

JMA-5312-6/6HS
JMA-5322-7/9/6HS
JMA-5332-12

**MARINE RADAR
EQUIPMENT**

**INSTRUCTION
MANUAL**

◆◆◆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 as radio and radar devices. You do not face any danger during normal operation, but sufficient care is 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 one 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.

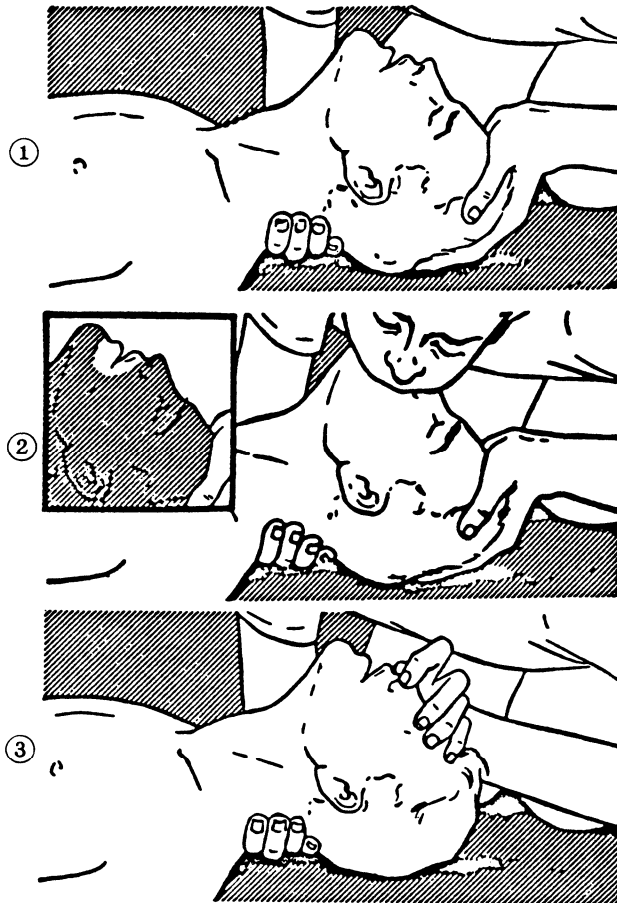
- (1) Do not touch the victim confusedly as a result of the accident, but the rescuer may also get an electric shock.
- (2) Turn off the power source calmly and move the victim away quietly from the electric line.
- (3) Call a physician or ambulance immediately or ask someone to call a doctor.
- (4) 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

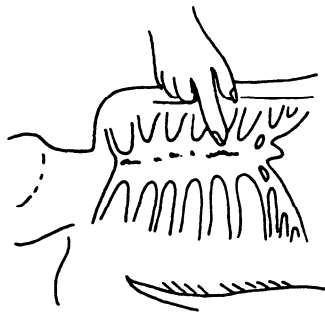
★When both pulse and breathing have stopped

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

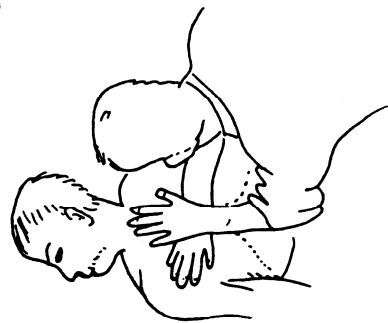
When no pulse has come not to be felt, his pupils are open and no heartbeat is heard, cardiac arrest is supposed to have occurred and artificial respiration must be performed.

- (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

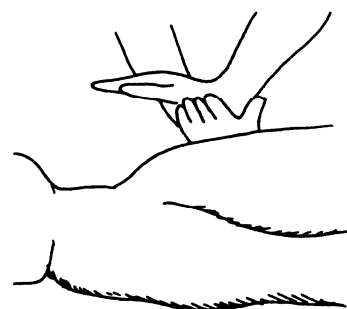


Fig. 2 Cardiac massage

PREFACE

Thank you very much for purchasing the JRC marine radar equipment, JMA-5300MK2 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



Electric Shock

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.



Disassembling Prohibited



Prohibited

The \odot mark represents prohibition.

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



Disconnect the power plug



Instruction

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 carry out internal inspection or repair work of the equipment by users.

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 scanner, make sure to turn its main power off.

Failure to comply may result in electrocution or injuries.



Make sure to turn off the scanner safety switch. Failure to comply may result in injuries caused by physical contact with the rotating scanner.



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 scanner 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.

To contact our sales department, branch offices, branch shops, and sales offices:

Please refer to the "Office List" at the end of the document.



Do not get close to the radiant section of the scanner. 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 scanner, make sure to turn the safety 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).

Radar Model	Scanner Unit	50W/m ²	10W/m ²	2.5W/m ²
JMA-5312-6/6HS	NKE-2103-6/6HS	n/a	26cm	123cm
JMA-5322-7/9/6HS	NKE-2254-7/9/6HS	5cm	81cm	162cm
JMA-5332-12	NKE-1130	11cm	76cm	181cm



Make sure to install the scanner 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 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.



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.



Normally, use the automatic tune mode. Use the manual tune mode only when best tuning is not possible in the automatic tune mode due to deterioration of magnetron.



If the gain is too high, unnecessary signals including receiver noise and false video increase resulting in reduction of visibility of targets. On the contrary, if the gain is too low, targets including ships and dangerous objects may not be clearly indicated.



When using the sea clutter suppression 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 sea clutter suppression function, make sure to choose the most appropriate image noise suppression level.



When using the rain / snow clutter suppression 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 rain / snow clutter suppression function, make sure to choose the most appropriate image noise suppression level.

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.



In setting an automatic acquisition zone, it is necessary to adjust the gain, sea clutter suppression and rain 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.



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 the operation test mode is used during navigation, pseudo targets appear on the radar display and they are confused with actual targets.

Do not use the mode during navigation.

Otherwise, an accident may result.



CAUTION



If a great value is set as a condition for deciding targets as identical, a tracking target near an AIS target is regarded as identical to the AIS target and it may not be displayed any more.

For example, when a pilot boat (which is a small target not being tracked) equipped with an AIS function approaches a cargo ship as a tracking target not equipped with an AIS function, the tracking target symbol of the cargo ship may not be displayed any more.



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.



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.



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

CAUTION



**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.**

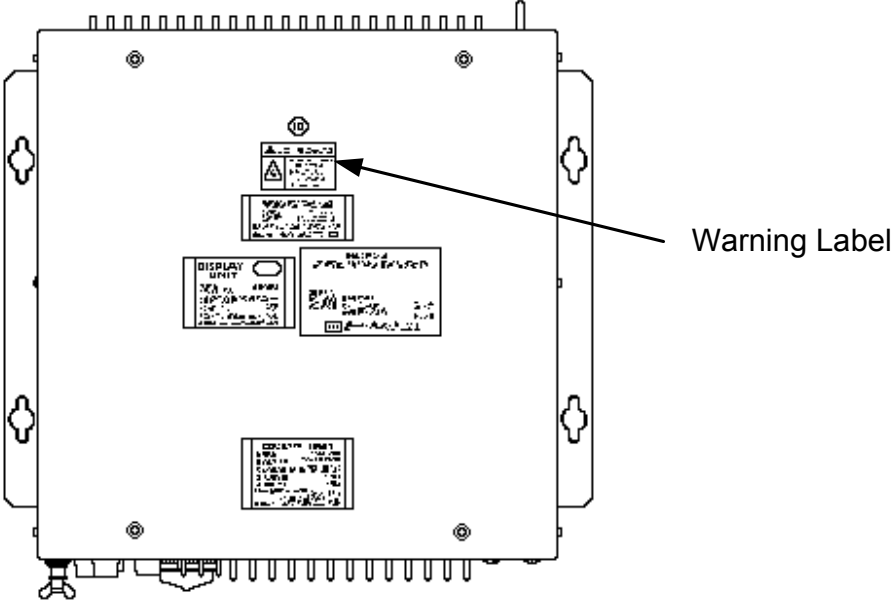


Make sure that two or more staff member work together when replacing the LCD. If only one person attempts to replace the LCD, he/she may drop it and become injured.

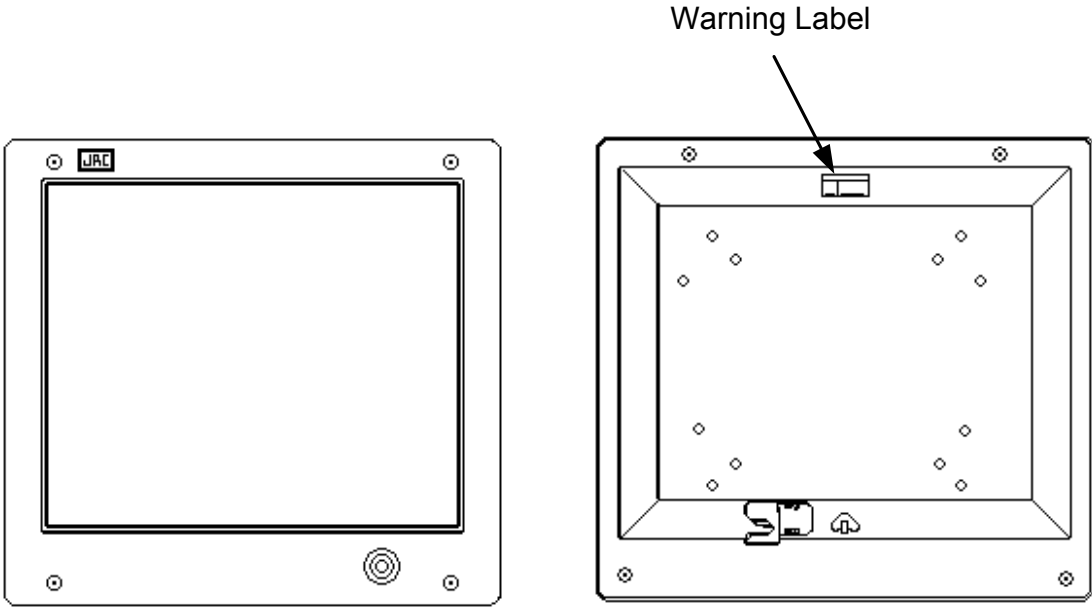


**Do not directly touch the inverter circuit of the LCD display with a bare hand since high voltage temporarily remains in the circuit even after the main power is shut off.
Failure to comply may result in electrocution.**

The Mounting Point of the Warning Label



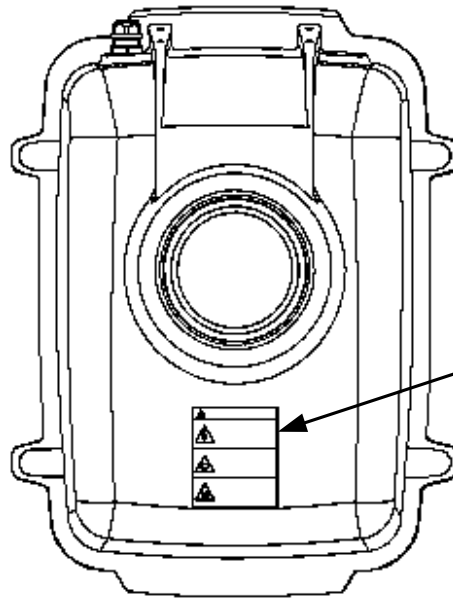
NDC-1417 Radar Process Unit



Front face

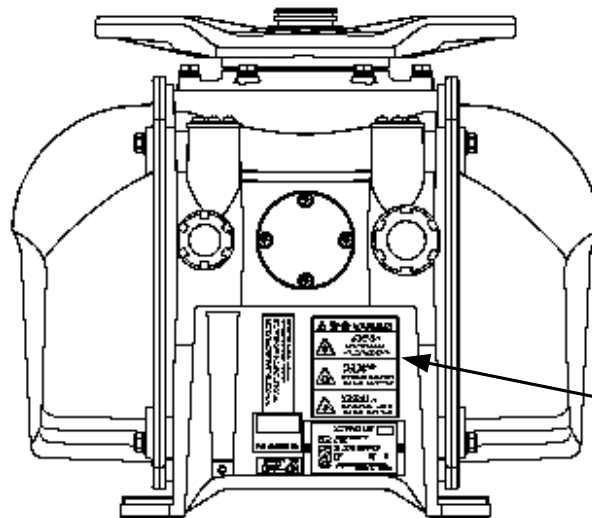
Back face

NWZ-173 LCD Monitor



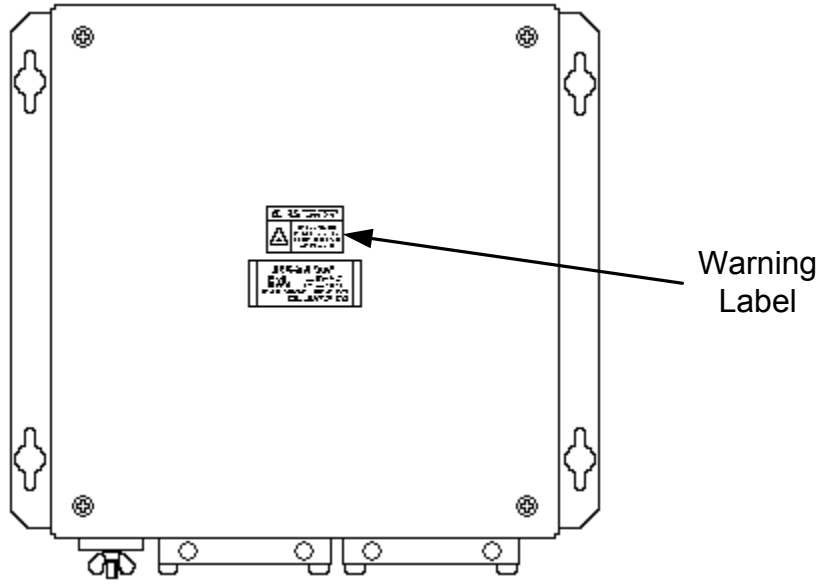
Warning Label

NKE-2103-6/6HS Scanner Unit
(JMA-5312-6/6HS)

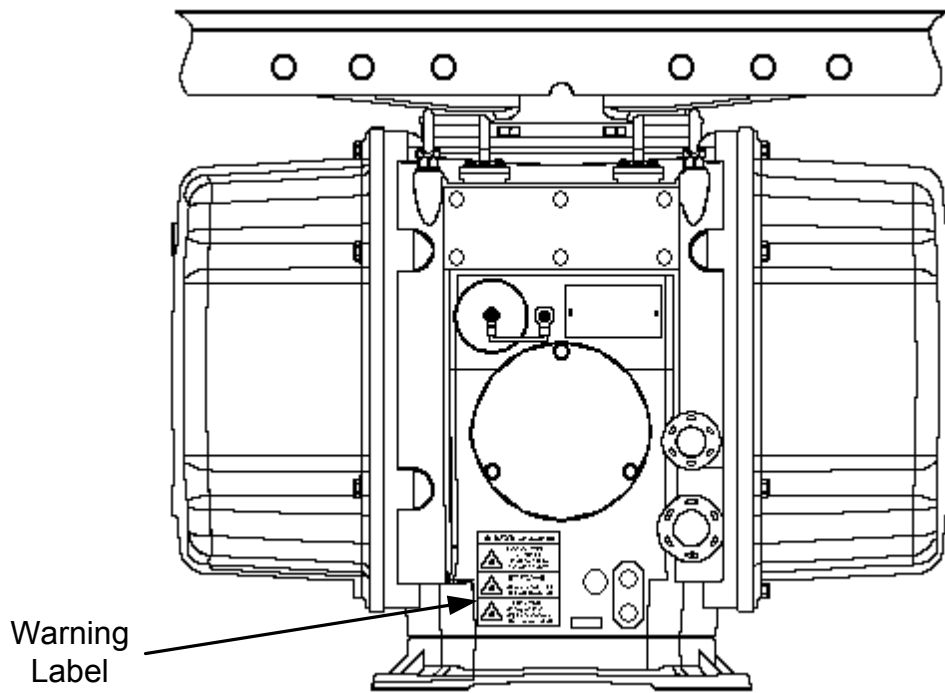


Warning Label

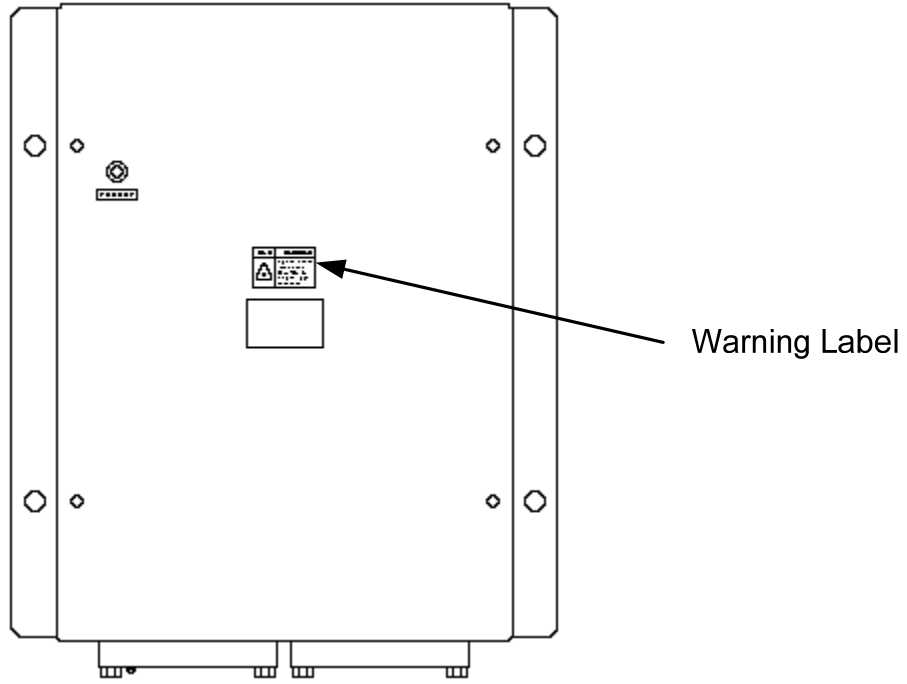
NKE-2254-7/9/6HS Scanner Unit
(JMA-5322-7/9/6HS)



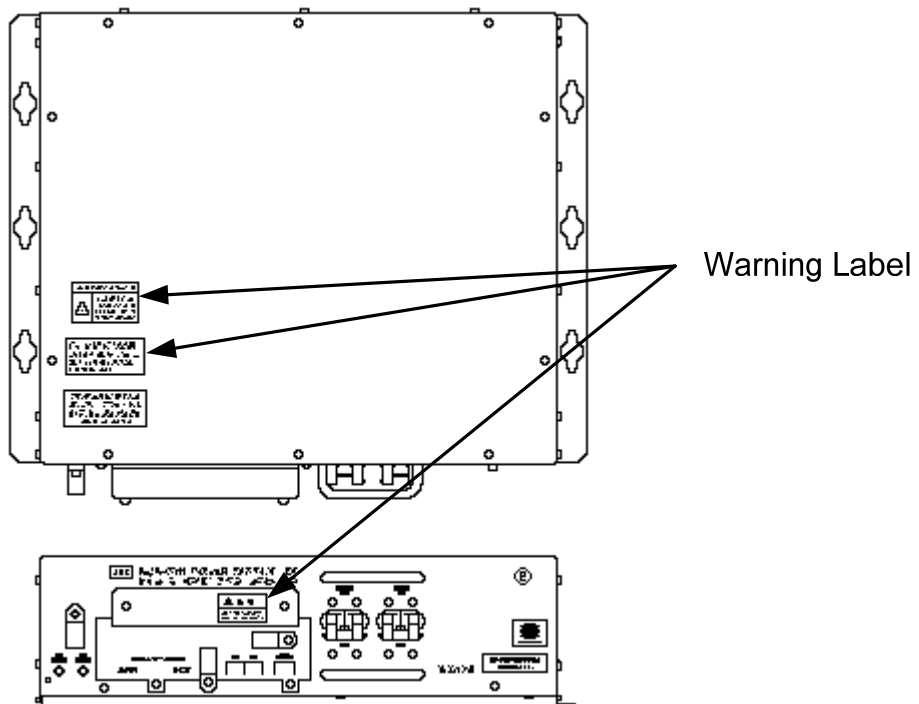
NQE-3151A Junction Box
(JMA-5332-12)



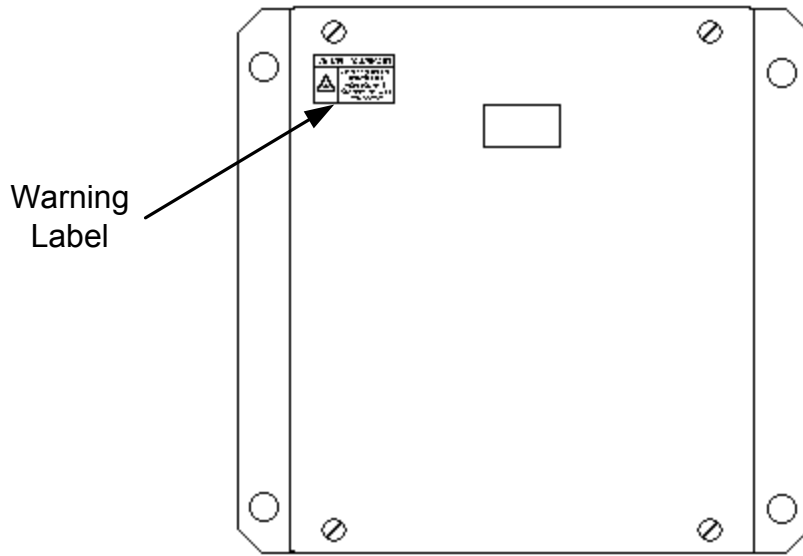
NKE-1130 Scanner Unit
(JMA-5332-12)



NQE-3141-4A/8A Interswitch Unit
(Option)



NBA-5111 Power Supply
(JMA-5312-6/6HS, JMA-5322-7/9/6HS : Option,
JMA-5332-12 : Standard)



NQE-3167 Power Control Unit
(Option)

EQUIPMENT APPEARANCE



Scanner Unit Type NKE-2103-6/6HS (6 feet) (JMA-5312-6/6HS)



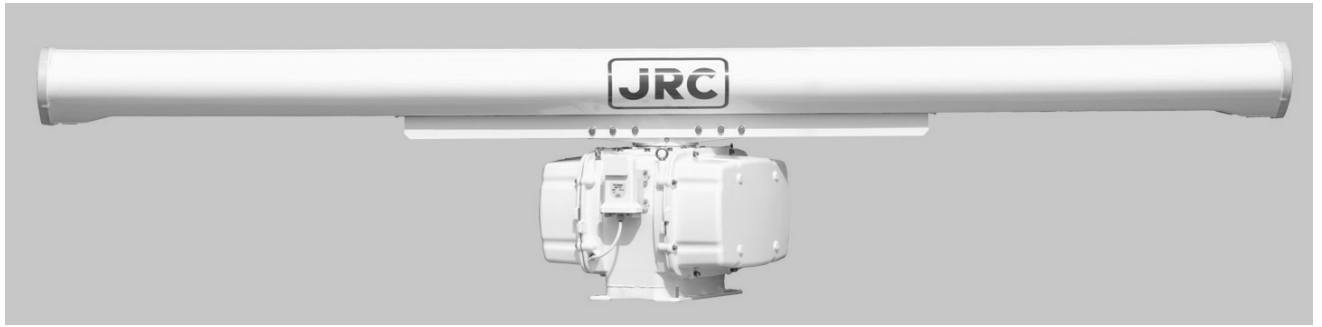
Scanner Unit Type NKE-2254-6HS (6 feet) (JMA-5322-6HS)



Scanner Unit Type NKE-2254-7 (7 feet) (JMA-5322-7)



Scanner Unit Type NKE-2254-9 (9 feet) (JMA-5322-9)



Scanner Unit Type NKE-1130 (12 feet) (JMA-5332-12)



NDC-1417 Radar Processor Unit (Desktop Type)



**NWZ-173 LCD Monitor Unit (Desktop Type)
NCE-5171 Operation Unit (Desktop Type)**

NCD-4530 Display Unit (Desktop Type)

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.
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

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 Tracks displayed by the radar echoes of targets in the form of an afterglow.

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.

CONTENTS

PREFACE.....	i
BEFORE OPERATION.....	ii
PRECAUTIONS	iii
THE MOUNTING POINT OF THE WARNING LABEL.....	x
EQUIPMENT APPEARANCE	xv
GLOSSARY.....	xvii

1. GENERAL AND EQUIPMENT COMPOSITION

1.1	FUNCTIONS	1-1
1.1.1	FUNCTION OF THIS SYSTEM.....	1-1
1.2	FEATURES	1-2
1.3	CONFIGURATION	1-4
1.4	OUTSIDE DRAWINGS.....	1-6
1.5	GENERAL SYSTEM DIAGRAMS	1-21

2. NAMES AND FUNCTIONS OF CONTROL PANEL KEYS AND FUNCTIONS OF SOFTWARE BUTTONS

2.1	NAMES OF DISPLAY.....	2-1
2.2	NAMES AND FUNCTIONS OF CONTROL PANEL KEYS	2-10
2.3	FUNCTIONS OF SOFTWARE BUTTONS.....	2-15

3. BASIC OPERATION

3.1	OPERATION FLOW	3-1
3.1.1	POWER ON AND START THE SYSTEM	3-2
3.1.2	OBSERVE AND ADJUST VIDEO	3-3
3.1.3	ACQUIRE AND MEASURE DATA	3-3
3.1.4	DISPLAY AND MEASURE WITH REFERENCE TO CCRP.....	3-3
3.1.5	END THE OPERATION AND STOP THE SYSTEM.....	3-4

3.2	OBSERVE AND ADJUST VIDEO	3-5
3.2.1	ADJUST MONITOR BRILLIANCE [BRILL]	3-5
3.2.2	CHANGE OBSERVATION RANGE [RANGE + / -]	3-5
3.2.3	TUNE.....	3-6
3.2.4	ADJUST GAIN [GAIN / PL]	3-7
3.2.5	SUPPRESS SEA CLUTTER [AUTO-SEA].....	3-8
3.2.6	SUPPRESS RAIN / SNOW CLUTTER [AUTO-RAIN]	3-10
3.2.7	RESET ALARM BUZZER [ALARM ACK]	3-11
3.3	OPERATION PROCEDURES	3-12
3.3.1	MOVE CROSS CURSOR MARK BY TRACKBALL	3-12
3.3.2	OPERATE SOFTWARE BUTTONS	3-13
3.3.3	BASIC MENU OPERATION	3-14
3.3.4	OPERATION ON NUMERIC VALUE, LATITUDE / LONGITUDE AND CHARACTER INPUT MENU	3-16
3.3.5	OVERVIEW OF MENU STRUCTURE	3-20
3.3.6	OPERATE MULTI-DIAL [MULTI].....	3-20
3.4	GENERAL RADAR OPERATION	3-22
3.4.1	INTERFERENCE REJECTION (IR)	3-22
3.4.2	SWITCH TRANSMITTER PULSE LENGTH [GAIN / PL]	3-23
3.4.3	TARGET ENHANCE (ENH).....	3-24
3.4.4	USE VIDEO PROCESSING (PROC).....	V25
3.4.5	SWITCH AZIMUTH DISPLAY MODE [AZI MODE].....	3-26
3.4.6	SWITCH TRUE / RELATIVE MOTION DISPLAY MODE [TM / RM]....	3-27
3.4.7	MOVE OWN SHIP'S DISPLAY POSITION [OFF CENT]	3-28
3.4.8	DISPLAY RADAR TRAILS [TRAILS].....	3-29
3.4.9	ERASE PART OF RADAR TRAILS (TRAILS ERASE)	3-31
3.4.10	OPERATE RADAR TRAILS FILE (FILE OPERATIONS)	3-32
3.4.11	ZOOM (X2)	3-34
3.4.12	HIDE / DISPLAY RANGE RINGS (RR / HL).....	3-34
3.4.13	HIDE GRAPHICS INFORMATION ON RADAR DISPLAY (DATA OFF)	3-35
3.4.14	SWITCH DAY / NIGHT MODE [DAY / NIGHT]	3-35
3.4.15	ADJUST OPERATION PANEL BRILLIANCE [PANEL]	3-35
3.4.16	SET TRUE BEARING (GYRO SETTING).....	3-36
3.4.17	SET OWN SHIP SPEED	3-36
3.4.18	MAGNET COMPASS CORRECTION (MAG COMPASS SETTING) ..	3-37
3.4.19	SET DRIFT CORRECTION (SET / DRIFT SETTING).....	3-38
3.4.20	GPS RECEIVER SETTING (GPS PROCESS SETTING)	3-39
3.4.21	DGPS RECEIVER SETTING (DGPS SETTING)	3-43

3.4.22	SBAS RECEIVER SETTING (SBAS SETTING)	3-44
3.4.23	DISPLAYING GPS RECEPTION STATUS (GPS STATUS).....	3-47
3.4.24	SET RADAR ALARM (RADAR ALARM)	3-48
3.5	USE OWN SHIP'S TRACK DATA.....	3-50
3.5.1	DISPLAY OWN SHIP'S TRACK (DISPLAY OWN TRACK).....	3-50
3.5.2	SAVE OWN SHIP'S TRACK DATA (OWN TRACK MEMORY)	3-51
3.5.3	CANCEL SAVING OF OWN SHIP'S TRACK DATA (OWN TRACK MEMORY).....	3-51
3.5.4	CLEAR OWN SHIP'S TRACK DATA (CLEAR OWN TRACK)	3-51
3.5.5	OPERATE OWN SHIP'S TRACK FILES (FILE OPERATIONS)	3-52
3.6	DISPLAY USER MAP	3-55
3.6.1	CREATE USER MAP (MARK / LINE).....	3-55
3.6.2	SET USER MAP DISPLAY (MARK DISPLAY SETTING).....	3-58
3.6.3	EDIT USER MAP (EDIT USER MAP).....	3-61
3.6.4	EDIT MARK / LINE LIST (MARK / LINE LIST)	3-67
3.6.5	CORRECT POSITION ON USER MAP (SHIFT USER MAP)	3-73
3.6.6	OPERATE USER MAP FILE (FILE OPERATIONS)	3-74
3.6.7	SET AND DISPLAY GEODETIC SYSTEM (GEODETIC)	3-78
3.7	USE ROUTE FUNCTION	3-79
3.7.1	DISPLAY DESTINATION MARK (NMEA WAYPOINT DISPLAY).....	3-79
3.7.2	RECEIVE ROUTE DATA SETTING (SELECT ROUTE)	3-80
3.8	APPLIED OPERATIONS.....	3-81
3.8.1	SET RADAR SIGNAL PROCESSING (PROCESS SETTING).....	3-81
3.8.2	SET RADAR TRAILS (RADAR TRAILS SETTING).....	3-83
3.8.3	SET SCANNER UNIT (TXRX SETTING).....	3-85
3.8.4	SET CURSOR (CURSOR SETTING).....	3-86
3.8.5	SET RADAR DISPLAY (DISPLAY SETTING)	3-87
3.8.6	ADJUST SOUND VOLUME (BUZZER VOLUME)	3-89
3.8.7	SET USER KEYS [USER KEY 1 / 2]	3-90
3.8.8	SET NAVIGATION DATA DISPLAY (MULTI WINDOW SETTING)	3-92
3.9	USE FUNCTION KEY [FUNC]	3-96
3.9.1	OPERATION PROCEDURES [FUNC].....	3-96
3.9.2	FUNCTION SETTING MENU ITEMS (USER FUNCTION SETTING).	3-97
3.9.3	OVERVIEW OF FUNCTION OPERATIONS (USER FUNCTION SETTING).....	3-98
3.9.4	OVERVIEW OF SAVED FUNCTION SETTING DATA.....	3-101
3.10	USE USER SETTING.....	3-102
3.10.1	SAVE OPERATING STATE (SAVE USER SETTING)	3-102
3.10.2	LOAD OPERATING STATE (LOAD USER SETTING).....	3-103
3.10.3	DELETE OPERATING STATE (DELETE USER SETTING).....	3-103

3.11	USING CARD	3-104
3.11.1	OPERATE FILE ON THE CARD (FILE MANAGER)	3-104
3.12	DISPLAY SIMPLE CHART	3-110
3.12.1	DISPLAY JRC COASTLINE ROM CARD [MAP]	3-110
3.12.2	DISPLAY ERC CARD [MAP].....	3-110
3.12.3	DISPLAY JRC CHART ON CF CARD (SEL JRC ROM CARD FILE)	3-111
3.12.4	FILL CHARTS (FILL LAND AREA)	3-112
3.12.5	SET JRC / ERC CHART DISPLAY (JRC / ERC SETTING)	3-113
3.12.6	DISPLAY C-MAP CARD [MAP].....	3-117
3.12.7	CORRECTING CHART POSITION (MAP DISPLAY SETTING)	3-120
3.12.8	CHART PLOTTING BEARING MODE (MAP DRAW AZI MODE)	3-122
3.13	CAPTURE SCREEN TO CARD	3-123
3.13.1	SAVE SCREEN TO CARD	3-123
3.13.2	AUTOMATICALLY SAVE SCREEN TO CARD.....	3-123
3.13.3	ERASING SAVE SCREEN DATA	3-124
3.13.4	SET SAVE ITEMS	3-125
3.13.5	SET FILE STYLE	3-125
3.13.6	OPEN THE CAPTURED SCREEN FILE	3-126
3.14	RECEIVE PORT SETTING.....	3-128
3.14.1	RECEIVE PORT SETTING (RX PORT).....	3-128

4. MEASUREMENT OF RANGE AND BEARING

4.1	USE OF NAVIGATION TOOLS.....	4-1
4.1.1	USING CURSOR (CURSOR)	4-2
4.1.2	USING RANGE RINGS [RR / HL]	4-2
4.1.3	USING ELECTRONIC BEARING LINE (EBL1/EBL2)	4-3
4.1.4	USING VARIABLE RANGE MARKER (VRM1 / VRM2)	4-6
4.1.5	USING PARALLEL INDEX LINES (PI MENU).....	4-7
4.1.6	OPERATING EBL MANEUVER FUNCTION (EBL MANEUVER SETTING)	4-12
4.1.7	USING MOB [MOB]	4-14
4.1.8	OPERATING EBL, VRM, AND PI WITH CURSOR.....	4-14
4.2	MEASUREMENT OF RANGE AND BEARING	4-17
4.2.1	MEASUREMENT WITH CURSOR POSITION (CURSOR).....	4-18
4.2.2	MEASUREMENT WITH ELECTRONIC BEARING LINE AND VARIABLE RANGE MARKER [EBL] [VRM].....	4-19
4.2.3	MEASUREMENT WITH TWO ARBITRARY POINTS.....	4-20

5. OPERATION OF TARGET TRACKING AND AIS

USAGE OF TARGET TRACKING FUNCTION	5-1
5.1 PREPARATION	5-2
5.1.1 COLLISION AVOIDANCE	5-3
5.1.2 DEFINITIONS OF SYMBOLS	5-6
5.1.3 RADAR DISPLAY	5-9
5.1.4 CURSOR MODES (CURSOR)	5-11
5.1.5 SETTING COLLISION DECISION CRITERIA	5-13
5.1.6 SETTING CPA RING	5-13
5.1.7 SETTING VECTORS (VECTOR TIME)	5-14
5.1.8 SETTING THE GPS ANTENNA LOCATION	5-15
5.2 TARGET TRACKING OPERATION	5-16
5.2.1 ACQUIRING TARGET [ACQ]	5-17
5.2.2 CANCELING UNWANTED TRACKED TARGETS [TGT CNCL]	5-20
5.2.3 TRACKED TARGET DATA DISPLAY [TGT DATA]	5-21
5.2.4 DISPLAYING TARGET ID NO. (TARGET NUMBER DISPLAY)	5-22
5.2.5 ADDING TRACKED TARGET ID NAME (NAME)	5-23
5.2.6 REFERENCE TARGET (REFERENCE)	5-24
5.2.7 OPERATION TEST (TT TEST MENU)	5-26
5.3 AIS OPERATION	5-31
5.3.1 RESTRICTIONS	5-31
5.3.2 SETTING AIS DISPLAY FUNCTION (AIS FUNCTION)	5-31
5.3.3 ACTIVATE AIS TARGETS (ACTIVATE AIS)	5-32
5.3.4 DEACTIVATE AIS TARGETS (DEACTIVATE AIS)	5-32
5.3.5 DISPLAYING AIS INFORMATION [TGT DATA]	5-33
5.3.6 DISPLAYING TARGET ID NO. (TARGET NUMBER DISPLAY)	5-37
5.3.7 SETTING AIS FILTER (AIS FILTER SETTING)	5-37
5.3.8 CONDITIONS FOR DECIDING AIS TARGET TO BE LOST	5-40
5.3.9 SETTING CONDITIONS FOR AIS ALARM (AIS ALARM SETTING)	5-41
5.4 DECISION OF TARGETS AS IDENTICAL (ASSOCIATION)	5-42
5.5 ALARM DISPLAY	5-44
5.6 TRACK FUNCTION	5-49
5.6.1 PAST POSITION (PAST POSN)	5-49
5.6.2 TARGET SHIP'S TRACKS (TARGET TRACK)	5-50
5.7 TRIAL MANEUVERING (TRIAL MANEUVER)	5-59
5.8 EPA OPERATION	5-63
5.8.1 DEFINITIONS OF SYMBOLS	5-64
5.8.2 PLOTTING TARGETS	5-65

5.8.3	MODIFYING PLOTTED TARGET DATA	5-65
5.8.4	CANCELING PLOTTED TARGET DATA	5-66
5.8.5	DISPLAYING NUMERIC DATA OF PLOTTED TARGETS	5-66

6. TRUE AND FALSE ECHOES ON DISPLAY

6.1	RADAR WAVE WITH THE HORIZON	6-1
6.2	STRENGTH OF REFLECTION FROM THE TARGET	6-3
6.3	SEA CLUTTER AND RAIN AND SNOW CLUTTER	6-5
6.4	FALSE ECHOES	6-9
6.5	DISPLAY OF RADAR TRANSPONDER (SART).....	6-12
6.6	DISPLAY OF AIS-SART	6-14

7. SETTINGS FOR SYSTEM OPERATION

7.1	SETTINGS AT INSTALLATION	7-1
7.1.1	HOW TO OPEN THE SERVICEMAN MENU	7-1
7.1.2	GYRO I/F SETTING	7-2
7.1.3	TUNING.....	7-4
7.1.4	BEARING ADJUSTMENT.....	7-6
7.1.5	RANGE ADJUSTMENT	7-6
7.1.6	NAVIGATOR SETTING (DEVICE).....	7-7
7.1.7	SETTING OF TRUE BEARING VALUE.....	7-7
7.1.8	ANTENNA HEIGHT SETTING (ANTENNA HEIGHT).....	7-8
7.1.9	SETTING OF CCRP/ANTENNA/GPS ANTENNA POSITION (CCRP SETTING)	7-9
7.2	SETTINGS	7-11
7.2.1	COMMUNICATION PORT SETTING (COM PORT SETTING).....	7-11
7.2.2	SECTOR BLANK SETTING (SECTOR BLANK).....	7-15
7.2.3	TNI BLANK SETTING (TNI BLANK).....	7-16
7.2.4	SETTING OF BEARING PULSES FROM ANTENNA (OUTPUT PULSE)	7-17
7.2.5	SLAVE MODE SETTING (MASTER/SLAVE)	7-18
7.2.6	LANGUAGE SETTING (LANGUAGE).....	7-19
7.2.7	DATE TIME SETTING	7-19
7.2.8	INPUT INSTALLATION INFORMATION	7-20
7.2.9	SETTING THE ALARM SYSTEM.....	7-21
7.2.10	NETWORK SETTING (NETWORK).....	7-23

7.2.11	TRANSMIT/RECEIVE DATA SETTING (LAN PORT SETTING)	7-26
7.3	ADJUSTMENT	7-30
7.3.1	NOISE LEVEL ADJUSTMENT (NOISE LEVEL)	7-30
7.3.2	ADJUSTMENT OF TARGET TRACKING FUNCTION (TT)	7-32
7.3.3	MAIN BANG SUPPRESSION ADJUSTMENT (MBS).....	7-35
7.3.4	ADJUSTMENT OF PERFORMANCE MONITOR (MON)	7-36
7.4	MAINTENANCE MENU	7-38
7.4.1	ANTENNA SAFETY SWITCH (SAFETY SWITCH)	7-38
7.4.2	INITIALIZATION OF MEMORY AREA (AREA INITIAL)	7-39
7.4.3	SAVE OF INTERNAL MEMORY DATA (CARD1/2).....	7-40
7.4.4	CLEAR AND SAVE/RESTORATION OF ANTENNA OPERATION TIME (TXRX TIME)	7-41
7.4.5	UPDATE OF CHARACTER STRING DATA (STRING DATA UPDATE).....	7-43

8. MAINTENANCE

8.1	ROUTINE MAINTENANCE	8-1
8.2	MAINTENANCE ON EACH UNIT.....	8-2
8.2.1	SCANNER UNIT NKE-2103 (JMA-5312-6/6HS), SCANNER UNIT NKE-2254 (JMA-5322-7/9/6HS), SCANNER UNIT NKE-1130 (JMA-5332-12).....	8-2
8.2.2	DISPLAY UNIT NCD-4530	8-5
8.3	PERFORMANCE CHECK.....	8-6
8.3.1	CHECK PERFORMANCE ON TEST MENU	8-7
8.4	REPLACEMENT OF MAJOR PARTS	8-12
8.4.1	PARTS REQUIRED FOR PERIODIC REPLACEMENT	8-13
8.4.2	REPLACEMENT OF MAGNETRON	8-14
8.4.3	REPLACEMENT OF MOTOR	8-21
8.4.4	REPLACEMENT OF LCD MONITOR	8-27
8.4.5	REPLACEMENT OF BACKUP BATTERY	8-28

9. TROUBLESHOOTING AND AFTER-SALES SERVICE

9.1	FAULT FINDING	9-1
9.1.1	LIST OF ALARMS AND OTHER INDICATIONS	9-1
9.1.2	OPERATION CHECKING	9-6
9.1.3	FUSE CHECKING.....	9-6
9.2	TROUBLE SHOOTING	9-7

9.3	AFTER-SALES SERVICE	9-12
9.3.1	KEEPING PERIOD OF MAINTENANCE PARTS	9-12
9.3.2	WHEN YOU REQUEST FOR REPAIR	9-12
9.3.3	RECOMMENDED MAINTENANCE	9-12

10. DISPOSAL

10.1	DISPOSAL OF THE UNIT	10-1
10.2	DISPOSAL OF USED BATTERIES	10-1
10.3	DISPOSAL OF USED MAGNETRON.....	10-2
10.4	ABOUT THE CHINA ROHS.....	10-2

11. SPECIFICATIONS

11.1	JMA-5312-6/6HS TYPE RADAR.....	11-1
11.2	JMA-5322-7/9/6HS TYPE RADAR.....	11-2
11.3	JMA-5332-12 TYPE RADAR.....	11-3
11.4	SCANNER UNIT NKE-2103-6 (JMA-5312-6).....	11-4
11.5	SCANNER UNIT NKE-2254-7/9 (JMA-5322-7/9).....	11-5
11.6	SCANNER UNIT NKE-1130 (JMA-5332-12)	11-7
11.7	SCANNER UNIT NKE-2103-6HS (JMA-5312-6HS).....	11-8
11.8	SCANNER UNIT NKE-2254-6HS (JMA-5322-6HS).....	11-9
11.9	DISPLAY UNIT NCD-4530	11-10
11.10	PROCESSOR UNIT NDC-1417.....	11-11
11.11	TARGET TRACKING FUNCTION (NCA-877WA/877A) (OPTION).....	11-13
11.12	AIS PROCESS UNIT NQA-2103 (OPTION)	11-14
11.13	PLOTTER.....	11-15
11.14	OPERATION UNIT NCE-5171	11-16
11.15	PERFORMANCE MONITOR NJU-84 (JMA-5332-12).....	11-17
11.16	PERFORMANCE MONITOR NJU-85 (JMA-5312-6/6HS, JMA-5322-7/9/6HS) (OPTION)	11-17
11.17	AVAILABLE INPUT SIGNAL.....	11-18
11.18	AVAILABLE OUTPUT SIGNAL.....	11-19
11.19	STANDARD CONFIGURATION.....	11-19
11.20	EQUIPMENT DISTANCE BETWEEN OTHER INSTRUMENTS.....	11-20
11.21	OTHERS (OPTION).....	11-20

APPENDIX

INTERSWITCH (OPTION) NQE-3141 INSTRUCTION MANUAL HOW TO INSERT AND REMOVE A CARD

FIG.1 BLOCK DIAGRAM OF JMA-5312-6/6HS, JMA-5322-7/9/6HS RADAR

FIG.2 BLOCK DIAGRAM OF JMA-5332-12 RADAR

FIG.3 TERMINAL BOARD CONNECTION DIAGRAM OF JMA-5312-6/6HS
RADAR

FIG.4 TERMINAL BOARD CONNECTION DIAGRAM OF JMA-5322-7/9/6HS
RADAR

FIG.5 TERMINAL BOARD CONNECTION DIAGRAM OF JMA5332-12 RADAR

FIG.6 TERMINAL BOARD CONNECTION DIAGRAM OF RADAR AND
INTERSWITCH UNIT (OPTION)

FIG.7 POWER SYSTEM DIAGRAM OF JMA-5312-6/6HS, JMA-5322-7/9/6HS
RADAR

FIG.8 POWER SYSTEM DIAGRAM OF JMA-5332-12 RADAR

FIG.9 INTERCONNECTION DIAGRAM OF NCD-1417 RADAR PROCESS
UNIT

FIG.10 INTERCONNECTION DIAGRAM OF NQA-2123 INTERFACE UNIT

FIG.11 INTERCONNECTION DIAGRAM OF NCE-5171 OPERATION UNIT

FIG.12 INTERNAL CONNECTION DIAGRAM OF NWZ-173 LCD MONITOR

FIG.13 INTERCONNECTION DIAGRAM OF NQE-3151A JUNCTION BOX
(JMA-5332-12)

FIG.14 INTERCONNECTION DIAGRAM OF NKE-2103 SCANNER UNIT
(JMA-5312-6/6HS)

FIG.15 INTERCONNECTION DIAGRAM OF NKE-2254 SCANNER UNIT
(JMA-5322-7/9/6HS)

FIG.16 INTERCONNECTION DIAGRAM OF NKE-1130 SCANNER UNIT
(100/110/115V) (JMA-5332-12)

FIG.17 INTERCONNECTION DIAGRAM OF NKE-1130 SCANNER UNIT
(220/230/240V) (JMA-5332-12)

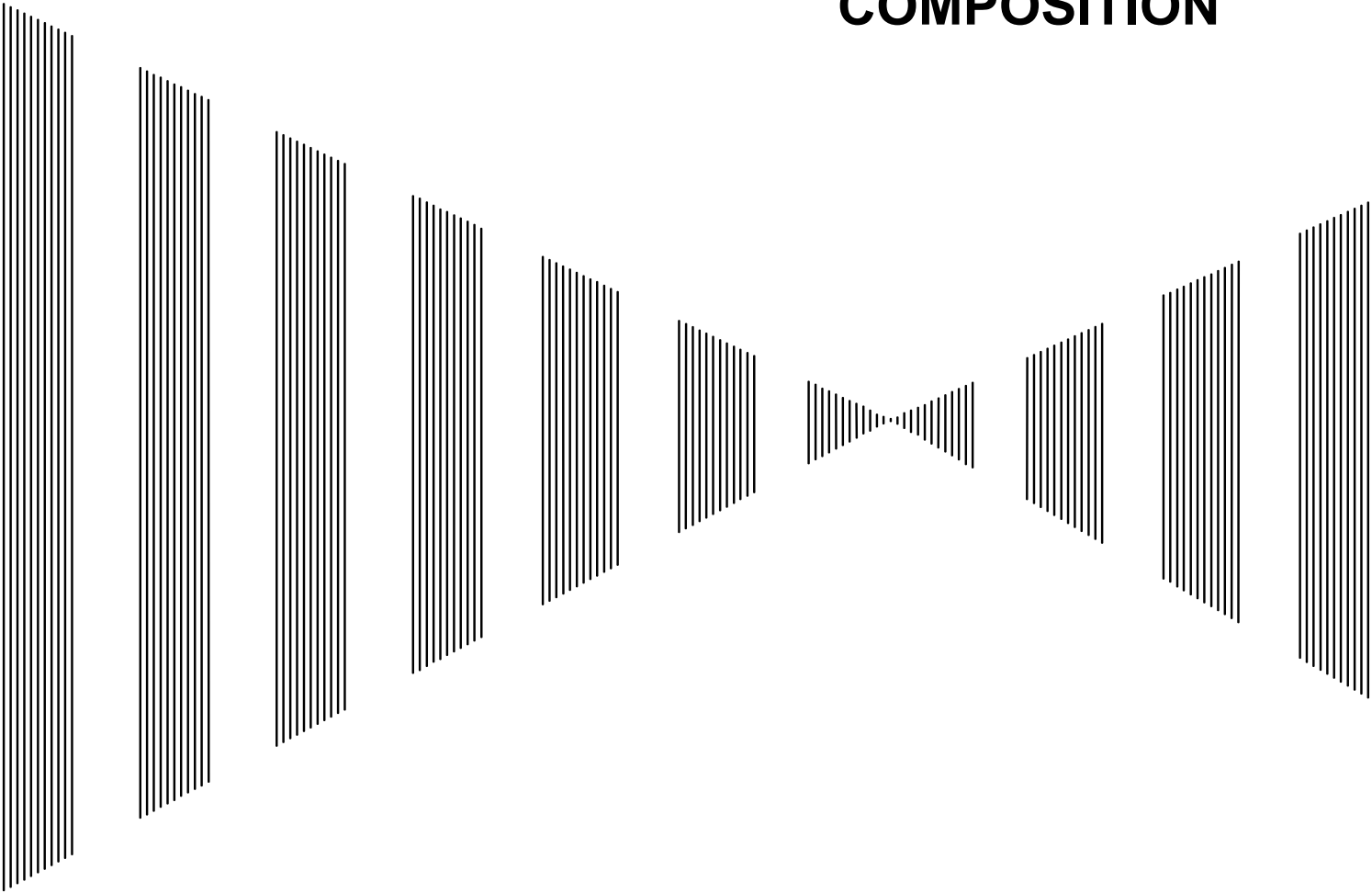
FIG.18 INTERCONNECTION DIAGRAM OF NQE-3141 INTERSWITCH UNIT
(OPTION)

FIG.19 OVER VIEW OF RADAR MENU

EU DECLARATION OF CONFORMITY

1	GENERAL AND EQUIPMENT COMPOSITION	1
2	NAME AND FUNCTION OF CONTROL PANEL KEYS AND FUNCTION OF SOFTWARE BUTTONS	2
3	BASIC OPERATION	3
4	MEASUREMENT OF RANGE AND BEARING	4
5	OPERATION OF ARPA AND AIS	5
6	TRUE AND FALSE ECHOES ON DISPLAY	6
7	MAINTENANCE	7
8	COUNTERMEASURES FOR TROUBLE AND ADJUSTMENT	8
9	AFTER-SALES SERVICE	9
10	DISPOSAL	10
11	SPECIFICATION	11
APPENDIX		APPENDIX

SECTION 1 GENERAL AND EQUIPMENT COMPOSITION



- 1.1 FUNCTIONS1-1
- 1.2 FEATURES1-2
- 1.3 CONFIGURATION1-4
- 1.4 OUTSIDE DRAWINGS1-6
- 1.5 GENERAL SYSTEM DIAGRAMS1-21

1.1 FUNCTIONS

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

1.1.1 Function of This System

The JMA-5300MK2 series is a color radar system designed to comply with the international standards of the IMO.

The main functions include:

- gain adjustment
- sea clutter and rain / snow clutter suppression
- interference rejection
- bearing and range measurement using a cursor, fixed/variable range markers, and electronic bearing line
- own track display
- colored own track display (7 colors) (option)
- NAV line and marker displays
- TM (True Motion) presentation
- self-diagnostic facilities
- radar performance monitoring (Performance Monitor, option)
- Target Tracking (TT) functions (manual / automatic target acquisition and automatic tracking, vector and track displays and alarm displays) (option)
- simple plotter functions:
 - marker and line display (up to 2000 items.)
 - marker and line display (up to 20000 items.)(option)
 - waypoint / route setting (option)
- 8-unit switchover (Inter switch) function (option)

Note: Performance monitor, ARPA/ATA Process Unit, AIS Process Unit and GYRO Interface Unit must be fitted on ships compliant to IMO.

1.2 FEATURES

1

Realization of Large, Easy-to-see Screen with High Resolution

The 19-inch color LCD with high resolution of 1280 × 1024 pixels can display radar images of 250 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 Target Tracking (TT) Functions (Option)

The 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 100 targets for High performance edition, 30 targets for Normal edition.
- Hazardous conditions are represented by shapes and colors of symbols as well as sounds.
- Trial maneuvering functions provided. (High performance edition)
- 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 7 different colors.

Note: ARPA/ATA Process Unit must be fitted on ships compliant to IMO.

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 / target 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.

Creation / display of marks and lines (up to 2000 items).

Use of the optional plotter function enables the own track display distinguished by using 7 different colors, creation of marks and lines (up to 20000 items) and the settings of waypoints / courses.

Easy Operation with GUI

All the radar functions can be easily controlled by simply using the trackball and 2 switches to operate the buttons shown on the radar display.

Improved Day / Night Mode

Five types of background colors are available in Day / Dusk / Night mode.

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.

Note: Performance monitor must be fitted on ships compliant to IMO.

Easy Interswitch Operation (Option)

If an interswitch unit (option) is connected, up to four JMA-5300MK2 radars can be switched over by performing simple operation.

* An interswitch (NQE-3141) is needed separately.

Various Functions

- RADAR Trails
- TM (True Motion) display
- Head-up / North-up / Course-up display
- Own ship's track display
- Automatic Acquisition / Activation function

1.3 CONFIGURATION

Specified of scanner, and categories of ship/craft for SOLAS V

Radar Model	Antenna Type	Transmitted Output Power	Band	Rate of Rotation	Category
JMA-5312-6	6 ft slot antenna	10 kW	X	27 rpm	CAT 2
JMA-5312-6HS	6 ft slot antenna	10 kW	X	48 rpm	CAT 2H
JMA-5322-7	7 ft slot antenna	25 kW	X	24 rpm	CAT 2
JMA-5322-9	9 ft slot antenna	25 kW	X	24 rpm	CAT 2
JMA-5322-6HS	6 ft slot antenna	25 kW	X	48 rpm	CAT 2H
JMA-5332-12	12 ft slot antenna	30 kW	S	24 rpm	CAT 2

*The class of emission: P0N (All scanner types)

Radar Configuration and Ship's Mains

Radar Model	Scanner Unit	Performance Monitor (option)	Display Unit	Ship's Mains
JMA-5312-6	NKE-2103-6	NJU-85	NCD-4530	DC24 V
JMA-5312-6HS	NKE-2103-6HS	NJU-85	NCD-4530	DC24 V
JMA-5322-7	NKE-2254-7	NJU-85	NCD-4530	DC24 V
JMA-5322-9	NKE-2254-9	NJU-85	NCD-4530	DC24 V
JMA-5322-6HS	NKE-2254-6HS	NJU-85	NCD-4530	DC24 V
JMA-5332-12	NKE-1130	NJU-84	NCD-4530	DC24 V (supplied from NBA-5111)
			*NQE-3151A	AC100-115 V, 50/60 Hz, 1 ϕ
				AC220-240 V, 50/60 Hz, 1 ϕ

* The NQE-3151A included in JMA-5332-12 is a connection unit to supply AC power for the motor to the scanner unit.

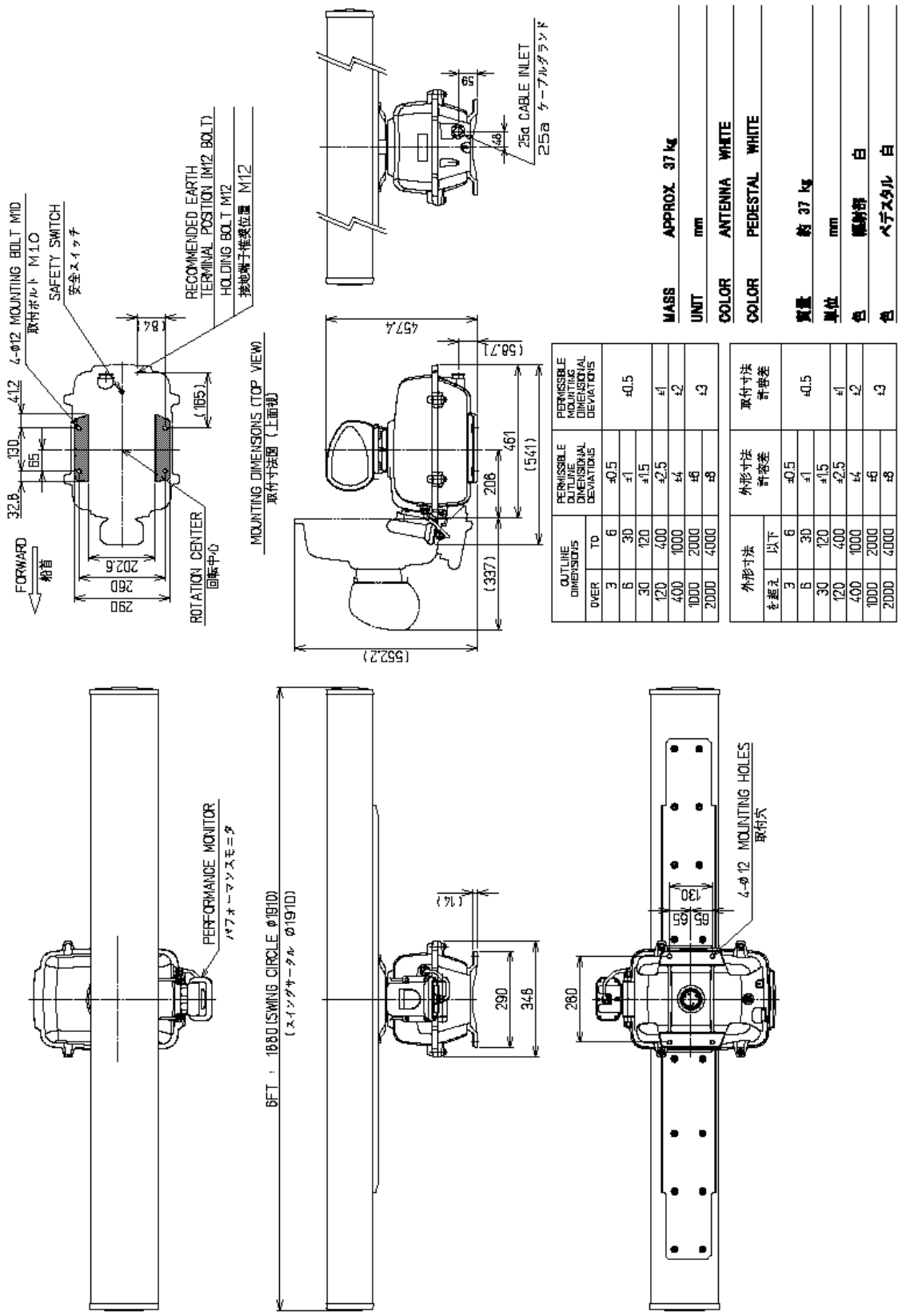
Notes:

1. The JMA-5332-12 needs AC power for the radar process unit (rectifier unit NBA-5111), and motor to drive the scanner unit.
2. The drive motor for the scanner unit is available in AC100-115 V or AC220-240 V type for JMA-5332-12. Please specify the motor type when ordering.
3. An optional POWER SUPPLY NBA-5111 is necessary for using Ship's Mains AC100-120/220-240 V, 50/60 Hz, 1 ϕ .
4. When using the ship's mains of AC440V as the radar power source, a step-down transformer shall be used.
5. The scanner unit except NKE-2103 series can be equipped with a deicing heater as an option, and '-D' shall be suffixed to the type name. (e.g. NKE-1130-D, NKE-2254-6D).

-
6. The DISPLAY UNIT NCD-4530 has a separate structure consisting of the following:
- | | |
|--------------|---------|
| LCD MONITOR | NWZ-173 |
| CONTROL UNIT | NCM-853 |
- The control unit NCM-853 is consisting of the following
- | | |
|--------------------|----------|
| RADAR PROCESS UNIT | NDC-1417 |
| OPERATION UNIT | NCE-5171 |
7. The ship with radar of IMO conformity must mount a Performance Monitor.

1.4 OUTSIDE DRAWINGS

- Fig. 1.1 Outside Drawing of NKE-2103-6 / 6HS SCANNER UNIT (JMA-5312-6/6HS)
- Fig. 1.2 Outside Drawing of NKE-2254-7 SCANNER UNIT (JMA-5322-7)
- Fig. 1.3 Outside Drawing of NKE-2254-9 SCANNER UNIT (JMA-5322-9)
- Fig. 1.4 Outside Drawing of NKE-2254-6HS SCANNER UNIT (JMA-5322-6HS)
- Fig. 1.5 Outside Drawing of NKE-1130 SCANNER UNIT (JMA-5332-12)
- Fig. 1.6 Outside Drawing of NWZ-173 LCD MONITOR
- Fig. 1.7 Outside Drawing of NWZ-173 LCD MONITOR with MPBC42446 Stand (Option)
- Fig. 1.8 Outside Drawing of NDC-1417 RADAR PROCESS UNIT
- Fig. 1.9 Outside Drawing of NCE-5171 OPERATION UNIT
- Fig. 1.10 Outside Drawing of NQE-3151A JUNCTION BOX (JMA-5332-12)
- Fig. 1.11 Outside Drawing of NQE-3141-4A INTERSWITCH UNIT (Option)
- Fig. 1.12 Outside Drawing of NQE-3141-8A INTERSWITCH UNIT (Option)
- Fig. 1.13 Outside Drawing of NBA-5111 RECTIFIER UNIT
(JMA-5312-6/6HS, JMA-5322-7/9/6HS : Option, JMA-5332-12 : Standard)
- Fig. 1.14 Outside Drawing of NQE-3167 POWER CONTROL UNIT (Option)



SCANNER UNIT OUTLINE DRAWING

NKE-2103-6/NKE-2103-6HS

SCHKE5303-3

Fig. 1.1 Outside Drawing of NKE-2103-6 / 6HS SCANNER UNIT (JMA-5312-6/6HS)

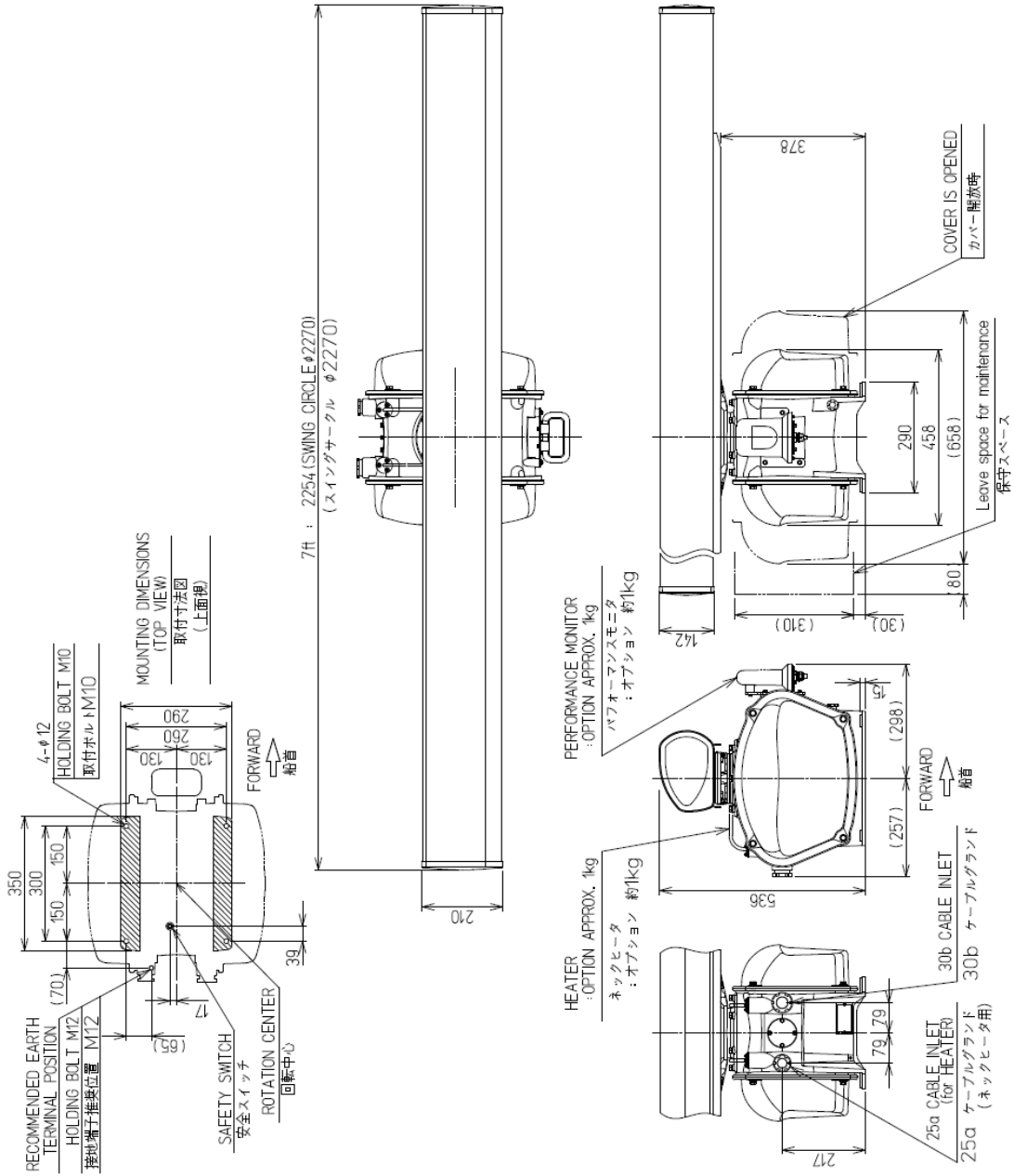


Fig. 1.2 Outside Drawing of NKE-2254-7 SCANNER UNIT (JMA-5322-7)

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

外形寸法を超過	外形寸法		取付寸法許容差
	以下		
3	6		±0.5
6	30		±1
30	120		±1.5
120	400		±2.5
400	1000		±4
1000	2000		±6
2000	4000		±8

MASS	APPROX. 58 kg (WITHOUT OPTION)
UNIT	mm
COLOR	ANTENNA WHITE
COLOR	PEDESTAL WHITE
質量	約 58 kg
単位	mm
色	輻射部 白
色	ベースタル 白

SCANNER UNIT OUTLINE DRAWING

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

SONKE5301-4-0

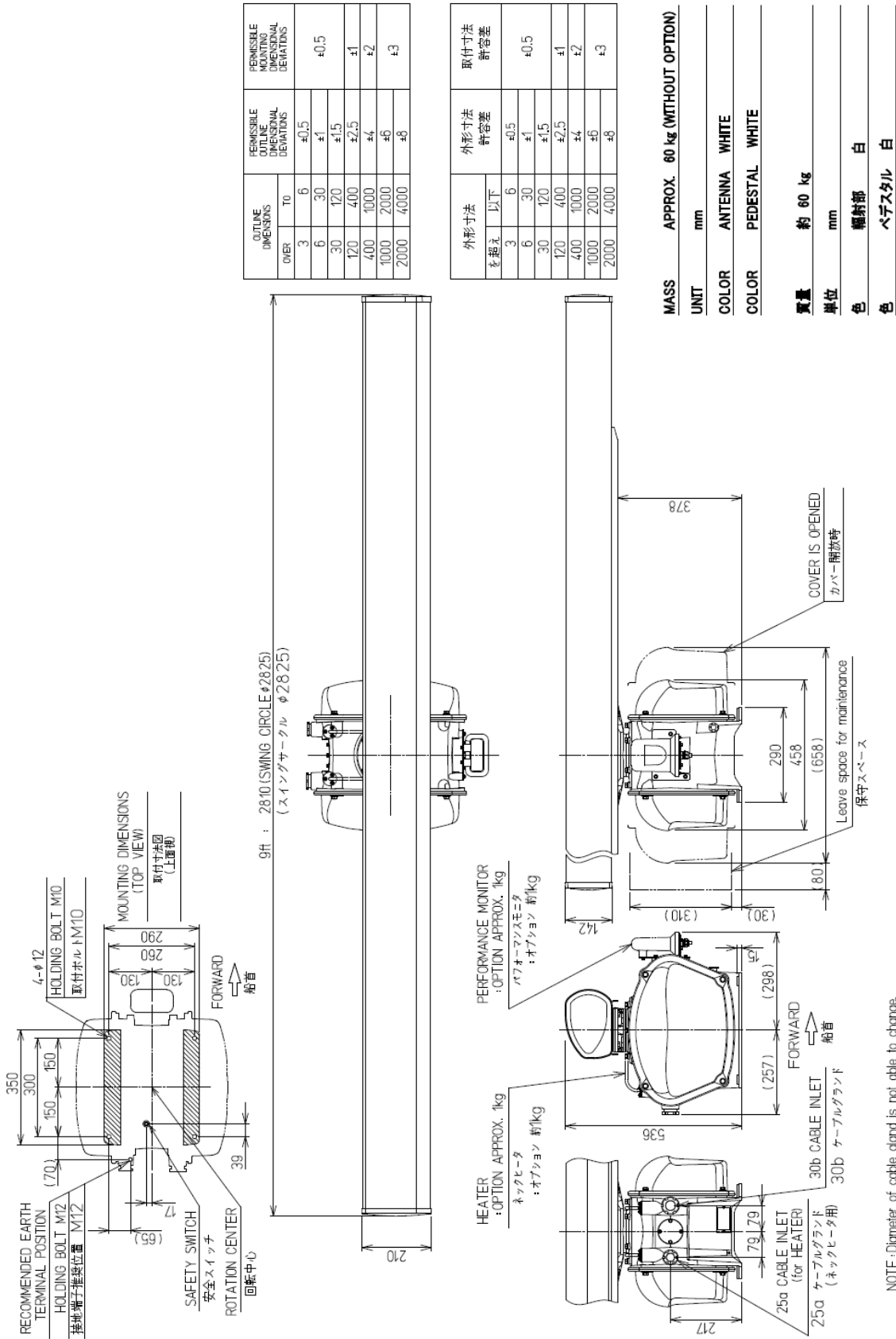
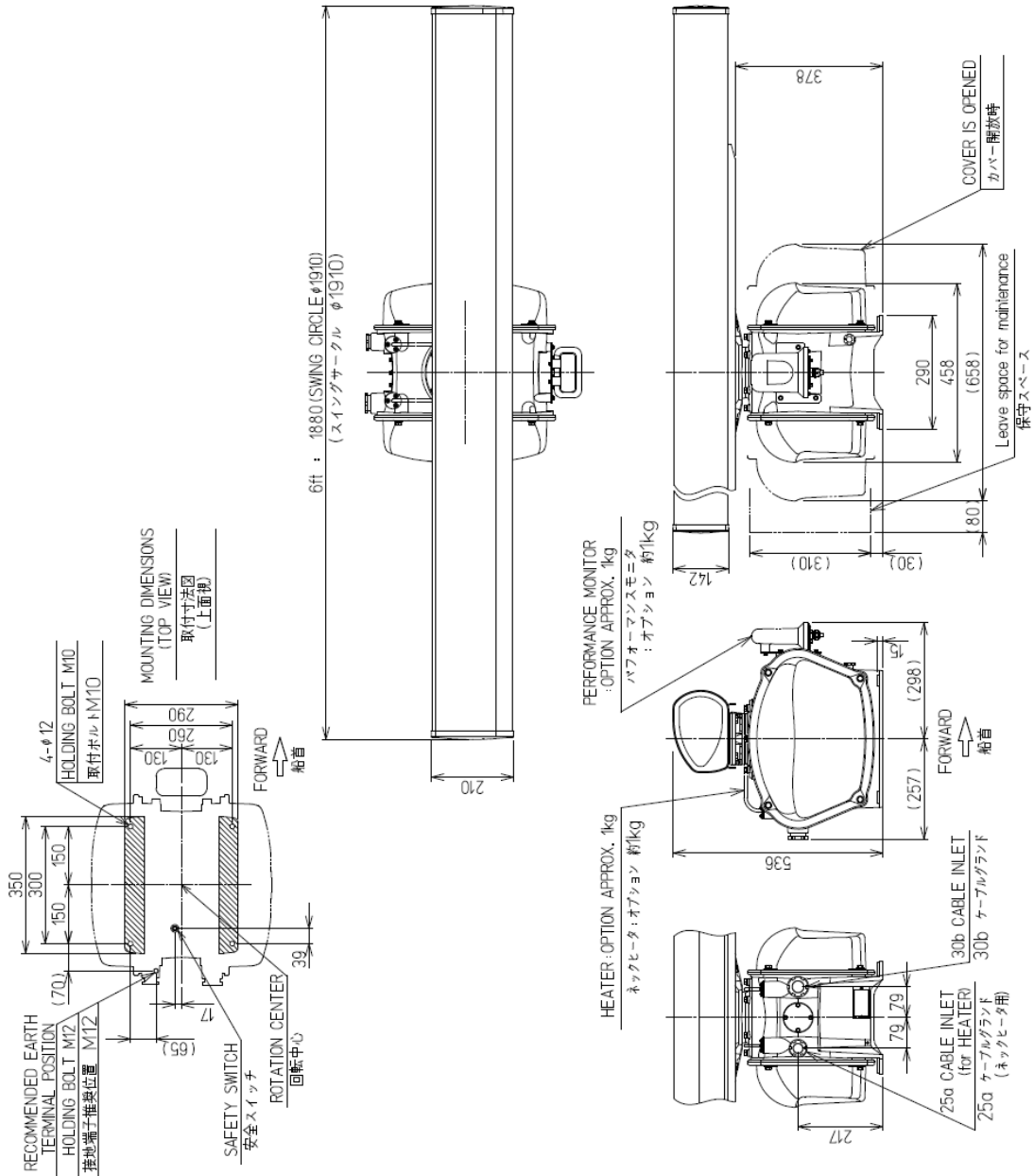


Fig. 1.3 Outside Drawing of NKE-2254-9 SCANNER UNIT (JMA-5322-9)

SCANNER UNIT OUTLINE DRAWING

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

SCNKE5307-4-0



OVER	OUTLINE DIMENSIONS		PERMISSIBLE MOUNTING DIMENSIONAL DEVIATIONS
	3	To	
6	6	±0.5	±0.5
30	30	±1	
120	120	±1.5	±1
400	400	±2.5	
1000	1000	±4	±2
2000	2000	±6	
4000	4000	±8	±3

外形寸法を超過	外形寸法		取付寸法許容差
	以下	許容差	
3	6	±0.5	±0.5
6	30	±1	
30	120	±1.5	±1
120	400	±2.5	
400	1000	±4	±2
1000	2000	±6	
2000	4000	±8	±3

MASS	APPROX. 55 kg (WITHOUT OPTION)
UNIT	mm
COLOR	ANTENNA WHITE
COLOR	PEDESTAL WHITE
質量	約 55 kg
単位	mm
色	輻射部 白
色	ベースタリ 白

SCANNER UNIT OUTLINE DRAWING

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。

SONKE5302-4-0

Fig. 1.4 Outside Drawing of NKE-2254-6HS SCANNER UNIT (JMA-5322-6HS)

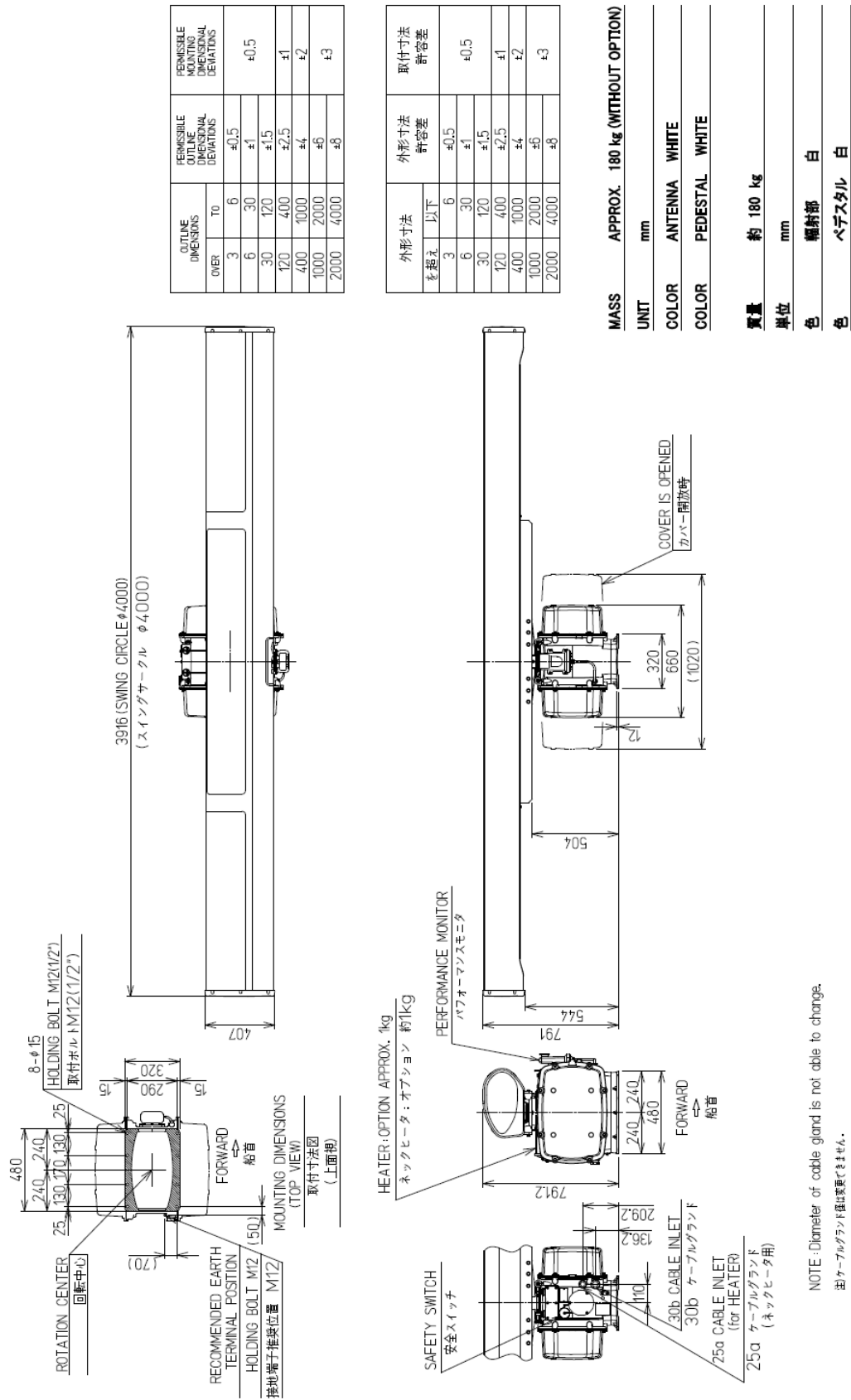


Fig. 1.5 Outside Drawing of NKE-1130 SCANNER UNIT (JMA-5332-12)

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。

SCANNER UNIT OUTLINE DRAWING

SONKE5312-2-0

NKE-1130

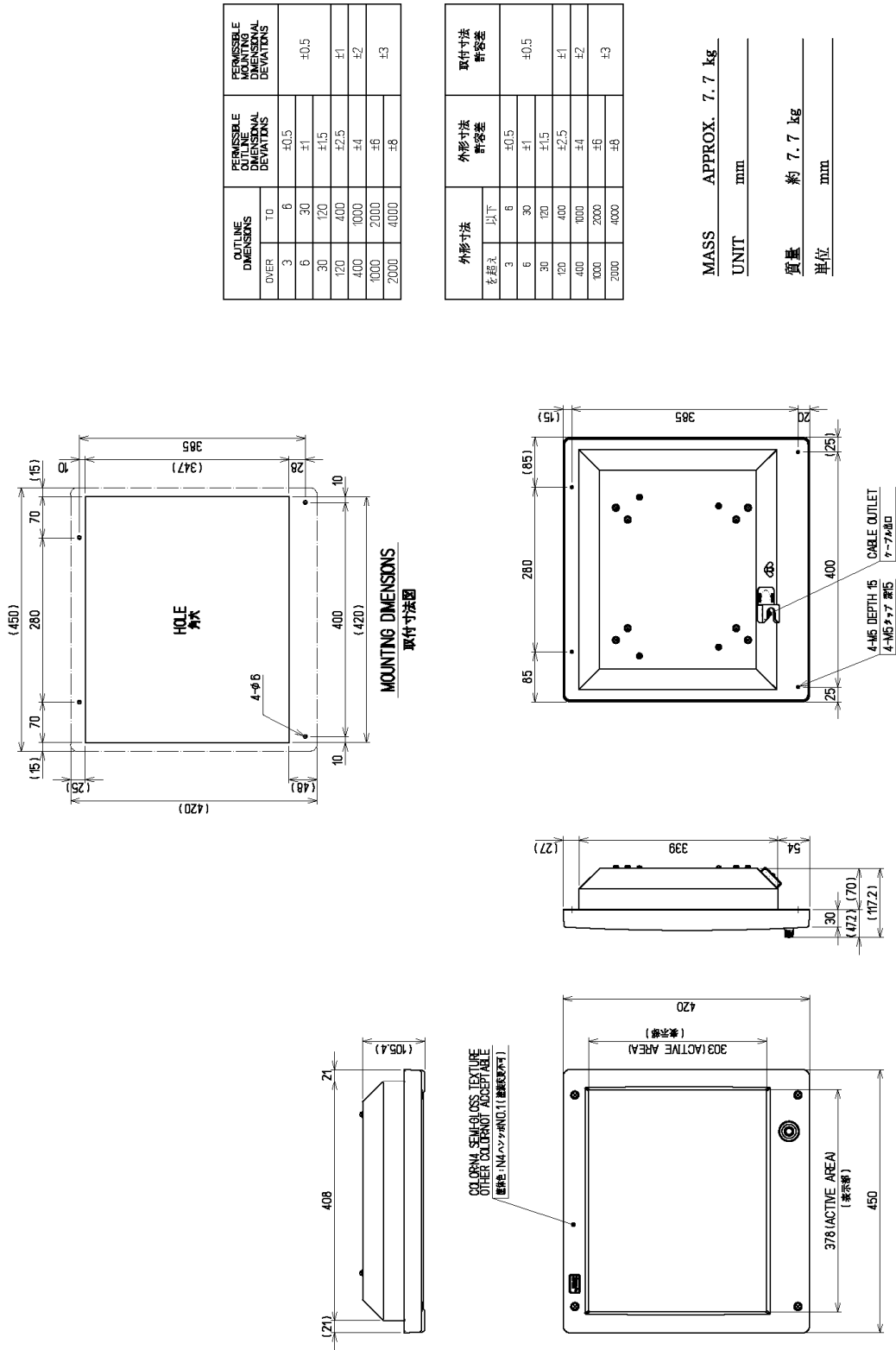


Fig. 1.6 Outside Drawing of NWZ-173 LCD MONITOR

NWZ-173

19 INCH MONITOR UNIT

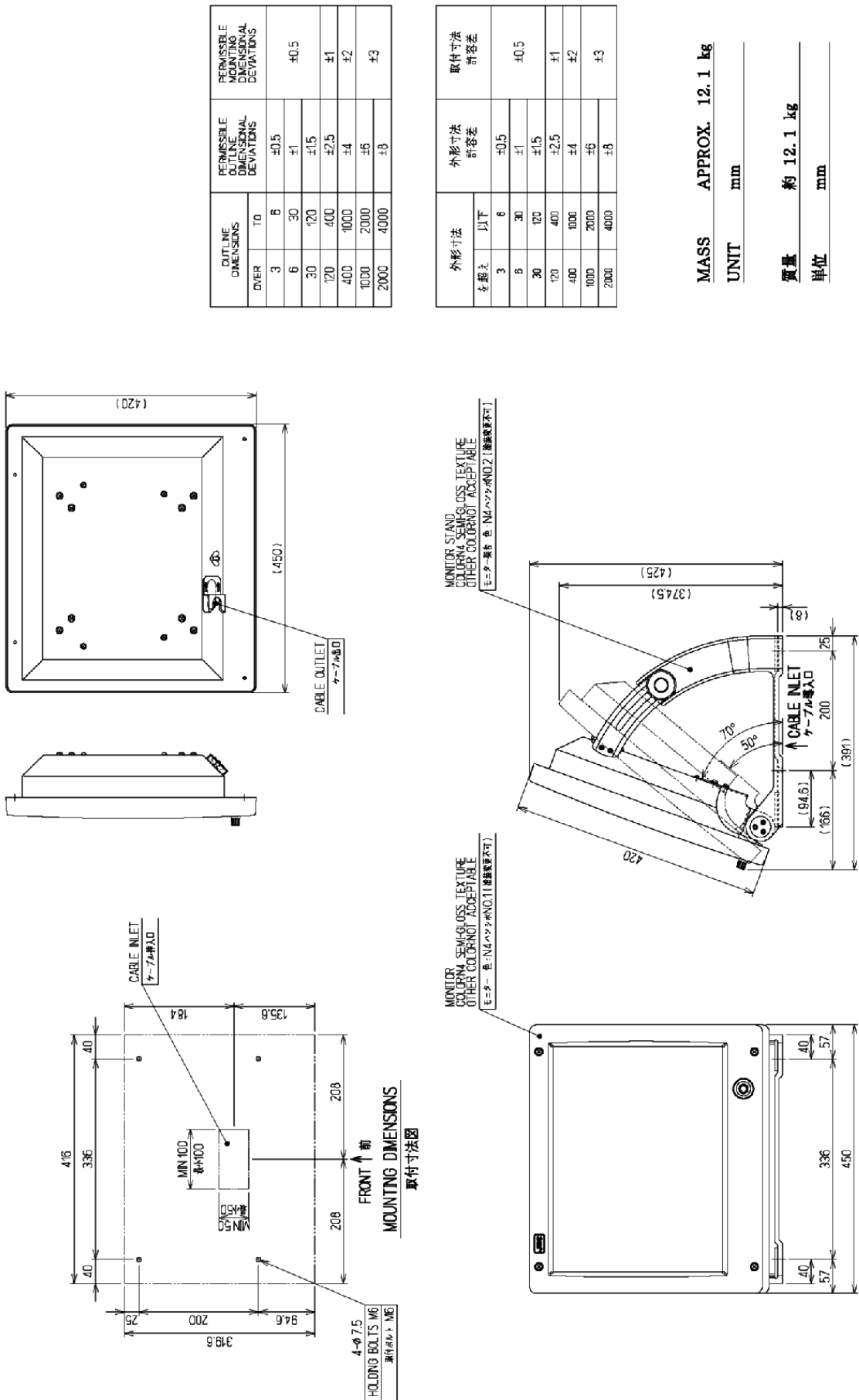


Fig. 1.7 Outside Drawing of NWZ-173 LCD MONITOR with MPBC42446 STAND (Option)

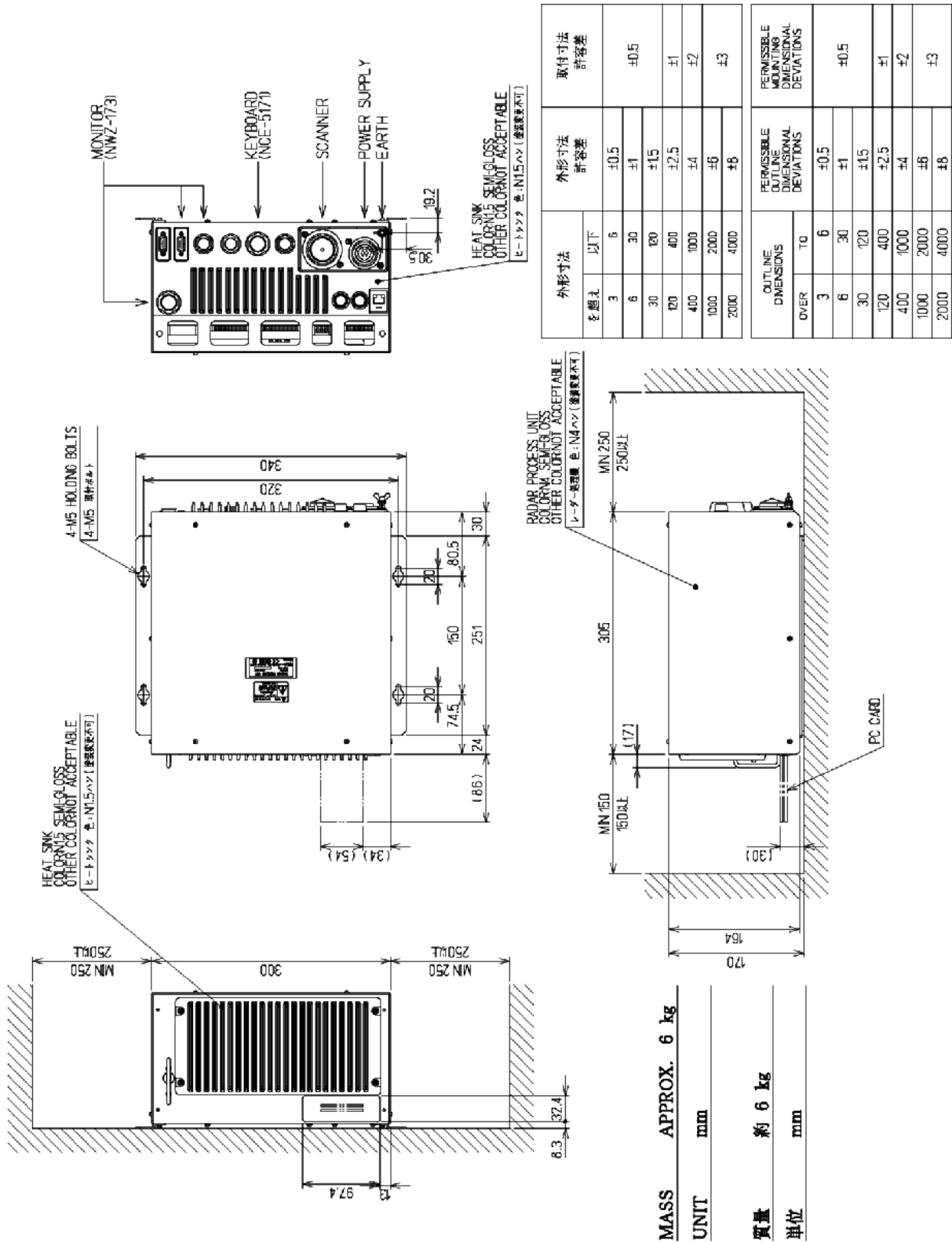
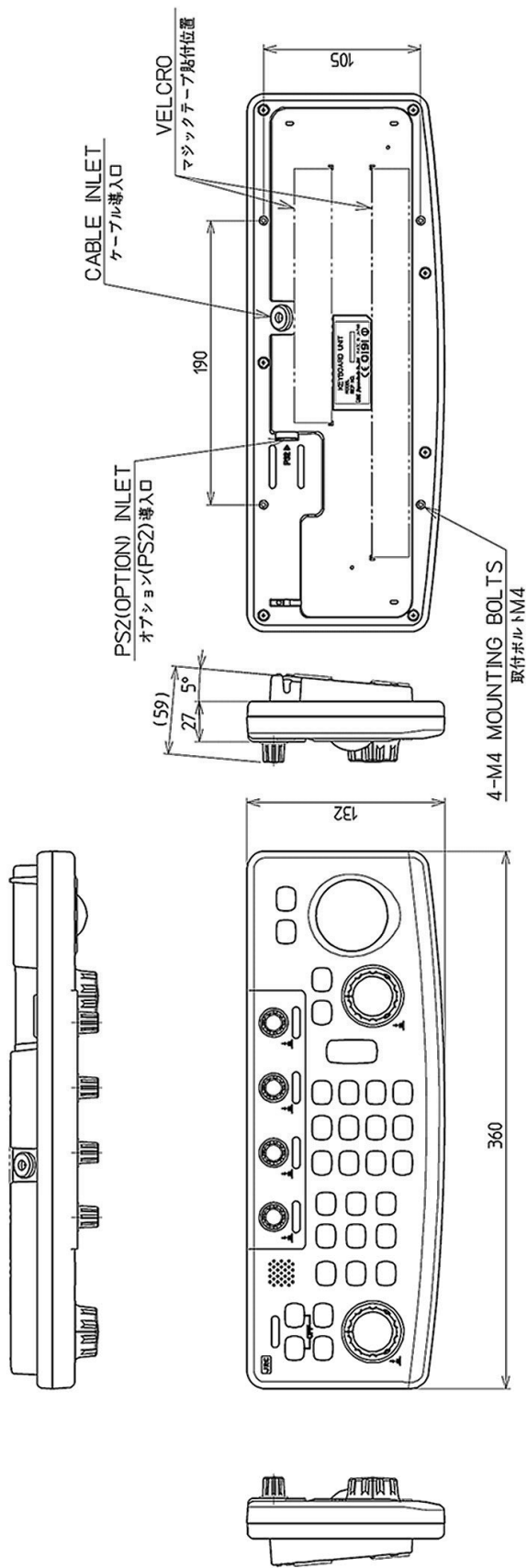


Fig. 1.8 Outside Drawing of NDC-1417 RADAR PROCESS UNIT



Mass : Approx. 1.3 kg (with Connected cable)

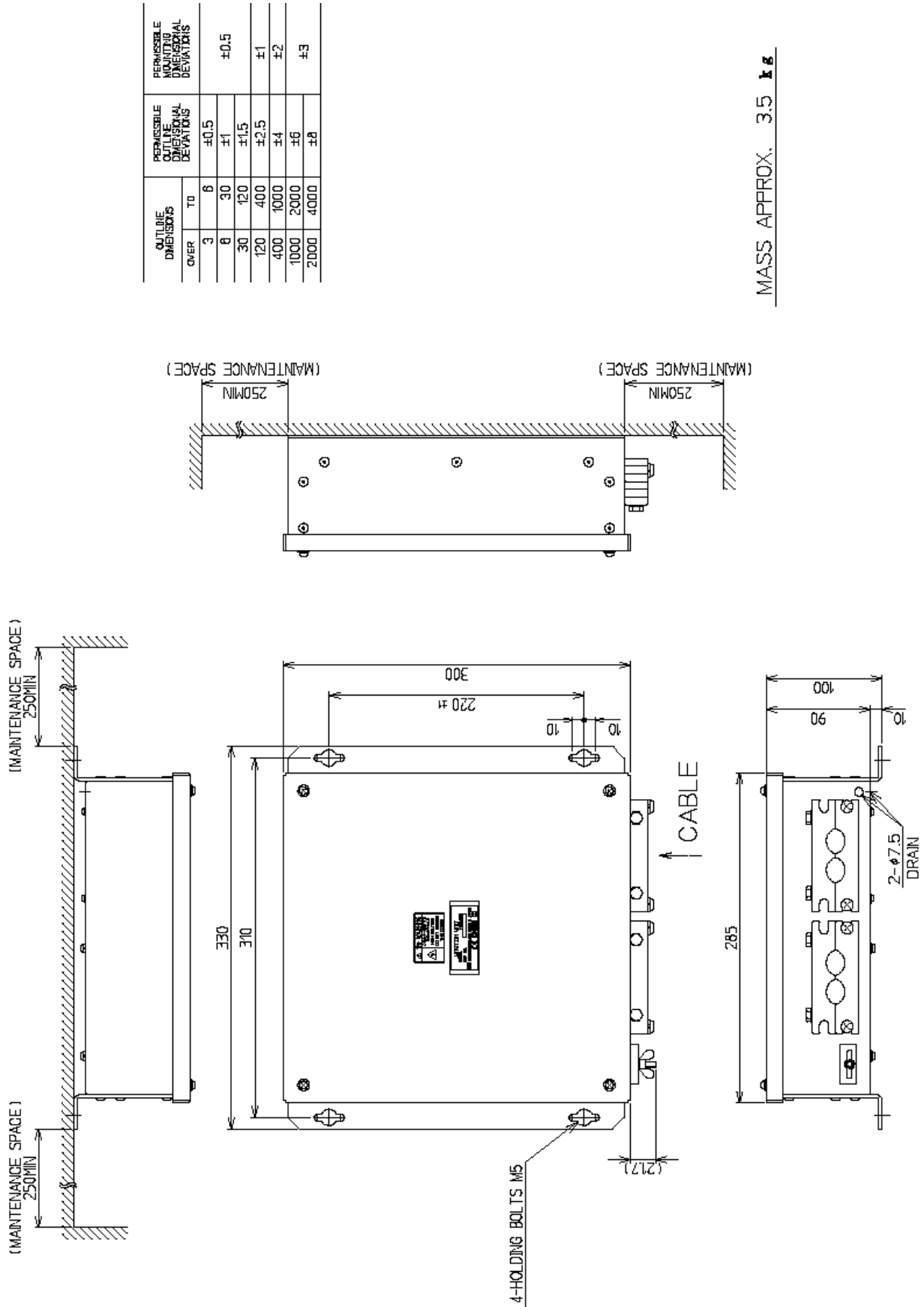
Unit : mm

質量 : 約 1.3 kg (接続ケーブル含む)

