JMA-2353/2354

MARINE RADAR EQUIPMENT

INSTRUCTION MANUAL

JRC Japan Radio Co., Ltd.

PRECAUTIONS BEFORE OPERATION

■ Cautions for high voltage

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

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

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

■ What to do in case of electric shock

When finding a victim of electric shock, turn off the power source and earth the circuit immediately. If it is impossible to turn off the circuit, move the victim away promptly using insulators such as dry wood plate and cloth without touching the victim directly.

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

FIRST-AID TREATMENTS

■ First-aid treatments

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

1 Do not touch the victim confusedly as a result of the accident, but the rescuer may also get an electric shock.

2 Turn off the power source calmly and move the victim away quietly from the electric line.

3 Call a physician or ambulance immediately or ask someone to call a doctor.

4 Lay the victim on this back and loosen his necktie, clothes, belt, etc.

5 a. Examine the victim's pulse.
b. Examine his heartbeat bringing your ear close to his heart.
c. Examine his breathing bringing the back of your hand or your face close to his face.
d. Check the size of the pupils of his eyes.

6 Open the victim's mouth and take out artificial teeth, cigarette or chewing gum if any. Keep his mouth open, stretch his tongue and insert a towel or the like in his mouth to prevent the tongue from suffocating. (If it is hard to open his mouth due to set teeth, open it with a screwdriver and insert a towel in this mouth.)

7 Then, wipe his mouth so that foaming mucus does not accumulate inside.

■ When pulse is beating but breathing has stopped

(Mouth-to-mouth respiration) Fig. 1

1 Tilt the victim's head back as far as this face looks back. (A pillow may be inserted his neck.)

2 Push his jaw upward to open his throat wide (to spread his airway).

3 Pinch the victim's nostrils and take a deep breath, block his mouth completely with yours and blow into his mouth strongly. Take a deep breath again and blow into his mouth.
Continue this 10 to 15 times a minutes (blocking his nostrils).

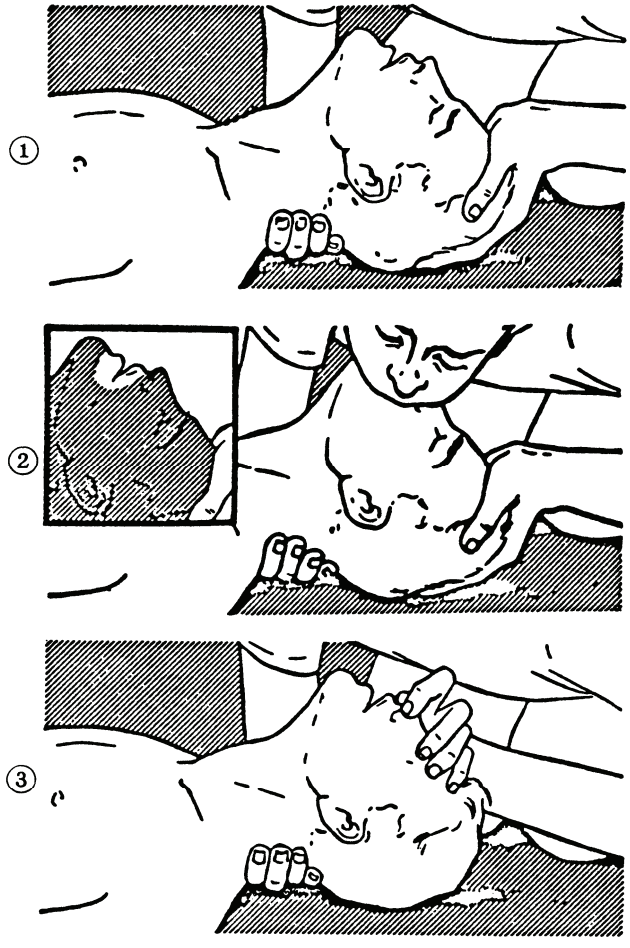
4 Carefully watch that he has recovered his natural breathing and atop practicing artificial respiration.

5 If it is difficult to open the victim's mouth, insert a rubber or vinyl tube into one of his nostrils and blow into it blocking the other nostril and his mouth completely.

6 When the victim recovers consciousness, he may try to stand up suddenly, but let him lie calmly and serve him with a cup of hot coffee or tea and keep him warm and quiet. (Never give him alcoholic drinks.)

● Method of mouth-to-mouth respiration by raising head

Fig. 1 Mouth-to mouth respiration



(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.

■ When both pulse and breathing have stopped

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

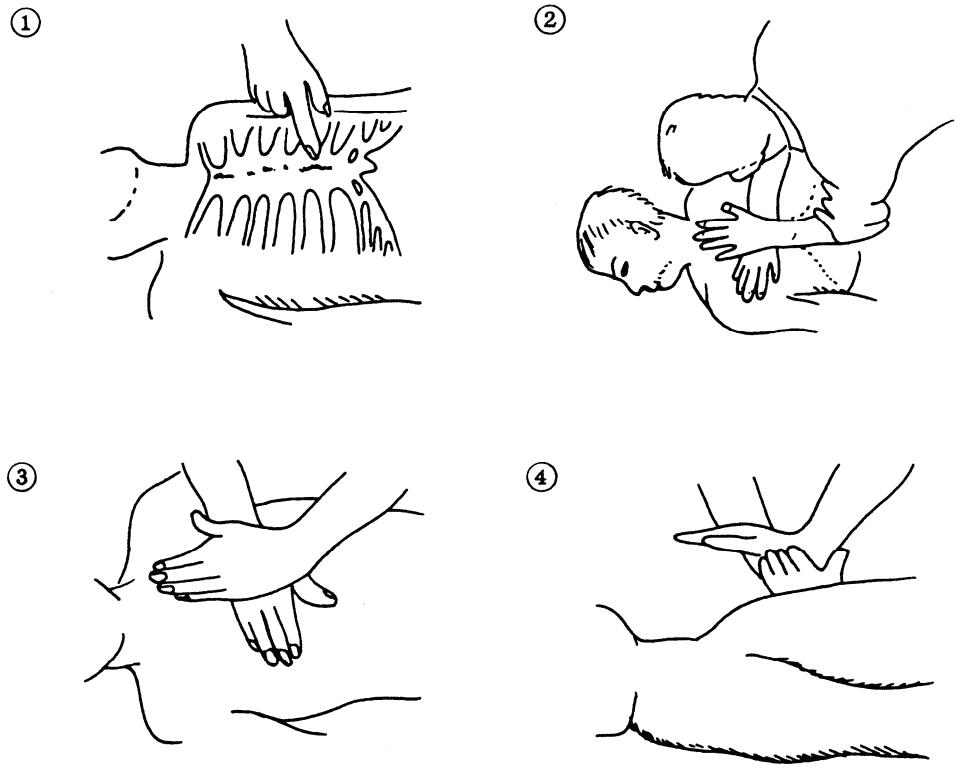
When no pulse has come not to be felt, his pupils are open and no heartbeat is heard, cardiac arrest is supposed to have occurred and artificial respiration must be performed.

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. (Never give him alcoholic drinks.) Commit the victim to a medical specialist depending on his condition. To let him recover from the mental shock, it is necessary for persons concerned to understand his situations and the necessary treatment.

Fig. 2 Cardiac massage



PREFACE

Thank you very much for purchasing the JRC marine radar equipment, JMA-2300MK2 series.
This equipment is a marine radar equipment designed to obtain safe operation of marine ships. This equipment consists of a scanner unit and a display 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 safety 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.

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 equipments 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 equipments are not operated correctly.

■ Examples of Pictorial Indication

Electric Shock

The △ 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 ⃠ 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 ● 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 equipment.

Do not try to remove, break or modify the label.

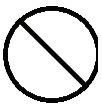
PRECAUTIONS

DANGER
Never conduct inspection or repair work of equipment components. Inspection or repair work by unauthorized personnel may result in fire hazard or electric shock. 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 output from the rectifier even after the radar is turned off. Failure to comply may result in equipment failure, electric shock.
When conducting maintenance work on the antenna, make sure to turn its main power off. Failure to comply may result in electrocution or injuries.
During scanner unit maintenance, set the safety switch for stopping the scanner unit to the "OFF" position. Failure to comply may result in injuries caused by physical contact with the rotating antenna.
Do not touch the radiator. Even if the power is turned off, the radiator may be rotated by the wind.

⚠ WARNING

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

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



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

Scanner Unit	10W/m^2
NKE-2063	40cm
NKE-2043	22cm

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

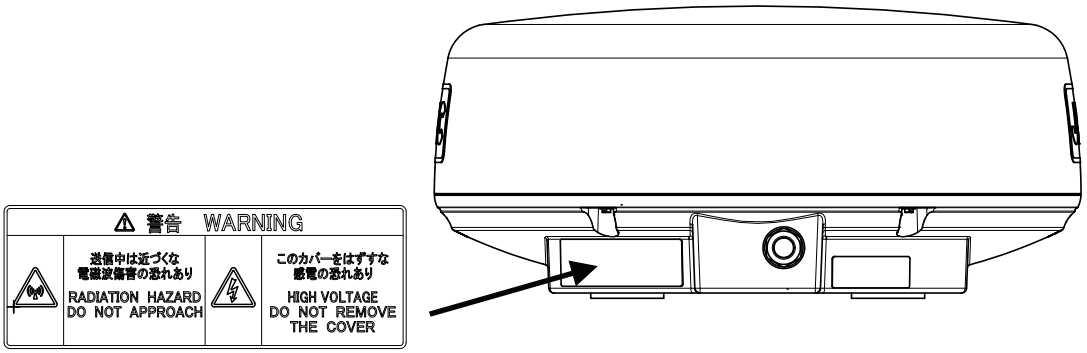
When it is necessary to get close to the antenna for maintenance or inspection purposes, make sure to turn the indicator power switch to "OFF" or "STBY."
Direct exposure to electromagnetic waves at close range will have adverse effects on the human body.

When conducting maintenance work, make sure to turn off the power and unplug the power connector J1 of the display unit so that the power supply to the equipment is completely cut off.
Some equipment components can carry electrical current even after the power switch is turned off, and conducting maintenance work without unplugging the power connector may result in electrocution, equipment failure, or accidents.

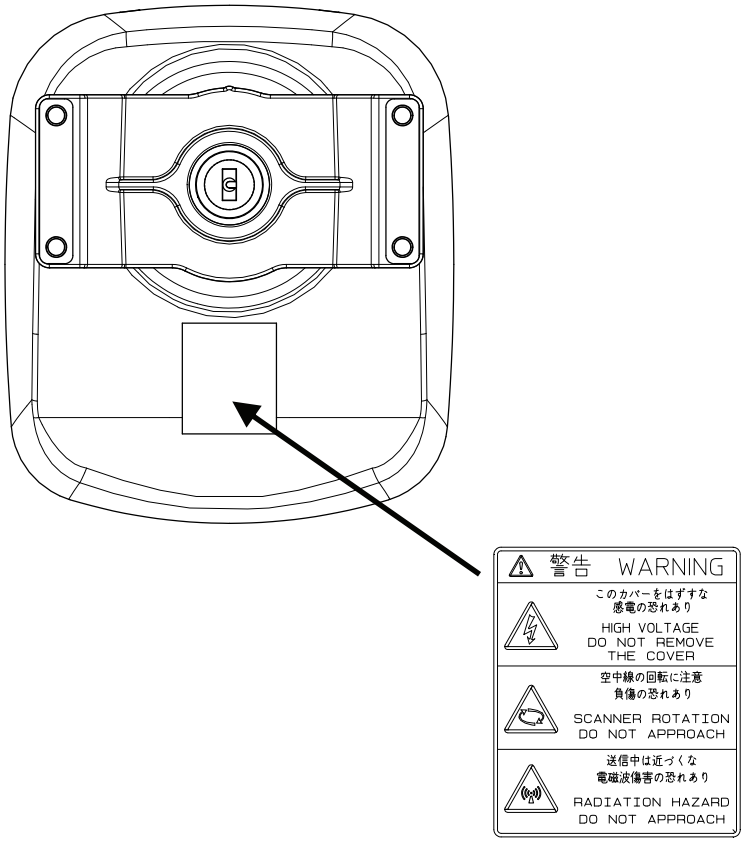
⚠ CAUTION
A malfunction may occur if the power in the ship is instantaneously interrupted during operation of the radar. In this case, the power should be turned on again.
Always use the automatic tuning mode. **Use the manual tuning mode only when the automatic tuning mode does not provide the best tuning state due to deterioration of magnetron for example.**
If sensitivity is set too high, unnecessary signals such as noises in the receiver and false echoes increase to lower target visibility. **At the same time, if sensitivity is set too low, detection of targets such as ships and dangerous objects may be hindered.** **Therefore, sensitivity must always be set to an optimal level.**
When using the 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 sea clutter suppression function, never set the suppression level too high canceling out all image noises from the rain or snow at close range. Detection of not only echoes from the rain or snow but also targets such as other ships or dangerous objects will become inhibited. **When using the sea clutter suppression function, make sure to choose the most appropriate image noise suppression level.**
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 the target tracking function (TT) only as a navigation aid. The final navigation decision must always be made by the operator him/herself. **Making the final navigation decision based only on the target tracking function (TT) information may cause accidents.** **The target tracking function (TT) information such as vector, target numerical data, and alarms may contain some errors. Also, targets that are not detected by the radar cannot be acquired or tracked.** **Making the final navigation decision based only on the radar display may cause accidents such as collisions or running aground.**

⚠ 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.**
When setting an automatic acquisition zone, make sure to properly adjust gain, sea-surface reflection suppression level, and rain/snow reflection suppression level so that the optimal target images are always on the radar screen. The automatic acquisition zone alarm will not be activated for targets undetected by the radar, and it may result in accidents such as collisions.
Any adjustments must be made by specialized service personnel. Incorrect settings may cause unstable operation and result in accidents or equipment failure.
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.
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.**
A part of CRT monitor (CCN-366) generates the high voltage of approx. 10 kV. For non-service personnel, never touch the inside of the display unit. **Failure to comply may result in electrocution.**
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.**

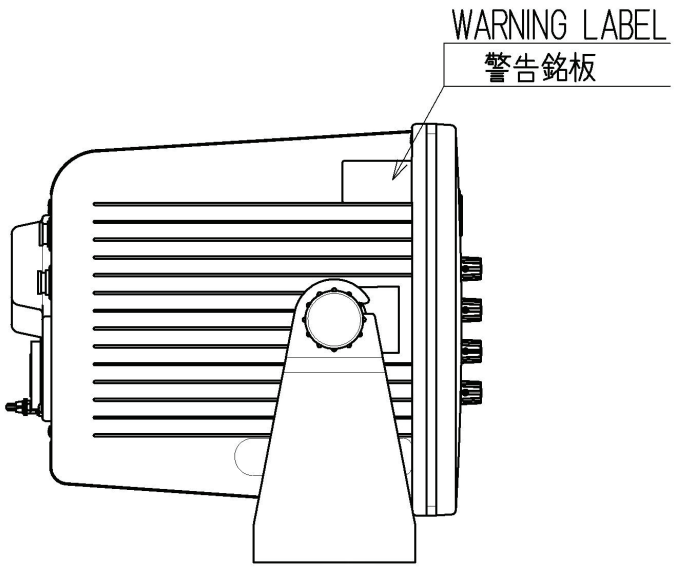
WARNING LABEL MOUNTING POINT

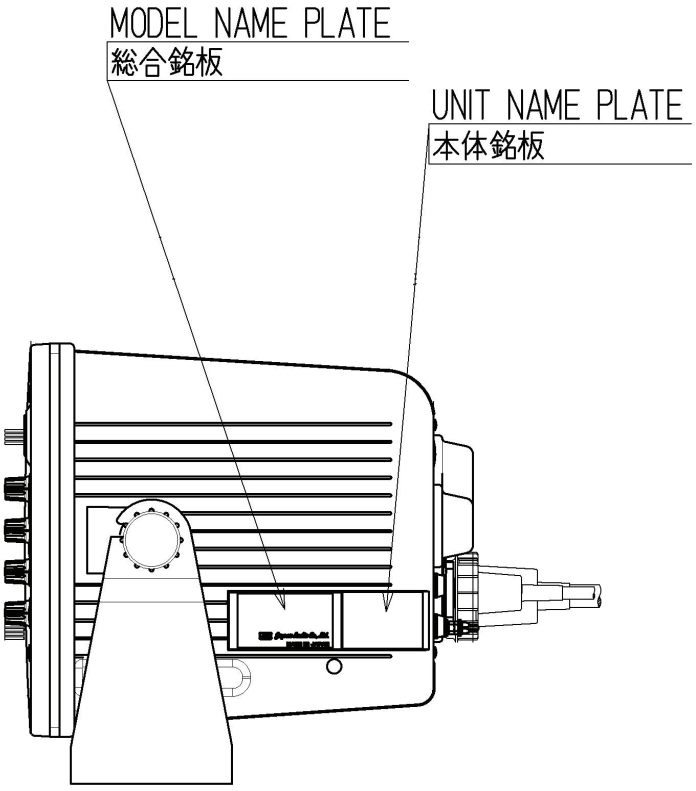


NKE-2043 Scanner Unit

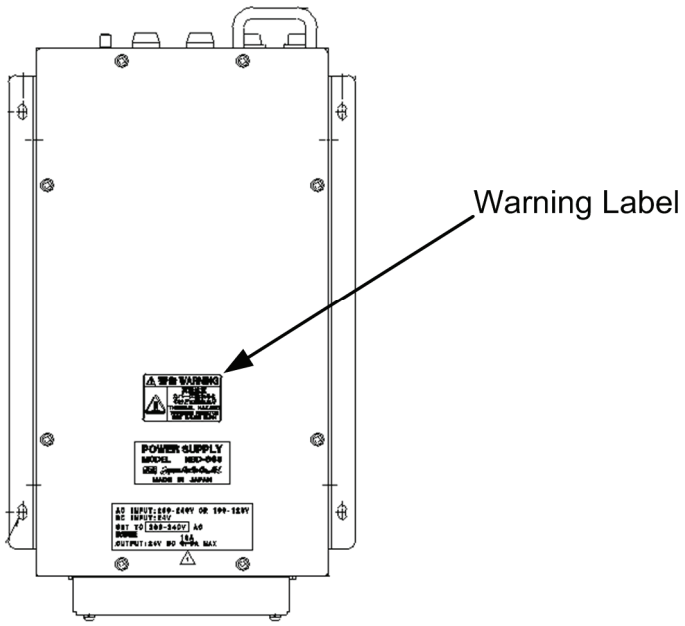


NKE-2063 Scanner Unit





NCD-2237 Display Unit



NBD-865 Rectifier unit

EQUIPMENT APPEARANCE

Scanner Unit Type NKE-2043 (2 feet)

Scanner Unit Type NKE-2063 (3.9 feet)

NCD-2237 Display Unit

CONTENTS

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.
AZI	AZImuth stabilization mode

B

BCR/BCT	Bow Crossing Range and Bow Crossing Time

C

C up	Course up Own ship's course is pointed to the top center of the radar display.
CCRP	The Consistent Common Reference Point A location on own ship, to which all horizontal measurements such as target range, bearing, relative course, relative speed, CPA or TCPA are referenced, typically the conning position of the bridge.
Clutter	Unwanted reflections on a radar screen, from sea surface, rain or snow.
COG	Course Over Ground The direction of the ship's movement relative to the earth, measured on board the ship, expressed in angular units from true north
CORREL	Correlation
CPA/TCPA	The distance to the Closest Point of Approach and Time to the Closest Point of Approach. Limits are set by the operator and are related to own ship.
CTW	Course Through Water The direction of the ship's movement through the water

D

DRIFT	The current velocity for manual correction or the current speed on the horizontal axis of the 2-axis log is displayed.

E

EBL	Electronic Bearing Line An electronic bearing line originated from own ship's position.
ENH	Enhance
ETA	Estimated Time of Arrival

G

Ground stabilization	A display mode in which speed and course information are referred to the ground, using ground track input data.

H

HDG	Heading The horizontal direction that the bow of a ship is pointing at any instant, expressed in angular units from a reference direction .
HL	Heading line A graphic line on a radar presentation drawn from the consistent common reference point to the bearing scale to indicate the heading of the ship
H up	Head up Own ship's heading line is always pointed to the top center of the radar display.

I

IR	Radar Interference Rejecter

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
MP	Medium Pulse

N

NM	1NM=1852m
NSK	North Stabilization Kit
N up	North up The north is always pointed to the top center of the radar display.

O

Own track	Display function of own ship's track

P

PI	Parallel Index line
Past positions	Equally time-spaced past position marks of a tracked or AIS target and own ship.
POSN	Position
PRF	Pulse Repetition Frequency The number of radar pulses transmitted each second.
PROC	Process Radar signal processing function

R

Radar beacon	A navigation aid which responds to the radar transmission by generating a radar signal to identify its position and identity
Radar cross-section	Radar cross-section of a target determines the power density returned to the radar for a particular power density incident on the target
Range Rings	A set of concentric circles labeled by distance from CCRP.
Reference target	A symbol indicating that the associated tracked stationary target is used as a speed reference for the ground stabilization
Relative course	The direction of motion of a target relative to own ship motion
Relative speed	The speed of a target relative to own ship's speed data
Relative vector	A predicted movement of a target relative to own ship's motion
RM	Relative Motion A display on which the position of own ship remains fixed, and all targets move relative to own ship.
RM(R)	Relative Motion. Relative Trails.
RM(T)	Relative Motion. True Trails.
ROT	Rate Of Turn Change of heading per time unit.
Route	A set of waypoints.
RR	Range Rings

S

SART	Search And Rescue Transponder Radar transponder capable of operating in the 9GHz band
Sea stabilization	A display mode in which speed and course information are referred to the sea.
Sea state	Status of the sea condition due to the weather environment, expressed as a sea state 0 for flat conditions with minimal wind, to sea state 8 for very rough sea conditions.
SET	The current direction for manual correction or the current speed on the horizontal axis of the 2-axis log is displayed.
Sleeping AIS target	A target indicating the presence and orientation of a vessel equipped with AIS in a certain location.
SOG	Speed Over the Ground The speed of the ship relative to the earth, measured on board of the ship.
SP	Short Pulse
STAB	Stabilization
STW	Speed Through Water The speed of the ship relative to the water surface.

T

TCPA	Time to Closest Point of Approach to own ship
Test target	Radar target of known characteristics used for test requirement
TM	True Motion A display across which own ship moves with its own true motion.
Trails	Display Radar Trails (Other Ships' Trails)
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 an event.

Chapter 1
GENERAL AND EQUIPMENT COMPOSITION

1.1 FUNCTIONS

This equipment is a marine radar equipment consisting of a scanner unit and an integrated monochrome CRT display unit.

■ Function of This System

- Sensitivity adjustment
- Sea clutter suppression
- Rain/snow clutter suppression
- IR (Interference rejection)
- Bearing and range measurement using a cursor, fixed/variable range markers, and electronic bearing line
- Own ship's track display
- NAV line and marker displays
- TM (True Motion) presentation
- Self-diagnostic
- TT (manual and automatic target acquisition/automatic tracking, vector and trail displays and alarm displays)
- AIS

1.2 FEATURES

■ Easy Operation with the Soft keys and the Multi Control

Simple and easy operations are provided so that you can operate without this instruction manual.

■ Target Detection by Latest Signal Processing Technology

The system employs a signal processing technology of DSP to eliminate undesired clutter, thus improving the target detection.

■ TT and AIS functions as Standard Equipment

High performance target tracking function which can automatically track targets (up to 10 targets) and AIS target display function (up to 50 targets) are provided.

1.3 CONFIGURATION

Radar Configuration and Ship's Mains

RADAR MODEL	Scanner	Display Unit	SHIP'S MAINS
JMA-2353	NKE-2043	NCD-2237	12/24 VDC
JMA-2354	NKE-2063		

Scanners and Transmitted Output Powers

SCANNER TYPE		TRANSMITTED OUTPUT POWER	BAND	RATE OF ROTATION
JMA-2353	620mm Radome	4kW	X	27 rpm
JMA-2354	3.9 FT SLOT ANTENNA	6kW		

Reference:

1 An optional rectifier NBD-865 is necessary for using Ship's Mains 100-200/200-240 VAC, 50/60Hz, 1ϕ.

2 If connecting to gyro with synchro signal output or step signal output, optional NSK unit NCT-4106A is required.

Supplied accessories

PRODUCT NAME/MODEL	QUANTITY	JRC CODE	REMARKS
Instruction manual 7ZPRD0846	1	7ZPRD0846	This manual
Installation manual 7ZPRD0848	1	7ZPRD0848	
Quick manual 7ZPRD0850	1	7ZPRD0850	
Read me	1	7ZPRD0853	
Power cord H-CFQ-6776	1	CFQ-6776	2m
Radar equipment cable H-CFQ5761-15	1	CFQ5761-15	Supplied with the scanner unit NKE-2043
Radar equipment cable H-CFQ5746-20	1	CFQ5746-20	Supplied with the scanner unit NKE-2063
Food MTV303344	1	MTV303344	

Included accessories

PRODUCT NAME/MODEL	QUANTITY	JRC CODE	REMARKS
Fuse ULTSC3.15AN1	2	7ZXRD0031	(For DC24V/DC32V) 3.15A
Fuse ULTSC6.3AN1	3		(For DC12V) 6.3A
Fuse ULTSC10AN1	2		(For spare for scanner unit) 10A
Connector LTWBD-06FFA-ll7001	1		
Connector LTWBD-08FFA-ll7001	1		

Option

PRODUCT NAME/MODEL	QUANTITY	JRC CODE	REMARKS
Rectifier NBD-865	1	NBD-865	For NKE-2043/2063
Equipment cable H-CFQ5761-05 H-CFQ5761-10 H-CFQ5761-20 H-CFQ5761-30		CFQ5761-05/10/20/30	Cable connecting the scanner unit and the display unit Length: 5/10/20/30 m Cable with connectors at both ends For NKE-2043 (4kW)
Equipment cable H-CFQ5746-05 H-CFQ5746-10 H-CFQ5746-15 H-CFQ5746-30		CFQ5746-05/10/15/30	Cable connecting the scanner unit and the display unit Length: 5/10/15/30 m Cable with connectors at both ends For NKE-2063 (6kW)
External monitor output cable H-CFQ-5762	1	CFQ5762	For JMA-2300MK2
Cable connecting a GPS compass H-CFQ-5469	1	CFQ-5469	For JLR-20/21/30/31

1.4 EXTERIOR DRAWINGS

Fig. 1.4-1 Exterior Drawing of Scanner Unit, Type NKE-2043

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

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

MASS APPROX. 10 kg
UNIT mm
COLOR WHITE

質量 約 10 kg
単位 mm
色 白

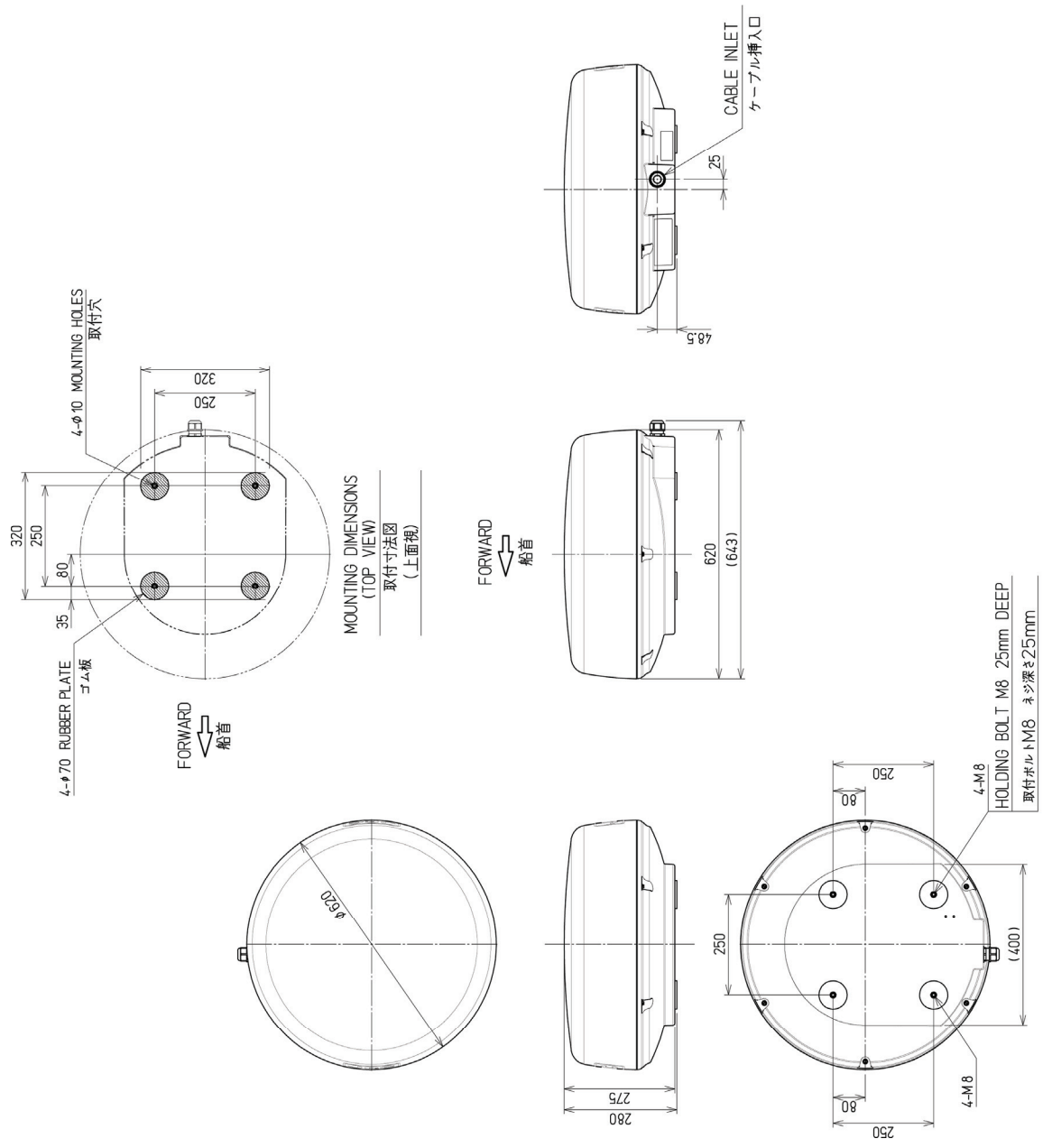
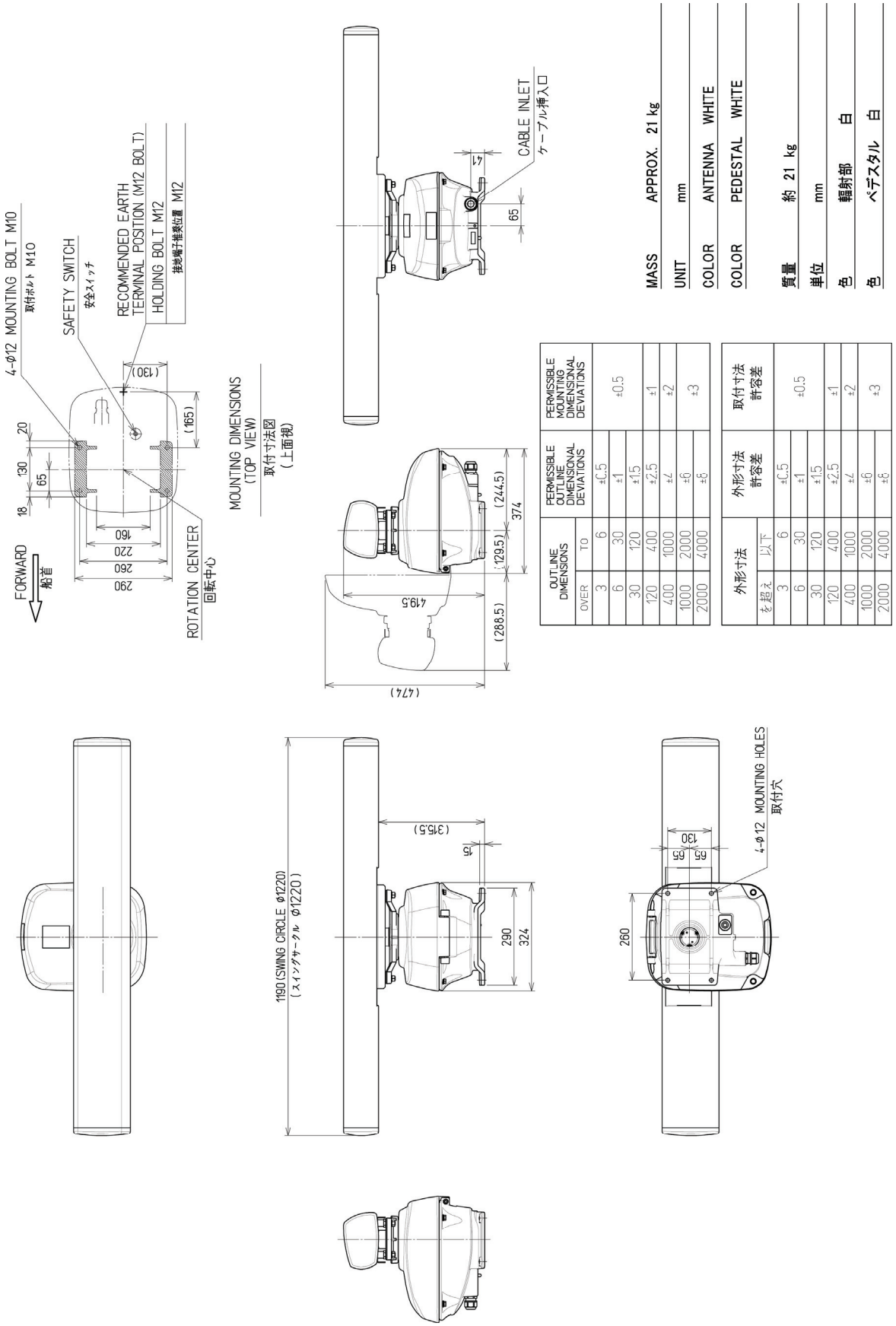


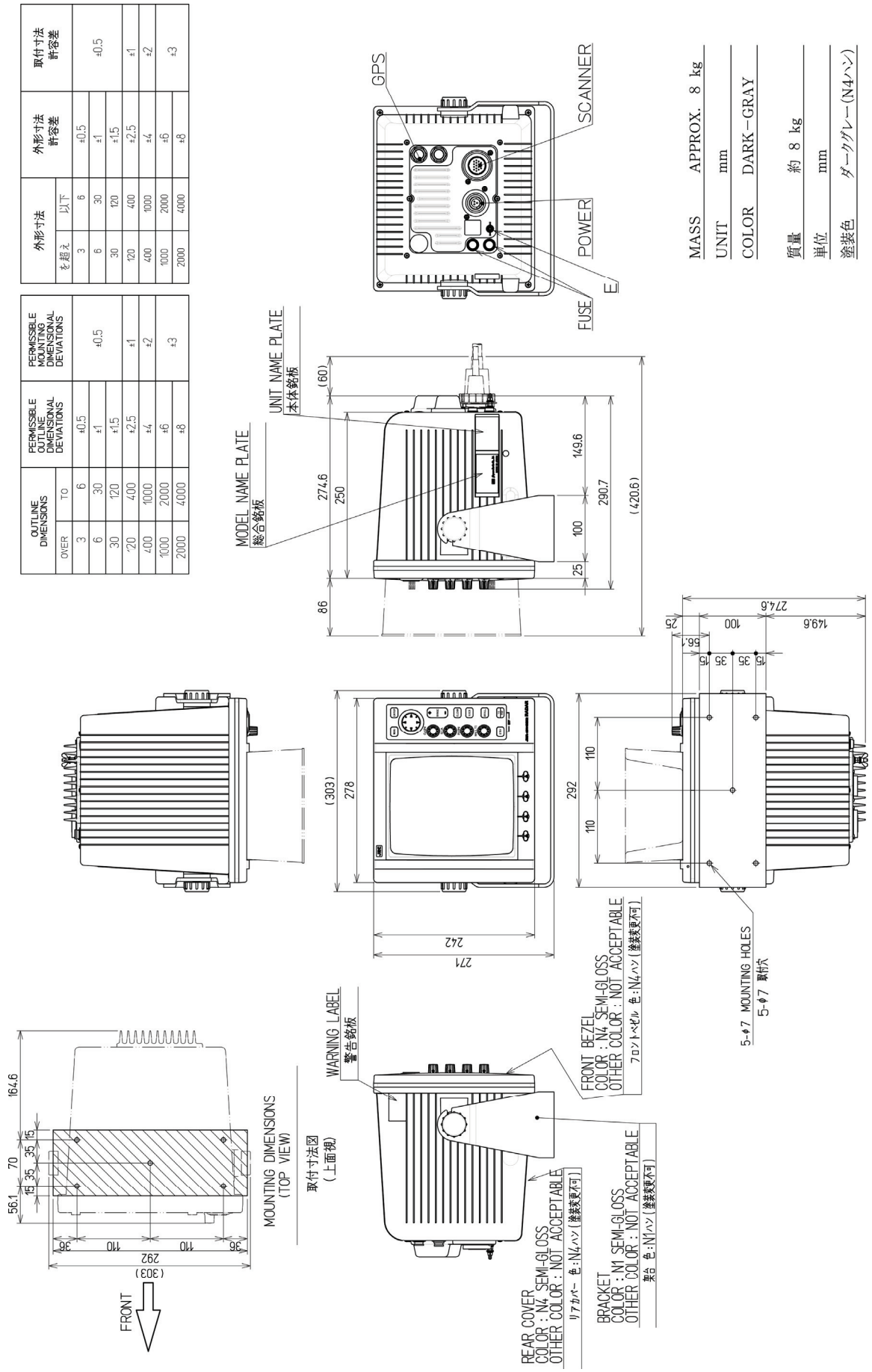
Fig. 1.4-2 Exterior Drawing of Scanner Unit, Type NKE-2063



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

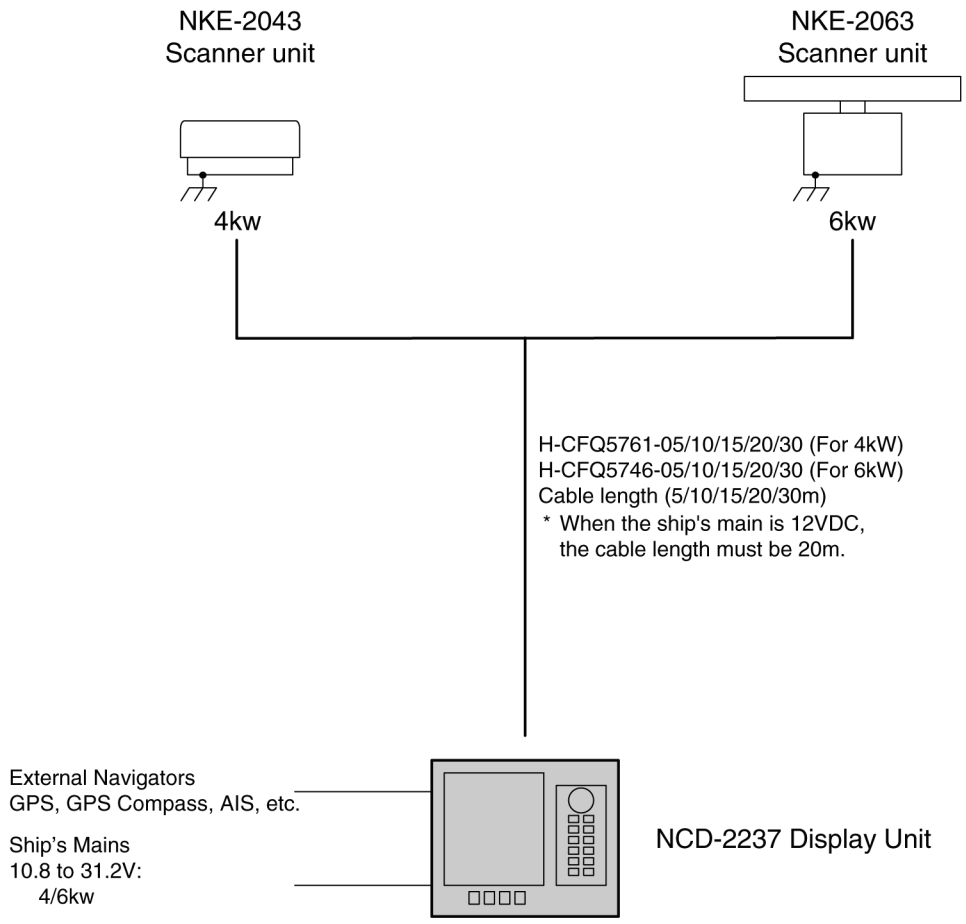
外形寸法		外形寸法許容差	取付寸法許容差
を超え	以下		
3	6	±0.5	±0.5
6	30	±1	
30	120	±1.5	±1
120	400	±2.5	±2
400	1000	±4	
1000	2000	±6	±3
2000	4000	±8	

Fig. 1.4-3 Exterior Drawing of Display Unit, Type NCD-2237



1.5 GENERAL SYSTEM DIAGRAMS

Fig. 1.5-1 General System Diagram of Radar



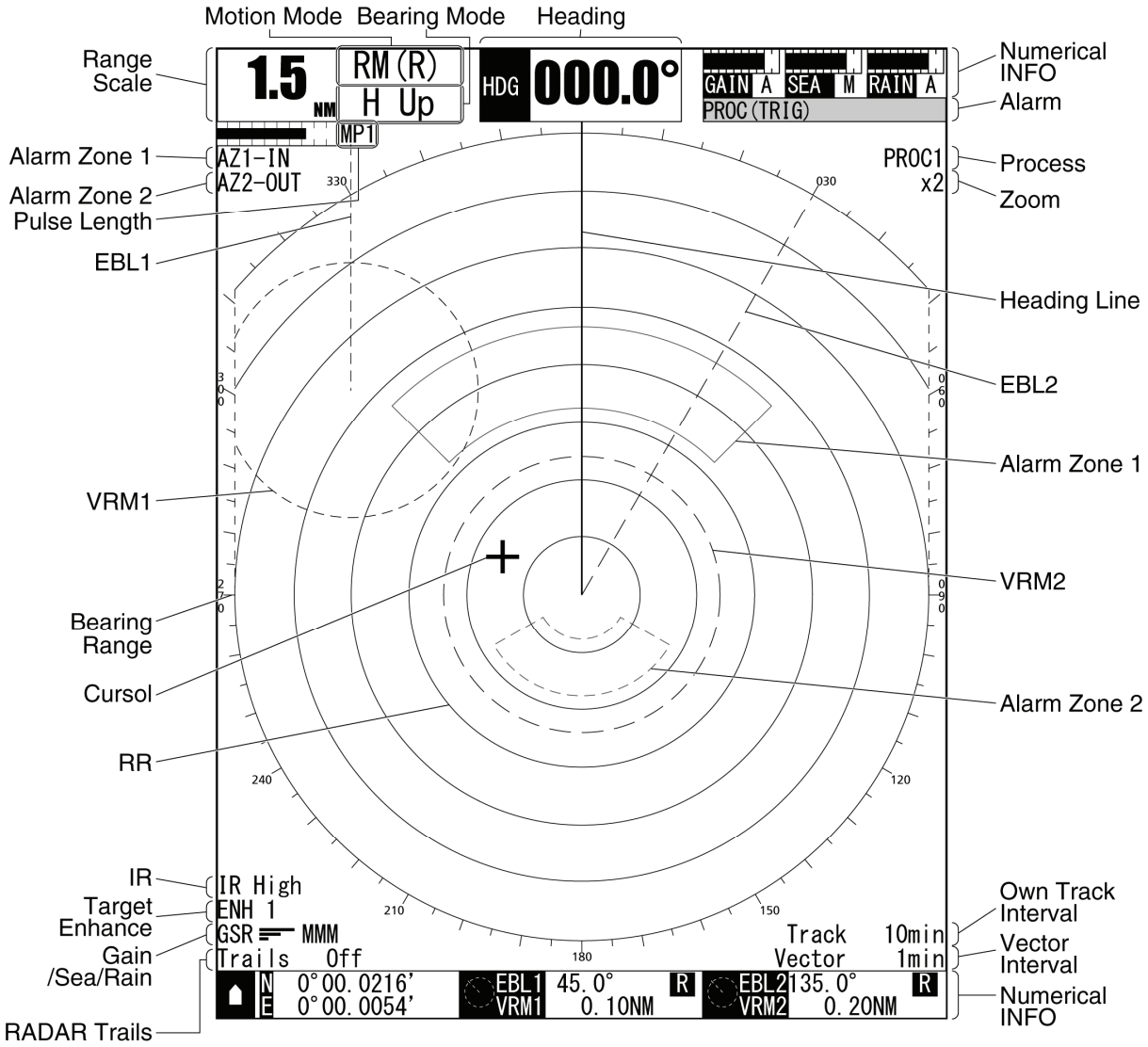
Reference:

Install the radar cable as far as from the cables of other radio equipment in order to prevent other radio equipment from interfering with the radar operations.

In particular, do not install the antenna cable parallel to the cables of other radio equipment.

Chapter 2 OPERATIONS

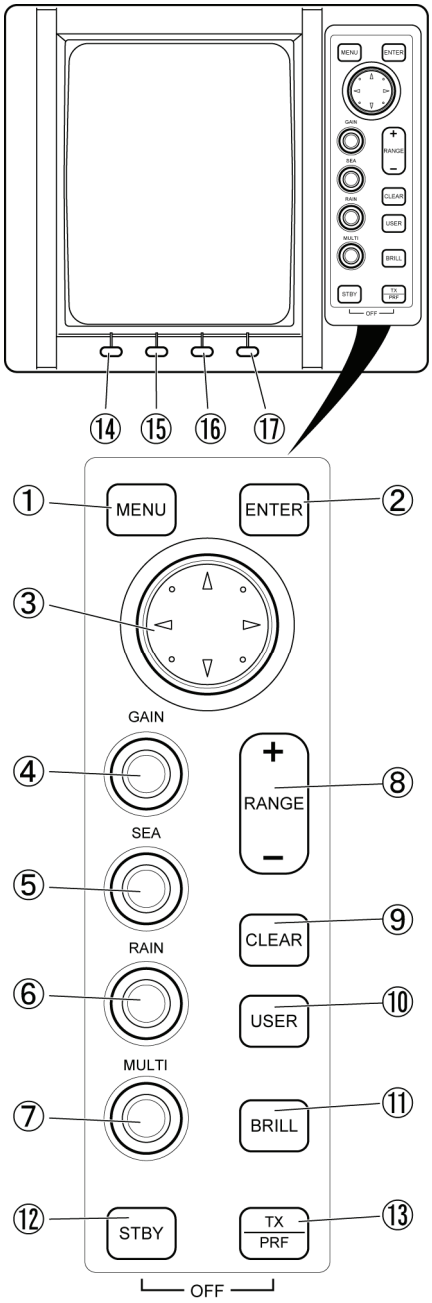
2.1 SCREEN DISPLAY



2.2 PANEL

Operate this equipment with the panel of the Display unit.

No.	Key	Description
①	MENU	Press: Opens/closes the menu. Hold down: Opens the code input screen (the Adjust Menu).
②	ENT	Press: Enters the selected menu item.
③	Cursor keys	Press: Selects menu items. Moves the cursor. Hold down: Accelerates cursor movement.
④	GAIN	Hold down: Switches the sensitivity between manual and automatic modes. Turn: Adjusts receiving sensitivity.
⑤	SEA	Hold down: Switches the sea clutter suppression function between manual and automatic modes. Turn: Removes sea clutter.
⑥	RAIN	Hold down: Switches the rain/snow clutter suppression function between manual and automatic modes. Turn: Removes rain/snow clutter.
⑦	MULTI	Press: Opens the soft key menu. Turn: Adjusts the selected mode. Changes the setting values. Selects soft key menu items.
⑧	RANGE	Press: Switches the range.
⑨	CLEAR	Press: Cancels menu operations. Returns to upper menu. Stops the alarm sound.
⑩	USER	Press: Performs the user key 1 function.
⑪	BRILL	Press: Changes the display brilliance Hold down: Opens the display brilliance.
⑫	STBY	Press: Turns on this equipment (when it is turned off). Turns to standby state (when the equipment is transmitting). Press multiple keys: Turns off the equipment when pressed together with the TX/PRF key.
⑬	TX/PRF	Press: Starts transmitting (in standby state) Tunes the repetition frequency (when transmitting). Hold down: Turns off the heading line. (after preheating finished).
⑭	Soft key 1	Press: Opens the soft key menu.
⑮	Soft key 2	Press: Opens the soft key menu.
⑯	Soft key 3	Press: Opens the soft key menu.
⑰	Soft key 4	Press: Opens the soft key menu.



