JMA-9133-SA
JMA-9132-SA
JMA-9123-7XA/9XA
JMA-9122-6XA/9XA/6XAH
JMA-9110-6XA/6XAH

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

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

■ What to do in case of electric shock

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

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

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

◆◆◆ FIRST-AID TREATMENTS ◆◆◆

☆ First-aid treatments

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

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

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

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

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

(5)

a. Examine the victim's pulse.

b. Examine his heartbeat bringing your ear close to his heart.

c. Examine his breathing bringing the back of your hand or your face close to his face.

d. Check the size of the pupils of his eyes.

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

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

☆ When pulse is beating but breathing has stopped

(Mouth-to-mouth respiration) Fig 1.

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

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

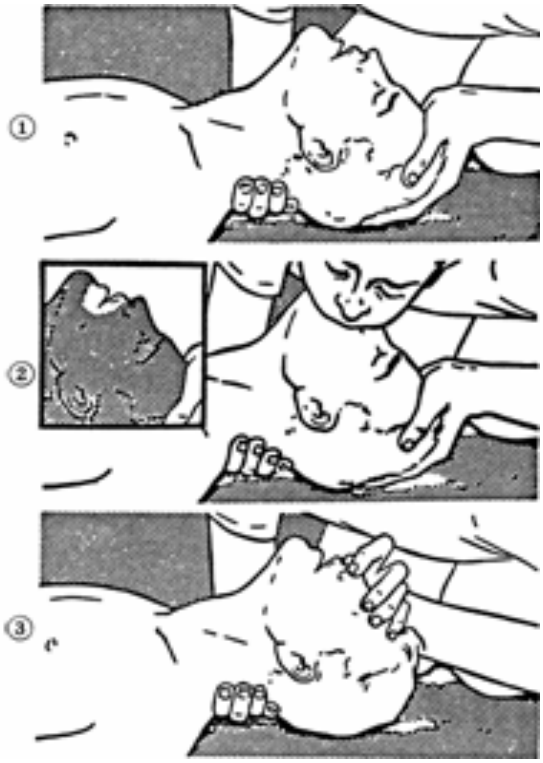
(3) Pinch the victim's nostrils and take a deep breath, block his mouth completely with yours and blow into his mouth strongly. Take a deep breath again and blow into his mouth. Continue this 10 to 15 times a minutes (blocking his nostrils).

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

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

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

Method of mouth-to-mouth respiration by raising hea



(1)Raise the victim's head. Support his forehead with one of your hand and his neck with the other hand. ①

When you tilt his head backward, the victim, in most cases, opens his mouth to the air. This makes mouth-to mouth respiration easy.

(2)Cover his mouth as widely as possible with yours and press your cheek against his nose ②

or, pinch his nostrils with your fingers to prevent air from leaking. ③

(3)Blow into his lungs. Continue blowing into his mouth until his breast swells. Blow into his mouth as quickly as possible for the first 10 times.

Fig 1. *Mouth-to mouth respiration*

☆ When both pulse and breathing have stopped

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

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

(1) Place your both hands, one hand on the other, on the lower one third area of his breastbone and compress his breast with your elbows applying your weight on his breast so that it is dented about 2cm (Repeat compressing his breast 50 times or so a minutes). (Cardiac massage)

(2) In case of one rescuer,

Repeat cardiac massages about 15 times and blow into his mouth 2 times quickly, and repeat this combination.

In case of two rescuers,

One person repeats cardiac massages 15 times while the other person blow into his mouth twice, and they shall repeat this combination. (Perform the cardiac massage and mouth-to-mouth respiration)

(3) Examine his pupils and his pulse sometimes. When the both have returned to normal, stop the artificial respiration, serve him with a cup of hot coffee or tea and keep him warm and calm while watching him carefully. Commit the victim to a medical specialist depending on his condition. (Never give him alcoholic drinks.) To let him recover from the mental shock, it is necessary for persons concerned to understand his situations and the necessary treatment.

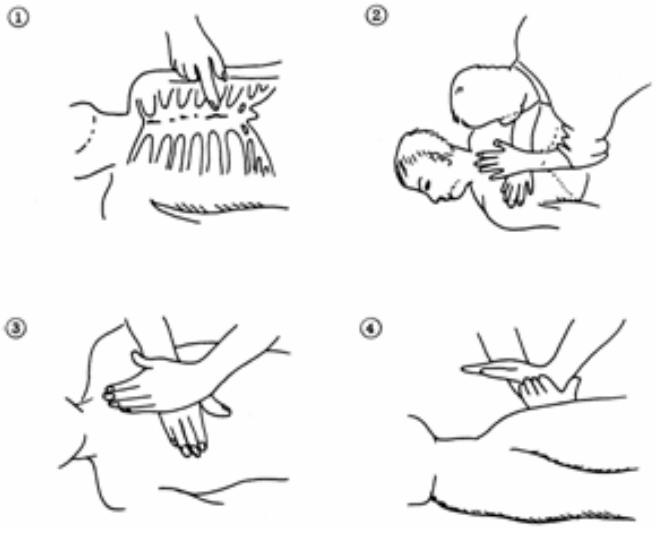


Fig 2. *Cardiac massage*

PREFACE

Thank you very much for purchasing the JRC marine radar equipment, JMA-9100 series.

This equipment is a marine radar equipment designed to obtain safe operation of marine ships.

This equipment consists of a radar signal transmitter-receiver unit, a LCD display unit and a scanner unit as its main units.

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

Refer to this manual when any inconvenience or defect occurs.

● Before Operation ●

Pictorial Indication

Various pictorial indications are included in this manual and are shown on these equipment so that you can operate them 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.

Please understand them before you read this manual:

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

Examples of Pictorial Indication

Electric Shock

The △ 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 top cover of the equipment.

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

● PRECAUTIONS ●

DANGER

Never conduct inspection or repair work of equipment components.

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

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

When conducting maintenance, make sure to turn the main power off.Failure to comply may result in electrocution.

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

When conducting maintenance work on the scanner, make sure to turn its main power off.Failure to comply may result in electrocution or injuries.

DANGER

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

WARNING

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

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

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

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

WARNING

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).

Microwave radiation level

System	50 W/m^2	10 W/m^2	2.5 W/m^2
NKE-2103	n/a	26cm	123cm
NKE-1125/1129/2254	5cm	81cm	162cm
NKE-1130/1139	11cm	76cm	181cm

Make sure to install the scanner at a place higher than human height.

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

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

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

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

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.

Do not change MBS Level/Area unless absolutely necessary.

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

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

CAUTION

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

CAUTION

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

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

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

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.

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

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

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

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

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

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

CAUTION

When setting a guard 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 guard zone alarm will not be activated for targets undetected by the radar, and it may result in accidents such as collisions.

The simulation function is used exclusively for deciding whether or not target tracking is properly operating. Therefore, never use this function unless you wish to check target tracking operations.

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

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

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

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

CAUTION

Make sure to take off your watch when your hand must get close to the magnetron.

Failure to comply may result in damage to the watch since the magnetron is a strong magnet.

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

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

Failure to comply may result in electrocution.

Any adjustments must be made by specialized service personnel.

Incorrect settings may result in unstable operation.

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

Any adjustments must be made by specialized service personnel.

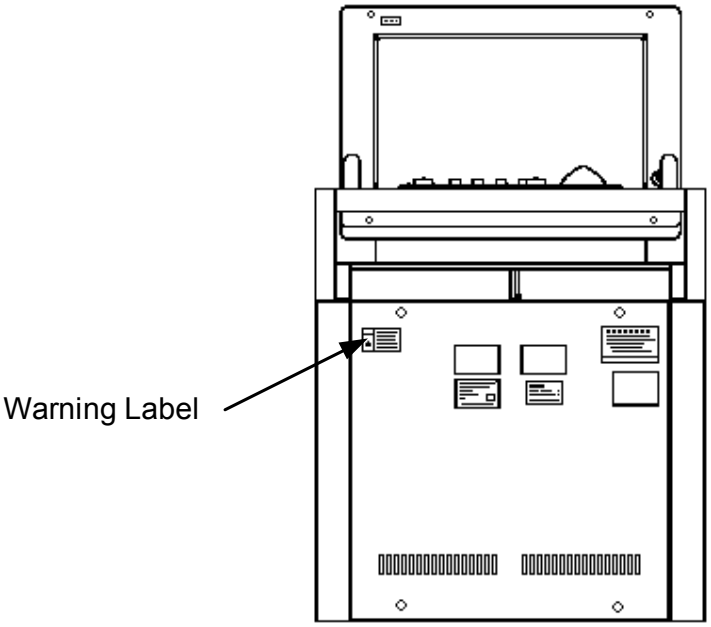
Failure to comply may result in accidents or equipment failure.

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.

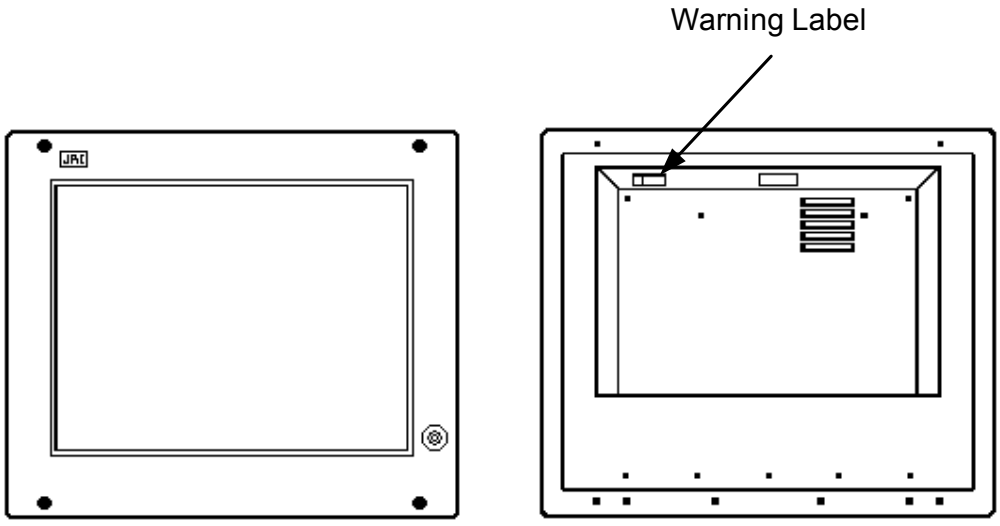
CAUTION

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

The Mounting Point of the Warning Label



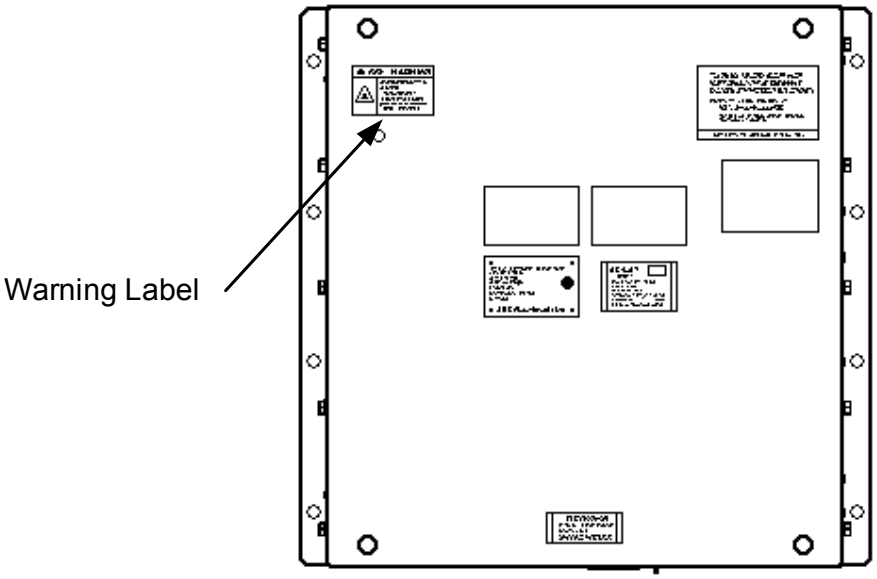
NCD-4990 Display Unit



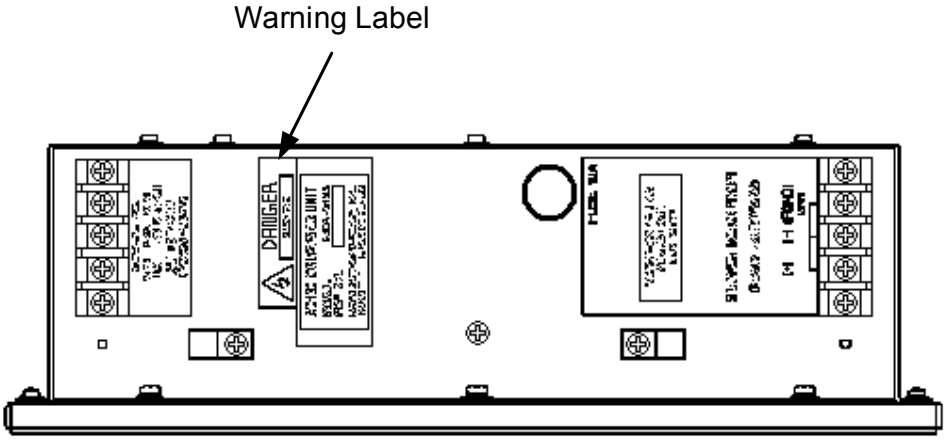
Front face

Back face

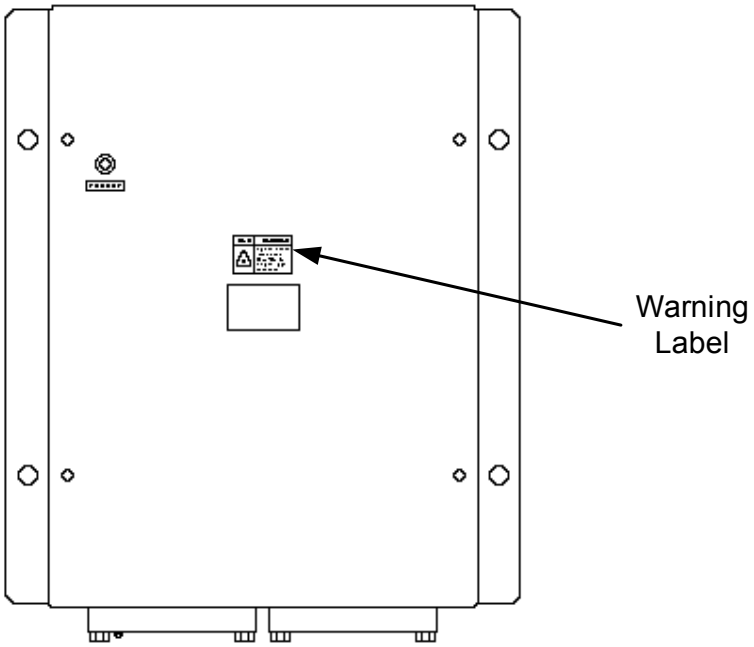
NWZ-170 Monitor Unit



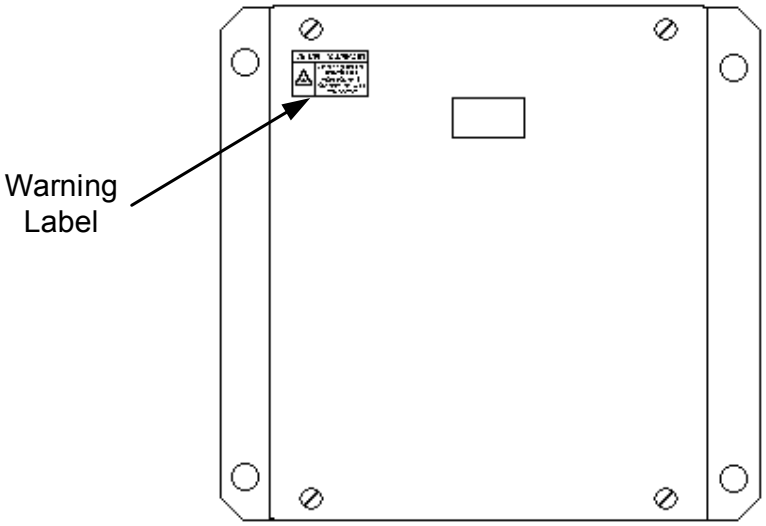
NDC-1399-9 Radar Process Unit
(Desktop Type)



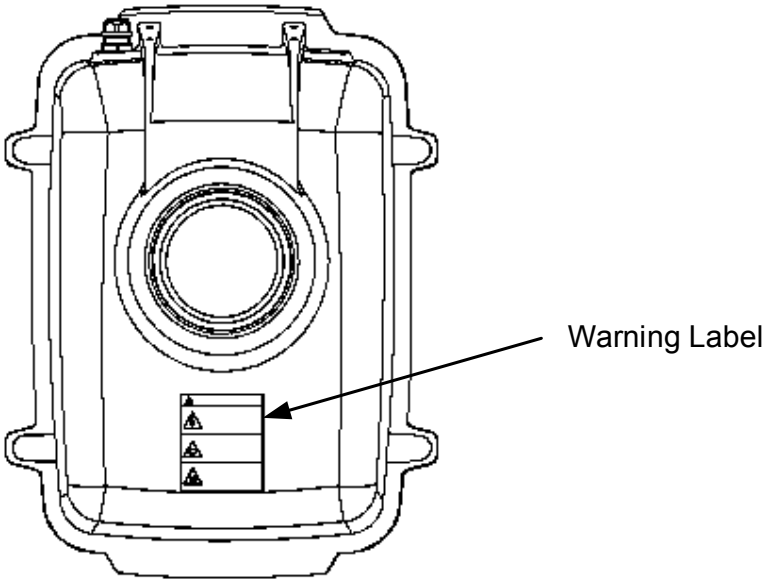
NBA-5135 AC/DC Converter
(Desktop Type)



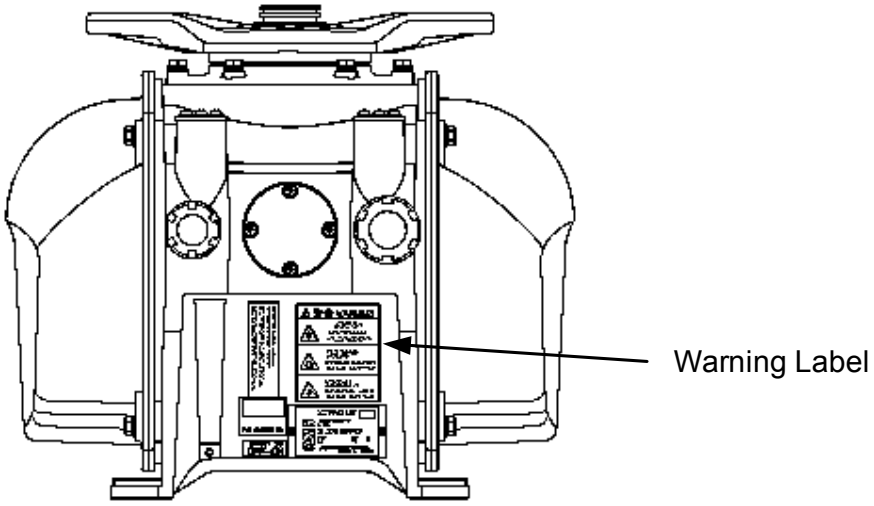
NQE-3141-4A/8A Interswitch Unit



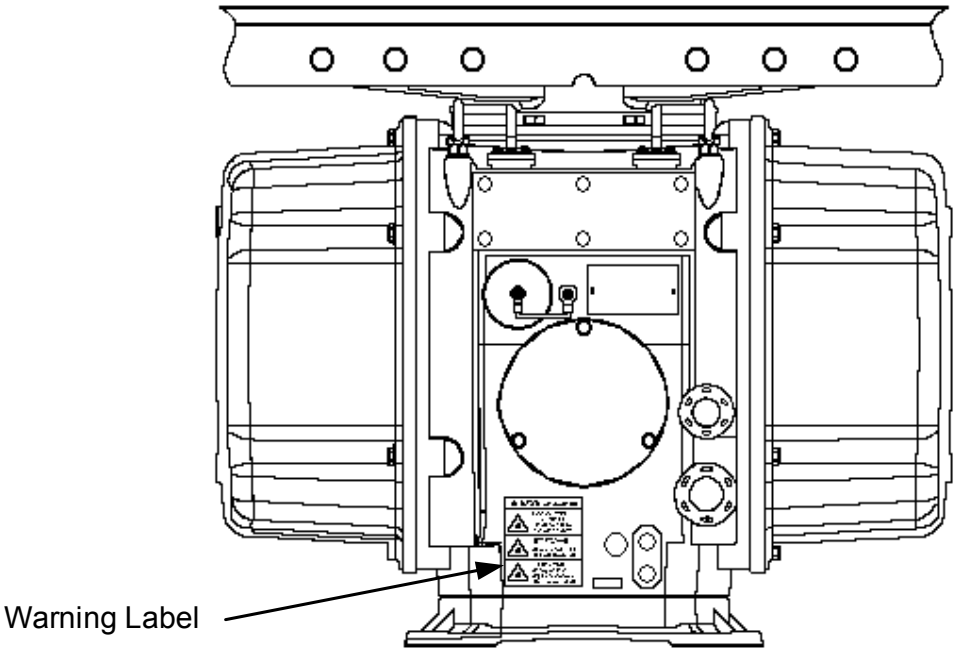
NQE-3167 Power Control Unit



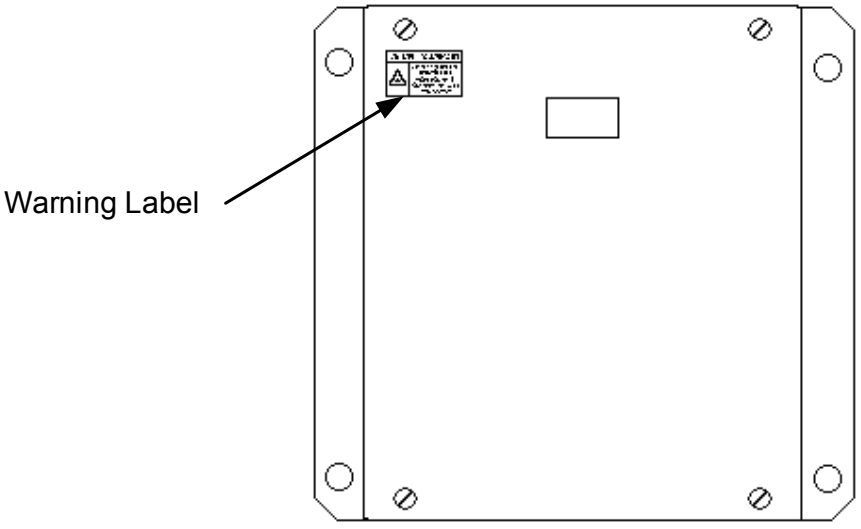
NKE-2103-6/6HS Scanner Unit



NKE-1129-7/9 Scanner Unit
NKE-1125-6/9 Scanner Unit
NKE-2254-6HS Scanner Unit



NKE-1139/1130 Scanner Unit



NTG-3230/3225 Transmitter Receiver Unit

EQUIPMENT APPEARANCE

Scanner Unit Type NKE-1130 (12 feet)

Scanner Unit Type NKE-1139 (12 feet)

Transmitter Receiver Unit Type NTG-3230(30kW)

Scanner Unit Type NKE-1129-7 (7 feet)

Scanner Unit Type NKE-1129-9 (9 feet)

Transmitter Receiver Unit Type NTG-3225(25kW)

Scanner Unit Type NKE-1125-6 (6 feet)

Scanner Unit Type NKE-1125-9 (9 feet)

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

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

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

Power Control Unit Type NQE-3167

Display Unit Type NCD-4990 (Stand alone type)

Interswitch Unit Type NQE-3141-4A

Monitor Unit Type NWZ-170 (Desktop type)

Operation Unit Type NCE-5163 (Desktop type)

Radar Process Unit Type NDC-1399-9 (Desktop type)

DISPLAY UNIT TYPE NCD-4990T (DESKTOP TYPE)

GLOSSARY

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

	A
AZ	Acquisition/Activation zone A zone set up by the operator in which the system should automatically acquire radar targets and activate reported AIS targets when entering the zone.
Activated target	A target representing the automatic or manual activation of a sleeping target for the display of additional information.
AIS	Automatic Identification System A system which enables ships and shore stations to obtain identifying and navigation information about other ships at sea, using an automated transponder.
Anti-clutter rain	Rain/snow clutter suppression.
Anti-clutter sea	Sea clutter suppression.
Associated target	A target simultaneously representing a tracked target and a reported AIS target having similar parameters (position, course, speed) which comply with an association algorithm.
AZI	AZImuth stabilization mode
	B
BCR/BCT	Bow Crossing Range/Bow Crossing Time
	C
C up	Course up Own ship's course is pointed to the top center of the radar display.
CCRP	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/Time to the Closest Point of Approach. Limits are set by the operator and are related to own ship.
CTW	Course Through Water The direction of the ship's movement through the water
	D
DRIFT	The current velocity for manual correction or the current speed on the horizontal axis of the 2-axis log is displayed.
	E
EBL	Electronic Bearing Line An electronic bearing line originated from own ship's position.
ETA	Estimated Time of Arrival
	G
Ground stabilization	A display mode in which speed and course information are referred to the ground, using ground track input data.
	H
HDG	Heading The horizontal direction that the bow of a ship is pointing at any instant, expressed in angular units from a reference direction.
HL	Heading line A graphic line on a radar presentation drawn from the consistent common reference point to the bearing scale to indicate the heading of the ship .
HSC	High Speed Craft Vessels which comply with the definition in SOLAS for high speed craft
H up	Head up Own ship's heading line is always pointed to the top center of the radar display.
	I
IMO	International Maritime Organisation
IR	RADAR Interference Rejector
ISW	A device to switch over two or more radar display units and two or more scanners.
	L

Lost AIS target	A target symbol representing the last valid position of an AIS target before the reception of its data was lost, or its last dead-reckoned position.
Lost tracked target	One for which target information is no longer available due to poor, lost or obscured signals.
LP	Long Pulse
	M
MMSI	Maritime Mobile Service Identity
MOB	Man OverBoard
MON	Performance monitor
MP	Medium Pulse
	N
NM	1nm=1852m
N up	North up
	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 stabilisation
Relative speed	The speed of a target relative to own ship's speed data
Relative vector	A predicted movement of a target relative to own ship's motion

RM	Relative Motion A display on which the position of own ship remains fixed, and all targets move relative to own ship.
RM(R)	Relative Motion. Relative Trails.
RM(T)	Relative Motion. True Trails.
ROT	Rate Of Turn Change of heading per time unit.
Route	A set of waypoints.
RR	Range Rings

S

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

T

TCPA	Time to Closest Point of Approach to own ship
Test target	Radar target of known characteristics used for test requirement
TM	True Motion A display across which own ship moves with its own true motion.
Trails	Tracks displayed by the radar echoes of targets in the form of an afterglow.

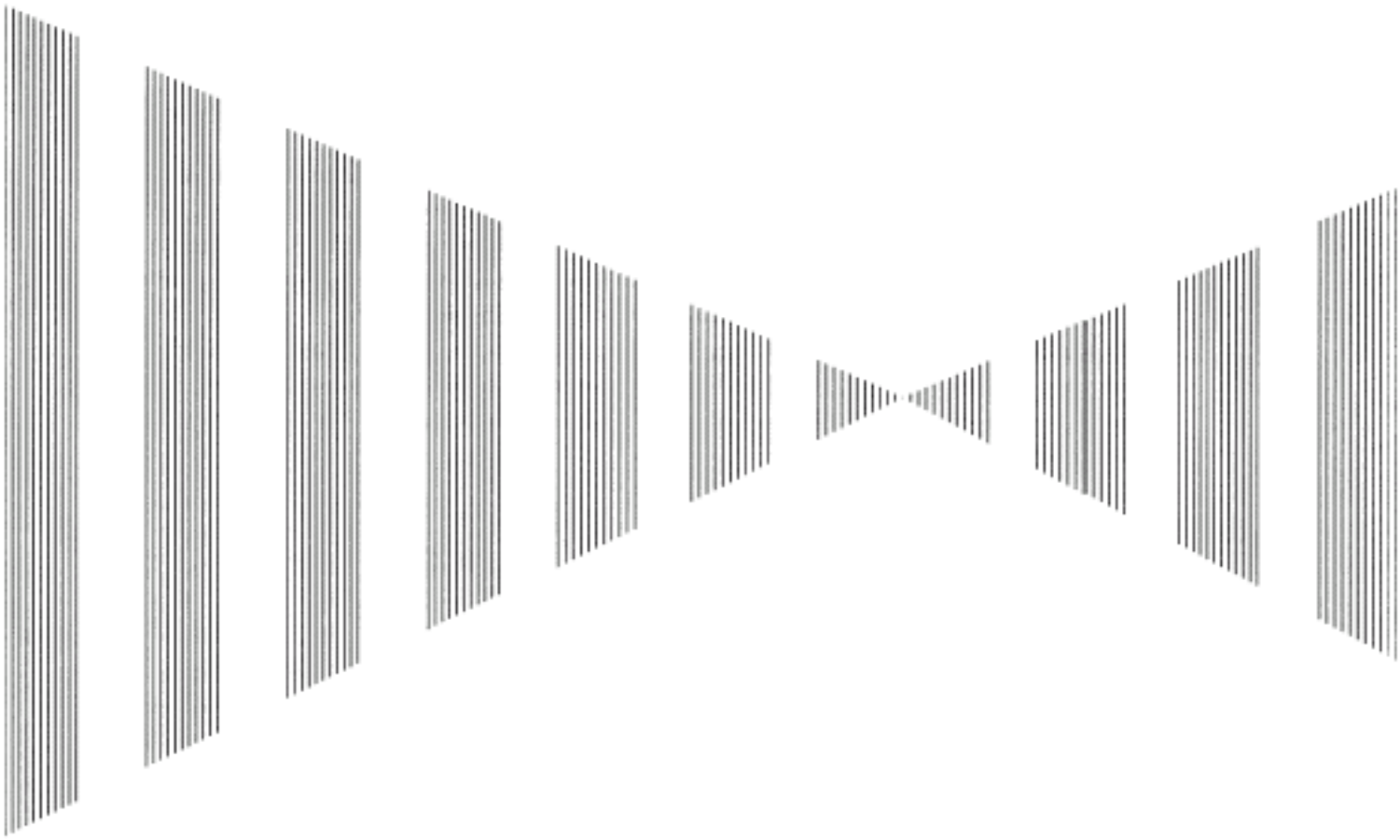
Trial manoeuvre	A graphical simulation facility used to assist the operator to perform a proposed maneuver for navigation and collision avoidance purposes.
True course	The direction of motion relative to ground or to sea, of a target expressed as an angular displacement from north
True speed	The speed of a target relative to ground, or to sea
True vector	A vector representing the predicted true motion of a target, showing course and speed with reference to the ground or sea
TT	Target Tracking. A computer process of observing the sequential changes in the position of a radar target in order to establish its motion. Such a target is a Tracked Target.
TTG	Time To Go. Time to next waypoint.
TXRX	Transmitter Receiver Unit
	U
UTC	Universal Time Coordinated. The international standard of time, kept by atomic clocks around the world.
	V
VRM	Variable Range Marker An adjustable range ring used to measure the distance to a target.
	W
Waypoint	A geographical location on a route indicating a event.

Index

Appendix A
NQE-3141 Interswitch Unit

Appendix B
DRAWINGS

SECTION 1
GENERAL AND EQUIPMENT COMPOSITION



GENERAL AND EQUIPMENT COMPOSITION

1.1 FUNCTIONS

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

This equipment complies with the performance standard of IMO.

1.1.1 Function of This System

The JMA-9100 series is a color radar system designed to comply with the international standards of the IMO.The main functions include:

- sensitivity adjustment
- sea clutter and rain/snow clutter suppression
- interference rejection
- bearing and range measurement using a cursor, fixed/variable range markers, and electronic bearing line
- colored own track display(7 colors)
- NAV line and marker displays
- TM (True Motion) presentation
- self-diagnostic facilities
- radar performance monitoring (Performance Monitor)
- Target Tracking functions (manual/automatic, target acquisition and tracking, vector and trail displays, Trial maneuver and alarm displays)
- 8-unit switchover (Interswitch) function (option)

1.2 FEATURES

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

The 23.1-inch color LCD[1] with high resolution can display radar images of 320 mm or more in diameter. Even short-range targets can also be displayed as high-resolution images.

Target Detection by Latest Signal Processing Technology

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

Target Tracking (TT) Function based on Advanced Technology

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

- Acquisition and tracking of 100 targets.
- Hazardous conditions are represented by shapes and colors of symbols as well as sounds.
- Trial maneuvering functions provided.
- Tracks of up to 20 target ships can be stored with a maximum of 1,500 points for each of them, and displayed distinguished by using seven different colors.

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

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

Easy Operation with GUI

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

1.The displayed resolution corresponds to SXGA(1280x1024).

Improved Day/Night Mode

Five types of background colors are available in Day/Dusk/Night mode (total 5 background colors). Each background color can be reproduced to be suited for the user's operating environment by simple key operation. The radar echoes and a variety of graphics can also be represented in different colors, ensuring easy-to-see displays.

Compact Design and Low Power Consumption

Since an LCD has been implemented as the display device, the weight of the display is greatly reduced and the power consumption is lowered in comparison with the conventional radar equipment.

Self-diagnostic Program Incorporated

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

Performance Monitor

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

Easy Interswitch Operation (Option)

If an interswitch unit (option) is connected, up to eight JMA-9100 radars can be switched over by performing simple operation.

Up to 2 radars:	NQE-3141-2A is needed in Display Unit.
Up to 4 radars:	NQE-3141-4A is needed separately.
Up to 8 radars:	NQE-3141-8A is needed separately.

Various Functions

- RADAR Trails (Other ship's track display)
- TM (True Motion) display
- Head-up/North-up/Course-up display
- Own ship's track display
- Auto-acquisition Zone function

1.3 CONFIGURATION

Table1-1:Specified of scanner, and categories of ship/craft for SOLAS V

Type of Radar	Antenna type	Transmitted Output Power	Band	Rate of rotation	Category
JMA-9133-SA	12ft Slotted Antenna	30kW	S	24rpm	CAT 1
JMA-9132-SA	12ft Slotted Antenna	30kW	S	24rpm	CAT 1
JMA-9123-7XA	7ft Slotted Antenna	25kW	X	24rpm	CAT 1
JMA-9123-9XA	9ft Slotted Antenna	25kW	X	24rpm	CAT 1
JMA-9122-6XA	6ft Slotted Antenna	25kW	X	24rpm	CAT 1
JMA-9122-9XA	9ft Slotted Antenna	25kW	X	24rpm	CAT 1
JMA-9122-6XAH	6ft Slotted Antenna	25kW	X	48rpm	CAT 1H
JMA-9110-6XA	6ft Slotted Antenna	10kW	X	27rpm	CAT 1
JMA-9110-6XAH	6ft Slotted Antenna	10kW	X	48rpm	CAT 1H

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

Table1-2:Radar Configuration and Ship's Mains

Type of Radar	Scanner Unit	Performance Monitor	Transmitter Receiver Unit	Display Unit	Ship's Main
JMA-9133-SA	NKE-1139	NJU-84	NTG-3230	NCD-4990	AC100 to 115V, or AC220 to 240V 50/60Hz 1φ
JMA-9132-SA	NKE-1130	NJU-84	———	NCD-4990	
JMA-9123-7XA	NKE-1129-7	NJU-85	NTG-3225	NCD-4990	
JMA-9123-9XA	NKE-1129-9	NJU-85	NTG-3225	NCD-4990	
JMA-9122-6XA	NKE-1125-6	NJU-85	———	NCD-4990	
JMA-9122-9XA	NKE-1125-9	NJU-85	———	NCD-4990	
JMA-9122-6XAH	NKE-2254-6HS	NJU-85	———	NCD-4990	AC100 to 115V, or AC220 to 240V 50/60Hz 1φ
JMA-9110-6XA	NKE-2103-6	NJU-85	———	NCD-4990	
JMA-9110-6XAH	NKE-2103-6HS	NJU-85	———	NCD-4990	

Notes:

1) **The drive motor for the scanner unit is available in AC100-115V or AC220-240V type for NKE-1139/1130/1125/1129 series. Please specify the motor type when ordering.**

2) **The motor of NKE-2254/2103 can operate under both AC100-115V and AC220-240V, then need not to specify the motor type.**

3) **When using NKE-2254/2103, they need AC/DC Converter NBA-5135 (Option) in display unit.**

4) **The scanner unit except NKE-2103 series can be equipped with a deicing heater as an option, and '-D' shall be suffixed to the type name. (e.g. NKE-1139-D, NKE-1125-6D).**

5) **When using the ship's mains of AC440V as the radar power source, a step-down transformer shall be used.**

6) **The desktop option is available for display NCD-4990. It has a separate structure consisting of the following:**

Monitor Unit	NWZ-170
Radar Process Unit	NDC-1399-9
Operation Unit	NCE-5163

7) **In JMA-9123, the following type name of JRC is used for the flexible wave guide between the scanner unit and the transmitter receiver unit.**

Type of Radar	Waveguide	Length(m)	Type name of JRC
JMA-9123-7XA/9XA	FR-9	20MT	H-7AWRD0003
JMA-9123-7XA/9XA	FR-9	30MT	H-7AWRD0004

8) **In JMA-9133, the following type name of JRC is used for the coaxial cable between the scanner unit and the transmitter receiver unit.**

Type of Radar	COAX cable	Length(m)	Type name of JRC
JMA-9133-SA	HF-20D	30MT	HF-20D (30MT)

1.4 EXTERIOR DRAWINGS

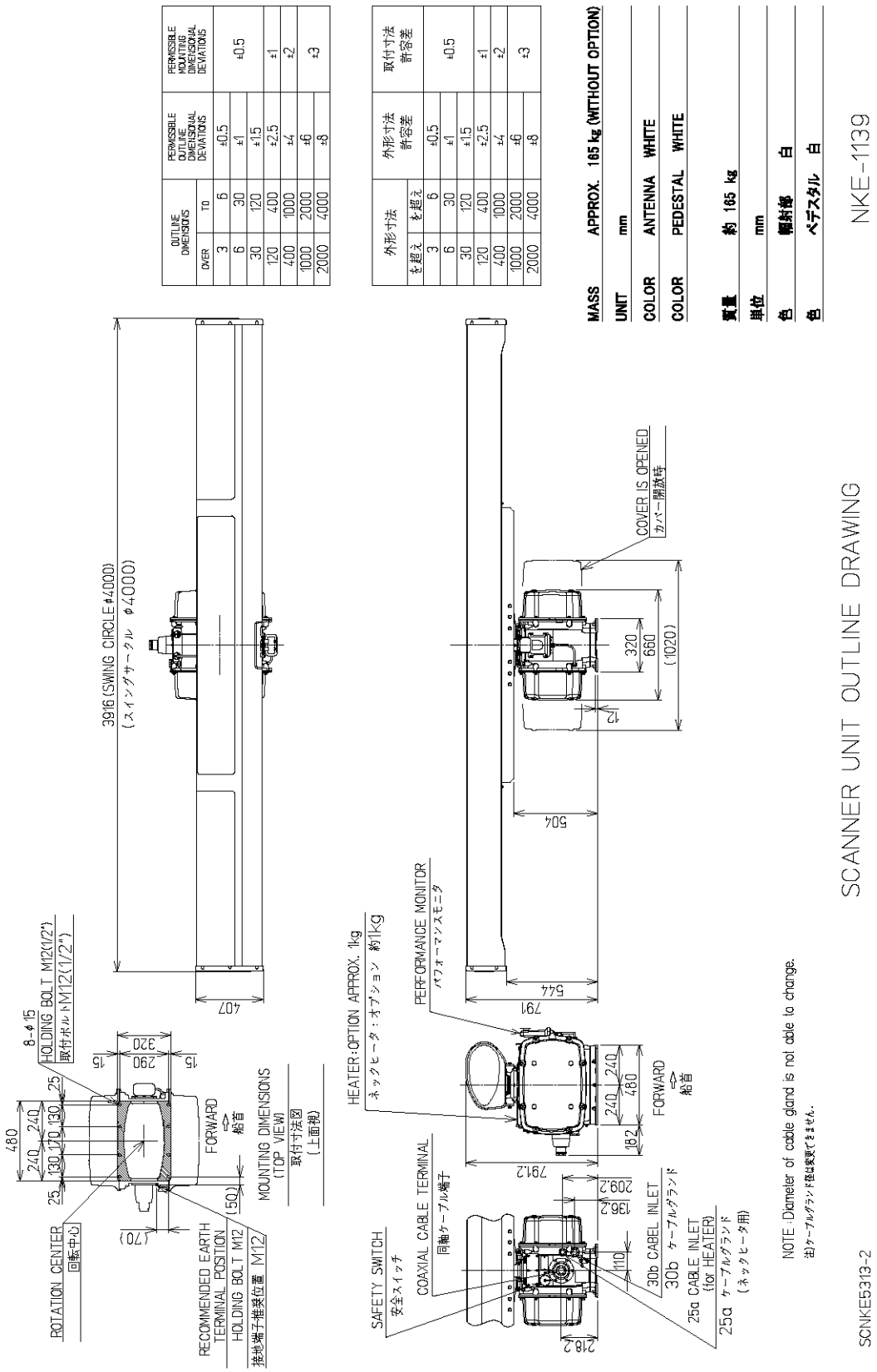


Fig 1-1: *Outline Drawing of Scanner Unit, Type NKE-1139*

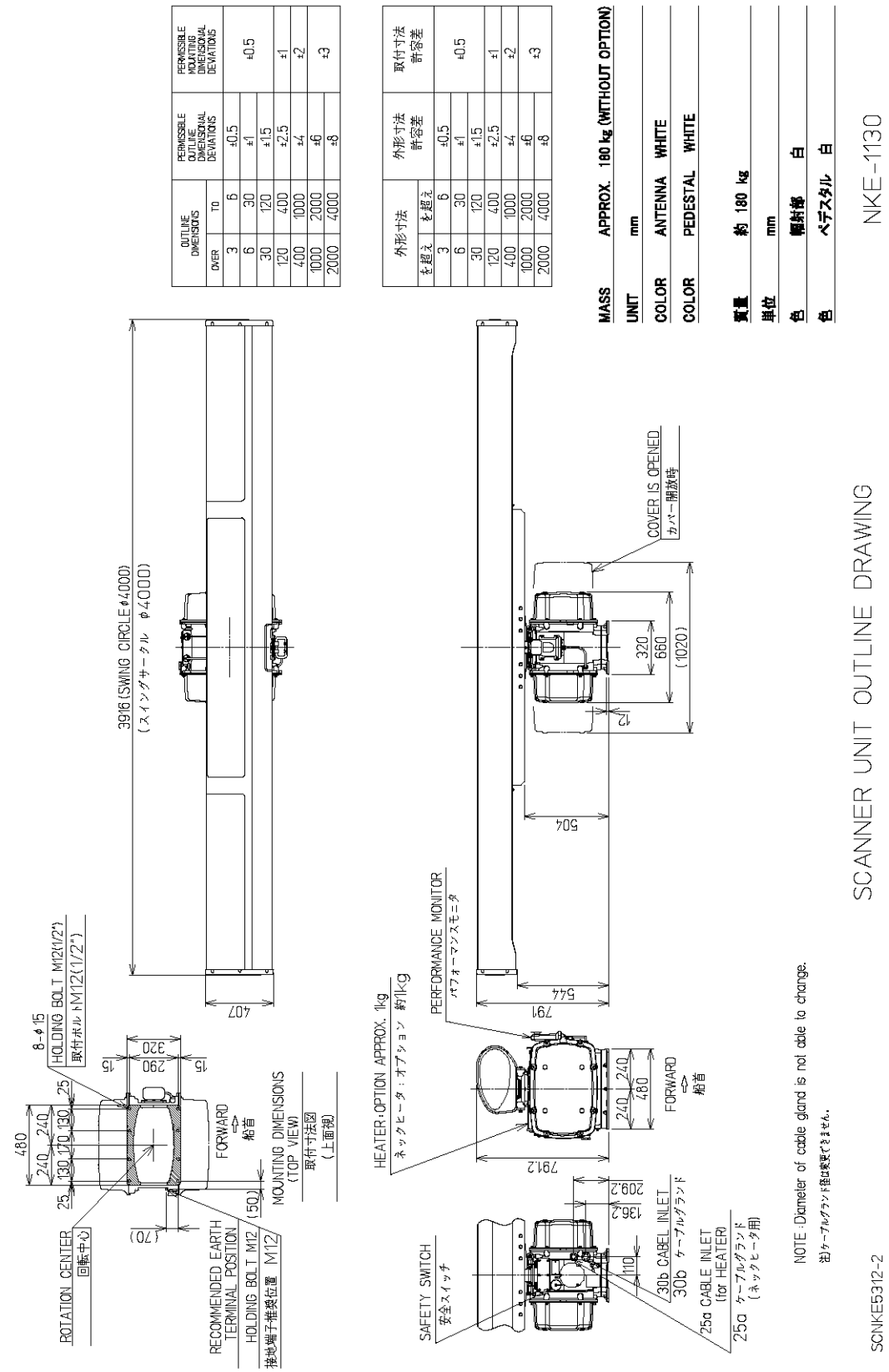


Fig 1-2: *Outline Drawing of Scanner Unit, Type NKE-1130*

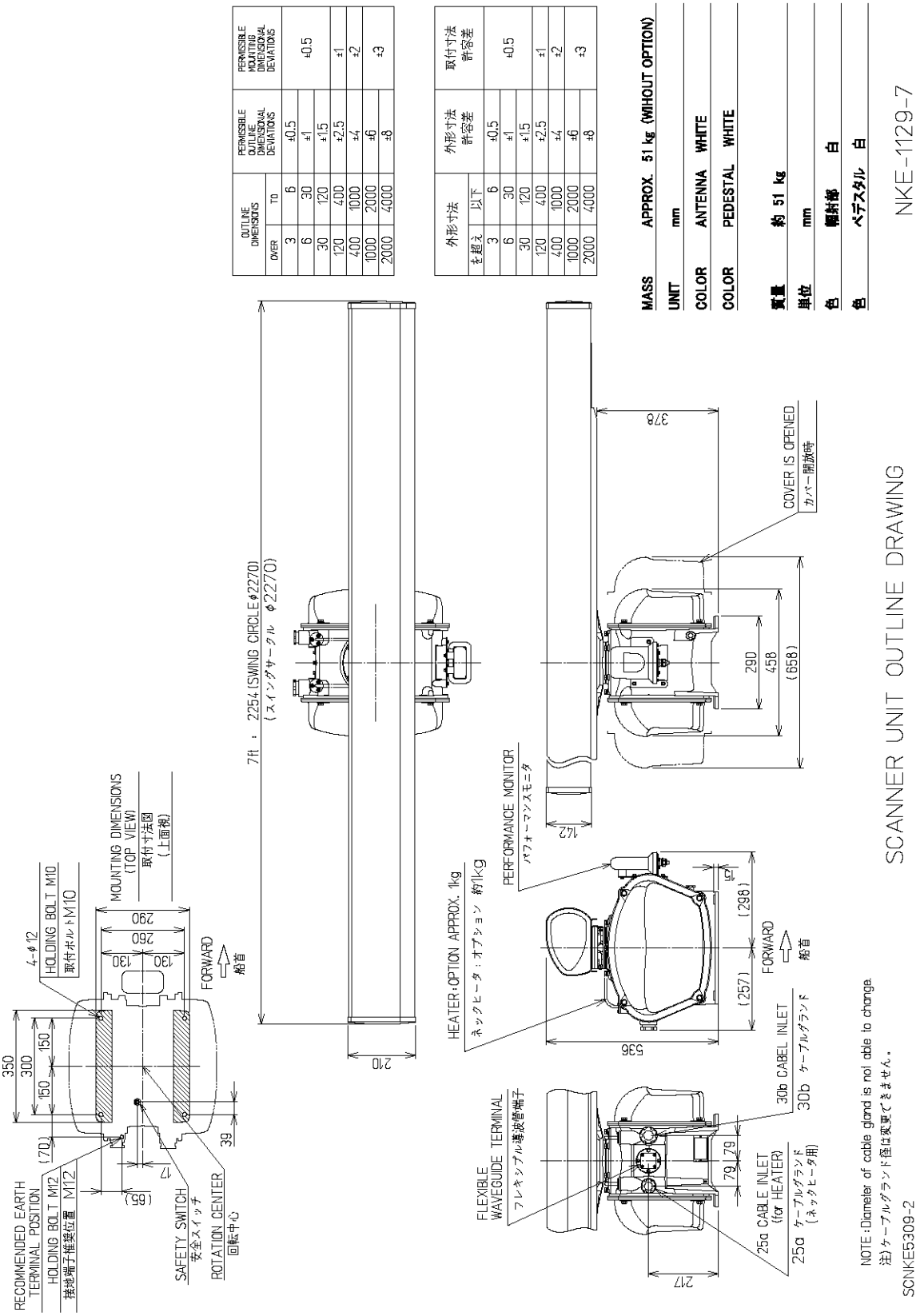


Fig 1-3: *Outline Drawing of Scanner Unit, Type NKE-1129-7*

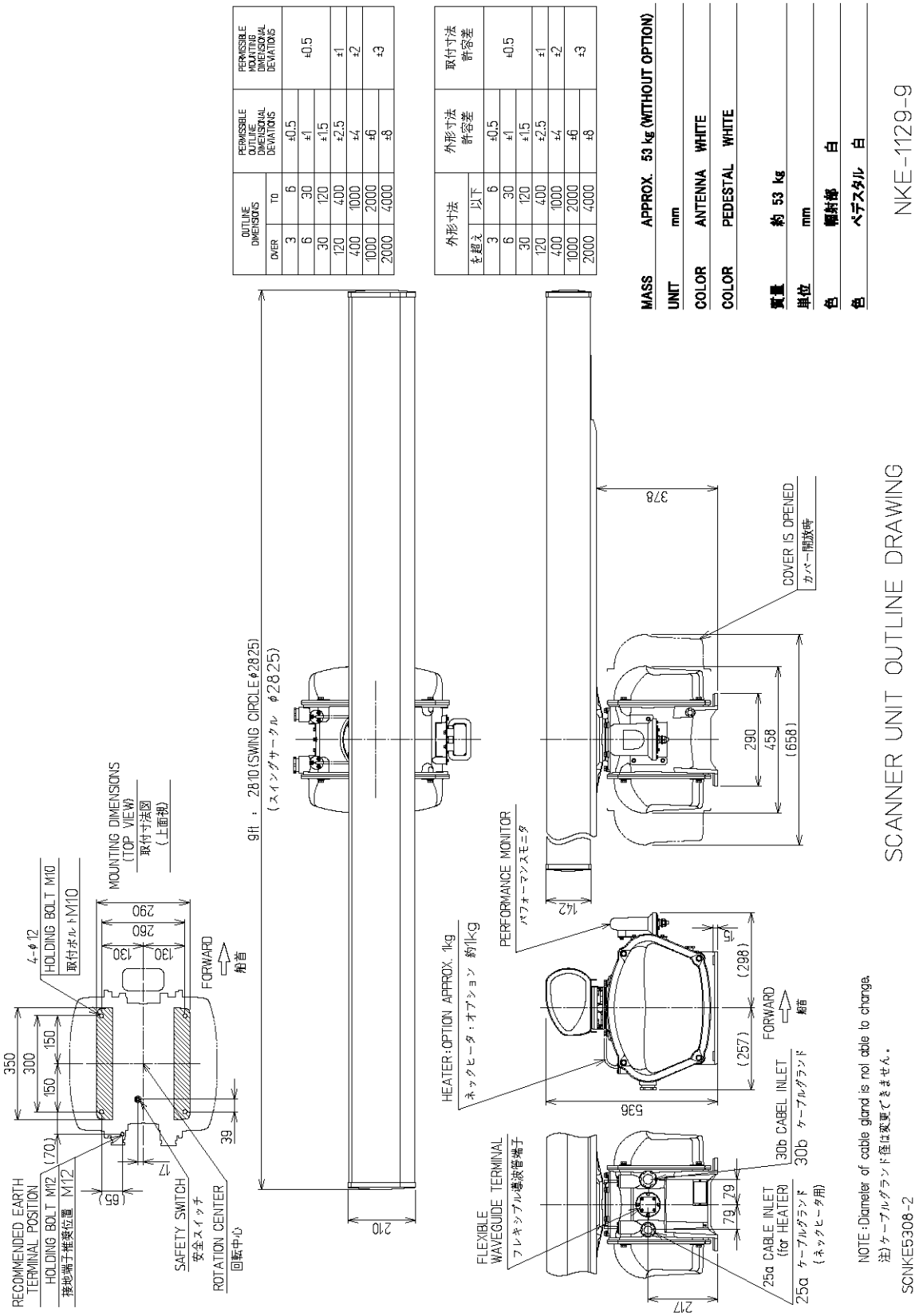


Fig 1-4: *Outline Drawing of Scanner Unit, Type NKE-1129-9*

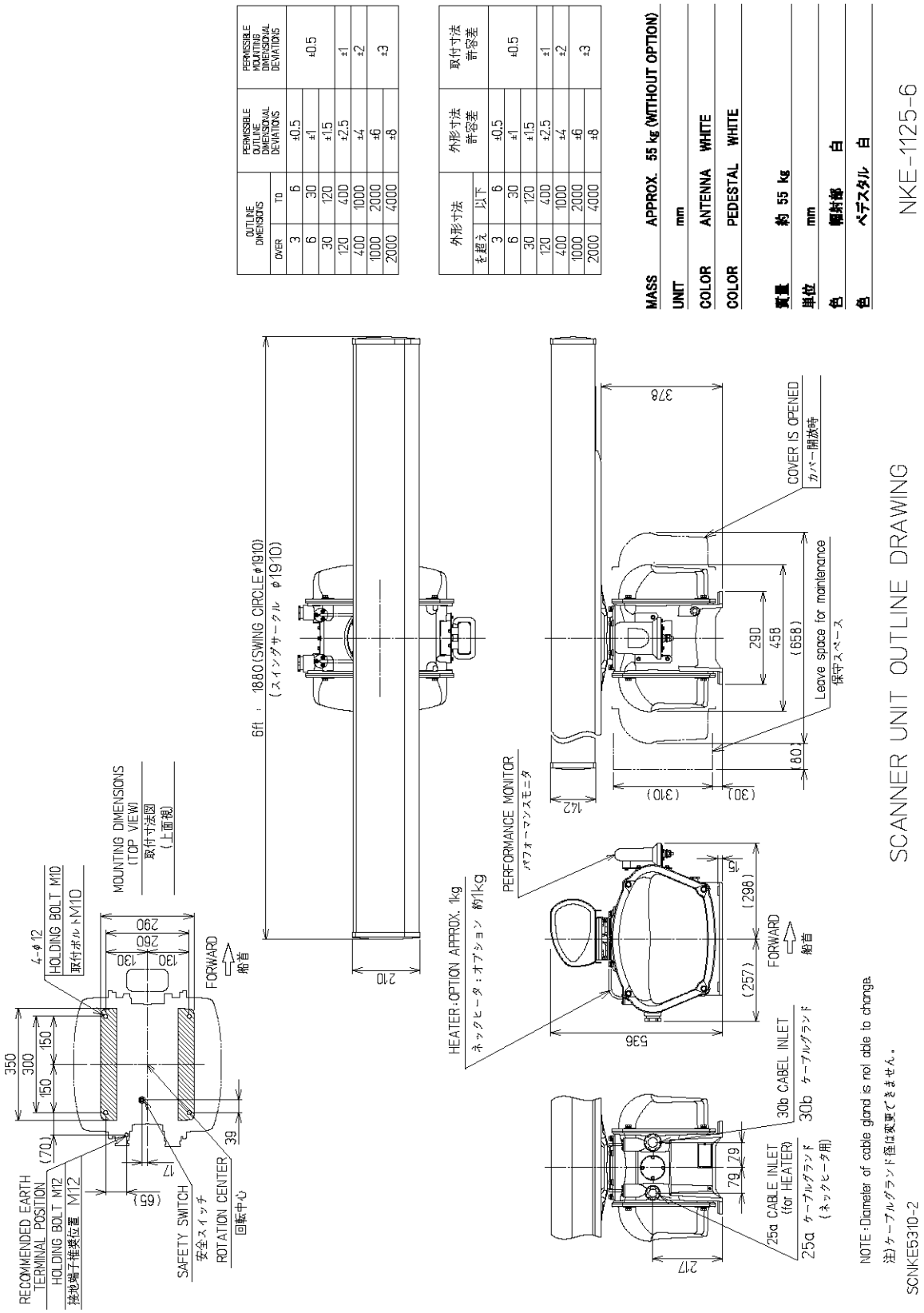


Fig 1-5: *Outline Drawing of Scanner Unit, Type NKE-1125-6*

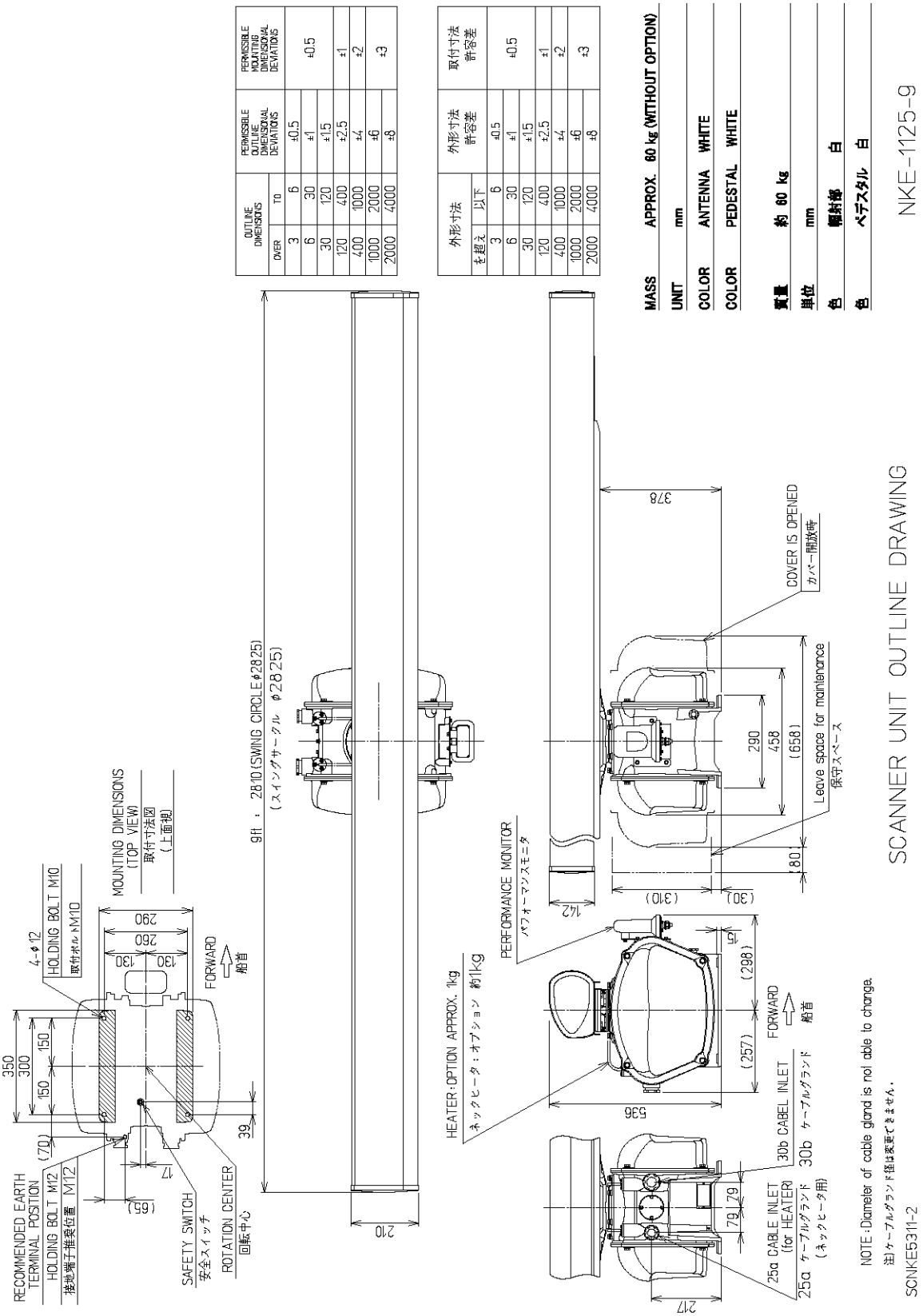


Fig 1-6: *Outline Drawing of Scanner Unit, Type NKE-1125-9*

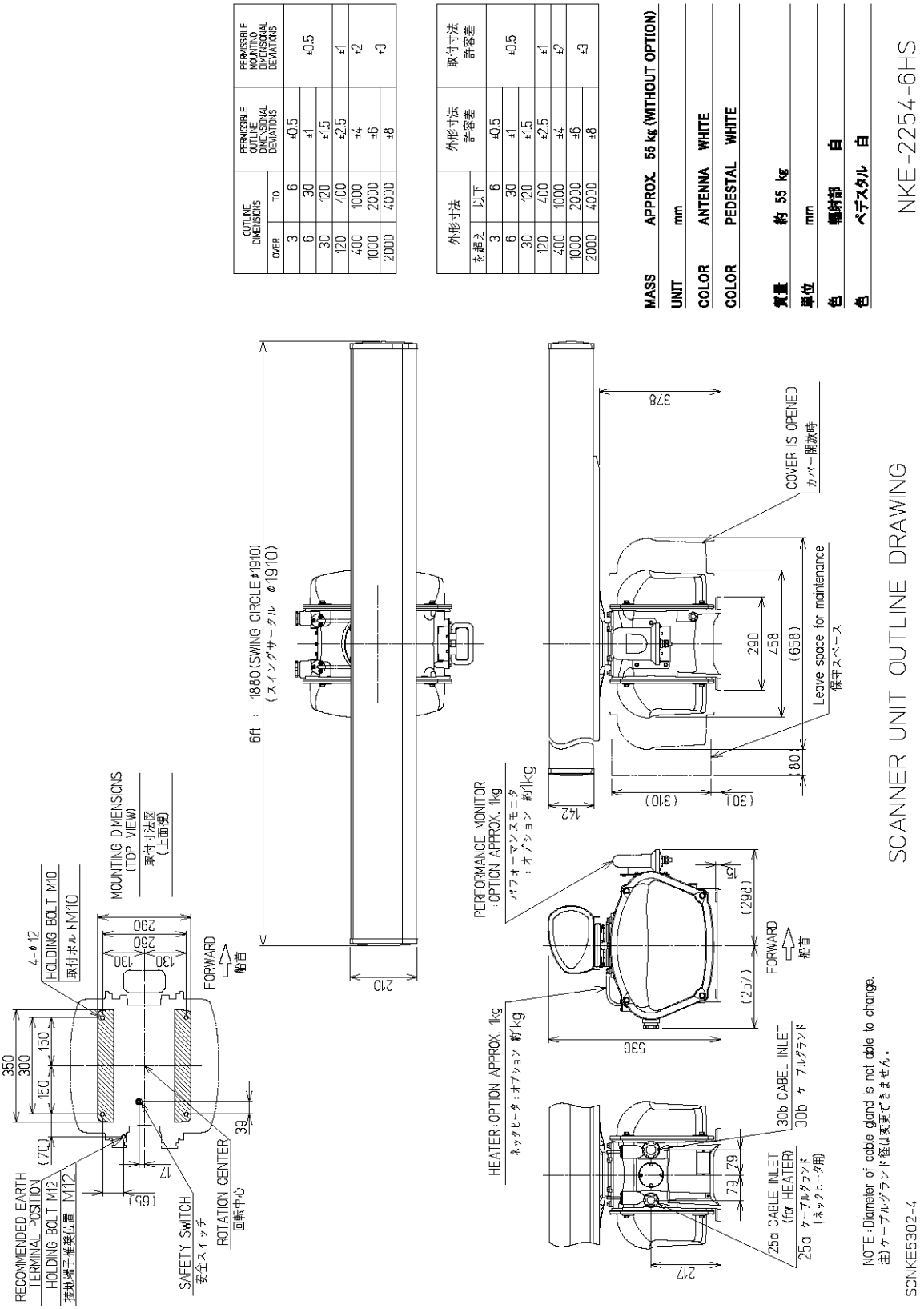


Fig 1-7: *Outline Drawing of Scanner Unit, Type NKE-2254-6HS*

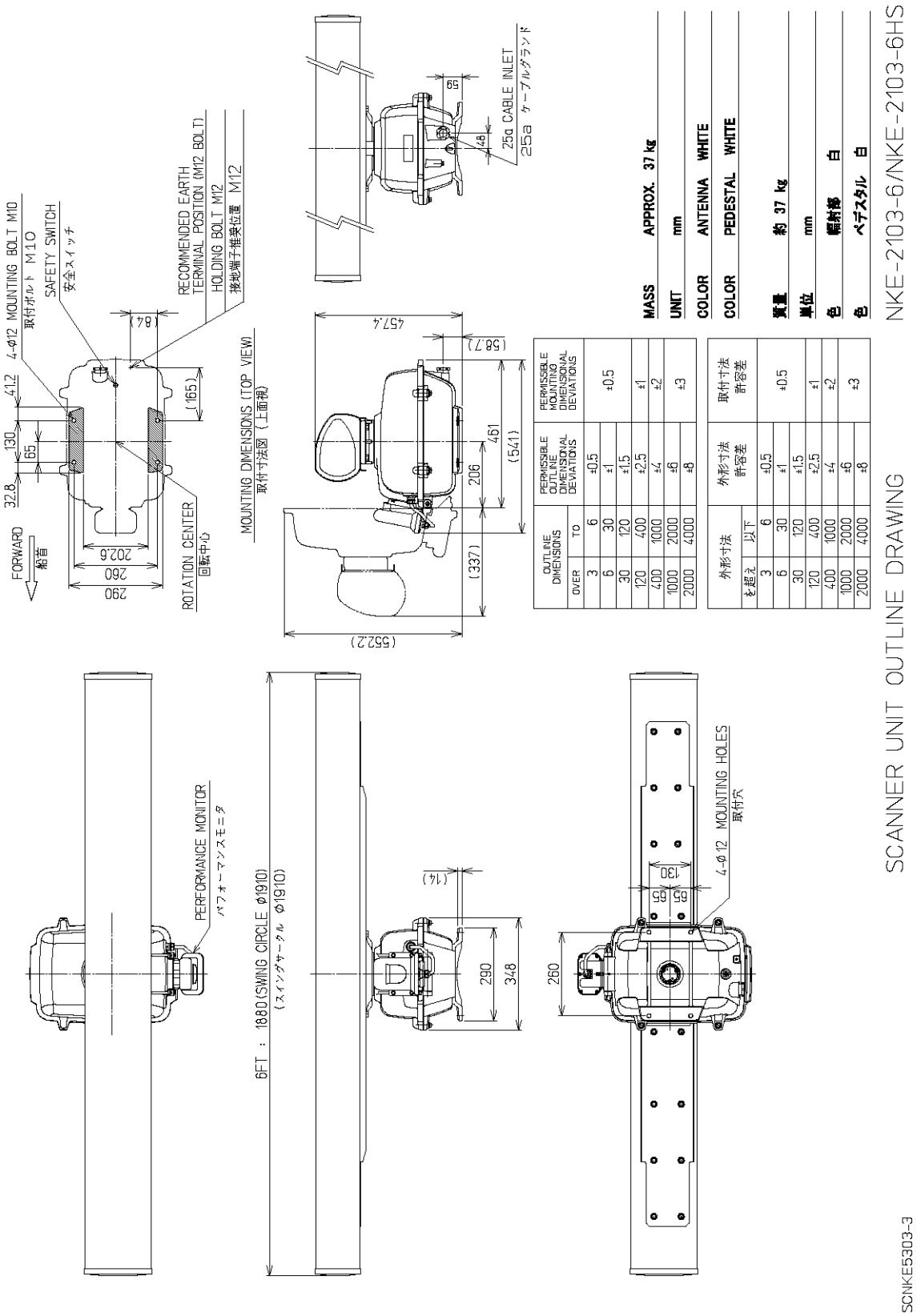


Fig 1-8: *Outline Drawing of Scanner Unit, Type NKE-2103-6/6HS*

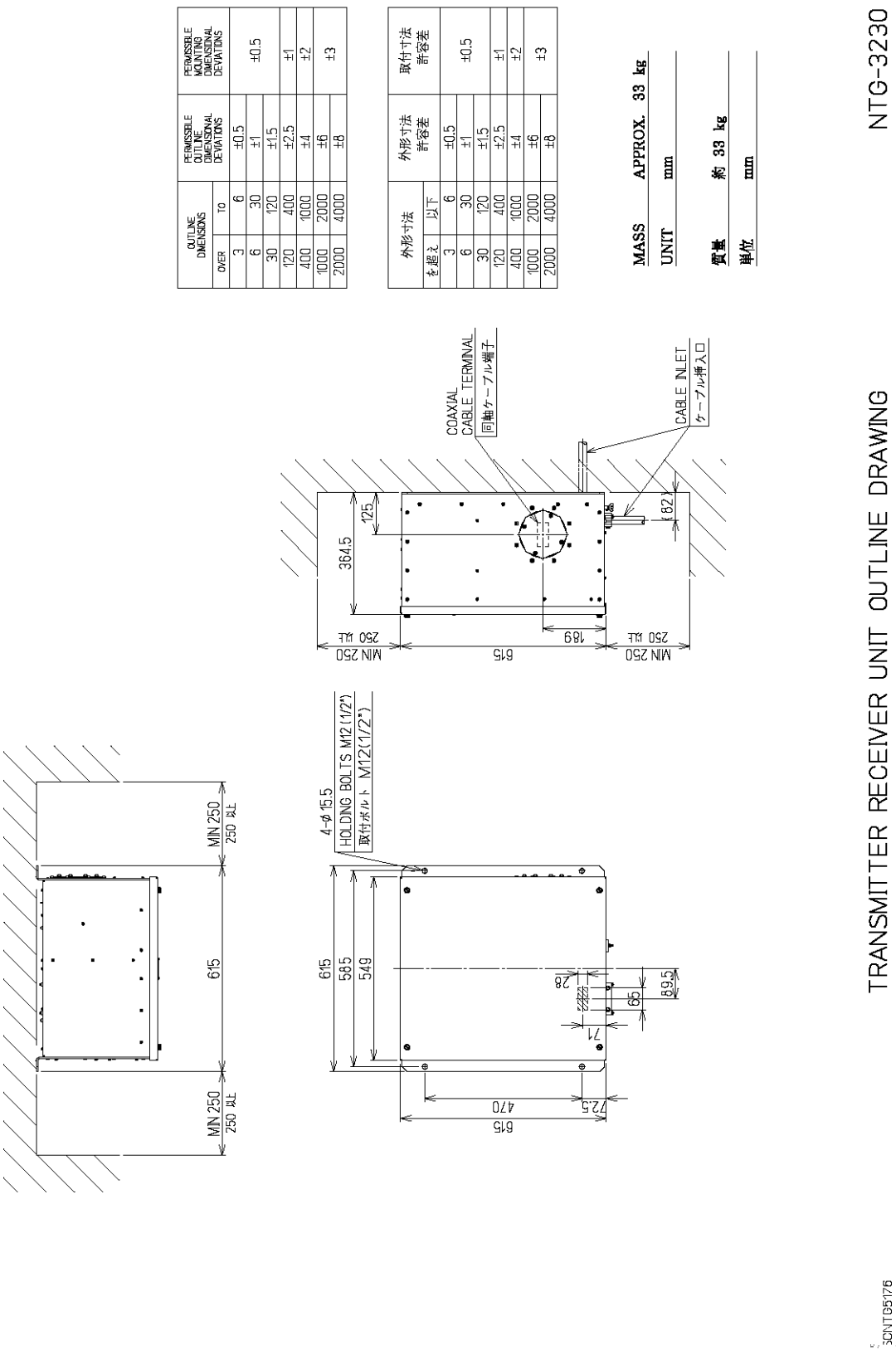


Fig 1-9: *Outline Drawing of Transmitter Receiver Unit, Type NTG-3230*

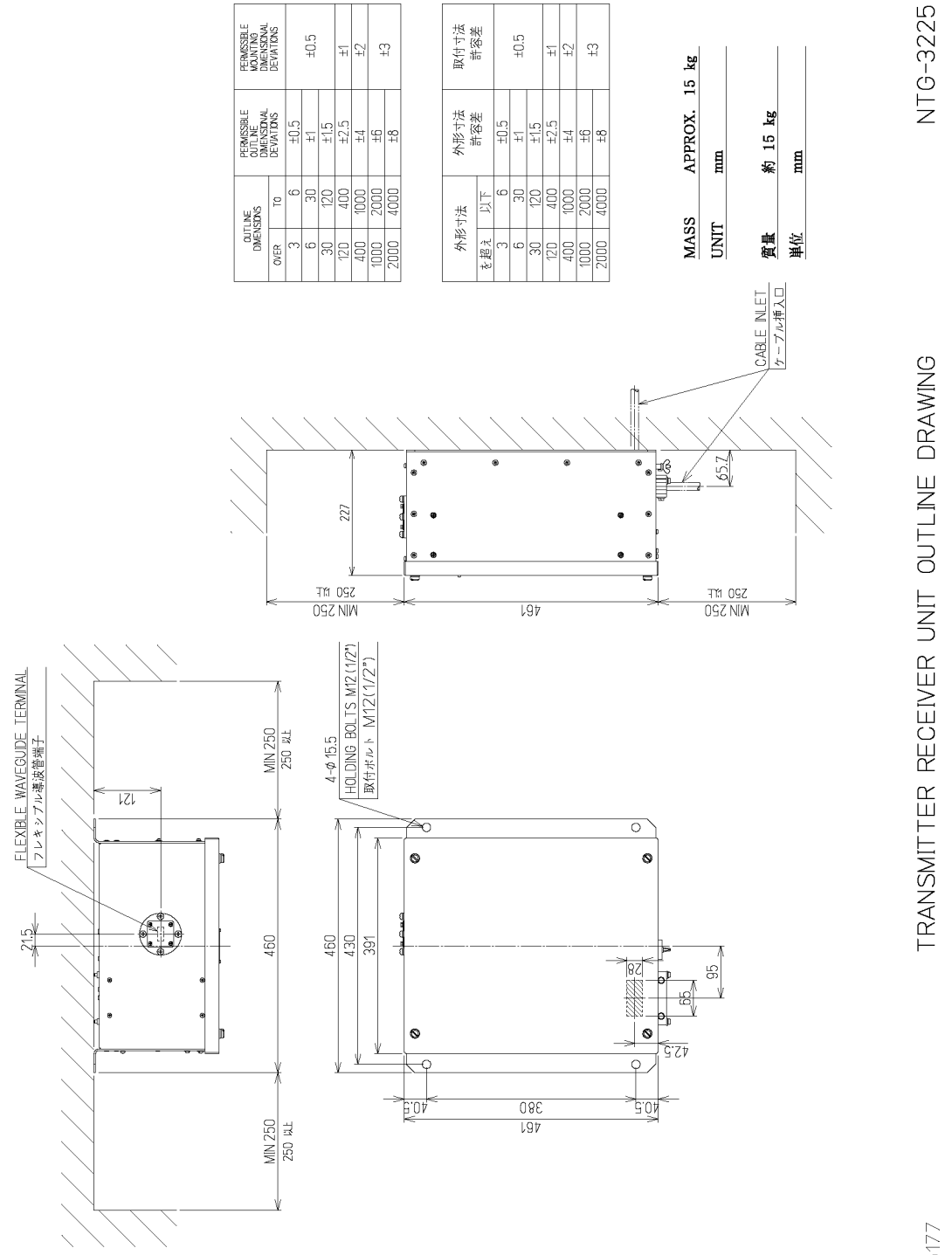


Fig 1-10: *Outline Drawing of Transmitter Receiver Unit, Type NTG-3225*

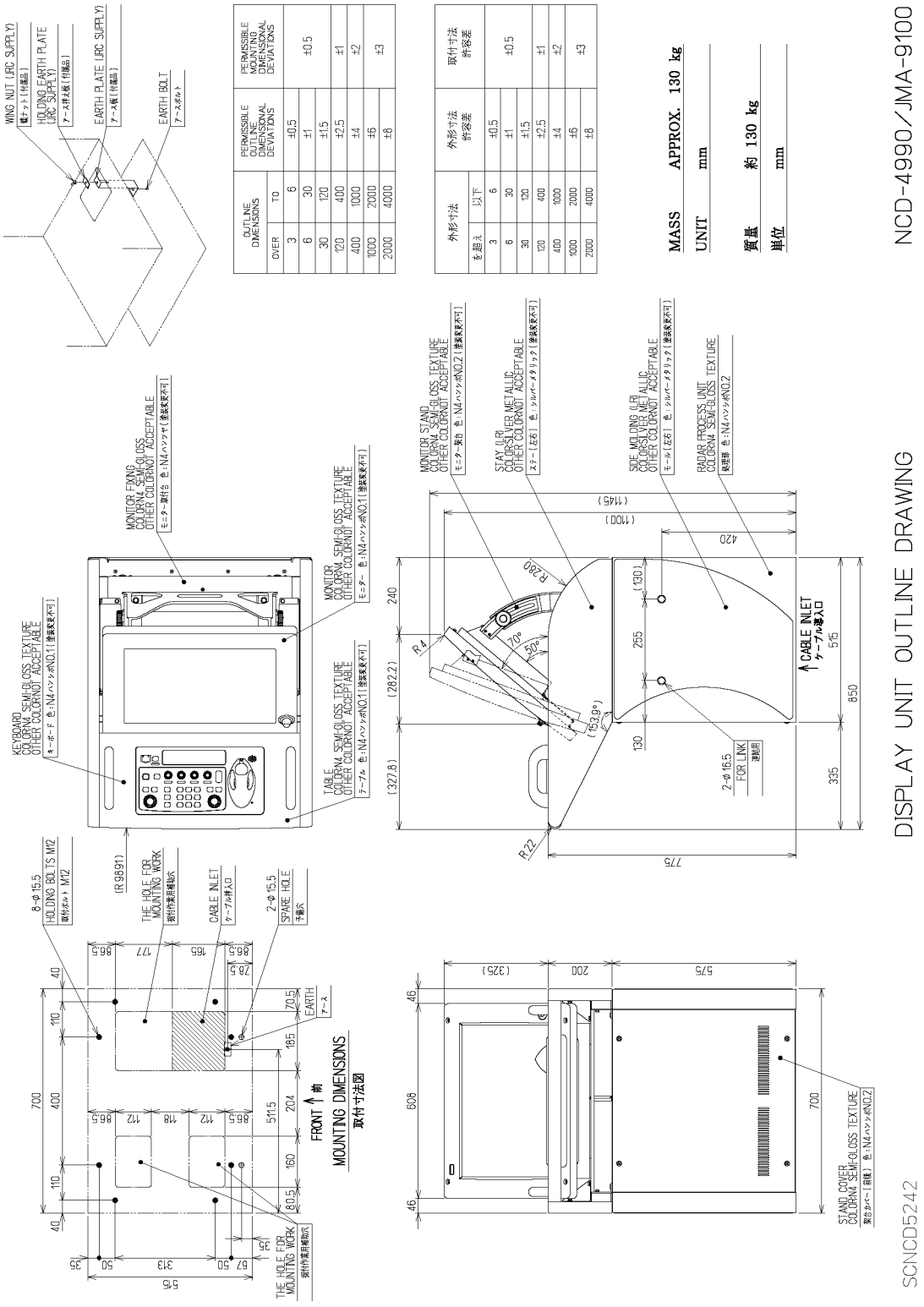


Fig 1-11: *Outline Drawing of Display Unit, Type NCD-4990*

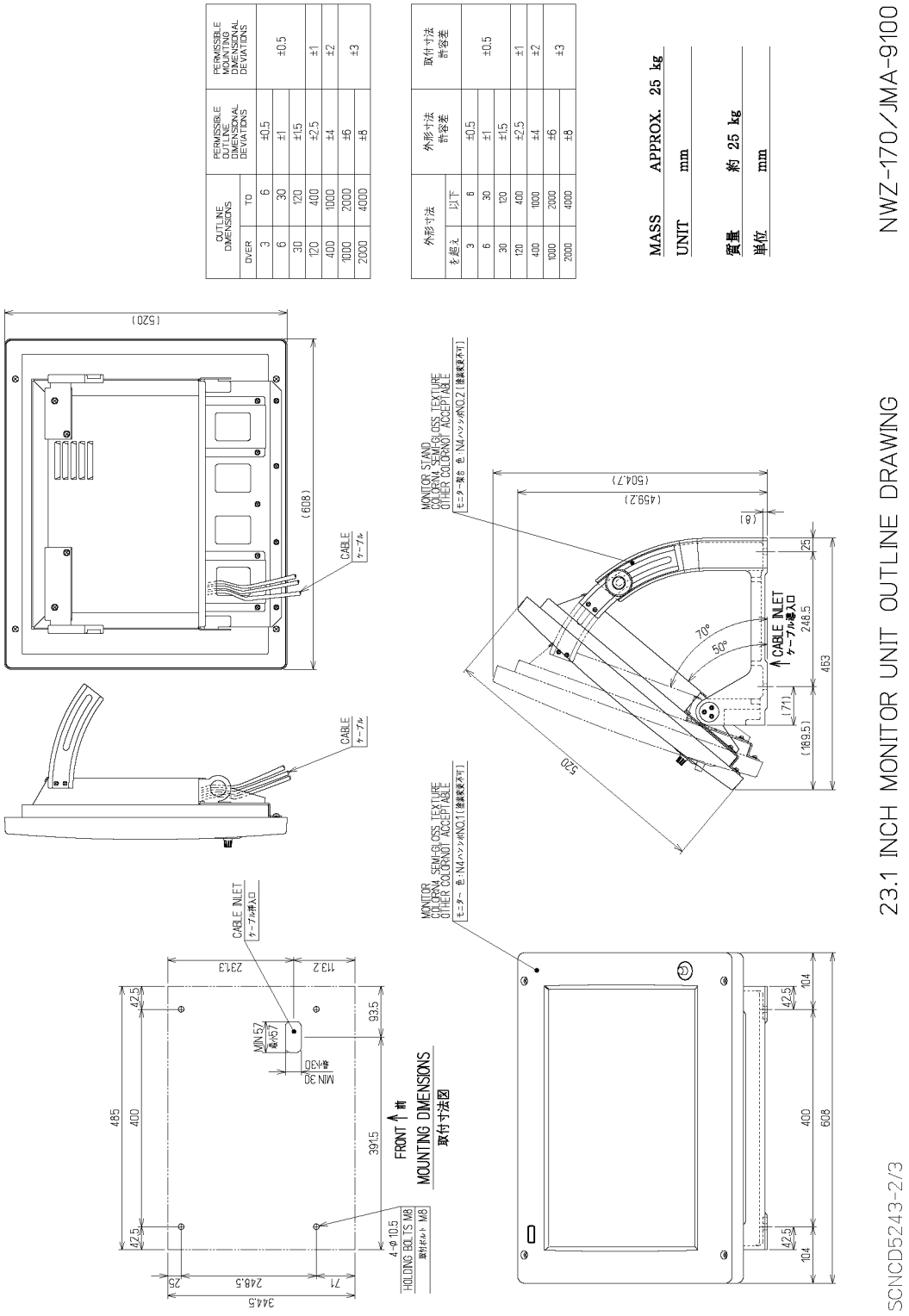
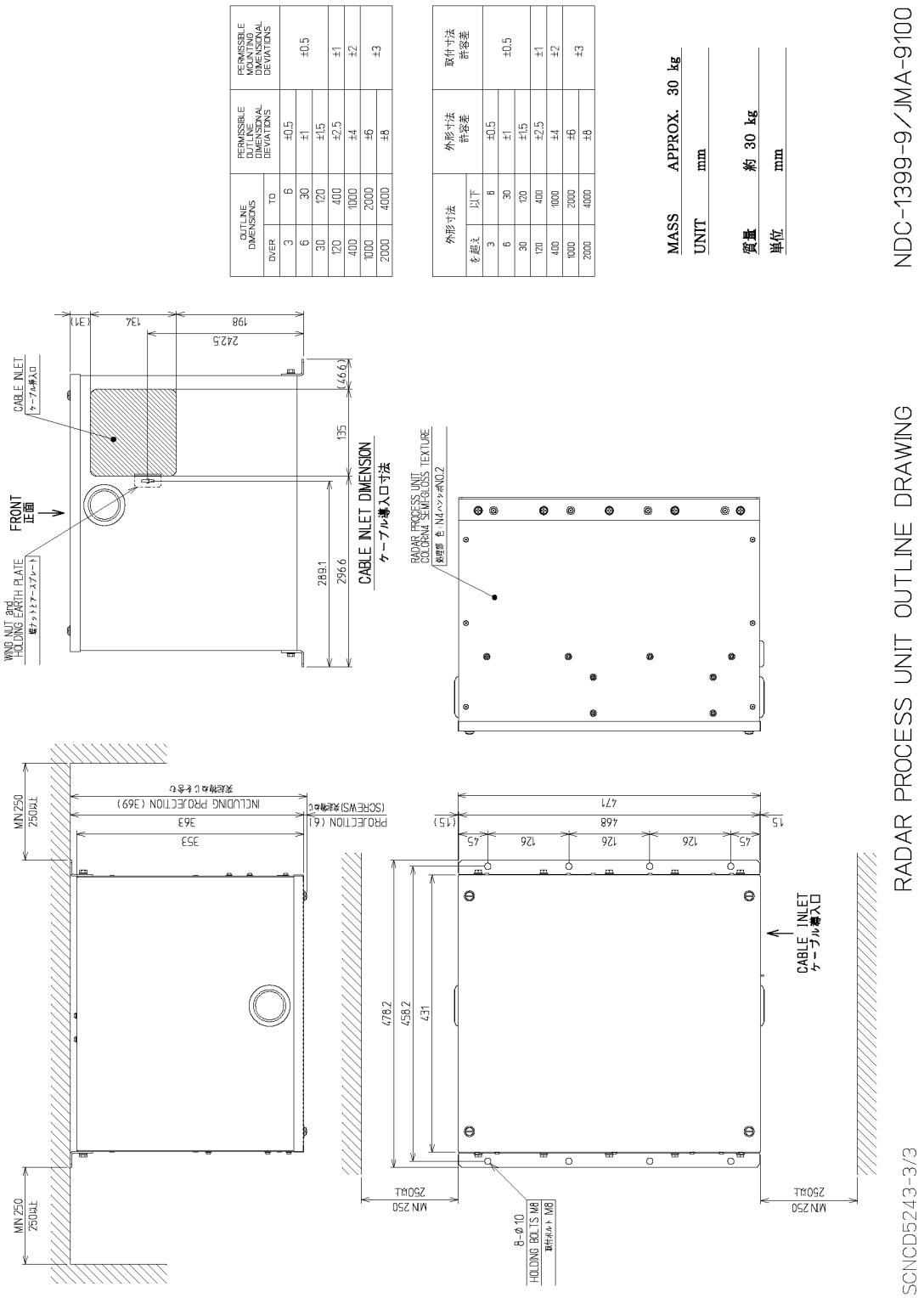


Fig 1-12: *Outline Drawing of Monitor Unit, Type NWZ-170 (Desktop type option)*



OUTLINE DIMENSIONS		PERMISSIBLE DEVIATIONS DIMENSIONAL DEVIATIONS	PERMISSIBLE MUTUAL 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	
120	400	±2.5	±1
400	1000	±4	±2
1000	2000	±6	±3
2000	4000	±8	

Fig 1-13: *NDOutline Drawing of Radar Process Unit, Type NDC-1399-9 (Desktop type option)*

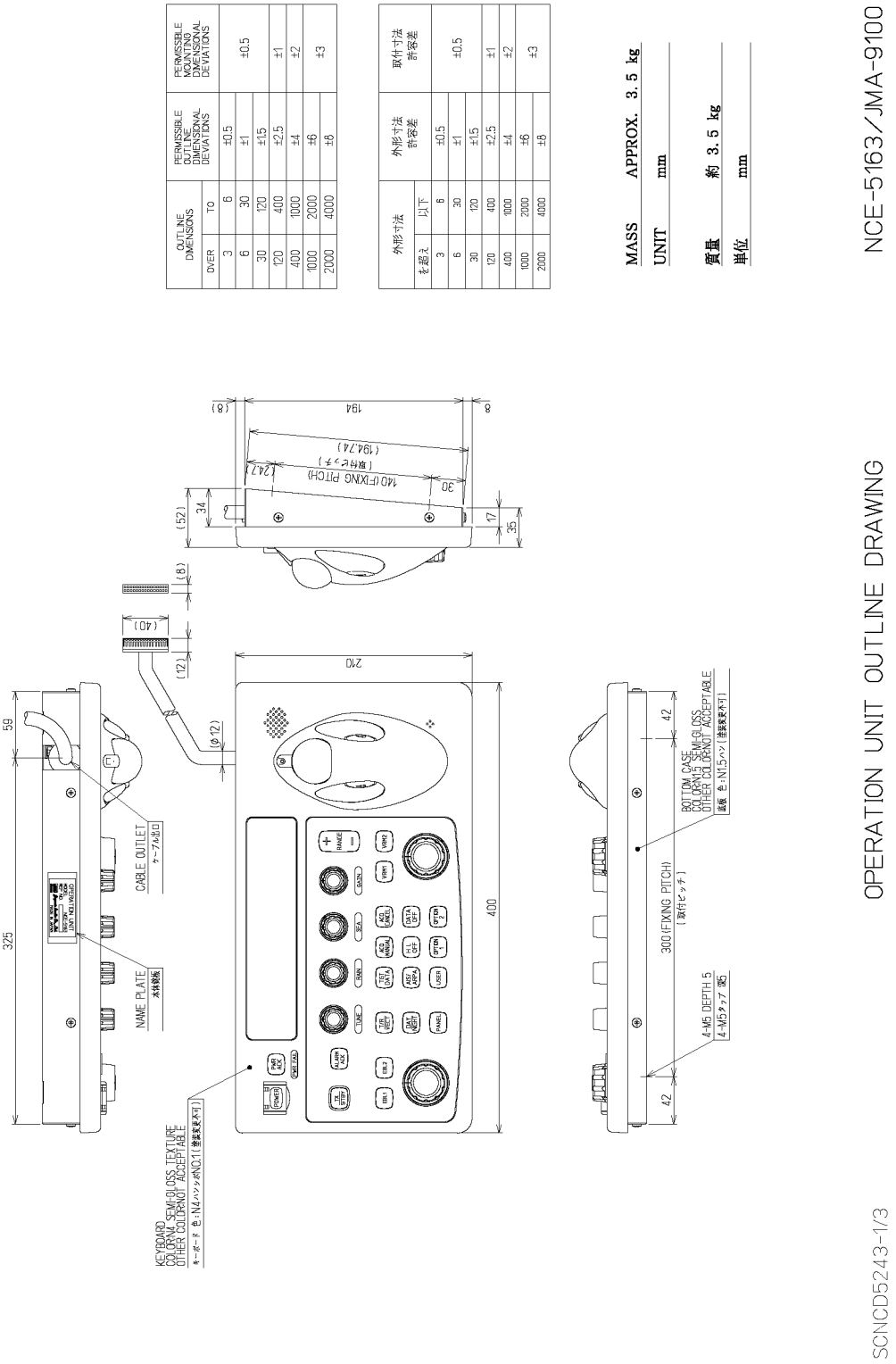


Fig 1-14: *Outline Drawing of Operation Unit, Type NCE-5163 (Desktop type option)*

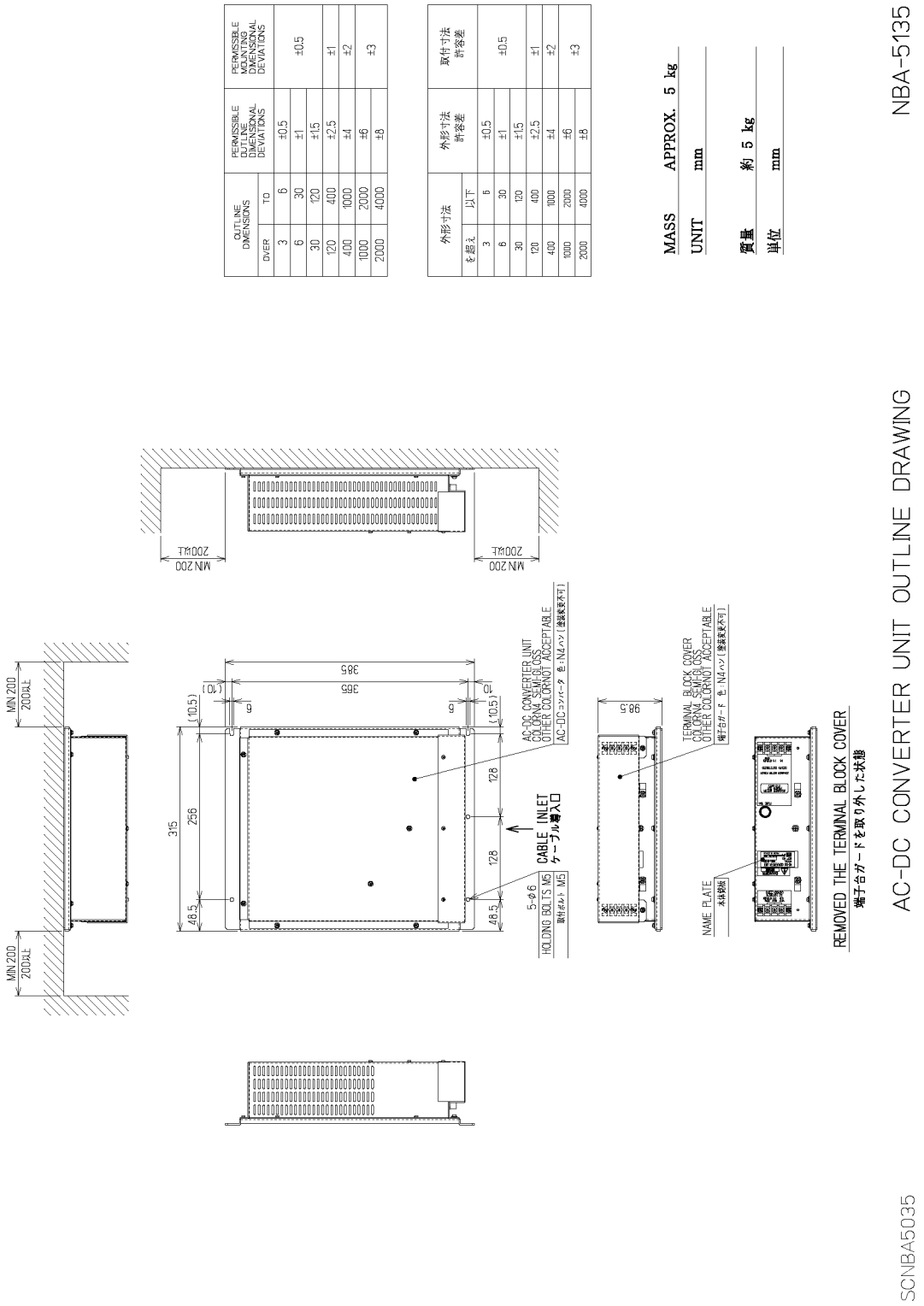


Fig 1-15: *Outline Drawing of AC/DC Converter, Type NBA-5135 (Desktop type option)*

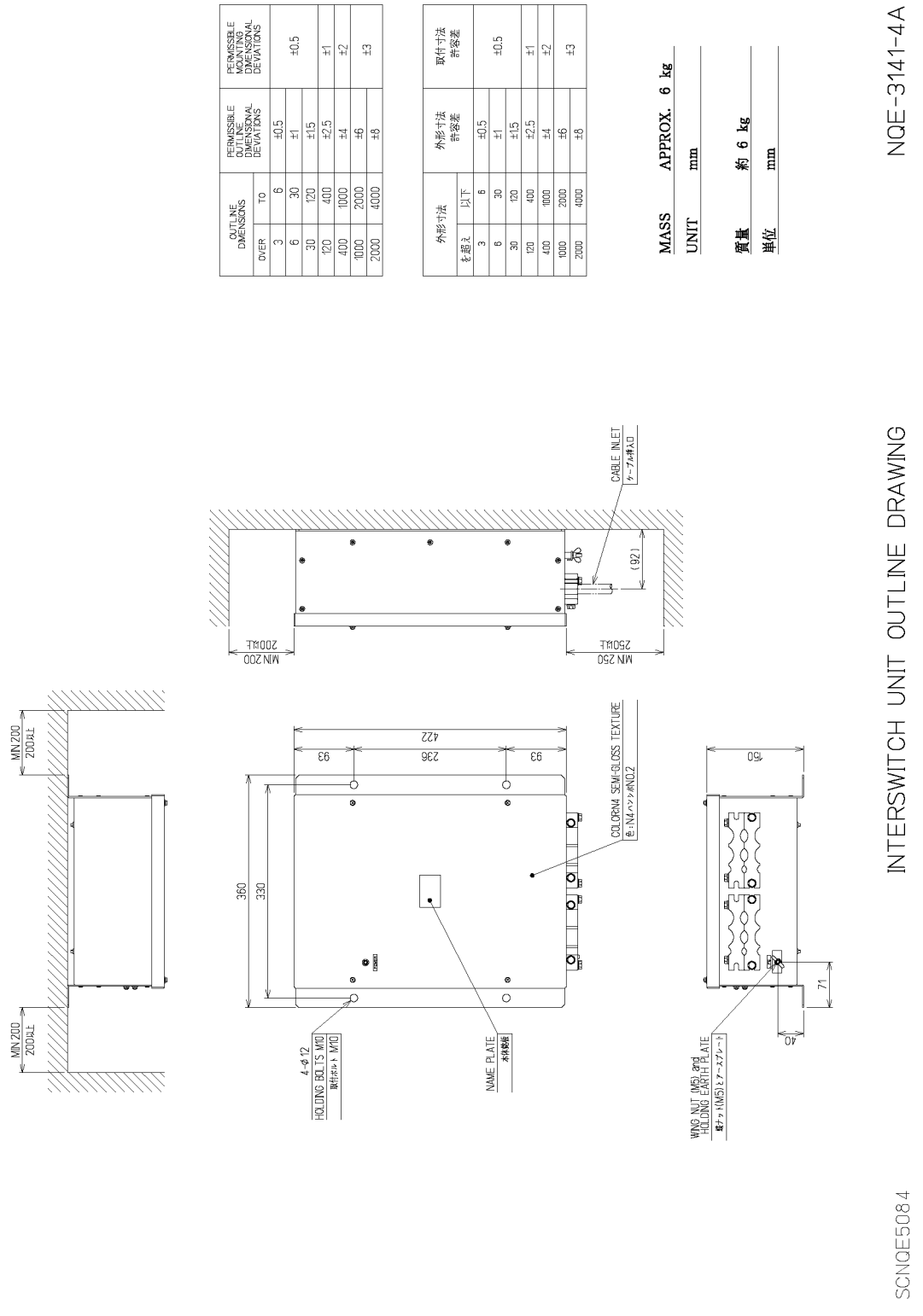


Fig 1-16: *Outline Drawing of Interswitch Unit, Type NQE-3141-4A (Option)*

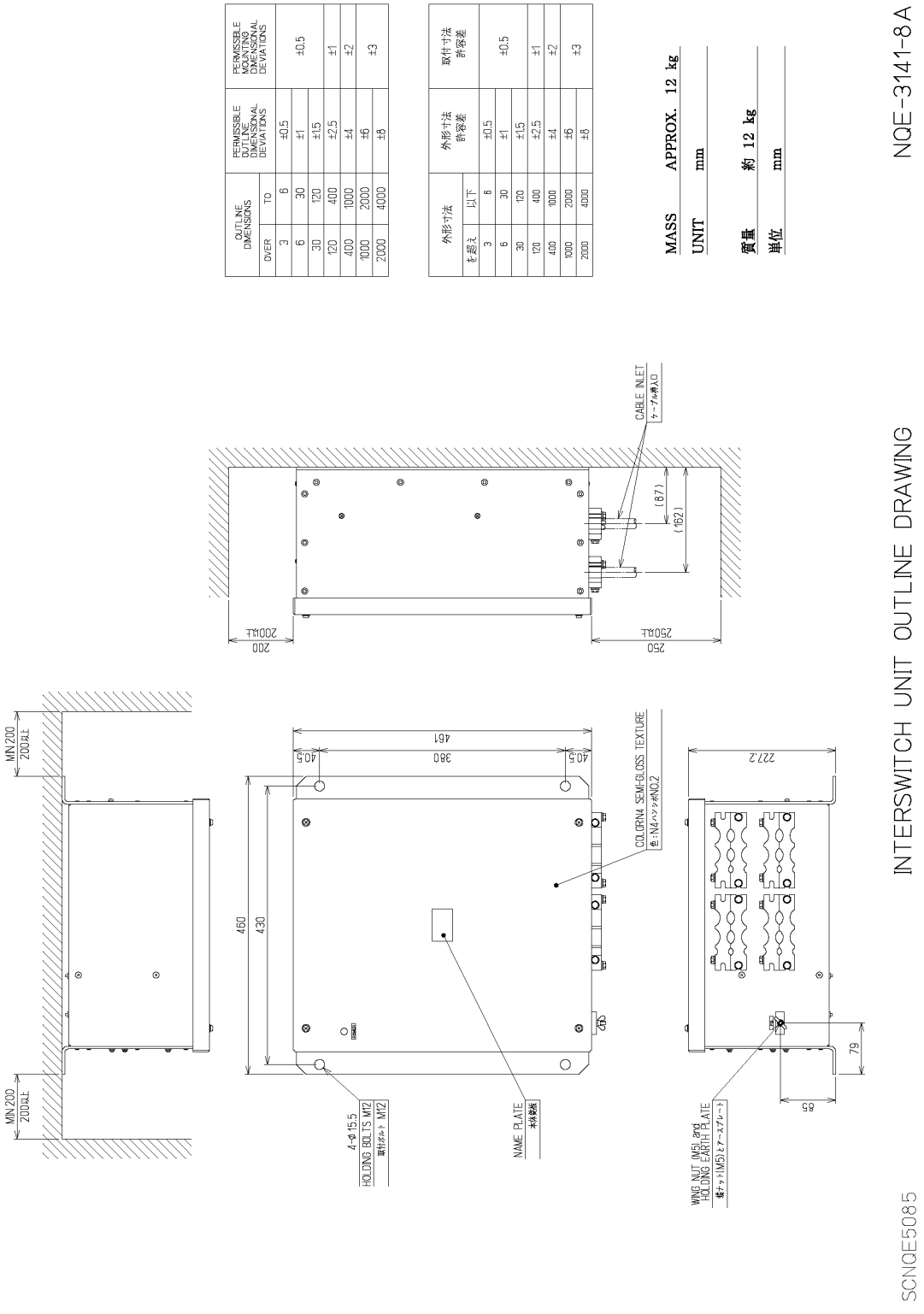


Fig 1-17: *Outline Drawing of Interswitch Unit, Type NQE-3141-8A (Option)*

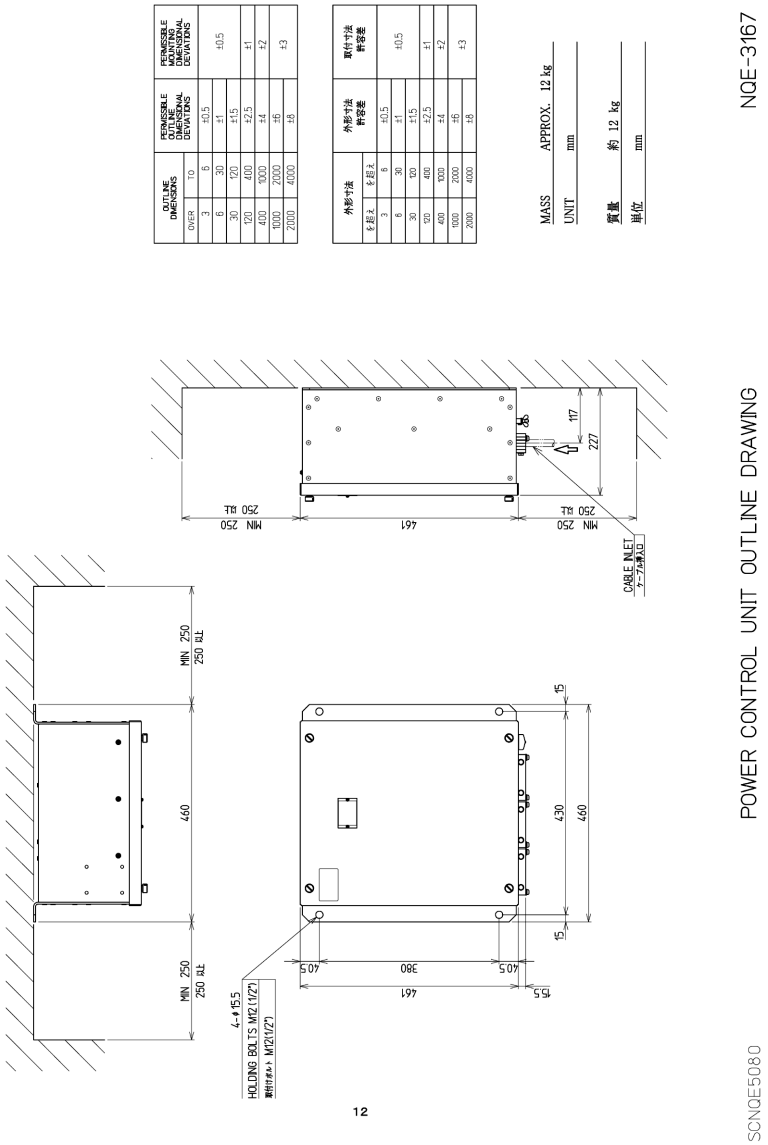


Fig 1-18: *Outline Drawing of Power Control Unit, Type NQE-3167 (Option)*

1.5 GENERAL SYSTEM DIAGRAMS

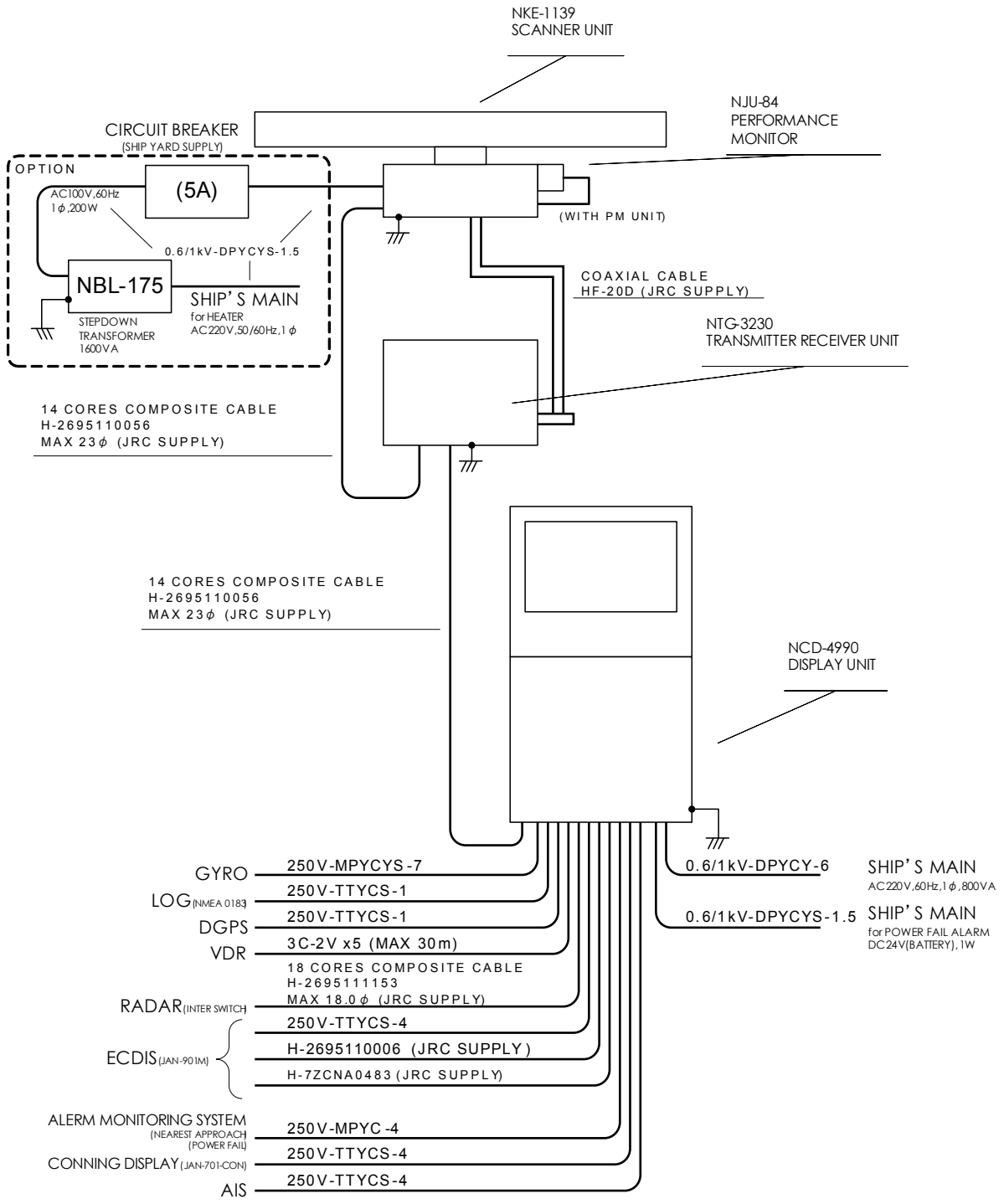


Fig 1-19: *General System Diagram of Radar, Type JMA-9133-SA*

Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment.(Ex. Radiotelephone. Communications receiver and direction finder, etc.)
Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.

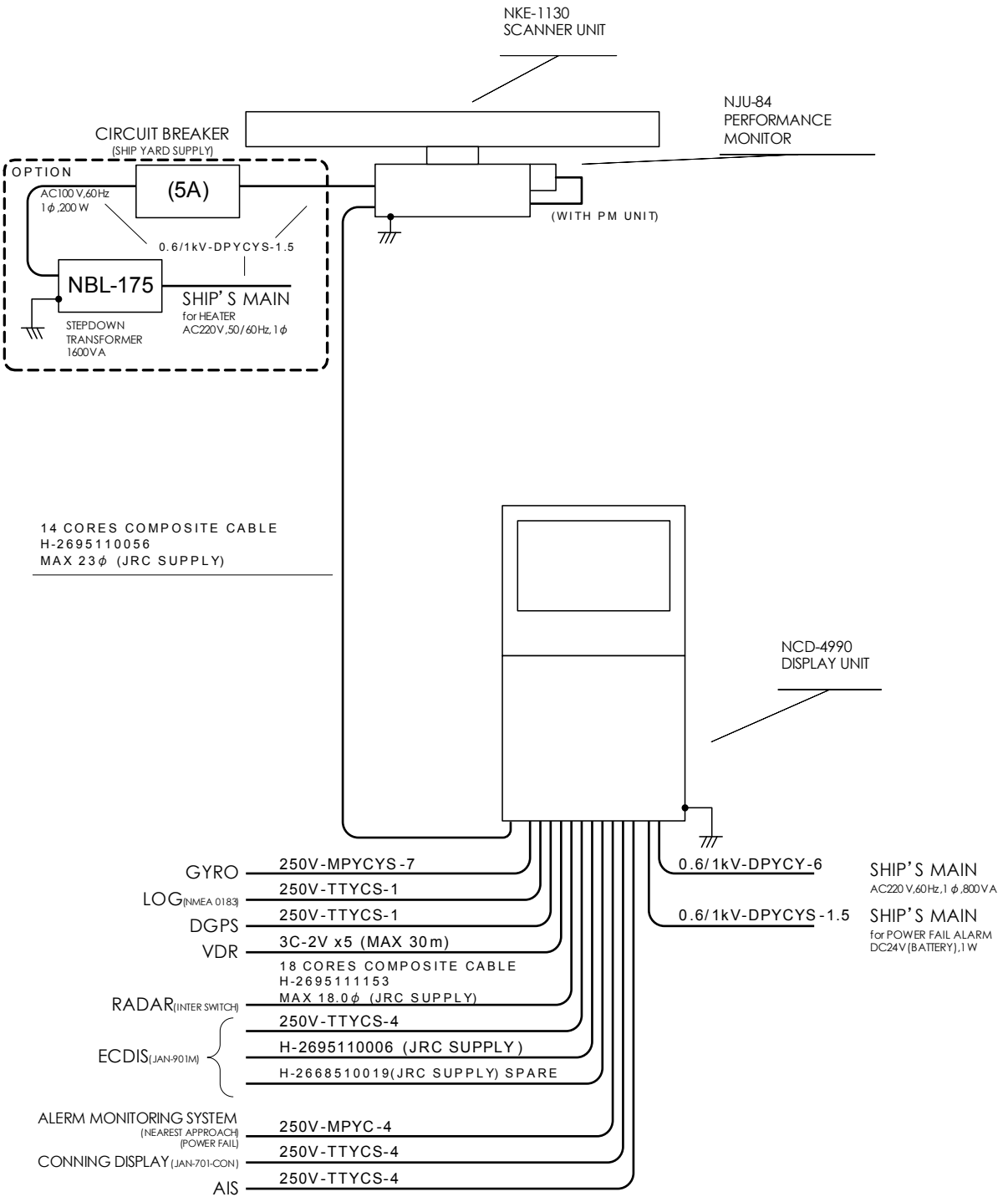


Fig 1-20: *General System Diagram of Radar, Type JMA-9132-SA*

Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment.(Ex. Radiotelephone. Communications receiver and direction finder, etc.) Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.

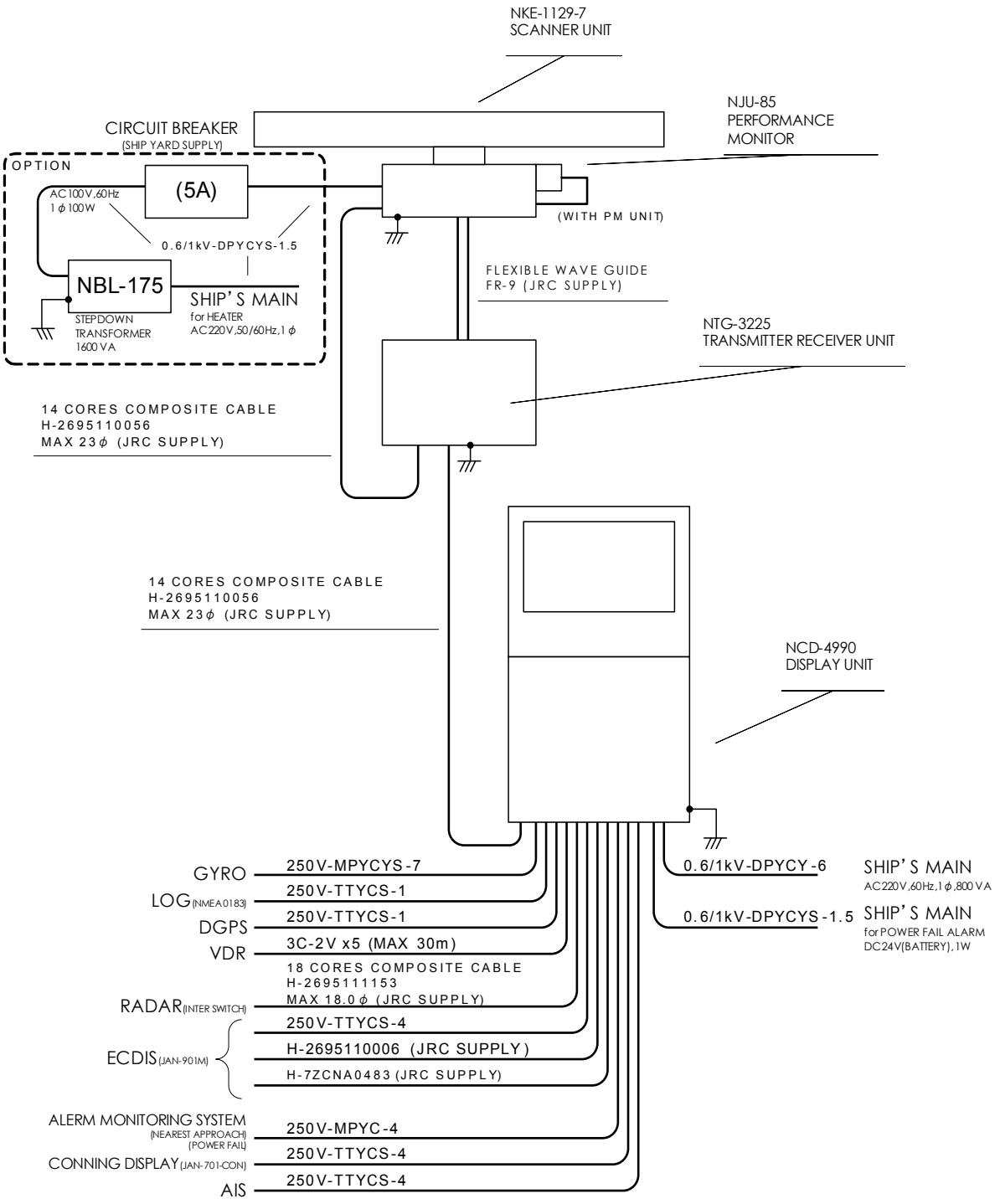


Fig 1-21: *General System Diagram of Radar, Type JMA-9123-7XA*

Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment.(Ex. Radiotelephone. Communications receiver and direction finder, etc.)
Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.

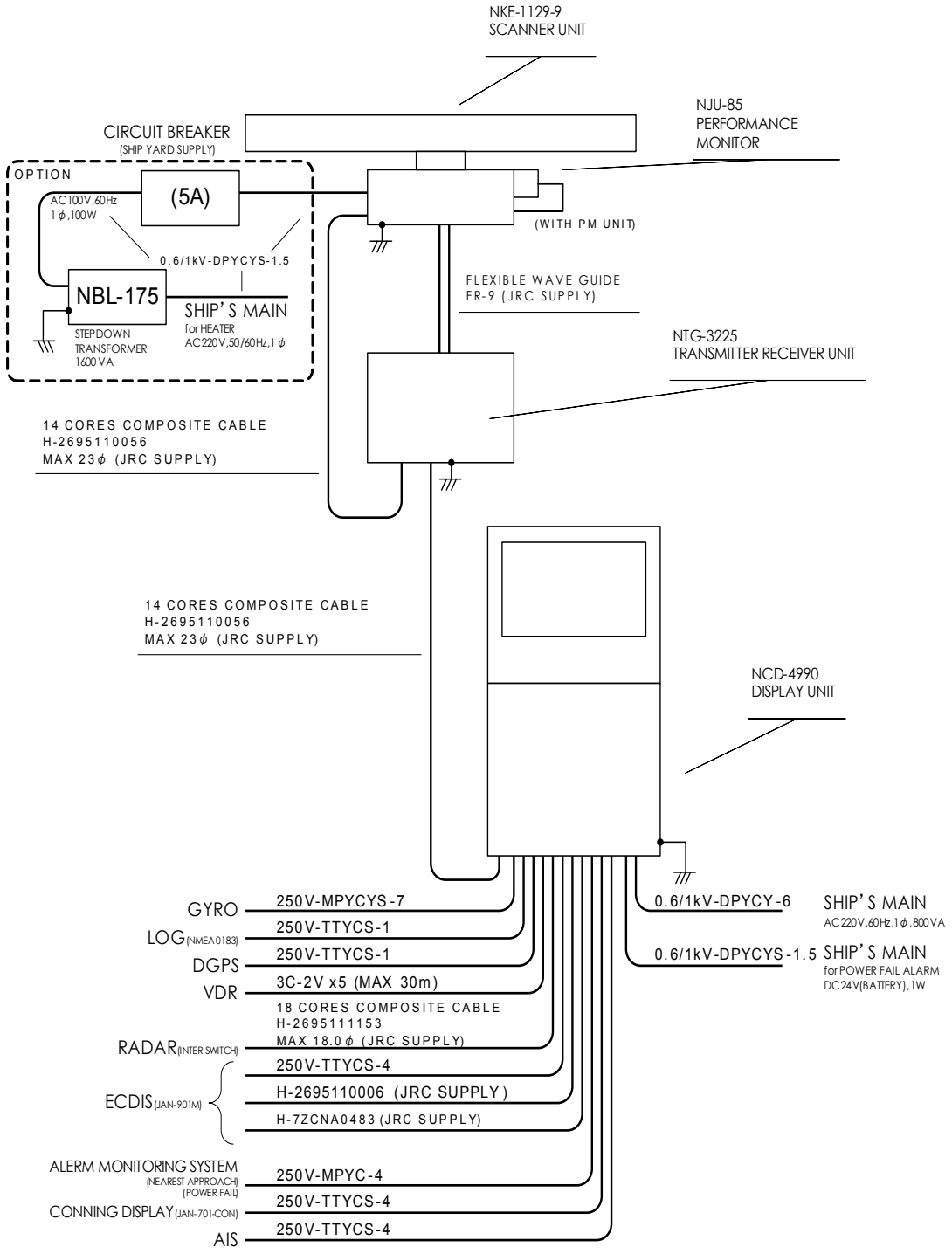


Fig 1-22: *General System Diagram of Radar, Type JMA-9123-9XA*

Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment.(Ex. Radiotelephone. Communications receiver and direction finder, etc.) Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.