単位 : mm

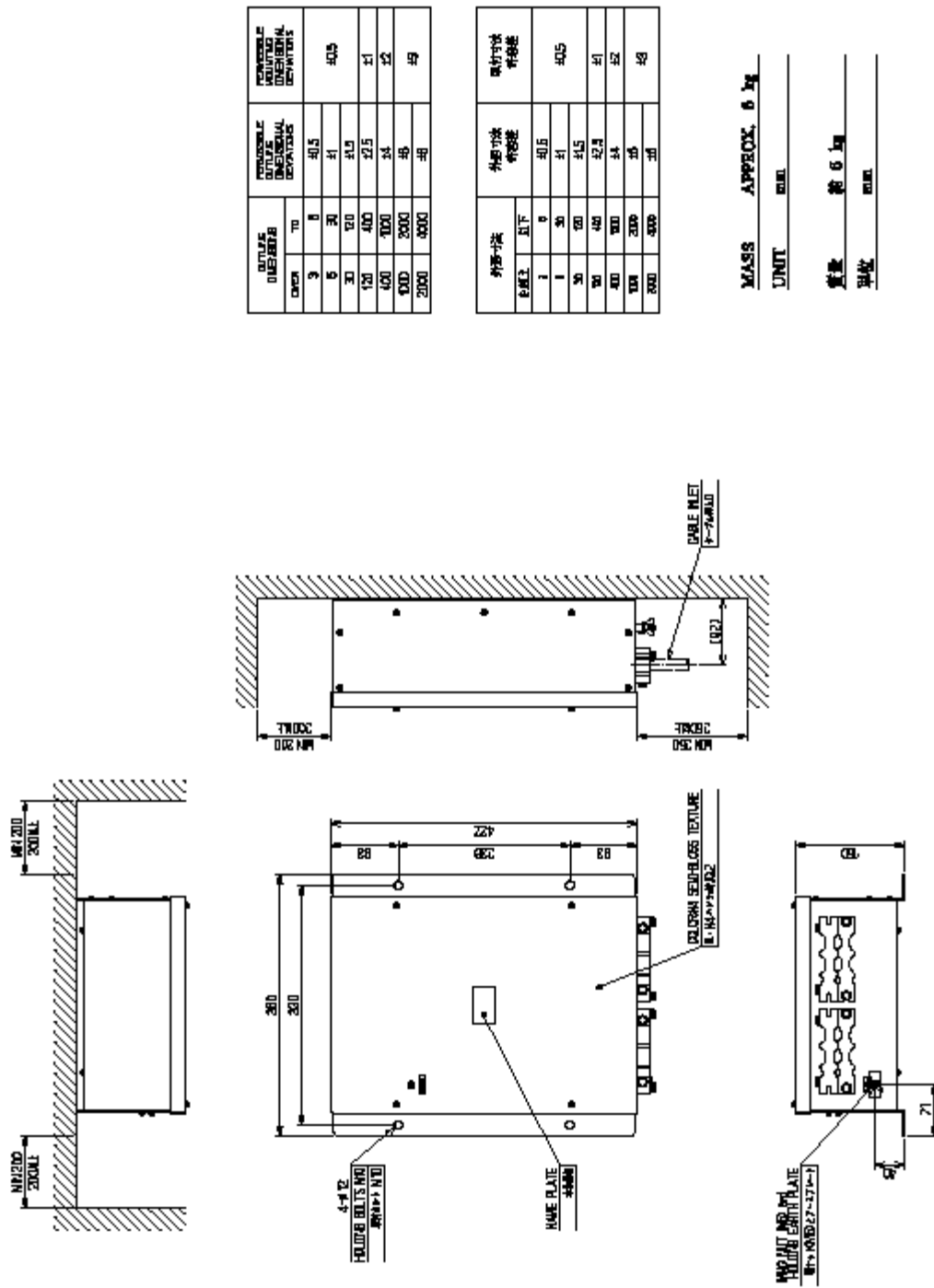
OUTLINE DIMENSIONS	PERMISSIBLE MOUNTING DIMENSIONAL DEVIATIONS		PERMISSIBLE OUTLINE DIMENSIONAL DEVIATIONS		PERMISSIBLE MOUNTING DIMENSIONAL DEVIATIONS	
	OVER	TO	PERMISSIBLE MOUNTING DIMENSIONAL DEVIATIONS	PERMISSIBLE OUTLINE DIMENSIONAL DEVIATIONS	PERMISSIBLE MOUNTING DIMENSIONAL DEVIATIONS	PERMISSIBLE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

Fig. 1.9 Outside Drawing of NCE-5171 OPERATION UNIT



MASS APPROX. 3.5 kg

Fig. 1.10 Outside Drawing of NQE-3151A JUNCTION BOX (JMA-5332-12)



OUTLINE DIMENSIONS		PERMISSIBLE OUTLINE DIMENSIONAL DEVIATION		PERMISSIBLE OUTLINE DIMENSIONAL DEVIATION	
Dimension	mm	mm	mm	mm	mm
3	0	±0.5		±0.5	
5	30	±1		±0.5	
20	100	±0.3		±0.3	
120	400	±2.5		±2	
400	1000	±4		±2	
5000	3000	±6		±6	
2000	4000	±8		±8	

外形尺寸		外形尺寸 允差		外形尺寸 允差	
尺寸	mm	mm	mm	mm	mm
3	0	±0.5		±0.5	
5	30	±1		±0.5	
20	100	±0.3		±0.3	
120	400	±2.5		±2	
400	1000	±4		±2	
5000	3000	±6		±6	
2000	4000	±8		±8	

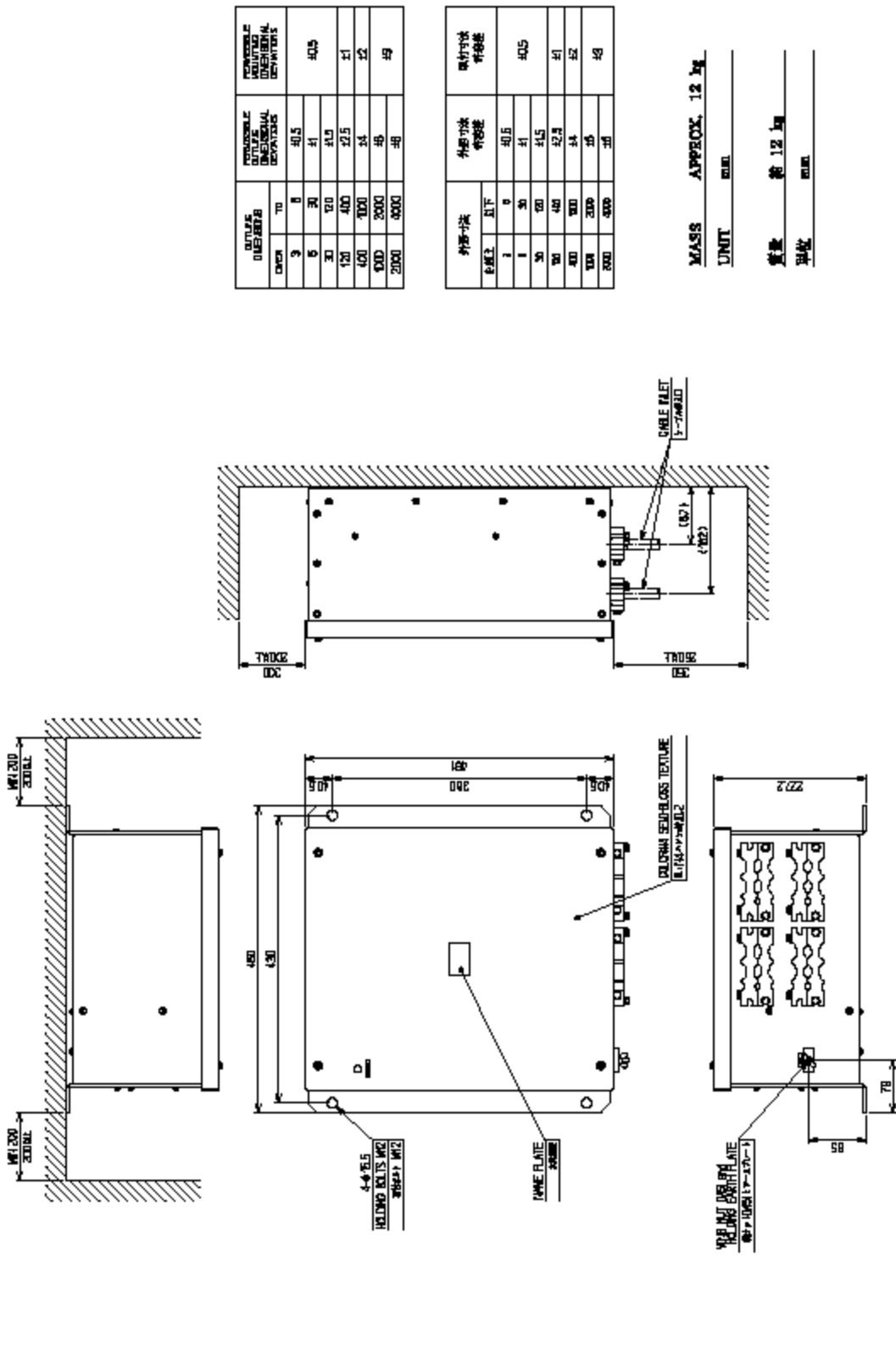
MASS APPROX. 6 kg
 UNIT mm
 重量 約 6 kg
 單位 mm

NQE-3141-4A

INTERSWITCH UNIT OUTLINE DRAWING

SCNQE5084

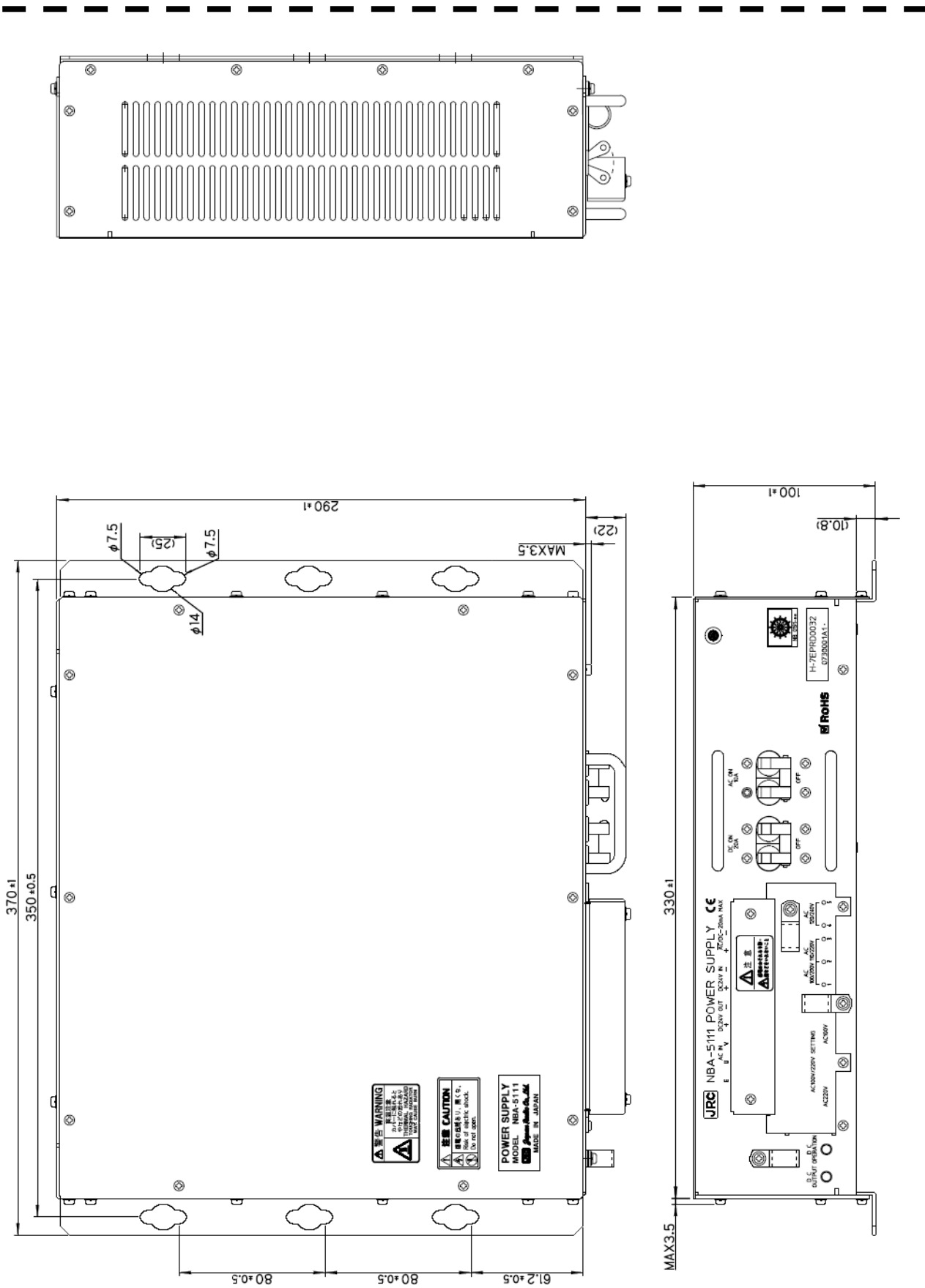
Fig. 1.11 Outside Drawing of NQE-3141-4A INTERSWITCH UNIT (Option)



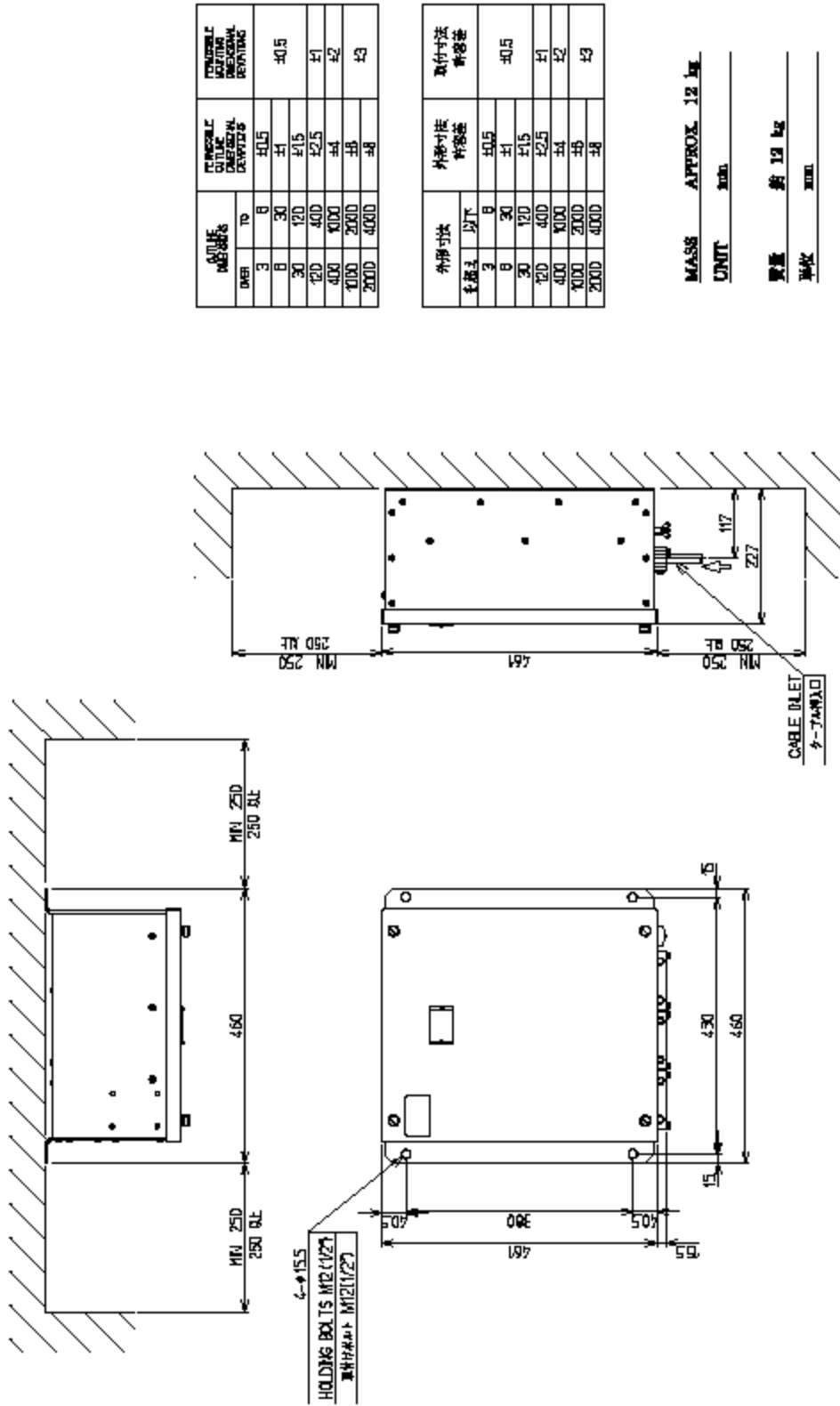
INTERSWITCH UNIT OUTLINE DRAWING

SCNQE5085

Fig. 1.12 Outside Drawing of NQE-3141-8A INTERSWITCH UNIT (Option)



**Fig. 1.13 Outside Drawing of NBA-5111 RECTIFIER UNIT
(JMA-5312-6/6HS, JMA-5322-7/9/6HS : Option, JMA-5332-12 : Standard)**



POWER CONTROL UNIT OUTLINE DRAWING

SCNQE5080

NQE-3167

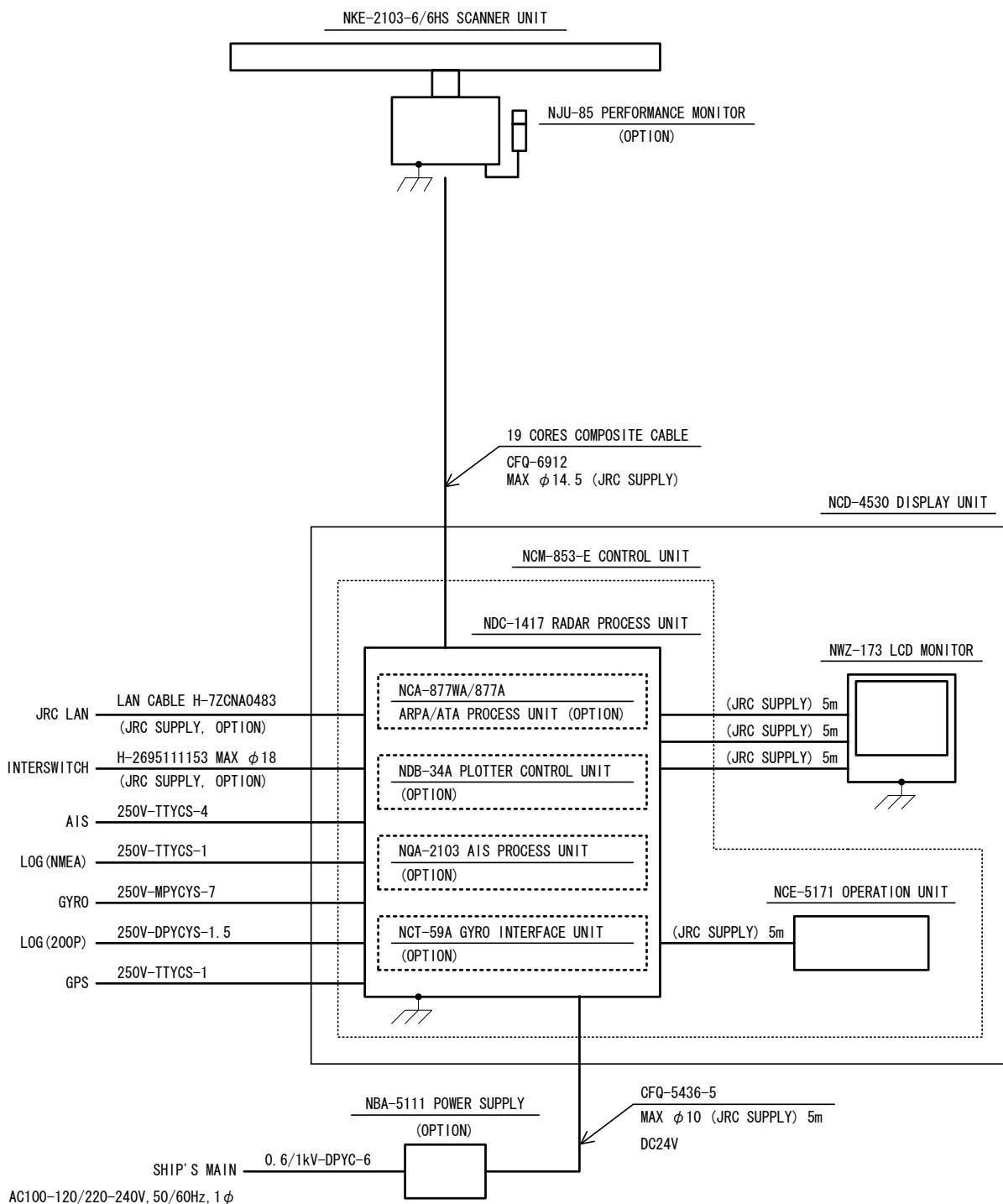
Fig. 1.14 Outside Drawing of NQE-3167 POWER CONTROL UNIT (Option)

1.5 GENERAL SYSTEM DIAGRAMS

Fig. 1.15 General System Diagram of JMA-5312-6/6HS RADAR

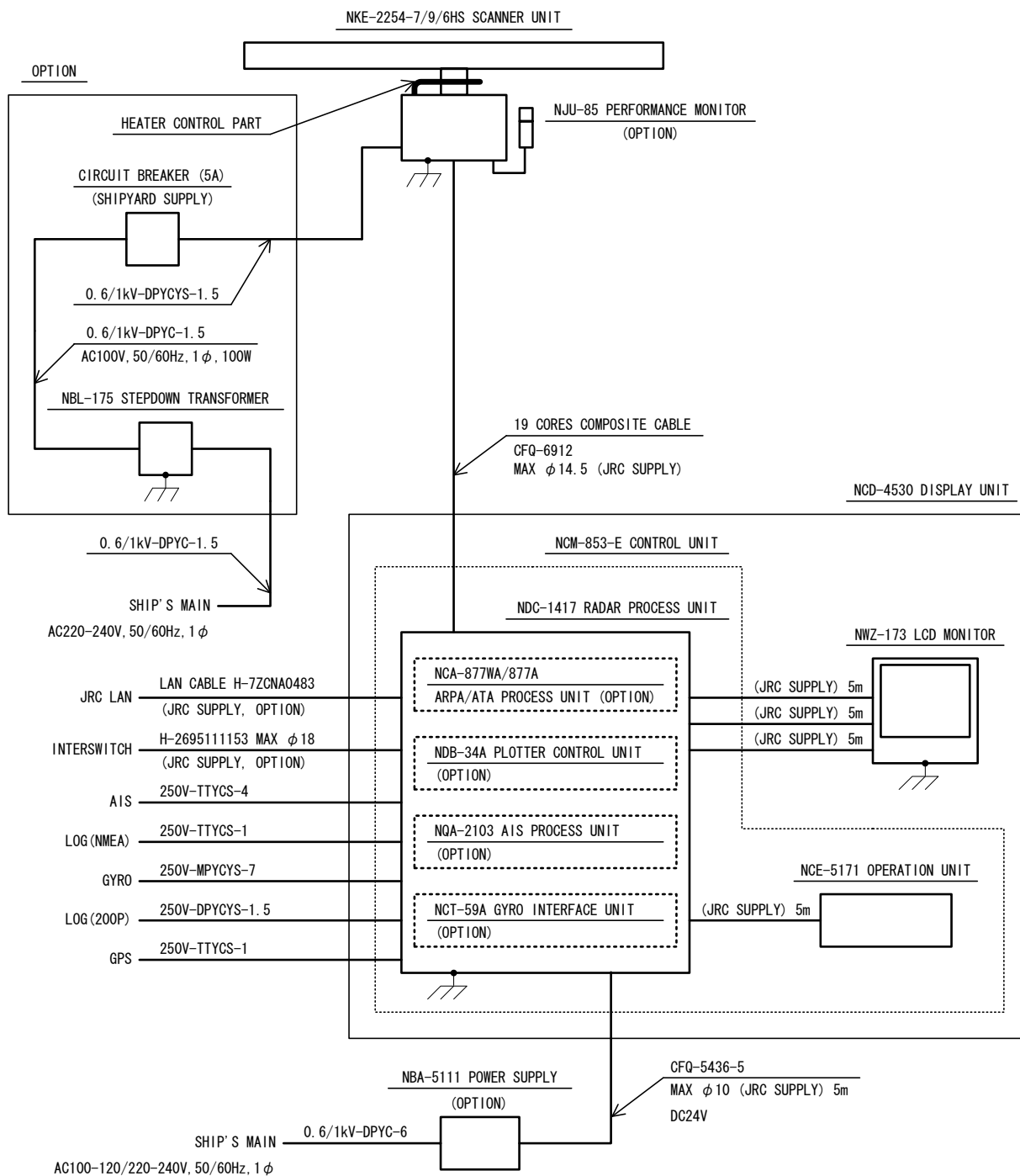
Fig. 1.16 General System Diagram of JMA-5322-7/9/6HS RADAR

Fig. 1.17 General System Diagram of JMA-5332-12 RADAR



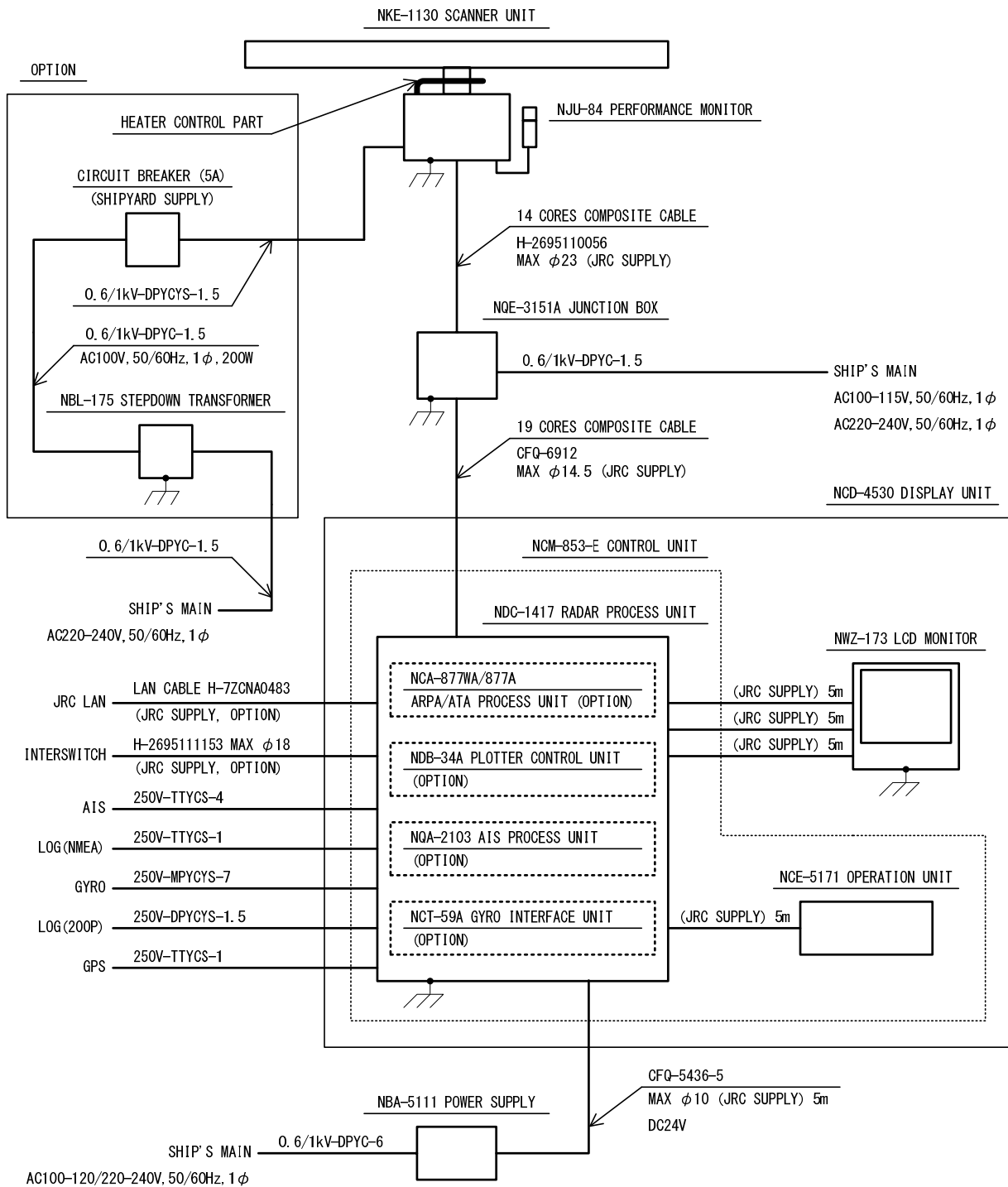
NOTE: Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar.
 All cables of the radar are to be run away from the cables of radio equipment.
 (Ex. Radiotelephone. Communications receiver and direction finder, etc.)
 Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.
 Performance monitor, ARPA/ATA Process Circuit, AIS Process Circuit and GYRO Interface Unit must be fitted on ships compliant to IMO.

Fig. 1.15 General System Diagram of JMA-5312-6/6HS RADAR



NOTE: Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar.
 All cables of the radar are to be run away from the cables of radio equipment.
 (Ex. Radiotelephone. Communications receiver and direction finder, etc.)
 Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.
 Performance monitor, ARPA/ATA Process Circuit, AIS Process Circuit and GYRO Interface Unit must be fitted on ships compliant to IMO.

Fig. 1.16 General System Diagram of JMA-5322-7/9/6HS RADAR



NOTE: Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar.
 All cables of the radar are to be run away from the cables of radio equipment.
 (Ex. Radiotelephone. Communications receiver and direction finder, etc.)
 Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.
 Performance monitor, ARPA/ATA Process Circuit, AIS Process Circuit and GYRO Interface Unit must be fitted on ships compliant to IMO.

Fig. 1.17 General System Diagram of JMA-5332-12 RADAR

SECTION 2

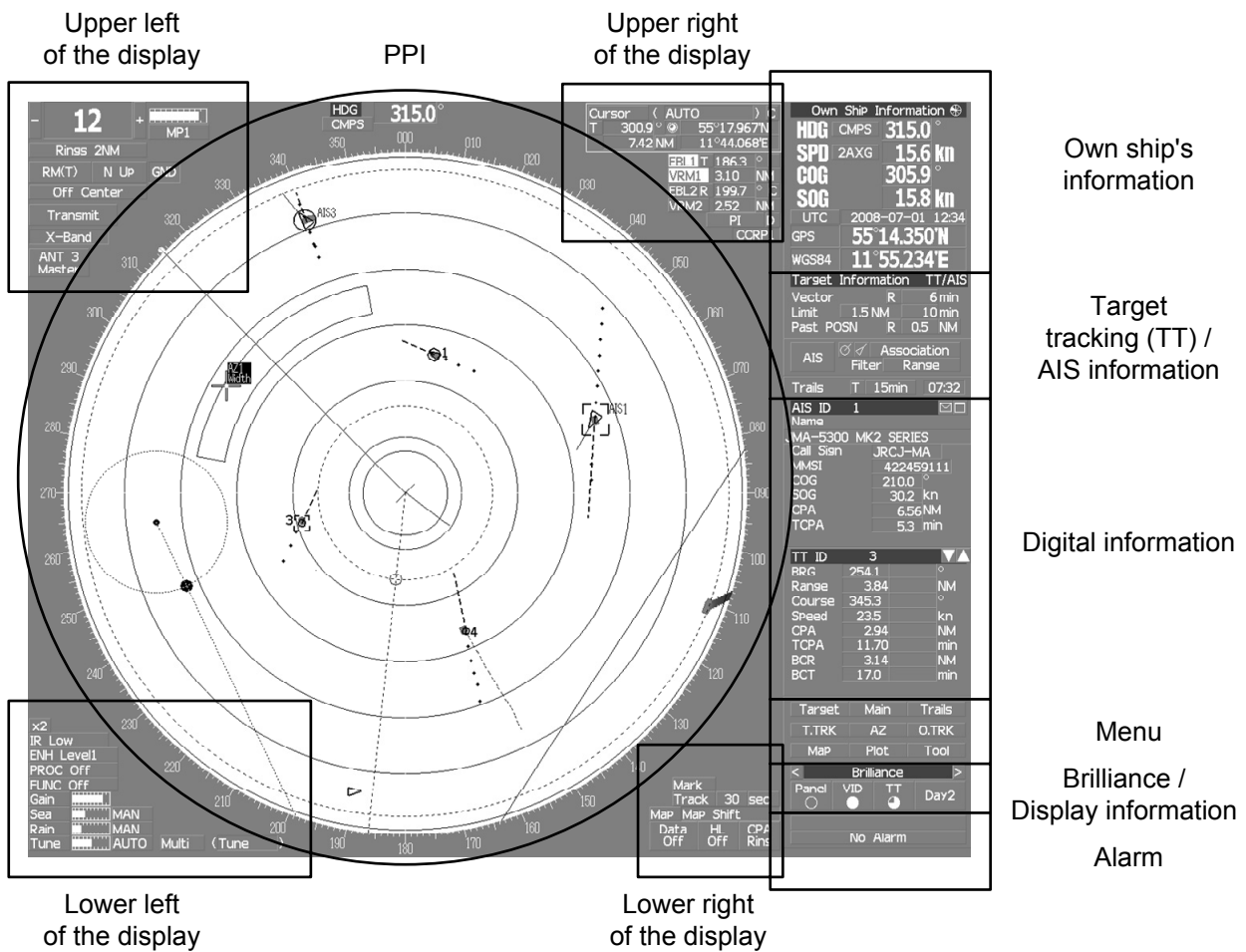
NAMES AND FUNCTIONS OF CONTROL PANEL KEYS AND FUNCTIONS OF SOFTWARE BUTTONS

2.1	NAMES OF DISPLAY	2-1
2.2	NAMES AND FUNCTIONS OF CONTROL PANEL KEYS.....	2-10
2.3	FUNCTIONS OF SOFTWARE BUTTONS.....	2-15

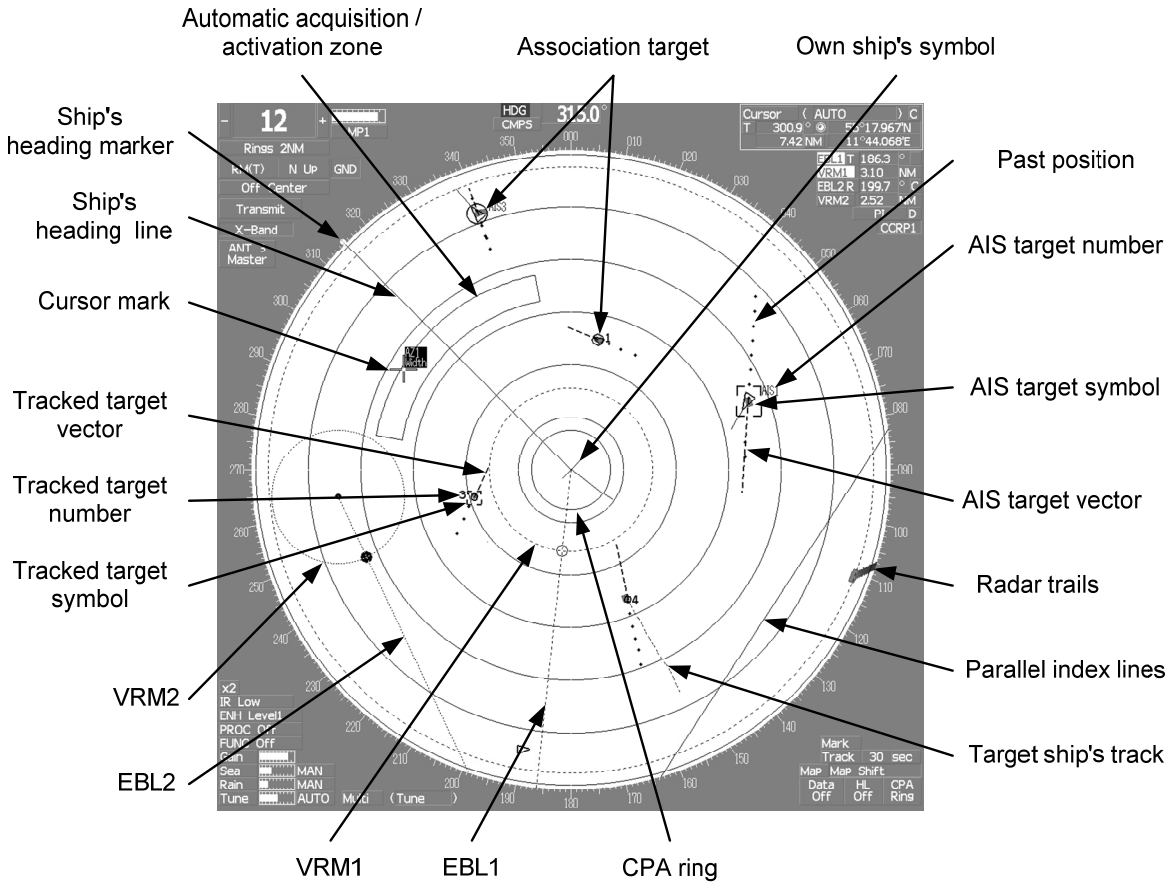
2.1 NAMES OF DISPLAY

Example of screen display

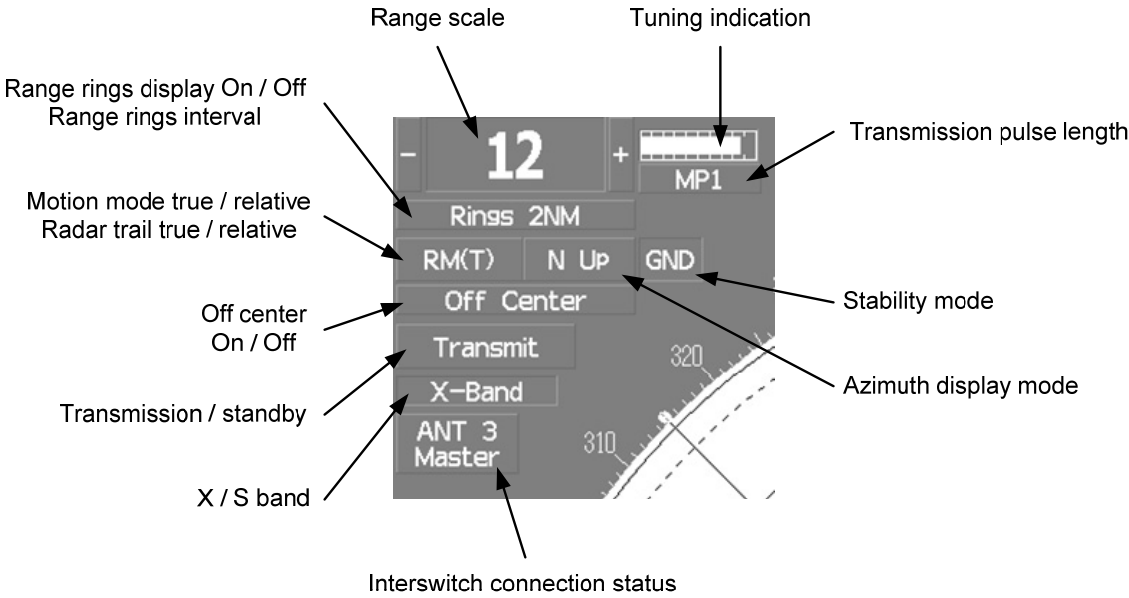
In this example, the screen is divided into a number of areas and the names in each area are indicated.



PPI

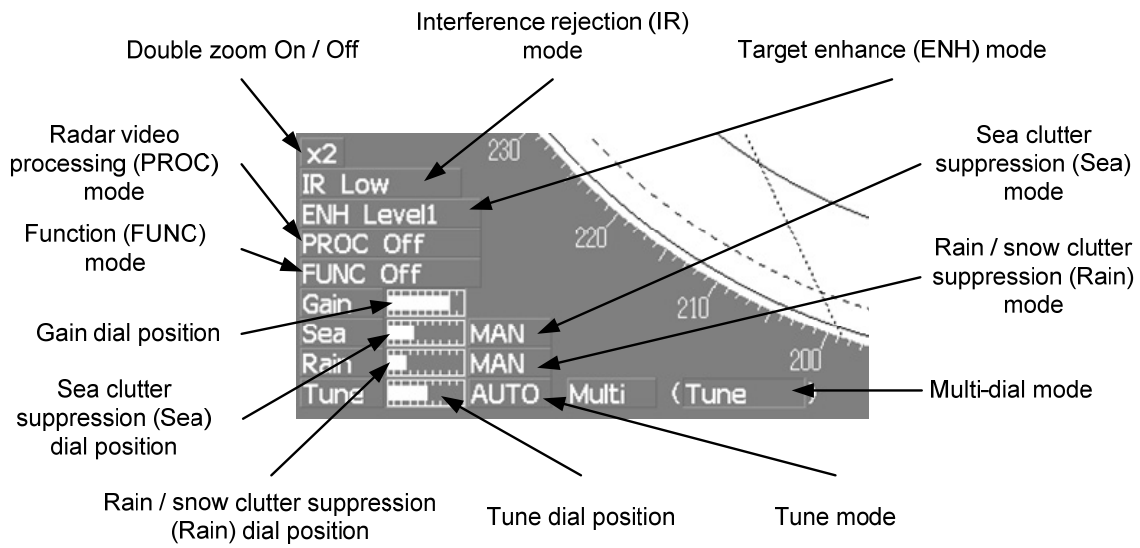


Upper left of the display

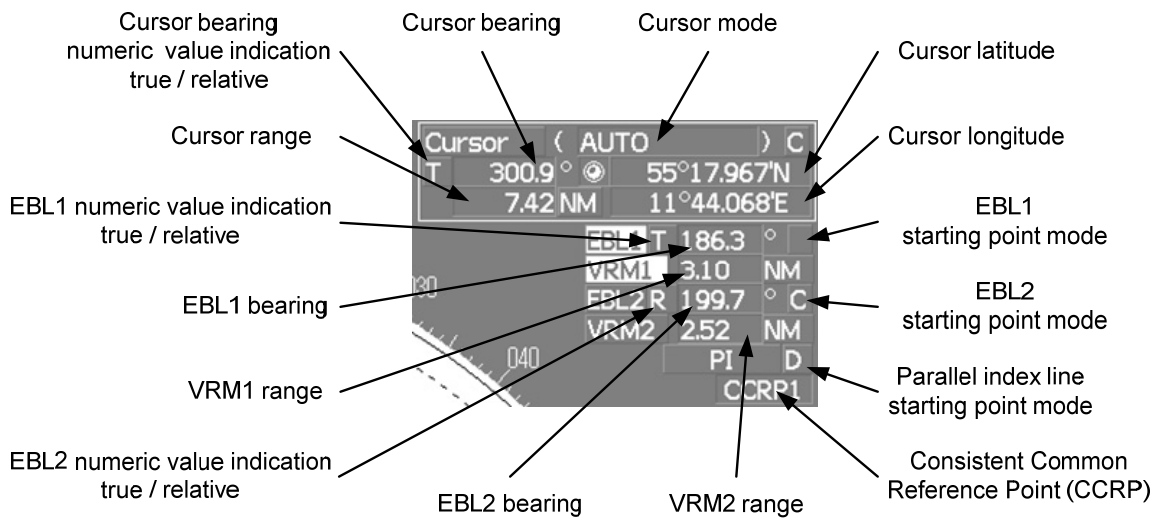


About ground and sea stabilization
 Speed sensor source is **MAN**, **LOG**, **2AXW**
 If Set/Drift Setting menu is on : GND (Ground stabilization)
 If Set/Drift Setting menu is off : Sea (Sea stabilization)
 Speed sensor source is **2AXG**, **GPS** : GND (Ground stabilization)

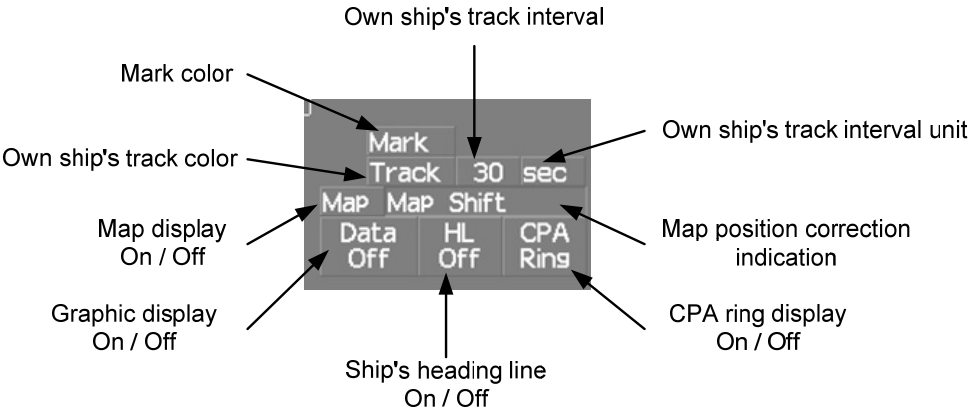
Lower left of the display



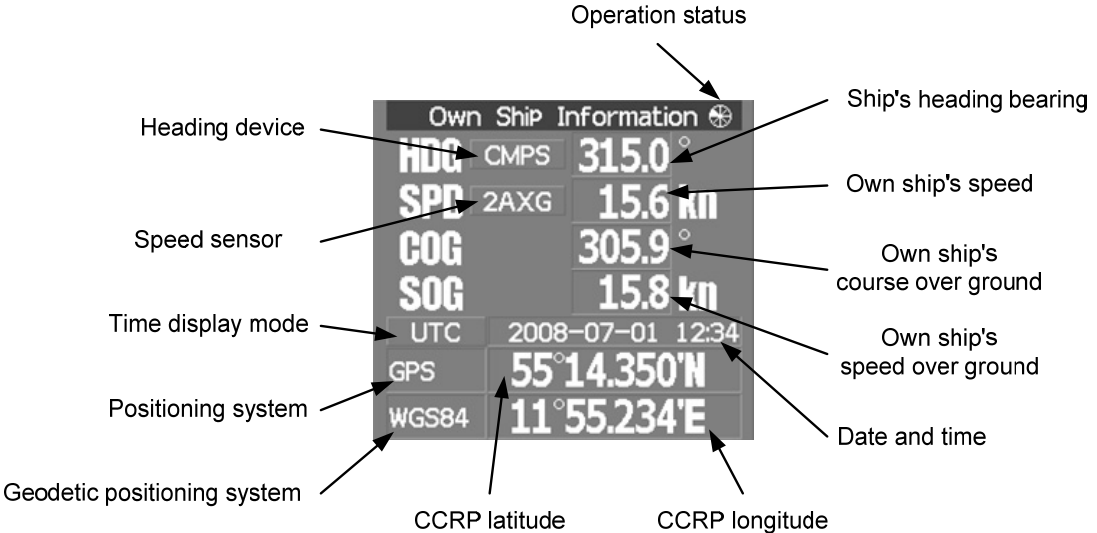
Upper right of the display



Lower right of the display

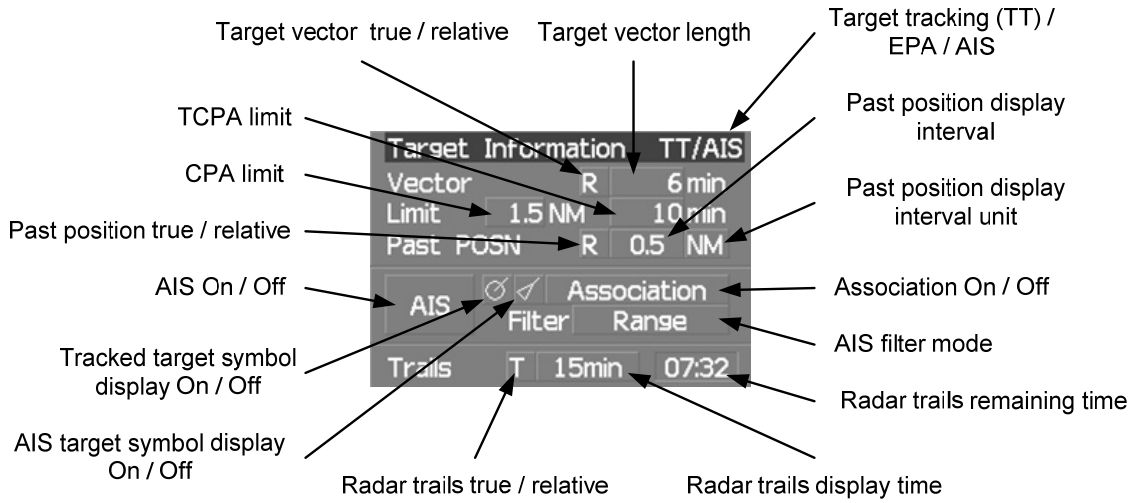


Own ship's information

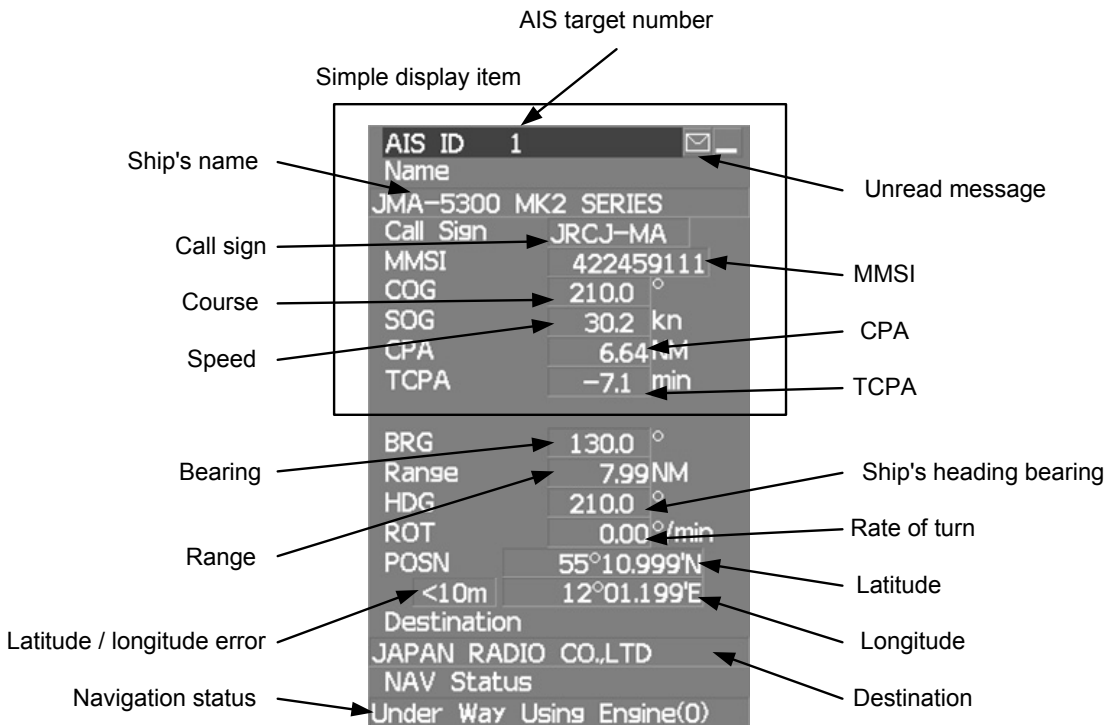


- About time display mode
- UTC : Universal Time Coordinate
 - UTC(S) : UTC (System Time)
 - LMT : Local Mean Time
 - LMT(S) : LMT (System Time)

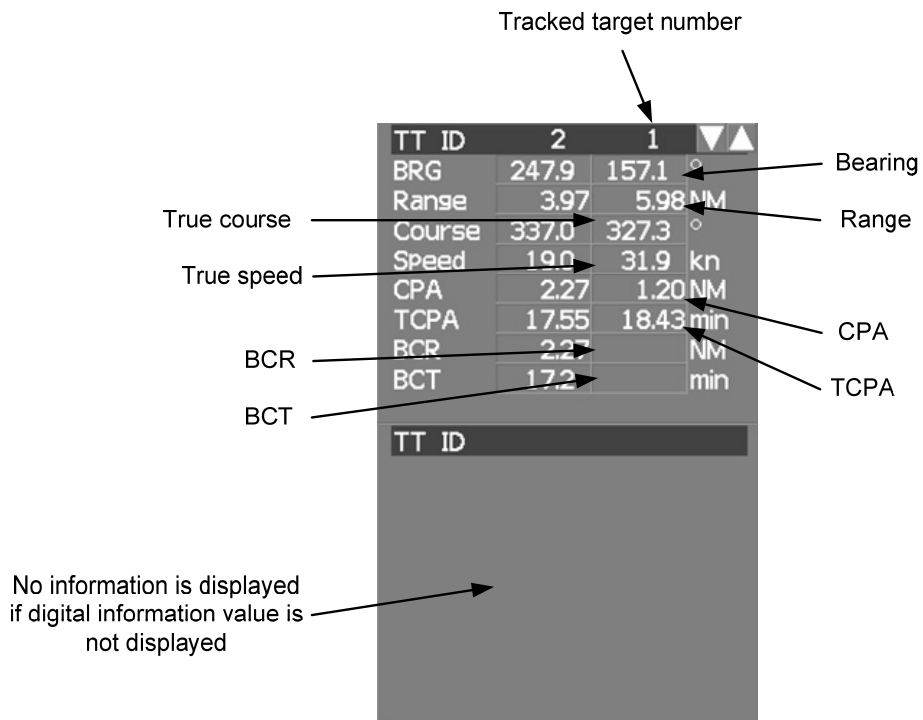
Target tracking (TT) / AIS information



Digital information: AIS target information

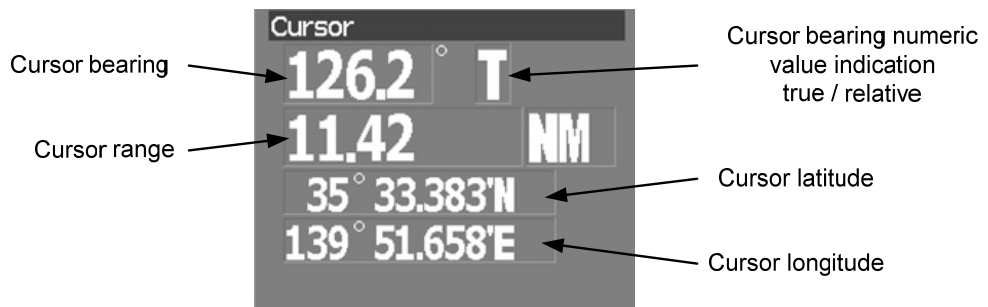


Digital information: Tracked target information

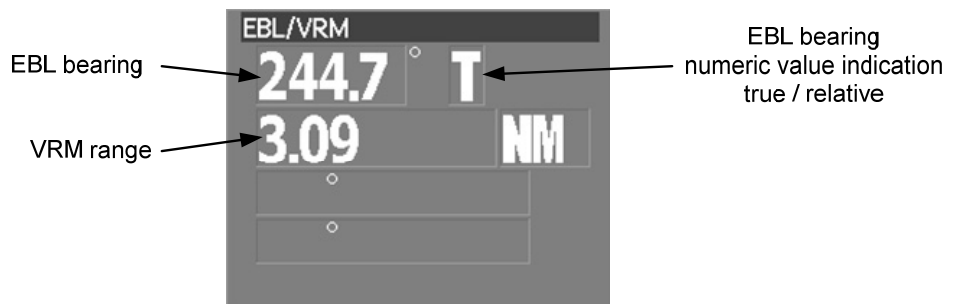


2

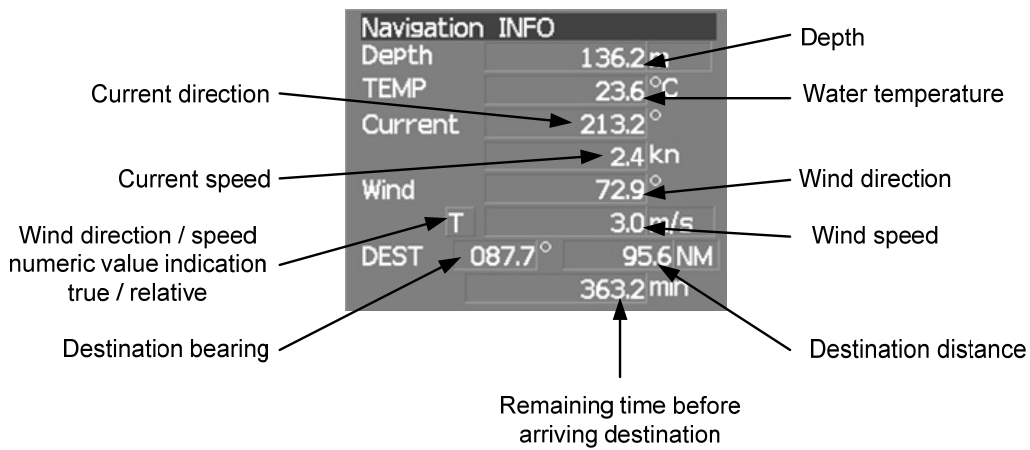
Digital information: Enhancement of cursor position numeric value indication



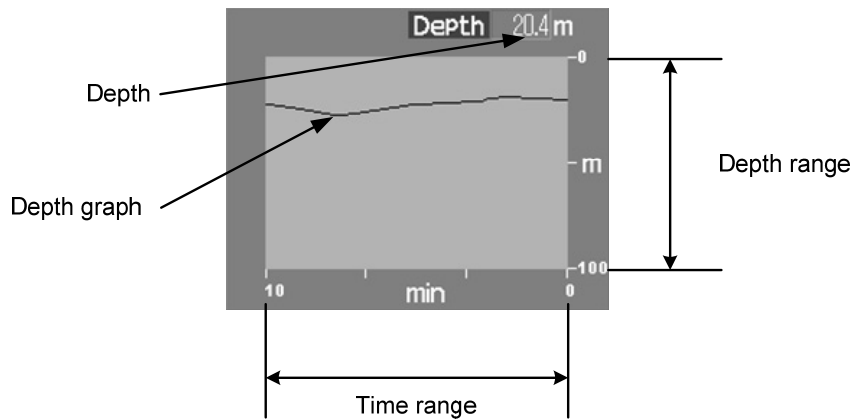
Digital information: Enhancement of EBL / VRM numeric value display



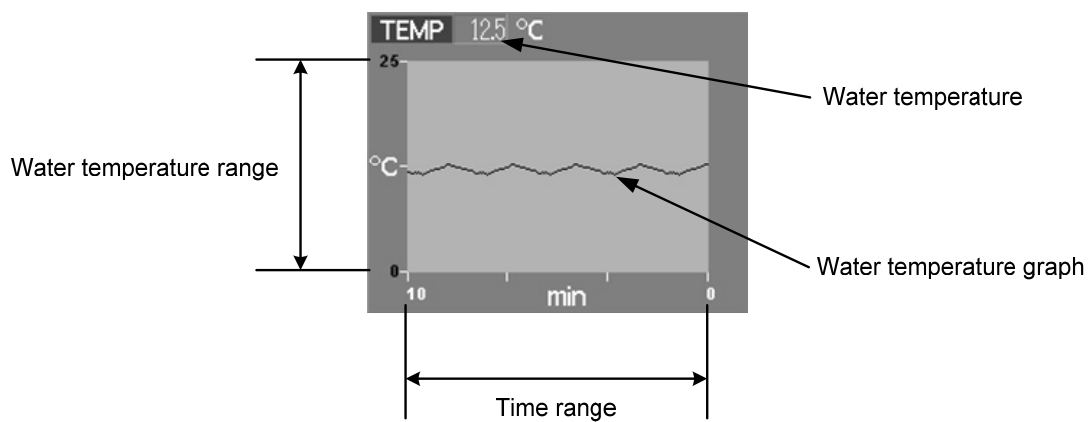
Digital information: Navigation information



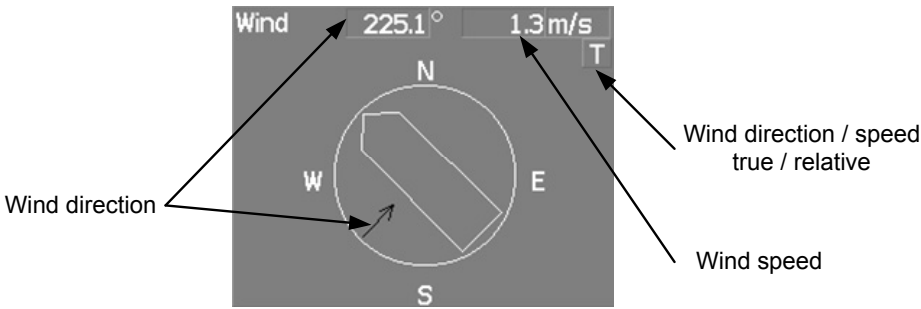
Digital information: Depth indication



Digital information: Water temperature indication

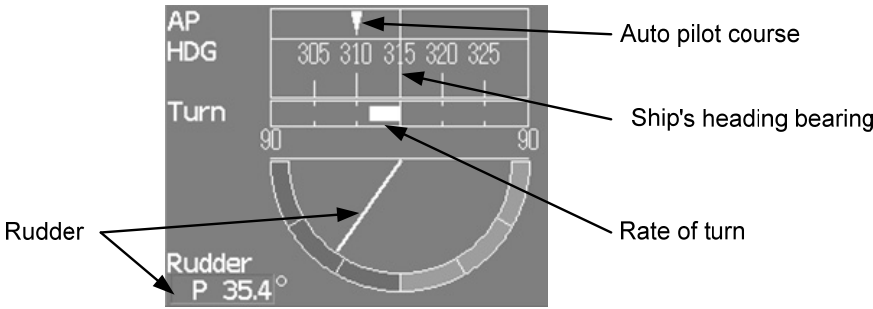


Digital information: Wind direction / speed



2

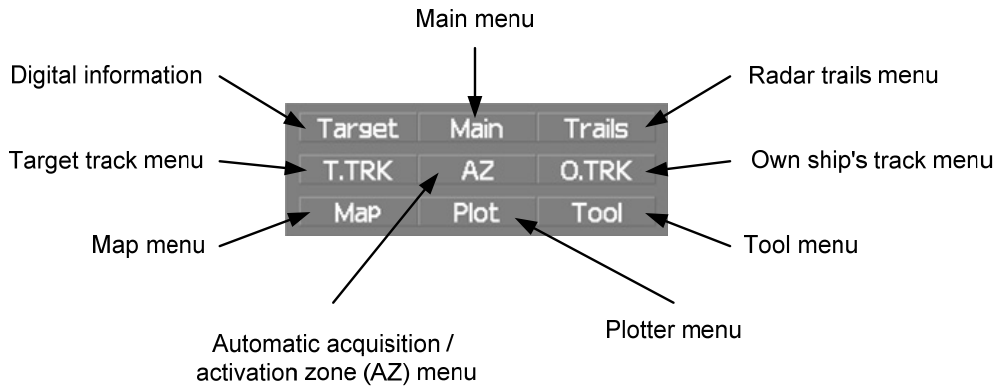
Digital information: Course bar



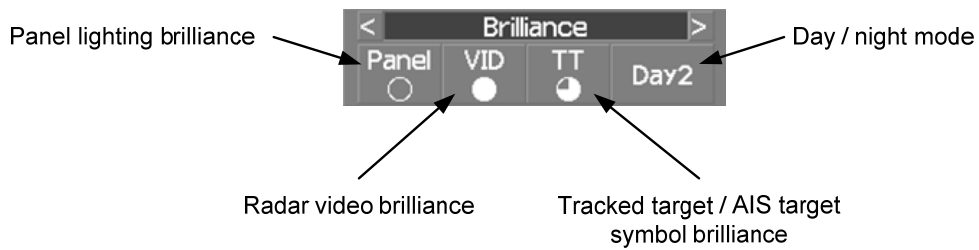
Digital information: Marker



Menu



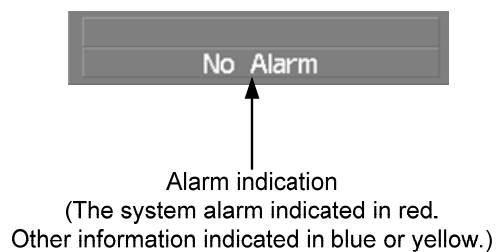
Brilliance



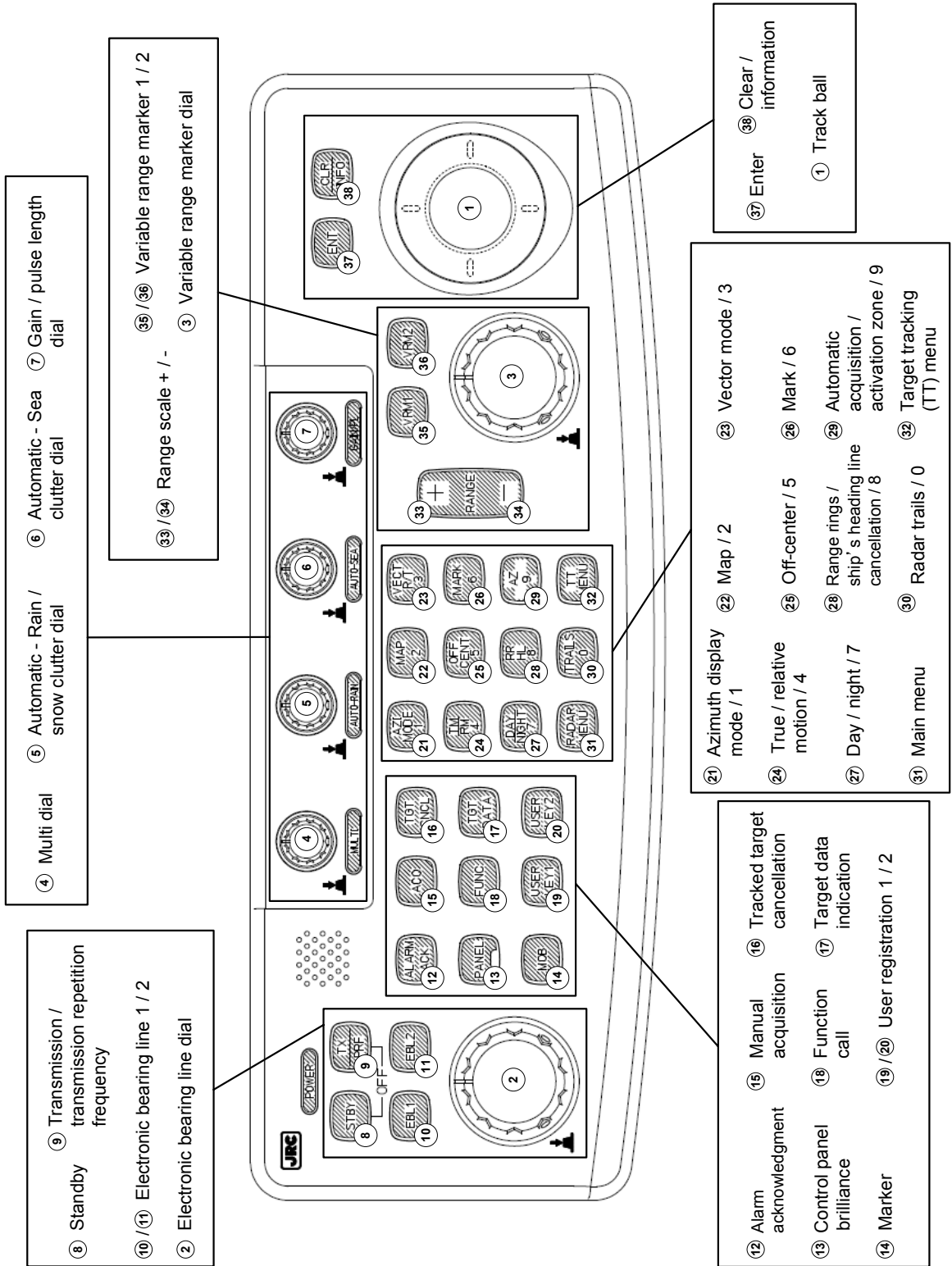
Display information



Alarm



2.2 NAMES AND FUNCTIONS OF CONTROL PANEL KEYS



The name of each button is described from the following page. See below.

① **Track ball**

Use the track ball to move the cursor mark to any position.

For example, use it for setting in each mode and specifying a floating EBL center position and off-center position.

② **[EBL] (Electronic Bearing Line) dial**

Turn the dial to rotate the bearing of the EBL.

By pressing the dial, the selected EBL can be switched.

(Center fixing) ⇒ C (Floating) ⇒ D (latitude / longitude fixing) ⇒

* D is enabled only when the navigator is connected.

③ **[VRM] (Variable Range Marker) dial**

Turn the dial to change the VRM range.

Press the dial to set the display of parallel index line (PI) to On / Off and open the PI Menu.

④ **[MULTI] dial**

Press the dial to switch the function that is registered in the multi-dial.

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

The function that is switched is displayed in multi-dial mode (lower left of the display on page 2-3)

If the dial is pressed for 2 seconds, the Multi Dial Setting menu is opened. If the dial is pressed again for 2 seconds, the setting menu is closed.

⑤ **[AUTO-RAIN] (Automatic - Rain / Snow clutter suppression) dial**

Turn the dial to suppress images by rain / snow clutter.

Turn the dial clockwise to increase the effect of suppression.

Press the dial to switch the mode to manual / automatic.

⑥ **[AUTO-SEA] (Automatic - Sea clutter suppression) dial**

Turn the dial to suppress images by sea clutter.

Turn the dial clockwise to increase the effect of suppression.

Press the dial to switch the mode to manual / automatic.

⑦ **[GAIN / PL] (Gain / Pulse Length) dial**

Turn the dial to adjust the reception gain of the radar.

Turn the dial clockwise to increase the gain.

Press the dial to switch the transmitting pulse length.

⑧ **[STBY] (Standby) key**

Use this key to turn on the power of the equipment.

Use this key also to switch the equipment from a transmitting state to a standby state.

The power can be turned off by pressing the [STBY] key and [TX / PRF] key concurrently while the power is On.

⑨ **[TX / PRF] (Transmission / transmission repetition frequency) key**

At expiration of the pre-heat time after the power is turned on, Preheat of the transmission / standby indication (Upper left of the display on page 2-2) changes to Standby.

If this key is pressed subsequently, transmission starts.

If this key is pressed during transmission, fine adjustments of the transmission repetition frequency are enabled.

By using the fine adjustments of the transmission repetition frequency and the interference removal function, the interference suppression effect can be improved.

⑩ / ⑪ [EBL1] / [EBL2] (Electronic Bearing Line 1 / 2) key

Use these keys to switch EBL1 / EBL2 to On / Off.

If the key is pressed for 2 seconds, the EBL / Cursor Setting menu is opened.

⑫ [ALARM ACK] (Alarm acknowledgment) key

Use this key to acknowledge the alarm such as a failure alarm and a collision alarm.

To stop the alarm, press this key while the alarm sound is emitted.

If multiple alarms occur, press this key same time as the alarms.

⑬ [PANEL] (Control panel brilliance) key

Use this key to adjust the brilliance of various keys and dials on the control panel.

⑭ [MOB] (Marker) key

A marker is set on the own ship's position latitude / longitude at that time. Use this key to store the own ship's position at the time in such a case that someone falls overboard from the ship.

The marker can be cleared by pressing the key for 2 seconds.

⑮ [ACQ] (Manual acquisition) key

Use this key to acquire a target of the cursor position manually.

⑯ [TGT CNCL] (Tracked target cancellation) key

Use this key to cancel the tracked target symbol / vector at the cursor position and stop tracking.

When this key is pressed for 2 seconds, all the tracked target symbols / vectors are cancelled and tracking is stopped.

⑰ [TGT DATA] (Target data indication) key

Use this key to check the digital information of the AIS target or the tracked target.

⑱ [FUNC] (Function call) key

Use this key to switch the original signal processing settings.

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

If the key is pressed for 2 seconds, the User Function Setting menu is displayed.

⑲ / ⑳ [USER KEY 1 / 2] (User registration 1 / 2) key

Use this key to perform pre-registered operations.

If this key is pressed for 2 seconds while no operation is registered, the User Key Setting menu is opened.

㉑ [AZI MODE / 1] (Azimuth display mode / 1) key

Switch the azimuth display.

[H Up] (Head Up) ⇒ [N Up] (North Up) ⇒ [C Up] (Course Up) ⇒ [N Up]

During the menu operation, the key functions as a numeric key [1].

If this key is pressed for 2 seconds, GYRO setting menu is opened.

㉒ [MAP / 2] key

Use this key to switch the map display to On / Off such as marine chart, coastline, and depth contour.

During the menu operation, the key functions as a numeric key [2].

If this key is pressed for 2 seconds, the Map Setting menu is opened.

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

Use this key to switch vector indication **[T]** (true vector) / **[R]** (relative vector).
During the menu operation, the key functions as a numeric key **[3]**.

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

Use this key to switch the motion mode between **[TM]** (true motion) and **[RM]** (relative motion).
If the key is pressed for 2 seconds in **[TM]**, the own ship's position is reset.
During the menu operation, the key functions as a numeric key **[4]**.

②⑤ **[OFF CENT / 5] (Off-center / 5) key**

By pressing this key, moving the cursor, and pressing the **[ENT]** key, the ship's position can be moved to the cursor position. The moving range is about 66% of the radius.
If the key is pressed for 2 seconds, the off-center is set to Off and the ship's position is returned to the center of the screen.
During the menu operation, the key functions as a numeric key **[5]**.

②⑥ **[MARK / 6] (Mark / 6) key**

Use this key to display a mark in any screen position. This key can also be used for clearing the mark that is currently displayed.
If the key is pressed for 2 seconds, the Mark Setting menu is opened.
During the menu operation, the key functions as a numeric key **[6]**.

②⑦ **[DAY / NIGHT / 7] (Day / night mode / 7) key**

Use this key to switch the color and brightness of the screen that have been set in advance.
If the key is pressed for 2 seconds, the Display Color Setting menu is opened.
During the menu operation, the key functions as a numeric key **[7]**.

②⑧ **[RR / HL / 8] (Range Rings / ship's heading line off / 8) key**

Use this key to set the range rings marker to On / Off.
If the key is pressed for 2 seconds, the ship's heading line is cleared while the key is pressed.
During the menu operation, the key functions as a numeric key **[8]**.

②⑨ **[AZ / 9] (Automatic Acquisition / Activation Zone / 9) key**

Use this key to set automatic acquisition / activation zone.
If the key is pressed for 2 seconds, the AZ Menu (automatic acquisition / activation zone menu) is opened.
During the menu operation, the key functions as a numeric key **[9]**.

③⑩ **[TRAILS / 0] (Radar trails / 0) key**

Use this key to switch the length of the radar trail period.
If the key is pressed for 2 seconds, the RADAR Trails setting menu is opened.
If this key is pressed for 5 seconds, the radar trail is cleared.
During the menu operation, the key functions as a numeric key **[0]**.

③① **[RADAR Menu] (Main menu) key**

Use this key to open the Main Menu.

③② **[TT Menu] key**

Use this key to open the TT Menu (target tracking menu).

③③ / ③④ **[RANGE + / -] key**

Press the **[+]** key to increase the observation range and the **[-]** key to reduce the observation range.

③⑤ / ③⑥ [VRM 1 / 2] (Variable Range Marker 1 / 2) key

Use this key to set the display of VRM1 / VRM2 to On / Off and acquire the operation right.

③⑦ [ENT] (Enter) key

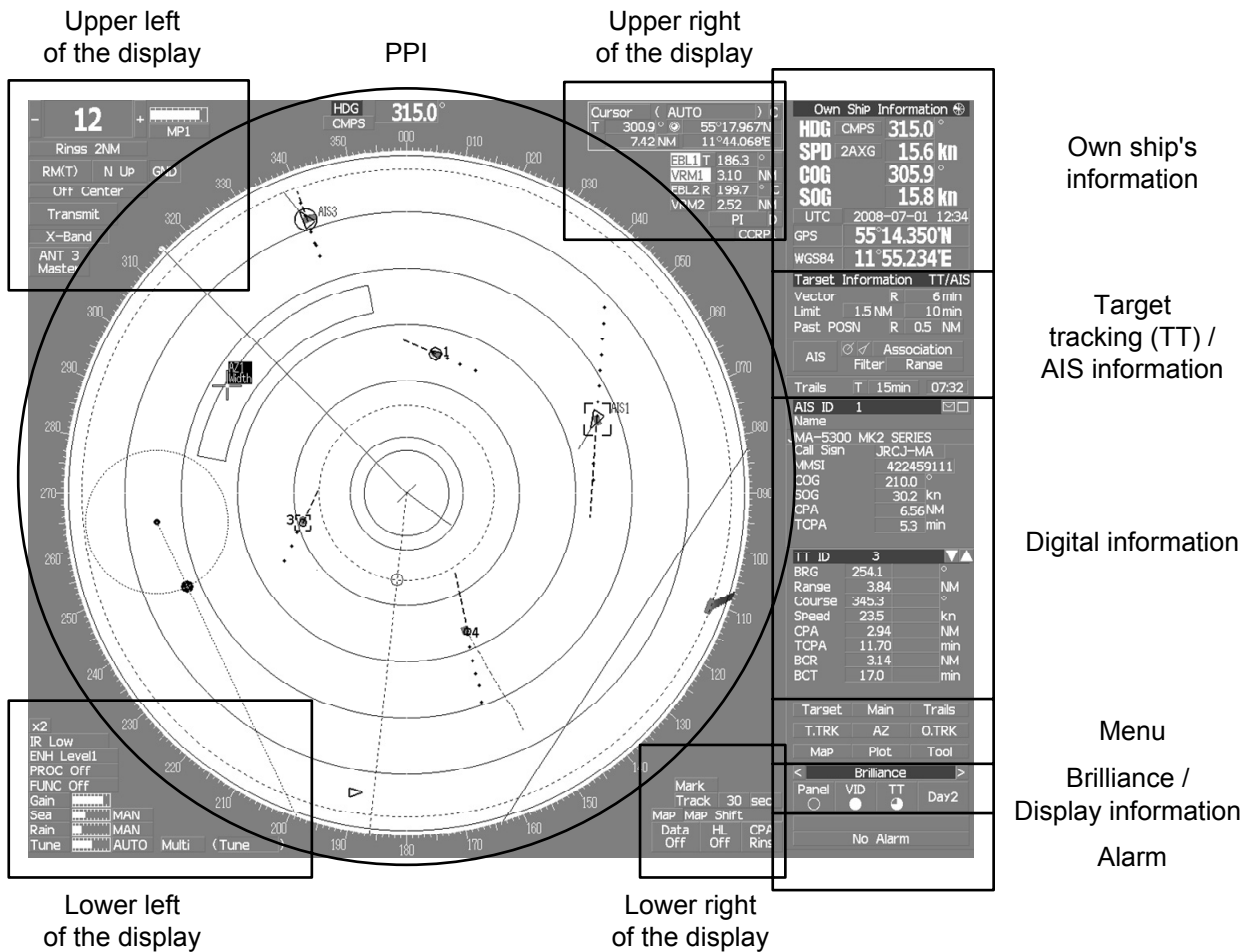
Use this key to confirm menu selection and input of numeric values.
This key is equivalent to the clicking of the left button of the track ball.

③⑧ [CLR / INFO] (Clear / information) key

Use this key to cancel menu selection or numeric value input.
This key is equivalent to the clicking of the right button of the track ball.

2.3 FUNCTIONS OF SOFTWARE BUTTONS

In this radar, the frequently used functions can be directly set from the screen without opening the menu by using the software buttons on the screen for quick handling. The screen is divided into a number of areas and each area is named.

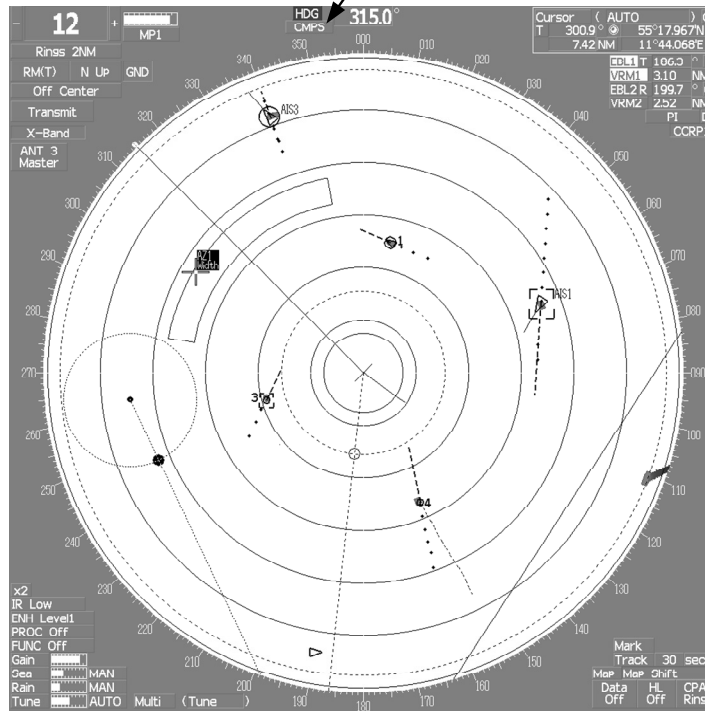


The name of each button is described from the next page. The function can be used by pressing (clicking) the [ENT] key while setting the arrow cursor on the button position.

PPI

2

① Heading device switching

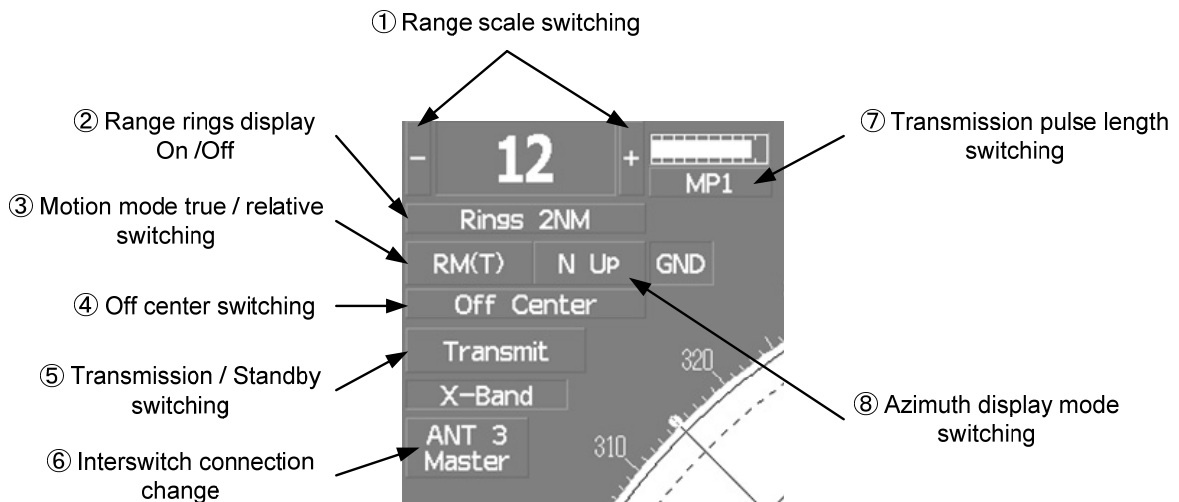


① : Heading device switching

This function switches the heading device.

GYRO (GYRO) ⇒ **CMPS** (Electronic compass) ⇒ **G.COM** (GPS compass) ⇒ **GYRO**
 If the selected heading device is not connected to the equipment, an alarm is issued.

Upper left of the 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

, .

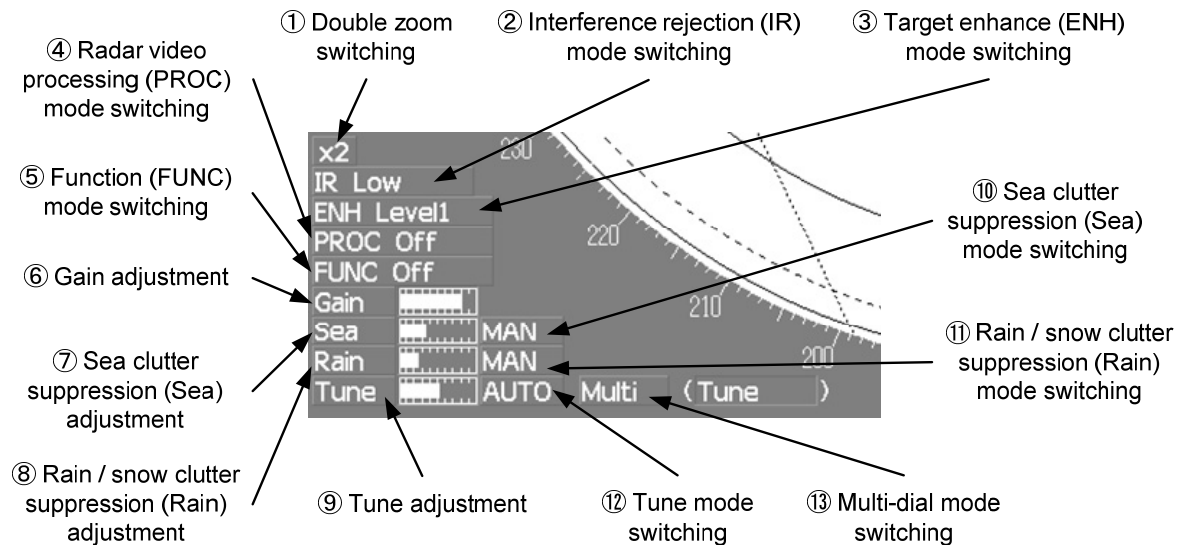
⑧ : Azimuth display mode switching

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.

Lower left of the 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 CORREL ⇒ 4Scan CORREL ⇒ 5Scan CORREL ⇒
⇒ 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**

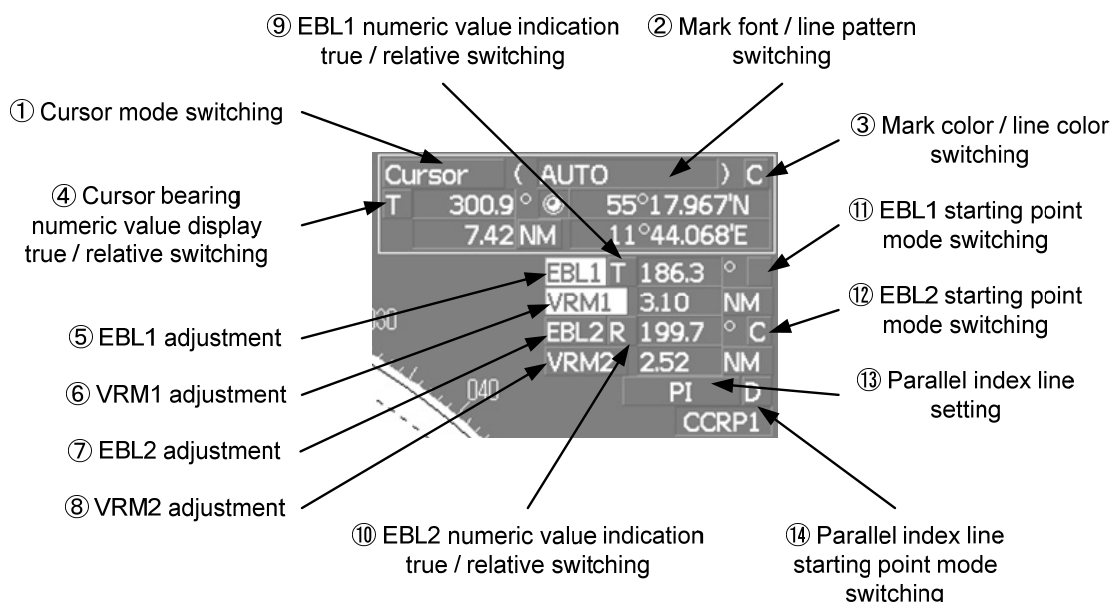
The function that is registered in the multi-dial is switched whenever the button is clicked.

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.

Upper right of the 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 : Mark font / line pattern switching

This function switches a mark font / 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 (true bearing) / (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 (true bearing) / (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.

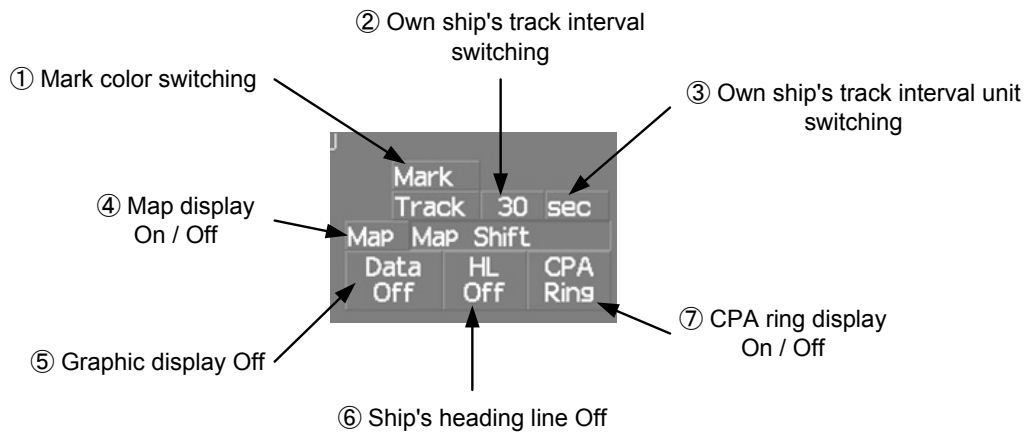
If this button is clicked, the operation right is acquired and the menu is opened. After setting, determine the setting by pressing the [ENT] key.

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.

Lower right of the 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.

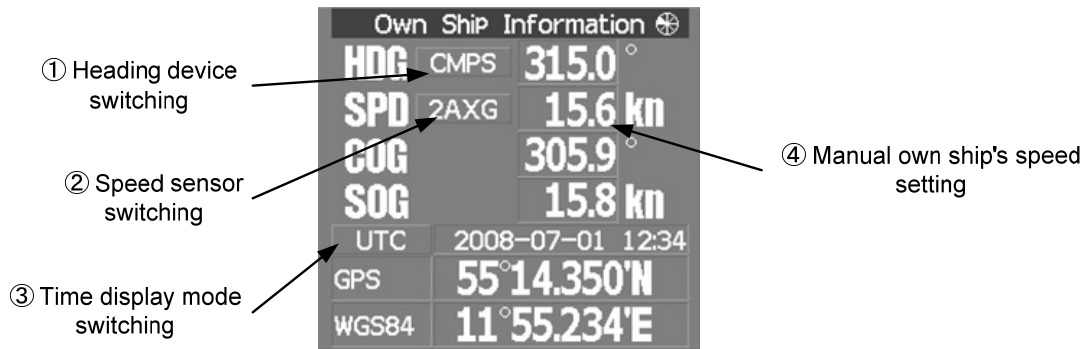
⑥ : Ship's heading line Off

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.

Own ship's information



① : Heading device switching

The heading device is switched whenever this button is clicked.

⇒ (Electronic compass) ⇒ (GPS compass) ⇒

When the selected heading device is not connected to the equipment, an alarm is issued.

② : Speed sensor switching

The speed sensor is switched whenever the button is clicked.

(Manual) ⇒ (Single-axis water log) ⇒ (Dual-axis water log)
⇒ (Dual-axis ground log) ⇒ ⇒

When the selected speed device is not connected to the equipment, an alarm is issued.

③ : Time display mode switching

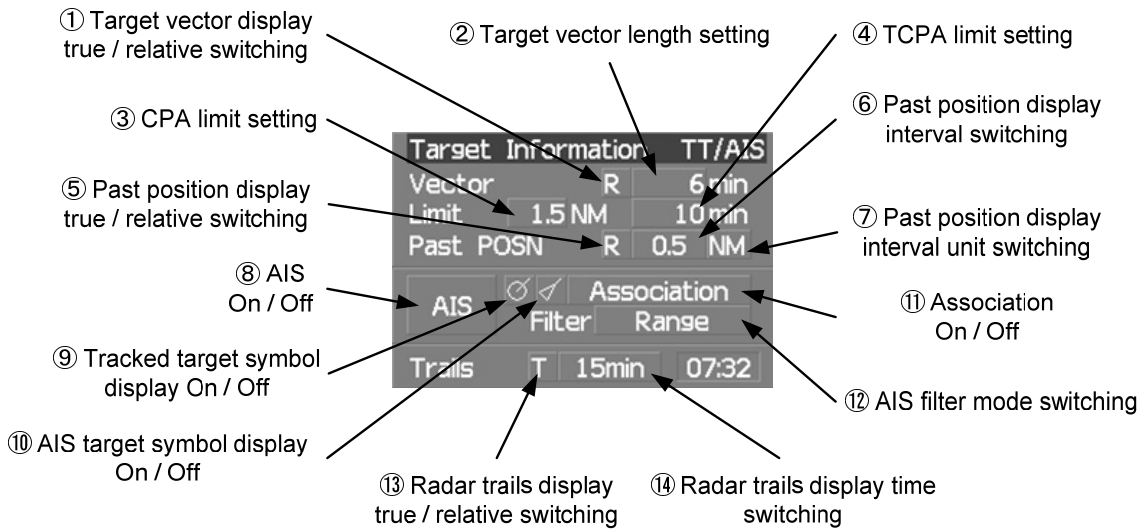
The time display mode (universal time clock) / (local mean time) is switched whenever this button is clicked.

④ : Manual own ship's speed setting

When selection of the speed sensor is set to , 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 .

Target tracking (TT) / AIS information



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.

Range ⇒ Sector ⇒ Zone ⇒ Range

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.

Digital information: AIS target information

Simple display item

The screenshot shows a list of AIS target information for target ID 1. The information is displayed in a list format with various parameters and their values. Two callouts point to specific features: ① points to a button in the top right corner of the target information block, and ② points to a message icon in the same area.

AIS ID	1	✉
Name	JMA-5300 MK2 SERIES	
Call Sign	JRCJ-MA	
MMSI	422459111	
COG	210.0 °	
SOG	30.2 kn	
CPA	6.64 NM	
TCPA	-7.1 min	
BRG	130.0 °	
Range	7.99 NM	
HDG	210.0 °	
ROT	0.00 °/min	
POSN	55°10.999'N	
<10m	12°01.199'E	
Destination	JAPAN RADIO CO.,LTD	
NAV Status	Under Way Using Engine(0)	

① : Detail / simple display switching

This function switches the display mode to detail / simple display when AIS target information is displayed.

② : Unread message display

When there is an unread message from the AIS target that is displayed, the message is displayed. If this button is clicked, the message is displayed.

Digital information: Tracked target information

TT ID	2	1	▼▲
BRG	247.9	157.1	°
Range	3.97	5.98	NM
Course	337.0	327.3	°
Speed	19.0	31.9	kn
CPA	2.27	1.20	NM
TCPA	17.55	18.43	min
BCR	2.27		NM
BCT	17.2		min

① Tracked target
numeric value indication
scroll

2

① : Tracked target numeric value indication scroll

This function scrolls the target numbers that are indicated in the tracked target information.

Digital information: Navigation information

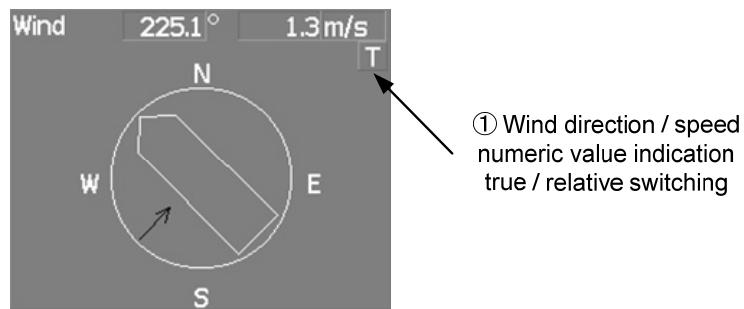
Navigation INFO	
Depth	136.2 m
TEMP	23.6 °C
Current	213.2 °
	2.4 kn
Wind	72.9 °
	T 3.0 m/s
DEST	087.7 ° 95.6 NM
	363.2 min

① Wind direction / speed
numeric value indication
true / relative switching

① : Wind direction / speed numeric value indication true / relative switching

The wind direction / speed numeric value indication is switched to T (true) / R (relative) whenever this button is clicked.

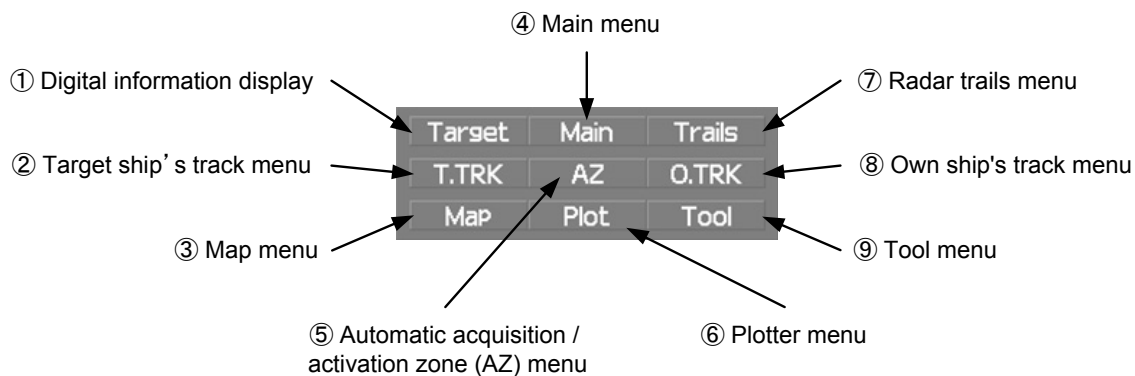
Digital information: Wind direction / speed



① : Wind direction / speed numeric value indication true / relative switching

The wind direction / speed numeric value indication is switched to **T** (true) / **R** (relative) whenever this button is clicked.

Menu



① : Digital information display

If this button is clicked while the menu screen is open, the menu is closed and control returns to the digital information display.
This function switches between the tracked target / AIS target display and navigation information or the course bar, and so on.

② : Target ship's track menu

If this button is clicked, the Target Track Setting menu is opened.

③ : Map menu

If the button is clicked, the Map Setting menu is opened.

④ : Main menu

If this button is clicked, the Main Menu is opened.

⑤ : Automatic acquisition / activation zone (AZ) menu

If this button is clicked, the AZ Menu is opened.