■ Key Operations

Press:	Press a key, then release the key before 2 seconds elapse.
Hold down:	Press a key, and hold down the key for 2 seconds or more.
Press multiple keys:	Press multiple keys simultaneously.
Turn:	Turn a control in clockwise/counterclockwise direction.

2.3 POWER ON/OFF

⚠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.

Note:

- 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.

■ Power On

1 Press the [STBY] key on the display unit to turn on the display unit.

STBY

The display unit is turned on, and the preheating time screen is displayed.

When the preheating time is over, the preheating time screen disappears.

■ Starting transmission

1 Press the [TX/PRF] key.

The radar starts transmission and the antenna starts rotating.

Reference:

The radar cannot start transmission if you press the [TX/PRF] key while the preheating time is displayed.

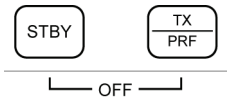
■ Stopping transmission

1 Press the [STBY] key on the display unit.

The radar stops transmission and the antenna stops rotating.
Maintain the standby state if radar observation is restarted in a relatively short time.
Only pressing the [TX/PRF] key starts observation.

■ Power Off

1 Press the [STBY] key and the [TX/PRF] key simultaneously.



The system is turned off.

WARNING

When conducting maintenance work, make sure to turn off the power and unplug the power connector J1 of the display 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.

2.4 SENSITIVITY ADJUSTMENT

Sensitivity can be adjusted.

Adjust the noise on the display unit to achieve better observation state.

CAUTION

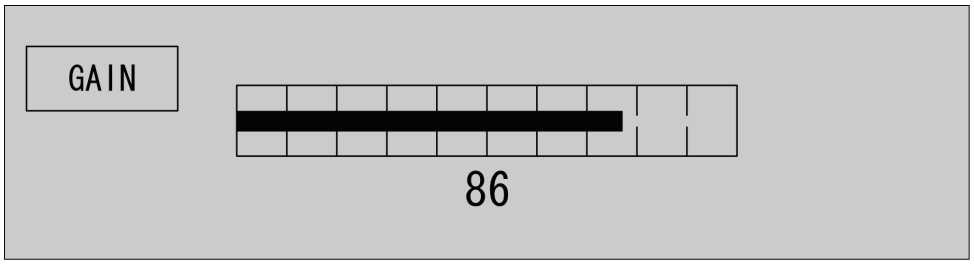
If sensitivity is set too high, unnecessary signals such as noises in the receiver and false echoes increase to lower target visibility. At the same time, if sensitivity is set too low, detection of targets such as ships and dangerous objects may be hindered. Therefore, sensitivity must always be set to an optimal level.

■ Noise Adjustment

1 Turn the [GAIN] control.

Turn the [GAIN] control clockwise to increase sensitivity.

Turn the [GAIN] control counterclockwise to decrease sensitivity.



The sensitivity adjustment screen appears when turning the [GAIN] control.

Sensitivity can be adjusted between 0 and 100.

When turning the [GAIN] control, the gain control indication is stretched or shrunk.

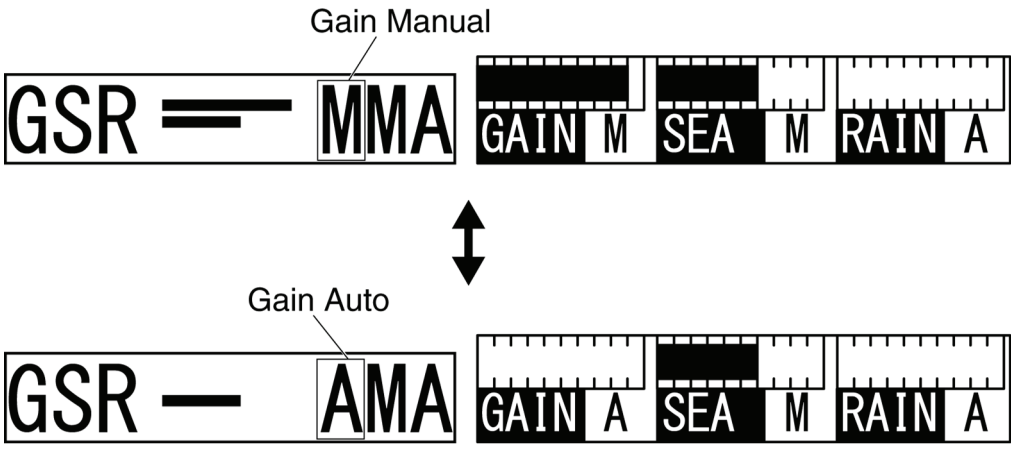
● [GAIN] Control

Turning the [GAIN] control clockwise increases receiving sensitivity and extends the radar observation range. If the sensitivity is too high, the receiver noise increases reducing the contrast between the targets and the background video. As a result, the targets become obscure on the radar display. To observe densely crowded targets or short-range targets, turn the [GAIN] control counterclockwise to reduce the sensitivity so that the targets are easy to observe. However, be careful not to overlook important small targets.

■ Switching to Manual/Automatic Mode

1 Hold down the [GAIN] control.

The sensitivity can be switched between manual and automatic modes.
The mode is indicated as shown below.



2.5 SEA CLUTTER SUPPRESSION

The sea clutter suppression function suppresses sea clutter returns.

⚠ 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.

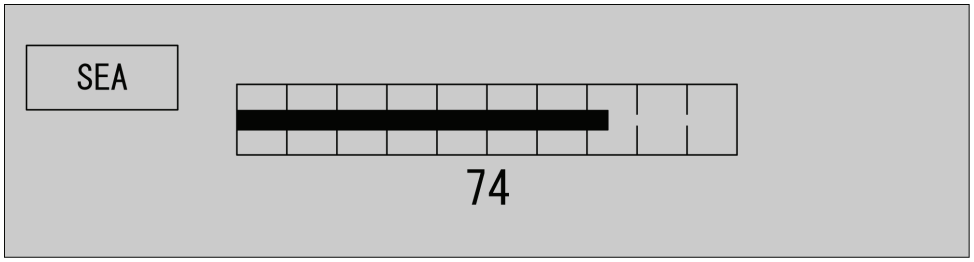
■ Manual Sea Clutter Suppression Function

Adjust the sea clutter returns on the display unit to achieve better observation state.

1 Turn the [SEA] control.

Turn the [SEA] control clockwise to suppress sea clutter returns.

Turn the [SEA] control counterclockwise to intensify sea clutter returns.



The sea clutter suppression adjustment screen appears when turning the [SEA] control.

Sea clutter suppression can be adjusted between 0 and 100.

When turning the [SEA] control, the sea clutter control indication is stretched or shrunk.

● [SEA] Control

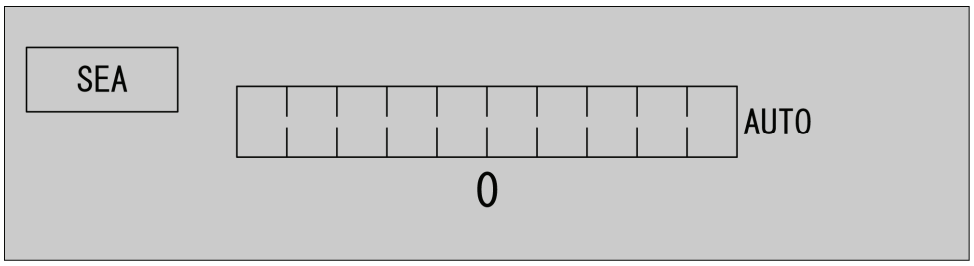
The sea clutter suppression function suppresses sea clutter returns by decreasing the receiving sensitivity on a short range. Turn the [SEA] control clockwise to heighten the effect of sea clutter suppression. However, be careful that excessive suppression causes low signal-strength targets such as buoys and boats to disappear from the radar display.

■ Automatic Sea Clutter Suppression Function

Sea clutter suppression can be performed in accordance with the level of sea clutter. Use this automatic mode when sea clutter returns vary in direction.

1 Hold down the [SEA] control.

Automatic function is selected.
Even when the automatic function is selected, you can manually perform fine adjustments by turning the [SEA] control.



The sea clutter suppression adjustment screen appears when turning the [SEA] control. Sea clutter suppression can be adjusted between 0 and 100.

When the sea clutter suppression (Auto) is set to "0"

When the sea clutter suppression (Auto) is set to "10"

■ Canceling Automatic Sea Clutter Suppression Function

1 Hold down the [SEA] control.

Automatic function is canceled.

The mode is indicated as shown below.

Reference:

When the automatic mode is selected for the sea clutter suppression function, the rain/snow clutter suppression function is switched to the manual mode.

The sea clutter suppression function (Auto) and the rain/snow clutter suppression function (Auto) cannot be selected at the same time.

2.6 RAIN/SNOW CLUTTER SUPPRESSION

This function suppresses rain/snow clutter returns.

⚠ CAUTION

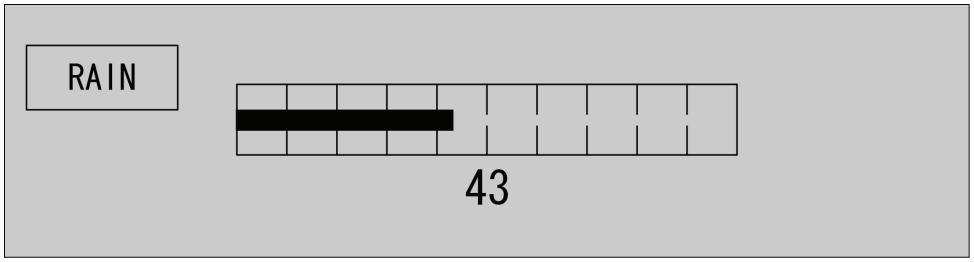
When using the sea clutter suppression function, never set the suppression level too high canceling out all image noises from the rain or snow at close range. Detection of not only echoes from the rain or snow but also targets such as other ships or dangerous objects will become inhibited.
When using the sea clutter suppression function, make sure to choose the most appropriate image noise suppression level.

■ Manual Rain/Snow Clutter Suppression Function

Adjust the rain/snow clutter returns on the display unit to achieve better observation state.

1 Turn the [RAIN] control.

Turn the [RAIN] control clockwise to suppress rain/snow clutter returns.
Turn the [RAIN] control counterclockwise to intensify rain/snow clutter returns.



The rain/snow clutter suppression adjustment screen appears when turning the [RAIN] control.
Rain/snow clutter suppression can be adjusted between 0 and 100.

When turning the [RAIN] control, the rain/snow clutter control indication is stretched or shrunk.

● [RAIN] Control

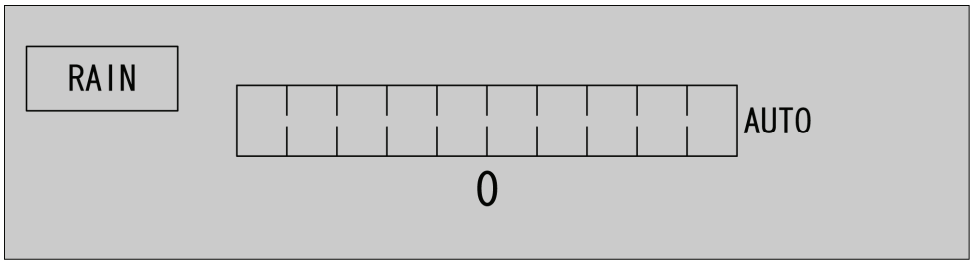
When the [RAIN] control is turned clockwise, targets hidden by rain/snow clutter returns appear on the radar display. However, be careful that excessive suppression may cause small targets to be overlooked. Since the rain/snow clutter suppression function also has the effect of suppressing sea clutter, the suppression efficiency improves when using with the [SEA] control. In general, set the value to "0".

■ Automatic Rain/Snow Clutter Suppression Function

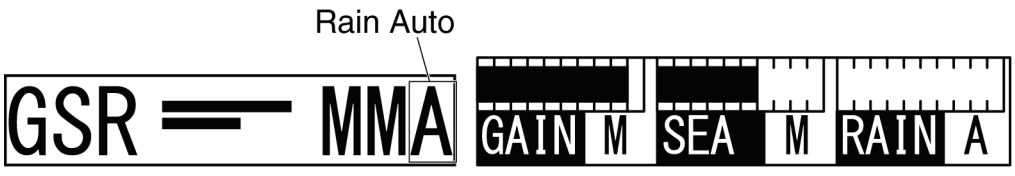
Rain/snow clutter suppression can be performed in accordance with the level of rain/snow clutter. Use this automatic mode when rain/snow clutter returns vary in direction.

1 Hold down the [RAIN] control.

Automatic function is selected.
Even when the automatic function is selected, you can manually perform fine adjustments by turning the [RAIN] control.



The rain/snow clutter suppression adjustment screen appears when turning the [RAIN] control. Rain/snow clutter suppression can be adjusted between 0 and 100.



When the rain/snow clutter suppression (Auto) is set to "0"

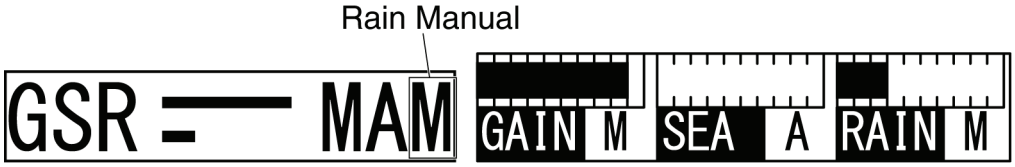
When the rain/snow clutter suppression (Auto) is set to "10"

■ Switching to Manual/Automatic Mode

1 Hold down the [RAIN] control.

Automatic function is canceled.

The mode is indicated as shown below.



Reference:

When the automatic mode is selected for the rain/snow clutter suppression function, the sea clutter suppression function is switched to the manual mode.

The sea clutter suppression function (Auto) and the rain/snow clutter suppression function (Auto) cannot be selected at the same time.

2.7 SOFT KEY OPERATION

This radar can be operated with the soft keys and the MULTI control placed on the front panel of the display unit. You can access to functions without opening the menu screen. To change the default settings, press the [MENU] key to open the menu screen.
This section describes the operation with the soft keys and the MULTI control.

■ Keys for operation

- Soft keys 1, 2, 3 and 4
- [MULTI] control
- [CLEAR] key

■ Soft Key Operations (Example: Opening "Display Screen")

This section describes how to operate with the soft keys shown below.

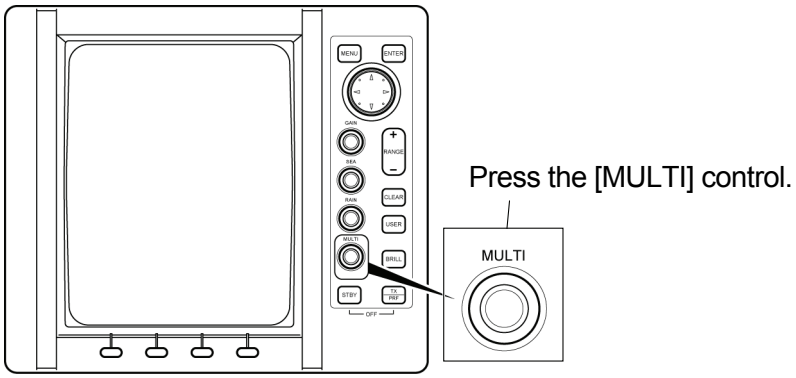
- TUNE/PRF
- Display Screen
- TM/RM
- Bearing Mode
- Pulse Length
- Off Center
- Symbol Display
- MOB
- Mark
- Line
- Own Track
- Event Mark
- AIS Filter
- TLL TX

Reference:

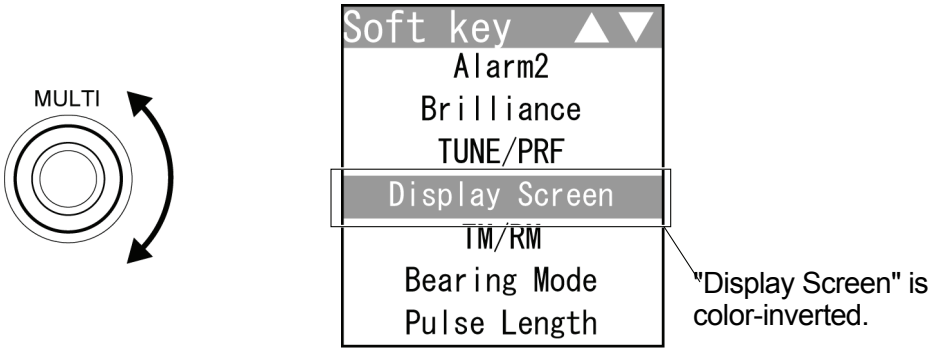
The functions for the following soft key menu are initially set to off. To use these functions, set the menu items to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

Symbol DISP, MOB, Mark, Line, Own Track, Event Mark, AIS Filter and TLL TX

1 Press the [[MULTI] control.



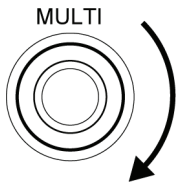
2 Turn the [MULTI] control to select Display Screen on the soft key menu.



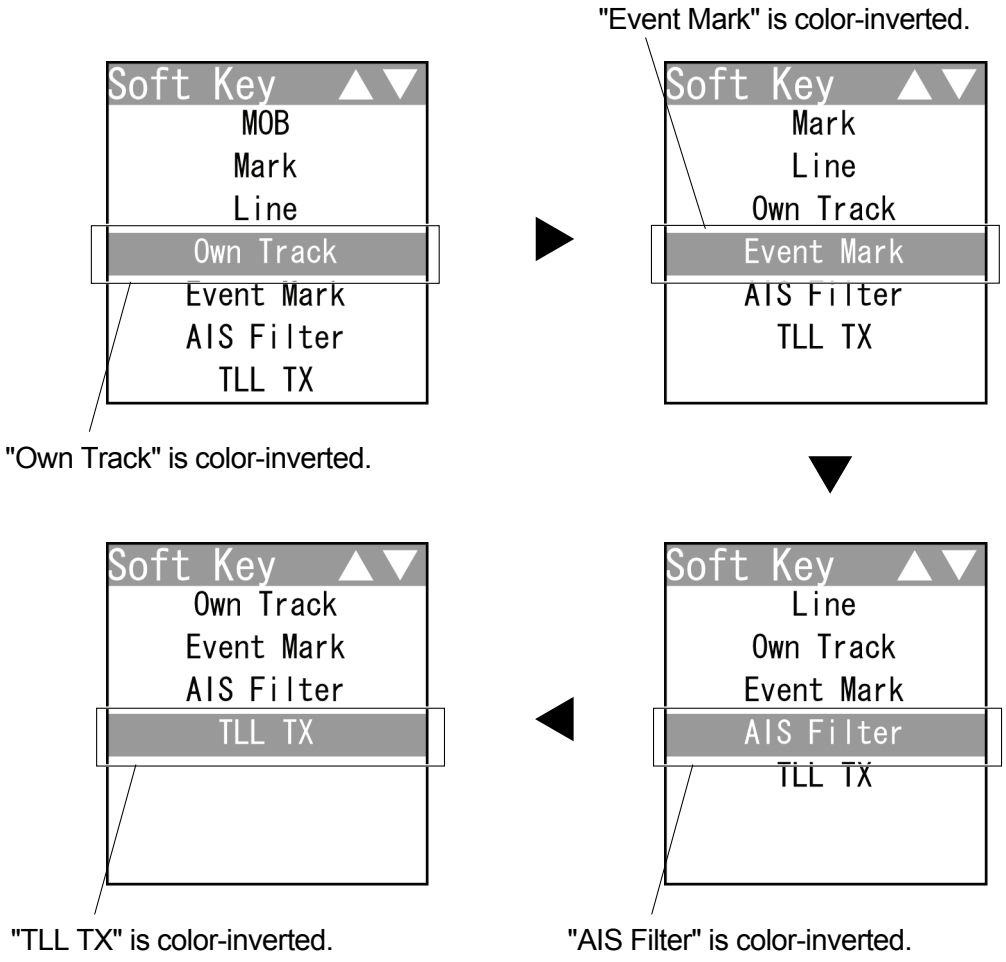
Reference:

When a certain time elapses without any key operation after selecting an item on the soft key menu, the soft key menu and the soft key display automatically disappear.

● Turning the [MULTI] control clockwise



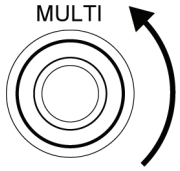
To select "Own Track" - "TLL TX"



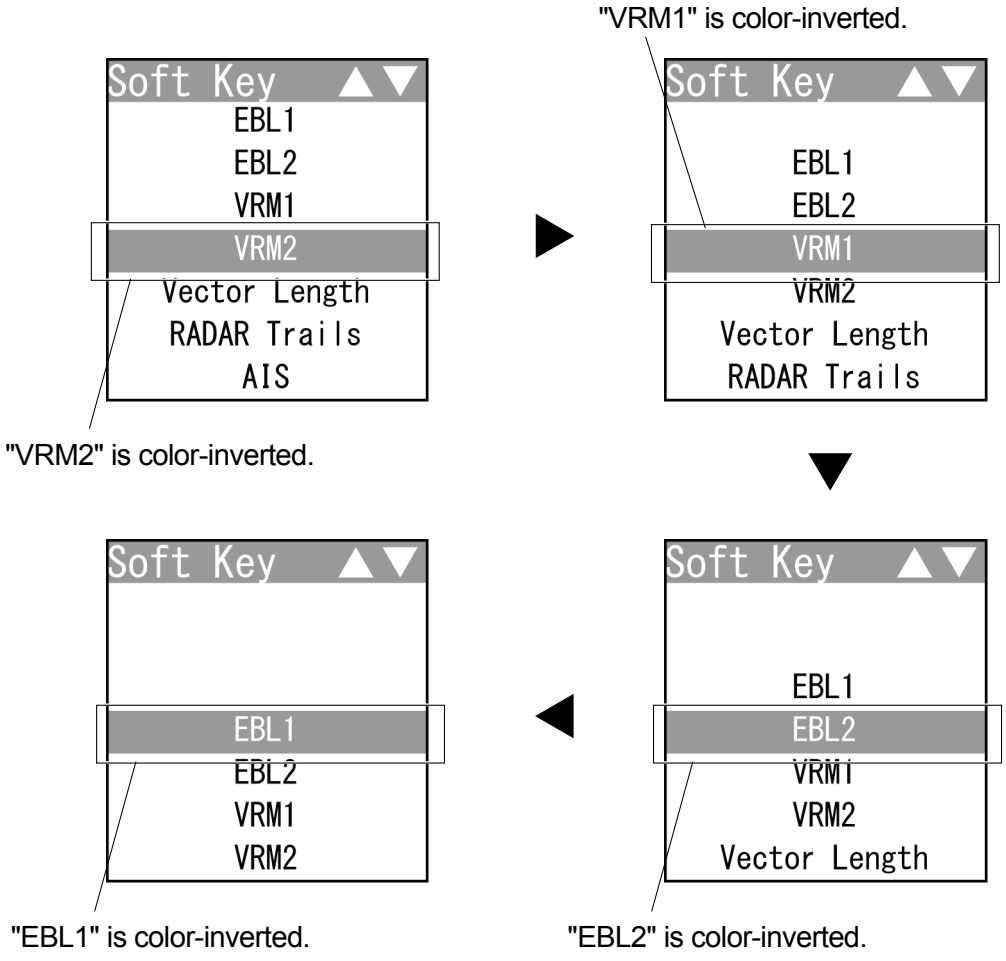
Reference:

When the item at the bottom of the soft key menu is color-inverted, the soft key menu does not scroll any more even if the control is turned clockwise.

● Turning the [MULTI] control counterclockwise



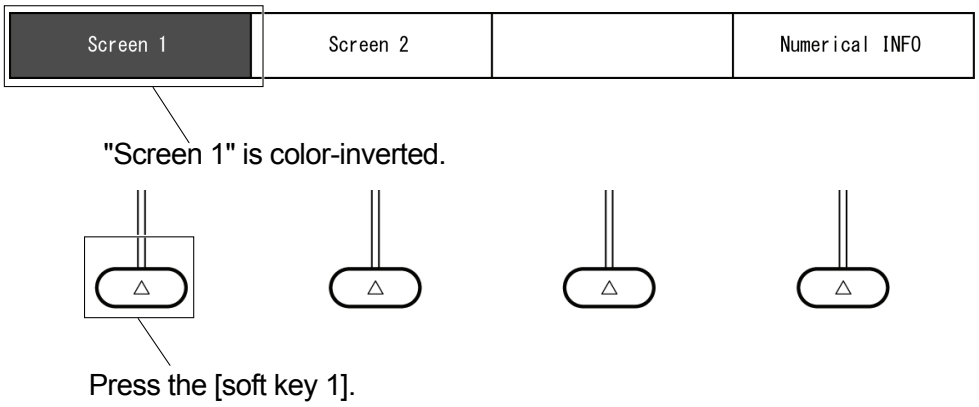
To select "VRM2" - "EBL1"



Reference:

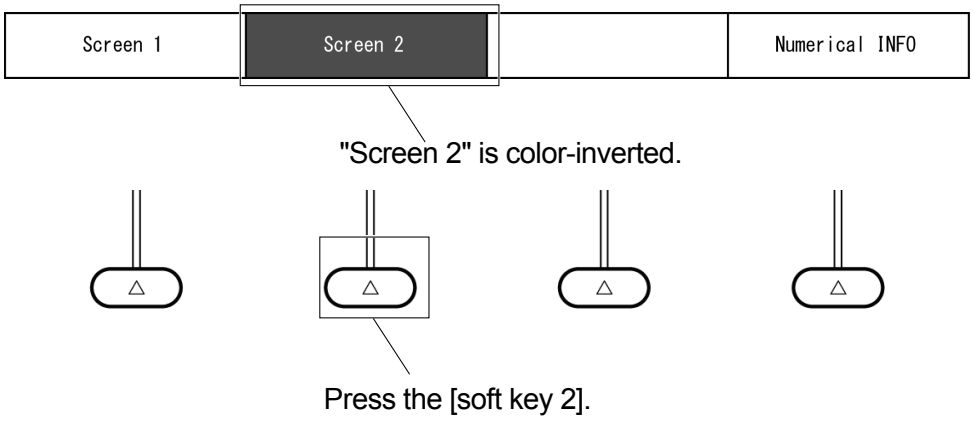
When the item at the top of the soft key menu is color-inverted, the soft key menu does not scroll any more even if the control is turned counterclockwise.

● Soft key 1



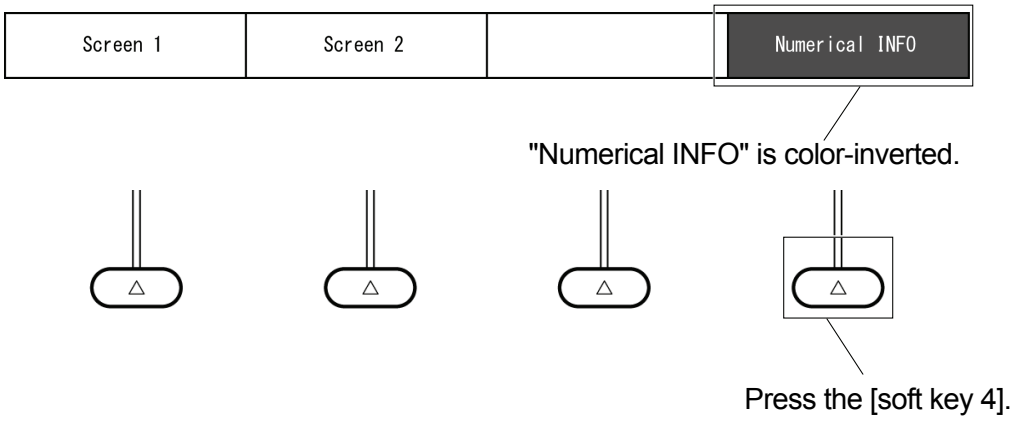
The screen changes to the layout set in the section "4.13.7 LOCATION CHANGE" - "1. Screen1".

● Soft key 2



The screen changes to the layout set in the section "4.13.7 LOCATION CHANGE" - "2. Screen2".

● Soft key 4



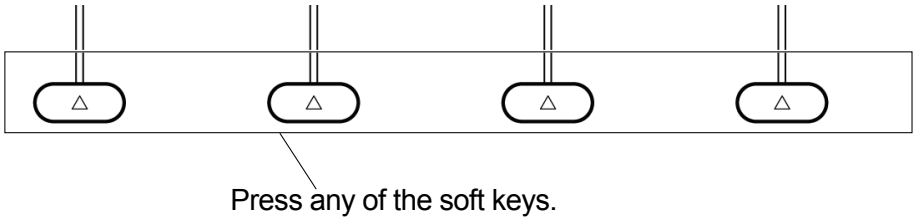
Each time you press the soft key 4 when "Numerical INFO" is set, the soft key display toggles in the following order:
"Numerical INFO" → "TT Detail" → "AIS Detail" → "Own AIS INFO"
→ "MOB INFO".

● Closing the soft key menu

CLEAR

Press the [CLEAR] key to turn off the soft key menu and the soft key display.

● Soft keys 1, 2, 3 and 4



If any of the soft keys is pressed when the soft key menu is turned off, the soft key menu and the soft key display which were displayed previously appear again.

■ "Soft key Operations (Example: Opening "Brilliance")

This section describes how to operate with the soft keys shown below.

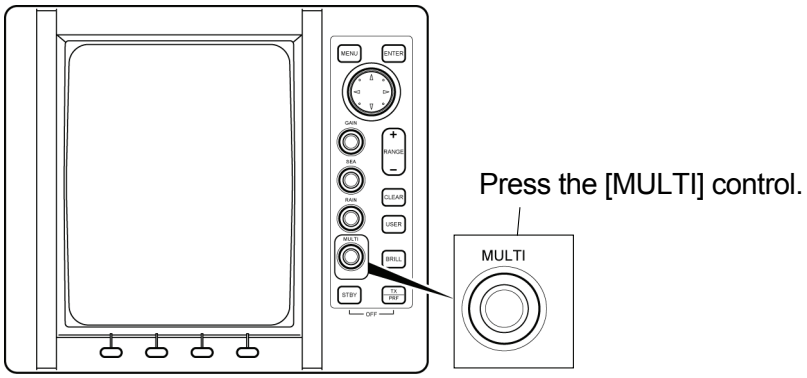
- EBL1
- EBL2
- VRM1
- VRM2
- Vector Length
- RADAR Trails
- AIS
- TT
- Alarm1
- Alarm2
- Brilliance

Reference:

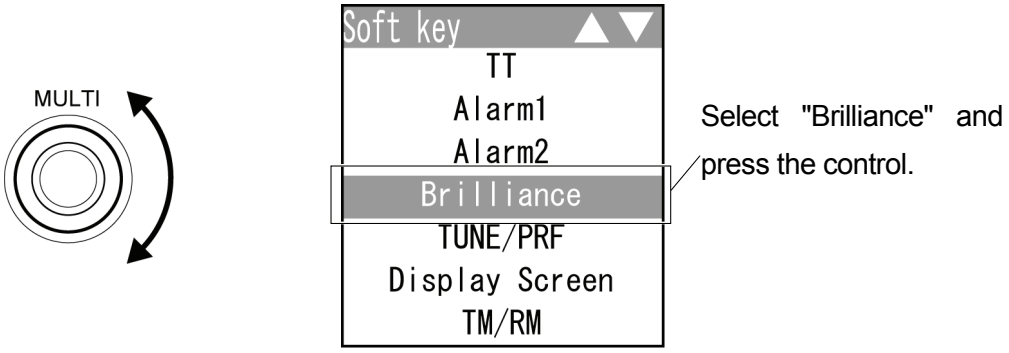
The functions for the following soft key menu are initially set to off. To use these functions, set the menu items to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

Vector Length, AIS, TT and Alarm2

1 Press a soft key.



2 Turn the [MULTI] control to select Brilliance on the soft key menu.

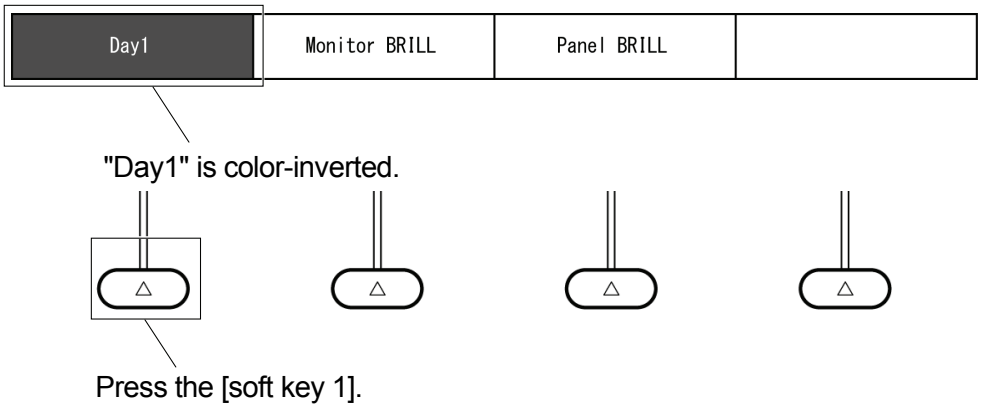


"Brilliance" is activated.

Reference:

Perform the same operations for the other soft key menu items to activate the functions.

● Soft key 1

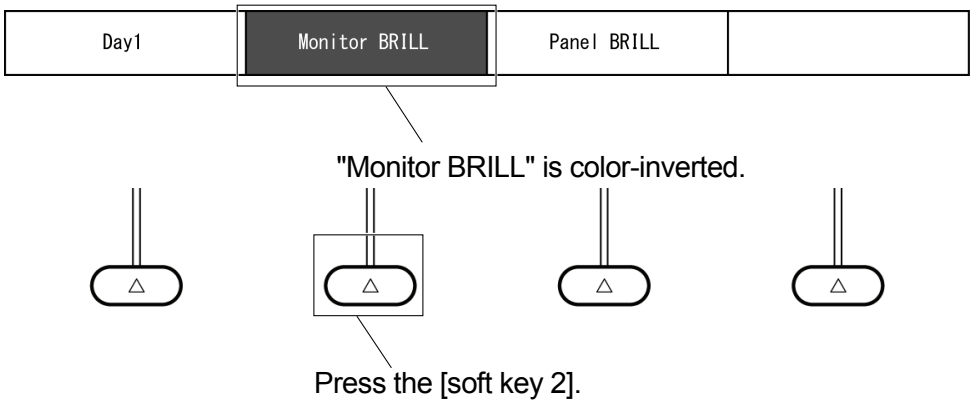


When the soft key 1 is pressed, the monitor brill is switched.

This cannot be switched in the factory setting.

To enable switching, perform the display setting for the soft keys.

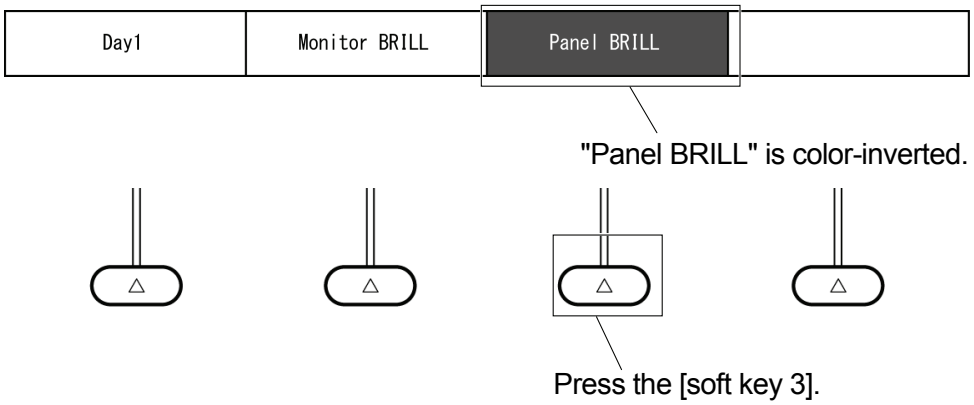
● Soft key 2



"Monitor BRILL" is color-inverted, and is activated.

Press the [BRILL] key to adjust at eight levels.

● Soft key 3



"Panel BRILL" is color-inverted, and is activated.

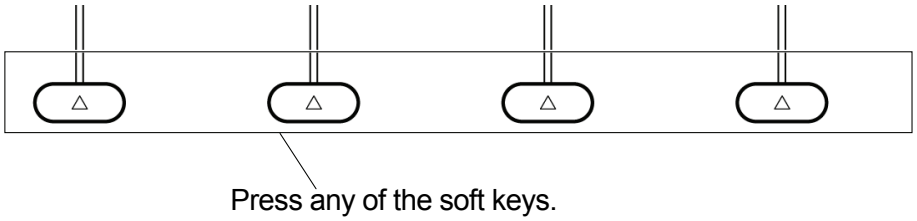
● Setting with the soft key menu

To determine the setting of the soft key menu item, press one of the followings:

- [Multi] control
- [CLEAR] key

The soft key menu item is determined, then the soft key menu and the soft key display are turned off and the setting is finished.

● Soft keys 1, 2, 3 and 4

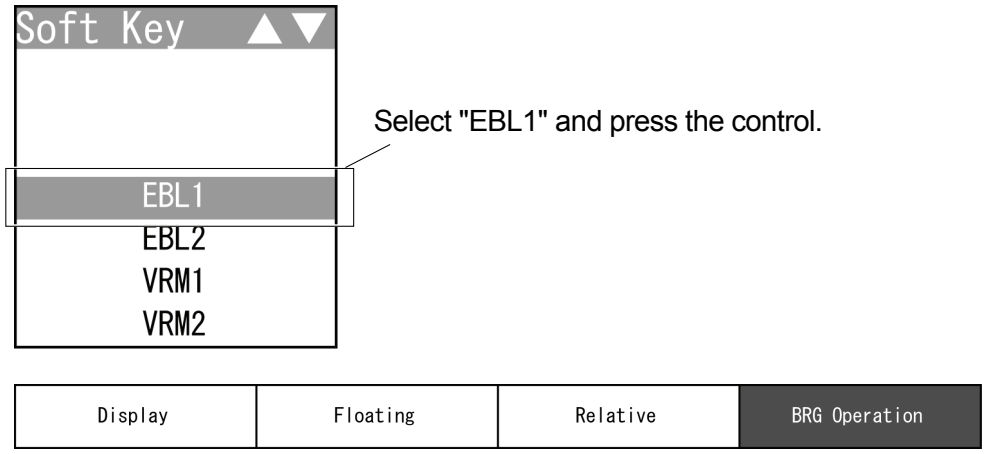


If any of the soft keys is pressed when the soft key menu is turned off, the soft key menu and the soft key display which were displayed previously appear again, and the function is activated.

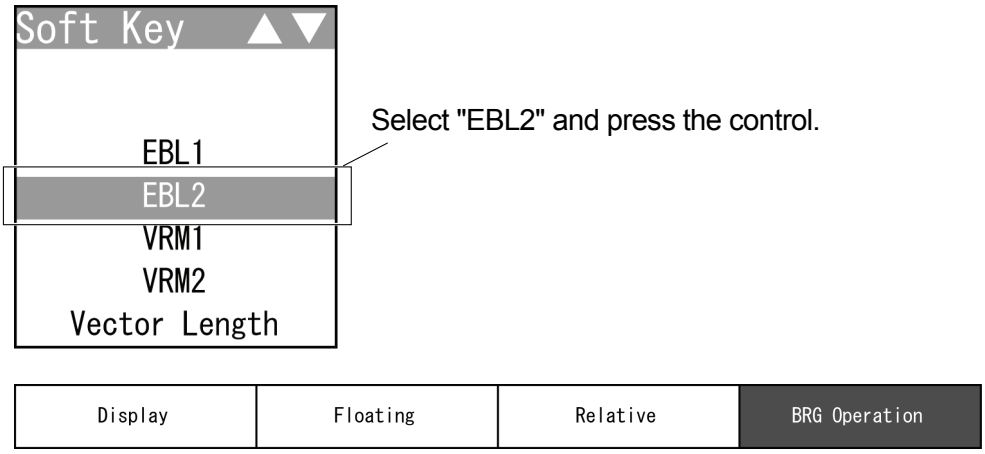
2.7.1 MEASURING TARGET BEARING (EBL)

Measures bearing with EBLs (Electronic Bearing Lines).

1 Select [EBL1] [EBL2] on the soft key menu.



When "EBL1" is selected, the soft key menu is turned off and "BRG Operation" of the soft key display is color-inverted.
"EBL1" is activated.



When "EBL2" is selected, the soft key menu is turned off and "BRG Operation" of the soft key display is color-inverted.
"EBL2" is activated.

2 Operate with the soft keys.

Soft key 1: [Display Off] [Display]

"Display Off": "EBL1"/"EBL2" is not displayed.

"Display": "EBL1"/"EBL2" is displayed.

Reference:

When "Display Off" is selected for the soft key 1, the equipment performs the followings:

- EBL is not displayed.
- The soft key menu and the soft key display disappears, and EBL function is terminated.

Soft key 2: [Floating]

When pressing the soft key 2, "Floating" is color-inverted.

The starting point of the currently operating EBL can be switched from the center of the radar display (floating off) to floating state.

Press the cursor keys to move the starting point of "EBL1"/"EBL2".

Press the [ENT] key at the starting point of "EBL1"/"EBL2" you want to move.

The starting point of "EBL1"/"EBL2" is determined.

Reference:

The floating position of the EBL's starting point can be fixed on the radar display or at specific latitude and longitude.

Floating function must be turned on to use floating.

For details of settings, refer to "2.10.1 SETTING OPERATIONS FOR EBLS (ELECTRONIC BEARING LINES)".

Soft key 3: [True] [Relative]

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

"True": "EBL1"/"EBL2" is displayed in true bearing mode.

"Relative": "EBL1"/"EBL2" is displayed in relative bearing mode.

Reference:

Bearing signal input is required to display true motion.

Soft key 4: BRG Operation

When "EBL1" or "EBL2" of the soft key menu is selected, "BRG Operation" of the soft key display is color-inverted.

Turn the [MULTI] control to change the direction of "EBL1"/"EBL2".

To determine the setting of "EBL1"/"EBL2", press one of the followings: the [MULTI] control, the soft key 4 or the [CLEAR] key.

The bearing is set and operation state ends.

Reference:

When "EBL1"/"EBL2" is not selected on the soft key menu, press the soft key 4 to activate the EBL function.

■ EBL Bearing Display

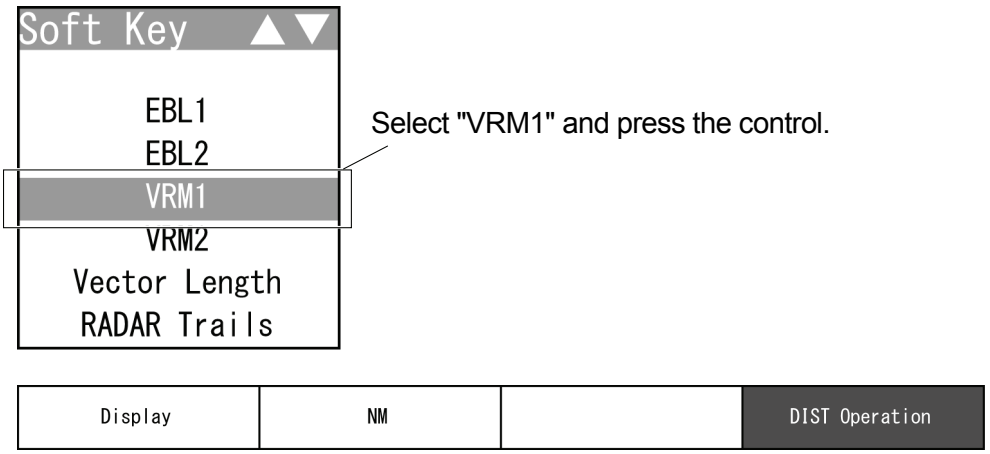
The bearing values of EBL1 and EBL2 displayed on the PPI are indicated at the radar display.

Even if EBL1 and EBL2 are not displayed, the bearing values are displayed.

2.7.2 MEASURING RANGE TO TARGET (VRM)

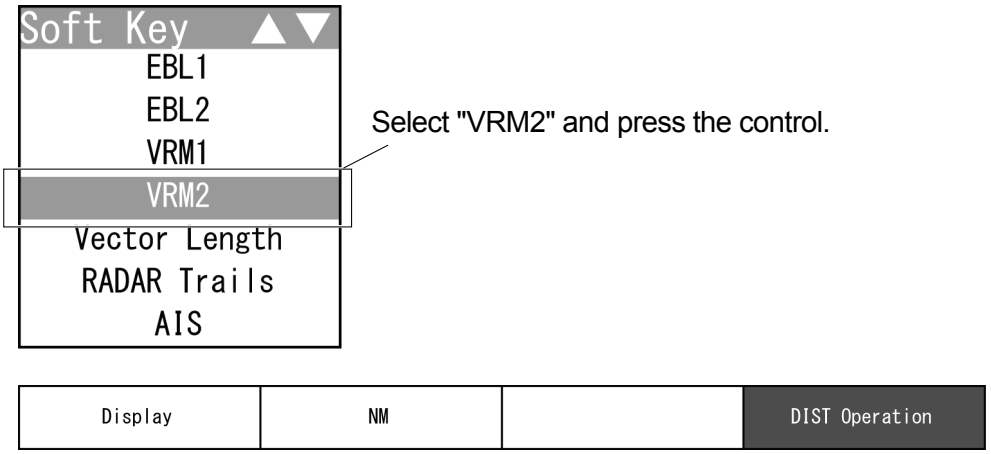
Measures the range with VRM (Variable Range Marker).

1 Select VRM1 VRM2 on the soft key menu.



When "VRM1" is selected, the soft key menu is turned off and "DIST Operation" of the soft key display is color-inverted.

"VRM1" is activated.



When "VRM1" is selected, the soft key menu is turned off and "DIST Operation" of the soft key display is color-inverted.
"VRM2" is activated.

2 Operate with the soft keys.

Soft key 1: [Display Off] [Display]

"Display Off": "VRM1"/"VRM2" is not displayed.

"Display": "VRM1"/"VRM2" is displayed.

Reference:

When "Display Off" is selected for the soft key 1, the equipment performs the followings:

- VRM is not displayed.
- The soft key menu and the soft key display disappears, and VRM function is terminated.

Soft key 2: [NM] [km] [sm]

Selects units of "VRM1"/"VRM2" range.

Soft key 3: Not available

Soft key 4: [DIST Operation]

When "VRM1" or "VRM2" of the soft key menu is selected, "DIST Operation" of the soft key display is color-inverted.

Turn the [MULTI] control to operate "VRM1"/"VRM2".

Press the [MULTI] control, the soft key 4 or the [CLEAR] key to determine the "VRM1" and "VRM2" settings. Distance is set and operation state ends.

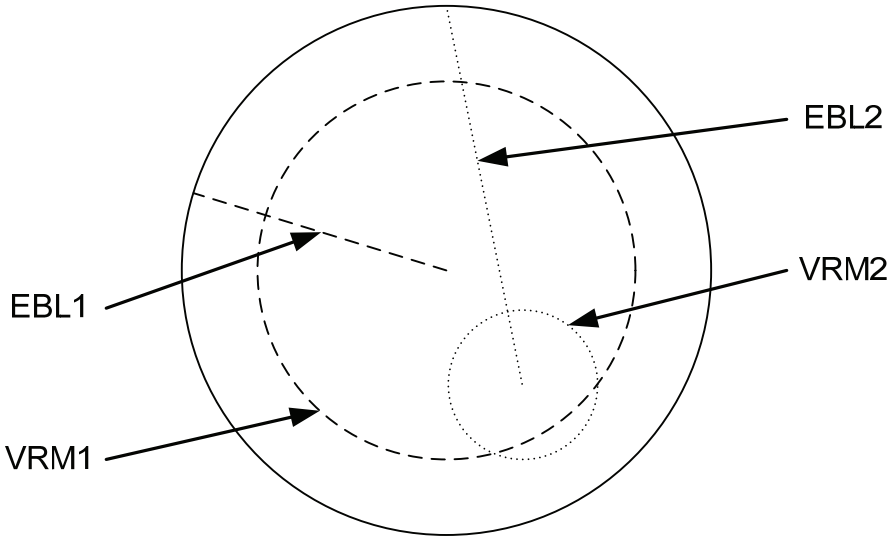
Reference:

When "VRM1"/"VRM2" is not selected on the soft key menu, press the soft key 4 to activate the VRM function.