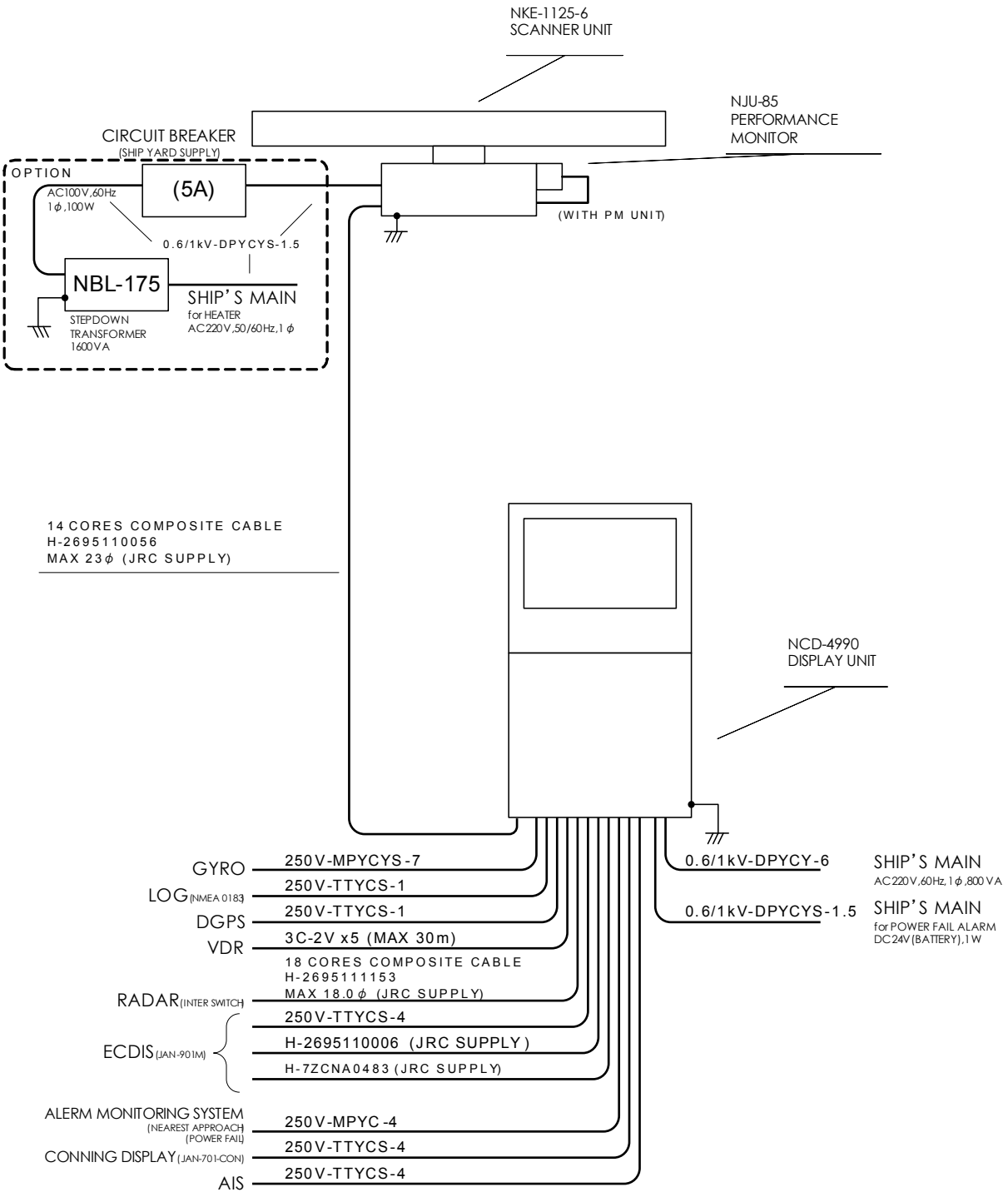


Fig 1-23: *General System Diagram of Radar, Type JMA-9122-6XA*

Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment.(Ex. Radiotelephone. Communications receiver and direction finder, etc.)
Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.

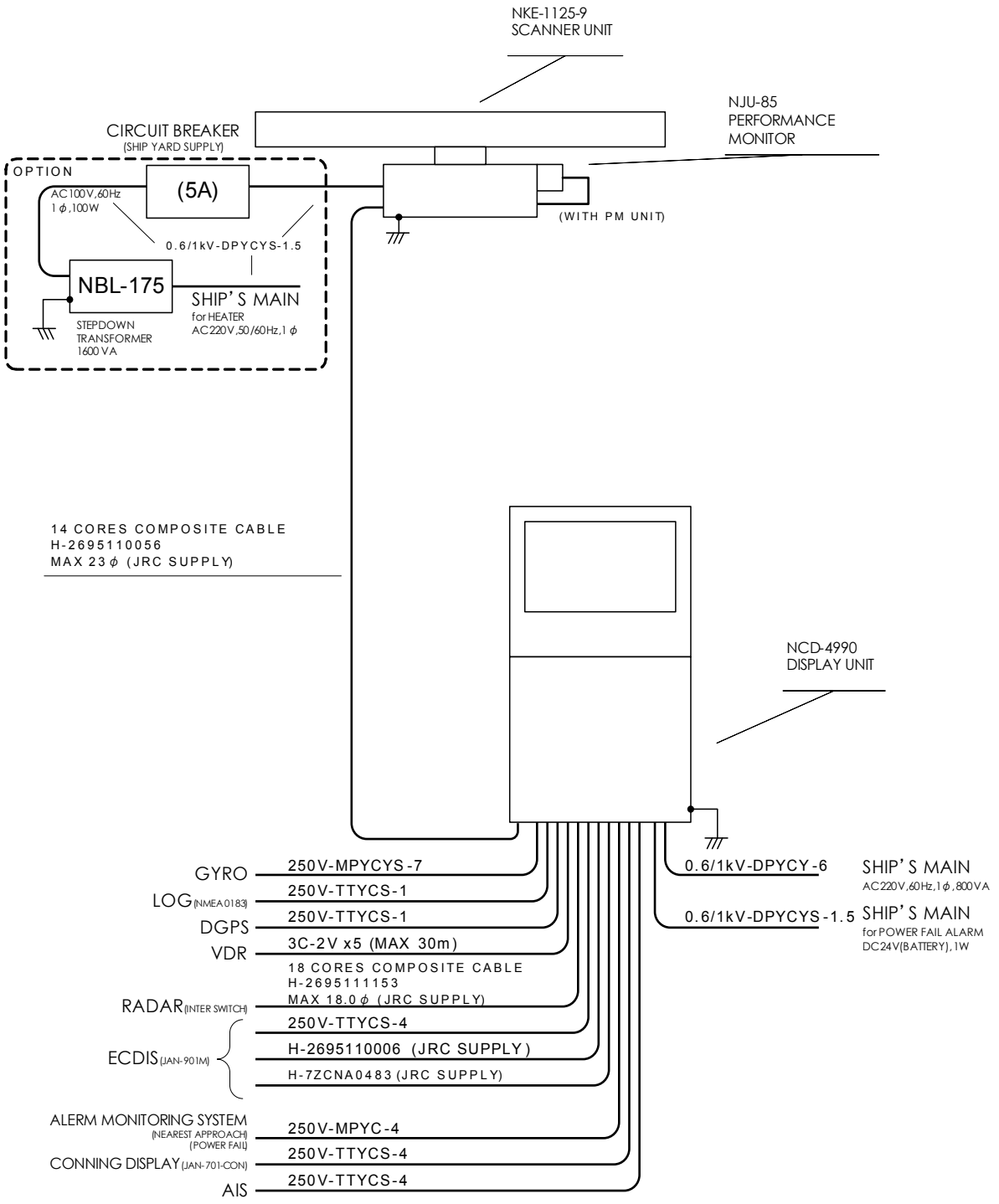


Fig 1-24: *General System Diagram of Radar, Type JMA-9122-9XA*

Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment.(Ex. Radiotelephone. Communications receiver and direction finder, etc.)
Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.

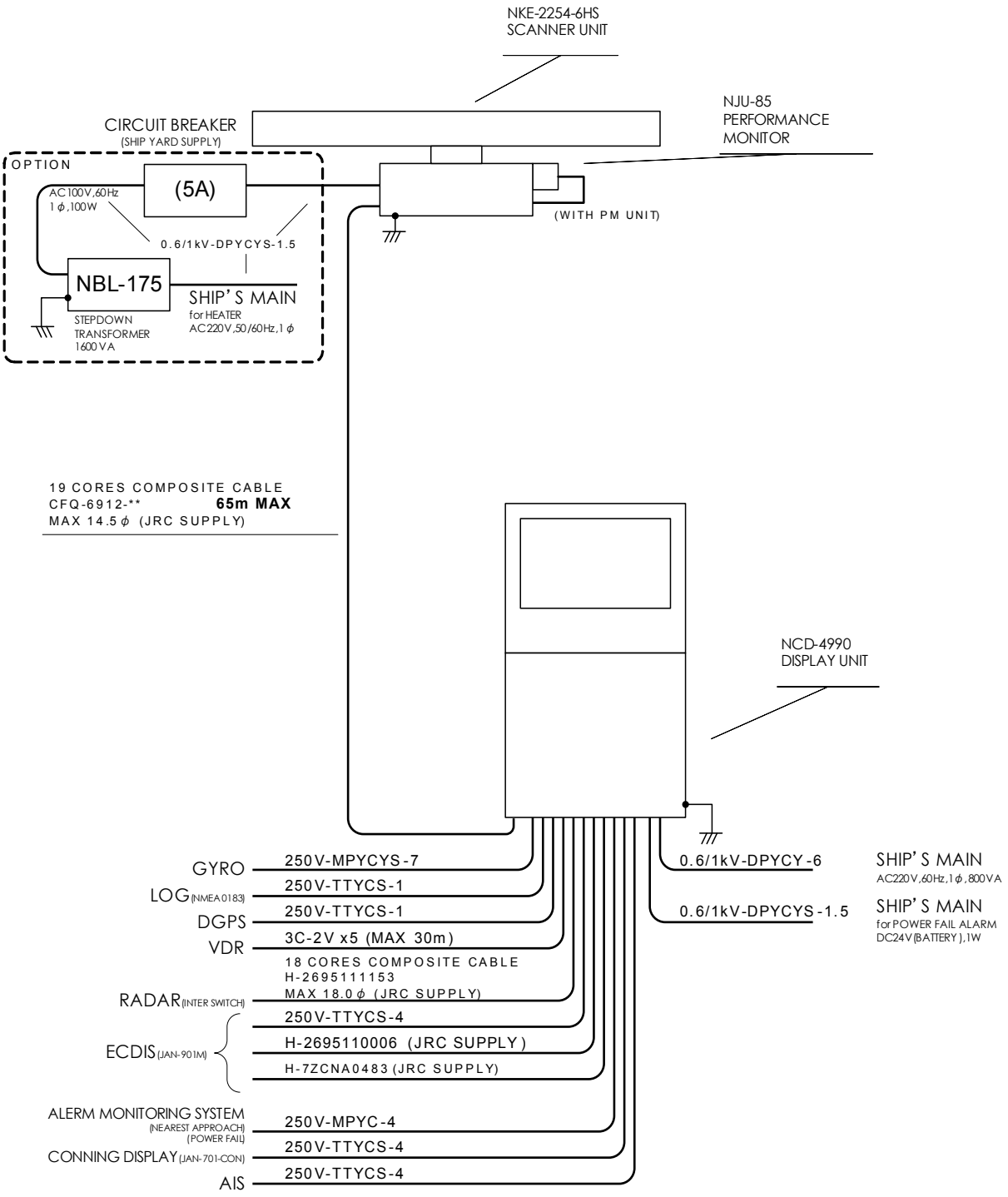


Fig 1-25: *General System Diagram of Radar, Type JMA-9122-6XAH*

Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment.(Ex. Radiotelephone. Communications receiver and direction finder, etc.)
Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.

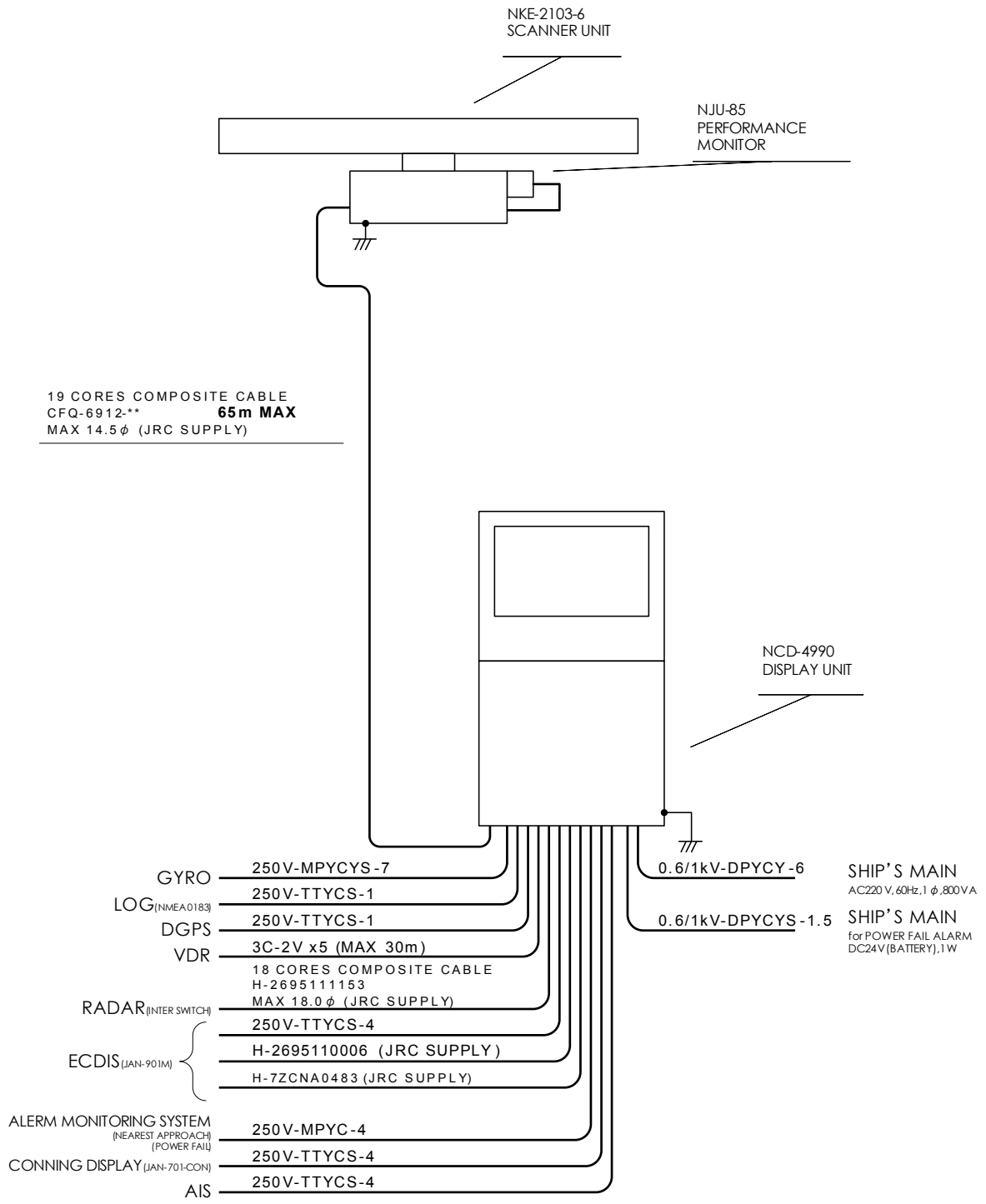


Fig 1-26: *General System Diagram of Radar, Type JMA-9110-6XA*

Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment.(Ex. Radiotelephone. Communications receiver and direction finder, etc.) Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.

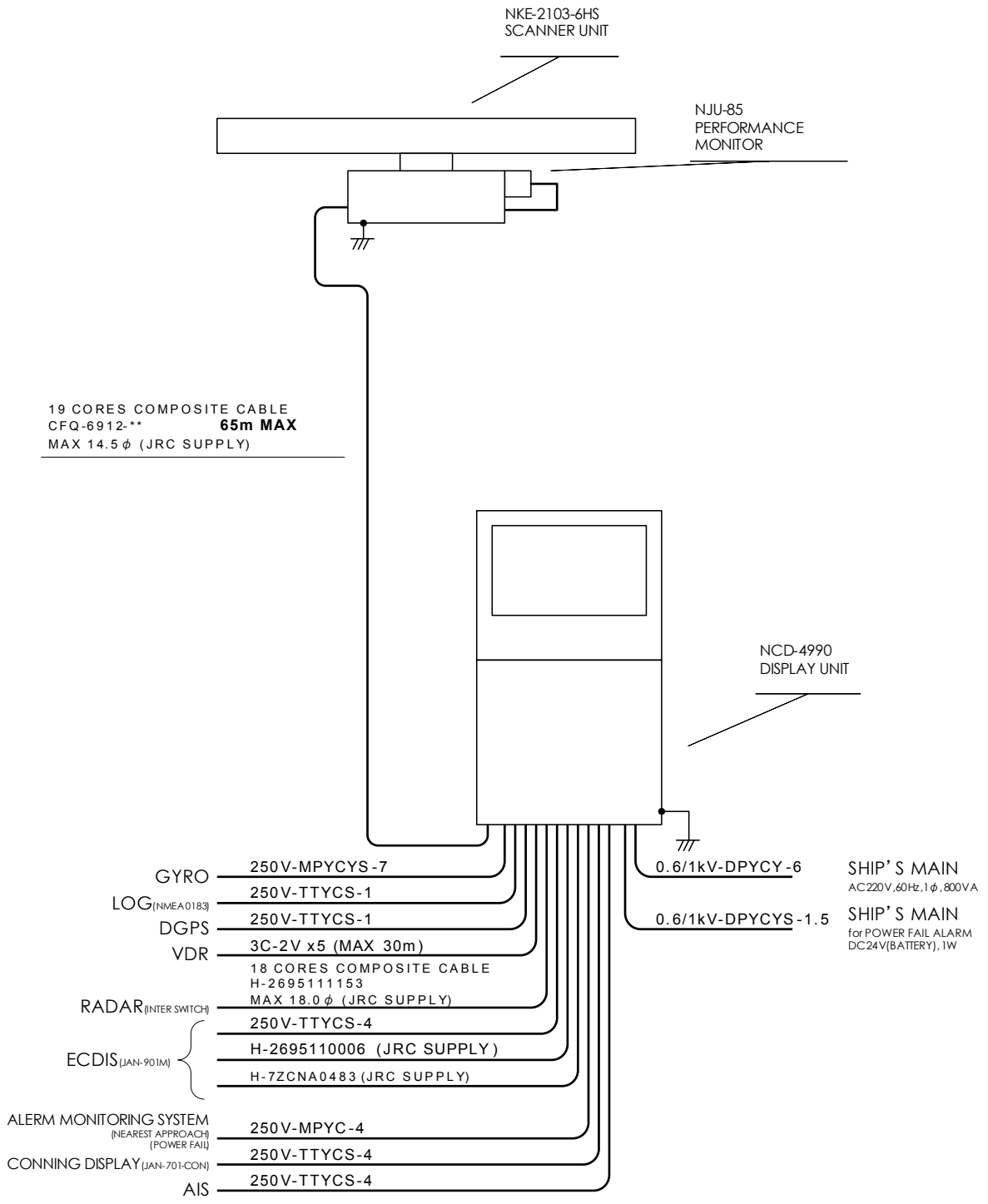
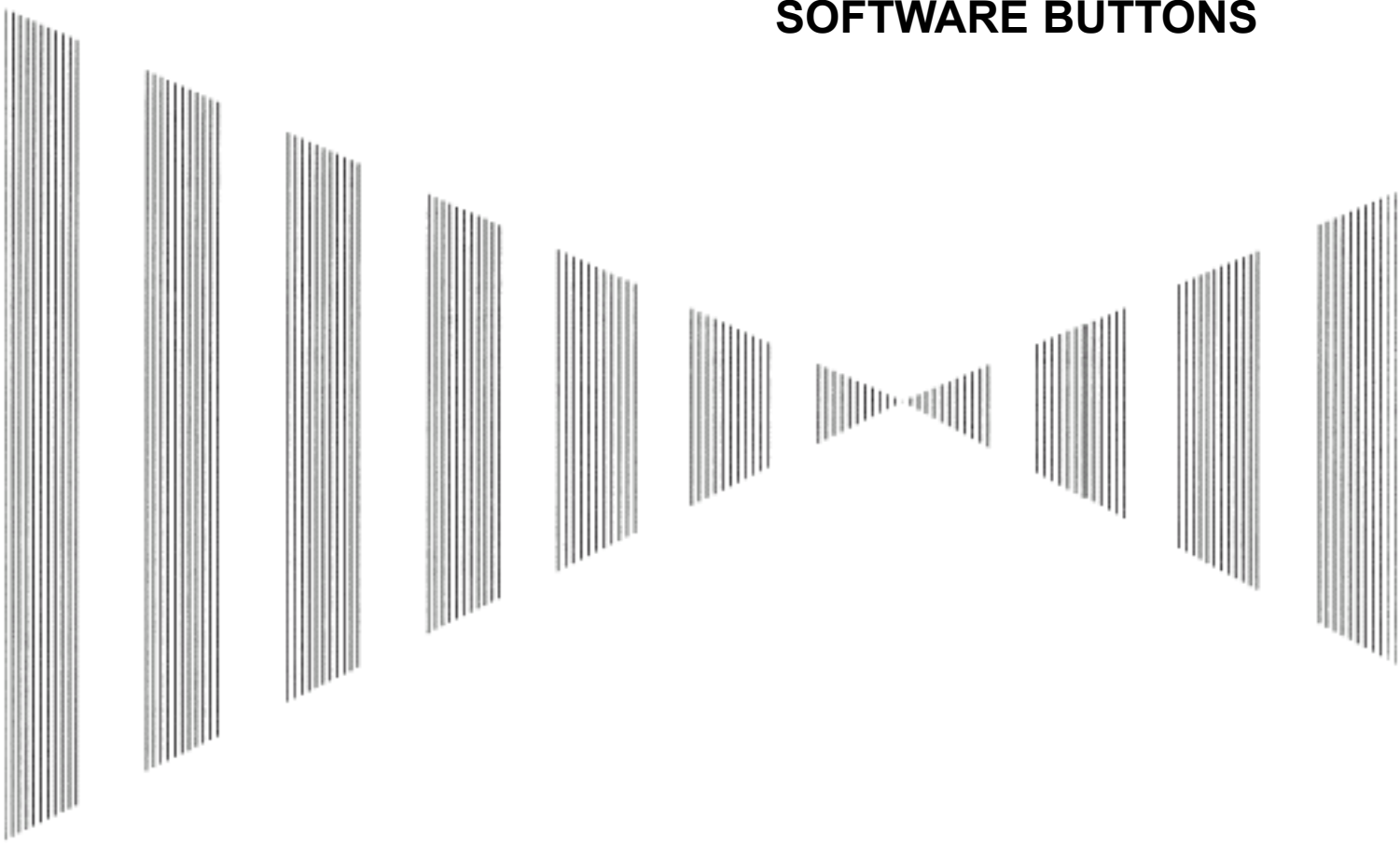


Fig 1-27: *General System Diagram of Radar, Type JMA-9110-6XAH*

Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment.(Ex. Radiotelephone. Communications receiver and direction finder, etc.)
Especially inter-wiring cables between scanner unit and display unit of the radar should not be run parallel with the cables of radio equipment.

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

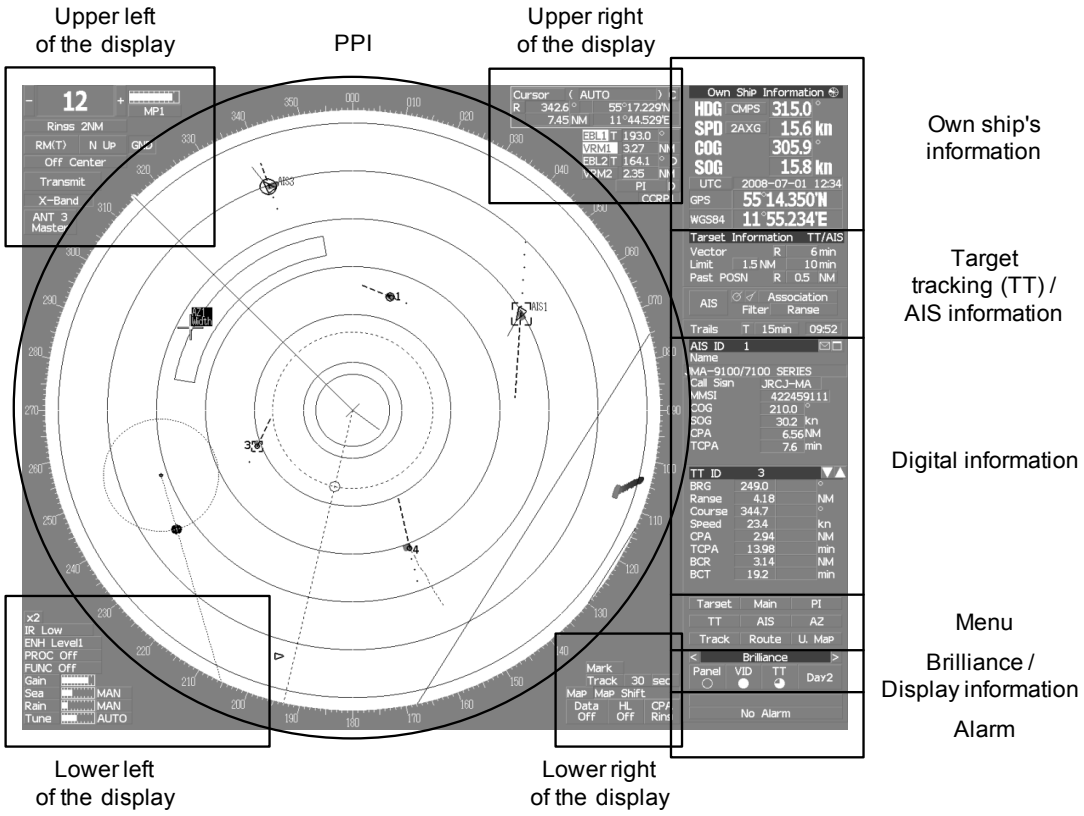


NAMES AND FUNCTIONS OF CONTROL PANEL KEYS AND FUNCTIONS OF SOFTWARE BUTTONS

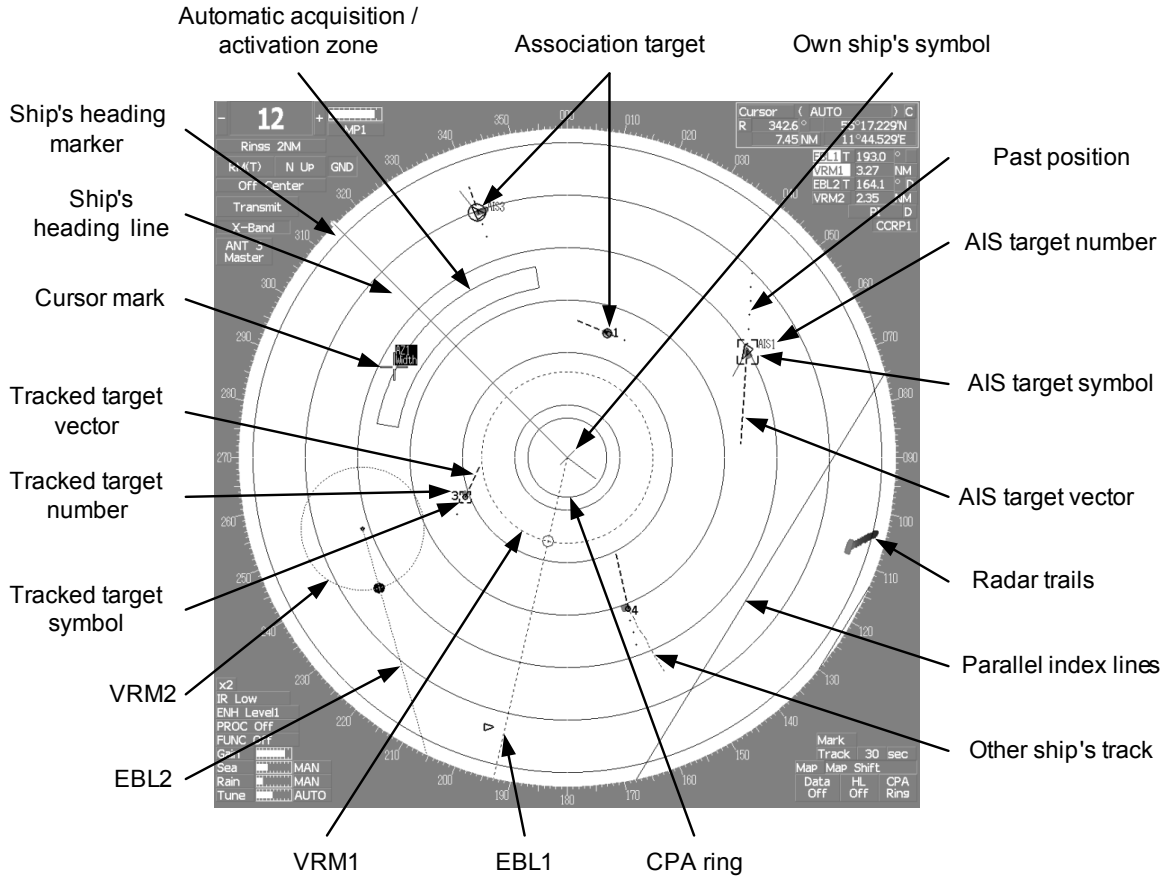
2.1 NAMES OF DISPLAY

Example of screen display

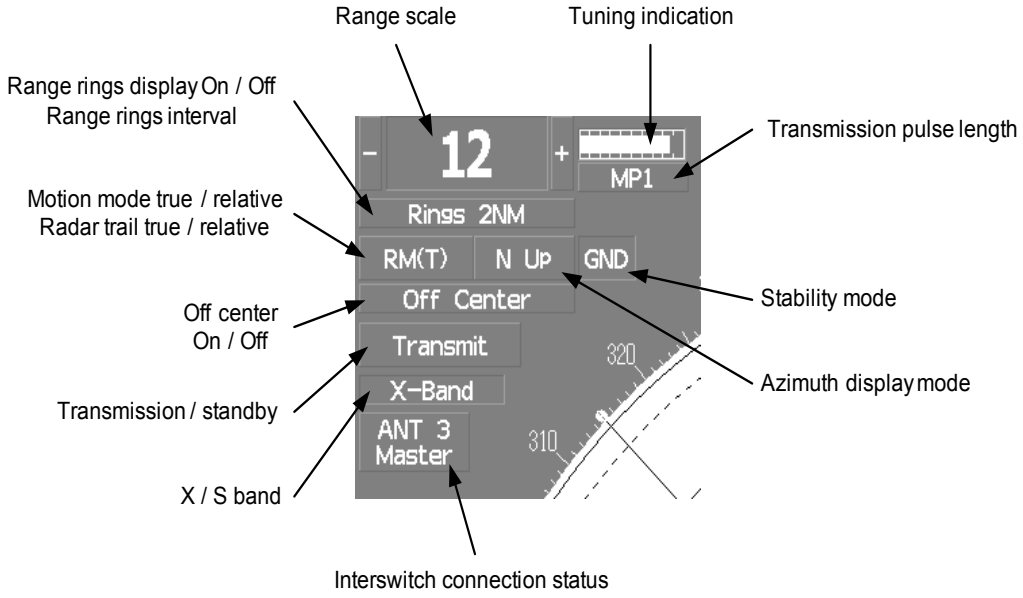
In this example, the screen is divided into a number of areas and the names in each area are indicated.



PPI


Automatic acquisition / activation zone
Association target
Own ship's symbol
Ship's heading marker
Ship's heading line
Cursor mark
Tracked target vector
Tracked target number
Tracked target symbol
VRM2
EBL2
Past position
AIS target number
AIS target symbol
AIS target vector
Radar trails
Parallel index lines
Other ship's track
VRM1
EBL1
CPA ring

Upper left of the display



About ground and sea stabilization

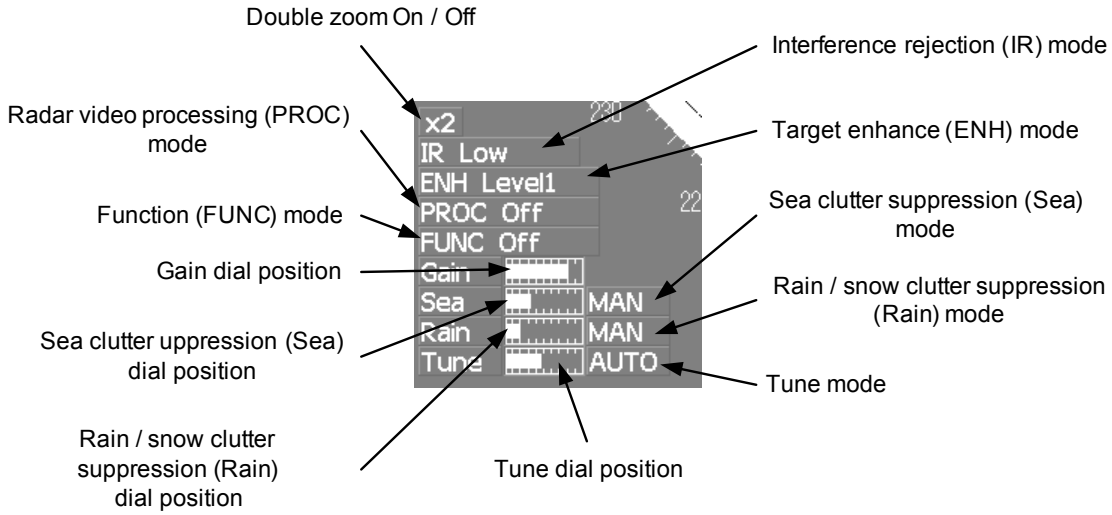
Speed sensor source is MAN , LOG , 2AXW

If Set/Drift Setting menu is on : GND (Ground stabilization)

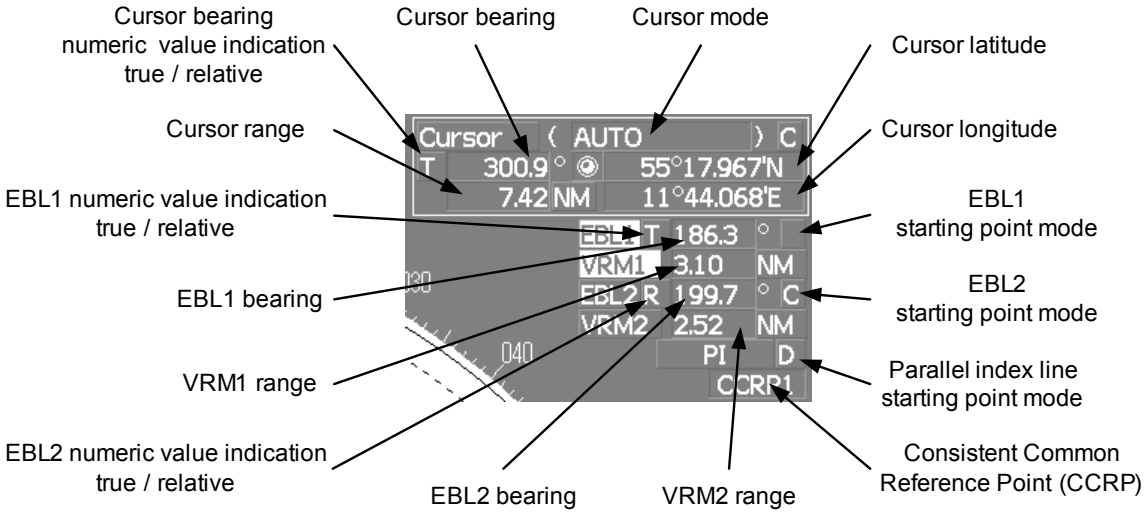
If Set/Drift Setting menu is off : Sea (Sea stabilization)

Speed sensor source is GPS , 2AXG : GND (Ground stabilization)

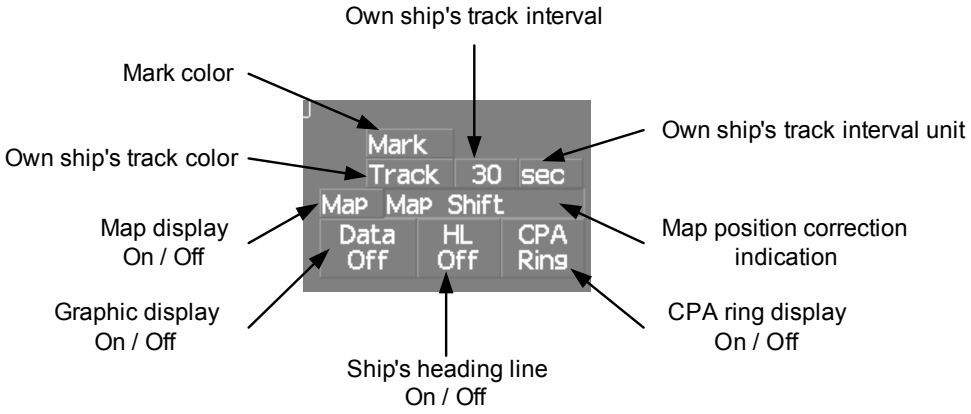
Lower left of the display



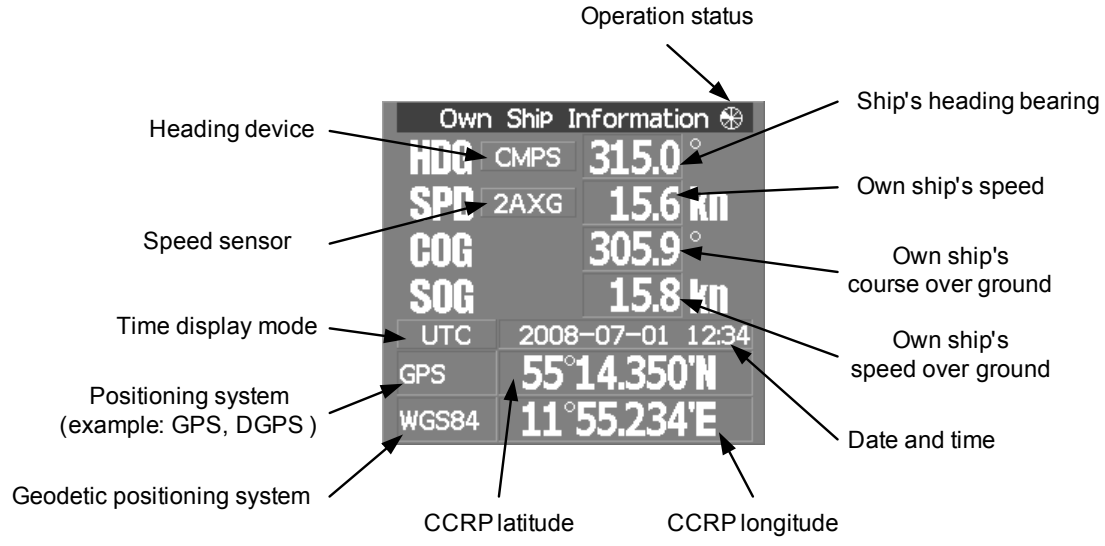
Upper right of the display



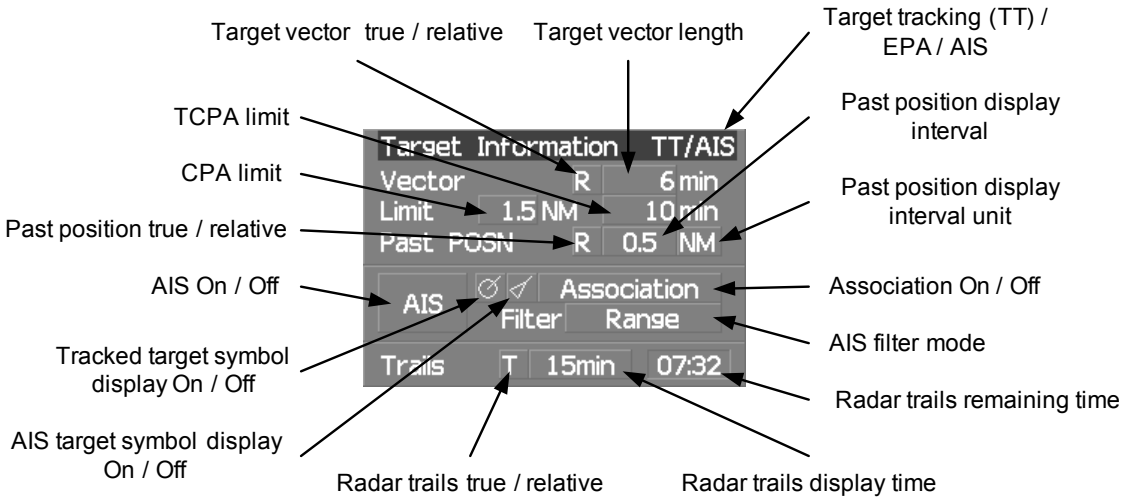
Lower right of the display



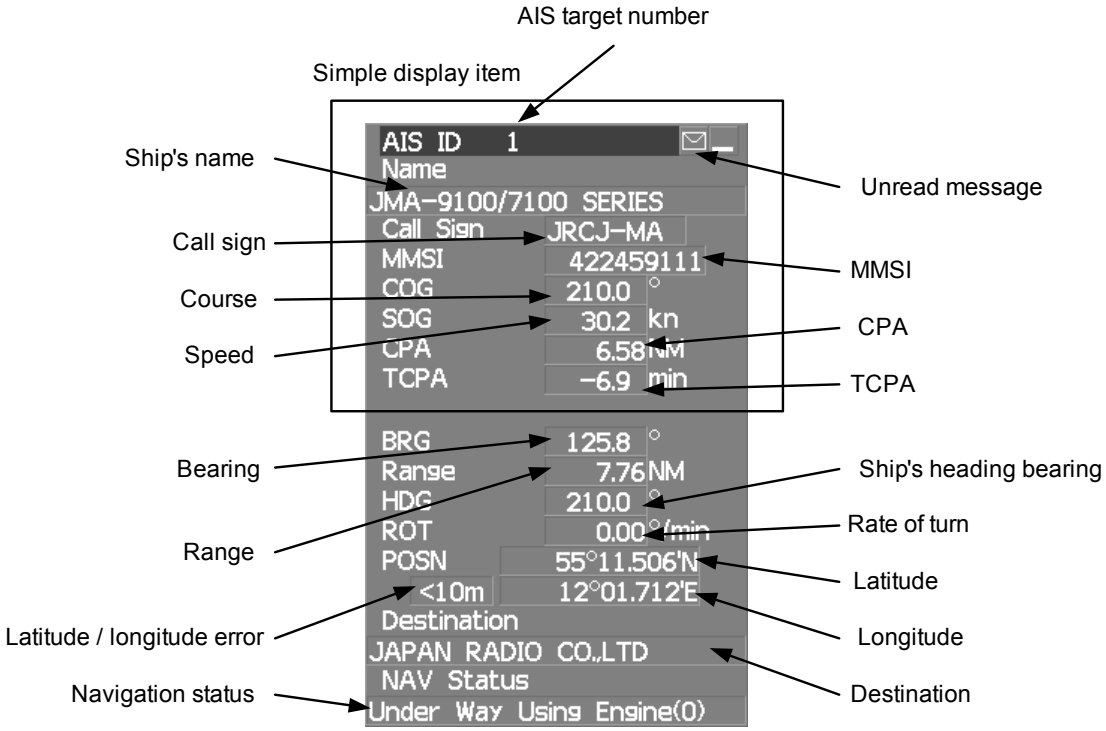
Own ship's information



Target tracking (TT) / AIS information



Numeric information: AIS target information



About time display mode

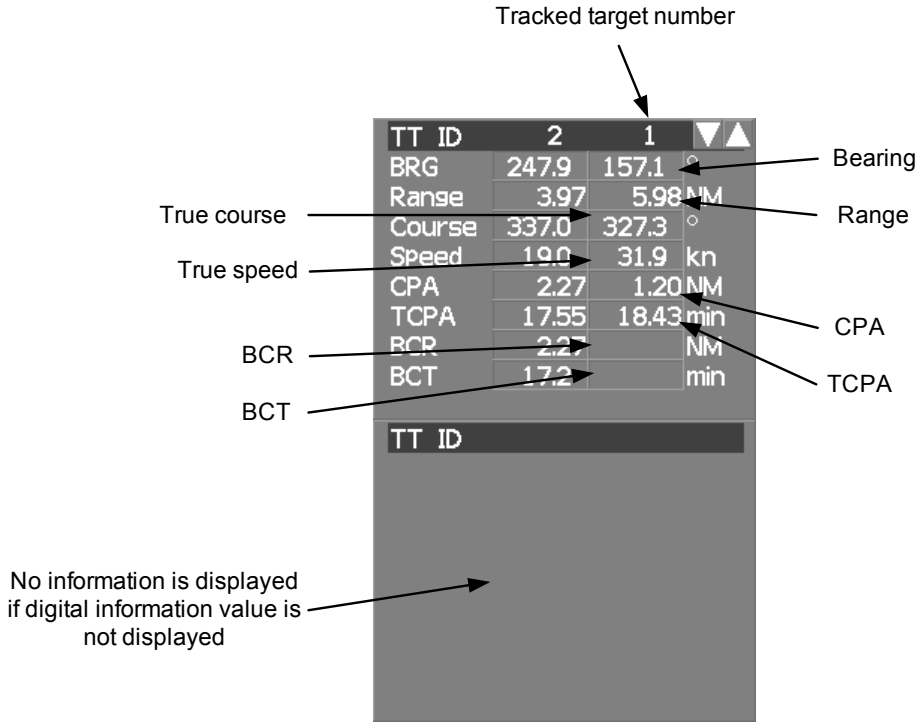
UTC : Universal Time Coordinate

UTC(S) : UTC (System Time)

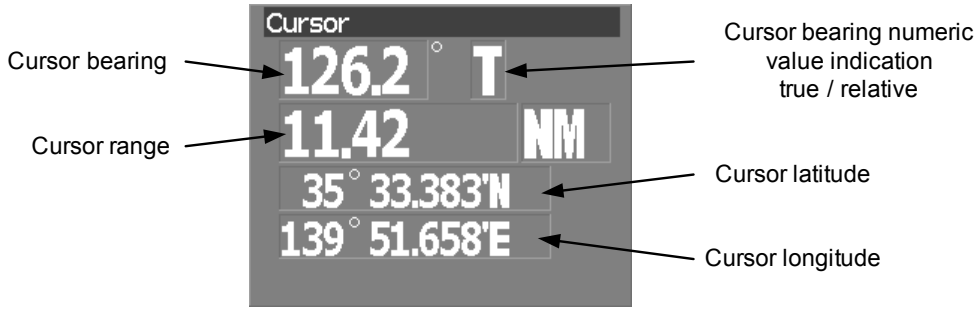
LMT : Local Mean Time

LMT (S) : LMT (System Time)

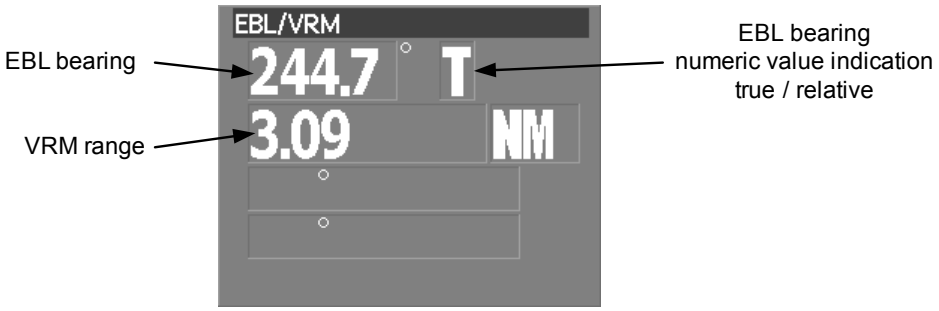
Numeric information: Tracked target information



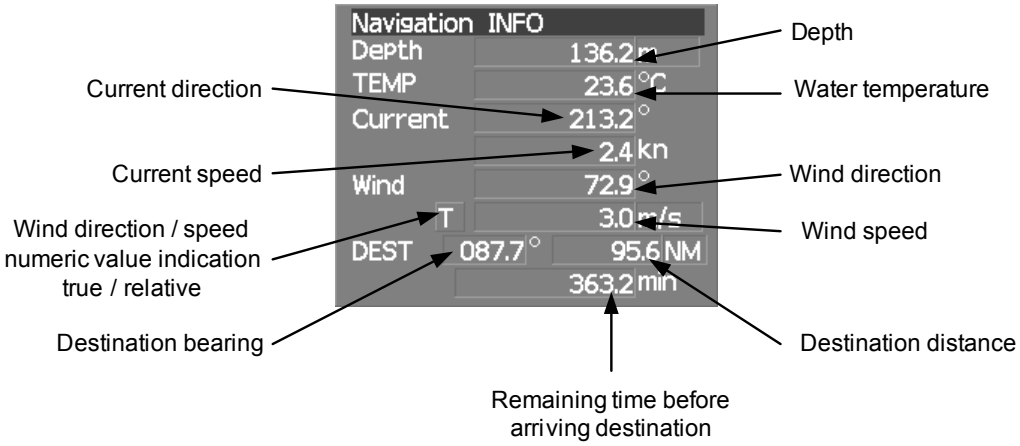
Numeric information: Enhancement of cursor position numeric value indication



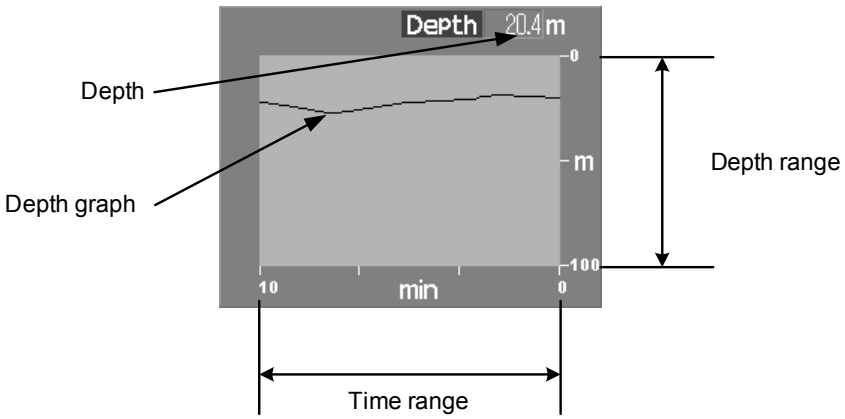
Numeric information: Enhancement of EBL / VRM numeric value display



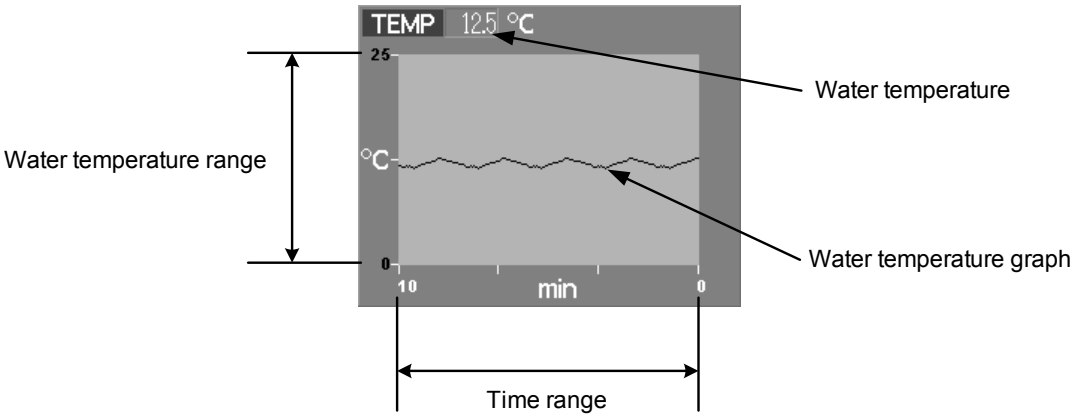
Numeric information: Navigation information



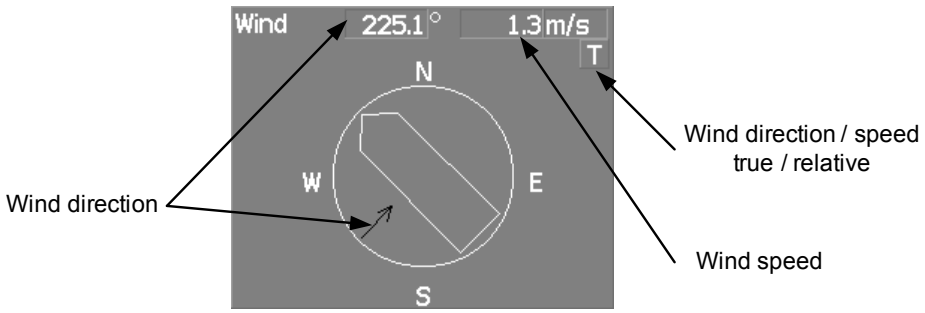
Graph information: Depth indication



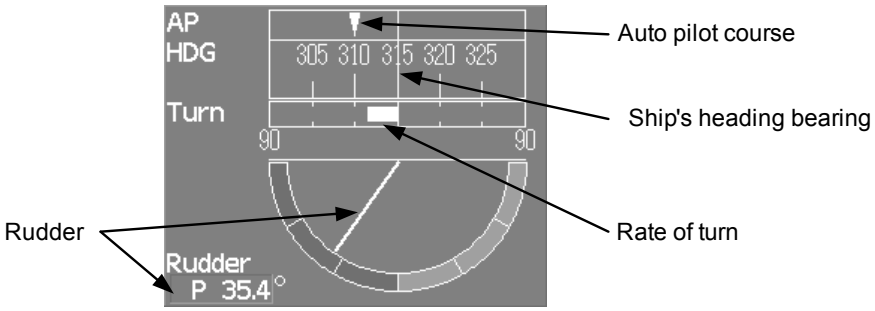
Graph information: Water temperature indication



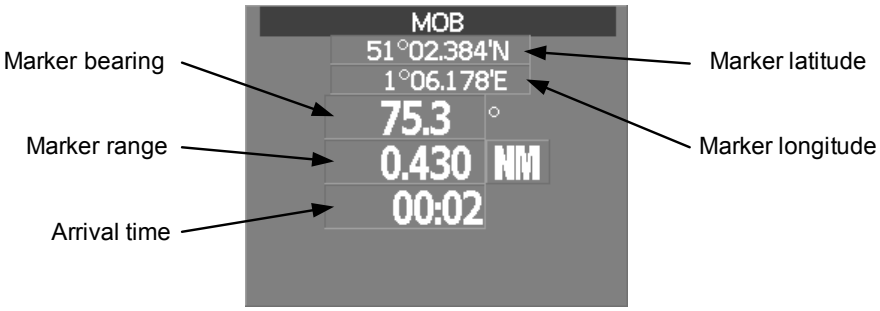
Graph information: Wind direction / speed



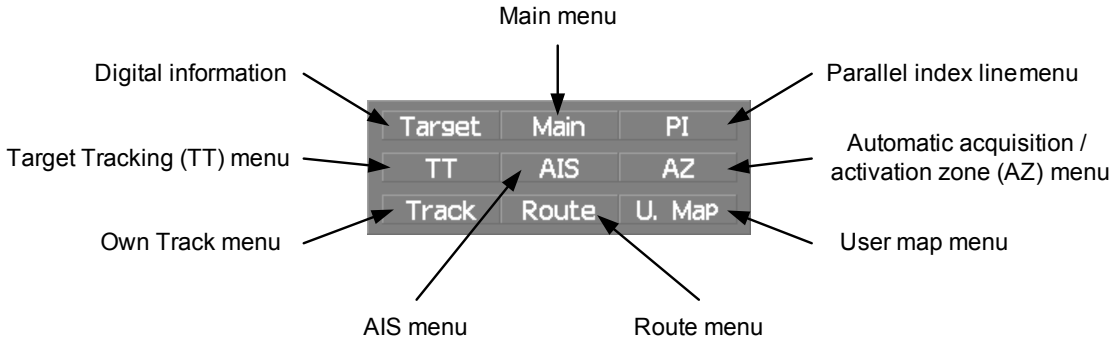
Graph information: Course bar



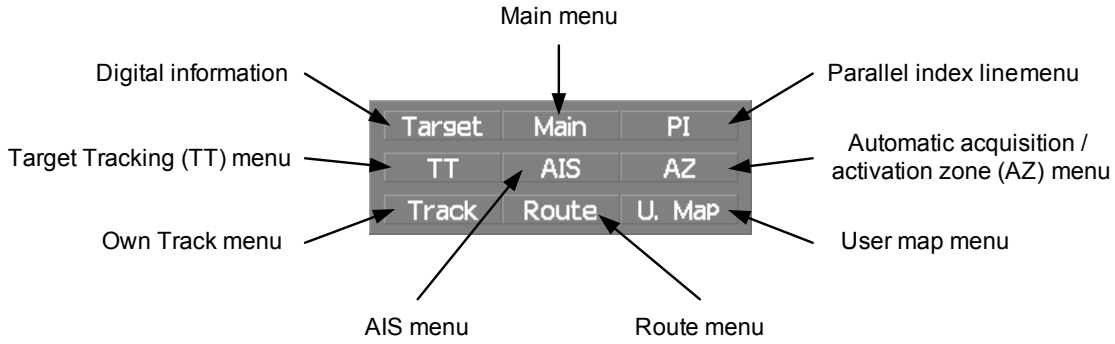
Numeric information: Marker



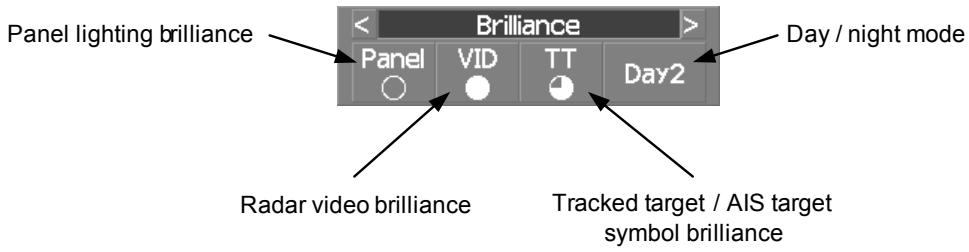
Menu



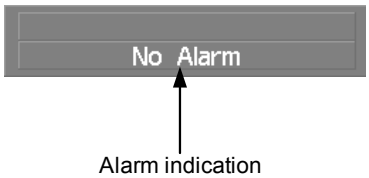
Brilliance



Display information

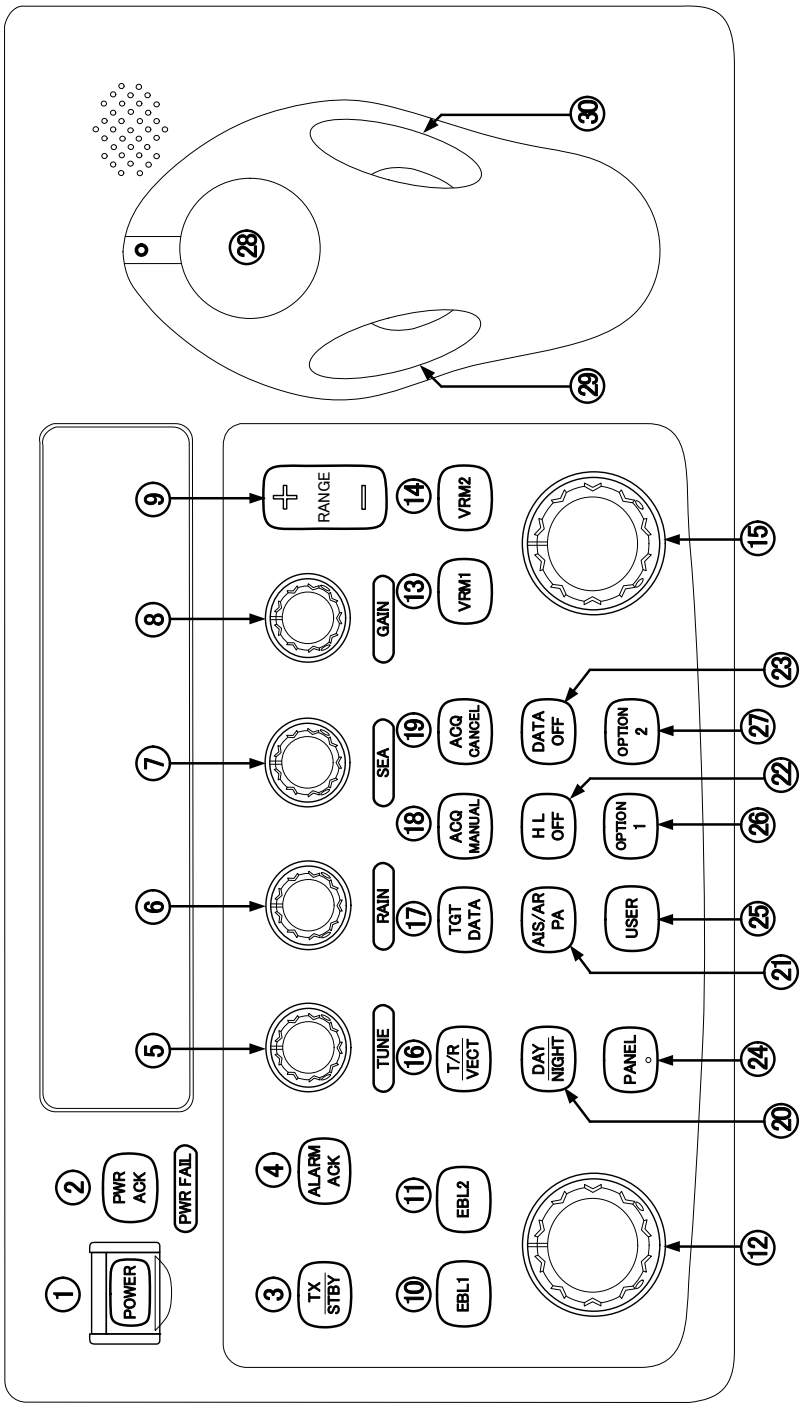


Alarm



Alarm indication
(The system alarm indicated in red.
Other information indicated in blue or yellow.)

2.2 NAMES AND FUNCTIONS OF CONTROL PANEL KEYS



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

① [POWER] (Power supply) switch

The lamp is lit and the equipment is activated.

If this switch is pressed while the equipment is running, the power of the equipment is shut down.

→3.1.1 on page 3-2

② [PWR ACK] (Power alarm acknowledgement) key

Use this function to acknowledge the alarm when power supply abnormality occurs.

To enable this key, an external battery (separate power from normal AC) is required.

③ [TX／STBY] (Transmission/Standby) key

When the [POWER] switch is pressed, the "STANDBY" message is displayed in the top-left corner of the screen in about 3 minutes. If this key is pressed, transmission starts. If this key is pressed during transmission, the equipment is set to a standby state.

→3.1.1 on page 3-2

④ [ALARM ACK] (Alarm acknowledgement) key

Use this function to acknowledge alarms such as failure alarm, approaching target alarm, and collision alarm.

By pressing this key at the occurrence of an alarm, the alarm sound can be stopped.

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

→3.2.7 on page 3-12

⑤ [TUNE] (Tuning) dial

Use his function to tune a transmitter.

The mode is switched to manual/automatic whenever this dial is pressed.

→3.2.3 on page 3-7

⑥ [RAIN] (Rain / snow clutter suppression) dial

This function suppresses rain / snow clutters.

To increase the effect of suppression, turn the dial clockwise.

The mode can be switched to manual or automatic by pressing the dial.

→3.2.6 on page 3-11

⑦ [SEA] (Sea clutter suppression) dial

This function suppresses sea clutter.

To increase the effect of suppression, turn the dial clockwise.

The mode can be switched to manual or automatic by pressing the dial.

→3.2.5 on page 3-9

⑧ [GAIN] (Gain/pulse length) dial

This function adjusts the reception sensitivity of the radar.

To increase the sensitivity, turn the dial clockwise.

The transmission pulse width can be switched by pressing the dial.

gain→3.2.4 on page 3-8

pulse width→3.4.2 on page 3-24

⑨ [RANGE ＋／－] (Range switching) key

This function switches the range.

Press [+] to increase the observation range.

Press [-] to reduce the observation range.

→3.2.2 on page 3-6

⑩ [EBL1] (Electronic Bearing Line 1) key

Use this function to display and select EBL1.

If the key is pressed for 2 seconds or more, the menu for setting EBL1 is displayed.

→4.1.3 on page 4-3

⑪ [EBL2] (Electronic Bearing Line 2) key

Use this function to display and select EBL2.

If the key is pressed for 2 seconds or more, the menu for setting EBL2 is displayed.

→4.1.3 on page 4-3

⑫ [EBL] (Electronic Bearing Line) dial

This function rotates the azimuth of the EBL that is selected in EBL1/2.

By pressing the dial, the selected EBL can be switched to Center fixing → Floating → Center fixing.

→4.1.3 on page 4-3

⑬ [VRM1] (Variable Range Marker 1) key

This function selects VRM1. The On/Off and dial use right are switched.

→ on page 4-6

⑭ [VRM2] (Variable Range Marker 2) key

This function selects VRM2. The On/Off and dial use right are switched.

→ on page 4-6

⑮ [VRM] (Variable Range Marker) dial

This function changes the range of the VRM that is selected by VRM1/2.

By pressing the dial, the parallel line cursor function can be switched to Operation → Fixed → Off → Operation.

→ on page 4-6

⑯ [T／R VECT] (True vector display / Relative vector display) key

This function switches the display mode (true/relative) of the tracked target and AIS target vector.

→5.1.6 on page 5-14

⑰ [TGT DATA] (Target data display) key

This function displays the digital data of the tracked target or AIS target at the cursor position.

the tracked target→5.2.3 on page 5-18

the AIS target→5.3.5 on page 5-29

⑱ [ACQ MANUAL] (Manual acquisition) key

This function enables manual acquisition of the target at the cursor position.

→5.2.1 on page 5-15

⑲ [ACQ CANCEL] (Tracked target cancellation) key

This function cancels the symbol and vector of the target that is being tracked and stops the tracking of the target.

If this key is pressed for 2 seconds or more, all the targets that are being tracked are cancelled.

→5.2.2 on page 5-17

⑳ [DAY／NIGHT] (Day/night mode) key

This function switches the color and brightness of the screen that was preset.

→3.4.12 on page 3-35

㉑ [AIS/TT] (AIS On/Off) key

This function switches the AIS function to ON/OFF when the AIS function is enabled.

→5.3.2 on page 5-27

㉒ [HL OFF] (Ship's heading line Off) key

HL (ship's heading highlight line) can be set to Off only while this key is pressed.

→3.4.10 on page 3-34

㉓ [DATA OFF] (DATA Off) key

This function sets the graphics other than HL, range ring, EBL, and VRM to OFF temporarily while this key is pressed.

→3.4.11 on page 3-34

㉔ [PANEL] (Operator panel brilliance) key

This function adjusts the lighting brilliance of various switches and dial positions on the operator panel. The brightness changes cyclically whenever this key is pressed.

→3.4.13 on page 3-35

㉕ [USER] key

By pressing this key, the signal processing setting that is preset can be called.

The setting changes to FUNC OFF ==> FUNC1 ==> FUNC2 ==> FUNC3 ==> FUNC4 whenever this key is pressed.

If this key pressed for 2 seconds or more, the function setting menu is displayed.

→3.9 on page 3-111

㉖ [OPTION1] key

By pressing this key, the pre-registered menu position can be directly displayed.

At factory shipment, the calling of [Main Menu] is assigned.

→3.8.7 on page 3-103

㉗ [OPTION2] key

By pressing this key, the pre-registered menu position can be directly displayed.

At factory shipment, the calling of [Sub Menu] is assigned.

→3.8.7 on page 3-103

㉘ Track ball

This function moves the cursor mark to any position. Use this function for setting in each mode.

Use this function to specify a center position of floating EBL and an off-center position.

→3.3.1 on page 3-14

㉙ [Track ball left button]

Use this function to confirm menu selection and numeric value input.

㉚ [Track ball right button]

Use this function to reset menu selection and numeric value input.

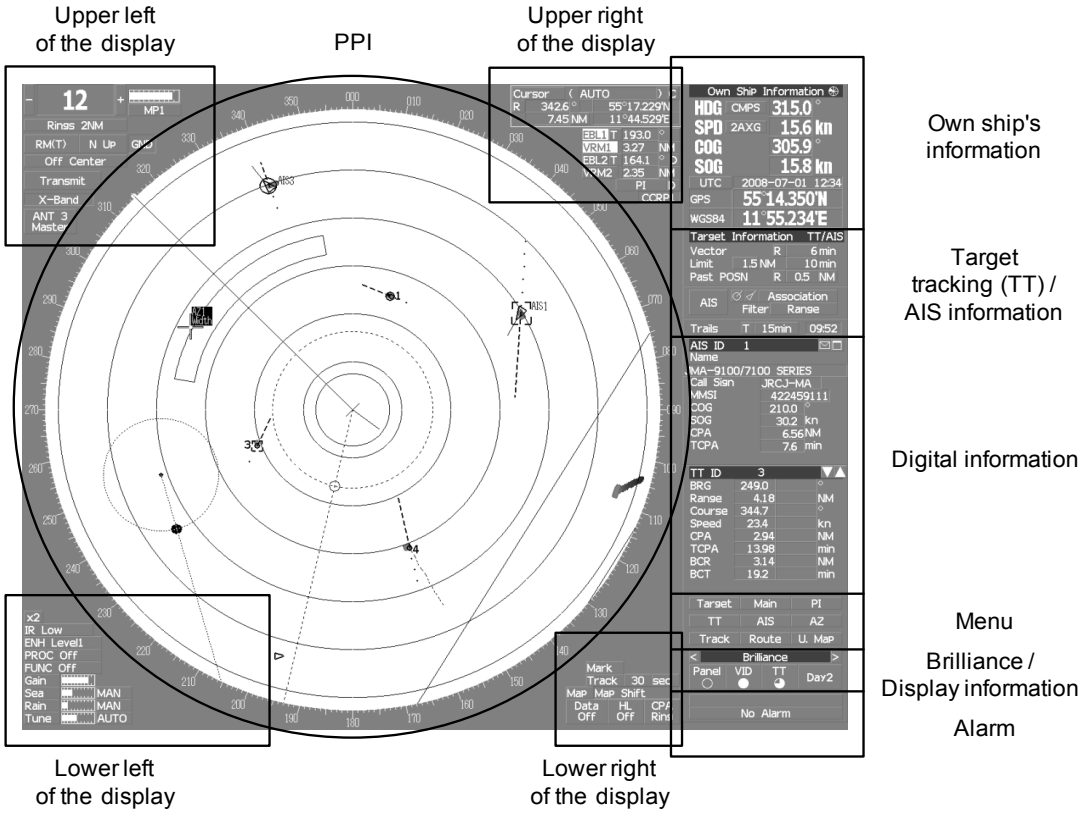
㉛ [BRILL] (Brilliance dial)

This dial is provided at the right of the monitor. Use this function to adjust the brilliance of the monitor.

→3.2.1 on page 3-6

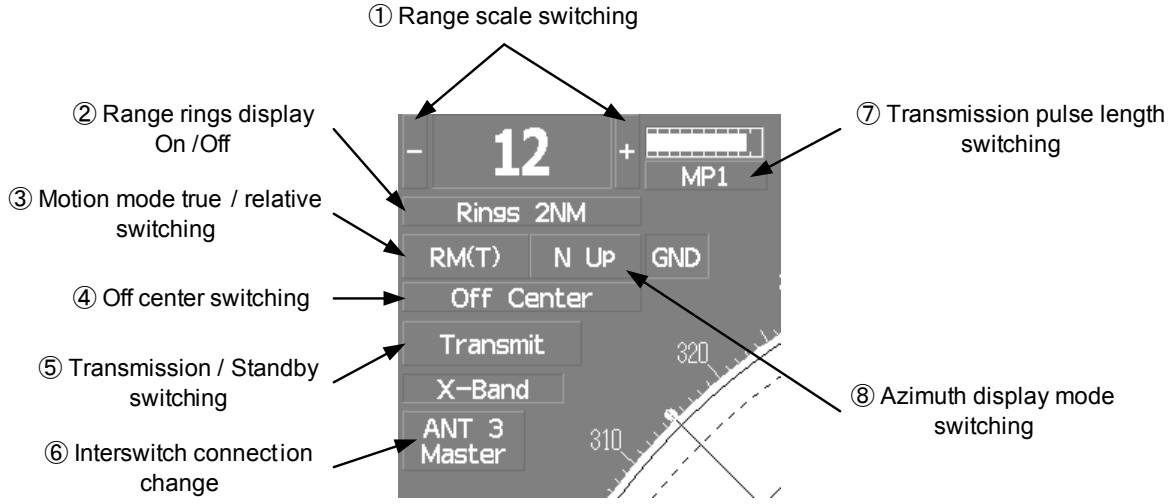
2.3 FUNCTIONS OF SOFTWARE BUTTONS

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



The name of each button is described from the next page. The function can be used by left-clicking while setting the arrow cursor on the button position.

Upper left of the display



① Range scale switching

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

② Range rings display On / Off

The display of range rings are set to On / Off whenever this button is clicked.

When the display is set to On, the interval of the fixed range marker is displayed.

③ Motion mode true / relative switching

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

[TM] (true motion) ⇒ [RM] (relative motion) ⇒ [TM]

[RM(R)] indicates that the radar trails is a relative trail.

[RM(T)] indicates that the radar trails is a true trail.

④ Off center switching

If this button is clicked, the cursor is moved, and left-clicked, the ship's position can be moved to the cursor position. The moving range is within 66% of the radius.

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

⑤ Transmission / standby switching

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

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

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

⑥ Interswitch connection change

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

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

Refer to the *Appendix A NQE-3141 Interswitch Unit* Interswitch (Optional) Instruction Manual that is attached for the setting method. This button is not displayed if the interswitch is not connected.

⑦ Transmission pulse length switching

The transmission pulse length is switched whenever this button is clicked. Three types of pulses are available, short pulse (SP), middle pulse (MP), and long pulse (LP). The pulse length and repetition frequency vary even for the same short pulse, according to the range that is used and it is displayed as SP1 , SP2 .

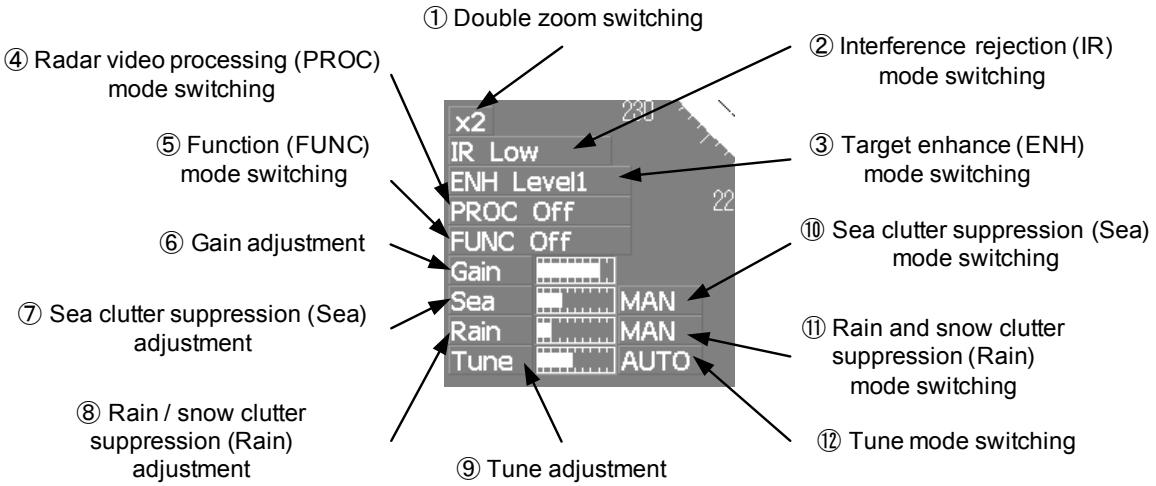
⑧ Azimuth display mode switching

The azimuth display is switched whenever this button is clicked.

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

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

Lower left of the display



① Double zoom switching

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

② Interference rejection (IR) mode switching

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

IR Off ⇒ IR Low ⇒ IR Meddle ⇒ IR High ⇒ IR Off

③ Target enhance (ENH) mode switching

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

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

④ Radar video processing (PROC) mode switching

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

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

⑤ Function (FUNC) mode switching

The function mode is switched whenever this button is clicked.

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

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

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

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

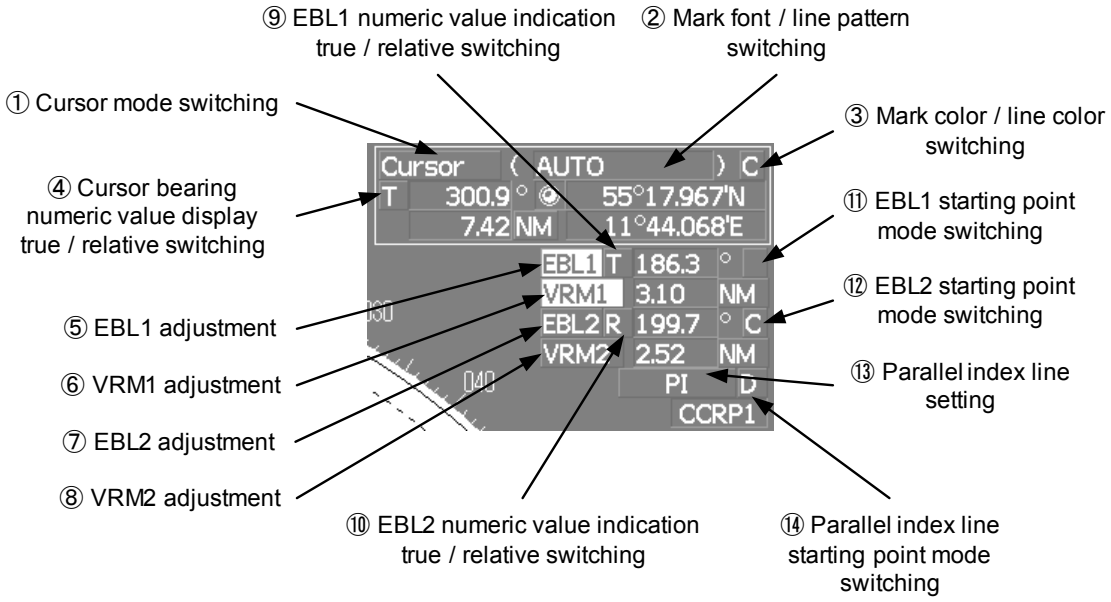
If the button is clicked on, the adjustment value is shown at the upper-right of the cursor. Make adjustments by moving the track ball to the left and right. Determine the adjustment by left-clicking.

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

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

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

Upper Right of the display



① Cursor mode switching

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

AUTO ⇒ ACQ TT ⇒ ACT AIS ⇒ TGT Data ⇒ CNCL TT ⇒ DEACT AIS ⇒ CNCL Data ⇒ □ ⇒ - - - - - - - ⇒ Property ⇒ AUTO

② Mark font / line pattern switching

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

③ Mark color / line color switching

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

④ Cursor bearing numeric value display true / relative switching

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

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

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

If the button is clicked on, the operation right is acquired. Make adjustments by moving the track ball to the left and right Determine the adjustment by left-clicking.

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

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

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

⑪ and ⑫ EBL1 / EBL2 starting point mode switching

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

⇒ C ⇒ D ⇒

: Center	The starting point is fixed to the CCRP position.
C : Screen Fix	The starting point is set to the cursor position. If left-clicked subsequently, the starting position is fixed to the cursor position.
D : L/L Fix[i]	The starting point is set to the cursor position. If left-clicked subsequently, the starting position is fixed to the latitude / longitude of the cursor. (Connection of a navigator is necessary.) If the starting point is moved outside of the screen, the operation is reset automatically and the starting point returns to the CCRP position.

i. D is enabled only when a navigator is connected.

⑬ Parallel index line setting

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

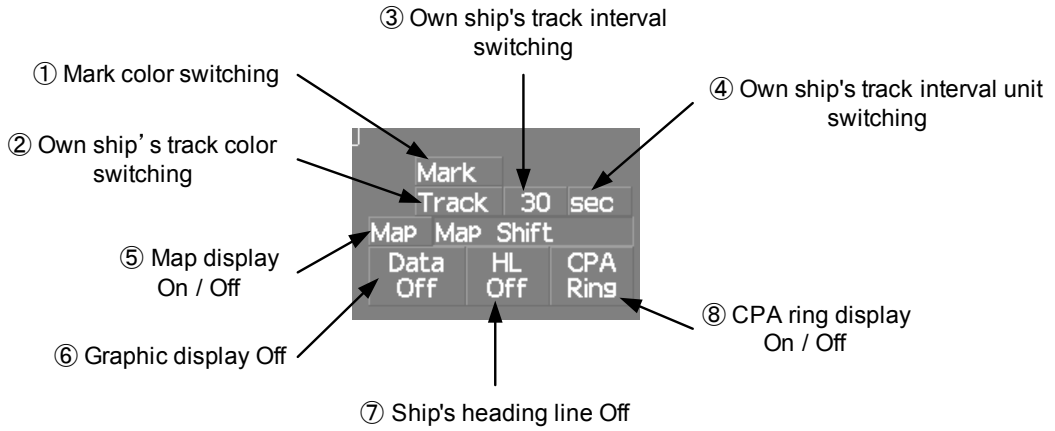
If this button is clicked, the operation right is acquired and the menu is opened. After setting, determine the setting by left-clicking.

⑭ Parallel index line starting point mode switching

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

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

Lower right of the display



① Mark color switching

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

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

② Own ship's track color switching

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

③ Own ship's track interval switching

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

④ Own ship's track interval unit switching

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

sec ⇒ min ⇒ NM ⇒ sec

⑤ Map display On / Off

The own track, target track and route display are set to On / Off whenever this button is clicked. If the button is clicked for 2 seconds, the Map Setting menu is opened.

⑥ Graphic display Off

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

⑦ Ship's heading line Off

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

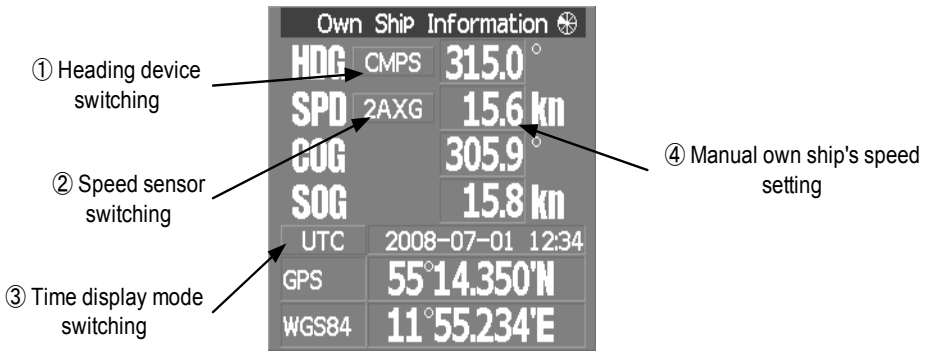
Since the ship's heading line is cleared while the button is clicked, the target in the ship's heading bearing can be clearly seen.

⑧ CPA ring display On / Off

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

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

Own ship's information



① Heading device switching

The heading device is switched whenever this button is clicked.

GYRO ⇒ CMPS (Electronic compass)⇒ GYRO

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

② Speed sensor switching

The speed sensor is switched whenever the button is clicked.

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

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

③ Time display mode switching

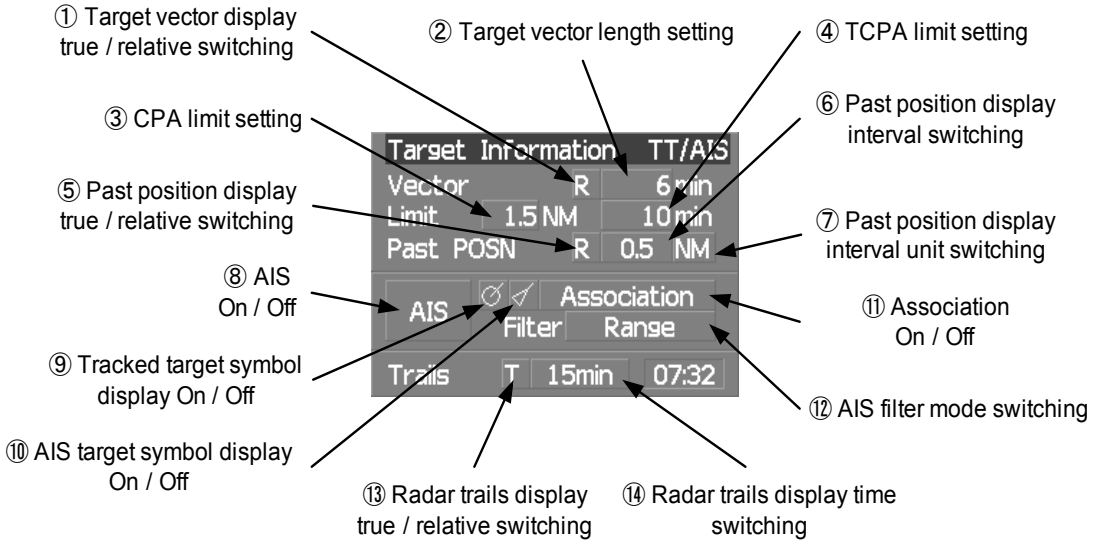
The time display mode UTC (universal time clock) / LMT (local mean time) is switched whenever this button is clicked.

④ Manual own ship's speed setting

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

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

Target tracking (TT) / AIS information



① Target vector display true / relative switching

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

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

② Target vector length setting

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

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

③ CPA limit setting

Set a CPA limit.

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

④ TCPA limit setting

Set a TCPA limit.

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

⑤ Past position display true / relative switching

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

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

⑥ Past position display interval switching

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

⑦ Past position display interval unit switching

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

min ⇒ NM ⇒ min

⑧ AIS On / Off

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

⑨ Tracked target symbol display On / Off

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

⑩ AIS target symbol display On / Off

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

⑪ Association On / Off

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

⑫ AIS filter mode switching

The AIS filter is switched whenever the button is clicked.

Range ⇒ Sector ⇒ Zone ⇒ Range

⑬ Radar trails display true / relative switching

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

This setting is restricted by the radar display motion mode.

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

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

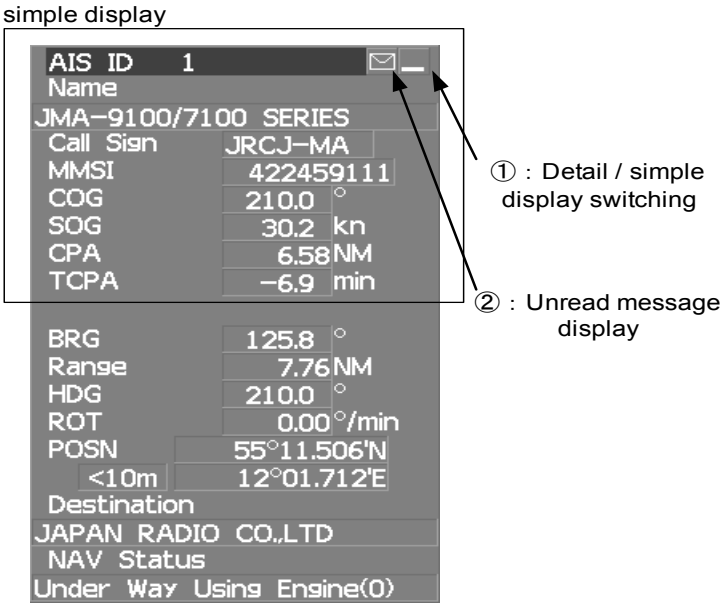
⑭ Radar trails display time switching

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

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

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

Numeric information: AIS target information



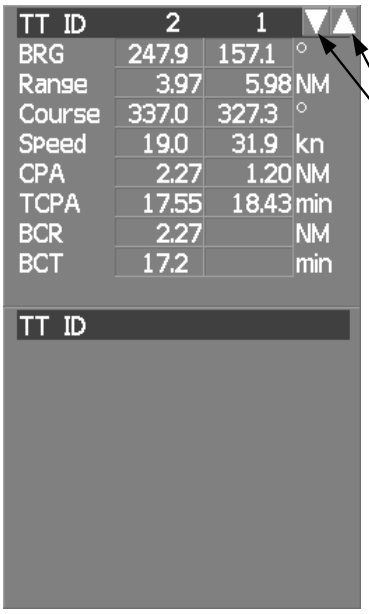
① Detail / simple display switching

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

② Unread message display

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

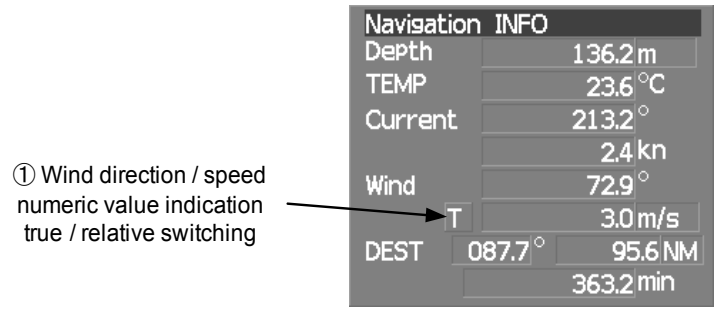
Numeric information: Tracked target information



① Tracked target numeric value indication scroll

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

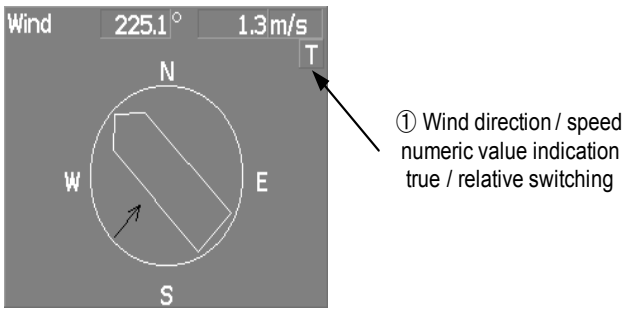
Numeric information: Navigation information



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

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

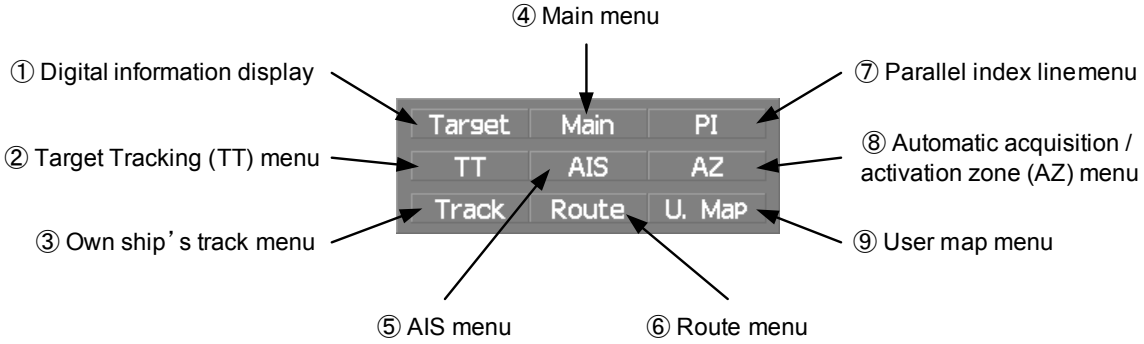
Graph information: Wind direction / speed



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

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

Menu



① Digital information display

If this button is clicked while the menu screen is open, the menu is closed and control returns to the digital information display.

This function switches between the tracked target / AIS target display and navigation information or the course bar, and so on.

② Target Tracking (TT) menu

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

③ Own track menu

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

④ Main menu

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

⑤ AIS menu

If the button is clicked, the AIS Menu is opened.

⑥ Route menu

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

⑦ Parallel index line menu

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

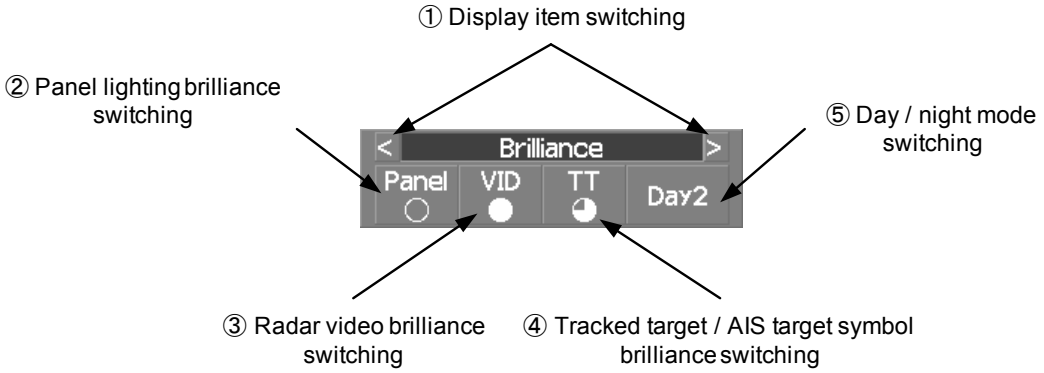
⑧ Automatic acquisition / activation zone menu

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

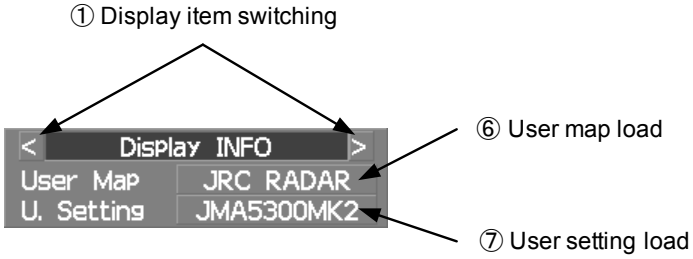
⑨ User map menu

If the button is clicked, the User Map Menu is opened.

Brilliance



Display information



① Display item switching

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

② Panel lighting brilliance switching

This function enables the setting of the brilliance of the lighting of the control panel.

The brilliance changes whenever this button is clicked. Five levels of settings are available.

③ Radar video brilliance switching

Adjust the brightness of the radar video (echo).

The brilliance changes whenever this button is clicked. Four levels of settings are available.

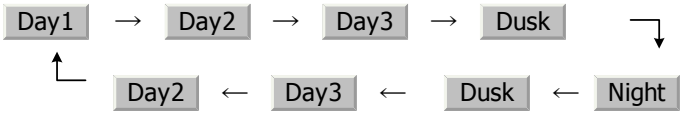
④ Tracked target / AIS target symbol brilliance switching

Use this function to adjust the brilliance of the tracked target / AIS target symbol.

The brilliance changes whenever this button is clicked. Five levels of settings are available.

⑤ Day / night mode switching

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



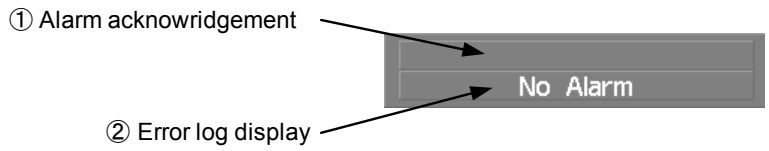
⑥ User map load

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

⑦ User setting load

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

Alarm



① Alarm acknowledgment

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

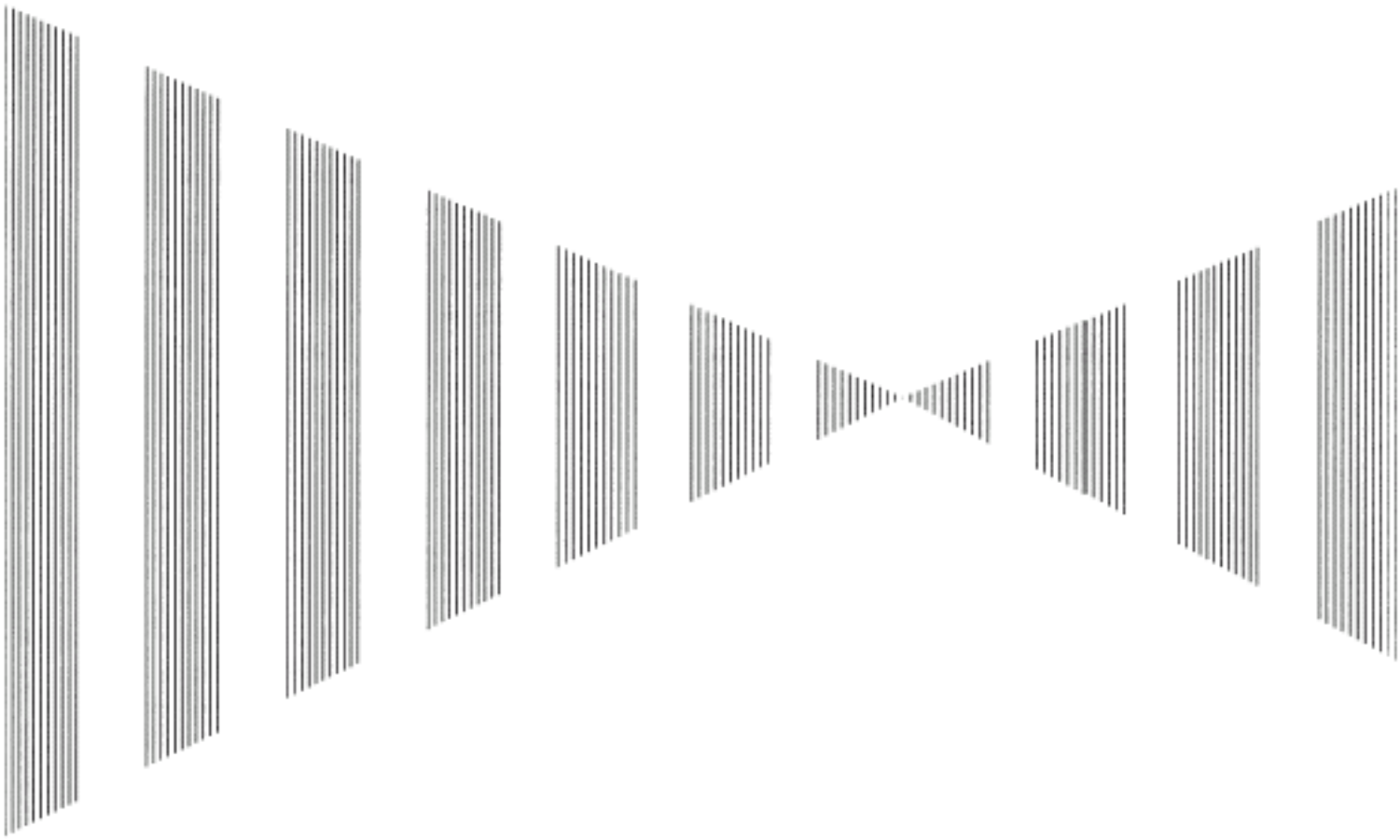
If the button is clicked, the alarm displayed on the top is acknowledged.

The alarms that are currently issued are displayed at the bottom one by one.

② Alarm log display

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

SECTION 3
BASIC OPERATION



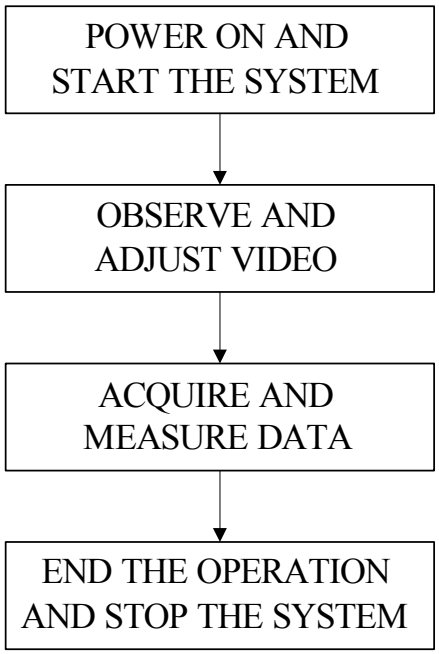
BASIC OPERATION

3.1 OPERATION FLOW

Attention

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

  Otherwise, any failure or damage may result.



Each operation is described in detail below.

3.1.1 Power ON and Start the System

CAUTION

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

Attention

- **Wait for about 2 seconds before turning on the power again.**
- **Immediately after the radar is installed, at start of the system after it has not been used for a long time, or after the magnetron is replaced, preheat the equipment in the standby state for 20 to 30 minutes before setting it into the transmit state.**
- **If the preheating time is short, the magnetron causes sparks, resulting in its unstable oscillation.**

  Start transmission on a short-pulse range and change the range to the longer pulse ranges in turn. If the transmission is unstable in the meantime, immediately place the system back into the standby state and maintain it in the standby state for 5 to 10 minutes before restarting the operation.

  Repeat these steps until the operation is stabilized.

Procedures

1) **Check that the ship's mains are turned on.**

2) **Press [POWER] key.**

The system is turned on, and the preheating time is displayed.

Preheat is indicated at the upper left of the radar display.

3) **Wait until the preheating time is over.**

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

4) **Press [TX/STBY] key.**

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

Standby at the upper left of the radar display changes to Transmit .

NOTE: The radar does not start transmission if you press [TX/STBY] key while Preheat is indicated.

3.1.2 Observe and Adjust Video

Procedures

1) **Press [RANGE+] key or [RANGE-] key to set the range to the scale required for target observation.**

2) **[GAIN] [SEA] and [RAIN] to obtain the clearest targets.**

Refer to

[GAIN] dial→Section 3.2.4 "Adjust Gain [GAIN]"

[SEA] dial→Section 3.2.5 "Suppress Sea Clutter [SEA]"

[RAIN] dial→Section 3.2.6 "Suppress Rain/Snow Clutter [RAIN]"

for how to use each dial.

For how to adjust video, see Section 3.2 "OBSERVE AND ADJUST VIDEO"

3.1.3 Acquire and Measure Data

For details on how to acquire data and measure, see the SECTION 4"MEASUREMENT OF RANGE AND BEARING".

3.1.4 Display and Measure with Reference to CCRP

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

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

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

For how to setting CCRP, see the Section 7.1.9 "Setting of CCRP (CCRP Setting)".

3.1.5 End the Operation and Stop the System

Exit

1) **Press [TX/STBY] key.**

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

Transmit at the upper left of the radar display changes to Standby .

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

2) **Press [POWER] key.**

The system will be turned off.

WARNING

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

3.2 OBSERVE AND ADJUST VIDEO

3.2.1 Adjust Monitor Brilliance [BRILL]

Procedures

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

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

Conversely, turning the [BRILL] dial counterclockwise decreases the brilliance of the entire display.

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

3.2.2 Change Observation Range [RANGE+/-]

Procedures

1) **Pressing the [RANGE+] key will increase the observation range, enabling the wider area to be observed.**

Increasing the observation range will enable a wider range to be observed.

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

2) **Pressing the [RANGE-] key will decrease the observation range, reducing the area that can be observed.**

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

3.2.3 Tune

CAUTION

Normally, use the automatic tune mode.

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

This radar system provides the automatic tune mode and the manual tune mode. The automatic tune mode automatically adjusts the tuning of the transmitting frequency and the receiving frequency, and the manual tune mode enables tuning to be adjusted by using the dial located on the operation panel. Normally use the automatic tune mode. Only when the best tuning is not possible by the automatic tune mode due to the deterioration of magnetron, use the manual tune mode.

The currently used tune mode is displayed in the area at the lower left of the display.

3.2.3.1 When using the automatic tune mode

Procedures

1) **Press the [TUNE] dial to set the automatic tune mode.**

Tune adjustment is automatically conducted in the automatic tune mode. Tune is adjusted at the start of transmission, at the change of the range or pulse width. Tune adjustment is completed within several seconds.

3.2.3.2 When using the manual tune mode

Procedures

1) **Press the [TUNE] dial to set the manual tune mode.**

2) **Turn the [TUNE] dial to make adjustments so that the tuning bar is maximized. The tuning bar is displayed in the area at the upper left of the display.**

3.2.4 Adjust Gain [GAIN]

CAUTION

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

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

Be sure to always adjust for the best gain.

See also the Section 3.2.8 "To get the appropriate image that targets can be easily observed".

Procedures

1) **Adjust noise on the radar display by turning the [GAIN] dial until targets can be easily observed.**

Turning [GAIN] dial clockwise increases gain.

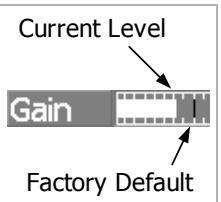
Turning [GAIN] dial counterclockwise decreases gain.

Turning the [GAIN] dial clockwise will increase the receiving gain, and the range to observe radar video is widened. However, if the gain is too high, unnecessary signals including receiver noise and false images increase resulting in reduction of targets' visibility.

To observe densely crowded targets or short-range targets, turning the [GAIN] dial counterclockwise will decrease the receiving gain, which enables targets to be easily observed. However, caution must be taken so as not to overlook a small and important target.

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

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



3.2.5 Suppress Sea Clutter [SEA]

CAUTION

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

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

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

See also the Section 3.2.8 "To get the appropriate image that targets can be easily observed".

3.2.5.1 Using the manual sea clutter suppression mode

Procedures

1) **Adjust the sea clutter returns on the radar display by turning the [SEA] dial until targets can be easily observed.**

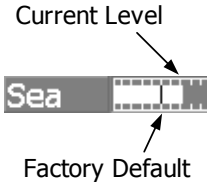
Turning [SEA] dial clockwise suppresses sea clutter returns.

Turning [SEA] dial counterclockwise intensifies sea clutter returns.

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

Turning the [SEA] dial clockwise heightens the effect of sea clutter suppression. However, be careful that excessive suppression causes low signal-strength targets such as buoys and boats to disappear from the radar display.

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



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

3.2.5.2 Using the automatic sea clutter suppression mode

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

Procedures

1) **Press the [SEA] dial. Alternatively, Left-click the Sea MAN button located at the lower left of the display.**

The automatic sea clutter suppression mode is selected, and Sea AUTO is displayed in the lower left of the radar display.

2) **Make adjustments by turning the [SEA] dial.**

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

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

To select both the sea clutter suppression function and the rain/snow suppression function in the automatic mode, use the automatic rain/snow suppression mode.

Cancel

1) **ress the [SEA] dial. Alternatively, Left-click the Sea AUTO button located at the lower left of the display.**

The automatic sea clutter suppression mode is cancelled, and Sea MAN is displayed in the lower left of the radar display.

3.2.6 Suppress Rain/Snow Clutter [RAIN]

CAUTION

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

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

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

See also the Section 3.2.8 "To get the appropriate image that targets can be easily observed".

3.2.6.1 Using the manual rain / snow clutter suppression mode

Procedures

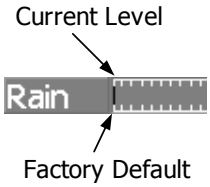
1) **Adjust the rain / snow clutter returns of the display by turning the [AUTO-RAIN] dial until targets can be easily observed.**

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

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

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

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



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

3.2.6.2 Using the automatic rain / snow clutter suppression mode

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

Procedures

1) **Press the [RAIN] dial. Alternatively, Left-click the Rain MAN button located at the lower left of the display.**

The automatic rain / snow clutter suppression mode is selected, and Sea AUTO, Rain AUTO is displayed in the lower left of the radar display.

2) **Make adjustments by turning the [RAIN] dial and the [SEA] dial.**

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

NOTE: When the automatic rain / snow clutter suppression mode is selected, the automatic sea clutter suppression mode is also activated.

It is not possible to set only the rain / snow clutter suppression function to the automatic mode.

Cancel

1) **Press the [RAIN] dial. Alternatively, Left-click the Rain AUTO button located at the lower left of the display.**

The automatic rain / snow clutter suppression mode is cancelled, and Sea AUTO, Rain AUTO is changed to Sea MAN ,Rain MAN in the lower left of the radar display.

3.2.7 Reset Alarm Buzzer [ALARM ACK]

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

Procedures

1) **Press [ALARM ACK] key. Alternatively, Left-click the Alarm Acknowridge button located at the lower right of the display.**

The alarm will stop buzzing.

3.2.8 To get the appropriate image that targets can be easily observed

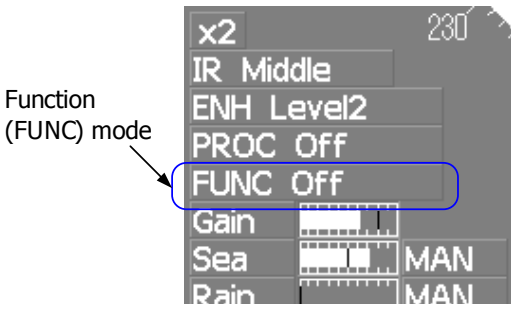
To get the appropriate image that targets can be easily observed which requires an understanding for RADAR signal processing features and an adjustment for the sea state. All of the parameter can be set indivisually and manually, but it may by difficult for even expert person.

The sets of signal processing parameters for the general using condition are stored in FUNC as factory default settings. In most cases, to select the FUNC mode which fit in the current sea state is lead to get the appropriate image easily and quickly. So It is recommended to enable the FUNC mode.

Procedures

1) **Press [USER] key / Press FUNC mode switch button and select the mode which fit in the current sea state.**

The four preset modes is assigned on the FUNC mode. For details, refer to the Section 3.9 "USE FUNCTION KEY [USER]".



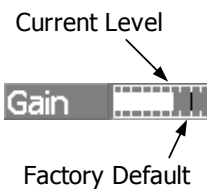
Coast	: Use this mode to monitor a relatively short range, for example, bays and coasts where many boats and ships are running.(Importance is attached to resolution.)
Deep Sea	: Use this mode to monitor a relatively long range, for example, the open sea. (Importance is attached to long-range gain.)
Storm	: Use this mode when many rain / snow clutter returns or sea clutter returns are detected in stormy weather. (Importance is attached to rain / snow clutter and sea clutter suppression, and gain slightly lowers.)
Rain	: Use this mode when sea clutter is not strong but rain / snow clutter is strong. (Importance is attached to rain / snow clutter suppression, and gain slightly lowers.)

2) **Make adjustments by turning the [GAIN] dial, the [SEA] dial and the [RAIN] dial when it is necessary.**

In most cases, it may be get the appropriate image.

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

The factory default level is assigned for every function mode. See the Section 3.9 "USE FUNCTION KEY [USER]"



3.3 OPERATION PROCEDURES

3.3.1 Move Cross Cursor Mark by Trackball

The cross cursor mark ＋ is used for position designation and other purposes in various operating procedures. The cross cursor mark ＋ moves in coupling with the trackball. If the trackball is rotated up and down or right and left, the cross cursor mark follows the move of the trackball.

Operators must be familiar with trackball operation before running the system.

3.3.1.1 Operation inside Radar Video PPI

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

- The distance, bearing, and latitude/longitude are digitally indicated in the cursor bearing, distance, latitude, and longitude fields (located at the upper right of the radar display.)
- When moving the current center position, use the cross cursor mark to designate a new center position.
- Use the cross cursor mark to create marks and lines.
- Use the cross cursor mark to manually acquire a target in the target tracking / AIS display functions.

3.3.1.2 Operation outside Radar Video PPI

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

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

> The EBL / VRM dial is available for operating the cursor mark. Pressing the EBL dial for 2 seconds can perform switching to the trackball operation. For details, refer to Section 3.8.4 "Set Cursor (Cursor Setting)".

3.3.2 Operate Software Buttons

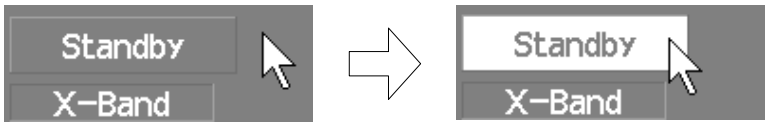
Software buttons are provided on the radar display so as to easily switch functions without operating menu items.

For software buttons that can be operated and their locations, see Section 2.3 "FUNCTIONS OF SOFTWARE BUTTONS".

Procedures

1) **Put the pointer on the software button on the radar display.**

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



2) **Press the left button of the trackball.**

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

In this instruction manual, this manual operation is described as "left-clicking."

- On/Off settings

Each time the left button is pressed, the operating state switches as follows:

On → Off → On → Off

- Multiple settings

For example, each time the left button is pressed, the operating state switches as follows:

IR Off → IR Low → IR Meddle → IR High → IR Off

3.3.3 Basic Menu Operation

3.3.3.1 To open the menu

By left-clicking the Main button located at the lower right of the radar display, the main menu will open

By left-clicking the buttons, TT , AIS , and AZ , adjacent to Main , each function's exclusive menu will open.

For the arrangement of software buttons, see Section 2.3 "FUNCTIONS OF SOFTWARE BUTTONS".

3.3.3.2 To close the menu

By left-clicking the Target button, the menu will close and the target data display screen will appear.

Alternatively, left-click 0.Exit located at the bottom of the menu until the menu will close.

3.3.3.3 To move to a lower level of the menu

The menu is in hierarchical structure. By left-clicking the software button for a desired menu item, it is possible to move to the lower level of the menu.

Alternatively, Click items corresponding to the desired menu item number, and the > mark will appear at the right end of a menu item having a lower level.

3.3.3.4 To move to a higher level of the menu

By left-clicking 0.Exit at the bottom of the menu while the menu is open, it is possible to return to the upper level of the menu.

3.3.3.5 To determine an item

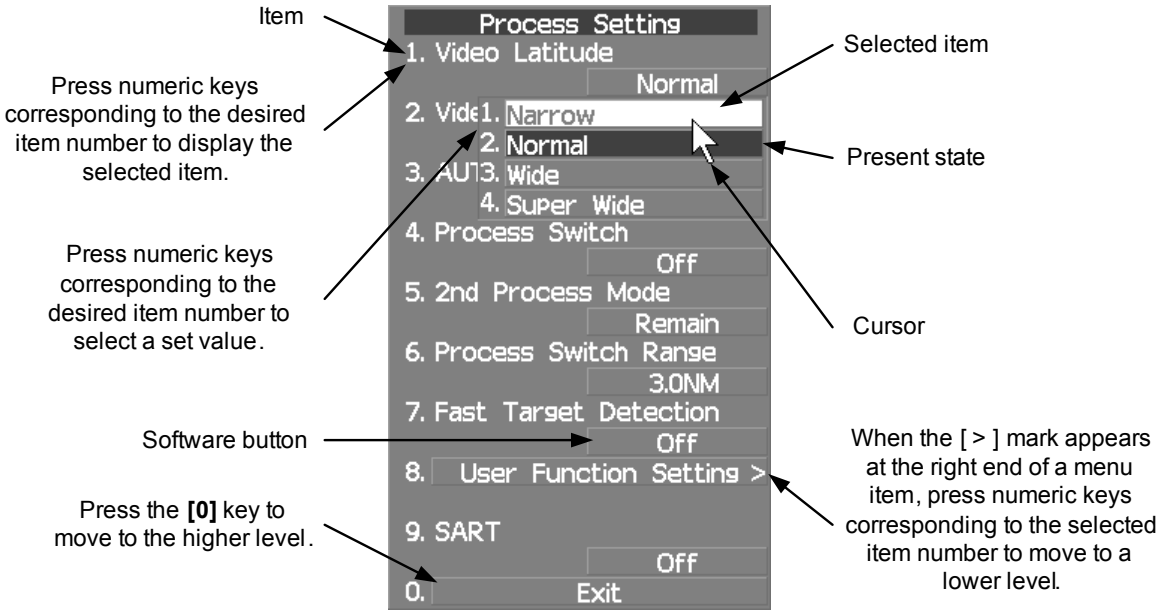
By left-clicking the software button for a menu item for which settings are to be changed, the selected item will be displayed.

3.3.3.6 To determine the selected item

Left-click the software button for an item you want to set, and then the selected item will be determined.

If you do not change the setting, right-click the button. The selected item will close without changing the setting.

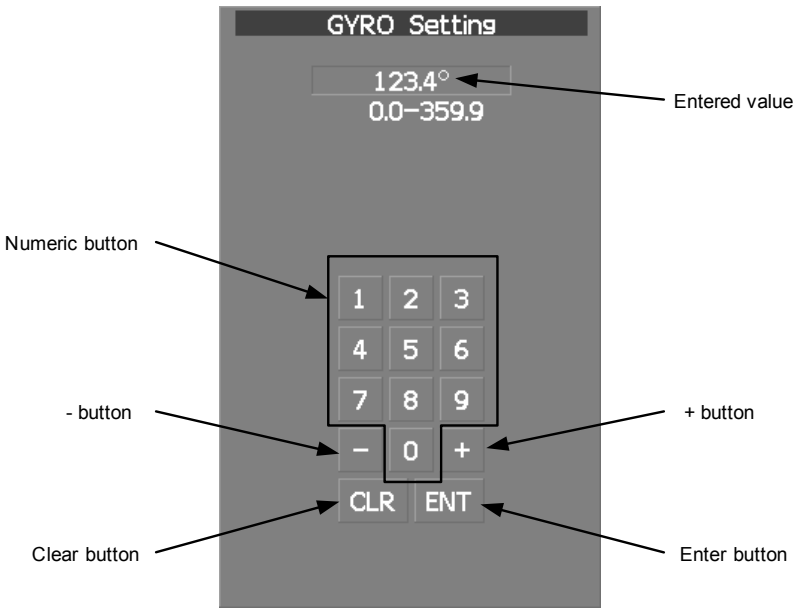
3.3.3.7 Menu Operation with the Trackball



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

When a numeric value must be entered while operating this radar system, the numeric value input screen will appear. In that case, enter a numeric value according to the following operation method.

3.3.4.1 Numeric value input screen



3.3.4.2 Directly entering a numeric value

Procedures

1) **On the numeric value input screen, sequentially left-click the software number keys located on the radar screen, and enter a desired numeric value.**

For example, when entering 1 → 2 → 3 → 4 for a bearing value, sequentially left-click the software number keys as shown below.

2) **Make sure that the entered value is correct, and left-click the ENT button.**

The set value is reflected to the operating state.

3) **To stop entering a value, right-click the [ENT] button. Alternatively, left-click the CLR button.**

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

3.3.4.3 Increasing or decreasing a numeric value

Procedures

1) **On the numeric value input screen, sequentially left-click the software button [+] or [−] located on the radar screen, and enter a desired numeric value.**

For example, when adjusting 123.0° to 123.4° for a bearing value, sequentially left-click the software number keys as shown below.

[+] → [+] → [+] → [+]

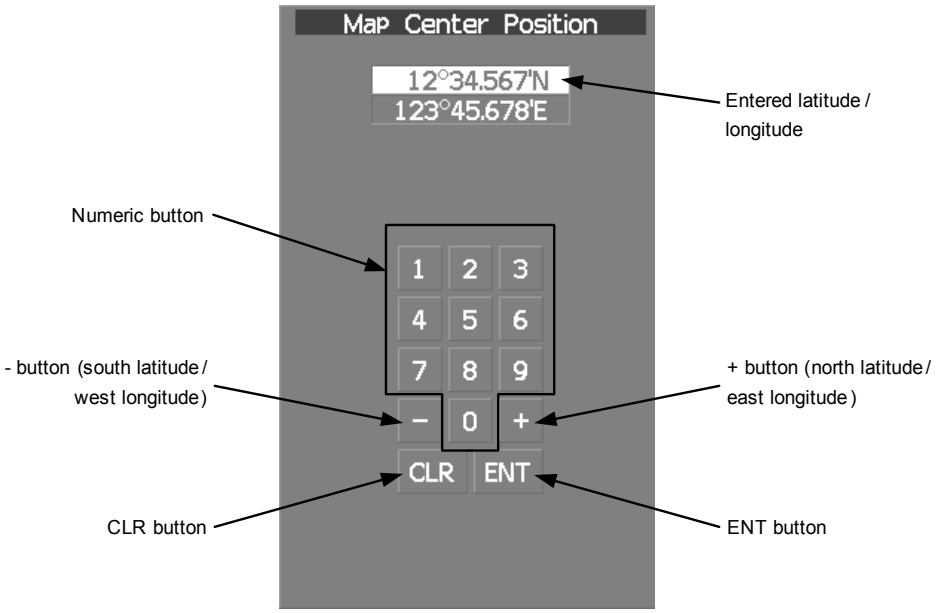
2) **Make sure that the entered value is correct, and left-click the [ENT] button.**

The set value is reflected to the operating state.

