JMA-9833-SA/9832-SA
JMA-9823-7XA/9XA
JMA-9822-6XA/9XA

MARINE RADAR EQUIPMENT

INSTRUCTION MANUAL

JRC Japan Radio Co., Ltd.

PREFACE

Thank you very much for purchasing the JRC marine radar equipment, JMA-9800 ARPA 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 CRT 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 diffect occur.

● Before Operation ●

Pictorial Indication

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

⚠WARNING	This indication is shown where any person is supposed to be in danger of being killed or seriously injured if this indication is neglected and these equipment are not operated correctly.
⚠CAUTION	This indication is shown where any person is supposed to be injured or any property damage is supposed to occur if this indication is neglected and these equipment are not operated correctly.

Examples of Pictorial Indication

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

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

The ● mark represents instruction.
Datailed 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.

● Cautions to be Used during Operation ●

⚠ WARNING

Do not touch the insides of the scanner, transmitter-receiver and display unit.

Touching any high voltage area, you will get an electric shock. For maintenance, inspection and adjustment of internal parts of these equipment, consult with our sales office or distributor in your district.

Since the scanner radiator rotates, do not approach it.

The scanner may start rotating suddenly, and consequently any person may be struck and be injured. We recommend you to install the scanner radiator on the roof of the wheel house, flying bridge, trestle, radar mast or any other high position so that no person can approach it. When servicing the scanner, set the scanner safety switch to the "OFF" position.

SCANNER RADIATION HAZARD
Never look up the antenna from which radiation is being output from a distance less than the following.

Injury may result from exposure to radiation produced by the antenna (particularly effects to the eyes) at a distance from the central front face of the antenna less than:
0.6 meter for NKE-1059/1052 (Radiation power density of 10 W/m^2)
1.1 meter for NKE-1079/1075 (Radiation power density of 10 W/m^2)
25 cm for NKE-1079/1075 (Radiation power density of 100 W/m^2)

Install the scanner at any place higher than any person.

If being exposed directly to electric wave at close range, you may suffer adverse influence.

When approaching the scanner for maintenance or inspection, set the power switch of the display unit to the "OFF" or "STBY" position.

If being exposed directly to electric wave to close range, you may suffer adverse influence.

⚠CAUTION

Use these radar only as assisting devices for navigation. Also, the officer should make the final decision for maneuvering by himself.

Use ARPA only as assisting device for navigation. Also, the officer should make the final decision for maneuvering by himself.

ARPA's information such as vector, target value data, alarm, etc. may contain some errors. Also, targets which cannot be detected with these radar cannot be tracked at their acquisition points.

◆◆◆◆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 and 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.

◆◆◆◆◆◆◆◆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 his 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.)

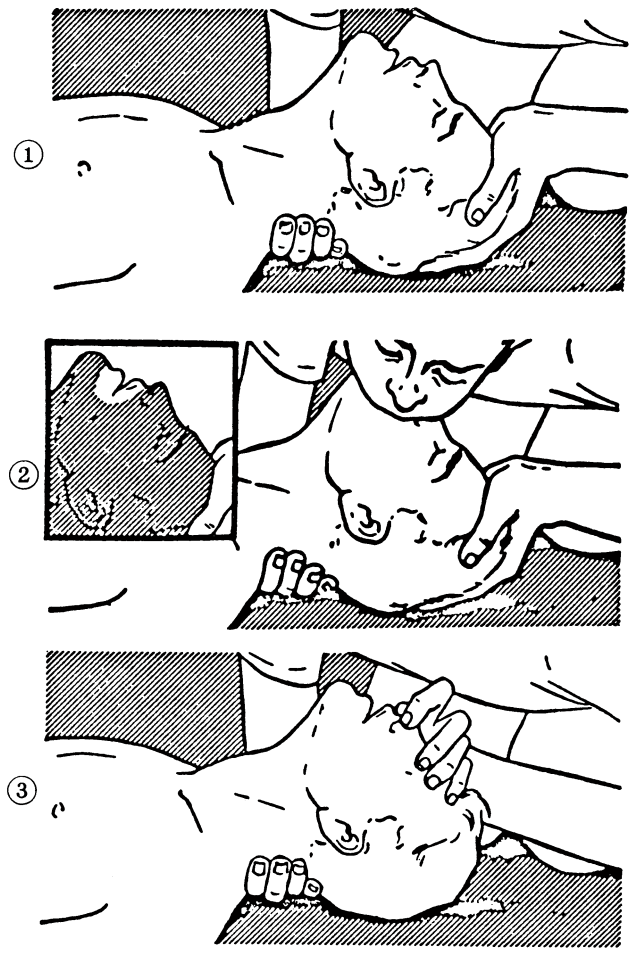
(7) Then, close his mouth so that foaming mucus does not accumulate inside.

☆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 minute (blocking his nostrils).
(4) Carefully watch that he has recovered his natural breathing and stop practicing artificial respiration.
(5) If it is difficult to open the victim's mouth, insert a rubber or vinyl tube into one of his nostrils and blow into it blocking the other nostril and his mouth completely.
(6) When the victim recovers consciousness, he may try to stand up suddenly, but let him lie calmly and serve him with a cup of hot coffee or tea and keep him warm and quiet. (Never give him alcoholic drinks.)

Method of mouth-to-mouth respiration by raising head



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

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

Fig.1 Mouth-to-mouth respiration

☆When both pulse and breathing have stopped

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

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

(1) Place your both hands, one hand on the other, on the lower one third area of his breastbone and compress his breast with your elbows applying your weight on his breast so that it is dented about 2 cm (Repeat compressing his breast 50 times or so a minute). (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 5 times while the other person blow into his mouth once, 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 treatments.

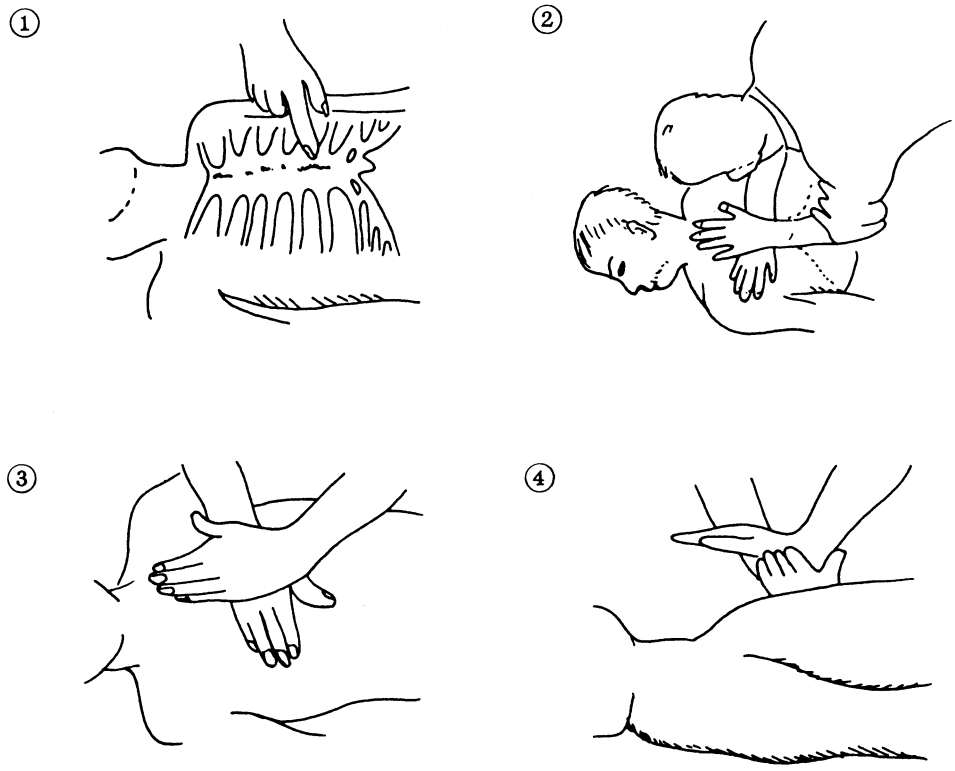
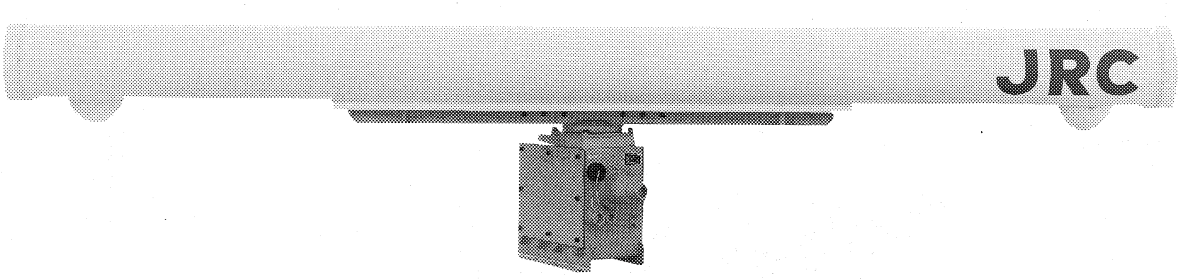


Fig.2 Cardiac massage

EQUIPMENT APPEARANCE



Scanner Unit Type NKE-1079 (12 feet)

Transmitter-receiver Unit Type NTG-3037

Scanner Unit Type NKE-1075 (12 feet)

Scanner Unit Type NKE-1059-7 (7 feet)

Scanner Unit Type NKE-1059-9 (9 feet)

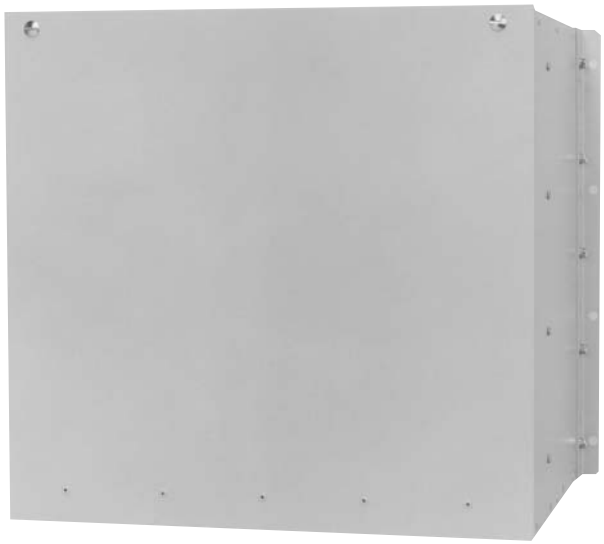
Transmitter-receiver Unit Type NTG-3027

Scanner Unit Type NKE-1052-6 (6 feet)

Scanner Unit Type NKE-1052-9 (9 feet)

Display Unit Type NCD-4111 (Self-standing Type)

Monitor Unit Type NWU-228 (Desktop Type) (Option)



Control Unit Type NDC-1097 (Desktop Type) (Option)

Keyboard Unit Type NCE-7292 (Desktop Type) (Option)

Display Unit Type NCD-4111-T (Desktop Type) (Option)

CONTENTS

3. BASIC OPERATION

4. MEASUREMENT OF RANGE AND BEARING

5. OPERATION OF ARPA

APPENDIX

GLOSSARY

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

ARPA:
Automatic Radar Plotting Aid

AZI MODE (Azimuth Stabilization MODE):
Bearing display mode

Anti-clutter rain (FTC):
Rain/snow clutter suppression

Anti-clutter sea (STC):
Sea clutter suppression

BCR (Bow Cross Range):
Bow crossing range

BCT (Bow Cross Time):
Bow crossing time

BRG (Bearing):
Bearing

CPA (Closest Point of Approach):
The closest point of approach from own ship, which can be set by the observer.

COG (Course Over Ground):
Course relative to the ground.

CUP (Course-Up):
Own ship's course is pointed to the top center of the radar display.

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

EBL (Electronic Bearing Line):
An electronic bearing line originated from own ship's position.

ENH (Enhance):
A target can be enlarged.

Floating EBL (Floating Electronic Bearing Line):
Floating electronic bearing line originated from an arbitrary point.

GND:
Stabilization relative to the ground.

GPS (Global Positioning System):
The position of a GPS receiver can be determined by the signals from GPS satellites.

Guard Zone:
Alarm ring against intrusion

HDG (Heading):
Own ship's heading bearing.
The display ranges from 000 to 360 degrees as scanned clockwise.

HL (Heading Line):
Ship's heading line

HUP (Head-Up):
Own ship's heading line is always pointed to the top center of the radar display.

IMO:
International Maritime Organization

Interswitch:
A device to switch over two or more radar display units and two or more antennas.

IR (Interference Reflector):
Radar interference reflector

MRK (Mark):
Reflection plot

NM (Nautical Mile):
1 NM = 1852 m

NSK (North Stabilization Kit):
True bearing unit

NUP (North-Up):
The north is always pointed to the top center of the radar display.

OWN TRACK:
Display function of own ship's track

Performance Monitor:
An additional unit to monitor the transmitted power and the receiving sensitivity of radar equipment.

PI (Parallel Index Line):
Parallel index line

PIN (Personal Access Code):
Information set by the user (personal code)

PROC (Process):
Target processing function

Relative Vector:
A target's movement predicted relative to own ship.

RR (Range Rings):
Fixed range ring

RM (Relative Motion):
Relative motion presentation
Own ship's position is fixed and other targets move relative to own ship.

S/X Band:
Radio frequency bands
S: 3 GHz band, X: 9 GHz band

SCANNER:
Antenna

SEA:
Sea clutter suppression

SET:
The current direction for manual correction or the current speed on the horizontal axis of the 2-axis log is displayed.

SOG (Speed Over Ground):
Speed relative to the ground.

STAB (Stabilization):
Stabilization

TCPA (Time to Closest Point of Approach):
The time to approach the closest point from own ship.

TM (True Motion):
True motion presentation
A presentation in which own ship and any other target move depending on their individual movements.

TRAILS:
Function of displaying tracks of other ships.

TRIAL:
Trial maneuvering

True Vector:
A target's true movement predicted as the result of entering own ship's direction and speed.

VRM (Variable Range Marker):
Variable range marker

WATER
Stabilization relative to the water

SECTION 1
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 29-inch color raster-scan CRT display unit.
This radar complies with the current performance standards of the IMO.

1.1.1 Functions of This System

The JMA-9800 ARPA series is a color radar system designed to comply with the international standards of the IMO. The main functions include; sea clutter and rain/snow clutter suppression, sensitivity adjustment, interference reflector, bearing and range measurement using a trackball, fixed/variable range markers, and electronic bearing line, and ARPA functions (automatic/manual target acquisition and tracking, vector and trail displays, alarm displays and trial maneuvering).
In addition, the equipment has the functions of color display setting (4 views), own track display, NAV line and marker displays, TM (True Motion) presentation, Self-diagnostic facilities, and radar performance monitoring (Performance Monitor). As an option, the radar of 3-units switchover function (Interswitch) is also available.

1.1.2 ARPA Functions

The ARPA functions that the JMA-9800 series incorporates will be outlined below.

[Ⅰ] First Stage: Target Detection from Radar Information

This work corresponds to plotting targets by hand on the radar display. Assume that a ship is approaching the own ship. You can catch the ship on the radar. Signals from the ship are processed with the data processor and are transferred to the computer as signals of bearing and range related to the own ship. In this stage, the system has the functions to quantize radar information, to reject noises, to eliminate any information other than ship information and to transfer necessary position data of ships to the computer.

[Ⅱ] Second Stage: Target Tracking

Targets are plotted at intervals of 3 to 6 minutes with the radar, but tracking on this system is to plot them electrically at intervals of fixed times. This means to compare target position data to be detected every moment with those detected previously so as to check if they are of the same target and also to save data of the target in its file so as to calculate changes of position data of the target.

[Ⅲ] Third Stage: Judgment of Existence of Ship in Danger of Collision

In this stage, the system calculates speeds and courses of a target ship from ever-changing position data of the target ship obtained in the previous stage so as to judge existence of any danger of collision. After the calculation, the system can easily calculate the Closest Point of Approach (CPA) to the own ship and the time required to reach the CPA (TCPA = Time to CPA). Both the CPA and the TCPA are compared with the preset values previously set according to the situations of the own ship so as to judge existence of any danger of collision.

[Ⅳ] Fourth Stage: Indication

The above information must be informed to the officer maneuvering the own ship. A variety of indicating methods are available including CRT display and numerical indicator, and various data are available.

This system indicates unprocessed video, vectors (to be selected from true vector and relative vector) of other ships and identification marks of danger ship or safe ship for these ships on the usual radar scope. When the target ship is a danger one, the system will sound an alarm and turns on the alarm lamp to alert the officer.

1.2 FEATURES

Target Detection by Latest Signal Processing Technology

The system employs the latest adaptive clutter suppression 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.

Key Arrangement for Higher Operability

The basic and main functions of the radar can be operated with the minimum necessary keys, ensuring quick action even in case of emergency. Other various useful functions are also available by the use of the simple keys behind a cover and the menu selection on the display.
In the case that two or more operators operate the radar equipment, each operator can register the operating conditions that are most favorable to him/her and can be recalled and set momentarily (Personal code function is built-in).

Advanced Technology Based ARPA Functions Provided as Standard

The ARPA target acquisition and tracking performance is enhanced by the use of the most advanced radar signal processing and tracking technologies, ensuring stable operation in target tracking under clutter.

- Acquisition and tracking of 50 targets
- Hazardous conditions are represented by shapes and colors of symbols as well as sounds.
- Trial maneuvering functions provided
- Simultaneous indication of other ships' data

Improved Day/Night Mode

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

Various Functions

- TRAILS (Other ship's track display)
- NAV lines
- TM (True Motion display)
- Head-up/North-up/Course-up display
- Own ship's track display
- Guard Zone function

Compact Design and Low Power Consumption

The radiator structure making the most of wind power contributes to the substantial reduction in size and power consumption of the S band scanner unit.

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)

By additionally installing an interswitch PC board, up to 3-units of the JMA-9800 series radar equipment can be combined and switched over by simple operation.

1.3 CONFIGURATION

Scanners and Transmitted Output Powers

Radar Model	Scanner Type	Transmitted Output Power	Band
JMA-9833-SA	12 ft slot antenna	30 kW	S
JMA-9832-SA	12 ft slot antenna	30 kW	S
JMA-9823-7XA	7 ft slot antenna	25 kW	X
JMA-9823-9XA	9 ft slot antenna	25 kW	X
JMA-9822-6XA	6 ft slot antenna	25 kW	X
JMA-9822-9XA	9 ft slot antenna	25 kW	X

Radar Configuration and Ship's Mains

Radar Model	Scanner Unit	Performance Monitor	Transmitter-receiver Unit	Display Unit	Ship's Mains
JMA-9833-SA	NKE-1079 (*)	NJU-63	NTG-3037	NCD-4111	220 V AC, 50/60 Hz, 3ø 110/220 V AC, 50/60 Hz, 1ø
JMA-9832-SA	NKE-1075 (*)	NJU-63	———		
JMA-9823-7XA	NKE-1059-7 (*)	NJU-64	NTG-3027		
JMA-9823-9XA	NKE-1059-9 (*)				
JMA-9822-6XA	NKE-1052-6 (*)	NJU-64	———		
JMA-9822-9XA	NKE-1052-9 (*)				

Note: JMA-9833-SA, 220 V AC, 50/60 Hz, 1Ø ··· MED only

Notes:

1. The drive motor for the scanner unit is available in 220 V AC (three-phase) type and 100/110/220 V AC (single-phase) type.
2. The scanner unit can be equipped with a deicing heater as an option marked with (*), in stead of which "-D" shall be suffixed to the type name.
3. When using the ship's mains of 440 V AC as the radar power source, a step-down transformer shall be used.
4. The name plates for the radar components indicate as follows:

   Scanner Unit: SCANNER UNIT
   Transmitter-receiver Unit: TRANSMITTER-RECEIVER UNIT
   Display Unit: DISPLAY UNIT

