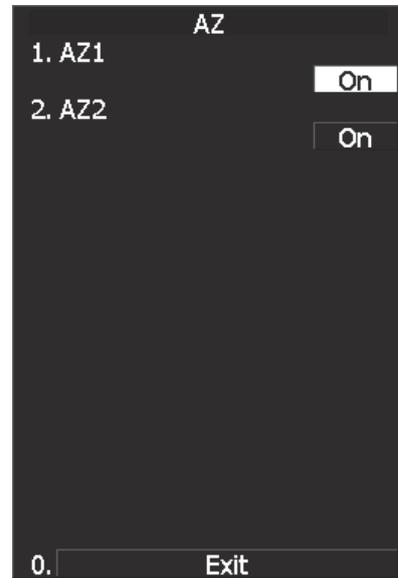
Press the [3] key.

Alarm key allocation menu (Set AZ Key) opens.

3 Press the [1] key.

Allocate alarm keys for the acquisition / activation zone.

- On :Pressing the [AZ] key turns on / off the acquisition / activation zone.
- Off :Pressing the [AZ] key does not turn on the acquisition / activation zone.



3

Note: If the RADAR Alarm key assignment is set, pressing the [AZ] key turns on / off the AZ Alarm key at the same time the RADAR Alarm is turned on / off.

3.5.21 Radar Alarm (Radar Alarm)

With a fan-shaped range made, the radar alarm can give an alarm to ships that enter or depart from the range.

[1] Display Sector Alarm (Sector Alarm 1, 2)

Display a created Sector Alarm.

Procedure

- 1 Press [TT MENU] key.**

The TT Menu will appear.

- 2 Press [5] key.**

Press [2] key.

The Radar Alarm Menu will appear.

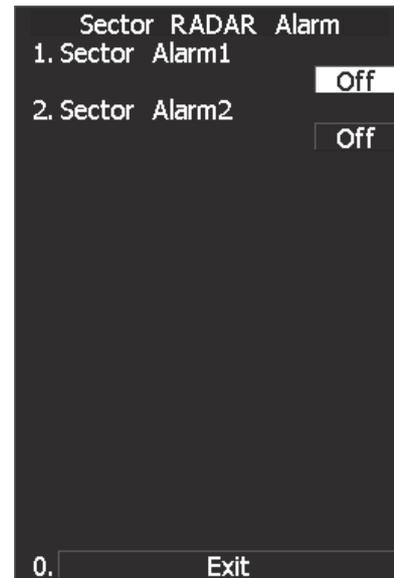
- 3 Press [1] key.**

The Sector Radar Alarm Menu will appear.

- 4 Press numeric key [1] or [2] in accordance with the Sector Alarm to be displayed.**

The display sector alarm mode will be switched between ON and OFF.

ON: Displayed
OFF : Not displayed



[III] Set Radar Alarm Mode (Radar Alarm Mode)

For alarm issuing conditions for the radar alarm, set either entry or departure.

Procedure

- 1 Press [TT MENU] key.

The TT Menu will appear.

- 2 Press [5] key.

Press [2] key.

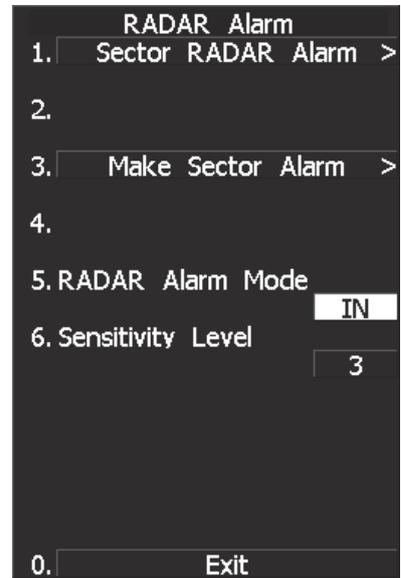
The Radar Alarm Menu will appear.

- 3 Press [5] key.

The radar alarm mode will be switched between ON and OFF.

IN: Issues an alarm when ship enters.

OUT: Issues an alarm when ship departs.



[III] Set Radar Alarm Detection Level (Sensitivity Level)

Detection levels can be set to issue alarms from the radar alarm.

Procedure

- 1 Press [TT MENU] key.**

The TT Menu will appear.

- 2 Press [5] key.**

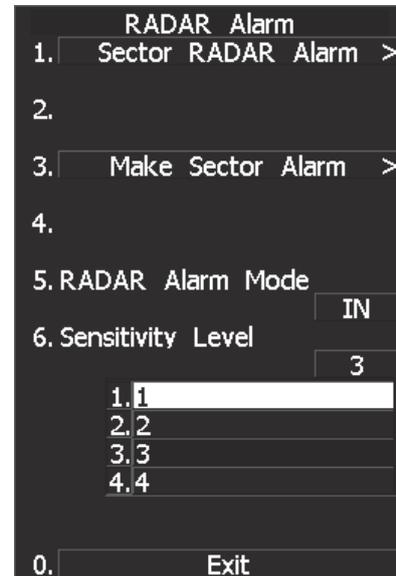
Press [2] key.

The Radar Alarm Menu will appear.

- 3 Press [6] key.**

When a detection level appears, select the number you want to set, pressing the numeric keys [1] to [4].

* As the numeric value for detection level is larger, echo needs to be stronger for detection. If the numeric value for detection level is low, detection can be made with weak echo to issue an alarm.



[IV] Make Sector Alarm (Make Sector Alarm)

Sector alarms that can be made are divided into the two types.

Procedure

- 1 Press [TT MENU] key.

The TT Menu will appear.

- 2 Press [5] key.

Press [2] key.

The Radar Alarm Menu will appear.

- 3 Press [3] key.

The Make Sector Alarm Menu will appear.

- 4 Press numeric key [1] or [2] in accordance with the Sector Alarm to be made.

This operation is available only while the unit is in the transmission mode.

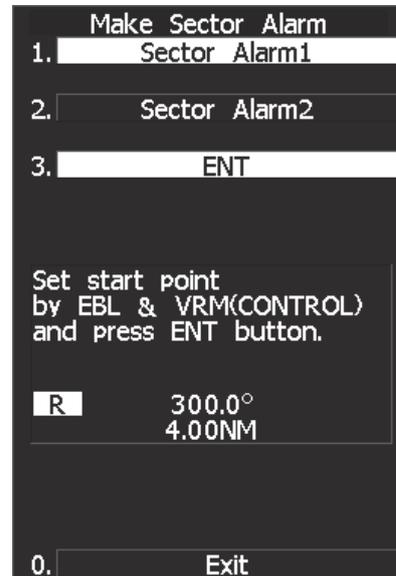
(In the stand-by state, operation is not allowed to go further.)

- 5 Place the start position of the sector alarm at a desired position by operating the EBL/VRM dial, and then select 3 ENT.

The start position of the Sector Alarm will be set.

- 6 Place the end position of the Sector Alarm at a desired position by operating the EBL/VRM dial, and then select 3 ENT.

The end position of the Sector Alarm will be set.



Setting RADAR Alarm Key Assignment (Set AZ Key)

This section explains how to set a RADAR alarm that is to be assigned to the [AZ] key.

The setting enables the operator to select ON/OFF for a generally used RADAR alarm by simply operating the [AZ] key on the control panel.

Procedure

1 Press [TT MENU] key.

Press [5].

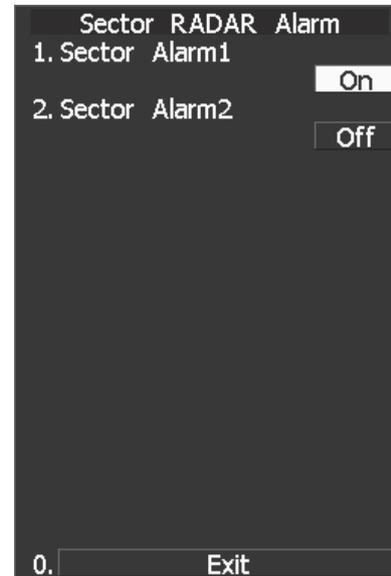
Press [3].

Press [2].

Sector RADAR Alarm menu will appear.

ON: Turns on the RADAR alarm when the [AZ] key is pressed.

OFF: Does not turn on the RADAR alarm when the [AZ] key is pressed.



Note: When the automatic acquisition / activation zone key allocation is set, pressing the [AZ] key will simultaneously turn on or off the radar alarm in the automatic acquisition / activation zone.

3.6 USE OWN SHIP'S TRACK DATA (OWN TRACK)

The own ship's track function saves and displays own ship's track.

If navigation equipment is connected, this radar system records latitude / longitude data sent from the navigation equipment and displays own ship's track.

Note: Even when own ship's track interval switching (software button ⑫ located at the bottom right corner of the radar display described in Section 2.3.4) is set to **Off**, own ship's track can be displayed. However, in this case, if rewrite operation such as changing of the display range is performed for the radar display, own ship's track display is erased and the track will not be plotted again.

If the DISP Own Track is turned off when the own ship track is in save, own ship's track is not shown of the display, but own ship's track data is still saved.

The own ship's track function is available between latitudes of 85°N and 85°S.

When a plotter unit (optional) is connected, own ship's track can be displayed and saved in seven different colors. The color display can be turned on or off by color.

3.6.1 Display Own Ship's Track (Display Own Track)

If navigation equipment is connected, this system records data received from the navigation equipment and displays the own ship's track.

1 Select color for new own ship past tracks. (Own Track Color)

Procedure

- 1 Press [RADAR MENU] key.
Press [9] key.
Press [1] key.

The Own Track Setting Menu will appear.

- 2 Press [5] key.

The color list is displayed.

- 3 Select the number to be set, pressing the numeric key.

The selected track color will be set.

* Software button ⑫ located at the bottom right corner of the radar display described in Section 2.3.4 is also available to select the Own Track color.



The selected color is applied to the newly displayed track only.
The tracks displayed already are not affected by the setting.

Note: The own ship's track can be displayed even while Own Track Memory is set to OFF. In this case, if rewrite operation such as changing of the display range is performed for the radar display, the own ship's track display is erased and the track is not plotted again.
If DISP Own Track is set to OFF when Own Track Memory is ON, the own ship's track is not shown on the radar display but the system stores own ship's track data at specified intervals.

2 Select Own ship tracks by the color. (Display Own Track Color)

Procedure

- 1 Press [RADAR MENU] key.

Press [9] key.

Press [1] key.

The Own Track Setting Menu will appear.

- 2 Press [2] key.

The track color list is displayed.

- 3 Select the color of the tracks to be displayed by Pressing the numeric key.

The selected tracks are displayed.



* You can select the color for new own ship's track in "Track Color". Then you can view the memorized own ship's tracks by colors selected in "DISP Own Track Color".

3.6.2 Set Own Ship's Track Data Storage Interval (Own Track Interval)

There are 10 preset time intervals and 8 preset range intervals that can be selected for storing own ship's track data.

Procedure

1 Press [RADAR MENU] key.

Press [9] key.

Press [1] key.

The Own Track Setting Menu will appear.

2 Press [1] key.

The Own Track Interval Setting Menu will appear.

3 Select the storage interval number to be set, pressing the numeric key.

The selected storage interval will be set.

A preset time interval or preset distance interval can be selected as the storage interval.

Storage intervals that can be selected

Time: 3 sec, 5 sec, 10 sec, 30 sec, 1 min, 3 min, 5 min, 10 min, 30 min, and 60 min

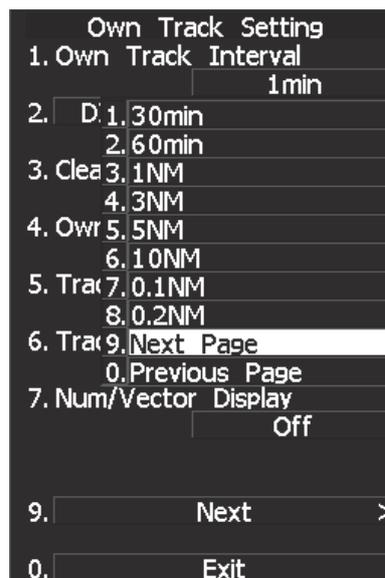
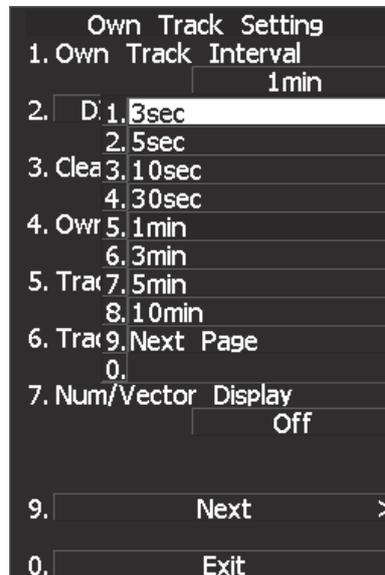
Range: 1 nm, 3 nm, 5 nm, and 10 nm

The pull-down menu consists of 2 pages.

To switch between the pages, select Next Page pressing the numeric key [9], or Previous Page pressing the numeric key [0].

* Pressing software button ⑫ located at the bottom right corner of the radar display described in Section 2.3.4, you can switch track data storage intervals, and pressing software button ⑬ located at the bottom right corner of the radar display described in Section 2.3.4, you can switch of a memory unit.

Setting the button to OFF cancels the storing of data.



3.6.3 Cancel Storing of Own Ship's Track Data (Own Track Memory)

This function cancels the storing of own ship's track data.

Procedure

- 1 Press [RADAR MENU] key.

Press [9] key.

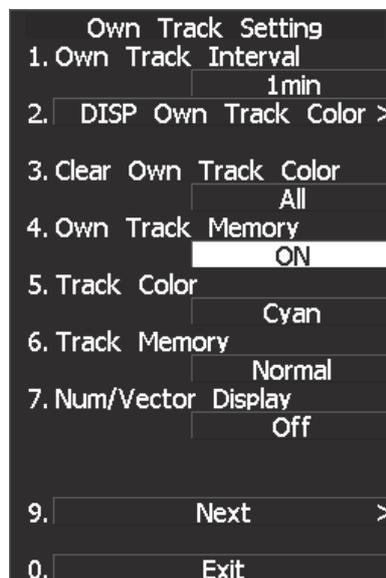
Press [1] key.

The Own Track Setting Menu will appear.

- 2 Press [4] key.

The setting of Own Track Memory will be switched between ON and OFF.

ON: Own ship's track data is stored.
 OFF: Own ship's track data is not stored.



* Software button ⑫ located at the bottom right corner of the radar display described in Section 2.3.4 is also available for switching Track Data Storage Intervals. Setting the button to OFF cancels own track memory.

Note: The own ship's track can be displayed even while Own Track Memory is set to OFF. In this case, if rewrite operation such as changing of the display range is performed for the radar display, the own ship's track display is erased and the track is not plotted again. If Display Own Track is set to OFF when Own Track Memory is ON, the own ship's track is not shown on the radar display but the system stores own ship's track data at specified intervals.

3.6.4 Clear Own Ship's Track Data (Clear Own Track)

This function clears own ship's track data from memory.

Procedure

- 1 Press [RADAR MENU] key.

Press [9] key.

Press [1] key.

The Own Track Setting Menu will appear.

- 2 Press [3] key.

The Own Track color list will appear.

- 3 Select the track color to be cleared, pressing the numeric key.

The tracks with selected color will be cleared.

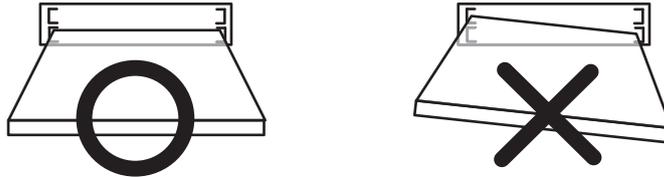


3.7 DISPLAY CHARTS

3.7.1 Insert/Remove a Card

Insert or remove the JRC coastline ROM card, ERC card, C-MAP card and memory card according to the procedures below.

Note: Keep a card horizontal when inserting it into a card slot. An inclined card causes a failure.



Do not simultaneously insert a JRC coastline ROM card, an ERC card and C-MAP card into the card slot. A malfunction will occur on the display.

Insert the card into the specified slot according to the following table:

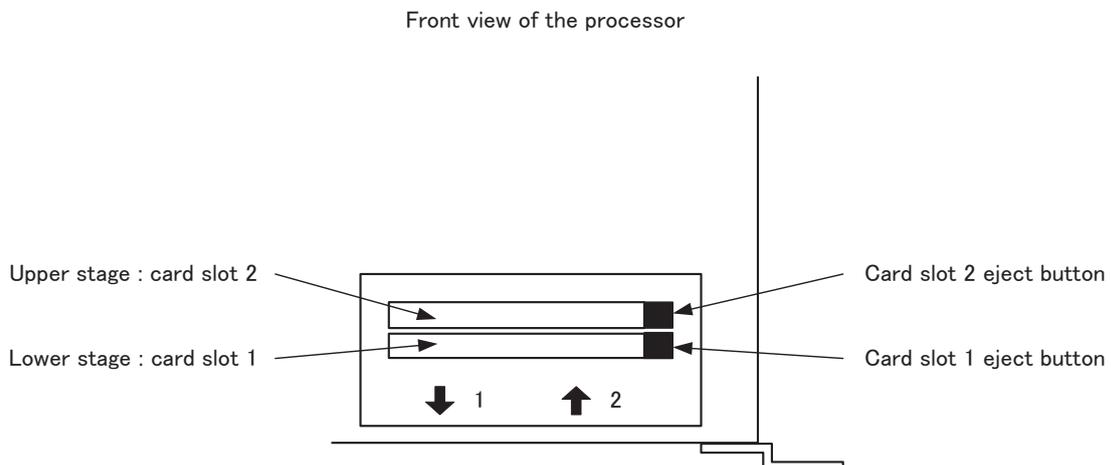
Card type	Insertion slot No.
JRC card	Either one
ERC card	Either one
C-Map NT+ detail card	Either one
Memory card	Card slot 2 (Upper stage)

Note: The Background of C-Map has been built in, don't insert C-Map NT+ background card. If the background card is inserted, the system will malfunction.

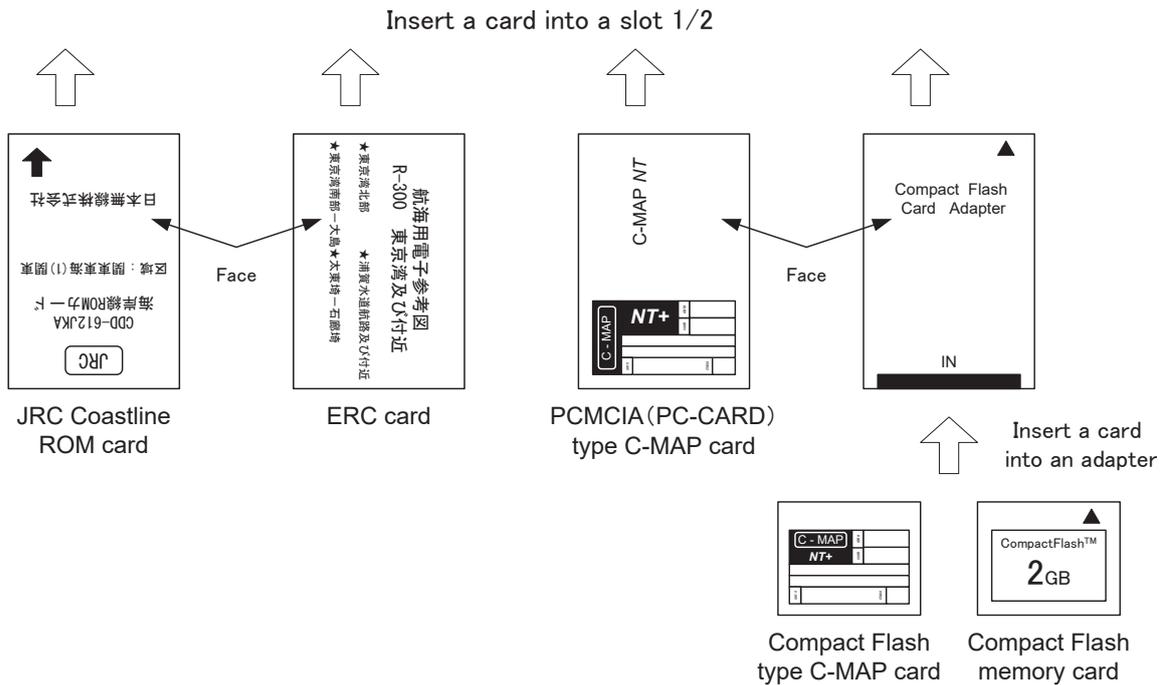
Insert a card into processor unit

Procedure

- 1 Remove the rubber packing located at the front view of the processing unit cabinet, and expose the card slot.



2 Insert the card in the direction indicated by the arrow.



3

3 Insert the card until the card slot's eject button protrudes and complete the installation of a card.

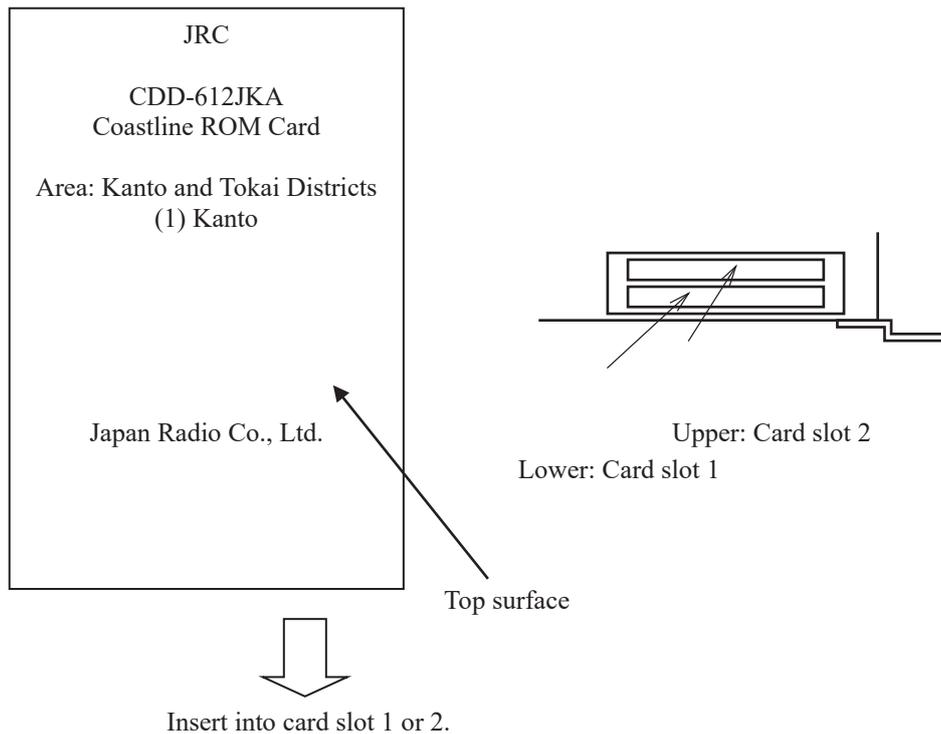
Eject a card from processor unit

Procedure

- 1 Push the eject button corresponding to the desired card slot.
- 2 remove a card from processor unit

3.7.2 Display Coastline ROM Card Produced by JRC

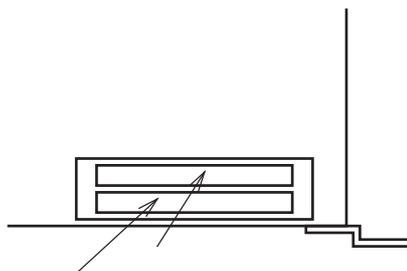
- Insert the Coastline ROM card produced by JRC with the top surface upward into card slot 1 (lower) or 2 (upper) as shown in the figure below. Press [MAP] key, and the coastlines will be displayed automatically.
- Two Coastline ROM cards can be inserted into card slots 1 and 2 at the same time.
- For ranges including detailed coastlines, refer to the Coastline ROM card catalog.
- Do not insert an ERC card (provided by Japan Hydrographic Association) or C-MAP card into a card slot while JRC's Coastline ROM card is in the other slot. Doing so causes display trouble.



* Insert the card and then press software button ④ located at the bottom right corner of the radar display described in Section 2.3.4 to switch Display Charts between ON and OFF.

3.7.3 Display ERC Card

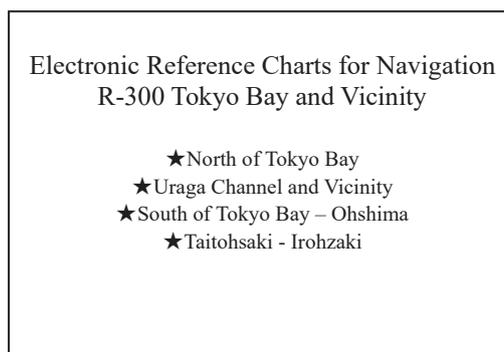
- Insert the ERC card (provided by Japan Hydrographic Association) with the top surface upward into card slot 1 (lower) or 2 (upper) as shown in the figure below. Press [MAP] key, and the coastlines will be displayed automatically.
- Two ERC cards can be inserted into card slots 1 and 2 at the same time.
- For ranges of charts to be displayed, refer to the catalog issued by Japan Hydrographic Association.
- Do not insert JRC's Coastline ROM card or C-MAP card into a card slot while the ERC card is in the other slot. Doing so causes display trouble.



Upper: Card slot 2

Lower: Card slot 1

Insert into card slot 1 or 2.



* Insert the card and then press software button ④ located at the bottom right corner of the radar display described in Section 2.3.4 to switch Display Charts between ON and OFF.

3.7.4 Fill Charts (Fill Land Area)

This function fills the chart when JRC/ERC card is in use.

Procedure

- 1 Press [RADAR MENU] key.

Press [9] key.

Press [5] key.

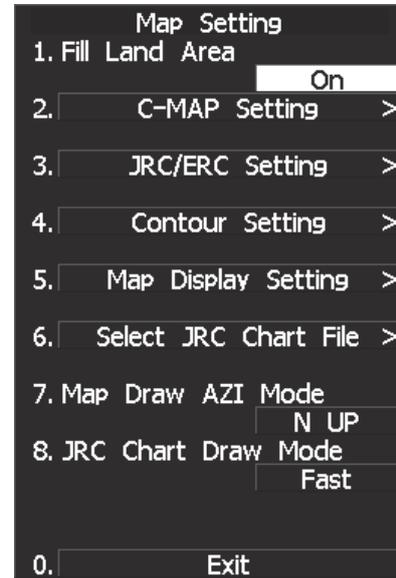
The Map Setting Menu will appear.

- 2 Press [1] key.

The setting of Fill Land Area will be switched between ON and OFF.

ON: Charts are filled.

OFF: Charts are not filled.



3.8 DISPLAY NAVIGATION INFORMATION (NAV INFORMATION DISPLAY)

Navigation information such as waypoint marks, and a maximum of 256 points of NAV lines, coastlines, depth contours, and NAV marks can be displayed, created, read, saved, corrected, and deleted. (This function is available only when navigation equipment is connected with the system.)

Note: Navigation information is available between latitudes of 85°N and 85°S.

3

3.8.1 Display Waypoint Marks (Waypoint Display)

When waypoint information is received from the navigation equipment, the waypoint mark appears on the radar display. In this case,  is indicated as the waypoint mark on the radar display.

Procedure

- 1 Press [RADAR MENU] key twice.

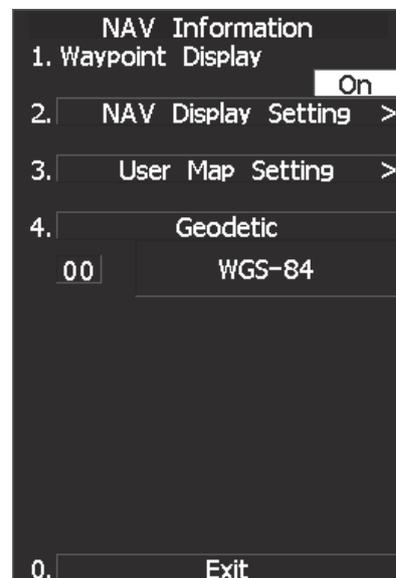
Press [6] key.

The NAV Information Menu will appear.

- 2 Press [1] key.

The setting of Waypoint Display will be switched between ON and OFF.

: Displays waypoint marks.
: Does not display waypoint marks.



Waypoint marks are displayed only when NMEA sentences are used to receive Waypoint information. A plotter function (option) is needed to make Waypoint in this radar.

3.8.2 Display Navigation Information (NAV Display Setting)

The navigation information below can be displayed (ON) or hidden (OFF) individually.

- ① Line 1 [Line 1] —
- ② Line 2 [Line 2] ----
- ③ Line 3 [Line 3] - —
- ④ Mark 1 [Mark 1] ⊗
- ⑤ Mark 2 [Mark 2] ★
- ⑥ Mark 3 [Mark 3] +
- ⑦ Mark 4 [Mark 4] Y

Procedure

- 1 Press [RADAR MENU] key.

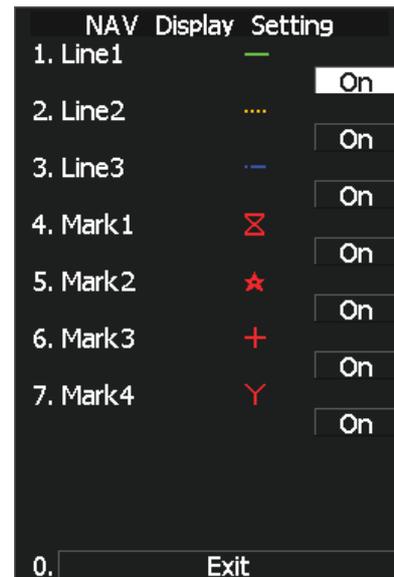
Press [6] key.

Press [2] key.

The NAV Display Setting Menu will appear.

To determine whether to display each type of navigation information, press the corresponding numeric key.

- | | | |
|-----|---|--|
| ON | : | Displays the navigation information. |
| OFF | : | Does not display the navigation information. |



3.8.3 Create/Edit Navigation Information (Edit User Map)

Procedure

- 1 Press [RADAR MENU] key.

Press [6] key.

Press [3] key.

Press [6] key.

The Edit User Map Menu will appear.

The Edit User Map enables the operations of the functions below.

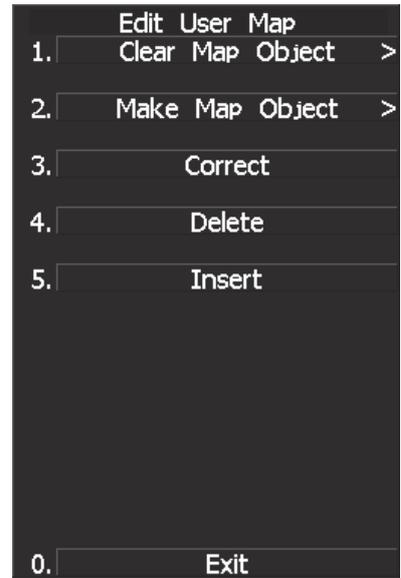
Clear Map Object: Clears all or an item of navigation information.

Make Map Object: Creates navigation information.

Correct: Corrects navigation information.

Delete: Deletes one point from navigation information.

Insert: Inserts an element into a line of each type



1 Clearing all or an item of navigation information (Clear Map Object)

Procedure

- 1 Press [1] key while the Edit User MAP Menu is open.

The Clear Map Object Menu will appear.

Select the type of navigation information to be cleared, pressing the corresponding numeric key.

Line1:	Clears Line 1.
Line2:	Clears Line 2.
Line3:	Clears Line 3.
Mark1:	Clears Mark 1.
Mark2:	Clears Mark 2.
Mark3:	Clears Mark 3.
Mark4:	Clears Mark 4.

All: Clears all items of navigation information.





2 Making navigation information (Make Map Object)

Procedure

- 1 Press [2] key while the Edit User MAP Menu is open.

The Make Map Object Menu will appear.

MAKE will appear in the **CURSOR** mode field at software button ② located at the bottom right corner of the radar display described in Section 2.3.3.

- 2 Select the type of navigation information to be made, pressing the corresponding numeric key.
- 3 Use the trackball to move the cross cursor mark to the starting point of a line or a point where a mark is to be made, and press [ENT] key.



The starting point of a line or one point of a mark will be determined.

- 4 Repeat step 3, and press [8] key when finishing the making of the line or mark.

The line or mark make mode will terminate.

- 5 To make another line or mark, repeat steps 2 to 4.

- 6 Press [0] key when finishing the making of all navigation information.

The Edit User Map Menu will reappear.

Note: Navigation information can be created with a maximum of 256 points being plotted. The number of points that can still be plotted (REMAIN POINT in the menu) is decremented each time a line or mark is plotted.

3 Correcting a continuous line or moving a mark (Correct)

Procedure

- 1 Press [3] key while the Edit User Map Menu is open.

The navigation information correction mode will be activated.

Correct will appear in the **CURSOR** mode field at software button ② located at the bottom right corner of the radar display described in Section 2.3.3.

- 2 Use the trackball to move the pointer to the vertex in a line to be corrected or the mark to be moved, and press [ENT] key.

The cross cursor mark will appear on the selected line or mark.

- 3 Use the trackball to move the cross cursor mark to a new point to which the line is corrected or the mark is moved.

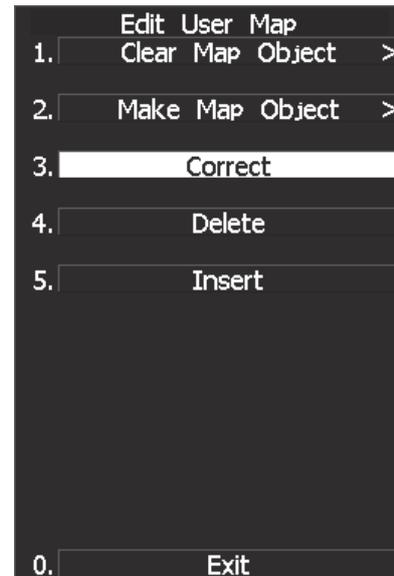
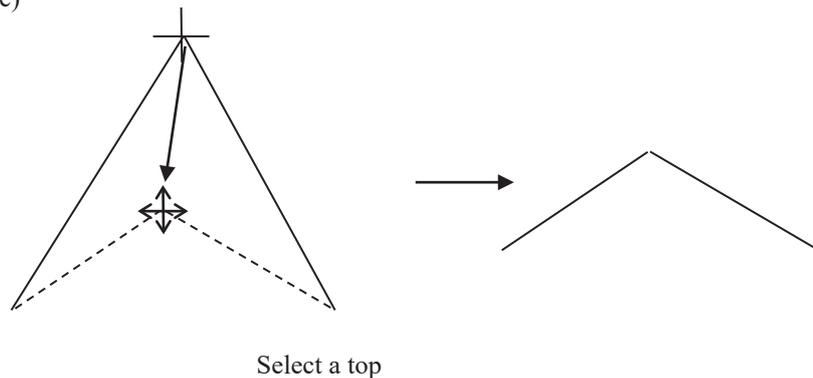
The selected line will be corrected to the new point, or the mark will be moved there.

- 4 To correct another line or mark, repeat steps 2 and 3.

- 5 Press [0] key when finishing the correction of lines and marks.

The **CURSOR** mode at the upper right of the radar display will change to the general operation mode, terminating the navigation information correction mode.

(Example)



4 Deleting a continuous line or mark (Delete)

Procedure

- 1 Press [4] key while the Edit User Map Menu is open.

The navigation information deletion mode will be activated.

Delete will appear in the **CURSOR** mode field at software button ② located at the top right corner of the radar display described in Section 2.3.3.

- 2 Use the trackball to move the pointer to the vertex in a line or the mark to be deleted, and press [ENT] key.

The selected line or mark will be deleted.

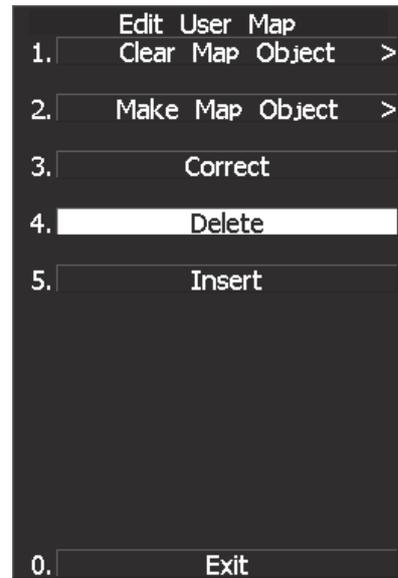
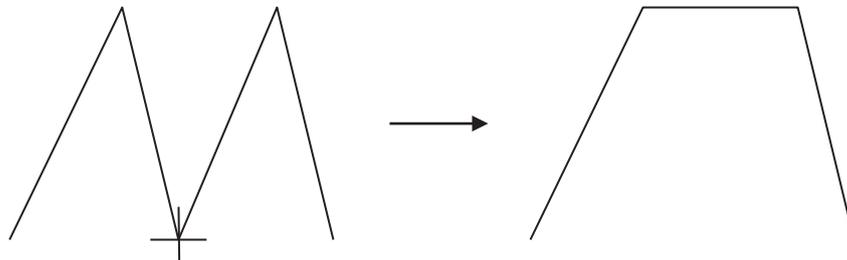
Note: A line drawn by joining two points is all deleted.

- 3 To delete another line or mark, repeat step 2.

- 4 Press [0] key when finishing the deletion of lines and marks.

The **CURSOR** mode at the upper right of the radar display will change to the general operation mode, terminating the navigation information deletion mode.

(Example) Deletion of a vertex from a line



5 Inserting a vertex into a line (Insert)

Procedure

- 1 Press [5] key while the Edit User MAP Menu is open.

The navigation information insertion mode will be activated.
[Insert] will appear in the [CURSOR] mode field at software button ② located at the top right corner of the radar display described in Section 2.3.3.

- 2 Use the trackball to move the pointer to the line that is to become a vertex, and press [ENT] key.

The cross cursor mark will appear on the selected point.

- 3 Use the trackball to move the cross cursor mark to a new point where a vertex is to be formed, and press [ENT] key.

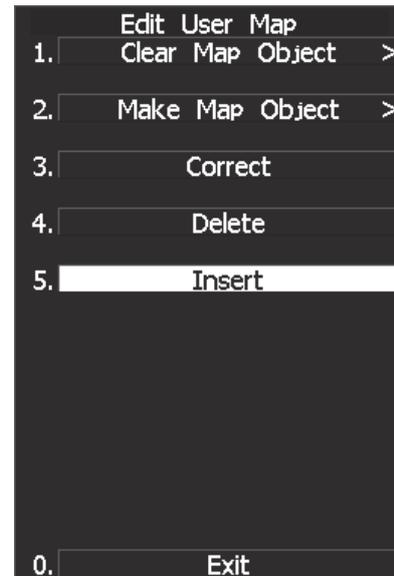
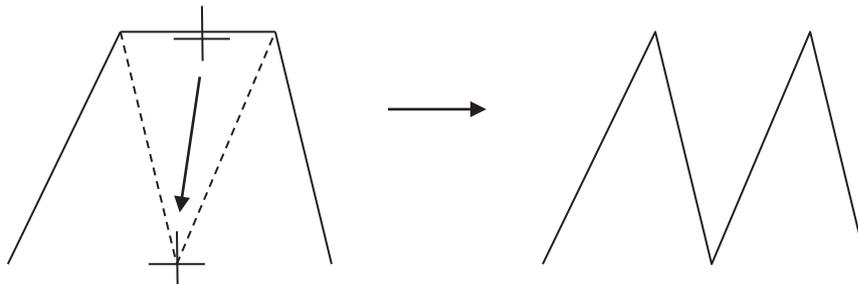
A vertex will be inserted into the selected line.

- 4 To insert another vertex, repeat steps 2 and 3.

- 5 Press [0] key when finishing the insertion of all vertices.

The [CURSOR] mode at the upper right of the radar display will change to the general operation mode, terminating the navigation information insertion mode.

(Example)



3.8.4 Set Navigation Information (User Map Setting)

Procedure

- 1 Press [RADAR MENU] key.

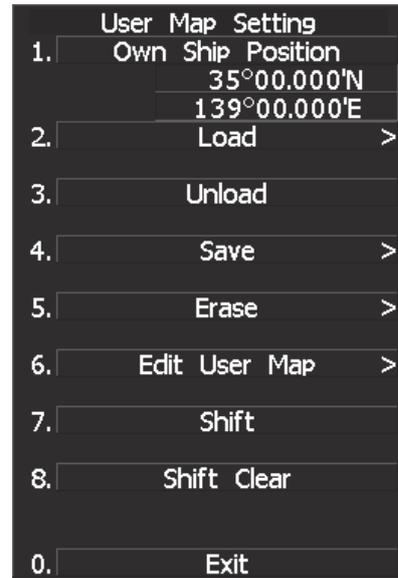
Press [6] key.

Press [3] key.

The User Map Setting Menu will appear.

Select operation for navigation information, pressing the corresponding numeric key. The selected operation will be performed.

- Load: Loads navigation information.
 Unload: Unloads navigation information.
 Save: Saves navigation information.
 Erase: Erases navigation information.
 Edit User Map: Edits navigation information.
 Shift: Shifts the display position of navigation information.
 Shift Clear: Clears position correction information.



[1] Entering the own ship's position in manual mode (Own Ship Position)

Use this function to edit the navigation information of any positions other than the own ship's position.

Procedure

- 1 Press [1] key while the User Map Setting Menu is open.

The CODE INPUT Menu for entering latitude and longitude of the own ship position will appear.

- 2 Enter a value as the latitude (xx° xxx.xx') using the numeric keys [0] to [9].
- 3 To switch between north latitude and south latitude, turn the [MULTI] control.

Each time the control is turned, N (north latitude) is changed to S (south latitude), or vice versa.

- 4 Press [ENT] key.

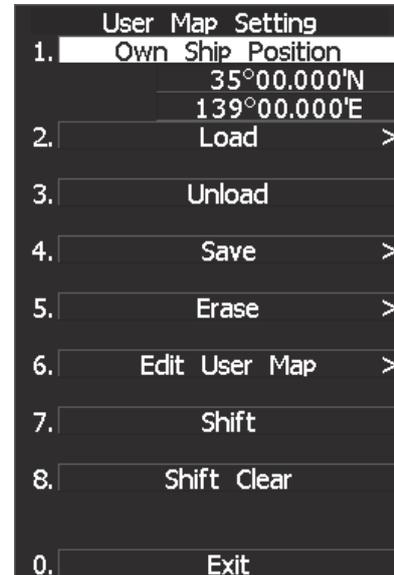
The latitude entered in manual mode will be determined. Subsequently, enter the longitude.

- 5 Enter a value as the longitude (xx° xxx.xx') using the numeric keys [0] to [9].
- 6 To switch between east longitude and west longitude, turn the [MULTI] control.

Each time the control is turned, E (east longitude) is changed to W (west longitude), or vice versa.

- 7 Press [ENT] key.

The longitude entered in manual mode will be determined.



* Button on the CODE INPUT Menu is also available instead of the numeric keys.

Note: The own ship's position manually entered by using the function above is valid only in the User MAP Setting Menu. When control exits from the menu, the manually entered position data is invalidated.

[III] Loading navigation information (Load User Map)**Procedure**

- 1 Press [2] key while the User Map Setting Menu is open.

The Load User Map Menu will appear.

- 2 Press [2] key.

The list of navigation information files saved in the system will appear.

* Each time you press [1] key, the Device item is switched between INTERNAL and CARD2.

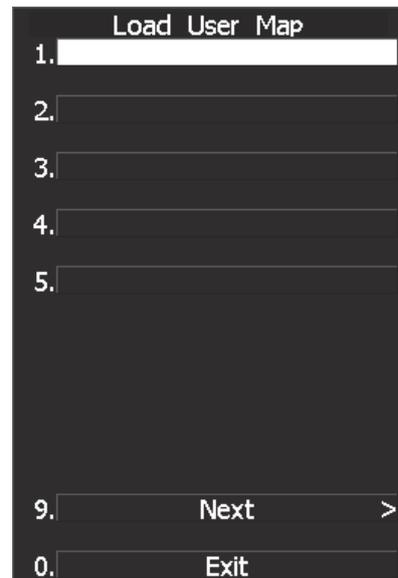
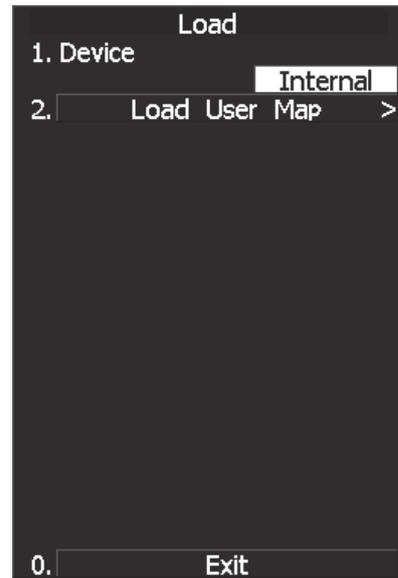
INTERNAL: Reads saved data from the processor.

CARD2: Reads saved data from CARD2.

To select CARD2, insert the flash memory card, in which data has been saved, into card slot 2 (upper stage).

- 3 Select the number of the file to be loaded, pressing the numeric key.

The selected navigation information will be loaded and shown on the radar display.



[III] Initializing Navigation Information (Unload)

Procedure

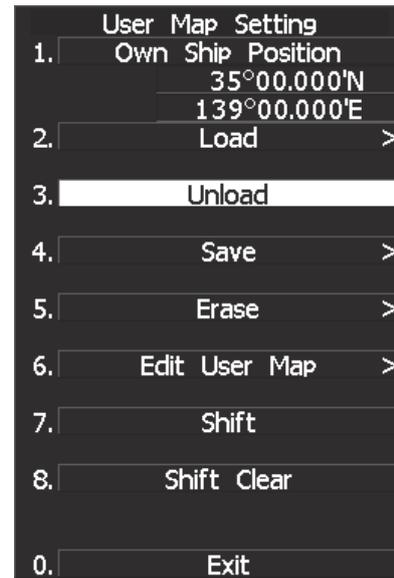
- 1 Press [3] key while the User Map Setting Menu is open.

Display the window to select whether or not the information is to be initialized.

- 2 Press [1] key.

The navigation information is initialized.

This function can be executed for files that have been read and new navigation information currently being entered.



[IV] Saving navigation information (Save User Map)

This function is available only when navigation equipment is connected with the system or the own ship's position is entered in manual mode.

Procedure

- 1 Press [4] key while the User Map Setting Menu is open.
- 2 Press [2] key.

The Save User Map Menu will appear.

* Each time you press [1] key, the Device item is switched between INTERNAL and CARD2.

INTERNAL: Saves data in the processor.

CARD2: Saves data in CARD2.

To select CARD2, insert the flash memory card, in which data has been saved, into card slot 2 (upper stage).

- 3 Select the number of the file to be saved, pressing the numeric key.

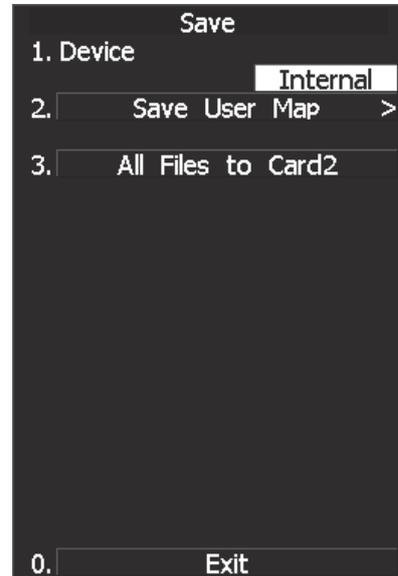
The Name Input Menu will appear.

- 4 Use the trackball to select an alphabetic character A-Z or 0-9 shown in the menu and press [ENT] key on your required characters.

A maximum of 8 characters can be entered.

- 5 Repeat step 4 until the file name to be saved is created, move the cursor to **ENT**, and press [ENT] key.

The currently displayed navigation information will be saved.



[V] Erasing navigation information from memory (Erase User Map)

Procedure

- 1 Press [5] key while the User Map Setting Menu is open.**
- 2 Press [2] key.**

The Erase User Map Menu will appear.

* Each time you press [1] key, the Device item is switched between INTERNAL and CARD2.

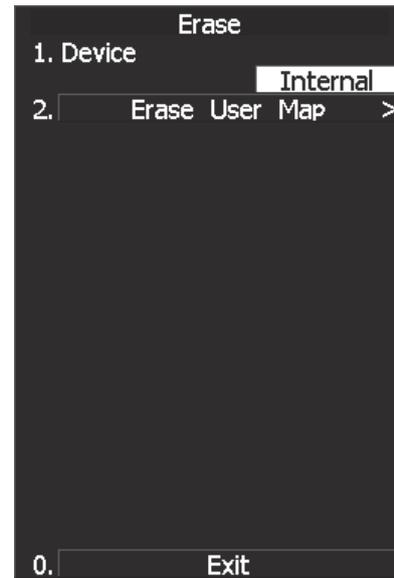
INTERNAL: Erases saved data from the processor.

CARD2: Erases saved data from CARD2.

To select CARD2, insert the flash memory card, in which data has been saved, into card slot 2 (upper stage).

- 3 Select the number of the file you want to erase, pressing the numeric keys [1] to [5].**

The navigation information file will be erased from the memory, and the file name will disappear from the file list.



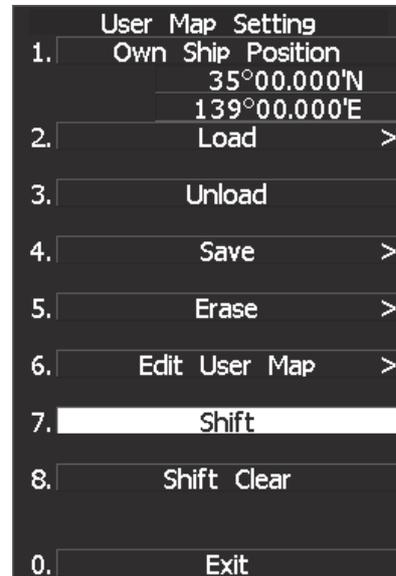
[VI] Shifting the display position of navigation information to a correct position (Shift)

If the display position of navigation information is incorrect, it can be shifted to the correct position in manual mode.

Procedure

- 1 Press [7] key while the User Map Setting Menu is open.

Shift will appear in the CURSOR mode field of software button ② located at the top right corner of the radar display described in Section 2.3.3, and the navigation information shift mode is activated.
- 2 Use the trackball to move the pointer to a mark or a point on a NAV line, coastline, or depth contour line, and press [ENT] key.
- 3 Use the trackball to move the cross cursor mark to the position to which the mark or line is shifted, and press [ENT] key.



3

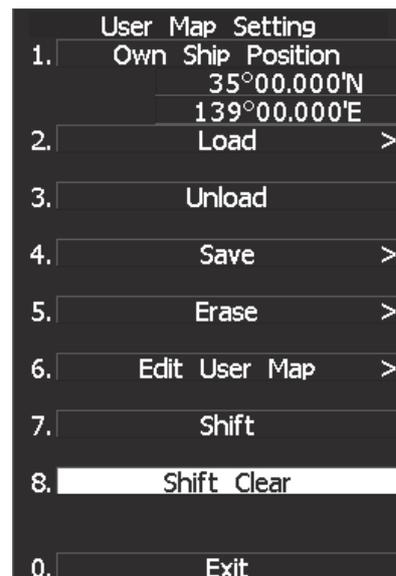
All the marks and lines currently displayed will be shifted to their correct positions.

[VII] Shifting the corrected display position of navigation information back to original (Shift Clear)

Procedure

- 1 Press [8] key while the User Map Setting Menu is open.

The MAP returns to the original position.



3.8.5 Set and Display Geodetic System

To create navigation information, set the geodetic system that is used with the connected navigation equipment. When navigation information is loaded, the geodetic system used when the navigation information was saved, is displayed. Make sure that the displayed geodetic system is identical to the one used with the navigation equipment. If the two geodetic systems are different, the positions of navigation information on the radar display will be shifted. Therefore, it is important to set the geodetic system of the navigation equipment.

Procedure

- 1 Press [RADAR MENU] key.

Press [6] key.

The NAV Information Menu will appear.

- 2 Press [4] key.

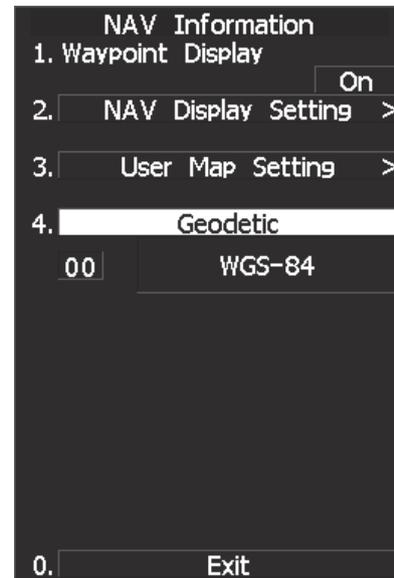
The geodetic system input ten-key screen will appear.

- 3 Enter the number of the target geodetic system, pressing the numeric keys.

- 4 The entered geodetic system number can be changed by turning the [MULTI] control.

- 5 Press [ENT] key.

The entered geodetic system will be determined.



Geodetic System List

No.	Name	Data Display
0	WGS-84	WGS-84
1	WGS-72	WGS-72
2	Japan	Japan
3	North American 1927(U.S)	NAS
4	North American 1927(Canada & Alaska)	NAS
5	European 1950 (Europe)	EUR
6	Australian geodetic 1966 (Australia)	AUA
7	Ordance Survery of Great Britain (England)	UK
8	NAD-83	NAD-83
9	- (No Use)	
10	- (No Use)	
11	ADINDAN (Etiopia & Sudan)	ADI
12	ARC 1950 (Botswana)	ARF
13	AUSTRALIAN GEODETIC 1984 (Australia)	AUF
14	BERMUDA 1957 (the Bermudas)	BER
15	BOGOTA OBSERVATORY (Columbia)	BOO
16	CAMPO INCHAUSPE	CAI
17	CHATHAM 1971	AHI
18	CHUAASTRO (Paraguay)	CHU
19	CORREGO ALEGRE (Brazil)	COA
20	DJAKARTA (VATAVIA) (Sumata)	BAT
21	EUROPEAN 1979 (Europe)	EUS
22	GEODETIC DATUM 1949 (New Zeland)	GEO
23	GUAM 1963 (Guam)	GUA
24	HAYFORD 1910 (Finland)	HAYFORD
25	HJORSEY 1955 (Ice land)	HJO
26	INDIAN (India & Nepal)	IND
27	IRELAND1965 (Ireland)	IRL
28	KERTAU 1948 (West Malaysia)	KEA
29	L.C.5 ASTRO (Cayman Black Island)	LCF
30	LIBERIA 1964 (Liberia)	LIB
31	LUZON (Philippines)	LUZ
32	MERCHICH (Morocco)	MER
33	MINNA (Cameroon)	MIN
34	NAHRWAN (Oman)	NAH
35	NAPARIMA, BWI (Trinidad & Tobago)	NAP
36	OLD EGYPTIAN (Egypt)	OEG
37	OLD HAWAIIAN (Hawaii)	OHA
38	PCO DE LAS NIEVES (Canary)	PLN
39	PROVISIONAL SOUTH AMERICAN 1956 (South America)	PRP
40	PROVISIONAL SOUTH CHILEAN 1963 (South Chile)	HIT
41	PUERTO RICO (Puerto Rico & Virgin Islands)	PUR
42	QORNOQ (South Greenland)	QUO
43	RT90 (Sweden)	RT90
44	SANTA BRAZ (San Miguel island & Saint Mary islands)	44
45	SOUTH AMERICAN 1969 (South America)	SAN
46	SOUTHWEST BASE (Faial & Sao Jorge & Pico & Graciosa & Terceira island)	46
47	TIMBALAI 1948 (Brunei & East Malaysia)	TIL
48	- (No Use)	
49	- (No Use)	

3.9 APPLIED OPERATIONS

3.9.1 Set Radar Signal Processing (Process Setting)

This function enables the setting of detail information about radar signal processing.

Procedure

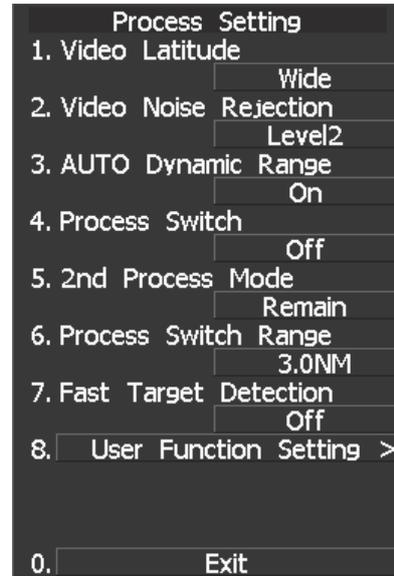
1 Press [RADAR MENU] key twice.

Press [6] key.

The Process Setting Menu will appear.

Detail information about radar signal processing can be set by changing the settings of the menu items.

Note: After the settings for radar signal processing are changed, small targets may not be displayed or unwanted waves may not be suppressed. Thus, do not make a significant change in the settings.



[1] Video Latitude

- Select the dynamic range in which receiving signals are to be shown on the radar display.
- Select **NORMAL** in standard, and **WIDE** in rainy weather.
- **NARROW** clearly displays short-range videos when STC is used in manual mode.
 - NORMAL**: Standard setting
The dynamic range varies depending on the actual range:
Short range > long range
 - WIDE**: Use this mode when rainy weather intensifies unwanted waves.
The dynamic range is about twice as wide as when **NORMAL** is selected.
 - SUPER WIDE**: Use this mode when rain cloud remain at **WIDE** mode.
The dynamic range is about twice as wide as when **NORMAL** is selected.
 - NARROW**: Narrows the dynamic range at short range.

[2] Video Noise Rejection

- This function rejects signals that assumed as noise and clutter in radar videos.
- Select **OFF** to display radar videos like analog signals.
- Select **LEVEL1** or **LEVEL2** to suppress noise and clutter.
- Select **LEVEL1** or **LEVEL2** to superimpose-display the chart.
 - OFF**: Turns off the noise rejection function, and displays all signals. Targets are popped up from noise and displayed like analog signals.
 - LEVEL1**: Rejects the signals of definitely unwanted waves (noise and clutter). When detection of targets or unwanted waves is not definite, the signals are displayed. When detection of targets is definite, the signals are displayed.
 - LEVEL2**: Rejects the signals of definitely unwanted waves (noise and clutter). When detection of targets or unwanted waves is not definite, the signals are rejected. Only when detection of targets is definite, the signals are displayed.

[3] Auto Dynamic Range Control

- This function automatically controls the dynamic range of radar videos when the AUTO SEA (sea clutter suppression)/AUTO RAIN (rain/snow clutter suppression) mode is used.
- When the AUTO SEA (sea clutter suppression) mode is used, this function improves sensitivity by widening the dynamic range of only areas where sea clutter is strong, and narrowing the dynamic range of areas where sea clutter is not detected.
- When the AUTO RAIN (rain/snow clutter suppression) mode is used, this function improves sensitivity by widening the dynamic range of areas where sea clutter or rain/snow clutter is strong, and narrowing the dynamic range of the other areas.
- Land videos become obscure when the AUTO RAIN clutter suppression mode is used.
 - OFF**: Does not control the dynamic range automatically. The dynamic range is set in the same manner as when the MANUAL SEA/RAIN clutter suppression mode is used.
 - ON**: Automatically controls the dynamic range. (Standard setting)

[4] Process Switch

- This function sets a specific area and switches the video process mode between the inside and outside of the area.
- In **[5] 2nd Process Mode**, set the second video process mode for the area outside the boundary.
- In **[2] PROCESS** of **Main Menu**, set the first video process mode for the area inside the boundary.
- Sensitivity at a distance can be improved by suppressing near sea clutter through the correlative process.
- There are two methods for setting an area:
 - OFF**: Disables the Process Switching function. (Standard setting)
 - RANGE FIX**: Sets a boundary at a constant range from the center. Set the boundary range in **[6] Process Switch Range**. The specific area turns out to be a circle with the own ship's position as the center.
 - AUTO**: Automatically sets a specific area. The area subject to many clutter returns is inside the boundary, and the area less subject to clutter returns is outside the boundary.

[5] 2nd Process Mode

- Set the second video process mode for the outside of a specific area.
- This function is enabled when **RANGE FIX** or **AUTO** is selected in **[4] Process Switching**.

Video process modes

PROC OFF	Correlation	Off :	Select this mode in general.
3 SCAN COREL	Correlation	Short :	Select this mode when many rain/snow clutter returns are detected.
4 SCAN COREL	Correlation	Medium :	Select this mode to highlight targets while suppressing sea clutter returns.
5 SCAN COREL	Correlation	Long :	Select this mode to detect small targets hidden by sea clutter returns.
REMAIN	Afterimage	Short:	Select this mode when own ship yaws wildly.
PEAK HOLD	Afterimage	Long :	Select this mode to detect small targets of which detection probability is low.

[6] Process Switch Range

- Set the boundary range of a specific area.
- This function is enabled when **RANGE FIX** is selected in **[4] Process Switch**.
- The specific area turns out to be a circle with the own ship's position as the center.
- The boundary range can be set in units of 0.1 nm, ranging 0.1 to 25.5 nm.
- After selecting PROC Switch Range, adjust the range using the **[MULTI]** control.
- When finishing the adjustment, press **[ENT]** key to determine the video process switching range.

[7] Fast Target Detection

- This function displays fast moving targets that are suppressed in scan-correlative process mode.
- This function is enabled when **3SCAN CORR**, **4SCAN CORR**, or **5SCAN CORR** is selected as the video process mode.
- If unwanted waves remain on the radar display, suppress them by using the **[SEA]**, **[RAIN]**, or **[GAIN]** control, or adjusting the interference rejection mode.
 - OFF**: Disables the Fast Target Detection function.
 - ON**: Enables the Fast Target Detection function.

[8] User Function Setting

- "Radar Function Setting" is provided for always obtaining the best radar video by storing complex radar signal processing settings in the optimum status by use, and by calling the setting in accordance with the conditions for using the radar signal processing function. The radar signal processing functions are factory-set for general use, and the settings can be fine adjusted through menu operation.
- For detail, refer to Section 3.10.3 "Overview of Function Operations".

3.9.2 Set Radar Trails (RADAR Trails Setting)

This function enables the setting of detail information about radar trails processing.

Procedure

1 Press [RADAR MENU] key twice.

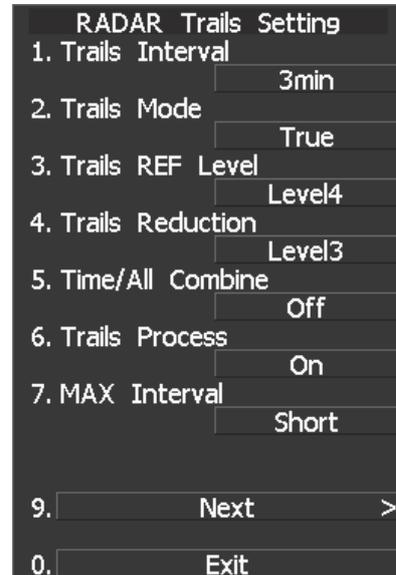
Press [7] key.

Alternatively, hold down the [TRAILS] key until the menu appears.

The RADAR Trails Setting Menu will appear.

Detail information about radar trails processing can be set by changing the settings of the menu items.

Note: After the settings for radar trails processing are changed, targets' trails may not be displayed or trails may be plotted with unwanted waves. Thus, do not make a significant change in the settings.



3

[1] Trails Interval

- Set the trail intervals at which radar trails are displayed.
- Selection items of trail intervals change depending on the setting of maximum value of radar trail display time.
- The Multi-function control is also available for setting.
- For the decision branches of trail interval, see Section 3.5.10 “Display Radar Trails (Other Ships' Trails)”.

[2] Trails Mode

- Set the radar trail display mode.
- Each time the button is pressed, you can switch between True and Relative.
- For details on the trail mode, see “Changing Motion Mode of Trails (Trails mode)” in 3.5.10 “Display Radar Trails (Other Ships' Trails).”

[3] Trails REF Level

- Select a radar video level required for plotting radar trails.
- The radar video level increases in order of LEVEL1 → LEVEL2 → LEVEL3 → LEVEL4.
- To plot radar trails with unwanted waves, change to a higher level.
- To thin radar trails, change to a higher level.
- If radar trails are plotted in snatches, change to a lower level.

[4] Trails Reduction

- Make a setting for thinning radar trails.
- The effect of thinning increases in order of → → .
- Radar videos do not become obscure because of the thinning of radar trails.

<input type="text" value="OFF"/>	:	Disables the Trails Reduction function.
<input type="text" value="LEVEL1"/>	:	Enables the Trails Reduction function. (Effect: Low)
<input type="text" value="LEVEL2"/>	:	Enables the Trails Reduction function. (Effect: Modest)
<input type="text" value="LEVEL3"/>	:	Enables the Trails Reduction function. (Effect: High)

[5] Time/Cont Combine

- This function superimpose-displays time radar trails and continuous radar trails.
- Operators can distinguish time radar trails from continuous radar trails by setting different colors for both types of trails.

<input type="text" value="OFF"/>	:	Disables the Time/Cont Combine function.
<input type="text" value="ON"/>	:	Enables the Time/Cont Combine function.

[6] Trails Process

- Determine whether to use the video process with radar signals for plotting radar trails.
- When Trails Process is , radar trails are never plotted with unwanted waves, but the radar trails of fast moving targets may not be plotted.
- When Trails Process is , radar trails may be plotted with unwanted waves, but the radar trails of fast moving targets are always plotted.

<input type="text" value="OFF"/>	:	Disables the Trails Process function.
<input type="text" value="ON"/>	:	Enables the Trails Process function.

[7] MAX Interval

- Select the maximum time for displaying radar trails.
- Select when short radar trails are often used in bays and the likes.
- Select when long radar trails are necessary for ocean navigation.
- is for specification between and .
- Continuous trails are available with all the options.

<input type="text" value="Short"/>	:	Sets 15 minutes as the maximum time for radar trails display.
<input type="text" value="Medium"/>	:	Sets 30 minutes as the maximum time for radar trails display.
<input type="text" value="Long"/>	:	Sets 60 minutes as the maximum time for radar trails display.
<input type="text" value="Super Long"/>	:	Sets 12 hours as the maximum time for radar trails display.

[9] NEXT

- The file menu will appear.

Load and save of the Rdar trails.**Procedure**

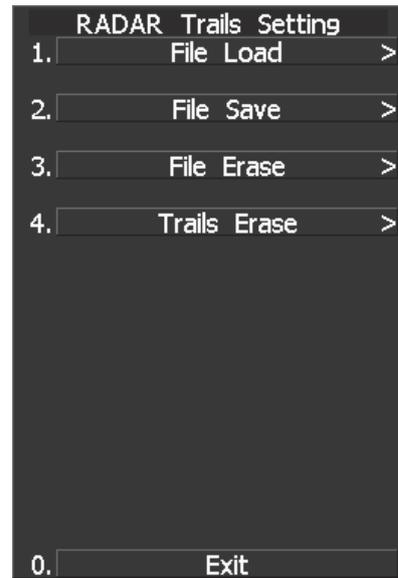
1 Press [RADAR MENU] key twice.

Press [7] key.

Alternatively, hold down the [TRAILS] key until the menu appears.

Press [9] key.

The RADAR Trails Setting Menu will appear.

**3****[1] Loading Trails File**

- Press [1] key.
The saved trail files are displayed.
- Select the file to be loaded
Confirmation warning is displayed.
Select “Yes” for loading.

It takes a few second to be loded.

Note: When the saved trail position is too far from own ship position, the saved trails can not be loaded.

On the standby mode, however, far trail positions can be loaded. In that case, the own ship position is changed to the loaded trail position temporally.

After loading, Range scale, Trails mode (True / Relative) and Max interval are set to loded settings.

[2] Saving Trails File

- Press [2] key.
The File Save menu is displayed.
- Using the cursor, enter the file name and click “ENT”
Confirmation warning is displayed.
Select “Yes” for saving.

It takes a few second to be loded.

Note: When the own ship position data are not available, trails can not be saved.



[3] Erasing Trails File

- Presse [3] key.
The saved trail files are displayed.
- Select the file to be erased.
Confirmation warning is displayed.
Select “Yes” for erasing.

Note: Deleted files can not be restored, so Erase files carefully.

Erasing the displayed trails partially.

Erasing the part of the displayed trails by using the cursor as a eraser.

Note: Deleted trails can not be restored, so Erase them carefully.

Procedure

- 1 Press [RADAR MENU] key twice.

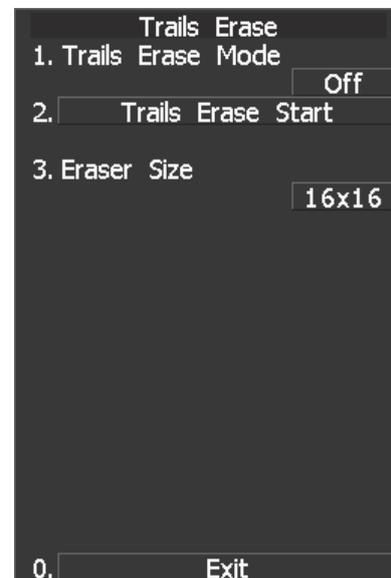
Press [7] key.

Alternatively, hold down the [TRAILS] key until the menu appears.

Press [9] key.

Press [4] key.

Trail erase menu will appear.



[1] Trails Erase Mode

Press [1] key.

- Trail erase mode is enabled.
- On the mode, cursor is fixed on the menu, and the eraser (white box) is displayed on the own ship position.
- Using the trackball, position the eraser on the Trail to be deleted.

[2] Trails Erase start

Press [2] key.

- Trail erase function starts.
Using the track ball, wipe out trails.
- Press [2] key again to disable the function temporarily.

The depth input scre

[3] Eraser Size

Press [3] key.

- Eraser size lit is displayed.
- Select the size of the eraser.

<input type="checkbox"/> 2x2	: 2x2 pixels
<input type="checkbox"/> 4x4	: 4x4 pixels
<input type="checkbox"/> 8x8	: 8x8 pixels
<input type="checkbox"/> 16x16	: 16x16 pixels
<input type="checkbox"/> 32x32	: 32x32 pixels

3.9.3 Set Cursor (Cursor Setting)

This function enables the setting of detail information about cursor operation and display.

Procedure

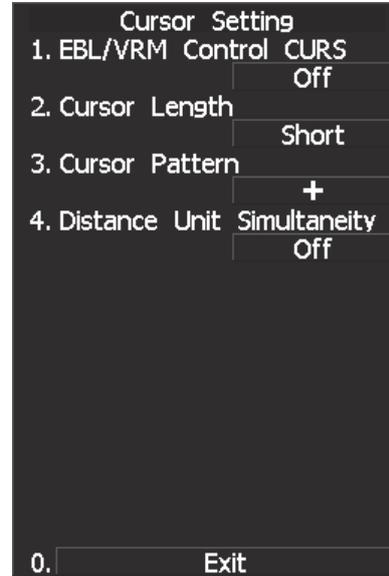
- 1 Press [RADAR MENU] key.

Press [3] key.

Press [6] key.

The Cursor Setting Menu will appear.

Detail information about cursor operation and display can be set by changing the settings of the menu items.



[1] EBL/VRM Control CURS (device for cursor operation)

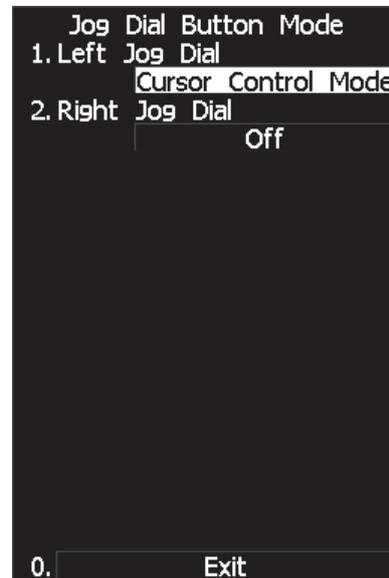
- This function is switched between ON and OFF of EBL/VRM Control CURS function
- The trackball is provided as a standard device. If the trackball malfunctions, the cursor can be moved by using the [EBL] control and [VRM] control.
- Set the cursor control mode as the Jog Dial mode.

Procedure

- 1 Hold down the [EBL] control for two seconds.

Press [1] key.

The Left Jog Dial will open. Select Cursor Control Mode.



- The cursor moves horizontally when [EBL] is operated, and moves vertically when [VRM] is operated.
- To switch between EBL/VRM operation and cursor operation while ON is selected, press the [EBL] control. Each time the [EBL] control is pressed, EBL/VRM operation is switched to cursor operation, or vice versa.

ON: Cursor is operated using a [EBL] [VRM] control.

OFF: Cursor is operated using a trackball.

[2] Cursor Length

- Set the length of the cross cursor mark on the radar display.

SHORT: Cuts the cross cursor mark in length.

LONG: Makes the cross cursor mark twice as long as when **SHORT** is selected.

[3] Cursor Pattern

- The type of the cross cursor mark displayed of the display is selected.

 : Type 1 is selected for the cross cursor mark 1 displayed in the radar display.

 : Type 2 is selected for the cross cursor mark 2 displayed in the radar display.

 : Type 3 is selected for the cross cursor mark 1 displayed in the radar display.

 : Type 4 is selected for the cross cursor mark 2 displayed in the radar display.

[4] Distance Unit Simultaneity

- Synchronizes the cursor range unit with the VRM1/VRM2 range unit.

ON: The range units are synchronized between the cursor and VRM1/VRM2. A range unit cannot be selected individually for the cursor or VRM1/VRM2, and the same range unit is selected for all of them.

OFF: The range units are not synchronized between the cursor and VRM1/VRM2. A range unit can be selected individually for the cursor and VRM1/VRM2.

3.9.4 Set Screen(Screen Setting)

This function enables the setting of detail information about screen display.

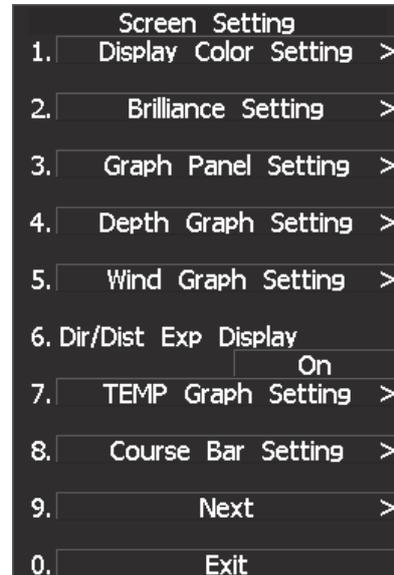
Procedure

- 1 Press [RADAR MENU] key.

Press [4] key.

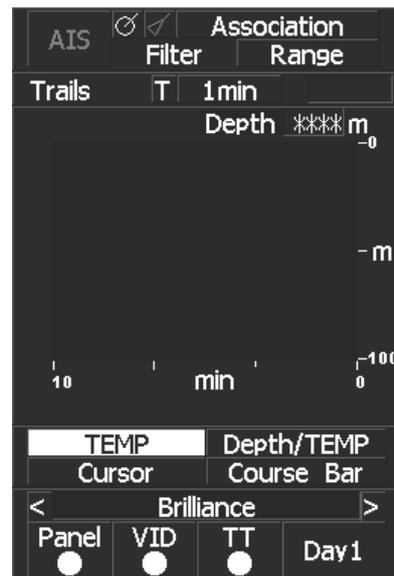
The Screen Setting Menu will appear.

Detail information about screen display can be set by changing the settings of the menu items.



Graph Display

Press the graph button to see the registered graph. To register a graph, hold down the graph button or use Graph Panel Setting menu described on the next page.



[3] Graph Settings (Graph Panel Setting)

Set the functions of a graph to be associated with the graph button.

The function shown in the parentheses is prioritized. Therefore, specify a graph to be displayed while the prioritized function is not active.

1. Panel 1 (Target):

A graph registered here can be displayed while target information is not displayed.

2. Panel 2 (Marker):

A graph registered here can be displayed while the marker function is not in use.

3. Panel 3 (Waypoint):

A graph registered here can be displayed while destination information is not displayed.

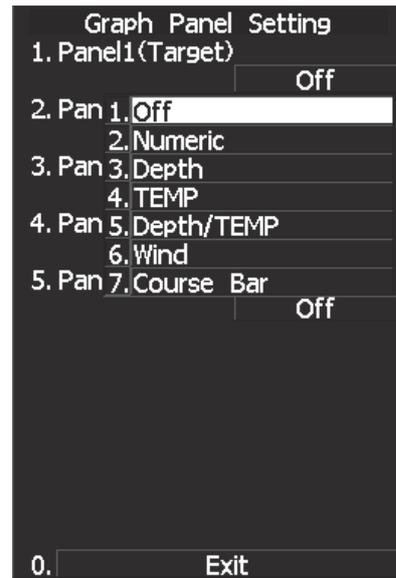
4. Panel 4 (Cursor/EBL/VRM):

A graph registered here can be displayed while the cursor/EBL/VRM zoom display function is not in use.

5. Panel 5 (Graph):

A graph registered here can be displayed since there are no priority functions to be displayed.

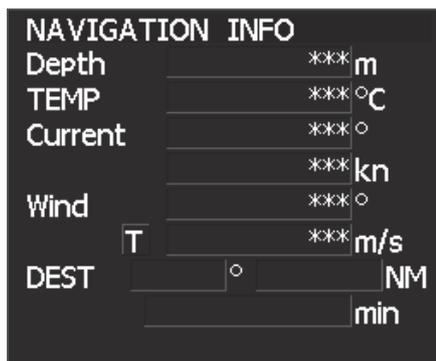
(*) When using a regular graph, first register it in Panel 5 menu.



3

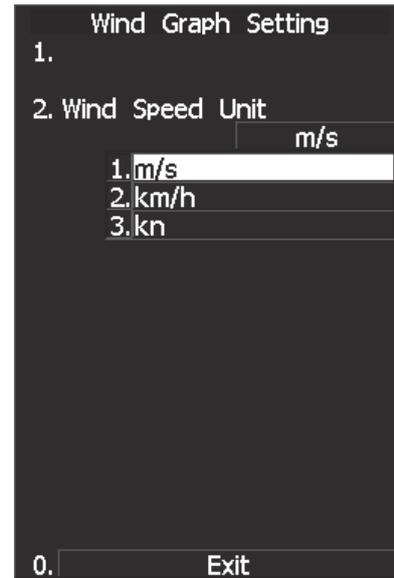
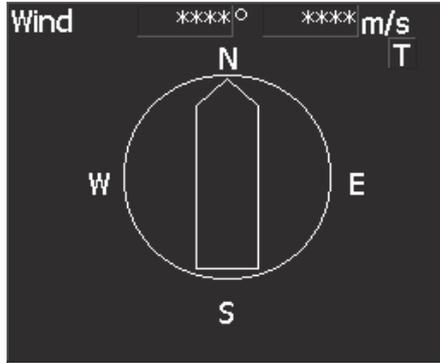
Numeric NAV INFO

- Select numerical information (Numeric) in graph setting menu to register the Numeric function with the graph button.
- Press the Numeric button to see received navigation information in numerical values.
- Water depth, water temperature, current, wind direction, wind speed, and destination are shown in numerical values.



Wind/Current Graph

- The wind direction and speed display function (Wind) is registered with the graph button when "Wind" is selected in the graph setting menu.
- Press the Wind button to call up numerical values and a graph for the received wind direction and speed information.

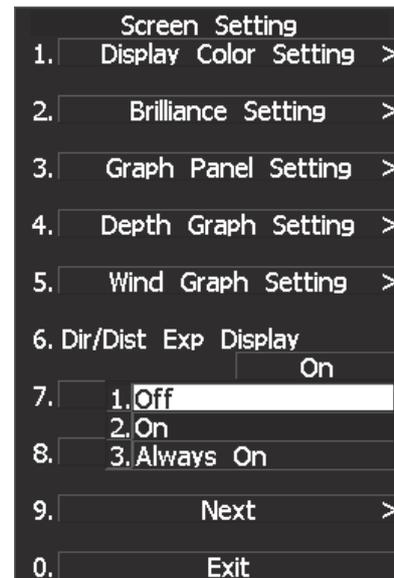
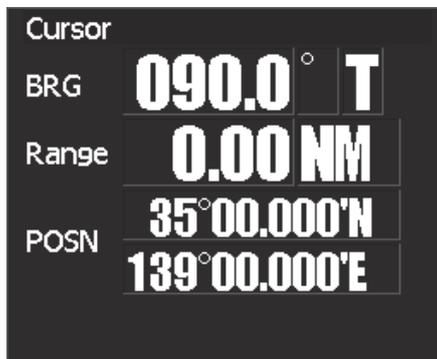


DIR/DIST EXP Display

- Cursor, EBL, and VRM values are displayed in a larger font.
- While the cursor is moving within the PPI screen, the cursor information is displayed in a larger font.
- When EBL and VRM are used, values for each marker are displayed in a larger font.
- Information will not be displayed in a larger font while menu is displayed.

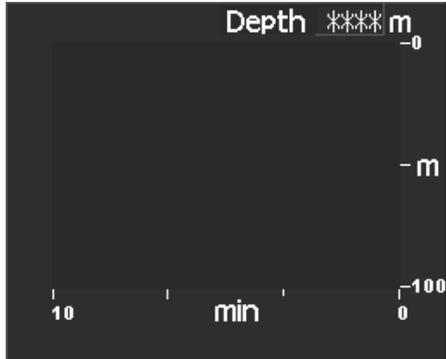
Direction and distance zoom display setting

- OFF : No zoom display.
- ON : Zoom display continues for 5 seconds after marker operations end.
- Always:ON : Information is always displayed in a larger font.



Depth Graph Display

- The water depth display function (Depth) is registered with the graph button when "Depth" is selected in the graph setting menu.
- Press the Depth button to call up numerical values and a graph for the received water depth information.



3

Displaying Water Depth Graph (Depth Graph Setting)

- Set the water depth graph display method.

Procedure

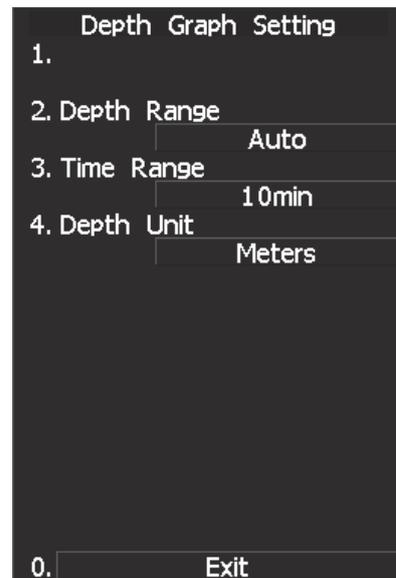
1 Press [RADAR MENU] key.

Press [4] key.

Press [4] key.

The Depth Graph Setting Menu will appear.

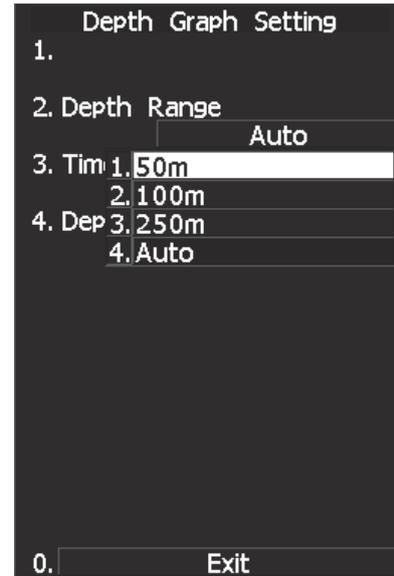
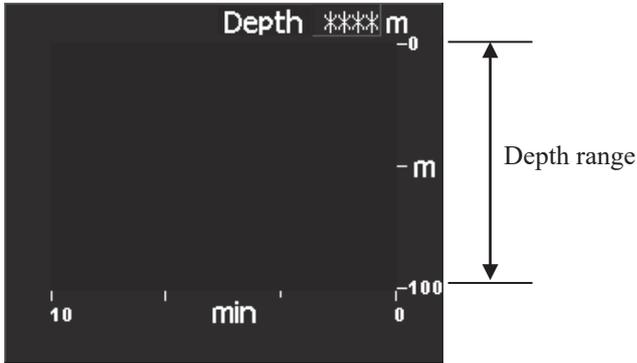
Detail information about screen display can be set by changing the settings of the menu items.



Depth Range

- Select the depth range on the water depth graph.

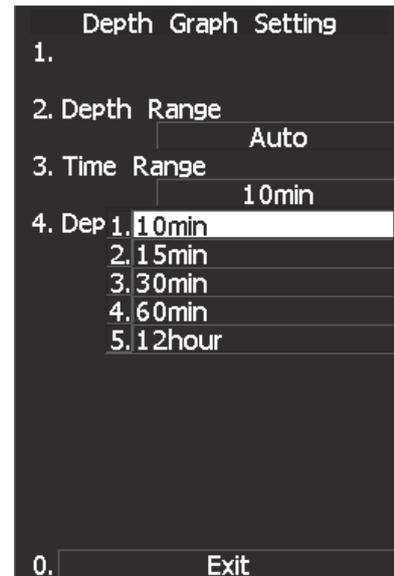
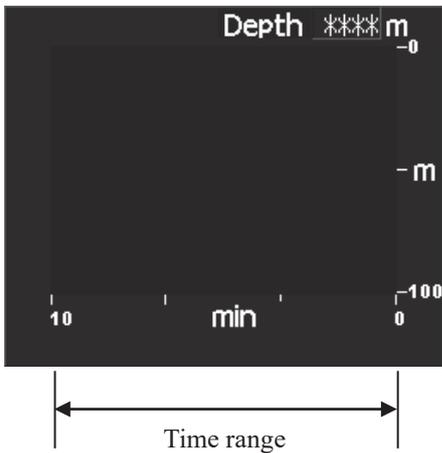
50m	Sets 50 m as the depth range.
100m	Sets 100 m as the depth range.
250m	Sets 250 m as the depth range.
AUTO	Uses the depth range in the DPT sentence included in received data.



Time Table

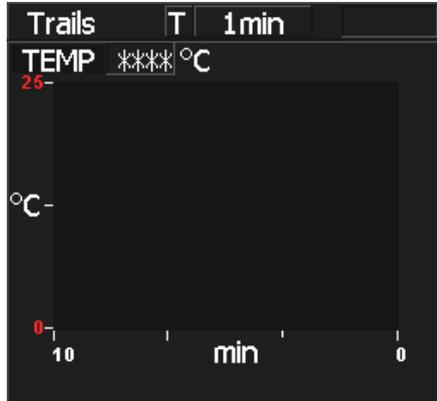
- Select the time range on the water depth graph.

10min	Sets 10 minutes as the time range.
15min	Sets 15 minutes as the time range.
30min	Sets 30 minutes as the time range.
60min	Sets 60 minutes as the time range.
12hour	Sets 12 hours as the time range.



Water Temperature Display (Temp Graph)

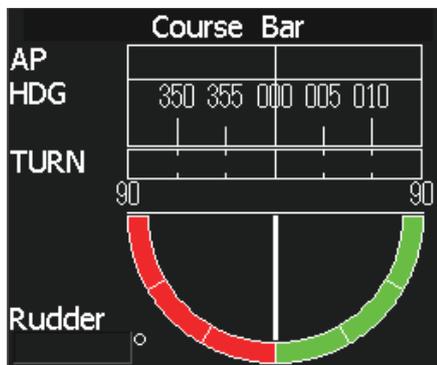
- The water temperature display function (Temp) is registered with the graph button when "Temp" is selected in the graph setting menu.
- Press the Temp button to call up numerical values and a graph for the received water temperature information.



3

Course Bar Display (Course Bar)

- The course bar display function (Course Bar) is registered with the graph button when "Course Bar" is selected in the graph setting menu.
- Press the Course Bar button to call up numerical values and a graph for the received heading, turning ratio, and steering direction information.



Screen Capture Setting

- This equipment can save the currently displayed images onto a memory card (CF card) while they are in bitmap format.
- In order to execute this item, a memory card (optional) must be inserted in the card slot 2 (upper slot) beforehand.
- For use of a CF card, see Section 3.11 "USING CARD."

Note: Once captured images have been saved, this equipment cannot display them.
To display or check a captured image which has been saved, import the capture-image file from the CF card into the PC, and then operate the file on the PC.

[1] Select Capture Item

Select the information to be saved as a captured image when performing the screen capture function.
Set a value in accordance with the information to be captured on the display.

Procedure

1 Press [RADAR MENU] key.

Press [4] key.

Press [9] key.

Press [1] key.

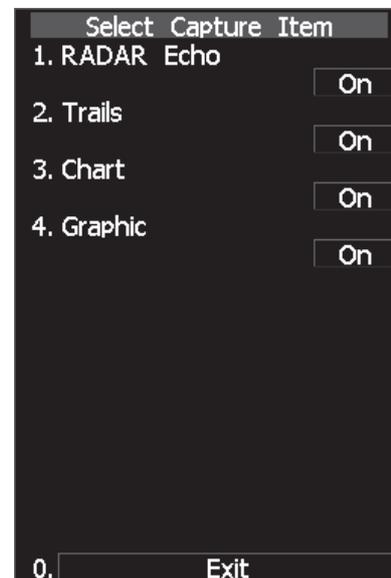
The Screen Capture Setting menu will appear.

2 Press [1] key.

The Select Capture Item menu will appear.

Details about the display capture function can be set by changing item settings.

Radar Echo	The radar echoes will be saved.
Trails	The radar trails will be saved.
Chart	The chart, mark, line, own ship's track, target track, route, destination and NAV line will be saved.
Graphic	The radar graphic (EBL, VRM) and characters will be saved.



[III] File Erase

Screen capture files can be deleted.

If the CF card is full, screen capture files which are no longer necessary can be deleted by specifying the file name (date and time).

Procedure

- 1 Press [RADAR MENU] key.

Press [4] key.

Press [9] key.

Press [1] key.

The Screen Capture Setting menu will appear.

- 2 Press [2] key.