3) **To stop entering a value, right-click the [ENT] button. Alternatively, left-click the [CLR] button.**

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

3.3.4.4 Latitude/longitude input screen



3.3.4.5 Entering latitude/longitude

Procedures

1) **On the latitude/longitude input screen, sequentially click numeric buttons to enter latitude (XX° XX. XXX').**

For example, to enter 12° 34.567', sequentially click numeric buttons as follows.

1 → 2 → 3 → 4 → 5 → 6 → 7

2) **To make change between north latitude and south latitude, use + and − .**

North latitude:Left-click the + button.

South latitude:Left-click the − button.

3) **Left-click the ENT button.**

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

4) **Sequentially click numeric buttons to enter longitude (XXX° XX. XXX').**

5) **To make change between east longitude and west longitude, use + and − .**

East longitude: Left-click the + button.

West longitude: Left-click the − button.

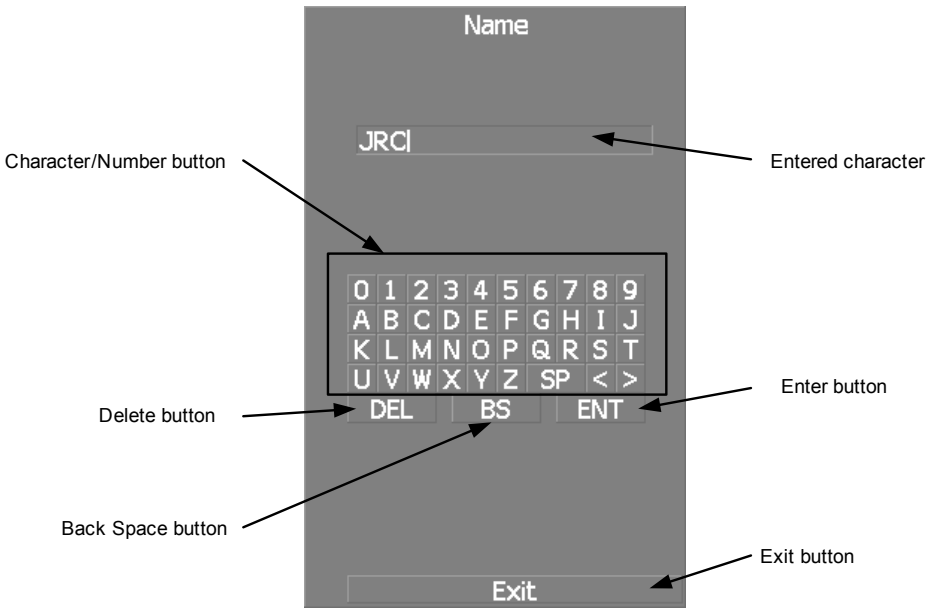
6) **Left-click the ENT button.**

The manually entered longitude value is determined.

7) **To cancel input, put the cursor on CLR and then left-click the button.**

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

3.3.4.6 Character input screen



3.3.4.7 Entering a character

Procedures

1) **On the character input screen, use trackball to select alphabet from A to Z, numbers from 0 to 9, or symbols (only comments for mark/line), and then left-click the ENT button to enter one character of the name to be inputted.**

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

J → R → C

2) **Make sure that the entered character is correct, left-click the ENT button.**

The character has been entered.

3) **To cancel input, left-click the Exit button.**

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

3.3.5 Overview of Menu Structure

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

Software buttons for opening those menus are displayed in the menu area located at the bottom ten of the display.

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

To prevent incorrect use, enter the special code to open the service man menu. For operating the service man menu, see Section 7.1.1 "How to Open the Serviceman Menu（Service Man Menu）"

Frequently used functions

TT	Used for operating and setting the target tracking function.
Track	Used for operating and setting the other ship trails function.
AIS	Used for operating and setting the AIS display function.
Route	Used for operating and setting the route function.
PI	Used for operating and setting the parallel-index-line function.
AZ	Used for operating and setting the automatic acquisition / activate function.
U.MAP	Used for operating and setting the user map function.

Main menu

Main	Used for operating and setting the functions.

Serviceman menu

	This menu is used for operation and settings when a system is installed. It is not used during normal operation.The special code must be entered to open the service man menu.

3.4 GENERAL RADAR OPERATION

3.4.1 Interference Rejection (IR)

Interference by other radars is rejected.

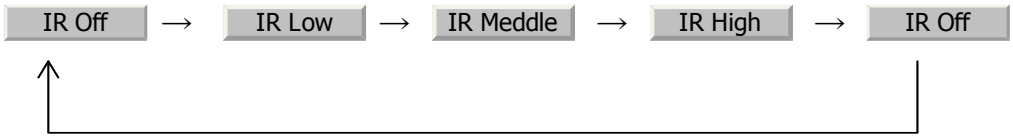
Attention

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

Procedures

1) **Left-click the IR button located at the lower left of the radar display.**

The interference rejection modes are switched.



Rejection levels of the interference rejector

IR Off : Interference rejector off

IR Low : Interference rejection level - low

IR Middle : Interference rejection level - moderate

IR High : Interference rejection level - high

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

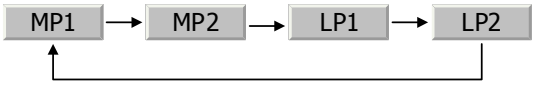
In general, IR Low should be selected.

3.4.2 Switch Transmitter Pulse Length [GAIN]

Procedures

1) **Press [GAIN] dial**

Values of the transmitter pulse width are switched.



Effects of transmitter pulse width

With [SP] selected: The transmitter pulse becomes shorter, and the range resolution improves. The effect of suppressing sea clutter returns and rain/snow clutter returns heightens.

Recommended condition for selection: In bays/harbors where targets are densely crowded. Rough sea state due to torrential rain or stormy weather.

With [MP] selected: The normal transmitter pulse length is set. Both range resolution and gain are appropriately set.

Recommended condition for selection: General navigation

With [LP] selected: The transmitter pulse becomes longer, and gain improves. Small targets are zoomed and are easy to observe. When the sea state is bad, detection performance decreases.

Recommended condition for selection: Detection of small targets in good weather conditions.

Usable transmitter pulse width differs according to the type of antenna being used and the observation range being used. For usable pulse width, see Section 11.8 "SCANNER UNIT (NKE-1139)"～Section 11.14 "SCANNER UNIT (NKE-2103-6HS)".

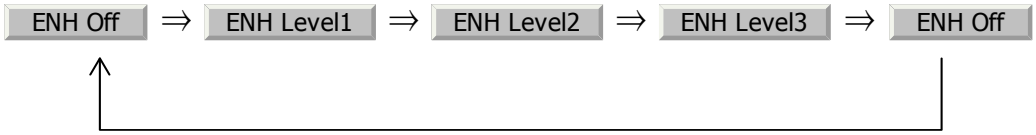
3.4.3 Target Enhance (ENH)

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

Procedures

1) **Left-click the ENH button located at the lower left of the radar display.**

The target enlargement levels are switched.



Effect of target enlargement

ENH Off	:Expansion off	Select this mode particularly when resolution is required.
ENH Level1	:Expansion small	Select this mode in general. Radar echoes are expanded by 1 scale in all directions.
ENH Level2	:Expansion medium	Select this mode to easily view the radar video. Radar echoes are expanded by 2 scales in all directions on the display.
ENH Level3	Expansion large	Select this mode to detect small targets such as buoys. The expansion near a screen center is added to ENH Level2.

NOTE: When ENH Level3 is selected, sea clutter returns and rain/ snow clutter returns are apt to be expanded. When using this expansion mode, operate [SEA] dial and [RAIN] dial to suppress sea clutter returns and rain/snow clutter returns.

In general, ENH Level1 or ENH Level2 should be selected.

3.4.4 Use Video Processing (PROC)

This function reduces unnecessary noise to highlight targets.

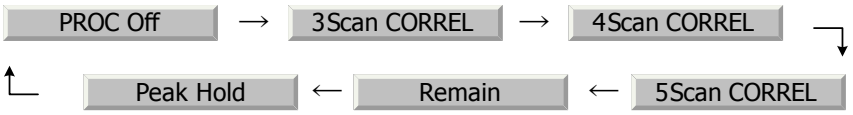
Attention

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

Procedures

1) **Left-click the PROC button located at the lower left of the display.**

The video processing modes are switched.



Video process modes

PROC Off : Select this mode in general.

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

4Scan CORREL : Select this mode to highlight targets while suppressing sea clutter returns.

5Scan CORREL : Select this mode to detect small targets hidden by sea clutter returns.

Remain : Select this mode when own ship yaws wildly.

Peak Hold : Select this mode to detect small targets of which detection probability is low.

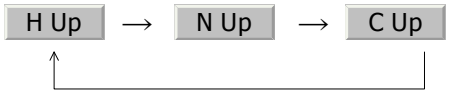
3.4.5 Switch Azimuth Display Mode (AZI MODE)

Select the bearing for the radar video to be displayed on the radar display.

Procedures

1) **Left-click the AZI Mode button located at the lower left of the display.**

The bearing display modes are switched.



True Bearing Mode [North Up]

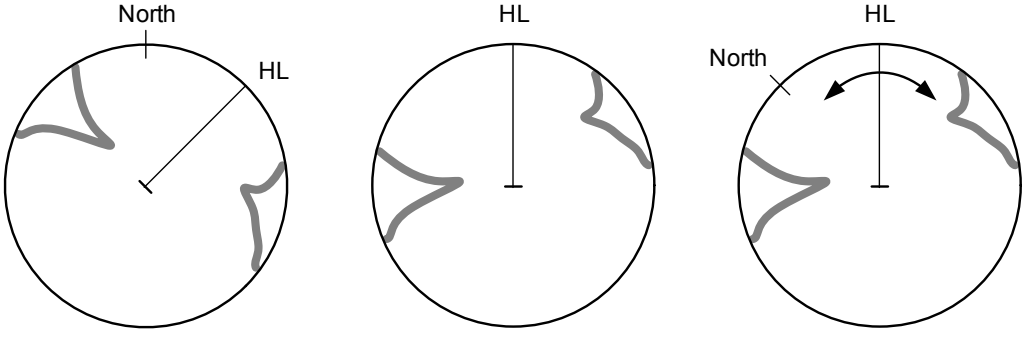
The video is displayed so that the zenith of the PPI (0° on range rings) points to the due north. Fixed targets do not flicker and are easily identified on the chart, and the true bearing of a target can easily be read out.

Relative Bearing Mode [Head Up]

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

Course-up Bearing Mode [Course Up]

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



North-up mode　　Head-up mode　　Course-up mode

3.4.6 Switch True/Relative Motion Display Mode (TM/RM)

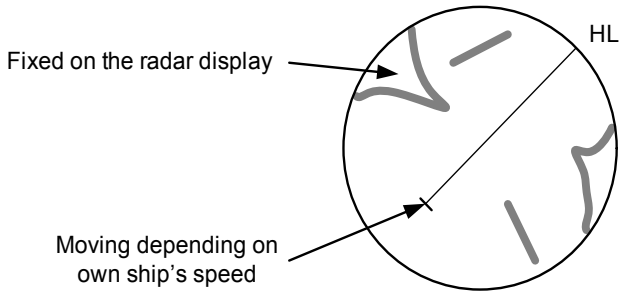
3.4.6.1 Switching Relative Motion (RM) Mode to True Motion (TM) Mode

Procedures

1) **Left-click the motion mode button located at the upper left of the radar display.**

RM(T) → TM

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



True Motion Display

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

Procedures

1) **Left-click the motion mode button for 2 seconds.**

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

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

Procedures

1) **Left-click the motion mode button.**

RM(T) → TM

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

3.4.7 Move Own Ship's Display Position (Off Center)

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

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

> This function is not available on the 96 NM range.

Procedures

1) **Left-click the Off Center button located at the upper left of the display.**

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

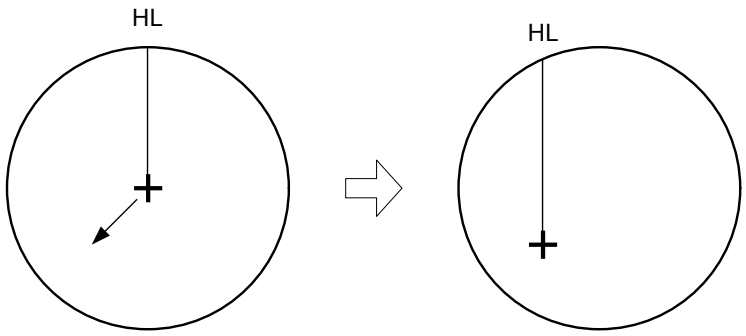
2) **Move the cross cursor mark (own ship's display position) to a desired position by using the trackball.**

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

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

3) **Press the trackball button on the left key.**

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



Move the cursor mark to a desired position

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

3.4.7.1 Returning Own Ship's Position to the Center

Procedures

1) **Left-click the Off Center button for 2 seconds.**

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

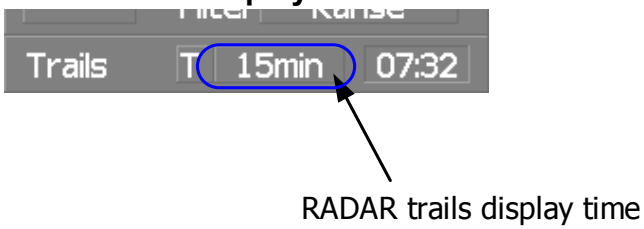
3.4.8 Display Radar Trails (Trails)

Other ship's movements and speeds can be monitored from the lengths and directions of their trails, serving for collision avoidance. The trail length varies according to setting.

3.4.8.1 Changing the length of the trail

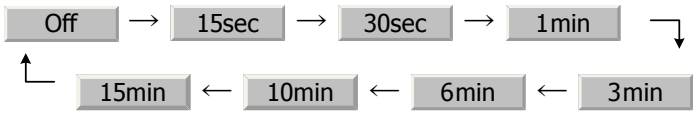
Procedures

1) **Left-click the Radar trails display time button located at the upper left of the display.**



Values of the length of the radar trails are switched.

Trails length setting: Short mode



Short : 15sec, 30sec, 1min, 3min, 6min, 10min and 15min

Middle : 30sec, 1min, 3min, 6min, 10min, 15min and 30min

Long : 1min, 3min, 6min, 10min, 15min, 30min and 60min

Saved trails cannot be erased even when the trail lengths are changed by using Trails button. Even after the trails display is turned off, the past trails can be displayed traced back by setting a desired time.

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

The system is plotting trails even while the trails display is off.

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

3.4.8.2 Erasing Trails Data

Procedures

1) **Hold down the Trails button for five seconds located at the upper right of the display.**

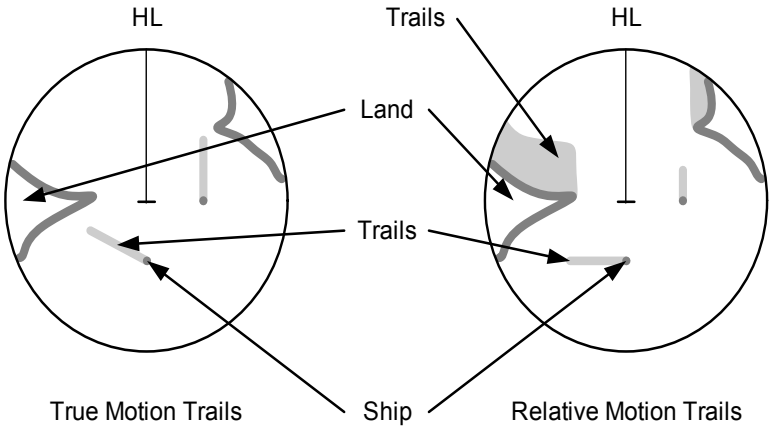
All the saved trails data will be erased. The system starts plotting trails in initial state.When Trails button is clicked for 2 seconds, a RADAR Trails Setting menu will be displayed. Furthermore, data will be erased if it continues pushing.

3.4.8.3 Trails Motion Mode

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

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

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



Trails modes provided with this system vary depending on the motion mode.

With true motion (TM) mode: Only the true motion trails mode is available.

With relative motion (RM) mode: The relative motion trails mode or true motion trails mode isselectable.

RM(R) is indicated while the relative motion trails mode is active.

RM(T) is indicated while the true motion trails mode is active.

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

- Motion display mode change (TM/RM)
- TM reset
- Bearing display mode change
- Center move (Off Center)
- MAP display on/off (Map)

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

3.4.8.4 Changing Motion Mode of Trails (Trails Mode)

Procedures

1) **Click the Trails Mode located at the upper right of the radar display.**

-

RADAR trails true/relative

The trails motion modes are switched.

T ⇔ R

3.4.9 Zoom (x2)

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

NOTE: If the range is 0.125 NM , this function is not available.

Procedures

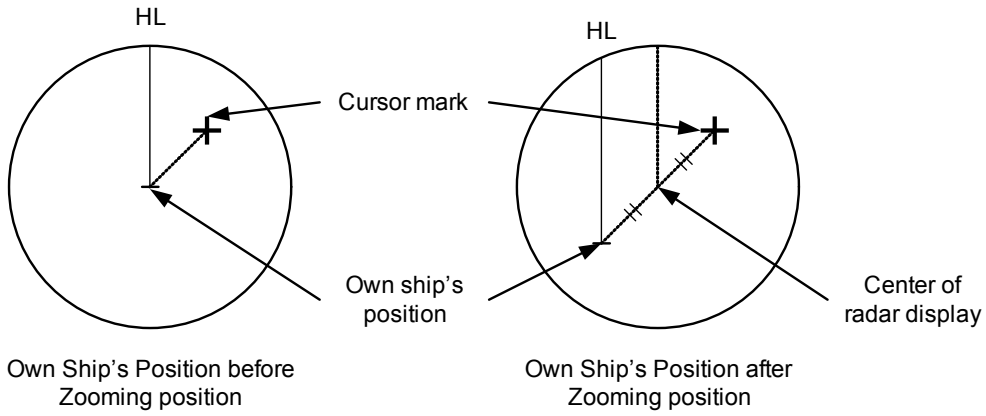
1) **Left-click the x2 button located at the lower left of the display.**

The zoom mode is selected.

2) **Subsequently, put the cross cursor mark on a location you want to zoom into, and press the left key of the trackball.**

The zoom is set.

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



Cancel

1) **Left-click the x2 button located at the lower left of the display.**

The zoom mode is cancelled.

3.4.10 Hide/Display Range Rings [HL OFF]

Procedures

1) **Press the [HL OFF] key. Alternatively, Left-click the button located at the lower right of the display.**

The ship's heading line (HL) is hidden while the [HL OFF] key is held down.

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

3.4.11 Hide Graphics Information on Radar Display [DATA OFF]

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

Procedures

1) **Press the [DATA OFF] key. Alternatively, Left-click the button located at the lower right of the display.**

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

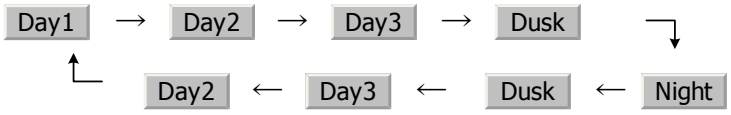
3.4.12 Switch Day/Night Mode [DAY/NIGHT]

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

Procedures

1) **Press the [DAY/NIGHT] key. Alternatively, left-click the Day/Night button located at the lower right of the radar display.**

The DAY/NIGHT modes are switched.



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

For how to set the display color and brilliance for each mode, see Section 3.8.5 "Set Radar Display (Display Setting)"

3.4.13 Adjust Operation Panel Brilliance [PANEL]

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

Procedures

1) **Press the [PANEL] key. Alternatively, left-click the** 

button located at the lower right of the radar display.

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

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

3.4.14 Set True Bearing

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

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

Procedures

1) **Open the numeric value input screen to enter a true bearing value by performing the menu operation below.**

Main → 6.NAV Equipment Setting → 1. Gyro Setting

2) **Enter a value indicated by the master gyro on the numeric value input screen.**

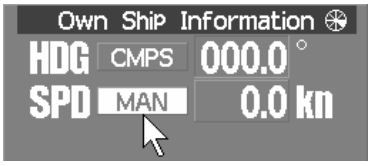
For how to input numeric data on the numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

3.4.15 Set Own Ship Speed

3.4.15.1 Switch the own ship speed device

Procedures

1) **Left-click the own ship speed device button in the Own Ship Information area located at the upper right of the display.**



The speed sensor is switched whenever the button is clicked.

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

NOTE:
- If the single axis water log display can present the speed of the ship in other than the forward direction, the direction of movement should be indicated unambiguously. Therefore single axis water logs cannot detect the effect of leeway.
- If you selected the 2AXW, the value of forward-backward direction is indicated.
- If ships in shallow water, when the accuracy of the dual-axis log may be decreased. If ships in deep sea area, when the accuracy of the dual-axis log error may be occurred.
- The accuracy of GPS's COG is ±3° when own ships speed no fewer than 1kn, no more than 17kn. The accuracy of GPS's COG is ±1° when own ships speed over 17kn.

3.4.15.2 Input the own ship speed (Manual Speed)

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

Procedures

1) **Left-click the own ship speed device button in the Own Ship Information area located at the upper right of the display, and select the manual mode** MAN **.**

2) **Left-click the value of the speed.**

The numeric value input screen will open to enter the own ship speed.

3) **Enter the value for the own ship speed on the numeric value input screen.**

For how to input numeric data on the numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

3.4.16 Magnet Compass Correction (MAG Compass Setting)

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

Procedures

1) **Open the MAG Compass Setting menu by performing the following menu operation.**

Main
→ 6.NAV Equipment Setting
→ 2. MAG Compass Setting

2) **Set whether to make corrections or not.**

1. Heading Correction

Off ⇔ On

3) **Input the correction value.**

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

For how to input numeric data on the numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

3.4.16.1 Set Drift Correction

The direction and speed of the drift are set.

This function can be used only when MAN or LOG is selected for ship-speed data.

Procedures

1) **Open the Set/Drift Setting menu by performing the menu operation below.**

Main → 6.NAV Equipment Setting → 3. Set/Drift Setting

2) **Set whether to make corrections or not.**

1. Correction

Off ⇔ On

For menu operation, see Section 3.3.3 "Basic Menu Operation".

3) **Enter the correction value for tidal current.**

2.Set : Direction of tidal current (true bearing)

3.Drift : Speed of tidal current

For how to input numeric data on the numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

3.5 USE 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.

NOTE: Even when own ship's track storage interval is turned Off, own ship's track can be displayed. However, in this case, if rewrite operation such as changing of the display range is performed for the radar display, own ship's track display is erased and the track will not be plotted again.

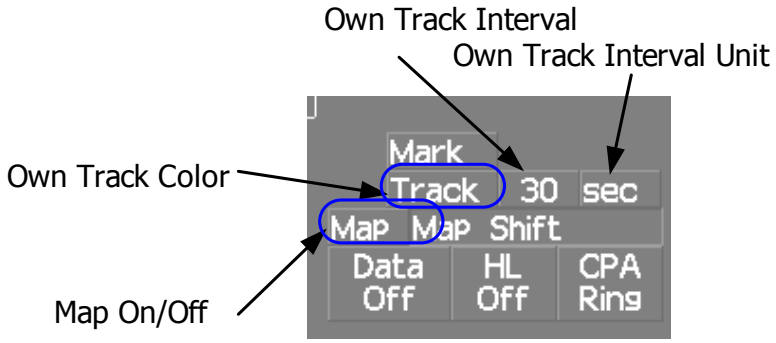
If the own ship track display is turned off when own ship track is in storage, own ship's tracks are not shown on the radar display, but own ship's track is still saved.

The own ship's track function is available between latitudes of 85° N and 85° S.

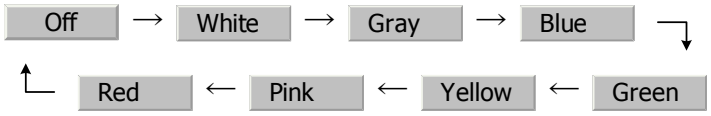
3.5.1 Display Own Ship's Track (Display Own Track)

Procedures

1) **Left-click the Own Track Color Track button located at the lower right of the display.**



The color of the own ship's track are switched.



2) **Left-click the Map button located at the lower right of the display.**

The map display function is turned on Map or off Map.

When Color is selected, the own ship's track is displayed.

3.5.2 Set Display Color of Own Ship's Track (Display Own Track Color)

Own ship's track can be saved in seven different colors.

Own ship's track can be displayed or not displayed individually by color.

Procedures

1) **Open the Display Own Track Setting menu by performing the menu operation**

Track

→ 1. DISP Own Track Color

The Display Own Track Setting menu will open.

Operations differ according to the following set modes.。

When 1. All is set to On All of own ship's tracks are displayed.

When 1. All is set to Off All of own ship's tracks are not displayed.

When 1. All is set to Individual Settings are made by color by performing the operation below.

2) **Left-click the color button for the desired display setting which is to be changed.**

Display of each item is switched between On and Off

On : Own ship's track plotted by the color is displayed.

Off : Own ship's track plotted by the color is not displayed.

3.5.3 Save Own Ship's Track (Own Track Memory)

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

The track storage interval can be selected from 10 preset time intervals and 8 preset range intervals.

Storage intervals that can be selected

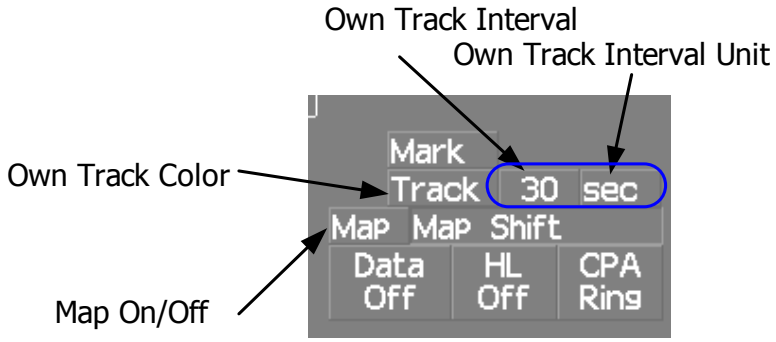
Time: 3 sec, 5 sec, 10 sec, 30 sec, 1 min, 3 min, 5 min, 10 min, 30 min, and 60 min

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

Procedures

1) **Left-click the Own Track Interval unit button located at the lower right of the display.**

Every time the button is clicked, the units of measure for the storage are switched.



2) **Left-click the Own Track Interval button located at the lower right of the display.**

Every time the button is clicked, storage intervals are switched.

When Off is selected, the storage function is turned off.

3.5.4 Cancel Saving of Own Ship's Track (Own Track Memory)

Storage of own ship's track can be turned off.

Cancel

1) **Left-click the Own Track Interval button located at the lower right of the display.**

Every time the button is clicked, interval for track storage are switched.

When Off is selected, the storage function is turned off.

3.5.5 Clear Own Ship's Track (Clear Own Track)

This function cancels the storing of own ship's track.

Procedures

1) **Open the Clear Own Track Color menu by performing the menu operation below.**

Track

→ 2. Clear Own Track Color

The Clear Own Track Color menu will appear.

2) **Left-click the button for the color to be deleted.**

All : All tracks are deleted

White / Gray / Blue / Red / Pink / Yellow / Green : Only track of specified color is deleted.

After the item has been selected, Clear Own Track Confirmation Window will appear.

3) **Left-click the Yes button.**

Own ship's track indicated by the specified color will be deleted.

3.5.6 Use Expanded Own Ship's Track (Own Track Type)

The following expanded track functions can be used for this radar system.

Water temperature track : The water temperature value at the latitude/longitude is recorded.

Water depth track : The water depth value at the latitude/longitude is recorded.

Tidal current track : The tidal current vector at the latitude/longitude is recorded.

Only one type of expanded own ship's track can be used at a time. Multiple types of expanded tracks cannot be used at the same time.

Specify the type of the expanded own ship's tracks to be used by performing the operation below.

Procedures

1) **Left-click the** Track **button located at the lower right of the display.**

The Own Track Menu will appear.

2) **Left-click the item button of** 3. Track Type **.**

The numeric value of the navigation data can be shown by the color of own ship's track.

Normal : The expanded own ship's track function is not used.

Depth : The color of the tracks is changed according to the water depth value

Temperature :The color of the tracks is changed according to the water temperature value.

3) **Select the function to be used.**

4) **Left-click the item button of** 4. Num Vector Display

Numeric value or vector of navigation data can be added to own ship's track.

Off : Numeric value and vector are not added.

Depth : Water depth value is added.

Temperature : Water temperature value is added.

Current :current vector is added.

5) **Select the function to be used.**

NOTE: To use the expanded own ship's track function, the track must be entered from the special navigation equipment into this radar system.

3.5.7 Use Water Depth Track (Water Depth Track)

Set the corresponding conditions for the water depth value and the color of own ship's track by performing the operation below.

Procedures

1) **Open the Water Depth Setting menu by performing the menu operation below.**

Track

→ 6. Water Depth Setting

The Water Depth Setting menu will appear.

Enter a value of the boundary water depth for each item according to the table below to set up the corresponding conditions for the water depth value and the color of own ship's track.

	Water depth value	Color of track
		White
1. xxxx m	Min	
		Gray
2. xxxx m		
		Blue
3. xxxx m		
		Green
4. xxxx m		
		Yellow
5. xxxx m		
		Pink
6. xxxx m	Max	
		Red

For example, if 10m is entered for 1. , 30m is entered for 2. , and 50m is entered for 3. , the area with a water depth of less than 10 meters is indicated by white tracks, the area with a water depth of 10 to 30 meters is indicated by gray tracks, and the area with a water depth of 30 to 50 meters is indicated by blue tracks.

3.5.8 Use Water Temperature Track (Water TEMP Track)

Set the corresponding conditions for the water temperature value and the color of own ship's track by performing the operation below.

Procedures

1) **Open the Water TEMP. Setting menu by performing the menu operation below**

Track

→ 7. Water TEMP. Setting

The Water TEMP. Setting menu will appear.

Enter a value of the boundary water temperature for each item according to the table below to set up the corresponding conditions for the water temperature value and the color of own ship's track.

	Water temperature value	Color of track
		White
1. xx.x ℃	Min	
		Gray
2. xx.x ℃		
		Blue
3. xx.x ℃		
		Green
4. xx.x ℃		
		Yellow
5. xx.x ℃		
		Pink
6. xx.x ℃	Max	
		Red

For example, if 10.0℃ is entered for 1. , 13.0℃ is entered for 2. , and 15.0℃ is entered for 3. , the area with a water temperature of less than 10.0℃ is indicated by white tracks, the area with a water depth of 10.0℃ to 13.0℃ is indicated by gray tracks, and the area with a water depth of 13.0℃ to 15.0℃ is indicated by blue tracks.

3.5.9 Use Tidal Current Track (Current Vector Track)

Set the conditions for adding tidal current vectors to own ship's track by performing the operation below.

Procedures

1) **Open the Current Setting menu by performing the menu operation below.**

Track

→ 8. Current Setting

The Current Setting menu will appear.

Set the tidal current vector display conditions.

[1]Length of the tidal current vector (Current Size)

- Set the length of the tidal current vector.
- The unit of measure is kn/cm.
- If 1.0kn/cm is set, a tidal current of 1.0kn is shown as a one-centimeter line on the radar display.

[2]Color of the vector for tidal current layer A (Layer A)

- Set the vector's display color for tidal current layer A.
- Choose one of the following colors
  White、Gray、Blue、Green、Yellow、Pink、Red

[3]Color of the vector for tidal current layer B (Layer B)

- Set the vector's display color for tidal current layer B.
- Choose one of the following colors
  White、Gray、Blue、Green、Yellow、Pink、Red

[4]Color of the vector for tidal current layer C (Layer C)

- Set the vector's display color for tidal current layer C.
- Choose one of the following colors
  White、Gray、Blue、Green、Yellow、Pink、Red

3.6 DISPLAY USER MAP

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

Marks that can be used : 29 types

Lines that can be used : 3 types (solid, broken, and dashed-dotted line)

Color of mark and lines that can be used : 7 colors

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

NOTE: The user map function is available between latitudes of 85° N and 85° S.

3.6.1 Create User Map (Mark/Line)

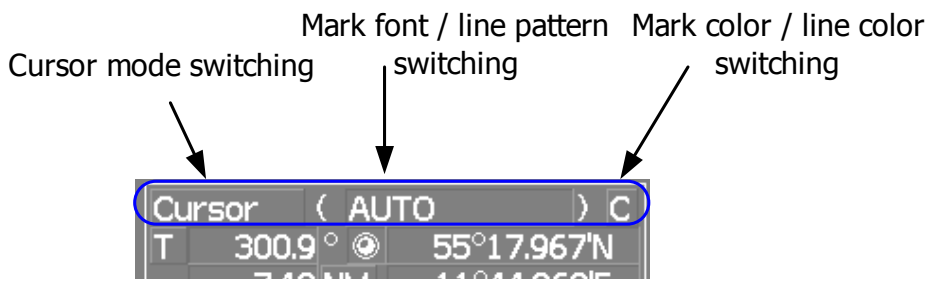
In this system, when the radar is in the transmission state, the user map is displayed all the time. However, valid latitude/longitude data and true bearing data must be entered into the system.

The user map can be created and edited by performing the following operation.

3.6.1.1 Plotting a mark

Procedures

1) **Left-click the** Cursor **button located at the upper right of the display to set the Mark mode.**



The mark font to be used is displayed to the right of the Cursor button.

2) **Left-click the mark font □ button to select a font for the mark.**

The mark fonts are switched.

3) **Left-click the C button located to the right of the mark font to select a color for the mark.**

The color for the mark font located to the right of the Cursor button will change.

4) **Left-click at a desired location on the radar display.**

The specified mark will be displayed in the specified color.

To create another mark, repeat the above procedures.

3.6.1.2 Plotting a line

Procedures

1) **Left-click the Cursor button located at the upper right of the display to select the line mode.**

The line pattern to be used is displayed to the right of the Cursor button.

2) **Left-click the - - - - - - - button located at the upper right of the display to select the line pattern.**

The line pattern to be used is displayed to the right of the Cursor button.

3) **Left-click the C button located to the right of the line pattern to select a color for the line.**

The color for the line pattern located to the right of the Cursor button will change.

4) **Left-click at a desired location on the radar display.**

Line colors are switched.

5) **Move the cursor to a desired location on the radar display and left-click.**

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

6) **When you want to finish plotting the line, left-click at the previous point.**

Line plotting will be terminated. To plot another line, repeat procedures 3.

3.6.1.3 Plotting a mark / line make with latitude and longitude

Procedures

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

U.Map → 2. Edit User Map → 2. Make with L/L

2) **Left-click the** 9. New Mark Input **button.**

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

3) **Left-click the item button of** 1. Type **to select the type of mark font or line pattern to be created.**

The desired mark font or line pattern is selected.

To add a line, select midpoint --O-- .

4) **Left-click the item button of** 2. Color **to select the color of mark or line to be created.**

The desired mark or line color is selected.

5) **Left-click the [3. L/L] button to input the latitude / longitude.**

For the input method on the latitude / longitude input screen, see Section 3.3.4.5 "Entering latitude/longitude"

6) **Left-click the [4. Comment] button to input the comment.**

For the input method on the character input screen, see Section 3.3.4.7 "Entering a character"

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

7) **Left-click the [5. Enter] button.**

Mark / Line plotting will be terminated.

To create another mark or line, repeat procedures 4 to 7.

3.6.2 Set User Map Display (Mark Display Setting)

The user map can be individually displayed (On) or hidden (Off).

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

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

The mark font display size can be selected.

Normal: The mark is displayed in normal size.

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

3.6.2.1 Setting display by type

Procedures

1) **Open the Display Mark Type menu by performing the menu operation below.**

[U.Map]

→ [5. Mark Display Setting]

→ [1. Display Mark Type]

The Display Mark Type menu will open.

2) **Specify whether to turn on or off the display for each type of mark and line.**

When [1. All] is selected, the setting will reflect to all types of marks and lines.

Off : All types are not displayed.

Individual : All types are displayed.

On : Setting by type is activated.

3.6.2.2 Setting display by color

Procedures

1) **Open the Display Mark Color Type menu by performing the menu operation below.**

[U.Map]

→ [5. Mark Display Setting]

→ [2. Display Mark Color]

The Display Mark Color Type menu will open.

2) **Specify whether to turn on or off the display for each color type of mark and line.**

When [1. All] is selected, the setting will reflect to all color types of marks and lines.

Off : All color types are not displayed.

Individual : Setting by color type is activated.

On : All color types are displayed.

3.6.2.3 Setting the mark font size

Procedures

1) **Open the Mark Size menu by performing the menu operation below.**

[U.Map]

→ [5. Mark Display Setting]

→ [3. Select Mark Size]

The Mark Size menu will appear.

2) **Specify the mark font size.**

Normal : The mark is displayed in normal size.

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

3.6.2.4 Setting the character size for comments

Procedures

1) **Open the Comment Font Size menu by performing the menu operation below.**

U.Map

→ 5. Mark Display Setting

→ 4. Comment Font Size

The Comment Font Size menu will appear.

2) **Specify the comment font size.**

Normal : The characters for comments are displayed in normal size.

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

3.6.3 Edit User Map (Edit User Map)

3.6.3.1 Manually entering the own ship position (Own Ship Position)

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

Procedures

1) **Open the Own Ship Position menu by performing the menu operation below.**

U.Map

→ 1. Own Ship Position

The number key screen for entering the latitude/longitude of the Own Ship Position will appear.

2) **Use the number buttons 0 to 9 to enter a value of latitude (xx°xxx.xxx').**

3) **To make changes between north latitude and south latitude, use the + and − buttons.**

North latitude : Left-click the + button.
South latitude : Left-click the − button.

4) **Left-click the ENT button.**

The manually entered latitude will be determined. Then, enter the value of longitude.

5) **Use the number buttons 0 to 9 to enter a value of longitude (xx°xxx.xxx').**

6) **To make changes between east longitude and west longitude, use the + and − buttons.**

East longitude: Left-click the + button.
West longitude: Left-click the − button.

7) **Left-click the ENT button.**

The manually entered longitude will be determined.

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

3.6.3.2 Moving a mark or line (Move)

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

Procedures

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

U.Map

→ 2. Edit User Map

The Edit User Map menu will appear.

2) **Left-click the 3. Move button.**

The user map move mode is selected.

Move Map is displayed in the cursor mode located at the upper right of the display.

3) **Put the cursor on a mark or line, and left-click.**

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

4) **Move the ✥ cursor mark to the destination, and left-click.**

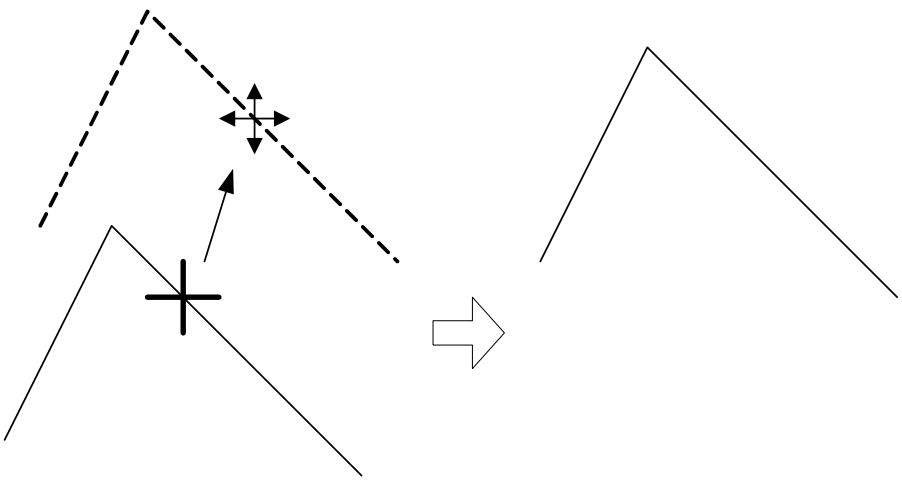
The selected mark or line is moved to the destination.

To move another mark or line, repeat procedures 3 and 4.

5) **When finished with the correction of all items, left-click the 0.Exit button.**

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

(Example)



3.6.3.3 Deleting a mark or line (Delete)

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

Procedures

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

U.Map

→ 2. Edit User Map

The Edit User Map menu will appear.

2) **Left-click the** 4. Delete **button.**

The user map delete mode is selected.

Delete is displayed in the cursor mode located at the upper right of the display.

3) **Put the cursor on a mark or line, and left-click.**

The entire selected mark or line is deleted.

To delete another mark or line, repeat procedures 3 and 4.

4) **When finished with the correction of all items, left-click the** 0.Exit **button.**

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

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

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

Procedures

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

U.Map

→ 2. Edit User Map

The Edit User Map menu will appear.

2) Left-click the 5. Insert/Move Vertex button.

The user map insert/correction mode is selected.

Insert/Move is displayed in the cursor mode located the upper right of the display.

3) **Put the cursor to a side line into which a vertex will be inserted, and left-click.**

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

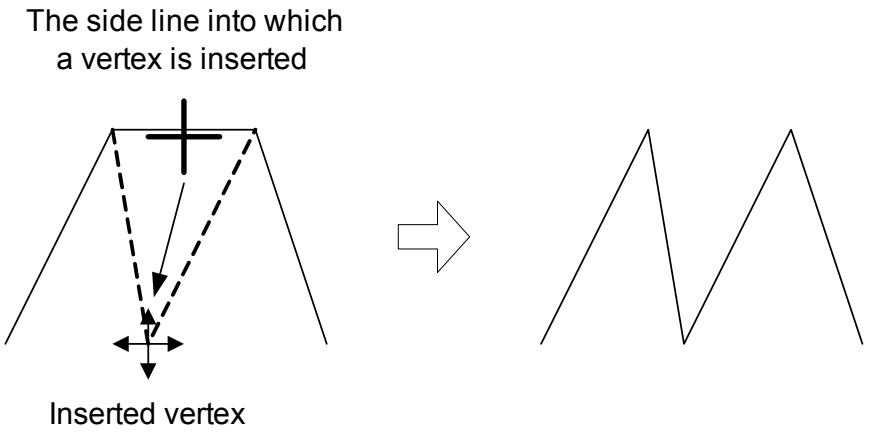
4) **Move the  cursor mark to the newly inserted vertex, and left-click.**

To insert another vertex, repeat procedures 3 and 4.

5) **When finished with the correction of all items, left-click the 0.Exit button.**

The cursor mode changes to the normal operation mode, terminating the user map insertion/ correction mode.

(Example)



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

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

Procedures

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

U.Map → 2. Edit User Map

The Edit User Map menu will appear.

2) **Left-click the** 5. Insert/Move Vertex **button.**

The user map insertion/correction mode is selected.

Insert/Move is displayed in the cursor mode located at the upper right of the display.

3) **Put the cursor on the mark or vertex of a line, and left-click.**

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

4) **Move the ✥ cursor mark to the destination, and left-click.**

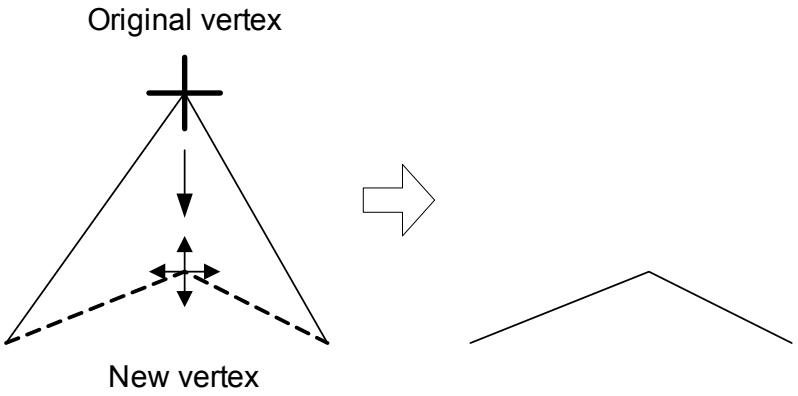
The selected mark or vertex of the line is moved to the destination.

To correct another mark or vertex of a line, repeat procedures 3 and 4.

5) **When finished with the correction of all items, left-click the** 0.Exit **button.**

The cursor mode changes to the normal operation mode, terminating the user map insertion/correction mode.

(Example)



3.6.3.6 Deleting a mark or vertex from a line (Delete Vertex)

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

Procedures

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

U.Map

→ 2. Edit User Map

The Edit User Map menu will appear.

2) **Left-click the** 6. Delete Vertex **button.**

The user map delete mode is selected.

Delete is displayed in the cursor mode located at the upper right of the radar display.

3) **Put the cursor on the vertex of a mark or line, and left-click.**

The selected mark or vertex of the line is deleted.

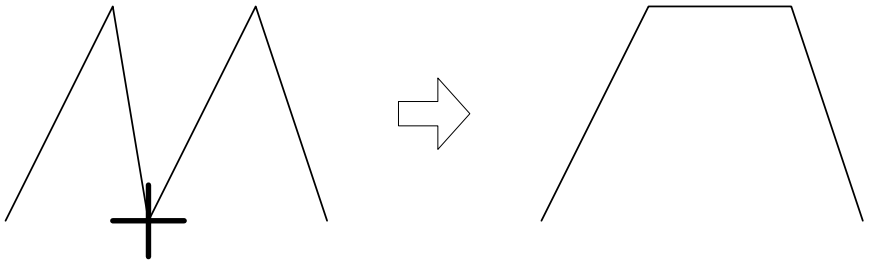
All of the lines drawn by joining two points are deleted.

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

4) **When finished with the correction of all items, left-click the** 0.Exit **button.**

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

(Example)



The vertex to be deleted

3.6.3.7 Batch clearing marks or lines (Clear)

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

Procedures

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

U.Map

→ 2. Edit User Map

The Edit User Map menu will appear.

2)-1 **Left-click the item button of** 7. Delete by Type

Select the type of marks or lines to be deleted.

To select all types, select All .

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

2)-2 **Left-click the item button of** 7. Delete

Select the color of marks or lines to be deleted.

To select all colors, select All .

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

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

3) **Left-click the [1. Yes] button.**

The selected mark will be deleted.

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

3.6.4 Correct Position on User Map (Shift User Map)

3.6.4.1 Correcting the display position on the user map (Shift)

If the display position on the user map is different from an actual position, it can be changed to the correct position in manual mode.

Procedures

1) **Open the [Shift] menu by performing the menu operation below.**

[U.Map]

→ [3. Shift]

[Shift] is displayed for the Cursor mode, indicating that the user map shift mode is selected.

2) **Put the pointer on a mark or end of a line, coastline, or depth contour line, and left-click.**

3) **Move the cross cursor mark to the location to be corrected, and left-click.**

Positions of all marks and lines currently displayed will be corrected.

At this time, Map Shift is displayed in the map position correction (lower right of the display), indicating that the position is being corrected.

[Map Shift] : Heading correction is conducted

[Map Shift] : Heading correction is not conducted

3.6.4.2 Restoring the corrected user map to its original state (Shift Clear)

Procedures

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

U.Map

→ 4. Shift Clear

Only the most recently corrected data (for a single input) will be cleared, and the data will be displayed at its original position.

At this time, Map Shift is not displayed in the map position correction (lower right of the display).

Map Shift : Heading correction is conducted

Map Shift : Heading correction is not conducted

3.6.5 Save User Map

3.6.5.1 Loading navigation data (Load User Map)

Procedures

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

Flash memory card (option) is necessary.

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

U.Map

→ 7. File Operation

3) **Left-click the item button of** 1. Select Card Slot **and select the card slot.**

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

4) **Left-click the item button of** 2. Load Mode **and select** Add **/** Overwrite **.**

Add and Overwrite of the Load Mode items are switched.

When [Add] is selected, new data is added to the savedd data. When [Overwrite] is selected, the saved data is overwritten.

5) **Left-click the** 3. Load **button.**

The list of navigation data saved in the system will be displayed.

6) **Left-click the button for the file to be loaded.**

Confirmation Window will appear.

7) **Left-click the** 1. Yes **button.**

The selected navigation data will be loaded and displayed on the radar display.

3.6.5.2 Discarding navigation data (Unload User Map)

Procedures

1) **Open the File Operations menu by performing the following menu operation.**

U.Map

→ 7. File Operation

2) **Left-click the** 4. Unload **button.**

Unload Confirmation Window will appear.

3) **Left-click the** 1. Yes **button.**

The saved navigation data will be discarded.

3.6.5.3 Storing navigation data (Save User Map)

Navigation data can be saved when navigation equipment is connected, or the own ship position on the user map is entered in the manual mode.

Procedures

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

Flash memory card (option) is necessary.

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

U.Map

→ 7. File Operation

3) **Left-click the item button of** 1. Select Card Slot **and select the card slot.**

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

4) **Left-click the** 5. Save **button.**

The Input File Name screen will appear.

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

Up to 10 characters can be entered.For the input method on the character input screen, see Section 3.3.4.7 "Entering a character".

After the data has been entered, Confirmation Window will appear.

6) **Left-click the** 1. Yes **button.**

Navigation data currently being displayed is saved.

3.6.5.4 Clearing the saved navigation data (Erase User Map)

Procedures

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

Flash memory card (option) is necessary.

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

U.Map

→ 7. File Operation

3) **Left-click the item button of** 1. Select Card Slot **and select the card slot.**

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

4) **Left-click the** 6. Erase **button.**

The Erace screen will appear.

The list of navigation data saved in the card will be displayed.

5) **Click numeric buttons corresponding to the number for the file to be deleted.**

Confirmation Window will appear.

6) **Left-click the** 1. Yes **button.**

The selected navigation data is deleted and the name of the file is deleted from the list.

3.6.5.5 Displaying saved navigation data (Card Mark Display)

Procedures

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

Flash memory card (option) is necessary.

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

U.Map

→ 7. File Operation

3) **Left-click the item button of** 1. Select Card Slot **and select the card slot.**

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

4) **Left-click the** 7. Card Mark Display **button.**

The Card Mark Display screen will appear.

The list of navigation data saved in the card will be displayed.

5) **Left-click the button corresponding to the number for the file to be displayed.**

Confirmation Window will appear.

6) **Left-click the** 1. Yes **button.**

The selected navigation data will be displayed.

3.6.6 Set and Display Geodetic System (Geodetic)

To create navigation information, set the geodetic system that is used with the connected navigation equipment. When navigation information is loaded, the geodetic system used when the navigation information was saved, is displayed. Make sure that the displayed geodetic system is identical to the one used with the navigation equipment. If the two geodetic systems are different, the positions of navigation information on the radar display will be shifted. Therefore, it is important to set the geodetic system of the navigation equipment.

[1] Setting the geodetic system for navigation data to be saved (Geodetic)

Procedures

1) **Open the Geodetic menu by performing the following menu operation.**

U.Map

→ 6. Geodetic

The numeric value input screen for Geodetic will appear.

2) **Enter the desired geodetic system number.**

The geodetic system is determined.

For how to input numeric datas on the numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

[2] Displaying the geodetic system of the navigation data being displayed (Geodetic)

Procedures

1) **Load navigation data by referring to Section 3.6.5.1 "Loading navigation data (Load User Map)".**

2) **Open the Mark Operations menu by performing the following menu operation.**

U.Map

The geodetic system will be displayed in the 6. Geodetic field.

Table3-1 : Geodetic System List

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

3.7 USE ROUTE FUNCTION

In this radar system, a destination mark set by navigation equipment can be displayed, and a simple route can be created, displayed, loaded and saved. (To use this function, navigation equipment must be connected to this system)

If radar video is poor visibility caused by route function, click the Map button to turn off the Map function. Otherwise, press the [DATA OFF] key to map displays temporarily off.

NOTE: The user map function is available between latitudes of 85° N and 85° S.

3.7.1 Display Route/Destination Mark (Select Route)

In this radar system, the following route and destination marks can be displayed.

Route : Route created in the radar system, ECDIS and GPS are displayed.

Destination mark : Destination marks sent from outside navigation equipment are displayed.

Procedures

1) **Left-click the** Route **button located at the lower right of the radar display.**

The Route Menu will appear.

2) **Set the** 1. Select Route **item.**

The following route/destination mark display modes can be selected.

Off : Route and destination marks are not displayed.

Internal : Route saved in the system are displayed.

NMEA : Destination marks are displayed by using WPT data sent from outside navigation equipment.[i]

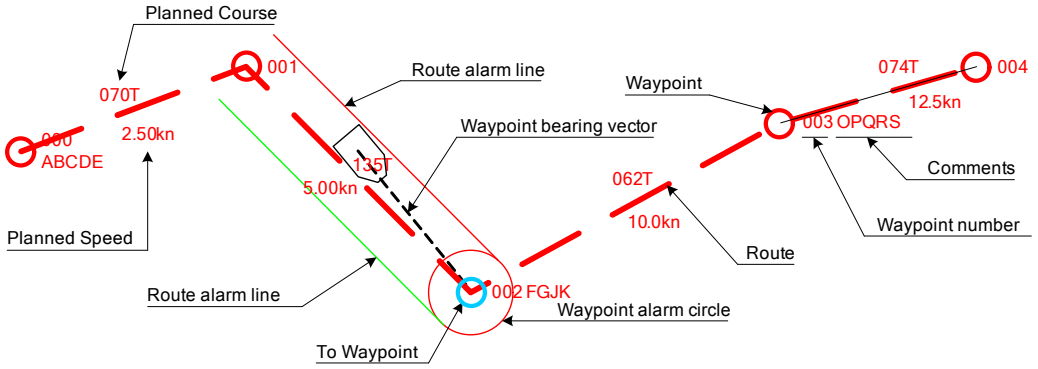
ECDIS/GPS : Route created in the ECDIS and GPS are displayed.[ii]

i. To display the ○WP mark on the radar display, NMEA select. The destination mark is displayed only when the Waypoint data is received from outside by using the NMEA sentence (RMB,BWC,BWR).

ii. When the system display Route which are created in the ECDIS, following items are not displayed.
- **XTL**
- **Arrival Radius**
- **ROT**
- **Turn Radius**
- **Time Zone**
- **Sail**

3.7.1.1 Displaying route created by the radar system (Internal)

In this radar system, route created by the radar system are displayed as shown below.



The following rout data is displayed.

Waypoint : Up to 512 points (number: 000 to 511), comments can be entered.

To Waypoint : Next Waypoint is displayed in a light blue circle.

Route : A route line that connects Waypoints.

Planned Courese : Scheduled route between Waypoints (automatically calculated).

Planned Speed : Scheduled sailing speed between Waypoints (entered by user).

Waypoint alarm circle : The circle that shows the distance to judge arrival in Waypoint.

Route alarm line : The line that shows the distance width to judge route alarm.

Waypoint bearing vector : A vector line that shows next destination from own ship's CCRP.

3.7.2 Edit Route (Set Route Sequence)

In this radar system, it is possible to easily create and correct route by performing operation on the radar display.

3.7.2.1 Initializing route data (New Monitor Route)

Route data saved in the radar system is initialized.

NOTE:	Once route data is initialized, route data saved in the radar system's storage section is deleted. If there is necessary route data, save the route data on the flash memory card before initializing it.

Procedures

1) **Open the Set Route Sequence menu by performing the menu operation below.**

Route

→ 2. WPT/Route Setting

→ 3. Set Route Sequence

2) **Left-click the** 7. New Monitor Route **button.**

Confirmation Window will appear.

3) **Left-click the** 1. Yes **button.**

The saved route data will be deleted.

3.7.2.2 Adding a Waypoint (Add Waypoint)

New Waypoint data is added to the route data saved in the radar system.

Procedures

1) **Open the Set Route Sequence menu by performing the menu operation below.**

Route

→ 2. WPT/Route Setting

→ 3. Set Route Sequence

2) **Left-click the** 2. Add **button.**

The Waypoint adding mode is selected.

The rubber band from the last Waypoint to the cursor position will be displayed on the radar display.

3) **Left-click the location at which you want to add a Waypoint.**

A Waypoint will be added.

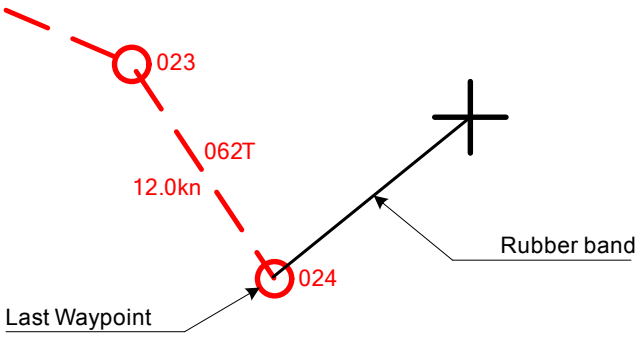
When a Waypoint is added, the value of the Planned Speed in the section up to the menu is used for the Planned Speed value up to the added Waypoint.

4) **To add another Waypoint, repeat procedure 3.**

5) **To finish adding a Waypoint, left-click twice at the last Waypoint.**

The Waypoint adding mode is cancelled.

(Example)



3.7.2.3 Correcting coordinates of a Waypoint (Correct Position)

The coordinates of a Waypoint in the route data saved in the radar system are corrected.

Procedures

1) **Open the Set Route Sequence menu by performing the menu operation below.**

Route → 2. WPT/Route Setting → 3. Set Route Sequence

2) **Left-click the** 3. Correct Position **button.**

The Waypoint correcting mode is selected.

3) **On the radar display, put the cursor on the Waypoint that is to have its coordinates corrected, and left-click.**

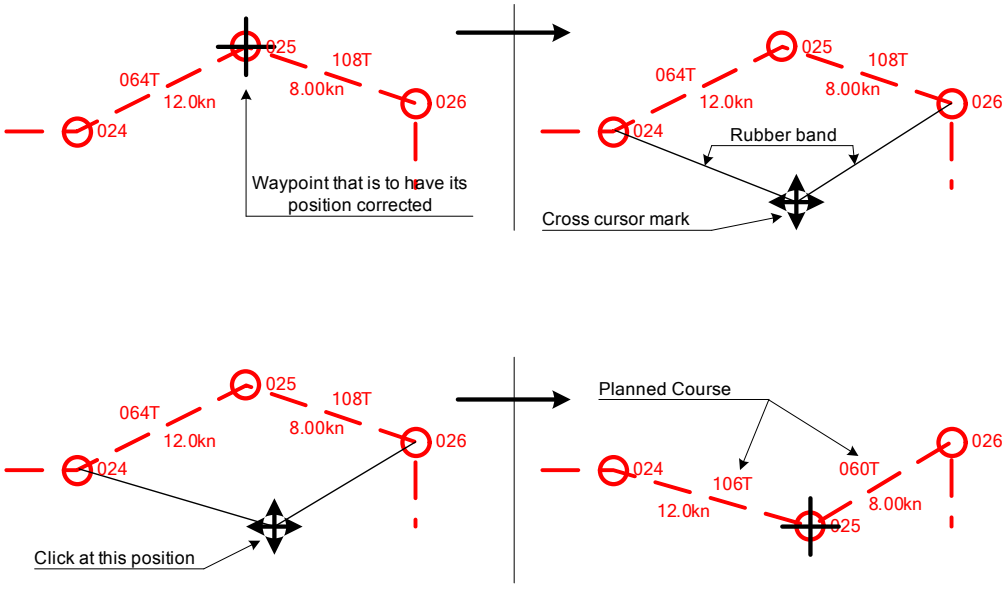
The Waypoint to be corrected is specified.

The cursor display becomes a ✥ cursor mark, and a rubber band is displayed.

4) **Move the cursor to new coordinates, and left-click.**

The coordinates of the Waypoint are corrected, and then the Waypoint correcting mode is cancelled.

(Example)



3.7.2.4 Correcting Planned Speed (Correct Planned Speed)

Planned Speed of the route data saved in the radar system is corrected.

Procedures

1) **Open the Set Route Sequence menu by performing the menu operation below.**

Route → 2. WPT/Route Setting → 3. Set Route Sequence

2) **Left-click the** 4. Correct Planned Speed **button.**

The Planned Speed correcting mode is selected.

3) **Left-click the** 1. Planned Speed **button.**

The Planned Speed input screen will appear.

Enter a numeric value of new Planned Speed.

4) **On the radar display, put the cursor on the line extending between Waypoints that is to have its Planned Speed corrected.**

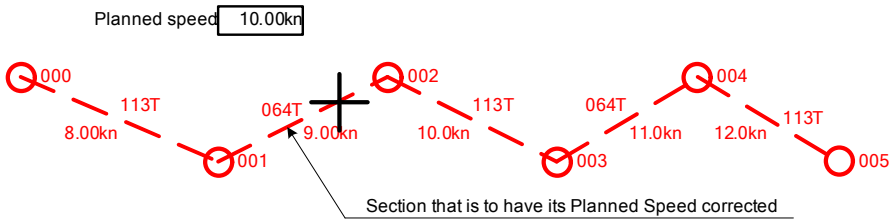
The section that is to have its Planned Speed corrected is specified, and the new Planned Speed is applied to the section.

5) **To correct the Planned Speed of another section, repeat procedures 3 and 4.**

6) **To finish correcting Planned Speed, left-click the** 4. Correct Planned Speed **button.**

The Planned Speed correcting mode will be cancelled.

(Example)



3.7.2.5 Deleting a Waypoint (Delete Waypoint)

The specified Waypoint in the route data saved in the radar system is deleted.

Procedures

1) **Open the Set Route Sequence menu by performing the menu operation below.**

Route → 2. WPT/Route Setting → 3. Set Route Sequence

2) **Left-click the** 5. Delete **button.**

The Waypoint deleting mode is selected.

3) **On the radar display, put the cursor on a Waypoint to be deleted, and left-click.**

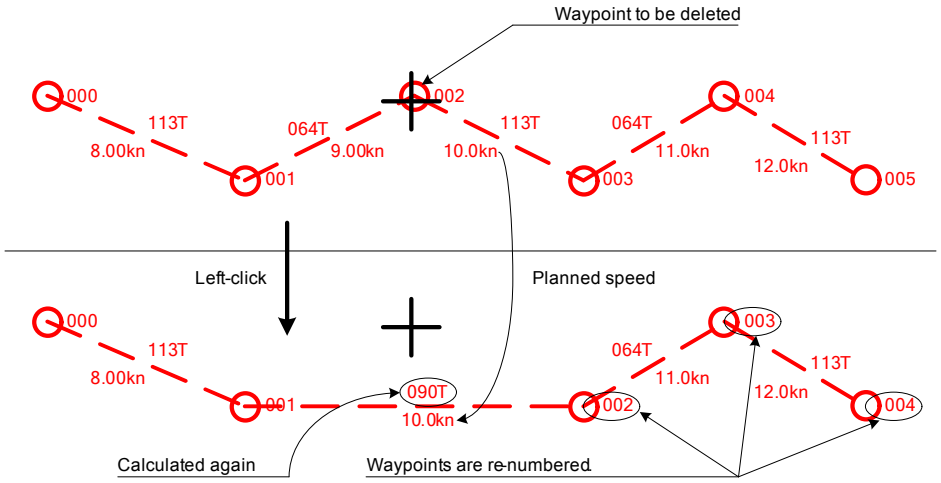
The specified Waypoint is deleted, and the previous and following Waypoints are then connected by a line.

4) **To delete another Waypoint, repeat procedure 3.**

5) **To finish deleting a Waypoint, left-click the** 5. Delete **button.**

The Waypoint deleting mode will be cancelled.

(Example)



3.7.2.6 Inserting a Waypoint (Insert Waypoint)

A Waypoint is inserted at a specific location of the route data saved in the radar system.

Procedures

1) **Open the Set Route Sequence menu by performing the menu operation below.**

Route

→ 2. WPT/Route Setting

→ 3. Set Route Sequence

2) **Left-click the** 6. Insert **button.**

The Waypoint inserting mode is selected.

3) **On the radar display, put the cursor on the section line into which a Waypoint is to be inserted, and left-click.**

The section is specified, the cursor becomes a cross cursor mark, and the cross cursor mark is connected to the previous and following Waypoints by a rubber band.

4) **On the radar display, put the cursor on the location at which a Waypoint is to be inserted, and left-click.**

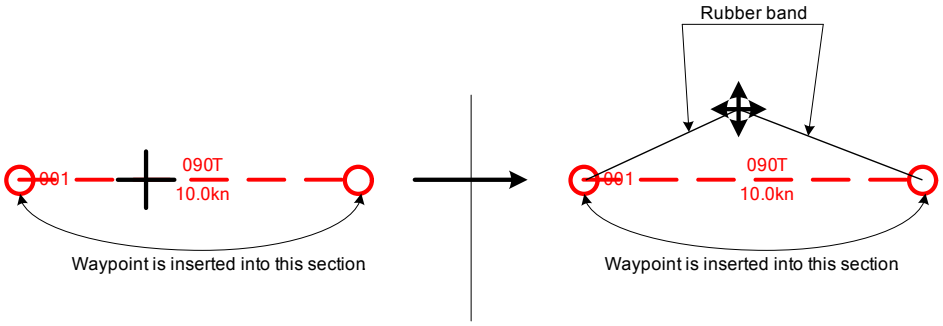
The coordinates of the new Waypoint are specified, and the new Waypoint is connected to the previous and following Waypoints by a line.

5) **To insert another Waypoint, repeat procedures 3 and 4.**

6) **To finish inserting a Waypoint, left-click the** 6. Insert **button.**

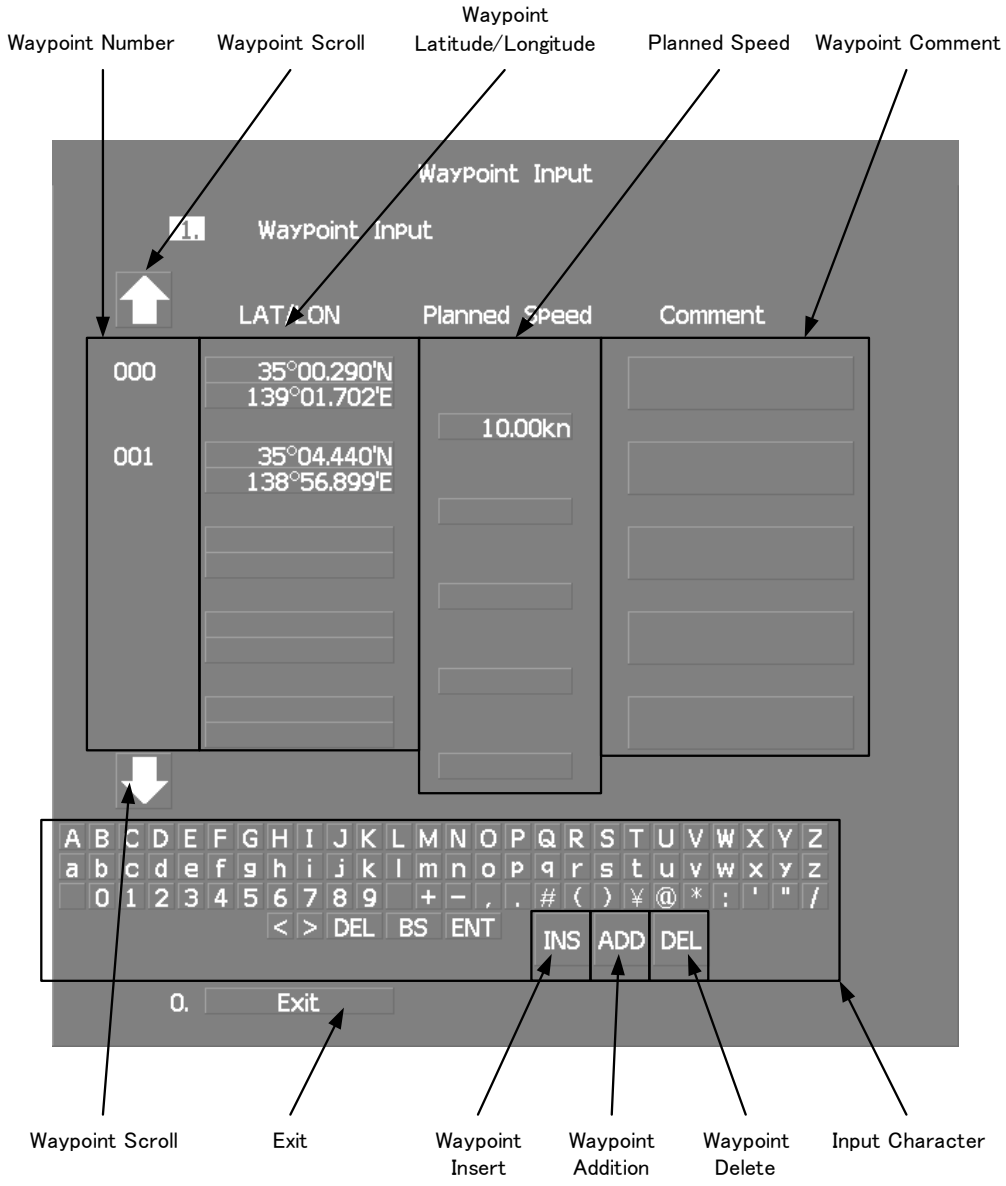
The Waypoint inserting mode will be cancelled.

(Example)



3.7.3 Edit Route Make with Latitude and Longitude (Waypoint Input)

In this radar system, it is possible to create and correct route by performing operation on the Waipoint Input menu.



3.7.3.1 Open the Waipoint Input Menu

Procedures

1) **Open the Waypoint Input menu by performing the menu operation below.**

Route

→ 2. WPT/Route Setting

→ 6. Waypoint Input

When transmitting, it can not be open.

3.7.3.2 Adding a Waypoint (Add)

New Waypoint data is added to the route data saved in the radar system.

Procedures

1) **Open the Waipoint Input menu.**

2) **Left-click the** ADD **button.**

The new latitude of waypoint is reversed.

3) **Enter a latitude / longitude and a planned speed.**

A Waypoint will be added.

For the input method on the latitude / longitude and numeric value input screen, see Section 3.3.4.5 "Entering latitude/longitude" and Section 3.3.4.7 "Entering a character".

3.7.3.3 Adding a Comment (Comment)

New Waypoint data is added to the route data saved in the radar system.

Procedures

1) **Open the Waipoint Input menu.**

2) **Left-click the Waypoint Scroll button.**

Left-click to show the desired comment.

3) **Left-click the Comment button to be added.**

The comment of waypoint is reversed.

4) **Enter a comment.**

A comment will be added.

For the input method on the character input screen, see Section 3.3.4.7 "Entering a character".

3.7.3.4 Correcting latitude / longitude of a Waypoint (LAT/LON)

The latitude / longitude of a Waypoint in the route data saved in the radar system are corrected.

Procedures

1) **Open the Waipoint Input menu.**

2) **Left-click the Waypoint Scroll button.**

Left-click to show the desired latitude / longitude.

3) **Left-click the Latitude / Longitude button to be corrected.**

The latitude of waypoint is reversed.

4) **Enter a latitude / longitude.**

A Waypoint will be corrected.

For the input method on the latitude / longitude input screen, see Section 3.3.4.5 "Entering latitude/longitude".

3.7.3.5 Correcting Planned Speed (Planned Speed)

Planned Speed of the route data saved in the radar system is corrected.

Procedures

1) **Open the Waipoint Input menu.**

2) **Left-click the Waypoint Scroll button.**

Left-click to show the desired planned speed.

3) **Left-click the Planned Speed button to be corrected.**

The planned speed of waypoint is reversed.

4) **Enter a planned speed.**

A Planned Speed will be corrected.

For the input method on the numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

3.7.3.6 Deleting a Waypoint (DEL)

The specified Waypoint in the route data saved in the radar system is deleted.

Procedures

1) **Open the Waipoint Input menu.**

2) **Left-click the Waypoint Scroll button.**

Left-click to show the desired waypoint.

3) **Left-click the** DEL **button to be corrected.**

Confirmation Window will appear.

4) **Left-click the** 1. Yes **button.**

The specified Waypoint is deleted, and the previous and following Waypoints are then connected by a line.

3.7.3.7 Inserting a Waypoint (INS)

A Waypoint is inserted at a specific location of the route data saved in the radar system.

Procedures

1) **Open the Waipoint Input menu.**

2) **Left-click the Waypoint Scroll button.**

Left-click to show the desired waypoint.

3) **Left-click the** INS **button to be corrected.**

The new latitude of waypoint is reversed.

4) **Enter a latitude / longitude and a planned speed.**

A Waypoint will be inserted.

For the input method on the latitude / longitude and numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

3.7.4 Use Route Monitoring Function (Waypoint/Route Alarm)

This radar system can monitor the movement of own ship with regard to its route and activate a variety of alarms.

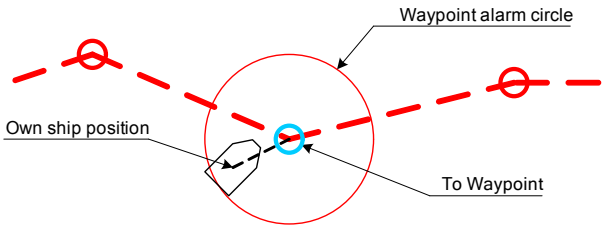
Destination alarm (Waypoint Alarm): When own ship arrives at next Waypoint, an alarm will be activated.

Route alarm: When own ship deviates from the specified route, an alarm will be activated.

3.7.4.1 Destination alarm (Waypoint Alarm)

The destination alarm is activated when own ship has reached next Waypoint or own ship has deviated from the scheduled route.

A Waypoint alarm circle with a specified radius distance is displayed.



Waypoint Alarm has the following two types of alarms:

Arrival: An alarm is activated when own ship has entered the circle from outside.

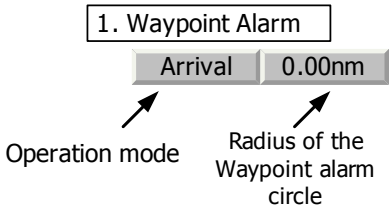
Break Off: An alarm is activated when own ship has left the circle to the outside.

Procedures

1) **Open the WPT/Route Setting menu by performing the menu operation below.**

Route → 2. WPT/Route Setting

2) **Left-click the set value of the** 1. Waypoint Alarm **item, and select an operation mode.**



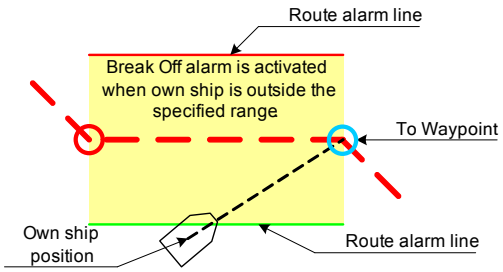
Arrival / Break Off : Set the operation mode.

0.00nm : Set the radius of the Waypoint alarm circle. If 0.00nm is set, alarm operation will be turned off.

3.7.4.2 Route Alarm

The route alarm is activated when own ship deviates from the specified width of the route.

The route alarm lines are displayed with a specified width provided.



Route Alarm has the following two types of operations:

Approach : An alarm is activated when own ship enters the route range from outside.

XTE(Cross Track Error) : An alarm is activated when own ship leaves the route range.

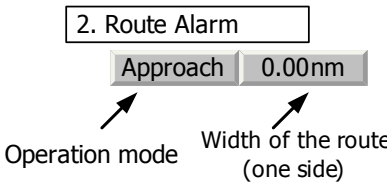
Procedures

1) **Open the WPT/Route Setting menu by performing the menu operation below.**

Route

→ 2. WPT/Route Setting

2) **Left-click the set value of the** 2. Route Alarm **item, and select an operation mode.**



Approach / XTE : Set the operation mode.

0.00nm : Set the width of the route (one side). If 0.00nm is set, an alarm operation will be turned off.

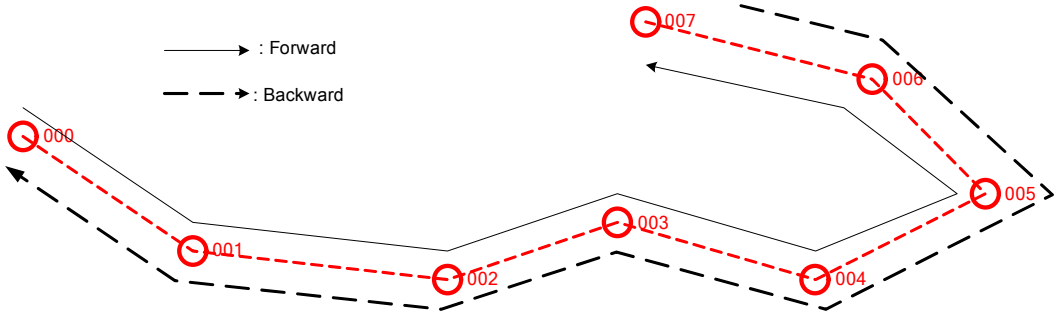
3.7.5 Method of Using Route

The method of using the route will be described.

Displaying the route (Route Alarm Color):	The internal route is displayed according to the procedures in Section 3.7.1 "Display Route/Destination Mark (Select Route)".
Selecting the forward or backward of the route (Route Sequence):	Whether to use Waypoints forward or backward is selected.
Skipping of route (Waypoint Skip):	The Waypoint which is after next Waypoint is set as the next Waypoint.
Skipping back of the route (Waypoint Back Skip):	The previous Waypoint is set as the next Waypoint.

3.7.5.1 Selecting the forward or backward of the route (Route Sequence)

Select whether Waypoints in route data are used in the forward direction or backward direction.



Procedures

1) **Open the WPT/Route Operations menu by performing the menu operation below.**

Route

→ 3. WPT/Route Operations

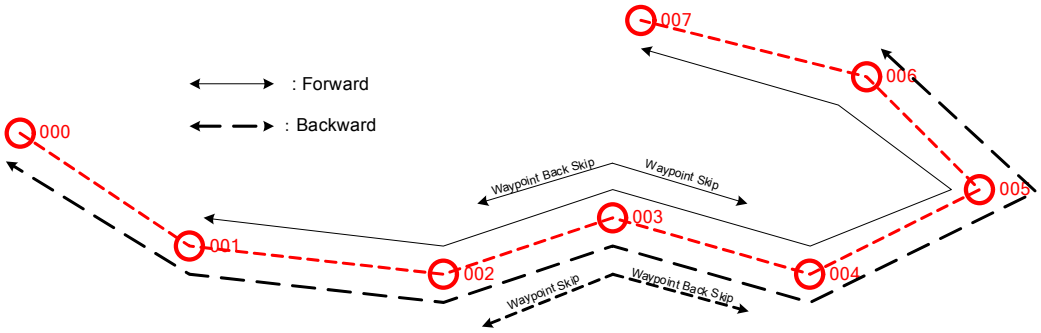
2 Left-click the set value of the 1. Route Sequence item, and select an operation mode.

Forward :Waypoints are used in the forward direction (ascending order).

Reverse :Waypoints are used in the reverse direction (descending order).

3.7.5.2 Skipping/Back-skipping of the route (Waypoint Skip/ Waypoint Back Skip)

Next Waypoint of the route can be changed by user manually.



Skipping of route (Waypoint Skip):	The Waypoint which is after the next Waypoint is set as the next Waypoint.
Skipping back the route (Waypoint Back Skip):	The previous Waypoint is set as the next Waypoint.

Procedures

1) **Open the WPT/Route Operations menu by performing the menu operation below.**

Route

→ 3. WPT/Route Operations

2) **To execute Waypoint Skip, left-click the 3. Waypoint Skip button.**

The Waypoint which is after the next Waypoint is set as the next Waypoint.

3) **To execute Waypoint Back Skip, left-click the 4. Waypoint Back Skip Skip button.**

The previous Waypoint is set as the next Waypoint.

3.7.6 Detailed Route Settings

Make detailed settings of the route.

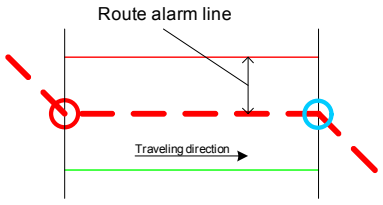
Color for the route alarm line (SEL NUM/Comment Size)	Set the display color for the route alarm line.

Display character size (SEL NUM/Comment Size)	:Specify the size of the numeric value and character displayed on the radar display.
Waypoint bearing vector (Waypoint Vector)	:Set the method to display line between next Waypoint and own ship.
Display of bearing distance to the destination(Status of Origin/DEST)	:Select the start point to be used for the bearing/distance display in the Waypoint data display area.
ON/OFF of Waypoint number display (WPT Number Display)	:Set whether or not to display Waypoint number next to the Waypoint mark.
Waypoint update (Waypoint Switch Mode)	:Set how to update Waypoint number when one Waypoint has been reached.

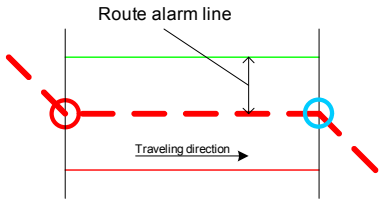
3.7.6.1 Color for the route alarm line (Off-Track Limit Line)

Route alarm lines are displayed on both sides of the center line of the route.

For this item, set which color is used to display each line.



Route Alarm Color Area A



Route Alarm Color Area B

Area A (IALA-A) : The port-side is red and the bow-side is green along the traveling direction.

Area B (IALA-B) : The port-side is green and the bow-side is red along the traveling direction.

Procedures

1) **Open the WPT/Route Setting menu by performing the menu operation below.**

Route

→ 2. WPT/Route Setting

2) **Left-click the set value of the** 8. Off-Track Limit Line **item, and select an operation mode.**

IALA-A : Area A

IALA-B : Area B

3.7.6.2 Display character size (SEL NUM/Comment Size)

Specify the size of the numeric value and character displayed on the radar display.

Procedures

1) **Open the Next menu by performing the menu operation below.**

Route → 2. WPT/Route Setting → 9. Next

2) **Left-click the set value of the** 1. SEL NUM/Comment Size **item, and select an operation mode.**

Normal :Numbers and characters are displayed in normal size.

Small :Numbers and characters are displayed in a size smaller than usual.

3.7.6.3 Waypoint bearing vector (Waypoint Vector)

Set how to display a line between next Waypoint and own ship.

Procedures

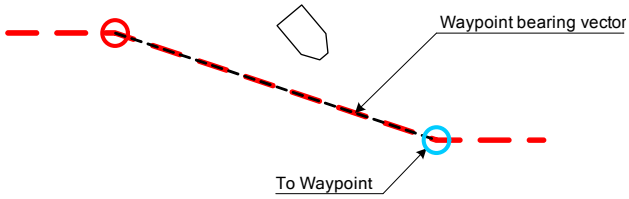
1) **Open the Next menu by performing the menu operation below.**

Route → 2. WPT/Route Setting → 9. Next

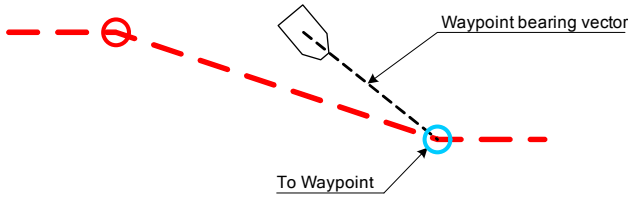
2) **Left-click the set value of the** 2. Waypoint Vector **item, and select an operation mode.**

Off : The Waypoint bearing vector is not displayed.

From Origin : A line is displayed from the previous Waypoint to next Waypoint.



From CURR : A line is displayed from own ship to next Waypoint.



3.7.6.4 Displaying bearing distance to the Waypoint (Status of Origin/DEST)

Select a start point used to display bearing/distance in the Waypoint data display area.

Procedures

1) **Open the Next menu by performing the menu operation below.**

Route

→ 2. WPT/Route Setting

→ 9. Next

2) **Left-click the set value of the** 3. Status of Origin/DEST **item, and select an operation mode.**

From CURR POSN :The bearing distance from the own ship position to next Waypoint is displayed.

Fix :The bearing distance from the previous Waypoint to next Waypoint is displayed.

3.7.6.5 ON/OFF of Waypoint number display (WPT Number Display)

Set whether to display a Waypoint number next to the Waypoint mark.

Procedures

1) **Open the Next menu by performing the menu operation below.**

Route

→ 2. WPT/Route Setting

→ 9. Next

2) **Left-click the set value of the** 4. WPT Number Display **item, and select an operation mode.**

Off : The Waypoint number is not displayed.

On : The Waypoint number is displayed.

3.7.6.6 Updating Waypoint data (Waypoint Switch Mode)

Set how to update the Waypoint number when one Waypoint has been reached.

Procedures

1) **Open the WPT/Route Operations menu by performing the menu operation below.**

Route

→ 3. WPT/Route Operations

2) **Left-click the set value of the** 2. Waypoint Switch Mode **item, and select an operation mode.**

Manual : When next Waypoint has been reached, user updates the following Waypoint.

AUTO : When next Waypoint has been reached, the following Waypoint is automatically updated.

3.7.7 Clear Waypoint/Route Data (Clear WPT/Route Data)

This function clears waypoint/route data from memory.

Procedures

1) **Open the WPT/Route Operations menu by performing the menu operation below.**

Route

→ 3. WPT/Route Operations

2) **Left-click the** 6. Clear WPT/Route Data **button.**

Confirmation Window will appear.

3) **Left-click the** 1. Yes **button.**

A route data will be cleared.

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

3.7.8 Operate Route Data File

Route data saved in the radar system can be saved onto a flash memory card, and data can be loaded from a flash memory card into the radar system.

With regard to this item, only route data can be saved and loaded. To save or load own ship's track, target track data, and mark/line data, see Section 3.11 "USING CARD".

Selecting a card slot (Select Card Slot):	Specify the card slot to be used for operating a route data file.
Saving route data (Save):	Route data saved in the radar system is saved onto a flash memory card.
Loading route data (Load):	Route data saved on a flash memory card is loaded into the radar system.
Erasing route data file (Erase):	A route data file saved in a flash memory card is erased.

3.7.8.1 Selecting a card slot (Select Card Slot)

Specify the card slot to be used for accessing a route data file

Flash memory card (option) is necessary.

Procedures

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

2) **Open the File Operations menu by performing the menu operation below.**

Route

→ 4. File Operation

3) **Left-click the set value of the** 1. Select Card Slot **item, and select a card slot.**

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

3.7.8.2 Saving route data (Save)

Route data saved in the radar system is saved onto a flash memory card.

Flash memory card (option) is necessary.

Procedures

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

2) **Open the File Operations menu by performing the menu operation below.**

Route

→ 4. File Operation

3) **Left-click the** 3. Save **button.**

The file name input screen will appear.

For the input method on the character input screen, see Section 3.3.4.7 "Entering a character".

4) **After having entered a file name, left-click the** ENT **button.**

The entry of the file name will be finished.

Confirmation Window will appear.

5) **Left-click the** 1. Yes **button.**

The route data will be saved with the specified file name.

3.7.8.3 Loading route data (Load)

Route data is loaded into the radar system from a flash memory card.

Flash memory card (option) is necessary.

NOTE:	Once route data has been loaded into the radar system from a flash memory card, the route data that has been saved in the radar system is overwritten and erased. Route data that has been erased cannot be resaved. Note that important route data should be saved in a flash memory card.

Procedures

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

2) **Open the File Operations menu by performing the menu operation below.**

Route

→ 4. File Operation

3) **Left-click the** 2. Load **button.**

Contents of the specified memory card (file list) will be displayed.

4) **Left-click the button for the desired file name.**

Confirmation Window will appear.

5) **Left-click the** 1. Yes **button.**

The route data with the specified file name will be loaded.

3.7.8.4 Erasing route data (Erase)

An unnecessary route data file saved on a flash memory card is erased.

Flash memory card (option) is necessary.

NOTE: Once route data files that have been saved on a flash memory card is erased, the erased data cannot be resaved. Note that important files should not be erased.

Procedures

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

2) **Open the File Operations menu by performing the menu operation below.**

Route

→ 4. File Operation

3) **Left-click the** 4. Erase **button.**

Contents of the specified memory card (file list) will be displayed.

4) **Left-click the button for the desired file name.**

Confirmation Window will appear.

5) **Left-click the** 1. Yes **button.**

A route data file with the specified file name will be erased.

3.8 APPLIED OPERATIONS

3.8.1 Set Radar Signal Processing (Process Setting)

This function enables the setting of detail information about radar signal processing.

Procedures

1) **Open the Process Setting menu by performing the menu operation below.**

Main

→ 3. RADAR Menu

→ 1. Process Setting

The Process Setting menu will appear.

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

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

3.8.1.1 Video Latitude

- Select the dynamic range in which receiving signals are to be shown on the radar display.
- Select Normal in standard, and Wide in rainy weather.
- Narrow clearly displays short-range videos when STC is used in manual mode.

Narrow : Narrows the dynamic range at short range.

Normal : Standard setting
The dynamic range varies depending on the actual range:
Short distance: wide **Long distance**: narrow

Wide : Use this mode when rainy weather intensifies unwanted waves.The dynamic range is about twice as wide as when Normal is selected.

Super Wide : Use this mode when rain cloud remain at Wide mode.

3.8.1.2 Video Noise Rejection

- This function rejects signals that assumed as noise and clutter in radar videos.
- Select Off to display radar videos like analog signals.
- Select Level1 or Level2 to suppress noise and clutter.

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.

Level2 : Rejects the signals of definitely unwanted waves (noise and clutter). When detection of targets or unwanted waves is not definite, the signals are rejected. Only when detection of targets is definite, the signals are displayed.

3.8.1.3 Auto Dynamic Range

- When the automatic sea clutter suppression mode and the automatic rain/snow clutter suppression mode are in use, the dynamic range is automatically controlled.
- When the automatic sea clutter suppression mode is in use, this function improves gain by widening the dynamic range of only areas where sea clutter is strong and narrowing the dynamic range of areas where sea clutter is not detected.
- When the automatic rain/snow clutter suppression mode is in use, this function improves gain by widening the dynamic range of areas where sea clutter and rain/snow clutter are strong and narrowing the dynamic range of the other areas.
- Land videos become obscure when the automatic rain/snow clutter suppression mode is in use.

Off : Does not control the dynamic range automatically. (Standard setting) The dynamic range is set in the same manner as when the manual sea clutter suppression mode or the manual rain/snow clutter suppression mode is in use.

On : Automatically controls the dynamic range.

3.8.1.4 Process Switch

- This function sets a specific area and switches the video process mode between the inside and outside of the area.
- In Section 3.8.1.5 "2nd Process Mode" 2nd Process Mode, set the second video process mode for the area outside the boundary.
- In [2] PROCESS of Main Menu , set the first video process mode for the area inside the boundary.
- Gain at a distance can be improved by suppressing near sea clutter through the correlative process.
- There are two methods for setting an area:

Off : Disables the Process Switching function. (Standard setting)

Range Fix : Sets a boundary at a constant range from the center. Set the boundary range in Section 3.8.1.6 "Process Switch Range". The specific area turns out to be a circle with the own ship's position as the center.

AUTO : Automatically sets a specific area. The area subject to many clutter returns is inside the boundary, and the area less subject to clutter returns is outside the boundary.

3.8.1.5 2nd Process Mode

- Set the second video process mode for the outside of a specific area.
- This function is enabled when Range Fix or AUTO is selected in Section 3.8.1.4 "Process Switch".

Video process modes

PROC Off : Select this mode in general.

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

4Scan CORREL : Select this mode to highlight targets while suppressing sea clutter returns.

5Scan CORREL : Select this mode to detect small targets hidden by sea clutter returns.

Remain : Select this mode when own ship yaws wildly.

Peak Hold : Select this mode to detect small targets of which detection probability is low.

3.8.1.6 Process Switch Range

- Set the boundary range of a specific area.
- This function is enabled when Range Fix is selected in Section 3.8.1.4 "Process Switch".
- The specific area turns out to be a circle with the own ship's position as the center.
- The boundary range can be set in units of 0.1 nm, ranging 0.1 to 25.5 nm.

3.8.1.7 Fast Target Detection

- This function displays fast moving targets that are suppressed in scan-correlative process mode.
- This function is enabled when 3Scan CORREL, 4Scan CORREL, or 5Scan CORREL is selected as the video process mode.
- If unwanted waves remain on the radar display, suppress them by using the [SEA], [RAIN], or [GAIN] dial, or adjusting the interference rejection mode.

Off : Disables the Fast Target Detection function.

On : Enables the Fast Target Detection function.

3.8.2 Set Radar Trails (RADAR Trails Setting)

This function enables the setting of detail information about radar trails processing.

Procedures

1) **Open the RADAR Trails Setting menu by performing the menu operation below.**

Main

→ 3. RADAR Menu

→ 2. RADAR Trails Setting

The RADAR Trails Setting menu will appear.

Detail data about radar trails processing can be set by changing the settings of each menu item.

NOTE: After the settings for radar trails processing are changed, targets' trails may not be displayed or trails may be plotted with unwanted waves. Thus, do not make a significant change in the settings.

3.8.2.1 Trails Mode

- Set the radar trail display mode.
- For details on the trail mode, see Section 3.4.8 "Display Radar Trails (Trails)"

3.8.2.2 Trails Reference Level

- Select a radar video level required for plotting radar trails.
- The radar video threshold level increases in order of Level1 → Level2 → Level3 → Level4 .
- To plot radar trails with unwanted waves, change to a higher level.
- To thin radar trails, change to a higher level.
- If radar trails are plotted in snatches, change to a lower level.

3.8.2.3 Trails Reduction

- Make a setting for thinning radar trails.
- The effect of thinning increases in order of Level1 → Level2 → Level3 .
- Radar videos do not become obscure because of the thinning of radar trails.

Off : Disables the Trails Reduction function.

Level1 : Enables the Trails Reduction function. (Effect: Low)

Level2 : Enables the Trails Reduction function. (Effect: Modest)

Level3 : Enables the Trails Reduction function. (Effect: High)

3.8.2.4 Trails Process

- Determine whether to use the video process with radar signals for plotting radar trails.
- When Trails Process is On , radar trails are never plotted with unwanted waves, but the radar trails of moving targets may not be plotted.
- When Trails Process is Off , radar trails may be plotted with unwanted waves, but the radar trails of moving targets are always plotted.

Off : Disables the Trails Process function.

On : Enables the Trails Process function.

3.8.2.5 MAX Interval

- Select the maximum time for displaying radar trails.
- Select Short when short radar trails are often used in bays and the likes.
- Select Long when long radar trails are necessary for ocean navigation.

Short : Sets 15 minutes as the maximum time for radar trails display.

Middle : Sets 30 minutes as the maximum time for radar trails display.

Long : Sets 60 minutes as the maximum time for radar trails display.

3.8.3 Set Scanner Unit (TXRX Setting)

This function enables the setting of detail information about an antenna.

Procedures

1) **Open the TXRX Setting menu by performing the menu operation below.**

Main

→ 3. RADAR Menu

→ 3. TXRX Setting

The TXRX Setting menu will appear.

Detail information about antenna operation can be set by changing the settings of the menu items.

3.8.3.1 PRF Fine Tuning

- Fine-tune the transmitting repetition frequency of the transmitter in the range 90 to 100%.
- If radar's interference patterns are concentrically displayed, increment or decrement the set value by 3 to 4 in order to heighten the effect of interference rejection.
- One of 32 levels 0-31 can be set.

3.8.3.2 Stagger Trigger

- The interference reduction function is activated by using the transmission repetition frequency control of the transmitter.
- This function is effective when radar interference does not go away.

Off : Stagger Trigger is not used.

On : Stagger Trigger is used.

3.8.3.3 PRF

- Select the operation mode the transmitting repetition frequency of the transmitter.

Normal	:Standard mode	Both appropriate gain and magnetron's life expectancy are maintained.
Economy	:Power saving mode	Gain slightly lowers, but the service life of magnetron is prolonged when short pulses are used.
High Power	:High gain mode	Gain improves when long pulses are used, but the service life of magnetron is slightly shortened.

3.8.3.4 Ice Class Standby Mode

- In this mode, the antenna is rotated when transmission is in the standby state.
- This mode is effective to prevent the antenna's rotating shaft from freezing.

Off :The ice class standby mode is not used. When transmission is in the standby state, the antenna also stops rotating.

On :The ice class standby mode is used. When transmission is in the standby state, the antenna rotates.

3.8.4 Set Cursor (Cursor Setting)

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

Procedures

1) **Open the Cursor Setting menu by performing the menu operation below.**

Main
→ 7. Sub Menu
→ 9. EBL/Cursor Setting
→ 3. Cursor Setting

The Cursor Setting menu will appear.

Detail information about cursor operation and display can be set by changing the settings of the menu items.

3.8.4.1 EBL/VRM Control Cursor

- The EBL/VRM Control Cursor is switched between Valid and Invalid.
- The trackball is provided as a standard device. If the trackball malfunctions, the cursor can be moved by using the [EBL] dial and [VRM] dial.
- The cursor moves horizontally when [EBL] is operated, and moves vertically when [VRM] is operated.
- To switch between EBL/VRM operation and cursor operation while ON is selected, hold down the [EBL] dial for 2 seconds.

On : Cursor is operated using a [EBL] [VRM] dial.

Off : Cursor is operated using a trackball.

3.8.4.2 Cursor Length

- Set the length of the cross cursor mark on the radar display.

Short Cuts the cross cursor mark in length.

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

3.8.4.3 Cursor Pattern

- The type of the cross cursor mark displayed of the display is selected.

: Type 1 is selected for the cross cursor mark 1 displayed in the radar display.

: Type 2 is selected for the cross cursor mark 2 displayed in the radar display.

: Type 3 is selected for the cross cursor mark 3 displayed in the radar display.

: Type 4 is selected for the cross cursor mark 4 displayed in the radar display.

3.8.5 Set Radar Display (Display Setting)

This system can save combinations of display color and brilliance in accordance with ambient lighting conditions and the radar display can be easily switched.

Follow the procedures below to set display color and brilliance to be saved before hand.

3.8.5.1 Setting display color (Display Color Setting)

Procedures

1) **Open the Color Setting menu by performing the menu operation below.**

Main

→ 7. Sub Menu

→ 1. Display Color Setting

Display Color Setting menu will appear.

3.8.5.2 Day/Night

- Specify the mode to be changed.
- The following modes are available:

Day1	: Day mode 1	: Used under bright lighting conditions.
Day2	: Day mode 2	: Used under bright lighting conditions.
Day3	: Day mode 3	: Used under bright lighting conditions.
Dusk	: Dusk mode	: Used under dim lighting conditions.
Night	: Night mode	: Used under dark lighting conditions.

Setting color of each element

- Specify the color for the element.
- The color for the following elements can be specified.

Outer PPI	: The color of the background outside radar video PPI is selected.
Inner PPI	: The color of the background inside radar video PPI is selected.
Character	: The color of the character and bearing scale is selected.
RADAR Video	: The color of the radar video is selected.
RADAR Trails(Time)	: The color of the time radar trails is selected.
RADAR Trails(All)	: The color of the time radar trails is selected.
Target Symbol	: The color of the target symbol is selected.
Cursor	: The color of the cursor is selected.
Range Rings	: The color of the range rings is selected.
EBL/VRM/PI	: The color of the EBL / VRM / PI is selected.
Own Symbol/HL/Vector	: The color of the own ship symbol, heading line, own ship vector is selected.

Those selected color can be saved for each Day/Night mode.

3.8.5.3 Setting display brilliance (Brilliance Setting)

For each Day/Night mode, background color outside the bearing scale, background color inside the bearing scale, and color for characters, radar echo and radar trails can be selected.

Procedures

1) **Open the Brilliance Setting menu by performing the menu operation below.**

Main → 7. Sub Menu → 2. Brilliance Setting

Display Brilliance Setting menu will appear.

Setting brilliance of each element

- Specify the brilliance for the element.
- Level4 indicates maximum brilliance and Level1 indicates minimum brilliance.
- The brilliance for the following elements can be specified.

RADAR Video	: The brilliance of the radar video is selected.
RADAR Trails	: The brilliance of the radar trails is selected.
Target Symbol	: The brilliance of the target symbol is selected.[i]
Range Rings	: The brilliance of the range rings is selected.
EBL/VRM/PI	: The brilliance of the EBL / VRM / PI is selected.
Character	: The brilliance of the character and bearing scale is selected.
Own Symbol/HL/Vector	: The brilliance of the own ship symbol, heading line, and own ship vector is selected.
Keyboard	: The brilliance of the operation panel is selected.[i]

i. Minimum level is Level0.(it means OFF)

Those selected brilliance can be saved for each Day/Night mode.

3.8.5.4 Setting radar video brilliance (VID)

The brilliance of the video on the radar display is adjusted.

Procedures

1) **Left-click the VID button located at the lower right of the radar display, and adjust the brilliance of the radar video so as to get the best view of the video display.**

The brilliance of the radar video can be adjusted on four stages without opening the Brilliance Setting menu.

Adjust the radar display to obtain the best-to-view video.

3.8.5.5 Setting target symbol brilliance (TT)

The brilliance of the target symbol on the radar display is adjusted.

Procedures

1) **Left-click the** TT ○ **button located at the lower right of the radar display, and adjust the brilliance of the target symbol so as to get the best view of the video display.**

The brilliance of the target symbol can be adjusted on four stages without opening the Brilliance Setting menu.

Adjust the radar display to obtain the best-to-view video.

3.8.6 Adjust Sound Volume (Buzzer Volume)

When an alarm is activated, the operation panel issues an alarm audible to inform user of the change of the condition.

The alarm sound can be adjusted by performing the following procedures.

Procedures

1) **Open the Buzzer Volume menu by performing the menu operation below.**

Main

→ 7. Sub Menu

→ 2. Brilliance Setting

Display Buzzer Volume menu will appear.

The volume of the alarm sound can be specified for each cause for alarm.

Level4 indicates maximum volume and Off indicates minimum volume.

Key ACK	: The operation key acknowledgement is set.
OPE Miss	: The incorrect operation alarm is set.
CPA/TCPA Alarm	: The dangerous ship alarm is set.
New Target Alarm	: The automatic acquisition target alarm is set.
Lost Alarm	: The target lost alarm is set.
Navigation Alarm	: The navigation data abnormality alarm is set.
System Alarm	: The system abnormality alarm is set.
Inter Switch	: The inter switch switching alarm is set.

3.8.7 Set User Option Keys [OPTION 1/2]

Users can freely make settings with [OPTION 1] key and [OPTION 2] key.

By using the keys, users can open a frequently used menu by only single operation, or assign special functions, to the user key switches.

3.8.7.1 Initial Setting (Option Key Setting)

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

Procedures

1) **Open the Option Key Setting menu by performing the menu operation below.**

Main → 7. Sub Menu → 4. Option Key Setting

The Option Key Setting menu will appear.

This system provides two user keys: [OPTION 1] and [OPTION 2]. Different functions can be allocated to each key.

Functions that can be allocated to each key are as follows:

Menu	: A specific menu is directly displayed.
Zoom	: The zoom display function is switched between on and off.
DEST	: Set/Cancel Waypoint menu key
->O	: Start-point, Pass-point key in simple route operating
O->	: End-point key in simple route operating
Capture Screen	: Screen capture key (This function is enabled only when the card (optional) is connected.)

3.8.7.2 Using Option Keys (Directly displaying a specified Menu)

Preset the Menu that is to be displayed with the option key switch.

Procedures

1) **Perform the general menu open procedure to open the menu that is to be directly displayed with Option Key.**

2) **While the menu is open, hold down [OPTION 1] key or [OPTION 2] key for 2 seconds.**

The menu currently being displayed is saved for the pressed option key.

> The menu set for the pressed option key will open. Subsequently, general menu operation can be performed.

3.8.7.3 How to use the Optin key (Zoom Display)

Preset whether to execute the Zoom display by operating the user key.

Procedures

1) **Press either [OPTION 1] key or [OPTION 2] key for which Zoom has been set.**

The zoom mode is activated.

2) **Put the cursor on a location that is to be zoomed, and left-click.**

Zoom is set.

Cancel

1) **Press either [OPTION 1] key or [OPTION 2] key for which Zoom has been set.**

The zoom mode is cancelled and a normal display will appear.

3.8.8 Set Navigation Data Display (Multi Window Setting)

By performing the following operation, it is possible to display navigation data of the wind direction / velocity, water depth and the like, as a graph on the radar display.

Procedures

1) **Open the Multi Window Setting menu by performing the menu operation below.**

Main

→ 4. Multi Window Setting

The Multi Window Setting menu will appear.

Detailed settings of the display are possible by changing the settings of each item.

3.8.8.1 DIR/DIST EXP Display

- Determine whether to expand the value display of cursor, EBL, and VRM.
- The value display is expanded in digital information area 2.
- When the cursor mark moves on the PPI, the display of cursor information is expanded.
- When an EBL or VRM is operated, the value display of each marker is expanded.
- While the menu is open, any display is not expanded.

Off : Does not expand any display.

On : Expands the display in digital information area 2. The expanded display remains for 5 seconds after the operation of each marker, and then it will disappear.

Always On : Expands the display in digital information area 2.

3.8.8.2 Numeric NAV INFO

- Determine whether to display the numeric values of received navigation information.
- One of two digital information areas is used to display data.
- When navigation data is displayed, the sizes of the target tracking (TT)/AIS numeric data display areas are exclusively decreased.

- Navigation information of the water depth, water temperature, tidal current, wind direction/velocity, and destination is displayed with numeric values.
- Left-click the Target button located at thelower righit of the display. The navigation data display function is switched between On and Off.

Off : Does not display the numeric values of navigation information.

Area1 : Displays the numeric values of navigation information in digital information area 1.

Area2 : Displays the numeric values of navigation information in digital information area 2.

3.8.8.3 Depth Graph Setting

- The Depth Graph Setting menu will appear.

[1] Depth Graph Display

- Determine whether to display received water depth information with a graph.
- One of two digital information areas is used to display data.
- When the water-depth graph is displayed, the sizes of the target tracking (TT)/ AIS numeric data display areas are exclusively decreased.
- Left-click the Target button located at thelower righit of the display. The water-depth graph display function is switched between On and Off.

Off : Does not display a water depth graph.

Area1 : Displays the water depth graph in digital information area 1.

Area2 : Displays the water depth graph in digital information area 2.

[2] Depth Range

- Select the depth range on the water depth graph.

50m : Sets 50 m as the depth range.

100m : Sets 100 m as the depth range.

250m : Sets 250 m as the depth range.

AUTO : Uses the depth range in the DPT sentence included in received data.

[3] Time Range

- Select the time range on the water depth graph.

10min : Sets 10 minutes as the time range.

15min : Sets 15 minutes as the time range.

30min : Sets 30 minutes as the time range.

60min : Sets 60 minutes as the time range.

12hour : Sets 12 hours as the time range.

[4] Depth Unit

- Set the unit of water depth for the water-depth graph.

Feet : The foot is used as the unit of water depth.

Fathom : The fathom is used as the unit of water depth.

Meters : The meter is used as the unit of water depth.

3.8.8.4 Wind Graph Setting

- The Wind Graph Setting menu will appear.

[1] Wind Graph Display

- Determine whether to display received wind direction/velocity information with a graph.
- One of two digital information areas is used to display data.
- When the wind direction / speed graph is displayed, the sizes of the target tracking (TT) / AIS numeric data display areas are exclusively decreased.
- Left-click the Target button located at thelower righit of the display. The wind direction / speed graph display function is switched between On and Off.

Off : Does not display the wind direction / speed graph.

Area1 : Displays the wind direction / speed graph in digital information area 1.

Area2 : Displays the wind direction / speed graph in digital information area 2.

[2] Wind Speed Unit

- Set the unit of wind velocity for the wind direction / speed graph.

m/s : Meters per second are used as the unit of wind speed.

km/h : Kirometers per hour are used as the unit of wind speed.

kn : Knots are used as the unit of wind speed.

3.8.8.5 TEMP Graph Setting

- The TEMP Graph Setting menu will appear.

[1] TEMP Graph Display

- Determine whether to display the graph of the water-temperature data that has been received on the radar display.
- One of two digital information areas is used to display data.
- When the water-temperature graph is displayed, the sizes of the target tracking (TT)/AIS numeric data display areas are exclusively decreased.
- Left-click the Target button located at thelower righit of the display. The water-temperature graph display function is switched between On and Off.

Off : The water-temperature graph is not displayed.

Area1 : The water-temperature graph is displayed in digital information area 1.

Area2 : The water-temperature graph is displayed in digital information area 2.

[2] TEMP Graph Color

- Set the color for the water-temperature graph.
- There are eight selection items:

White , Gray , Blue , Green , Yellow , Pink , Red

[3] TEMP Range

- When Color is selected for the display color for the water-temperature graph, set the temperature range of each color.

[4] Time Range

- Set the time range for the water-temperature graph.

10min : The time range is set at 10 minutes.

15min : The time range is set at 15 minutes.

30min : The time range is set at 30 minutes.

60min : The time range is set at 60 minutes.

12hour : The time range is set at 12 hours.

3.8.8.6 Course Bar Setting

- The Course Bar Setting menu will appear.

[1] Course Bar Display

- Determine whether to display the bar graph for the course data that has been received on the radar display.
- One of two digital information areas is used to display data.
- When the course-bar graph is displayed, the sizes of the target tracking (TT)/ AIS numeric data display areas are exclusively decreased.
- Left-click the Target button located at the lower righit of the display. The course bar display function is switched between On and Off.

Off : The course bar graph is not displayed.

Area1 : The course bar graph is displayed in digital information area 1.

Area2 : The course bar graph is displayed in digital information area 2.

[2] Autopilot Course

- Determine which field of the APB sentence that has been received is used to display AP course.

Course to Steer : Heading to Steer to Destination

From Origin : Bearing Origin to Destination

From CURR POSN : Bearing, Present Postion to Destination

[3] ROT Scale

- Set the maximum scale for the TURN Rate graph.

30-0-30 : The scale is set at ±30°/min.

60-0-60 : The scale is set at ±60°/min.

90-0-90 : The scale is set at ±90°/min.

120-0-120 : The scale is set at ±120°/min.

150-0-150 : The scale is set at ±150°/min.

300-0-300 : The scale is set at ±300°/min.

3.8.9 AUTO Backup

Data can be automatically backed up when the power supply is turned on.

Procedures

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

Flash memory card (option) is necessary.

2) **Open the Plot Setting menu by performing the following menu operation.**

Main

→ 8. Plot Setting

3) **Left-click the item button of** 5. AUTO Backup **Backup button.**

The AUTO Backup menu will appear.

4) **Select the number for the card slot to back up data.**

Off : The automatic backup function is turned off.

Slot1 : Data is automatically backed up on the compact flash memory card inserted into slot 1.

Slot2 : Data is automatically backed up on the compact flash memory card inserted into slot 2.

Data that can be backed up includes own ship's track (Own Track), other ships' trails data (Target Track), mark/line data (Mark/Line), destination data (WPT), and route data (Route).

The file name to be saved is either 9998 or 9999. Every time the power supply is turned on, those numbers are alternately displayed.

3.9 USE FUNCTION KEY [USER]

"Radar Function Setting" is provided for easily obtaining the best radar video by storing complex radar signal processing settings in the optimum status by use, and calling the setting in accordance with the conditions for using the function.

Functions are factory-set for general use, and the settings can be fine adjusted by operating the menu.

Four function modes are available, and they are factory-set as follows:

Function 1:	Coast	Useful for observing short-range videos.
Function 2:	Deep Sea	Suitable for general ocean navigation.
Function 3:	Storm	Useful for observing videos in stormy weather.
Function 4:	Rain	Use this mode when sea clutter is not strong but rain / snow clutter is strong.

3.9.1 Operation Procedures

3.9.1.1 Calling a Function

Procedures

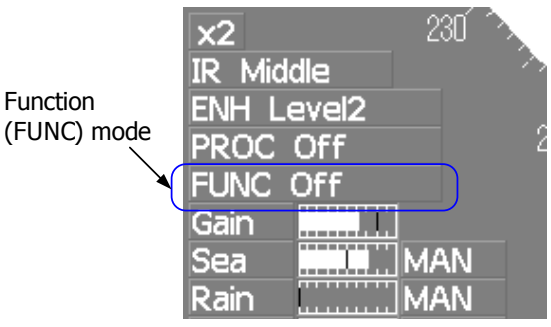
1) **Press the [USER] key.**

Each time the [USER] key is pressed, the selection changes cyclically as follows:

Function Off→Function1→Function2→Function3→Function4→Function Off

The name of the current function mode is displayed at the lower left of the display.

Alternatively, left-clicking the function button located at the lower left of the radar display will enable the same operation.



3.9.1.2 Changing Function Setting (temporary change)

When radar signal processing setting is changed by using the menu or button on the radar display while function 1 to 4 is called, the change is temporarily reflected to the operating state.

Since this method does not change the memory contents, the new setting is discarded as soon as another function is called.

When the previous function is called again, operation is performed according to the memory contents.

3.9.1.3 Changing Function Setting (memory contents change)

To change the memory contents of functions 1 to 4, use the function setting menu.

For how to operate the function setting menu, see Section 3.9.3 "Overview of Function Operations (User Function Setting)".

3.9.2 Function Setting Menu Items

The function setting menu has the items below.

page 1		Option
1. Mode	Name of the mode to be used	Coast/Deepsea/....
2. IR	Radar interference rejection	Off/Low/Middle/High
3. Process	Video process	PROC Off/3Scan CORREL/....
4. Target Enhance	Target expansion	Off/Level1/Level2/Level3
5. AUTO Sea/Rain	Automatic clutter suppression	Off / AUTO Sea / AUTO Sea/Rain
6. Save Present State	Saving the present state	

page 2		Option
1. Pulse Length 0.75NM	Standard pulse length for 0.75nm range	SP1/MP1
2. Pulse Length 1.5NM	Standard pulse length for 1.5nm range	SP1/MP1/MP2/MP3
3. Pulse Length 3/4NM	Standard pulse length for 3nm range	MP1/MP2/MP3/LP1
4. Pulse Length 6/8NM	Standard pulse length for 6nm range	MP1/MP2/MP3/LP1/LP2
5. Pulse Length 12NM	Standard pulse length for 12nm range	MP1/MP2/MP3/LP1/LP2
6. Pulse Length 16NM	Standard pulse length for 16nm range	MP1/MP2/MP3/LP1/LP2

page 3		Option
1. Video Latitude	Dynamic range of radar video	Narrow/ Normal /Wide/Super Wide
2. Video Noise Rejection	Radar video noise rejection	Off/Level1/Level2
3. AUTO Dynamic Range	Automatic dynamic range control	Off/On
4. Process Switch	Radar video process switching	Off/Range FIX/AUTO
5. 2nd Process Mode	2nd video process mode	PROC Off/3Scan CORREL/....
6. Process Switch Range	Video process switching range	
7. Fast Target Detection		Off/On

page 4		Option
1. Trails Interval	Radar trails length	Off/15sec/....
2. Trails Mode		True/Relative
3. Trails Reference Level	Radar trails plotting threshold	Level1-4
4. Trails Reduction	Thinning of radar trails	Off/Level1-3
6. Trails Process	Superimpose-display of time radar trails and continuous radar trails.	Off/On
7. Max Interval	Maximum time for radar trails display	Short/Middle/Long

page 5		Option
1. Gain Offset	Gain correction	
2. PRF	Transmitting repetition frequency	Normal/Economy/High Power
3. Small Buoy Detection	Small target detection mode	Off/On
4. Fishnet Detection	Fishnet detection mode	Off/On
5. Antenna Height		Default/-5m/5-10m/10-20m/20m
8. Set Mode Default		
9. Initialize		

3.9.3 Overview of Function Operations (User Function Setting)

The following outlines the operation of each function selected from the function setting menu:

Procedures

1) **Open the Process Setting menu by performing the menu operation below.**

Main
→ 3. RADAR Menu
→ 1. Process Setting
→ 8. User Function Setting

The User Function Setting menu will appear.

Specify the number for the function for which the settings are to be changed.

The following are the operation overviews of each function setting item.

page 1-[1] Mode

- Selects the function name to be indicated at the lower left of the radar display when the function is selected.
- When the setting is changed back to the factory setting, the initial value of the selected mode is called.
- The following 11 modes are provided:

Coast	: Use this mode to monitor a relatively short range, for example, bays and coasts where many boats and ships are running. (Importance is attached to resolution.)
Deep Sea	: Use this mode to monitor a relatively long range, for example, the open sea. (Importance is attached to long-range gain.)
Fish Net	: Use this mode to detect small targets such as fishnets of round haul netters hidden by sea clutter returns. (Importance is attached to sea clutter suppression, and gain to moving targets lowers.)
Storm	: Use this mode when many rain / snow clutter returns or sea clutter returns are detected in stormy weather. (Importance is attached to rain / snow clutter and sea clutter suppression, and gain slightly lowers.)
Calm	: Use this mode when only a few rain / snow clutter returns or sea clutter returns are detected.
Rain	: Use this mode when sea clutter is not strong but rain / snow clutter is strong. (Importance is attached to rain / snow clutter suppression, and gain slightly lowers.)
Bird	: Use this mode to detect flocks of sea birds.
Long	: Use this mode to monitor utmost distances in the broad ocean.
Buoy	: Use this mode to detect small targets like radio buoys in areas outside the sea clutter area. (This mode displays targets of which detection probability is low.)
User1	: General mode used when the nine modes above are not applicable.
User2	: General mode used when the nine modes above are not applicable.

page 1-[2] IR (Radar interference rejection)

- Same function as IR Setting described in Section 3.4.1 "Interference Rejection (IR)".

page 1-[3] Process (Video process)

- Same function as PROCESS Setting described in Section 3.4.4 "Use Video Processing (PROC)"

page 1-[4] Target Enhance

- Same function as TARGET ENHANCE Setting described in Section 3.4.3 "Target Enhance (ENH)".

page 1-[5] Auto STC/FTC (Auto Sea/Rain)

- Detects unwanted waves such as rain/snow clutter and sea clutter and automatically suppresses them.
- When the sea state or weather changes, this function automatically performs suppression processing in accordance with the situation.
- Suppression processing is not full automatic, and requires the operator to adjust the afterimages of unwanted waves.
- To adjust the afterimage of sea clutter, use the [SEA] dial.
- To adjust the afterimage of rain/snow clutter, use the [RAIN] dial.
- In areas where the density of unwanted waves is low, unwanted waves may remain being judged as targets. Thus, use the automatic clutter suppression mode together with the video process mode.
- Characteristics of the automatic clutter suppression function:

Off	: Disables the automatic clutter suppression function. Select off when rain / snow clutter and sea clutter are not strong or when the ship is in a bay.
AUTO Sea	: Automatically detects the strength of sea clutter, and performs the most suitable sea clutter suppression processing. Even when the strength of sea clutter varies depending on the wind direction, AUTO Sea performs the most suitable suppression processing. Land like islands can be displayed naturally. Since rain clouds outside sea clutter areas are recognized as land, there is no effect of suppressing rain / snow clutter.
AUTO Sea/Rain	: Along with AUTO Sea, AUTO Rain automatically detects the strength of rain / snow clutter, and performs the most suitable rain / snow clutter suppression processing. When rain clouds are scattered about, AUTO Rain performs rain / snow clutter suppression processing for only the rain-cloud areas. Since land is recognized as rain clouds, land videos become obscure.

page 2-[1]~[7] PL (Pulse Length)

- Sets the standard transmitter pulse length in each range.
- When the range is called, the pulse range is used.

page 3-[1]~[7] Video setting menu (Process Setting)

- Operation is the same as that of the Process Setting menu described in Section 3.8.1 "Set Radar Signal Processing (Process Setting)".

page 4-[1]~[7] Radar trails settings (Trails Setting)

- Same functions as in the Trails Setting of the RADAR Menu described in Section 3.8.2 "Set Radar Trails (RADAR Trails Setting)".

page 5-[1] Gain Offset

- Corrects gain while the function mode is called.
- Since the displayed noise level varies depending on the combination of the video process mode and the interference rejection level, gain needs fine adjustment for always obtaining the highest level.
- The gain correction function saves the correction value set by the gain adjust in each function mode, so it can obtain the highest gain without the gain adjust being operated when the function mode is changed.
- To set high gain, set a value on the "+" side.
- To set low gain, set a value on the "-" side.
- When the radar interference rejection level is increased, the noise level is lowered. Thus, set a gain correction value to the "+" side.
- When the video process mode 3Scan CORREL, 4Scan CORREL, or 5Scan CORREL is used, the noise level is lowered. Thus, set a gain correction value to the "+" side.
- When the video process mode Remain or Peak Hold is used, noise is hard to disappear. Thus, set a gain correction value to the "-" side.

page 5-[2] PRF

- Same function as in the TXRX Setting described in Section 3.8.3 "Set Scanner Unit (TXRX Setting)".

page 5-[3] Small Buoy Detection

- Reduces the loss of signal processing during detection of small targets.