1.4 EXTERIOR DRAWING

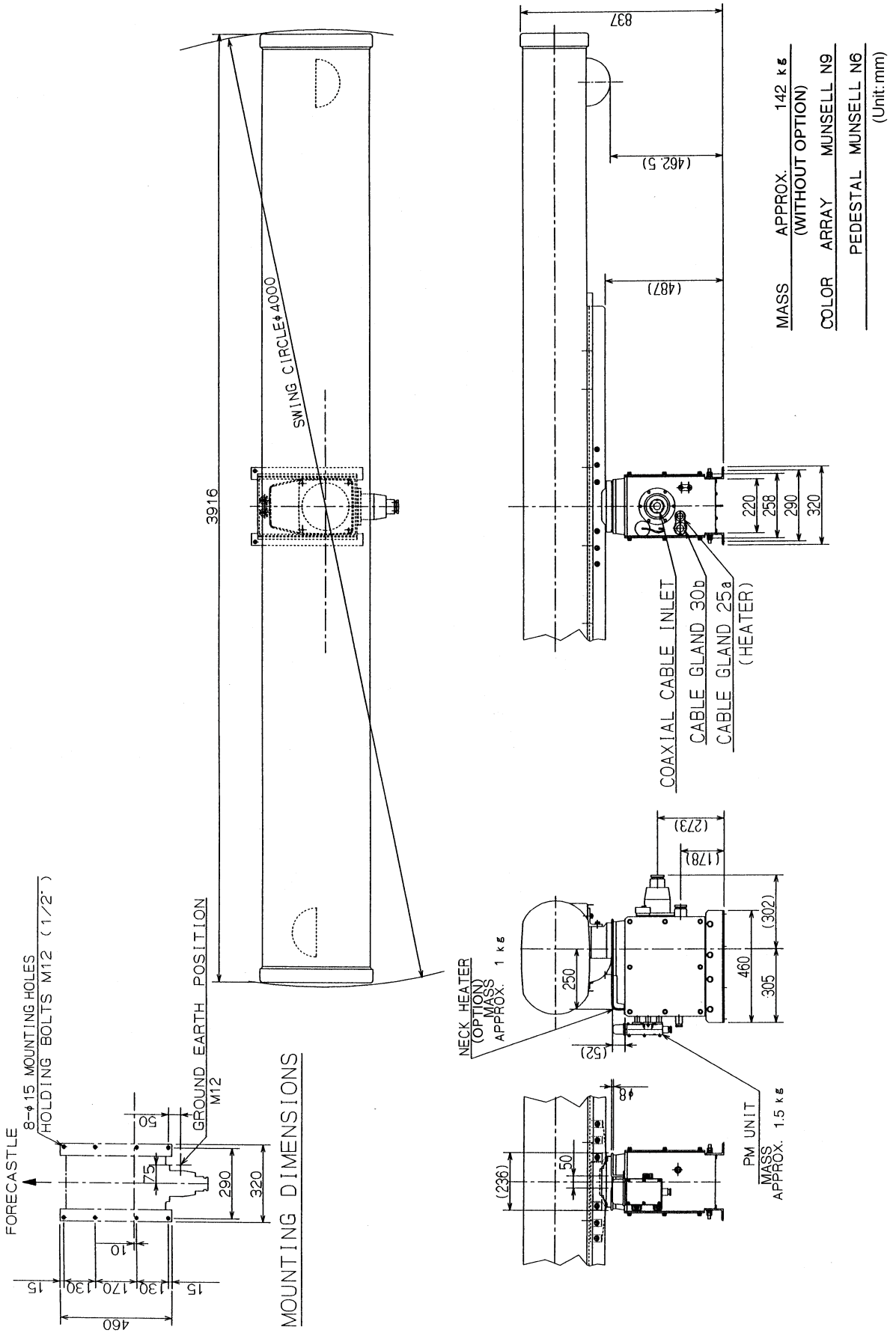


Fig.1.1 EXTERIOR DRAWING OF SCANNER UNIT, TYPE NKE-1079

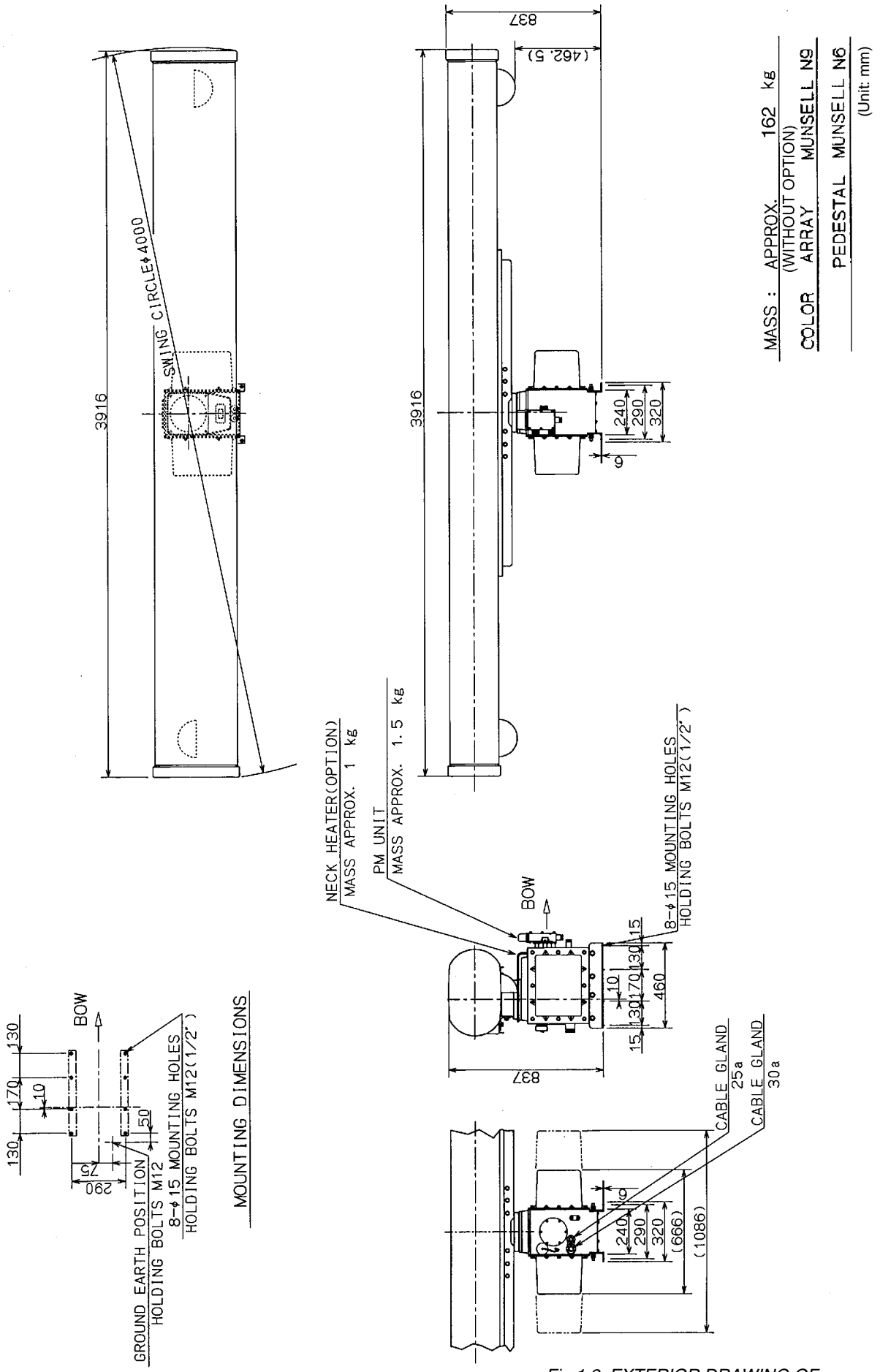


Fig.1.2 EXTERIOR DRAWING OF SCANNER UNIT, TYPE NKE-1075

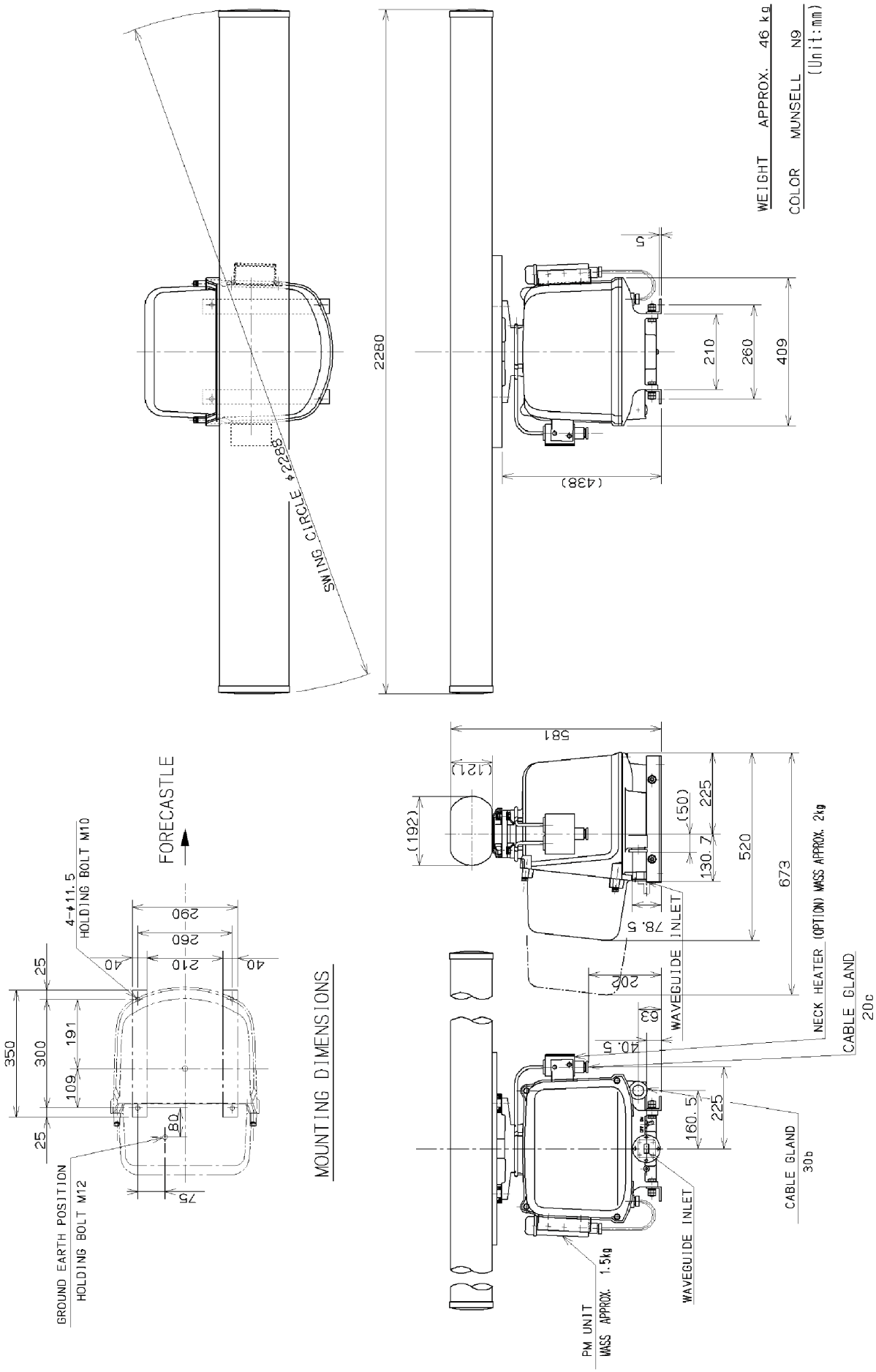


Fig.1.3 EXTERIOR DRAWING OF SCANNER UNIT, TYPE NKE-1059-7

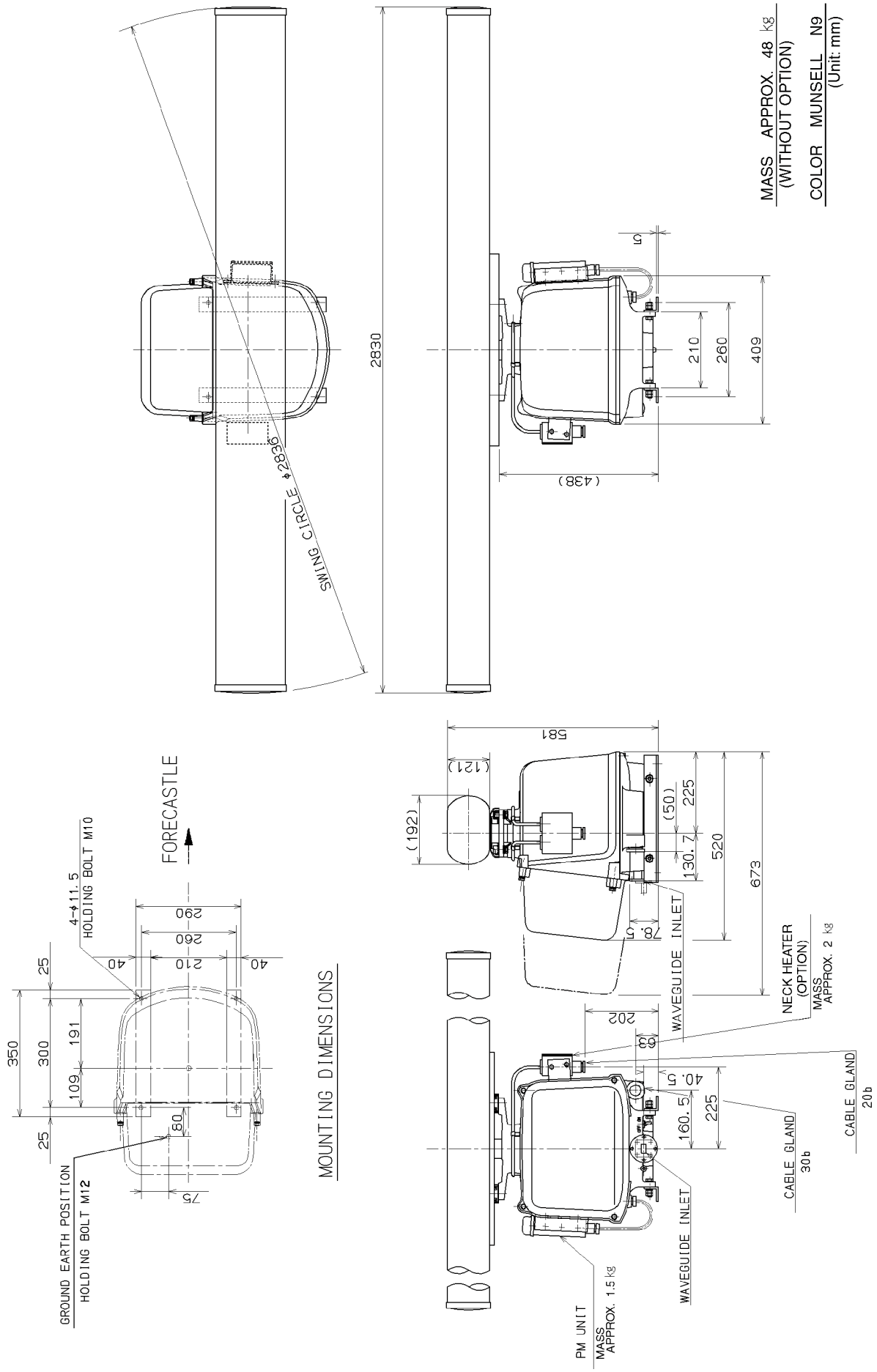


Fig.1.4 EXTERIOR DRAWING OF SCANNER UNIT, TYPE NKE-1059-9

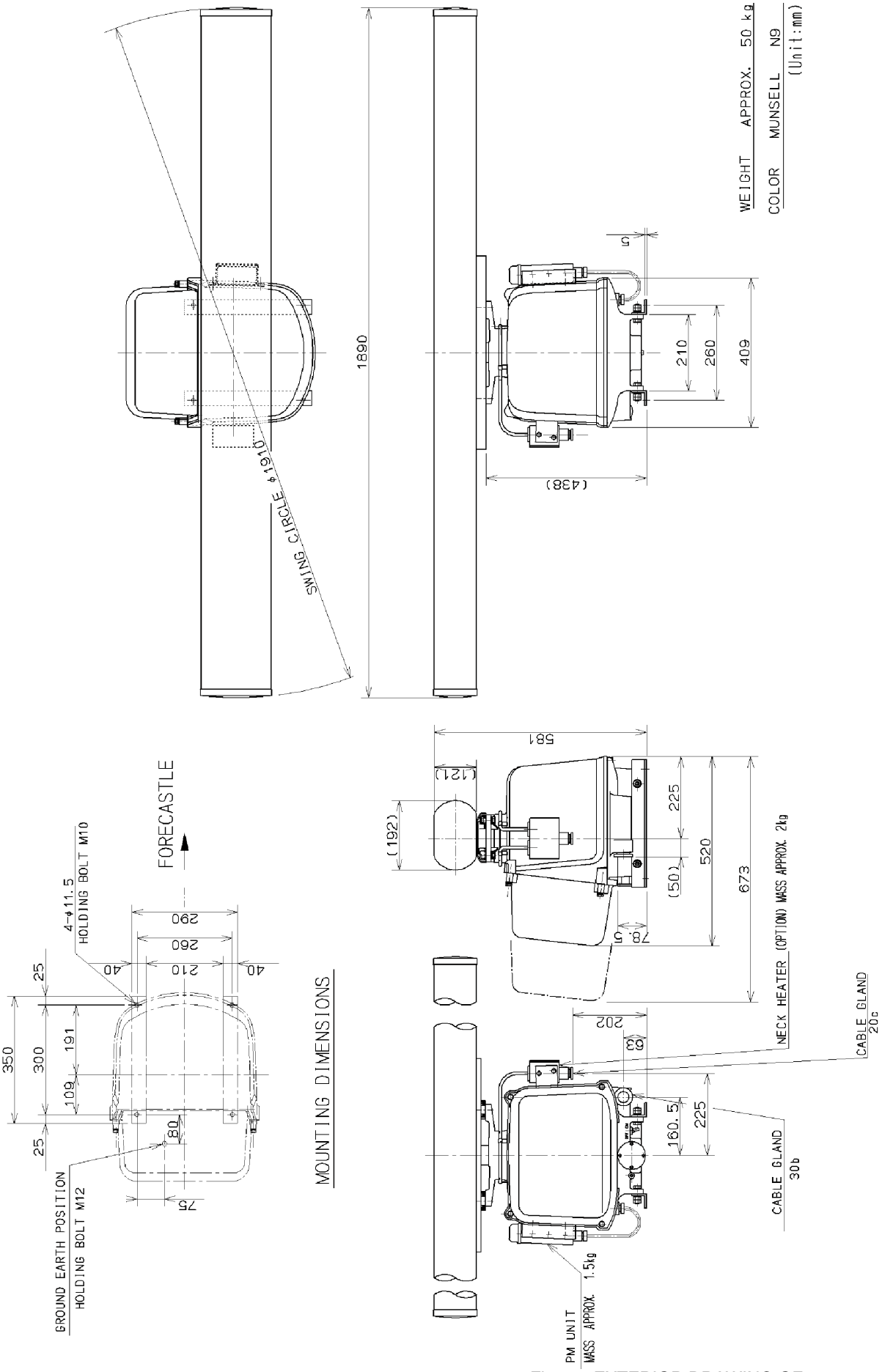


Fig.1.5 EXTERIOR DRAWING OF SCANNER UNIT, TYPE NKE-1052-6

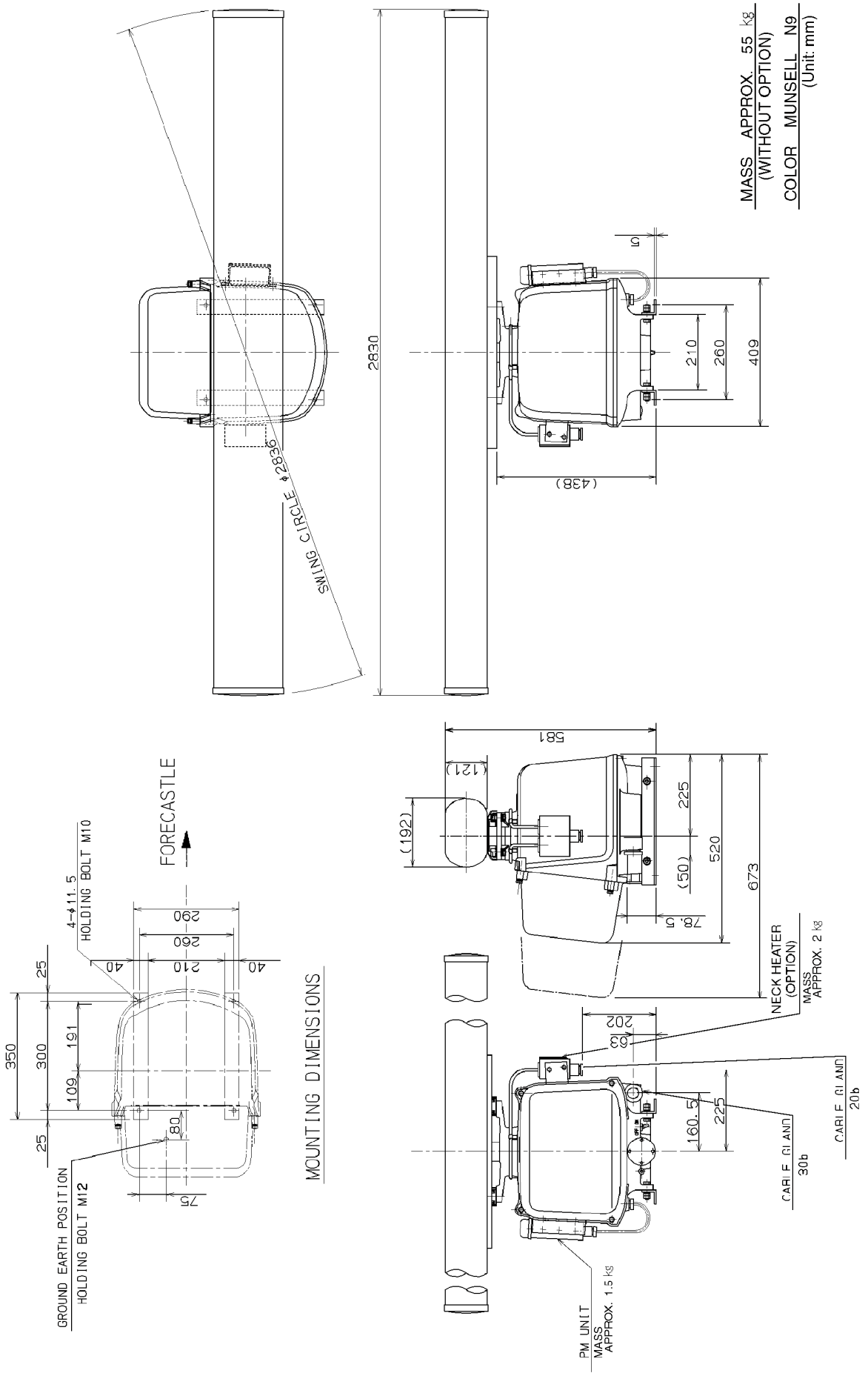


Fig.1.6 EXTERIOR DRAWING OF SCANNER UNIT, TYPE NKE-1052-9

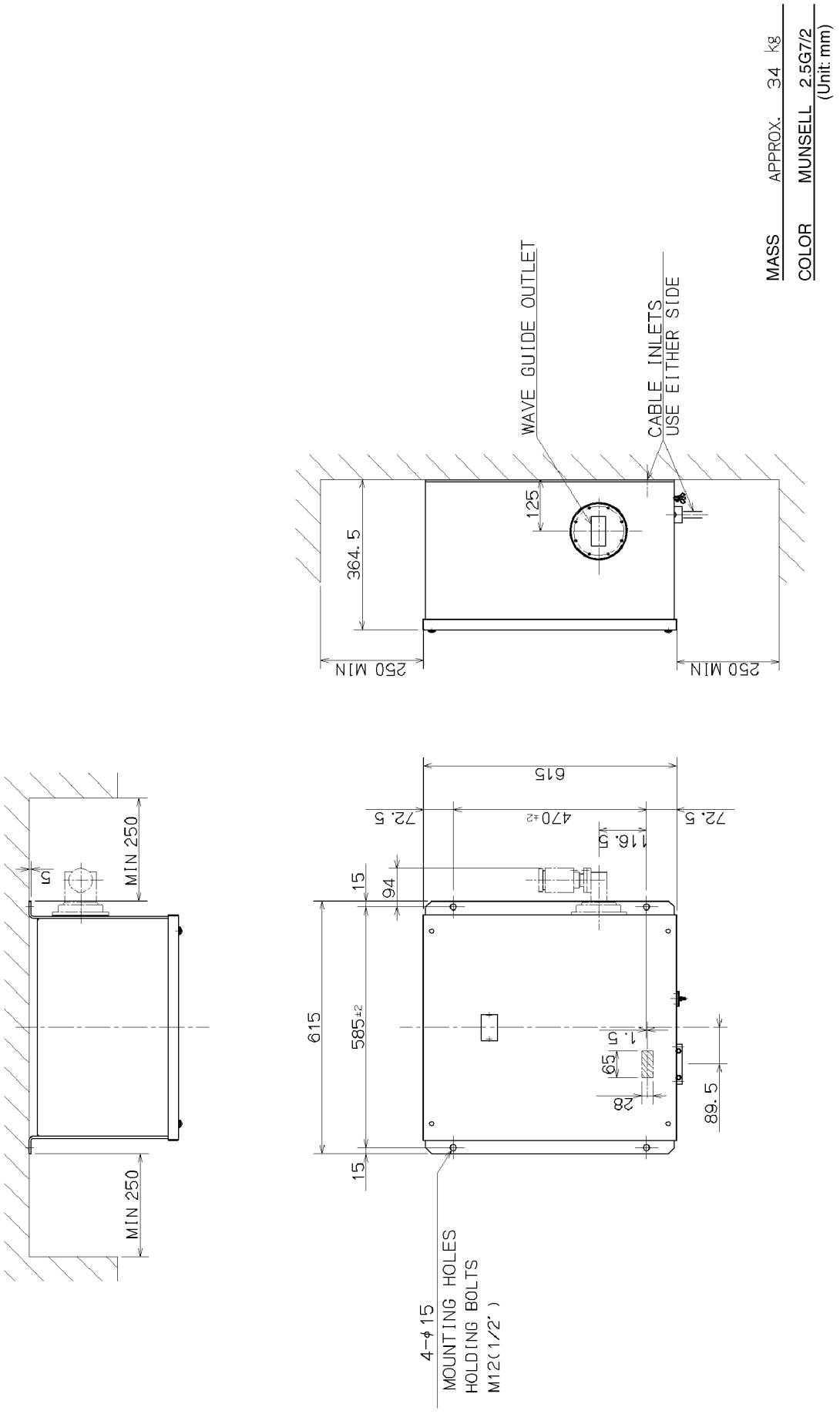


Fig.1.7 EXTERIOR DRAWING OF TRANSMITTER-RECEIVER UNIT, TYPE NTG-3037

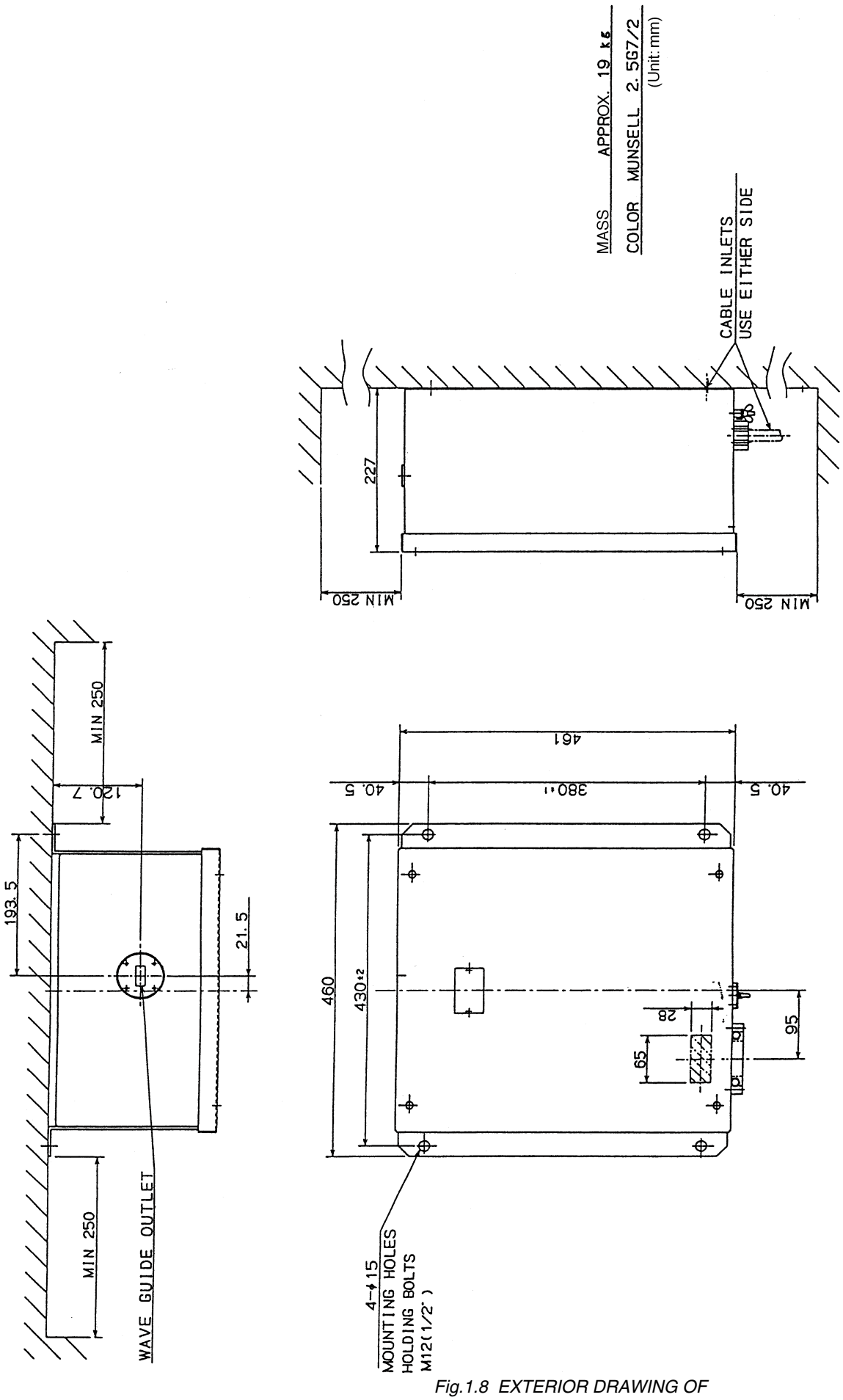


Fig.1.8 EXTERIOR DRAWING OF TRANSMITTER-RECEIVER UNIT, TYPE NTG-3027

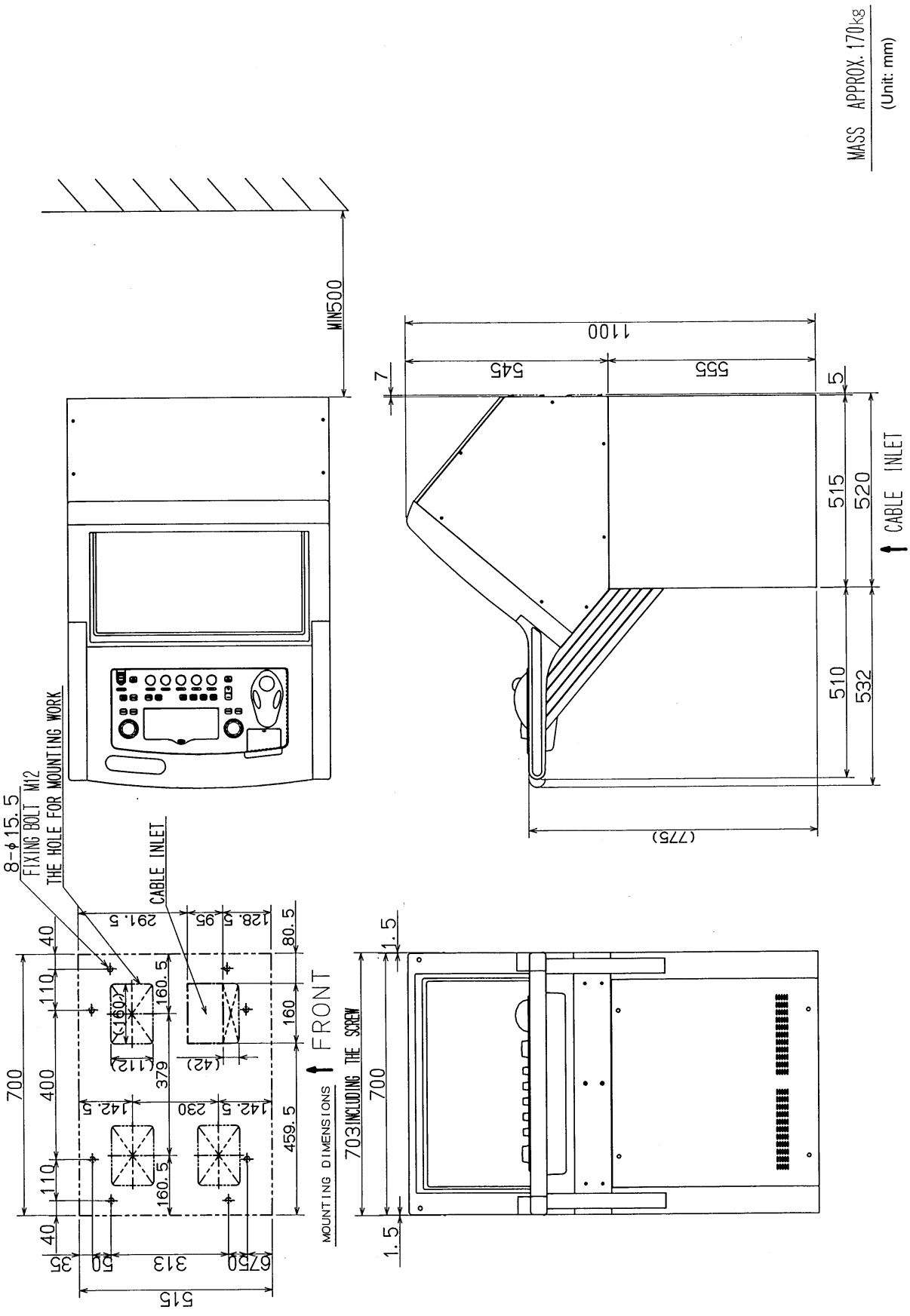


Fig.1.9 EXTERIOR DRAWING OF DISPLAY UNIT, TYPE NCD-4111 (SELF-STANDING TYPE)

Fig.1.10 EXTERIOR DRAWING OF MONITOR UNIT, TYPE NWU-228 (DESKTOP TYPE) (OPTION)

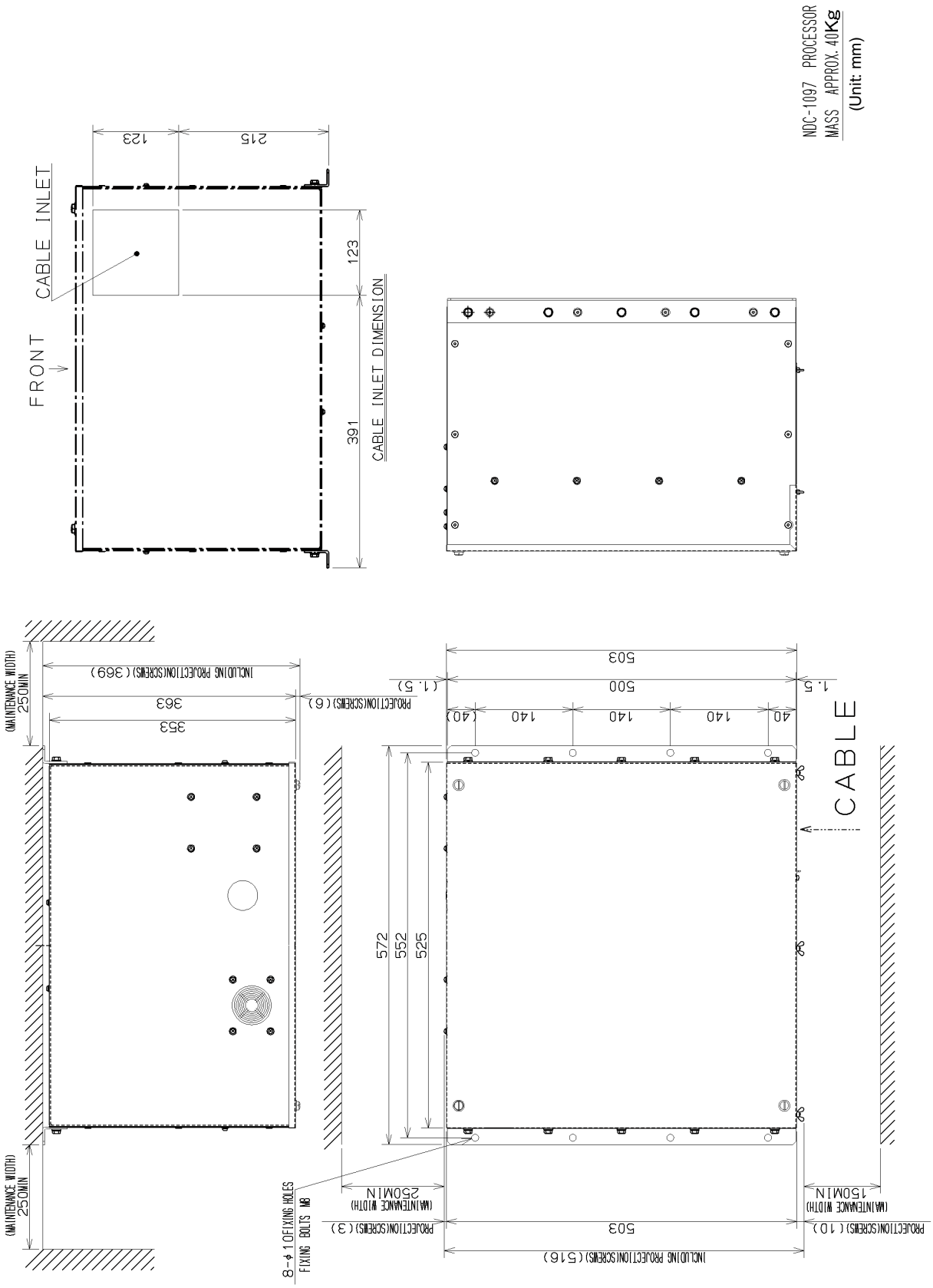


Fig.1.11 EXTERIOR DRAWING OF CONTROL UNIT, TYPE NDC-1097 (DESKTOP TYPE) (OPTION)

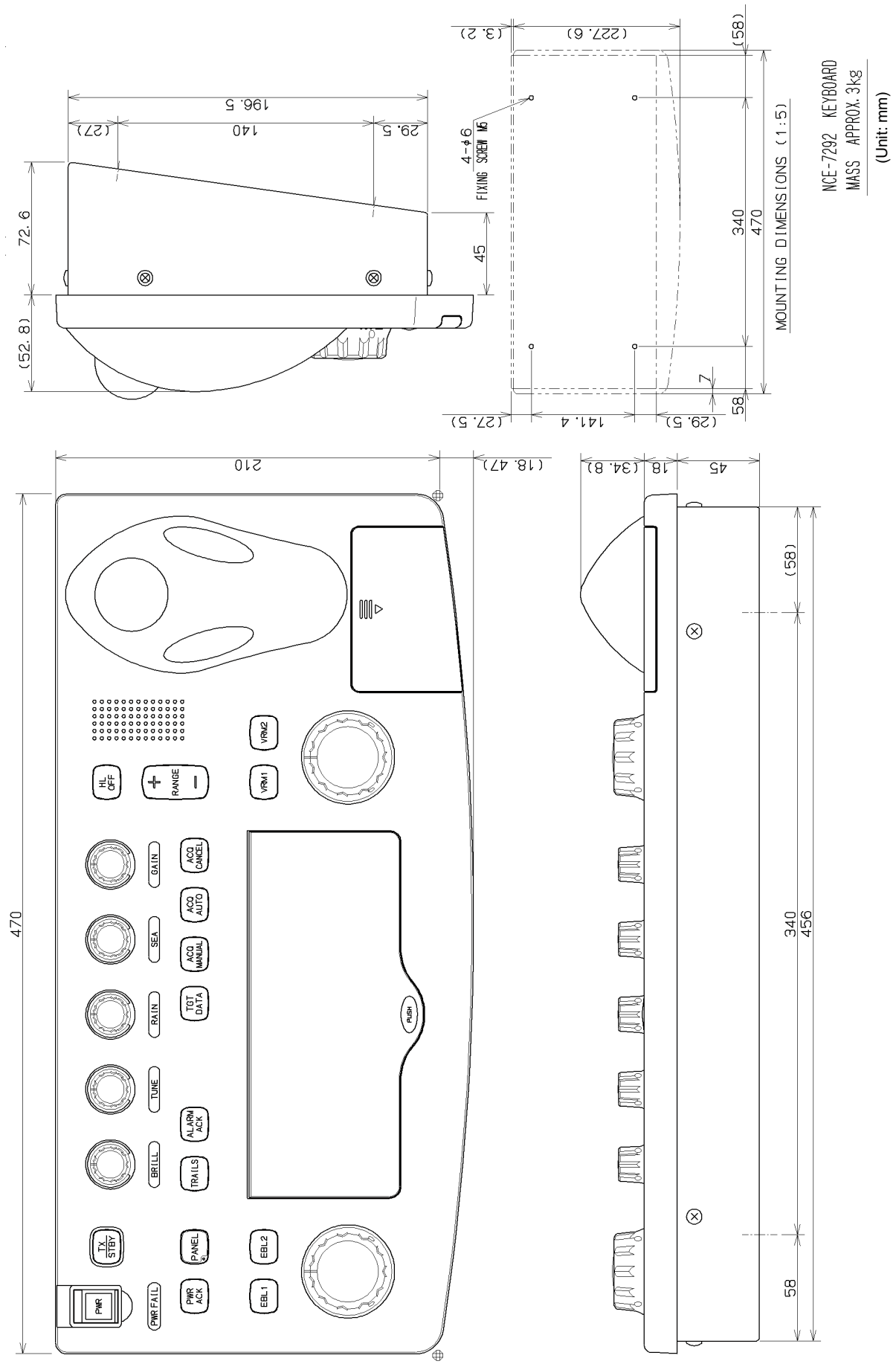
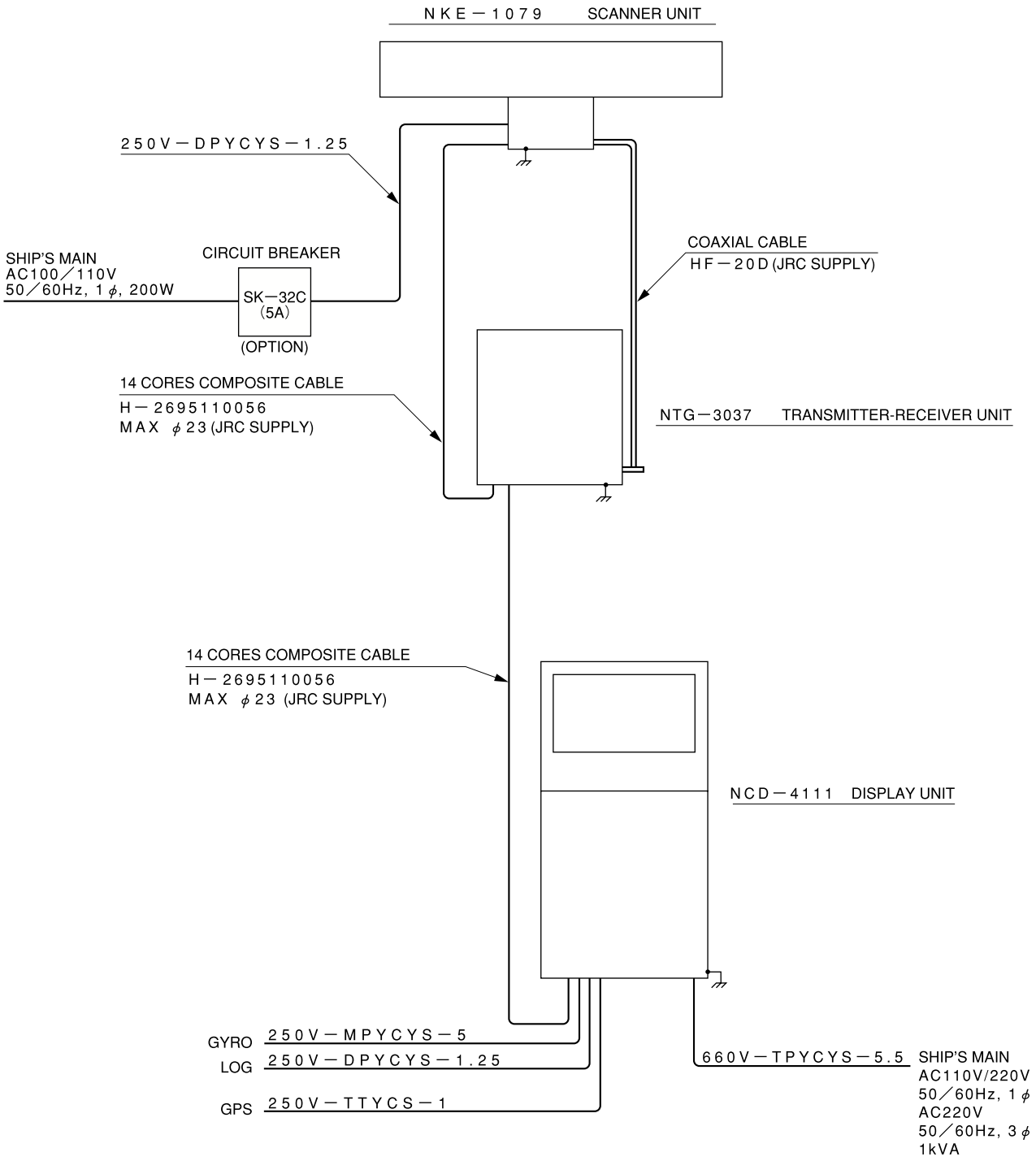


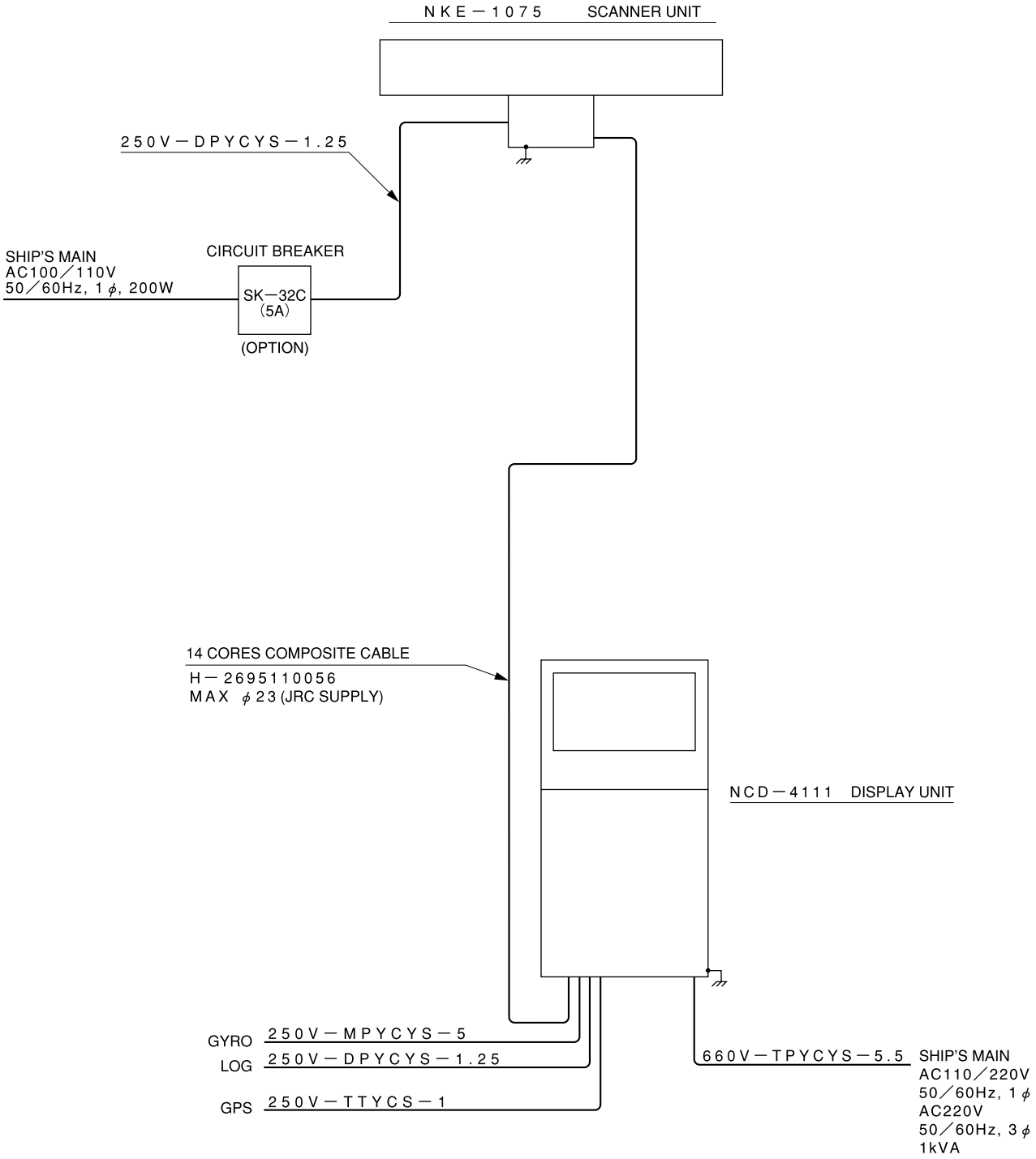
Fig.1.12 EXTERIOR DRAWING OF KEYBOARD UNIT, TYPE NCE-7292 (DESKTOP TYPE) (OPTION)

1.5 GENERAL SYSTEM DIAGRAM



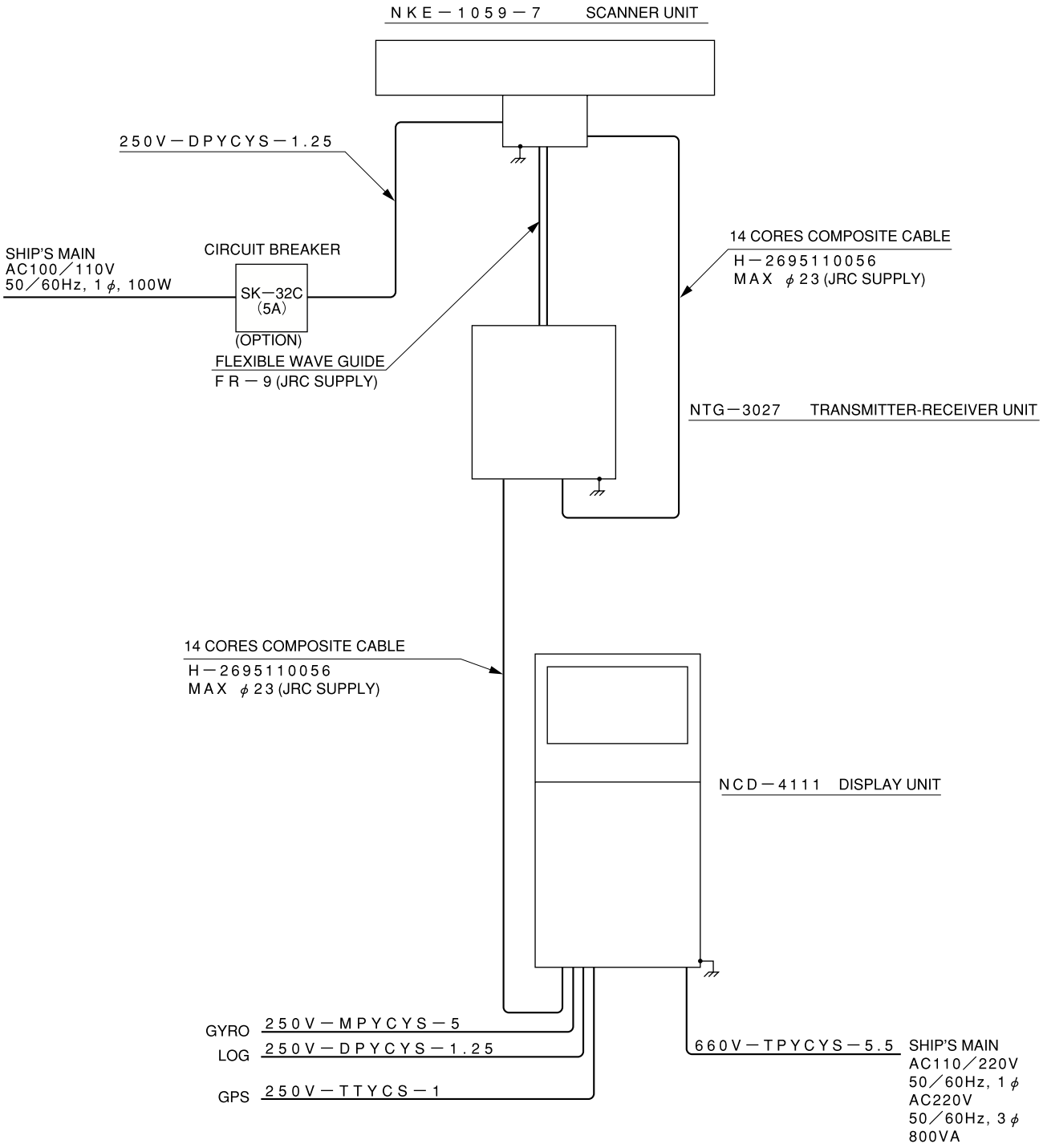
Note: Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar.
All cables of the radar are to be run away from the cables of radio equipment.
(Ex. Radiotelephone. Communications receiver and dirrection finder. etc.)
Especially inter-wiring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

Fig.1.13 GENERAL SYSTEM DIAGRAM OF RADAR, TYPE JMA-9833-SA



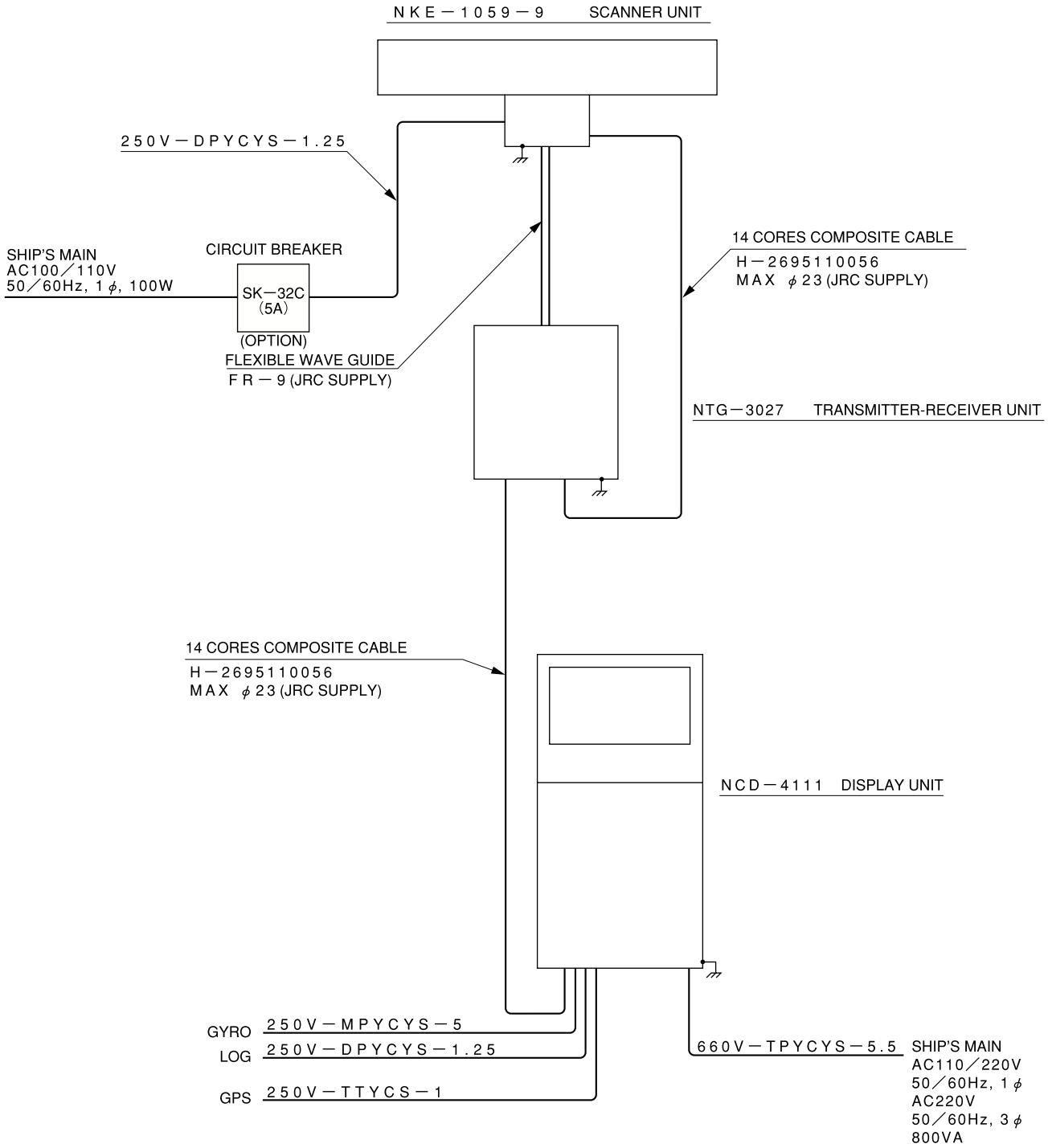
Note: Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar.
All cables of the radar are to be run away from the cables of radio equipment.
(Ex. Radiotelephone. Communications receiver and dirrection finder. etc.)
Especially inter-wiring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

Fig.1.14 GENERAL SYSTEM DIAGRAM OF RADAR, TYPE JMA-9832-SA



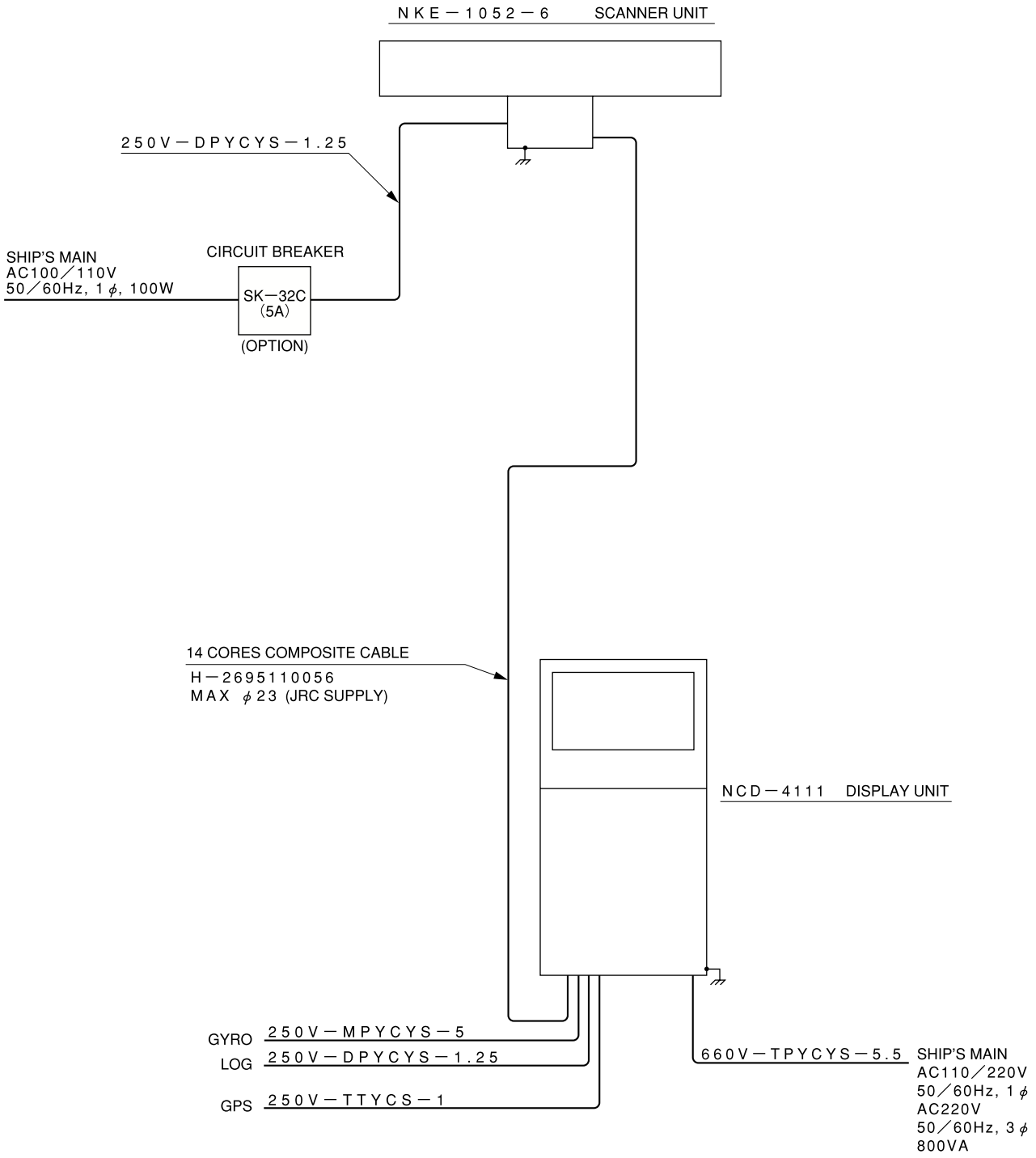
Note: Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar.
All cables of the radar are to be run away from the cables of radio equipment.
(Ex. Radiotelephone. Communications receiver and dirrection finder. etc.)
Especially inter-wiring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

Fig.1.15 GENERAL SYSTEM DIAGRAM OF RADAR, TYPE JMA-9823-7XA



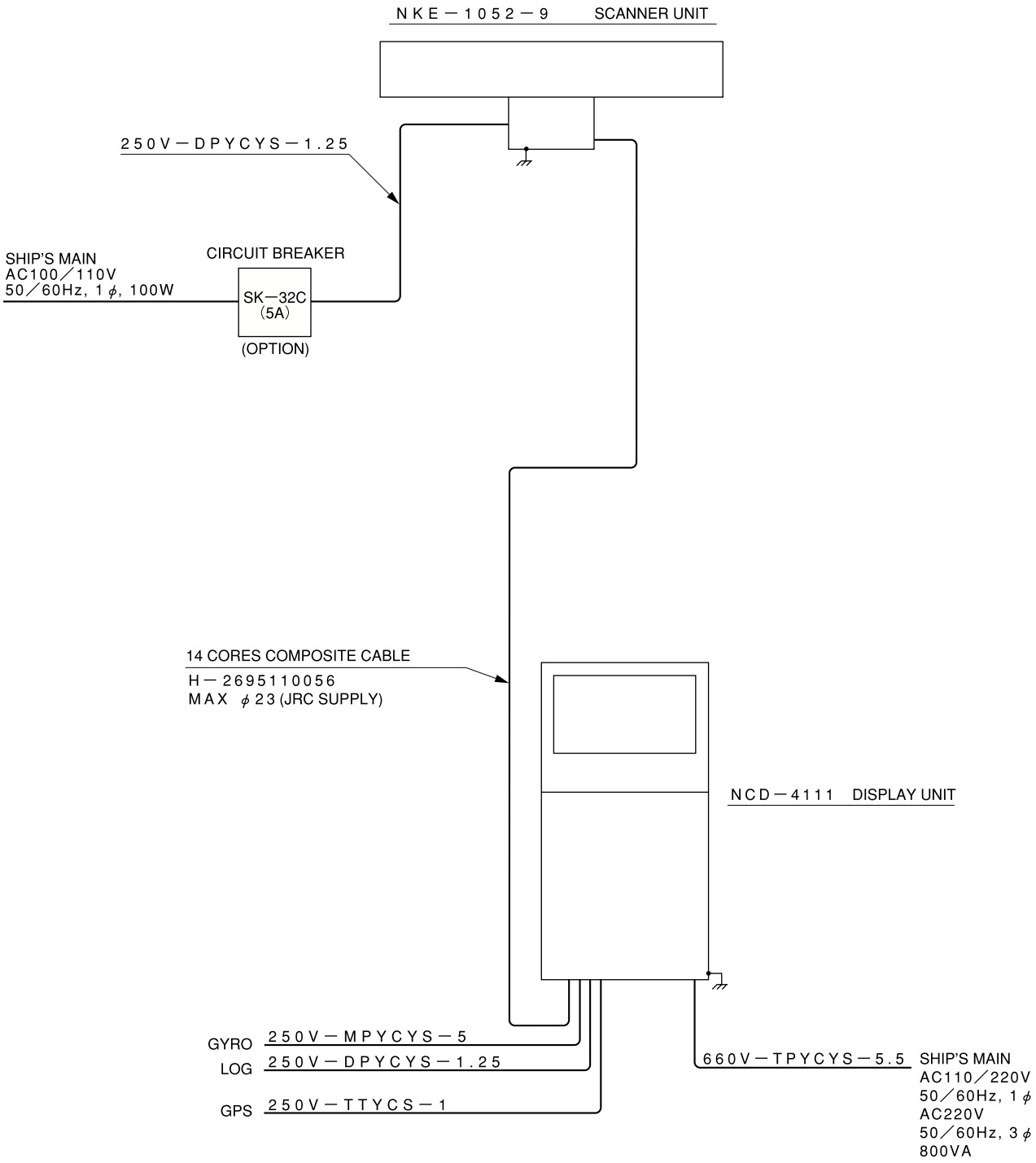
Note: Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar.
All cables of the radar are to be run away from the cables of radio equipment.
(Ex. Radiotelephone. Communications receiver and dirrection finder. etc.)
Especially inter-wiring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

Fig.1.16 GENERAL SYSTEM DIAGRAM OF RADAR, TYPE JMA-9823-9XA



Note: Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar.
All cables of the radar are to be run away from the cables of radio equipment.
(Ex. Radiotelephone. Communications receiver and dirrection 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.1.17 GENERAL SYSTEM DIAGRAM OF RADAR, TYPE JMA-9822-6XA



Note: Eliminating the interference on frequencies used for marine communications and navigation due to operation of the radar.
All cables of the radar are to be run away from the cables of radio equipment.
(Ex. Radiotelephone. Communications receiver and dirrection 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.1.18 GENERAL SYSTEM DIAGRAM OF RADAR, TYPE JMA-9822-9XA

1.6 COLLISION AVOIDANCE

……Problems of Collision Avoidance in Navigation ……

Marine collision avoidance is one of the problems that have been recognized from of old. Now, it will be described briefly who the collision avoidance is positioned among the navigational aid problems.
The navigation pattern of all mobile craft constitues 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.1.19 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.