⑥ : **Plotter menu**

If this button is clicked, the Plot Menu is opened.

⑦ : **Radar trails menu**

If this button is clicked, the RADAR Trails Setting menu is opened.

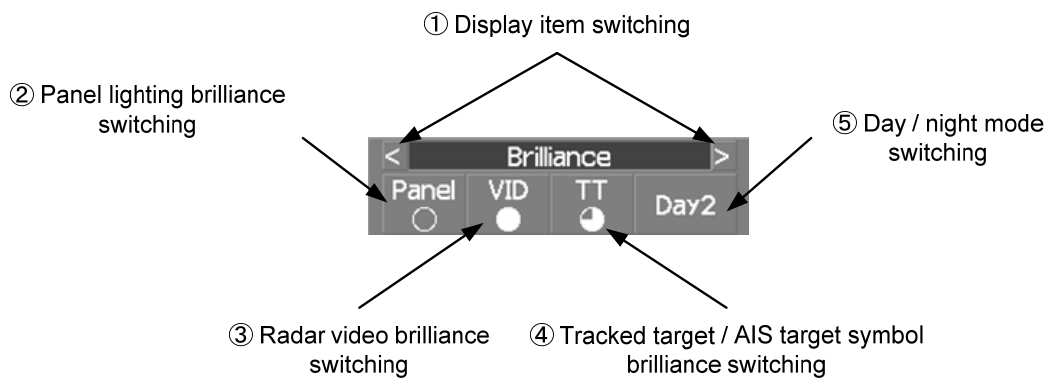
⑧ : **Own ship's track menu**

If this button is clicked, the Own Track Menu is opened.

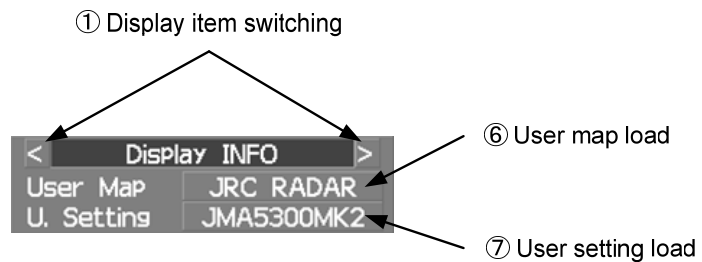
⑨ : **Tool menu**

If this button is clicked, the Tool Menu is opened.

Brilliance

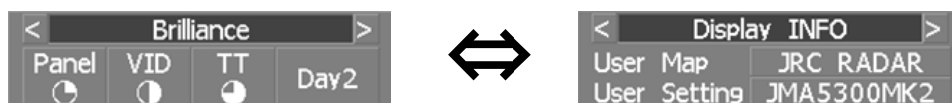


Display information



① : **Display item switching**

The brilliance adjustment screen and display information setting screen interchange whenever this button is clicked.



② : Panel lighting brilliance switching

This function enables the setting of the brilliance of the lighting of the control panel.
The brilliance changes whenever this button is clicked. Five levels of settings are available.

③ : Radar video brilliance switching

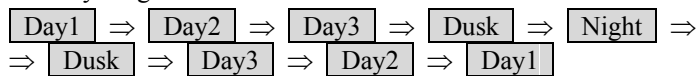
Adjust the brightness of the radar video (echo).
The brilliance changes whenever this button is clicked. Four levels of settings are available.

④ : Tracked target / AIS target symbol brilliance switching

Use this function to adjust the brilliance of the tracked target / AIS target symbol.
The brilliance changes whenever this button is clicked. Five levels of settings are available.

⑤ : Day / night mode switching

The day / night mode is switched whenever this button is clicked.



⑥ : User map load

If this button is clicked, the user created map read menu is opened.

⑦ : User setting load

If this button is clicked, the user setting read menu is opened.

Alarm

① Alarm acknowledgement



② Alarm log display

① : Alarm acknowledgment

If this button is clicked, the buzzer sound of the alarm that is currently issued is stopped and the alarm lamp stops blinking. If multiple alarms are issued, the next alarm to be acknowledged is displayed.
If the button is clicked, the alarm displayed on the top is acknowledged.
The alarms that are currently issued are displayed at the bottom one by one.

② : Alarm log display

If this button is clicked, the alarm log is displayed.

SECTION 3

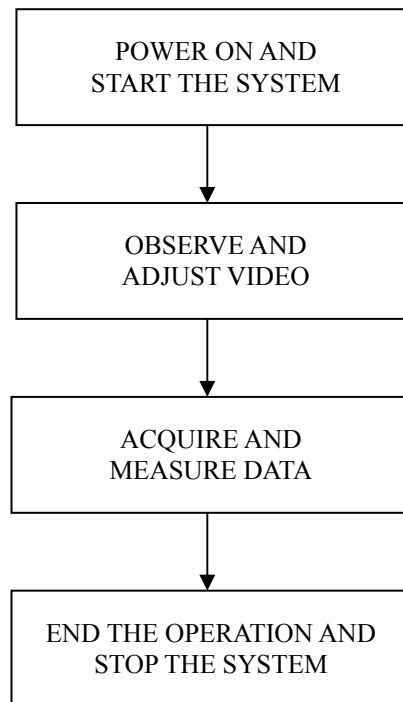
BASIC OPERATION

3.1	OPERATION FLOW	3-1
3.2	OBSERVE AND ADJUST VIDEO	3-5
3.3	OPERATION PROCEDURES	3-12
3.4	GENERAL RADAR OPERATION	3-22
3.5	USE OWN SHIP'S TRACK DATA	3-50
3.6	DISPLAY USER MAP	3-55
3.7	USE ROUTE FUNCTION	3-79
3.8	APPLIED OPERATIONS	3-81
3.9	USE FUNCTION KEY [FUNC]	3-96
3.10	USE USER SETTING	3-102
3.11	USING CARD	3-104
3.12	DISPLAY SIMPLE CHART	3-110
3.13	CAPTURE SCREEN TO CARD	3-123
3.14	RECEIVE PORT SETTING	3-128

3.1 OPERATION FLOW

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.

Procedures

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

The system is turned on, and the preheating time is displayed.
Preheat is indicated upper left of the display.

- 3 Wait until the preheating time is over.

When the preheating time is over, the preheating time screen disappears, and Preheat upper left of the display changes to Standby.

- 4 Press the [TX / PRF] key.

The radar will start transmission and the antenna will start rotating.
Standby upper left of the display changes to Transmit.

Note: The radar does not start transmission if you Press the [TX / PRF] key while Preheat is indicated.

3.1.2 Observe and Adjust Video

Procedures

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

Refer to
[GAIN/PL]→3-7P
[AUTO-SEA]→3-7P
[AUTO-RAIN]→3-9P
for how to use each dial.

For how to adjust video, see Chapter 3.2.

3.1.3 Acquire and Measure Data

For details on how to acquire data and measure, see 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 set scanner position to 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, see the section 7.1.9.

3.1.5 End the Operation and Stop the System

Exit**1 Press the [STBY] key.**

The radar will stop transmission and the antenna will stop rotating.
Transmit upper left of the 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.

3

3.2 OBSERVE AND ADJUST VIDEO

3.2.1 Adjust Monitor Brilliance [BRILL]

Procedures

- 1 Obtain the best-to-see display with optimum brilliance by turning the [BRILL] dial at the lower right of the LCD monitor.**

Turning the [BRILL] dial clockwise increases the brilliance of the entire display. Conversely, turning the [BRILL] dial 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.

3.2.2 Change Observation Range [RANGE + / -]

Procedures

- 1 When increasing the observation range, press the [RANGE+] key.**

Increasing the observation range will enable a wider range to be observed. However, a video image is small and the ability to detect targets near own ship decreases. Therefore, when observing the vicinity of own ship, use the smaller observation range.

- 2 When decreasing the observation range, press the [RANGE-] key.**

Decreasing the observation range will enable the vicinity of own ship to be enlarged. However, caution must be taken because video images of the area beyond the observation range cannot be displayed.

3.2.3 Tune



Normally, use the automatic tune mode.

Use the manual tune mode only when best tuning is not possible in the automatic tune mode due to deterioration of magnetron.

3

This radar system provides the automatic tune mode and the manual tune mode. The automatic tune mode automatically adjusts the tuning of the transmitting frequency and the receiving frequency, and the manual tune mode enables tuning to be adjusted by using the dial located on the operation unit. The tune mode currently being used is displayed in the tune mode switching (lower left of the display ⑫ on page 2-18).

When using the automatic tune mode

Procedures

- 1 Put the cursor on the tune mode switching (lower left of the display ⑫ on page 2-18) and press the [ENT] key.

The automatic tune mode is selected and **AUTO** is displayed in the tune mode field.

Tune adjustment is automatically conducted. Tune is adjusted at the start of transmission, at the change of the range or pulse length. Tune adjustment is completed within several seconds.

When using the manual tune mode

Procedures

- 1 Put the cursor on the tune mode switching (lower left of the display ⑫ on page 2-18) and press the [ENT] key to set the manual tune mode.

The automatic tune mode is cancelled, and **MAN** is displayed in the tune mode field.

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

Tune is displayed in the multi-dial mode (lower left of the display on page 2-3).

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

Make adjustments so that the tuning indication (upper left of the display on page 2-2) indicates the maximum.

3.2.4 Adjust Gain [GAIN / PL]

CAUTION



If the gain is too high, unnecessary signals including receiver noise and false video increase resulting in reduction of visibility of targets.

On the contrary, if the gain is too low, targets including ships and dangerous objects may not be clearly indicated.

Procedures

- 1 Adjust noise of the display by turning the [GAIN / PL] dial until targets can be easily observed.

Turning [GAIN / PL] dial clockwise increases gain.

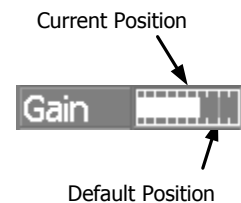
Turning [GAIN / PL] dial counterclockwise decreases gain.

By increasing receiving gain, the range to observe radar video is widened.

To observe densely crowded targets or short-range targets, reducing the receiving gain will enable the targets to be easily observed.

It is recommended to restore the setting to the factory default, if you lost the appropriate settings. The factory default level is shown on the bar chart as a green line.

The factory default level is assigned by every function mode. See the Section 3.9 “USE FUNCTION KEY [FUNC]”.



3.2.5 Suppress Sea Clutter [AUTO-SEA]

CAUTION



When using the sea clutter suppression 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 sea clutter suppression function, make sure to choose the most appropriate image noise suppression level.

3

Using the manual sea clutter suppression mode

Procedures

- 1 Adjust the sea clutter returns of the display by turning the [AUTO-SEA] dial until targets can be easily observed.

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

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

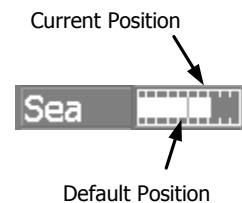
The sea clutter suppression function suppresses sea clutter returns by decreasing the receiving gain on a short range.

Turning the [AUTO-SEA] dial 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.

It is recommended to restore the setting to the factory default, if you lost the appropriate settings. The factory default level is shown on the bar chart as a green line.

The factory default level is assigned by every function mode. See the Section 3.9 “USE FUNCTION KEY [FUNC]”.



Using the automatic sea clutter suppression mode

The sea clutter suppression in accordance with the intensity of sea clutter is possible. Use this mode when the sea clutter's intensity differs according to directional orientation.

Procedures

1 Press the [AUTO-SEA] dial.

The automatic sea clutter suppression mode is selected, and **AUTO** is displayed in sea clutter suppression (Sea) mode switching (lower left of the display ⑩ on page 2-18).

2 Make adjustments by turning the [AUTO-SEA] dial.

Even when the automatic sea clutter suppression mode is selected, turning the [AUTO-SEA] dial can make fine adjustments manually.

Note: When the automatic sea clutter suppression mode is selected, the automatic rain/snow clutter suppression mode is switched to the manual mode.
To select both the sea clutter suppression function and the rain/snow clutter suppression function in the automatic mode, use the automatic rain/snow clutter suppression mode.

Cancellation

1 Press the [AUTO-SEA] dial.

The automatic sea clutter suppression mode is cancelled, and **MAN** is displayed in the sea clutter suppression (Sea) mode field.

3.2.6 Suppress Rain / Snow Clutter [AUTO-RAIN]

CAUTION



When using the rain / snow clutter suppression 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 rain / snow clutter suppression function, make sure to choose the most appropriate image noise suppression level.

3

Using the manual rain / snow clutter suppression mode

Procedures

- 1 Adjust the rain / snow clutter returns of the display by turning the [AUTO-RAIN] dial until targets can be easily observed.

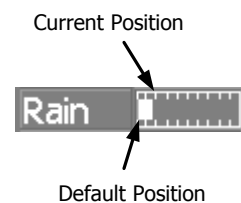
Turning [AUTO-RAIN] dial clockwise suppresses rain / snow clutter returns.

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

When the [AUTO-RAIN] dial 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 of the 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] dial is used with the [AUTO-SEA] dial. In general, turn the [AUTO-RAIN] dial fully to the left.

It is recommended to restore the setting to the factory default, if you lost the appropriate settings. The factory default level is shown on the bar chart as a green line.

The factory default level is assigned by every function mode. See the Section 3.9 “USE FUNCTION KEY [FUNC]”.



Using the automatic rain / snow clutter suppression mode

The rain / snow clutter suppression in accordance with the intensity of rain / snow clutter is possible. Use this mode when the rain / snow clutter's intensity differs according to directional orientation.

Procedures

1 Press the [AUTO-RAIN] dial.

The automatic rain / snow clutter suppression mode is selected, and **AUTO** is displayed in the sea clutter suppression (Sea) mode switching and the rain / snow clutter suppression (Rain) mode switching (lower left on the display ⑩ and ⑪ on page 2-18)

2 Make adjustments by turning the [AUTO-RAIN] dial and the [AUTO-SEA] dial.

Even when the automatic rain / snow clutter suppression mode is selected, turning the [AUTO-RAIN] dial and the [AUTO-SEA] dial can make fine adjustments manually.

Note: When the automatic rain / snow clutter suppression mode is selected, the automatic sea clutter suppression mode is also activated.
It is not possible to set only the rain / snow clutter suppression function to the automatic mode.

Cancellation

1 Press the [RAIN] dial.

The automatic rain / snow clutter suppression mode is cancelled, and **AUTO** is changed to **MAN** in the sea clutter suppression (Sea) mode field and the rain / snow clutter suppression (Rain) mode field.

3.2.7 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 key for each alarm indication.) The alarm stops buzzing, but the alarm indication does not disappear.



Procedures

1 Press the [ALARM ACK] key.

The alarm will stop buzzing.

3.3 OPERATION PROCEDURES

3.3.1 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, bearing, and latitude / longitude are digitally indicated in the cursor bearing, range, latitude, and longitude (upper right of the display on page 2-3).
- 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) Use the cross cursor mark to designate a target in the target tracking (TT) function and the AIS display function.
- 5) Use the cross cursor mark to adjust EBL, VRM, automatic acquisition and activation zone (AZ), radar alarm zone (RA), parallel index line (PI), and AIS filter.

Operation outside Radar Video PPI

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



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

* The EBL / VRM dial is available for operating the cursor mark. Pressing the EBL dial for 2 seconds can perform switching to the trackball operation. For details, refer to Section 3.8.4.

3.3.2 Operate Software Buttons

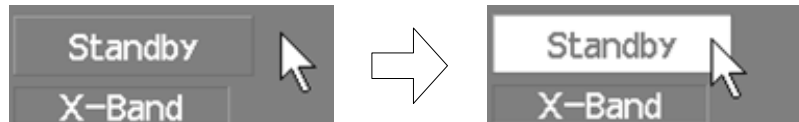
Software buttons are provided of the display so as to easily switch functions without operating menu items.

For software buttons that can be operated and their locations, see Chapter 2.

Procedures

1 Put the pointer on the software button of the display.

The software button indicated by the cursor will be shown in reverse video, which indicates that the button is specified.



2 Press the [ENT] key.

The operating state changes according to the function of the software button.

On / off settings

Each time the [ENT] key is pressed, the operating state switches as follows:

On ⇒ Off ⇒ On ⇒ Off

Multiple settings

For example, each time the [ENT] key is pressed, the operating state switches as follows:

IR Off ⇒ IR Low ⇒ IR Middle ⇒ IR High ⇒ IR Off

3.3.3 Basic Menu Operation

To open the menu:

Put the cursor on main menu **Main** (Menu ④ on page 2-27) and press the **[ENT]** key, and the main menu will open. Alternatively, press the **[RADAR MENU]** key.
By putting the cursor on **Target**, **Map**, or **AZ** adjacent to **Main** and pressing the **[ENT]** key, the menu exclusive for the function will open.
For the arrangement of software buttons, see Chapter 2.

3

To close the menu:

Put the cursor on digital information display **Target** (Menu ① on page 2-27) and press the **[ENT]** key, and the menu will close and the digital information display screen will appear.
Alternatively, press the **[0]** key until the menu will close.

To move to a lower level of the menu:

The menu is in hierarchical structure. Put the cursor on the desired menu item and press the **[ENT]** key, and control will move to the lower level. Alternatively, Press numeric keys corresponding to the desired menu item number, and the **[>]** mark will appear at the right end of a menu item having a lower level.

To move to a higher level of the menu:

Put the cursor on **0. Exit** located lower of the menu when the menu is open. Control will return to the higher level. Alternatively, press the **[0]** key.

To determine an item:

Put the cursor on the menu item you want to change and press the **[ENT]** key. The selected item will be displayed. Alternatively, Press numeric keys corresponding to the desired item number.

To determine the selected item:

Put the cursor on the desired item and then press the **[ENT]** key. The selected item will be determined. Alternatively, Press numeric keys corresponding to the selected item number.
If you do not change the setting of the selected item, press the **[CLR / INFO]** key. The selected item will be closed without changing the settings.

Example of menu display

The image shows a screenshot of a 'Process Setting' menu. The menu items are listed as follows:

- 1. Video Latitude (Selected item) Normal
- 2. Video Latitude (Present state) Narrow
- 3. AU13. Wide
- 4. Super Wide
- 4. Process Switch (Cursor) Off
- 5. 2nd Process Mode (Cursor) Remain
- 6. Process Switch Range (Cursor) 3.0NM
- 7. Fast Target Detection (Cursor) Off
- 8. User Function Settings >
- 9. SART (Cursor) Off
- 0. Exit

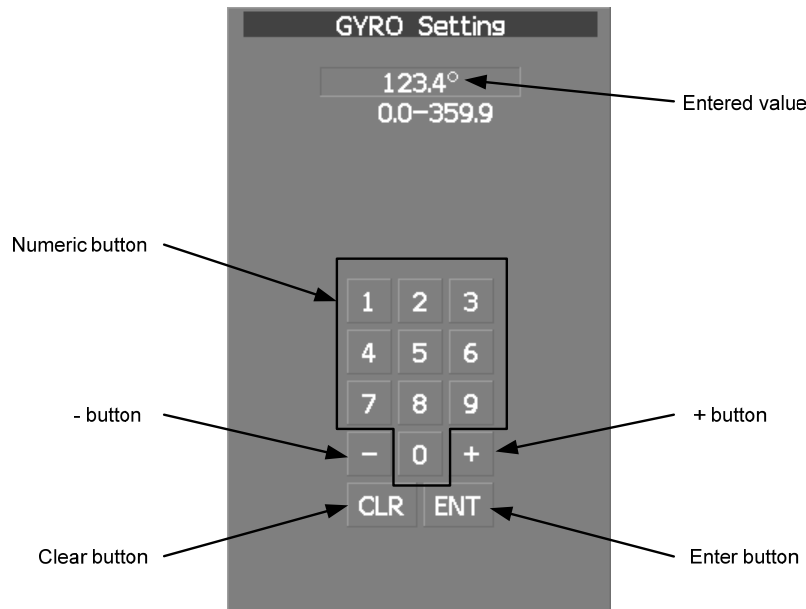
Annotations and instructions:

- Item:** Points to the menu items.
- Press numeric keys corresponding to the desired item number to display the selected item.** Points to item 1.
- Press numeric keys corresponding to the desired item number to select a set value.** Points to item 2.
- Software button:** Points to the right arrow on item 8.
- Press the [0] key to move to the higher level.** Points to item 0.
- Selected item:** Points to the 'Normal' value for item 1.
- Present state:** Points to the 'Narrow' value for item 2.
- Cursor:** Points to the white arrow on item 2.
- When the [>] mark appears at the right end of a menu item, press numeric keys corresponding to the selected item number to move to a lower level.** Points to the right arrow on item 8.

3.3.4 Operation on Numeric Value, Latitude / Longitude and Character Input menu

When a numeric value, latitude / longitude, or character must be entered during operation, the input screen will appear. Enter a numeric value, latitude / longitude, or character according to the procedures below.

Numeric value input menu



3

Directly entering a numeric value

Procedures

- 1 On the numeric value input menu, sequentially press numeric keys to enter a desired numeric value.

For example, when entering 123.4 ° for a bearing value, sequentially press the keys as follows:

[1] → [2] → [3] → [.]

- 2 Make sure that the entered value is correct, put the cursor on **[ENT]**, and then press the **[ENT]** key.

The set value is reflected to the operating state.

- 3 To cancel input, put the cursor on **[CLR]**, and then press the **[ENT]** key.

The numeric value input menu will close without reflecting the set value to the operating state.

Increasing or decreasing a numeric value

Procedures

- 1 On the numeric value input menu, put the cursor on **+** or **-**, and then press the **[ENT]** key to increase or decrease numeric value so as to change to the desired numeric value.

For example, to change bearing value of 123.0 ° to 123.4 °, put the cursor sequentially on **+** located on the software numeric value input menu, and then press the **[ENT]** key four times.

* Turning the **[MULTI]** dial will conduct the same operation.

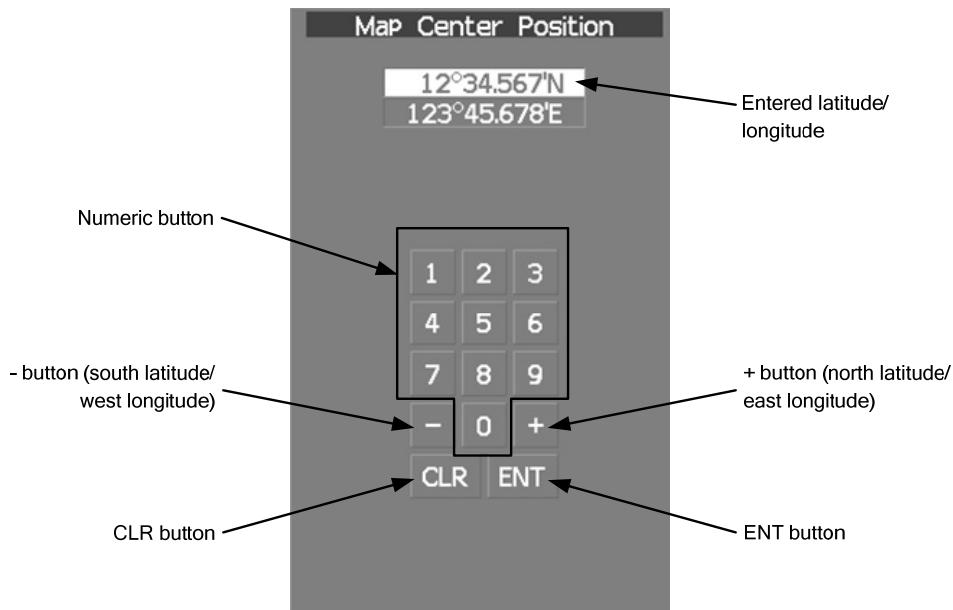
- 2 Make sure that the entered value is correct, put the cursor on **ENT**, and then press the **[ENT]** key.

The set value is reflected to the operating state.

- 3 To cancel input, put the cursor on **CLR**, and then press the **[ENT]** key.

The numeric value input menu will close without reflecting the set value to the operating state.

Latitude / longitude input screen



3

Entering latitude / longitude

Procedures

- 1 On the latitude / longitude input menu, sequentially press numeric keys to enter latitude (XX°XX. XXX').

For example, to enter 12°34.567'N, sequentially press numeric keys as follows.
[1] → [2] → [3] → [4] → [5] → [6] → [7]

- 2 To make change between north latitude and south latitude, use and .

North latitude: Put the cursor on and then press the [ENT] key.

South latitude: Put the cursor on and then press the [ENT] key.

- 3 Put the cursor on and then press the [ENT] key.

The manually entered latitude value is determined. Then, enter the longitude value.

- 4 Sequentially press numeric keys to enter longitude (XXX°XX. XXX').

- 5 To make change between east longitude and west longitude, use and .

East longitude: Put the cursor on and then press the [ENT] key.

West longitude: Put the cursor on and then press the [ENT] key.

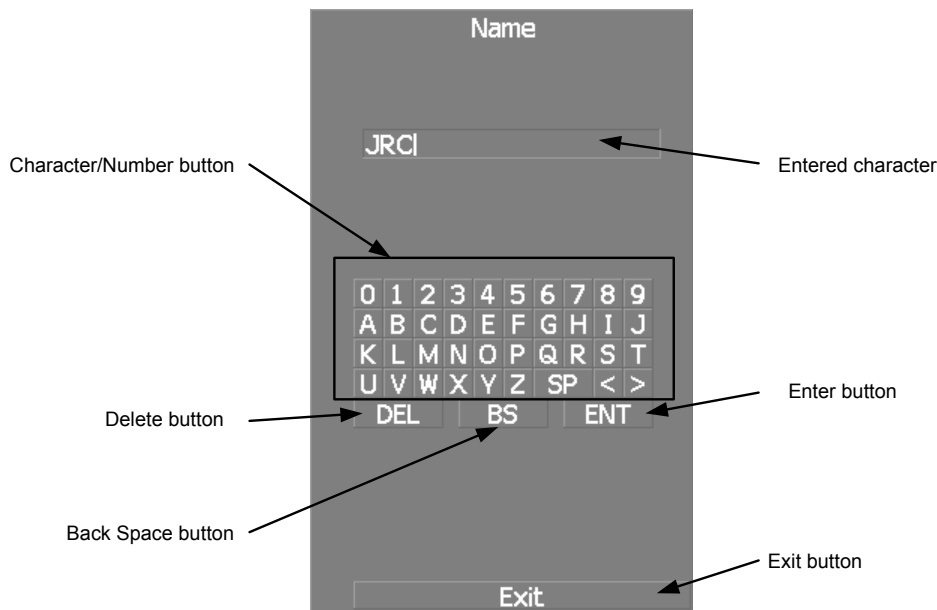
- 6 Put the cursor on and then press the [ENT] key.

The manually entered longitude value is determined.

-
- 7 To cancel input, put the cursor on **CLR** and then press the [ENT] key.

The latitude / longitude input menu will close without reflecting the set value to the operating state.

Character input screen



Entering a character

Procedures

- 1 On the character input menu, use trackball to select alphabet from A to Z, numbers from 0 to 9, or symbols (only comments for mark / line), and then press the [ENT] key to enter one character of the name to be inputted.

For example, JRC for a name, click button as follows:

J → **R** → **C**

- 2 Make sure that the entered character is correct, put the cursor on **ENT**, and then press the [ENT] key.

The character has been entered.

- 3 To cancel input, put the cursor on **Exit**, and press the [ENT] key.

The character input menu will be closed without entering the character.

3.3.5 Overview of Menu Structure

The menu structure of this radar system consists of seven frequently used function menus, one main menu, and one service man menu used for the installation settings.

Software buttons for opening those menus are displayed in the menu area.

For each menu item and structure, see the menu list in the appendix.

To prevent incorrect use, enter the special code to open the service man menu. For operating the service man menu, see Chapter 7.

Frequently used functions

Trails	Used for operating and setting the radar trails function.
T.TRK	Used for operating and setting the target track function.
AZ	Used for operating and setting the automatic acquisition / activation function.
O.TRK	Used for operating and setting the own ship track function.
Map	Used for operating and setting the map function.
Plot	Used for operating and setting the plotter function.
Tool	Used for operating and setting the navigation tool functions.

3

Main menu

Main Used for operating and setting the functions other than the above.

Service man menu

This menu is used for operation and settings when a system is installed.

It is not used during normal operation.

The special code must be entered to open the service man menu.

3.3.6 Operate Multi-Dial [MULTI]

The [MULTI] dial is provided to change the settings of parameters such as the length of radar trails. Radar operation is simplified by using the [MULTI] dial.

[1] Initial Setting (Multi Dial Setting)

Set parameters that can be operated with the multi-dial.

Procedures

- 1 Press the [MULTI] dial for 2 seconds.

The Multi Dial Setting menu will appear.

2 Press numeric keys corresponding to the desired item number.

On and off functions of the item are switched.

On : Operation is conducted by the [MULTI] dial.

Off : Operation is not conducted by the [MULTI] dial.

Items set to On can be opened by pressing the [MULTI] dial.

Item overview

Vector Length : The vector length of tracked target and activate AIS target is adjusted.

Trails Length : The radar trails length is adjusted.

TT Display No. : The target numbers of tracked target to be displayed are switched.

C-Up Angle : The course in the course up mode is adjusted.

Mark/Line Color : Mark / line colors are switched.

Manual Tune : Tune in the manual tune mode is adjusted.

III] Using Multi-dial

Procedures

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

The multi-dial modes are switched.

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

The selected item is displayed in the multi-dial mode (lower left of the display on page 2-3).

For example, when three items, 1/2/3, are set to On at the initial setting, the multi-dial modes switch as shown below every time the [MULTI] dial is pressed.

Vector ⇒ Trails ⇒ TGT No. ⇒ Vector

2 Turn the [MULTI] dial to change the setting.

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

3.4 GENERAL RADAR OPERATION

3.4.1 Interference Rejection (IR)

Interference by other radars is rejected.

3

Attention

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

Procedures

- 1 Put the cursor on interference rejection (IR) mode switching **IR** (② lower left of the display on page 2-18) and press the [ENT] key.

The interference rejection modes are switched.

IR Off ⇒ **IR Low** ⇒ **IR Middle** ⇒ **IR High** ⇒ **IR Off**

Rejection levels of the interference rejection

IR Off	: Interference rejection off
IR Low	: Interference rejection level - low
IR Middle	: Interference rejection level - middle
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.

3.4.2 Switch Transmitter Pulse Length [GAIN / PL]

Procedures

1 Press the [GAIN / PL] dial.

Values of the transmitter pulse length are switched.

Example [MP1] ⇒ [MP2] ⇒ [LP1] ⇒ [LP2] ⇒ [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 Chapter 11.

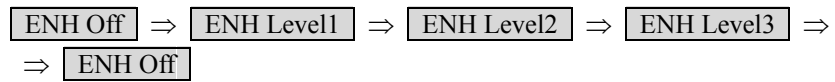
3.4.3 Target Enhance (ENH)

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

Procedures

- 1 Put the cursor on target enlarge (ENH) mode switching **ENH** (lower left of the display ③ on page 2-18) and press the [ENT] key.

The target enlargement levels are switched.



Effect of target enlargement

ENH Off	Enhance off	: Select this mode particularly when resolution is required.
ENH Level1	Enhance - small	: Select this mode in general. Radar echoes are expanded by 1 scale in all directions.
ENH Level2	Enhance - 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	Enhance - 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] dial and [AUTO-RAIN] dial to suppress sea clutter returns and rain / snow clutter returns. In general, ENH Level1 or ENH Level2 should be selected.

3.4.4 Use Video Processing (PROC)

This function reduces unnecessary noise to highlight targets.

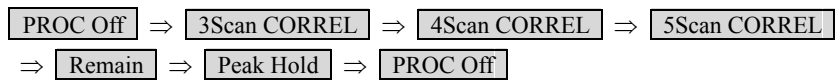
Attention

- 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.

Procedures

- 1 Put the cursor on radar video processing (PROC) mode switching **PROC** (lower left of the display ④ on page 2-18) and press the [ENT] key.

The video processing modes are switched.



Video process modes

- | | |
|--------------|---|
| PROC Off | : Select this mode in general. |
| 3Scan CORREL | : Select this mode when many rain / snow clutter returns are detected. |
| 4Scan CORREL | : Select this mode to highlight targets while suppressing sea clutter returns. |
| 5Scan CORREL | : Select this mode to detect small targets hidden by sea clutter returns. |
| Remain | : Select this mode when own ship yaws wildly. |
| Peak Hold | : Select this mode to detect small targets of which detection probability is low. |

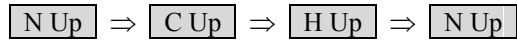
3.4.5 Switch Azimuth Display Mode [AZI MODE]

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

Procedures

- 1 Press the [AZI MODE] key.

The azimuth display modes are switched.



North-up Mode [N Up]

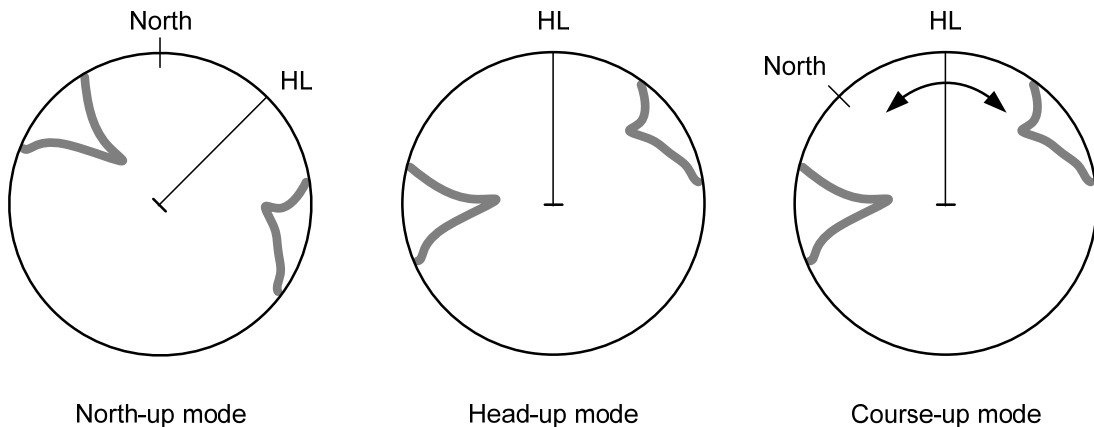
The video is displayed so that the zenith of the PPI (0° on bearing scale) points to the due north. Fixed targets do not flicker and are easily identified on the chart, and the true bearing of a target can easily be read out.

Head-up Mode [H Up]

The video is displayed so that the ship's heading line points to the zenith of the PPI (0° on bearing scale). 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 Mode [C Up]

By setting the course-up mode, own ship's course is fixed so that it is located on the zenith of the display (0° on bearing scale). 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 the [AZI MODE] key several times again to select the course-up mode so as to set a new course.



North-up mode

Head-up mode

Course-up mode

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

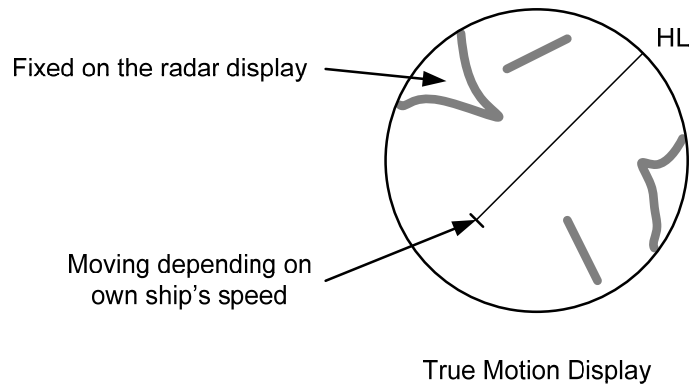
Switching Relative Motion (RM) Mode to True Motion (TM) Mode

Procedures

- 1 Press the [TM / RM] key.

[RM] ⇒ [TM]

The true motion mode will be selected. In the true motion mode, the own ship's position of the display moves depending upon its speed and course and the influence of the current. Land and other fixed targets are fixed of the display and only actually moving targets move of the 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 60% of the display radius, it is automatically reset to its initial position at about 66% 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

Procedures

- 1 Press the [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

Procedures

- 1 Press the [TM / RM] key.

[TM] ⇒ [RM] ⇒ [TM]

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

3.4.7 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. If Off Center functions set to scanner position is outside of the PPI range, when function switching display with reference to scanner position.

Note: This function is not available on the 96 NM range.

Procedures

1 Press the [OFF CENT] key.

The cursor mark will appear at the own ship's position of the display.

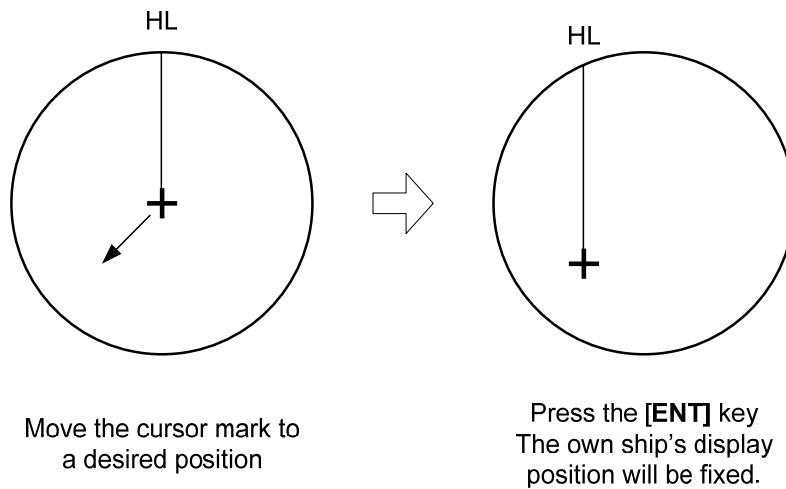
2 Move the cursor mark (CCRP display position) to a desired position by using the trackball.

While the cursor mark is moving, the own ship's display position moves following the 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 the [ENT] key.

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



Returning Own Ship's Position to the Center

Cancellation

1 Press the [OFF CENT] key for 2 seconds.

The own ship position is returned to the center of the display.

3.4.8 Display Radar Trails [TRAILS]

Other ship's 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.

Changing the length of the trail

Procedures

1 Press the [TRAILS] key.

Values of the length of the radar trail are switched.

Trails length setting: Short mode

Off ⇒ 15sec ⇒ 30sec ⇒ 1min ⇒ 3min ⇒ 6min ⇒
⇒ 10min ⇒ 15min ⇒ Off

Short:	: 15 sec, 30 sec, 1 min, 3 min, 6 min, 10 min, and 15 min
Middle:	: 30 sec, 1 min, 3 min, 6 min, 10 min, 15 min, and 30 min
Long:	: 1 min, 3 min, 6 min, 10 min, 15 min, 30 min, and 1 hr
Super Long	: 30 min, 1 hr, 2 hr, 3 hr, 4 hr, 5 hr, 6 hr, 7 hr, 8 hr, 9 hr, 10 hr, 11 hr, and 12 hr

Saved 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 radar system is start transmission, trails is start plot.

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.

Erasing Trails Data

Procedures

1 Press the [TRAILS] key for 5 seconds.

All the saved trails data will be erased. The system starts plotting trails in initial state.

If [TRAILS] key is pressed for 2 seconds, the RADAR Trails Setting menu is opened. Furthermore, data will be erased if it continues pressing.

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.

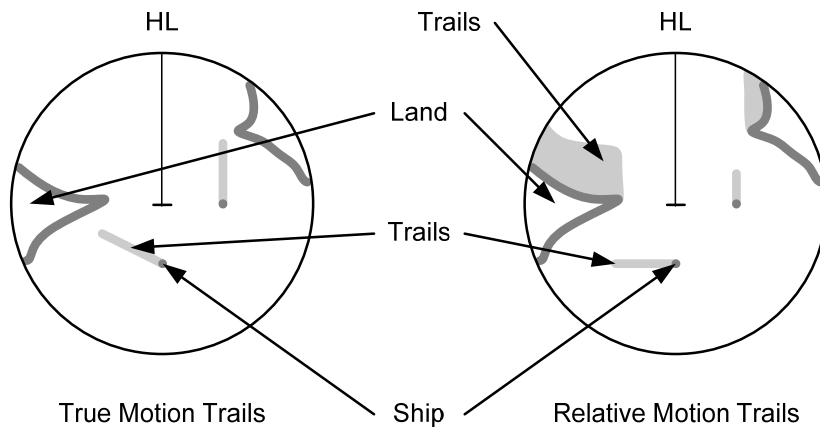
The operator can easily judge whether the target is approaching the own ship.

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.



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)
- TM reset
- Azimuth display mode change (AZI Mode)
- Center move (Off Center)
- MAP display on / off (Map)

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

Changing Motion Mode of Trails (Trails mode)

Procedures

- 1 Put the cursor on radar trails display true / relative switching (TT / AIS information ⑬ on page 2-23), and press the [ENT] key.

The trails motion modes are switched.

T ⇒ **R** ⇒ **T**

3.4.9 Erase Part of Radar Trails (Trails Erase)

A part of the radar trails can be erased.

Procedures

- 1 **Press the [TRAILS] key for 2 seconds.**

The RADAR Trails Setting menu will appear.

- 2 **Open the Trails Erase menu by performing the following menu operation.**

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

The Erase Size switches.

<input type="text" value="2x2"/>	: 2x2 pixels
<input type="text" value="4x4"/>	: 4x4 pixels
<input type="text" value="8x8"/>	: 8x8 pixels
<input type="text" value="16x16"/>	: 16x16 pixels
<input type="text" value="32x32"/>	: 32x32 pixels

- 4 **Press the [1] key.**

The Trails Erase Mode is set to .

A square cursor will appear at the location of own ship.

- 5 **Put the cursor on the position where you want to start erasing, and press the [2] key.**

The Trails Erase Start function is selected and trails start to be erased. Moving the cursor will erase that portion of the trails.

- 6 **To finish erasing the trails, press the [2] key.**

The trails erase operation is terminated.

- 7 **Press the [1] key.**

The Trails Erase Mode is set to .

3.4.10 Operate Radar Trails File (File Operations)

[I] Loading radar trails (Load RADAR Trails)

Procedures

- 1 Insert a flash memory card into the card slot.**

Flash memory card (option) is necessary.
For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Press the [TRAILS] key for 2 seconds.**

The RADAR Trails Setting menu will appear.

- 3 Open the File Operations menu by performing the following menu operation.**

8. File Operations

- 4 Press the [1] key to select a card slot.**

Slot1 and Slot2 of the Select Card Slot items are switched.

- 5 Press the [2] key.**

The list of radar trails saved in the card will be displayed.

- 6 Press numeric keys corresponding to the desired file.**

Confirmation Window will appear.

- 7 Press the [1] key.**

The selected radar trails data is loaded and displayed of the display.

[II] Saving radar trails (Save RADAR Trails)

Procedures

- 1 Insert a flash memory card into the card slot.**

Flash memory card (option) is necessary.
For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Press the [TRAILS] key for 2 seconds.**

The RADAR Trails Setting menu will appear.

- 3 Open the File Operations menu by performing the following menu operation.**

8. File Operations

- 4 Press the [1] key to select a card slot.**

Slot1 and Slot2 of the Select Card Slot items are switched.

5 Press the [3] key.

The Input File Name screen will appear.

6 Enter the file name to be saved.

Up to 15 characters can be entered.

For the input method on the character input screen, see Section 3.3.4.

After characters have been entered, Confirmation Window will appear.

7 Press the [1] key.

Radar trails data currently being displayed is saved.

[[III]] Erasing save radar trails (Erase RADAR Trails)

Procedures

1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Press the [TRAILS] key for 2 seconds.

The RADAR Trails Setting menu will appear.

3 Open the File Operations menu by performing the following menu operation.

8. File Operations

4 Press the [1] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

5 Press the [4] key.

The File Erase menu will appear.

The list of radar trails saved in the card will be displayed.

6 Press numeric keys corresponding to the desired file number.

Confirmation Window will appear.

7 Press the [1] key.

The selected radar trails data is erased and the name of the radar trails data is deleted from the list.

3.4.11 Zoom (x2)

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

Note: If the range is 0.125 NM or motion mode is true motion mode (TM), this function is not available.

Procedures

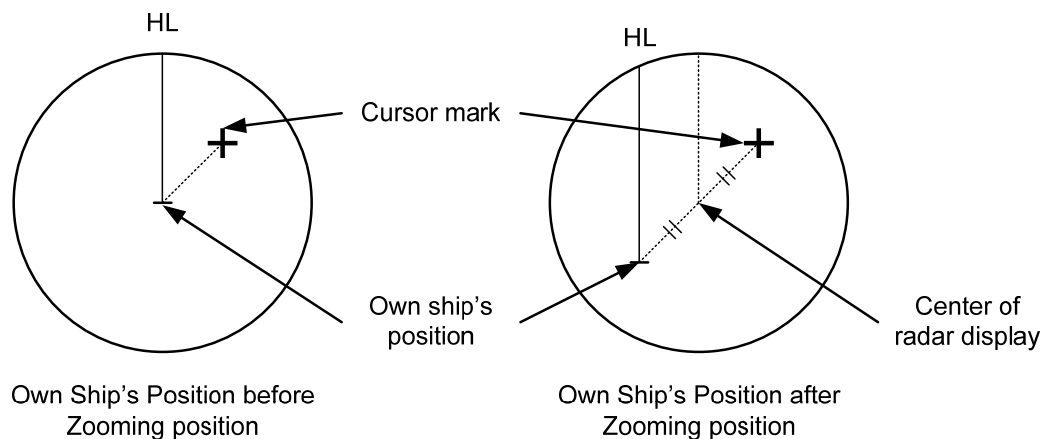
- 1 Put the cursor on double zoom switching **x2** (lower left of the display ① on page 2-18), and press the [ENT] key.

The zoom mode is selected.

- 2 Put the cursor on the position to be zoomed, and then press the [ENT] key.

The zoom is set.

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.



Cancellation

- 1 Put the cursor on double zoom switching **x2** (lower left of the display ① on page 2-18), and press the [ENT] key.

The zoom mode is cancelled.

3.4.12 Hide / Display Range Rings (RR / HL)

Procedures

- 1 Press the [RR / HL] key for 2 seconds or more.

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

3.4.13 Hide Graphics Information on Radar Display (Data Off)

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

Procedures

- 1 Put the cursor on graphic display Off **Data Off** (lower right on the display ⑤ on page 2-21), and press the [ENT] key.

While the key is pressed, graphics data other than VRM, EBL, HL, cursor mark, and range rings of the display is temporarily hidden.

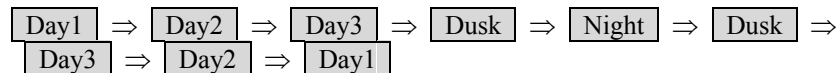
3.4.14 Switch Day / Night Mode [DAY / NIGHT]

Several combinations of the display color and brilliance according to the ambient lighting conditions are provided. The display color setting is easily changed.

Procedures

- 1 Press the [DAY / NIGHT] key.

The Day / Night modes are switched.



The current mode is displayed in the Day / Night mode switching (brilliance / Alarm ⑤ on page 2-28).

For how to set the display color and brilliance for each mode, see Section 3.8.6.

3.4.15 Adjust Operation Panel Brilliance [PANEL]

Adjust brilliance of the operation panel according to the ambient lighting conditions.

Procedures

- 1 Press the [PANEL] key.

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.

3.4.16 Set True Bearing (GYRO Setting)

When the GYRO I/F unit is used to enter a gyro signal, there is a rare case in which a true bearing value indicated by the master gyro does not match the true bearing value indicated by this radar system.

In that case, adjust the true bearing value of this system so that it matches the value indicated by the master gyro.

Procedures

- 1 Press the [AZI MODE] key for 2 seconds.

The numeric value input menu for the GYRO Setting menu will appear.

- 2 Enter the value indicated by the master gyro.

For how to input numeric data on the numeric value input menu, see Section 3.3.4.

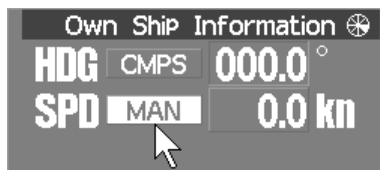
3

3.4.17 Set Own Ship Speed

Switch the own ship speed device

Procedures

- 1 Put the cursor on speed sensor switching (own ship information ② on page 2-22), and press the [ENT] key.



The speed sensor is switched whenever the button is clicked.

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

* If the single axis water log display can present the speed of the ship in other than the forward direction, the direction of movement should be indicated unambiguously.

Therefore single axis water logs cannot detect the effect of leeway.

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.

Input the own ship speed (Manual Speed)

If the ship-speed system, such as LOG, etc., connected to this radar system malfunctions, it is possible to manually enter own ship speed by the method described below to use the target tracking (TT) and true motion display functions.

Procedures

- 1 Put the cursor on speed sensor switching (own ship information ② on page 2-22), and press the [ENT] key to select manual mode .

- 2 Put the cursor on manual own ship's speed setting (own ship information ④ on page 2-22), and press the [ENT] key.

The numeric value input screen for the Manual Speed menu will appear.

- 3 Enter the value of own ship speed.

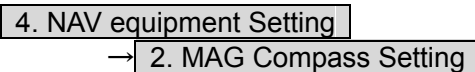
For how to input numeric data on the numeric value input screen, see Section 3.3.4.

3.4.18 Magnet Compass Correction (MAG Compass Setting)

Set the correction value, when the radar receive HDM sentence from magnet compass or the variation of HDG is NULL.

Procedures

1. Press the [RADAR MENU] key twice.
2. Open the MAG Compass Setting menu by performing the following menu operation.



2. Press the [1] key.

The Heading Correction function can be turned on / off.

: Heading correction is not conducted.

: Heading correction is conducted.

3. Press the [2] key.

The correction set numeric value input menu will appear.

4. Input the correction value.

Press the or button to select south and north for latitude or the east and west for longitude.

For how to input numeric data on the numeric value input screen, see Section 3.3.4.

3.4.19 Set Drift Correction (Set / Drift Setting)

The direction and speed of the drift are set.
This function can be used only when MAN or LOG is selected for ship-speed data.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Set / Drift Setting menu by performing the following menu operation.

4. NAV Equipment Setting
→ 3. Set/Drift Setting

- 3 Press the [1] key.

The Correction function can be turned on / off.

Off : Drift correction is not conducted.
 On : Drift correction is conducted.

- 4 Press the [2] key.

The direction set numeric value input menu will appear.

- 5 Enter the value of the drift direction (true bearing).

For how to input numeric data on the numeric value input menu, see Section 3.3.4.

- 6 Press the [3] key.

The drift speed numeric value input menu will appear.

- 7 Enter the value of the drift speed.

For how to input numeric data on the numeric value input menu, see Section 3.3.4.

3.4.20 GPS Receiver Setting (GPS Process Setting)

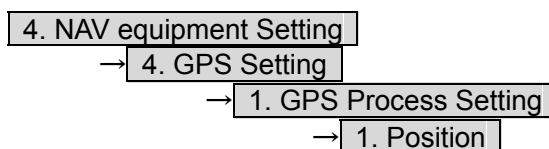
Set to a JRC's GPS receiver.

This setting is enabled when a JRC's GPS is connected to the GPS connector of processor unit.

[I] Own Ship's position setting (Position)

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the Position menu.



2. Enter the own ship's position in the numeric value input menu.

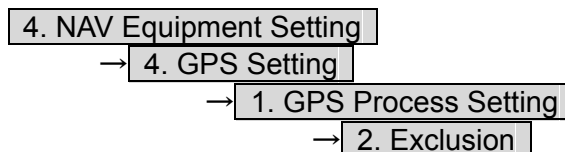
For the input method on the latitude / longitude input screen, see Section 3.3.4.

3. Press the [9] key to send the setting value to GPS receiver.

[II] Satellite exclusion setting (Exclusion)

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the Exclusion menu.



2. Enter the satellite exclusion number in the numeric value input menu.

For the input method on the numeric value input screen, see Section 3.3.4.

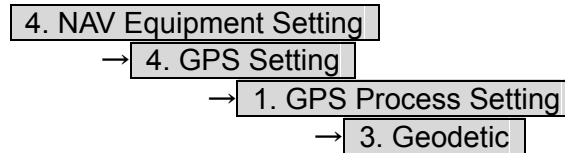
3. Press the [9] key to send the setting value to GPS receiver.



[III] Geodetic system setting (Geodetic)

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the Geodetic menu.



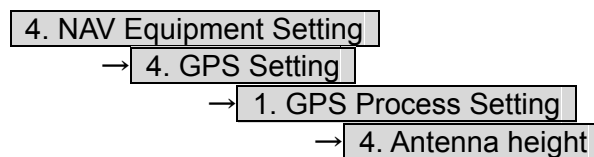
2. Enter the geodetic system number in the numeric value input menu refer to next page.
3. Press the [9] key to send the setting value to GPS receiver.

3

[IV] Antenna height setting (Antenna height)

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the Antenna Height menu.

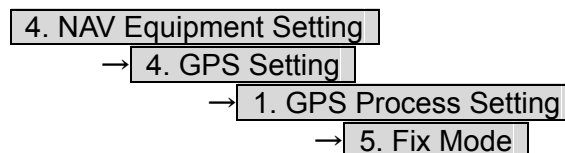


2. Enter the GPS antenna height in the numeric value input menu.
3. Press the [9] key to send the setting value to GPS receiver.

[V] Fix mode setting (Fix mode)

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the Fix Mode menu.



2. Select the fix mode.

2D	: height is measured in two dimensions
3D	: height is measured in three dimensions
AUTO	:select the proper dimension to measure a height automatically

3. Press the [9] key to send the setting value to GPS receiver.

Geodetic System List

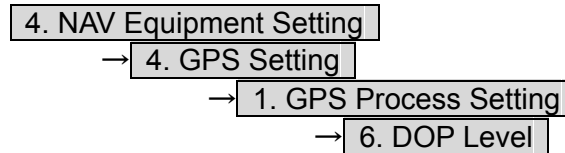
番号	名称
0	WGS-84
1	WGS-72
2	Japan
3	North American 1927(U.S)
4	North American 1927(Canada & Alaska)
5	European 1950 (Europe)
6	Australian geodetic 1966 (Australia)
7	Ordnance Survey of Great Britain (England)
8	NAD-83
9	- (No Use)
10	- (No Use)
11	ADINDAN (Ethiopia & Sudan)
12	ARC 1950 (Botswana)
13	AUSTRALIAN GEODETIC 1984 (Australia)
14	BERMUDA 1957 (Bermuda islands)
15	BOGOTA OBSERVATORY (Colombia)
16	CAMPO INCHAUSPE (Argentina)
17	CHATHAM 1971 (Chatham Islands)
18	CHUA ASTRO (Paraguay)
19	CORREGO ALEGRE (Brazil)
20	DJAKARTA (VATAVIA) (Sumatra)
21	EUROPEAN 1979 (Europe)
22	GEODETIC DATUM 1949 (New Zealand)
23	GUAM 1963 (Guam)
24	HAYFORD 1910 (Finland)
25	HJORSEY 1955 (Iceland)
26	INDIAN (India & Nepal)
27	IRELAND1965 (Ireland)
28	KERTAU 1948 (West Malaysia)
29	L.C.5 ASTRO (Cayman Brac Island)
30	LIBERIA 1964 (Liberia)
31	LUZON (Philippines)
32	MERCHICH (Morocco)
33	MINNA (Nigeria)
34	NAHRWAN (Oman)
35	NAPARIMA, BWI (Trinidad & Tobago)
36	OLD EGYPTIAN (Egypt)
37	OLD HAWAIIAN (Hawaii)
38	PICO DE LAS NIEVES (Canary Islands)
39	PROVISIONAL SOUTH AMERICAN 1956 (South America)
40	PROVISIONAL SOUTH CHILEAN 1963 (South Chile)
41	PUERTO RICO (Puerto Rico & Virgin Islands)
42	QORNOQ (South Greenland)
43	RT90 (Sweden)
44	SANTA BRAZ (San Miguel island & Santa Maria islands)
45	SOUTH AMERICAN 1969 (South America)
46	SOUTHWEST BASE (Faial & Sao Jorge & Pico & Graciosa & Terceira island)
47	TIMBALAI 1948 (Brunei & East Malaysia)
48	- (No Use)
49	- (No Use)



[VI] HDOP level setting (DOP Level)

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the DOP Level menu.



2. Enter the HDOP level in the numeric value input menu.

When the HDOP level is decrease, the accuracy is increased. But it is hard to measure the position.

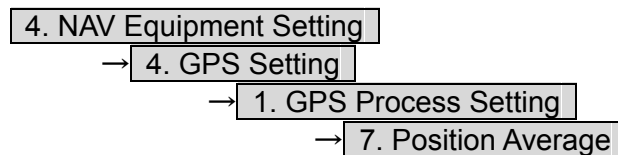
3. Press the [9] key to send the setting value to GPS receiver.

3

[VII] Position average time setting (Position Average)

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the Position Average menu.



2. Set the position average time.

The following are provided according to the ROM version of GPS receiver.

ROM Version R26.00: Select the average time

LONG (40 sec)

STANDARD (10 sec)

NONE (2 sec)

Other ROM Version: Enter the average time

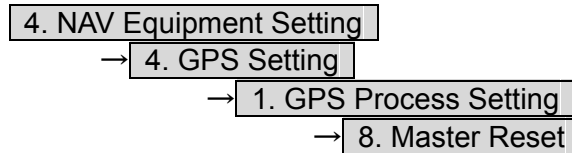
When the average time is short, the renewal speed is increased. But the stability become worse.

3. Press the [9] key to send the setting value to GPS receiver.

[VIII] Master reset

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu procedure to set the Master Reset On.



2. Press the [9] key to send the setting value while the master reset is on.

3.4.21 DGPS Receiver Setting (DGPS Setting)

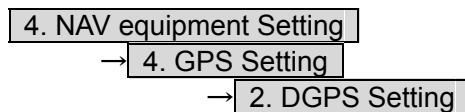
Set to a JRC's DGPS receiver.

This setting is enabled when a JRC's DGPS is connected to the GPS connector of processor unit.

[I] Beacon frequency mode setting (Mode)

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the DGPS Setting menu.



2. Press the [1] key to select the beacon frequency mode.

AUTO : The beacon frequency mod is selected automatically
 Manual : The beacon frequency mod is selected manually

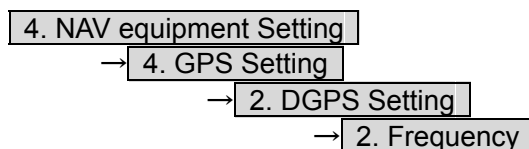
3. Press the [5] key to send the setting value to DGPS receiver.

[II] Beacon frequency setting(Frequency)

This setting is enabled when beacon frequency mode is set to manual.

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the Frequency menu.



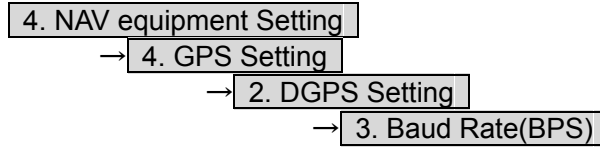
2. Enter the beacon frequency.
3. Press the [5] key to send the setting value to DGPS receiver.

[III] baud rate setting(Baud Rate(BPS))

This setting is enabled when beacon frequency mode is set to manual.

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the Baud Rate menu.



2. Select the baud rate.

Following baud rate is selectable
50 bps/100 bps/200 bps

3. Press the [5] key to send the setting value to DGPS receiver.

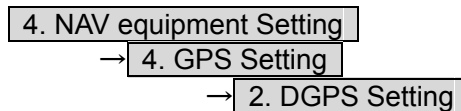
[IV] DGPS Mode setting(DGPS Mode)

When DGPS mode set to on, DGPS use the information from beacon to get reliable position.

When DGPS mode set to off, the accuracy of position is same as GPS.

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the DGPS Mode menu.



2. Press [4] key to select the DGPS Mode.

On	: DGPS use the information from beacon
Off	: DGPS don't use the information from beacon

3. Press the [5] key to send the setting value to DGPS receiver.

3.4.22 SBAS Receiver Setting (SBAS Setting)

Set to a JRC's SBAS receiver.

SBAS receiver use the information from satellite same as that of beacon which DGPS use. So the accuracy of position is higher than GPS.

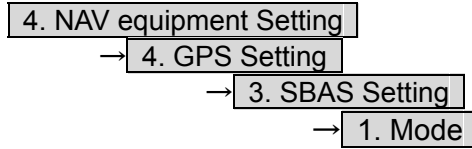
This setting is enabled when a JRC's DGPS is connected to the GPS connector of processor unit.

[I] SBAS mode setting (Mode)

Select the satellite or the beacon whose differential information is used.

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the Mode menu.



2. Select the satellite or the beacon whose differential information is used.

Beacon : SBAS receiver use the information from beacon
 SBAS : SBAS receiver use the information from SBAS satellite
 AUTO : SBAS receiver selects automatically

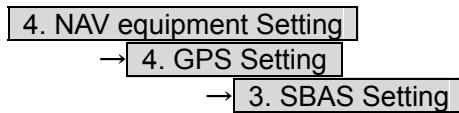
3. Press the [6] key to send the setting value to SBAS receiver.

[II] Ranging satellite setting (Ranging)

Set the SBAS satellite to be used or not to be used.

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the SBAS Setting menu.



2. Press [2] key to select the SBAS satellite to be used or not to be used.

On : SBAS satellite is used
 Off : SBAS satellite is not used

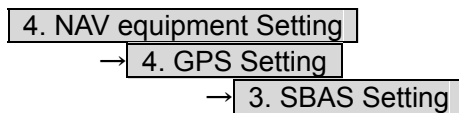
3. Press the [6] key to send the setting value to SBAS receiver.

[III] Prohibitive satellite setting (NG SBAS)

Set the information from prohibitive SBAS satellite to be used or not to be used.

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the SBAS Setting menu.



2. Press [3] key to select the information from prohibitive SBAS satellite to be used or not to be used.

On : The information from prohibitive SBAS satellite is used
 Off : The information from prohibitive SBAS satellite is not used

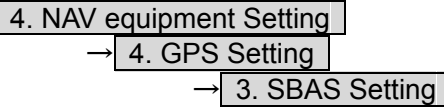
3. Press the [6] key to send the setting value to SBAS receiver.

[IV] Satellite number select mode setting (SBAS Select Mode)

Set the satellite number select mode.

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the SBAS Setting menu.



2. Press [4] key to select the satellite number select mode.

Manual : SBAS satellite number is set manually
AUTO : SBAS satellite number is set automatically

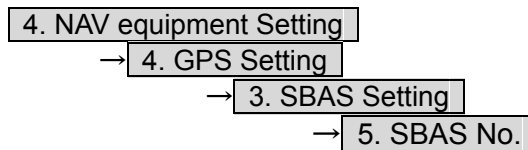
3. Press the [6] key to send the setting value to SBAS receiver.

[V] Satellite number setting (SBAS No.)

Set the satellite number.
 This setting is enabled when satellite number select mode is set to manual.

Procedures

1. Press the [RADAR MENU] key twice, and then perform the following menu open procedure to open the SBAS No. menu.



2. Enter the satellite number.

Enter the number from 120 to 138.

3. Press the [6] key to send the setting value to SBAS receiver.



3.4.23 Displaying GPS Reception Status (GPS Status)

The reception status of GPS(GPS/DGPS/WAAS) which is connected to radar processor unit is displayed.

This setting is enabled when a JRC'S GPS/DGPS/WAAS is connected to the GPS connector of processor unit.

GPS Status

DATE/TIME (UTC) 2008-08-21 10:24
 L/L 35°41.257'N 139°34.235'E
 FIX MODE 3D
 ALT 89m
 DOP LEVEL 1.0

GPS Ver.R31.06

Software version
 FIX mode
 Antenna height (If 2D is used, this is initial value)
 HDOP level (Small number is high accuracy)

SATELLITE No.	3	6	7	8	11	19
FIX	Use	---	Use	Use	Use	---
AZIMUTH	86°	87°	227°	272°	259°	58°
ELEVATE	23°	11°	28°	33°	71°	47°
LEVEL	40	39	54	51	37	0
STATUS	D	T	D	D	D	S

SATELLITE No.	20	22	25	27	28	32
FIX	Use	---	Use	Use	---	Use
AZIMUTH	170°	41°	211°	242°	316°	143°
ELEVATE	21°	9°	17°	28°	21°	30°
LEVEL	46	0	53	45	0	43
STATUS	D	S	D	D	S	D

RSSI 120

0. Exit

to Close This Menu, Click Exit Button or (0) Key.

Callouts:
 Satellite number
 Used satellite
 Azimuth of satellite
 Elevate of satellite
 Received signal level
 Status of satellite
 S: Search
 T: Tracking
 D: Data detection complete
 Received Signal Strength Indicator

Procedures

1. Press the [STBY] key.

The transmission standby state is activated.

2. Press the [RADAR MENU] key twice.

3. Open the GPS Status menu by performing the following menu operation.

4. NAV equipment Setting
 → 4. GPS Status

This window cannot be opened in the transmission state.

4. After check of the GPS status, press [0] key to close the GPS status window.

3.4.24 Set Radar Alarm (RADAR Alarm)

The radar alarm can be issued when targets have entered the radar alarm range.

Turning on / off the radar alarm (Sector RADAR Alarm)

Procedures

- 1 Press the [AZ] key for 2 seconds.

The AZ Menu will appear.

- 2 Open the Sector RADAR Alarm menu by performing the following menu operation.

4. RADAR Alarm

→ 1. Sector RADAR Alarm

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

Sector Alarm1 or Sector Alarm2 is turned on / off.

On : The radar alarm is turned on.
 Off : The radar alarm is turned off.

Change the Radar Alarm Setting (RADAR Alarm Mode)

Procedures

- 1 Press the [AZ] key for 2 seconds.

The AZ Menu will appear.

- 2 Open the Sector RADAR Alarm menu by performing the following menu operation.

4. RADAR Alarm

- 3 Press the [5] key.

Sector Alarm1 or Sector Alarm2 is turned in / out.

In : When a target has entered the zone, RADAR Alarm (In) is issued.
 Out : When a target has departed the zone, RADAR Alarm (Out) is issued.

- 4 Press the [6] key.

Selected items for Sensitivity Level will be displayed.

- 5 Press numeric keys corresponding to the Sensitivity Level.

The threshold video level increases in order of
 Level1 → Level2 → Level3 → Level4.

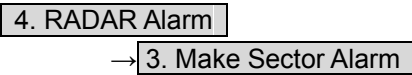
Creating the radar alarm zone (Make Sector Alarm)

Procedures

- 1 Press the [AZ] key for 2 seconds.

The AZ Menu will appear.

- 2 Open the Make Sector Alarm menu by performing the following menu operation.



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

The range setting for Sector Alarm1 or Sector Alarm2 starts.

- 4 Turn the [EBL] dial and the [VRM] dial to set the start bearing and the start range, and then press the [ENT] key.

- 5 Turn the [EBL] dial and the [VRM] dial to set the end bearing and the end range, and then press the [ENT] key.

The radar alarm zone is determined.

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

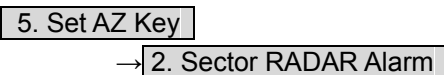
Only by pressing the [AZ] key, the normally-used radar alarm can be easily turned on / off.

Procedures

- 1 Press the [AZ] key for 2 seconds.

The AZ Menu will appear.

- 2 Open the Sector RADAR Alarm menu by the following menu operation.



- 3 Set the [AZ] key allocation.

On : Pressing the [AZ] key will turn on or off the radar alarm.

Off : Even if the [AZ] key is pressed, the radar alarm zone is not turned on.

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.

3.5 USE OWN SHIP'S TRACK DATA

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 (lower right of the display ③ on page 2-21) 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.

3

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.

3.5.1 Display Own Ship's Track (Display Own Track)

Procedures

- 1 Open the Own Track Menu by the following menu operation.

- 2 Press the [1] key.

The DISP Own Track function item is turned on / off.

On : Own ship's track is displayed.

Off : Own ship's track is not displayed.

- 3 Press the [MAP] key.

The map display function is turned on or off.

Selecting On will display own ship's track.

3.5.2 Save Own Ship's Track Data (Own Track Memory)

To save own ship's track data, save at a specified time interval and at a specified range interval can be selected.

The data save interval can be selected from 10 preset time intervals and 8 preset range intervals.

Save 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 : 0.1 NM, 0.2 NM, 0.3 NM, 0.5 NM,
1 NM, 3 NM, 5 NM, and 10 NM

Procedures

- 1 Put the cursor on own ship's track interval unit switching (lower right of the display ④ on page 2-21), and press the [ENT] key.

Units of own ship's track interval are switched.

- 2 Put the cursor on own ship's track interval switching (lower right of the display ③ on page 2-21), and press the [ENT] key.

Own ship's track intervals are switched.

Setting the button to cancels the saving of data.

3.5.3 Cancel Saving of Own Ship's Track Data (Own Track Memory)

This function cancels the saving of own ship's track data.

Procedures

- 1 Put the cursor on own ship's track interval switching (lower right of the display ③ on page 2-21), and press the [ENT] key.

Own ship's track intervals are switched.

Selecting will cancel the saving of data.

3.5.4 Clear Own Ship's Track Data (Clear Own Track)

This function clears own ship's track data from memory.

Procedures

- 1 Open the Own Track Menu by the following menu operation.

- 2 Press the [2] key.

Clear Own Track Confirmation Window will appear.

- 3 Press the [1] key.

The own ship's track data will be cleared.



3.5.5 Operate Own ship's Track Files (File Operations)

[1] Loading own ship's track data (Load Own Track)

Procedures

- 1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Open the File Operations menu by the following menu operation.

→

- 3 Press the [1] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

- 4 Press the [2] key to select Add or Overwrite.

Add and Overwrite in the Load Mode items are switched.

When is selected, new data is added to the saved data. When is selected, the saved data is overwritten.

- 5 Press the [3] key.

The list of own ship's tracks data saved in the system will be displayed.

- 6 Press numeric keys corresponding to the file to be loaded.

Confirmation Window will appear.

- 7 Press the [1] key.

The selected own ship's track data is loaded and displayed of the display.

[II] Saving own ship's track data (Save Own Track)

Procedures

- 1 Insert a flash memory card into the card slot.**

Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Open the File Operations menu by performing the following menu operation.**



- 3 Press the [1] key to select a card slot.**

Slot1 and Slot2 of the Select Card Slot items are switched.

- 4 Press the [4] key.**

The character input screen for Input File Name will appear.

- 5 Enter the file name to be saved.**

Up to 10 characters can be entered.

For the input method on the character input screen, see Chapter 3.3.4.

After entry has been finished, Confirmation Window will appear.

- 6 Press the [1] key.**

Own ship's track data currently being displayed is saved.

[III] Erasing own ship's track data (Erase Own Track)

Procedures

- 1 Insert a flash memory card into the card slot.**

Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Open the File Operations menu by performing the following menu operation.**



- 3 Press the [1] key to select a card slot.**

Slot1 and Slot2 of the Select Card Slot items are switched.

- 4 Press the [5] key.**

The Erase screen will appear.

The list of own ship's track data saved in the card will be displayed.



5 Press numeric keys corresponding to the file to be deleted.

Confirmation Window will appear.

6 Press the [1] key.

The selected own ship's track data is deleted and the file name is deleted from the list.

[IV] Displaying saved own ship's track data (Card Own Track Display)

3

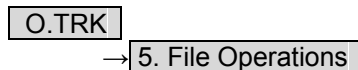
Procedures

1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Open the File Operations menu by performing the following menu operation.



3 Press the [1] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

4 Press the [6] key.

The Card Own Track Display menu will appear.

The list of own ship's track data saved in the card will be displayed.

5 Press numeric keys corresponding to the number for the file to be displayed.

Confirmation Window will appear.

6 Press the [1] key.

The saved own ship's track data will be displayed.

3.6 DISPLAY USER MAP

Up to 2,000 items (20,000 items when a plotter unit option is connected) of NAV lines, coastlines, depth contours, and NAV marks can be created, displayed, loaded, and saved. (This function is available only when navigation equipment is connected to this radar system.)

If the number of items exceeds 2,000, the oldest saved items are sequentially deleted.
Up to 20 items of temporarily used marks can be created and displayed.

Marks that can be used : 29 types
Lines that can be used : 3 types (solid, broken, and dashed-dotted line)
Color of mark and line that can be used : 7 colors

If radar video is poor visibility caused by user map function, press the [DATA OFF] key to map displays temporarily off.

3.6.1 Create User Map (Mark / Line)


In this system, when the radar is in the transmission state, the user map is displayed all the time. However, valid latitude / longitude data and true bearing data must be entered into the system. The user map can be created and edited by performing the following operation.

Plotting a mark

Procedures

- 1 Press the [MARK] key to select the mark mode.

The mark font to be used is displayed in the mark font switching (upper right of the display ② on page 2-19).

- 2 Put the cursor on mark font switching  (upper right of the display ② on page 2-19), and press the [ENT] key.

The mark fonts are switched.

- 3 Put the cursor mark on mark color switching  (upper right of the display ③ on page 2-19), and press the [ENT] key.

The mark colors are switched.

- 4 Put the cursor on a location of the display at which you want to plot the mark, and press the [ENT] key.


The specified mark is displayed in the specified shape and color.
To create another mark, repeat the above procedures.

Plotting a line

Procedures

- 1 Press the [MARK] key to select the line mode.

The line pattern to be used is displayed in the line pattern switching (upper right of the display ② on page 2-19).

- 2 Put the cursor on line pattern switching  (upper right of the display ② on page 2-19), and press the [ENT] key.

Line patterns are switched.

- 3 Put the cursor on line color switch  (upper right of the display ③ on page 2-19), and press the [ENT] key.

Line colors are switched.

- 4 Put the cursor on a location of the display at which you want to start plotting a line, and press the [ENT] key.

The start point of the specified line will be displayed.

- 5 Move the cursor to a location of the display at which you want to finish plotting the line, and press the [ENT] key.

A line is plotted between the previous point and the end point.
Repeat this procedure so that sequential lines can be plotted.

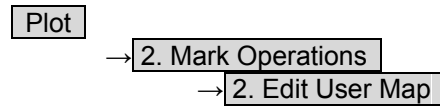
- 6 When you want to finish plotting the line, press the [ENT] key at the previous point.

Line plotting will be terminated.
To plot another line, repeat procedures 4 to 6.

Plotting a mark / line make with latitude and longitude

Procedures

- 1 **Open the Edit User Map menu by performing the following menu operation.**



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

The Make with L/L menu will appear.

- 3 **Press the [9] key to select the New Mark Input or New Line Input.**

The Mark Input menu and the Line Input menu are switched.

- 4 **Press the [1] key to select the type of mark font or line pattern to be created.**

The desired mark font or line pattern is selected.

To add a line, select midpoint .

- 5 **Press the [2] key to select the color of mark or line to be created.**

The desired mark or line color is selected.

- 6 **Press the [3] key to input the latitude / longitude.**

For the input method on the latitude / longitude input screen, see Section 3.3.4.

- 7 **Press the [4] key to input the comment.**

For the input method on the character input screen, see Section 3.3.4.

The window will not be open when the system is in the transmission state.

- 8 **Press the [5] key.**

Mark / Line plotting will be terminated.

To create another mark or line, repeat procedures 4 to 8.


Plotting a temporarily used mark

Procedures

- 1 Put the cursor on a location of the display at which you want to plot a mark, and press the [CLR / INFO] key.

The cursor mode list will be displayed.

- 2 Press the [7] key.

Temporarily used marks  will be displayed. To create another mark, put the cursor on a location at which you want to plot a mark, and press the [ENT] key. Up to 20 temporarily used marks can be created, but adding comments and saving data onto a card are not possible. When the power supply is turned off, the data will be deleted.

When the number of temporarily used marks exceeds 20, if rewrite operation such as changing of the display range is performed for the radar display, items older than most recently plotted 20 items will not be plotted again.

3

3.6.2 Set User Map Display (Mark Display Setting)

The user map can be individually displayed (on) or hidden (off).

Setting by type : Setting can be made by mark font and line pattern.

Setting by color : Setting can be made by color of mark or line.

The mark font display size can be selected.

Normal : The mark is displayed in normal size.

Small : The mark is displayed in a size smaller than usual.

Setting display by type

Procedures

- 1 Press the [MARK] key for 2 seconds.

The Mark Setting display will appear.


- 2 Open the Display Mark Type menu by performing the following menu operation.

1. Display Mark Type

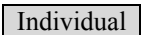
- 3 Press the [1] key.

Selected items for  will be displayed.


- 4 Press the [3] key to make  setting.

 : All types are not displayed.

 : All types are displayed.

 : Setting by type is activated.

- 5 Press numeric keys corresponding to each mark font / line pattern display.

 : Displayed.

 : Not Displayed.

Setting display by color

Procedures

- 1 Press the [MARK] key for 2 seconds.

The Mark Setting menu will appear.

- 2 Open the Display Mark Color menu by performing the following menu operation.

2. Display Mark Color

- 3 Press the [1] key.

Selected items for will be displayed.

- 4 Press the [3] key to make setting.

<input type="text" value="Off"/>	: All colors are not displayed.
<input type="text" value="On"/>	: All colors are displayed.
<input type="text" value="Individual"/>	: Setting by color is activated.

- 5 Press numeric keys corresponding to each mark font / line pattern display.

<input type="text" value="On"/>	: Displayed.
<input type="text" value="Off"/>	: Not Displayed.

Setting the mark font size

Procedures

- 1 Press the [MARK] key for 2 seconds.

The Mark Setting display will appear.

- 2 Open the Select Mark Size menu by performing the following menu operation.

4. Select Mark Size

- 3 Press numeric keys corresponding to the mark font size to be set.

<input type="text" value="Normal"/>	: The mark is displayed in normal size.
<input type="text" value="Small"/>	: The mark is displayed in a size smaller than usual.

Setting the character size for comments

Procedures

- 1 Press the [MARK] key for 2 seconds.

The Mark Setting menu will appear.

- 2 Open the Comment Font Size menu by performing the following menu operation.

5. Comment Font Size

- 3 Press numeric keys corresponding to the desired character size for comments.

Normal

: The characters for comments are displayed in normal size.

Small

: The characters for comments are displayed in a size smaller than usual.

3

Clearing mark / line data (Clear Mark / Line Data)

The mark / line data saved in the process unit is cleared.

Procedures

- 1 Open the Clear Mark / Line Data menu by performing the following menu operation.

Plot

→ 5. Clear Memory

→ 1. Clear Mark/Line Data

- 2 Press the [1] key.

Confirmation Window will appear.

- 3 Press the [1] key.

The mark / line data is deleted.

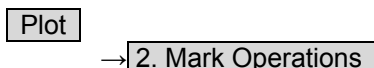
3.6.3 Edit User Map (Edit User Map)

Manually entering the own ship position (Own Ship Position)

Use this function when editing navigation data for a location different from the own ship position.

Procedures

- 1 **Open the Mark Operations menu by performing the following menu operation.**



- 2 **Press the [1] key.**

The latitude / longitude input menu for Own Ship Position menu will appear.

- 3 **Enter a latitude / longitude value.**

For how to enter a value on the latitude / longitude input screen, see Chapter 3.3.4. The own ship position latitude / longitude value is determined.

Note: The own ship's position manually entered by using the function above is valid only in the navigation data setting menu. After exiting from the menu, the manually entered position data is invalidated.

Cancellation

- 1 **Press the [0] key.**

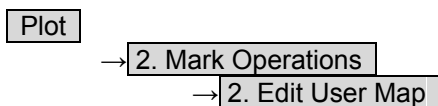
The Mark Operations menu is closed, and Own Ship Position menu is cancelled.

Moving a mark or line (Move)

With regard to the created user map, a mark or line is moved individually.

Procedures

- 1 **Open the Edit User Map menu by performing the following menu operation.**



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

The user map move mode is selected.

Move is displayed in the cursor mode (upper right of the display on page 2-3).

- 3 **Put the cursor on a mark or line, and press the [ENT] key.**

When a mark or line to be moved is selected, the cross cursor mark will appear.

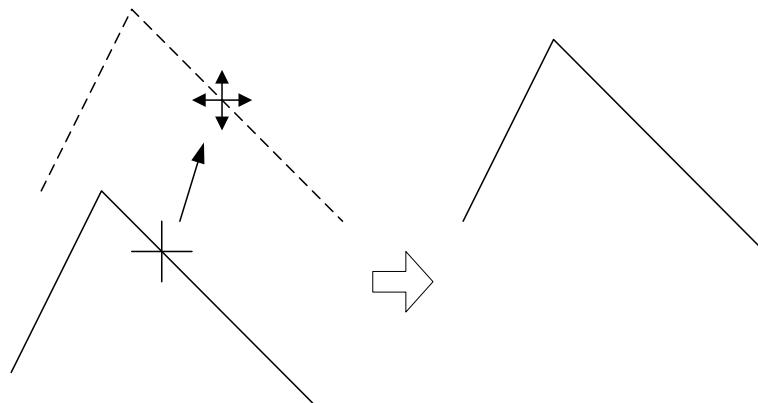
4 Move the cursor mark to the destination, and press the [ENT] key.

The selected mark or line is moved to the destination.
To move another mark or line, repeat procedures 3 and 4.

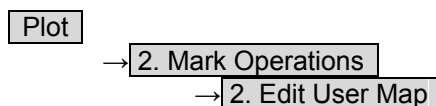
5 When finished with the correction of lines and marks, press the [0] key.

The cursor mode changes to the normal operation mode, terminating the user map move mode.

(Example)

**3****Deleting a mark or line (Delete)**

With regard to the created user map, a mark or line is deleted individually.

Procedures**1 Open the Edit User Map menu by performing the following menu operation.****2 Press the [4] key.**

The user map delete mode is selected.

Delete Map is displayed in the cursor mode (upper right of the display on page 2-3).

3 Put the cursor on a mark or line, and press the [ENT] key.

The selected mark or line is deleted.
To delete another mark or line, repeat procedures 3.

4 When finished with the correction of lines and marks, press the [0] key.

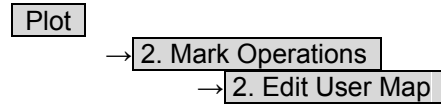
The cursor mode changes to the normal operation mode, terminating the user map delete mode.

Inserting a vertex into a line (Insert / Move Vertex)

With regard to the created user map, a vertex is inserted into a line.

Procedures

- 1 **Open the Edit User Map menu by performing the following menu operation.**



- 2 **Press the [5] key.**

The user map insert / move mode is selected.

Insert/Move is displayed in the cursor mode (upper right of the display on page 2-3).

- 3 **Put the cursor to a side line into which a vertex will be inserted, and press the [ENT] key.**

A vertex is inserted into the selected line, and the cross cursor mark will be displayed.

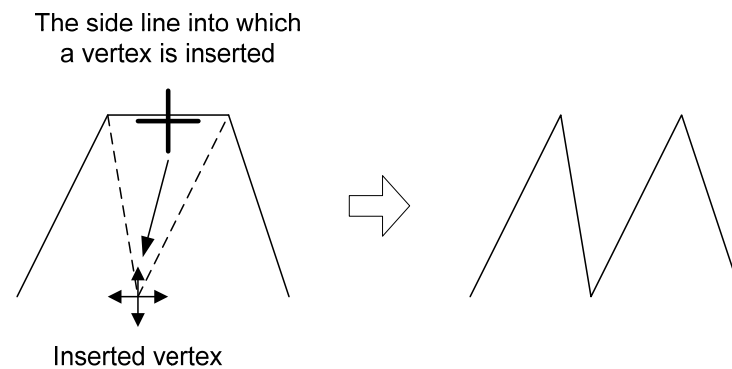
- 4 **Move the cross cursor mark to the newly inserted vertex, and press the [ENT] key.**

To insert another vertex, repeat procedures 3 and 4.

- 5 **When finished with the insertion of all vertices, press the [0] key.**

The cursor mode changes to the normal operation mode, terminating the user map insert / move mode.

(Example)

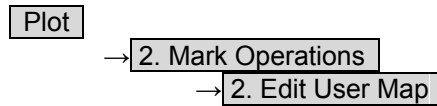


Correcting the mark or vertex of a line (Insert / Move Vertex)

With regard to the created user map, a mark or line is corrected.

Procedures

- 1 **Open the Edit User Map menu by performing the following menu operation.**



- 2 **Press the [5] key.**

The user map insert / move mode is selected.

Insert / Move is displayed in the cursor mode (upper right of the display on page 2-3).

- 3 **Put the cursor on the mark or vertex of a line, and press the [ENT] key.**

When the mark or vertex of a line to be corrected is selected, the cross cursor mark will appear.

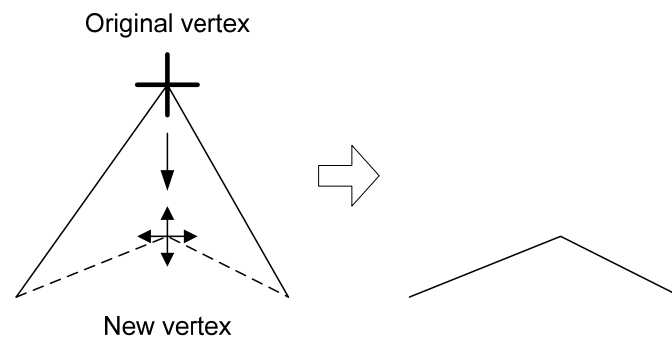
- 4 **Move the cross cursor mark to the destination, and press the [ENT] key.**

The vertex of the selected mark or vertex of a line is moved to the destination. To correct another mark or vertex of a line, repeat procedures 3 and 4.

- 5 **When finished with the correction of all vertices, press the [0] key.**

The cursor mode changes to the normal operation mode, terminating the user map insert / move mode.

(Example)

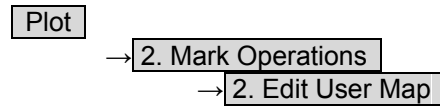


Deleting a mark or vertex of a line (Delete Vertex)

With regard to the created user map, a vertex is deleted individually from a mark or line.

Procedures

- 1 **Open the Edit User Map menu by performing the following menu operation.**



- 2 **Press the [6] key.**

The user map delete mode is selected.

Delete is displayed in the cursor mode (upper right of the display on page 2-3).

- 3 **Put the cursor on the mark or vertex of a line, and press the [ENT] key.**

The vertex of the selected mark or vertex of a line is deleted.

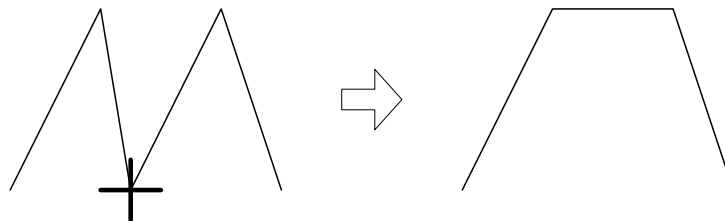
All of the lines drawn by joining two points are deleted.

To delete another mark or vertex of a or line, repeat procedure 3.

- 4 **When finished with the correction of all vertices, press the [0] key.**

The cursor mode changes to the normal operation mode, terminating the user map delete mode.

(Example)



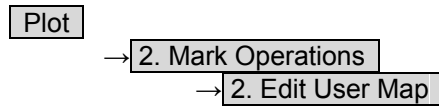
The vertex to be deleted

Batch clearing marks or lines (Clear by Type by Color)

With regard to the created user map, marks or lines are batch cleared by type or by color.

Procedures

- 1 **Open the Edit User Map menu by performing the following menu operation.**



- 2 **Press the [7] key to select the type of marks or lines to be deleted.**

Select the type of marks or lines to be deleted.

To select all types, select .

For example, to delete "red ○" marks, select .

- 3 **Select the color of the marks or lines to be deleted.**

Select the color of marks or lines to be deleted.

To select all colors, select .

For example, to clear "red ○" marks, select .

After the items have been selected, Confirmation Window will appear.

- 4 **Press the [1] key.**

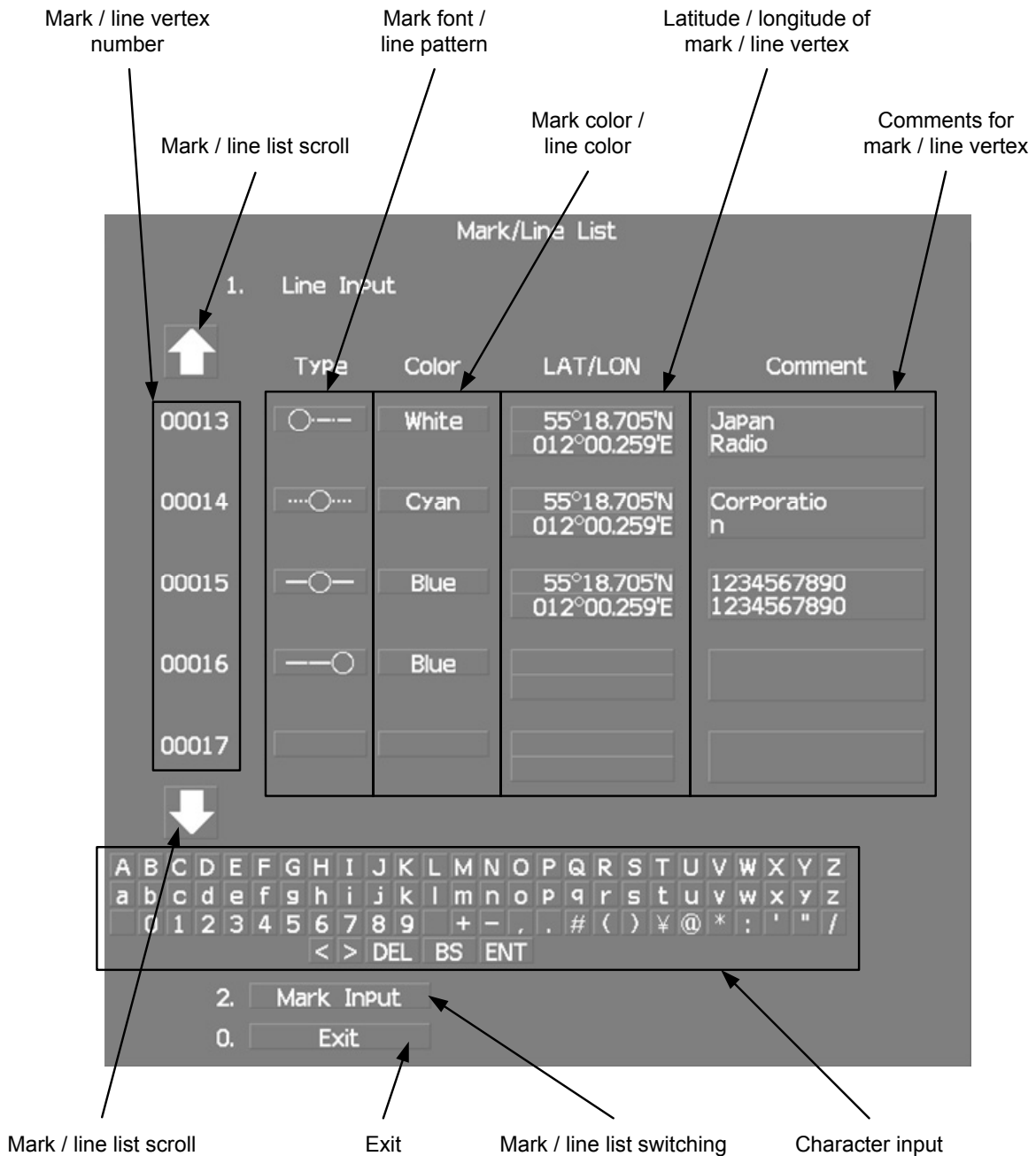
Selected marks or lines will be batch cleared.

Note: If data is not copied on the flash memory card (option), the data is not be reloaded.

3.6.4 Edit Mark / Line List (Mark / Line List)

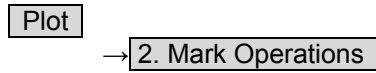
With regard to the created user map, it is possible to display the mark / line list, add and edit marks and lines, and also add comments.

When editing a line, a line extending from the changed vertex to the previous point can be changed.



Procedures**1 Press the [STBY] key.**

The transmission standby state is activated.

2 Open the Mark Operations menu by performing the following menu operation.**3 Press the [5] key.**

The Mark/Line Entry menu will appear.

4 Select an item to be edited.

For batch entry, select whether to enter the latitude / longitude and comments. For new entry, select LAT / LON or LAT / LON + Comment.

<input type="checkbox"/> LAT / LON	: Latitude / longitude can be entered.
<input type="checkbox"/> Comment	: Comments can be entered.
<input type="checkbox"/> LAT / LON + Comment	: Both latitude / longitude and comments can be entered.

5 Press the [6] key.

The Mark/Line List menu will appear.
This window cannot be opened in the transmission state.

Creating marks and lines

Procedures

1 Open the Mark / Line List menu.

2 Press the [2] key to select the mark list or line list.

The Mark Input menu and the Line Input menu are switched.

3 Press the [1] key.

The input list will appear.

4 Turn the [MULTI] dial to show a vacant number in reverse video.

Holding down the [RANGE +/-] key for at least two seconds will enable scroll. Even if a mark or line is created for a vacant number, the created mark or line is listed at the end of the current mark / line list.

5 Press the [MULTI] dial.

The list of the mark font or the line pattern will be displayed.

6 Press numeric keys corresponding to the desired mark font or the line pattern.

The desired mark font or line pattern is selected.

7 In the same manner, enter the color of the mark or line, latitude / longitude, and comments.

Use the numeric keys, latitude / longitude input screen, and the character input screen for entry.

For the input method on the latitude / longitude and character input screens, see Section 3.3.4.

To create another mark or line, repeat procedures 2 to 5.

Adding a line

With regard to the created user map, a vertex is added to the end of the line.

Procedures

- 1 Open the input list for the Mark / Line List menu.**

- 2 Press the [2] key to select the line list.**

The Mark Input menu and the Line Input menu are switched.

- 3 Press the [1] key.**

The input list will appear.

- 4 Turn the [MULTI] dial to show the number for the end point of a desired line  in reverse video.**

Holding down the [RANGE +/-] key for at least two seconds will enable scroll.

- 5 Press the [MULTI] dial.**

The list of the line pattern will be displayed.

- 6 Press numeric keys corresponding to the desired line type.**

The previous end point of the line is changed to the midpoint and a new end point is added.

- 7 In the same manner, enter the color of the mark or line, latitude / longitude, and comments.**

Use the numeric keys, latitude / longitude, and the character input screen for entry. For the input method on the latitude / longitude and character input screens, see Section 3.3.4.

To add another line, repeat procedures 2 to 5.

Editing a mark or line

Procedures

1 Open the input list for the Mark / Line List menu.

2 Press the [2] key to select the mark list or line list.

The Mark Input menu and the Line Input menu are switched.

3 Press the [1] key.

The input list will appear.

4 Turn the [MULTI] dial to show the number for a mark or line to be changed in reverse video.

Holding down the [RANGE + / -] key for at least two seconds will enable scroll.

5 Press the [MULTI] dial.

The list of the mark font or line type will be displayed.

6 Press numeric keys corresponding to the desired mark font or line pattern.

The mark font or line type is changed.

7 In the same manner, enter the color of the mark or line, latitude / longitude, and comments.

Use the numeric keys, latitude / longitude, and the character input screen for entry. For the input method on the latitude / longitude and character input screens, see Section 3.3.4.

To edit or add another mark or line, repeat procedures 2 to 5.

Changing mark / line list items individually

Procedures

1 Open the input list for the Mark / Line List menu.

2 Press the [2] key to select the mark list or line list.

The Mark Input menu and the Line Input menu are switched.

3 Press the [1] key.

The input list will appear.

4 Turn the [MULTI] dial to display the vertex of a mark or line to be changed.

Holding down the [RANGE + / -] key for at least two seconds will enable scroll.

5 Put the cursor on the item to be changed, and press the [ENT] key.

The list will be displayed or the input can be enabled.

6 Press numeric keys corresponding to the number for the item to be changed. Alternatively, enter a numeric value and character to be changed.

Use the numeric keys, latitude / longitude, and the character input screen for entry. For the input method on the latitude / longitude and character input screens, see Section 3.3.4.

To change another item in the mark / line list individually, repeat procedures 2 to 4.

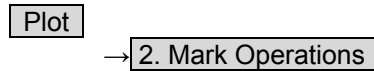
3.6.5 Correct Position on User Map (Shift User Map)

If the display position on the user map is different from an actual position, it can be changed to the correct position in manual mode.

Correcting the display position on the user map (Shift)

Procedures

- 1 **Open the Mark Operations menu by performing the following menu operation.**



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

Shift is displayed in the cursor mode (upper right of the display on page 2-3) and the user map shift mode is activated.

- 3 **Put the cursor on a mark or end of a line, and press the [ENT] key.**
- 4 **Put the cursor on the point to be corrected, and press the [ENT] key.**

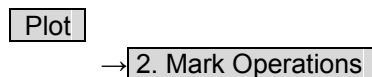
Positions of all marks and lines currently displayed will be corrected.

At this time, **Map Shift** is displayed in the map position correction (lower right of the display on page 2-4), indicating that the position is being corrected.

Clearing the corrected user map to its original state (Shift Clear)

Procedures

- 1 **Open the Mark Operations menu by performing the following menu operation.**



- 2 **Press the [4] key.**

Shift Clear Confirmation window will appear.

- 3 **Press the [1] key.**

Corrected data will be cleared, and the data will be displayed at its original position.

At this time, **Map Shift** is not displayed in the map position correction (lower right of the display on page 2-4).

3.6.6 Operate User Map File (File Operations)

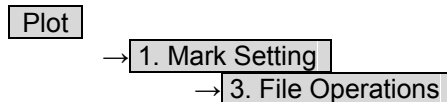
[I] Loading navigation data (Load User Map)

Procedures

- 1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.
For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Open the File Operations menu by performing the following menu operation.



- 3 Press the [1] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

- 4 Press the [2] key to select Add or Overwrite.

Add and Overwrite of the Load Mode items are switched.

When is selected, new data is added to the saved data. When is selected, the saved data is overwritten.

- 5 Press the [3] key.

The list of navigation data saved in the system will be displayed.

- 6 Press numeric keys corresponding to the file to be loaded.

Confirmation Window will appear.