■ Variable Range Marker

VRM1 is represented as a broken line, and VRM2 as a dotted line. When EBL1 is displayed, VRM1 marker appears on the EBL1. When EBL2 is displayed, VRM2 marker appears on the EBL2.

If the starting point of an EBL is offset, the center of a VRM marker is positioned at the starting point of the EBL.



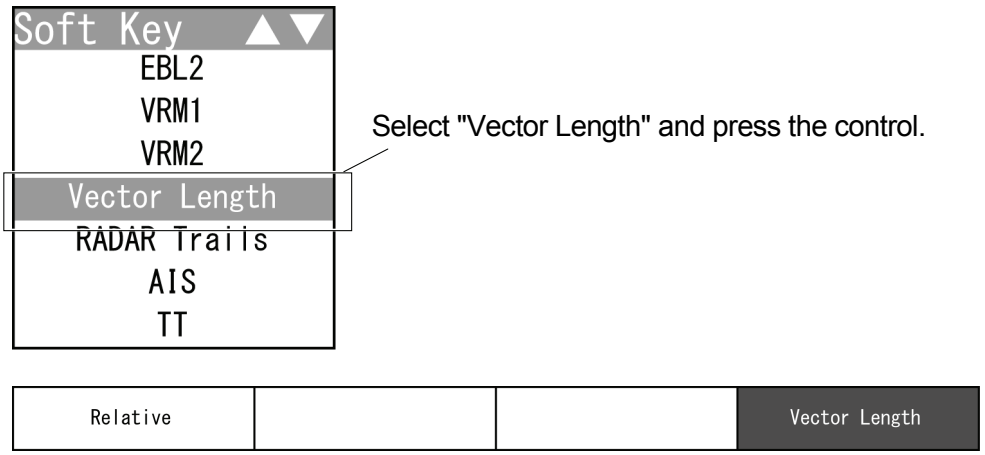
2.7.3 SETTING VECTORS

Sets TT and AIS vectors.

Reference:

- The bearing input is required to display TT and AIS vectors.
- This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select [Vector Length] on the soft key menu.



The soft key menu disappears and "Vector Length" of the soft key display is color-inverted.

"Vector Length" is activated.

2 Operate with the soft keys.

Soft key 1: [True] [Relative]

Switches between true vector mode and relative vector mode.

Soft key 2: Not available

Soft key 3: Not available

Soft key 4: [Vector Length]

When "Vector Length" of the soft key menu is selected, "Vector Length" of the soft key display is color-inverted.

Vector time can be set in minutes in the range 1 to 60 min.

Turn the [MULTI] control to set the vector length.

Reference:

When "Vector Length" is not selected on the soft key menu, press the soft key 4 to activate the Vector Length function.

■ Vector display

Note:

- When a target or own ship changes its course, or when a new target is acquired, its vector may not reach a given level of accuracy until three minutes or more has passed after such course change or target acquisition.
  Even if three minutes or more has passed, the vector may include an error depending upon the. tracking conditions.

A vector to represent a target's predicted position can 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.

■ Vector Modes

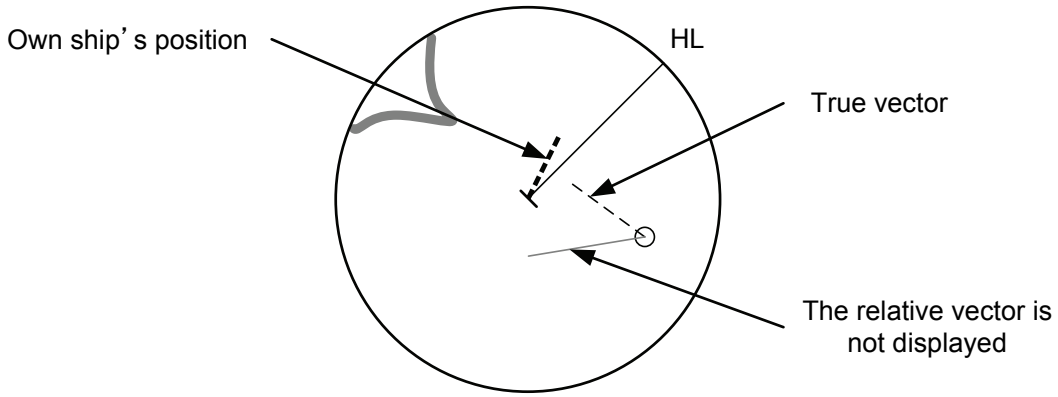
● True Vector Mode

In the true vector mode, the direction of a target vector indicates the true course of the target and its vector length is proportional to its speed.

In this mode, own ship's vector is displayed as shown below.

In this mode, the movements of other ships around own ship can be accurately and easily monitored.

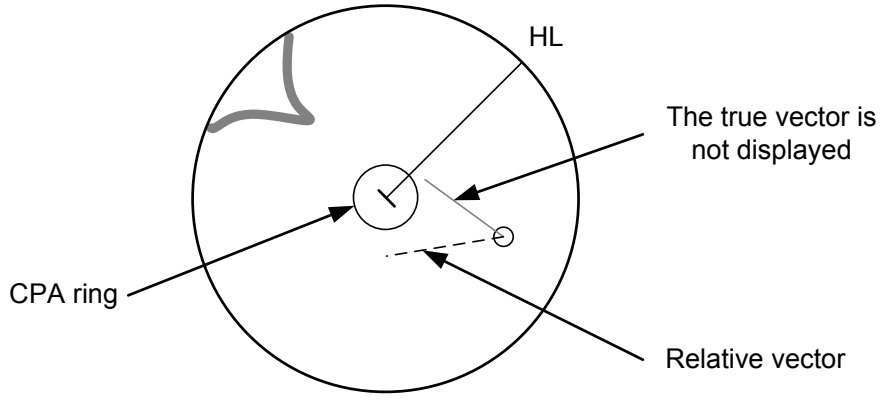
However, no CPA RING can appear in this mode.



● Relative Vector Mode

The relative vector does not represent the true motion of the target, but its relative relation with own ship. This means that a target with its relative vector directed to own ship (passing through the CPA LIMIT ring) will be a dangerous target.

In the Relative Vector mode, it can be seen at a glance where the CPA LIMIT of the dangerous target is.

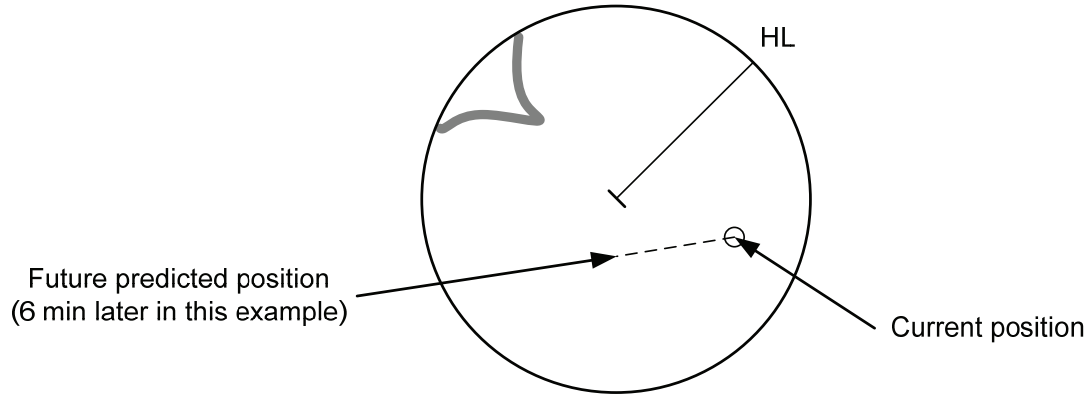


Therefore, the TRUE/REL mode shall optionally be used for the purpose of observation: the TRUE vector mode for grasping the true aspect of a target, and the REL vector mode for grasping a target's closest point of approach (CPA).

■ Vector Length

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 six minutes, and the tip of the vector represents the target's position expected to reach six minutes later.

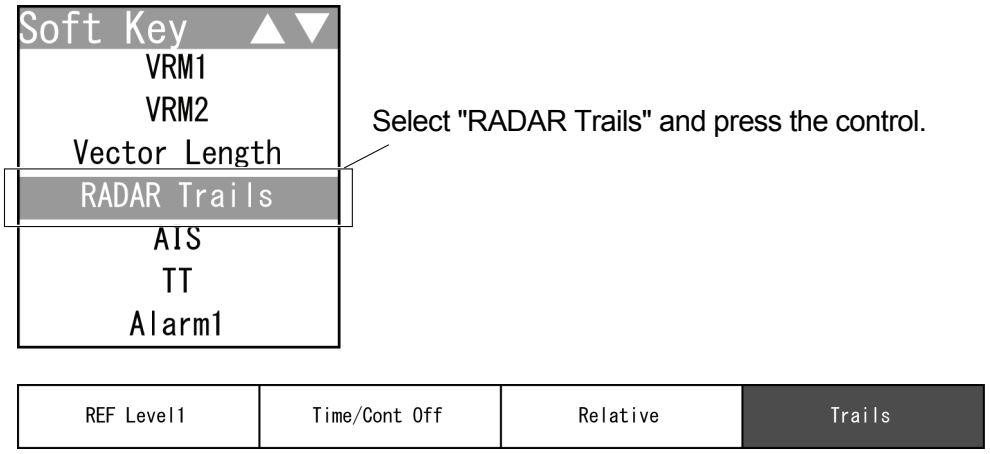


2.7.4 DISPLAYING OTHER SHIP'S TRACKS (RADAR TRAILS)

Sets radar trails.

Other ships' movements and speeds can be monitored from the lengths and directions of their trails, serving for collision avoidance.

1 Select RADAR Trails on the soft key menu.



The soft key menu disappears and "Trails" of the soft key display is color-inverted. "RADAR Trails" is activated.

2 Operate with the soft keys.

Soft key 1: [REF Level1] [REF Level2] [REF Level3] [REF Level4]

Selects a radar video level required for plotting radar trails.

"REF Level1" is the lowest level while "REF Level4" is the highest level.

- When radar trails are plotted 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.

Soft key 2: [Time/Cont Off] [Time/Cont On]

This function superimpose-displays time radar trails and continuous radar trails.

When "Time/Cont Off" is selected, this superimpose-display is disabled.

When "Time/Cont On" is selected, this superimpose-display is enabled.

Soft key 3: [True] [Relative]

Switches the radar trail display between true and relative motion trail modes.

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.

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 when the own ship is turning.

Reference:

True bearing signal input and speed signal input are required to display radar trails in true motion trail mode.

Soft key 4: [Trails]

When "RADAR Trails" of the soft key menu is selected, "Trails" of the soft key display is color-inverted.

Turn the [MULTI] control to change the radar trail length.

Reference:

When "RADAR Trails" is not selected on the soft key menu, press the soft key 4 to activate the RADAR Trails function.

The time for "Trails" changes as shown below.

Off/15sec/30sec/1min/2min/3min/4min/5min/6min/10min/15min/All

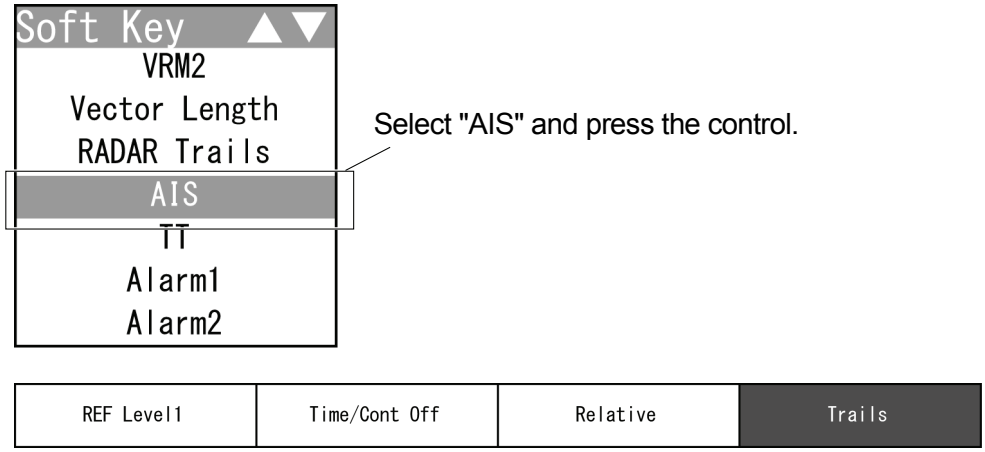
2.7.5 AIS OPERATIONS

The AIS function shows the target's information on the radar display, using other ship's information sent out from the AIS unit.

Reference:

- The inputs of heading, latitude/longitude and AIS signal are required to display AIS.
- For detail settings of AIS functions, see "2.13 SETTING TT/AIS".
- This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select [AIS] on the soft key menu.



The soft key menu disappears and "Target Select" of the soft key display is color-inverted.

"AIS" is activated.

2 Operate with the soft keys.

Soft key 1: [Numerical Data] [Retrieved Vessel] [DEST Ship]

"Numerical Data": The mode is set to AIS numerical data display selection mode.

"Retrieved Vessel": The mode is set to AIS retrieved vessel selection mode.

"DEST Ship": The mode is set to AIS destination ship selection mode

Soft key 2: [Setting/Release]

AIS data display (numerical display, retrieved vessel and destination ship) can be set/released.

Soft key 3: [AIS List] [AIS Number SEL]

"AIS List": AIS list is displayed.

"AIS Number SEL": AIS list is not displayed.

Soft key 4: [Target Select]

When "AIS" of the soft key menu is selected, "Target Select" of the soft key display is color-inverted.

Sets the numerical display, retrieved vessel and destination ship.

Reference:

When "AIS" is not selected on the soft key menu, press the soft key 4 to activate the AIS function.

■ AIS Retrieved Vessel

AIS retrieved vessel is the function to preferentially display the user-specified ship.

■ AIS Destination Ship

AIS destination ship is the function to display the user-specified ship as the destination.

■ AIS data (Numerical Data, Retrieved Vessel, DEST Ship)

● Displaying AIS data (Operation with the soft key menu)

1 Press the cursor keys to select "AIS", then press the [ENT] key.

- When "Numerical Data" is displayed above the soft key 1

- When "Retrieved Vessel" is displayed above the soft key 1

- When "DEST Ship" is displayed above the soft key 1

The specified target data is displayed and the symbol is changed.
The target data will remain on the radar display until the target is lost, or until another target is designated.

Note:

- Numerical Data, AIS retrieved vessel and AIS destination ship can be operated when
  Soft key 1: [Numerical Data] [Retrieved Vessel] [DEST Ship]
  are selected.

● Displaying AIS data (Operation with the [ENT] key)

AIS data (numerical display) can be done by the [ENT] key operation without displaying the soft key menu.

1 Press the cursor keys to select "AIS", then press the [ENT] key.

The selected AIS numerical display is set, and the "AIS" soft key is displayed.

Note:

- If operating with the [ENT] key when the soft key menu is closed, the equipment performs the followings:
  On the AIS symbol: Opens the AIS soft key and the numerical display of AIS.
  On the TT symbol: Opens the TT soft key and the numerical display of TT.
  Not on the AIS or TT symbol:
  Opens the TT soft key, it will be acquired.
- If operating with the [ENT] key when the AIS symbol overlaps the TT symbol, the numerical display of AIS symbol takes priority.

Reference:

- After setting the AIS numerical display, perform the same operations in "● Displaying AIS data (Operation with the soft key menu)".
- AIS data (numerical data) is displayed when the soft key 4 is set to "AIS Detail" in the section "2.7.10 SETTING DISPLAY SCREEN".

● Releasing AIS data display

1 Press the cursor keys to select "AIS", then press the [ENT] key.
Numerical Data, AIS retrieved vessel and AIS destination ship are canceled.

■ Displaying the other AIS data

Reference:

- AIS retrieved vessel can be set by specifying MMSI number.
  For details of settings, see "2.13.8 SETTING AIS RETRIEVED VESSEL".
- AIS destination ship can be set by specifying MMSI number.
  For details of settings, see "2.13.7 SETTING AIS DESTINATION SHIP".

● Displaying AIS data

1 Turn the [MULTI] control to select "AIS", then press the soft key 3 "Setting/Release".

- When "Numerical Data" is displayed above the soft key 1

- When "Retrieved Vessel" is displayed above the soft key 1

- When "DEST Ship" is displayed above the soft key 1

The specified target data is displayed and the symbol is changed.
The target data will remain on the radar display until the target is lost, or until another target is designated.

	No.	BRG[°]R	RNG[NM]	NAME	MMSI ▲▼
#	12	36.9	0.99		377470001
$	15	109.7	1.02		377470003
*	20	322.7	1.00		377470009
	11	359.7	1.00		377470000
	13	72.6	1.01		377470002
	14	287.2	1.02		377470008
	17	144.6	1.03		377470004

When the target for the numerical display is set, "#" is displayed in the AIS list.
"#" disappears when the target is released.
When the AIS retrieved vessel is set, "*" is displayed in the AIS list.
"*" disappears when it is released.

When the AIS destination ship is set, "$" is displayed in the AIS list.
"$" disappears when it is released.

Reference:

AIS data (Numerical Data) is displayed when the soft key 4 is set to "AIS Detail" in the section "2.7.10 SETTING DISPLAY SCREEN"

Note:

- Numerical Data, AIS retrieved vessel and AIS destination ship can be operated when
  Soft key 1: [Numerical Data] [Retrieved Vessel] [DEST Ship]
  are selected.

- Releasing AIS data display

  1 Turn the [MULTI] control to select "AIS", then press the soft key 3 "Setting/Release".
  Numerical Data, AIS retrieved vessel and AIS destination ship are canceled.

■ AIS Symbols

This section describes types and definitions of AIS symbols.

Symbol	Definition	Remarks
	Activated AIS target	This symbol shows the position of an AIS target on the PPI. The shape is an isosceles triangle, and its vertex shows the approximate heading direction. If heading bearing information or COG information is not received, the target is displayed toward PPI.
	Selection	When selecting an AIS target to display its numeric information, this symbol is superimpose-displayed on the selected target. This is displayed with a split square.
	AIS SART	This symbol shows the position of an AIS SART target on the PPI. This is displayed with a circle and cross lines.

■ Setting AIS Symbol Display

For details of displaying/hiding of the AIS symbols, see Section "2.7.15 SETTING SYMBOL ".

2.7.6 TT OPERATIONS

The target tracking function calculates the course and speed of a target by automatically tracking the target's move.

Note:

- 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 less 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 correlationship, and thus the target will be lost if no echoes are detected during seven 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.

To execute accurate tracking, it becomes necessary to appropriately adjust the [GAIN], [SEA] and [RAIN] controls of the radar so that the target to be acquired and tracked id clearly displayed on the radar display.

Inappropriate settings of these adjustments reduce the reliability / accuracy of automatic tracking.

⚠CAUTION

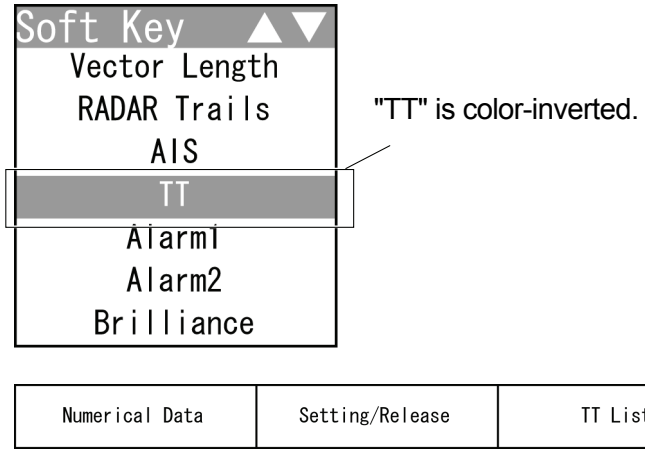
Use the radar only as a navigation aid.
The final navigation decision must always be made by the operator him/herself.
Making the final navigation decision based only on the radar display may cause accidents such as collisions or running aground.

Use the target tracking function (TT) only as a navigation aid. The final navigation decision must always be made by the operator him/herself.
Making the final navigation decision based only on the target tracking function (TT) information may cause accidents.
The target tracking function (TT) information such as vector, target numerical data, and alarms may contain some errors. Also, targets that are not detected by the radar cannot be acquired or tracked.
Making the final navigation decision based only on the radar display may cause accidents such as collisions or running aground.

Reference:

This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select [TT] on the soft key menu.



The soft key menu disappears and "Target Select" of the soft key display is color-inverted.
"TT" is activated.

2 Operate with the soft keys.

Soft key 1: [Numerical Data] [TT Acquisition] [TT Release]

"Numerical Data": The mode is set to TT numerical data display selection mode.
"TT Acquisition": The mode is set to TT acquisition selection mode.
"TT Release": The mode is set to TT release selection mode

Soft key 2: [Setting/Release]

Target tracking data (numerical display) can be set/released.

Soft key 3: [TT List] [TT Number SEL]

"TT List": TT list is displayed.

"TT Number SEL": TT list is not displayed.

Soft key 4: [Target Select]

When "TT" of the soft key menu is selected, "Target Select" of the soft key display is color-inverted.

Sets the numerical display, TT acquisition and TT release.

Reference:

When "TT" is not selected on the soft key menu, press the soft key 4 to activate the TT function.

■ Target acquisition

This equipment has automatic acquisition and manual acquisition.

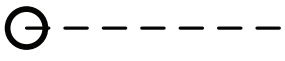
● Manual acquisition (Operation with the soft key menu)

Note:

- Manual acquisition can be operated when
  Soft key 1: [TT Acquisition]
  are selected.
- If the range is switched, the acquisitions of targets acquired before switching the range are released when those targets get out of the echo radius.

1 Press the cursor keys to select the target for acquisition with the cursor, then press the [ENT] key.

An initial acquisition symbol appears.



After one minute elapses, the target tracking symbol and vector are displayed.

Reference:

When the number of targets tracked has reached to the maximum (10 targets), any new target is not acquired.
Delete the unnecessary targets, then acquire new targets.

● Manual acquisition (Operation with the [ENT] key)

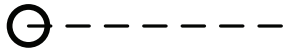
Target can be acquired by the [ENT] key operation without displaying the soft key menu.

Note:

- If operating with the [ENT] key when the soft key menu is closed, the equipment performs the followings:
  On the AIS symbol: Opens the AIS soft key and the numerical display of AIS.
  On the TT symbol: Opens the TT soft key and the numerical display of TT.
  Not on the AIS or TT symbol:
  Opens the TT soft key, it will be acquired.
- If operating with the [ENT] key when the AIS symbol overlaps the TT symbol, the numerical display of AIS symbol takes priority.

1 Press the cursor keys to select the target for acquisition with the cursor, then press the [ENT] key.

An initial acquisition symbol appears, and the "TT" soft key is displayed.



After one minute elapses, the target tracking symbol and vector are displayed.

Reference:

- When operating the [ENT] key on a TT symbol, the "TT" soft key and the target tracking data are displayed.
- When operating the [ENT] key on an AIS symbol, the "AIS" soft key and the selected AIS data (numerical display) are displayed.

● Automatic acquisition

1 Perform the procedure as shown below to start automatic acquisition.

Open [Alarm1] from the soft key menu.

Soft key 1: [On]

Soft key 2: [AZ1]

Reference:

- If untracked targets intrude into the automatic acquisition area in the conditions that maximum number of targets (10 targets) is under tracking, the targets acquired automatically will be cancelled in the order of lower levels of danger.
- For details of automatic acquisition operation, refer to "2.7.7 DISPLAYING THE RADAR ALARM AND AUTOMATIC ACQUISITION OPERATIONS".

■ Deleting the unnecessary targets

Note:

● Releasing manual acquisition can be operated when
Soft key 1: [TT Release]
are selected.

1 Press the cursor keys to select the target for releasing with the cursor, then press the [ENT] key.
The target's vectors and symbols disappear, and only the radar video remains.

■ Target tracking data (numerical display)

Note:

● The numerical display can be operated when
Soft key 1: [Numerical Data]
are selected.

● Displaying tracking target data (Operation with the soft key menu)

1 Press the cursor keys to select the target for the numerical display with the cursor, then press the [ENT] key.

The specified target data is displayed and the symbol is changed.
The target data will remain on the radar display until the target is lost and its vector disappears, or until another target is designated.

Reference:

- If a target with the mark "○" is designated, only its true bearing and range will appear until its vector appears.
- Tracking target data is displayed when the soft key 4 is set to "TT Detail" in the section "2.7.10 SETTING DISPLAY SCREEN"

● Displaying tracking target data (Operation with the [ENT] key)

The target tracking data can be displayed by the [ENT] key operation without displaying the soft key menu.

Note:

- If operating with the [ENT] key when the soft key menu is closed, the equipment performs the followings:
  On the AIS symbol: Opens the AIS soft key and the numerical display of AIS.
  On the TT symbol: Opens the TT soft key and the numerical display of TT.
  Not on the AIS or TT symbol:
  Opens the TT soft key, it will be acquired.
- If operating with the [ENT] key when the AIS symbol overlaps the TT symbol, the numerical display of AIS symbol takes priority.

1 Press the cursor keys to select the target for numerical display with the cursor, then press the [ENT] key.

The selected target tracking numerical display is set, and the "TT" soft key is displayed.

Reference:

After setting the TT numerical display, perform the same operations in "● Displaying tracking target data (Operation with the soft key menu)".

● Releasing tracking target data display

1 Press the cursor keys to select the target for the numerical display with the cursor, then press the [ENT] key.

Numerical data display is released.

■ Displaying the other tracking target data

Note:

- The numerical display can be operated when
  Soft key 4: [Target Select]
  are selected.

- Displaying tracking target data

  1 Turn the [MULTI] control to select the target for the numerical display, then press the soft key 3 "Setting/Release".

  The specified target data is displayed and the symbol is changed.
  The target data will remain on the radar display until the target is lost and its vector disappears, or until another target is designated.

◌No.	BGR[°]R	RNG[NM]	COG[°]	SOG[kn]
# 1	302.5	0.65	33.2	9.9
2	303.9	1.15	36.0	15.2
3	308.0	1.66	20.0	10.0
4	268.4	1.51	337.9	8.7
5	265.8	0.79	20.6	10.0
6	39.2	0.98	9.5	11.2
8	316.2	0.73	4.4	12.2

  When the target for the numerical display is set, "#" is displayed in the TT list.
  "#" disappears when the target is released.

Reference:

- If a target with the mark "○" is designated, only its true bearing and range will appear until its vector appears.
- Tracking target data is displayed when the soft key 4 is set to "TT Detail" in the section "2.7.10 SETTING DISPLAY SCREEN".

- Releasing tracking target data display

  1 Turn the [MULTI] control to select the target for the numerical display, then press the soft key 3 "Setting/Release".
  Numerical data display is released.

■ Target Tracking Symbols

This section describes types and definitions of target tracking symbols.

Symbol	Definition	Remarks
	Initial acquisition	This symbol is displayed where the target is acquired. This is displayed with a circle of thin dotted line. This symbol is also used for the target acquired automatically.
	Tracking target	This symbol is displayed for the target which becomes the tracking target after acquired. This is displayed with a circle of thick line.
	New tracking target	This symbol is displayed for the target which becomes the tracking target after automatically acquired. This is displayed with a circle of thick line. This is changed to a normal tracking target when acknowledged to new target alarm.
	Dangerous target	This symbol is displayed when the tracking target becomes a dangerous target with CPA/TCPA decision. This is displayed with a circle of thick line. This blinks while this is not acknowledged. Then, it stops blinking when it is acknowledged. When there are some dangerous targets, targets which is not acknowledged blinks, and targets which has been acknowledged does not blink.
	Lost	When a tracking target is no longer detected as a target, this symbol is superimpose-displayed on the target symbol. This is displayed with cross lines. This is superimpose-displayed on tracking targets, new tracking targets or dangerous targets.
	Selection	When selecting a tracking target to display its numeric information, this symbol is superimpose-displayed on the selected target. This is displayed with a split square. This is superimpose-displayed on tracking targets, new tracking targets or dangerous targets.

■ Setting Tracking Target Symbol Display

For details of displaying/hiding of the tracking target symbols, see Section "2.7.15 SETTING SYMBOL ".

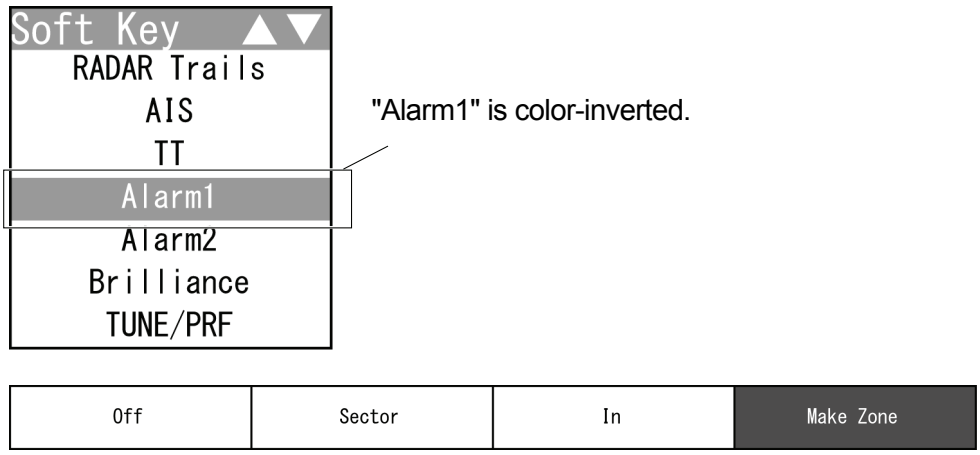
2.7.7 DISPLAYING THE RADAR ALARM AND AUTOMATIC ACQUISITION OPERATIONS

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

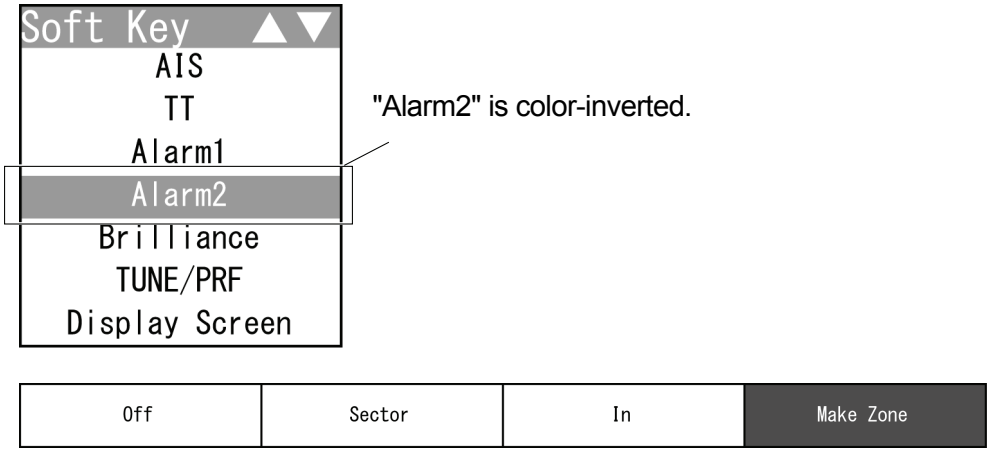
Reference:

"Alarm2" is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select [Alarm1] [Alarm2] on the soft key menu.



The soft key menu disappears and "Make Zone" of the soft key display is color-inverted.
"Alarm1" is activated.



The soft key menu disappears and "Make Zone" of the soft key display is color-inverted.
"Alarm2" is activated.

2 Operate with the soft keys.

Soft key 1: When Alarm1 is selected

Off | On

When Alarm2 is selected

Off | On

Turns on/off the alarm display.

Soft key 2: When Alarm1 is selected

Sector | Rectangle | AZ1

When Alarm2 is selected

Sector | Rectangle | AZ2

"Sector":

Displays a fan-shaped radar alarm.

"Rectangle":

Displays a rectangle-shaped radar alarm.

"AZ1" "AZ2":

Displays the acquisition area.

Soft key 3: When Alarm1 is selected

In | Out

When Alarm2 is selected

In | Out

Sets the alarm issuing conditions for the radar alarm.

"In": An alarm is issued when ship enters.

"Out": An alarm is issued when ship departs.

Soft key 4: When Alarm1 is selected

Make Zone

When Alarm2 is selected

Make Zone

"Make Zone" "Make Zone":

When "Make Zone" of the soft key menu is selected, "Target Select" of the soft key display is color-inverted.

Reference:

When "Alarm1"/"Alarm2" is not selected on the soft key menu, press the soft key 4 to activate the Alarm1/Alarm2 function.

■ Automatic acquisition operations

Reference:

If untracked targets intrude into the acquisition area in the conditions that maximum number of targets (10 targets) is under tracking, the targets acquired automatically will be cancelled in the order of lower levels of danger.

● Turning on the automatic acquisition

1 Perform the following settings.

Soft key 1: When Alarm1 is selected

On

When Alarm2 is selected

On

Soft key 2: When Alarm1 is selected

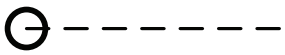
AZ1

When Alarm2 is selected

AZ2

The acquisition area is activated.

An initial acquisition symbol appears for an acquired target.



After one minute elapses, the target tracking symbol is displayed.

● Turning off the automatic acquisition

1 Perform the following settings.

Soft key 1: When Alarm1 is selected

Off

When Alarm2 is selected

Off

The acquisition area is deactivated.

The acquisition area disappears from the radar screen, however, the tracking target which has been already acquired are continued to be tracked.

■ Creating a fan-shaped radar alarm/acquisition area

1 Perform the following settings.

Soft key 2: When Alarm1 is selected

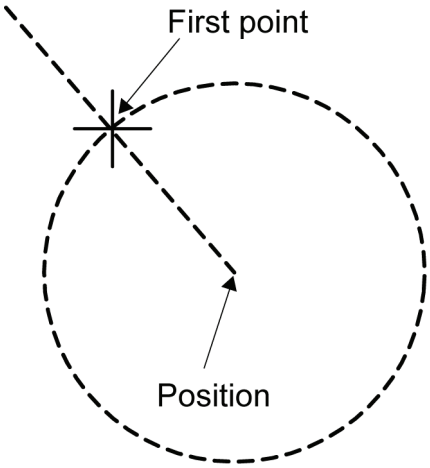
Sector | AZ1

When Alarm2 is selected

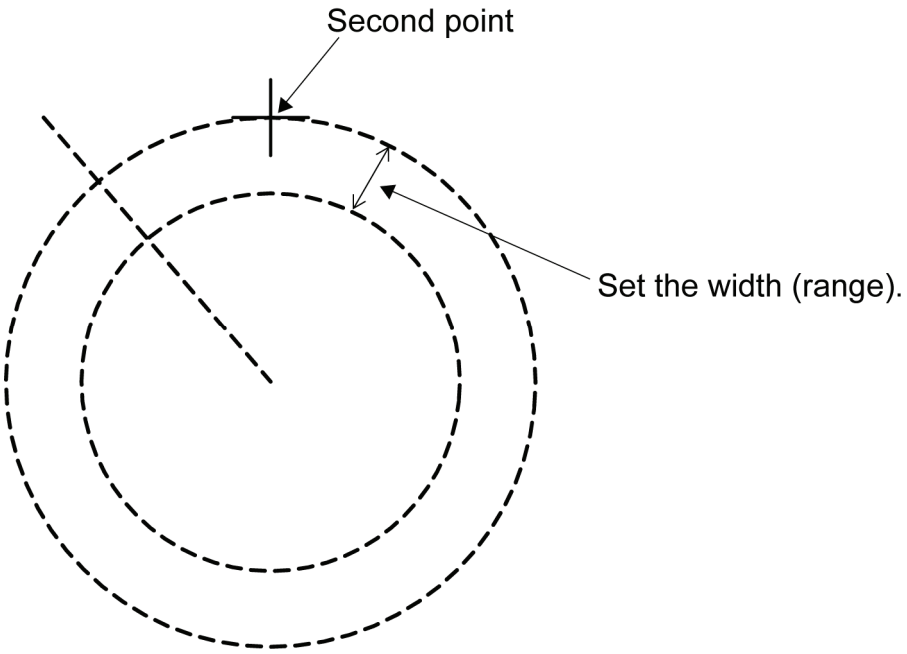
Sector | AZ2

The range setting is started for a fan-shaped radar alarm/acquisition area.

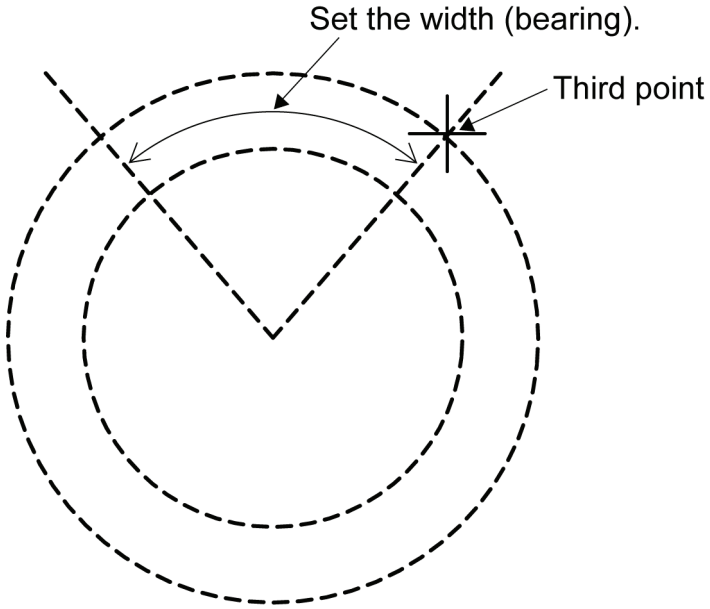
2 Press the cursor keys to move the cursor to the first point (setting of the start bearing and range), then press the [ENT] key.



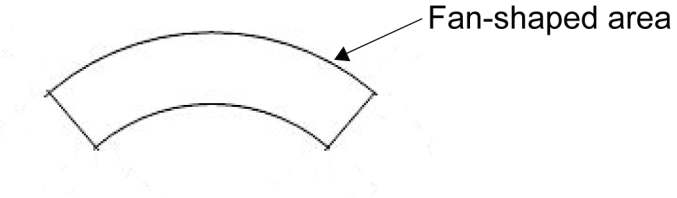
3 Press the cursor keys to move the cursor to the second point (setting of the end range), then press the [ENT] key.



4 Press the cursor keys to move the cursor to the third point (setting of the end bearing), then press the [ENT] key.



5 A fan-shaped radar alarm/acquisition area is determined.



Reference:

After the fan-shaped radar alarm/acquisition area is determined, the soft key menu and the soft key display disappears, and Alarm1 function is terminated.

■ Creating a rectangle-shaped radar alarm

1 Perform the following settings.

Soft key 2: When Alarm1 is selected

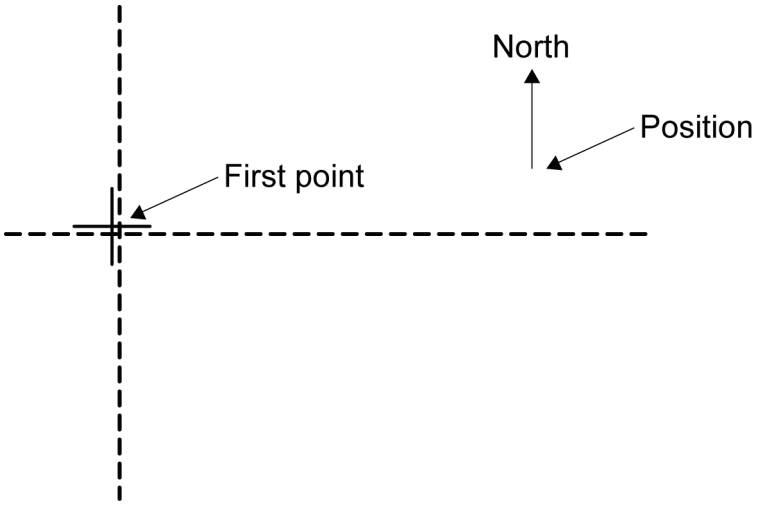
Rectangle

When Alarm2 is selected

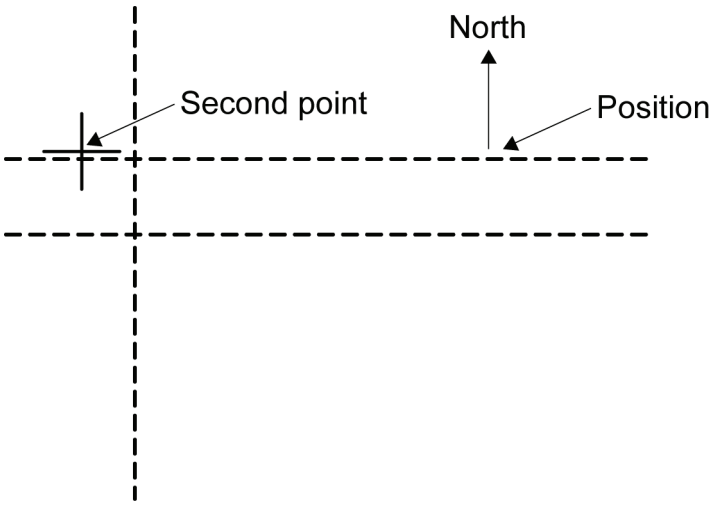
Rectangle

The range setting is started for a rectangle-shaped radar alarm.

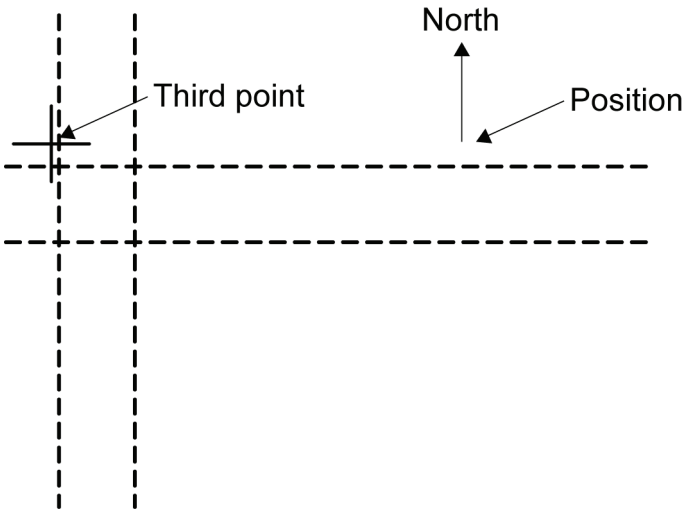
2 Press the cursor keys to move the cursor to the first point (setting of the start latitude and longitude), then press the [ENT] key.



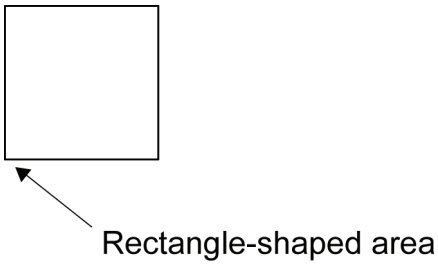
3 Press the cursor keys to move the cursor to the second point (setting of the end latitude), then press the [ENT] key.



4 Press the cursor keys to move the cursor to the third point (setting of the end latitude), then press the [ENT] key.



5 Rectangle-shaped area



Rectangle-shaped area is set with Nup as reference.

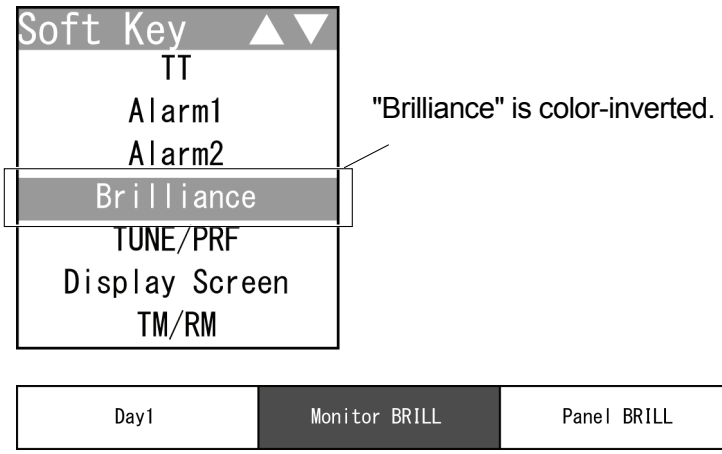
Reference:

After the fan-shaped radar alarm/acquisition area is determined, the soft key menu and the soft key display disappears, and Alarm1 function is terminated.

2.7.8 SETTING DISPLAY BRILLIANCE

Display brilliance can be changed.

1 Select [Brilliance] on the soft key menu.



2 Operate with the soft keys.

Soft key 1: [Day1] [Day2] [Day3] [Dusk] [Night]

Display brilliance and panel brilliance are changed in accordance with the setting of "Main Menu" - "Brilliance".

Each time the soft key 1 is pressed when "Day1" is displayed above the soft key 1, the setting changes in order of "Day2" → "Day3" → "Dusk" → "Night".

If "Main Menu" - "Display Color" - "Day1" - "Soft Key" is set to "Off", "Day1" is not displayed above the soft key 1.

Operate the same way for "Day2", "Day3", "Dusk" and "Night".

Reference:

In the factory setting, "Soft Key" menu items for "Day2", "Day3", "Dusk" and "Night" are set to "Off" in "Main Menu" - "Brilliance". To use these, set the items to "On".

Soft key 2: Monitor BRILL

Press the soft key 2 to adjust Monitor BRILL at eight levels. Also, you can press the [BRILL] key to adjust at eight levels.

Soft key 3: Panel BRILL

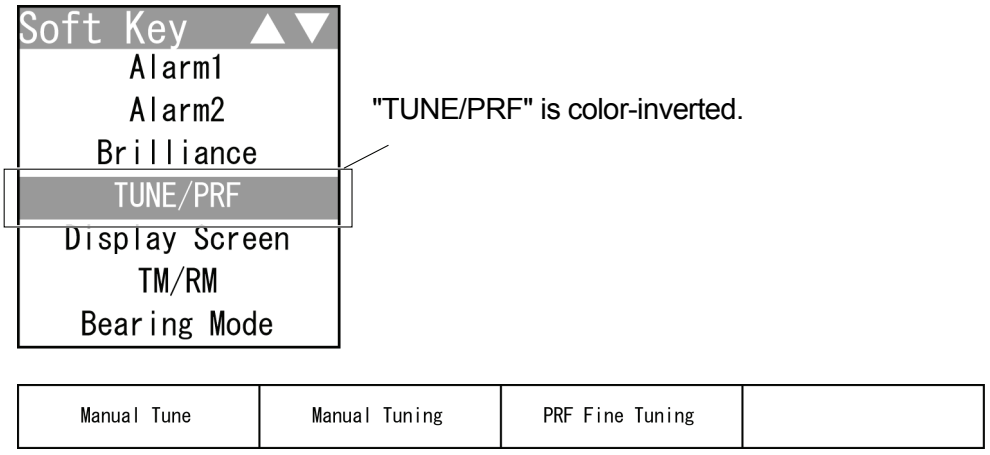
Press the soft key 3 to adjust Monitor BRILL at four levels.

Soft key 4: Not available

2.7.9 ADJUSTING SCANNER

There are automatic tuning mode (AUTO) and manual tuning mode (MAN). In the automatic tuning mode, transmission and receiving frequencies are tuned and adjusted automatically. In the manual tuning mode, tuning is carried out using the MULTI control.

1 Select TUNE/PRF on the soft key menu.



The "TUNE/PRF" soft key display appears.

2 Operate with the soft keys.

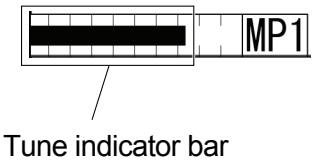
Soft key 1: AUTO Tune | Manual Tune

Selects whether to use the tuning function in automatic or manual mode.

Soft key 2: Manual Tuning

When pressing the soft key 2, "Manual Tuning" is color-inverted.