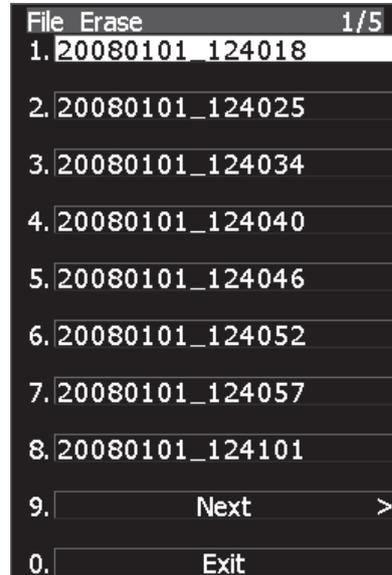
The File Erase menu will appear.

Screen capture files are displayed in date and time order, so select the file to be deleted and press the [ENT] key.

The deletion confirmation screen will appear.

To delete the file, press the [1] key according to the displayed instructions.

To cancel the deletion, press the [2] key. The file deletion operation will be cancelled.



[III] AUTO Capture Interval

This function automatically saves a screen capture file at specified time intervals. Time intervals can be specified in minutes.

Note: The use of the automatic capture function applies a high load to the CPU. As a result, processing is always slow, so use the automatic capture function only when needed. If the function is to be used, the allowable maximum value should be set.

Procedure

- 1 Press [RADAR MENU] key.**

Press [4] key.

Press [9] key.

Press [1] key.

The Screen Capture Setting menu will appear.

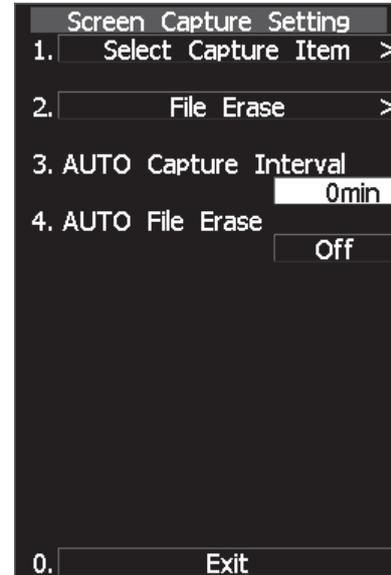
- 2 Press [3] key.**

The AUTO Capture Interval menu will appear.

The screen capture file is saved at specified time intervals in minutes.

When 0 min is specified, the automatic capture function is turned off.

When 1 min or more is specified, the automatic capture function is turned on and performed at the specified time intervals.



[IV] AUTO File Erase

When a CF card is full with screen capture files saved, this function automatically erases files, starting with the oldest one.

Procedure

- 1 Press [RADAR MENU] key.

Press [4] key.

Press [9] key.

Press [1] key.

The Screen Capture Setting menu will appear.

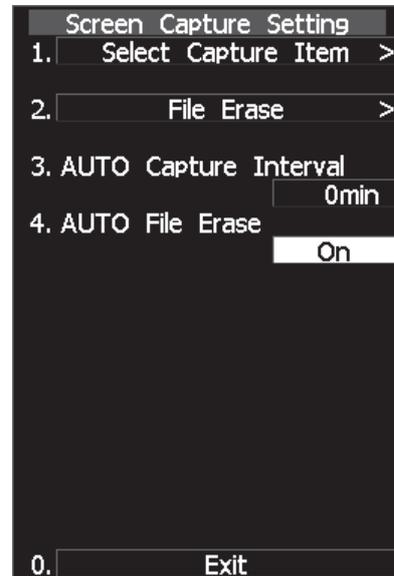
- 2 Press [4] key.

The AUTO File Erase menu will appear.

AUTO File Erase = Off, the system continues to capture images until the CF card becomes full. Select this item when you do not want to erase captured images that have been saved.

AUTO File Erase = On, the system erases the oldest file so as to save a new screen capture file when the CF card becomes full. Select this item when you want to always save the latest captured-image data while old files are not necessary.

This function is initially set to Off.



3.9.5 Set Scanner (TXRX Setting)

This function enables the setting of detail information about a scanner

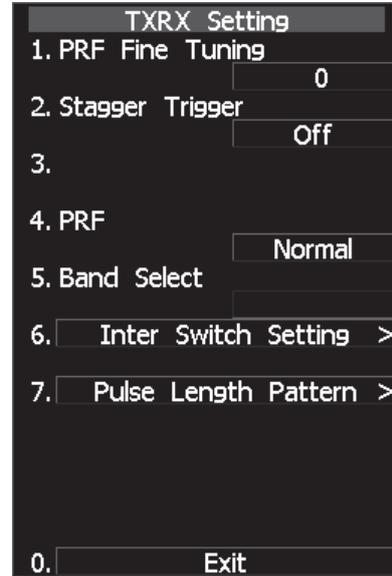
Procedure

- 1 Press [RADAR MENU] key.

Press [5] key.

The TXRX Setting Menu will appear.

Detail information about antenna operation can be set by changing the settings of the menu items.



[1] PRF Fine Tuning

- Fine-tune the transmitting repetition frequency of the transmitter in the range 90 to 100%.
- If radar's interference patterns are concentrically displayed, increment or decrement the set value by 3 to 4 in order to heighten the effect of interference rejection.
- The same operation can be performed by pressing the [TX/STBY] key several times.
- One of 32 levels 0-31 can be set.

[2] Stagger Trigger

- The interference reduction function is activated by using the transmission repetition frequency control of the transmitter.
- This function is effective when radar interference does not go away.
 - OFF: Stagger Trigger is not used.
 - ON: Stagger Trigger is used.

[4] PRF

- Select the operation mode the transmitting repetition frequency of the transmitter.
 - NORMAL Standard mode: Both appropriate sensitivity and magnetron's life expectancy are maintained.
 - ECONOMY Power saving mode: Sensitivity slightly lowers, but the service life of magnetron is prolonged when short pulses are used.
 - HI POWER High sensitivity mode: Sensitivity improves when long pulses are used, but the service life of magnetron is slightly shortened.

[5] Band Select

- Select band of antenna. This item is effective only when the antenna in connection supports two frequencies.

X-Band	: Selects the X-band side from the two frequencies.
S-Band	: Selects the S-band side from the two frequencies.
X/S-band	: Supports the two frequencies.

Note: This function is not functioning now. The function is for future use.

[6] Inter Switch Setting

- The master and slave antennas are switched by the simplified interswitch function.

master	: Images are displayed with the antenna connected to the display unit. The antenna connected can be controlled.
slave	: The signal of the antenna connected to another display unit is obtained via the display unit and used to display the image. The antenna connected to another display unit cannot be controlled.

Note: The simplified interswitch cannot control the antenna of another display unit.
Only the master antenna can be controlled.

[7] Pulse Length Pattern

- Up to 3 pulses can be selected as a pulse width in a range. Select a pulse width in combination of the three pulses.

(Example) With a 3 NM range:

Select a combination of pulses as a desired pulse width from the following three patterns:

SP1/MP1/MP2

SP1/MP1/LP1

MP1/MP2/LP1

3.9.6 Set Chart Display (Map Setting)

This function enables the setting of detail information about chart display.

Setting JRC/ERC Chart Display (JRC/ERC Setting)

Procedure

- 1 Press [RADAR MENU] key.

Press [9] key.

Press [5] key.

Or, hold down the [Map] key.

Sea chart menu (Map Setting) opens.

- 2 Press [3] key.

The JRC/ERC Setting Menu will appear.

Detail information about the colors and brilliance of JRC/ERC chart display can be set by changing the settings of the menu items.

The data of colors and brilliance can be stored for each day/night mode.



[1] Day/Night

- Select a desired display mode before setting the colors and brilliance of chart display.
- There are four selection items: [DAY1], [DAY2], [DUSK], and [NIGHT].

[2] Color of Land

- Select the color of land display.
- There are four selection items: [BROWN], [YELLOW], [GREEN], and [WHITE].

[3] Bright of Land

- Select the brilliance of land display.
- There are three selection items: [LOW], [MEDIUM], and [HIGH].

[4] Color of Sea

- Select the color of sea display.
- There are four selection items: [GRAY], [CYAN], [BLUE], and [GREEN].

Note: This function is available on the plotter mode only.

[5] Bright of Sea

- Select the brilliance of sea display.
- There are four selection items: **OFF**, **LOW**, **MEDIUM**, and **HIGH**.

Note: This function is available on the plotter mode only.

[6] Color of Name

- Select the color of a location name.
- There are eight selection items: **BLACK**, **WHITE**, **CYAN**, **BLUE**, **GREEN**, **YELLOW**, **PINK**, and **RED**.

[7] Bright of Name

- Select the brilliance of location name display.
- There are four selection items: **OFF**, **LOW**, **MEDIUM**, and **HIGH**.

[8] Bright of Track/Mark/Line

- Select the brilliance of track, mark and line..
- There are four selection items: **LEVEL1**, **LEVEL2**, **LEVEL3**, and **LEVEL4**.

[9] Next Page

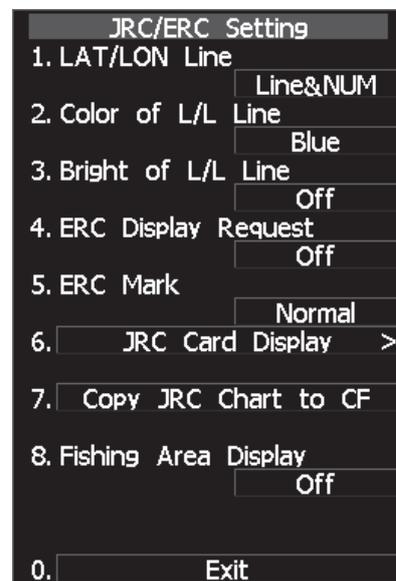
- Moves to the next page.
- The next page of the JRC/ERC Setting Menu will appear.

[1] LAT/LON Line

- Select the mode to display latitude and longitude lines.
- There are two selection items:
 - Line NUM**: Displays both latitude/longitude lines and values indicating the latitude and longitude.
 - NUM**: Displays only the values indicating the latitude and longitude.

[2] Color of L/L Line

- Select the colors that are to represent latitude and longitude lines.
- There are eight selection items: **BLACK**, **WHITE**, **CYAN**, **BLUE**, **GREEN**, **YELLOW**, **PINK**, and **RED**.



[3] Bright of L/L Line

- Select the brilliance of latitude/longitude line display.
- There are four selection items: OFF, LOW, MEDIUM, and HIGH.

[4] ERC Display Request

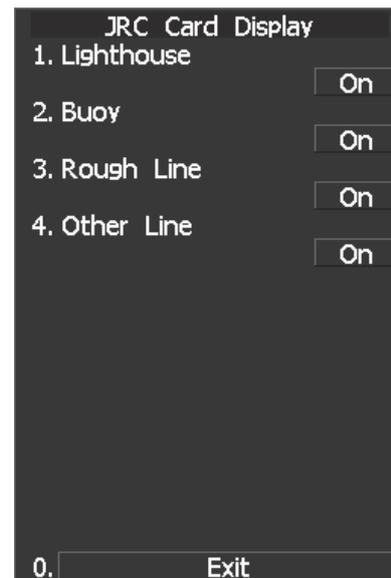
- Display of the information within ERC can be switched between ON and OFF .
- There are two selection items: ON, and OFF.
 On : Data in the ERC is displayed.
 Off : Data in the ERC is not displayed.

[5] ERC Mark

- Select the size of mark display on the ERC chart.
- There are two selection items: NORMAL and SMALL.
 Normal : The ERC mark is displayed in normal size.
 Small : The ERC mark is displayed in a size smaller than normal.

[6] JRC Card Display

- Sets the display contents of the JRC card.
- The JRC Card Display Setting Menu will appear.



[1] Light House

- Determine whether to display lighthouses.
- There are two selection items: ON and OFF.
 On : Light houses are displayed.
 Off : Light houses are not displayed.

[2] Buoy

- Determine whether to display buoys.
- There are two selection items: ON and OFF.
 On : Buoys are displayed.
 Off : Buoys are not displayed.

[3] Rough Line

- Determine whether to display rough lines.
- There are two selection items: ON and OFF.
 On : Rough lines are displayed.
 Off : Rough lines are not displayed.

[4] Other Line

- Determine whether to display other lines.
- There are two selection items: ON and OFF.
 - On : Other lines are displayed.
 - Off : Other lines are not displayed.

[7] Copy JRC Chart to CF

By copying multiple JRC coastline ROM cards onto a compact flash memory card, this function selectively displays any two charts among the copied charts. For a ship that sails in the wide range, this function is convenient because charts can be selected from the menu without alternately inserting JRC coastline ROM cards.

Note: The copied chart can operate only in the system that originally copied the chart. The copied chart cannot be operated in other systems. The capacity of the compact flash memory card to be used is 2GB or less.

Procedures

- 1 Insert a JRC coastline ROM card into card slot 1 (lower) and insert a compact flash memory card into card slot 2 (upper).**

Flash memory card (option) is necessary.

A PCMCIA (PC card) adapter for the compact flash memory card is necessary to insert a compact flash memory card.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Press the [Map] key for 2 seconds.**

Press [3] key.

Press [9] key.

- 3 Press the [7] key.**

Confirmation Window will appear.

- 4 Press the [1] key.**

Data on the JRC card will be copied onto the compact flash memory card.

- 5 To copy multiple JRC charts, alternately change JRC coastline ROM cards and repeat procedures 4 and 5.**

[8] Fishing Area Display

- If a fishery card is used but the fishery is not displayed, this setting gives priority to the fishery card.
 On : Select this item if the fishery card is inserted in the card slot but the fishery is not displayed. The fishery is displayed by giving priority to the fishery card over other cards.
 Off : Select this item if the fishery card is not to be used. If the fishery card is used but the fishery is displayed, the setting can be left off.

Setting Contour Lines on Chart (Contour Setting)

Procedure

- 1 Press [RADAR MENU] key.**

Press [9] key.

Press [5] key.

Or, hold down the [Map] key.

Sea chart menu (Map Setting) opens.

- 2 Press [4] key.**

JRC depth contour display menu (Contour Setting) opens.

Depths and display colors can be set for 9 contour lines in total: 8 for depth specification and 1 for other depths.

- 3 Select the number of depth to be changed, pressing the numeric key.**

The depth input screen will appear. Enter the value as the depth to be set. Subsequently, the display line list will appear.

- 4 Select the number to be set, pressing the numeric key.**

The selected color to represent the contour lines of the depth will be set. To change the settings of other depths, repeat steps 3 and 4.

1.	10m	.....	Off
2.	20m	.....	Pink
3.	30m	.....	Yellow
4.	40m	.....	Blue
5.	50m	.....	Blue
6.	60m	.....	Blue
7.	70m	.....	Blue
8.	80m	.....	Blue
9.	Other	.....	Blue
1-99:			
100-999:			
1000-9999:			
0.	Exit		

Set C-MAP Display

Procedure

- 1 Press [RADAR MENU] key.

Press [9] key.

Press [5] key.

Or, hold down the [Map] key.

The MAP Setting Menu will appear.

- 3 Press [2] key.

The C-MAP Setting Menu will appear.

C-MAP Setting	
1. Grid Display	On
2. Sounding Display	On
3. Sounding Unit	Feet
4. Light Sectors Display	On
5. Light Sectors Level	C
6. Chart Boundary	On
7. Buoy&Beacon	International
8. Names	On
9.	Next >
0.	Exit

3

[1] Grid Display

- Sets whether or not latitudinal longitudinal lines are displayed with C-MAP.
- Each time you press [1] key, the grid display item is switched between ON and OFF.
- ON: Displayed
- OFF: Not displayed

[2] Sounding Display

- Sets whether or not soundings values are displayed with C-MAP.
- Each time you press [2] key, the sounding display item is switched between ON and OFF.
- ON: Displayed
- OFF: Not displayed

[3] Sounding Unit

- Sets the units when soundings values are displayed with C-MAP.
- Press [3] key to display a list of units.
- 1: FEET
- 2: FATHOM
- 3: METERS

You can select one from the above three items. Select the item you want to set, pressing the numeric keys [1] to [3].

[4] Light Sectors Display

- Sets whether or not the light sectors are displayed.
- Each time you press [4] key, the light sectors display item is switched between ON and OFF.
- ON: Displayed
- OFF: Not displayed

[5] Light Sectors Level

- Sets levels when light sectors are displayed with C-MAP.
- Press **[5]** key to display a list of levels.
- Selects one from level settings A to H.

[6] Chart Boundaries

- Sets whether or not the Chart Boundaries are displayed.
- Each time you press **[6]** key, the function is switched between ON and OFF.
- ON: Displayed
OFF: Not displayed

[7] Buoy and Beacon

- Sets display style of the buoy and beacon.
- Press **[7]** key to display a list of display style.
 - 1: OFF
 - 2: INTER NATIONAL : The style based on the official paper chart presentation.
 - 3:United States : The style based on the NOAA paper chart.
 - 4: SIMPLIFIED : Simplified style display.

[8] Geographical Names

- Sets whether or not the geographical names are displayed.
- Each time you press **[8]** key, the geographical name is switched between ON and OFF.
- ON: Displayed
OFF: Not displayed

[9] NEXT

- Going to Next page.
- Another C-MAP setting menu is displayed..

[1] Land Marks

- Sets whether or not the Land Marks are displayed.
- Each time you press [8] key, the Land Marks is switched between ON and OFF.
- ON: Displayed
OFF: Not displayed

[2] Rivers and Lakes

- Sets whether or not the Inland waters are displayed.
- Each time you press [8] key, the Rivers and Lakes is switched between ON and OFF.
- ON: Displayed
OFF: Not displayed

[3] Cultural Features

- Sets whether or not the cultural features are displayed.
- Each time you press [8] key, the Cultural features is switched between ON and OFF.
- ON: Displayed
OFF: Not displayed

[4] Sea bottom types

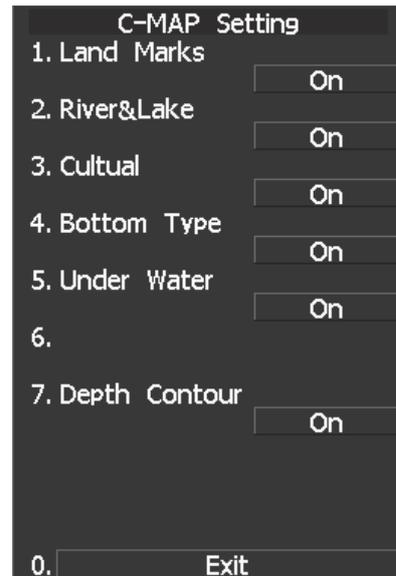
- Sets whether or not the types of the seabed are displayed.
- Each time you press [8] key, the Sea bottom type is switched between ON and OFF.
- ON: Displayed
OFF: Not displayed

[5] Under water rocks etc.

- Sets whether or not the rocks, obstructions etc are displayed.
- Each time you press [8] key, the Under water is switched between ON and OFF.
- ON: Displayed
OFF: Not displayed

[7] Depth Contours.

- Sets whether or not the Depth Contours are displayed.
- Each time you press [7] key, the Depth Contours is switched between ON and OFF.
- ON: Displayed
OFF: Not displayed



Correcting Chart Position (Map Display Setting)

Caution



When the chart position is corrected, the display will be shifted away from the actual position. With this in mind, navigate your ship with attention to the surroundings. Otherwise, this may cause accidents.

Procedure

- 1 Press [RADAR MENU] key.

Press [9] key.

Press [5] key.

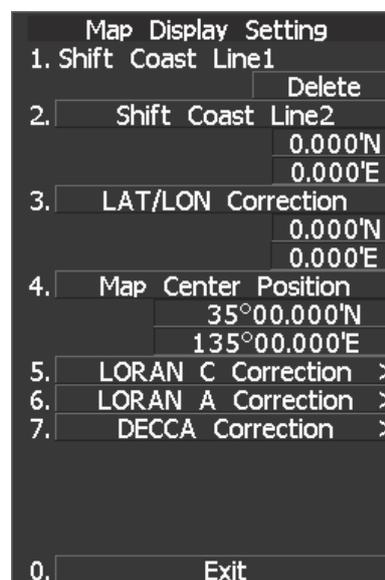
Or, hold down the [Map] key.

Sea chart menu (Map Setting) opens.

- 2 Press [5] key.

The Map Display Setting Menu will appear.

There are three methods for correcting the chart position.



[1] Shift Coast Line 1

Set the correction value by operating the cursor.

- 1 Press [1] key while the Map Display Setting Menu is open.

The chart display position correction 1 (Shift Coast Line 1) is set.

- 2 Move the cursor to the chart on which a position is to be corrected, and press [ENT] key.
- 3 Move the cursor to the radar video of which position is to be corrected, and press [ENT] key.

SETTING (correcting) will be indicated for Shift Coast Line 1.

At this time, MAP SHIFT will appear at software button  located at the bottom right corner of the radar display described in Section 2.3.4, indicating that the position is being corrected.

Note: A correction value can be operated in the range -9.999' to +9.999'.

Cancellation of Shift Coast Line 1

- 1 Press [1] key while the MAP Display Setting Menu is open.

DELETE (no correction) will be indicated for Shift Coast Line 1.

At this time, **MAP SHIFT** will disappear from software button ① located at the bottom right corner of the radar display described in Section 2.3.4.

[2] Shift Coast Line 2

Set a correction value pressing the numeric values.

A correction value can be entered in the range -9.999' to +9.999'.

- 1 Press [2] key while the Map Display Setting Menu is open.

The latitude / longitude input screen for the Shift Coast Line2 menu will appear.

- 2 Enter the correction value for the latitudinal direction, pressing the numeric keys.

To switch between the north and south, turn the **[MULTI]** control.

- 3 Press [ENT] key.

The correction value for the latitudinal direction will be determined.

- 4 Enter the correction value for the longitudinal direction, pressing the numeric keys.

To switch between the east and west, turn the **[MULTI]** control.

- 5 Press [ENT] key.

The correction value for the longitudinal direction will be determined.

At this time, **MAP SHIFT** will appear at software button ① located at the bottom right corner of the radar display described in Section 2.3.4, indicating that the position is being corrected.

Cancellation of Shift Coast Line 2

- 1 Press [2] key while the MAP Display Setting Menu is open.

The chart position correction value input screen will appear.

- 2 Press [0] key, and then [ENT] key.

The correction value for the latitudinal direction will be set to 0.

- 3 Press [0] key, and then [ENT] key.

The correction value for the longitudinal direction will be set to 0.

At this time, **MAP SHIFT** will disappear from software button ① located at the bottom right corner of the radar display described in Section 2.3.4.

[3] LAT/LON Correction

This method corrects a chart position by changing the values of latitude and longitude that are sent by the navigation equipment.

Only our service engineers are to use this correction method because the contents of data such as trails data to be saved are changed when the method is used.

A correction value can be entered in the range -9.999' to +9.999'.

1 Press [3] while the MAP Display Setting Menu is open.

The latitude / longitude input screen for the LAT/LON Correction menu will appear.

2 Enter the correction value for the latitudinal direction, pressing the numeric keys.

To switch between the north and south, turn the [MULTI] control.

3 Press [ENT] key.

The correction value for the latitudinal direction will be determined.

4 Enter the correction value for the longitudinal direction, pressing the numeric keys.

To switch between the east and west, turn the [MULTI] control.

5 Press [ENT] key.

The correction value for the longitudinal direction will be determined.

Cancellation of LAT/LON Correction

1 Press [3] key while the MAP Display Setting Menu is open.

The latitude/longitude correction value input screen will appear.

2 Press [0] key, and then [ENT] key.

The correction value for the latitudinal direction will be set to 0.

3 Press [0] key, and then [ENT] key.

The correction value for the longitudinal direction will be set to 0.

[4] MAP Center Position

This method corrects a chart position by entering the values of latitude and longitude at own ship's position in manual mode.

If latitude and longitude data sent by the navigation equipment has been entered, the data has priority over the manually entered values.

1 Press [4] key while the MAP Display Setting Menu is open.

The latitude / longitude input screen for the Map Center Position menu will appear.

2 Enter the value as latitudinal, pressing the numeric keys.

To switch between the north latitude and south latitude, turn the [MULTI] control.

3 Press [ENT] key.

The entered value will be determined as latitude.

4 Enter the value as longitude, pressing the numeric keys.

To switch between the east longitude and west longitude, turn the [MULTI] control.

5 Press [ENT] key.

The entered value will be determined as longitude.

Note: The function is available in the plotter mode only.

3.9.7 Set LORAN C (LORAN C Correction)

Note: Plotter option (NDB-44) is necessary to enable LORAN C time difference display.

Setting LORAN C

Procedure

1 Press [RADAR MENU] key.

Press [9] key.

Press [5] key.

Press [5] key.

Press [5] key.

The LORAN C Correction Menu will appear.

The chain and time difference for LORAN C time difference display can be set by changing the settings of the menu items.

LORAN C Correction	
1. Chain	0000
2. TD1	00
3. TD2	00
4. TD1 Correction	0.0us
5. TD2 Correction	0.0us
0.	Exit

[1] Chain

- Set the chain.
- Enter the value in the range 0000 to 9999 by using the numeric keys.
- Only a value in the table can be entered.

[2] TD1, [3] TD2

- Enter the TD value for slave station 1/2.

[4] TD1 Correction, [5] TD2 Correction

- Enter the sound velocity time correction value for the TD value of slave station 1/2.

3.10 USE FUNCTION SWITCH [FUNC]

“Radar Function Setting” is provided for always obtaining the best radar video by storing complex radar signal processing settings in the optimum status by use, and calling the setting in accordance with the conditions for using the function.

Functions are factory-set for general use, and the settings can be fine adjusted by operating the menu.

Four function modes are available, and they are factory-set as follows:

Function 1:	COAST	Useful for observing short-range videos
Function 2:	DEEP SEA	Suitable for general ocean navigation
Function 3:	FISH NET	Useful for small target.
Function 4:	STORM	Useful for observing videos in stormy weather

3

3.10.1 Operation Procedure

Calling a Function

Procedure

1 Press the [FUNC] key.

Each time the [FUNC] key is pressed, the selection changes cyclically as follows:

Function Off → Function 1 → Function 2 → Function 3 → Function 4 → Function Off

The currently called function mode will be indicated at the lower left of the radar display.

* Switching can be done each time software button ⑤ located at the bottom left corner of the radar display described in Section 2.3.2 is pressed.

Changing Function Setting (temporary change)

- When radar signal processing setting is changed by using the menu or button on the radar display while function 1 to 4 is called, the change is temporarily reflected to the operating state.
- Since this method does not change the memory contents, the new setting is deleted as soon as another function is called.
- When the previous function is called again, operation is performed according to the memory contents.

Changing Function Setting (memory contents change)

- To change the memory contents of functions 1 to 4, use the function setting menu.
- To display the function setting menu, press [RADAR MENU] twice, [6] key, and then [8] key.
- Press the numeric key corresponding to the target function number.
- The function setting menu consists of five pages. To switch between the pages, select [0] key Previous Page or [9] key Next Page.

3.10.2 Function Setting Menu Items

The function setting menu has the items below.

Page 1

1. Mode	Name of the mode to be used	
2. IR	Radar interference rejection	OFF/LOW/MEDIUM/HIGH
3. Process	Video process	OFF/••••
4. Target Enhance	Target expansion	OFF/ LEVEL1/LEVEL2/LEVEL3
5. Auto STC/FTC	Automatic clutter suppression	OFF/AUTO SEA/AUTO RAIN
6. Save Present State	Saving of the present state	

Page 2

1. Pulse Length 0.75nm	Standard pulse length of 0.75 nm range	PL1/PL2
2. Pulse Length 1.5nm	Standard pulse length of 1.5 nm range	PL1/PL2/PL3
3. Pulse Length 3/4nm	Standard pulse length of 3 nm range	PL1/PL2/PL3
4. Pulse Length 6/8nm	Standard pulse length of 6 nm range	PL1/PL2/PL3
5. Pulse Length 12nm	Standard pulse length of 12 nm range	PL1/PL2/PL3
6. Pulse Length 16nm	Standard pulse length of 16 nm range	PL1/PL2/PL3
8. Pulse Length Pattern	Pulse Length Pattern	3NM/6NM/12NM

Page 3

1. Video Latitude	Dynamic range of radar video	NORMAL/WIDE/NARROW /SUPER WIDE
2. Video Noise Rejection	Radar video noise rejection	OFF/LEVEL1/LEVEL2
3. Auto DR Control	Automatic dynamic range control	OFF/ON
4. Process Switch	Radar video process switching	OFF/RANGE FIX/AUTO
5. 2nd Process Mode	Second video process mode	OFF/••••
6. Process Switch Range	Video process switching range	Range setting
7. Fast Target Detection	Fast moving target detection	OFF/ON

Page 4

1. Trails Interval	Radar trails length	OFF/••••
2. Trails Mode	Radar trails mode	TRUE/RELATIVE
3. Trails REF Level	Radar trails plotting threshold	LEVEL1-4
4. Trails Reduction	Thinning of radar trails	OFF/LEVEL1-3
5. Time/Cont Combine	Superimpose-display of time radar trails and continuous radar trails	OFF/ON
6. Trails Process	Radar trails video process	OFF/ON
7. Max Interval	Maximum time for radar trails display	SHORT/MEDIUM/LONG/SUPER LONG

Page 5

1. Gain Offset	Sensitivity correction	Correction value setting
2. PRF	Transmitting repetition frequency	NORMAL/ECONOMY/HIPOWER
3. Small Buoy Detection	Small target detection mode	OFF/ON
4. Fishnet Detection	Fishnet detection mode	OFF/ON
5. Antenna Height	Antenna height	DEFAULT/-5m/5-10m/10-20m/20m
8. Set Mode Default	Initialization	Yes/No

3.10.3 Overview of Function Operations

The following outlines the operation of each function selected from the function setting menu:

Procedure

1 Press the [FUNC] key for 2 seconds.

The User Function Setting menu will appear.
Specify the number for the function for which the settings are to be changed.

The following are the operation overviews of each function setting item.

3

[Page 1] [1] MODE (Mode)

- Selects the function name to be indicated at the lower left of the radar display when the function is selected.
- When the setting is changed back to the factory setting, the initial value of the selected mode is called.
- The following 11 modes are provided:
 - COAST: Use this mode to monitor a relatively short range, for example, bays and coasts where many boats and ships are running. (Importance is attached to resolution.)
 - DEEPSEA: Use this mode to monitor a relatively long range, for example, the open sea. (Importance is attached to long-range sensitivity.)
 - FISHNET: Use this mode to detect small targets such as fishnets of round haul netters hidden by sea clutter returns. (Importance is attached to sea clutter suppression, and sensitivity to moving targets lowers.)
 - STORM: Use this mode when many rain/snow clutter returns or sea clutter returns are detected in stormy weather. (Importance is attached to rain/snow clutter and sea clutter suppression, and sensitivity slightly lowers.)
 - CALM: Use this mode when only a few rain/snow clutter returns or sea clutter returns are detected.
 - RAIN: Use this mode when sea clutter is not strong but rain/snow clutter is strong. (Importance is attached to rain/snow clutter suppression, and sensitivity slightly lowers.)
 - BIRD: Use this mode to detect tens of seabirds at low altitude during coastal navigation or hundreds of seabirds at high altitude during ocean navigation.
 - LONG: Use this mode to detect small targets at relatively long distance in the open sea.
 - Buoy: Use this mode to detect small targets like radio buoys in areas outside the sea clutter area. (This mode displays targets of which detection probability is low.)
 - USER1: General mode used when the nine modes above are not applicable
 - USER2: General mode used when the nine modes above are not applicable

[Page 1] [2] IR (radar interference rejection)

- Same function as IR in the RADAR Menu

[Page 1] [3] Process (video process)

- Same function as PROCESS in the RADAR Menu

[Page 1] [4] Target Enhance

- Same function as TARGET ENHANCE in the RADAR Menu

[Page 1] [5] Auto SEA/RAIN (Auto STC/FTC)

- Detects unwanted waves such as rain/snow clutter and sea clutter and automatically suppresses them.
- When the sea state or weather changes, this function automatically performs suppression processing in accordance with the situation.
- Suppression processing is not full automatic, and requires the operator to control the afterimages of unwanted waves.
- To control the afterimage of sea clutter, use the [SEA] control.
- To control the afterimage of rain/snow clutter, use the [RAIN] control.
- In areas where the density of unwanted waves is low, unwanted waves may remain being judged as targets. Thus, use the automatic clutter suppression mode together with the video process mode.
- Characteristics of the automatic clutter suppression function:
 - OFF: Disables the automatic clutter suppression function.
Select OFF when rain/snow clutter and sea clutter are not strong or when the ship is in a bay.
 - AUTO SEA: Automatically detects the strength of sea clutter, and performs the most suitable sea clutter suppression processing.
Even when the strength of sea clutter varies depending on the wind direction, AUTO SEA performs the most suitable suppression processing.
Land like islands can be displayed naturally.
Since rain clouds outside sea clutter areas are recognized as land, there is no effect of suppressing rain/snow clutter.
 - AUTO RAIN: Along with AUTO SEA, AUTO RAIN automatically detects the strength of rain/snow clutter, and performs the most suitable rain/snow clutter suppression processing.
When rain clouds are scattered about, AUTO RAIN performs rain/snow clutter suppression processing for only the rain-cloud areas.
Since land is recognized as rain clouds, land videos become obscure.

[Page 1] [6] Save Present State (Save Present State)

- Registers the currently used settings as function settings.

[Page 2] [11]-[6] PL (Pulse Width)

- Sets the standard transmitter pulse length in each range.
- When the range is called, the pulse range is used.

[Page 2] [8] Pulse Length Pattern

- Select a combination of pulses as a pulse width that can be used for each range of 3/6/12 NM.

[Page 3] [11]-[7] Radar signal processing settings (Process Setting)

- Same functions as those in the Process Setting Menu generally used

[Page 4] [11]-[7] Radar trails settings (Trails Setting)

- Same functions as in the RADAR Trails Setting of the RADAR Menu generally used

[Page 5] [1] Gain Offset

- Corrects sensitivity while the function mode is called.
- Since the displayed noise level varies depending on the combination of the video process mode and the interference rejection level, sensitivity needs fine adjustment for always obtaining the highest level.
- The sensitivity correction function saves the correction value set by the sensitivity control in each function mode, so it can obtain the highest sensitivity without the sensitivity control being operated when the function mode is changed.
- To set high sensitivity, set a value on the “+” side.
- To set low sensitivity, set a value on the “-” side.
- When the radar interference rejection level is increased, the noise level is lowered. Thus, set a sensitivity correction value to the “+” side.
- When the video process mode 3SCAN CORR, 4SCAN CORR, or 5SCAN CORR is used, the noise level is lowered. Thus, set a sensitivity correction value to the “+” side.
- When the video process mode REMAIN or PEAK HOLD is used, noise is hard to disappear. Thus, set a sensitivity correction value to the “-” side.

[Page 5] [2] PRF

- Same function as in the TXRX Setting of the Main Menu generally used

[Page 5] [3] Small Buoy Detection

- Reduces the loss of signal processing during detection of small targets.
 - OFF: Activates the general signal processing mode.
 - ON: Activates the small buoy detection mode that reduces the loss of signal processing.

[Page 5] [4] Fishnet Detection

- Use this mode to detect small targets hidden by sea clutter returns.
- This function becomes more effective when the AUTO RAIN clutter suppression function is used together.
 - OFF: Activates the general signal processing mode.
 - ON: Activates the fishnet detection mode.

[Page 5] [5] Antenna Height

- Set the height of radar antenna above sea level.
- The STC/FTC curve is changed.

-5m	: Set the antenna height under 5m.
5-10m	: Set the antenna height 5m to 10m.
10-20m	: Set the antenna height 10m to 20m.
20m-	: Set the antenna height over 20m.

[Page 5] [8] Set Mode Default

- Sets the initial value of a selected function setting mode.
Select this item to change the current function mode to the initial value.

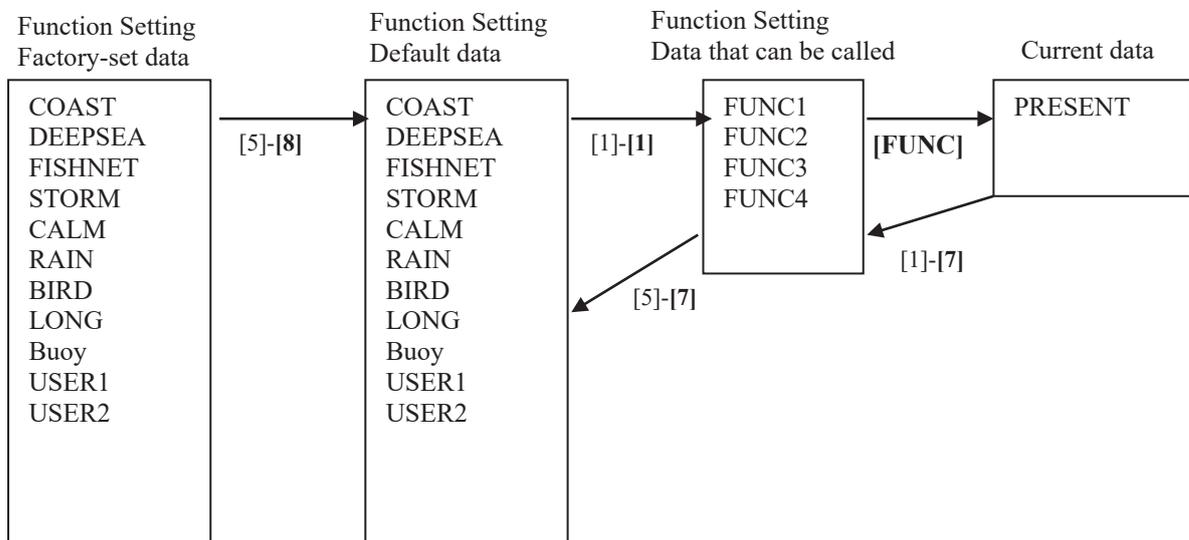
[Page 5] [9] Initialize

- Sets the function settings to the factory-set values.
Select this item to change all the function settings to the factory-set values.

3.10.4 Overview of Stored Function Setting Data

The overview of stored function setting data is as follows:

- Factory-set data: Stored data that general operation cannot change
- Default data: Standard data of each function mode that users can change
- Data that can be called: Stored data that can be called by pressing the [FUNC] key



[Page 1] [1] Call Mode

- Calls the standard setting of the mode, and stores it for the function number.

[Page 1] [6] Save Present State

- The currently operating state can be stored for the function number.
- Use this function to store the state of good setting that will be frequently used.

[Page 5] [8] Save Default of Mode

- Stores the setting of the current function number, as the default setting of the mode.

[Page 5] [9] Initialization

- Changes the memory contents of the mode, which is used with the current function number, back to the factory setting.

3.10.5 Personal Information (PIN Setting)

The operation status of the radar is recorded. If the system is operated by more than one operator, the operators can register operation status as suitable for them and call the status. Operation status for up to five operations can be registered, and a name can be assigned to each status. (Up to 10 alphanumeric characters)

* Data stored as personal information

- Day/Night mode setting
- Brilliance
- Alarm volume
- Vector length/mode
- Various types of image processing (IR, ENH, PROC, FUNC)

[1] Calling Operation Status (Load PIN Data)

Procedure

- 1 **Press [RADAR MENU] key twice.**

Press [8] key.

The Radar Sub Menu will appear.

- 2 **Press [1] key.**

The PIN Setting Menu will appear.

- 3 **Press [1] key.**

The Load PIN Data Menu will appear.

- 4 **Select the item you want to load, pressing the numeric keys [1] to [5].**

The Load Execution Check Menu will appear.
Select "Yes" for loading.



Exit

- 1 **Press [RADAR MENU] key.**

The Target Information Display Menu will reappear.

[III] Saving Operation Status (Save PIN Data)**Procedure**

- 1 Press [RADAR MENU] key twice.

Press [8] key.

The Radar Sub Menu will appear.

- 2 Press [1] key.

The PIN Setting Menu will appear.

- 3 Press [2] key.

The Save PIN Data Menu will appear.

- 4 Select the number corresponding to the place where you want to save status, pressing the numeric keys [1] to [5].

The Code Input Menu will appear.

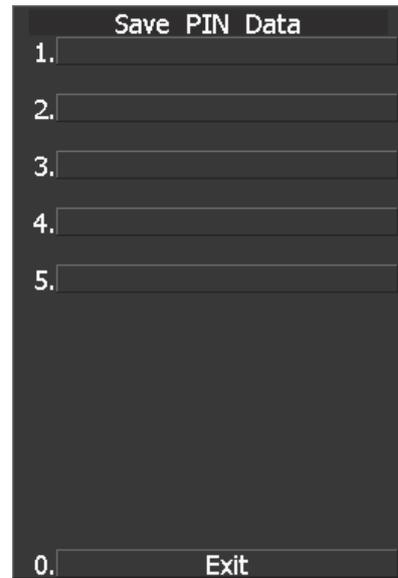
- 5 Using numeric key, enter the name and then move the cursor onto the "ENT" button and press [ENT] key.

Data will be saved with the entered name.

Exit

- 1 Press [RADAR MENU] key.

The Target Information Display Menu will reappear.



[III] Erasing Registered Operation Status (Delete PIN Data)

Procedure

- 1 Press [RADAR MENU] key twice.

Press [8] key.

The Radar Sub Menu will appear.

- 2 Press [1] key.

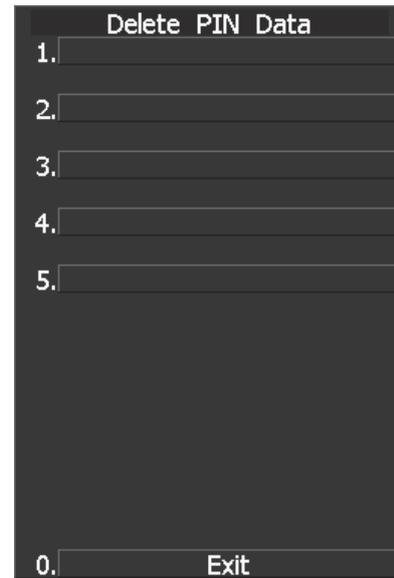
The PIN Setting Menu will appear.

- 3 Press [3] key.

The Delete PIN Data Menu will appear.

- 4 Select the file you want to erase, pressing the numeric keys [1] to [5].

The Delete Execution Check Menu will appear.
Select "Yes" for deletion.



Exit

- 1 Press [RADAR MENU] key.

The Target Information Display Menu will reappear.

3.11 USING CARD

This radar has two card slots. Inserting a flash memory card (option) into a card slot, you can save the following contents, saved in the processor, in the card or can read data from the card to the processor.

- Trails of own ship: 7000 points maximum
- Track of other ship: 20 target×1500 points (TT or AIS option)
- Mark Line: 20000 points maximum (plotter option)
- Waypoint: 99 points maximum (plotter option)
- Route: 10 routes maximum (plotter option)

These pieces of information can be saved in a flash memory card as a file. The internal capacity is as large as only a file. An internally created file can be saved until the flash memory card is full.

3

Caution



Compact Flash Cards can be used with this system. The following shows the recommendations in use. However they do not guarantee that CF cards may properly work with this system. Depending on the hardware or software, the cards will not work correctly. Any damage including loss of data caused by using the data created on this system is out of warranty. Important files should be backed up therefore.

© Recommendations on using CF cards.

★ Recommended card size.

64 MB, 128 MB, 256 MB, 512 MB, 1GB.

★ Recommended file system.

The Compact card should be formatted to FAT32 in Windows.

Many CF cards are formatted to FAT16 before shipping. Be sure to Format the CF card to FAT32, before use.

★ Recommended OS.

Windows.

★ Operating temperature range

Depending on the CF card specification and the radar specification, -15 to +55 degree Celsius.

Ⓢ Caution in use.

Never eject the CF card while files are being written to the card.
Turn the power off before inserting or ejecting a CF card.

3.11.1 Save in and Transfer to Card (MEM CAPA/Copy)

Procedure

- 1 Press [RADAR MENU] key.

The Radar Menu will appear.

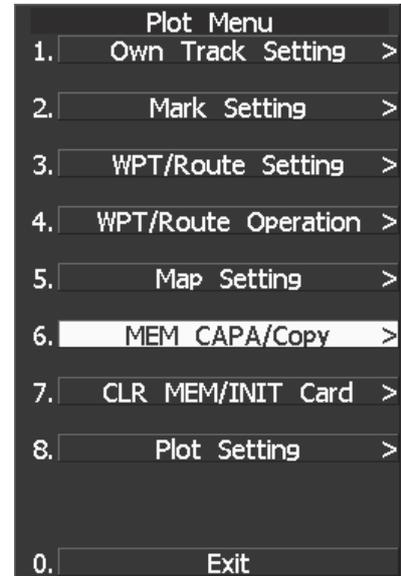
- 2 Press [9] key.

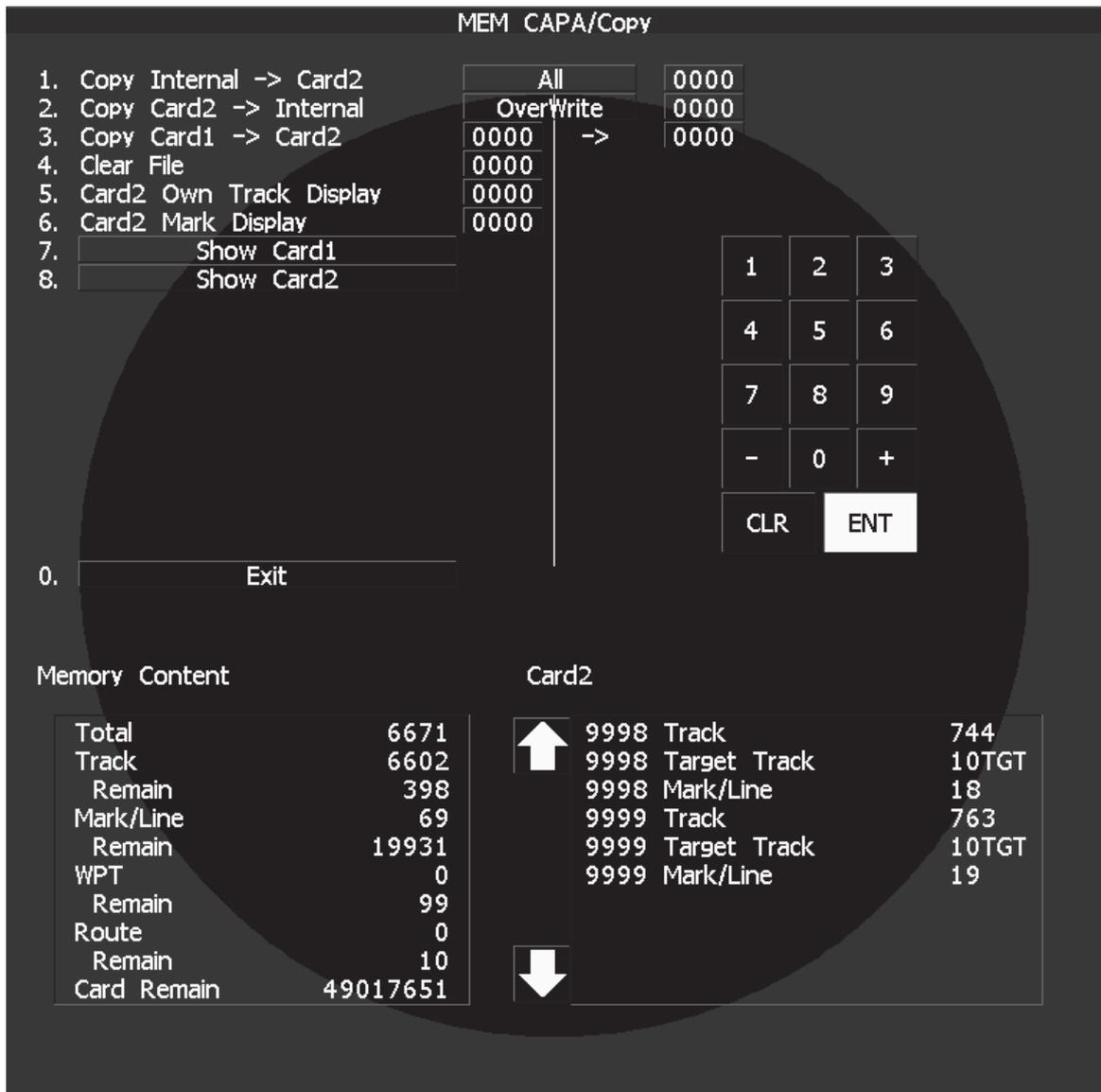
The Plot Menu will appear.

* Software button ④ located at the operation/message area in Section 2.3.9 is also available to save and transfer data.

- 3 Press [6] key.

The MEM CAPA/Copy window will appear.





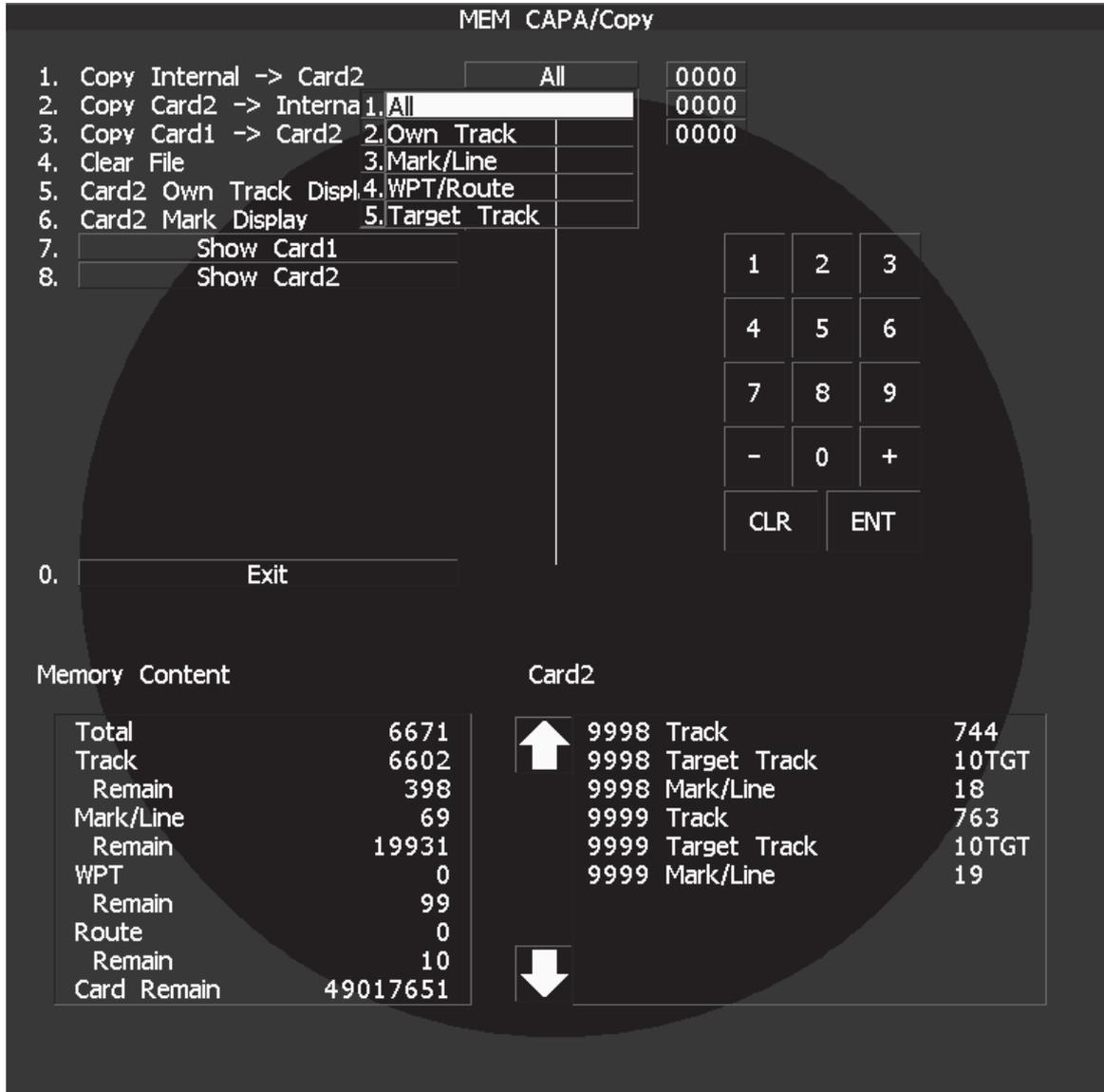
- Information saved in the processor is displayed in the Memory Content.
 - Total: Total number of data points
 - Track: Number of data points for own ship's track (7000 points maximum)
 - Remain: Number of remaining data points of own ship's track that can be saved
 - Mark/Line: Number of mark and line points made with user map (20000 points maximum only when a plotter option is installed)
 - Remain: Number of remaining data points of marks and lines that can be saved
 - WPT: Number of data points of created waypoints (99 points maximum)
 - Remain: Remaining waypoints that can be saved
 - Route: Number of data points of created routes (10 routes maximum)
 - Remain: Remaining routes that can be saved
- File names and information saved in the card is displayed in Card 2.
- Arrows next to Card 2 are used to scroll the contents of Card 2.
Range +/- keys can be used to scroll also.
- Numeric key is used to give a file name.

[I] Copy Internal Information to Card 2 (Copy Internal → Card 2)

Procedure

- 1 Press [1] key while the CAPA/Copy Menu is open.

The items to be saved are displayed.



- 2 Select the item to be saved, using the numeric keypad on the keyboard.

A file name to copy Internal information to Card 2 can be entered.

- 3 Using the numeric key, enter a file name.

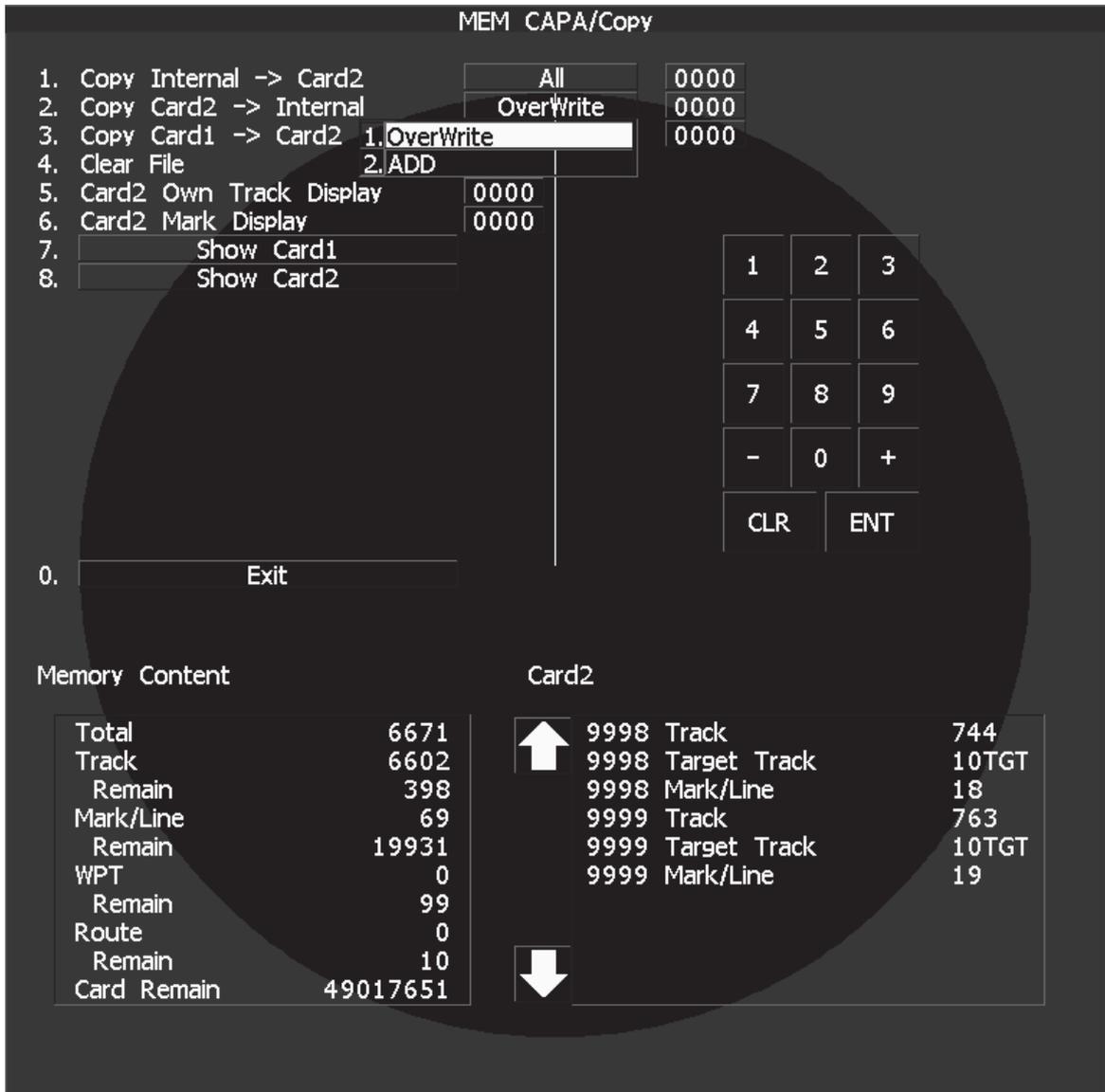
After the input, move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The system writes internal information into Card 2 with an entered number used as a file name.

The capacity of information that can be saved in the internal portion is limited to the maximum number of points in items described on the previous page. For the capacity of information that can be saved in a card, the system can save information in a card until the card capacity is filled with a file, counting the information saved in the internal portion as a file.

[III] Read Information from Card 2 to Internal Portion(Copy Card 2 → Internal)**Procedure**

- 1 Press [2] key while the CAPA/Copy Menu is open.
- 2 Using the numeric key, select ADD mode or OVER WRITE mode.

**3**

A file name to copy information from Internal portion to Card 2 can be entered.
Read the file name displayed in the Card 2 window.

3 Using the numeric key, enter a file name.

Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.
The entered file name is read from Card 2 to the internal portion.

When information is to be transferred from Card 2 to the internal portion in the ADD mode, the information can be copied from multiple files. However, information cannot be read when the number of points for an item has reached the maximum. In the ADD mode, the WPT and Route are overwritten.

[III] Copy Information from Card 1 to Card 2 (Copy Card 1 → Card 2)

Procedure

- 1 **Press [3] key while the CAPA/Copy Menu is open.**

A file name to copy information from Card 1 to Card 2 can be entered.

- 2 **Using the numeric key, enter a file name.**

Using the numeric key, enter a file name to be copied.

After having enter the name, move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

- 3 **Using the numeric key, enter a file name to copy.**

After having enter the name, move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key. CLR will be cancelled.

The entered file number is copied from Card 1 to Card 2.

[IV] Delete File from Card 2 (Clear File)

Procedure

- 1 **Press [4] key while the CAPA/Copy Menu is open.**

A file name to clear file can be entered.

- 2 **Using the numeric key, enter a file name.**

After having enter the name, move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key. CLR will be cancelled.

The entered file number is deleted from Card 2.

[VI, VII] View Information in Card (Show Card)

Procedure

- 1 **Press [7] or [8] key while the CAPA/Copy Menu is open.**

7: Card slot 1

8: Card slot 2

Select a card to be displayed.

Exit

- 1 **Press [0] key.**

The MEM CAPA/Copy window will be closed.

3.11.2 Erase/Initialize Card Memory (CLR MEM/INIT Card)

Erase saved information from inside the processor.

[I] Erase Mark/Line (CLR Mark/Line Data)

Erase saved mark/line from inside the processor.

Procedure

- 1 Press [RADAR MENU] key.

The Main Menu will appear.

- 2 Press [9] key.

The Plot Menu will appear.

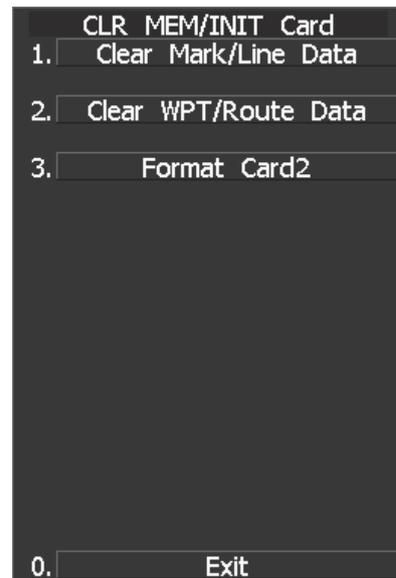
- 3 Press [7] key.

The CLR MEM/INT Menu will appear.

- 4 Press [1] key.

A window will appear to select whether or not marks/lines should be erased.

1. Erased
- 2: Cancel



3

[II] Erase Waypoint/Route (CLR WPT/Route Data)

Erase saved WPT/Route from inside the processor.

Procedure

- 1 Press [RADAR MENU] key.

The Main Menu will appear.

- 2 Press [9] key.

The Main Menu will appear.

- 3 Press [7] key.

The CLR MEM INIT Card Menu will appear.

- 4 Press [2] key.

The Waypoint/Route Erase Execution window will appear.

1. Erase
- 2: Cancel

[III] Initialize Card 2 (Format Card 2)

Initialize Card 2.

Procedure

- 1 Press [RADAR MENU] key.**

The Main Menu will appear.

- 2 Press [9] key.**

The Plot Menu will appear.

- 3 Press [7] key.**

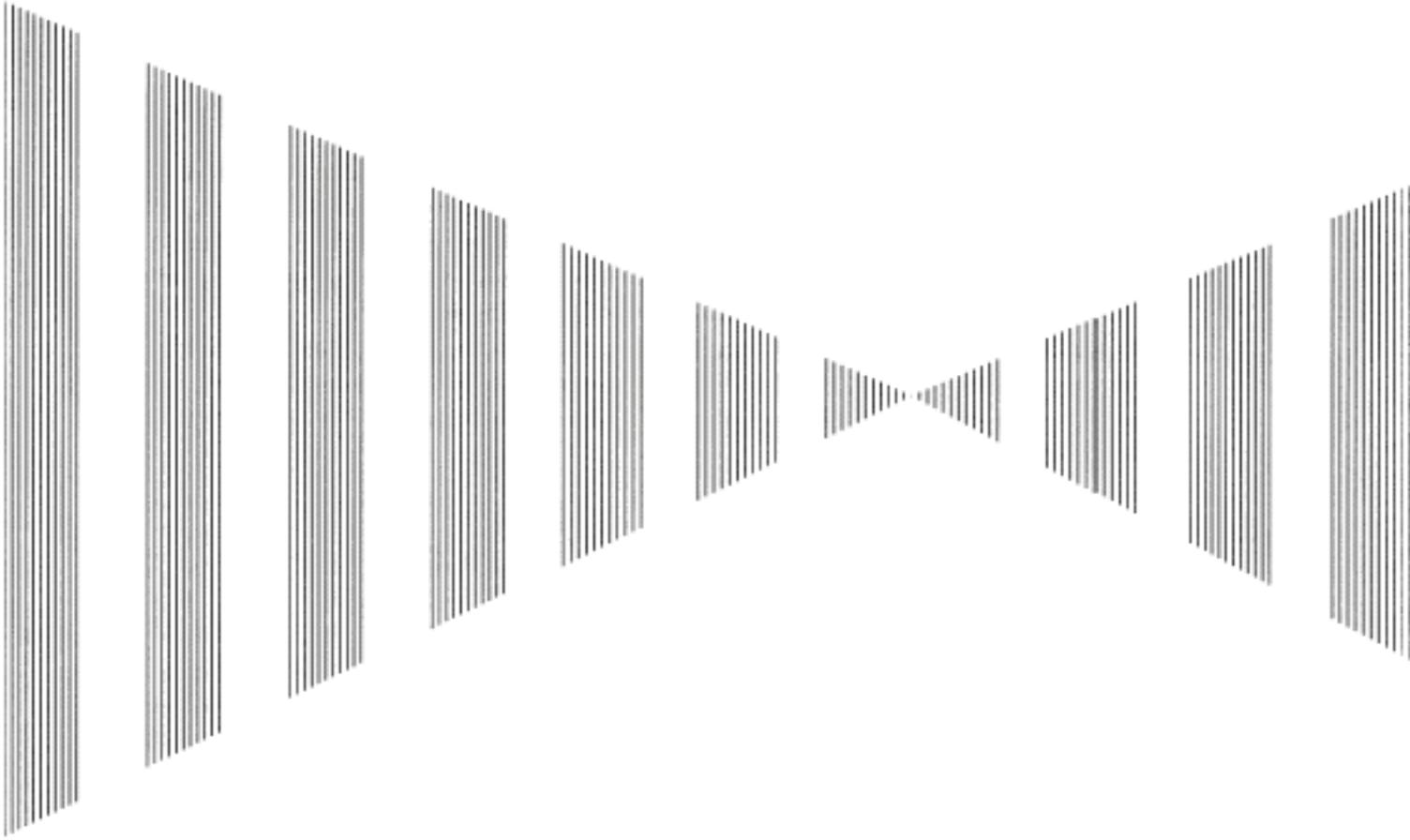
The CLR MEM INIT Card Menu will appear.

- 4 Press [3] key.**

The window to select whether or not Card 2 is initialized will appear.

1. Initialize
- 2: Cancel

SECTION 4 MEASUREMENT OF RANGE AND BEARING



- 4.1 MEASUREMENT USING THE CURSOR WITH THE TRACKBALL ..4-1
- 4.2 MEASUREMENT BY RANGE RINGS4-2
- 4.3 MEASUREMENT BY EBLs AND VRMS.....4-3
- 4.4 MEASUREMENT BETWEEN TWO OPTIONAL POINTS.....4-4

4.1

MEASUREMENT USING THE CURSOR WITH THE TRACKBALL

Procedure

- 1 Check the target echoes on the radar display.
- 2 Move the cursor mark to a target by the trackball.

The **CURSOR** on the radar display indicates the bearing and range of the target. The range is a distance from own ship's position.

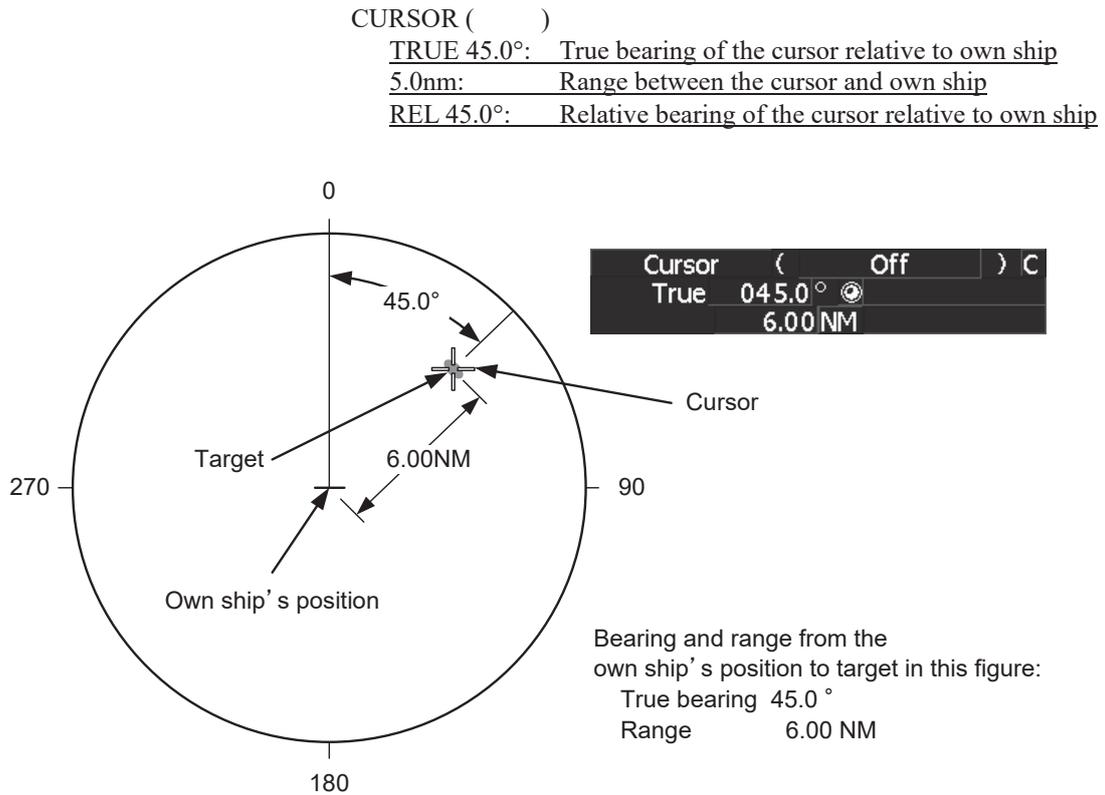


Figure 4.1

4.2 MEASUREMENT BY RANGE RINGS

Procedure

1 Press [RR/HL] key.

Display and non-display of the scale of the range rings is switched every time the [RR/HL] key is pressed. Also, the scale unit is shown on the Range rings display On / Off button (Software button ② located at the top left corner of the radar display described in Section 2.3.1).

Assess the distance to the target based on the location of the target on the range ring scale.

To change brilliance of the range rings scale, refer to Section 3.3.5 “Adjust Brilliance of Information on Radar Display (Brilliance Setting).”

4.3 MEASUREMENT BY EBLs AND VRMS

Procedure 1 Press [EBL1] key to select EBL1 display and operation.

The [EBL1] indication at the upper right of the radar display will be selected and the EBL1 will appear as a broken-line on the PPI display.

2 Turn the [EBL] control to put EBL1 on a target.

The bearing of the EBL1 will appear at the upper right of the radar display. The EBL1 bearing represents the target's bearing.

3 Press [VRM1] key to select VRM1 display and operation.

The [VRM1] indication at the upper right of the radar display will be selected and the VRM1 will appear as a broken-line circle on the PPI display.

4 Move the broken-line VRM1 to the target by using the [VRM] control.

The range of the VRM1 from own ship will appear at the upper right of the radar display. The range of VRM1 signifies a distance between the target and own ship.

Refer to Figure 4.2.

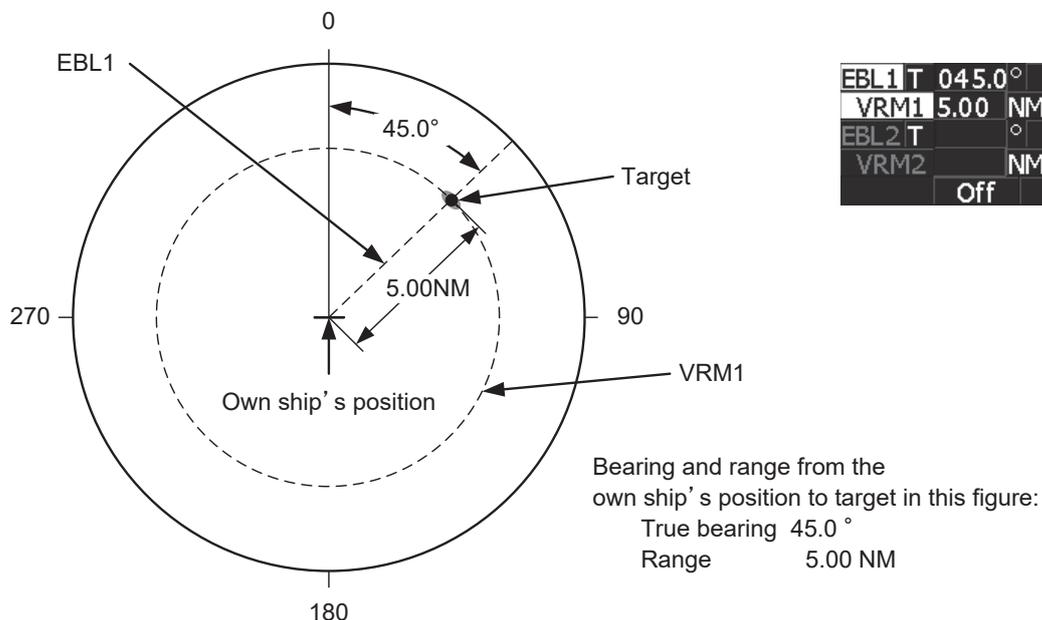


Figure 4.2

4.4

MEASUREMENT BETWEEN TWO OPTIONAL POINTS

Procedure

- 1 Press [EBL2] key to select EBL2 display and operation.

The EBL2 indication at the upper right of the radar display will be selected and the EBL2 will appear as a dotted-line on the PPI display.

- 2 Place the cursor over the button of EBL2 at the top right corner of the radar screen, and press the [ENT] key.

The EBL cursor mode changes

between C and D every time the button is pressed. Select C.

EBL1 T	123.4° C
VRM1	NM
EBL2 T	234.5° C
VRM2	NM

4

- 3 Using the trackball, move the starting point of EBL2 to one (A) of the two points and press [ENT] key.

(See Figure 4.3.)

- 4 Turn the [EBL] control to move EBL2 to the other point (B).

(See Figure 4.3.)

- 5 Press [VRM2] key to select VRM2 display and operation.

○ (VRM marker) will appear on a dotted-line of the EBL2.

- 6 Using the [VRM] control, move the VRM2 marker on a dotted-line of EBL2 to the point B.

The bearing and range between the two points will appear in the VRM2 and EBL2 area on the lower right of the radar display.

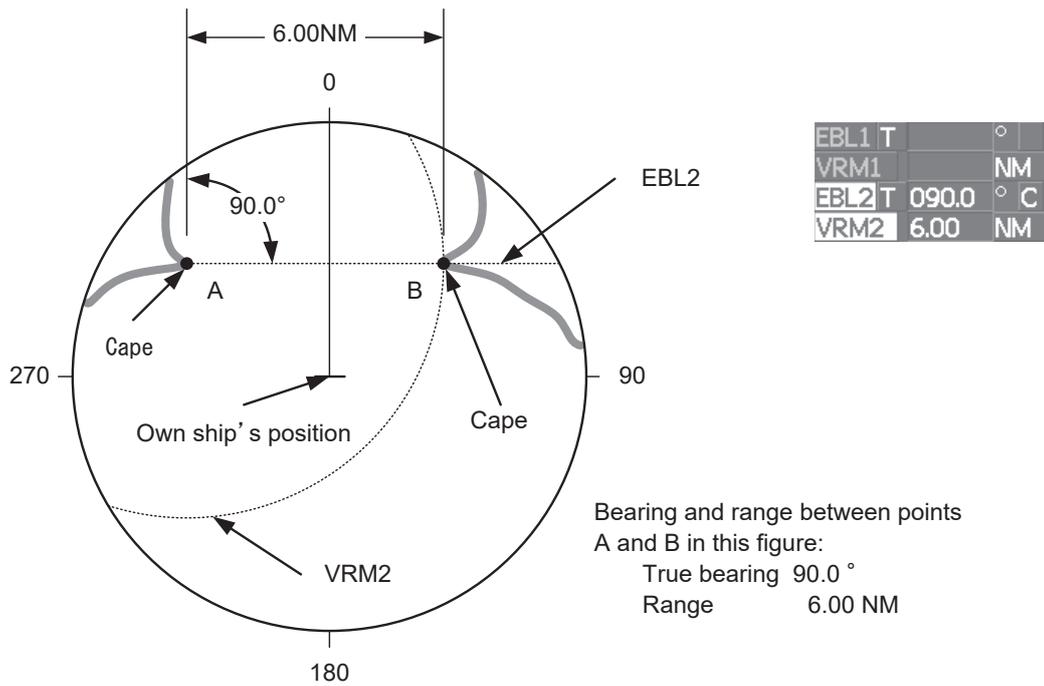


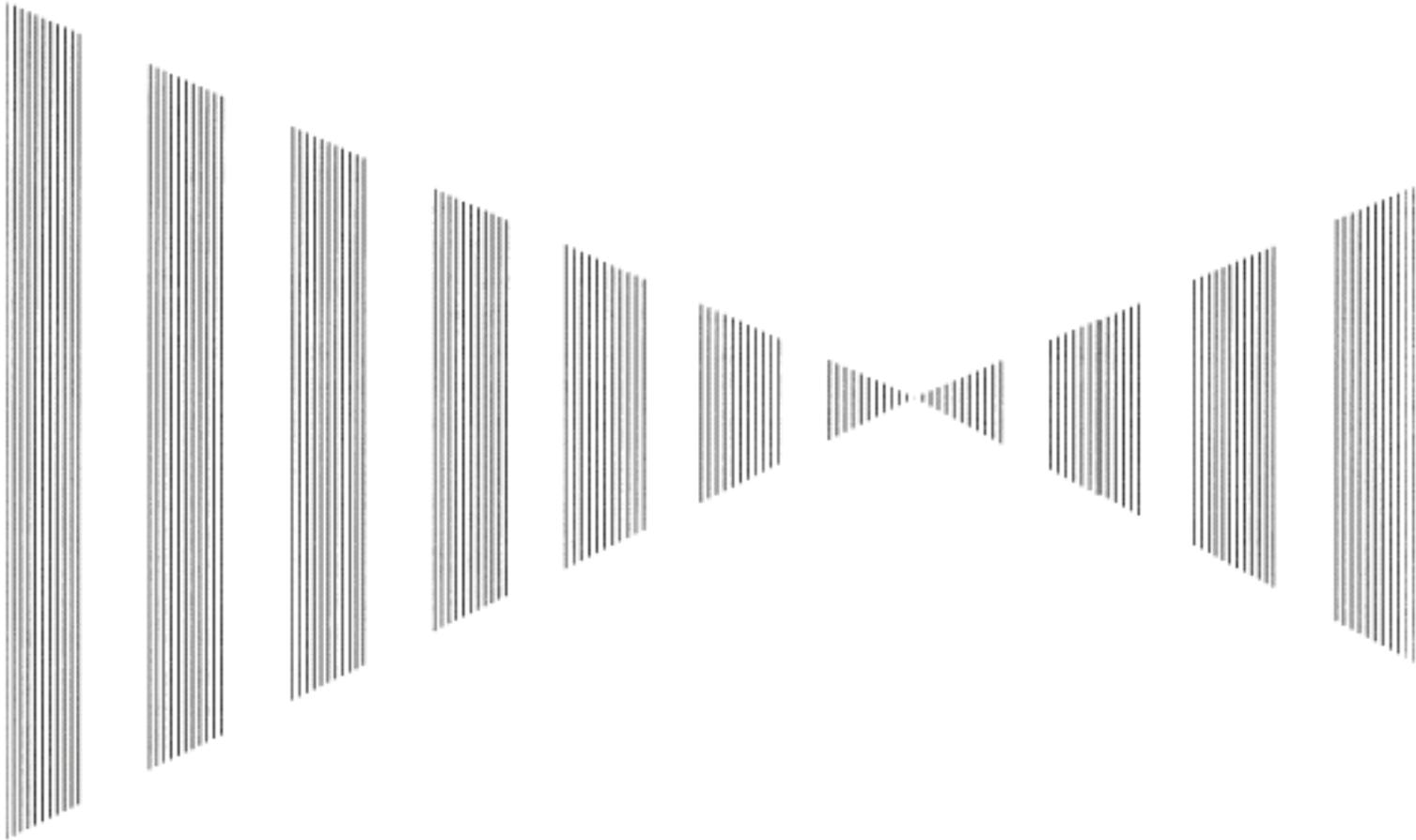
Figure 4.3

It is also possible to use EBL1 instead of EBL2 in measuring the bearing and range between two optional points.

In this case, read EBL2 as EBL1 and VRM2 as VRM1 in the procedure above, point the cursor to **C** of EBL2 in step 2, and then press [ENT] key.

SECTION 5

OPERATION OF TT AND AIS



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USAGE OF TARGET TRACKING FUNCTION

Attention

- There are the following limitations on use of the target acquisition and target tracking functions.

[I] Resolution between adjacent targets and swapping during automatic target tracking

Depending on the particular distance and echo size, resolution between adjacent targets during automatic target tracking usually ranges somewhere between 0.03 to 0.05 NM. If multiple targets approach each other, resolution will become about 0.05 NM and this may cause the system to regard them as one target and thus to swap them or lose part of them. Such swapping or loss of targets may also occur if the picture of the target being tracked is affected by rain/snow clutter returns or sea clutter returns or moves very close to land.

[II] Intensity of echoes and the target tracking function

The intensity of echoes and the tracking function have a relationship, and thus the target will be lost if no echoes are detected during six scans in succession. If a lost target exists, therefore, radar gain must be increased to support detection of the target. If, however, radar gain is increased too significantly, sea clutter returns or other noise may be erroneously detected and tracked as a target, and resultingly, a false alarm may be issued.

[III] Adverse effects of error sources on automatic tracking

To execute accurate tracking, it becomes necessary first to appropriately adjust the [GAIN], [SEA] and [RAIN] dials of the radar so that the target to be acquired and tracked is clearly displayed on the radar display. Inappropriate settings of these adjustments reduce the reliability / accuracy of automatic tracking.



5.1 PREPARATION

This section explains the features of the target tracking and AIS functions, and the initial setting for using each function.

Before the target tracking function or AIS function can be used, the corresponding optional device must be installed.

Target Tracking Function

The target tracking function calculates the course and speed of a target by automatically tracking the target's move.

The target tracking function enables the automatic acquisition of targets by using the automatic acquisition zone function.

If the mode is ground stabilization, SOG/COG used for own ship's information in target tracking. If the mode is sea stabilization, SPD (speed through the water) / HDG (heading) used for own ship's information in target tracking.

The target tracking function is available when a target tracking unit (option) is installed.

AIS (Automatic Identification System) function

The AIS function shows the target's information on the radar display, using other ship's information sent out from the AIS unit.

This function is available when the optional AIS unit is installed.

5.1.1 Collision Avoidance

Problems of Collision Avoidance in Navigation

Marine collision avoidance is one of the problems that have been recognized from of old. Now, it will be described briefly who the collision avoidance is positioned among the navigational aid problems.

The navigation pattern of all mobile craft constitutes a system with some closed loops regardless of the media through which the mobile craft travels, whether air, water, the boundary between air and water, or space. This pattern consists of two closed loops in principle, one of which is a collision with another mobile craft and the other is a loop of finding a right and safe way to reach a predeterminate destination. Fig. 5-1 shows the conceptual diagram of navigation pattern by MR. E.W. Anderson. The closed loop of collision avoidance is shown on the left side and the closed loop of finding a right course on the right side.

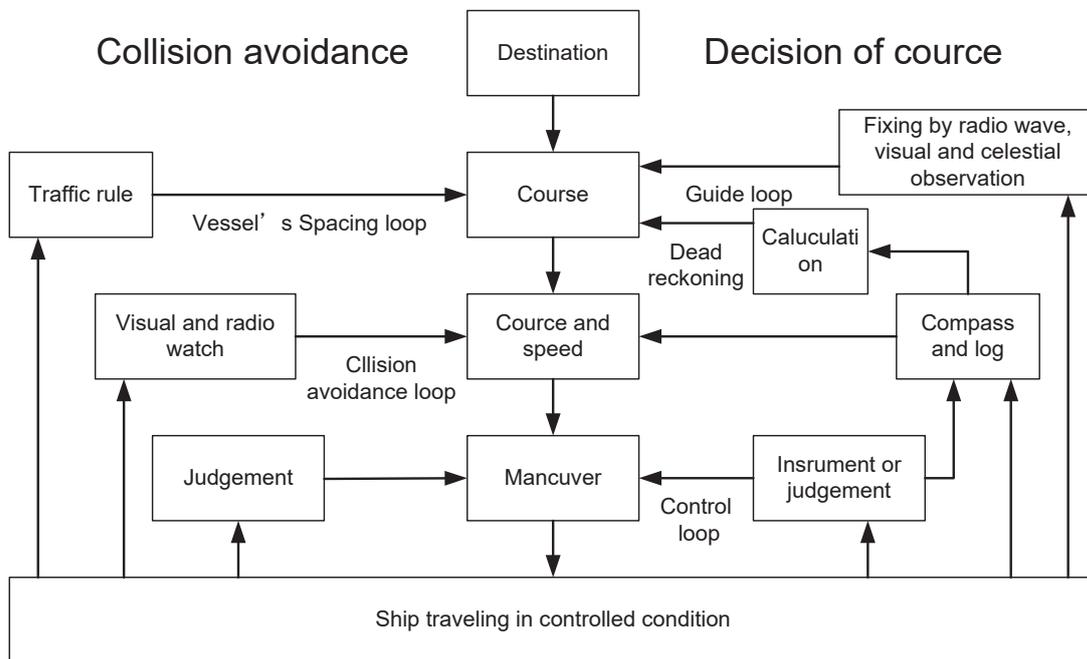


Fig. 5-1 Navigation Pattern

Marine Accidents and Collisions

Among marine accidents, collision accidents have been highlighted as the tonnages and speeds of ships become higher along with the increase in traffic at sea. If a tanker carrying dangerous articles such as crude oil collides with any other vessel, then not only the vessels involved with the accident but other vessels in the vicinity, port facilities, inhabitants in the coastal area as well as marine resources may also suffer immeasurable damages and troubles. Collision accidents have a high percentage of the marine accidents that have occurred in recent years. To cope with these problems, any effective measures are needed and some equipment to achieve collision avoidance requirements have been developed at rapid strides.



Basic Concept of Collision Avoidance

There are two aspects in collision avoidance: collision prediction and avoidance. Collision prediction is to predict that two or more vessels will happen to occupy the same point at the same time, while collision avoidance is to maneuver vessels not to occupy the same point at the same time.

In practical operation of vessels, a spot of collision has to be deemed to be a single point but a closed zone. This closed zone is conceptually defined as a CPA (Closest Point of Approach). In collision prediction, the time to be taken until a ship reaches the CPA is defined as a TCPA (Time to CPA).

Fig. 5-2 shows a diagram caked “Collision Triangle”.

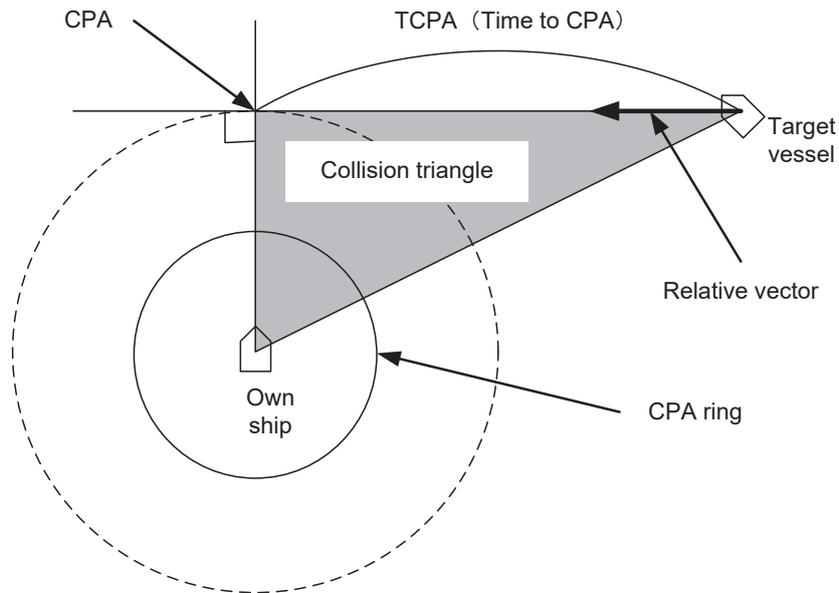


Fig. 5-2 Collision Triangle

Relative Vector and True Vector

From two points of view, collision prediction and avoidance, it is necessary to obtain the relative vector of other ship for prediction and the true vector of other ship for collision avoidance in order to grasp other ship's aspect. The relationship between the relative vector and true vector is shown in Fig. 5-3.

Both rough CPA and TCPA can be obtained easily from the relative speed vector of other ship. This method has an advantage that the risks of collision with all other ships within the radar range can be seen at a glance. On the other hand, the course and speed of other ship can easily be obtained from its true speed vector, enabling other ship's aspect to be seen at a glance. Thus, the aspects of other ships (transverse, outsail, parallel run, reverse run, etc.) as described in the act of prevention of collision at sea can be readily grasped. If there is a risk of collision with other ship, the operator can determine which rule to be applied and how to operate own ship.

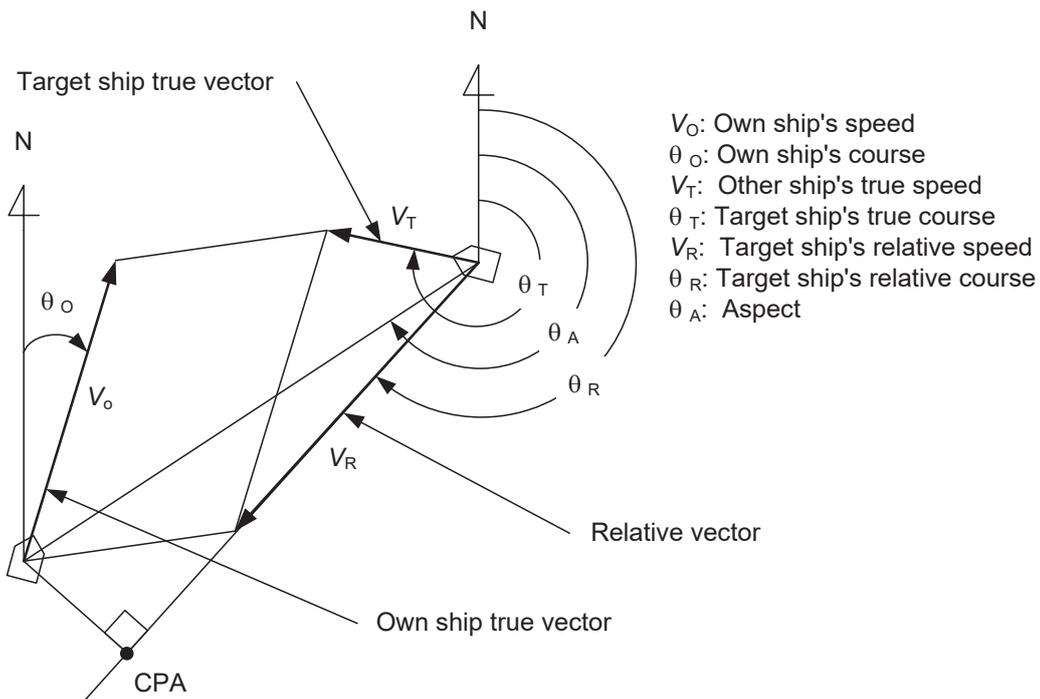


Fig. 5-3 Relative Vector and True vector

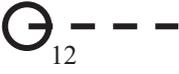
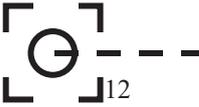
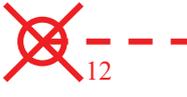
Radar and Collision Avoidance

Radar is still playing an important roll for collision prevention and positioning. A plotter is used to further enhance the radar functionality. The plotter is capable of plotting other positions of other ships in 3 to 6 minute intervals to monitor their movement. The plots of other ships represent their tracks relative to own ship, and it is shown whether there is a risk of collision, namely CPA and TCPA can be obtained. This method using a plotter is fairly effective, but the number of target ship, which is manually plotted, is limited and it takes several minutes to measure those.