Off :Activates the general signal processing mode.

On :Activates the small buoy detection mode that reduces the loss of signal processing.

page 5-[4] FishNet Detection

- Use this mode to detect small targets hidden by sea clutter returns.
- This function becomes more effective when the AUTO RAIN clutter suppression function is used together.

Off :Activates the general signal processing mode.

On :Activates the fishnet detection mode.

page 5-[5] Antenna Height

- Set the height of radar antenna above sea level.
- The STC/FTC curve is changed.

Default : Set default

~5m : Set the antenna height under 5m.

5m~10m : Set the antenna height 5m to 10m.

10m~20m : Set the antenna height 10m to 20m.

20m~ : Set the antenna height over 20m.

3.9.4 Overview of saved Function Setting Data

The overview of saved function setting data is as follows:

Factory-set data: : Saved data that general operation cannot change

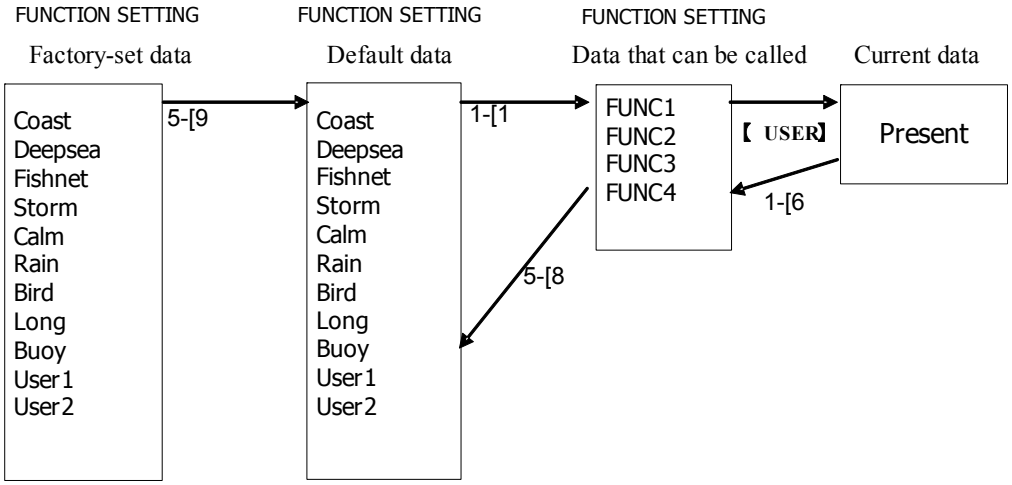
Default data: : Standard data of each function mode that users can change

Data that can be called: : Saved data that can be called by pressing the [USER] key

Procedures

1) **Open the User Function Setting menu by performing the menu operation below.**

Main → 3. RADAR Menu → 1. Process Setting → 8. User Function Setting



page 1-[1] Mode

- Calls the default value of the mode, and saves it for the function number.

page 1-[6] Save Present State

- The currently operating state can be saved for the function number.
- Use this function to save the state of good setting that will be frequently used.

page 5-[8] Set Mode Default

- Saves the setting of the current function number, as the default setting of the mode.

page 5-[9] Initialize

- Changes the memory contents of the mode, which is used with the current function number, back to the factory setting.

3.10 USE USER SETTING

The operation status of the radar is recorded. If the system is operated by more than one operator, the operators can register operation status as suitable for them and call the status. Operation status for up to five operations can be registered, and a name can be assigned to each status. (Up to 10 alphanumeric characters)

Data saved by the user setting
Display Color Setting
Buzzer Volume
Option Key Setting
Date Display Style
EBL/VRM Control CURS
Cursor Length

3.10.1 Save Operating State (Save User Setting)

The system's current operating state can be saved in the system by performing the operation below.

Procedures

1) **Open the Save User Setting menu by performing the menu operation below.**

Main → 7. Sub Menu → 3. User Setting → 2. Save User Setting

The Save User Setting menu will appear.

2) **Left-click the button for the file to be saved.**

The file name input screen will appear.

3) **Enter a file name to be saved.**

The Input File Name menu will appear.

On the numeric value input screen, enter a file name.

After the file name has been entered, the operating conditions will be saved.

3.10.2 Load Operating State (Load User Setting)

The operating state saved in the system can be loaded by performing the operation below.

When the operating state is loaded, the previous operating state data is discarded. Therefore, if you do not want to discard the operating state data, save the operating state by performing the operation described in Section 3.10.1 "Save Operating State (Save User Setting)".

Procedures

1) **Open the Load User Setting menu by performing the menu operation below.**

Main
→ 7. Sub Menu
→ 3. User Setting
→ 1. Load User Setting

The Load User Setting menu will appear.

2) **Left-click the button for the file to be loaded.**

Confirmation Window will appear.

To load the file, left-click the 1. Yes button.

3.10.3 Delete Operating State (Delete User Setting)

The operating state saved in the system can be deleted by performing the operation below.

Use this function to delete unnecessary operating state data.

Procedures

1) **Open the Delete User Setting menu by performing the menu operation below.**

Main
→ 7. Sub Menu
→ 3. User Setting
→ 1. Load User Setting

The Delete User Setting menu will appear.

2) **Left-click the button for the file to be deleted.**

Confirmation Window will appear.

To delete the file, left-click the 1. Yes button.

3.11 USING CARD

This radar has two card slots. Inserting a flash memory card (option) into a card slot, you can save the following contents, saved in the processor, in the card or can load data from the card to the processor.

Trails of own ship:	7000 points maximum
Track of other ship:	20 target X 500 points
Mark/Line:	20000 points maximum
WPT:	512 points maximum
Route:	1 route maximum

These pieces of information can be saved in a flash memory card as a file. The internal capacity is as large as only a file. An internally created file can be saved until the flash memory card is full.

3.11.1 Operate File on the Card (File Manager)

Procedures

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

Flash memory card (option) is necessary.

2) **Set the radar in the standby state.**

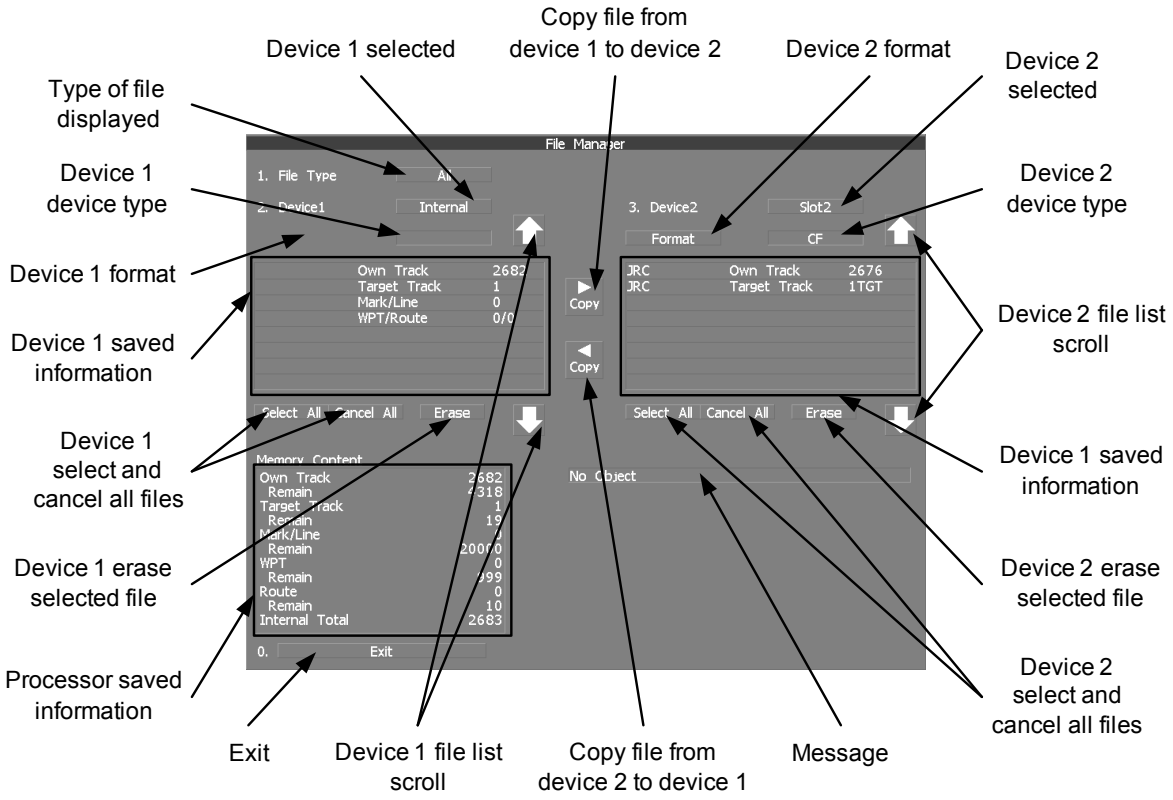
While the radar is in the transmission state, the File Manager screen cannot be opened.

3) **Open the File Manager window by performing the menu operation below.**

Main

→ 2. File Manager

The File Manager window will appear.



Information saved in the processor is displayed in the Memory Content.	
Own Track	: Number of data points for own ship's track (7000 points maximum)
Remain	: Number of remaining data points of own ship's track that can be saved
Target Track	: The number of other ships' trails (up to 20 targets)
Remain	: The remaining number of other ships' trails to be saved
Mark/Line	: Number of mark and line points made with user map (up to 20000 items)
Remain	: Number of remaining data points of marks and lines that can be saved
WPT	: Number of data points of created waypoints (512 points maximum)
Remain	: Remaining waypoints that can be saved
Route	: Number of data points of created routes (1 route maximum)
Remain	: Remaining routes that can be saved
Internal Total	: Total number of data points

- The file name and data saved in the selected device will be displayed.
- Pressing the arrows located at the upper right and lower right of the file name list will scroll the list.

3.11.1.1 Copy Internal Information to Card (Copy Internal -> Card)

Procedures

1) **While the File Manager window is open, left-click the device 1 selection button.**

Selected items for Device1 will be displayed.

2) **Left-click the** 1. Internal **button among the selection items.**

Internal is selected.

3) **Left-click the device 2 selection button.**

Selected items for Device2 will be displayed.

4) **Left-click button corresponding to the device to which data is to be copied.**

The list of files saved in the selected device will be displayed.

5) **Put the cursor on the data to be copied, and Left-click button.**

Left-click button one more time will cancel the selection.

6) **Left-click the** ▶ COPY **button.**

The character input screen for the Input File Name menu will appear.

7) **Enter the file name to be saved.**

Up to 10 characters can be entered.For the input method on the character input screen, see Section 3.3.4.7 "Entering a character".

After the data has been entered, Confirmation Window will appear.

8) **Left-click the** 1. Yes **button.**

The entered name is written into the selected device as a file name.

Up to the maximum number of items, described on the previous page, can be saved in the device. With regard to the capacity for saving data, data can be saved on a flash memory card as a file, and those files can be saved until the flash memory card is full.

3.11.1.2 Load Information from Card to Internal Portion (Copy Card -> Internal)

Procedures

1) **While the File Manager window is open, left-click the device 1 selection button.**

Selected items for Device1 will be displayed.

2) **Left-click the** 1. Internal **button among the selection items.**

Internal is selected.

3) **Left-click the device 2 selection button.**

Selected items for Device2 will be displayed.

4) **Left-click button corresponding to the device in which data to be loaded is saved.**

The list of files saved in the selected device will be displayed.

5) **Select the desired data.**

Left-click button one more time will cancel the selection.

6) **Left-click the** ◀ COPY **button.**

Confirmation Window will appear.

7) **Left-click the** 1. Overwrite **button to overwrite data, or Left-click the** 2. Add **button to add new data.**

When Overwrite is selected, internally saved data is deleted and new data is loaded. When Add is selected, new data is added to the saved data.

8) **Left-click the** 1. Yes **button.**

The selected file is loaded into the system from the card.

When adding data saved on the card to the data saved in the system, data can be copied from multiple files. However, when the maximum number of units of data is reached, additional data cannot be loaded. Even in the ADD mode, WPT data and Route data are overwritten.

3.11.1.3 Copy Information (Copy)

Procedures

1) **While the File Manager window is open, left-click the device 1 selection button.**

Selected items for Device1 will be displayed.

2) **Left-click the button corresponding to the device from which data is to be copied.**

The list of files saved in the selected device will be displayed.

3) **Left-click the device 2 selection button.**

Selected items for Device2 will be displayed.

4) **Left-click button corresponding to the device to which data is to be copied.**

The list of files saved in the selected device will be displayed.

5) **Put the cursor on the data to be copied, and Left-click button.**

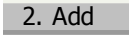
Left-click button one more time will cancel the selection.

6) **Left-click the** 

button.

The character input screen for the Input File Name menu will appear.If there is a file having the same name, the file selection window will appear.

7) **When deleting saved data and copying new data, left-click** 

to select Overwrite. When adding data to a destination file, left-click 

to select Add. Even in the Add mode, WPT data and Route data are overwritten. When selection has been made, Confirmation Window will appear.

8) **Enter the file name to be saved.**

Up to 10 characters can be entered. For the input method on the character input screen, see Section 3.3.4.7 "Entering a character"

After the data has been entered, Confirmation Window will appear.

9) **Left-click the** 

button.

The entered name is written into the selected device as a file name.

3.11.1.4 Erase File (Erase)

Procedures

1) **While the File Manager window is open, left-click the device 1 selection button.**

Selected items for Device1 will be displayed.

2) **Left-click button corresponding to the device in which data to be erased is saved.**

The list of files saved in the selected device will be displayed.

3) **Select data to be erased.**

Left-click button one more time will cancel the selection.

4) **Left-click** Erase **button.**

Confirmation Window will appear.

5) **Left-click the** 1. Yes **button.**

The selected file will be erased.

3.11.1.5 Initializing a card (Format)

Procedures

1) **While the File Manager window is open, left-click the device 1 selection button or the device 2 selection button.**

Selection items for Device1 or Device2 will appear.

2) **Left-click the button which corresponds to the system (device) where data to be displayed is saved.**

The File Manager window will appear.

3) **Put the cursor on** Format **for the device to be initialized, and Left-click button.**

Confirmation Window will appear.

4) **Left-click the** 1. Yes **button.**

Initialization will be executed.

3.11.1.6 Showing data saved on the card (Show Card)

Procedures

1) **While the File Manager window is open, left-click the device 1 selection button.**

Selected items for Device1 or Device2 will be displayed.

2) **Left-click button corresponding to the device in which data to be displayed is saved.**

The list of files saved in the selected device will be displayed.

Exit

1) **Left-click the** 1. Exit **button.**

The File Manager menu will close.

3.12 RECEIVE PORT SETTING

The system can receive data from other system via the JRC-LAN. The purpose of JRC-LAN is interoperation with other JRC systems. The JRC systems are synchronized with datum in JRC-LAN network.

NOTE: If the connection is not suggested from JRC office, don't connect PC or other maker's system to JRC-LAN.

- **Connecting PC or other maker's system may cause a lower radar system performance.**
- **Connecting PC or other maker's system may cause a lower that performance.**

3.12.1 Receive Port Setting (RX Port)

Select ports for receiving signals from sensors.

There are two methods for receiving signals: specifying a port for each sensor, or using the automatic recognition function without specifying ports.

Procedures

1) **Open the RX Port Setting menu by performing the menu operation below.**

Main
→ 6. NAV Equipment Setting
→ 6. RX Port

2) **Set a port for each sensor.**

Settable sensor signals

Heading, Speed, AIS, GPS, DLOG, Alarm, Depth, Temperature, Wind, Current, ROT, RSA, Time Zone, Date/Time

Selectable ports

When the automatic recognition function is used: AUTO

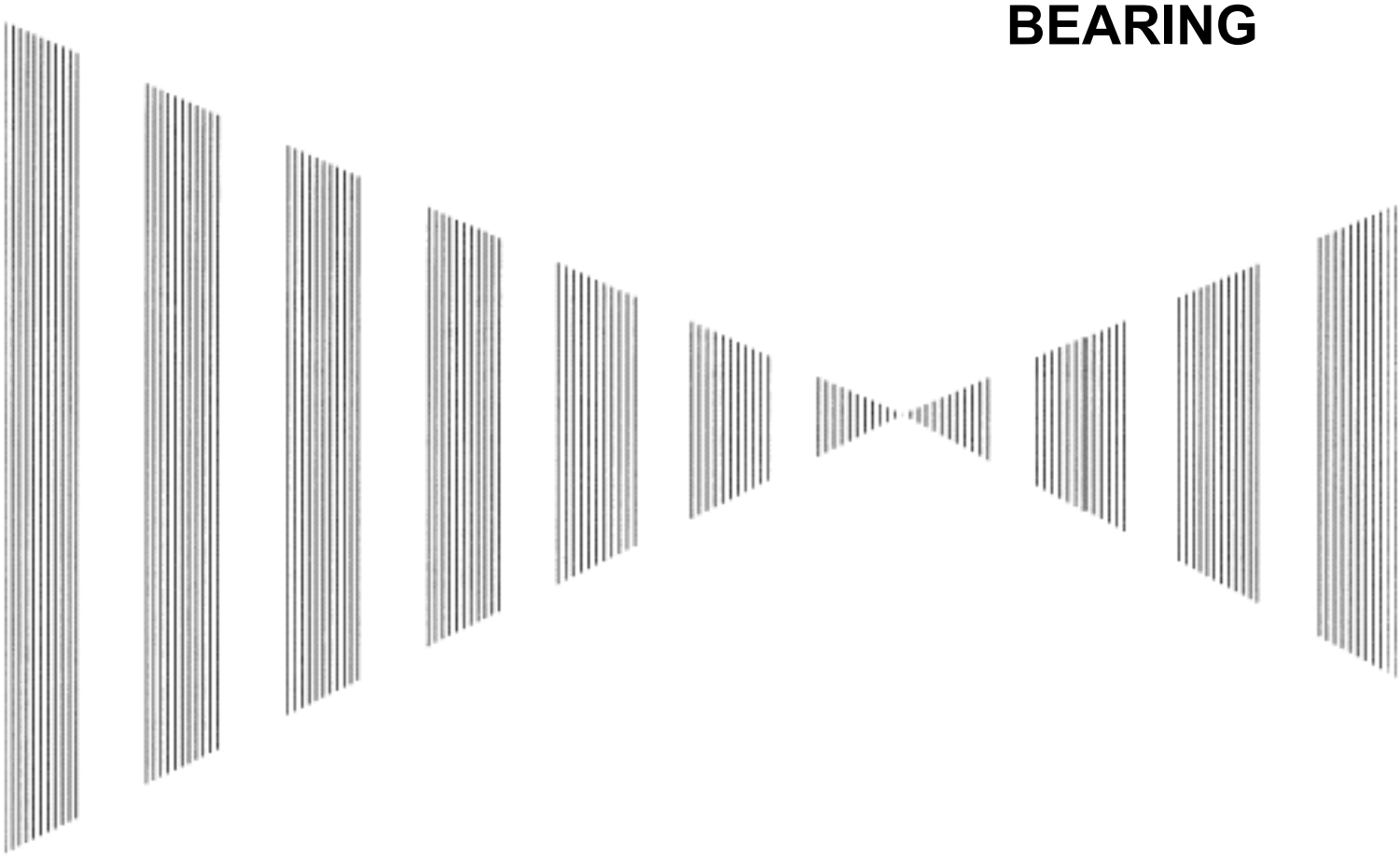
When ports are specified: Own | LAN | LAN (GPS) | LAN (Ship's Clock)

Behavior pattern of selectable ports

AUTO	: Data from JRC-LAN is prior
Own	: The system use data from sensor connected to the system directly.
LAN	: The system uses data from JRC-LAN.
LAN (GPS)	: The system uses GPS data from GPS (JRC-LAN connected).
LAN (Ship's Clock)	: The system uses ship's clock data from ship's clock (JRC-LAN connected)

Setting of Section 7.2.11.2 "Reception Port Setting (RX Port)" is prior. If you want to set this menu, Section 7.2.11.2 "Reception Port Setting (RX Port)" menu set to User Setting.

SECTION 4
MEASUREMENT OF RANGE AND BEARING

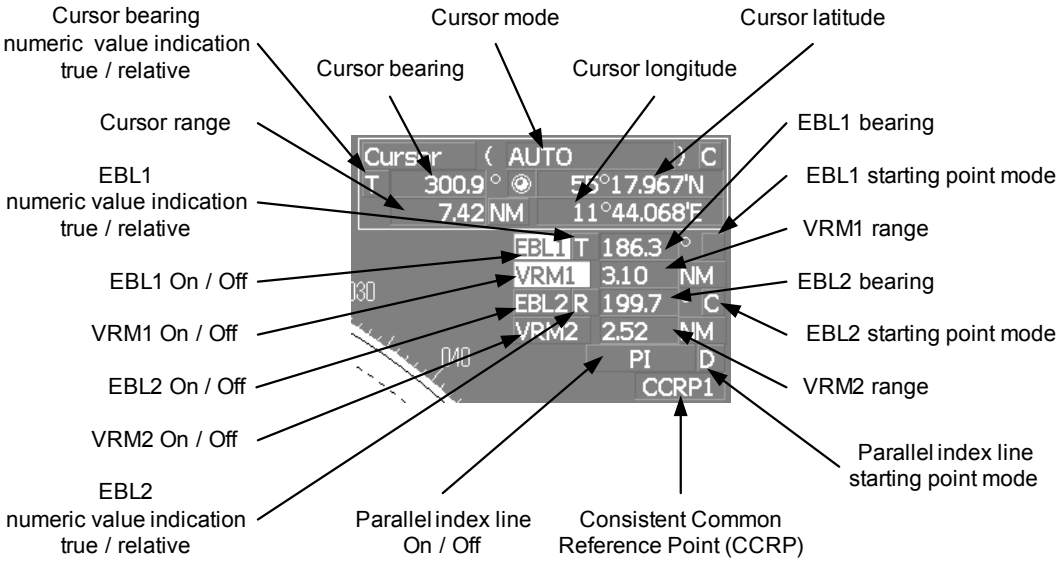


MEASUREMENT OF RANGE AND BEARING

4.1 USE OF NAVIGATION TOOLS

The system is equipped with the navigation tools below.

Cursor:	Specifies an arbitrary point, and measures the range and bearing from the own ship.
Range Rings:	Displays concentric circles with own ship's position as the center at specified intervals, and the rings are used as rough guides for range measurement.
Electronic Bearing Line (EBL1/2):	Displays a straight line for specifying an arbitrary bearing, and measures the bearing from the own ship.The process unit is equipped with two electronic bearing lines.
Variable Range Marker (VRM1/2):	Displays a circle for specifying an arbitrary range, and measures the range from the own ship.The process unit is equipped with two variable range markers.
Parallel Index Line (PI):	Displays straight lines at even intervals, and the lines are used as rough guides for complex measurement or ship courses.
EBL Maneuver:	Displays the course by steering the own ship, and it is used as a rough guide for ship maneuvering.
Marker:	Stores the latitude and longitude where the own ship was at the point of storing the markers, and shows an anchor symbol on the radar display. When the own ship has moved, the system displays the range and bearing to the position.
EBL/VRM/PI Operation with Cursor (Cursor AUTO):	Operates EBL, VRM, or PI on the radar display by using the cursor.



4.1.1 Using Cursor (Cursor)

Procedures

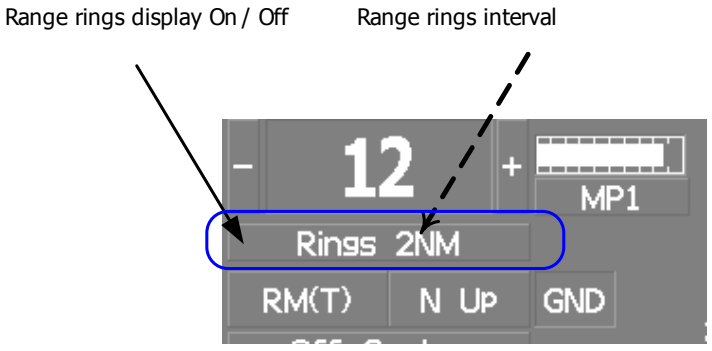
1) **Move the cursor onto the PPI display by moving the trackball.**

When the cursor is moved onto the PPI display, the arrow cursor turns into a cross cursor.

4.1.2 Using Range Rings (Range Rings)

Procedures

1) **Left-click the** Rings **button on upper left area on the display.**



The range ring display switches disappear and appear between display and non-display each time the Rings button is clicked. The range ring interval is shown in the Rings button.

The range between the target and own ship can be determined by visually measuring the target's position that lies between two range rings.

For change of the brilliance of range rings, refer to Section 3.8.5 "Set Radar Display (Display Setting)".

4.1.3 Using Electronic Bearing Line (EBL1/EBL2)

Electronic bearing lines (EBL) are indispensable to the measurement of bearings.

Operators must be familiar with the operation of EBL beforehand.

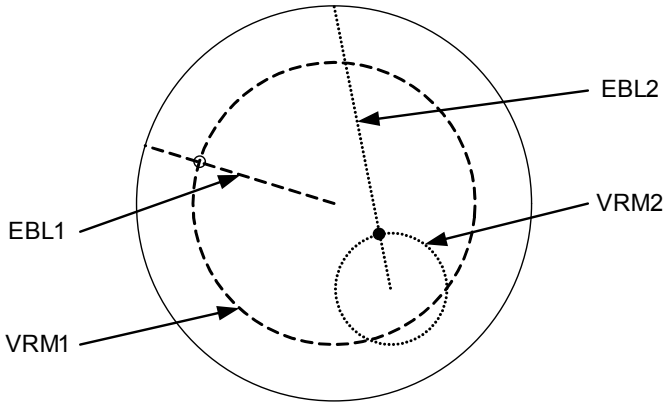
The system is equipped with two EBL. The bearing and starting point of an EBL can be operated separately from the other EBL.

An intersection marker is displayed at the intersection point of the EBL and VRM of the same number.

Intersection markers shown on EBL:

○: EBL1, VRM1

●: EBL2, VRM2



EBL Bearing Display

The bearing value of the current EBL1 or EBL2 on the PPI display is shown in the upper right of the display.

The currently operable EBL1 or EBL2 is highlighted in the upper right of the display.

Starting Point of EBL

The starting point of the currently operating EBL can be switched from the center of the radar display to any offset position . The offset position of the EBL starting point can be fixed on the radar display or at the latitude and longitude. (The setting of the navigator is necessary for fixing the offset position at the latitude and longitude.)

4.1.3.1 Operating EBL (EBL)

Procedures

1) **Press the [EBL1] or [EBL2] key.**

The EBL button (located at the upper right of the display) will be highlighted, and the selected EBL becomes operable.

2) **Turn the [EBL] dial.**

To turn the [EBL] dial to the right, turn the EBL control clockwise; to turn the [EBL] dial to the left, turn the EBL control counterclockwise.

Cancel

1) **Press the [EBL1] or [EBL2] key again.**

The selected EBL display will disappear.

4.1.3.2 Moving the Starting Point of EBL

The system provides three types of EBL starting points. Select one of them in accordance with purpose.

- : The EBL starting point is defined as the own ship's position.
- C : The EBL starting point is moved and fixed on the radar display.
- D : The EBL starting point is moved and fixed at the latitude and longitude. (The navigator needs to be connected.)

[1] To move the starting point of EBL

Procedures

1) **Make EBL1 or EBL2 operable.**

2) **Press the [EBL] dial to set C or D for the EBL1 / EBL2 starting point mode switching located at the upper right of the display.**

The selected EBL starting point mode is switched as shown below each time the dial is pressed.

⇒ C ⇒ D ⇒

3) **Put the cursor on the EBL starting point is to be moved, and left-click.**

The selected EBL starting point will be determined.

[2] To return the EBL starting point to own ship's position

Procedures

1) **Make EBL1 or EBL2 operable.**

2) **Press the [EBL] dial to set for the EBL1 / EBL2 starting point mode switching located at the upper right of the display.**

The selected EBL starting point will be set as the own ship's position.

4.1.3.3 Setting EBL Operation Mode

[1] To set the numeric value display mode of EBL (EBL Bearing REF)

Determine whether to display EBL in true bearing mode or relative bearing mode.

Procedures

1) **Put the cursor on the EBL1/2 numeric value indication true / relative switching (located at the upper right of the display), and left-click.**

The selected mode is switched as shown below each time the left button is clicked.

T ⇒ R ⇒ T

T :EBL bearing is displayed in true bearing mode.

R :EBL bearing is displayed in relative bearing mode.

[2] To set a mode for fixing EBL display (EBL Bearing Fix)

When this function is set to Angle , an EBL is fixed to the preset bearing. For example, if a true bearing of 020° is preset, the EBL is fixed to the true bearing 020° even when the own ship turns.

When the function is set to Screen , the EBL is fixed on the radar display. In this case, the EBL is always fixed to the same bearing on the display when the own ship turns.

Procedures

1) **Open the EBL/Cursor Setting menu by performing the following menu operation.**

Main
→ 7. Sub Menu
→ 9. EBL/Cursor Setting

2) **Left-click at the item button of** 1. EBL1 Bearing FIX **or** 2. EBL2 Bearing FIX **.**

Angle :EBL bearing is fixed to the preset value.

Screen :EBL bearing is fixed on the radar display.

Course data is necessary for turning on this function.

Variable range markers (VRM) are indispensable to the measurement of ranges. Operators must be familiar with the operation of VRM beforehand.

The system is equipped with two VRM. The VRM can be operated separately from each other.

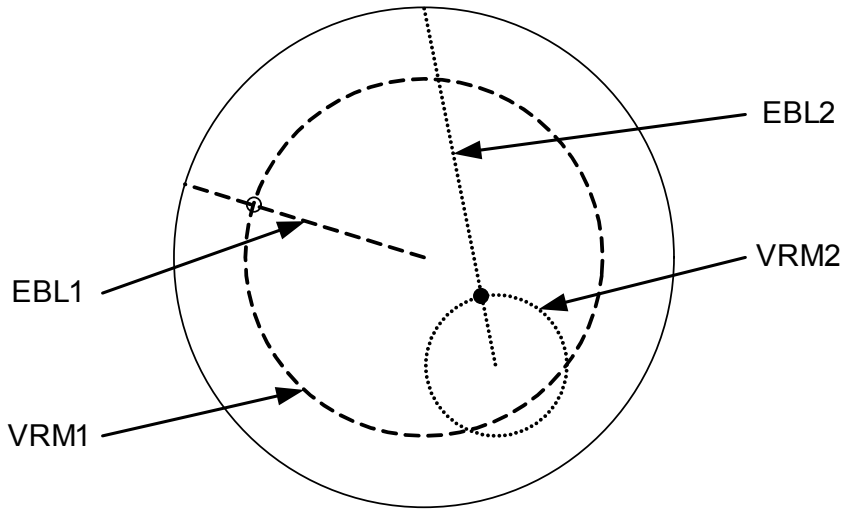
An intersection marker is displayed at the intersection point of the VRM and EBL of the same number.

When the starting point of an EBL is offset, the center of the VRM is defined as the offset EBL starting point.

Intersection markers shown on VRM:

○: EBL1, VRM1

●: EBL2, VRM2



VRM Operation

The range value of the current VRM1 or VRM2 on the PPI display is shown in the VRM1/2 range located at the upper right of the display. The currently operable VRM1 or VRM2 is highlighted in the VRM1 VRM2 button located at the upper right of the display.

4.1.3.4 To operate VRM (VRM)

Procedures

1) **Press the [VRM1] or [VRM2] key.**

The VRM1 and VRM2 buttons (located at the upper right of the display) will be highlighted, and the selected VRM becomes operable.

2) **Turn the [VRM] dial.**

To turn the [VRM] dial to the right, the VRM control wide, to turn the [VRM] dial to the left, the VRM control narrow.

Cancel

1) **Press the [VRM1] or [VRM2] key again.**

The selected EBL display will disappear.

4.1.4 Using Parallel Index Lines (PI Menu)

Parallel index lines can be displayed.

4.1.4.1 Operating Parallel Index Lines (PI)

Procedures

1) **Press the [VRM] dial.**

Parallel index lines and the PI Menu will appear.

To change the bearing of parallel index lines, turn the [EBL] dial, to change the line interval, turn the [VRM] dial.

The bearing and interval of parallel index lines are displayed in the PI Menu.

2) **Press the [VRM] dial again.**

The parallel index lines will be fixed.

> Parallel index lines are operable only while the PI Menu is displayed. When the menu is closed, the parallel index line display remains, but the settings of the bearing and interval cannot be adjusted any more. To adjust the bearing and interval after closing the menu, press the [VRM] dial twice to open the PI Menu.

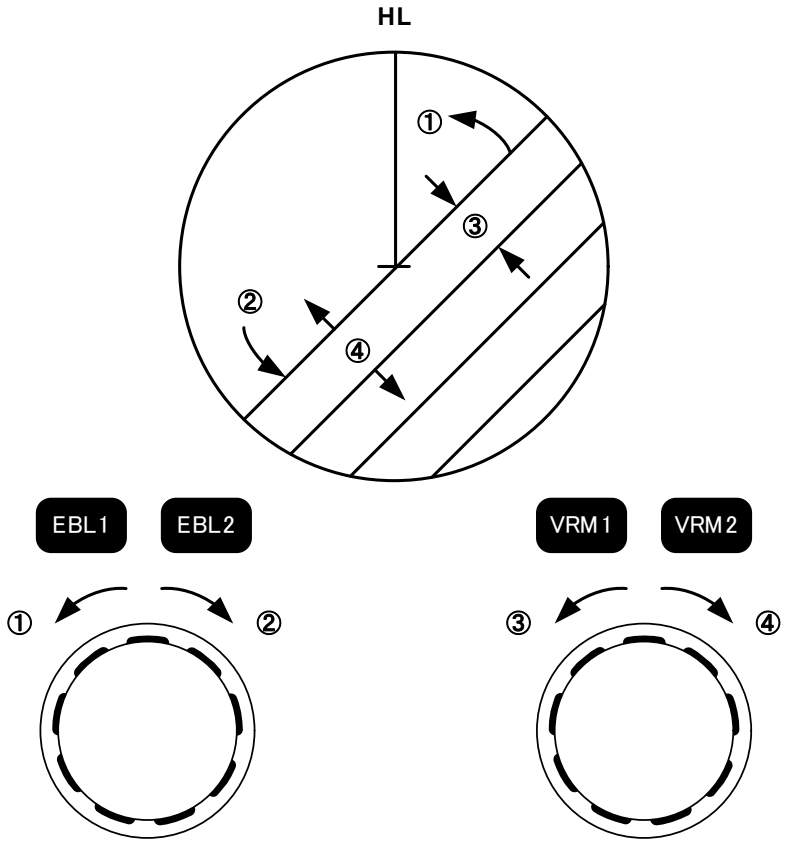
Cancel

1) **Press the [VRM] dial again.**

The parallel index line display will disappear.

4.1.4.2 Operation of Parallel Index Lines

- Parallel index lines rotate in the same direction as you turn the [EBL] dial.(①, ②)
- The intervals of parallel index lines narrow when you turn the [VRM] dial counterclockwise (③), and widen when you turn the [VRM] dial clockwise (④).
- When the [VRM] dial is pressed, the PI Menu closes and the parallel index lines are fixed.



During the operation of parallel index lines, pressing the [EBL1] or [EBL2] key disables operation for rotation directions. Pressing the [VRM1] or [VRM2] key disables operation for parallel index line intervals.

4.1.4.3 Settings in PI Menu (PI Menu)

The operation of parallel index lines can be set in the PI Menu.

Procedures

1) **Left-click the** PI **button to open the PI menu.**

[1] Display for All Lines

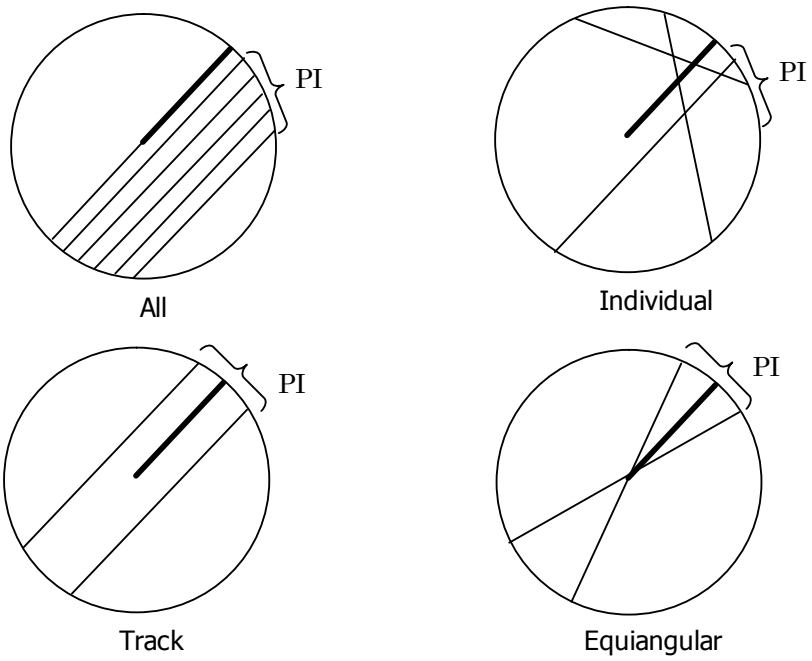
Sets the parallel index line display to on or off.

On :Parallel index lines are displayed.

Off :Parallel index lines are not displayed.

[2] Operation Mode

Sets an operation mode for parallel index lines.



All :All the parallel lines are operated at the same time.

Individual :The bearing of each line is operated individually.

Track :Equally spaced lateral lines are displayed on both sides.

Equiangular :Two lines intersecting at the center of a circle are displayed.

a. Operation if Individual is selected

- A line perpendicular to the own ship and the intersection marker "----○" are displayed on an operable line.
- Turning the [EBL] dial changes the direction.
- Pressing the [VRM] dial changes the range, end point 1, or end point 2 to be operated.
- An operable point is displayed with "● " and can be operated by turning the [VRM] dial.
- If Sequential is selected for [3] Control, the parallel index lines of the next number can be displayed by pressing the [EBL] dial.
- To close the menu, left click 0.Exit software button.

b. Operation if Equiangular is selected

- Select a group of lines to be operated according to the setting of [3] Control.
- Pressing the [EBL] dial switches between the direction change mode and elevation-angle change mode. Turning the [EBL] dial changes the direction or elevation angle.

[3] Control

Determines whether to operate all the lines at the same time. The setting items are determined by the setting of Section [2] "Operation Mode".

a. If All **is selected**

The setting cannot be changed.

All :All the lines are operated at the same time.

b. If Individual **is selected**

Determine whether to set consecutive lines or individual lines.

Sequential :Lines are operated sequentially.

Index Line1 to Line8 :A specified line is operated.

c. If Track **or** Equiangular **is selected**

Select a group of lines to be operated.

Group1 to Group4 :A specified group is operated.

[4] Floating

Moves the center point of parallel index lines.

Off :The starting point of parallel index lines is defined as the own ship's position.

Screen Fix :The center of parallel index lines is moved and fixed on the radar display.

L/L Fix :The center of parallel index lines is moved and fixed at the latitude and longitude. (The navigator needs to be connected.)

[5] Heading Link

Determines whether to operate parallel index lines following the heading bearing.

On :Parallel index lines are operated following the heading bearing.

Off :Parallel index lines are not operated following the heading bearing.

[6] Next

Moves to the next page.

[7] Range Scale Link

Determines the operation of parallel index line intervals when the range is changed.

On :The intervals are fixed with the actual range (nm). The appearance of parallel index line intervals changes when the range is changed.

Off :The intervals are fixed with the display range. The parallel index line intervals (nm) change when the range is changed.

[8] Reference Bearing

Sets a reference bearing for the numeric data display of parallel index lines. The setting items are determined by the setting of Section [2] "Operation Mode"

a. If All is selected

True :Displayed with true bearing (with North as reference).

HL :Displayed with the heading line as reference.

b. If Individual is selected

True :Displayed with true bearing (with North as reference).

HL :Displayed with the heading line as reference.

Index Line1 to Line8 :Displayed with a specified line as reference.

c. If [Track] is selected

[True] : Displayed with true bearing (with North as reference).

[HL] : Displayed with the heading line as reference.

[Index Line1] to [Line8] : Displayed with a specified line as reference.

Line1, Line3, Line5 and Line7 correspond to Group1, Group2, Group3 and Group4, respectively.

[Line1] ⇔ [Group1]
[Line3] ⇔ [Group2]
[Line5] ⇔ [Group3]
[Line7] ⇔ [Group4]

d. If [Equiangular] is selected

The setting cannot be changed.

4

[9] Operation Area

If All is selected for Section [2] "Operation Mode", this function sets an area for displaying parallel index lines.

[One Side] :Parallel index lines are displayed only on one side.

[Both Side] :Parallel index lines are displayed on both sides.

[10]Display for Individual Line

Determines whether to turn on / off the parallel index line display of a selected number.

On :The line of the selected number is displayed.

Off :The line of the selected number is not displayed.

If [All] is selected for Section [2] "Operation Mode", the line near the own ship is [Index Line1].

If [Track] or [Equiangular] is selected for Section [2] "Operation Mode", Line1, Line3, Line5 and Line7 correspond to Group1, Group2, Group3 and Group4, respectively.

[Line1] ⇔ [Group1]
[Line3] ⇔ [Group2]
[Line5] ⇔ [Group3]
[Line7] ⇔ [Group4]

4.1.5 Operating EBL Maneuver Function (EBL Maneuver Setting)

4.1.5.1 Initial Setting (EBL Maneuver Setting)

Procedures

1) **Open the EBL Maneuver Setting menu by performing the following menu operation.**

Main

→ 1. EBL Maneuver Setting

2) **Set the following parameters.**

Reach :Set the range from when the rudder is steered to when the ship beings to turn.

Turn Mode :Select a turn mode.

Radius :Turning radius (NM)

Rate :Rate of turn (deg/min)

Turn Set :Select the setting for turning.

If Radius is selected :Turning radius (NM)

If Rate is selected :Rate of turn (deg/min)

For inputs to the value input screen, refer to Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

A wrong initial setting affects the maneuver curve function explained below.

4.1.5.2 Creation of Maneuver Curve (EBL Maneuver)

Procedures

1) **Left-click the item button of** 1. EBL Maneuver **while the EBL Maneuver Setting menu is open.**

The EBL maneuver function will be set to on or off.

A auxiliary line for maneuver curve creation, a maneuver curve, and a WOL will appear on the radar display.

2) **Put the cursor on the starting point of the auxiliary line, and set the bearing of the auxiliary line by operating the [EBL] dial.**

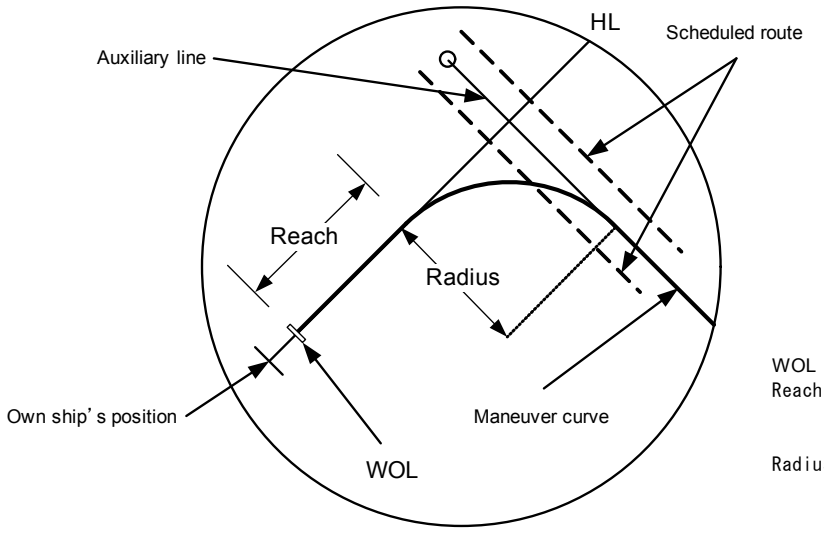
The bearing of the auxiliary line is the final bearing in which the own ship is to move.

The WOL position varies depending on the bearing of the auxiliary line.

If the WOL is behind the CCRP, the line color of WOL will change.

3) **Left-click.**

The setting will be determined. However, if the WOL is behind the CCRP position at this point, left-clicking is rejected, and the setting is not determined.



WOL : Steering point
Reach : Range from when the rudder is steered to when the ship begins to turn
Radius : Turning radius

4.1.6 Operating EBL, VRM, and PI with Cursor

When the cursor mode is set to AUTO (located at the upper right of the display), EBL, VRM, and PI can be operated simply by using the trackball.

4.1.6.1 Operating Electronic Bearing Line (EBL)

Procedures

1) **Put the cursor on EBL1 or EBL2, and left-click.**

When the cursor is moved to it, EBL1 or EBL2 is shown at the upper right of the cursor. The EBL becomes operable when left-clicking.

2) **Move the cursor to the bearing to be set.**

The EBL will move as the cursor moves.

3) **Left-click.**

The EBL will be fixed.

4.1.6.2 Operating Variable Range Marker (VRM)

Procedures

1) **Put the cursor on VRM1 or VRM2, and left-click.**

When the cursor is moved to it, VRM1 or VRM2 is shown at the upper right of the cursor. The VRM becomes operable when left-clicking.

2) **Move the cursor to the range to be set.**

The VRM will move as the cursor moves.

3) **Left-click.**

The VRM will be fixed.

4.1.6.3 Operating EBL and VRM Concurrently (EBL・VRM)

Procedures

1) **Put the cursor on the intersection marker (○ or ●), and left-click.**

When the cursor is moved to it, EBL1 VRM1 or EBL2 VRM2 is shown at the upper right of the cursor. The EBL and VRM become operable when left-clicking.

2) **Move the cursor to the bearing / range to be set.**

The EBL and VRM will move as the cursor moves.

3) **Left-click.**

The EBL and VRM will be fixed.

4.1.6.4 Operating Parallel Index Lines (PI)

[1] To change the direction of parallel index lines

Procedures

1) **Put the cursor on near the center of line, and left-click.**

When the cursor is moved there, it will turn into and PI will be displayed at the upper right of the cursor. The parallel index lines become operable when left-clicking.

2) **Move the cursor to the direction to be set.**

The parallel index lines will change the direction as the cursor moves.

3) **Left-click.**

The parallel index lines will be fixed.

[2] To change parallel index line intervals

Procedures

1) **Put the cursor on near the end of line, and left-click.**

When the cursor is moved there, it will turn into ⇔ and PI will be displayed at the upper right of the cursor. The parallel index lines become operable when left-clicking.

2) **Move the cursor to the interval to be set.**

The parallel index lines interval will change as the cursor moves.

If Individual is selected for Operation Mode, the parallel index lines move.

3) **Left-click.**

The parallel index lines will be fixed.

[3] To change the end points of parallel index lines

If Individual is selected for Operation Mode, the length of parallel index lines can be changed.

Procedures

1) **Put the cursor on the end point of parallel index lines, and left-click.**

When the cursor is moved there, it will turn into ⇔ and PI will be displayed at the upper right of the cursor. The parallel index lines become operable when left-clicking.

2) **Move the cursor to the position to be set.**

The position of the end point will change as the cursor moves.

3) **Left-click.**

The parallel index lines will be fixed.

4.2 MEASUREMENT OF RANGE AND BEARING

Target position on the RADAR screen

RADAR antenna transmits pulses of radio waves. The object returns the wave (radar echo) to the antenna. So on the RADAR screen the leading edge of echo is the actual target position. The length of echo is dependent on the transmitted pulse length.

Point the cursor to the leading edge of echo to measure the target range or to make a mark on the target.

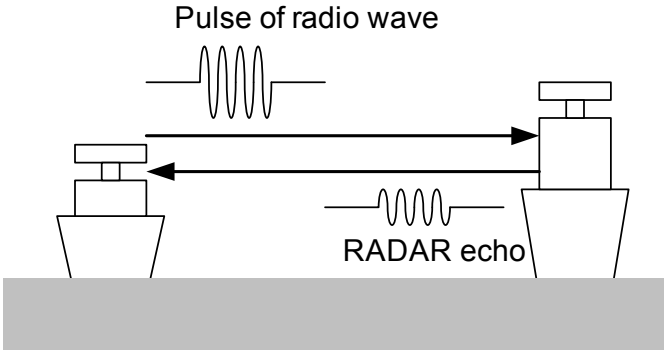


Fig 4-1: *Transmitting-Receiving of RADAR*

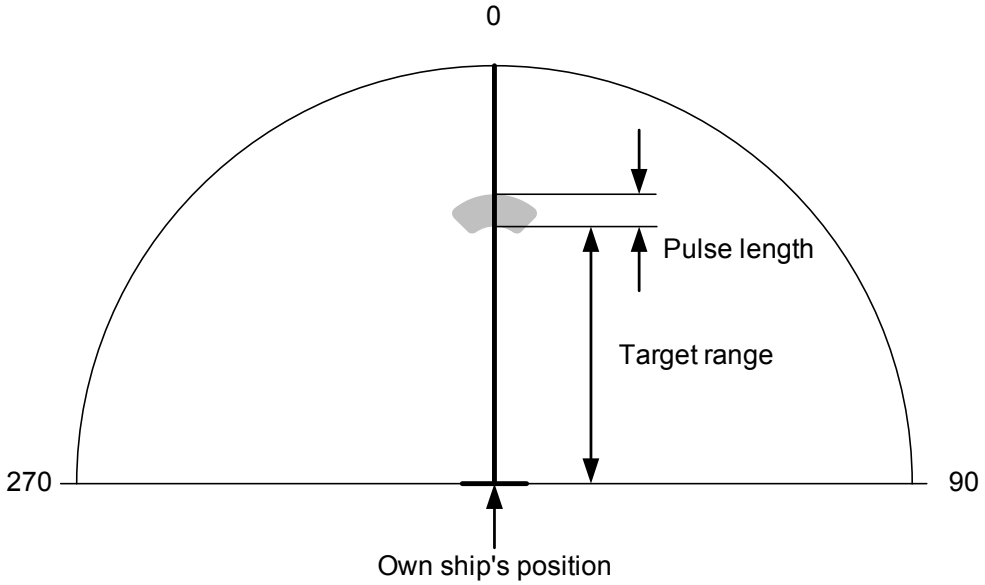


Fig 4-2: *Relation of echo, target range and pulse length*

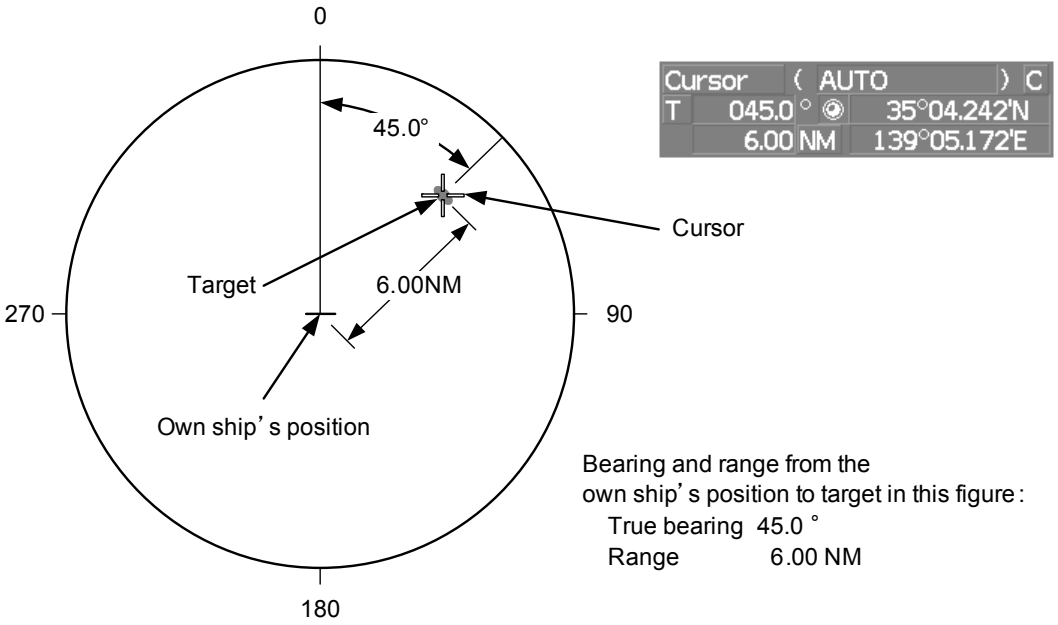
4.2.1 Measurement with Cursor Position (Cursor)

Procedures

1) **Make sure of the target echoes on the radar display.**

2) **Move the cursor to the target.**

The bearing and range of the target will be shown in the Cursor bearing / range located at the upper right of the display. The range is a distance from the own ship's position.



4.2.1.1 To set a cursor bearing numeric value mode

Determine whether to display a cursor bearing in true or relative bearing mode.

Procedures

1) **Put the cursor on the Cursor bearing numeric value indication true / relative switching (located at the upper right of the display), and left-click.**

The selected mode is switched as shown below each time left-clicking.

T ⇒ R ⇒ T

T :Cursor bearing is displayed in true bearing mode.

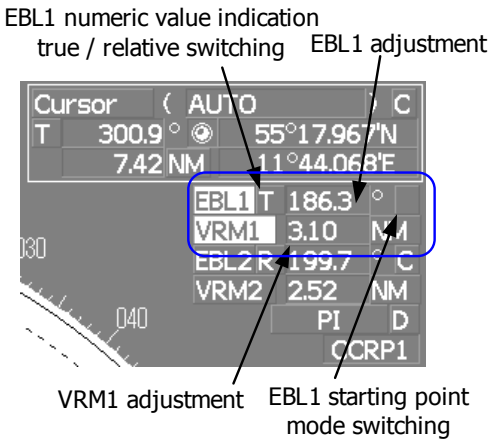
R :Cursor bearing is displayed in relative bearing mode.

4.2.2 Measurement with Electronic Bearing Line and Variable Range Marker [EBL] [VRM]

Procedures

1) **Press the [EBL1] key.**

The EBL1 (located at the upper right of the display) will be highlighted, and EBL1 will be shown with a dotted line on the PPI display.



2) **Move the EBL1 to the target by turning the [EBL] dial.**

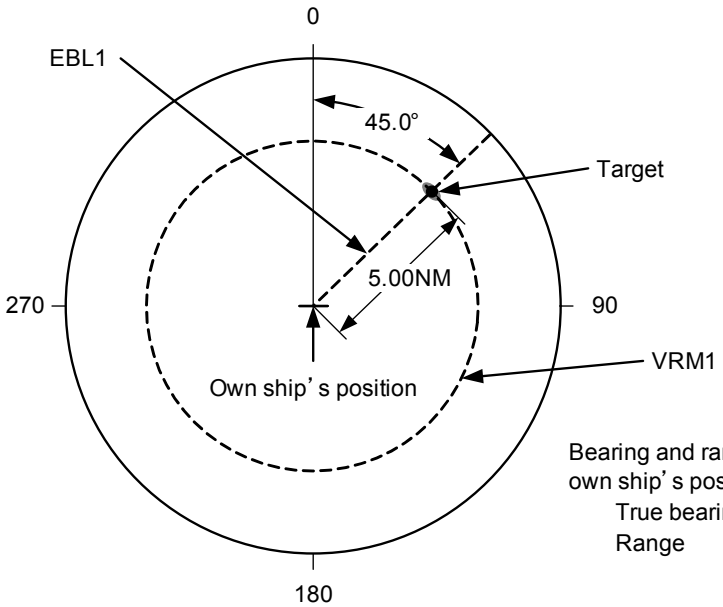
The EBL1 bearing will be shown in the EBL1 bearing (located at the upper right of the display). The EBL1 bearing is the bearing of the target.

3) **Press the [VRM1] key.**

The VRM1 (located at the upper right of the display) will be highlighted, and VRM1 will be shown with a dotted line on the PPI display.

4) **Move the VRM1 to the target by turning the [VRM] dial.**

The range of VRM1 from the own ship's position will be shown in the VRM1 range located at the upper right of the display.



Bearing and range from the own ship's position to target in this figure:
True bearing 45.0 °
Range 5.00 NM

4.2.3 Measurement with Two Arbitrary Points

Procedures

1) **Press the [EBL2] key.**

The EBL2 (located at the upper right of the display) will be highlighted, and EBL2 will be shown on the PPI display.

2) **Press the [EBL] dial to select C for the EBL2 starting point mode switching located at the upper right of the display.**

3) **Put the cursor on the point A of the two points between which measurement is made, and left-click.**

Refer to the figure below.

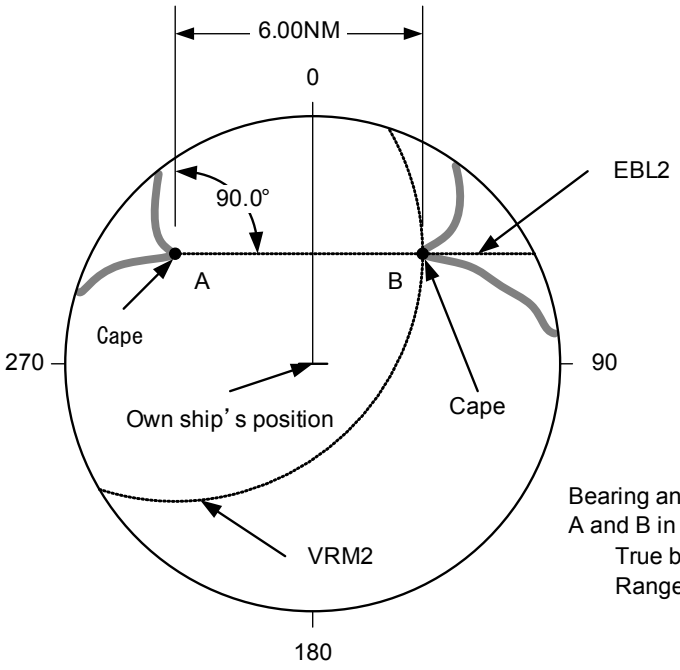
4) **Move the EBL2 to the other point B by turning the [EBL] dial.**

5) **Press the [VRM2] key.**

When VRM2 is selected, ● (intersection marker) will appear on the dotted line of EBL2.

6) **Move the intersection marker on the dotted line to point B by turning the [VRM] dial.**

The range and bearing between the two points will be shown in the VRM2 range and EBL2 bearing (located at the upper right of display).

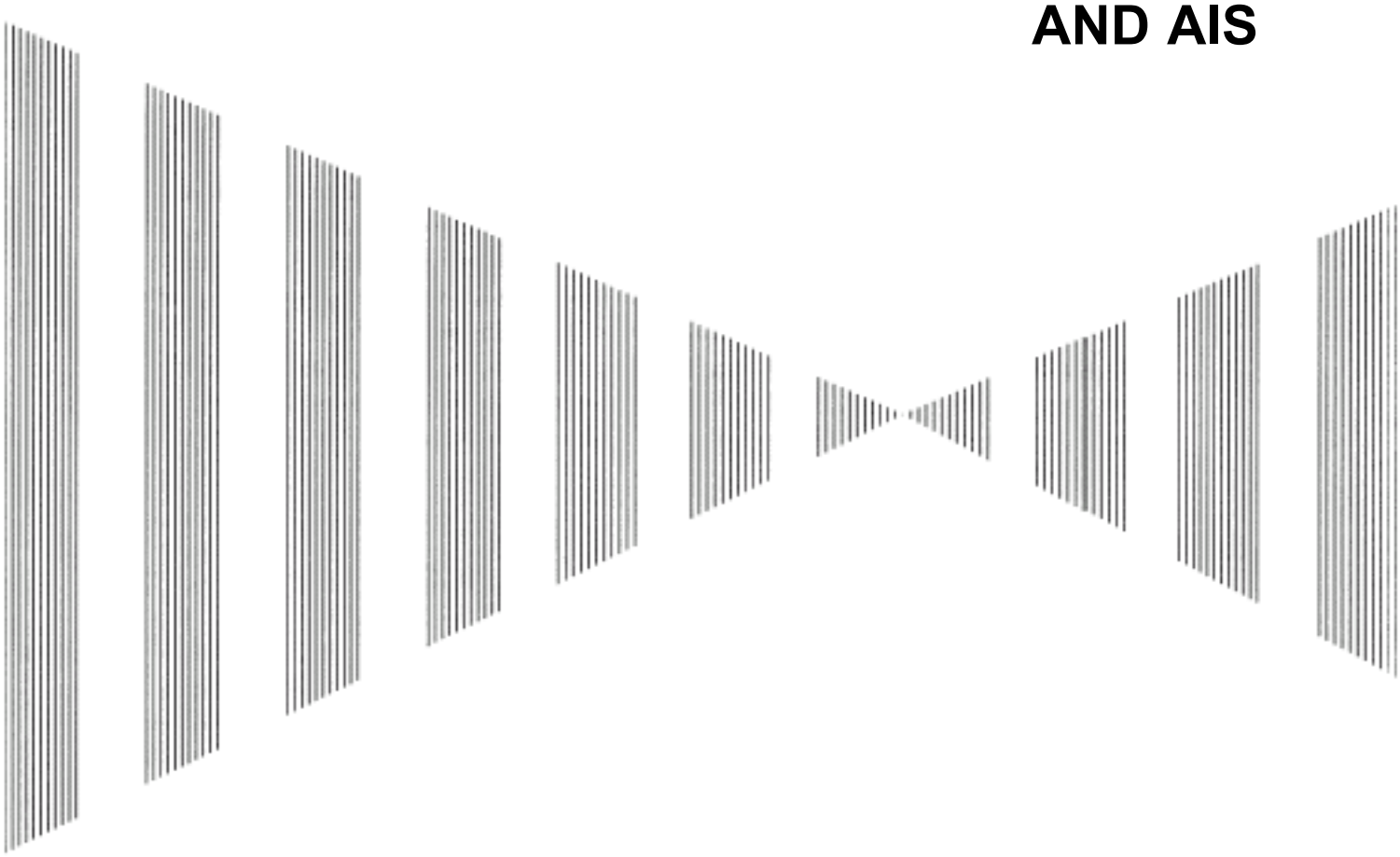


EBL1	T		°
VRM1			NM
EBL2	T	090.0	° C
VRM2		6.00	NM

Bearing and range between points A and B in this figure:
True bearing 90.0 °
Range 6.00 NM

Similarly, EBL1 can also be used for measuring the bearing and range between two points. In this case, perform the above procedure reading EBL2 as EBL1 and VRM2 as VRM1.

SECTION 5
OPERATION OF TARGET TRACKING AND AIS



OPERATION OF TARGET TRACKING AND AIS

5.1 PREPARATION

Attention

- **There are the following limitations on use of the target acquisition and target tracking functions.**

[I] Resolution between adjacent targets and swapping during automatic target tracking

Depending on the particular distance and echo size, resolution between adjacent targets during automatic target tracking usually ranges somewhere between 0.03 to 0.05 NM. If multiple targets approach each other, resolution will become about 0.05 NM and this may cause the system to regard them as one target and thus to swap them or lose part of them. Such swapping or 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 six scans in succession. If a lost target exists, therefore, radar gain must be increased to support detection of the target. If, however, radar gain is increased too significantly, sea clutter returns or other noise may be erroneously detected and tracked as a target, and resultingly, a false alarm may be issued.

[III]Adverse effects of error sources on automatic tracking

To execute accurate tracking, it becomes necessary first to appropriately adjust the [GAIN], [SEA] and [RAIN] dials of the radar so that the target to be acquired and tracked id clearly displayed on the radar display. Inappropriate settings of these adjustments reduce the reliability / accuracy of automatic tracking.

This section explains the features of the target tracking and AIS functions, and the initial setting for using each function.

Target Tracking Function

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

The target tracking function enables the automatic acquisition of targets by using the automatic acquisition zone function.

The target tracking function also enables the simulation of the ship maneuvering method to avoid collisions by using the trial maneuver function.

If the mode is ground stabilization, SOG/COG used for own ship's information in target tracking. If the mode is sea stabilization, SPD (speed through the water) / HDG (heading) used for own ship's information in target tracking.

AIS (Automatic Identification System) function

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

5.1.1 Collision Avoidance

5.1.1.1 Problems of Collision Avoidance in Navigation

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

The navigation pattern of all mobile craft constitutes a system with some closed loops regardless of the media through which the mobile craft travels, whether air, water, the boundary between air and water, or space. This pattern consists of two closed loops in principle, one of which is a collision with another mobile craft and the other is a loop of finding a right and safe way to reach a predeterminate destination. Fig. 5-1 shows the conceptual diagram of navigation pattern by MR. E.W. Anderson. The closed loop of collision avoidance is shown on the left side and the closed loop of finding a right course on the right side.

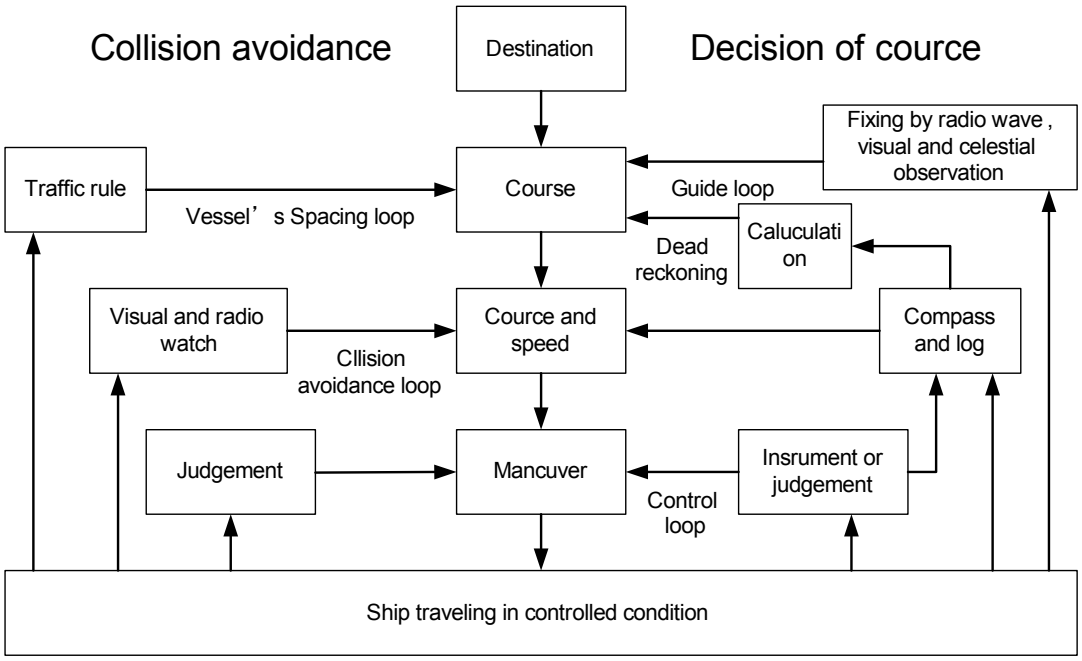


Fig 5-1: *Navigation Pattern*

5.1.1.2 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.

5.1.1.3 Basic Concept of Collision Avoidance

There are two aspects in collision avoidance: collision prediction and avoidance. Collision prediction is to predict that two or more vessels will happen to occupy the same point at the same time, while collision avoidance is to maneuver vessels not to occupy the same point at the same time.

In practical operation of vessels, a spot of collision has to be deemed to be a single point but a closed zone. This closed zone is conceptually defined as a CPA (Closest Point of Approach). In collision prediction, the time to be taken until a ship reaches the CPA is defined as a TCPA (Time to CPA).

Fig. 5-2 shows a diagram caked "Collision Triangle".

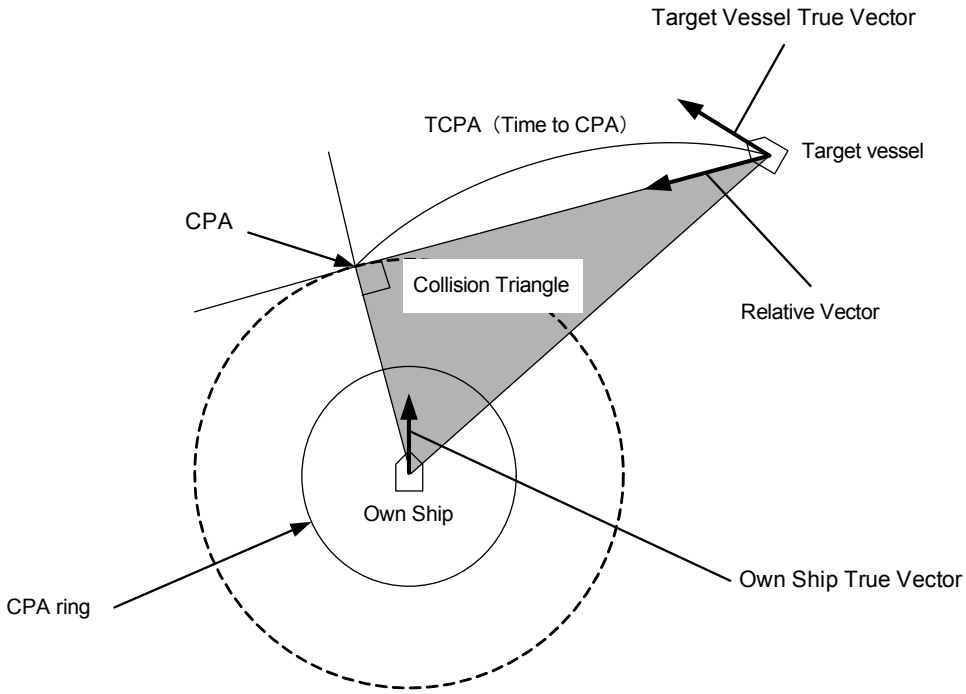


Fig 5-2: *Collision Triangle*

5.1.1.4 Relative Vector and True Vector

From two points of view, collision prediction and avoidance, it is necessary to obtain the relative vector of other ship for prediction and the true vector of other ship for collision avoidance in order to grasp other ship's aspect. The relationship between the relative vector and true vector is shown in Fig. 5-3.

Both rough CPA and TCPA can be obtained easily from the relative speed vector of other ship. This method has an advantage that the risks of collision with all other ships within the radar range can be seen at a glance. On the other hand, the course and speed of other ship can easily be obtained from its true speed vector, enabling other ship's aspect to be seen at a glance. Thus, the aspects of other ships (transverse, outsail, parallel run, reverse run, etc.) as described in the act of prevention of collision at sea can be readily grasped. If there is a risk of collision with other ship, the operator can determine which rule to be applied and how to operate own ship.

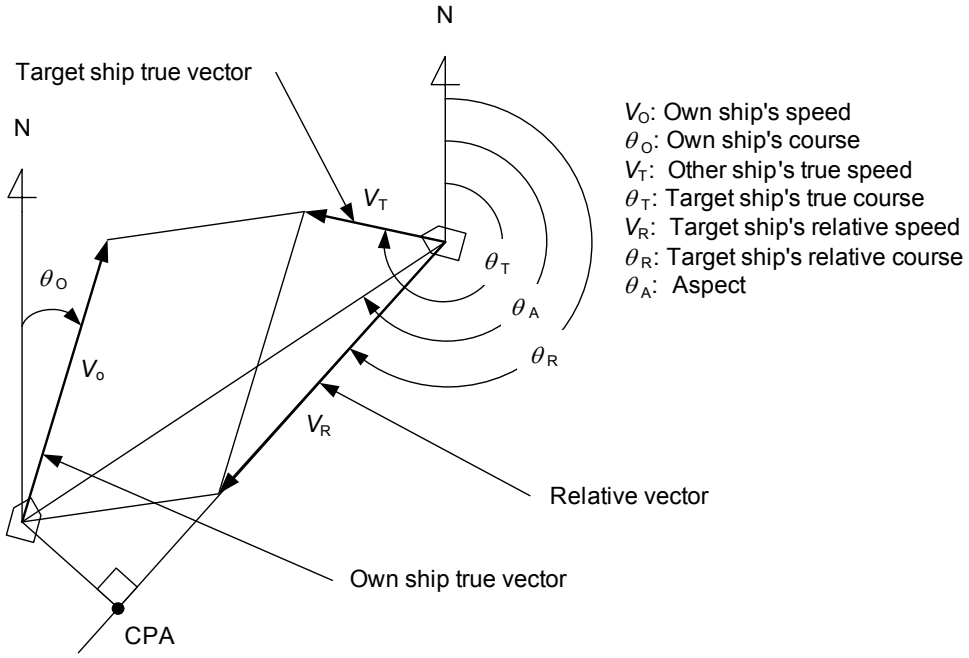


Fig 5-3: *Relative Vector and True vector*

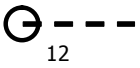
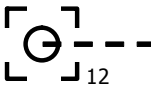
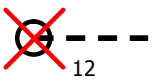
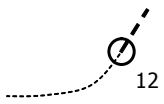
5.1.1.5 Radar and Collision Avoidance

Radar is still playing an important roll for collision prevention and positioning.

A plotter is used to further enhance the radar functionality. The plotter is capable of plotting other positions of other ships in 3 to 6 minute intervals to monitor their movement. The plots of other ships represent their tracks relative to own ship, and it is shown whether there is a risk of collision, namely CPA and TCPA can be obtained. This method using a plotter is fairly effective, but the number of target ship, which is manually plotted, is limited and it takes several minutes to measure those.

5.1.2 Definitions of Symbols

5.1.2.1 Types and Definitions of Target Tracking Symbols

Vector/ Symbol	Definition	Remarks
	Initial acquisition target	This symbol is displayed until the vector is displayed after target acquisition.
	Target acquired in automatic acquisition zone	The alarm sounds. The alarm message (New Target) turns red and blinks.The symbol is red colored.
	Tracked target	
	Dangerous target	The alarm sounds. The alarm message (CPA/TCPA) turns red and blinks.The symbol turns red and enlarges.
	Numeric displayed target	When the numeric data is displayed, the target symbol is enclosed in a square.
	Lost target	The alarm sounds. The alarm message (Lost) turns red and blinks.The symbol turns red, and indicates with X mark.
	Past position	The past positions of an AIS target are displayed as well as the target tracking symbol.
	Target track	The track of another ship as an AIS target is displayed as well as the target tracking symbol.

5

5.1.2.2 Types and Definitions of AIS Target Symbols

Vector/ Symbol	Definition	Remarks
	Sleeping target	This symbol is displayed when received data is valid.The direction of the triangle's vertex indicates the target's bow or course.
	Activated target	The heading direction is displayed with a solid line, and the course vector is displayed with a dotted line. The line perpendicular to the heading direction indicates the direction to which the course is to be changed. This line may not be displayed.
	Target acquired in automatic acquisition zone	The alarm sounds. The alarm message (New Target) turns red and blinks.
	Outline display	The outlines of ships are displayed scaled down.
	Numeric displayed target	When the numeric data is displayed, the target symbol is enclosed in a square.
	Dangerous target	The alarm sounds. The alarm message (CPA/TCPA) turns red and blinks.The symbol turns red and enlarges.
	Lost target	The alarm sounds. The symbol turns red, and indicates with X mark.
	Sleeping AIS-SART target	The AIS-SART symbol is colored as well as AIS target symbol
	Activated AIS-SART target	The target number displayed beside the symbol.
	Numeric displayed AIS-SART target	When the numeric data is displayed, the target symbol is enclosed in a square.
	Lost AIS-SART target	When the data of an AIS-SART target cannot be received for 6 minutes, the lost target is displayed.

NOTE: For details about AIS-SART, refer to Section 6.6 "DISPLAY OF AIS-SART".

AIS-SART function is available in the display software ver. 01.01.

As for method of confirming software version, refer to Section 8.3.1.6 "System Information".

- Up to 300 targets can be displayed in total of activated and sleeping AIS targets. Up to 100 activated AIS targets can be included in the total.
- If there are more AIS targets than the allowable maximum, they are displayed in the following priority order:

1. Numeric displayed target
2. Target of which CPA / TCPA is lower than the set value(Target as a dangerous ship for which an alarm has occurred)
3. Target in automatic activation zone
4. Activated AIS target
5. Target inside AIS filter
6. Target outside AIS filter

- If the number of targets at the same priority level exceeds the allowable maximum, they are displayed in the following priority order:

1. Association target
2. Activated AIS target
3. Sleeping AIS target

The vector of an AIS target is to be displayed with a vector over ground or over water, depending on the speed sensor setting and current offset setting. The type of the currently displayed vector can be confirmed by viewing the setting of the stable mode.

When GND is displayed for the stability mode (Upper left of the display on page 2-3): **Vector over ground**

When Sea is displayed for the stability mode (Upper left of the display on page 2-3): **Vector over water**

When the vector of an AIS target is displayed with a vector over water, the system has converted the AIS target's vector over ground to the vector over water according to the data received from the AIS and the own ship's information.

NOTE: When the AIS target's symbol is activated but the vector is not displayed, the following are probable causes of the trouble:

- COG/SOG is not yet input from the GPS.
- The selected speed sensor is malfunctioning.

5.1.2.3 Types and Definitions of Association Target Symbols

When a tracked target and an AIS target are decided as identical, it is displayed with either of the following symbols:

Vector/ Symbol	Definition	Remarks
	Priority for tracked target Association target	
	Priority for AIS target Association target	

a. Setting of Tracked Target Symbol Display

This function switches the tracking target symbol display between on and off.Even if the tracking target symbol display is turned off, the data is retained.

Procedures

1) **Left-click the  button in the Target Information located at the upper right of the display.**

The tracking target symbol display will be set to on or off.

b. Setting of AIS Target Symbol Display

This function switches the AIS target symbol display between on and off.

Procedures

1) **Left-click the  button in the Target Information located at the upper right of the display.**

The AIS target symbol display will be set to on or off.

5.1.3 Radar Display

5.1.3.1 Vector Display

A vector to represent a target's predicted position can be presented in the True vector or Relative vector mode. In each mode, a vector length can be freely changed for a time interval of 1 to 60 minutes.

To switch between the true vector mode and relative vector mode, press the [T/R VECT] key.

5.1.3.2 Vector Mode Selection

[1] 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 Fig 5-4.

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

However, CPA Ring cannot appear in this mode.

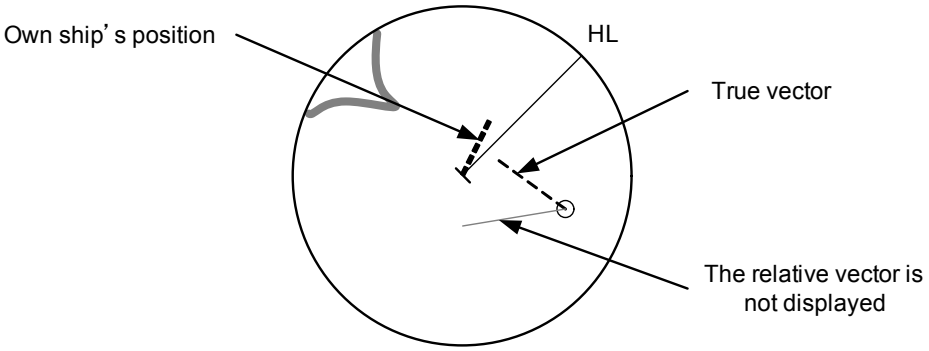


Fig 5-4: *True Vector*

[2] Relative Vector Mode

The relative vector does not represent the true motion of the target, but its relative relation with own ship. This means that a target with its relative vector directed to own ship (passing through the CPA Limit ring) will be a dangerous target. In the Relative Vector mode, it can be seen at a glance where the CPA Limit of the dangerous target is.

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

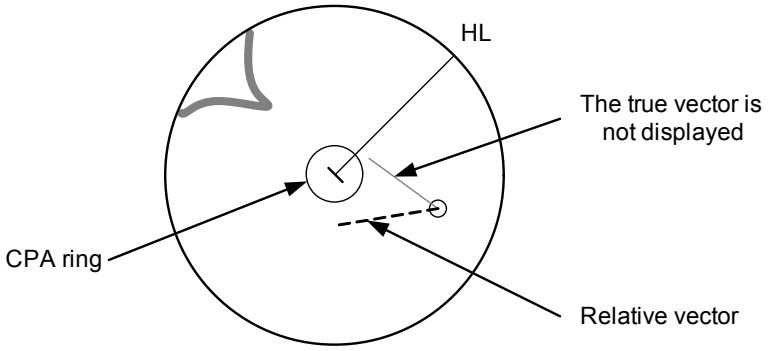


Fig 5-5: *Relative Vector*

5.1.3.3 Vector Length (Vector Time)

The vector length of a target is proportional to its speed, and the vector time can be switched in a range of 1 to 60 minutes.

The diagram below illustrates a vector length of a target for 6 minutes, and the tip of the vector represents the target's position expected to reach 6 minutes later.

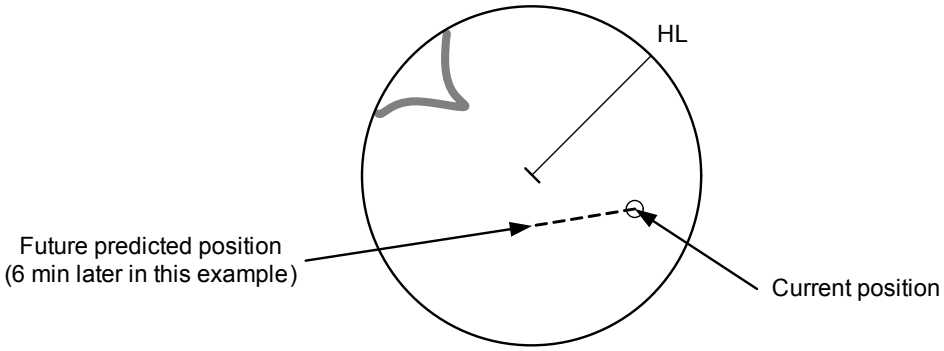


Fig 5-6: *Vector Length*

Refer to Section 5.1.6 "Setting Vectors (Vector Time)".

5.1.4 Cursor Modes (Cursor)

5.1.4.1 Types and Functions of Cursor Modes

The types of cursor modes are listed in the table below. To use the function of a cursor mode, move the cursor onto the PPI object and left-click.

Mode	Function
ACQ TT	Enables the target tracking function to acquire a target in manual mode.
ACT AIS	Activates AIS targets, and sets a point filter.
TGT Data	Displays the numeric data of a tracking target or AIS target.
CNCL TT	Cancels a tracking target.
DEACT AIS	Deactivates AIS target.
Data CNCL	Hides the displayed numeric data of a tracked target or AIS target.
Mark	Puts a temporary mark.
Property	Displays the information of tracked targets, AIS targets, and marks.
AUTO	Changes operation in accordance with the object at the cursor position.

5.1.4.2 Change of Cursor Mode

Procedures

1) **Left-click the Cursor button located at the upper right of the display. Alternatively, on the PPI, right-click and select a desired cursor mode from the list.**

The selected cursor mode will be shown at the cursor mode (Upper right of the display on page 2-4).

If the function of a selected cursor mode is not used for one minute or more, the cursor mode is automatically changed to AUTO .

5.1.4.3 Operation of AUTO Mode

As shown below, the AUTO mode performs operation in accordance with the object at the cursor position when left-clicked.

The AUTO mode permits to access that you want by intuitive operation.

Object at Cursor Position	Operation
None	Acquires a target.
EBL	EBL operation.
VRM	VRM operation.
Intersection point of EBL and VRM	Performs EBL operation and VRM operation at the same time.
Parallel index line	Operates the parallel index line.
Tracked target	Displays the numeric data of the tracked target.
Tracked target with numeric data displayed	Hides the numeric data.
Sleeping AIS target	Activates the AIS target.
Activated AIS target	Displays the AIS target information.
AIS target with numeric data displayed	Hides the AIS target information.
Automatic acquisition / activation zone	Operates the automatic acquisition / activation zone.
AIS filter	Operates the AIS filter zone.

5.1.5 Setting Collision Decision Criteria

Attention

- **Set the optimum values of collision decision conditions, depending upon vessel type, water area, weather and oceanographic conditions. (For the relations between those conditions and alarms, refer to Section 5.5 "ALARM DISPLAY".)**

5.1.5.1 Input of CPA Limit

Procedures

1) **Left-click the CPA limit setting button in the Target Information located at the upper right of the display.**

The CPA Limit value input screen will appear.

2) **Enter the value to be set as a CPA limit.**

For inputs to the value input screen, refer to Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

5.1.5.2 Input of TCPA Limit

Procedures

1) **Left-click the TCPA limit setting button in the Target Information located at the upper right of the display.**

The TCPA Limit value input screen will appear.

2) **Enter the value to be set as a TCPA limit.**

For inputs to the value input screen, refer to Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

5.1.5.3 Setting CPA Ring (CPA Ring)

While the distance of the specified CPA Limit value is used as the radius, the CPA ring is displayed with a red circle.

Procedures

1) **Left-click the CPA Ring button located at the lower right of the display.**

The CPA ring will be displayed.

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

5.1.6 Setting Vectors (Vector Time)

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

A true vector mode or relative vector mode can be selected.

5.1.6.1 Setting vector time on the display (Vector)

Procedures

1) **Left-click the target vector time setting button in the Target Information located at the lower right of the display.**

The Vector Time value input screen will appear.

2) **Enter the value to be set as vector time.**

For inputs to the value input screen, refer to Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

5.1.6.2 Setting vector mode [T/R VECT]

Procedures

1) **Press the [T/R VECT] key.**

The current vector mode T (true vector) or R (relative vector) will be displayed in the target vector display true / relative switching in Target Information located at the upper right of the display.

5.1.7 Setting the GPS antenna location

Set the GPS antenna location. Set offset ranges in longitudinal direction and latitudinal direction from the own ship's reference position.

For the setting procedure, refer to Section 7.1.9 "Setting of CCRP (CCRP Setting)".

Attention

- **If offset ranges are not set correctly, AIS symbols and radar echoes may be displayed shifted.**
- **When offset ranges are set, latitude and longitude data received from the GPS is offset, and the offset data is displayed as the latitude and longitude of own ship's position.**

5.2 TARGET TRACKING OPERATION

This section explains how to use the target tracking function.

The target tracking function automatically tracks a target, and displays the target's course and speed as vectors. The target tracking function calculates CPA and TCPA, and issues an alarm as needed.

The tracking data is erased from memory when the power is turned off or during transmission standby.

5.2.1 Acquiring Target [ACQ]

Target acquisition can be performed on two modes, Automatic and Manual, and both modes can be used at the same time.

5.2.1.1 Automatic acquisition

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

The position of the scanner shall be at the centre of the azimuth or range in the acquisition/activation zone.

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

Procedures

1) **Open the AZ menu by following menu operations.**

AZ

The AZ Menu will appear.

2) **Left-click the item button of** 1. AZ1 **or** 2. AZ2 **.**

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

On :The acquisition / activation zone is turned on. The mark $\bigcirc_{12}$ and target ID number are put to an acquired target and move with the target. The vectors are displayed within 1 minute. AIS targets are activated.

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

[2] Creating the automatic acquisition and AIS activation Zone (Make AZ)

Procedures

1) **Open the AZ menu by following menu operations.**

AZ

The AZ Menu will appear.

2) **Left-click the item button of** 3. Make AZ1 **or** 4. Make AZ2 **.**

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

3) **Set the starting azimuth and range by turning the [EBL] dial and [VRM] dial, and left-click.**

4) **Set the ending azimuth and range by turning the [EBL] dial and [VRM] dial, and left-click.**

The acquisition / activation zone will be determined.

5.2.1.2 Manual Acquisition [ACQ MANUAL]

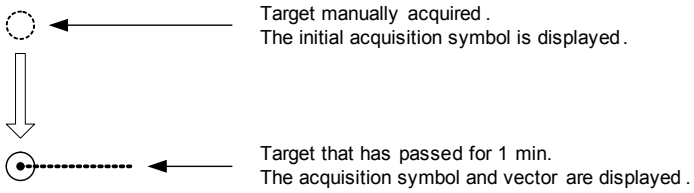
NOTE: If more targets are acquired manually in the condition that the maximum number of targets are under tracking, the targets cannot acquired.

Procedures

1) **Move the cursor onto the target to be acquired, and press the [ACQ MANUAL] key.**

The target will be acquired and the initial acquisition symbol will be displayed.

The vector will be displayed within one minute.



To perform operation only in the manual acquisition mode without automatic acquisition/ activation, turn off the automatic acquisition/activation function.

[1] Use of Automatic and Manual Acquisition Modes

Use the manual acquisition mode while the automatic acquisition mode is on.

Manually acquire the target to which particular attention should be paid, and get the other targets automatically acquired. If a new target appears exceeding the maximum number of targets, the manually acquired target is displayed even in the background until it gets out of the display. However, automatically acquired targets are canceled starting far distance from own ship.

5.2.2 Canceling Unwanted Tracked Targets [ACQ CANCEL]

Unwanted tracked targets can be canceled one by one in the following cases:

- Tracking is no longer necessary for targets with which vectors/symbols are displayed after being acquired and tracked.
- The number of vectors on the radar display needs to be reduced for easy observation.

When targets are to be re-acquired from the beginning, all the current vectors can also be canceled.

5.2.2.1 Canceling targets one by one [ACQ CANCEL]

Procedures

1) **Put the cursor on the tracked target to the desired for canceling target, and press the [ACQ CANCEL] key.**

The vectors and symbols of the tracked targets will disappear, and only the radar video remain.

5.2.2.2 Canceling all targets collectively [ACQ CANCEL]

Procedures

1) **Press the [ACQ CANCEL] key for 5 seconds.**

The vectors and symbols of all the targets will disappear, and only the radar videos remain.

NOTE: When all the targets have been canceled, the system stops tracking them. Thus, you need to re-acquire targets in manual or automatic acquisition mode. Do not cancel all the targets unless otherwise required.

5.2.3 Tracked Target Data Display [TGT DATA]

Attention

When a target or own ship changes its course, or when a new target is acquired, its vector may not reach a given level of accuracy until 3 minutes or more has passed after such course change or target acquisition.

Even if 3 minutes or more has passed, the vector may include an error depending upon the tracking conditions.

5.2.3.1 Type of Data Display (Target Information)

Target Data	
Target identification (TT ID)	ID number of the target
True bearing(BRG)	0.1° unit
Range	0.01NM unit
Cource	0.1° unit
Speed	0.1knot unit
Closest point of approach (CPA)	0.01NM unit
Time to CPA (TCPA)	0.1min unit
Bow crossing range (BCR)	0.01NM unit
Bow crossing time (BCT)	0.1min unit

The target for which its numeric data is displayed is marked with a symbol  to distinguish from other targets.

If a target's data is displayed, but without the symbol  , such a target exists outside the currently displayed radar display.

5.2.3.2 Method of Displaying Numeric Data [TGT DATA]

Procedures

1) **Put the cursor on the tracked target for which numeric data is to be displayed, and press the [TGT DATA] key.**

Then, the data of the designated target will appear, it will be marked with a symbol  . The target data will remain on the radar display until the target is lost and its vector disappears, or until another target is designated.

If a target with the mark  is designated, only its true bearing and range will appear until its vector appears.

5.2.3.3 Cancellation of Numeric Data Display (CNCL Data)

Procedures

1) **Put the cursor on the tracked target with which numeric data is displayed, and right-click.**

The cursor mode list will appear.

2) **Left-click** 6. CNCL Data **button.**

The numeric value will disappear.

5.2.4 Displaying Target ID No.(Target Number Display)

A target ID number is a value displayed beside the acquisition symbol when a target is acquired.

A target ID number 1 to 100 is assigned to each target in acquisition order. Once a target ID number is assigned, it identifies the target until the target is lost or the target acquisition is canceled.

Procedures

1) **Open the TT Menu by following menu operation.**

TT

2) **Left-click the item button of** 4. Target Number Display

Target Number Display will appear.

3) **Press the [numeric] key corresponding to the display method to be set.**

On : Displays target ID numbers.

Off : Hides target ID numbers.

Target Track : Displays target ID number with target track.

If there are many tracking targets and their symbol display is confusing, set Target Number Display to off to view the radar display easily.

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

5.2.5 Adding Tracked Target ID Name (Name)

The system can enter a name for each of tracking targets that have been acquired.

Procedures

1) **Put the cursor on the tracked target, and right-click.**

The cursor mode list will appear.

2) **Left-click** 8. Property

The Property will appear.

3) **Left-click the item button of** 1. Name **.**

The setting items for ship name (Name) will be displayed.

4) **Select the input method.**

Data Base :Selection of one of previously input ship names.When this method is selected, a list of ship names that have been input by selecting Input will be displayed.

Input :Input of a new ship name. When this method is selected, the ship name (Name) input window will open.

5.2.5.1 Entering a new ship name (Input)

5) **Input a new ship name.**

Up to 8 characters can be input as a ship name.For the input method on the character input screen, see Section 3.3.4.7 "Entering a character".

The input name by selecting Input is saved in Data Base .

5.2.5.2 Selecting one of previously input ship names (Data Base)

5) **Press the [numeric] key corresponding to the ship name to be selected.**

The selected ship name will be entered.

Data Base can contain 30 ship names.

5.2.6 Reference Target (Reference)

The system can display the own ship's speed. To do so, it sets a reference target by tracking a target for which ground fixed.

Attention

- **The reference target function is to be used if the own ship's speed cannot be displayed normally due to trouble such as a speed sensor malfunction. Do not use the reference target function except in emergencies.**
- **If the speed or course of the own ship is changed or a new reference target is set, the displayed speed may take 3 minutes or more to reach the specified speed after the speed / course change or the setting.**
- **Even after 3 minutes or more has passed, the speed may differ from the specified speed depending on the tracking condition.**
- **If a large radar echo such as a land target is set as a reference target, the vectors of the speed and other tracking targets will not be displayed correctly and may cause an accident.**
- **If a sailing ship is set as a reference target, the vectors of the speed and other tracking targets will not be displayed correctly and may cause an accident.**
- **If the REF. is selected for the speed sensor, the AIS function cannot be turned on.**
- **If the reference target is lost or the target tracking function is stopped, the speed sensor is placed in manual mode MAN .**
- **The loss of a reference target may have a major impact on the accuracy of the results for true speed and true course of the target and that own speed will be degraded.**
- **The reference targets are only used for the calculation of true speed.**

Procedures

1) **Tracking a target for which ground fixed.**

2) **Put the cursor on the tracked target, and right-click.**

The cursor mode list will appear.

3) **Left-click** 8. Property

The Property will appear.

4) **Left-click the item button of** 3. Reference

The reference target function will be set to on or off.

On :A reference target is set.

Off :The reference target is canceled.

5) **Left-click the speed sensor switching button in the Own Ship Information located at the upper right of the display, and select** REF. **.**

The speed of own ship calculated from the reference target will be displayed.

When a reference target is set, the symbol display is changed to ◯R .

Only one target can be set as a reference target.When a new reference target is set, the previously set reference target is canceled.

5.2.7 Operation Test (TT Test Menu)

CAUTION

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

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

Do not use the mode during navigation. Otherwise, an accident may result.

The following functions are available for testing the target tracking function:

Test Video	Makes an operation check on the target detection circuit.
TT Simulator	Generates pseudo targets on the radar display in order to test if the target tracking function is operating normally.
Status	Displays the status of the target tracking function.
Gate Display	Displays the gate size for acquiring / tracking a target.

5.2.7.1 Test Video (Test Video)

Test Video is used to check whether the video signals under target acquisition and tracking are inputted to and processed in the target detection circuit normally.

However, it is sufficient to check that VDH in Test Video is displayed.

NOTE: Test Video may not be displayed for a target which is not yet acquired or tracked. Test Video may not be displayed either if the [GAIN] dial or [SEA] dial is not properly adjusted.

Procedures

1) **Open the TT test menu by following menu operation.**

TT

→ 9. TT Test Menu

2) **Left-click the item button of** 1. Test Video **.**

The setting items for Test Video will be displayed.

3) **Select the test video to be displayed.**

In general, VDH is sufficient for target display checks in test video mode.

If any target displayed clearly in the radar display is not displayed in the Test Video mode, the target detection circuit of the Target Tracking unit may have a trouble.

Cancel

1) **Left-click the item button of** 1. Test Video **while the TT Test Menu is displayed.**

The setting items for Test Video will be displayed.

2) **Left-click** Off **button.**

The test video display will be turned off.

5.2.7.2 Target Tracking Simulator (Target Tracking Simulator)

Pseudo targets can be generated in certain known positions to check whether the target tracking units are operating normally. Since the pseudo targets move depending on known parameters, the values for these pseudo targets can be compared with the known value if the pseudo targets are acquired and tracked, and displayed. Thus, it can be checked if the system is operating normally.

Procedures

1) **Press the [TX/STBY] key to stop the transmitting.**

The equipment will enter the transmission standby state.

2) **Open the TT Test Menu by performing the following menu operation.**

TT

→ 9. TT Test Menu

3) **Left-click the item button of** 2. TT Simulator **.**

The setting items for TT Simulator will be displayed.

4) **Select the scenario to be set.**

The TT Simulator display will be turned on.

5) **Press the [TX/STBY] key to transmit.**

When the TT simulator is active, the character " X " will display at the bottom of the radar display.

Target tracking simulator / scenario

Scenario	Target start point		Target end point		Pseudo-target speed
	Distance	Bearing	Distance	Bearing	
1	3.2NM	20°	1NM	90°	20kn
2	6NM	0°	0NM	0°	10kn
3	6NM	18° every	1NM	18° every	10kn
4	6NM	45°	1NM	45°	105kn
5	6NM	45°	6NM	150°	20kn
6	6NM	45°	6NM	150°	20kn

When the simulator is operating, set 0° as the heading bearing, and 0 kn as the speed of own ship.When the range between own ship and the pseudo target is 0, the target will disappear.

Exit

1) **Press the [TX/STBY] key to stop the transmitting.**

The equipment will enter the transmission standby state.

2) **Left-click the item button of** 2. TT Simulator **while the TT Test Menu is displayed.**

The setting items for TT Simulator will be displayed.

3) **Left-click** Off **.**

The TT Simulator display will be turned off.

5.2.7.3 Status display (Status)

The current Target Tracking status will appear.

Procedures

1) **Open the TT Test Menu by performing the following menu operation.**

TT

→ 9. TT Test Menu

2) **Left-click the item button of** 3. Status **.**

The setting items for Status will be displayed.

*Constant	: Vector response
*VID Level TD	: Threshold value used for automatic acquisition
*VID Level HIGH	: Threshold value used for tracking
*VID Level LOW	: Unused
*Gate Size	: Size of gate used for tracking
*Tracking	: Number of targets currently acquired

5.2.7.4 Gate Display

The gate displays an area monitoring a target using the Target Tracking function. This radar equipment allows the gate size to change automatically according to target range and size. User can check the gate size using the following function.

Procedures

1) **Open the TT Test Menu by performing the following menu operation.**

TT

→ 9. TT Test Menu

2) **Left-click the item button of** 4. Gate Display **.**

The gate display mode is switched.

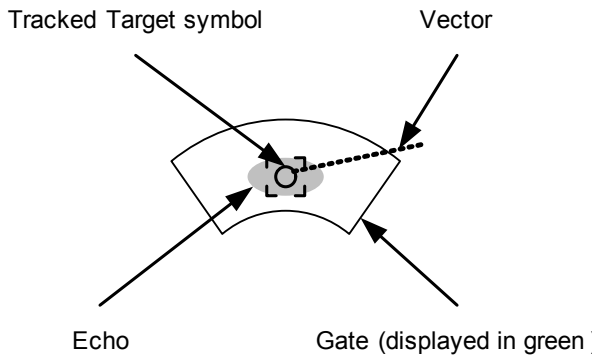
On : Gate is displayed

Off : Gate is not displayed

3) **Display the numeric value of a target according to Section 5.2.3 "Tracked Target Data Display [TGT DATA]" .**

The numeric value of the target will be displayed, and the tracked target symbol will be enclosed in a green gate.

> The Target Tracking can display the gate of two targets simultaneously.



5.3 AIS OPERATION

5.3.1 Restrictions

The following restrictions are placed on use of the AIS function.

The AIS function is unavailable in the following cases:

- MAN or REF. is selected for the speed sensor.
- The current offset (Set/Drift Setting) is set while LOG or 2AXW is selected for the speed sensor.
- The GPS geodetic system is used except WGS-84.

LOG or 2AXW cannot be selected for the speed sensor in the following case:

- The AIS function is turned on and the current offset (Set/Drift Setting) is selected.

MAN cannot be selected for the speed sensor in the following case:

- The AIS function is On.

Current offset (Set/Drift Setting) cannot be turned On in the following case:

- LOG or 2AXW is selected for the speed sensor while the AIS function is on.

5.3.2 Setting AIS Display Function (AIS Function)

Attention

- **When the AIS function is set to Off, the AIS display function is turned off and AIS symbols are no longer displayed.**
- **Once the AIS display function is set to Off, it is not automatically switched to On even if a dangerous target exists.**

Procedures

1) **Press the [AIS/TT] key. Alternatively, left-click the AIS button in the Target Information located at the upper right of the display.**

The received AIS information will be shown on the radar display.

5.3.3 Activate AIS Targets (Activate AIS)

Activate an AIS target, and display the target's vector and make a collision decision.

5.3.3.1 Manual activation (ACT AIS)

Activate an AIS target in manual mode to display the vector and heading line.

Procedures

1) **Put the cursor on the AIS symbol to be activated, and right-click.**

The setting items for cursor modes will be displayed.

2) Left-click 2. ACT AIS .

The selected AIS target will be activated.

5.3.3.2 Automatic activation

Activate an AIS target in automatic mode to display the vector and heading line.

When the automatic activation function is used, AIS targets are automatically activated when they go into the automatic activation zone. The automatic activation zone is identical to the automatic acquisition zone (AZ) used for target tracking. For the zone setting, refer to Section 5.2.1 "Acquiring Target [ACQ]"

The position of the scanner shall be at the centre of the azimuth or range in the acquisition/ activation zone.

If there are more AIS targets than the allowable maximum, they are deactivated in the low-priority (See the Section 5.1.2 "Definitions of Symbols").

If an AIS target is activated but the vector is not displayed, refer to Section 5.3.6 "Displaying Target ID No. (Target Number Display)".

5.3.4 Deactivate AIS Targets (Deactivate AIS)

Deactivate an AIS target and clear the display of the vector and heading line.

Procedures

1) **Put the cursor on the AIS target to be deactivated, and right-click.**

The setting items for cursor modes will be displayed.

2) Left-click 5. DEACT AIS

The selected AIS target will be deactivated.

This operation is available only for an activated AIS target.

5.3.5 Displaying AIS Information [TGT DATA]

5.3.5.1 Types of information displayed

There are two modes (simple and detail) to display AIS target information. The display items are determined by the selected mode.

Display Item[i]	Detail mode	Simple mode
NAME (ship name)	Up to 20 characters	
Call Sign	Up to 7 characters	
MMSI	Up to 9 characters	
COG (course over ground) or CTW (course through water)	0.1° unit	
SOG (speed over ground) or STW (speed through water)	0.1kn unit	
CPA (closest point of approach)[ii]	0.01NM unit	
TCPA (time to CPA)	0.1min unit	
BRG (true bearing)	0.1° unit	Not displayed
Range	0.01NM unit	
HDG (heading bearing)	0.1° unit	
ROT (rate of turn)[iii]	0.01° /min	
POSN (latitude / longitude)	0.0001' unit	
Destination (waypoint)	Up to 20 characters	
NAV Status	Status (number)	

i. The detail mode displays the numeric data of only a single ship, the simple mode can display the numeric data of up to two ships.

ii. If the numeric information of SOG or STW is 102.2kn, the target ship's speed is 102.2kn or over. Then the system cannot calculate CPA and TCPA. Therefore, missing is indicated in the CPA and TCPA information.

iii. If the numeric information of ROT is blank, the radar is receiving the AIS data which is cannot displayed. In this case, you can only trust the turning direction which is indicated by the turn indicator. The turn indicator is displayed on the AIS symbol as the line perpendicular to the heading direction. (See the Section 5.1.2.2 "Types and Definitions of AIS Target Symbols")

The detail mode displays the numeric data of only a single ship, the simple mode can display the numeric data of up to two ships.

For NAV Status, one of the following statuses is displayed in accordance with Navigation Status:

No.	Status
0	Under Way Using Engine
1	at Anchor
2	Not Under Command
3	Restricted Manoeuvrability
4	Constrained by Her Draft
5	Moored
6	Aground
7	Engaged in Fishing
8	Under Way Sailing

9	Reserved
10	Reserved
11-14	Reserved
15	Not Defined

5.3.5.2 Displaying AIS Target Information [TGT DATA]

Procedures

1) **Put the cursor on the AIS target of which information is to be displayed , and press the [TGT DATA] key.**

The information of the selected AIS target will be displayed.

When the numeric data of a target is displayed but the mark  is not on the radar display, the target is outside the display.

5.3.5.3 Canceling AIS Target Information Display (CNCL Data)

Procedures

1) **Put the cursor on the activated AIS target of which information display is to be cancelled, and right-click.**

The setting items for cursor modes will be displayed.

2) **Left-click** 6. CNCL Data **.**

The information display of the selected AIS target will be cleared.

5.3.5.4 Selecting Detail / Simple Mode for AIS Target Information Display

Procedures

1) **Left-click the □ or _ button in the Digital Information located at the center right of the display.**

The detail or simple mode display for AIS target information will be selected.

5.3.5.5 Message

Received AIS messages can be displayed.

Up to 10 messages of addressed message and up to 10 messages of broadcast message can be displayed.

If the number of messages exceeds 10, the oldest received messages are sequentially deleted.

[1] Displaying Message Selected from List (Message)

Procedures

1) **Open the Message menu by performing the following menu operation.**

AIS

→ 9. TT Test Menu

2) **Left-click** Addressed Message **or** Broadcast Message **.**

Addressed messages list or broadcast messages list are displayed.

Each list shows ship names and message-received time.

For an unread message, [*] is displayed to the left of the item number.

3) **Left-click the item button to display the message.**

The message will appear.

[2] Displaying Specified Target's Message

Procedures

1) **Display AIS target information.**

If there are messages from the target, a message mark will be displayed in the Digital Information located at the center right of the display.

2) **Left-click the unread message display button in the Digital Information located at the center right of the display.**

The message will appear.

[3] Deleting Message (Delete)

Procedures

1) **Left-click** 1. Delete **while the message is displayed.**

The Confirmation Window will appear.

2) **Left-click** 1. Yes **to delete the message.**

The message will be deleted, and the ship name and message-received time will disappear from the list.

5.3.5.6 Displaying Data of Lost AIS Target (Display Lost TGT Data)

The data of the last-lost AIS target can be displayed.

The data of only one target that has been lost most recently can be displayed.

Procedures

1) **Open the Display Lost Target Data menu by performing the following menu operation.**

AIS

→ 8. Display Lost Target Data

The data of the last-lost AIS target will be displayed.

5.3.5.7 Displaying Own Ship's AIS Data (Own Ship's AIS Data)

The AIS data of own ship can be displayed.

Procedures

1) **Open the Own Ship's AIS Data menu by performing the following menu operation.**

AIS

→ 9. Own Ship's AIS Data

The own ship's AIS data will be displayed.

5.3.6 Displaying Target ID No. (Target Number Display)

When an AIS target is activated, a target ID number is displayed next to the AIS target symbol.

A target ID number 1 to 100 is assigned to each target in activation order. Once a target ID number is assigned, it identifies the target until the target is lost or deactivated.

Procedures

1) **Open the Target Number Display menu by performing the following menu operation.**

AIS

→ 4. AIS Filter Setting

2) **Left-click the item button corresponding to the display method to be set.**

On : Displays target ID numbers.

Off : Hides target ID numbers.

Target Track : Displays target ID number with AIS track.

Ship's Name : Displays the ship's name.

If there are many tracking targets and their symbol display is confusing, set Target Number Display to off to view the radar display easily.

> An ID number or ship's name is always displayed for only targets with which numeric value is displayed.

5.3.7 Setting AIS Filter (AIS Filter Setting)

5.3.7.1 About an AIS filter

By setting an AIS filter, an AIS target in the area can be displayed by priority or only the targets in the area can be displayed. An AIS filter is initially set in a circle having a radius of 20 [nm] from the CCRP. If 301 or more AIS targets exist in the filter range, they are displayed in the priority order explained in Section 5.1.2 "Definitions of Symbols".

5.3.7.2 Types of AIS Filters (Filter Type)

There are the following 3 types of AIS filters:

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

Sector : A filter is set in a sector formed by two bearings with the bow as reference.

Zone : A filter is set in a zone formed by two bearings and two ranges with the bow as reference.

Procedures

1) **Left-click the AIS filter mode switching in Target Information located at the upper right of the display, and select the filter to be set.**

The AIS filter will be selected.

5.3.7.3 Creation of AIS Filter (Make AIS Filter)

Procedures

1) **Open the AIS Filter Setting menu by performing the following menu operation.**

AIS

→ 4. AIS Filter Setting

2) Left-click 2. Make AIS Filter .

The mode to make an AIS filter will be activated.

[1] Setting Range Filter

3) **Set a filter range by turning the [VRM] dial, and left-click.**

[2] Setting Sector Filter

3) **Set a starting bearing by turning the [EBL] dial, and left-click.**

4) **Set an ending bearing by turning the [EBL] dial, and left-click.**

[3] Setting Zone Filter

3) **Set a starting bearing and range by turning the [EBL] dial and [VRM] dial, and left-click.**

4) **Set an ending bearing and range by turning the [EBL] dial and [VRM] dial, and left-click.**

> When the automatic activation function is enabled, the filter range is automatically changed for covering the automatic activation zone. Thus, the automatic activation zone is always within the filter range.

5.3.7.4 AIS Filter Display On/Off (Filter Display)

Procedures

1) **Open the AIS Filter Setting menu by performing the following menu operation.**

AIS

→ 4. AIS Filter Setting

2) **Left-click the item button of** 3. Filter Display **.**

Filter Display will be set to on or off.

5.3.7.5 Display of Targets outside AIS Filter (Filter Mode)

Procedures

1) **Open the Filter Mode menu by performing the following menu operation.**

AIS

→ 4. AIS Filter Setting

2) Left-click the item button of 6. Filter Mode .

Display : Displays only AIS targets in the AIS filter.

Priority : Displays AIS targets in the AIS filter by priority, and also displays targets outside the AIS filter.

> Activated AIS targets can be displayed even when they are outside the AIS filter.

5.3.7.6 Point Filter

AIS targets which are not displayed because they are outside the AIS filter or at low priority levels can be activated by giving a higher priority to them.

Procedures

1) **Put the cursor on the position where a point filter is to be set, and right-click to select the filter to be set.**

2) The setting items for cursor modes will be displayed.Left-click 2. ACT AIS .

A point filter will be set at the cursor position.

If an AIS target is in the point filter, it will be activated.

When an AIS target is activated or an AIS target is not found within one minute, the point filter will be cleared.

> The point filter's range is 1 nm, and cannot be changed.

5.3.8 Conditions for Deciding AIS Target to be Lost

About a lost target

When the data of an AIS target cannot be received for a specified time, the target is decided to be lost and the target data is deleted. As shown in the table below, the time until target data is deleted varies depending on the class of receive data and the target status.

Deciding AIS Target to be Lost

Target status	Time until data deletion	
	SOLAS ship (Class A)	SOLAS ship (Class B)
Vessel below 3 knots (Class A) or 2 knots (Class B) and it is now at anchor or on the berth	18 min	18 min
Vessel of 3 knots or more and it is now at anchor or on the berth	60 sec	18 min
Vessel of 0 to 14 knots (Class B: 0 to 14 knots)	60 sec	180 sec
Vessel of 14 to 23 knots	36 sec	180 sec
Vessel of 23 knots or more	30 sec	180 sec
SAR (Search and Rescue)	60 sec	60 sec
ATON (Aid to Navigation)	18 min	18 min
Base Station	60 sec	60 sec

> When a dangerous target ship is lost, a lost alarm is issued and the symbol changes to a lost symbol. The lost symbol will display continuously on the last-received position.

If the [ALARM ACK] key is pressed, the symbol is cleared.

5.3.9 Setting Conditions for AIS Alarm (AIS Alarm Setting)

Conditions for issuing a Lost alarm and CPA/TCPA alarm for AIS targets can be set.

5.3.9.1 Setting of Condition for Lost Alarm

Procedures

1) **Open the AIS Alarm Setting menu by performing the following menu operation.**

AIS

→ 6. AIS Alarm Setting

2) **Left-click the item button of** 1. Lost Alarm **.**

The setting items for Lost Alarm will be displayed.

3) **Left-click the item button corresponding to the condition to be set.**

Off : A lost alarm is not issued.[i]

Danger : A lost alarm is issued only for AIS targets for which a dangerous target alarm has been issued.

ACT&Danger : A lost alarm is issued only for activated AIS targets and AIS targets for which a dangerous target alarm has been issued.

ACT&Danger&Select : A lost alarm is issued only for activated AIS targets, data indicated AIS targets and AIS targets for which a dangerous target alarm has been issued.

i. A lost alarm is not issued for sleeping AIS targets.

5.3.9.2 Setting of Condition for CPA/TCPA Alarm

Procedures

1) **Open the AIS Alarm Setting menu by performing the following menu operation.**

AIS

→ 6. AIS Alarm Setting

2) **Left-click the item button of** CPA/TCPA Alarm **.**

The setting items for CPA/TCPA Alarm is switched.

Off : A CPA/TCPA alarm is not issued.[i]

ACT : A CPA/TCPA alarm is issued only for activated AIS targets.

ACT&Sleep : A CPA/TCPA alarm is issued for all AIS targets on the radar display.

i. When the Lost Alarm menu set to Off, the CPA ring color changes to dark color.

5.4 DECISION OF TARGETS AS IDENTICAL (Association)

5.4.1 Setting of Function to Decide Targets as Identical (Association)

When an AIS target and a tracking target are decided to be identical, an association symbol is displayed for the targets regarded as identical. In this case, the AIS target symbol is automatically activated.

Attention

- **Turn off** Association **in order not to make a decision on if targets are identical, or in order to display symbols that have disappeared.**

Procedures

1) **Left-click the** Association **in Target Information located at the upper right of the display.**

Association will be set to on or off.

5.4.2 Setting of Conditions for Deciding AIS and Tracked Targets as Identical (Association Setting)

Procedures

1) **Open the Association Setting menu by performing the following menu operation.**

AIS

→ 1. Association Setting

The Association Setting menu will appear.

2) **Select and enter the item to be set.**

Conditions for deciding targets as identical will be set. When the differences of all item between AIS and tracked target are under the set conditions..

Once regard as identical, when one of the differences exceed 125% of the set condition, they are regarded as dissidence.

The setting for this function is common to Association Setting in the AIS Menu.

5.4.3 Types of Decision Conditions to be Set

Decision conditions	
1. Association	On / Off (Function to decide targets as identical)
2. Priority	AIS / TT (Symbol to be displayed)
3. Bearing	0.0～9.9°
4. Range	0～999m
5. Cource	0～99°
6. Speed	0～99kn
7.Applicable AIS Target	ACT or ACT&Sleep (activated AIS target or all AIS target)

CAUTION

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

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

5.5 ALARM DISPLAY

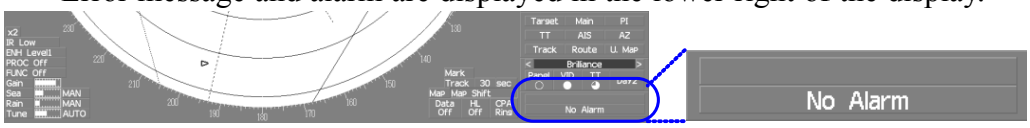
Critical alarm messages for Target Tracking (TT) and AIS functions:

Error message	Description
CPA/TCPA	There is a dangerous target. See also Section 5.5.1.

Alarm messages for Target Tracking (TT) and AIS functions:

Error message	Description
CPA/TCPA	There is a dangerous target.
New Target	A new target is acquired in the automatic acquisition zone.
Lost	There is a lost target.
REF Target	The accuracy of the reference target may be decreased.
95% Capacity	The number of targets being tracked by the Target Tracking function has reached 95% of the maximum.
MAX Target	The number of targets being tracked by the Target Tracking function has reached the maximum.
AIS 95% Capacity	The number of displayed AIS target symbols has reached 95% of the maximum.
AIS MAX Target	The number of received data items exceeds the maximum number of AIS target symbols that can be displayed.
AIS ACT 95% Capacity	The number of activated AIS targets by the AIS function has reached 95% of the maximum.
AIS ACT MAX	The number of activated AIS targets by the AIS function has reached the maximum.
AIS Alarm ***	Alarm information issued with the ALR sentence by the AIS. *** is a 3-digit number which is Local Alarm No in the ALR sentence. See below.
AIS Alarm 001	Tx malfunction
AIS Alarm 002	Antenna VSWR exceeds limit
AIS Alarm 003	Rx channel 1 malfunction
AIS Alarm 004	Rx channel 2 malfunction
AIS Alarm 005	Rx channel 70 malfunction
AIS Alarm 006	general failure
AIS Alarm 008	MKD connection lost
AIS Alarm 025	external EPFS lost
AIS Alarm 026	no sensor position in use
AIS Alarm 029	no valid SOG information
AIS Alarm 030	no valid COG information
AIS Alarm 032	Heading lost/invalid
AIS Alarm 035	no valid ROT information

Error message and alarm are displayed in the lower right of the display.



See also Section 9.1.1 "List of Alarms and other Indications".

5.5.1 CPA / TCPA Alarm

CAUTION

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

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

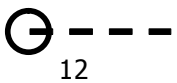
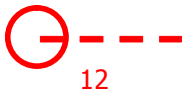
In the system, targets are categorized into two types: tracked / activate AIS targets and dangerous targets.

The grade of danger can easily be recognized on the display at a glance. So the officer can easily decide which target he should pay attention to.

It is not possible to switch off the tracked target visual alarm, unless tracking is ceased, or the alarm condition no longer applies.

The types of target and alarm are shown below.

CPA / TCPA Alarm

Status	Symbol on display	Alarm characters	Alarm sound	Conditions
Tracked target		(Off)	(Off)	・CPA>CPA LIMIT ・0>TCPA ・TCPA>TCPA LIMIT The symbol is displayed when one of the above conditions is met.
Activated AIS target				
Dangerous target	 Red blinking	CPA/TCPA	Beep sound (pee-poh) Alarm acknowledgeable	・CPA ≦ CPA LIMIT ・0 ≦ TCPA ≦ TCPA LIMIT An alarm is issued when all the conditions are met. The AIS targets that issues alarm refer to Section 5.3.9
	 Red blinking			

CPA Limit and TCPA Limit: The Setting Values

5.5.2 Alarm for New Target Acquired in Automatic Acquisition Zone (New Target)

CAUTION

In setting an automatic acquisition zone, it is necessary to adjust the gain, sea clutter suppression and rain / snow clutter suppression to ensure that target echoes are displayed in the optimum conditions. No automatic acquisition zone alarms will be issued for targets undetected

The automatic acquisition function sets a zone in a range and issues an alarm when a new target (which is not yet acquired) goes into this zone.

For the setting of an automatic acquisition zone, refer to " Acquiring Target " in Section 5.2.1.1 "Automatic acquisition".

Alarm for New Target Acquired in Automatic Acquisition Zone

Status	Symbol on display	Alarm characters	Alarm sound	Conditions
New target in automatic acquisition zone	 12 Red Blinking	New Target	Beep sound (pipi-pipi) Alarm acknowledge able	The alarm is issued when a new target is acquired in the automatic acquisition zone.

When an already acquired target goes into automatic acquisition zone, the alarm message is not displayed and the buzzer does not sound either.

5.5.3 Lost Target Alarm (Lost)

Attention

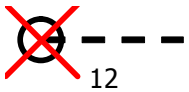
- **If the gain, sea clutter suppression, rain/snow clutter suppression are not adjusted adequately, the lost target alarm may be easily generated. So such adjustments should be mad carefully.**

When it is impossible to continue tracking any acquired and tracked target, or the data of AIS target cannot received for a specified time, the Lost Alarm will be generated. The typical causes for alarm generation are shown below, but not limited to the following:

- The target echo is very weak.
- The target is shadowed by a shore or a large ship and its echo is not received.
- The target echo is blurred by sea clutter returns.

If a target under tracking goes out of a range of 32 nm and can no longer be tracked, it is canceled without a lost target alarm.

Lost Target Alarm

Status	Symbol on display	Alarm characters	Alarm sound	Conditions
Lost Target	 Red Blinking	Lost	Beep sound (pee) Alarm acknowledgeable	The alarm will sound once when a lost target symbol is displayed.
	 Red Blinking			

5.5.4 Gyro Set Alarm

The GYRO I/F in this system receives signals from a gyro. Even if the power is turned off, the system will follow up the gyro. However, the system stops the follow-up operation when the power of the master gyro is turned off or when any trouble occurs to the line. When the power of the master gyro is recovered, the Set Gyro alarm will be generated.

If this alarm occurs, set the gyro.

Gyro Set Alarm

Alarm characters	Alarm sound	Conditions
Set Gyro	Beep sound (pipi-pipi)	The signals from the gyro are stopped, but the gyro is recovered.