- When "MAN" is displayed above the soft key 1
  You can manually adjust using the MULTI control.

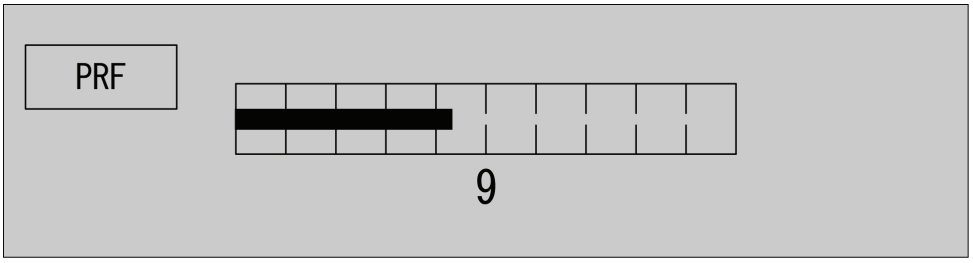


Turn the MULTI control to adjust tuning.
Adjust the video to be the largest by observing the tune indicator bar.
Because the tune indicator bar is the guide during manual tuning, adjust the tune indicator bar to the maximum.

- When "AUTO" is displayed above the soft key 1
  "Manual Tuning" is not color-inverted. The equipment automatically adjust tuning. Tuning is adjusted when transmission is started, the range is changed or pulse length is changed.

Soft key 3: PRF Fine Tuning

When pressing the soft key 3, "PRF Fine Tuning" is color-inverted.



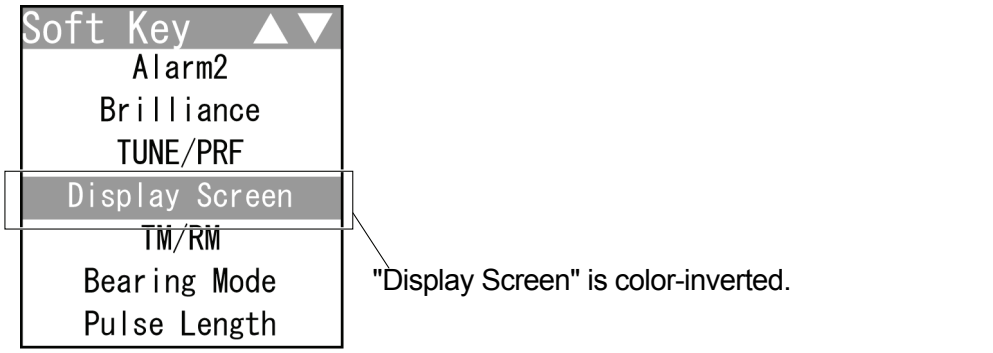
The PRF fine tuning screen appears.
Fine-tune the transmitting repetition frequency of the transmitter in the range 90 to 100%.
If radar's interference patterns are concentrically displayed, increment or decrement the set value by 3 to 4 in order to heighten the effect of interference rejection.
The same operation can be performed by pressing the [TX/PRF] key several times.
Use the [MULTI] control to perform PRF fine tuning between 0 and 31.
When the soft key 3 "PRF Fine Tuning" is pressed, color-inverted display returns to normal color.

Soft key 4: Not available

2.7.10 SETTING DISPLAY SCREEN

Sets the layout of radar screen.

1 Select [Display Screen] on the soft key menu.



The "Display Screen" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [Screen1]

The screen changes to the layout set with the menu "Adjust Menu" - "Display Screen" - "Location Change" - "Screen1".

Soft key 2: [Screen2]

The screen changes to the layout set with the menu "Adjust Menu" - "Display Screen" - "Location Change" - "Screen2".

Soft key 3: Not available

Soft key 4: [Numerical INFO] [TT Detail] [AIS Detail] [Own AIS INFO] [MOB INFO]

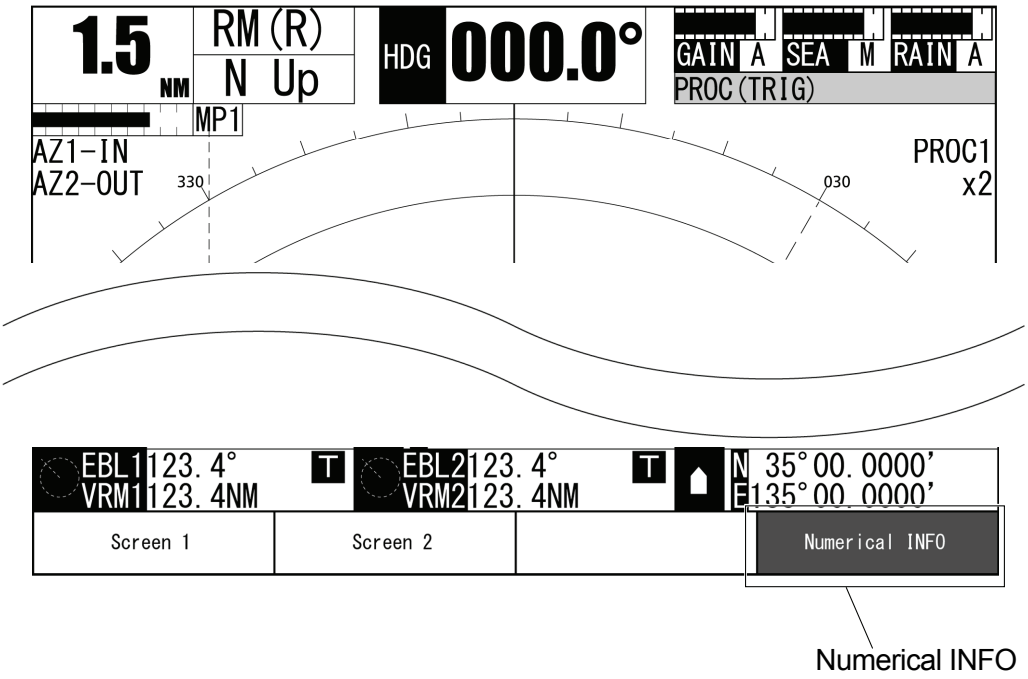
Each time you press the soft key 4 when "Numerical INFO" is set, the soft key display toggles in the following order:

"Numerical INFO" → "TT Detail" → "AIS Detail" → "Own AIS INFO" → "MOB INFO".

■ Numerical INFO

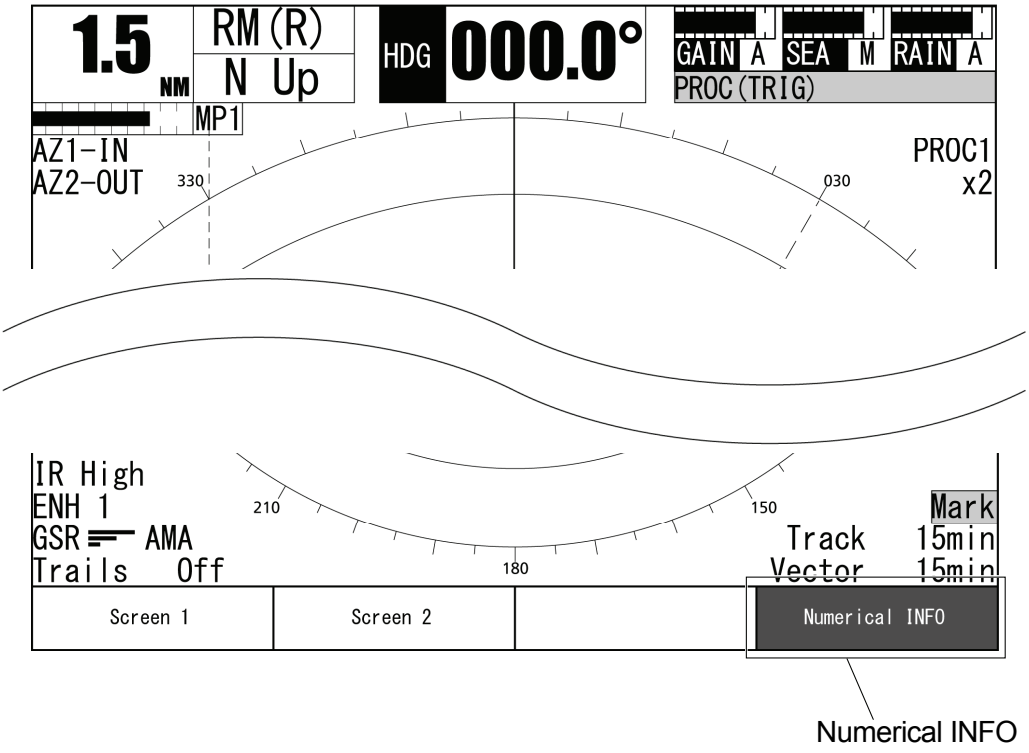
If "Screen1" has been set in the menu

When "Numerical INFO" is displayed above the soft key 4, "Numerical INFO" which has been set in the menu "Screen 1" is displayed.



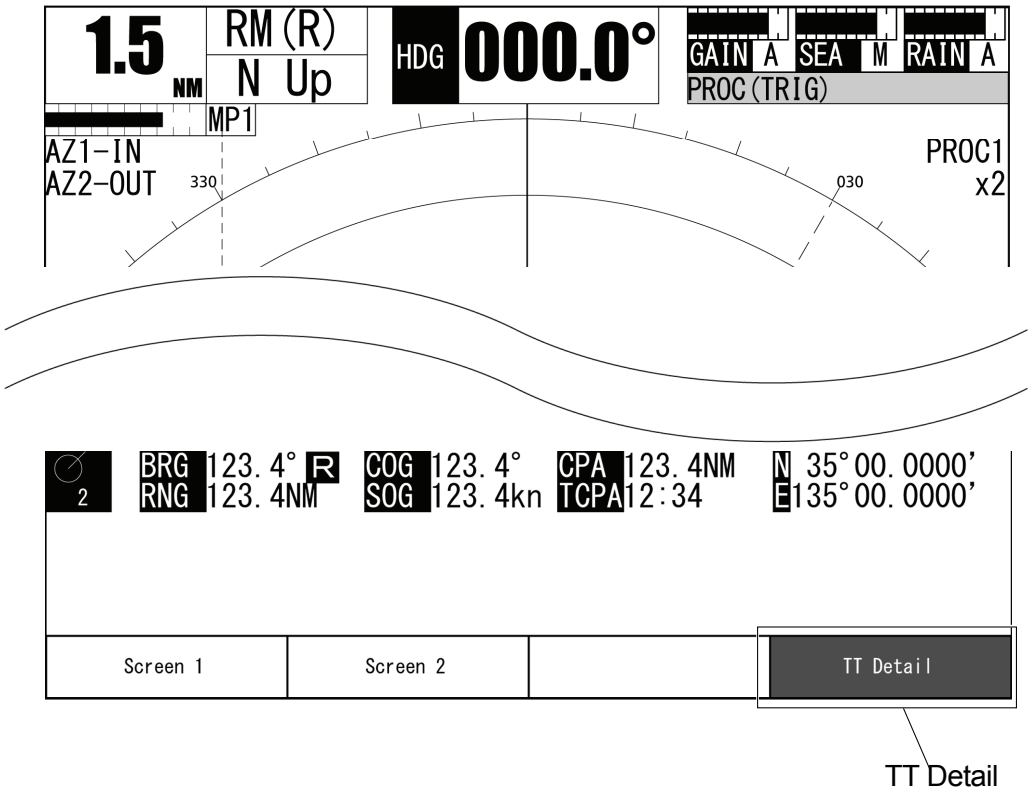
If "Screen2" has been set in the menu

When "Numerical INFO" is displayed above the soft key 4, "Numerical INFO" which has been set in the menu "Screen 2" is displayed.



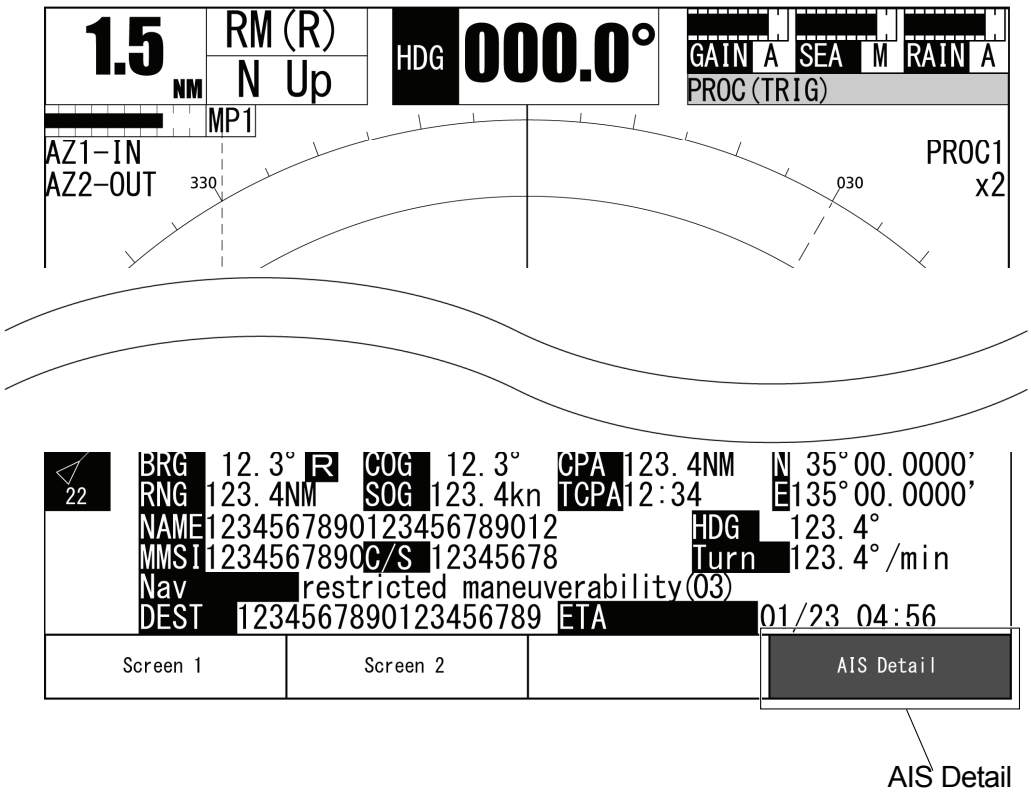
■ TT Detail

When "Numerical INFO" is displayed above the soft key 4, press the soft key 4 to display "TT Detail" on the radar screen.



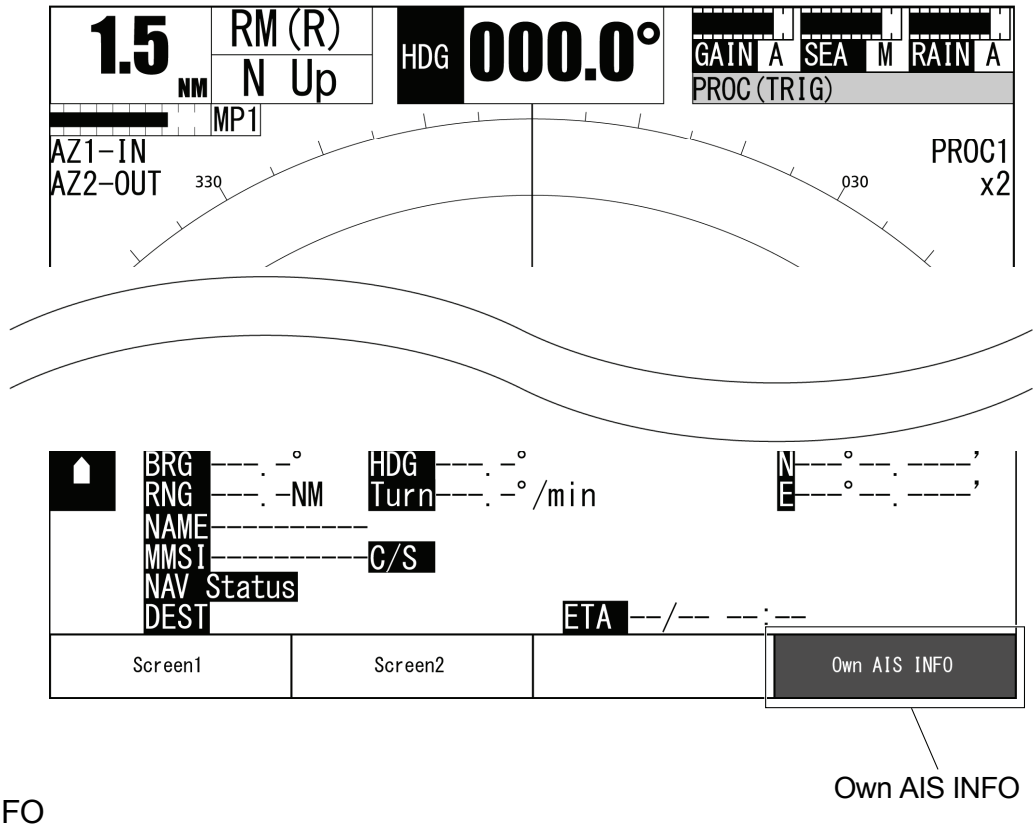
■ AIS Detail

When "TT Detail" is displayed above the soft key 4, press the soft key 4 to display "AIS Detail" on the radar screen.



■ Own AIS INFO

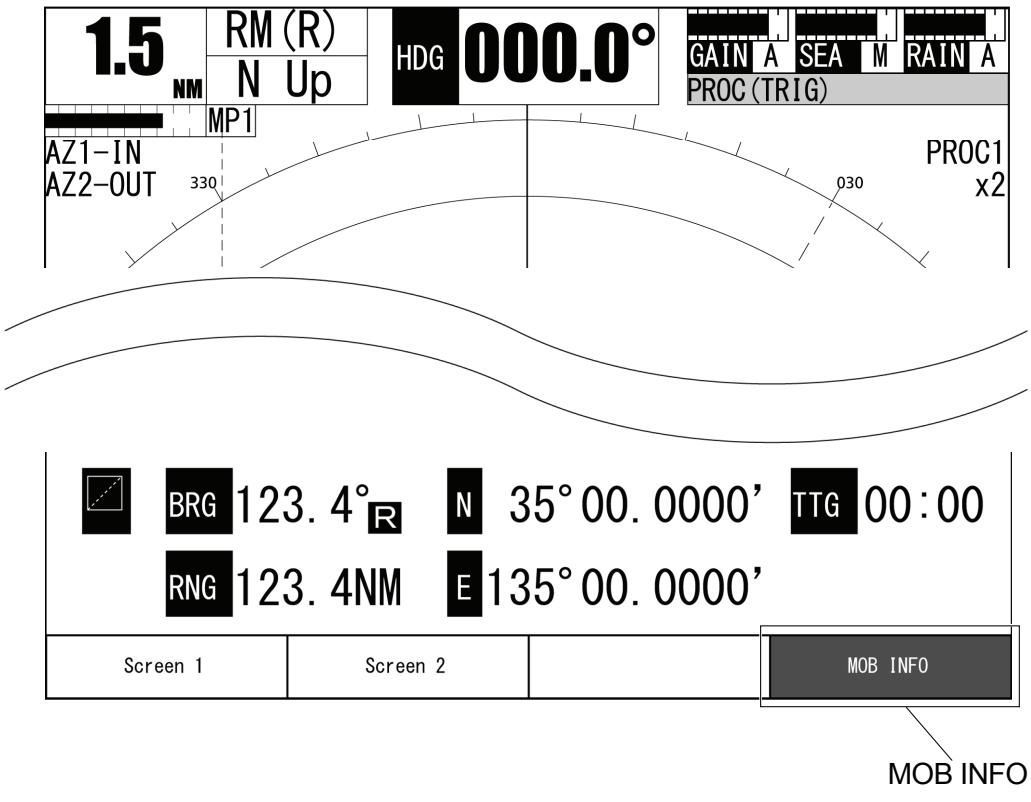
When "AIS Detail" is displayed above the soft key 4, press the soft key 4 to display "Own AIS INFO" on the radar screen.



Own AIS INFO

■ MOB INFO

When "Own AIS INFO" is displayed above the soft key 4, press the soft key 4 to display "MOB INFO" on the radar screen.



MOB INFO

■ Hiding the heading line

1 Hold down the [TX/PRF] key.

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

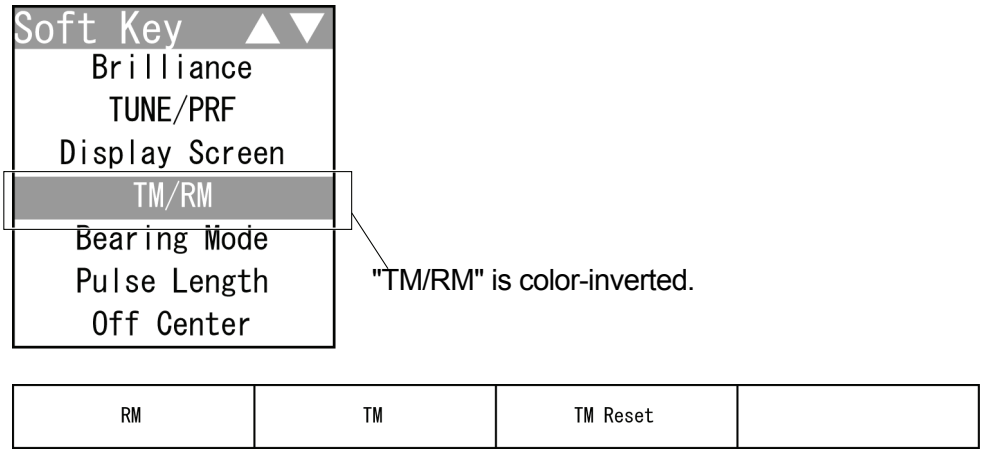
2.7.11 SWITCHING TO TRUE/RELATIVE MOTION DISPLAY MODE

Switches between true and relative motion display modes.

Reference:

The bearing signal input is required to display true motion.

1 Select [TM/RM] on the soft key menu.



The "TM/RM" soft key display appears.

2 Operate with the soft keys.

Soft key 1: RM

Press the soft key 1 to switch to relative motion display.

Own ship returns to the center of the radar screen.

Soft key 2: TM

Press the soft key 2 to switch to true motion display.

Soft key 3: TM Reset

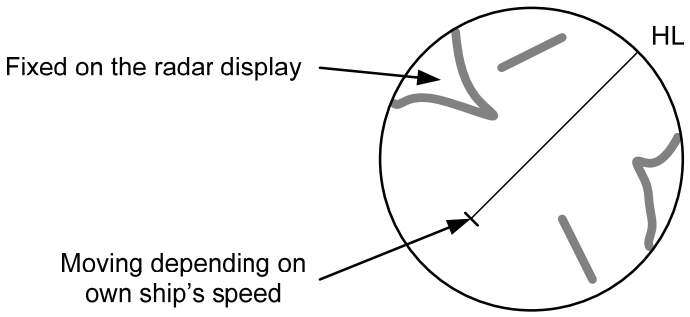
Press the soft key 3 during the true motion display mode, the own ship position is reset, as same as switching from relative motion display to true motion display.

Own ship starts from the reset position.

Soft key 4: Not available

■ True motion display

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



True Motion Display

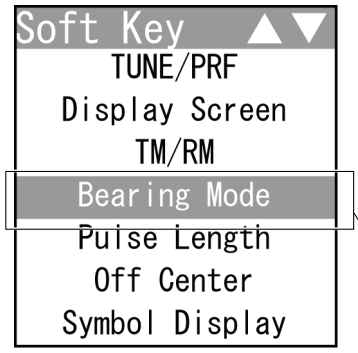
2.7.12 SWITCHING BEARING DISPLAY MODE

Selects the azimuth of the radar video.

Reference:

The bearing signal input is required to display N Up/C Up.

1 Select Bearing Mode on the soft key menu.



"Bearing Mode" is color-inverted.

H Up	N Up	C Up	C Up Reset

The "Bearing Mode" soft key display appears.

2 Operate with the soft keys.

Soft key 1: H Up

Relative bearing mode [Head Up] is selected.

Soft key 2: N Up

True bearing mode [North Up] is selected.

Soft key 3: C Up

Course-up bearing mode [Course Up] is selected.

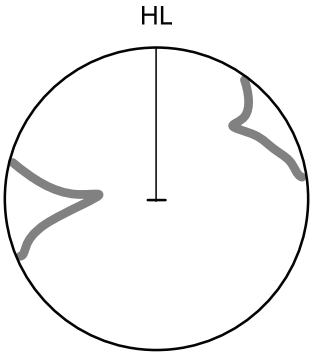
Soft key 4: C Up Reset

In Course-up mode, reset the course-up display.

■ Relative Bearing Mode

The video is displayed so that the ship's heading line points to the zenith of the PPI (0° on range rings).

Since targets are displayed in their directions relative to the ship's heading line, the operator can view the video in the same field of view as in operating the ship at sea. This mode is suitable for watching over other ships.

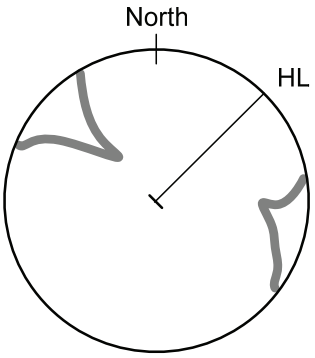


Head-up mode

■ True Bearing Mode

The video is displayed so that the zenith of the PPI (0° on range rings) points to the due north.

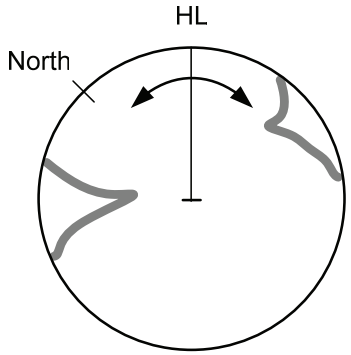
Fixed targets do not flicker and are easily identified on the chart, and the true bearing of a target can easily be read out.



North-up mode

■ Course-up Bearing Mode

By pressing the soft key 3, the own ship's course is fixed pointing to the zenith of the PPI (0° on range rings) points to the due north. In the same way as in the North-up mode, fixed targets do not flicker, and are stabilized even if the ship is yawing. The bearing of the heading line varies by the same shift of own ship's course. To change the course, press the soft key 3 several times to select the Course-up mode, and set a new course.

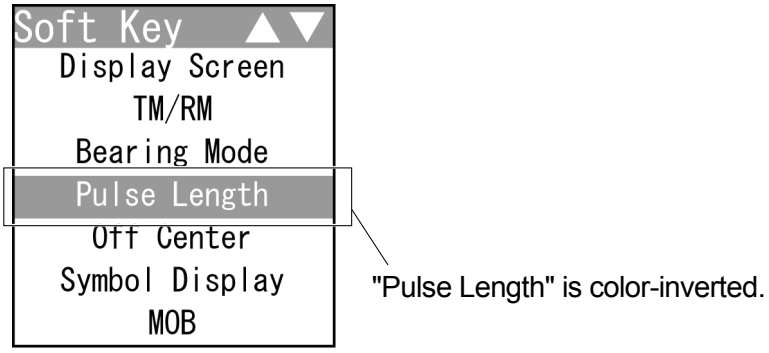


Course-up mode

2.7.13 SELECTING TRANSMITTER PULSE LENGTH

Switches the transmitter pulse length.

1 Select [Pulse Length] on the soft key menu.



The "Pulse Length" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [SP1] [SP2] [SP3] [MP1] [MP2] [LP1] [LP2]

The transmitter pulse length is switched.

Press the soft key 1 to change the setting in order of:

"SP1" → "SP2" → "SP3" → "MP1" → "MP2" → "LP1" → "LP2".

Reference:

Options of the transmitter pulse length vary depending on the range.

For details, see "7.2 SCANNER".

Soft key 2: Not available

Soft key 3: Not available

Soft key 4: Not available

■ Effects of transmitter pulse length

● SP :

The transmitter pulse length 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

● MP :

The normal transmitter pulse length is set.

Both range resolution and sensitivity are appropriately set.

Recommended condition for selection:

General navigation

● LP :

The transmitter pulse length becomes longer, and sensitivity 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

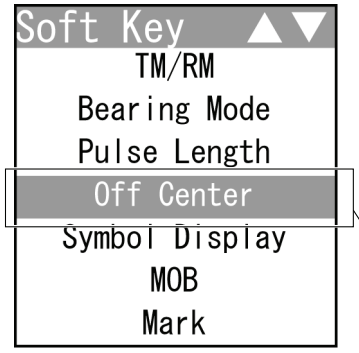
Usable transmitter pulse length varies according to the type of scanner unit being used and the observation range being used. For usable pulse length, see the section "SCANNER" in "SPECIFICATIONS".

2.7.14 MOVING OWN SHIP'S DISPLAY POSITION

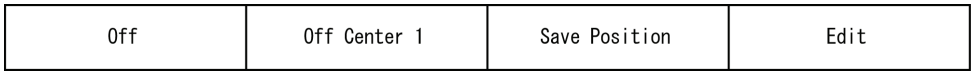
The own ship's position can be moved from the display center to any position within 66% of the display radius.

This function is convenient for observing a wide coverage in any direction.

1 Select [Off Center] on the soft key menu.



"Off Center" is color-inverted.



The "Off Center" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [Off] [On]

Turns on/off the off center function.

"Off": The own ship's position returns to the center.

"On": The cross cursor mark + will appear at the own ship's position on the radar screen.

Soft key 2: [Off Center1] [Off Center2] [Off Center3] [Custom] [Load Position]

"Off Center1": The own ship's position is moved to 66% position of the display radius.

"Off Center2": Te own ship's position is moved to 44% position of the display radius.

"Off Center3": The own ship's position is moved to 22% position of the display radius.

"Custom": The own ship's position can be moved to any position.

When pressing the soft key 4, "Edit" is color-inverted.

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

Press the ENT key to fix the own ship's display position at the cross cursor mark + position.

"Load Position": The saved own ship's display position is displayed.

Soft key 3: Save Position

When "Custom" is displayed above the soft key 2, press the soft key 3 to save the current own ship's display position.

Soft key 4: Edit

When "Custom" is displayed above the soft key 2, press the soft key 4 to move the own ship's display position to any position.

2.7.15 SETTING SYMBOL DISPLAY

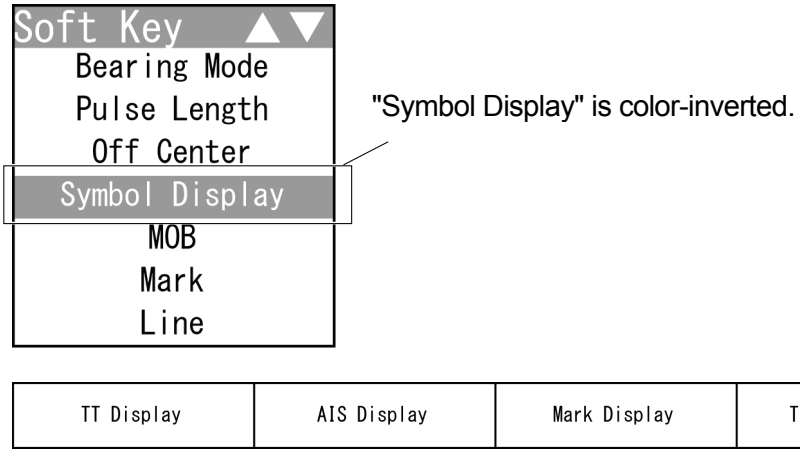
Displays/hides the following functions.

- TT
- AIS
- Marks/lines
- Own track

Reference:

This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select Symbol Display on the soft key menu.



The "Symbol Display" soft key display appears.

2 Operate with the soft keys.

Soft key 1: TT Display | TT Display Off

"TT Display": The TT symbols are displayed.

"TT Display Off": The TT symbols are hidden.

However, the dangerous targets are shown.

Soft key 2: AIS Display | AIS Display Off

"AIS Display": The AIS symbols are displayed.

"AIS Display Off": The AIS symbols are hidden.

Soft key 3: [Mark Display] [Mark DISP Off]

"Mark Display": The marks and lines are displayed.

"Mark DISP Off": The marks and lines are hidden.

Soft key 4: [Track Display] [Track DISP Off]

"Track Display": The own track is displayed.

"Track DISP Off": The own track is hidden.

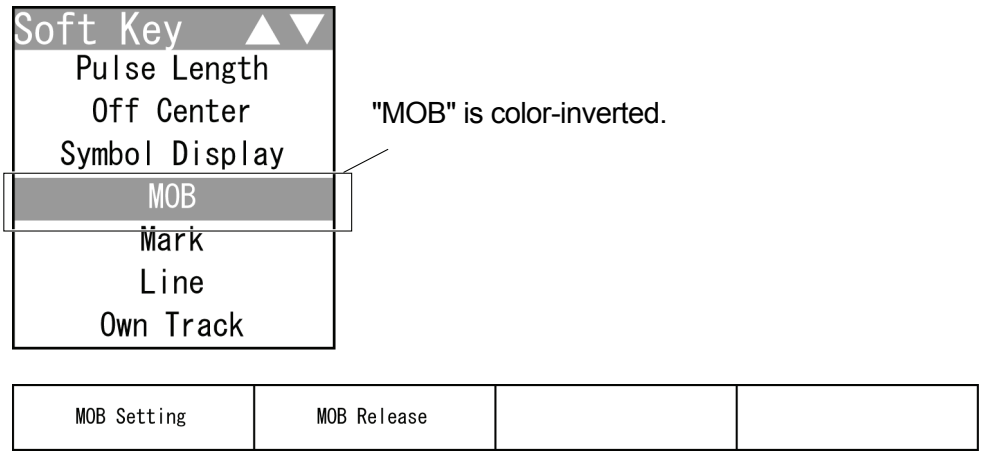
2.7.16 SETTING MOB

MOB is the mark of a person or an object overboard. If someone or something falls overboard, set MOB to memorize the latitude/longitude of the location and display the mark. Also, a straight line from the own ship to the mark is displayed.

Reference:

- Bearing signal input and latitude/longitude data input are required to display MOB.
- This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select [MOB] on the soft key menu.



The "MOB" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [MOB Setting]

Sets the MOB at the own ship's position.

Soft key 2: [MOB Release]

The displayed MOB is cleared.

Soft key 3: Not available

Soft key 4: Not available

2.7.17 MARKING

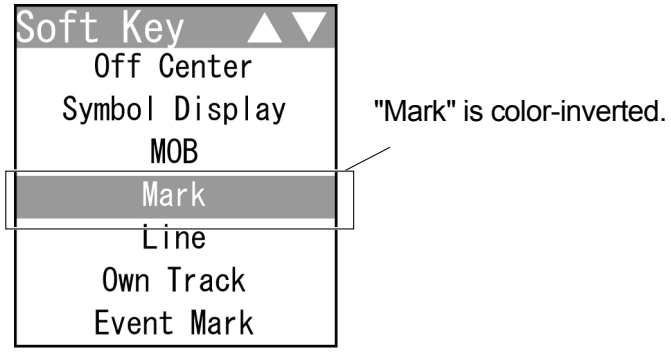
Marks can be indicated at arbitrary positions on the screen.

A mark created on the screen holds the latitude and longitude.

Reference:

- Bearing signal input and latitude/longitude data input are required to use marks.
- Up to 200 lines/marks can be displayed for lines, marks and event marks in total.
- When the marks are hidden in "2.7.15 SETTING SYMBOL DISPLAY", marks cannot be created.
- This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select [Mark] on the soft key menu.



×		Delete	Off

The "Mark" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [X] [+] [Y] [⧖]

The mark type of a target is changed.

Soft key 2: Not available

Soft key 3: [Delete]

Press to delete the marks of selected type.

Hold down to delete all marks.

The confirmation dialog window is displayed.

(Marks and event marks are not distinguished when deleting.)

Soft key 4: [Off] [Enter] [Erase] [Move]

You can use the [ENT] key to create/delete/move the marks.

"Enter": Press the [ENT] key to create a mark at the cursor position.

"Erase": Press the [ENT] key to delete a mark at the cursor position.

"Move": Use the cursor to select the mark to be moved and press the [ENT] key. Then move the cursor to select the new position and press the [ENT] key to place the mark.

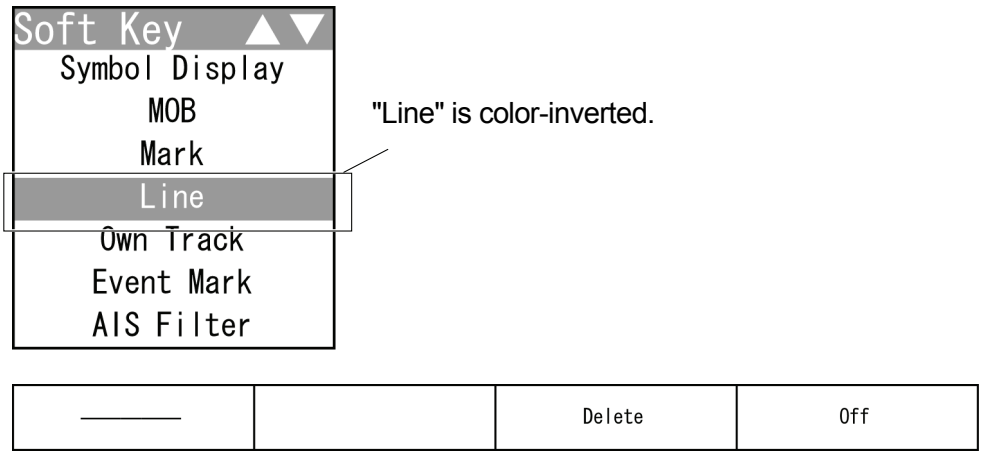
2.7.18 USING LINES

Lines can be indicated at arbitrary positions on the screen.

Reference:

- Bearing signal input and latitude/longitude data input are required to use lines.
- Up to 200 lines/marks can be displayed for lines, marks and event marks in total.
- This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select [Line] on the soft key menu.



The "Line" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [——] [- - - -] [— — — —]

The line type of a target is changed.

Soft key 2: Not available

Soft key 3: [Delete]

Press to delete the lines of selected type.

Hold down to delete all lines.

The confirmation dialog window is displayed.

Soft key 4: [Off] [Enter] [Erase] [Move] [Insert]

You can use the [ENT] key to create/delete/move the lines.

"Enter": Press the [ENT] key to create a line at the cursor position.

"Erase": Press the [ENT] key to delete a line at the cursor position.

"Move": Use the cursor to select the line to be moved and press the [ENT] key. Then move the cursor to select the new position and press the [ENT] key to place the line.

"Insert": Use the cursor to select the line to be inserted and press the [ENT] key. Then move the cursor to select the position and press the [ENT] key to insert the line.

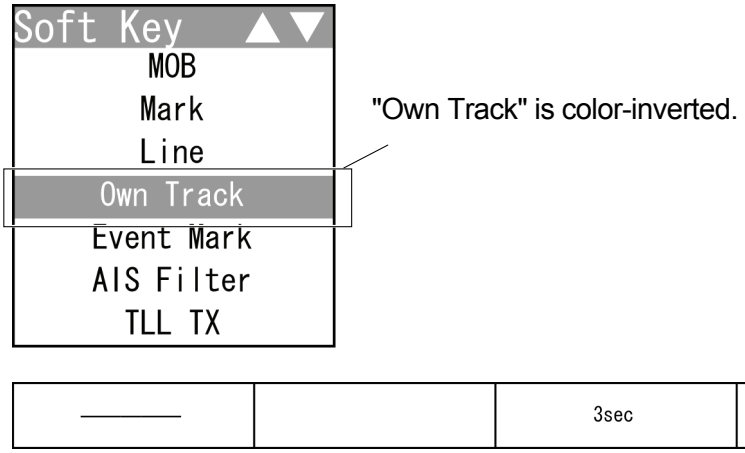
2.7.19 DISPLAYING OWN SHIP'S TRACK

The own ship's track function saves and displays own ship's track.
If navigation equipment is connected, this radar system records latitude/longitude data sent from the navigation equipment and displays own ship's track. For detail settings of own track (clearing own tracks, saved data clearing method, etc), see "2.15.1 DISPLAYING WAYPOINT MARKS".

Reference:

- Bearing signal input and latitude/longitude data input are required to display own track.
- This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select [Own Track] on the soft key menu.



The "Own Track" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [——] [- - - -] [— — — —]

The line type of the own ship's track is changed.

Soft key 2: Not available

Soft key 3: [3sec] [5sec] [10sec] [30sec] [1min] [3min] [5min]
[10min] [30min] [60min] [1NM] [3NM] [5NM] [10NM]

The storage interval of the own ship's track is changed.

A preset time interval or preset distance interval can be selected as the storage interval.

The distance setting varies depending on the range scale unit setting.

NM range: 1NM, 3NM, 5NM, 10NM

km range: 1km, 3km, 5km, 10km

sm range: 1sm, 3sm, 5sm, 10sm

Soft key 4: [On] [Off]

"On": This system starts saving the position of the own ship's track.

"Off": This system stops saving the position of the own ship's track.

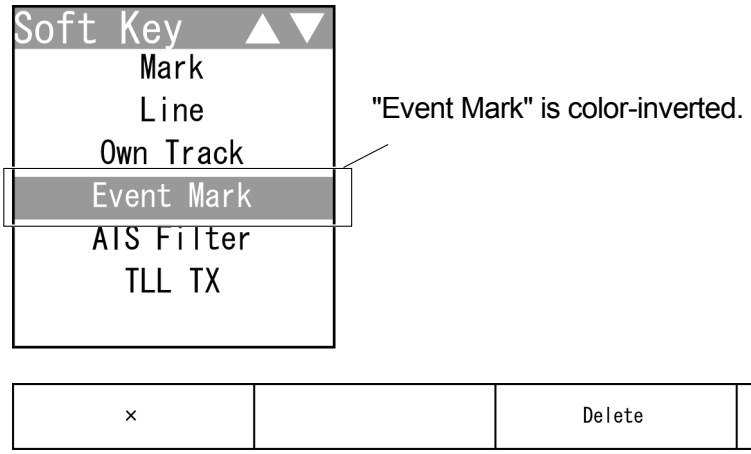
2.7.20 USING EVENT MARKS

Displays the event marks.

Reference:

- Bearing signal input and latitude/longitude data input are required to display event marks.
- Up to 200 lines/marks can be displayed for lines, marks and event marks in total.
- This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select [Event Mark] on the soft key menu.



The "Event Mark" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [X] [+] [Y] [⊠]

The mark type of a target is changed.

Soft key 2: Not available

Soft key 3: Delete

Press to delete the marks of selected type.

Hold down to delete all marks.

The confirmation dialog window is displayed.

(Marks and event marks are not distinguished when deleting.)

Soft key 4: Event Mark ENT

An event mark is placed at the own ship's position.

Reference:

You can easily store the event marks, such as fishing spots.

Use the cursor to enter the marks for fishing spots, a sinking ship, fish reef, etc.

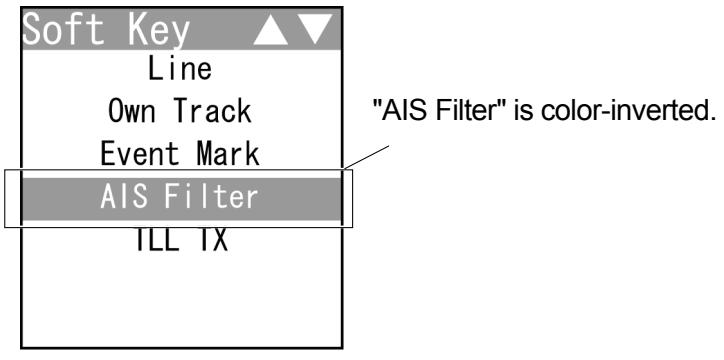
2.7.21 SETTING AIS FILTER

Once the AIS filter is set, only the AIS targets that are inside the filter area are displayed (setting can be made such that AIS targets outside the AIS filter will not be shown). The filter is initially set in a circle having a radius of 20 [NM] from the own ship's position. If 50 or more targets exist in the filter range, they are displayed according to the priority explained in "■ AIS Symbols" of Section "2.7.5 AIS OPERATIONS".

Reference:

- Bearing signal input and latitude/longitude data input are required to use AIS functions.
- This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

1 Select AIS Filter on the soft key menu.



The "AIS Filter" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [Off] [Range]

Switches between Off and Range..

"Range": A filter is set in a circle with a set range as the radius.

Soft key 2: [Off] [On]

"Off": The filter is not displayed.

"On": The filter is displayed.

2.7.22 USING TLL TX

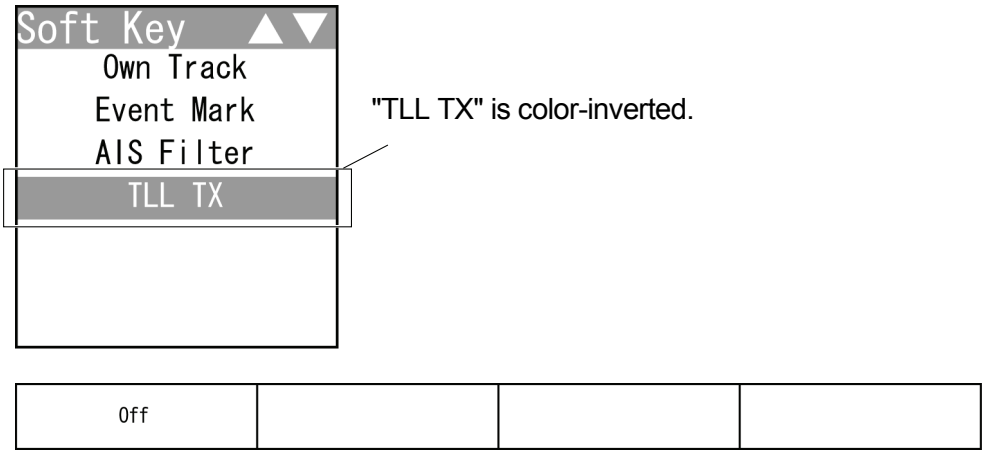
Reference:

This function is initially set to off. To use this function, set this to on by referring to "■ Soft Key Menu Setting" in "4.10 Control" of the Installation Manual.

Sets the TLL TX.

Transmits the TLL sentence of the cursor position on the screen to inform the mark position.

1 Select [TLL TX] on the soft key menu.



The "TLL TX" soft key display appears.

2 Operate with the soft keys.

Soft key 1: [Off] [TLL TX]

"Off": TLL sentence is not transmitted with the [ENT] key.

"TLL TX": TLL sentence of the cursor position is transmitted with the [ENT] key.

Soft key 2: Not available

Soft key 3: Not available

Soft key 4: Not available

2.8 BASIC MENU OPERATIONS

The settings which will not be frequently changed are called by the [MENU] key.
This section describes the operation with the MENU key.

■ Keys for operation

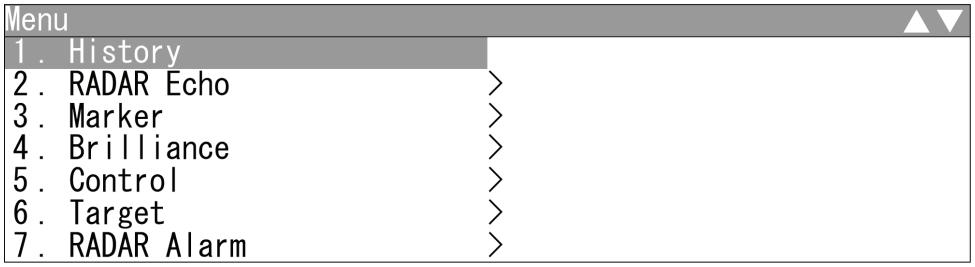
- [MENU] key
- Cursor keys
- [MULTI] control
- [CLEAR] key

● [CLEAR] key

Press the [CLEAR] key to return to the upper level.