5.1.2 Definitions of Symbols

Types and Definitions of Target Tracking Symbols

Vector/Symbol	Definition	Remarks
	Initial acquisition target	This symbol is displayed until the vector is displayed after target acquisition.
	Target acquired in automatic acquisition zone	The alarm sounds. The alarm message (New Target) turns red and blinks. The symbol is red colored.
	Tracked target	
	Dangerous target	The alarm sounds. The alarm message (CPA/TCPA) turns red and blinks. The symbol is turns red, and indicates with X mark.
	Numeric displayed target	When the numeric data is displayed, the target symbol is enclosed in a square.
	Lost target	The alarm sounds. The alarm message (Lost) turns red and blinks. The symbol is turns red, and indicates with X mark.
	Past position	The past positions of an AIS target are displayed as well as the target tracking symbol.
	Target track	The track of another ship as an AIS target is displayed as well as the target tracking symbol.

Types and Definitions of AIS Target Symbols

Vector/Symbol	Definition	Remarks
	Sleeping target	This symbol is displayed when received data is valid. The direction of the triangle's vertex indicates the target's bow or course.
	Activated target	The heading direction is displayed with a solid line, and the course vector is displayed with a dotted line. The line perpendicular to the heading direction indicates the direction to which the course is to be changed. This line may not be displayed.
	Target acquired in automatic acquisition zone	The alarm sounds. The alarm message (New Target) turns red and blinks.
	Outline display	The outlines of ships are displayed scaled down.
	Numeric displayed target	When the numeric data is displayed, the target symbol is enclosed in a square.
	Dangerous target	The alarm sounds. The alarm message (CPA/TCPA) turns red and blinks. The symbol is turns red, and indicates with X mark.
	Lost target	The alarm sounds. The alarm message (Lost) turns red and blinks. The symbol is turns red, and indicates with X mark.

Up to a total of 130 activated and sleeping AIS targets can be displayed.

Of which, up to 30 activated AIS targets can be displayed.

If there are more than 130 AIS targets, priority of displaying these targets is as follows:

1. Numeric displayed targets
2. Targets with CPA / TCPA smaller than the set value
(They are considered as dangerous targets and the alarm sounds.)
3. Targets within the automatic activation area
4. Activated AIS targets
5. Targets within the AIS filter (sleeping AIS targets)

If the number of targets exceeds the maximum number of targets that can be displayed within one priority, these targets are then displayed in accordance with the priority list below:

1. Association targets
2. Activated AIS targets
3. Sleeping AIS targets



The vector of an AIS target is to be displayed with a vector over ground or over water, depending on the speed sensor setting and current offset setting. The type of the currently displayed vector can be confirmed by viewing the setting of the stable mode.

When **GND** is displayed for the stability mode (ⓐ located at the top left corner of the radar display described in Section 2.3.1):

Vector over ground

When **Sea** is displayed for the stability mode (ⓐ located at the top left corner of the radar display described in Section 2.3.1):

Vector over water

When the vector of an AIS target is displayed with a vector over water, the system has converted the AIS target's vector over ground to the vector over water according to the data received from the AIS and the own ship's information.

Note: When the AIS target's symbol is activated but the vector is not displayed, the following are probable causes of the trouble:

COG/SOG is not yet input from the GPS.

The selected speed sensor is malfunctioning.

Types and Definitions of Association Target Symbols

When a tracked target and an AIS target are decided as identical, it is displayed with either of the following symbols:

Vector/Symbol	Definition	Remarks
	Priority for tracked target Association target	
	Priority for AIS target Association target	

TT symbol display setting (TT Symbol Display)

Turn on or off (ON / OFF) the TT symbol display.

This function can be used only when the AIS display function (optional) is on.

This function cannot be used when the AIS display function (The TT display function cannot be deactivated if only TT is used without using the AIS function).

Data is saved even though the TT display is turned off by this function.

Refer to Section 5.3 “AIS OPERATION” for the AIS display function.

Procedure

1 Press the [TT MENU] key.

2 Press the [1] key.

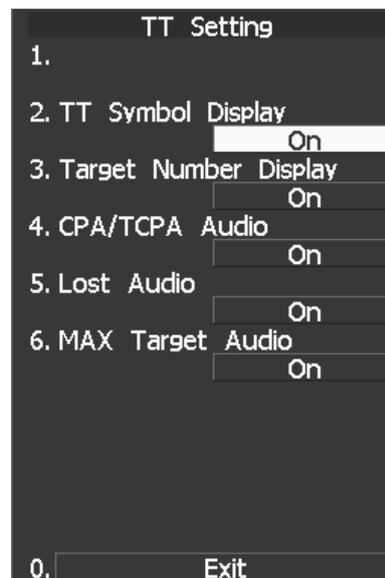
TT Setting menu opens.

3 Press the [2] key.

TT Symbol Display is turned on or off.

ON : Enables the TT symbol display function.

OFF : Disables the TT symbol display function.



* Software button ⑨ located at the other ship's information area in Section 2.3.6 is also available for switching.

Setting AIS Symbol Display Function (AIS Symbol Display)

Switch ON or OFF to set the AIS symbol display function.

Procedure

1 Press [TT MENU] key.

Press [2] key.

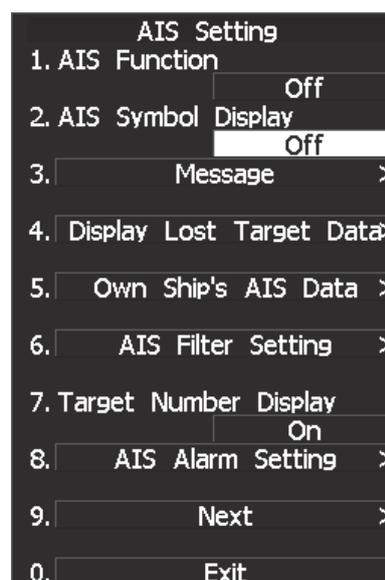
The AIS Setting menu will appear.

2 Press [2] key.

The AIS Symbol Display is switched between ON and OFF.

ON: Enables the AIS symbol display function.

OFF: Disables the AIS symbol display function.



* Software button ⑩ located at the other ship's information area in Section 2.3.6 is also available for switching.



5.1.3 TT Data Display

(Refer to Example of Display in Section 2.1 “EXAMPLE OF DISPLAY.”)

Display of Vectors

Attention

- **When a target or own ship changes a course, or when a target is acquired, its vector may not reach a given level of accuracy until three minutes or more has passed after such course change or target acquisition.**
- Even if three minutes or more has passed, the vector may include an error depending upon the tracking conditions.**

5

A vector to represent a target's predicted position can be presented in the True vector or Relative vector mode. In each mode, a vector length can be freely changed for a time interval of 1 to 60 minutes.

The True and Relative vector can be switched by using software button ① located at the other ship's information area in Section 2.3.6.

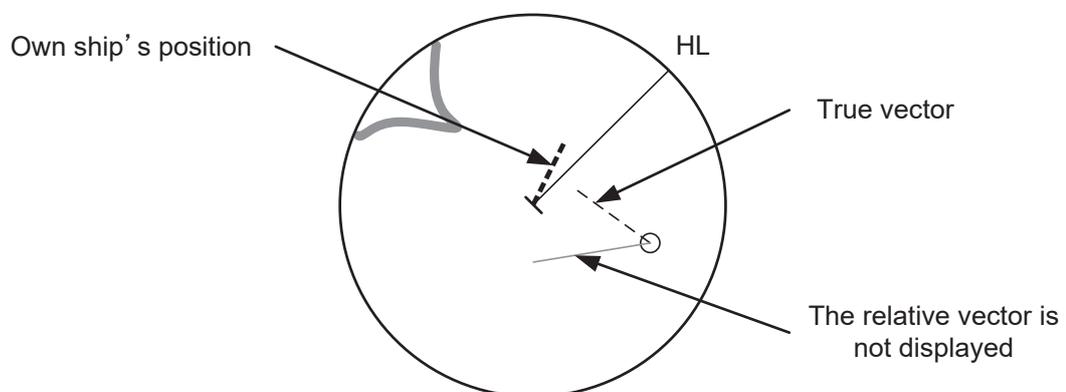
[I] Vector Mode Selection

True Vector Mode

In the true vector mode, the direction of a target vector indicates the true course of the target and its vector length is proportional to its speed.

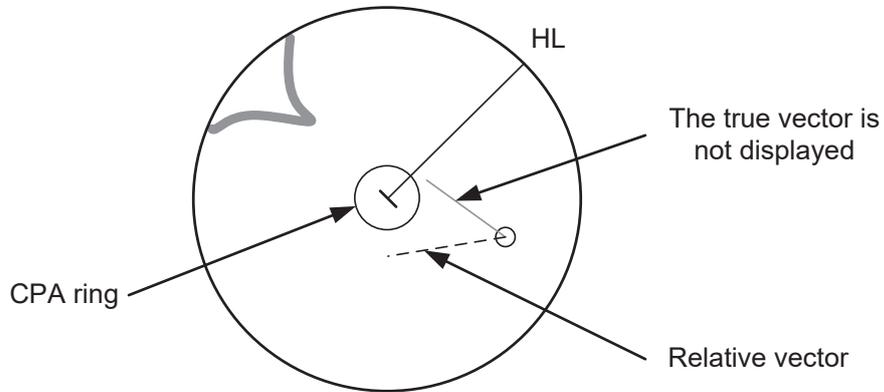
In this mode, own ship's vector is displayed as shown below.

In this mode, the movements of other ships around own ship can be accurately and easily monitored. However, no CPA RING can appear in this mode.



Relative Vector Mode

In displaying the relative vector of a target, press the [VECT R/T] key to select the Relative Vector mode. The relative vector does not represent the true motion of the target, but its relative relation with own ship. This means that a target with its relative vector directed to own ship (passing through the CPA LIMIT ring) will be a dangerous target. In the Relative Vector mode, it can be seen at a glance where the CPA LIMIT of the dangerous target is.

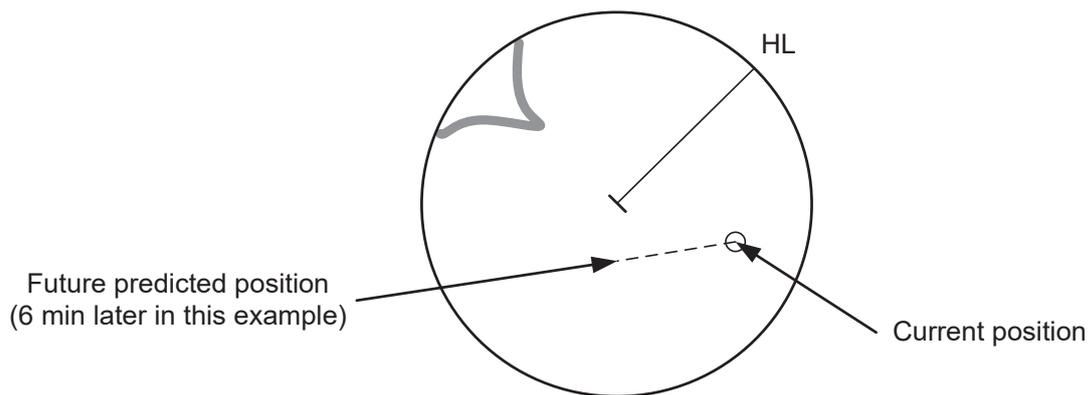


Therefore, the TRUE/REL mode shall optionally be used for the purpose of observation: the TRUE vector mode for grasping the true aspect of a target, and the REL vector mode for grasping a target's closest point of approach (CPA)

[II] Vector Length: VECTOR TIME

The vector length of a target is proportional to its speed, and the vector time can be switched in a range of 1 to 60 minutes by used for ten-key.

The diagram below illustrates a vector length of a target for six minutes, and the tip of the vector represents the target's position expected to reach six minutes later.



Refer to Section 5.1.7 "Setting Vectors (Vector Time)" for how to change the vector time.



5.1.4 Cursor Modes (Cursor)

Types and Functions of Cursor Modes

The types of cursor modes are listed in the table below. To use the function of a cursor mode, move the cursor onto the PPI object and press the [ENT] key.

Mode	Function
ACQ TT	Enables the target tracking function to acquire a target in manual mode.
ACT AIS	Activates AIS targets, deactivates AIS target and sets a point filter.
TGT Data	Select or deselect a tracking or AIS target whose numerical data is to be displayed.
Cancel	Cancel a target tracking.
Mark	Puts a temporary mark.

Change of Cursor Mode

Procedure

- 1 Move the cursor to the cursor mode **Cursor** (software button ① located at the top right corner of the radar display described in Section 2.3.3), and press the [ENT] key.

The selected cursor mode will be shown at the cursor mode (software button ② located at the top right corner of the radar display described in Section 2.3.3).

5.1.5 Setting Collision Decision Criteria (CPA/TCPA Limit)

For details on each operation, see 3.4 BASIC OPERATION and 4 MEASUREMENT OF RANGE AND BEARING.

Attention

- **Set the optimum values of collision decision conditions, depending upon vessel type, water area, weather and oceanographic conditions.
(For the relations between those conditions and alarms, refer to Section 5.5 “ALARM DISPLAY.”)**

Set and check collision decision criteria before operating the TT system.

Procedure

1 Press [TT MENU] key.

2 Press [3].

The TT Setting menu will appear.

3 Press [5].

The ten-key screen will appear.

4 **Select the value to be set pressing the numeric key, and press [ENT].**

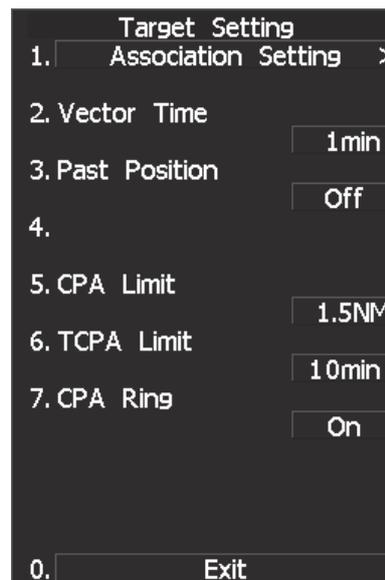
The selected CPA Limit value will be determined.

5 Press [6].

The ten-key screen will appear.

6 **Select the value to be set pressing the numeric key, and press [ENT].**

The selected TCPA Limit value will be determined.





5.1.6 Setting CPA Ring (CPA Ring)

Procedure

1 Press [TT MENU] key.

2 Press [3].

The TT Setting menu will appear.

3 Press [7].

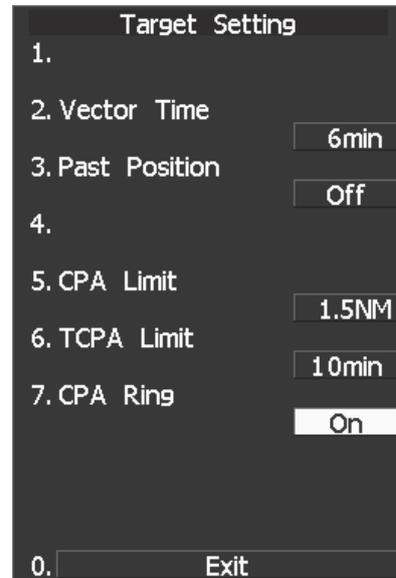
The setting of CPA Ring will change between ON and OFF.

ON: Displays the CPA ring.

OFF: Hides the CPA ring.

While the CPA ring is displayed, CPA RING is shown at the lower right of the radar display.

While the distance of the specified CPA Limit value is used as the radius, the CPA ring is displayed with a white circle of which center is the own ship's position.



Note: The CPA ring is not displayed when the true (T) vector mode is selected.

* The CPA ring switch to Display or Hide within software button ⑦ located at the bottom right corner of the radar display described in Section 2.3.4.

5.1.7 Setting Vectors (Vector Time)

Vector time can be set in minutes in the range 1 to 60 min.
A true vector mode or relative vector mode can be selected.

Setting vector time on the display

Procedure

- 1 **Move the cursor to the target vector time setting (Software button ② located at the other ship's information area in Section 2.3.6), and press the [ENT] key.**

The Vector Time value input screen will appear.

- 2 **Use number keys, input a vector length, and press the [ENT] key.**

The inputted vector length is confirmed.

Setting vector time using the multi-dial [MULTI]

Procedure

- 1 **Press the [MULTI] dial several times to activate the Vector mode.**

Vector will be displayed in the multi-dial mode (⑭ located at the bottom left corner of the radar display described in Section 2.3.2).

- 2 **Turn the [MULTI] dial to set the vector time.**

Setting vector mode [VECT R / T]

Procedure

- 1 **Press the [VECT R / T] key.**

The current vector mode T (true vector) or R (relative vector) will be displayed in the target vector display true / relative switching (software button ① located at the other ship's information area in Section 2.3.6).

The vector mode is switched between T (true vector) and R (relative vector) each time the button is pressed.



5.1.8 Setting the GPS antenna location

Set the GPS antenna location. Set offset ranges in longitudinal direction and latitudinal direction from the own ship's reference position.

For the setting procedure, refer to Section 7.1.6 “Setting of CCRP/Antenna/GPS Antenna Position (CCRP Setting).”

Attention

- **If offset ranges are not set correctly, AIS symbols and radar echoes may be displayed shifted.**
- **When offset ranges are set, latitude and longitude data received from the GPS is offset, and the offset data is displayed as the latitude and longitude of own ship's position.**

5.2 TT OPERATION

This section explains how to use the target tracking (TT) functions.
Each function is available only when the target tracking (TT) option is installed.
The functions automatically track a target, and store/display vectors as the course and speed.
They calculate CPA and TCPA, and issue an alarm.
The target tracking (TT) function can track up to 30 ships.
Automatic acquisition/activate zone can be set for automatic acquisition.
When the power is turned off or the transmit/standby mode is activated, tracking data is erased from memory.

Caution



Use the radar only as a navigation aid.
The final navigation decision must always be made by the operator him/herself.
Making the final navigation decision based only on the radar display may cause accidents such as collisions or running aground.



Use target tracking function only as a navigation aid.
The final navigation decision must always be made by the operator him/herself.
Making the final navigation decision based only on tracking target information may cause accidents.
Tracking target information such as vector, target numerical data, and alarms may contain some errors.
Also, targets that are not detected by the radar cannot be acquired or tracked.
Making the final navigation decision based only on the radar display may cause accidents such as collisions or running aground.



5.2.1 Acquiring Target [ACQ]

Target acquisition can be performed on two modes, AUTO and MANUAL, and both modes can be used at the same time.

Automatic Acquisition [AUTO]

Attention

- **If untracked targets intrude into automatic acquisition/activate zone in the conditions that maximum number of targets is under tracking, the targets acquired automatically will be cancelled in the order of lower levels of danger.**

5

Procedure

1 Press the [AZ] key.

Automatic acquisition will be started. The mark “▽” and target ID number are put to an acquired target, and they move together with the target. The vectors are displayed within one minute.

2 Press the [AZ] key again.

Automatic acquisition will be turned off, and automatic acquisition/activate zone disappears from the radar display. However, automatically acquired ships are continuously tracked.

For automatic acquisition/activate zone to be called by using the [AZ] key, refer to “Setting Automatic Acquisition Key Assignment (Set AZ Key)” on the next page.

Setting Automatic Acquisition Key Assignment (Set AZ Key)

This section explains how to set automatic acquisition/activate zone that is to be assigned to the [AZ] key.

The setting enables the operator to select ON/OFF for a generally used automatic acquisition/activate zone by simply operating the [AZ] key on the control panel.

Procedure

1 Press [TT MENU] key.

Press [5].

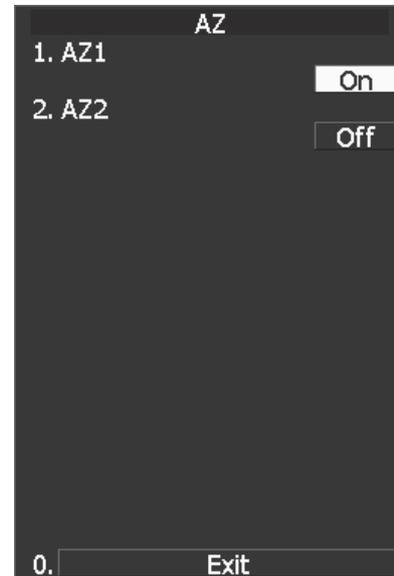
Press [3].

Press [1].

AZ menu will appear.

ON: Turns on automatic acquisition/activate zone when the [AZ] key is pressed.

OFF: Does not turn on automatic acquisition/activate zone when the [AZ] key is pressed.



The same function also as RADAR Alarm (Sector Alarm) can be given.

Procedure

1 Press [TT MENU] key.

Press [5].

Press [3].

Press [2].

* The setting method is the same as the method of automatic acquisition/activate zone. For the creation method of sector alarm, refer to [IV] "Make Sector Alarm (Make Sector Alarm)" in Section 3.5.21 "Radar Alarm (Radar Alarm)."



Manual Acquisition [MANUAL]

Attention

- If more targets are acquired manually in the condition that the maximum number of targets are under tracking, the targets under tracking will be cancelled in the order of lower level of danger in order to track the manually acquired targets.

Procedure

- 1 Move the cross cursor mark onto the target to be acquired, and press the [ACQ] key.

The target will be acquired. The initial acquisition mark and target ID number are put to the acquired target, and the vectors are displayed within one minute.

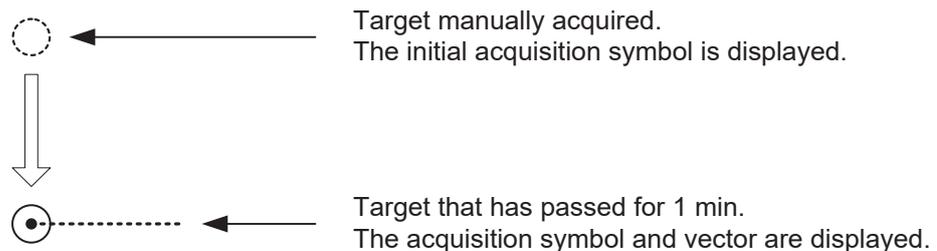
Alternative

- 1 Press the **CURSOR** button at the upper right of the radar display several times until **ACQ TT** appears.

The TT acquisition mode is set as the cursor mode.

- 2 Move the cross cursor mark onto the target to be acquired, and press the [ENT] key.

The target will be acquired. The initial acquisition mark and target ID number are put to the acquired target, and the vectors are displayed within one minute.



When using only the manual acquisition mode alone, press the [AZ] key to turn off the automatic acquisition mode.

Use of Automatic and Manual Acquisition Modes [ACQ AUTO] / [ACQ MANUAL]

Use the manual acquisition mode while the automatic acquisition mode is on.

Manually acquire the target to which particular attention should be paid, and get the other targets automatically acquired. If a new target appears exceeding the maximum number of targets, the manually acquired target is displayed even in the background until it gets out of the display. However, automatically acquired targets are canceled starting far distance from own ship.

5.2.2 Canceling Unwanted Targets

Unwanted targets can be canceled one by one in the following cases:

- Tracking is no longer necessary for targets with which vectors/symbols are displayed after being acquired and tracked.
 - The number of vectors on the radar display needs to be reduced for easy observation.
- When targets are to be re-acquired from the beginning, all the current vectors can also be canceled.

Canceling targets one by one

Procedure

- 1 **Move the cross cursor mark onto the target to be canceled.**
- 2 **Press the [TGT CNCL] key.**

The target's vectors and symbols will disappear, and only the radar video remains.

Alternative

- 1 **Press the **CURSOR** button at the upper right of the radar display several times until **ACQ TT** appears.**

The TT acquisition mode is set as the cursor mode.

- 2 **Move the cross cursor mark onto the target to be acquired, and press the [CLR/INFO] key.**

The target's vectors and symbols will disappear, and only the radar video remains.

Canceling all targets collectively

Procedure

- 1 **Hold down the [TGT CNCL] key.**

The vectors and symbols of all the targets will disappear, and only the radar videos remain.

Note: When all the targets have been canceled, the system stops tracking them. Thus, you need to re-acquire targets in manual or automatic acquisition mode. Do not cancel all the targets unless otherwise required.



5.2.3 Tracking Target Data Display [TGT DATA]

Attention

- **When a target or own ship changes its course, or when a new target is acquired, its vector may not reach a given level of accuracy until three minutes or more has passed after such course change or target acquisition.
Even if three minutes or more has passed, the vector may include an error depending upon the tracking conditions.**

Type of Data Display

Target Data

Target identification (TT ID)	ID number of the target
True bearing: BEARING	0.1° unit
Range: RANGE	0.01 NM unit
True course: COURSE	0.1° unit
True speed: SPEED	0.1 knot unit
Closest point of approach (CPA)	0.01 NM unit
Time to CPA (TCPA)	0.1 min unit
Bow crossing range (BCR)	0.01 NM unit
Bow crossing time (BCT)	0.1 min unit

The target for which its numeric data is displayed is marked with a symbol “” to distinguish from other targets.

If a target's data is displayed, but without the symbol “”, such a target exists outside the currently displayed radar display.

[I] Method of Displaying Target Data [TGT DATA]

Procedure

- 1 **Move the cross cursor mark onto the target for which numeric data is to be displayed, and press the [TGT DATA] key.
Or, set the cursor mode to TGT Data, place the cross cursor over the target whose numerical data is to be displayed, and press the [ENT] key.**

Then, the data of the designated target will appear, it will be marked with a symbol “”. The target data will remain on the radar display until the target is lost and its vector disappears, or until another target is designated.

If a target with the mark “” is designated, only its true bearing (BEARING) and range (RANGE) will appear until its vector appears.

[II] Canceling numerical data display (CNCL Data)

Procedure

- 1 **Set the cursor mode to TGT Data, place the cross cursor over the tracked target whose numerical data is to be displayed, and press the [CLR/INFO] key.**

Numerical data display is canceled.



5.2.4 Displaying Target ID No. (Target Number Display)

A target ID number is a value displayed beside the acquisition symbol when a target is acquired. These numbers are assigned to targets in acquisition order. The numbers 1 to 30 are automatically assigned. Each target is identified by the assigned ID number until it is lost or its acquisition is canceled.

Procedure

1 Press [TT MENU] key.

2 Press [1] key.

The TT Setting menu will appear.

3 Press [3] key.

The Target Number Display is switched ON or OFF.

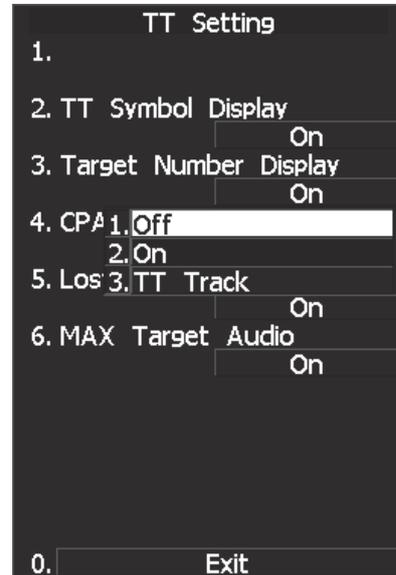
ON: Displays target ID numbers.

OFF: Hides target ID numbers.

Target TRACK:

Displays target ID number with target track.

If there are many tracking targets and their symbol display is confusing, set Target Number Display to OFF to view the radar display easily.



5

Note: An ID number is always displayed for only targets with which numeric data is displayed.

5.2.5 Input of target information (TT Individual Setting)

This radar enables name inputs and target track color changes for individual TT targets acquired.

Procedure

1 Turn OFF the cursor mode.

Software button ① located at the top right corner of the radar display described in Section 2.3.3 is available to change the cursor mode.

2 Place the cursor over the target and then press [CLR/INFO] key.

The TT Individual Setting INFO screen opens.

*** This function is available only when the cursor mode is set to OFF.**

Item overview

- Target ID : Target ID currently selected.
Name : The name of the target. It is blanked in the initial status. The user is to enter a name.
Track Color : Determines a target track color.
Association Priority : Specify whose target information is to be displayed between an AIS target and a TT target when an association is made.
Reference Target :
On : Set this target as a reference target.
Off : Stop using this target as a reference target.

Target information screen

TT Individual Setting	
Target ID	1
1. Name	
2. Track Color	
3. Association Priority	Off
4. Reference Target	Off
0.	Exit



Name entry (Name)

Procedure

- 1 While the TT Target INFO screen is open, press [1] key.
- 2 For the entry of a new name
→ 2. INPUT
For the selection of a name from names that have already been entered
→ 1. DATA BASE.

TT Individual Setting
Target ID 1

1. Name
2. Tra: 1. Database
2. Input
3. Ass 3. Off
4. Reference Target Off

0. Exit

For new entry

Selecting INPUT displays the screen shown below.

After making an entry, place the cursor over [ENT] key and then press it.

When the name entered with INPUT is changed to a target name, it is saved in DATA BASE.

* Up to eight characters can be entered as a name.

Name

0 1 2 3 4 5 6 7 8 9
A B C D E F G H I J
K L M N O P Q R S T
U V W X Y Z SP < >
DEL BS ENT

Exit

For calling a name from the names that have been entered

Selecting DATA BASE lists INPUT names that have already been entered. From the list, select a name you want to use.

* Names for 32 ships can be saved in DATA BASE.

Track Color Setting (Track Color)

Procedure

- 1 While the TT Target INFO screen is open, press [2] key.
- 2 Pressing numeric key(s), select a color number you want to set.

Colors selectable with Track Color are colors that have been set within the TT Track Setting. When colors are set, individual colors can be set for the 1th to 20th.

On this screen, selection of the 1st track is to select CYAN.

For target tracks, up to 20 ships can be displayed.

TT Individual Setting	
Target ID	1
1. Name	
2. Track Color	Off
3. Ass 1.	Off
2.	1-White
4. Ref 3.	2-Cyan
4.	3-Blue
5.	4-Green
6.	5-Yellow
7.	6-Pink
8.	7-Red
9.	Next Page
0.	
0.	Exit



5.2.6 Reference Target (Reference)

This equipment can calculate and display the speed of own ship by tracking a target whose position is fixed with respect to the ground and by setting this target as a reference target.

Attention

- The reference target function is to be used if the own ship's speed cannot be displayed normally due to trouble such as a speed sensor malfunction. Do not use the reference target function except in emergencies.
- If the speed or course of the own ship is changed or a new reference target is set, the displayed speed may take 3 minutes or more to reach the specified speed after the speed / course change or the setting.
Even after 3 minutes or more has passed, the speed may differ from the specified speed depending on the tracking condition.
- If a large radar echo such as a land target is set as a reference target, the vectors of the speed and other tracking targets will not be displayed correctly and may cause an accident.
- If a sailing ship is set as a reference target, the vectors of the speed and other tracking targets will not be displayed correctly and may cause an accident.
- If the **REF.** is selected for the speed sensor, the AIS function cannot be turned on.
- If the reference target is lost or the target tracking function is stopped, the speed sensor is placed in manual mode **MAN**.
- The loss of a reference target may have a major impact on the accuracy of the results for true speed and true course of the target and that own speed will be degraded.
- The reference targets are only used for the calculation of true speed.

Procedure

- 1 **Acquire a target whose position is fixed with respect to the ground.**
- 2 **Set the cursor mode to OFF.**
- 3 **Place the cursor over the tracked target and press the [CLR/INFO] key.**
- 4 **Target information menu is displayed.**
- 5 **Press the [4] key.**

ON : Set this target as a reference target.

OFF : Stop using this target as a reference target.

When ON is selected, the speed device activates the reference target function.

Then symbol “○_R” is displayed when the reference target is set.

Only one target can be set as a reference target.

When a new reference target is created, the previous reference target is deleted.

When OFF is selected, the speed device deactivates the reference target function and other functions become available.



5.2.7 TT Test Menu



CAUTION



Target Tracking Function Test is provided to test if the target tracking function is operating normally. Thus, do not use the function except when you test the target tracking function.

In particular, if this mode is used during navigation, pseudo targets appear on the radar display, which may be confused with the actual targets. Do not use this mode during navigation. Otherwise, this may cause accidents.

5

The following simulation to be used for TT can be referred to and modified:

[I]	Test Video:	Test video for use in checking the operation of the target detection circuit.
[II]	TT Simulator:	Pseudo targets are generated on the radar display to check whether the TT functions are operating normally.
[III]	Status:	Displays the TT status.
[IV]	Gate Display:	Gate size to acquire and track targets.

[I] Test Video

Attention

- **TEST VIDEO may not appear for targets that are not acquired nor tracked, or if the [GAIN] and [SEA] controls are adjusted properly**

Test Video is used to check whether the video signals under target acquisition and tracking are inputted to and processed in the target processing circuit normally. However, it is sufficient to check that VDH in TEST VIDEO is displayed. The start of the Test Video mode is available only in the Standby mode.

Procedure

1 Press [STBY] key.

The equipment will enter the standby state.

2 Press [TT MENU] key.

Press [6] key.

The TT Test Menu will appear.

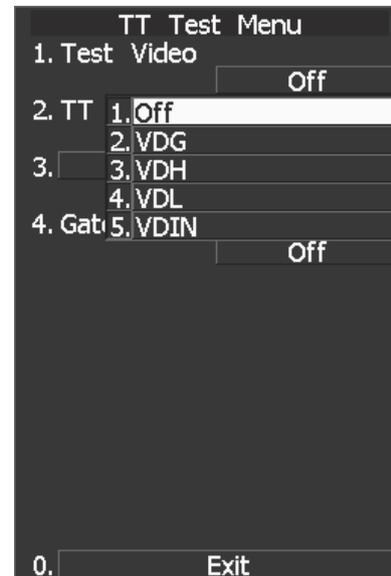
3 Press [1] key.

The Test Video setting screen will appear.

4 Press a numeric key to select a video signal you want to set.

The selected test video will be set.
The test video is displayed in the background of the radar display.

In general, VDH is sufficient for target display checks in test video mode.



If any target displayed clearly in the radar display is not displayed in the Test Video mode, the target detection circuit of the TT system may have a trouble.



[II] Target Tracking Simulator

Pseudo targets can be generated in certain known positions to check whether the TT processing circuits are operating normally. Since the pseudo targets move depending on known parameters, the values for these pseudo targets can be compared with the known value if the pseudo targets are acquired and tracked, and displayed. Thus, it can be checked if the TT system is operating normally.

Procedure

1 Press the [STBY] key.

The equipment will enter the standby state.

2 Press [TT MENU] key.

Press [6] key.

The TT Test Menu will appear.

3 Press [2] key.

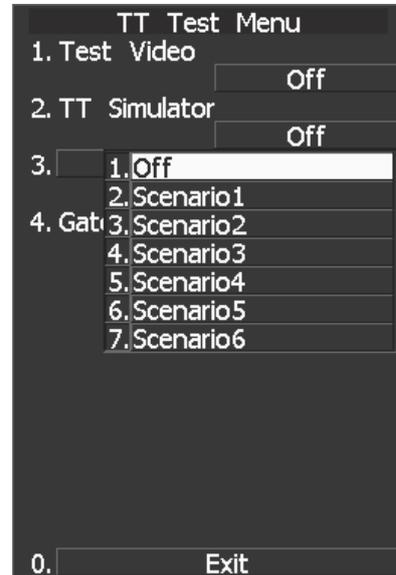
Choices for the TT simulator (TT Simulator) are displayed.

4 Select the simulator to be set, pressing the numeric key.

The selected simulator will be set.

5 Press the [TX/PRF] key.

The simulator will be activated and generate pseudo targets. The characters "X" at the bottom of the radar display blinks indicating that the simulation mode is active.



5

TT simulator/scenario

SCENARIO	TARGET START POINT		TARGET END POINT		TARGET SPEED
	DISTANCE	BEARING	DISTANCE	BEARING	
1	3.2NM	10°	1NM	90°	20kts
2	6NM	0°	0NM	0°	10kts
3	6NM	every 18°	1NM	every 18°	10kts
4	6NM	45°	1NM	45°	105kts
5	6NM	45°	6NM	150°	20kts
6	6NM	45°	6NM	150°	20kts

Note: Set the ship's heading bearing to 0° and the own ship speed to 0 kn while the simulator is operating. When the range between own ship and the pseudo target is 0, the target will disappear.

Exit**1 Press the [STBY] key.**

The equipment will enter the standby state.

2 Press [2] key while the TT Test Menu is open.

Choices for the TT simulator (TT Simulator) are displayed.

3 Press [1] key to select OFF.

The TT Simulator is turned off.



[III] Status

The current TT status will appear.

Procedure

1 Press [TT MENU] key.

The TT Menu will appear

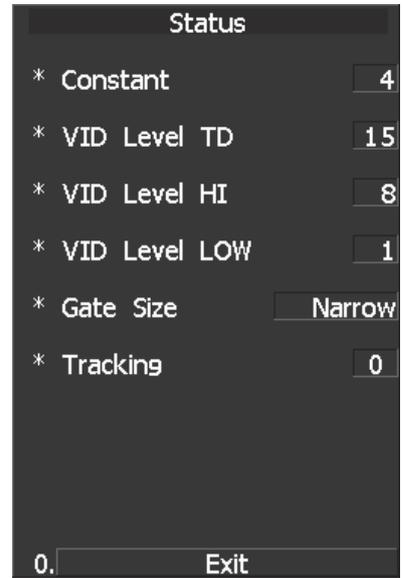
Press [6] key.

The TT Test Menu will appear.

2 Press [3] key.

The Status screen will appear..

- *Constant: Vector response
- *Video Level TD: Threshold value used for tracking
- *Video Level HI: VD threshold value used for automatic acquisition/activate zone
- *Video Level Low: Unused
- *Gate Size: Size of gate used for tracking
- *Tracking: Number of targets currently acquired



[IV] Gate Display

The gate displays an area monitoring a target using the TT function. This radar equipment allows the gate size to change automatically according to target distance and size. User can check the gate size using the following function.

Procedure

- 1 Press [TT MENU] key.
Press [6] key.

The TT Test Menu will appear.

- 2 Press [4] key.

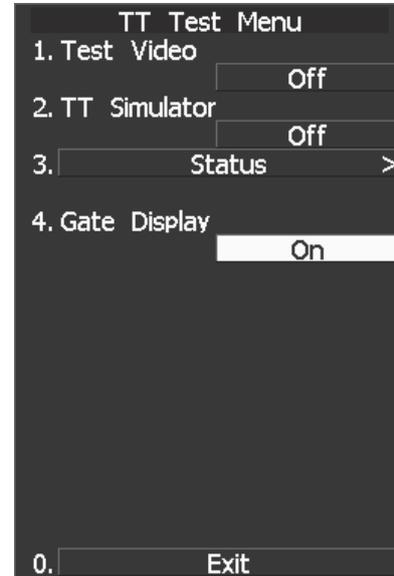
The gate display mode is switched.

ON: Gate is displayed

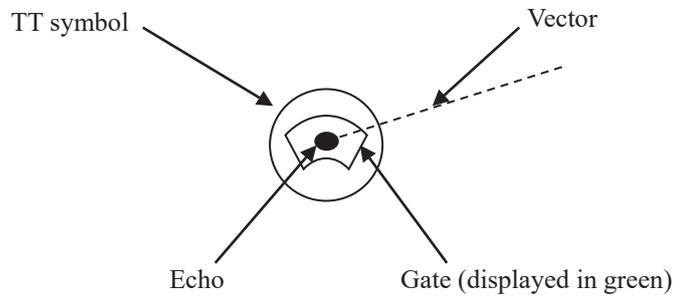
OFF: Gate is not displayed

- 3 The gate displays data of a target you want to check using the cursor and [TGT DATA] key. (See Section 5.3.6 “Displaying Numeric Data of AIS Targets (TGT DATA).”)

The data is displayed, and the gate is displayed around the TT symbol in green.



Note: The TT function can display the gate of two targets simultaneously.





5.3 AIS OPERATION

5.3.1 Restrictions

Attention

There are the following limitations on use of the AIS function, system, and operation:

- [I] This system can display up to a total of 130 targets. Of which, up to 30 activated targets can be displayed. There are 3 types of filters for controlling sleeping target display.
(Refer to Section 5.3.8 “Setting AIS Filter (AIS Filter Setting)”.)
- [II] The following restrictions are placed on use of the AIS function.
- The AIS function is unavailable in the following cases:
 - **MAN** is selected for the speed sensor.
The current offset (Set/Drift Setting) is set while **LOG** or **2AXW** is selected for the speed sensor.
The GPS geodetic system is used except WGS-84.
 - **LOG** or **2AXW** cannot be selected for the speed sensor in the following case:
The AIS function is turned on and the current offset (Set/Drift Setting) is selected.
 - **MAN** cannot be selected for the speed sensor in the following case:
The AIS function is On.
 - Current offset (Set/Drift Setting) cannot be turned On in the following case:
LOG or **2AXW** is selected for the speed sensor while

* The AIS function is optional for non-MED ships.
Use of this function requires AIS I/F (option).

5.3.2 Initial Setting

This section explains the initial setting for using the AIS function.

Setting the GPS antenna location

Set the GPS antenna location. Set offset ranges in longitudinal direction and latitudinal direction from the own ship's reference position.

For the setting procedure, refer to Section 7.1.6 “Setting of CCRP/Antenna/GPS Antenna Position (CCRP Setting).”

Attention

- **If offset ranges are not set correctly, AIS symbols and radar echoes may be displayed shifted.**
- **When offset ranges are set, latitude and longitude data received from the GPS is offset, and the offset data is displayed as the latitude and longitude of own ship's position.**

Setting collision decision criteria (CPA Limit/TCPA Limit)

The collision decision criteria for the TT function are applied to the AIS function.

For the setting procedure, refer to Section 5.1.5 “Setting Collision Decision Criteria (CPA/TCPA Limit).”

Note that the same collision decision criteria must apply to TT.

Attention

- **Set the optimum values of collision decision conditions, depending upon vessel type, water area, weather, and oceanographic conditions.**

**Procedure**

1 Press [TT MENU] key.

2 Press [3] key.

The Target Setting Menu will appear.

3 Press [5] key.

The ten-key screen will appear.

4 Using numeric keys, enter the CPA value you want to set, and then press [ENT] key.

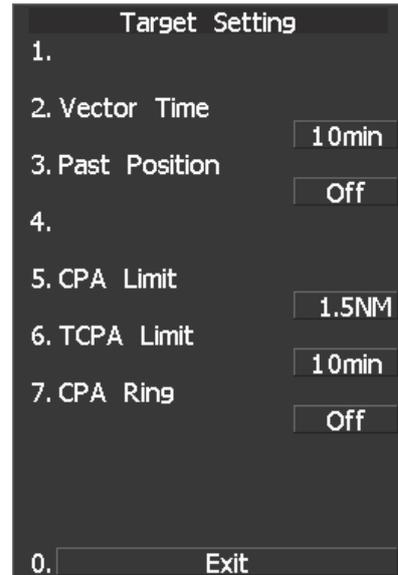
The entered CPA Limit value is determined.

5 Press [6] key.

The ten-key screen will appear.

6 Using numeric keys, enter the TCPA value you want to set, and then press [ENT] key.

The entered TCPA Limit value is determined.



5.3.3 Setting AIS Display Function (AIS Function)

Switch the AIS symbol display function to ON/OFF.

Attention

- When the AIS display function is set to OFF, no AIS symbols are displayed.
- The AIS display function itself is turned OFF.
- Once the AIS display function is set to OFF, it is not automatically switched to ON even if a dangerous target exists.

Procedure

- 1 Press [TT MENU] key.

Press [2] key.

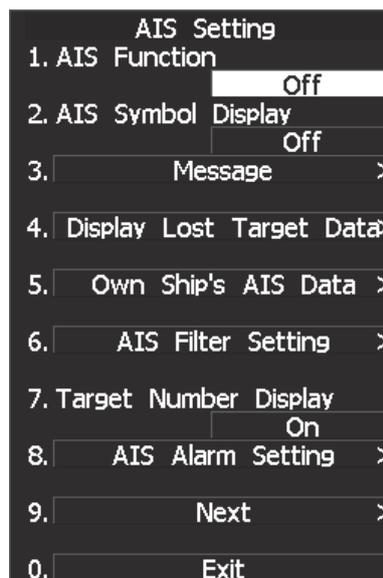
The AIS Setting menu will appear.

- 2 Press [1] key.

The AIS Function is switched between ON and OFF.

ON: Enables the AIS display function.

OFF: Disables the AIS display function.



* Software button ⑧ located at the other ship's information area in Section 2.3.6 is also available to switch the display functions.

* Note that turning OFF this function switches all AIS display functions to OFF.



5.3.4 Activating AIS Targets (Activate AIS)

Activate an AIS target, and display the target's vector and make a collision decision.

Manual activation

Activate an AIS target*¹ in manual mode to display the vector and HL.

Procedure

- 1 Press the **CURSOR** button at the upper right of the radar display several times until **ACT AIS** appears.

The cursor mode is set to the AIS activation mode.

- 2 Move the cross cursor mark onto the inactive AIS target that is to be activated*¹, and press [ENT] key.

The selected AIS target will be activated*¹.

5

Automatic activation

Activate an AIS target in automatic mode to display the vector and heading line.

When the automatic activation function is used, AIS targets are automatically activated when they go into the automatic activation zone. The automatic activation zone is identical to the automatic acquisition zone (AZ) used for target tracking. For the zone setting, refer to Section 3.5.20 "Auto Acquisition" and Section 5.2.1 "Acquiring Target [ACQ]."

Reference If an AIS target is activated but the vector is not displayed, refer to "Setting AIS Symbol Display Function (AIS Symbol Display)" in Section 5.1.2 "Definitions of Symbols."

*¹ For activation of targets, refer to "Types and Definitions of AIS Target Symbols" in Section 5.1.2 "Definitions of Symbols."

5.3.5 Deactivating AIS Targets (Deactivate AIS)

Deactivate an AIS target^{*2} and clear the display of the vector and HL.

Attention

- **The operation above is effective only for active targets.**

Procedure

- 1 Press the **CURSOR** button at the upper right of the radar display several times until **CANCEL** appears.

The cursor mode is set to the deactivation mode.

- 2 Move the cross cursor mark onto the active AIS target that is to be deactivated^{*2}, and press [ENT] key.

The selected AIS target will be deactivated^{*2}.

Alternative

- 1 Press the **CURSOR** button at the upper right of the radar display several times until **ACT AIS** appears.

The cursor mode is set to the AIS activation mode.

- 2 Move the cross cursor mark onto the inactive AIS target that is to be activated^{*1}, and press [CLR/INFO] key.

The selected AIS target will be deactivated^{*2}.

^{*2} For deactivation of targets, refer to “Types and Definitions of AIS Target Symbols” in Section 5.1.2 “Definitions of Symbols.”



5.3.6 Displaying Numeric Data of AIS Targets (TGT DATA)

Numerical data for a specified AIS target is displayed.

Types of numeric data displayed

Display items

- Navigation information

BRG (true bearing)	0.01° unit
RANGE	0.01nm unit
COG (course over ground)	0.1° unit
SOG (speed over ground)	0.1knot unit
CPA (closest point of approach)	0.1nm unit
TCPA (time to CPA)	0.1min unit
HDG (heading bearing)	1° unit
ROT (course change speed)	0.01°/min

- Destination and location information

Destination	
Estimated time of arrival	
L/L (latitude/longitude)	0.0001' unit
Position fixing device	
RAIM	
Position fixing accuracy	

- Ship information

NAME (ship name)	Up to 20 characters
CALL SIGN	Up to 7 characters
MMSI	Up to 9 characters
IMO number	
Navigation status	

- AtoN information

AtoN class	
AtoN type	

If missing is displayed in place of the numeric information of ROT, the radar is receiving the AIS data which cannot be displayed. In this case, you can only trust the turning direction which is indicated by the turn indicator. The turn indicator is displayed on the AIS symbol as the line perpendicular to the heading direction. (Refer to Section 5.1.2 "Types and Definitions of AIS Target Symbols")

If the numeric information of SOG or STW is 102.2kn, the target ship's speed is 102.2kn or over. Then the system cannot calculate CPA and TCPA. Therefore, missing is indicated in the CPA and TCPA information.

Displaying numeric data

Procedure

- 1 Press the **CURSOR** button at the upper right of the radar display several times until **TGT DATA** appears.

The cursor mode is set to the numeric data display mode.

- 2 Move the cross cursor mark onto the active AIS target for which numeric data is to be displayed, and press [ENT] key.

The values of the selected AIS target will appear on the right side of the radar display. The mark  is displayed around the symbol.

Reference: If the values are displayed but the mark  is not on the radar display, the target is outside the radar display.

Clearing numeric data

Procedure

- 1 Press the **Cursor** button at the upper right of the radar display several times until **TGT Data** appears.

The cursor mode is set to the numeric data display mode.

- 2 Move the cross cursor mark onto the active AIS target for which numeric data is to be cleared, and press [CLR] key.

The values of the selected AIS target will be cleared from the right side of the radar display, and the mark  displayed around the symbol will also disappear.



AIS information panel display setting

A set of AIS information to be preferentially displayed (before other sets of information) on the AIS information panel can be specified.

Information type can be selected from the choices of: navigation information, ship information, and destination and location information.

Procedure

1 Press the [TT menu] key.

2 Press the following buttons.

2. AIS setting
9. Next menu list
2. AIS numerical data display setting

Select AIS information panel display setting.
AIS numerical data display setting menu is displayed.

3 Press a number key for the desired setting.

Navigation information :

COG/SOG, CPA/TCPA, azimuth, distance, and turning ratio

Ship information :

ship name, call sign, and MMSI

Destination and location information :

destination, arrival time, and location

AIS information for the selected condition will be displayed.

5

Received AIS message display

Messages received from AIS can be displayed.

Messages can be displayed while the received AIS message display screen is displayed.

Procedure

1 Press the [TT menu] key.

2 Press the following buttons.

2. AIS setting
3. Received AIS message display

1. Messages for a specific address:

Messages sent to own ship are displayed.

2. Broadcasted message:

Messages sent to all vessels are displayed.



Lost target data display

Information of the last lost AIS target can be displayed.
Data can be displayed for the target that was lost most recently.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 2. AIS setting
 4. Lost target data display

Information of the last lost AIS target is displayed.

Display Lost Target Data	
Name	SHIPNAME-377470002
Call Sign	JRC0003
MMSI	377470002
IMO Number	145687923
NAV Status	Under Way Using Engine
BRG	24.37°
Range	2.90NM
COG	24.0°
SOG	10.0kn
CPA	0.0NM
TCPA	-17.3min
HDG	21°
ROT	6.4°/min
9.	Next >
0.	Exit

Display Lost Target Data	
DEST	YOKOHAMA
ETA	Missing
POSN	35°35.9033'N 139°57.2274'E
EPFS	Combined GPS/GLONASS
RAIM	Use
POSN Accuracy	High(< 10 m)
ATON Real/Virtual	Missing
ATON Type	Missing
0.	Exit



AIS own ship information display

AIS information for own ship can be displayed.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 2. AIS setting
 5. AIS own ship information display

AIS information for own ship is displayed.

Own Ship's AIS Data	
Name	SHIPNAME-377470000
Call Sign	JRC0001
MMSI	377470000
IMO Number	123456789
NAV Status	Under Way Sailing
COG	90.0°
SOG	10.0kn
HDG	115°
ROT	4.5°/min
9.	Next >
0.	Exit

Own Ship's AIS Data	
DEST	DESTNAMESETAREADESUY
ETA	Missing
POSN	35°33.7660'N 139°55.7104'W
EPFS	Chayka
RAIM	Use
POSN Accuracy	High(< 10 m)
0.	Exit

5

5.3.7 Displaying Target ID No. (Target Number Display)

A target ID number is a value displayed beside the AIS symbol.
ID numbers are assigned to AIS symbols in displayed order. ID numbers 1 to 130 are automatically assigned.
Each target is identified by the assigned ID number until it is lost.

Procedure

1 Press [TT MENU] key.

2 Press [2] key.

The TT Setting menu will appear.

3 Press [7] key.

The Target Number Display is switched ON or OFF.

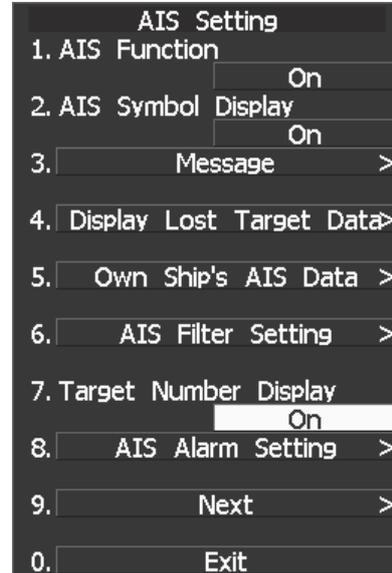
ON: Displays target ID numbers.

OFF: Hides target ID numbers.

Target TRACK:

Displays target ID number with target track.

If there are many AIS targets and their symbol display is confusing, set Target Number Display to OFF to view the radar display easily.



Note: An ID number is always displayed for only targets with which numeric data is displayed.



5.3.8 Setting AIS Filter (AIS Filter Setting)

About an AIS filter

Once the AIS filter is set, only the AIS targets that are inside the filter area are displayed (setting can be made such that sleeping targets outside the AIS filter will not be shown).

The filter is initially set in a circle having a radius of 20 [nm] from the own ship's position. If 131 or more targets exist in the filter range, they are displayed according to the priority explained in "Types and Definitions of AIS Target Symbols" of Section 5.1.2 "Definitions of Symbols."

Type of AIS filters (Filter Type)

There are the following three types of AIS filters:

- 1) RANGEA filter is set in a circle with a set range as the radius.
- 2) SECTOR.....A filter is set in a sector formed by two bearings with the bow as reference.
- 3) ZONEA filter is set in a zone formed by two bearings and two ranges with the bow as reference.

Procedure

- 1 **Press [TT MENU] key.**

Press [2] key.

Press [6] key.

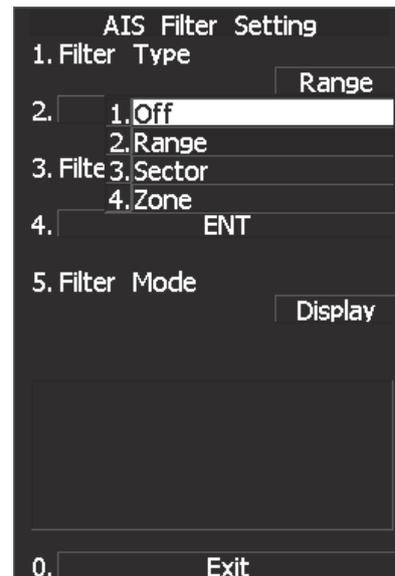
The TT Filter Setting menu will appear.

- 2 **Press [1] key.**

The Filter type selection screen will appear.

- 3 **Select the AIS filter type to be set, pressing the numeric key.**

The selected AIS filter type will be determined.



Making an AIS filter (Make AIS Filter)

Procedure

- 1 Press [2] key while the AIS Filter Setting menu is open.

The Make AIS Filter screen will appear.

[I] Setting a RANGE filter

- 2 Turn the [VRM] key control to set a filter range, and press [ENT] key.

The range of a RANGE filter will be set.
AIS targets in the set circle are displayed by priority.

[II] Setting a SECTOR filter

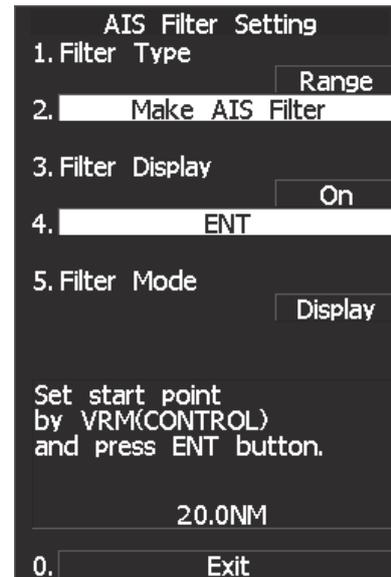
- 2 Turn the [EBL] key control to set the bearing of the port side, and press [ENT] key.
- 3 Turn the [EBL] key control to set the bearing of the starboard, and press [ENT] key.

A SECTOR filter will be set.
AIS targets in the area formed by the two set bearings are displayed by priority.

[III] Setting a ZONE filter

- 2 Turn the [EBL] key and [VRM] key controls to set the bearing and range of the port side, and press [ENT] key.
- 3 Turn the [EBL] key and [VRM] key controls to set the bearing and range of the starboard, and press [ENT] key.

A ZONE filter will be set.
AIS targets in the area formed by the two set bearings and ranges are displayed by priority.





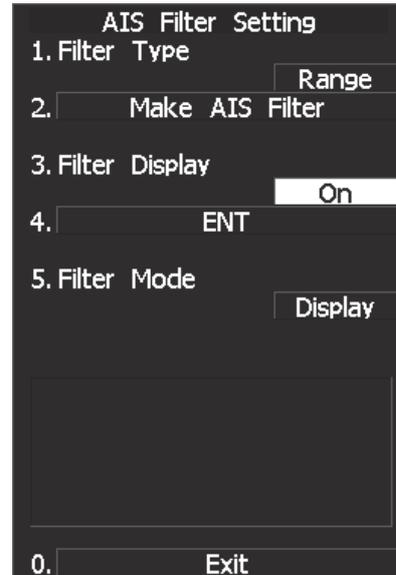
Setting the AIS filter display function to ON/OFF (Filter Display)

Procedure

- 1 Press [3] key while the AIS Filter Setting menu is open.

The setting of AIS Filter display will be switched ON or OFF.

ON: Displays the AIS filter.
OFF: Hides the AIS filter.



5

Display of Targets outside AIS Filter (Filter Mode)

Procedure

- 1 Press [TT MENU] key.

Press [2] key.

Press [6] key.

- 2 Press the [5] key.

The Filter Mode is switched.

Display :Displays only AIS targets in the AIS filter.

Priority :Displays AIS targets in the AIS filter by priority, and also displays targets outside the AIS filter.

Note: Activated AIS targets can be displayed even when they are outside the AIS filter.

Point Filter

AIS targets which are not displayed because they are outside the AIS filter or at low priority levels can be activated by giving a higher priority to them.

Procedure

- 1 Press a few times the **CURSOR** button at the top right corner of the screen to call up **ACT AIS**.**

The cursor mode is set to AIS activation mode.

- 2 Place the cursor over the location where you wish to set a point filter, and press the [ENT] key.**

A point filter will be set at the cursor position.

If an AIS target is in the point filter, it will be activated.

When an AIS target is activated or an AIS target is not found within ten seconds, the point filter will be cleared.



5.3.9 Conditions for Deciding AIS Target to be Lost

About a lost target

When the data of an AIS target cannot be received for a specified time, the target is decided to be lost and the target data is deleted. As shown in the table below, the time until target data is deleted varies depending on the class of receive data and the target status.

Deciding AIS Target to be Lost

Target status	Time until data deletion	
	SOLAS ship (Class A)	SOLAS ship (Class B)
Vessel below 3 knots and it is now at anchor or on the berth (Class B: below 2 knots)	18 min	18 min
Vessel of 3 knots or more and it is now at anchor or on the berth	60 sec	18 min
Vessel of 0 to 14 knots (Class B: 2 to 14 knots)	60 sec	180 sec
Vessel of 0 to 14 knots and it is now changing the course	60 sec	180 sec
Vessel of 14 to 23 knots	36 sec	180 sec
Vessel of 14 to 23 knots and it is now changing the course	36 sec	180 sec
Vessel of 23 knots or more	30 sec	180 sec
Vessel of 23 knots or more and it is now changing the course	30 sec	180 sec
SAR (Search and Rescue)	60 sec	60 sec
ATON (Aid to Navigation)	18 min	18 min
Base station	60 sec	60 sec

Reference:

- If Active targets (including dangerous ships) and numerically displayed targets is lost, a lost target alarm is issued, and the symbol changes to a lost target symbol. The system continues to display the symbol where it received the last data. If the ALARM ACK switch is pressed, the symbol is cleared.

5.3.10 Setting AIS Alarm (AIS Alarm Setting)

Conditions for setting off a lost AIS target alarm (Lost) and a dangerous target alarm (CPA/TCPA) can be set.

Lost target alarm (Lost)

Procedure

- 1 Press the [TT menu] key.

Press [2] key.

Press [8] key.

- 2 Press the [2] key.

The Lost Alarm setting is switched.

Off : Lost target alarm will not be active.

Dangerous ship : Lost target alarm will sound only for the AIS targets for which a dangerous target alarm has already been activated.

Activated and dangerous ship :

Lost target alarm will sound only for the AIS targets for which an activated AIS target and dangerous target alarm has already been activated.

Note: Sleeping AIS targets will not set off a lost target alarm.

Dangerous target alarm setting (CPA/TCPA)

Procedure

- 1 Press the [TT menu] key.

Press [2] key.

Press [8] key.

- 2 Press the [1] key.

The Target Alarm (CPA/TCPA) setting is switched.

Activated : Dangerous target alarm will be activated only for activated AIS targets.

Activated & sleeping : Dangerous target alarm will be activated for all AIS targets that are displayed.

Off : Dangerous target alarm will not be activated.



5.4 TARGET ASSOCIATION ASSESSMENT (ASSOCIATION SETTING)

Caution



When a large value is set as an association condition, a tracked target near an AIS target is identified as the AIS target and may thus disappear from the display.

For example, when a pilot vessel equipped with the AIS function (a small target which is not a tracked target) goes near a cargo vessel which is a tracked target without the AIS function, the tracked target symbol for the cargo vessel may disappear.

5

5.4.1 Target Association Assessment

Whether or not the AIS target and the tracked targets are identical is assessed. If they are determined to be identical, an association symbol is displayed.

When this occurs, the AIS target symbol is activated automatically.

Attention

- Turn off the software button  **Association** located at the other ship's information area in Section 2.3.6 if you wish to cancel association assessment or to bring back symbols that are no longer displayed.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 1 Association assessment setting
 - 1 Association assessment

On : Use the association assessment function.

(Targets that are judged to be identical will be indicated as an association symbol.)

Off : Do not use the association assessment function.

(AIS target and tracked target are shown separately even though they are determined to be identical.)

5.4.2 Priority

An association symbol can be created based on either AIS target data or tracked target data.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 1 Association assessment setting
 - 2 Priority

AIS : Symbol is created and displayed based on AIS target data.

TT : Symbol is created and displayed based on tracked target data.

5.4.3 Azimuth

Set an azimuth difference between targets to be identified as one target.

Targets that are within the set azimuth range will be identified as one target.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 1 Association assessment setting
 - 3 Azimuth

Set an azimuth difference between a tracked target and an AIS target to be identified as one target. Set the azimuth range between 0.0 and 9.9 degrees.

A narrower azimuth range means a stricter condition.

The possibility of mistakenly identify resembling targets will be lower, but targets are less likely to be identified as one target.

A wider azimuth range means a looser condition.

Targets are likely to be identified as one target, but targets with similar parameters are likely to be mistakenly identified.

Adjust the setting in accordance with the intention.



5.4.4 Distance

Set a distance between targets to be identified as one target.
Targets that are within the set distance will be identified as one target.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 1 Association assessment setting
 - 4 Distance

Set a distance between a tracked target and an AIS target to be identified as one target.
Set the distance between 0 and 999 m.

A shorter distance means a stricter condition.
The possibility of mistakenly identify resembling targets will be lower, but targets are less likely to be identified as one target.

A longer distance means a looser condition.
Targets are likely to be identified as one target, but targets with similar parameters are likely to be mistakenly identified.

Adjust the setting in accordance with the intention.

5.4.5 Course

Set a course difference between targets to be identified as one target.
Targets that are within the set course angle will be identified as one target.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 1 Association assessment setting
 - 5 Course

Set a course difference between a tracked target and an AIS target to be identified as one target. Set the course angle between 0 and 99 degrees.

A narrower course angle means a stricter condition.
The possibility of mistakenly identify resembling targets will be lower, but targets are less likely to be identified as one target.

A wider course angle means a looser condition.
Targets are likely to be identified as one target, but targets with similar parameters are likely to be mistakenly identified.

Adjust the setting in accordance with the intention.

5.4.6 Speed

Set a speed difference between targets to be identified as one target.
Targets that are within the set speed range will be identified as one target.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 1 Association assessment setting
 - 6 Speed

Set a speed difference between a tracked target and an AIS target to be identified as one target. Set the speed range between 0 and 99 kn.

A smaller speed range means a stricter condition.
The possibility of mistakenly identify resembling targets will be lower, but targets are less likely to be identified as one target.

A larger speed range means a looser condition.
Targets are likely to be identified as one target, but targets with similar parameters are likely to be mistakenly identified.

Adjust the setting in accordance with the intention.



5.4.7 Hysteresis

Set a hysteresis level at which a tracked target and an AIS target are identified as one target by the association assessment function.

Set the condition for using an association symbol when a tracked target symbol and an AIS target symbol overlap each other.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 1 Association assessment setting
 - 7 Hysteresis

Set a level of hysteresis at which targets are identified as one target between 0% and 300%. The standard percentage is 100%.

In the case of 100%, The level of hysteresis is equal to n/m .

n: The time of judgment which targets are identified as one target

m: The time of judgment

Therefore 50% means that the level of hysteresis is equal to $n/(2*m)$.

200% means that the level of hysteresis is equal to $(2*n)/m$.

A larger value means a stricter condition.

The possibility of mistakenly identify resembling targets will be lower, but targets are less likely to be identified as one target.

A smaller value means a looser condition.

Targets are likely to be identified as one target, but targets with similar parameters are likely to be mistakenly identified.

Adjust the setting in accordance with the intention.

5

Caution



When a small value is set as a hysteresis condition, a tracked target near an AIS target is identified as the AIS target and may thus disappear from the display.

For example, when a pilot vessel equipped with the AIS function (a small target which is not a tracked target) goes near a cargo vessel which is a tracked target without the AIS function, the tracked target symbol for the cargo vessel may disappear.

5.4.8 Non-Hysteresis

Set a non-hysteresis level at which targets that were once identified as one target by the association assessment function are identified as separate targets.

Set the condition for separating an association symbol into a tracked target symbol and an AIS target symbol.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 1 Association assessment setting
 - 8 Non-Hysteresis

Set a level of non-hysteresis at which an associated target is separated into individual targets between 0% and 300%. The standard percentage is 100%.

In the case of 100%, The level of non-hysteresis is equal to n/m .

n: The time of judgment which an associated target is separated into individual targets

m: The time of judgment

Therefore 50% means that the level of hysteresis is equal to $n/(2*m)$.

200% means that the level of hysteresis is equal to $(2*n)/m$.

A larger value means a stricter condition.

It becomes harder to separate a tracked target symbol from an AIS target symbol.

Targets that are not separated to start with are less likely to be separated, and also, separated individual symbols are less likely to be displayed properly after separation.

A smaller value means a looser condition.

It becomes easier to separate a tracked target symbol from an AIS target symbol.

Targets that are not separated to start with are more likely to be separated, and also, separated individual symbols are more likely to be displayed soon after separation.

Adjust the setting in accordance with the intention.



Caution



When a small value is set as a hysteresis condition, a tracked target near an AIS target is identified as the AIS target and may thus disappear from the display.

For example, when a pilot vessel equipped with the AIS function (a small target which is not a tracked target) goes near a cargo vessel which is a tracked target without the AIS function, the tracked target symbol for the cargo vessel may disappear.



5.4.9 AIS Target to be Assessed

Specify an AIS target to be assessed for association.

Targets of association assessment can be either activated targets only or both activated and sleeping targets.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 1 Association assessment setting
 - 9 AIS target to be assessed

Select AIS targets to be assessed for association.

Activated : Only activated targets will be assessed for association.

Activated & sleeping : All activated and sleeping targets will be assessed for association.

5.5 ALARM DISPLAY

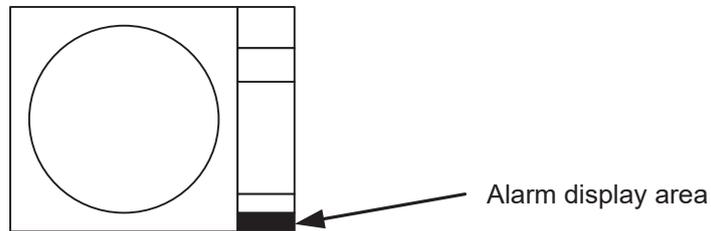
Alarm messages for Target Tracking (TT) and AIS functions:

Error message	Description
TT CPA/TCPA	A dangerous target is detected in target tracking.
AIS CPA/TCPA	A dangerous AIS target is detected.
TT(New Target)	A new target being tracked was acquired in the automatic acquisition area.
AIS(New Target)	A new AIS target was activated in the automatic acquisition area.
TT(Lost)	A lost target is detected in target tracking.
AIS(Lost)	A lost AIS target is detected.
REF TT(Lost)	A reference TT target has been lost. (Accuracy decreased)
TT(MAX 95% Capacity)	The number of TT targets acquired has reached 95% of the maximum acquisition count.
TT(MAX Target)	The number of TT targets acquired has exceeded the maximum acquisition count.
AIS(ACT 95% Capacity)	The number of targets activated has reached 95% of the maximum activation count.
AIS(ACT MAX)	The number of targets activated has exceeded the maximum activation count.
AIS (MAX Target 95%)	The number of AIS targets displayed has reached 95% of the maximum display count.
AIS (MAX Target)	The number of AIS targets displayed has exceeded the maximum display count.
TT processing unit (Communication data error) *	Communication error with the TT processing unit
AIS (No communication)	No communication with AIS. The AIS transponder is not connected correctly or the power is turned off.
AIS (Communication data error)	AIS communication error. The data of communication with the AIS unit contains an error.
AIS I/F (No communication)	No communication with AIS IF. The AIS unit is not connected or is not operating.
AIS I/F (No data communication)	AIS I/F communication error. The data of communication with the AIS unit contains an error.
AIS(Alarm ***)	Alarm information issued with the ALR sentence by the AIS *** is a 3-digit number which is Local Alarm No in the ALR sentence.
AIS Alarm 001	Tx malfunction
AIS Alarm 002	Antenna VSWR exceeds limit
AIS Alarm 003	Rx channel 1 malfunction
AIS Alarm 004	Rx channel 2 malfunction
AIS Alarm 005	Rx channel 70 malfunction



AIS Alarm 006	general failure
AIS Alarm 008	MKD connection lost
AIS Alarm 025	external EPFS lost
AIS Alarm 026	no sensor position in use
AIS Alarm 029	no valid SOG information
AIS Alarm 030	no valid COG information
AIS Alarm 032	Heading lost/invalid
AIS Alarm 035	no valid ROT information

An alarm is displayed in the alarm indication (software button ⑭ located at the operation/message area in Section 2.3.9).



CPA / TCPA Alarm



Caution

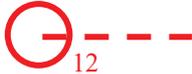


Since these alarms may include some errors depending on the target tracking conditions, the navigation officer himself should make the final decision for ship operations such as collision avoidance.

Making the final navigation decision based only on the alarm may cause accidents such as collisions.

In the system, targets are categorized into two types: tracked / activate AIS targets and dangerous targets. The grade of danger can easily be recognized on the display at a glance. So the officer can easily decide which target he should pay attention to. The types of target and alarm are shown below.

CPA / TCPA Alarm

Status	Symbol on display	Alarm characters	Alarm sound	Conditions
Dangerous target	  Red blinking	CPA / TCPA	Beep sound (pee-poh) Alarm acknowledgeable	<ul style="list-style-type: none"> • $CPA \leq CPA \text{ LIMIT}$, • $0 \leq TCPA \leq TCPA \text{ LIMIT}$ An alarm is issued when all the conditions are met. The AIS targets that issues alarm refer to Section 5.1.5 “Setting Collision Decision Criteria (CPA/TCPA Limit)”.

CPA Limit and TCPA Limit: The Setting Values



Alarm for New Target Acquired in Automatic Acquisition Zone (New Target)



Caution



In setting an automatic acquisition zone, it is necessary to adjust the gain, sea clutter suppression and rain / snow clutter suppression to ensure that target echoes are displayed in the optimum conditions. No automatic acquisition zone alarms will be issued for targets undetected by the radar, and this may cause accidents such as collisions.

5

The automatic acquisition function sets a zone in a range and issues an alarm when a new target (which is not yet acquired) goes into this zone.

For the setting of an automatic acquisition zone, refer to “Automatic Acquisition [AUTO]” in Section 5.2.1 “Acquiring Target [ACQ].”

Alarm for New Target Acquired in Automatic Acquisition Zone

Status	Symbol on display	Alarm characters	Alarm sound	Conditions
New target in automatic acquisition zone	 Red Blinking	New Target	Beep sound (pipi-pipi) Alarm acknowledgeable	The alarm is issued when a new target is acquired in the automatic acquisition zone.

Note: When an already acquired target goes into automatic acquisition zone, the alarm message is not displayed and the buzzer does not sound either.

Lost Target Alarm

Attention

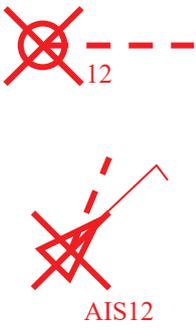
- **If the gain, sea clutter suppression, rain/snow clutter suppression are not adjusted adequately, the lost target alarm may be easily generated. So such adjustments should be mad carefully.**

When it is impossible to continue tracking any acquired and tracked target, or the data of AIS target cannot received for a specified time, the **LOST** alarm will be generated. The typical causes for alarm generation are shown below, but not limited to the following:

- The target echo is very weak.
- The target is shadowed by a shore or a large ship and its echo is not received.
- The target echo is blurred by sea clutter returns.

If a target under tracking goes into a range of 32 nm and can no longer be tracked, it is canceled without a lost target alarm being issued.

Lost Target Alarm

Status	Symbol on display	Alarm characters	Alarm sound	Conditions
Lost target	 <p>Red Blinking</p>	Lost	Beep sound (pee) Alarm acknowledgeable	The alarm will sound once when a lost target symbol is displayed.

The AIS symbol blinks for x only.

System Function Alarm (TT Data)

When an abnormal state of an input signal or Target Tracking unit may have a trouble, alarm is generated. When an alarm occurs against any Target Tracking function, **TT (Data)** will appear in the alarm indication (Software button ⑭ located at the operation/message area in Section 2.3.9), but no indication is made in the Tracked Target information display (panel display area in Section 2.3.8). This status means that there is any operational trouble in the Target Tracking unit. Please, contact the service depot or the manufactures.

System Function Alarm

Alarm characters	Alarm sound	Conditions
TT (DATA)	Beep sound (pipipi) Alarm acknowledgeable	An alarm sound is generated when a Target Tracking circuit error occurs.

Gyro Set Alarm

The GYRO I/F in this system receives signals from a gyro. Even if the power is turned off, the system will follow up the gyro. However, the system stops the follow-up operation when the power of the master gyro is turned off or when any trouble occurs to the line. When the power of the master gyro is recovered, the **Set Gyro** alarm will be generated.

If this alarm occurs, set the gyro.

Gyro Set Alarm

Alarm characters	Alarm sound	Conditions
Set Gyro	Beep sound (pipi-pipi)	The signals from the gyro are stopped, but the gyro is recovered.

AIS Alarm Display

The following provides a list of the AIS alarm.

Alarm No.	Definition
001	Tx malfunction
002	Antenna VSWR exceeds limit
003	Rx channel 1 malfunction
004	Rx channel 2 malfunction
005	Rx channel 70 malfunction
006	general failure
008	MKD connection lost
025	external EPFS lost
026	no sensor position in use
029	no valid SOG information
030	no valid COG information
032	Heading lost/invalid
035	no valid ROT information

5.6 TRACK DISPLAY

5.6.1 Display Past Tracks (Past Position)

With the past position function (Past Position), up to 6 past tracked and AIS target positions can be displayed (5 set time and distance intervals).

Select one of the time intervals at which past time positions should be displayed: 0.5 minutes, 1 minute, 2 minutes, and 4 minutes. Also, select one of the distance intervals at which past locations should be displayed: 0.1 NM, 0.2 NM, 0.5 NM, and 1 NM.

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.
 - 3 Target setting
 - 3 Past position
- 3 Press a number key for the desired setting.

0.5 minutes, 1 minute, 2 minutes, and 4 minutes :

Past positions are displayed at a specified time interval.

0.1 NM, 0.2 NM, 0.5 NM, and 1 NM :

Past locations are displayed at a specified distance interval.

The selected interval will be displayed on the Past position display interval switching button (Software button ⑥ located at the other ship's information area in Section 2.3.6). The track display mode is not active when the button shows "Off." Track modes are linked with vector modes to show a true or relative track. In relative vector mode, the relative past position of the target is displayed. In true vector mode, the true past position, which is calculated from the relative bearing/range and the own ship's course/speed, is displayed.

The past position of a target being tracked is stored from when the target is acquired.

The past position of an AIS target is stored from when the target is activated.

If the past position plotted time is short, the indicated past position duration may not have achieved the specified time or range.



5.6.2 Other Ship's Tracks (Target Track Setting)

Make track settings for acquired tracked and AIS targets.
This equipment can display tracks of up to 20 other vessels.
The target track function is available between latitudes of 85°N and 85°S.

* Tracks of other ships will not be recorded with the Target Track Function is deactivated.

[I] Track color setting (Target Track Color)

Procedure

- 1 Turn OFF the cursor mode.
- 2 Place the cursor over a tracked target or an AIS target, and press the [CLR/INFO] key.
- 3 Target information menu opens.
- 4 Press the [2] key.

Track color choices are listed (Track Color).

- 5 Press a number key for the desired color.

The track will be shown in the selected color.

5

[II] Turning on/off the Target Track Function

Procedure

- 1 Press the [TT menu] key.
- 2 Press the following buttons.

- 4 Target Track Setting
- 1 Target Track Color

On : Activate the Target Track Function.
Off : Deactivate the Target Track Function.

* Selecting "Off" deactivates the entire Target Track Function.
Tracks will not be recorded; therefore, they cannot be checked later on.

[III] Other ship's track color setting (Target Track Color)

The track color can be the same for all tracked targets, or different colors can be assigned to the first 20 targets.

* Tracks of other ships will not be recorded with the Target Track Function is deactivated.

Procedure

- 1 Press the [TT menu] key.**
- 2 Press the following buttons.**

- 4 Target Track Setting
- 2 Target Track Color

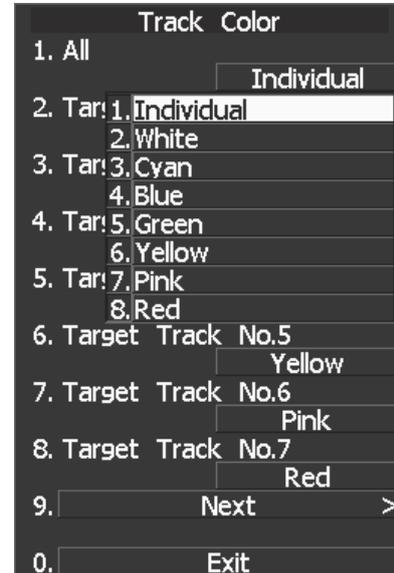
- 3 Press the [1] key.**

Choices for "All" are displayed.

- 4 Press a number key for the desired setting.**

Individual : Assign different colors to individual tracks.

Color name :The selected color will be assigned to all tracks. Select a track color.



When "INDIVIDUAL" is selected

- 5 Press a number key for the desired track number.**

Color choices for the selected track number are displayed.

- 6 Press a number key that corresponds to the desired track color.**

The selected color will be assigned to the selected track.

Selecting "Individual" allows assignment of different colors to the first 20 tracks, from Track No.1 to Track No.20. Select a color for each target. Press the target number to see the list of available colors. Then, select a color.

There are 8 colors: Off/White/Cyan/Blue/Green/Yellow/Pink/Red.

* Note that different colors can be assigned to individual tracks only when "Individual" is selected.



[IV] Other ship's track display setting (Target Track Display)

Other ship's track display can be turned on/off. Also, track display mode can be chosen between display/non-display of all tracks and individual tracks.

Procedure

1 Press the [TT menu] key.

2 Press the following buttons.

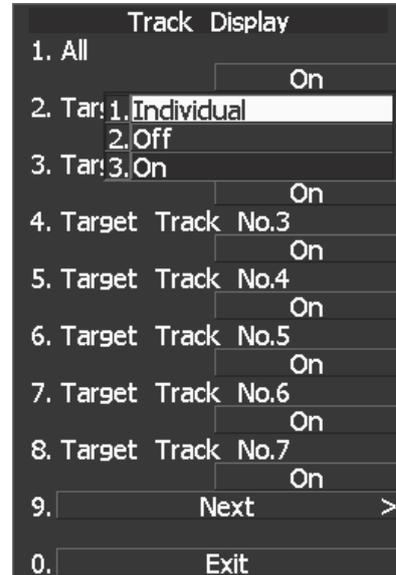
- 4 Target Track Setting
- 3 Target Track Display

3 Press the [1] key.

Choices for "All" are displayed.

4 Press a number key for the desired setting.

- Individual : Set track display mode for each track.
- Off : Hide all tracks for all ships.
- On : Show all tracks for all ships.



* Even though the track display mode is set to "Off," tracks of other ships are still recorded as long as the track recording interval is set.

When "INDIVIDUAL" is selected

5 Press a number key for the desired track number.

Display/Non-display of the selected track can be set.

- On : Show the track.
- Off : Do not show the track.

Selecting "Individual" allows the track display mode to be set for the first 20 tracks, from Track No.1 to Track No.20. For each target, decide whether or not the track should be displayed. The mode changes between On and Off every time the On/Off window is pressed.

* Note that the track display mode can be set for individual tracks only when "Individual" is selected.

[V] Other ship track recording interval setting (Track Memory Interval)

A time interval for recording tracks of other ships can be set.

* This function can be used only when the Target Track Setting function is enabled.

Procedure

1 Press the [TT menu] key.

2 Press the following buttons.

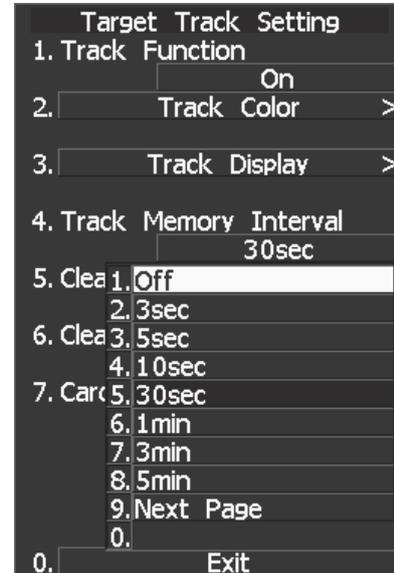
- 4 Target Track Setting
- 4 Track Memory Interval

Choices for "Target Memory Interval" are displayed.

3 Press a number key that corresponds to the desired track recording interval.

Select from the following:

Off,
3 sec, 5 sec, 10 sec, 30 sec,
1 min, 3 min, 5 min, 10 min, 30 min, 60 min,
1 NM, 3 NM, 5 NM, and 10 NM





[VI] Deletion of other ship's tracks (Clear Track)

Tracks of other ships can be deleted. They can be deleted by track color or by track number.

* When using the card-based track display function (Card T. TRK Display), tracks of other ships that are loaded from the card cannot be deleted.

Deletion of other ship's tracks by track color (Clear Track Color)

Procedure

1 Press the [TT menu] key.

2 Press the following buttons.

- 4 Target Track Setting
- 5 Clear Track Color

Choices for "Clear Track Color" are displayed.

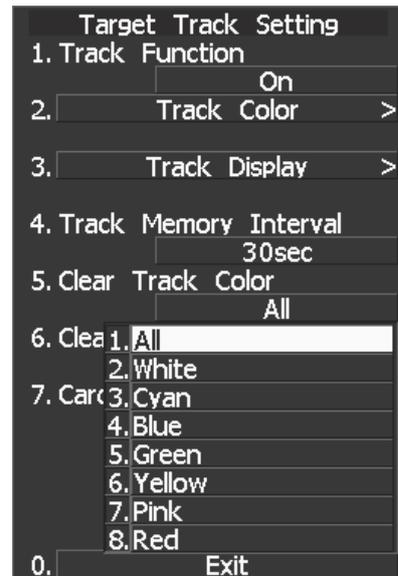
3 Press a number key that corresponds to the track color to be deleted.

The confirmation dialog window opens.

4 Press the [1] key.

Tracks of the selected color will all be deleted.

Select ALL to delete all tracks regardless of the color.



5

Deletion of other ship's tracks by track number (Clear Track Number)

Procedure

1 Press the [TT menu] key.

2 Press the following buttons.

- 4 Target Track Setting
- 6 Clear Track Number

Choices for "Clear Track Number" are displayed.

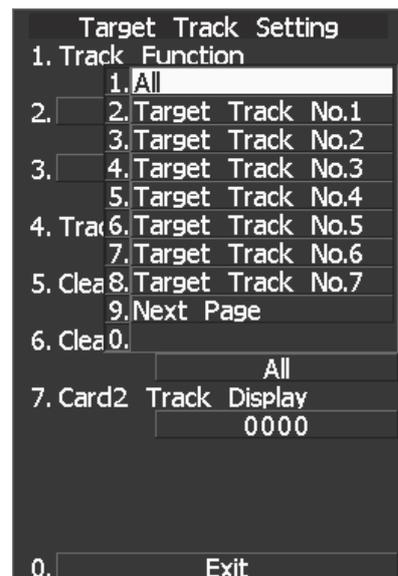
3 Press a number key that corresponds to the track number to be deleted.

The confirmation dialog window opens.

4 Press the [1] key.

Tracks of the selected number will all be deleted.

Select ALL to delete all tracks regardless of the number.



[VII] Loading target tracks from CARD2 (Card2 Track Display)

Target tracks saved in CARD2 can be loaded.

Procedure

- 1 Insert a Flash memory card into the card slot.**

Refer to the attached instruction manual for how to insert/remove the card.

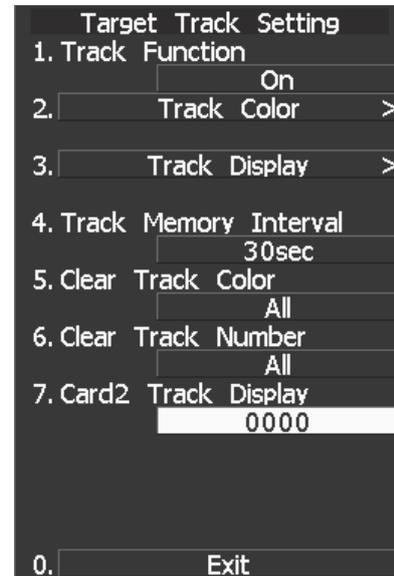
- 2 Press the [TT menu] key.**

- 3 Press the following buttons.**

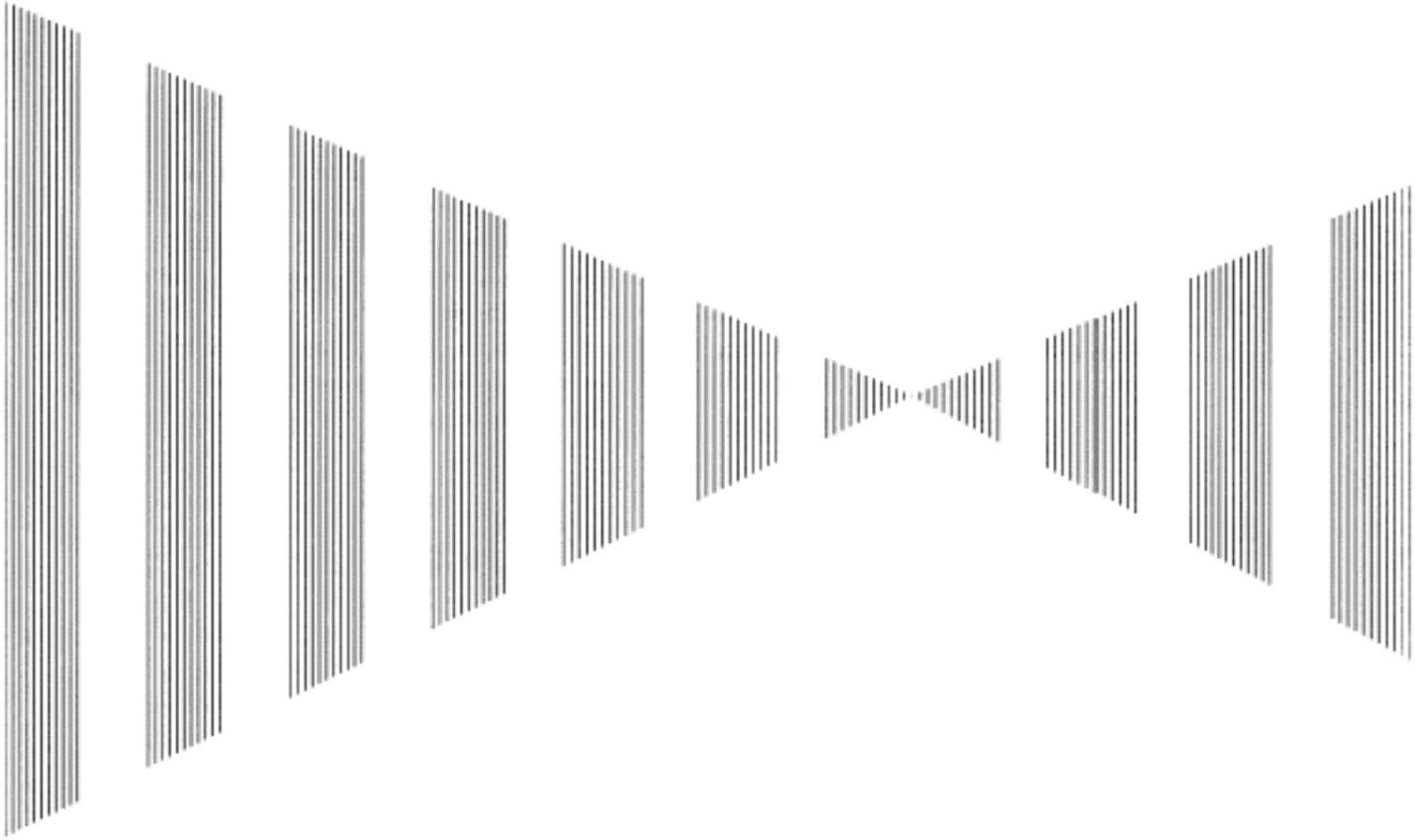
4 Target Track Setting
7 Card2 Track Display

- 4 Input the number of track and press the [ENT] key.**

Data of the selected track number is loaded and displayed on the radar screen.