5.6 TRACK FUNCTION

5.6.1 Past Position (Past POSN)

Procedures

1) **Left-click the past position display interval unit switching button in the Target Information located at the upper right of the display, and set a desired unit.**

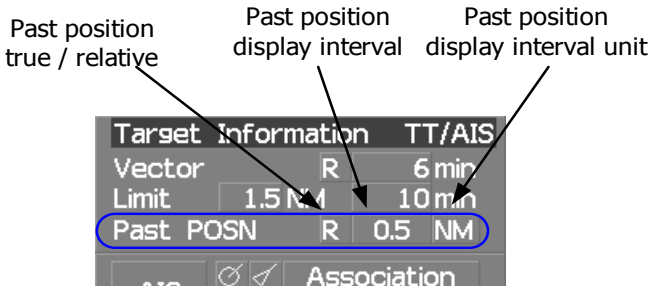
The past position display interval unit will be set to min or NM .

2) **Left-click the past position display interval switching button in the Target Information located at the upper right of the display, and set a desired track display interval.**

The past position will be set.

Off : Tracks are not displayed.

Numeric : Tracks are displayed at intervals of a specified value.



The past position function can display up to ten past positions of a target under tracking. The past position display interval can be set to specified time intervals of 0.5, 1, 2, or 4 minutes, or specified range intervals of 0.1, 0.2, 0.5, or 1 nm.

The specified interval is displayed in the past position display interval switching in Target Information located at the upper right of the display. When Off is displayed, the track display function is turned off.

The track mode operates in conjunction with the vector mode, and a true or relative track is displayed. In relative vector mode, the relative tracks of the target are displayed. In true vector mode, true tracks that are calculated from the relative bearing, range, own ship's course, and speed are displayed.

The target is acquisition, past position of traced target is start plot. The AIS target is displayed, past position of AIS target is start plot.

If the past position plotted time is short, the indicated past position duration may not have achieved the specified time or range.

5.6.2 Target Ship's Tracks (Target Track)

This function makes settings for the tracks of tracked targets and AIS targets.

The system can display the tracks of up to 20 target ships.

The target track function is available between latitudes of 85° N and 85° S.

5.6.2.1 Track Color Setting (Target Track Color)

Procedures

1) **Put the cursor on the tracked target or activated AIS target, and right-click.**

The setting items for cursor modes will be displayed.

2) **Left-click** Property **.**

The Property will appear.

3) Left-click the item button of 2. Track Color .

The setting items for Track Color will be displayed.

4) **Left-click the button corresponding to the track color to be set.**

Colors set by performing the procedure in Section 5.6.2.3 "Setting of Target Ship's Track Colors (Target Track Color)" can be selected.

Individual colors can be set for up to 10 ships. The same color is set for 11 to 20 ships.

5.6.2.2 Target Ship's Track Function On/Off (Target Track Function)

Procedures

1) **Open the T.TRK menu by performing the following menu operation.**

TT

→ 2. Target Track Setting

2) Left-click the item button of 1. Target Track Function .

The Target Track Function will be set to on or off.

On : Target Track Function is turned on.

Off : Target Track Function is turned off.

Note that when this function is turned off, all the other ship's track functions are turned off. In this case, the track data of other ships is not saved, so they cannot be traced later.

5.6.2.3 Setting of Target Ship's Track Colors (Target Track Color)

You can set either one track color for all targets under tracking, or individual colors for the ships of track numbers 1 to 10. The tracks of ships 11 to 20 are displayed in the same color.

> If the other ship's track function (Target Track Function) is turned off, the track data of other ships is not saved.

Procedures

1) **Open the Target Track Color menu by performing the following menu operation.**

TT → 2. Target Track Setting → 2. Target Track Color → 1. All

The setting items for All will be displayed.

2) **Left-click the button corresponding to the track display to be set.**

Individual : Track color is set individually for ships.
color name : One color is set for all ships.

Individual setting

3) **Left-click the button corresponding to the track number to be set.**

The setting items for the selected track number will be displayed.

4) **Left-click the button corresponding to the track color to be set.**

The track color of the selected track number will be set.

When Individual is selected, the track numbers Target Track No.1 to No.10 and the individual setting for Other are valid. Select a color for each target.

The color list is displayed by left-clicking the button corresponding to the item number to be set. Select a desired color. There are 8 color choices: Off, White, Gray, Blue, Green, Yellow, Pink, and Red.

Target Track No.1 ～ No.10 : Setting for 1 to 10 ships
Other : Setting for 11 to 20 ships

> Note that the individual setting is not enabled unless Individual is selected.

5.6.2.4 Setting of Target Ship's Track Display (Target Track Display)

The target track display function can be turned on / off. Choices for track display are displaying / hiding the tracks of all ships and Individual (displaying the tracks of individual ships).

Procedures

1) **Open the Target Track Display menu by performing the following menu operation.**

TT

→ 2. Target Track Setting

→ 3. Target Track Display

→ 1. All

The setting items for All will be displayed.

2) **Left-click the button corresponding to the track display to be set.**

Individual : Track display is set for individual ships.

Off : The tracks of all ships are hidden.

On : The tracks of all ships are displayed.

> Even when Target Track Display is turned off, the track data of other ships is saved if Track Memory Interval is set.

Individual setting

3) **Left-click the button corresponding to the track number to be set.**

The selected track number display will be set to on or off.

On :The track number display is turned on.

Off :The track number display is turned off.

When Individual is selected, the track numbers Target Track No.1 to No.10 and the individual setting for Other are valid. Select on / off for each target.

Target Track No.1 ～ No.10 : Setting for 1 to 10 ships

Other : Setting for 11 to 20 ships

> Note that the individual setting is not enabled unless Individual is selected.

5.6.2.5 Setting of Target Ship's Track Saving Interval (Track Memory Interval)

An interval for saving target ship's track data can be set.

> This function is not available when the Target Track Function is turned off.

Procedures

1) **Open the Track Memory Interval menu by performing the following menu operation.**

TT

→ 2. Target Track Setting

→ 4. Track Memory Interval

2) **Left-click the button corresponding to the interval to be set.**

Select an interval from the following:

Off/

3sec/5sec/10sec/30sec/

1min/3min/5min/10min/30min/60min/

1NM/3NM/5NM/10NM

5.6.2.6 Clear of Target Ship's Track (Clear Track)

The target ship's track can be cleared by setting a color or a track number.

> If Card T.TRK Display is used, target ship's tracks displayed through the card cannot be cleared.

[1] Clear of Tracks by Setting Color (Clear Track Color)

Procedures

1) **Open the Clear Track Color menu by performing the following menu operation.**

TT

→ 2. Target Track Setting

→ 5. Clear Track Color

The setting items for Clear Track Color will be displayed.

2) **Left-click the button corresponding to the color of the target tracks to be cleared.**

The Confirmation Window will appear.

3) Left-click [1. Yes] to clear the track line.

All the tracks of the selected color will be cleared.

[2] Clear of Tracks by Setting Track Number (Clear Track Number)

Procedures

1) **Open the T.TRK menu by performing the following menu operation.**

[TT]
→ [2. Target Track Setting]
→ [6. Clear Track Number]

The setting items for Clear Track Number will be displayed.

2) **Left-click the button corresponding to the number of the tracks to be cleared.**

The Confirmation Window will appear.

3) **Left-click [1. Yes] to clear the track line.**

The tracks of the selected number will be cleared.

5.6.2.7 Operation of Target Ship's Track Data Saved on Card (File Operations)

Target ship's track data can be saved on a flash memory card and read from the card.

> Data can be saved to a flash memory card until the card becomes full, but the number of files that can be read and displayed is limited to 64 in alphanumeric order. When the number of files has reached 64, delete unnecessary files.

[1] Loading File (Load)

Procedures

1) **Insert a flash memory card into the card slot**

Flash memory card (option) is necessary.

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

TT

→ 2. Target Track Setting

→ 7. File Operations

3) Left-click the item button of 1. Select Card Slot to select a card slot.

The setting item for Select Card Slot is switched between Slot1 and Slot2.

4) **Left-click the item button of 2. Load Mode to select Add or Overwrite.**

The setting item for Load Mode is switched between Add and Overwrite.

When Add is selected, new data is added to the current data on the card. When Overwrite is selected, new data is saved over the current data on the card.

5) **Left-click 3. Load .**

Currently saved target ship's track data will be listed.

6) **Left-click the button corresponding to the file to be loaded.**

The Confirmation Window will appear.

7) **Left-click 1. Yes to load the file.**

The selected target track data will be loaded and shown on the radar display.

[2] Saving File (Save)

Procedures

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

Flash memory card (option) is necessary.

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

TT

→ 2. Target Track Setting

→ 7. File Operations

3) **Left-click the item button of** 1. Select Card Slot **to select a card slot.**

The setting item for Select Card Slot is switched between Slot1 and Slot2.

4) **Left-click** 4. Save **.**

The Input File Name menu will appear.

5) **Input the file name to be saved.**

Up to ten characters can be input as a file name.

For inputs to the characters input screen, refer to Section 3.3.4.7 "Entering a character". After the input, the Confirmation Window will appear.

6) **Left-click** 1. Yes **to save the file.**

The currently displayed target track data will be saved.

[3] Erasing File (Erase)

Procedures

1) **Insert the flash memory card into the card slot.**

Flash memory card (option) is necessary.

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

TT

→ 2. Target Track Setting

→ 7. File Operations

3) **Left-click the item button of** 1. Select Card Slot **to select a card slot.**

The setting item for Select Card Slot is switched between Slot1 and Slot2.

4) **Left-click** 5. Erase **.**

The Erase menu will appear.

Currently saved target ship's track data on the card will be listed.

5) **Left-click the button corresponding to the file to be erased.**

The Confirmation Window will appear.

6) **Left-click** 1. Yes **to erase the file.**

The selected target track data will be erased and the file name will disappear from the list.

[4] Displaying File (Card Target Track Display)

Procedures

1) **Insert the flash memory card into the card slot.**

Flash memory card (option) is necessary.

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

TT → 2. Target Track Setting → 7. File Operations

3) **Left-click the item button of** 1. Select Card Slot **to select a card slot.**

The setting item for Select Card Slot is switched between Slot1 and Slot2.

4) **Left-click** 6. Card T.TRK Display **.**

The Card T.TRK Display menu will appear.

Currently saved target ship's track data on the card will be listed.

5) **Left-click the button corresponding to the file to be displayed.**

The Confirmation Window will appear.

6) **Left-click** 1. Yes **to display the T.TRK line.**

The selected file will be highlighted, and the currently saved target track data will be displayed.

Cancel

1) **Open the Card T.TRK Display window.**

The displayed file is highlighted.

2) **Left-click the button corresponding to the displayed file.**

The file will be deselected and returned to normal display.

5.7 TRIAL MANEUVERING

(Trial Maneuver)

Attention

- **Trial maneuvering is to simulate own ship's course and speed in the conditions that the course and speed of a target ship are unchanged as they are. As the situation is different from any actual ship maneuvering, set values with large margins to CPA Limit and TCPA Limit.**

The trial maneuvering is the function of simulating own ship's course and speed for collision avoidance when a dangerous target appears. When the own ship's course and speed are entered in manual mode, the trial maneuvering function checks if pre-acquired or pre-activated targets are dangerous.

The ranges of course and speed to be entered manually:

Course: 360° (in 0.1° intervals) ..... [EBL] dial

Speed: 0 to 100kn (in 0.1kn step) ..... [VRM] dial

5.7.1 Trial Maneuvering in the True Vector Mode

In the True Vector mode, calculations are performed according to the values set by Trial Speed, Trial Course and other features, and the result is displayed as a bold-line that represents the change of own ship's vector as shown in the Fig 5-7 below (an example of the course changed to the right).

In this Fig 5-7, the dangerous target forward left becomes safe as a result of simulation.

The tracked target information indicates the current CPA and TCPA values regardless of the result of simulation.

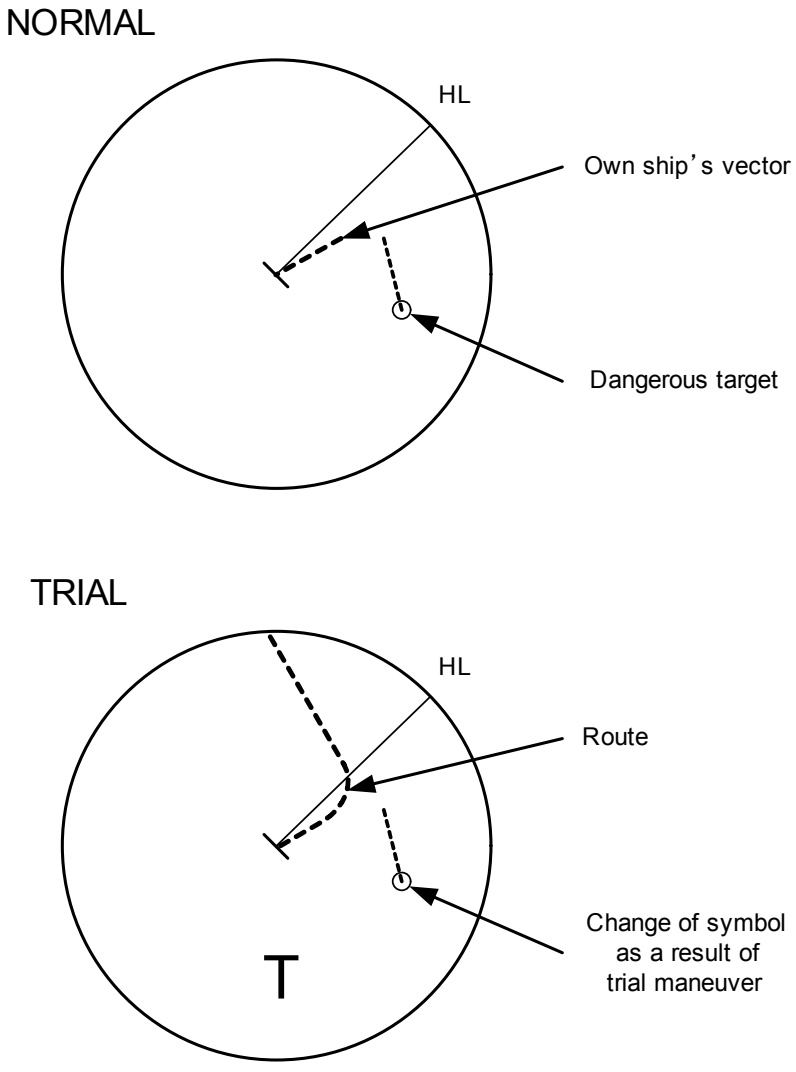


Fig 5-7: *True Vector Mode*

5.7.2 Trial Maneuvering in the Relative Vector Mode

The result of Trial maneuvering in the Relative Vector mode is shown by a change in target vector. In the Fig 5-8 below (in the same conditions as in the True Vector mode in the previous page), it is seen that the acquired target is a dangerous one because its vector is crossing the CPA RING.

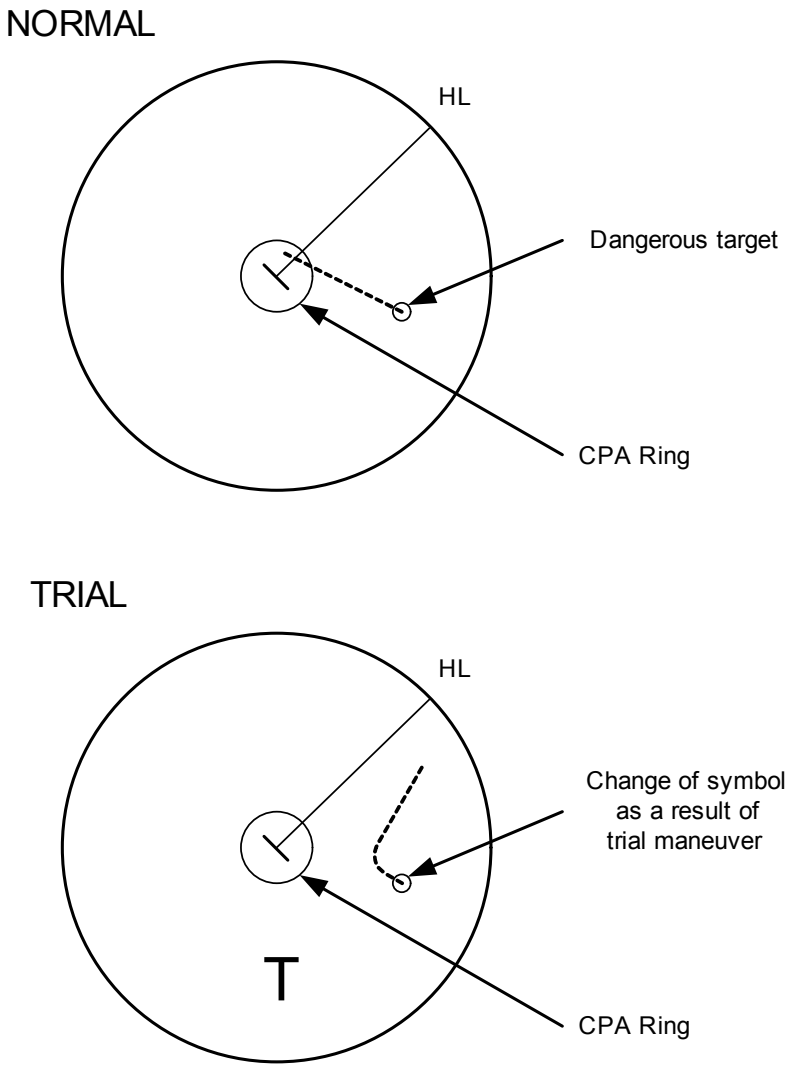


Fig 5-8: *Relative Vector Mode*

The above Fig 5-8 shows that the relative vector of the target has changed as shown in the figure as a result of simulation (course and speed), so that the symbol color is changed into "White", a safe target.

Irrespective of the simulation results, the current CPA and TCPA values are shown in the tracked target information just like when the true vector mode is active.

The course change of own ship is displayed as a dotted-line.

Better information is provided by using relative motion and sea stabilization.

5.7.3 Operation of Trial Maneuvering Function

Procedures

1) **Open the Trial Maneuver menu by performing the following menu operation.**

TT

→ 3. Trial Maneuver

2) **Left-click the item button of** 1. Trial Function **.**

The Trial Function will be set to on or off.

On : The trial maneuvering function is turned on.

Off : The trial maneuvering function is turned off.

When the Trial Function is active, the character " T " will display at the bottom of the radar display.

3) **Set values for Course by turning the [EBL] dial, and for Speed by turning the [VRM] dial.**

4) **Set other characteristics.**

Vector Time : Vector time (1 to 60 min)

Time to Maneuver : Time until trial maneuvering is started (0 to 30 min)

Own Ship Dynamic Trait : Dynamic trait of the own ship

→ Reach : Range from when steered to when the ship beings to turn (0 to 2000 m)

→ Turn Radius : Turning radius (0.10 to 2.00 nm)

→ Acceleration : Acceleration (0.0 to 100 knots/min)

→ Decceleration : Deceleration (0.0 to 100 knots/min)

For inputs to the value input screen, refer to Section 3.3.4.2 "Directly entering a numeric value".

Dangerous target symbols are displayed in red and safe target symbols in white.

Vector Time is valid only when Trial Function is set to on. If it is off, the vector time before trial maneuvering is displayed.

Time until the start of trial maneuvering is counted down immediately after the input. The acceleration and deceleration are influenced depending on the relationship between the current speed and the input speed for trial maneuvering.

If 0.0 kn/min is set for Acceleration when the speed for trial maneuvering is faster than the current speed, or for Deceleration when the speed for trial maneuvering is slower than the current speed, the system performs simulation on the assumption that the speed is changed immediately after the time set for Time to Maneuver .

Cancel

1) **Open the Trial Maneuver menu by performing the following menu operation.**

TT

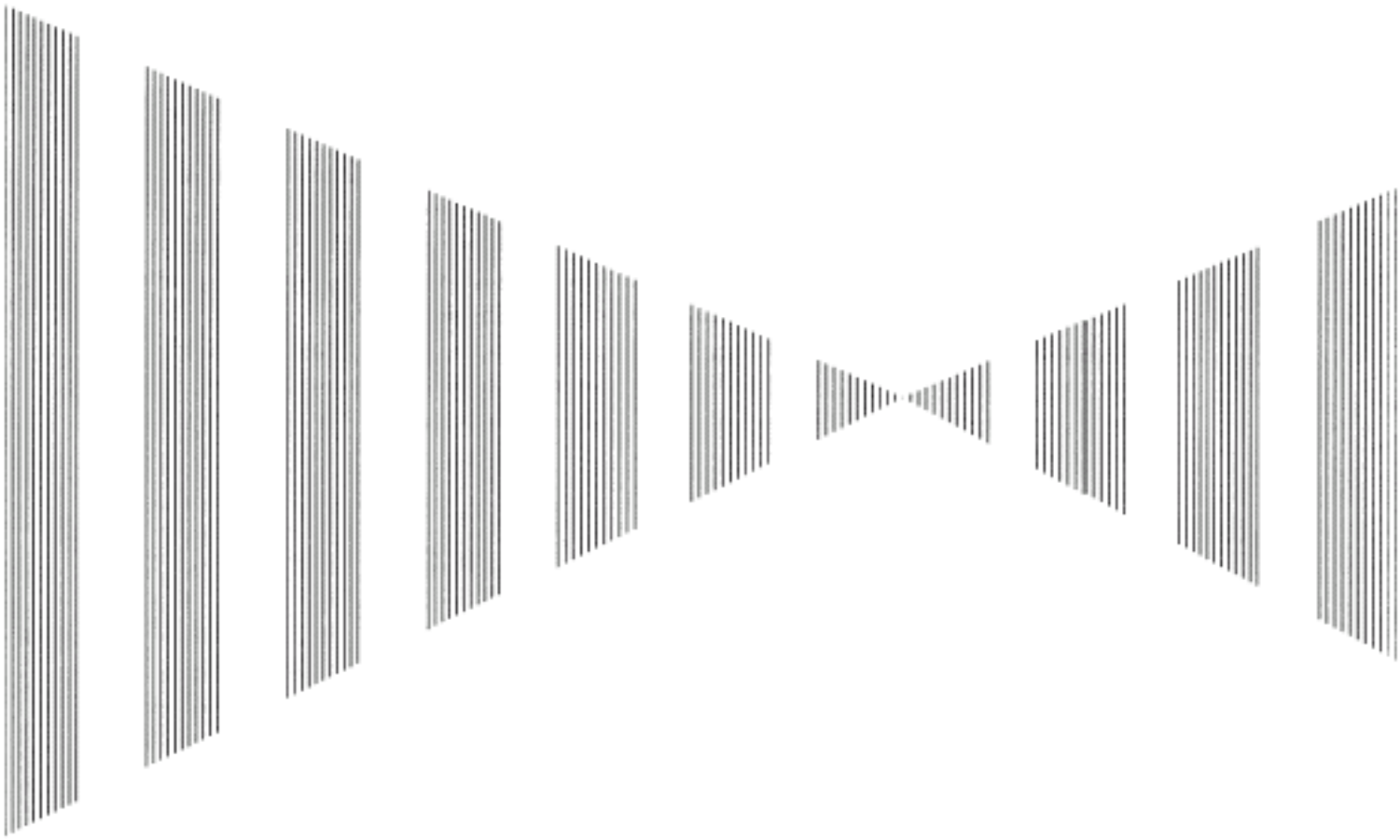
→ 3. Trial Maneuver

2) **Left-click the item button of** 1. Trial Function **.**

The Trial Function will be set to on or off.

Off : The Trial Function will be set to off.

SECTION 6
TRUE AND FALSE ECHOES ON DISPLAY



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.

6.1 RADAR WAVE WITH THE HORIZON

Radar beam radiation has the nature of propagating nearly along the curved surface of the earth. The propagation varies with the property of the air layer through which the radar beam propagates. In the normal propagation, the distance (D) of the radar wave to the horizon is approximately 10% longer than the distance to the optical horizon. The distance (D) is given by the following formula:

$$D = 2.23(\sqrt{h_1} + \sqrt{h_2}) \text{ [NM]}$$

h_1 : Height (m) of radar scanner above sea level

h_2 : Height (m) of a target above sea level

Fig 6-2 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.

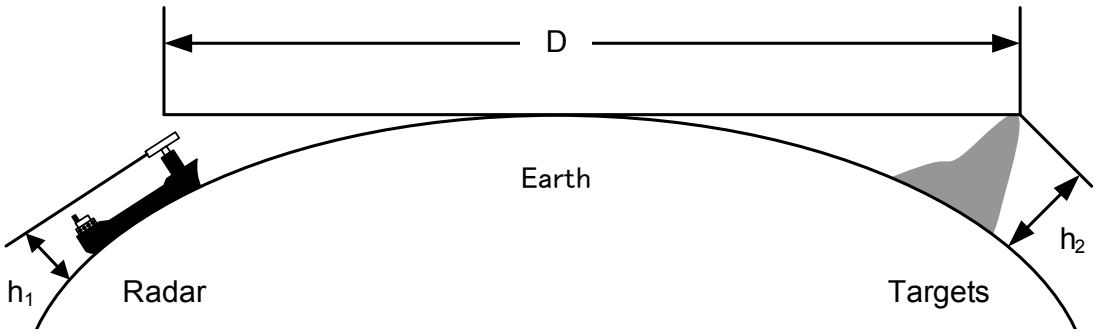


Fig 6-1: *RADAR wave with the horizon*

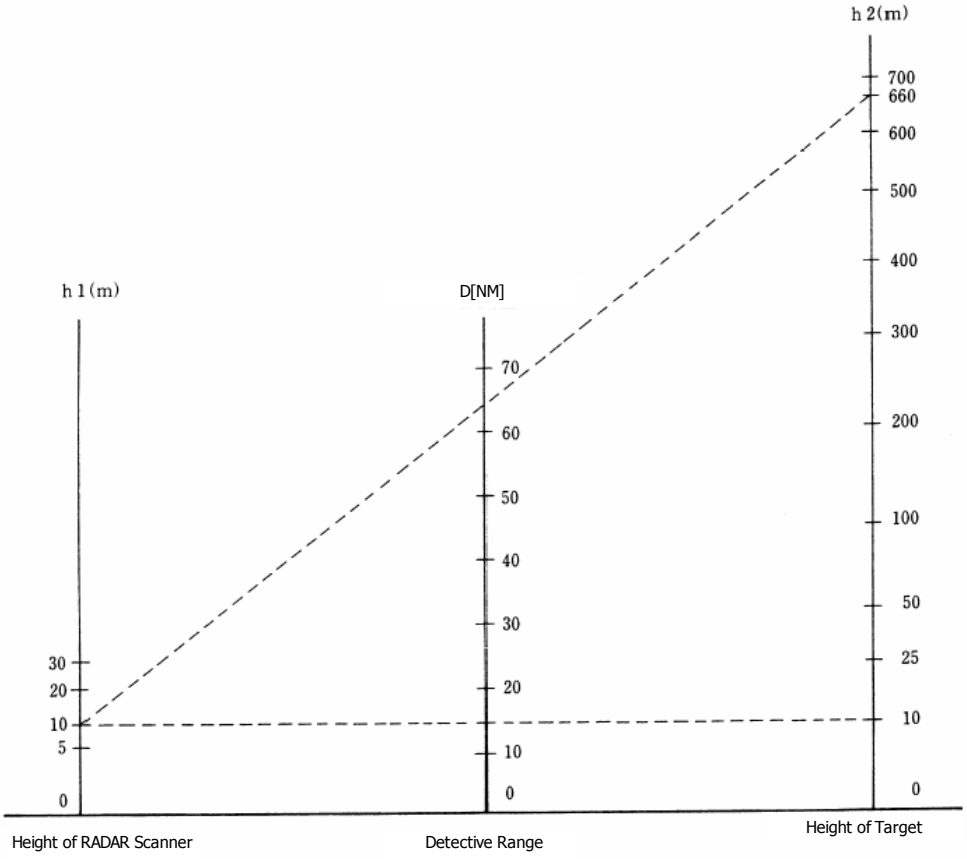


Fig 6-2: *Maximum detection range of a target*

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

i. 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.

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

6.2 STRENGTH OF REFLECTION FROM THE TARGET

The signal intensity reflected from a target depends not only on the height and size of the target but also on its material and shape. The echo intensity from a higher and larger target is not always higher in general.

In particular, the echo from a coast line is affected by the geographic conditions of the coast. If the coast has a very gentle slop, the echo from a mountain of the inland appears on the radar display.(Fig 6-3) Therefore, the distance to the coast line should be measured carefully.

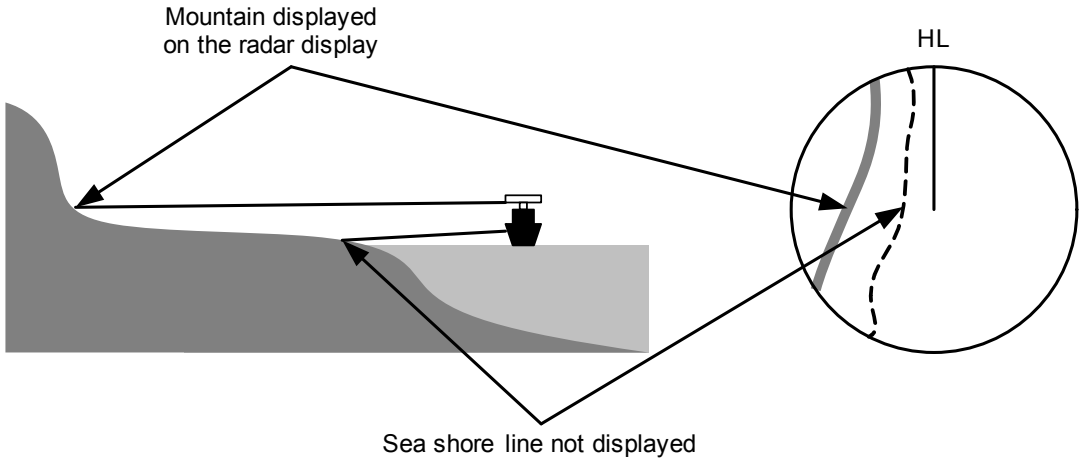


Fig 6-3: *Sea shore line which is not displayed*

Table 6-1 shows the graph indicating the relation between the target detection distance and the radar reflection cross-sectional area (RCS) with regard to the type and the height of the target in a situation in which the weather is good, the sea state is calm and the radio wave propagation is normal. As revealed by this table, even on the same sea shore line, detection distance greatly differs depending on the height of the target from the surface of the sea. Furthermore, because the target detection distance is greatly influenced by the shape and material of the target and environmental conditions, such as the sea state, weather, and radio wave propagation, caution should be taken when detecting distance of target.

Table 6-1 : Relation between type and height of target and detection distance and RCS

Type of target	Height from sea surface (m)	Detection distance (NM)		RCS [m^2]	
		X band	S band	X band	S band
Sea shore line	60	20	20	50,000	50,000
Sea shore line	6	8	8	5000	5000
Sea shore line	3	6	6	2500	2500
SOLAS target ship (>5000GT)	10	11	11	50,000	30,000
SOLAS target ship (>500GT)	5	8	8	1800	1000
Small boat with IMO standard compatible radar reflector	4	5.0	3.7	7,5	0,5
Marine buoy with corner reflector	3,5	4.9	3.6	10	1
Standard marine buoy	3,5	4.6	3.0	5	0,5
10-meter small boat without radar reflector	2	3.4	3.0	2,5	1,4
Waterway location beacon	1	2.0	1.0	1	0,1

Detection distance shown in the above table may greatly decrease depending on the shape of the target, sea state, weather and radio wave propagation conditions.

6.3 SEA CLUTTER AND RAIN AND SNOW CLUTTER

In addition to the echo required for observing ships and land, radar video image also includes unnecessary echo, such as reflection from waves on the sea surface and reflection from rain and snow. Reflection from the sea surface is called "sea clutter," and reflection from rain and snow is called "rain and snow clutter," and those spurious waves must be eliminated by the clutter rejection function.

a. Sea clutter

Sea clutter appears as an image radiating outwardly from the center of the radar display and changing depending on the size and the shape of waves. Generally, as waves become larger, image level of the sea clutter is intensified and the clutter far away is also displayed. When waves are large and the sea clutter level is high, it is difficult to distinguish sea clutter from a small boat whose reflection intensity is weak. Accordingly, it is necessary to properly adjust the sea clutter rejection function. Table 6-2 shows the relation between the sea state (SS) showing the size of waves generated by wind and the radar's detection probability.

Table 6-2 : Sea state and probability of target detection

S band radar (probability to detect a target at a distance of 0.4 NM)				
RCS	SS1～2	SS2～3	SS3～4	SS4～5
0.1m2	V[i]	V-M[ii]	M-NV[iii]	
0.5 m2	V	V	V-M	M-NV
1 m2	V	V	V	V-M

X band radar (probability to detect a target at a distance of 0.7 NM)				
RCS	SS1～2	SS2～3	SS3～4	SS4～5
1m2	V-M	M-NV		
5 m2	V	V-M	M-NV	
10 m2	V	V	V	V-M

i. V: Detection probability of 80%
ii. M: Detection probability of 50%
iii. NV: Detection probability of less than 50%

As shown in Table 6-2, the number of SS increases as the wind speed becomes high and the waves become large. Table 6.2 reveals that detection probability decreases from V (80 %) to NV (less than 50 %) as the number of SS increases. Therefore, even if the sea state is calm and a target clearly appears on the radar display, when the sea state becomes rough, target detection probability decreases resulting in difficulty of target detection by the radar.

Table 6-3 : Relation between Douglas sea state and average wind speed and significant wave height

Sea state	Average wind speed (kn)	Significant wave height (m)[i]
0	<4	<0,2
1	5-7	0,6
2	7-11	0,9
3	12-16	1,2
4	17-19	2,0
5	20-25	3,0
6	26-33	4,0

i. Significant wave height: an average of top N/3 higher waves when the number of waves detected within a constant time duration is N

For example, in the case of a standard marine buoy, RCS of X band radar is 5 m2 as shown in Table 6-1. When observing such a target in the sea state (SS3) in which significant wave height exceeds 1.2 meters, detection probability is M-NV, as shown in Table 6-2, which indicates 50 % or less.

b. Rain and snow clutter

Rain and snow clutter is a video image that appears in a location where rain or snow is falling. The image changes according to the amount of rain (or the amount of snowfall). As precipitation increases, the image of rain and snow clutter becomes intensified on the radar display, and in the case of localized heavy rain, an image similar to the image indicating land is displayed in some cases. Furthermore, because radio waves tend to attenuate due to rain and snow, the ability to detect a target in the rain and snow clutter or a target beyond the rain and snow clutter may decrease. The amount of attenuation depends on the transmission frequency, antenna beam width, and the pulse length. Fig 6-4 and Fig 6-5 show examples in which detection distance is reduced due to the influence of precipitation. Because of this, a target, which clearly appeared up to 10 NM by an X band radar (pulse width of 0.8μs) when it was not raining, may become dimly visible up to 5 NM when the amount of rain becomes 4 millimeters per hour. Furthermore, when comparing the X band radar with the S band radar, target detection distance decreases less when an S band radar is used, which means it is influenced less by precipitation.

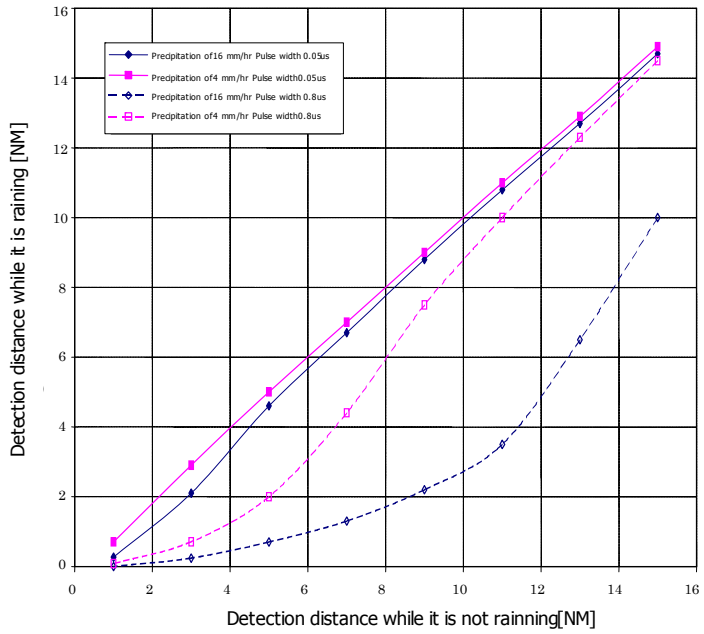


Fig 6-4: *Decreased target detection distance by S band radar due to precipitation*

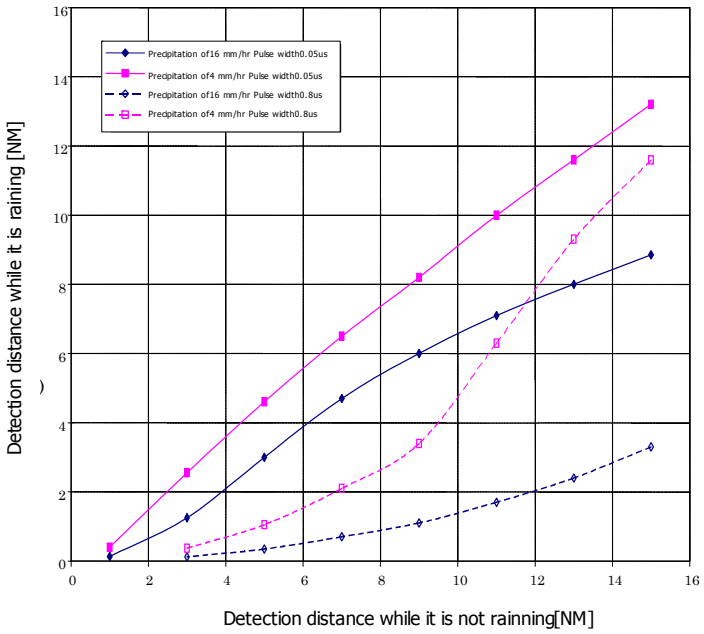


Fig 6-5: *Decreased target detection distance by X band radar due to precipitation*

c. Coping with sea clutter and rain and snow clutter

When the weather is bad and the ocean is rough, the use of an S band radar is effective because the radar is not influenced by sea clutter so much and attenuation due to rain drops is small. When an X band radar is used, reducing the pulse width will reduce the influence by spurious waves, and also the spurious wave rejection function effectively works; therefore, the use of short pulse is effective when the weather is bad. By using image processing functions PROCl 1 to 3, it is expected that spurious waves are further suppressed. Since optimal settings for those items can be automatically made by using the function mode, it is recommended that STORM or RAIN be used by selecting the function mode when the weather is bad. For details of the function mode, see Section 3.9 "USE FUNCTION KEY [USER]".

However, these functions may make some targets invisible, particularly targets with higher speeds.

6.4 FALSE ECHOES

The radar observer may be embarrassed with some echoes that do not exist actually. These false echoes appear by the following causes that are well known:

a. 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.

b. 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 6-6)

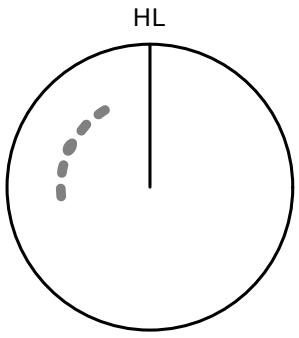


Fig 6-6: *False echo*

c. 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 6-7.

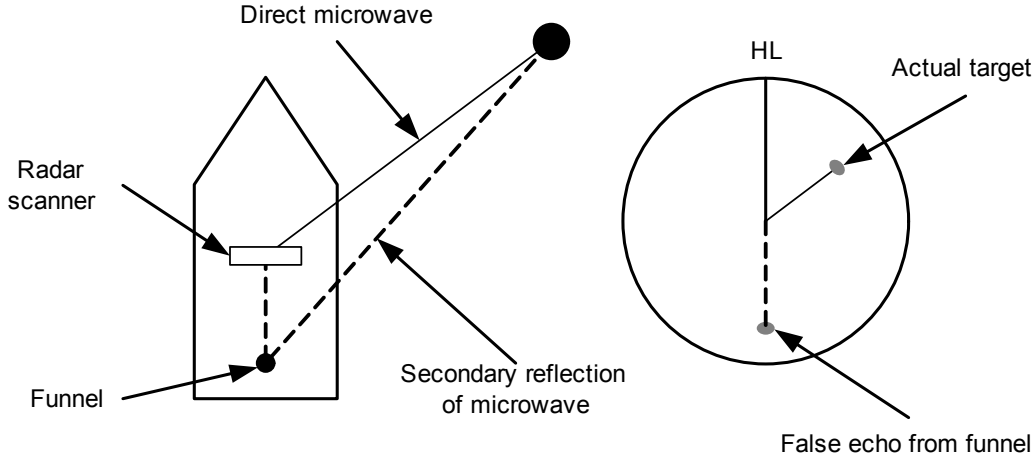


Fig 6-7: *False echo by secondary reflection*

d. 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 6-8, 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.

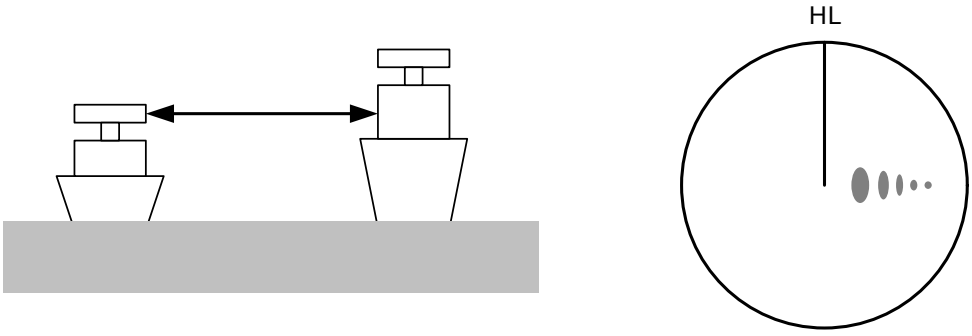


Fig 6-8: *False echo by multiple reflection*

e. Second Time Echoes

The maximum radar detection range depends upon the height of the scanner and the height of a target as described in the Section 6.1 "RADAR WAVE WITH THE HORIZON". If a so-called “duct” occurs on the sea surface due to a certain weather condition, however, the radar beam may propagate to 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. (See Section 3.8.3 "Set Scanner Unit (TXRX Setting)").

f. 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 6-9)

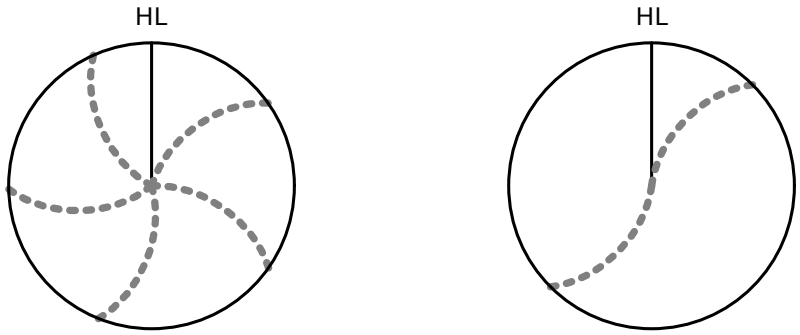


Fig 6-9: *Radar interference*

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 ine-tune the transmitting repetition frequency.(See Section 3.8.3 "Set Scanner Unit (TXRX Setting)")

An interference suppressing effect can be heightened by applying a different transmitting repetition frequency to the interference pattern source radar and this radar.

6.5 DISPLAY OF RADAR TRANSPONDER (SART)

The SART (Search and rescue Radar Transponder) is a survival device authorized by the GMDSS (Global Maritime Distress and Safety System), which is used for locating survivors in case that a distress accident occurs at sea. The SART is designed to operate in the 9 GHz frequency band.

When receiving the 9 GHz radar signal (interrogating signal) transmitted from the radar equipment on a rescue ship or search aircraft, the SART transmit a series of response signals to inform the distress position to the rescue and search party.

> This radar provides a shortcut item to make settings for SART signal reception. Execution of this item automatically switches to the setting for SART reception.It also functions for detect the beacon or target enhancer.

Procedures

1) **Press [RANGE +] or [RANGE -] key to set the radar range to 6 NM or 12 NM.**

2) **Set the SART display mode according to the procedures below.**

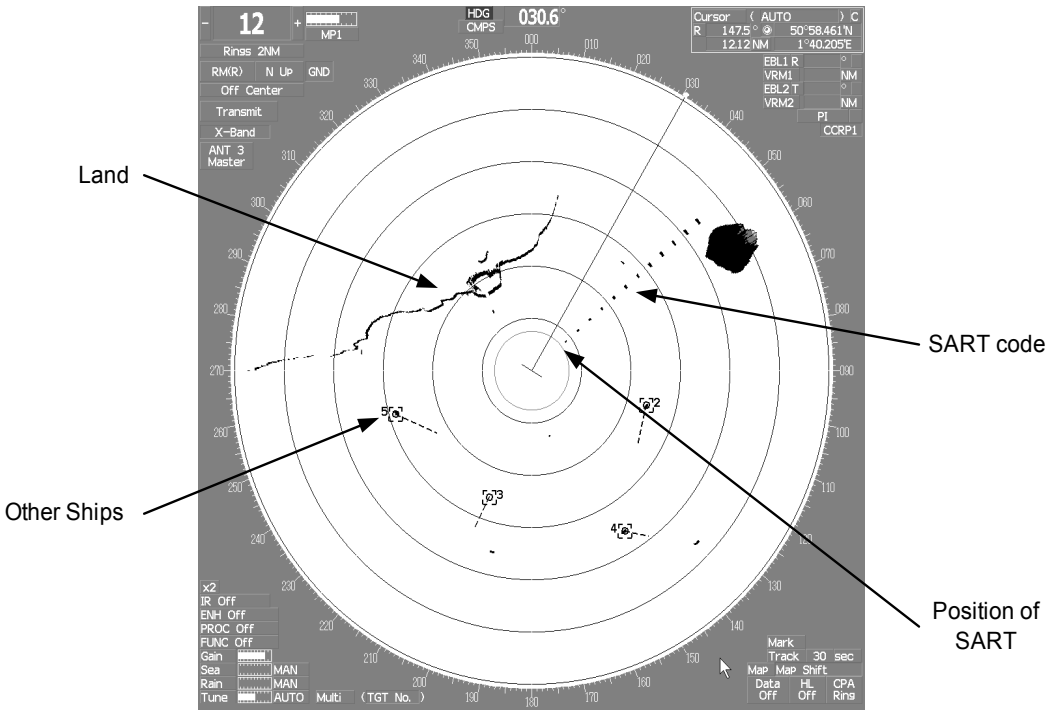
Main
→ 3. RADAR Menu
→ 1. Process Setting
→ 9. SART

On : SART ON
Off : SART OFF

With the SART display mode set to ON, settings as shown below are made automatically.

Sea clutter control	:	Minimum (Most counterclockwise)
AUTO SEA function	:	OFF
Rain and Snow Clutter Control (RAIN)	:	Minimum
Auto Rain and Snow Clutter function (AUTO RAIN)	:	OFF
TUNE control	:	No tuning (to weaken clutter echoes)
Interference rejection (IR)	:	OFF
PROCESS	:	OFF

[Example of Display]



Attention

- **When the SART function is set to ON, small targets around own ship will disappear from the radar display. So it is necessary to exercise full surveillance over the conditions around own ship by visual watch in order to avoid any collision or stranding.**

  If two or more sets of radar equipment are installed on own ship, use one set of 9 GHz band radar for detection of the SART signal and operate others as normal radars for avoiding collision, monitoring targets around own ship, and checking on own ship's position and avoidance of stranding.

  After end of detecting the START signal, turn the START display off. Then the radar returns normally to the nautical mode.

6.6 DISPLAY OF AIS-SART

AAIS-SART is an equipment to display the position of distress ship on the AIS indicator in ship station or coast station when the distress occurs.

It is usable as an alternate equipment of SART(Search And Rescue Transponder).

When connecting AIS indicator to RADAR, it is possible to display AIS-SART symbol on the RADAR screen.

6.6.1 Display

When receiving AIS-SART signal, AIS-SART symbol is displayed on the RADAR screen.

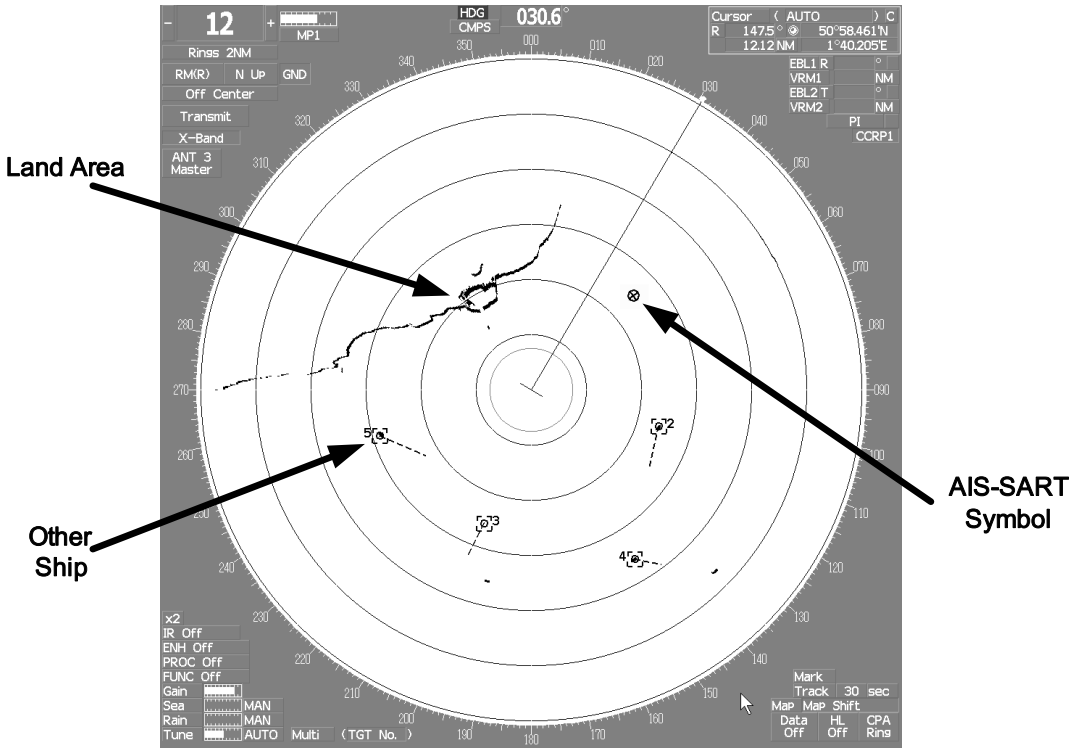


Fig 6-10: *Example of AIS-SART Symbol display*

For details of AIS-SART Symbol, refer to Section 5.1.2.2 "Types and Definitions of AIS Target Symbols".

6.6.2 Numeric Display

When the sleeping AIS-SART symbol is clicked once, the symbol changes into activated AIS-SART symbol. And then activated AIS-SART symbol is clicked once more, the symbol changes into numeric displayed AIS-SART symbol and their information is displayed.

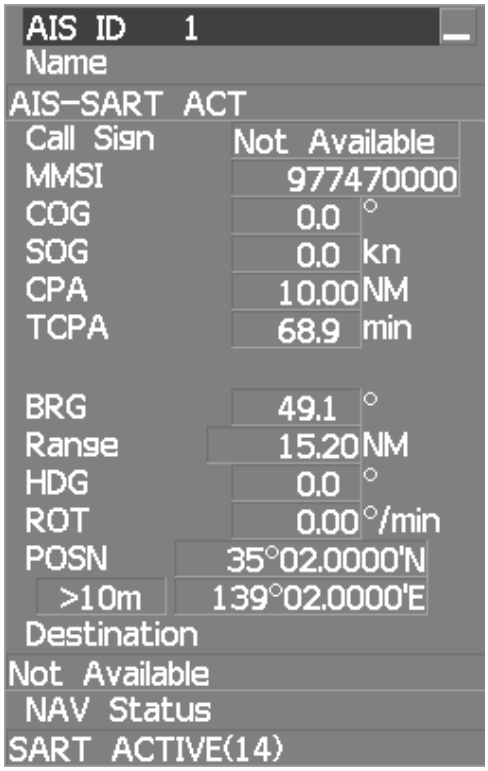


Fig 6-11: *Example of numeric information display of AIS-SART*

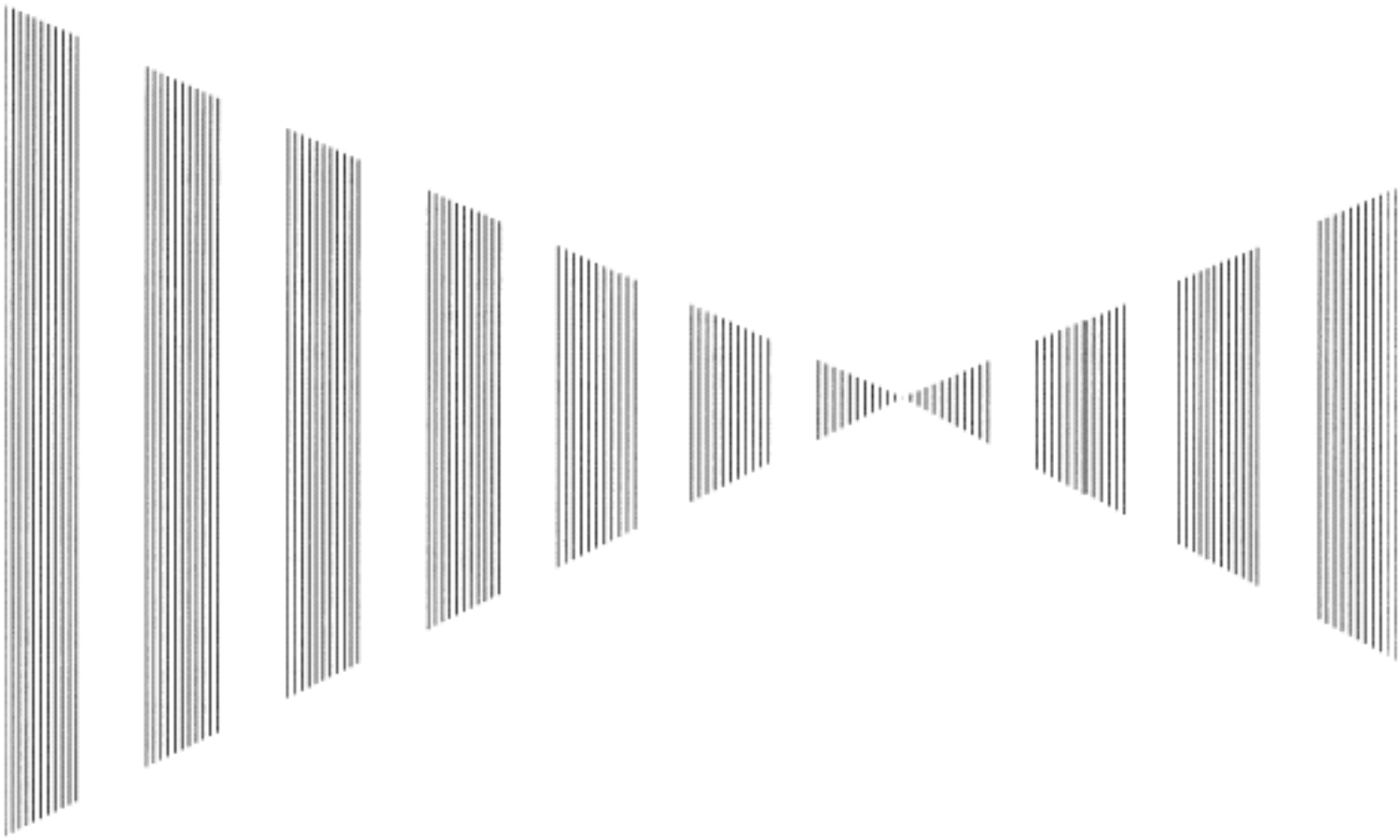
Depending on operation condition, NAV Status is displayed as follows.

Normal operation: SART ACTIVE(14)

Test operation: SART TEST(15)

Notice:	AIS-SART function is available in the display software ver. 01.01. As for method of confirming software version, refer to Section 8.3.1.6 "System Information".

SECTION 7
SETTINGS FOR SYSTEM OPERATION



SETTINGS FOR SYSTEM OPERATION

7.1 SETTINGS AT INSTALLATION

This section describes the electrical adjustment procedures to be performed by service engineers during system installation.

The bearing adjustment value is saved to non-volatile memory in the scanner. Other settings are saviedto non-volatile memory in the radar process unit.

CAUTION

- **Do not carry out the adjustments of the equipment except authorized service persons. If wrong setting is carried out, this may cause unstable operation.**
- **Do not carry out the adjustments during navigation. Otherwise, the radar performance may be affected, resulting in an accident or trouble.**

7.1.1 How to Open the Serviceman Menu（Service Man Menu）

Procedures

1) **Hold down the Main button at the lower right of the display together with the left key.**

   The Code Input menu will appear.

2) **Left-click the 0 button.**

3) **Left-click the ENT button.**

   The Serviceman Menu will appear.

Fig 7-1: *Code Input*

7.1.2 GYRO I/F Setting

a. Gyro Settings (STEP or SYNC)

The GYRO I/F circuit of the system is designed to be compatible with most types of gyro compasses by simply setting the switches.

Step motor type: DC24V to DC100V

Synchro-motor type: Primary excitation voltage 50 to 115 VAC

Before power-on operation can be performed, the switches S1, S2, S5, S6, S7 and jumper TB105 on the gyro interface circuit (PC4201) must be set in accordance with the type of your gyro compass by performing the procedure below.

The switches are factory-set for a gyration ratio of 180X and the step motor type. Make sure of the type of the gyro compass installed on the own ship before starting the procedure below.

Procedures

1) **Set S5 to "OFF".**

The gyro compass and GYRO I/F are cut off.

2) **Set S6 and S7 in accordance with the type of your gyro compass.**

There are two types of gyro compasses: one type outputs a step signal, and the other type outputs a synchro signal. Make sure of the type of the gyro compass installed on the own ship before setting the switches S6 and S7.

Synchro signal: Set the switches to [SYNC].

Step signal: Set the switches to [STEP].

3) **Set the DIP switch S1 in accordance with the type of the compass.**

The items to be set are listed below. For the settings, refer to Table 7-1 : Gyro and Log Select Switches (S1 DIP Switch).

S1-1: Type of gyro signal (step/synchro)

S1-2/3: Gyration ratio of gyro compass

S1-4: Gyration direction of gyro compass

S1-5: Type of log signal (pulse/synchro)

S1-7/8: Ratio of log signal

4) **Set the DIP switch S2.**

The items to be set are listed below. For the setting, refer to Table 7-2: Gyro and Log Select Switches (S2 DIP Switch).

1	2	3	4	5	6	7	8
ON	OFF	OFF	OFF	ON	OFF	ON	OFF

5) **Confirm the settings of the DIP switch S10.**

The DIP switch must be set as shown below. Do not change any of the settings.

1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

6) **Set the jumper TB105.**

The TB105 is set for using a low-voltage step signal.

1-2 connected: Setting for normal use

2-3 connected: Setting for a step signal of 22 V or less

7) **Connect the gyro signal and log signal cables to the terminal block.**

8) **Set S5 to "ON".**

The gyro compass and GYRO I/F are connected.

9) **After power-on operation, make sure of the radar video and the operation with the true bearing value.**

See the Section 7.1.7 "Setting of True Bearing Value".

10) **If the true bearing value of the radar equipment is reversed, change the setting of the switch S1-4.**

Table 7-1 : Gyro and Log Select Switches (S1 DIP Switch)

		1	2	3	4	5	6	7	8
GYRO SIG	STEP	ON							
	SYNC	OFF							
	360X		OFF	OFF					
	180X		ON	OFF					
	90X		OFF	ON					
	36X		ON	ON					
	DIRECTION		REV		ON				
			NOR		OFF				
LOG SIG	TYPE	SYNC				ON			
		PULSE				OFF			
	P U L S E / NM	Don't care					OFF		
		100P／30X						ON	ON
		200P／90X						OFF	ON
		400P／180X						ON	OFF
		800P／360X						OFF	OFF

Table 7-2 : Gyro and Log Select Switches (S2 DIP Switch)

S2 SETTING TABLE		1	2	3	4	5	6	7	8
OTHER SETTING	LOG ALARM	ON							
		OFF							
	GYRO SIMULATOR		ON						
			OFF						
	LOG SIMULATOR			ON					
				OFF					
	N.A.	Don't care			any				
	GYRO ALARM TIME		5s			ON			
			0.2s			OFF			
	HEADING SENSOR SOURCE			NMEA(HDT/THS)			ON		
				GYRO SIGNAL			OFF		
	NMEA BAUDRATE SETTING				4800			OFF	OFF
					9600			ON	OFF
					19200			OFF	ON
					38400			ON	ON

7.1.3 Tuning

Adjust the tuning control for the transmitter and receiver.

The turning control should be adjusted when the system is installed or when the magnetron is replaced.

7.1.3.1 Tune Adjustment

Procedures

1) **Set a 48 NM range or more.**
2) **Open the Serviceman Menu.**
3) **Perform the following menu open procedure to open the Tune Adjustment menu.**

   [1. Adjust Menu]
   → [1. Tune Adjustment]

4) **Adjust the tune adjustment value so that the tune indicator bar at the upper left of the display is maximized.**

   For inputs to the value input screen, refer to Section 3.3.4.3 "Increasing or decreasing a numeric value".

5) **Move the cursor onto the [ENT] button, and left-click .**

7.1.3.2 Tune Indicator Adjustment)

Set the scale mark when the tune indicator bar reaches the maximum point.

Procedures

1) **Set a 48 NM range or more.**
2) **Open the Serviceman Menu.**
3) **Perform the following menu open procedure to open the Tune Indicator Adjust menu.**

   [1. Adjust Menu]
   → [4. TXRX Adjustment]
   → [3. Tune Indicator Adjust]

4) **Adjust the tune indicator adjustment value by operating the [+] / [−] button so that the tune indicator bar at the upper left of the display reaches a point of 80 to 90% of the maximum.**

   For inputs to the value input screen, refer to Section 3.3.4.3 "Increasing or decreasing a numeric value".

5) **Move the cursor onto the [ENT] button, and left-click .**

- With the JMA-9110-6XA or JMA-9110-6XAH

  Adjusted this menu in factory.

  Don't touch this adjustment menu in normal case.

  When tune indicator and echo peak are mismatch, adjust this menu.

7.1.3.3 Tune Peak Adjustment

Adjust the tune indicator and echo peak.

Procedures

1) **Adjust tuning by referring to Section 7.1.3.1 "Tune Adjustment"**

2) **Adjust tune indicator by referring to Section 7.1.3.2 "Tune Indicator Adjustment)"**

3) **Set the 48NM range or more.**

4) **Open the Serviceman Menu.**

5) **Open the Tune Peak Adjustment menu by performing the following menu operation.**

   [1. Adjust Menu]

   → [4. TXRX Adjustment]

   → [2. Tune Peak Adjustment]

6) **Adjust the tune peak adjustment to get maximum echoes on a display when the tune indicator is maximum.**

   For inputs to the value input screen, refer to Section 3.3.4.3 "Increasing or decreasing a numeric value".

7) **Move the cursor onto the [ENT] button, and left-click.**

7.1.4 Bearing Adjustment

Make adjustment so that the bearing of the target measured with the ship's compass matches the bearing of the target echo on the radar display.

Procedures

1) **Select** H Up **for the bearing presentation. Set video processing (PROC) to** PROC Off **.**

2) **Measure the bearing of an adequate target (e.g., a ship at anchor, a breakwater, or a buoy) relative to own ship's heading.**

3) **Open the Serviceman Menu.**

4) **Perform the following menu open procedure to open the Bearing Adjustment menu.**

   1. Adjust Menu

   → 2. Bearing Adjustment

   For inputs to the value input screen, refer to Section 3.3.4.3 "Increasing or decreasing a numeric value".

   Make adjustment by the 0.1°.

5) **Adjust the bearing adjustment value by operating the** + **/** − **button so that the target measured in step 2) is adjusted to the correct bearing.**

6) **Left-click the** ENT **button to determine the value.**

7.1.5 Range Adjustment

Make adjustment so that the range of a target on the radar display is shown correctly.

Procedures

1) **Search the radar display for a target of which range is already known.**

2) **Open the Serviceman Menu.**

3) **Perform the following menu open procedure to open the Range Adjustment menu.**

[1. Adjust Menu]

→ [3. Range Adjustment]

For inputs to the value input screen, refer to Section 3.3.4.3 "Increasing or decreasing a numeric value".

4) **Adjust the range adjustment value by operating the [+] / [–] button so that the target measured in step 1) falls in the correct range.**

5) **Left-click the [ENT] button to determine the value.**

7.1.6 Navigator Setting (Device)

Determine whether to connect navigators to the radar equipment.

Only the navigators set to ON here can be used.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Device Installation menu.**

[2. Installation Menu]

→ [9. Next]

→ [3. Device Installation]

3) **Select [On] for navigators connected to the radar equipment, and [Off] for navigators not connected.**

Gyro : Gyro (via GYRO I/F)
Compass : Compass (Compliant with IEC61162)
GPS Compass : GPS Compass (JRC)
LOG : Log (via GYRO I/F)
2AXW : 2-axis log (Speed over water: Compliant with IEC61162)
2AXG : 2-axis log (Speed over ground: Compliant with IEC61162)
GPS : GPS (Compliant with IEC61162)

7.1.7 Setting of True Bearing Value

If GYRO I/F is used to input a gyro signal, the true bearing value indicated by the master gyro does not match the value indicated by the radar equipment only in a rare case. In this case, perform the following procedure to adjust the true bearing value of the radar equipment to the value of the master gyro.

Procedures

1) **Perform the following menu open procedure to open the true bearing value setting menu.**

Main

→ 6. NAV Equipment Setting

→ 1. Gyro Setting

2) **Input the master gyro value to the value input screen.**

For inputs to the value input screen, refer to Section 3.3.4.3 "Increasing or decreasing a numeric value".

7.1.8 Antenna Height Setting (Antenna Height)

Set the height of radar antenna above sea level. Do not change this setting carelessly.

Procedures

1) **Measure the height of radar antenna above sea level in advance.**

2) **Open the Serviceman Menu.**

3) **Perform the following menu open procedure to open the Antenna Height setting menu.**

1. Adjust Menu

→ 4. TXRX Adjustment

→ 1. Antenna Height

The Antenna Height menu will open.

4) **Select the setting that matches the antenna height measured in step 1).**

7.1.9 Setting of CCRP (CCRP Setting)

Set the own ship's CCRP location, radar antenna installation location, and GPS installation location.

CCRP : Up to four locations can be input. (One location selected when used)

Radar antenna: Up to eight radar antennas can be input. (Automatically selected in response to ISW operation)

GPS : Up to four locations can be input. (One location selected when used)

Procedures

1) **Measure the CCRP location, radar antenna location, and GPS antenna location in advance.**

2) **Open the Serviceman Menu.**

3) **Perform the following menu open procedure to open the CCRP Setting menu.**

2. Installation Menu

→ 4. CCRP Setting

4) **Specify the ship length for Length at the upper right of the CCRP Setting Menu, and the ship width for Beam.**

5) **Move the cursor onto the CCRP1 X, Y value, and left-click to input the CCRP1 location.**

When X > 0, the CCRP is on the starboard side of the ship.

When X < 0, it is on the port side.

6) **To input the second CCRP, click the CCRP2 button to display the CCRP2 X,Y value, and input the value in the same manner for step 5).**

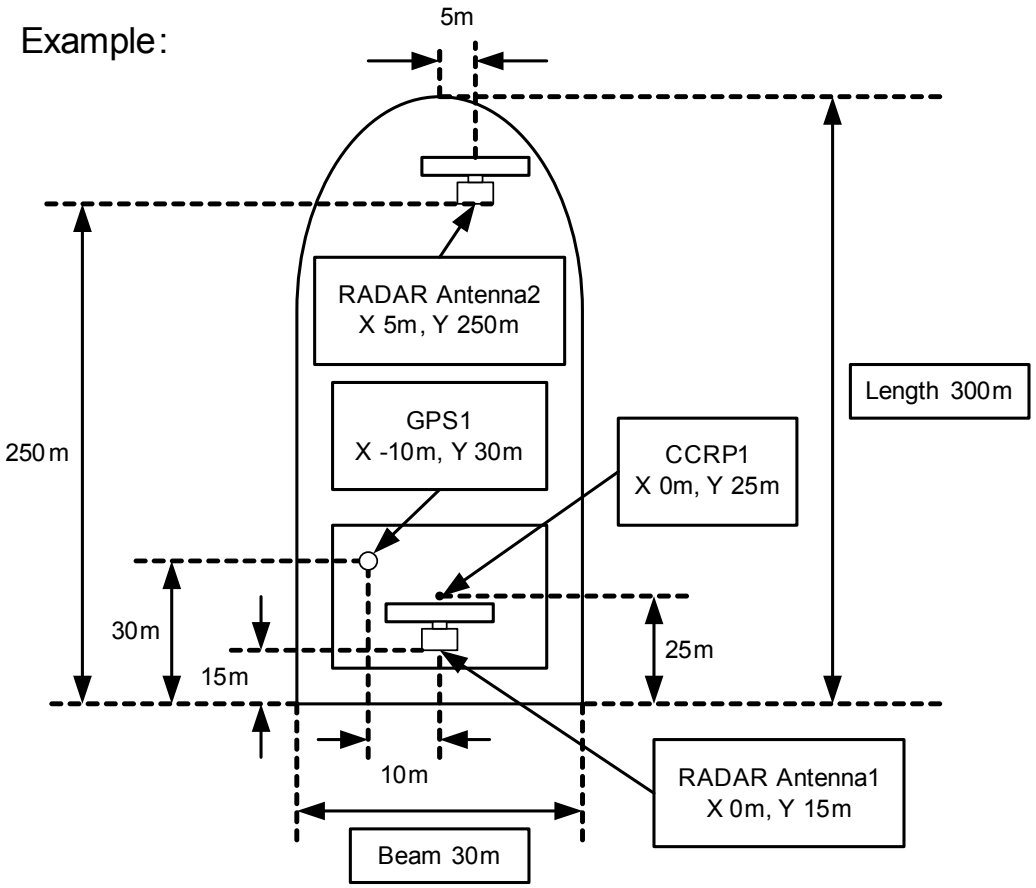
Similarly, input the third and subsequent CCRPs.

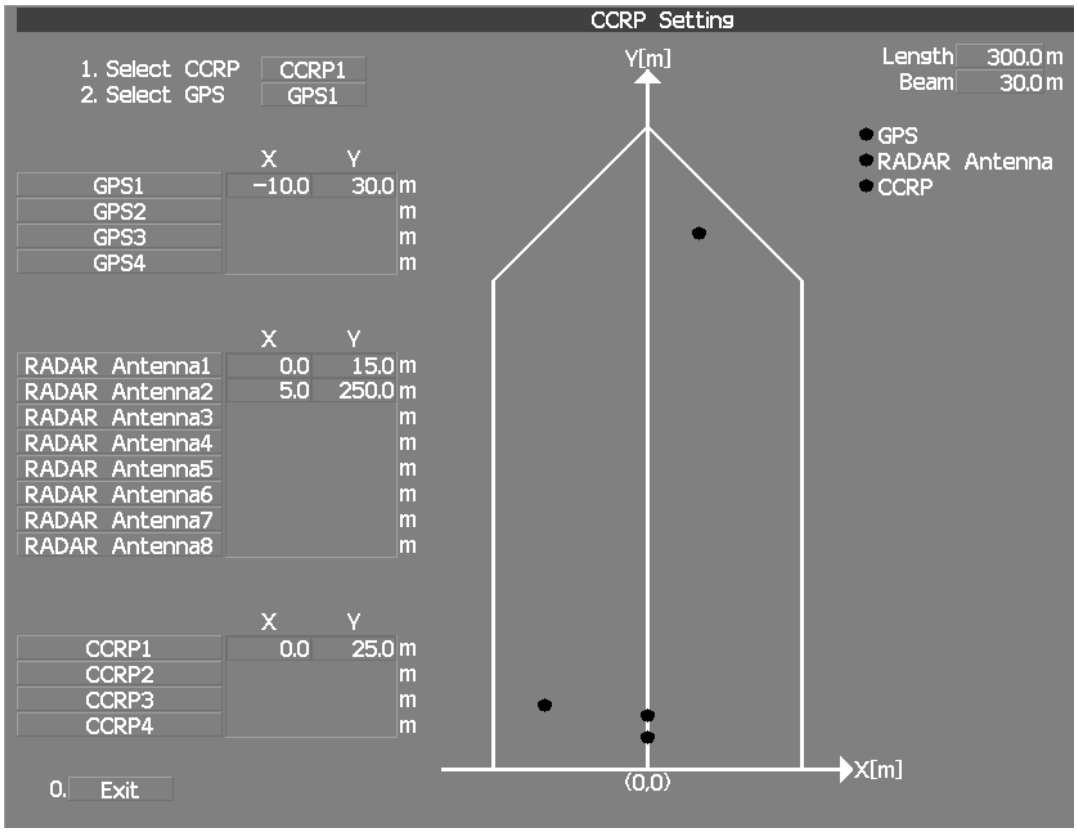
7) **Repeat the above steps to input the GPS location(s) and radar antenna location(s).**

8) **If multiple CCRP locations and GPS locations are input, select the CCRP location and GPS location to be used by pressing the buttons at the upper left of the menu.**

9) **Click the 0.Exit to close the CCRP Setting menu.**

Example:


5m
RADAR Antenna2
X 5m, Y 250m
GPS1
X -10m, Y 30m
CCRP1
X 0m, Y 25m
Length 300m
250m
30m
15m
25m
10m
RADAR Antenna1
X 0m, Y 15m
Beam 30m


CCRP Setting
1. Select CCRP CCRP1
2. Select GPS GPS1
Y[m]
Length 300.0 m
Beam 30.0 m
GPS
RADAR Antenna
CCRP
X Y
GPS1 -10.0 30.0 m
GPS2 m
GPS3 m
GPS4 m
X Y
RADAR Antenna1 0.0 15.0 m
RADAR Antenna2 5.0 250.0 m
RADAR Antenna3 m
RADAR Antenna4 m
RADAR Antenna5 m
RADAR Antenna6 m
RADAR Antenna7 m
RADAR Antenna8 m
X Y
CCRP1 0.0 25.0 m
CCRP2 m
CCRP3 m
CCRP4 m
0. Exit
(0,0)
X[m]

7.2 SETTINGS

This section describes the electrical adjustment procedures to be performed by service engineers during system installation.

CAUTION

- **Do not carry out the adjustments of the equipment except authorized service persons. If wrong setting is carried out, this may cause unstable operation.**
- **Do not carry out the adjustments during navigation. Otherwise, the radar performance may be affected, resulting in an accident or trouble.**

7.2.1 Communication Port Setting (COM Port Setting)

External sensor signals are input to the radar equipment through a communication port. The radar equipment has ten communication ports. For signals to be input from sensors or to be output to the sensors, communication ports need to be set in accordance with the sensors.

7.2.1.1 Baud Rate Setting (Baud Rate)

Set the baud rate of the signal to be input to the COM port.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Baud Rate setting menu.**

2. Installation Menu → 5. COM Port Setting → 1. Baud Rate

3) **Set the baud rate of the port to be set.**

1. COMPASS[i] :	4800(NMEA)/9600(NSK)/**38400(fast NMEA)**[ii] bps
2. MAINTENANCE/LOG :	1200/**4800**/9600/38400 bps
3. NAV1 :	1200/**4800**/9600/38400 bps
4. NAV2 :	1200/**4800**/9600/38400 bps
5. ALARM :	1200/**4800**/9600/38400 bps
6. JARPA[iii] :	1200/**4800**/9600/38400 bps
7. AIS :	1200/4800/9600/**38400** bps
8. ARPA[iv] :	1200/**4800**/9600/38400 bps
9. COM[v] :	1200/**4800**/9600/38400/115200 bps

i. The compass port is a receive-only port that is dedicated to COMPASS signals.
ii. The bold values are factory-set.
iii. The JARPA port is a transmit-only port that is dedicated to JRC ARPA signals.
iv. The ARPA port is a transmit-only port.
v. The COM port connector is D-sub 9pin.

7.2.1.2 Reception Port Setting(RX Port)

Set the numbers of ports for receiving signals from sensors.

There are two methods for receiving signals: specifying a port for each sensor, or using the automatic recognition function without specifying ports.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the RX Port setting menu.**

2. Installation Menu
→ 5. COM Port Setting
→ 2. RX Port

3) **Set a port for each sensor.**

Settable sensor signals	**GPS、DLOG、Alarm、Depth、Temperature、Wind、Current、ROT、RSA**	
Selectable ports	When the automatic recognition function is used:	**AUTO**
	When ports are specified:	**LOG、NAV1、NAV2、ALARM、COM**

7.2.1.3 Reception Sentence Setting (RX Sentence)

Set signal sentences to be received from sensors.

The system is factory-set for using all sentences. To receive only specified sentences, select No Use for sentences which are not necessary.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the RX Sentence setting menu.**

2. Installation Menu

→ 5. COM Port Setting

→ 3. RX Sentence

3) **Select the sentences to be used by the sensors to be set.**

Selection value: Use or No Use can be set for each sentence.

1. GPS(LL/COG/SOG) :	GGA/RMC/RMA/GNS/GLL/VTG
2. GPS(WPT/Time) :	GGA/RMC/RMB/BWC/BWR/ZDA
3. Depth :	DPT/DBK/DBT/DBS
4. Wind :	MWV/MWD
5. Current :	
→Data Set Number :	0-9. Set the number of the sentence to be used by Data Set Number. (Initial value 0)
→Layer A :	Set the number of the sentence to be used with layer A by Layer Number. (Initial value 3)
→Layer B :	Set the number of the sentence to be used with layer B by Layer Number. (Initial value 4)
→Layer C :	Set the number of the sentence to be used with layer C by Layer Number. (Initial value 5)
6. Autopilot :	APB

7.2.1.4 Transmission Port Setting (TX Port)

For each sentence, set a communication port through which signals are transmitted to sensors.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the TX Port setting menu**

2. Installation Menu
→ 5. COM Port Setting
→ 4. TX Port

3) **Select the communication port through which the sentence to be set is output.**

Settable sentences	TTM(TT)、TLL(TT)、TTD(TT)、TLB(TT)、OSD、RSD、ALR、ACK、TTM(AIS)、TLL(AIS)、TTD(AIS)、TLB(AIS)、RemoteMaintenance、JRC-ARPA、APB、BOD、GGA、GLL、RMC、RMB、VTG、XTE、BWC、HDT、THS
Selectable ports	MAINTENANCE、NAV1、NAV2、ALARM、JARPA、ARPA、COM

4) **Select the output format, talker, and transmission interval.**

Signals for which the above items can be set:

Item	Name	Option
NMEA0183 Output Format	APB, BOD, GGA, GLL, RMC, RMB, VTG, XTE, BWC, HDT	V1.5 V2.0 **V2.3**[i]
NMEA0183 Talker[ii]	APB, BOD,RMB, XTE, BWC, HDT, THS	**STANDARD**：The talker is RA . GP：The talker is GP.
NMEA0183 TX Interval	APB, BOD, GGA, GLL, RMC, RMB, VTG, XTE, BWC, HDT, THS	Set an interval in the range **1** to 9 seconds.

i. The **bold** values are factory-set.
ii. For TTM, TLL, OSD, RSD, and ALR, the talker is always RA .
For GGA, GLL, RMC, and VTG, the talker is always GP.

7.2.2 Sector Blank Setting (Sector Blank)

In order not to display radar echoes, set a sector range and stop transmission in the bearing range. Three types of sectors can be created.

The sector blank function operates in the relative bearing with the bow as the benchmark.

Notice

- **Displays the Magnetron Current bar instability indicating in sector blank area, but it is normal operating.**
- **For how to magnetron current to check, see Section 8.3.1.7 "Magnetron Current".**

7.2.2.1 Sector Blank Function On/Off (Sector1,2 and 3)

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Sector Blank setting menu.**

   2. Installation Menu

   → 3. Sector Blank

3) **Set the sector blank number Sector 1 , Sector 2 , or Sector 3 with which the sector blank function operates.**

   The system allows the use of up to three sector blank areas.

   Set each sector blank area to on or off.

   On : The sector blank function of the number is operated.

   Off : The sector blank function of the number is stopped.

7.2.2.2 Sector Blank Area Creation (Make Sector 1,2,3)

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Sector Blank setting menu.**

   2. Installation Menu

   → 3. Sector Blank

3) **Select the sector blank number (Make Sector 1 to Make Sector 3) for sector creation, and click the Make Sector button in the menu.**

   The selected sector blank will be made.

4) **Set the starting azimuth of the sector blank by operating the [EBL] dial, and left-click the ENT button.**

The start angle of the sector blank will be set.

5) **Set the ending azimuth of the sector blank by operating the [EBL] dial, and left-click the ENT button.**

The end angle of the sector blank will be set.

7.2.3 TNI Blank Setting (TNI Blank)

Set a sector range and stop tuning operation in the bearing range.

If a structure such as the mast is close to the radar antenna, automatic tuning operation may become unstable. In this case, set a TNI blank in the direction of the structure in order to stabilize the tuning operation.

Only one type of a sector can be created. The TNI blank function operates in the relative bearing with the bow as the benchmark.

7.2.3.1 TNI Blank Function On/Off (Sector)

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the TNI Blank setting menu.**

2. Installation Menu

→ 9. Next

→ 2. TNI Blank

3) **Select the item 1. TNI Blank in the menu, and turn on or off the TNI blank function.**

On : The TNI blank function is operated.

Off : The TNI blank function is stopped.

7.2.3.2 TNI Blank Area Creation (Make Sector)

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Sector Blank setting menu.**

[2. Installation Menu]

→ [9. Next]

→ [2. TNI Blank]

3) **Left-click the [2. Make Sector] button in the menu.**

The selected sector blank will be made.

4) **Set the starting azimuth of the TNI blank by operating the [EBL] dial, and left-click the [ENT] button.**

The start angle of the TNI blank will be set.

5) **Set the ending azimuth of the TNI blank by operating the [EBL] dial, and left-click the [ENT] button.**

The end angle of the TNI blank will be set.

7.2.4 Setting of Bearing Pulses from Scanner Unit (Output Pulse)

Set the output value of bearing pulses from the scanner unit. The system can set 2048 pulses or 4096 pulses. This setting is enabled only when the scanner unit of 25 or 30 kW is used.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Output Pulse setting menu.**

[1. Adjust Menu]

→ [4. TXRX Adjustment]

→ [6. Output Pulse]

3) **Set the number of pulses to be output by the scanner unit.**

[2048] [i] :2048 pulses per antenna rotation (Recommended value)

[4096] :4096 pulses per antenna rotation

i. If a 10 kW antenna is used, 2048 is always set.

7.2.5 Slave Mode Setting (Master/Slave)

Place the system in the Slave mode when it is to be operated as the sub-display that displays radar echoes by using radar signals from other radar equipment.

The input value of externally input bearing pulses can be set. The system can set 2048 pulses or 4096 pulses.

7.2.5.1 Slave Mode Setting (Master/Slave)

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the installation setting menu.**

[2. Installation Menu]

3) **Select Slave for the item** [2. Master Slave] **in the menu.**

[Master] :The system operates as radar equipment while the own antenna is connected.

[Slave] :The system operates as a sub-display while the signal cable of other radar equipment is connected.

7.2.5.2 Setting of Input Bearing Pulse (Input BP Pulse)

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the second page of the installation setting menu.**

[2. Installation Menu]

→ [9. Next]

3) **Set the number of pulses for the item** [1. Input BP Count] **in the menu.**

[2048] : 2048 pulses per antenna rotation

[4096] : 4096 pulses per antenna rotation

7.2.6 Language Setting (Language)

The system is designed to switch between display languages, Japanese and English.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the language setting menu.**

[2. Installation Menu]
→ [8. Language]

3) **Select the language to be used.**

[1. English]

[2. Japanese]

[3. Other] [i]

i. Other is an option to display character strings created by our overseas agents. Ask the overseas agent or our sales department if your language is supported. To determine the selected language, turn the power off, and then turn it on.

7.2.7 Date Time Setting

To display time, the local time, local date, and time-zone difference must be set.

However, if the "ZDA" sentence of NMEA0183 is received, time can be automatically displayed.

Procedures

1) **Perform the following menu open procedure to open the Date Time setting menu.**

[Main]
→ [7. Sub Menu]
→ [6. Date Time Setting]

The Date Time Setting menu will open.

2) **Set information about date and time**

2)-1. UTC/LMT (Time display system)

[UTC] : Universal Time Coordinate

[UTC (S)] : UTC (System Time)

[LMT] : Local Mean Time

[LMT (S)] : LMT (System Time)

2)-2. LMT Date

Input the date in local time.

2)-3. LMT Time

Input the date in local time.

2)-4. Time Zone

Input the time-zone difference between the universal time and local time.

2)-5. Display Style

Set one of the following date display formats.

YYYY-MM-DD ex) 2007-12-31

MMM DD, YYYY ex) DEC 31, 2007

DD MMM, YYYY ex) 31 DEC, 2007

2)-6. Synchronize with GPS

A ZDA sentence sent by the GPS is used, thereby displaying time synchronized with the GPS time.

On[i] : Time synchronized with the GPS time

Off : Time not synchronized with the GPS time

i. If On is selected for this item but a ZDA sentence is not input, the system internal clock function is used to display the date and time.

7.2.8 Input Installation Information

The system can input installation information.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Installation Information setting menu.**

Main

→ 1. Installation Information

3) **Input the installation information.**

For the input method on the numeric value and character input screens, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

Date Input the date of installed system.

Name Input the name of installation personel.

Company Input the name of radar installer.

7.2.9 Setting the Alarm System

7.2.9.1 Setting the reset interval (Reset Interval)

This function enables the control of WMRST terminal (on the terminal board circuit).The reset signal is turned on when operation in a set period of time.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Reset Interval menu.**

2. Installation Menu
→ 6. Alarm System
→ 1. Watch Alarm
→ 1. Reset Interval

3) **Input the value to be set.**

For how to input numeric data on the numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

7.2.9.2 Setting the Trackball Threshold

This function enables the control of WMRST terminal (on the terminal board circuit).

The reset signal is turned off when trackball is moved, that caused by vibration.If trackball move distance go over the threshold (dot unit) when reset signal is turned on.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Trackball Threshold menu.**

2. Installation Menu
→ 6. Alarm System
→ 1. Watch Alarm
→ 2. Trackball Threshold

3) **Input the value to be set.**

For how to input numeric data on the numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

7.2.9.3 Setting the relay output (Relay Output)

This function enables the control of ARPAALM terminal (on the terminal board circuit).

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Relay Output menu.**

[2. Installation Menu]
→ [6. Alarm System]
→ [2. Relay Output]

3) **Left-click the [1. Relay Output Mode] button in the menu.**

The Relay Output mode is switched.

[Continuous] : The output is continuously controlled.
[Intermittent] : The output is intermittenly controlled.

4) **Click the item button corresponding to the item to be changed.**

The item can be turned on / off.

[On] : The relay output is turned on when alarm have issued.
[Off] : The relay output is not turned on when alarm have issued.

[2. TT CPA/TCPA] : There is a dangerous target. (tracked target)
[3. AIS CPA/TCPA] : There is a dangerous target. (AIS target)
[4. New Target] : A new target is acquired in the automatic acquisition zone.
[5. Lost] : There is a lost target. (Target Tracking / AIS).

7.2.9.4 Setting the ALR output (ALR Output)

This function enables the control of ALR port (See Section 7.2.1 "Communication Port Setting (COM Port Setting)").

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the ALR Output menu.**

[2. Installation Menu]
→ [6. Alarm System]
→ [2. Relay Output]

3) **Click the item button corresponding to the item to be changed.**

The item is turned on / off.

[On] : The ALR sentence is output when alarm have issued.
[Off] : The ALR sentence is not output when alarm have issued.

[1. System Alarm] : The internal alarm.
[2. TT/AIS Alarm] : Target Tracking Alarms and AIS Function Alarms.

7.2.9.5 Setting the External Acknowledgement (External ACK Setting)

This function enables the control of system when ACK sentence have received.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the External ACK Setting menu.**

[2. Installation Menu]
→ [6. Alarm System]
→ [5. External ACK Setting]

3) **Click the item button corresponding to the menu to be changed.**

[Critical Alarm] : CPA/TCPA alarm.
[Normal Alarm] : Exept Critical Alarm.

4) **Click the item button corresponding to the item to be changed.**

The item is switched.

Audio : Setting of alarm sound.

→ On : The alarm sound is not stopped when acknowridgement have received.

→ Off : The alarm sound is stopped when acknowridgement have received.

Indication : Setting of alarm indication.

→ Lightning : The alarm indication brinking is stopped when acknowridgement have received.

→ Brinking : The alarm indication brinking is not stopped when acknowridgement have received.。

Acknowledge State : Setting of ALR sentence.

→ A;ACK : Add acknowridgement to ALR sentence.

→ V;UNACK : Add no acknowridgement (unrecognized) to ALR sentence.

7.2.9.6 Setting the Alarm Buzzer (Sound Output Mode)

This function enables the control of alarm buzzer.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the External ACK Setting menu.**

2. Installation Menu

→ 6. Alarm System

→ 4. Sound Output Mode

3) **Select the function to be used.**

On , Off1 and Off2

Setting and Ararm Function

Alarm Setting	Operation	Operation Miss	CPA/ TCPA	New Target	Lost	NAV	System	ISW
On	①							
Off1	①		②					
Off2	①		③			①	②	①

①: Followed by Buzzer Volume menu setting.
②: Alarm Buzzer is turned off.
③: If Relay Output menu is turned on when Alam Buzzer is turned off. If Relay Output menu is turned off when Alam Buzzer is turned on.
For how to setting Buzzer Volume menu, see Section 3.8.6 "Adjust Sound Volume (Buzzer Volume)".

7.2.10 Network Setting (Network)

The system can receive data from other system via the JRC LAN. The purpose of JRC-LAN is interoperation with other JRC systems. The JRC systems are synchronized with datum in JRC-LAN network.

To connect JRC-LAN, LAN cable and HUB (option) is necessary. For details, contact the JRC offices.

NOTE: If the connection is not suggested from JRC office, don't connect PC or other maker's system to JRC-LAN.

- **Connecting PC or other maker's system may cause a lower radar system performance.**
- **Connecting PC or other maker's system may cause a lower that performance.**

- **Accepted Devices**

RADAR	: JMA-7100/9100/5300MK2 Series
ECDIS	: JMA-901B/701B
Chart RADAR	: JMA-900B Series
Conning Display	: JMA-901B-CON/701B-CON
Route planning system	: JAN-1186
Navigation workstation	: NDC-1186
GPS/DGPS	: JLR-7500/7800

- **Receivable Data**

[1] Route Data

The system can display the route created by other JRC navigation equipements. Refer to Section 3.7 "USE ROUTE FUNCTION".

When the system display Route which are created in the ECDIS, following items are not displayed.

- **XTL**
- **Arrival Radius**
- **ROT**
- **Turn Radius**
- **Time Zone**
- **Sail**

[2] Sensor Data

The system can receive sensor data (Heading, Speed etc...) from other system (ECDIS, Chart RADAR etc...).

[3] AIS Data

The system can receive AIS data from AIS.

[4] Selected GPS number

Selected GPS number can be synchronized.

[5] Day/Night mode, operation panel brilliance.

Day/Night mode and operation panel brilliance can be synchronized.

7.2.10.1 Network Function Setting (Network Function)

Turning on/off the network function.

Procedures

1) **Open the Serviceman Menu.**

2) **Perfome the following menu open procedure to open the Network Function setting menu.**

[2. Installation Menu] → [9. Next] → [4. Network]

3) **Select the item [1. Network Function] in the menu, and turn on or off the Network Function.**

[On] : The Network Function is operated.
[Off] : The Network Function is stopped.

7.2.10.2 Sensor Priority Setting

The system can receive data from 2 sensors. If the same sentences are received from 2 sensors, the system use primary system's data.

Procedures

1) **Open the Serviceman Menu.**

2) **Perfome the following menu open procedure to open the Sensor Priority setting menu.**

[2. Installation Menu] → [9. Next] → [4. Network] → [3. Sensor Priority]

3) **Select the data source sensor for each priority.**

[1. Primary] : High priority sensor (Factory-set: [No.1 ECDIS])
[2. Secondary] : Low priority sensor (Factory-set: [No.2 ECDIS])

Settable sensors

No.1 ECDIS	No.1 FFD	Conning Display	No.2 Data Server	No.3 Remote GPS
No.2 ECDIS	No.2 FFD	No.1 Converter Unit	Console Conning	None[i]
No.3 ECDIS	No.3 FFD	No.2 Converter Unit	NAV W/S	
No.4 ECDIS	No.4 FFD	No.1 Alart I/F	No.1 GPS	
No.1 MFD	No.1 Chart RADAR	No.2 Alart I/F	No.2 GPS	
No.2 MFD	No.2 Chart RADAR	Port Conning	No.3 GPS	
No.3 MFD	No.3 Chart RADAR	STAB Conning	No.1 Remote GPS	
No.4 MFD	No.4 Chart RADAR	No.1 Data Server	No.2 Remote GPS	

i. if you selected "None", the system does not receive data.

7.2.10.3 Synchronization Setting

Day/Night mode and operation panel brilliance can be synchronized.

Procedures

1) **Open the Serviceman Menu.**

2) **Perfome the following menu open procedure to open the Synchronization setting menu.**

[2. Installation Menu] → [9. Next] → [4. Network] → [4. Synchronization]

3) **Select the [1. Day/Night] or [2. Keyboard] to be synchronized.**

[On] : Day/Night and operation panel brilliance are sinchronized.

[Off] : Day/Night and operation panel brilliance are not sinchronized.

7.2.11 LAN Port Setting)

The system can receive data from other system via the JRC LAN. The purpose of JRC-LAN is interoperation with other JRC systems. The JRC systems are synchronized with datum in JRC-LAN network

To connect JRC-LAN, LAN cable and HUB (option) is necessary. For details, contact the JRC offices.

NOTE: If the connection is not suggested from JRC office, don't connect PC or other maker's system to JRC-LAN.

- **Connecting PC or other maker's system may cause a lower radar system performance.**
- **Connecting PC or other maker's system may cause a lower that performance.**

7.2.11.1 Transmission Setting (TX Setting)

For each sentence, turn on/off transmission.

Procedures

1) **Open the Serviceman Menu.**

2) **Perfome the following menu open procedure to open the TX Setting menu.**

2. Installation Menu → 9. Next → 5. LAN Port Setting → 1. TX Setting

3) **Set on/off for each sensor.**

On : The sentence is transmitted.

Off : The sentence is not transmitted.

These sentences can be turned on/off.

Settable sentences

TTM(TT), TLL(TT), TTD(TT), TLB(TT), OSD, RSD, ALR, ACK, TTM(AIS), TLL(AIS), TTD(AIS), TLB(AIS)

7.2.11.2 Reception Port Setting (RX Port)

Set the numbers of ports for receiving signals from sensors.

There are two methods for receiving signals: specifying a port for each sensor, or using the automatic recognition function without specifying ports.

Procedures

1) **Open the Serviceman Menu.**

2) **Perfome the following menu open procedure to open the RX Port setting menu.**

[2. Installation Menu] → [9. Next] → [5. LAN Port Setting] → [2. RX Port]

3) **Set a port for each sensor.**

Settable sensor signals	
Heading, Speed, AIS, GPS, DLOG, Alarm, Depth, Temperature, Wind, Current, ROT, RSA, Time Zone, Date/Time	
Selectable ports	
When the automatic recognition function is used:	[AUTO]
When the ports are specified:	[Own] [LAN] [LAN (GPS)] [LAN (Ship's Clock)]

Behavior pattern of selectable ports

[AUTO]	: Data from JRC-LAN is prior
[User Setting]	: The system use the port selected by Section 3.12.1 "Receive Port Setting (RX Port)". The system use data from JRC-LAN or sensor connected directly.[i]
[Own]	: The system use data from sensor connected to the system directly.
[LAN]	: The system uses data from JRC-LAN.
[LAN (GPS)]	: The system uses GPS data from GPS (JRC-LAN connected).[ii]
[LAN (Ship's Clock)]	: The system uses ship's clock data from ship's clock (JRC-LAN connected)[ii]

i. In order to set Section 3.12.1 "Receive Port Setting (RX Port)", select [User Setting] in advance.

ii. [LAN (GPS)] and [LAN (Ship's Clock)] are selectable signals for Time Zone and Date/Time.

7.2.11.3 Reception Sentence Setting (RX Sentence)

Set signal sentences to be received from sensors.

The system is factory-set for using all sentences. To receive only specified sentences, select [No Use] for sentences which are not necessary.

Procedures

1) **Open the Serviceman Menu.**

2) **Perfome the following menu open procedure to open the Rx Sentence setting menu.**

[2. Installation Menu] → [9. Next] → [5. LAN Port Setting] → [3. RX Sentence]

3) **Select the sentences to be used by the sensors to be set.**

Selection value: [Use] or [No Use] can be set for each sentence.

1.	GPS(LL/COG/SOG) :	GGA/RMC/RMA/GNS/GLL/VTG
2.	GPS(WPT/Time) :	GGA/RMC/RMB/BWC/BWR/ZDA
3.	Depth :	DPT/DBK/DBT/DBS
4.	Wind :	MWV/MWD
5.	Current :	
	→Data Set Number :	0-9. Set the number of the sentence to be used by Data Set Number. (Initial value 0)
	→Layer A :	Set the number of the sentence to be used with layer A by Layer Number. (Initial value 3)
	→Layer B :	Set the number of the sentence to be used with layer B by Layer Number. (Initial value 4)
	→Layer C :	Set the number of the sentence to be used with layer C by Layer Number. (Initial value 5)
6.	Autopilot :	APB

7.3 ADJUSTMENT

This section describes the electrical adjustment procedures to be performed by service engineers during system installation.

CAUTION

Do not carry out the adjustments of the equipment except authorized service persons. If wrong setting is carried out, this may cause unstable operation.

Do not carry out the adjustments during navigation. Otherwise, the radar performance may be affected, resulting in an accident or trouble.

7.3.1 Noise Level Adjustment (Noise Level)

7.3.1.1 Noise Level Adjustment for Signal Processing

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the noise level adjustment menu.**

9. RADAR/TT Initial Setup → 1. Signal Processing → 1. Echo Noise Level

3) **Increase/decrease the noise level adjustment value.**

The noise level is factory-set. (Initial value: 140)

After system installation, a great change in the noise level adjustment value should be avoided; it should be fine adjusted within ±5.

7.3.1.2 Noise Level Adjustment Mode (Setting Mode)

A noise level is factory-adjusted while this mode is turned on.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the noise level adjustment menu.**

9. RADAR/TT Initial Setup
→ 1. Signal Processing
→ 2. Setting Mode

The noise level adjustment mode is switched between on and off.

Factory-adjustment method

- The noise level adjustment value is once decreased to about 130.
- While the noise level adjustment value is gradually increased, the value with which radar echoes start turning yellow is determined as the set value.
- The noise level adjustment mode is turned off when the adjustment is finished.

7.3.2 Adjustment of Target Tracking Function (TT)

7.3.2.1 Vector Constant Adjustment (Vector Constant)

Adjust the vector follow-up performance of the target tracking function.

The vector constant is adjusted to an optimal value, so do not change it carelessly.

Attention

Do not change the set value carelessly.

The vector constant shall be set to 5 normally. If the vector constant value is higher, a target's vector will be better followed up when the target and own ship change their course or speed, but the vector accuracy will be lower on the contrary.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Vector Constant adjustment menu.**

9. RADAR/TT Initial Setup

→ 2. TT

→ 1. Vector Constant

The window for setting vector constants will appear.

3) **Input the value to be set.**

For how to input numeric data on the numeric value input screen, see Section 3.3.4 "Operation on Numeric Value, Latitude / Longitude and Character Input menu".

7.3.2.2 Quantization Level Adjustment (Video TD Level)

Use the target tracking function (TT) to adjust the level of the signal to be recognized as a target. If a small value is set, even weak target signals will be input to the target detection circuit of the target tracking function. However, many unnecessary signals are also input, which may cause unstable target acquisition or tracking. It is important to set a value four or five greater than the value with which unnecessary signals are detected.

The quantization level is adjusted to an optimal value, so do not change it carelessly.

CAUTION

Do not change the set quantization level carelessly. If the level deviates from the proper value, the target acquisition and tracking functions will deteriorate. Otherwise, this may cause accidents.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the target tracking setting menu.**

9. RADAR/TT Initial Setup

→ 2. TT

3) **To change the quantization level of the automatic acquisition area, specify the item** 2. Video TD Level **in the menu. To change the quantization level of tracking and manual acquisition, specify the item** 3. Video High Level **.**

4) **Input the value to be set.**

7.3.3 Main Bang Suppression Level Adjustment (MBS)

Main Bang Suppression is adjusted to suppress main bang, a reflection signal from 3D circuit including wave guide tube, that generally appears as a circular image focusing on the center of the radar display. Optimum adjustment allows main bang image to remain lightly on the display.

CAUTION

Do not change this adjusted level carelessly.

Incorrect adjustment may erase targets in point-blank range and cause collision, resulting in death or serious injury.

7.3.3.1 Adjustment of Main Bang Suppression Level (MBS Level)

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the MBS level adjustment menu.**

9. RADAR/TT Initial Setup → 3. MBS → 1. MBS Level

3) **Set the radar as follows:**

- Set the radar range to 0.125 NM.
- Set the radar video enhance function (ENH) to OFF.
- Set the image processing (PROC) to OFF.
- Turn the [RAIN] control to the minimum position (fully to the left).
- Turn the [GAIN] control to the maximum position (fully to the right).
- Turn the [SEA] control to achieve the strength with which main bang can be judged.

4) **Adjust the value so that the main bang can be erased.**

7.3.3.2 Adjustment of Main Bang Suppression Area (MBS Area)

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the MBS Area adjustment menu.**

9. RADAR/TT Initial Setup
→ 3. MBS
→ 2. MBS Area

3) **Set the radar as follows:**

- Set the radar range to 0.125 NM.
- Set the radar video enhance function (ENH) to OFF.
- Set the image processing (PROC) to OFF.
- Turn the [RAIN] control to the minimum position (fully to the left).
- Turn the [GAIN] control to the maximum position (fully to the right).
- Turn the [SEA] control to achieve the strength with which main bang can be judged.

4) **Adjust the value so that the main bang can be erased.**

7.3.4 Adjustment of Performance Monitor

After replacement of either of the following units, adjust the performance monitor according to the procedures in this section:

- Magnetron
- Performance monitor
- Antenna unit

7.3.4.1 Reception Monitor Adjustment (MON Adjustment)

Adjust the circuit for monitoring the reception performance of the radar equipment.

The radar system is equipped with an interswitch.

For adjusting the performance unit, set the interswitch connection to straight, i.e. No.1 scanner is connected to No.1 display unit as the Master.

Procedures

1) **Open the Serviceman Menu.**

2) **Open the MON (Performance Monitor) Adjustment menu by performing the following menu operation.**

1. Adjust Menu
→ 4. TXRX Adjustment
→ 4. MON Adjustment

3) **Increase or decrease the adjustment value so that the farthest point of the performance monitor pattern touches the 18.0 NM line.**

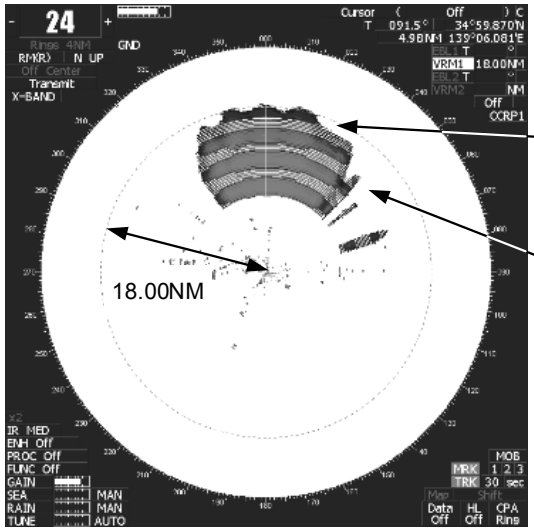


Fig 7-2: *MON Adjustment*

Notice: During performance monitor adjustment, all acquisitions by the target tracking function are released.
The released target acquisitions are not recovered.

7.3.4.2 Transmission Monitor Adjustment (MON Indicator Adjustment)

Adjust the circuit for monitoring the transmission performance of the radar equipment.

The radar system is equipped with an interswitch.

For adjusting the performance unit, set the interswitch connection to straight, i.e. No.1 scanner is connected to No.1 display unit as the Master.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the performance monitor Indicator Adjustment menu.**

1. Adjust Menu
→ 4. TXRX Adjustment
→ 5. MON Indicator Adjustment

3) **Increase or decrease the adjustment value so that the performance monitor level indicator will be adjusted to "8".**

MON 

4) **Attach the INFORMATION LABEL provided with the performance monitor to an appropriate position on the display unit.**

5) **Write the performance monitor bar value check date to the INFORMATION LABEL.**

Notice: During performance monitor adjustment, all acquisitions by the target tracking function are released.

The released target acquisitions are not recovered.

7.4 MAINTENANCE MENU

This item is provided for equipment maintenance, including settings of antenna safety switch, master reset, etc.

CAUTION

Only our service engineers are to make the adjustment. Neglecting this caution may cause accidents and failures.

Do not make the adjustments during navigation. Otherwise, adjustments may affect the radar functions, causing accidents and failures.

7.4.1 Antenna Safety Switch (Safety Switch)

Use this switch to measure the transmission/reception performance while the antenna is in stopped state.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Safety Switch setting menu.**

[3. Maintenance Menu] → [1. Safety Switch]

3) **Select the item to be set.**

Set operation when the antenna safety switch is turned off.

[1. TX-OFF] : The transmitter stops transmission. The screen on the display unit remains in transmission state.

[2. Standy] : (Normal setting) The transmitter stops transmission. The screen on the display unit is placed in standby state.

[3. TX-ON] : The transmitter continues transmission. The screen on the display unit remains in transmission state. In this case, however, an error such as a bearing signal failure occurs because the safety switch is turned off.

4) **Change the setting back to [2. Standy] when the work is finished.**

7.4.2 Initialization of Memory Area(Area Initial)

If system operation is unstable, it may be stabilized by initializing the memory area. To initialize the memory area, follow the procedure in this section. The memory area is reset to the factory setting when initialized.

7.4.2.1 Partial Master Reset

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Partial Master Rest operation menu for the memory area.**

[3. Maintenance Menu] → [2. Area Initial] → [1. Partial Master Reset]

3) **Select the items to be initialized.**

[1. Serviceman Menu]	The set values in the Serviceman menu are initialized.
[2. Except Serviceman Menu]	The set values not in the Serviceman menu are initialized.
[3. User Setting]	The user-set values are initialized.
[4. TT Setting]	The set values for the target tracking function are initialized.
[5. AIS Setting]	The set values for the AIS display function are initialized.
[6. Day/Night]	The color scheme and brilliance setting for the day/night mode are initialized.

4) **Select [1. Yes] in the Confirmation Menu.**

The memory areas of specified items are initialized, and the system is restarted.

7.4.2.2 All Master Reset

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the All Master Rest operation menu for the memory area.**

[3. Maintenance Menu] → [2. Area Initial] → [2. All Master Reset]

3) **Select [1. Yes] in the Confirmation Menu.**

The whole memory area is initialized, and the system is restarted.

7.4.3 Save of Internal Memory Data (Card1/2)

The system can save internal memory data such as item settings in all menus onto a flash memory card. If the radar processing circuit in the system has been replaced, the set values before the circuit replacement can be restored by reading the set values you saved before the replacement.

To save the internal memory data onto a flash memory card (option), the card must be inserted in card slot beforehand.

7.4.3.1 Copying of Internal Settings onto Card (Internal To Card1/2)

Save the internal memory data, such as item settings in menus, onto a flash memory card.

The internal memory data should be saved at completion of system setting, and the operation condition should be saved periodically.

Procedures

1) **Open the Serviceman Menu.**

2) **Open the** 3. Maintenance Menu.

3) **Select** Slot2 **in the** 3. Internal To Card1/2 **.**

4) **Select** 1. Yes **in the Confirmation Menu.**

The internal memory data is saved on the flash memory card.

7.4.3.2 Reading of Internal Settings from Card (Card1/2 To Internal)

Read the saved memory data from the flash memory card into the system memory.

Perform the read operation in order to return the system to the previous operation condition after replacement of the radar processing circuit in the system.

Procedures

1) **Open the Serviceman Menu.**

2) **Open the** 3. Maintenance Menu.

3) **Select** Slot2 **in the** 4. Card1/2 To Internal **.**

4) **Select** 1. Yes **in the Confirmation Menu.**

The memory data is read from the flash memory card into the system memory.

After the internal memory area is updated, the system is restarted.

7.4.4 Restoration of Scanner Unit Operation Time (TXRX Time)

The system adds up the following operation time and contains it in the scanner unit:

- Transmission time
- Motor run time

Clear the above total time when the magnetron or scanner unit motor is replaced.

7.4.4.1 Clear of Motor Run Time (Clear TX Time)

Clear the scanner's motor run time.

Perform the following procedure to clear the motor run time when the scanner motor is replaced.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Clear Motor Time menu.**

3. Maintenance Menu → 5. TXRX Time → 1. Clear TX Time

3) **Select** 1. Yes **in the Confirmation Menu.**

The motor run time in the TXRX's internal control circuit is cleared to 0.

7.4.4.2 Save of Antenna Time (Clear Motor Time)

Save the following scanner unit time data from the scanner unit into the display unit.

Perform the following procedure to inherit the scanner unit time data when the TXRX's internal control circuit is replaced.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Clear Motor Time menu.**

3. Maintenance Menu → 5. TXRX Time → 2. Clear Motor Time

3) **Select** 1. Yes **in the Confirmation Menu.**

The motor run time in the TXRX's internal control circuit is cleared to 0.

7.4.4.3 Save of Scanner Unit Time (TXRX To Display Unit)

Save the following scanner unit time data from the scanner unit into the display unit.

Perform the following procedure of 7.4.4.4 to inherit the scanner unit time data when the TXRX's internal control circuit is replaced.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the TXRX to Display Unit menu.**

3. Maintenance Menu
→ 5. TXRX Time
→ 3. TXRX To Display Unit

3) **Select** 1. Yes **in the Confirmation Menu.**

The scanner unit time data in the TXRX's internal control circuit is saved transferred to the display unit.

7.4.4.4 Restoration of Antenna Time (Display Unit To TXRX)

Restore the antenna time data from the display unit into the antenna's internal control circuit.

Perform the above procedure of 7.4.4.3 to inherit the antenna time data when the antenna's internal control circuit is replaced.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the Display Unit to TXRX menu.**

3. Maintenance Menu
→ 5. TXRX Time
→ 4. Display Unit To TXRX

3) **Select** 1. Yes **in the Confirmation Menu.**

The scanner unit time data in the display unit is restored transferred to the antenna's internal control circuit.

7.4.5 Update of Character String Data (String Data Update)

The system is designed to transfer and display external character strings as the second language display. The second language is factory-set to "Japanese."

Ask our agent or sales department for the supply of character strings to be updated.

To update character strings, the flash memory card (option) containing the character string file must be inserted in card slot 2.

Procedures

1) **Open the Serviceman Menu.**

2) **Perform the following menu open procedure to open the String Data Update menu.**

3. Maintenance Menu

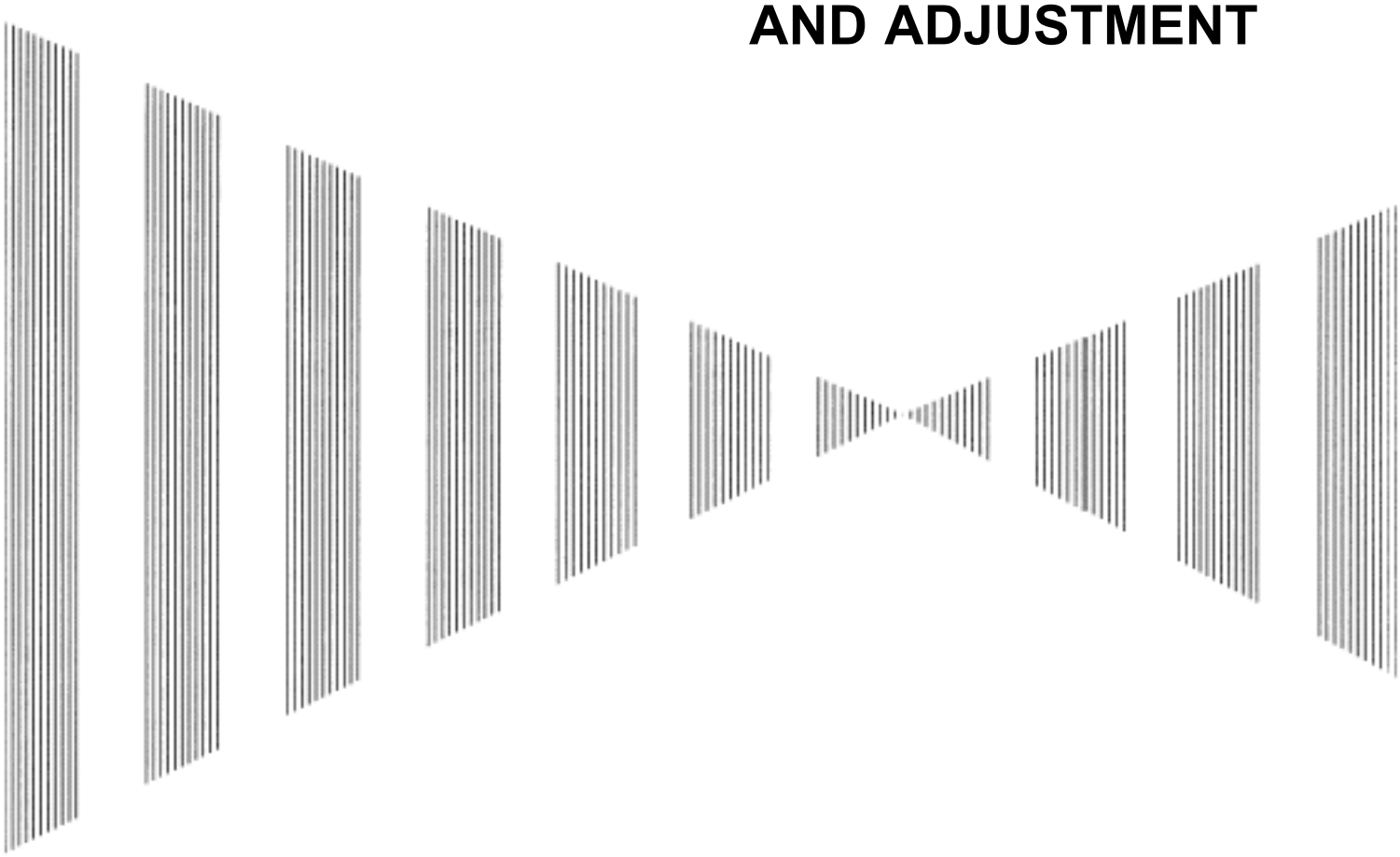
→ 6. String Data Update

3) **Select** 1. Yes **in the Confirmation Menu.**

The character string file on the flash memory card is read into the system, and the second language area is updated.

To display the read character strings in the second language, select Other in the menu shown in Section 7.2.6 "Language Setting (Language)".

SECTION 8
COUNTERMEASURES FOR TROUBLE AND ADJUSTMENT



COUNTERMEASURES FOR TROUBLE AND ADJUSTMENT

8.1 ROUTINE MAINTENANCE

WARNING

- **Never carry out internal inspection or repair work of the equipment by users. Inspection or repair work by unauthorized personnel may result in fire hazard or electric shock. Ask the nearest branch, business office or a dealer for inspection and repair.**
- **Turn off the main power before maintenance work. Otherwise, an electric shock may result.**
- **Turn off the main power before cleaning the equipment. Especially, make sure to turn off the indicator if a rectifier is used. Otherwise, equipment failure, or death or serious injury due to electric shock may result, because voltage is outputted from the rectifier even when the radar is not operating.**

For operating the radar equipment in the good conditions, it is necessary to make the maintenance work as described below. If maintenance is made properly, troubles will reduce. It is recommended to make regular maintenance work.

Common points of maintenance for each unit are as follow:

- Clean the equipment.

Remove the dust, dirt, and sea water rest on the equipment cabinet with a piece of dry cloth.

Especially, clean the air vents with a brush for good ventilation.

8.2 MAINTENANCE ON EACH UNIT

8.2.1 Scanner Unit NKE-1125/1129/1130/1139/2103/2254

WARNING

- **Turn off the main power source before starting maintenance. Otherwise, an electric shock or injury may be caused.**
- **Turn "OFF[i]" the safety switch to stop the scanner unit. (Refer to Section 1.4 "EXTERIOR DRAWINGS".) Otherwise, you may be injured if touching the rotating scanner unit by accident.**
- **Do not touch the radiator. Even if the power is turned off, the radiator may be rotated by the wind.**

i. After the work, turn "ON" the scanner unit safety switch.

a. Precautions in Mounting the Cover

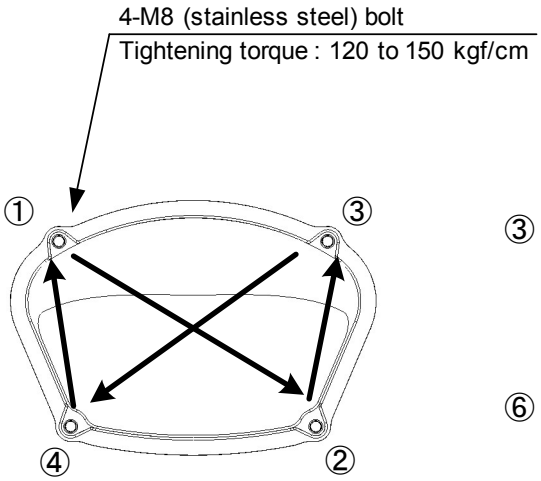
When the cover is removed for regular checkup and replacement of parts and refitted after such work, the procedures of fastening bolts shall be taken with the following precautions:

1) **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.**

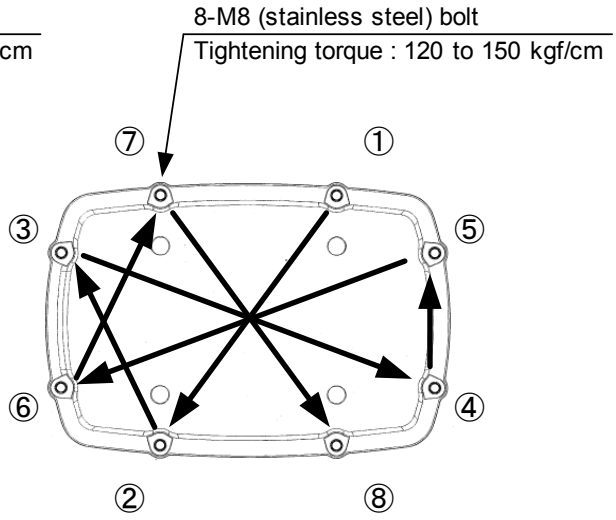
2) **Use an offset wrench of 11 mm X 13 mm or a double-ended wrench of 13 mm X 17 mm (not longer than 200 mm).**

3) **Screw all the bolts by hand first to prevent them playing, then fasten them evenly in order not to cause one-sided fastening. (Fasten the bolts with 25% of the required torque at the first step.)**

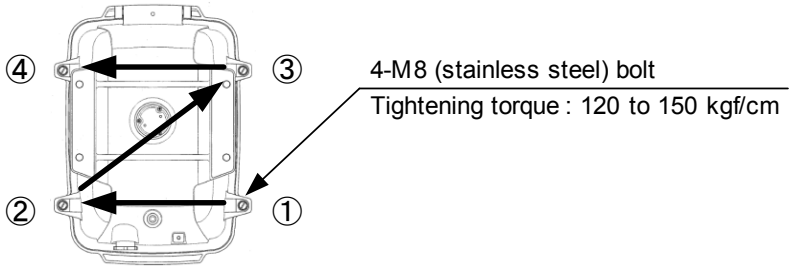
*Fasten the bolts in the diagonal order.