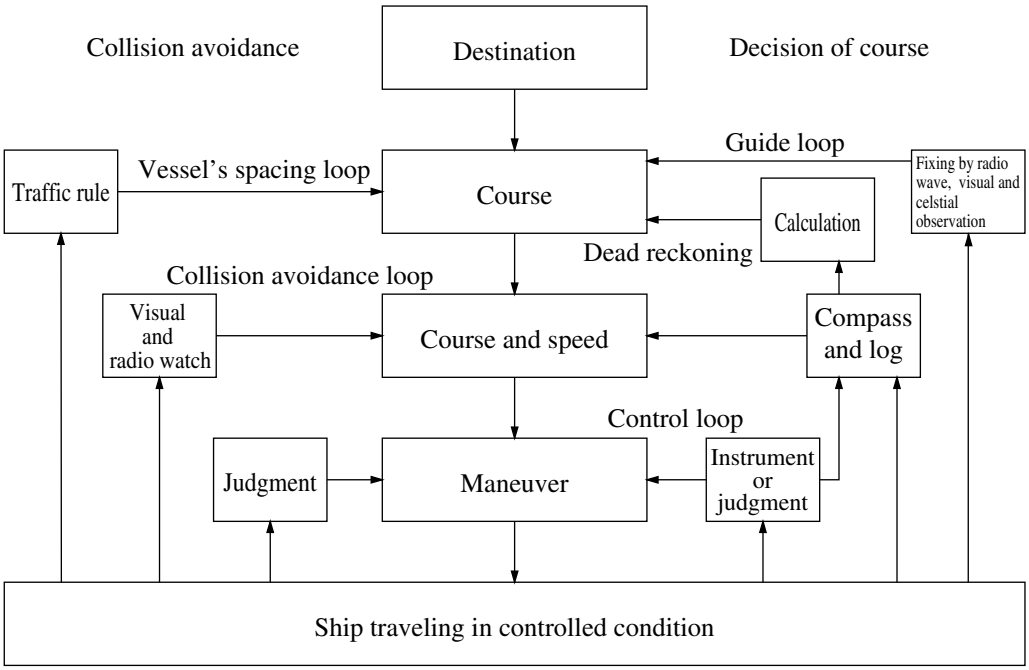


Fig.1.19 Navigation Pattern

……Marine Accidents and Collisions ……

Among marine accidents, collision accidents have been highlighted as the tonnages and speeds of ships become higher along with the increase in traffic at sea. If a tanker carrying dangerous articles such as crude oil collides with any other vessel, then not only the vessels involved with the accident but other vessels in the vicinity, port facilities, inhabitants in the coastal area as well as marine resources may also suffer immeasurable damages and troubles. Collision accidents have a high percentage of the marine accidents that have occurred in recent years. To cope with these problems, any effective measures are needed and some equipment to achieve collision avoidance requirements have been developed at rapid strides.

.....Basic Concept of Collision Avoidance .....

There are two aspects in collision avoidance: collision prediction and avoidance. Collision prediction is to predict that two or more vessels will happen to occupy the same point at the same time, while collision avoidance is to maneuver vessels not to occupy the same point at the same time.
In practical operation of vessels, a spot of collision has to be deemed to be a single point but a closed zone. This closed zone is conceptually defined as a CPA (Closest Point of Approach). In collision prediction, the time to be taken until a ship reaches the CPA is defined as a TCPA (Time to CPA). Fig.1.20 shows a diagram called “Collision Triangle”.

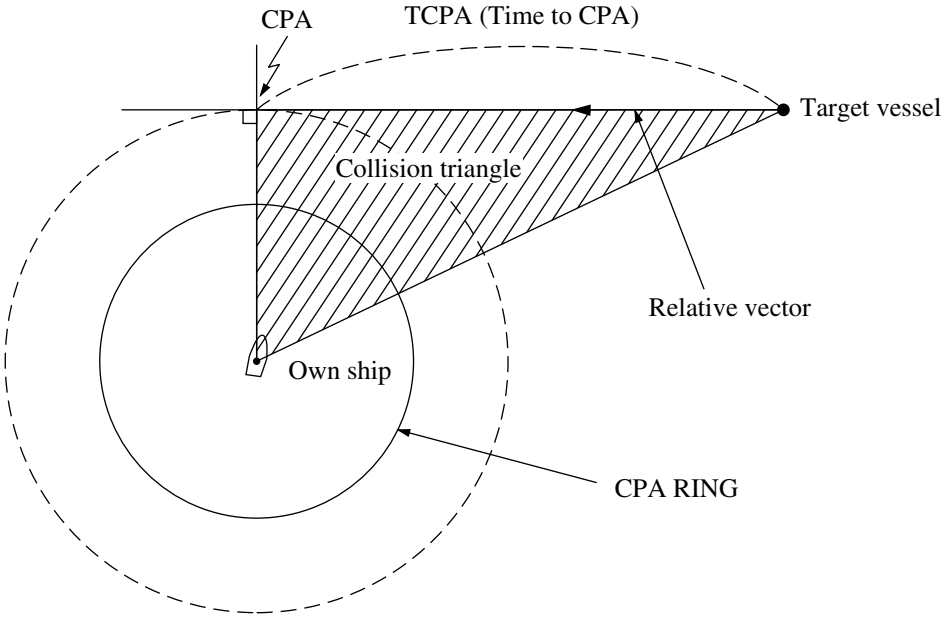


Fig.1.20 Collision Triangle

……Relative Vector and True Vector ……

From two points of view, collision prediction and avoidance, it is necessary to obtain the relative vector of other ship for prediction and the true vector of other ship for collision avoidance in order to grasp other ship's aspect. The relationship between the relative vector and true vector is shown in Fig.1.21.
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.

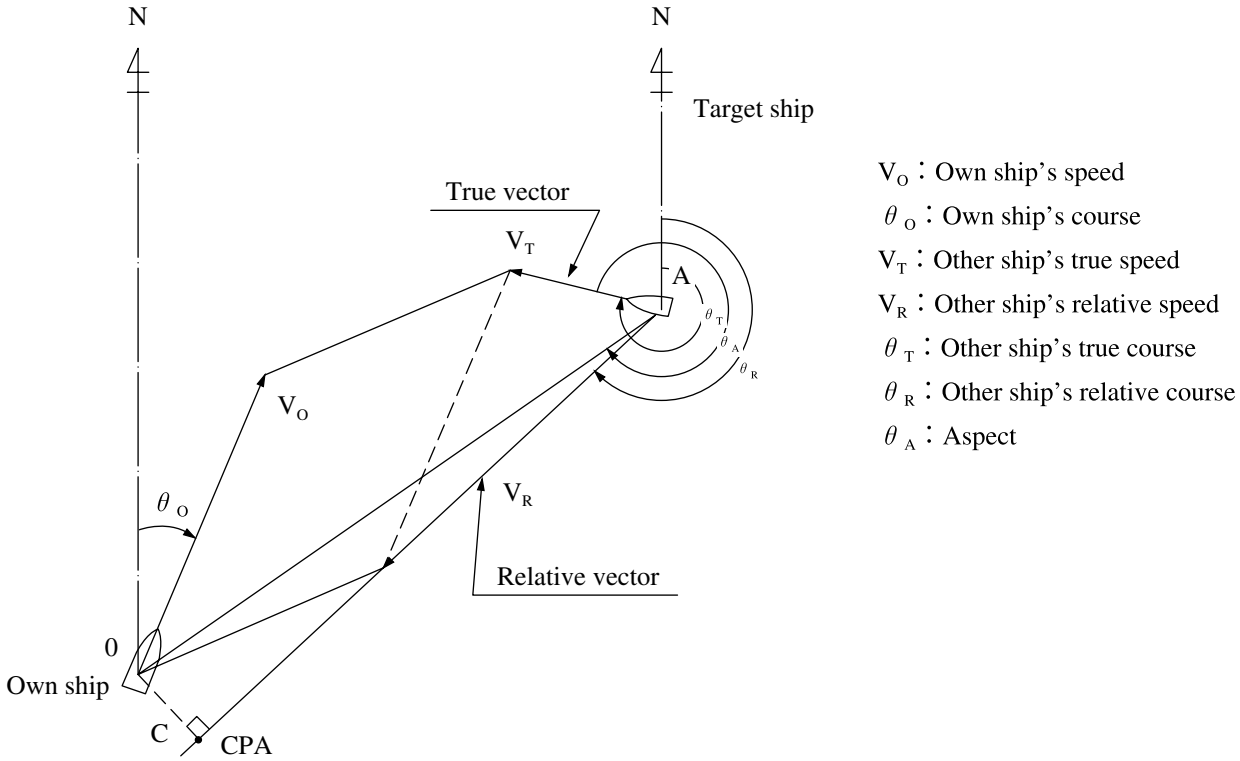


Fig.1.21 Relative Vector and True Vector

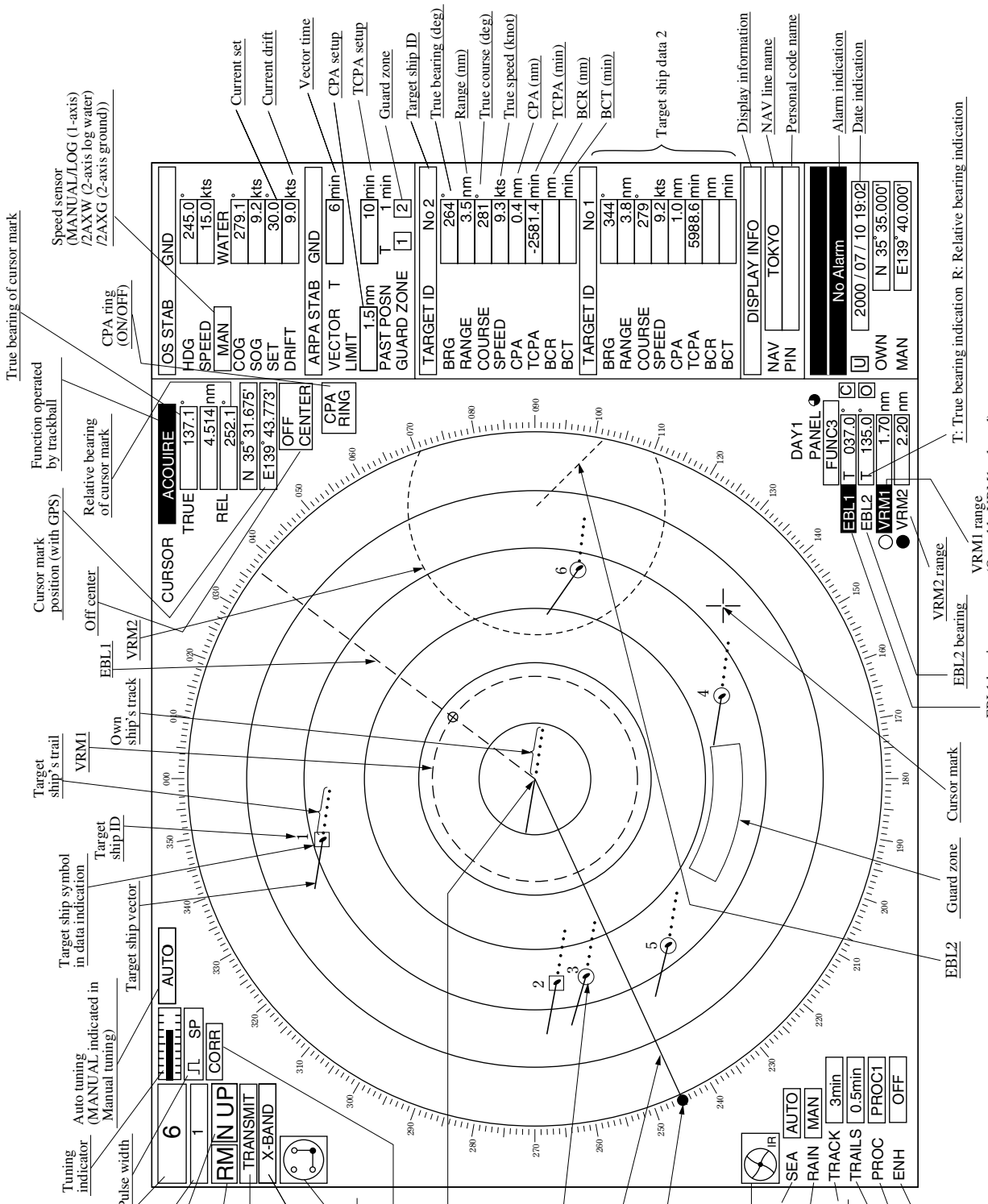
……Radar and Collision Avoidance ……

Radar is still playing an important roll for collision prevention and positioning. A plotter is used to further enhance the radar functionality. The plotter is capable of plotting other positions of other ships in 3 to 6 minute intervals to monitor their movements. 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 ships, which are manually plotted, is limited and it takes several minutes to measure those.

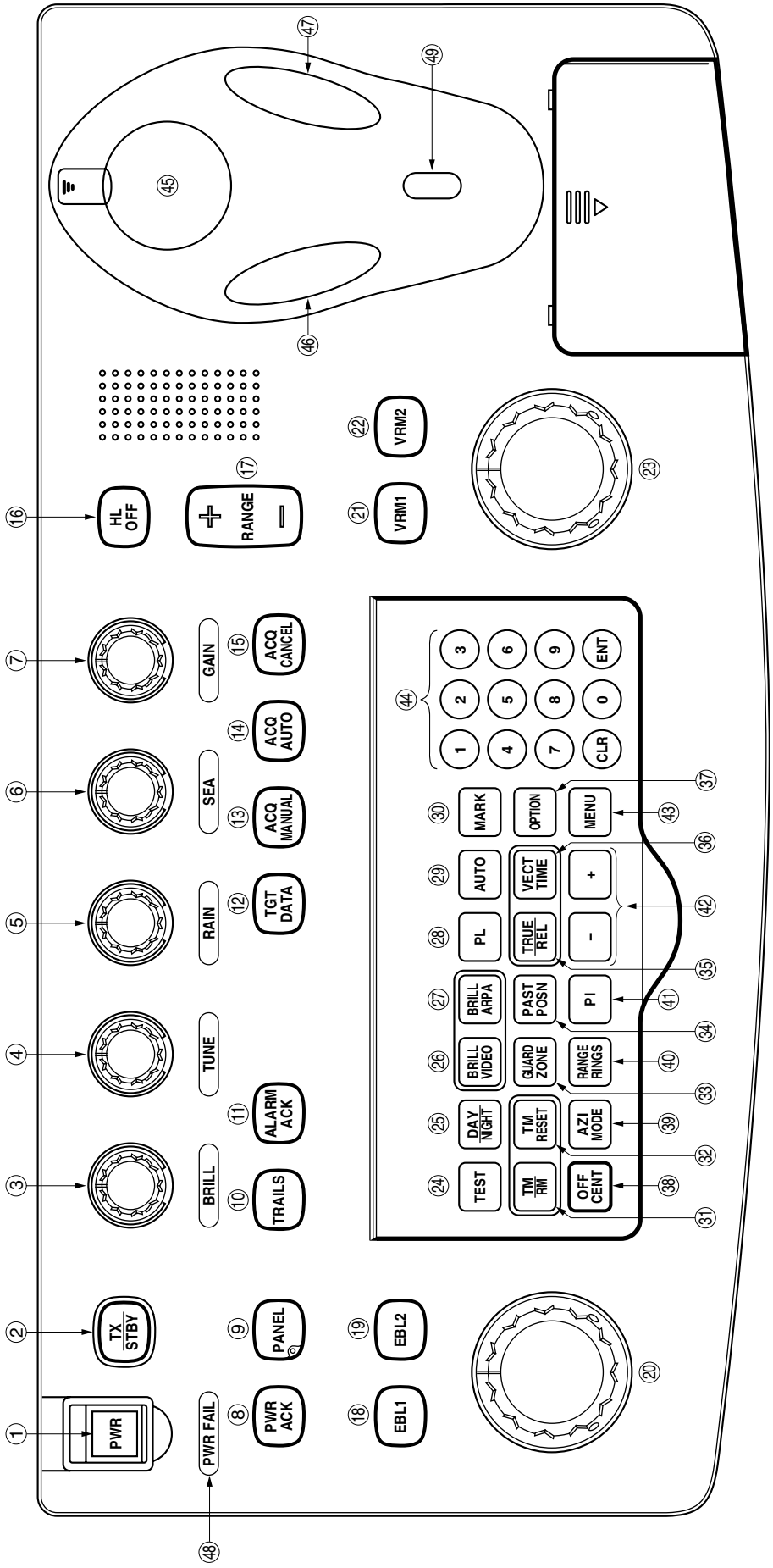
SECTION 2
NAME AND FUNCTION OF CONTROL PANEL SWITCHES AND FUNCTION OF SOFTWARE BUTTONS

2.1 NAME AND FUNCTION OF CONTROL PANEL SWITCHES

Example of Display



Name and Function of Control Panel Switches



① [PWR] (Power Supply) Switch
When this switch is set to ON, the lamp lights to start the system.

② [TX/STBY] (Operation) Switch
The 「STANDBY」 will appear at the upper left of the radar display about 3 minutes after the [PWR] switch is set to ON. Then, press this switch, and transmission will be started. Pressing the switch during transmission sets the equipment to the standby state.

③ [BRILL] (Video Brilliance) Control
Controls the brilliance of the entire display panel.

④ [TUNE] (Tuning) Control
Tunes the target signals to display the targets most clearly on the radar display.

⑤ [RAIN] (Rain/Snow Clutter Suppression) Control
Diminishes the clutter echo from rain or snow.

⑥ [SEA] (Sea Clutter Suppression) Control
Diminishes the clutter echo from the sea surface.

⑦ [GAIN] (Receiving Sensitivity) Control
Controls the radar receiving sensitivity.

⑧ [PWR ACK] (Power Alarm Acknowledgment) Switch
Acknowledges the alarm in case of power trouble.

⑨ [PANEL] (Operation Panel Brilliance) Switch
Controls the brilliance for the controls and switches on the operation panel.

⑩ [TRAILS] (Trails Display) Switch
Press the switch to display the trails of other ships.

⑪ [ALARM ACK] (Alarm Acknowledge) Switch
Press this switch to acknowledge an failure, target approach or collision alarm.

⑫ [TGT DATA] (Target Data Setup) Switch
Sets up a target under tracking to read its numeric data.

⑬ [ACQ MANUAL] (Manual Acquisition) Switch
Sets the manual target acquisition mode to ON/OFF.

⑭ [ACQ AUTO] (Automatic Acquisition) Switch
Sets the automatic target acquisition mode to ON/OFF.

⑮ [ACQ CANCEL] (Acquisition Cancel) Switch
Cancels the symbol and vector of a target under tracking and stops tracking the target.

⑯ [HL OFF] (Heading Line Off) Switch
The ship's HL (heading line) can be cancelled as long as the switch is being depressed.

⑰ [RANGE + / -] (Range Scale Select) Switch
Selects a range scale from 0.125 to 96 (or 120) nautical miles.

⑱ [EBL1] (Electric Bearing Line 1) Switch
Selects and displays EBL1.

⑲ [EBL2] (Electric Bearing Line 2) Switch
Selects and displays EBL2.

⑳ [EBL] (Electric Bearing Line) Control
Rotates the bearing of an EBL.

㉑ [VRM1] (Variable Range Marker 1) Switch
Selects and displays VRM1.

㉒ [VRM2] (Variable Range Marker 2) Switch
Selects and displays VRM2.

㉓ [VRM] (Variable Range Marker) Control
Adjusts the range of a VRM.

㉔ [TEST] (Test) Switch
Checks the operational status of the radar equipment.

㉕ [DAY/NIGHT] (Day/Night Mode Select) Switch
Switch over the color and brilliance of the display screen depending upon the preset conditions.

㉖ [BRILL VIDEO] (Radar Video Brilliance) Switch
Adjusts the radar video brilliance.

㉗ [BRILL ARPA] (ARPA Information Brilliance) Switch
Adjusts the brilliance of the ARPA information such as vectors and symbols.

㉘ [PL] (Pulse Width) Switch
Switches over the pulse width.

㉙ [AUTO] (Automatic) Switch
Selects the Automatic/manual mode for tuning, SEA and RAIN functions.

㉚ [MARK] (Mark) Switch
Presents a mark at an arbitrary position or clears the mark displayed on the display.

㉛ [TM/RM] (True Motion/Relative Motion) Switch
Switch over the presentation mode to TM/RM presentation mode.

㉜ [TM RESET] (Reset) Switch
Resets own ship's position to its initial point during operating in the TM presentation mode.

㉝ [GUARD ZONE] (Guard Zone) Switch
Sets and displays a guard zone.

㉞ [PAST POSN] (Past Position Interval) Switch
Selects a past position time interval of a target tracked by ARPA.

㉟ [TRUE/REL] (TM/RM Mode Select) Switch
Selects the ARPA vector presentation in the TM or RM mode.

㊱ [VECT TIME] (Vector Time Length) Switch
Sets up a vector time length in the range of 1 to 60 min.

㊲ [OPTION] (Option) Switch
Recalls a registered function. (Registered by service personnel among vector length max. ON/OFF, parallel index line display ON/OFF and NAV/MAP INFO menu recall.)

㊳ [OFF CENT] (Off center) Switch
Shifts own ship's position within a desired direction (within 65% of the scope's radius) from the scope's center to expand the display portion.

㊴ [AZI MODE] (Bearing Mode Select) Switch
Selects the North-up (true bearing), Head-up (relative bearing) or Course-up bearing presentation mode.

㊵ [RANGE RINGS] (Fixed Range Marker) Switch
Turn ON/OFF the display of the fixed range markers.

㊶ [PI] (Parallel Index Line) Switch
Sets and display the parallel index lines.

㊷ [- , +] Switches
Subtracts or add one from or to the numerical values every time of pressing the switch.

㊸ [MENU] (Menu) Switch
Displays a menu.

㊹ [DATA ENTRY] (Data Entry) Ten-key Pad
Enter numeric data using the ten-key ⓪ to ⑨ and set the entered data pressing the [ENT] switch. Pressing the [CLR] switch returns the set data to the previous data before the data is set.

㊺ [Trackball]
Use this trackball to move the cursor mark to an arbitrary point.

㊻ [Trackball section left button]
Sets the cursor position.

㊼ [Trackball section right button]

Clears the marks on the display in the MARK mode.

㊽ [PWR FAIL] (Power Failure) Lamp

The lamp lights in case of power failure.

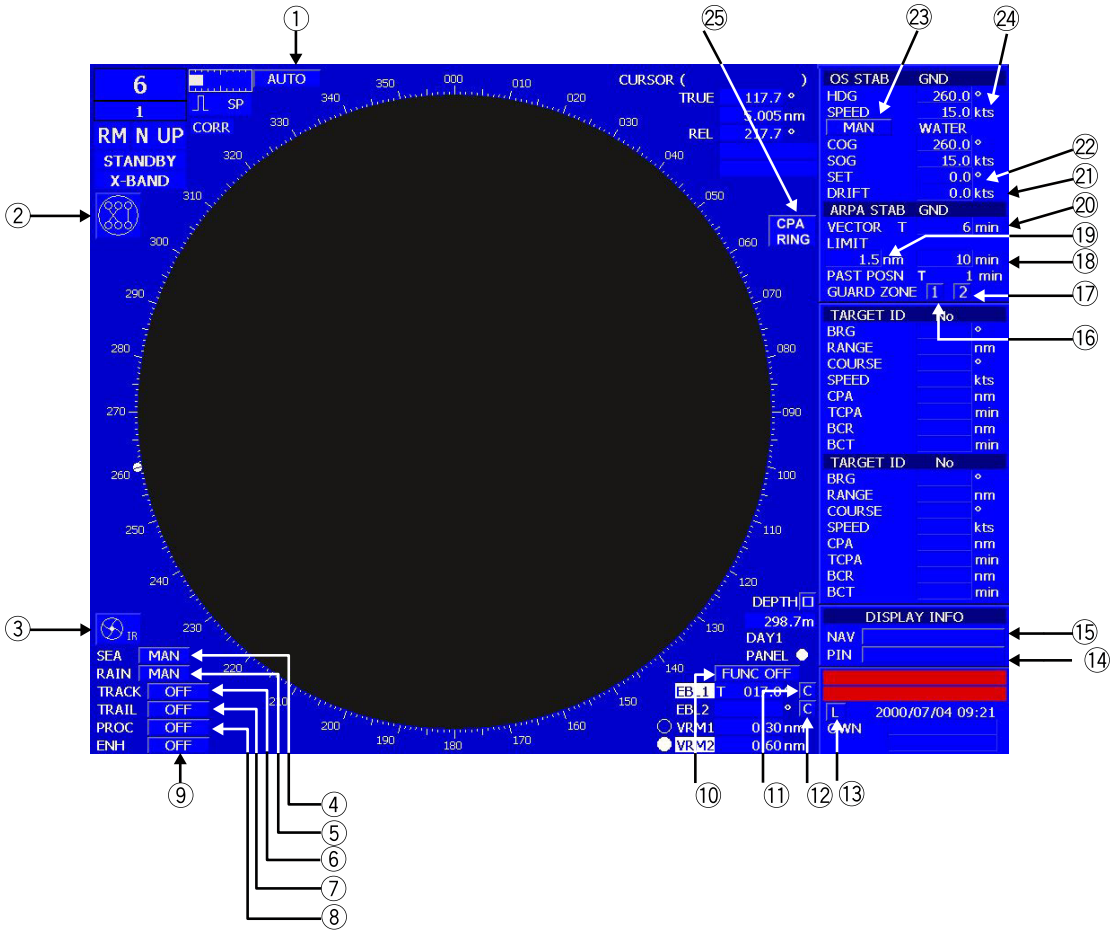
㊾ [Hand sensor]

When the sensor senses something, the trackball becomes operable.

To acquire target automatically.

2.2 FUNCTION OF SOFTWARE BUTTONS

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



By positioning the arrow cursor on the buttons located at ① to ㉕ in the above figure and then clicking the trackball section left button, the settings can be changed as follows:

①: Tuning indicator mode

Sets the tuning mode to MANUAL or AUTO.

MANUAL → AUTO

(Manual tuning) ← (Automatic tuning)

②: Change the Interswitch connection pattern

Opens the interswitch menu.

Attention:

This function is operable only when the radar is in the standby mode.

③: Function of Radar interference reflector (IR)

Turns the radar interference reflector ON or OFF.

→

(radar interference reflector OFF) ← (radar interference reflector ON)

④: Function of Sea clutter suppression (SEA)

Sets the sea clutter suppression to MANUAL or AUTO.

MAN → AUTO

(Manual sea clutter suppression) ← (Automatic sea clutter suppression)

⑤: Function of Rain/snow clutter suppression (RAIN)

Sets the rain/snow clutter suppression to MANUAL or AUTO.

MAN → AUTO

(Manual rain/snow clutter suppression) ← (Automatic rain/snow clutter suppression)

⑥: Function of Own ship's track indication (TRACK)

Turns the own ship's track indication ON or OFF.

OFF → "Interval Time preset in the TRACK menu"

(No own ship's track indication) ← (One memory interval of 3, 10, 15 or 30 minutes displayed)

Attention:

This function is available only when the latitude and longitude data and the course data are received.

⑦: Function of Radar video track indication (TRAILS)

Sets the interval time for radar video track indication.

⑧: Function of Radar video processing (PROC)

Sets the radar video processing mode.

⑨: Function of Radar video enhance (ENH)

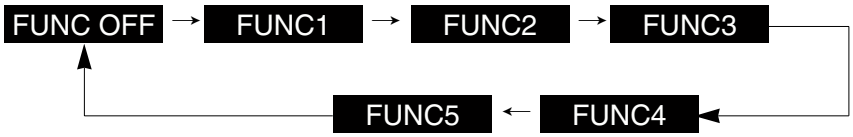
Turns the radar video enhance ON or OFF.

OFF → ON

(Radar video enhance OFF) ← (Radar video enhance ON)

⑩: Function of Processing setting

Sets the processing setting mode.



⑪: Starting point mode of EBL1

Determines whether the EBL1 starting point is placed at the center of the own ship or at any position on the radar display.

C → O

(CENTER: The EBL1 starting point is placed at the center of the own ship.) ← (OFFSET: After the EBL1 starting point is moved, the starting point is pasted on the display.)

or

C → O

(CENTER: The EBL1 starting point is placed at the center of the own ship.) ← (L ··· L/L FIX: After the EBL1 starting point is moved, the latitude and longitude at the starting point are fixed.)

Attention:

When the EBL1 starting point is moved, whether the display is O or L depends on the setting in the EBL OFFSET ORIGIN Menu.

⑫: Starting point mode of EBL2

Determines whether the EBL2 starting point is placed at the center of the own ship or at any position on the radar display.

C → O

(CENTER: The EBL2 starting point is placed at the center of the own ship.) ← (OFFSET: After the EBL2 starting point is moved, the starting point is pasted on the display.)

or

C → O

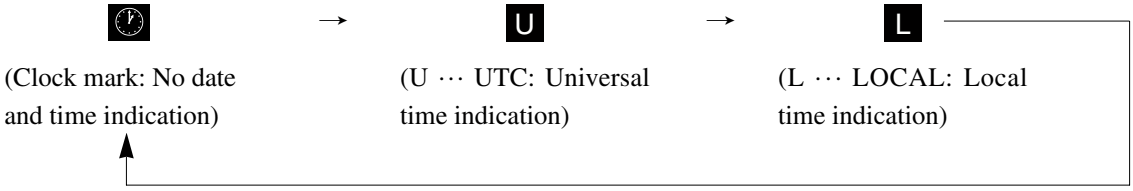
(CENTER: The EBL2 starting point is placed at the center of the own ship.) ← (L ··· L/L FIX: After the EBL2 starting point is moved, the latitude and longitude at the starting point are fixed.)

Attention:

When the EBL2 starting point is moved, whether the display is O or L depends on the setting in the EBL OFFSET ORIGIN Menu.

⑬: Date and time indication mode

Sets the mode of date and time indicated on the radar display.



Attention:

The LOCAL TIME, LOCAL DATE and GMT + / - (difference between the local time and the universal time) must be correctly set in order to indicate the time accurately.

⑭: Function of Personal code name (PIN)

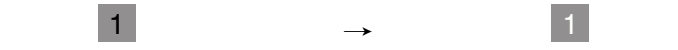
Opens a list of personal code files in the PIN Menu.

⑮: Function of Navigation information readout (NAV)

Opens a list of navigation information files stored in the MAV/MAP INFO Menu.

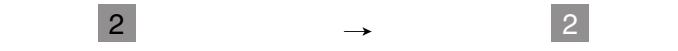
⑯: Function of Guard zone 1 ON/OFF

Turns the guard zone 1 function ON or OFF.



⑰: Function of Guard zone 2 ON/OFF

Turns the guard zone 2 function ON or OFF.



⑱: TCPA setting

Position the arrow cursor on the value area and click the trackball section left button, then the ten-key pad can be used to enter a value. After entering the value, press the ENT to set the TCPA.

⑲: CPA setting

Position the arrow cursor on the value area and click the trackball section left button, then the ten-key pad can be used to enter a value. After entering the value, press the ENT to set the CPA.

⑳: Vector length setting

Position the arrow cursor on the value area and click the trackball section left button, then the ten-key pad can be used to enter a value. After entering the value, press the ENT to set the vector length.

㉑: DRIFT setting

Position the arrow cursor on the value area and click the trackball section left button, then the ten-key pad can be used to enter a value. After entering the value, press the ENT to set the DRIFT.

Attention:

This function is available only when CORRECTION in the SET/DRIFT Menu is ON.
Also, CORRECTION can be turned ON only when the speed unit is set to MANUAL or LOG (1-AXIS).

㉒: SET setting

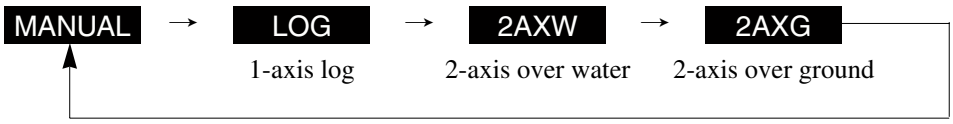
Position the arrow cursor on the value area and click the trackball section left button, then the ten-key pad can be used to enter a value. After entering the value, press the ENT to set the SET.

Attention:

This function is available only when CORRECTION in the SET/DRIFT Menu is ON.
Also, CORRECTION can be turned ON only when the speed unit is set to MANUAL or LOG (1-AXIS).

㉓: Speed unit setting

Setting the speed unit.



Attention:

An alarm is activated if the selected speed unit is not connected to the radar.

㉔: Manual input of own ship's speed

Position the arrow cursor on the value area and click the trackball section left button, then the ten-key pad can be used to enter a value. After entering the value, press the ENT to set the own ship's speed.

Attention:

The own ship's speed can be manually entered only when MANUAL is selected for the speed unit setting (㉓).

㉕: CPA RING indication ON/OFF

Turns the CPA RING indication ON or OFF.

CPA RING → CPA RING

(CPA RING indication OFF) ← (CPA RING indication ON)

Attention:

CPA RING cannot be turned ON when the vector mode is TRUE.

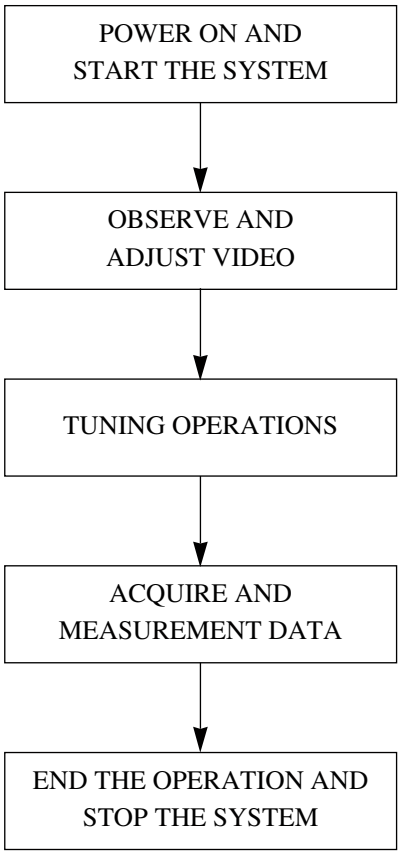
SECTION 3
BASIC OPERATION

3.1 FLOW OF OPERATION

Attention

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

The flow of basic operations is shown below.



Each operation will be described in detail below.

.....Power ON and Start the System .....

Attention

- When the radar power is turned on, the message "DiskOnChip Error" may be displayed. Note that if [Yes] is selected in this case, the settings for the radar will be initialized. [No] should be always selected.

  Example 1

  DiskOnChip Error

  The directory entry for 'bkset2.dat' specifies an incorrect file size.
  Do you want this problem automatically repaired now?

  [Yes] [No] [Cancel]

- If the installed indicator is used in an ambient condition of 0º or less, the power to the radar should be turned on more than 60 minutes after the power in the ship is turned on.

- Wait approximately 6 seconds before turning on the power again.

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

- Immediately after the radar is installed, if the system is not used for a long time, or after the magnetron is replaced, warm-up the equipment in the standby mode for 20 to 30 minutes before setting it to the transmit mode.

- If the warm-up time is short, the magnetron may cause 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, reset the system to the standby mode immediately and maintain it in the standby mode for 5 to 10 minutes before restart the operation. Repeat these steps until the operation is stabilized.

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

2 Press [PWR] .

Green lamp on → [PWR]

The warm-up time will appear.

3 Press [TX/STBY] .

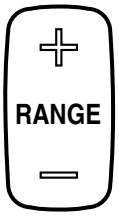
The radar starts transmission and the scanner starts rotating.
The ⌈ STANDBY ⌋ changes to ⌈ TRANSMIT ⌋ on the display.
Even if the [TX/STBY] switch is pressed before ⌈ STANDBY ⌋ is displayed, the radar does not start transmission.

The way of operation to cancel preheat time at the emergency.

Push and hold [MENU] key for about 10 seconds, and push the (9) , (8) , (0) , (0) , (ENT) keys, the preheat time is canceled and become to ST-BY.

But there is a possibility that the degradation of the magnetron, use only in emergency.

.....Observe and Adjust Video .....

Procedures **1 Press** 

to set the range to the scale required for target observation.

2 Rotate  **and**  **.**

GAIN BRILL

Adjust to obtain the clearest targets.

Attention

- In the AUTO SEA mode, there are cases in which the targets are not displayed because the sea clutter returns are suppressed in a simple way.
  Use the manual [SEA] control during sailing under normal conditions.
- In the AUTO RAIN mode, there are cases in which the targets are not displayed because the rain/snow clutter returns are suppressed in a simple way.
  Use the manual [RAIN] control during sailing under normal conditions.
- It is not to use the AUTO SEA and AUTO RAIN mode at the same time. If one is set to AUTO mode, the other will be set to MANUAL mode.

In case of Using AUTO SEA:

Procedures **1 Press** **AUTO** **.**

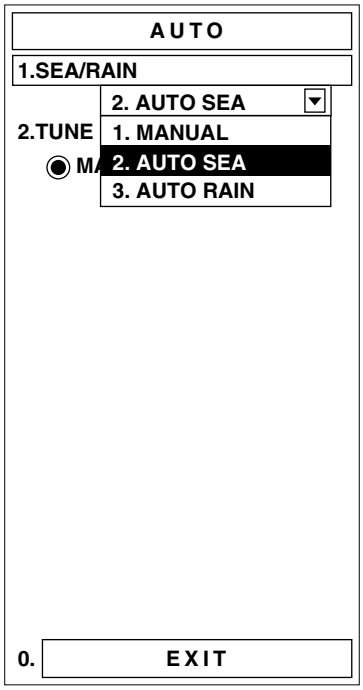
The AUTO Menu will appear.

2 Press **1** **.**

1.SEA/RAIN will be selected and the pull-down menu will appear.

3 Press **2** **.**

2.AUTO SEA will be set and "SEA AUTO" will appear at the lower left of the radar display.



Note: When setting AUTO SEA, the AUTO RAIN is set to the MANUAL mode.
Both AUTO SEA and AUTO RAIN cannot be set at the same time.

Cancellation **1 Repeat the procedures up to step 2 in case of using AUTO SEA.**

2 Press (1) **.**

[1. MANUAL] will be set and "SEA [AUTO]" at the lower left of the radar display will change to "SEA [MAN]" and AUTO SEA mode will be cancelled.

In case of Using AUTO RAIN:

Procedures **1 Press** [AUTO] **.**

The AUTO Menu will appear.

2 Press (1) **.**

[1.SEA/RAIN] will be selected and the pull-down menu will appear.

3 Press (3) **.**

[3. AUTO RAIN] will be set and "RAIN [AUTO]" will appear at the lower left of the radar display.

Note: When setting AUTO RAIN, the AUTO SEA is set to the MANUAL mode.
Both AUTO RAIN and AUTO SEA cannot be set at the same time.

Cancellation **1 Repeat the procedures up to step 2 in case of using AUTO RAIN.**

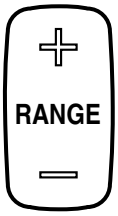
2 Press (1) **.**

[1. MANUAL] will be set and "RAIN [AUTO]" at the lower left of the radar display will change to "RAIN [MAN]" and AUTO RAIN mode will be cancelled.