SECTION 6 TRUE AND FALSE ECHOES ON DISPLAY



6.1	RADAR WAVE WITH THE HORIZON.....	6-2
6.2	STRENGTH OF REFLECTION FROM THE TARGET	6-4
6.3	SEA CLUTTER AND RAIN AND SNOW CLUTTER.....	6-6
6.4	FALSE ECHOES	6-10
6.5	DISPLAY OF RADAR TRANSPONDER (SART).....	6-13

The radar operator has a role of interpreting the radar displays to provide his best aid in maneuvering the ship. For this purpose, the operator has to observe the radar displays after fully understanding the advantages and disadvantages that the radar has. For better interpretation of radar display, it is important to gain more experiences by operating the radar equipment in fair weathers and comparing the target ships watched with the naked eyes and their echoes on the radar display.

The radar is mainly used to monitor the courses of own ship and other ships in open seas, to check buoys and other nautical marks when entering a port, to measure own ship's position in the coastal waters relative to the bearings and ranges of the shore or islands using a chart, and to monitor the position and movement of a heavy rain if it appears on the radar display.

Various types of radar display will be explained below.



6.1 RADAR WAVE WITH THE HORIZON

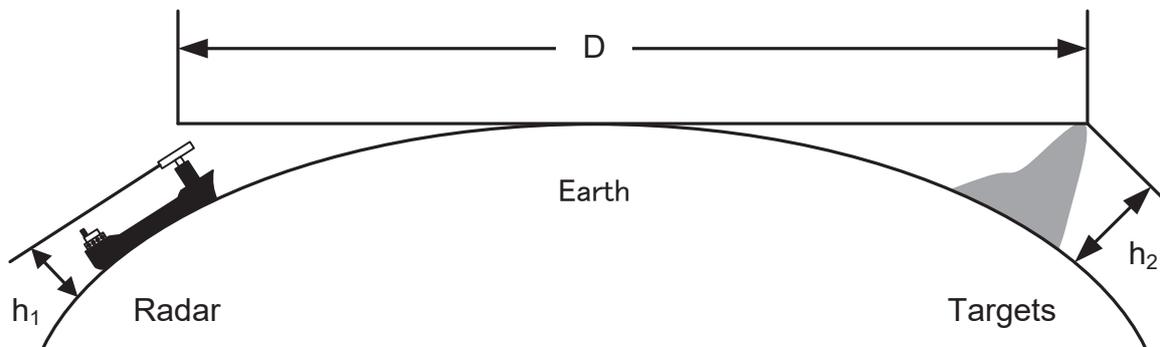
Radar beam radiation has the nature of propagating nearly along the curved surface of the earth. The propagation varies with the property of the air layer through which the radar beam propagates. In the normal propagation, the distance (D) of the radar wave to the horizon is approximately 10% longer than the distance to the optical horizon. The distance (D) is given by the following formula:

$$D = 2.23(\sqrt{h_1} + \sqrt{h_2}) \text{ (nm)}$$

h_1 : Height (m) of radar scanner above sea level

h_2 : Height (m) of a target above sea level

Figure 6.1 is a diagram for determining the maximum detection range of a target that is limited by the curve of the earth surface in the normal propagation.



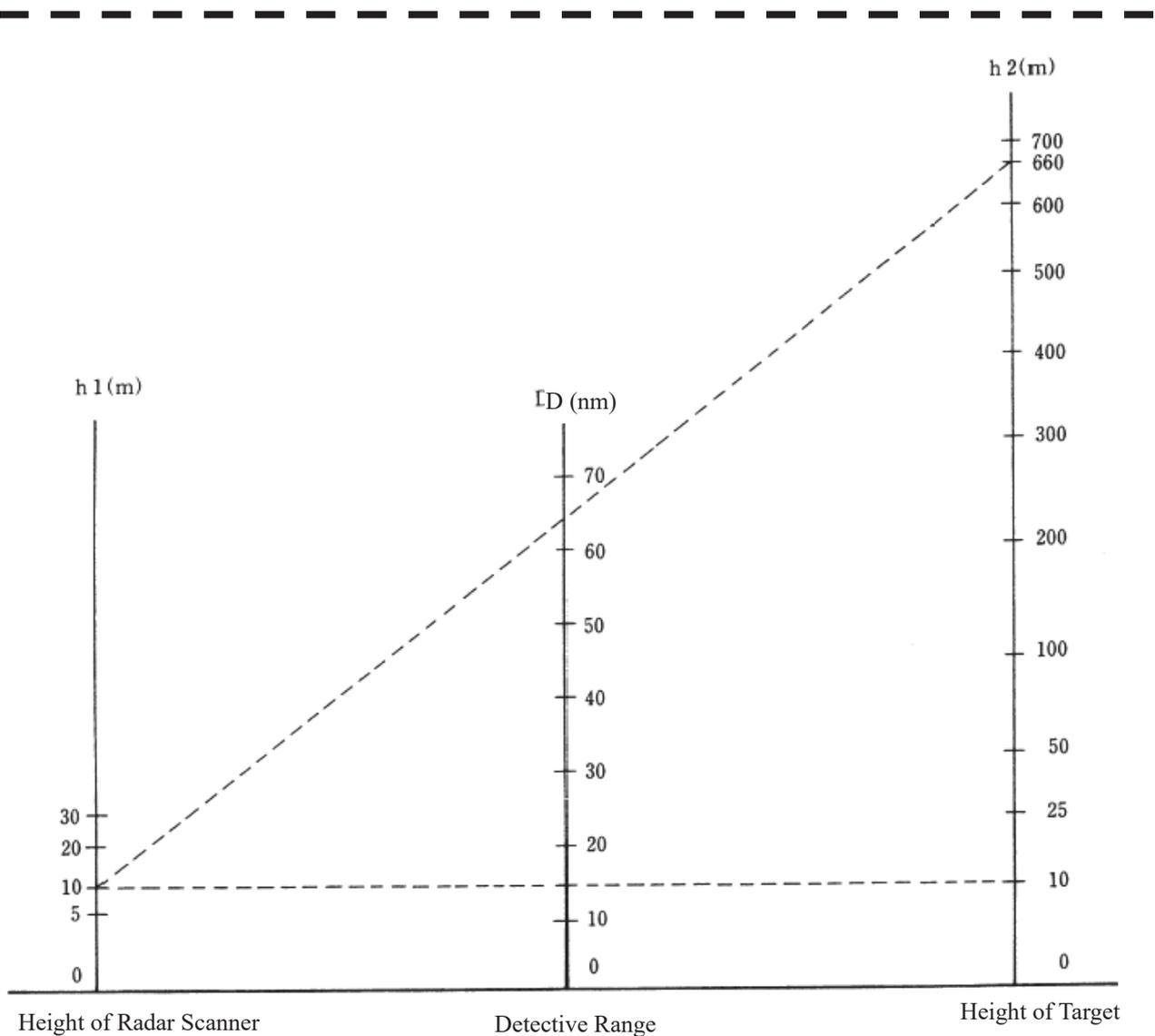


Figure 6.1

When the height of own ship's scanner is 10 m for instance,

- (a) A target that can be detected at the radar range of 64 nm on the radar display is required to have a height of 660 m or more.
- (b) If the height of a target is 10 m, the radar range has to be approx. 15 nm. However, the maximum radar range at which a target can be detected on the radar display depends upon the size of the target and the weather conditions, that is, the radar range may increase or decrease depending upon those conditions.

6.2 STRENGTH OF REFLECTION FROM THE TARGET

The signal intensity reflected from a target depends not only on the height and size of the target but also on its material and shape. The echo intensity from a higher and larger target is not always higher in general. In particular, the echo from a coast line is affected by the geographic conditions of the coast. If the coast has a very gentle slope, the echo from a mountain of the inland appears on the radar display. Therefore, the distance to the coast line should be measured carefully.

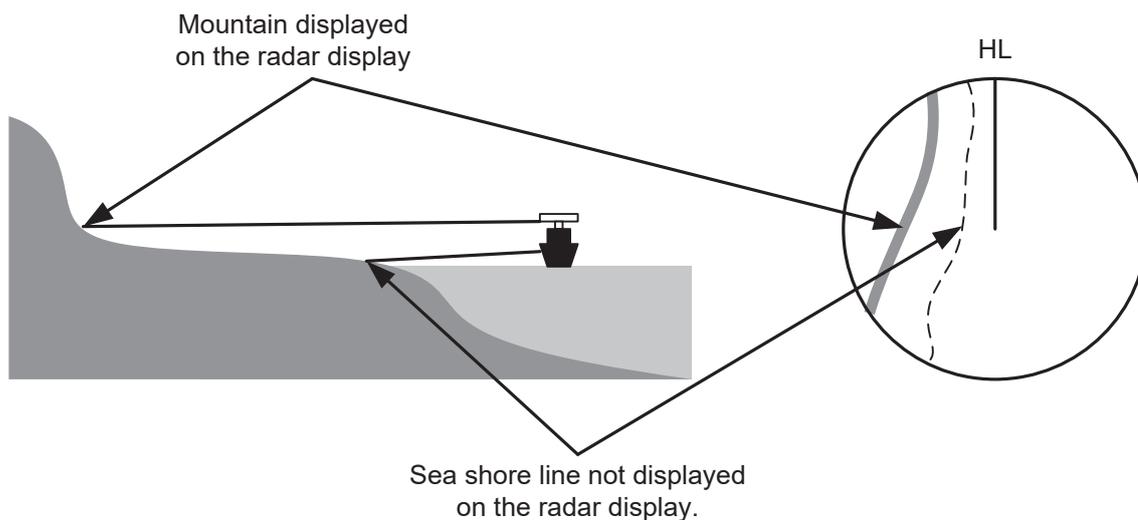


Figure 6.2

Table 6.1 shows the graph indicating the relation between the target detection distance and the radar reflection cross-sectional area (RCS) with regard to the type and the height of the target in a situation in which the weather is good, the sea state is calm and the radio wave propagation is normal. As revealed by this table, even on the same sea shore line, detection distance greatly differs depending on the height of the target from the surface of the sea. Furthermore, because the target detection distance is greatly influenced by the shape and material of the target and environmental conditions, such as the sea state, weather, and radio wave propagation, caution should be taken when detecting distance of target.

Table 6.1 Relation between type and height of target and detection distance and RCS

Type of target	Height from sea surface (m)	Detection distance (NM)		RCS (m ²)	
		X band	S band	X band	S band
Sea shore line	60	20	20	50,000	50,000
Sea shore line	6	8	8	5000	5000
Sea shore line	3	6	6	2500	2500
SOLAS target ship (>5000GT)	10	11	11	50,000	30,000
SOLAS target ship (>500GT)	5	8	8	1800	1000
Small boat with IMO standard compatible radar reflector	4	5.0	3.7	7.5	0.5
Marine buoy with corner reflector	3.5	4.9	3.6	10	1
Standard marine buoy	3.5	4.6	3.0	5	0.5
10-meter small boat without radar reflector	2	3.4	3.0	2.5	1.4
Waterway location beacon	1	2.0	1.0	1	0.1

Caution: Detection distance shown in the above table may greatly decrease depending on the shape of the target, sea state, weather and radio wave propagation conditions.



6.3 SEA CLUTTER AND RAIN AND SNOW CLUTTER

In addition to the echo required for observing ships and land radar video image also includes unnecessary echo, such as reflection from waves on the sea surface and reflection from rain and snow. Reflection from the sea surface is called "sea clutter," and reflection from rain and snow is called "rain and snow clutter," and those spurious waves must be eliminated by the clutter rejection function.

[I] Sea clutter

Sea clutter appears as an image radiating outwardly from the center of the radar display and changing depending on the size and the shape of waves. Generally, as waves become larger, image level of the sea clutter is intensified and the clutter far away is also displayed. When waves are large and the sea clutter level is high, it is difficult to distinguish sea clutter from a small boat whose reflection intensity is weak. Accordingly, it is necessary to properly adjust the sea clutter rejection function. Table 6.2 shows the relation between the sea state (SS) showing the size of waves generated by wind and the radar's detection probability.

Table 6.2 Sea state and probability of target detection

RCS	SS1 to 2	SS2 to 3	SS3 to 4	SS4 to 5
0.1m ²	V	V-M	M-NV	
0.5 m ²	V	V	V-M	M-NV
1 m ²	V	V	V	V-M

S band radar (probability to detect a target at a distance of 0.4 NM)

RCS	SS1 to 2	SS2 to 3	SS3 to 4	SS4 to 5
1m ²	V-M	M-NV		
5 m ²	V	V-M	M-NV	
10 m ²	V	V	V	V-M

X band radar (probability to detect a target at a distance of 0.7 NM)

V: Detection probability of 80 %

M: Detection probability of 50 %

NV: Detection probability of less than 50 %

As shown in Table 6.3, the number of SS increases as the wind speed becomes high and the waves become large. Table 6.2 reveals that detection probability decreases from V (80 %) to NV (less than 50 %) as the number of SS increases. Therefore, even if the sea state is calm and a target clearly appears on the radar display, when the sea state becomes rough, target detection probability decreases resulting in difficulty of target detection by the radar.

Table 6.3 Relation between Douglas sea state and average wind speed and significant wave height

Sea state	Average wind speed (kn)	Significant wave height (m)
0	<4	<0.2
1	5-7	0.6
2	7-11	0.9
3	12-16	1.2
4	17-19	2.0
5	20-25	3.0
6	26-33	4.0

Significant wave height: an average of top N/3 higher waves when the number of waves detected within a constant time duration is N

For example, in the case of a standard marine buoy, RCS of X band radar is 5 m² as shown in Table 6.1. When observing such a target in the sea state (SS3) in which significant wave height exceeds 1.2 meters, detection probability is M-NV, as shown in Table 6.2, which indicates 50 % or less.

[II] Rain and snow clutter

Rain and snow clutter is a video image that appears in a location where rain or snow is falling. The image changes according to the amount of rain (or the amount of snowfall). As precipitation increases, the image of rain and snow clutter becomes intensified on the radar display, and in the case of localized heavy rain, an image similar to the image indicating land is displayed in some cases. Furthermore, because radio waves tend to attenuate due to rain and snow, the ability to detect a target in the rain and snow clutter or a target beyond the rain and snow clutter may decrease. The amount of attenuation depends on the transmission frequency, antenna beam width, and the pulse length. Figure 6.3 and Figure 6.4 show examples in which detection distance is reduced due to the influence of precipitation. Because of this, a target, which clearly appeared up to 10 NM by an X band radar (pulse width of 0.8 μs) when it was not raining, may become dimly visible up to 5 NM when the amount of rain becomes 4 millimeters per hour. Furthermore, when comparing the X band radar with the S band radar, target detection distance decreases less when an S band radar is used, which means it is influenced less by precipitation.

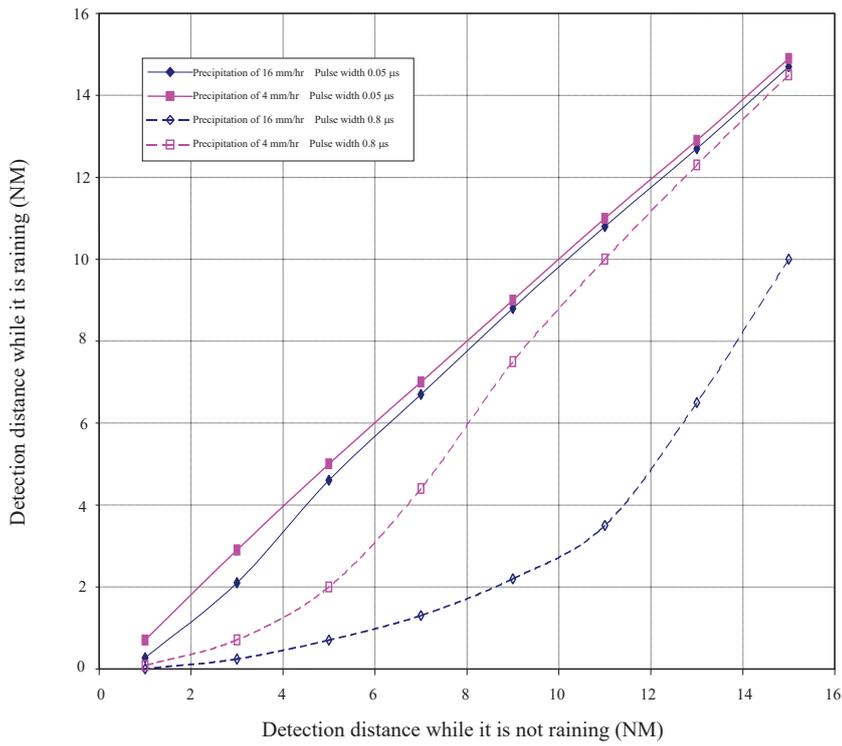


Figure 6.3 Decreased target detection distance by S band radar due to precipitation

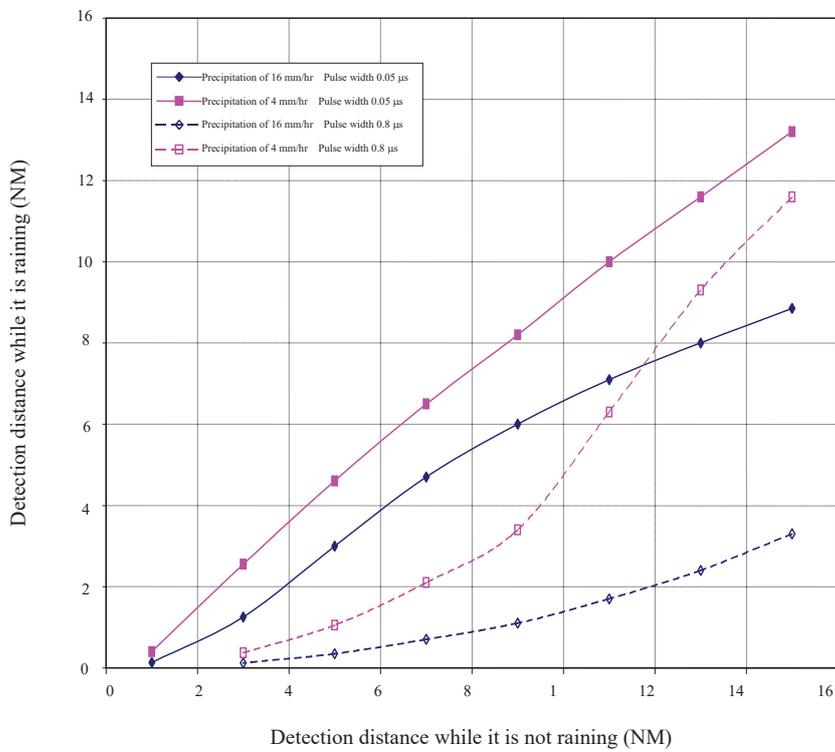


Figure 6.4 Decreased target detection distance by X band radar due to precipitation

[III] Coping with sea clutter and rain and snow clutter

When the weather is bad and the ocean is rough, the use of an S band radar is effective because the radar is not influenced by sea clutter so much and attenuation due to rain drops is small. When an X band radar is used, reducing the pulse width will reduce the influence by spurious waves, and also the spurious wave rejection function effectively works; therefore, the use of short pulse is effective when the weather is bad. By using image processing functions PROC1 1 to 3, it is expected that spurious waves are further suppressed. Since optimal settings for those items can be automatically made by using the function mode, it is recommended that STORM or RAIN be used by selecting the function mode when the weather is bad. For details of the function mode, see Section 3.10 "USE FUNCTION SWITCH [FUNC]". However, these functions may make some targets invisible, particularly targets with higher speeds.

6.4 FALSE ECHOES

The radar observer may be embarrassed with some echoes that do not exist actually. These false echoes appear by the following causes that are well known:

[I] Shadow

When the radar scanner is installed near a funnel or mast, the echo of a target that exists in the direction of the funnel or mast cannot appear on the radar display because the radar beam is reflected on the funnel or mast. Whether there are some false echoes due to shadows can be checked monitoring the sea clutter returns, in which there may be a part of weak or no returns.

Such shadows appear always in the same directions, which the operator should have in mind in radar operation.

[II] Side Lobe Effect

A broken-line circular arc may appear at the same range as the main lobe of the radar beam on the radar display. This type of false echo can easily be discriminated when a target echo appears isolated. (See Figure 6.5.)

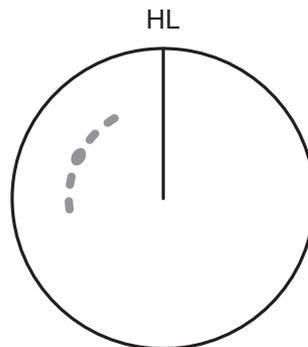


Figure 6.5

[III] False Echo by Secondary Reflection

When a target exists near own ship, two echoes from the single target may appear on the radar display. One of those echoes is the direct echo return from the target and the other is the secondary reflection return from a mast or funnel that stands in the same direction as shown in Figure 6.6.

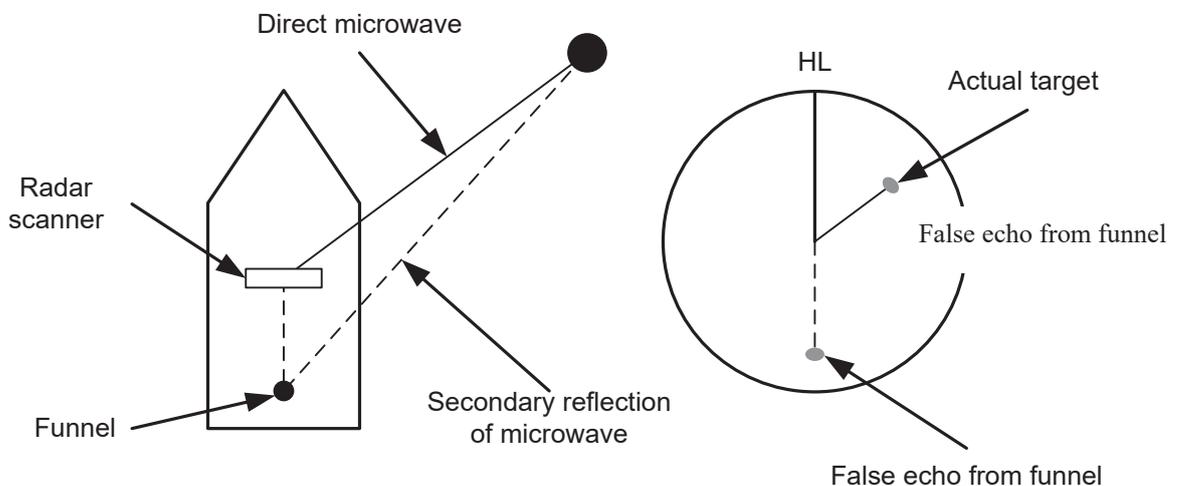


Figure 6.6

[IV] False Echo by Multiple Reflection

When there is a large structure or ship with a high vertical surface near own ship as shown in Figure 6.7, multiple reflection returns may appear on the radar display. These echoes appear in the same intervals, of which the nearest echo is the true echo of the target.

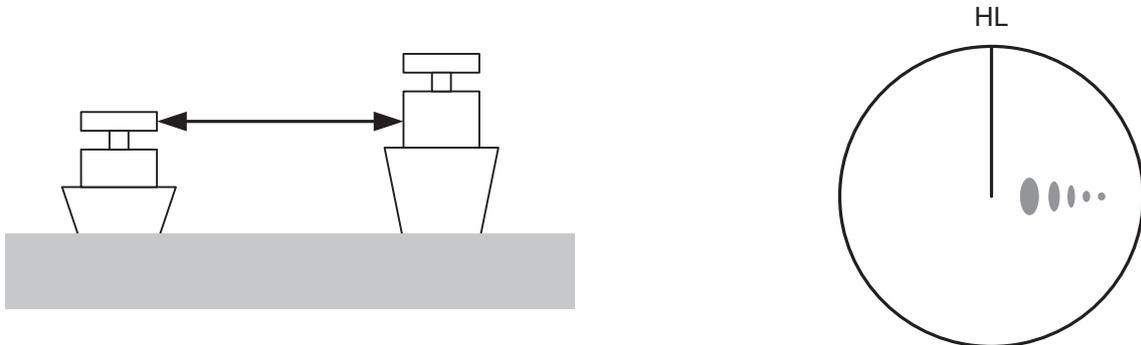


Figure 6.7

[V] Second Time Echoes

The maximum radar detection range depends upon the height of the scanner and the height of a target as described in the Section 6.1 “RADAR WAVE WITH THE HORIZON”. If a so-called "duct" occurs on the sea surface due to a certain weather condition, however, the radar beam may propagate to an abnormally long distance, at which a target may be detected by the radar.

For instance, assuming that the pulse length is MP3 (on the repetition frequency of 1400 Hz), the first pulse is reflected from a target at about 58 NM or more and received during the next pulse repetition time. In this case, a false echo (second time echo) appears at a position that is about 58 NM shorter than the actual distance. If the false echo appears at 5 NM on the radar display, the true distance of the target is $5+58=63$ NM. On the pulse length is SP1 (on the repetition frequency of 2250 Hz), a false echo may appear at a position that is about 36 NM shorter than the actual distance.

This type of false echo can be discriminated by changing over the range scale (the repetition frequency), because the distance of the target changes accordingly.

If second time echo is appeared, the use of Economy mode in PRF menu is effective. Otherwise, Stagger Trigger menu set to on. (Refer to Section 3.9.5 “Set Scanner (TXRX Setting)”.)



[VI] Radar Interference

When another radar equipment using the same frequency band as that on own ship is near own ship, a radar interference pattern may appear on the radar display. This interference pattern consists of a number of spots which appear in various forms. In many cases, these spots do not always appear at the same places, so that they can be discriminated from the target echoes. (See Figure 6.8.)

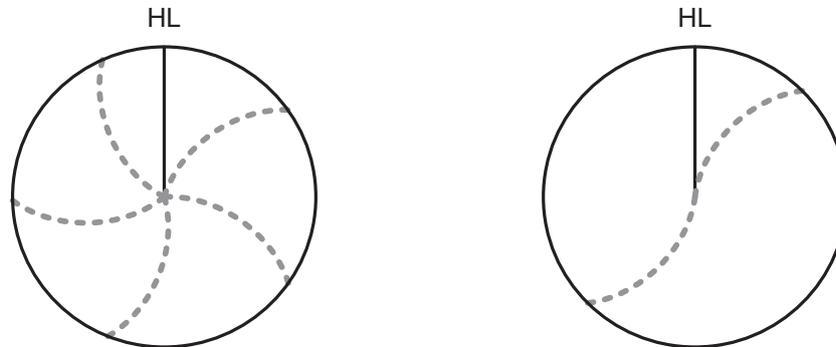


Figure 6.8

If radar equipment causing an interference pattern and this radar are of the same model, their transmitting repetition frequency is nearly the same. As a result, interference patterns may be displayed concentrically.

In this case, the interference patterns cannot be eliminated by using only the interference reflector function, so press **[TX/PRF]** several times to fine-tune the transmitting repetition frequency.

An interference suppressing effect can be heightened by applying a different transmitting repetition frequency to the interference pattern source radar and this radar.

6.5 DISPLAY OF RADAR TRANSPONDER (SART)

The SART (Search and rescue Radar Transponder) is a survival device authorized by the GMDSS (Global Maritime Distress and Safety System), which is used for locating survivors in case that a distress accident occurs at sea. The SART is designed to operate in the 9 GHz frequency band.

When receiving the 9 GHz radar signal (interrogating signal) transmitted from the radar equipment on a rescue ship or search aircraft, the SART transmit a series of response signals to inform the distress position to the rescue and search party.

* This radar provides a shortcut item to make settings for SART signal reception. Execution of this item automatically switches to the setting for SART reception. It also functions for detect the beacon or target enhancer.

Procedure

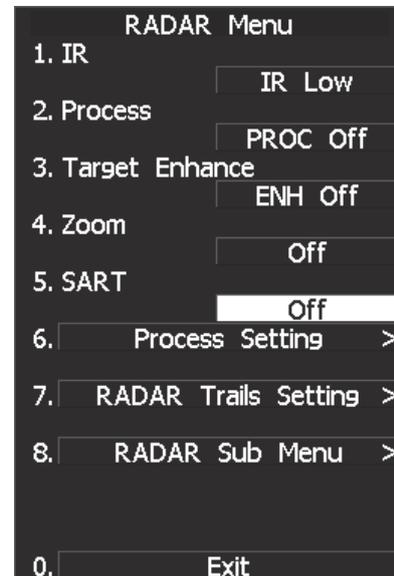
1 Press [RANGE +] or [RANGE -] to set the radar range to 6 NM or 12 NM.

2 Press [RADAR MENU] twice.

The RADAR Menu will appear.

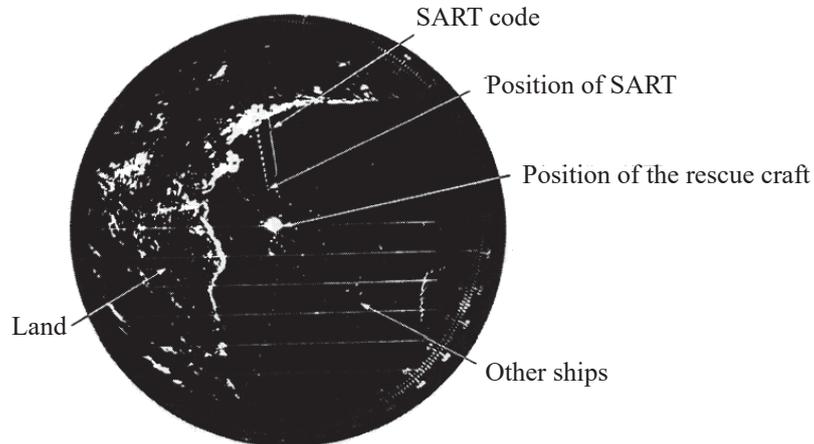
3 Press [5].

Each time the key is pressed, switching between ON and OFF takes place.



With the SART display mode set to ON, settings as shown below are made automatically.

- | | |
|--|--------------------------------------|
| (1) Sea clutter control: | Minimum (Most counterclockwise) |
| (2) AUTO SEA function: | OFF |
| (3) Rain and Snow Clutter Control (RAIN): | minimum |
| (4) Auto Rain and Snow Clutter function (AUTO RAIN): | OFF |
| (5) TUNE control: | No tuning (to weaken clutter echoes) |
| (6) Interference rejector (IR): | OFF |
| (7) PROCESS: | OFF |



[Example of Display]

Attention

- **When the SART function is set to ON, small targets around own ship will disappear from the radar display. So it is necessary to exercise full surveillance over the conditions around own ship by visual watch in order to avoid any collision or stranding.**

If two or more sets of radar equipment are installed on own ship, use one set of 9 GHz band radar for detection of the SART signal and operate others as normal radars for avoiding collision, monitoring targets around own ship, and checking on own ship's position and avoidance of stranding.

After end of detecting the SART signal, turn the SART display off. Then the radar returns normally to the nautical mode.



SECTION 7

SETTINGS FOR SYSTEM OPERATION

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7.1 SETTINGS AT INSTALLATION

This section describes the electrical adjustment procedures to be performed by service engineers during system installation.

The bearing adjustment value is saved to non-volatile memory in the scanner. Other settings are saved to non-volatile memory in the radar process unit.

 CAUTION	
	Do not carry out the adjustments of the equipment except authorized service persons. If wrong setting is carried out, this may cause unstable operation.
	Do not carry out the adjustments during navigation. Otherwise, the radar performance may be affected, resulting in an accident or trouble.

Tuning, bearing and range adjustments can be made from the operation panel. Start the adjustment mode in the following procedures.

7.1.1 How to open the Adjust Menu

Procedure

- 1 Continue to press [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

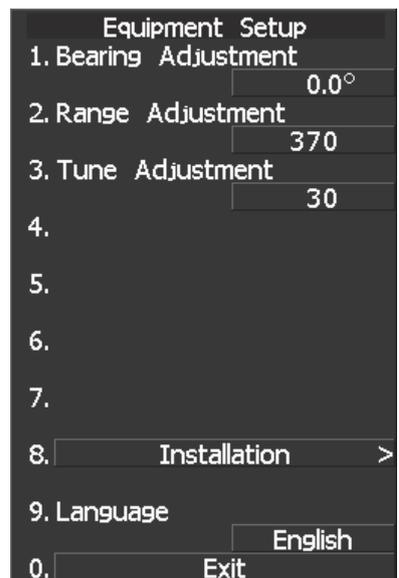
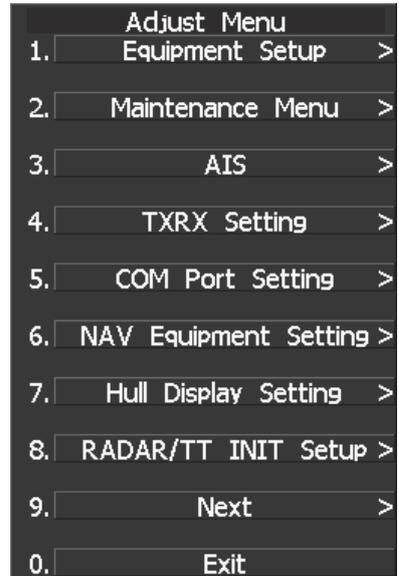
- 4 Press [1] key.

The Equipment Setup Menu will appear.

Exit

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.



7.1.2 Tuning Adjustment

Adjust the tuning control for the transmitter and receiver.
The turning control should be adjusted when the system is installed or when the magnetron is replaced.

Procedure

- 1 **Set a range of 24 NM or more.**

- 2 **Hold down [RADAR MENU] key.**

The CODE Input screen opens.

- 3 **Press [0] key.**

The numeric keypad screen opens.

- 4 **Place the cursor over the “ENT” button of the numeric keypad and press [ENT] key.**

Adjust Menu opens.

- 5 **Press [1] key.**

Equipment Setup menu opens.

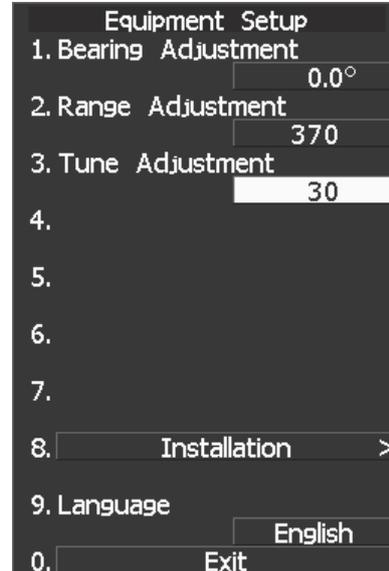
- 6 **Press [3] key.**

A numeric keypad screen for Tune Adjustment opens.

- 7 **Adjust the value until the tuning state gauge reaches maximum by inputting a value with the number keys or by turning the multi-dial to change the value.**

- 8 **When the adjustment is complete, place the cursor over the “ENT” button of the numeric keypad and press [ENT] key.**

The adjustment value is memorized and the adjustment is complete.



Exit

- 1 **Press [RADAR MENU] key.**

The Main Menu will reappear.

[I] Tune Indicator Adjustment

Set the scale mark when the tune indicator bar reaches the maximum point.

Procedure

- 1 **Set the range to 24 NM or more.**

- 2 **Hold down [RADAR MENU] key.**

The CODE Input screen opens.

- 3 **Press [0] key.**

The numeric keypad screen opens.

- 4 **Place the cursor over the “ENT” button of the numeric keypad and press [ENT] key.**

Adjust Menu opens.

- 5 **Press [4] key.**

TXRX Setting menu opens.

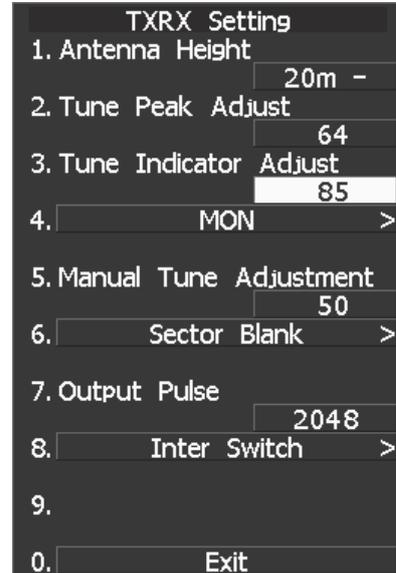
- 6 **Press [3] key.**

The Tune Indicator numeric keypad screen opens.

- 7 **Adjust the value until the tune indicator bar at the top left corner of the screen reads 80% to 90% by inputting a value with the number keys or by turning the multi-dial to change the value.**

- 8 **Place the cursor over the “ENT” button and press [ENT] key.**

The tune level value is memorized and the level adjustment is complete.



Note: Do not let the tune indicator bar reach 100% while adjusting the tune level. The automatic tuning function may not perform properly if the bar reaches 100%. Set the level such that the tune indicator bar always reads 80% to 90%.

- **With the JMA-5212 radar:**

For this model, perform Tune Peak Adjustment and Tune Indicator Adjustment explained below.
After the above adjustment procedure, perform the adjustment procedure below.

III Tune Peak Adjustment

Adjust the tune indicator and echo peak.

Procedure

- 1 Set the range to 24 NM or more.**

- 2 Hold down [RADAR MENU] key.**

The CODE Input screen opens.

- 3 Press [0] key.**

The numeric keypad screen opens.

- 4 Place the cursor over the “ENT” button of the numeric keypad and press [ENT] key.**

Adjust Menu opens.

- 5 Press [4] key.**

TXRX Setting menu opens.

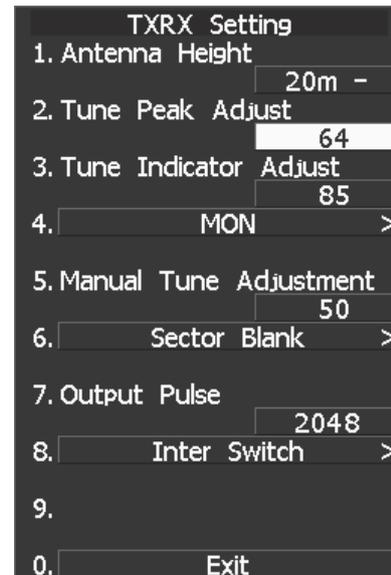
- 6 Press [2] key.**

The Tune Indicator numeric keypad screen opens.

- 7 Adjust the tune peak value until the tune indicator bar at the top left corner of the screen reaches maximum by inputting a value with the number keys or by turning the multi-dial to change the value.**

- 8 Place the cursor over the “ENT” button and press [ENT] key.**

The tune peak value is memorized and the peak adjustment is complete.



Note: Always set the tune peak adjustment value to 64.

When the equipment is used for a long time and the automatic tuning function no longer works properly, adjusting the tune peak adjustment value may result in improvement of the automatic tuning function. It should be noted that an optimal adjustment value is required for proper operation of the automatic tuning function.

7.1.3 Bearing Adjustment

Adjust the bearing so that bearing of the target measured with the ship's compass matches that of the target echo on the radar display.

Procedure

- 1 Press **AZI MODE** to select the relative bearing presentation [H UP] mode. Set Image Processing to OFF.

[AZI MODE] → Software button  located at the top left corner of the radar display described in Section 2.3.1 → Software button  located at the bottom left corner of the radar display described in Section 2.3.2.

- 2 Measure the bearing of an adequate target (for example, a ship at anchor, a breakwater or a buoy) relative to own ship's heading.

- 3 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 4 Press [0] key.

- 5 Move the cursor onto the "ENT" button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 6 Press [1] key.

Equipment Setup menu opens.

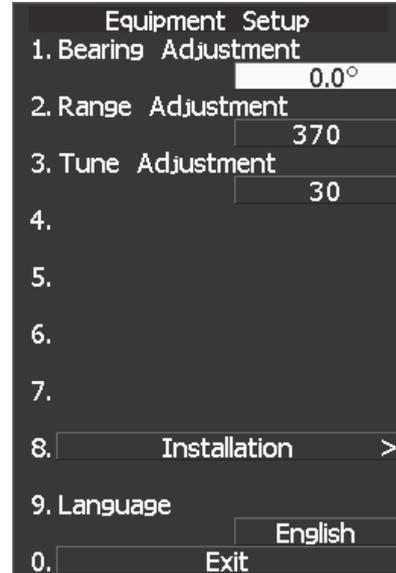
- 7 Press [1] key.

The Code Input Menu will appear.

- 8 Using numeric key, enter the value and then press "ENT" button, and press "EXIT" button to determine the value.

The multi-function control can also be used to enter the value.
Make adjustment by the 0.1°.

- 9 Repeat Step 5 above, and adjust to display the target measured in Step 2 to the measured bearing.



Exit

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.

7.1.4 Range Adjustment

Adjust the range so that the range of the target on the radar video is indicated correctly.

Procedure

- 1 **Search the radar display for a target of which range is already known.**

- 2 **Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 3 **Press [0] key.**

- 4 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 5 **Press [1] key.**

Equipment Setup menu opens.

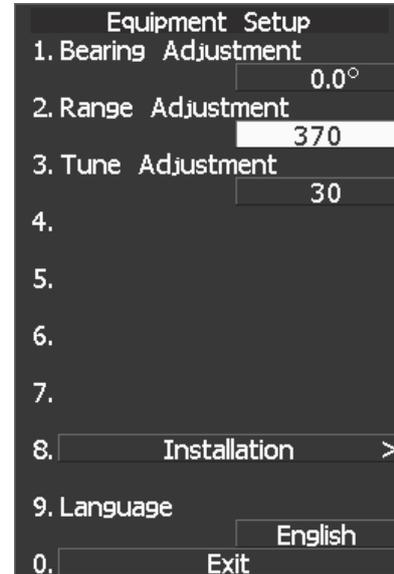
- 6 **Press [2] key.**

The Code Input Menu will appear.

- 7 **Using numeric pad, enter the value and then press “ENT” button, and press “EXIT” button to determine the value.**

The multi-function control can also be used to enter the value.

- 8 **Repeat step 4, and adjust until the target range measured in step 1 and the range on the radar display become identical.**



Exit

- 1 **Press [RADAR MENU] key.**

The Main Menu will reappear.

7.1.5 Antenna Height Setting (Antenna Hight)

Set the antenna height above the sea level, but change this setting carelessly.

Procedure

- 1 **Measure the height from the sea level to the antenna in advance.**

- 2 **Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 3 **Press [0] key.**

- 4 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 5 **Press [4] key.**

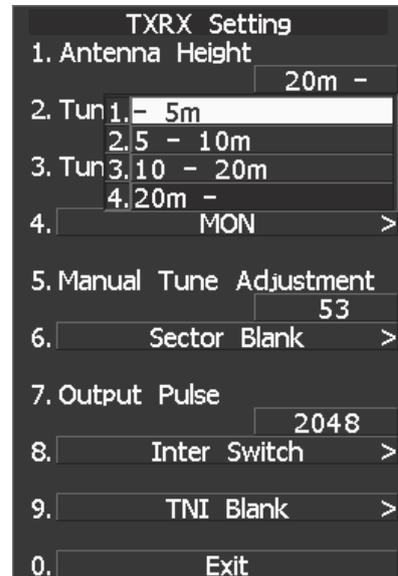
The TXRX Setting Menu will appear.

- 6 **Press [1] key.**

The Antenna Height Set Value window will appear.

- 7 **Select the antenna height measured in step 1 from the pull-down menu by pressing the numeric key [1] to [4].**

The antenna height will be determined.



Exit

- 1 **Press [RADAR MENU] key.**

The Main Menu will reappear.

7.1.6 Setting of CCRP/Antenna/GPS Antenna Position (CCRP Setting)

Set the own ship's CCRP location, radar antenna installation location, and GPS installation location.

GPS : Up to 4 locations can be inputted (select one through the receiving port setting when using the GPS).

Radar antenna : 1 location can be inputted (one master and one slave).

CCRP : 1 location can be inputted (another location is reserved as an antenna location).

Procedure

1 Measure the CCRP, radar antenna, and GPS antenna positions beforehand.

2 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

3 Press [0] key.

4 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

5 Press the following keys.

7 Hull Display Setting
1 CCRP Setting

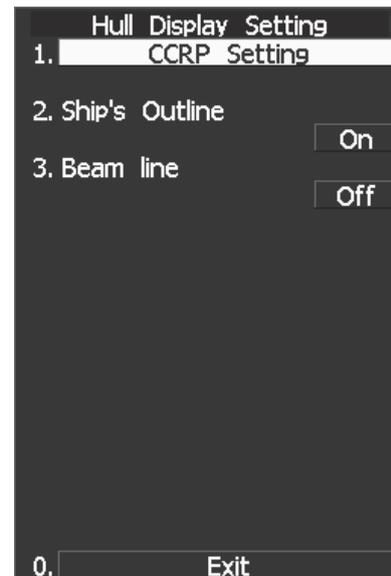
6 Input the vessel length in the Length field and the vessel width in the Beam field at the top right corner of the CCRP Setting screen.

7 Move the cursor to the X and Y values of CCRP1. Press the ENT key and input the CCRP1 position.

CCRP is on the starboard side of the ship when $X > 0$ and is on the port side of the ship when $X < 0$.

8 In the same manner, input the GPS antenna and radar antenna positions.

9 Press [0] key and exit the CCRP setting screen.



GPS position :

If you wish to connect multiple GPS systems to a COM port and select a GPS position to be used, select it through the receiving port setting of the GPS you wish to use.

Reference: Section 7.3.1.2 “Reception Port Setting (RX Port)”

Radar antenna position :

The radar antenna position changes as the antenna mode is switched between the master mode and the slave mode by the simplified inter-switch.

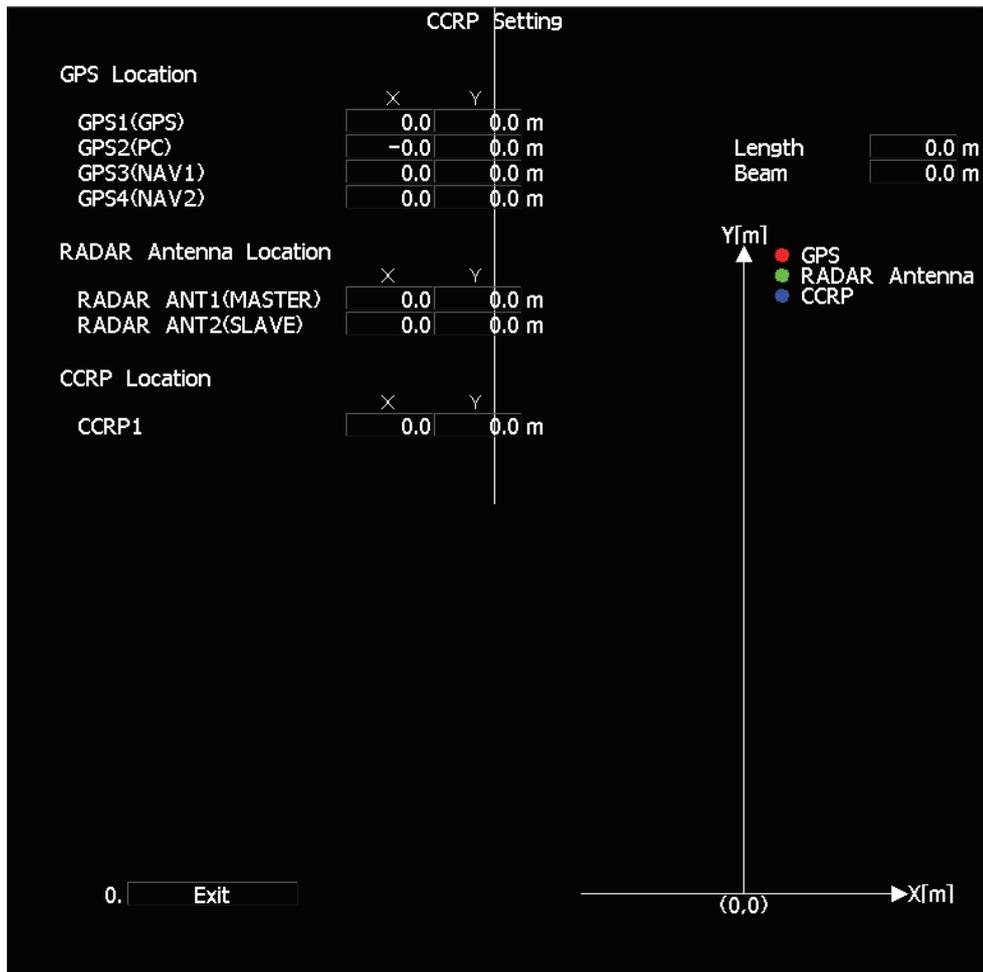
CCRP position :

Only one position can be set.

If CCRP1 is outside the display area, ANT1 or ANT2 becomes the CCRP.

ANT1: Radar antenna position (MASTER)

ANT2: Radar antenna position (SLAVE)



CCRP is changed on the condition as following.

- Radar antenna position is outside of the off center limit.
- The CCRP position is outside of PPI.

This condition occurs with for example off center, true motion, turn of own ship, etc.

7.2 NAVIGATOR SETTING

This section describes the electrical adjustment procedures to be performed by service engineers during system installation.

 CAUTION	
	Do not carry out the adjustments of the equipment except authorized service persons. If wrong setting is carried out, this may cause unstable operation.
	Do not carry out the adjustments during navigation. Otherwise, the radar performance may be affected, resulting in an accident or trouble.

Make an appropriate setting for each type of equipment when inputting true bearing signals, true bearing data, and speed data.

Settings and parameters are different for each type of equipment.

Make settings for the type of equipment to be connected.

II Inputting analog true bearing signals from a gyro system through synchronization and steps

By following the procedure described in the INSTALLATION MANUAL, connect the optional NSK unit (NCT-4106A) to this equipment. Then, follow the steps below to make settings.

In Section 7.2.1 “Ship Heading Equipment Setting (Heading Equipment),” select 1: GYRO (NCT-4106A, JLR10, JRL20/30).

By referring to Section 7.2.2 “NSK Unit Setting,” make a setting for the gyro system.

By referring to Section 7.2.3 “True Bearing Value Setting (Set GYRO),” make a setting such that the gyro azimuth and the radar azimuth are the same.

Refer to an applicable page for details.

[III] Inputting digital true bearing signals from a gyro system (IEC61162, NMEA0183)

By following the procedure described in the INSTALLATION MANUAL, connect the gyro system to this equipment. Then, follow the steps below to make settings.

In Section 7.2.1 “Ship Heading Equipment Setting (Heading Equipment),” select 2: COMPASS (IEC61162).
In Section 7.3.1.1 “Baud Rate Setting,” select 5. COM5 (COMPASS).
Select either 38400 bps or 48000 bps depending on the data baud rate outputted from the GPS compass.

(*) For digital signal output from the gyro system

- Select 38400 bps if possible. A higher baud rate means shorter data output cycle, which results in better course following performance.
- If the system allows setting of data output cycle, set it to 10 ms to 20 ms. A longer data output cycle results in lower course following performance. This may affect the radar performance level and the target tracking performance level.

Refer to an applicable page for details.

[III] Inputting true bearing data from GPS Compass JLR10 or JLR20/30

By following the procedure described in the INSTALLATION MANUAL, connect GPS Compass JLR10 or JLR20/30 to this equipment. Then, follow the steps below to make settings.

In Section 7.2.1 “Ship Heading Equipment Setting (Heading Equipment),” select 1: GYRO (NCT-4106A, JLR10, JLR20/30).

True bearing value setting described in Section 7.2.3 is not required when using the GPS compass. If the GPS compass azimuth and the radar azimuth are not the same, use the GPS compass to adjust the azimuth.

Refer to an applicable page for details.

[IV] Inputting digital true bearing data from a GPS compass (other than JLR10 and JLR20/30) or other true bearing systems (IEC61162 or NMEA0183)

By following the procedure described in the INSTALLATION MANUAL, connect a GPS compass or other true bearing system to this equipment. Then, follow the steps below to make settings.

In Section 7.2.1 “Ship Heading Equipment Setting (Heading Equipment),” select 2: COMPASS (IEC61162).
In Section 7.3.1.1 “Baud Rate Setting,” select 5. COM5 (COMPASS).
Select either 38400 bps or 48000 bps depending on the data baud rate outputted from the GPS compass.

(*) For the GPS compass or other true bearing systems

- Select 38400 bps if possible. A higher baud rate means shorter data output cycle, which results in better course following performance.
- If the system allows setting of data output cycle, set it to 10 ms to 20 ms. A longer data output cycle results in lower course following performance. This may affect the radar performance level and the target tracking performance level.

Refer to an applicable page for details.

[V] Inputting analog speed signals from a log system through synchronization and steps

By following the procedure described in the INSTALLATION MANUAL, connect the optional NSK unit (NCT-4106A) to this equipment. Then, follow the steps below to make settings.

In Section 7.2.5 “Ship Speed Equipment Setting (Speed Equipment),” select 2: LOG.

Refer to an applicable page for details.

[VI] Inputting digital speed data using a current meter or a Doppler sonar (IEC61162 or NMEA0183)

By following the procedure described in the INSTALLATION MANUAL, connect speed equipment to this equipment. Then, follow the steps below to make settings.

In Section 7.2.5 “Ship Speed Equipment Setting (Speed Equipment),” select 3: 2 AXIS W to use the sea speed. Select 4: 2 AXIS G to use the ground speed.

Refer to an applicable page for details.

[VII] Inputting GPS speed data (IEC61162 or NMEA0183)

By following the procedure described in the INSTALLATION MANUAL, connect speed equipment to this equipment. Then, follow the steps below to make settings.

In Section 7.2.5 “Ship Speed Equipment Setting (Speed Equipment),” select 5: GPS.

Refer to an applicable page for details.

[VIII] Inputting speed data manually

In Section 7.2.5 “Ship Speed Equipment Setting (Speed Equipment),” select 1: Manual.

In Section 7.2.6 “Manual Speed Setting (Manual Speed),” input the speed manually using the numeric keypad or multi-dial.

Refer to an applicable page for details.

7.2.1 Ship Heading Equipment Setting (Heading Equipment)

Procedure

- 1 Press [RADAR MENU] key.

Main Menu opens.

- 2 Press [7] key.

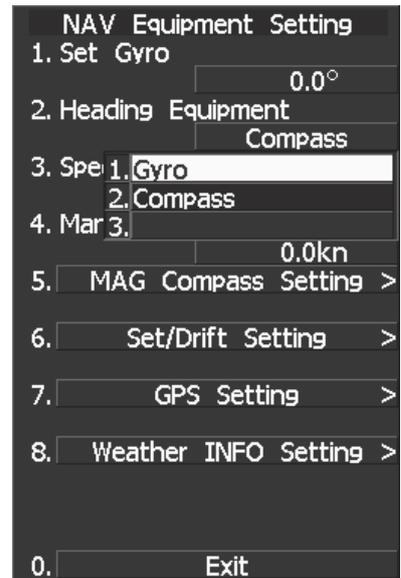
NAV Equipment Setting menu opens.

- 3 Press [2] key.

Heading Equipment settings are displayed.

- 4 From the pull-down menu, select heading equipment.

1 : GYRO (NCT-4106A, JLR10, JLR20/30)
2 : COMPASS (IEC61162)



<The alternative procedure for steps above>

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [6] key.

NAV Equipment Setting menu opens.

- 5 Perform steps 3 and 4 in the “Procedure” above.

Exit

- 1 Press [RADAR MENU] key.

Menu closes.

7.2.2 NSK Unit Setting

The NSK Unit circuit of the system is designed to be compatible with most types of gyro compasses by simply setting the switches.

Step motor type: 20 to 170 VDC

Synchro-motor type: Primary excitation voltage 35 to 120 VAC

Before power-on operation can be performed, the switches S1 to S5 on the NSK Unit circuit (PC4201) must be set in accordance with the type of your gyro compass by performing the procedure below. The switches are factory-set for a gyration ratio of 180X and the step motor type. Make sure of the type of the gyro compass installed on the own ship before starting the procedure below.

Procedure

1 Set S1 to "OFF."

The gyro compass and NSK Unit are turned off.

2 Set S2 and S3 in accordance with the type of your gyro compass.

There are two types of gyro compasses: one type outputs a step signal, and the other type outputs a synchro signal. Make sure of the type of the gyro compass installed on the own ship before setting the switches S2 and S3.

Synchro signal: Set the switches to [SYNC].

Step signal: Set the switches to [STEP].

3 Set the DIP switch S4.

The items to be set are listed below. For the settings, refer to Table 7-1.

- S4-1: LOG alarm ON/OFF
- S4-2: GYRO simulator ON/OFF
- S4-3: LOG simulator ON/OFF
- S4-5: Time before occurrence of GYRO alarm
- S4-6: Sensor to be used (GYRO/NMEA)
- S4-7/8: Baud rate when NMEA is used

4 Set the DIP switch S5.

The items to be set are listed below. For the setting, refer to Table 7-2.

- S5-1: Type of gyro signal (step/synchro)
- S5-2/3: Gyration ratio of gyro compass
- S5-4: Gyration direction of gyro compass
- S5-5: Type of log signal (pulse/synchro)
- S5-7/8: Ratio of log signal

5 Connect the gyro signal and log signal cables to the terminal block.

6 Set S1 to "ON."

The gyro compass and NSK Unit are connected.

7 After power-on operation, set the true bearing according to Section 7.2.3.

8 Make sure of the radar video and the operation with the true bearing value.

9 If the true bearing value of the radar equipment is reversed, change the setting of the switch S5-4.

Table 7-1 Setting Table (S4 DIP Switch)

		1	2	3	4	5	6	7	8
OTHER SETTING	LOG ALARM	ON							
		OFF							
	GYRO SIMULATOR	ON							
		OFF							
	LOG SIMULATOR	ON							
		OFF							
	N.C.	Don't care		any					
	GYRO ALARM TIME	5s				ON			
		0.5s				OFF			
	HEADING SENSOR SOURCE	NMEA(HDT/THS)					ON		
GYRO SIGNAL						OFF			
NMEA BAUDRATE SETTING	4800						OFF	OFF	
	9600						ON	OFF	
	19200						OFF	ON	
	38400						ON	ON	

Table 7-2 Setting Table (S5 DIP Switch)

		1	2	3	4	5	6	7	8
GYRO SIG	TYPE	STEP	ON						
		SYNC	OFF						
	RATIO	36 ×	ON	ON					
		90 ×	OFF	ON					
		180 ×	ON	OFF					
		360 ×	OFF	OFF					
DIRECTION	REV				ON				
	NOR				OFF				
LOG SIG	TYPE	SYNC				ON			
		PULSE				OFF			
	N.C.	Don't care		any					
	PULSE	100P/30 ×						ON	ON
		200P/90 ×						OFF	ON
400P/180 ×							ON	OFF	
800P/360 ×							OFF	OFF	



7.2.3 True Bearing Value Setting (Set GYRO)

Adjust the bearing that the bearing angle of the radar is the same as that of the gyro.

When the NSK unit is used to input gyro signals, in rare cases, the true bearing value indicated by the master gyro and the true bearing value indicated by this equipment do not agree with each other. If this occurs, make the setting described below to adjust the true bearing value of this equipment to the value indicated by the master gyro.

This setting is available only when the NSK unit NCT-4106A is used.

Procedure

- 1 Press [RADAR MENU] key twice.

The Main Menu will appear.

- 2 Press [7] key.

The NAV Equipment Setting Menu will appear.

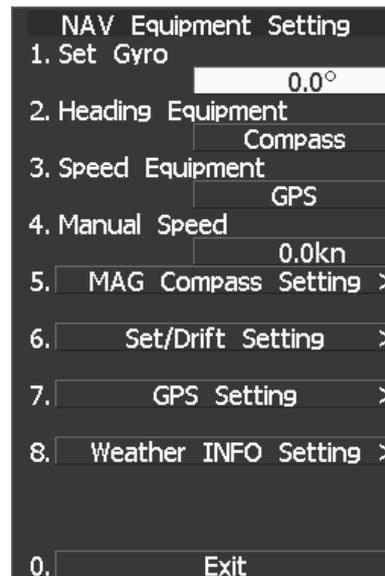
- 3 Press [1] key.

The Code Input Menu will appear.

- 4 Adjust true bearing value.

Adjust the bearing that the bearing angle of the radar is the same as that of the gyro.

The multi-function control can also be used to enter the value.



After having entered the value, move the cursor onto the “ENT” button and press [ENT] key.

<The alternative procedure for steps above>

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [6] key.

NAV Equipment Setting menu opens.

- 5 Perform steps 3 and 4 in the “Procedure” above.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

7.2.4 MAG Compass Setting

Set the MAG compass.

Procedure

- 1 Press [RADAR MENU] key twice.

The Main Menu will appear.

- 2 Press [7] key.

NAV Equipment Setting Menu will appear.

- 3 Press [5] key.

MAG Compass Setting Menu will appear.

- 4 Press [1] key.

This item is set as to whether or not the heading bearing is to be corrected. Switching between ON and OFF is done each time you press [1] key.

- 5 Press [2] key.

The Code Input Menu will appear.

- 6 Pressing a numeric key, enter the value. Select “ENT” and then determine the value.

The correction direction and angle will be set. On the screen, press “+” to make correction in the eastern direction, and press “-” to make correction in the western direction. Also enter a correction angle, pressing the numeric key.

The multi-function control is also available for the entry. To do so, enter the correction direction, press the multi-function control, enter the correction angle, and then set ENT in order.



<The alternative procedure for steps above>

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [6] key.

NAV Equipment Setting menu opens.

- 5 Perform steps 3 to 6 in the “Procedure” above.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

7.2.5 Ship Speed Equipment Setting (Speed Equipment)

Procedure

- 1 Press [RADAR MENU] key twice.

The Main Menu will appear.

- 2 Press [7] key.

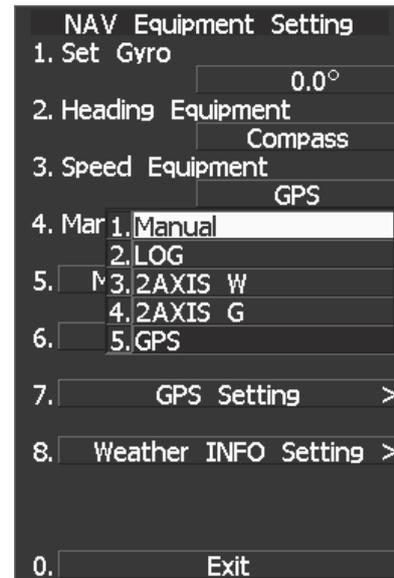
The NAV Equipment Setting Menu will appear.

- 3 Press [3] key.

- 4 Select a ship speed sensor from the pull-down menu.

Types of selectable speed sensors:

- 1: Manual
- 2: Log
- 3: 2-axis log (NMEA signal: Speed over water)
- 4: 2-axis log (NMEA signal: Speed over ground)
- 5: GPS



<The alternative procedure for steps above>

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [6] key.

NAV Equipment Setting menu opens.

- 5 Perform steps 3 and 4 in the “Procedure” above.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

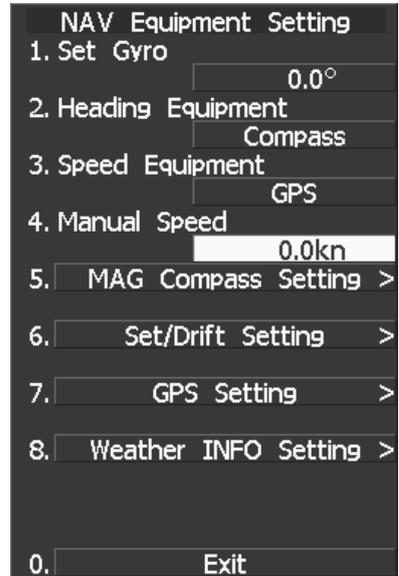
Attention

- The manually entered speed is effective only when “Manual” is set.
- 2-axis log cannot be effective when the sentence VBW of NMEA0183 is not entered.

7.2.6 Manual Speed Setting (Manual Speed)

Procedure

- 1 **Press [RADAR MENU] key twice.**
The Main Menu will appear.
- 2 **Press [7] key.**
NAV Equipment Setting Menu will appear.
- 3 **Press [4] key.**
The Code Input menu will appear.
- 4 **Pressing a numeric key, enter the value and select “ENT.”**
The multi-function control is also available for the entry.



<The alternative procedure for steps above>

- 1 **Hold down [RADAR MENU] key.**
The Code Input Menu will appear.
- 2 **Press [0] key.**
- 3 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**
The Adjust Menu will appear.
- 4 **Press [6] key.**
NAV Equipment Setting menu opens.
- 5 **Perform steps 3 and 4 in the “Procedure” above.**

Note: The manually entered speed is effective only when “Manual” is set.

7.2.7 Current Correction (SET/DRIFT) Setting

The current set and drift will be set.

Attention

- **The manually entered speed is effective only when “Speed Equipment” is set to “Manual” or “LOG”.**

Procedure

- 1 Press [RADAR MENU] key twice.**

The Main Menu will appear.

- 2 Press [7] key.**

The NAV Equipment Setting Menu will appear.

- 3 Press [6] key.**

The Set/Drift Setting Menu will appear.

- 4 Press [1] key to enable Correction.**

The setting of Correction is switched back and forth between ON and OFF each time [1] key is pressed.

Off : Do not perform current correction.

On : Perform current correction.

- 5 Press [2] key.**

The Code Input Menu will appear.

- 6 Enter the direction of tendency.**

The direction of tendency will be set. The multi-function control is also available for the entry.

After having entered the direction, move the cursor onto the “ENT” button and press [ENT] key.

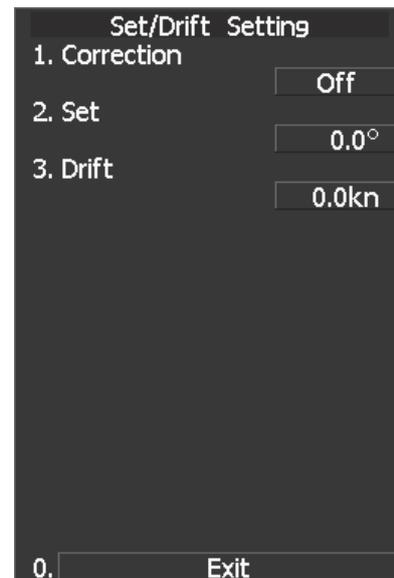
- 7 Press [3] key.**

The Code Input Menu will appear.

- 8 Enter the speed of tendency.**

The speed of tendency will be set. The multi-function control is also available for the entry.

After having enter the value, move the cursor onto the “ENT” button and press [ENT] key.



<The alternative procedure for steps above>

- 1 **Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 2 **Press [0] key.**

- 3 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 4 **Press [6] key.**

NAV Equipment Setting menu opens.

- 5 **Perform steps 3 to 8 in the “Procedure” above.**

Exit

- 1 **Press [RADAR MENU] key.**

The menu will be closed.

7.3 SETTINGS

This section describes the electrical adjustment procedures to be performed by service engineers during system installation.

 CAUTION	
	Do not carry out the adjustments of the equipment except authorized service persons. If wrong setting is carried out, this may cause unstable operation.
	Do not carry out the adjustments during navigation. Otherwise, the radar performance may be affected, resulting in an accident or trouble.

7.3.1 Communication Port Setting (COM Port Setting)

External sensor signals are input to the radar equipment through a communication port. The radar equipment has five communication ports. For signals to be input from sensors or to be output to the sensors, communication ports need to be set in accordance with the sensors.

7.3.1.1 Baud Rate Setting

Set the baud rate of the signal to be entered into the COM port.

Each ports on the menu represents following connectors.

COM1(GPS)	J3 GPS
COM2(PC)	J8 NMEA
COM3(NAV1)	J6 AIS/NMEA
COM4(NAV2)	J9 AUX
COM5(NSK/COMPASS)	J5 GYRO COMPASS

Procedure

1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

2 Press [0] key.

3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

4 Press [5] key.

The COM Port Setting Menu will appear.

5 Press [1] key.

The Baud Rate Setting Menu will appear.

6 Select the port number you want to set, pressing the numeric keys [1] to [5].

The Baud Rate Selection menu will appear.

7 In the selection menu, select the baud rate you want to set, pressing the numeric key.

Selection value

- | | |
|--------------------|---------------------------------|
| 1. COM1 (GPS): | 1200/4800/*38400/9600 bps |
| 2. COM2 (PC): | 1200/4800/38400/115200/9600 bps |
| 3. COM3 (NAV1): | 1200/4800/38400/9600 bps |
| 4. COM4 (NAV2): | 1200/4800/*38400/9600 bps |
| 5. COM5 (COMPASS): | 4800/38400 bps |

* If COM1/COM4 is set to 38400 bps, signals can only be transmitted. The baud rate for reception can be set to up to 4800 bps.

COM5 can be used for receive port only. It is dedicated for COMPASS signal. This means that the port is unavailable for other signals.

The GPS, PC, NAV1, NAV2, COMPASS in the parentheses are the standard ports connecting to the external sensors.

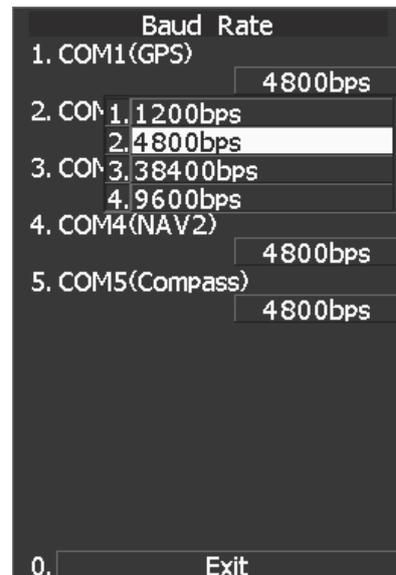
When an AIS unit is used, COM3 is used exclusively for the AIS.

Connect the AIS to COM3.

Use a port other than COM3 when connecting a device other than an AIS unit.

An external device can be connected to COM3 when an AIS unit is not used.

When a baud rate of 1200 bps is selected, a 1200 bps JRC format is used.



Exit

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.

7.3.1.2 Reception Port Setting (RX Port)

Set the number of the port via which signals are received from sensors.

There are two methods for receiving signals: specifying a port for each sensor, or using the automatic recognition function without specifying ports.

Procedure

1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

2 Press [0] key.

3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

4 Press [5] key.

The COM Port Setting Menu will appear.

5 Press [4] key.

The RX Port Menu will appear.

6 Select the signal you want to set, pressing the numeric keys [1] to [6].

The Reception Port Setting Menu for each signal will appear.

Settable signals

1. GPS
2. DLOG
3. Depth
4. Temperature
5. Wind
6. Current
7. Rate of Turn
8. Rudder

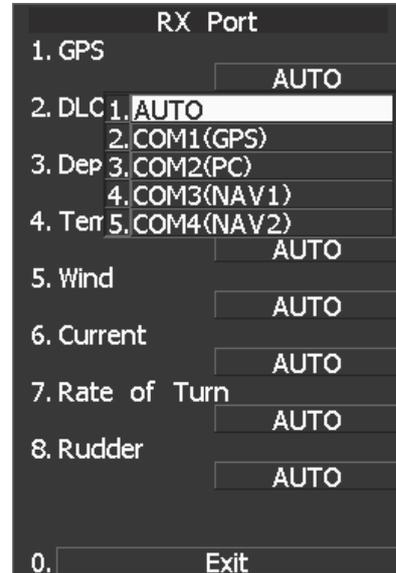
7 Select which port you want to use for output.

Types of ports to be used

1. AUTO
2. COM1 (GPS)
3. COM2 (PC)
4. COM3 (NAV1)
5. COM4 (NAV2)

* For AUTO, the initial value will be selected.

Select the number of the port to be used, pressing the numeric key.



Exit

1 Press [RADAR MENU] key.

The Main Menu will reappear.



7.3.1.3 Reception Sentence Setting (RX Sentence)

Set signal sentences to be received from sensors.

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [5] key.

The COM Port Setting Menu will appear.

- 5 Press [2] key.

The RX Sentence Menu will appear.

- 6 Select the signal you want to set, pressing the numeric keys [1] to [3].

The Setting Menu for each signal will appear.

Settable signal

1. GPS (LL/COG/SOG)
2. GPS (WPT)
3. Depth
4. Wind
5. Current

- 7 Select whether or not you want to use sentence for the signal.

Types of sentences to be used

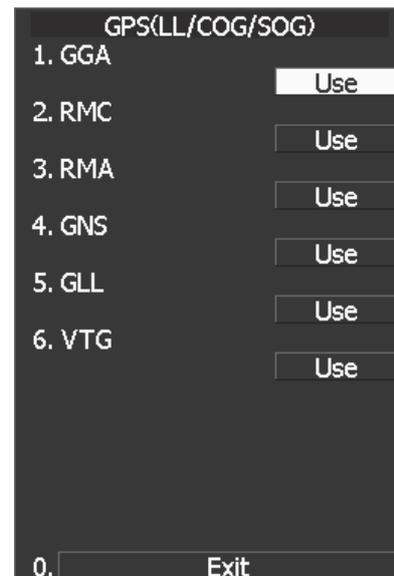
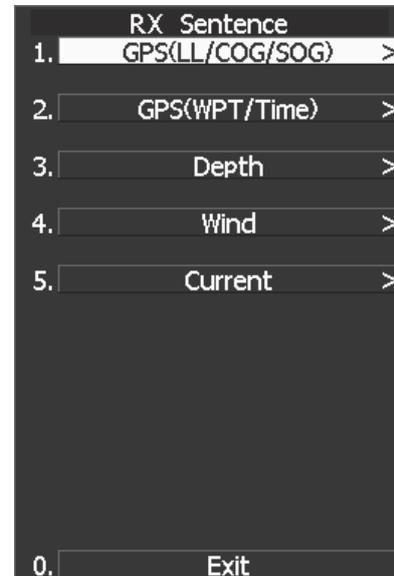
GPS (LL/COG/SOG): GGA/RMC/RMA/GNS/
GLL/VTG

GPS (WPT): GGA/RMC/RMB/
BWC/BWR/ZDA

Depth: DPT/DBK/DBT/DBS

Wind: MWV/MWD

Current: CUR



After having selected a signal, choose the number of the sentence for which you want to set whether or not it is used, pressing the numeric key.

As concerns current, set layer number of CUR sentence.

Layer A:

0-999. Set the number of the sentence to be used with layer A by Layer Number.
(Initial value 3)

Layer B:

0-999. Set the number of the sentence to be used with layer B by Layer Number.
(Initial value 4)

Layer C:

0-999. Set the number of the sentence to be used with layer C by Layer Number.
(Initial value 5)

Exit

1 Press [RADAR MENU] key.

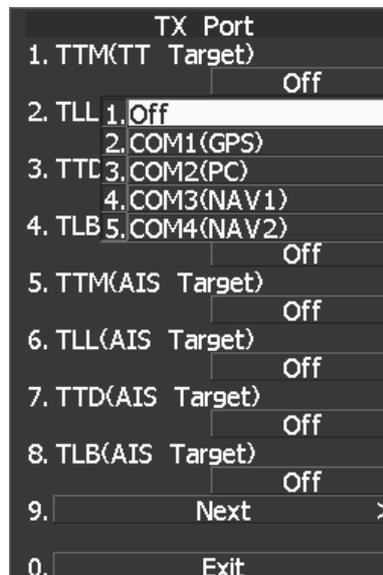
The Main Menu will reappear.

7.3.1.4 Transmission Port Setting (TX Port)

For each sentence, set a communication port through which signals are transmitted to sensors.

Procedure

- 1 **Hold down [RADAR MENU] key.**
The Code Input Menu will appear.
- 2 **Press [0] key.**
- 3 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**
The Adjust Menu will appear.
- 4 **Press [5] key.**
Press [3] key.
The TX Port Menu will appear.
- 5 **Select the signal you want to set, pressing the numeric keys [1] to [9].**



The Output Port Setting Menu for each signal will appear.

Settable sentences

1. TTM(TT Target)
2. TLL(TT Target)
3. TTD(TT Target)
4. TLB(TT Target)
5. TTM(AIS Target)
6. TLL(AIS Target)
7. TTD(AIS Target)
8. TLB(AIS Target)



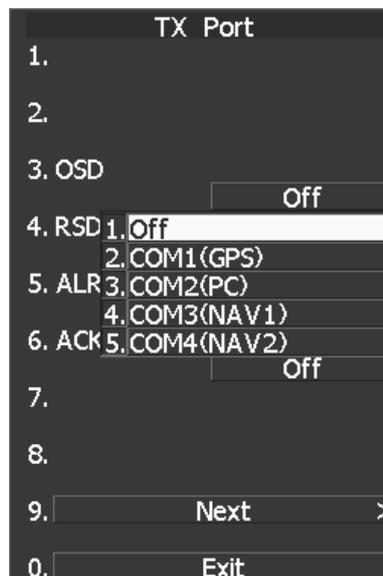
- 1.
- 2.
3. OSD
4. RSD
5. ALR
6. AIS
- 7.
- 8.



1. Remote Maintenance
2. NMEA0183 Output Format
3. NMEA0183 Talker
4. NMEA0183 TX Interval
5. APB
6. BOD
7. GGA
8. GLL



1. RMC
2. RMB
3. VTG
4. XTE
5. BWC



- 6. HDT
- 7. THS

6 Select which port you want to use for output.

Types of ports to be used

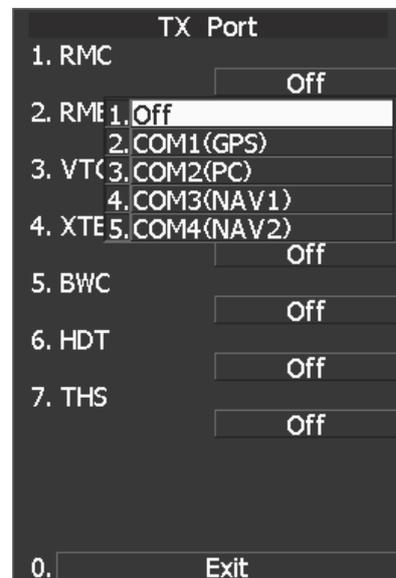
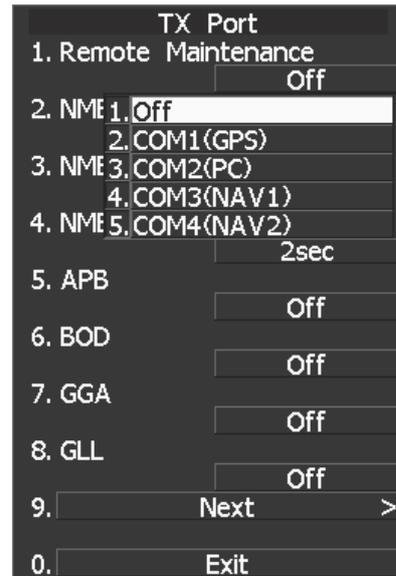
- 1. OFF
- 2. COM1 (GPS)
- 3. COM2 (PC)
- 4. COM3 (NAV1)
- 5. COM4 (NAV2)

Select the number of the port to be used, pressing the numeric key.

7 Select the output format, talker, and transmission interval.

Signals for which the above items can be set:

- NMEA0183 Output Format
Signal names: APB, BOD, GGA, GLL, RMC, RMB, VTG, XTE, BWC, HDT, THS
Selection Value: V1.5, V2.0, and V2.3
- NMEA0183 Talker
Signal names: APB, BOD, RMB, XTE, BWC, HDT, THS
Selection Value:
Standard: The talker is RA.
GP: The talker is GP.
For TTM, TLL, TTD, TLB, OSD, RSD, ALR, and AIS, the talker is always RA .
For GGA, GLL, RMC, and VTG, the talker is always GP.
- NMEA0183 TX Interval
Signal names: APB, BOD, GGA, GLL, RMC, RMB, VTG, XTE, BWC, HDT, THS
Selection Value: Set an interval in the range 1 to 9 seconds.



Note: When multiple output sentences are selected, data may not be transmitted at the selected transmission interval.

In particular, the volume of TTM, TLL, TLB, and TTD data containing TT and AIS target information increases as the number of targets increases, and as a result, the transmission interval becomes longer.

Exit

1 Press [RADAR MENU] key.

The Main Menu will reappear.

* Note that, if you set COM1 and COM4 for transmission, they cannot be used as reception ports.



7.3.2 Sector Blank Setting (Sector Blank)

Set a sector range, preventing displaying the radar echo only within the area. Three types of sector can be created.

The sector blank function operates in the relative bearing with the bow.

Note: This function can be performed only when the scanner is connected to NKE-2043, NKE-2063A, NKE-2103, and NKE-2254.

[I] Turning ON/OFF the Sector function (Sector 1, 2 and 3)

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the "ENT" button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [4] key.
Press [6] key.

The Sector Blank Menu will appear.

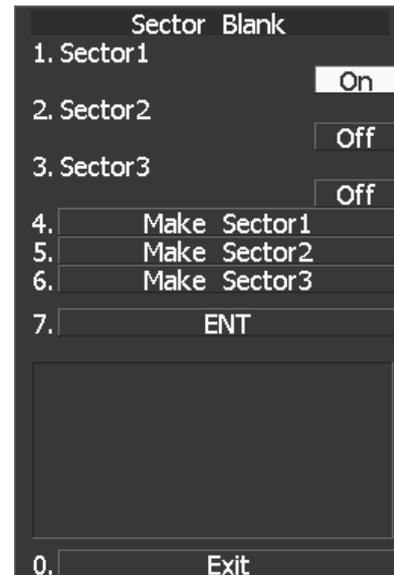
- 5 Select the number you want to excuted sector blank, Pressing the numeric keys [1] to [3].

The system allows the use of up to three sector blank areas.

Set each sector blank area to on or off.

On: The sector blank function is operated.

Off: The sector blank function is stopped.



Exit

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.

[II] Making Sector Function (Make Sector 1, 2, 3)**Procedure**

1 **Transmit the radar.**

2 **Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

3 **Press [0] key.**

4 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

4 **Press [4] key.**
Press [6] key.

The Sector Blank Menu will appear.

5 **Select the number you want to make sector blank, pressing the numeric keys [4] to [6].**

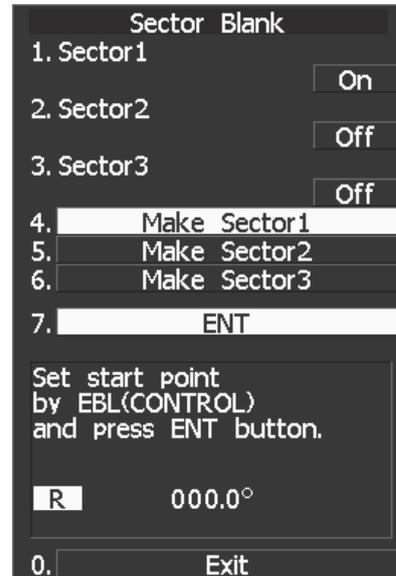
The sector blank for the numeric key pressed will be made.

6 **Set the start point of the sector blank by operating the [EBL] dial, and then press 7 ENT.**

The start angle of the sector blank will be set.

7 **Set the end point of the sector blank by operating the [EBL] dial, and then press 7 ENT.**

The end angle of the sector blank will be set.

**Exit**

1 **Press [RADAR MENU] key.**

The Main Menu will reappear.

7.3.3 TNI Blank Setting (TNI Blank)

Set a sector and stop tuning operation in the bearing.

If a structure such as the mast is close to the radar antenna, automatic tuning operation may become unstable. In this case, set a TNI blank in the direction of the structure in order to stabilize the tuning operation.

Only one TNI blank sector can be created. The TNI blank function operates in the relative bearing with the bow.

Note: This function can be performed only when the scanner is connected to NKE-2043, NKE-2063A, NKE-2103, and NKE-2254.

[!] TNI Blank Function On/Off (Sector)

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

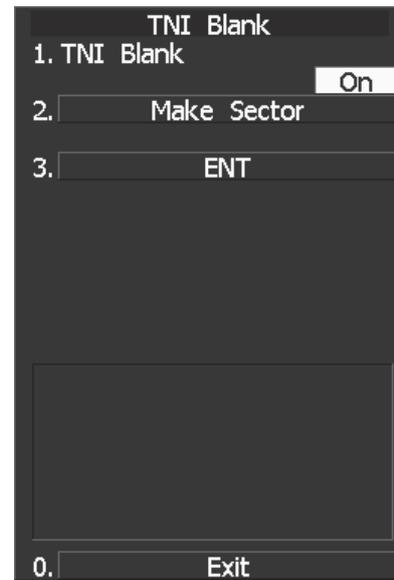
The Adjust Menu will appear.

- 4 Press the following keys.

- 4 TXRX Setting
- 9 TNI Blank
- 1 TNI Blank

On: The TNI blank function is operated.

Off: The TNI blank function is stopped.



[II] TNI Blank Area Creation (Make Sector)**Procedure**

1. Transmit the radar.
2. Hold down [RADAR MENU] key.

The Code Input Menu will appear.

3. Press [0] key.
4. Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

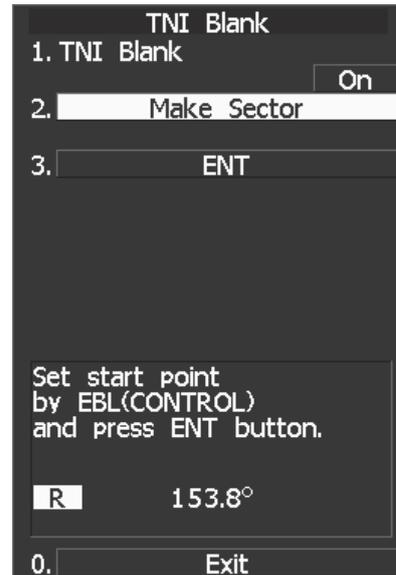
5. Press the following keys.

4 TXRX Setting
9 TNI Blank
2 Create sector

6. Set the starting bearing of the TNI blank by operating the [EBL] dial, and press the [ENT] key.

7. Set the ending bearing of the TNI blank by operating the [EBL] dial, and press the [ENT] key.

The TNI blank area is set.

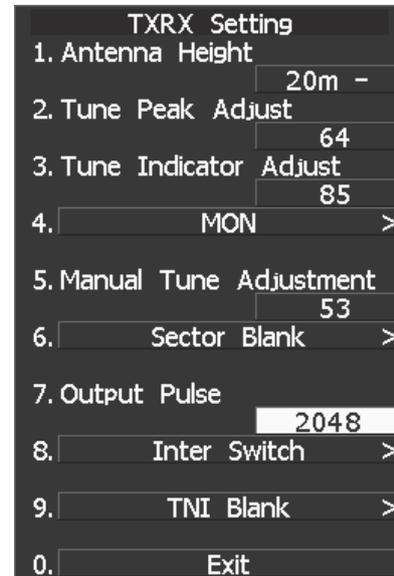


7.3.4 Bearing Pulse Output Adjustment (Output Pulse)

Set the output value of bearing pulse. This radar can set the output value to 2048 pulses and 4096 pulses. This setting is allowed only when a 25 kw antenna is used.

Procedure

- 1 Hold down [RADAR MENU] key.**
The Code Input Menu will appear.
- 2 Press [0] key.**
- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**
The Adjust Menu will appear.
- 4 Press [4] key.**
The TXRX Setting Menu will appear.
- 5 Press [7] key.**
- 6 Select a set value to be used.**



Exit

- 1 Press [RADAR MENU] key.**
The Main Menu will reappear.

7.3.5 Language Setting (Language)

You can switch between Japanese and English.

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

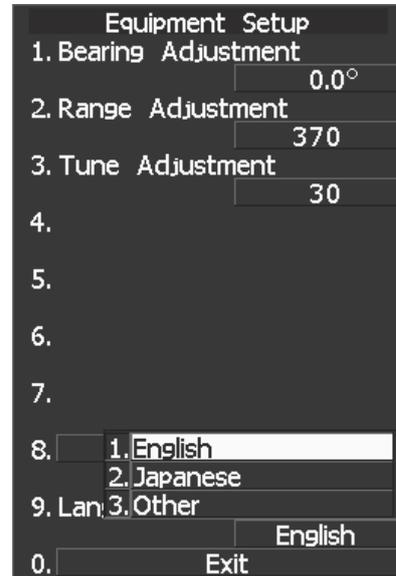
The Adjust Menu will appear.

- 4 Press [1].

The Equipment Setup window will appear.

- 5 Select the language you want to display, pressing the numeric keys [1] to [3].

1. English
2. Japanese
3. Other



“Other” in 3. is a language corresponding to characters created in overseas agents.

To confirm whether or not your language is supported, contact overseas agents or our sales department.

To make the set language effective, turn off the power supply and then restart.

Exit

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.

7.3.6 Date/Time Display Setting (Date/Time Setting)

In displaying the time, it is necessary to set the LOCAL TIME, LOCAL DATE and TIME ZONE. When the “ZDA” sentence of NMEA0183 is received, Date/Time is displayed automatically.

* If “ZDA” sentence is not received, the system internal clock function is used to display the date and time.

Procedure

1 Press [RADAR MENU] key twice.

The RADAR Menu will appear.

2 Open the following windows.

- 8 Open the Radar Sub Menu window.
- 4 Open the Data/Time Setting window.

3 Set information about date and time.

[1] UTC/LMT (Time display system)

Press [1] to switch the time mode between:

- UTC: Universal Time Coordinate
- LMT: Local Time

[2] LMT Date

Input the date in local time.

Press [2] key and call up the numeric keypad.

Input the date using the numeric keypad or the multi-dial. Then, press [ENT] button.

[3] LMT Time

Input the time in local time.

Input the time using the numeric keypad or the multi-dial. Then, press [ENT] button.

[4] Time Zone

Input the time-zone difference between the universal time and local time.

Input the time difference using the numeric keypad or the multi-dial.

Then, press [ENT] button.

[5] Display Style

Set one of the following date display formats.

Press [5] key and select a date display format.

- | | |
|--------------|-----------------------|
| YYYY-MM-DD | Example: 2007-12-31 |
| MMM DD, YYYY | Example: Dec 31, 2007 |
| DD MMM, YYYY | Example: 31 Dec, 2007 |

Date/Time Setting	
1. UTC/LMT	UTC
2. LMT Date	2008-01-01
3. LMT Time	12:00
4. Time Zone	+00:00
5. Display Style	YYYY-MM-DD
0.	Exit

Exit

1 Press [RADAR MENU] key.

The menu will be closed.

Attention

- The “ZDA” sentence of NMEA0183 take precedence of the above setting.