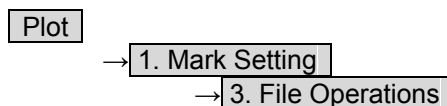
- 7 Press the [1] key.

The selected navigation data will be loaded and displayed of the display.

[II] Discarding navigation data (Unload User Map)

Procedures

- 1 Open the File Operations menu by performing the following menu operation.



- 2 Press the [4] key.

Unload Confirmation Window will appear.

- 3 Press the [1] key.

The saved navigation data will be discarded.

[III] Saving navigation data (Save User Map)

Navigation data can be saved when navigation equipment is connected, or the own ship position on the user map is entered in the manual mode.

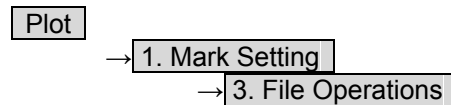
Procedures

1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Open the File Operations menu by performing the following menu operation.



3 Press the [1] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

4 Press the [5] key.

The Input File Name menu will appear.

5 Enter the file name to be saved.

Up to 10 characters can be entered.

For the input method on the character input screen, see Section 3.3.4.

After the data has been entered, Confirmation Window will appear.

6 Press the [1] key.

Navigation data currently being displayed is saved.



[IV] Clearing the saved navigation data (Erase User Map)

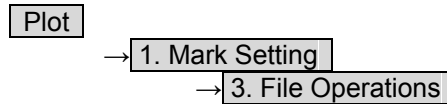
Procedures

1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Open the File Operations menu by performing the following menu operation.

**3**

3 Press the [1] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

4 Press the [6] key.

The Erase screen will appear.

The list of navigation data saved in the card will be displayed.

5 Press numeric keys corresponding to the number for the file to be erased.

Confirmation Window will appear.

6 Press the [1] key.

The selected navigation data is erased and the name of the file is deleted from the list.

[V] Displaying saved navigation data (Card Mark Display)

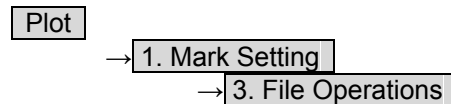
Procedures

1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Open the File Operations menu by performing the following menu operation.



3 Press the [1] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

4 Press the [7] key.

The Card Mark Display menu will appear.

The list of navigation data saved in the card will be displayed.

5 Press numeric keys corresponding to the number for the file to be displayed.

Confirmation Window will appear.

6 Press the [1] key.

The selected navigation data will be displayed.

3.6.7 Set and Display Geodetic System (Geodetic)

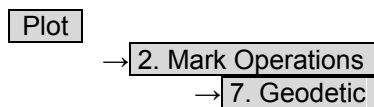
To create navigation information, set the geodetic system that is used with the connected navigation equipment. When navigation information is loaded, the geodetic system used when the navigation information was saved, is displayed. Make sure that the displayed geodetic system is identical to the one used with the navigation equipment. If the two geodetic systems are different, the positions of navigation information of the display will be shifted. Therefore, it is important to set the geodetic system of the navigation equipment.

Setting the geodetic system for navigation data to be saved (Geodetic)

3

Procedures

- 1 Open the Geodetic menu by performing the following menu operation.



The numeric value input screen for Geodetic will appear.

- 2 Enter the desired geodetic system number. (See the section 3.4.20 Geodetic System List)

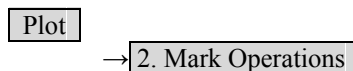
The geodetic system is determined.

For how to input numeric value on the numeric value input menu, see Section 3.3.4. By turning the [MULTI] dial, the geodetic system number can be changed.

Displaying the geodetic system of the navigation data being displayed (Geodetic)

Procedures

- 1 Load navigation data by referring to Section "[] Loading navigation data" on page 3-74.
- 2 Open the Mark Operations menu by performing the following menu operation.



The geodetic system will be displayed in the field.

3.7 USE ROUTE FUNCTION

In this radar system, a destination mark set by navigation equipment can be displayed and a simple route can be created, displayed, loaded and saved. (To use this function, navigation equipment must be connected to this system)

A plotter unit (option) is required to create, display, load and save the simple route.

If radar video is poor visibility caused by route function, click the button to turn off the Map function. Otherwise, press the [DATA OFF] key to map displays temporarily off.

3.7.1 Display Destination Mark (NMEA Waypoint Display)

A destination mark sent from the external navigation equipment can be displayed.

If route type set , refer to "3.7.2 Receive Route Data Setting".

Procedures

- 1 Open the Plot menu by performing the following menu operation.**

- 2 Press the [7] key.**

The NMEA Waypoint Display is turned on or off.

: Destination is not displayed.

: Destination is displayed.

When is selected, the mark appears of the display.

The destination mark is displayed only when Waypoint data is received from outside by the NMEA sentence (RMB,BWC,BWR).



3.7.2 Receive Route Data Setting (Select Route)

The system can receive data from other system via the JRC-LAN. The JRC-LAN is designed for interoperation of JRC systems. The JRC-LAN network can synchronize data of systems connected to the network.

The Plotter Control Unit (option) is necessary.

The setting of the Route Type is necessary for receiving route data. Refer to "Section 7.2.11 Transmit/Receive Data Setting"

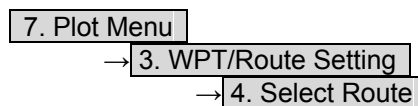
*When the system display Route which are created in the ECDIS or Chart RADAR, following items are not displayed.

- XTL
- Arrival Radius
- ROT
- Turn Radius
- Time Zone
- Sail

3

Procedures

- 1 Press the [RADAR MENU] key.
- 2 Open the Select Route menu by performing the following menu operation.



3. Select the data to be displayed.

The NMEA Waypoint Display is turned on or off.

Off	: Route is not displayed.
Internal	: Internal route data is displayed.
NMEA	: Destination marks are displayed by using WPT data sent from outside navigation equipment.
ECDIS	: Route created in the ECDIS and GPS are displayed.

When On is selected, the WP mark appears of the display.

The destination mark is displayed only when Waypoint data is received from outside by the NMEA sentence (RMB,BWC,BWR).

3.8

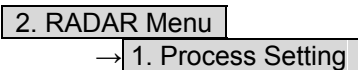
APPLIED OPERATIONS

3.8.1 Set Radar Signal Processing (Process Setting)

This function enables the setting of detail information about radar signal processing.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Process Setting menu by performing the following menu operation.



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 of the display.
- Select **Normal** in standard, and **Wide** in rainy weather.
- **Narrow** clearly displays short-range videos when STC is used in manual mode.
 - Narrow** : Narrows the dynamic range at short range.
 - Normal** : Standard setting
The dynamic range varies depending on the actual range.
Short distance : wide Long distance : narrow
 - 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.

[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

- When the automatic sea clutter suppression mode and the automatic rain / snow clutter suppression mode are in use, the dynamic range is automatically controlled.
- When the automatic sea clutter suppression mode is in use, this function improves gain 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 automatic rain / snow clutter suppression mode is in use, this function improves gain by widening the dynamic range of areas where sea clutter and rain / snow clutter are strong and narrowing the dynamic range of the other areas.
- Land videos become obscure when the automatic rain / snow clutter suppression mode is in use.
 - Off** : Does not control the dynamic range automatically. (Standard setting)
The dynamic range is set in the same manner as when the manual sea clutter suppression mode or the manual rain / snow clutter suppression mode is in use.
 - On** : Automatically controls the dynamic range.

3**[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 radar video processing (PROC) mode switching (④ lower left of the display on page 2-18), set the first video process mode for the area inside the boundary.
- Gain 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 Switch**.

Video process modes.

- PROC Off** : Select this mode in general.
- 3Scan CORREL** : Select this mode when many rain / snow clutter returns are detected.
- 4Scan CORREL** : Select this mode to highlight targets while suppressing sea clutter returns.
- 5Scan CORREL** : Select this mode to detect small targets hidden by sea clutter returns.
- Remain** : Select this mode when own ship yaws wildly.
- Peak Hold** : 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.

[7] Fast Target Detection

- This function displays fast moving targets that are suppressed in scan-correlative process mode.
- This function is enabled when **3Scan CORREL**, **4Scan CORREL**, or **5Scan CORREL** is selected as the video process mode.
- If unwanted waves remain of the display, suppress them by using the **[SEA]**, **[RAIN]**, or **[GAIN]** dial, or adjusting the interference rejection mode.

- Off** : Disables the Fast Target Detection function.
- On** : Enables the Fast Target Detection function.

3.8.2 Set Radar Trails (RADAR Trails Setting)

This function enables the setting of detail information about radar trails processing.

Procedures

1 Press the [TRAILS] key for 2 seconds.

The RADAR Trails Setting menu will appear.

Detail data about radar trails processing can be set by changing the settings of each menu item.

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.

[1] Trails Mode

- Set the radar trail display mode.
- For details on the trail mode, see Section 3.4.8.

[2] Trails Reference Level

- Select a radar video threshold level required for plotting radar trails.
- The radar video threshold 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.

[3] 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: Middle)
<input type="text" value="Level3"/>	: Enables the Trails Reduction function. (Effect: High)

[5] 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 moving targets may not be plotted.
- When Trails Process is , radar trails may be plotted with unwanted waves, but the radar trails of 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.

[6] 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.
- 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="Middle"/>	: 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.

[7] Trails Erase

- A part of the radar trails can be erased.
- For details on the trail erase, see Section 3.4.9.

[8] File Operations

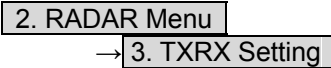
- For details on the file operations, see Section 3.4.10.

3.8.3 Set Scanner Unit (TXRX Setting)

This function enables the setting of detail information about an scanner unit.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the TXRX Setting menu by performing the following menu operation.



Detail information about scanner unit 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.
- 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.

<input type="checkbox"/> Normal	: Standard mode	: Both appropriate gain and magnetron's life expectancy are maintained.
<input type="checkbox"/> Economy	: Power saving mode	: Gain slightly lowers, but the service life of magnetron is prolonged when short pulses are used.
<input type="checkbox"/> High Power	: High gain mode	: Gain improves when long pulses are used, but the service life of magnetron is slightly shortened.

[5] Ice Class Standby Mode

- In this mode, the scanner is rotated when transmission is in the standby state.
- This mode is effective to prevent the antenna's rotating shaft from freezing.

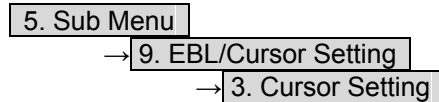
<input type="checkbox"/> Off	: The ice class standby mode is not used. When transmission is in the standby state, the antenna also stops rotating.
<input type="checkbox"/> On	: The ice class standby mode is used. When transmission is in the standby state, the antenna rotates.

3.8.4 Set Cursor (Cursor Setting)

This function enables the setting of detail information about EBL / cursor operation and display.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Cursor Setting menu by performing the following menu operation.



Detail information about cursor operation and display can be set by changing the settings of the menu items.

3

[1] EBL / VRM Control Cursor

- The EBL / VRM Control Cursor is switched between Valid and Invalid.
- The trackball is provided as a standard device. If the trackball malfunctions, the cursor can be moved by using the [EBL] dial and [VRM] dial.
- 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] dial for 2 seconds.

On : Cursor is operated using a [EBL] [VRM] dial.

Off : Cursor is operated using a trackball.

[2] Cursor Length


- Set the length of the cross cursor mark of the display.


Short : Cuts the cross cursor mark in length.


Long : Makes the cross cursor mark twice as long as when Short is selected.


[4] 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.

3.8.5 Set Radar Display (Display Setting)

This system can save combinations of display color and brilliance in accordance with ambient lighting conditions and the radar display can be easily switched.
Follow the procedures below to set display color and brilliance to be saved before hand.

Setting display color (Display Color Setting)

Procedures

- 1 Press the [DAY / NIGHT] key for 2 seconds.

The Display Color Setting menu will appear.

[1] Day / Night

- Specify the mode to be changed.
- The following modes are available.

Day1	: Day mode 1	: Used under bright lighting conditions.
Day2	: Day mode 2	: Used under bright lighting conditions.
Day3	: Day mode 3	: Used under bright lighting conditions.
Dusk	: Dusk mode	: Used under dim lighting conditions.
Night	: Night mode	: Used under dark lighting conditions.

Setting color of each element

- Specify the color for the element.
- The color for the following elements can be specified.

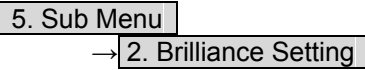
Outer PPI	: The color of the background outside radar video PPI is selected.
Inner PPI	: The color of the background inside radar video PPI is selected.
Character	: The color of the character and bearing scale is selected.
RADAR Video	: The color of the radar video is selected.
RADAR Trails (Time)	: The color of the time radar trails is selected.
Target Symbol	: The color of the target symbol is selected.
Cursor	: The color of the cursor is selected.
Range Rings	: The color of the range rings is selected.
EBL / VRM / PI	: The color of the EBL / VRM / PI is selected.
Own Symbol / HL / Vector	: The color of the own ship symbol, heading line, own ship vector is selected.

Note: Those selected colors can be saved for each Day / Night mode.

Setting display brilliance (Brilliance Setting)

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Brilliance Setting menu by performing the following menu operation.



Setting brilliance of each element

- Specify the brilliance for the element.
- **Level4** indicates maximum brilliance and **Level1** indicates minimum brilliance.
- The brilliance for the following elements can be specified.

RADAR Video	: The brilliance of the radar video is selected.
RADAR Trails	: The brilliance of the radar trails is selected.
Target Symbol	: The brilliance of the target symbol is selected.
Range Rings	: The brilliance of the range rings is selected.
EBL / VRM / PI	: The brilliance of the EBL / VRM / PI is selected.
Character	: The brilliance of the character and bearing scale is selected.
Own Symbol / HL / Vector	: The brilliance of the own ship symbol, heading line, and own ship vector is selected.
Keyboard	: The brilliance of the operation panel is selected.

Note: Those selected brilliance can be saved for each Day / Night mode.

Setting radar video brilliance (VID)

The brilliance of the video of the display is adjusted.

Procedures

- 1 Put the cursor on radar video brilliance switching **VID** (brilliance / Alarm ③ on page 2-28), and press the [ENT] key to adjust the radar video brilliance to obtain the best-to-view video.

The brilliance of the radar video can be adjusted on four stages without opening the Brilliance Setting menu.

Adjust the radar display to obtain the best-to-view video.

Setting target symbol brilliance (TT)

The brilliance of the target symbol of the display is adjusted.

Procedures

- 1 Put the cursor on tracked target / AIS target symbol brilliance switching **TT** (brilliance / Alarm ④ on page 2-28), and press the [ENT] key to adjust the brilliance of the target symbol to obtain the best-to-view video.

The brilliance of the target symbol can be adjusted on four stages without opening the Brilliance Setting menu.

Adjust the radar display to obtain the best-to-view video.

3.8.6 Adjust Sound Volume (Buzzer Volume)

When an alarm is activated, the operation panel issues an alarm audible to inform user of the change of the condition.

The alarm sound can be adjusted by performing the following procedures.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Buzzer Volume menu by performing the following menu operation.

5. Sub Menu
→ 5. Buzzer Volume

- The volume of the alarm sound can be specified for each cause for alarm.
- **Level4** indicates maximum volume and **Level1** indicates minimum volume.

Key ACK	: The operation key acknowledgement is set.
OPE Miss	: The incorrect operation alarm is set.
CPA / TCPA Alarm	: The dangerous ship alarm is set.
New Target Alarm	: The automatic acquisition target alarm is set.
Lost Alarm	: The target lost alarm is set.
Navigation Alarm	: The navigation data abnormality alarm is set.
System Alarm	: The system abnormality alarm is set.
Inter Switch	: The inter switch switching alarm is set.

3.8.7 Set User Keys [USER KEY 1 / 2]

Users can freely make settings with [USER KEY1] key and [USER KEY2] key. By using the keys, users can open a frequently used menu by only single operation, or assign special functions, to the user key switches.

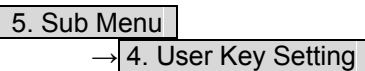
[I] Initial Setting (User Key Setting)

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

3

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the User Key Setting menu by performing the following menu operation.



This system provides two user keys: [USER KEY1] and [USER KEY2]. Different functions can be allocated to each key.

Functions that can be allocated to each key are as follows:

Menu	: A specific menu is directly displayed.
Zoom	: The zoom display function is switched between on and off.
TM Reset	: Reset to initial own ship position in true motion display mode.

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

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

Procedures

- 1 Make the initial setting for the user key to Menu.
- Make settings in accordance with Section [I] Initial Setting (User Key Setting).
- 2 Perform the general menu open procedure to open the menu that is to be directly displayed with User Key.
 - 3 While the menu is open, Press the [USER KEY1] key or [USER KEY2] key for 2 seconds.

The menu currently being displayed is saved for the pressed user key.

Directly displaying the menus assigned to the User Keys

Procedures

- 1 Press the [USER KEY1] key or the [USER KEY2] key.

The menu set for the pressed user key will open. Subsequently, general menu operation can be performed.

[III] How to use the User key (Zoom Display)

Preset whether to execute the zoom display by operating the user key.

Procedures

- 1 Make the initial setting for the user key to **Zoom**.

Make settings in accordance with Section [I] Initial Setting (User Key Setting).

Executing zoom display

Procedures

- 1 Press either [USER KEY1] key or [USER KEY2] key for which **Zoom** has been set.

The zoom mode is activated.

- 2 Put the cursor on a location that is to be zoomed, and press the [ENT] key.

Zoom is set.

Cancellation

- 1 Press either [USER KEY1] key or [USER KEY2] key for which **Zoom** has been set.

The zoom mode is cancelled and a normal display will appear.

[IV] How to use the User key (TM Reset)

Preset whether to execute the TM Reset by operating the user key.

Procedures

- 1 Make the initial setting for the user key to **TM Reset**.

Make settings in accordance with Section [I] Initial Setting (User Key Setting).

Resetting own ship to its initial position

Procedures

- 1 Press either [USER KEY1] key or [USER KEY2] key for which **TM Reset** has been set.

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.

3.8.8 Set Navigation Data Display (Multi Window Setting)

By performing the following operation, it is possible to display navigation data of the wind direction / velocity, water depth and the like, as a graph of the display.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Press the [3] key.

The Multi Window Setting menu will appear.

Detailed settings of the display are possible by changing the settings of each item.

3

[1] DIR / DIST EXP Display

- Determine whether to expand the value display of cursor, EBL, and VRM.
- The value display is expanded in digital information area 2.
- When the cursor mark moves on the PPI, the display of cursor information is expanded.
- When an EBL or VRM is operated, the value display of each marker is expanded.
- While the menu is open, any display is not expanded.

Off
 On

: Does not expand any display.

: Expands the display in digital information area 2.

The expanded display remains for 5 seconds after the operation of each marker, and then it will disappear.

Always On

: Expands the display in digital information area 2.

[2] Numeric NAV INFO

- Determine whether to display the numeric values of received navigation information.
- One of two digital information areas is used to display data.
- When navigation data is displayed, the sizes of the target tracking (TT) / AIS information areas are exclusively decreased.
- Navigation information of the water depth, water temperature, tidal current, wind direction / speed, and destination is displayed with numeric values.
- Put the cursor on the digital information display Target (menu ① on page 2-27), and press the [ENT] key. The navigation data display function is switched between on and off.

Off

: Does not display the numeric values of navigation information.

Area1

: Displays the numeric values of navigation information in digital information area 1.

Area2

: Displays the numeric values of navigation information in digital information area 2.

[3] Depth Graph Setting >

- The Depth Graph Setting menu will appear.

[1] Depth Graph Display

- Determine whether to display received water depth information with a graph.
- One of two digital information areas is used to display data.
- When the water-depth graph is displayed, the sizes of the target tracking (TT) / AIS information areas are exclusively decreased.
- Put the cursor on the digital information display **Target** (menu ① on page 2-27), and press the [ENT] key. The water-depth graph display function is switched between on and off.

Off	: Does not display a water depth graph.
Area1	: Displays the water depth graph in digital information area 1.
Area2	: Displays the water depth graph in digital information area 2.

[2] 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.

[3] Time Range

- 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.

[4] Depth Unit

- Set the unit of water depth for the water-depth graph.

Feet	: The feet is used as the unit of water depth.
Fathom	: The fathom is used as the unit of water depth.
Meters	: The meter is used as the unit of water depth.

[4] Wind Graph Setting >

- The Wind Graph Setting menu will appear.

[1] Wind Graph Display

- Determine whether to display received wind direction / speed information with a graph.
- One of two digital information areas is used to display data.
- When the wind direction / speed is displayed, the sizes of the target tracking (TT) / AIS information areas are exclusively decreased.
- Put the cursor on the digital information display **Target** (menu ① on page 2-27), and press the [ENT] key. The wind direction / speed graph display function is switched between on and off.

Off

: Does not display the wind direction / speed graph.

Area1

: Displays the wind direction / speed graph in digital information area 1.

Area2

: Displays the wind direction / speed graph in digital information area 2.

[2] Wind Speed Unit

- Set the unit of wind speed for the wind direction / speed graph.

m/s

: Meters per second are used as the unit of wind speed.

km/h

: Meters per hour are used as the unit of wind speed.

kn

: Knots are used as the unit of wind speed.

[5] TEMP Graph Setting >

- The TEMP Graph Setting menu will appear.

[1] TEMP Graph Display

- Determine whether to display the graph of the water-temperature data that has been received of the display.
- One of two digital information areas is used to display data.
- When the water-temperature graph is displayed, the sizes of the target tracking (TT) / AIS digital information areas are exclusively decreased.
- Put the cursor on the digital information display **Target** (menu ① on page 2-27), and press the [ENT] key. The water-temperature graph display function is switched between on and off.

Off

: The water-temperature graph is not displayed.

Area1

: The water-temperature graph is displayed in the digital information area 1.

Area2

: The water-temperature graph is displayed in the digital information area 2.

[2] TEMP Graph Color

- Set the color for the water-temperature graph.
- There are eight selection items: **Color**, **White**, **Gray**, **Blue**, **Green**, **Yellow**, **Pink**, and **Red**.

[3] TEMP Range

- When **Color** is selected for the display color for the water-temperature graph, set the temperature range of each color.

[4] Time Range

- Set the time range for the water-temperature graph.

10min	: The time range is set at 10 minutes.
15min	: The time range is set at 15 minutes.
30min	: The time range is set at 30 minutes.
60min	: The time range is set at 60 minutes.
12hour	: The time range is set at 12 hours.

[6] Course Bar Setting >

- The Course Bar Setting menu will appear.

[1] Course Bar Display

- Determine whether to display the bar graph for the course data that has been received of the display.
- One of two digital information areas is used to display data.
- When the course-bar graph is displayed, the sizes of the target tracking (TT) / AIS information areas are exclusively decreased.
- Put the cursor on the digital information display **Target** (menu ① on page 2-27), and press the [ENT] key. The course bar display function is switched between on and off.

Off	: The course bar graph is not displayed.
Area1	: The course bar graph is displayed in the numeric value data area 1.
Area2	: The course bar graph is displayed in the numeric value data area 2.

[2] AUTO Pilot Course

- Determine which field of the APB sentence that has been received is used to display Autopilot (AP) course.

Course to Steer	: The steering angle is displayed.
From ORG	: The bearing difference from the original point is displayed.
From CURR POSN	: The bearing difference from own ship is displayed.

[3] ROT Scale

- Set the maximum scale for the TURN Rate graph.

30-0-30	: The scale is set at ± 30 °/min.
60-0-60	: The scale is set at ± 60 °/min.
90-0-90	: The scale is set at ± 90 °/min.
120-0-120	: The scale is set at ± 120 °/min.
150-0-150	: The scale is set at ± 150 °/min.
300-0-300	: The scale is set at ± 300 °/min.

3.9

USE FUNCTION KEY [FUNC]

“Radar Function Setting” is provided for easily obtaining the best radar video by saving 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	: Deepsea	Suitable for general ocean navigation.
Function 3	: Fishnet	Useful for small target.
Function 4	: Storm	Useful for observing videos in stormy weather.

3

3.9.1 Operation Procedures [FUNC]

Calling a Function

Procedures**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 name of the current function mode is displayed in the function (FUNC) mode switching (lower left of the display ⑤ on page 2-18).

Alternatively, put the cursor on the function (FUNC) mode switching, and press the [ENT] key to conduct the same operation as the above.

Changing Function Setting (temporary change)

- When radar signal processing setting is changed by using the menu or button of the 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 discarded 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.
- For how to operate the function setting menu, see Section 3.9.3.

3.9.2 Function Setting Menu Items (User Function Setting)

The function setting menu has the items below.

Page 1

1. Mode	Name of the mode to be used	Coast / Deepsea / ····
2. IR	Radar interference rejection	Off / Low / Middle / High
3. Process	Video process	PROC Off / 3Scan CORREL / ····
4. Target Enhance	Target enhance	Off / Level1 / Level2 / Level3
5. AUTO STC/FTC	Automatic clutter suppression	Off / AUTO Sea / AUTO Sea/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	SP1 / MP1
2. Pulse Length 1.5NM	Standard pulse length of 1.5 NM range	SP1 / MP1 / MP2 / MP3
3. Pulse Length 3 / 4NM	Standard pulse length of 3 NM range	MP1 / MP2 / MP3 / LP1
4. Pulse Length 6 / 8NM	Standard pulse length of 6 NM range	MP1 / MP2 / MP3 / LP1 / LP2
5. Pulse Length 12NM	Standard pulse length of 12 NM range	MP1 / MP2 / MP3 / LP1 / LP2
6. Pulse Length 16NM	Standard pulse length of 16 NM range	MP1 / MP2 / MP3 / LP1 / LP2

Page 3

1. Video Latitude	Dynamic range of radar video	Narrow / Normal / Wide / Super Wide
2. Video Noise Rejection	Radar video noise rejection	Off / Level1 / Level2
3. AUTO Dynamic Range	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	PROC Off / 3Scan CORREL / ····
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 / 15sec / ····
2. Trails Mode	Radar trails mode	True / Relative
3. Trails Reference Level	Radar trails plotting threshold	Level1-4
4. Trails Reduction	Thinning of radar trails	Off / Level1-3
5. Time / All 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 / Middle / Long / Super Long

Page 5

1. Gain Offset	Gain correction	Correction value setting
2. PRF	Pulse repetition frequency	Normal / Economy / High Power
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-

3.9.3 Overview of Function Operations (User Function Setting)

The following outlines the operation of each function selected from the function setting menu.

Procedures

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

- Selects the function name to be indicated at the lower left of the 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 gain.)
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 gain 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 gain 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 gain slightly lowers.)
Bird	: Use this mode to detect flocks of sea birds.
Long	: Use this mode to monitor utmost distances in the broad ocean.
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 (Interference Rejection)

- Same function as IR described in Section 3.4.1.

[Page 1] [3] Process (Video Process)

- Same function as Process described in Section 3.4.4.

[Page 1] [4] Target Enhance

- Same function as Target Enhance described in Section 3.4.3.

[Page 1] [5] Auto STC / FTC (Auto Sea / Rain)

- 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 adjust the afterimages of unwanted waves.
- To adjust the afterimage of sea clutter, use the [SEA] dial.
- To adjust the afterimage of rain / snow clutter, use the [RAIN] dial.
- 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 Sea/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 2] [1] - [7] Pulse Length

- Sets the standard transmitter pulse length in each range.
- When the range is called, the pulse range is used.

[Page 3] [1] - [7] Process Setting

- Operation is the same as that of the Process Setting menu described in Section 3.8.1.

[Page 4] [1] - [7] Trails Setting

- Same functions as in the Trails Setting menu described in Section 3.8.2.

[Page 5] [1] Gain Offset

- Corrects gain 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, gain needs fine adjustment for always obtaining the highest level.
- The gain correction function saves the correction value set by the gain adjust in each function mode, so it can obtain the highest gain without the gain adjust being operated when the function mode is changed.
- To set high gain, set a value on the “+” side.
- To set low gain, set a value on the “-” side.
- When the radar interference rejection level is increased, the noise level is lowered. Thus, set a gain correction value to the “+” side.
- When the video process mode **3Scan CORREL**, **4Scan CORREL**, or **5Scan CORREL** is used, the noise level is lowered. Thus, set a gain correction value to the “+” side.
- When the video process mode **Remain** or **Peak Hold** is used, noise is hard to disappear. Thus, set a gain correction value to the “-” side.

[Page 5] [2] PRF

- Same function as in the Pulse Repetition Frequency described in 3.8.3.

[Page 5] [3] Small Buoy Detection

- When the automatic sea clutter suppression function is used, this mode is used to process signals for detecting small targets.

Off : Activates the general signal processing mode.

On : The signal processing mode for detecting small targets.

[Page 5] [4] Fishnet Detection

- Use this mode to detect small targets hidden by sea clutter returns.
- The simultaneous use with the automatic rain / snow clutter suppression function will increase effects.

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.

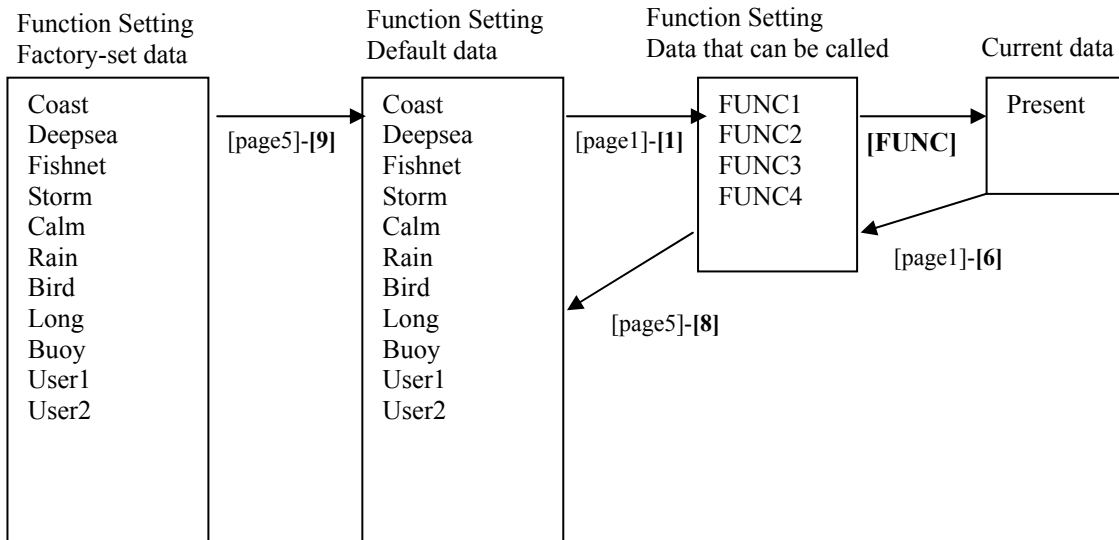
10-20m : Set the antenna height 10m to 20m.

20m- : Set the antenna height over 20m.

3.9.4 Overview of saved Function Setting Data

The overview of saved function setting data is as follows:

- Factory-set data : Saved data that general operation cannot change
- Default data : Standard data of each function mode that users can change
- Data that can be called : Saved data that can be called by pressing the [FUNC] key



User Function Menu [Page 1] [1] Mode

- Calls the default value of the mode, and saves it for the function number.

User Function Menu [Page 1] [6] Save Present State

- The currently operating state can be saved for the function number.
- Use this function to save the state of good setting that will be frequently used.

User Function Menu [Page 5] [8] Set Mode Default

- Saves the setting of the current function number, as the default setting of the mode.

User Function Menu [Page 5] [9] Initialize

- Changes the memory contents of the mode, which is used with the current function number, back to the factory setting.

3.10 USE USER 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 saved by the user setting

- Display Color Setting menu
- Buzzer Volume
- User Key Setting menu
- Display Style (Date display style)
- EBL / VRM Control CURS
- Cursor Length

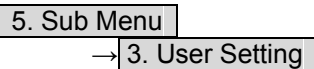
3

3.10.1 Save Operating State (Save User Setting)

The system's current operating state can be saved in the system by performing the operation below.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the User Setting menu by performing the following menu operation.



- 3 Press the [2] key.

The Input File Name menu will appear.

- 4 Enter the file name to be saved.

The operating state data will be saved.

Up to 10 characters can be entered.

For the input method on the character input screen, see Section 3.3.4.

3.10.2 Load Operating State (Load User Setting)

The operating state saved in the system can be loaded by performing the operation below. When the operating state is loaded, the previous operating state data is discarded. Therefore, if you do not want to discard the operating state data, save the operating state by performing the operation described in Section 3.10.1.

Procedures

- 1 **Put the cursor on the display item switching (Brilliance / Alarm ① on page 2-28), and press the [ENT] key.**

The Brilliance menu and the Display INFO menu are switched.

- 2 **Put the cursor on the user setting load (Display information ⑦ on page 2-28), and press the [ENT] key.**

The Load User Setting menu will appear.

- 3 **Press numeric keys corresponding to the file to be loaded.**

Confirmation Window will appear.

- 4 **Press the [1] key.**

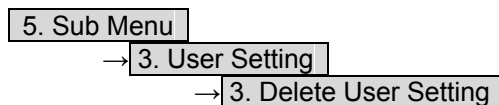
The operating state data will be loaded.

3.10.3 Delete Operating State (Delete User Setting)

The operating state saved in the system can be deleted by performing the operation below. Use this function to delete unnecessary operating state data.

Procedures

- 1 **Press the [RADAR MENU] key twice.**
- 2 **Open the Delete User Setting menu by performing the following menu operation.**



- 3 **Press numeric keys corresponding to the file to be deleted.**

Confirmation Window will appear.

- 4 **Press the [1] key.**

The operating state data will be deleted.

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 process unit, in the card or can load data from the card to the process unit.

- Trails of own ship : 7000 points maximum
- Track of other ship : 20 target × 1500 points (the Target Tracking unit, or AIS unit option is necessary)
- Mark Line : 2000 points maximum (20000 items when the plotter unit option is connected)
- Waypoint : 999 points maximum (the plotter unit option is necessary)
- Route : 10 routes maximum (the plotter unit option is necessary)

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.

3.11.1 Operate File on the Card (File Manager)

Procedures

1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.
For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

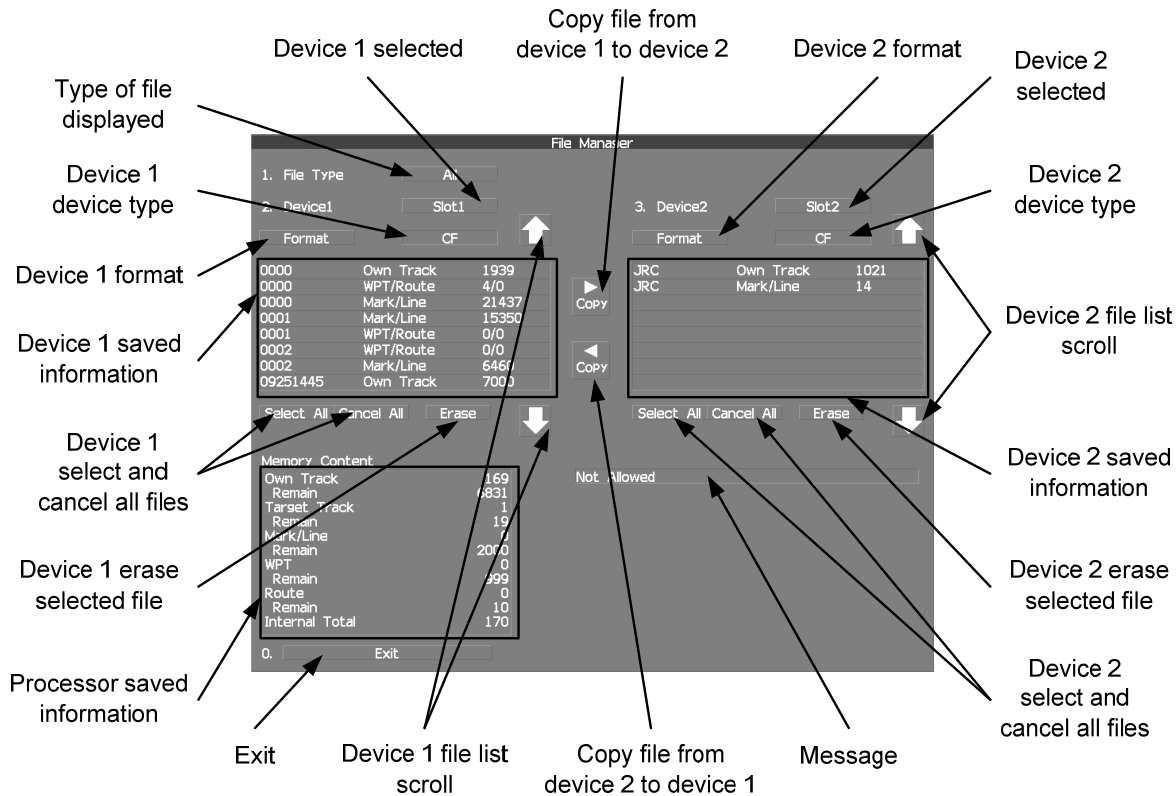
2 Press the [STBY] key.

The transmission standby state is activated.

3 Press the [RADAR MENU] key twice.

4 Press the [1] key.

The File Manager window will appear.
The window will not be open when the system is in the transmission state.



- Information saved in the process unit is displayed in the Memory Content.

Own 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.
Target Track	:	The number of target track (up to 20 targets).
Remain	:	The remaining number of target track to be saved.
Mark / Line	:	Number of mark and line points made with user map (up to 2000 items. 20000 items when the plotter unit option is connected).
Remain	:	Number of remaining data points of marks and lines that can be saved.
WPT	:	Number of data points of created waypoints (999 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.
Internal Total	:	Total number of data points.
- The file name and data saved in the selected device will be displayed.
- Pressing the arrows located upper right and bottom right of the file name list will scroll the list.

[1] Copy Internal Information to Card (Copy Internal -> Card)

Procedures

- 1 Press the [2] key while the File Manager menu is open.**

Selected items for will be displayed.

- 2 Press the [1] key.**

is selected.

- 3 Press the [3] key.**

Selected items for will be displayed.

- 4 Press numeric keys corresponding to the device to which data is to be copied.**

The list of files saved in the selected device will be displayed.

- 5 Put the cursor on the data to be copied, and press the [ENT] key.**

Pressing the [ENT] key will select the data. Pressing the [ENT] key one more time will cancel the selection.

- 6 Put the cursor on , and press the [ENT] key.**

The character input screen for the Input File Name menu will appear.

- 7 Enter the file name to be saved.**

Up to 10 characters can be entered.

For the input method on the character input screen, see Section 3.3.4.
After the data has been entered, Confirmation Window will appear.

- 8 Press the [1] key.**

The entered name is written into the selected device as a file name.

Up to the maximum number of items, described on the previous page, can be saved in the device. With regard to the capacity for saving data, data can be saved on a flash memory card as a file, and those files can be saved until the flash memory card is full.

[II] Load Information from Card to Internal Portion (Copy Card -> Internal)

Procedures

- 1 Press the [2] key while the File Manager menu is open.**

Selected items for will be displayed.

- 2 Press the [1] key.**

is selected.

- 3 Press the [3] key.**

Selected items for will be displayed.

- 4 Press numeric keys corresponding to the device in which data to be loaded is saved.**

The list of files saved in the selected device will be displayed.

- 5 Put the cursor on the data to be copied, and press the [ENT] key.**

Pressing the [ENT] key will select the data. Pressing the [ENT] key one more time will cancel the selection.

- 6 Put the cursor on , and press the [ENT] key.**

Confirmation Window will appear.

- 7 Press the [1] key to overwrite data, or press the [2] key to add new data.**

When Overwrite is selected, internally saved data is deleted and new data is loaded. When Add is selected, new data is added to the saved data.

- 8 Press the [1] key.**

The selected file is loaded into the system from the card.

When adding data saved on the card to the data saved in the system, data can be copied from multiple files. However, when the maximum number of units of data is reached, additional data cannot be loaded. Even in the ADD mode, WPT data and Route data are overwritten.

[III] Copy Information (Copy)

Procedures

- 1 Press the [2] key while the File Manager menu is open.**

Selected items for will be displayed.

- 2 Press numeric keys corresponding to the device from which data is to be copied.**

The list of files saved in the selected device will be displayed.

- 3 Press the [3] key.**

Selected items for will be displayed.

- 4 Press numeric keys corresponding to the device to which data is to be copied.**

The list of files saved in the selected device will be displayed.

- 5 Put the cursor on the data to be copied, and press the [ENT] key.**

Pressing the [ENT] key will select the data. Pressing the [ENT] key one more time will cancel the selection.

- 6 Put the cursor on  Copy, and press the [ENT] key.**

The character input screen for the Input File Name menu will appear.
If there is a file having the same name, the file selection window will appear.
When deleting saved data and copying new data, press the [1] key to select Overwrite.
When adding data to a Waypoint file, press the [2] key to select Add. Even in the Add mode, WPT data and Route data are overwritten. When selection has been made, Confirmation Window will appear.

- 7 Enter the file name to be saved.**

Up to 10 characters can be entered.
For the input method on the character input screen, see Section 3.3.4.
After the data has been entered, Confirmation Window will appear.

- 8 Press the [1] key.**

The entered name is written into the selected device as a file name.

[IV] Erase File (Erase)

Procedures

- 1 **Press the [2] key while the File Manager menu is open.**

Selected items for will be displayed.

- 2 **Press numeric keys corresponding to the device in which data to be erased is saved.**

The list of files saved in the selected device will be displayed.

- 3 **Select data to be erased.**

Pressing the [ENT] key will select the data. Pressing the [ENT] key one more time will cancel the selection.

- 4 **Put the cursor on , and press the [ENT] key.**

Confirmation Window will appear.

- 5 **Press the [1] key.**

The selected file will be erased.

[V] Initializing a card (Format)

Procedures

- 1 **Press the [2] or [3] key while the File Manager is open.**

Selected items for or will be displayed.

- 2 **Put the cursor on for the device to be initialized, and press the [ENT] key.**

Confirmation Window will appear.

- 3 **Press the [1] key.**

Initialization will be executed.

[VI] Showing data saved on the card (Show Card)

Procedures

- 1 **Press the [2] or [3] key while the File Manager is open.**

Selected items for or will be displayed.

- 2 **Press numeric keys corresponding to the device in which data to be displayed is saved.**

The list of files saved in the selected device will be displayed.

[VII] Exit

Exit

- 1 **Press the [0] key.**

The File Manager menu will close.

3.12 DISPLAY SIMPLE CHART

3.12.1 Display JRC Coastline ROM Card [MAP]

- Insert the JRC coastline ROM card with the top surface upward into card slot 1 (lower) or 2 (upper). Press the [MAP] key, and the coastlines will be displayed automatically.
- Two JRC 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 Coastline ROM card is in the other slot. Doing so causes display trouble.

3**Procedures**

- 1 Press the [Map] key while the JRC coastline ROM card is being inserted into the card slot.

Coastline will be displayed.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

3.12.2 Display ERC Card [MAP]

- Insert the ERC card (provided by Japan Hydrographic Association) with the top surface upward into card slot 1 (lower) or 2 (upper). Press the [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 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.

Procedures

- 1 Press the [Map] key while the ERC card is being inserted into the card slot.

Coastlines will be displayed.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

3.12.3 Display JRC Chart on CF Card (SEL JRC ROM Card File)

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.

[I] Copying a JRC ROM card to a CF card (Copy JRC ROM Card to CF)

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.**

The Map Setting menu will appear.

- 3 Open the JRC / ERC Setting menu by performing the following menu operation.**

3. JRC/ERC Setting
→ 9. Next

- 4 Press the [7] key.**

Confirmation Window will appear.

- 5 Press the [1] key.**

Data on the JRC card will be copied onto the compact flash memory card.

- 6 To copy multiple JRC charts, alternately change JRC coastline ROM cards and repeat procedures 4 and 5.**

[II] Selecting a copied JRC chart (SEL JRC ROM Card File)

Procedures

- 1 Insert a compact flash memory card on which a JRC chart has been copied into slot 2.**

Flash memory card (option) is necessary.
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.**

The Map Setting menu will appear.

- 3 Press the [6] key.**

The SEL JRC ROM Card File menu will appear.

- 4 Press numeric keys corresponding to the desired file to be selected.**

The selected file will be shown in reverse video.

3

Cancelling the selected file

- 5 Press numeric keys corresponding to the file to be cancelled.**

The canceled file name will return to the original normal display.

Note: Up to 2 files of the JRC chart can be selected.
If JRC charts are not copied on the compact flash memory card, the file names is not be displayed.

3.12.4 Fill Charts (Fill Land Area)

This function fills the chart when JRC / ERC card is in use.

Procedures

- 1 Press the [Map] key for 2 seconds.**

The Map Setting menu will appear.

- 2 Press the [1] key.**

The Fill Land Area function is switched between on and off.

On	: Charts are filled.
Off	: Charts are not filled.

3.12.5 Set JRC / ERC Chart Display (JRC / ERC Setting)

This function enables the setting of detail information about chart display.

Procedures

1 Press the [Map] key for 2 seconds.

The Map Setting menu will appear.

2 Press the [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 saved for each day / night mode.

[1] Day/Night

- Select a desired display mode before setting the colors and brilliance of chart display.
- There are 5 selection items: , , , , and .

[2] Color of Land

- Select the color of land display.
- There are 4 selection items: , , , and .

[3] Bright of Land

- Select the brilliance of land display.
- There are 3 selection items: , , and .

[4] Color of Sea

- Select the color of sea display.
- There are 4 selection items: , , , and .

[5] Bright of Sea

- Select the bright of sea display.
- There are 4 selection items: , , , and .

[6] Color of Name

- Select the color of a location name.
- There are 8 selection items: , , , , , , , and .

[7] Bright of Name

- Select the brilliance of location name display.
- There are 4 selection items: , , , and .

[8] Bright of Track/Mark/Line

- Select the brilliance of track, mark and line.
- There are 4 selection items: , , , and .

[9] Next

- Moves to the next page.

[1] LAT/LON Line

- Select the mode to display latitude and longitude lines.
- There are 2 selection items:
 - :Displays both latitude / longitude lines and values indicating the latitude and longitude.
 - :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 8 selection items: , , , , , , , and .

[3] Bright of L/L Line

- Select the bright of latitude / longitude line display.
- There are 4 selection items: , , , and .

[4] ERC Display Request

- Set whether to display data saved in the ERC.
 - : Data in the ERC is displayed.
 - : Data in the ERC is not displayed.

[5] ERC Mark

- Select the size of mark display on the ERC chart.
 - : The ERC mark is displayed in normal size.
 - : The ERC mark is displayed in a size smaller than normal.

[6] JRC ROM Card Display

- Sets the display contents of the JRC card.
- The JRC ROM Card Display menu will appear.

[1] Light House

- Determine whether to display lighthouses.
- Set whether to display data saved in the ERC.
 - On : Light houses are displayed.
 - Off : Light houses are not displayed.

[2] Buoy

- Determine whether to display buoys.
- Set whether to display data saved in the ERC.
 - On : Buoys are displayed.
 - Off : Buoys are not displayed.

[3] Rough Line

- Determine whether to display rough lines.
- Set whether to display data saved in the ERC.
 - On : Rough lines are displayed.
 - Off : Rough lines are not displayed.

[4] Other Line

- Determine whether to display other lines.
- Set whether to display data saved in the ERC.
 - On : Other lines are displayed.
 - Off : Other lines are not displayed.

Setting Contour Lines on JRC Chart (Contour Setting)

Procedures

- 1 Press the [Map] key for 2 seconds.**

The Map Setting menu will appear.

- 2 Press the [4] key.**

The Contour Setting Menu will appear.

Depths and display colors can be set for 9 contour lines in total: 8 for depth specification and 1 for other depths.

- 3 Press numeric keys corresponding to the depth for which the settings are to be changed.**

The numeric value input screen for the Contour Setting menu will appear.

- 4 Enter the depth to be set.**

For how to input numeric data on the numeric value input screen, see Section 3.3.4. After a value has been entered, depth contour setting items will be displayed.

- 5 Press numeric keys corresponding to the type of the depth contour to be set.**

The type of line for displaying the depth contour corresponding to the depth is set.

- 6 Select the number of display color to be set, pressing the numeric key.**

The selected color to represent the contour lines of the depth will be set. When Off is selected, the depth contour will not be displayed.

To change the settings of other depths, repeat steps 3 to 6.

3

JRC ROM card plotting mode (JRC ROM Card Draw Mode)

Procedures

- 1 Press the [Map] key for 2 seconds.**

The Map Setting menu will appear.

- 2 Press the [8] key.**

The JRC ROM Card Draw Modes are switched. If the chart is plotted in segments due to the [Fast] display mode, change the mode to the [Detailed] mode.

Fast : The chart is displayed quickly.
 Detailed : The chart is displayed in detail.

3.12.6 Display C-MAP Card [MAP]

- Turn off the power supply to the system, insert a C-MAP card into either card slot 1 (lower) or card slot 2 (upper), and then press the [Map] key. Coastlines will be displayed.
- Be sure to turn off the power supply to the system before inserting or removing a C-MAP card. If a C-MAP card is inserted or removed with the power supply turned on, a malfunction will occur on the display.
- When using a compact flash memory type C-MAP card, be sure to use a PCMCIA(PC card) adapter for the compact flash memory card which is commonly sold at retail outlets.
- Only one C-MAP card can be inserted. If two C-MAP cards are inserted at the same time, a malfunction will occur on the display.
- With regard to the range of the chart to be displayed, refer to the catalog.
- Do not simultaneously insert a JRC coastline ROM card and an ERC card (issued by Japan Hydrographic Association) into the card slot. A malfunction will occur on the display.

Procedures

- 1 **Press the [Map] key while a C-MAP card is being inserted into the card slot.**

Coastlines will be displayed.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

Insert or remove a C-MAP card while the power supply to the system is turned off.

C-MAP display setting (C-MAP Setting)

Procedures

- 1 **Press the [Map] key for 2 seconds.**

The Map Setting menu will appear.

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

The C-Map Setting menu will appear.

[1] LAT/LON Line Display

- Set whether to display latitude / longitude lines on the C-MAP.

On : Latitude / longitude lines are displayed.

Off : Latitude / longitude lines are not displayed.

[2] Depth Display

- Set whether to display water depth values on the C-MAP

On : Water depth values are displayed.

Off : Water depth values are not displayed.

[3] Depth Unit

- Set the unit to display water depth value on the C-MAP.

<input type="checkbox"/> Feet	: The feet is used as the unit of water depth.
<input type="checkbox"/> Fathom	: The fathom is used as the unit of water depth.
<input type="checkbox"/> Meters	: The meter is used as the unit of water depth.
<input type="checkbox"/> Decimal Fathom	: The decimal fathom is used as the unit of water depth.

[4] Light Sectors Display

- Set whether to display lighthouse's light sectors on the C-MAP.

<input type="checkbox"/> On	: Light sectors are displayed.
<input type="checkbox"/> Off	: Light sectors are not displayed.

[5] Light Sectors Level

- Set the level of lighthouse's light sectors displayed on the C-MAP.
Levels from A to H are available.

[6] Chart Boundary

- Set whether to display chart boundary on the C-MAP.

<input type="checkbox"/> On	: The chart boundary is displayed.
<input type="checkbox"/> Off	: The chart boundary is not displayed.

[7] Buoy&Beacon

- Set the buoy and beacon display on the C-MAP and the type of marks.

<input type="checkbox"/> Off	: Buoys and beacons are not displayed.
<input type="checkbox"/> International	: Buoys and beacons are displayed in the international format.
<input type="checkbox"/> US	: Buoys and beacons are displayed in the US format.
<input type="checkbox"/> Simple	: Buoys and beacons are displayed in a simple format.

[8] Names

- Set whether to display place-names on the C-MAP.

<input type="checkbox"/> On	: Place-names are displayed.
<input type="checkbox"/> Off	: Place-names are not displayed.

[9] Next

- Move on to the following page.

[1] Land Marks

- Set whether to display land marks on the C-MAP.

<input type="checkbox"/> On	: Land marks are displayed.
<input type="checkbox"/> Off	: Land marks are not displayed.

[2] River&Lake

- Set whether to display rivers and lakes on the C-MAP.
 On : Rivers and lakes are displayed.
 Off : Rivers and lakes are not displayed.

[3] Cultural

- Set whether to display cultural facilities on the C-MAP.
 On : Cultural facilities are displayed.
 Off : Cultural facilities are not displayed.

[4] Bottom Type

- Set whether to display bottom sediment on the C-MAP.
 On : Bottom sediment is displayed.
 Off : Bottom sediment is not displayed.

[5] Under Water

- Set whether to display reefs on the C-MAP.
 On : Reefs are displayed.
 Off : Reefs are not displayed.

[6] Depth Contour

- Set whether to display depth contour on the C-MAP.
 On : Depth contour is displayed.
 Off : Depth contour is not displayed.

3.12.7 Correcting Chart Position (Map Display Setting)

Procedures

- 1 Press the [Map] key for 2 seconds.

The Map Setting menu will appear.

- 2 Press the [5] key.

The Map Display Setting Menu will appear.

There are three methods for correcting the chart position.

3

[1] Shift Coast Line 1

With regard to display Coast Line 1, set the correction value by operating the cursor.

Procedures

- 1 Press the [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 the [ENT] key.

- 3 Move the cursor to the radar video of which position is to be corrected, and Press the [ENT] key.

(correcting) will be indicated for Shift Coast Line 1.

At this time, is displayed in the map position correction (lower right of the display on page 2-4), indicating that the position is being corrected.

Note: A correction value can be operated in the range -9.999' to +9.999'.

Cancellation

- 1 Press the [1] key while the Map Display Setting menu is open.

(no correction) is selected for the Shift Coast Line 1.

At this time, is not displayed in the map position correction (lower right of the display on page 2-4).

[2] Shift Coast Line 2

With regard to Shift Coast Line 2, enter latitude / longitude to set a correction value.
A correction value can be entered in the range -9.999' to +9.999'.

Procedures

- 1 Press the [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 a latitude / longitude correction value.**

For how to enter a value on the latitude / longitude input screen, see Section 3.3.4.
The latitude / longitude correction value is determined.

At this time, Map Shift is displayed in the map position correction (lower right of the display on page 2-4), indicating that the position is being corrected.

Cancellation

- 1 Press the [2] key while the Map Display Setting menu is open.**

The latitude / longitude input screen for the Shift Coast Line2 menu will appear.

- 2 Press the [0] key, and then [ENT] key.**

The correction value for the latitudinal direction will be set to 0.

- 3 Press the [0] key, and then [ENT] key.**

The correction value for the longitudinal direction will be set to 0.

At this time, Map Shift is not displayed in the map position correction (lower right of the display on page 2-4).

[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 track 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'.

Procedures

- 1 Press the [3] key while the MAP Display Setting Menu is open.**

The latitude / longitude input screen for the LAT/LON Correction menu will appear.

- 2 Enter a latitude / longitude correction value.**

For how to enter a value on the latitude / longitude input screen, see Section 3.3.4.
The latitude / longitude correction value is determined.

Cancellation

- 1 Press the [3] key while the Map Display Setting menu is open.**

The latitude / longitude input screen for the LAT/LON Correction menu will appear.

- 2 Press the [0] key, and then [ENT] key.**

The correction value for the latitudinal direction will be set to 0.

3 Press the [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.

3**Procedures****1 Press the [4] while the Map Display Setting Menu is open.**

The latitude / longitude input screen for the Map Center Position menu will appear.

2 Enter a latitude / longitude value.

For how to enter a value on the latitude / longitude input screen, see Section 3.3.4.
The latitude / longitude correction value is determined.

Cancellation**1 Press the [4] key while the Map Display Setting menu is open.**

The latitude / longitude input screen for the Map Center Position menu will appear.

2 Press the [0] key, and then press the [ENT] key.

The latitude direction correction value will set at 0.

3 Press the [0] key, and then press the [ENT] key.

The longitude direction correction value will be set at 0.

3.12.8 Chart plotting bearing mode (Map Draw AZI Mode)**Procedures****1 Press the [Map] key for 2 seconds.**

The Map Setting menu will appear.

2 Press the [7] key.

The Map Draw AZI Mode are switched.

N-Up

: The chart is displayed in the North-up mode.

C-Up

: The chart is displayed in the Course-up mode.

3.13 CAPTURE SCREEN TO CARD

Screen can be saved to the memory card (option). Saved screen can be printed and reference of computer (This system can not print and reference.). Screen is saved BMP style or PNG style.

3.13.1 Save Screen to Card

Procedures

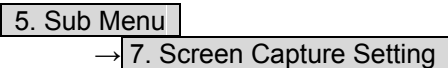
- 1 Make the initial setting for the user key to **Capture Screen**. Make settings in accordance with Section 3.8.7.

- 2 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.
For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 3 Press the [RADAR MENU] key twice.

- 4 Open the Capture Screen Setting menu by performing the following menu operation.



- 5 Press the [2] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

- 6 Press either [USER KEY1] key or [USER KEY2] key for which **Capture Screen** has been set.

The **Copying** displayed in lower right of the display, and screen data is saved to memory card.

3.13.2 Automatically Save Screen to Card

Screen is saved to the memory card at a specified time interval.

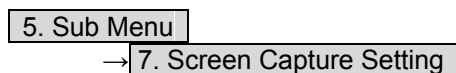
Procedures

- 1 Insert a flash memory card into the card slot.

Flash memory card (option) is necessary.
For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Press the [RADAR MENU] key twice.

- 3 Open the Capture Screen Setting menu by performing the following menu operation.



4 Press the [2] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

5 Press the [5] key to set a auto file erase.

The AUTO file erase function can be turned on / off.

On : If the flash memory card is full, oldest folder is deleted and screen is captured. (The folder make 1 per hour.)

Off : If the flash memory card is full, pause to automatically save screen.

6 Press the [4] key

AUTO Capture Interval setting menu will appear.

7 Enter the value of save screen interval time.

For how to input numeric data on the numeric value input menu, see Section 3.3.4.

The Copying displayed in lower right of the display at specified interval time, and screen data is saved to memory card.

3.13.3 Erasing Save Screen Data**Procedures****1 Insert a flash memory card into the card slot.**

Flash memory card (option) is necessary.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Press the [RADAR MENU] key twice.**3 Open the Capture Screen Setting menu by performing the following menu operation.**

5. Sub Menu

→ 7. Screen Capture Setting

4 Press the [2] key to select a card slot.

Slot1 and Slot2 of the Select Card Slot items are switched.

5 Press the [3] key.

The File Erase menu will appear.

6 Press numeric keys corresponding to the desired folder number.

Folder is named "YYYYMMDD_hh00". * Y : year, M: month, D : day, h : hour

7 Press numeric keys corresponding to the desired file number.

File is named "JMA-5300_YYYYMMDD_hhmmss". * m : minute, s: second
Confirmation Window will appear.

8 Press the [1] key.

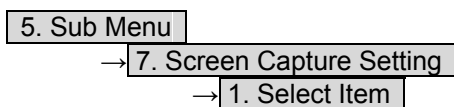
The selected screen data is erased and the name of the screen data is deleted from the list.

3.13.4 Set Save Items

Set save items in the screen.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Capture Screen Setting menu by performing the following menu operation.



- 3 Press numeric keys corresponding to the desired item number.

The item can be turned on / off.

- Off : The item is not saved.
 On : The item is saved.

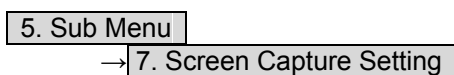
- | | |
|--|---|
| <input type="checkbox"/> 1. Graphic | : Except in radar echo, radar trails and chart. |
| <input type="checkbox"/> 2. RADAR Video | : Radar echo. |
| <input type="checkbox"/> 3. RADAR Trails | : Radar trails. |
| <input type="checkbox"/> 4. Chart | : JRC/ERC chart, C-MAP. |

3.13.5 Set File Style

Set screen capture file style.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Capture Screen Setting menu by performing the following menu operation.



- 3 Press the [6] key to select screen capture file style.

- BMP : File is saved to BMP style.
 PNG : File is saved to PNG style.

3.13.6 Open the Captured Screen File

As an example, Windows XP®.

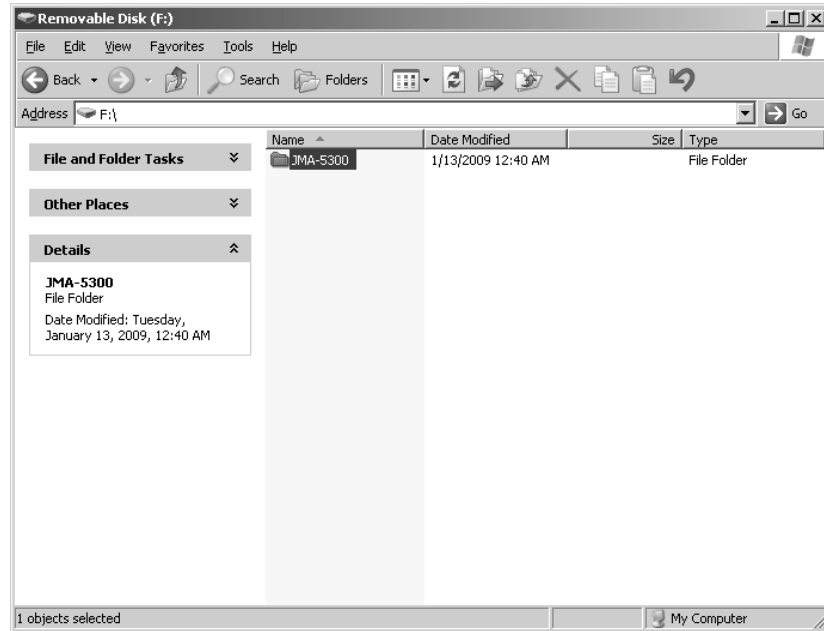
Windows is a registered trademark of Microsoft Corporation in the United States and other countries. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation.

Procedures

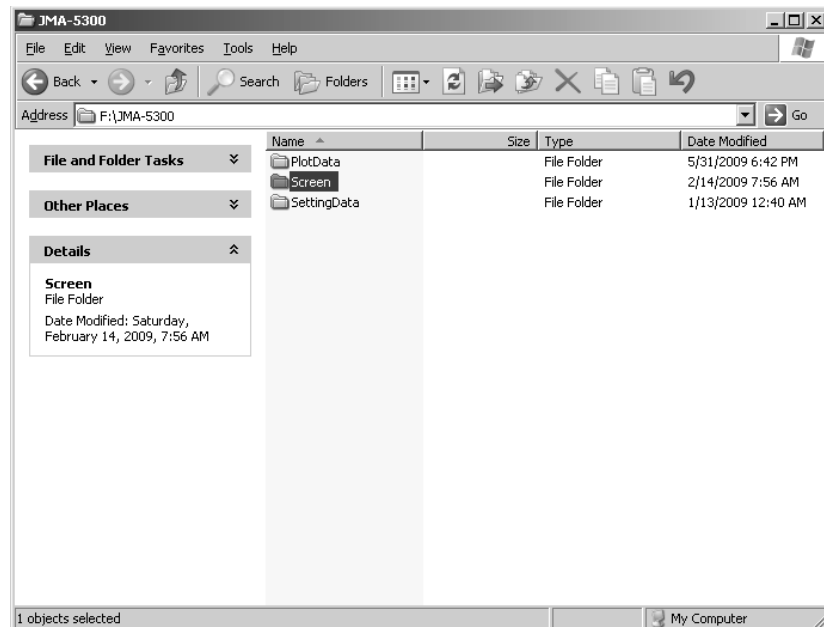
- 1 Insert a flash memory card into the PC. And open the drive.

The drive name is difference of your PC installation.

- 2 Open the "JMA-5300" folder.



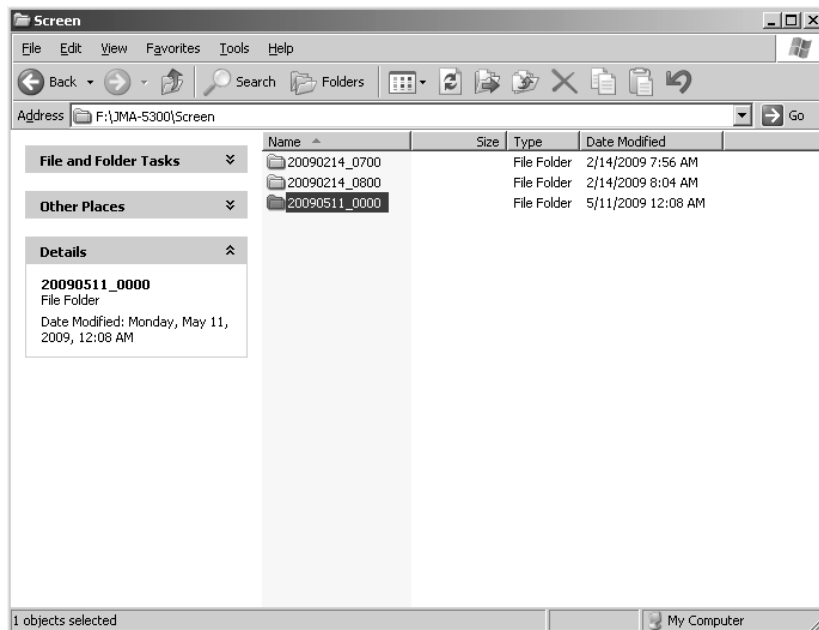
- 3 Open the "Screen" folder.



3

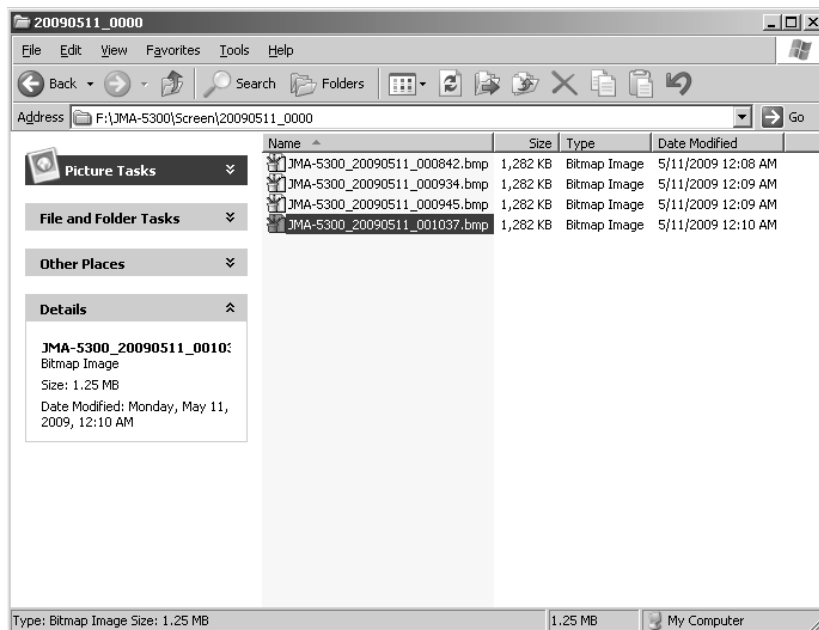
4 Open the folder of saved files.

Folder is named "YYYYMMDD_hh00". * Y : year, M : month, D : day, h : hour



5 Open the file.

File is named "JMA-5300_YYYYMMDD_hhmmss". * m : minute, s : second



3.14 RECEIVE PORT SETTING

The system can receive data from other system via the JRC LAN. The purpose of JRC-LAN is interoperation with other JRC systems. The JRC systems are synchronized with datum in JRC-LAN network.

Note: If the connection is not suggested from JRC office, don't connect PC or other maker's system to JRC-LAN.

- Connecting PC or other maker's system may cause a lower radar system performance.
- Connecting PC or other maker's system may cause a lower that performance.

3

3.14.1 Receive Port Setting (RX Port)

Procedures

1. Press the [RADAR MENU] key twice.
2. Open the RX Port menu by performing the following menu operation.

4. NAV Equipment Setting
→ 6. RX Port

3. Set a port for each sensor.

Settable sensor signals

Heading, Speed, AIS, GPS, DLOG, Alarm, Depth, Temperature, Wind, Current, ROT, RSA, Time Zone, Date/Time

Selectable ports

When the automatic recognition function is used : AUTO
When ports are specified : User Setting, Serial, LAN, LAN(GPS), LAN(Ship's Clock)

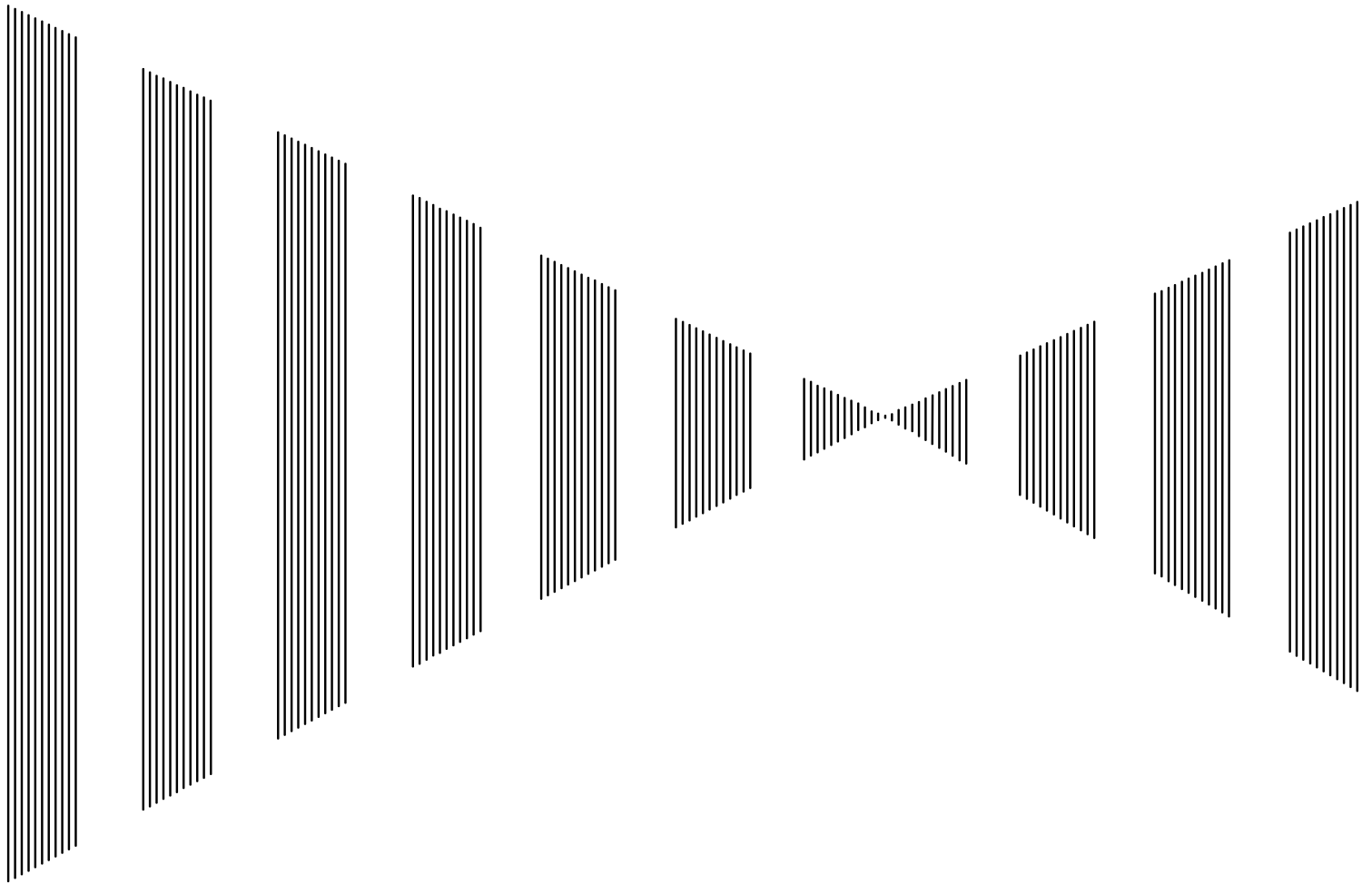
Behavior pattern of selectable ports

AUTO	: Data from JRC-LAN is prior
Own	: The system uses data from connected port.
LAN	: The system uses data from JRC-LAN.
LAN(GPS)	: The system uses GPS data from GPS (JRC-LAN connected).
LAN(Ship's Clock)	The system uses ship's clock data from ship's clock (JRC-LAN connected) ⁱⁱ .

Note: Setting of "7.2.11 [ii] Transmit/Receive Data Setting (LAN Port Setting)" is prior. If you want to set this menu, "7.2.11 [ii] Transmit/Receive Data Setting (LAN Port Setting)" menu set to User Setting.

SECTION 4

MEASUREMENT OF RANGE AND BEARING



4.1	USE OF NAVIGATION TOOLS	4-1
4.2	MEASUREMENT OF RANGE AND BEARING	4-17

4.1 USE OF NAVIGATION TOOLS

The system is equipped with the navigation tools below.

Cursor

Specifies an arbitrary point, and measures the range and bearing from the own ship.

Range Rings

Displays concentric circles with own ship's position as the center at specified intervals, and the rings are used as rough guides for range measurement.

Electronic Bearing Line (EBL1/2)

Displays a straight line for specifying an arbitrary bearing, and measures the bearing from the own ship.

The process unit is equipped with two electronic bearing lines.

Variable Range Marker (VRM1/2)

Displays a circle for specifying an arbitrary range, and measures the range from the own ship.

The process unit is equipped with two variable range markers.

Parallel Index Line (PI)

Displays straight lines at even intervals, and the lines are used as rough guides for complex measurement or ship courses.

EBL Maneuver

Displays the course by steering the own ship, and it is used as a rough guide for ship maneuvering.

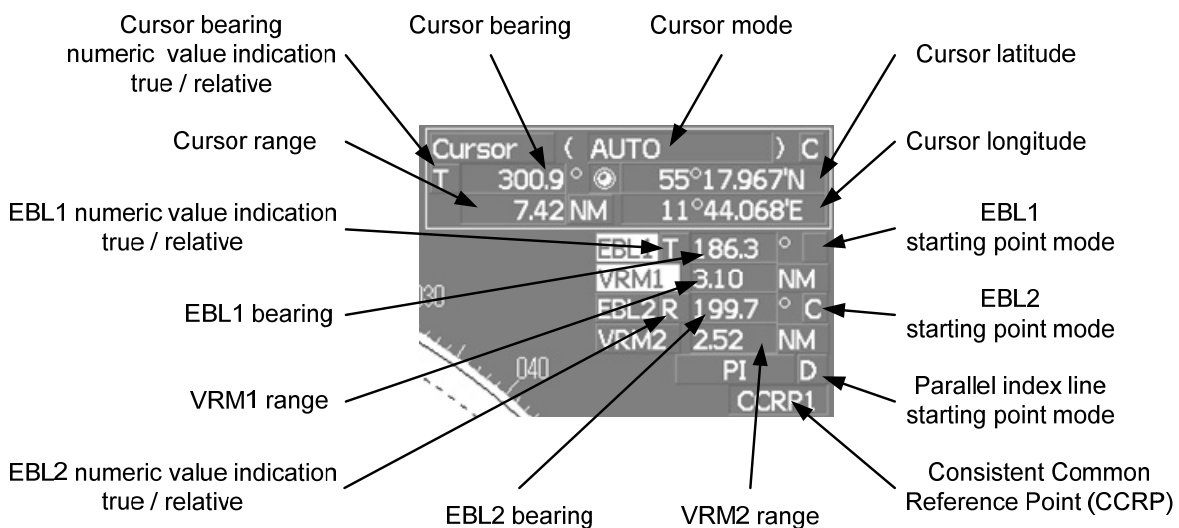
Man Overboard

Stores the latitude and longitude where the own ship was at the point of storing the markers, and shows an anchor symbol on the radar display. When the own ship has moved, the system displays the range and bearing to the position.

Use this tool when the ship is anchored or man overboard.

EBL/VRM/PI Operation with Cursor (Cursor AUTO)

Operates EBL, VRM, or PI on the radar display by using the cursor.



4.1.1 Using Cursor (Cursor)

Procedures

- 1 Move the cursor onto the PPI display by moving the trackball.

When the cursor is moved onto the PPI display, the arrow cursor turns into a cross cursor.

4.1.2 Using Range Rings [RR / HL]

Procedures

- 1 Press the [RR / HL] key.

The range ring display switches disappear and appear between display and non-display each time the [RR / HL] key is pressed. The range ring interval is shown in the Range Rings display on / off (upper left of the display ② on page 2-16). The range between the target and own ship can be determined by visually measuring the target's position that lies between two range rings. For change of the brilliance of range rings, refer to Section 3.8.5.

4.1.3 Using Electronic Bearing Line (EBL1/EBL2)

Electronic bearing lines (EBL) are indispensable to the measurement of bearings.

Operators must be familiar with the operation of EBL beforehand.

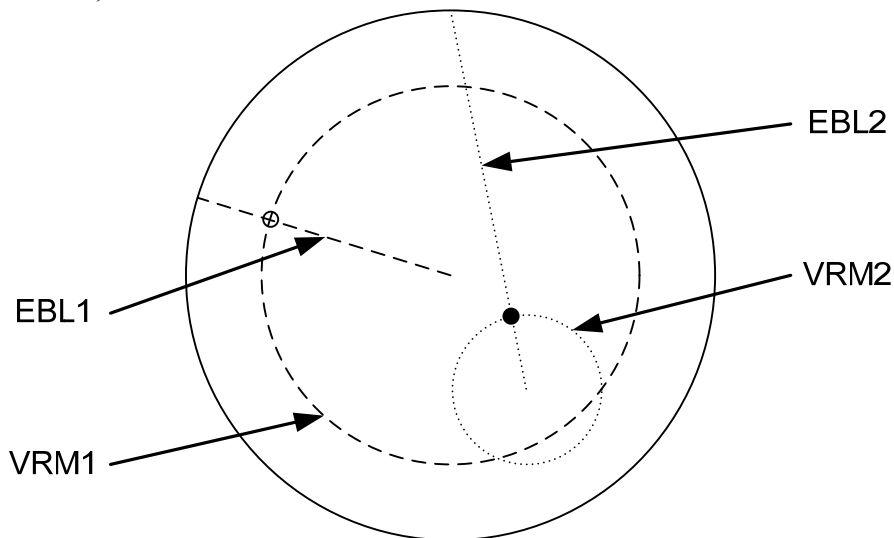
The system is equipped with two EBL. The bearing and starting point of an EBL can be operated separately from the other EBL.

An intersection marker is displayed at the intersection point of the EBL and VRM of the same number.

Intersection markers shown on EBL:

○ : EBL1, VRM1

● : EBL2, VRM2



EBL Bearing Display

The bearing value of the current EBL1 or EBL2 on the PPI display is shown in the EBL1/2 bearing (upper right of the display on page 2-3). The currently operable EBL1 or EBL2 is highlighted in the EBL1/2 adjustment (upper right of the display ⑤ /⑦ on page 2-19).

Starting Point of EBL

The starting point of the currently operating EBL can be switched from the center of the radar display to any offset position. The offset position of the EBL starting point can be fixed on the radar display or at the latitude and longitude. (The setting of the navigator is necessary for fixing the offset position at the latitude and longitude.)

[I] Operating EBL (EBL)

To operate EBL

Procedures

- 1 Press the [EBL1] or [EBL2] key.

The EBL adjustment (upper right of the display ⑤/⑦ on page 2-19) will be highlighted, and the selected EBL becomes operable.

- 2 Turn the [EBL] dial.

To turn the [EBL] dial to the right, turn the EBL control clockwise, to turn the [EBL] dial to the left, turn the EBL control counterclockwise.

Cancellation

- 1 Press the [EBL1] or [EBL2] key again.

The selected EBL display will disappear.

4

[II] Moving the Starting Point of EBL

The system provides three types of EBL starting points. Select one of them in accordance with purpose.

- :The EBL starting point is defined as the own ship's position.
- C :The EBL starting point is moved and fixed on the radar display.
- D :The EBL starting point is moved and fixed at the latitude and longitude.
(The navigator needs to be connected.)

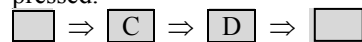
To move the starting point of EBL

Procedures

- 1 Make EBL1 or EBL2 operable.

- 2 Press the [EBL] dial to set C or D for the EBL1 / EBL2 starting point mode switching (upper right of the display ⑪/⑫ on page 2-19).

The selected EBL starting point mode is switched as shown below each time the dial is pressed.



- 3 Put the cursor on the EBL starting point is to be moved, and press the [ENT] key.

The selected EBL starting point will be determined.

To return the EBL starting point to own ship's position

Procedures

- 1 Make EBL1 or EBL2 operable.
- 2 Press the [EBL] dial to set for the EBL1 / EBL2 starting point mode switching (upper right of the display ⑪/⑫ on page 2-19).

The selected EBL starting point will be set as the own ship's position.

[III] Setting EBL Operation Mode

To set the numeric value display mode of EBL (EBL Bearing REF)

Determine whether to display EBL in true bearing mode or relative bearing mode.

Procedures

- 1 Put the cursor on the EBL1/2 numeric value indication true / relative switching (upper right of the display ⑨/⑩ on page 2-19), and press the [ENT] key.

The selected mode is switched as shown below each time the [ENT] key is pressed.

T ⇒ R ⇒ T

T :EBL bearing is displayed in true bearing mode.

R :EBL bearing is displayed in relative bearing mode.

To set a mode for fixing EBL display (EBL Bearing Fix)

When this function is set to Angle, an EBL is fixed to the preset bearing. For example, if a true bearing of 020° is preset, the EBL is fixed to the true bearing 020° even when the own ship turns.

When the function is set to Screen, the EBL is fixed on the radar display. In this case, the EBL is always fixed to the same bearing on the display when the own ship turns.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the EBL/Cursor Setting menu by performing the following menu operation.

5. Sub Menu

9. EBL/Cursor Setting

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

To set EBL1, press the [1] key, to set EBL2, press the [2] key

Angle :EBL bearing is fixed to the preset value.

Screen :EBL bearing is fixed on the radar display.

Note: Course data is necessary for turning on this function.

4.1.4 Using Variable Range Marker (VRM1 / VRM2)

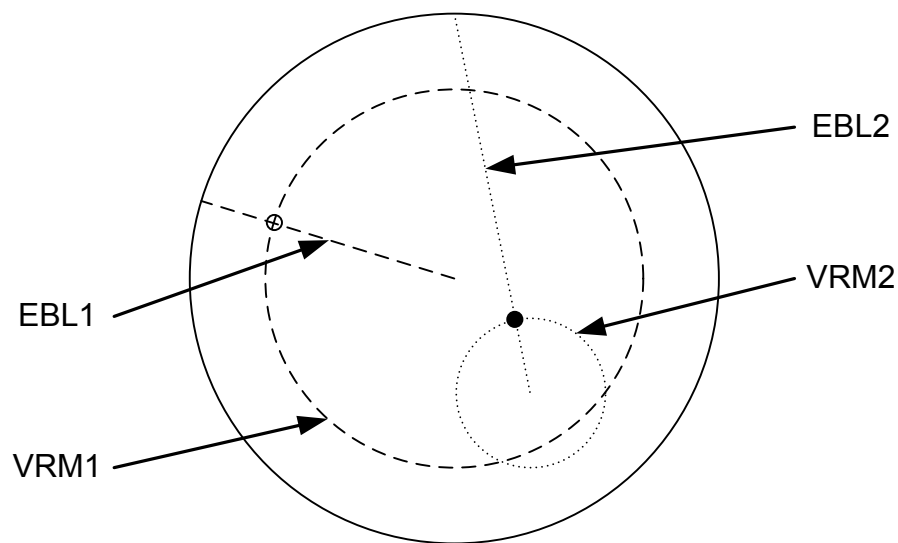
Variable range markers (VRM) are indispensable to the measurement of ranges. Operators must be familiar with the operation of VRM beforehand.

The system is equipped with two VRM. The VRM can be operated separately from each other. An intersection marker is displayed at the intersection point of the VRM and EBL of the same number.

When the starting point of an EBL is offset, the center of the VRM is defined as the offset EBL starting point.

Intersection markers shown on VRM:

- : EBL1, VRM1
- : EBL2, VRM2



VRM Operation

The range value of the current VRM1 or VRM2 on the PPI display is shown in the VRM1/2 range (upper right of the display on page 2-3). The currently operable VRM1 or VRM2 is highlighted in the VRM1/2 adjustment (upper right of the display ⑥/⑧ on page 2-19).

To operate VRM

Procedures

- 1 Press the [VRM1] or [VRM2] key.

The VRM adjustment (upper right of the display ⑥/⑧ on page 2-19) will be highlighted, and the selected VRM becomes operable.

- 2 Turn the [VRM] dial.

To turn the [VRM] dial to the right, the VRM control wide, to turn the [VRM] dial to the left, the VRM control narrow.

Cancellation

- 1 Press the [VRM1] or [VRM2] key again.

The selected EBL display will disappear.

4.1.5 Using Parallel Index Lines (PI Menu)

Parallel index lines can be displayed.

[I] Operating Parallel Index Lines (PI)

Procedures

1 Press the [VRM] dial.

Parallel index lines and the PI Menu will appear.

To change the bearing of parallel index lines, turn the [EBL] dial, to change the line interval, turn the [VRM] dial.

The bearing and interval of parallel index lines are displayed in the PI Menu.

2 Press the [VRM] dial again.

The parallel index lines will be fixed.

Note: Parallel index lines are operable only while the PI Menu is displayed. When the menu is closed, the parallel index line display remains, but the settings of the bearing and interval cannot be adjusted any more. To adjust the bearing and interval after closing the menu, press the [VRM] dial twice to open the PI Menu.

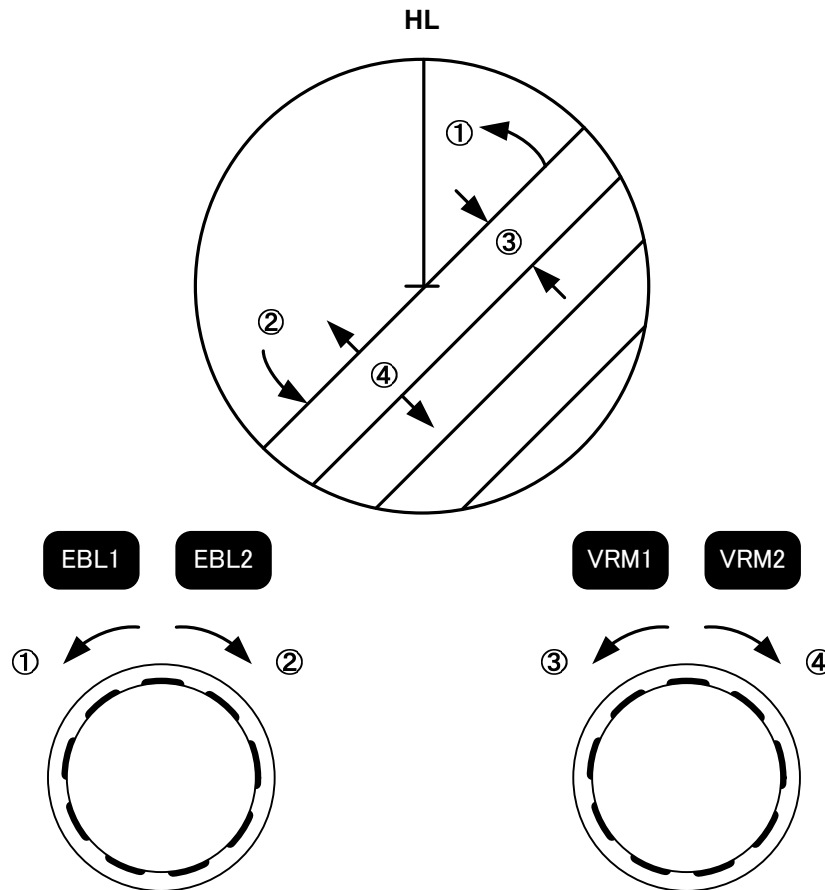
Cancellation

1 Press the [VRM] dial again.

The parallel index line display will disappear.

III] Operation of Parallel Index Lines

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



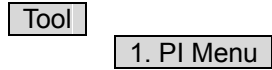
- ⊙ When the **[VRM]** dial is pressed, the PI Menu closes and the parallel index lines are fixed.

During the operation of parallel index lines, pressing the **[EBL1]** or **[EBL2]** key disables operation for rotation directions. Pressing the **[VRM1]** or **[VRM2]** key disables operation for parallel index line intervals.

[III] Settings in PI Menu

The operation of parallel index lines can be set in the PI Menu.

Procedures 1 **Open the PI Menu by performing the following menu operation.**



[1] Display for All Lines

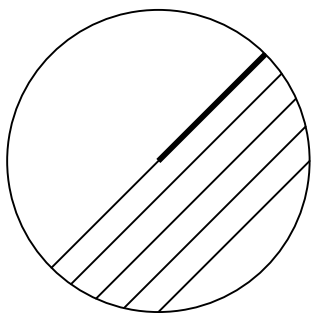
Sets the parallel index line display to on or off.

- On :Parallel index lines are displayed.
- Off :Parallel index lines are not displayed.

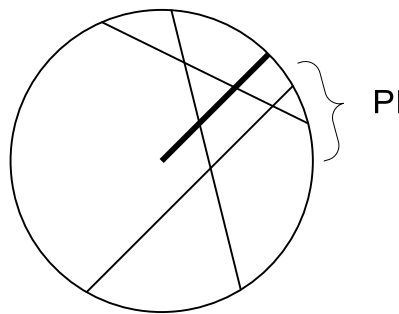
[2] Operation Mode

Sets an operation mode for parallel index lines.

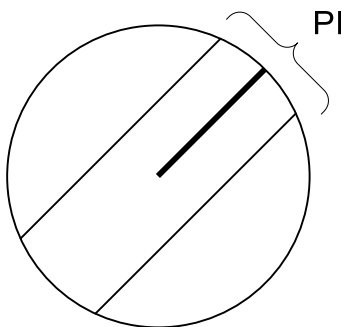
- All :All the parallel lines are operated at the same time.
- Individual :The bearing of each line is operated individually.
- Track :Equally spaced lateral lines are displayed on both sides.
- Equiangular :Two lines intersecting at the center of a circle are displayed.



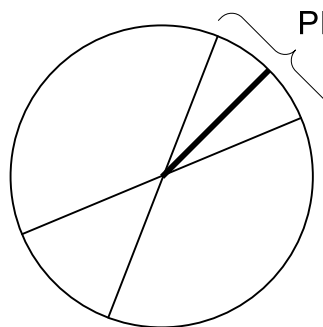
All



Individual



Track



Equiangular

Operation if Individual is selected

A line perpendicular to the own ship and the intersection marker "----○" are displayed on an operable line.

Turning the [EBL] dial changes the direction.

Pressing the [VRM] dial changes the range, end point 1, or end point 2 to be operated.

An operable point is displayed with " ● " and can be operated by turning the [VRM] dial.

If [Sequential] is selected for [3] Control, the parallel index lines of the next number can be displayed by pressing the [EBL] dial.

To close the menu, press [0] key.

Operation if Equiangular is selected

Select a group of lines to be operated according to the setting of [3] Control.

Pressing the [EBL] dial switches between the direction change mode and elevation-angle change mode. Turning the [EBL] dial changes the direction or elevation angle.

4**[3] Control**

Determines whether to operate all the lines at the same time. The setting items are determined by the setting of [2] Operation Mode.

If All is selected

The setting cannot be changed.

[All] : All the lines are operated at the same time.

If Individual is selected

Determine whether to set consecutive lines or individual lines.

[Sequential] : Lines are operated sequentially.

[Index Line1] to [Line8] : A specified line is operated.

If Track or Equiangular is selected

Select a group of lines to be operated.

[Group1] to [Group4] : A specified group is operated.

[4] Floating

Moves the center point of parallel index lines.

[Off] : The starting point of parallel index lines is defined as the own ship's position.

[Screen Fix] : The center of parallel index lines is moved and fixed on the radar display.

[L/L Fix] : The center of parallel index lines is moved and fixed at the latitude and :longitude. (The navigator needs to be connected.)

[5] Heading Link

Determines whether to operate parallel index lines following the heading bearing.

[On] : Parallel index lines are operated following the heading bearing.

[Off] : Parallel index lines are not operated following the heading bearing.

[6] Next

Moves to the next page.

[1] Range Scale Link

Determines the operation of parallel index line intervals when the range is changed.

On

: The intervals are fixed with the actual range (nm).

The appearance of parallel index line intervals changes when the range is changed.

Off

: The intervals are fixed with the display range.

The parallel index line intervals (nm) change when the range is changed.

[2] Reference Bearing

Sets a reference bearing for the numeric data display of parallel index lines. The setting items are determined by the setting of **[2] Operation Mode**.

If **All is selected**

True

: Displayed with true bearing (with North as reference).

HL

: Displayed with the heading line as reference.

If **Individual is selected**

True

: Displayed with true bearing (with North as reference).

HL

: Displayed with the heading line as reference.

Index Line1 to **Line8**

: Displayed with a specified line as reference.

If **Track is selected**

True

: Displayed with true bearing (with North as reference).

HL

: Displayed with the heading line as reference.

Index Line1 to **Line8**

: Displayed with a specified line as reference.

Line1, **Line3**, **Line5**, and **Line7** correspond to **Group1**, **Group2**, **Group3**, and **Group4**, respectively.

If **Equiangular is selected**

The setting cannot be changed.

[3] Operation Area

If **All** is selected for **[2] Operation Mode**, this function sets an area for displaying parallel index lines.

One Side

: Parallel index lines are displayed only on one side.

Both Sides

: Parallel index lines are displayed on both sides.

[4] Display for Individual Line

Determines whether to turn on / off the parallel index line display of a selected number.

On : The line of the selected number is displayed.

Off : The line of the selected number is not displayed.

If All is selected for **[2] Operation Mode**, the line near the own ship is line1.

If Track or Equiangular is selected for **[2] Operation Mode**, Line1, Line3, Line5, and Line7 correspond to Group1, Group2, Group3, and Group4, respectively.

4.1.6 Operating EBL Maneuver Function (EBL Maneuver Setting)**4****[I] Initial Setting (EBL Maneuver Setting)****Procedures**

- 1 Open the EBL Maneuver Setting menu by performing the following menu operation.

Tool

3. EBL Maneuver Setting

- 2 Set the following parameters.

Reach : Set the range from when the rudder is steered to when the ship begins to turn.

Turn Mode : Select a turn mode.

Radius : Turning radius (nm)

Rate : Rate of turn (deg/min)

Turn Set : Select the setting for turning.

If Radius is selected : Turning radius (nm)

If Rate is selected : Rate of turn (deg/min)

For inputs to the numeric value input menu, refer to Section 3.3.4.

Note: A wrong initial setting affects the maneuver curve function explained below.

III] Creation of Maneuver Curve (EBL Maneuver)

Procedures

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

The EBL maneuver function will be set to on or off.

A auxiliary line for maneuver curve creation, a maneuver curve, and a WOL will appear on the radar display.

- 2 Put the cursor on the starting point of the auxiliary line, and set the bearing of the auxiliary line by operating the [EBL] dial.**

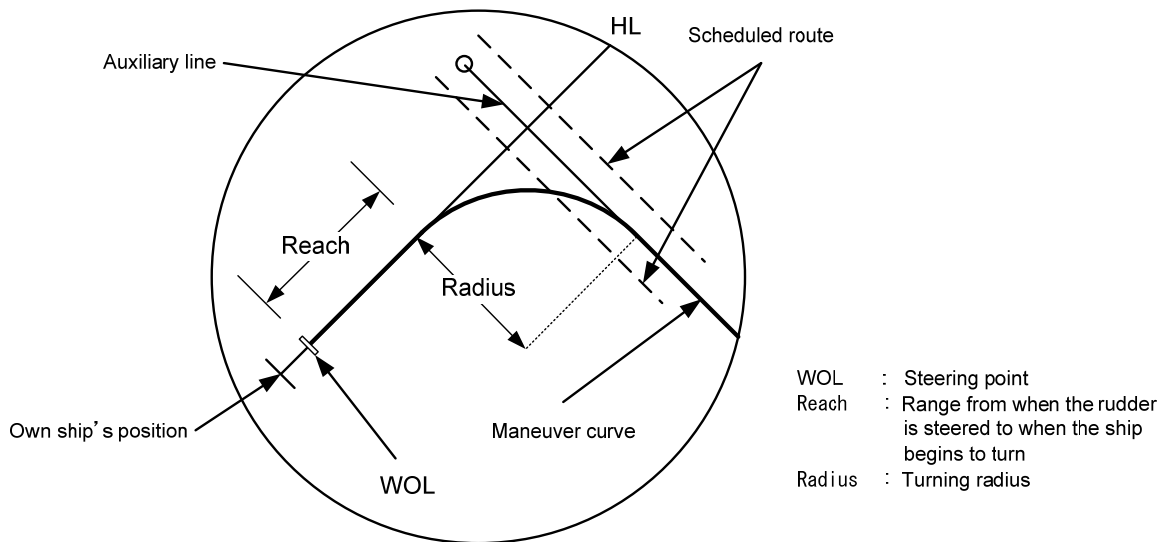
The bearing of the auxiliary line is the final bearing in which the own ship is to move.

The WOL position varies depending on the bearing of the auxiliary line.

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

- 3 Press the [ENT] key.**

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



4.1.7 Using MOB [MOB]

The marker (anchor symbol) 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's position to the marker. (The navigator needs to be connected.)

For example, the function can be used for following purposes:

To confirm the drifting distance from where the ship was anchored.

To record a position of man overboard.

Procedures

1 Press the [MOB] key.

A marker will be displayed at the own ship's position on the radar display at the moment when the [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.

Cancellation

1 Press the [MOB] key for 2 seconds.

The marker will disappear.

4

4.1.8 Operating EBL, VRM, and PI with Cursor

When the cursor mode is set to (upper right of the display on page 2-3), EBL, VRM, and PI can be operated simply by using the trackball and the [ENT] key.

[I] Operating Electronic Bearing Line (EBL)

Procedures

1 Put the cursor on EBL1 or EBL2, and press the [ENT] key.

When the cursor is moved to it, or is shown at the upper right of the cursor. The EBL becomes operable when the [ENT] key is pressed.