Bolt Tightening Procedure of
NKE-1125/1129/2254 Cover



Bolt Tightening Procedure of
NKE-1130/1139 Cover



Bolt Tightening Procedure of
NKE-2103 Cover

b. Radiator

Attention

- **If the radiator front face (radiation plane) is soiled with smoke, salt, dust, paint or birds' droppings, wipe it with a piece of soft cloth wetted with alcohol or water and try to keep it clean at all times. Otherwise, radar beam radiation may attenuate or reflect on it, resulting in deterioration of radar performance.**
- **Never use solvents of gasoline, benzine, trichloroethylene and ketone for cleaning. Otherwise, the radiation plane may deteriorate.**

Check up and clean the radiator.

c. Rotating section

c-1 Supply Oil Seal

The scanner unit NKE-1130 (JMA-9132-SA) and NKE-1139 (JMA-9133-SA) with a grease nipple needs grease supply. Remove the cap on the grease nipple on the front of the radiator support, and grease with a grease gun. Make the oiling every six months. The oil quantity shall be approximately 100 g, which is as much as the grease comes out of the oil seal. Use the grease of Mobilux 2 of Mobil Oil.

c-2 Oiling gears

Apply grease evenly to the tooth surfaces of the main shaft drive gear and the encoder drive gear with a spreader or brush. Oiling in short intervals is more effective to prevent the gears from wear and tear and extend their service life, but oil at least every six months.

Use Mobilux2 of Mobile Oil.

c-3 Mounting legs

Check the mounting legs and mounting bolts of the antenna unit case for corrosion at intervals and maintain them to prevent danger. Apply paint to them once a half year because painting is the best measure against corrosion.

8.2.2 Flexible wave guide (JMA-9123-7XA/9XA)

Attention

- **Install flexible wave guide without any clearance. Leaving a clearance may cause water leakage or corrosion later.**

8.2.3 Coaxial Cable (JMA-9133-SA)

The coaxial tube gland of a coaxial cable terminal is fully waterproofed when installed. To prevent a water leakage accident, periodically inspect the coaxial tube gland. In particular, the coaxial tube gland should be repainted every six months.

WARNING

- **Do not apply strong shock to the coaxial cable by striking it with a tool or hammering it. Otherwise, an open circuit failure may result.**
- **Do not place anything heavy on the coaxial cable.Otherwise, an open circuit failure may result.**
- **Do not twist or pull the coaxial cable.**

For details, refer to the coaxial cable installation procedure for S-band radars.

8.2.4 Transmitter Receiver Unit (NTG-3225/3230)

Wipe dust off the transmitter and receiver with a dry cloth or feather duster.

8.2.5 Display Unit (NCD-4990)

WARNING

- **When cleaning the screen, do not wipe it too strongly with a dry cloth. Also, do not use gasoline or thinner to clean the screen. Otherwise the screen surface may be damaged**

Dust accumulated on the screen will reduce clarity and darken the video. For cleaning it, wipe it with a piece of soft cloth (flannel or cotton).

Do not wipe it strongly with a piece of dry cloth nor use gasoline or thinner.

8.3 PERFORMANCE CHECK

Make operational check on the radar equipment regularly and if any problem is found, investigate it immediately. Pay special attention to the high voltage sections in checking and take full care that no trouble is caused by any error or carelessness in measurement. Take note of the results of checking, which can be used effectively in the next check work.

Operational check shall be made in accordance with Table 8-1 Function Check List in the order as specified in it.

Table8-1 : Performance Check List

Equipment	Item to be checked	Criteria	Remarks
Display Unit	Video and echoes on the screen Sensitivity LCD brilliance can be controlled correctly Various markers Various numerical indications Lighting	Can be correctly controlled	
	Memory	See the Section [1] "Memory Test"	
	Communications Lines	See the Section [3] "Check of Communication Lines (Line Test)"	
	Power Supply, Backup Battery	See the Section [4] "Supply Voltage"	
	Monitor	See the Section 8.3.1.2 "Monitor Test"	
	Operation Unit	See the Section 8.3.1.3 "Operation Unit Test (Keyboard Test)"	
	System Alarm Log Display	See the Section 8.3.1.5 "System Alarm Log display"	
	System Information Display	See the Section 8.3.1.6 "System Information"	
	Magnetron current	See the Section 8.3.1.7 "Magnetron Current"	
	Target Tracking	See the Section 5.2.7 "Operation Test (TT Test Menu)"	
Scanner Unit	Signals from the Scanner Unit	See the Section [2] "TXRX Test"	
	Performance Monitor	See the Section 8.3.1.4 "Check of the Performance Monitor (MON Display)"	

8.3.1 Check Performance on Test Menu

The radar operating state can be checked by opening the Test Menu.

Procedures

1) **Perform the following menu open procedure to open the Test Menu.**

Main

→ 9. Test Menu

2) **Select the items to be checked.**

1. Self Test	8.3.1.1Self-diagnosis function (Self Test)
2. Monitor Test	8.3.1.2Monitor Test
3. Keyboard Test	8.3.1.3Operation Unit Test (Keyboard Test)
4. MON Display	8.3.1.4Check of the Performance Monitor (MON Display)
5. System Alarm Log	8.3.1.5System Alarm Log display
6. System Information	8.3.1.6System Information
Magnetron Current	8.3.1.7Magnetron Current

The list of check items will appear.

8.3.1.1 Self-diagnosis function (Self Test)

Check of memory, scanner unit, and communications Lines

1. Memory Test	[1]Memory Test
2. TXRX Test	[2]TXRX Test
3. Line Test	[3]Check of Communication Lines (Line Test)
4. Supply Voltage	[4]Supply Voltage

[1] Memory Test

Checks for the performance of built-in memory.

1. SDRAM	SDRAM Check
2. SRAM	SRAM Check
3. FLASH ROM	FLASH ROM Check
4. GRAPHIC	GRAPHIC Check

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

[2] TXRX Test

Checks for signals from the scanner.

Safety Switch	Scanner's safety switch check
AZI Pulse	Scanner rotation signal check
HL Pulse	Heading line signal check
MH Current	Check on the load current of high voltage in the modulator
Trigger	Radar trigger signal check
Video	Radar video check

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

In standby, ** will appear.

[3] Check of Communication Lines (Line Test)

Check the status of communications with options.

TXRX	Check on connection with the transmitter-receiver
SIG. PROC	Check on connection with the signal processing circuit
TT	Check on connection with the target tracking unit
GYRO I/F	Check on connection with the GYRO I/F unit
ISW	Check on connection with the interswitch

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

The status display field of equipment not connected is left blank.

[4] Supply Voltage

Check the voltage of internal power supply.

Item	Normal operating range
12V	11.4 to 12.6V
5V	4.75 to 5.25V
3.3V	3.14 to 3.46V
Battery	2.5V or more

8.3.1.2 Monitor Test

Checks for the display.

The test pattern will be shown on the display.

1. Pattern1	:	All colors are filled with white.
2. Pattern2	:	A white box is displayed on the black background of 1280 × 1024dot.
3. Pattern3	:	Displays rectangle X 2, circle X 2, and cross-shape X13 (white lines on the black background).
4. Pattern4	:	Displays "H" of 9 dots X 9 dots on the entire screen (white character on the black background).
5. Pattern5	:	Gray scale display (16 levels)
6. Pattern6	:	Displays a color bar.
7. Pattern7	:	Displays the VDR test pattern.
8. Pattern8	:	Displays the specified color.

To return to the normal display, press any key.

If errors occur in the monitor, no test pattern will appear.

8.3.1.3 Operation Unit Test (Keyboard Test)

Checks for the controls and switches of the operation panel.

1. Key Test	[1]Key Test
2. Buzzer Test	[2]Buzzer Test
3. Light Test	[3]Light Test

[1] Key Test

Checks for the controls and switches of the operation panel.

Each key on the operation panel on the display is shown in reverse video at the same time the key is pressed, and the name of the pressed key is displayed.

[2] Buzzer Test

Checks for the operation panel buzzer.

The buzzer will sound. The buzzer automatically stops after it sounds for a specified length of time.

[3] Light Test

Checks for the control panel light.

The brightness of the operation panel is gradually intensified at four levels.

8.3.1.4 Check of the Performance Monitor (MON Display)

The radar system is equipped with an interswitch.

For checking the performance unit, set the interswitch connection to straight, i.e. No.1 scanner is connected to No.1 display unit as the Master.

Procedures

1) **Open the MON Display menu by performing the following menu operation.**

Main → 9. Test Menu → 4. MON Display

[1] Check the Transmitter System (*including Magnetron)

Procedures

1) **Check the attenuation value.**

*Transmitter System

Attenuation Value

Initial value: 8.0 bar

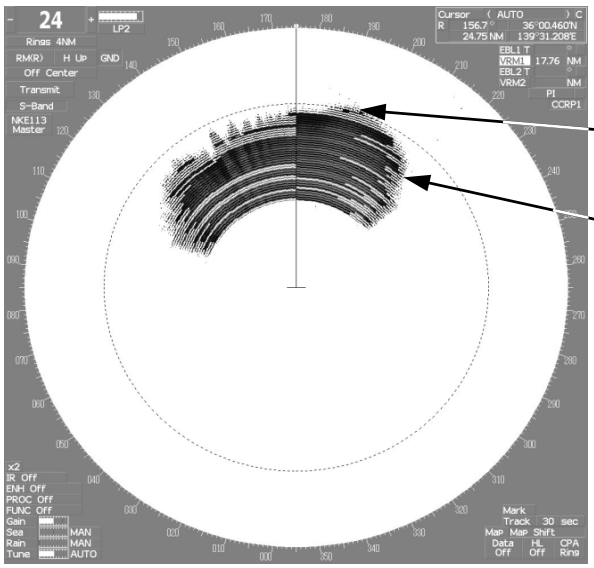
Normal operating range: -6.9dB to +2.0dB
Performance degradation range: -15.0dB to -7.0dB

About one minute after opening this menu item, check the transmitter attenuation value.

[2] Check the Receiver System

Procedures

1) **Turn the [VRM] dial to make adjustments so that the farthest point of the performance monitor pattern.**



Adjust the VRM to the farthest point of the performance monitor pattern

Performance Monitor pattern (When the performance of receiver unit is degraded, the pattern distance will be shorter.)

2) **Check the attenuation value.**

*Receiver System		
	MON Pattern Range	Initial value: 18.0NM
	Attenuation Value	Normal operating range : -2.9dB to +3.5dB Performance degradation range: -15.0dB to -3.0dB

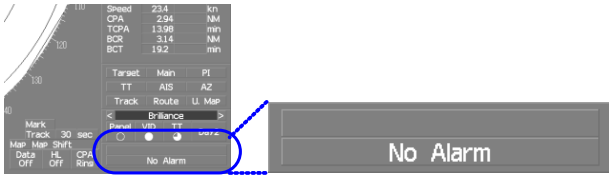
If Receiver System Attenuation Value display is under -3 dB or Transmitter System Attenuation Value display is under -7 dB with the performance monitor test, radar should be checked by service engineer. This means that the TX/RX unit may be faulty. Consult with the near-by dealer or our sales department.

8

8.3.1.5 System Alarm Log display

Displays previously occurred system alarms with the dates and times when they occurred.

The current alarm is displayed at the lower right of the radar display. For details, refer to Section 9.1.1 "List of Alarms and other Indications".



The Alarm log display button (page2-31 Alarm) is clicked, in the same way as that one.

To erase the alarm logs, press the [All Clear] button in the log display window.

8.3.1.6 System Information

Displays the current system information.

Indicator	Processor software version information
TXRX	Scanner software version information
System No.	System number
TX Time	Total magnetron transmitting time (Total time during which radar was transmitted)
→ X-Band	
→ S-Band	
Motor Time	Total operating time (Total power-on time)
TXRX Total Time	Total operating time of the scanner unit (Total power-on time of the scanner unit)
Total Time	Total operating time of the display unit (Total power-on time of the display unit)

8.3.1.7 Magnetron Current

Displays the Magnetron Current bar indicating the magnetron current to check.

When a 48 NM range is set, the magnetron current is normal if the Magnetron Current bar reads the value below.

10kW (JMA-9110) : **4** to **7** scale marks
25/30kW (JMA-912* or JMA-913*) : **6** to **9** scale marks

Note: Displays the Magnetron Current bar instability indicating in sector blank area, but it is normal operating.
For how to setting sector blank function, see Section 7.2.2 "Sector Blank Setting (Sector Blank)".

8.4 REPLACEMENT OF MAJOR PARTS

The system includes parts that need periodic replacement. The parts should be replaced as scheduled. Use of parts over their service life can cause a system failure.

CAUTION

- **Turn off the main power source before replacing parts. Otherwise, an electric shock or trouble may be caused.**
- **Before replacing the magnetron, turn off the main power source and wait for 5 minutes or more until the high voltage circuits are discharged. Otherwise, an electric shock may be caused.**
- **Take off your wrist watch when bringing your hands close to the magnetron. Otherwise, your watch may be damaged because the magnetron is a strong magnet.**
- **Two or more persons shall replace the liquid crystal monitor. If only one person does this work, he may drop the LCD, resulting in injury.**
- **Even after the main power source is turned off, some high voltages remain for a while. Do not contact the inverter circuit in the LCD with bare hands. Otherwise, an electric shock may be caused.**

8.4.1 Parts Expected for Periodic Replacement

Here are parts expected for periodic replacement

Part name	Interval	Radar model	Part type	Part code
1. Magnetron	4,000 hours	JMA-9110-6XA/6XAH	MAF1565N[i]	5VMAA00102
		JMA-9122-6XA/9XA/6XAH JMA-9123-7XA/9XA	M1568BS[i]	5VMAA00106
		JMA-9132-SA JMA-9133-SA	M1555[i]	5VMAA00104
2. Motor	10,000 hours	JMA-9110-6XA/6XAH	H-7BDRD0048*[ii]	7BDRD0048*[ii]
		JMA-9122-6XA/9XA JMA-9123-7XA/9XA	MDBW10822*[ii]	MDBW10822*[ii]
		JMA-9122-6XAH	H-7BDRD0045*[ii]	7BDRD0045*[ii]
		JMA-9132-SA JMA-9133-SA	MDBW10823*[ii]	MDBW10823*[ii]
3. Fan (Scanner Unit)	20,000 hours	JMA-9122-6XA/9XA/6XAH JMA-9132-SA	H-7BFRD0002*[ii]	7BFRD0002*[ii]
4. LCD PANEL	50,000 hours		CML-799L	CML-799L
5. Fan				
(Radar Process Circuit)	20,000 hours		109R0612S4D13	5BFAB00588
(Power Supply)	20,000 hours		H-7BFRD0006*[ii]	7BFRD0006*[ii]
7. Backup battery	5 years		CR2032	5ZBCJ00012

i. Use a genuine magnetron.
ii. "*" means revision, such as A, B and so on.

8.4.2 Replacement of magnetron

Replacement of magnetron must be made by specialized service personnel.
For details, refer to Service Manual.
Use genuine parts as mentioned above.

When mounting a new magnetron, do not touch the magnet with a screwdriver or put it on an iron plate. After replacement, connect the lead wire correctly.

Handling of Magnetron under Long-Time Storage

The magnetron that has been kept in storage for a long time may cause sparks and operate unstably when its operation is started. Perform the aging in the following procedures:

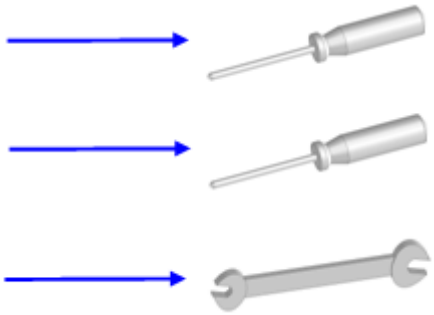
1) **Warm up the cathode for a longer time than usually. (20 to 30 minutes in the STBY state.)**

2) **Start the operation from the short pulse range and shift it gradually to the longer pulse ranges. If the operation becomes unstable such as the magnetron current is unstable, in during this process, return it to the standby mode immediately. Keep the state for 5 to 10 minutes until the operation is restarted.**

8.4.2.1 Scanner Unit NKE-1130

[Required tools]

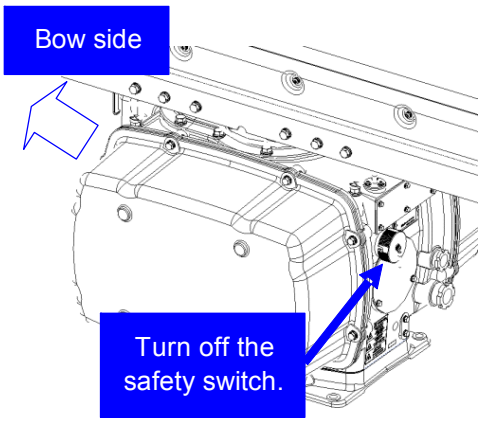
- A Phillips screwdriver for 4 mm screw
- A Phillips screwdriver for 6 mm screw
- A wrench (width across flats 13 mm, for M8 screws)



[Replacement procedure]

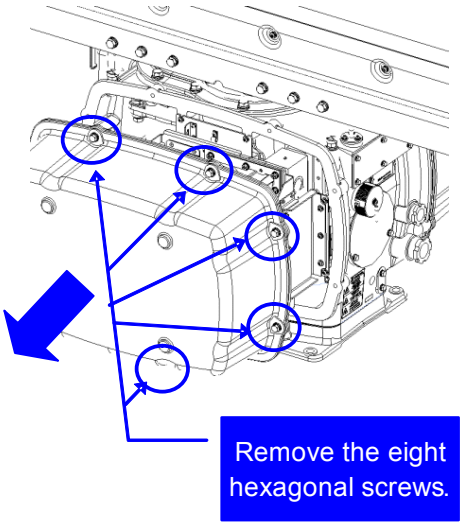
1) *Before starting part replacement work, turn off the safety switch of the scanner unit.*

   The safety switch is located on the rear (stern) side. Remove the cover and turn off (to the lower side) the safety switch.



2) *Remove the pedestal cover.*

   Make sure that there is no foreign matter or dust adhered to the gasket when you put the cover on.

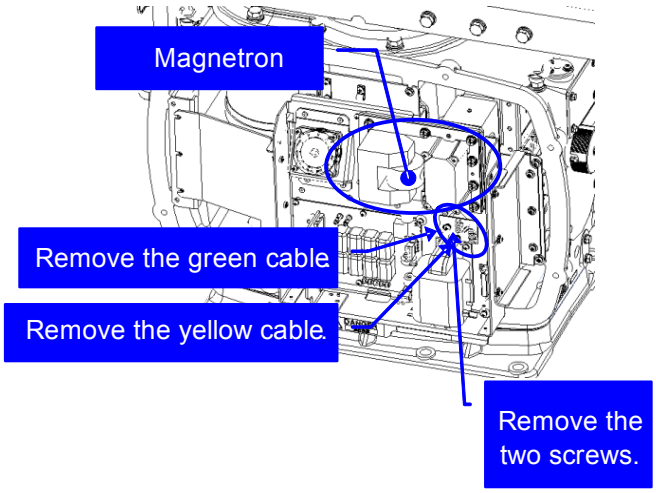


Removing the port side cover

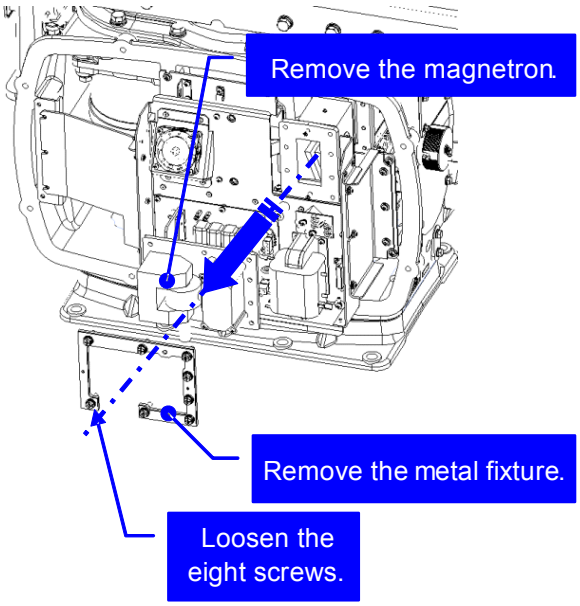
8

3) *Remove the cover on the left (port) side and check that there is no remaining electric charge between J2101 pin 1 and J2101 pin 3 in the modulation circuit board CPA-264. (Multimeter requires DC1000V input capability).*

Remove the two screws (M4) holding the magnetron cables (both yellow and green).



4) *Remove the eight screws (M6) to remove the fixture holding the magnetron. The screws cannot be removed from the fixture, so loosen the all eight screws and remove the magnetron together with the fixture.*



CAUTION
The magnetron is held by a hook, but be careful not to let it fall.

CAUTION
Use a non-magnetic screwdriver. If the magnetron comes into contact with any metal (tool), its performance may deteriorate.

5) *Install the new magnetron together with the fixture and tighten the screws to hold the cables.*

Follow the removal procedure in the reverse order.

Do not forget to tighten the screws and connect the cables.

[Operation check]

After you have completed the replacement work, follow the procedure below to check the operation.

1) *Turn on the power supply for the radar. Allow sufficient time for the radar to be preheated (about 20 to 30 minutes / bring the radar unit to STBY mode).*

2) *Start emitting radio waves from the short pulse range and gradually change the emissions to the long pulse range. Open the service engineer menu to perform tuning adjustment.*

   If operation becomes unstable such as the magnetron current is unstable, bring the radar unit back to STBY mode and restart emission after allowing for an interval of 5 to 10 minutes.

3) *Emit radio waves in long pulse range mode for about 15 minutes and reopen the service engineer menu to perform tuning adjustment.*

   Adjust the setting in the service engineer menu until the tuning indication bar on the display unit reaches the 8th calibration marking.

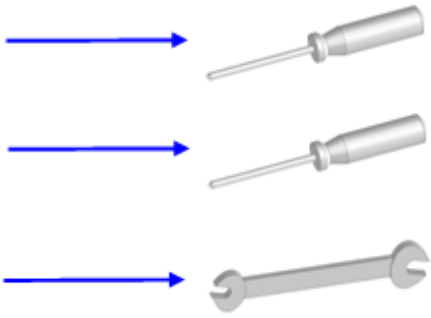
   Check in the service engineer menu that the magnetron current is between the 6th and 9th calibration markings.

4) *Finally, initialize the transmission time in the service engineer menu.*

8.4.2.2 Scanner Unit NKE-2254, NKE-1125

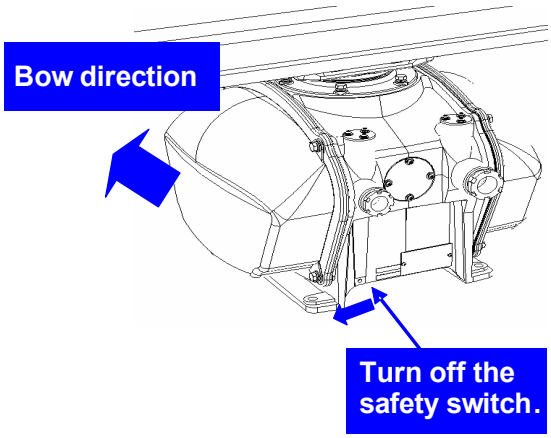
[Required tools]

- A Phillips screwdriver for 4 mm screw
- A Phillips screwdriver for 6 mm screw
- A wrench (width across flats 13 mm, for M8 screws)



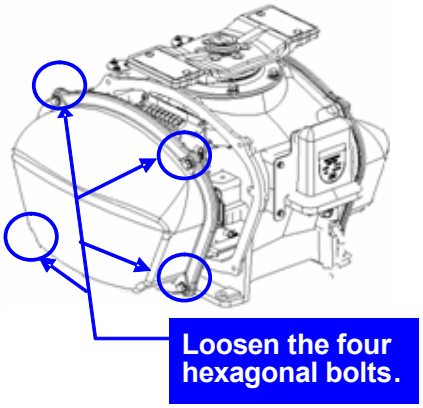
[Replacement procedure]

1) *Before starting part replacement work, turn off the safety switch of the scanner unit.*



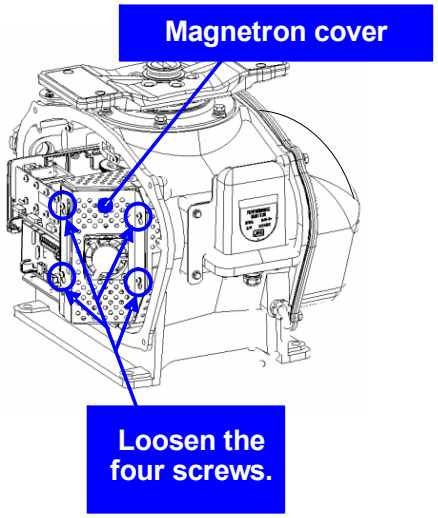
2) *Loosen the hexagonal bolts (4) and remove the pedestal cover.*

Make sure that there is no foreign matter or dust adhered to the gasket when you put the cover on.



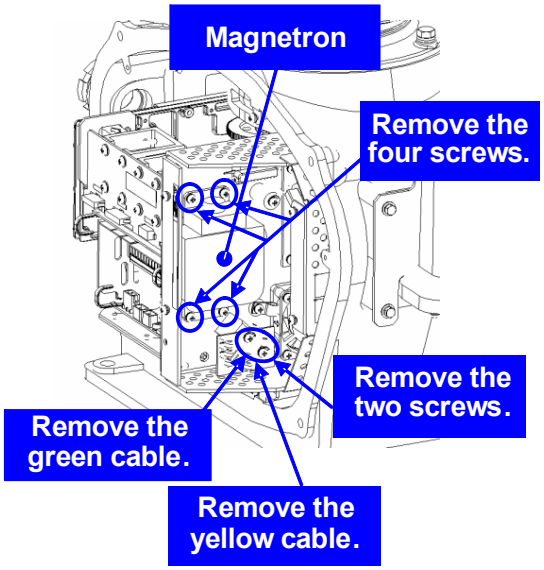
When the starboard side cover is removed

3) *Loosen the screws (four M4 screws) to remove the magnetron cover.*



4) *Make sure there is no charge remaining between J2101 pin 1 and J2101 pin 3 in the modulation circuit board CPA-264 (Multimeter requires DC1000V input capability), and then remove the screws (two M4 screws) holding the magnetron cables (yellow and green) in place.*

5) *Remove the screws (four M4 screws) holding the magnetron in place, then replace the magnetron after cutting the leads (yellow and green) for the replacement magnetron to an appropriate length.*



CAUTION
Use a non-magnetic screwdriver. If the magnetron comes into contact with any metal (tool), its performance may deteriorate.

6) *After having replaced the magnetron, reassemble the unit by following the disassembly procedure in the reverse order.*

Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables.

CAUTION
Extreme care should be taken to connect the leads (yellow and green) to the magnetron for prevention of contact with other parts or the casing. Contact may cause them to discharge.

[Operation check]

After you have completed the replacement work, follow the procedure below to check the operation.

1) *Turn on the power supply for the radar. Allow sufficient time for the radar to be preheated (about 20 to 30 minutes / bring the radar unit to STBY mode).*

2) *Start emitting radio waves from the short pulse range and gradually change the emissions to the long pulse range. Open the service engineer menu to perform tuning adjustment.*

If operation becomes unstable such as the magnetron current is unstable, bring the radar unit back to STBY mode and restart emission after allowing for an interval of 5 to 10 minutes.

3) *Emit radio waves in long pulse range mode for about 15 minutes and reopen the service engineer menu to perform tuning adjustment.*

Adjust the setting in the service engineer menu until the tuning indication bar on the display unit reaches the 8th calibration marking.

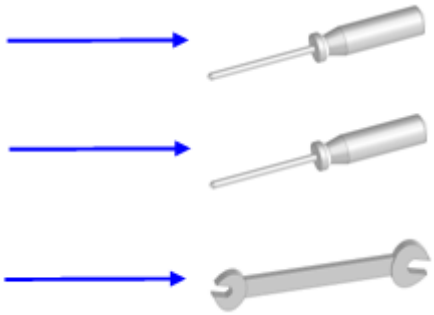
Check in the service engineer menu that the magnetron current is between the 6th and 9th calibration markings.

4) *Finally, initialize the transmission time in the service engineer menu.*

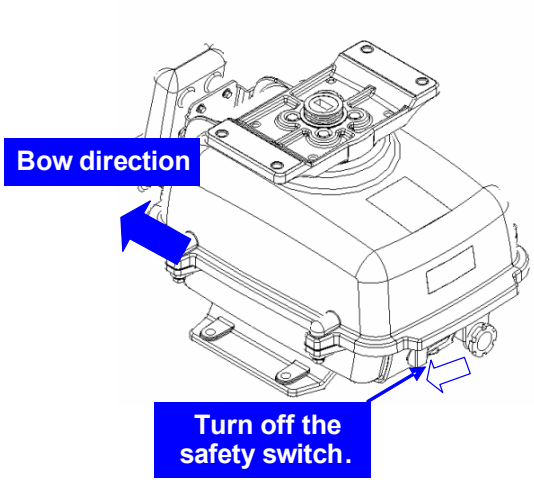
8.4.2.3 Scanner Unit NKE-2103

[Required tools]

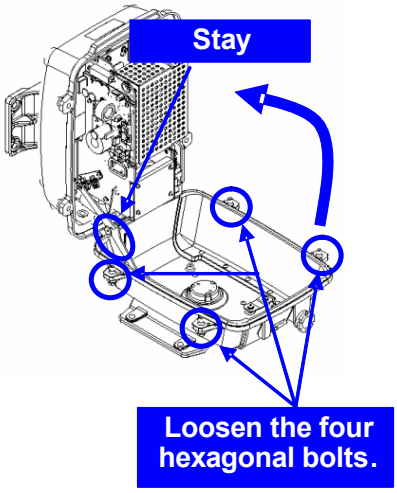
- A Phillips screwdriver for 4 mm screw
- A Phillips screwdriver for 6 mm screw
- A wrench (width across flats 13 mm, for M8 screws)



1) *Before starting part replacement work, turn off the safety switch on the bottom of the scanner unit.*

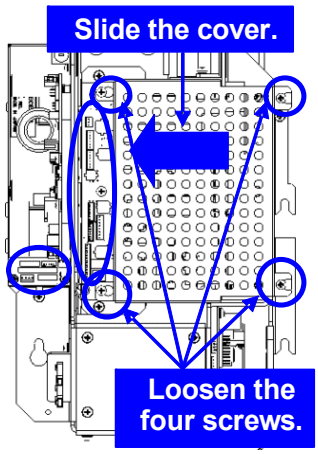


2) *Loosen the hexagonal bolts (four bolts) and open the upper cover until the stopper of the stay operates.*

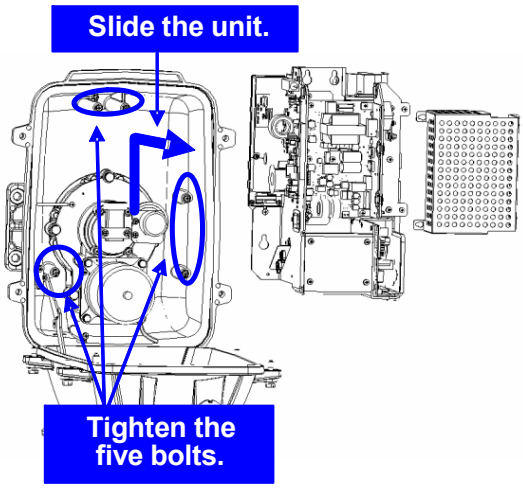


CAUTION
When closing the upper cover, release the stay stopper and then tighten the cover.

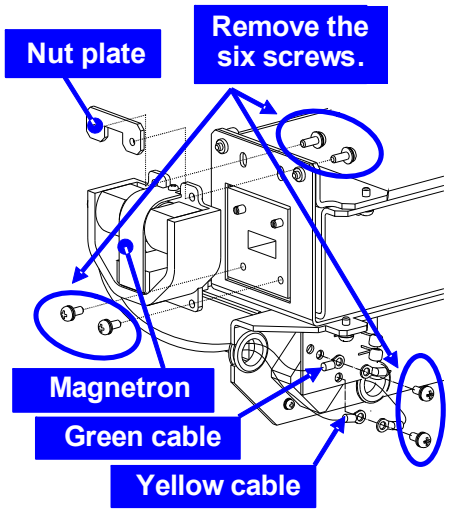
1) *Loosen the screws (four M4 screws), remove the transmitter-receiver unit cover, and remove the cables connected to the transmitter-receiver unit (ten cables). Slide the cover of the transmitter-receiver unit to remove it.*



2) *Loosen the bolts (five M5 bolts) and remove the transmitter-receiver unit. Slide the transmitter-receiver unit upward to remove it.*



3) *Remove the screws (six M4 screws) holding the magnetron in place and replace the magnetron.*



CAUTION
Use a non-magnetic screwdriver. If the magnetron comes into contact with any metal (tool), its performance may deteriorate.

4) *Cut the leads (yellow and green) for the replacement magnetron to an appropriate length, then tighten the screws and fix the cables in place.*

After having replaced the magnetron, reassemble the unit by following the disassembly procedure in the reverse order.

CAUTION
Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables.

CAUTION
Extreme care should be taken to connect the leads (yellow and green) to the magnetron for prevention of contact with other parts or the casing.

[Operation check]

After you have completed the replacement work, follow the procedure below to check the operation.

1) *Turn on the power supply for the radar. Allow sufficient time for the radar to be preheated (about 20 to 30 minutes / bring the radar unit to STBY mode).*

2) *Start emitting radio waves from the short pulse range and gradually change the emissions to the long pulse range. Open the service engineer menu to perform tuning adjustment.*

   If operation becomes unstable such as the magnetron current is unstable, bring the radar unit back to STBY mode and restart emission after allowing for an interval of 5 to 10 minutes.

3) *Emit radio waves in long pulse range mode for about 15 minutes and reopen the service engineer menu to perform tuning adjustment.*

   Adjust the setting in the service engineer menu until the tuning indication bar on the display unit reaches the 8th calibration marking.

   Check in the service engineer menu that the magnetron current is between the 4th and 7th calibration markings.

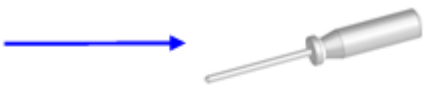
4) *Finally, initialize the transmission time in the service engineer menu.*

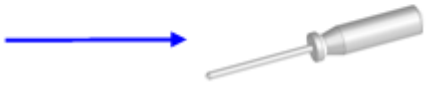
8.4.2.4 Transmitter Receiver Unit NTG-3230

[Required tools]

A flatblade screwdriver for 6 mm screws

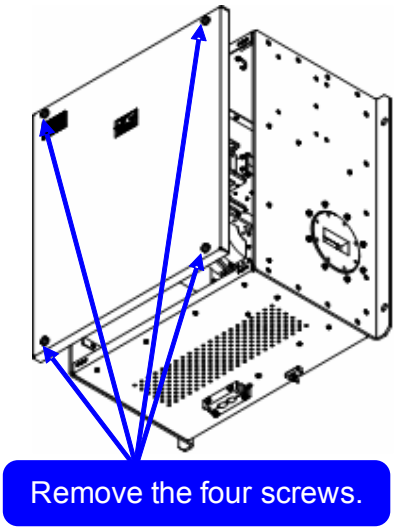
- A Phillips screwdriver for 4 mm screw
- A Phillips screwdriver for 6 mm screw



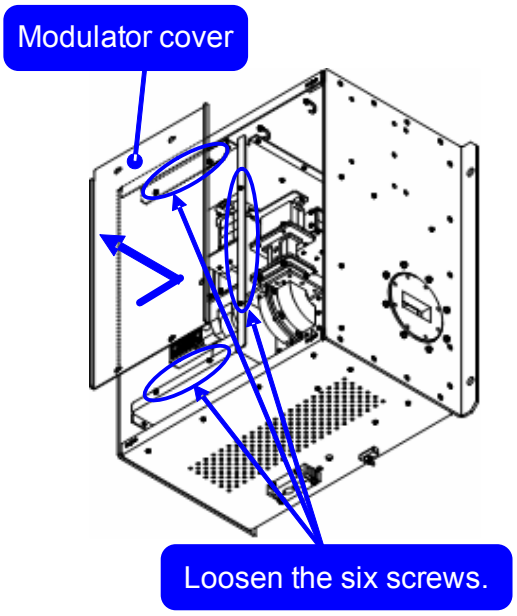


[Replacement procedure]

1) *Loosen the four screws and remove the cover.*
The screws are slotted captive screws.Use a flatblade screwdriver.



2) *Remove the screws (six M4 screws) and slide the modulator cover to the right to remove it.*



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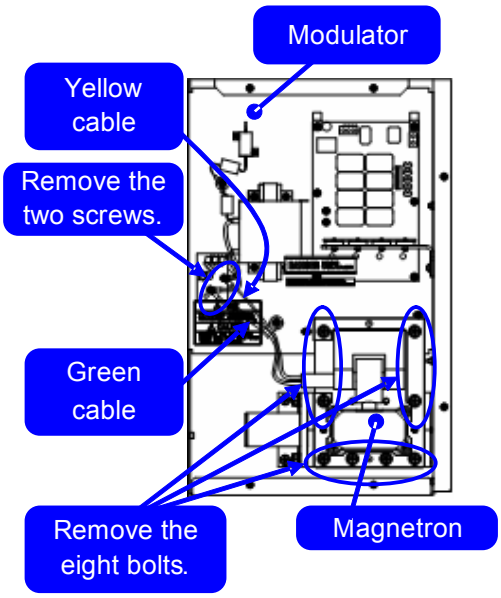
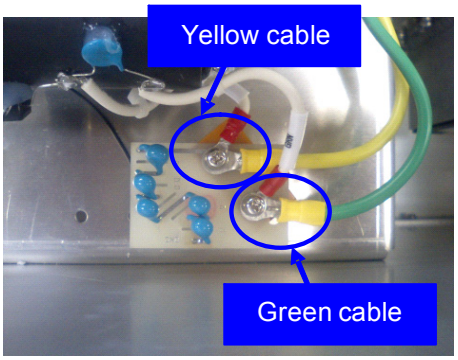
3) *Remove the screws holding the cables (two M4 screws) and the bolts holding the magnetron (eight M6 screws) and remove the metal fitting and the magnetron.*



CAUTION
Use a non-magnetic screwdriver. If the magnetron comes into contact with any metal (tool), its performance may deteriorate.

4) *Be careful to attach the colored cables (yellow and green) to the correct connections on the replacement magnetron.*

After having replaced the magnetron, reassemble the unit by following the disassembly procedure in the reverse order.



CAUTION
Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables.

[Operation check]

After you have completed the replacement work, follow the procedure below to check the operation.

1) *Turn on the power supply for the radar. Allow sufficient time for the radar to be preheated (about 20 to 30 minutes / bring the radar unit to STBY mode).*

2) *Start emitting radio waves from the short pulse range and gradually change the emissions to the long pulse range. Open the service engineer menu to perform tuning adjustment.*

If operation becomes unstable such as the magnetron current is unstable, bring the radar unit back to STBY mode and restart emission after allowing for an interval of 5 to 10 minutes.

3) *Emit radio waves in long pulse range mode for about 15 minutes and reopen the service engineer menu to perform tuning adjustment.*

Adjust the setting in the service engineer menu until the tuning indication bar on the display unit reaches the 8th calibration marking.

Check in the service engineer menu that the magnetron current is between the 6th and 9th calibration markings.

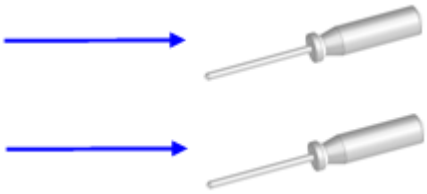
4) *Finally, initialize the transmission time in the service engineer menu.*

8.4.2.5 Transmitter Receiver Unit NTG-3225

[Required tools]

A flatblade screwdriver for 6 mm screws

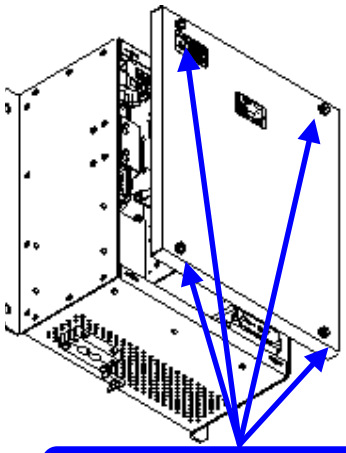
・A Phillips screwdriver for 4 mm screw



[Replacement procedure]

1) *Loosen the four screws and remove the cover.*

The screws are slotted captive screws. Use a flatblade screwdriver.



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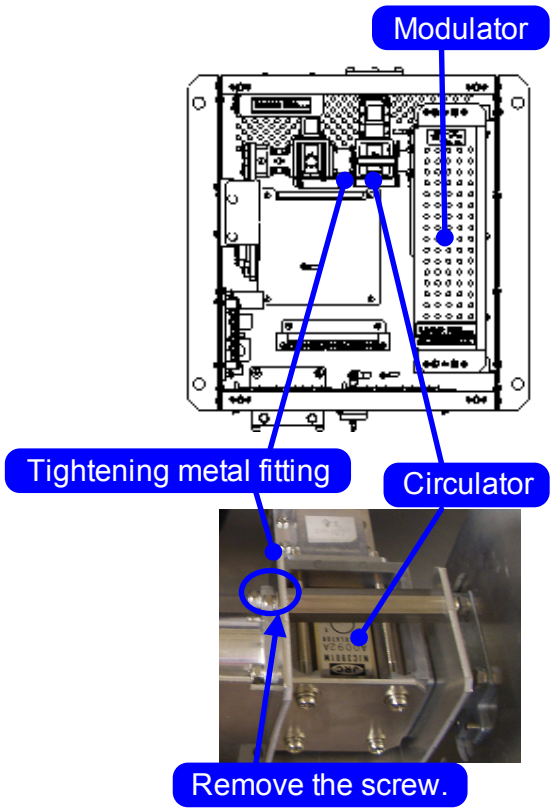
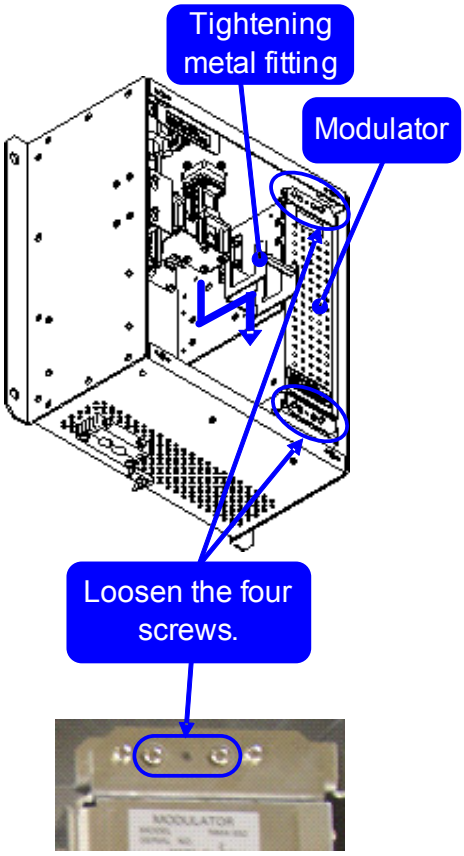
2) *Loosen the upset head bolt (one M4 bolt), and slide the tightening metal fitting, located between the modulator and the circulator, to remove it.*

The magnetron is installed within the modulator.

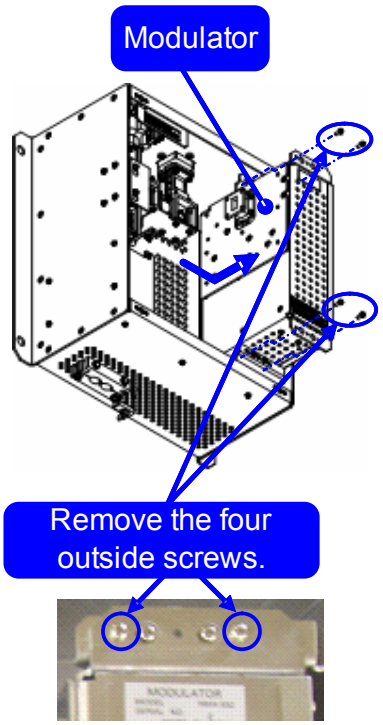


3) *Loosen the inside screws of the modulator (four M4 screws).*

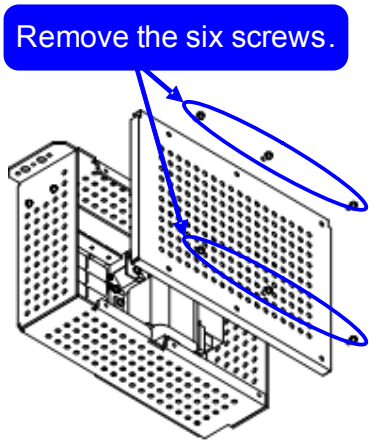
Removing the outside screws makes it possible to slide the modulator.



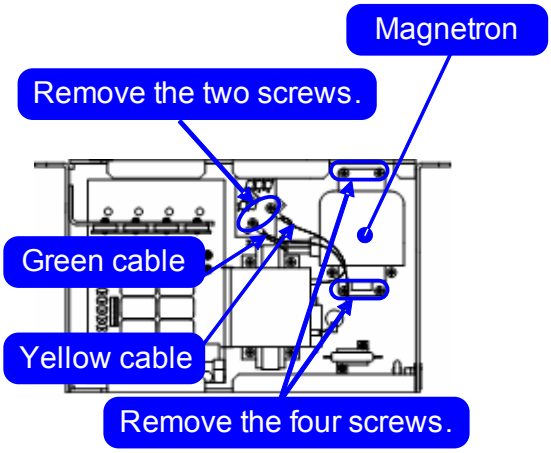
4) *Remove the cables connected to the modulator and the screws on the outside of the modulator (four M4 screws) and slide the modulator to the right to remove it.*



5) *Remove the screws (six M4 screws) and take off the modulator cover.*



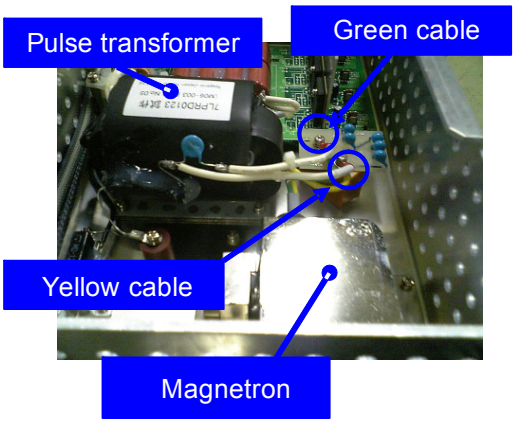
6) *Remove the screws holding the cables (two M4 screws) and the screws holding the magnetron (four M4 screws) and remove the metal fitting and the magnetron.*



CAUTION
Use a non-magnetic screwdriver. If the magnetron comes into contact with any metal (tool), its performance may deteriorate.

7) *Be careful to attach the colored cables (yellow and green) to the correct connections on the replacement magnetron.*

After having replaced the magnetron, reassemble the unit by following the disassembly procedure in the reverse order.



CAUTION
Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables.

[Operation check]

After you have completed the replacement work, follow the procedure below to check the operation.

1) *Turn on the power supply for the radar. Allow sufficient time for the radar to be preheated (about 20 to 30 minutes / bring the radar unit to STBY mode).*

2) *Start emitting radio waves from the short pulse range and gradually change the emissions to the long pulse range. Open the service engineer menu to perform tuning adjustment.*

If operation becomes unstable such as the magnetron current is unstable, bring the radar unit back to STBY mode and restart emission after allowing for an interval of 5 to 10 minutes.

3) *Emit radio waves in long pulse range mode for about 15 minutes and reopen the service engineer menu to perform tuning adjustment.*

Adjust the setting in the service engineer menu until the tuning indication bar on the display unit reaches the 8th calibration marking.

Check in the service engineer menu that the magnetron current is between the 6th and 9th calibration markings.

4) *Finally, initialize the transmission time in the service engineer menu.*

8.4.3 Replacement of Motor

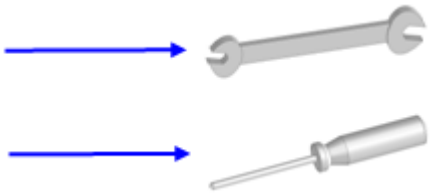
Replacement of motor must be made by specialized service personnel.

For details, refer to Service Manual.

8.4.3.1 Scanner Unit NKE-1139/1130

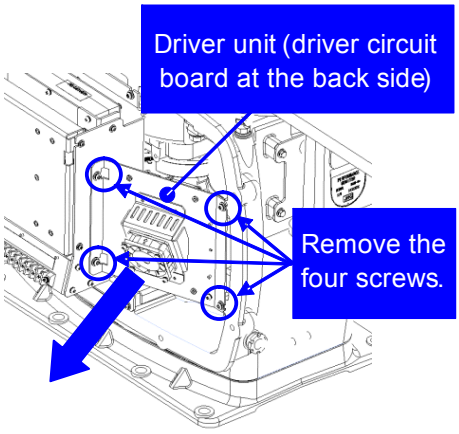
[Required tools]

- A wrench (width across flats 17 mm, for M10 screws)
- A Phillips screwdriver for 4 mm screw
- Tools for removing the cover from the scanner unit.(Refer to the 8.4.2.1)

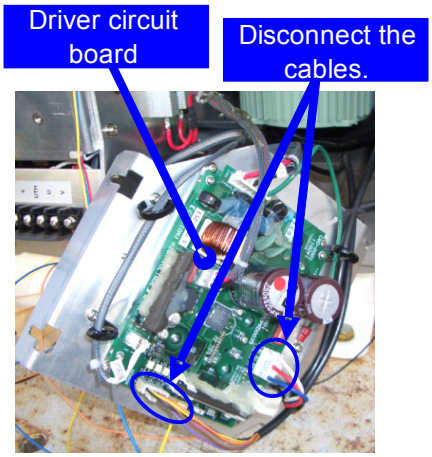


[Replacement procedure]

1) *Remove the cover on the right (starboard) side (see 8.4.2.1) and loosen the four screws (M4) to remove the driver unit, which has the motor driver circuit board on its back side.*

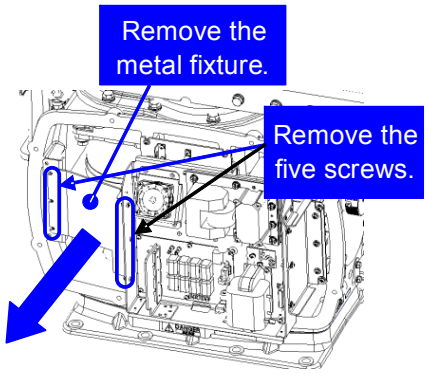


Disconnect the cables connecting the motor to the motor driver circuit board.

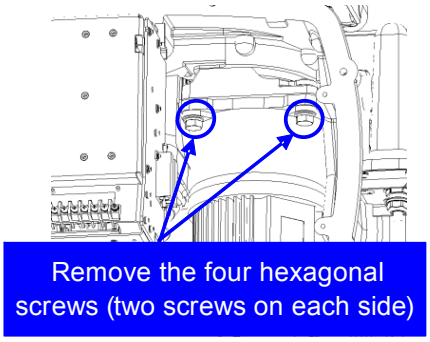


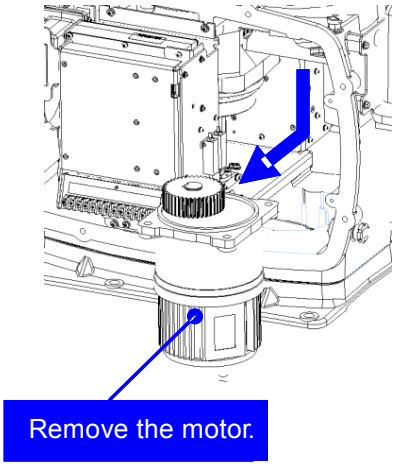
8

2) *Remove the cover on the left (port) side and remove the five screws (M5) to remove the fixture.*



3) *Remove the four hexagonal screws (M10x40, SW10, and W10) that hold the motor from both the right and left sides to remove the motor.*

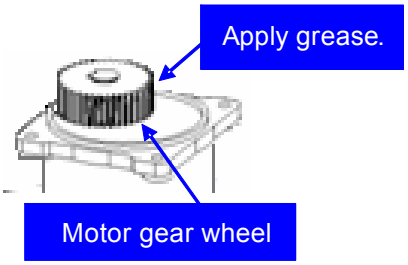




4) *Apply grease to the gear wheel of the new motor.*

5) *Install the new motor in the scanner unit and secure it using the hexagonal screws. Tighten the screws with the specified torque (380 kgf-cm).*

6) *After replacing the motor, assemble the unit in the reverse order of the disassembly procedure.*



CAUTION
Do not forget to tighten the screws and connect the cables.

[Operation check]

After you have completed the replacement work, follow the procedure below to check the operation.

1) *Turn on the radar power supply. After the countdown is completed, start emission and check that the radar image appears without error. Check that you do not hear any unusual sound when the motor starts, rotates, and stops.*

2) *Open the service engineer menu to initialize the motor rotation time.*

8.4.3.2 Scanner Unit NKE-1125/2254

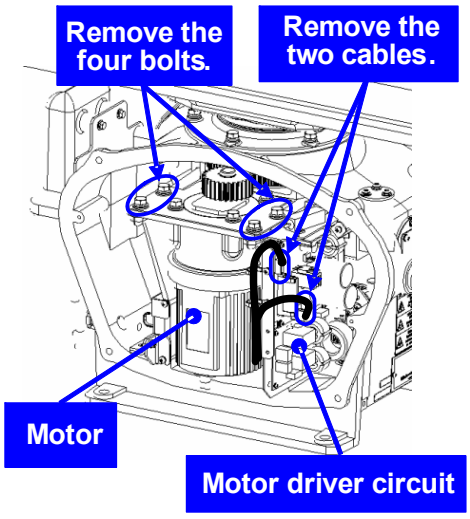
[Required tools]

- Single-ended wrench (width across flats 17 mm for M8 bolts)
- Tools for removing the cover from the scanner unit.(Refer to the 8.4.2.2)

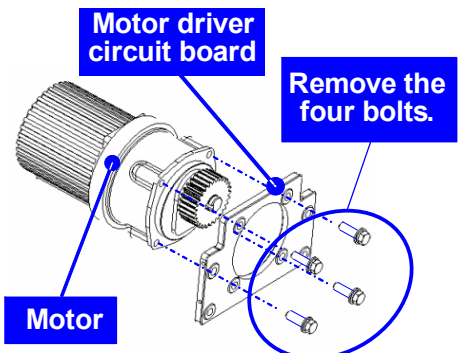
[Replacement procedure]

1) *Remove the cover on the left (port) side (see Section 8.4.2.2) and remove the cables connected to the motor driver circuit board.*

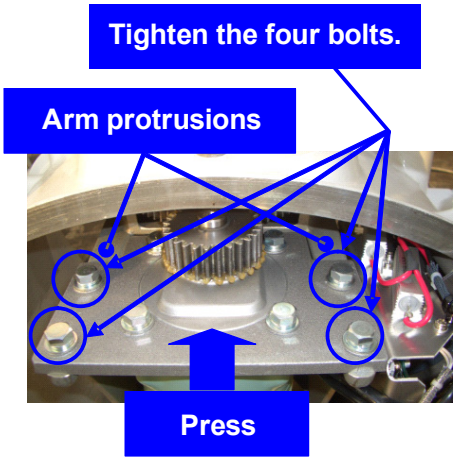
2) *Remove the hexagonal bolts (four M8 bolts) and remove the motor.*



3) *Remove the hexagonal bolts (four M8 bolts) and remove the installation plate from the motor.*



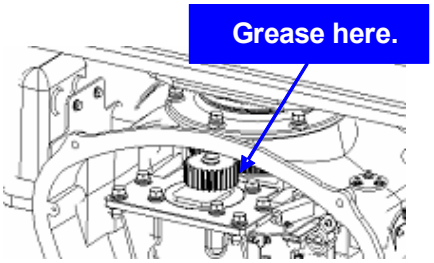
4) *Attach the installation plate to the replacement motor. Do not forget to tighten the hexagonal bolts to an appropriate torque (210 kgf-cm) so they are free of looseness.*



5) *Install the motor into the scanner unit. Press the motor against the protrusions of the arm fixed to the motor on which the arm extends through the wall of the casing, adjust it to minimize backlash, and fix it in place.*

Do not forget to tighten the hexagonal bolts, to an appropriate torque (140 kgf-cm) so they are free of looseness.

6) *After having installed the motor, grease the gear wheel.*



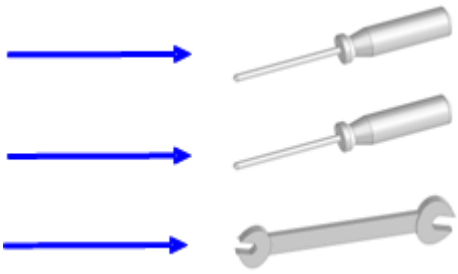
7) *After having replaced the motor, reassemble the unit by following the disassembly procedure in the reverse order.*

CAUTION
Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables.

8)

8.4.3.3 Scanner Unit NKE-2103

[Required tools]

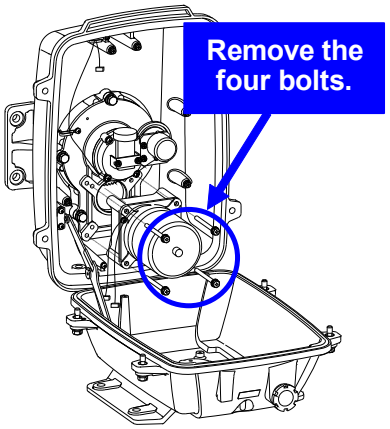


- A Phillips screwdriver for 4 mm screw
- A Phillips screwdriver for 5 mm screw
- Single-ended wrench (width across flats 10 mm for M6 bolts)
- Tools for removing the cover from the scanner unit.(Refer to the 8.4.2.3)

[Replacement procedure]

1) *Open the upper cover (see Section 8.4.2.3) to remove the transmitter-receiver unit.*

2) *Remove the hexagonal bolts (four M6 bolts) and remove the motor. Grease the gear wheel of the replacement motor and place it in the casing. Do not forget to tighten the hexagonal bolts to an appropriate torque (72 kgf-cm) so they are free of looseness.*



3) *After having replaced the motor, reassemble the unit by following the disassembly procedure in the reverse order.*

CAUTION
Do not forget to tighten the bolts and screws, and do not forget to reconnect the cables.

CAUTION
Clamp the cables so they do not interfere with the rotation of the motor's rotors.

[Operation check]

After you have completed the replacement work, follow the procedure below to check the operation.

1) *Turn on the radar and emit radar waves once the countdown is finished, and check that the radar image is correctly displayed. Check that the motor does not make any abnormal sound when it starts to rotate, while it is rotating, or when it stops.*

8.4.4 Replacement of 23inch LCD CML-799

Replacement of LCD monitor must be made by specialized service personnel.

For details, refer to Service Manual.

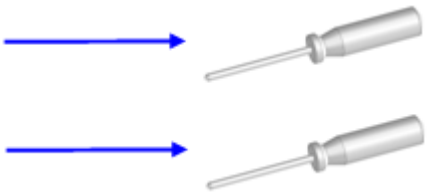
CAUTION
Do not touch the LCD screen directly with your fingers.

CAUTION
Do not touch the AR filter directly with your fingers.

CAUTION
Perform the replacement work on a soft cloth to avoid damage to the LCD screen and other parts.

[Required tools]

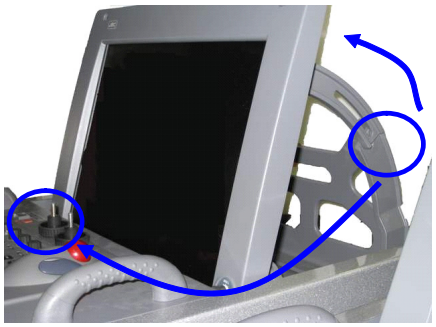
- A Phillips screwdriver for 4 mm screws
- A Phillips screwdriver for 6 mm screws



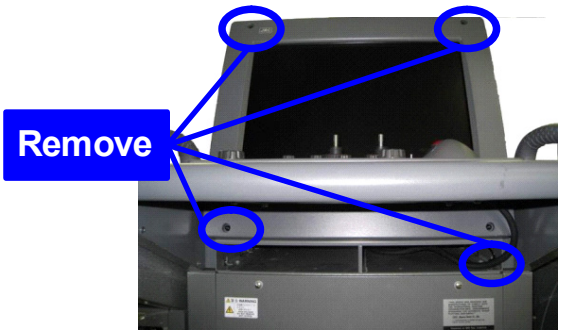
[Disassembly]

1) *Remove the tilt fixing handle (standalone type only).*

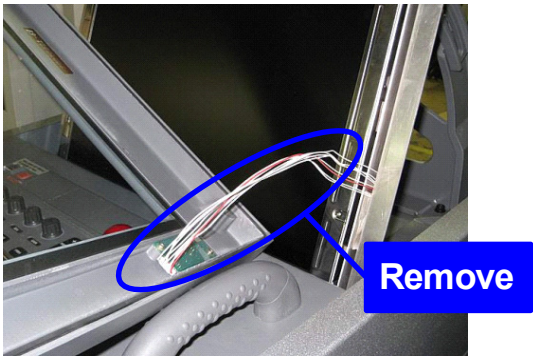
2) *Tilt up the screen as much as you can (standalone type only).*



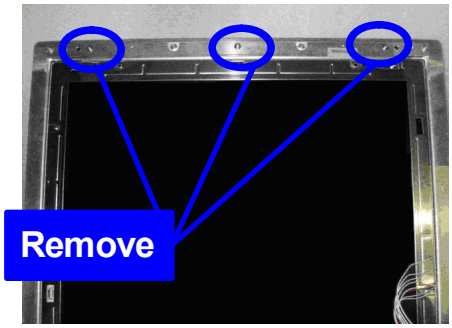
3) *Remove the screws (M6) from the four corners and displace the face cover.*

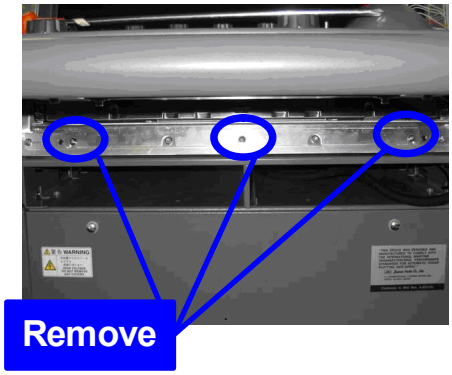


4) *LRemove the LCD operation circuit cables and remove the face cover.*



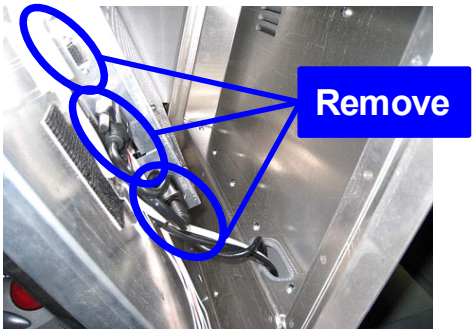
5) *Remove six M4 screws.*





6) *Displace the module and remove the three cables.*

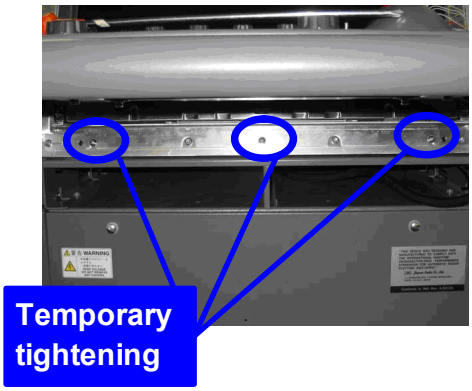
7) *Remove the LCD module.*



8

[Assembly]

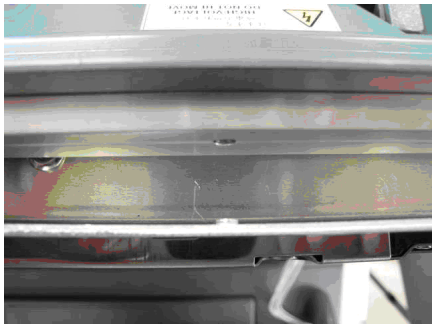
1) *Tighten the lower three M4 screws halfway.*



2) *Connect the cables to the LCD module.*

3) *Align the module to the lower three screws and insert it downward.*

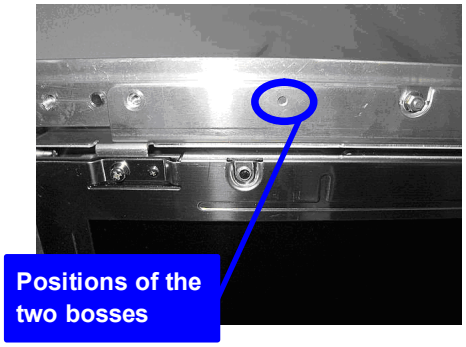
4) *Check the positions of the two bosses and ensure that appropriate space is maintained under the LCD module. Tighten the six screws evenly.*



5) *Connect the LCD operation circuit cables and attach the face cover.*

6) *Tighten the screws at the four corners.*

7) *Attach the tilt fixing handle.*



[Operation Check]

1) *After completing the replacement procedures, start the system to make sure that images are displayed properly.*

2) *Turn the brightness knob to make sure the brightness can be changed between the minimum and the maximum levels.*

8.4.5 Replacement of Backup Battery

Replacement of backup battery must be made by specialized service personnel.

For details, refer to Service Manual.

A coin-cell battery maintains radar system configuration, date, and time information while power off condition. Radar system configuration is saving to non-volatile memory at fixed intervals.

8.4.5.1 About the Battery Alarm

If Battery Low is appeared at the lower-right of the display when start up the radar system, the battery has not enough time left to live. We recommend to replace the battery.

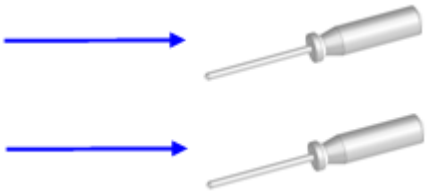
If Battery Dead is appeared at the lower-right of the display when start up the radar system, the battery has no time left to live. There is a necessary to replace the battery. In This condition, this radar system is restored configuration information from flash memory and normal operation is available. However, you turned of the radar system before saving to flash memory, the configuration information is maybe lost. In this case, you must setup the configuration again.

About disposal of used battery, refer to Section 10.2.

8.4.5.2 How to Replacement of Backup Battery

[Required tools]

- A flat tip screwdriver for 6 mm screws
- A Phillips screwdriver for 4 mm screws
- A flat tip nonconductive screwdriver for 3 mm screws



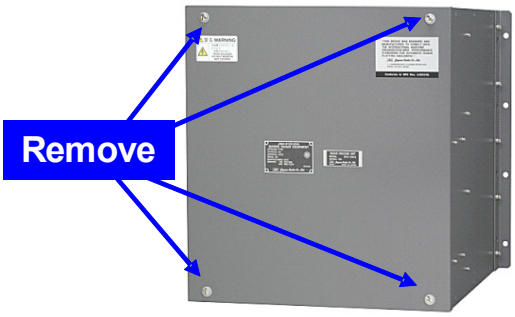
[Disassembly]

1) *Remove the four fixing screws to remove the cover from the display unit (NCD-4990).*

(A flat tip screwdriver for 6 mm screws)

For standalone type NCD-4990

For desktop type: NDC-1399-9

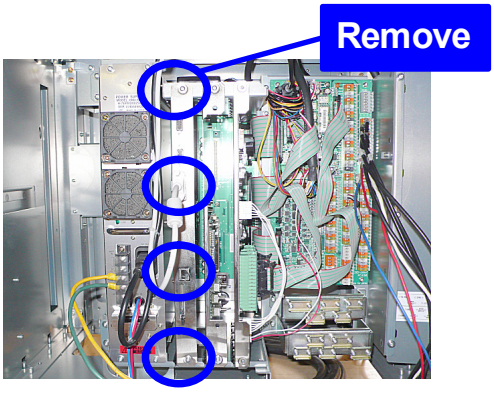


2) *Remove the cable connected to the radar process circuit board.*

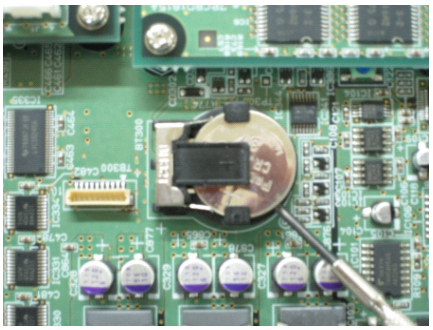
The radar process circuit is the first board from the left.

3) *Remove the two fixing screws (M4).*

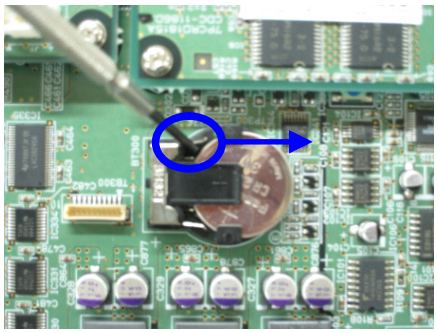
4) *Pull out the board to the front.*

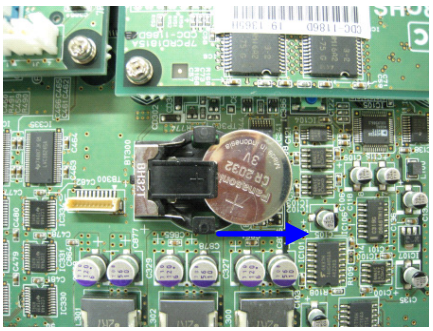


5) *Insert the flat tip **nonconductive** screwdriver for adjustment or some stick between the battery and the battery holder and lift the battery up.*



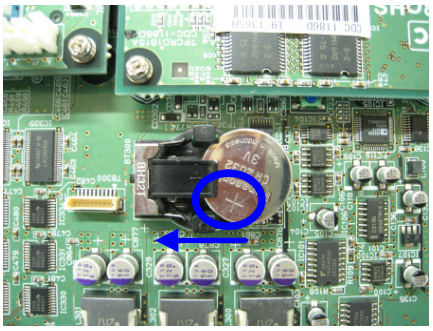
6) *Insert the flat tip **nonconductive** screwdriver for adjustment or some stick to the location shown in the figure below and slide the battery sideways to remove the battery.*





[Assembly]

1) *Check the polarity of the battery. Make sure that the battery's positive (+) side is facing up.*
2) *Slide the battery sideways into the battery holder.*
3) *Make sure that the battery is inserted fully.*



[Check Item]

1) *Check that no error message comes up.*
2) *Check that the system starts up normally.*

[Notes]

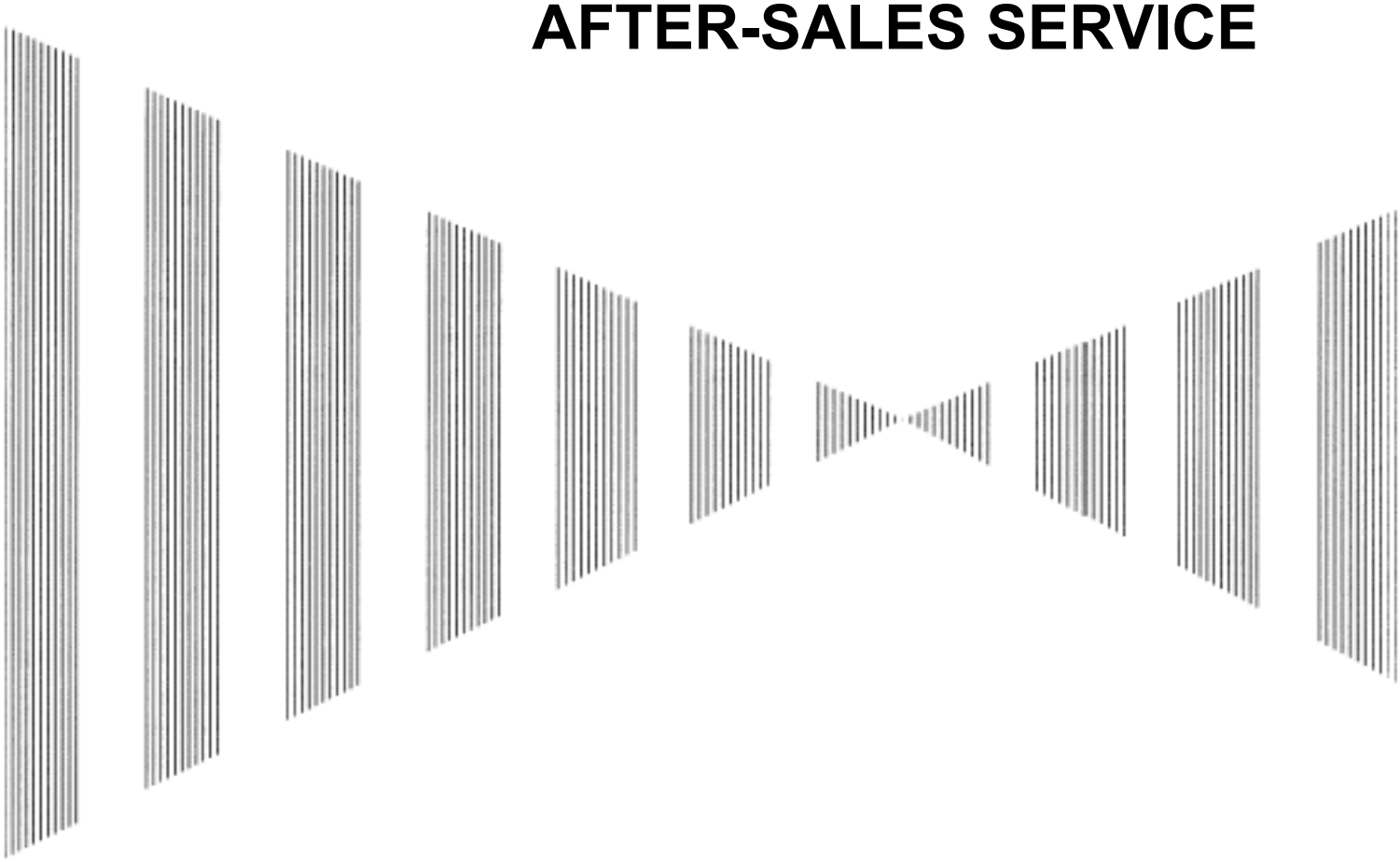
CAUTION
If you installed the battery with the wrong polarity, remove the battery immediately and do not use the same battery again.

CAUTION
During the procedures, do not put the battery on any circuit board or conductive item.

CAUTION
To dispose of a used battery, follow the instructions provided in Section 10.2 "DISPOSAL OF USED BATTERIES".

CAUTION
To disassemble of a used battery, have to use non-conductive tool.

SECTION 9
TROUBLE SHOOTING AND AFTER-SALES SERVICE



9.1 FAULT FINDING

In case of semiconductor circuits, it is deemed that there are few cases in which the used semiconductor devices have inferior quality or performance deterioration except due to insufficient design or inspection or by other external and artificial causes. In general, the relatively many causes are disconnection in a high-value resistor due to moisture, a defective variable resistor and poor contact of a switch or relay.

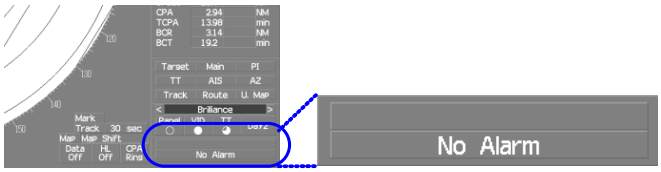
Some troubles are caused by defective parts, imperfect adjustment (such as tuning adjustment) or insufficient service (such as poor cable contact). It will also be effective to check and readjust these points.

9.1.1 List of Alarms and other Indications

If any of the following alarm occurs, the system displays the alarm message in red in order to attract the attention of operator. Other messages are displayed with the suitable color which is yellow or blue depending on the level of message importance.

Alarm:	Red	• Collision-related Alarm • Navigation Alarm • System Alarm
Warning:	Yellow	• System Warning
Infomation:	Blue	• Operation Information

Alarm message is displayed in the lower right of the display. For more details refer to page2-31 Alarm.



This section gives the list of alarms displayed by the system and other display lists.

Table9-1 : Critical Alarm

Message	Class	Description	ALR No.[i]
CPA/TCPA	Alarm	There is a dangerous target.	301

i. ALR No.: Unique alarm number in ALR sentence and ACK sentence

Table9-2 : List of System Error Message

Message	Class	Description	ALR No.[1]
Autopilot (Data)	Alarm	Autopilot: No communication or data error.	101
Current (Data)	Alarm	Tidal current: No communication or data error.	119
Date (Data)	Alarm	Date data: No communication or data error.	112
Datum (Data)	Alarm	DTM: No communication or data error.	122
Depth (Data)	Alarm	Water depth: No communication or data error.	115
Fan (LCD)	Alarm	LCD monitor: Fan error.	955
Fan (Power)	Alarm	Power Supply: Fan error.	953
Fan (PROC)	Alarm	RADAR Process Unit Interconnection: Fan error.	951
GPS (Status)	Alarm	GPS status error.	103
GYRO I/F (Data)	Alarm	GYRO I/F: No communication or checksum error.	324
GYRO I/F (GYRO)	Alarm	GYRO I/F: GYRO error detected.	110
GYRO I/F (Log)	Alarm	GYRO I/F: Log error detected.	111
Heading (Data)	Alarm	Heading data: No communication or data error.	113
Keyboard (Data)	Alarm	Operation unit: Communication error or checksum error.	325
Keyboard2 (Data)	Alarm	Second operation unit: Communication error or checksum error.	325
Out of Bounds	Alarm	Own ship's latitude is over 85° N or 85° S.	123
Position (Data)	Alarm	Latitude / longitude data: No communication or data error.	102
PROC (AZI)	Alarm	Process unit: AZI error.	305
PROC (HL)	Alarm	Process unit: HL error.	306
PROC (Interrupt)	Alarm	Process unit: Interrupt error.	962
PROC (Trigger)	Alarm	Process unit: Trigger error.	304
PROC (Video)	Alarm	Process unit: VIDEO error.	303
ROT (Data)	Alarm	Rate of Turn: No communication or data error.	120
RSA (Data)	Alarm	Rudder Sensor Angle: No communication or data error.	121
Speed (2AXG)	Alarm	2-axis log (speed over ground): No communication or data error.	114
Speed (2AXW)	Alarm	2-axis log (speed over water): No communication or data error.	114
Speed (GPS)	Alarm	GPS speed: No communication or data error.	114
Speed (Log)	Alarm	1-axis log: No communication or data error.	114
SRB (Data)	Alarm	SRB: No communication or data error.	960
TEMP. (Data)	Alarm	Water temperature: No communication or data error.	117
TXRX (AZI)	Alarm	Scanner: BP error.	311
TXRX (Data)	Alarm	Scanner: No communication, communication mismatched, checksum error, or collision.	326
TXRX (Fan 1)	Alarm	Scanner: FAN 1 error.	320
TXRX (Fan 2)	Alarm	Scanner: FAN 2 error.	320
TXRX (Heater)	Alarm	Scanner: Magnetron heater voltage error.	314
TXRX (HL)	Alarm	Scanner: HL error.	312
TXRX (MHV)	Alarm	Scanner: Modulator's high voltage alarm.	315
TXRX (Reverse)	Alarm	Scanner: Reverse rotation.	313
TXRX (SSW Off)	Alarm	Scanner: Safety switch OFF.	308

Table9-2 : List of System Error Message

Message	Class	Description	ALR No.[i]
TXRX (Trigger)	Alarm	Scanner: TRIGGER error..	310
TXRX (Video)	Alarm	Scanner: VIDEO error.	309
Wind (Data)	Alarm	Wind direction/velocity: No communication or data error.	118

i. ALR No.: Unique alarm number in ALR sentence and ACK sentence

Table9-3 : List of Notification

Message	Class	Description	ALR No.[i]
CCRP Changed	INFO	CCRP is automatically changed.	
Copying	INFO	Displayed-image is capturing to file.	
POSN Reset	INFO	Change the latitude and longitude sentence.	
Set GYRO	INFO	Requires setting of true bearing.	
TM Reset	INFO	Resetting TM in a short time.	

i. ALR No.: Unique alarm number in ALR sentence and ACK sentence

Table9-4 : List of Target Tracking Alarms and AIS Function Alarms

Message	Class	Description	ALR No.[i]
AIS (Data)	Alarm	AIS: No communication or communication error.	116
AIS 95% Capacity	INFO	Over 95% of the maximum number of AIS targets.	
AIS ACT 95% Capacity	INFO	Over 95% of the maximum number of AIS targets to be activated.	
AIS ACT MAX	INFO	Maximum number of AIS targets to be activated.	
AIS Alarm *[ii]**	Alarm	AIS alarm (Up to 10 alarm messages can be displayed.).	
AIS Max Target	INFO	Maximum number of AIS targets.	
AIS PROC (Data)	Alarm	AIS processing circuit: No communication or communication error.	328
CPA/TCPA	Alarm	There is a dangerous target.	301
Lost	Alarm	Failure in tracking the target that has been under tracking. Failure in receiving AIS target data for a specified time.	
New Target	Alarm	Acquisition or activation of a target in the automatic acquisition / activation zone.	302
REF Target	Alarm	Decrease in the reference target accuracy.	
Trial	Warning	There is a dangerous target, when trial maneuver is active.	
TT (Boot)	Alarm	Target tracking unit start failure.	344
TT (Data)	Alarm	The target tracking unit is malfunctioning.	323
TT 95% Capacity	INFO	Over 95% of the maximum number of targets to be tracked.	
TT MAX Target	INFO	The maximum number of targets is under acquisition.	

i. ALR No.: Unique alarm number in ALR sentence and ACK sentence
ii. *** is a 3-digit number which is Local Alarm No in the ALR sentence.

Table9-5 : List of Route Messages and Warnings

Message	Class	Description	ALR No.[i]
Approach	Alarm	Approach the route.	
Arrival	Alarm	Arrive at way point.	
Break Off(WPT)	Alarm	Out of the way point.	
Cross Track Error	Alarm	Go off the route.	

i. ALR No.: Unique alarm number in ALR sentence and ACK sentence

Table9-6 : List of Operational Alarm Messages and Warnings

Message	Class	Description	ALR No.[i]
Can't Transmit	INFO	Tried to transmit within 5 second after standby or when the transmitter-receiver has any trouble.	
Card Full	INFO	Card: Run out of free space.	
Copy Failed	INFO	Card: Copy failure.	
Delete Failed	INFO	Card: Deletion failure.	
Format Card	INFO	Card: Unformatted card.	
Format Failed	INFO	Card: Format failure.	
Invalid Card	INFO	Card: Invalid card.	
Invalid Connection	INFO	The operator set performance monitor to on without selecting straight.	
Invalid Data	INFO	Tried to enter any data beyond its range.	
Invalid Range	INFO	TM selection due to TM-disabled range (96 nm). Zooming in a ZOOM-disabled range (0.125 nm).	
MAX Point	INFO	Tried to enter navigation information beyond the specified.	
No Card	INFO	Card not detected yet.	
No Heading Data	INFO	Target tracking operation or TM selection when bearing data is invalid.	
No Object	INFO	No object at the cursor-specified position.	
No Position Data	INFO	Mark or line input when the latitude and longitude is invalid.	
Not Allowed	INFO	General operation error.	
Out of Range	INFO	Out of target acquisition range.	
Read Failed	INFO	Card: Read failure.	
Slave Mode	INFO	Operation of a menu for the scanner unit when the slave mode is active.	
Write Failed	INFO	Card: Write failure.	

i. ALR No.: Unique alarm number in ALR sentence and ACK sentence

Table9-7 : List of Conditions Messages

Message	Class	Description	ALR No.[i]
Battery Dead	Warning	The battery is dead.	
Battery Low	Warning	battery is weakening.	
GPS (HDOP)	Warning	The HDOP level is increased (Decrease in the GPS accuracy.).	
MON Test	Warning	Performance monitor is active.	
Scanner Rotating	Warning	The scanner is rotating (When transmitter is standby state.).	

i. ALR No.: Unique alarm number in ALR sentence and ACK sentence

Table9-8 : List of Interswitch Alarms and Messages

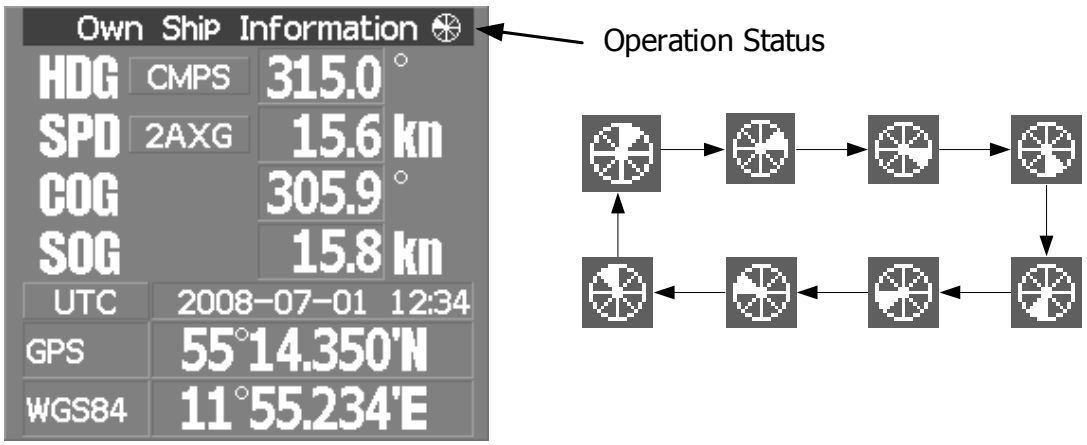
Message	Class	Description	ALR No.[i]
Connection Masked	INFO	Inhibition of control / connection is set.	
ISW (Data)	Alarm	No communication, data mismatched, or checksum error.	327
ISW Busy	INFO	Access to the ISW menu was made during interswitching.	
ISW Complete	INFO	The switchover of the Interswitch ended normally.	
ISW Error	INFO	The interswitch is disabled.	
ISW Standby	INFO	The Interswitch recovered normally.	
ISW Straight	INFO	The interswitch is forced to change the connection into straight.	
ISW Time Out	INFO	Failed in switching.	
Master Range CHG	INFO	The range of the own display unit has changed due to change in the range of the master display unit.	
Master Standby	INFO	The master display unit does not transmit any signals.	
Pattern CHG Failed	INFO	Connection change failed.	
TXRX Standby	INFO	The scanner unit is in the standby mode.	
Update ISW Software	INFO	Tried to enter new TXRX function, when interswitch software used old version.	

i. ALR No.: Unique alarm number in ALR sentence and ACK sentence

9.1.2 Operation Checking

When the system is operating, the operation status (located at the upper right of the screen) is changing pictures.

If picture freeze occurred, turn off the system and restart the system.



9.1.3 Fuse Checking

Melted fuses are caused by any clear cause. When a fuse is replaced, it is necessary to check the related circuits even if there is no trouble. In checking, note that there is some dispersion in the fusing characteristics. Table 9-8 shows a list of fuses used in the equipment.

Table9-9：Fuse List

Location	Parts#	Current Rating	Protection Circuit	Type
AC/DC Converter	F501	10A	Motor	ST6-10AN1
GYRO Interface circuit	F1～F4	0.5A	GYRO Interface circuit	MF60NR250V0.5

9.2 TROUBLE SHOOTING

As this radar equipment includes complicated circuits, it is necessary to request a specialist engineer for repair or instructions for remedy if any circuit is defective.

There are also troubles by the following causes, which should be referred to in checking or repair work.

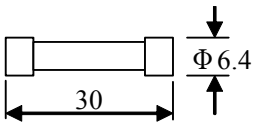
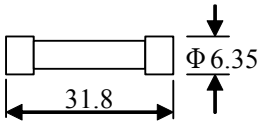
1 Poor Contact in Terminal Board of Inter-Unit Cables

a. Poor contact in terminal board
b. The cable end is not fully connected, that it, contacted with earthed another terminal.
c. Disconnected cable wire

2 Poor Contact of Connector within Unit

This radar equipment is provided with Table 9-10 standard spares.

Table9-10：7ZXRD0025

Name	Type/Code	Shape (mm)	In use	Spare	Parts #	Location
Fuse	MF60NR250V0.5 (5ZFGD00006)		4	12	F1～F4	GYRO Interface Circuit CMJ-462E
Fuse	ST6-10AN1 (5ZFCA00053)		1	3	F501	AC/DC Converter NBA-5135

9.2.1 Special Parts

NKE−2103

Table9-11：NKE-2103 (JMA-9110-6XA/6XAH、JMA-7110-6XA/6XAH)

Parts No.	Name	Type	Manufacture	Location	Code
V101	Magnetron	MAF1565N	NJRC	Scanner Unit	5VMAA00102
A101/A102	Circulator	FCX68R	Orient Microwave	Scanner Unit	5AJIX00027
A103	Dummy	NJC4002	NJRC	Scanner Unit	5ANDF00001
A104	Filter	NJC9952	NJRC	Scanner Unit	5AWAX00002
A301	Diode Limiter	NJS6930	NJRC	Scanner Unit	5ATBT00006

NKE-1125/2254

Table9-12：NKE-1125/2254 (JMA-9122-6XA/9XA/6XAH、JMA-7122-6XA/9XA/6XAH)

Parts No.	Name	Type	Manufacture	Location	Code
V101	Magnetron	M1568BS	NJRC	Scanner Unit	5VMAA00106
A101/A102	Circulator	NJC3901M	NJRC	Scanner Unit	5AJBV00007
A103	Dummy	NJC4002	NJRC	Scanner Unit	5ANDF00001
A104	Filter	NJC9952	NJRC	Scanner Unit	5AWAX00002
A301	Diode Limiter	NJS6930	NJRC	Scanner Unit	5ATBT00006

NTG-3225

Table9-13：NTG-3225 (JMA-9123-7XA/9XA、JMA-7123-7XA/9XA)

Parts No.	Name	Type	Manufacture	Location	Code
V101	Magnetron	M1568BS	NJRC	Transmitter Receiver Unit	5VMAA00106
A101/A102	Circulator	NJC3901M	NJRC	Transmitter Receiver Unit	5AJBV00007
A103	Dummy	NJC4002	NJRC	Transmitter Receiver Unit	5ANDF00001
A104	Filter	NJC9952	NJRC	Transmitter Receiver Unit	5AWAX00002
A301	Diode Limiter	NJS6930	NJRC	Transmitter Receiver Unit	5ATBT00006
A302	PIN Attenuator	NJS6926	NJRC	Transmitter Receiver Unit	5ATBT00007

NKE-1130

Table9-14：NKE-1130 (JMA-9132-SA、JMA-7132-SA)

Parts No.	Name	Type	Manufacture	Location	Code
V101	Magnetron	M1555	NJRC	Scanner Unit	5VMAA00104
A101	Circulator	NJC3316	NJRC	Scanner Unit	5AJBV00008
A301	Diode Limiter	NJS6318	NJRC	Scanner Unit	5ATBT00005

NTG-3230

Table9-15：NTG-3230 (JMA-9133-SA、JMA-7133-SA)

Parts No.	Name	Type	Manufacture	Location	Code
V101	Magnetron	M1555	NJRC	Transmitter Receiver Unit	5VMAA00104
A101	Circulator	NJC3317	NJRC	Transmitter Receiver Unit	5AJBV00009
A301	TRHPL	TL378A	NJRC	Transmitter Receiver Unit	5VLAA00037

9.2.2 Circuit Block to be Repaired

Table9-16 : Circuit Block to be Repaired (JMA-9110-6XA/6XAH)

Location	Circuit Block	Type	Remarks
SCANNER UNIT	MOTOR	H-7BDRD0048*[i]	DC brushless motor (common with HS)
SCANNER UNIT	MODULATOR CIRCUIT	CME-363	Excluding Magnetron
SCANNER UNIT	RECEIVER UNIT	NRG-610	Including CAE-529-1
SCANNER UNIT	POWER SUPPLY CIRCUIT	CBD-1783	
SCANNER UNIT	ENCODER	CHT-71A	
SCANNER UNIT	BRAKE CIRCUIT	CFA-252	
SCANNER UNIT	MOTOR CONTROL POWER CIRCUIT	CBD-1779	
SCANNER UNIT	PERFORMANCE MONITOR	NJU-85	
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MPBC44213*	CDC-1324 with mounting bracket, CDC-1325 and CDC-1186D
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MDLW11900*	CDC-1324 with mounting bracket
RADAR PROCESS UNIT	AIS PROCESS CIRCUIT	CDC-1325	
RADAR PROCESS UNIT	ARPA PROCESS CIRCUIT	CDC-1186D	
RADAR PROCESS UNIT	GYRO INTERFACE CIRCUIT	CMJ-462E	
RADAR PROCESS UNIT	TERMINAL BOARD	CQD-2097A	
RADAR PROCESS UNIT	MOTHER BOARD	CQC-1192	
RADAR PROCESS UNIT	FAN (RPU)	109R0612S4D13	
RADAR PROCESS UNIT	POWER SUPPLY	CBD-1661	
RADAR PROCESS UNIT	FAN (PSU)	H-7BFRD0006*	
OPERATION UNIT	OPERATION CIRCUIT A	CCK-973	
OPERATION UNIT	OPERATION CIRCUIT B	CCK-974	
OPERATION UNIT	OPERATION CIRCUIT D	CCK-976	
OPERATION UNIT	TRACKBALL	CCK-1013	
MONITOR UNIT	BEZEL KIT	MPXP34376*	Radar bezel kit
MONITOR UNIT	23 inch LCD	CML-799L	23.1-inch LCD PANEL
MONITOR UNIT	LCD OPERATION CIRCUIT	CCK-972	

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

Table9-17 : Circuit Block to be Repaired (JMA-9122-6XA/9XA)

Location	Circuit Block	Type	Remarks
SCANNER UNIT	MOTOR	MDBW10822*[i]	For 100/220VAC
SCANNER UNIT	ENCODER	CHT-71A	
SCANNER UNIT	AC220V MOTOR DRIVER	H-7EPRD0034*	For 220VAC
SCANNER UNIT	AC100V MOTOR DRIVER	H-7EPRD0035*	For 100VAC
SCANNER UNIT	PERFORMANCE MONITOR	NJU-85	
SCANNER UNIT	BRAKE CIRCUIT	CFA-253	
SCANNER UNIT	BRAKE CONTROL CIRCUIT	CCB-655	
SCANNER UNIT	BRAKE UNIT	NZR-16	Including CFA-259/260
SCANNER UNIT	T/R CONTROL CIRCUIT	CMC-1205R	
SCANNER UNIT	MODULATOR UNIT	NMA-550-1	Including CPA-264, CMB-404 and CFR-229 Excluding Magnetron
SCANNER UNIT	MODULATOR CIRCUIT	CPA-264	
SCANNER UNIT	RECEIVER UNIT	NRG-162A	Including CMA-866A
SCANNER UNIT	POWER SUPPLY CIRCUIT	CBD-1682A	
SCANNER UNIT	RELAY FILTER CIRCUIT	CSC-656	
SCANNER UNIT	FAN	H-7BFRD0002*	
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MPBC44213*	CDC-1324 with mounting bracket, CDC-1325 and CDC-1186D
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MDLW11900*	CDC-1324 with mounting bracket
RADAR PROCESS UNIT	AIS PROCESS CIRCUIT	CDC-1325	
RADAR PROCESS UNIT	ARPA PROCESS CIRCUIT	CDC-1186D	
RADAR PROCESS UNIT	GYRO INTERFACE CIRCUIT	CMJ-462E	
RADAR PROCESS UNIT	TERMINAL BOARD	CQD-2097A	
RADAR PROCESS UNIT	MOTHER BOARD	CQC-1192	
RADAR PROCESS UNIT	FAN (RPU)	109R0612S4D13	
RADAR PROCESS UNIT	POWER SUPPLY	CBD-1661	
RADAR PROCESS UNIT	FAN (PSU)	H-7BFRD0006*	
OPERATION UNIT	OPERATION CIRCUIT A	CCK-973	
OPERATION UNIT	OPERATION CIRCUIT B	CCK-974	
OPERATION UNIT	OPERATION CIRCUIT D	CCK-976	
OPERATION UNIT	TRACKBALL	CCK-1013	
MONITOR UNIT	BEZEL KIT	MPXP34376*	Radar bezel kit
MONITOR UNIT	23 inch LCD	CML-799L	23.1-inch LCD PANEL
MONITOR UNIT	LCD OPERATION CIRCUIT	CCK-972	

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

Table9-18 : Circuit Block to be Repaired (JMA-9122-6XAH)

Location	Circuit Block	Type	Remarks
SCANNER UNIT	MOTOR	H-7BDRD0045*[i]	For 100/220VAC
SCANNER UNIT	ENCODER	CHT-71A	
SCANNER UNIT	MOTOR CONTROL POWER CIRCUIT	CBD-1779	
SCANNER UNIT	BRAKE CIRCUIT	CFA-257	
SCANNER UNIT	PERFORMANCE MONITOR	NJU-85	
SCANNER UNIT	POWER SUPPLY CIRCUIT	CBD-1682A	
SCANNER UNIT	T/R CONTROL CIRCUIT	CMC-1205R	
SCANNER UNIT	MODULATOR UNIT	NMA-550-1	Including CPA-264, CMB-404 and CFR-229 Excluding Magnetron
SCANNER UNIT	MODULATOR CIRCUIT	CPA-264	
SCANNER UNIT	RECEIVER UNIT	NRG-162A	Including CMA-866A
SCANNER UNIT	FAN	H-7BFRD0002*	
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MPBC44213*	CDC-1324 with mounting bracket, CDC-1325 and CDC-1186D
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MDLW11900*	CDC-1324 with mounting bracket
RADAR PROCESS UNIT	AIS PROCESS CIRCUIT	CDC-1325	
RADAR PROCESS UNIT	ARPA PROCESS CIRCUIT	CDC-1186D	
RADAR PROCESS UNIT	GYRO INTERFACE CIRCUIT	CMJ-462E	
RADAR PROCESS UNIT	TERMINAL BOARD	CQD-2097A	
RADAR PROCESS UNIT	MOTHER BOARD	CQC-1192	
RADAR PROCESS UNIT	FAN (RPU)	109R0612S4D13	
RADAR PROCESS UNIT	POWER SUPPLY	CBD-1661	
RADAR PROCESS UNIT	FAN (PSU)	H-7BFRD0006*	
OPERATION UNIT	OPERATION CIRCUIT A	CCK-973	
OPERATION UNIT	OPERATION CIRCUIT B	CCK-974	
OPERATION UNIT	OPERATION CIRCUIT D	CCK-976	
OPERATION UNIT	TRACKBALL	CCK-1013	
MONITOR UNIT	BEZEL KIT	MPXP34376*	Radar bezel kit
MONITOR UNIT	23 inch LCD	CML-799L	23.1-inch LCD PANEL
MONITOR UNIT	LCD OPERATION CIRCUIT	CCK-972	

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

Table9-19 : Circuit Block to be Repaired (JMA-9123-7XA/9XA)

Location	Circuit Block	Type	Remarks
SCANNER UNIT	MOTOR	MDBW10822*[i]	For 100/220VAC
SCANNER UNIT	ENCODER	CHT-71A	
SCANNER UNIT	AC220V MOTOR DRIVER	H-7EPRD0034*	For 220VAC
SCANNER UNIT	AC100V MOTOR DRIVER	H-7EPRD0035*	For 100VAC
SCANNER UNIT	PERFORMANCE MONITOR	NJU-85	
SCANNER UNIT	BRAKE CIRCUIT	CFA-253	
SCANNER UNIT	BRAKE CONTROL CIRCUIT	CCB-655	
SCANNER UNIT	BRAKE UNIT	NZR-15	Including CFA-259/260
TRANSMITTER RECEIVER UNIT	T/R CONTROL CIRCUIT	CMC-1205R	
TRANSMITTER RECEIVER UNIT	MODULATOR UNIT	NMA-552-1	Including CPA-264, CMB-405 and CFR-229 Excluding Magnetron
TRANSMITTER RECEIVER UNIT	MODULATOR CIRCUIT	CPA-264	
TRANSMITTER RECEIVER UNIT	RECEIVER UNIT	NRG-162A	Including CMA-866A
TRANSMITTER RECEIVER UNIT	POWER SUPPLY CIRCUIT	CBD-1682A	
TRANSMITTER RECEIVER UNIT	RELAY FILTER CIRCUIT	CSC-656	
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MPBC44213*	CDC-1324 with mounting bracket, CDC-1325 and CDC-1186D
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MDLW11900*	CDC-1324 with mounting bracket
RADAR PROCESS UNIT	AIS PROCESS CIRCUIT	CDC-1325	
RADAR PROCESS UNIT	ARPA PROCESS CIRCUIT	CDC-1186D	
RADAR PROCESS UNIT	GYRO INTERFACE CIRCUIT	CMJ-462E	
RADAR PROCESS UNIT	TERMINAL BOARD	CQD-2097A	
RADAR PROCESS UNIT	MOTHER BOARD	CQC-1192	
RADAR PROCESS UNIT	FAN (RPU)	109R0612S4D13	
RADAR PROCESS UNIT	POWER SUPPLY	CBD-1661	
RADAR PROCESS UNIT	FAN (PSU)	H-7BFRD0006*	
OPERATION UNIT	OPERATION CIRCUIT A	CCK-973	
OPERATION UNIT	OPERATION CIRCUIT B	CCK-974	
OPERATION UNIT	OPERATION CIRCUIT D	CCK-976	
OPERATION UNIT	TRACKBALL	CCK-1013	
MONITOR UNIT	BEZEL KIT	MPXP34376*	Radar bezel kit
MONITOR UNIT	23 inch LCD	CML-799L	23.1-inch LCD PANEL
MONITOR UNIT	LCD OPERATION CIRCUIT	CCK-972	

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

Table9-20 : Circuit Block to be Repaired (JMA-9132-SA)

Location	Circuit Block	Type	Remarks
SCANNER UNIT	MOTOR	MDBW10823*[i]	For 100/220VAC
SCANNER UNIT	ENCODER	CHT-71A	
SCANNER UNIT	AC220V MOTOR DRIVER	H-7EPRD0034*	For 220VAC
SCANNER UNIT	AC100V MOTOR DRIVER	H-7EPRD0035*	For 100VAC
SCANNER UNIT	PERFORMANCE MONITOR	NJU-84	
SCANNER UNIT	BRAKE CIRCUIT	CFA-255	
SCANNER UNIT	BRAKE CONTROL CIRCUIT	CCB-655	
SCANNER UNIT	BRAKE UNIT	NZR-17	Including CFA-261/262
SCANNER UNIT	T/R CONTROL CIRCUIT	CMC-1205R	
SCANNER UNIT	MODULATOR UNIT	NMA-551-1	Including CPA-264, CMB-406 and CFR-229 Exluding Magnetron
SCANNER UNIT	MODULATOR CIRCUIT	CPA-264	
SCANNER UNIT	RECEIVER UNIT	NRG-229	
SCANNER UNIT	POWER SUPPLY CIRCUIT	CBD-1682A	
SCANNER UNIT	RELAY FILTER CIRCUIT	CSC-656	
SCANNER UNIT	FAN	H-7BFRD0002*	
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MPBC44213*	CDC-1324 with mounting bracket, CDC-1325 and CDC-1186D
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MDLW11900*	CDC-1324 with mounting bracket
RADAR PROCESS UNIT	AIS PROCESS CIRCUIT	CDC-1325	
RADAR PROCESS UNIT	ARPA PROCESS CIRCUIT	CDC-1186D	
RADAR PROCESS UNIT	GYRO INTERFACE CIRCUIT	CMJ-462E	
RADAR PROCESS UNIT	TERMINAL BOARD	CQD-2097A	
RADAR PROCESS UNIT	MOTHER BOARD	CQC-1192	
RADAR PROCESS UNIT	FAN (RPU)	109R0612S4D13	
RADAR PROCESS UNIT	POWER SUPPLY	CBD-1661	
RADAR PROCESS UNIT	FAN (PSU)	H-7BFRD0006*	
OPERATION UNIT	OPERATION CIRCUIT A	CCK-973	
OPERATION UNIT	OPERATION CIRCUIT B	CCK-974	
OPERATION UNIT	OPERATION CIRCUIT D	CCK-976	
OPERATION UNIT	TRACKBALL	CCK-1013	
MONITOR UNIT	BEZEL KIT	MPXP34376*	Radar bezel kit
MONITOR UNIT	23 inch LCD	CML-799L	23.1-inch LCD PANEL
MONITOR UNIT	LCD OPERATION CIRCUIT	CCK-972	

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

Table9-21 : Circuit Block to be Repaired (JMA-9133-SA)

Location	Circuit Block	Type	Remarks
SCANNER UNIT	MOTOR	MDBW10823*[i]	For 100/220VAC
SCANNER UNIT	ENCODER	CHT-71A	
SCANNER UNIT	AC220V MOTOR DRIVER	H-7EPRD0034*	For 220VAC
SCANNER UNIT	AC100V MOTOR DRIVER	H-7EPRD0035*	For 100VAC
SCANNER UNIT	PERFORMANCE MONITOR	NJU-84	
SCANNER UNIT	BRAKE CIRCUIT	CFA-255	
SCANNER UNIT	BRAKE CONTROL CIRCUIT	CCB-655	
SCANNER UNIT	BRAKE UNIT	NZR-17	Including CFA-261/262
TRANSMITTER RECEIVER UNIT	T/R CONTROL CIRCUIT	CMC-1205R	
TRANSMITTER RECEIVER UNIT	MODULATOR UNIT	NMA-553-1	Including CPA-264, CMB-407 and CFR-229 Exluding Magnetron
TRANSMITTER RECEIVER UNIT	MODULATOR CIRCUIT	CPA-264	
TRANSMITTER RECEIVER UNIT	RECEIVER UNIT	NRG-229	
TRANSMITTER RECEIVER UNIT	POWER SUPPLY CIRCUIT	CBD-1682A	
TRANSMITTER RECEIVER UNIT	RELAY FILTER CIRCUIT	CSC-656	
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MPBC44213*	CDC-1324 with mounting bracket, CDC-1325 and CDC-1186D
RADAR PROCESS UNIT	RADAR PROCESS CIRCUIT	MDLW11900*	CDC-1324 with mounting bracket
RADAR PROCESS UNIT	AIS PROCESS CIRCUIT	CDC-1325	
RADAR PROCESS UNIT	ARPA PROCESS CIRCUIT	CDC-1186D	
RADAR PROCESS UNIT	GYRO INTERFACE CIRCUIT	CMJ-462E	
RADAR PROCESS UNIT	TERMINAL BOARD	CQD-2097A	
RADAR PROCESS UNIT	MOTHER BOARD	CQC-1192	
RADAR PROCESS UNIT	FAN (RPU)	109R0612S4D13	
RADAR PROCESS UNIT	POWER SUPPLY	CBD-1661	
RADAR PROCESS UNIT	FAN (PSU)	H-7BFRD0006*	
OPERATION UNIT	OPERATION CIRCUIT A	CCK-973	
OPERATION UNIT	OPERATION CIRCUIT B	CCK-974	
OPERATION UNIT	OPERATION CIRCUIT D	CCK-976	
OPERATION UNIT	TRACKBALL	CCK-1013	
MONITOR UNIT	BEZEL KIT	MPXP34376*	Radar bezel kit
MONITOR UNIT	23 inch LCD	CML-799L	23.1-inch LCD PANEL
MONITOR UNIT	LCD OPERATION CIRCUIT	CCK-972	

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

9.3 AFTER-SALES SERVICE

9.3.1 Keeping period of maintenance parts

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

9.3.2 When you Request for Repair

If you suppose the product may be out of order, read the description in Section 9 carefully and check the suspected point again.

If it is still out of order, you are recommended to stop operation of the equipment and consult with the dealer from whom you purchased the product, or our branch office in your country or district, the sales department in our main office in Tokyo.

Repair within the Warranty Period

If any failure occurs in the product during its normal operation in accordance with the instruction manual, the dealer or JRC will repair free of charge. In case that any failure is caused due to misuse, faulty operation, negligence or force major such as natural disaster and fire, the product will be repaired with charges.

Repair after the Warranty Period

If any defective function of the product is recoverable by repair, the repair of it will be made at your own charge upon your request.

Necessary Information for Repair

- Product name, model, manufacturing date and serial number
- Trouble conditions (as detailed as possible. Refer to "Radar Failure Check List" on page 9-16
- Name of company/organization, address and telephone number

9.3.3 Recommended Maintenance

The performance of the product may deteriorate due to the secular change of the parts used in it, though such deterioration depends upon the conditions of operation. So checkup and maintenance is recommendable for the product in addition to your daily care.

For maintenance, consult with the near-by dealer or our sales department.Such maintenance will be made with charges.

For further details of after-sale service, contact the JRC Offices.

Radar Failure Check List

When placing an order for repair of the product, it is requested that you could confirm the check items and fill the results and sent the sheet to our contact. If there is any unclear items, contact the ship on which the product is installed, and give the correct information on the product.

Ship name: _____ Phone: _____ Fax: _____

[i] Radar general model name:JMA- _____ [i]Serial No. : _____

i. Write the full model name correctly

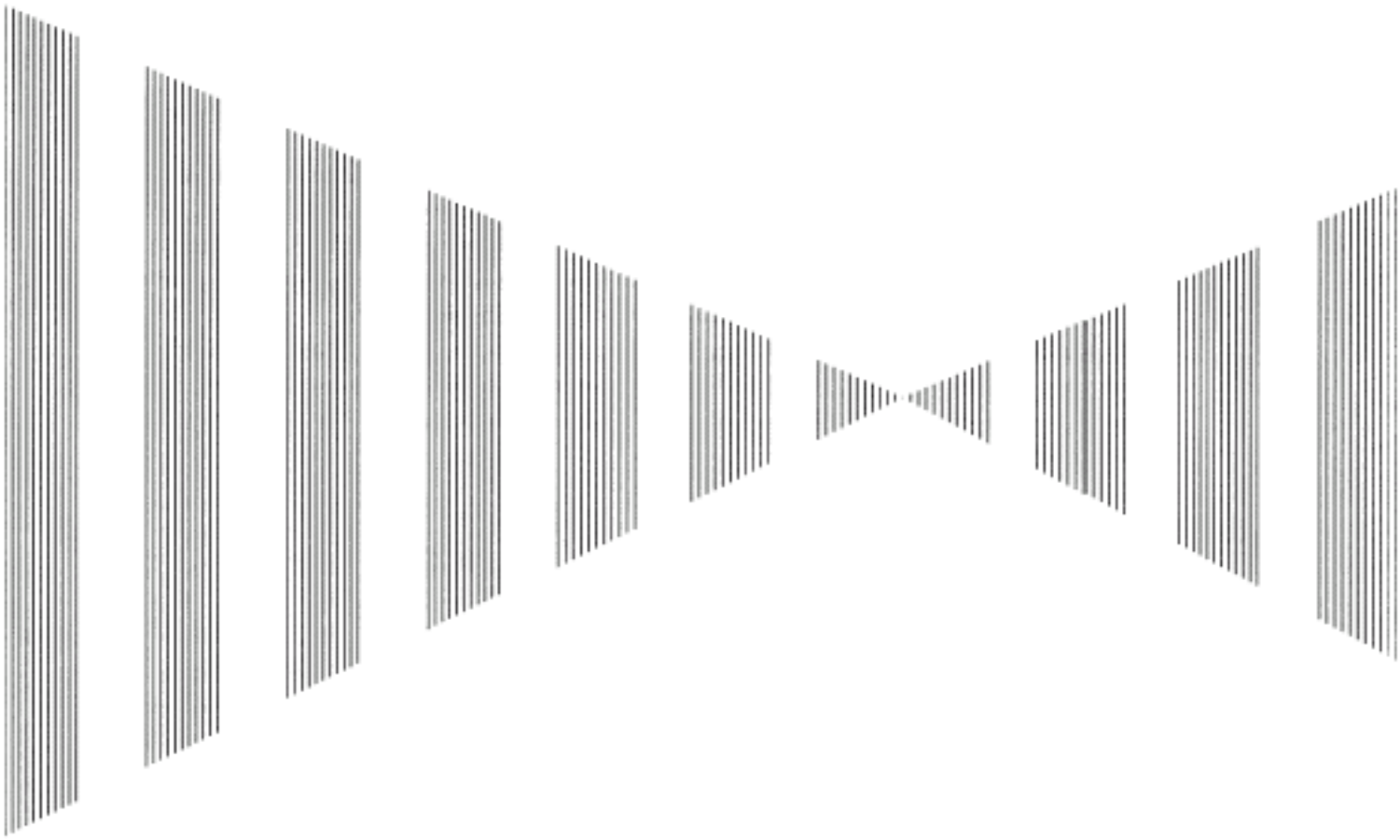
Check the following items in the order of the number, and check the applicable answer between YES or NO.

If the item cannot be determined as YES or NO, explain in detail in the item (18), others.

No.	Check Item	Result	
(1)	Power can be turned on. (The lamp on the Operation unit is lit)	YES	NO
(2)[i]	A few minutes after powering-on, it will become standby status.	YES	NO
(3)[i]	When powering-on (or TX ON), LCD monitor something is lit.	YES	NO
(4)[i,ii]	The antenna rotates at the transmission (TX) ON.	YES	NO
(5)[i,ii]	Current is supplied to the magnetron. (Refer to the instruction manual)	YES	NO
(6)[ii]	Turning is enabled. (Check with the range of 6 NM or more)	YES	NO
(7)[ii]	Fixed marker is displayed.	YES	NO
(8)[ii]	VRM is displayed.	YES	NO
(9)[ii]	While noise is displayed while set at SEA and RAIN minimum, GAIN maximum, IR-OFF and range 48 NM.	YES	NO
(10)[ii]	Target reflection echo is displayed.	YES	NO
(11)[ii]	Sensitivity of reflection echo is normal.	YES	NO
(12)[ii]	EBL is displayed.	YES	NO
(13)[ii]	Cursor mark moves.	YES	NO
(14)[ii,iii]	GYRO course can be set and normally displayed.	YES	NO
(15)[ii,iii]	LOG speed can be normally displayed.	YES	NO
(16)[ii]	Target tracking function works normally.	YES	NO
(17)[ii,iii]	If equipped with an interswitch, when switching from the straight mode (II) to (X), the failures (items marked NO) in the above (1) to (16), are switched over to the other unit.	YES	NO
(18)	Others (Error message, etc.)		

i. If result is NO, then check the fuse. (Refer to Section 9.1.2 "Operation Checking" and Section 9.2 "TROUBLE SHOOTING")
ii. Check these items while transmission is ON.
iii. Functions mentioned in the items (14), (15) and (17) may be optional, answer is not necessary.

SECTION 10
DISPOSAL



DISPOSAL

10.1 DISPOSAL OF THE UNIT

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

10.2 DISPOSAL OF USED BATTERIES

WARNING

When disposing of used lithium batteries, be sure to insulate the batteries by taping the ⊕⊖ terminals.

Otherwise, heat generation, explosion or a fire may occur.

In this unit, Lithium batteries are used for the following parts:

Radar Processing circuit (CDC-1324): BT300 (Maxell: CR2032)

- Do not store used lithium batteries. Dispose of them in accordance with regulations of local government.
- When disposing of used lithium batteries be sure to insulate the batteries by taping the ⊕⊖ terminals. For disposal of batteries, be sure to follow the local laws and regulations. For detail, consult with the dealer you purchased the product our business office, or local government.

10.3 DISPOSAL OF USED MAGNETRON

Magnetron is used in the Scanner （NKE－2103/2254/1125/1130） and Transmitter Receiver Unit (NTG-3225/3230).

- When the magnetron is replaced with a new one, return the used magnetron to our dealer or business office.

  For detail, consult with our dealer or business office.

10.4 DISPOSAL OF TR-TUBE

In the case that either mark shown in Fig 10-1 is on the expired TR-tube, Radioisotopes are in the TR-tube.

- Disposal of TR-tube with these marks must be done in accordance with the laws and regulations of the pertaining country. For detail, consult with our dealer or business office.
- Radiation from TR-tube has no effect on the human body.
- Don't take apart TR-tube.

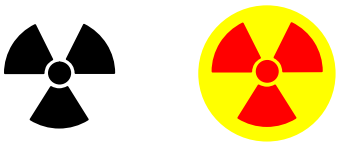


Fig 10-1: Radioisotopes Marks

10.5 ABOUT THE CHINA ROHS

有毒有害物质或元素的名称及含量

(Names & Content of toxic and hazardous substances or elements)

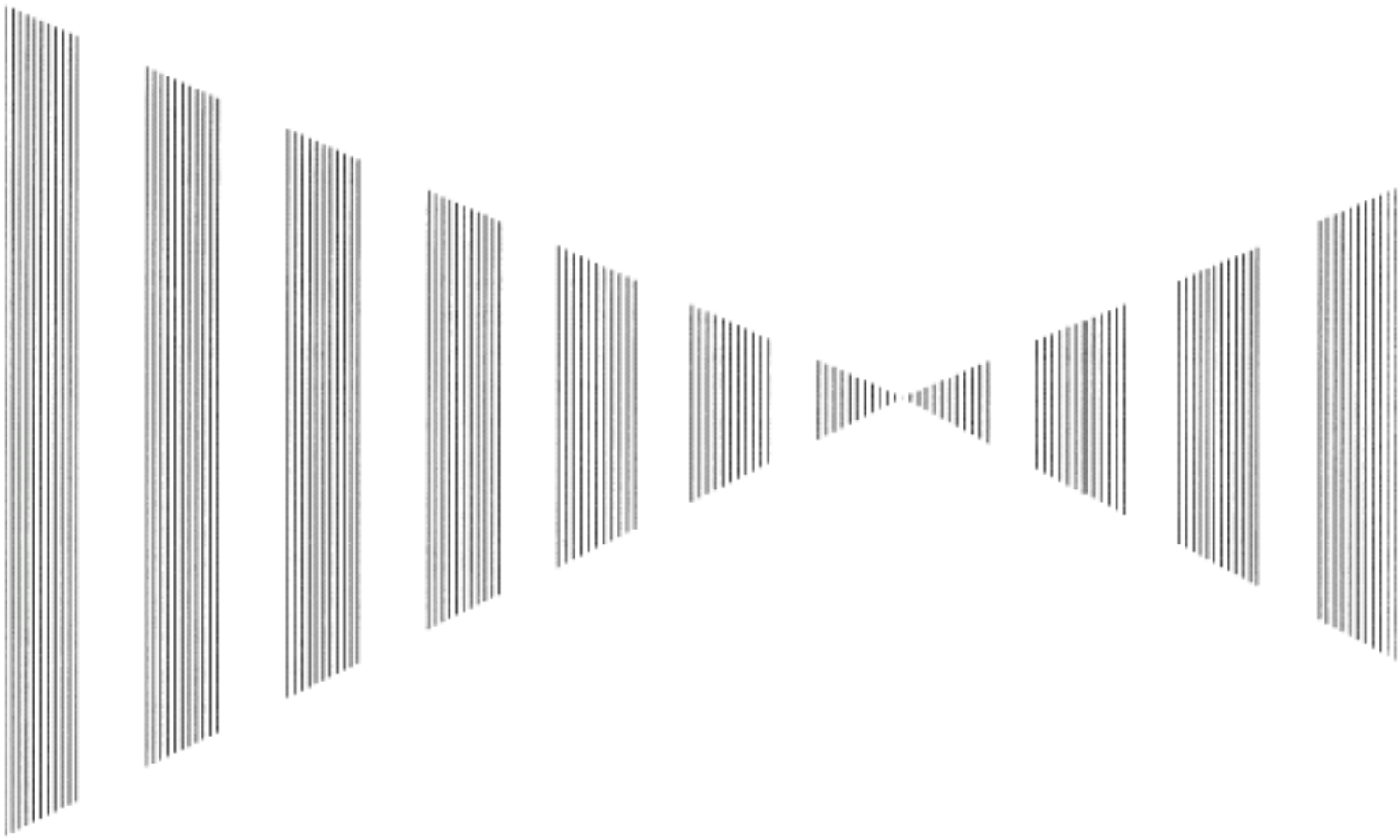
形式名(Type): JMA-9100 Series, JMA-7100Series　　名称(Name): RADAR

部件名称 (Part name)	有毒有害物质或元素 (Toxic and Hazardous Substances and Elements)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
雷达天线单元 (Scanner Unit)	×	×	○	×	×	×
收发信单元 (Transmitter-receiver Unit)	×	×	×	×	×	×
主船内装置 (Inboard Unit) ・显示装置 (Display Unit) ・键盘装置 (OperationUnit) ・信号处理装置 (RADAR Process Unit)	×	×	×	×	×	×
外部设备 (Peripherals) ・选择 (Options) ・电线类 (Cables) ・手册 (Documennts)	×	×	×	×	×	×

○：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.)