7.4 ADJUSTMENT

This section describes the electrical adjustment procedures to be performed by service engineers during system installation.



CAUTION



Do not carry out the adjustments of the equipment except authorized service persons. If wrong setting is carried out, this may cause unstable operation.



Do not carry out the adjustments during navigation. Otherwise, the radar performance may be affected, resulting in an accident or trouble.

7.4.1 Noise Level Adjustment (Noise Level)

[!] Noise Level Adjustment for Signal Processing

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 When the Adjust Menu appears, press [8] key.

The SP/TT INIT Setup Menu will appear.

- 5 Press [1] key.

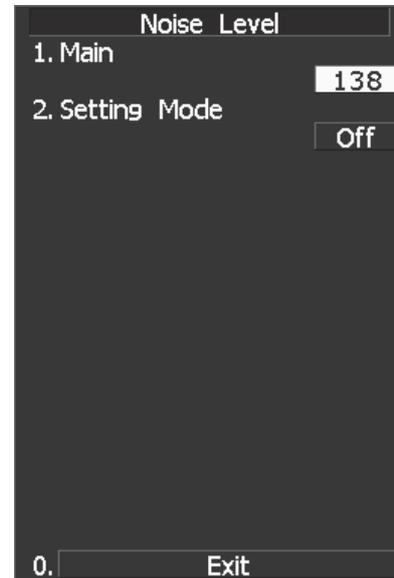
The Noise Level Menu will appear.

- 6 Press [1] key.

The Code Input Menu will open to change the noise level value.

- 7 Change the value to display echo correctly.

In addition to the entry on the Code Input menu, the Multi-functional Dial Control is available to change the value.



Note: The noise level is factory-set. After system installation, a great change in the noise level adjustment value should be avoided; it should be fine adjusted within ± 5 .

Exit

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.

[II] Noise Level Adjustment Mode (Setting Mode)**Procedure****1 Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

2 Press [0] key.**3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

4 When the Adjust Menu appears, press [8] key.

The SP/TT INIT Setup Menu will appear.

5 Press [1] key.

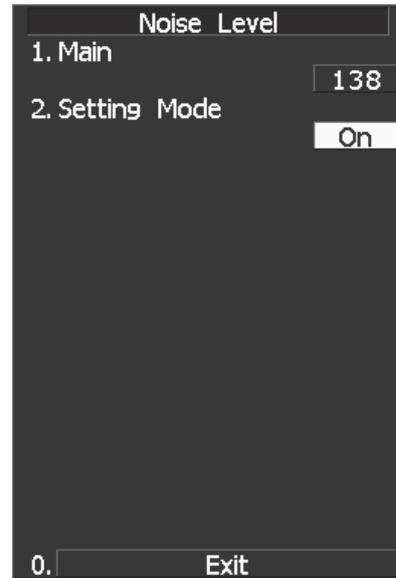
Noise Level Menu will appear.

6 Press [2] key.

The noise level adjustment mode is switched between on and off.

Factory-adjustment method

- The GAIN control is set to the maximum position, the SEA control is set to the minimum position, the RAIN control is set to the minimum position, and IR, AUTO-SEA, AUTO-RAIN, PROC, FUNC, and TRAILS are all set to off.
- The noise level adjustment mode is turned on.
- While the noise level adjustment value is decreased gradually, the value with which radar echoes no longer appear is determined as the set value.
- Ten is added to the set value (with which radar echoes no longer appear), and the result is set as the final noise level adjustment value.
- The noise level adjustment mode is turned off when the adjustment is finished.

**Exit****1 Press [RADAR MENU] key.**

The Main Menu will reappear.

7.4.2 Adjustment of Target Tracking Function (TT)



CAUTION



Optimal values have been set for Video Level and Vector Constant; therefore, never change their values unless absolutely necessary. Failure to comply may result in accidents that would lower target tracking performance.

[!] Vector Constant Adjustment (Vector Constant)

Adjust the vector follow-up performance of the target tracking function.
The vector constant is adjusted to an optimal value, so do not change it carelessly.

Attention

- **Do not change the set value carelessly.**
The vector constant shall be set to 4 normally. If the vector constant value is higher, a target's vector will be better followed up when the target and own ship change their course or speed, but the vector accuracy will be lower on the contrary.

Procedure

- 1 **Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 2 **Press [0] key.**

- 3 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 4 **Press [8] key while the Adjust Menu is open.**

The SP/TT INIT Setup Menu will appear.

- 5 **Press [2] key.**

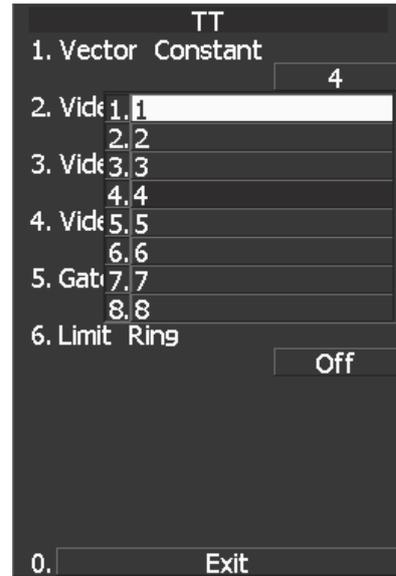
The TT Menu will appear.

- 6 **Press [1] key.**

The window for setting vector constants will appear.

- 7 **Select the value you want to set, pressing the numeric keys [1] to [8].**

To improve vector follow-up performance, increase the set value.
To stabilize vectors, decrease the set value.

**Exit**

- 1 **Press [RADAR MENU] key.**

The Main Menu will reappear.

[II] Quantization Level Adjustment (Video Level)

Use the target tracking function (TT) to adjust the level of the signal to be recognized as a target. If a small value is set, even weak target signals will be input to the target detection circuit of the target tracking function. However, many unnecessary signals are also input, which may cause unstable target acquisition or tracking. It is important to set a value four or five greater than the value with which unnecessary signals are detected. The quantization level is adjusted to an optimal value, so do not change it carelessly.

**CAUTION**

**Do not change the set quantization level carelessly.
If the level deviates from the proper value, the TT
acquisition and tracking functions will deteriorate.
Otherwise, this may cause accidents.**

Procedure

1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

2 Press [0] key.

3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

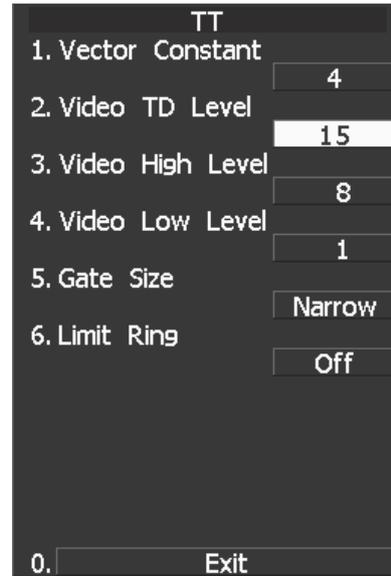
The Adjust Menu will appear.

4 Press [8] key while the Adjust Menu is open.

The SP/TT INIT Setup Menu will appear.

5 Press [2] key.

The TT Menu will appear.



- **To change the quantization level of the automatic acquisition area**

6 Press [2] key.

The numeric keypad for inputting the quantization level of the automatic acquisition area opens.

7 Enter the Video TD Level value.

The multi-function control can also be used to enter the value. After having entered the value, move the cursor onto the “ENT” button and press [ENT] key.

The quantization level can be entered using the numeric keypad, or the multi-function control knob. When entry is complete, set the cursor over the "ENT" button on the numeric keypad, and press [ENT].

You can set this value smaller to detect targets with weaker signals, but by doing so the unit may pick up unwanted signals that can cause the display of targets to be unstable. Setting this to a larger value can cause the unit to ignore weaker signals. Filtering out unwanted signals can stabilize the display of targets, but targets with weaker signals can be more difficult to detect.

- **To change the quantization level of tracking and manual acquisition**

6 Press [3] key.

The numeric keypad for inputting the quantization level of tracking and manual acquisition opens.

7 Enter the Video High Level value.

The multi-function control can also be used to enter the value. After having entered the value, move the cursor onto the “ENT” button and press [ENT] key.

The quantization level can be entered using the numeric keypad, or the multi-function control knob.

When entry is complete, set the cursor over the "ENT" button on the numeric keypad, and press [ENT].

You can set this value smaller to detect targets with weaker signals, but by doing so the unit may pick up unwanted signals that can cause the display of targets to be unstable. Setting this to a larger value can cause the unit to ignore weaker signals. Filtering out unwanted signals can stabilize the display of targets, but targets with weaker signals can be more difficult to detect.

Exit

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.

[III] Gate Size Adjustment (Gate Size)

Use the target tracking function (TT) to set a target search area.

The gate size is adjusted to an optimal value, so do not change it carelessly.

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the "ENT" button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [8] key while Adjust Menu is open.

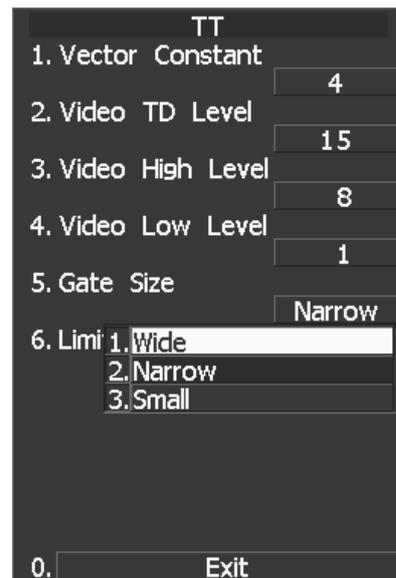
SP/TT INIT Setup menu opens.

- 5 Press [2] key.

TT menu opens.

- 6 Press [5] key and select a desired gate size.

Narrow: Small gate size
Normal: Medium gate size
Wide: Large gate size

**Exit**

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.

[IV] CPA Limit Ring Display On/Off (Limit Ring)

Use the target tracking function (TT) to determine whether to display the CPA limit for determining a dangerous ship. When the CPA limit ring display function is turned on and a relative vector is used, the CPA limit ring is displayed as a circle.

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [8] key while Adjust Menu is open.

SP/TT INIT Setup menu opens.

- 5 Press [2] key.

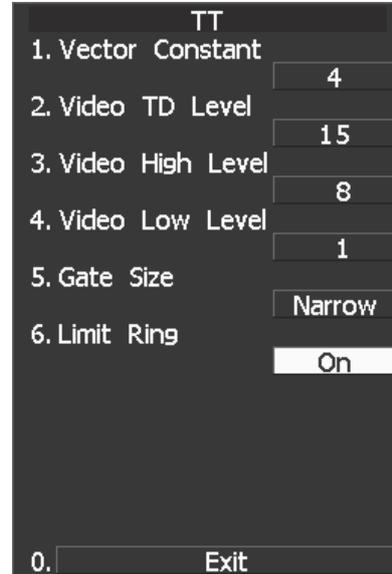
TT menu opens.

- 6 Press [6] key.

Activate or deactivate the CPA limit ring display function.

Off: Limit ring not displayed

On: Limit ring displayed



Exit

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.

7.4.3 Main Bang Suppression Adjustment (MBS Level)

Main Bang Suppression is adjusted to suppress main bang, a reflection signal from 3D circuit including wave guide tube, that generally appears as a circular image focusing on the center of the radar display. Optimum adjustment allows main bang image to remain lightly on the display.

This adjustment is made for settings in the processing circuit of the display unit.



WARNING



Do not change MBS Level/Area unless absolutely necessary.

Incorrect adjustment may erase targets in point-blank range and cause collision, resulting in death or serious injury.

Procedure

1 Perform the following operation before setting.

- Set the range to 0.125 nm.
- Set the radar video enhance function (ENH).
- Set the correlation processing function (PROC) to OFF.
- Rotate [AUTO-RAIN] control to the minimum position (counterclockwise fully).
- Rotate [GAIN/PL] control to the maximum position (clockwise fully).
- Rotate the [AUTO-SEA] control to achieve the strength with which main bang can be judged.

2 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

3 Press [0] key.

4 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

5 Press [8] key.

The SP/TT INIT Setup Menu will appear.

6 Press [3] key.

The MBS Menu will appear.



7 Press [2] key.

The numeric keypad to be used in MBS Area Menu will appear.

8 Input “20” as an MBS Area setting value.

The value can also be entered with the multi-dial.
Press [ENT] key after inputting the value.

9 Input [1] key.

The numeric keypad to be used in MBS Level Menu will appear.

10 Input an MBS Level setting value such that the main bang image remains lightly on the display.

The value can also be entered with the multi-dial.
Press [ENT] key after inputting the value.

11 Press [2] key.

The numeric keypad to be used in MBS Area Menu will appear.

12 Input an MBS area setting value such that the suppression area and the main bang image completely overlap with each other.

The value can also be entered with the multi-dial.
Press [ENT] key after inputting the value.

Exit

1 Press [RADAR MENU] key.

The Main Menu will reappear.

7.4.4 Adjustment of Performance Monitor (NJU-85)

After replacement of either of the following units, adjust the performance monitor according to the procedure in this section:

- Performance monitor
- Antenna unit

*A Performance Monitor unit is necessary to carry out.

[I] Transmission Monitor Adjustment (MON Adjustment)

Adjust the circuit for monitoring the transmission performance of the radar equipment.

Procedure

1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

2 Press [0] key.

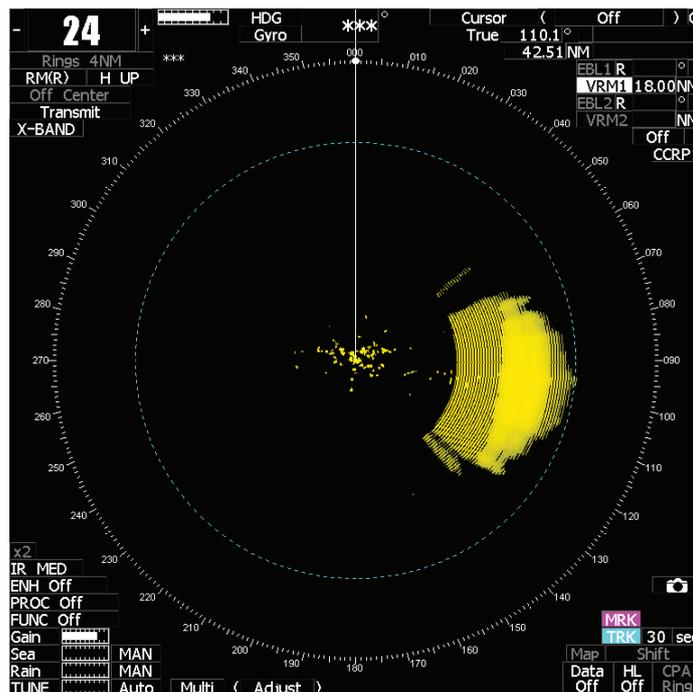
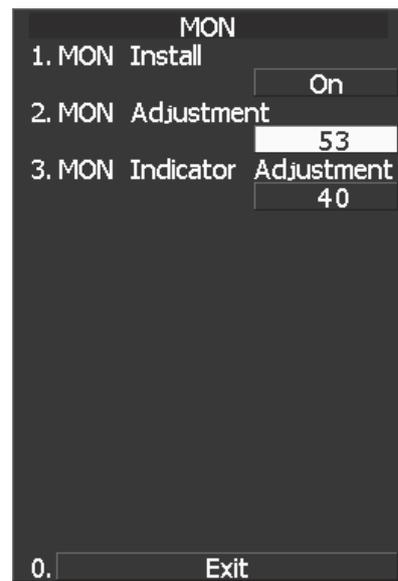
3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

4 Open Adjust Menu.

- 4 TXRX Setting
- 4 MON
- 2 MON Adjustment

5 Increase or decrease the adjustment value so that the farthest point of the performance monitor pattern touches the 18.0 nm line.



[II] Reception Monitor Adjustment (MON Indicator Adjustment)

Adjust the circuit for monitoring the reception performance of the radar equipment.

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

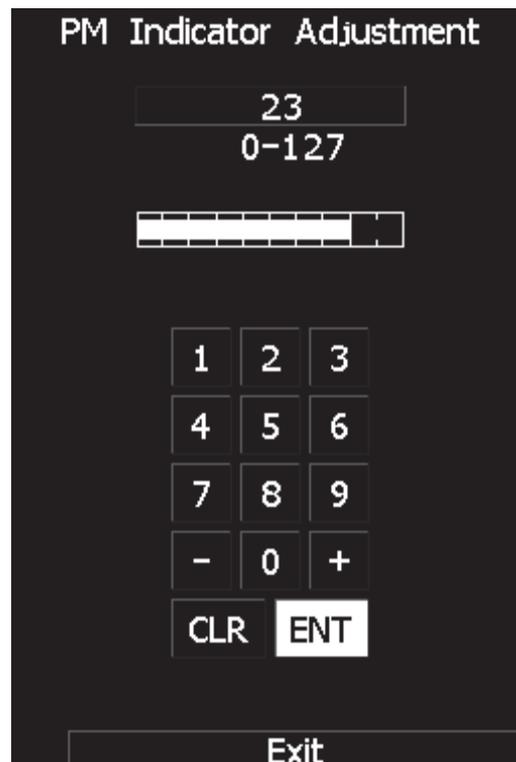
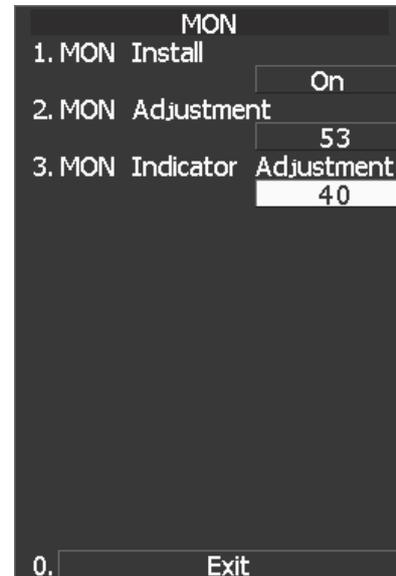
- 3 Move the cursor onto the "ENT" button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Open Adjust Menu.

4 TXRX Setting
4 MON
2 MON Indicator Adjustment

- 5 Increase or decrease the adjustment value so that the performance monitor level indicator will be adjusted to "8."



- 6 Press the **EXIT** button to close the adjustment menu.

Note: During performance monitor adjustment, all acquisitions by the target tracking function are released. The released target acquisitions are not recovered.

7.5 MAINTENANCE MENU

This item is provided for equipment maintenance, including settings of antenna safety switch, master reset, etc.

 CAUTION	
	Only our service engineers are to make the adjustment. Neglecting this caution may cause accidents and failures.
	Do not make the adjustments during navigation. Otherwise, adjustments may affect the radar functions, causing accidents and failures.

7.5.1 Scanner Safety Switch Setting (Safety Switch)

Use this switch to measure the transmission/reception performance while the antenna is in stopped state.

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [2] key.

The Maintenance Menu will appear.

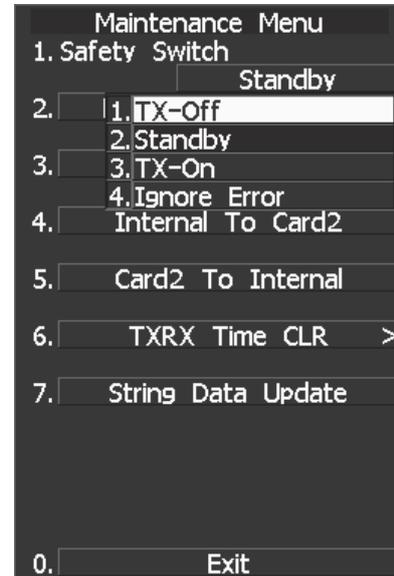
- 5 Press [1] key.

Setting items for the scanner safety switch will appear.

- 6 Select the item you want to set, pressing the numeric key [1] to [4].

1. TX OFF:
Stops transmission. (The screen remains in the transmission status.)
2. STANDBY: (Normal setting)
Stops transmission. (The screen switches to the standby status)
3. TX-ON:
Continues transmission without changes. (The display unit remains in transmission state.)
(However, errors in bearing signals etc. are to occur due to safety switch-off.)
4. IGNORE ERROR:
Continues transmission without changes.(Errors in bearing signals etc. due to safety switch-off are also ignored.)

- 7 Change the setting back to **2. Standby** when the work is finished.



Exit

- 1 Press [RADAR MENU] key.

The Main Menu will reappear.

7.5.2 Initialization of Memory Area (Area Initial)

If system operation is unstable, it may be stabilized by initializing the memory area. To initialize the memory area, follow the procedure in this section. The memory area is reset to the factory setting when initialized.

[1] Partial Master Reset

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [2] key.

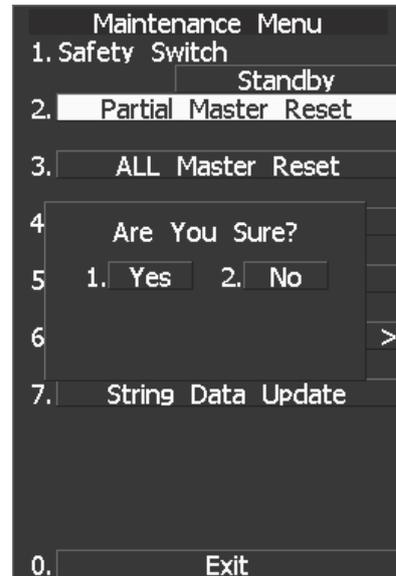
The Maintenance Menu will appear.

- 5 Press [2] key.

The Partial Master Reset Execution Check window will appear.

- 1 YES: Execution of Partial Master Reset
- 2 NO: Cancellation

The memory areas of specified items are initialized, and the system is restarted.



[II] All Master Reset (All Master Reset)

Procedure

1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

2 Press [0] key.

3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

4 Press [2] key.

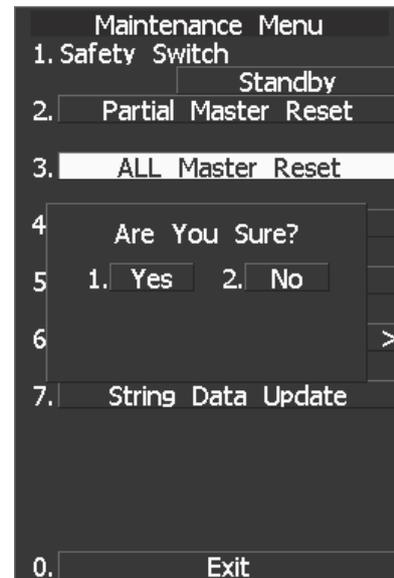
The Maintenance Menu will appear.

5 Press [3] key.

The All Master Reset Execution Check window will appear.

- 1 YES: Execution of All Master Reset
- 2 NO: Cancellation

The whole memory area is initialized, and the system is restarted.



7.5.3 Save of Internal Memory Data (Card2)

The system can save internal memory data such as item settings in menus onto a flash memory card. If the radar processing circuit in the system has been replaced, the set values before the circuit replacement can be restored by reading the set values you saved before the replacement.

To save the internal memory data onto a flash memory card (option), the card must be inserted in card slot beforehand.

The data which are saved : Setting in menus, Trails of own ship (7000 points), Track of other ship (20 target x 1500 points, TT option), user map (256 points), etc.

The data which always changes (for example Radar echo, etc) are not saved.

[!] Copying of Internal Settings onto Card (Internal to Card)

Save the internal memory data, such as item settings in menus, onto a flash memory card.

The internal memory data should be saved at completion of system setting, and the operation condition should be saved periodically.

Procedure

- 1 **Insert a flash memory card into the CARD slot 2.**

The lower slot is slot 1; the upper slot is slot 2.

- 2 **Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 3 **Press [0] key.**

- 4 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 5 **Press [2] key.**

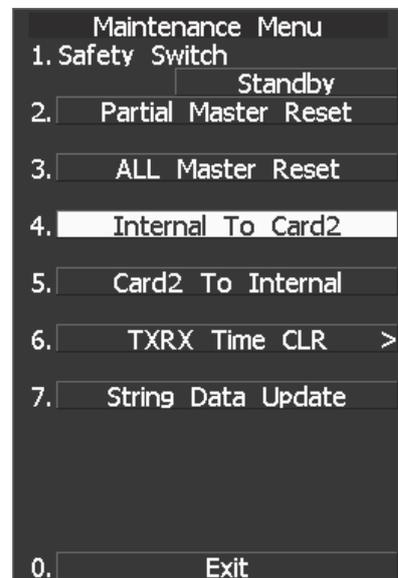
The Maintenance Menu will appear.

- 6 **Press [4] key.**

The execution check window will open to check whether or not you want to copy the internal settings to Card2.

- 1 YES: Execution of copy
- 2 NO: Cancellation

If YES is selected, the internal memory data is saved on the flash memory card.



Exit

- 1 **Press [RADAR MENU] key.**

The Main Menu will reappear.

[II] Reading of Internal Settings from Card (Card to Internal)

Read the saved memory data from the flash memory card into the system memory.

Perform the read operation in order to return the system to the previous operation condition after replacement of the radar processing circuit in the system.

Procedure

- 1 Insert the memory flash card, in which internal settings have been saved, into Card slot 2.**

The lower slot is slot 1; the upper slot is slot 2.

- 2 Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 3 Press [0] key.**

- 4 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 5 Press [2] key.**

The Maintenance Menu will appear.

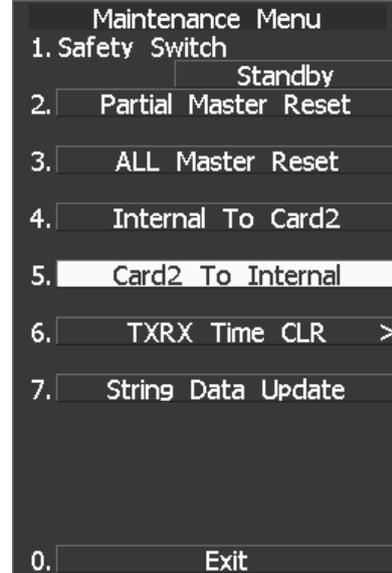
- 6 Press [5] key.**

The execution check window will open to check whether or not you want to read the internal settings from Card2.

- 1 YES: Read
- 2 NO: Cancellation

If YES is selected, the memory data is read from the flash memory card into the system memory.

After the internal memory area is updated, the system is restarted.



7.5.4 Update of Character String Data (String Data Update)

The system is designed to transfer and display external character strings as the second language display. The second language is factory-set to "Japanese."

Ask our agent or sales department for the supply of character strings to be updated.

To update character strings, the flash memory card (option) containing the character string file must be inserted in card slot 2.

Procedure

1 Insert a flash memory card containing character string data into CARD slot 2.

2 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

3 Press [0] key.

4 Move the cursor onto the "ENT" button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

5 Press [2] key.

The Maintenance Menu will appear.

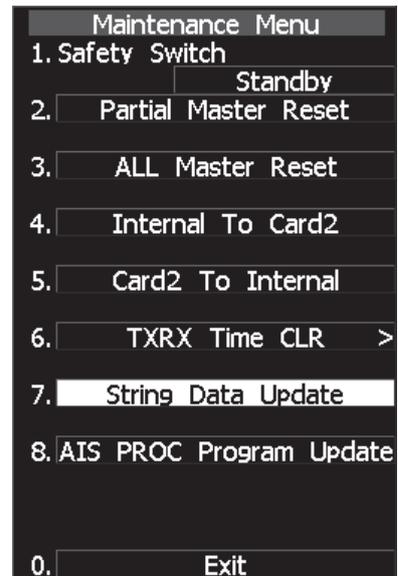
6 Press [7] key.

A dialog appears asking if you wish to load the character string data from Card2.

- 1 YES : Load data.
- 2 NO : Cancel.

If YES is selected, the character string file on the flash memory card is read into the system, and the second language area is updated.

To display the read character strings in the second language, select Other in the menu shown in Section 7.3.5 "Language Setting (Language)".



7.5.5 Clear of Antenna Operation Time (TXRX Time CLR)

The system adds up the following operation time and contains it in the antenna unit:

- Transmission time
- Motor run time

Clear the above total time when the magnetron or antenna unit motor is replaced.

[I] Transmission Time Clear (TX Time Clear)

Clear the transmission time of the antenna unit.

Perform the following procedure to clear the transmission time when the magnetron is replaced.

Procedure

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the "ENT" button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [2] key.

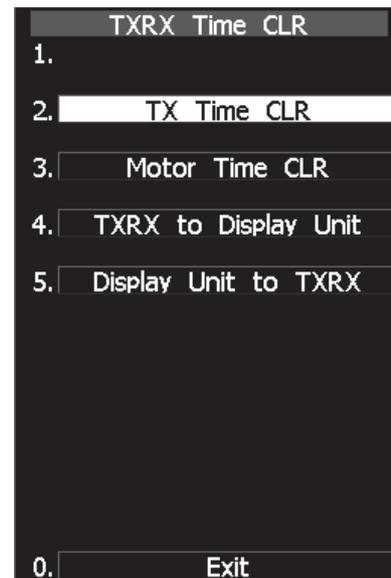
The Maintenance Menu will appear.

- 5 Press [6] key.

Press [2] key.

6. Select Yes in the Transmission Time Clear Confirmation Window.

The transmission time in the antenna's internal control circuit is cleared to 0.



[II] Motor Run Time Clear (Motor Time Clear)

Clear the transmission time of the antenna unit.

Perform the following procedure to clear the transmission time when the magnetron is replaced.

Note: This function can be performed only when the scanner is connected to NKE-2043, NKE-2063A, NKE-2103, and NKE-2254.

Procedure**1 Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

2 Press [0] key.**3 Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

4 Press [2] key.

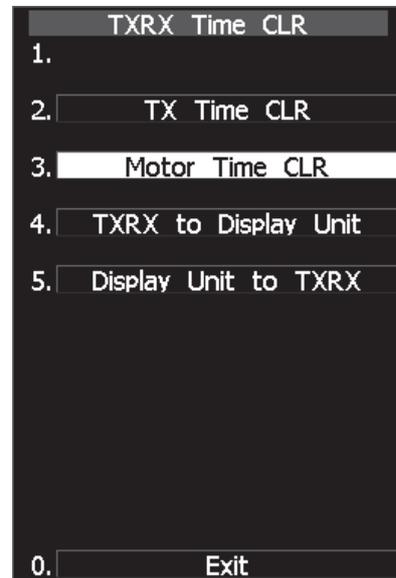
The Maintenance Menu will appear.

5 Press [6] key.

Press [3] key.

6. Select Yes in the Motor Run Time Clear Confirmation Window.

The motor run time in the antenna's internal control circuit is cleared to 0.



[III] Antenna -> Display Unit (TXRX to Display Unit)

Save the following antenna time data from the antenna unit into the display unit.

- Antenna's operating hours
- Transmission time
- Motor run time

Perform the following procedure to inherit the antenna time data when the antenna's internal control circuit is replaced.

1. Saving the antenna time data
2. Replacing the antenna's internal control circuit
3. Restoring the antenna time data

Note: This function can be performed only when the scanner is connected to NKE-2043, NKE-2063A, NKE-2103, and NKE-2254.

Procedure

- 1 Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 2 Press [0] key.**

- 3 Move the cursor onto the "ENT" button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 4 Press [2] key.**

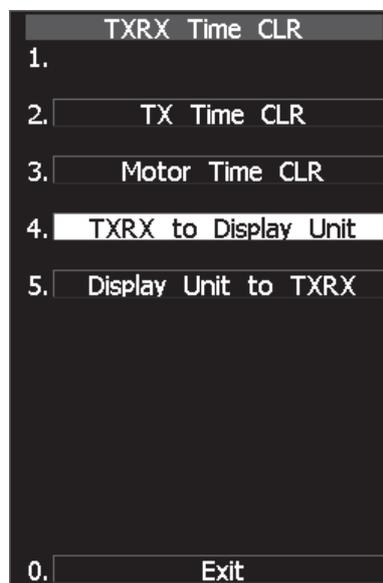
The Maintenance Menu will appear.

- 5 Press [6] key.**

Press [4] key.

- 6. Select Yes in the Antenna -> Display Unit Confirmation Window.**

The antenna time data in the antenna's internal control circuit is saved transferred to the display unit.



[IV] Display Unit -> Antenna (Display Unit to TXRX)

Restore the antenna time data from the display unit into the antenna's internal control circuit.
Perform the following procedure to inherit the antenna time data when the antenna's internal control circuit is replaced.

1. Saving the antenna time data
2. Replacing the antenna's internal control circuit
3. Restoring the antenna time data

Note: This function can be performed only when the scanner is connected to NKE-2043, NKE-2063A, NKE-2103, and NKE-2254.

Procedure

- 1 Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 2 Press [0] key.**

- 3 Move the cursor onto the "ENT" button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 4 Press [2] key.**

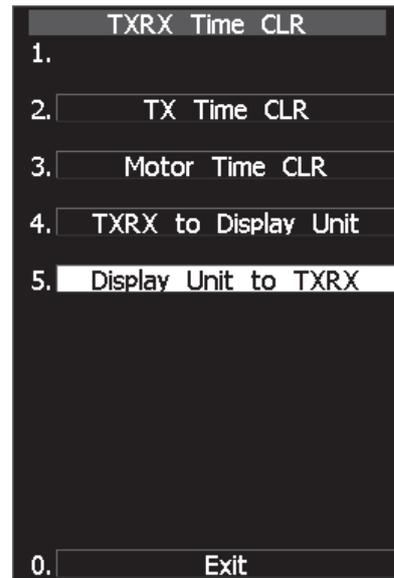
The Maintenance Menu will appear.

- 5 Press [6] key.**

Press [4] key.

- 6. Select Yes in the Display Unit -> Antenna Confirmation Window.**

The antenna time data in the display unit is restored transferred to the antenna's internal control circuit.



7.5.6 Update of AIS Processor Program (AIS PROC Program Update)

AIS processor programs can be updated by using a flash memory card. In order to update AIS processor programs, the flash memory card (optional) containing the update program file must be inserted in the card slot 2 beforehand.

[I] Transmission Time Clear (TX Time Clear)

Clear the transmission time of the antenna unit.

Perform the following procedure to clear the transmission time when the magnetron is replaced.

Procedure

- 1 **Insert the flash memory card, containing the update program file for AIS processor programs, into the CARD slot 2.**

- 2 **Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 3 **Press [0] key.**

- 4 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 5 **Press [2] key.**

The Maintenance Menu will appear.

- 6 **Press [8] key.**

The window asking whether to update AIS processor programs and whether to execute character strings will open.

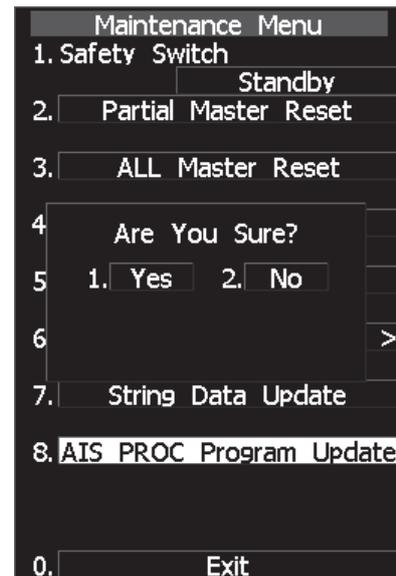
1 YES: Program update execution
2 NO: Program update cancel

When 1. YES is selected:

The AIS processor programs on the flash memory card are updated read into the equipment.

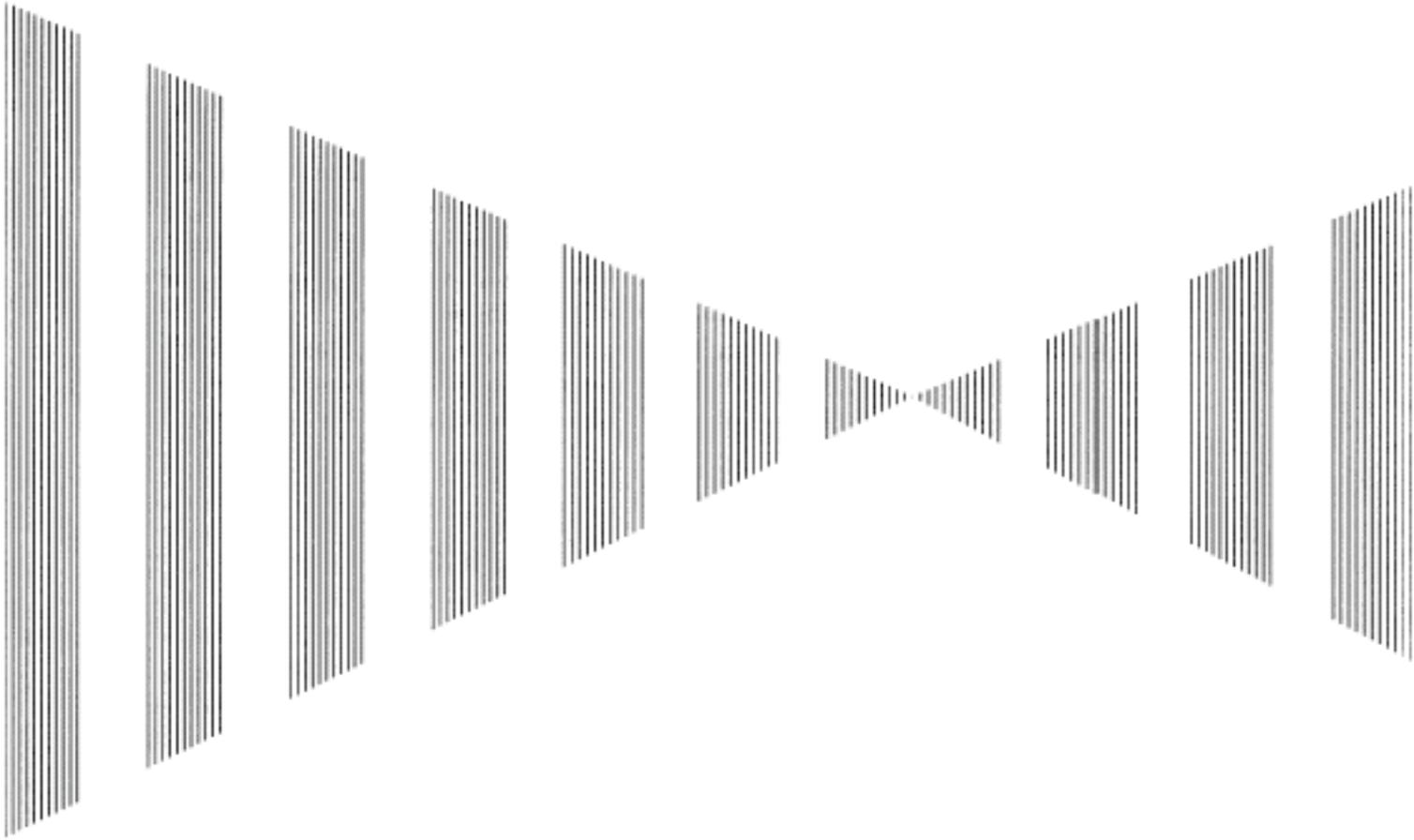
Follow the displayed instructions during program update.

Do not turn off this equipment during program update.



SECTION 8

MAINTENANCE AND INSPECTION



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8.1 ROUTINE MAINTENANCE

DANGER



Never carry out internal inspection or repair work of the equipment by users.

Inspection or repair work by unauthorized personnel may result in fire hazard or electric shock.

Ask the nearest branch, business office or a dealer for inspection and repair.



Turn off the main power before maintenance work. Otherwise, an electric shock may result.



Turn off the main power before cleaning the equipment. Especially, make sure to turn off the indicator if a rectifier is used. Otherwise, equipment failure, or death or serious injury due to electric shock may result, because voltage is outputted from the rectifier even when the radar is not operating.

For operating the radar equipment in the good conditions, it is necessary to make the maintenance work as described below. If maintenance is made properly, troubles will reduce. It is recommended to make regular maintenance work.

Common points of maintenance for each unit are as follow:

Clean the equipment.

Remove the dust, dirt, and sea water rest on the equipment cabinet with a piece of dry cloth. Especially, clean the air vents with a brush for good ventilation.

8.2 MAINTENANCE ON EACH UNIT

8.2.1 Scanner Unit NKE-2043/2062/2063A/2103/2254

DANGER



When conducting maintenance work on the antenna, make sure to turn its main power off.

Failure to comply may result in electrocution or injuries.



Make sure to turn off the antenna operation switch.

Failure to comply may result in injuries caused by physical contact with the rotating antenna.



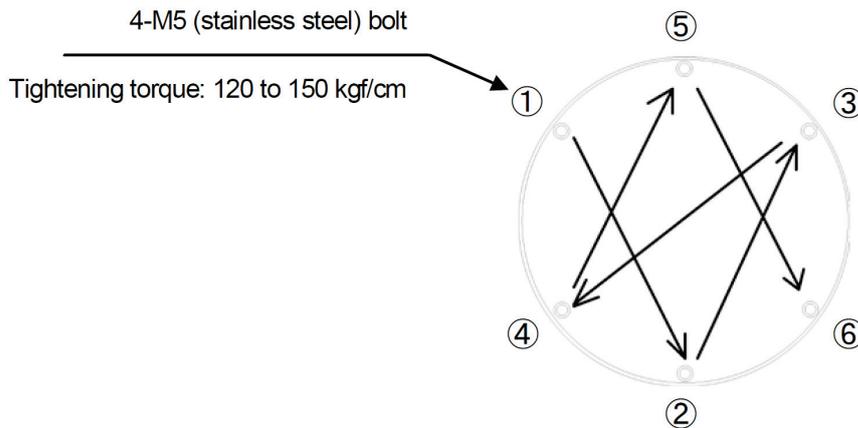
Do not touch the radiator. Even if the power is turned off, the radiator may be rotated by the wind.

After the work, turn "ON" the scanner unit safety switch.

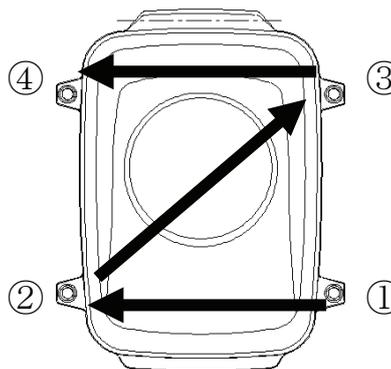
Precautions in Mounting the Cover

When the cover is removed for regular checkup and replacement of parts and refitted after such work, the procedure of fastening bolts shall be taken with the following precautions:

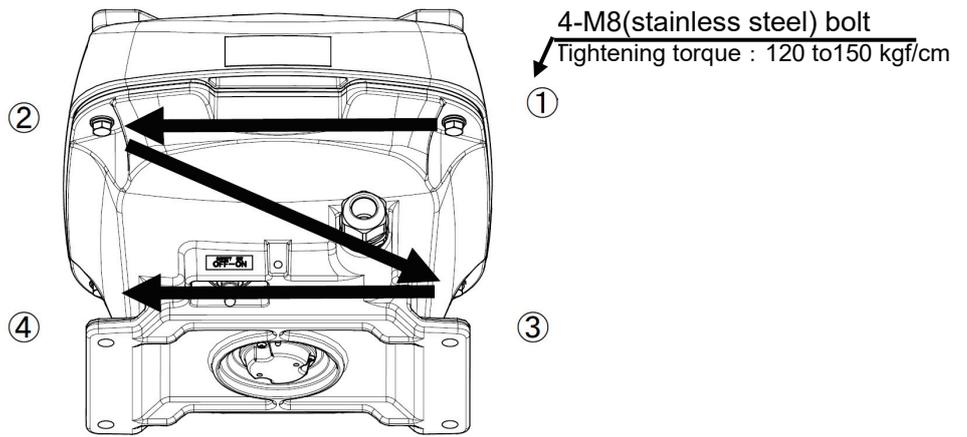
- (a) The proper fastening torque of the fitting bolts (M8) is 1176 to 1470 N•cm (120 to 150kgf•cm) (which makes the inside water-tight and protects the packings against permanent compressive strain). The packings start producing from the cover at a torque of approximately 1470N•cm (150kgf•cm). Do not fasten the bolts with a torque exceeding the specified value. Otherwise, the screws may be broken.
- (b) Use an offset wrench of 11 mm × 13 mm or a double-ended wrench of 13 mm × 17 mm (not longer than 200 mm).
- (c) Screw all the bolts by hand first to prevent them playing, then fasten them evenly in order not to cause one-sided fastening. (Fasten the bolts with 25% of the required torque at the first step.)



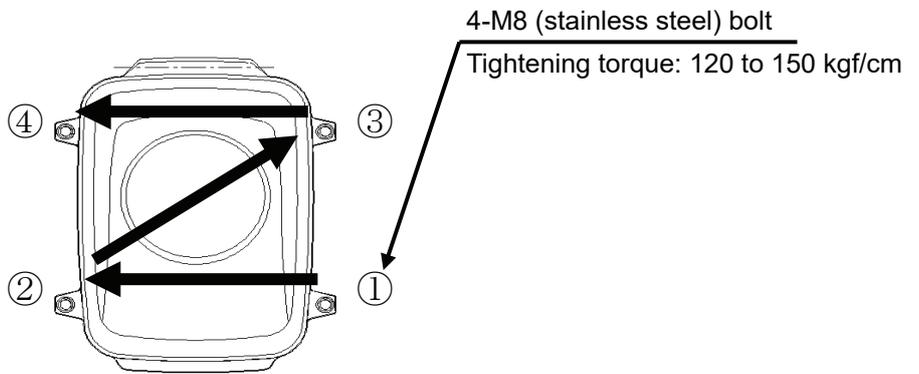
Bolt Tightening Procedure of NKE-2043 Cover



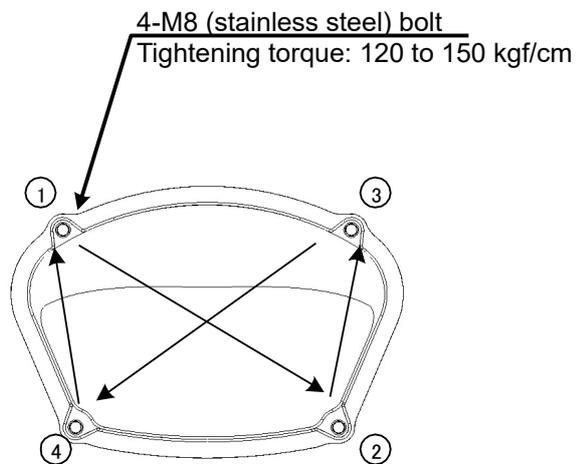
Bolt Tightening Procedure of NKE-2062 Cover



Bolt Tightening Procedure of NKE-2063A Cover



Bolt Tightening Procedure of NKE-2103 Cover



Bolt Tightening Procedure of NKE-2254 Cover

(1) Radiator

Attention

- **If the radiator front face (radiation plane) is soiled with smoke, salt, dust, paint or birds' droppings, wipe it with a piece of soft cloth wetted with alcohol or water and try to keep it clean at all times. Otherwise, radar beam radiation may attenuate or reflect on it, resulting in deterioration of radar performance.**
- **Never use solvents of gasoline, benzene, trichloroethylene and ketone for cleaning.**

Check up and clean the radiator.

(2) Rotating section

(a) Oiling gears

Apply grease evenly to the tooth surfaces of the main shaft drive gear and the encoder drive gear with a spreader or brush. Oiling in short intervals is more effective to prevent the gears from wear and tear and extend their service life, but oil at least every six months.
Use Mobilux2 of Mobile Oil.

(b) Mounting legs

Check the mounting legs and mounting bolts of the scanner unit case for corrosion at intervals and maintain them to prevent danger. Apply paint to them once a half year because painting is the best measure against corrosion.

8.2.2 Display Unit NCD-4380



When cleaning the screen, do not wipe it too strongly with a dry cloth. Also, do not use gasoline or thinner to clean the screen. Otherwise the screen surface may be damaged.

Dust accumulated on the screen will reduce clarity and darken the video. For cleaning it, wipe it with a piece of soft cloth (flannel or cotton). Do not wipe it strongly with a piece of dry cloth nor use gasoline or thinner.

8.3

PERFORMANCE CHECK

Make operational check on the radar equipment regularly and if any problem is found, investigate it immediately. Pay special attention to the high voltage sections in checking and take full care that no trouble is caused by any error or carelessness in measurement. Take note of the results of checking, which can be used effectively in the next check work.

Operational check shall be made in accordance with Table 8-1 Function Check List in the order as specified in it.

Table 8-1 Check List

Equipment	Item to be checked	Criteria	Remarks
Transmitter-receiver Unit	Tuning LED of Receiver	The LED is lighting during operation	48NM range
Display Unit	Video and echoes on the screen Sensitivity LCD brilliance can be controlled correctly Various markers Various numerical indications Lighting	Can be correctly controlled	
	Safety Switch Various Currents and Voltages	Refer to [II] in Section 8.3.1.1	
	Communications Lines	Refer to [III] in Section 8.3.1.1	
	Memory	Refer to [I] in Section 8.3.1.1	
	Panel	Refer to Section 8.3.1.3	
	Monitor	Refer to Section 8.3.1.2	
	TT	Refer to Section 5.2.7	
	Magnetron current	Refer to Section 8.3.1.7	
	Performance Monitor	Refer to Section 8.3.1.4	
	Error Logging Display	Refer to Section 8.3.1.5	
	System Information Display	Refer to Section 8.3.1.6	

8.3.1 Test Menu

The performance status of this radar equipment can be checked on the TEST Menu.

Self Test	[I] Self-diagnostic function
Monitor Test	[II] Monitor check
Keyboard Test	[III] Operation panel check
MON Display	[IV] Performance monitor
Error Logging	[V] Error log display
System INFO	[VI] System information display
MAGI	[VII] Indication of magnetron current

* Execution of MON Display requires a performance monitor unit NJU-85.

Procedure

- 1 Press [RADAR MENU] key twice.

Press [8] key.

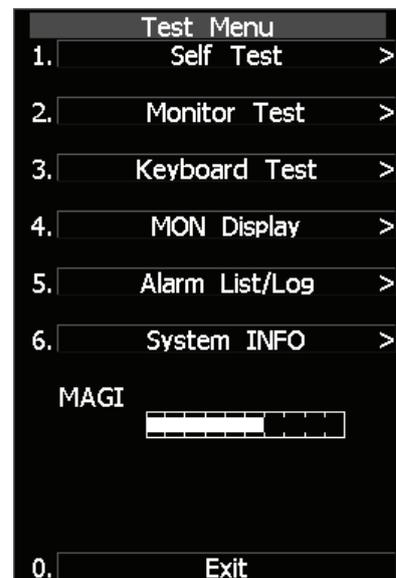
Press [9] key.

The TEST Menu will appear.

* Software button  located at the operation/message area in Section 2.3.9 is also available.

- 2 Select the check item you want to check, pressing the numeric keys [1] to [6] on Test Menu.

The list of check items will appear.



Exit

- 1 Press [RADAR MENU] key.

The TEST Menu will be closed.

8.3.1.1 Self-diagnosis function

Check of Memory, Scanner Unit, and Communications Lines

Memory Test	1) Memory check
Sensor Test	2) Antenna check
Line Test	3) Communication line check

Procedure

- 1 Press [1] key while the Test Menu is open.

The SELF TEST Menu will appear.

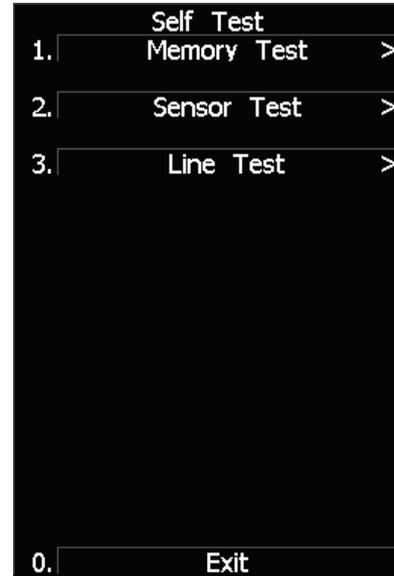
- 2 Select the item you want to check, pressing numeric keys [1] to [3] .

The SELF CHECK Menu will appear.

Exit

- 1 Press [RADAR MENU] key.

The Self Test Menu will be closed.



[1] Memory Test

Checks for the performance of built-in memory.

SDRAM	SDRAM check
SRAM	SRAM check
FLASH ROM	Flash ROM check
GRAPHIC	Graphic check

Procedure

- 1 Press [1] key while the Self Test menu is open.

The Memory Test Menu will appear.

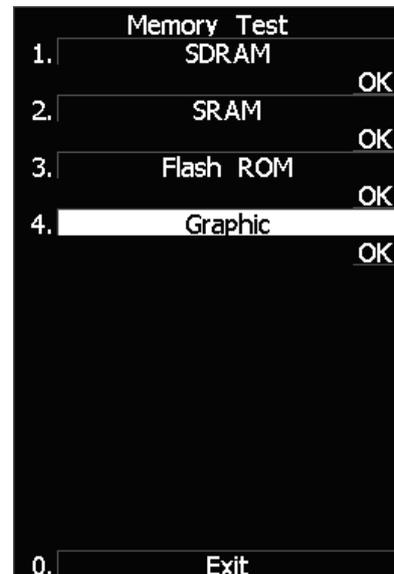
- 2 Select the item you want to check, pressing numeric keys [1] to [4].

When no abnormality is found, OK is displayed.
When an abnormality is found, NG is displayed.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.



[II] Sensor Test

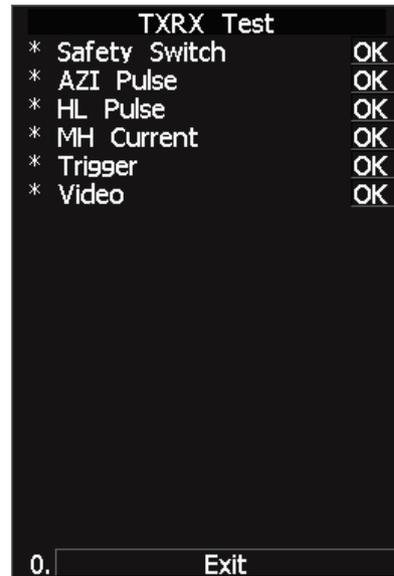
Checks for signals from the antenna.

Safety Switch	Antenna's safety switch check
AZI Pulse	Antenna rotation signal check
HL Pulse	Heading line signal check
MH Current	Check on the load current of high voltage in the modulator
Trigger	Radar trigger signal check
Video	Radar video check

Procedure

- 1 Press [2] key while the Self Test menu is open.

The Sensor Test menu will appear.
 When no abnormality is found, OK is displayed.
 When an abnormality is found, NG is displayed.
 In standby, * * will appear.



Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

[III] Check of Communication Lines (Line Test)

Check communication with operational devices and external navigators.

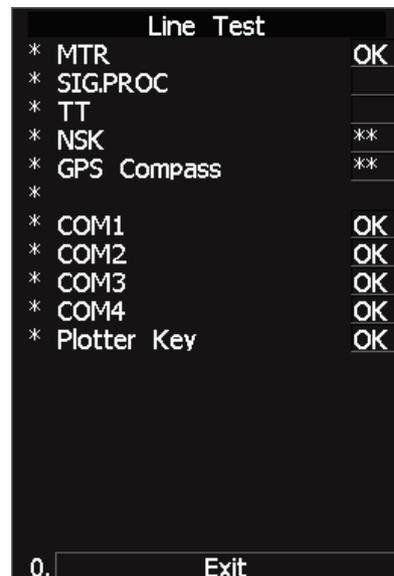
MTR	Check on connection with the transmitter-receiver
NSK	Check on connection with the NSK unit
GPS Compass	Check on connection with the GPS compass
COM1	Check on connection with COM1
COM2	Check on connection with COM2
COM3	Check on connection with COM3
COM4	Check on connection with COM4
Plotter Key	Check on connection with Plotter Key.

Procedure

- 1 Press [3] key with the Self Test menu open.

The Line Test menu will appear.
 When no abnormality is found, OK is displayed.
 When an abnormality is found, NG is displayed.

The status display field of equipment not connected is * *.



Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

8.3.1.2 Monitor Test

Checks for the display.
The test pattern will be shown on the display.

Procedure

- 1 Press [2] key while the Test Menu is open.

The Monitor Test Menu will appear.

- 2 Select the item number you want to display, pressing numeric keys [1] to [5] of the test pattern.

The selected test pattern will be displayed.

Pattern 1: All colors are filled with white.

Pattern 2: A white box is displayed on the black background of 1024 × 768 dots.

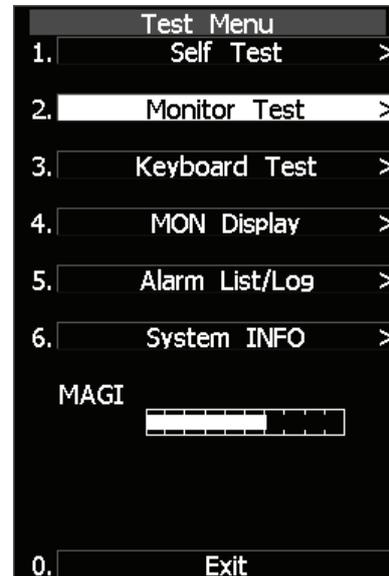
Pattern 3: Displays rectangle × 2, circle × 2, and cross-shape × 13 (white lines on the black background).

Pattern 4: Displays “H” of 9 dots × 9 dots on the entire screen (white character on the black background).

Pattern 5: Gray scale display (16 levels)

Pattern 6: Displays a color bar.

Pattern 7: The square figure of a specified RGB value is shown at the center of the display.



- 3 To return to the original display, press any key.
If Pattern7 is selected, resetting is performed by pressing the CLR button.

If errors occur in the monitor, no test pattern will appear.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

8.3.1.3 Operation Panel Test

Checks for the controls and switches of the operation panel.

Key Test	1) Key check
Buzzer Test	2) Buzzer check
Light	3) Keyboard light check

Procedure

- 1 Press [3] key while the Test Menu is open.

The Keyboard Test Menu will appear.

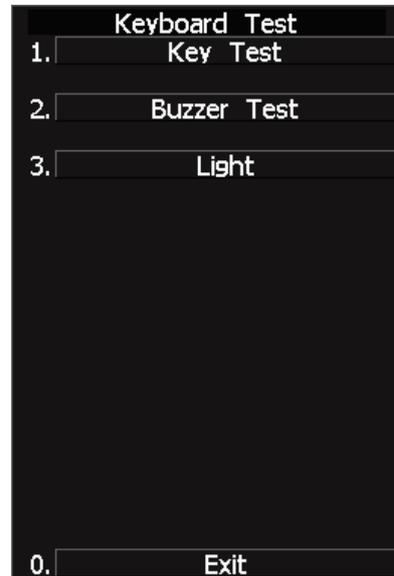
- 2 Select the item number you want to check, pressing numeric keys [1] to [3] of the item.

The check contents will be displayed.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.



[I] Key Check

Checks for the controls and switches of the operation panel.

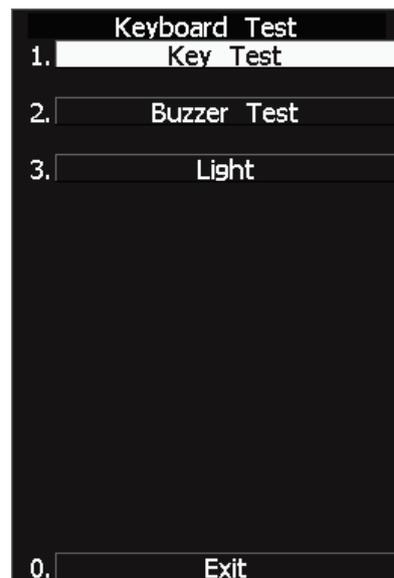
Procedure

- 1 Press [1] key while the Keyboard Test menu is open.

The operation panel image will appear at the upper left of the display.

Each key on the operation panel on the display is shown in reverse video at the same time the key is pressed, and the name of the pressed key is displayed.

- 2 To perform resetting, position the cursor to "EXIT" shown on the left side of the display, and press the [ENT] key or [0] key.



Exit

- 1 Press [0] key.

The menu will be closed.

[III] Buzzer Test

Checks for the operation panel buzzer.

Procedure

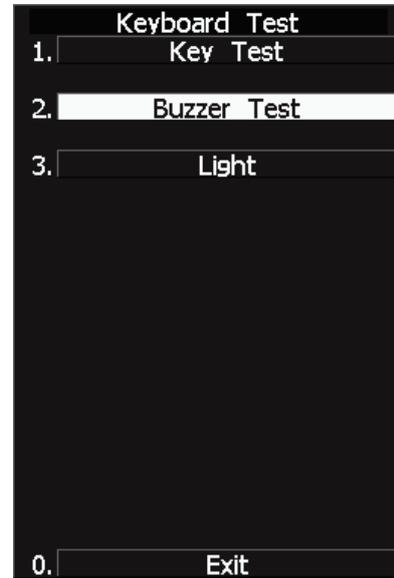
- 1 Press [2] key while the Keyboard Test menu is open.

The buzzer will sound.
- 2 The buzzer automatically stops after it sounds for a specified length of time.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.



[III] Light

Checks for the operation panel light.

Procedure

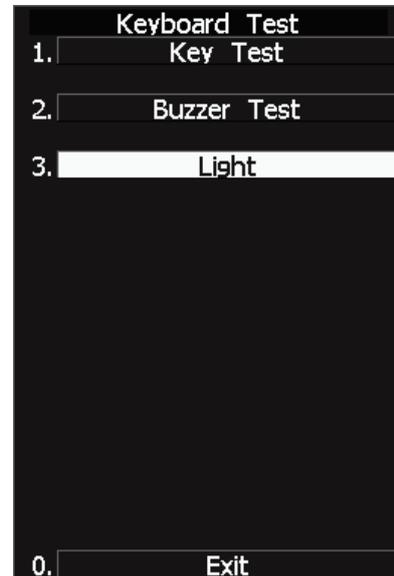
- 1 Press [3] key while the Keyboard Test menu is open.

The brightness of the operation panel is gradually intensified at four levels.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.



8.3.1.4 MON Display

The performance monitor status is shown.
 * A performance monitor unit is required.

Transmitter System Attenuation Value	Check attenuation in the transmitter system
Receiver System MON Pattern Range Attenuation Value	Check attenuation in the receiver system

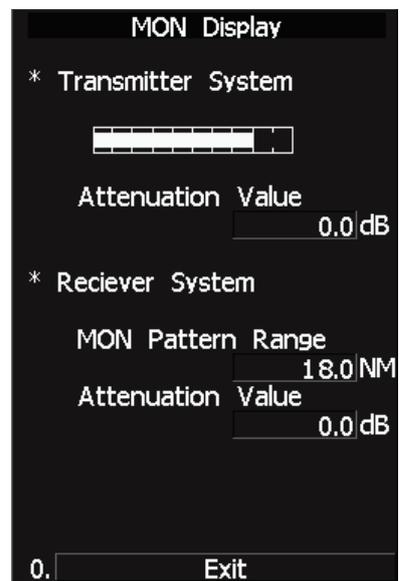
[I] Check the Transmitter

When the performance of magnetron is degraded, the attenuation will be strong.

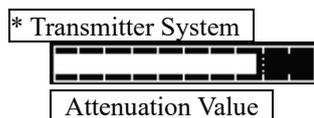
Procedure

- 1 Press [4] key while Test Menu is open.

MON Display menu opens.



- 2 Check the attenuation value.



(Initial value : 8.0)
 Normal operating range : -6.9dB to +2.0dB
 Performance degradation range : -15.0dB to -7.0dB

Note: About one minute after opening this menu item, check the transmitter attenuation value.

III] Check the Receiver System

When the performance of receive unit is degraded, the attenuation will be strong.

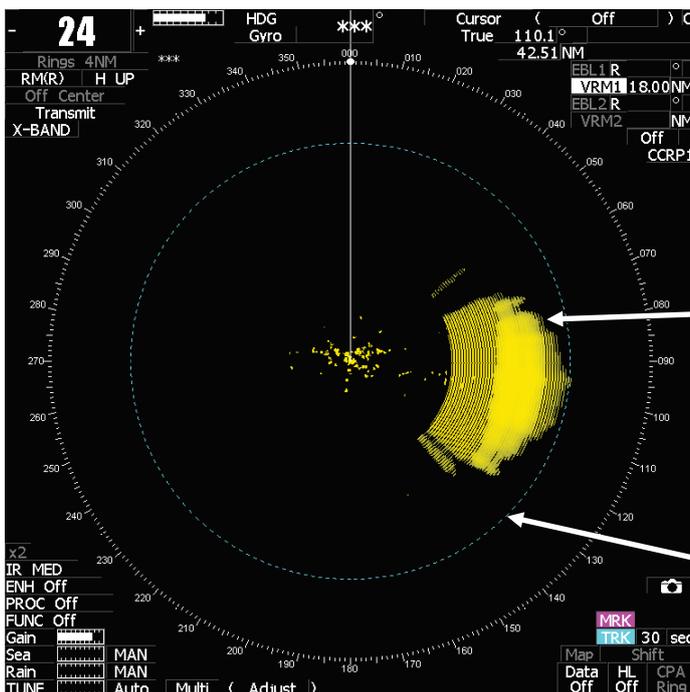
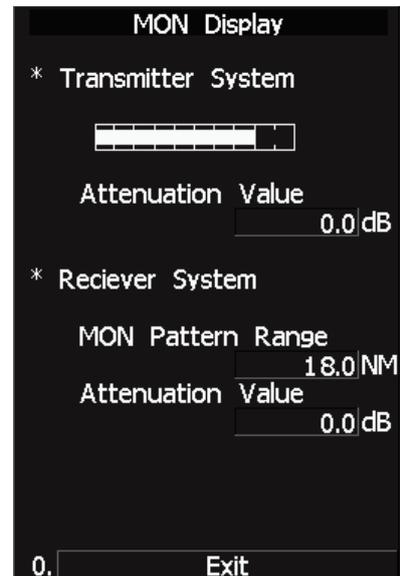
Procedure

- 1 Press [4] key while Test Menu is open.

MON Display menu opens.

- 2 Turn [VRM] control to slide the VRM to the end of the performance monitor pattern.

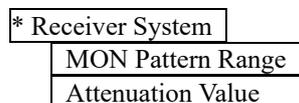
Attenuation in the receiver system is displayed in Attenuation Value of Receiver System.



Performance Monitor Pattern
(When the performance of receiver unit is degraded, the pattern distance will be shorter.)

Adjust the VRM to the farthest point of the performance monitor pattern.

- 3 Check the attenuation value.



(Initial value : 18.0NM)
Normal operating range : -2.9dB to +3.5dB
Performance degradation range : -15.0dB to -3.0dB

Note: If Receiver System Attenuation Value display is under -3 dB or Transmitter System Attenuation Value display is under -7 dB with the the performance monitor test, radar should be checked by service engineer. This means that the TX/RX unit may be faulty. Consult with the near-by dealer or our sales department.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

8.3.1.5 Alarm Logging

Displays previously occurred system errors with the dates and times when they occurred.
The current error is displayed in reverse video.

Procedure

- 1 Press [5] key while the Test Menu is open.

The Alarm Log will appear.

- 2 Error logs will be displayed.

For the display contents, refer to Table 8-2, Table 8-3 and Table 8-4.

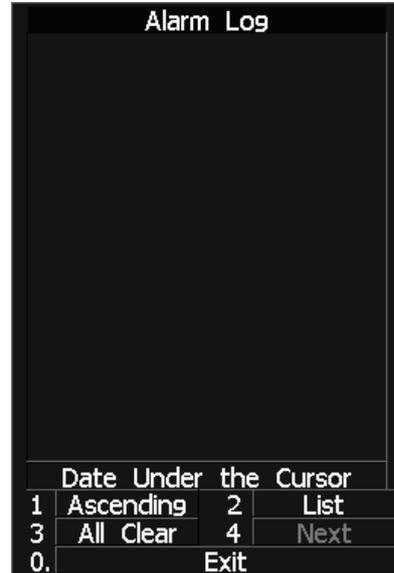
Press [1] key to switch the error log display modes between chronological display and reverse chronological display.

Press [2] key to switch between error log display and alarm list display.

Press [3] key to delete all error logs.

Press [4] key to see the next page.

Place the cursor over the listed error to see when it occurred.



Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

Table 8-2 System alarm warning list 1: Scanner

Message	Class	Description	ALR No.
TXRX(AZI)	Alarm	Scanner: Rotation signal (BP) error.	311
TXRX(Data)	Alarm	Scanner: Communication data error, checksum error or data mismatched.	901
TXRX(Fan 1)	Alarm	Scanner: FAN 1 error.	320
TXRX(Fan 2)	Alarm	Scanner: FAN 2 error.	902
TXRX(Heater)	Alarm	Scanner: Magnetron heater voltage error.	314
TXRX(HL)	Alarm	Scanner: Reference rotation signal (HL) error.	312
TXRX(MHV)	Alarm	Scanner: Modulator's high voltage alarm.	315
TXRX(Motor)	Alarm	Scanner: Motor current error.	317
TXRX(Reverse)	Alarm	Scanner: Reverse rotation.	313
TXRX(SSW Off)	Alarm	Scanner: Safety switch OFF.	308
TXRX(Time Out)	Alarm	Scanner: No communication.	326
TXRX(Trigger)	Alarm	Scanner: TRIGGER error.	310
TXRX(Video)	Alarm	Scanner: VIDEO error.	309

ALR No: Unique alarm number in ALR sentence and ACK sentence.

Table 8-3 System alarm warning list 2: Display

Message	Class	Description	ALR No.
AIS PROC(Data)	Alarm	AIS processing circuit: Communication data error or checksum error.	919
AIS PROC(Time Out)	Alarm	AIS processing circuit: No communication.	328
Indicator(Fan)	Alarm	LCD monitor: FAN error.	905
Keyboard(Data)	Alarm	Operation unit: Communication data error, checksum error or data mismatched.	906
Keyboard(Time Out)	Alarm	Operation unit: No communication.	325
Keyboard2(Data)	Alarm	Second operation unit: Communication data error, checksum error or data mismatched.	908
Keyboard2(Time Out)	Alarm	Second operation unit: No communication.	907
PROC(AZI)	Alarm	Process unit: Rotation signal error.	305
PROC(HL)	Alarm	Process unit: Reference rotation signal error.	306
PROC(Interrupt)	Alarm	Process unit: Interrupt error.	913
PROC(Reverse)	Alarm	Process unit: Reverse rotation error.	307
PROC(Trigger)	Alarm	Process unit: Trigger error.	304
PROC(Video)	Alarm	Process unit: VIDEO error.	303

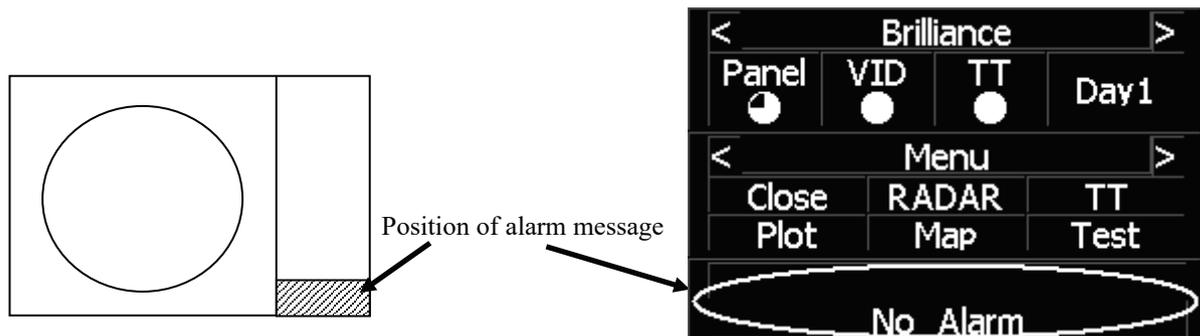
ALR No: Unique alarm number in ALR sentence and ACK sentence.

Table 8-4 System alarm warning list 3: External device communication

Message	Class	Description	ALR No.
2AXG(Data)	Alarm	2AXG: Communication data error.	911
2AXG(Time out)	Alarm	2AXG: No communication.	342
2AXW(Data)	Alarm	2AXW: Communication data error.	910
2AXW(Time out)	Alarm	2AXW: No communication.	341
AIS(Alarm ***)	Alarm	AIS alarm and the alarm number.	
AIS(Data)	Alarm	AIS: Communication data error or checksum error.	918
AIS(Time Out)	Alarm	AIS: No communication.	116
Autopilot(Data)	Alarm	Autopilot: Communication data error or checksum error.	930
Autopilot(Time Out)	Alarm	Autopilot: No communication.	101
COM Port1(Open)	Alarm	COM1: Port error.	920
COM Port2(Open)	Alarm	COM2: Port error.	921
COM Port3(Open)	Alarm	COM3: Port error.	922
COM Port4(Open)	Alarm	COM4: Port error.	923
Current(Data)	Alarm	Tidal current: Communication data error or checksum error.	927
Current(Time Out)	Alarm	Tidal current: No communication.	119
Depth(Data)	Alarm	Water depth: Communication data error or checksum error.	924
Depth(Time Out)	Alarm	Water depth: No communication.	115
GPS(Date)	Alarm	Valid date data from GPS not receive.	112
GPS(Datum)	Alarm	Valid geodetic system data from GPS not receive.	122
GPS(Position)	Alarm	Valid latitude and longitude data from GPS not receive.	102
GPS(Speed)	Alarm	Valid speed data from GPS not receive.	343
Heading(Time Out)	Alarm	Heading data: No communication.	113
L/L(Out of Bounds)	Alarm	L/L Own ship's latitude is over 85°N or 85°S.	123
Log(Data)	Alarm	Log: Communication data error (error bit detected).	111
NSK(Time Out)	Alarm	NSK unit: No communication.	324
Rate of Turn(Data)	Alarm	Rate of Turn: Communication data error or checksum error.	928
Rate of Turn(Time Out)	Alarm	Rate of Turn: No communication.	120
Rudder(Data)	Alarm	Rudder Sensor Angle: Communication data error or checksum error.	929
Rudder(Time Out)	Alarm	Rudder Sensor Angle: No communication.	121
Temperature(Data)	Alarm	Water temperature: Communication data error or checksum error.	925
Temperature(Time Out)	Alarm	Water temperature: No communication.	117
Wind(Data)	Alarm	Wind direction/velocity: Communication data error or checksum error.	926
Wind(Time Out)	Alarm	Wind direction/velocity: No communication.	118

ALR No: Unique alarm number in ALR sentence and ACK sentence.

Reference: Alarm message is displayed in the lower right of the display.



8.3.1.6 System INFO

Displays the current system information.

Indicator	Processor software version information
TXRX	Scanner software version information
System No.	System number
TXRX Time	
Total	Total operating time of the scanner unit (Total power-on time of the antenna unit)
Motor	Total operating time (Total power-on time)
Transmit	Total transmitting time (Total time during which radar was transmitted)
System Time	
Total	Total operating time of the display unit (Total power-on time of the display unit)

Procedure

- 1 Press [6] key while the Test Menu is open.

The System INFO Menu will appear.

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.

System INFO	
* Indicator	Ver.02.00
* TXRX	Ver.02.00
* System No.	No.02.00
* TXRX Time	
Transmit	100hrs
Motor	100hrs
Total	100hrs
* System Time	
Total	100hrs
Exit	

8.3.1.7 MAGI

Displays the MAGI bar indicating the magnetron current to check.

Procedure

- 1 Check if the MAGI bar in the Test Menu reads the value below in a range of 24 NM.

6 kW: 4 to 5 scale marks
 10 kW: 4 to 7 scale marks
 25 kW: 6 to 9 scale marks

Exit

- 1 Press [RADAR MENU] key.

The menu will be closed.



8.3.2 Line Monitor

Serial communication data can be seen on the built-in Line monitor.
Line monitor can be used to make sure that the serial data are received properly.

Procedure

- 1 **Hold down [RADAR MENU] key.**

The Code Input Menu will appear.

- 2 **Press [0] key.**

- 3 **Move the cursor onto the “ENT” button in the Code Input menu, and press [ENT] key.**

The Adjust Menu will appear.

- 4 **Press [5] key.**

The COM Port Setting Menu will appear.

- 5 **Press [7] key.**

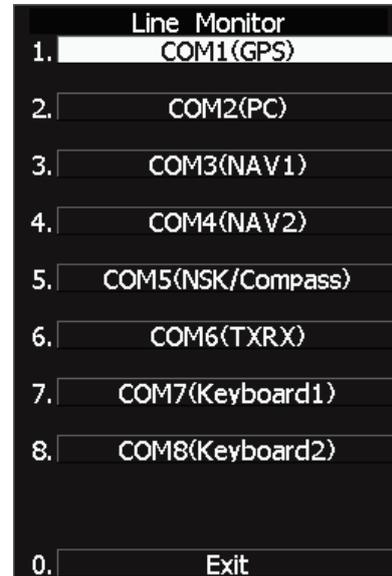
The LINE MONITOR menu will appear.

- 6 **Select the Communication port you want to see, pressing the numeric keys [1] to [8].**

The LINE MONITOR appears.
Refer to the next page for the display.

Each ports on the menu resets following connectors.

COM1(GPS)	J3 GPS
COM2(PC)	J8 NMEA
COM3(NAV1)	J6 AIS/NMEA
COM4(NAV2)	J9 AUX (Option)
COM5(NSK/COMPASS)	J5 GYRO / COMPASS
COM6(TXRX)	J2 SCANNER
COM7(KEY BOARD1)	J4 KEY BOARD
COM8(KEY BOARD2)	J9 AUX (Optioon)



Exit

- 1 **Press [0] key.**

- 2 **Press [RADAR MENU] key.**

The Main Menu will reappear.

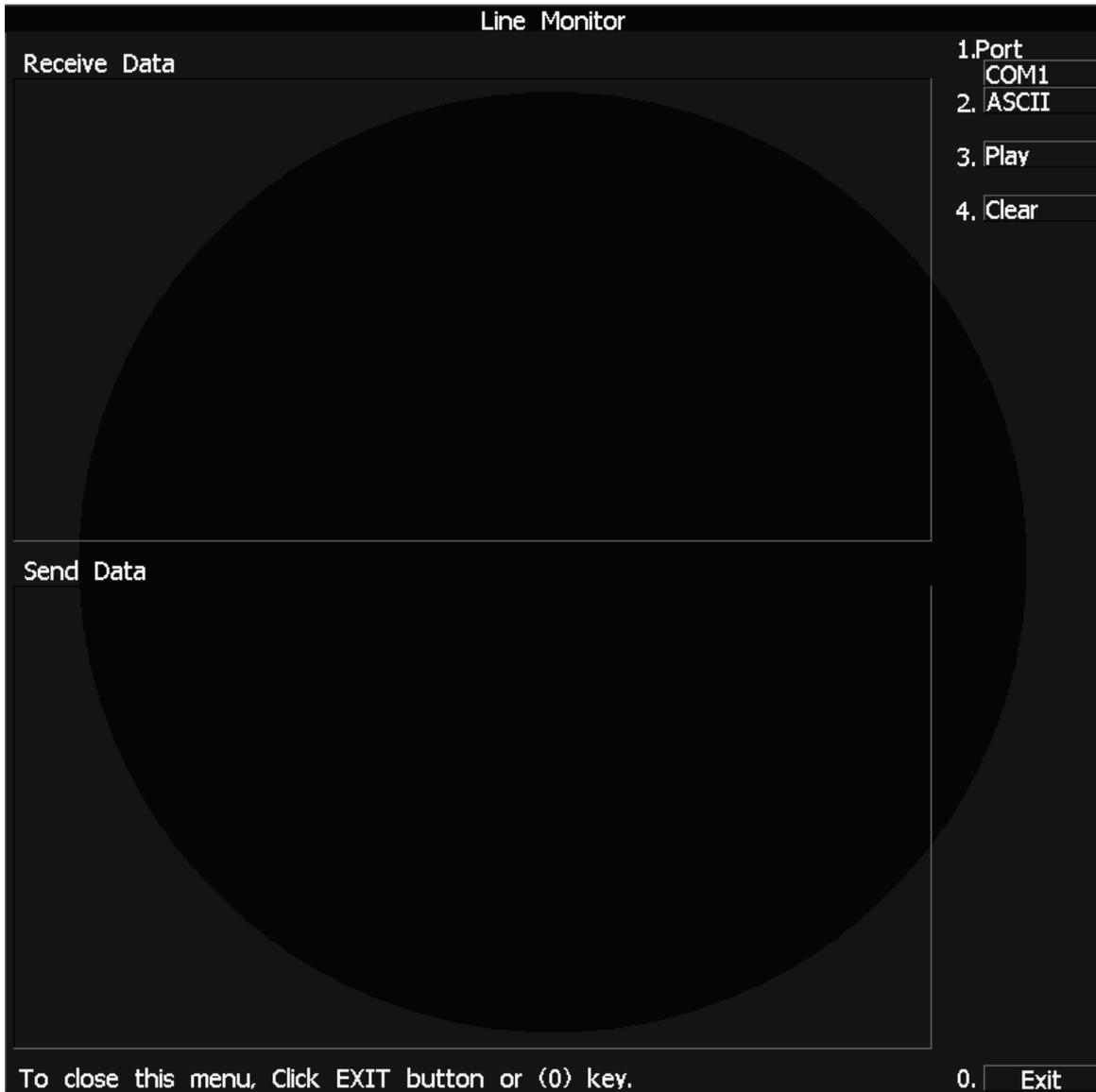
LINE MONITOR display

Received data ; The received serial communication data are displayed.

Transmitted data ; The transmitted serial communication data are displayed.

On-screen controls ; Line monitor can be controlled by the following soft keys on the upper right corner of the LINE MONITOR.

1. Port selection ; This key selects communication port to be displayed.
2. Data format selection ; This key switches the data format between ASCII format and binary format.
3. Play and Stop ; This key activates or deactivates data display renewing.
4. Clear ; The key clears all data.



8.3.3 GPS Reception Status Display (GPS Status)

Display the reception status of the GPS receiver (GPS, DGPS and WAAS receivers) currently connected. Seize the status of satellites that are currently performing positioning.

Procedure

- 1 Press [RADAR MENU] key.

The Main Menu will appear.

- 2 Press [7] key.

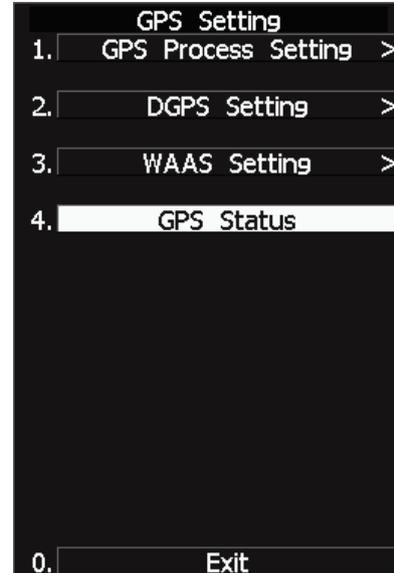
NAV Equipment Setting Menu will appear.

- 3 Press [7] key.

GPS Setting Menu will appear.

- 4 Press [4] key.

GPS Status Menu will appear.



<The alternative procedure for steps above>

- 1 Hold down [RADAR MENU] key.

The Code Input Menu will appear.

- 2 Press [0] key.

- 3 Move the cursor onto the "ENT" button in the Code Input menu, and press [ENT] key.

The Adjust Menu will appear.

- 4 Press [6] key.

NAV Equipment Setting menu opens.

- 5 Perform steps 3 and 4 in the "Procedure" above.

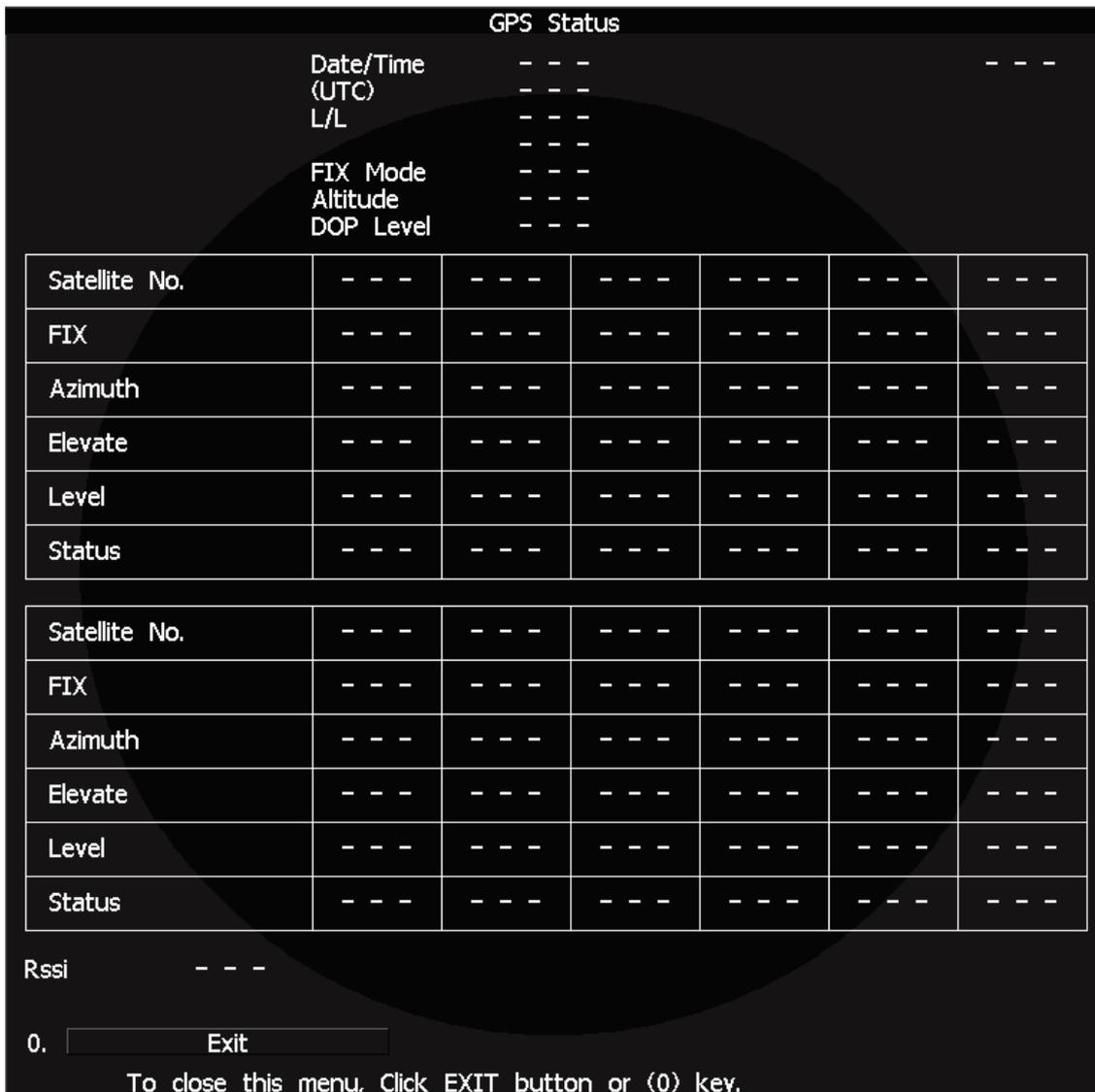
Exit

- 1 Press [0] key.

The Status Menu will be closed.

- 2 Press [RADAR MENU] key.

The menu will be closed.



GPS Status Display

The following items are to appear on the Status display.

- DATE/TIME : Local date and time
- (UTC) : Greenwich Mean Time
- L/L : Current latitude and longitude

- FIX MODE : Fix Mode (2D positioning/3D positioning)
- ALT : Altitude of own ship. Setting the Fix Mode to 2D displays the antenna height initially set.
- DOP LEVEL : Precision of positioning results. As the value is smaller, the indicated precision is higher.

- SATELLITE No. : Satellite No.
- FIX : Is positioning data used?
- AZIMUTH : Azimuthal angle of satellite
- ELEVATE : Elevation angle of satellite
- LEVEL : Reception signal level
- STATUS : Current status of satellite
- RSSI : Reception intensity of Beacon station

8.4 REPLACEMENT OF MAJOR PARTS

The system includes parts that need periodic replacement. The parts should be replaced as scheduled. Use of parts over their service life can cause a system failure.



WARNING



Direct exposure to electromagnetic waves at close range will have adverse effects on the human body. When it is necessary to get close to the scanner for maintenance or inspection purposes, make sure to turn the indicator power switch to "OFF" or "STBY."

Direct exposure to electromagnetic waves at close range will have adverse effects on the human body.



When conducting maintenance work, make sure to turn off the power and unplug the power connector J1 of the radar process unit so that the power supply to the equipment is completely cut off. Some equipment components can carry electrical current even after the power switch is turned off, and conducting maintenance work without unplugging the power connector may result in electrocution, equipment failure, or accidents.

**CAUTION**

-  Turn off the main power source before replacing parts. Otherwise, an electric shock or trouble may be caused.
-  Before replacing the magnetron, turn off the main power source and wait for 5 minutes or more until the high voltage circuits are discharged. Otherwise, an electric shock may be caused.
-  Take off your wrist watch when bringing your hands close to the magnetron. Otherwise, your watch may be damaged because the magnetron is a strong magnet.
-  Two or more persons shall replace the liquid crystal monitor.
If only one person does this work, he may drop the LCD, resulting in injury.
-  Even after the main power source is turned off, some high voltages remain for a while.
Do not contact the inverter circuit in the LCD with bare hands. Otherwise, an electric shock may be caused.

8.4.1 Parts Expected for Periodic Replacement

Here are parts expected for periodic replacement

Part name	Interval
1. Magnetron	4000 hours
2. Motor	10000 hours
3. LCD backlight	50000 hours
4. Fan motor	20000 hours
5. Backup battery	5 years

8.4.2 Replacement of magnetron

Before replacing the magnetron, turn off the main power source, wait for five minutes or more, and confirm that no charge remains in the high-voltage modulator circuit.

When mounting a new magnetron, do not touch the magnet with a screwdriver or put it on an iron plate. After replacement, connect the lead wire correctly.