2 Move the cursor to the bearing to be set.

The EBL will move as the cursor moves.

3 Press the [ENT] key.

The EBL will be fixed.

[II] Operating Variable Range Marker (VRM)

Procedures

- 1 Put the cursor on VRM1 or VRM2, and press the [ENT] key.

When the cursor is moved to it, or is shown at the upper right of the cursor. The VRM becomes operable when the [ENT] key is pressed.

- 2 Move the cursor to the range to be set.

The VRM will move as the cursor moves.

- 3 Press the [ENT] key.

The VRM will be fixed.

[III] Operating EBL and VRM Concurrently (EBL and VRM)

Procedures

- 1 Put the cursor on the intersection marker (or) , and press the [ENT] key.

When the cursor is moved to it, or is shown at the upper right of the cursor. The EBL and VRM become operable when the [ENT] key is pressed.

- 2 Move the cursor to the bearing / range to be set.

The EBL and VRM will move as the cursor moves.

- 3 Press the [ENT] key.


The EBL and VRM will be fixed.

[IV] Operating Parallel Index Lines (PI)

To change the direction of parallel index lines

Procedures

- 1 Put the cursor on near the center of line, and press the [ENT] key.

When the cursor is moved there, it will turn into "" and will be displayed at the upper right of the cursor. The parallel index lines become operable when the [ENT] key is pressed.

- 2 Move the cursor to the direction to be set.

The parallel index lines will change the direction as the cursor moves.

- 3 Press the [ENT] key.

The parallel index lines will be fixed.

To change parallel index line intervals

Procedures

- 1 Put the cursor on near the end of line, and press the [ENT] key.**

When the cursor is moved there, it will turn into "↔" and PI will be displayed at the upper right of the cursor. The parallel index lines become operable when the [ENT] key is pressed.

- 2 Move the cursor to the interval to be set.**

The parallel index lines interval will change as the cursor moves.
If Individual is selected for Operation Mode, the parallel index lines move.

- 3 Press the [ENT] key.**

The parallel index lines will be fixed.

4

To change the end points of parallel index lines

If Individual is selected for Operation Mode, the length of parallel index lines can be changed.

Procedures

- 1 Put the cursor on the end point of parallel index lines, and press the [ENT] key.**

When the cursor is moved there, it will turn into "↔" and PI will be displayed at the upper right of the cursor. The parallel index lines become operable when the [ENT] key is pressed.

- 2 Move the cursor to the position to be set.**

The position of the end point will change as the cursor moves.

- 3 Press the [ENT] key.**

The parallel index lines will be fixed.

4.2 MEASUREMENT OF RANGE AND BEARING

Target position on the RADAR screen

RADAR antenna transmits pulses of radio waves. The object returns the wave (radar echo) to the antenna.

So on the RADAR screen the leading edge of echo is the actual target position.

The length of echo is dependent on the transmitted pulse length.

Point the cursor to the leading edge of echo to measure the target range or to make a mark on the target.

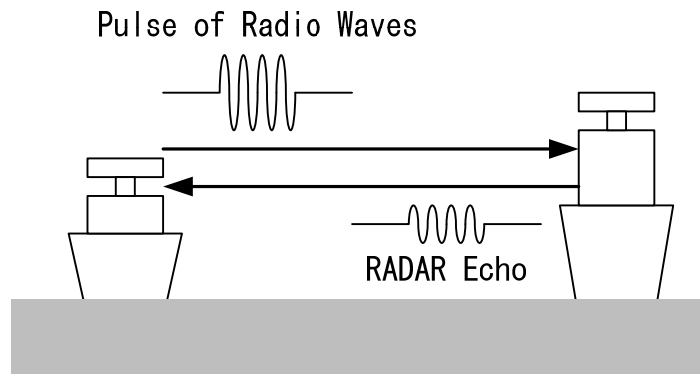


Fig. 4.1 Transmitting-Receiving of RADAR

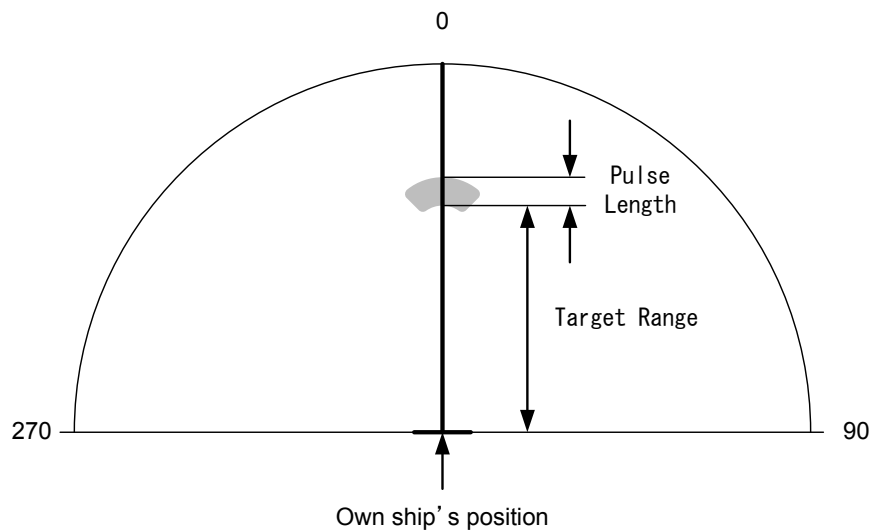


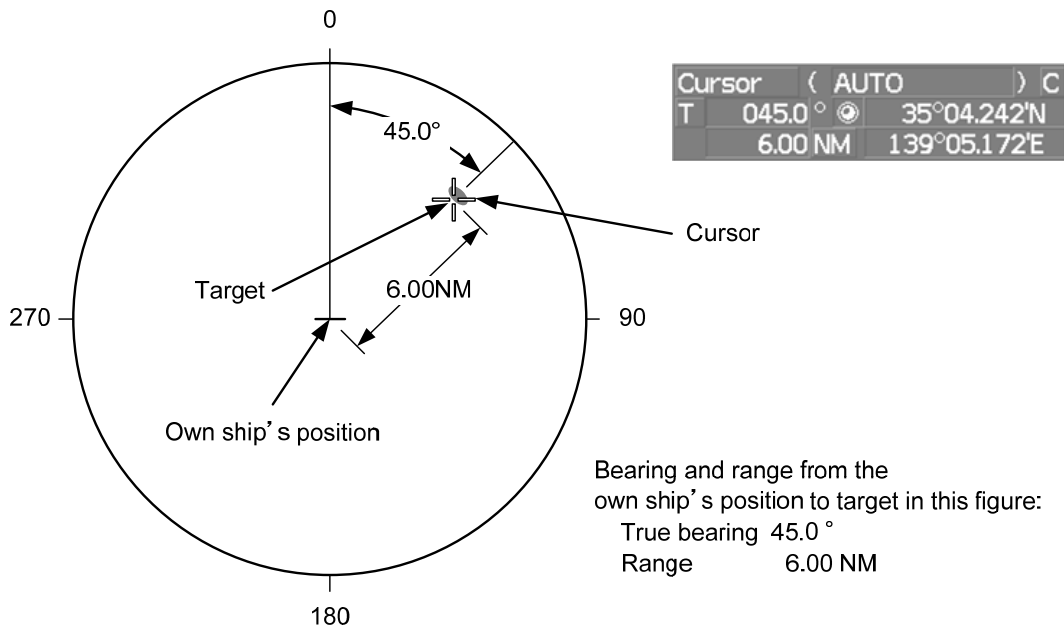
Fig. 4.2 Relation of echo, target range and pulse length

4.2.1 Measurement with Cursor Position (Cursor)

Procedures

- 1 Make sure of the target echoes on the radar display.
- 2 Move the cursor to the target.

The bearing and range of the target will be shown in the Cursor bearing / range (upper right of the display on page 2-3). The range is a distance from the own ship's position.



4

To set a cursor bearing numeric value mode

Determine whether to display a cursor bearing in true or relative bearing mode.

Procedures

- 1 Put the cursor on the Cursor bearing numeric value indication true / relative switching (upper right of the display ④ on page 2-19), and press the [ENT] key.

The selected mode is switched as shown below each time the [ENT] key is pressed.

T ⇒ R ⇒ T

T : Cursor bearing is displayed in true bearing mode.

R : Cursor bearing is displayed in relative bearing mode.

4.2.2 Measurement with Electronic Bearing Line and Variable Range Marker [EBL] [VRM]

Procedures

1 Press the [EBL1] key.

The display in the EBL1 adjustment (upper right of the display ⑤ on page 2-19) will be highlighted, and EBL1 will be shown with a dotted line on the PPI display.

2 Move the EBL1 to the target by turning the [EBL] dial.

The EBL1 bearing will be shown in the EBL1 bearing (upper right of the display on page 2-3).

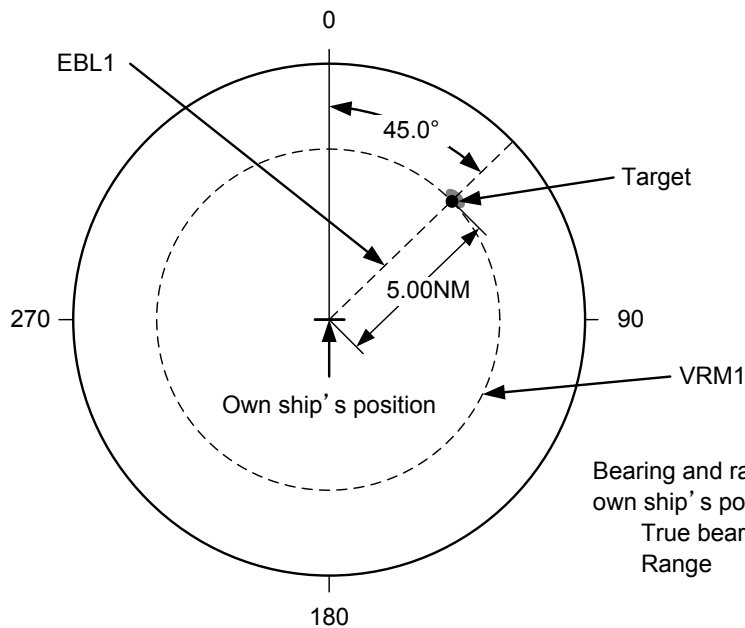
The EBL1 bearing is the bearing of the target.

3 Press the [VRM1] key.

The display in the VRM1 adjustment (upper right of the display ⑥ on page 2-19) will be highlighted, and VRM1 will be shown with a dotted line on the PPI display.

4 Move the VRM1 to the target by turning the [VRM] dial.

The range of VRM1 from the own ship's position will be shown in the VRM1 range (upper right of the display on page 2-3).



EBL1 T	045.0	°	C
VRM1	5.00	NM	
EBL2 T		°	
VRM2		NM	
			PI

4.2.3 Measurement with Two Arbitrary Points

Procedures

- 1 Press the [EBL2] key.

The display in the EBL2 adjustment (upper right of the display ⑦ on page 2-19) will be highlighted, and EBL2 will be shown on the PPI display.

- 2 Press the [EBL] dial to select **C** for the EBL2 starting point mode switching (upper right of the display ⑫ on page 2-19).


- 3 Put the cursor on the point A of the two points between which measurement is made, and press the [ENT] key.

Refer to the figure below.

- 4 Move the EBL2 to the other point B by turning the [EBL] dial.

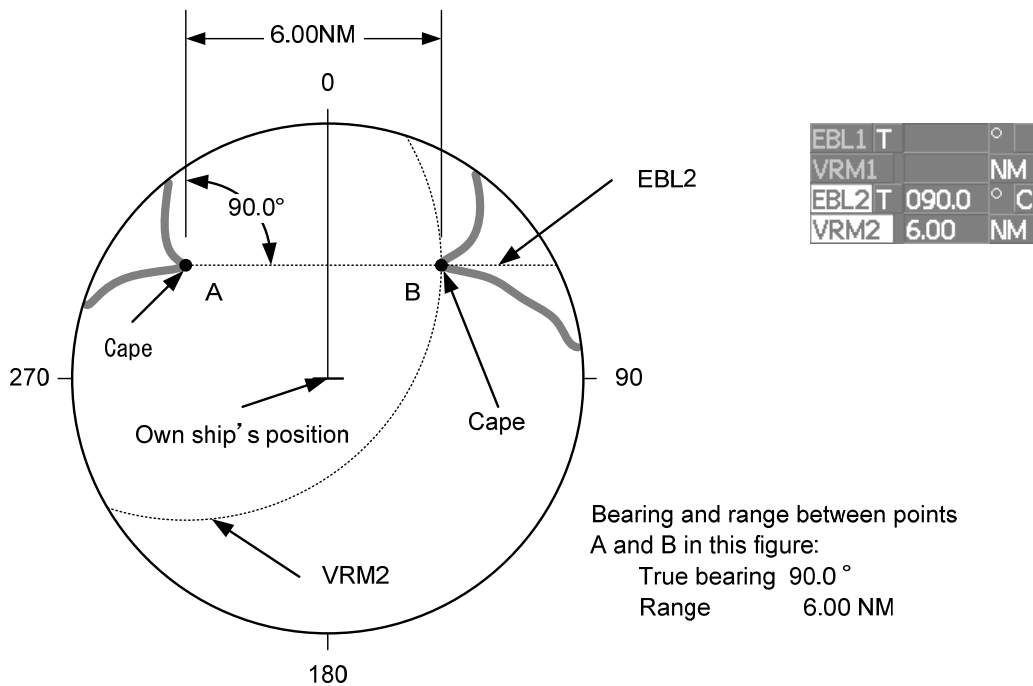
Refer to the figure below.

- 5 Press the [VRM2] key.

When VRM2 is selected,  (intersection marker) will appear on the dotted line of EBL2.

- 6 Move the intersection marker on the dotted line to point B by turning the [VRM] dial.

The range and bearing between the two points will be shown in the VRM2 range and EBL2 bearing (upper right of display on page 2-3).



Similarly, EBL1 can also be used for measuring the bearing and range between two points. In this case, perform the above procedure reading EBL2 as EBL1 and VRM2 as VRM1.

SECTION 5

OPERATION OF TARGET TRACKING AND AIS

USAGE OF TARGET TRACKING FUNCTION	5-1
5.1 PREPARATION	5-2
5.2 TARGET TRACKING OPERATION	5-16
5.3 AIS OPERATION.....	5-31
5.4 DECISION OF TARGETS AS IDENTICAL (ASSOCIATION)	5-42
5.5 ALARM DISPLAY	5-44
5.6 TRACK FUNCTION	5-49
5.7 TRIAL MANEUVERING (TRIAL MANEUVER).....	5-59
5.8 EPA OPERATION.....	5-63

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 correlation, 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.

Target Tracking Function (Option)

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.

The target tracking function also enables the simulation of the ship maneuvering method to avoid collisions by using the trial maneuver function. (NCA-877WA)

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.

	Normal edition NCA-877A	High performance edition NCA-877WA
Maximum number of targets that can be tracked	30	100
Trial maneuver function	Not provided	Provided

Note: ARPA Process Unit (NCA-877WA) or ATA Process Unit (NCA-877A) must be fitted on ships compliant to IMO.

AIS (Automatic Identification System) function (Option)

The AIS function shows the target's information on the radar display, using other ship's information sent out from the AIS unit.

Note: AIS Process Unit must be fitted on ships compliant to IMO.

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 predetermine 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.

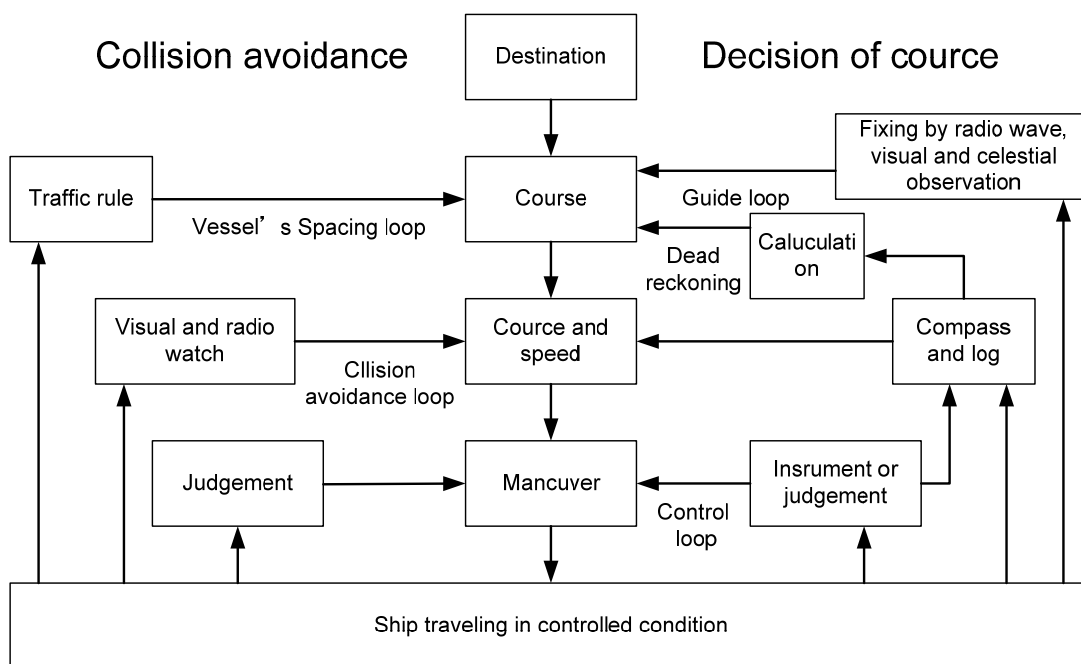


Fig. 5-1 Navigation Pattern

Marine Accidents and Collisions

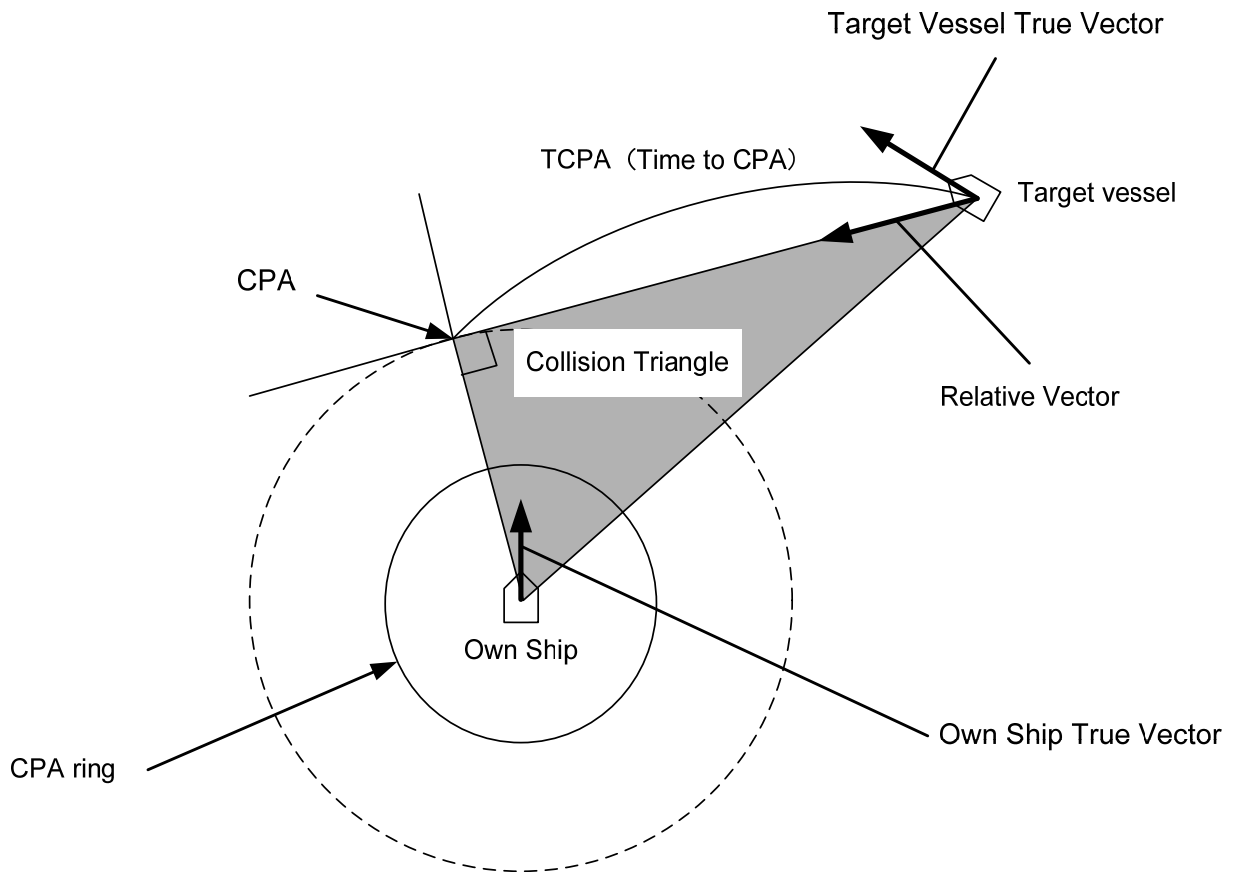
Among marine accidents, collision accidents have been highlighted as the tonnages and speeds of ships become higher along with the increase in traffic at sea. If a tanker carrying dangerous articles such as crude oil collides with any other vessel, then not only the vessels involved with the accident 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".



5

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.

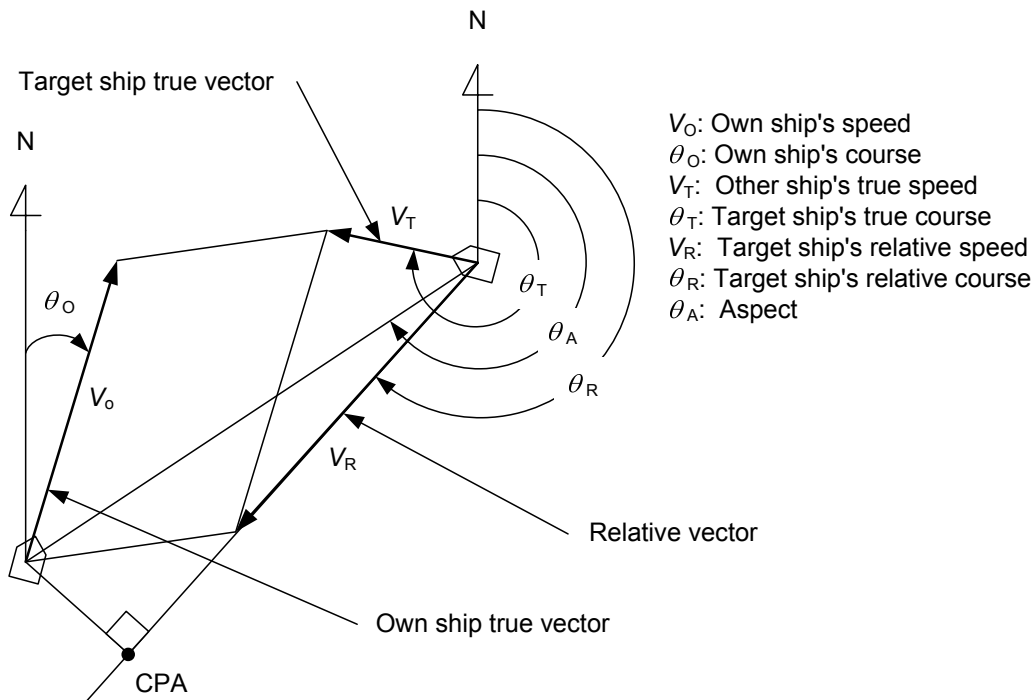


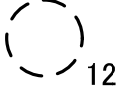

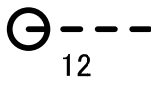
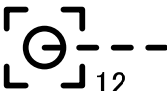

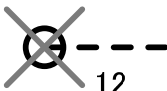
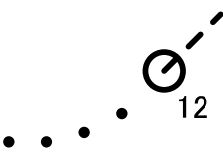
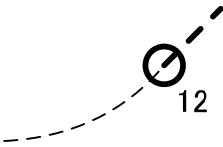
Fig. 5-3 Relative Vector and True vector

Radar and Collision Avoidance





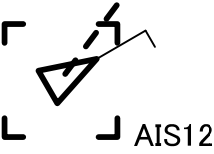






Radar is still playing an important roll for collision prevention and positioning. A plotter is used to further enhance the radar functionality. The plotter is capable of plotting other positions of other ships in 3 to 6 minute intervals to monitor their movement. The plots of other ships represent their 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	
	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 turns red.
	Lost target	The alarm sounds. The alarm message (Lost) turns red and blinks. The red X mark is displayed on the target tracking symbol.
	Past position	The past positions of an AIS target are displayed as well as the target tracking symbol.
	Target track	The target track of 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.
 AIS12	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.
 AIS12	Target acquired in automatic acquisition zone	The alarm sounds. The alarm message (New Target) turns red and blinks.
 AIS12	Outline display	The outlines of ships are displayed scaled down.
 AIS12	Numeric displayed target	When the numeric data is displayed, the target symbol is enclosed in a square.
 AIS12	Dangerous target	The alarm sounds. The alarm message (CPA/TCPA) turns red and blinks. The symbol turns red.
 AIS12	Lost target	The alarm sounds. The alarm message (Lost) turns red and blinks. The red X mark is displayed on the AIS symbol.
	Sleeping AIS-SART target	The AIS-SART symbol is same color as AIS target symbol.
 AIS12	Activated AIS-SART target	The target number displayed beside the symbol.
 AIS12	Numeric displayed AIS-SART target	When the numeric data is displayed, the target symbol is enclosed in a square.
 AIS12	Lost AIS-SART target	When the data of an AIS-SART target cannot be received for 6 minutes, the lost target is displayed.

Note: AIS-SART function is available in the display software ver. 1.01 or later. As for method of confirming software version, refer to section 8.3.1 " Check Performance on Test Menu ".

For details about AIS-SART, refer to section 6.6 " Display of AIS-SART ".

Up to 300 targets can be displayed in total of activated and sleeping AIS targets. Up to 100 activated AIS targets can be included in the total.

If there are more AIS targets than the allowable maximum, they are displayed in the following priority order:

1. Numeric displayed target
2. Target of which CPA / TCPA is lower than the set value
(Target as a dangerous ship for which an alarm has occurred)
3. Target in automatic activation zone
4. Activated AIS target
5. Target inside AIS filter
6. Target outside AIS filter

If the number of targets at the same priority level exceeds the allowable maximum, they are displayed in the following priority order:

1. Association target
2. Activated AIS target
3. Sleeping AIS target

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 (upper left of the display on page 2-2):

Vector over ground

When Sea is displayed for the stability mode (upper left of the display on page 2-2):

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	

Setting of Tracked Target Symbol Display

This function switches the tracking target symbol display between on and off.
Even if the tracking target symbol display is turned off, the data is retained.

- Procedures**
- 1 Move the cursor onto the tracking target symbol display On / Off (TT / AIS information ⑨ on page 2-23), and press the [ENT] key.

The tracking target symbol display will be set to on or off.

Setting of AIS Target Symbol Display

This function switches the AIS target symbol display between on and off.

- Procedures**
- 1 Move the cursor onto the AIS target symbol display On / Off (TT/AIS information ⑩ on page 2-23), and press the [ENT] key.

The AIS target symbol display will be set to on or off.

5.1.3 Radar Display

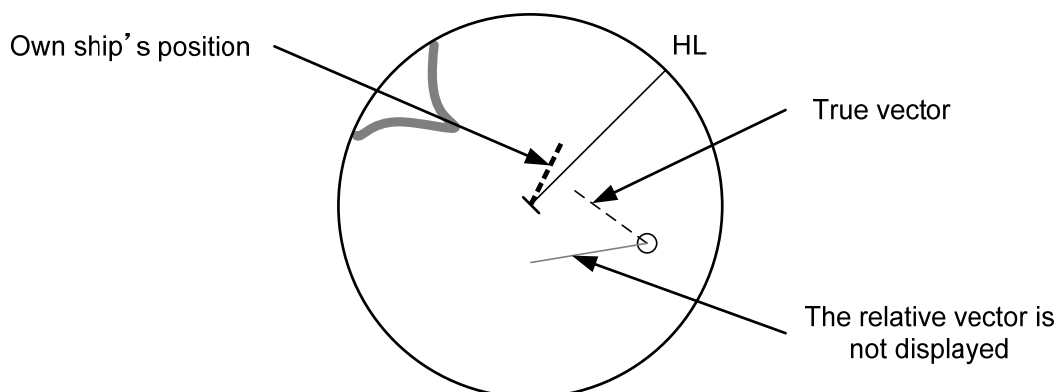
Vector Display

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.
To switch between the true vector mode and relative vector mode, press the [VECT R/T] key.

[I] Vector Mode Selection

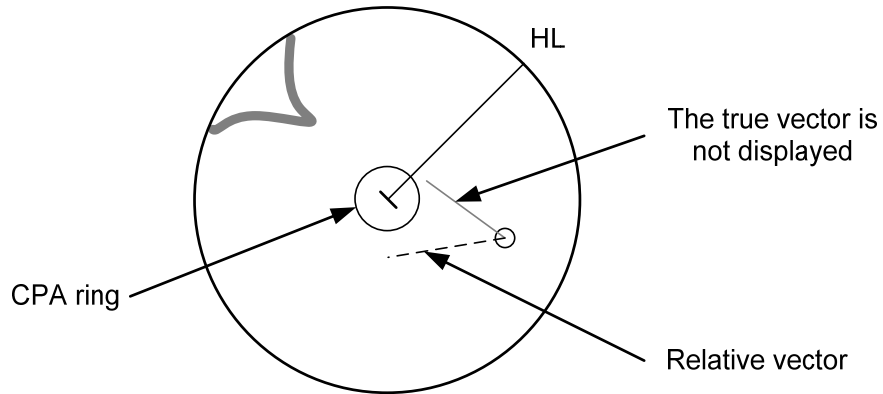
True Vector Mode

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, CPA Ring cannot appear in this mode.



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.



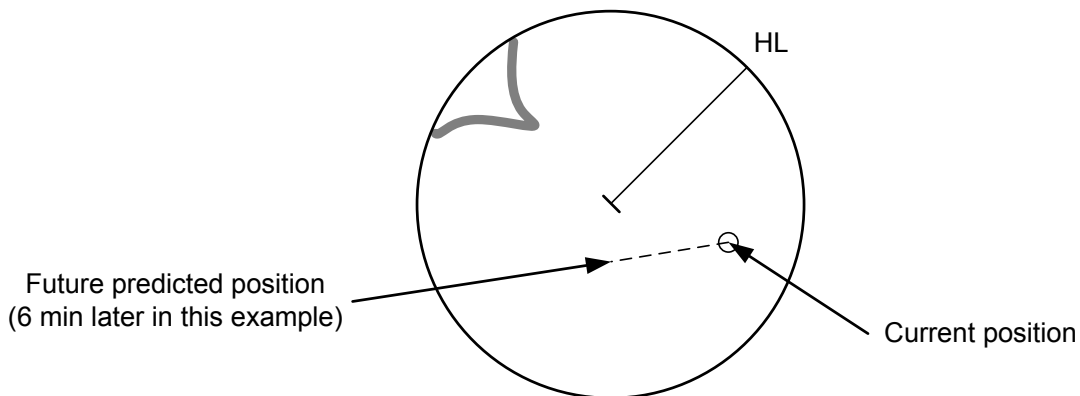
Therefore, the True / Relative mode shall optionally be used for the purpose of observation: the True vector mode for grasping the true aspect of a target, and the Relative vector mode for grasping a target's closest point of approach (CPA).

5

[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.

The diagram below illustrates a vector length of a target for 6 minutes, and the tip of the vector represents the target's position expected to reach 6 minutes later.



Refer to Section 5.1.7 Setting Vectors 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, and sets a point filter.
TGT Data	Displays the numeric data of a tracked target or AIS target.
CNCL TT	Cancel a target tracking.
DEACT AIS	Deactivates AIS target.
CNCL Data	Hides the displayed numeric data of a tracked target or AIS target.
Mark	Puts a temporary mark.
Property	Displays the information of tracked targets, AIS targets, and marks.
AUTO	Changes operation in accordance with the object at the cursor position.

Change of Cursor Mode

Procedures

- 1 Move the cursor to the cursor mode **Cursor** (upper right of the display ① on page 2-19), and press the [ENT] key. On the PPI, press the [CLR / INFO] key and select a desired cursor mode from the list.

The selected cursor mode will be shown at the cursor mode (upper right of the display on page 2-3).

Note: If the function of a selected cursor mode is not used for one minute or more, the cursor mode is automatically changed to **AUTO**.

Operation of AUTO Mode

As shown below, the **AUTO** mode performs operation in accordance with the object at the cursor position when the **[ENT]** key is pressed.

Object at Cursor Position	Operation
None	Acquires a target.
EBL	Performs EBL operation.
VRM	Performs VRM operation.
Intersection point of EBL and VRM	Performs EBL operation and VRM operation at the same time.
Parallel index line (PI)	Operates the parallel index line.
Tracked target	Displays the numeric data of the tracked target.
Tracked target with numeric data displayed	Hides the numeric data.
Sleeping AIS target	Activates the AIS target.
Activated AIS target	Displays the AIS target information.
AIS target with numeric data displayed	Hides the AIS target information.
Automatic acquisition / activation zone	Operates the automatic acquisition / activation zone.
Sector radar alarm zone	Operates the sector radar alarm zone.
AIS filter zone	Operates the AIS filter zone.

5.1.5 Setting Collision Decision Criteria

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.)**

Input of CPA Limit

Procedures

- 1 **Move the cursor to the CPA limit setting (TT/AIS information ③ on page 2-23), and press the [ENT] key.**

The CPA Limit value input screen will appear.

- 2 **Enter the value to be set as a CPA limit.**

For inputs to the value input screen, refer to Section 3.3.4.

Input of TCPA Limit

Procedures

- 1 **Move the cursor to the TCPA limit setting (TT/AIS information ④ on page 2-23), and press the [ENT] key.**

The TCPA Limit value input screen will appear.

- 2 **Enter the value to be set as a TCPA limit.**

For inputs to the value input screen, refer to Section 3.3.4.

5.1.6 Setting CPA Ring

While the distance of the specified CPA Limit value is used as the radius, the CPA ring is displayed with a red circle.

Procedures

- 1 **Move the cursor to the CPA ring display On / Off (lower right of the display ⑦ on page 2-21), and press the [ENT] key.**

The CPA ring will be displayed.

Note: The CPA ring is not displayed when the true vector mode is selected.

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

Procedures

- 1 Move the cursor to the target vector time setting (TT / AIS information ② on page 2-23), and press the [ENT] key.

The Vector Time value input screen will appear.

- 2 Enter the value to be set as vector time.

For how to input numeric data on the numeric value input screen, see Section 3.3.4.

Setting vector time using the multi-dial [MULTI]

Procedures

- 1 Press the [MULTI] dial several times to activate the **Vector** mode.

Vector will be displayed in the multi-dial mode (lower left of the display on page 2-3).

- 2 Turn the [MULTI] dial to set the vector time.

Setting vector mode [VECT R / T]

Procedures

- 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 (TT / AIS information ① on page 2-23).

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 7.1.9 Setting of CCRP/Antenna/GPS Antenna Position.

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 TARGET TRACKING OPERATION

ARPA/ATA Process Unit (option) is necessary.

This section explains how to use the target tracking function.

The target tracking function automatically tracks a target, and displays the target's course and speed as vectors.

The target tracking function calculates CPA and TCPA, and issues an alarm as needed.

The tracking data is erased from memory when the power is turned off or during transmission standby.

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.



In setting an automatic acquisition zone, it is necessary to adjust the gain, sea clutter suppression and rain 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.

5.2.1 Acquiring Target [ACQ]

Target acquisition can be performed on two modes, Automatic and Manual, and both modes can be used at the same time.

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.

The position of the scanner shall be at the centre of the azimuth or range in the acquisition/activation zone.

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


Procedures

1 Press the [AZ] key for two seconds.

The AZ Menu will appear.

2 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

Procedures

- 1 Press the [AZ] key for 2 seconds.

The AZ Menu will appear.

- 2 Open the Make AZ menu by performing the following menu operation.

3. Make AZ

- 3 Press [1] or [2] 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.

5

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.

Procedures

- 1 Press the [AZ] key for 2 seconds.

The AZ Menu will appear.

- 2 Open the AZ menu by performing the following menu operation.

5. Set AZ Key

→ 1. AZ

- 3 Set the assignment of the key.

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.

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

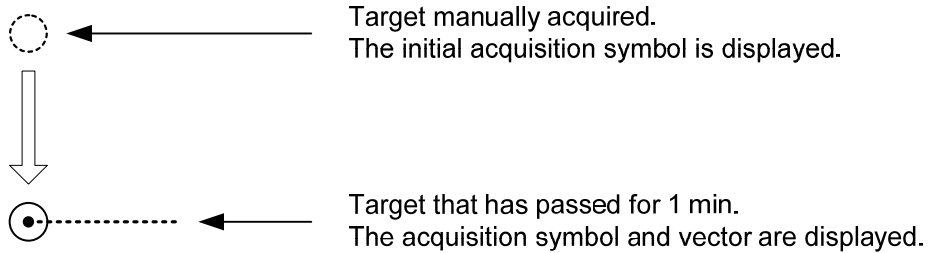
Manual Acquisition [ACQ]

Note: If more targets are acquired manually in the condition that the maximum number of targets are under tracking, the targets cannot be acquired.

Procedures

- 1 **Move the cursor onto the target to be acquired, and press the [ACQ] key.**

The target will be acquired and the initial acquisition symbol will be displayed. The vector will be displayed within one minute.



To perform operation only in the manual acquisition mode without automatic acquisition/activation, turn off the automatic acquisition/activation function.

Use of Automatic and Manual Acquisition Modes

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 Tracked Targets [TGT CNCL]

Unwanted tracked 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 [TGT CNCL]

Procedures

- 1 **Put the cursor on the tracked target to the desired for canceling target, and press the [TGT CNCL] key.**

The vectors and symbols of the tracked targets will disappear, and only the radar video remain.

Canceling all targets collectively [TGT CNCL]

Procedures

- 1 **Press the [TGT CNCL] key for 5 seconds.**

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 Tracked 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 3 minutes or more has passed after such course change or target acquisition. Even if 3 minutes or more has passed, the vector may include an error depending upon the tracking conditions.**

Type of Data Display (Target Information)

Target Data

Target identification (TT ID)	ID number of the target
True bearing (BRG)	0.1° unit
Range	0.01 NM unit
Course	0.1° unit
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.


Method of Displaying Numeric Data [TGT DATA]

Procedures

- 1 **Put the cursor on the tracked target for which numeric data is to be displayed, and press the [TGT DATA] 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 and range will appear until its vector appears.

Cancellation of Numeric Data Display (CNCL Data)

Procedures

- 1 Put the cursor on the tracked target with which numeric data is displayed, and press the [CLR / INFO] key.

The cursor mode list will appear.

- 2 Press the [6] key.

The numeric value will disappear.

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.

A target ID number 1 to 100 is assigned to each target in acquisition order. Once a target ID number is assigned, it identifies the target until the target is lost or the target acquisition is canceled.

5

Procedures

- 1 Press the [TT MENU] key.

- 2 Press the [4] key.

Target Number Display will appear.

- 3 Press the [numeric] key corresponding to the display method to be set.

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.

Note: An ID number is always displayed for only targets with which numeric data is displayed.

5.2.5 Adding Tracked Target ID Name (Name)

The system can enter a name for each of tracking targets that have been acquired.

Procedures

- 1 **Put the cursor on the tracked target, and press the [CLR / INFO] key.**

The cursor mode list will appear.

- 2 **Press the [8] key.**

The TT Target Information will appear.

- 3 **Press the [1] key.**

The setting items for ship name (Name) will be displayed.

- 4 **Select the input method.**

- | | |
|------------------------------------|--|
| <input type="checkbox"/> Data Base | : Selection of one of previously input ship names.
When this method is selected, a list of ship names that have been input by selecting <input type="checkbox"/> Input will be displayed. |
| <input type="checkbox"/> Input | : Input of a new ship name.
When this method is selected, the ship name (Name) input window will open. |
| <input type="checkbox"/> Off | : Target ship's name is not displayed. |

Entering a new ship name (Input)

- 5 **Input a new ship name.**

Up to 8 characters can be input as a ship name.

For the input method on the character input screen, see Section 3.3.4.

The input name by selecting Input is saved in Data Base.

Selecting one of previously input ship names (Data Base)

- 5 **Press the [numeric] key corresponding to the ship name to be selected.**

The selected ship name will be entered.

* Data Base can contain 30 ship names.

5.2.6 Reference Target (Reference)

The system can display the own ship's speed. To do so, it sets a reference target by tracking a target for which ground fixed.

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.

Procedures

1 Tracking a target for which ground fixed.

2 Put the cursor on the tracked target, and press the [CLR / INFO] key.

The cursor mode list will appear.

3 Press the [8] key.

The Property will appear.

4 Press the [3] key.

The reference target function will be set to on or off.

On :A reference target is set.

Off :The reference target is canceled.

5 Put the cursor on the speed sensor switching (Own ship information ② on page 2-22), press the [ENT] key, and select REF.

The speed of own ship calculated from the reference target will be displayed.

When a reference target is set, the symbol display is changed to " \bigcirc_R ".

Only one target can be set as a reference target.

When a new reference target is set, the previously set reference target is canceled.

Note: If AIS function is set to on, the reference target function cannot be used.

5.2.7 Operation Test (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 the operation test mode is used during navigation, pseudo targets appear on the radar display and they are confused with actual targets.

Do not use the mode during navigation.

Otherwise, an accident may result.

5

The following functions are available for testing the target tracking function:

[I] Test Video	Makes an operation check on the target detection circuit.
[II] TT Simulator	Generates pseudo targets on the radar display in order to test if the target tracking function is operating normally.
[III] Status	Displays the status of the target tracking function.
[IV] Gate Display	Displays the gate size for acquiring / tracking a target.

[1] Test Video

Test Video is used to check whether the video signals under target acquisition and tracking are inputted to and processed in the target detection circuit normally. However, it is sufficient to check that VDH in Test Video is displayed.

Note: Test Video may not be displayed for a target which is not yet acquired or tracked. Test Video may not be displayed either if the [GAIN] dial or [SEA] dial is not properly adjusted.

Procedures

- 1 Press the [TT MENU] key.**
- 2 Open the TT Test Menu by performing the following menu operation.**

9. TT Test Menu

- 3 Press the [1] key.**

The setting items for Test Video will be displayed.

- 4 Select the test video to be displayed.**

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 Target Tracking unit may have a trouble

Cancellation

- 1 Press the [1] key while the TT Test Menu is displayed.**

The setting items for Test Video will be displayed.

- 2 Press the [1] key**

The test video display will be turned off.

III Target Tracking Simulator

Pseudo targets can be generated in certain known positions to check whether the target tracking units 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 system is operating normally.

Procedures

1 Press the [STBY] key.

The equipment will enter the transmission standby state.

2 Press the [TT MENU] key.

3 Open the TT Test Menu by performing the following menu operation.

9. TT Test Menu

4 Press the [2] key.

The setting items for TT Simulator will be displayed.

5 Select the scenario to be set.

The TT Simulator display will be turned on.

6 Press the [TX / PRF] key.

When the TT simulator is active, the character " X " will display at the bottom of the radar display.



Target tracking simulator / scenario

Scenario	Target start point		Target end point		Pseudo-target speed
	Distance	Bearing	Distance	Bearing	
1	3.2 nm	20 °	1 nm	90 °	20 kn
2	6 nm	0 °	0 nm	0 °	10 kn
3	6 nm	every 18 °	1 nm	every 18 °	10 kn
4	6 nm	45 °	1 nm	45 °	105 kn
5	6 nm	45 °	6 nm	150 °	20 kn
6	6 nm	45 °	6 nm	150 °	20 kn

Note: When the simulator is operating, set 0 ° as the heading bearing, and 0 kn as the speed of own ship. When the range between own ship and the pseudo target is 0, the target will disappear.

Cancellation

1 Press the [STBY] key.

The equipment will enter the transmission standby state.

2 Press the [2] key while the TT Test Menu is displayed.

The setting items for TT Simulator will be displayed.

3 Press the [1] key.

The TT Simulator display will be turned off.

[III] Status display (Status)

The current Target Tracking status will appear.

Procedures

- 1 Press the [TT MENU] key.**
- 2 Open the TT Test Menu by performing the following menu operation.**

9. TT Test Menu

- 3 Press the [3] key.**

The setting items for Status will be displayed.

*Constant	: Vector response
*VID Level TD	: Threshold value used for automatic acquisition
*VID Level High	: Threshold value used for tracking
*VID 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 Target Tracking function. This radar equipment allows the gate size to change automatically according to target range and size. User can check the gate size using the following function.

Procedures

- 1 Press the [TT MENU] key.
- 2 Open the TT Test Menu by performing the following menu operation.

9. TT Test Menu

- 3 Press the [4] key.

The gate display mode is switched.

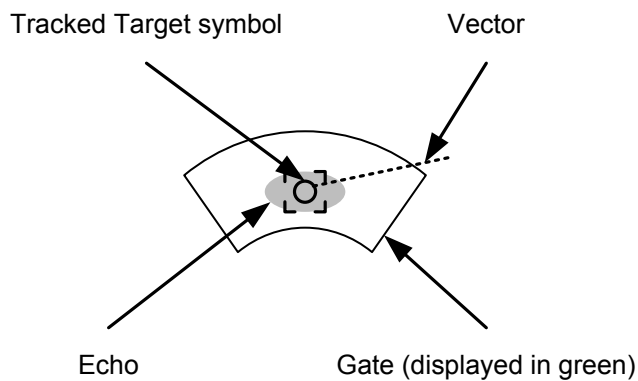
On	: Gate is displayed
Off	: Gate is not displayed

- 4 Display the numeric value of a target according to Section 5.2.3.

The numeric value of the target will be displayed, and the tracked target symbol will be enclosed in a green gate.

5

Note: The Target Tracking can display the gate of two targets simultaneously.



5.3 AIS OPERATION

AIS Process Unit (option) is necessary.

5.3.1 Restrictions

The following restrictions are placed on use of the AIS function.

- The AIS function is unavailable in the following cases:
 - a) **MAN** or **REF.** is selected for the speed sensor.
 - b) The current offset (Set/Drift Setting) is set while **LOG** or **2AXW** is selected for the speed sensor.
 - c) 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 on.

5.3.2 Setting AIS Display Function (AIS Function)

Attention

- **When the AIS function is set to Off, the AIS display function is turned off and AIS symbols are no longer displayed.**
- **Once the AIS display function is set to Off, it is not automatically switched to On even if a dangerous target exists.**

Procedures

- 1 Put the cursor on the AIS On / Off (TT / AIS information ⑧ on page 2-23), and press the [ENT] key.

The received AIS information will be shown on the radar display.

5.3.3 Activate AIS Targets (Activate AIS)

Activate an AIS target, and display the target's vector and make a collision decision.

Manual activation (ACT AIS)

Activate an AIS target in manual mode to display the vector and heading line.

Procedures

- 1 **Put the cursor on the AIS symbol to be activated, and press the [CLR/INFO] key.**

The setting items for cursor modes will be displayed.

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

The selected AIS target will be activated.

Automatic activation (AUTO Activate)

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 "Acquiring Target" in Section 5.2.1

The position of the scanner shall be at the centre of the azimuth or range in the acquisition/activation zone. If there are more AIS targets than the allowable maximum, they are deactivated in the low-priority (See the section 5.1.2).

Reference If an AIS target is activated but the vector is not displayed, refer to "Displaying Target ID Number" in section 5.3.6

5

5.3.4 Deactivate AIS Targets (Deactivate AIS)

Deactivate an AIS target and clear the display of the vector and heading line.

Procedures

- 1 **Put the cursor on the AIS target to be deactivated, and press the [CLR/INFO] key.**

The setting items for cursor modes will be displayed.

- 2 **Press the [5] key.**

The selected AIS target will be deactivated.

Note: This operation is available only for an activated AIS target.

5.3.5 Displaying AIS Information [TGT DATA]

Types of information displayed

There are two modes (simple and detail) to display AIS target information. The display items are determined by the selected mode.

Display Item	Detail mode	Simple mode
NAME (ship name)	Up to 20 characters	
Call Sign	Up to 7 characters	
MMSI	Up to 9 characters	
COG (course over ground) or CTW (course through water)	0.1 ° unit	
SOG (speed over ground) or STW (speed through water)	0.1 knot unit	
CPA (closest point of approach)	0.01 nm unit	
TCPA (time to CPA)	0.1 min unit	
BRG (true bearing)	0.1 ° unit	Not displayed
Range	0.01 nm unit	
HDG (heading bearing)	0.1 ° unit	
ROT (rate of turn)	0.01 °/min	
POSN (latitude / longitude)	0.0001' unit	
Destination (waypoint)	Up to 20 characters	
NAV Status	Status (number)	

If the numeric information of ROT is blank, the radar is receiving the AIS data which is cannot 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. (See the 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.

The detail mode displays the numeric data of only a single ship, the simple mode can display the numeric data of up to two ships.

For NAV Status, one of the following statuses is displayed in accordance with Navigation Status:


No.	Status
0	Under Way Using Engine
1	at Anchor
2	Not Under Command
3	Restricted Maneuverability
4	Constrained by Her Draft
5	Moored
6	Aground
7	Engaged in Fishing
8	Under Way Sailing
9	Reserved
10	Reserved
11-14	Reserved
15	Not Defined

Displaying AIS Target Information [TGT DATA]

Procedures

- 1 Put the cursor on the AIS target of which information is to be displayed , and press the [TGT DATA] key.

The information of the selected AIS target will be displayed.

Reference: When the numeric data of a target is displayed but the mark "  " is not on the radar display, the target is outside the display.

Canceling AIS Target Information Display (CNCL Data)

Procedures

- 1 Put the cursor on the activated AIS target of which information display is to be cancelled, and press the [CLR / INFO] key.

The setting items for cursor modes will be displayed.

- 2 Press the [6] key.

The information display of the selected AIS target will be cleared.

5

Selecting Detail / Simple Mode for AIS Target Information Display

Procedures

- 1 Put the cursor on the detail/simple display switching (AIS target information ① on page 2-25), and press the [ENT] key.

The detail or simple mode display for AIS target information will be selected.

Message

Received AIS messages can be displayed.

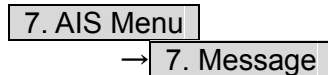
Up to 10 messages of addressed message and up to 10 messages of broadcast message can be displayed.

If the number of messages exceeds 10, the oldest received messages are sequentially deleted.

Displaying Message Selected from List (Message)

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Message menu by performing the following menu operation.



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

Pressing [1] key lists addressed messages; pressing [2] key lists broadcast messages.

Each list shows ship names and message-received time.

For an unread message, [*] is displayed to the left of the item number.

- 4 Press the [numeric] key corresponding to the message to be displayed.

The message will appear.

Displaying Specified Target's Message

Procedures

- 1 Display AIS target information.

If there are messages from the target, a message mark will be displayed in the unread message display field (AIS target information ② on page 2-25).

- 2 Put the cursor on the unread message display (AIS target information in ② on page 2-25), and press the [ENT] key.

The message will appear.

Deleting Message (Delete)

Procedures

- 1 Press the [1] key while the message is displayed.

The Confirmation Window will appear.

- 2 Press the [1] key.

The message will be deleted, and the ship name and message-received time will disappear from the list.

Displaying Data of Lost AIS Target (Display Lost TGT Data)

The data of the last-lost AIS target can be displayed.

The data of only one target that has been lost most recently can be displayed.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Display Lost Target Data menu by performing the following menu operation.

7. AIS Menu

→ 8. Display Lost TGT Data

The data of the last-lost AIS target will be displayed.

Displaying Own Ship's AIS Data (Own Ship's AIS Data)

The AIS data of own ship can be displayed.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Own Ship's AIS Data menu by performing the following menu operation.

7. AIS Menu

→ 9. Own Ship's AIS Data

The own ship's AIS data will be displayed.

5.3.6 Displaying Target ID No. (Target Number Display)

When an AIS target is activated, a target ID number is displayed next to the AIS target symbol. A target ID number 1 to 100 is assigned to each target in activation order. Once a target ID number is assigned, it identifies the target until the target is lost or deactivated.

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Target Number Display menu by performing the following menu operation.



- 3 Press the [numeric] key corresponding to the display method to be set.

On	: Displays target ID numbers.
Off	: Hides target ID numbers.
Target Track	: Displays target ID number with AIS track.
Ship's Name	: Displays the ship's name.

If there are many tracking targets and their symbol display is confusing, set Target Number Display to off to view the radar display easily.

Note: An ID number or ship's name is always displayed for only targets with which numeric value is displayed.

5.3.7 Setting AIS Filter (AIS Filter Setting)

About an AIS filter

By setting an AIS filter, an AIS target in the area can be displayed by priority or only the targets in the area can be displayed. An AIS filter is initially set in a circle having a radius of 20 [nm] from the CCRP. If 301 or more AIS targets exist in the filter range, they are displayed in the priority order explained in Section 5.1.2 Symbols - Types and Definitions of AIS Target Symbols.

Types of AIS Filters (Filter Type)

There are the following 3 types of AIS filters:

Range	:A filter is set in a circle with a set range as the radius.
Sector	:A filter is set in a sector formed by two bearings with the bow as reference.
Zone	:A filter is set in a zone formed by two bearings and two ranges with the bow as reference.

Procedures

- 1 Put the cursor on the AIS filter mode switching (TT / AIS information ⑫ on page 2-23), and press the [ENT] key to select the filter to be set.

The AIS filter will be selected.

Creation of AIS Filter (Make AIS Filter)

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the AIS Filter Setting menu by performing the following menu operation.

7. AIS Menu

→

4. AIS Filter Setting

- 3 Press the [2] key.

The mode to make an AIS filter will be activated.

[I] Setting Range Filter

- 4 Set a filter range by turning the [VRM] dial, and press the [ENT] key.

[II] Setting Sector Filter

- 4 Set a starting bearing by turning the [EBL] dial, and press the [ENT] key.
- 5 Set an ending bearing by turning the [EBL] dial, and press the [ENT] key.

[III] Setting Zone Filter

- 4 Set a starting bearing and range by turning the [EBL] dial and [VRM] dial, and press the [ENT] key.
- 5 Set an ending bearing and range by turning the [EBL] dial and [VRM] dial, and press the [ENT] key.

Note: When the automatic activation function is enabled, the filter range is automatically changed for covering the automatic activation zone. Thus, the automatic activation zone is always within the filter range.

AIS Filter Display On/Off (Filter Display)

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the AIS Filter Setting menu by performing the following menu operation.

7. AIS Menu

→

4. AIS Filter Setting

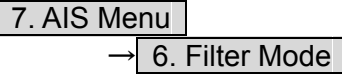
- 3 Press the [3] key.

Filter Display will be set to on or off.

Display of Targets outside AIS Filter (Filter Mode)

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the Filter Mode menu by performing the following menu operation.



- 3 Press the [6] key.

The Filter Mode is switched.

<table border="1"><tr><td>Display</td></tr></table>	Display	: Displays only AIS targets in the AIS filter.
Display		
<table border="1"><tr><td>Priority</td></tr></table>	Priority	: Displays AIS targets in the AIS filter by priority, and also displays targets outside the AIS filter.
Priority		

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.

Procedures

- 1 Put the cursor on the position where a point filter is to be set, and press the [CLR / INFO] key to select the filter to be set.

The setting items for cursor modes will be displayed.

- 2 Press the [2] 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 one minute, the point filter will be cleared.

Note: The point filter's range is 1 nm, and cannot be changed.

5.3.8 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 (Class A) or 2 knots (Class B) and it is now at anchor or on the berth	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: 0 to 14 knots)	60 sec	180 sec
Vessel of 14 to 23 knots	36 sec	180 sec
Vessel of 23 knots or more	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: When a dangerous target ship is lost, a lost alarm is issued and the symbol changes to a lost symbol. The lost symbol will display continuously on the last-received position. If the **[ALARM ACK]** key is pressed, the symbol is cleared.

5.3.9 Setting Conditions for AIS Alarm (AIS Alarm Setting)

Conditions for issuing a Lost alarm and CPA/TCPA alarm for AIS targets can be set.

Setting of Condition for Lost Alarm

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the AIS Alarm Setting menu by performing the following menu operation.

7. AIS Menu

→ 6. AIS Alarm Setting

- 3 Press the [1] key.

The setting items for Lost Alarm will be displayed.

- 4 Press the [numeric] key corresponding to the condition to be set.

Off

: A lost alarm is not issued.

Danger

: A lost alarm is issued only for AIS targets for which a dangerous target alarm has been issued.

ACT&Danger

: A lost alarm is issued only for activated AIS targets and AIS targets for which a dangerous target alarm has been issued.

ACT&Danger&Select

: A lost alarm is issued only for activated AIS targets, data indicated AIS targets and AIS targets for which a dangerous target alarm has been issued.

Note: A lost alarm is not issued for sleeping AIS targets.

Setting of Condition for CPA/TCPA Alarm

Procedures

- 1 Press the [RADAR MENU] key twice.
- 2 Open the AIS Alarm Setting menu by performing the following menu operation.

7. AIS Menu

→ 6. AIS Alarm Setting

- 3 Press the [2] key.

The setting items for CPA/TCPA Alarm is switched.

Off

: A CPA/TCPA alarm is not issued.

ACT

: A CPA/TCPA alarm is issued only for activated AIS targets.

ACT&Sleep

: A CPA/TCPA alarm is issued for all AIS targets on the radar display.

Note: When the Lost Alarm menu set to Off, the CPA ring color changes to dark color.

5.4**DECISION OF TARGETS AS IDENTICAL
(ASSOCIATION)****CAUTION**

If a great value is set as a condition for deciding targets as identical, a tracking target near an AIS target is regarded as identical to the AIS target and it may not be displayed any more.

For example, when a pilot boat (which is a small target not being tracked) equipped with an AIS function approaches a cargo ship as a tracking target not equipped with an AIS function, the tracking target symbol of the cargo ship may not be displayed any more.

5**Setting of Function to Decide Targets as Identical (Association)**

When an AIS target and a tracking target are decided to be identical, an association symbol is displayed for the targets regarded as identical. In this case, the AIS target symbol is automatically activated.

Attention

- Turn off **Association** in order not to make a decision on if targets are identical, or in order to display symbols that have disappeared.

Procedures

- 1 Put the cursor on the association On/Off (TT/AIS information  on page 2-23), and press the [ENT] key.

Association will be set to on or off.

Setting of Conditions for Deciding AIS and Tracked Targets as Identical (Association Setting)

Procedures

1 Press the [TT MENU] key.

2 Press the [1] key.

The Association Setting menu will appear.

3 Select and enter the item to be set.

Conditions for deciding targets as identical will be set. When the differences of all item between AIS and tracked target are under the set conditions..

Once regard as identical, when one of the differences exceed 125 % of the set condition, they are regarded as dissidence.

* The setting for this function is common to Association Setting in the AIS Menu.

Types of Decision Conditions to be Set

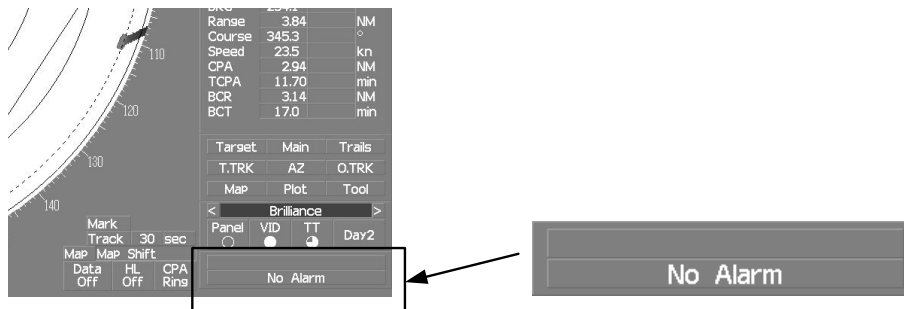
Decision conditions

1. Association	On / Off (Function to decide targets as identical)
2. Priority	AIS / TT (Symbol to be displayed)
3. Bearing	0.0 to 9.9 °
4. Range	0 to 999 m
5. Course	0 to 99 °
6. Speed	0 to 99 kn
7. Applicable AIS Target	ACT or ACT&Sleep (activated AIS target or all AIS target)

5.5 ALARM DISPLAY

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



5

Critical alarm messages for Target Tracking (TT) and AIS functions:

Message	Class	Description	ALR No.
CPA/TCPA	Alarm	There is a dangerous target.	301

ALR No. : Unique alarm number in ALR sentence and ACK sentence.


Alarm messages for Target Tracking (TT) and AIS functions:

Message	Class	Description	ALR No.
AIS (Data)	Alarm	AIS: No communication or communication error.	116
AIS 95% Capacity	INFO	Over 95% of the maximum number of AIS targets.	
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.	
AIS Alarm ***	Alarm	AIS alarm (Up to 10 alarm messages can be displayed.).	
AIS Alarm 001	Alarm	Tx malfunction	
AIS Alarm 002	Alarm	Antenna VSWR exceeds limit	
AIS Alarm 003	Alarm	Rx channel 1 malfunction	
AIS Alarm 004	Alarm	Rx channel 2 malfunction	
AIS Alarm 005	Alarm	Rx channel 70 malfunction	
AIS Alarm 006	Alarm	general failure	
AIS Alarm 008	Alarm	MKD connection lost	
AIS Alarm 025	Alarm	external EPFS lost	
AIS Alarm 026	Alarm	no sensor position in use	

Message	Class	Description	ALR No.
AIS Alarm 029	Alarm	no valid SOG information	
AIS Alarm 030	Alarm	no valid COG information	
AIS Alarm 032	Alarm	Heading lost/invalid	
AIS Alarm 035	Alarm	no valid ROT information	
AIS MAX Target	INFO	Maximum number of AIS targets.	
AIS PROC (Data)	Alarm	AIS processing circuit: No communication or communication error.	328
CPA/TCPA	Alarm	There is a dangerous target.	301
Lost	Alarm	Failure in tracking the target that has been under tracking. Failure in receiving AIS target data for a specified time.	
New Target	Alarm	Acquisition or activation of a target in the automatic acquisition / activation zone.	302
RADAR Alarm (In)	Alarm	Targets have entered the radar alarm range.	
RADAR Alarm (Out)	Alarm	Targets have left the radar alarm range.	
REF Target	Alarm	Decrease in the reference target accuracy.	
Trial	Warning	There is a dangerous target, when trial maneuver is active.	
TT (Boot)	Alarm	Target tracking unit start failure.	344
TT (Data)	Alarm	The target tracking unit is malfunctioning..	323
TT 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.	

ALR No : Unique alarm number in ALR sentence and ACK sentence.

CPA / TCPA Alarm



CAUTION

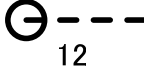



Since these alarms may include some errors depending on the target tracking conditions, the navigation officer himself should make the final decision for ship operations such as collision avoidance.

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

5

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. It is not possible to switch off the tracked target visual alarm, unless tracking is ceased, or the alarm condition no longer applies. The types of target and alarm are shown below.

CPA / TCPA Alarm

Status	Symbol on display	Alarm characters	Alarm sound	Conditions
Tracked target Activated AIS target	 	(Off)	(Off)	<ul style="list-style-type: none"> • CPA > CPA LIMIT • 0 > TCPA • TCPA > TCPA LIMIT <p>The symbol is displayed when one of the above conditions is met.</p>
Dangerous target	  Red blinking	CPA / TCPA	Beep sound (pee-poh) Alarm acknowledgeable	<ul style="list-style-type: none"> • CPA ≤ CPA LIMIT, • 0 ≤ TCPA ≤ TCPA LIMIT <p>An alarm is issued when all the conditions are met. The AIS targets that issues alarm refer to 5.3.9.</p>

CPA Limit and TCPA Limit: The Setting Values

Alarm for New Target Acquired in Automatic Acquisition Zone (New Target)




In setting an automatic acquisition zone, it is necessary to adjust the gain, sea clutter suppression and rain 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.

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 "Acquiring Target" in Section 5.2.1.

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.**

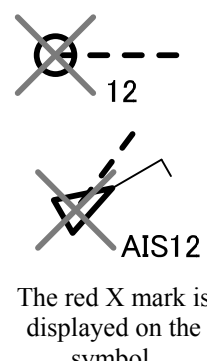
When it is impossible to continue tracking any acquired and tracked target, or the data of AIS target cannot received for a specified time, the **LOST** alarm will be generated. The typical causes for alarm generation are shown below, but not limited to the following:

- 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 out of a range of 32 nm and can no longer be tracked, it is canceled without a lost target alarm.



Lost Target Alarm

Status	Symbol on display	Alarm characters	Alarm sound	Conditions
Lost target		Lost	Beep sound (pee) Alarm acknowledgeable	The alarm will sound once when a lost target symbol is displayed.

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.

5.6 TRACK FUNCTION

5.6.1 Past Position (Past POSN)

Procedures

- 1 Put the cursor on the past position display interval unit switching (TT/AIS information ⑦ on page 2-23), and press the [ENT] key to set a desired unit.

The past position display interval unit will be set to or .

- 2 Put the cursor on the past position display interval switching (TT/AIS information ⑥ on page 2-23), and press the [ENT] key to set a desired track display interval.

The past position will be set.

<input type="text" value="Off"/>	: Tracks are not displayed.
<input type="text" value="Numeric"/>	: Tracks are displayed at intervals of a specified value.

The past position function can display up to 10 past positions of a target under tracking. The past position display interval can be set to specified time intervals of 0.5, 1, 2, or 4 minutes, or specified range intervals of 0.1, 0.2, 0.5, or 1 nm.

The specified interval is displayed in the past position display interval switching (TT / AIS information ⑥ on page 2-23). When is displayed, the track display function is turned off.

The track mode operates in conjunction with the vector mode, and a true or relative track is displayed.

In relative vector mode, the relative tracks of the target are displayed.

In true vector mode, true tracks that are calculated from the relative bearing, range, own ship's course, and speed are displayed.

The target is acquisition, past position of traced target is start plot.

The AIS target is displayed, past position of AIS target is start plot.

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 Target Ship's Tracks (Target Track)

This function makes settings for the tracks of tracked targets and AIS targets.
The system can display the tracks of up to 20 target ships.

[I] Track Color Setting (Target Track Color)

Procedures

- 1 Put the cursor on the tracked target or activated AIS target, and press the [CLR / INFO] key.

The setting items for cursor modes will be displayed.

- 2 Press the [8] key.

The TT Target Information will appear.

- 3 Press the [2] key.

The setting items for Track Color will be displayed.

- 4 Press the [numeric] key corresponding to the track color to be set.

Colors set by performing the procedure in [III] Setting of Target Ship's Track Colors can be selected.

Individual colors can be set for up to 10 ships.

The same color is set for 11 to 20 ships.

5

[III] Target Ship's Track Function On/Off (Target Track Function)

Procedures

- 1 Open the T.TRK menu by performing the following menu operation.

- 2 Press the [1] key.

The Target Track Function will be set to on or off.

<input type="text" value="On"/>	: Target Track Function is turned on.
<input type="text" value="Off"/>	: Target Track Function is turned off.

* Note that when this function is turned off, all the other ship's track functions are turned off. In this case, the track data of other ships is not saved, so they cannot be traced later.

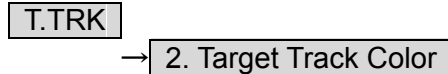
[III] Setting of Target Ship's Track Colors (Target Track Color)

You can set either one track color for all targets under tracking, or individual colors for the ships of track numbers 1 to 10. The tracks of ships 11 to 20 are displayed in the same color.

* If the other ship's track function (Target Track Function) is turned off, the track data of other ships is not saved.

Procedures

- 1 Open the Target Track Color menu by performing the following menu operation.**



- 2 Press the [1] key.**

The setting items for All will be displayed.

- 3 Press the [numeric] key corresponding to the track display to be set.**

Individual : Track color is set individually for ships.
 Color name : One color is set for all ships.

Individual setting

- 4 Press the [numeric] key corresponding to the track number to be set.**

The setting items for the selected track number will be displayed.

- 5 Press the [numeric] key corresponding to the track color to be set.**

The track color of the selected track number will be set.

When Individual is selected, the track numbers Target Track No. 1 to No. 10 and the individual setting for Other are valid. Select a color for each target.

The color list is displayed by pressing the [numeric] key corresponding to the item number to be set.

Select a desired color. There are 8 color choices: Off, White, Gray, Blue, Green, Yellow, Pink, and Red.

Target Track No. 1 to No. 10 : Setting for 1 to 10 ships
 Other : Setting for 11 to 20 ships

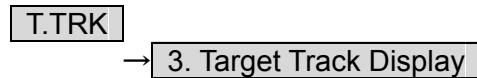
* Note that the individual setting is not enabled unless Individual is selected.

[IV] Setting of Target Ship's Track Display (Target Track Display)

The target track display function can be turned on / off. Choices for track display are displaying / hiding the tracks of all ships and Individual (displaying the tracks of individual ships).

Procedures

- 1 **Open the Target Track Display menu by performing the following menu operation.**



- 2 **Press the [1] key.**

The setting items for All will be displayed.

- 3 **Press the [numeric] key corresponding to the track display to be set.**

<input type="checkbox"/> Individual	: Track display is set for individual ships.
<input type="checkbox"/> Off	: The tracks of all ships are hidden.
<input type="checkbox"/> On	: The tracks of all ships are displayed.

* Even when Target Track Display is turned off, the track data of other ships is saved if Track Memory Interval is set.

5

Individual setting

- 4 **Press the [numeric] key corresponding to the track number to be set.**

The selected track number display will be set to on or off.

<input type="checkbox"/> On	:The track number display is turned on.
<input type="checkbox"/> Off	:The track number display is turned off.

When Individual is selected, the track numbers Target Track No. 1 to No. 10 and the individual setting for Other are valid. Select on / off for each target.

<input type="checkbox"/> Target Track No. 1 to <input type="checkbox"/> No. 10	: Setting for 1 to 10 ships
<input type="checkbox"/> Other	: Setting for 11 to 20 ships

* Note that the individual setting is not enabled unless Individual is selected.

[V] Setting of Target Ship's Track Saving Interval (Track Memory Interval)

An interval for saving target ship's track data can be set.

* This function is not available when the Target Track Function is turned off.

Procedures

- 1 Open the T.TRK menu by performing the following menu operation.**

T.TRK

- 2 Press the [4] key.**

The setting items for Track Memory Interval will be displayed.

- 3 Press the [numeric] key corresponding to the interval to be set.**

Select an interval 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 / 10 NM

[VI] Clear of Target Ship's Track

The target ship's track can be cleared by setting a color or a track number.

* If Card T.TRK Display is used, target ship's tracks displayed through the card cannot be cleared.

Clear of Tracks by Setting Color (Clear Track Color)

Procedures

- 1 **Open the T.TRK menu by performing the following menu operation.**

- 2 **Press the [5] key.**

The setting items for Clear Track Color will be displayed.

- 3 **Press the [numeric] key corresponding to the color of the target tracks to be cleared.**

The Confirmation Window will appear.

- 4 **Press the [1] key.**

All the tracks of the selected color will be cleared.

5

Clear of Tracks by Setting Track Number (Clear Track Number)

Procedures

- 1 **Open the T.TRK menu by performing the following menu operation.**

- 2 **Press the [6] key.**

The setting items for Clear Track Number will be displayed.

- 3 **Press the [numeric] key corresponding to the number of the tracks to be cleared.**

The Confirmation Window will appear.

- 4 **Press the [1] key.**

The tracks of the selected number will be cleared.

[VII] Operation of Target Ship's Track Data Saved on Card (File Operations)

Target ship's track data can be saved on a flash memory card and read from the card.

Note: Data can be saved to a flash memory card until the card becomes full, but the number of files that can be read and displayed is limited to 64 in alphanumeric order. When the number of files has reached 64, delete unnecessary files.

Loading File (Load)

Procedures

1 Insert a flash memory card into the card slot

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Open the File Operations menu by performing the following menu operation.



3 Press the [1] key and select a card slot.

The setting item for Select Card Slot is switched between Slot1 and Slot2.

4 Press the [2] key and select Add or Overwrite.

The setting item for Load Mode is switched between Add and Overwrite. When Add is selected, new data is added to the current data on the card. When Overwrite is selected, new data is saved over the current data on the card.

5 Press the [3] key.

Currently saved target ship's track data on the card will be listed.

6 Press the [numeric] key corresponding to the file to be loaded.

The Confirmation Window will appear.

7 Press the [1] key.

The selected target track data will be loaded and shown on the radar display.

Saving File (Save)

Procedures

1 Insert a flash memory card into the card slot.

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

2 Open the File Operations menu by performing the following menu operation.



3 Press the [1] key and select a card slot.

The setting item for Select Card Slot is switched between Slot1 and Slot2.

4 Press the [4] key.

The Save menu will appear.

5 Input the file name to be saved.

Up to 10 characters can be input as a file name.
For inputs to the characters input screen, refer to Section 3.3.4.
After the input, the Confirmation Window will appear.

6 Press the [1] key.

The currently displayed target track data will be saved.

Erasing File (Erase)

Procedures

- 1 Insert the flash memory card into the card slot.**

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Open the File Operations menu by performing the following menu operation.**



- 3 Press the [1] key and select a card slot.**

The setting item for Select Card Slot is switched between Slot1 and Slot2.

- 4 Press the [5] key.**

The Erase menu will appear.

Currently saved target ship's track data on the card will be listed.

- 5 Press the [numeric] key corresponding to the file to be erased.**

The Confirmation Window will appear.

- 6 Press the [1] key.**

The selected target track data will be erased and the file name will disappear from the list.

Displaying File (Card Target Track Display)

Procedures

- 1 Insert the flash memory card into the card slot.**

For the insertion and removal of the card, see HOW TO INSERT AND REMOVE A CARD in the appendix.

- 2 Open the File Operations menu by performing the following menu operation.**



- 3 Press the [1] key and select a card slot.**

The setting item for Select Card Slot is switched between Slot1 and Slot2.

- 4 Press the [6] key.**

The Card T.TRK Display menu will appear.
Currently saved target ship's track data on the card will be listed.

- 5 Press the [numeric] key corresponding to the file to be displayed.**

The Confirmation Window will appear.

- 6 Press the [1] key.**

The selected file will be highlighted, and the currently saved target track data will be displayed.

5

Cancellation

- 1 Open the Card T.TRK Display window.**

The displayed file is highlighted.

- 2 Press the [numeric] key corresponding to the displayed file.**

The Confirmation Window will appear.

- 3 Press the [1] key.**

The file will be deselected and returned to normal display.

5.7 TRIAL MANEUVERING (TRIAL MANEUVER)

Attention

- Trial maneuvering is to simulate own ship's course and speed in the conditions that the course and speed of a target ship are unchanged as they are. As the situation is different from any actual ship maneuvering, set values with large margins to CPA Limit and TCPA Limit.

The trial maneuvering is the function of simulating own ship's course and speed for collision avoidance when a dangerous target appears. When the own ship's course and speed are entered in manual mode, the trial maneuvering function checks if pre-acquired or pre-activated targets are dangerous. The ranges of course and speed to be entered manually:

Course: 360 ° (in 0.1 ° intervals).....[EBL] dial
Speed: 0 to 100 kn (in 0.1 kn steps)[VRM] dial

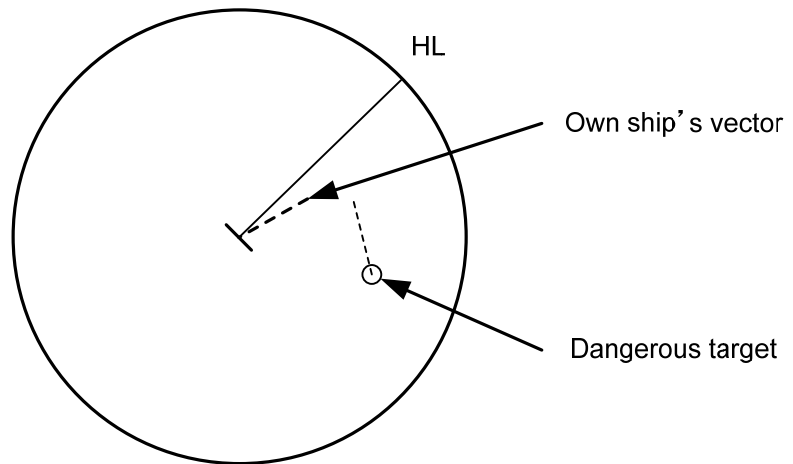
Trial Maneuvering in the True Vector Mode

In the True Vector mode, calculations are performed according to the values set by Trial Speed, Trial Course and other features, and the result is displayed as a bold-line that represents the change of own ship's vector as shown in the figure below (an example of the course changed to the right).

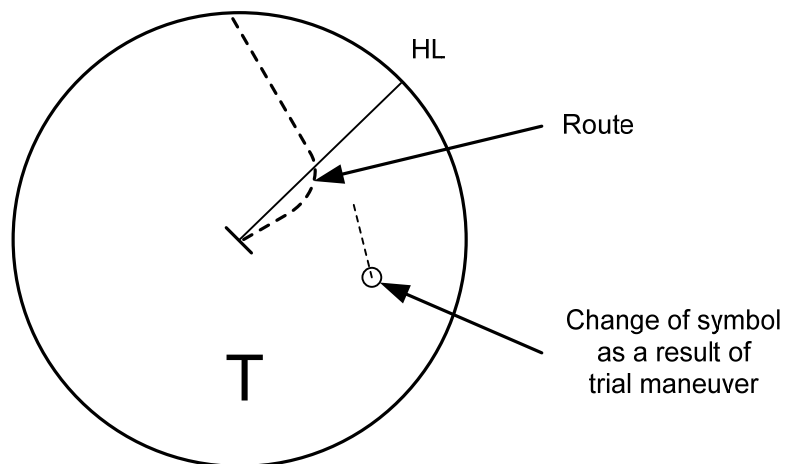
In this figure, the dangerous target forward left becomes safe as a result of simulation.

The tracked target information indicates the current CPA and TCPA values regardless of the result of simulation.

NORMAL



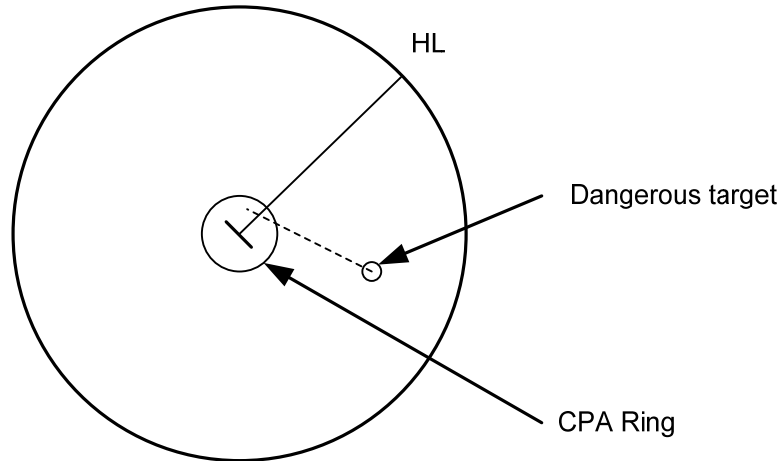
TRIAL



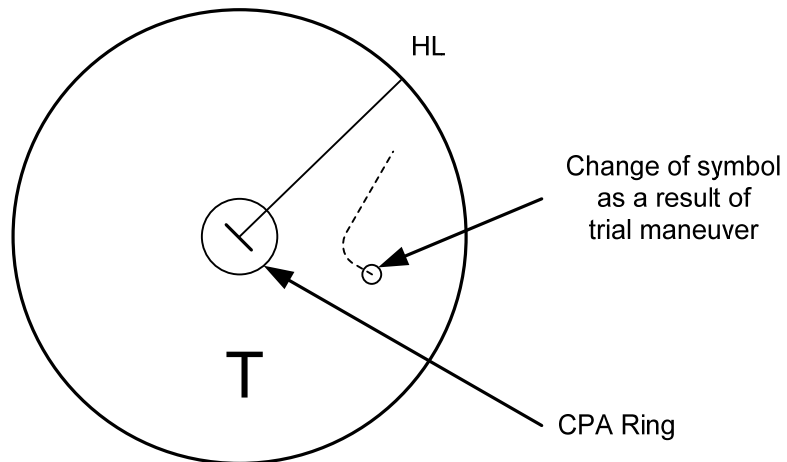
Trial Maneuvering in the Relative Vector Mode

The result of Trial maneuvering in the Relative Vector mode is shown by a change in target vector. In the figure below (in the same conditions as in the True Vector mode in the previous page), it is seen that the acquired target is a dangerous one because its vector is crossing the CPA RING.

NORMAL



TRIAL



The above figure shows that the relative vector of the target has changed as shown in the figure as a result of simulation (course and speed), so that the symbol color is changed into "White", a safe target.

Irrespective of the simulation results, the current CPA and TCPA values are shown in the tracked target information just like when the true vector mode is active.

The course change of own ship is displayed as a dotted-line.

Better information is provided by using relative motion and sea stabilization.

Operation of Trial Maneuvering Function

Procedures

- 1 Press the [TT MENU] key.
- 2 Open the Trial Maneuver menu by performing the following menu operation.

3. Trial Maneuver

- 3 Press the [1] key.

The Trial Function will be set to on or off.

- On : The trial maneuvering function is turned on.
 Off : The trial maneuvering function is turned off.

When the Trial Function is active, the character " T " will display at the bottom of the radar display.

- 4 Set values for Course by turning the [EBL] dial, and for Speed by turning the [VRM] dial.
- 5 Set other characteristics.

<input type="text" value="Vector Time"/>	: Vector time (1 to 60 min)
<input type="text" value="Time to Maneuver"/>	: Time until trial maneuvering is started (0 to 30 min)
<input type="text" value="Own Ship Dynamic Trait>"/>	: Dynamic trait of the own ship
→ <input type="text" value="Reach"/>	: Range from when steered to when the ship beings to turn (0 to 2000 m)
→ <input type="text" value="Turn Radius"/>	: Turning radius (0.10 to 2.00 NM)
→ <input type="text" value="Acceleration"/>	: Acceleration (0.0 to 100 kn/min)
→ <input type="text" value="Deceleration"/>	: Deceleration (0.0 to 100 kn/min)

For inputs to the value input screen, refer to Section 3.3.4.

Dangerous target symbols are displayed in red and safe target symbols in white.

- * Vector Time is valid only when Trial Function is set to on. If it is off, the vector time before trial maneuvering is displayed.
Time until the start of trial maneuvering is counted down immediately after the input.
The acceleration and deceleration are influenced depending on the relationship between the current speed and the input speed for trial maneuvering.
If 0.0 kn/min is set for when the speed for trial maneuvering is faster than the current speed, or for when the speed for trial maneuvering is slower than the current speed, the system performs simulation on the assumption that the speed is changed immediately after the time set for .

Cancellation

- 1 Press the [1] key while the Trial Maneuver menu is displayed.

The Trial Function will be set to on or off.

- Off : The trial maneuvering function is turned off.

5.8 EPA OPERATION

The EPA function is available when a target tracking unit (option) is not connected.

Note: ARPA Process Unit (NCA-877WA) or ATA Process Unit (NCA-877A) must be fitted on ships compliant to IMO.

This section explains how to use the EPA function.

The EPA function displays vectors as the courses and speeds of target ships.

The data of up to 10 target ships (plot/ID numbers 0-9) can be specified.

The EPA function calculates CPA/TCPA, and issues an alarm.

The data of plotted target ships is erased from memory when the power is turned off or transmission standby state.

The EPA function does not display any past plot data.

The past position function is not available.

The EPA function does not calculate BCR or BCT.

The target ID name function is not available.

The automatic acquisition function is not available. (The radar alarm is available.)

The Target Track Function is not available.

The reference target function is not available.

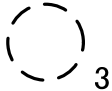
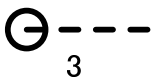

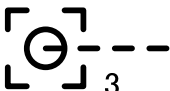

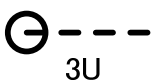
The Trial Maneuver is not available.

* The setting procedure for target tracking applies to the following:

1. Vector Time
2. CPA Limit
3. TCPA Limit
4. CPA Ring

5.8.1 Definitions of Symbols

Types and Definitions of EPA Symbol

Vector/Symbol	Definition	Remarks
	Initial plot	This symbol is displayed when the first plotting is performed. The symbol is displayed until the vector is displayed after the second plotting.
	Plot vector	
	Dangerous plot vector	The alarm message CPA/TCPA is displayed The alarm sounds. The symbol blinks red.
	Numeric displayed plot vector	When the numeric data is displayed, the symbol is enclosed in a square.
	Plot data modification	M is displayed beside the plot data modification symbol. It is displayed at the previous plotting position.
	Plot data update request	U is displayed when the plot data is not updated for 10 minutes. The alarm message Update EPA is displayed and the alarm sounds once. If the plot data is not updated within 5 minutes after the alarm, it is erased.

5.8.2 Plotting Targets

Vectors are displayed when a target is plotted twice.

A course and speed are calculated from the two plotting positions, and the plotted target moves in the course at the speed.

The plot can be modified.

The target ID number is not displayed while Display ID Number is set to off.

Procedures

- 1 Put the cursor on the target, and press the [ACQ] key to start the first plotting.
- 2 Enter the plot number (target ID number), pressing [0] to [9].
3. Press [ENT] to finish the first plotting.

The symbol and plot number will be displayed at the plotting position.

- 4 When 30 seconds to 15 minutes has passed after the first plot, Put the cursor on the current target position, and take steps 1 to 3 to perform the second plotting.

When finishing the second plotting, the system clears the symbol and plot number that were displayed at the end of the first plotting, and displays the symbol (vector) and plot number at the second plotting position.

The plotted target (symbol and plot ID number) moves in a specified course at a specified speed. The course and speed are calculated from the two plotting positions. At this time, the CPA and TCPA at positions where the plotted target moves are calculated, and an alarm is issued when the plotted target goes into the dangerous judgment.

5.8.3 Modifying Plotted Target Data

The system modifies specified plotted target data.

It clears the specified data, and displays the plotted target immediately before it moves to the clear position until re-acquiring a target.

Procedures

- 1 Press the [ACQ] key.
- 2 Enter the plot number (target ID number) for modification, pressing [0] to [9].
- 3 Press the [CLR / INFO] key.

The previously updated status will be displayed. M is also displayed beside the mark, indicating that modification is in progress.

- 4 Put the cursor on the modification position to re-acquire a target, and plotting.

At this time, specify the plot number you entered in step 2.
([ACQ], [0]-[9], [ENT])

5.8.4 Canceling Plotted Target Data

The system cancels the display of specified plotted target data.
Once plotted target data is canceled, it cannot be re-saved any more.

Procedures

- 1 Press the [ACQ] key.
- 2 Enter the plot number for cancellation, pressing [0] to [9].
- 3 Press the [TGT CNCL] key.

The plotted target data of the specified plot number will be canceled.

Canceling all plotted targets

Procedures

- 1 Press the [TGT CNCL] key for 5 seconds or more.

The plotted targets of all the plot numbers will be canceled.

5

5.8.5 Displaying Numeric Data of Plotted Targets


The following data is displayed for a specified plotted target:

TGT ID	Plot number	
BRG	Bearing	:0.1° unit
Range	Range	:0.01 nm unit
Course	Target's true course	:0.1° unit
Speed	Target's true speed	:0.1 kn unit
CPA	CPA	:0.01 nm unit
TCPA	TCPA	:0.1 min unit
TIME	Elapsed time	:0.1 min unit

Procedures

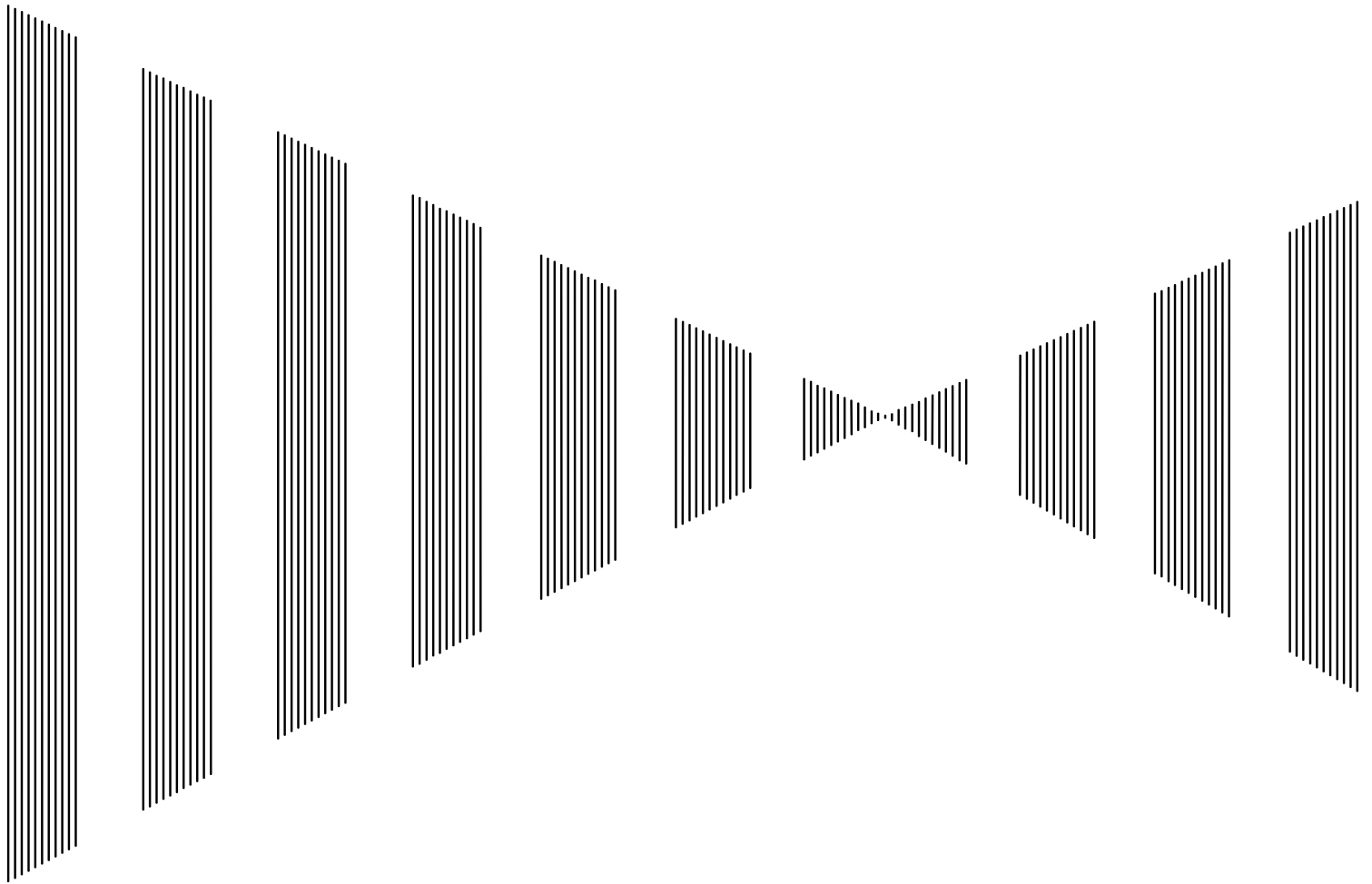
- 1 Press the [TGT DATA] key.
- 2 Enter the plot number pressing [0] to [9].
- 3 Press the [ENT] key.

The data of the specified plot number will be displayed.

The mark of the target for which numeric data is displayed is changed into “”.

SECTION 6

TRUE AND FALSE ECHOES ON DISPLAY



6.1	RADAR WAVE WITH THE HORIZON	6-1
6.2	STRENGTH OF REFLECTION FROM THE TARGET	6-3
6.3	SEA CLUTTER AND RAIN AND SNOW CLUTTER.....	6-5
6.4	FALSE ECHOES.....	6-9
6.5	DISPLAY OF RADAR TRANSPONDER (SART).....	6-12
6.6	DISPLAY OF AIS-SART.....	6-14

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

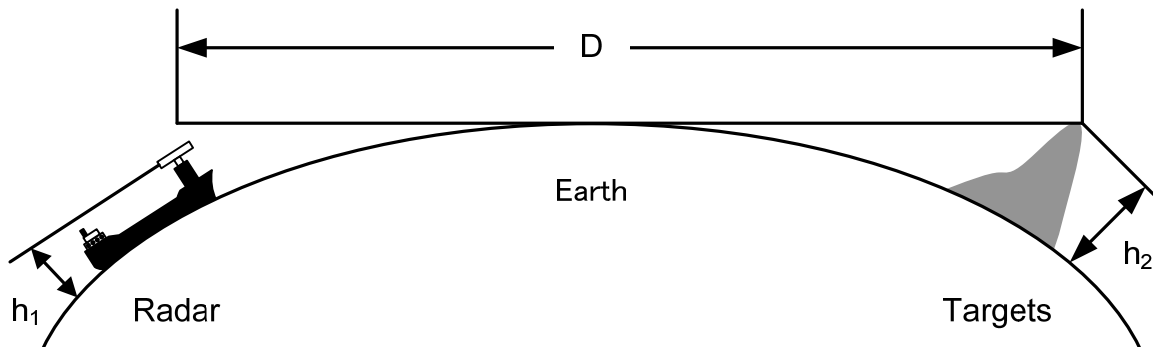
Radar beam radiation has the nature of propagating nearly along the curved surface of the earth. The propagation varies with the property of the air layer through which the radar beam propagates. In the normal propagation, the distance (D) of the radar wave to the horizon is approximately 10% longer than the distance to the optical horizon. The distance (D) is given by the following formula:

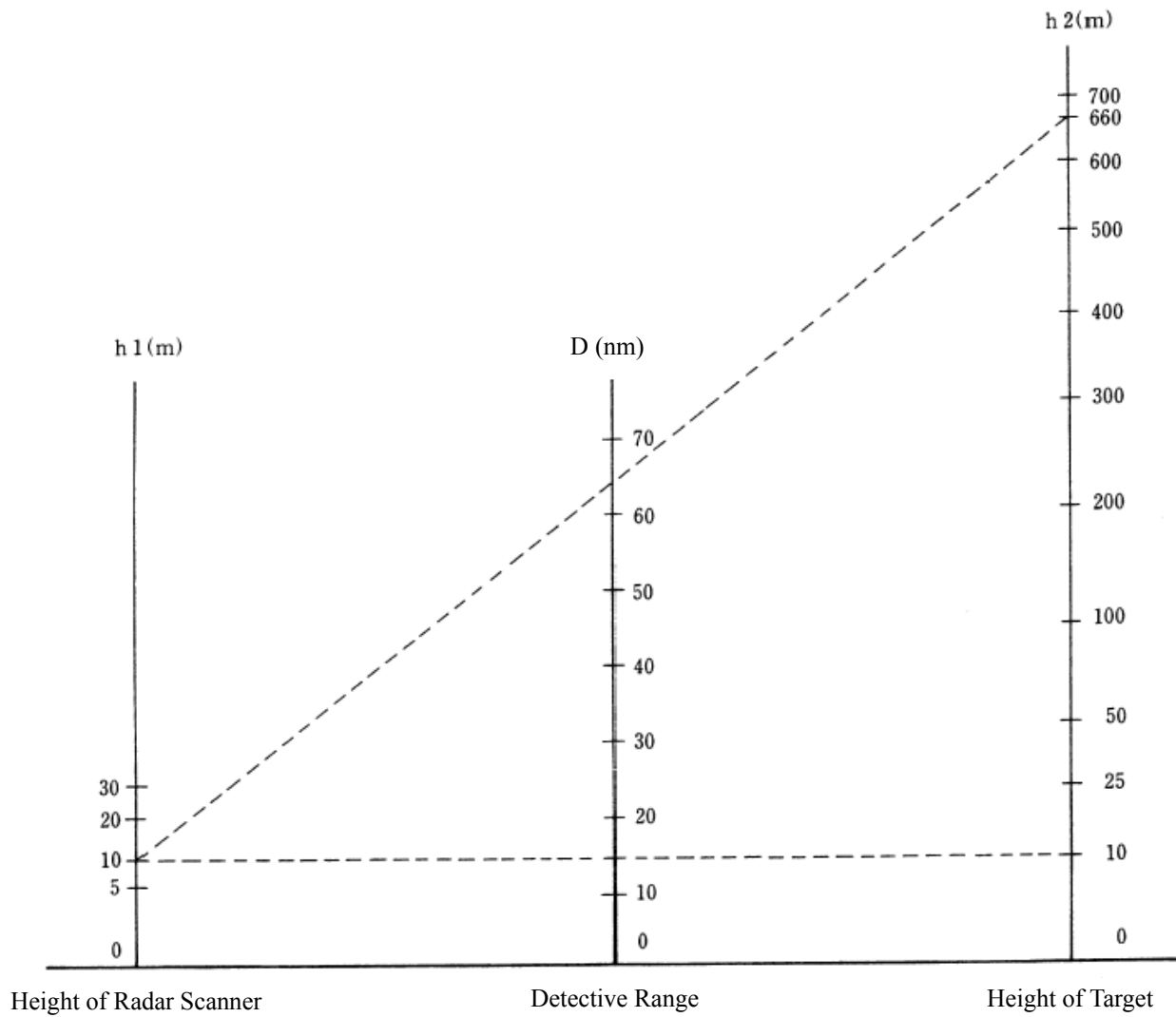
$$D=2.23(\sqrt{h_1} + \sqrt{h_2})(nm)$$

h₁: Height (m) of radar scanner above sea level

h₂: 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.





6

Figure 6.1

When the height of own ship's scanner is 10 m for instance,

- 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.
- 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.