.....Tuning Operations .....

Attention

● When the receiver is detuned, the best video may not be obtained even if the maximum bar-graph is displayed on the AUTO TUNE tuning indicator. In this case, adjust the [TUNE] control manually so that the best video is presented.

Procedures **1 Press** 

and select any range scale from 0.125 to 96 (or 120) NM. (The current range scale is displayed at the upper left of the radar display.)

The range scale becomes shorter by pressing  and longer by pressing  .

2 Rotate  **.**

TUNE

Adjust the video to present the clearest targets.
If there is no adequate target, adjust [TUNE] control to indicate the maximum bar-graph on the tuning indicator at the upper left of the radar display.

In case of Using AUTO TUNE:

Procedures **1 Press** 

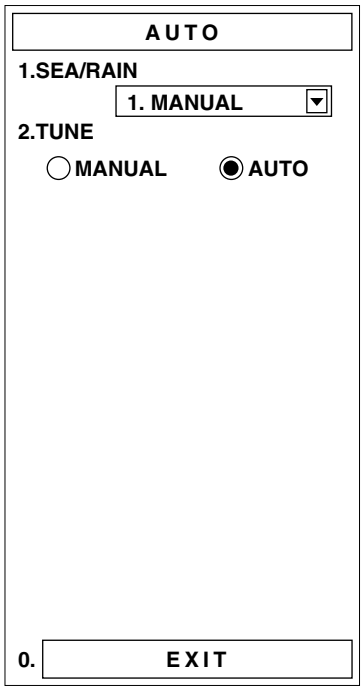
.

The AUTO Menu will appear.

2 Press 

.

"AUTO" in "2.TUNE" will be set and "AUTO" will appear at the upper left of the radar display.



Cancellation **1 Repeat the procedures up to step 2 in case of using AUTO TUNE.**

2 Press 

.

"MANUAL" in "2.TUNE" will be set and "AUTO" at the upper left of the radar display will change to "MANUAL" and AUTO TUNE mode will be cancelled.

……Acquire and Measurement Data ……

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

……End the Operation and Stop the System ……

Exit

1 Press TX/STBY.

The radar transmission will end and the scanner will stop rotating.
The indication ⌜TRANSMIT⌟ will be changed into ⌜STANDBY⌟.

(Maintain the [STANDBY] mode if radar observation is restarted in a relatively short time. Only pressing [TX/STBY] switch will restart observation.)

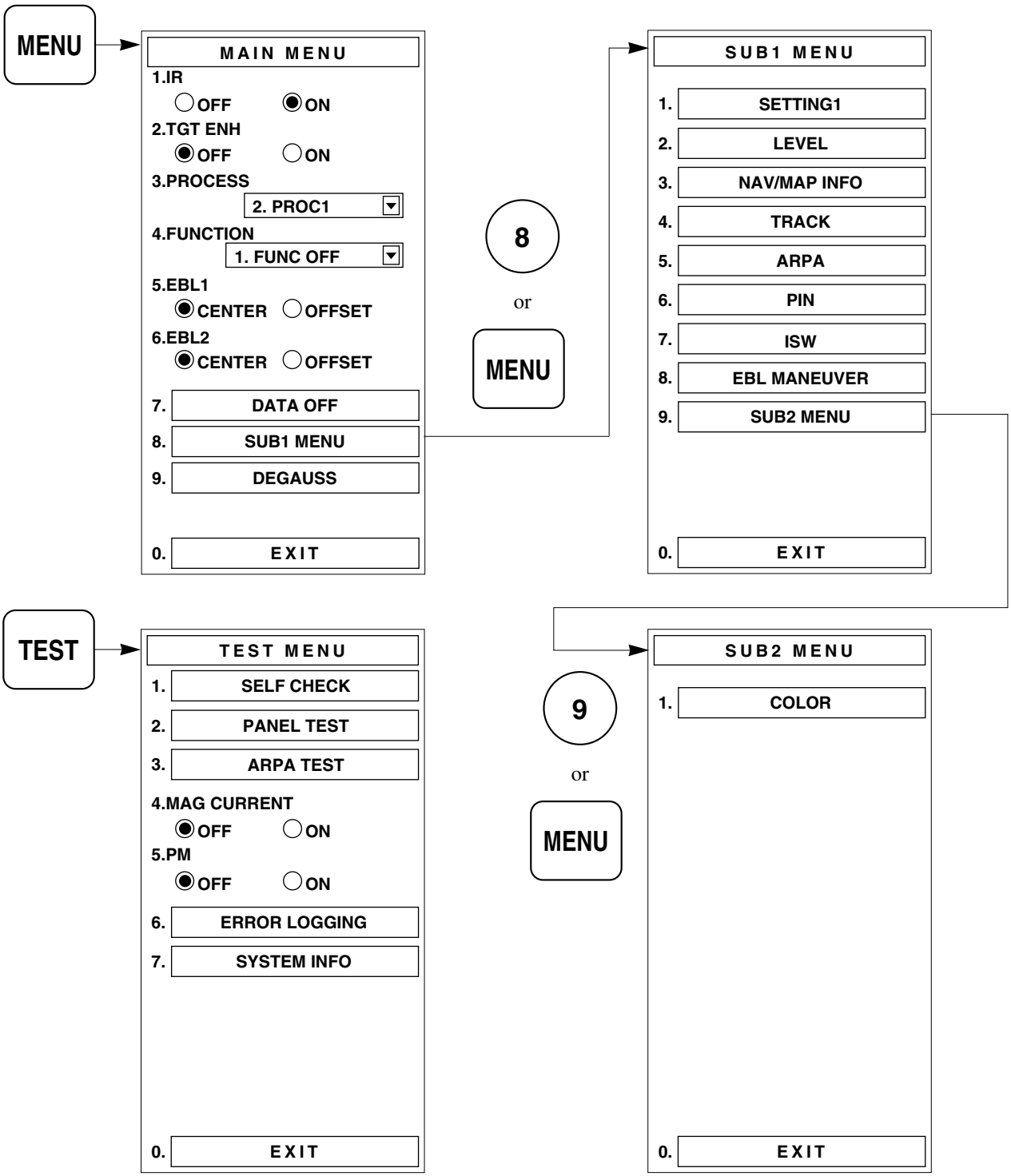
2 Press PWR.

The power will be turned off.

Green lamp off → PWR

3.2 MENU COMPOSITION

The Menu system of this radar equipment consists of the Main menu, Sub1 menu, Sub2 menu and Test menu.



The Main menu consists of the items of signal processing functions and EBL control., and other functions are included in the Sub1 menu. The video color setting is included in the Sub2 menu.
The Test menu consists of the items of input monitoring and Self-diagnostic functions.

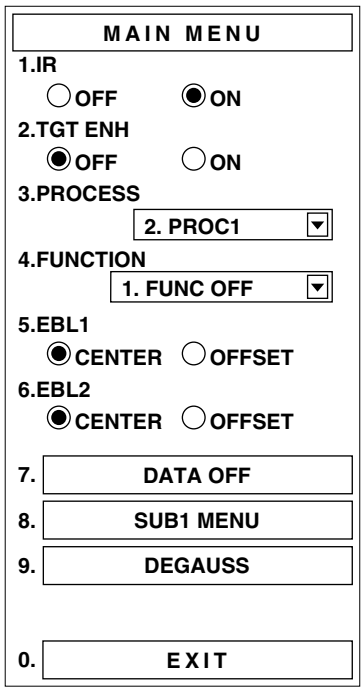
A. Main Menu

1 Displaying the Main menu

Press MENU.

2 Ending the Main menu

Press 0 (EXIT).



B. Sub1 Menu

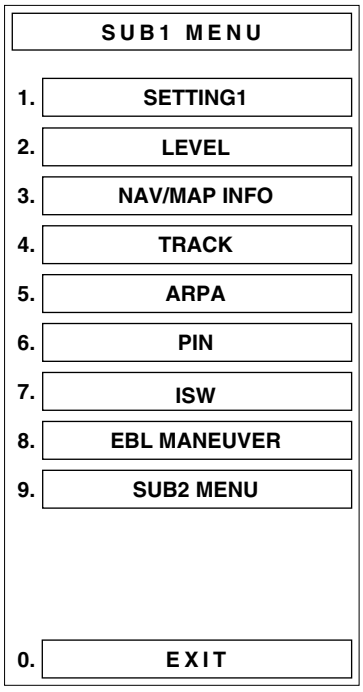
1 Displaying the Sub1 menu

Press MENU, then 8

or press MENU, then MENU.

2 Ending the Sub1 menu

Press 0 (EXIT).



C. Sub2 Menu

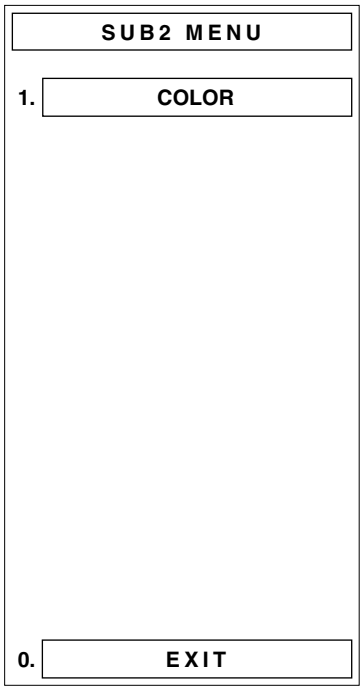
1 Displaying the Sub2 menu

Press MENU **, then** 8 **and** 9

or press MENU **, then** MENU **and** MENU **.**

2 Ending the Sub2 menu

Press 0 **(EXIT) or** MENU **.**



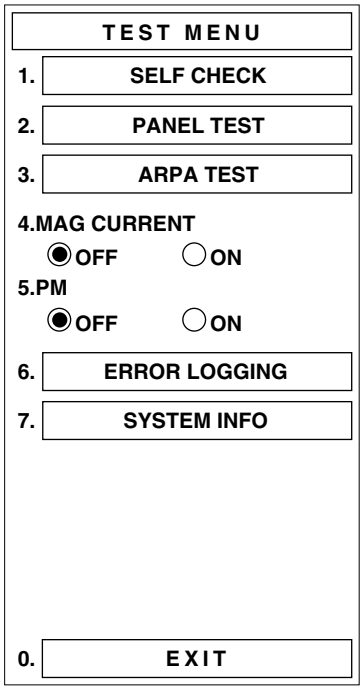
D. Test Menu

1 Displaying the Test menu

Press TEST **.**

2 Ending the Test menu

Press 0 **(EXIT) or** TEST **.**



3.3 PREPARATION

.....Tuning【TUNE】.....

TUNE

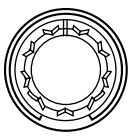
This control is used to tune the receiver.
If the receiver is detuned from the best level, the receiving sensitivity falls, and the targets on a long range or the small targets on a short range may be overlooked.
In manual tuning, rotate the [TUNE] control clockwise or counterclockwise and adjust so that the target echoes are the clearest. If no suitable target is present, adjust the control so that the tuning indication bar-graph at the upper left of the radar display is maximized.
After setting the radar to the TRANSMIT mode, it takes about 10 minutes until the oscillation frequency of the magnetron is stabilized. Therefore, tune the receiver once again after about 10 minutes.
For automatic tuning, setting "2.TUNE" to "AUTO" in the AUTO Menu. (Refer to page 3 - 5)

.....Sensitivity Control【GAIN】.....

GAIN

This control is used to control the radar receiving sensitivity.
Clockwise rotation of the [GAIN] control increases receiving sensitivity and extends the radar observation range. If the sensitivity is too high, the receiver noise will increase to reduce the contrast of the targets with the background video and make the targets obscure on the display. To observe densely crowded targets or the targets on a short range, rotate the [GAIN] control counterclockwise to reduce the sensitivity so that the targets are easy to observe. Be careful not to overlook small and important targets.

.....Display Brilliance Control【BRILL】.....



BRILL

This control is used to adjust the brilliance of the entire display.
Clockwise rotation of the [BRILL] control increases the brilliance of the entire display. Adjust the [BRILL] control to obtain the best-to-see display with optimum brilliance.

.....Contrast Control【BRILL VIDEO】.....

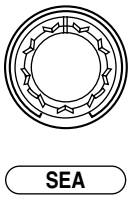
The contrast of the radar video display can be adjusted in four levels. Each time the [BRILL VIDEO] switch is pressed, the contrast will change the mode in the following order: ◔ → ◑ → ◕ → ● . The current mode is indicated at the lower right of the radar display. (The VIDEO indication will change to the PANEL indication in several second.) Adjust the [BRILL VIDEO] switch to obtain the best-to-see video with optimum contrast.

Attention

- In the AUTO SEA mode, there are cases in which the targets are not displayed because the sea clutter returns are suppressed in a simple way.
  Use the manual [SEA] control during sailing under normal conditions.

- In the AUTO RAIN mode, there are cases in which the targets are not displayed because the rain/snow clutter returns are suppressed in a simple way.
  Use the manual [RAIN] control during sailing under normal conditions.

.....Sea Clutter Suppression【SEA】.....



This control is used to reduce the receiving sensitivity on a short range to suppress the sea clutter returns.
Clockwise rotation of the [SEA] control can suppress sea clutter returns more effectively. Be careful not to suppress sea clutter excessively. Otherwise, small buoys and boats may disappear from the radar display.
When setting 1.SEA/RAIN to 2. AUTO SEA in the AUTO Menu, sea clutter returns can be suppressed depending on their intensity levels. This setting is used for the case that the sea clutter returns are different in their directions.
When setting 1.SEA/RAIN to 1. MANUAL in the AUTO Menu, the mode is changed into the MANUAL mode. (Refer to page 3 - 3)

Note: It is impossible to use both the AUTO SEA mode and the AUTO RAIN mode at the same time.

……Rain/Snow Clutter Suppression【RAIN】……

RAIN

This control is used to suppress rain or snow clutter returns. Clockwise rotation of the [RAIN] control makes the targets clearer that may be hidden among rain/snow clutter returns. Be careful not to overlook small targets in the clutter. This control also has the effect of reducing sea clutter, so that it is more effective to use this control together with the [SEA] control.
Rotate the control counterclockwise to the maximum in the normal condition.
When setting 1.SEA/RAIN to 3. AUTO RAIN in the AUTO Menu, rain/snow clutter can be suppressed depending upon the intensity level. When setting 1.SEA/RAIN to 1. MANUAL in the AUTO Menu, the mode is changed into the MANUAL mode.
(Refer to page 3 - 4)

AUTO

Note: It is impossible to use both the AUTO RAIN mode and the AUTO SEA mode at the same time.

……Brilliance Control ……

Press each of the following switches:

The BRILLIANCE switches [PANEL], [BRILL VIDEO] and [BRILL ARPA] are used to adjust the brilliance of the panel, video and ARPA markers. Each time a switch is pressed, the brilliance is increased by one level up to 4 or 5 levels. When the maximum level is reached, the brilliance is reset to the original level.

【PANEL】 – Adjusts the lighting for the characters on the controls and switches on the operation panel.
【BRILL VIDEO】 – Adjusts the brilliance of radar display.
【BRILL ARPA】 – Adjusts the brilliance of ARPA information.

Brilliance Control by Menu Operation

【RANGE RINGS】 – Adjusts the brilliance of range rings.
【VRM】 – Adjusts the brilliance of variable range markers (VRM1 and VRM2).
【EBL】 – Adjusts the brilliance of electronic bearing lines (EBL1 and EBL2).
【CHARACTER】 – Adjusts the brilliance of characters.
【BUZZER】 – Adjusts the volume of the buzzer.

Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 8 .

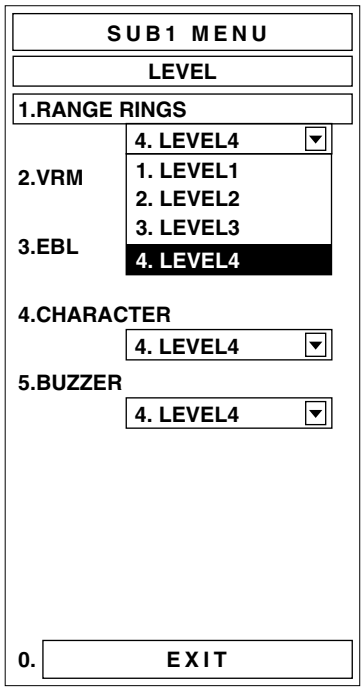
The Sub1 Menu will appear.

3 Press 2 .

The LEVEL Menu will appear.

4 Press 1 .

1.RANGE RINGS will be selected and the following pull-down menu will appear.

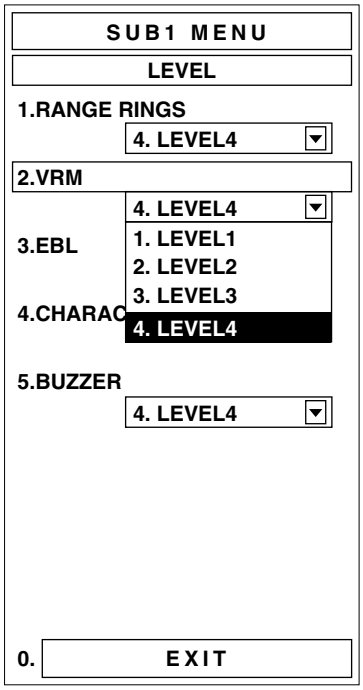


5 Select any level from 1 to 4 for RANGE RINGS brilliance in the pull-down menu and press it.

The default value is set to 4. LEVEL4 .

6 Press 2 .

2.VRM will be selected and the following pull-down menu will appear.

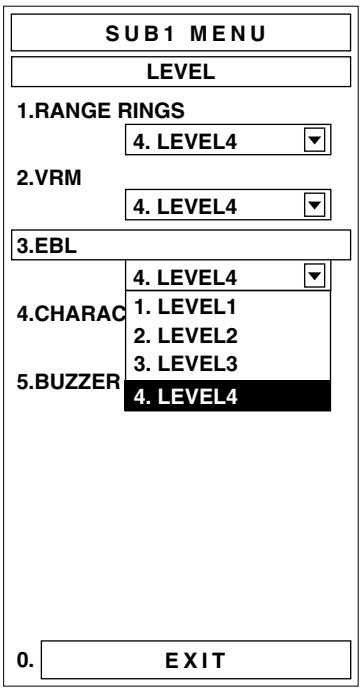


7 Select any level from 1 to 4 for VRM (VRM1 and VRM2) brilliance in the pull-down menu and press it.

The default value is set to 4. LEVEL4 .

8 Press 3 .

3.EBL will be selected and the following pull-down memu will appear.

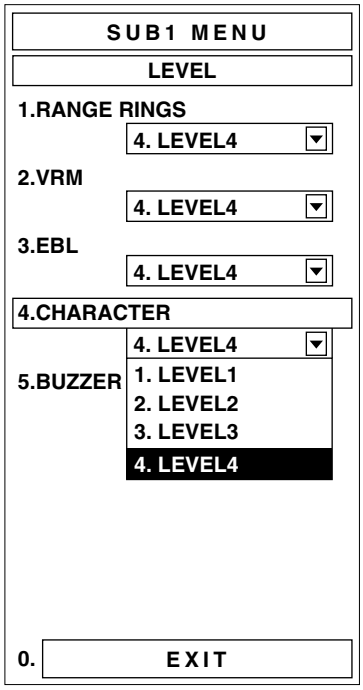


9 Select any level from 1 to 4 for EBL (EBL1 and EBL2) brilliance in the pull-down menu and press it.

The default value is set to 4. LEVEL4.

10 Press (4) **.**

4.CHARACTER will be selected and the following pull-down menu will appear.

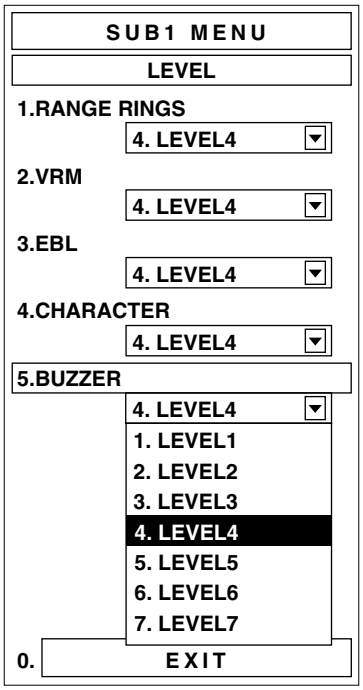


11 Select any level from (1) **to** (4) **for CHARACTER brilliance in the pull-down menu and press it.**

The default value is set to 4. LEVEL4.

12 Press 5 .

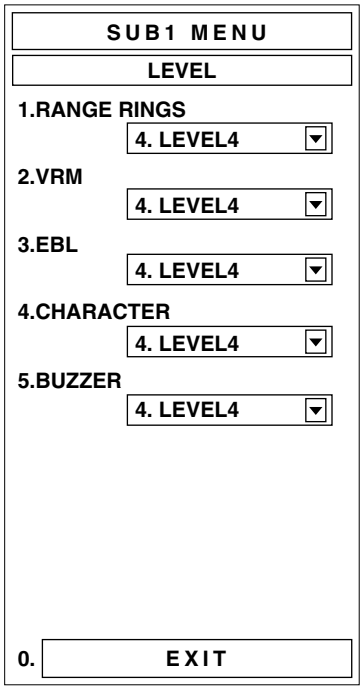
5.BUZZER will be selected and the following pull-down menu will appear.



13 Select any level from 1 to 7 for BUZZER volume level in the pull-down menu and press it.

The default value is set to 4. LEVEL4.

After the brilliance levels are adjusted, the following menu will appear.



The menu display after adjustment shows the level values set for the indiviual brilliance items.

Note: Changing the "LEVEL" of the buzzer will cause the levels of all the alarms to be changed as well as the key touch sound.
The level of any alarm cannot be set to 0 as well as the key touch sound.

Exit

1 Press (0) .

The Sub1 Menu will reappear.

2 Press (0) .

The Sub1 Menu will be closed.

These set brilliance levels are saved depending upon the Day/Night mode.

……Day/Night Mode Selection【DAY/NIGHT】……

Whenever the [DAY/NIGHT] switch is pressed, the mode is changed over from DAY1 → DAY2 → NIGHT1 → NIGHT2 and the current mode is indicated at the lower right of the radar display.
The brilliance levels selected for each mode are saved. For brilliance adjustment, refer to page 3 - 12.
For selection of DAY/NIGHT mode by Menu operation, refer to "Color Setting" on the next page.

.....Color Setting【COLOR】.....

The colors of the Day/Night mode [DAY1, 2/NIGHT1, 2], system, background color outside the bearing scale, background color inside the bearing scale, echoes, characters, dials, own ship's track and radar trails are set up.

Color Adjustment by Menu Operation

【DAY/NIGHT】 – Register of DAY/NIGHT mode (the same function as [DAY/NIGHT] setting)
【SYSTEM】 – System color adjustment
【OUTER PPI】 – Adjustment of the background color outside the bearing scale
【INNER PPI】 – Adjustment of the background color inside the bearing scale
【ECHO】 – Adjustment of echo colors
【CHARACTER】 – Adjustment of character colors
【DIAL】 – Adjustment of dial color
【OWN TRACK】 – Adjustment of the color of own ship's track
【TRAILS】 – Adjustment of the color of radar trails

Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 8 .

The Sub1 Menu will appear.

3 Press 9 .

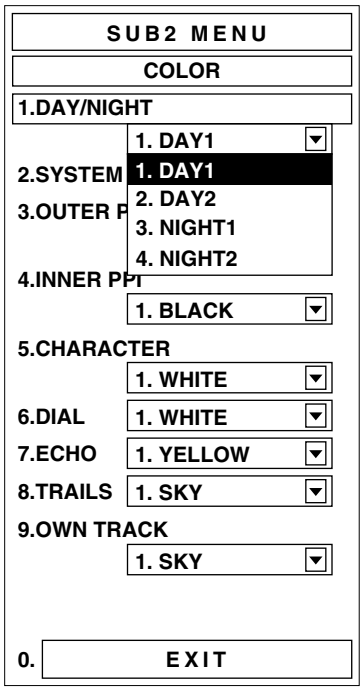
The Sub2 Menu will appear.

4 Press 1 .

The COLOR Menu will appear.

5 Press 1 .

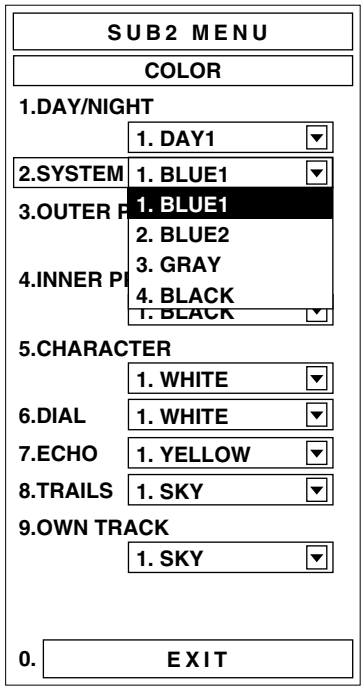
1.DAY/NIGHT will be selected and the following pull-down menu will appear.



6 Select any colors from 1 to 4 for the Day/Night mode selection in the pull-down menu and press it.

7 Press (2) **.**

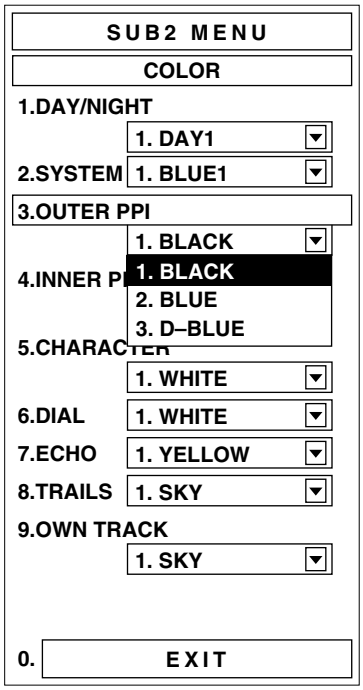
2.SYSTEM will be selected and the following pull-down menu will appear.



8 Select any colors from (1) **to** (4) **for the system color in the pull-down menu and press it.**

9 Press 3 .

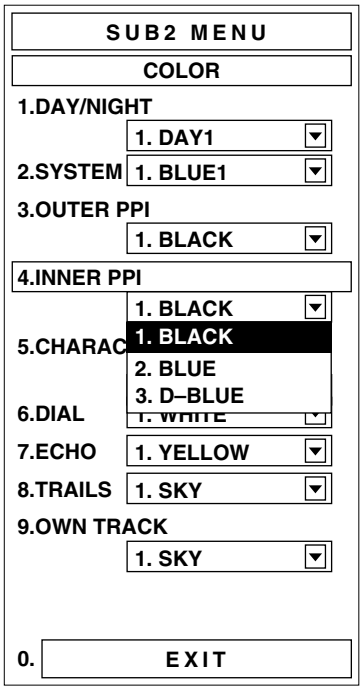
3.OUTER PPI will be selected and the following pull-down menu will appear.



10 Select any colors from 1 to 3 for the background color outside the bearing scale in the pull-down menu and press it.

11 Press 4 .

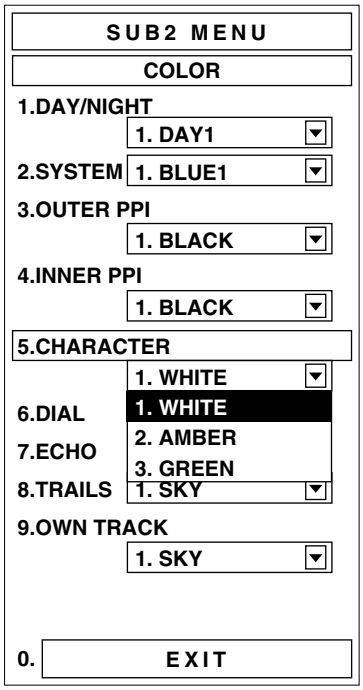
4.INNER PPI will be selected and the following pull-down menu will appear.



12 Select any colors from 1 to 3 for the background color inside the bearing scale in the pull-down menu and press it.

13 Press 5 .

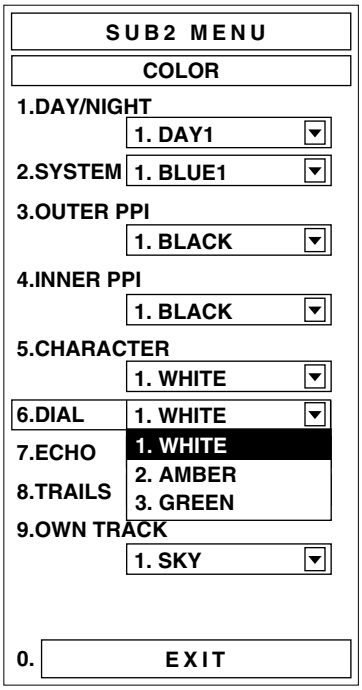
5.CHARACTER will be selected and the following pull-down menu will appear.



14 Select any colors from 1 to 3 for the character color in the pull-down menu and press it.

15 Press (6) .

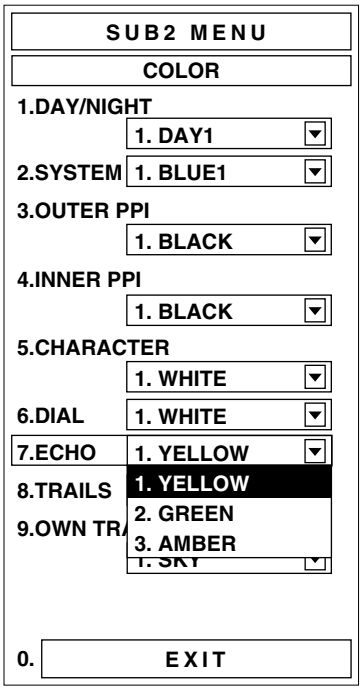
6.DIAL will be selected and the following pull-down menu will appear.



16 Select any colors from (1) to (3) for the dial color in the pull-down menu and press it.

17 Press (7) .

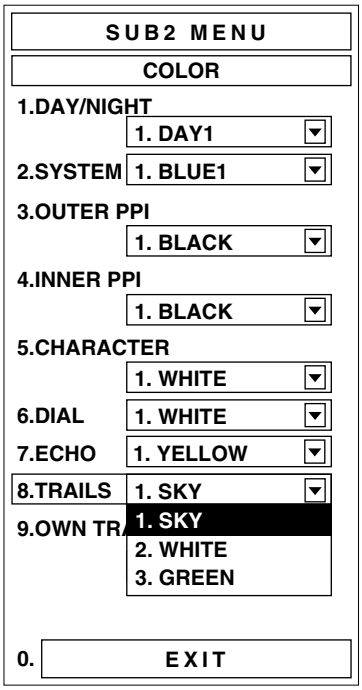
7.ECHO will be selected and the following pull-down menu will appear.



18 Select any colors from (1) to (3) for the echo color in the pull-down menu and press it.

19 Press (8) **.**

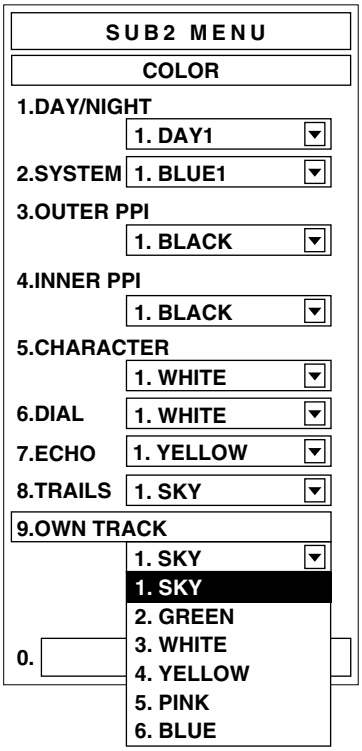
8.TRAILS will be selected and the following pull-down menu will appear.



20 Select any colors from (1) **to** (3) **for the colors of radar trails in the pull-down menu and press it.**

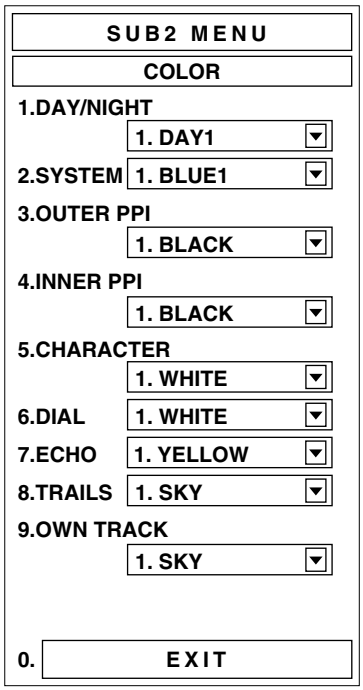
21 Press (9) **.**

9.OWN TRACK will be selected and the following pull-down menu will appear.



22 Select any colors from (1) **to** (6) **for the colors of own ship's track in the pull-down menu and press it.**

After the colors are adjusted, the following menu will appear.



The menu display after adjustment shows the colors set for the indiviual items.

Exit

1 Press (0) .

The Sub2 Menu will reappear.

2 Press (0) .

The Sub2 Menu will be closed.

……Degaussing【DEGAUSS】……

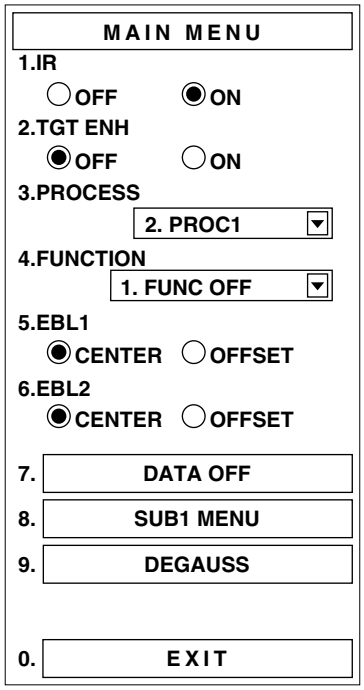
Since this radar equipment employs a color CRT, color slip-outs may be caused due to change in the magnetism of the hull structure or the earth magnetism. When turning on the power, the CRT is automatically degaussed. However, color slip-outs may be caused due to magnetization during radar operation. In this case, it is necessary to degauss the CRT in the following procedures:

Procedures **1 Press** **MENU** .

The Main Menu will appear.

2 Press **9** .

9. DEGAUSS will be selected and the CRT will be forcedly degaussed.
If it is insufficient by one time of degaussing, press **9** again after about 30 seconds.



Exit **1 Press** **0** .

The Main Menu will be closed.

……Radar Interference Rejection【IR】……

Procedures **1 Press** **MENU** .

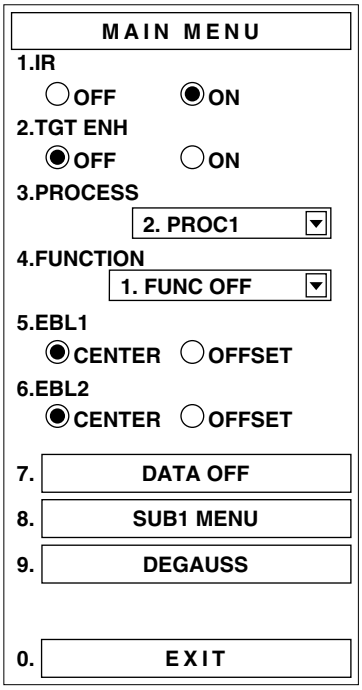
The Main Menu will appear.

2 Press **1** .

"ON" in "1.IR" will be set.

Then, the mark 

at the lower left of the radar display will be shown and the radar interference rejector is turned on.



Cancellation **1 Press** (1) .

"OFF" in "1.IR" is set and the radar interference rejector is turned off.

Exit **1 Press** (0) .

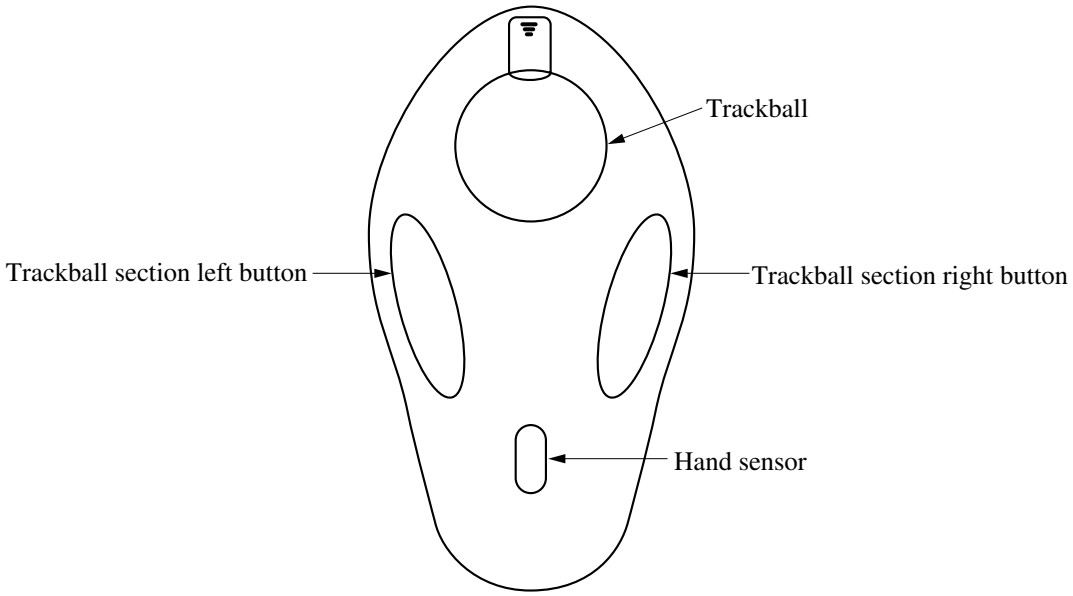
The Main Menu will be closed.

Attention

- When watching a radar beacon or a SART signal, set the following parameters to suppress the video:
  IR OFF (Interference Rejector OFF).

3.4 BASIC OPERATIONS

.....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 left and right, the cross cursor mark follows the move of the trackball. The distance and bearing between own ship and the cross cursor mark [+] are indicated on the upper right of the radar display. Before operating other controls and switches, the operator must be familiar with manipulation of the trackball and the move of the cross cursor mark. When rotating the trackball, the cross cursor mark [+] will not move if the palm is apart from the hand sensor section. Approach the palm to the hand sensor section and operate the trackball.

……Methods for Setting Menu Items with the Trackball ……

In addition to the method for setting menu items with the switches, the trackball can be also used to set menu items in almost the same manner as with the control panel. (Certain value entries are excluded.)
There are several methods for setting an item in a menu with the trackball.

[I] Radio Button Type of Setting Change

When an item has alternative selections, for example, ON and OFF, radio buttons are provided to set the item in many menu items.

①  **ON**  **OFF**

When the current item is set in the OFF position as shown the figure ①:

②  **ON**  **OFF**

Move the arrow cursor to the ON position with the trackball.

③  **ON**  **OFF**

With the arrow cursor on the ON position, press the trackball section left button.

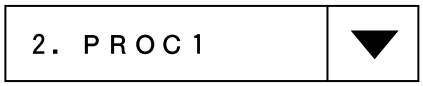
④  **ON**  **OFF**

The setting will change from OFF to ON.

⑤ When changing from ON to OFF, operate in the same manner.

[Ⅱ] Pull-down Menu Type of Setting Change

This method is used when there are three or more selections:

① 

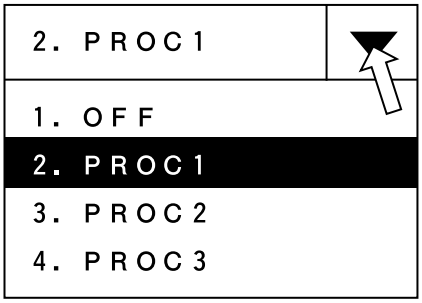
When PROC1 is set as shown in the figure ①:

② 

Move the arrow cursor to the position in the figure ② (downward triangle) with the trackball.

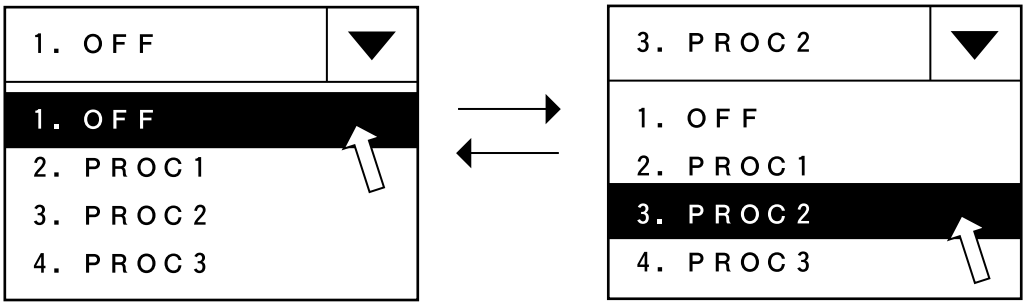
③ 

Put the arrow cursor on the position in the figure ② and press the trackball section left button.

④ 

A pull-down menu will be opened displaying selections in the menu.

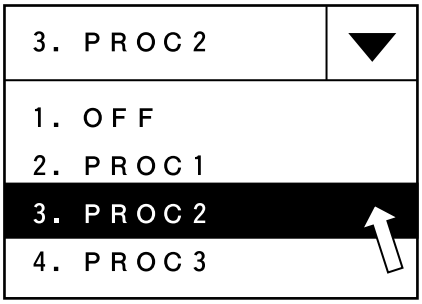
⑤ When changing between selections, operate in the same manner.



Move the arrow cursor with the trackball.

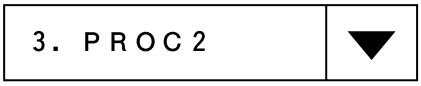
The selection positioned with the arrow cursor will appear in reverse.

⑥



Position the arrow cursor over the desired selection and selected it, then press the trackball section left button.

⑦

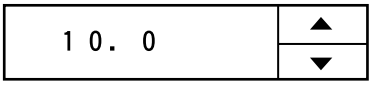


The pull-down menu will be closed and the setting will be determined.