SECTION 11
SPECIFICATION



SPECIFICATION

11.1 JMA-9133-SA TYPE RADAR

GENERAL SPECIFICATION	
Class of emission	P0N
Display	Color Raster Scan
Screen	23.1inch LCD (Effective diameter of Radar: more than 320mm)
Range Scale	0.125、0.25、0.5、0.75、1.5、3、6、12、24、48、96NM
Range Resolution	less than 30m
Minimum Detection Range	less than 40m
Bearing Accuracy	less than 1°
Bearing Indication	Relative motion mode : N-UP, C-UP and H-UP True motion mode : N-UP and C-UP
Ambient Condition	Temperature SCANNER UNIT -25 to +55℃ (Storage -25 to +70℃) Other Unit -15 to +55℃ Relative humidity 93% at +40℃
Vibration	2 to 13.2Hz Amplitude +/-1mm +/-10% 13.2 to 100Hz Acceleration 7m/s^2
Power Supply Input	AC100 to 115V, 50/60Hz, 1φ or AC220 to 240V, 50/60Hz, 1φ
Power Consumption	Approx.400VA typical Approx. 2000VA at Maximum wind speed
PS Voltage Fluctuation	+/-10% (at the maximum cable length)
Pre Heating Time	Within 4 minute
From STBY to TX	Within 5 sec.
SCANNER UNIT (NKE-1139)	
	See 11.8
TRANSMITTER RECEIVER UNIT (NTG-3230)	
	See 11.15
DISPLAY UNIT (NCD-4990)	
	See 11.17
PERFORMANCE MONITOR (NJU-84)	
	See 11.20
OPTION	
Scanner with Deicing Heater	NKE-1139-D (Only heater collar)
Interswitch Unit	NQE-3141-2A (Maximum 2 Radars) NQE-3141-4A (Maximum 4 Radars)
DISPLAY UNIT (Desktop type)	NCD-4990T
Maximum Cable Length	
SCANNER UNIT to TRANSMITTER RECEIVER UNIT	30m
DISPLAY UNIT to TRANSMITTER RECEIVER UNIT	35m
SAFE DISTANCE FOR STANDARD COMPASS	
SCANNER UNIT	1.4m
TRANSMITTER RECEIVER UNIT	3.9m
DISPLAY UNIT	4.0m

11.2 JMA-9132-SA TYPE RADAR

GENERAL SPECIFICATION	
Class of emission	P0N
Display	Color Raster Scan
Screen	23.1inch LCD (Effective diameter of Radar: more than 320mm)
Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96NM
Range Resolution	less than 30m
Minimum Detection Range	less than 40m
Bearing Accuracy	less than 1°
Bearing Indication	Relative motion mode : N-UP, C-UP and H-UP True motion mode : N-UP and C-UP
Ambient Condition	Temperature SCANNER UNIT -25 to +55℃ (Storage -25 to +70℃) Other Unit -15 to +55℃ Relative humidity 93% at +40℃
Vibration	2 to 13.2Hz Amplitude +/-1mm +/-10% 13.2 to 100Hz Acceleration 7m/s^2
Power Supply Input	AC100 to 115V, 50/60Hz, 1φ or AC220 to 240V, 50/60Hz, 1φ
Power Consumption	Approx.400VA typical Approx. 2000VA at Maximum wind speed
PS Voltage Fluctuation	+/-10% (at the maximum cable length)
Pre Heating Time	Within 4 minute
From STBY to TX	Within 5 sec.
SCANNER UNIT (NKE-1130)	
	See 11.9
DISPLAY UNIT (NCD-4990)	
	See 11.17
PERFORMANCE MONITOR (NJU-84)	
	See 11.20
OPTION	
Scanner with Deicing Heater	NKE-1130-D (Only heater collar)
Interswitch Unit	NQE-3141-2A (Maximum 2 Radars) NQE-3141-4A (Maximum 4 Radars)
DISPLAY UNIT (Desktop type)	NCD-4990T
Maximum Cable Length	
SCANNER UNIT to TRANSMITTER RECEIVER UNIT	65m
SAFE DISTANCE FOR STANDARD COMPASS	
SCANNER UNIT	5.1m
DISPLAY UNIT	4.0m

11.3 JMA-9123-7XA/9XA TYPE RADAR

GENERAL SPECIFICATION	
Class of emission	P0N
Display	Color Raster Scan
Screen	23.1inch LCD (Effective diameter of Radar: more than 320mm)
Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96NM
Range Resolution	less than 30m
Minimum Detection Range	less than 40m
Bearing Accuracy	less than 1°
Bearing Indication	Relative motion mode : N-UP, C-UP and H-UP True motion mode : N-UP and C-UP
Ambient Condition	Temperature SCANNER UNIT -25 to +55℃ (Storage -25 to +70℃) Other Unit -15 to +55℃ Relative humidity 93% at +40℃
Vibration	2 to 13.2Hz Amplitude +/-1mm +/-10% 13.2 to 100Hz Acceleration 7m/s^2
Power Supply Input	AC100 to 115V, 50/60Hz, 1φ or AC220 to 240V, 50/60Hz, 1φ
Power Consumption	Approx.350VA typical Approx. 1700VA at Maximum wind speed
PS Voltage Fluctuation	+/-10% (at the maximum cable length)
Pre Heating Time	Within 4 minute
From STBY to TX	Within 5 sec.
SCANNER UNIT (NKE-1129-7/9)	
	See 11.10
TRANSMITTER RECEIVER UNIT (NTG-3225)	
	See 11.16
DISPLAY UNIT (NCD-4990)	
	See 11.17
PERFORMANCE MONITOR (NJU-85)	
	See 11.21
OPTION	
Scanner with Deicing Heater	NKE-1129-7D/9D (Only heater collar)
Interswitch Unit	NQE-3141-2A (Maximum 2 Radars) NQE-3141-4A (Maximum 4 Radars)
DISPLAY UNIT (Desktop type)	NCD-4990T
Maximum Cable Length	
SCANNER UNIT to TRANSMITTER RECEIVER UNIT	30m
DISPLAY UNIT to TRANSMITTER RECEIVER UNIT	35m
SAFE DISTANCE FOR STANDARD COMPASS	
SCANNER UNIT	1.05m
TRANSMITTER RECEIVER UNIT	2.8m
DISPLAY UNIT	4.0m

11.4 JMA-9122-6XA/9XA TYPE RADAR

GENERAL SPECIFICATION	
Class of emission	P0N
Display	Color Raster Scan
Screen	23.1inch LCD (Effective diameter of Radar: more than 320mm)
Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96NM
Range Resolution	less than 30m
Minimum Detection Range	less than 40m
Bearing Accuracy	less than 1°
Bearing Indication	Relative motion mode : N-UP, C-UP and H-UP True motion mode : N-UP and C-UP
Ambient Condition	Temperature SCANNER UNIT -25 to +55℃ (Storage -25 to +70℃) Other Unit -15 to +55℃ Relative humidity 93% at +40℃
Vibration	2 to 13.2Hz Amplitude +/-1mm +/-10% 13.2 to 100Hz Acceleration 7m/s^2
Power Supply Input	AC100 to 115V, 50/60Hz, 1φ or AC220 to 240V, 50/60Hz, 1φ
Power Consumption	Approx.350VA typical Approx. 1700VA at Maximum wind speed
PS Voltage Fluctuation	+/-10% (at the maximum cable length)
Pre Heating Time	Within 4 minute
From STBY to TX	Within 5 sec.
SCANNER UNIT (NKE-1125-6/9)	
	See 11.11
DISPLAY UNIT (NCD-4990)	
	See 11.17
PERFORMANCE MONITOR (NJU-85)	
	See 11.21
OPTION	
Scanner with Deicing Heater	NKE-1125-6D/9D (Only heater collar)
Interswitch Unit	NQE-3141-2A (Maximum 2 Radars) NQE-3141-4A (Maximum 4 Radars)
DISPLAY UNIT (Desktop type)	NCD-4990T
Maximum Cable Length	
SCANNER UNIT to TRANSMITTER RECEIVER UNIT	65m
SAFE DISTANCE FOR STANDARD COMPASS	
SCANNER UNIT	2.4m
DISPLAY UNIT	4.0m

11.5 JMA-9122-6XAH TYPE RADAR

GENERAL SPECIFICATION	
Class of emission	P0N
Display	Color Raster Scan
Screen	23.1inch LCD (Effective diameter of Radar: more than 320mm)
Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96NM
Range Resolution	less than 30m
Minimum Detection Range	less than 40m
Bearing Accuracy	less than 1°
Bearing Indication	Relative motion mode : N-UP, C-UP and H-UP True motion mode : N-UP and C-UP
Ambient Condition	Temperature SCANNER UNIT -25 to +55℃ (Storage -25 to +70℃) Other Unit -15 to +55℃ Relative humidity 93% at +40℃
Vibration	2 to 13.2Hz Amplitude +/-1mm +/-10% 13.2 to 100Hz Acceleration 7m/s^2
Power Supply Input	AC100 to 115V, 50/60Hz, 1φ or AC220 to 240V, 50/60Hz, 1φ
Power Consumption	Approx.350VA typical Approx. 1000VA at Maximum wind speed
PS Voltage Fluctuation	+/-10% (at the maximum cable length)
Pre Heating Time	Within 4 minute
From STBY to TX	Within 5 sec.
SCANNER UNIT (NKE-2254-6HS)	
	See 11.11
DISPLAY UNIT (NCD-4990)	
	See 11.17
PERFORMANCE MONITOR (NJU-85)	
	See 11.21
AC/DC CONVERTER (NBA-5135)	
	See 11.22
OPTION	
Scanner with Deicing Heater	None
Interswitch Unit	NQE-3141-2A (Maximum 2 Radars) NQE-3141-4A (Maximum 4 Radars)
DISPLAY UNIT (Desktop type)	NCD-4990T
Maximum Cable Length	
SCANNER UNIT to TRANSMITTER RECEIVER UNIT	65m
SAFE DISTANCE FOR STANDARD COMPASS	
SCANNER UNIT	2.4m
DISPLAY UNIT	4.0m

11.6 JMA-9110-6XA TYPE RADAR

GENERAL SPECIFICATION	
Class of emission	P0N
Display	Color Raster Scan
Screen	23.1inch LCD (Effective diameter of Radar: more than 320mm)
Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96NM
Range Resolution	less than 30m
Minimum Detection Range	less than 40m
Bearing Accuracy	less than 1°
Bearing Indication	Relative motion mode : N-UP, C-UP and H-UP True motion mode : N-UP and C-UP
Ambient Condition	Temperature SCANNER UNIT -25 to +55℃ (Storage -25 to +70℃) Other Unit -15 to +55℃ Relative humidity 93% at +40℃
Vibration	2 to 13.2Hz Amplitude +/-1mm +/-10% 13.2 to 100Hz Acceleration 7m/s^2
Power Supply Input	AC100 to 115V, 50/60Hz, 1φ or AC220 to 240V, 50/60Hz, 1φ
Power Consumption	Approx.350VA typical Approx. 1000VA at Maximum wind speed
PS Voltage Fluctuation	+/-10% (at the maximum cable length)
Pre Heating Time	Within 4 minute
From STBY to TX	Within 5 sec.
SCANNER UNIT (NKE-2103-6)	
	See 11.13
DISPLAY UNIT (NCD-4990)	
	See 11.17
PERFORMANCE MONITOR (NJU-85)	
	See 11.21
AC/DC CONVERTER (NBA-5135)	
	See 11.22
OPTION	
Scanner with Deicing Heater	None
Interswitch Unit	NQE-3141-2A (Maximum 2 Radars) NQE-3141-4A (Maximum 4 Radars)
DISPLAY UNIT (Desktop type)	NCD-4990T
Maximum Cable Length	
SCANNER UNIT to TRANSMITTER RECEIVER UNIT	65m
SAFE DISTANCE FOR STANDARD COMPASS	
SCANNER UNIT	2.4m
DISPLAY UNIT	4.0m

11.7 JMA-9110-6XAH TYPE RADAR

GENERAL SPECIFICATION	
Class of emission	P0N
Display	Color Raster Scan
Screen	23.1inch LCD (Effective diameter of Radar: more than 320mm)
Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96NM
Range Resolution	less than 30m
Minimum Detection Range	less than 40m
Bearing Accuracy	less than 1°
Bearing Indication	Relative motion mode : N-UP, C-UP and H-UP True motion mode : N-UP and C-UP
Ambient Condition	Temperature SCANNER UNIT -25 to +55℃ (Storage -25 to +70℃) Other Unit -15 to +55℃ Relative humidity 93% at +40℃
Vibration	2 to 13.2Hz Amplitude +/-1mm +/-10% 13.2 to 100Hz Acceleration 7m/s^2
Power Supply Input	AC100 to 115V, 50/60Hz, 1φ or AC220 to 240V, 50/60Hz, 1φ
Power Consumption	Approx.350VA typical Approx. 1000VA at Maximum wind speed
PS Voltage Fluctuation	+/-10% (at the maximum cable length)
Pre Heating Time	Within 4 minute
From STBY to TX	Within 5 sec.
SCANNER UNIT (NKE-2103-6HS)	
	See 11.14
DISPLAY UNIT (NCD-4990)	
	See 11.17
PERFORMANCE MONITOR (NJU-85)	
	See 11.21
AC/DC CONVERTER (NBA-5135)	
	See 11.22
OPTION	
Scanner with Deicing Heater	None
Interswitch Unit	NQE-3141-2A (Maximum 2 Radars) NQE-3141-4A (Maximum 4 Radars)
DISPLAY UNIT (Desktop type)	NCD-4990T
Maximum Cable Length	
SCANNER UNIT～DISPLAY UNIT	65m
SAFE DISTANCE FOR STANDARD COMPASS	
SCANNER UNIT	2.4m
DISPLAY UNIT	4.0m

11.8 SCANNER UNIT (NKE-1139)

SCANNER UNIT NKE-1139	
Dimension	Height 791 x Swing Circle 4000 (mm)
Mass	Approx.150kg
Polarization	Horizontal
Directional Characteristics	Horizontal beam width : 1.9° Vertical beam width : 25° Side lobe Level : below -26dB (within +/-10°) : below -30dB (outside +/-10°)
Revolution	Approx.24rpm
Power Supply for Motor	AC100 - 115V、50/60Hz、1φ or AC220 - 240V、50/60Hz、1φ
Maximum Wind Velocity	51.5m/s (100knots)

11.9 SCANNER UNIT (NKE-1130)

SCANNER UNIT NKE-1130	
Dimension	Height 791 x Swing Circle 4000 (mm)
Mass	Approx.180kg
Polarization	Horizontal
Directional Characteristics	Horizontal beam width : 1.9° Vertical beam width : 25° Side lobe Level : below -26dB (within +/-10°) : below -30dB (outside +/-10°)
Revolution	Approx.24rpm
Power Supply for Motor	AC100 - 115V、50/60Hz、1φ or AC220 - 240V、50/60Hz、1φ
Maximum Wind Velocity	51.5m/s (100knots)
Transmitting Frequency	3050 ± 20MHz
Transmitting Power	30kW
Transmitting Tube	Magnetron[M1555]
TX Pulse width / Repetition Frequency	SP1 : 0.07μs/2250Hz MP1 : 0.2μs/2250Hz MP2 : 0.3μs/1900Hz、MP3 : 0.4μs/1400Hz LP1 : 0.8μs/750Hz、LP2 : 1.0μs/650Hz LP3 : 1.2μs/510Hz

0.125、0.25、0.5NM	: SP1
0.75NM	: SP1/MP1
1.5NM	: SP1/MP1/MP2/MP3
3NM	: MP1/MP2/MP3/LP1
6NM	: MP1/MP2/MP3/LP1/LP2
12NM	: MP1/MP2/MP3/LP1/LP2
24NM	: MP3/LP1/LP2
48NM	: LP2
96NM	: LP3

Modulator	Solid State Modulator Circuit
Duplexer	Circulator + Diode Limiter
Front End Module	Built-in
Intermediate Frequency Amplifier	Intermediate Frequency : 60MHz Band Width : 25/8/3MHz Gain : more than 90dB Amplifying Characteristics : Logarithmic Amplifier
Overall Noise Figure	7.5dB (Typical)
Tuning	Manual/AUTO

11.10 SCANNER UNIT (NKE-1129-7/9)

SCANNER UNIT NKE-1129-7/9	
Dimension	7ft Height 536 x Swing Circle 2270 (mm) 9ft Height 536 x Swing Circle 2825 (mm)
Mass	7ft Approx.51kg 9ft Approx.53kg
Polarization	Horizontal
Directional Characteristics	Horizontal beam width : 1.0° (7ft) : 0.8° (9ft) Vertical beam width : 20° Side lobe Level : below -26dB (within +/-10°) : below -30dB (outside +/-10°)
Revolution	Approx.24rpm
Power Supply for Motor	AC100 - 115V、50/60Hz、1φ or AC220 - 240V、50/60Hz、1φ
Maximum Wind Velocity	51.5m/s (100knots)

11.11 SCANNER UNIT (NKE-1125-6/9)

SCANNER UNIT NKE-1125-6/9	
Dimension	6ft Height 536 x Swing Circle 1910 (mm) 9ft Height 536 x Swing Circle 2825 (mm)
Mass	6ft Approx. 55kg 9ft Approx. 60kg
Polarization	Horizontal
Directional Characteristics	Horizontal beam width : 1.2° (6ft) : 0.8° (9ft) Vertical beam width : 20° Side lobe Level : below -26dB (within +/-10°) : below -30dB (outside +/-10°)
Revolution	Approx.24rpm
Power Supply for Motor	AC100 - 115V、50/60Hz、1φ or AC220 - 240V、50/60Hz、1φ
Maximum Wind Velocity	51.5m/s (100knots)
Transmitting Frequency	9410 ± 30MHz
Transmitting Power	25kW
Transmitting Tube	Magnetron[M1568BS]
TX Pulse width / Repetition Frequency	SP1 : 0.07μs/2250Hz MP1 : 0.2μs/2250Hz MP2 : 0.3μs/1900Hz、MP3 : 0.4μs/1400Hz LP1 : 0.8μs/750Hz、LP2 : 1.0μs/650Hz LP3 : 1.2μs/510Hz

0.125、0.25、0.5NM	: SP1
0.75NM	: SP1/MP1
1.5NM	: SP1/MP1/MP2/MP3
3NM	: MP1/MP2/MP3/LP1
6NM	: MP1/MP2/MP3/LP1/LP2
12NM	: MP1/MP2/MP3/LP1/LP2
24NM	: MP3/LP1/LP2
48NM	: LP2
96NM	: LP3

Modulator	Solid State Modulator Circuit
Duplexer	Circulator + Diode Limiter
Front End Module	Built-in
Intermediate Frequency Amplifier	Intermediate Frequency : 60MHz Band Width : 25/8/3MHz Gain : more than 90dB Amplifying Characteristics : Logarithmic Amplifier
Overall Noise Figure	7.5dB (Typical)
Tuning	Manual/AUTO

11.12 SCANNER UNIT (NKE-2254-6HS)

SCANNER UNIT NKE-2254-6HS	
Dimension	Height 536 x Swing Circle 1910 (mm)
Mass	Approx. 55kg
Polarization	Horizontal
Directional Characteristics	Horizontal beam width : 1.2° Vertical beam width : 20° Side lobe Level : below -26dB (within +/-10°) : below -30dB (outside +/-10°)
Revolution	Approx.48rpm
Power Supply for Motor	DC24V
Maximum Wind Velocity	51.5m/s (100knots)
Transmitting Frequency	9410 ± 30MHz
Transmitting Power	25kW
Transmitting Tube	Magnetron[M1568BS]
TX Pulse width / Repetition Frequency	SP1：0.07μs/2250Hz MP1：0.2μs/2250Hz MP2：0.3μs/1900Hz、MP3：0.4μs/1400Hz LP1：0.8μs/750Hz、LP2：1.0μs/650Hz LP3：1.2μs/510Hz
	0.125、0.25、0.5NM : SP1 0.75NM : SP1/MP1 1.5NM : SP1/MP1/MP2/MP3 3NM : MP1/MP2/MP3/LP1 6NM : MP1/MP2/MP3/LP1/LP2 12NM : MP1/MP2/MP3/LP1/LP2 24NM : MP3/LP1/LP2 48NM : LP2 96NM : LP3
Modulator	Solid State Modulator Circuit
Duplexer	Circulator + Diode Limiter
Front End Module	Built-in
Intermediate Frequency Amplifier	Intermediate Frequency : 60MHz Band Width : 25/8/3MHz Gain : more than 90dB Amplifying Characteristics : Logarithmic Amplifier
Overall Noise Figure	7.5dB (Typical)
Tuning	Manual/AUTO

11.13 SCANNER UNIT (NKE-2103-6)

SCANNER UNIT NKE-2103-6	
Dimension	Height 458 x Swing Circle 1910 (mm)
Mass	Approx. 40kg
Polarization	Horizontal
Directional Characteristics	Horizontal beam width : 1.2° Vertical beam width : 20° Side lobe Level : below -26dB (within +/-10°) : below -30dB (outside +/-10°)
Revolution	Approx.24rpm
Power Supply for Motor	DC24V
Maximum Wind Velocity	51.5m/s (100knots)
Transmitting Frequency	9410 ± 30MHz
Transmitting Power	10kW
Transmitting Tube	Magnetron[MAF1565N]
TX Pulse width / Repetition Frequency	SP1 : 0.08μs/2250Hz MP1 : 0.25μs/1700Hz MP2 : 0.5μs/1200Hz LP1 : 0.8μs/750Hz、LP2 : 1.0μs/650Hz
	0.125、0.25、0.5NM : SP1 0.75NM : SP1/MP1 1.5NM : SP1/MP1/MP2 3NM : MP1/MP2LP1 6NM : MP1/MP2/LP1/LP2 12NM : MP1/MP2/LP1/LP2 24NM : MP2/LP1/LP2 48NM : LP2 96NM : LP2
Modulator	Solid State Modulator Circuit
Duplexer	Circulator + Diode Limiter
Front End Module	Built-in
Intermediate Frequency Amplifier	Intermediate Frequency : 60MHz Band Width : 20/6/3MHz Gain : more than 90dB Amplifying Characteristics : Logarithmic Amplifier
Overall Noise Figure	7.5dB (Typical)
Tuning	Manual/AUTO

11.14 SCANNER UNIT (NKE-2103-6HS)

SCANNER UNIT NKE-2103-6HS	
Dimension	Height 458 x Swing Circle 1910 (mm)
Mass	Approx. 40kg
Polarization	Horizontal
Directional Characteristics	Horizontal beam width : 1.2° Vertical beam width : 20° Side lobe Level : below -26dB (within +/-10°) : below -30dB (outside +/-10°)
Revolution	Approx.48rpm
Power Supply for Motor	DC24V
Maximum Wind Velocity	51.5m/s (100knots)
Transmitting Frequency	9410 ± 30MHz
Transmitting Power	10kW
Transmitting Tube	Magnetron[MAF1565N]
TX Pulse width / Repetition Frequency	SP1 : 0.08μs/2250Hz MP1 : 0.25μs/1700Hz MP2 : 0.5μs/1200Hz LP1 : 0.8μs/750Hz、LP2 : 1.0μs/650Hz
	0.125、0.25、0.5NM : SP1 0.75NM : SP1/MP1 1.5NM : SP1/MP1/MP2 3NM : MP1/MP2LP1 6NM : MP1/MP2/LP1/LP2 12NM : MP1/MP2/LP1/LP2 24NM : MP2/LP1/LP2 48NM : LP2 96NM : LP2
Modulator	Solid State Modulator Circuit
Duplexer	Circulator + Diode Limiter
Front End Module	Built-in
Intermediate Frequency Amplifier	Intermediate Frequency : 60MHz Band Width : 20/6/3MHz Gain : more than 90dB Amplifying Characteristics : Logarithmic Amplifier
Overall Noise Figure	7.5dB (Typical)
Tuning	Manual/AUTO

11.15 TRANSMITTER RECEIVER UNIT (NTG-3230)

TRANSMITTER RECEIVER UNIT NTG-3230	
Dimension	:Width 615 x Depth 365 x Height 615 (mm)
Structure	Wall Mount, Drip Proof
Mass	Approx.33kg
Transmitting Frequency	3050 ± 20MHz
Transmitting Power	30kW
Transmitting Tube	Magnetron [M1555]
TX Pulse width / Repetition Frequency	SP1 : 0.07μs/2250Hz MP1 : 0.2μs/2250Hz MP2 : 0.3μs/1900Hz、MP3 : 0.4μs/1400Hz LP1 : 0.8μs/750Hz、LP2 : 1.0μs/650Hz LP3 : 1.2μs/510Hz
	0.125、0.25、0.5NM : SP1 0.75NM : SP1/MP1 1.5NM : SP1/MP1/MP2/MP3 3NM : MP1/MP2/MP3/LP1 6NM : MP1/MP2/MP3/LP1/LP2 12NM : MP1/MP2/MP3/LP1/LP2 24NM : MP3/LP1/LP2 48NM : LP2 96NM : LP3
Modulator	Solid State Modulator Circuit
Duplexer	Circulator + TRHPL
Front End Module	Built-in
Intermediate Frequency Amplifier	Intermediate Frequency : 60MHz Band Width : 25/8/3MHz Gain : more than 90dB Amplifying Characteristics : Logarithmic Amplifier
Overall Noise Figure	7.5dB (Typical)
Tuning	Manual/AUTO

11.16 TRANSMITTER RECEIVER UNIT (NTG-3225)

TRANSMITTER RECEIVER UNIT NTG-3225	
Dimension	:Width 460 x Depth 227 x Height 461 (mm)
Structure	Wall Mount, Drip Proof
Mass	Approx.15kg
Transmitting Frequency	9410 ± 30MHz
Transmitting Power	25kW
Transmitting Tube	Magnetron[M1568BS]
TX Pulse width / Repetition Frequency	SP1：0.07μs/2250Hz MP1：0.2μs/2250Hz MP2：0.3μs/1900Hz、MP3：0.4μs/1400Hz LP1：0.8μs/750Hz、LP2：1.0μs/650Hz LP3：1.2μs/510Hz

0.125、0.25、0.5NM	：SP1
0.75NM	：SP1/MP1
1.5NM	：SP1/MP1/MP2/MP3
3NM	：MP1/MP2/MP3/LP1
6NM	：MP1/MP2/MP3/LP1/LP2
12NM	：MP1/MP2/MP3/LP1/LP2
24NM	：MP3/LP1/LP2
48NM	：LP2
96NM	：LP3

Modulator	Solid State Modulator Circuit
Duplexer	Circulator + Diode Limiter
Front End Module	Built-in
Intermediate Frequency Amplifier	Intermediate Frequency : 60MHz Band Width : 25/8/3MHz Gain : more than 90dB Amplifying Characteristics : Logarithmic Amplifier
Overall Noise Figure	7.5dB (Typical)
Tuning	Manual/AUTO

11.17 DISPLAY UNIT (NCD-4990)

DISPLAY UNIT NCD-4990	
Dimension	Width 700 x Depth 850 x Height 1100 (mm)
Structure	Self-Standing, Drip Proof
Mass	Approx.130kg
Screen	23.1inch Color LCD (Effective Diameter, more than 320mm)
Viewing Distance	1m from the center of Display
Range Scale	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96NM
Range Marker	0.025, 0.05, 0.1, 0.25, 0.25, 0.5, 1, 2, 4, 8, 16NM
Range Accuracyr	Less than 1% of the Range Scale in use, or 30m whichever is larger
Variable Range Marker	2 (VRM1/VRM2)
VRM Scale	0.000 to 100.0nm, Numerical Indication in 4 digits
Bearing Scale	360° in 1° step
Off Center	Within 66% of Radius, except 96nm range
Trackball Cursor	Built-in (Target Range, Relative/True bearing Presentation)
Electronic Bearing Lines	2 (EBL1/EBL2) (on Center/Floating)
EBLBearing Indication	000.0° to 359.9° Numerical Indication in 4 digits
Tuning Indication	Bar graph
Marking Function	Electronic Mark (Maximum 20 points)
Heading Line Indication	Electronic
True Motion Unit	Built in (0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24 and 48nm)
Anti Sea Clutter (SEA)	Manual/AUTO
Anti Rain Clutter (SEA)	Manual/AUTO
Display mode	North-up / Head-up / Course-up
Trails Indication	Off/0.25/0.5/1/3/6/10/15/30/60min
Video Process (PROC)	Built in (Scan correlation / Remain)
Interference Rejection (IR)	Built in (Off / Low / Middle / High)
Auto-acquisition Zone (AZ)	Sector (2)
User Map[i]	Built in, Mark and Line (20,000 points)
Self diagnostic function	Built in
Own Ship's Track Indication[i]	Built in
Parallel Index Line (PI)	Built in
AIS Indication	Built in Display: 300 Activate: 100 Association function:Built in
Interfacing	Slave Display (TRG, VD, BP, BZ) GPS IEC61162-1(NMEA0183) LOG GYRO AIS IEC61162-2 Inter Switch (OPTION) Radar Buoy External Alarm output

Receivable Signal[ii]			
	Receive capability Port:	NAV1/NAV2/LOG/ALM/AIS/HDG at TB4501 COM DSub-9pin	
	Navigation equipment IEC61162-1/2	Longitude/Latitude	GGA>RMC>RMA>GNS>GLL
		Waypoint	RMB>BWC(BWR)
		COG/SOG	RMC > RMA > VTG
		SPEED	VBW
		Day/Time information	ZDA
		Alarm acknowledge	ACK
		Rate of Turn	ROT
		Rudder	RSA
	Bearing signal	GYRO-SYNC	360x, 180x, 90x, 36x(GYRO I/F)
		GYRO-STEP	360x, 180x, 90x, 36x(GYRO I/F)
		IEC61162-2 38400bps	THS>HDT over 40Hz (HDG port at terminal board TB4501)
		IEC61162-1[iii]	HDT>HDG>HDM>VHW (HDG port at terminal board TB4501)
	Speed signal	LOG-SYNC	360x, 180x, 90x, 30x(GYRO I/F)
		LOG-PULSE	800, 400, 200, 100(GYRO I/F)
	External event mark	Contact input (EVENT port at terminal board TB4601)	
	Radar buoy	Negative input (RBVD port at terminal board TB4401)	
	Depth	IEC61162-1/JRC	DPT>DBS>DBT>DBK, JRC format
	Water temperature	IEC61162-1/JRC	MTW, JRC format
	Tendency	IEC61162-1/JRC	CUR, JRC format
	Wind	IEC61162-1	MWV>MWD
	AIS	IEC61162-2	VDM,VDO (AIS port at terminal board TB4601)
	Acknowledge	Contact input (SYSACK, ARPAACK, PWRACK port at terminal board TB4601)	
Sendable Signal			
	Slave video	Radar video: TIY, VD, BP(2048p), BZ (Terminal board TB4401)	
	Send capability Port	NAV1/NAV2/ALM/ARPA/JARPA port at TB4501 MNT port at TB4601 COM at DSub-9pin	
	Navigation information IEC61162-1/2	Radar system data	RSD
		Own ship data	OSD
		Tracking target data	TTM,TLL,TTD,TLB,JRC-ARPA
		AIS target data	TTM,TLL,TTD,TLB
		Alarm	ALR
		Auto pilot	APB
		Bearing of destination	BOD
		Latitude/Longitude data	GGA,GLL,RMC
		Waypoint	RMB,BWC
		COG/SOG	VTG
		Cross track error	XTE

	Heading data	HDT,THS
External alarm	Default setting	normally closed contact
	Maximum current	200mA (SYSALM, ALPAALM, PWRALM port at terminal board TB4601)
Acknowledge	Contact output (ACKOUT port at terminal board TB4401)	
Watchman reset	Contact output (WMRST port at terminal board TB4401)	
Remote maintenance	JRC format (MNT port at terminal board TB4601)	
AIS alarm acknowledge	ACK (AIS port at terminal board TB4601)	
External monitor	Multi scan monitor	Analog RGB, HD15pin Connector 2 port

i. Only with Navigation Equipment is connected.

ii. The Speed measuring accuracy of speed sensor shall confirm to IMO Resolution MSC.96(72).
The measuring accuracy of GPS shall confirm to IMO Resolution MSC.112(73).

iii. Can't be use for target tracking.

11.18 Target Tracking Function

Target Tracking Function			
Available range scale	All range		
Acquisition	Acquisition mode	Manual/AUTO (AUTO mode uses Auto-acquisition Zone)	
	Manual Cancellation	Any one Target or All targets at once	
	Acquisition Range	0.1nm - 32nm (Available all range scale)	
Tracking	Number of Target	100 Targets (AUTO Tracking)	
	Tracking range	0nm - 32nm (Available all range scale)	
Presentation	Display mode	TM (True Motion) / RM (Relative Motion)	
	Azimuth mode	North-up / Head-up / Course-up	
	Vector mode	True/Relative Display	
	Vector Length	Variable, 1 to 60 min. (1min. step)	
	Past Position	True/Relative Display Number of Dots…10 points Display Interval Time…0.5 / 1 / 2/ 4 min	
	Time to Display Vector	Within 1min	
	Time to Stabilize Vector	Within 3min	
Alarm	Auto-acquisition Zone	2 (sector)	
	Setting Range	AZ1 (0.5～32NM),AZ2 (0.5～32NM)	
	Alarm Indication	Symbol on Display, Visible / Audible Alarm	
Safe Limits (CPA／TCPA)	Setting Condition	CPA LIMIT	0.1 to 9.9NM
		TCPA LIMIT	1 to 99 minute
	Setting Condition	Safe Target	CPA ＞ CPA LIMIT
			0 ＞ TCPA
			TCPA ＞ TCPA LIMIT
		Danger Target	CPA ≦ CPA LIMIT
			0 ≦ TCPA ≦ TCPA LIMIT
	Alarm Indication	Status	Symbol / Alarm / Audible
		Safe Target	○ (wht) / OFF / OFF
		Danger Target	○ (red) / CPA/TCPA / ON
	Lost Target	Symbol on Display Visible / Audible Alarm	
Data Indication	Target Data	Simultaneous and Continuous Display for 4 Targets True Bearing, Range, True Course, True Speed,CPA,TCPA,BCR,BCT	
	Own Ship's Data	Course and Speed	
Trial Maneuver	Manual Setting		
	Trial Course	0° to 359.9°	
	Trial Speed	0 to 100 kn	
Accuracy of Display	Complied with IMO Requirement		
System Failure Alarm	Visible / Audible Alarm		
Speed Input	Manual/AUTO (LOG)		

11.19 AIS FUNCTION

AIS Function

Available range scale: All range

Activation	Activation mode	Manual/AUTO (AUTO mode uses Auto-activation Zone)	
	Manual Cancellation	Any one Target	
Presentation	Number of Activated Target	100 Targets	
	Number of Target	300 Targets (sleeping target and activated target)	
	Past Position	True/Relative Display	
		Number of Dots…10 points	
		Display Interval Time…0.5 / 1 / 2/ 4 min	
		Display Interval distance…0.1 / 0.2 / 0.5/ 1 NM	
	Message	Broadcast Message, Addressed Message	
	Display mode	TM (True Motion) / RM (Relative Motion)	
	Azimuth mode	North-up / Head-up / Course-up	
	Vector mode	True/Relative Display	
	Vector Length	Variable, 1 to 60 min. (1min. step)	
Alarm	Auto-activation Zone	2 (Sector)	
	Setting Range	AZ1(0.5 to 32nm), AZ2(0.5 to 32nm)	
	Alarm Indication	Symbol on Display, Visible / Audible Alarm	
Safe Limits (CPA／TCPA)	Setting Condition	CPA LIMIT	0.1 to 9.9NM
		TCPA LIMIT	1 to 99min

Alarm Condition

Safe Target	CPA > CPA LIMIT
	0 > TCPA
	TCPA > TCPA LIMIT
Danger Target	CPA ≦ CPA LIMIT
	0 ≦ TCPA ≦ TCPA LIMIT

Alarm Indication

Status	Symbol	Alarm	Audible
Safe Target	△ (wht)	OFF	OFF
Danger Target	△ (red)	CPA/TCPA	ON

	Lost Target	Symbol on Display Visible / Audible Alarm
Data Indication	Target Data	Simultaneous and Continuous Display for 2 Targets
	simple display	Ship's Name, Call Sign, MMSI, Course, Speed, CPA and TCPA
	detail display	Ship's Name, Call Sign, MMSI, Course, Speed, CPA, TCPA, Bearing, Range, Ship's Heading Bearing, Rate of Turn, Latitude, Longitude, Destination and Navigation Status
	Own Ship's Data	The ship's name, call sign, MMSI, course, speed, ship's heading bearing, rate of turn, latitude, longitude, destination and navigation status of own ship
Trial Maneuver	Manual Setting	
	Trial Course	0° to 360°
	Trial Speed	0 to 100 kn

Accuracy of Display	Complied with IMO Requirement
System Failure Alarm	Visible / Audible Alarm
Speed Input	Auto (LOG)

11.20 PERFORMANCE MONITOR (NJU-84)

PERFORMANCE MONITOR NJU-84	
Dimension	Width 130 x Depth 180 x Height 70 (mm)
Mass	Approx.0.7kg
Operating Frequency	3050 ± 30MHz

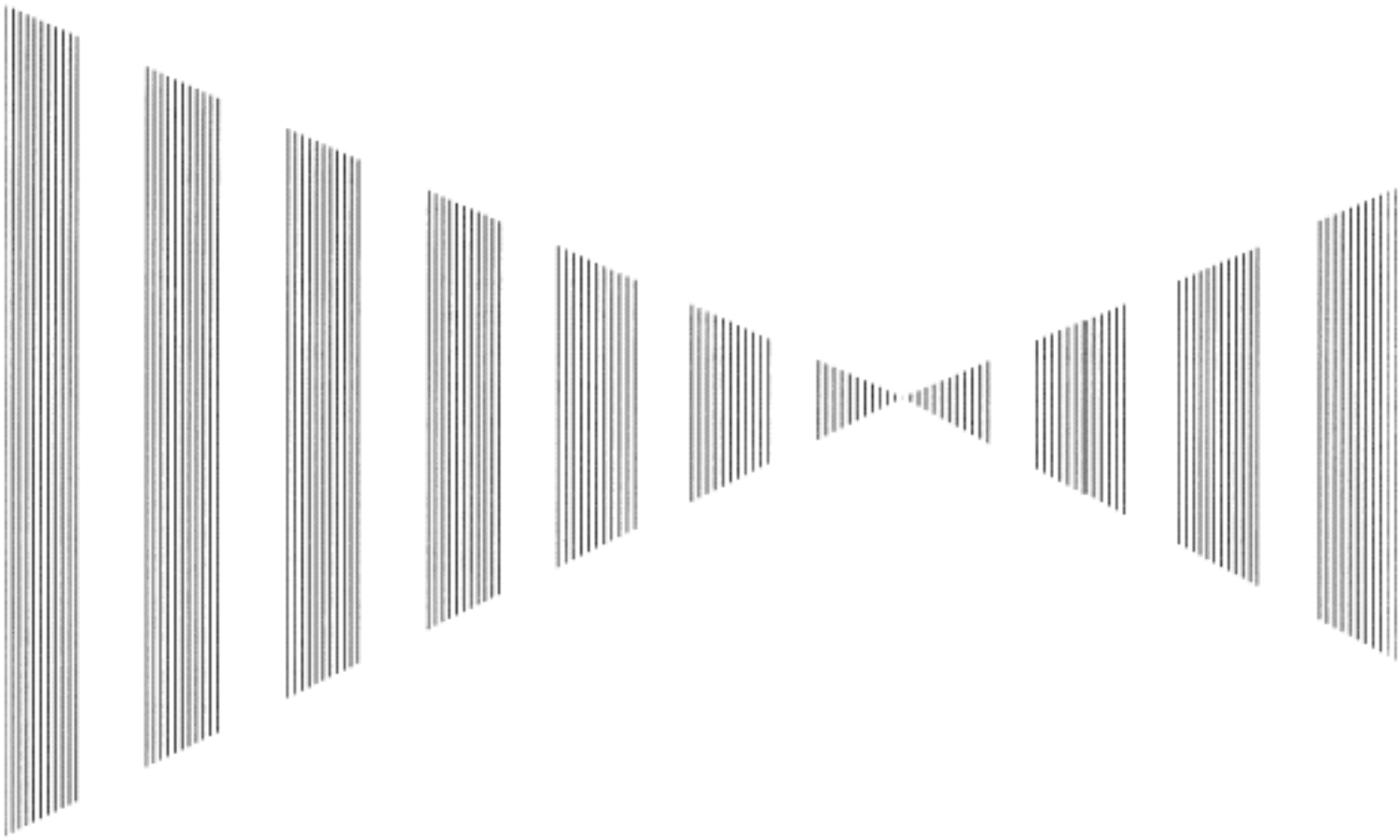
11.21 PERFORMANCE MONITOR (NJU-85)

PERFORMANCE MONITOR NJU-85	
Dimension	Width 130 x Depth 149 x Height 70 (mm)
Mass	Approx.0.7kg
Operating Frequency	9410 ± 30MHz

11.22 AC/DC CONVERTER (NBA-5135)

AC/DC CONVERTERNBA-5135	
Dimension	Width 315 x Depth 385 x Height 99 (mm)
Mass	Approx.5kg
Power supply Input	AC100 to 240V, 50/60Hz, 1φ
Output Voltage	DC24V +/-5%
Output Current	12A max

Appendix A
NQE-3141 Interswitch Unit



NQE-3141 Interswitch Unit

A.1 OVERVIEW

A.1.1 Overview

Interswitch NQE-3141 is equipment that enables free changeover between radar display units installed on the bridge and antenna units having different characteristics.

If display unit is turned off or malfunctioned, the scanner unit can be controlled by other display unit.

If interswitch unit had malfunctioned, the radar system is switched to standalone mode.

Up to 8 units can be changed over.

When the connected scanner is changed, following setting values are automatically loaded.

Tune Adjustment	Section 7.1.3 "Tuning"
Bearing Adjustment	Section 7.1.4 "Bearing Adjustment"
Range Adjustment	Section 7.1.5 "Range Adjustment"
Antenna Height	Section 7.1.8 "Antenna Height Setting (Antenna Height)"
Antenna installation location	Section 7.1.9 "Setting of CCRP (CCRP Setting)"
Sector Blank	Section 7.2.2 "Sector Blank Setting (Sector Blank)"
TNI Blank	Section 7.2.3 "TNI Blank Setting (TNI Blank)"
Performance monitor adjustment	Section 7.3.4 "Adjustment of Performance Monitor"
PRF Fine Tuning	Section 3.8.3 "Set Scanner Unit (TXRX Setting)"

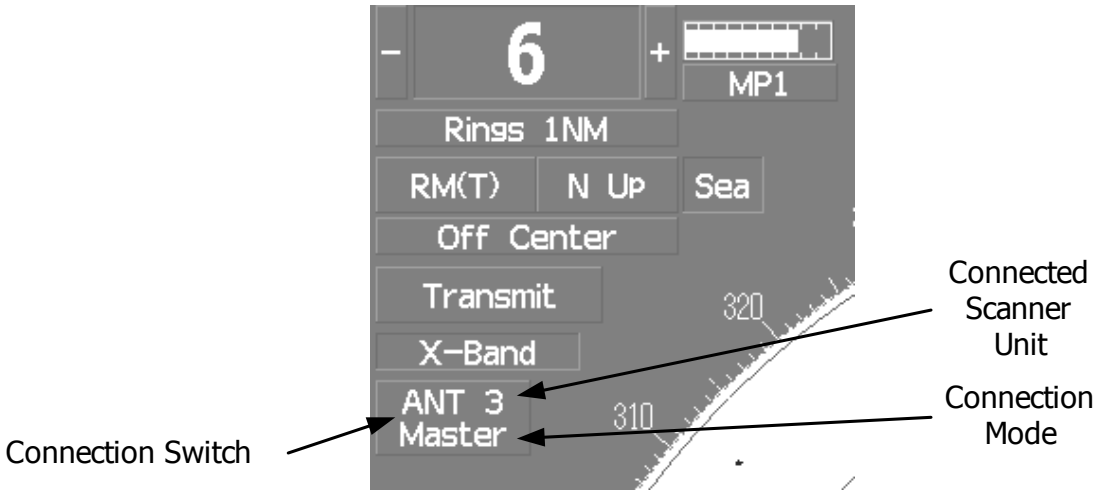
A.1.2 Interswitch Setup

Connection modes can be changed simply by changing the interswitch connection (upper left of the display).

A master display unit is always necessary for establishing a slave connection.

Before a slave display unit can be placed in transmission state, the master display unit must be placed in transmission state.

upper left of the display



The upper stand indicates the number of the connected scanner unit.

The lower stand indicates the connection mode.

Master :Mode in which the scanner unit can be controlled by the display unit

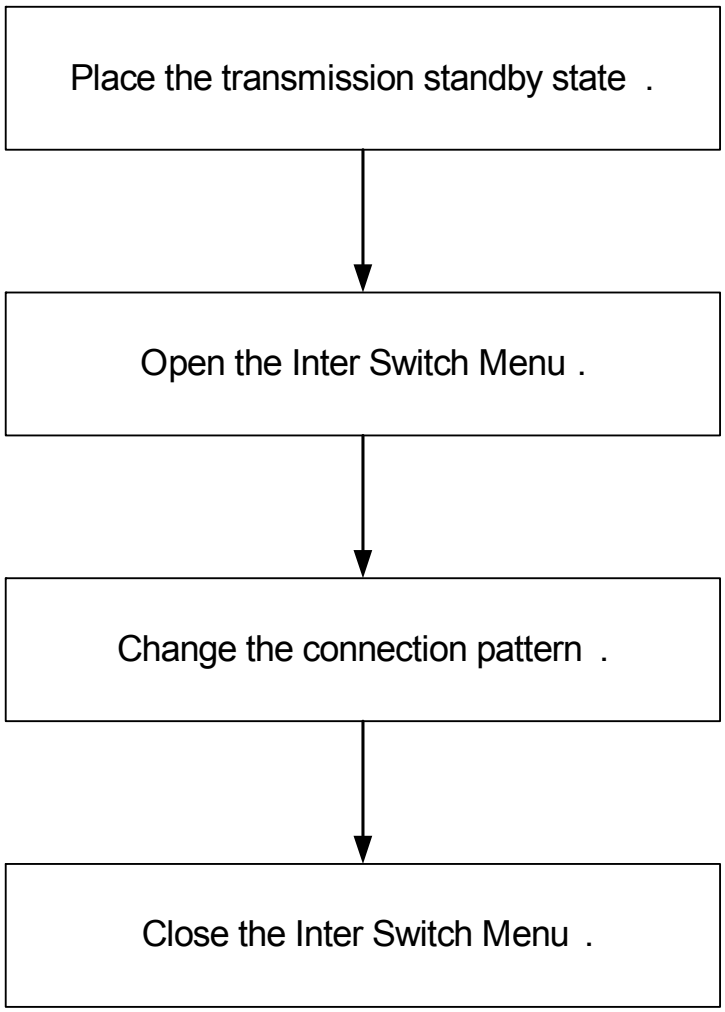
Slave :Mode in which the scanner unit cannot be controlled[i]

i. When Slave is selected, transmission / standby and pulse length cannot be changed. The available range is also limited.

A.2 INTERSWITCH OPERATION

Follow the flowchart below to change the current interswitch connection pattern.

A.2.1 Operation Flow



A.2.2 Inter Switch Menu

The Inter Switch Menu can be opened only when the transmission standby state.

Procedures

1) **Press the [TX/STBY] key to stop transmitting.**

The transmission standby state will be placed.

2) **Move the cursor onto the Interswitch connection change (upper left of the display), and left-click.**

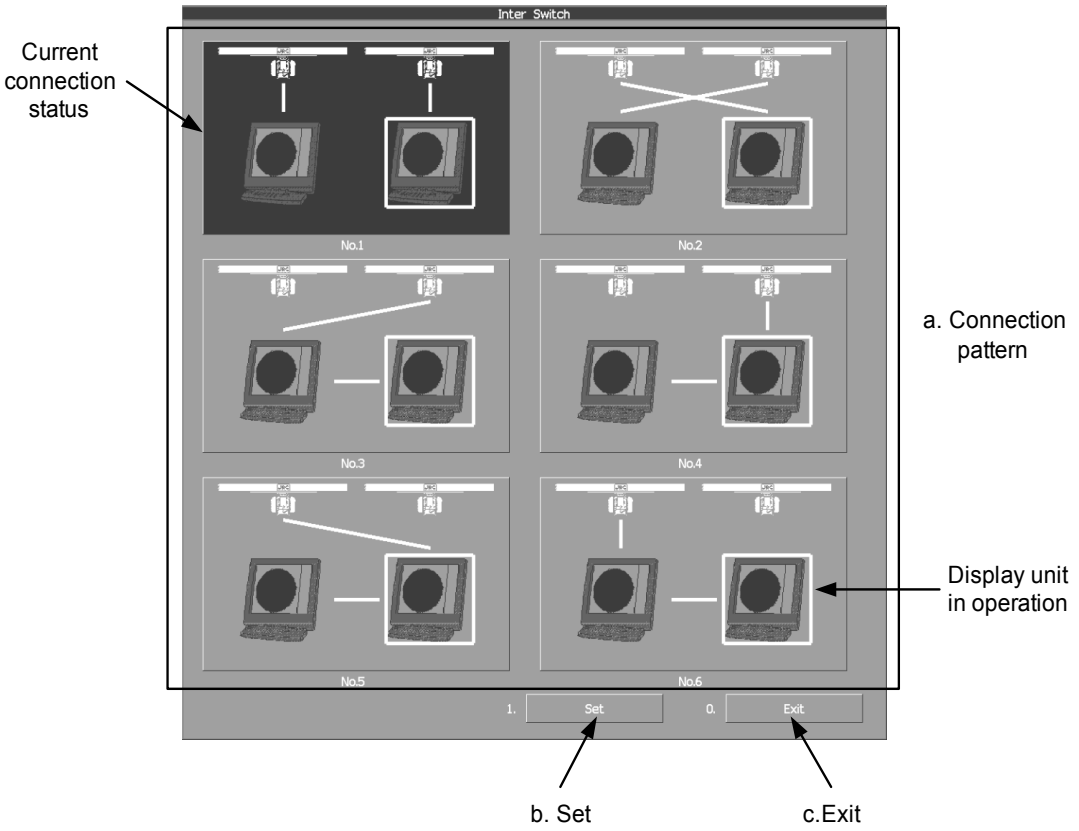
The Inter Switch Menu will appear.

Exit

1) **Left-click the** 0.Exit **button.**

The Inter Switch Menu will close.

Inter Switch Menu (with 2 Display Units)



a. Connection pattern

If this button is clicked, the connection pattern is selected.

The display unit in operation is enclosed in a square ☐.

The background of the current connection pattern display is highlighted.

b. Set

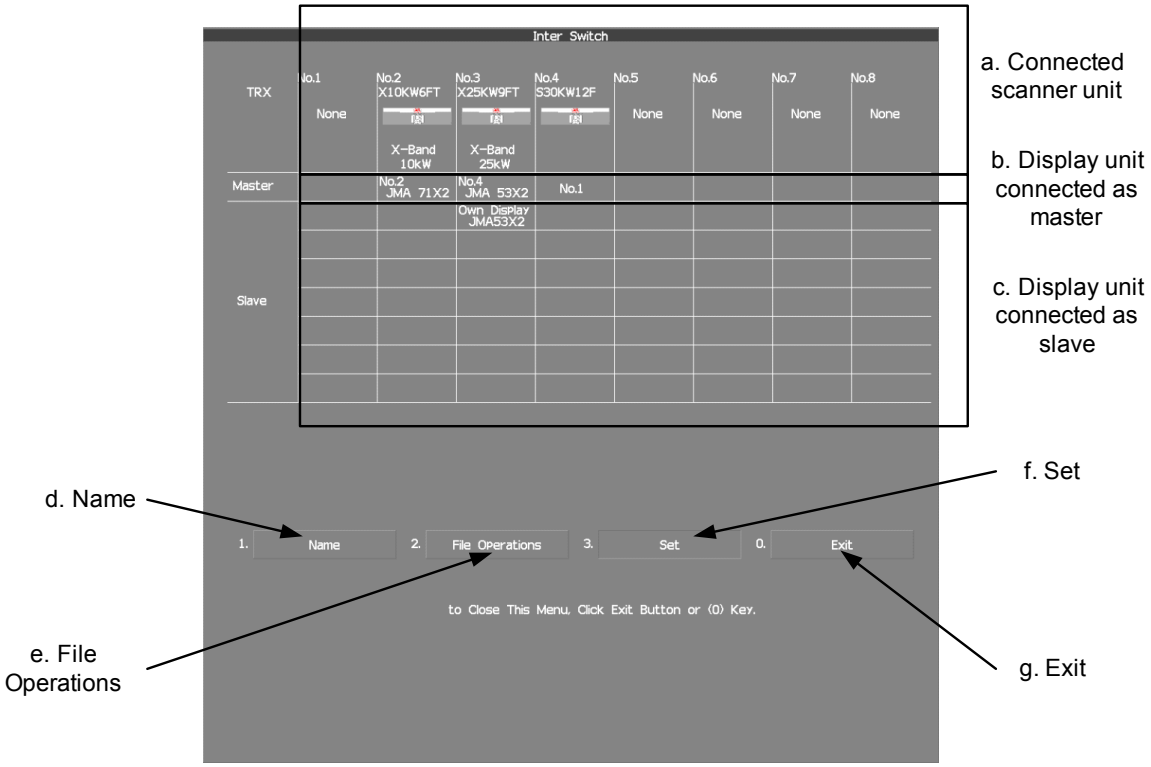
If this button is clicked, the change of connection is determined.

c. Exit

If this button is clicked, the Inter Switch Menu is closed .

> If only 2 display units are installed but the interswitch is set for 3 or more display units, the Inter Switch Menu for 3 or more display units will appear.

Inter Switch Menu (with 3 or More Display Units)



a. Connected scanner unit

In mode for naming a display unit or antenna unit, clicking on a unit opens the name input window.

b. Display unit connected as master

c. Display unit connected as slave

If this button is clicked, select / cancel the display unit.

If this button is clicked in the naming a display unit or scanner unit mode , the name input window is opened .

d. Name

If this button is clicked, set to the display or scanner unit rename mode.

e. File Operations

If this button is clicked, the File Operations menu is opened.。

f. Set

If this button is clicked, the change of connection is determined.

g. Exit

If this button is clicked, the Inter Switch Menu is closed .

A.2.3 Change of Connection Pattern (with 2 Display Units)

If two display units are installed, a connection pattern needs to be selected.

Procedures

1) **Open the Inter Switch menu (with 2 Display Units).**

2) **Move the cursor onto the Connection pattern** (see Section A.2.2 "Inter Switch Menu" and Section a. "Connection pattern") **to be changed , and left-click.**

The connection pattern will be selected, and 3. Set (Section b. "Set") will blink.

3) **Left-click the** 3. Set **button.**

The connection pattern will be changed.

A.2.4 Change of Connection Pattern (with 3 or More Display Units)

If three or more display units are installed, the layout of connection patterns needs to be set.

Procedures

1) **Open the Inter Switch Menu (with 3 or More Display Units).**

2) **Move the cursor onto the display unit** (Section b. "Display unit connected as master" or Section c. "Display unit connected as slave") **to be changed , and left-click.**

The selected display unit will be highlighted.

To deselect the display unit, left-click key again.

3) **Move the cursor to the change-destination display unit, and left-click.**

he selected display unit in step 2 will be switched to the change-destination display unit, and 3. Set (Section f. "Set") will blink.

If the change destination is empty, control will move and 3. Set will blink.

4) **Left-click the 3. Set button.**

The connection pattern will be changed.

> A master display unit is always necessary for establishing a slave connection.

A

A.2.5 Operating Connection Pattern Files (File Operations)

Frequently used connection patterns can be read easily by saving interswitch connection patterns.

[1] Loading connection patterns (Load)

Procedures

1) **Open the Inter Switch Menu (with 3 or More Display Units).**

2) **Left-click the** 2. File Operation **button.**

The File Operations menu will appear.

3) **Left-click the** 3. Load **button.**

Currently saved connection patterns in memory will be listed.

4) **Left-click the button corresponding to the file to be loaded.**

Confirmation Window will appear.

5) **Left-click the** 1. Yes **to load.**

The connection pattern will be changed.

[2] Saving connection patterns (Save)

Procedures

1) **Open the Inter Switch Menu (with 3 or More Display Units).**

2) **Left-click the** 2. File Operation **button.**

The File Operations window will appear.

3) **Left-click the** 2. Save **button.**

The Save menu will appear.

Currently saved connection patterns in memory will be listed.

4) **Left-click the button corresponding to the file to be saved.**

The Input File Name window will appear.

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

Up to 8 characters can be entered.For the input method on the character input screen, see Section 3.3.4.7 "Entering a character".

The connection pattern will be saved when the name is input.

[3] Erasing a connection pattern (Erase)

Procedures

1) **Open the Inter Switch Menu (with 3 or More Display Units).**

2) **Left-click the** 2. File Operation **button.**

The File Operations window will appear.

3) **Left-click the** 3. Erase **button.**

The Erase menu will appear.

The list of connection patterns stored in the memory will be displayed.

4) **Left-click the button corresponding to the file to be erased.**

Confirmation Window will appear.

5) **Left-click the** 1. Yes **to load.**

The selected connection pattern is erased and the file name is deleted from the list.

A.2.6 Names of Display Units and Scanner Units

The display units and antenna units can be named.

Procedures

1) **Open the Inter Switch Menu (with 3 or More Display Units).**

2) **Left-click the** 1. Name **button.**

"Name" will be highlighted, indicating that the rename mode is activated.

3) **Move the cursor to the display unit** (Section b. "Display unit connected as master" or Section c. "Display unit connected as slave") **or scanner unit** (Section a. "Connected scanner unit") **to be renamed , and left-click.**

he Input IND Name or the Input TXRX Name window will appear.

4) **Input a new unit name.**

Up to 8 characters can be input as a unit name. For the input method on the character input menu, see Section 3.3.4.7 "Entering a character".

The selected display unit or antenna unit will be renamed when the new name is input.

A.3 REFERENCE

A.3.1 Preheat Time after Change of Connection Pattern

After the current interswitch connection pattern has been changed, operation needs to wait until the system is ready. This is because the preheat time varies depending on the previous connection of the scanner unit and display unit.

The wait time is necessary for protecting the electronic tubes that emit radio waves.

a) When not changed to a new connection pattern	Preheating not required
b) When changed to a new connection pattern and an scanner unit had been used before the change	Preheating not required
c) When changed to a new connection pattern and an scanner unit had not been used before the change	Preheating required

A.3.2 Notes on Changing Connection Pattern

An attempt to change to another connection pattern immediately after the completion of connection pattern change may fail.

This is because internal processing still needs some preparation time upon completion of connection pattern change. Let several seconds pass between connection pattern change operations.

A.3.3 Notes on Connecting Slave Display Unit

Before a slave display unit can be placed in transmission state, the master display unit must be placed in transmission state. If the master display unit is moved from the transmission state to the transmission standby state, the slave display unit is forcibly placed in transmission standby state. When they are in transmission standby state, Master Standby is shown in the alarm indication (lower right of the display), and the alarm sounds.

A slave display unit cannot control tune. Tune is controlled by the master display unit. Slave is shown in the transmitter pulse length (upper left of the display).

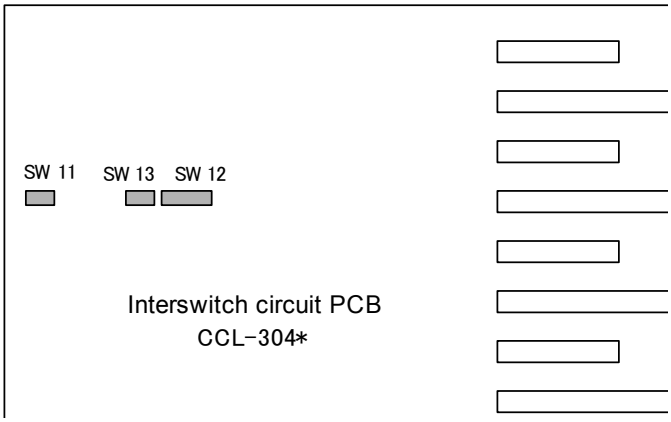
Range change for a slave display unit is limited by the range and pulse length / repetition frequency of the master display unit. As a rule, a greater range than the range of the master display unit cannot be set for a slave display unit. However, if the transmitter pulse length of a slave display unit is identical to the master display unit's and the repetition frequency is within the master display unit's, a greater range than the master display unit's can be selected for the slave display unit. When the master display unit narrows the range or changes the transmitter

pulse length, the range of the slave display unit may be forcibly changed. In this case, Master Range CHG is shown in the alarm indication (lower right of the display), and the alarm sounds.

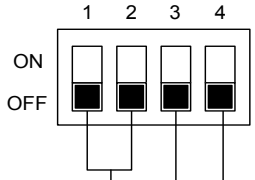
A.3.4 Setting at Installation

Setting of the interswitch circuit (CCL-304*)

The settings of the DIP switches SW11 to SW13 are shown below.



1) **SW11 setting (extension mode and master/slave settings)**



Unused

Description	1, 2
Unused	ON
Unused	OFF

Set the switch to OFF in normal state.

Master/slave setting

Description	3
Slave	ON
Master	OFF

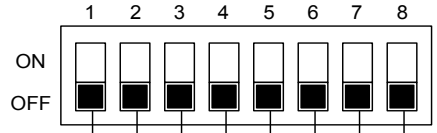
Set the switch to ON if the slave ISW PCB is selected in extension mode.

Extension mode setting

Description	4
Extension mode	ON
Normal mode	OFF

Set the switch to OFF if the number of connected display units is four or less.

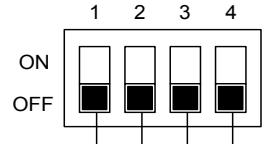
2) SW12 setting (radar connection settings)



Radar connection settings

No.1 display unit connected	ON	1
No.1 display unit NOT connected	OFF	
No.1 scanner unit connected	ON	2
No.1 scanner unit NOT connected	OFF	
No.2 display unit connected	ON	3
No.2 display unit NOT connected	OFF	
No.2 scanner unit connected	ON	4
No.2 scanner unit NOT connected	OFF	
No.3 display unit connected	ON	5
No.3 display unit NOT connected	OFF	
No.3 scanner unit connected	ON	6
No.3 scanner unit NOT connected	OFF	
No.4 display unit connected	ON	7
No.4 display unit NOT connected	OFF	
No.4 scanner unit connected	ON	8
No.4 scanner unit NOT connected	OFF	

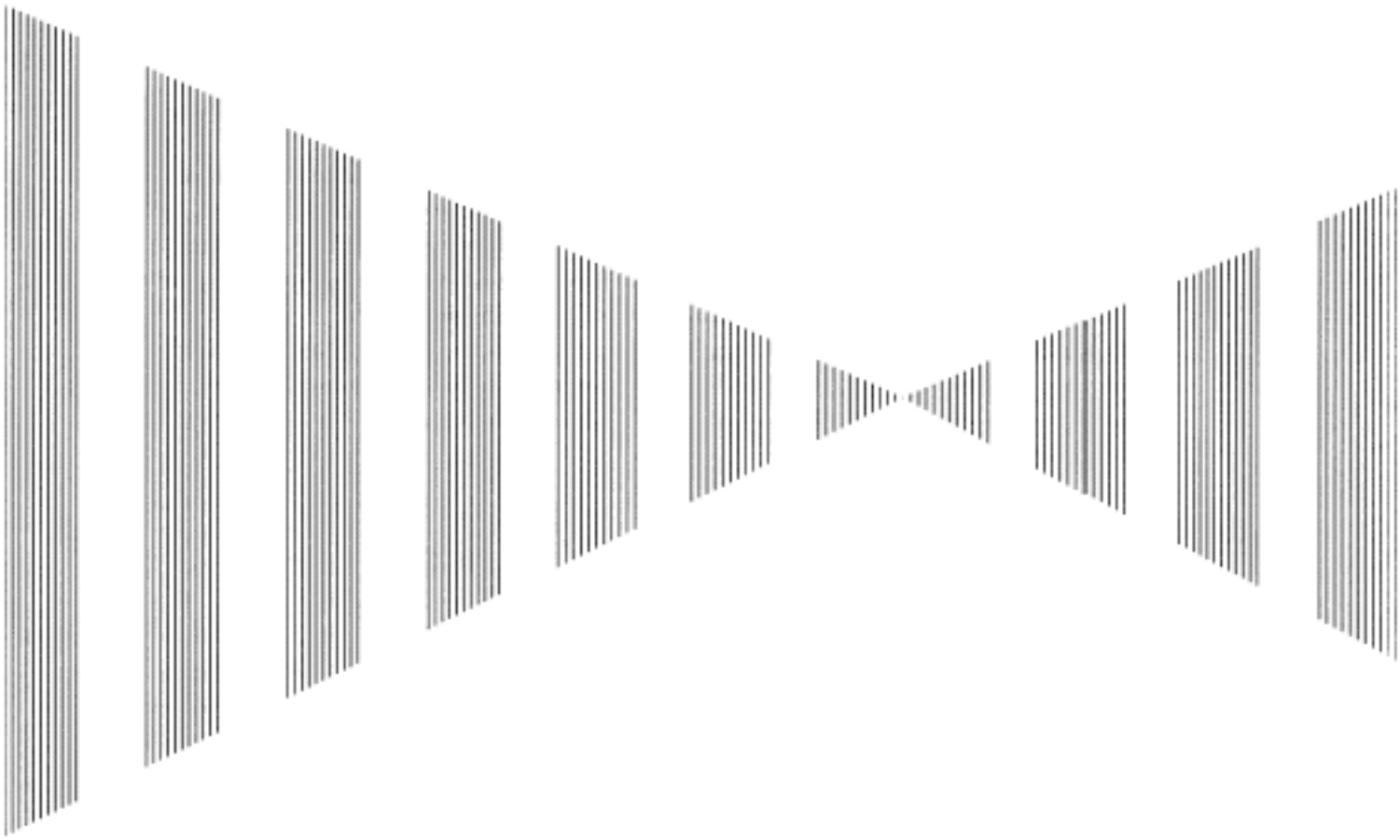
3) SW13 (unused)



Unused (All OFF)	1,2,3,4

Before the DIP switches of the interswitch circuit can be set, the interswitch breaker must be turned off in order to ensure safety operation.

Appendix B
DRAWINGS



DRAWINGS

B.1 Interconnection Diagram of Display Unit

B.1.1 NCD-4990

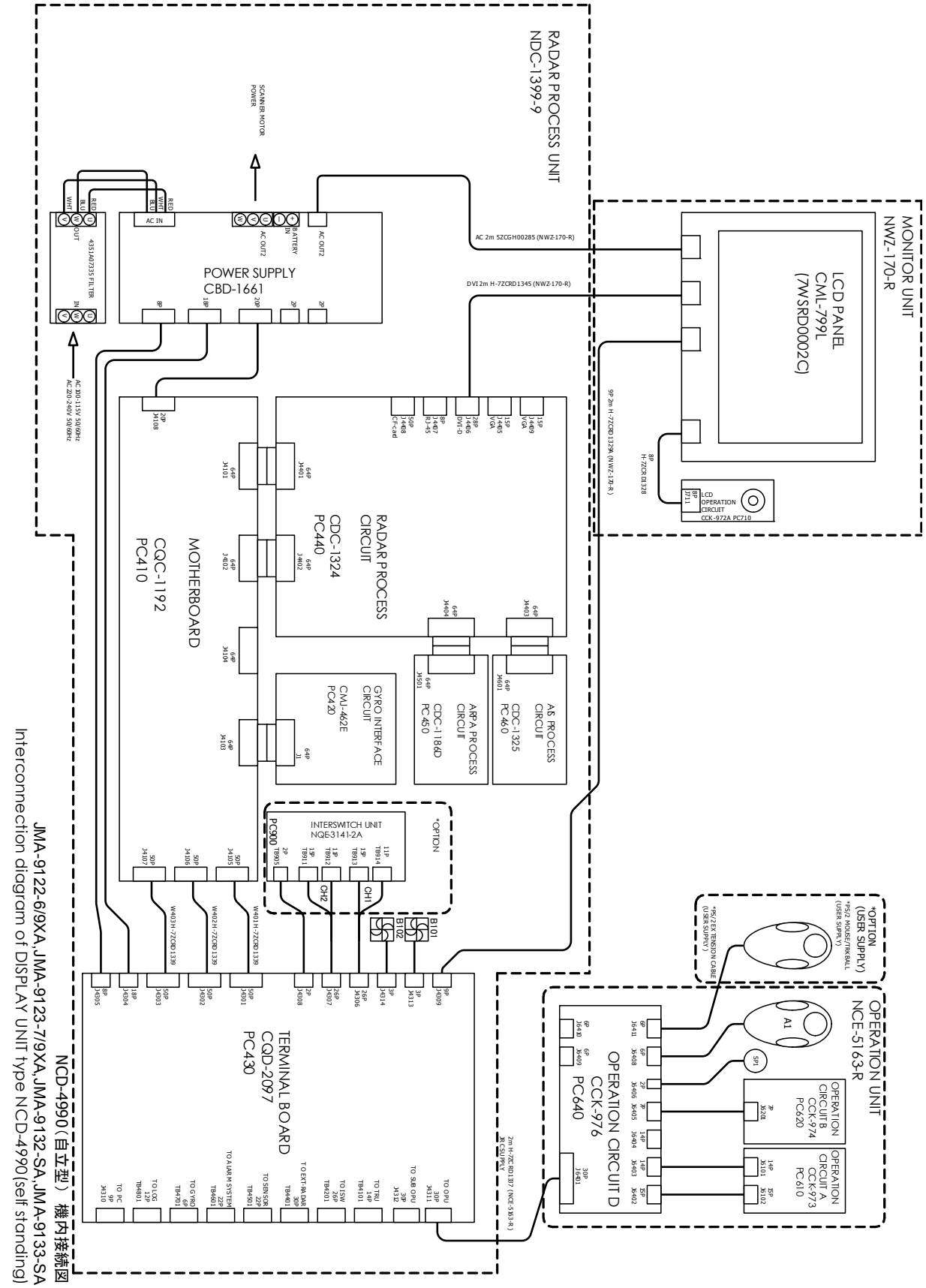
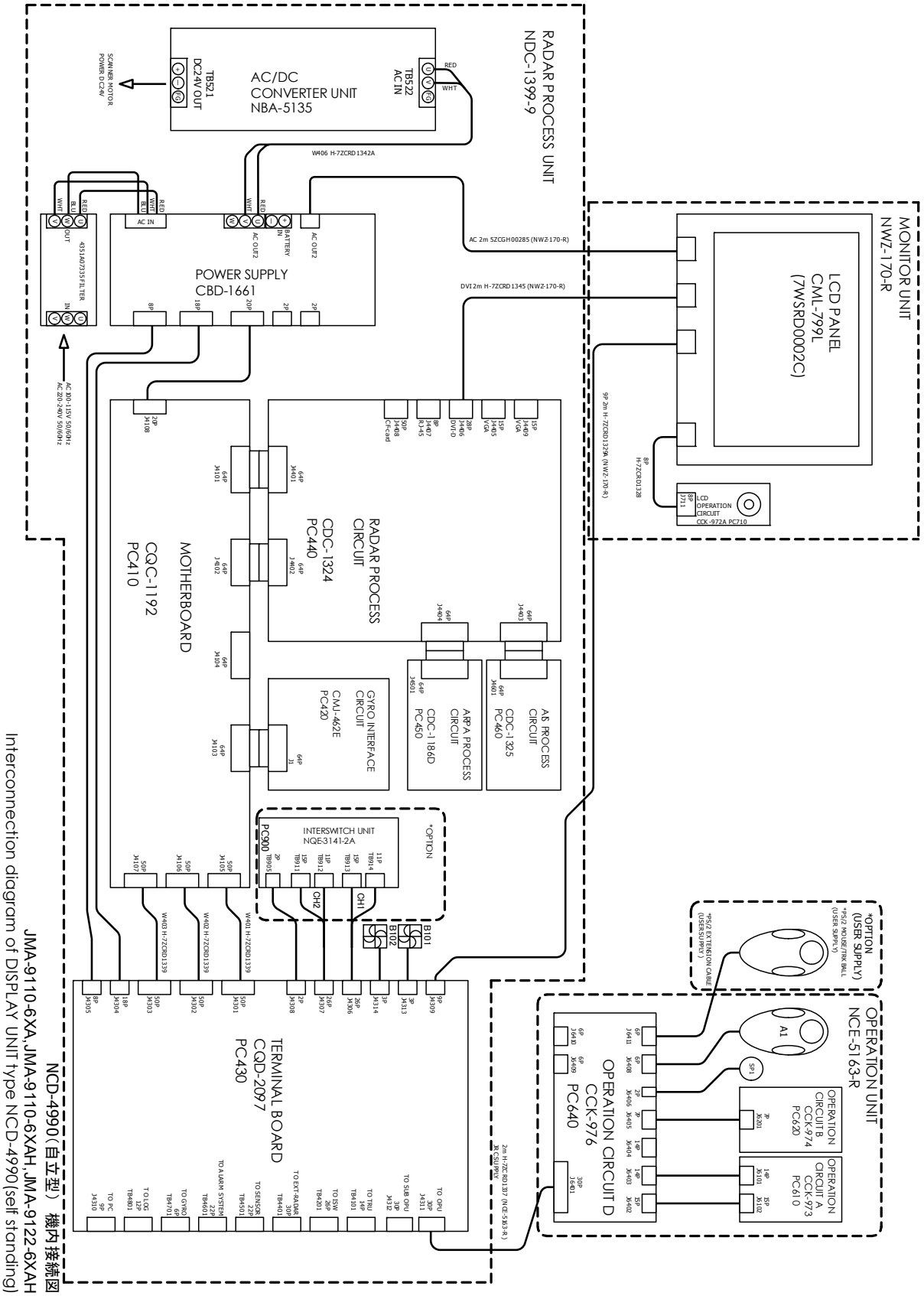


Fig B-1: *Interconnection Diagram of NCD-4990*

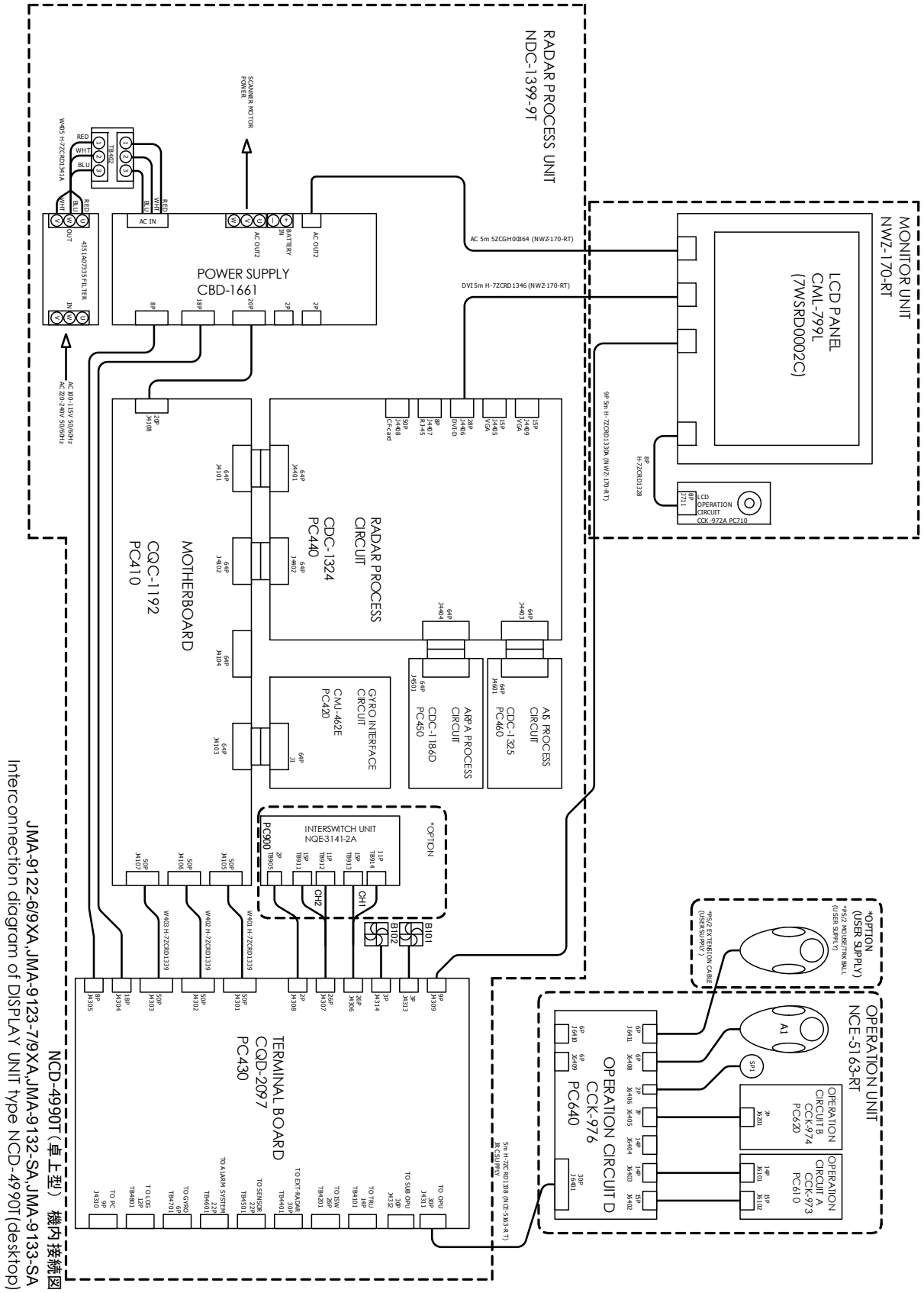
B.1.2 NCD-4990 w/NBA-5135



NCD-4990(自立型) 機内接続図
JMA-9110-6XA,JMA-9110-6XAH,JMA-9122-6XAH
Interconnection diagram of DISPLAY UNIT type NCD-4990(self standing)

Fig B-2: *Interconnection Diagram of NCD-4990 w/NBA-5135*

B.1.3 NCD-4990T



NCD-4990T（卓上型）機内接続図
JMA-9122-6/9XA,JMA-9123-7/9XA,JMA-9132-SA,JMA-9133-SA
Interconnection diagram of DISPLAY UNIT type NCD-4990T(desktop)

Fig B-3: *Interconnection Diagram of NCD-4990T*

B.1.4 NCD-4990T w/NBA-5135

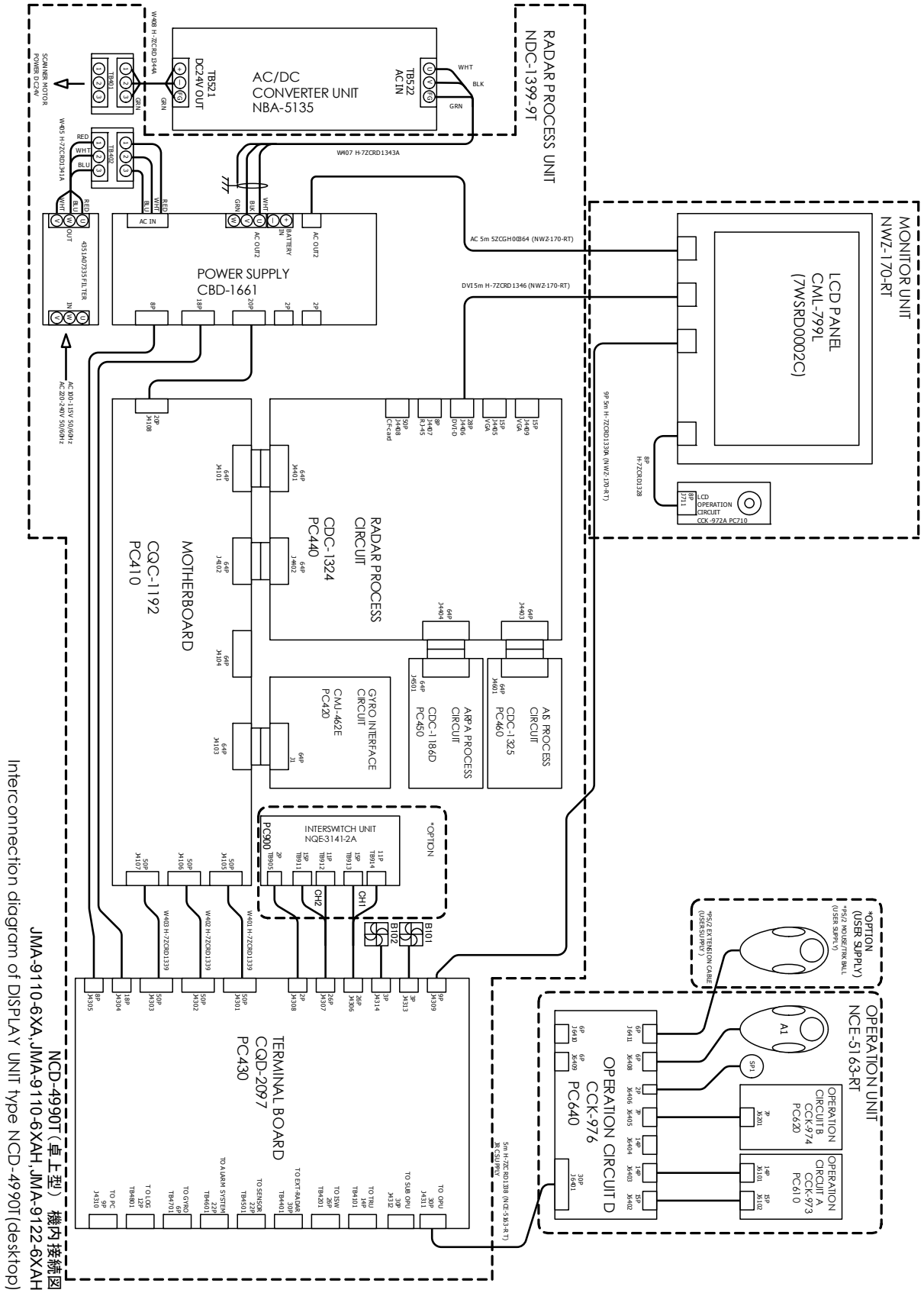
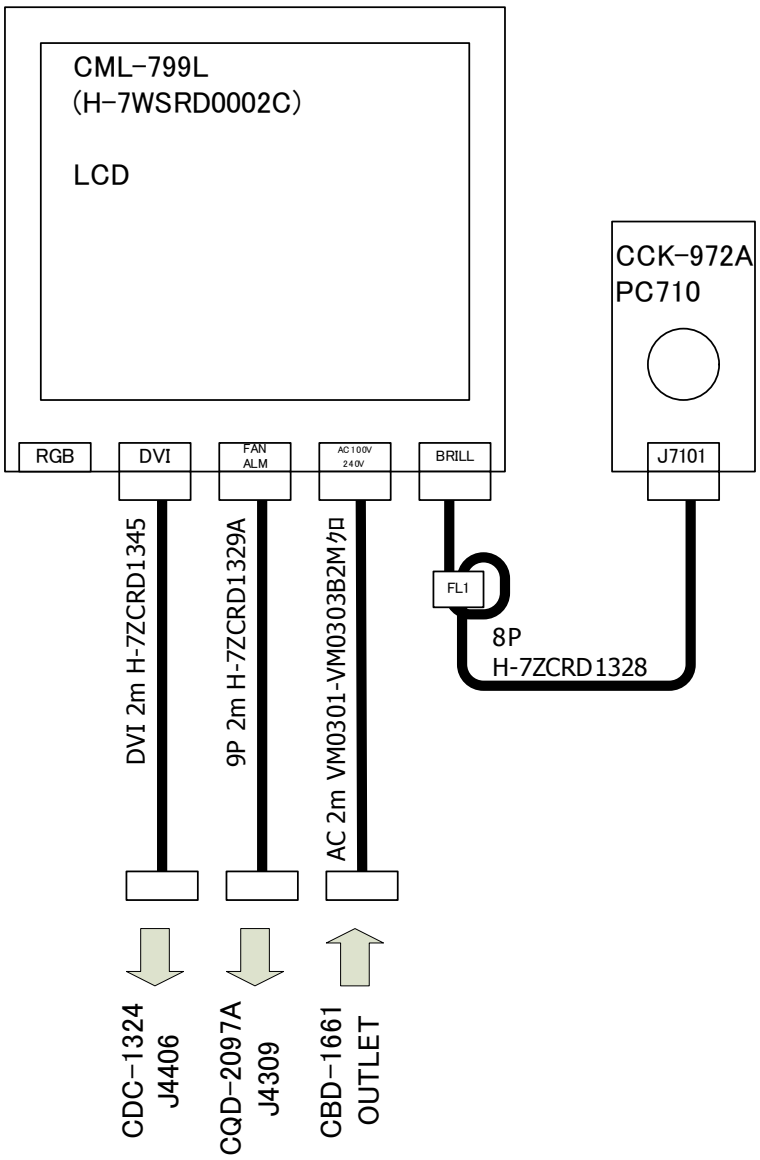


Fig B-4: *Interconnection Diagram of NCD-4990T w/NBA-5135*

B.1.5 NWZ-170-R

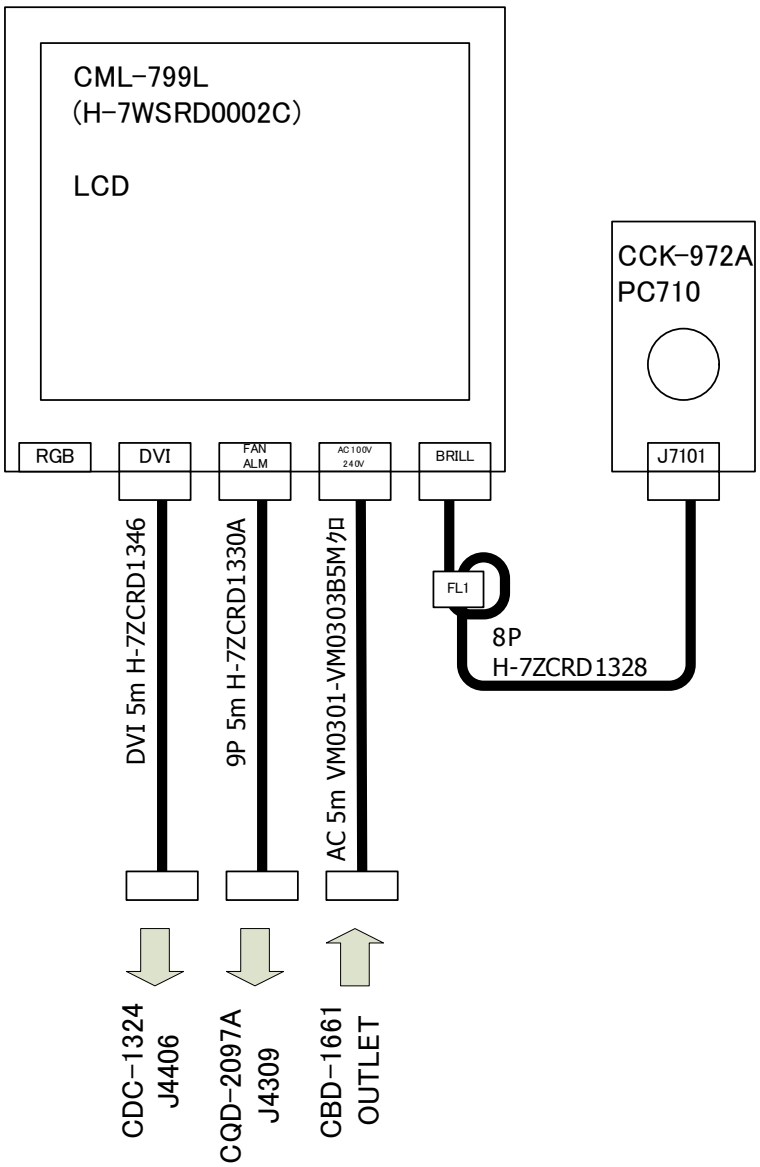


CML-764-R (NWZ-170-R)

Monitor Unit Interconnection

Fig B-5: *Interconnection Diagram of NWZ-170-R*

B.1.6 NWZ-170-RT

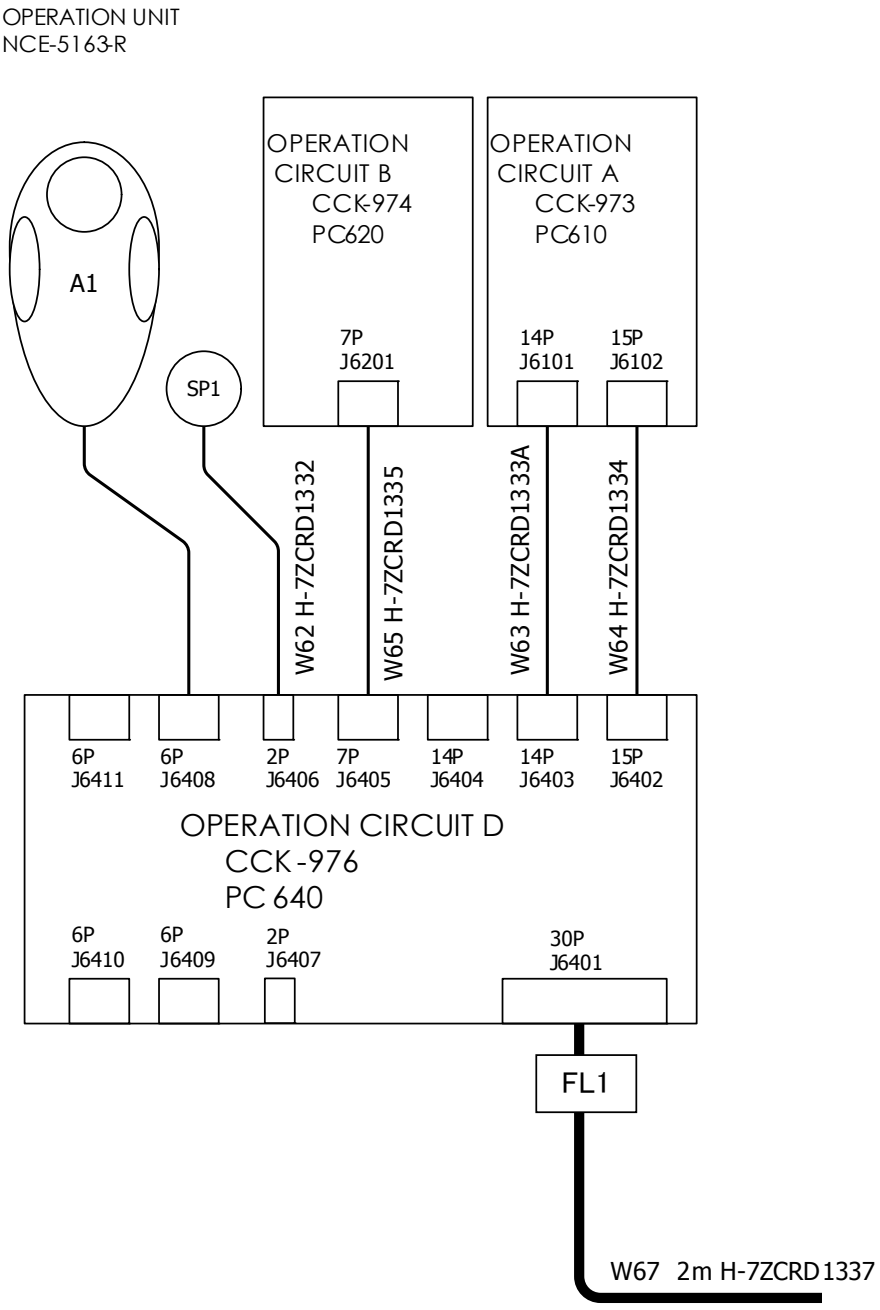


CML-764-RT (NWZ-170-RT)

Monitor Unit Interconnection

Fig B-6: *Interconnection Diagram of NWZ-170-RT*

B.1.7 NCE-5163-R

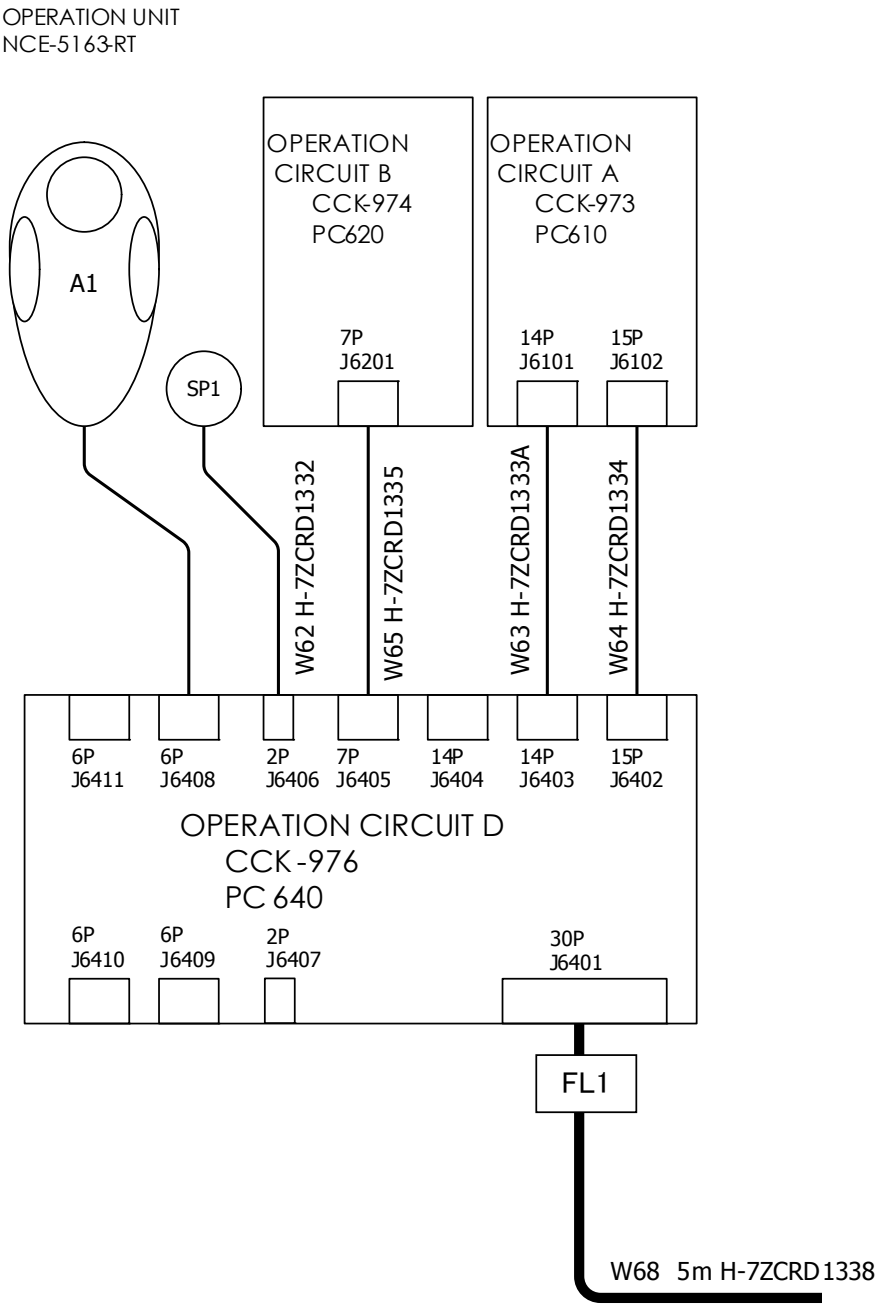


CMD-996-R (NCE-5163-R)

Operation Unit Interconnection

Fig B-7: *Interconnection Diagram of NCE-5163-R*

B.1.8 NCE-5163-RT

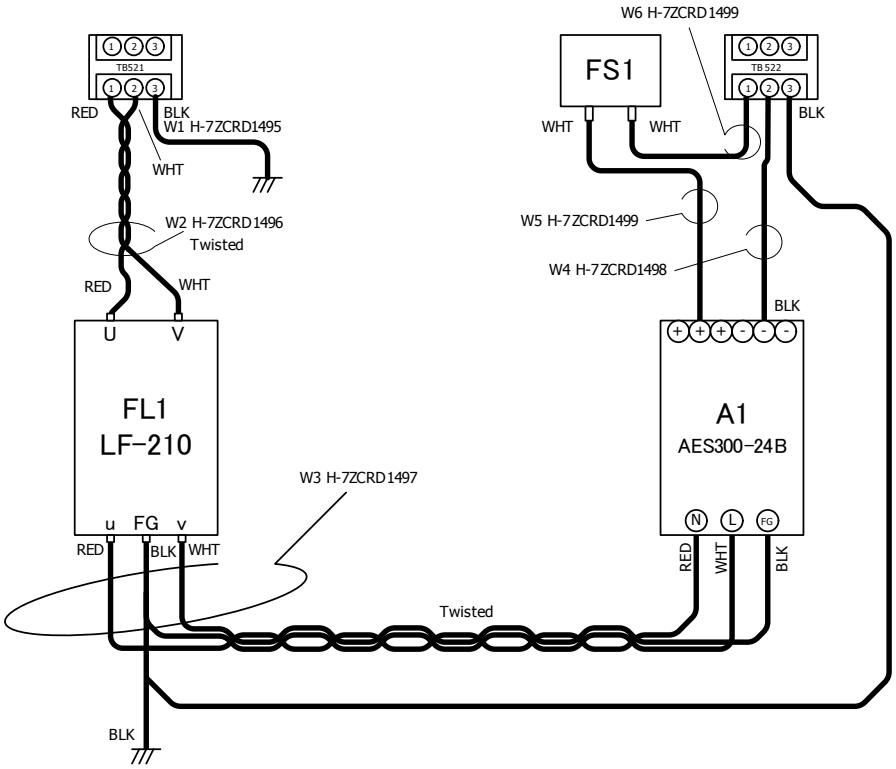


CMD-996-RT (NCE-5163-RT)

Operation Unit Interconnection

Fig B-8: *Interconnection Diagram of NCE-5163-RT*

B.1.9 NBA-5135

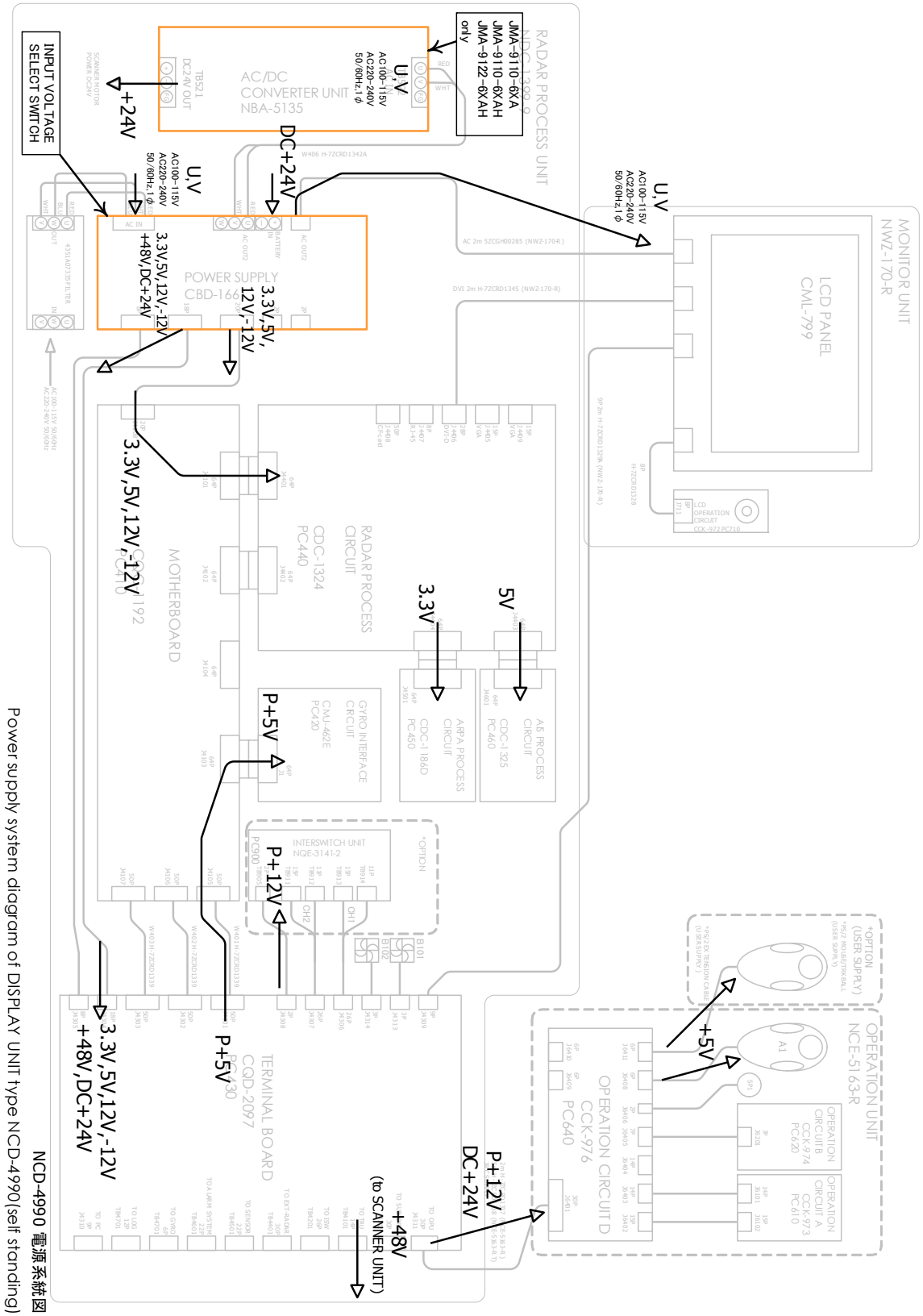


CBD-1684A (NBA-5135)

AC/DC Converter Interconnection

Fig B-9: *Interconnection Diagram of NBA-5135*

B.2 Power System Diagram of Display Unit

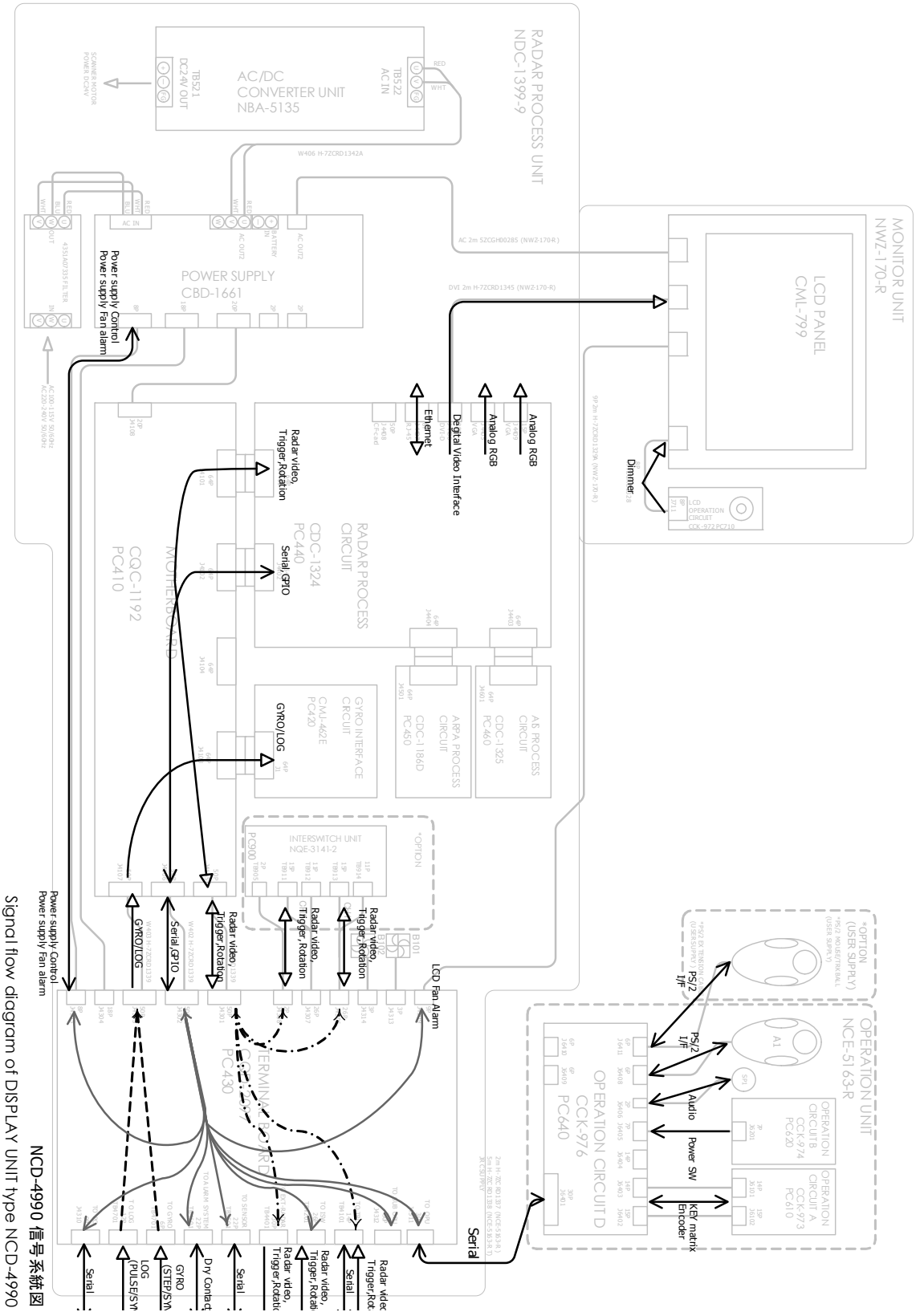


Power supply system diagram of DISPLAY UNIT type NCD-4990(self standing)

NCD-4990 電源系統図

Fig B-10: *Power System Diagram of NCD-4990/T*

B.3 Signal Flow Diagram of Display Unit



Signal flow diagram of DISPLAY UNIT type NCD-4990

NCD-4990 信号系統図

Fig B-11: *Signal Flow Diagram of NCD-4990/T*

B.4 Primary Power System Diagram

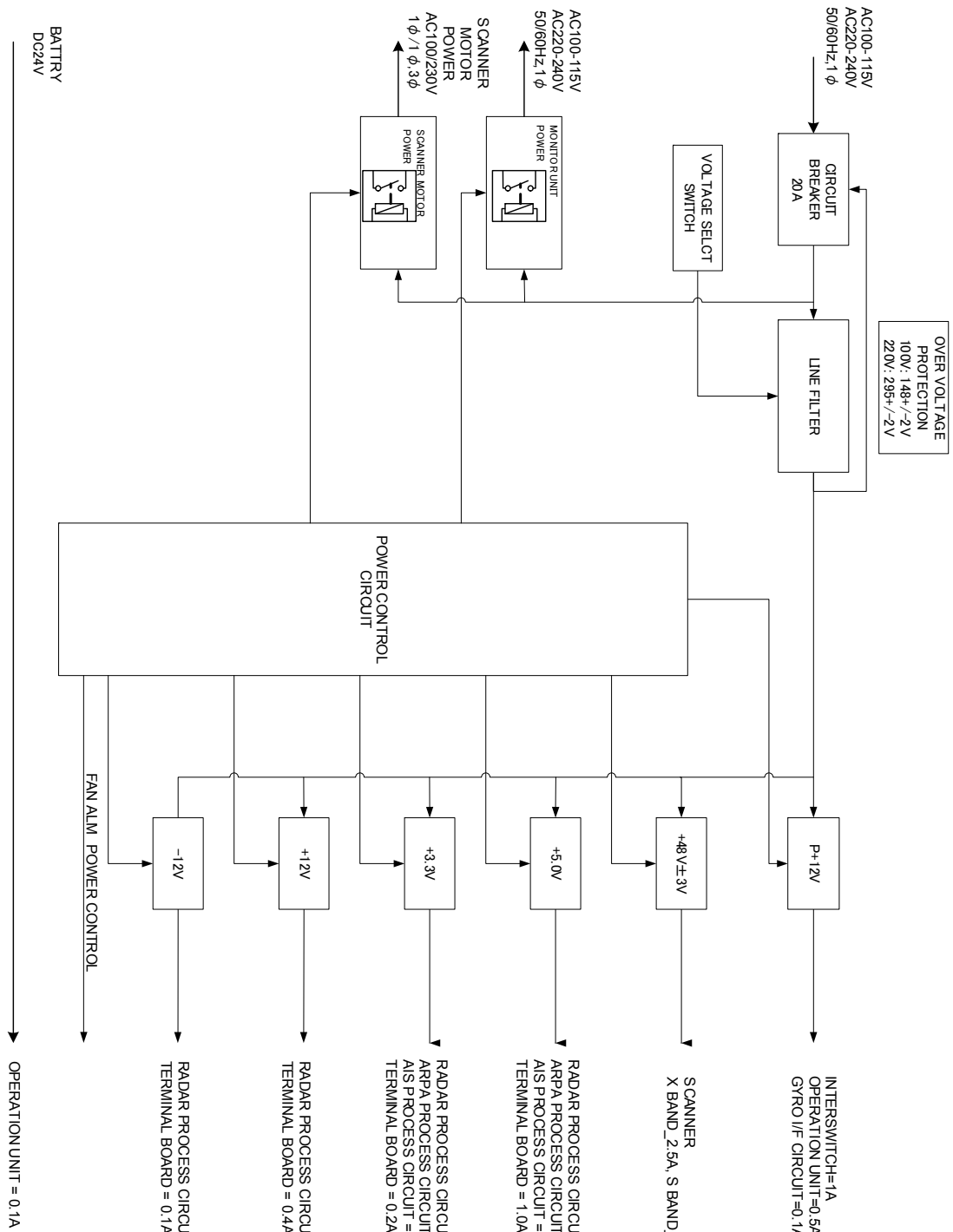


Fig B-12: *Primary Power System Diagram*

B.5 Block Diagram of Scanner Unit

B.5.1 NKE-2103

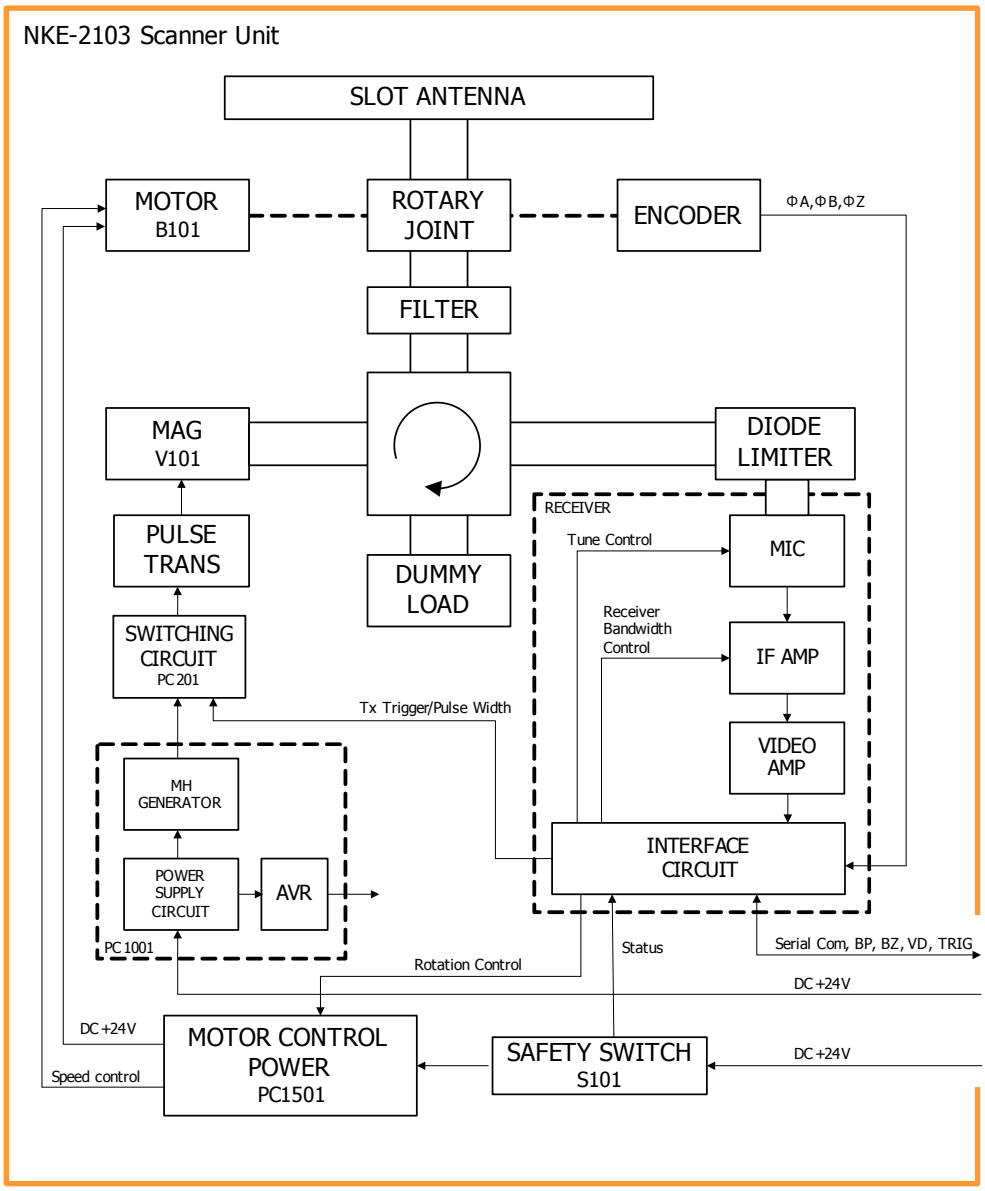


Fig B-13: *Block Diagram of NKE-2103*

B.5.2 NKE-2254

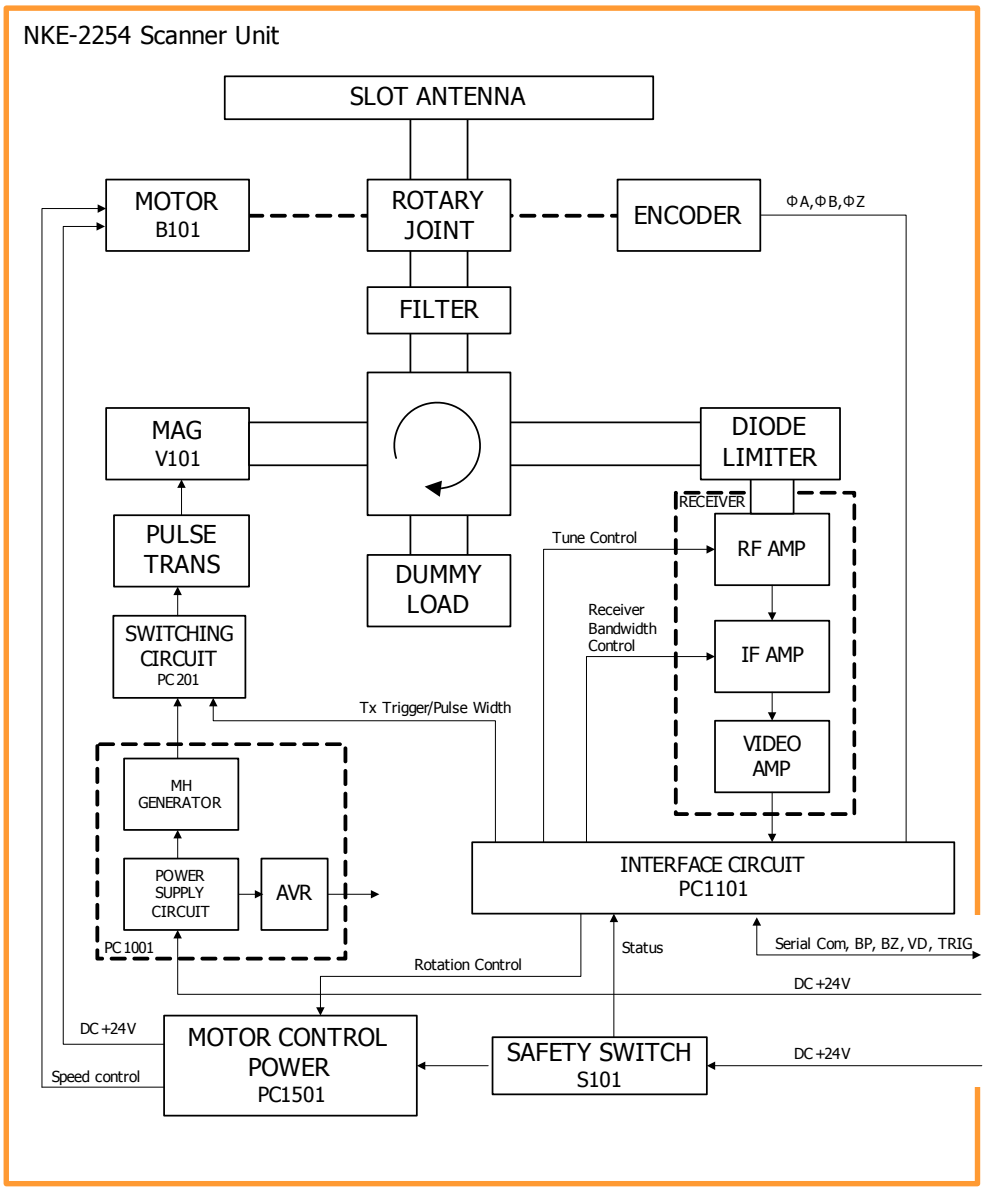


Fig B-14: *Block Diagram of NKE-2254*

B.5.3 NKE-1125/NKE-1130

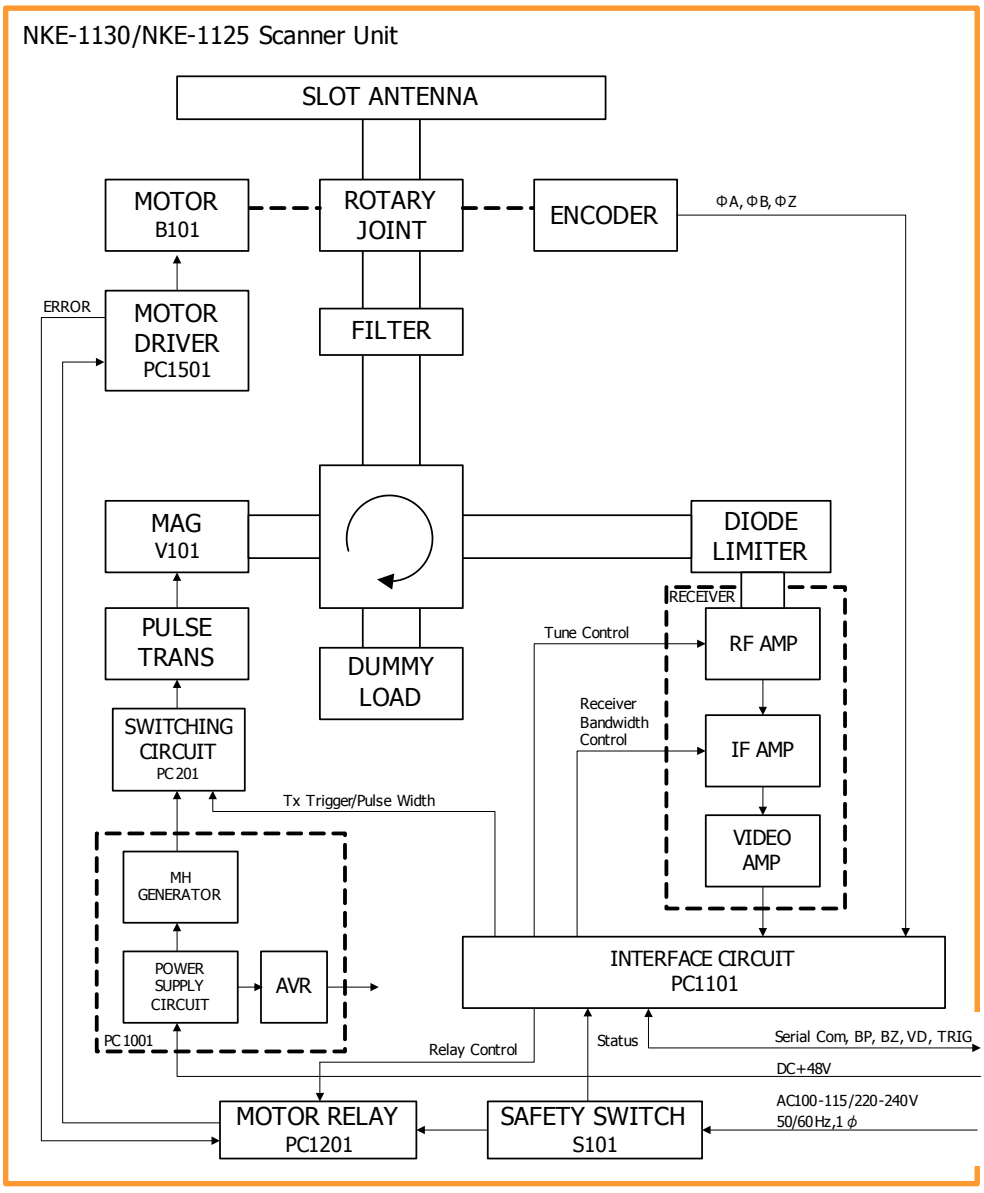


Fig B-15: *Block Diagram of NKE-1125/NKE-1130*

B.5.4 NKE-1129, NTG-3225 / NKE-1139, NTG-3230

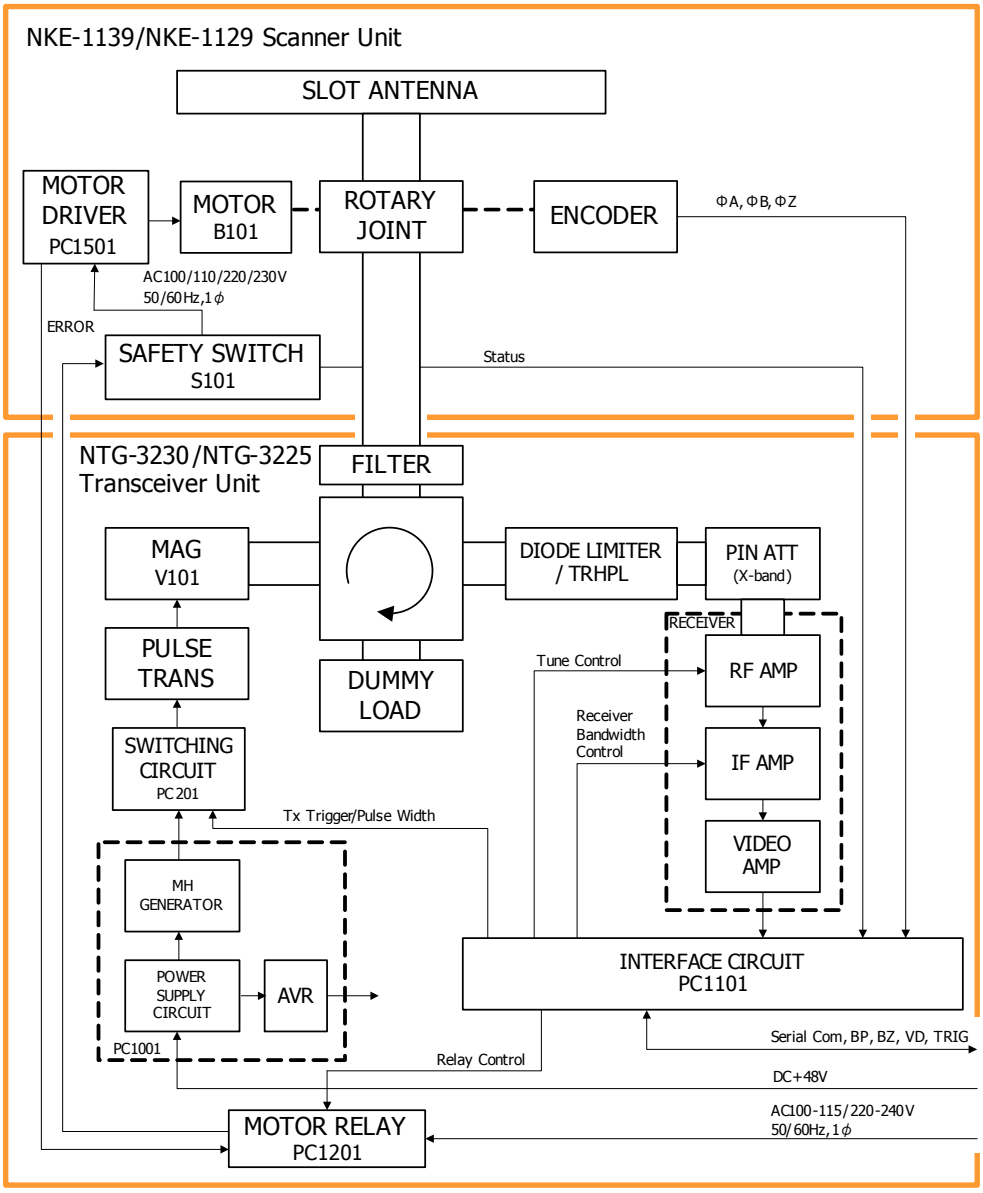


Fig B-16: *Block Diagram of NKE-1129, NTG-3225 / NKE-1139, NTG-3230*

B.6 Interconnection Diagram of Scanner Unit

B.6.1 NKE-2103

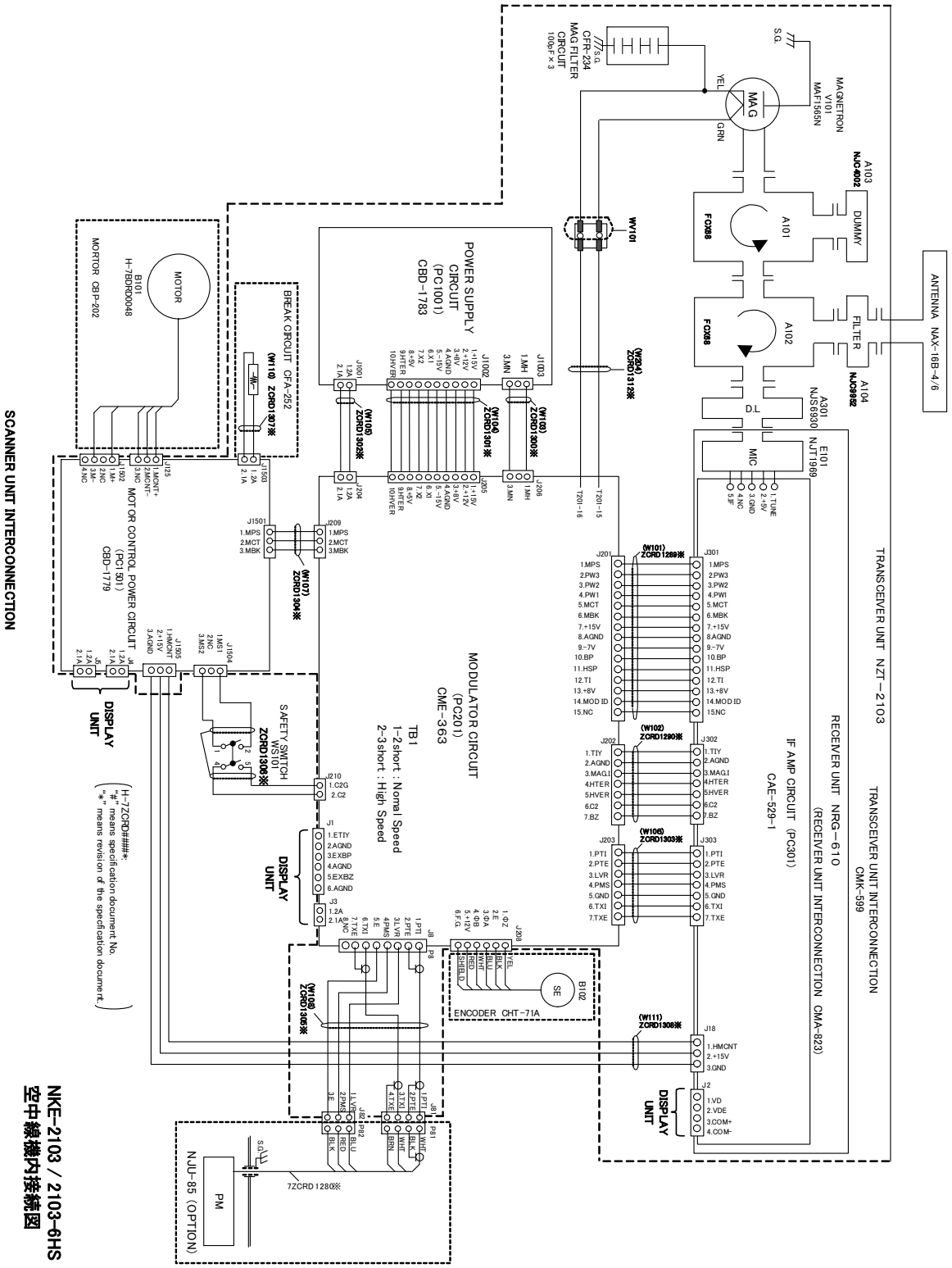


Fig B-17: *Interconnection Diagram of NKE-2103*

B.6.2 NKE-2254

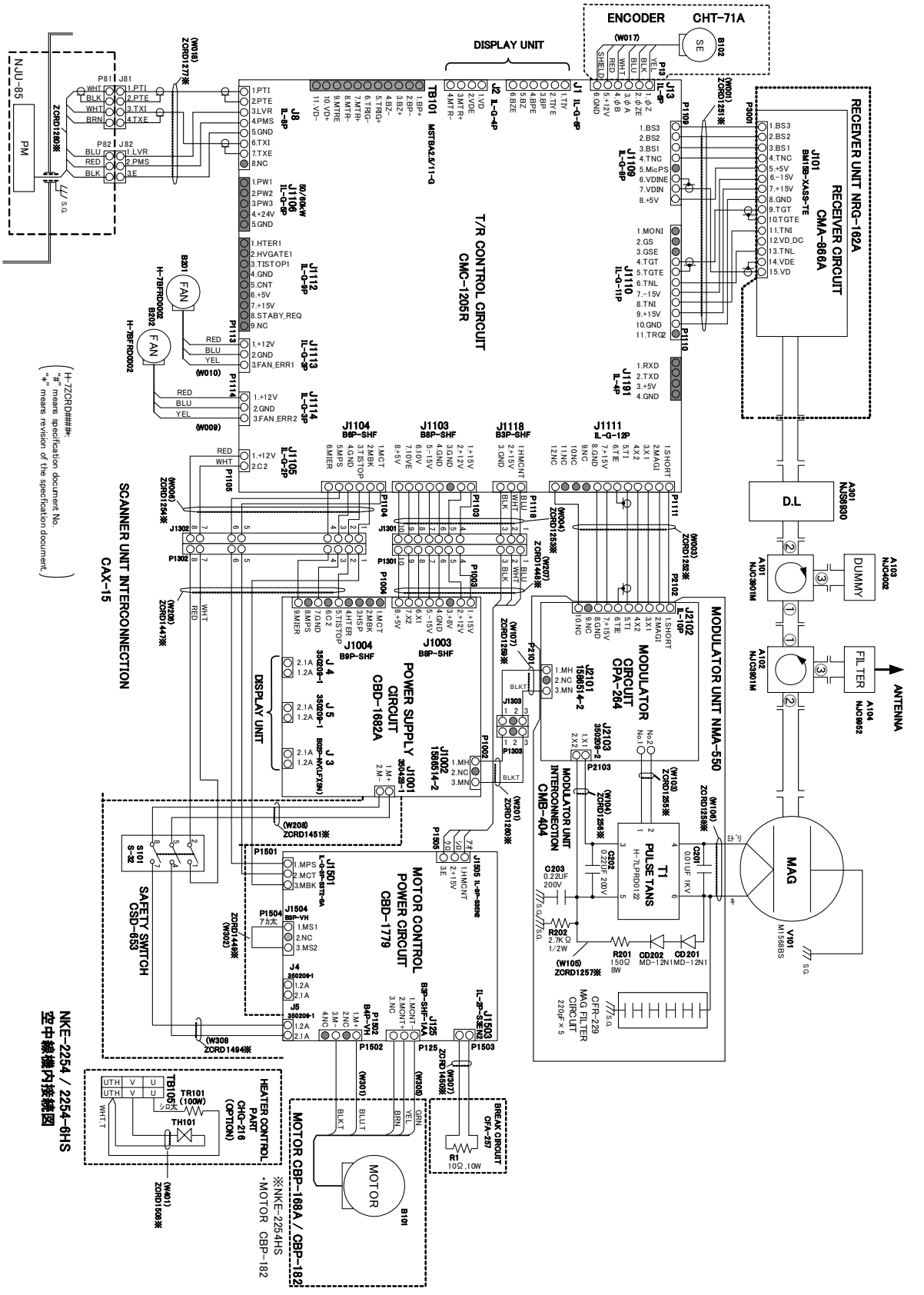


Fig B-18: *Interconnection Diagram of NKE-2254*

B.6.3 NKE-1125 (AC110V)