Handling of Magnetron under Long-Time Storage

The magnetron that has been kept in storage for a long time may cause sparks and operate unstably when its operation is started. Perform the aging in the following procedure:

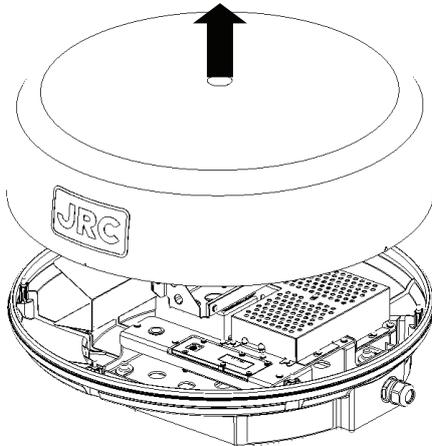
- (1) Warm up the cathode for a longer time than usually. (20 to 30 minutes in the STBY state.)
- (2) Start the operation from the short pulse range and shift it gradually to the longer pulse ranges. If the operation becomes unstable during this process, return it to the standby mode immediately. Keep the state for 5 to 10 minutes until the operation is restarted.

How to replace a 4kW antenna magnetron

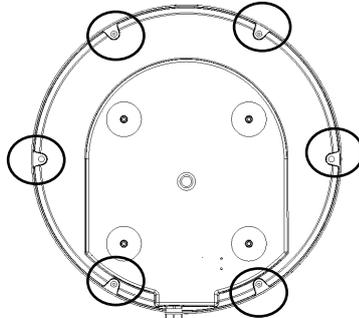
Make sure that all radars are turned off before replacing the magnetron (if there are multiple radar devices, turn them all off). It is also recommended that the breaker be turned off for safety.

Step 1: Remove the radome.

The radome is fixed with 6 hexagonal bolts.



The figure below shows the positions for 6 bolts.



Bottom view

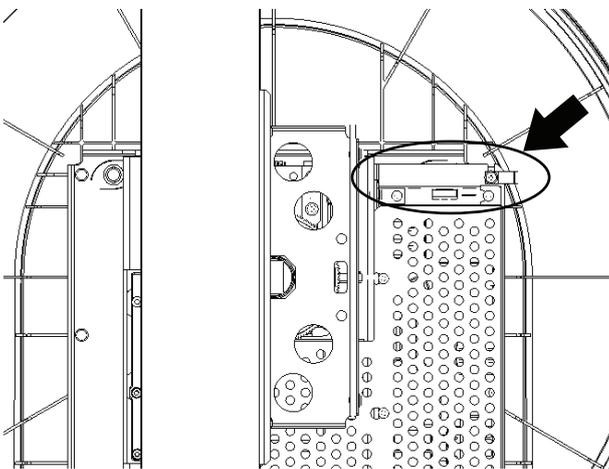


Place the removed radome in a safe place. Be sure not to be blown off by the wind.

Step 2: Remove the equipment cable.

Remove the connectors of the equipment cable connected to the transceiver unit.

Remove the cable clamp fixing the equipment cable. (You do not need to remove the equipment cable from the scanner unit.)



Step 3 Remove the motor cable, the

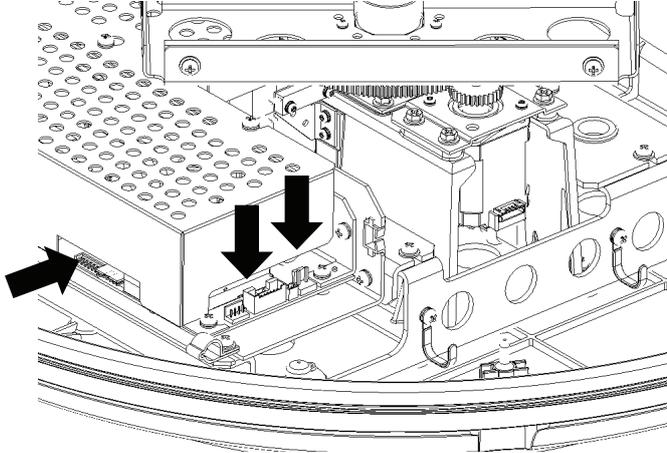
Step 3: Receiver cable and the sensor cable.

Remove the connection cable of the motor unit.

Remove the connection cable of the receiver unit.

Remove the connection cable of the sensor.

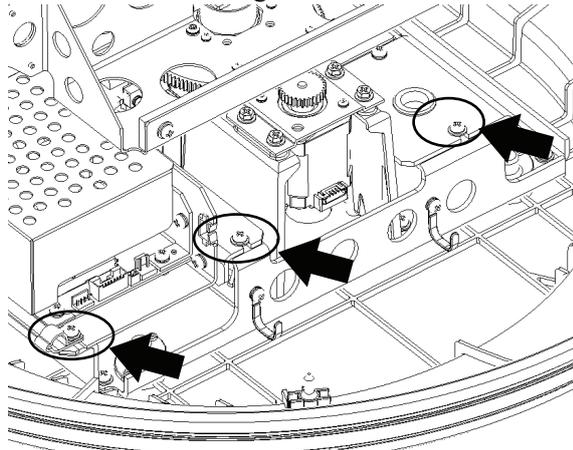
When removing the transceiver unit, be sure not to be stuck in parts and be careful not to interfere with the work.



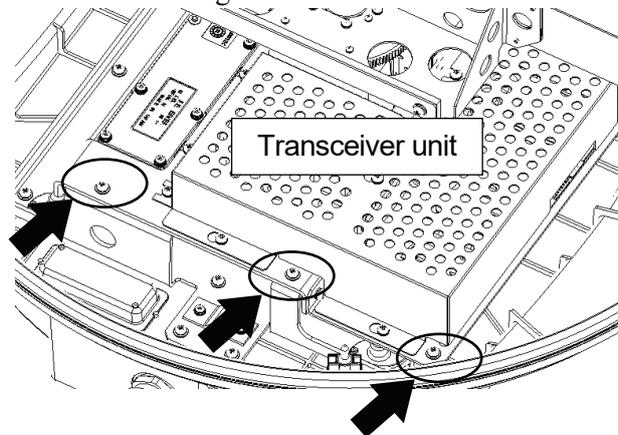
Step 4: Remove the transceiver unit.

The transceiver unit is fixed with 5 screws with washer (M4X10Bs_SW_W) and a screw (M4X12_SW_W, fixed with clamp).

- a) Loosen the 3 screw fixing the unit on the bow side.



- b) Remove the remaining 3 screws on the stern side.

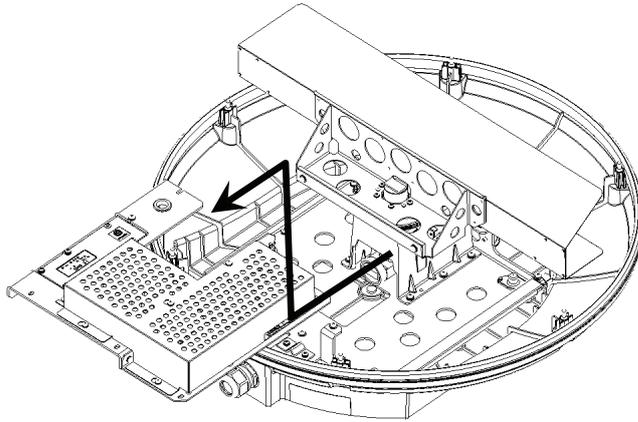


- c) Remove the transceiver unit.

When removing the transceiver unit, once slide it to stern direction and pull it off

obliquely backward.

Perform the replacement of circuits within the transceiver unit in a safe place.



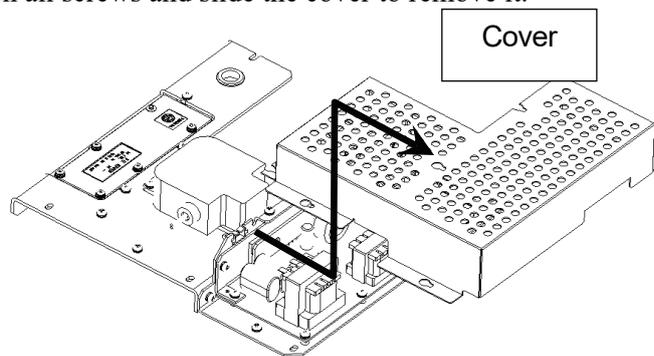
Step 5: Remove the cover of the transceiver unit.

Perform the replacement of circuits and parts within the transceiver unit.

Remove the cover of the transceiver unit.

The cover is fixed with 7 screws with washer (M4X10Bs_SW_LW).

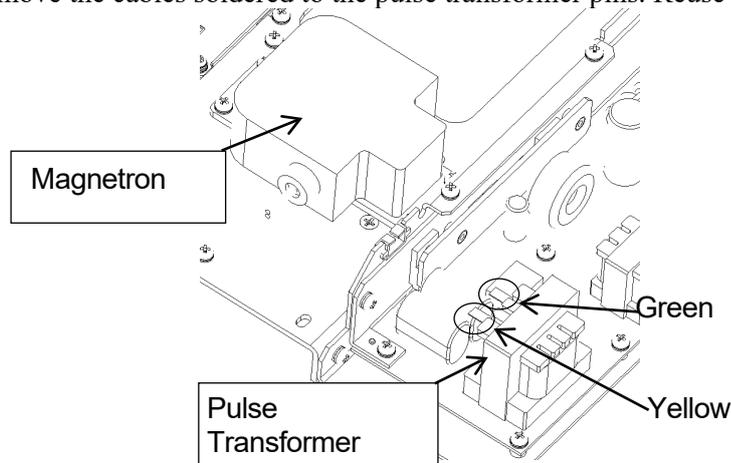
Loosen all screws and slide the cover to remove it.



Step 6: Remove the magnetron cable.

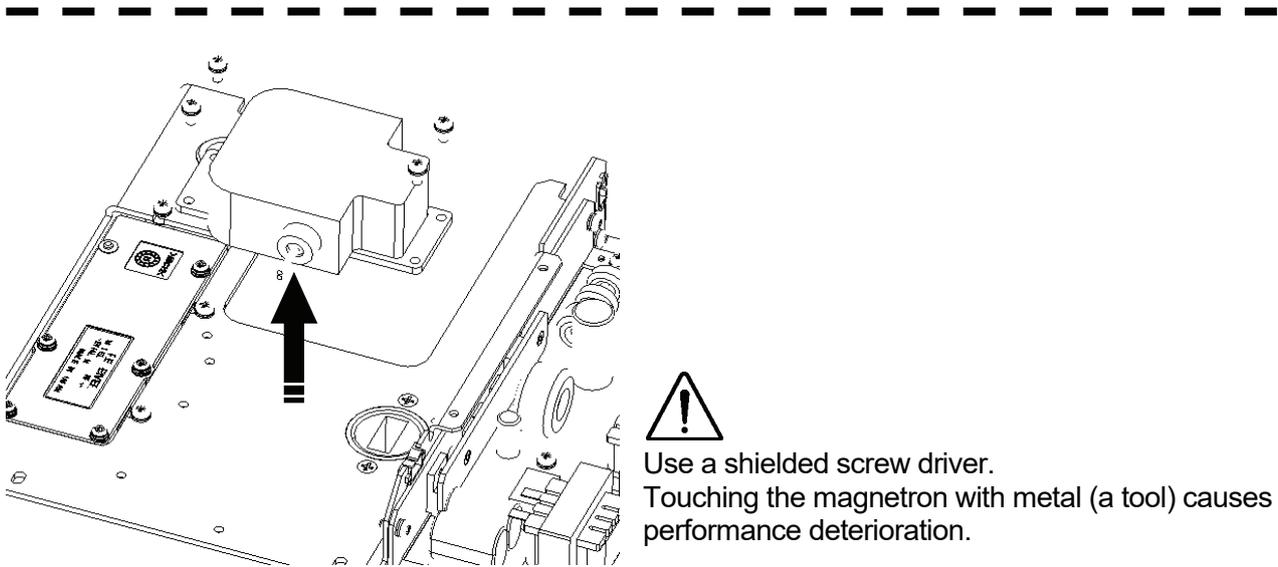
The magnetron cable is connected to the pulse transformer with two cables (green and yellow).

Remove the cables soldered to the pulse transformer pins. Reuse the protection tube.



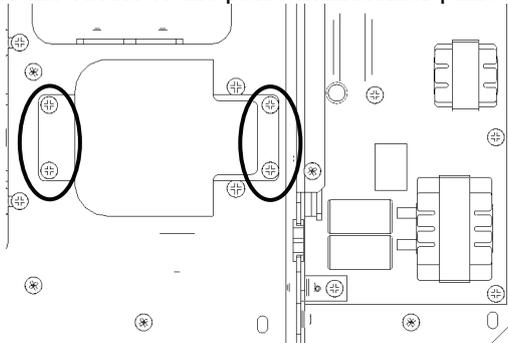
Step 7: Replace the magnetron.

The magnetron is fixed with 4 screws with washer (M4X10Bs_SW_LW). Remove the screws and replace the magnetron.



Step 8: Connect the magnetron cable.

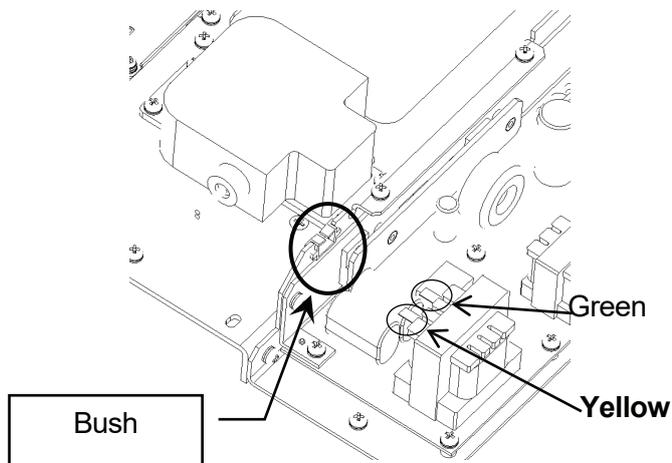
Connect the cables after fixing the magnetron.
Solder the cables to the pulse transformer pins.



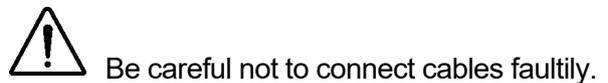
Pass the magnetron cable through the protection tube (reused).

Step 9: Connect the magnetron cables as follows:

the green cable to No. 16 of the pulse transformer and
the yellow cable to No. 15 of the pulse transformer.



After soldering, place the cables into the bush and attach the cover.



Adjust the cables for optimal length.
 The recommended length is 155 ± 5 mm.
 Use a shielded screw driver.
 Touching the magnetron with metal (a tool)
 causes performance deterioration.

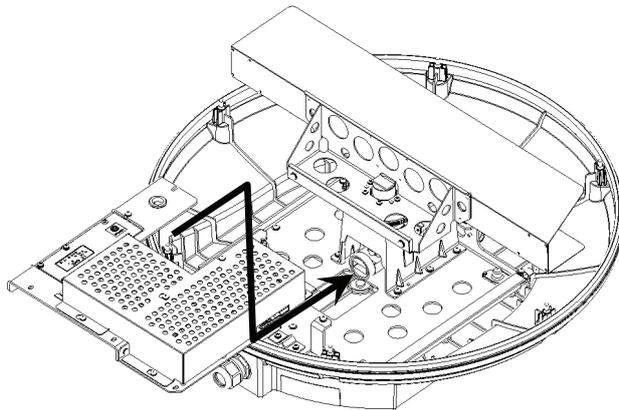
Step 10: Install the transceiver unit into the scanner unit.

Install the transceiver unit into the scanner unit.

When installing the transceiver unit, put the unit inside, then slide it into the joint of the wave guide tube.

Push the transceiver unit wholly so that the unit and the joint of the wave guide tube stick together.

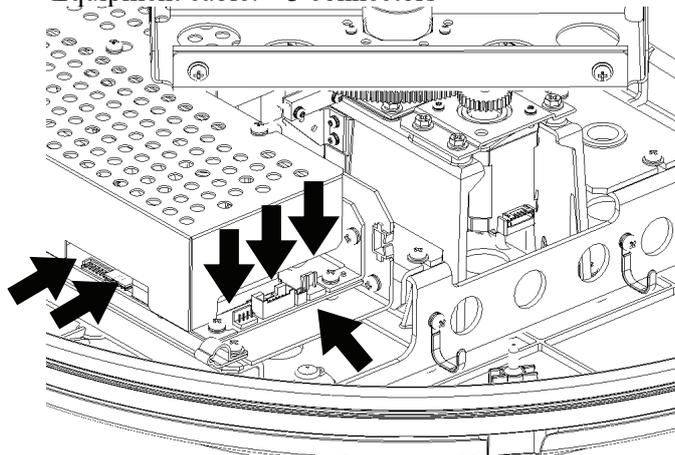
Fix the unit with screws with washer.



Step 11: Connect the cables to the unit.

Connect the following cables.

- Motor cable: 1 connector
- Receiver cable: 1 connector
- Sensor cable: 1 connector
- Equipment cable: 3 connectors



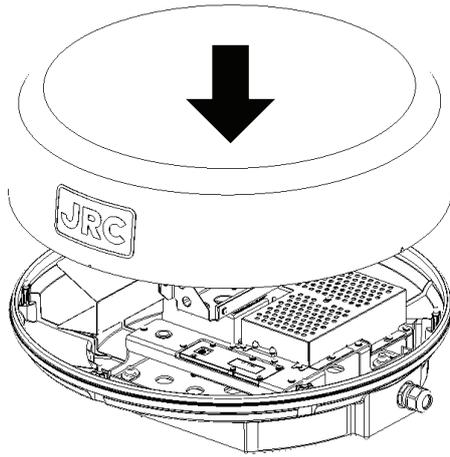
After connecting all cables, check the cables not to interfere the antenna rotation.

Step 12: Attach the radome.

Before attaching the radome, check that the packing has no abnormality, such as deformation or cracks.

Also, remove foreign material and dust if attached.

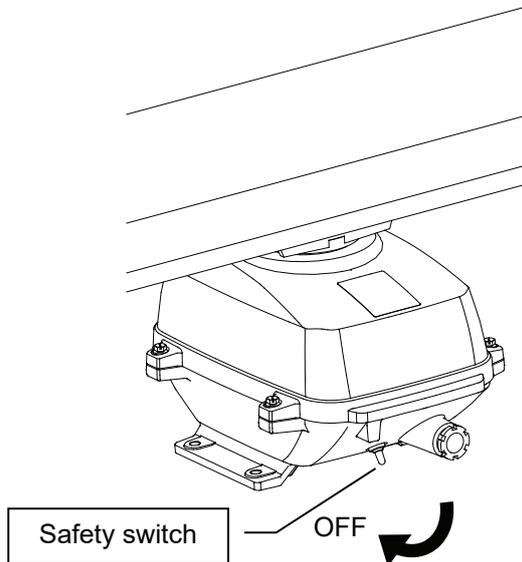
If any hexagonal bolt is not tightened enough or is loosened, the waterproof performance may be deteriorated. Be sure to tighten all bolts with specified torque (10.5kgf·cm).



This completes the magnetron replacement procedure.

How to replace a 6kW NKE-2062 antenna magnetron

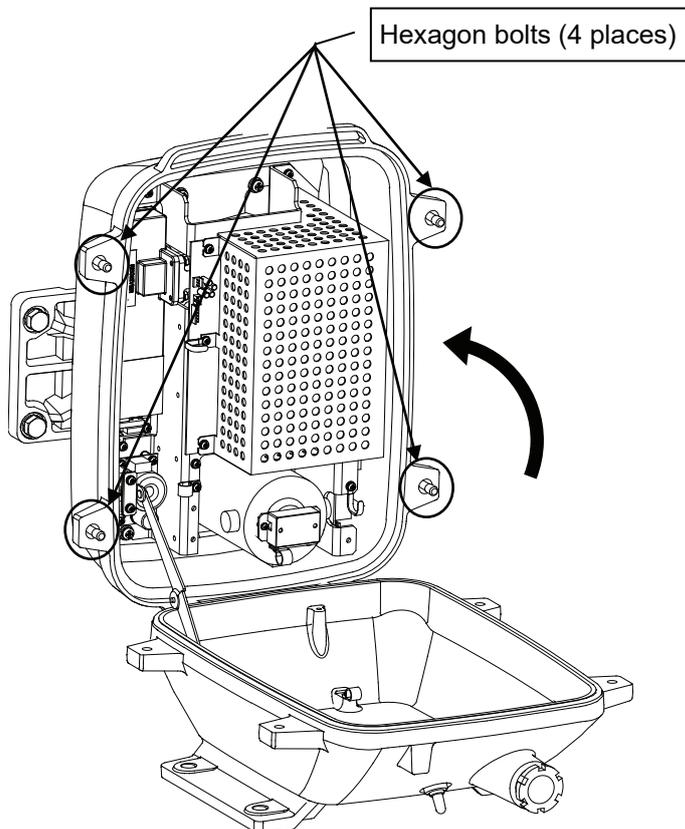
Make sure that all radars are turned off before replacing the magnetron (if there are multiple radar devices, turn them all off). It is also recommended that the breaker be turned off for safety.

Step 1: Turn off the antenna safety switch.

 When replacing a magnetron, make sure to first turn off the antenna safety switch.

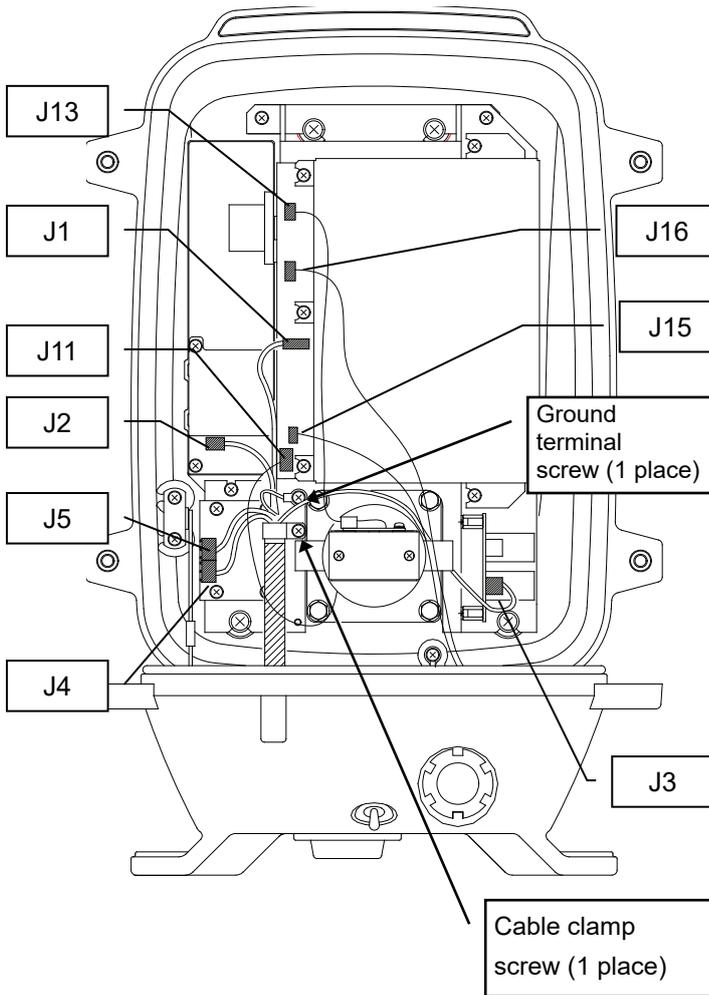
The switch is at the rear bottom of the antenna.

Turn off the switch.

Step 2: Remove the bolts and open the top cover.

The top cover is fixed with 4 hexagon bolts (M8 captive screw).

Step 3: Remove the cable.



Remove the equipment cable connectors (5 places). (J1 through J5)

Remove the safety switch connectors (2 places). (J15 and J16)

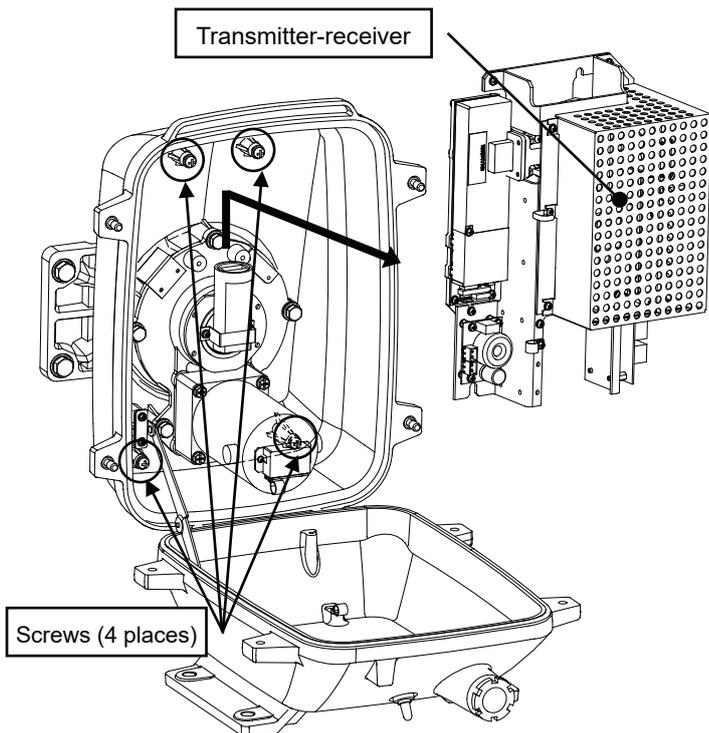
Remove the motor connector (2 places). (J11 and J13)

Remove 9 connectors in total.

Remove the screws (1 place) and remove the ground terminal.

Remove the screw (1 place) and remove the cable clamp as well as the equipment cable.

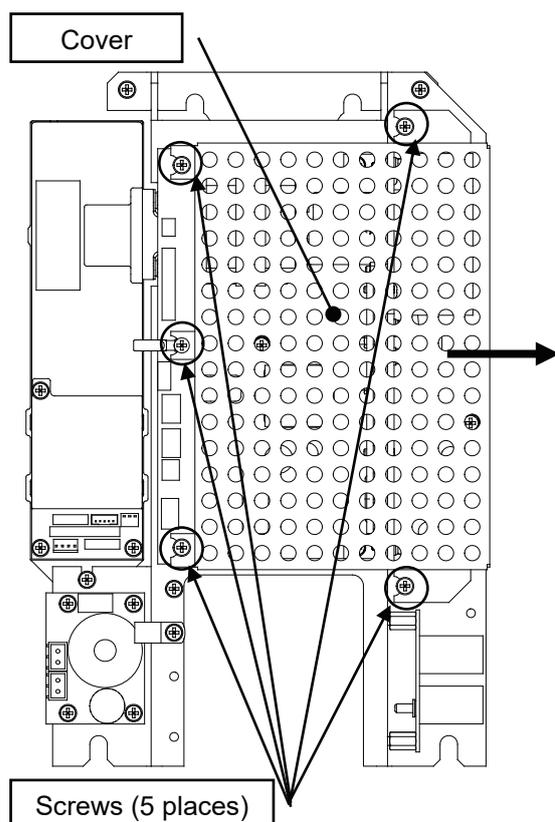
Step 4: Remove the transmitter-receiver.



Loosen all the screws (4 places).

Slide upward and remove the transmitter-receiver.

Step 5: Remove the cover.



Loosen all the screws (5 places).

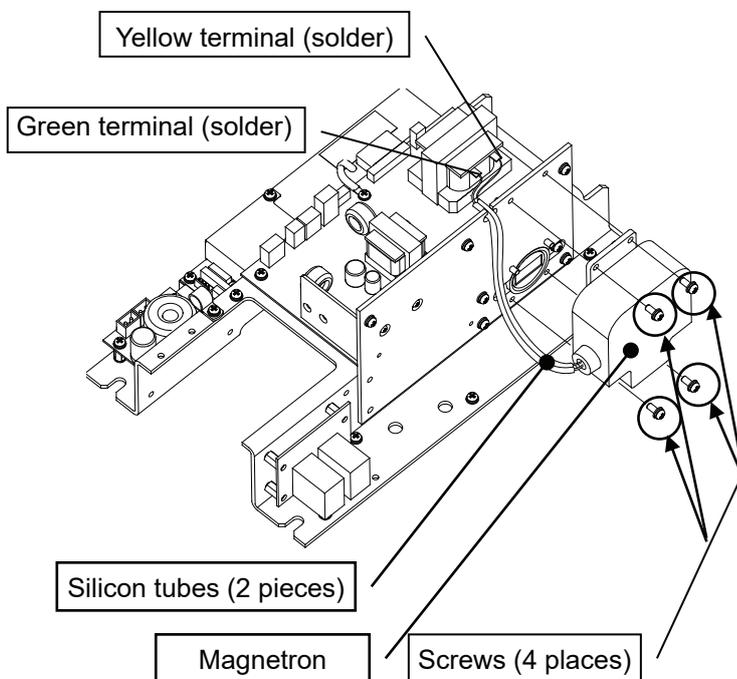
Slide the cover to the right and remove it.

! Use a shielded screw driver.
Metal (tools) may deteriorate if they come in contact with the magnetron.

Remove the screws (4 places).
Remove the magnetron cable (solder).

Replace the magnetron.

Step 6: Replace the magnetron.



Two silicon tubes are moved to the magnetron cable for the exchange and it changes it.

Replace the magnetron.

! Please solder with a correct terminal when you solder a yellow terminal and a green terminal with the pulse transformer. Moreover, please note that solder might not fall on the circuit when soldering.

Reverse the order to complete the procedure.

Make sure that all bolts and screws are tightened again, and all cables are properly re-connected.

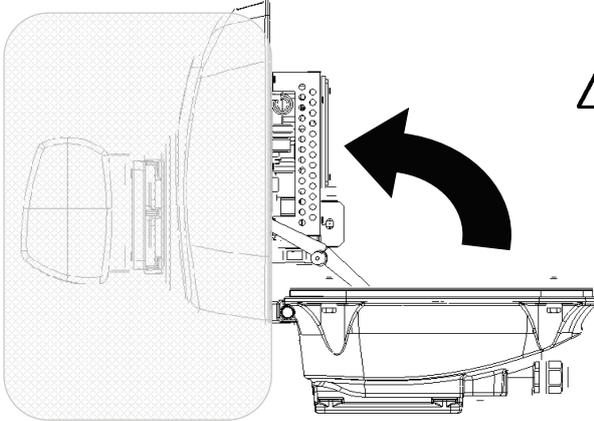
This completes the magnetron replacement procedure.

How to replace a 6kW NKE-2063A antenna magnetron

Step 1: Open the upper housing.

- a) Open or close the scanner unit by turning the upper housing (including the antenna) to the bow side.

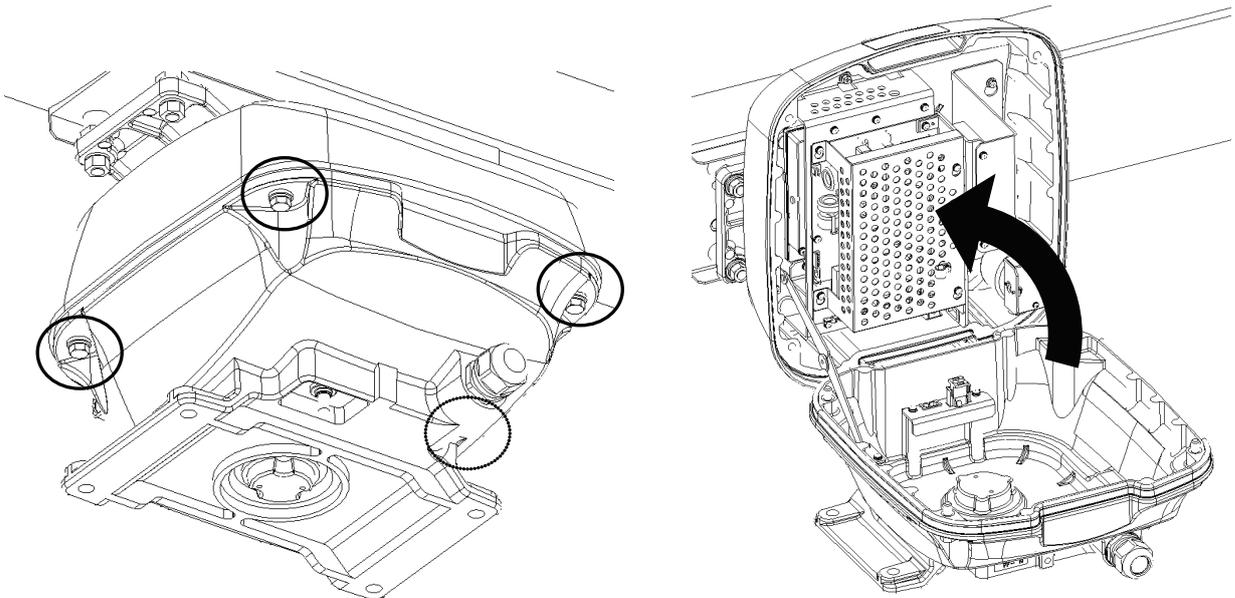
The gray area shown in the figure below must be clear.



Check if you can open or close safely for work.
Be careful with the antenna behavior when opening or closing.
Be careful with the antenna not to hit the mast or platform.
Open it slowly. Do not apply too much force to the stay, otherwise, it may break.

The upper housing is fixed with 4 M8 hexagonal bolts.

- b) Loosen those hexagonal bolts.
(Bolts are falling-out prevention bolts.)



- c) Open the upper housing by rotating upward to the bow side.



Check if the upper housing is stable while opened.
If it is unstable, it will be dangerous while working.

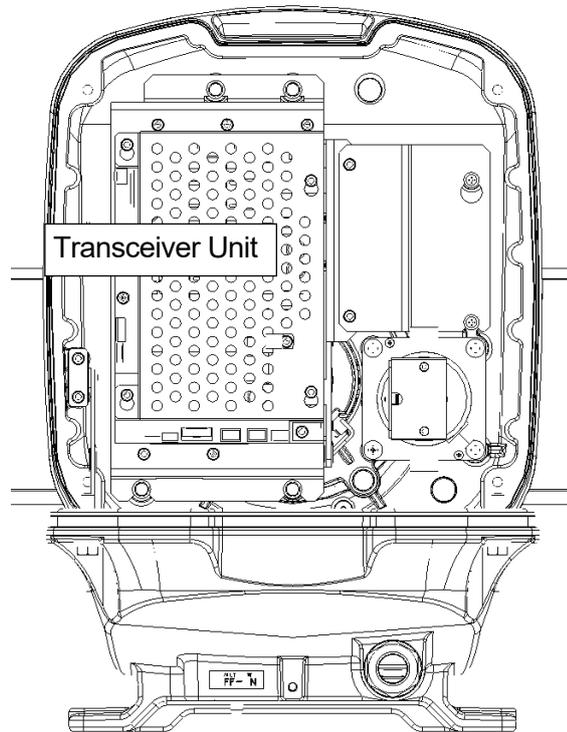
Step 2: Remove the transceiver unit.

The transceiver unit is installed in the port side of the scanner.

Remove each cable connected to the transceiver unit.

- Remove the equipment cable.
- Remove the motor cable.
- Remove the sensor cable.
- Remove the safety switch cable.

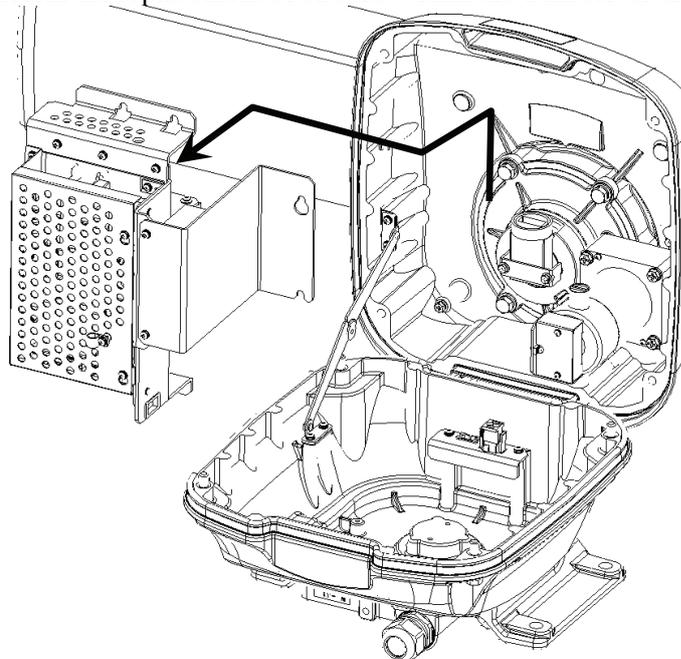
The transceiver unit is fixed with 4 upset head bolts with washer (M5X16SUS_SW_W) and 2 upset head bolts with washer (M4X10SUS_SW_W).
Loosen those bolts.



Step 3: Remove the transceiver unit.

Remove the transceiver unit.

When removing the transceiver unit, once slide it to upper direction and pull it off.
Perform the replacement of circuits within the transceiver unit in a safe place.



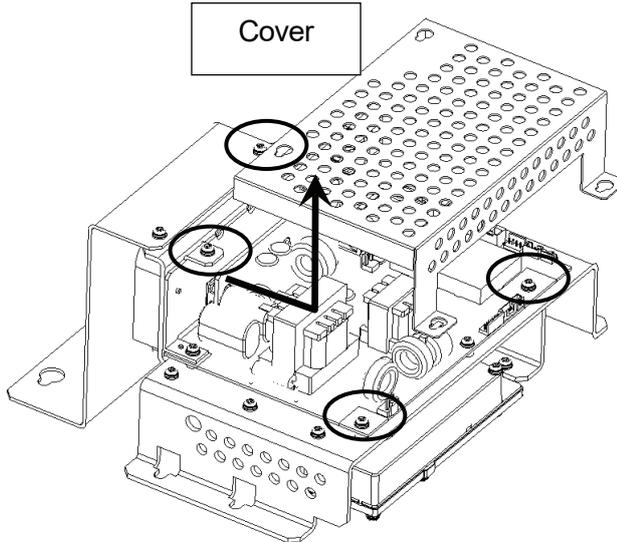
Step 4: Remove the cover of the transceiver unit.

Perform the replacement of circuits and parts within the transceiver unit.

Remove the cover of the transceiver unit.

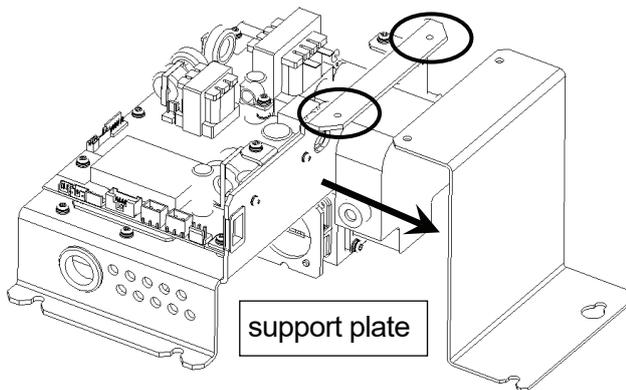
The cover is fixed with 4 built-in M4X10Bs_SW_LW screws.

Loosen all screws and slide the cover to remove it.

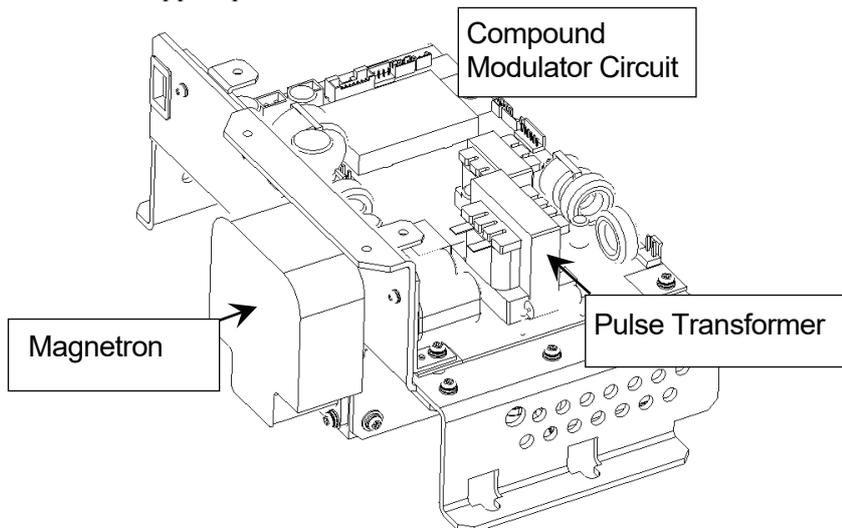


Step 5: Remove the support plate of the transceiver unit.

The support plate is fixed with 2 screws with washer (M4X10Bs_SW_LW). Remove all screws and slide the support plate to remove it.

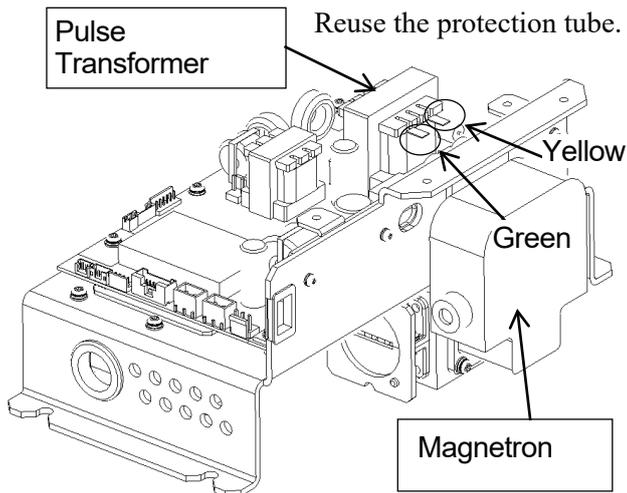


Cover and support plate removed



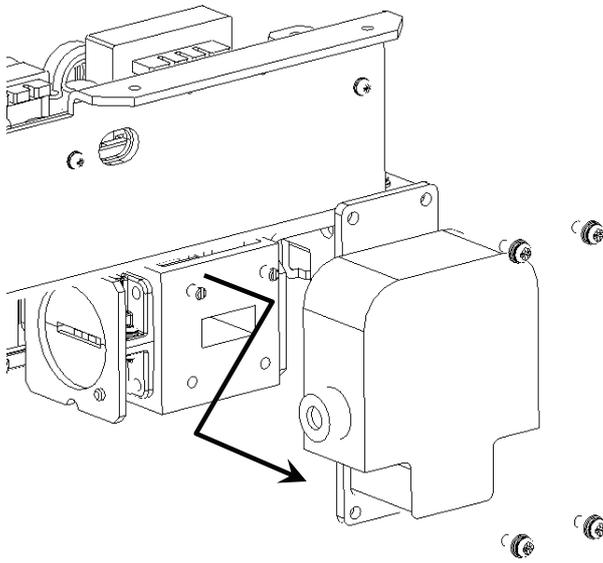
Step 6: Remove the magnetron cable.

The magnetron cable is connected to the pulse transformer with two cables (green and yellow). Remove the cables soldered to the pulse transformer pins.



Step 7: Replace the magnetron.

The magnetron is fixed with 4 built-in M4X10Bs_SW_LW screws. Loosen the screws and replace the magnetron.



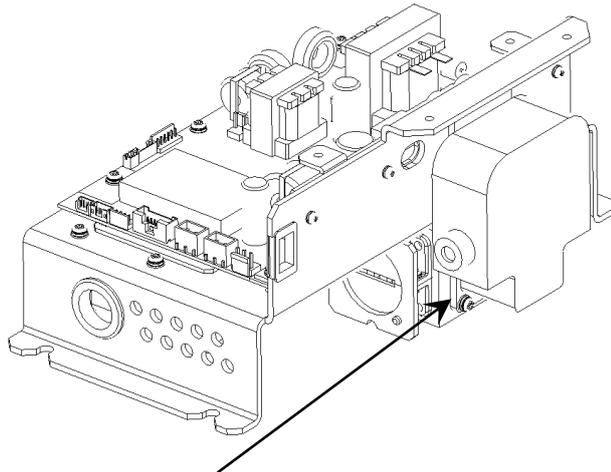
Use a shielded screw driver.
Touching the magnetron with metal (a tool) causes performance deterioration.

8

Step 8: Connect the magnetron cable.

Connect the cables after fixing the magnetron.
Solder the cables to the pulse transformer pins.
Pass the magnetron cable through the protection tube (reused). Pass the cable through the elongate hole of the chassis.

Connect the magnetron cables as follows:
the green cable to No. 16 of the pulse transformer and
the yellow cable to No. 15 of the pulse transformer.



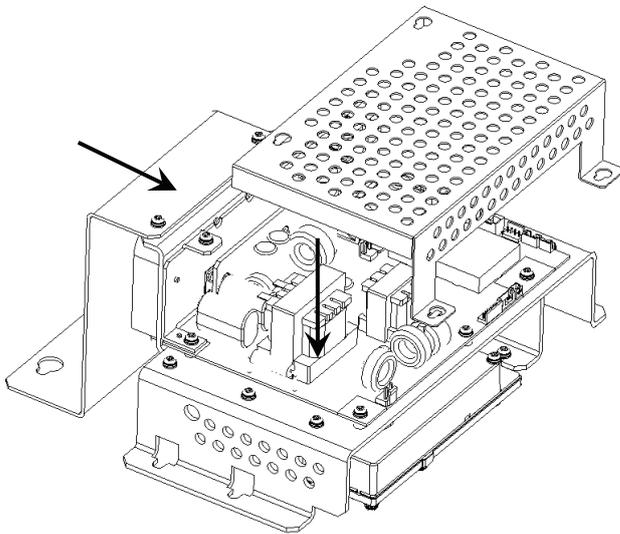
After replacement, check that the magnetron is steady.



Be careful not to connect cables faultily.
 Adjust the cables for optimal length.
 The recommended length of green cable is 175 ± 5 mm.
 The recommended length of yellow cable is 175 ± 5 mm.
 Touching the magnetron with metal (a tool) causes performance deterioration.

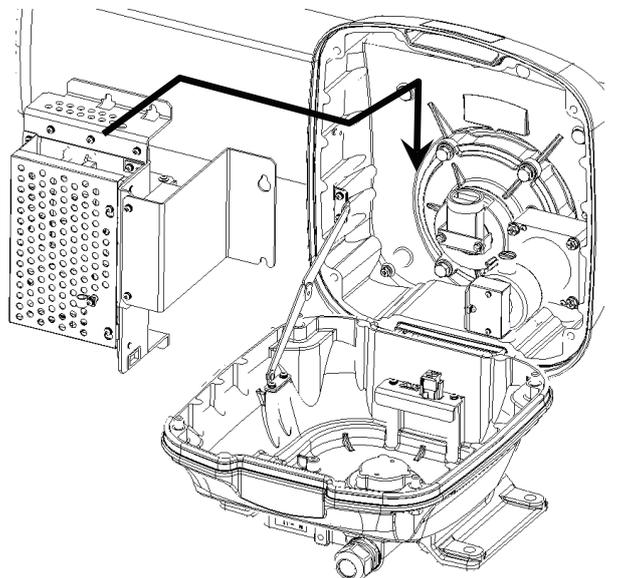
Step 9: Set up the transceiver unit.

Attach the cover and the support plate to the transceiver unit.



Step 10: Install the transceiver unit.

Install the transceiver unit into the scanner unit.
 When installing the transceiver unit, put the unit inside.
 Push the transceiver unit wholly so that the unit a together.
 Fix the unit with bolts with washer.



Step 11: Close the upper housing.

Before closing the upper housing, check that the packing has no abnormality, such as deformation or cracks.

Also, remove foreign material and dust if attached.

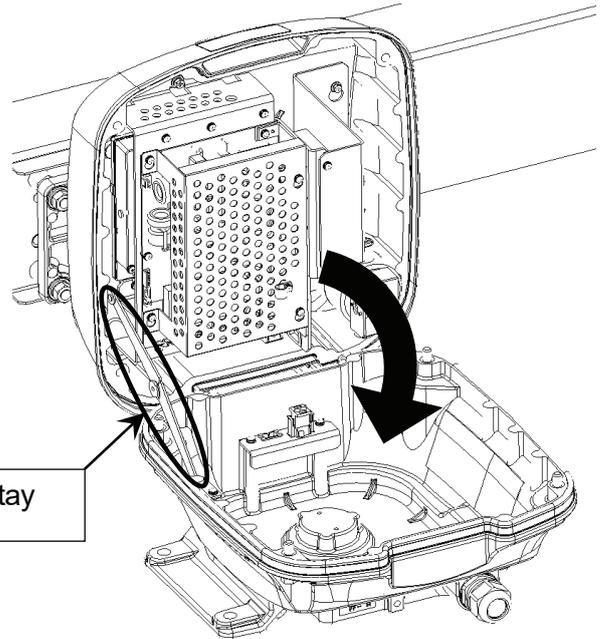
Close the upper housing while pulling the center of the stay.

If any hexagonal bolt is not tightened enough or is loosened, the waterproof performance may be deteriorated. Be sure to tighten all bolts with specified torque (120 to 150kgf·cm).



When closing the housing, be careful that the cables are not caught.
When closing the upper housing, always pull the center of the stay. Otherwise the stay may be broken.

Stay



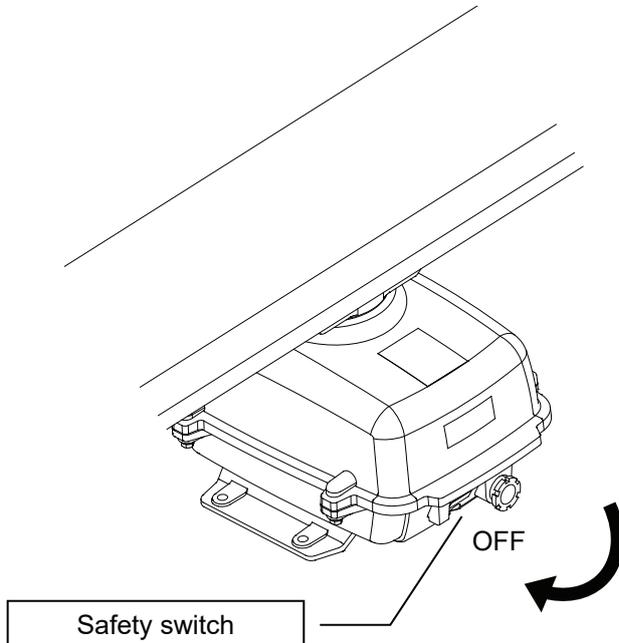
After the work, turn "ON" the safety switch.

This completes the magnetron replacement procedure.

How to replace a 10 kW antenna magnetron

Make sure that all radars are turned off before replacing the magnetron (if there are multiple radar devices, turn them all off). It is also recommended that the breaker be turned off for safety.

Step 1: Turn off the antenna safety switch.

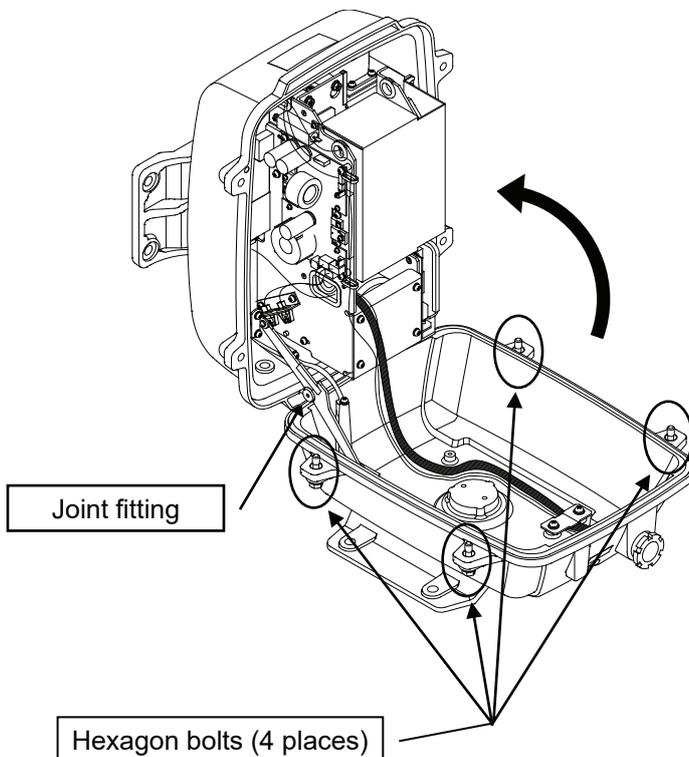


 When replacing a motor, make sure to first turn off the antenna safety switch.

The switch is at the rear bottom of the antenna.

Turn off the switch.

Step 2: Remove the bolts and open the top cover.

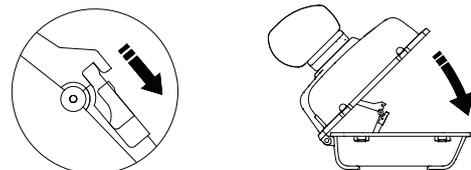


The top cover is fixed with 4 hexagon bolts (M8 captive screw).

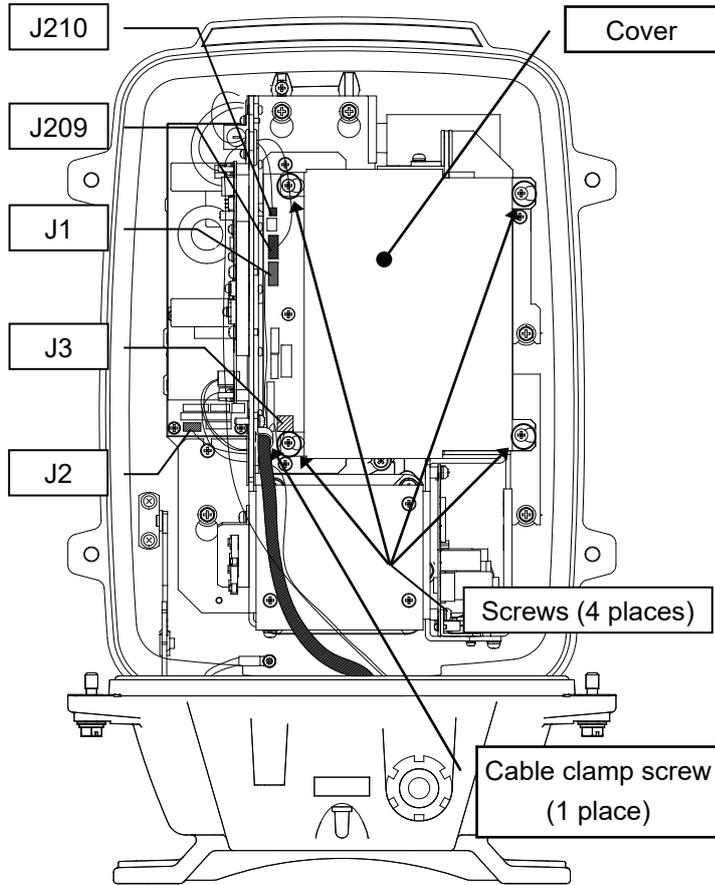
Remove the bolts and fully open the top cover such that the stopper of the joint fitting is locked.

* When closing the top cover

Release the stopper of the joint fitting before closing the top cover.



Step 3: Remove the cable.



Loosen all the screws (4 places).

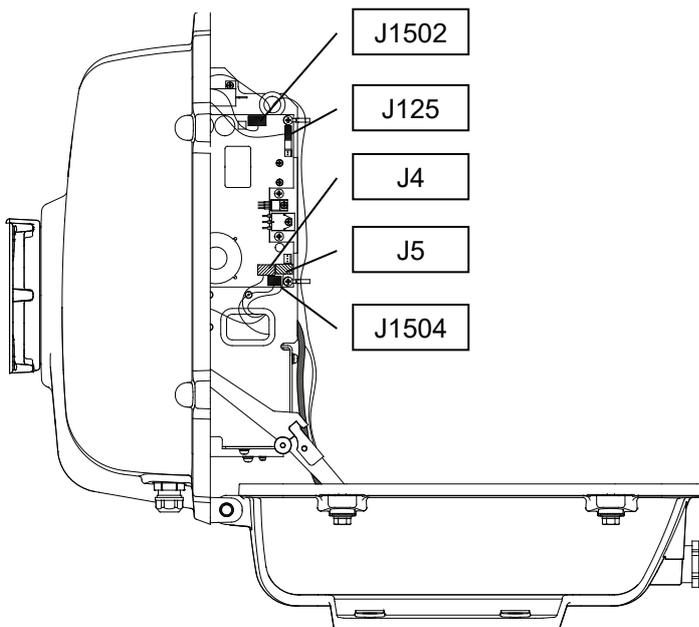
Slide the cover to the left and remove it.

Remove the encoder connector (1 place).
(J209)

Remove the equipment cable connectors
(5 places).
(J1 through J5)

Remove the safety switch connectors
(2 places).
(J210 and J1504)

Remove the motor connector (2 places).
(J1502 and J125)



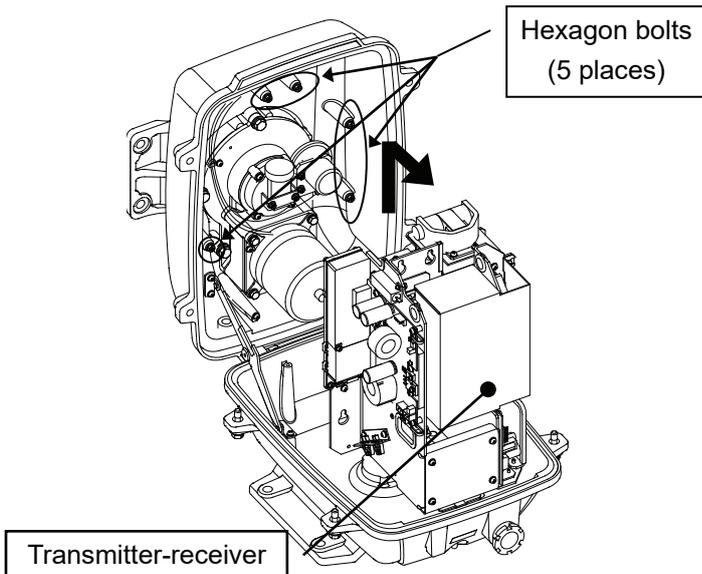
Remove 10 connectors in total.

* When a PM monitor (optional) is installed,
remove the connectors (2 places) and then
remove the screwed ground terminal.

Remove the screw (1 place) and remove the
cable clamp as well as the equipment cable.



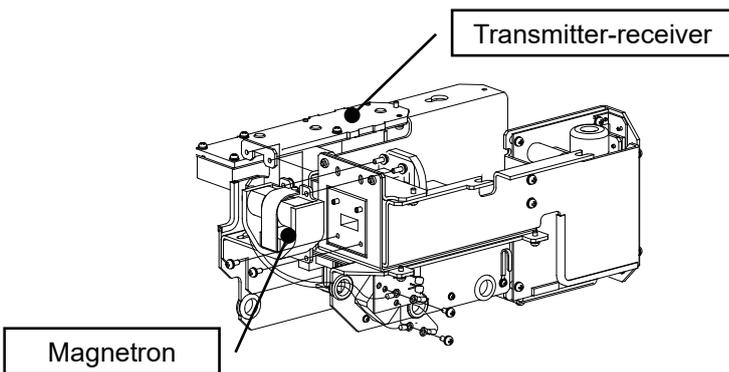
Step 4: Remove the transmitter-receiver.



Loosen all the hexagon bolts.

Slide upward and remove the transmitter-receiver.

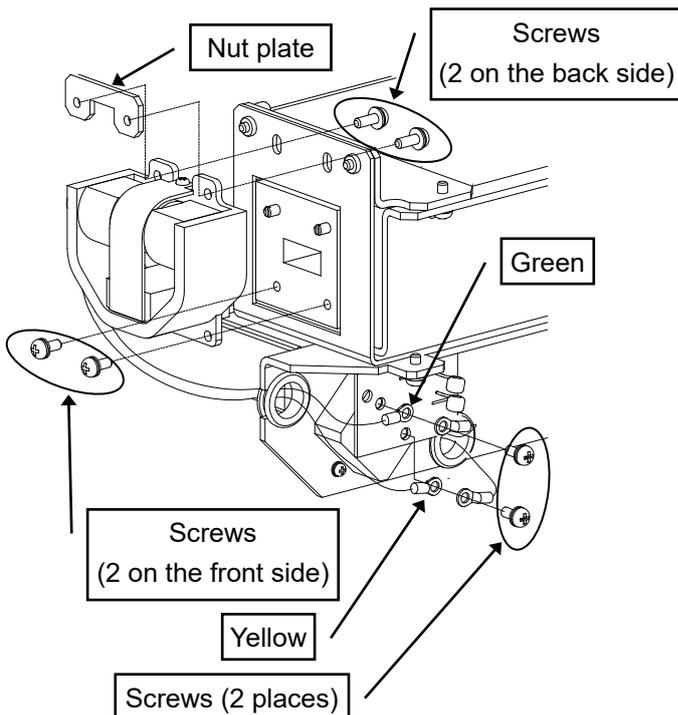
Step 5: Replace the magnetron.



Remove the screws (2 places) and remove the magnetron cable.

! Use a shielded screw driver. Metal (tools) may deteriorate if they come in contact with the magnetron.

Remove the screws (4 places) and remove the magnetron.



Set the new magnetron in place.

Fix the magnetron and pulse transformer cables (yellow and green, respectively) carefully in place.

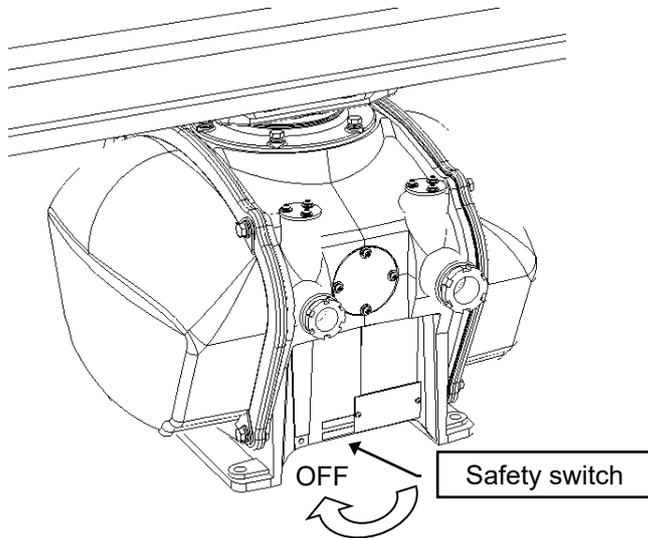
Reverse the order to complete the procedure.

Make sure that all bolts and screws are tightened again, and all cables are properly re-connected.

This completes the magnetron replacement procedure.

How to replace a 25 kW antenna magnetron

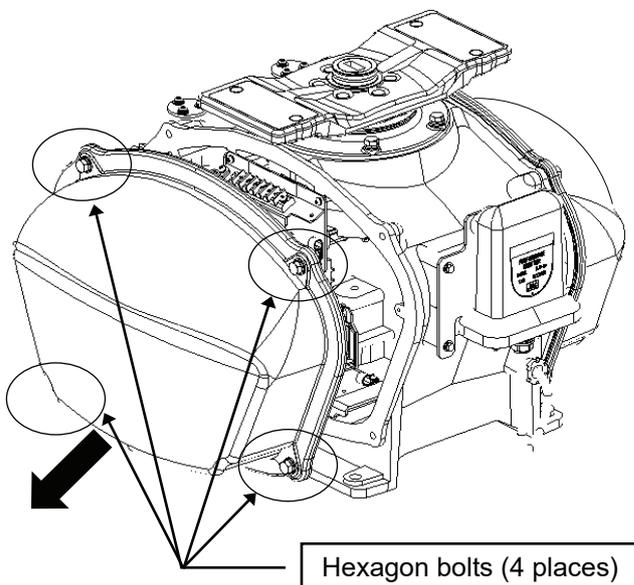
Make sure that all radars are turned off before replacing the magnetron (if there are multiple radar devices, turn them all off). It is also recommended that the breaker be turned off for safety.

Step 1: Turn off the antenna safety switch.

 When replacing a magnetron, make sure to first turn off the antenna safety switch.

The switch is at the rear bottom of the antenna.

Turn off the switch.

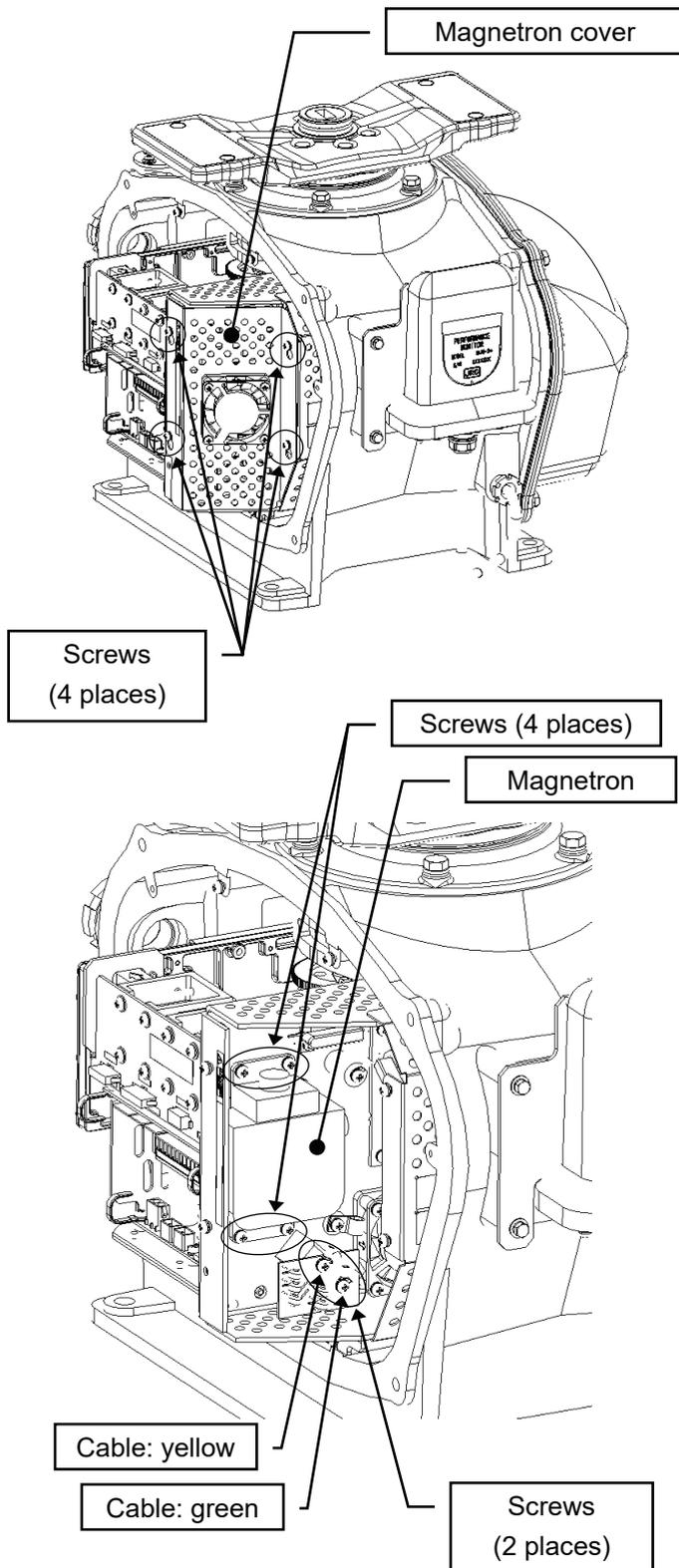
Step 2: Remove the cover.

The magnetron is placed on the right hand side (starboard side) of the antenna. Therefore, remove the right cover.

The cover is fixed with 4 hexagon bolts (M8 Captive Screw).

Place the cover in a safe place.
Prevent dust from being attached to the gasket.

Step 3: Replace the magnetron.



Remove the screws (M4X10, at 4 places) and remove the magnetron cover.

Remove the screws (M4X12, at 2 places) and remove the magnetron cable.

 Use a shielded screw driver.
Metal (tools) may deteriorate if they come in contact with the magnetron.

Remove the screws (M4X12, at 4 places) and remove the magnetron.

Do not lose the removed screws.

Set the new magnetron and cable in place.

Reverse the order to complete the procedure.

Make sure that all bolts and screws are tightened again, and all cables are properly re-connected.

This completes the magnetron replacement procedure.

8.4.3 Motor Replacement

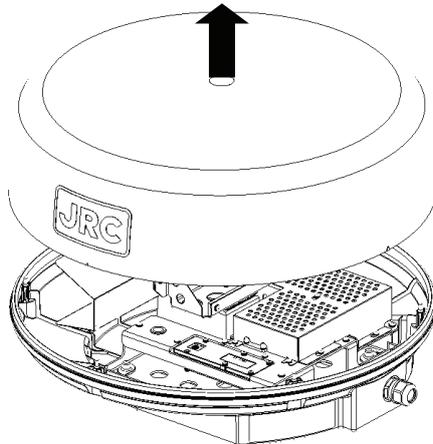
First remove the cover, and then remove the socket of the motor. Remove the screws that hold the motor, and remove the motor. Connect the leads correctly after replacing the motor.

How to replace a 4kW antenna motor

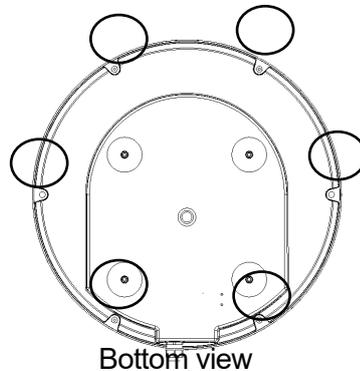
Make sure that all radars are turned off before replacing the motor (if there are multiple radar devices, turn them all off). It is also recommended that the breaker be turned off for safety.

Step 1: Remove the radome.

The radome is fixed with 6 hexagonal bolts.



The figure below shows the positions for 6 bolts.



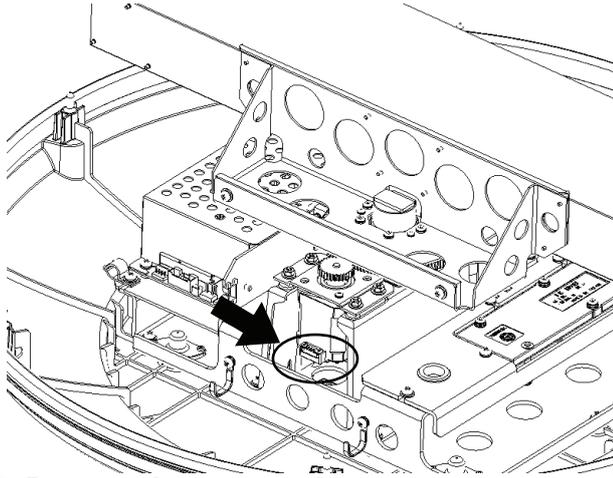
Place the removed radome in a safe place.
Be sure not to be blown off by the wind.

Step 2: Remove the motor cable.

The motor unit is installed on the bow side of the scanner.

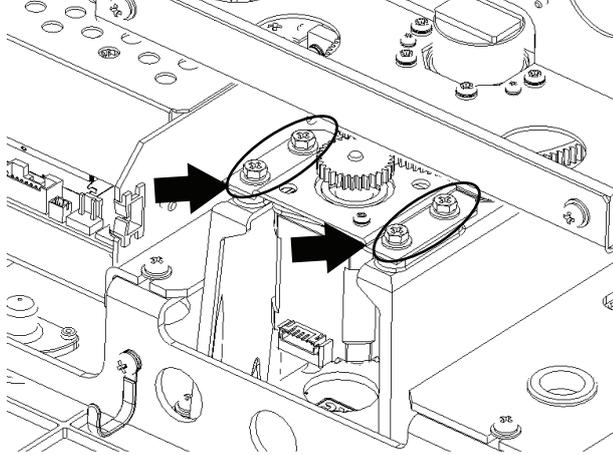
Remove the motor cable.

Remove the cable from the connector on the side of the motor unit.



Step 3: Remove the motor unit.

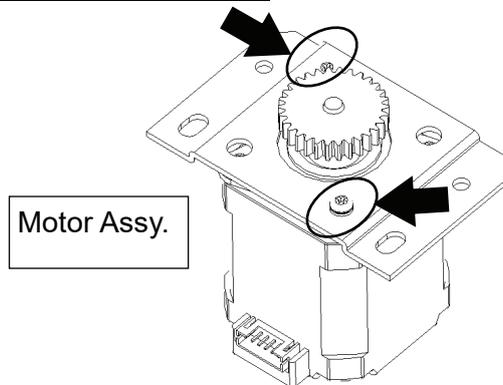
The motor unit is fixed with
4 upset head bolts with washer (M4X12SUS_SW_W).
Remove the upset head bolts to remove the motor unit.



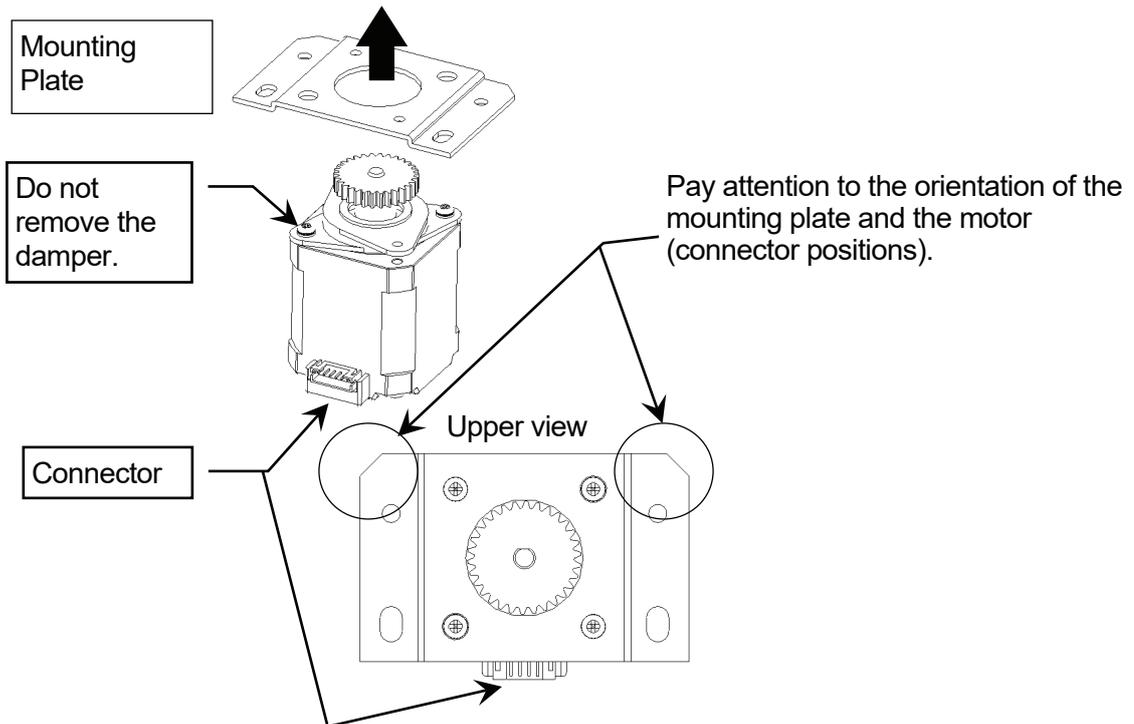
1 Replace the motor.

The motor is fixed with 2 screws with washer (M3X6Bs_SW).

Step 4: Remove 2 screws.



Step 5: Remove the motor for replacement.



Pay attention to the orientation of the motor.

For installation, pay attention to the orientation of the mounting plate and the motor (connector positions). The motor connector is positioned in reverse to the chamfer of the mounting plate.



Step 6: Install the motor into the scanner.

Be sure to tighten all the upset head bolts with specified torque.

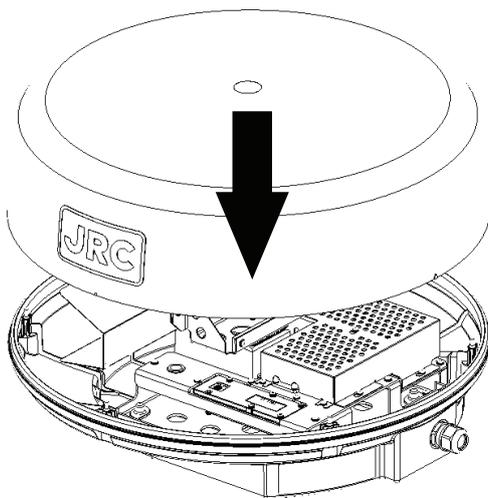
Connect the motor cable to the connector on the motor.

After connection, check the cables not to interfere the antenna rotation.

Apply grease to the gear after installing the motor.

Step 7: Attach the radome.

Before attaching the radome, check that the packing has no abnormality, such as deformation or cracks. Also, remove foreign material and dust if attached.

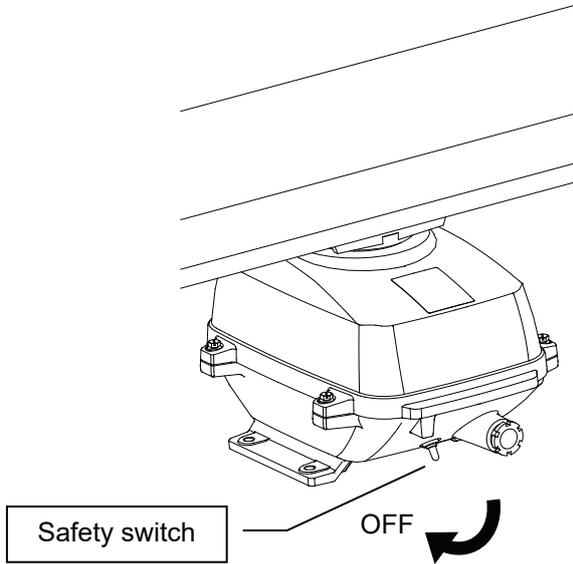


If any hexagonal bolt is not tightened enough or is loosened, the waterproof performance may be deteriorated. Be sure to tighten all bolts with specified torque (10.5kgf·cm). This completes the motor replacement procedure.

How to replace a 6kW NKE-2062 antenna motor

Make sure that all radars are turned off before replacing the magnetron (if there are multiple radar devices, turn them all off). It is also recommended that the breaker be turned off for safety.

Step 1: Turn off the antenna safety switch.

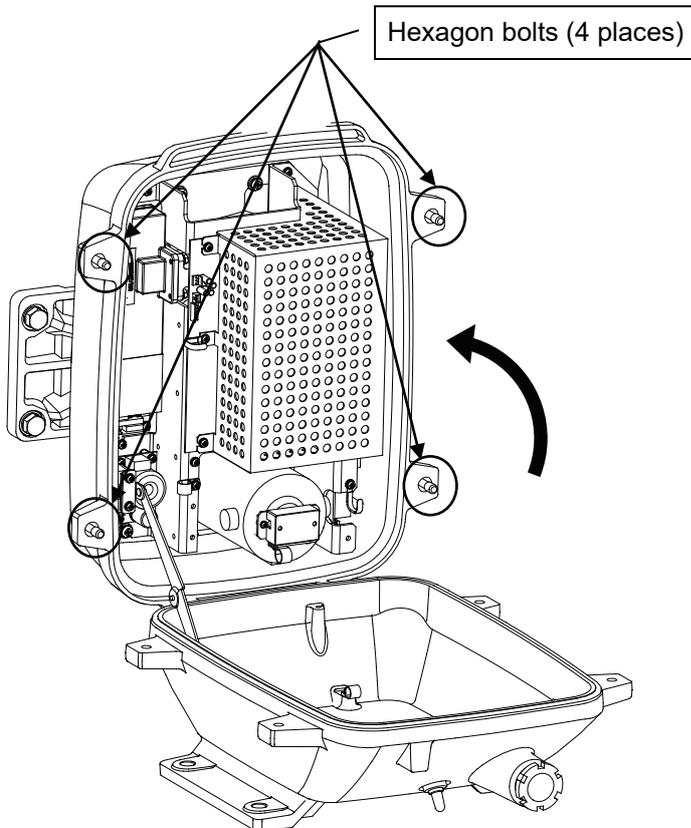


 When replacing a motor, make sure to first turn off the antenna safety switch.

The switch is at the rear bottom of the antenna.

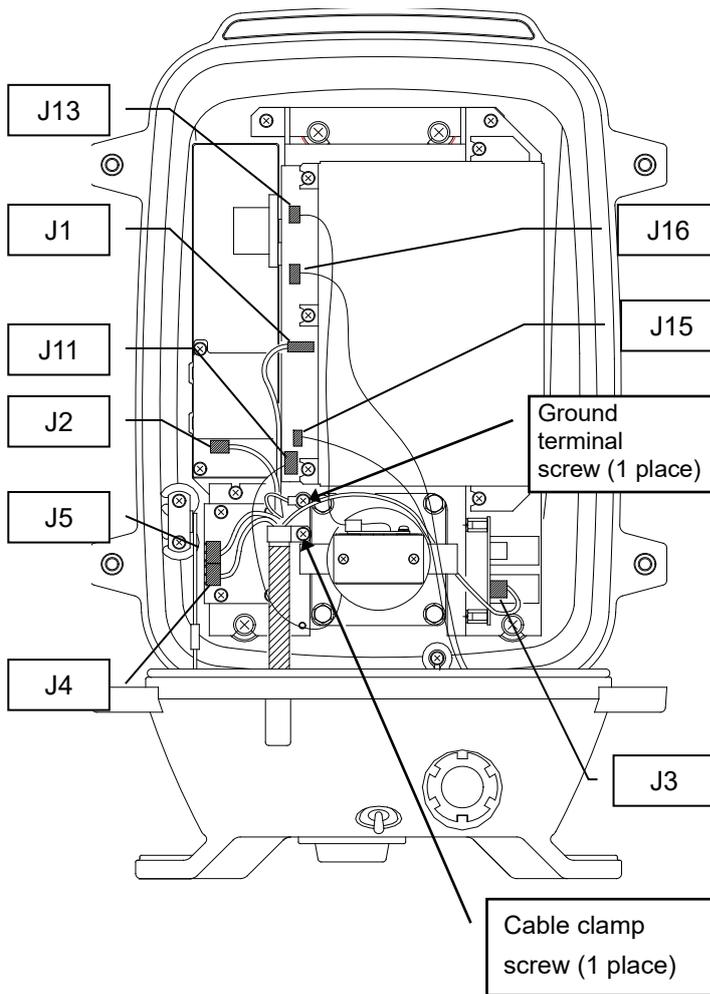
Turn off the switch.

Step 2: Remove the bolts and open the top cover.



The top cover is fixed with 4 hexagon bolts (M8 captive screw).

Step 3: Remove the cable.



Remove the equipment cable connectors (5 places).
(J1 through J5)

Remove the safety switch connectors (2 places).
(J15 and J16)

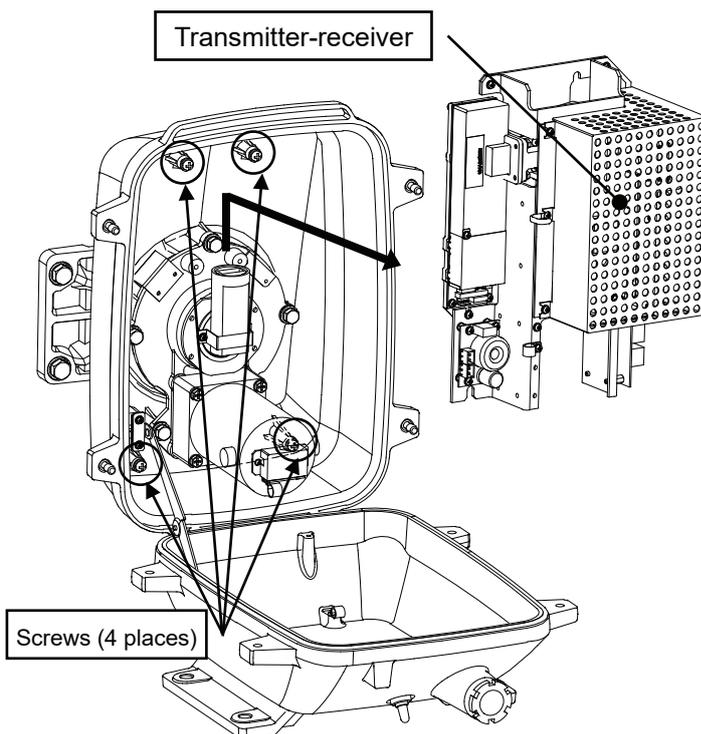
Remove the motor connectors (2 places).
(J11 and J13)

Remove 9 connectors in total.

Remove the screw (1 place) and remove the ground terminal.

Remove the screw (1 place) and remove the cable clamp as well as the equipment cable.

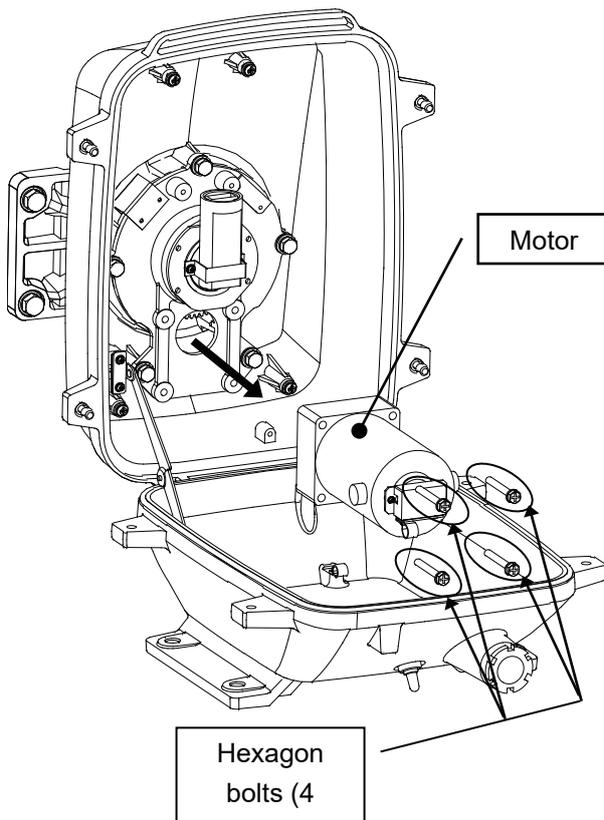
Step 4: remove the transmitter-receiver.



Loosen all the screws (4 places).

Slide upward and remove the transmitter-receiver.

Step 5: Replace the motor.



Remove the hexagon bolts (M6, at 4 places) and then remove the motor.

Apply grease to the gears of the new motor, and bolt the new motor.

Tighten the hexagonal bolts using a torque wrench (72 kgf · cm).

Reverse the order to complete the procedure.

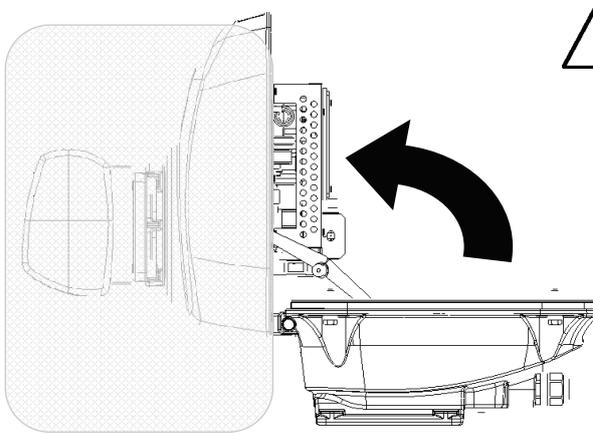
Make sure that all bolts and screws are tightened again, and all cables are properly re-connected.

This completes the motor replacement procedure.

How to replace a 6kW NKE-2063A antenna motor**Step 1: Open the upper housing.**

Open or close the scanner unit by turning the upper housing (including the antenna) to the bow side.

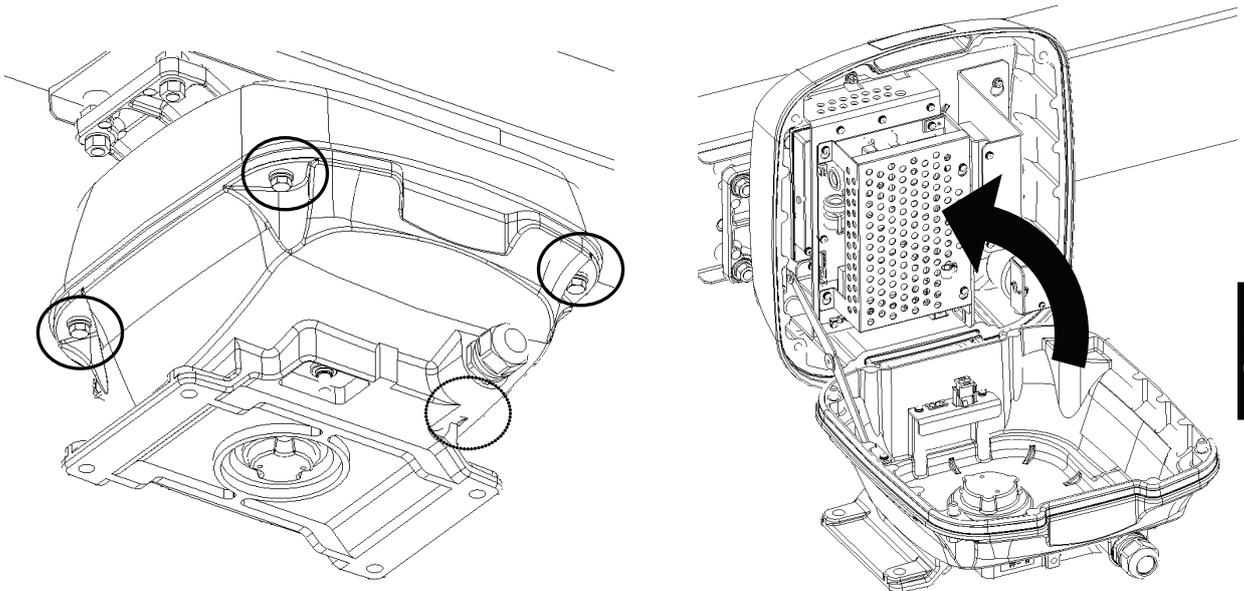
The gray area shown in the figure below must be clear.



Check if you can open or close safely for work. Be careful with the antenna behavior when opening or closing. Be careful with the antenna not to hit the mast or platform. Open it slowly. Do not apply too much force to the stay, otherwise, it may break.

The upper housing is fixed with 4 M8 hexagonal bolts.

Loosen those hexagonal bolts. (Bolts are falling-out prevention bolts.)



Open the upper housing by rotating upward to the bow side.



Check if the upper housing is stable while opened. If it is unstable, it will be dangerous while working.