[Ⅲ] Value Input Type of Setting Changes

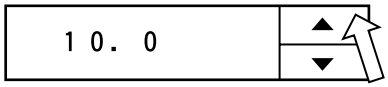
This method can be used in most of boxes where a numeric value is to be entered.

① 0.0-100.0kts



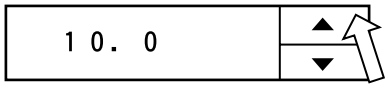
When the value is set as shown in the figure ①:
The minimum and maximum (min-max) are displayed on the left side and the unit is also displayed if present.

② 0.0-100.0kts



To increase the value, move the arrow cursor to the position in the figure ② (upward triangle) with the trackball.

③ 0.0-100.0kts



With the arrow cursor on the position in the figure ②, click the trackball section left button once.

④ 0.0-100.0kts

The value will be increase in the minimum step.

⑤ To increase the value continuously:

Hold down the trackball section left button in the figure ③.

⑥ To decrease the value:

Move the arrow cursor to the downward triangle in the figure ②.
The following procedures are the same as for increasing.

[Ⅳ] Checkbox Type of Setting Change

This method is used when a number of items have alternative selections of ON and OFF in one menu. (In this case, only one item is presented.)

①  N A V　L I N E

The status in the figure ① means that the item is OFF.

②  N A V　L I N E

Move the arrow cursor to the position in the figure ② with the trackball.

③  N A V　L I N E

With the arrow cursor on the position in the figure ②, press the trackball section left button.

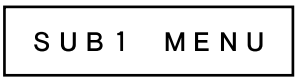
④  N A V　L I N E

A check mark will appear in the checkbox and the function will be turned on.

⑤ To turn off the function:
With the checkbox and arrow cursor position as shown in the figure ③, press the trackball section left button.

[V] Switch Type

This method is used, for example, in switching the current menu to the next.

① 

A menu has an item as presented in the figure ①.

② 

Move the arrow cursor to the position in the figure ② with the trackball.

③ 

With the arrow cursor over SUB1 MENU, press the trackball section left button.

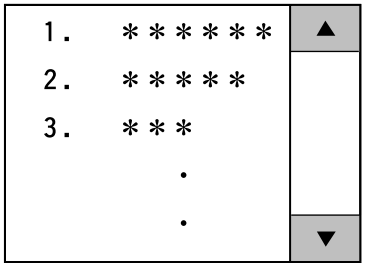
④ The Sub1 Menu will appear.

* In some selections of this type, the key color will change in the step ② entering a certain mode.
To reset the setting, select the same item again.
Example: Select NAV/MAP INFO Menu “SHIFT”.
NAV SHIFT mode

[Ⅵ] Vertical Scroll Type

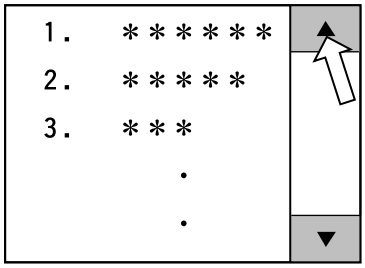
The display is scrolled vertically.
This method is mainly used for functions such as display of a stored file.

①



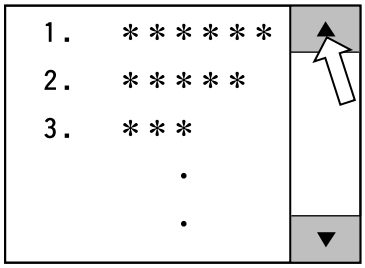
The vertical scrollbar is provided in a menu as shown in the figure ①.

②



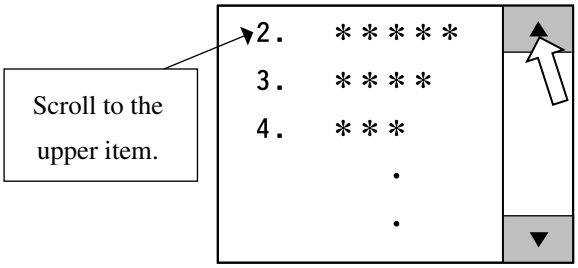
When scrolling the display, move the arrow cursor to the position in the figure (upward triangle) with the trackball.

③



With the arrow cursor on the position in the figure ②, click the trackball section left button.

④



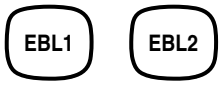
The display will be scrolled to the upper item.

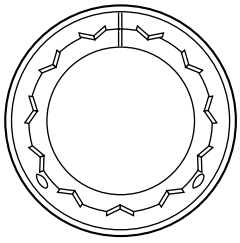
⑤ To scroll continuously the display upward:
Hold down the trackball section left button on the trackball in the figure ③.

⑥ To scroll the display downward:
Move the arrow cursor to the downward triangle in the figure ②.
The following procedures are the same as for the upward scroll.

.....Use EBLs (Electronic Bearing Lines) .....

The EBLs (Electronic Bearing Lines) are indispensable to measure distances and bearings of targets.
Before operation, the operator must be familiar with the operation of EBLs.



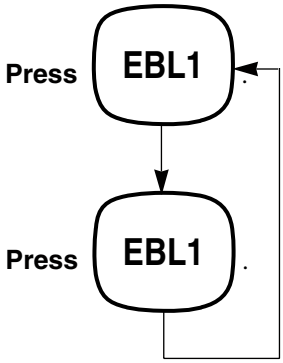


EBL1 Operation

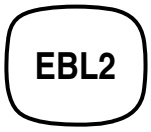
If EBL2 is selected, press 

to select EBL1 before operation. (The currently selected EBL is indicated by selected characters in the lower right of the radar display.)

Procedures

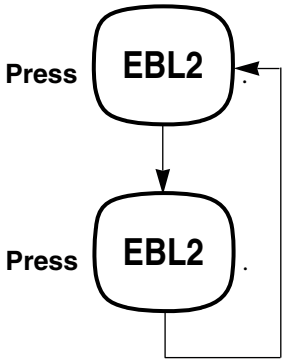


EBL2 Operation

If EBL1 is selected, press 

to select EBL2 before operation. (The currently selected EBL is indicated by selected characters in the lower right of the radar display.)

Procedures



EBL Bearing Display

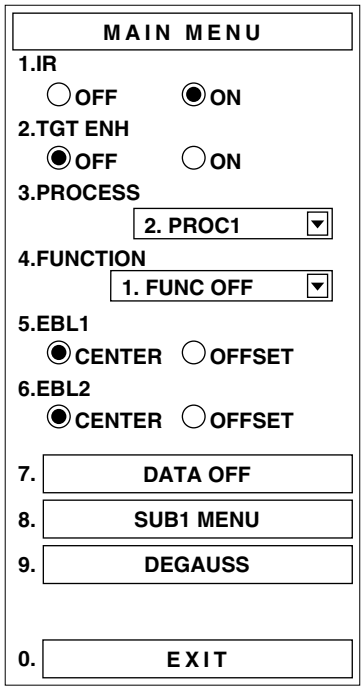
◎ The bearing values of EBL1 and EBL2 currently displayed within the PPI video are indicated at the lower right of the radar display. The currently operable EBL, the characters EBL1 or EBL2 are indicated in selected next the bearing value.

Starting Point of EBL

◎ The starting point of the currently operating EBL can be changed over to the center of the radar display (CENTER) or to any offset position (OFFSET).

Note: For OFFSET of the EBL's starting point, it is possible to determine whether the starting point is fixed at specific latitude and longitude. (Refer to page 3 - 42)

To offset the starting point of EBL1 during its operation:



Ⅰ) Press **MENU** .

The Main Menu will appear.

Press **5** .

"OFFSET" in "5.EBL1" will be set.

Move the starting point of EBL1 with the trackball.
Click the trackball section left button to fix the starting point of EBL1.

To reset the starting point of EBL1 to the center of the radar display:

Press **5** .

"CENTER" in "5.EBL1" will be set.

Press **0** .

The Main Menu will be closed.

Ⅱ) Continue to press **EBL1** also allow you to set the starting point of EBL1.

Continue to press **EBL1** . "OFFSET" in "5.EBL1" will be set.

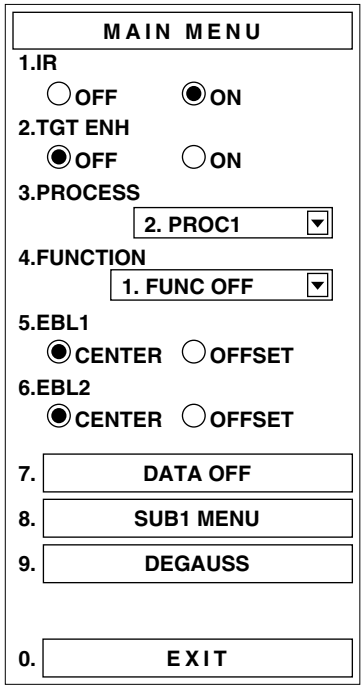
Continue to press **EBL1** . "CENTER" in "5.EBL1" will be set.

Note: For OFFSET of the EBL's starting point, it is possible to determine whether the starting point is fixed at specific latitude and longitude.

To offset the starting point of EBL2 during its operation:

Ⅰ) Press **MENU** .

The Main Menu will appear.



Press **6** .

"OFFSET" in "6.EBL2" will be set.

Move the starting point of EBL2 with the trackball.
Click the trackball section left button to fix the starting point of EBL2.

To reset the starting point of EBL2 to the center of the radar display:

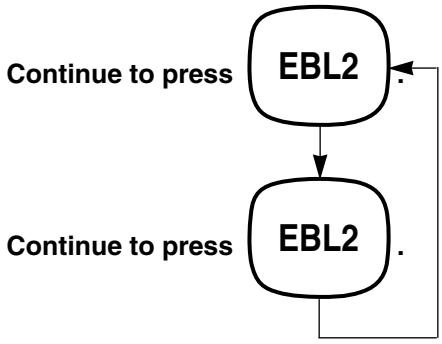
Press **6** .

"CENTER" in "6.EBL2" will be set.

Press **0** .

The Main Menu will be closed.

Ⅱ) Continue to press **EBL2** also allow you to set the starting point of EBL2.



.....Set Floating EBL .....

When this function is turned on and the starting point of EBL is moved to a position, the starting point can be fixed at the latitude and longitude of that position. This function is effective when the bearing from a certain point is repeatedly measured.
With this function OFF, the starting point of EBL is pasted on the radar display. When own ship is moved, the starting point will remain at the same point on the display.

Procedures **1 Press** MENU **, then** MENU **,** 1 **and** 9 **.**

The SETTING2 Menu will appear.

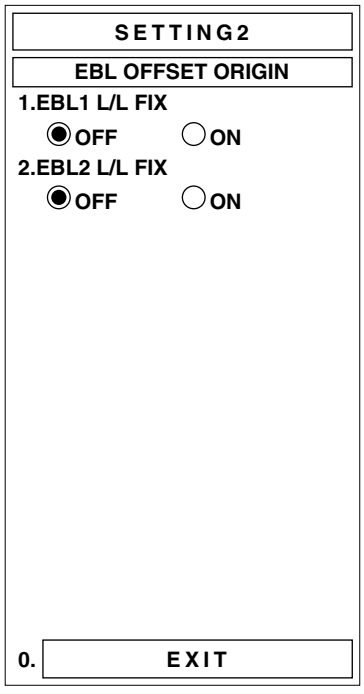
2 Press 1 **.**

The EBL OFFSET ORIGIN Menu will appear.

[I] Setting the Mode when the EBL1 Starting Point is Moved

1 Perform the operating procedures 1 and 2.

The EBL OFFSET ORIGIN Menu will appear.
"1.EBL1 L/L FIX" is in the initial mode and set in "OFF".
When the EBL1 starting point is moved, the starting point of EBL1 will remain at the set position on the radar display.



2 Press 1 **.**

"1.EBL1 L/L FIX" will switch from "OFF" to "ON".
When the EBL1 starting point is moved to a position, the starting point of EBL1 will be fixed at the latitude and longitude of that position.

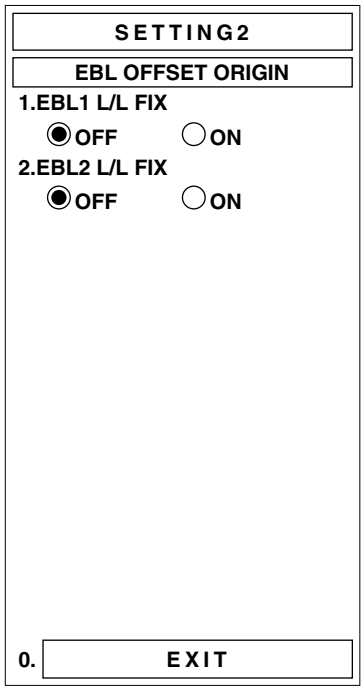
3 Press 1 **.**

The function will be reset to "OFF".

[Ⅱ] Setting the Mode when the EBL2 Starting Point is Moved

1 Perform the operating procedures 1 and 2.

The EBL OFFSET ORIGIN Menu will appear.
"2.EBL2 L/L FIX" is in the initial mode and set in "OFF".
When the EBL2 starting point is moved, the starting point of EBL2 will remain at the set position on the radar display.



2 Press (2).

"2.EBL2 L/L FIX" will switch from "OFF" to "ON".
When the EBL2 starting point is moved to a position, the starting point of EBL2 will be fixed at the latitude and longitude of that position.

3 Press (2).

The function will be reset to "OFF".

Exit

1 Press (0).

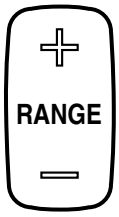
The SETTING2 Menu will reappear.

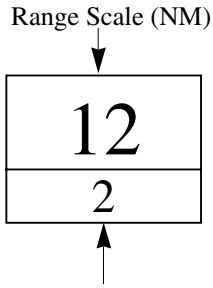
2 Press (0).

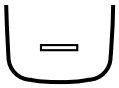
The SETTING2 Menu will be closed.

Note: • The course data and the own ship's latitude and longitude data are required to activate this function.
• With this function ON, the starting point will be returned to the center if the starting point of EBL1 is moved to outside the radar display.

.....Select Range【RANGE】.....





Any range scale is selectable from 0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48 and 96 (or 120) (nautical miles). Pressing  decreases the range and pressing  increases the range in each step. The range scale selected is indicated at the upper left of the display together with the range ring interval linked with it.

.....Set Maximum Range.....

The maximum range available may be set to 96 nm or 120 nm.

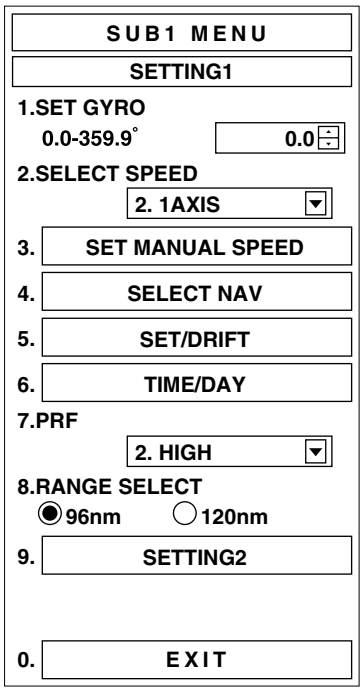
Procedures **1 Press** MENU **, then** MENU **and** 1 **.**

The SETTING1 Menu will appear.

2 Press 8 **.**

Each time this switch is pressed, the maximum range is changed between 96 nm or 120 nm.

Note: When the maximum range is set to 120 nm, the next range of 48 nm is 120 nm and so the range of 96 nm cannot be selected.



Exit **1 Press** 0 **.**

The Sub1 Menu will reappear.

2 Press 0 **.**

The Sub1 Menu will be closed.

……Select Pulse Length【PULSE LENGTH】……

PL

The transmission pulse length can be changed over in three levels (SP, MP and LP) every time the [PL] switch is pressed. The selected pulse length is indicated at the upper left of the radar display. The pulse length can be changed only when the range is set to one of 0.75, 1.5, 3, 6 and 12 NM. If 「 SP 」 is selected, the range resolution increases, making small targets clearer. If 「 LP 」 is selected, the range resolution decreases, but the sensitivity increases, making small targets larger with higher definition.

……Select Bearing Display Mode【AZI MODE】……

The bearing presentation mode is changed over in the order of [NORTH UP] (true bearing), [HEAD UP] (relative bearing) and [COURSE UP] (course-up bearing) mode every time the [AZI MODE] switch is pressed. When the currently selected mode is North-up or Course-up, it will be changed over to Head-up by pressing this switch, and to another mode by pressing this switch once again.

(Example) RM H UP→RM N UP→RM C UP→RM H UP

AZI MODE

True Bearing Mode [NORTH UP]

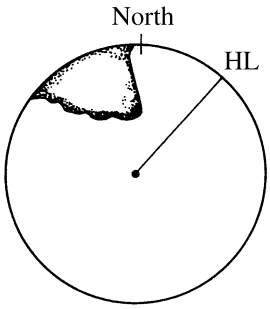
The video is displayed so that the zenith of the PPI (0° on range rings) points to the due north. Fixed targets do not flicker and are easily identified on a chart, and the true bearing of a target can readily be read out.

Relative Bearing Mode [HEAD UP]

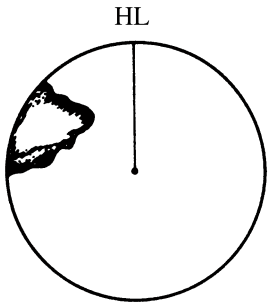
The video is displayed so that the ship's heading line points to the zenith of the PPI (0° on range rings). Since targets are displayed in their directions relative to the ship's heading line, the operator can watch the video in the same field of view as in operating the ship at sea.
This mode is suitable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

Course-Up Mode [COURSE UP]

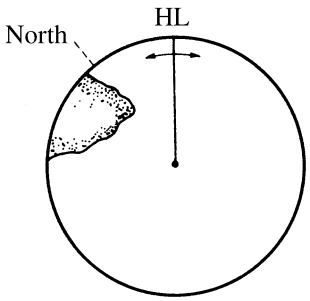
By pressing this switch, the ship's heading line is fixed pointing to the zenith of the PPI (0° on range rings). In the same way as in the North-up mode, fixed targets do not flicker, but stabilized even if the ship is yawing. The bearing of the heading line varies by the same shift of own ship's course. If the course is changed, the heading line can be reset to the Course-up mode by pressing the switch several times.



North-up Mode



Head-up Mode



Course-up Mode

.....Cancel Ship's Heading Line【HL OFF】 .....

HL OFF

The ship's heading line (HL) that presents the course of own ship is always displayed on the radar display. The heading line is canceled while this switch is being pressed, so that the targets on the heading line can be seen easily.

.....Cancel All Display Items Except HL and Cross Cursor Mark [+]【DATA OFF】 .....

All display information such ARPA vectors, symbols and navigation data may be cancelled temporarily by the following operations, except VRMs, EBLs, HL, cross cursor mark [+] and range rings:

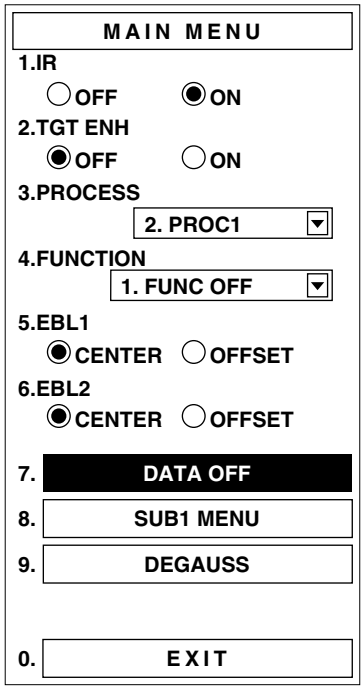
Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 7 .

7. DATA OFF will be set.

All the display items except radar display, VRMs, EBLs, HL, cross cursor mark [+] and range rings will disappear from the radar display.



Cancellation **1 Press** (7) .

7. DATA OFF will be reset and, the information temporarily cancelled will reappear.

Exit **1 Press** (0) .

The Main Menu will be closed.

.....Display PI (Parallel Index Lines)【PI】.....

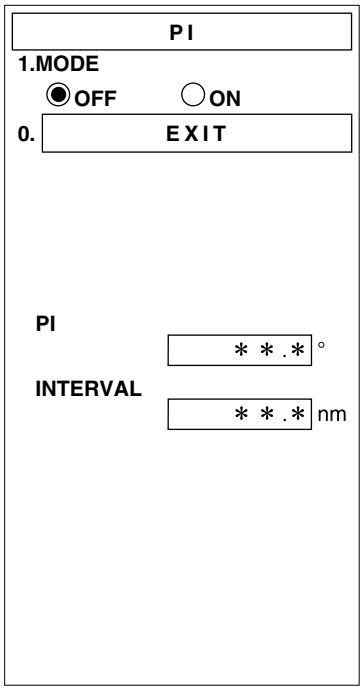
Parallel index lines can be displayed in a semicircular area.

Procedures **1 Press** [PI] .

The PI Menu will appear.

2 Press (1) .

"ON" in "1.MODE" will be set and parallel index lines will appear on the radar display. The direction of PI will be changed by rotating the [EBL] control, and the line intervals will be changed by rotating the [VRM] control.



Cancellation **1 Press** (1) .

"OFF" in "1.MODE" will be set and the PI will disappear on the radar display.

Exit **1 Press** (0) .

The PI Menu will be closed.

Note: The bearing of the parallel index lines displayed in the PI menu represents the true value when the bearing display of the radar reads N UP or C UP and the relative value when it reads H UP.

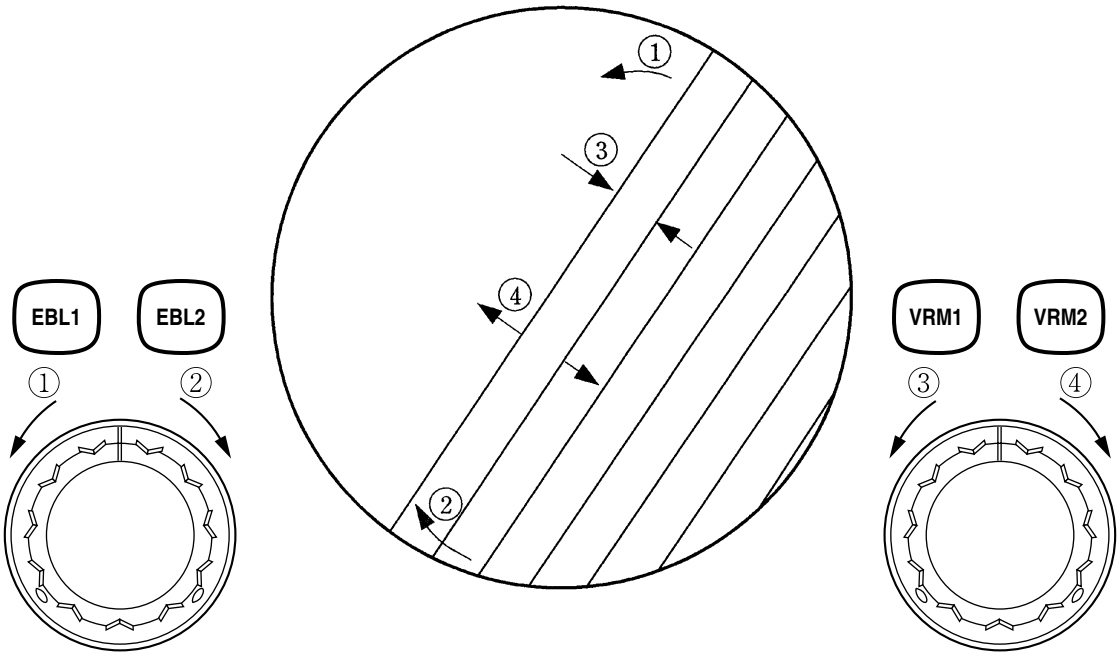
Operation of Parallel Index Lines

◎ Rotate the PI (Parallel Index Lines) in the same direction of rotating the [EBL] control. (①, ②)

◎ The intervals of the PI can be decreased as the [VRM] control is rotated counterclockwise (③) and increased as the [VRM] control is rotated clockwise (④).

◎ The rotation and intervals of the PI are controlled effectively only from the PI Menu. When the PI Menu is closed, the PI are fixed.
Repeat the above Procedures from the first step to move the PI again.

Display of Parallel Index Lines



◎ Press **PI** , and the PI Menu will be closed and the PI will be fixed.

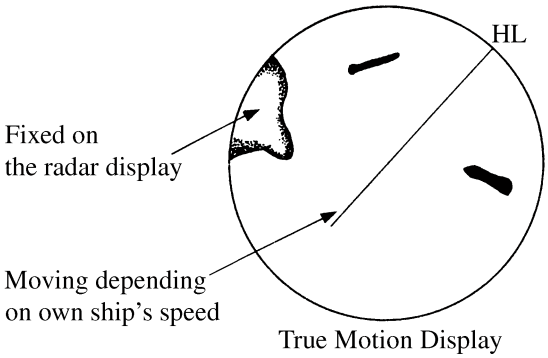
Press any of **EBL1** , **EBL2** , **VRM1** and **VRM2** the PI will be fixed and the PI Menu will be closed.

.....Select True/Relative Motion Display Mode 【TM/RM】【TM RESET】 .....

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

Procedures **1 Press** [TM/RM] .

The Relative Motion mode is changed over to the True Motion mode. In the True Motion mode, the position of own ship on the display moves depending upon its course and speed and the influence of the current. Land and other fixed targets are fixed on the display and only actually moving targets move on the radar display. When the True Motion mode is selected, own ship's position will be set to about 60% of the display radius in the opposite direction to its course allowing for the influence of the current. Own ship will start moving depending upon its course and speed and the influence of the tide. Subsequently, when own ship arrives at the position of about 65% of the display radius, the ship will be 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.



Reset Own Ship to its Original Position in True Motion (TM) Mode

Procedures **1 Press** [TM RESET] .

Own ship will be reset to its initial position as established when the Relative Motion mode is changed over to the True Motion mode. It will then start moving from that position.

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

Procedures **1 Press** TM/RM .

The True Motion mode is changed over to the Relative Motion mode, in which own ship will be returned to the center of the radar display.

……Move Own Ship's Display Position【OFF CENTER】……

Own ship's position at the display center can be moved to a off centered position within 65% of the display radius. This function is convenient to observe a wide coverage in any direction.

This Function is not Available on the 96 (or 120) NM Range

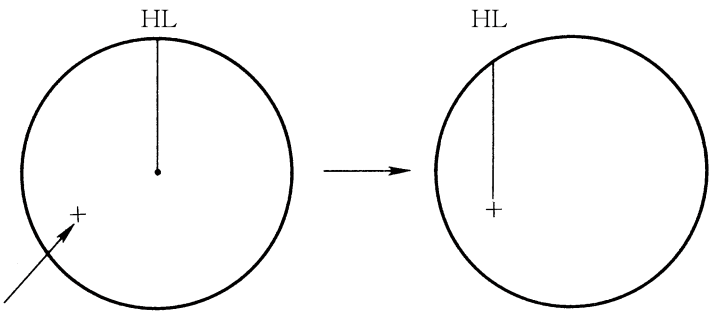
Procedures **1 Press** OFF CENT .

The cross cursor mark [+] will appear at the position of own ship on the radar display.

2 Move the cross cursor mark [+] (own ship's position) to another position with the trackball.

3 Click the trackball section left button.

Own ship's position will move to the position of the cross cursor mark [+], where it will be fixed.



Press the trackball section left button or [ENT] switch.

Return Own Ship's Position to the Center

Cancellation **1 Press** OFF CENT .

.....Display Other Ships' Trails【TRAILS】.....

Other ship's movement and speed can be monitored from the length and direction of its trail, serving for collision avoidance. The trail length can be changed over in 4 levels of 0.5 min, 1 min, 3 min and 6 min.

Procedures

Press **TRAILS**.

The level [0.5 min] will be selected and 「TRAILS [0.5 min] 」 will appear at the lower left of the radar display.
The trails (of 0.5 min long) will appear after other ships' symbols.

Press **TRAILS**.

The level [1 min] will be selected and 「TRAILS [1 min] 」 will appear at the lower left of the radar display.
The trails (of 1 min long) will appear after other ships' symbols.

Press **TRAILS**.

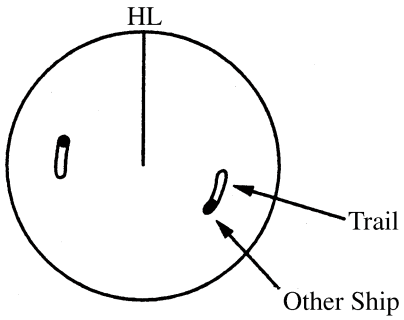
The level [3 min] will be selected and 「TRAILS [3 min] 」 will appear at the lower left of the radar display.
The trails (of 3 min long) will appear after other ships' symbols.

Press **TRAILS**.

The level [6 min] will be selected and 「TRAILS [6 min] 」 will appear at the lower left of the radar display.
The trails (of 6 min long) will appear after other ships' symbols.

Press **TRAILS**.

「TRAILS [OFF] 」 will appear at the lower left of the radar display and the trails of other ships will disappear.



……Display Own Ship's Track【OWN TRACK】……

In the case that Any Navigation Equipment is Connected to This System

Own ship's track data is sent from the navigation equipment and up to 1024 points of data can be recorded and displayed. The data storage time interval can be set in 4 levels 3 min (equal to the length of own ship's track for 3 minutes), 10 min, 15 min and 30 min.

Procedures **1 Press** MENU .

The Main Menu will appear.

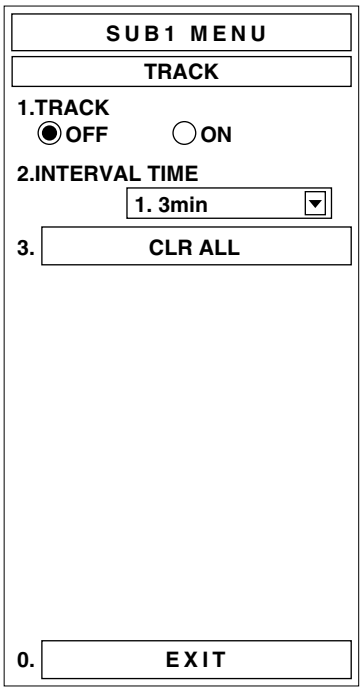
2 Press 8 .

The Sub1 Menu will appear.

3 Press 4 .

The TRACK Menu will appear.

4 Press 1 .



"ON" in "1.TRACK" will be set and own ship's past track originated from its current position will appear. The current storage time interval will appear at lower left on the radar display.

Cancellation **1 Press** 1 .

"OFF" in "1.TRACK" will be set and own ship's track and the storage time interval will disappear.

In Case of Changing Storage Time Interval

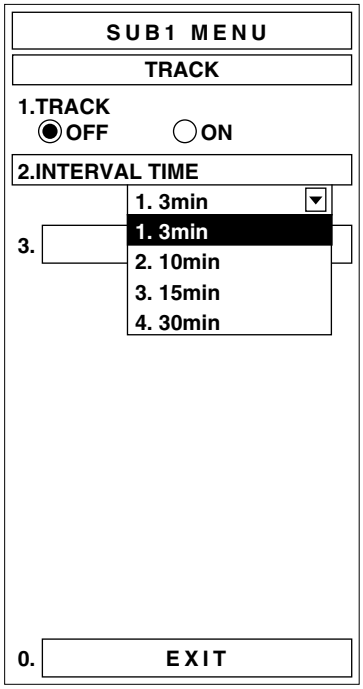
Procedures **1 Repeat the above procedures up to step 3.**

2 Press (2) **.**

2.INTERVAL TIME will be selected and the pull-down menu will appear.

3 Select the interval time in the pull-down menu and

press any of (1) **to** (4) **.**

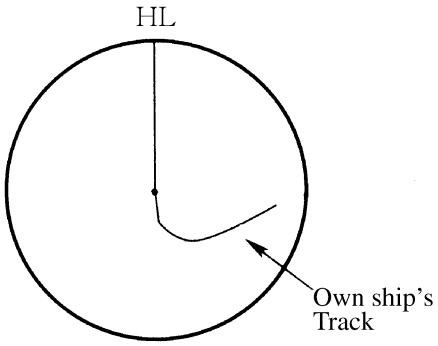


Exit **1 Press** (0) **.**

The Sub1 Menu will reappear.

2 Press (0) **.**

The Sub1 Menu will be closed.

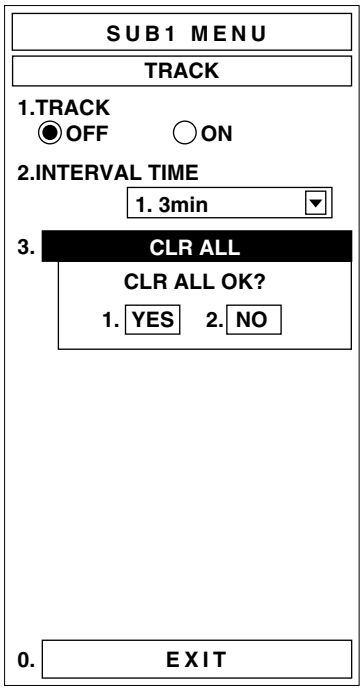


Clear Own Ship's Track Storage

Procedures **1 Repeat the procedures of changing storage time interval up to step 1.**

2 Press (3) **.**

3. CLR ALL will be selected. When clearing all the past track, press (1) (YES) to the question "CLR ALL OK?". If (2) (NO) is pressed, all the track will be cleared.



Exit **1 Press** (0) **.**

The Sub1 Menu will reappear.

2 Press (0) **.**

The Sub1 Menu will be closed.

Attention

- This system incorporates a simple backup function. If the power switch is not turned ON within 24 hours after it is set to OFF, own ship's track may disappear from the radar display.

.....Marking【MARK】.....

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

[Ⅰ] Plotting Marks

Procedures **1 Press MARK.**

MARK will appear in the CURSOR ( ) at the upper right of the radar display.

2 Put the cross cursor mark [+] on the position where the [□] mark is inserted.

3 Press ENT or trackball section left button.

The cross cursor mark [+] will be changed into the [□] mark and fixed on the radar display. When entering more [□] marks, repeat the procedures from step 2. Up to 20 marks can be entered.

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

[Ⅱ] Clearing Marks

Procedures **1 Press MARK.**

MARK will appear in the CURSOR ( ) at the upper right of the radar display.

2 Put the cross cursor mark [+] on the position where the [□] mark is inserted.

3 Press CLR or trackball section right button.

The [□] mark will disappear. When clearing another [□] mark, repeat the procedure from step 2.

When clearing all [□] marks, press MARK and continue to depress CLR for about 2 seconds.

……Display Range Rings【RANGE RINGS】……

The range rings will appear.

Procedures **1 Press** RANGE RINGS .

The range rings will appear and the interval of the range rings will be digitally indicated at the upper left of the radar display.

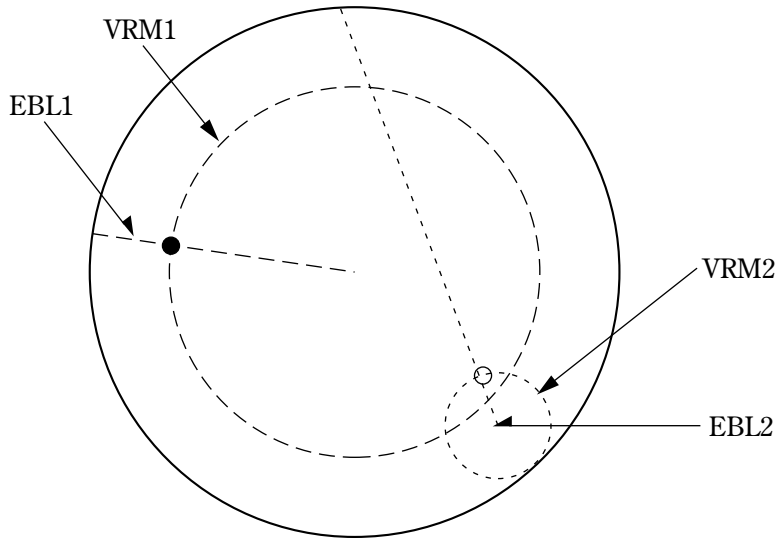
Cancellation **1 Press** RANGE RINGS .

The range rings will disappear.

……Display Variable Range Markers【VRM1/VRM2】……

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

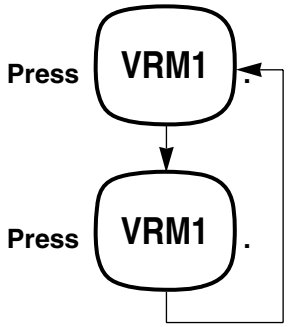
VRM markers presented on EBL1/EBL2
● mark: VRM1
○ mark: VRM2



VRM1 Operation

If VRM2 is selected, press VRM1 to select VRM1 before operation. (The currently selected VRM is indicated by selected characters in the lower right of the radar display.)

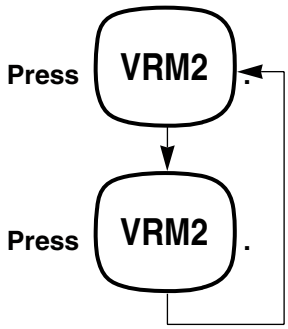
Procedures



VRM2 Operation

If VRM1 is selected, press VRM2 to select VRM2 before operation. (The currently selected VRM is indicated by selected characters in the lower right of the radar display.)

Procedures



VRM Range Display

◎ The values of the VRM1 and VRM2 that are currently displayed on the PPI will be indicated on the lower left of the radar display.
The VRM1 or VRM2 that is currently operable will be selected close to its range value.

VRM Operations

◎ The variable range markers are displayed centering around own ship. When rotating the [VRM] control clockwise, the VRM will be larger. When rotating the [VRM] control counterclockwise, the VRM will be smaller.

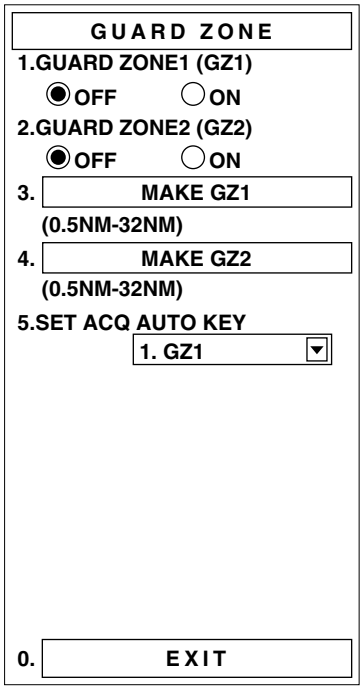
……Set Guard Zones【GUARD ZONE】……

A fan-shaped guard zone can be set up to keep a watch over intrusion of other ships or targets, or to automatically acquire other ships that have intruded in the zone.

[I] Creation of Fan-shaped Guard Zone

Procedures **1 Press** GUARD ZONE .

The GUARD ZONE Menu will appear.



2 Press 1 **to set GUARD ZONE 1,**

press 2 **to set GUARD ZONE 2.**

When Guard Zones 1 and 2 are set, "ON" will set.

3 Press 3 **to create GUARD ZONE 1, press**

4 **to create GUARD ZONE 2.**

Note: Guard Zones 1 or 2 can be set in any area within a range of 0.5 to 32 NM.

4 Rotate [EBL] and [VRM] controls to adjust the cross point of EBL and VRM to the starting point of a guard zone. Then press ENT .

The starting point of the guard zone will be set.

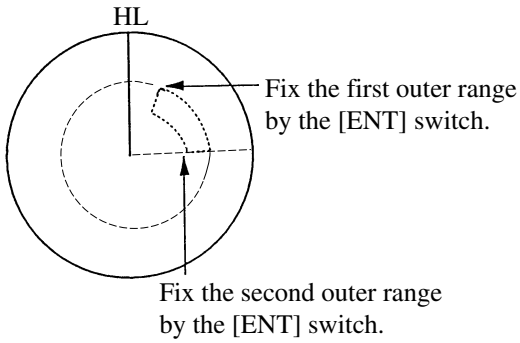
5 Move the EBL to make a fan-shaped zone enclosed by the current cross cursor position.

Press ENT **when a desired guard zone is made.**

The shape of guard zone will be set up. (The width of a guard zone is fixed to 0.5 NM)

Exit **1 Press** 0 **or** GUARD ZONE .

The GUARD ZONE Menu will be closed.



Operation of Guard Zones

◎ When a target is within a fan-shaped guard zone, an alarm will sound and a mark ▽ will appear on the target. The tracking mode is entered after about 1 min.

◎ In creating a guard zone, a circular guard ring may be created if the start and end points of the guard zone are set to the same point by omitting step 5 above.

◎ The guard zone is displayed only during radar transmission, but not appear during the standby operation.

Automatic Operation

◎ When pressing **ACQ AUTO**, the set guard zone 1 or 2 will appear. If there is a target within the guard zone, the guard zone operates automatically. When the target goes out of the zone, it is tracked. (The default is set for Guard Zone 1 only)
For a description of setting, refer to "[Ⅲ] Guard Zones ON/OFF Allotment to the ACQ AUTO Switch".

[Ⅱ] Clearing Guard Zones from Radar Display

Procedures

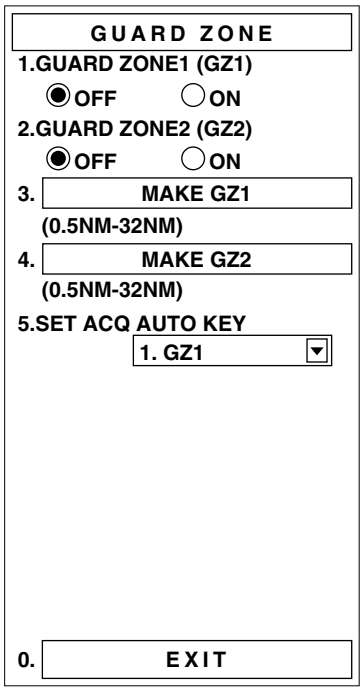
1 Execute the procedures for [Ⅰ] Creation of Fan-shaped Guard Zone up to step 2.

2 Press 1 to clear Guard Zone 1 from radar display, and press 2 to clear Guard Zone 2.

"OFF" will be set for Guard Zone 1 or 2, which will be cleared from radar display.