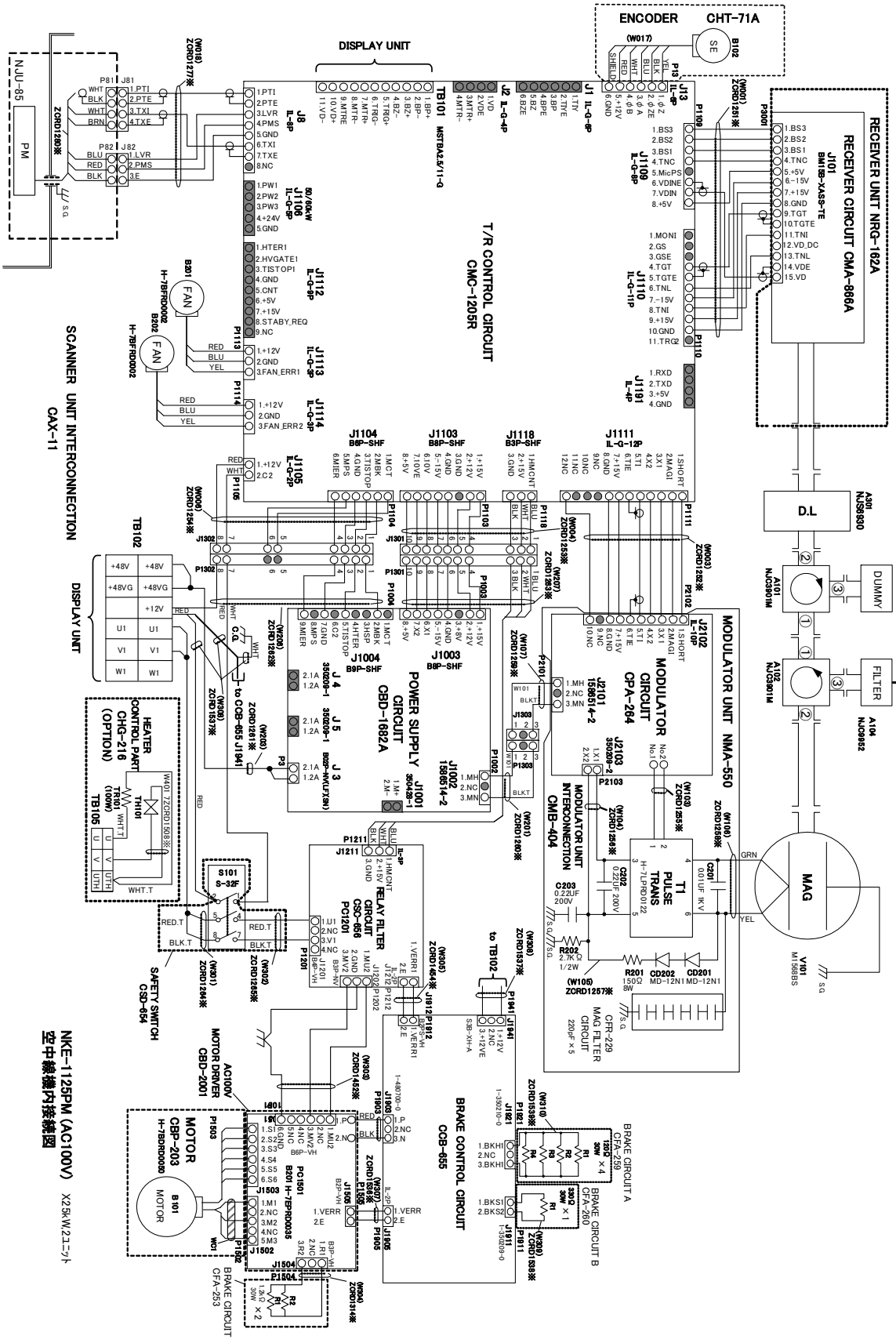


Fig B-19: *Interconnection Diagram of NKE-1125 (AC110V)*

B.6.4 NKE-1125 (AC220V)

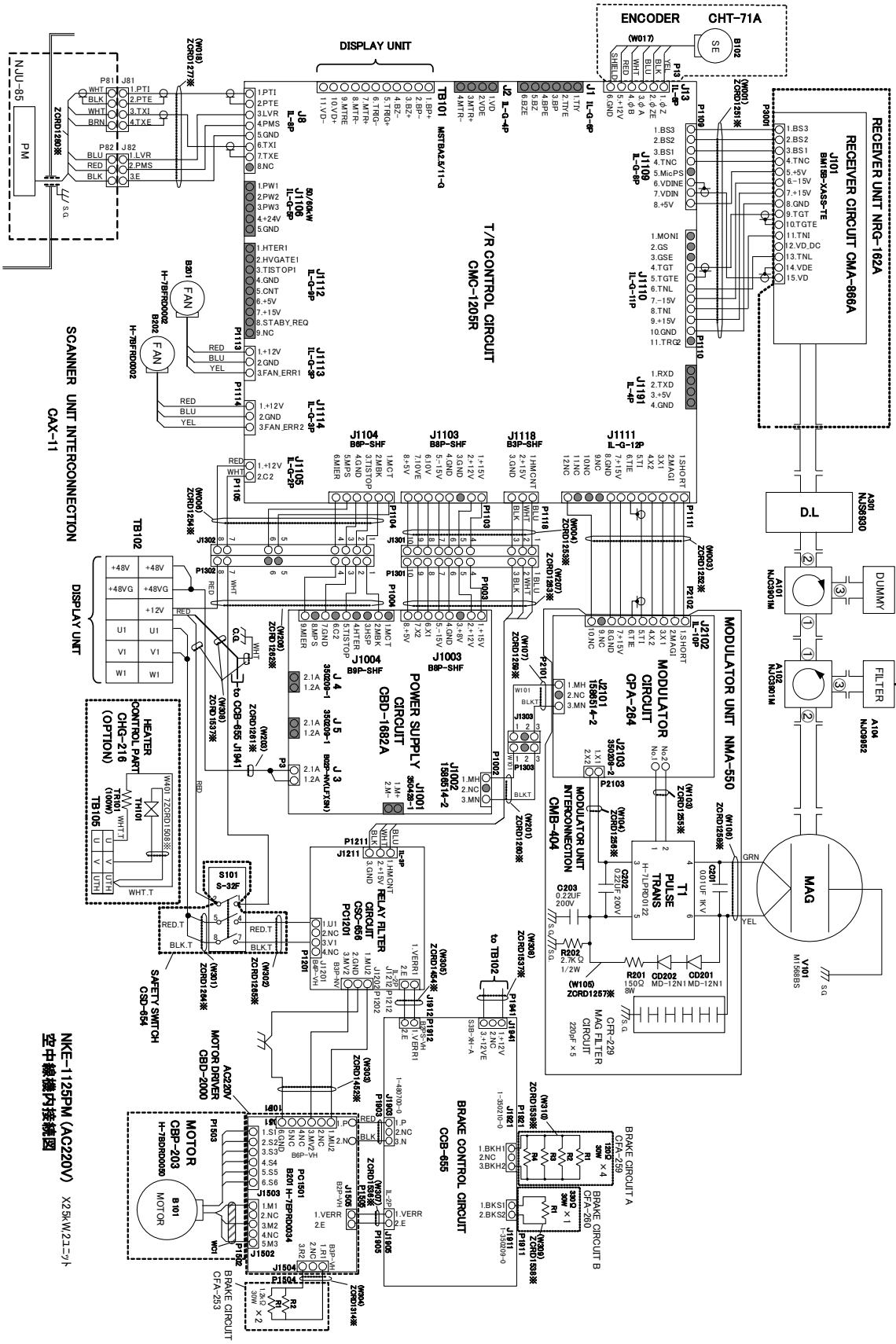


Fig B-20: *Interconnection Diagram of NKE-1125 (AC220V)*

B.6.5 NKE-1129 (AC110V)

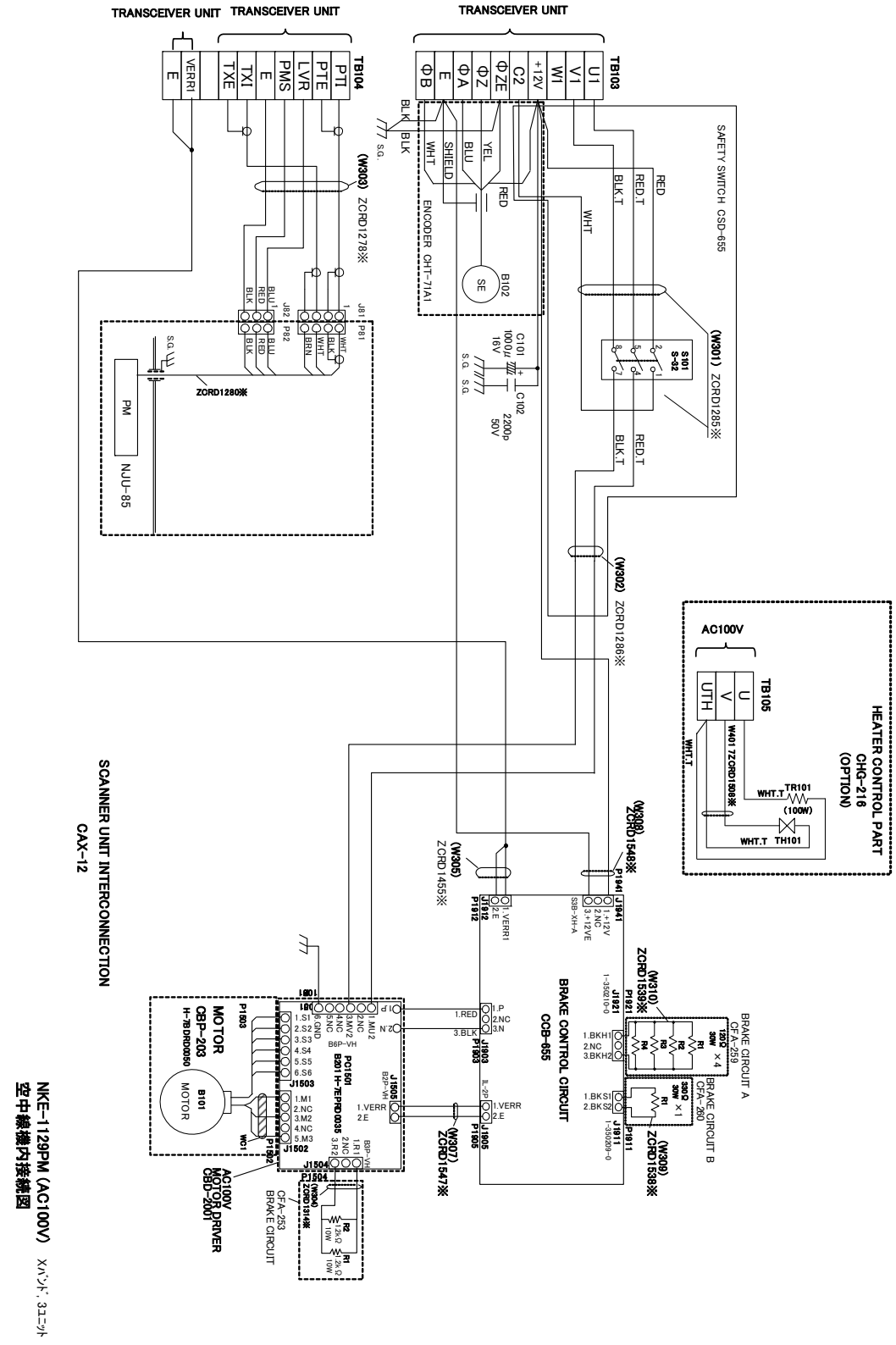


Fig B-21: *Interconnection Diagram of NKE-1129 (AC110V)*

B.6.6 NKE-1129 (AC220V)

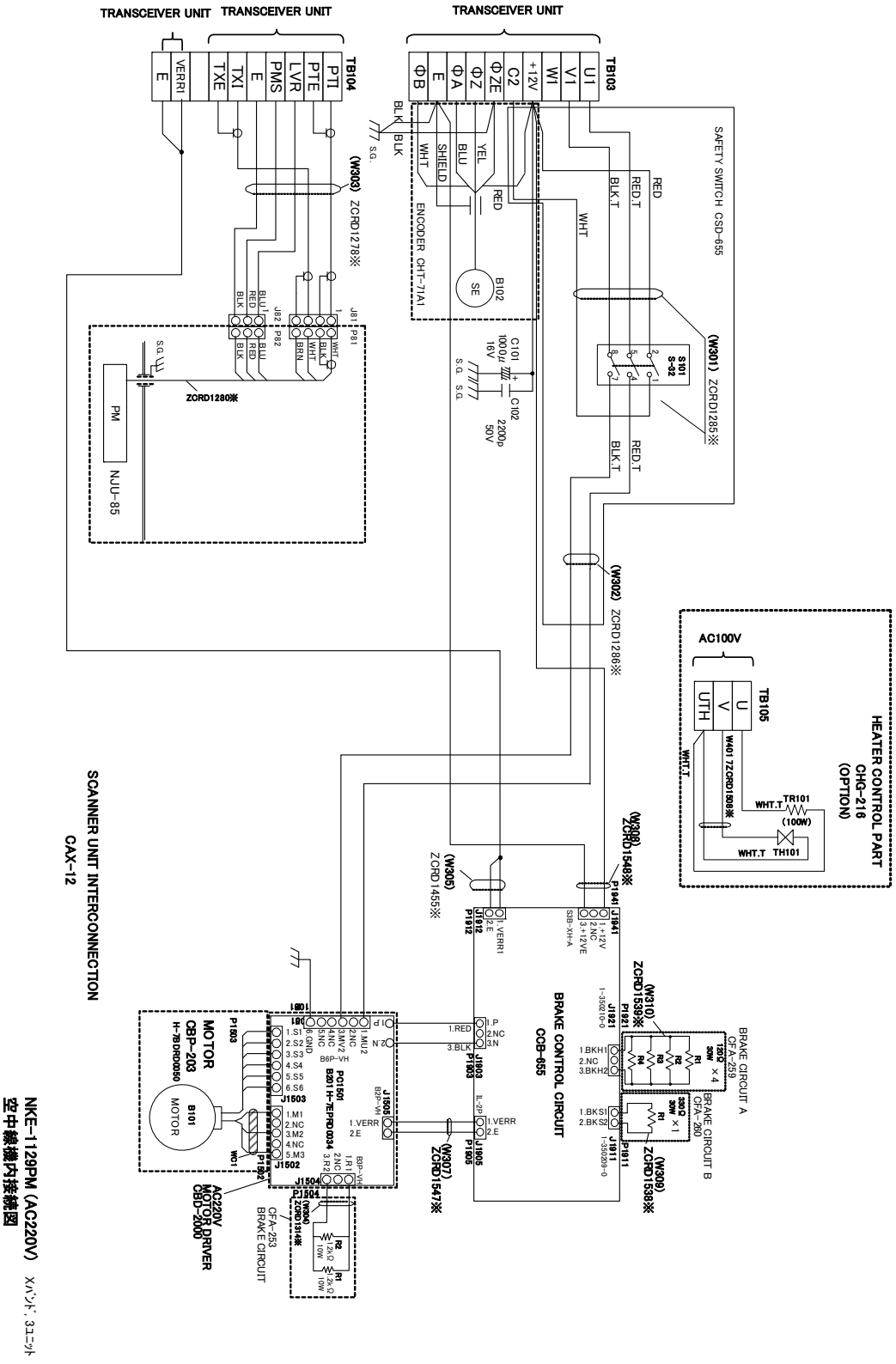


Fig B-22: *Interconnection Diagram of NKE-1129 (AC220V)*

B.6.7 NTG-3225

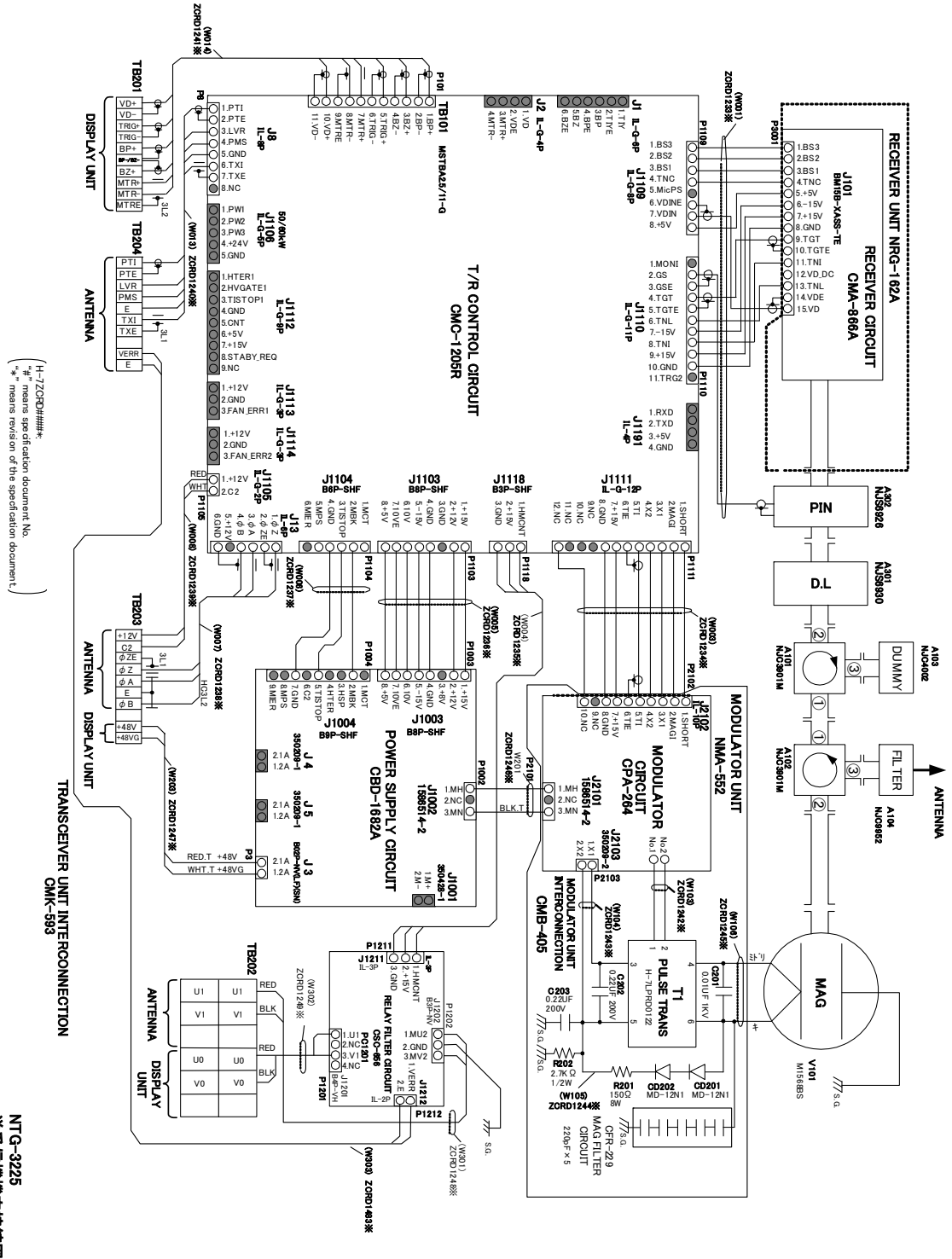


Fig B-23: *Interconnection Diagram of NTG-3225*

B.6.8 NKE-1130 (AC110V)

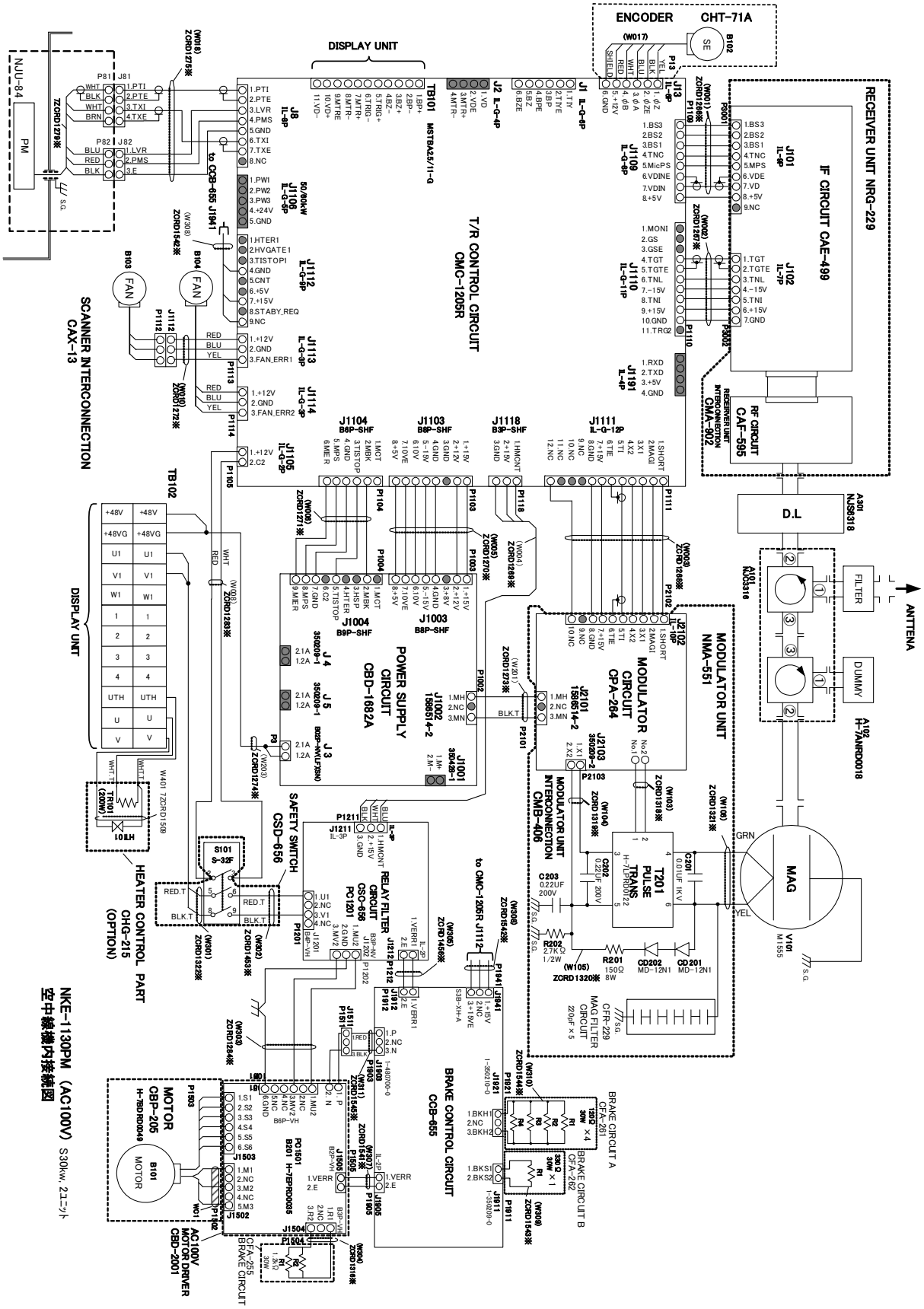


Fig B-24: *Interconnection Diagram of NKE-1130 (AC110V)*

B.6.9 NKE-1130 (AC220V)

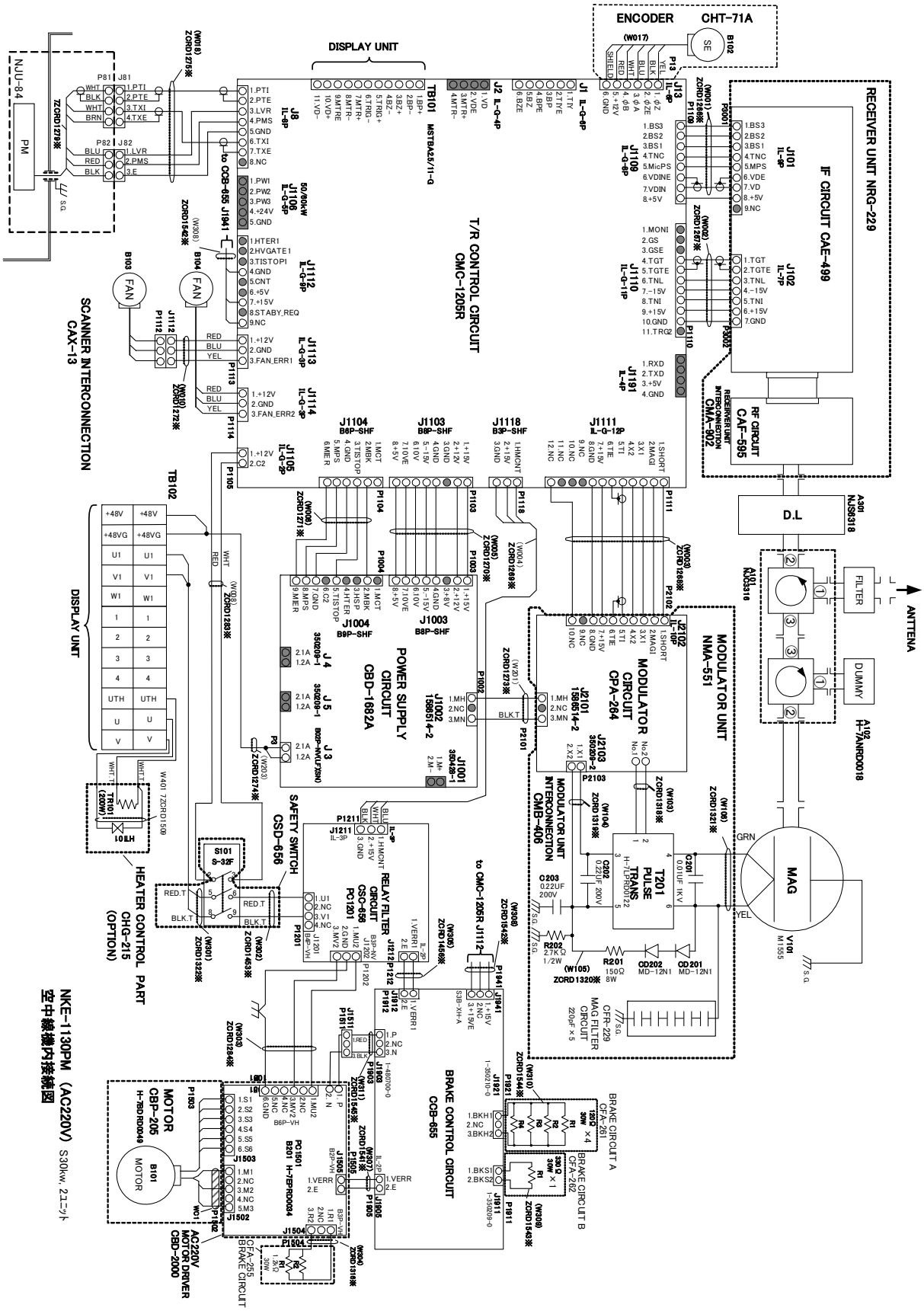


Fig B-25: *Interconnection Diagram of NKE-1130 (AC220V)*

B.6.10 NKE-1139 (AC110V)

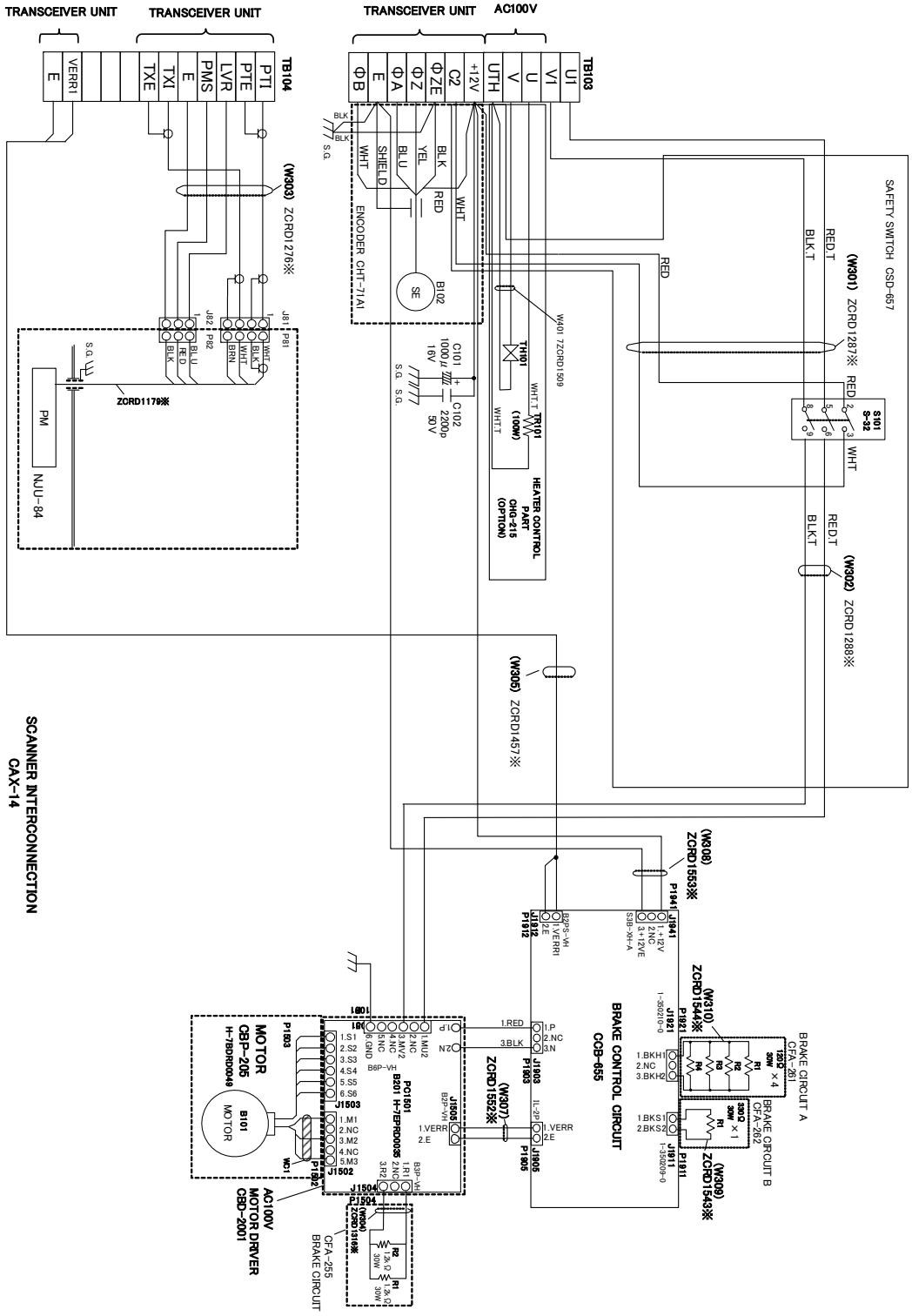


Fig B-26: *Interconnection Diagram of NKE-1139 (AC110V)*

B.6.11 NKE-1139 (AC220V)

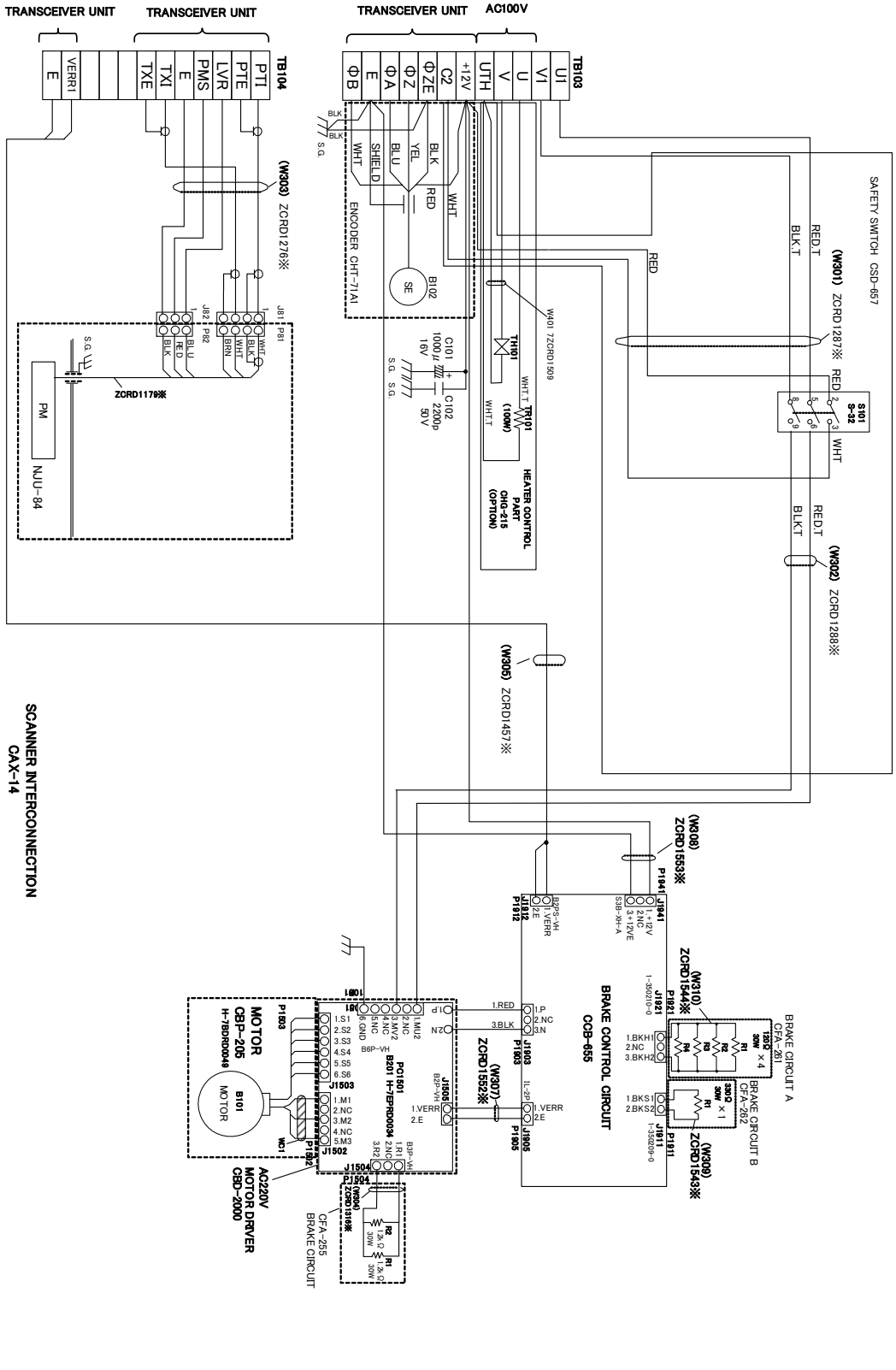


Fig B-27: *Interconnection Diagram of NKE-1139 (AC220V)*

B.6.12 NTG-3230

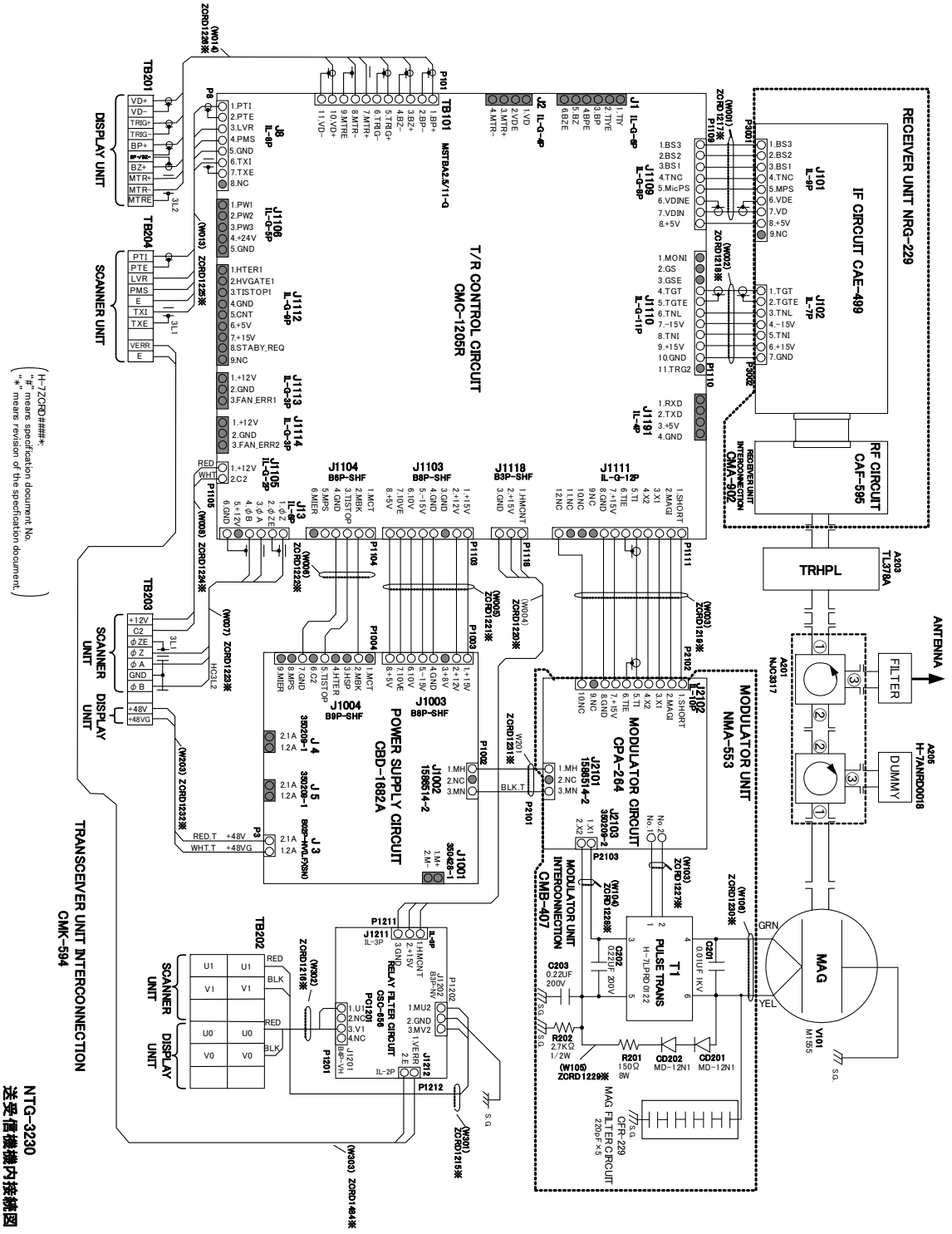


Fig B-28: *Interconnection Diagram of NTG-3230*

B.7 Terminal Board Connection Diagram

B.7.1 JMA-9110-6XA/JMA-9110-6XAH

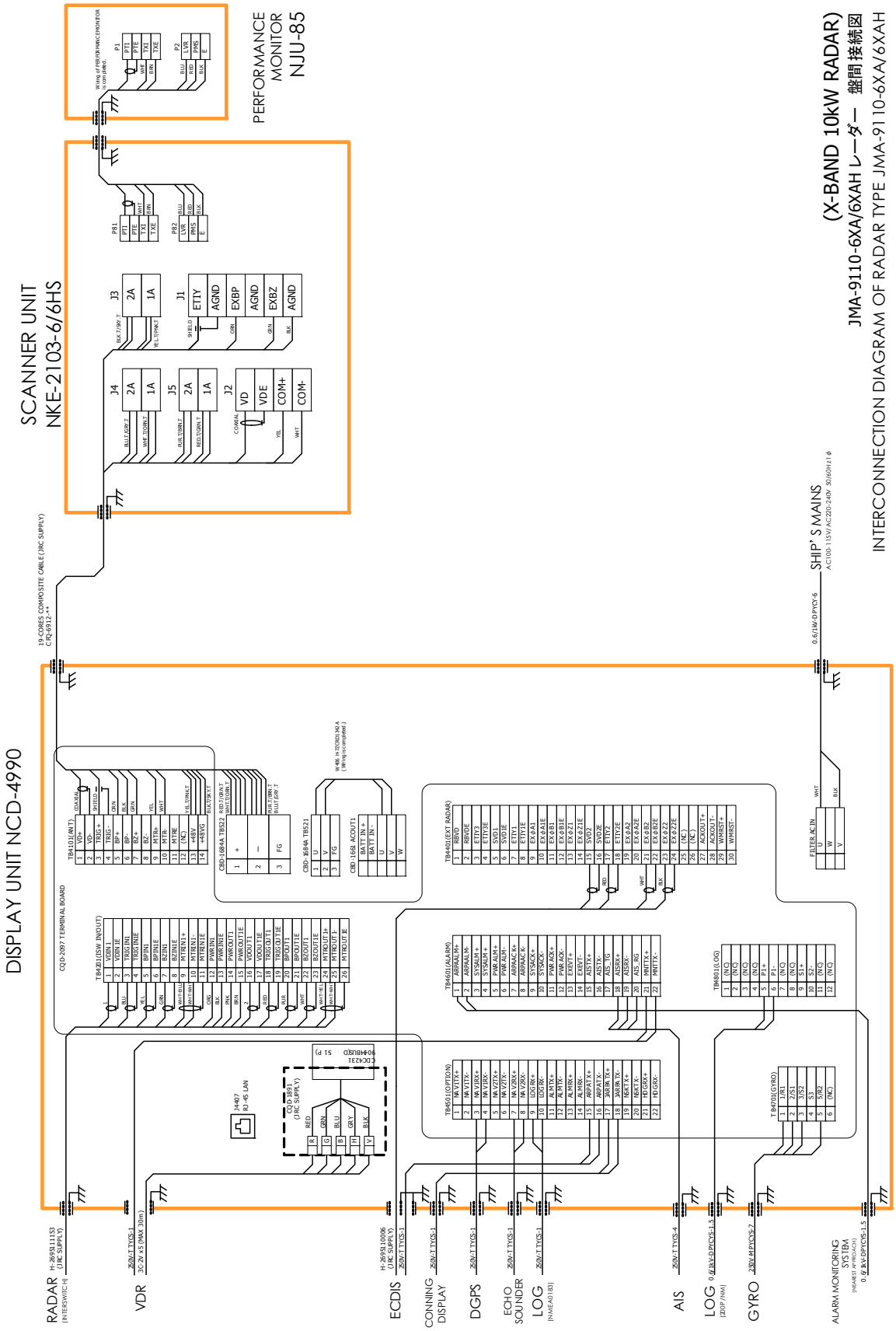


Fig B-29: *Terminal Board Connection Diagram of JMA-9110-6XA/JMA-9110-6XAH*

B.7.2 JMA-9110-6XA/JMA-9110-6XAH (desktop)

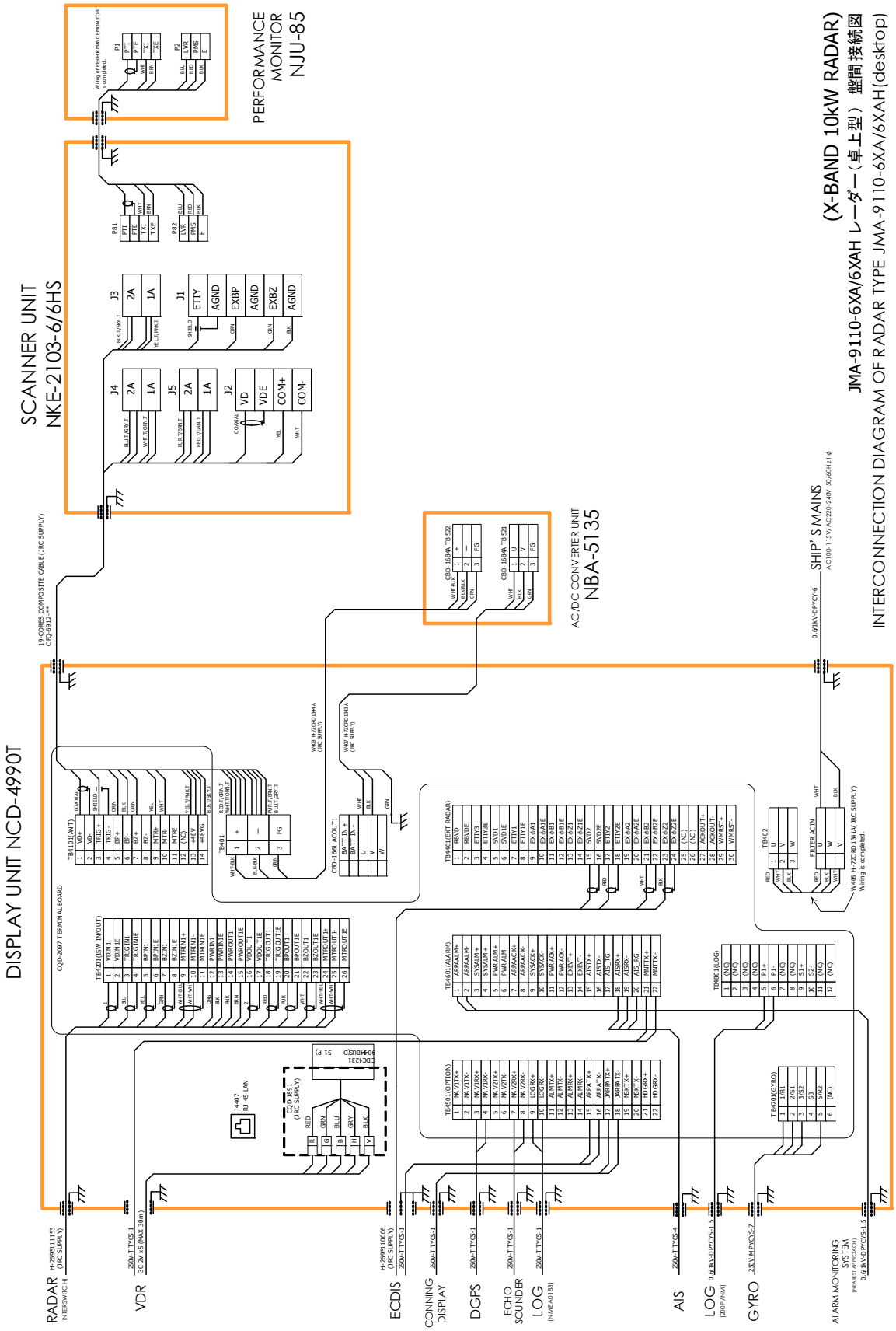


Fig B-30: *Terminal Board Connection Diagram of JMA-9110-6XA/JMA-9110-6XAH (desktop)*

B.7.3 JMA-9122-6XAH

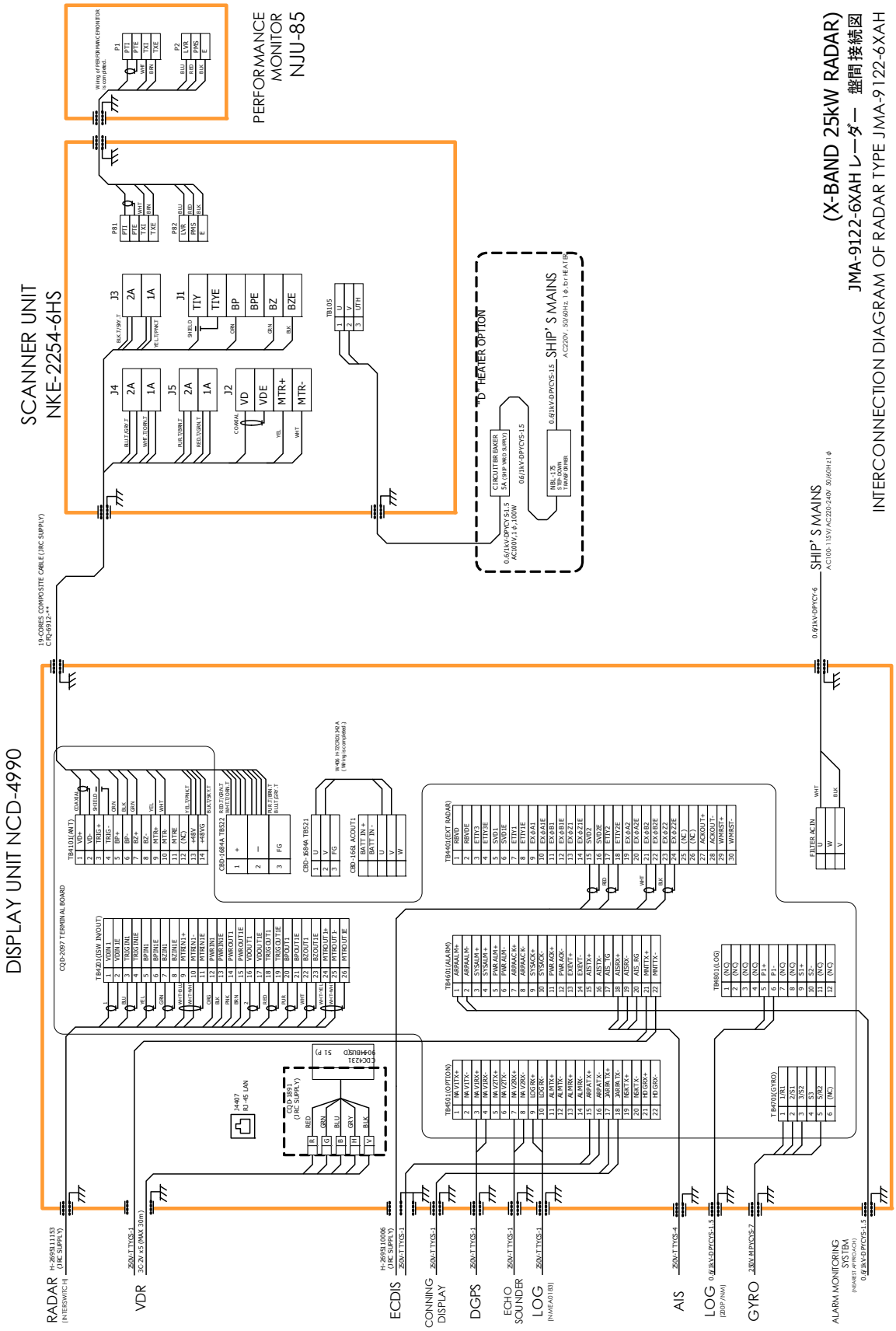


Fig B-31: *Terminal Board Connection Diagram of JMA-9122-6XAH*

B.7.4 JMA-9122-6XAH (desktop)

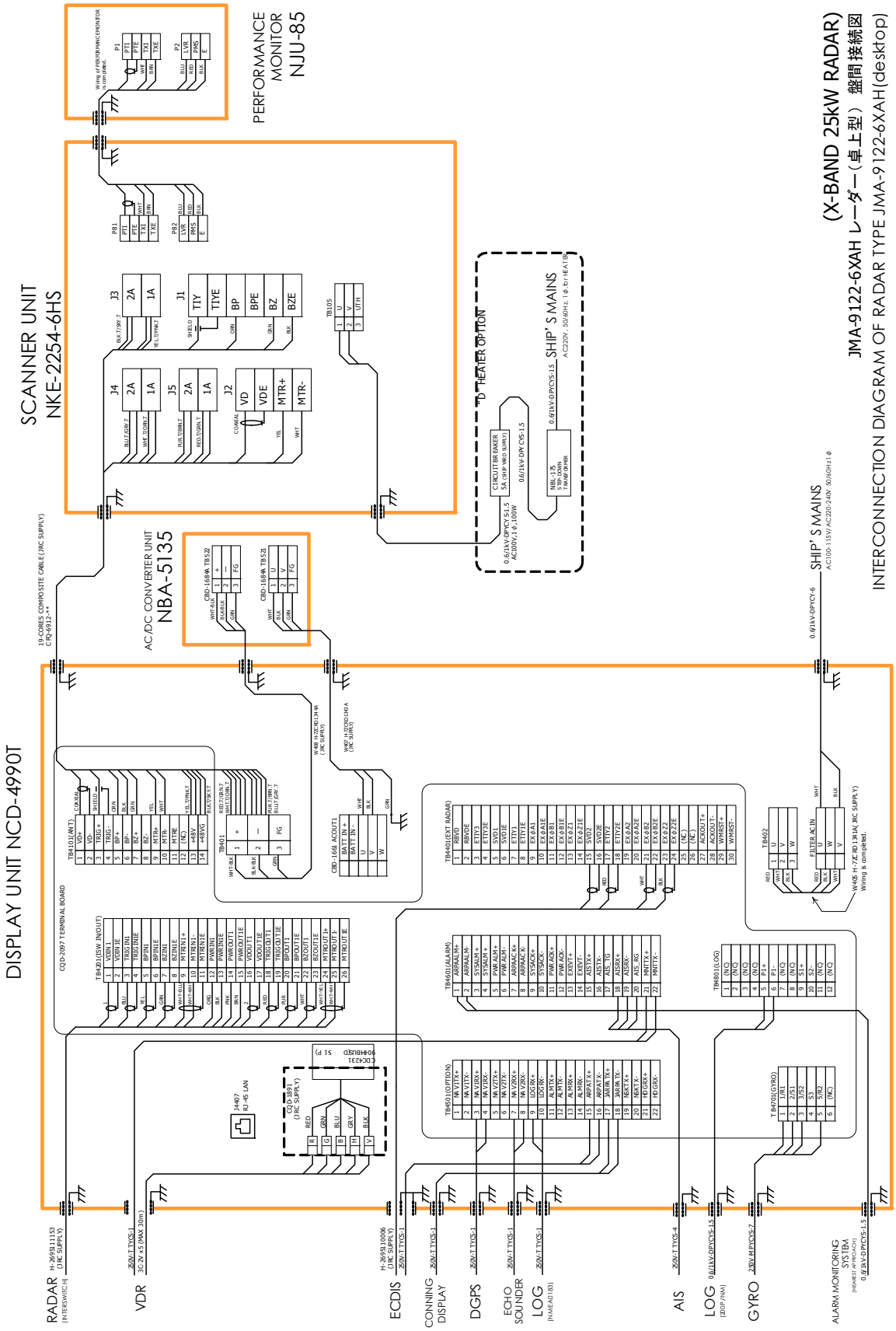


Fig B-32: *Terminal Board Connection Diagram of JMA-9122-6XAH (desktop)*

B.7.5 JMA-9122-6XA/9XA

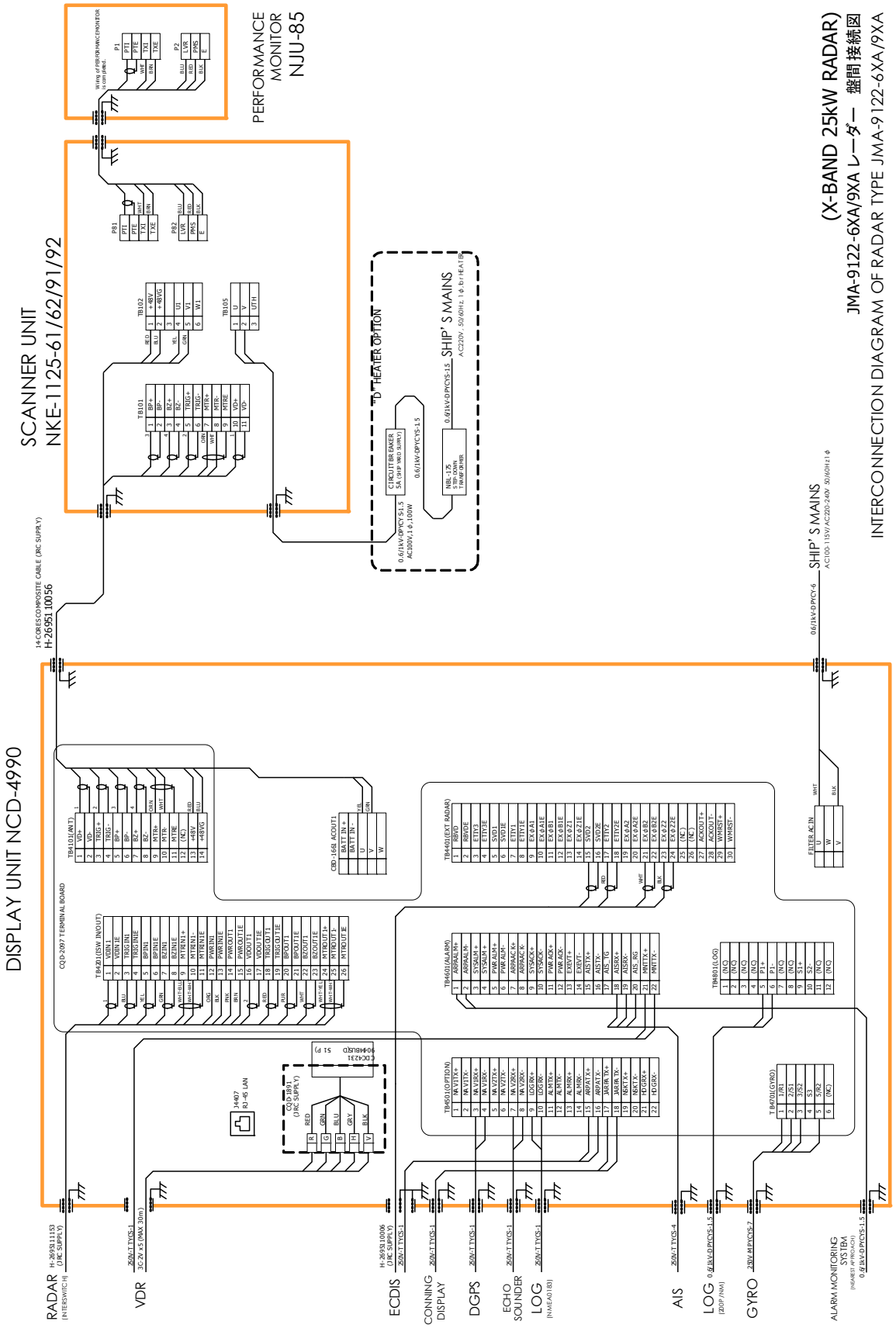


Fig B-33: *Terminal Board Connection Diagram of JMA-9122-6XA/9XA*

B.7.6 JMA-9123-7XA/9XA

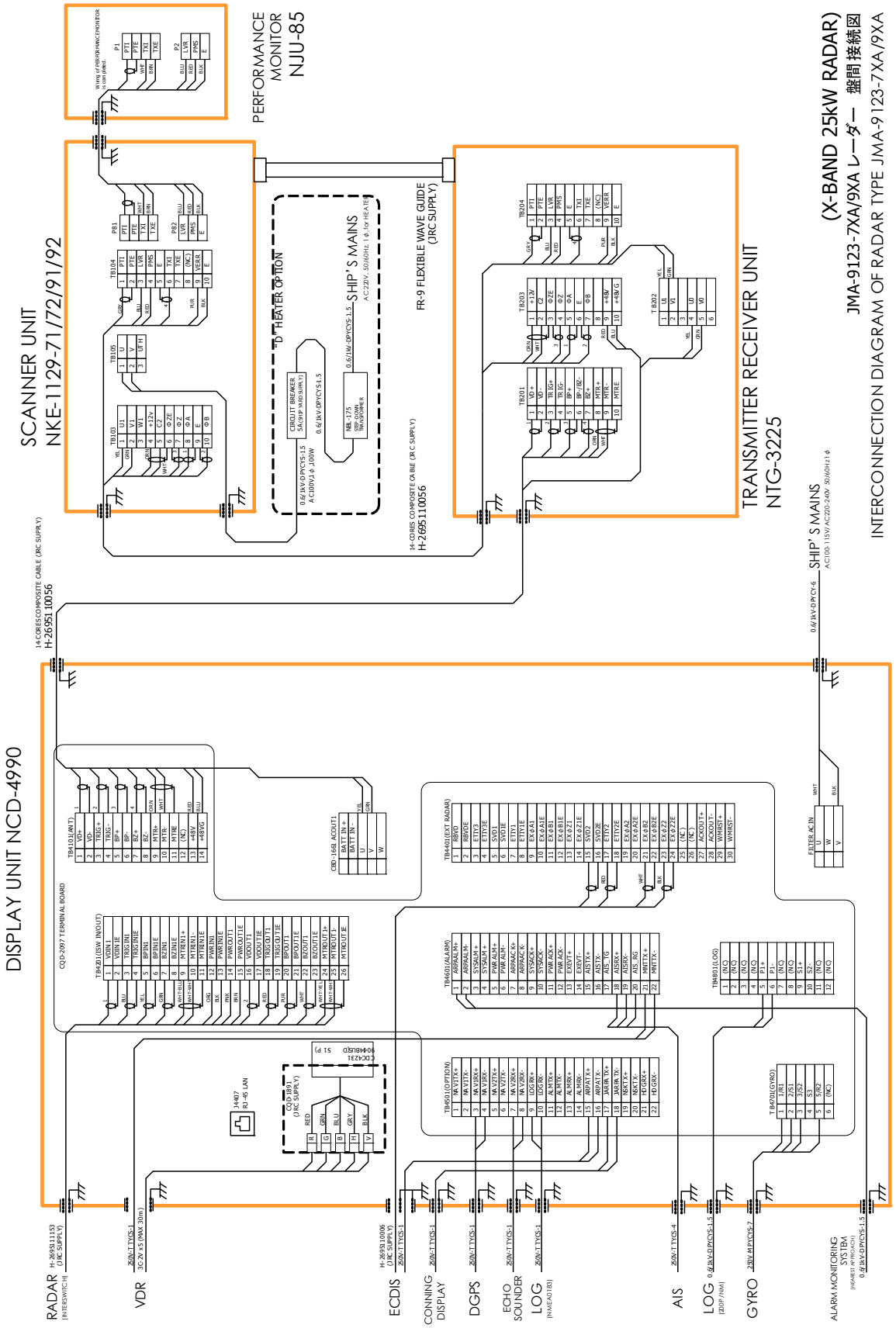


Fig B-34: *Terminal Board Connection Diagram of JMA-9123-7XA/9XA*

B.7.7 JMA-9132-SA

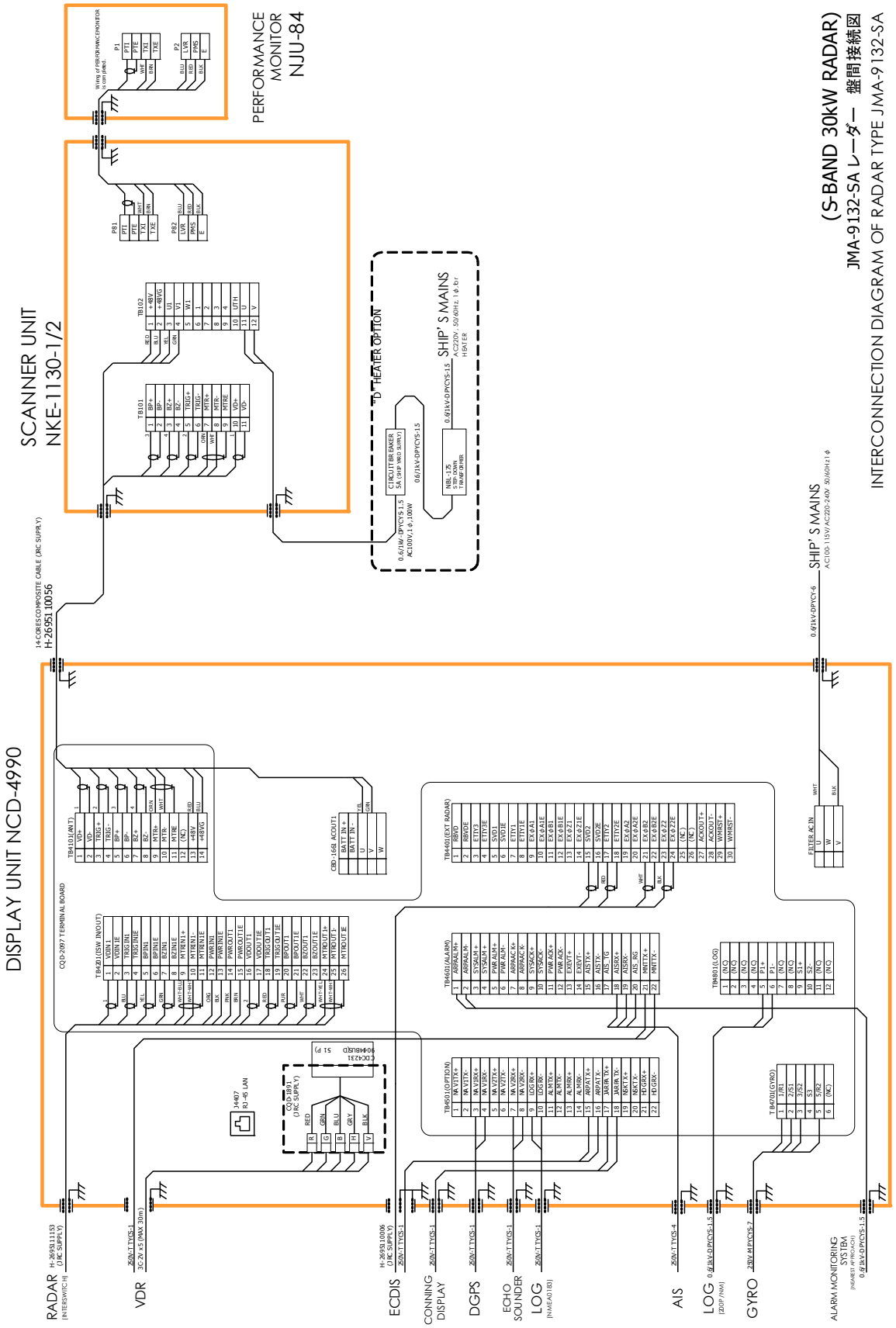


Fig B-35: *Terminal Board Connection Diagram of JMA-9132-SA*

B.7.8 JMA-9133-SA

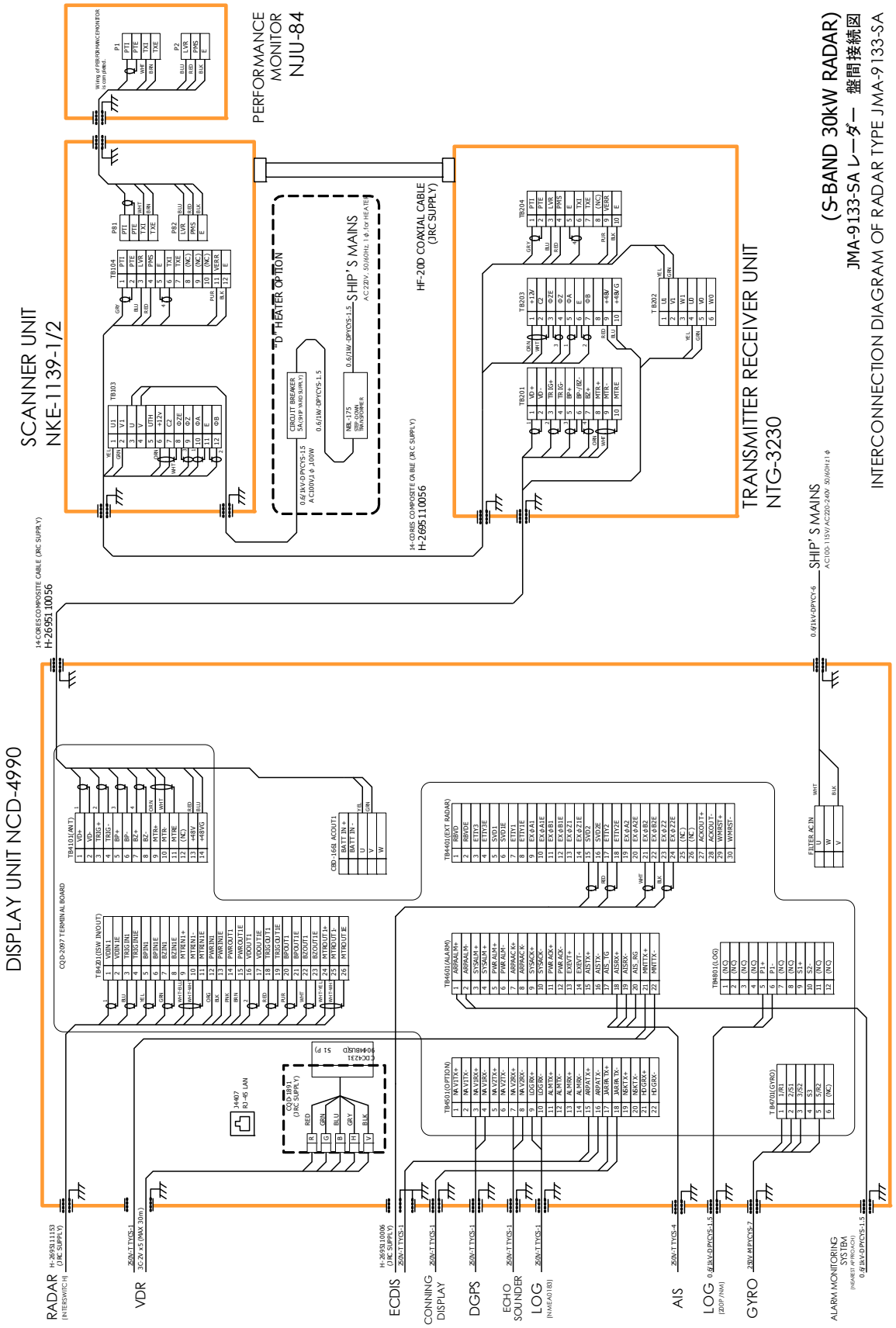
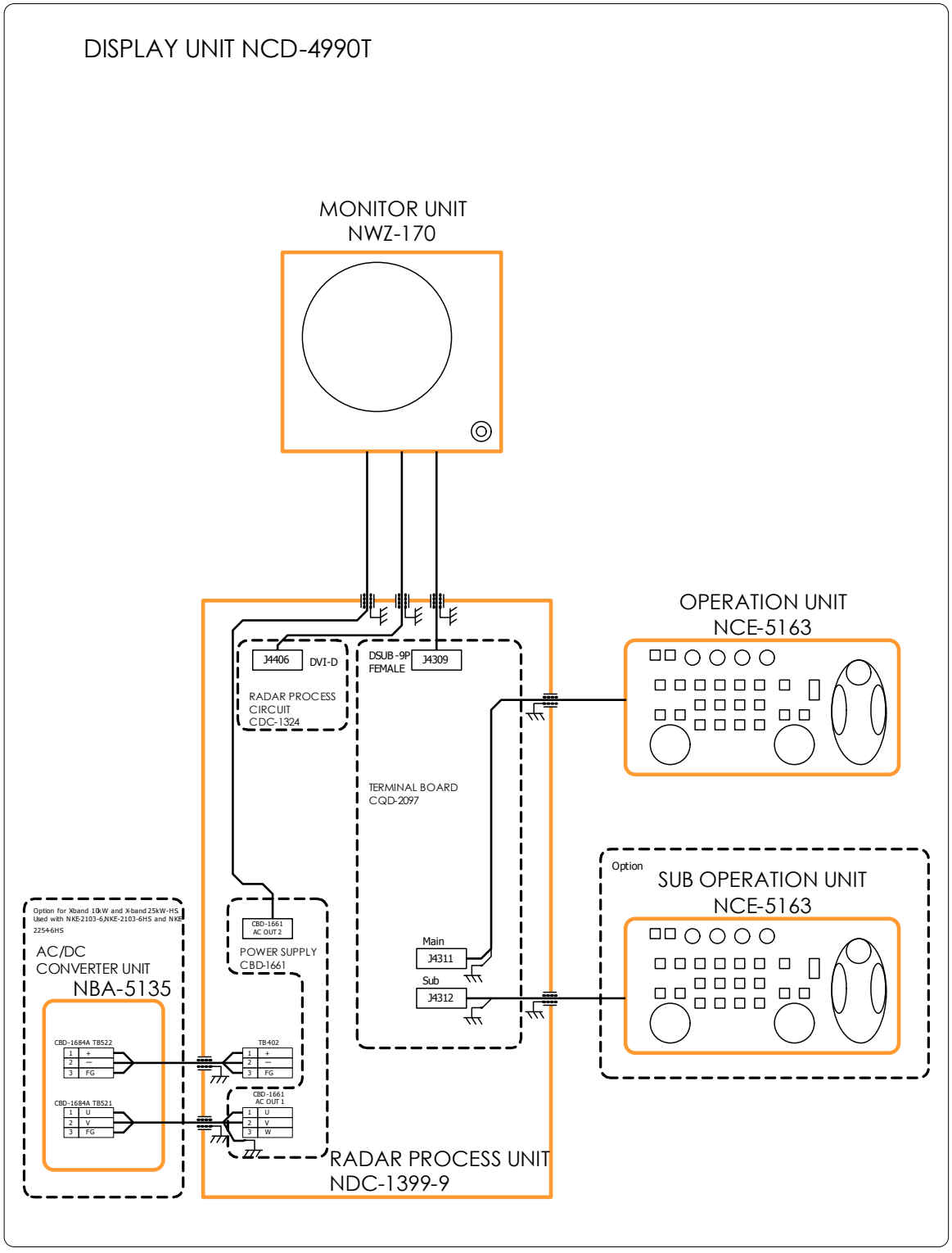


Fig B-36: *Terminal Board Connection Diagram of JMA-9133-SA*

B.7.9 NCD-4990T



JMA-9100 Series RADAR
NCD-4990T 卓上型レーダー指示機　ユニット間接続図
INTERCONNECTION DIAGRAM OF DISPLAY UNIT TYPE NCD-4990T(desktop)

Fig B-37: *Inter-Unit Connection Diagram of NCD-4990T*

B.8 GYRO I/F

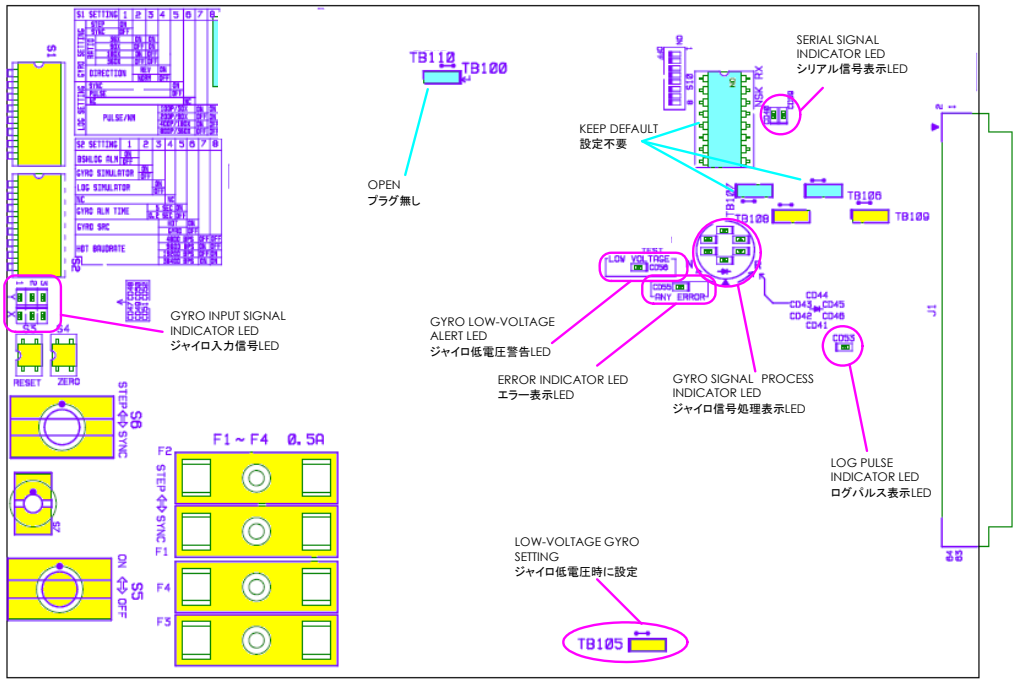


Fig B-38: *Parts Location of CMJ-462E*

TableB-1 : Setting Table of CMJ-462E S1/S2

S1 SETTING			1	2	3	4	5	6	7	8
ジャイロ信号 GYRO SETTING	STEP		ON							
	SYNC		OFF							
	RATIO	36X		ON	ON					
		90X		OFF	ON					
		180X		ON	OFF					
		360X		OFF	OFF					
	回転方向 DIRECTION	逆／REV				ON				
		正／NOR				OFF				
ログ信号 LOG SETTING	シンクロ／SYNC						ON			
	パルス／PULSE						OFF			
	未接続／NC							OFF		
	パルス PULSE/NM	100P／30X							ON	ON
		200P／90X							OFF	ON
		400P／180X							ON	OFF
		800P／360X							OFF	OFF

S2 SETTING		1	2	3	4	5	6	7	8
BSHLOG ALM		ON							
		OFF							
GYRO SIMULATOR			ON						
			OFF						
LOG SIMULATOR				ON					
				OFF					
N.C. (No Connection)					OFF				
GYRO ALM TIME	5 SEC					ON			
	0.2 SEC					OFF			
GYRO SRC (Heading Sensor Source)	HDT (NMEA (HDT/THS))						ON		
	GYRO						OFF		
NMEA BAUDRATE	4800 BPS							OFF	OFF
	9600 BPS							ON	OFF
	19200 BPS							OFF	ON
	38400 BPS							ON	ON

TableB-2 : Gyro, Log Settings

Item / Manufactuer	Gyro compasses	Repeater motors (For refernce only)	CMJ-462 Excitation voltate	Gyro select swiches (S1, S6, S7 located on the CMJ-462) S1 setting 1	2	3	4	5	6	7	8	S6, S7 setting
トキメック TOKIMEC (JAPAN)	ES-2/11, GLT-100～103/105/106K/107/1104, NJZ-501 (R501)	Synchro motor INMS (TS63N7E13) (36X)	115 VAC 60Hz	OFF	ON	ON	OFF	Speed log selection				SYNC
	ES-11A, GM-11/11A/21/110/120, MS-2000/3000 PR-222R/226/237/237-L /1*8*/2022/2023/22** TG-200	Synchro motor TSAN6GE11 (90X)	110 VAC 60Hz	OFF	OFF	OFF						SYNC
スペリー Sperry (U.S.A.)	GLT-201/202/203, MK-14/14T, MKE-1/14T, MOD-1/2/T, PR-500/2502/2503/2507/2507L /3507/4507/5507, SR-130/140, TG-100/5000	Step motor GA-2001G Drawing#103590810 600 excitation (180X)	70 VDC	ON	ON	OFF	OFF	注) レーダー画像及び COURSEの指示値 が逆転する場合は ONに設定する				STEP
	ES-16 SR-120/220	Step motor GA-2001G	35 VDC									STEP
	CMZ-700D ES-140/160 PR-26**/6*0*/6*7*, SR-140/160 TG-6000/8000	Drawing#103590820 150 excitation (180X)	24 VDC	ON	ON	OFF						
横河電機 YOKOGAWA (JAPAN)	C-1A/2/3/E, HOKUSHIN PLATH-55/C, PLATH HKRK-C3	Synchro motor YM-14 TS-19 (360X)	60 VAC 60Hz	OFF	OFF	OFF	OFF					SYNC
	C1JR, C-1JUNIOR, CMZ-200A/300, D-1, IPS, IPS-2-H2/2B/2B-H2C/5, KM008, KR-053 PLATH NAVIGAT-1, PT11-H2/21/21-H2	Synchro motor PY76-N2 (360X)	100 VAC 50/60Hz	OFF	OFF	OFF						SYNC
アーマーブラウン ARMA BROWN (France)	1351, MK-1～7/10/20, MKL-1, NOD-4, NB-23-86, SERIE, SQB-1000	Step motor BZ-2191 (180X)	50 VDC	ON	ON	OFF						STEP
アンシュッツ ANSCHUTZ (Germany)	110-301, 139-31, ANSCHUTZ-1～6/12/14/Z, GM-BH, K8051, NB23-126, Z0658U	Synchro motor NB23-91 (360X)	50 VAC 50Hz	OFF	OFF	OFF						SYNC
プラート社 C. PLATH (Germany)	NAVIGAT 763-331E, PLATH NAVIGAT-Ⅱ/Ⅲ	Synchro motor YM14A (360X)	50 VAC 60Hz	OFF	OFF	OFF						SYNC

*: Numeric number

B.9 Inter Switch Unit

B.9.1 Terminal Board Connection Diagram

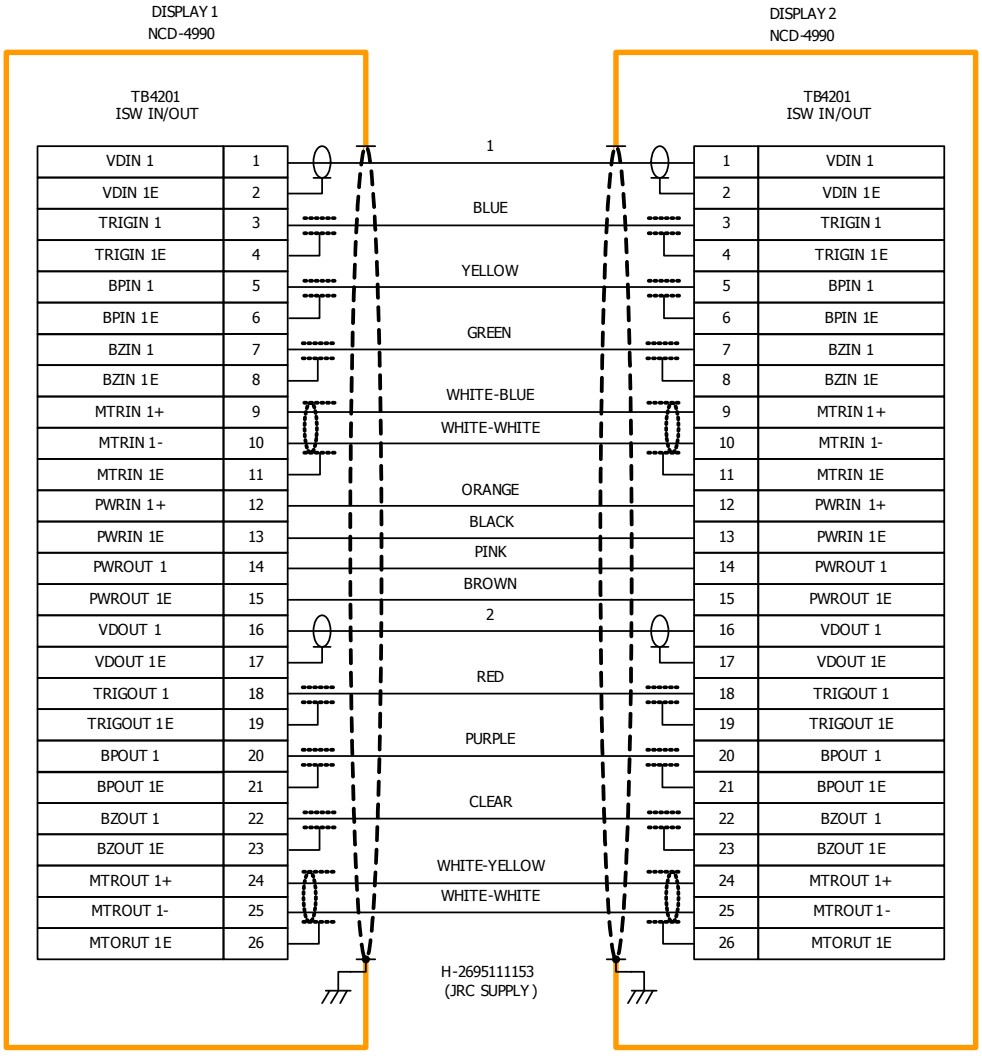


Fig B-39: *Terminal Board Connetion Diagram of NQE-3141-2A*

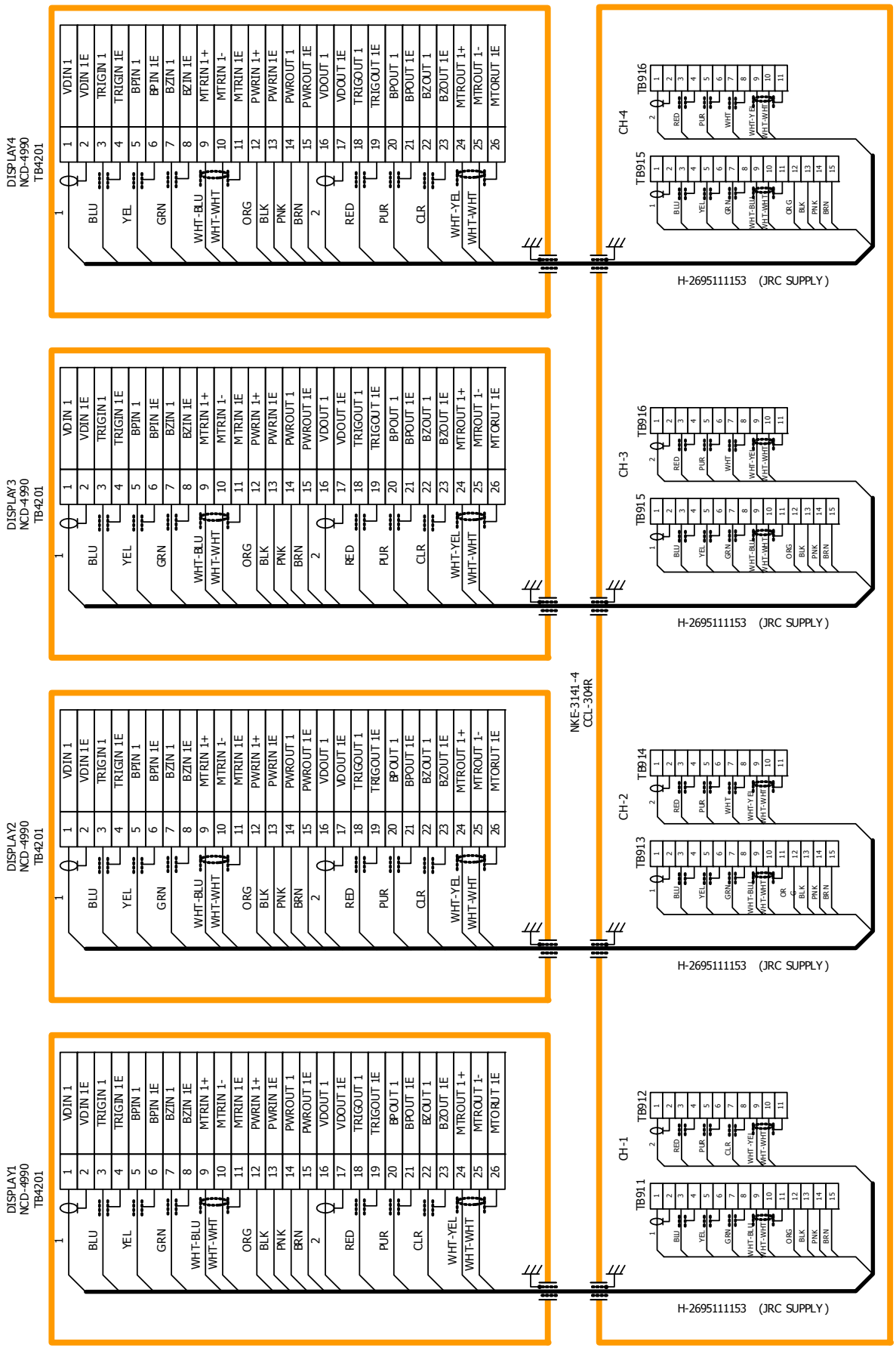


Fig B-40: *Terminal Board Connection Diagram of NQE-3141-4A*

B.9.2 Interconnection Diagram

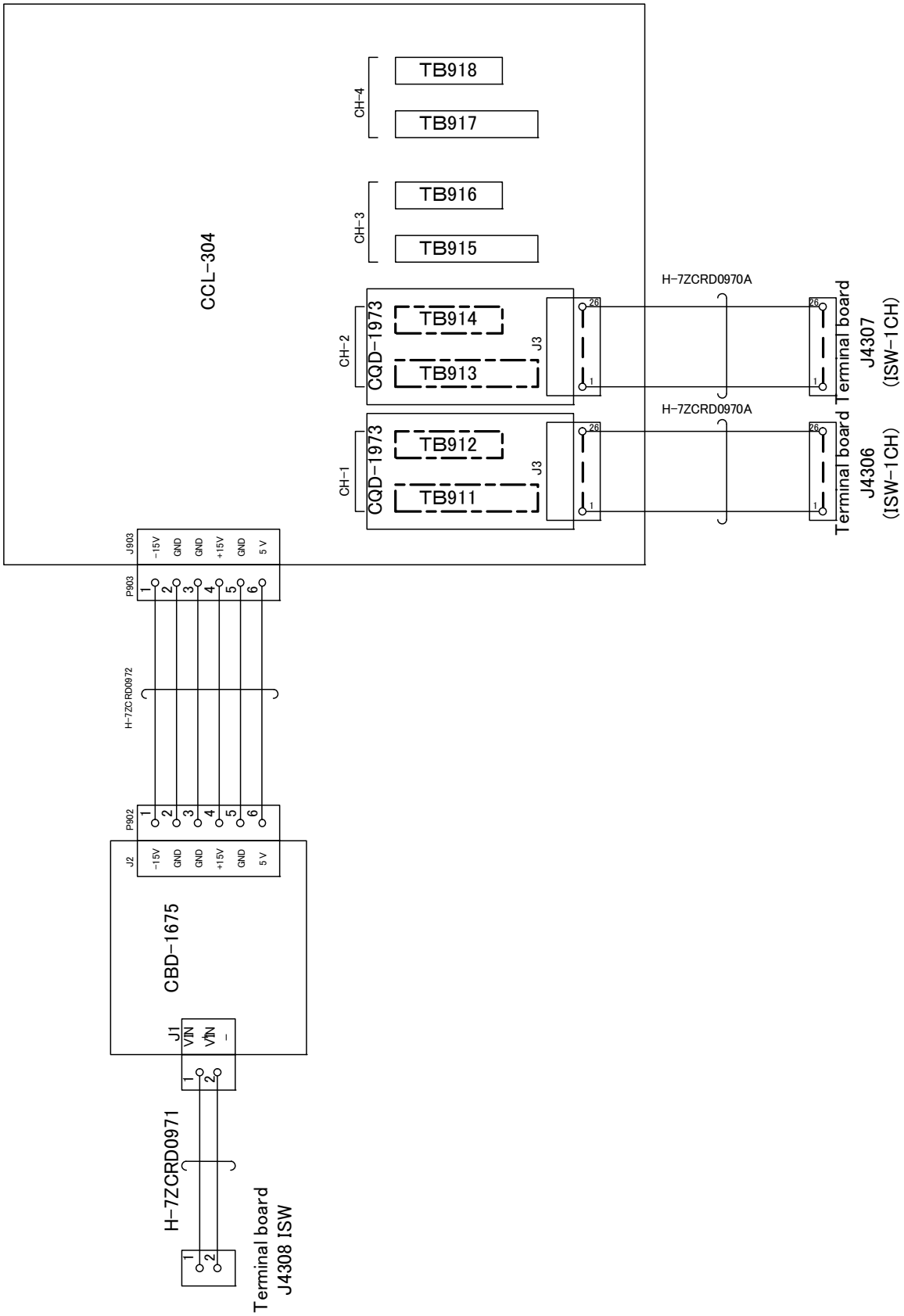


Fig B-41: *Interconnection Diagram of NQE-3141-2A*

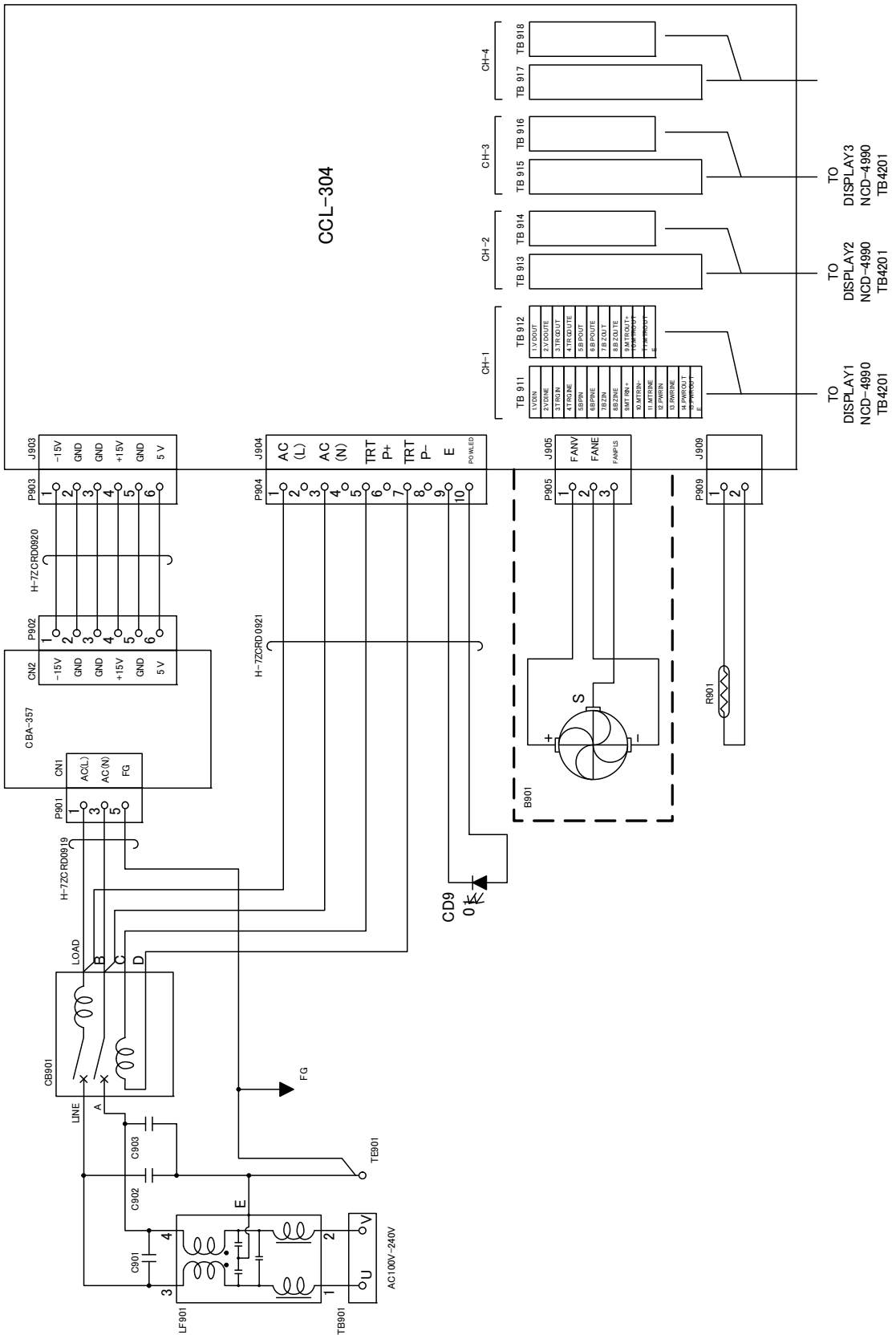
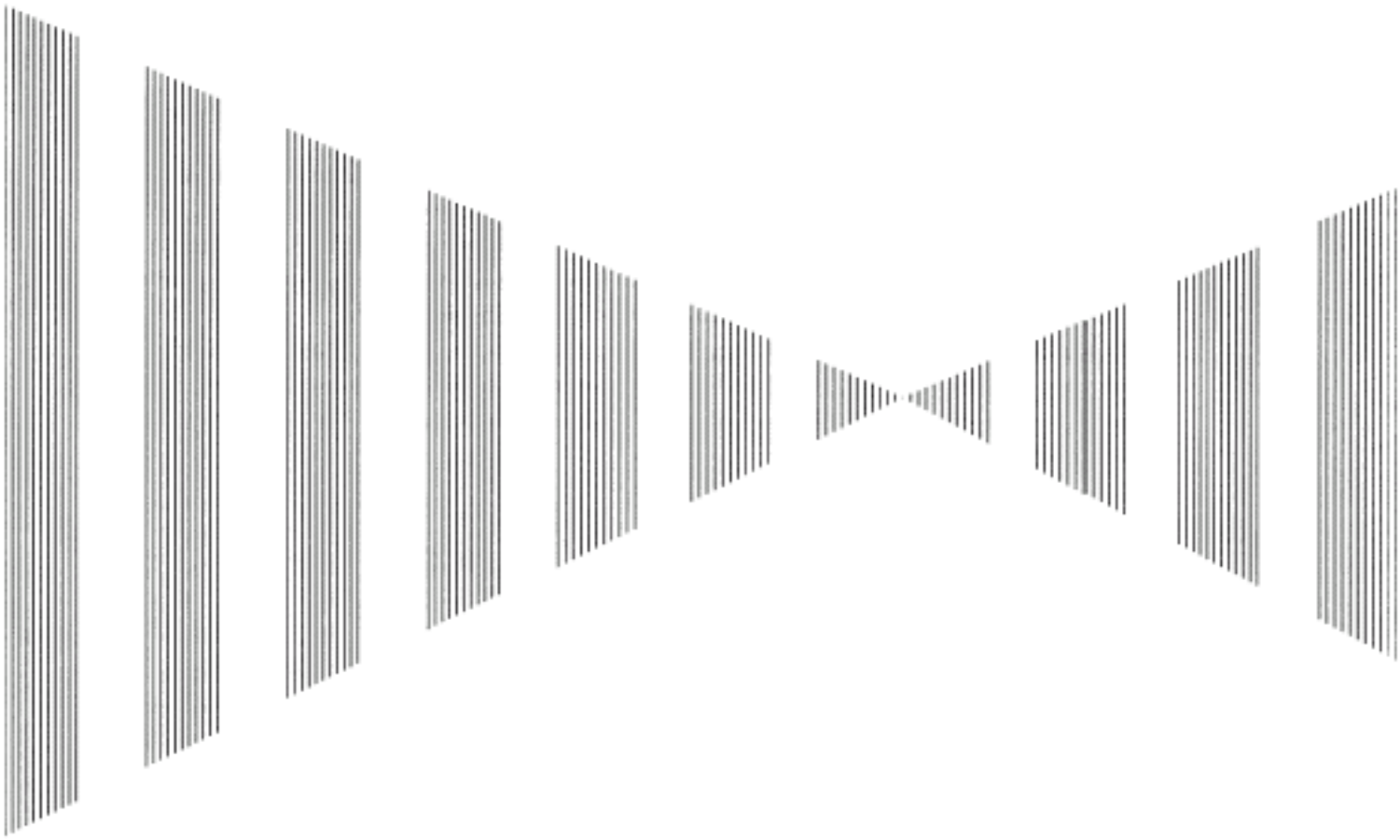


Fig B-42: *Interconnection Diagram of NQE-3141-4A*

Appendix C
Menu Index



Menu Index

C.1 Main

```
│      ├⊟1. Self Test - - - - - - - - - - - - - - - - - - - - - - - - - - - - - section 8.3.1.1 on page 8-7
│      │      ├⊟1. Memory Test
│      │      │      ├  1. SDRAM
│      │      │      ├  2. SRAM
│      │      │      ├  3. FLASH ROM
│      │      │      └  4. GRAPHIC
│      │      ├  2. TXRX Test
│      │      ├  3. Line Test
│      │      └  4. Supply Voltage
│      ├⊟2. Monitor Test - - - - - - - - - - - - - - - - - - - - - - - - - - - section 8.3.1.2 on page 8-9
│      │      ├  1. Pattern 1
│      │      ├  2. Pattern 2
│      │      ├  3. Pattern 3
│      │      ├  4. Pattern 4
│      │      ├  5. Pattern 5
│      │      ├  6. Pattern 6
│      │      ├  7. Pattern 7
│      │      └  8. Pattern 8
│      ├⊟3. Keyboard Test - - - - - - - - - - - - - - - - - - - - - - - - - - section 8.3.1.3 on page 8-9
│      │      ├  1. Key Test
│      │      ├  2. Buzzer Test
│      │      └  3. Light Test
│      ├  4. MON Display - - - - - - - - - - - - - - - - - - - - - - - - - section 8.3.1.4 on page 8-10
│      ├  5. System Alarm Log - - - - - - - - - - - - - - - - - - - - - - section 8.3.1.5 on page 8-12
│      └  6. System Information - - - - - - - - - - - - - - - - - - - - - section 8.3.1.6 on page 8-12
└  0. EXIT
```

C.2 PI

1.The setting items are determined by the setting of Operation Mode.
2.*Operating Mode*: *Control*
3.Displayed only when "3. Control" is Individual.
4.*Operating Mode*: *Reference Bearing*

C

- 1. Index Line 1
- 2. Index Line 2
- 3. Index Line 3
- 4. Index Line 4
- 5. Index Line 5
- 6. Index Line 6
- 7. Index Line 7
- 8. Index Line 8

8. Press EBL Dial to Control PI#[ii]
9. Press VRM Dial to Move End Point#[ii]

C.3 TT

- 1. Association Setting - - - section 5.4 on page 5-38
  - 1. Association
  - 2. Proprity
  - 3. Bearing
  - 4. Range
  - 5. Course
  - 6. Speed
  - 7. Applicable AIS Target
- 2. Target Track Setting - - - section 5.6.2 on page 5-45
  - 1. Target Track Function - - - section 5.6.2.2 on page 5-45
  - 2. Target Track Color - - - section 5.6.2.1 on page 5-45
    - 1. All
    - 2. Target Track No.1
    - 3. Target Track No.2
    - 4. Target Track No.3
    - 5. Target Track No.4
    - 6. Target Track No.5
    - 7. Target Track No.6
    - 8. Target Track No.7
    - 9. Next
    - 1. Target Track No.8
    - 2. Target Track No.9
    - 3. Target Track No.10
    - 4. Other
  - 3. Target Track Display - - - section 5.6.2.4 on page 5-47
    - 1. All
    - 2. Target Track No.1
    - 3. Target Track No.2
    - 4. Target Track No.3
    - 5. Target Track No.4
    - 6. Target Track No.5
    - 7. Target Track No.6
    - 8. Target Track No.7
    - 9. Next
    - 1. Target Track No.8
    - 2. Target Track No.9
    - 3. Target Track No.10
    - 4. Other
  - 4. Track Memory Interval - - - section 5.6.2.5 on page 5-48
  - 5. Clear Track Color - - - section 5.6.2.6 on page 5-48
  - 6. Clear Track Number
  - 7. File Operations - - - section 5.6.2.7 on page 5-49
    - 1. Select Card Slot
    - 2. Load Mode
    - 3. Load - - - -page 5-50
    - 4. Save - - - -page 5-51
    - 5. Erase - - - -page 5-52
    - 6. Card T.TRK Display - - - -page 5-53
- 3. Trial Maneuver - - - section 5.7 on page 5-54
  - 1. Trial Function
  - 2. Course(EBL)
  - 3. Speed(VRM)
  - 4. Vector Time
  - 5. Time to Maneuver
  - 6. Own Ship's Dynamic Trait
    - 1. Reach
    - 3. Turn Radius
    - 4. Acceleration
    - 5. Deceleration
- 4. Target Number Display - - - section 5.2.4 on page 5-19
- 9. TT Test Menu - - - section 5.2.7 on page 5-22
  - 1. Test Video - - - section 5.2.7.1 on page 5-23
  - 2. TT Simulator - - - section 5.2.7.2 on page 5-24
  - 3. Status - - - section 5.2.7.3 on page 5-25
  - 4. Gate Display - - - section 5.2.7.4 on page 5-26

C.4 AIS

- 1. Association Setting - - - *section 5.4.2 on page 5-38*
  - 1. Association
  - 2. Proprity
  - 3. Bearing
  - 4. Range
  - 5. Course
  - 6. Speed
  - 7. Applicable AIS Target
- 2. Target Track Setting - - - *section 5.6.2 on page 5-45*
  - 1. Target Track Function - - - *section 5.6.2.2 on page 5-45*
  - 2. Target Track Color - - - *section 5.6.2.1 on page 5-45*
    - 1. All
    - 2. Target Track No.1
    - 3. Target Track No.2
    - 4. Target Track No.3
    - 5. Target Track No.4
    - 6. Target Track No.5
    - 7. Target Track No.6
    - 8. Target Track No.7
    - 9. Next
    - 1. Target Track No.8
    - 2. Target Track No.9
    - 3. Target Track No.10
    - 4. Other
  - 3. Target Track Display - - - *section 5.6.2.4 on page 5-47*
    - 1. All
    - 2. Target Track No.1
    - 3. Target Track No.2
    - 4. Target Track No.3
    - 5. Target Track No.4
    - 6. Target Track No.5
    - 7. Target Track No.6
    - 8. Target Track No.7
    - 9. Next
    - 1. Target Track No.8
    - 2. Target Track No.9
    - 3. Target Track No.10
    - 4. Other
  - 4. Track Memory Interval - - - *section 5.6.2.5 on page 5-48*
  - 5. Clear Track Color - - - *section 5.6.2.6 on page 5-48*
  - 6. Clear Track Number
  - 7. File Operations - - - *section 5.6.2.7 on page 5-49*
    - 1. Select Card Slot
    - 2. Load Mode
    - 3. Load - - - *-page 5-50*
    - 4. Save - - - *-page 5-51*
    - 5. Erase - - - *-page 5-52*
    - 6. Card T.TRK Display - - - *-page 5-53*
- 3. Trial Maneuver - - - *section 5.7 on page 5-54*
  - 1. Trial Function
  - 2. Course(EBL)
  - 3. Speed(VRM)
  - 4. Vector Time
  - 5. Time to Maneuver
  - 6. Own Ship's Dynamic Trait
    - 1. Reach
    - 2. Turn Radius
    - 3. Acceleration
    - 4. Deceleration
- 4. AIS Filter Setting - - - *section 5.3.7 on page 5-33*
  - 1. Filter Type - - - *section 5.3.7.2 on page 5-33*
  - 2. Make AIS Filter - - - *section 5.3.7.3 on page 5-34*

C.5 AZ

C.6 Track

C.7 Route

C

C.8 U.Map

C.9 Serviceman Menu

- 3. TTD(TT)
- 4. TLB(TT)
- 5. OSD
- 6. RSD
- 7. ALR
- 8. ACK
- 9. Next
  - 1. TTM(AIS)
  - 2. TLL(AIS)
  - 3. TTD(AIS)
  - 4. TLB(AIS)
  - 5. Remote Maintenance
  - 6. JRC-ARPA
  - 7. NMEA0183 Output Format
  - 8. NMEA0183 Talker
  - 9. Next
    - 1. NMEA0183 TX Interval
    - 2. APB
    - 3. BOD
    - 4. GGA
    - 5. GLL
    - 6. RMC
    - 7. RMB
    - 8. VTG
    - 9. Next
      - 1. XTE
      - 2. BWC
      - 3. HDT
      - 4. THS
- 7. Line Monitor
  - 1. COMPASS
  - 2. MAINTENANCE/LOG
  - 3. NAV1
  - 4. NAV2
  - 5. ALARM
  - 6. JARPA
  - 7. AIS
  - 8. BRIDGE NET
  - 9. Next
    - 1. ARPA
    - 2. COM
    - 3. TXRX/ISW
    - 4. KEYBOARD1
    - 5. KEYBOARD2
- 6. Alarm System - *section 7.2.9 on page 7-22*
  - 1. Watch Alarm
    - 1. Reset Interval - - - - - - - - - - - - - - - - - *section 7.2.9.1 on page 7-22*
    - 2. Trackball Threshold - - - - - - - - - - - - - *section 7.2.9.2 on page 7-22*
  - 2. Relay Output - *section 7.2.9.3 on page 7-23*
    - 1. Relay Output Mode
    - 2. TT CPA/TCPA
    - 3. AIS CPA/TCPA
    - 4. New Target
    - 5. Lost
    - 6. RADAR Alarm
  - 3. ALR Output - *section 7.2.9.4 on page 7-23*
    - 1. System Alarm
    - 2. TT/AIS Alarm
  - 4. Sound Output Mode - - - - - - - - - - - - - - - - - *section 7.2.9.6 on page 7-25*
  - 5. External ACK Setting - - - - - - - - - - - - - - - - *section 7.2.9.5 on page 7-24*
    - 1. Critical Alarm
      - 1. Audio
      - 2Indication
      - 3. Acknowledge State
    - 2. Normal Alarm
      - 1. Audio
      - 2. Indication
      - 3. Acknowledge State
- 7. Inter Switch
  - 1. ISW Install

1.Only for ISW Extended Mode

アスベストは使用しておりません
Not use the asbestos

For further information,contact:

JRC Japan Radio Co., Ltd.
Since 1915

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