Step 2: Remove the motor unit.

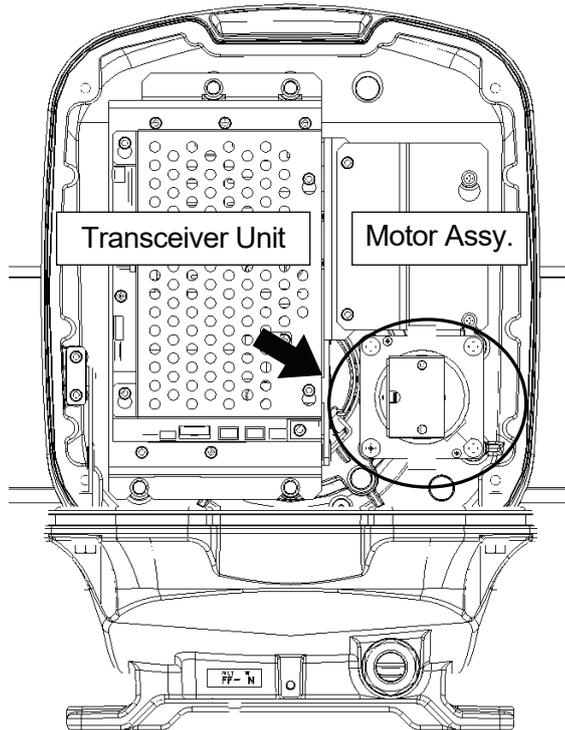
The motor unit is installed in the starboard bow side (starboard lower side when opened) of the scanner.

Remove the motor cable.

Remove the connectors of the cables connected to the transceiver unit.

The motor is fixed with 4 upset head bolts (M6X45FE) and spring washers (SW6).

Remove the bolts.

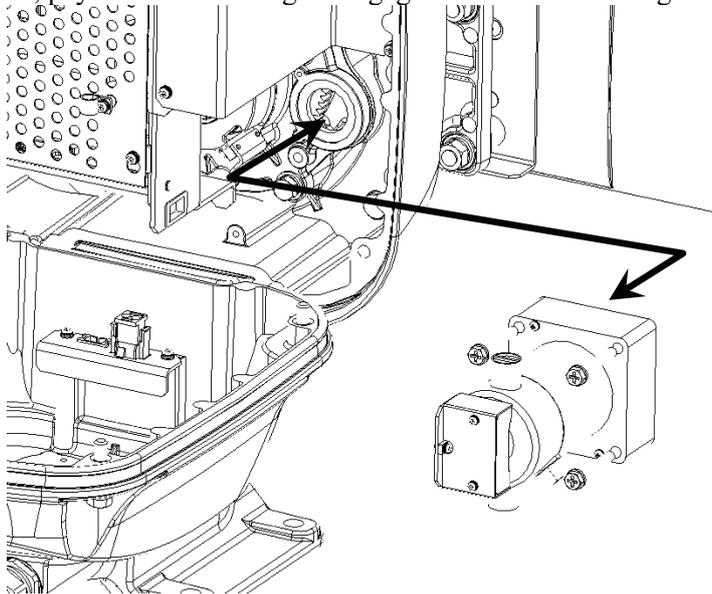


Step 3: Replace the motor unit.

Replace the motor unit.

Apply grease to the gear when installing the motor unit.

In addition, pay attention to the gear engagement when installing.



Note:

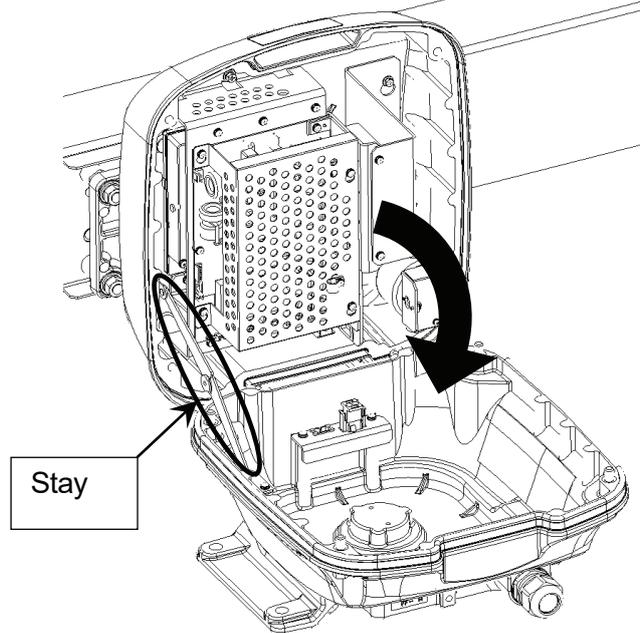
Do not forcibly install the motor. Otherwise, the gear may be damaged. If the motor cannot be installed easily, we recommend to rotate the antenna several times.

Step 4: Close the upper housing.

Before closing the upper housing, check that the packing has no abnormality, such as deformation or cracks.

Also, remove foreign material and dust if attached.

Close the upper housing while pulling the center of the stay.



If any hexagonal bolt is not tightened enough or is loosened, the waterproof performance may be deteriorated. Be sure to tighten all bolts with specified torque (120 to 150kgf·cm).

After the work, turn "ON" the safety switch.

When closing the housing, be careful that the cables are not caught.

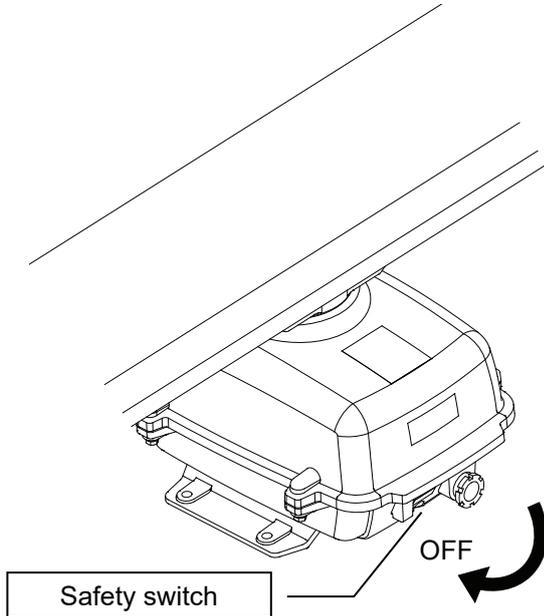
When closing the upper housing, always pull the center of the stay. Otherwise the stay may be broken.

This completes the motor replacement procedure.

How to replace a 10 kW antenna motor

Make sure that all radars are turned off before replacing the magnetron (if there are multiple radar devices, turn them all off). It is also recommended that the breaker be turned off for safety.

Step 1: Turn off the antenna safety switch.

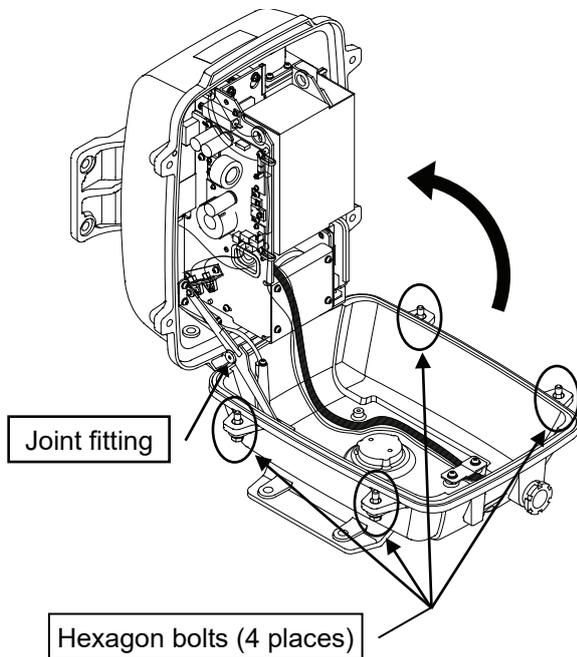


 When replacing a motor, make sure to first turn off the antenna safety switch.

The switch is at the rear bottom of the antenna.

Turn off the switch.

Step 2: Remove the bolts and open the top cover.

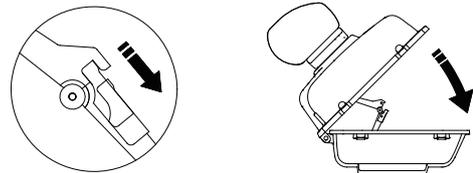


The top cover is fixed with 4 hexagon bolts (M8 captive screw).

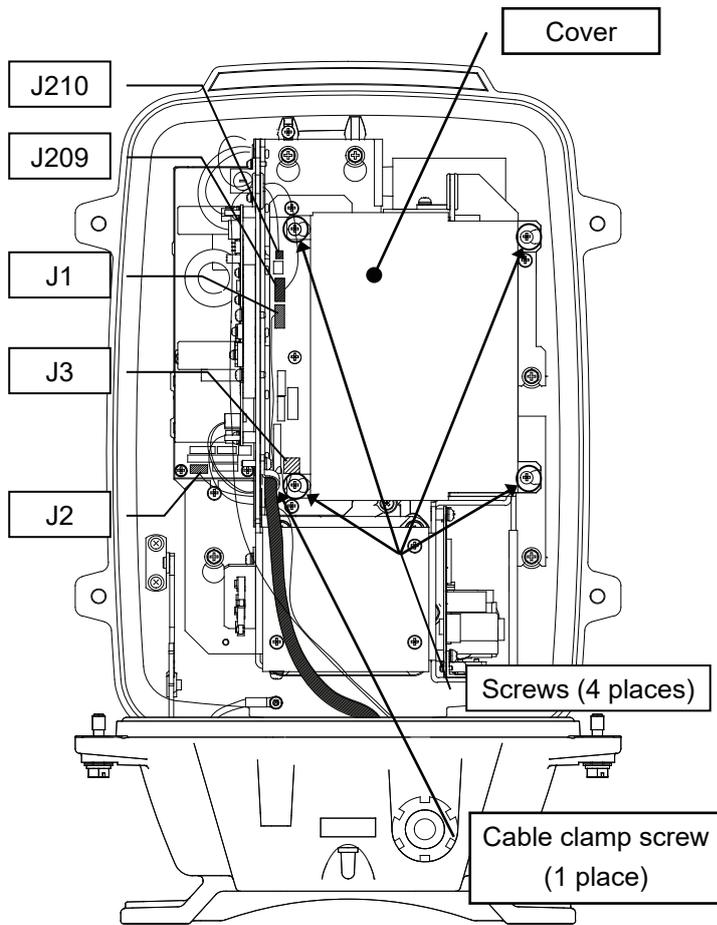
Remove the bolts and fully open the top cover such that the stopper of the joint fitting is locked.

* When closing the top cover

Release the stopper of the joint fitting before closing the top cover.



Step 3: Remove the cable.



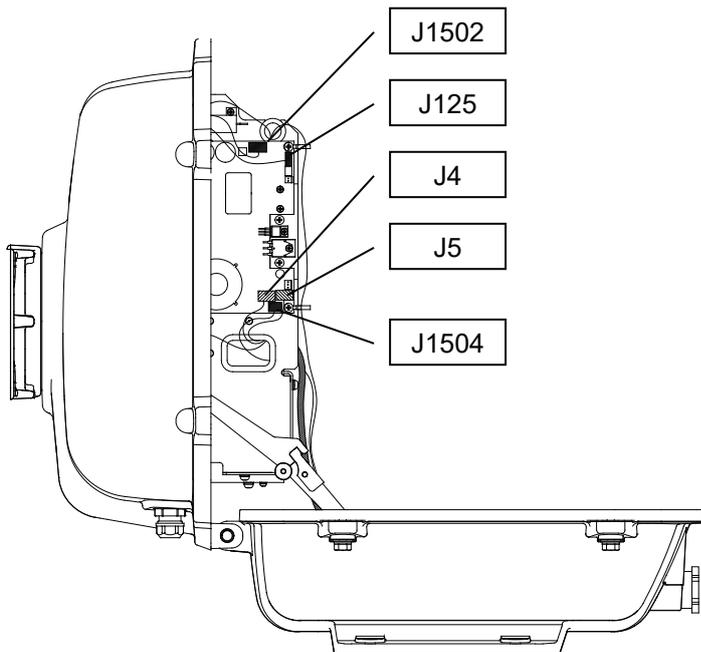
Loosen all the screws (4 places).

Slide the cover to the left and remove it.

Remove the encoder connector (1 place).
(J209)

Remove the equipment cable connectors
(5 places).
(J1 through J5)

Remove the safety switch connectors
(2 places).
(J210 and J1504)



Remove the motor connectors (2 places).
(J1502 and J125)

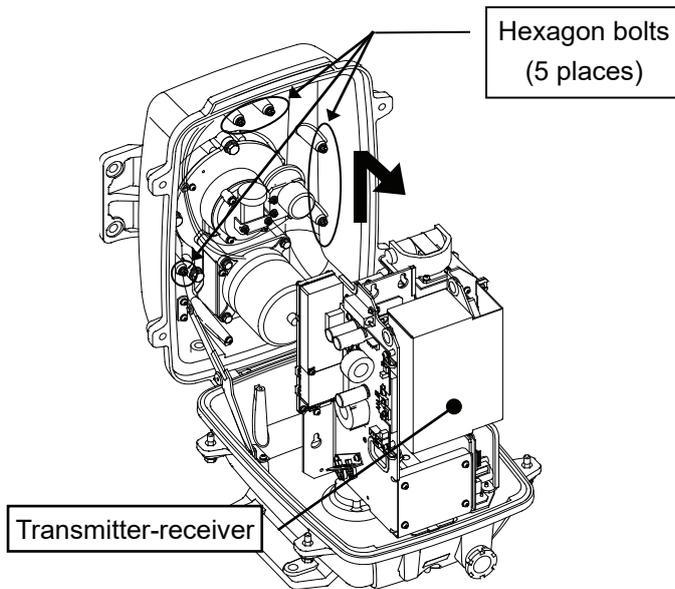
Remove 10 connectors in total.

* When a PM monitor (optional) is installed,
remove the connectors (2 places) and then
remove the screwed ground terminal.

Remove the screw (1 place) and remove the
cable clamp as well as the equipment cable.



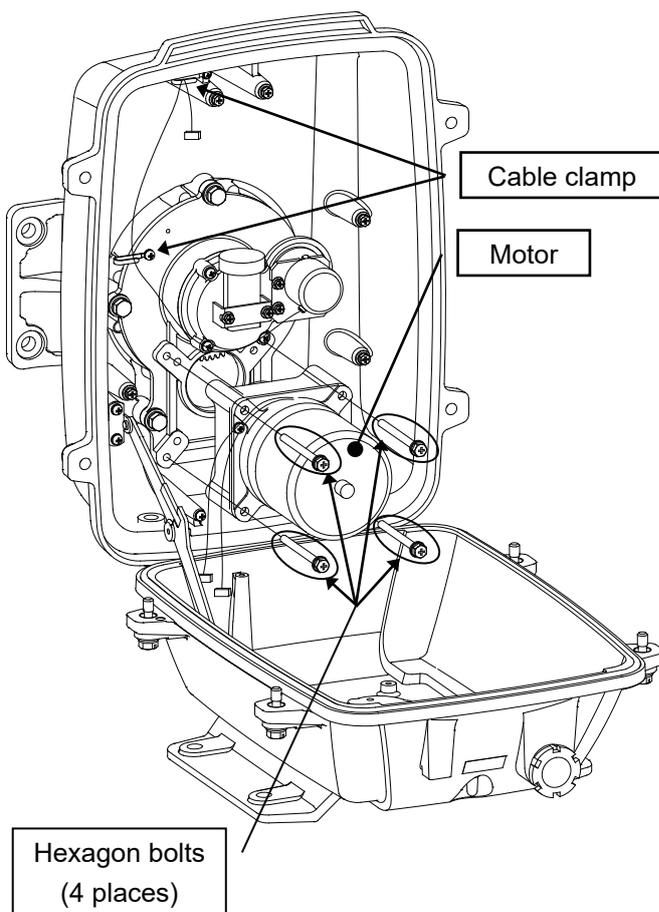
Step 4: Remove the transmitter-receiver.



Loosen all the hexagon bolts (5 places).

Slide upward and remove the transmitter-receiver.

Step 5: Replace the motor.



Remove the motor cable from the cable clamp.

Remove the hexagon bolts (M6, at 4 places) and then remove the motor.

Apply grease to the gears of the new motor, and bolt the new motor.

Tighten the hexagonal bolts using a torque wrench (72 kgf·cm).

Reverse the order to complete the procedure.

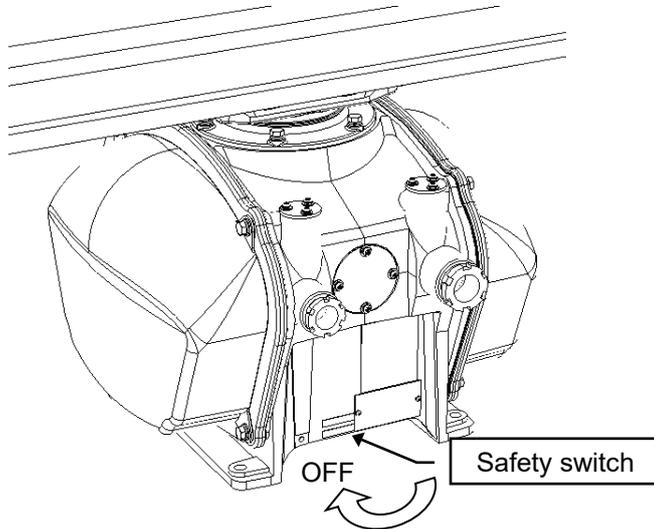
The rotor of the motor rotates. Clamp the cable such that it will not touch the rotor.

Make sure that all bolts and screws are tightened again, and all cables are properly re-connected.

This completes the motor replacement procedure.

How to replace a 25 kW antenna motor

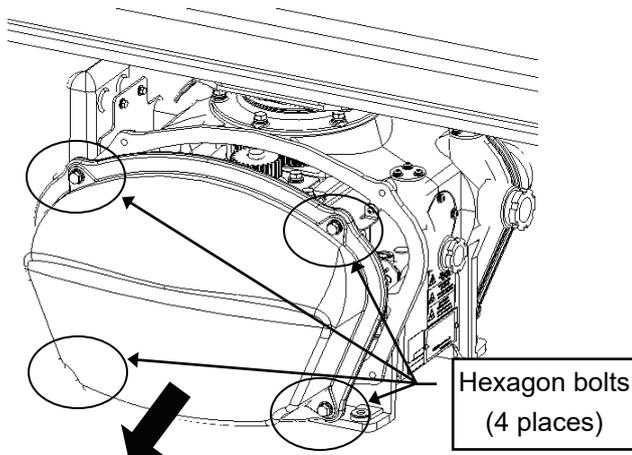
Make sure that all radars are turned off before replacing the magnetron (if there are multiple radar devices, turn them all off). It is also recommended that the breaker be turned off for safety.

Step 1: Turn off the antenna safety switch.

 When replacing a motor, make sure to first turn off the antenna safety switch.

The switch is at the rear bottom of the antenna.

Turn off the switch.

Step 2: Remove the cover.

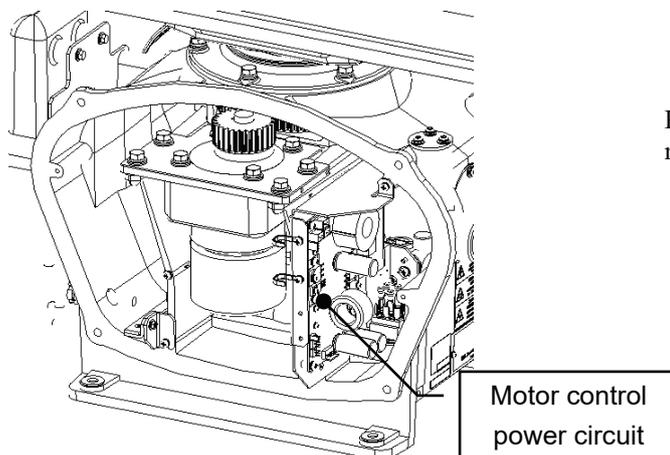
The motor is placed on the left hand side (port side) of the antenna.

Therefore, remove the left cover.

The cover is fixed with 4 hexagon bolts (M8 captive screw).

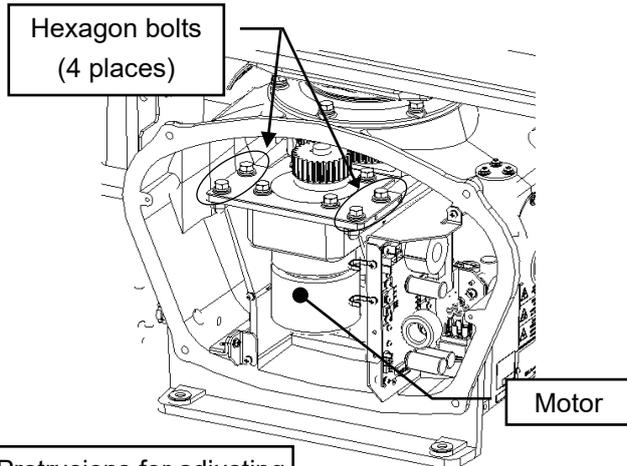
Place the cover in a safe place.
Prevent dust from being attached to the gasket.

8

Step 3: Remove the motor cable.

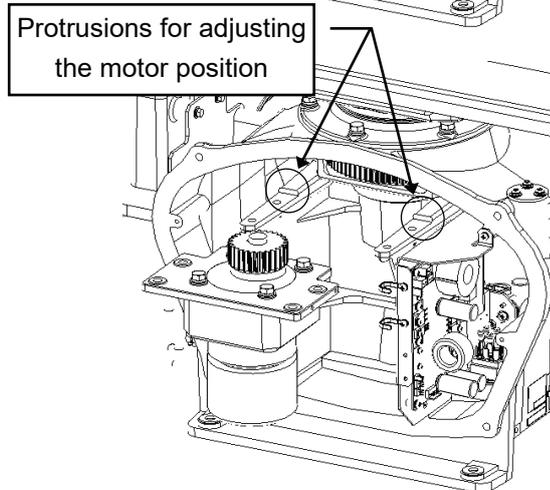
Remove the motor cable connected to the motor control power circuit.

Step 4: Replace the motor.



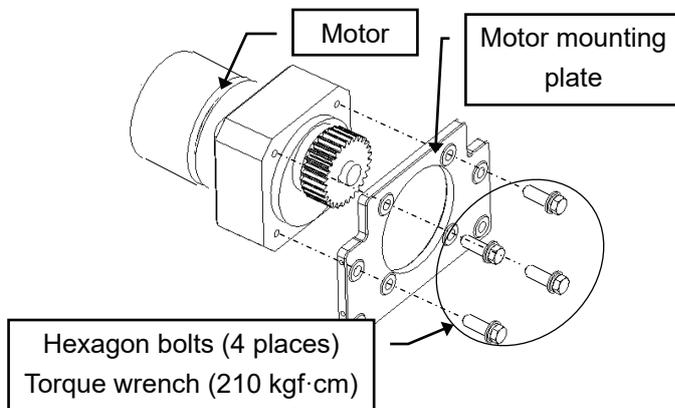
The motor is fixed with 4 hexagon bolts (M8 x 20 SW W, embedded type).

Remove all the hexagon bolts (4 pieces).



Remove the motor.

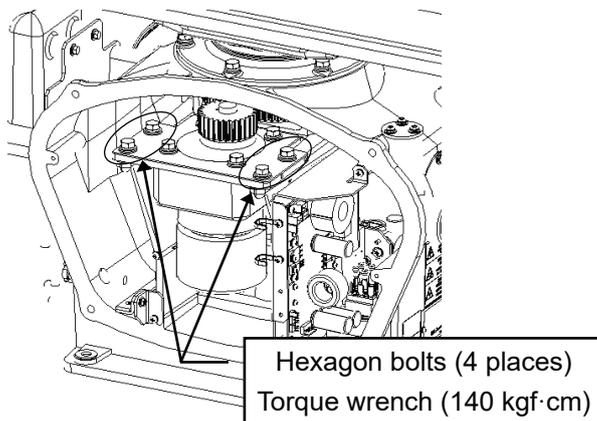
 The motor weighs about 6 kg.
Handle it carefully.



Attach the mounting plate to the new motor.

Remove the motor mounting plate from the removed motor. The mounting plate is fixed with 4 hexagon bolts (M8 x 30 SW W, embedded type).

Attach the removed parts to the new motor. Make sure to properly tighten all the hexagon bolts at the optimal torque (210 kgf·cm).

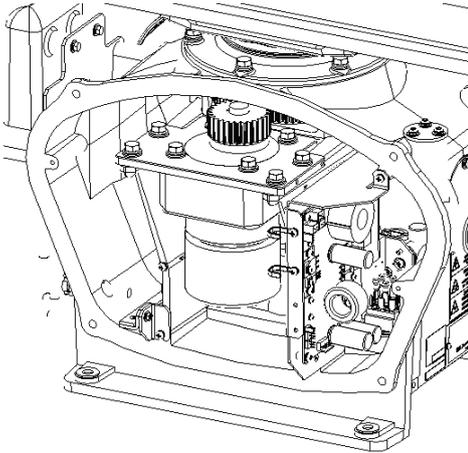


Place the motor in the antenna.

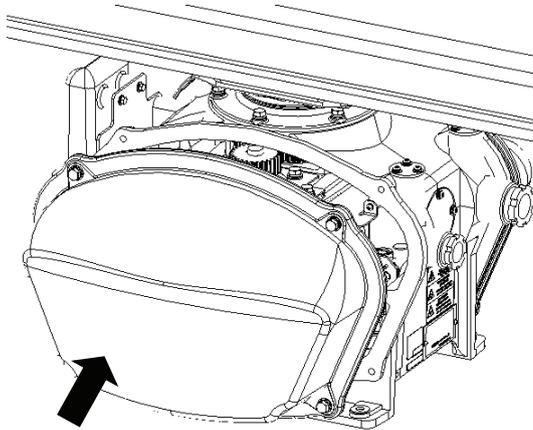
Press the motor against the protrusions from the arms of the case, and adjust its position to minimize the backlash.

Make sure to properly tighten all the hexagon bolts at the optimal torque (140 kgf·cm).

Apply grease to the gear after placing the motor in the case.

Step 5: Connect the motor cables.

Reconnect the cables to the motor control power circuit.

Step 6: Put the cover on.

Before attaching the cover to the antenna, make sure that the gasket of the cover is not deformed or cracked. Also, remove any dust attached to the gasket.

Fix the cover with 4 hexagon bolts.

Failure to tighten the bolts or loose bolts will affect waterproof property; therefore, make sure to tighten all the bolts at the optimal torque.

Turn on the antenna safety switch.

This completes the motor replacement procedure.

8.4.4 Replacement of Diode Limiter (A102/A301)

Remove the 4 screws fixing the receiver. Remove the 4 screws fixing the diode and the limiter, and remove diode limiter. When mounting the diode limiter, take care of the mounting direction and mount it in the arrow direction facing it the receiver front end.
Connect the wiring in the same way as before the replacement.

8.4.5 Replacement of Backup Battery

Caution: Replacement of backup battery must be made by specialized service personnel.
For details, refer to Service Manual.

A coin-cell battery maintains radar system configuration, date, and time information while power off condition. radar system configuration is saving to non-volatile memory at fixed intervals.

How to Replacement of Backup Battery

1. Remove the Coin-Cell Battery from the Holder

Be careful, don't break holder.

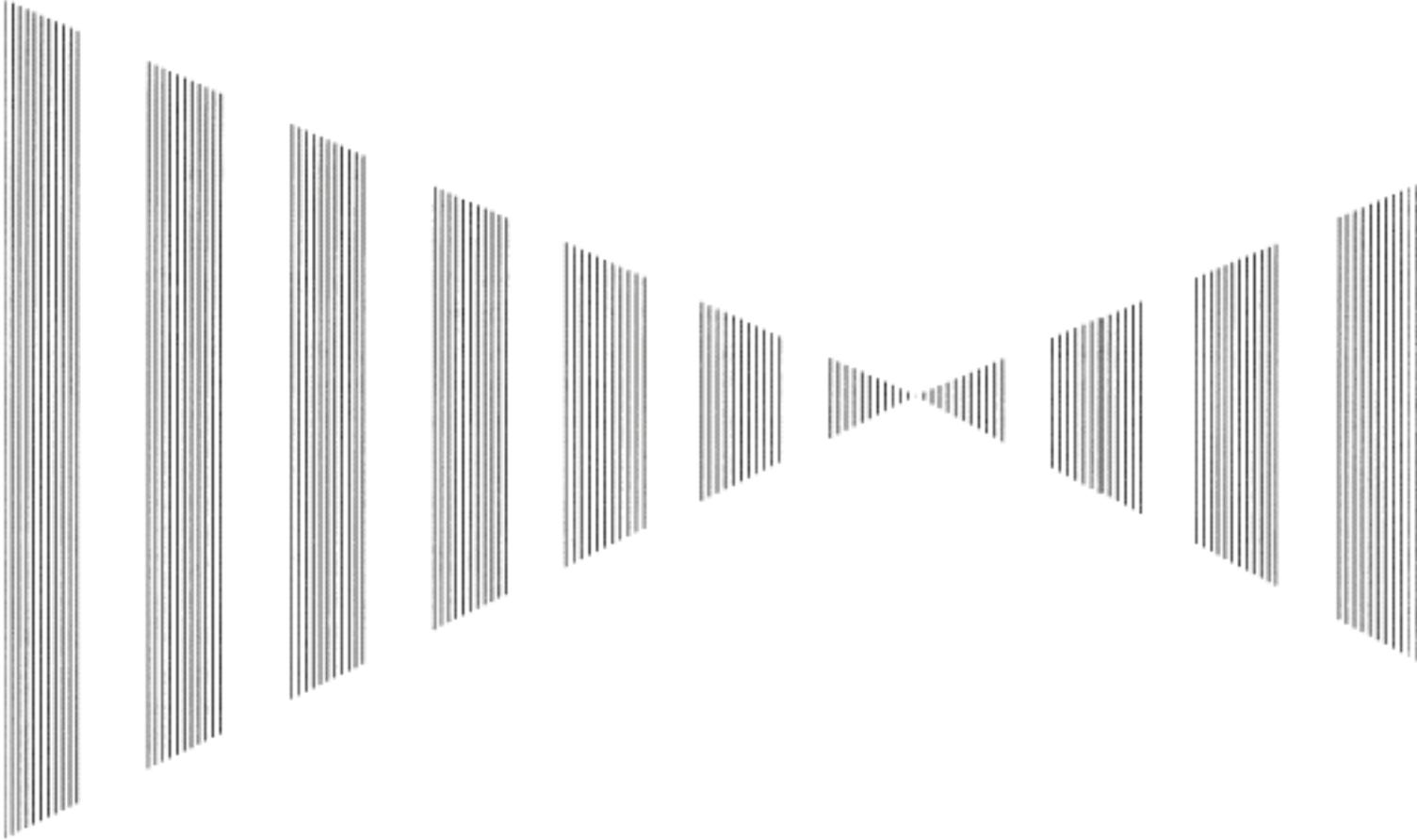
3. Fix the Coin-Cell Battery in the Holder

Turn up + surface.
Battery type : CR2450



SECTION 9

TROUBLESHOOTING AND AFTER-SALES SERVICE



9.1	FAULT FINDING	9-1
9.1.1	List of Alarms and other Indications	9-1
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9.2.2	Special Parts	9-9
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9.1 FAULT FINDING

In case of semiconductor circuits, it is deemed that there are few cases in which the used semiconductor devices have inferior quality or performance deterioration except due to insufficient design or inspection or by other external and artificial causes. In general, the relatively many causes are disconnection in a high-value resistor due to moisture, a defective variable resistor and poor contact of a switch or relay. Some troubles are caused by defective parts, imperfect adjustment (such as tuning adjustment) or insufficient service (such as poor cable contact). It will also be effective to check and readjust these points.

9.1.1 List of Alarms and other Indications

If any of the following alarm occurs, the system displays the alarm message in red in order to attract the attention of operator. Other messages are displayed with the suitable color which is yellow or blue depending on the level of message importance.

Alarm:	Red	• Collision-related Alarm • Navigation Alarm • System Alarm
Warning:	Yellow	• System Warning
Information:	Blue	• Operation Information

Table 9-1 List of Notification

Message	Class	Description	ALR No.
CCRP Changed	INFO	CCRP is automatic changed.	
Copying	INFO	Display is capturing to file.	
GPS (HDOP)	Warning	The HDOP level is increased (Decrease in the GPS accuracy).	
GPS(Low Integrity)	Warning	GPS Low integrity	
MON Test	Warning	Performance monitor is active.	
Position Reset	INFO	Change the latitude and longitude sentence.	
Set GYRO	INFO	Set a course with the gyro.	
TM Reset	INFO	Use care of resetting TM.	
TXRX(Standby)	INFO	Scanner Ready for transmission	
Weather Information	INFO	Weather information received.	

ALR No: Unique alarm number in ALR sentence and ACK sentence.

Table 9-2 List of Target Tracking Alarms and AIS Function Critical Alarms

Message	Class	Description	ALR No.
AIS(CPA/TCPA)	Alarm	There is a AIS dangerous target.	931
TT(CPA/TCPA)	Alarm	There is a TT dangerous target.	301

ALR No: Unique alarm number in ALR sentence and ACK sentence.

**Table 9-3 List of RADAR Alarm, Target Tracking Alarms and AIS Function Alarms**

Message	Class	Description	ALR No.
AIS (ACT 95% Capacity)	INFO	Over 95% of the maximum number of AIS targets to be activated.	
AIS(ACT MAX)	INFO	Maximum number of AIS targets to be activated.	334
AIS(CPA/TCPA)	Alarm	There is a AIS dangerous target.	931
AIS(Data)	Alarm	AIS communication error. The data of communication with the AIS unit contains an error.	918
AIS(Lost)	Alarm	AIS Target has been lost. (Failure in receiving AIS target data for a specified time.)	335
AIS(New Target)	Alarm	AIS Automatic new target acquisition in the automatic acquisition area.	302
AIS(Time Out)	Alarm	No communication with AIS. The AIS transponder is not connected correctly or the power is turned off.	116
AIS 95% Capacity	INFO	Over 95% of the maximum number of AIS targets.	
AIS Alarm ***	Alarm	Alarm information issued with the ALR sentence by the AIS. *** is a 3-digit number which is Local Alarm No in the ALR sentence.	
AIS MAX Target	INFO	Maximum number of AIS targets.	333
AIS PROC(Data)	Alarm	AIS I/F communication error. The data of communication with the AIS unit.	919
AIS PROC(Time Out)	Alarm	No communication with AIS I/F. The AIS unit is nor connected or is not operating.	328
REF TT(Lost)	Alarm	Decrease in the reference target accuracy. (Reference TT target has been lost.)	337
Radar Alarm(In)	Alarm	Targets have entered the radar alarm range.	933
Radar Alarm(Out)	Alarm	Targets have left the radar alarm range.	934
TT(CPA/TCPA)	Alarm	There is a TT dangerous target.	301
TT(Data *)	Alarm	Communication error with the TT processing unit. The target tracking unit is malfunctioning.	323 914 915 916
TT(Lost)	Alarm	TT Target has been lost. (Failure in tracking the target that has been under tracking.)	336
TT (MAX 95% Capacity)	INFO	Over 95% of the maximum number of targets to be tracked.	
TT(MAX Target)	INFO	The maximum number of targets is under acquisition.	338
TT(New Target)	Alarm	TT Automatic new target acquisition in the automatic acquisition area.	932

ALR No: Unique alarm number in ALR sentence and ACK sentence.

Table 9-4 List of Route Error Messages and Warnings

Message	Class	Description	ALR No.
Radar Alarm(In)	Alarm	Targets have entered the radar alarm range.	933
Radar Alarm(Out)	Alarm	Targets have left the radar alarm range.	934
Route(Approach)	Alarm	Approach the route.	938
Route(Break Off)	Alarm	Out of the route.	939
WPT(Arrival)	Alarm	Arrive at way point.	936
WPT(Break Off)	Alarm	Out of the way point.	937

ALR No: Unique alarm number in ALR sentence and ACK sentence.

Table 9-5 List of Operational Error Messages and Warnings

Message	Class	Description	ALR No.
Can't Transmit	INFO	Transmission cannot be executed. Tried to transmit within 5 second after standby or when the transmitter-receiver has any trouble.	
Card Full	INFO	Card capacity insufficient.	
Delete Failed	INFO	Data deletion from the card failed.	
Format Failed	INFO	Card format failed.	
In Use	INFO	Data cannot be deleted / changed because it is being used now.	
In Use	INFO	Data has been inputted.	
Invalid Card	INFO	Card is not valid.	
Invalid Data	INFO	The value is invalid. Tried to enter any data beyond its range.	
MAX Point	INFO	The maximum number of points has been reached. Tried to enter navigation information beyond the specified.	
No Card	INFO	Card not detected yet.	
No Position Data	INFO	There is no position data. Mark or line input when the latitude and longitude is invalid.	
No Heading Data	INFO	There is no bearing data. Target tracking operation or TM selection when bearing data is invalid.	
Not Allowed	INFO	General operation error.	
Out of Bounds	INFO	The latitude cannot be displayed on the map.	
Out of Bounds	INFO	The latitude is outside the displayable latitude range.	
Out of Range	INFO	Out of operation range.	
Read Failed	INFO	Data load from the card failed.	
Write Failed	INFO	Data write to the card failed.	

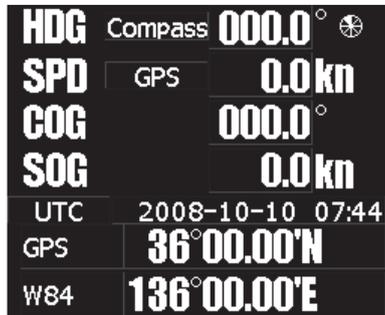
ALR No: Unique alarm number in ALR sentence and ACK sentence.



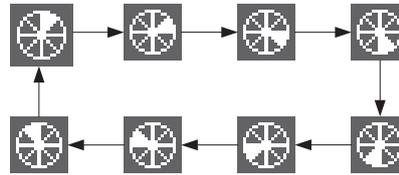
9.1.2 Operation Checking

When the system is operating, the operation status (located at the upper right of the screen) is changing pictures.

If picture freeze occurred, turn off the system and restart the system.



Operation status



9.1.3 Fuse Checking

Melted fuses are caused by any clear cause. When a fuse is replaced, it is necessary to check the related circuits even if there is no trouble. In checking, note that there is some dispersion in the fusing characteristics. Table 9-6 shows a list of fuses used in the equipment.

Table 9-6 Fuse List

Location	Parts No.	Current Rating	Type	Protection Circuit	Scanner Unit
Radar processing circuit	F2	6.3A	ST4-6.3AN1	I/F circuit	NKE-2043 (4kW) for 12V DC
Radar processing circuit	F2	3.15A	ST4-3.15AN1	I/F circuit	NKE-2043 (4kW) for 12V DC
Radar processing circuit	F2	6.3A	ST4-6.3AN1	I/F circuit	NKE-2063A(6kW) for 12V DC
Radar processing circuit	F2	3.15A	ST4-3.15AN1	I/F circuit	NKE-2063A (6kW) for 24V DC
Radar processing circuit	F3	5A	ST4-5AN1	I/F circuit	NKE-2063A(6kW)
Radar processing circuit	F2	5A	ST4-5AN1	I/F circuit	NKE-2103 (10kw)
Radar processing circuit	F3	10A	ST6-10AN1	I/F circuit	NKE-2103 (10kw)
Radar processing circuit	F2	10A	ST6-10AN1	I/F circuit	NKE-2254 (25kw)
Radar processing circuit	F3	10A	ST6-10AN1	I/F circuit	NKE-2254 (25kw)

9.2 TROUBLE SHOOTING

As this radar equipment includes complicated circuits, it is necessary to request a specialist engineer for repair or instructions for remedy if any circuit is defective.

There are also troubles by the following causes, which should be referred to in checking or repair work.

1 Poor Contact in Terminal Board of Inter-Unit Cables

- a) Poor contact in terminal board
- b) The cable end is not fully connected, that it, contacted with earthed another terminal.
- c) Disconnected cable wire

2 Poor Contact of Connector within Unit

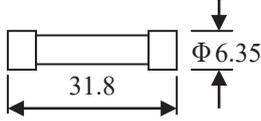
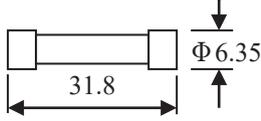
Reference: This radar equipment is provided with Table 9-7 standard spares.



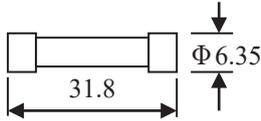
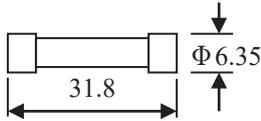
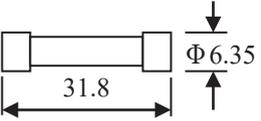
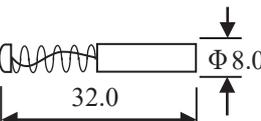
9.2.1 Spares

Table 9-7 Spares

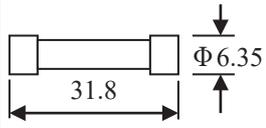
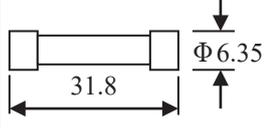
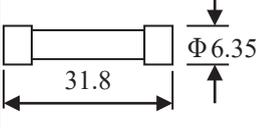
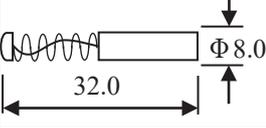
7ZXRD0012 : Scanner NKE-2043 (4kw)

Name	Type/Code	Shape (mm)	In use	Spare	Parts No.	Location
Fuse (For DC12V)	ST4-6.3AN1 (5ZFCA00051)		1	3	F2	Inside processing unit
Fuse (For DC24V)	ST4-3.15AN1 (5ZFCA00047)		1	3	F2	Inside processing unit

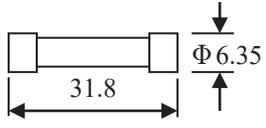
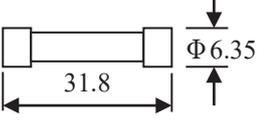
7ZXRD0013 : Scanner NKE-2062 (6kw)

Name	Type/Code	Shape (mm)	In use	Spare	Parts No.	Location
Fuse (For DC12V)	ST4-6.3AN1 (5ZFCA00051)		1	3	F2	Inside processing unit
Fuse (For DC24V)	ST4-3.15AN1 (5ZFCA00047)		1	3	F2	Inside processing unit
Fuse	ST4-5AN1 (5ZFCA00050)		1	3	F3	Inside processing unit
Motor brush	54531-01 (BRXP05247)		1	2	—	Scanner monitor

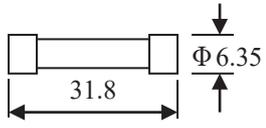
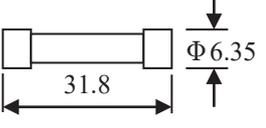
7ZXRD0013 : Scanner NKE-2063A (6kw)

Name	Type/Code	Shape (mm)	In use	Spare	Parts No.	Location
Fuse (For DC12V)	ST4-6.3AN1 (5ZFCA00051)		1	3	F2	Inside processing unit
Fuse (For DC24V)	ST4-3.15AN1 (5ZFCA00047)		1	3	F2	Inside processing unit
Fuse	ST4-5AN1 (5ZFCA00050)		1	3	F3	Inside processing unit
Carbon brush	54531-01 (BRXP05247)		1	1	—	Scanner monitor

7ZXRD0026 : Scanner NKE-2103 (10kw)

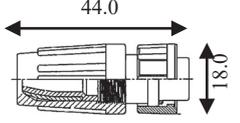
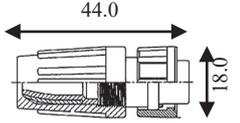
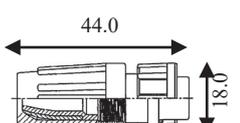
Name	Type/Code	Shape (mm)	Number	Parts No.	Location	Application
Fuse	ST4-5AN1 (5ZFCA00050)		4	F2	Inside processing unit	For the power supply to antenna
Fuse	ST6-10AN1 (5ZFCA00053)		4	F3	Inside processing unit	For the antenna motor

7ZXRD0015 : Scanner NKE-2254 (25kw)

Name	Type/Code	Shape (mm)	Number	Parts No.	Location	Application
Fuse	ST6-10AN1 (5ZFCA00053)		4	F2	Inside processing unit	For the power supply to antenna
Fuse	ST6-10AN1 (5ZFCA00053)		4	F3	Inside processing unit	For the antenna motor



7ZXR0027 : Processor unit NDC-1460

Name	Type/Cde	Shape (mm)	In use	Spare	Parts No.	Location	Application
Connector	LTWBD- 06BFFA-LL7001 (5JCDX00032)		1	1	P3	Inside processing unit	Mainly for GPS connection
Connector	LTWBD- 08BFFA-LL7001 (5JCDX00034)		1	1	P5	Inside processing unit	Mainly for connecting course equipment such as a GPS compass
Connector	LTWBD- 07BFFA-LL7001 (5JCD00033)		1	1	P6	Inside processing unit	For AIS connection For connecting other external devices when the AIS is not used
Connector	LTWCD- 14BFFA-LL7001 (5JCDX00052)		1	1	P9	Inside processing unit	For connecting external devices For acquiring 2-axis logs, current data, and wind direction data

9.2.2 Special Parts

Table 9-8 Special Parts

[I] JMA-5204

Parts No.	Name	Type	Manufacturer	Location	Code
V101	Magnetron	MSF1421B	NJRC	Scanner	5VMAA00092
A101	Circulator	FCX68R	Orient Microwave	Scanner	5AJIX00027
A102	Diode Limiter	NJS6930	NJRC	Scanner	5ATBT00006

[II] JMA-5208/HS

Parts No.	Name	Type	Manufacturer	Location	Code
V101	Magnetron	MSF1422B	NJRC	Scanner	5VMAA00068
A101	Circulator	FCX68R	Orient Microwave	Scanner	5AJIX00027
A102	Diode Limiter	NJS6930	NJRC	Scanner	5EZAA00024

[III] JMA-5209

Parts No.	Name	Type	Manufacturer	Location	Code
V101	Magnetron	MSF1422B	NJRC	Scanner	5VMAA00090
A101	Circulator	FCX68R	Orient Microwave	Scanner	5AJIX00027
A102	Diode Limiter	NJS6930	NJRC	Scanner	5ATBT00006

[IV] JMA-5212-4/6/4HS/6HS

Parts No.	Name	Type	Manufacturer	Location	Code
V101	Magnetron	MAF1565N	NJRC	Scanner unit	5VHAA00102
A101/A102	Circulator	FCX68R	OrientMicrowave	Scanner unit	5AJIX00027
A103	Dummy	NJC4002	NJRC	Scanner unit	5ANDF00001
A104	Filter	NJC9952	NJRC	Scanner unit	5AWAX00002
A301	Diode Limiter	NJS6930	NJRC	Scanner unit	5ATBT00006

[III] JMA-5222-7/9

Parts No.	Name	Type	Manufacturer	Location	Code
V1	Magnetron	M1568BS	NJRC	Scanner unit	5VMAA00106
A101/A102	Circulator	NJC3901M	NJRC	Scanner unit	5AJBV00007
A103	Dummy	NJC4002	NJRC	Scanner unit	5ANDF00001
A104	Filter	NJC9952	NJRC	Scanner unit	5AWAX00002
A301	Diode Limiter	NJS6930	NJRC	Scanner unit	5ATBT00006



9.2.3 Circuit Block to be Repaired

Table 9-9 Circuit Block to be Repaired (JMA-5204)

Location	Circuit Block	Type	Remarks
Scanner	Motor	7BDRD0052*	
Scanner	Compound Modulator Circuit	CME-385	
Scanner	Receiver Unit	NRG-239	Including CAE-548
Processor	Radar processing circuit	CDC-1350	
Processor	DSP circuit (TT)	NCA-877A	
Processor	Power supply terminal circuit unit	NBD-866A	
Processor	AIS processing circuit	NQA-2155	
Operation panel unit	Operation circuit	CCK-979	
Operation panel unit	PS2 connector circuit	CQC-1204	
Display	Brilliance control circuit	CCK-970	Brilliance controller
NSK unit	Gyro IF circuit	CMJ-304E	

"*" means revision, such as A, B and so on

Table 9-10 Circuit Block to be Repaired (JMA-5208)

Location	Circuit Block	Type	Remarks
Scanner	Motor with gear	CBP-153	DC brush motor (ordinary)
Scanner	Modulator	CME-323	Excluding Magnetron
Scanner	Receiver	NRG-226	Including CAE-475-1
Processor	Radar processing circuit	CDC-1350	
Processor	DSP circuit (TT)	NCA-877A	
Processor	Power supply terminal circuit unit	NBD-866A	
Processor	AIS processing circuit	NQA-2155	
Operation panel unit	Operation circuit	CCK-979	
Operation panel unit	PS2 connector circuit	CQC-1204	
Display	Brilliance control circuit	CCK-970	Brilliance controller
NSK unit	Gyro IF circuit	CMJ-304E	

Table 9-11 Circuit Block to be Repaired (JMA-5208HS)

Location	Circuit Block	Type	Remarks
Scanner	Motor with gear	CBP-169	DC brushless motor
Scanner	Modulator	CME-339	Excluding Magnetron
Scanner	Receiver	NRG-226	Including CAE-475-1
Processor	Radar processing circuit	CDC-1350	
Processor	DSP circuit (TT)	NCA-877A	
Processor	Power supply terminal circuit unit	NBD-866A	
Processor	AIS processing circuit	NQA-2155	
Operation panel unit	Operation circuit	CCK-979	
Operation panel unit	PS2 connector circuit	CQC-1204	
Display	Brilliance control circuit	CCK-970	Brilliance controller
NSK unit	Gyro IF circuit	CMJ-304E	

Table 9-12 Circuit Block to be Repaired (JMA-5209)

Location	Circuit Block	Type	Remarks
Scanner	Motor	CBP-218	DC Brush motor
Scanner	Compound Modulator Circuit	CME-386A	Excluding Magnetron
Scanner	Receiver Unit	NRG-239	Including CAE-548
Processor	Radar processing circuit	CDC-1350	
Processor	DSP circuit (TT)	NCA-877A	
Processor	Power supply terminal circuit unit	NBD-866A	
Processor	AIS processing circuit	NQA-2155	
Operation panel unit	Operation circuit	CCK-979	
Operation panel unit	PS2 connector circuit	CQC-1204	
Display	Brilliance control circuit	CCK-970	Brilliance controller
NSK unit	Gyro IF circuit	CMJ-304E	

**Table 9-13 Circuit Block to be Repaired (JMA-5212-4/6/4HS/6HS)**

Location	Circuit Block	Type	Remarks
Scanner	Motor with gear	7BDRD0048*	DC brushless motor
Scanner	Modulation circuit	CME-363	Excluding Magnetron
Scanner	Receiver	NRG-610	Including CAE-529-1
Scanner	Power supply circuit	CBD-1783	
Scanner	Encoder	CHT71A	
Scanner	Motor control power circuit	CBD-1779	
Scanner	Performance monitor	NJU-85	
Processor	Radar processing circuit	CDC-1350	
Processor	DSP circuit (TT)	NCA-877A	
Processor	Power supply terminal circuit unit	NBD-866A	
Processor	AIS processing circuit	NQA-2155	
Operation panel unit	Operation circuit	CCK-979	
Operation panel unit	PS2 connector circuit	CQC-1204	
Display	Brilliance control circuit	CCK-970	Brilliance controller
NSK unit	Gyro IF circuit	CMJ-304E	

""* means revision, such as A, B and so on.

Table 9-14 Circuit Block to be Repaired (JMA-5222-7/9)

Location	Circuit Block	Type	Remarks
Scanner	Motor with gear	7BDRD0044*	DC brushless motor (ordinary speed)
Scanner	Modulator	NMA-550	Including CPA-264 Including CMB-404 Excluding Magnetron
Scanner	Receiver	NRG-162A	Including CMA-866A
Scanner	Modulation circuit	CPA-264	
Scanner	Power supply circuit	CBD-1682A	
Scanner	T/R control circuit	CMC-1205R	
Scanner	Motor control circuit	CBD-1779	
Scanner	Heater control circuit	CHG-216	Optional (AC100V)
Scanner	Encoder	CHT71A	
Scanner	Fan	7BFRD0002*	
Scanner	Performance monitor	NJU-85	
Processor	Radar processing circuit	CDC-1350	
Processor	DSP circuit (TT)	NCA-877A	
Processor	Power supply terminal circuit unit	NBD-866A	
Processor	AIS processing circuit	NQA-2155	
Operation panel unit	Operation circuit	CCK-979	
Operation panel unit	PS2 connector circuit	CQC-1204	
Display	Brilliance control circuit	CCK-970	Brilliance controller
NSK unit	Gyro IF circuit	CMJ-304E	

**" means revision, such as A, B and so on.



9.3 AFTER-SALES SERVICE

9.3.1 Keeping period of maintenance parts

Keeping period of maintenance parts is ten years from the production is discontinued.

9.3.2 When you Request for Repair

If you suppose the product may be out of order, read the description in Section 9.1 “FAULT FINDING” and Section 9.2 “TROUBLE SHOOTING” carefully and check the suspected point again.

If it is still out of order, you are recommended to stop operation of the equipment and consult with the dealer from whom you purchased the product, or our branch office in your country or district, the sales department in our main office in Tokyo.

- **Repair within the Warranty Period**

If any failure occurs in the product during its normal operation in accordance with the instruction manual, the dealer or JRC will repair free of charge. In case that any failure is caused due to misuse, faulty operation, negligence or force major such as natural disaster and fire, the product will be repaired with charges.

- **Repair after the Warranty Period**

If any defective function of the product is recoverable by repair, the repair of it will be made at your own charge upon your request.

- **Necessary Information for Repair**

- ☆ Product name, model, manufacturing date and serial number
- ☆ Trouble conditions (as detailed as possible. Refer to “Radar Failure Check List” in page 9-10.)
- ☆ Name of company/organization, address and telephone number

9.3.3 Recommended Maintenance

The performance of the product may deteriorate due to the secular change of the parts used in it, though such deterioration depends upon the conditions of operation.

So checkup and maintenance is recommendable for the product in addition to your daily care.

For maintenance, consult with the near-by dealer or our sales department.

Such maintenance will be made with charges.

For further details of after-sale service, contact the JRC Offices.

Radars Failure Check List

When placing an order for repair of the product, it is requested that you could confirm the check items and fill the results and sent the sheet to our contact.

If there is any unclear items, contact the ship on which the product is installed, and give the correct information on the product.

Ship name: _____ Phone: _____ Fax: _____

Radars general model name: JMA- _____ Serial No. : _____

(Write the full model name correctly)

(1) Check the following items in the order of the number, and circle the applicable answer between YES or NO. If the item cannot be determined as YES or NO, explain in detail in the item (18), others.

(2) If any of the items (1) to (5) is marked as NO, check the fuse of the product (refer to Section 9.1.2 and 9.2).

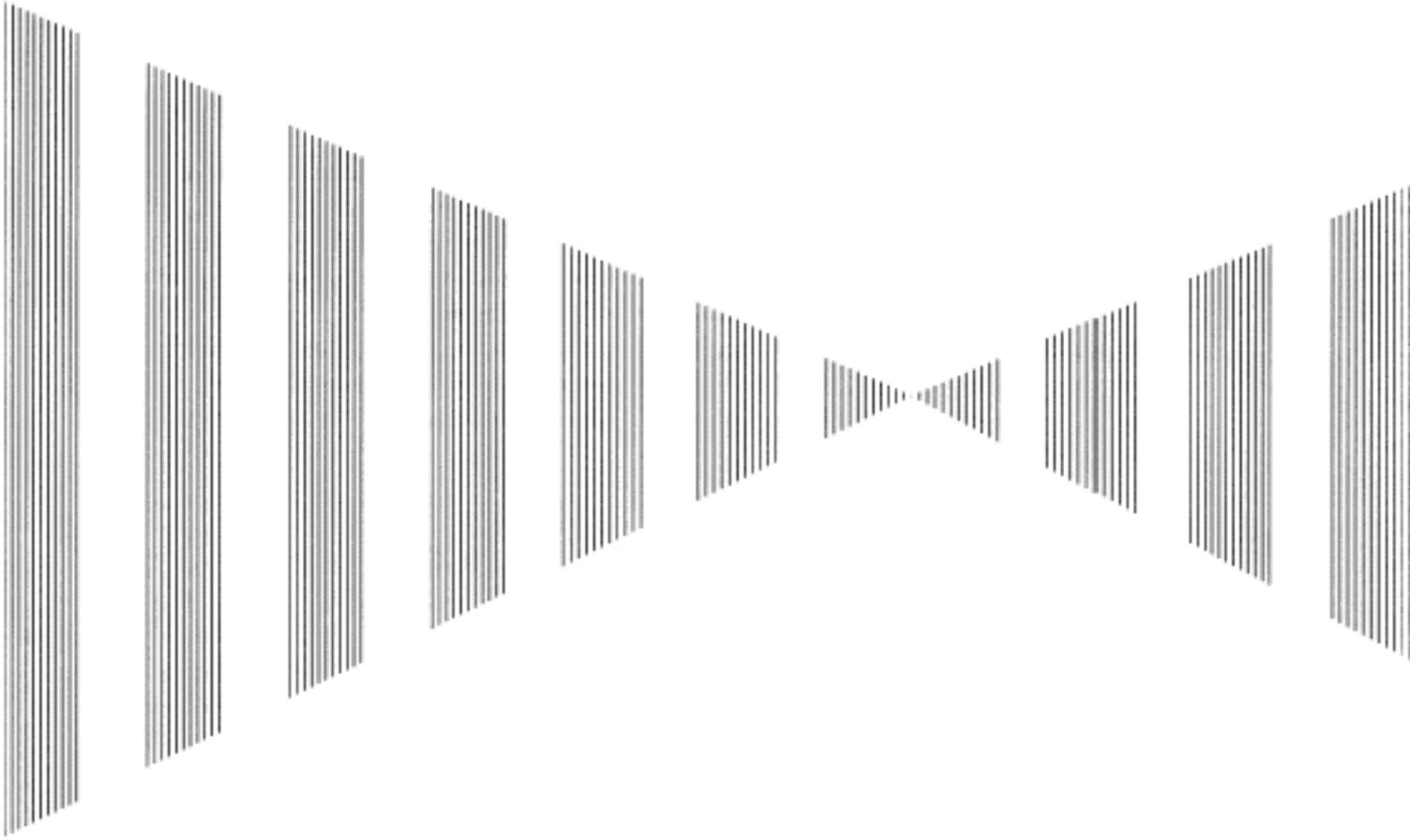
(3) Check the items (4) to (17) while the transmission (TX) is ON.

*Functions mentioned in the items (14), (15) and (17) may be optional, answer is not necessary.

No.	Check Item	Result	
		YES	NO
(1)	Power can be turned on. (The lamp on the Operation unit is lit)	YES	NO
(2)	A few minutes after powering-on, it will become standby status .	YES	NO
(3)	When powering-on (or TX ON), LCD monitor something is lit.	YES	NO
(4)	The antenna rotates at the transmission (TX) ON. (Check the following items while transmission is ON)	YES	NO
(5)	Current is supplied to the magnetron. (Refer to the instruction manual)	YES	NO
(6)	Turning is enabled. (Check with the range of 6 NM or more)	YES	NO
(7)	Fixed marker is displayed.	YES	NO
(8)	VRM is displayed.	YES	NO
(9)	While noise is displayed while set at SEA and RAIN minimum, GAIN maximum, IR-OFF and range 48 NM.	YES	NO
(10)	Target reflection echo is displayed.	YES	NO
(11)	Sensitivity of reflection echo is normal.	YES	NO
(12)	EBL is displayed.	YES	NO
(13)	Cursor mark moves.	YES	NO
*(14)	GYRO course can be set and normally displayed.	YES	NO
*(15)	LOG speed can be normally displayed.	YES	NO
(16)	Target tracking function works normally.	YES	NO
*(17)	If equipped with an interswitch, when switching from the straight mode (II) to (X), the failures (items marked NO) in the above (1) to (16), are switched over to the other unit.	YES	NO

(18) Others (Error message, etc.) _____

SECTION 10 DISPOSAL



10.1	DISPOSAL OF THE UNIT.....	10-1
10.2	DISPOSAL OF USED BATTERIES.....	10-2
10.3	DISPOSAL OF USED MAGNETRON	10-3
10.4	ABOUT THE CHINA ROHS.....	10-4

10.1 DISPOSAL OF THE UNIT

When disposing of this unit, be sure to follow the local laws and regulations for the place of disposal.



10.2

DISPOSAL OF USED BATTERIES



WARNING



When disposing of used lithium batteries, be sure to insulate the batteries by taping the \oplus and \ominus terminals. Otherwise, heat generation, explosion or a fire may occur.

In this unit, Lithium batteries are used for the following parts:
Radar Processing circuit (CDC-1350): BT1 (Maxell: CR2450)

- Do not store used lithium batteries. Dispose of them in accordance with regulations of local government.
- When disposing of used lithium batteries be sure to insulate the batteries by taping the \oplus and \ominus terminals. For disposal of batteries, be sure to follow the local laws and regulations. For detail, consult with the dealer you purchased the product our business office, or local government.

10.3 DISPOSAL OF USED MAGNETRON

Magnetron is used in the Scanner (NKE-2043/2062/2063A/2103/2254)

- When the magnetron is replaced with a new one, return the used magnetron to our dealer or business office.
For detail, consult with our dealer or business office.



10.4 ABOUT THE CHINA ROHS

有毒有害物质或元素的名称及含量

(Names & Content of toxic and hazardous substances or elements)

形式名(Type): JMA-5200MK2 Series

名称(Name): RADAR

部件名称 (Part name)	有毒有害物质或元素 (Toxic and Hazardous Substances and Elements)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
雷达天线单元 (Scanner Unit)	×	×	○	×	×	×
收发信单元 (Transmitter-receiver Unit)	×	×	×	×	×	×
主船内装置 (Inboard Unit) · 显示装置 (Display Unit) · 键盘装置 (OperationUnit) · 信号处理装置 (RADAR Process Unit)	×	×	×	×	×	×
外部设备 (Peripherals) · 选择 (Options) · 电线类 (Cables) · 手册 (Documentts)	×	×	×	×	×	×
<p>○: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11306-2006 标准规定的限量要求以下。 (Indicates that this toxic, or hazardous substance contained in all of the homogeneous materials for this part is below the requirement in SJ/T11363-2006.)</p> <p>×: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求。 (Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T 11363-2006.)</p>						



SECTION 11

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11.1 JMA-5204 TYPE RADAR

(1) Class of Emission	P0N
(2) Display	Color Raster Scan
(3) Screen	15-inch Color LCD Effective diameter of radar display, more than 180 mm
(4) Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96nm
(5) Range Resolution	Less than 30m
(6) Minimum Detectable Range	Less than 40m
(7) Range Accuracy	Less than 1% of the maximum distance of the range scale in use or less than 15m whichever is larger
(8) Bearing Accuracy	Less than 1°
(9) Bearing Indication	Relative Motion mode: Head-up/Course-up/North-up True Motion mode: Course-up/North-up
(10) Ambient Condition	According to IEC60945-4 Temperature Scanner: -25 to +55°C (Storage Temperature: -25 to +70°C) Other Units except Scanner: -15 to +55°C Relative Humidity 93% at +40°C Vibration 2 to 13.2Hz, amplitude ±1mm ±10% 13.2 to 100Hz, acceleration 7m/s ² Velocity of the wind 51.5m/s(100kt)
(11) Power Supply Input	+12/24/32VDC (Display Unit) +12/24/32VDC (Scanner) * Display Unit and Scanner correspond to 100/110/115/220/230/240VAC, 1φ, 50/60Hz when use NBA-5111
(12) Power Consumption	Approx. 100W (In maximum wind velocity)
(13) Power Supply Voltage Fluctuation	+12V/24V/32VDC +10.8 to 41.6VDC (Display Unit) +12V/24V/32VDC +10.8 to 41.6VDC (Scanner Unit)
(14) Pre-heating Time	Approx. Within 1min30sec



11.2 JMA-5208/HS TYPE RADAR

(1) Class of Emission	P0N
(2) Display	Color Raster Scan
(3) Screen	15-inch Color LCD Effective diameter of radar display, more than 180 mm
(4) Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96nm
(5) Range Resolution	Less than 25m
(6) Minimum Detectable Range	Less than 35m
(7) Range Accuracy	Less than 1% of the maximum distance of the range scale in use or less than 15m whichever is larger
(8) Bearing Accuracy	Less than 1°
(9) Bearing Indication	Relative Motion mode: Head-up/Course-up/North-up True Motion mode: Course-up/North-up
(10) Ambient Condition	According to IEC60945-4 Temperature Scanner: -25 to +55°C (Storage Temperature: -25 to +70°C) Other Units except Scanner: -15 to +55°C Relative Humidity 93% at +40°C Vibration 2 to 13.2Hz, amplitude $\pm 1\text{mm}$ $\pm 10\%$ 13.2 to 100Hz, acceleration 7m/s^2 Velocity of the wind 51.5m/s(100kt)
(11) Power Supply Input	+24VDC (Display Unit) +24VDC (Scanner) * Display Unit and Scanner correspond to 100/110/115/220/230/240VAC, 1 ϕ , 50/60Hz when use NBA-5111
(12) Power Consumption	Approx. 300W (In maximum wind velocity)
(13) Power Supply Voltage Fluctuation	+12V/24V/32VDC +10.8 to 41.6VDC (JMA-5208) +24VDC -10/+30% (JMA-5208HS)
(14) Pre-heating Time	Approx. Within 1min30sec

11.3 JMA-5209 TYPE RADAR

(1) Class of Emission	P0N
(2) Display	Color Raster Scan
(3) Screen	15-inch Color LCD Effective diameter of radar display, more than 180 mm
(4) Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96nm
(5) Range Resolution	Less than 30m
(6) Minimum Detectable Range	Less than 40m
(7) Range Accuracy	Less than 1% of the maximum distance of the range scale in use or less than 15m whichever is larger
(8) Bearing Accuracy	Less than 1°
(9) Bearing Indication	Relative Motion mode: Head-up/Course-up/North-up True Motion mode: Course-up/North-up
(10) Ambient Condition	According to IEC60945-4 Temperature Scanner: -25 to +55°C (Storage Temperature: -25 to +70°C) Other Units except Scanner: -15 to +55°C Relative Humidity 93% at +40°C Vibration 2 to 13.2Hz, amplitude ±1mm ±10% 13.2 to 100Hz, acceleration 7m/s ² Velocity of the wind 51.5m/s(100kt)
(11) Power Supply Input	+12/24/32VDC (Display Unit) +12/24/32VDC (Scanner) * Display Unit and Scanner correspond to 100/110/115/220/230/240VAC, 1φ, 50/60Hz when use NBA-5111
(12) Power Consumption	Approx. 220W (In maximum wind velocity)
(13) Power Supply Voltage Fluctuation	+12V/24V/32VDC +10.8 to 41.6VDC (Display Unit) +12V/24V/32VDC +10.8 to 41.6VDC (Scanner Unit)
(14) Pre-heating Time	Approx. Within 1min30sec



11.4 JMA-5212-4/6/4HS/6HS TYPE RADAR

(1) Class of emission	P0N
(2) Display	Color Raster Scan, PPI Method
(3) Screen	15-inch Color LCD Effective diameter of radar display, more than 180 mm
(4) Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96 nm
(5) Range Resolution	Less than 30m
(6) Minimum Detectable Range	Less than 40m
(7) Range Accuracy	Less than 1% of the maximum distance of the range scale in use or less than 15m whichever is larger
(8) Bearing Accuracy	Less than 1°
(9) Bearing Indication	Relative Motion mode: Head-up/Course-up/North-up True Motion mode: Course-up/North-up
(10) Ambient Condition	According to IEC60945-4 Temperature Scanner: -25 to +55°C (Storage Temperature: -25 to +70°C) Other Units except Scanner: -15 to +55°C Relative Humidity 93% at +40°C Vibration 2 to 13.2Hz, amplitude ±1mm ±10% 13.2 to 100Hz, acceleration 7m/s ² Velocity of the wind 51.5m/s (100kt)
(11) Power Supply Input	+24VDC (Display Unit) +24VDC (Scanner) * Display Unit and Scanner correspond to 100/110/115/220/230/240VAC, 1φ, 50/60Hz when use NBA-5111.
(12) Power Consumption	Approx. 600W (In maximum wind velocity)
(13) Power Supply Voltage Fluctuation	+24VDC -10/+30% (Display Unit) +24VDC -10/+30% (Scanner Unit)
(14) Pre-heating Time	Approx. Within 1min30sec

11.5 JMA-5222-7/9 TYPE RADAR

(1) Class of emission	P0N
(2) Display	Color Raster Scan, PPI Method
(3) Screen	15-inch Color LCD Effective diameter of radar display, more than 180 mm
(4) Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96 nm
(5) Range Resolution	Less than 30m
(6) Minimum Detectable Range	Less than 40m
(7) Range Accuracy	Less than 1% of the maximum distance of the range scale in use or less than 15m whichever is larger
(8) Bearing Accuracy	Less than 1°
(9) Bearing Indication	Relative Motion mode: Head-up/Course-up/North-up True Motion mode: Course-up/North-up
(10) Ambient Condition	According to IEC60945-4 Temperature Scanner: -25 to +55°C (Storage Temperature: -25 to +70°C) Other Units except Scanner: -15 to +55°C Relative Humidity 93% at +40°C Vibration 2 to 13.2Hz, amplitude ±1mm ±10% 13.2 to 100Hz, acceleration 0.7m/s ² Velocity of the wind 51.5m/s (100kt)
(11) Power Supply Input	+24VDC (Display Unit) +24VDC (Scanner) * Display Unit and Scanner correspond to 100/110/115/220/230/240VAC, 1φ, 50/60Hz when use NBA-5111.
(12) Power Consumption	Approx. 680W (In maximum wind velocity)
(13) Power Supply Voltage Fluctuation	+24VDC -10/+30% (Display Unit) +24VDC -10/+30% (Scanner Unit)
(14) Pre-heating Time	Approx. Within 3min



11.6 SCANNER (NKE-2043)

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|---------------------------------------|--|--------------------|--------------------|--|--|--------|--------------------|--|--|-------|--------------------|--|--|--------|--------------------|--------------------|--|-------|--------------------|--------------------|-------------------|-----|--------------------|-------------------|------------------|-----|--------------------|-------------------|------------------|------|--------------------|-------------------|------------------|------|--|--|------------------|------|--|--|------------------|------|--|--|------------------|
| (1) Dimensions | Height 275mm×Diameter of radome 620mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (2) Mass | Approx. 10kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (3) Polarization | Horizontal Polarization | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (4) Directional Characteristic | Horizontal Beam Width: 4° (-3dB width)
Vertical Beam Width: 25° (-3dB width)
Sidelobe Level: Below -21dB (within ±10°) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (5) Revolution | Approx. 27rpm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (6) Peak Power | 4 kW ± 50% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (7) Transmitting Frequency | 9410 ± 30MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (8) Transmitting Tube | Magnetron [MSF1421B] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (9) Pulse width/Repetition Frequency | <p>SP1 : 0.08μs/2250Hz/Wide
MP1 : 0.25μs/1700Hz/Middle
LP1 : 0.5μs/1200Hz/Narrow, LP2 : 1.0μs/650Hz/Narrow</p> <table border="0"> <tr> <td>0.125NM</td> <td>0.08μs/2250Hz(SP1)</td> <td></td> <td></td> </tr> <tr> <td>0.25NM</td> <td>0.08μs/2250Hz(SP1)</td> <td></td> <td></td> </tr> <tr> <td>0.5NM</td> <td>0.08μs/2250Hz(SP1)</td> <td></td> <td></td> </tr> <tr> <td>0.75NM</td> <td>0.08μs/2250Hz(SP1)</td> <td>0.25μs/1700Hz(MP1)</td> <td></td> </tr> <tr> <td>1.5NM</td> <td>0.08μs/2250Hz(SP1)</td> <td>0.25μs/1700Hz(MP1)</td> <td>0.5μs/1200Hz(LP1)</td> </tr> <tr> <td>3NM</td> <td>0.25μs/1700Hz(MP1)</td> <td>0.5μs/1200Hz(LP1)</td> <td>1.0μs/650Hz(LP2)</td> </tr> <tr> <td>6NM</td> <td>0.25μs/1700Hz(MP1)</td> <td>0.5μs/1200Hz(LP1)</td> <td>1.0μs/650Hz(LP2)</td> </tr> <tr> <td>12NM</td> <td>0.25μs/1700Hz(MP1)</td> <td>0.5μs/1200Hz(LP1)</td> <td>1.0μs/650Hz(LP2)</td> </tr> <tr> <td>24NM</td> <td></td> <td></td> <td>1.0μs/650Hz(LP2)</td> </tr> <tr> <td>48NM</td> <td></td> <td></td> <td>1.0μs/650Hz(LP2)</td> </tr> <tr> <td>96NM</td> <td></td> <td></td> <td>1.0μs/650Hz(LP2)</td> </tr> </table> | 0.125NM | 0.08μs/2250Hz(SP1) | | | 0.25NM | 0.08μs/2250Hz(SP1) | | | 0.5NM | 0.08μs/2250Hz(SP1) | | | 0.75NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | | 1.5NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(LP1) | 3NM | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(LP1) | 1.0μs/650Hz(LP2) | 6NM | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(LP1) | 1.0μs/650Hz(LP2) | 12NM | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(LP1) | 1.0μs/650Hz(LP2) | 24NM | | | 1.0μs/650Hz(LP2) | 48NM | | | 1.0μs/650Hz(LP2) | 96NM | | | 1.0μs/650Hz(LP2) |
| 0.125NM | 0.08μs/2250Hz(SP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.25NM | 0.08μs/2250Hz(SP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.5NM | 0.08μs/2250Hz(SP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.75NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.5NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(LP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3NM | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(LP1) | 1.0μs/650Hz(LP2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6NM | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(LP1) | 1.0μs/650Hz(LP2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12NM | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(LP1) | 1.0μs/650Hz(LP2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24NM | | | 1.0μs/650Hz(LP2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 48NM | | | 1.0μs/650Hz(LP2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 96NM | | | 1.0μs/650Hz(LP2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (10) Duplexer | Circulator + Diode Limiter | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (11) Mixer | MIC Front End | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (12) Intermediate Frequency Amplifier | <p>Intermediate Frequency: 60MHz
Band Width: 20MHz(0.08μs/0.13μs)
6MHz(0.25μs)
3MHz(0.5μs, 0.8μs, 1.0μs)
Gain: More than 90dB
Amplifying Characteristics: Logarithmic Amplifier</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (13) Overall Noise Figure | 6dB(Average) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

11.7 SCANNER (NKE-2062)

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|---------------------------------------|--|
| (1) Dimensions | Height 432mm×Swing Circle 1220mm |
| (2) Mass | Approx. 24kg |
| (3) Polarization | Horizontal Polarization |
| (4) Directional Characteristic | Horizontal Beam Width: 2° (-3dB width)
Vertical Beam Width: 30° (-3dB width)
Sidelobe Level: Below -23dB (within ±10°)
Below -26dB (outside ±10°) |
| (5) Revolution | Approx. 27rpm (Normal) |
| (6) Peak Power | 6 kW ± 50% |
| (7) Transmitting Frequency | 9410 ± 30MHz |
| (8) Transmitting Tube | Magnetron [MSF1422B] |
| (9) Pulse width/Repetition Frequency | SP1 : 0.08μs/2250Hz/Wide
MP1 : 0.25μs/1700Hz/Middle、MP2 : 0.5μs/1200Hz/Middle
LP1 : 1.0μs/650Hz/Narrow |
| | 0.125NM 0.08μs/2250Hz(SP1) |
| | 0.25NM 0.08μs/2250Hz(SP1) |
| | 0.5NM 0.08μs/2250Hz(SP1) 0.25μs/1700Hz(MP1) |
| | 0.75NM 0.08μs/2250Hz(SP1) 0.25μs/1700Hz(MP1) |
| | 1.5NM 0.08μs/2250Hz(SP1) 0.25μs/1700Hz(MP1) |
| | 3NM 0.25μs/1700Hz(MP1) 0.5μs/1200Hz(MP2) |
| | 6NM 0.5μs/1200Hz(MP2) 1.0μs/650Hz(LP1) |
| | 12NM 1.0μs/650Hz(LP1) |
| | 24NM 1.0μs/650Hz(LP1) |
| | 48NM 1.0μs/650Hz(LP1) |
| | 96NM 1.0μs/650Hz(LP1) |
| (10) Duplexer | Circulator + Diode Limiter |
| (11) Mixer | MIC Front End |
| (12) Intermediate Frequency Amplifier | Intermediate Frequency: 60MHz
Band Width: 20MHz(0.08μs)
6MHz(0.25μs,0.5μs)
3MHz(1μs)
Gain: More than 90dB
Amplifying Characteristics: Logarithmic Amplifier |
| (13) Overall Noise Figure | 6dB(Average) |



11.8 SCANNER (NKE-2062HS)

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|---------------------------------------|--|--------------------|--------------------|--|--|--------|--------------------|--|--|-------|--------------------|--------------------|--|--------|--------------------|--------------------|--|-------|--------------------|--------------------|--|-----|--|--------------------|-------------------|-----|--|-------------------|------------------|------|--|--|------------------|------|--|--|------------------|------|--|--|------------------|------|--|--|------------------|
| (1) Dimensions | Height 432mm×Swing Circle 1220mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (2) Mass | Approx. 24kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (3) Polarization | Horizontal Polarization | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (4) Directional Characteristic | Horizontal Beam Width: 2° (-3dB width)
Vertical Beam Width: 30° (-3dB width)
Sidelobe Level: Below -23dB (within ±10°)
Below -26dB (outside ±10°) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (5) Revolution | Approx. 48rpm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (6) Peak Power | 6 kW ± 50% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (7) Transmitting Frequency | 9410 ± 30MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (8) Transmitting Tube | Magnetron [MSF1422B] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (9) Pulse width/Repetition Frequency | <p>SP1 : 0.08μs/2250Hz/Wide
MP1 : 0.25μs/1700Hz/Middle、MP2 : 0.5μs/1200Hz/Middle
LP1 : 1.0μs/650Hz/Narrow</p> <table border="0"> <tbody> <tr> <td>0.125NM</td> <td>0.08μs/2250Hz(SP1)</td> <td></td> <td></td> </tr> <tr> <td>0.25NM</td> <td>0.08μs/2250Hz(SP1)</td> <td></td> <td></td> </tr> <tr> <td>0.5NM</td> <td>0.08μs/2250Hz(SP1)</td> <td>0.25μs/1700Hz(MP1)</td> <td></td> </tr> <tr> <td>0.75NM</td> <td>0.08μs/2250Hz(SP1)</td> <td>0.25μs/1700Hz(MP1)</td> <td></td> </tr> <tr> <td>1.5NM</td> <td>0.08μs/2250Hz(SP1)</td> <td>0.25μs/1700Hz(MP1)</td> <td></td> </tr> <tr> <td>3NM</td> <td></td> <td>0.25μs/1700Hz(MP1)</td> <td>0.5μs/1200Hz(MP2)</td> </tr> <tr> <td>6NM</td> <td></td> <td>0.5μs/1200Hz(MP2)</td> <td>1.0μs/650Hz(LP1)</td> </tr> <tr> <td>12NM</td> <td></td> <td></td> <td>1.0μs/650Hz(LP1)</td> </tr> <tr> <td>24NM</td> <td></td> <td></td> <td>1.0μs/650Hz(LP1)</td> </tr> <tr> <td>48NM</td> <td></td> <td></td> <td>1.0μs/650Hz(LP1)</td> </tr> <tr> <td>96NM</td> <td></td> <td></td> <td>1.0μs/650Hz(LP1)</td> </tr> </tbody> </table> | 0.125NM | 0.08μs/2250Hz(SP1) | | | 0.25NM | 0.08μs/2250Hz(SP1) | | | 0.5NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | | 0.75NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | | 1.5NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | | 3NM | | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(MP2) | 6NM | | 0.5μs/1200Hz(MP2) | 1.0μs/650Hz(LP1) | 12NM | | | 1.0μs/650Hz(LP1) | 24NM | | | 1.0μs/650Hz(LP1) | 48NM | | | 1.0μs/650Hz(LP1) | 96NM | | | 1.0μs/650Hz(LP1) |
| 0.125NM | 0.08μs/2250Hz(SP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.25NM | 0.08μs/2250Hz(SP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.5NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.75NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.5NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3NM | | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(MP2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6NM | | 0.5μs/1200Hz(MP2) | 1.0μs/650Hz(LP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12NM | | | 1.0μs/650Hz(LP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24NM | | | 1.0μs/650Hz(LP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 48NM | | | 1.0μs/650Hz(LP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 96NM | | | 1.0μs/650Hz(LP1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (10) Duplexer | Circulator + Diode Limiter | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (11) Mixer | MIC Front End | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (12) Intermediate Frequency Amplifier | <p>Intermediate Frequency: 60MHz
Band Width: 20MHz(0.08μs)
6MHz(0.25μs,0.5μs)
3MHz(1μs)
Gain: More than 90dB
Amplifying Characteristics: Logarithmic Amplifier</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (13) Overall Noise Figure | 6dB(Average) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



11.10 SCANNER (NKE-2103-4/6)

- | | |
|---------------------------------------|--|
| (1) Dimensions | 10kW-4ft: Height 458mm×Swing Circle 1285mm
10kW-6ft: Height 458mm×Swing Circle 1910mm |
| (2) Mass | 10kW-4ft: Approx. 38 kg
10kW-6ft: Approx. 40 kg |
| (3) Polarization | Horizontal Polarization |
| (4) Directional Characteristic | Horizontal Beam Width: 1.8° (4ft, -3dB width)
1.2° (6ft, -3dB width)
Vertical Beam Width: 20° (4/6ft, -3dB width)
Sidelobe Level: Below -26dB (4/6ft, within ±10°)
Below -30dB (4/6ft, outside ±10°) |
| (5) Revolution | Approx. 27rpm (4/6ft, Normal) |
| (6) Peak Power | 10kW ±50% |
| (7) Transmitting Frequency | 9410 ±30MHz |
| (8) Transmitting Tube | Magnetron [MAF1565N] |
| (9) Pulse width/Repetition Frequency | SP1 : 0.08μs/2250Hz/Wide
MP1 : 0.25μs/1700Hz/Middle、MP2 : 0.5μs/1200Hz/Middle
LP1 : 0.8μs/750Hz/Narrow、LP2 : 1.0μs/650Hz/Narrow |
| | 0.125NM 0.08μs/2250Hz(SP1) |
| | 0.25NM 0.08μs/2250Hz(SP1) |
| | 0.5NM 0.08μs/2250Hz(SP1) 0.25μs/1700Hz(MP1) |
| | 0.75NM 0.08μs/2250Hz(SP1) 0.25μs/1700Hz(MP1) 0.5μs/1200Hz(MP2) |
| | 1.5NM 0.08μs/2250Hz(SP1) 0.25μs/1700Hz(MP1) 0.5μs/1200Hz(MP2) |
| | 3NM 0.25μs/1700Hz(MP1) 0.5μs/1200Hz(MP2) 0.8μs/750Hz(LP1) |
| | 6NM 0.5μs/1200Hz(MP2) 0.8μs/750Hz(LP1) 1.0μs/650Hz(LP2) |
| | 12NM 0.5μs/1200Hz(MP2) 0.8μs/750Hz(LP1) 1.0μs/650Hz(LP2) |
| | 24NM 1.0μs/650Hz(LP2) |
| | 48NM 1.0μs/650Hz(LP2) |
| | 96NM 1.0μs/650Hz(LP2) |
| (10) Duplexer | Circulator + Diode Limiter |
| (11) Mixer | MIC Front End |
| (12) Intermediate Frequency Amplifier | Intermediate Frequency: 60MHz
Band Width: 20MHz(0.08μs)
8MHz(0.25μs,0.5μs)
3MHz(0.8μs, 1μs)
Gain: More than 90dB
Amplifying Characteristics: Logarithmic Amplifier |
| (13) Overall Noise Figure | 7.5dB (Average) |



SCANNER (NKE-2103-4HS/6HS)

- (1) Dimensions 10kW-4ft: Height 458mm×Swing Circle 1285mm
10kW-6ft: Height 458mm×Swing Circle 1910mm
- (2) Mass 10kW-4ft: Approx. 38 kg
10kW-6ft: Approx. 40 kg
- (3) Polarization Horizontal Polarization
- (4) Directional Characteristic Horizontal Beam Width: 1.8° (4ft, -3dB width)
1.2° (6ft, -3dB width)
Vertical Beam Width: 20° (4/6ft, -3dB width)
Sidelobe Level: Below -26dB (4/6ft, within ±10°)
Below -30dB (4/6ft, outside ±10°)
- (5) Revolution Approx. 48rpm (4/6ft)
- (6) Peak Power 10kW ±50%
- (7) Transmitting Frequency 9410 ±30MHz
- (8) Transmitting Tube Magnetron [MAF1565N]
- (9) Pulse width/Repetition Frequency
SP1 : 0.08μs/2250Hz/Wide
MP1 : 0.25μs/1700Hz/Middle、MP2 : 0.5μs/1200Hz/Middle
LP1 : 0.8μs/750Hz/Narrow、LP2 : 1.0μs/650Hz/Narrow
- | | | | |
|---------|--------------------|--------------------|-------------------|
| 0.125NM | 0.08μs/2250Hz(SP1) | | |
| 0.25NM | 0.08μs/2250Hz(SP1) | | |
| 0.5NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | |
| 0.75NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(MP2) |
| 1.5NM | 0.08μs/2250Hz(SP1) | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(MP2) |
| 3NM | 0.25μs/1700Hz(MP1) | 0.5μs/1200Hz(MP2) | 0.8μs/750Hz(LP1) |
| 6NM | 0.5μs/1200Hz(MP2) | 0.8μs/750Hz(LP1) | 1.0μs/650Hz(LP2) |
| 12NM | 0.5μs/1200Hz(MP2) | 0.8μs/750Hz(LP1) | 1.0μs/650Hz(LP2) |
| 24NM | | | 1.0μs/650Hz(LP2) |
| 48NM | | | 1.0μs/650Hz(LP2) |
| 96NM | | | 1.0μs/650Hz(LP2) |
- (10) Duplexer Circulator + Diode Limiter
- (11) Mixer MIC Front End
- (12) Intermediate Frequency Amplifier Intermediate Frequency: 60MHz
Band Width: 20MHz(0.08μs)
8MHz(0.25μs,0.5μs)
3MHz(0.8μs, 1μs)
Gain: More than 90dB
Amplifying Characteristics: Logarithmic Amplifier
- (13) Overall Noise Figure 7.5dB (Average)

11.13 DISPLAY UNIT (NCD-4380)

- | | |
|----------------------------|--|
| (1) Structure | Desk Top Type
(LCD Monitor Unit/Keyboard Unit/Processor Unit Separation Structure) |
| (2) Screen | 15-inch Color LCD 1024x768 dot (XGA)
Viewing Distance: 1m from the center of Display |
| (3) Display mode | Radar mode
Synthesis mode (Synthesis Radar echo and Coastline)
Plotter mode (Require Plotter Unit (option)) |
| (4) Range Scale | 0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96nm |
| (5) Range Marker | 0.025, 0.05, 0.1, 0.25, 0.5, 1, 2, 4, 8, 16nm |
| (6) Bearing Indication | Rader mode/Synthesis mode
Relative motion: North-up, Course-up, Head-up
True motion: North-up, Course-up
True motion (Plotter mode (Option)): N-up, C-up |
| (7) Variable Range Maker | 2VRM (Digital Display)
VRM Range:0.000 to 97.7nm (0.000 to 181.1km) |
| (8) Electric Bearing lines | 2EBL(Digital Display)
Each EBL can be floating displayed.
EBL unit of Display: 0.1°
EBL Range: 0.000° to 359.9°
Bearing Indication: Relative bearing and True bearing can be switched. |
| (9) Cursor | Target Range, Bearing and Latitude presentation can be possible to move with trackball. |



11.14 PROCESSOR UNIT (NDC-1460)

(1) Structure	Desk Top Type (Horizontal putting and length putting using combinedly)
(2) Dimensions	Height 125mm×Width 340mm×Depth 347mm
(3) Mass	Approx. 4kg
(4) Tune Method	AUTO/MANUAL (Bar-graph indicate)
(5) STC (SEA)	AUTO/MANUAL
(6) FTC (RAIN)	AUTO/MANUAL
(7) Radar Interference Rejection	Built-in (The effect can be adjusted by three stages.)
(8) Scan Correlation	Function1/2/3, 2 Peak Hold Processing1/2 Automatic change of processing method. (Target range synchronize/Clutter synchronize)
(9) Bearing Marker	360° in 1° digit. Relative motion: Fixation True motion: Rewrite at a position correct in every scan.
(10) Heading Line	Electronic
(11) Radar Alarm	Invasion, Seccession, OFF can be Selected. With buzzer sound.(Possible to output to External buzzer.) Ring, operating in $r\theta$ space, relative position *Automatically acquisition by TT described in Section "TT"
(12) Off Center	Within 66% of the radius of any range. (Except 96nm) Can be operated in all mode in relative motion. Trail is succeed at Off Center mode.
(13) True motion Unit	Built-in (Except 96nm)
(14) True motion reset position	66% of radius of any range. Possible to manual reset.