Exit

1 Execute the Exit step in the same procedure for [Ⅰ] Creation of Fan-shaped Guard Zone.



[Ⅲ] Guard Zones ON/OFF Allotment to the ACQ AUTO Switch

A guard zone is set so that the display is turned ON or OFF when the [ACQ AUTO] switch is pressed.

Procedures **1 After end of the Procedures for [Ⅰ] Creation of Fan-shaped Guard Zone, press 5 .**

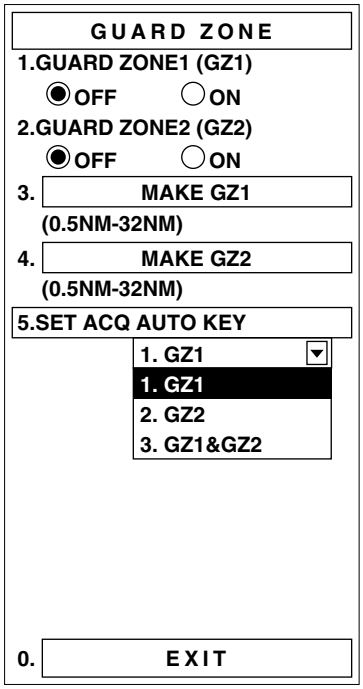
5.SET ACQ AUTO KEY will be selected and the pull-down menu will appear.

2 Press 1 to allot an area to Guard Zone 1.

1. GZ1 will be set and the area for Guard Zone 1 will be allotted to the [ACQ AUTO] switch.

3 Press 2 to allot an area to Guard Zone 2.

2. GZ2 will be set and the area for Guard Zone 2 will be allotted to the [ACQ AUTO] switch.



4 Press 3 to allot the areas for both Guard Zones 1 and 2.

3. GZ1&GZ2 will be set and the areas for both Guard Zones 1 and 2 will be allotted to the [ACQ AUTO] switch.

Exit **1 Execute the Exit step in the same Procedures for [Ⅰ] Creation of Fan-shaped Guard Zone.**

……Reset Alarm Buzzer 【ALARM ACK】 ……

ALARM ACK is the function of acknowledging the alarm item when an alarm sounds, and stopping an alarm sound as well as cancelling the selected of alarm indication. (If there are two or more alarms, it is necessary to operate the switch for each alarm indication.) The alarm sound can be stopped, but the alarm indication is not cancelled.

Stopping Alarm Sound

Procedures **1 Press ALARM ACK .**

The alarm sound will be stopped.

.....Set Alarm Sound Level .....

The function is to set the volume level of an alarm (buzzer sound) to be delivered from the keyboard.

Setting Alarm Sound Level

Procedures **1 Press** **MENU** .

The Main Menu will appear.

2 Press **8** .

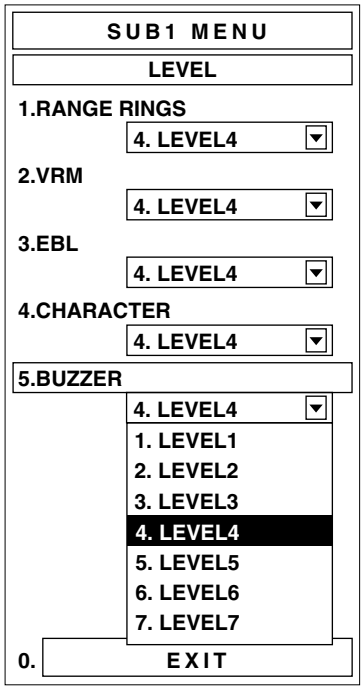
The Sub1 Menu will appear.

3 Press **2** .

The LEVEL Menu will be selected.

4 Press **5** .

5.BUZZER will be selected and the pull-down menu will appear.



5 Select any level from **1** **to** **7** **for BUZZER volume level in the pull-down menu and press it.**

Exit **1 Press** **0** .

The Sub1 Menu will reappear.

2 Press **0** .

The Sub1 Menu will be closed.

Note: Changing the "LEVEL" of the buzzer will cause the levels of all the alarms to be changed as well as the key touch sound.
The level of any alarm cannot be set to 0 as well as the key touch sound.

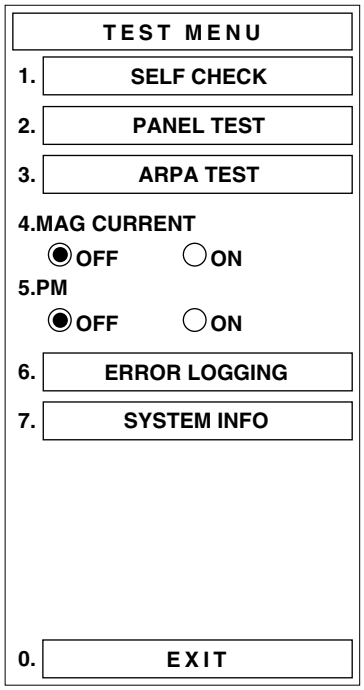
……Check Operational Status 【TEST】……

(Refer to 8.1.1 Function Check on Test Menu.)

Procedures **1 Press** **TEST** .

The TEST Menu will appear.

Select a number corresponding to a test item to be checked, and the checking items will appear.



Exit **1 Press** **0** **or** **TEST** .

The TEST Menu will be closed.

Description of Test Items

1 SELF CHECK

1-1 SENSOR

Refer to (1) Checking Memory, Safety Switch, Various Currents and Voltages, and Communication Lines in Section 8.1.1 Function Check on Test Menu.

Procedures

1 Press TEST .

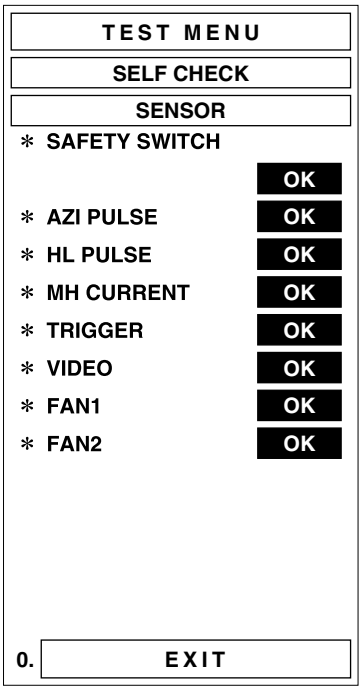
The TEST Menu will appear.

2 Press 1 .

The SELF CHECK Menu will appear.

3 Press 2 .

The SENSOR Menu will appear and the operational status of the scanner unit and the transmitter unit will appear.



Exit

1 Press TEST .

The TEST Menu will be closed.

1-2 LINE CHECK

Refer to (1) Checking Memory, Safety Switch, Various Currents and Voltages, and Communication Lines in Section 8.1.1 Function Check on Test Menu.

Procedures

1 Press TEST .

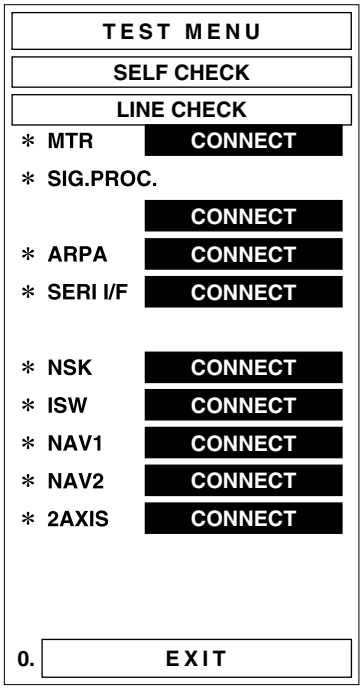
The TEST Menu will appear.

2 Press 1 .

The SELF CHECK Menu will appear.

3 Press 3 .

The LINE CHECK Menu will appear. If the transmitter-receiver unit and navigation equipment are connected via serial data lines, it can be checked whether data is transferred.



Exit **1 Press** **TEST** .

The TEST Menu will be closed.

2 PANEL TEST

2-1 KEY

Refer to (2) Checking Panel in Section 8.1.1 Function Check on Test Menu.

Procedures **1 Press** **TEST** .

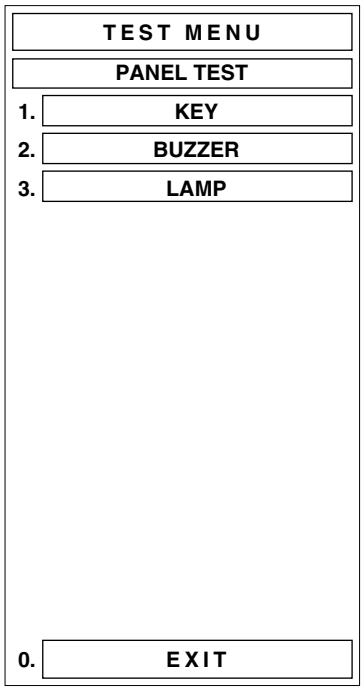
The TEST Menu will appear.

2 Press **2** .

The PANEL TEST Menu will appear.

3 Press **1** .

"1. KEY" is set and the control panel diagram will appear on the display.
When a key on the control panel of the actual equipment is pressed, the portion corresponding to the pressed key in the panel diagram will turn the color.



Exit **1 Press** **TEST** .

The TEST Menu will be finished.

2 Press **TEST** .

The TEST Menu will be closed.

2-2 BUZZER

Refer to (2) Checking Panel in Section 8.1.1 Function Check on Test Menu.

Procedures **1 Press** TEST .

The TEST Menu will appear.

2 Press 2 .

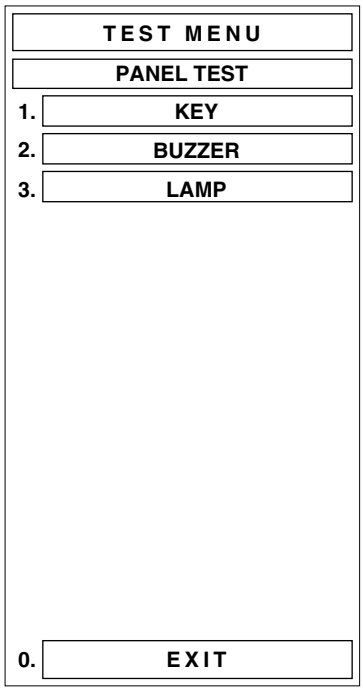
The PANEL TEST Menu will appear.

3 Press 2 .

The BUZZER Menu will appear. A beep of the buzzer indicates that the operation is normal.

Exit **1 Press** TEST .

The TEST Menu will be closed.



2-3 LAMP

Refer to (2) Checking Panel in Section 8.1.1 Function Check on Test Menu.

Procedures **1 Press** TEST .

The TEST Menu will appear.

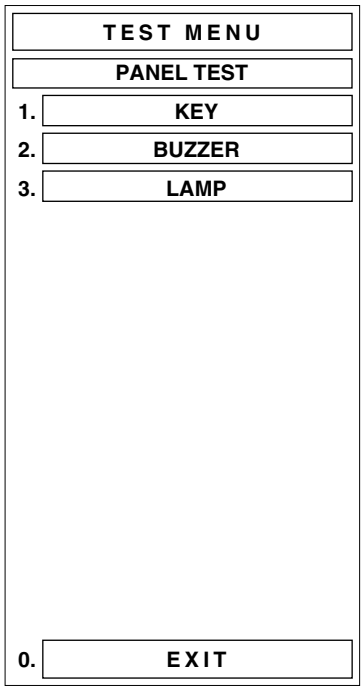
2 Press PANEL **to set the brilliance level of the key backlight to 0 to 3.**

3 Press 2 .

The PANEL TEST Menu will appear.

4 Press 3 .

The LAMP Menu will appear. The key backlight is turned on, the operation is normal.



Exit **1 Press** TEST .

The TEST Menu will be closed.

Note: When performing a LAMP test, the operation cannot be checked if the brilliance level of the key backlight is at maximum.

3 ARPA TEST

3-1 SIMULATOR

Refer to (3) Checking ARPA in Section 8.1.1 Function Check on Test Menu.

Procedures **1 Press** TX/STBY **to set the standby mode.**

2 Press TEST .

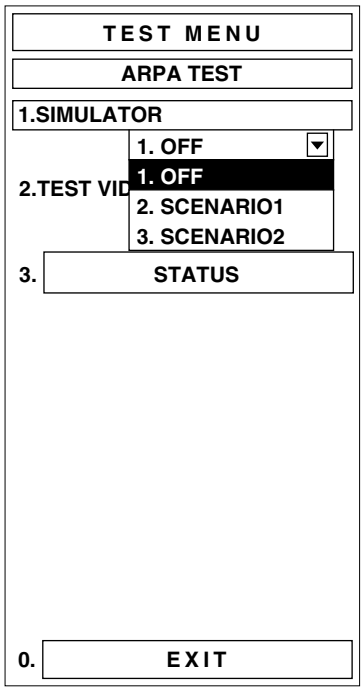
The TEST Menu will appear.

3 Press 3 .

The ARPA TEST Menu will appear.

4 Press 1 .

1.SIMULATOR will be selected and the pull-down menu will appear.



5 Select any setting item of ARPA Simulator in the pull-down menu and press any of 1 **to** 3 .

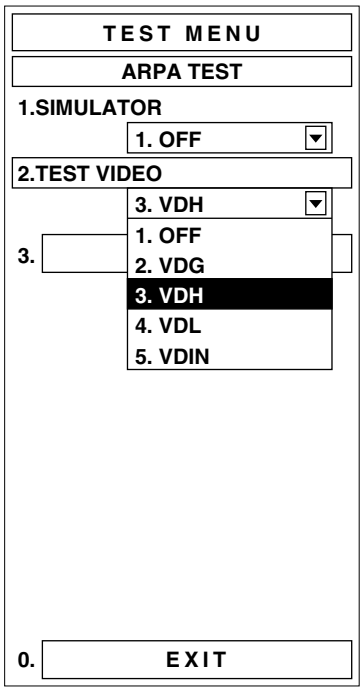
6 Press TX/STBY **to set the transmission mode.**

Exit **1 Press** TEST .

The TEST Menu will be closed.

3-2 TEST VIDEO

Refer to (3) Checking ARPA in Section 8.1.1 Function Check on Test Menu.



Procedures

1 Press TX/STBY to set the standby mode.

2 Press TEST .

The TEST Menu will appear.

3 Press 3 .

The ARPA TEST Menu will appear.

4 Press 2 .

2.TEST VIDEO will be selected and the pull-down menu will appear.

5 Select any setting item in the pull-down menu and press any of 1 to 5 .

6 Press TX/STBY to set the transmission mode.

Exit

1 Press TEST .

The TEST Menu will be closed.

3-3 STATUS

Refer to (3) Checking ARPA in Section 8.1.1 Function Check on Test Menu.

Procedures **1 Press** TEST .

The TEST Menu will appear.

2 Press 3 .

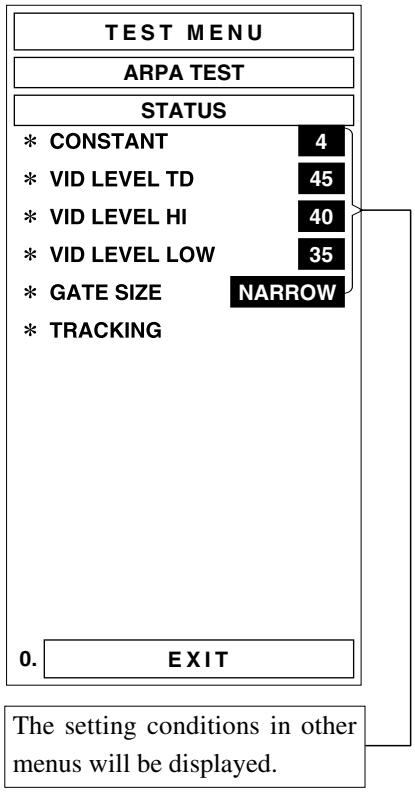
The ARPA TEST Menu will appear.

3 Press 3 .

The STATUS Menu will appear and the setting conditions in other menus will appear.

Exit **1 Press** TEST .

The TEST Menu will be closed.



4 MAG CURRENT

Refer to (4) Checking Magnetron Current in Section 8.1.1 Function Check on Test Menu.

Procedures **1 Press** TEST .

The TEST Menu will appear.

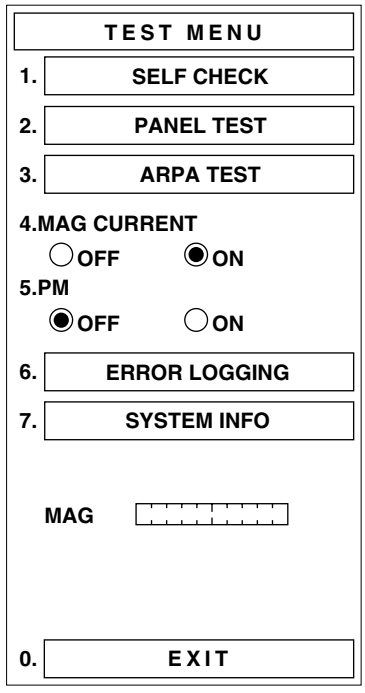
2 Press 4 .

"ON" in "4.MAG CURRENT" will be set and the magnetron current value will appear by the [MAG] bar-graph in the TEST Menu.

Press 4 again. "4.MAG CURRENT" will be set to "ON" and the [MAG] indicator in the menu will disappear.

Exit **1 Press** 0 **or** TEST .

The TEST Menu will be closed. If "4.MAG CURRENT" is set to "ON", the status will be set to "OFF" automatically.



5 PM (Performance Monitor)

Refer to (5) Checking Performance Monitor in Section 8.1.1 Function Check on Test Menu.

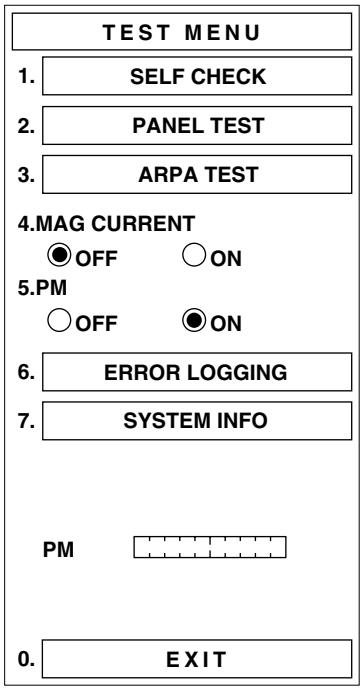
Procedures **1 Press** **TEST** .

The TEST Menu will appear.

2 Press **5** .

If the Performance Monitor is installed,"ON" in "5.PM" will be set and the status of performance monitor will appear by the [PM] bar-graph in the TEST Menu.

Press **5** again. "5.PM" will be set to "ON" and the [PM] indicator in the menu will disappear.



Exit **1 Press** **0** **or** **TEST** .

The TEST Menu will be closed. If "5.PM" is set to "ON", the status will be set to "OFF" automatically.

6 ERROR LOGGING

Refer to (6) Checking Error Logging in Section 8.1.1 Function Check on Test Menu.

Procedures **1 Press** **TEST** .

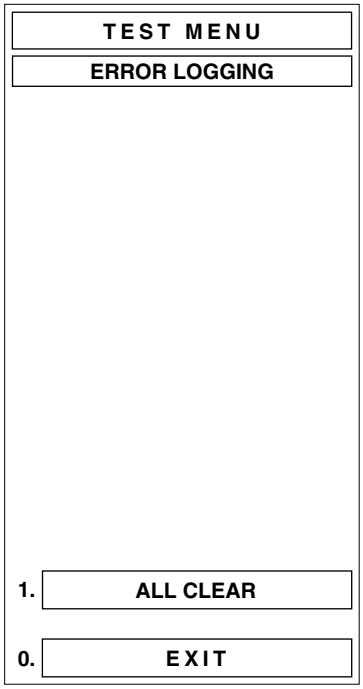
The TEST Menu will appear.

2 Press **6** .

ERROR LOGGING Menu will appear. If any error is caused, the type of the error will be memorized and displayed.

Exit **1 Press** **0** **or** **TEST** .

The TEST Menu will be closed.



7 SYSTEM INFO

Refer to (7) Checking System Information Display in Section 8.1.1 Function Check on Test Menu.

Procedures **1 Press** **TEST** .

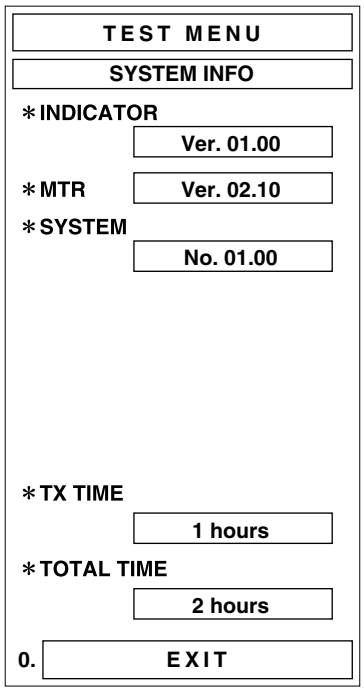
The TEST Menu will appear.

2 Press **7** .

SYSTEM INFO Menu will appear and the current system information will appear.

Exit **1 Press** **0** **or** **TEST** .

The TEST Menu will be closed.



.....FUNCTION.....

FUNCTION is a function of setting the process suited for each condition during navigation to enhance the target detectability performance.

Setting items: the following modes can be switched over:

FUNC1: Effective in observing the echoes on short ranges.
FUNC2: Effective in observing the echoes on long ranges.
FUNC3: Effective in observing the echoes in rough weathers.
FUNC4: Set by service personnel. The initial setting is the same as FUNC1.
FUNC5: Set by service personnel. The initial setting is the same as FUNC1.

Procedures

1 Press MENU .

The Main Menu will appear.

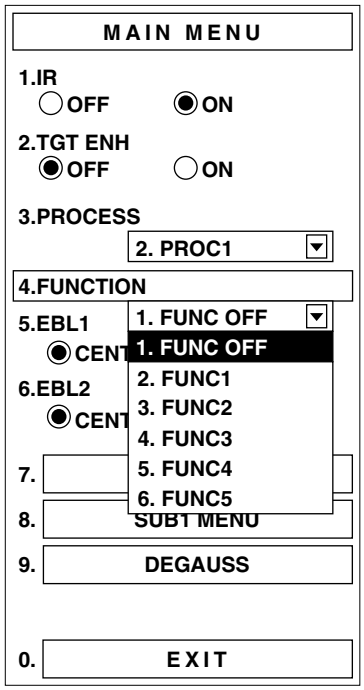
2 Press 4 .

4.FUNCTION will be selected and the pull-down menu will appear.

3 Select a desired process setting item from the ten-key.

The process setting item will be changed and the current setting state will appear at the lower right of the radar display.

4 For changing the setting item, open the pull-down menu in step 2 above again and select a desired process setting item.



Exit

1 Press 0 .

The Main Menu will be closed.

Cancellation

1 Execute the procedures to function up to step 2.

4.FUNCTION will be selected and the pull-down menu will appear.

2 Press 1 .

1. FUNC OFF will be set and "FUNC OFF" will appear at the lower right of the radar display.

The process setting items of FUNC4 and FUNC5 can be changed by service personnel.

- Setting gain of input target signal (sensitivity preset)
- Setting standard value of input target signal (noise level)
- Setting radar interference rejection (IR): IR1 to IR4 (Effective when IR is ON)
- Setting target enhancement (TGT ENH): EXP1 to EXP4 (Effective when TGT ENH is ON)
- Setting target processing (PROCESS): MODE1 to MODE8 (Effective when PROCESS is ON)
- Setting sensitivity range (Maximum and minimum values)
- Setting sea clutter suppression range (Maximum and minimum values)
- Setting rain/snow clutter suppression range (Maximum and minimum values)

Note: Do not use FUNC2 and FUNC3 on short ranges. Otherwise, detection of ship targets moving high speeds may become poor.
For FUNC1 to FUNC3, the recommended parameters have been preset by the manufacturer, but the preset parameters could no be changed after delivery. In using FUNC1 to FUNC3, IR, TGT ENH and PROCESS shall be set to ON (PROC1 to PROC3).

.....Expand Targets .....

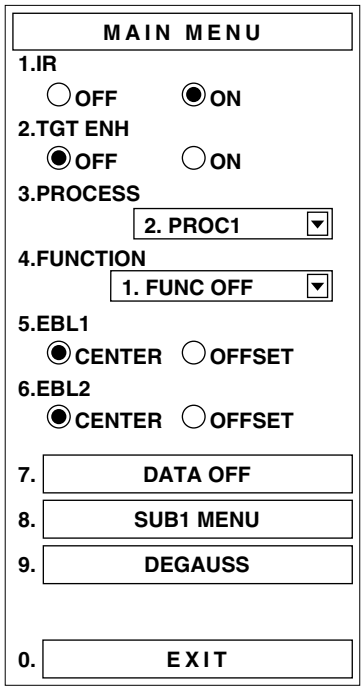
Targets displayed on the radar display can be expanded, regardless of the pulse length selected.

Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 2 .

"ON" in "2.TGT ENH" will be set and "ENH ON " will appear at the lower left of the radar display.
Then, the targets on the radar display will be expanded for higher definition.



Cancellation **1 Execute the procedures to expand targets up to step 2.**

2 Press 2 .

"OFF" in "2.TGT ENH" will be set and "ENH OFF " will appear at the lower left of the radar display.
The expanded targets on the radar display will be reset to their original sizes.

Exit **1 Press** 0 .

The Main Menu will be closed.

.....Display Processed Videos .....

Unnecessary noise will be reduced to highlight targets.

Attention

- In watching a radar beacon mark, SART signal or a fast moving target on the radar display, set the system to: PROCESS OFF (Processed Video OFF)
- It is most suitable to use this function in the TM mode.
  In using this function in the RM mode, use it in the North-up or Course-up mode. In using the function in the Head-up mode, the video may be blurred.

Procedures

1 Press MENU .

The Main Menu will appear.

2 Press 3 .

3.PROCESS will be selected and the pull-down menu will appear.

3-1 Press 2 .

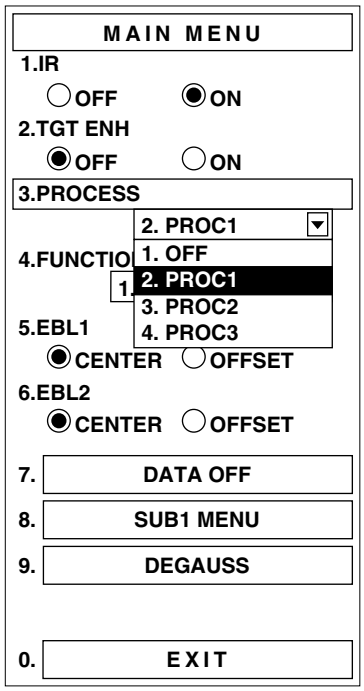
2. PROC1 will be set and the targets moving at high speeds will be selected.
The targets moving at low speeds will be darkened.
This function is recommendable on the radar ranges of 1.5 NM or less.

3-2 Press 3 .

3. PROC2 will be set.
This processing speed is in a range between PROC1 and PROC3.

3-3 Press 4 .

4. PROC3 will be set and the targets moving at low speeds will be selected.
The targets moving at high speeds will be darkened.
This function is recommendable on the radar ranges of 3 NM or more.



Cancellation **1 Execute the procedures to display processed videos up to step 2.**

2 Press (1) .

1. OFF will be set.

Exit **1 Press** (0) .

The Main Menu will be closed.

.....Reduce Radar Interference .....

Attention

● In watching a radar beacon mark or SART signal on the radar display, set the system to: IR OFF (Radar Interference Rejection OFF)

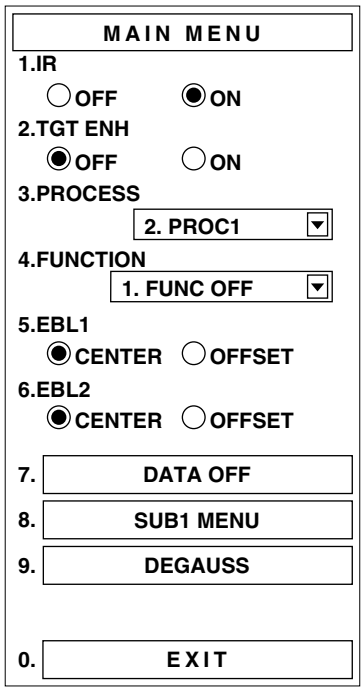
This function is used when the interference from other ship's radar is strong.

Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press (1) .

"ON" in "1.IR" will be set and the radar interference rejection will be set to ON to reduce radar interference.



Cancellation **1 Execute the procedures to reduce radar interference rejection up to step 2.**

2 Press (1) .

"OFF" in "1.IR" will be set and the radar interference rejection will be set to OFF.

Exit **1 Press** (0) .

The Main Menu will be closed.

.....Personal Information .....

The operating status of the radar equipment is recorded. If there are two or more operators to operate the radar, each operator can register and recall the operating status suitable for him or her. The operating status for up to 5 operators can be registered and each status can be named. (using a maximum of 10 alphanumeric characters)

* Personal Data to be Stored:
- Bearing mode
- DAY/NIGHT mode setting
- Brilliance
- Buzzer sound level
- Vector length/mode
- Various video processing methods (IR, ENH, PROC and FUNC)

Recalling Operating Status

Procedures **1 Press** **MENU** .

The Main Menu will appear.

2 Press **8** .

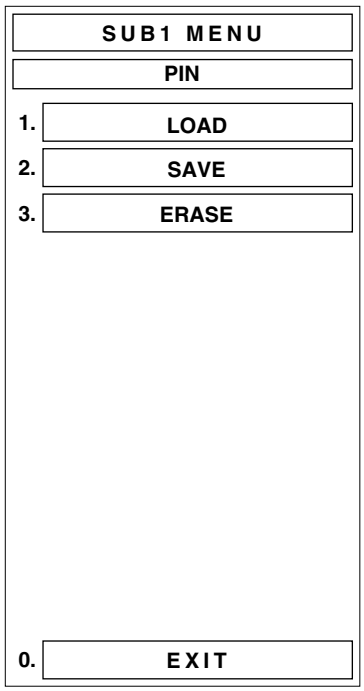
The Sub1 Menu will appear.

3 Press **6** .

The PIN Menu will appear.

4 Press **1** .

The LOAD Menu will appear.



5 Select any number on the LOAD Menu and press any of **1** **to** **5** .

The registered operating status will be recalled.

6 Press **1** **(YES) to the question "FILE ERASE OK?" to recall the registered operating status.**

Press **2** **(NO) to stop the recall.**

Exit

1 Press 0 .

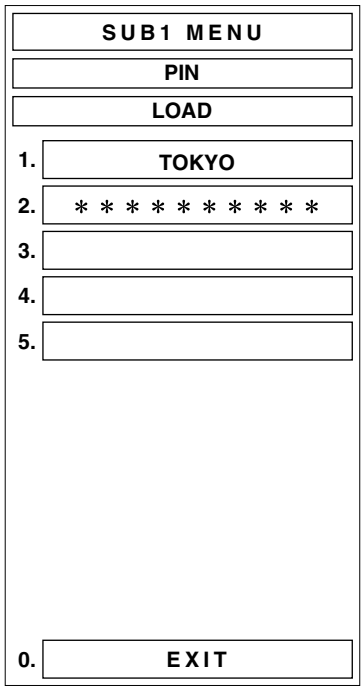
The PIN Menu will reappear.

2 Press 0 .

The Sub1 Menu will reappear.

3 Press 0 .

The Sub1 Menu will be closed.



Registering Operating Status

Procedures **1 Execute the procedures to recalling operating status up to step 3.**

2 Press 2 .

The SAVE Menu will appear.

3 Press any of 1 to 5 to save the operating status item assigned by any number 1 to 5.

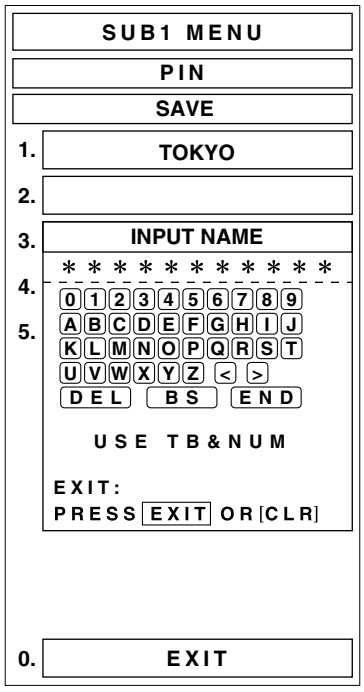
The INPUT NAME Menu will appear and the selected number to save will be set up.

4 Select any alphanumeric character of A to Z on the Menu using the trackball, and click the trackball section left button to enter one character of the name to save, or press any of 0 to 9 to enter one numeric character.

A maximum of 10 characters can be entered.

5 Repeat step 4 until the name to save is made up, and select "END" in INPUT NAME Menu by using the trackball and click the trackball section left button.

The operating status will be saved.



Exit **1 Press** (0) .

The PIN will reappear.

2 Press (0) .

The Sub1 Menu will reappear.

3 Press (0) .

The Sub1 Menu will be closed.

Cancelling Registered Operating Status

Procedures **1 Execute the procedures to recalling operating status up to step 3.**

2 Press (3) .

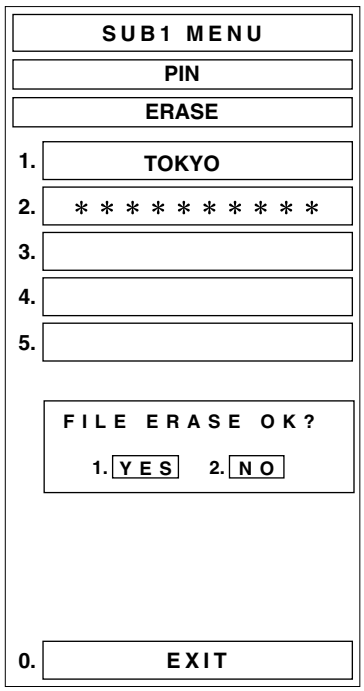
The ERASE Menu will appear.

3 Press any of (1) **to** (5) .

The register number of the operating status to be erased will be selected.

4 Press (1) **(YES) to the question "FILE ERASE OK?" to erase the registered number.**

Press (2) **(NO) to stop the erasing.**



Exit **1 Press** (0) .

The PIN Menu will reappear.

2 Press (0) .

The Sub1 Menu will reappear.

3 Press (0) .

The Sub1 Menu will be closed.

.....Display of Navigational Information .....

Navigational information such as waypoint marks, and a maximum of 256 points of NAV lines, coastlines, depth contours and NAV marks can be created, displayed, read out, saved, edited and cancelled. (This function is effective only when navigation equipment is connected to this system.)

[I] Displaying Waypoint Marks

If waypoint information is sent from navigation equipment, a waypoint mark will appear on the radar display. If the waypoint appears within the radar display, it is displayed as "◯WP".

Procedures **1 Press** (MENU) .

The Main Menu will appear.

2 Press (8) .

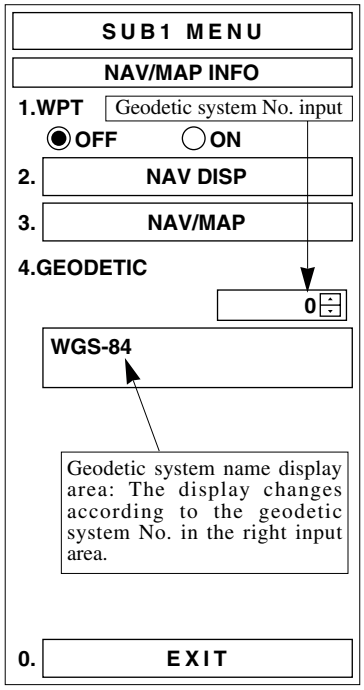
The Sub1 Menu will appear.

3 Press (3) .

The NAV/MAP INFO Menu will appear.

4 Press (1) .

"ON" in "1.WPT" will be set and the selected waypoint mark will appear.



Exit **1 Press** (0) .

The Sub1 Menu will reappear.

2 Press (0) .

The Sub1 Menu will be closed.

[Ⅱ] Setting NAV INFO to ON/OFF

The following navigational information can be displayed or cancelled by pressing the corresponding switch.

① Own ship mark [OS MARK]
② NAV lines [NAV LINE]
③ Coast lines [COAST]
④ Depth contour [CONTOUR]
⑤ Mark 1 [MARK1]
⑥ Mark 2 [MARK2]
⑦ Mark 3 [MARK3]
⑧ Mark 4 [MARK4]

Procedures

1 Press MENU .

The Main Menu will appear.

2 Press 8 .

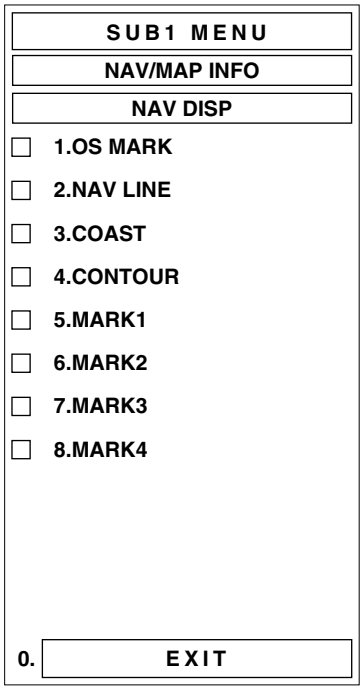
The Sub1 Menu will appear.

3 Press 3 .

The NAV/MAP INFO Menu will appear.

4 Press 2 .

The NAV DISP Menu will appear.



5 Press any of 1 to 9 to set any NAV DISP item to ON/OFF.

The menu item set to ON will be marked with a check mark in the "□".

The Own ship mark display is set to ON/OFF every time the 1 is pressed.

The NAV lines display is set to ON/OFF every time the 2 is pressed.

The Coast lines display is set to ON/OFF every time the 3 is pressed.

The Depth contour display is set to ON/OFF every time the 4 is pressed.

The Mark1 display is set to ON/OFF every time the 5 is pressed.

The Mark2 display is set to ON/OFF every time the 6 is pressed.

The Mark3 display is set to ON/OFF every time the 7 is pressed.

The Mark4 display is set to ON/OFF every time the 8 is pressed.

Exit

1 Press 0 .

The NAV/MAP INFO Menu will reappear.

2 Press 0 .

The Sub1 Menu will reappear.

3 Press 0 .

The Sub1 Menu will be closed.

[Ⅲ] Making and Editing Navigational Information

Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 8 .

The Sub1 Menu will appear.

3 Press 3 .

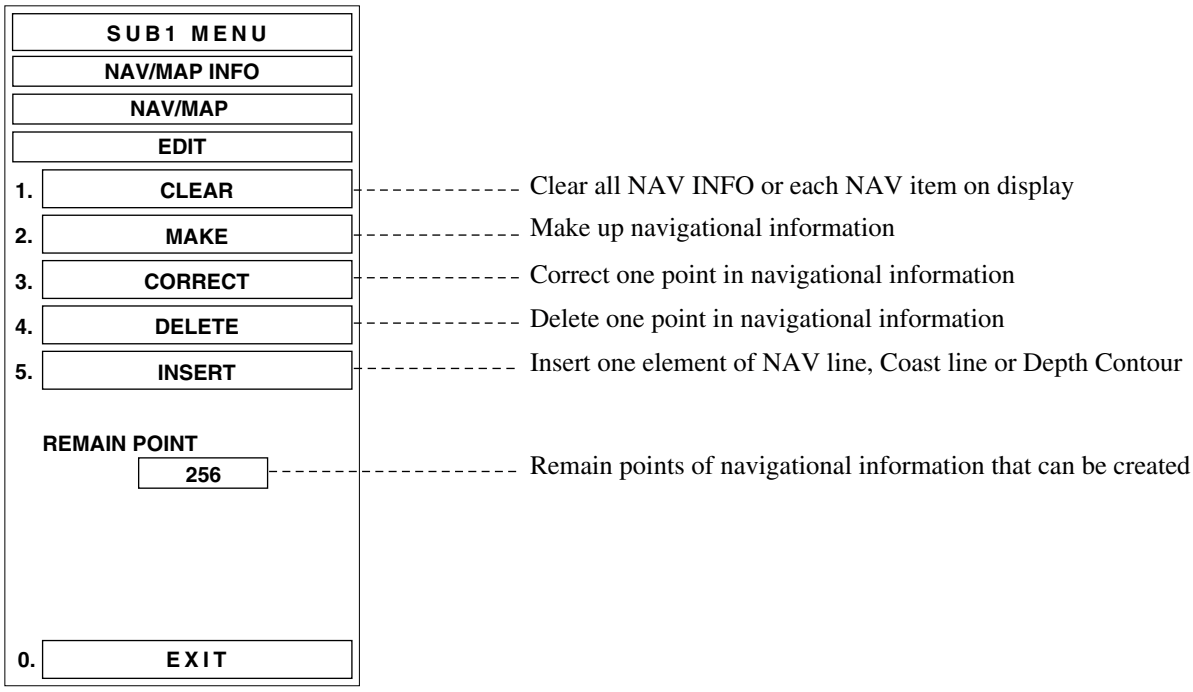
The NAV/MAP INFO Menu will appear.

4 Press 3 .

The NAV/MAP Menu will appear.

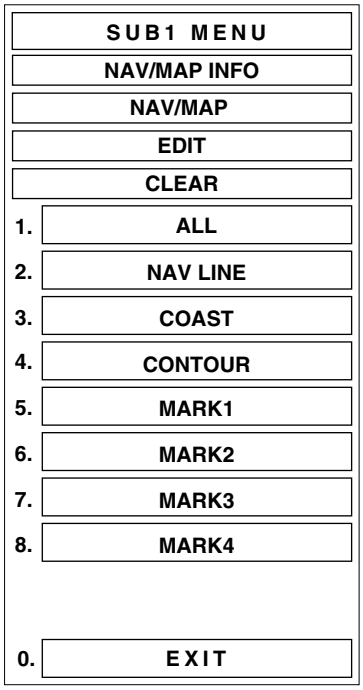
5 Press 5 .

The EDIT Menu will appear.