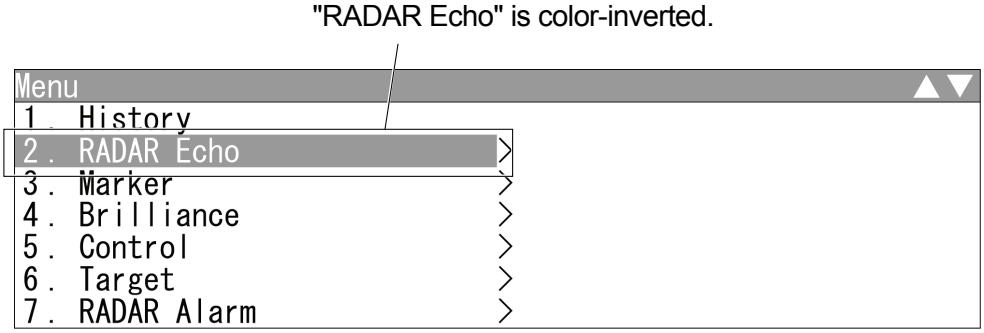
■ MENU Key Operations (Example: Opening "IR")

1 Press the [MENU] key.

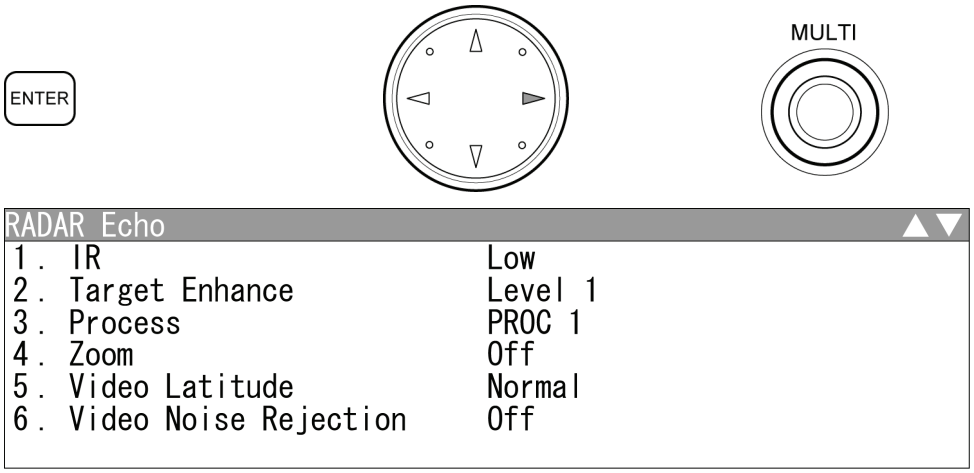


Select one of the menu items with ">" mark, then press the [ENT] key or the cursor key (right) to display the submenu.

2 Press the cursor key (down) or turn the [MULTI] control (clockwise) to select RADAR Echo.



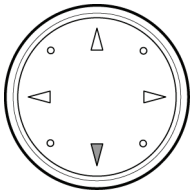
3 Press the [ENT] key, the cursor key (right) or the [MULTI] control.

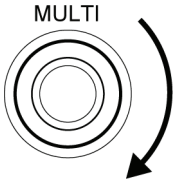


"RADAR Echo" menu appears.

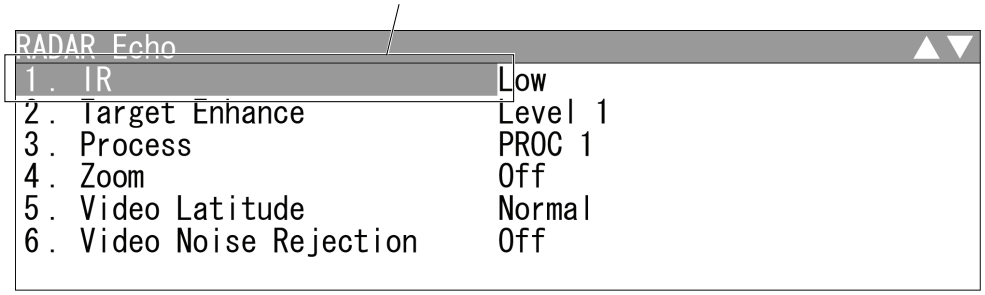
Current settings are displayed on the right pane of the menu.

4 Press the cursor key (down) or turn the [MULTI] control (clockwise) to select IR.

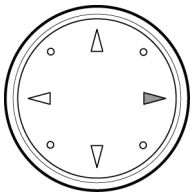


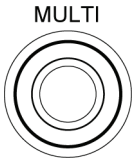


"IR" is color-inverted.

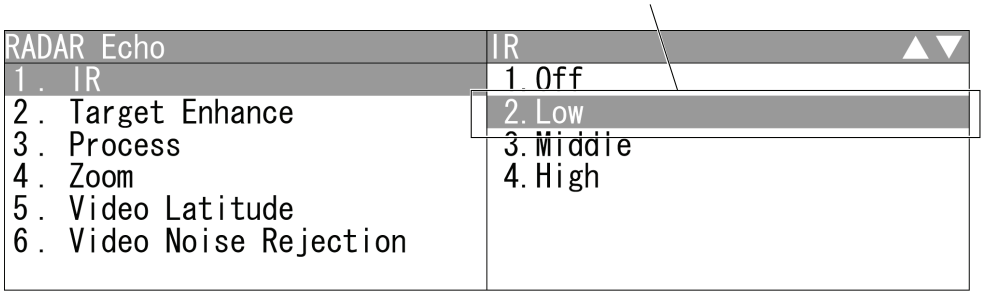


5 Press the [ENT] key, the cursor key (right) or the [MULTI] control.





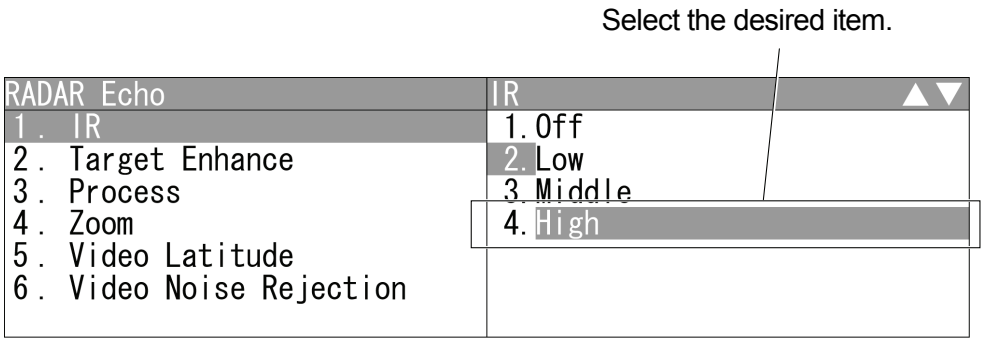
The current setting is color-inverted.



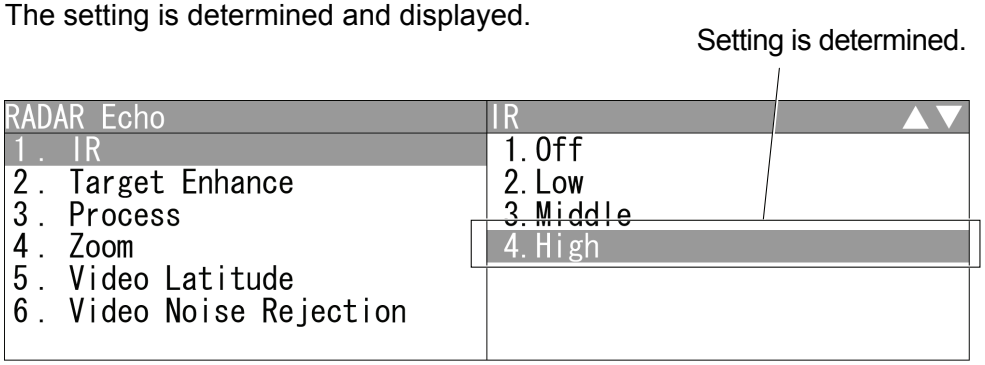
"IR" menu appears.

Selectable items are displayed on the right pane of the menu.

6 Select the desired item, then press the [ENT] key or the [MULTI] control.



7 The setting is determined and displayed.



● Closing the menu

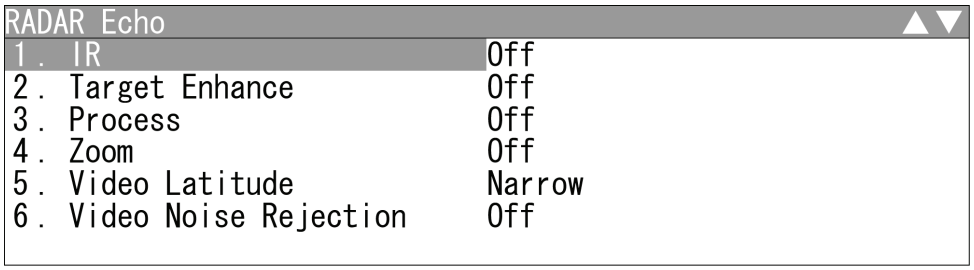
Repeatedly press the [CLEAR] key or the cursor key (left) to return to the upper level and then close the menu screen.

2.9 RADAR ECHO SETTINGS

This function enables the setting of detail information about radar echo.

■ "RADAR Echo" operations

1 Open [RADAR Echo] from the Main Menu.



"RADAR Echo" menu appears.

Detail information about radar signal processing can be set by changing the settings of the menu items.

Reference:

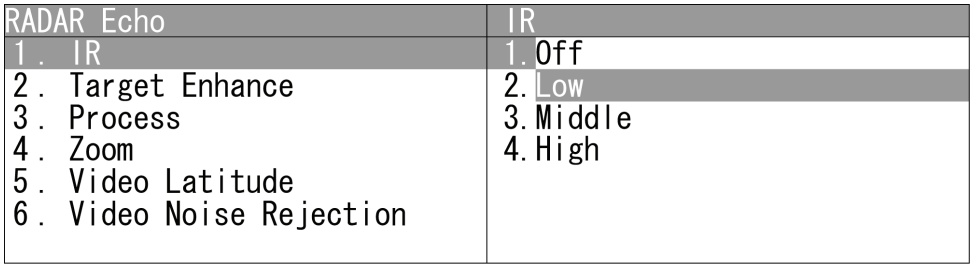
After the settings for radar signal processing are changed, small targets may not be displayed or unwanted waves may not be suppressed. Thus, do not make a significant change in the settings.

2.9.1 SETTING RADAR INTERFERENCE REJECTION

■ Setting Radar Interference Rejection

Use this function to eliminate interference waves from other radars.

1 Open [RADAR Echo] - [IR].



"IR" menu appears.

[Off] : Interference rejecter off

[Low] : Interference rejection level - low

[Middle] : Interference rejection level - moderate

[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, [Low] should be selected.

2.9.2 SETTING FOR ENHANCING TARGETS

■ Setting for Enhancing Targets

The dimension of video display is enlarged in angle and distance.

Note:

- When target enhancement function is used, echo displays of two targets closing in angle and distance may be displayed in PPI screen as one target.

1 Open [RADAR Echo] - [Target Enhance].

RADAR Echo	IR
1. IR	1.Off
2. Target Enhance	2.Level1
3. Process	3.Level2
4. Zoom	4.Level3
5. Video Latitude	
6. Video Noise Rejection	

"Target Enhance" menu appears.

[Off] : Select this mode particularly when resolution is required.

[Level1] : Select this mode in general.
Expands the radar echo area at 1 step for vertical direction and at 1 step for horizontal direction.

[Level2] : Select this mode to easily view the radar video.
Expands the radar echo area at 1 step for vertical direction and at 2 steps for horizontal direction.

[Level3] : Select this mode to detect small targets such as buoys.
Expands the radar echo area at 2 steps for vertical direction and at 3 steps for horizontal direction.

Reference:

When [Level3] is selected, sea clutter returns and rain/snow clutter returns are apt to be enhanced. When using this enhance mode, operate the [SEA] control and the [RAIN] control to suppress sea clutter returns and rain/snow clutter returns.
In general, [Level1] or [Level2] should be selected.

2.9.3 PROCESS

■ Process

This function reduces unnecessary noise to highlight targets.

Note:

- When viewing a radar beacon, SART signal, or fast moving target on the radar display, do not use this function.
- This function is suitable for use in TM mode.
- When used in RM mode, use with N Up or C Up. This can be used with H Up, however, the video may be blurred. Use this in TM mode.

Reference:

The bearing data input is required for video processing.

1 Open [RADAR Echo] - [Process].

RADAR Echo	Process
1. IR	1. Off
2. Target Enhance	2. 3Scan COREL
3. Process	3. 4Scan COREL
4. Zoom	4. 5Scan COREL
5. Video Latitude	5. Remain
6. Video Noise Rejection	6. Peak Hold

"Process" menu appears.

[Off] : Select this mode in general.

[3Scan COREL] : Select this mode when many rain/snow clutter returns are detected.

[4Scan COREL] : Select this mode to highlight targets while suppressing sea clutter returns.

[5Scan COREL] : 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.

Note:

- When "COREL" is set, the image becomes smaller.
- When "Remain" or "Peak Hold" is set, the afterimage will appears.

2.9.4 ZOOMING

■ Zooming

This function doubles the size of radar video.

1 Open [RADAR Echo] - [Zoom].

RADAR Echo	Zoom
1. IR	1.Off
2. Target Enhance	2.On
3. Process	
4. Zoom	
5. Video Latitude	
6. Video Noise Rejection	

[Off] : Not zoomed.

[On] : Zoomed.

2.9.5 VIDEO LATITUDE

■ Video Latitude

Select the dynamic range in which receiving signals are to be shown on the radar display.

1 Open [RADAR Echo] - [Video Latitude].

RADAR Echo	Video Latitude
1. IR	1.Narrow
2. Target Enhance	2.Normal
3. Process	3.Wide1
4. Zoom	4.Wide2
5. Video Latitude	
6. Video Noise Rejection	

[Narrow] : Narrows the dynamic range at short range.

[Normal] : Standard setting

The dynamic range varies depending on the actual range:

Short range > long range

[Wide1] : Use this mode when rainy weather intensifies unwanted waves.

The dynamic range is about twice as wide as when [NORMAL] is selected.

[Wide2] : Use this mode when rain clouds remain even when using [Wide1].

● Video Latitude

Select [Normal] in standard, and [Wide1] in rainy weather.

[Narrow] clearly displays short-range videos when STC is used in manual mode.

2.9.6 VIDEO NOISE REJECTION

■ Video Noise Rejection

This function rejects signals that assumed as noise and clutter in radar videos.

1 Open [RADAR Echo] - [Video Noise Rejection].

RADAR Echo	Video Noise Rejection
1. IR	1.Off
2. Target Enhance	2.Level1
3. Process	3.Level2
4. Zoom	4.Level3
5. Video Latitude	
6. Video Noise Rejection	

[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.
When detection of targets is definite, the signals are displayed.

[Level3] : Select if "Level1" and "Level2" cannot reject the signals enough.

● Video Noise Rejection

Select [Off] to display radar videos like analog signals.

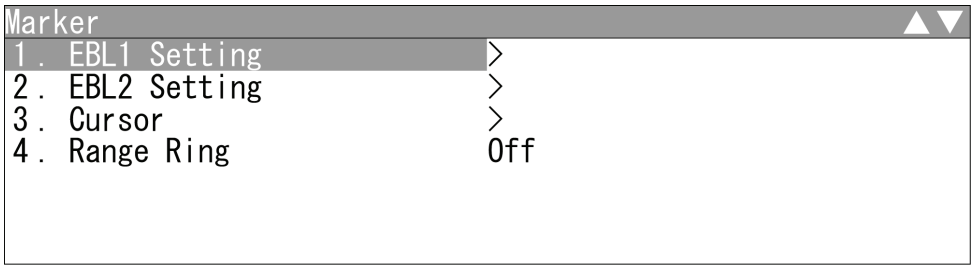
Select [Level1], [Level2] or [Level3] to suppress noise and clutter.

2.10 MARKER SETTING

Sets operations for EBLs, parallel cursors, cursors and range rings.

■ "Marker" operations

1 Open [Marker] from the Main Menu.

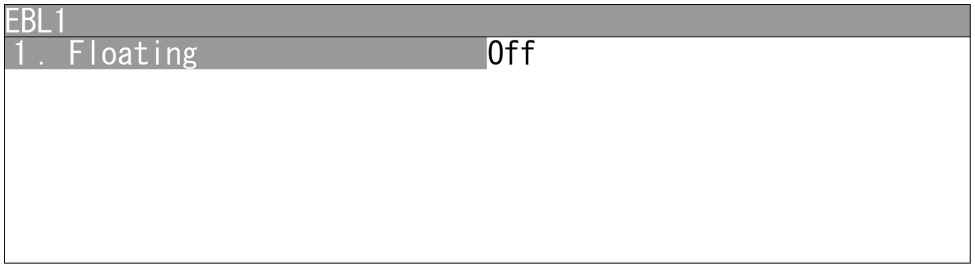


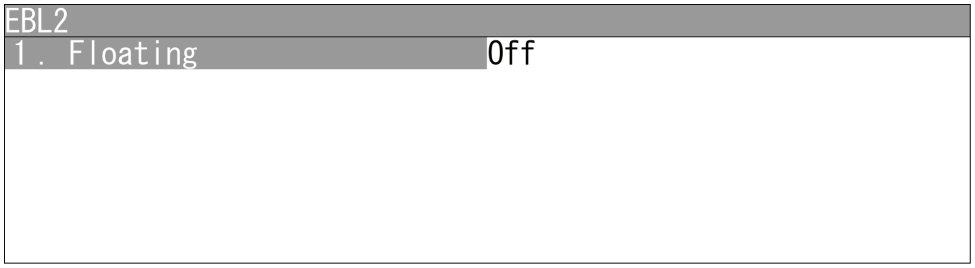
"Marker" menu appears.

2.10.1 SETTING OPERATIONS FOR EBLS (ELECTRONIC BEARING LINES)

■ "EBL" operations

1 Open [Marker] - [EBL1] [EBL2].





"EBL" menu appears.

■ Setting the mode to move the starting point of EBL (Floating setting)

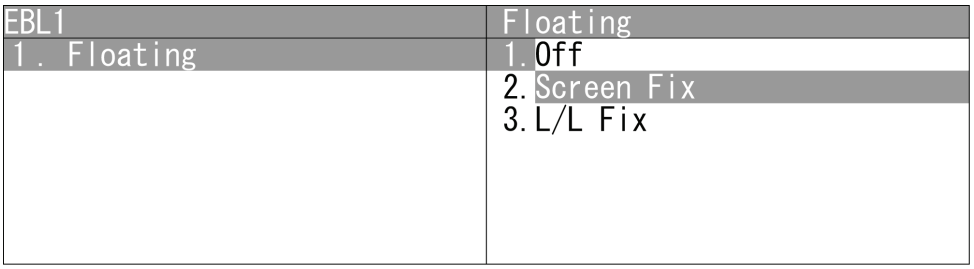
Reference:

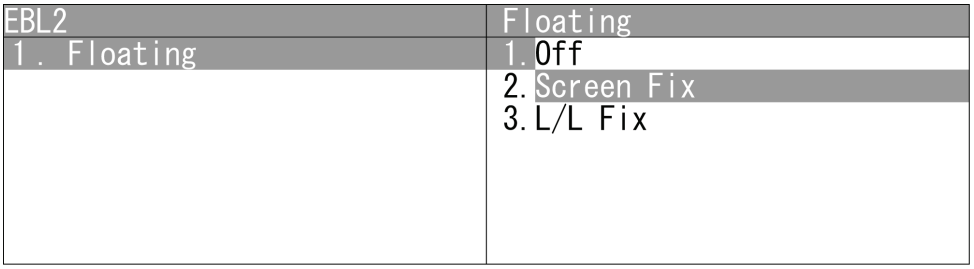
Course and latitude/longitude data input is required for floating setting.

The heading and latitude/longitude input are not required during floating (Screen FIX).

When this function is set to [L/L Fix] and the starting point of an EBL is moved to a position, the starting point can be fixed at the latitude and longitude of that position. When the function is set to [Screen Fix], the starting point of an EBL is fixed on the radar display. The starting point is always indicated at the same position on the radar display even when the own ship has moved.

1 Open [EBL1] [EBL2] - [Floating].





"Floating" menu appears.

[Off] : Floating mode is disabled.

[Screen Fix] : The starting point of EBL is fixed on the radar display.

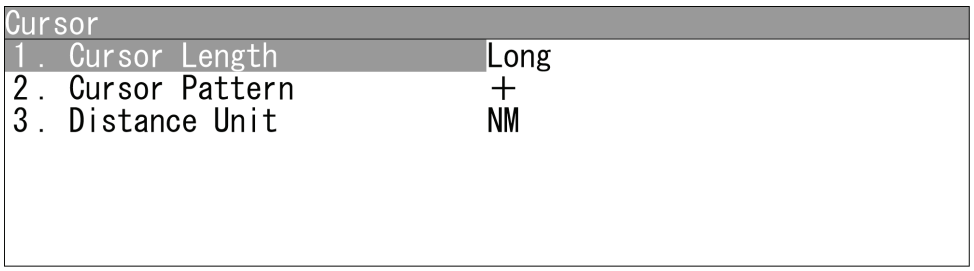
[L/L Fix] : The starting point of EBL is fixed at specific latitude and longitude.

2.10.2 SETTING CURSORS

This function enables the setting of detail information about cursor display.

■ "Cursor" operations

1 Open [Marker] - [Cursor].

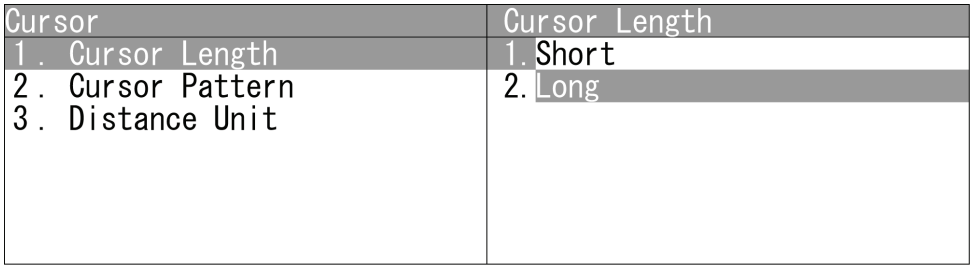


"Cursor" menu appears.

■ Cursor Length

Sets the length of the cross cursor mark on the radar display.

1 Open [Cursor] - [Cursor Length].



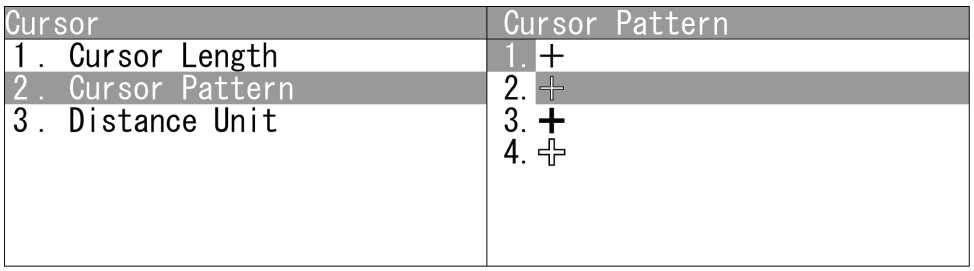
[Short] : Cuts the cross cursor mark in length.

[Long] : Makes the cross cursor mark twice as long as when "Short" is selected.

■ Cursor Pattern

Selects the type of the cross cursor mark on the radar display.

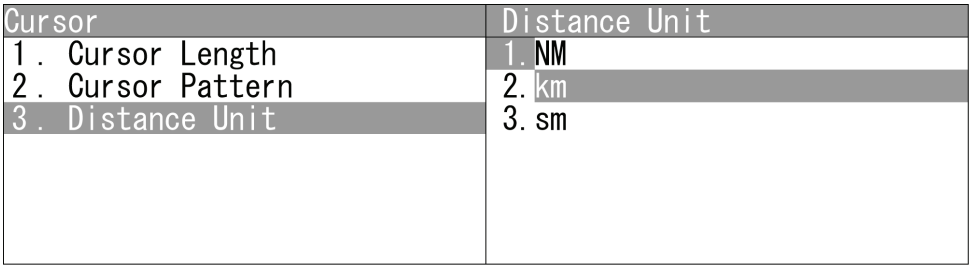
1 Open [Cursor] - [Cursor Pattern].



■ Distance Unit

Sets the distance unit for cursor.

1 Open [Cursor] - [Distance Unit].



[NM] : The distance unit is set to NM.

[km] : The distance unit is set to km.

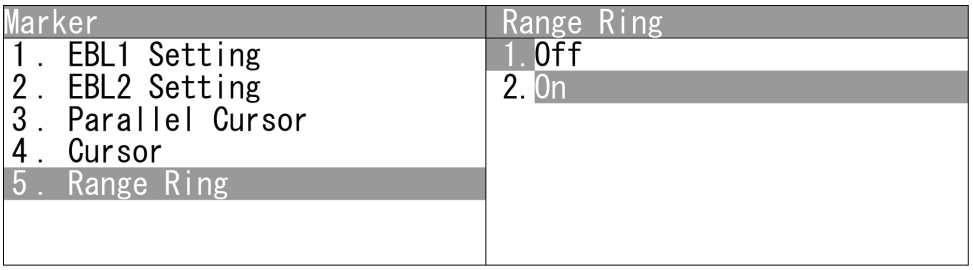
[sm] : The distance unit is set to sm.

2.10.3 SETTING RANGE RINGS

Displays/hides the range rings.

■ Setting the range rings

1 Open [Marker] - [Range Ring].



[Off] : The range rings are not displayed.

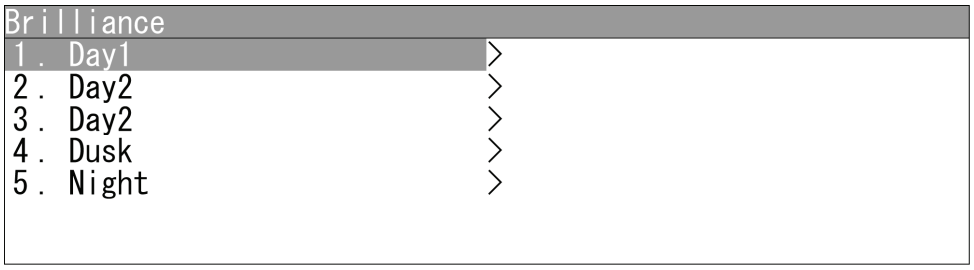
[On] : The range rings are displayed.

2.11 BRILLIANCE

This function enables the setting of detail information about radar display.

■ "Brilliance" operations

1 Open [Brilliance] from the Main Menu.



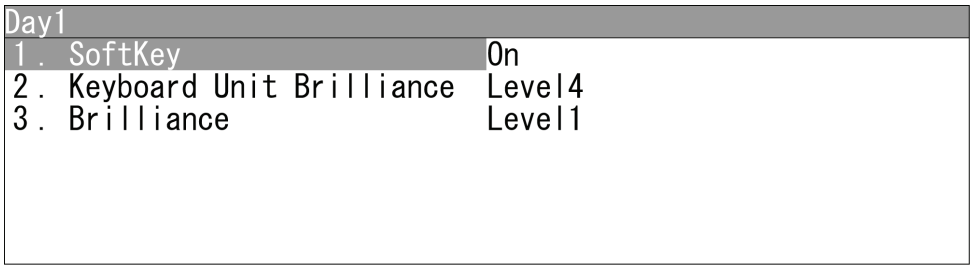
"Brilliance" menu appears.

■ Setting each items

Sets the brilliance of each item.

● Day1

1 Open [Brilliance] - [Day1].

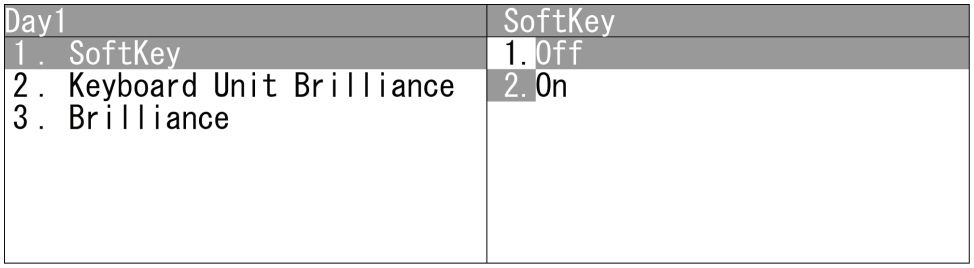


"Day1" menu appears.

■ SoftKey

If "Off" is selected, "Day1" is not displayed for the "Display Screen" soft keys.

1 Open [Day1] - [SoftKey].



"SoftKey" menu appears.

[Off] : "Day1" is not displayed for the "Display Screen" soft keys.

[On] : "Day1" is displayed for the "Display Screen" soft keys.

■ Keyboard Unit Brilliance

Adjusts the brilliance of operation panel.

Day1	Keyboard Unit Brilliance
1. SoftKey	1.Off
2. Keyboard Unit Brilliance	2.Level1
3. Brilliance	3.Level2
	4.Level3
	5.Level4

"Keyboard Unit Brilliance" menu appears.

■ Brilliance

Adjusts the brilliance of operation panel.

Day1	Brilliance
1. SoftKey	1.Level1
2. Keyboard Unit Brilliance	2.Level2
3. Brilliance	3.Level3
	4.Level4
	5.Level5
	6.Level6
	7.Level7

Day1	Brilliance
1. SoftKey	8.Level8
2. Keyboard Unit Brilliance	
3. Brilliance	

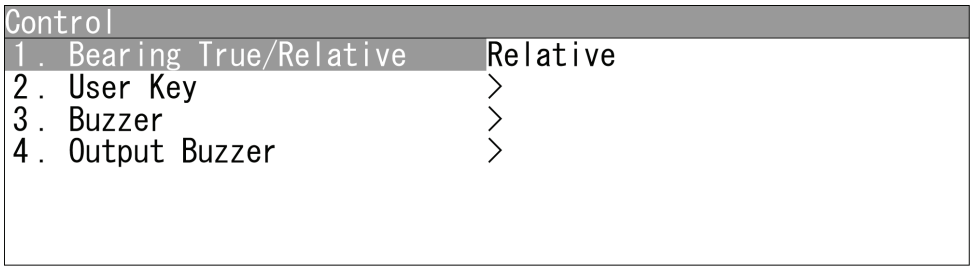
"Brilliance" menu appears.

2.12 CONTROL SETTING

This function enables the setting of detail information about radar echo.

■ "Control" operations

1 Open [Control] from the Main Menu.



"Control" menu appears.

2.12.1 DISPLAYING TRUE/RELATIVE MOTION

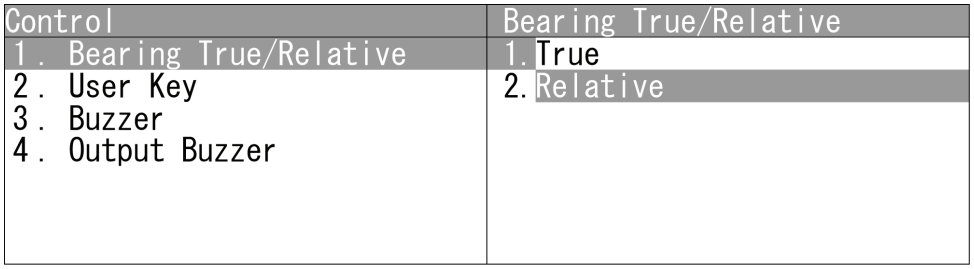
Sets the bearing standards for the cursor, TT, AIS and MOB.

Reference:

Bearing signal input is required to display true motion.

■ Setting Bearing

1 Open [Control] - [Bearing True/Relative].



"Bearing True/Relative" menu appears.

[True] : True bearing mode is selected.

[Relative] : Relative bearing mode is selected.

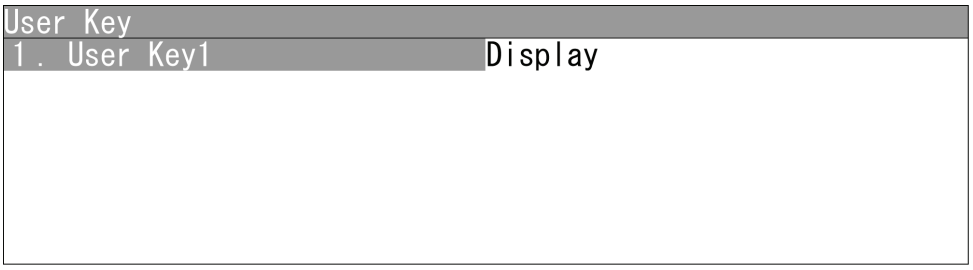
2.12.2 SETTING USER KEYS

Users can freely assign functions to the user keys.

When using this function, you can instantly open the menu screen of "VRM1 Unit", "VRM2 Unit", "Alarm" and "Display".

■ "User Key" operations

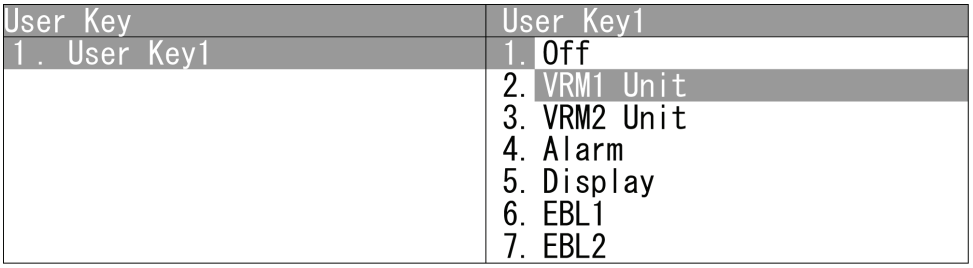
1 Open [Control] - [User Key].

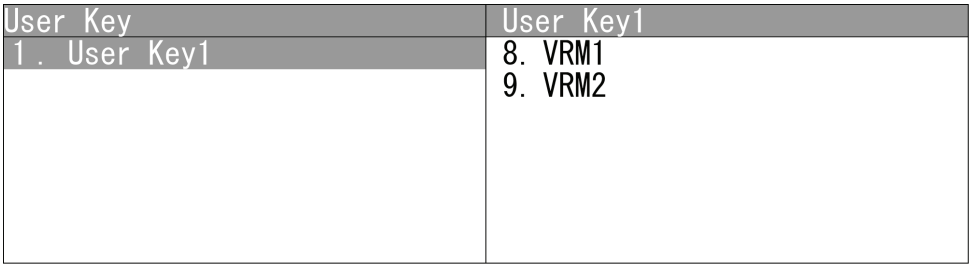


"User Key" menu appears.

■ Factory presetting

Sets functions that can be performed with the user keys.





User key items

[Off] : No function is assigned to this user key.

[VRM1 Unit] : The setting can be changed in VRM1 unit on the radar display.

[VRM2 Unit] : The setting can be changed in VRM2 unit on the radar display.

[Alarm] : Radar alarms can be set.

[Display] : Display can be set.

[EBL1] : EBL1 on the radar display can be operated.

[EBL2] : EBL2 on the radar display can be operated.

[VRM1] : VRM1 on the radar display can be operated.

[VRM2] : VRM2 on the radar display can be operated.

■ Using user keys

Operates as user keys.

● Displaying the menu assigned to the user key1

USER

Press the [USER] key.

2.12.3 ADJUSTING BUZZER VOLUME

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

Adjust the sound volume as follows.

■ "Buzzer" operations

1 Open Control - Buzzer.

Buzzer	
1. Key ACK	255
2. Operation Error	255
3. CPA/TCPA	255
4. AZ/Alarm Zone	255
5. Target Lost	255
6. System Alarm	255

"Buzzer" menu appears.

■ Setting volume

Sets Key ACK volume.

Buzzer	Key ACK
1. Key ACK	0-255 2 5 5
2. Operation Error	
3. CPA/TCPA	
4. AZ/Alarm Zone	▲Value UP
5. Target Lost	▼Value Down
6. System Alarm	◀Input Figure Left ▶Input Figure Right

Turn the [MULTI] control to adjust Key ACK volume.

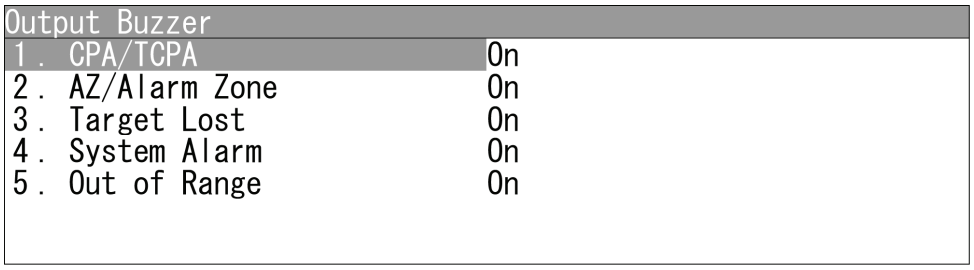
Key ACK volume can be adjusted between 0 and 255.

When "0" is set, the volume is turned off.

Operate the same way for the other volume settings.

■ "Output Buzzer" operations

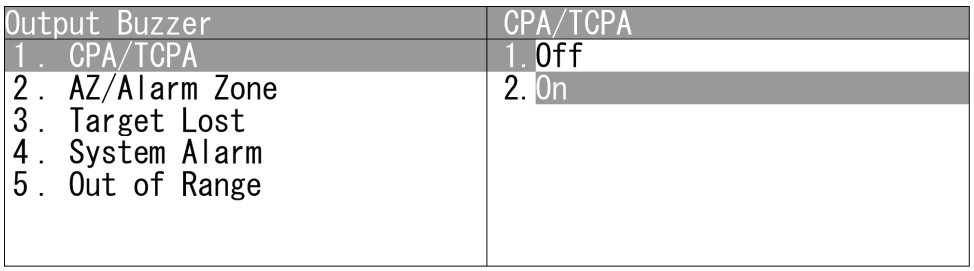
1 Open [Control] - [Output Buzzer].



"Output Buzzer" menu appears.

■ Setting CPA/TCPA

Sets the external buzzer for CPA/TCPA.



[Off] : Sets the external buzzer to Off.

[On] : Sets the external buzzer to On.

Operate the same way for the other external buzzer settings.

Reference:

For details of external buzzer connection, refer to "3.10 CONNECTING CONTACT SIGNALS TO EXTERNAL BUZZERS/EXTERNAL DEVICES" in the INSTALLATION MANUAL.

2.13 SETTING TT/AIS

This section describes the operations of TT and AIS.

2.13.1 COLLISION AVOIDANCE

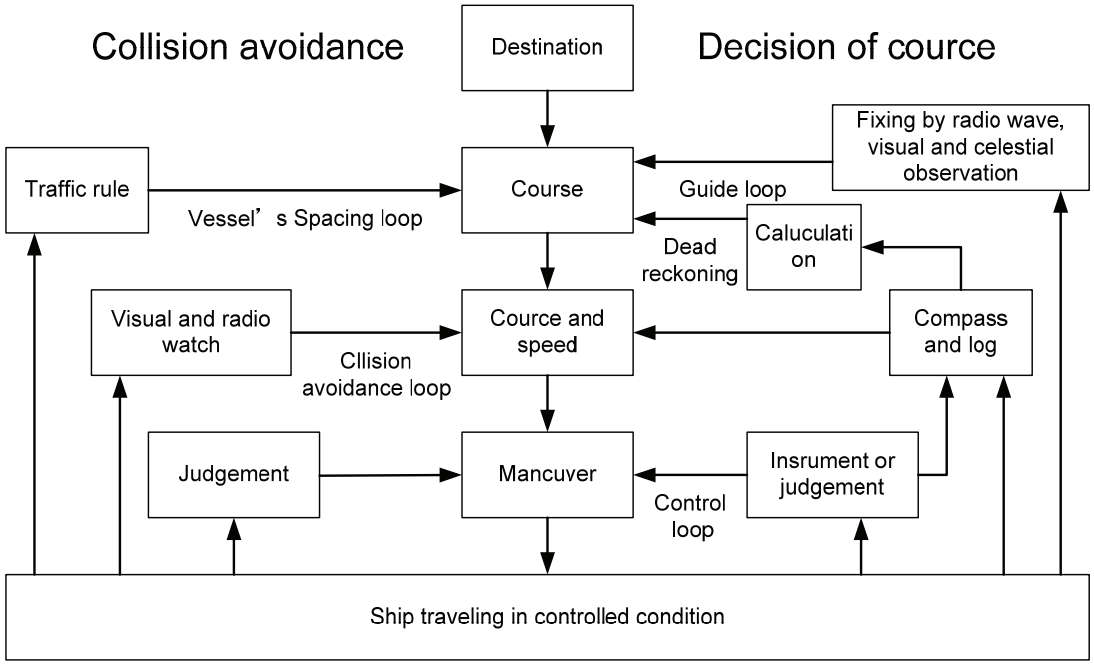
■ Problems of Collision Avoidance in Navigation

Marine collision avoidance is one of the problems that have been recognized from of old. Now, it will be described briefly who the collision avoidance is positioned among the navigational aid problems.

The navigation pattern of all mobile craft constitutes a system with some closed loops regardless of the media through which the mobile craft travels, whether air, water, the boundary between air and water, or space. This pattern consists of two closed loops in principle, one of which is a collision with another mobile craft and the other is a loop of finding a right and safe way to reach a predeterminate destination.

Fig. 2.13-1 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. 2.13-1 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.

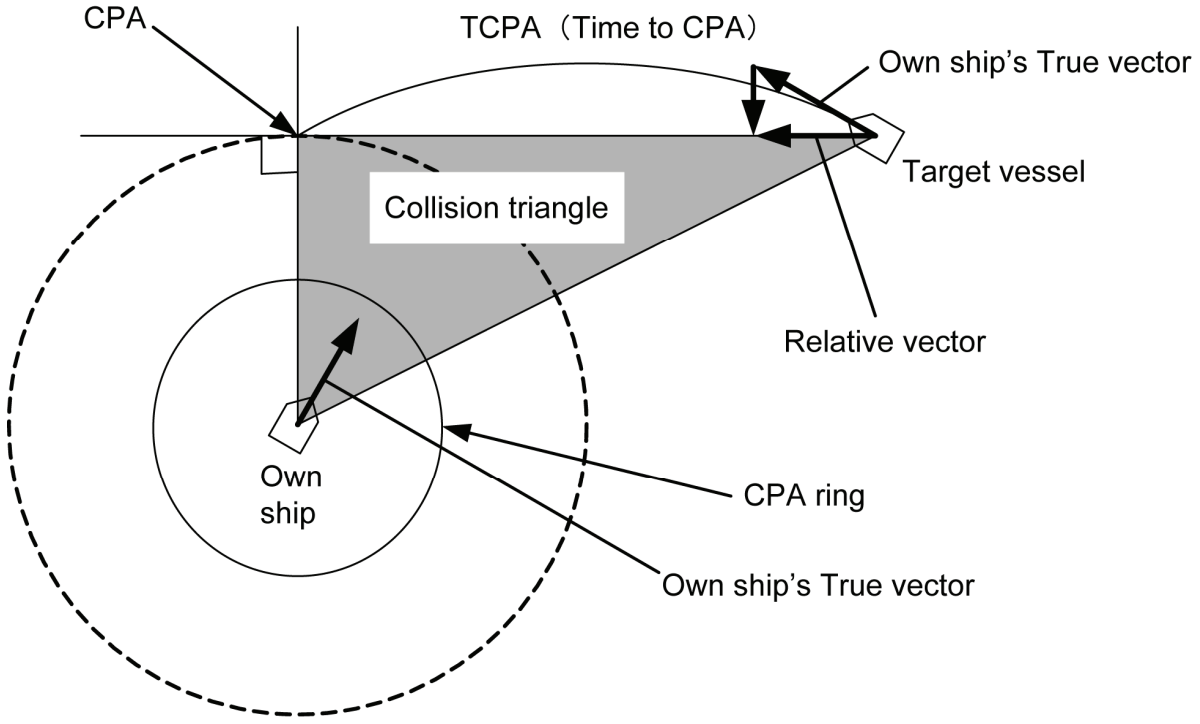
Collision accidents have a high percentage of the marine accidents that have occurred in recent years. To cope with these problems, any effective measures are needed and some equipment to achieve collision avoidance requirements have been developed at rapid strides.

■ 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. 2.13-2 shows a diagram called "Collision Triangle".

Fig. 2.13-2 Collision Triangle



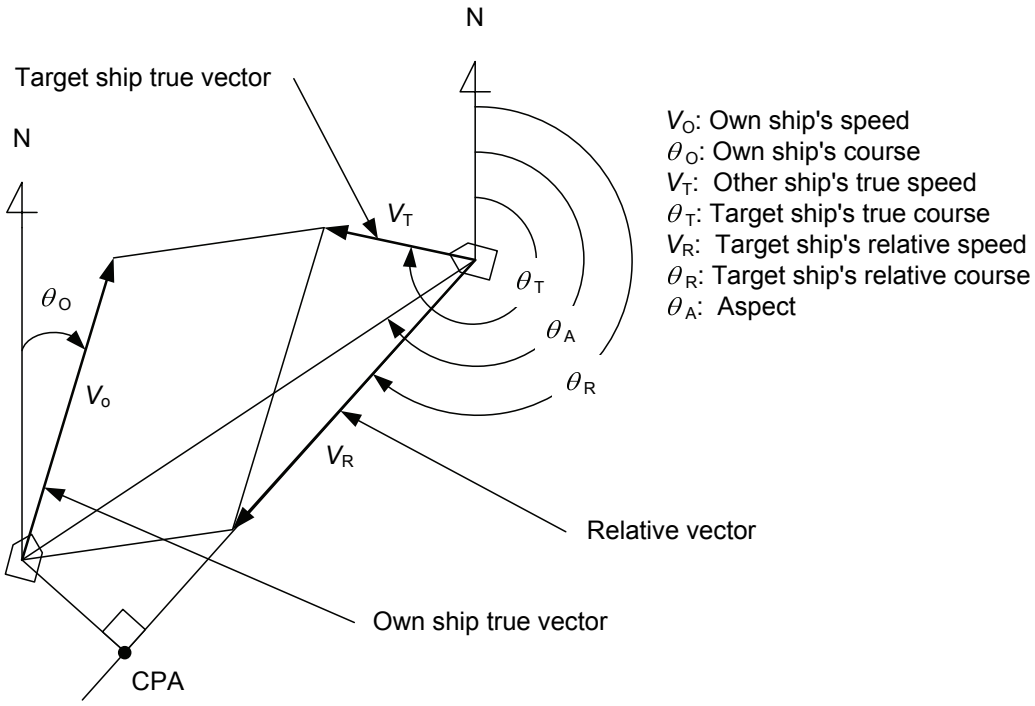
■ Relative Vector and True Vector

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. 2.13-3. Furthermore, the meanings of both vectors are described.

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. 2.13-3 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 are manually plotted, is limited and it takes several minutes to measure those.

2.13.2 PREPARATION

Initializes Tracking Target and AIS Function

■ "Target" operations

1 Open [Target] from the Main Menu.

Target	▲▼
1. TT Target All Clear	
2. CPA Limit	1.5NM
3. TCPA Limit	10min
4. CPA Ring	On
5. Target Number Display	>
6. Target Number Allocation	>
7. ALR Alarm From AIS	Off

"Target" menu appears.

■ TT Target All Clear

All targets currently acquired are cleared.

■ Setting Collision Decision Criteria

Set and check collision decision criteria before operating.

Target	CPA Limit
1. TT Target All Clear	0.1-9.9
2. CPA Limit	1. 5 NM
3. TCPA Limit	
4. CPA Ring	▲Value Up
5. Target Number Display	▼Value Down
6. Target Number Allocation	◀Input Figure Left
7. ALR Alarm From AIS	▶Input Figure Right

Input the CPA Limit value.

Turn the [MULTI] control to set the CPA Limit value.

The CPA Limit value can be set between 0.1 and 9.9 NM.

Target	TCPA Limit
1. TT Target All Clear	1-99
2. CPA Limit	1 0 min
3. TCPA Limit	
4. CPA Ring	▲Value Up
5. Target Number Display	▼Value Down
6. Target Number Allocation	◀Input Figure Left
7. ALR Alarm From AIS	▶Input Figure Right

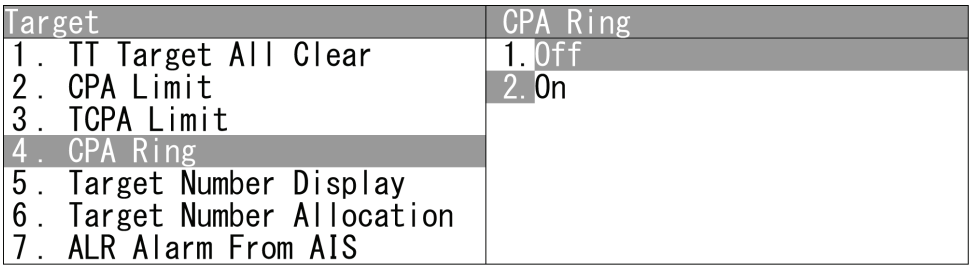
Input the TCPA Limit value.