11.15 TARGET TRACKING UNIT (NCA-877A)

Radar mode, synthesis mode

- | | |
|----------------|--|
| 1) Acquisition | MANUAL/AUTO (by automatic acquisition/activation zone) |
| 2) Tracking | 30 target (Automatic tracking)
Maximum tracking range: 32nm (Available all range scale) |
| 3) Display | Tracking data: 2 at the same time. (Can be scroll.)
Naming function: Possible to name by the alphabet up to 8 characters to each target.
The range, bearing, CPA, TCPA, true course, true speed, BCR, BCT of target can be displayed.
(When naming is displayed, BCR/BCT can't be displayed.)
Vector display: True/Relative
Past position |
| 4) Alarm | Automatic acquisition/activation zone
Danger ship: CPA limit 0.1 to 9.9 nm, TCPA limit 1 to 99 min |

Synthesis mode

- | | |
|-----------------------|--|
| 5) Another ship track | 20 targets. 1500 point per one target can be displayed.
(including AIS targets)
Display color: 7 colors
(The display color of each target can be set.)
(The display color of all targets can be set by the batch. In this case, the display color is one color.)
Interval of save: 3/5/10/30 sec, 1/3/5/10/130/160 min, 1/3/5/10 nm
Possible to storage in memory card (Option). |
|-----------------------|--|

11.16 AIS UNIT (NQA-2155)

Radar mode, synthesis mode

1) Activation

30 target

MANUAL/AUTO (by automatic activation/activation zone)

2) Display

130 target (sleeping target and activated target)

AIS data: 1 at the same time. (simple display)

Vector display: True/Relative

Past position

The message can be displayed. (broadcast message, addressed message)

Target information in numerical values: Select one of the following four screens:

- Navigation information screen
True bearing, Distance, Course, Speed, CPA, TCPA,
Heading bearing, Turning speed
- Destination and position information screen
Destination, Estimated time of arrival, Latitude and longitude,
Position fixing equipment, RAIM, Position fixing accuracy
- Ship information screen
Ship name, Call sign, MMSI, IMO number, Navigation status
- AtoN information screen
AtoN class, AtoN type

3) Alarm

Automatic activation/activation zone

Danger ship: CPA limit 0.1 to 9.9 nm, TCPA limit 1 to 99 min

Synthesis mode

4) Another ship track

20 targets. 1500 point per one target can be displayed. (including TTs)

Display color: 7 colors

(The display color of each target can be set.)

(The display color of all targets can be set by the batch. In this case, the display color is one color.)

Interval of save: 3/5/10/30 sec, 1/3/5/10/130/160 min, 1/3/5/10 nm

Possible to storage in memory card (Option).



11.17 PLOTTER UNIT

(1) Plotter (Normal) (Synthesis mode)

Projection:	Mercator projection (Latitude 70 degree or less.)
Scale:	Radar synchronize range scale
Own ship trail:	Color of 1 stage. Interval of storage 3/5/10/30 sec, 1/3/5/10/30/60 min or every 0.1/0.2/0.3/0.5/1/3/5/10 nm and OFF
Cursor mark :	Storage Capacity 7,000 point
Coastline data :	Coastline ROM Card (Option) (ERC, JRC, C-Map NT+) One selected isobath can be displayed.
Painting out:	ON/OFF can be selected.

(2) Plotter (Option NDB-44) (Synthesis mode)

Projection:	Mercator projection (Latitude 70 degree or less.)
Scale:	Synchronize range scale
Own ship trail:	Color of 7 stages. Interval of storage: 3/5/10/30 sec, 1/3/5/10/30/60 min or every 0.1/0.2/0.3/0.5/1/3/5/10 nm and OFF Storage capacity of own ship trail: 7,000 point
Cursor mark:	Color of 7 stages Storage capacity of cursor mark: 20,000 point Variety of cursor Mark: 19
Event mark:	Color of 7 stages Storage capacity of event mark: Include in cursor mark Variety of event mark: 3 kinds, (Two kinds can be switched. /8 form to selection.) Variety of external event mark: One kind, Monochrome
Line:	Color of 7 stage Storage capacity of line: Include in cursor mark Variety of line: Solid line, broken line, alternate long and short dash line
Coast line data:	Coast line ROM card (Option) (ERC, JRC, C-Map NT+) Selected one isoline can be displayed.
Painting out:	ON/OFF can be selected.
External memory:	Memory card (Option)
Destination and sea route:	Destination can be set up to 99 point. Information of destination: Azimuth, distance and the time to required destination. Setting of sea route: 10 sea routes. (10 destination for one sea route can be set.) Alarm of sea route: Destination, Secession, Invetion, Secession
Position compensation:	Radar display synchronize range scale coast line by manual.

(3) Plotter (Option NDB-44) (Synthesis mode)

Projection:	Mercator projection (Latitude 85 degree or less.)
Scale:	1/1,000 to 1/10,000,000 are continuously selected. 10 stage can be changed (Preset can be used)
Own ship trail:	Color of 7 stages. Interval of storage: 3/5/10/30 sec, 1/3/5/10/30/60 min or every 0.1/0.2/0.3/0.5/1/3/5/10 nm and OFF Storage capacity of own ship trail: 7,000 point
Cursor mark:	Color of 7 stages Storage capacity of cursor mark: 20,000 point Variety of cursor Mark: 19
Event mark:	Color of 7 stages Storage capacity of event mark: Include in cursor mark Variety of event mark: 3 kinds, (Two kinds can be switched. /8 form to selection.) Variety of external event mark: One kind, Monochrome
Line:	Color of 7 stage Storage capacity of line: Include in cursor mark Variety of line: Solid line, broken line, alternate long and short dash line
Coast line data:	Coast line ROM card (Option)(ERC, JRC, C-Map NT+) Selected one isoline can be displayed.
Painting out:	ON/OFF can be selected.
External memory:	Memory card (Option) Own ship trail, another ship trail, cursor mark, event mark, line, destination, sea route can be memorized.
Destination and sea route:	Destination can be set up to 99 point. Information of destination: Azimuth, distance and the time to required destination. Setting of sea route: 10 sea routes. (10 destination for one sea route can be set.) Alarm of sea route: Destination, Seccession, Invetion, Seccession



11.18 KEYBOARD UNIT (NCE-7699A)

- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|-------------------------------|---------------------------|------------------------------------|---------------------------|---|---------------------------------------|------------------------|-----------------------------|-------------|--|-------------|--|-------------|--|-------------|--|---------------------------------|-------------------------|---------------------------------|-------------------------|-------------------|-----------------------|----------------------------|-------------------------------------|---------------------------------|--|--------------|--------------------------------|-------------|--------------------------------|--------------------------------|--------------------------|--------------------|---|--|---|----------------------------|--|------------------------------|---|---------------------------------|---|--|----------------------|-----------------------|----------------------|------------------------|---|--|---|---|---|--|--|------------------|--|---|---|-----------------|---------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------------------|-------------|-------------|--|-------------------|----------|
| (1) Structure | Structure of keyboard unit is separate from processor unit.
Desk-Top type
Correspond Flush mount | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (2) Switch | Gain (Transmit pulse width can be changed by PUSH-SW.)
SEA (AUTO/MANU can be changed by PUSH-SW.)
RAIN (AUTO/MANU can be changed by PUSH-SW.)
MULTI (Adjustment item can be changed by PUSH-SW.)
EBL (Floating EBL ON/OFF can be changed by PUSH-SW.)
VRM
Trackball | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (3) Operation switch | <table border="0"> <tr> <td>STBY/OFF (Standby/Power off):</td> <td>Stop transmit, Power off.</td> </tr> <tr> <td>TX/OFF (Transmit start/Power off):</td> <td>Start transmit, Power off</td> </tr> <tr> <td>PANEL(Brightness of keyboard adjustment):</td> <td>Brightness of keyboard switch adjust.</td> </tr> <tr> <td>ALARM ACK(Stop Alarm):</td> <td>Acknowledge and stop alarm.</td> </tr> <tr> <td>EBL1(EBL1):</td> <td>Selection display and non-display of EBL1.</td> </tr> <tr> <td>EBL2(EBL2):</td> <td>Selection display and non-display of EBL2.</td> </tr> <tr> <td>VRM1(VRM1):</td> <td>Selection display and non-display of VRM1.</td> </tr> <tr> <td>VRM2(VRM2):</td> <td>Selection display and non-display of VRM2.</td> </tr> <tr> <td>RANGE+(Increase display range):</td> <td>Increase display range.</td> </tr> <tr> <td>RANGE-(decrease display range):</td> <td>decrease display range.</td> </tr> <tr> <td>ACQ(acquisition):</td> <td>TT target acquisition</td> </tr> <tr> <td>TGT DATA(Numeric display):</td> <td>Numeric display of tracking target.</td> </tr> <tr> <td>TGT CNCL(Release of selection):</td> <td>Release of selection of tracking target.</td> </tr> <tr> <td>MOB(Marker):</td> <td>Turning on and release marker.</td> </tr> <tr> <td>ENT(Enter):</td> <td>Left side button of trackball.</td> </tr> <tr> <td>CLR/INFO(Release/Information):</td> <td>Right side of trackball.</td> </tr> <tr> <td>MAP(Display mode):</td> <td>Selection display and non-display of MAP(NAV LINE, etc...).</td> </tr> <tr> <td> </td> <td>Selection of Rader, Synthesis and Plotter mode.</td> </tr> <tr> <td>AZI MODE(Display azimuth):</td> <td>Selection of North-up, Course-Up, Head-Up.</td> </tr> <tr> <td>TM/RM(True/Relative Motion):</td> <td>Selection true motion, relative motion.</td> </tr> <tr> <td>RR/HL(Fixed ring/Heading Line):</td> <td>Selection display and non-display of fixed ring and heading line.</td> </tr> <tr> <td> </td> <td>Off center operation</td> </tr> <tr> <td>OFF CENT(Off Center):</td> <td>Off center operation</td> </tr> <tr> <td>AZ (Guard zone alarm):</td> <td>Setting and release of automatic acquisition/activate zone.</td> </tr> <tr> <td> </td> <td>Selection of true motion and relative motion of vector.</td> </tr> <tr> <td>VECT T/R (True/Relative motion vector):</td> <td>Selection of true motion and relative motion of vector.</td> </tr> <tr> <td> </td> <td>Selection display and non-display of trails.</td> </tr> <tr> <td>TRAILS (Trails):</td> <td>Selection display and non-display of trails.</td> </tr> <tr> <td>Day/Night(Brightness of screen switch):</td> <td>Selection of screen arrangement of color.</td> </tr> <tr> <td>FUNC(Function):</td> <td>Selection of signal processing.</td> </tr> <tr> <td>USER KEY1(User key1):</td> <td>User assignment key1.</td> </tr> <tr> <td>USER KEY2(User key2):</td> <td>User assignment key2.</td> </tr> <tr> <td>RADAR MENU(Radar menu):</td> <td>Rader menu.</td> </tr> <tr> <td>MARK(MARK):</td> <td>Selection display and non-display of mark.</td> </tr> <tr> <td>TT MENU(TT menu):</td> <td>TT menu.</td> </tr> </table> | STBY/OFF (Standby/Power off): | Stop transmit, Power off. | TX/OFF (Transmit start/Power off): | Start transmit, Power off | PANEL(Brightness of keyboard adjustment): | Brightness of keyboard switch adjust. | ALARM ACK(Stop Alarm): | Acknowledge and stop alarm. | EBL1(EBL1): | Selection display and non-display of EBL1. | EBL2(EBL2): | Selection display and non-display of EBL2. | VRM1(VRM1): | Selection display and non-display of VRM1. | VRM2(VRM2): | Selection display and non-display of VRM2. | RANGE+(Increase display range): | Increase display range. | RANGE-(decrease display range): | decrease display range. | ACQ(acquisition): | TT target acquisition | TGT DATA(Numeric display): | Numeric display of tracking target. | TGT CNCL(Release of selection): | Release of selection of tracking target. | MOB(Marker): | Turning on and release marker. | ENT(Enter): | Left side button of trackball. | CLR/INFO(Release/Information): | Right side of trackball. | MAP(Display mode): | Selection display and non-display of MAP(NAV LINE, etc...). | | Selection of Rader, Synthesis and Plotter mode. | AZI MODE(Display azimuth): | Selection of North-up, Course-Up, Head-Up. | TM/RM(True/Relative Motion): | Selection true motion, relative motion. | RR/HL(Fixed ring/Heading Line): | Selection display and non-display of fixed ring and heading line. | | Off center operation | OFF CENT(Off Center): | Off center operation | AZ (Guard zone alarm): | Setting and release of automatic acquisition/activate zone. | | Selection of true motion and relative motion of vector. | VECT T/R (True/Relative motion vector): | Selection of true motion and relative motion of vector. | | Selection display and non-display of trails. | TRAILS (Trails): | Selection display and non-display of trails. | Day/Night(Brightness of screen switch): | Selection of screen arrangement of color. | FUNC(Function): | Selection of signal processing. | USER KEY1(User key1): | User assignment key1. | USER KEY2(User key2): | User assignment key2. | RADAR MENU(Radar menu): | Rader menu. | MARK(MARK): | Selection display and non-display of mark. | TT MENU(TT menu): | TT menu. |
| STBY/OFF (Standby/Power off): | Stop transmit, Power off. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TX/OFF (Transmit start/Power off): | Start transmit, Power off | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PANEL(Brightness of keyboard adjustment): | Brightness of keyboard switch adjust. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ALARM ACK(Stop Alarm): | Acknowledge and stop alarm. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EBL1(EBL1): | Selection display and non-display of EBL1. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EBL2(EBL2): | Selection display and non-display of EBL2. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VRM1(VRM1): | Selection display and non-display of VRM1. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VRM2(VRM2): | Selection display and non-display of VRM2. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RANGE+(Increase display range): | Increase display range. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RANGE-(decrease display range): | decrease display range. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACQ(acquisition): | TT target acquisition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TGT DATA(Numeric display): | Numeric display of tracking target. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TGT CNCL(Release of selection): | Release of selection of tracking target. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MOB(Marker): | Turning on and release marker. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENT(Enter): | Left side button of trackball. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLR/INFO(Release/Information): | Right side of trackball. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAP(Display mode): | Selection display and non-display of MAP(NAV LINE, etc...). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Selection of Rader, Synthesis and Plotter mode. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AZI MODE(Display azimuth): | Selection of North-up, Course-Up, Head-Up. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TM/RM(True/Relative Motion): | Selection true motion, relative motion. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RR/HL(Fixed ring/Heading Line): | Selection display and non-display of fixed ring and heading line. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Off center operation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF CENT(Off Center): | Off center operation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AZ (Guard zone alarm): | Setting and release of automatic acquisition/activate zone. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Selection of true motion and relative motion of vector. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VECT T/R (True/Relative motion vector): | Selection of true motion and relative motion of vector. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Selection display and non-display of trails. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TRAILS (Trails): | Selection display and non-display of trails. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Day/Night(Brightness of screen switch): | Selection of screen arrangement of color. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FUNC(Function): | Selection of signal processing. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USER KEY1(User key1): | User assignment key1. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USER KEY2(User key2): | User assignment key2. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RADAR MENU(Radar menu): | Rader menu. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MARK(MARK): | Selection display and non-display of mark. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TT MENU(TT menu): | TT menu. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

11.19 PERFORMANCE MONITOR (NJU-85)

- | | |
|-------------------------|-------------------------------------|
| (1) Dimensions | Height 130mm×Width 149mm×Depth 70mm |
| (2) Mass | Approx. 1.2kg |
| (3) Operating frequency | 9410 ±30MHz |

11.20 INPUT ENABLE SIGNAL

- | | |
|--|--|
| (1) Navigation equipment: | IEC61162-1/2
Receive port NAV1/NAV2/GPS port
Receive capability sentence.
Longitude/Latitude: GGA>RMC>RMA>GNS/GLL
Waypoint: RMB>BWC(BWR)
COG/SOG: RMC>RMA>VTG
SPEED: VBW
Day/Time information: ZDA
Alarm acknowledge: ACK
Rate of Turn : ROT
Rudder : RSA |
| (2) Bearing signal: | GYRO-SYNC: 360X, 180X, 90X, 30X. (Require optional NSK unit NCT-4106A)
GYRO-STEP: 360X, 180X, 90X, 30X. (Require optional NSK unit NCT-4106A)
JRC-NSK format (JLR-10, JLR20/30)
IEC61162-2 38400bps: THS>HDT>HDG>HDM>VHW
(over 40Hz)
IEC61162-1: THS>HDT>HDG>HDM>VHW
* Can't be use for target tracking. |
| (3) Speed signal: | LOG-SYNC: 360X, 180X,90X, 30X. (Require optional NSK unit NCT-4106A)
LOG-PULSE: 800, 400, 200, 100. (Require optional NSK unit NCT-4106A) |
| (4) External event mark: | Contact input by way of terminal board. |
| (5) Depth: | DPT>DBK>DBT>DBS, JRC format |
| (6) Water temperature: | MTW, JRC format |
| (7) Tendency: | CUR, JRC format |
| (8) Direction of wind, velocity of wind: | MWV, MWD |
| (9) AIS: | IEC61162-2
VDM, VDO (Require optional AIS process unit NQA-2155) |

Note: The Speed measuring accuracy of speed sensor shall confirm to IMO Resolution MSC.96(72).
The measuring accuracy of GPS shall confirm to IMO Resolution MSC.112(73).



11.21 OUTPUT ENABLE SIGNAL

- | | | |
|-----|------------------------------------|---|
| (1) | Slave video | Radar video: TIY, VD, BP(2048p), BZ (Option) |
| (2) | Navigation information | IEC61162-1/2
Radar system data: RSD
Own ship data: OSD
Tracking target data: TTM, TLL, TTD, TLB
Alarm: ALR
Auto pilot: APB
Bearing of destination: BOD
Latitude/Longitude data : GGA, GLL, RMC
Waypoint data : RMB, BWC
COG/SOG data : VTG
Cross track error: XTE
Heading data: HDT, THS |
| (3) | Failure of RADAR or External alarm | J5 (NSK/COMPASS connector) ⑥ALM+, ⑦ALM-NCT-4106A(TB40) option
Refer to 3.21 and 3.22 in Installation manual. |
| (4) | External monitor | Multi scan monitor, Analog RGB, HD15pin Connector (Option) |

11.22 STANDARD CONFIGURATION

- | | | |
|-----|-------------------------|---|
| (1) | Scanner | 1 |
| (2) | Display unit | 1 (Processor unit, LCD unit, Keyboard unit) |
| (3) | Power cable | CFQ-5436-5 (5m) |
| (4) | Equipment reserve parts | 1 |
| (5) | Instruction manual | 1 (Japanese or English) |

Note: An equipment cable is optional.
Purchase an equipment cable of desired length.

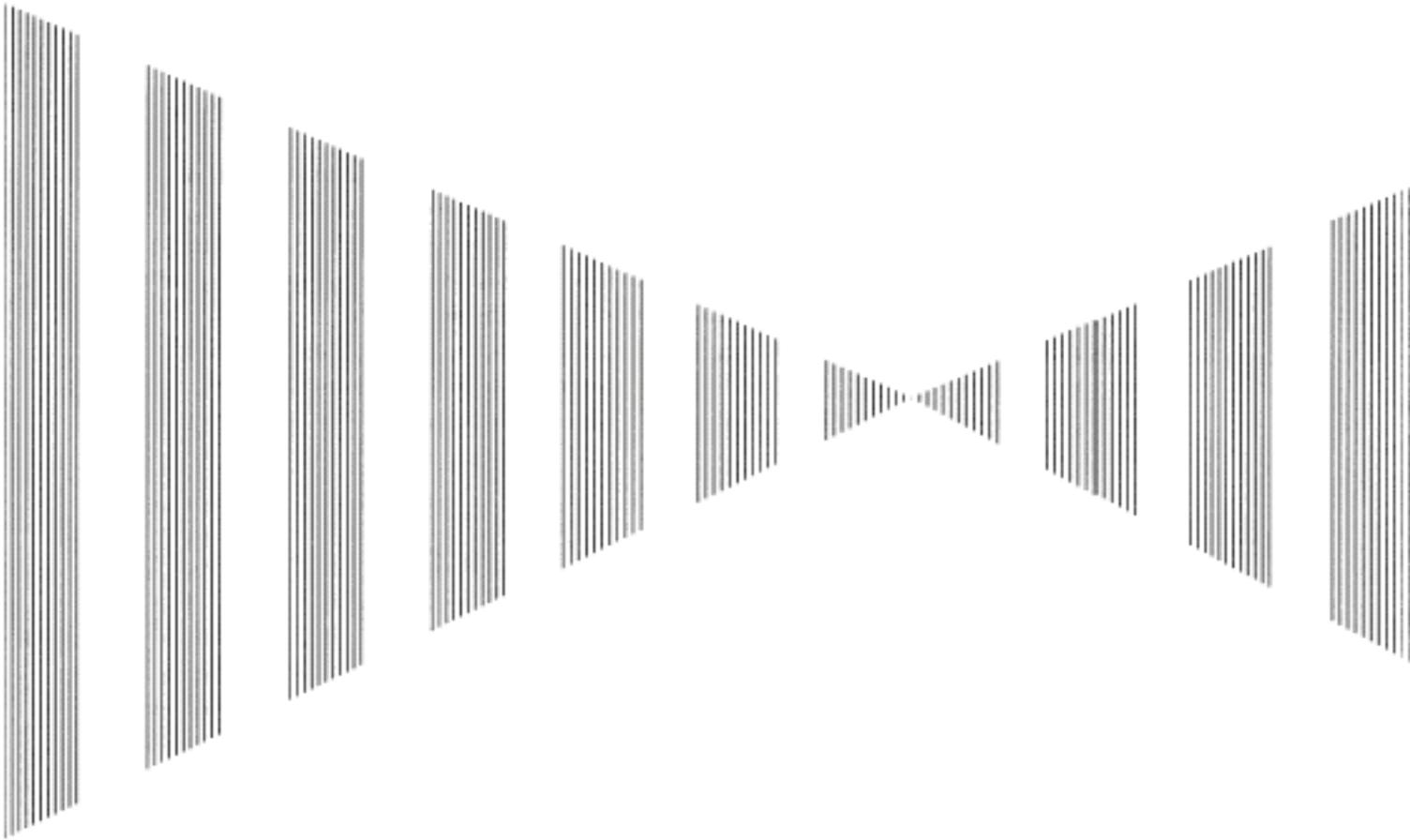
11.23 EQUIPMENT DISTANCE BETWEEN OTHER INSTRUMENTS

	Maximum
(1) LCD monitor to processor unit	5m
(2) Keyboard unit to processor unit	5m
(3) Scanner to display unit (4kw NKE-2043 12VDC)	20m
(4) Scanner to display unit (4kw NKE-2043 24V/32VDC)	30m
(5) Scanner to display unit (6kw NKE-2062/2063A 12VDC)	20m
(6) Scanner to display unit (6kw NKE-2062/2063A 24V/32VDC)	30m
(7) Scanner to display unit (6kw NKE-2062HS 24VDC)	30m
(8) Scanner to display unit (10/25kw)	65m

11.24 OTHERS (OPTION)

- Equipment cable 4/6/10/25 kW type (connectors on both ends)
Cable length:
10m CFQ-6912-10/15m CFQ-6912-15
20m CFQ-6912-20/30m CFQ-6912-30
40m CFQ-6912-40/50m CFQ-6912-50
65m CFQ-6912-65
- TT unit NCA-877A
- NSK unit NCT-4106A
- AIS unit NQA-2155
- Plotter unit NDB-44
- X band performance monitor NJU-85
- Display stand MPBX42944
- Horizontal sun visor for NWZ-164 MPOL30369
- Vertical sun visor for NWZ-164 MPOL30370
- Simple ISW cable CFQ-5251 (5 m)
- Sub-monitor lead cable CFQ-5350 (7ZCRD1153)
- ISW/sub-operation unit lead cable CFQ-5351 (7ZCRD1152)
- NMEA lead cable CFQ-5352 (7ZCRD1212)
- NMEA lead cable 2 CFQ-5462 (2CH pair for transmission and receive)
- Cable between connected NMEA units CFQ-6560 (10 m)
- JLR-10 connection cable CFQ-6934 (10 m)
- JLR-20/30 connection cable CFQ-5469
- Keyboard extension cable CFQ-6999 (10 m)
- NDW-51 connection cable CFQ-7082
- Coast line ROM card
- Memory card
- Rectifier unit NBA-5111

APPENDIX



- FIGURE 1 JMA-5204, JMA-5208/HS, JMA-5209, JMA-5212-4/6/4HS/6HS, JMA-5222-7/9 BLOCK DIAGRAM
- FIGURE 2 JMA-5204 INTER-CONNECTION DIAGRAM
- FIGURE 3 JMA-5208/HS INTER-CONNECTION DIAGRAM
- FIGURE 4 JMA-5209 INTER-CONNECTION DIAGRAM
- FIGURE 5 JMA-5212-4/6/4HS/6HS INTER-CONNECTION DIAGRAM
- FIGURE 6 JMA-5222-7/9 INTER-CONNECTION DIAGRAM
- FIGURE 7 PRIMARY POWER SUPPLY DIAGRAM, TYPE JMA-5204, JMA-5208/HS, JMA-5209, JMA-5212-4/6/4HS/6HS, JMA-5222-7/9
- FIGURE 8 PROCESSOR UNIT, NDC-1460 INTER-CONNECTION DIAGRAM
- FIGURE 9 KEY-BOARD UNIT, NCE-7699A INTER-CONNECTION DIAGRAM
- FIGURE 10 NKE-2043 SCANNER UNIT INTERCONNECTION DIAGRAM
- FIGURE 11 NKE-2062 SCANNER UNIT INTERCONNECTION DIAGRAM
- FIGURE 12 NKE-2062HS SCANNER UNIT INTERCONNECTION DIAGRAM
- FIGURE 13 NKE-2063A SCANNER UNIT INTERCONNECTION DIAGRAM
- FIGURE 14 NKE-2103 SCANNER UNIT INTERCONNECTION DIAGRAM
- FIGURE 15 NKE-2254 INTERCONNECTION DIAGRAM OF SCANNER UNIT
- FIGURE 16 JMA-5200MK2 ON-SCREEN CONTROLS

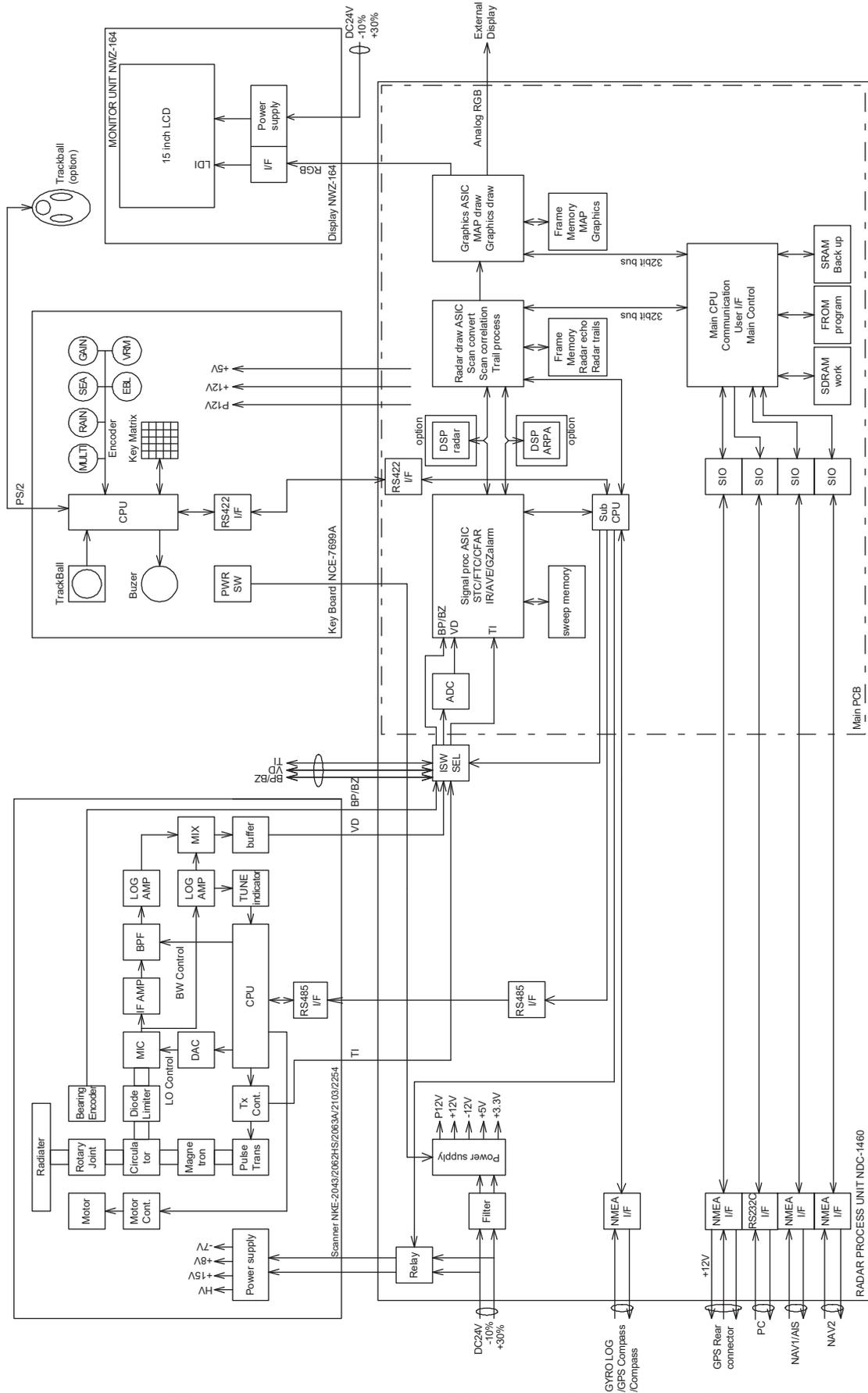


Figure 1 JMA-5204, JMA-5208/HS, JMA-5209, JMA-5212-4/6/4HS/6HS, JMA-5222-7/9 Block Diagram

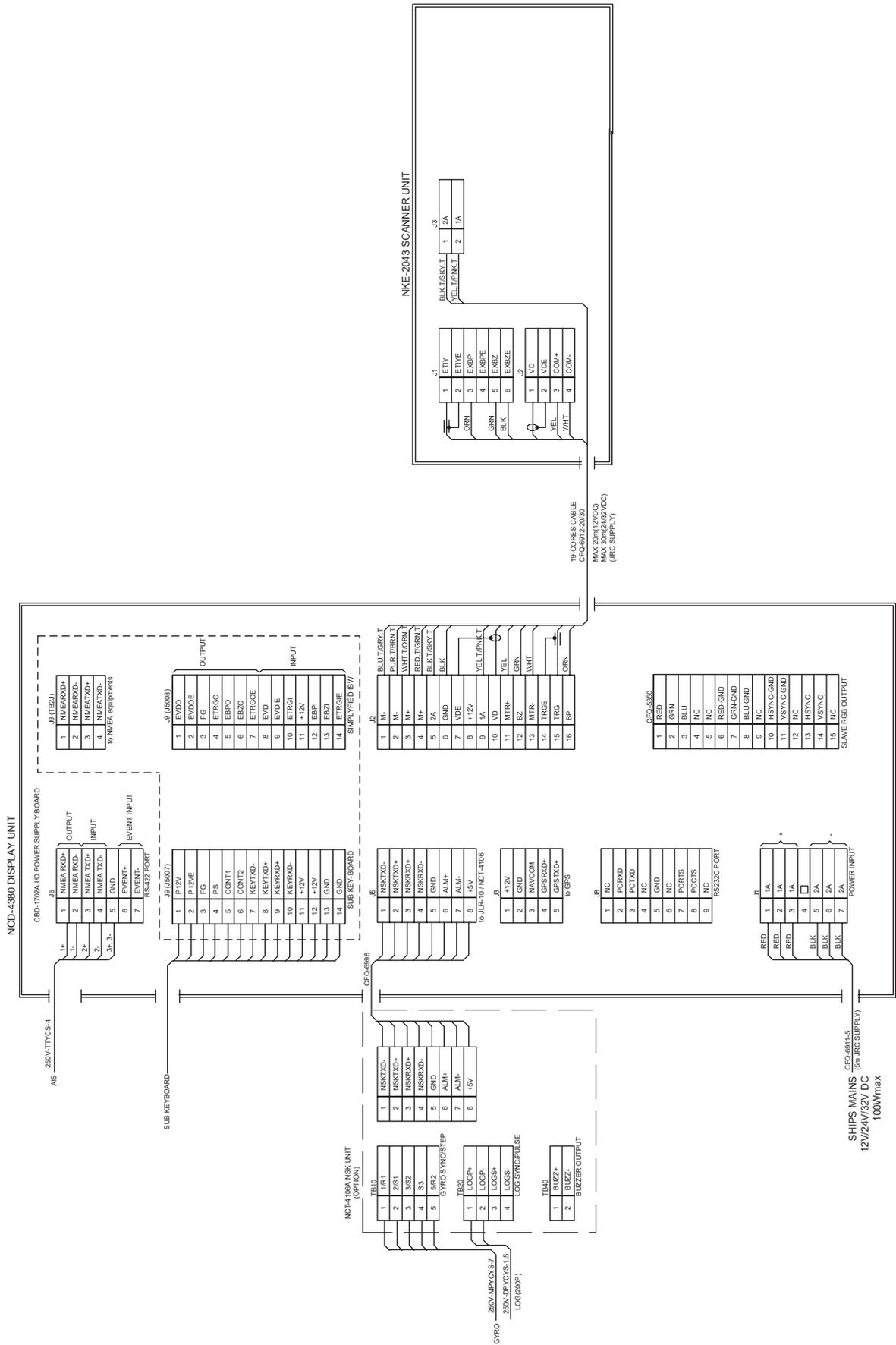


Figure 2 JMA-5204 Inter-connection Diagram

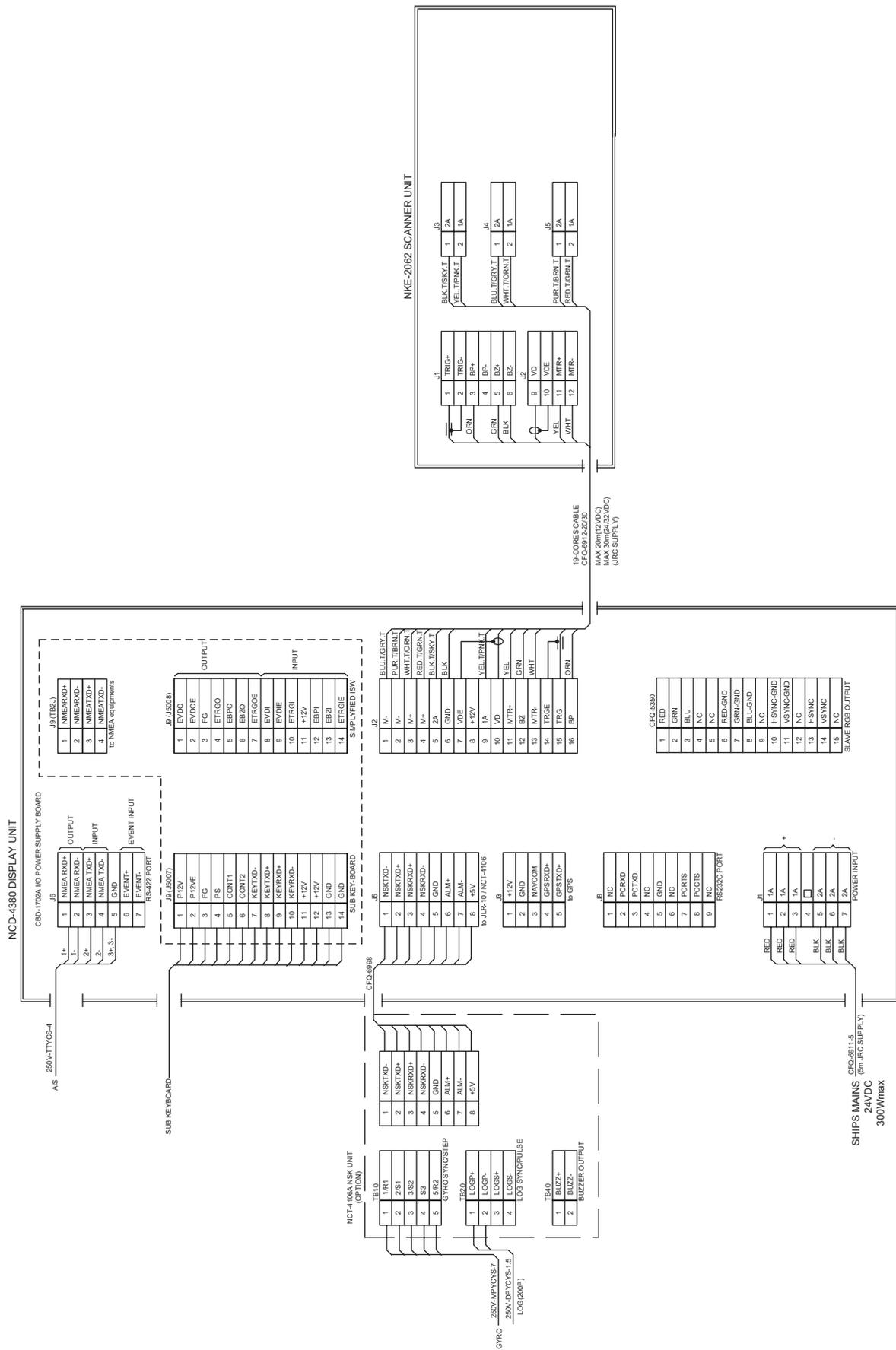
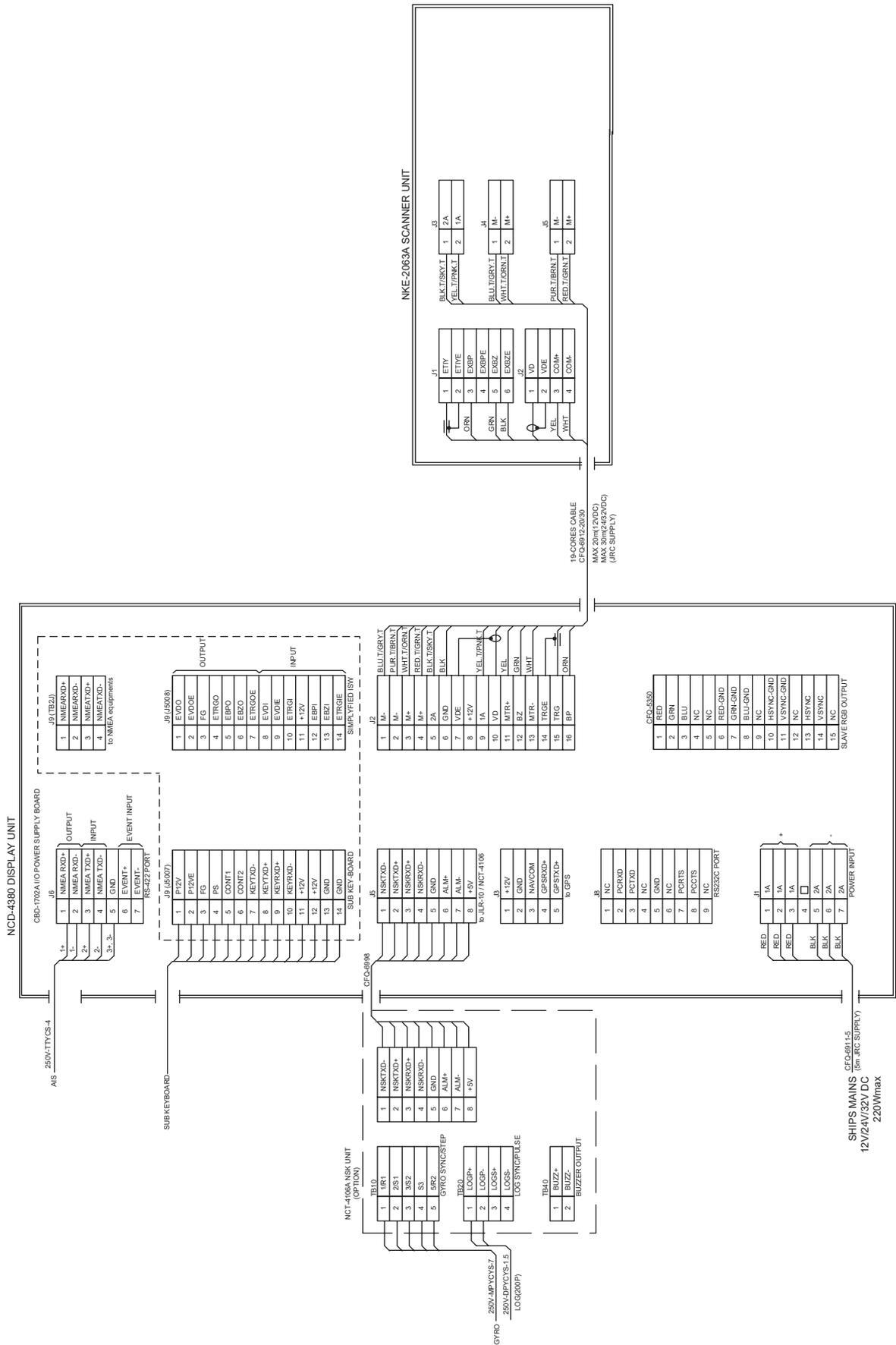
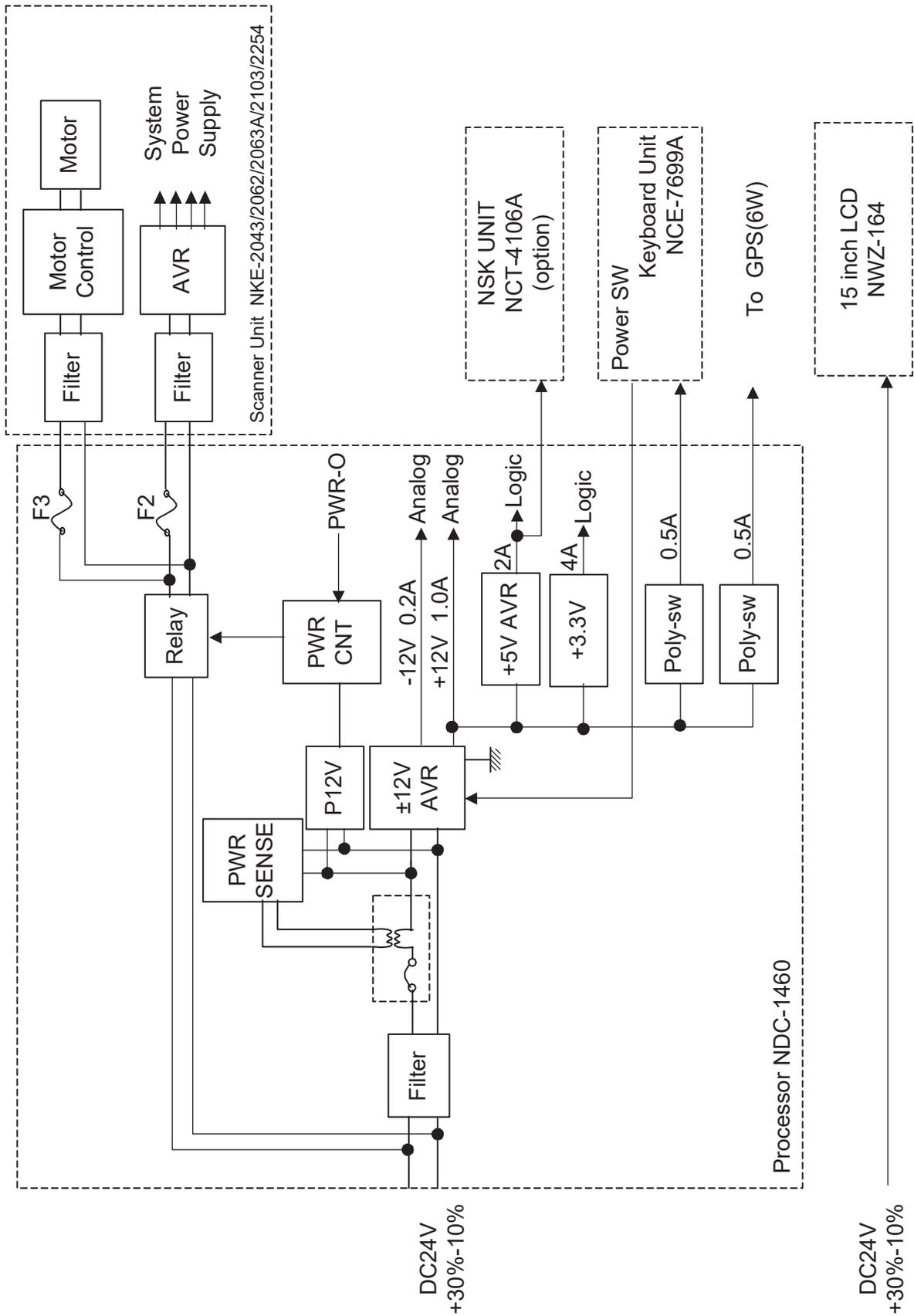


Figure 3 JMA-5208/HS Inter-connection Diagram





**Figure 7 Primary Power Supply Diagram,
Type JMA-5204, JMA-5208/HS, JMA-5209,
JMA-5212-4/6/4HS/6HS, JMA-5222-7/9**

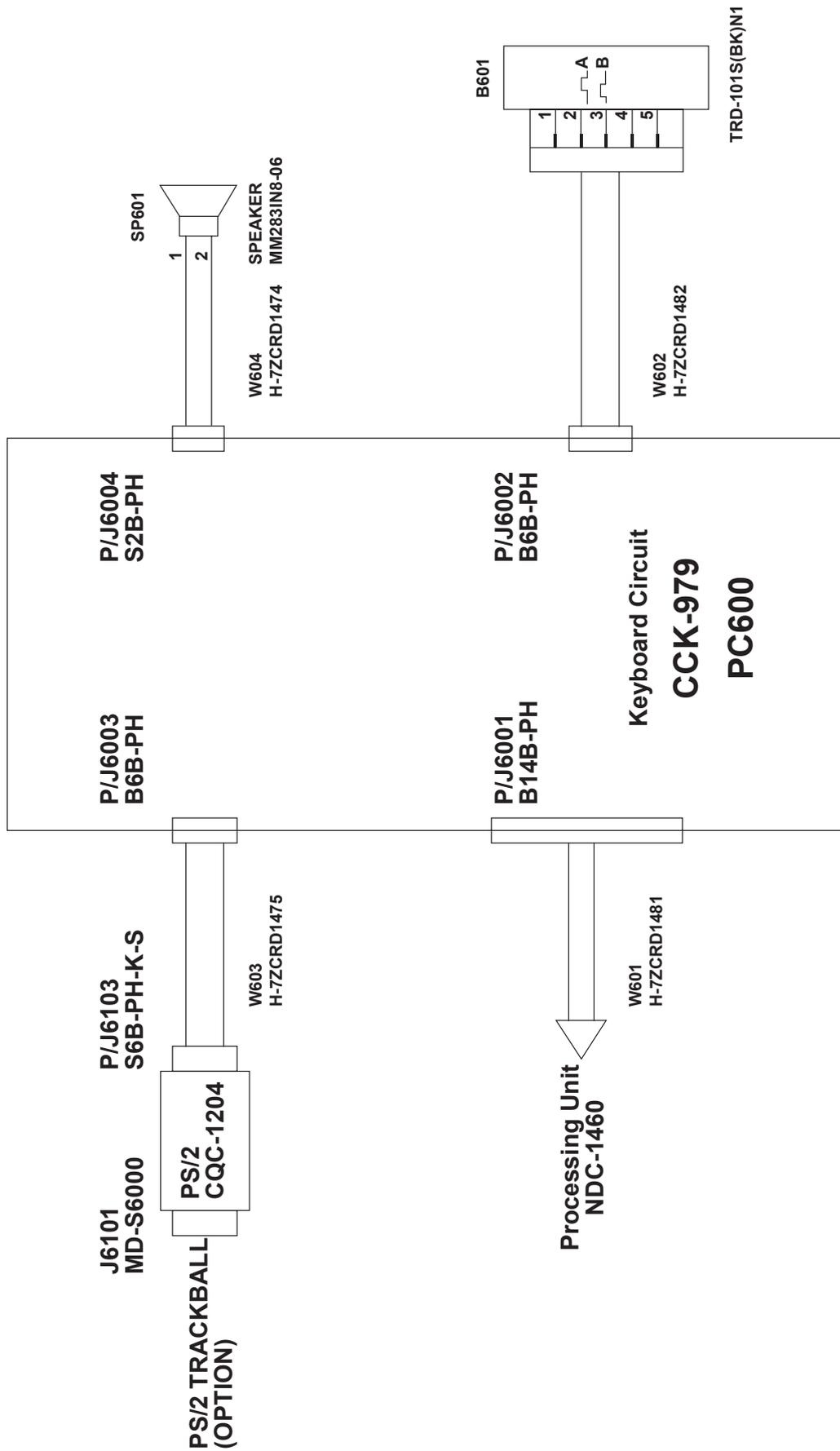


Figure 9 Key-board Unit, NCE-7699A Inter-connection Diagram

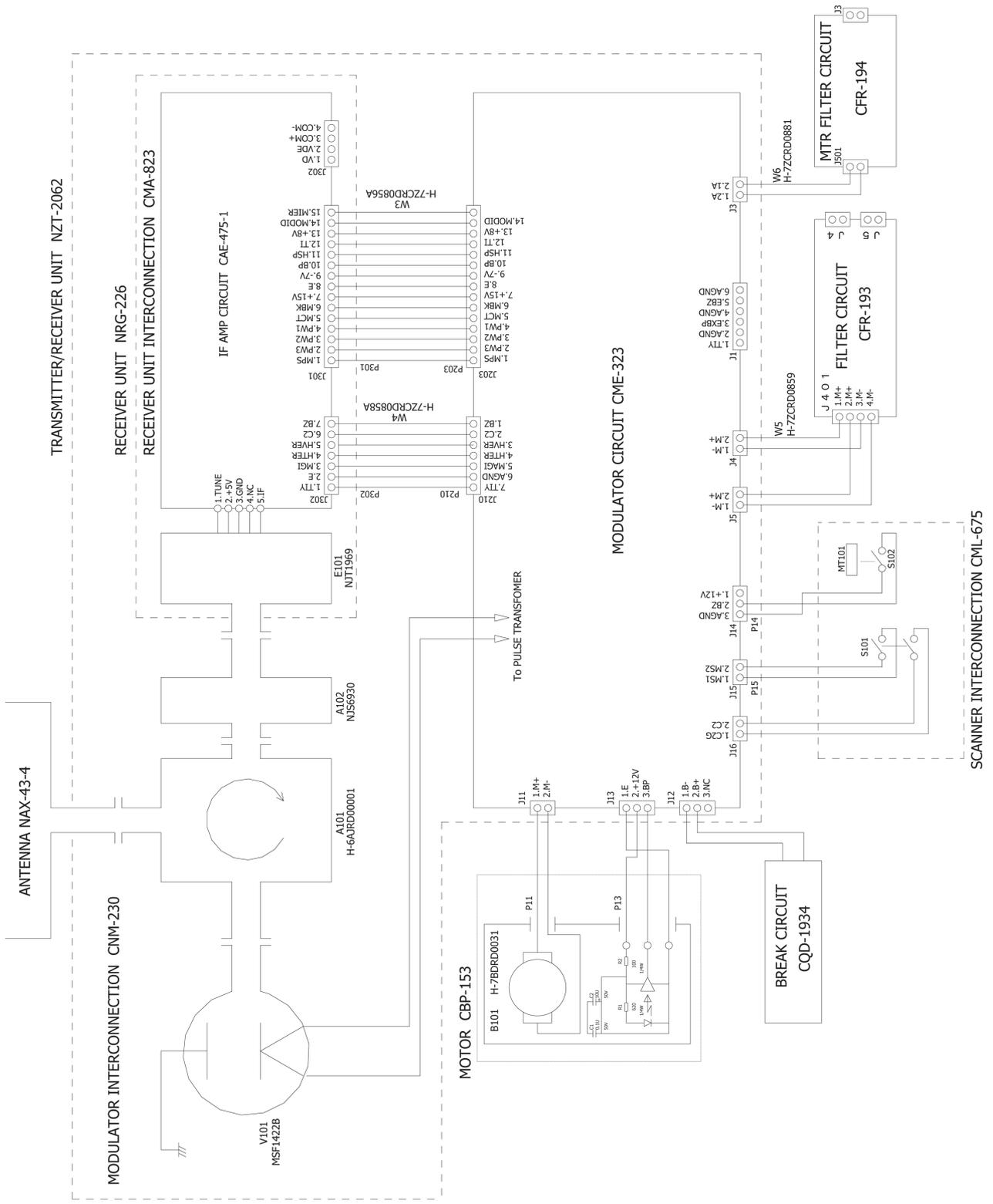


Figure 11 NKE-2062 Scanner Unit Interconnection Diagram

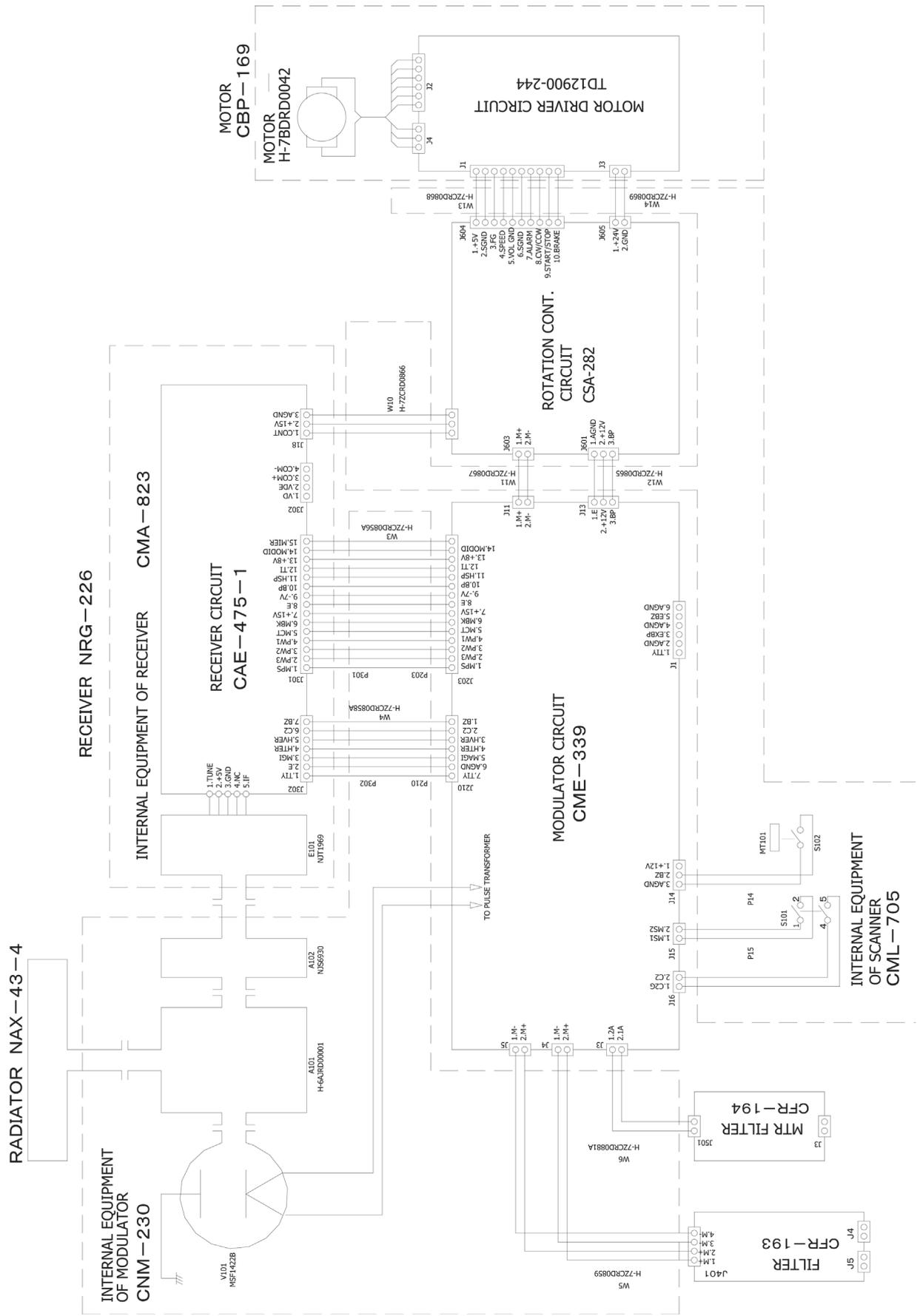
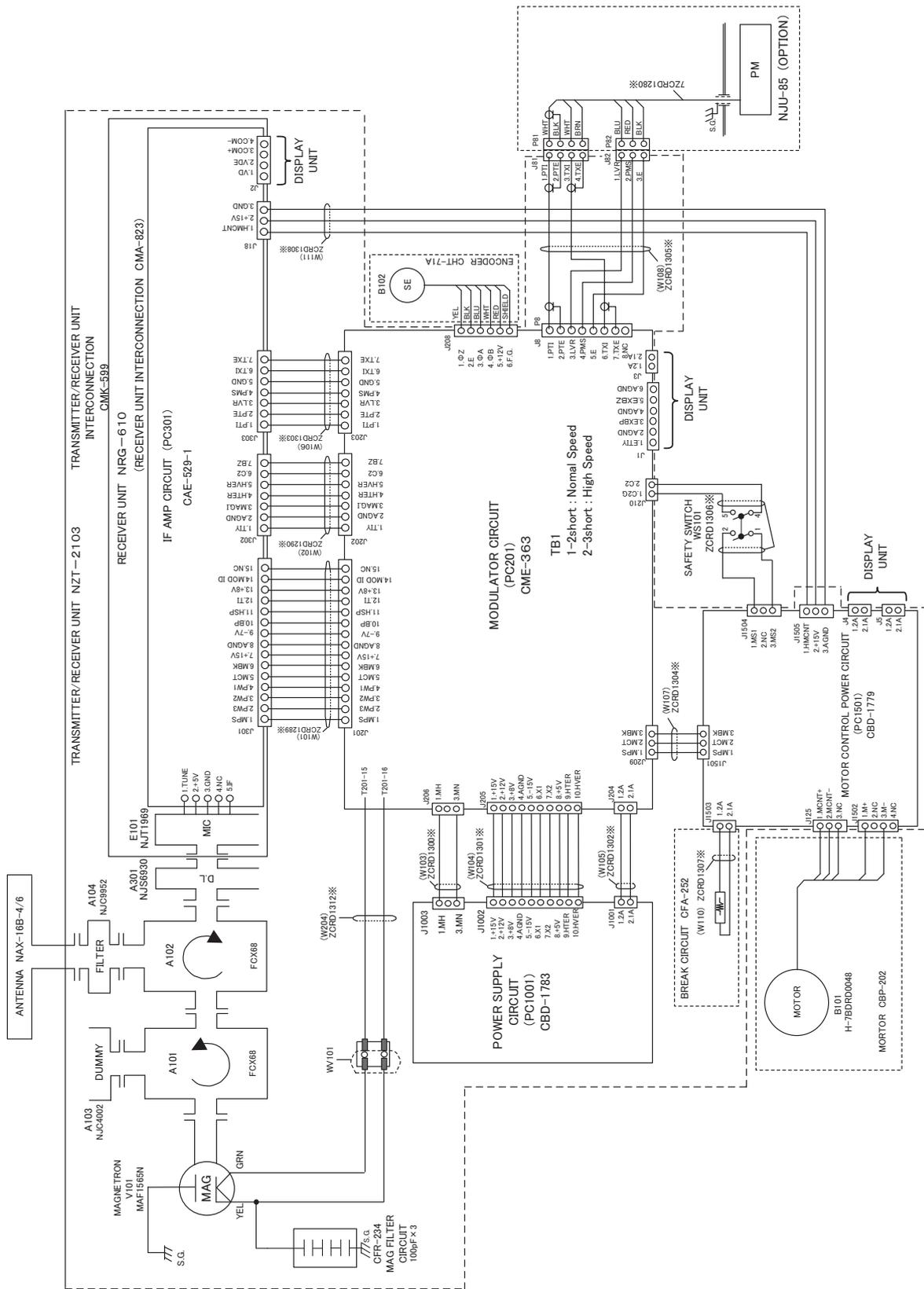


Figure 12 NKE-2062HS Scanner Unit Interconnection Diagram



SCANNER UNIT INTERCONNECTION
CAX-10

Figure 14 NKE-2103 Scanner Unit Interconnection Diagram

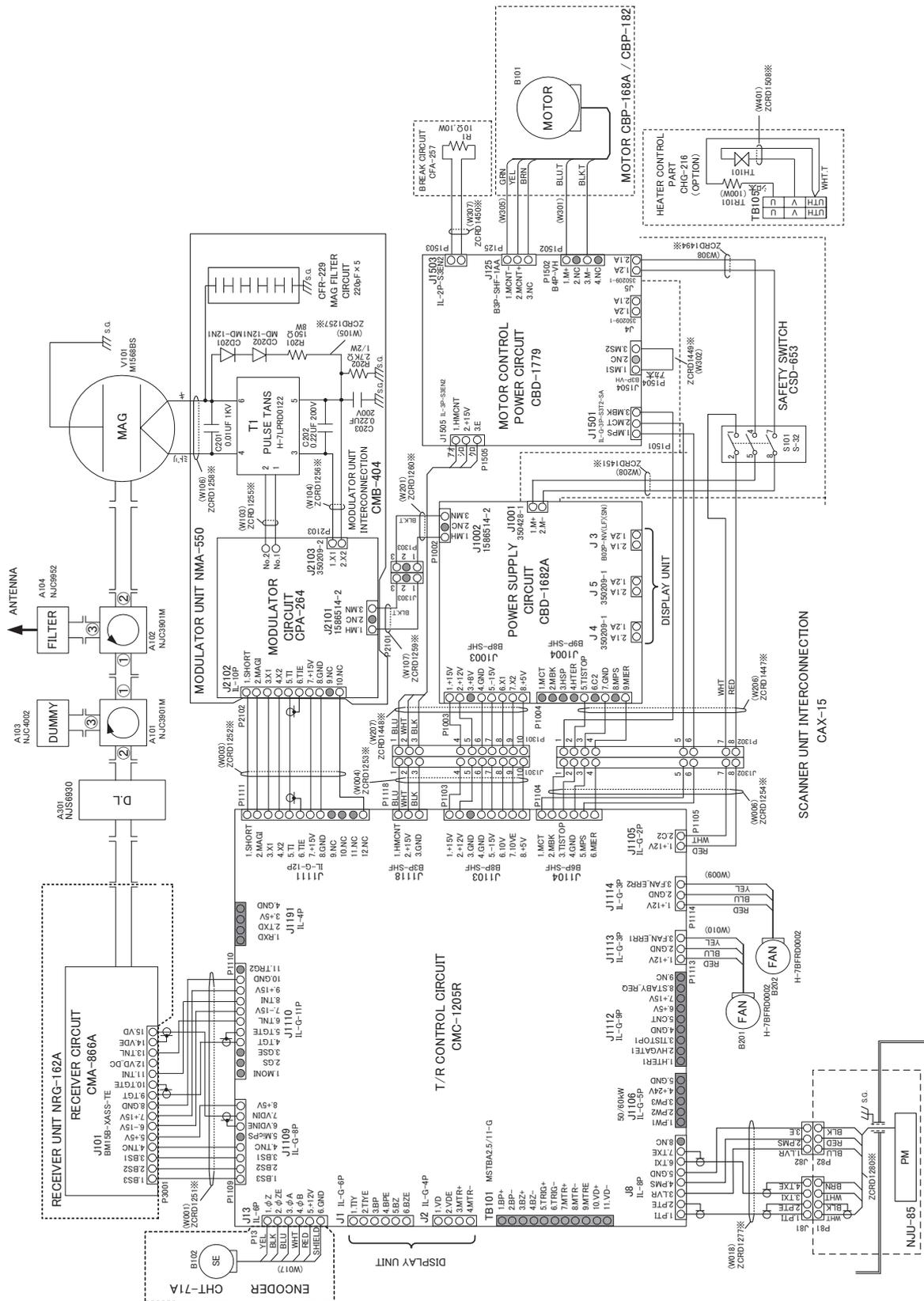


Figure 15 NKE-2254 Interconnection Diagram of Scanner Unit

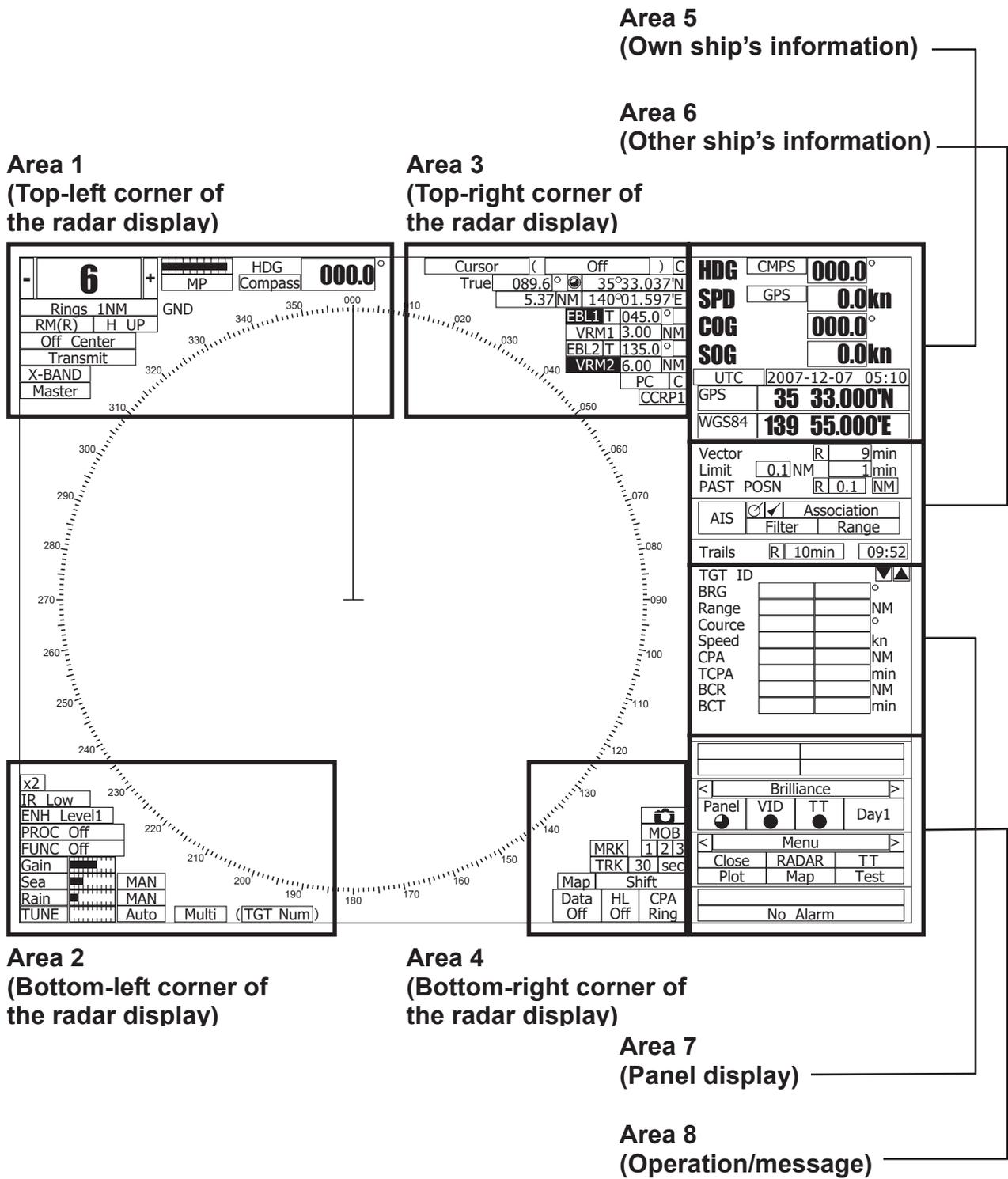
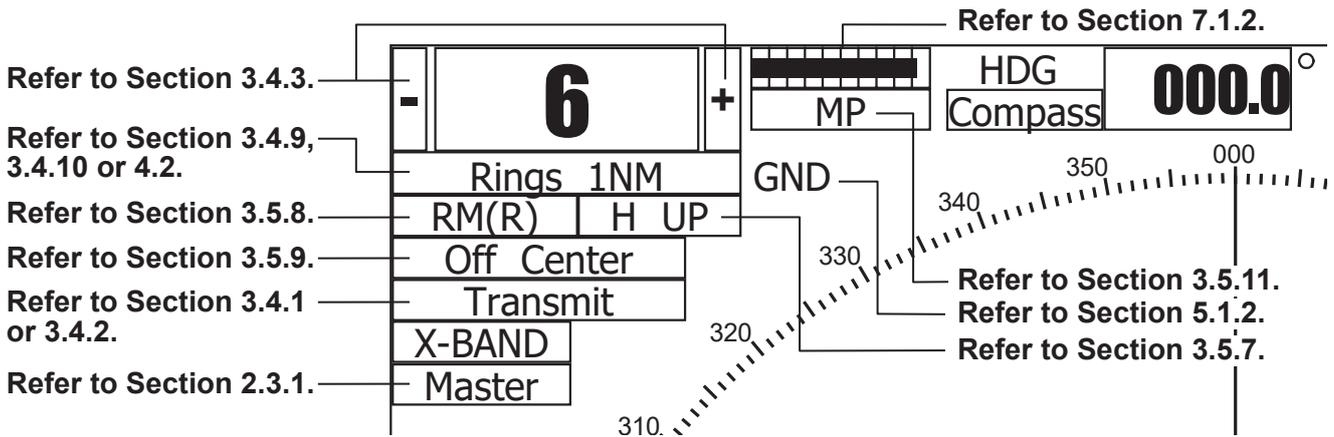
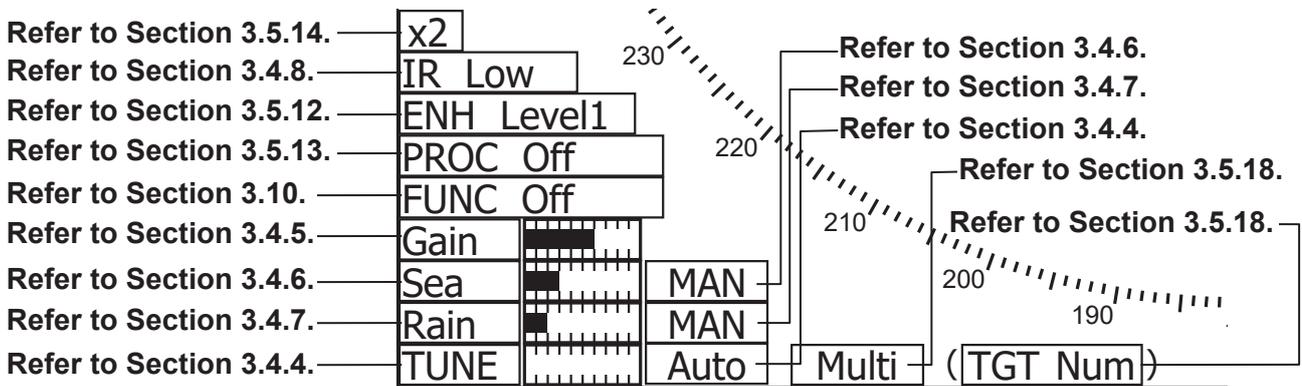


Figure 16 JMA-5200MK2 ON-screen Controls

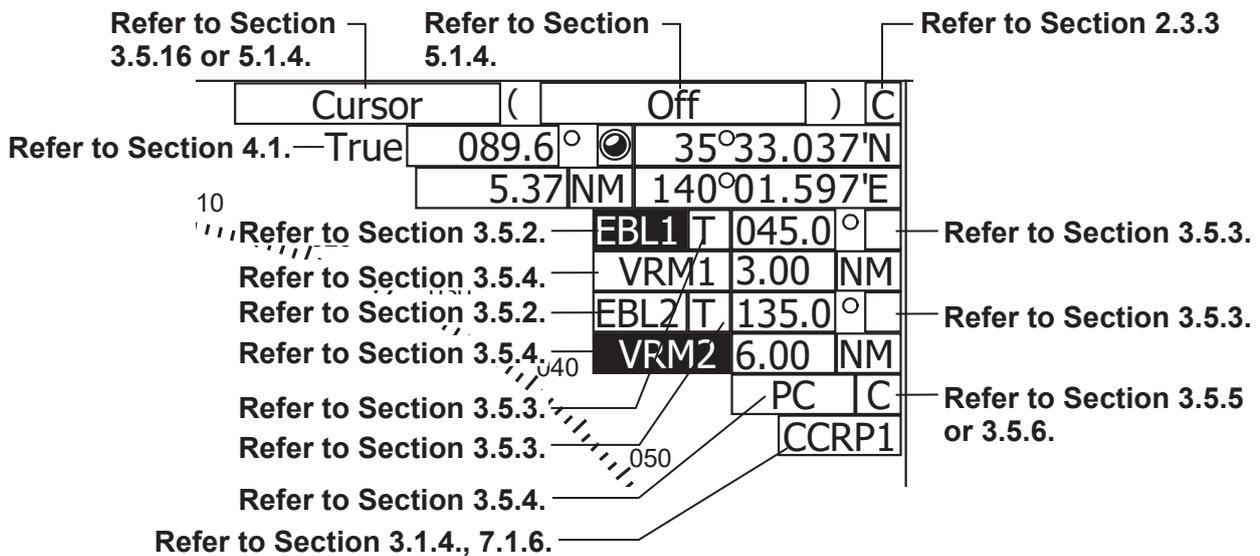
Area 1 (Top-left corner of the radar display)



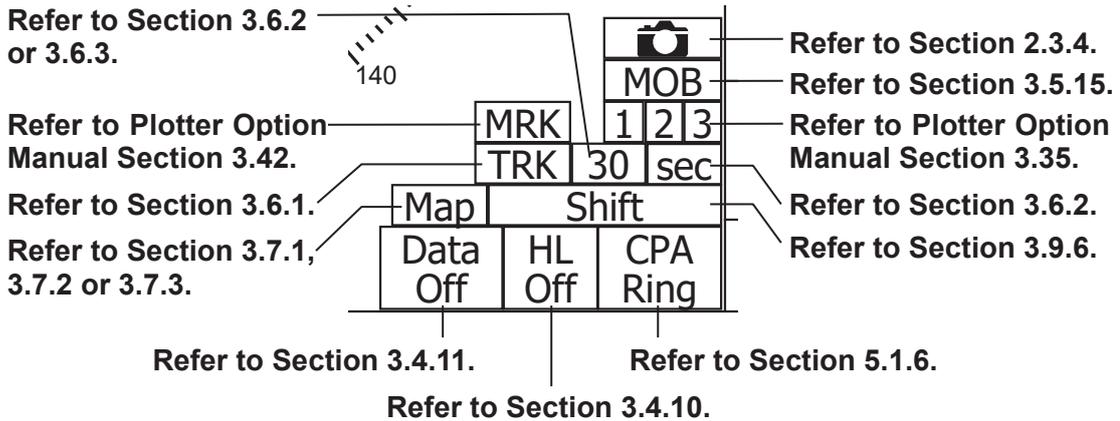
Area 2 (Bottom-left corner of the radar display)



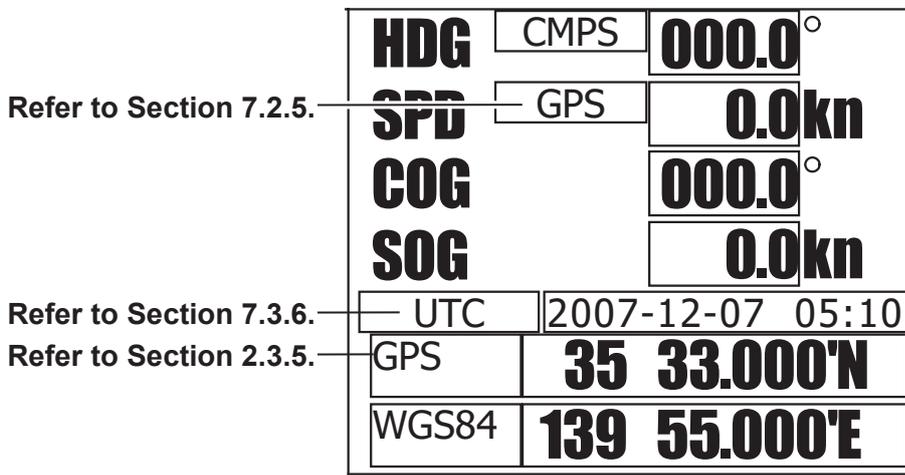
Area 3 (Top-right corner of the radar display)



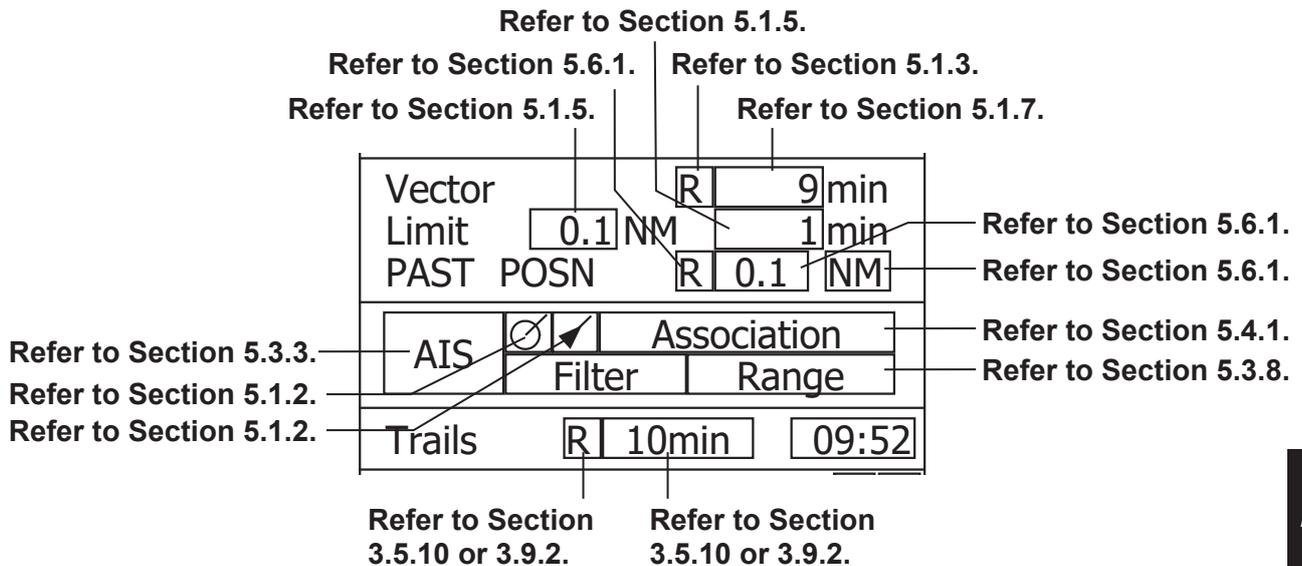
Area 4 (Bottom-right corner of the radar display)



Area 5 (Own ship's information)



Area 6 (Other ship's information)



Area 7 (Panel display)

AIS ID	<input type="text"/>	<input type="button" value="◀"/>	<input type="button" value="▼"/>	<input type="button" value="▲"/>	<input type="button" value="▶"/>
DEST	<input type="text"/>				
ETA	<input type="text"/>				
POSN	<input type="text"/>				
EPFS	<input type="text"/>				
RAIM	<input type="text"/>				
POSN Accuracy	<input type="text"/>				

AIS ID	<input type="text"/>	<input type="button" value="◀"/>	<input type="button" value="▼"/>	<input type="button" value="▲"/>	<input type="button" value="▶"/>
BRG	<input type="text"/>	°			
Range	<input type="text"/>	NM			
COG	<input type="text"/>	°			
SOG	<input type="text"/>	kn			
CPA	<input type="text"/>	NM			
TCPA	<input type="text"/>	min			
HDG	<input type="text"/>	°			
ROT	<input type="text"/>	°/min			

Refer to Section 5.3.6.

AIS ID	<input type="text"/>	<input type="button" value="◀"/>	<input type="button" value="▼"/>	<input type="button" value="▲"/>	<input type="button" value="▶"/>
Name	<input type="text"/>				
Call SIGN	<input type="text"/>				
MMSI	<input type="text"/>				
IMO Number	<input type="text"/>				
NAV Status	<input type="text"/>				

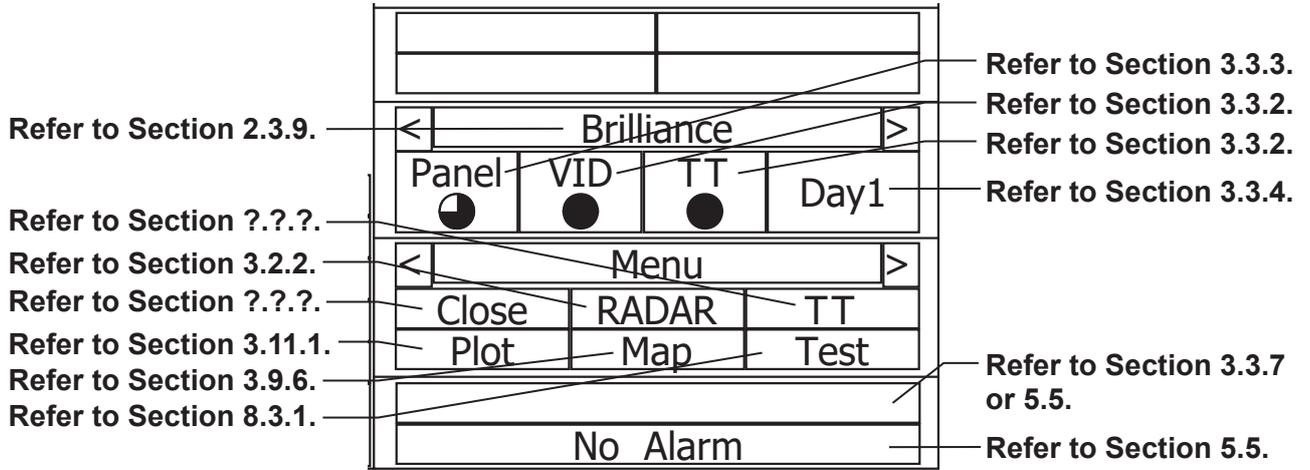
AIS ID	<input type="text"/>	<input type="button" value="◀"/>	<input type="button" value="▼"/>	<input type="button" value="▲"/>	<input type="button" value="▶"/>
AtoN Real/Virtual	<input type="text"/>				
AtoN Type	<input type="text"/>				

Refer to Section 5.2.3.

Area 7 (Panel display)

TT ID	<input type="text"/>	<input type="button" value="▼"/>	<input type="button" value="▲"/>
BRG	<input type="text"/>	<input type="text"/>	°
Range	<input type="text"/>	<input type="text"/>	NM
Course	<input type="text"/>	<input type="text"/>	°
Speed	<input type="text"/>	<input type="text"/>	kn
CPA	<input type="text"/>	<input type="text"/>	NM
TCPA	<input type="text"/>	<input type="text"/>	min
BCR	<input type="text"/>	<input type="text"/>	NM
BCT	<input type="text"/>	<input type="text"/>	min
BCR	<input type="text"/>	<input type="text"/>	NM
BCT	<input type="text"/>	<input type="text"/>	min

Area 8 (Operation/message)



EU Declaration Of Conformity

01) Apparatus Product/Model:

Product: Marine Radar.

Model: JMA-5200MK2 Series

(JMA-5204/5209/5212-4/5212-4HS/5212-6/5212-6HS/5222-7/5222-9)

02) Name & Address of the Manufacturer:

Japan Radio Co., Ltd.,

21-11, Mure 6-chome, Mitaka-shi, Tokyo 181-0002 Japan.

03) This declaration of conformity is issued under the sole responsibility of the manufacturer.

04) Object of the declaration – identification of apparatus allowing traceability:

- Marine Radar, Japan Radio Co., Ltd. manufactured model JMA-5204.
- Marine Radar, Japan Radio Co., Ltd. manufactured model JMA-5209.
- Marine Radar, Japan Radio Co., Ltd. manufactured model JMA-5212-4.
- Marine Radar, Japan Radio Co., Ltd. manufactured model JMA-5212-4HS.
- Marine Radar, Japan Radio Co., Ltd. manufactured model JMA-5212-6.
- Marine Radar, Japan Radio Co., Ltd. manufactured model JMA-5212-6HS.
- Marine Radar, Japan Radio Co., Ltd. manufactured model JMA-5222-7.
- Marine Radar, Japan Radio Co., Ltd. manufactured model JMA-5222-9.

05) The object of the declaration described above is in conformity with the relevant EU harmonization legislation:

Radio Equipment Directive (RED): 2014/53/EU.

06) References to the relevant harmonized standards used, including the date of the standard, or references to other technical specifications, including the date of the specification, in relation to which conformity is declared:

EN60945:2002 (Ed4) - General Requirements for Marine Equipment.

ETSI EN 302 248 (v2.1.1) – Navigation radar for use on non-SOLAS vessels.

IEC61162 series – as applicable.

07) Notified Body involved:

Not applicable.

08) Description of accessories and components, including software:

System Components

		JMA-5204	JMA-5209	JMA-5212-4	JMA-5212-4HS	JMA-5212-6	JMA-5212-6HS	JMA-5222-7	JMA-5222-9
Display Unit	NCD-4380 ^{note 1}	X	X	X	X	X	X	X	X
4kW Radome Scanner Unit	NKE-2043	X							
6kW Slot Antenna Scanner Unit	NKE-2063A		X						
10kW Slot Antenna Scanner Unit	NKE-2103-4			X					
10kW Slot Antenna Scanner Unit/ High speed craft	NKE-2103-4HS				X				
10kW Slot Antenna Scanner Unit	NKE-2103-6					X			
10kW Slot Antenna Scanner Unit/ High speed craft	NKE-2103-6HS						X		
25kW Slot Antenna Scanner Unit	NKE-2254-7							X	
25kW Slot Antenna Scanner Unit	NKE-2254-9								X

Software version:

Scanner Unit NKE-2043 V03.00

Scanner Unit NKE-2063A V03.00

Scanner Unit NKE-2103-4/4HS/6/6HS V01.00

Scanner Unit NKE-2254-7/9 V01.00

Radar Processor NDC-1460 V02.00 or V02.01

NOTES:

1 The NCD-4380 consists of the NWZ-164 15" LCD Display Unit, NDC-1460 Radar Processor Unit and NCE-7699A Operation Unit.

09) Additional Information:

Antenna length 2ft, Peak power 4kW(Magnetron) X-Band Scanner Unit: NKE-2043.

Antenna length 3.9ft, Peak power 6kW(Magnetron) X-Band Scanner Unit: NKE-2063A.

Antenna length 4ft, Peak power 10kW(Magnetron) X-Band Scanner Unit: NKE-2103-4.

Antenna length 4ft, Peak power 10kW(Magnetron) X-Band Scanner Unit: NKE-2103-4HS.

Antenna length 6ft, Peak power 10kW(Magnetron) X-Band Scanner Unit: NKE-2103-6.

Antenna length 6ft, Peak power 10kW(Magnetron) X-Band Scanner Unit: NKE-2103-6HS.

Antenna length 7ft, Peak power 25kW(Magnetron) X-Band Scanner Unit: NKE-2254-7.

Antenna length 9ft, Peak power 25kW(Magnetron) X-Band Scanner Unit: NKE-2254-9.

Signed for and on behalf of: Japan Radio Co., Ltd., Tokyo, Japan.**Place and date of issue:**

Nagano-shi, Nagano, Japan

Dated 27th June 2019

Navigation Group

Quality Assurance Department

Marine Systems

Name/function: Hiroshi Isohata / Manager**Signed:**


Marking with market circulation mark

We Japan Radio Co., Ltd. declare that the JRC Radar JMA-5200Mk2 corresponds with Technical regulations concerning the safety of sea transport facilities (approved by the Russian Federal Government in its Order No. 620 of August 12, 2010).

1. Products Classification (Annex 1 to Technical regulations concerning the safety of sea transport facilities)

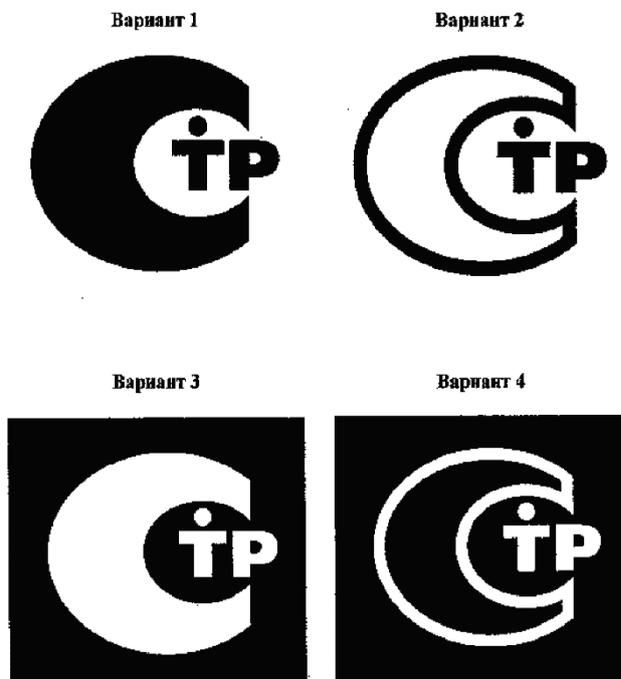
All Russian Products Classification Code	Designation of technical regulation item	Regulations of 1974* Convention, Resolutions and Circulars of International Maritime Organization which should be met by technical regulation items
648700	Automatic radar plotting equipment	Reg. V/18.1, V/19.2.3.2, V/19.2.7.1 and V/19.2.8.1, Resolution A 278 (VIII), Resolution A 477 (XII), Annex 4 to Resolution MSC.64 (67), Resolution A.823 (19), Resolution A.694 (17)

* International Convention for the Prevention of Pollution from Ships as Modified by the Protocol of 1978 1978 Relating Thereto (Convention, 1973);

2. Present procedures for products intended for operation in the territory of the Russian Federation for ships entitled to fly the flag of the Russian Federation:

2.1 Warning signs (Warning Labels) to be made in the Russian language.

2.2 The products labeled with a conformity mark, as prescribed by the Russian Federation laws concerning technical regulation (The Russian Federation Government Order "On Conformity Mark" No. 696 of 19 November 2003).



2.3 Disposal (utilization) of products should be made in conjunction with the ship on a single technology or separately in accordance with the Federal Law of the Russian Federation No.89 FZ "On Waste of Production and Consumption".



アスベストは使用していません
Not use the asbestos

For further information, contact:



Japan Radio Co., Ltd.

Since 1915

URL Head office : <http://www.jrc.co.jp/eng/>

Marine Service Department

1-7-32 Tatsumi, Koto-ku, Tokyo 135-0053, Japan

e-mail : tmsc@jrc.co.jp

One-call : +81-50-3786-9201

ISO 9001, ISO 14001 Certified