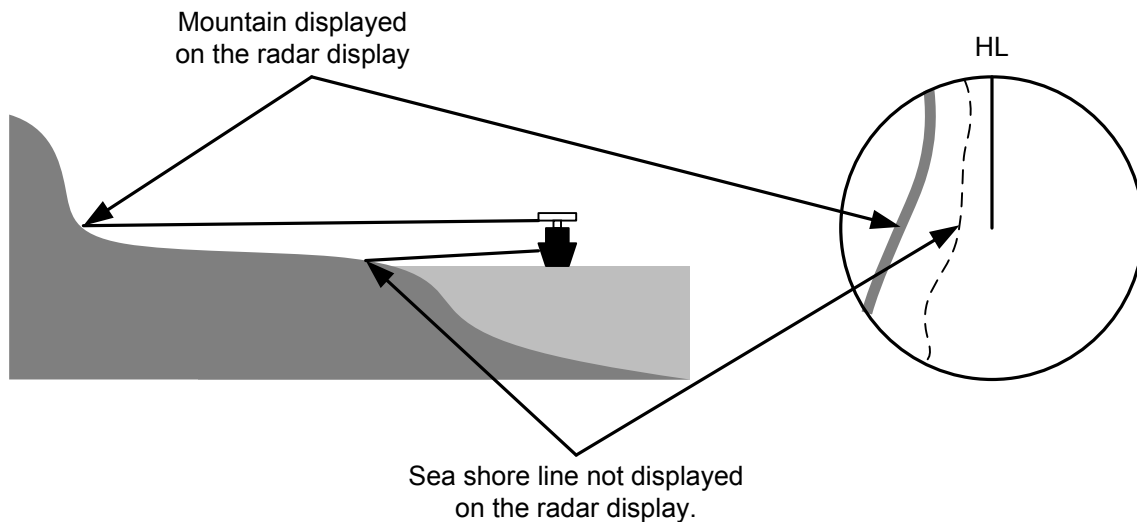


Figure 6.2

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 μ s) 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.

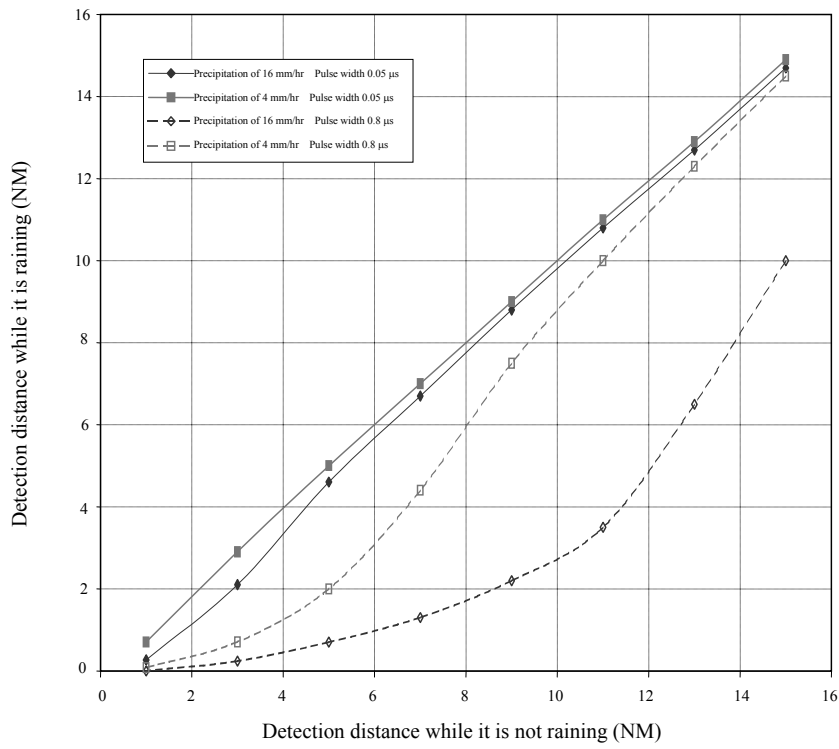


Figure 6.3 Decreased target detection distance by S band radar due to precipitation

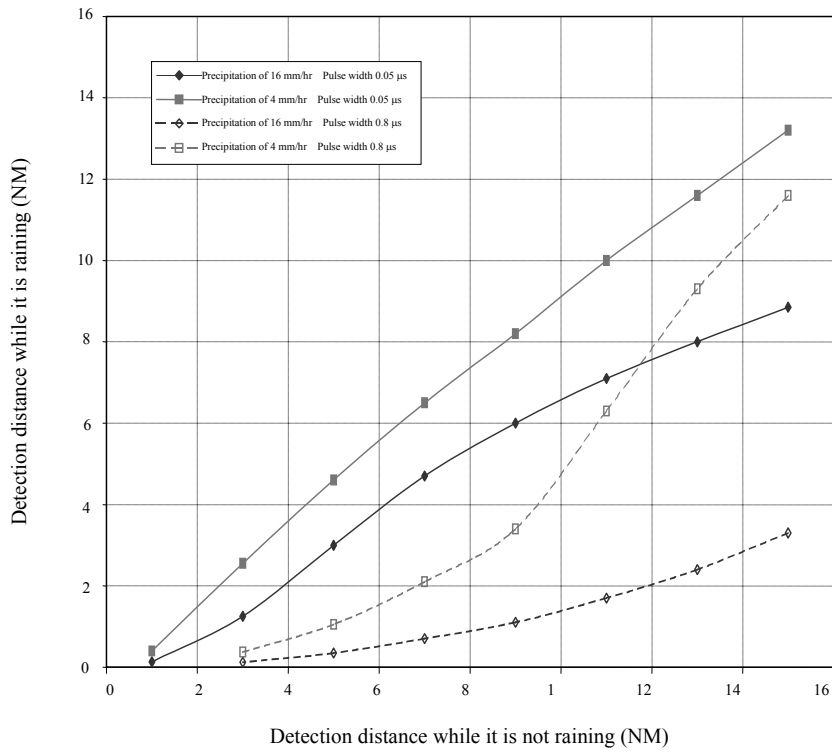


Figure 6.4 Decreased target detection distance by X band radar due to precipitation



[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 PROC 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 **FUNC Storm** or **FUNC Rain** be used by selecting the function mode when the weather is bad. For details of the function mode, see Chapter 3.9.

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)

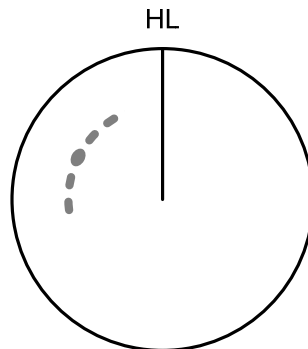


Figure 6.5

[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.

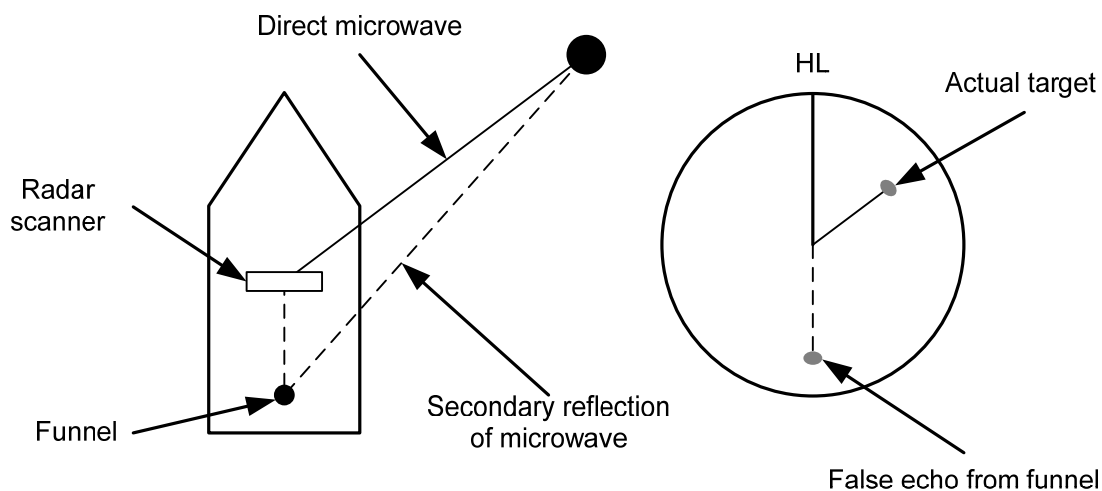


Figure 6.6



[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.

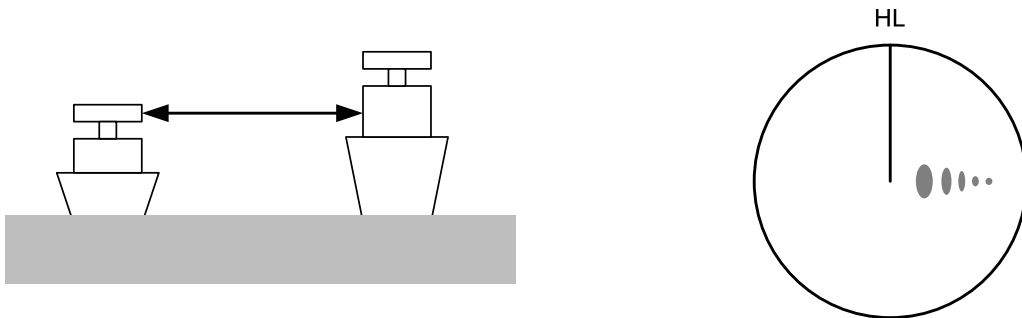


Figure 6.7

[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 of “The Horizon for Radar Beam Radiation”. 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. (See section 3.8.3)

[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)

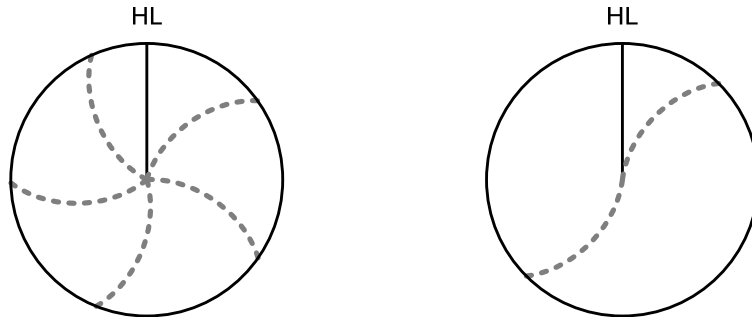


Figure 6.8

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]** key 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)

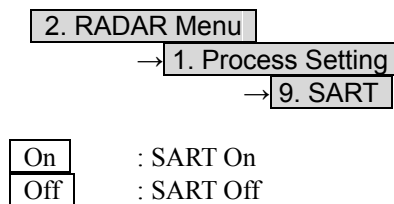
The SART (Search and rescue Radar Transponder) is a survival device authorized by the GMDSS (Global Maritime Distress and Safety System), which is used for locating survivors in case that a distress accident occurs at sea. The SART is designed to operate in the 9 GHz frequency band.

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.

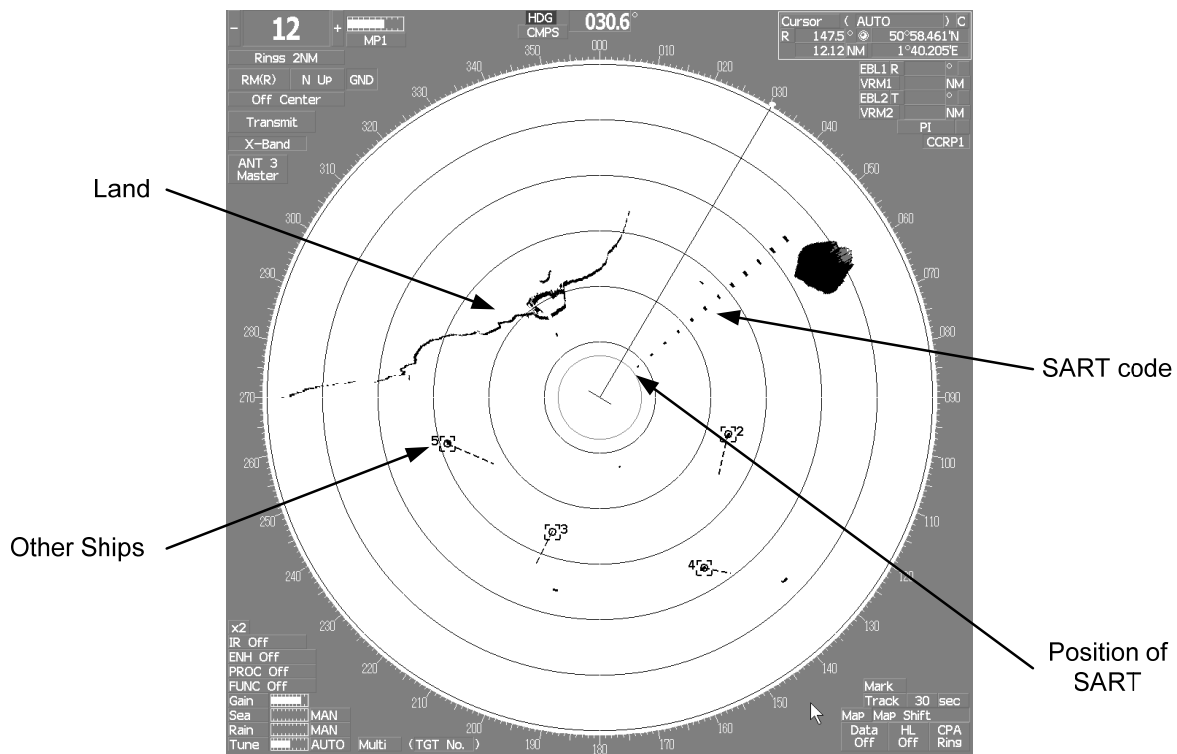
Procedures

- 1 Press [RANGE +] or [RANGE -] key to set the radar range to 6 NM or 12 NM.
- 2 Press [RADAR MENU] key twice, and then set the SART display mode according to the procedures below.



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 rejecter (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.



6.6 DISPLAY OF AIS-SART

AIS Process Unit (option) is necessary.

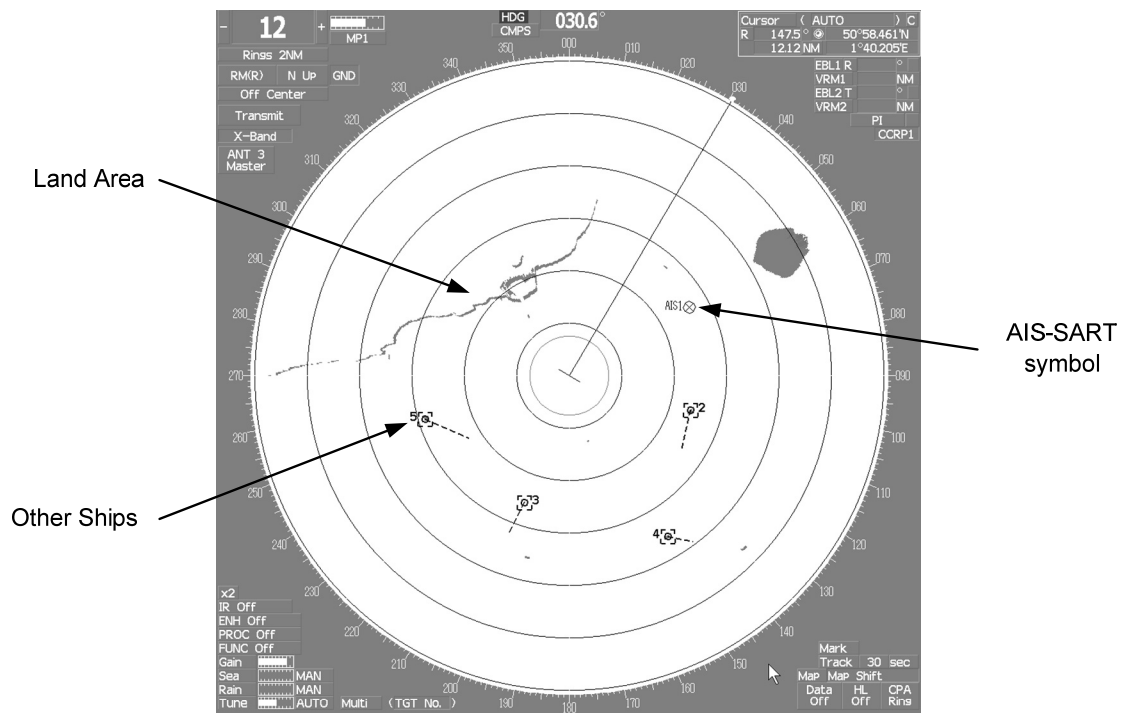
AIS-SART is an equipment to display the position of distress ship on the AIS indicator in ship station or coast station when the distress occurs.

It is usable as an alternate equipment of SART(Search And Rescue Transponder).

When connecting AIS indicator to RADAR, it is possible to display AIS-SART symbol on the RADAR screen.

[1] Display

When receiving AIS-SART signal, AIS-SART symbol is displayed on the RADAR screen.



[Example of AIS-SART Symbol Display]

For details of AIS-SART Symbol, refer to section 5.1.2 " Definitions of Symbols ".

[II] Numeric Display

When the sleeping AIS-SART symbol is clicked once, the symbol changes into activated AIS-SART symbol.
And then activated AIS-SART symbol is clicked once more, the symbol changes into numeric displayed AIS-SART symbol and their information is displayed.

AIS ID 1	
Name	
AIS-SART ACT	
Call Sign	Not Available
MMSI	977470000
COG	0.0 °
SOG	0.0 kn
CPA	10.00 NM
TCPA	68.9 min
BRG	49.1 °
Range	15.20 NM
HDG	0.0 °
ROT	0.00 °/min
POSN	35°02.0000'N
>10m	139°02.0000'E
Destination	
Not Available	
NAV Status	
SART ACTIVE(14)	

[Example of numeric information display of AIS-SART]

Depending on operation condition, Navigation Status is displayed as follows.

Normal operation: AIS-SART ACTIVE(14)

Test operation: AIS-SART TEST(15)

It means operation test of AIS-SART when “AIS-SART TEST(15)” is displayed.

Note: AIS-SART function is available in the display software ver. 1.01 or later. As for method of confirming software version, refer to section 8.3.1 " Check Performance on Test Menu ".

SECTION 7

SETTINGS FOR SYSTEM OPERATION

7.1	SETTINGS AT INSTALLATION	7-1
7.2	SETTINGS.....	7-11
7.3	ADJUSTMENT	7-30
7.4	MAINTENANCE MENU	7-38

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



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.

7.1.1 How to Open the Serviceman Menu

Procedures

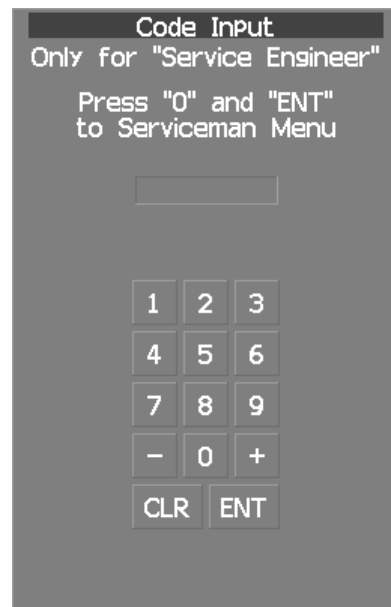
1. Press the [RADAR Menu] key for 2 seconds.

The Code Input menu will appear.

2. Press [0] key.

3. Put the cursor on the **ENT** button, and press the [ENT] key.

The Serviceman Menu will appear.



7.1.2 GYRO I/F Setting

The GYRO I/F 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 GYRO I/F 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.

Procedures

1. Set S1 to "OFF."

The gyro compass and GYRO I/F 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 GYRO I/F are connected.

7. After power-on operation, set the true bearing according to Section 7.1.7.

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)

S4 SETTING	1	2	3	4	5	6	7	8
BSHLOG ALM	ON							
	OFF							
GYRO SIMULATOR		ON						
		OFF						
LOG SIMULATOR			ON					
			OFF					
N.C. (No Connection)				OFF				
GYRO ALM TIME			5 SEC		ON			
			0.2 SEC		OFF			
GYRO SRC (Heading Sensor Source)	HDT (NMEA (HDT/THS))					ON		
	GYRO					OFF		
NMEA BAUDRATE	4800 BPS						OFF	OFF
	9600 BPS						ON	OFF
	19200 BPS						OFF	ON
	38400 BPS						ON	ON

Table 7-2 Setting Table (S5 DIP Switch)

S5 SETTING	1	2	3	4	5	6	7	8	
GYRO SETTING	STEP	ON							
	SYNC	OFF							
	RATIO	36X		ON	ON				
		90X		OFF	ON				
		180X		ON	OFF				
		360X		OFF	OFF				
	DIRECTION	REV (Reverce)			ON				
NOR (Normal)			OFF						
LOG SETTING	SYNC (Synchro)				ON				
	PULSE				OFF				
	NC (No Connection)					OFF			
	PULSE/NM			100P / 30X		ON			ON
				200P / 90X		OFF			ON
400P / 180X				ON	OFF				
800P / 360X				OFF	OFF				

7.1.3 Tuning

[I] Tune 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.

Procedures

1. Set the 48NM range or more.
2. Open the Serviceman Menu.
3. Open the Tune Adjustment menu by performing the following menu operation.

```

1. Adjust Menu
  → 1. Tune Adjustment
  
```

The tune mode switching (lower left of the display ⑫ on page 2-18) is changed to **MAN**.

The tune dial position (lower left of the display on page 2-3) is changed to medium value.

4. Adjust the tune adjustment value so that the tune indicator bar at the upper left of the display is maximized.

For how to input numeric data on the numeric value input screen, see Section 3.3.4.

5. Move the cursor onto the **ENT** button, and press the [ENT] key.

[II] Tune Indicator Adjustment

Set the scale mark at the time of which tuning reached the maximum point.

Procedures

1. Set the 48NM range or more.
2. Open the Serviceman Menu.
3. Open the Tune Indicator Adjust menu by performing the following menu operation.

```

1. Adjust Menu
  → 4. TXRX Adjustment
     → 3. Tune Indicator Adjust
  
```

4. Adjust the tune indicator adjustment value so that the tune indicator bar at the upper left of the display reaches a point of 80 to 90% of the maximum.

For how to input numeric data on the numeric value input screen, see Section 3.3.4.

5. Move the cursor onto the **ENT** button, and press the [ENT] key.

- **With the JMA-5312 radar:**

Adjusted this menu in factory.

Don't touch this adjustment menu in normal case.

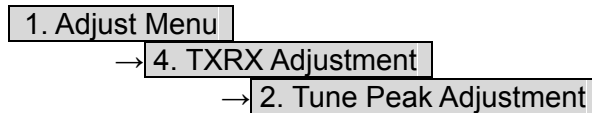
When tune indicator and echo peak are mismatched, adjust this menu.

[III]Tune Peak Adjustment

Adjust the tune indicator and echo peak.

Procedures

1. **Adjust tuning by referring to Section " [I] Tune Adjustment.**
2. **Adjust tune indicator by referring to Section " [II] Tune Indicator Adjustment.**
3. **Set the 48NM range or more.**
4. **Open the Serviceman Menu.**
5. **Open the Tune Peak Adjustment menu by performing the following menu operation.**



The tune mode seitching (lower left of the display ⑫ on page 2-18) is changed to

MAN .

6. **Adjust the tune peak adjustment to get maximum echoes on a display when the tune indicator is maximum.**

For how to input numeric data on the numeric value input screen, see Section 3.3.4.

7. **Move the cursor onto the **ENT** button, and press the [ENT] key.**

7.1.4 Bearing Adjustment

Make adjustment so that the bearing of the target measured with the ship's compass matches the bearing of the target echo on the radar display.

Procedures

1. Select H Up for the bearing presentation. Set video processing (PROC) to OFF.
2. Measure the bearing of an adequate target (e.g., a ship at anchor, a breakwater, or a buoy) relative to own ship's heading.
3. Open the Serviceman Menu.
4. Open the Bearing Adjustment menu by performing the following menu operation.

```

1. Adjust Menu
  → 2. Bearing Adjustment
  
```

5. Adjust the bearing adjustment value so that the target measured in step 2 is adjusted to the correct bearing.

For how to input numeric data on the numeric value input screen, see Section 3.3.4. Make adjustment by the 0.1°.

6. Move the cursor onto the **ENT** button, and press the [ENT] key.

7.1.5 Range Adjustment

Make adjustment so that the range of a target on the radar display is shown correctly.

Procedures

1. Search the radar display for a target of which range is already known.
2. Open the Serviceman Menu.
3. Open the Range Adjustment menu by performing the following menu operation.

```

1. Adjust Menu
  → 3. Range Adjustment
  
```

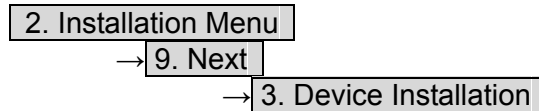
4. Adjust the range adjustment value so that the target measured in step 1 is adjusted to the correct range. (For inputs to the value input screen, refer to Section 3.3.4.)
5. Move the cursor onto the **ENT** button, and press the [ENT] key.

7.1.6 Navigator Setting (Device)

Determine whether to connect navigators to the radar equipment.
Only the navigators set to ON here can be used.

Procedures

1. Open the **Serviceman Menu**.
2. Open the **Device Installation** menu by performing the following menu operation.



3. Select **On** for navigators connected to the radar equipment, and **Off** for navigators not connected.

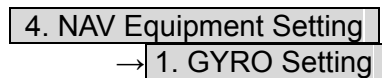
GYRO	: Gyro (via GYRO I/F)
Compass	: Compass (Compliant with IEC61162)
GPS Compass	: GPS compass produced by JRC
Log	: Log (via GYRO I/F)
2AXW	: 2-axis log (Speed over water: Compliant with IEC61162)
2AXG	: 2-axis log (Speed over ground: Compliant with IEC61162)
GPS	: GPS (Compliant with IEC61162)

7.1.7 Setting of True Bearing Value

If GYRO I/F is used to input a gyro signal, the true bearing value indicated by the master gyro does not match the value indicated by the radar equipment only in a rare case. In this case, perform the following procedure to adjust the true bearing value of the radar equipment to the value of the master gyro.

Procedures

1. Press the **[RADAR MENU]** key twice.
2. Open the **GYRO Setting** menu by performing the following menu operation.



3. Input the master gyro value to the value input screen. (For inputs to the value input screen, refer to Section 3.3.4.)
4. Move the cursor onto the **ENT** button, and press the **[ENT]** key.

7.1.8 Antenna Height Setting (Antenna Height)

Set the height of radar antenna above sea level. Do not change this setting carelessly.

Procedures

1. Measure the height of radar antenna above sea level in advance.
2. Open the Serviceman Menu.
3. Open the Antenna Height menu by performing the following menu operation.

1. Adjust Menu

→ 4. TXRX Adjustment

→ 1. Antenna Height

4. Select the setting that matches the antenna height measured in step 1.

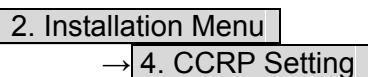
7.1.9 Setting of CCRP/Antenna/GPS Antenna Position (CCRP Setting)

Set the own ship's CCRP location, radar antenna installation location, and GPS installation location.

- CCRP : Up to four locations can be input. (One location selected when used)
Radar antenna : Up to eight radar antennas can be input. (Automatically selected in response to ISW operation)
GPS : Up to four locations can be input. (One location selected when used)

Procedures

1. Measure the CCRP location, radar antenna location, and GPS antenna location in advance.
2. Press the [STBY] key.
The transmission standby state is activated.
3. Open the Serviceman Menu.
4. Open the CCRP Setting menu by performing the following menu operation.



5. Specify the ship length for Length at the upper right of the CCRP Setting Menu, and the ship width for Beam.
6. Move the cursor onto the CCRP1 X, Y value, and press the ENT key to input the CCRP1 location.

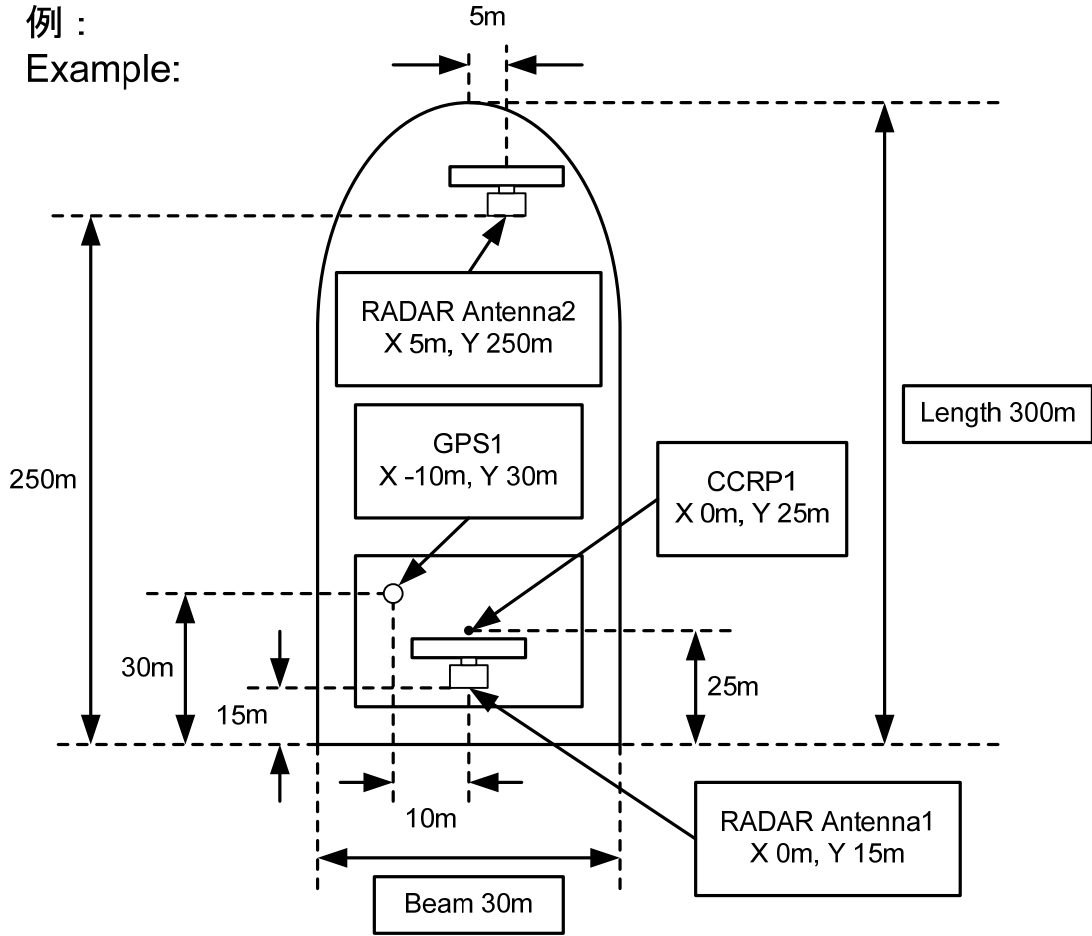
When $X > 0$, the CCRP is on the starboard side of the ship. When $X < 0$, it is on the port side.

7. To input the second CCRP, press the **CCR2** button to display the CCRP2 X,Y value, and input the value in the same manner for step 5.

Similarly, input the third and subsequent CCRPs.

8. Repeat the above steps to input the GPS location(s) and radar antenna location(s).
9. If multiple CCRP locations and GPS locations are input, select the CCRP location and GPS location to be used by pressing the buttons at the upper left of the menu.
10. Press [0] key to close the CCRP Setting menu.

例：
Example:



CCRP Setting

1. Select CCRP
2. Select GPS

Length
Beam

	X	Y
GPS1	-10.0	30.0 m
GPS2		m
GPS3		m
GPS4		m

	X	Y
RADAR Antenna1	0.0	15.0 m
RADAR Antenna2	5.0	250.0 m
RADAR Antenna3		m
RADAR Antenna4		m
RADAR Antenna5		m
RADAR Antenna6		m
RADAR Antenna7		m
RADAR Antenna8		m

	X	Y
CCRP1	0.0	25.0 m
CCRP2		m
CCRP3		m
CCRP4		m

0.

Y[m]

(0,0) X[m]

7.2 SETTINGS

This section describes the electrical adjustment procedures to be performed by service engineers during system installation.

CAUTION



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.

7.2.1 Communication Port Setting (COM Port Setting)

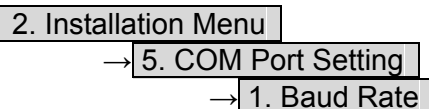
External sensor signals are input to the radar equipment through a communication port. The radar equipment has five communication ports. For signals to be input from sensors or to be output to the sensors, communication ports need to be set in accordance with the sensors.

[I] Baud Rate Setting

Set the baud rate of the signal to be input to the COM port.

Procedures

1. Open the **Serviceman Menu**.
2. Open the **Baud Rate** menu by performing the following menu operation.



3. Set the baud rate of the port to be set.**Selection value**

1. COMPASS	: 4800(NMEA)/9600(NSK)/ 38400(Fast NMEA) bps
2. NAV1	: 1200/ 4800 /9600/38400 bps
3. NAV2	: 1200/ 4800 /9600/38400 bps
4. GPS	: 1200/ 4800 /9600/38400 bps
5. NMEA	: 1200/ 4800 /9600/38400/115200 bps

The bold values are factory-set.

The COMPASS port is a receive-only port that is dedicated to COMPASS signals.

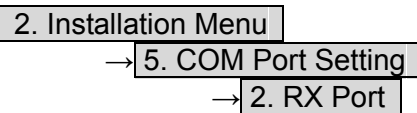
III] Reception Port Setting (RX Port)

Set the numbers of ports for receiving signals from sensors.

There are two methods for receiving signals: specifying a port for each sensor, or using the automatic recognition function without specifying ports.

Procedures

- 1. Open the Serviceman Menu.**
- 2. Open the RX Port menu by performing the following menu operation.**



- 3. Set a port for each sensor.**

Settable sensor signals

GPS, DLOG, Alarm, Depth, Temperature, Wind, Current, ROT, RSA

Selectable ports

When the automatic recognition function is used: AUTO

When ports are specified: NAV1, NAV2, GPS, and NMEA

[III] Reception Sentence Setting (RX Sentence)

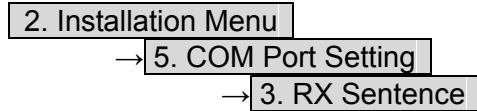
Set signal sentences to be received from sensors.

The system is factory-set for using all sentences.

To receive only specified sentences, select for sentences which are not necessary.

Procedures

1. Open the Serviceman Menu.
2. Open the RX Sentence menu by performing the following menu operation.



3. Select the sentences to be used by the sensors to be set.

Selection value: or can be selected for each sentence.

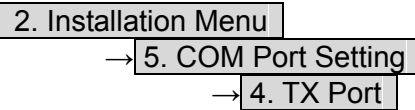
<input type="text" value="1. GPS(LL/COG/SOG) >"/>	: GGA/RMC/RMA/GNS/GLL/VTG
<input type="text" value="2. GPS(WPT/Time) >"/>	: GGA/RMC/RMB/BWC/BWR/ZDA
<input type="text" value="3. Depth >"/>	: DPT/DBK/DBT/DBS
<input type="text" value="4. Wind >"/>	: MWV/MWD
<input type="text" value="5. Current >"/>	:
<input type="text" value="Data Set Number"/>	: 0-9. Set the number of the sentence to be used by Data Set Number. (Initial value All)
<input type="text" value="Layer A"/>	: 0-999. Set the number of the sentence to be used with layer A by Layer Number. (default value : 3)
<input type="text" value="Layer B"/>	: 0-999. Set the number of the sentence to be used with layer B by Layer Number. (default value : 4)
<input type="text" value="Layer C"/>	: 0-999. Set the number of the sentence to be used with layer C by Layer Number. (default value : 5)
<input type="text" value="6. Autopilot"/>	: APB (default value : Not Use)

[IV] Transmission Port Setting (TX Port)

For each sentence, set a communication port through which signals are transmitted to sensors.

Procedures

1. Open the Serviceman Menu.
2. Open the TX Port menu by performing the following menu operation.



3. Select the communication port through which the sentence to be set is output.

Settable sentences

TTM(TT), TLL(TT), TTD(TT), TLB(TT), OSD, RSD, ALR, ACK,
TTM(AIS), TLL(AIS), TTD(AIS), TLB(AIS), RemoteMaintenance,
JRC-ARPA, APB, BOD, GGA, GLL, RMC, RMB, VTG, XTE,
BWC, HDT, THS

Selectable ports

NAV1, ARPA, GPS, and NMEA

4. Select the output format, talker, and transmission interval.

Signals for which the above items can be set:

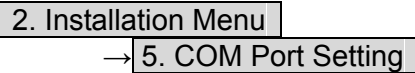
- NMEA0183 Output Format
Signal names: APB, BOD, GGA, GLL, RMC, RMB,VTG, XTE, BWC, HDT, THS
Selection Value: V1.5, V2.0, and V2.3
- NMEA0183 Talker
Signal names: APB, BOD,RMB, XTE, BWC, HDT, THS
Selection Value:
Standard: The talker is RA.
GP: The talker is GP.
For TTM, TLL, TTD, TLB, OSD, RSD and ALR 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.

[V] GPS Receive Port Setting (Select NAV Equipment)

Select the receive port of GPS data.

Procedures

1. Open the Serviceman Menu.
2. Open the COM Port setting menu by performing the following menu operation.



3. Press the [5] key.

Units of Select NAV Equipment are switched.

Internal GPS	: The receive port is selected GPS connector of processor unit (JRC's GPS).
External GPS	: The receive port is selected GPS terminal of terminal board circuit.

7.2.2 Sector Blank Setting (Sector Blank)

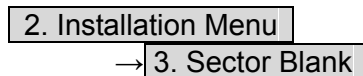
In order not to display radar echoes, set a sector and stop transmission in the bearing. Three sector blank areas can be created.

The sector blank function operates in the relative bearing with the bow.

[I] Sector Blank Function On/Off (Sectors 1, 2, and 3)

Procedures

1. Open the Serviceman Menu.
2. Open the Sector Blank menu by performing the following menu operation.



3. Set the sector blank number **Sector 1**, **2**, or **3** with which the sector blank function operates.

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.

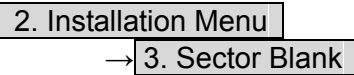
Note: Displays the Magnetron Current bar instability indicating in sector blank area, but it is normal operating.

For how to magnetron current to check, see Section 8.3.1.

[II] Sector Blank Area Creation (Make Sectors 1, 2, and 3)

Procedures

1. Transmit the radar.
2. Open the Serviceman Menu.
3. Open the Sector Blank menu by performing the following menu operation.



4. Press numeric keys corresponding to the desired sector creation

Make Sector 1, **2**, or **3**.

The selected sector blank will be made.

5. Set the starting bearing of the sector blank by operating the [EBL] dial, and press the [ENT] key.
6. Set the ending azimuth of the sector blank by operating the [EBL] dial, and press the [ENT] key.

7.2.3 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.

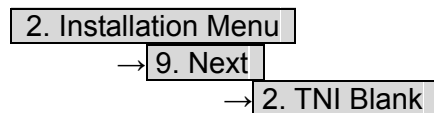
Only one TNI blank sector can be created. The TNI blank function operates in the relative bearing with the bow as the benchmark.

7

[I] TNI Blank Function On/Off (Sector)

Procedures

1. Open the Serviceman Menu.
2. Open the TNI Blank menu by performing the following menu operation.



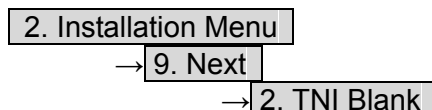
3. Select the item **1. TNI Blank** in the menu, and turn on or off the TNI blank function.

On : The TNI blank function is operated.
Off : The TNI blank function is stopped.

III] TNI Blank Area Creation (Make Sector)

Procedures

1. Transmit the radar.
2. Open the Serviceman Menu.
3. Open the TNI Blank menu by performing the following menu operation.



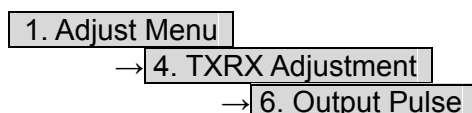
4. Press the **2. Make Sector** button in the menu.
5. Set the starting bearing of the TNI blank by operating the [EBL] dial, and press the [ENT] key.
6. Set the ending bearing of the TNI blank by operating the [EBL] dial, and press the [ENT] key.

7.2.4 Setting of Bearing Pulses from Antenna (Output Pulse)

Set the output value of bearing pulses from the antenna. The system can set 2048 pulses or 4096 pulses. This setting is enabled only when an antenna of NKE-2254-7/9/6HS (JMA-5322-7/9/6HS), NKE-1130 (JMA-5332-12) is used.

Procedures

1. Open the Serviceman Menu.
2. Open the Output Pulse menu by performing the following menu operation.



3. Set the number of pulses to be output by the antenna.

2048 : 2048 pulses per antenna rotation (Recommended value)

4096 : 4096 pulses per antenna rotation

* If a NKE-2103-6/6HS (JMA-5312-6/6HS) antenna is used, **2048** is always set.

7.2.5 Slave Mode Setting (Master/Slave)

Place the system in the mode when it is to be operated as the sub-display that displays radar echoes by using radar signals from other radar equipment.

The input value of externally input bearing pulses can be set. The system can set 2048 pulses or 4096 pulses.

[I] Slave Mode Setting (Master/Slave)

Procedures

1. Open the Serviceman Menu.
2. Open the Installation Menu by performing the following menu operation.

3. Select Slave for the item in the menu.

: The system operates as radar equipment while the own antenna is connected.

: The system operates as a sub-display while the signal cable of other radar equipment is connected.

[II] Setting of Input Bearing Pulse (Input BP Count)

Procedures

1. Open the Serviceman Menu.
2. Open the second page of the Installation Menu by performing the following menu operation.

→

3. Set the number of pulses for the item in the menu.

: 2048 pulses per antenna rotation

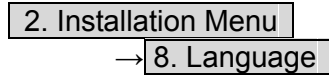
: 4096 pulses per antenna rotation

7.2.6 Language Setting (Language)

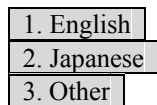
The system is designed to switch between display languages, Japanese and English.

Procedures

1. Open the Serviceman Menu.
2. Open the Language menu by performing the following menu operation.



3. Select the language to be used.



3. Other is an option to display character strings created by our agents. Ask the agent or our sales department if your language is supported.

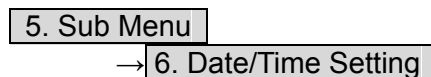
4. To determine the selected language, turn the radar off, and then turn it on.

7.2.7 Date Time Setting

To display time, the local time, local date, and time-zone difference must be set. However, if the "ZDA" sentence of NMEA0183 is received, time can be automatically displayed.

Procedures

1. Press the [RADAR MENU] key twice.
2. Open the Date/Time Setting menu by performing the following menu operation.



2. Set information about date and time.**[1] UTC/LMT (Time display system)**

<input type="checkbox"/>	UTC	: Universal Time Coordinate
<input type="checkbox"/>	LMT	: Local Mean Time

[2] LMT Date

Input the date in local time.

[3] LMT Time

Input the time in local time.

[4] Time Zone

Input the time-zone difference between the universal time and local time.

[5] Display Style

Set one of the following date display formats.

<input type="checkbox"/>	YYYY-MM-DD	: Example: 2007-12-31
<input type="checkbox"/>	MMM DD, YYYY	: Example: Dec 31, 2007
<input type="checkbox"/>	DD MMM YYYY	: Example: 31 Dec 2007

[6] Synchronize with GPS

A ZDA sentence sent by the GPS is used, thereby displaying time synchronized with the GPS time.

<input type="checkbox"/>	On	: Time synchronized with the GPS time
<input type="checkbox"/>	Off	: Time not synchronized with the GPS time

* If On is selected for this item but a ZDA sentence is not input, the system internal clock function is used to display the date and time.

7.2.8 Input Installation Information

The system can input installation information.

Procedures**1. Open the Serviceman Menu.****2. Open the Installation Information menu by performing the following menu operation.**

<input type="checkbox"/>	2. Installation Menu
→	<input type="checkbox"/>
	1. Installation Information

3. Input the installation information.

For the input method on the numeric value and character input screens, see Section 3.3.4.

[1] Date

Input the date of installed system.

[2] Name

Input the name of installation personnel.

[3] Company

Input the name of radar installer.

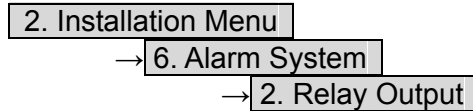
7.2.9 Setting the Alarm System

Setting the relay output (Relay Output)

This function enables the control of ARPAALM terminal (on the terminal board circuit).

Procedures

1. **Open the Serviceman Menu.**
2. **Open the Relay Output menu by performing the following menu operation.**



3. **Press the [1] key.**

The Relay Output mode is switched.

Continuous	: The output is continuously controlled.
Intermittent	: The output is intermittently controlled.

4. **Press the [numeric] key corresponding to the item to be changed.**

The item can be turned on / off.

On	: The relay output is turned on when alarm have issued.
Off	: The relay output is not turned on when alarm have issued.

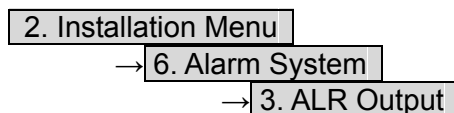
2. TT CPA/TCPA	: There is a dangerous target. (tracked target)
3. AIS CPA/TCPA	: There is a dangerous target. (AIS target)
4. New Target	: A new target is acquired in the automatic acquisition zone.
5. Lost	: There is a lost target. (Target Tracking / AIS).
6. RADAR Alarm	: Targets have entered the radar alarm range.

Setting the ALR output (ALR Output)

This function enables the control of ALR port (See the section 7.2.1).

Procedures

1. **Open the Serviceman Menu.**
2. **Open theALR output menu by performing the following menu operation.**



3. **Press the [numeric] key corresponding to the item to be changed.**

The item is turned on / off.

On	: The ALR sentence is output when alarm have issued.
Off	: The ALR sentence is not output when alarm have issued.

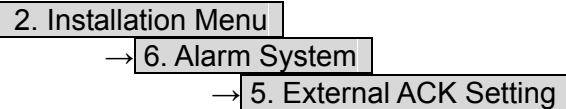
1. System Alarm	: The internal alarm.
2. TT/AIS Alarm	: Target Tracking Alarms and AIS Function Alarms.

Setting the External Acknowledgement (External ACK Setting)

This function enables the control of system when ACK sentence have received.

Procedures

1. Open the **Serviceman Menu**.
2. Open the **External ACK Setting** menu by performing the following menu operation.



3. Press the [numeric] key corresponding to the menu to be changed.

Critical Alarm	: CPA/TCPA alarm.
Normal Alarm	: Except Critical Alarm.

4. Press the [numeric] key corresponding to the item to be changed.

The item is switched.

Audio	: Setting of alarm sound.
On	: The alarm sound is not stopped when acknowledgement have received.
Off	: The alarm sound is stopped when acknowledgement have received.

Indication	: Setting of alarm indication.
Lighting	: The alarm indication brinking is stopped when acknowledgement have received.
Brinking	: The alarm indication brinking is not stopped when acknowledgement have received.

Acknowledge State	: Setting of ALR sentence.
A:ACK	: Add acknowledgement to ALR sentence.
V:UNACK	: Add no acknowledgement (unrecognized) to ALR sentence.

7.2.10 Network Setting (Network)

The system can receive data from other system via the JRC-LAN. The JRC-LAN is designed for interoperation of JRC systems. The JRC-LAN network can synchronize data of systems connected to the network.

* To connect JRC-LAN, LAN cable and HUB (option) is necessary.
For details, contact the JRC offices.

Note: If the connection is not suggested from JRC offices, don't connect PC or other maker's system.

- Connecting PC or other maker's system can cause a lower performance to radar system.
- Connecting PC or other maker's system can cause a lower performance to them.

Accepted Devices

- RADAR : JMA-9100/7100/5300MK2 series
- ECDIS : JAN-901B/701B
- Chart RADAR : JMA-900B series
- Conning Display : JAN-901B-CON/701B-CON
- Route planning system : JAN-1186
- Navigation workstation : NDC-1186
- GPS/DGPS : JLR-7500/7800

Receivable Data

1. Route Data (the Plotter Control Unit (option) is necessary)

The system can display the route created by other JRC navigation equipments. Refer to instruction manual "Section 3.7.11 Transmit/Receive Data Setting"

The setting of the Route Type is necessary for receiving route data. Refer to instruction manual "Section 7.2.11 Transmit/Receive Data Setting"

*When the system display Route which are created in the ECDIS or Chart RADAR, following items are not displayed.

- XTL
- Arrival Radius
- ROT
- Turn Radius
- Time Zone
- Sail

2. Sensor Data

The system can receive sensor data (Heading, Speed etc...) from other system (ECDIS, Chart RADAR, etc...).

3. AIS data

The system can receive AIS data from AIS.

4. Selected GPS number

Selected GPS number can be synchronized.

5. Day/Night mode, operation panel brilliance.

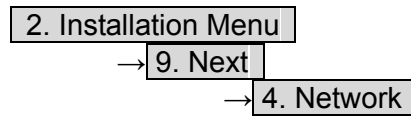
Day/Night mode and operation panel brilliance can be synchronized.

[I] Network Function Setting (Network Function)

Turning on/off the network function.

Procedures

1. Open the Serviceman Menu.
2. Open the Network Function menu by performing the following menu operation.



3. Set the Network for the item **1. Network Function** in the menu.

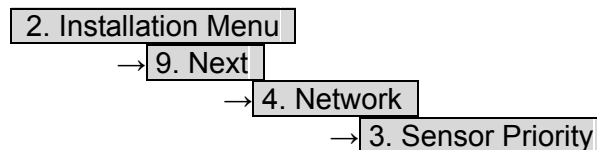
On : The network function is operated.
 Off : The network function is stopped.

[II] Sensor Priority Setting (Sensor Priority)

The system can receive data from 2 sensors. If the same sentences are received from 2 sensors, the system use primary system's data.

Procedures

1. Open the Serviceman Menu.
2. Open the Sensor Priority Setting menu by performing the following menu operation.



3. Select sensors for **1.primary** and **2.Secondary**.

Default
 1. Primary : No.1 ECDIS
 2. Secondary : No.2 ECDIS

Available sensors

No.1 ECDIS	No.1 FFD	Conning Display	No.2 Data Server	No.3 Remote GPS
No.2 ECDIS	No.2 FFD	No.1 Converter Unit	Console Conning	None ⁱ
No.3 ECDIS	No.3 FFD	No.2 Converter Unit	NAV W/S	
No.4 ECDIS	No.4 FFD	No.1 Alart I/F	No.1 GPS	
No.1 MFD	No.1 Chart RADAR	No.2 Alart I/F	No.2 GPS	
No.2 MFD	No.2 Chart RADAR	Port Conning	No.3 GPS	
No.3 MFD	No.3 Chart RADAR	STAB Conning	No.1 Remote GPS	
No.4 MFD	No.4 Chart RADAR	No.1 Data Server	No.2 Remote GPS	

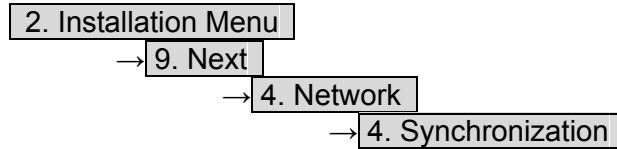
i : if you selected "None", the system does not receive data.

[III] Synchronization Setting (Synchronization)

Day/Night mode and operation panel brilliance can be synchronized.

Procedures

1. Open the **Serviceman Menu**.
2. Open the **Synchronization Setting** menu by performing the following menu operation.



3. Set the item **Day/Night** and **Keyboard** which are synchronized.

On
Off

: Day/Night and operation panel brilliance are synchronized.

: Day/Night and operation panel brilliance are not synchronized.

7.2.11 Transmit/Receive Data Setting (LAN Port Setting)

The system can receive data from other system via the JRC-LAN. The JRC-LAN is designed for interoperation of JRC systems. The JRC-LAN network can synchronize data of systems connected to the net work.

* To connect JRC-LAN, LAN cable and HUB (option) is necessary.
For details, contact the JRC offices.

Note: If the connection is not suggested from JRC offices, don't connect PC or other maker's system.

- Connecting PC or other maker's system can cause a lower performance to radar system.
- Connecting PC or other maker's system can cause a lower performance to them.

[I] Receive Route Data Setting (Route Type)

Set route type.

Note: type data and type data are incompatible.
Route Type set model.

RADAR :	JMA-5300/5200 series
	JMA-5300MK2 series (factory default : <input type="text" value="Plotter"/>)
Plotter :	JLZ-700



Never change except following setting. Failure to comply may result in accidents that would lower performance.

Procedures

1. Press the [RADAR Menu] key for 2 seconds.

The Code Input menu will appear.

2. Press [5] [3] [0] [0] [1] key.

3. Put the cursor on the button, and press the [ENT] key.

The Utilities menu will appear.

2. Open the Plot menu by performing the following menu operation.

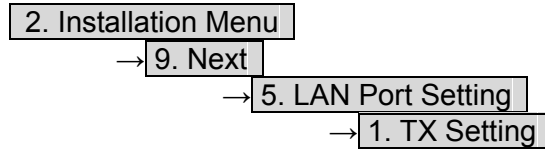
3. Press [3] key, and set to .

III Transmit Port Setting (TX Setting)

For each sentence, turn on/off transmission.

Procedures

1. Open the Serviceman Menu.
2. Open the TX Setting menu by performing the following menu operation.



3. Set on/off for each sensor.

These sentences can be turned on/off.

Available sentences

TTM(TT), TLL(TT), TTD(TT), TLB(TT), OSD, RSD, ALR, ACK, TTM(AIS),
TLL(AIS), TTD(AIS), TLB(AIS)

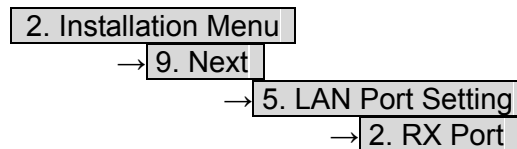
[III] Receive Port Setting (RX Port)

Select ports for receiving signals from sensors.

There are two methods for receiving signals: specifying a port for each sensor, or using the automatic recognition function without specifying ports.

Procedures

1. **Open the Serviceman Menu.**
2. **Open the RX Port menu by performing the following menu operation.**



3. **Select ports for each sensor.**

Available sensor signals

Heading, Speed, AIS, GPS, DLOG, Alarm, Depth, Temperature, Wind, Current, ROT, RSA, Time Zone, Date/Time

Available ports

When the automatic recognition function is used : AUTO

When ports are specified : User Setting, Serial, LAN, LAN(GPS), LAN(Ship's Clock)

Behavior pattern of selectable ports

AUTO	: The system use data from JRC-LAN preferentially
User Setting	: The system use the port selected by "3.14.1 Receive Port Setting (RX Port)". The system use data from JRC-LAN or sensor connected directly. ⁱ
Own	: The system use data from sensor connected to the system directly.
LAN	: The system use data from JRC-LAN.
LAN(GPS)	: The system use GPS data from GPS connected to JRC-LAN ⁱⁱ .
LAN(Ship's Clock)	: The system use ship's clock data from ship's clock connected to JRC-LAN ⁱⁱ .

i. In order to set "3.14.1 Receive Port Setting (RX Port)", select User Setting in advance.

ii. LAN(GPS) and LAN(Ship's Clock) are selectable signals for Time Zone and Date/Time.

[IV] Receive Sentence Setting (RX Sentence)

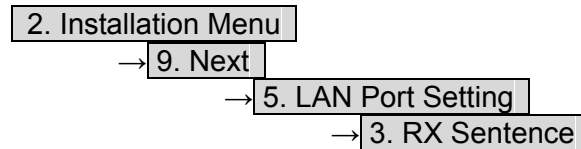
Select Use/no Use for each sentences.

The system is factory-set for using all sentences.

To receive only specified sentences, select for sentences which are not necessary.

Procedures

1. Open the Serviceman Menu.
2. Open the RX Sentence menu by performing the following menu operation.



3. Select the sentences used by the sensors to be set.

Selection value: or can be selected for each sentence.

<input type="text" value="1. GPS(LL/COG/SOG)"/>	: GGA/RMC/RMA/GNS/GLL/VTG
<input type="text" value="2. GPS(WPT/Time)"/>	: GGA/RMC/RMB/BWC/BWR/ZDA
<input type="text" value="3. Depth"/>	: DPT/DBK/DBT/DBS
<input type="text" value="4. Wind"/>	: MWV/MWD
<input type="text" value="5. Current"/>	:
<input type="text" value="Data Set Number"/>	: 0-9. Set the number of the sentence to be used by Data Set Number. (Initial value All)
<input type="text" value="Layer A"/>	: 0-999. Set the number of the sentence to be used with layer A by Layer Number. (default value : 3)
<input type="text" value="Layer B"/>	: 0-999. Set the number of the sentence to be used with layer B by Layer Number. (default value : 4)
<input type="text" value="Layer C"/>	: 0-999. Set the number of the sentence to be used with layer C by Layer Number. (default value : 5)
<input type="text" value="6. Autopilot"/>	: APB (default value : Not Use)

7.3 ADJUSTMENT

This section describes the electrical adjustment procedures to be performed by service engineers during system installation.

CAUTION



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.

7.3.1 Noise Level Adjustment (Noise Level)

[I] Noise Level Adjustment for Signal Processing

Procedures

1. Open the Serviceman Menu.
2. Open the Echo Noise Level menu by performing the following menu operation.

9. SP/TT Initial Setup

→ 1. Signal Processing

→ 1. Echo Noise Level

3. Increase/decrease the noise level adjustment value.

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 .

III Noise Level Adjustment Mode (Setting Mode)

A noise level is factory-adjusted while this mode is turned on.

Procedures

- 1. Open the Serviceman Menu.**
- 2. Open the Signal Processing menu by performing the following menu operation.**

9. SP/TT Initial Setup

→ 1. Signal Processing

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

The noise level setting 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.

7.3.2 Adjustment of Target Tracking Function (TT)



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.

[I] 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.

7

Procedures

1. Open the Serviceman Menu.
2. Open the Vector Constant menu by performing the following menu operation.

9. SP/TT Initial Setup

→ 2. TT

→ 1. Vector Constant

3. Input the value to be set.

To improve vector follow-up performance, increase the set value.
To stabilize vectors, decrease the set value.

III] 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.



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

Procedures

1. Open the Serviceman Menu.
2. Open the TT (Target Tracking) menu by performing the following menu operation.

9. SP/TT Initial Setup

→ 2. TT

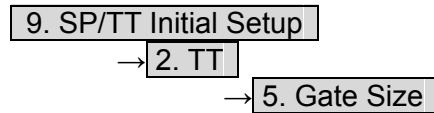
3. To change the quantization level of the automatic acquisition area, specify the item **2. Video TD Level** in the menu. To change the quantization level of tracking and manual acquisition, specify the item **3. Video High Level**.

[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.

Procedures

1. Open the Serviceman Menu.
2. Open the Gate Size menu by performing the following menu operation.



3. Select a gate size.

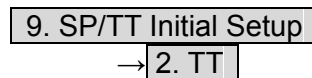
Wide	: Large gate size
Normal	: Medium gate size
Narrow	: Small gate size

[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 red circle.

Procedures

1. Open the Serviceman Menu.
2. Open the TT (Target Tracking) menu by performing the following menu operation.



3. Press the [6] key.

The Limit Ring item is turned on / off.

Off	: Limit ring not displayed
On	: Limit ring displayed

7.3.3 Main Bang Suppression Adjustment (MBS)

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 video focusing on the center of the radar display. Optimum adjustment allows main bang video to remain slightly on the display.



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.

Procedures

1. Open the Serviceman Menu.
2. Open the MBS menu by performing the following menu operation.

9. SP/TT Initial Setup
→ 3. MBS
3. Set the radar as follows:
 - Set the radar video enhance function and video processing (PROC) to OFF.
 - Turn the [RAIN] control to the minimum position (fully to the left).
 - Turn the [GAIN] control to the maximum position (fully to the right).
 - Turn the [SEA] control to achieve the strength with which main bang can be judged.
4. Set 20 for **2. MBS Area**.
5. Adjust the value set for **1. MBS Level** so that the main bang remains slightly.
6. Adjust the value set for **2. MBS Area** so that the suppression area will match the main bang.

7.3.4 Adjustment of Performance Monitor (MON)

After replacement of either of the following units, adjust the performance monitor according to the procedures in this section:

- Magnetron

- Performance monitor
- Antenna unit

If the radar system is equipped with interswitch (option), set the connection to straight mode.

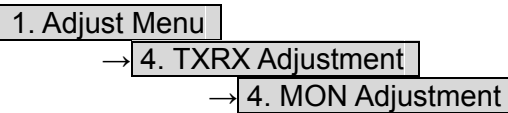
[I] Reception Monitor Adjustment (MON Adjustment)

Adjust the circuit for monitoring the reception performance of the radar equipment.

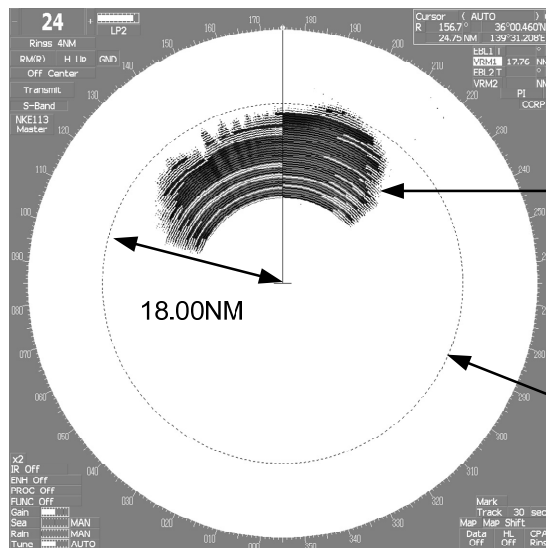
Note: The radar system is equipped with an interswitch.
For adjusting the performance unit, set the interswitch connection to straight, i.e. No.1 scanner is connected to No.1 display unit as the Master.

Procedures

1. Open the Serviceman Menu.
2. Open the MON (Performance Monitor) Adjustment menu by performing the following menu operation.



3. Increase or decrease the adjustment value so that the farthest point of the performance monitor pattern touches the 18.0 NM line.



Note: During performance monitor adjustment, all acquisitions by the target tracking function are released.
The released target acquisitions are not recovered.

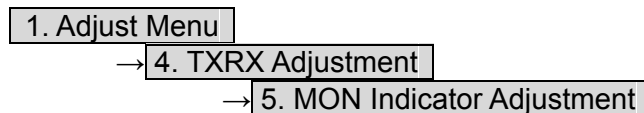
III Transmission Monitor Adjustment (MON Indicator Adjustment)

Adjust the circuit for monitoring the transmission performance of the radar equipment.

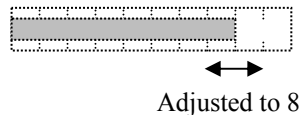
Note: The radar system is equipped with an interswitch.
For adjusting the performance unit, set the interswitch connection to straight, i.e. No.1 scanner is connected to No.1 display unit as the Master.

Procedures

1. Open the Serviceman Menu.
2. Open the MON (Performance Monitor) Indicator Adjustment menu by performing the following menu operation.



3. Increase or decrease the adjustment value so that the performance monitor level indicator will be adjusted to "8."



4. 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.

7.4 MAINTENANCE MENU

This item is provided for equipment maintenance, including settings of antenna safety switch, master reset, etc.

 <h2 style="margin: 0;">CAUTION</h2>	
	<p>Any adjustments must be made by specialized service personnel. Failure to comply may result in accidents or equipment failure.</p>
	<p>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.</p>

7.4.1 Antenna Safety Switch (Safety Switch)

Use this switch to measure the transmission/reception performance while the antenna is in stopped state.

Procedures

1. Open the Serviceman Menu.
2. Open the Safety Switch menu by performing the following menu operation.

3. Maintenance Menu
 → 1. Safety Switch

3. Select the item to be set.

Set operation when the antenna safety switch is turned off.

1. TX-Off :

The transmitter stops transmission.
 The display unit remains in transmission state.

2. Standby : (Normal setting)

The transmitter stops transmission.
 The display unit is placed in standby state.

3. TX-On :

The transmitter continues transmission.
 The display unit remains in transmission state.

4. Change the setting back to 2. Standby when the work is finished.



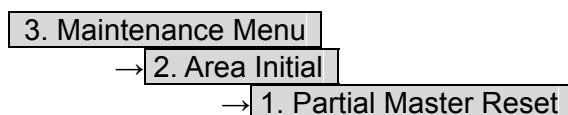
7.4.2 Initialization of Memory Area (Area Initial)

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.

I] Partial Master Reset

Procedures

1. Open the Serviceman Menu.
2. Open the Partial Master Rest menu by performing the following menu operation.



3. Select the items to be initialized.

Serviceman Menu	: The set values in the Serviceman menu are initialized.
Except Serviceman Menu	: The set values not in the Serviceman menu are initialized.
User Setting	: The user setting values are initialized.
TT Setting	: The set values for the target tracking function are initialized.
AIS Setting	: The set values for the AIS function are initialized.
Day/Night	: The color scheme and brilliance setting for the day/night mode are initialized.
JRC Card Copy Record	: The history of JRC charts copied on the memory card is erased.

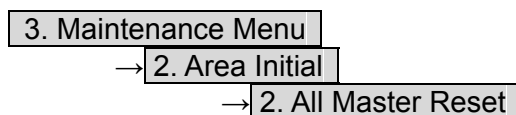
4. Select **Yes** in the Confirmation Window.

The memory areas of specified items are initialized, and the system is restarted.

III] All Master Reset

Procedures

1. Open the Serviceman Menu.
2. Open the All Master Rest menu by performing the following menu operation.



3. Select **Yes** in the Confirmation Window.

The whole memory area is initialized, and the system is restarted.

7.4.3 Save of Internal Memory Data (Card1/2)

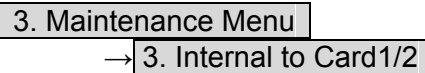
The system can save internal memory data such as item settings in all menus onto a flash memory card. If the radar processing circuit in the system has been replaced, the set values before the circuit replacement can be restored by reading the set values you saved before the replacement. To save the internal memory data onto a flash memory card (option), the card must be inserted in card slot beforehand.

[I] Copying of Internal Settings onto Card (Internal to Card1/2)

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.

Procedures

1. Open the Serviceman Menu.
2. Open the Internal to Card 1/2 menu by performing the following menu operation.



3. Select the slot of the card on which the internal memory data is to be saved.

The lower slot is slot 1; the upper slot is slot 2.

4. Select **Yes** in the Confirmation Window.

The internal memory data is saved on the flash memory card.

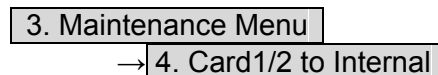
7

[II] Reading of Internal Settings from Card (Card1/2 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.

Procedures

1. Open the Serviceman Menu.
2. Open the Card 1/2 to Internal menu by performing the following menu operation.



3. Select the slot of the card from which the previously saved internal memory data is to be read.

The lower slot is slot 1; the upper slot is slot 2.

4. Select **Yes** in the Confirmation Window.

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.

7.4.4 Clear and Save/Restoration of Antenna Operation Time (TXRX Time)

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.

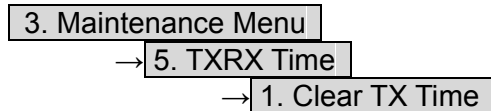
[I] Clear of Transmission Time (Clear TX Time)

Clear the transmission time of the antenna unit.

Perform the following procedure to clear the transmission time when the magnetron is replaced.

Procedures

1. Open the Serviceman Menu.
2. Open the Clear TX Time menu by performing the following menu operation.



3. Select **Yes** in the Confirmation Window.

The transmission time in the antenna's internal control circuit is cleared to 0.

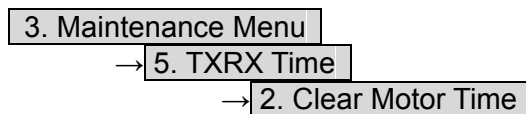
[II] Clear of Motor Run Time (Clear Motor Time)

Clear the antenna's motor run time.

Perform the following procedure to clear the motor run time when the antenna motor is replaced.

Procedures

1. Open the Serviceman Menu.
2. Open the Clear Motor Time menu by performing the following menu operation.



3. Select **Yes** in the Confirmation Window.

The motor run time in the antenna's internal control circuit is cleared to 0.

[III] Save of Antenna Time (TXRX to Display Unit)

Save the following antenna time data from the antenna unit into the display unit.

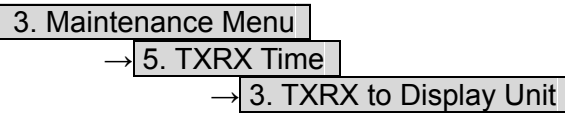
- Antenna's operating hours
- Transmission time
- Motor run time

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

Procedures

1. Open the Serviceman Menu.
2. Open the TXRX to Display Unit menu by performing the following menu operation.



3. Select **Yes** in the Confirmation Window.

The antenna time data in the antenna's internal control circuit is saved transferred to the display unit.

[IV] Restoration of Antenna Time (Display Unit to TXRX)

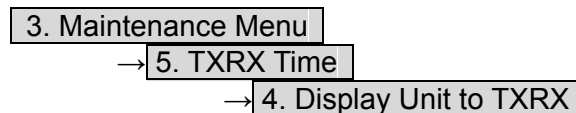
Restore the antenna time data from the display unit into the antenna's internal control circuit.

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

Procedures

1. Open the Serviceman Menu.
2. Open the Display Unit to TXRX menu by performing the following menu operation.



3. Select **Yes** in the Confirmation Window.

The antenna time data in the display unit is restored transferred to the antenna's internal control circuit.

7.4.5 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.

Procedures

1. Open the Serviceman Menu.
2. Open the String Data Update menu by performing the following menu operation.

3. Maintenance Menu

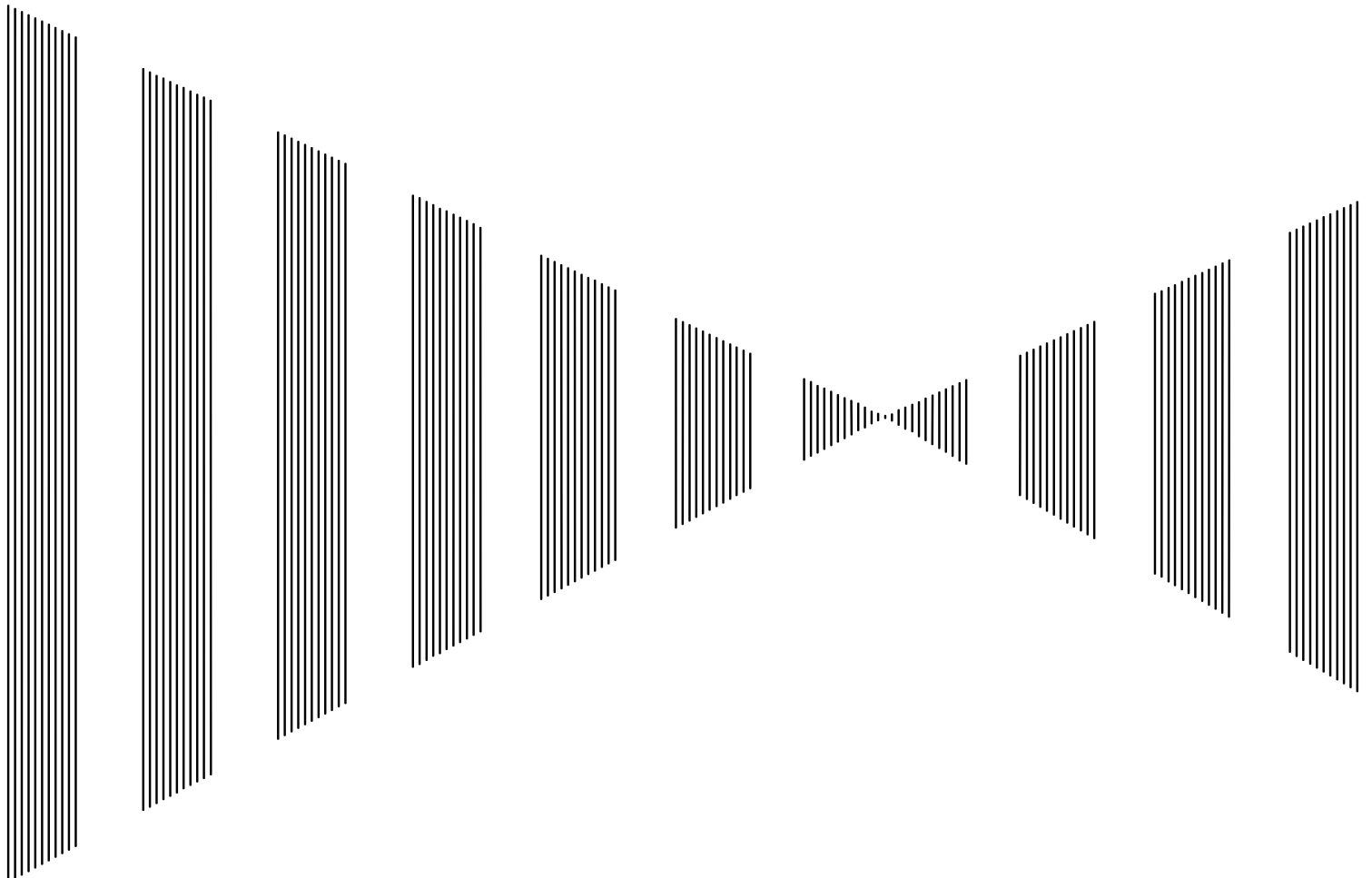
→ 6. String Data Update

3. Select **Yes** in the Confirmation Window.

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 7.2.6.

SECTION 8 MAINTENANCE



8.1	ROUTINE MAINTENANCE	8-1
8.2	MAINTENANCE ON EACH UNIT	8-2
8.3	PERFORMANCE CHECK.....	8-6
8.4	REPLACEMENT OF MAJOR PARTS	8-12

8.1 ROUTINE MAINTENANCE

DANGER



Never carry out internal inspection or repair work of the equipment by users.

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.

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-2103 (JMA-5312-6/6HS),
Scanner Unit NKE-2254 (JMA-5322-7/9/6HS),
Scanner Unit NKE-1130 (JMA-5332-12)**



When conducting maintenance work on the scanner, make sure to turn its main power off. Failure to comply may result in electrocution or injuries.



Make sure to turn off the scanner safety switch. Failure to comply may result in injuries caused by physical contact with the rotating scanner.



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

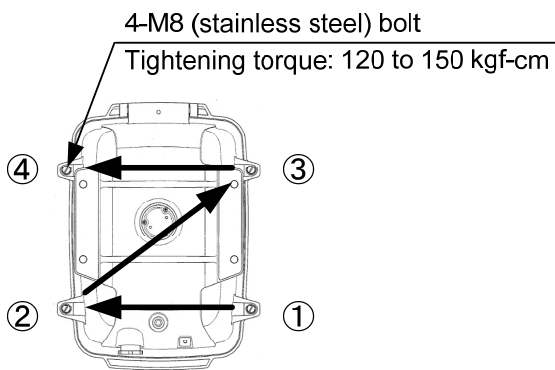
After the work, turn "ON" the scanner unit safety switch.

Precautions in Mounting the Cover

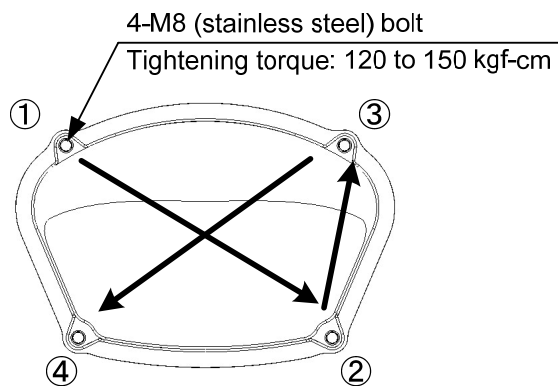
When the cover is removed for regular checkup and replacement of parts and refitted after such work, the procedures of fastening bolts shall be taken with the following precautions:

- The proper fastening torque of the fitting bolts (M8) is 1176 to 1470 N-cm (120 to 150 kgf-cm) (which makes the inside water-tight and protects the packing against permanent compressive strain). The packing start producing from the cover at a torque of approximately 1470N-cm (150 kgf-cm). Do not fasten the bolts with a torque exceeding the specified value. Otherwise, the screws may be broken.
- Use an offset wrench of 11 mm × 13 mm or a double-ended wrench of 13 mm × 17 mm (not longer than 200 mm).
- 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.)

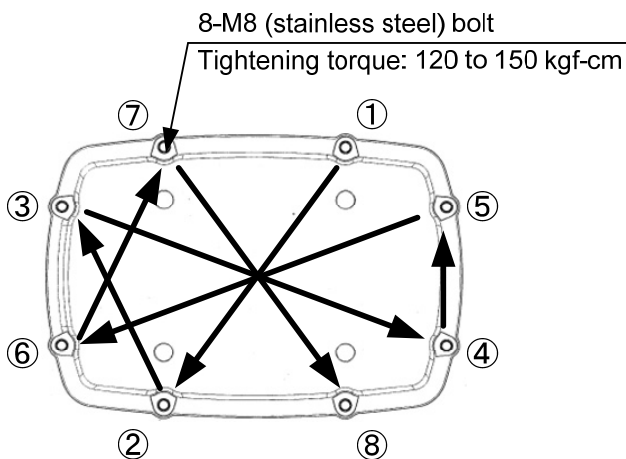
*: Fasten the bolts in the diagonal order.



Bolt Tightening Procedure of
NKE-2103 Cover
(JMA-5312-6/6HS)



Bolt Tightening Procedure of
NKE-2254 Cover
(JMA-5322-7/9/6HS)



Bolt Tightening Procedure of
NKE-1130 Cover
(JMA-5332-12)

(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, benzine, trichloroethylene and ketone for cleaning.**

Check up and clean the radiator.

(2) Rotating section

(a) Supply Oil Seal

The scanner unit NKE-1130 (JMA-5332-12) needs grease supply. Remove the cap of the grease nipple on the front of the radiator support, and supply grease with a grease gun. Make the oiling every six months. The oil quantity shall be approximately 100 g, which is as much as the grease comes out of the oil seal. Use the grease of Mobilux 2 of Mobil Oil.

(b) 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.

(c) 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-4530



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.

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

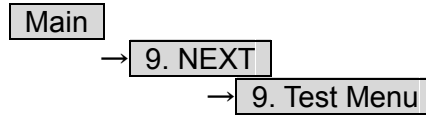
Equipment	Item to be checked	Criteria	Remarks
Display Unit	Video and echoes on the screen Sensitivity LCD brilliance can be controlled correctly Various markers Various numerical indications Lighting	Can be correctly controlled	
	Memory	See section 8.3.1 [I]-[1].	
	Communications Lines	See section 8.3.1 [I]-[3].	
	Power Supply, Backup Battery	See section 8.3.1 [I]-[4].	
	Monitor	See section 8.3.1 [II].	
	Operation Unit	See section 8.3.1 [III].	
	System Alarm Log Display	See section 8.3.1 [V].	
	System Information Display	See section 8.3.1 [VI].	
	Magnetron current	See section 8.3.1 [VII].	
Scanner Unit	Target Tracking	See section 5.2.7.	
	Signals from the Scanner Unit	See section 8.3.1 [I]-[2].	
	Performance Monitor	See section 8.3.1 [IV].	

8.3.1 Check Performance on Test Menu

The radar operating state can be checked by opening the Test Menu.

Procedures

1. Open the Test Menu by performing the following menu operation.



2. Select the items to be checked.

The list of check items will appear.

1. Self Test	[I] Self-diagnostic function
2. Monitor Test	[II] Monitor check
3. Keyboard Test	[III] Operation unit check
4. MON Display	[IV] Performance monitor
5. System Alarm Log	[V] Error log display
6. System Information	[VI] System information display
Magnetron Current	[VII] Indication of magnetron current

3. Select the items to be checked.

The list of check items will appear.

[II] Self-diagnosis function (Self Test)

Check of memory, scanner unit, and communications Lines.

1. Memory Test	[1] Memory check
2. TXRX Test	[2] Scanner check
3. Line Test	[3] Communication line check
4. Supply Voltage	[4] Supply voltage check

[1] Memory Test

Checks for the performance of built-in memory.

1. SDRAM	[1] SDRAM check
2. SRAM	[2] SRAM check
3. FLASH ROM	[3] Flash ROM check
4. GRAPHIC	[4] Graphic check

When no abnormality is found, OK is displayed.

When an abnormality is found, NG is displayed.

[2] TXRX Test

Checks for signals from the scanner.

Safety Switch	Scanner's safety switch check
AZI Pulse	Scanner 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

When no abnormality is found, OK is displayed.

When an abnormality is found, NG is displayed.

In standby, ** will appear.

[3] Check of Communication Lines (Line Test)

Check the status of communications with options.

TXRX	Check on connection with the transmitter-receiver
SIG.PROC	Check on connection with the signal processing circuit
TT	Check on connection with the target tracking unit
GYROO I/F	Check on connection with the GYRO I/F unit
GPS Compass	Check on connection with the GPS compass
ISW	Check on connection with the interswitch
Plotter Key	Check on connection with the plotter option

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 left blank.

[4] Supply Voltage

Check the voltage of internal power supply.

Item	Normal operating range
12V	11.00-12.20 V
5V	4.75-5.25 V
3.3V	3.14-3.46 V
Battery	2.50 V or more

[III] Monitor Test

Checks for the display.

The test pattern will be shown on the display.

Pattern 1	All colors are filled with white.
Pattern 2	A white box is displayed on the black background of 1280 × 1024 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	Displays the VDR test pattern.
Pattern 8	Displays the specified color.

To return to the normal display, press any key.

If errors occur in the monitor, no test pattern will appear.

[IIII] Keyboard Test (Operation Unit Test)

Checks for the controls and switches of the operation panel.

1. Key Test	[1] Key check
2. Buzzer Test	[2] Buzzer check
3. Light	[3] Control panel light check

[1] Key Test

Checks for the controls and switches of the operation panel.

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] Buzzer Test

Checks for the operation panel buzzer.

The buzzer will sound.

The buzzer automatically stops after it sounds for a specified length of time.

[3] Light Test

Checks for the control panel light.

The brightness of the operation panel is gradually intensified at four levels.

[IV] Performance Monitor (MON Display)

Note: The radar system is equipped with an interswitch.
For checking the performance unit, set the interswitch connection to straight, i.e. No.1 scanner is connected to No.1 display unit as the Master.

[I] Check the Transmitter System (Transmitter System)

Procedures

1. Check the attenuation value.

* Transmitter System	
Attenuation Value	(Initial value : 8.0)
Normal operating range	: -6.9dB to +2.0dB
Performance degradation range	: -15.0dB to -7.0dB

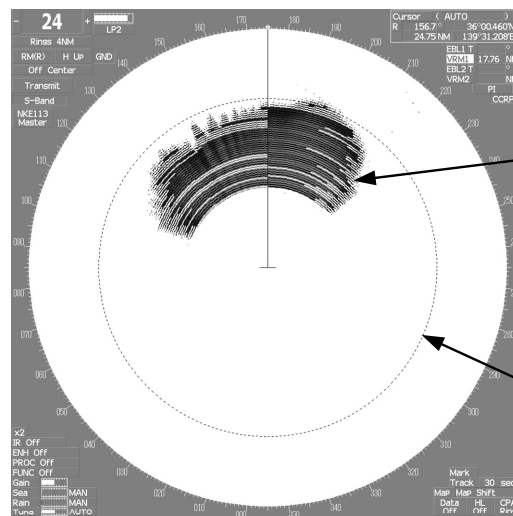
Note: About one minute after opening this menu item, check the transmitter attenuation value.

[II] Check the Receiver System

Procedures

1. Turn the [VRM] dial to make adjustments so that the farthest point of the performance monitor pattern.

The Attenuation Value of *Receiver System is displayed.



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.

2. Check the attenuation value.

* Receiver System	
MON Pattern Range	(Initial value : 18.0NM)
Attenuation Value	
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 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.

[VI] System Alarm Log display

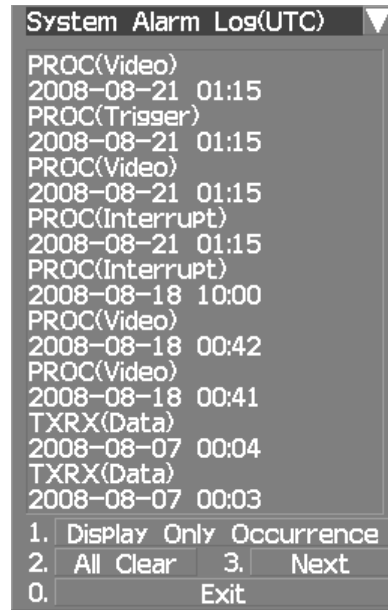
Displays previously occurred system alarms with the dates and times when they occurred.

The Alarm log display button (2-29P Alarm) is clicked, in the same way as that one.

To display the occurrence alarm, press the

1. Display Only Occurrence button.

To erase the alarm logs, press the **2. All Clear** button.



The current alarm is displayed at the lower right of the radar display. For details, refer to Chapter 9.



[VI] System INFO

Displays the current system information.

Indicator
TXRX
System No.
TX Time

Processor software version information

Scanner software version information

System number

Total magnetron transmitting time (Total time during which radar was transmitted)

X-Band
S-Band

Motor Time
TXRX Total Time

Total operating time (Total power-on time)

Total operating time of the scanner unit (Total power-on time of the antenna unit)

Total Time

Total operating time of the display unit (Total power-on time of the display unit)

[VII] Magnetron Current

Displays the Magnetron Current bar indicating the magnetron current to check.

When a 48 NM range is set, the magnetron current is normal if the Magnetron Current bar reads the value below.

JMA-5312-6/6HS 10 kW: 4-7 scale marks

JMA-5322-7/9/6HS 25kW, JMA-5332-12 30 kW: 6-9 scale marks

Note: Displays the Magnetron Current bar instability indicating in sector blank area, but it is normal operating.

For how to setting sector blank function, see Section 7.2.2.

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.

8

CAUTION



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.

CAUTION



**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.**

8.4.1 Parts Required for Periodic Replacement

Here are parts required for periodic replacement

Part name	Interval	Radar model	Part type	Part code
1. Magnetron	4000 hours	JMA-5312-6/6HS	MAF1565N	5VMAA00102
		JMA-5322-7/9/6HS	M1568BS	5VMAA00106
		JMA-5332-12	M1555	5VMAA00104
2. Motor	10000 hours	JMA-5312-6/6HS	7BDRD0048*	7BDRD0048*
		JMA-5322-7/9	7BDRD0044*	7BDRD0044*
		JMA-5322-6HS	7BDRD0045*	7BDRD0045*
		JMA-5332-12	MDBW10823	MDBW10823
3. Fan (Scanner Unit)†	20000 hours	JMA-5322-7/9/6HS JMA-5332-12	7BFRD0002*	7BFRD0002*
4. LCD PANEL	50000 hours		CML-771	CML-771
5. Monitor fan	20000 hours		CBP-173A	CBP-173A
6. Fan (Radar Process Unit)	20000 hours		7BFRD0005*	7BFRD0005*
7. Backup battery	5 years		CR2032	5ZBCJ00012

"*" means revision, such as A, B and so on.

Use a genuine magnetron.

† JMA-5322-7/9/6HS uses 2 parts (B201/B202).

JMA-5332-12 uses 2 parts (B103/B104).

8.4.2 Replacement of Magnetron

Caution: Replacement of magnetron must be made by specialized service personnel.
For details, refer to Service Manual.
Use genuine parts as mentioned above.

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.

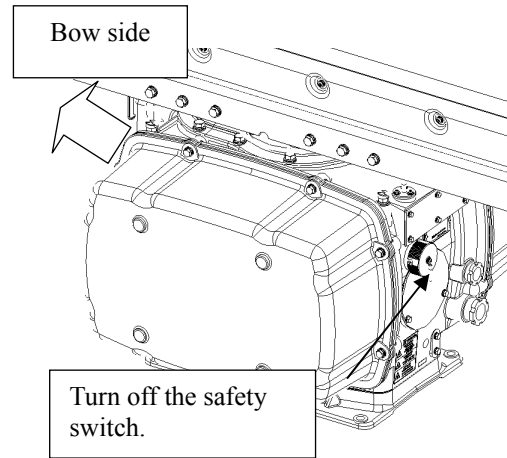
Handling of Magnetron under Long-Time Storage

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 procedures:

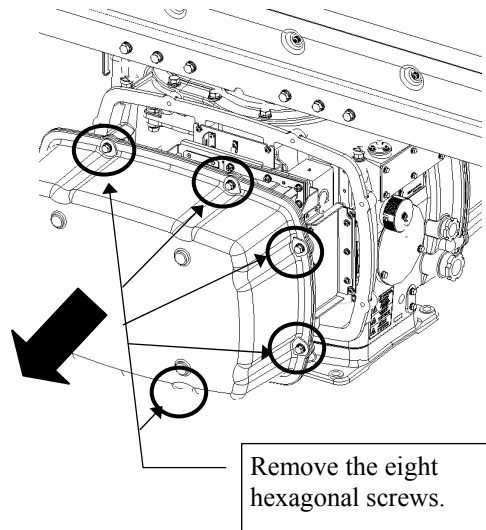
- (1) Warm up the cathode for a longer time than usually. (20 to 30 minutes in the STBY state.)
- (2) Start the operation from the short pulse range and shift it gradually to the longer pulse ranges. If the operation becomes unstable during this process, return it to the standby mode immediately. Keep the state for 5 to 10 minutes until the operation is restarted.

Magnetron Replacement Procedure for Scanner Unit NKE-1130
(JMA-5332-12)

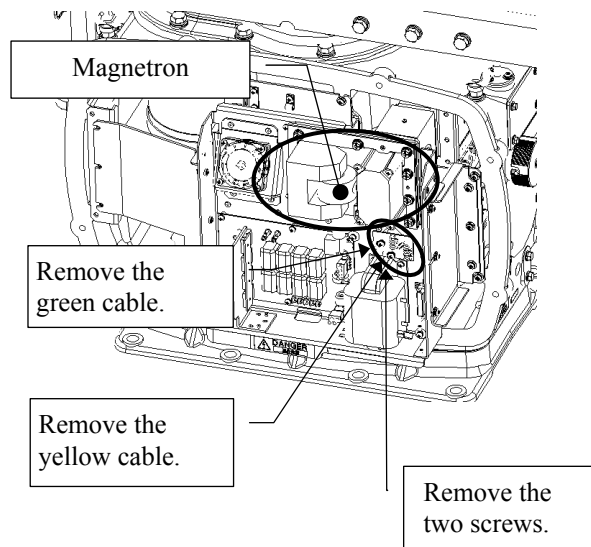
- (1) Before starting part replacement work, turn off the safety switch of the scanner unit.
The safety switch is located on the rear (stern) side.
Remove the cover and turn off (to the lower side) the safety switch.




- (2) Loosen the hexagonal bolts and remove the cover on the left (port) side




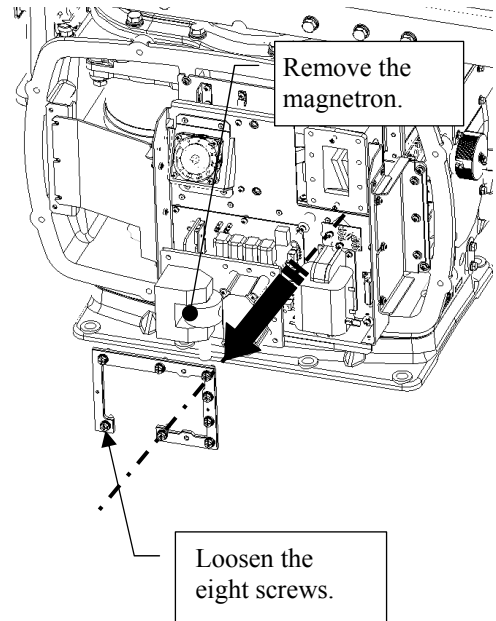
- (3) Check that there is no remaining electric charge in the modulation high-voltage circuit board.
Remove the two screws (M4) holding the magnetron cables (both yellow and green).



- (4) Remove the eight screws (M6) to remove the fixture holding the magnetron. The screws cannot be removed from the fixture, so loosen the all eight screws and remove the magnetron together with the fixture.

 The magnetron is held by a hook, but be careful not to let it fall.

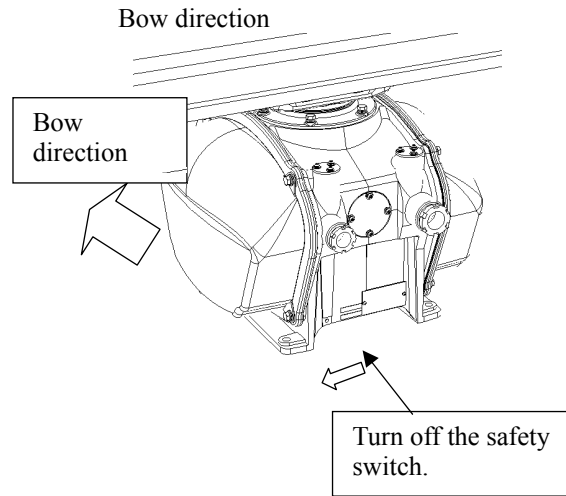
 Use a shielded screwdriver. If the magnetron comes into contact with any metal (tool), its performance may deteriorate.



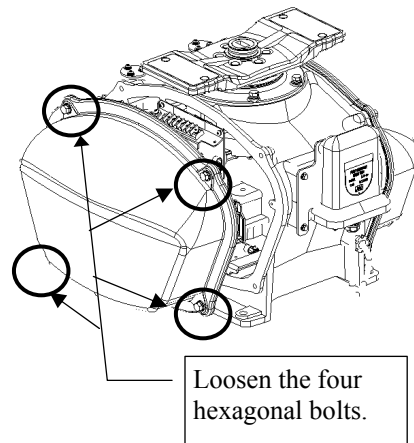
- (5) Install the new magnetron together with the fixture and tighten the screws to hold the cables. Follow the removal procedure in the reverse order. Do not forget to tighten the screws and connect the cables.

Magnetron Replacement Procedure for Scanner Unit NKE-2254
(JMA-5322-7/9/6HS)

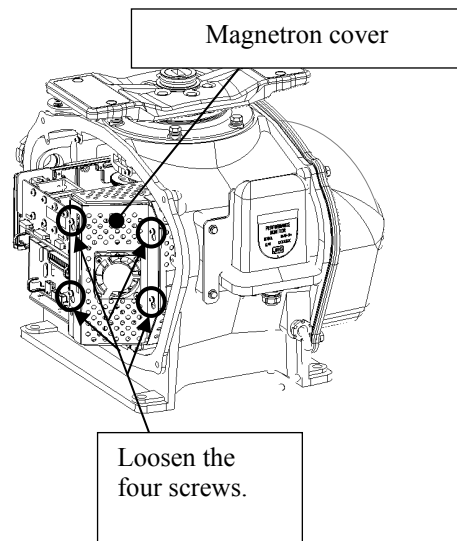
- (1) Before beginning work, turn off the safety switch located on the bottom of the stern side of the scanner unit.




- (2) Loosen the hexagonal bolts and remove the cover on the right (starboard) side.

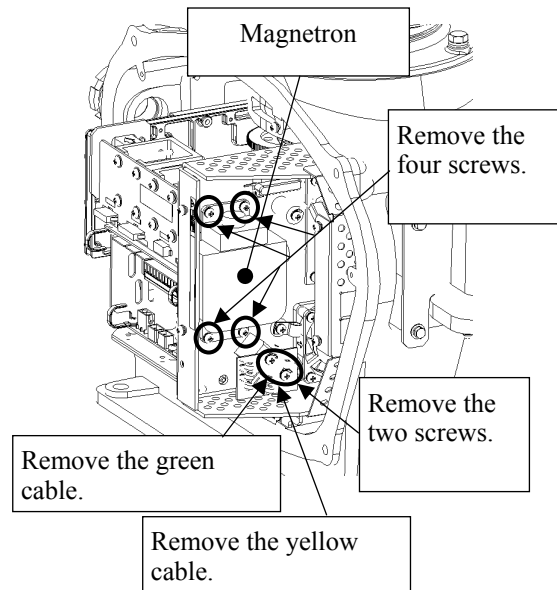


- (3) Loosen the screws (four M4 screws) to remove the magnetron cover.




- (4) Make sure there is no charge remaining in the modulation high-voltage circuit board, and then remove the screws (two M4 screws) holding the magnetron cables (yellow and green) in place.
- (5) Remove the screws (four M4 screws) holding the magnetron in place, then replace the magnetron after cutting the leads (yellow and green) for the replacement magnetron to an appropriate length.

 Use a shielded screwdriver because the contact of the metal tool with the magnetron causes deterioration of its performance.

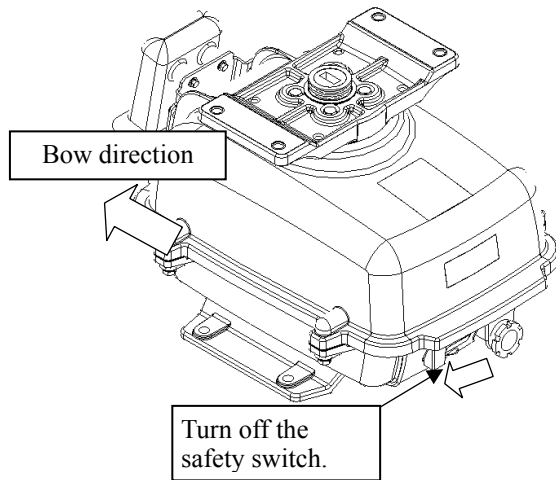


- (6) After having replaced the magnetron, reassemble the unit by following the disassembly procedure in the reverse order. Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables.


 Extreme care should be taken to connect the leads (yellow and green) to the magnetron for prevention of contact with other parts or the casing. Contact may cause them to discharge.