Turn the [MULTI] control to set the TCPA Limit value.

The TCPA Limit value can be set between 1 and 99 min.

■ Setting CPA Ring

Sets the CPA ring display.



Off : The CPA ring is not displayed.

On : The CPA ring is displayed.

While the distance of the specified CPA Limit value is used as the radius, the CPA ring is displayed with a white circle of which center is the own ship's position.

Reference:

The CPA ring is not displayed when the true vector mode is selected.

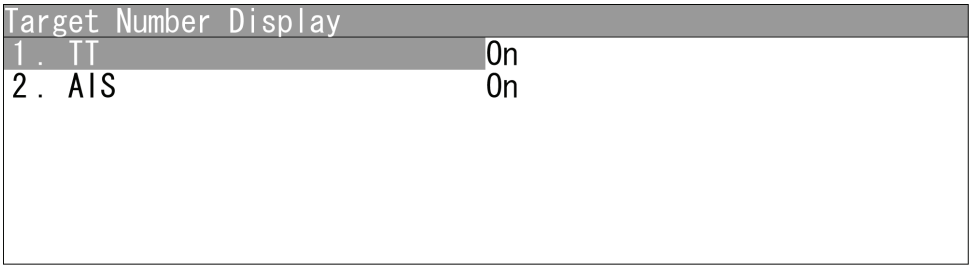
See "2.7.3 SETTING VECTORS" to change the settings.

2.13.3 SETTING TARGET NUMBER DISPLAY

A target ID number is a value displayed beside the target symbol or AIS symbol. These numbers are assigned to targets in acquisition order. The numbers 1 to 10 are automatically assigned. Each target is identified by the assigned ID number until it is lost or its acquisition is canceled.

■ "Target Number Display" operations

1 Open Target - Target Number Display.

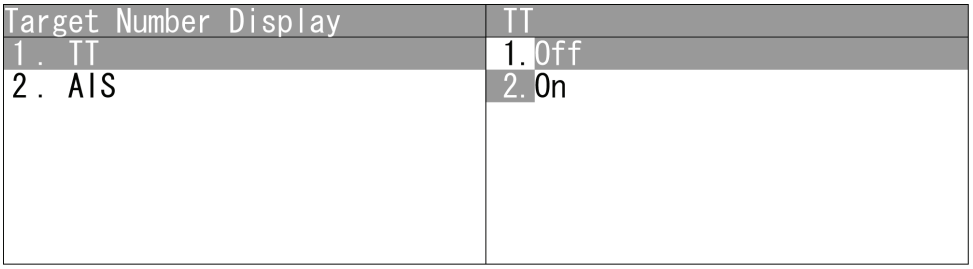


"Target Number Display" menu appears.

■ Turning On/Off the Number of Tracking Target and AIS

Turns on/off the number of tracking target and AIS symbol.

1 Open [Target Number Display] - [TT] [AIS].



[Off] : Target numbers of TT/AIS are not displayed.

[On] : Target numbers of TT/AIS are displayed.

Reference:

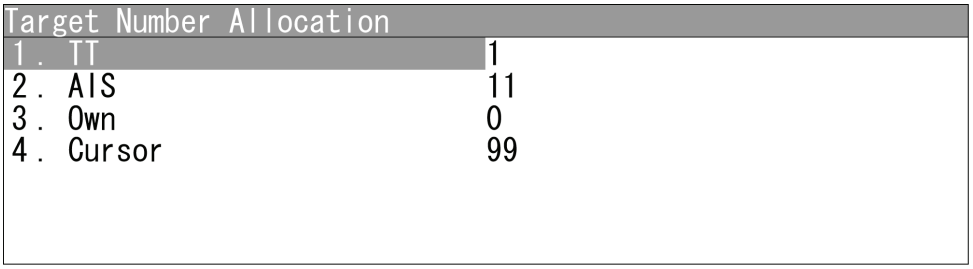
An ID number is always displayed for only targets with which numeric data is displayed.

2.13.4 SETTING TARGET NUMBER ALLOCATION

The start number of target can be specified for the target symbol or AIS symbol.

■ "Target Number Allocation" operations

1 Open [Target] - [Target Number Allocation].

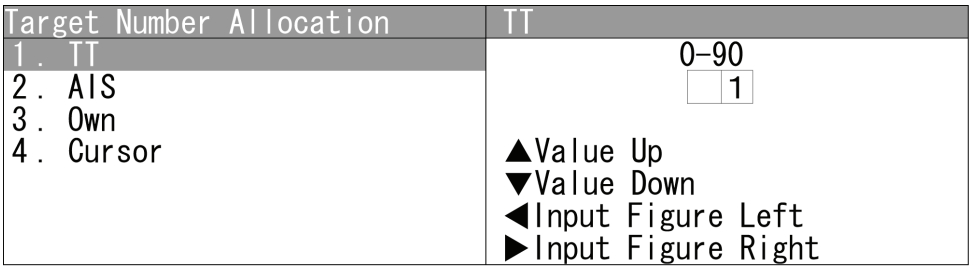


"Target Number Allocation" menu appears.

■ Target Number Allocation

Turns on/off the start number of target for tracking.

1 Open [Target Number Allocation] - [TT] [AIS] [Own Ship's] [Cursor].



Turn the [MULTI] control to set the start number of target.

Operate the same way for the other target numbers.

[TT] : The start number of target can be adjusted between 0 and 90.

[AIS] : The start number of target can be adjusted between 0 and 50.

[Own Ship's] : The start number of target can be adjusted between 0 and 99.

[Cursor] : The start number of target can be adjusted between 0 and 99.

Reference:

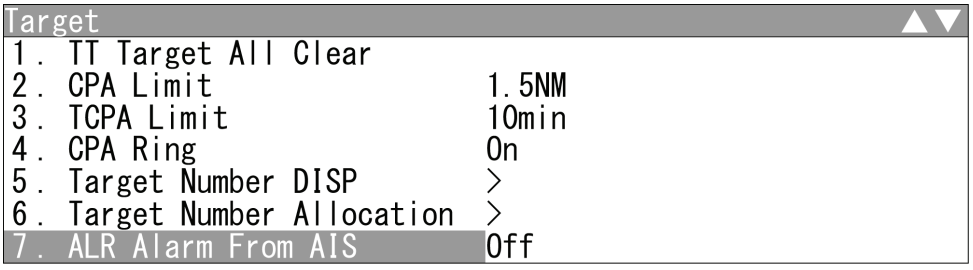
Set the target number of TT/AIS not to overlap each other.

2.13.5 SETTING AIS ALARM

Sets the display of NMEA ALR sentence received from AIS.

■ Setting AIS Alarm

1 Open [Target] - [ALR Alarm From AIS].



[Off] : ALR alarm is turned off.

[On] : ALR alarm is turned on.

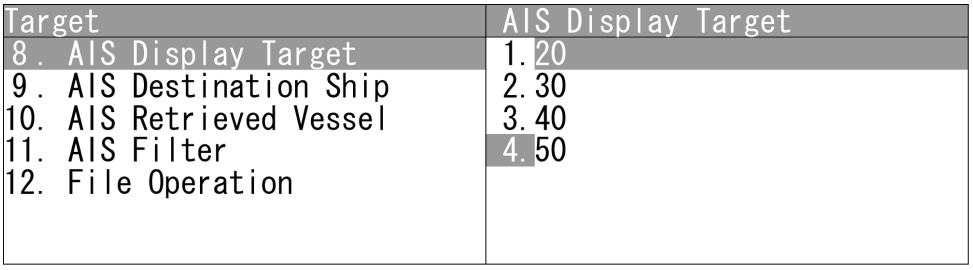
2.13.6 SETTING AIS DISPLAY TARGET

Set the number of AIS display targets.

Set this to get a better look at the screen by limiting the number of AIS symbols.

■ Setting AIS Display Target

1 Open [Target] - [AIS Display Target].



[20] : The number of AIS display targets is set to 20.

[30] : The number of AIS display targets is set to 30.

[40] : The number of AIS display targets is set to 40.

[50] : The number of AIS display targets is set to 50.

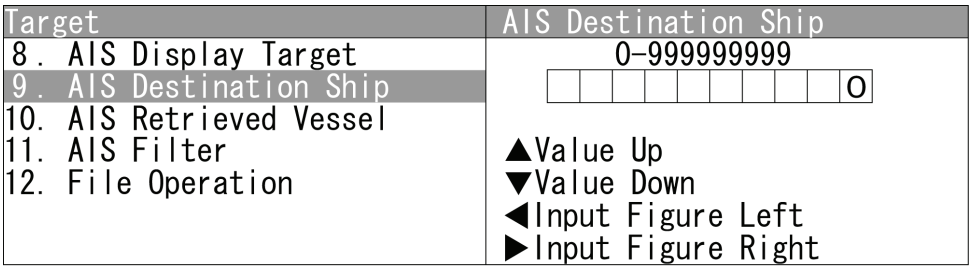
2.13.7 SETTING AIS DESTINATION SHIP (DirecTrak™)

AIS destination ship is the function to display the user-specified ship as the destination.

If MMSI of AIS target is set, the destination ship can be specified.

■ Setting AIS Destination Ship

1 Open [Target] - [AIS Destination Ship].



Turn the [MULTI] control to set MMSI.

MMSI can be adjusted between 0 and 999999999.

2.13.8 SETTING AIS RETRIEVED VESSEL

AIS retrieved vessel is the function to preferentially display the user-specified ship.

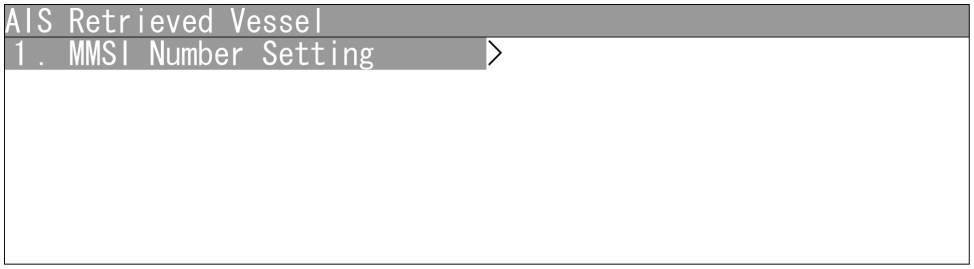
If MMSI of AIS target is set, the retrieved vessel can be specified.

Reference:

AIS retrieved vessel can be set up to 10 vessels.

■ "AIS Retrieved vessel" operations

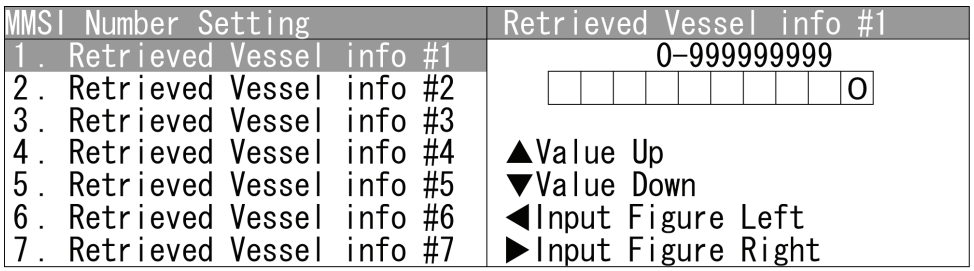
1 Open [Target] - [AIS Retrieved Vessel].



"AIS Retrieved Vessel" menu appears.

■ MMSI Number Setting

1 Open [AIS Retrieved Vessel] - [MMSI Number Setting] - [Retrieved Vessel info #1].



Turn the [MULTI] control to set MMSI number.

MMSI number can be adjusted between 0 and 999999999.

Operate the same way for the other retrieved vessels.

2.13.9 SETTING AIS FILTER

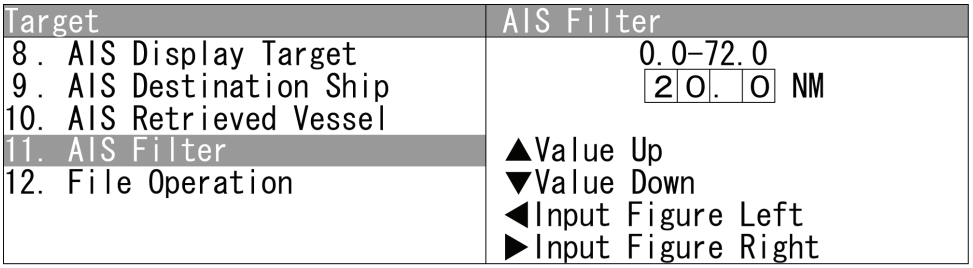
Sets the range for AIS filter.

Reference:

For details of AIS filter, refer to "2.7.21 SETTING AIS FILTER".

■ Setting AIS Filter

1 Open [Target] - [AIS Filter].



Turn the [MULTI] control to set the range for AIS filter.

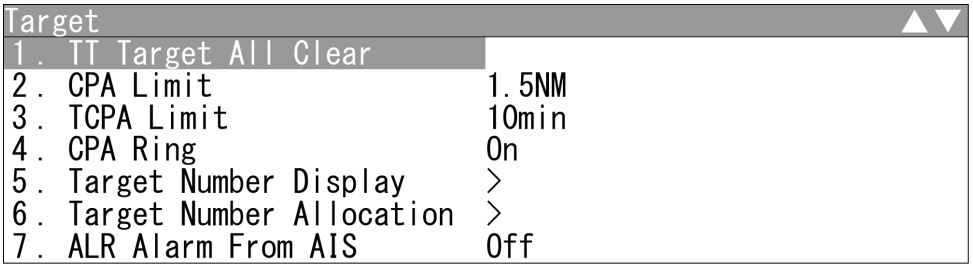
The range can be set between 0 and 72.0 NM.

2.13.10 TT Target All Clear

All TT targets currently acquired are cleared.

■ TT Target All Clear

1 Open [Target] - [TT Target All Clear].



All targets currently acquired are cleared.

2.14 SETTING DETECTION LEVELS OF RADAR ALARM

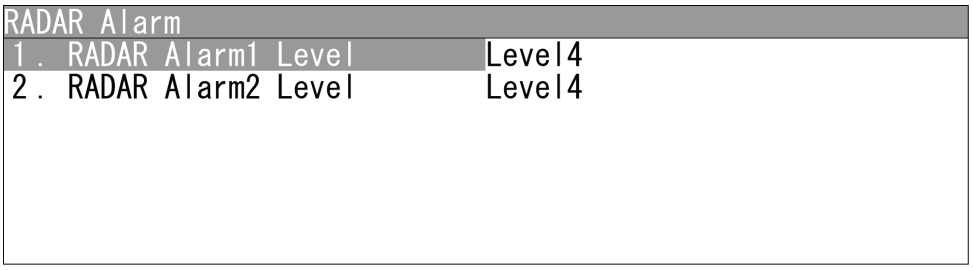
Detection levels can be set to issue alarms from the radar alarm.

Reference:

For details of display settings for radar alarm, see "2.7.7 DISPLAYING THE RADAR ALARM AND AUTOMATIC ACQUISITION OPERATIONS".

■ "RADAR Alarm" operations

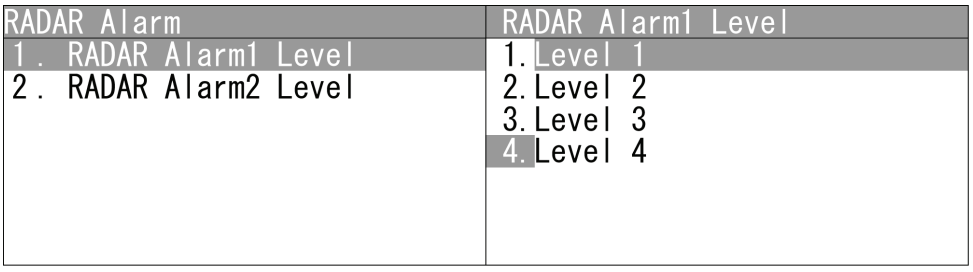
1 Open [Main Menu] - [RADAR Alarm].



"RADAR Alarm" menu appears.

■ Setting Detection Level

1 Open [RADAR Alarm] - [RADAR Alarm1 Level].



"RADAR Alarm1 Level" menu appears.

Select Level1, Level2, Level3 or Level4.

Operate the same way for the settings of "RADAR Alarm2 Level".

Note:

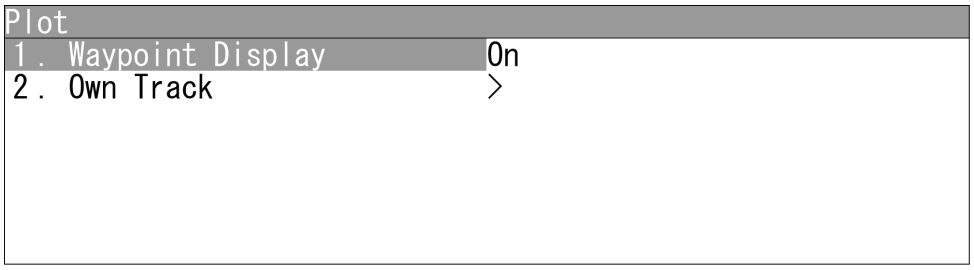
- Select Level1, Level2, Level3 or Level4 for alarm level.
  When setting to lower level of detection, the alarm operates for weaker targets.
  When setting to higher level of detection, be careful because the alarm may not operate properly.

2.15 PLOTTER UNIT

Sets the plotter unit.

■ "Plot" operations

1 Open [Main Menu] - [Plot].



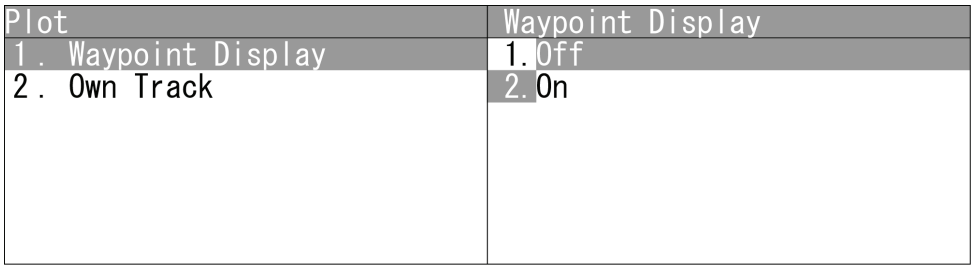
"Plot" menu appears.

2.15.1 DISPLAYING WAYPOINT MARKS

When waypoint information is received from the navigation equipment, the waypoint mark appears on the radar display.
"○" is indicated as the waypoint mark on the radar display.

■ Setting for Waypoint Display

1 Open [Plot] - [Waypoint Display].



[Off] : The waypoint marks are not displayed.

[On] : The waypoint marks are displayed.

Waypoint marks are displayed only when NMEA/RMB/BWC sentences are used to receive Waypoint information.

Reference:

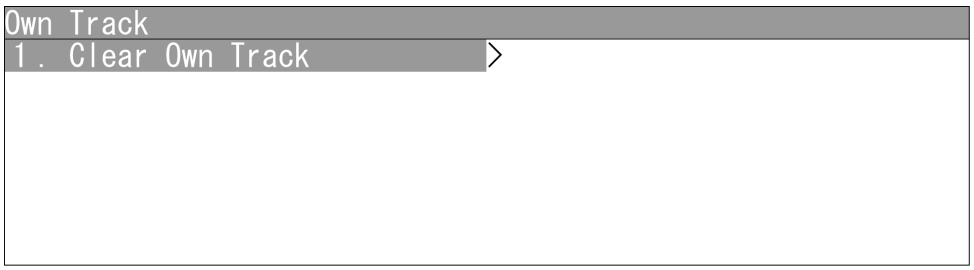
To display Numerical INFO of waypoint, see "4.13.7 LOCATION CHANGE" in "INSTALLATION MANUAL".

2.15.2 DISPLAYING OWN SHIP'S TRACK

Sets the own ship's track display.

■ "Own Track" operations

1 Open [Plot] - [Own Track].

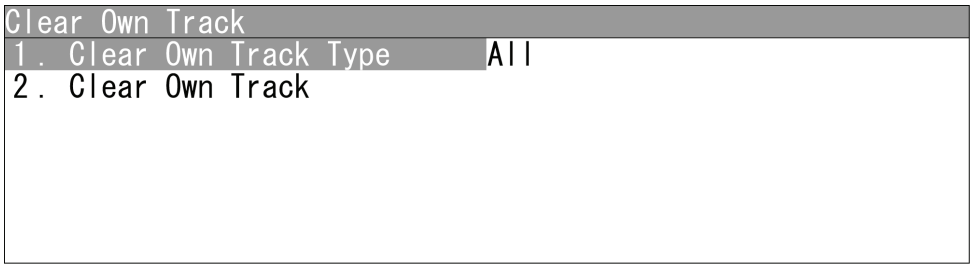


"Own Track" menu appears.

■ Clear Own Track

Sets to clear the own tracks by specifying color/type.

1 Open [Own Track] - [Clear Own Track].



"Clear Own Track" menu appears.

"Clear Own Track Type" : Specifies the type of the own tracks to be cleared.

"Clear Own Track" : Clears the own tracks according to the setting of "Clear Own Track Color" and "Clear Own Track Type".

2.16 SETTING TIMED TX

Sets timed TX function.

■ Timed TX

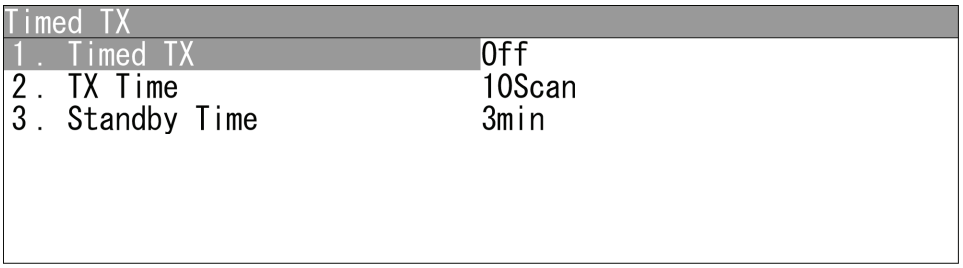
This function reduces power consumption.

When using timed TX function, the operation state is repeatedly changed between TX and standby state.

The timed TX function can set TX time and standby time as desired.

■ "Timed TX" operations

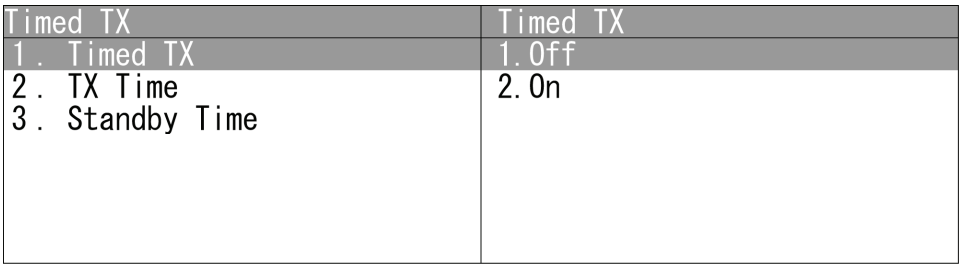
1 Open [Main Menu] - [Timed TX].



"Timed TX" menu appears.

■ Turning on/off Timed TX Function

Turns on/off the timed TX function.



[Off] : Sets the timed TX function to Off.

[On] : Sets the timed TX function to On.

Reference:

The timed TX function can be turned off only in TX state. It cannot be turned off in standby state.

■ Setting TX Time

Sets the number of antenna rotation.

Timed TX	TX Time
1. Timed TX 2. TX Time 3. Standby Time	1-99 10 Scan ▲Value UP ▼Value Down ◀Input Figure Left ▶Input Figure Right

Turn the [MULTI] control to set the TX time.

TX time can be adjusted between 0 and 99Scan.

■ Setting Standby Time

Sets the time for standby state.

Timed TX	Standby Time
1. Timed TX 2. TX Time 3. Standby Time	1-99 3 min ▲Value Up ▼Value Down ◀Input Figure Left ▶Input Figure Right

Turn the [MULTI] control to set the Standby Time.

The standby time can be adjusted between 0 and 99min.

Chapter 3
TRUE AND FALSE ECHOES ON DISPLAY

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.

3.1 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:

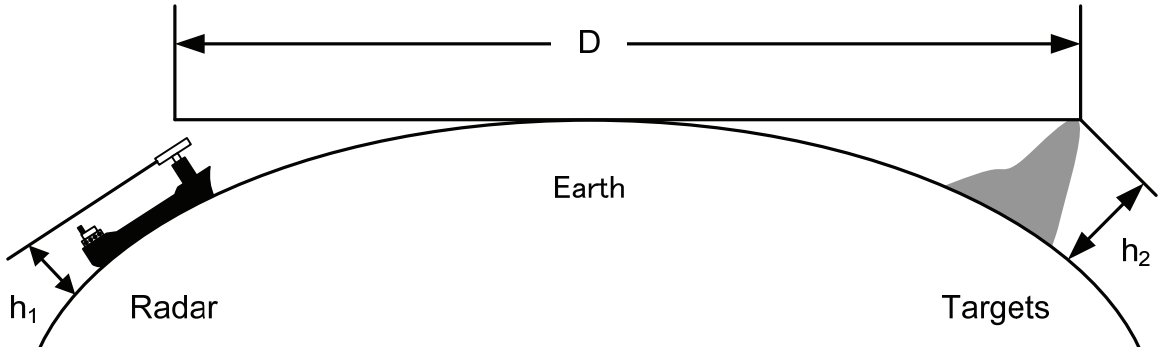
$D=2.23(\sqrt{h1} + \sqrt{h2})(nm)$

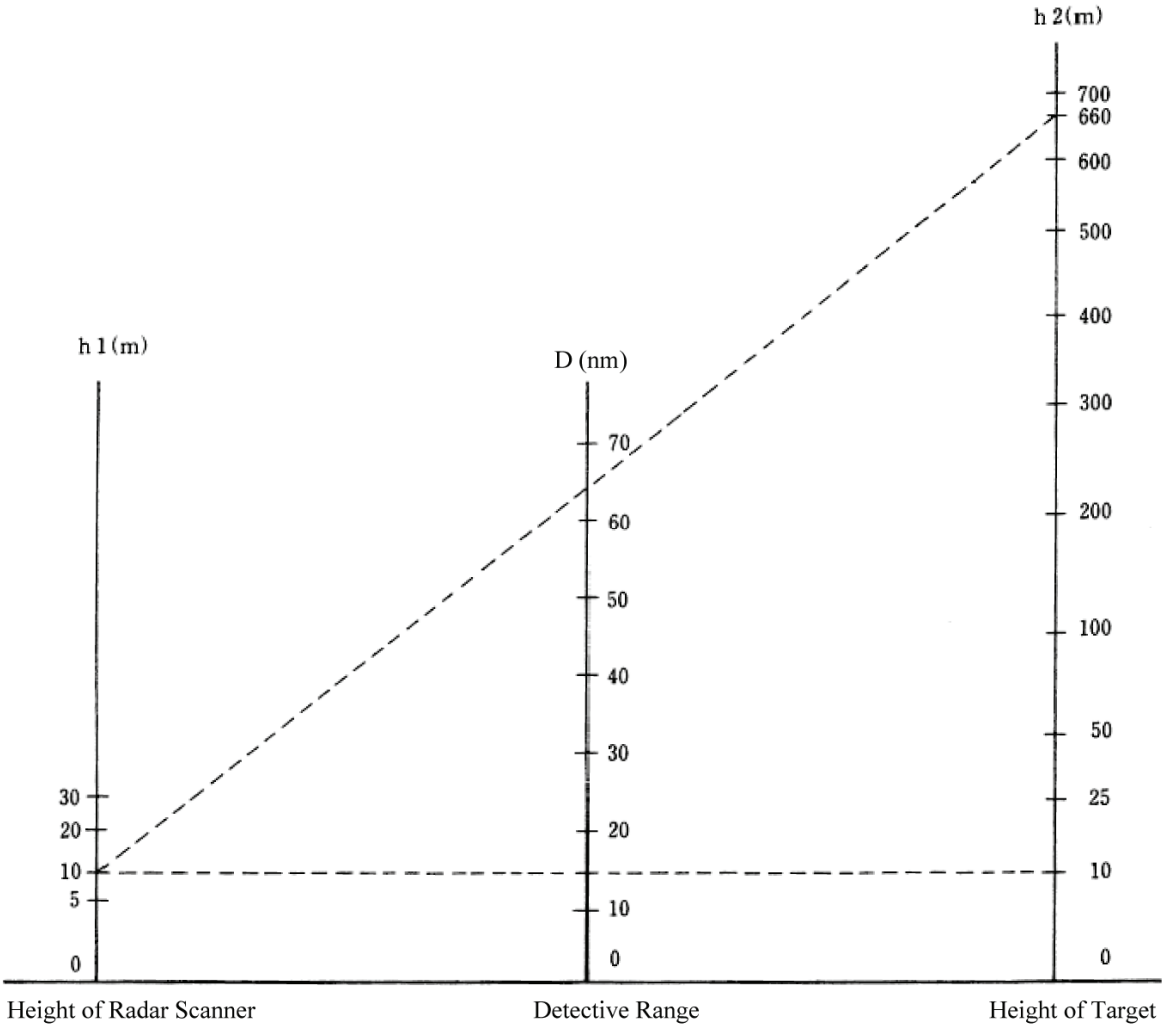
h1: Height (m) of radar scanner above sea level

h2: Height (m) of a target above sea level

Fig. 3.1-1 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.

Fig. 3.1-1





When the height of own ship's scanner is 10 m for instance,

(a) A target that can be detected at the radar range of 64 nm on the radar display is required to have a height of 660 m or more.

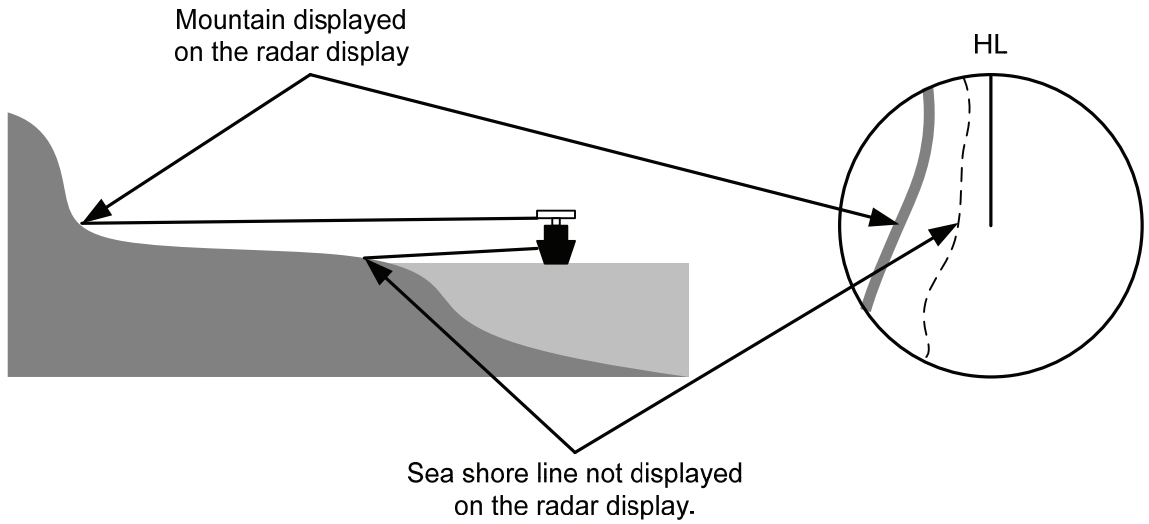
(b) If the height of a target is 10 m, the radar range has to be approx. 15 nm. However, the maximum radar range at which a target can be detected on the radar display depends upon the size of the target and the weather conditions, that is, the radar range may increase or decrease depending upon those conditions.

3.2 REFLECTION FROM 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 slop, the echo from a mountain of the inland appears on the radar display, as shown in Fig. 3.2-1. Therefore, the distance to the coast line should be measured carefully.

Fig. 3.2-1



3.3 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.

3.3.1 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.

3.3.2 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

3.3.3 COPING WITH SEA CLUTTER AND RAIN AND SNOW CLUTTER

When the weather is bad and the ocean is rough, 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 "3Scan COREL" to "5Scan COREL", it is expected that spurious waves are further suppressed.
However, these functions may make some targets invisible, particularly targets with higher speeds.

3.4 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:

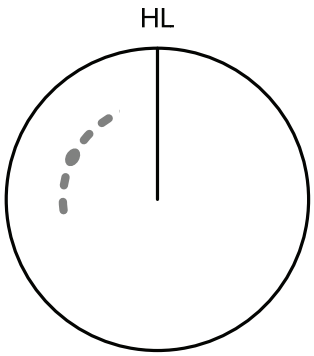
3.4.1 SHADOW

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.

3.4.2 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 Fig. 3.4-1.)

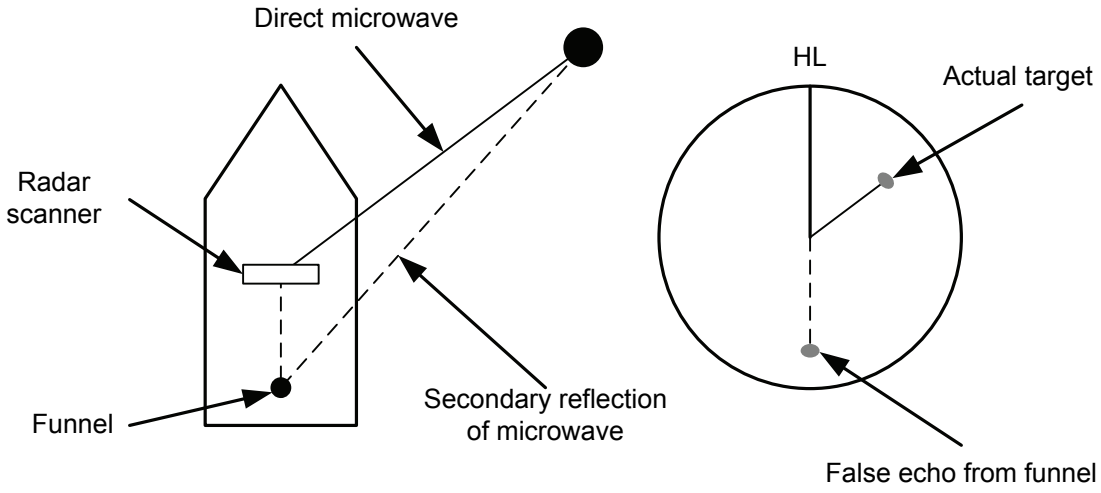
Fig. 3.4-1



3.4.3 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 Fig. 3.4-2.

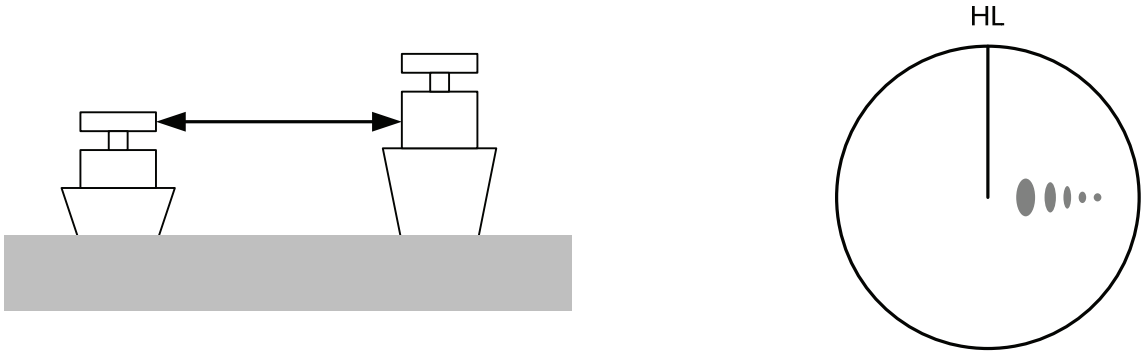
Fig. 3.4-2



3.4.4 FALSE ECHO BY MULTIPLE REFLECTION

When there is a large structure or ship with a high vertical surface near own ship as shown in Fig. 3.4-3, multiple refection 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.

Fig. 3.4-3



3.4.5 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 "3.1 RADAR WAVE WITH THE HORIZON". If a so-called "duct" occurs on the sea surface due to a certain weather condition, however, the radar beam may propagate to a abnormally long distance, at which a target may be detected by the radar.

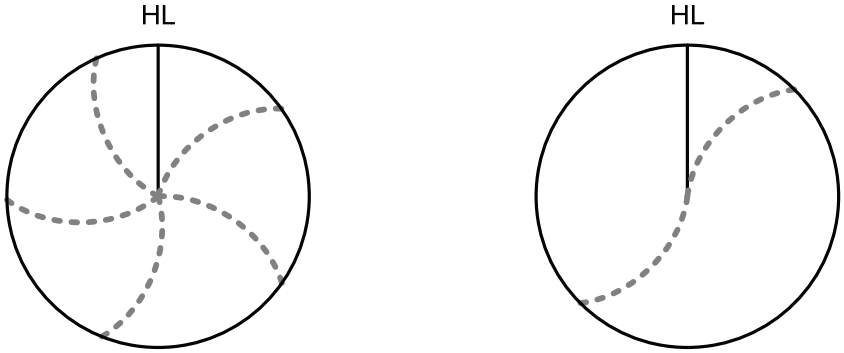
For instance, assuming that the pulse length is MP3 (on the repetition frequency of 1400 Hz), the first pulse is reflected from a target at about 58 NM or more and received during the next pulse repetition time. In this case, a false echo (second time echo) appears at a position that is about 58 NM shorter than the actual distance. If the false echo appears at 5 NM on the radar display, the true distance of the target is 5+58=63 NM. On the pulse

length is SP1 (on the repetition frequency of 2250 Hz), a false echo may appear at a position that is about 36 NM shorter than the actual distance.
This type of false echo can be discriminated by changing over the range scale (the repetition frequency), because the distance of the target changes accordingly.
If second time echo is appeared, the use of Economy mode in PRF menu is effective. Otherwise, Stagger Trigger menu set to on. (Refer to Section "4.6 SCANNER" of INSTALLATION MANUAL.)

3.4.6 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 Fig. 3.4-4.)

Fig. 3.4-4



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 the [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.

3.5 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.

Perform the following settings to display SART on the radar screen.

1. Range: 6 NM or 12 NM
2. [SEA] control: Turning to the minimum position (counterclockwise fully)
3. Automatic sea clutter suppression function: Off
4. Tuning function: Off (for less clutter)
5. IR: Off
6. Processing: Off

Note:

- When performing the settings 1 to 6 above to display the SART signal, 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 the detection of SART signal, the radar adjustment is required for general navigation.

Chapter 4 MAINTENANCE

4.1 ROUTINE MAINTENANCE

⚠DANGER
Never conduct inspection or repair work of equipment components. Inspection or repair work by unauthorized personnel may result in fire hazard or electric shock. 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 output from the rectifier even after the radar is turned off. Failure to comply may result in equipment failure, 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.

4.2 MAINTENANCE ON EACH UNIT

4.2.1 SCANNER UNIT NKE-2043, 2063

⚠DANGER
When conducting maintenance work on the antenna, make sure to turn its main power off. Failure to comply may result in electrocution or injuries.
During scanner unit maintenance, set the safety switch for stopping the scanner unit to the "OFF" position. Failure to comply may result in injuries caused by physical contact with the rotating antenna.
Do not touch the radiator. Even if the power is turned off, the radiator may be rotated by the wind.

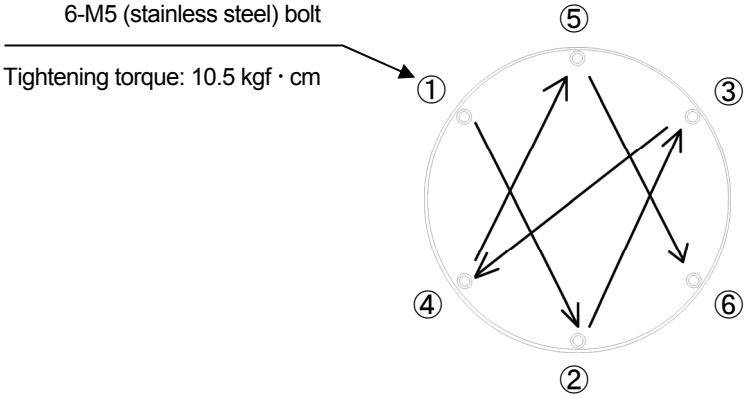
After the work, turn "OFF" the scanner unit safety switch.

■ Notes for installing the radome (NKE-2043)

When the radome 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 (M5) is 103 N・cm (10.5 kgf・cm) (which makes the inside water-tight and protects the packings against permanent compressive strain). Do not fasten the bolts with a torque exceeding the specified value. Otherwise, the screws may be broken.
- Use a box wrench or a wrench of 8 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.



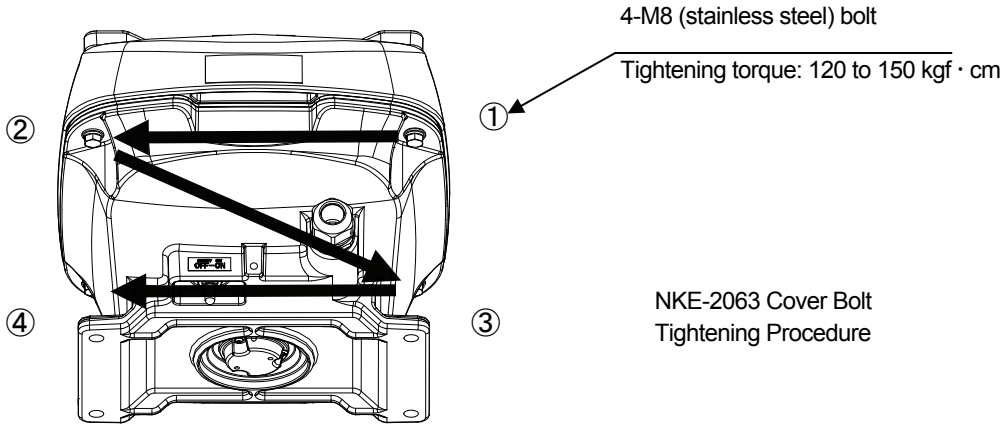
NKE-2043 Redome Bolt Tightening Procedure

■ Precautions in Mounting the Cover (NKE-2063)

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 150kgf•cm) (which makes the inside water-tight and protects the packings against permanent compressive strain). The packings start producing from the cover at a torque of approximately 1470N•cm (150kgf•cm). Do not fasten the bolts with a torque exceeding the specified value. Otherwise, the screws may be broken.
- 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.



NKE-2063 Cover Bolt Tightening Procedure

■ Radiator

Note:

- 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.
  Otherwise, the radiation plane may deteriorate.

Check up and clean the radiator.

■ Rotating section

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 the grease of Mobilux 2 of Mobil Oil.

Driving motor

i) Attenuator

Greasing is not necessary unless there is oil leakage.

ii) Motor

The life span of the brush itself is 2000 hours. When the brush is worn out to a half of the entire length, replace it.

The communicator must be kept clean all the time. If carbon dust is stuck and cannot be removed with a dry cloth, polish the section with sand paper of No.150 to 400.

The carbon brush can be removed by removing the caps on both sides of the bottom of the motor.

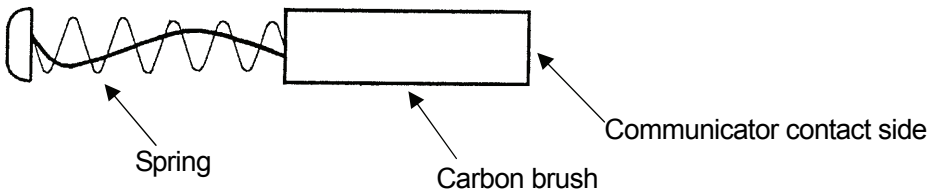


Table 4.2-1 List of replacement carbon brushes

Scanner unit model name	Item name	Model name	JRC code	Replacement quantity
NKE-2063	Carbon brush	54531-01	BRXP05247	2

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.

4.2.2 DISPLAY UNIT NCD-2237

⚠ WARNING

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.

4.3 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 4.3-1 Function Check List in the order as specified in it.

Table 4.3-1 Function Check List

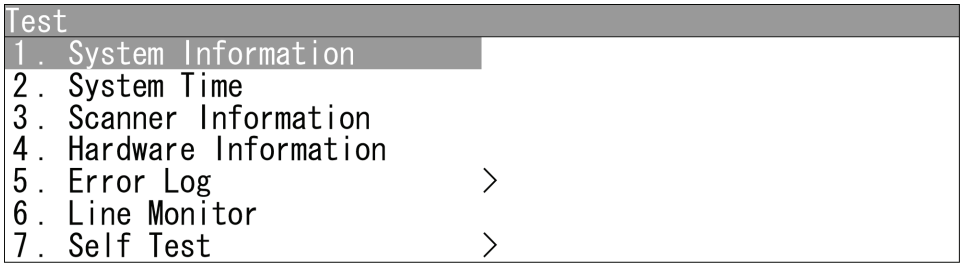
Equipment	Item to be checked	Criteria	Remarks
Transmitter-receiver Unit	Tuning LED of Receiver	The LED is lighting during operation	48NM range
Display Unit	Video and echoes on the screen Sensitivity LCD brilliance can be controlled correctly Various markers Various numerical indications Lighting	Can be correctly controlled	
	Safety Switch Various Currents and Voltages	See "■ Sensor Test" in "4.3.8 SELF TEST".	
	Communication Lines	See "■ Line Test" in "4.3.8 SELF TEST".	
	Memory	See "■ Memory Test" in "4.3.8 SELF TEST".	
	Panel	See "■ Key Test" in "4.3.8 SELF TEST".	
	Checking the Monitor	See "■ Monitor Display Test" in "4.3.8 SELF TEST".	
	Magnetron Current	See "4.3.4 SCANNER INFORMATION".	
	Error Logging Display	See 4.3.6 ERROR LOG.	
	System Information Display	See 4.3.2 SYSTEM INFORMATION and 4.3.3 SYSTEM TIME.	

4.3.1 TEST MENU

The performance status of this radar equipment can be checked on the Test Menu.

■ "Test" operations

1 Open Test from the Main Menu.



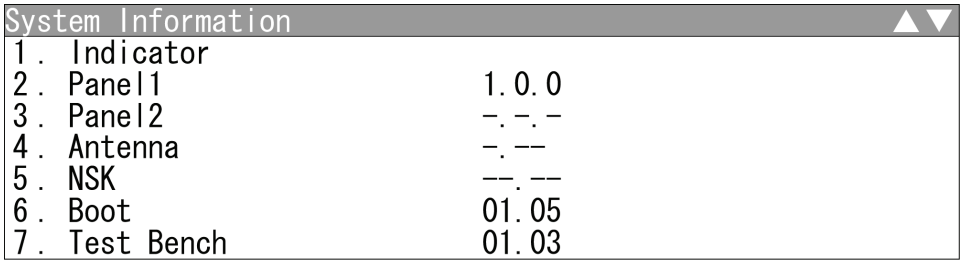
"Test" menu appears.

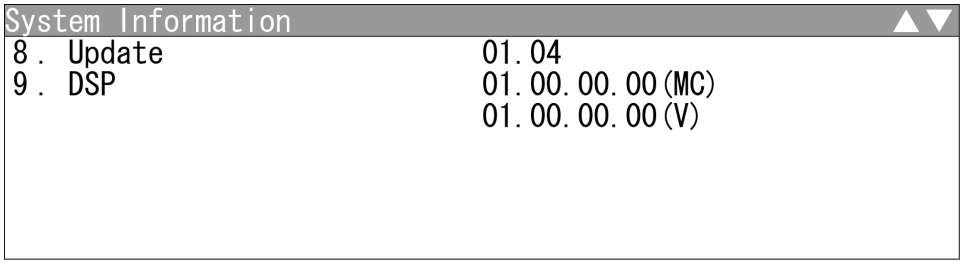
4.3.2 SYSTEM INFORMATION

Displays the current system information (software version information).

■ "System INFO" operations

1 Open Test - System Information.





The software version is displayed.