1 CLEAR (Clear all NAV INFO or each NAV item on display)

Procedures **1 Press** (1) **.**



The CLEAR Menu will appear.

2 Press any of 1 to 8 to clear any item of navigation information.

(1) : Clear all navigational information on display.

(2) : Clear NAV LINE.

(3) : Clear COAST Line.

(4) : Clear CONTOUR.

(5) : Clear MARK1.

(6) : Clear MARK2.

(7) : Clear MARK3.

(8) : Clear MARK4.

The NAV INFO to be cleared will be selected.

2 MAKE (Make up navigational information)

Procedures **1 Press** (2) **.**

The MAKE Menu will appear.

2 Press any of 1 to 7 to make up any item of navigational information.

(1) : Make NAV LINE.

(2) : Make COAST Line.

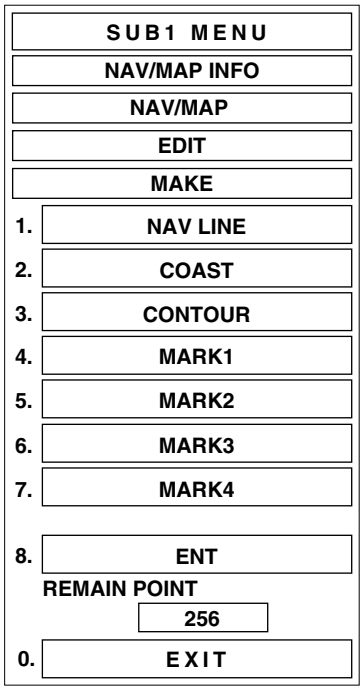
(3) : Make CONTOUR.

(4) : Make MARK1.

(5) : Make MARK2.

(6) : Make MARK3.

(7) : Make MARK4.



When one of 1 to 7 is selected, NAV MAKE will appear in the CURSOR ( ) at the upper right of the radar display.

3 Move the cross cursor mark to the starting point of a line or any element of a mark using the trackball, and click the trackball section left button.

The starting point of a line or the element of a mark to make will be set up.

4 Repeat step 3 above. If a line or mark is completed, press the (8) (ENT).

Then, a line or a mark will be made.

5 Repeat the steps 2 to 4 to make another line or mark.

6 Press 0 when all NAV INFO item is made.

The EDIT Menu will reappear.

Note: Navigation information can have a maximum of 256 points plotted.
Note that the value of REMAIN POINTS (the number of points that can be still plotted) is decreased whenever lines and marks are plotted.

3 CORRECT (Correct one position of navigational information)

Procedures **1 Press 3 .**

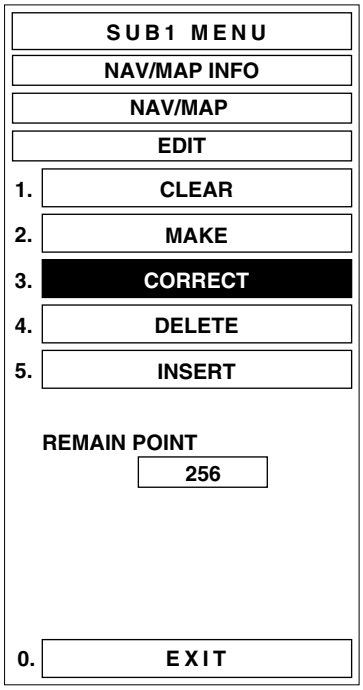
3. CORRECT will be selected. CORRECT will appear in the CURSOR ( ) at the upper right of the radar display.

2 Move the cross cursor mark to any line element or mark to correct using the trackball, and click the trackball section left button.

A dotted-line starting from the line or mark will be drawn as the cross cursor moves.

3 Move the cross cursor to the point to correct using the trackball, and click the trackball section left button.

One element of the line or the mark will be moved.



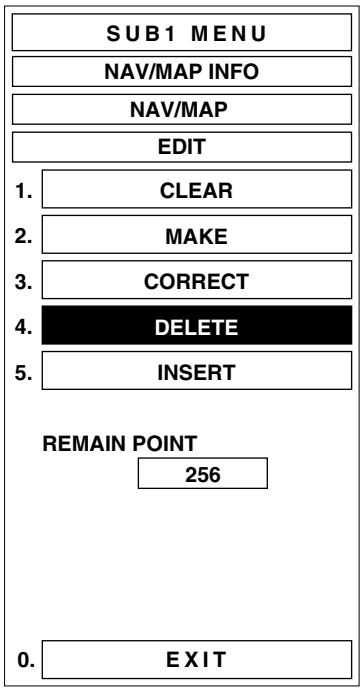
4 DELETE (Delete one point in navigational information)

Procedures **1 Press 4 .**

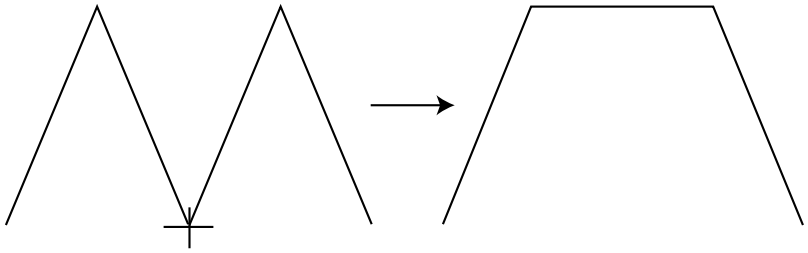
4. DELETE will be selected. NAV DEL will appear in the CURSOR ( ) at the upper right of the radar display.

2 Move the cross cursor mark to any line element or mark to delete using the trackball, and click the trackball section left button.

One element of the line or the mark will be deleted.



(Example)



5 INSERT (Insert one element of NAV line, Coast line or Depth Contour)

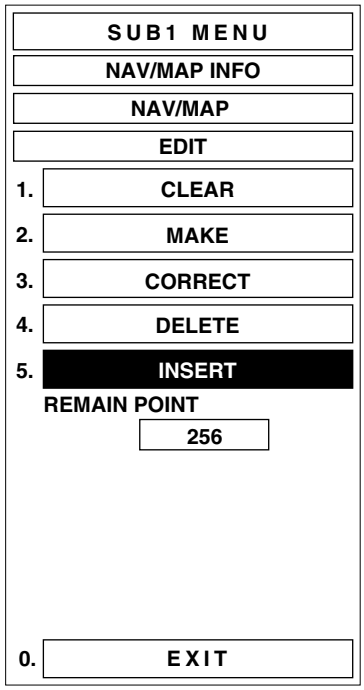
Procedures **1 Press** (5) .

5. INSERT will be selected. NAV INS will appear in the CURSOR ( ) at the upper right of the radar display.

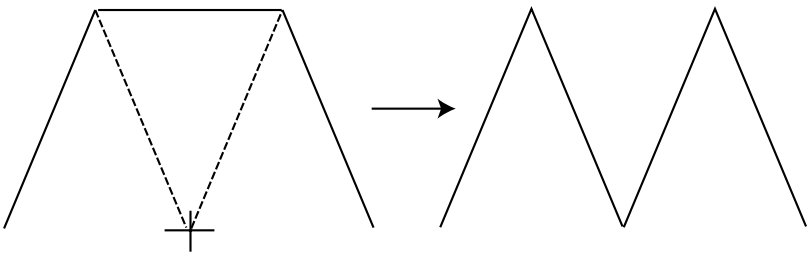
2 Move the cross cursor mark to any line element to which another element is to add, using the trackball, and click the trackball section left button.

3 Move the cross cursor to the point at which another line element is to be inserted, using the trackball, and click the trackball section left button.

One line element will be inserted.



(Example)



6 EXIT (End making and editing navigational information)

Exit

1 Press (0) .

The NAV/MAP Menu will reappear.

2 Press (0) .

The NAV/MAP INFO Menu will reappear.

3 Press (0) .

The Sub1 Menu will reappear.

4 Press (0) .

The Sub1 Menu will be closed.

[Ⅳ] Setting Navigational Information

Procedures

1 Press [MENU] .

The Main Menu will appear.

2 Press (8) .

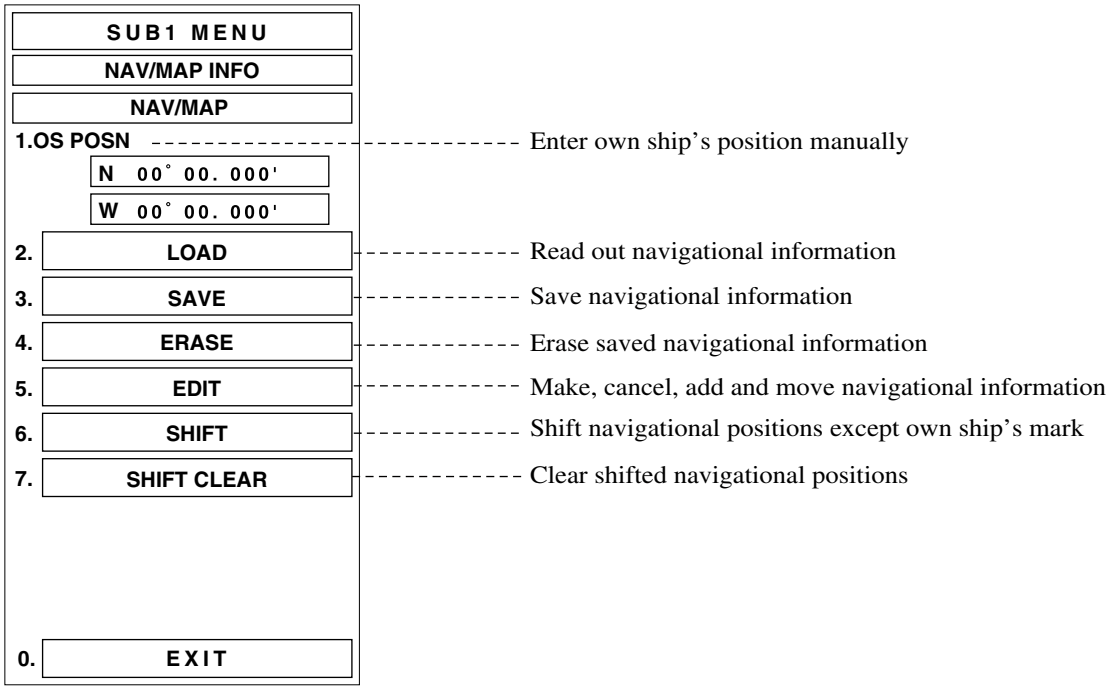
The Sub1 Menu will appear.

3 Press (3) .

The NAV/MAP INFO Menu will appear.

4 Press (3) .

The NAV/MAP Menu will appear.



1 OS POSN (Enter own ship's position manually)

Set this function to use the navigational information at any other position than own ship's position.

Procedures

1 Press (1) .

1.OS POSN will be selected.

2 Press (–) **or** (+) .

N (north latitude) or S (south latitude) will be selected.

3 Enter a latitude value (XX°XXX.XX') using any of (0) **to** (9) .

4 Press (ENT) .

The latitude value entered manually will be set up.

5 Press (–) **or** (+) .

E (east longitude) or W (west longitude) will be selected.

6 Enter a longitude value (XXX°XX.XX') using any of (0) **to** (9) .

7 Press (ENT) .

The longitude value entered manually will be set up.

Note: The own ship's position entered manually is effective only in the NAV/MAP INFO Menu.

2 Select Equipment to Load the Read-out Navigational Information

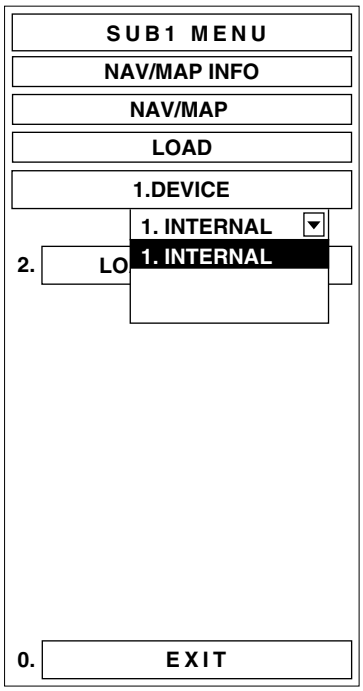
In the case that any electronic positioning equipment such as GPS is connected to the system, or that own ship's position is entered manually, the data can be read out.

Procedures **1 Press** (2) .

The LOAD Menu will appear.

2 Press (1) .

1.DEVICE will be selected and the pull-down menu will appear.



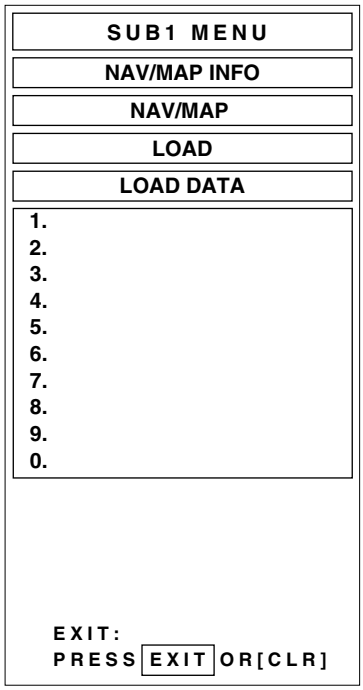
3 Readout Navigational Information Display (Radar Internal Data)

Only when navigational equipment is connected to the system or when own ship's position is entered manually, the readout files can be selected. The selecting method is different depending upon the type of device to load the readout data.

When Setting DEVICE to INTERNAL

Procedures **1 Press** (2) **.**

The LOAD DATA Menu will appear.



2 Press any of (0) to (9) to select any navigational information item assigned by any number of 0 to 9.

3 Press (1) (YES) to the question "FILE LOAD OK?" if the file name is right.

The selected number of navigational information will be read out.

To cancel file loading, press (2) (NO).

4 The selected file name will appear at the lower right of the radar display.

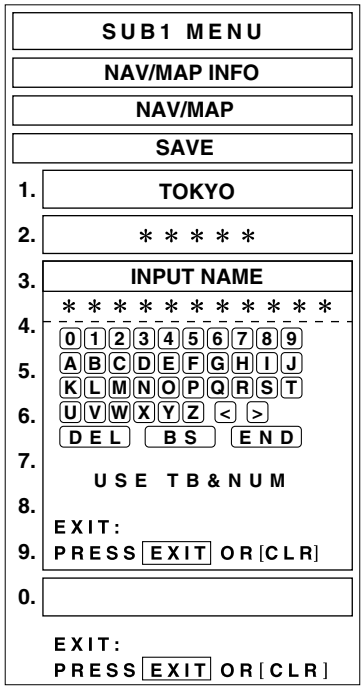
4 SAVE (Save navigational information)

In the case that any electronic navigation equipment is connected to the system, or that own ship's position is entered manually, the data can be saved.

Procedures

1 Press 3 .

The SAVE Menu will appear.



2 Press any of 0 to 9 to save the navigational information item assigned by any number 1 to 0 (10).

The INPUT NAME Menu will appear and the selected number to save will be set up.

3 Select any alphanumeric character of A to Z on the Menu using the trackball, and click the trackball section left button to enter one character of the name to save, or press any of 0 to 9 to enter one numeric character.

A maximum of 10 characters can be entered.

4 Repeat step 3 until the name to save is made up, and select "END" in INPUT NAME Menu by using the trackball and click the trackball section left button.

The currently displayed navigational information will be saved.

5 ERASE (Erase saved navigational information)

Procedures **1 Press 4 .**

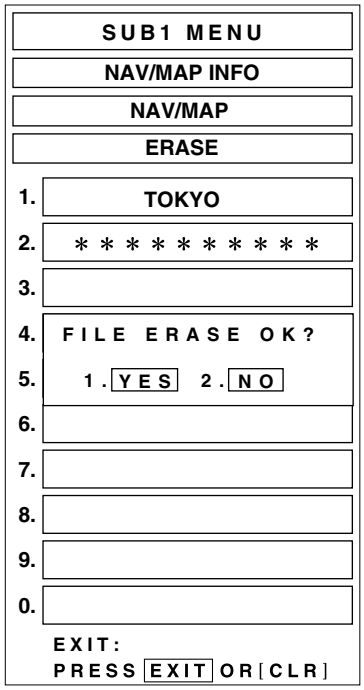
The ERASE Menu will appear.

2 Press any of 0 to 9 to erase any navigational information item assigned by any number of 1 to 0 (10).

3 Press 1 (YES) to the question "FILE ERASE OK?" to erase the information.

The selected number of navigational information will be erased.

Press 2 (NO) to stop erasing the information.



6 SHIFT (Shift navigational positions except own ship's mark)

The position of any navigational information such as NAV lines, coast lines, depth contours, and other marks except own ship's mark can be corrected manually.

Procedures **1 Press 6 .**

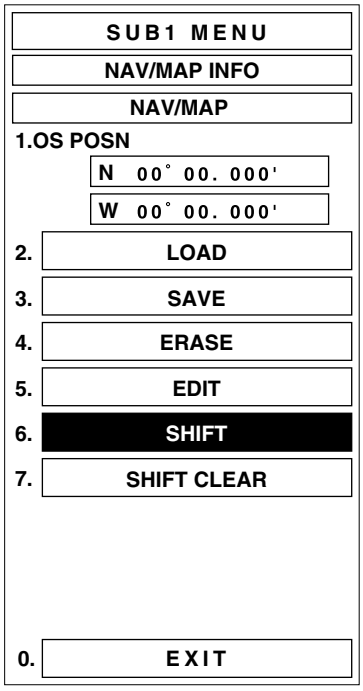
6. SHIFT will be selected. NAV SHIFT will appear in the CURSOR ( ) at the upper right of the radar display.

2 Move the cross cursor mark to an element of a line such as NAV line, coast line, depth contour line, or a mark using the trackball.

3 Click the trackball section left button.

A line or mark to correct will be set up.

4 Move the cross cursor mark to any point to which a line or mark will be shifted, using the trackball.



5 Click the trackball section left button.

The point to which a line or mark is to be shifted will be set up, and all lines and marks will be shifted.

7 SHIFT CLEAR (Clear the corrected positions of navigation information)

Procedures **1 Press** (7) .

7. SHIFT CLEAR will be selected.

The latest correction to navigation information (only one correction) will be cleared.

Note: Only the latest correction is cleared and the previous navigation information is restored.
The information cannot be further restored.

8 EXIT (Exit from setting of navigational information)

Exit **1 Press** (0) .

The NAV/MAP INFO Menu will reappear.

2 Press (0) .

The Sub1 Menu will reappear.

3 Press (0) .

The Sub1 Menu will be closed.

[V] Setup and Display of Geodetic System

In making up any navigational information, it is necessary to set up the geodetic system used by the connected navigation equipment. When any saved navigational information is loaded, the geodetic system used when the navigational information was saved will also be displayed. Then, check that the geodetic system on display is the same as that for the connected navigation equipment. If both geodetic systems are different, the positions of the navigational information on radar display may be deviated. Therefore, it is important to set the same geodetic system as the navigation equipment.

Exit

1 Press MENU .

The Main Menu will appear.

2 Press 8 .

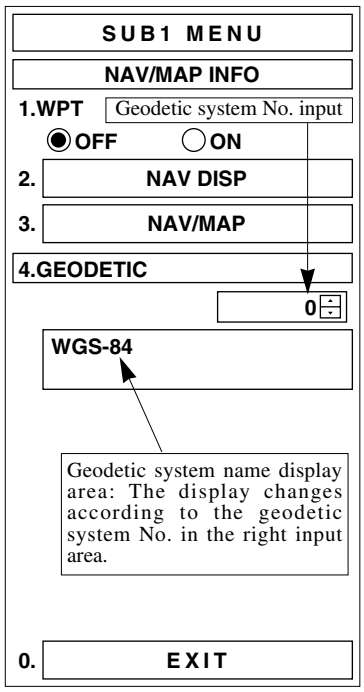
The Sub1 Menu will appear.

3 Press 3 .

The NAV/MAP INFO Menu will appear.

4 Press 4 .

4.GEODETIC will be selected.



5 Select the number of geodetic system using any of + **and** − **or**

0 **to** 9 **. (See Table of Geodetic Systems)**

When the number of geodetic system is entered, its name is changed.

6 Press ENT .

The selected geodetic system will be set up.

Exit

1 Press 0 .

The Sub1 Menu will reappear.

2 Press 0 .

The Sub1 Menu will be closed.

TABLE OF GEODETIC SYSTEMS

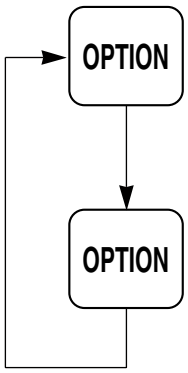
No.	NAME	REPRESENTATION
0	WGS-84	WGS-84
1	WGS-72	WGS-72
2	Japan	Japan
3	North American 1927 (U.S)	1927 North America
4	North American 1927 (Canada & Alaska)	1927 Canada, Araska
5	European 1950 (Europe)	European 1950
6	Australian geodetic 1966 (Australia)	Austrarian geodetic 1966
7	Ordnance Survey of Great Britain (England)	UK
8	NAD-83	NAD-83
9		no use
10		no use
11	ADINDAN (Ethiopia & Sudan)	ADINDAN
12	ARC 1950 (Botswana)	ARC 1950
13	AUSTRALIAN GEODETIC 1984 (Australia)	AUSTRALIAN GEODETIC 1984
14	BERMUDA 1957 (the Bermudas)	BERMUDA 1957
15	BOGOTA OBSERVATORY (Columbia)	BOGOTA OBSERVATORY
16	CAMPO INCHAUSPE (Argentine)	CAMPO INCHAUSPE
17	CHATHAM 1971 (Chatham Island)	CHATHAM 1971
18	CHUA ASTRO (Paraguay)	CHUA ASTRO
19	CORREGO ALEGRE (Brazil)	CORREGO ALEGRE
20	DJAKARTA (VATAVIA) (Sumatra)	DJAKARTA
21	EUROPEAN 1979 (Europe)	EUROPEAN 1979
22	GEODETIC DATUM 1949 (New Zealand)	GEODETIC DATUM 1949
23	GUAM 1963 (Guam)	GUAM 1963
24	HAYFORD 1910 (Finland)	HAYFORD 1910
25	HJORSEY 1955 (Iceland)	HJORSEY 1955
26	INDIAN (India & Nepal)	INDIAN
27	IRELAND 1965 (Ireland)	IRELAND 1965
28	KERTAU 1948 (West Malaysia)	KERTAU 1948
29	L.C.5 ASTRO (Cayman Black Island)	L.C.5 ASTRO
30	LIBERIA 1964 (Liberia)	LIBERIA 1964
31	LUZON (Philippines)	LUZON
32	MERCHICH (Morocco)	MERCHICH
33	MINNA (Cameroon)	MINNA
34	NAHRWAN (Oman)	NAHRWAN
35	NAPARIMA, BWI (Trinidad and Tobago)	NAPARIMA, BWI
36	OLD EGYPTIAN (egypt)	OLD EGYPTIAN
37	OLD HAWAIIAN (the Hawaii Islands)	OLD HAWAIIAN
38	PICO DE LAS NIEVES (the Canary Islands)	PICO DE LAS NIEVES
39	PROVISIONAL SOUTH AMERICAN 1956 (South America)	PROVISIONAL S-AMERICAN 1956
40	PROVISIONAL SOUTH CHILEAN 1963 (Southern Chile)	PROVISIONAL S-CHILEAN 1963
41	PUERTO RICO (Puerto Rico and Virgin Islands)	PUERTO RICO
42	QORNOQ (South Greenland)	QORNOQ
43	RT90 (Sweden)	RT90
44	SANTA BRAZ (Sao Maguel, santa Maria Islands)	SANTA BRAZ
45	SOUTH AMERICAN 1969 (South America)	SOUTH AMERICAN 1969
46	SOUTHWEST BASE (Faial,Graciosa,Pico.Sao Jorge and terceira Islands)	SOUTHWEST BASE
47	TIMBALAI 1948 (Brunei and East Malaysia)	TIMBALAI 1948

.....Function of OPTION Switch .....

In the initial setting, the vector length maximum ON/OFF is registered.
These funcions can be changed only by service personnel.

Functions Registerable in Option Switch:

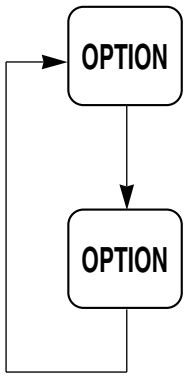
① Vector Length Maximum: ON/OFF



ON: Vector length 60 min (max.)

OFF: Vector length Time set on VECTOR TIME Menu.

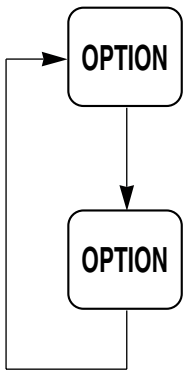
② NAV/MAP INFO Menu: ON/OFF



ON: The NAV/MAP INFO Menu will appear.

OFF: The NAV/MAP INFO Menu will be closed.

③ Parallel Index Line Display: ON/OFF



ON: The parallel index lines set on the PI Menu will appear on the radar display.

OFF: The displayed parallel index lines will be cleared.

……Operation of Performance Monitor……

This function can be used only when the radar equipment is equipped with the NJU-63/64 Performance Monitor.

1 Method of Operation

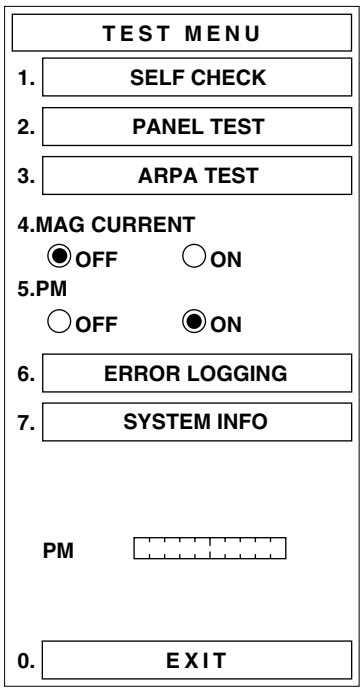
In the case that the equipment is provided with a radar interswitch, the interswitch shall be set to the Master Radar mode.

Procedures **1 Press** **TEST** .

The TEST Menu will appear.

2 Press **5** .

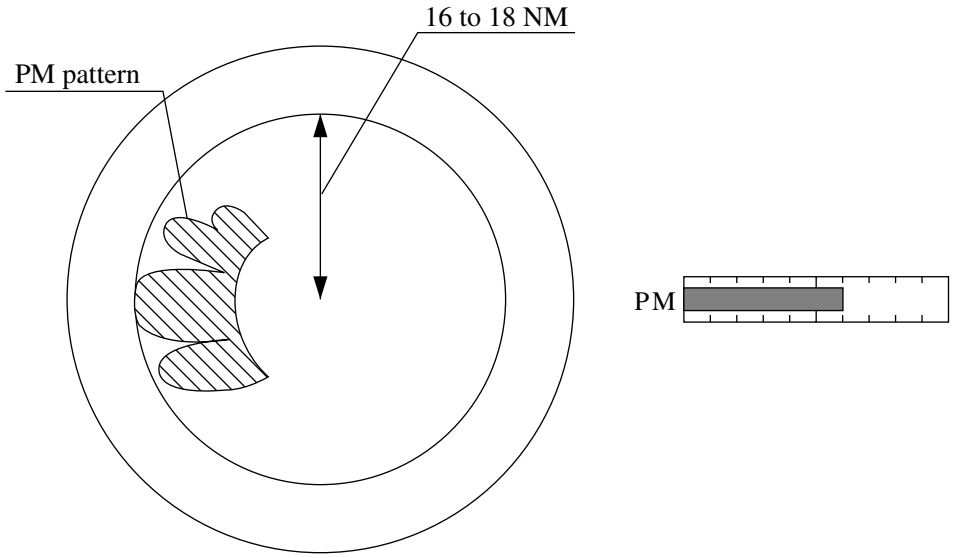
"ON" in "5.PM" will be set and the radar will automatically be set to RM, OFF CENTER OFF, IR OFF, PROCESS OFF, TGT ENH OFF, FUNCTION OFF and 24 NM range. The PM pattern for checking the receiving system will appear and the [PM] indicator bar-graph will also be in the TEST Menu to be used for checking the transmitted power.



Exit **1 Press** **0** .

The TEST Menu will be closed.

Note: All target acquisitions by ARPA functions will be cancelled.
The target acquisition cancelled when PM is ON will not be recovered.
The radar image is suppressed to make the PM image easy to see.
So, the test menu should be always closed after the PM has been checked.



2 Checking Transmitter System

The [PM] indicator bar-graph in the TEST Menu indicates the value corresponding to the transmitted output power. If the indicated value becomes extremely short against the bar length checked at the initial time, it is necessary to request for checking the transmitter system by a service engineer.

Procedures of Checking

① Read a current value A on the bar indicator.
② Referring to the Calibration Curve I, obtain a relative attenuation d (B) for the initial bar indicator length B that is specified in the INFORMATION LABEL.
③ Then, obtain a relative attenuation d (A) for the value A referring to the Calibration Curve I. The value given by d (A) – d (B) represents the attenuation of the current transmitted output power compared with the value at the initial time.
④ If the attenuation value given by d (A) – d (B) is 10 dB or more (due to the life of the magnetron), it is necessary to request for checking the transmitter system by a service engineer.

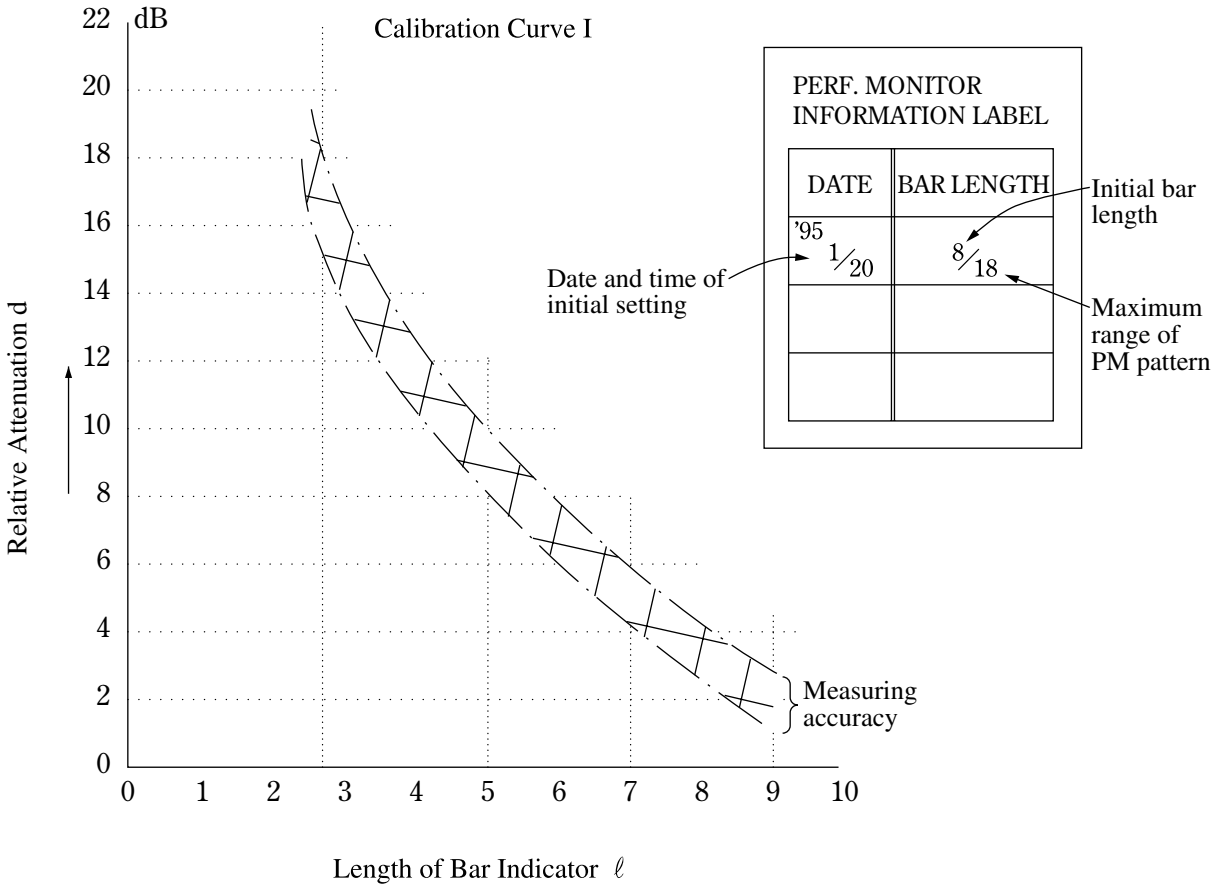
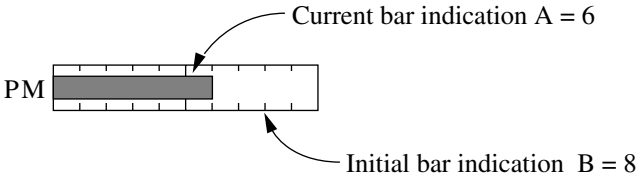


Fig.1

Example

Assuming that the initial bar indication is B = 8 and the current bar indication A = 6, the relative attenuation is d (B) = 3.5 dB, d (A) = 7 dB. Thus, d (A) – d (B) = 3.5 dB.
From this, it is clear that the current transmitted output power is attenuated by approx. 3.5 dB.

Example of Checking Transmitting System



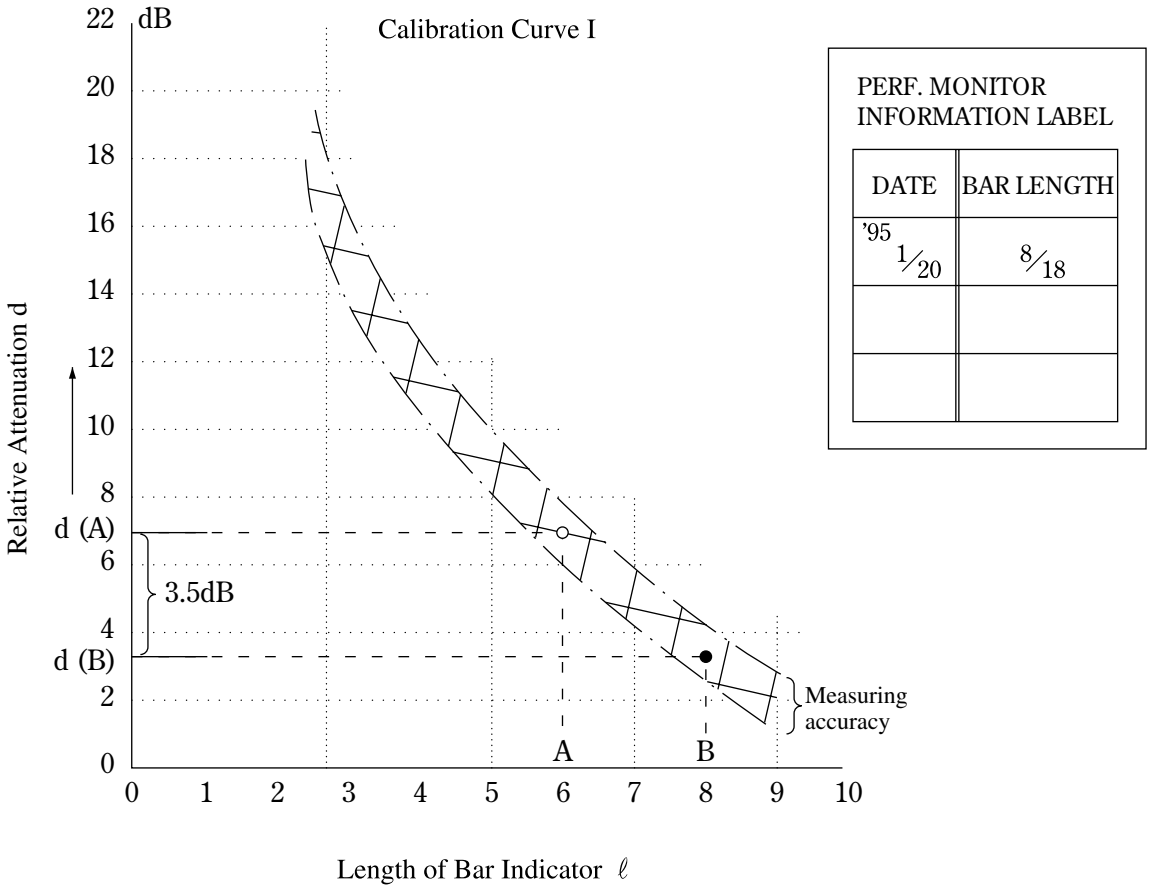


Fig.2

3 Checking Receiver System

The maximum range of the PM pattern on display indicates a fall of the sensitivity of the receiver system.

Procedures of Checking

① Measure the maximum range rmax from the PPI center to the PM pattern on display using a VRM (Variable Range Marker).
② Obtain a fall of sensitivity R (rmax) to the maximum range rmax referring to the Calibration Curve II.

The value R (rmax) represents a current sensitivity fall in the receiver system.

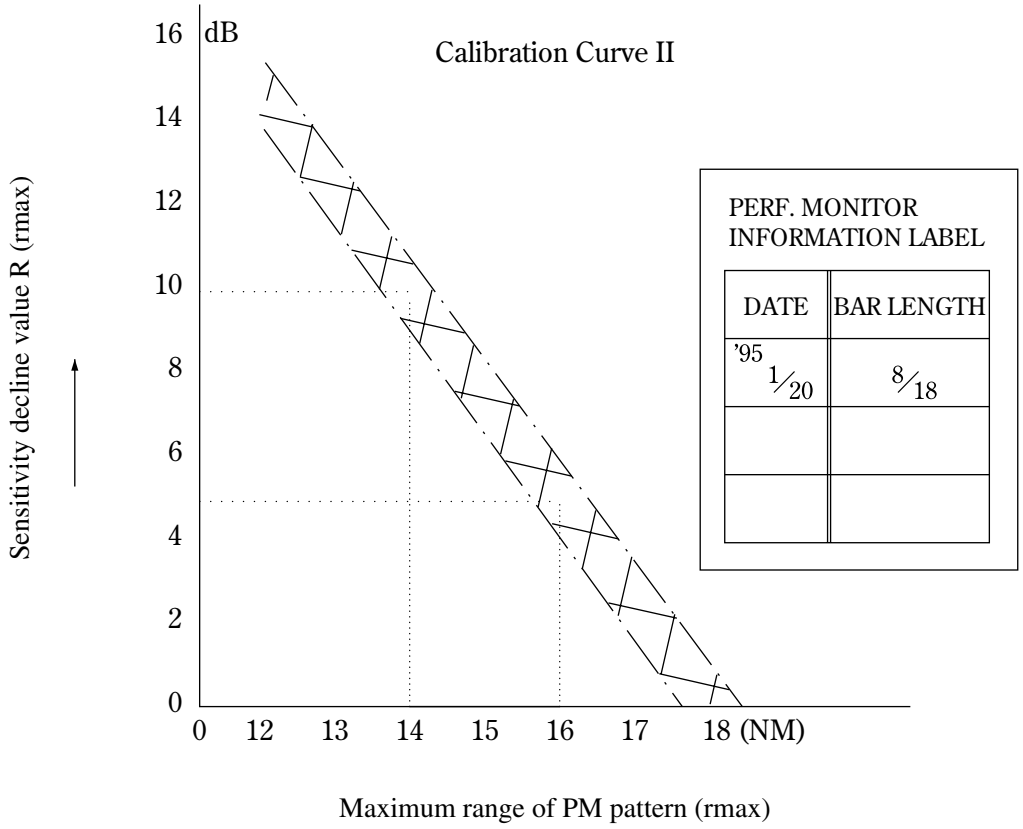
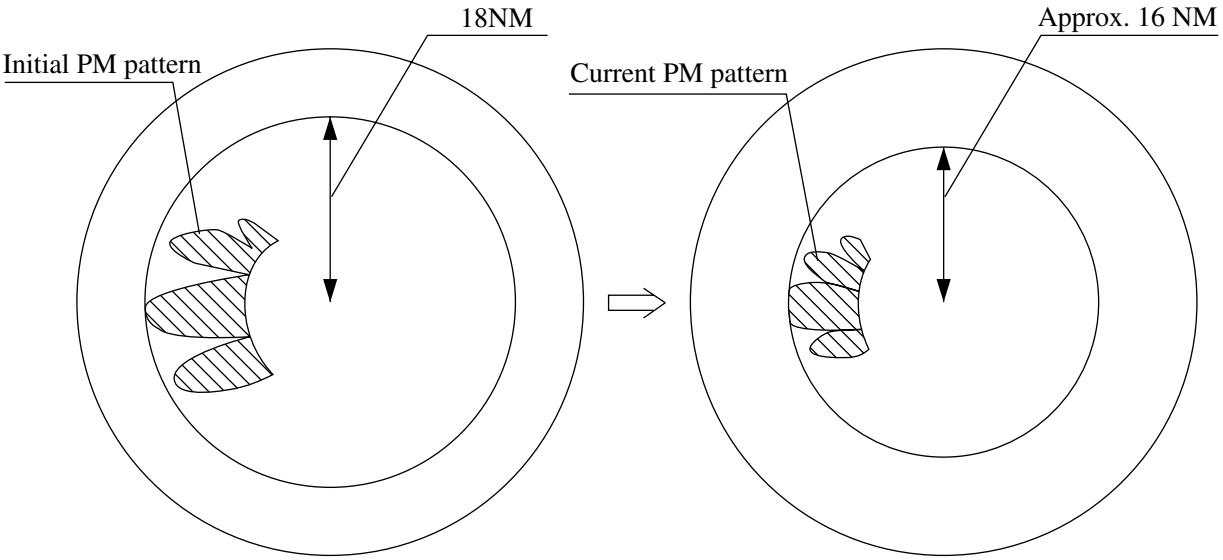


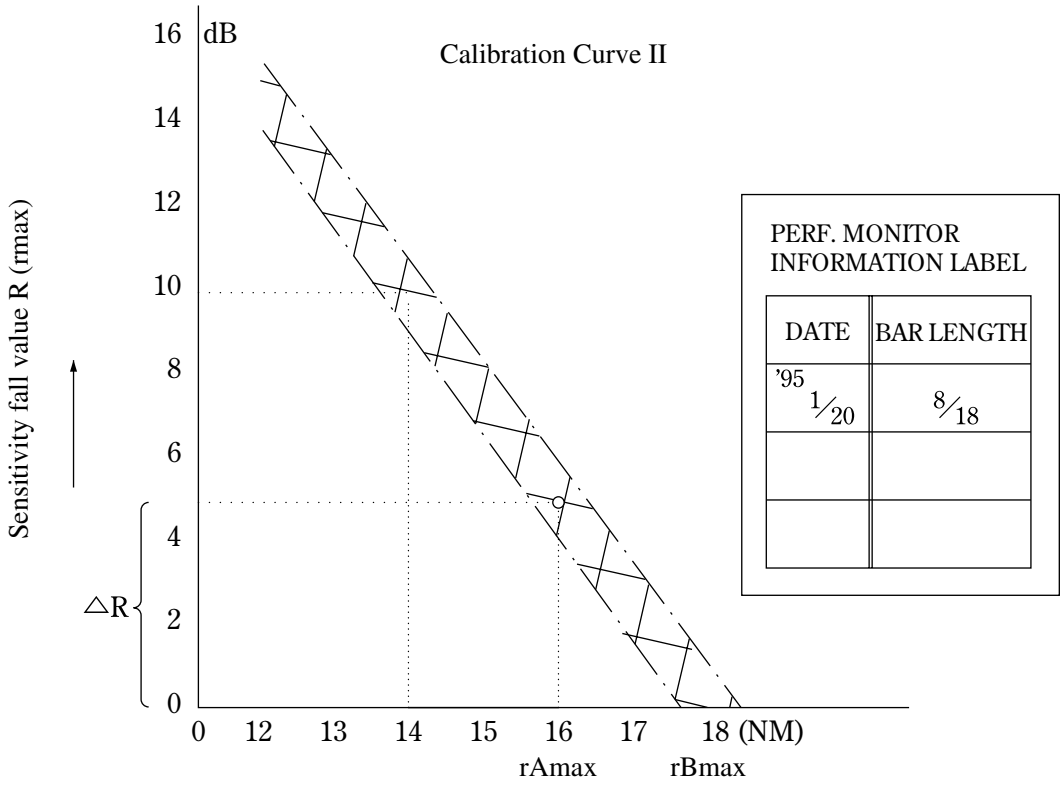
Fig. 3

Example

Assuming that the maximum range of the initial PM pattern is rBmax = 18 NM according to the INFORMATION LABEL, and if that of the current PM pattern is rAmax = 16 NM, the fall value is −R (rmax) = 5 dB, referring to Calibration Curve II.
This means that the receiving system has a sensitivity fall of approx. 5 dB.