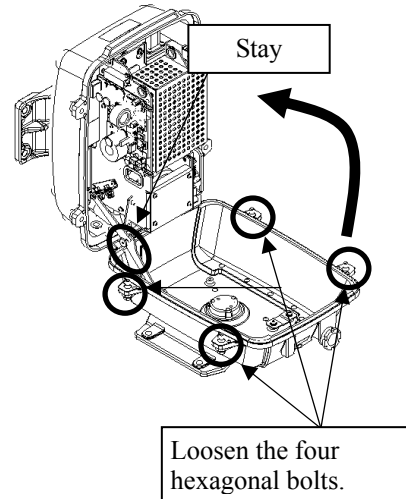
Magnetron Replacement Procedure for Scanner Unit NKE-2103
(JMA-5312-6/6HS)

- (1) Before beginning work, turn off the safety switch on the bottom of the scanner unit.

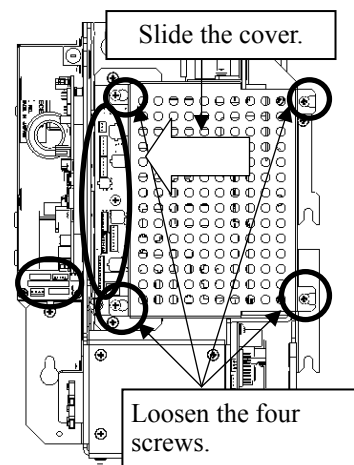


- (2) Loosen the hexagonal bolts (four bolts) and open the upper cover until the stopper of the stay operates.

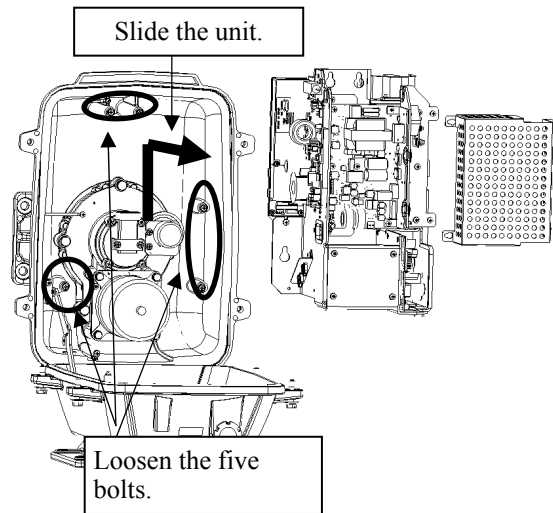
 When closing the upper cover, release the stay stopper and then tighten the cover.




- (3) Loosen the screws (four M4 screws), remove the transmitter-receiver unit cover, and remove the cables connected to the transmitter-receiver unit (ten cables). Slide the cover of the transmitter-receiver unit to remove it.

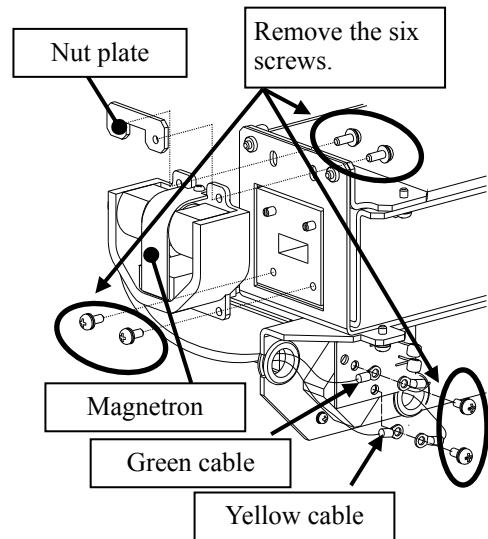


- (4) Loosen the bolts (five M5 bolts) and remove the transmitter-receiver unit. Slide the transmitter-receiver unit upward to remove it.




- (5) Remove the screws (six M4 screws) holding the magnetron in place and replace the magnetron.

 Use a shielded screwdriver because the contact of the metal tool with the magnetron causes deterioration of its performance.



- (6) Cut the leads (yellow and green) for the replacement magnetron to an appropriate length, then tighten the screws and fix the cables in place. After having replaced the magnetron, reassemble the unit by following the disassembly procedure in the reverse order. Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables.

 Extreme care should be taken to connect the leads (yellow and green) to the magnetron for prevention of contact with other parts or the casing. Contact may cause them to discharge.

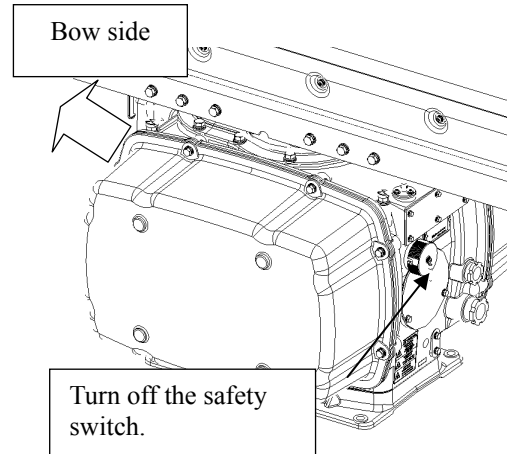
8.4.3 Replacement of Motor

Caution: Replacement of motor must be made by specialized service personnel.
For details, refer to Service Manual.

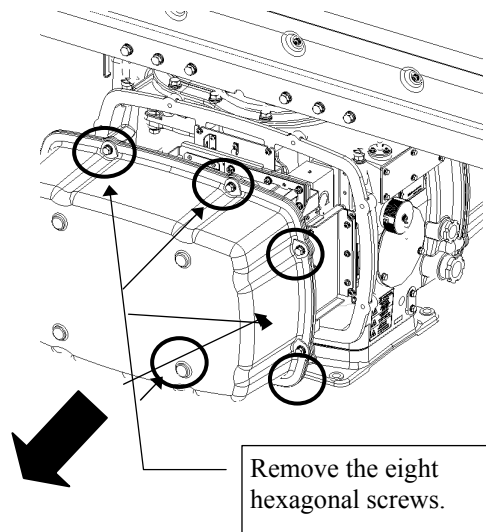
Motor Replacement Procedure for Scanner Unit NKE-1130 (JMA-5332-12)

- (1) Before starting part replacement work, turn off the safety switch of the scanner unit.

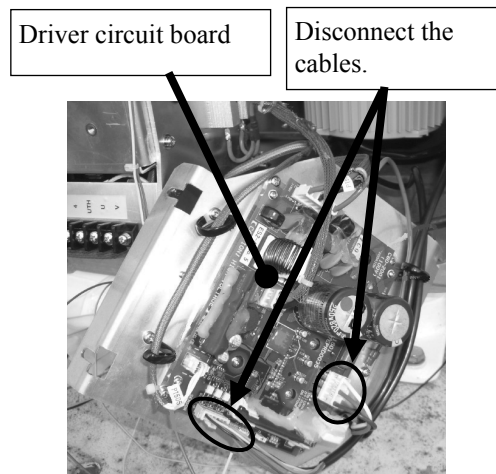
The safety switch is located on the rear (stern) side. Remove the cover and turn off (to the lower side) the safety switch.



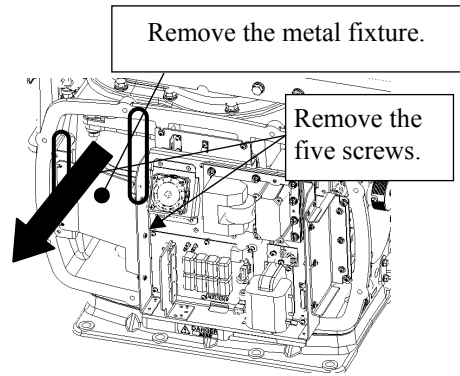
- (2) Loosen the hexagonal bolts and remove the cover on the both sides



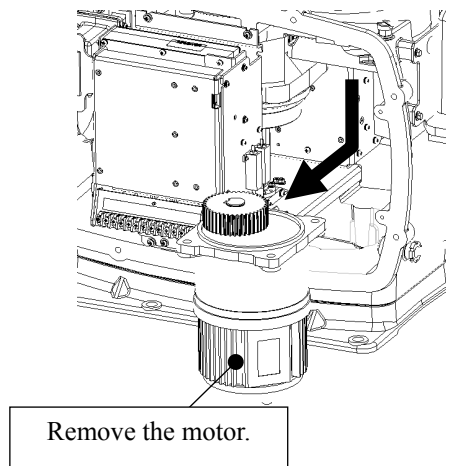
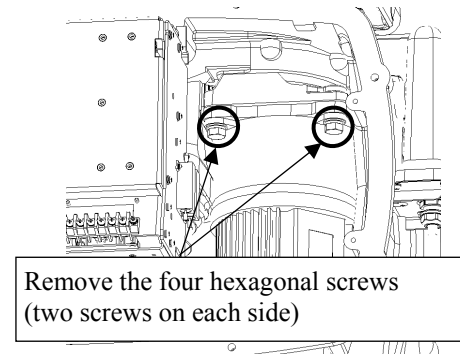
- (3) Remove the cover on the right (starboard) side and loosen the four screws (M4) to remove the driver unit, which has the motor driver circuit board on its back side. Disconnect the cables connecting the motor to the motor driver circuit board.



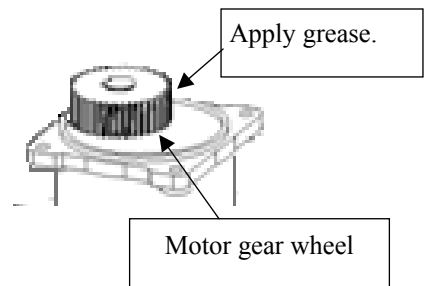
- (4) Remove the cover on the left (port) side and remove the five screws (M5) to remove the fixture.



- (5) Remove the four hexagonal screws (M10x40, SW10, and W10) that hold the motor from both the right and left sides to remove the motor.



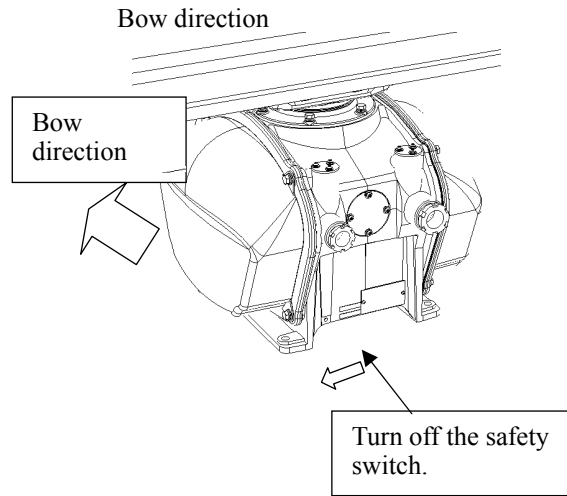
- (6) Apply grease to the gear wheel of the new motor.



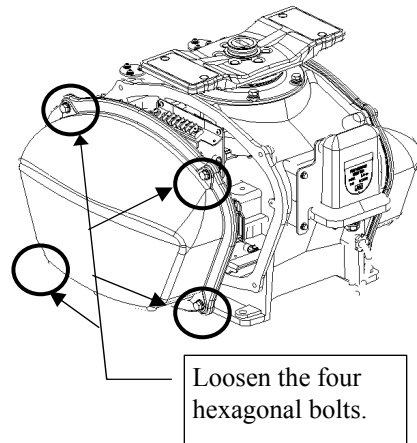
- (7) Install the new motor in the scanner unit and secure it using the hexagonal screws. Tighten the screws with the specified torque (380 kgf-cm).
- (8) After replacing the motor, assemble the unit in the reverse order of the disassembly procedure. Do not forget to tighten the screws and connect the cables.

**Motor Replacement Procedure for Scanner Unit NKE-2254
(JMA-5322-7/9/6HS)**

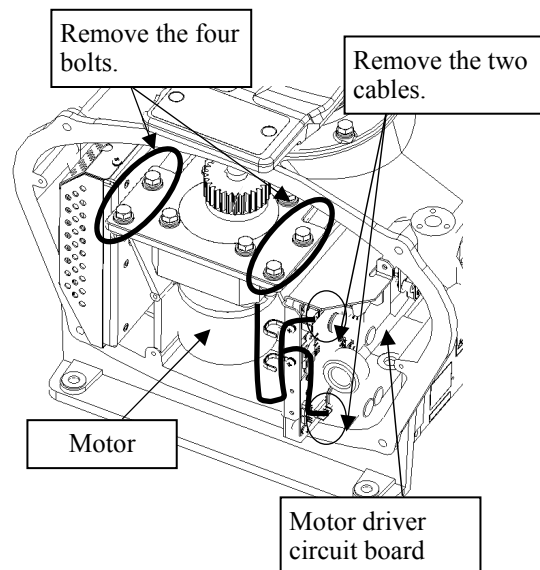
- (1) Before beginning work, turn off the safety switch located on the bottom of the stern side of the scanner unit.



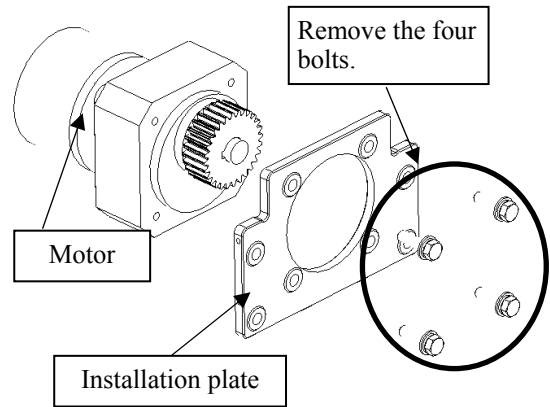
- (2) Loosen the hexagonal bolts and remove the cover on the **left** (port) side.



- (3) Remove the cables connected to the motor driver circuit board.
- (4) Remove the hexagonal bolts (four M8 bolts) and remove the motor.

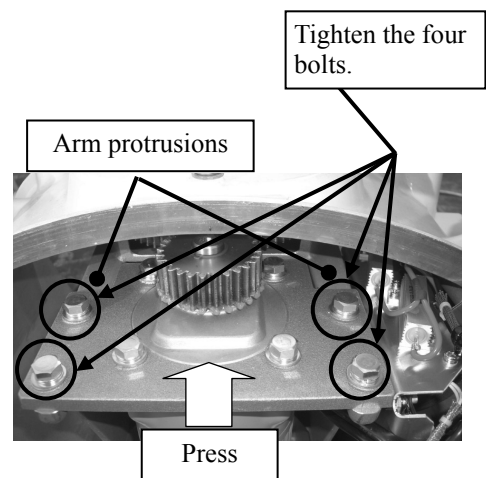


- (5) Remove the hexagonal bolts (four M8 bolts) and remove the installation plate from the motor.

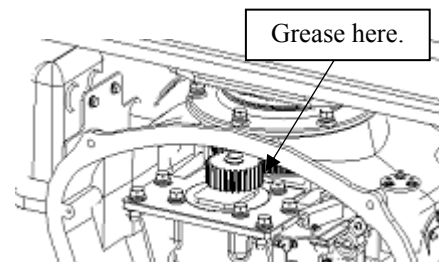


- (6) Attach the installation plate to the replacement motor. Do not forget to tighten the hexagonal bolts to an appropriate torque (210 kgf-cm) so they are free of looseness.

- (7) Install the motor into the scanner unit. Press the motor against the protrusions of the arm fixed to the motor on which the arm extends through the wall of the casing, adjust it to minimize backlash, and fix it in place. Do not forget to tighten the hexagonal bolts, to an appropriate torque (140 kgf-cm) so they are free of looseness.



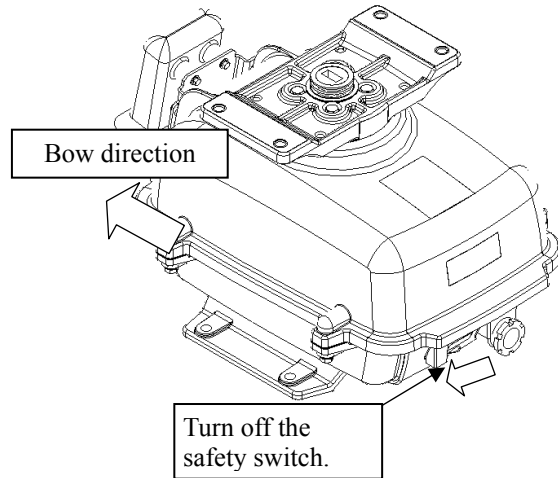
- (8) After having installed the motor, grease the gear wheel.




- (9) After having replaced the motor, reassemble the unit by following the disassembly procedure in the reverse order. Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables.

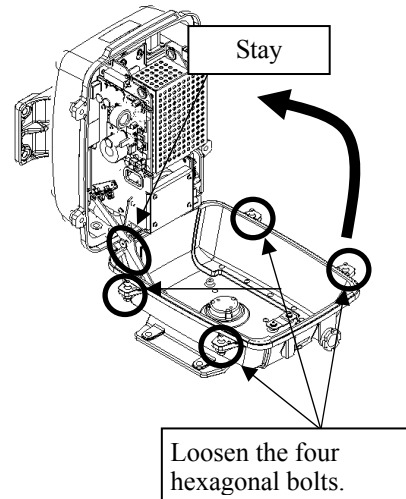
Motor Replacement Procedure for Scanner Unit NKE-2103 (JMA-5312-6/6HS)

- (1) Before beginning work, turn off the safety switch on the bottom of the scanner unit.

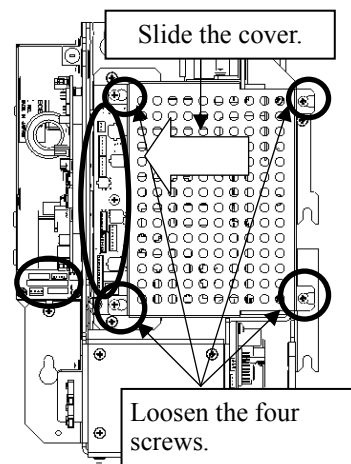


- (2) Loosen the hexagonal bolts (four bolts) and open the upper cover until the stopper of the stay operates.

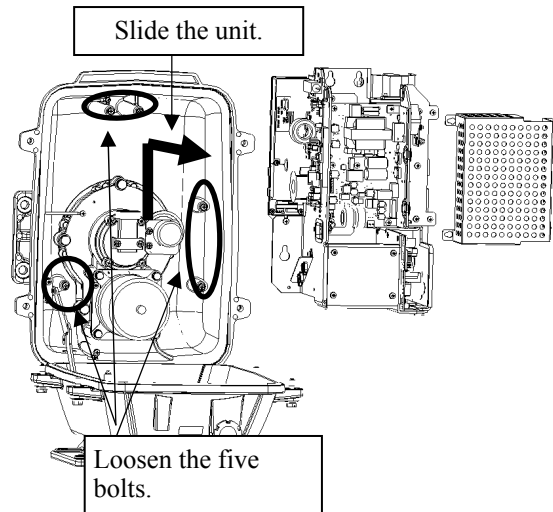
 When closing the upper cover, release the stay stopper and then tighten the cover.



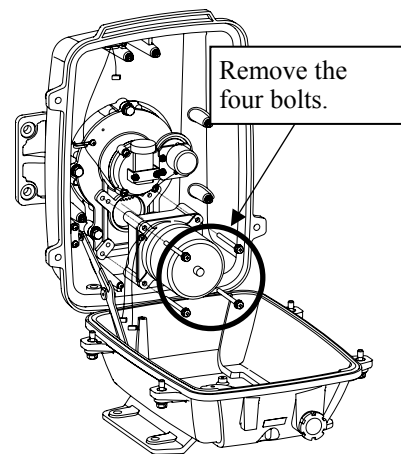
- (3) Loosen the screws (four M4 screws), remove the transmitter-receiver unit cover, and remove the cables connected to the transmitter-receiver unit (ten cables). Slide the cover of the transmitter-receiver unit to remove it.




- (4) Loosen the bolts (five M5 bolts) and remove the transmitter-receiver unit. Slide the transmitter-receiver unit upward to remove it.



- (5) Remove the hexagonal bolts (four M6 bolts) and remove the motor. Grease the gear wheel of the replacement motor and place it in the casing. Do not forget to tighten the hexagonal bolts to an appropriate torque (72 kgf-cm) so they are free of loose



- (6) After having replaced the motor, reassemble the unit by following the disassembly procedure in the reverse order.

 Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables. Clamp the cables so they do not interfere with the rotation of the motor's rotors.

8.4.4 Replacement of LCD Monitor

Caution: Replacement of LCD Monitor must be made by specialized service personnel.
For details, refer to Service Manual.

Attention

- **When replacing the LCD monitor, which is easily broken by a little impact, handle it carefully and do not hit any article against it or put it on a hard article.**

- (1) Disconnect the cables from the connectors “VIDEO” and “VIDEO DC OUT” on the rear of the processor.
- (2) Softly place the LCD monitor on a desk covered with a soft cloth.
- (3) Attach a new LCD monitor in the reverse sequence as described above.

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.

About the Battery Alarm

If **Battery Low** is appeared at the lower-right of the display when start up the radar system, the battery has not enough time left to live. We recommend to replace the battery.

If **Battery Dead** is appeared at the lower-right of the display when start up the radar system, the battery has no time left to live. There is a necessary to replace the battery. In This condition, this radar system is restored configuration information from flash memory and normal operation is available. However, you turned of the radar system before saving to flash memory, the configuration information is maybe lost. In this case, you must setup the configuration again.

If **No Battery** is appeared at the lower-right of the display when start up the radar system, the battery has not inserted. There is a necessary to insert the battery.

Note: About disposal of used battery, refer to Section 10.2.

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 : CR2032

SECTION 9 TROUBLESHOOTING AND AFTER-SALES SERVICE

9.1	FAULT FINDING.....	9-1
9.2	TROUBLE SHOOTING	9-7
9.3	AFTER-SALES SERVICE.....	9-12

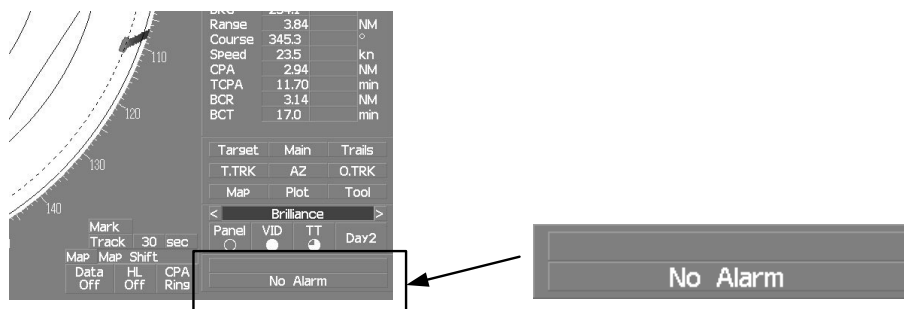
9.1 FAULT FINDING

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



Alarm message is displayed in the lower right of the display. For operation details refer to page2-29 Alarm.

Table 9-1 Critical Alarm

Message	Class	Description	ALR No.
CPA/TCPA	Alarm	There is a dangerous target.	301

ALR No : Unique alarm number in ALR sentence and ACK sentence.

**Table 9-2 List of System Alarm Message**

Message	Class	Description	ALR No.
Autopilot (Data)	Alarm	Autopilot: No communication or data error.	101
Current (Data)	Alarm	Tidal current: No communication or data error.	119
Date (Data)	Alarm	Date data: No communication or data error.	112
Datum (Data)	Alarm	DTM: No communication or data error.	122
Depth (Data)	Alarm	Water depth: No communication or data error.	115
Fan (LCD)	Alarm	LCD monitor: Fan error.	955
GPS (Status)	Alarm	GPS status error.	103
GYRO I/F (Data)	Alarm	GYRO I/F: No communication or checksum error.	324
GYRO I/F (GYRO)	Alarm	GYRO I/F: GYRO error detected.	110
GYRO I/F (Log)	Alarm	GYRO I/F: Log error detected.	111
Heading (Data)	Alarm	Heading data: No communication or data error.	113
Keyboard (Data)	Alarm	Operation unit: Communication error or checksum error.	325
Keyboard2 (Data)	Alarm	Second operation unit: Communication error or checksum error.	325
Out of Bounds	Alarm	Own ship's latitude is over 85°N or 85°S.	123
Position (Data)	Alarm	Latitude / longitude data: No communication or data error.	102
PROC (AZI)	Alarm	Process unit: AZI error.	305
PROC (HL)	Alarm	Process unit: HL error.	306
PROC (Interrupt)	Alarm	Process unit: Interrupt error.	962
PROC (Trigger)	Alarm	Process unit: Trigger error.	304
PROC (Video)	Alarm	Process unit: VIDEO error.	303
ROT (Data)	Alarm	Rate of Turn: No communication or data error.	120
RSA (Data)	Alarm	Rudder Sensor Angle: No communication or data error.	121
Speed (2AXG)	Alarm	2-axis log (speed over ground): No communication or data error.	114
Speed (2AXW)	Alarm	2-axis log (speed over water): No communication or data error.	114
Speed (GPS)	Alarm	GPS speed: No communication or data error.	114
Speed (Log)	Alarm	1-axis log: No communication or data error.	114
SRB (Data)	Alarm	SRB: No communication or data error.	960
TEMP (Data)	Alarm	Water temperature: No communication or data error.	117
TXXR (AZI)	Alarm	Scanner: BP error.	311
TXXR (Data)	Alarm	Scanner: No communication, communication mismatched, checksum error, or collision.	326
TXXR (Fan 1)	Alarm	Scanner: FAN 1 error. Scanner Unit NKE-2254-7/9/6HS (JMA-5322-7/9/6HS) : B201 Scanner Unit NKE-1130 (JMA-5332-12) : B103	320
TXXR (Fan 2)	Alarm	Scanner: FAN 2 error. Scanner Unit NKE-2254-7/9/6HS (JMA-5322-7/9/6HS) : B202 Scanner Unit NKE-1130 (JMA-5332-12) : B104	320
TXXR (HL)	Alarm	Scanner: HL error.	312
TXXR (MHV)	Alarm	Scanner: Modulator's high voltage alarm.	315
TXXR (Reverse)	Alarm	Scanner: Reverse rotation.	313
TXXR (SSW Off)	Alarm	Scanner: Safety switch OFF.	308

Message	Class	Description	ALR No.
TXRX (Trigger)	Alarm	Scanner: TRIGGER error..	310
TXRX (Video)	Alarm	Scanner: VIDEO error.	309
Wind (Data)	Alarm	Wind direction/velocity: No communication or data error.	118

ALR No : Unique alarm number in ALR sentence and ACK sentence.

Table 9-3 List of Notification

Message	Class	Description	ALR No.
CCRP Changed	INFO	CCRP is automatically changed.	
Copying	INFO	Displayed-image is capturing to file.	
POSN Reset	INFO	Change the latitude and longitude sentence.	
Set GYRO	INFO	Requires setting of true bearing.	
TM Reset	INFO	Resetting TM in a short time.	
Weather INFO	INFO	Weather information is received.	

ALR No : Unique alarm number in ALR sentence and ACK sentence.

Table 9-4 List of RADAR Alarm, Target Tracking Alarms and AIS Function Alarms

Message	Class	Description	ALR No.
AIS (Data)	Alarm	AIS: No communication or communication error.	116
AIS 95% Capacity	INFO	Over 95% of the maximum number of AIS targets.	
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.	
AIS Alarm ***	Alarm	AIS alarm (Up to 10 alarm messages can be displayed.).	
AIS MAX Target	INFO	Maximum number of AIS targets.	
AIS PROC (Data)	Alarm	AIS processing circuit: No communication or communication error.	328
CPA/TCPA	Alarm	There is a dangerous target.	301
Lost	Alarm	Failure in tracking the target that has been under tracking. Failure in receiving AIS target data for a specified time.	
New Target	Alarm	Acquisition or activation of a target in the automatic acquisition / activation zone.	302
RADAR Alarm (In)	Alarm	Targets have entered the radar alarm range.	
RADAR Alarm (Out)	Alarm	Targets have left the radar alarm range.	
REF Target	Alarm	Decrease in the reference target accuracy.	
Trial	Warning	There is a dangerous target, when trial maneuver is active.	
TT (Boot)	Alarm	Target tracking unit start failure.	344
TT (Data)	Alarm	The target tracking unit is malfunctioning..	323
TT 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.	

ALR No : Unique alarm number in ALR sentence and ACK sentence.

**Table 9-5 List of Route Error Messages and Warnings**

Message	Class	Description	ALR No.
Approach	Alarm	Approach the route.	
Arrival	Alarm	Arrive at way point.	
Break Off (WPT)	Alarm	Out of the way point.	
Cross Track Error	Alarm	Go off the route.	

ALR No : Unique alarm number in ALR sentence and ACK sentence.

Table 9-6 List of Operational Error Messages and Warnings

Message	Class	Description	ALR No.
Can't Transmit	INFO	Tried to transmit within 5 second after standby or when the transmitter-receiver has any trouble.	
Card Full	INFO	Card : Run out of free space.	
Copy Failed	INFO	Card : Copy failure.	
Delete failed	INFO	Card : Deletion failure.	
Format Card	INFO	Card : Unformatted card.	
Format Failed	INFO	Card : Format failure.	
Invalid Card	INFO	Card : Invalid card.	
Invalid Connection	INFO	The operator set performance monitor to on without selecting straight.	
Invalid Data	INFO	Tried to enter any data beyond its range.	
Invalid Range	INFO	TM selection due to TM-disabled range (96 nm). Zooming in a ZOOM-disabled range (0.125 nm).	
MAX Point	INFO	Tried to enter navigation information beyond the specified.	
No Card	INFO	Card not detected yet.	
No Position Data	INFO	Mark or line input when the latitude and longitude is invalid.	
No Heading Data	INFO	Target tracking operation or TM selection when bearing data is invalid.	
No Object	INFO	No object at the cursor-specified position.	
Not Allowed	INFO	General operation error.	
Out of Range	INFO	Out of operation range.	
Read Failed	INFO	Card : Read failure.	
Slave Mode	INFO	Operation of a menu for the scanner unit when the slave mode is active.	
Write Failed	INFO	Card : Write failure.	

ALR No : Unique alarm number in ALR sentence and ACK sentence.

Table 9-7 List of Conditions Messages

Message	Class	Description	ALR No.
Battery Dead	Warning	The battery is dead.	
Battery Low	Warning	The battery is weakening.	
GPS (HDOP)	Warning	The HDOP level is increased (Decrease in the GPS accuracy.).	
MON Test	Warning	Performance monitor is active.	
No Battery	Warning	The battery had removed.	
Scanner Rotating	Warning	The scanner is rotating (When transmitter is standby state.).	

ALR No : Unique alarm number in ALR sentence and ACK sentence.

Table 9-8 List of Interswitch Alarms and Messages

Message	Class	Description	ALR No.
Connection Masked	INFO	Inhibition of control / connection is set.	
ISW (Data)	Alarm	ISW: No communication, data mismatched, or checksum error.	327
ISW Busy	INFO	Access to the ISW menu was made during interswitching.	
ISW Complete	INFO	The switchover of the Interswitch ended normally.	
ISW Error	INFO	The interswitch is disabled.	
TXRX Standby	INFO	The scanner unit is in the standby mode.	
ISW Straight	INFO	The interswitch is forced to change the connection into straight.	
ISW Standby	INFO	The Interswitch recovered normally.	
ISW Time Out	INFO	Failed in switching.	
Master Range CHG	INFO	The range of the own display unit has changed due to change in the range of the master display unit.	
Master Standby	INFO	The master display unit does not transmit any signals.	
Pattern CHG Failed	INFO	Connection change failed.	
Update ISW Software	INFO	Tried to enter new TXRX function, when interswitch software used old version.	

ALR No : Unique alarm number in ALR sentence and ACK sentence.

Message set off in a failure of the monitor fan



When a failure has occurred in the monitor fan, the LCD monitor displays LCD FAN FAILURE at the center. This display will disappear by pressing the BRIGHTNESS knob on the LCD monitor. In order to replace the monitor fan, contact our service department, or the distributor.



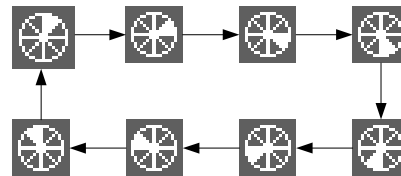
9.1.2 Operation Checking

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 9-9 shows a list of fuses used in the equipment.

Table 9-9 Fuse List

Location	Parts No.	Current Rating	Protection Circuit	Type
Radar process unit (JMA-5312-6/6HS)	F2	5A	I/F circuit PC410	ST4-5AN1
	F3	10A		ST6-10AN1
Radar process unit (JMA-5322-7/9/6HS, JMA-5332-12)	F2	10A	I/F circuit PC410	ST6-10AN1
	F3	10A		ST6-10AN1
GYRO I/F unit	F1 to F4	0.5A	GYRO I/F circuit PC4201	MF51NR 250V 0.5

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

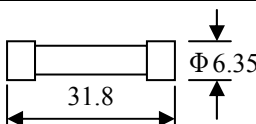
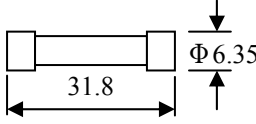
- a) Poor contact in terminal board
- b) The cable end is not fully connected, that it, contacted with earthed another terminal.
- c) Disconnected cable wire

2 Poor Contact of Connector within Unit

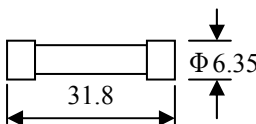
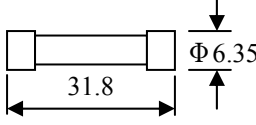
Reference: This radar equipment is provided with 9-10 standard spares.

Table 9-10 Spares (7ZXRD0026, JMA-5312-6/6HS, 7ZXRD0015, JMA-5322-7/9/6HS, JMA-5332-12)

7ZXRD0026

Name	Type/Code	Shape (mm)	In use	Spare	Parts No.	Location
Fuse	ST4-5AN1 (5ZFCA00050)		1	3	F2	Inside radar process unit
Fuse	ST6-10AN1 (5ZFCA00053)		1	3	F3	Inside radar process unit

7ZXRD0015

Name	Type/Code	Shape (mm)	In use	Spare	Parts No.	Location
Fuse	ST6-10AN1 (5ZFCA00053)		1	3	F2	Inside radar process unit
Fuse	ST6-10AN1 (5ZFCA00053)		1	3	F3	Inside radar process unit



Caution: Use the specified magnetron in table 9-11.

Table 9-11 Special Parts

[I] JMA-5312-6/6HS

Parts No.	Name	Type	Manufacturer	Location	Code
V101	Magnetron	MAF1565N	NJRC	Scanner unit	5VMAA00102
A101/A102	Circulator	FCX68R	Orient Microwave	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

[II] JMA-5322-7/9/6HS

Parts No.	Name	Type	Manufacturer	Location	Code
V101	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

[III] JMA-5332-12

Parts No.	Name	Type	Manufacturer	Location	Code
V101	Magnetron	M1555	NJRC	Scanner unit	5VMAA00104
A101	Circulator	NJC3316	NJRC	Scanner unit	5AJBV00008
A301	Diode Limiter	NJS6318	NJRC	Scanner unit	5ATBT00005

Table 9-12 Circuit Block to be Repaired (JMA-5312-6/6HS)

Location	Circuit Block	Type	Remarks
Scanner unit	Motor	7BDRD0048*	DC brushless motor
Scanner unit	Motor control power circuit	CBD-1779	
Scanner unit	Encoder	CHT-71A	
Scanner unit	Brake circuit	CFA-252	
Scanner unit	Performance Monitor	NJU-85	
Scanner unit	Modulator circuit	CME-363	Excluding Magnetron
Scanner unit	Receiver unit	NRG-610	Including CAE-529-1
Scanner unit	Power supply circuit	CBD-1783	
Process unit	Radar process circuit	CDC-1332	
Process unit	ARPA process circuit	NCA-877WA	
Process unit	ATA process circuit	NCA-877A	
Process unit	AIS process circuit	NQA-2103	
Process unit	GYRO interface circuit	CMJ-304E	
Process unit	Terminal board	CQD-1937A	
Process unit	I/F circuit	NQA-2123	
Process unit	Power supply circuit	NBD-818A	
Process unit	Fan	7BFRD0005*	
Operation unit	Operation circuit	CCK-979	
Operation unit	Interface circuit	CQC-1204	
Operation unit	Trackball	CCK-1000	
LCD Monitor	Bezel kit	MPBC43590*	for radar
LCD Monitor	Brower circuit	CBP-173A	
LCD Monitor	Interface circuit	CMH-2227	
LCD Monitor	Inverter circuit	CBF-38	
LCD Monitor	Brilliance control circuit	CCK-989	
LCD Monitor	LCD Panel	CML-771	

"*" means revision, such as A, B and so on.

**Table 9-13 Circuit Block to be Repaired (JMA-5322-7/9/6HS)**

Location	Circuit Block	Type	Remarks
Scanner unit	Motor	7BDRD0044*	DC brushless motor (normal speed)
Scanner unit	Motor	7BDRD0045*	DC brushless motor (high speed)
Scanner unit	Motor control power circuit	CBD-1779	
Scanner unit	Encoder	CHT-71A	
Scanner unit	Brake circuit	CFA-257	
Scanner unit	Fan (B201/B202)	7BFRD0002*	
Scanner unit	Performance Monitor	NJU-85	
Scanner unit	Modulator unit	NMA-550-1	Including CPA-264 Including CMB-404 Including CFR-229 Excluding Magnetron
Scanner unit	Modulator circuit	CPA-264	
Scanner unit	Receiver unit	NRG-162A	Including CMA-866A
Scanner unit	T/R control circuit	CMC-1205R	
Scanner unit	Power supply circuit	CBD-1682A	
Process unit	Radar process circuit	CDC-1332	
Process unit	ARPA process circuit	NCA-877WA	
Process unit	ATA process circuit	NCA-877A	
Process unit	AIS process circuit	NQA-2103	
Process unit	GYRO interface circuit	CMJ-304E	
Process unit	Terminal board	CQD-1937A	
Process unit	I/F circuit	NQA-2123	
Process unit	Power supply circuit	NBD-818A	
Process unit	Fan	7BFRD0005*	
Operation unit	Operation circuit	CCK-979	
Operation unit	Interface circuit	CQC-1204	
Operation unit	Trackball	CCK-1000	
LCD Monitor	Bezel kit	MPBC43590*	for radar
LCD Monitor	Brower circuit	CBP-173A	
LCD Monitor	Interface circuit	CMH-2227	
LCD Monitor	Inverter circuit	CBF-38	
LCD Monitor	Brilliance control circuit	CCK-989	
LCD Monitor	LCD Panel	CML-771	

"*" means revision, such as A, B and so on.

Table 9-14 Circuit Block to be Repaired (JMA-5332-12)

Location	Circuit Block	Type	Remarks
Scanner unit	Motor	MDBW10823*	DC brushless motor
Scanner unit	AC220V motor driver	7EPRD0034*	AC200-220V, 50/60Hz, 1φ
Scanner unit	AC100V motor driver	7EPRD0035*	AC100-115V, 50/60Hz, 1φ
Scanner unit	Encoder	CHT-71A	
Scanner unit	Brake circuit	CFA-255	
Scanner unit	Brake control circuit	CCB-655	
Scanner unit	Brake unit	NZR-17	Including CFA-261 Including CFA-262
Scanner unit	Fan (B103/B104)	7BFRD0002*	
Scanner unit	Performance Monitor	NJU-84	
Scanner unit	Modulator unit	NMA-551-1	Including CPA-264 Including CMB-406 Including CFR-229 Excluding Magnetron
Scanner unit	Modulator circuit	CPA-264	
Scanner unit	Receiver unit	NRG-229	Including CAE-499 Including CAF-595
Scanner unit	T/R control circuit	CMC-1205R	
Scanner unit	Power supply circuit	CBD-1682A	
Scanner unit	Relay filter circuit	CSC-656	
Process unit	Radar process circuit	CDC-1332	
Process unit	ARPA process circuit	NCA-877WA	
Process unit	ATA process circuit	NCA-877A	
Process unit	AIS process circuit	NQA-2103	
Process unit	GYRO interface circuit	CMJ-304E	
Process unit	Terminal board	CQD-1937A	
Process unit	I/F circuit	NQA-2123	
Process unit	Power supply circuit	NBD-818A	
Process unit	Fan	7BFRD0005*	
Operation unit	Operation circuit	CCK-979	
Operation unit	Interface circuit	CQC-1204	
Operation unit	Trackball	CCK-1000	
LCD Monitor	Bezel kit	MPBC43590*	for radar
LCD Monitor	Brower circuit	CBP-173A	
LCD Monitor	Interface circuit	CMH-2227	
LCD Monitor	Inverter circuit	CBF-38	
LCD Monitor	Brilliance control circuit	CCK-989	
LCD Monitor	LCD Panel	CML-771	

"*" 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 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 9-13.)
- ☆ 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.

Radar 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: _____

Radar 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	
(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	10-1
10.3	DISPOSAL OF USED MAGNETRON.....	10-2
10.4	ABOUT THE CHINA ROHS	10-2

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



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.

In this unit, Lithium batteries are used for the following parts:
Radar Processing Circuit (CDC-1332) in the Radar Process Unit (NDC-1417) : BT300
(Maxell: CR2032)

- 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 + and - 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 Unit NKE-2103-6/6HS (JMA-5312-6/6HS), NKE-2254-7/9/6HS (JMA-5322-7/9/6HS), NKE-1130 (JMA-5332-12)

- 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-5300MK2 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 SPECIFICATIONS

11.1	JMA-5312-6/6HS TYPE RADAR	11-1
11.2	JMA-5322-7/9/6HS TYPE RADAR	11-2
11.3	JMA-5332-12 TYPE RADAR	11-3
11.4	SCANNER UNIT NKE-2103-6 (JMA-5312-6)	11-4
11.5	SCANNER UNIT NKE-2254-7/9 (JMA-5322-7/9)	11-5
11.6	SCANNER UNIT NKE-1130 (JMA-5332-12).....	11-6
11.7	SCANNER UNIT NKE-2103-6HS (JMA-5312-6HS)	11-7
11.8	SCANNER UNIT NKE-2254-6HS (JMA-5322-6HS)	11-8
11.9	DISPLAY UNIT NCD-4530	11-9
11.10	PROCESSOR UNIT NDC-1417.....	11-10
11.11	TARGET TRACKING FUNCTION (NCA-877WA/877A) (OPTION)	11-12
11.12	AIS PROCESS UNIT NQA-2103 (OPTION).....	11-13
11.13	PLOTTER	11-14
11.14	OPERATION UNIT NCE-5171.....	11-15
11.15	PERFORMANCE MONITOR NJU-84 (JMA-5332-12)	11-16
11.16	PERFORMANCE MONITOR NJU-85 (JMA-5312-6/6HS, JMA-5322-7/9/6HS) (OPTION).....	11-16
11.17	AVAILABLE INPUT SIGNAL	11-17
11.18	AVAILABLE OUTPUT SIGNAL	11-18
11.19	STANDARD CONFIGURATION	11-18
11.20	EQUIPMENT DISTANCE BETWEEN OTHER INSTRUMENTS	11-19
11.21	OTHERS (OPTION).....	11-19

11.1 JMA-5312-6/6HS TYPE RADAR

(1) Class of emission	P0N
(2) Display	Color Raster Scan
(3) Screen	19-inch Color LCD Effective diameter of radar display, more than 250 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 30 m
(6) Minimum Detectable Range	Less than 40 m
(7) Range Accuracy	Less than 1% of the maximum distance of the range scale in use or less than 15 m 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 Unit except Scanner : -15 to +55°C Relative Humidity 93% at +40°C Vibration 2 to 13.2 Hz, amplitude +/-1mm +/-10% 13.2 to 100 Hz, Gravity acceleration 7m/s ² Velocity of the wind 51.5 m/s (100 knot)
(11) Power Supply Input	DC+24 V (Display Unit) DC+24 V (Scanner) * Display Unit correspond to AC100-120/220-240 V, 50/60 Hz, 1 φ when use NBA-5111.
(12) Power Consumption	Approx. 140 W (typical) Approx. 620 W (In maximum wind resistant velocity)
(13) Power Supply Voltage Fluctuation	DC+24 V -10/+50% (Display Unit) DC+24 V -10/+50% (Scanner Unit)
(14) Pre-heating Time	Approx. Within 1min 30sec



11.2 JMA-5322-7/9/6HS TYPE RADAR

(1) Class of emission	P0N
(2) Display	Color Raster Scan
(3) Screen	19-inch Color LCD Effective diameter of radar display, more than 250 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 30 m
(6) Minimum Detectable Range	Less than 40 m
(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 Unit except Scanner : -15 to +55°C Relative Humidity 93% at +40°C Vibration 2 to 13.2 Hz, amplitude +/-1 mm +/-10% 13.2 to 100 Hz, Gravity acceleration 7 m/s ² Velocity of the wind 51.5 m/s (100 knot)
(11) Power Supply Input	DC+24 V (Display Unit) DC+24 V (Scanner) * Display Unit correspond to AC100-120/220-240 V, 50/60 Hz, 1 φ when use NBA-5111.
(12) Power Consumption	Approx. 220 W (typical) Approx. 700 W (In maximum wind resistant velocity)
(13) Power Supply Voltage Fluctuation	DC+24 V -10/+50% (Display Unit) DC+24 V -10/+50% (Scanner Unit)
(14) Pre-heating Time	Approx. Within 3min

11.3 JMA-5332-12 TYPE RADAR

(1) Class of emission	P0N
(2) Display	Color Raster Scan
(3) Screen	19-inch Color LCD Effective diameter of radar display, more than 250 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 30 m
(6) Minimum Detectable Range	Less than 40 m
(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 Unit except Scanner : -15 to +55°C Relative Humidity 93% at +40°C Vibration 2 to 13.2 Hz, amplitude+/-1 mm+/-10% 13.2 to 100 Hz, Gravity acceleration 7 m/s ² Velocity of the wind 51.5 m/s (100 knot)
(11) Power Supply Input	DC+24 V (Display Unit) AC100-115/220-240V, 50/60 Hz, 1φ (Scanner) * Display Unit correspond to AC100-120/220-240V, 50/60Hz, 1φ when use NBA-5111.
(12) Power Consumption	Approx. 240 W +600 VA (typical) Approx. 240 W +1600 VA (In maximum wind resistant velocity)
(13) Power Supply Voltage Fluctuation	DC+24 V -10/+50% (Display Unit) AC100-115/220-240 V+/-10% (Scanner Unit)
(14) Pre-heating Time	Approx. Within 3 min



11.4 SCANNER UNIT NKE-2103-6 (JMA-5312-6)

(1) Dimensions	Height 457 mm × Swing Circle 1910 mm
(2) Mass	Approx. 40kg
(3) Polarization	Horizontal Polarization
(4) Directional Characteristic	Horizontal Beam Width : 6 ft : 1.2° (-3 dB width) Vertical Beam Width : 20° (-3 dB width) Sidelobe Level : Below -26 dB (within+/-10°) Below -30 dB (outside+/-10°)
(5) Revolution	Approx. 27 rpm (Normal)
(6) Peak Power	10 kW+/-50%
(7) Transmitting Frequency	9410+/-30 MHz
(8) Transmitting Tube	Magnetron [MAF1565N]
(9) Pulse width/Repetition Frequency	SP1 : 0.08 μs/2250 Hz MP1 : 0.25 μs/1700 Hz, MP2 : 0.5 μs/1200 Hz LP1 : 0.8 μs/750 Hz, LP2 : 1.0 μs/650 Hz 0.125 NM SP1 0.25 NM SP1 0.5 NM SP1 0.75 NM SP1/MP1 1.5 NM SP1/MP1/MP2 3 NM MP1/MP2/LP1 6 NM MP1/MP2/LP1/LP2 12 NM MP1/MP2/LP1/LP2 24 NM MP2/LP1/LP2 48 NM LP2 96 NM LP2
(10) Duplexer	Circulator + Diode Limiter
(11) Mixer	MIC Front End
(12) Intermediate Frequency Amplifier	Intermediate Frequency : 60 MHz Band Width : 20 MHz (0.08 μs) 6 MHz (0.25 μs, 0.5 μs) 3 MHz (0.8 μs, 1 μs) Gain : More than 90 dB Amplifying Characteristics : Logarithmic Amplifier
(13) Overall Noise Figure	7.5 dB (Average)
(14) Compass Safe Distance	Standard 2.4 m Steering 1.8 m

11.5 SCANNER UNIT NKE-2254-7/9 (JMA-5322-7/9)

(1) Dimensions	NKE-2254-7 : Height 536 mm × Swing Circle 2270 mm NKE-2254-9 : Height 536 mm × Swing Circle 2825 mm
(2) Mass	NKE-2254-7 : Approx. 58kg NKE-2254-9 : Approx. 60kg
(3) Polarization	Horizontal Polarization
(4) Directional Characteristics	Horizontal Beam Width : NKE-2254-7 : 7 ft : 1.0° (-3 dB width) NKE-2254-9 : 9 ft : 0.8° (-3 dB width) Vertical Beam Width : NKE-2254-7/9 : 20° (-3 dB width) Sidelobe Level : NKE-2254-7/9 : Below -26 dB (within+/-10°) Below -30 dB (outside+/-10°)
(5) Revolution	24 rpm (Normal)
(6) Peak Power	25 kW+/-50%
(7) Transmitting Frequency	9410+/-30 MHz
(8) Transmitting Tube	Magnetron [M1568BS]
(9) Pulse Width/Repetition Frequency	SP1 : 0.07 μs/2250 Hz MP1 : 0.2 μs/2250 Hz, MP2 : 0.3 μs/1900 Hz, MP3 : 0.4 μs/1400 Hz LP1 : 0.8 μs/750 Hz, LP2 : 1.0 μs/650 Hz, LP3 : 1.2 μs/510 Hz 0.125 NM SP1 0.25 NM SP1 0.5 NM SP1 0.75 NM SP1/MP1 1.5 NM SP1/MP1/MP2/MP3 3 NM MP1/MP2/MP3/LP1 6 NM MP1/MP2/MP3/LP1/LP2 12 NM MP1/MP2/MP3/LP1/LP2 24 NM MP3/LP1/LP2 48 NM LP2 96 NM LP3
(10) Duplexer	Circulator + Diode Limiter
(11) Mixer	MIC Front End
(12) Intermediate Frequency Amplifier	Intermediate Frequency : 60 MHz Band Width : 25 MHz (0.07 μs) 8 MHz (0.2 μs, 0.3 μs, 0.4 μs) 3 MHz (0.8 μs, 1 μs, 1.2 μs) Gain : More than 90 dB Amplifying Characteristics : Logarithmic Amplifier
(13) Overall Noise Figure	7.5 dB (Average)
(14) Compass Safe Distance	Standard 2.4 m Steering 1.8 m



11.6

SCANNER UNIT

NKE-1130 (JMA-5332-12)

(1) Dimensions	Height 791 mm × Swing Circle 400 0mm
(2) Mass	Approx. 180kg
(3) Polarization	Horizontal Polarization
(4) Directional Characteristics	Horizontal Beam Width : 12 ft : 1.9° Vertical Beam Width : 25 ° Sidelobe Level : Below -26 dB (within+/-10°) Below -30 dB (outside+/-10°)
(5) Revolution	24 rpm (60/50 Hz, Normal)
(6) Peak Power	30 kW+/-50%
(7) Transmitting Frequency	3050+/-20 MHz
(8) Transmitting Tube	Magnetron M1555
(9) Pulse Width/Repetition Frequency	SP1 : 0.07 μs/2250 Hz MP1 : 0.2 μs/2250 Hz, MP2 : 0.3 μs/1900 Hz, MP3 : 0.4 μs/1400 Hz LP1 : 0.8 μs/750 Hz, LP2 : 1.0 μs/650 Hz, LP3 : 1.2 μs/510 Hz 0.125 NM SP1 0.25 NM SP1 0.5 NM SP1 0.75 NM SP1/MP1 1.5 NM SP1/MP1/MP2/MP3 3 NM MP1/MP2/MP3/LP1 6 NM MP1/MP2/MP3/LP1/LP2 12 NM MP1/MP2/MP3/LP1/LP2 24 NM MP3/LP1/LP2 48 NM LP2 96 NM LP3
(10) Duplexer	Circulator + Diode Limiter
(11) Mixer	MIC Front End
(12) Intermediate Frequency Amplifier	Intermediate Frequency : 60 MHz Band Width : 25 MHz (0.07 μs) 8 MHz (0.2 μS, 0.3 μS, 0.4 μS) 3 MHz (0.8 μS, 1.0 μS, 1.2 μS) Gain : More than 90 dB Amplifying Characteristics : Logarithmic Amplifier
(13) Overall Noise Figure	7.5 dB (Average)
(14) Compass Safe Distance	Standard 5.1 m Steering 2.7 m

11.7

SCANNER UNIT

NKE-2103-6HS (JMA-5312-6HS)

(1) Dimensions	Height 457 mm × Swing Circle 1910 mm
(2) Mass	Approx. 40kg
(3) Polarization	Horizontal Polarization
(4) Directional Characteristic	Horizontal Beam Width : 6 ft : 1.2 ° (-3 dB width) Vertical Beam Width : 20 ° (-3 dB width) Sidelobe Level : Below -26 dB (within+/-10°) Below -30 dB (outside+/-10°)
(5) Revolution	Approx. 48 rpm
(6) Peak Power	10 kW+/-50%
(7) Transmitting Frequency	9410+/-30 MHz
(8) Transmitting Tube	Magnetron [MAF1565N]
(9) Pulse width/Repetition Frequency	SP1 : 0.08 μs/2250 Hz MP1 : 0.25 μs/1700 Hz, MP2 : 0.5 μs/1200 Hz LP1 : 0.8 μs/750 Hz, LP2 : 1.0 μs/650 Hz 0.125 NM SP1 0.25 NM SP1 0.5 NM SP1 0.75 NM SP1 / MP1 1.5 NM SP1 / MP1 / MP2 3 NM MP1 / MP2 / LP1 6 NM MP1 / MP2 / LP1 / LP2 12 NM MP1 / MP2 / LP1 / LP2 24 NM MP3 / LP1 / LP2 48 NM LP2 96 NM LP2
(10) Duplexer	Circulator + Diode Limiter
(11) Mixer	MIC Front End
(12) Intermediate Frequency Amplifier	Intermediate Frequency : 60 MHz Band Width : 20 MHz (0.08 μs) 6 MHz (0.25 μs, 0.5 μs) 3 MHz (0.8 μs, 1 μs) Gain : More than 90 dB Amplifying Characteristics : Logarithmic Amplifier
(13) Overall Noise Figure	7.5 dB (Average)
(14) Compass Safe Distance	Standard 2.4 m Steering 1.8 m



11.8 SCANNER UNIT

NKE-2254-6HS (JMA-5322-6HS)

(1) Dimensions	Height 536 mm × Swing Circle 1910 mm
(2) Mass	Approx. 55kg
(3) Polarization	Horizontal Polarization
(4) Directional Characteristics	Horizontal Beam Width : 6 ft : 1.2° Vertical Beam Width : 20° (-3 dB width) Sidelobe Level : Below -26 dB (within+/-10°) Below -30 dB (outside+/-10°)
(5) Revolution	48 rpm (Normal)
(6) Peak Power	25 kW+/-50%
(7) Transmitting Frequency	9410+/-30 MHz
(8) Transmitting Tube	Magnetron [M1568BS]
(9) Pulse Width/Repetition Frequency	SP1 : 0.07 μs/2250 Hz MP1 : 0.2 μs/2250 Hz, MP2 : 0.3 μs/1900 Hz, MP3 : 0.4 μs/1400 Hz LP1 : 0.8 μs/750 Hz, LP2 : 1.0 μs/650 Hz, LP3 : 1.2 μs/510 Hz 0.125 NM SP1 0.25 NM SP1 0.5 NM SP1 0.75 NM SP1/MP1 1.5 NM SP1/MP1/MP2/MP3 3 NM MP1/MP2/MP3/LP1 6 NM MP1/MP2/MP3/LP1/LP2 12 NM MP1/MP2/MP3/LP1/LP2 24 NM MP3/LP1/LP2 48 NM LP2 96 NM LP3
(10) Duplexer	Circulator + Diode Limiter
(11) Mixer	MIC Front End
(12) Intermediate Frequency Amplifier	Intermediate Frequency : 60 MHz Band Width : 25 MHz (0.07 μs) 8 MHz (0.2 μs, 0.3 μs, 0.4 μs) 3 MHz (0.8μs, 1 μs, 1.2 μs) Gain : More than 90 dB Amplifying Characteristics : Logarithmic Amplifier
(13) Overall Noise Figure	7.5 dB (Average)
(14) Compass Safe Distance	Standard 2.4 m Steering 1.8 m

11.9 DISPLAY UNIT NCD-4530

- | | |
|----------------------------|---|
| (1) Structure | Desktop Type
(LCD Monitor/Operation Unit/Processor Unit Separation Structure) |
| (2) Screen | 19-inch Color LCD 1280 × 1024 dot (SXGA)
Viewing Distance : 1 m 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, 96 NM |
| (5) Range Marker | 0.025, 0.05, 0.1, 0.25, 0.5, 1, 2, 4, 8, 16 NM |
| (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 unit of Display : NM
VRM Range : 0.000 to 97.2 NM |
| (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. |
| (10) Compass Safe Distance | Standard 3.1 m
Steering 1.9 m |



11.10 PROCESSOR UNIT NDC-1417

- | | |
|----------------------------------|--|
| (1) Structure | Desk Top Type (Horizontal putting and length putting using combined) |
| (2) Dimensions | Height 170 mm × Width 300 mm × Depth 320 mm |
| (3) Mass | Approx. Below 10kg |
| (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 (Stern Line can be displayed.) |
| (11) Radar Alarm | Invasion, Seccession, OFF can be selected.
With buzzer sound.(Possible to output to external buzzer.)
Ring.
Automatically acquisition by target tracking described in Section “TARGET TRACKING”. |
| (12) Off Center | Within 66% of the radius of any range. (Except 96 NM)
Can be operated in all mode in relative motion.
Trail is succeed at Off Center mode. |
| (13) True motion Unit | Built-in (Except 96 NM) |
| (14) True motion reset position | 66% of radius of any range.
Possible to manual reset. |
| (15) Twice zoom | The zoom center is 66% radius of any range. (Except 0.125 NM) |

-
- (16) Radar trails indication
- True motion mode : (Only true motion trails
Relative motion mode :
True motion trails and relative motion trails can be selected.
Trail time length :
15 sec / 30 sec / 1 min / 3 min / 6 min / 10 min / 15 min /
30 min / 60 min / OFF
Arbitrary trail time length can be displayed at any time.
Built-in Trail thinning process.
Trail function can be use at true motion reset.
When range is changed, Trail function can be use.
Trail function can be use at Off Center. (Relative motion)
When motion indication and bearing indication changed, Trail
function can be use.(Only true motion trails indication.)
- (17) Variety of Pulse width
- NKE-2103-6/6HS (JMA-5312-6/6HS) :
SP1/MP1/MP2/LP1/LP2
NKE-2254-7/9/6HS (JMA-5322-7/9/6HS),
NKE-1130 (JMA-5332-12) :
SP1/SP2/MP1/MP2/MP3/LP1/LP2/LP3
- (18) Target enhance
- 3 stages can be changed.
- (19) Correct position
- When synthesis Radar and Coastline is displayed, position can
be corrected by manually.
- (20) Display color
- Radar echo : 16 stages (Yellow, Green, Amber, Purple, Red)
Radar trails : 16 stages (White, Cyan, Green)
Fixed Maker : 4 colors (White, Cyan, Green, Amber)
VRM1/2, EBL1/2, PI : 4 colors (White, Cyan, Green, Amber)
Character, Bearing Marker : 5 colors (White, Green, Amber,
Black, Red)
Cursor : 4 colors (White, Cyan, Green, Amber)
Heading Line/Vector : 4 colors (Cyan, Green, Amber, Black)
Own Ship's track/Another Ship's track : 7 colors
Coastline, Isobaths : 16 colors
Mark, Line : 7 colors



11.11

TARGET TRACKING FUNCTION (NCA-877WA/877A) (OPTION)

Radar mode, synthesis mode

- | | |
|--------------------------------|---|
| (1) Available range scale | All range |
| (2) Acquisition | MANUAL/AUTO(by two automatic acquisition/activation zone)
Acquisition range : 0.1 to 32 NM (Available all range scale) |
| (3) Tracking | Normal edition type NCA-877A : 30 targets
High performance type NCA-877WA : 100 targets
Tracking range : 0 to 32 NM (Available all range scale) |
| (4) Display | Tracking data : 4 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 |
| (5) Alarm | Automatic acquisition/activation zone
Danger ship : Depends on CPA/TCPA setting. |
| (6) Trial Maneuver (NCA-877WA) | Input parameter : Course, Speed, Vector time, Time to Maneuver, Reach, Turn Radius, Acceleration, Deceleration |
|
 | |
| Synthesis mode | |
| (7) Another ship track | 20 targets. 1500 points per one target can be displayed. (Own ship track and marks are another.)
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, 1/3/5/10/30/60 min, 1/3/5/10 NM Possible to storage in memory card (Option). |

Note: ARPA Process Unit (NCA-877WA) or ATA Process Unit (NCA-877A) must be fitted on ships compliant to IMO.

11.12 AIS PROCESS UNIT NQA-2103 (OPTION)

Radar mode, synthesis mode

(1) Activation 100 targets
MANUAL/AUTO(by two automatic activation/activation zone)

(2) Display 300 targets (sleeping target and activated target)
AIS data : 2 at the same time. (simple display)
The ship's name, call sign, MMSI, course, speed, CPA, TCPA of target can be displayed. (simple display item)
The ship's name, call sign, MMSI, course, speed, CPA, TCPA, bearing, range, ship's heading bearing, rate of turn, latitude, longitude, destination, navigation status of target can be displayed. (detail display item)
Vector display : True/Relative
Past position
The message can be displayed. (broadcast message, addressed message)

(3) Alarm Automatic activation/activation zone
Danger ship : Depends on CPA/TCPA setting.

Synthesis mode

(4) Another ship track 20 targets. 1500 points per one target can be displayed.
(Own ship track and marks are another.)
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, 1/3/5/10/30/60 min, 1/3/5/10 NM
Possible to storage in memory card (Option).

Note : AIS Process Unit must be fitted on ships compliant to IMO.



11.13 PLOTTER

(1) Plotter (Normal) (Synthesis mode)

Projection :	Mercator projection (Latitude 85 degree or less.)
Scale :	Radar synchronize range scale
Own ship track :	1 color(Cyan) Interval of save 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 Capacity 7,000 points
Cursor mark :	7 colors Capacity of cursor mark : 2,000 points Variety of cursor Mark : 29
Line :	7 colors Capacity of line : Include in cursor mark Variety of line : Solid line, broken line, alternate long and short dash line
Coastline data :	Coastline ROM Card (Option) (ERC, JRC, C-Map NT+) One selected depth contour can be displayed.
External memory :	Memory card (Option)
Position correction :	Latitude / Longitude correction Radar video synchronize range scale coast line by manual. (Synthesis mode)

(2) Plotter (Option NDB-34A) (Synthesis mode, Plotter mode)

Projection :	Mercator projection (Latitude 70 degree or less.)
Scale :	Synchronize range scale (Synthesis mode) 1/1,000 to 1/10,000,000 are continuously selected. 10 stage can be changed (preset can be used). (Plotter mode)
Own ship track :	7 colors. Interval of save : 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 Capacity of own ship track : 7,000 points
Cursor mark :	7 colors Capacity of cursor mark : 20,000 points Variety of cursor Mark : 29
Line :	7 colors 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 depth contour can be displayed.
External memory :	Memory card (Option)
Waypoint and route :	Waypoint can be set up to 999 points. Information of waypoint : Azimuth, distance and the time to required destination. Setting of sea route : 10 sea routes. (20 destination for one route can be set.) Alarm of route : Waypoint arrival / break off, Route arrival / break off
Position correction :	Latitude / Longitude correction Radar video synchronize range scale coast line by manual. (Synthesis mode)

11.14

OPERATION UNIT NCE-5171

- (1) Structure
- Structure of operation unit is separate from processor unit.
Desk-Top type
Correspond Flush mount
- (2) Switch
- GAIN/PL : Adjust the reception gain. (Transmit pulse width can be changed by PUSH-SW.)
- AUTO-SEA : Sea clutter suppression.
(AUTO/MANU can be changed by PUSH-SW.)
- AUTO-RAIN : Rain clutter suppression.
(AUTO/MANU can be changed by PUSH-SW.)
- MULTI : Change the setting. (Adjustment item can be changed by PUSH-SW)
- EBL (Electric Bearing Line) : Rotate the bearing of the EBL (Floating EBL ON/OFF can be changed by PUSH-SW.)
- VRM (Variable Range Marker) : Change the VRM range.
- (3) Operation switch
- Trackball : Move the cursor mark.
- 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 (Alarm Acknowledge) : Acknowledge and stop alarm.
- EBL1 : Selection display and non-display of EBL1.
- EBL2 : Selection display and non-display of EBL2.
- VRM1 : Selection display and non-display of VRM1.
- VRM2 : Selection display and non-display of VRM2.
- RANGE+ (Increase Display Range) : Increase display range.
- RANGE- (Decrease Display Range) : Decrease display range.
- ACQ (Acquisition) : Target acquisition
- TGT DATA (Numeric Display) : Numeric display of tracking target.
- TGT CNCL (Cancel of Selection) : Release of selection of tracking target.
- MOB (Marker) : Turning on and release marker.
- ENT (Enter) : Left side button of trackball.
- CLR/INFO (Clear/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 Mode) : Selection of North-up, Course-Up, Head-Up.
- TM/RM (True/Relative Motion) : Selection true motion, relative motion.
- RR/HL (Range Ring/Heading line) : Selection display and non-display of fixed ring and heading line.
- OFF CENT(Off Center) : Off center operation
- AZ (Automatic Acquisition/Activate zone) : Setting and release of acquisition/activation zone.
- VECT T/R (True/Relative Motion Vector) : Selection of true motion and relative motion of vector.
- TRAILS : Switching trails display time.
- DAY/NIGHT : Selection of screen arrangement of color.
- FUNC (Function) : Selection of signal processing.
- USER KEY1 : User assignment key1.
- USER KEY2 : User assignment key2.
- RADAR MENU : Rader menu.
- MARK : Selection display and non-display of mark.
- TT MENU : Target tracking menu.



11.15 PERFORMANCE MONITOR NJU-84 (JMA-5332-12)

- | | |
|-------------------------|--|
| (1) Dimensions | Height 130 mm × Width 180 mm × Depth 70 mm |
| (2) Mass | Approx. 1.2kg |
| (3) Operating Frequency | 3050+/-30 MHz |

Note : Performance monitor must be fitted on ships compliant to IMO.

11.16 PERFORMANCE MONITOR NJU-85 (JMA-5312-6/6HS, JMA-5322-7/9/6HS) (OPTION)

- | | |
|-------------------------|--|
| (1) Dimensions | Height 130 mm × Width 149 mm × Depth 70 mm |
| (2) Mass | Approx. 1.2kg |
| (3) Operating Frequency | 9410+/-30 MHz |

Note : Performance monitor must be fitted on ships compliant to IMO.

11.17

AVAILABLE INPUT SIGNAL

Receive capability Port : .NAV1, NAV2, GPS port at terminal board TB4303. NMEA Connector at rear of the process unit (D-Sub 9 PIN)

- | | |
|---|--|
| (1) Navigation equipment : | IEC61162-1/2 |
| | Longitude/Latitide : 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. (GYRO I/F Unit) |
| | GYRO-STEP : 360X, 180X, 90X, 30X. (GYRO I/F Unit) |
| | JRC-NSK format (JLR-10, 20, 30) (COMPASS Connector at rear of the process unit) |
| | IEC61162-2 38400 bps : THS>HDT (over 40 Hz) (COMPAS port at terminal board TB4303). |
| | IEC61162-1 4800 bps : HDT>HDG>HDM>VHW (COMPAS port at terminal board TB4303). ※Can't be use for target tracking. |
| (3) Speed signal : | LOG-SYNC : 360X, 180X, 90X, 30X. (GYRO I/F Unit) |
| | LOG-PULSE : 800, 400, 200, 100. (GYRO I/F Unit) |
| (4) External event mark : | Contact input (EVENT port at terminal board TB4303). |
| (5) Radar buoy : | Negative input (RBVD port at terminal board TB4302). |
| (6) Depth : | DPT>DBS>DBT>DBK, JRC format |
| (7) Water temperature : | MTW, JRC format |
| (8) Tendency : | CUR, JRC format |
| (9) Direction of wind, velocity of wind : | MWV, MWD |
| (10) AIS : | VDM, VDO |

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).



11.18

AVAILABLE OUTPUT SIGNAL

- | | | |
|-----|------------------------|---|
| (1) | Slave video | Radar video : TIY, VD, BP (2048 p), BZ (Terminal board TB4302) |
| (2) | Navigation information | Send capability Port : .NAV1, NAV2, GPS port at terminal board TB4303.
NMEA Connector at rear of the process unit (D-Sub 9 PIN). IEC61162-1/2
Radar system data : RSD
Own ship data : OSD
Tracking target data : TTM, TLL, TTD, TLB, JRC-ARPA
AIS 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) | External alarm | Default setting : normally closed contact
Maximum current : 200 mA
(SYSALM, ARPAALM port at terminal board TB4303). |
| (4) | External monitor | Multi scan monitor, Analog RGB, HD15 pin Connector |

11.19

STANDARD CONFIGURATION

- | | | |
|-----|-------------------------|---|
| (1) | Scanner Unit | 1 |
| (2) | Display Unit | 1 (Process unit, LCD unit, Operation unit) |
| (3) | Equipment cable | JMA-5312-6/6HS, JMA-5322-7/9/6HS
Standard : 20 m
JMA-5332-12
Display unit to junction box Standard : 10 m
Junction box to scanner Standard : 20 m |
| (4) | Equipment reserve parts | 1 |
| (5) | Instruction manual | 1 (Japanese or English) |

11.20 EQUIPMENT DISTANCE BETWEEN OTHER INSTRUMENTS

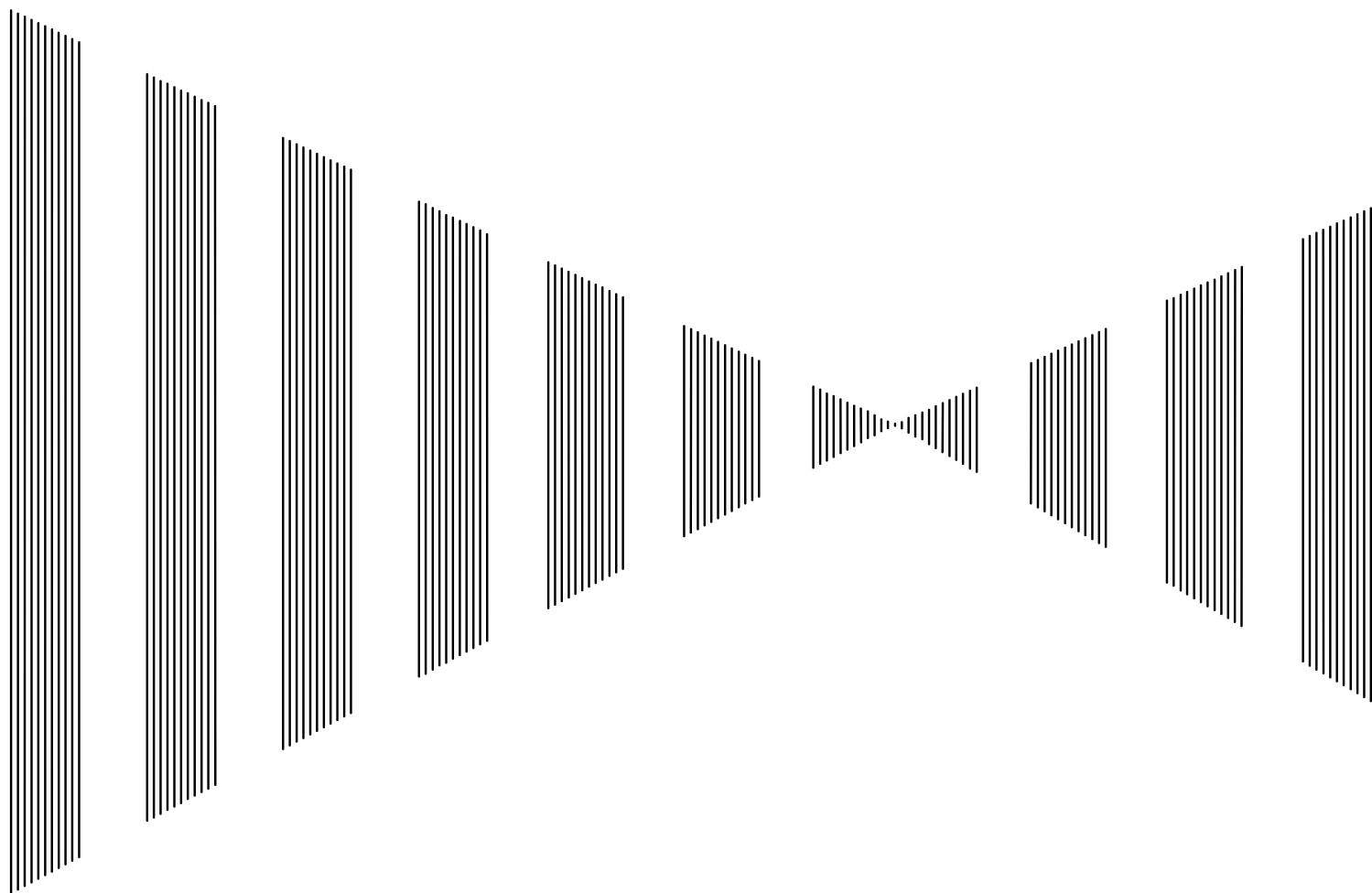
	Maximum	Standard
(1) LCD Monitor to Radar Process Unit	5 m	5 m
(2) Operation Unit to Radar Process Unit	5 m	5 m
(3) Display Unit to Scanner Unit (JMA-5312-6/6HS, JMA-5322-7/9/6HS)	65 m	20 m
(4) Display Unit to Junction box (JMA-5332-12)	30 m ^{*1}	10 m
(5) Junction box to Scanner Unit (JMA-5332-12)	50 m ^{*1}	20 m

*1 Total distance between Display Unit and Scanner Unit must be 65 m or less.

11.21 OTHERS (OPTION)

- Coast line ROM card
- Memory card
- Interswitch unit (NQE-3141)
- Rectifier unit (NBA-5111)
- Power Control Unit (NQE-3167)

APPENDIX



INTERSWITCH (OPTION) NQE-3141 INSTRUCTION MANUAL

I	OVERVIEW	A-1
	I-I OVERVIEW	A-1
	I-II INTERSWITCH SETUP	A-1
II	INTERSWITCH OPERATION	A-2
	II-I OPERATION FLOW	A-2
	II-II INTER SWITCH MENU	A-3
	II-III CHANGE OF CONNECTION PATTERN (WITH 2 DISPLAY UNITS)	A-6
	II-IV CHANGE OF CONNECTION PATTERN (WITH 3 OR MORE DISPLAY UNITS)	A-6
	II-V OPERATING CONNECTION PATTERN FILES (FILE OPERATIONS)	A-7
	II-VI NAMES OF DISPLAY UNITS AND SCANNER UNITS	A-8
III	REFERENCE	A-9



OVERVIEW

I-i Overview

Interswitch NQE-3141 is equipment that enables free changeover between radar display units installed on the bridge and antenna units having different characteristics.

If display unit is turned off or malfunctioned, the scanner unit can be controlled by other display unit.

If interswitch unit had malfunctioned, the radar system is switched to standalone mode.

Up to 8 units can be changed over.

When the connected scanner is changed, following setting values are automatically loaded.

Tune Adjustment	(See the section 7.1.3)
Bearing Adjustment	(See the section 7.1.4)
Range Adjustment	(See the section 7.1.5)
Antenna Height	(See the section 7.1.8)
Antenna installation location	(See the section 7.1.9)
Sector Blank	(See the section 7.2.2)
TNI Blank	(See the section 7.2.3)
Performance monitor adjustment	(See the section 7.2.4)
PRF Fine Tuning	(See the section 3.8.3)

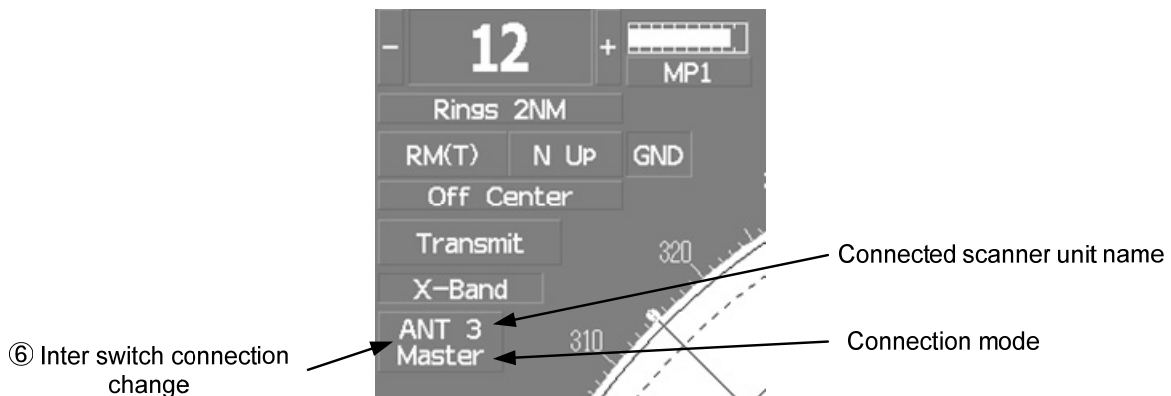
I-ii Interswitch Setup

Connection modes can be changed simply by changing the interswitch connection (upper left of the display ⑥ on page 2-16).

Note: A master display unit is always necessary for establishing a slave connection.

Before a slave display unit can be placed in transmission state, the master display unit must be placed in transmission state.

upper left of the display



The upper stand indicates the connected scanner unit.

If scanner unit name is not entered. :The scanner number is indicated.

If scanner unit name is entered. :The scanner name is indicated (Max 6 characters).

For How to names of scanner unit, see the "II-vi Names of display units and scanner units".

The lower stand indicates the connection mode.

Master :Mode in which the scanner unit can be controlled by the display unit.

Slave :Mode in which the scanner unit cannot be controlled.

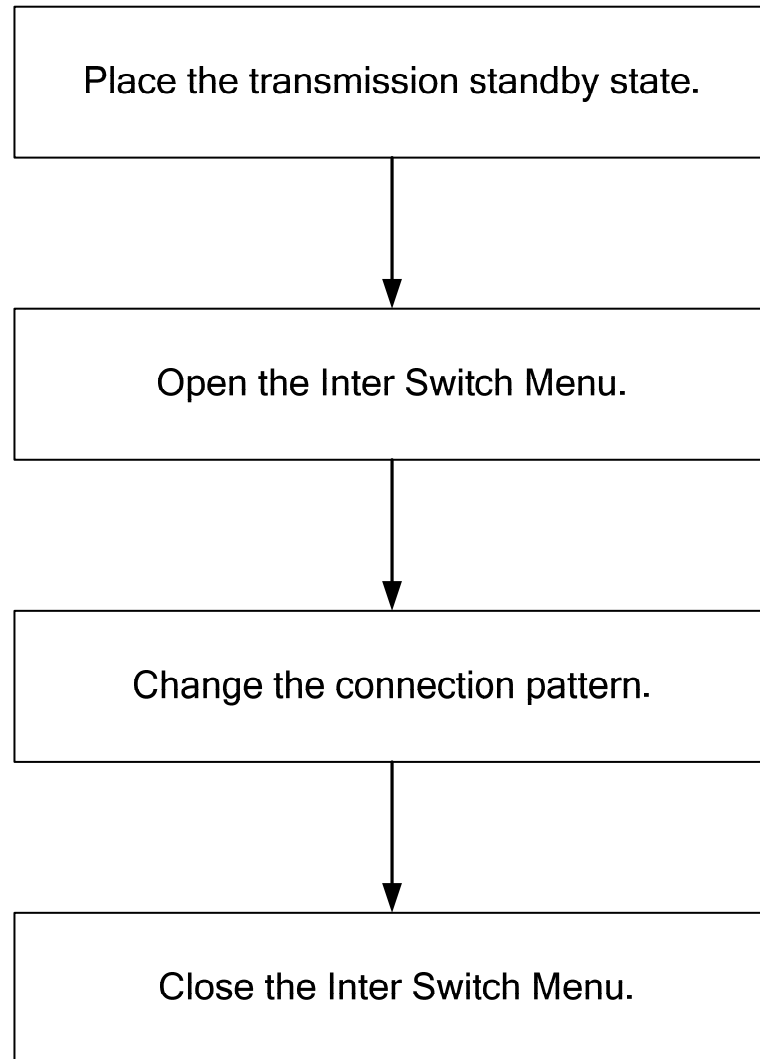
When **Slave** is selected, transmission / standby and pulse length cannot be changed. The available range is also limited.



INTERSWITCH OPERATION

Follow the flowchart below to change the current interswitch connection pattern.

II-i Operation Flow



II-ii Inter Switch Menu

The Inter Switch Menu can be opened only when the transmission standby state.

Procedures

1 Press the [STBY] key.

The transmission standby state will be placed.

2 Move the cursor onto the Interswitch connection change (upper left of the display ⑥ on page 2-16), and press the [ENT] key.

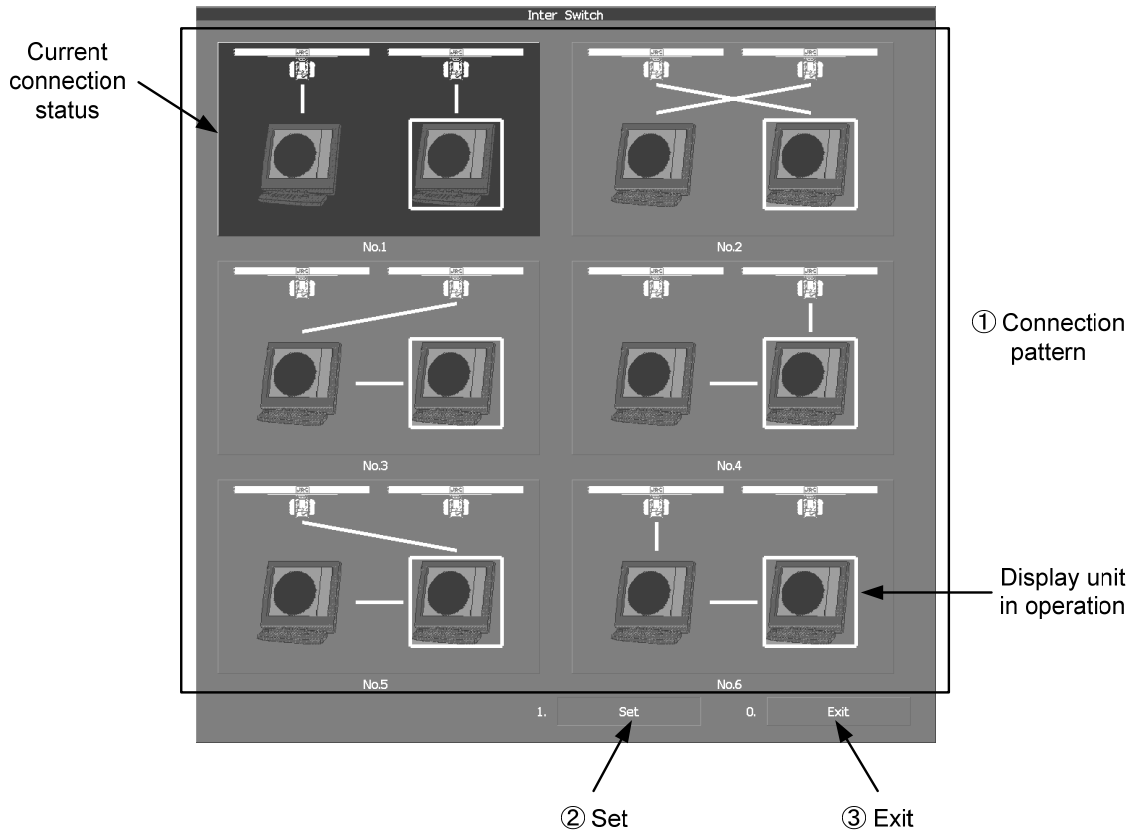
The Inter Switch Menu will appear.

Exit

1 Press the [0] key.

The Inter Switch Menu will close.

Inter Switch Menu (with 2 Display Units)



① : Connection pattern

If this button is clicked, the connection pattern is selected.
 The display unit in operation is enclosed in a square □.
 The background of the current connection pattern display is highlighted.

② : Set

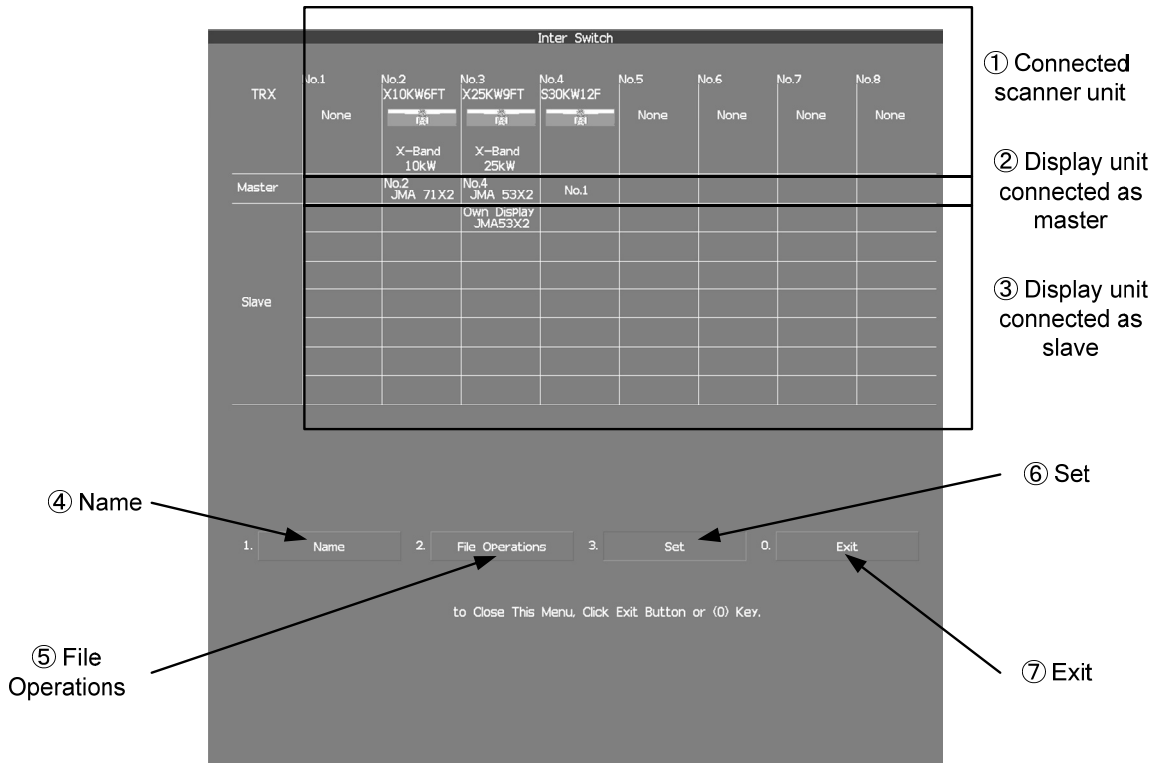
If this button is clicked, the change of connection is determined.

③ : Exit

If this button is clicked, the Inter Switch Menu is closed .

Note: If only 2 display units are installed but the interswitch is set for 3 or more display units, the Inter Switch Menu for 3 or more display units will appear.

Inter Switch Menu (with 3 or More Display Units)



① : **Connected scanner unit**

In mode for naming a display unit or antenna unit, clicking on a unit opens the name input window.

②, ③ : **Display unit connected as master, and Display unit connected as slave**

If this button is clicked, select / cancel the display unit.

If this button is clicked in the naming a display unit or scanner unit mode, the name input window is opened.

④ : **Name**

If this button is clicked, set to the display or scanner unit rename mode.

⑤ : **File Operations**

If this button is clicked, the File Operations menu is opened.

⑥ : **Set**

If this button is clicked, the change of connection is determined.

⑦ : **Exit**

If this button is clicked, the Inter Switch Menu is closed.

II-iii Change of Connection Pattern (with 2 Display Units)

If two display units are installed, a connection pattern needs to be selected.

Procedures

- 1 **Open the Inter Switch menu (with 2 Display Units).**
- 2 **Move the cursor onto the Connection pattern (Inter Switch Menu ① on page A-4) to be changed , and press the [ENT] key.**

The connection pattern will be selected, and (in Inter Switch Menu ② on page A-4) will blink.

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

The connection pattern will be changed.

II-iv Change of Connection Pattern (with 3 or More Display Units)

If three or more display units are installed, the layout of connection patterns needs to be set.

Procedures

- 1 **Open the Inter Switch Menu (with 3 or More Display Units).**
- 2 **Move the cursor onto the display unit (Inter Switch Menu ②/③ on page A-5) to be changed , and press the [ENT] key.**

The selected display unit will be highlighted.
To deselect the display unit, press the [ENT] key again.

- 3 **Move the cursor to the change-destination display unit, and press the [ENT] key.**

The selected display unit in step 2 will be switched to the change-destination display unit, and (Inter Switch Menu ⑥ on page A-5) will blink.
If the change destination is empty, control will move and will blink.

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

The connection pattern will be changed.

Note: A master display unit is always necessary for establishing a slave connection.

II-v Operating Connection Pattern Files (File Operations)

Frequently used connection patterns can be read easily by saving interswitch connection patterns.

I] Loading connection patterns (Load)

Procedures

1 Open the Inter Switch Menu (with 3 or More Display Units).

2 Press the [2] key.

The File Operations menu will appear.

3 Press the [1] key.

Currently saved connection patterns in memory will be listed.

4 Press the [numeric] key corresponding to the file to be loaded.

Confirmation Window will appear.

5 Press the [1] key.

The connection pattern will be changed.

III] Saving connection patterns (Save)

Procedures

1 Open the Inter Switch Menu (with 3 or More Display Units).

2 Press [2] key.

The File Operations window will appear.

3 Press [2] key.

The Save menu will appear.

Currently saved connection patterns in memory will be listed.

4 Press the [numeric] key corresponding to the file to be saved.

The Input File Name window will appear.

5 Enter the file name to be saved.

Up to 8 characters can be entered.

For the input method on the character input screen, see Section 3.3.4.

The connection pattern will be saved when the name is input.

III] Erasing a connection pattern (Erase)**Procedures****1 Open the Inter Switch Menu (with 3 or More Display Units).****2 Press the [2] key.**

The File Operations window will appear.

3 Press the [3] key.

The Erase menu will appear.

The list of connection patterns stored in the memory will be displayed.

4 Press the [numeric] key corresponding to the file to be erased.

Confirmation Window will appear.

5 Press the [1] key.

The selected connection pattern is erased and the file name is deleted from the list.

II-vi Names of Display Units and Scanner Units

The display units and antenna units can be named.

Procedures**1 Open the Inter Switch Menu (with 3 or More Display Units).****2 Press the [1] key.**

"Name" will be highlighted, indicating that the rename mode is activated.

3 Move the cursor to the display unit or scanner unit to be renamed (Inter Switch Menu ① / ② / ③ on page A-5), and press the [ENT] key.

The Input IND Name or the Input TXRX Name window will appear.

4 Input a new unit name.

Up to 8 characters can be input as a unit name.

For the input method on the character input menu, see Section 3.3.4.

The selected display unit or antenna unit will be renamed when the new name is input.

The scanner name is indicated in the interswitch connection change (upper left of the display ⑥ on page 2-16) (Max 6 characters).



REFERENCE

Preheat Time after Change of Connection Pattern

After the current interswitch connection pattern has been changed, operation needs to wait until the system is ready. This is because the preheat time varies depending on the previous connection of the scanner unit and display unit.

The wait time is necessary for protecting the electronic tubes that emit radio waves.

- a) When not changed to a new connection pattern : Preheating not required
- b) When changed to a new connection pattern and an scanner unit had been used before the change : Preheating not required
- c) When changed to a new connection pattern and an scanner unit had not been used before the change : Preheating required

Notes on Changing Connection Pattern

An attempt to change to another connection pattern immediately after the completion of connection pattern change may fail.

This is because internal processing still needs some preparation time upon completion of connection pattern change. Let several seconds pass between connection pattern change operations.

Notes on Connecting Slave Display Unit

Before a slave display unit can be placed in transmission state, the master display unit must be placed in transmission state. If the master display unit is moved from the transmission state to the transmission standby state, the slave display unit is forcibly placed in transmission standby state.

When they are in transmission standby state,

Master Standby is shown in the alarm indication (Brilliance / alarm on page 2-9), and the alarm sounds.

A slave display unit cannot control tune. Tune is controlled by the master display unit. Slave is shown in the transmitter pulse length (upper left of the display on page 2-2).

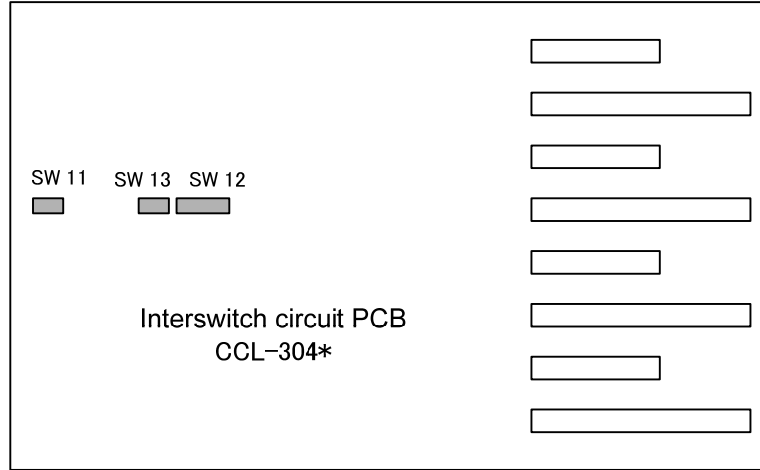
Range change for a slave display unit is limited by the range and pulse length / repetition frequency of the master display unit. As a rule, a greater range than the range of the master display unit cannot be set for a slave display unit. However, if the transmitter pulse length of a slave display unit is identical to the master display unit's and the repetition frequency is within the master display unit's, a greater range than the master display unit's can be selected for the slave display unit. When the master display unit narrows the range or changes the transmitter pulse length, the range of the slave display unit may be forcibly changed. In this case, Master Range

CHG is shown in the alarm indication (Brilliance / alarm on page 2-9), and the alarm sounds.

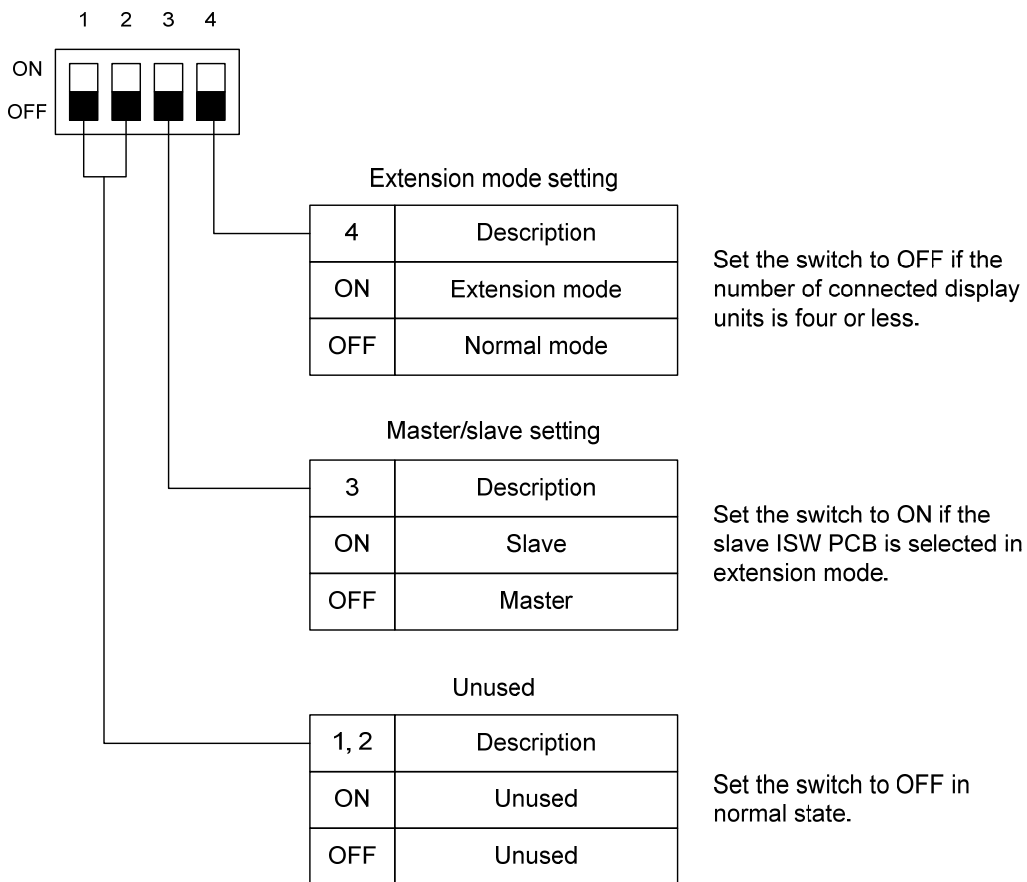
Setting at Installation

◎ **Setting of the interswitch circuit (CCL-304*)**

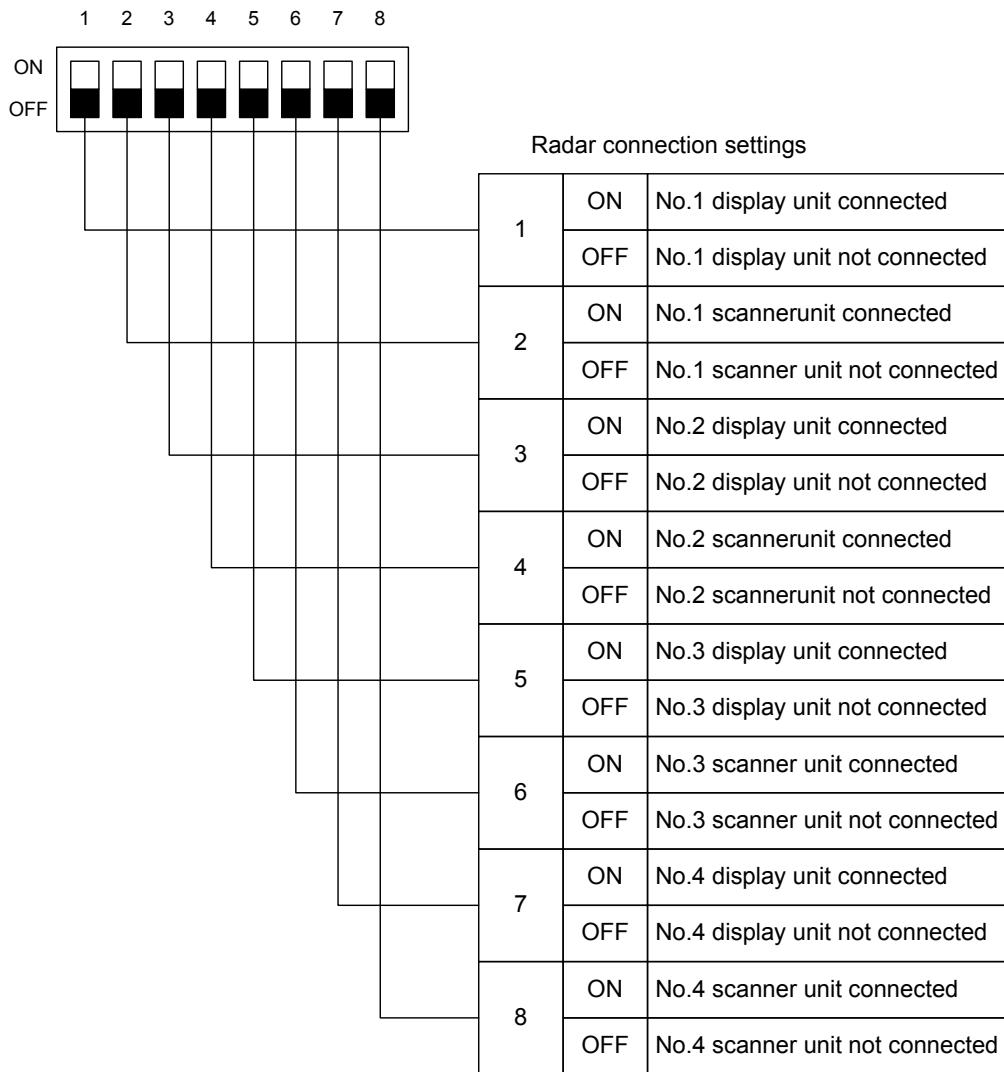
The settings of the DIP switches SW11 to SW13 are shown below.