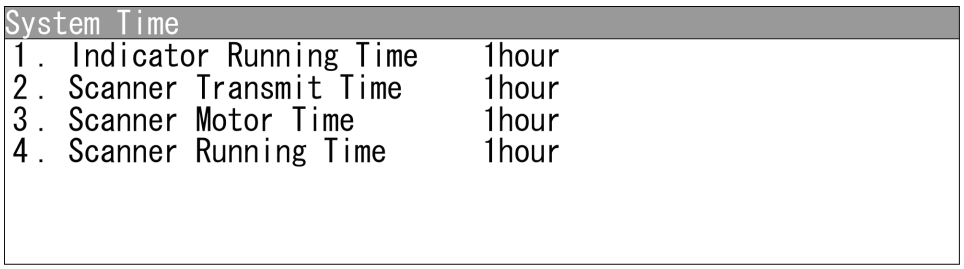
4.3.3 SYSTEM TIME

Displays the following system time information.

- Indicator Running Time
- Scanner Transmit Time
- Scanner Motor Time
- Scanner Running Time

■ "System Time" operations

1 Open Test - System Time.



"System Time" menu appears.

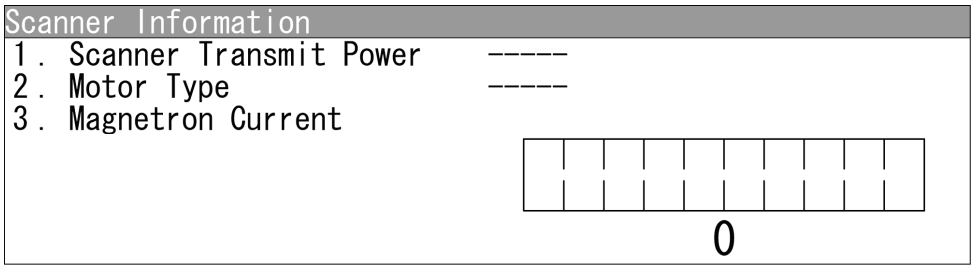
4.3.4 SCANNER INFORMATION

Displays the following scanner information.

- Transmitted output power
- Motor Type
- Magnetron Current

■ "Scanner Information" operations

1 Open Test - Scanner INFO.



"Scanner Information" menu appears.

4.3.5 HARDWARE INFORMATION

Displays the following hardware information.

- Serial Number
- MAC Address
- Temperature

■ "Hardware Information" operations

1 Open [Test] - [Hardware Information].

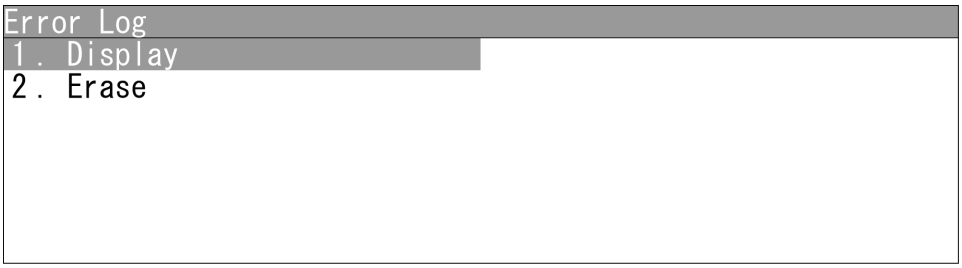
"Hardware Information" menu appears.

4.3.6 ERROR LOG

The error log displays previously occurred system alarms with the dates and times when they occurred.

■ "Error Log" operations

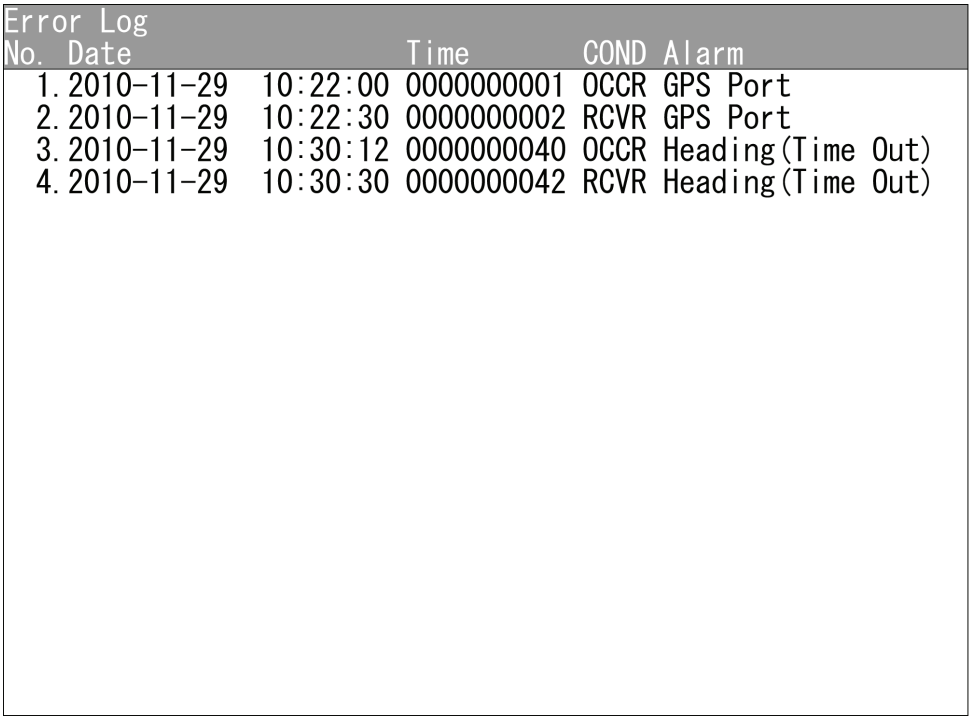
1 Open [Test] - [Error Log].



"Error Log" menu appears.

■ Displaying Error Log

1 Open [Error Log] - [Display].

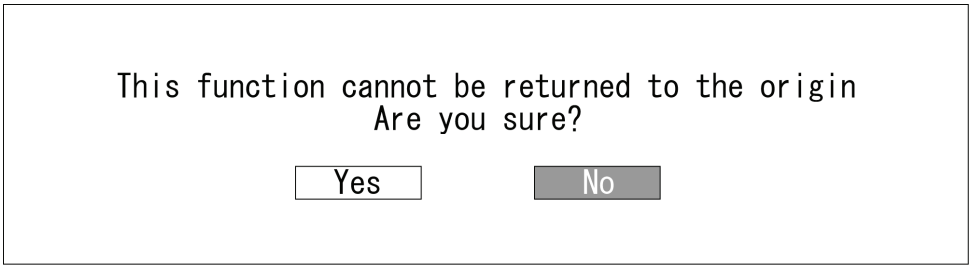


"Error Log" menu appears.

For details of alarms, refer to "4.5.1 LIST OF ALARMS AND OTHER INDICATIONS".

■ Erasing Error Log

1 Open [Error Log] - [Erase].



[Yes] : Erases the error log.

[No] : Does not erase the error log.

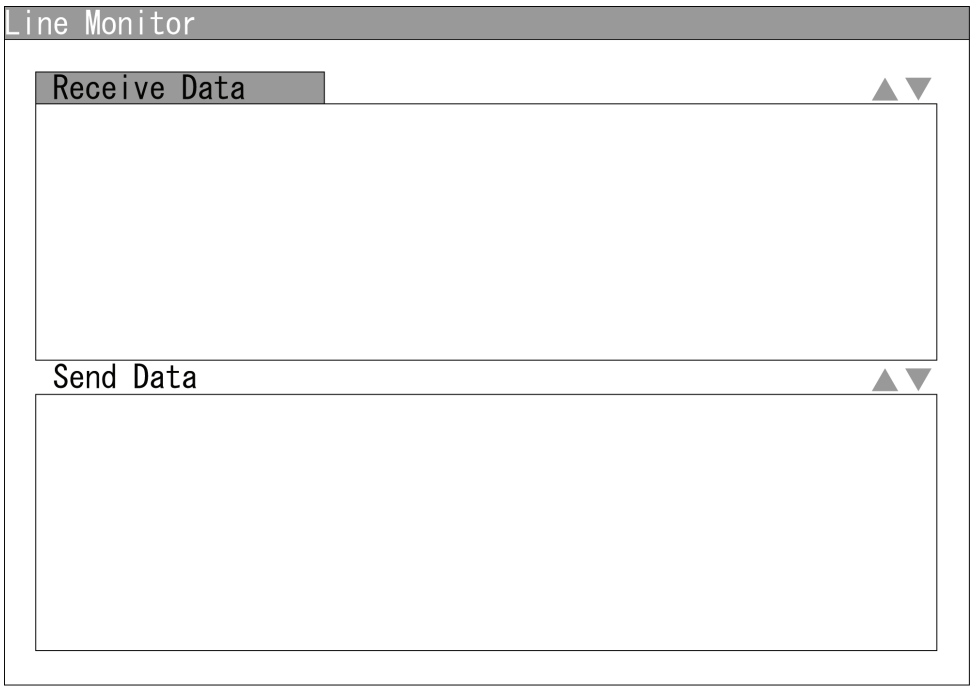
4.3.7 LINE MONITOR

Serial communication data can be seen on the built-in Line monitor.

Line monitor can be used to make sure that the serial data are received properly.

■ "Line Monitor" operations

1 Open [Test] - [Line Monitor].



"Line Monitor" menu appears.

Receive Data: The received serial communication data are displayed.

Send Data: The transmitted serial communication data are displayed.

Soft key 1: [GPS] [NMEA1] [Gyro/Compass] [NMEA2] [Keyboard] [Scanner]

Press the soft key 1 to select the port for serial communication data.

Soft key 2: [ASCII] [Binary]

Press the soft key 2 to switch the display.

Soft key 3: [Stop] [Play]

Press the soft key 3 to stop/start scrolling.

Soft key 4: [Clear]

Press the soft key 4 to clear all listed serial communication data.

4.3.8 SELF TEST

The following tests can be performed.

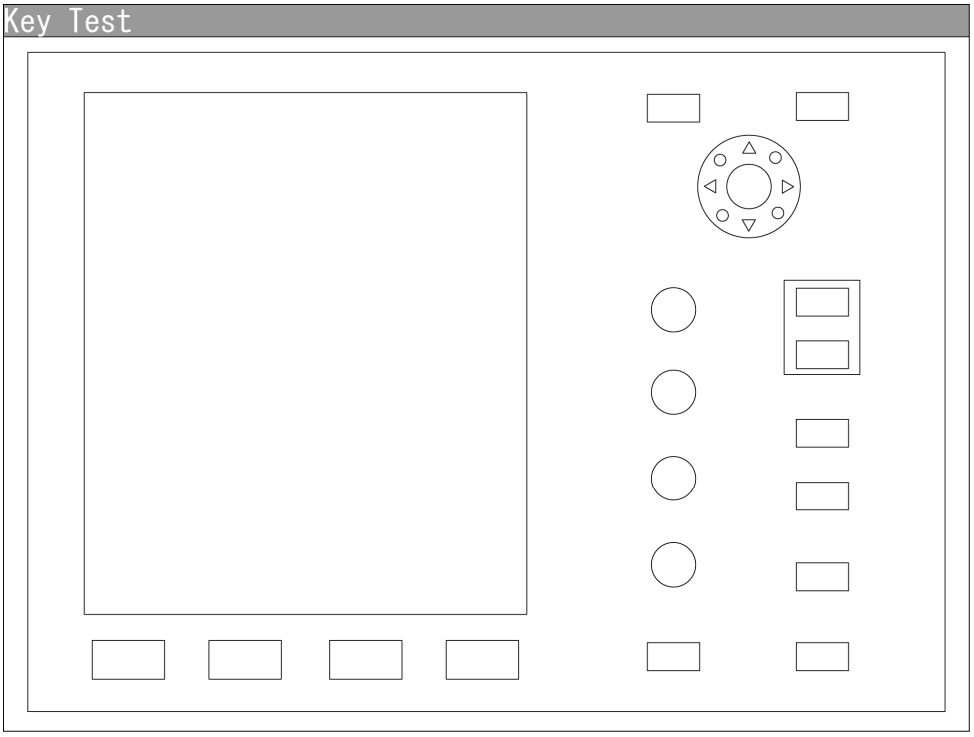
- Key Test
- Buzzer Test
- Key Light Test
- Monitor Display Test
- Memory Test
- Line Test
- Sensor Test

■ "Self Test" operations

1 Open [Test] - [Self Test].

■ Key Test

1 Open [Self Test] - [Key Test].



Operation key video will be displayed.

When pressing each key, the corresponding operation key is brightness-inverted on the display.

Press the [CLEAR] key to turn off the operation keys.

■ Buzzer Test

1 Open [Self Test] - [Buzzer Test].

The buzzer will sound.

The buzzer automatically stops after it sounds for a certain time.

The buzzer will sound regardless of the buzzer setting.

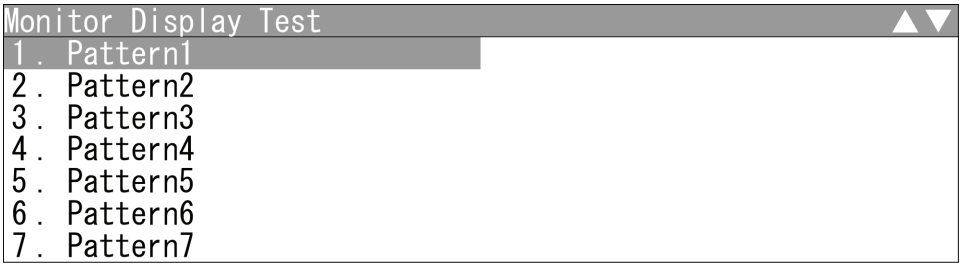
■ Key Light Test

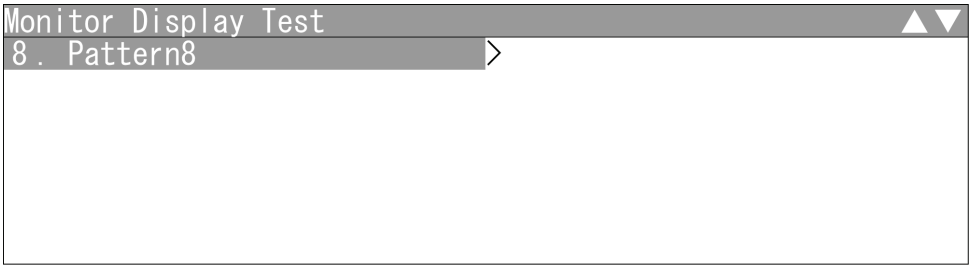
1 Open [Self Test] - [Key Light Test].

The brightness of the operation panel is gradually intensified.

■ Monitor Display Test

1 Open [Self Test] - [Monitor Display Test].





[Pattern1] : All colors are filled with white.

[Pattern2] : A white box is displayed on the black background of 1024 × 768 dots.

[Pattern3] : Displays rectangle × 2, circle × 2, and cross-shape× 9 (white lines on the black background).

[Pattern4] : Displays "H" of 9 dots × 9 dots on the entire screen (white character on the black background).

[Pattern5] : Gray scale display (16 levels)

[Pattern6] : Displays a color bar.

[Pattern7] : Displays a test pattern for inspection.

[Pattern8] : The square figure of a specified RGB value is shown at the center of the display.

Pattern8	
1. Red	31
2. Green	31
3. Blue	31
4. Display	

Pattern8	Red
1. Red	0-31 3 1
2. Green	
3. Blue	
4. Display	▲Value Up ▼Value Down ◀Input Digure Left ▶Input Figure Right

Input the value.
Turn the [MULTI] control to set the value.
The value can be set between 0 and 31.

Operate the same way for the other settings.

■ Memory Test

1 Open [Self Test] - [Memory Test].

Memory Test	
1. SDRAM	OK
2. Flash ROM	OK
3. USB	NG

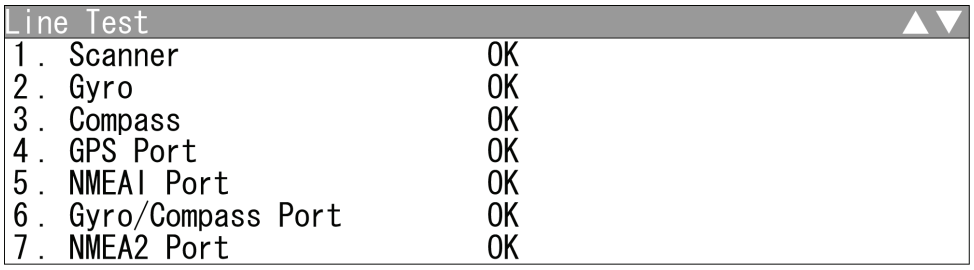
When no abnormality is found, "OK" is displayed. When an abnormality is found, "NG" is displayed.

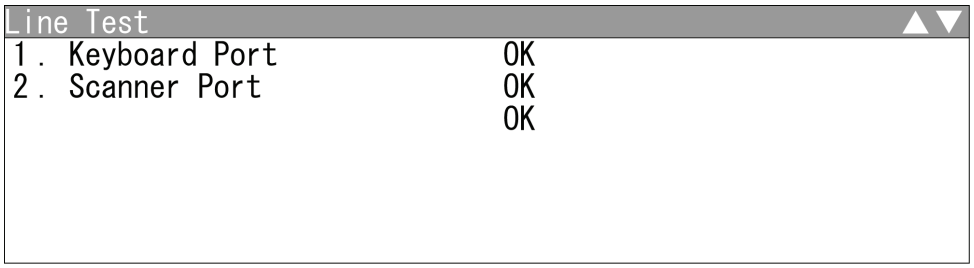
Note:

- "NG" is always displayed for USB memory test.

■ Line Test

1 Open [Self Test] - [Line Test].

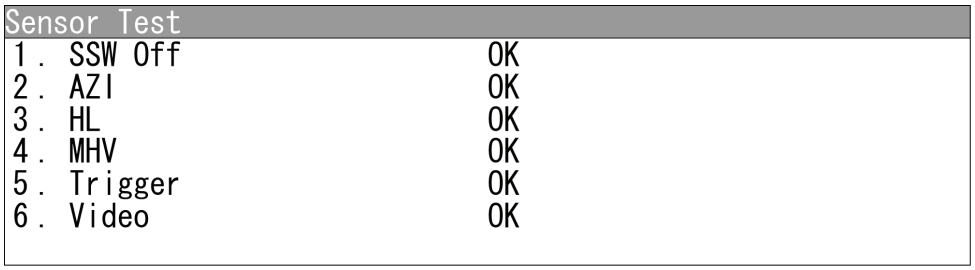




When no abnormality is found, "OK" is displayed. When an abnormality is found, "NG" is displayed.

■ Sensor Test

1 Open [Self Test] - [Sensor Test].

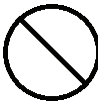


When no abnormality is found, "OK" is displayed. When an abnormality is found, "NG" is displayed.

4.4 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	
	**When it is necessary to get close to the antenna for maintenance or inspection purposes, make sure to turn the indicator power switch to "OFF" or "STBY." Direct exposure to electromagnetic waves at close range will have adverse effects on the human body.**
	**When conducting maintenance work, make sure to turn off the power and unplug the power connector J1 of the display unit so that the power supply to the equipment is completely cut off. Some equipment components can carry electrical current even after the power switch is turned off, and conducting maintenance work without unplugging the power connector may result in electrocution, equipment failure, or accidents.**

CAUTION	
	**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.**
	**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.**

■ Parts Required for Periodic Replacement

Here are parts required for periodic replacement.

Part name	Interval
1. Magnetron	4,000 hours
2. Motor	10,000 hours

4.5 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.

4.5.1 LIST OF ALARMS AND OTHER INDICATIONS

The following table shows alarms and other indications the system displays.

Table 4.5-1 Alarm list

Alarm name (Japanese)	Alarm name (English)	Class	Description
警報エラー	Alarm Error	Alarm	Cannot send the alarm because of insufficient message buffer for alarm task.

Table 4.5-2 Alarm list of system alarm: scanner

Alarm name (Japanese)	Alarm name (English)	Class	Description
空中線 安全 SW オフ	Scanner(SSW Off)	Alarm	The safety switch OFF bit of scanner communication data is set.
空中線 AZI	Scanner(AZI)	Alarm	The BP error bit of scanner communication data is set.
空中線 HL	Scanner(HL)	Alarm	The BZ error bit of scanner communication data is set.
空中線 変調高圧	Scanner(MHV)	Alarm	The high-voltage modulator error bit of scanner communication data is set.
空中線 無通信	Scanner(Time Out)	Alarm	No reply from the scanner after data transmission.
空中線 データ	Scanner(Data)	Alarm	Collision occurs when transmitting data to the scanner. Checksum of the received data is different.
空中線 EEPROM	Scanner(EEPROM)	Alarm	Stored value error is returned from the scanner when the initial adjustment data is requested. The save operation is not completed when data save is requested to scanner EEPROM.
空中線 ヒータ電圧	Scanner(Heater)	Alarm	The MAG heater voltage error bit of scanner communication data is set.
空中線 逆回転	Scanner(Reverse)	Alarm	The reverse rotation alarm bit of scanner communication data is set.
空中線 ビデオ	Scanner(Video)	Alarm	The VIDEO error bit of scanner communication data is set.
空中線 トリガー	Scanner(Trigger)	Alarm	The TRIGGER error bit of scanner communication data is set.
空中線 ファン 1	Scanner(Fan 1)	Alarm	The FAN error bit (FAN 1) of scanner communication data is set.
空中線 ファン 2	Scanner(Fan 2)	Alarm	The FAN error bit (FAN 2) of scanner communication data is set.
空中線 モータ電流	Scanner(Motor)	Alarm	The motor current error of scanner communication data is set.

Table 4.5-3 Alarm list of system alarm: display unit

Alarm name (Japanese)	Alarm name (English)	Class	Description
操作部 1 無通信	Keyboard1(Time Out)	Alarm	No reply from the control panel after data transmission.
操作部 2 無通信	Keyboard2(Time Out)	Alarm	No reply from the control panel after data transmission.
DSP ビデオ	DSP(Video)	Alarm	DSP detects VIDEO error.
DSP トリガー	DSP(Trigger)	Alarm	DSP cannot receive TI interrupt.
DSP AZI	DSP(AZI)	Alarm	DSP cannot receive BP interrupt.
DSP HL	DSP(HL)	Alarm	DSP cannot receive BZ interrupt.
DSP 処理異常	DSP Error	Alarm	Abnormal operation (infinite loop) of DSP.

Table 4.5-4 Alarm list of system alarm: external equipment communication

Alarm name (Japanese)	Alarm name (English)	Class	Description
GPS ポート	GPS Port	Alarm	Serial driver error occurs during COM1 port communication.
Gyro/Compass ポート	Gyro/Compass Port	Alarm	Serial driver error occurs during COM2 port communication.
NMEA1 ポート	NMEA1 Port	Alarm	Serial driver error occurs during COM3 port communication.
NMEA2 ポート	NMEA2 Port	Alarm	Serial driver error occurs during COM4 port communication.
Keyboard ポート	Keyboard Port	Alarm	Serial driver error occurs during COM5 port communication.
Scanner ポート	Scanner Port	Alarm	Serial driver error occurs during COM6 port communication.
ジャイロ 無通信	GYRO(Time Out)	Alarm	For heading equipment=Gyro, cannot receive valid sentences (including checksum error) which had been received properly.
ログ 無通信	Log(Time Out)	Alarm	For speed equipment=log, cannot receive valid sentences (including checksum error) which had been received properly.
ジャイロ 通信データ	GYRO(Data)	Alarm	For heading equipment=Gyro, the GYRO error bit of NSK communication data is set.
ログ 通信データ	Log(Data)	Alarm	For speed equipment=log, the LOG error bit of NSK communication data is set.
針路 無通信	Heading(Time Out)	Alarm	For heading equipment=compass, cannot receive valid NMEA bearing sentences (including checksum error) which had been received properly.
針路 通信データ	Heading(Data)	Alarm	For heading equipment=compass, cannot receive valid NMEA bearing data which had been received properly.
2 軸対地 無通信	2AXG(Time Out)	Alarm	For speed equipment=2-axis log, cannot receive valid VBW sentences (including checksum error) which had been received properly.
2 軸対地 通信データ	2AXG(Data)	Alarm	For speed equipment=2-axis log, cannot receive valid VBW ground data which had been received properly.
GPS エラー	GPS(Error)	Status	Failed to set GPS.
GPS 無通信	GPS(Time Out)	Alarm	Cannot receive valid GPS sentences (including checksum error) which had been received properly.
GPS 位置データ	GPS(Position)	Alarm	Cannot receive valid position data which had been received properly
GPS 測地系データ	GPS(Datum)	Alarm	Cannot receive valid geodetic data which had been received properly
GPS 速度データ	GPS(Speed)	Alarm	For speed equipment=GPS, cannot receive valid speed data which had been received properly
GPS 測位状態	GPS(Status)	Alarm	Received GPS fixing status error (invalid) data

Alarm name (Japanese)	Alarm name (English)	Class	Description
水深 無通信	Depth(Time Out)	Alarm	Cannot receive valid depth sentences (including checksum error) which had been received properly
水深 通信データ	Depth(Data)	Alarm	Cannot receive valid depth data which had been received properly
水温 無通信	TEMP(Time Out)	Alarm	Cannot receive valid water temperature sentences which had been received properly
水温 通信データ	TEMP(Data)	Alarm	Cannot receive valid water temperature data which had been received properly
風向風速 無通信	Wind(Time Out)	Alarm	Cannot receive valid wind direction/wind velocity sentences (including checksum error) which had been received properly
風向風速（真） 通信ﾃﾞｰﾀ	Wind True(Data)	Alarm	Cannot receive valid water temperature data after valid wind direction/wind velocity (true) data had been received properly
風向風速（相） 通信ﾃﾞｰﾀ	Wind Relative(Data)	Alarm	Cannot receive valid water temperature data after valid wind direction/wind velocity (relative) data had been received properly
回頭率 無通信	Turn(Time Out)	Alarm	Cannot receive valid turning ratio sentences (including checksum error) which had been received properly
回頭率 通信データ	Turn(Data)	Alarm	Cannot receive valid turning ratio data which had been received properly
舵角 無通信	Rudder(Time Out)	Alarm	Cannot receive valid steering direction sentences (including checksum error) which had been received properly
舵角 通信データ	Rudder(Data)	Alarm	Cannot receive valid steering direction data which had been received properly
AIS 無通信	AIS(Time Out)	Alarm	For AIS function=On, cannot receive valid AIS data (including checksum error) which had been received properly
AIS 通信データ	AIS(Data)	Alarm	For AIS function=On, cannot receive valid AIS data which had been received properly
AIS ｱﾗｰﾑ 001	AIS(Alarm 001)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 002	AIS(Alarm 002)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 003	AIS(Alarm 003)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 004	AIS(Alarm 004)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 005	AIS(Alarm 005)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 006	AIS(Alarm 006)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 008	AIS(Alarm 008)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 025	AIS(Alarm 025)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 026	AIS(Alarm 026)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 029	AIS(Alarm 029)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 030	AIS(Alarm 030)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 032	AIS(Alarm 032)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)
AIS ｱﾗｰﾑ 035	AIS(Alarm 035)	Alarm	For AIS function=On, an error from the AIS receiver is received (ALR)

Table 4.5-5 Notification list

Alarm name (Japanese)	Alarm name (English)	Class	Description
ジャイロ設定	Set Gyro	Status	Requires setting of true bearing.
まもなく TM リセット	TM Reset	Status	For TM, the own ship position is out of 60% of the radius of PPI.
機内温度上昇	High Temperature	Caution	Adjusting the LCD brilliance due to internal temperature control.
GPS 測位精度低下	GPS(HDOP)	Caution	Received excessive HDOP value beyond the setting.

Table 4.5-6 Radar alarm list

Alarm name (Japanese)	Alarm name (English)	Class	Description
ﾚｰﾀﾞｰｱﾗｰﾑ 1 進入	Area1(Approach)	Alarm	Echo in area 1.
ﾚｰﾀﾞｰｱﾗｰﾑ 2 進入	Area2(Approach)	Alarm	Echo in area 2.
ﾚｰﾀﾞｰｱﾗｰﾑ 1 離脱	Area1(Secession)	Alarm	No echo in area 1
ﾚｰﾀﾞｰｱﾗｰﾑ 2 離脱	Area2(Secession)	Alarm	No echo in area 2
ﾚｰﾀﾞｰｱﾗｰﾑ 1 領域外	Area1(Out of Range)	Alarm	• Rectangle area 1 is out of range • Creation of area 1 is out of range
ﾚｰﾀﾞｰｱﾗｰﾑ 2 領域外	Area2(Out of Range)	Alarm	• Rectangle area 1 is out of range • Creation of area 2 is out of range
TT 危険目標	TT(CPA/TCPA)	Alarm	TT is changed to a dangerous ship
TT 新規目標	TT(New Target)	Alarm	TT is automatically acquired
TT 目標ロスト	TT(Lost)	Alarm	TT is lost
TT 領域外	TT(Out of Range)	Alarm	TT is too far to be tracked
TT 最大捕捉数	TT(Max Target)	Status	Manually acquired when the number of acquisition reached maximum
TT 最大捕捉数	TT(Max Target)	Status	Detected when DSP tries to acquire 11 targets or more DSP notifies the maximum target alarm occurrence of automatic acquisition to the TT process task, then the TT process task notifies it to the alarm task
EBL1/VRM1 領域外	EBL/VRM1(Out)	Status	The floating position of EBL1/VRM1 in the latitude/longitude floating setting is out of the radius of PPI
EBL2/VRM2 領域外	EBL/VRM2(Out)	Status	The floating position of EBL2/VRM2 in the latitude/longitude floating setting is out of the radius of PPI
平行線カーソル領域外	P-CURS(Out)	Status	The floating position of the parallel cursor in the latitude/longitude floating setting is out of the radius of PPI

Table 4.5-7 Error message list and alarm list for operations

Alarm name (Japanese)	Alarm name (English)	Class	Description
方位データ無し	No Heading Data	Status	Cannot function because own ship heading is not available • Operations for specifying TT acquisition/numerical display • Changing to TM • Changing to N Up/C Up
プリヒート中です	On Preheating	Status	Transmission operation during preheating
操作間隔が短いです	Short Interval	Status	Transmission operation in the interval of 1 second or less between standby and transmission

Alarm name (Japanese)	Alarm name (English)	Class	Description
エラー発生中です	Error Occurring	Status	Transmission operation during prohibition of transmission caused by scanner error
最大点数です	Max Point	Status	Exceeded the maximum number of marks
ファイル無し	File Not Found	Status	File does not exists
外部メモリ無し	USB Memory Not Set	Status	USB memory does not exists
ファイル読込み失敗	File Read Error	Caution	Failed to load the file
ファイル書出し失敗	File Write Error	Caution	Failed to write the file
空容量不足	Not Enough Space	Status	Insufficient capacity
フォーマット失敗	Format Error	Caution	Failed to format
ファイル数オーバー	Num of files Over	Caution	Writing data to the USB memory in which the number of the file has reached to the maximum
ファイル削除失敗	File Erase Error	Caution	Failed to delete the file
診断結果 NG	Self Test NG	Caution	Diagnosis NG
自船高緯度オーバー	LAT(Out of Bounds)	Caution	The own ship's latitude is 80 degrees or more (indicating that some functions are limited) • Displays AIS, waypoint, mark/line, own ship trail, etc. for 80 degrees or more • Input operations for 80 degrees or more (refer to "High Latitude" alarm)
設定されていません	Unsetting	Status	• Menu display operations when all soft key menu/multi control menu items are turned off • Area creation operations for alarm class=Off • EBL bearing setting while EBL is off • Floating setting while EBL/VRM is off • VRM range setting while VRM is off • Bearing/width setting while parallel cursor is off • Manual tuning setting while automatic tuning is on • AIS operations while AIS function is off • TT operations while TT function is off • Operations to display the weather information while no observation point is selected
最大レンジです	MAX Range Scale	Status	Range up operations at the maximum range
最小レンジです	MIN Range Scale	Status	Range down operations at the minimum range
無効値です	Invalid Data	Status	Cannot function due to invalid value • Invalid code is input for the code input screen

Alarm name (Japanese)	Alarm name (English)	Class	Description
操作中です	In Operation	Status	This operation is disabled due to another operation • Setting enable/disable and class during alarm area creation • Setting operations for on/off and floating position during EBL bearing setting • Setting operations for on/off and bearing during EBL floating position setting • Operations for on/off during VRM range setting • Operations for on/off, mode and saving during off center custom position setting • Operations for PRF tuning during manual tuning operations • Setting for automatic/manual mode during manual tuning operations • Operations for manual tuning during PRF tuning operation
方位/緯度経度 無し	No HDG/POSN Data	Status	Cursor operations when own heading or latitude/longitude is disabled • MOB input • Event mark input • Inputting/erasing/moving marks • Inputting/erasing/moving/inserting lines • Floating position setting for EBL latitude/longitude. • Floating position setting for VRM latitude/longitude. • Floating position setting for parallel cursor latitude/longitude • AIS numerical display/destination ship/retrieved vessel selection • Creating latitude/longitude alarm area. • TLL transmission for cursor.
できません	Not Allowed	Status	• Operations for inserting by selecting the end point in the line list. • Operations for switching to H-UP during TM (When heading is not available, temporarily changed to RM-HUp, therefore, message is disabled.)
設定不可なレンジです	Range Scale Limit	Status	Operations functionally restricted for certain range. • Zoom operations in range where zoom is not available. • Off center operations in range where off center is not available. • TM setting operations in range where TM setting is not available.
データがありません	No Valid Data	Status	Operations without data. • Displaying history menu without history data. • Operations for editing/erasing in the mark list while there is no mark. • Operations for editing/erasing/inserting in the line list while there is no line.

Alarm name (Japanese)	Alarm name (English)	Class	Description
スタンバイ中です	Scanner Standby	Status	The functions which are available only during transmitting are operated during standby (or preheating). • Setting Timed TX to on. Cursor operations during standby (no graphic display is available). • Custom position setting for off center. • Inputting/erasing/moving marks • Inputting/erasing/moving/inserting lines • Floating position setting for EBL. • Floating position setting for VRM. • Floating position setting for parallel cursor. • TT acquisition/release/numerical display selection. • AIS numerical display/destination ship/retrieved vessel selection • Alarm area creation
高緯度オーバー	High Latitude	Status	Operations for the position of latitude 80 degrees or more. • MOB input • Event mark input • Inputting/moving marks • Inputting/moving/inserting lines • Floating position setting for EBL latitude/longitude. • Floating position setting for VRM latitude/longitude. • Floating position setting for parallel cursor latitude/longitude. • Creating latitude/longitude alarm area.
無効なバージョンです	Invalid Version	Status	Program is loading a file with an incompatible version. • Internal Setting • Marks/lines • Own track • Option languages • STC curve • Color
Flash ROM 異常	Flash ROM Error	Alarm	Initialization error of flash ROM file system during startup.
USB 異常	USB Error	Alarm	Initialization error of USB during startup.

4.5.2 FUSE CHECKING

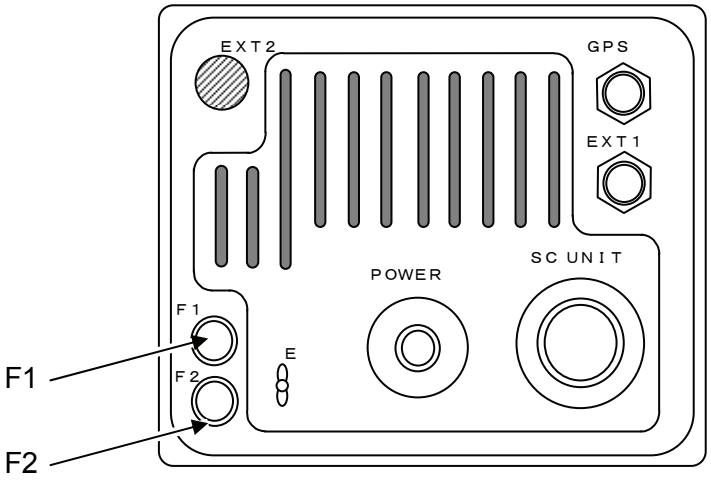
Melted fuses are caused by any clear cause. When a fuse is replaced, it is necessary to check the related circuits even if there is no trouble. In checking, note that there is some dispersion in the fusing characteristics. Table 4.5-8 shows a list of fuses used in the equipment.

Table 4.5-8 Fuse List

Location	Parts No.	Current Rating	Type	Application
Display Unit	F1	6.3A rush resistant	ULTSC6.3AN1	Display Unit (For DC12V)
Display Unit	F1	3.15A rush resistant	ULTSC3.15AN1	Display Unit (For DC24V)
Display Unit	F2	6.3A rush resistant	ULTSC10AN1	Scanner NKE-2043 (4kW, DC12V) NKE-2063 (6kW DC12V/24V)

■ Fuse Locations

Fuse locations are shown below.



4.6 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.

- Poor Contact in Terminal Board of Inter-Unit Cables
  - Poor contact in terminal board
  - The cable end is not fully connected, that it, contacted with earthed another terminal.
  - Disconnected cable wire
- Poor Contact of Connector within Unit

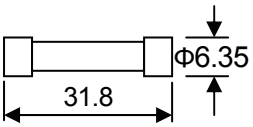
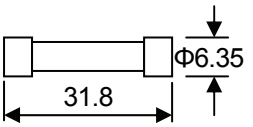
Reference:

This radar equipment is provided with standard included accessories shown in Table 4.6-1.

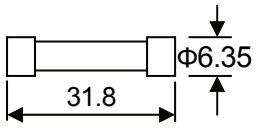
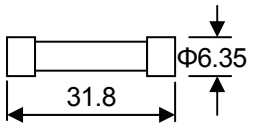
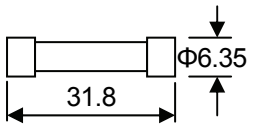
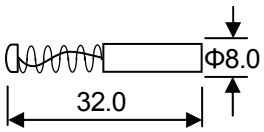
4.6.1 INCLUDED ACCESSORIES

Table 4.6-1 Included accessories

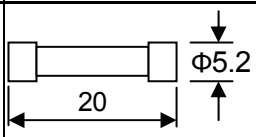
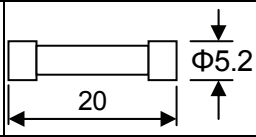
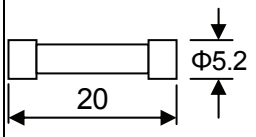
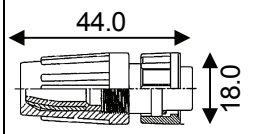
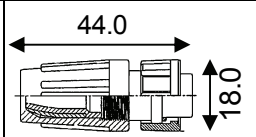
7ZXRD0012 : Scanner NKE-2043 (4kW)

Name/Type	Parts No.	Code	Shape (mm)	Quantity	Location	Application
Fuse ST4-6.3AN1	F2	5ZFCA00051		4	* Not used for this display unit	
Fuse ST4-3.15AN1	F2	5ZFCA00047		4	* Not used for this display unit	

7ZXRD0013 : Scanner NKE-2063 (6kW)

Name/Type	Parts No.	Code	Shape (mm)	Quantity	Location	Application
Fuse ST4-6.3AN1	F2	5ZFCA00051		4	* Not used for this display unit	
Fuse ST4-3.15AN1	F2	5ZFCA00047		4	* Not used for this display unit	
Fuse ST4-5AN1	F3	5ZFCA00050		4	* Not used for this display unit	
Carbon brush 54531-01	–	BRXP05247		2	Scanner	For the scanner motor

7ZXRD0031 : Display unit NCD-2237

Name/Type	Parts No.	Code	Shape (mm)	Quantity	Location	Application
Fuse ULTSC3.15AN1	F1-1	5ZFCA00033		2	processing unit	Display Unit (For DC24V)
Fuse ULTSC6.3AN1	F1-2	5ZFCA00034		3	processing unit	Display Unit (For DC12V)
Fuse ULTSC10AN1	F2	5ZFCA00035		2	processing unit	For NKE-2043/ NKE-2063
Connector LTWBD-06FFA-ll7001	P3	5JCDX00032		1	processing unit	Mainly for GPS connection
Connector LTWBD-08FFA-ll7001	P4	5JCDX00034		1	processing unit	Mainly for connecting course equipment such as a GPS compass

4.6.2 SPECIAL PARTS

Table 4.6-2 Special Parts

JMA-2353

Parts No.	Name	Type	Code	Manufacturer	Location
V101	Magnetron	MSF1421B	5VMAA00092	NJRC	Scanner
A101	Circulator	FCX68R	5AJIX00027	Orient Microwave	Scanner
A102	Diode Limiter	NJS6930	5ATBT00006	NJRC	Scanner

JMA-2354

Parts No.	Name	Type	Code	Manufacturer	Location
V101	Magnetron	MSF1422B	5VMAA00090	NJRC	Scanner
A101	Circulator	FCX68R	5AJIX00027	Orient Microwave	Scanner
A102	Diode Limiter	NJS6930	5ATBT00006	NJRC	Scanner

4.6.3 CIRCUIT BLOCK TO BE REPAIRED

Table 4.6-3 Circuit Block to be Repaired

JMA-2353

Location	Circuit Block	Type	Remarks
Scanner	Motor	7BDRD0052*	
Scanner	Compound Modulator Circuit	CME-385	
Scanner	Receiver Unit	NRG-239	Including CAE-548
Display Unit	Processing circuit	CDC-1346BS	
Display Unit	I/F circuit	CMH-2353	
Display Unit	Power supply circuit	CBD-1596	Including CRT monitor
Display Unit	Operation circuit	CCK-872	
Display Unit	Operation circuit	CCK-1041	
Display Unit	Fuse	ULTSC6.3AN1 (DC12V) ULTSC3.15AN1 (DC24V)	F1

"*" means revision, such as A, B and so on.

JMA-2354

Location	Circuit Block	Type	Remarks
Scanner	Motor	CBP-218	DC brushless motor
Scanner	Compound Modulator Circuit	CME-386	Excluding Magnetron
Scanner	Receiver Unit	NRG-239	Including CAE-548
Display Unit	Processing circuit	CDC-1346BS	
Display Unit	I/F circuit	CMH-2353	
Display Unit	Power supply circuit	CBD-1596	Including CRT monitor
Display Unit	Operation circuit	CCK-872	
Display Unit	Operation circuit	CCK-1041	
Display Unit	Fuse	ULTSC6.3AN1 (DC12V) ULTSC3.15AN1 (DC24V)	F1

Chapter 5
AFTER-SALES SERVICE

5.1 KEEPING PERIOD OF MAINTENANCE PARTS

Keeping period of maintenance parts is ten years from the production is discontinued.

5.2 WHEN YOU REQUEST FOR REPAIR

If you suppose the product may be out of order, read the description in "4.5 FAULT FINDING" and "4.6 TROUBLE SHOOTING", 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 page 5-2 "■ Radar Failure Check List".)
  ☆ Name of company/organization, address and telephone number

5.3 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

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 (17), 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 (16) while the transmission (TX) is ON.

*Functions mentioned in the items (14), (15) and (16) 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)Others (Error message, etc.)_____
_____
_____
_____
_____

Chapter 6 DISPOSAL

6.1 DISPOSAL OF THE UNIT

When disposing of this unit, be sure to follow the local laws and regulations for the place of disposal.

6.2 DISPOSAL OF USED MAGNETRON

Magnetron is used in the Scanner.

- 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.

6.3 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-2300MK2 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 (Operation Unit) ・信号处理装置 (RADAR Process Unit)	×	×	×	×	×	×
外部设备 (Peripherals) ・选择 (Options) ・电线类 (Cables) ・手册 (Documents)	×	×	×	×	×	×

○：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.)

×：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.)