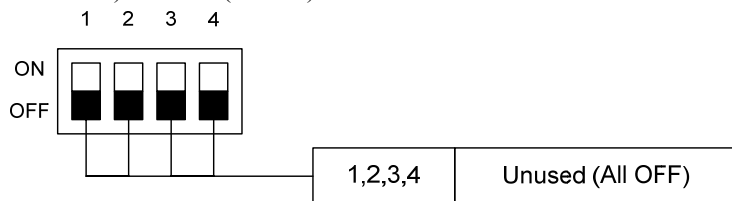
1) SW11 setting (extension mode and master/slave settings)



2) SW12 setting (radar connection settings)



3) SW13 (unused)

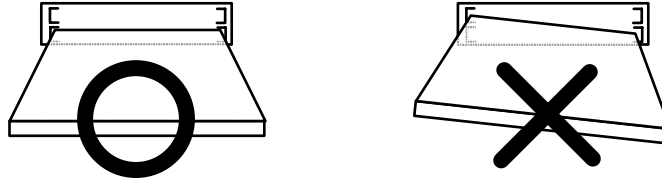


Note: Before the DIP switches of the interswitch circuit can be set, the interswitch breaker must be turned off in order to ensure safety operation.

HOW TO INSERT AND 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:

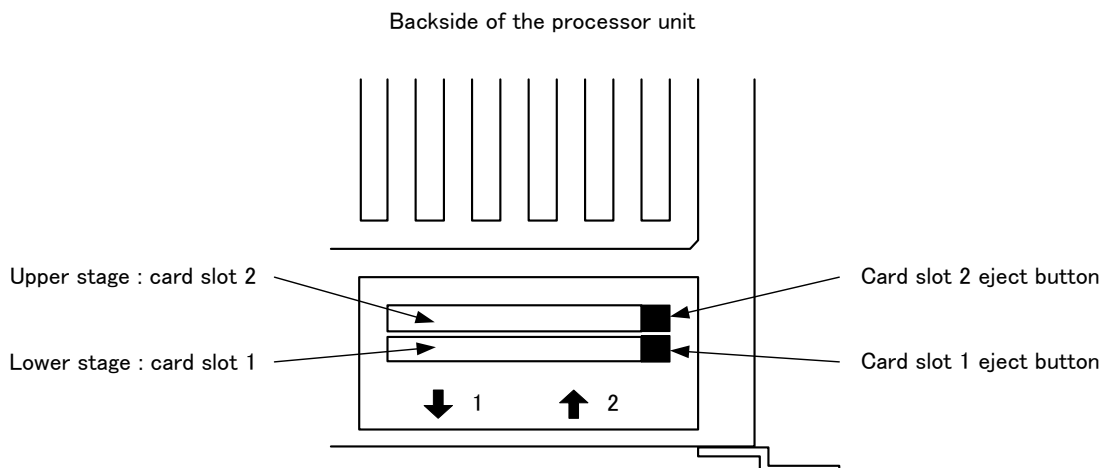
Card type	Insertion slot No.
JRC card	Either one
ERC card	Either one
C-Map NT+ detail card	Either one
Memory card	Either one

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.

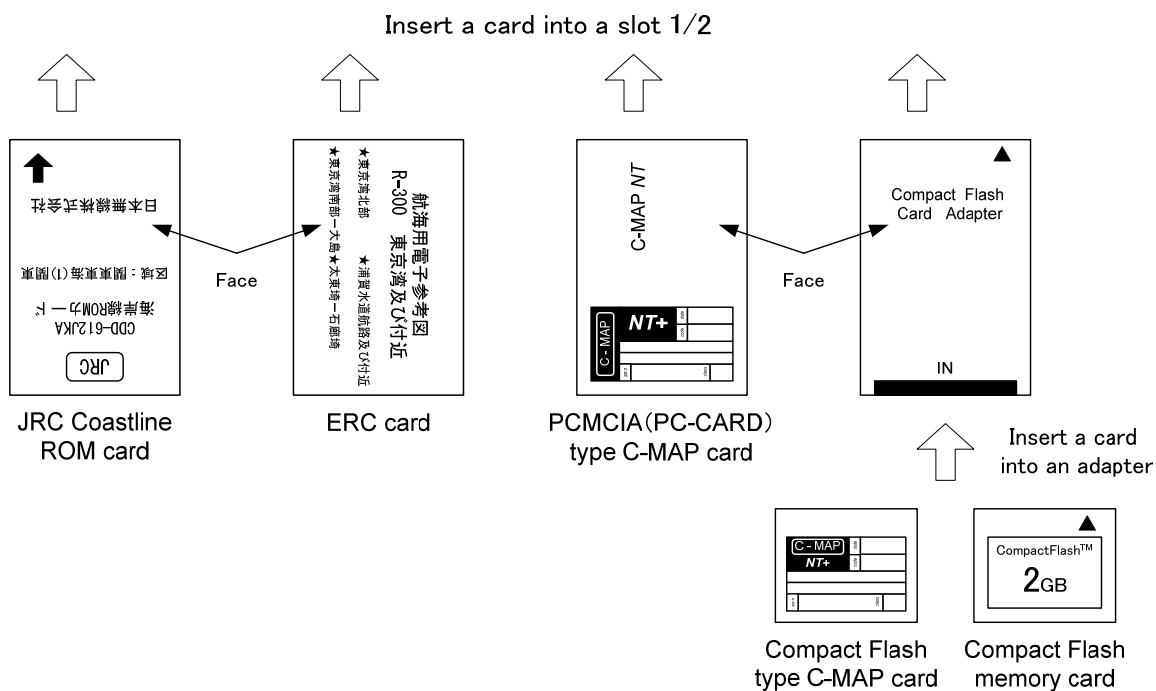
Insert a card into processor unit

Procedures

- 1 Remove the rubber packing located at the backside of the processing unit cabinet, and expose the card slot.



2 Insert the card in the direction indicated by the arrow.

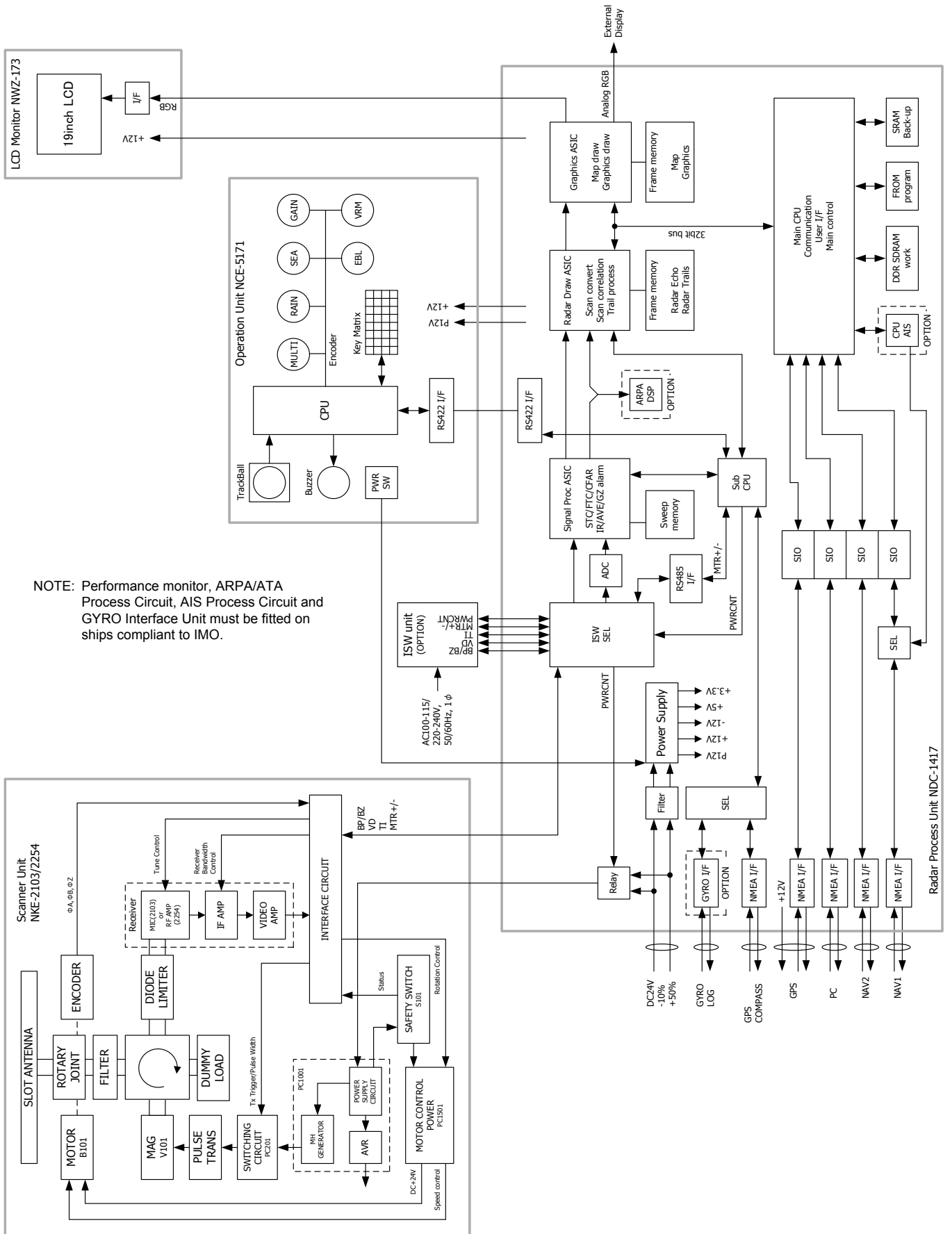


3 Insert the card until the card slot's eject button protrudes and complete the installation of a card.

Eject a card from processor unit

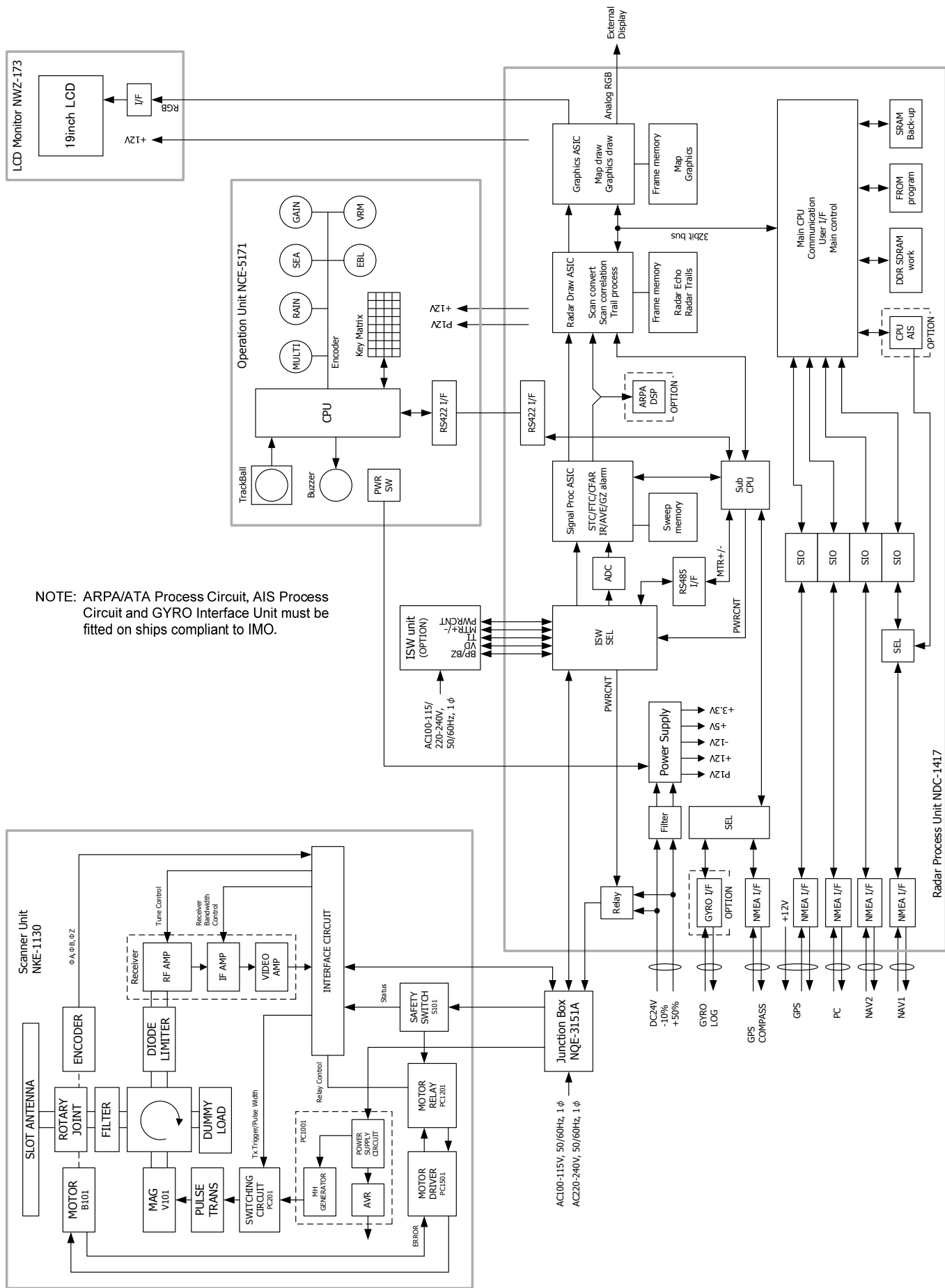
Procedures

- 1 Push the eject button corresponding to the desired card slot.
- 2 remove a card from processor unit



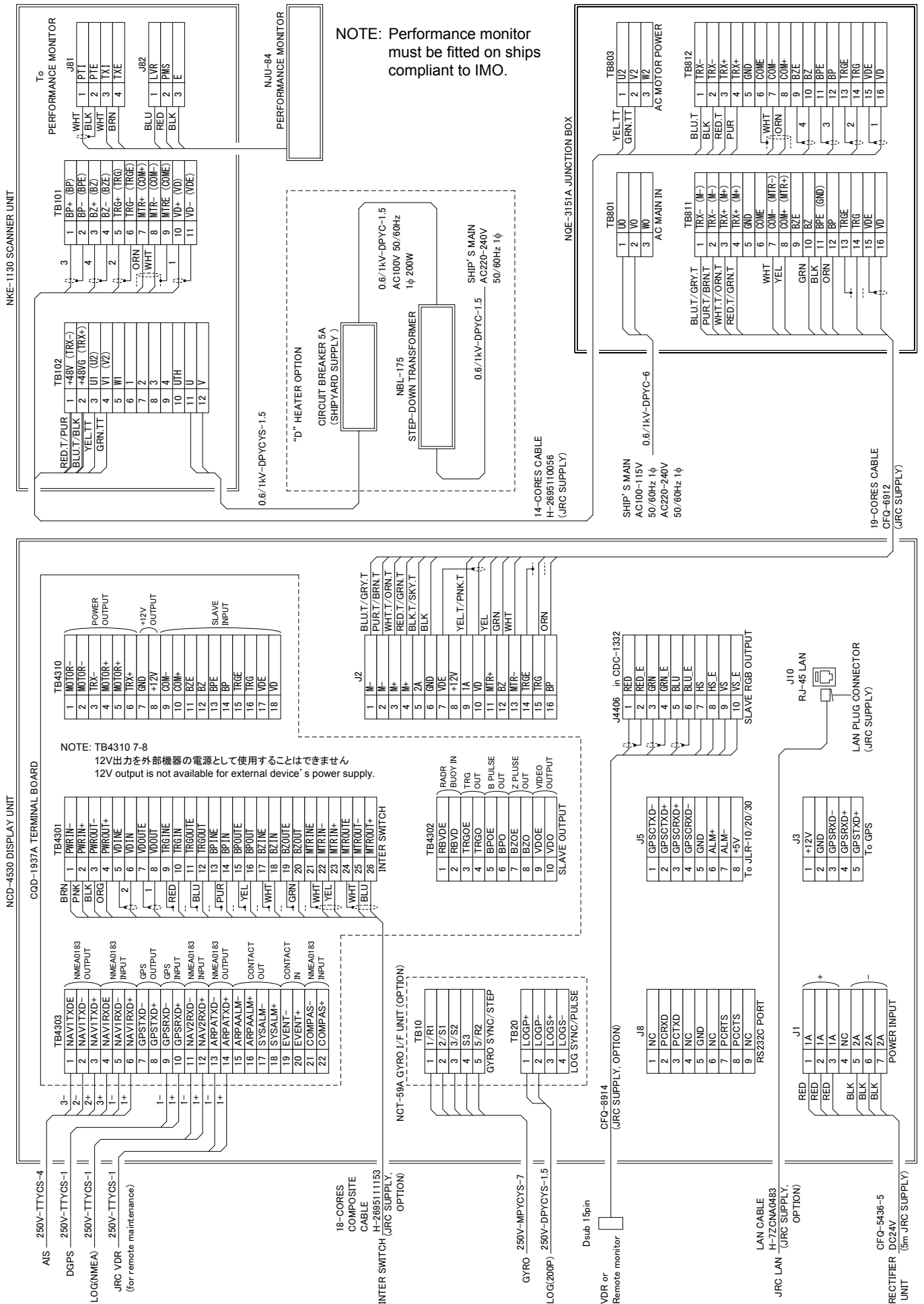
NOTE: Performance monitor, ARPA/ATA Process Circuit, AIS Process Circuit and GYRO Interface Unit must be fitted on ships compliant to IMO.

付図 1 JMA-5312-6/6HS, JMA-5322-7/9/6HS レーダー装置回路動作説明図
 Fig.1 Block Diagram of JMA-5312-6/6HS, JMA-5322-7/9/6HS RADAR

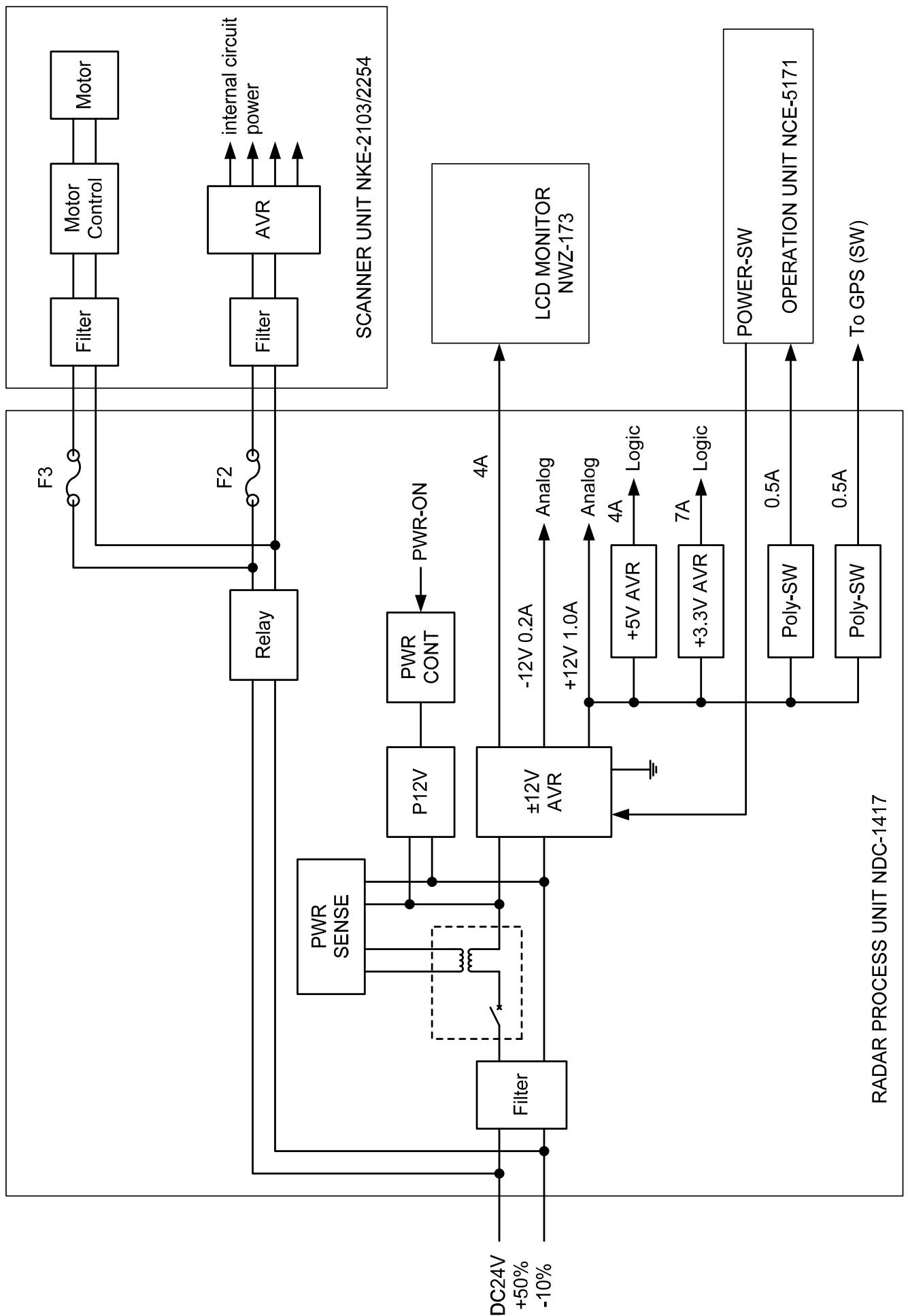


NOTE: ARPA/ATA Process Circuit, AIS Process Circuit and GYRO Interface Unit must be fitted on ships compliant to IMO.

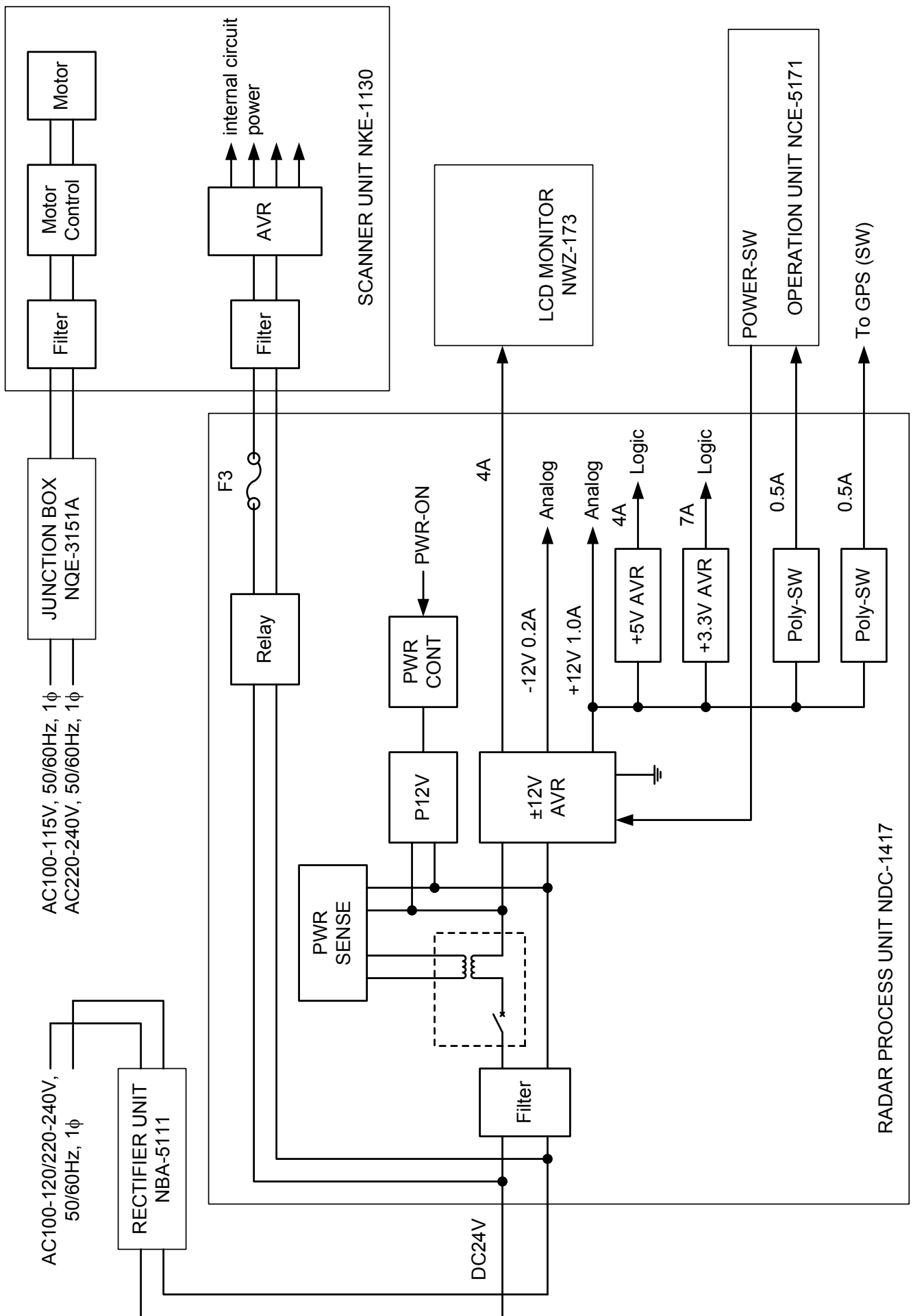
付図2 JMA-5332-12 レーダー装置回路動作説明図
Fig.2 Block Diagram of JMA-5332-12 RADAR



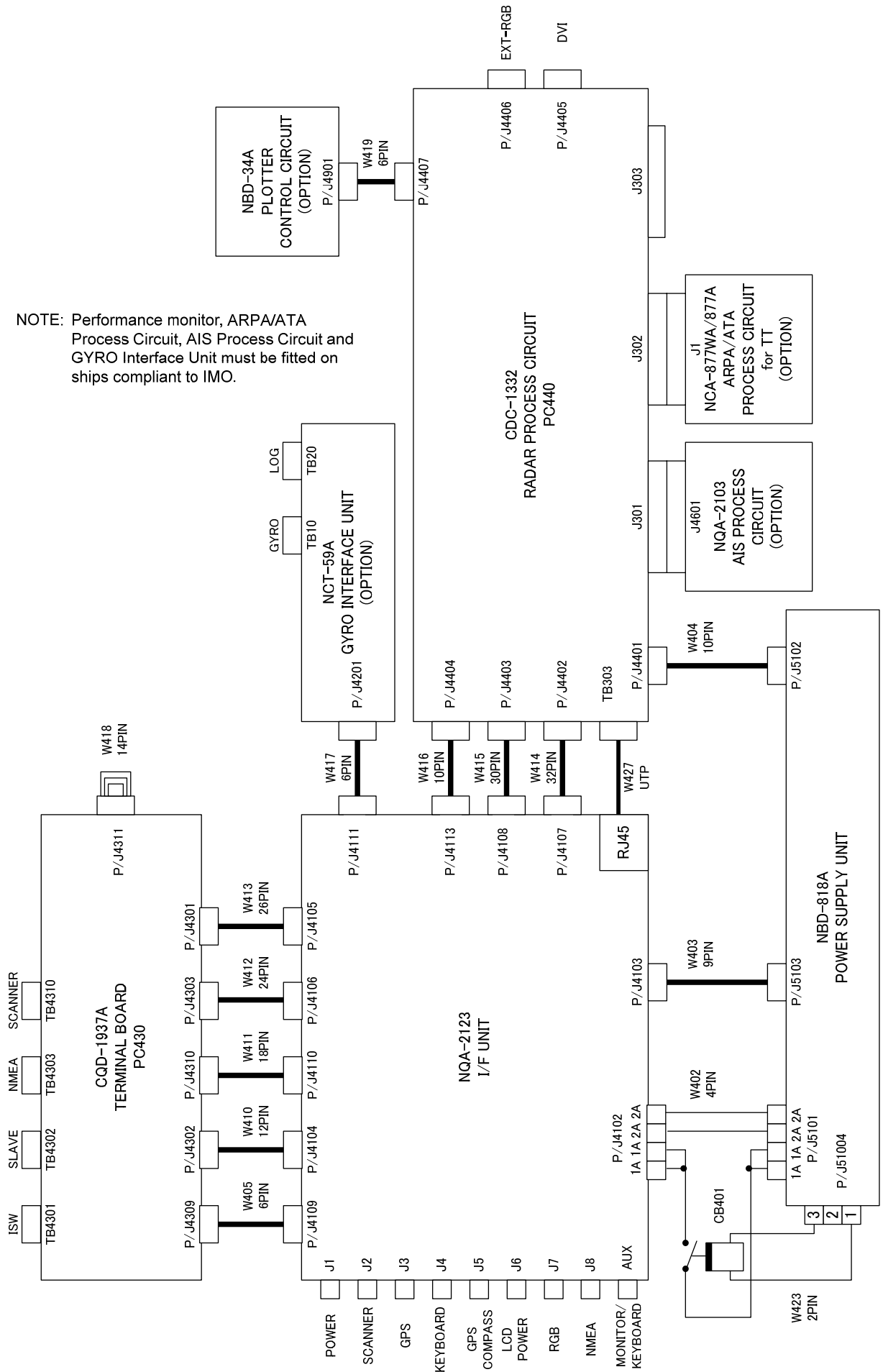
付図5 JMA-5332-12形レーダー一盤間接続図
Fig.5 Terminal Board Connection Diagram of JMA-5332-12 RADAR



付図7 JMA-5312-6/6HS, JMA-5322-7/9/6HS 形レーダー電源系統図
 Fig.7 Power System Diagram of JMA-5312-6/6HS, JMA-5322-7/9/6HS RADAR



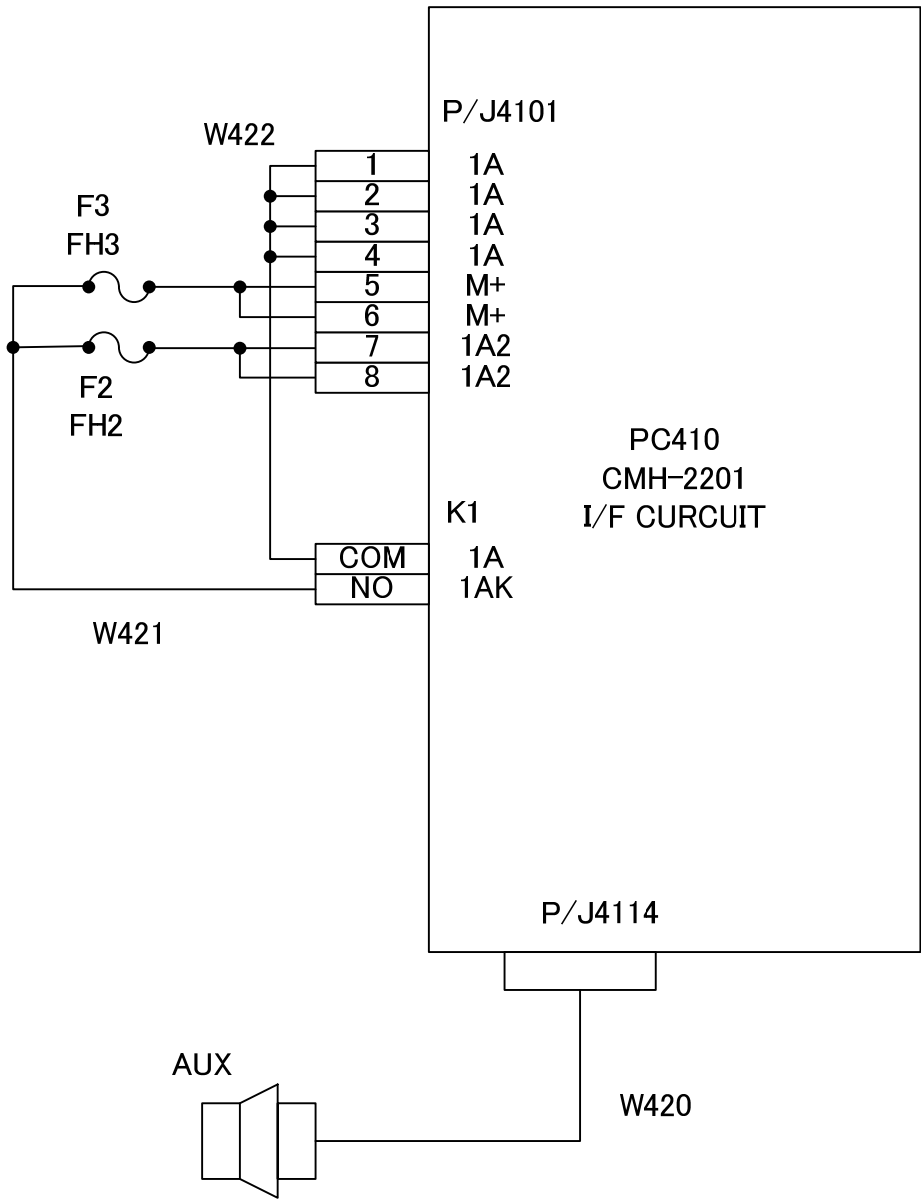
付図 8 JMA-5332-12 形レーダー電源系統図
Fig.8 Power System Diagram of JMA-5332-12 RADAR



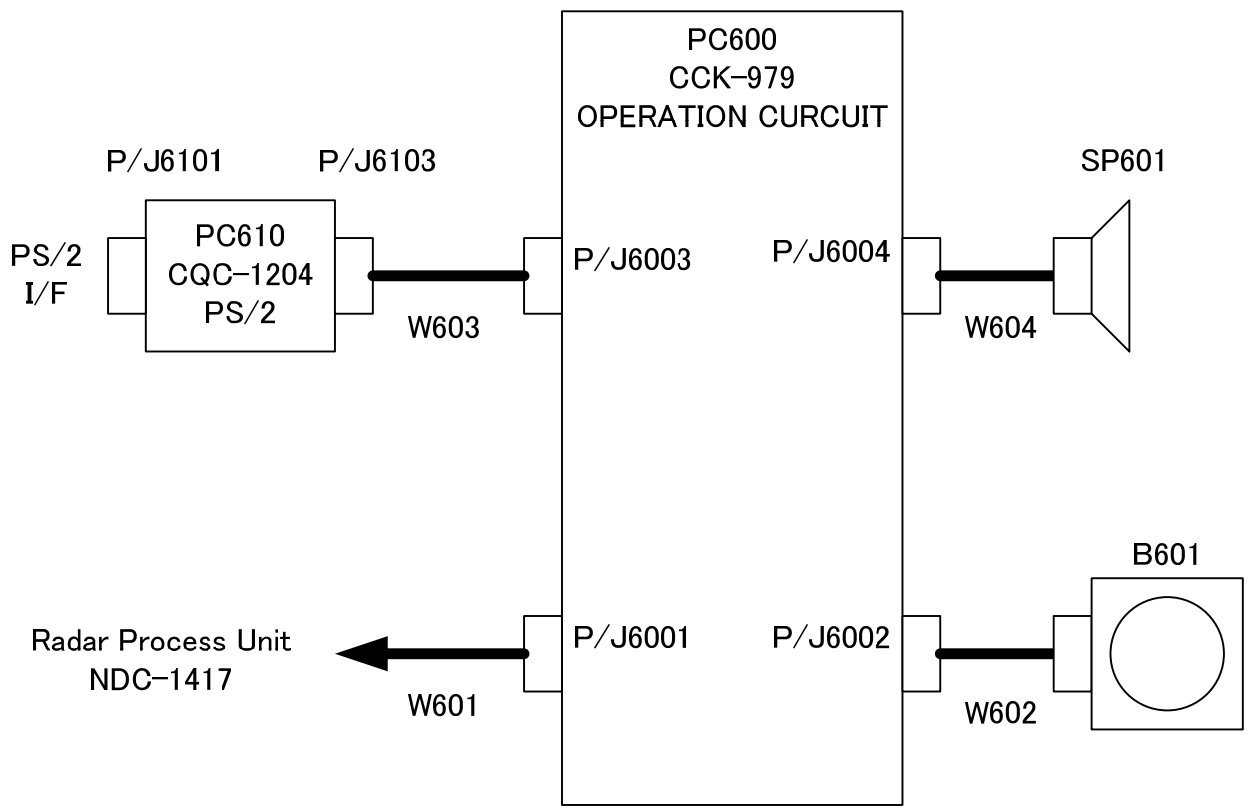
NOTE: Performance monitor, ARPA/ATA Process Circuit, AIS Process Circuit and GYRO Interface Unit must be fitted on ships compliant to IMO.

付图 9 NDC-1417 处理部機内接続図

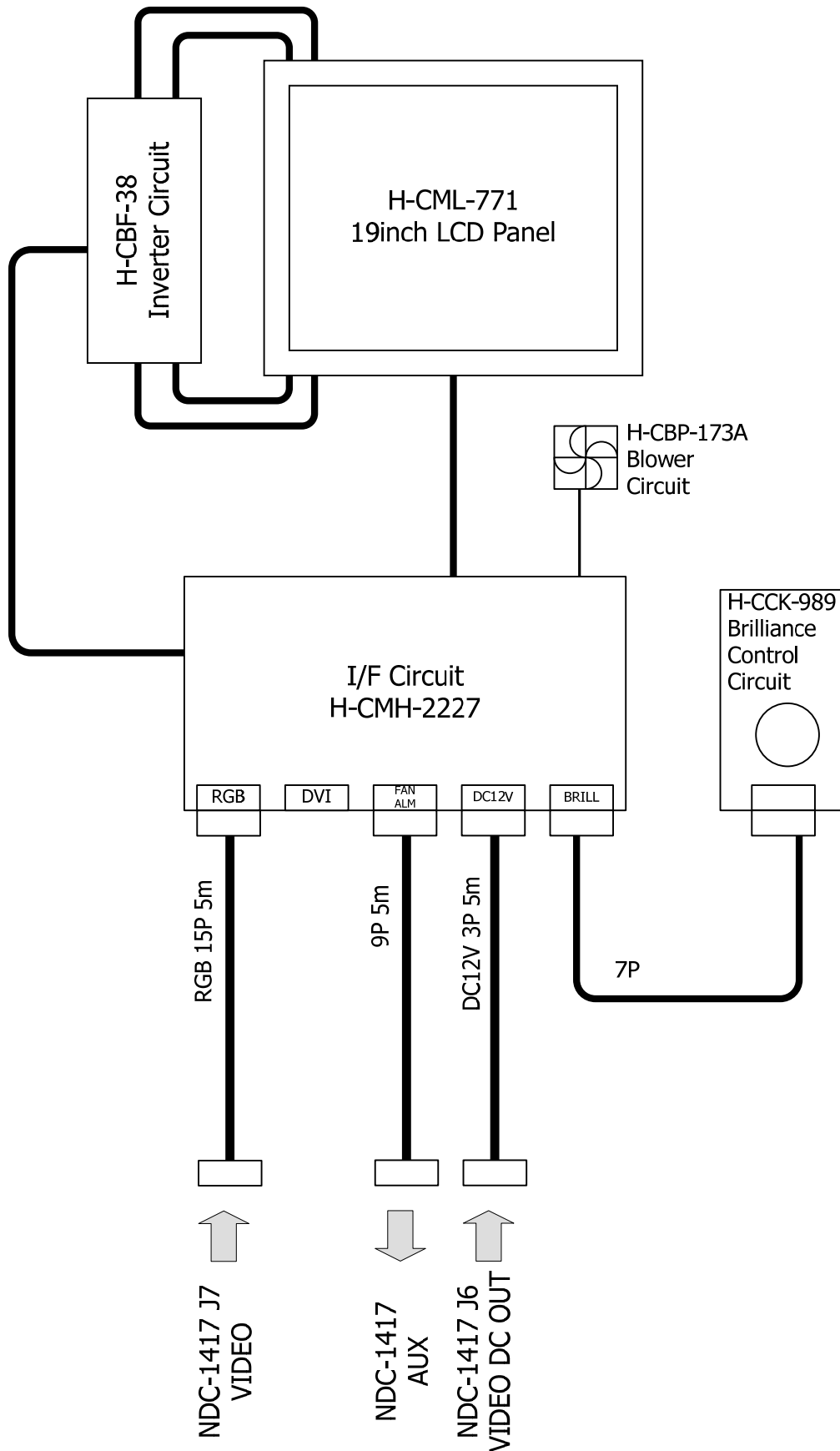
Fig.9 Internal Connection Diagram of NDC-1417 RADAR PROCESS UNIT



付図 10 NQA-2123 入出力部機内接続図
 Fig.10 Internal Connection Diagram of NQA-2123 INTERFACE UNIT

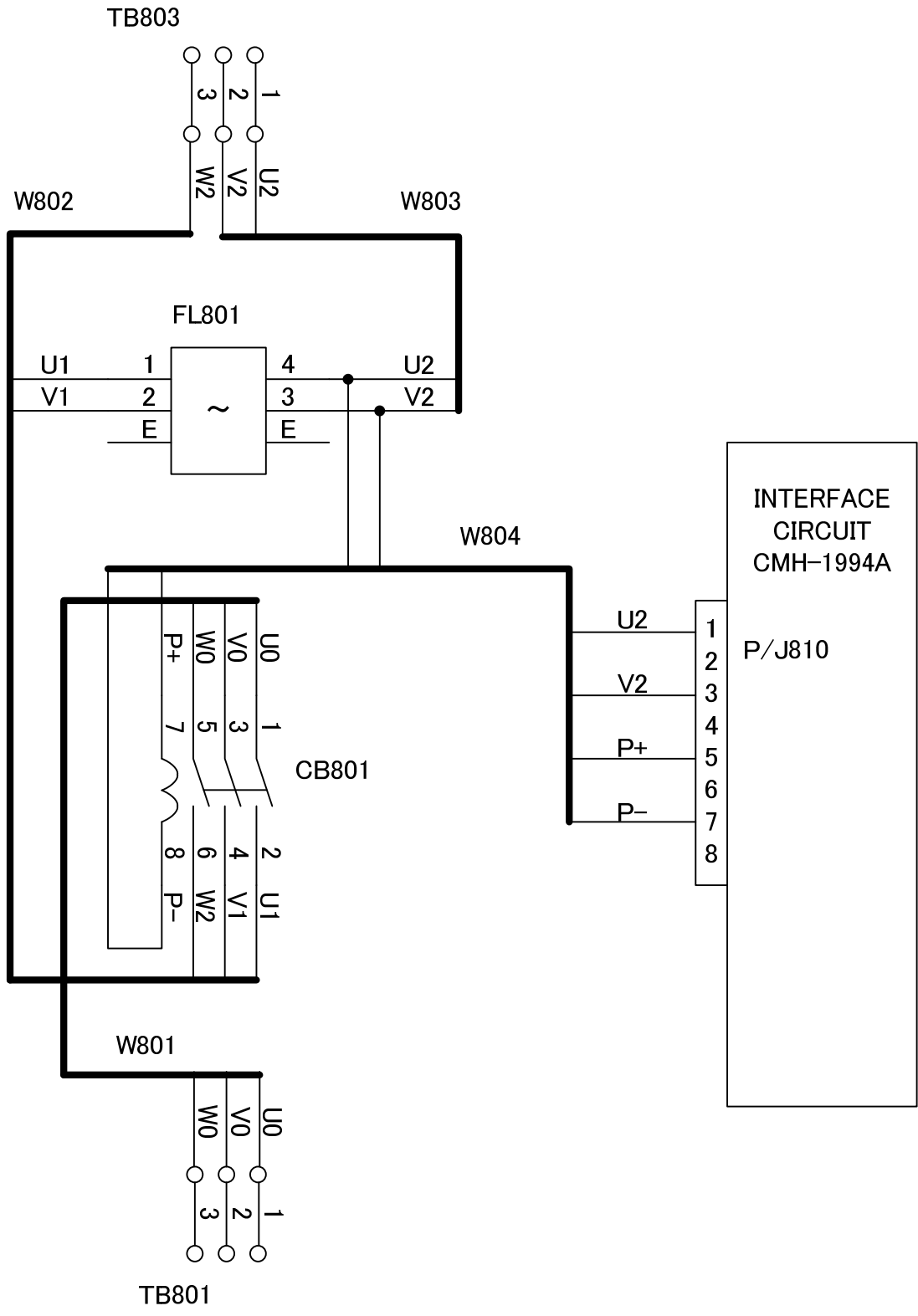


付図 11 NCE-5171 操作部機内接続図
 Fig.11 Internal Connection Diagram of NCE-5171 OPERATION UNIT



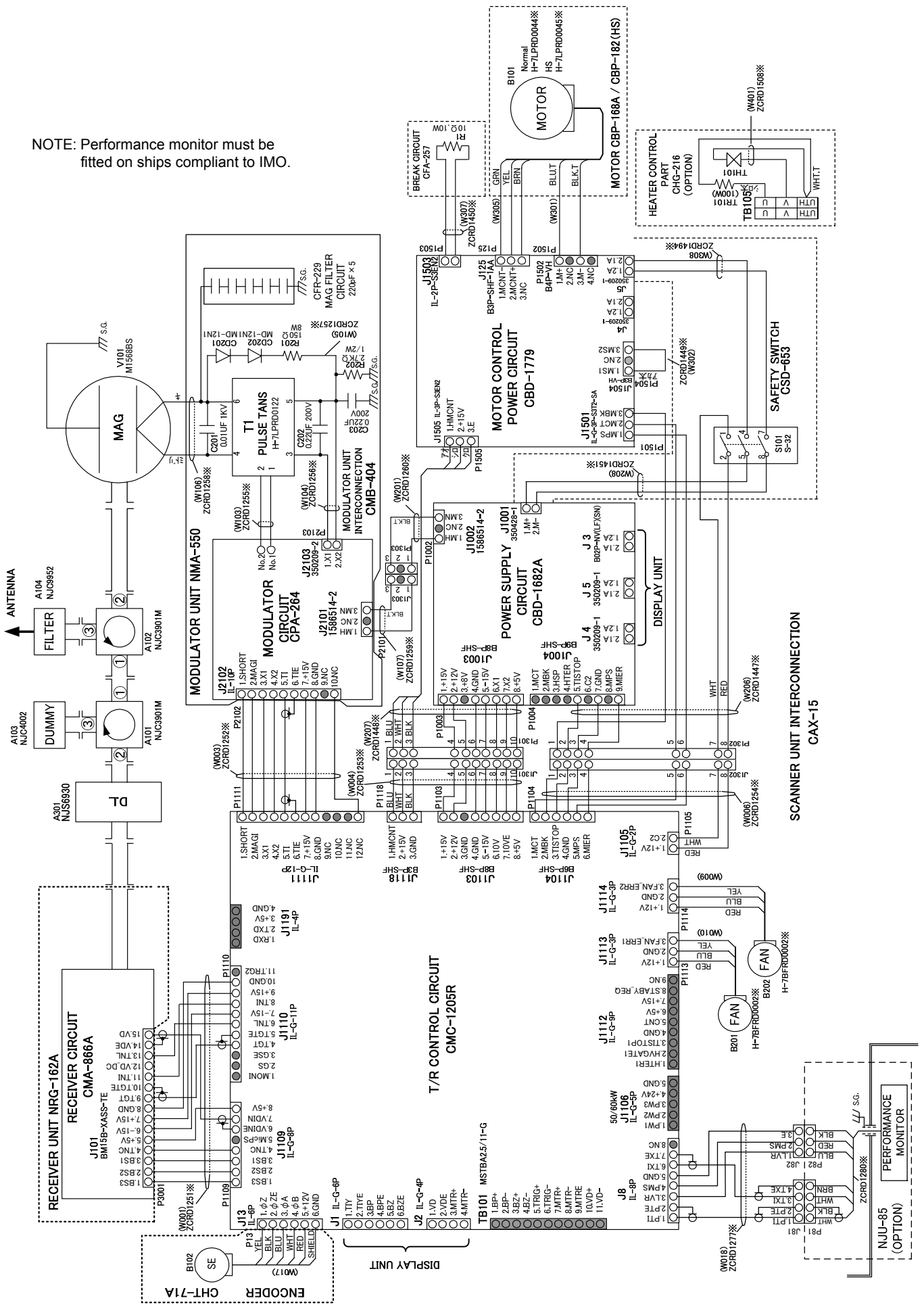
付図 12 NWZ-173 表示部機内接続図

Fig.12 Internal Connection Diagram of NWZ-173 LCD MONITOR



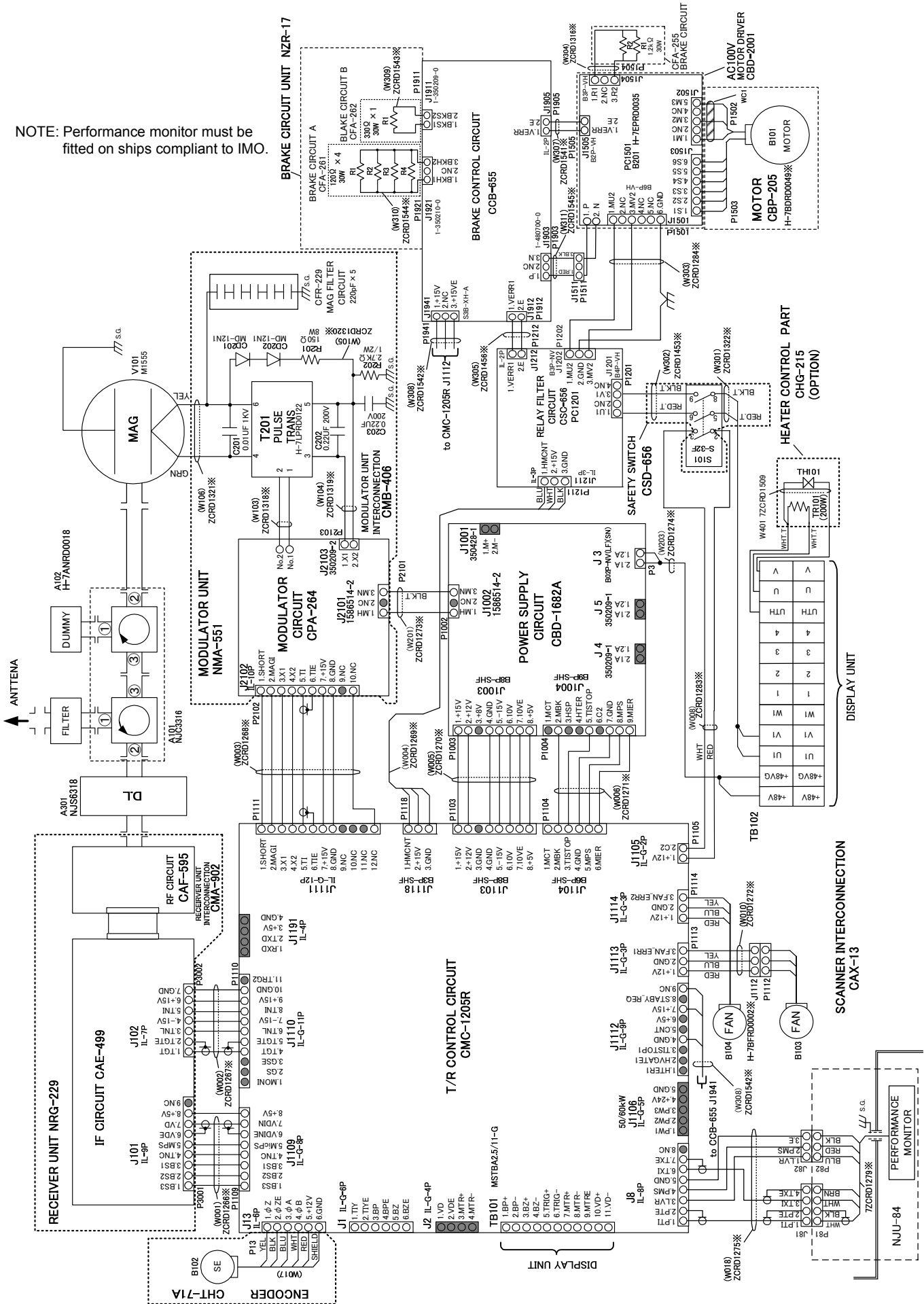
付図 13 NQE-3151A 接続箱機内接続図 (JMA-5332-12)
 Fig.13 Internal Connection Diagram of NQE-3151A JUNCTION BOX (JMA-5332-12)

NOTE: Performance monitor must be fitted on ships compliant to IMO.



付図 15 NKE-2254 空中線機内接続図 (JMA-5322-7/9/6HS)
 Fig.15 Internal Connection Diagram of NKE-2254 SCANNER UNIT (JMA-5322-7/9/6HS)

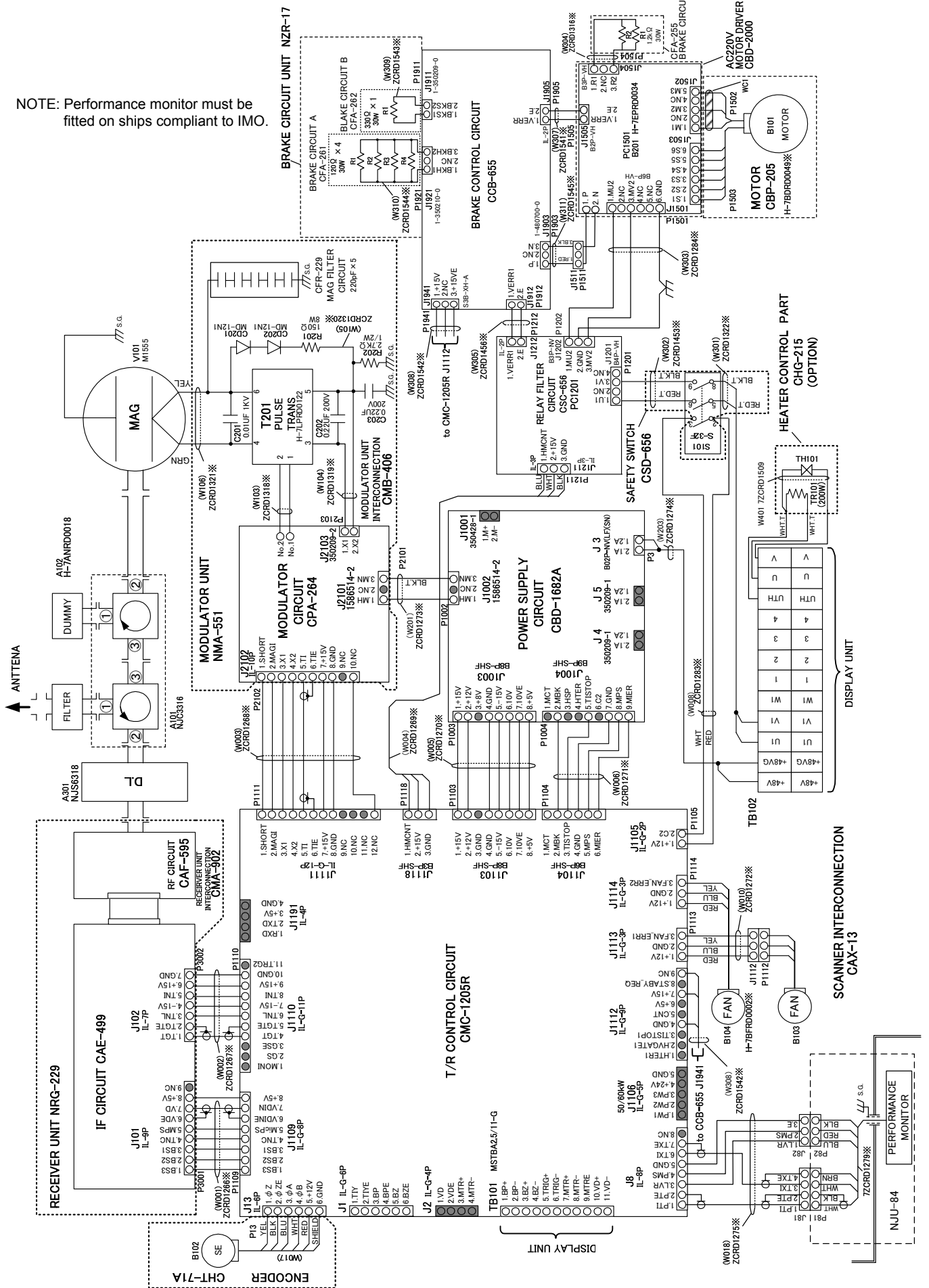
NOTE: Performance monitor must be fitted on ships compliant to IMO.



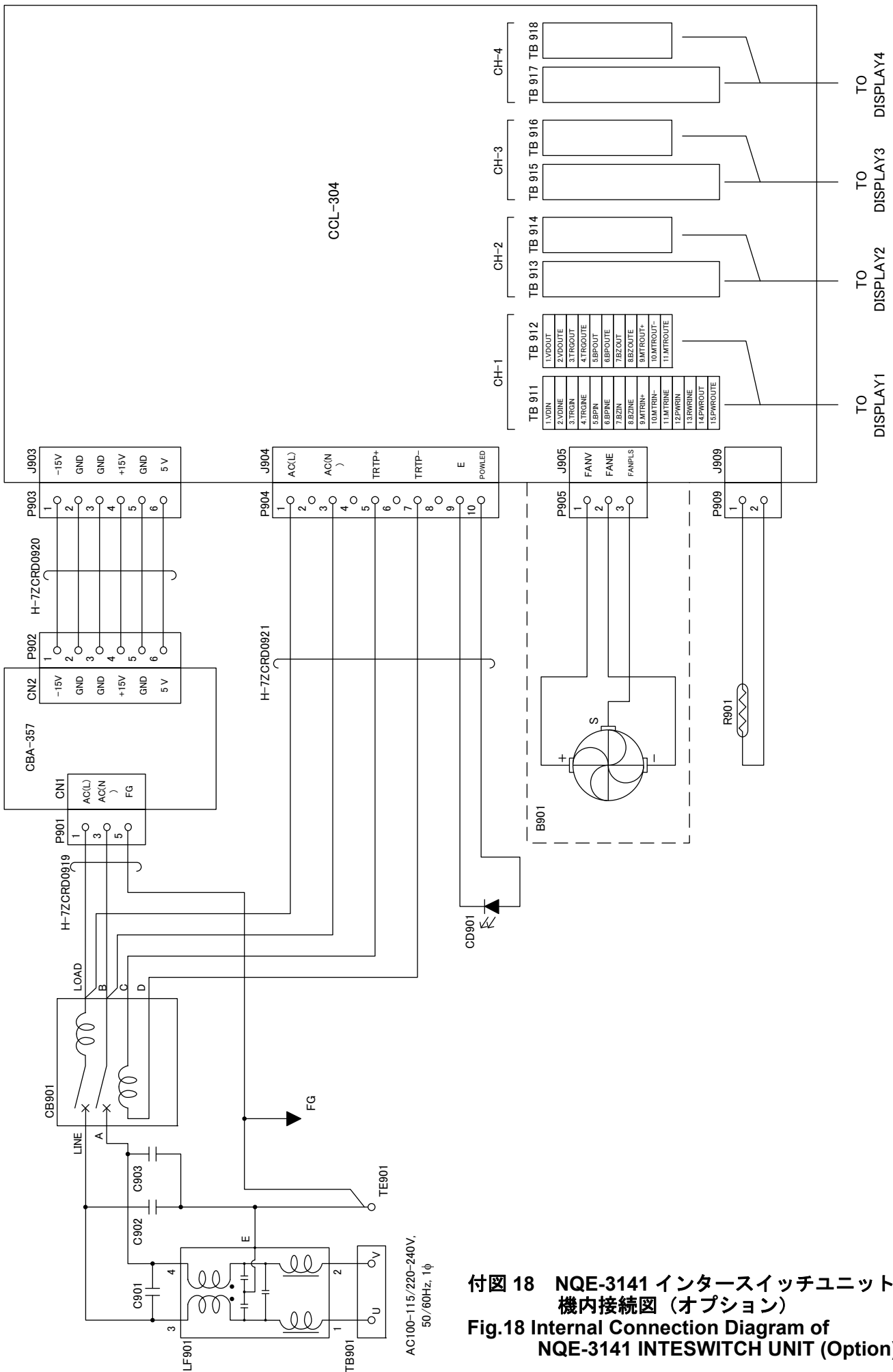
付図 16 NKE-1130 空中線機内接続図 (AC100-115V) (JMA-5332-12)

Fig.16 Internal Connection Diagram of NKE-1130 SCANNER UNIT (AC100-115V) (JMA-5332-12)

NOTE: Performance monitor must be fitted on ships compliant to IMO.



付図 17 NKE-1130 空中線機内接続図 (AC220-240V) (JMA-5332-12)
 Fig.17 Internal Connection Diagram of NKE-1130 SCANNER UNIT (AC220-240V) (JMA-5332-12)



付図 18 NQE-3141 インタースイッチユニット
機内接続図 (オプション)
Fig.18 Internal Connection Diagram of
NQE-3141 INTESWITCH UNIT (Option)

付図19 レーダーメニュー階層
Fig.19 Over View of RADAR Menu

MAIN MENU(RADAR MENU key)

1 RADAR Trails Setting

- 1 Trails Mode
- 2 Trails Reference Level
- 3 Trails Reduction
- 5 Trails Process
- 6 Max Interval
- 7 Trails Erase

- Section 3.8.2
- Section 3.8.2
- Section 3.8.2
- Section 3.8.2
- Section 3.8.2

- 1 Trails Erase Mode
- 2 Trails Erase Start
- 3 Eraser Size

- Section 3.4.9
- Section 3.4.9
- Section 3.4.9

8 File Operations

- 1 Select Card Slot
- 2 Load
- 3 Save
- 4 Erase

- Section 3.4.10
- Section 3.4.10
- Section 3.4.10
- Section 3.4.10

2 Map Setting

- 1 Fill Land Area
- 2 C-MAP Setting

→ Section 3.12.4

- 1 LAT/LON Line Display
- 2 Depth Display
- 3 Depth Unit
- 4 Light Sectors Display
- 5 Light Sectors Level
- 6 Chart Boundary
- 7 Buoy&Beacon
- 8 Names
- 9 Next

- Section 3.12.6
- Section 3.12.6
- Section 3.12.6
- Section 3.12.6
- Section 3.12.6
- Section 3.12.6
- Section 3.12.6
- Section 3.12.6

- 1 Land Marks
- 2 River&Lake
- 3 Cultural
- 4 Bottom Type
- 5 Under Water
- 6 Depth Contour

- Section 3.12.6
- Section 3.12.6
- Section 3.12.6
- Section 3.12.6
- Section 3.12.6
- Section 3.12.6

3 JRC/ERC Setting

- 1 Day/Night
- 2 Color of Land
- 3 Bright of Land
- 4 Color of Sea
- 5 Bright of Sea
- 6 Color of Name
- 7 Bright of Name
- 8 Bright of Track/Mark/Line
- 9 Next

- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5

- 1 LAT/LON Line
- 2 Color of L/L Line
- 3 Bright of L/L Line
- 4 ERC Display Request
- 5 ERC Mark
- 6 JRC ROM Card Display

- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5

- 1 Lighthouse
- 2 Buoy
- 3 Rough Line
- 4 Other Line

- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5

- 7 Copy JRC ROM Card to CF
- 8 Fishing Area Display

- Section 3.12.3

4 Contour Setting

- 1 10m
- 2 20m
- 3 30m
- 4 40m
- 5 50m
- 6 60m
- 7 70m
- 8 80m
- 9 Other

- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5
- Section 3.12.5

5 Map Display Setting

- 1 Shift Coast Line 1
- 2 Shift Coast Line 2
- 3 LAT/LON Correction
- 4 Map Center Position

- Section 3.12.7
- Section 3.12.7
- Section 3.12.7
- Section 3.12.7

- 5 LORAN C Correction

- 1 Chain
- 2 TD1
- 3 TD2
- 4 TD1 Correction
- 5 TD2 Correction

- 6 LORAN A Correction

- 1 LOP1
- 2 LOP2
- 3 TD1 Correction
- 4 TD2 Correction

- 7 DECCA Correction

- 1 Chain
- 2 LOP1
- 3 LOP2
- 4 LOP1 Correction
- 5 LOP2 Correction

- 6 SEL JRC ROM Card File
- 7 Map Draw AZI Mode
- 8 JRC Card Draw Mode

- Section 3.12.3
- Section 3.12.8
- Section 3.12.5

With PLOTTER Unit (option)

MAIN MENU(RADAR MENU key)

- 3 TOOL Menu
- 4 TARGET TRACK Setting (T.TRK)

- 1 PI Menu
- 2 Rectangle Cursor
- 3 EBL Maneuver Setting
- 4 Trial Maneuver

- 1 Display for All Lines → Section 4.1.5
- 2 Operation Mode → Section 4.1.5
- 3 Control → Section 4.1.5
- 4 Floating → Section 4.1.5
- 5 Heading Link → Section 4.1.5
- 6 Next
- PI Bearing Interval
- 8 Press EBL Dial to Control PI#
- 9 Press VRM Dial to Move End Point#

Displayed only when "Control" is Individual.

The setting items are determined by the setting of Operation Mode

All :
Individual :
Track :
Equiangular :

- 1 Range Scale Link → Section 4.1.5
- 2 Reference Bearing → Section 4.1.5
- 3 Operation Area → Section 4.1.5
- 4 Display for Individual Line
- PI Bearing Interval
- 8 Press EBL Dial to Control PI#
- 9 Press VRM Dial to Move End Point#

- 1 Index Line 1 → Section 4.1.5
- 2 Index Line 2 → Section 4.1.5
- 3 Index Line 3 → Section 4.1.5
- 4 Index Line 4 → Section 4.1.5
- 5 Index Line 5 → Section 4.1.5
- 6 Index Line 6 → Section 4.1.5
- 7 Index Line 7 → Section 4.1.5
- 8 Index Line 8 → Section 4.1.5

The setting items are determined by the setting of Operation Mode

All :
Individual :
Track :
Equiangular :

Displayed only when "Control" is Individual.

- 1 Rectangle Cursor Display
- 2 Make Rectangle Cursor
- 3 Ent
- 4 Unit of Distance

- 1 EBL Maneuver → Section 4.1.6
- 2 Reach → Section 4.1.6
- 3 Turn Mode → Section 4.1.6
- 4 Turn Set → Section 4.1.6

- 1 Trial Function → Section 5.7
- 2 Course(EBL) → Section 5.7
- 3 Speed(VRM) → Section 5.7
- 4 Vector Time → Section 5.7
- 5 Time to Maneuver → Section 5.7
- 6 Own Ship's Dynamic Trait

- 1 Reach → Section 5.7
- 2 Turn Radius → Section 5.7
- 3 Acceleration → Section 5.7
- 4 Deceleration → Section 5.7

- 1 Target Track Function → Section 5.6.2
- 2 Target Track Color
- 3 Target Track Display
- 4 Track Memory Interval → Section 5.6.2
- 5 Clear Track Color → Section 5.6.2
- 6 Clear Track Number → Section 5.6.2
- 7 File Operations

- 1 All → Section 5.6.2
- 2 Target Track No.1 → Section 5.6.2
- 3 Target Track No.2 → Section 5.6.2
- 4 Target Track No.3 → Section 5.6.2
- 5 Target Track No.4 → Section 5.6.2
- 6 Target Track No.5 → Section 5.6.2
- 7 Target Track No.6 → Section 5.6.2
- 8 Target Track No.7 → Section 5.6.2
- 9 Next

- 1 Target Track No.8 → Section 5.6.2
- 2 Target Track No.9 → Section 5.6.2
- 3 Target Track No.10 → Section 5.6.2
- 4 Other → Section 5.6.2

- 1 All → Section 5.6.2
- 2 Target Track No.1 → Section 5.6.2
- 3 Target Track No.2 → Section 5.6.2
- 4 Target Track No.3 → Section 5.6.2
- 5 Target Track No.4 → Section 5.6.2
- 6 Target Track No.5 → Section 5.6.2
- 7 Target Track No.6 → Section 5.6.2
- 8 Target Track No.7 → Section 5.6.2
- 9 Next

- 1 Target Track No.8 → Section 5.6.2
- 2 Target Track No.9 → Section 5.6.2
- 3 Target Track No.10 → Section 5.6.2
- 4 Other → Section 5.6.2

- 1 Select Card Slot → Section 5.6.2
- 2 Load Mode → Section 5.6.2
- 3 Load → Section 5.6.2
- 4 Save → Section 5.6.2
- 5 Erase → Section 5.6.2
- 6 Card T.TRK Display → Section 5.6.2

MAIN MENU(RADAR MENU key)

5 AZ Menu

- 1 AZ 1
- 2 AZ 2
- 3 Make AZ

- 4 RADAR Alarm

- 5 Set AZ Key

→ Section 5.2.1

→ Section 5.2.1

- 1 Make AZ 1
- 2 Make AZ 2
- 3 ENT

→ Section 5.2.1

→ Section 5.2.1

- 1 Sector RADAR Alarm

- 3 Make Sector Alarm

- 5 RADAR Alarm Mode
- 6 Sensitivity Level

- 1 Sector Alarm 1
- 2 Sector Alarm 2

→ Section 3.4.24

→ Section 3.4.24

- 1 Sector Alarm 1
- 2 Sector Alarm 2
- 3 ENT

→ Section 3.4.24

→ Section 3.4.24

→ Section 3.4.19

→ Section 3.4.19

- 1 AZ

- 2 Sector RADAR Alarm

- 1 AZ 1
- 2 AZ 2

→ Section 5.2.1

→ Section 5.2.1

- 1 Sector Alarm 1
- 2 Sector Alarm 2

→ Section 3.4.24

→ Section 3.4.24

6 Own Track Menu
(O.TRK)

- 1 DISP Own Track
- 1 DISP Own Track Color

- 2 Clear Own Track
- 2 Clear Own Track Color
- 3 Track Type
- 4 Num/Vector Display
- 5 File Operations

- 6 Water Depth Setting

- 7 Water TEMP. Setting

- 8 Current Setting

→ Section 3.5.1

- 1 All
- 2 White
- 3 Cyan
- 4 Blue
- 5 Green
- 6 Yellow
- 7 Pink
- 8 Red

→ Section 3.5.4

→ Section 3.5.4

- 1 Select Card Slot
- 2 Load Mode
- 3 Load
- 4 Save
- 5 Erase
- 6 Card Own Track Display

→ Section 3.5.5

→ Section 3.5.5

→ Section 3.5.5

→ Section 3.5.5

→ Section 3.5.5

→ Section 3.5.5

- 1 Depth setting (MIN)
- 2 Depth setting
- 3 Depth setting
- 4 Depth setting
- 5 Depth setting
- 6 Depth setting (MAX)

- 1 Temperature setting (MIN)
- 2 Temperature setting
- 3 Temperature setting
- 4 Temperature setting
- 5 Temperature setting
- 6 Temperature setting (MAX)

- 1 Current Size
- 2 Layer A
- 3 Layer B
- 4 Layer C

7 PLOT Menu

1 Mark Setting

1 Display Mark Type

- 1 All → Section 3.6.2
- 2 ○ → Section 3.6.2
- 3 △ → Section 3.6.2
- 4 ▽ → Section 3.6.2
- 5 □ → Section 3.6.2
- 6 ◇ → Section 3.6.2
- 7 wreck (mark) → Section 3.6.2
- 8 △△ → Section 3.6.2
- 9 Next

- 1 ▽▽ → Section 3.6.2
- 2 △▽ → Section 3.6.2
- 3 ▽△ → Section 3.6.2
- 4 + → Section 3.6.2
- 5 × → Section 3.6.2
- 6 Y → Section 3.6.2
- 7 hand drum (mark) → Section 3.6.2
- 8 light house (mark) → Section 3.6.2
- 9 Next

- 1 trapezoid(mark) → Section 3.6.2
- 2 filled trapezoid(mark) → Section 3.6.2
- 3 hat(mark) → Section 3.6.2
- 4 ●● → Section 3.6.2
- 5 ● → Section 3.6.2
- 6 filled triangle(mark) → Section 3.6.2
- 7 ! → Section 3.6.2
- 8 anchor(mark) → Section 3.6.2
- 9 Next

- 1 slash-anchor(mark) → Section 3.6.2
- 2 circle-dotted line(mark) → Section 3.6.2
- 3 non-dangerous wreck(mark) → Section 3.6.2
- 4 ◎ → Section 3.6.2
- 5 mariner's event mark(mark) → Section 3.6.2
- 6 · → Section 3.6.2
- 7 wavy line (mark) → Section 3.6.2
- 8 solid line (mark) → Section 3.6.2
- 9 Next

- 1 dashed-dotted line (mark) → Section 3.6.2

2 Display Mark Color

- 1 All → Section 3.6.2
- 2 White → Section 3.6.2
- 3 Cyan → Section 3.6.2
- 4 Blue → Section 3.6.2
- 5 Green → Section 3.6.2
- 6 Yellow → Section 3.6.2
- 7 Pink → Section 3.6.2
- 8 Red → Section 3.6.2

3 File Operations

- 1 Select Card Slot → Section 3.6.6
- 2 Load Mode → Section 3.6.6
- 3 Load → Section 3.6.6
- 4 Unload → Section 3.6.6
- 5 Save → Section 3.6.6
- 6 Erase → Section 3.6.6
- 7 Card Mark Display → Section 3.6.6

- 4 Select Mark Size → Section 3.6.2
- 5 Comment Font Size → Section 3.6.2

2 Mark Operations

1 Own Ship Position
2 Edit User Map

→ Section 3.6.3

- 1 Make with Cursor → Section 3.6.1
- 2 Make with L/L → Section 3.6.1
- 3 Move → Section 3.6.3
- 4 Delete → Section 3.6.3
- 5 Insert/Move Vertex → Section 3.6.3
- 6 Delete Vertex → Section 3.6.3
- 7 Delete by Type by Color → Section 3.6.3

- 1 Type → Section 3.6.1
- 2 Color → Section 3.6.1

- 1 Type → Section 3.6.1
- 2 Color → Section 3.6.1
- 3 L/L → Section 3.6.1
- 4 Comment → Section 3.6.1
- 5 Enter → Section 3.6.1
- 9 New Line Input → Section 3.6.1

New Mark Input ⇄

- 3 Shift → Section 3.6.5
- 4 Shift Clear → Section 3.6.5
- 5 Mark/Line Entry → Section 3.6.4
- 6 Mark/Line List → Section 3.6.4
- 7 Geodetic → Section 3.6.7

MAIN MENU(RADAR MENU key)

- 7 PLOT Menu
- 9 Next

- 3 WPT/Route Setting (Route Type : Plotter)
- 4 WPT/Route Operation
- 5 Clear Memory
- 6 Plot Setting
- 7 NMEA Waypoint Display

- 1 Waypoint Alarm
- 2 Route Alarm
- 3 Set Route Sequence
- 4 Select Route
- 5 Waypoint Entry
- 6 Waypoint Input
- 7 Save Temporary Route
- 8 Cross Track Limit Line
- 9 Next

→ Section 3.7.2

- 1 Select WPT Mark Size
- 2 Waypoint Vector
- 3 Status of Origin/DEST
- 4 WPT Number Display
- 5 RTE Number Display

- 1 Route Sequence
- 2 Waypoint Switch Mode
- 3 Waypoint Skip
- 4 Waypoint Back Skip
- 5 Set/Cancel Waypoint

- 1 Clear Mark/Line Data
- 2 Clear WPT/Route Data

→ Section 3.6.2

- 1 Scale/Course Up Setup
- 2 Current Position Display
- 3 Cursor Vector DISP
- 4 Cursor HL Length
- 5 Scalebar Display
- 6 AUTO Backup

- 1 Scale
- 2 Preset Scale
- 3 Course Up Data

- 1 Tolerance
- 2 Averaging
- 3 Round Speed

→ Section 3.7.1

Press RADAR MENU again

- 1 File Manager
- 2 RADAR Menu

- 1 Process Setting

→ Section 3.11.1

- 1 Video Latitude
- 2 Video Noise Rejection
- 3 AUTO Dynamic Range
- 4 Process Switch
- 5 2nd Process Mode
- 6 Process Switch Range
- 7 Fast Target Detection
- 8 User Function Setting

→ Section 3.8.1

- 1 Function1 Setting

- 1 Mode
- 2 IR
- 3 Process
- 4 Target Enhance
- 5 AUTO Sea/Rain
- 6 Save Present State
- 9 Next

→ Section 3.9.3

- 1 Pulse Length 0.75nm
- 2 Pulse Length 1.5nm
- 3 Pulse Length 3/4nm
- 4 Pulse Length 6/8nm
- 5 Pulse Length 12nm
- 6 Pulse Length 16nm
- 9 Next

→ Section 3.9.3

- 1 Video Latitude
- 2 Video Noise Rejection
- 3 AUTO Dynamic Range
- 4 Process Switch
- 5 2nd Process Mode
- 6 Process Switch Range
- 7 Fast Target Detection
- 9 Next

→ Section 3.9.3

- 1 Trails Interval
- 2 Trails Mode
- 3 Trails Reference Level
- 4 Trails Reduction
- 5 Time/All Combine
- 6 Trails Process
- 7 Max Interval
- 9 Next

→ Section 3.9.3

- 1 Gain Offset
- 2 PRF
- 3 Small Buoy Detection
- 4 Fishnet Detection
- 5 Antenna Height
- 8 Set Mode Default
- 9 Initialize

→ Section 3.9.3

- 2 Function2 Setting
- 3 Function3 Setting
- 4 Function4 Setting

→ Section 3.9.3

9 SART

→ Section 6.5

MAIN MENU(RADAR MENU key)

-> Press RADAR MENU again

2 RADAR Menu	3 TXRX Setting	1 PRF Fine Tuning	→ Section 3.8.3	
		2 Stagger Trigger	→ Section 3.8.3	
		4 PRF	→ Section 3.8.3	
		5 Ice Class Standby Mode	→ Section 3.8.3	
	3 Multi Window Setting	1 DIR/DIST EXP Display	→ Section 3.8.8	
		2 Numeric NAV INFO	→ Section 3.8.8	
3 Depth Graph Setting		1 Depth Graph Display	→ Section 3.8.8	
		2 Depth Range	→ Section 3.8.8	
		3 Time Range	→ Section 3.8.8	
		4 Depth Unit	→ Section 3.8.8	
	4 Wind Graph	1 Wind Graph Display	→ Section 3.8.8	
		2 Wind Speed Unit	→ Section 3.8.8	
	5 TEMP Graph Setting	1 TEMP Graph Display	→ Section 3.8.8	
		2 TEMP Graph Color	→ Section 3.8.8	
		3 TEMP Range	→ Section 3.8.8	
		1 Temperature setting (MIN)	→ Section 3.8.8	
		2 Temperature setting	→ Section 3.8.8	
		3 Temperature setting	→ Section 3.8.8	
		4 Temperature setting	→ Section 3.8.8	
		5 Temperature setting	→ Section 3.8.8	
		6 Temperature setting (MAX)	→ Section 3.8.8	
		4 Time Range	→ Section 3.8.8	
	6 Course Bar Setting	1 Course Bar Display	→ Section 3.8.8	
		2 Autopilot Course	→ Section 3.8.8	
		3 ROT Scale	→ Section 3.8.8	
4 NAV Equipment Setting	1 GYRO Setting	→ Section 3.4.16 → Section 7.1.7		
	2 MAG Compass Setting	1 Heading Correction	→ Section 3.4.18	
		2 Correct Value	→ Section 3.4.18	
	3 Set/Drift Setting	1 Correction	→ Section 3.4.19	
		2 Set	→ Section 3.4.19	
		3 Drift	→ Section 3.4.19	
	4 GPS Setting	1 GPS Process Setting	1 Position	→ Section 3.4.20
			2 Exclusion	→ Section 3.4.20
			3 Geodetic	→ Section 3.4.20
			4 Antenna Height	→ Section 3.4.20
			5 Fix Mode	→ Section 3.4.20
			6 DOP Level	→ Section 3.4.20
7 Position Average			→ Section 3.4.20	
8 Master Reset			→ Section 3.4.20	
9 Send Data			→ Section 3.4.20	
2 DGPS Setting		1 Mode	→ Section 3.4.21	
		2 Frequency	→ Section 3.4.21	
		3 Baud Rate(BPS)	→ Section 3.4.21	
	4 DGPS Mode	→ Section 3.4.21		
	5 Send Data	→ Section 3.4.21		
3 SBAS Setting	1 Mode	→ Section 3.4.22		
	2 Ranging	→ Section 3.4.22		
	3 NG SBAS	→ Section 3.4.22		
	4 SBAS Select Mode	→ Section 3.4.22		
	5 SBAS No.	→ Section 3.4.22		
	6 Send Data	→ Section 3.4.22		
4 GPS Status	→ Section 3.4.23			
5 Weather INFO Setting	1 Display Weather INFO			
	2 SEL Observation Place			
	3 RX Message Display			
	4 RX Buzzer			
6 RX Port	1 Heading	→ Section 3.14.1		
	2 Speed	→ Section 3.14.1		
	3 AIS	→ Section 3.14.1		
	4 GPS	→ Section 3.14.1		
	5 DLOG	→ Section 3.14.1		
	6 Alarm	→ Section 3.14.1		
	7 Depth	→ Section 3.14.1		
	8 Temperature	→ Section 3.14.1		
	9 NEXT			
		1 Wind	→ Section 3.14.1	
	2 Current	→ Section 3.14.1		
	3 ROT	→ Section 3.14.1		
	4 RSA	→ Section 3.14.1		
	5 Time Zone	→ Section 3.14.1		

MAIN MENU(RADAR MENU key)

-> Press RADAR MENU again

5 Sub Menu	1 Display Color Setting	<ul style="list-style-type: none"> 1 Day/Night → Section 3.8.5 2 Outer PPI → Section 3.8.5 3 Inner PPI → Section 3.8.5 4 Character → Section 3.8.5 5 RADAR Video → Section 3.8.5 6 RADAR Trails(Time) → Section 3.8.5 7 RADAR Trails(All) → Section 3.8.5 8 Target Symbol → Section 3.8.5 9 Next → Section 3.8.5
		<ul style="list-style-type: none"> 1 Cursor → Section 3.8.5 2 Range Rings → Section 3.8.5 3 EBL/VRM/PI → Section 3.8.5 4 Own Symbol/HL/Vector → Section 3.8.5
	2 Brilliance Setting	<ul style="list-style-type: none"> 1 RADAR Video → Section 3.8.5 2 RADAR Trails → Section 3.8.5 3 Target Symbol → Section 3.8.5 4 Range Rings → Section 3.8.5 5 EBL/VRM/PI → Section 3.8.5 6 Character → Section 3.8.5 7 Own Symbol/HL/Vector → Section 3.8.5 8 Keyboard → Section 3.8.5
	3 User Setting	<ul style="list-style-type: none"> 1 Load User Setting → Section 3.10.2 2 Save User Setting → Section 3.10.1 3 Delete User Setting → Section 3.10.3
	4 User Key Setting	<ul style="list-style-type: none"> 1 User Key 1 → Section 3.8.7 2 User Key 2 → Section 3.8.7
	5 Buzzer Volume	<ul style="list-style-type: none"> 1 Key ACK → Section 3.8.6 2 OPE Miss → Section 3.8.6 3 CPA/TCPA Alarm → Section 3.8.6 4 New Target Alarm → Section 3.8.6 5 Lost Alarm → Section 3.8.6 6 Navigation Alarm → Section 3.8.6 7 System Alarm → Section 3.8.6 8 Inter Switch → Section 3.8.6
	6 Date/Time Setting	<ul style="list-style-type: none"> 1 UTC/LMT → Section 7.2.7 2 LMT Date → Section 7.2.7 3 LMT Time → Section 7.2.7 4 Time Zone → Section 7.2.7 5 Display Style → Section 7.2.7 6 Synchronize with GPS → Section 7.2.7
	7 Screen Capture Setting	<ul style="list-style-type: none"> 1 Select Item <ul style="list-style-type: none"> 1 Graphic → Section 3.13.4 2 RADAR Video → Section 3.13.4 3 RADAR Trails → Section 3.13.4 4 Chart → Section 3.13.4 2 Select Card Slot → Section 3.13 3 File Erase → Section 3.13.3 4 AUTO Capture Interval → Section 3.13.2 5 AUTO File Erase → Section 3.13.2
	9 EBL/Cursor Setting	<ul style="list-style-type: none"> 1 EBL1 Bearing Fix → Section 4.1.3 2 EBL2 Bearing Fix → Section 4.1.3 3 Cursor Setting <ul style="list-style-type: none"> 1 EBL/VRM Control CURS → Section 3.8.4 2 Cursor Length → Section 3.8.4 4 Cursor Pattern → Section 3.8.4
	6 TT Menu	1 Association Setting
3 Trial Maneuver		<ul style="list-style-type: none"> 1 Trial Function → Section 5.7 2 Course(EBL) → Section 5.7 3 Speed(VRM) → Section 5.7 4 Vector Time → Section 5.7 5 Time to Maneuver → Section 5.7 6 Own Ship's Dynamic Trait <ul style="list-style-type: none"> 1 Reach → Section 5.7 2 Turn Radius → Section 5.7 3 Acceleration → Section 5.7 4 Deceleration → Section 5.7
4 Target Number Display		→ Section 5.2.4
9 TT Test Menu		<ul style="list-style-type: none"> 1 Test Video → Section 5.2.7 2 TT Simulator → Section 5.2.7 3 Status → Section 5.2.7 4 Gate Display → Section 5.2.7

MAIN MENU(RADAR MENU key)

-> Press RADAR MENU again

7 AIS Menu	1 Association Setting	1 Association	→ Section 5.4
		2 Priority	→ Section 5.4
		3 Bearing	→ Section 5.4
		4 Range	→ Section 5.4
		5 Course	→ Section 5.4
		6 Speed	→ Section 5.4
		7 Applicable AIS Target	→ Section 5.4
	3 Trial Maneuver	1 Trial Function	→ Section 5.7
		2 Course(EBL)	→ Section 5.7
	3 Speed(VRM)	→ Section 5.7	
	4 Vector Time	→ Section 5.7	
	5 Time to Maneuver	→ Section 5.7	
	6 Own Ship's Dynamic Trait	1 Reach → Section 5.7	
		2 Turn Radius → Section 5.7	
		3 Acceleration → Section 5.7	
		4 Deceleration → Section 5.7	
4 AIS Filter Setting	1 Filter Type	→ Section 5.3.7	
	2 Make AIS Filter	→ Section 5.3.7	
	3 Filter Display	→ Section 5.3.7	
	4 ENT		
	6 Filter Mode	→ Section 5.3.7	
5 Target Number Display	→ Section 5.3.6		
6 AIS Alarm Setting	1 Lost Alarm	→ Section 5.3.9	
	2 CPA/TCPA Alarm	→ Section 5.3.9	
7 Message	1 Addressed Message	→ Section 5.3.5	
	2 Broadcast Message	→ Section 5.3.5	
8 Display Lost TGT Data	→ Section 5.3.5		
9 Own Ship's AIS Data	→ Section 5.3.5		
8 Multi Dial Setting	1 Vector Time	→ Section 3.3.6	
	2 Trails Length	→ Section 3.3.6	
	3 TT Display No.	→ Section 3.3.6	
	4 C-UP Angle	→ Section 3.3.6	
	5 Own Track Color	→ Section 3.3.6	
	6 Mark/Line Color	→ Section 3.3.6	
	7 Manual Tune	→ Section 3.3.6	
9 Test Menu	1 Self Test	1 Memory Test	1 SDRAM → Section 8.3.1
			2 SRAM → Section 8.3.1
			3 FLASH ROM → Section 8.3.1
			4 GRAPHIC → Section 8.3.1
		2 TXRX Test	→ Section 8.3.1
		3 Line Test	→ Section 8.3.1
		4 Supply Voltage	→ Section 8.3.1
	2 Monitor Test	1 Pattern 1	→ Section 8.3.1
		2 Pattern 2	→ Section 8.3.1
		3 Pattern 3	→ Section 8.3.1
		4 Pattern 4	→ Section 8.3.1
		5 Pattern 5	→ Section 8.3.1
		6 Pattern 6	→ Section 8.3.1
	7 Pattern 7	→ Section 8.3.1	
	8 Pattern 8	→ Section 8.3.1	
3 Keyboard Test	1 Key Test	→ Section 8.3.1	
	2 Buzzer Test	→ Section 8.3.1	
	3 Light Test	→ Section 8.3.1	
4 MON Display	→ Section 8.3.1		
5 System Alarm Log	→ Section 8.3.1		
6 System Information	→ Section 8.3.1		
0 EXIT			

Serviceman Menu

→ Section 7.1.1

2 Installation Menu

6 Alarm System

2 Relay Output

1 Relay Output Mode

→ Section 7.2.9

2 TT CPA/TCPA

→ Section 7.2.9

3 AIS CPA/TCPA

→ Section 7.2.9

4 New Target

→ Section 7.2.9

5 Lost

→ Section 7.2.9

6 RADAR Alarm

→ Section 7.2.9

3 ALR Output

1 System Alarm

→ Section 7.2.9

2 TT/AIS Alarm

→ Section 7.2.9

5 External ACK Setting

1 Critical Alarm

→ Section 7.2.9

1 Audio

→ Section 7.2.9

2 Indication

→ Section 7.2.9

3 Acknowledge State

→ Section 7.2.9

2 Normal Alarm

→ Section 7.2.9

1 Audio

→ Section 7.2.9

2 Indication

→ Section 7.2.9

3 Acknowledge State

→ Section 7.2.9

7 Inter Switch

1 ISW Install

2 Mask Setting

1 No.1 Connection

No.1 Master

2 No.2 Connection

No.2 Master

3 No.3 Connection

No.3 Master

4 No.4 Connection

No.4 Master

5 No.5 Connection

No.5 Master

6 No.6 Connection

No.6 Master

7 No.7 Connection

No.7 Master

8 No.8 Connection

No.8 Master

Only for ISW Extended Mode

3 S-ISW TXRX Power Supply

8 Language

→ Section 7.2.6

Serviceman Menu

2 Installation Menu

→ Section 7.1.1

9 Next

↓

- 1 Input BP Count
- 2 TNI Blank
- 3 Device Installation
- 4 Network
- 5 LAN Port Setting

→ Section 7.2.5

- 1 TNI Blank
- 2 Make Sector

→ Section 7.2.3
→ Section 7.2.3

→ Section 7.1.6

- 1 Gyro
- 2 Compass
- 3 GPS Compass
- 4 LOG
- 5 2AXW
- 6 2AXG
- 7 GPS

→ Section 7.1.6
→ Section 7.1.6
→ Section 7.1.6
→ Section 7.1.6
→ Section 7.1.6
→ Section 7.1.6
→ Section 7.1.6

→ Section 7.2.10

- 1 Network Function
- 2 IP Address
- 3 Sensor Priority
- 4 Synchronization

→ Section 7.2.10
→ Section 7.2.10
→ Section 7.2.10
→ Section 7.2.10

→ Section 7.2.11

- 1 TX Setting

→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11

↓

- 1 TTM(AIS)
- 2 TLL(AIS)
- 3 TTD(AIS)
- 4 TLB(AIS)

→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11

→ Section 7.2.11

- 2 RX Port

→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11

↓

- 1 Wind
- 2 Current
- 3 ROT
- 4 RSA
- 5 Time Zone
- 6 Date/Time

→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11

→ Section 7.2.11

- 3 RX Sentence

→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11

- 1 Data Set Number
- 2 Layer A
- 3 Layer B
- 4 Layer C

→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11
→ Section 7.2.11

→ Section 7.2.11

- 6 Autopilot

→ Section 7.2.11

3 Maintenance Menu

- 1 Safety Switch
- 2 Area Initial
- 3 Internal To Card 1/2
- 4 Card 1/2 To Internal
- 5 TXRX Time
- 6 String Data Update

→ Section 7.4.1

- 1 Partial Master Reset
- 2 All Master Reset

→ Section 7.4.2
→ Section 7.4.2
→ Section 7.4.2
→ Section 7.4.2
→ Section 7.4.2
→ Section 7.4.2
→ Section 7.4.2
→ Section 7.4.2

→ Section 7.4.3

- 1 Clear TX Time
- 2 Clear Motor Time
- 3 TXRX to Display Unit
- 4 Display Unit to TXRX

→ Section 7.4.4
→ Section 7.4.4
→ Section 7.4.4
→ Section 7.4.4

→ Section 7.4.5

- 1 Signal Processing
- 2 TT
- 3 MBS

→ Section 7.3.1

- 1 Echo Noise Level
- 2 Setting Mode

→ Section 7.3.1
→ Section 7.3.1

→ Section 7.3.2

- 1 Vector Constant
- 2 Video TD Level
- 3 Video High Level
- 4 Video Low Level
- 5 Gate Size
- 6 Limit Ring

→ Section 7.3.2
→ Section 7.3.2
→ Section 7.3.2
→ Section 7.3.2
→ Section 7.3.2
→ Section 7.3.2

→ Section 7.3.3

- 1 MBS Level
- 2 MBS Area

→ Section 7.3.3
→ Section 7.3.3

9 RADAR/TT Initial Setup

EU Declaration Of Conformity

01) Apparatus Product/Model:

Product: Marine Radar.

Model: JMA-5300MK2 Series

(JMA-5312-4/5312-4HS/5312-6/5312-6HS/5322-7/5322-9/5322-6HS/5332-12)

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-5312-4.
- Marine Radar, Japan Radio Co., Ltd manufactured model JMA-5312-4HS.
- Marine Radar, Japan Radio Co., Ltd manufactured model JMA-5312-6.
- Marine Radar, Japan Radio Co., Ltd manufactured model JMA-5312-6HS.
- Marine Radar, Japan Radio Co., Ltd manufactured model JMA-5322-7.
- Marine Radar, Japan Radio Co., Ltd manufactured model JMA-5322-9.
- Marine Radar, Japan Radio Co., Ltd manufactured model JMA-5322-6HS.
- Marine Radar, Japan Radio Co., Ltd manufactured model JMA-5332-12.

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-5312-4	JMA-5312-4HS	JMA-5312-6	JMA-5312-6HS	JMA-5322-7	JMA-5322-9	JMA-5322-6HS	JMA-5332-12
Display Unit	NCD-4530 ^{note 1}	X	X	X	X	X	X	X	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		
25kW Slot Antenna Scanner Unit/ High speed craft	NKE-2254-6HS							X	
30kW Slot Antenna Scanner Unit	NKE-1130								X
Junction Box	NQE-3151A								X

Software version:

Scanner Unit NKE-2103-4/4HS/6/6HS V01.00

Scanner Unit NKE-2254-7/9/6HS V01.00

Scanner Unit NKE-1130 V01.00

Radar Processor NDC-1417 V01.00 or V01.01

NOTES:

1 The NCD-4530 consists of the NWZ-173 19" LCD Display Unit, NDC-1417 Radar Processor Unit and NCE-5171 Operation Unit.

09) Additional Information:

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.

Antenna length 6ft, Peak power 25kW(Magnetron) X-Band Scanner Unit:NKE-2254-6HS.

Antenna length 12ft, Peak power 30kW(Magnetron) S-Band Scanner Unit:NKE-1130.

Signed for and on behalf of: Japan Radio Co., Ltd., Tokyo, Japan.**Place and date of issue:**Nagano-shi, Nagano ,Japan Dated 7th June 2017

Navigation Group

Quality Assurance Department

Marine Systems

Name/function: Hiroshi Isohata / Manager**Signed:** 

CE

アスベストは使用していません
Not use the asbestos

For further information, contact:

JRC *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

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