Chapter 7 SPECIFICATIONS

7.1 GENERAL SPECIFICATIONS

(1) Class of Emission	P0N
(2) Display	Raster Scan, PPI
(3) Screen	10.4-inch Monochrome LCD, VGA (640 × 480 dots)
(4) Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 72 NM (6 kw for 72 NM) User can add 1, 2, 4, 8, 16 or 32NM. * Off Center is not available at maximum range.
(5) Range Resolution	Less than 30m
(6) Minimum Detective Range	Less than 40m
(7) Range Accuracy	Less than 1% of the maximum distance of the range scale in use or less than 15m whichever is larger
(8) Bearing Accuracy	Less than 1°
(9) Bearing Indication	Head-up, North-up, Course-up
(10) Ambient Condition	
Standards	IEC60945 Ed.4.0
Temperature	
Scanner	Operation: -25 to +55°C / Storage: -25 to +70°C
Other Unit except Scanner	Operation: -15 to +55°C
Relative Humidity	
Entire Unit	+40°C, 93%
Vibration	
Entire Unit	2 to 13.2 Hz, amplitude±1mm 13.2 to 100 Hz 0.7 G
Velocity of the wind	51.5m/s (100kn)
(11) Power Supply Input	DC+24V (Cable length of 30m or less) DC+12V (Cable length of 20m or less)
(12) Power Consumption	In calm wind: Approx. 60W (4kW) Approx. 85W (6kW) Maximum (Velocity of the wind: 100kn): Approx. 60W (4kW) Approx. 180W (6kW)
(13) Pre-heating Time	Approx. Within 1min30sec

7.2 SCANNER

7.2.1 NKE-2043

(1) Dimensions Height 275mm × Diameter of radome 620mm

(2) Mass Approx. 10kg

(3) Polarization Horizontal Polarization

(4) Directional Characteristic

Horizontal Beam Width (-3dB):
4°

Vertical Beam Width (-3dB):
25°

Sidelobe Level: -21dB or less (less than ±10° from the main lobe)

(5) Rotation Approx. 27rpm
(16/20/24/27/30/36/42/48rpm can be set)

(6) Peak Power 4 kW

(7) Transmitting Frequency 9410 ±30MHz

(8) Transmitting Tube Magnetron [MSF1421B]

(9) Pulse width/Repetition Frequency (Bandwidth)

SP1: 0.08μs/4000Hz, SP2: 0.08μs/2250Hz, SP3: 0.13μs/1700Hz

MP1: 0.25μs/1700Hz, MP2: 0.5μs/1200Hz

LP1: 0.8μs/750Hz, LP2: 1.0μs/650Hz

0.125NM	0.08μs/4000Hz (SP1)		
0.25NM	0.08μs/4000Hz (SP1)		
0.5NM	0.08μs/4000Hz (SP1)	0.25μs/1700Hz (MP1)	
0.75NM	0.08μs/2250Hz (SP2)	0.25μs/1700Hz (MP1)	
1.5NM	0.08μs/2250Hz (SP2)	0.25μs/1700Hz (MP1)	0.5μs/1200Hz (MP2)
3NM	0.13μs/1700Hz (SP3)	0.25μs/1700Hz (MP1)	0.5μs/1200Hz (MP2)
6NM	0.5μs/1200Hz (MP2)	0.8μs/750Hz (LP1)	1.0μs/650Hz (LP2)
12NM	0.5μs/1200Hz (MP2)	0.8μs/750Hz (LP1)	1.0μs/650Hz (LP2)
24NM	1.0μs/650Hz (LP2)		
48NM	1.0μs/650Hz (LP2)		
72NM	1.0μs/650Hz (LP2)		

(10) Duplexer Circulator + Diode Limiter

(11) Front End Module MIC

(12) Intermediate Frequency Amplifier

Intermediate Frequency:	60MHz
Band Width:	20MHz (0.08μs, 0.13μs)
	6MHz (0.25μs)
	3MHz (0.5μs, 0.8μs, 1.0μs)
Gain:	More than 90dB
Amplifying Characteristics:	Logarithmic Amplifier

(13) Overall Noise Figure 6dB (Average)

7.2.2 NKE-2063

(1) Dimensions Height 419.5mm × Swing Circle 1220mm

(2) Mass Approx. 21kg

(3) Polarization Horizontal Polarization

(4) Directional Characteristic

Horizontal Beam Width (-3dB):
2°

Vertical Beam Width (-3dB):
30°

Sidelobe Level: -23dB or less (less than ±10° from the main lobe)
-26dB or less (±10° or more from the main lobe)

(5) Rotation Approx. 27rpm

(6) Peak Power 6 kW

(7) Transmitting Frequency 9410 ±30MHz

(8) Transmitting Tube Magnetron [MSF1422B]

(9) Pulse width/Repetition Frequency (Bandwidth)

SP1: 0.08μs/4000Hz, SP2: 0.08μs/2250Hz, SP3: 0.13μs/1700Hz

MP1: 0.25μs/1700 Hz, MP2: 0.5μs/1200 Hz

LP1: 0.8μs/750Hz, LP2: 1.0μs/650Hz

0.125NM	0.08μs/4000Hz (SP1)		
0.25NM	0.08μs/4000Hz (SP1)		
0.5NM	0.08μs/4000Hz (SP1)	0.25μs/1700Hz (MP1)	
0.75NM	0.08μs/2250Hz (SP2)	0.25μs/1700Hz (MP1)	
1.5NM	0.08μs/2250Hz (SP2)	0.25μs/1700Hz (MP1)	0.5μs/1200Hz (MP2)
3NM	0.13μs/1700Hz (SP3)	0.25μs/1700Hz (MP1)	0.5μs/1200Hz (MP2)
6NM	0.5μs/1200Hz (MP2)	0.8μs/750Hz (LP1)	1.0μs/650Hz (LP2)
12NM	0.5μs/1200Hz (MP2)	0.8μs/750Hz (LP1)	1.0μs/650Hz (LP2)
24NM	1.0μs/650Hz (LP2)		
48NM	1.0μs/650Hz (LP2)		
72NM	1.0μs/650Hz (LP2)		

(10) Duplexer Circulator + Diode Limiter

(11) Front End Module MIC

(12) Intermediate Frequency Amplifier

Intermediate Frequency: 60MHz

Band Width: 20MHz (0.08μs, 0.13μs)
6MHz (0.25μs)
3MHz (0.5μs, 0.8μs, 1.0μs)

Gain: More than 90dB

Amplifying Characteristics: Logarithmic Amplifier

(13) Overall Noise Figure 6dB (Average)

(14) Tune AUTO/MANUAL

7.3 DISPLAY UNIT

7.3.1 INTEGRATED DISPLAY UNIT (NCD-2237)

(1) Structure	Desk Top Integrated Type (LCD Monitor Unit/Keyboard Unit/Processor Unit Integrated Structure) Vertical installation only desk top integrated type
(2) Dimensions	Height 242mm × Width 278mm × Depth 275mm
(3) Mass	Approx. 8kg
(4) Tune Method	MANUAL/AUTO (Bar-graph indication)
(5) STC (SEA)	MANUAL/AUTO
(6) FTC (RAIN)	MANUAL/AUTO
(7) Radar Interference Rejection	Built-in (The effect can be adjusted by three stages.)
(8) Bearing Marker	360° in 5° digit
(9) Heading Line	Electronic
(10) Off Center	Within 66% of the radius of PPI Transition of the radar trails is possible during Off Center mode.
(11) True Motion Unit	Built-in
(12) True Motion Reset Position	66% of radius of any range
(13) Radar trail indication	
True motion mode:	Only true motion trails
Relative motion mode:	True motion trails or relative motion trails can be selected.
Trail time length:	15sec/30sec/1min/2min/3min/6min/10min/15min/ Continuous Arbitrary trail time length can be displayed at any time. When changing the motion mode, the trails can be succeeded.
(14) Variety of Pulse width	Short/Middle/Long (depending on range)
(15) Target enhance	Range and bearing
(16) Plotting	Line: Line type can be selected. Mark: Mark type can be selected. 200 marks or lines can be used.
(17) Display color	
Radar echo	Monochromatic
Radar trails	Monochromatic, 16 stages
Time trails	
Continuous trails	

(18) Multiple languages	English, Japanese, Chinese, Korean, Spanish, Portuguese, French, Norwegian
(19) LL / TD conversion	Built-in
(20) Navigation information during STBY	Built-in
(21) Land mile display	Range, scale, VRM
(22) Barge display	Displays the own ship and a barge.
(23) AIS information display	(MMSI, ship name) List display, Retrieved Vessel, WPT setting

7.3.2 OPERATION PANEL

(1) Structure	Integrated on the display unit
(2) Controls	GAIN
	SEA
	RAIN
	MULTI
(3) Keys	
Cursor keys	
STBY	Stops transmission (Turns off the equipment if simultaneously pressed with "TX/PRF")
TX/PRF	Starts transmission (Turns off the equipment if simultaneously pressed with "STBY") Changes PRF during transmission.
RANGE+	Increases the distance range.
RANGE-	Decreases the distance range.
USER	Registers in the user menu
BRILL	Adjusts CRT brightness
ENT	Enter key (Selects menu items, etc)
CLEAR	Cancels operations
MENU	Opens/closes the menu screen

7.3.3 AIS FUNCTION

(1) Screen	
Number of targets	Up to 50 targets (stores up to 500 ship static data)
Target information	Select MMSI, call sign, ship name, COG, SOG, CPA, TCPA, direction, distance, latitude, longitude and/or status, etc. as you need to display.
Filters	Distance only
Active targets	Not available
Dangerous ship targets	No CPA/TCPA decision
(2) Operation	Built-in (Options not required)

7.3.4 TT FUNCTION

(1) Acquisition	MANUAL/AUTO (by automatic acquisition zone)
(2) Tracking	10 targets (Automatic tracking)
(3) Display	
Tracking data	1 ship (AIS or TT)
Maximum tracking range	20 NM This varies depending on the range.
Target information	Displays items selected from true bearing, distance, true course, true speed, CPA, TCPA.
Display of Vectors	True/Relative

7.4 INPUT/OUTPUT SIGNAL

7.4.1 INPUT ENABLE SIGNAL

(1) Navigation equipment	IEC61162-1/2
	Longitude/Latitude: GGA>RMC>GNS>GLL
	COG/SOG: RMC>VTG
	Log speed: VBW>VHW, NSK data
	Bearing: THS>HDT>HDG>HDM
	Depth: DPT>DBT
	Water temperature: MTW
	Rate of Turn: ROT
	Rudder: RSA
	AIS: VDM, VDO, ALR
	Direction of wind, velocity of wind: MWV>VWT, VWR
(2) Bearing signal	IEC61162 4800bps/38400bps:
	THS>HDT>HDG>HDM
	JRC-NSK format (JLR-20/30)
(3) Speed signal	IEC61162 4800bps: VBW, VHW

7.4.2 OUTPUT ENABLE SIGNAL

(1) Navigation information	IEC61162-1/2	
	Radar data:	RSD
	Own ship's data:	OSD
	TT data:	TTM, TLL, TTD
	latitude/longitude data:	GGA, RMC, GNS, GLL
	COG/SOG:	RMC, VTG
	Bearing signal:	THS, HDT
(2) External buzzer	Option	
(3) External monitor	Option	

7.5 STANDARD CONFIGURATION

Scanner:	1 unit
Display Unit:	1 unit
Standard included accessories:	1 set
Instruction manual:	1 book
Installation manual:	1 book
Quick instruction:	1 book

APPENDIX

Fig. A1 NKE-2043 SCANNER INTERCONNECTION DIAGRAM

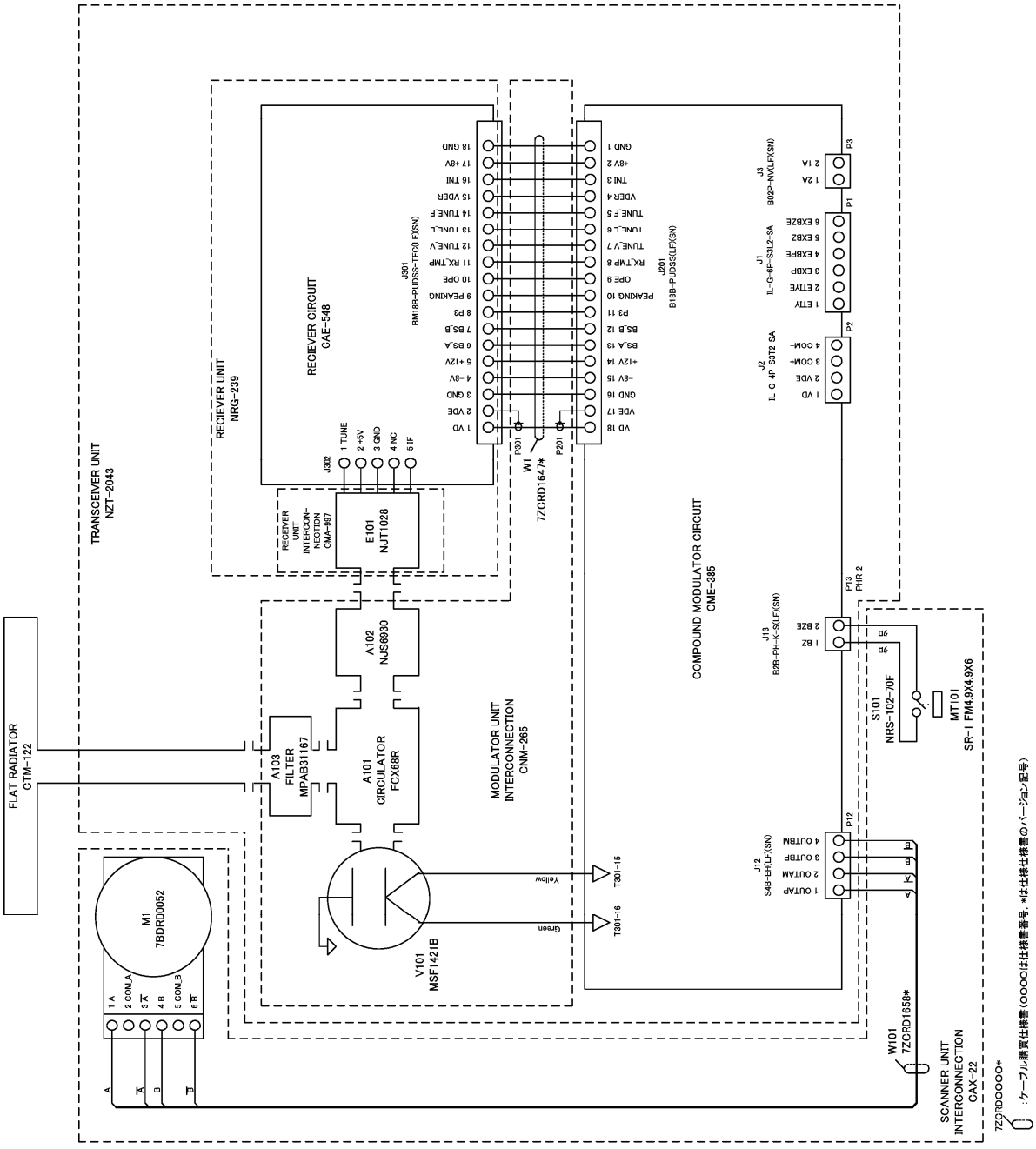


Fig. A2 NKE-2063 SCANNER INTERCONNECTION DIAGRAM

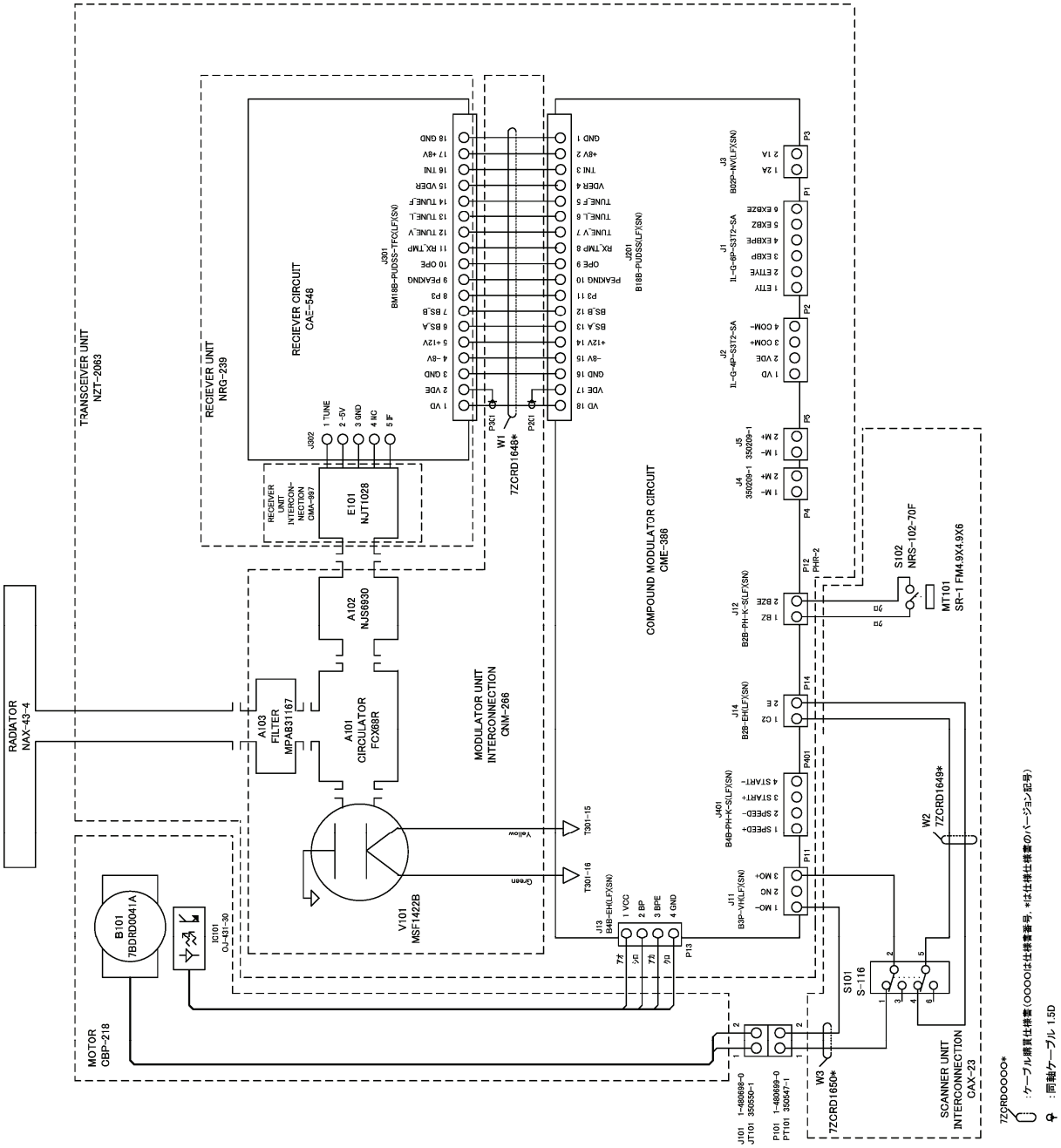


Fig. A3 NCD-2237 DISPLAY UNIT INTERCONNECTION DIAGRAM

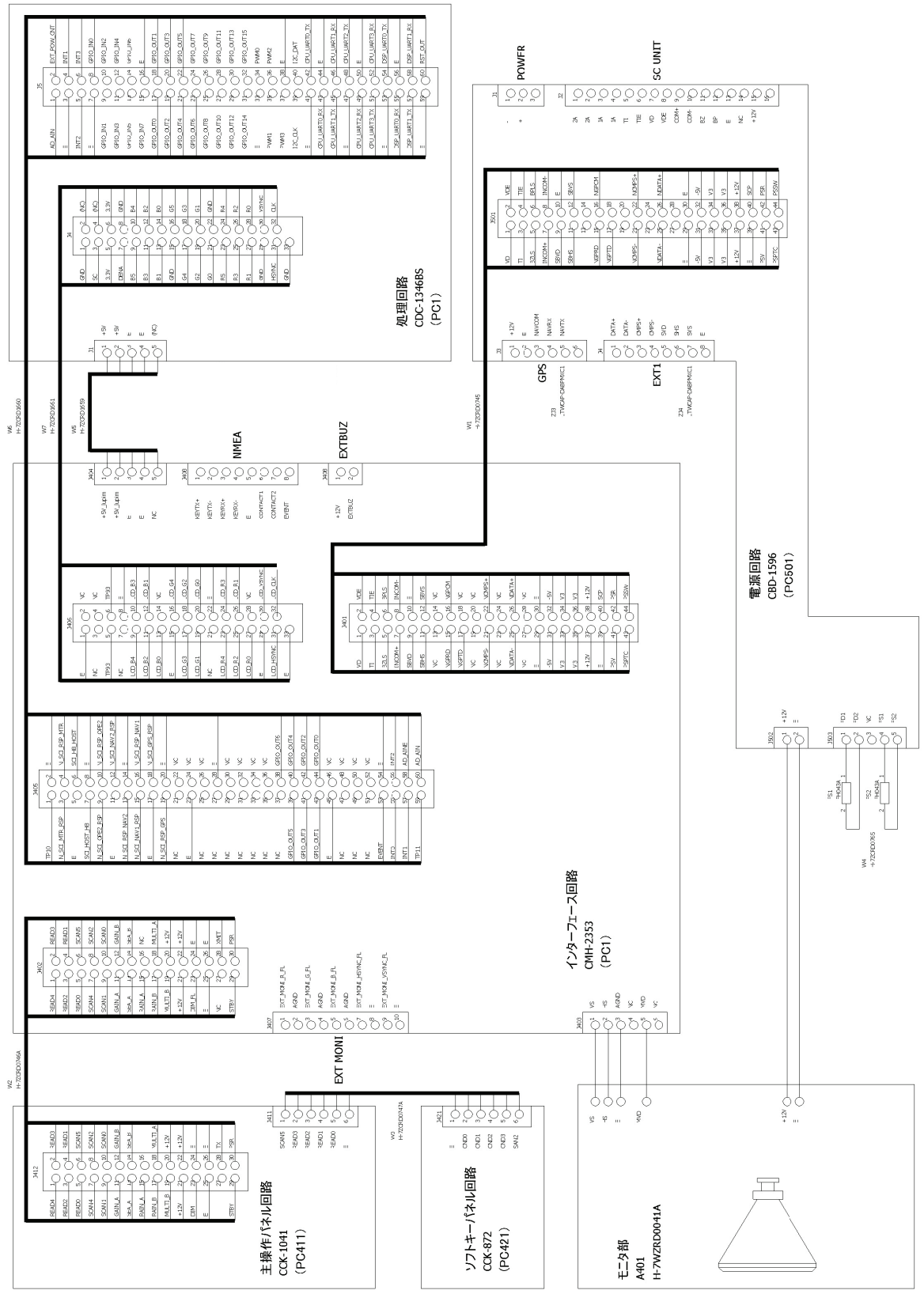


Fig. A4 PRIMARY POWER SUPPLY DIAGRAM, TYPE JMA-2300MK2

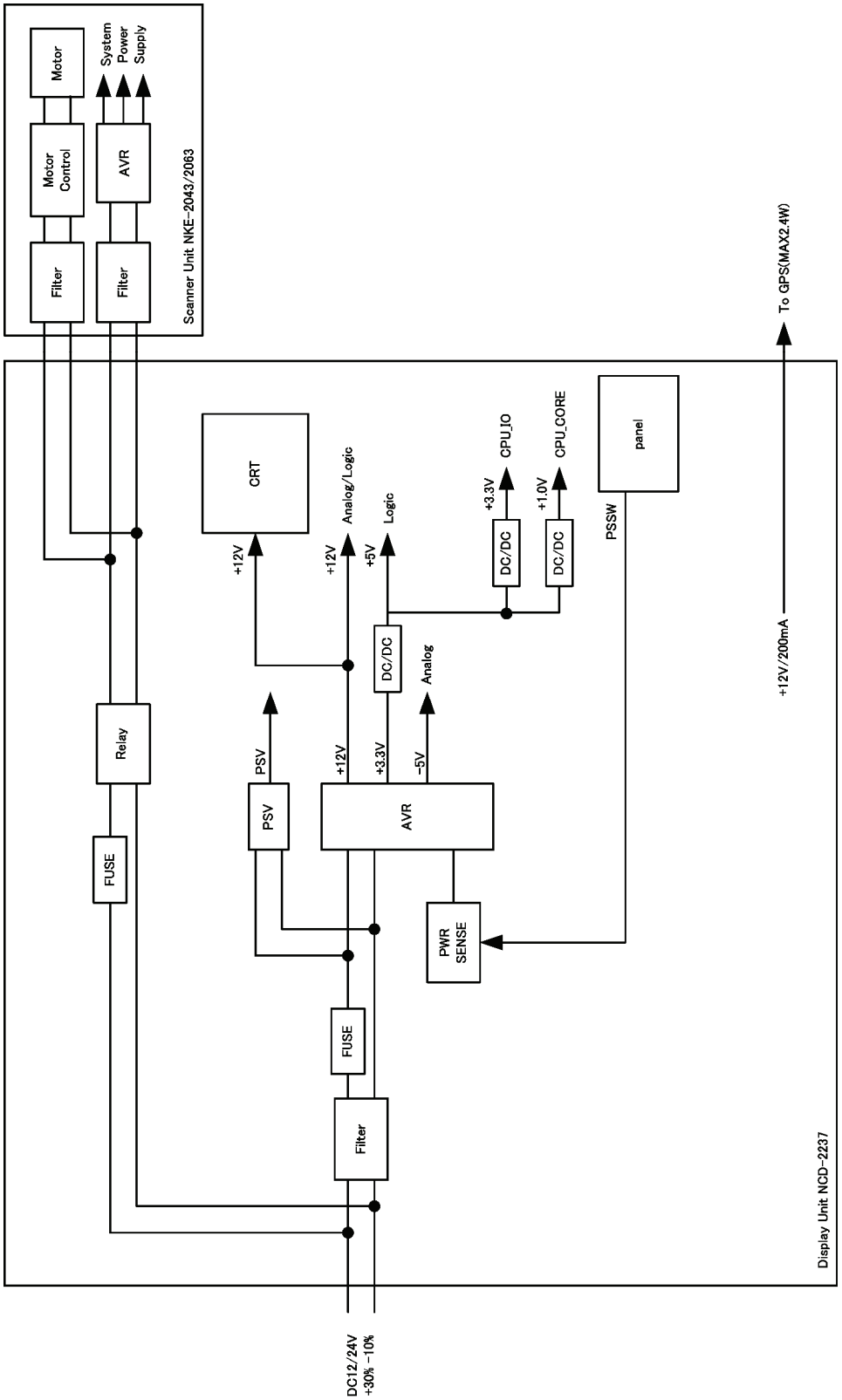


Fig. A5 JMA-2353 INTERCONNECTION DIAGRAM

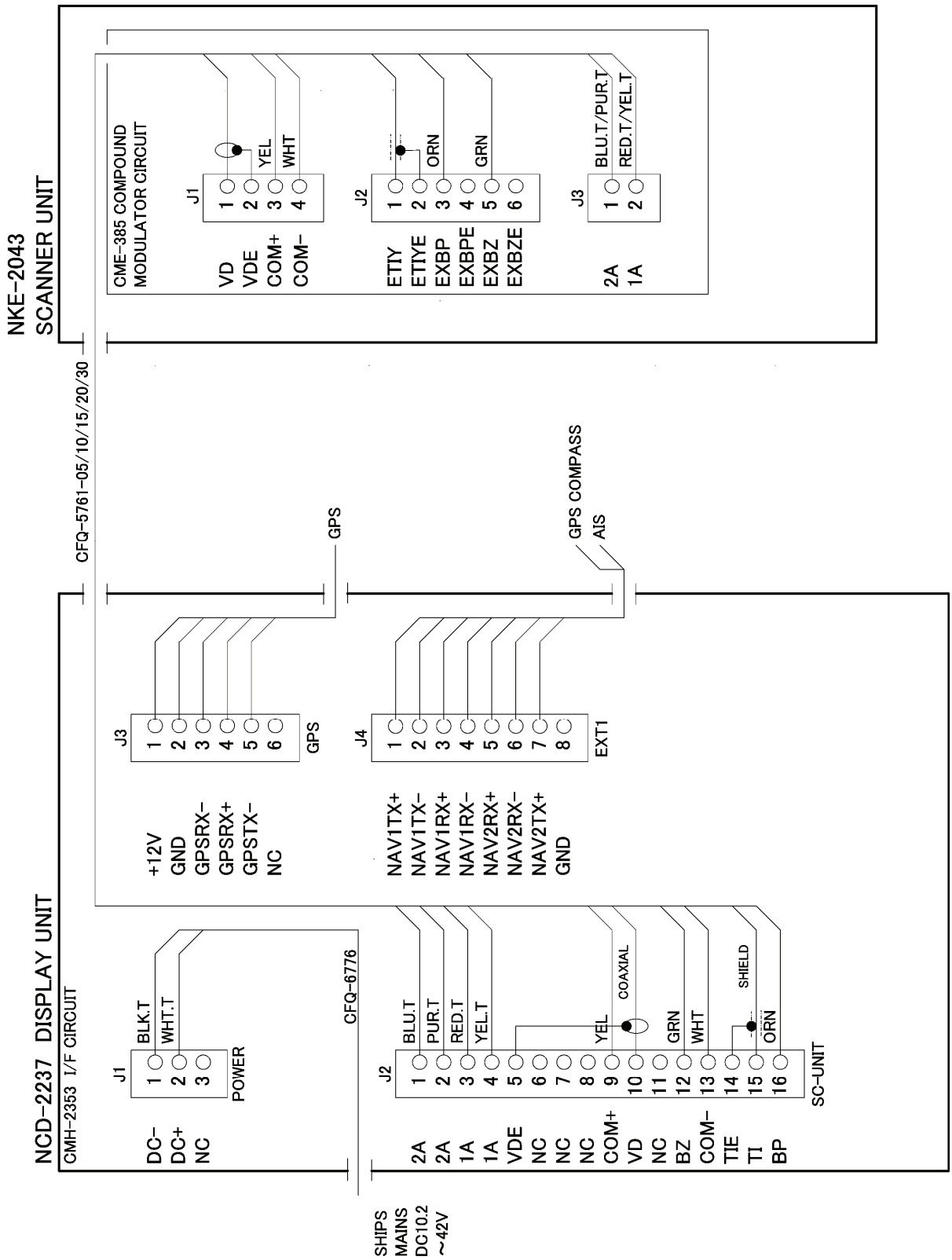
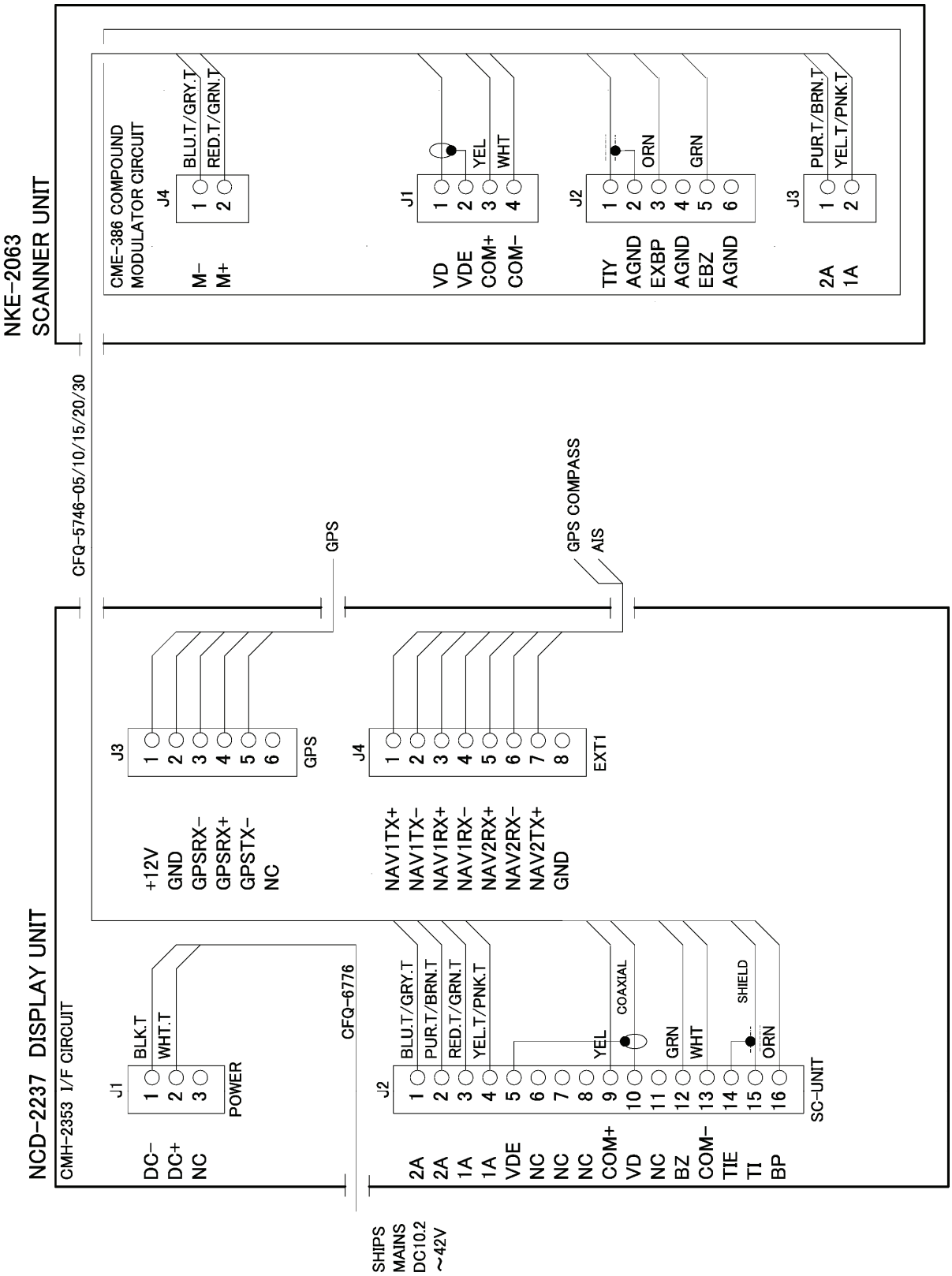


Fig. A6 JMA-2354 INTERCONNECTION DIAGRAM



■ Menu function list

1)Main Menu

History				
RADAR Echo				
	IR			Off / Low / Middle / High
	Target Enhance			Off / Level1 / Level2 / Level3
	Process			Off / 3Scan COREL / 4Scan COREL / 5Scan COREL / Remain / Peak Hold
	Zoom			Off / On
	Video Latitude			Narrow/ Normal / Wide1 / Wide2
	Video Noise Rejection			Off / Level1 / Level2 / Level3
Marker				
	EBL1 Setting			
		Floating		Off / Screen Fix / L/L Fix
	EBL2 Setting			
		Floating		Off / Screen Fix / L/L Fix
	Cursor			
		Cursor Size		Large / Small
		Cursor Pattern		┼/╪/╋/╬
		Distance Unit		NM / km / sm
	Range Ring			Off / On
Brilliance				
	Day1			
		SoftKey		Off / On
		Keyboard Unit Brilliance		Off / Level1 / Level2 / Level3 / Level4
		Brilliance		Level1 / Level2 / Level3 / Level4 / Level5 / Level6 / Level7 / Level8
	Day2			
	Day3			
	Dusk			
	Night			
Control				
	Bearing True/Relative			True / Relative
	User Key			
		User Key1		Off / VRM1 Unit / VRM2 Unit / Alarm / Display / EBL1 Setting / EBL2 Setting / VRM1 / VRM2
	Buzzer			
		Key ACK		0～255
		Operation Error		0～255
		CPA/TCPA		0～255
		AZ/Alarm Zone		0～255
		Target Lost		0～255
		System Alarm		0～255
	Output Buzzer			
		CPA/TCPA		Off / On
		AZ/Alarm Zone		Off / On
		Target Lost		Off / On
		System Alarm		Off / On
		Out of Range		Off / On
Target				
	TT Target All Clear			
	CPA Limit			0.1～9.9NM
	TCPA Limit			1～99min
	CPA Ring			Off / On
	Target Number Display			
		TT		Off / On
		AIS		Off / On
	AIS Destination Ship			000000000～999999999
	AIS Retrieved Vessel			
		MMSI Number Setting		
			Retrieved Vessel info #1	000000000～999999999
			Retrieved Vessel info #2	000000000～999999999
			Retrieved Vessel info #3	000000000～999999999
			Retrieved Vessel info #4	000000000～999999999
			Retrieved Vessel info #5	000000000～999999999
			Retrieved Vessel info #6	000000000～999999999
			Retrieved Vessel info #7	000000000～999999999
			Retrieved Vessel info #8	000000000～999999999
			Retrieved Vessel info #9	000000000～999999999
			Retrieved Vessel info #10	000000000～999999999
	AIS Filter			0.0～96.0NM
RADAR Alarm				
	RADAR Alarm1 Level			Level1 / Level2 / Level3 / Level4
	RADAR Alarm2 Level			Level1 / Level2 / Level3 / Level4

Plot					
	Waypoint Display				Off / On
	Own Track				
		Clear Own Track			
			Clear Own Track Type		All / ——— / - - - - / — — — —
			Clear Own Track		[Yes] [No]
Timed TX					
	Timed TX				Off / On
	TX Time				1～99Scan
	Standby Time				1～99min
Test					
	System Information				1.Indicator/ 2.Panel1 / 3.Panel2 / 4.Antenna / 5.NSK / 6.Boot / 7.Test Bench
					1.Update / 2.DSP
	System Time				1.Indicator Running Time / 2.Scanner Transmit Time / 3.Scanner Motor Time / 4.Scanner Running Time
	Scanner Information				1.Scanner Transmit Power / 2.Motor Type / 3.Magnetron Current
	Hardware Infomation				1.Serial Number
	Error Log				
		Display			[No.] [Date] [Time] [COND] [Alarm]
		Erase			
	Line Monitor				[Receive Data] [Send Data]
	Self Test				
		Key Test			
		Buzzer Test			
		Key Light Test			
		Monitor Display Test			
			Pattern1		
			Pattern2		
			Pattern3		
			Pattern4		
			Pattern5		
			Pattern6		
			Pattern7		
			Pattern8		
				Red	0～31
				Green	0～31
				Blue	0～31
				Display	
		Memory Test			
		Line Test			
		Sensor Test			

2)Adjust Menu

Basic Adjustment					
	Bearing Adjustment				0～359.9°
	Range Adjustment				0～999
	Tune Adjustment				0～127
	Antenna Height				～5m / 5～10m / 10～20m / 20m～
	Language				English / Japanese / Chinese (traditional) / Chinese (Simplified) / Vietnamese / Indonesian / Korean / Russian / Custom
RADAR Echo					
	Noise Level				0～255
	Main Bang Suppression				
		Main Bang Suppression Level			0～255
		Main Bang Suppression Area			0～255
	Target Enhance Level				Level1 / Level2 / Level3 / Level4
	Gain				
		Preset			0～255
	Sea				
		STC Curve Select			Sea / River
		STC Slope Correction			0.0～2.0
		STC Offset			0～FF
	Rain				
		FTC Curve Select			Sea / River
		FTC Slope Correction			0.0～2.0
		FTC Offset			0～FF
Trails					
	Trails Suppression Distance				0～1000m
TT					
	Vector Constant				1～8
	Gate Display				Off / On
	Gate Size				0～64
Scanner					
	Slope Correction				0.0～2.0
	PRF Fine Tuning				0～31
	Stagger Trigger				Off / On
	Scanner Rotation Speed				
		SP1			0～7
		SP2			0～7
		SP3			0～7
		MP1			0～7
		MP2			0～7
		LP1			0～7

		LP2		0～7
		LP3		0～7
	PRF			Normal / Economy / High Power
	Safety Switch			TX-Off / Standby / TX-On / Ignore Error
	Tune Peak Adjustment			0～127
	Tune Indicator			0～127
I/F Device				
	Set GYRO			0～359.9°
	Heading Equipment			AUTO / GYRO / Compass / GPS / Manual
	Manual Heading			0～359.9°
	Speed Equipment			GPS / Log / 2Log / Manual
	Manual Speed			0～100.0kn
	MAG Compass Setting			
		Heading Correction		Off / On
		Correct Value		E/W 0～9.9°
COM Port Setting				
	Baud Rate			
		GYRO/Compass		AUTO / 4800bps / 38400bps
		GPS		AUTO / 4800bps / 38400bps
		NMEA1		AUTO / 4800bps / 38400bps
		NMEA2		AUTO / 4800bps / 38400bps
	RX Sentence			
		GPS(LL)		
			GGA	Off / On
			RMC	Off / On
			RMA	Off / On
			GNS	Off / On
			GLL	Off / On
		GPS(COG/SOG)		
			RMC	Off / On
			RMA	Off / On
			VTG	Off / On
		Heading		
			THS	Off / On
			HDT	Off / On
			HDG	Off / On
			HDM	Off / On
			VHW	Off / On
		Depth		
			DPT	Off / On
			DBS	Off / On
			DBT	Off / On
			DBK	Off / On
		Wind		
			MWV	Off / On
			VWT	Off / On
			VWR	Off / On
		WPT		
			RMB	Off / On
			BWC	Off / On
			BWR	Off / On
	RX Port			
		GPS		AUTO / GYRO/Compass / GPS / NMEA1 / NMEA2
		Log		AUTO / GYRO/Compass / GPS / NMEA1 / NMEA2
		2Log		AUTO / GYRO/Compass / GPS / NMEA1 / NMEA2
		Depth		AUTO / GYRO/Compass / GPS / NMEA1 / NMEA2
		Temperature		AUTO / GYRO/Compass / GPS / NMEA1 / NMEA2
		Wind		AUTO / GYRO/Compass / GPS / NMEA1 / NMEA2
		WPT		AUTO / GYRO/Compass / GPS / NMEA1 / NMEA2
		Rate of Turn		AUTO / GYRO/Compass / GPS / NMEA1 / NMEA2
		Rudder		AUTO / GYRO/Compass / GPS / NMEA1 / NMEA2
	TX Port			
		TTM		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		TLL		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		TTD		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		TLB		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		GGA		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		GLL		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		RMC		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		GNS		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		VTG		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		OSD		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		RSD		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		THS		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
		HDT		Off / GYRO/Compass / GPS / NMEA1 / NMEA2
	TX Data Format			
		TX Interval		1～9sec
		NMEA Version		V2.3 / V2.0 / V1.5
		NMEA Talker		Normal / GP
	Target Information TX			
		TX Target		TT / AIS / TT･AIS / Off
		TTM Distance Accuracy		1 / 2 / 3
		TT Average Mode		Off / On
		TT Average Scan		2～10

GPS				
	GPS Setting			
		NMEA Version		AUTO / V1.5 / V2.1 / V2.3
		Correction Method		GPS Single / SBAS / Beacon / AUTO
		Fix Mode		2D / 3D / AUTO
		Elevate Mask		5～89°
		HDOP		4 / 10 / 20
		Latitude and Longitude		0～99sec (R40.00～)
		SOG		0～99sec(R40.00～)
		COG		0～99sec (R40.00～)
		Smoothing		0～99sec(R29.04～R39.99) 1～99sec(R26.01～R29.03)
		Smoothing		0sec / 10sec / 40sec (～R26.00)
		RAIM Accuracy Level		Off / 10m / 30m / 50m / 100m
		Exclusion Satellite		
			Exclusion Satellite1	0～32
			Exclusion Satellite2	0～32
			Exclusion Satellite3	0～32
			Exclusion Satellite4	0～32
			Exclusion Satellite5	0～32
			Exclusion Satellite6	0～32
		Send Data		
		GPS Adjust		
			Position	Lon./Lat.
			Antenna Heigth	0～8191m
			Time	00:00:00～23:59:59
			Date	2010/01/01～2099/12/31
			Master Reset	
			Send Data	
	Beacon Setting			
		Select		AUTO / Manual
		Frequency		283.5-325.0kHz
		Baud Rate		50 / 100 / 200 bps
		Send Data		
	SBAS Setting			
		Satellite Search		AUTO / Manual
		Ranging		Off / On
		SBAS Satellite Number		120～138
		Send Data		
	Display GPS Receive Status			[Frequency] [Baudrate] [WER] [Antenna Height] [Mode] [SNR] [RSSI] [HDOP] [Geodetic Datum] [ROM Version]
	LORAN Setting			
		Display Time Zone		Off / LORAN A / LORAN C
		LORAN A		
			Select 1	1S1 1S2 1S3 1S4 1S6 1L0 1L1 1L4 1L5 2S0 2S1 2S2 2S3 2S4 2S5 2S6 2S7 2H4 2H5 2H6
			Select 2	(Same as Select 1)
			TD1 Correction	0.0～9.9μsec
			TD2 Correction	0.0～9.9μsec
		LORAN C		
			Chain	4990, 5930, 5970, 5980, 5990, 6730, 6731, 6780, 7001, 7030, 7170, 7270, 7430, 7499, 7930, 7950, 7960, 7970, 7980, 7990, 8000, 8290, 8390, 8830, 8930, 8970, 8990, 9007, 9610, 9930, 9940, 9960, 9970, 9980, 9990
			TD1	0～99
			TD2	0～99
			TD1 Correction	0.0～9.9μsec
			TD2 Correction	0.0～9.9μsec
Control				
	Soft Key Menu Setting			
		EBL1		Off / On
		EBL2		Off / On
		VRM1		Off / On
		VRM2		Off / On
		Vector Length		Off / On
		Trails		Off / On
		AIS		Off / On
		TT		Off / On
		Alarm1		Off / On
		Alarm2		Off / On
		Display Screen		Off / On
		TM/RM		Off / On
		Bearing Mode		Off / On
		Pulse Length		Off / On
		Off Center		Off / On
		Symbol Display		Off / On
		MOB		Off / On
		Mark		Off / On
		Line		Off / On
		Own Track		Off / On
		Event Mark		Off / On
		AIS Filter		Off / On
		TLL TX		Off / On
	Soft Key Time Out			0～255sec
	Cross Key Gain			1～5

	Multi Control			
		EBL		1～5
		VRM		1～5
		Common		1～5
	Gain Control			
		Response Level		1～5
		Gain MIN Preset		0～127
		Gain MAX Preset		128～255
	Sea Control			
		Response Level		1～5
		Sea MIN Preset		0～127
		Sea MAX Preset		128～255
	Rain Control			
		Response Level		1～5
		Rain MIN Preset		0～127
		Rain MAX Preset		128～255
Maintenace				
	Partial Reset			
		RADAR Echo		[Yes] [No]
		Basic Adjustment		[Yes] [No]
		Main Menu		[Yes] [No]
		Adjust Menu		[Yes] [No]
		System Information 1		[Yes] [No]
		System Information 2		[Yes] [No]
		All Menu		[Yes] [No]
	All Reset			[Yes] [No]
	System Time Clear			
	Scanner Time Clear			
		TX Time Clear		[Yes] [No]
		Motor Time Clear		[Yes] [No]
		Scanner to Display Unit		[Yes] [No]
		Display Unit to Scanner		[Yes] [No]
	Table Update			
		STC Curve		[Yes] [No]
		Initial Value		
			RADAR Echo	[Yes] [No]
			Basic Adjustment	[Yes] [No]
			Main Menu	[Yes] [No]
			Adjust Menu	[Yes] [No]
			System Information 1	[Yes] [No]
			System Information 2	[Yes] [No]
			All Menu	[Yes] [No]
		Insert Language		[Yes] [No]
		Echo Simulation		[Yes] [No]
	Internal Setting			
		Internal Memory to USB		
			RADAR Echo	[Yes] [No]
			Basic Adjustment	[Yes] [No]
			Main Menu	[Yes] [No]
			Adjust Menu	[Yes] [No]
			System Information 1	[Yes] [No]
			System Information 2	[Yes] [No]
			All Menu	[Yes] [No]
		USB to Internal Memory		
			RADAR Echo	[Yes] [No]
			Basic Adjustment	[Yes] [No]
			Main Menu	[Yes] [No]
			Adjust Menu	[Yes] [No]
			System Information 1	[Yes] [No]
			System Information 2	[Yes] [No]
			All Menu	[Yes] [No]
	USB Format			
System Setting				
	Master/Slave/Demo			Master / Slave / Demo
	Unit			
		Range		NM / km / sm
		Distance		NM / km / sm
		Speed		kn / km/h / mph
		Depth		ft / fm / m / user
		User Depth		0.0001～9.9999 m
		Temperature		℃ / ゜F
		Wind		m/s / km/h / kn
		Size/Location Setting		m / ft
	Move Own Ship			
		Ship's Move		LL / COG / SOG
	Range			
		NM		
			0.0625NM	Off / On
			0.125NM	Off / On
			0.25NM	Off / On
			1NM	Off / On
			2NM	Off / On
			4NM	Off / On
			8NM	Off / On
			16NM	Off / On
			24NM	Off / On
			32NM	Off / On
			48NM	Off / On

			64NM	Off / On
			72NM	Off / On
			96NM	Off / On
		km		
			0.15km	Off / On
			0.3km	Off / On
			0.5km	Off / On
			1.2km	Off / On
			2km	Off / On
			8km	Off / On
		sm		
			0.0625sm	Off / On
			0.125sm	Off / On
			0.25sm	Off / On
			1sm	Off / On
			2sm	Off / On
			4sm	Off / On
			8sm	Off / On
			16sm	Off / On
			24sm	Off / On
			32sm	Off / On
			48sm	Off / On
			64sm	Off / On
			72sm	Off / On
			96sm	Off / On
Display Screen				
	Own Vector Width			0～5
	Own Outline			
		On/Off		Off / On
		Input Outline Size		
			All Length	0.0～600.0m
			All Width	0.0～200.0m
			GPS Antenna(Length)	0.0～600.0m
			GPS Antenna(Side)	-100.0～+100.0m
			Scanner(Length)	0.0～600.0m
			Scanner(Side)	-100.0～+100.0m
	Barge Outline			
		On/Off		Off / On
		Input Outline Size		
			All Length	0.0～600.0m
			All Width	0.0～200.0m
			Barge Position(Length)	-600.0～+600.0m
			Barge Position(Side)	-200.0～+200.0m
	Standby Numeric Display			Off / On
	Operation Numeric Display			Off / On
	Location Change			
		Screeen1		
			Numeric Information(Large)	Off / AXG Course/Speed / Latitude/Longitude
			Numeric Display(0)	Off Own Heading/Speed Own AXG Course/Speed Own Latitude/Longitude ROT/Rudder Depth/Temperature Relative Wind True Wind(Head) Waypoint Bearing/Distance Waypoint Latitude/Longitude Waypoint Arrival Time Cursor Bearing/Distance Cursor Latitude/Longitude Cursor Arrival Time MOB Bearing/Distance MOB Latitude/Longitude MOB Arrival Time EBL1/VRM1 EBL2/VRM2 TT Bearing/Distance TT CRS/SPD TT CPA/TCPA AIS Bearing/Distance AIS COG/SOG AIS CPA/TCPA Rate of Turn Rudder Depth Temperature Gain/Sea/Rain
			Numeric Display(1)	Same options as Numeric Display(0)
			Numeric Display(2)	Same options as Numeric Display(0)
			Numeric Display(3)	Same options as Numeric Display(0)
			Wide Screen	Standard / Wide
		Screen2		
			Numeric Information(Large)	Off / AXG Course/Speed / Latitude/Longitude
			Numeric Display(0)	* Same options as Screen 1
			Numeric Display(1)	Same options as Numeric Display(0)
			Numeric Display(2)	Same options as Numeric Display(0)
			Numeric Display(3)	Same options as Numeric Display(0)
			Wide Screen	Off / Wide

Error Alarm Mask				
	Scanner			
		Scanner(Time Out)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Scanner(Data)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Scanner(AZI)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Scanner(HL)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Scanner(MHV)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Scanner(Heater)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Scanner(Video)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Scanner(Trigger)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Scanner(Motor)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
	Display Unit			
		Display Unit(Video)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Display Unit(Trigger)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Display Unit(AZI)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Display Unit(HL)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Display Unit(DSP)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		COM Port		
			Alarm Sensitivity	Off / On
	Connection Device			
		Panel1(Time Out)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		GYRO(Time Out)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Log(Time Out)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		GPS(Time Out)		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
	RX Data			
		GYRO		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Compass		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Log		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		2Log		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Course/Speed		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Depth		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Temperature		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Wind		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec
		Rate of Turn		
			Alarm Sensitivity	Off / On
			Sensitivity Time	0～999sec

Rudder	Alarm Sensitivity	Off / On
	Sensitivity Time	0～999sec
WPT	Alarm Sensitivity	Off / On
	Sensitivity Time	0～999sec
LAT/LON	Alarm Sensitivity	Off / On
	Sensitivity Time	0～999sec
Datum	Alarm Sensitivity	Off / On
	Sensitivity Time	0～999sec
Status	Alarm Sensitivity	Off / On
	Sensitivity Time	0～999sec
HDOP	Alarm Sensitivity	Off / On
	Sensitivity Time	0～999sec
AIS	Alarm Sensitivity	Off / On
	Sensitivity Time	0～999sec

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