Example of Checking Receiption System



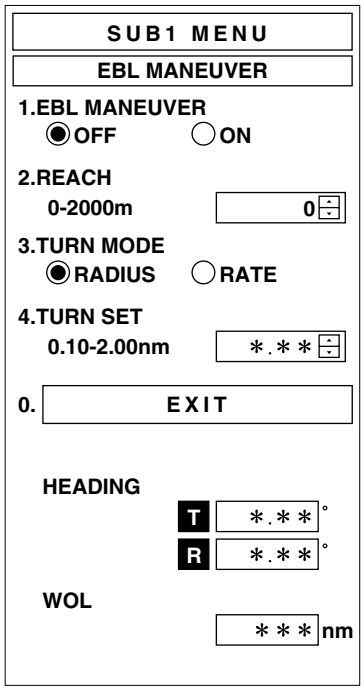


PM pattern maximum range (rmax)

Fig. 4

.....EBL Maneuvering .....

Menu Composition



[I] Initial Setting

Procedures **1 Press** MENU **, then** 8 **and** 8 **.**

The EBL MANEUBER Menu will appear.

2 Press 2 **.**

2.REACH will be selected.

3 Enter the value of reach using any of 0 **to** 9 **.**

4 Press ENT **to fix the value.**

5 Press (3) .

3.TURN MODE will be selected.

Select any turn mode.
RADIUS: Constant turn diameter (NM)
RATE: Constant turn speed (deg/min)

6 Press (4) .

4.TURN SET will be selected.

7 Enter any value of turn using any of (0) to (9) .

The unit is different in the turn modes in step 5.

8 Press (ENT) to fix the turn mode.

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

[Ⅱ] Creating Maneuver Curve

Procedures **1 Press** MENU **, then** 8 **and** 8 **.**

The EBL MANEUVER Menu will appear.

2 Press 1 **.**

"ON" in "1.EBL MANEUBER" will be set and a supplemental line, a maneuver curve and WOL will appear on the radar display.

3 Set the starting point of the supplemental line using the trackball and press ENT **to fix it.**

The position of WOL (steering point) will change depending upon the starting point of the supplemental line. If the WOL is behind own ship's position, the line color of the WOL will change.

4 Set the bearing of the supplemental line using the [EBL] control.

The bearing of the supplemental line will be the bearing in which own ship will finally move. The position of WOL will change depending upon the bearing of the supplemental line.
If WOL is behind own ship's position, the line color of the WOL will change.

5 Press ENT **.**

The setting will be established. However, if the WOL is behind own ship's position, the entry of ENT will be rejected and the setting will not be established.

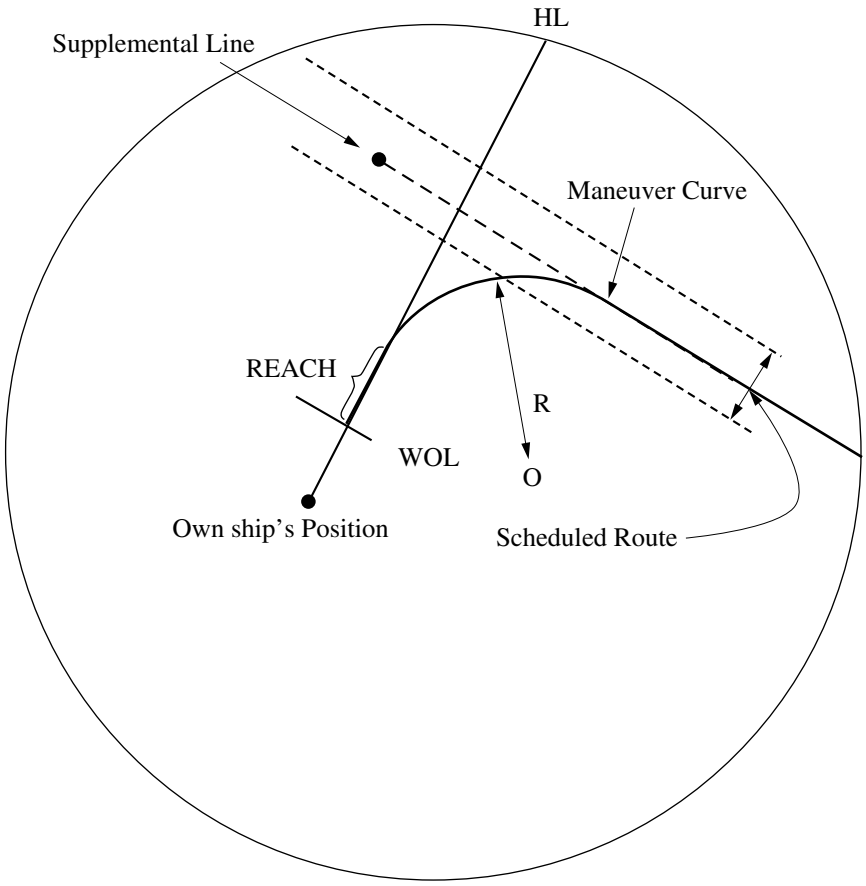
Note: If the [EBL] is pressed during the EBL MANEUVER operation, the Menu will be closed and the maneuver curve creating operation will be stopped.

Cancellation **1 Press** (1) .

"OFF" in "1.EBL MANEUVER" will be set and the EBL MANEUVER function will set to OFF.

Exit **1 Press** (0) .

The Sub1 Menu will be closed.



WOL : Steering point
REACH : Distance between when the wheel is steered and when the ship begins to turn
R : Turning radius

SECTION 4
MEASUREMENT OF RANGE AND BEARING

.....Measurement by Trackball .....

Procedures **1 Check the target echoes on the radar display.**

2 Move the cross cursor mark to a target by the trackball.

The ⌈CURSOR⌋ on the radar display indicates the bearing and range of the target. The range is a distance from own ship's position.

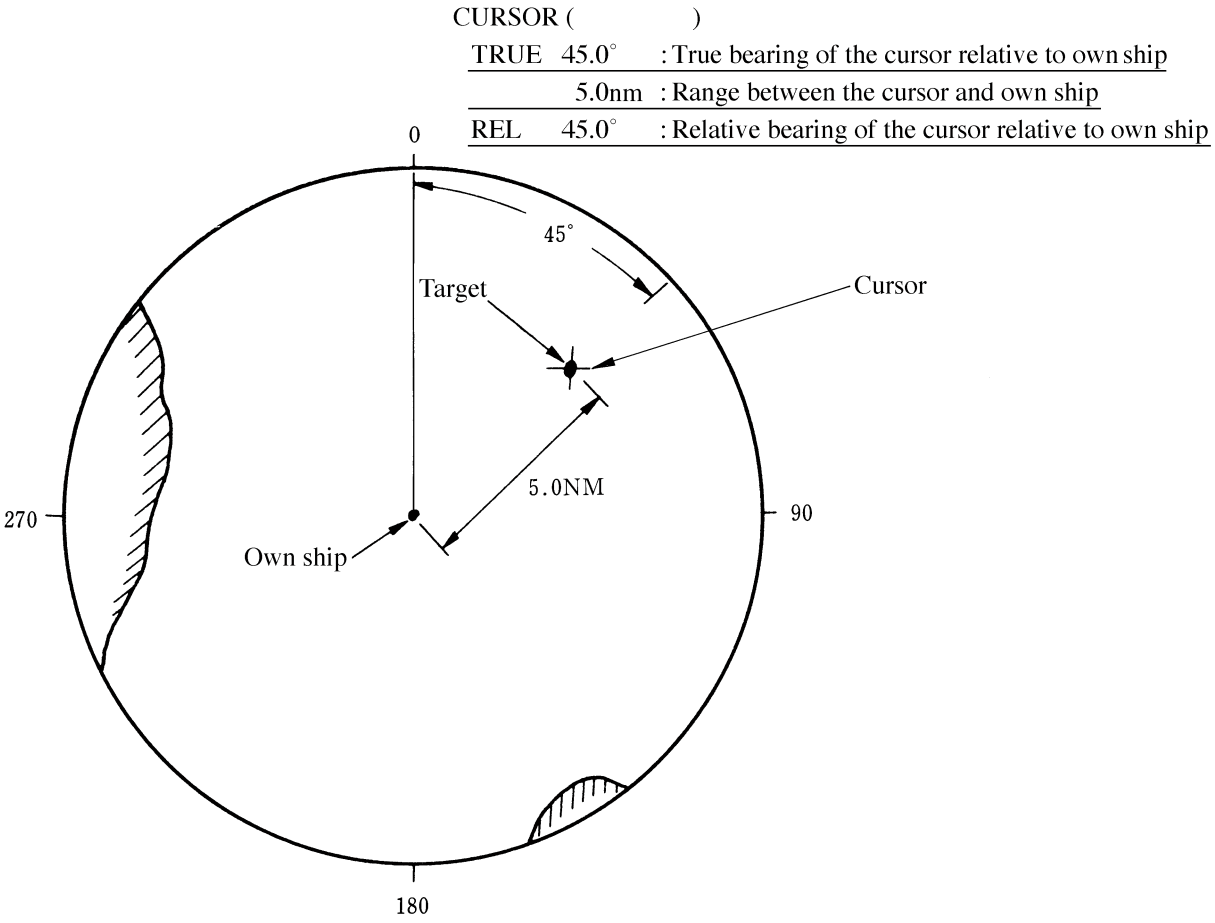


Fig.4.1

.....Measurement by Range Rings .....

Procedures **1 Press** RANGE RINGS .

The Range Rings will appear on the radar display.
The range between the target and own ships can be determined by visually measuring the target's position that lies between two range rings. (The range ring interval is fixed and indicated at the upper left of the radar display.)

.....Measurement by EBLs and VRMs .....

Procedures **1 Press** EBL1 **to select EBL1 display and operation.**

The "EBL1" indication at the lower right of the radar display will be selected and the EBL1 will appear as a broken-line on the PPI display.

2 Turn the [EBL] control to put EBL1 on a target.

The bearing of the EBL1 will appear at the lower right of the radar display. The EBL1 bearing represents the target's bearing.

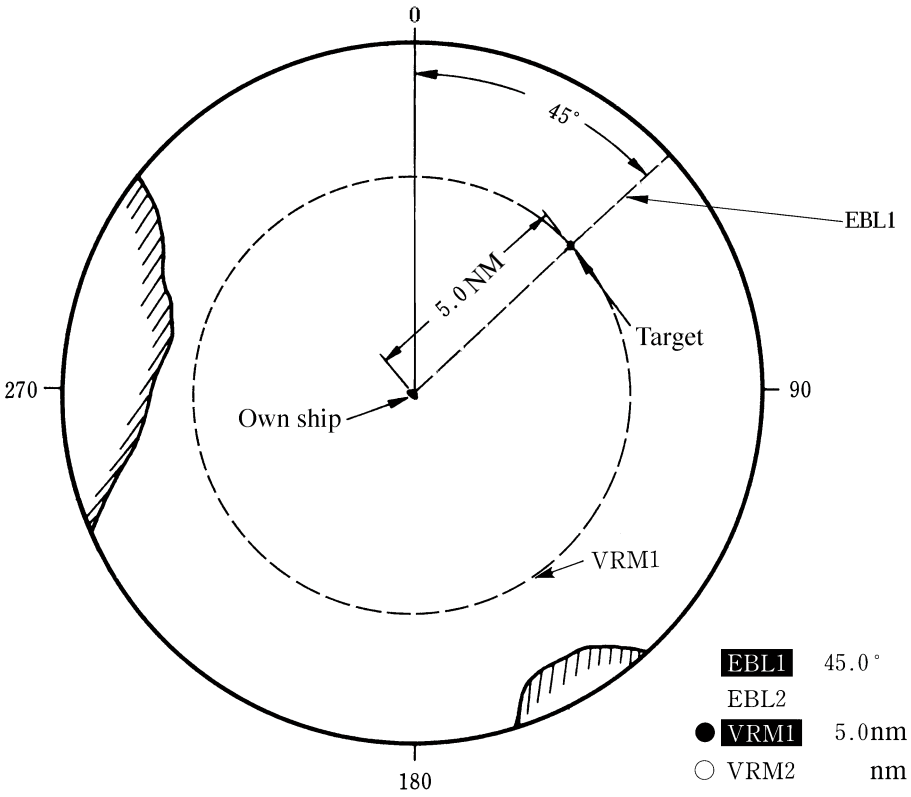
3 Press VRM1 **to select VRM1 display and operation.**

The "VRM1" indication at the lower right of the radar display will be selected and the VRM1 will appear as a broken-line circle on the PPI display.

4 Move the broken-line VRM1 to the target by using the trackball.

The range of the VRM1 from own ship will appear at the lower right of the radar display. The range of VRM1 signifies a distance between the target and own ship.

Refer to Fig.4.2 in the next page.
In this figure, the range and bearing are;
Range : 5.0nm
Bearing : 45.0˚


0
45°
EBL1
5.0NM
Target
270
90
Own ship
VRM1
180
EBL1 45.0°
EBL2
VRM1 5.0nm
VRM2 nm

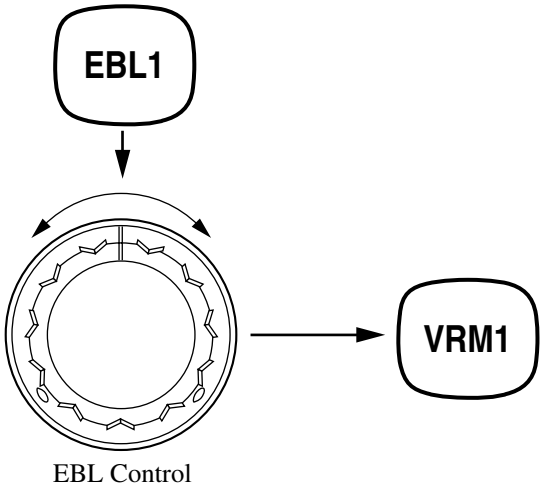

EBL1
VRM1
EBL Control

Fig.4.2

.....Measurement between Two Optional Points .....

The procedures of measuring the range and bearing between two optional points by using EBL2 will be described below.

Procedures **1 Press** EBL2 **to select EBL2 display and operation.**

The "EBL2" indication at the lower right of the radar display will be selected and the EBL2 will appear as a dotted-line on the PPI display.

2 Press MENU .

The Main Menu will appear.

3 Press 6 .

"OFFSET" in "6.EBL2" will be set.

4 Using the trackball, move the starting point of EBL2 to one (A) of the two points.
(See Fig.4.3.)
In this figure, the starting point of EBL2 is represented as the cross cursor mark.

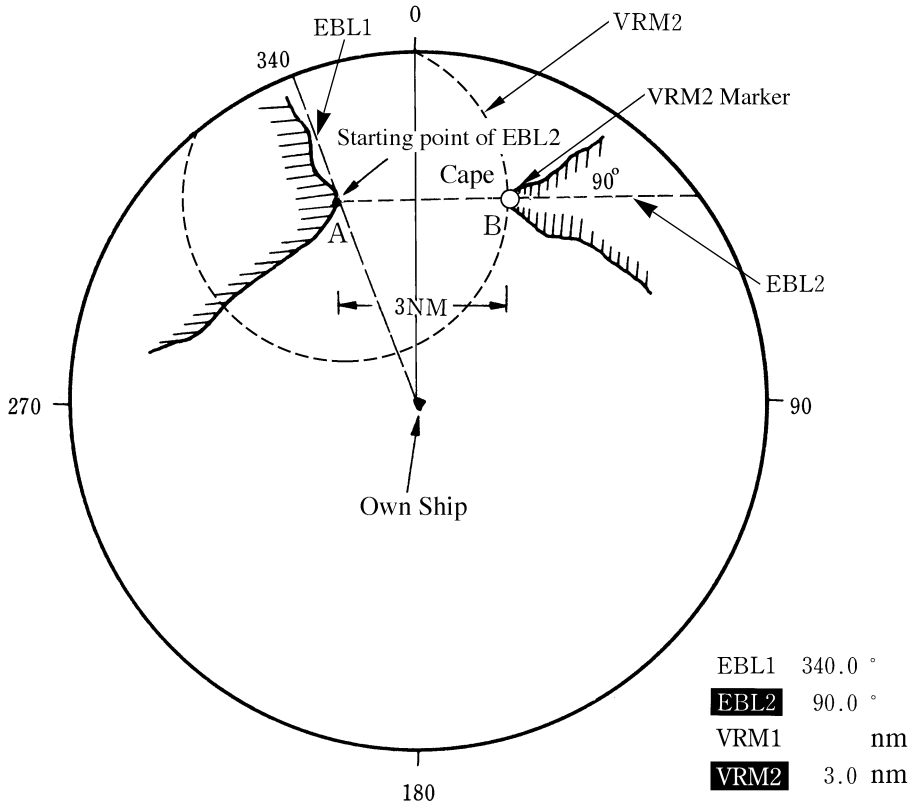
5 Turn the [EBL] control to move EBL2 to the other point (B).
(See Fig.4.3.)

6 Press VRM2 **to select VRM2 display and operation.**

○ (VRM marker) will appear on a dotted-line of the EBL2.

7 Using the trackball, move the VRM2 marker on a dotted-line of EBL2 to the point B.

The VRM2 marker ◯ moves away from the center of the display by turning the trackball clockwise, and closer to the center.
The bearing and range between the two points will appear in the “VRM2” and “EBL2” area on the lower right of the radar display.



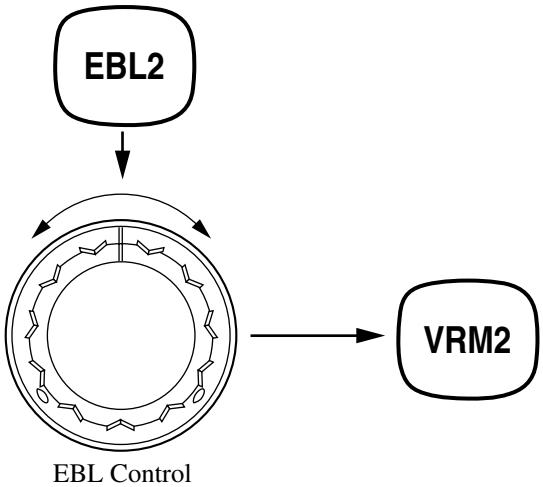


Fig.4.3

It is also possible to use EBL1 instead of EBL2 in measuring the bearing and range between two optional points. In the procedures above, change EBL2 into EBL1 and VRM2 into VRM1, and press **5** to select EBL1 in step 3.

SECTION 5
OPERATION OF ARPA

Attention

There are the following limitations on use of the target acquisition and tracking functions of ARPA:
Use these radar only as assisting device for navigation.
The final decision for navigation should made by the officer himself.

[Ⅰ] Resolution between adjacent targets and swapping during automatic tracking

Depending on the particular distance and echo size, resolution between adjacent targets during automatic tracking usually ranges somewhere between 0.03 to 0.05 nm. If multiple targets approach each other, resolution will become about 0.03 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 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. In such a case, radar gain must be reduced to suppress the noise.

[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] controls of the radar so that the target to be acquired and tracked is clearly displayed. Inappropriate settings of these controls reduce the reliability/accuracy of automatic tracking.

5.1 INITIAL SETTING

The procedures of initial setting in using the ARPA functions will be described below.

……Setting Collision Decision Criteria: SAFE LIMIT ……

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 5.7 "ALARM DISPLAY".)

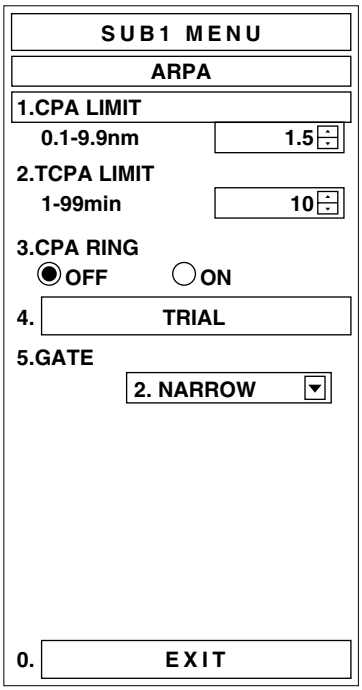
Set and check collision decision criteria before operating the ARPA system.

Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 8 **, then** 5 **.**

The ARPA Menu will appear.



3 Set CPA LIMIT (Closest Point of Approach).

(1) Press 1 .

1.CPA LIMIT will be selected.

(2) Enter a value using the ten-key.

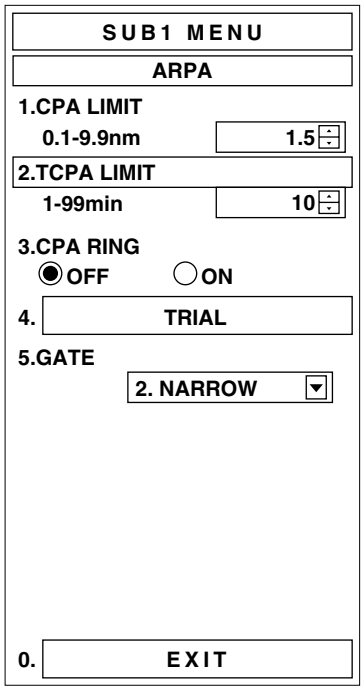
(3) Press ENT to set up the value entry.

4 Display the CPA LIMIT ring.

(1) Press **3** .

"ON" in "3.CPA RING" will be set and "CPA RING" will appear on the radar display.

(2) Should the CPA ring not appear, press **3** . "OFF" in "3.CPA RING" will be set.



Note: The CPA RING is not appear in the TRUE Vector mode.

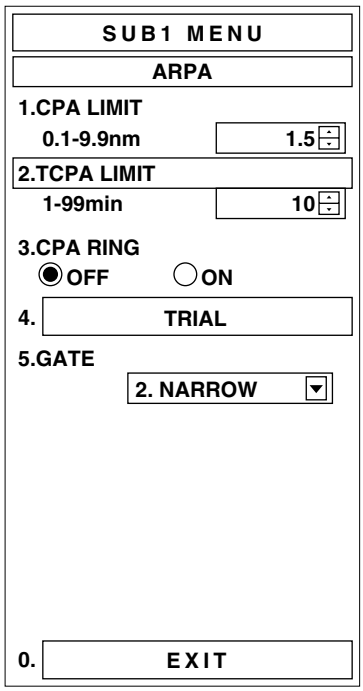
5 Set TCPA LIMIT (Time to CPA).

(1) Press **2** .

2.TCPA LIMIT will be selected.

(2) Enter a value using the ten-key.

(3) Press **ENT** to set up the value entry.



Exit

1 Press 0 .

The Sub1 Menu will reappear.

2 Press 0 .

The Sub1 Menu will be closed.

Note: The set values of CPA LIMIT/TCPA LIMIT will appear on the radar display.

.....Automatic Setting Mode (System Start) .....

The modes that are automatically set on the system start are shown in Table 5.1.

Table 5.1 Mode Setting on System Start

Mode	Initial Setting	Refer to Section
DISPLAY MODE	RM (relative motion)	3.4
ACQUIRE	AUTO OFF	5.3
TRIAL	OFF	5.7
GUARD ZONE	OFF	3.4 and 5.6

.....Setting Range Scale: RANGE SCALE .....

The ARPA functions can operate on all range scales. Usually, set any range scale in a range of 1.5 to 24 NM depending on the water area of operation.

Note: The range over which the target can be captured by the ARPA is from 0.1 to 32 NM.

.....Setting Own Ship's Speed .....

[I] When the LOG is not in operation (Manual Setting)

If the LOG is not in operation, set an estimated own ship's speed manually.

Procedures

1 Press MENU .

The Main Menu will appear.

2 Press 8 **, then** 1 .

The SETTING1 Menu will appear.

3 Press 2 .

2.SELECT SPEED will be set and pull-down menu will appear.

4 Press 1 .

1. MANUAL will be set.

5 Press 3 .

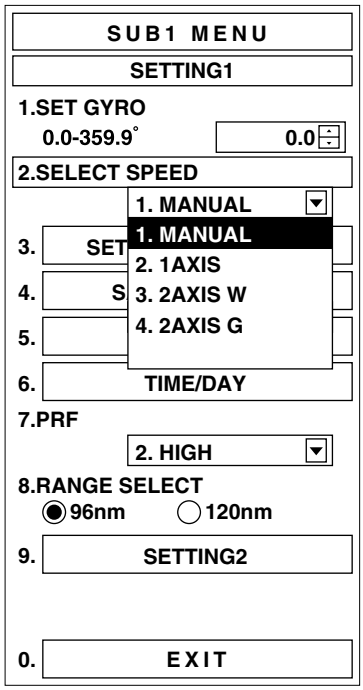
3. SET MANUAL SPEED will be selected.

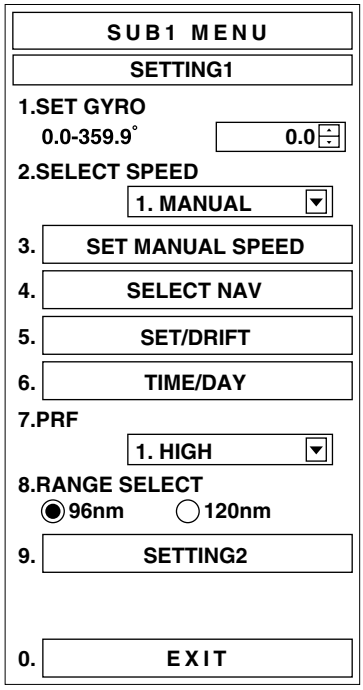
6 Enter a value of own ship's speed from any of ten-key

or + **and** − .

7 Press ENT .

Own ship's speed will be set.





Exit

1 Press (0) .

The Sub1 Menu will reappear.

2 Press (0) .

The Sub1 Menu will be closed.

[Ⅱ] When the LOG is operating

Attention

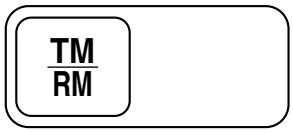
● Make sure that the speed readout of own ship is correctly displayed.
If it not correct some problem will occurred at speed inputs.
Without correct own speed input, ARPA will not function correctly.

When the ARPA system is set to the LOG mode, speed signal will be automatically entered and the own ship's speed will appear on the radar display.

Select the following from the SELECT SPEED Menu:
1AXIS ·····1-axis log
2AXIS W·····2-axis log Speed against water
2AXIS G ·····2-axis log Speed against the ground

5.2 DISPLAY MODE SETTING

.....Setting Motion Display Mode【TM/RM】.....

Press 

to select the true motion (TM) display mode or the relative motion (RM) display mode. In the initial state, the mode is set to RM.

Note

● For further details of the TM/RM mode, refer to section 3.4 “Select True/Relative Motion Display Mode”.

.....Setting Bearing Display Mode【AZI MODE】.....

Press 

to set the bearing display mode.

Note

● For further details of the AZI MODE, refer to section 3.4 “Select Bearing Display Mode”.

5.3 TARGET ID No. DISPLAY

The target ID No. is a number displayed next to the capture symbol when a target ship is captured.
This number is allocated to target ships from No.1 to No.50 in the order that they are captured.
This number is used to identify each target ship until the target ship is lost or released from capture.

Note: Whether the Target ID No. Display is turned ON or OFF can be checked only with the target captured. For a description of capture, refer to "5.4 TARGET AQUISITION."

Depress TGT DATA to turn the Target ID No. Display ON or OFF.

With this display ON, the target ID No. is displayed next to the capture symbol.
With this display OFF, all the target ID Nos. are non-displayed.
However, the numbers remain displayed for captured targets of which numeric data display is specified.

Note

● For a description of how to specify numeric data display, refer to "5.6 DATA DISPLAY".

5.4 TARGET ACQUISITION

Attention

● It is important to adjust the controls [SEA] and [GAIN] properly in the automatic target acquisition mode to minimize sea clutter returns acquired falsely.

Target acquisition can be performed on two modes, AUTO and MANUAL, and both modes can be used at the same time.

.....Automatic Acquisition【AUTO】.....

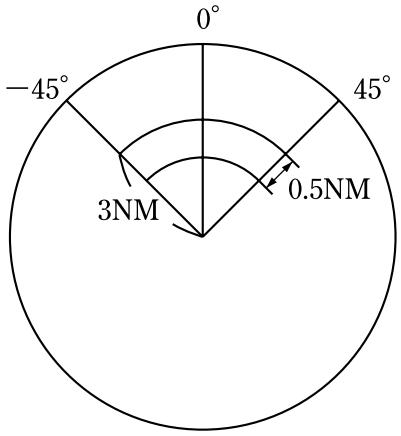
Attention

● If untracked targets intrude into the guard zone in the conditions that the maximum number of targets (50 targets) are under tracking, the targets acquired automatically will be cancelled in the order of lower levels of danger.

Procedures **1 Press** **ACQ AUTO** .

The automatic target acquisition will start. The target acquired will be marked with "▽" and its target ID No., which will move with the target. Its vector will appear within one minute.

Note: When Target ID No. Display is set to OFF, any captured target ship will not be attached with its target ID No.

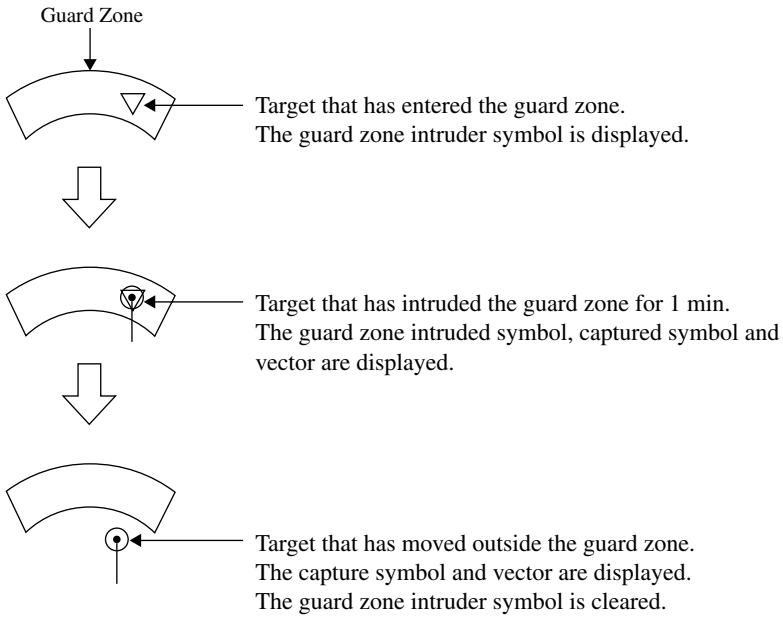


In the ACQ AUTO mode, the targets within a guard zone will be acquired automatically. The guard zone can be set arbitrarily. If a guard zone is not set, a guard zone of 3 NM and ±45° in the direction of own ship will be set. (Guard Zone 1: heading direction, Guard Zone 2: sternward direction)

For the setting method, refer to section 3.4 "Set Guard Zones".

When the guard zone is set, it will be ON by pressing ACQ AUTO.

Press ACQ AUTO again, and the automatic acquisition mode will be set to OFF and the guard zone will disappear from the radar display. However, the target ships that have been acquired automatically will be tracked continuously.



.....Manual Acquisition【MANUAL】.....

Attention

● If more targets is acquired manually in the condition that the maximum number of targets (50 targets) are under tracking, the targets under tracking will be cancelled in the order of lower level of danger in order to track the manually acquired targets.

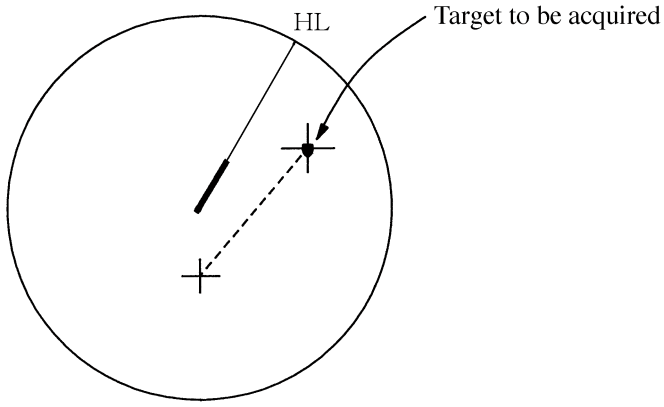
Procedures **1 Press** ACQ MANUAL .

2 Adjust the cross cursor onto the target to be acquired and press the trackball section left button or ENT .

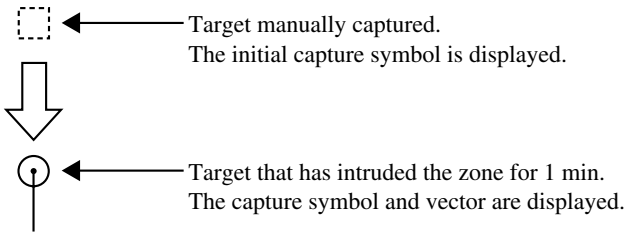
The target acquired will be marked with "⬚" and its target ID No. Its vector will appear within one minute.

Note: When Target ID No. Display is set to OFF, any captured target ship will not be attached with its target ID No.

Number of Targets and Acquisition Area



In using the manual acquisition mode only, but not together with the automatic mode, the press ACQ AUTO and the Automatic Acquisition mode to OFF.



……Use of Automatic and Manual Acquisition Modes 【ACQ AUTO】/【ACQ MANUAL】……

Method of Operation

Execute manual target acquisition in the automatic acquisition mode, that is, in the condition that the Automatic Acquisition mode is ON.

Use of Combined Auto/Manual Mode

In operation in both automatic and manual acquisition modes, the targets to which the operator has to pay special attention shall be acquired manually and other targets shall be acquired automatically. If new targets are acquired manually in excess of the maximum number of targets, the targets acquired manually will continue to appear on the display until they moves away from the display edge, but the targets acquired automatically will disappear in the order of more safety target.

5.5 ARPA DATA DISPLAY

(Refer to Example of Display in page 2-1.)

.....Display of Vectors .....

Attention

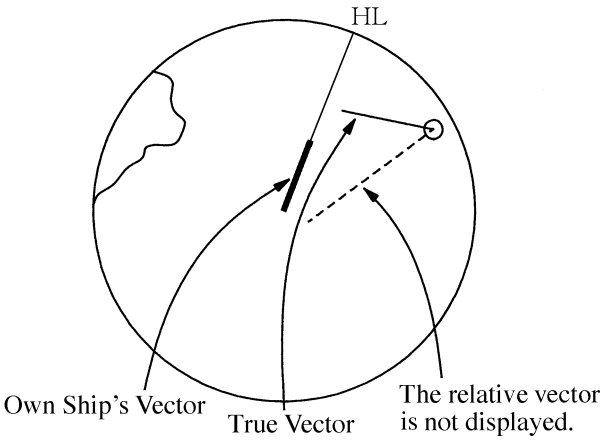
- When a target or own ship changes a course, or when a target is acquired, its vector may not reach a given level of accuracy until three minutes or more has passed after such course change or target acquisition.
  Even if three minutes or more has passed, the vector may include an error depending upon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

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.

[I] Vector Mode Selection

True Vector Mode

In the true vector mode, the direction of a target vector indicates the true course of the target and its vector length is proportional to its speed.
In this mode, own ship's vector is displayed as shown below.
In this mode, the movements of other ships around own ship can be accurately and easily monitored.
However, no CPA RING can appear in this mode.

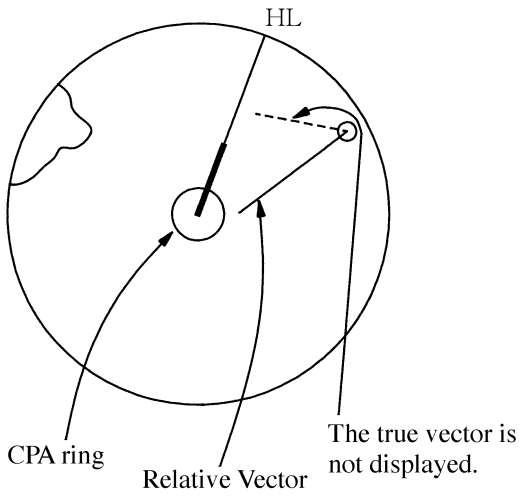


Relative Vector Mode

In displaying the relative vector of a target, press the [TRUE/REL] switch to select the Relative Vector mode.

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

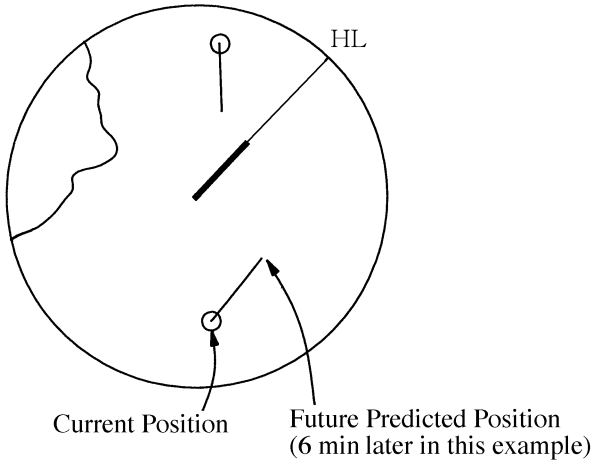
In the Relative Vector mode, it can be seen at a glance where the CPA LIMIT of the dangerous target is.



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

[Ⅱ] Vector Length: VECTOR TIME

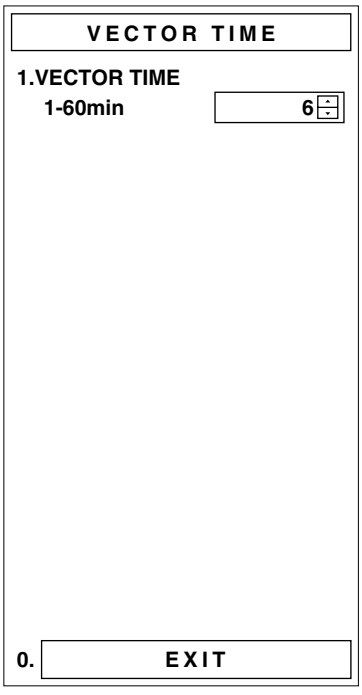
The vector length of a target is proportional to its speed, and the vector time can be changed over in a range of 1 to 60 minutes by used for ten-key.
The diagram below illustrates a vector length of a target for six minutes, and the tip of the vector represents the target's position expected to reach six minutes later.



Setting Vector Time

Procedures **1 Press** VECT TIME .

The VECTOR TIME Menu will appear.



2 Set a vector time using

+ **and** **−** **. (Unit: minute)**

(When depressing **+** or **−** continuously, the vector time will be change rapidly.)

The vector time will appear at upper right of the radar display.

or,

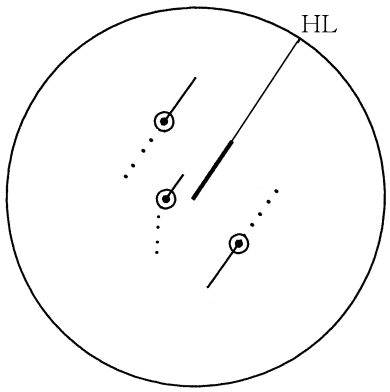
Procedures **1 Press** **1** **from the VECTOR TIME Menu.**

2 Use the ten-key to enter the vector time.

3 Press **ENT** **to enter the setting.**

……Display of Past Positions【PAST POSN】……

Press [PAST POSN] switch to display the past positions of targets.
A maximum of six past positions of each target can appear. Every time the [PAST POSN] switch is pressed, the time interval is changed over to 0.5, 1, 2 and 4 min. When pressing the switch once again in the 4 min interval, the past positions on display will be turned OFF.
The trail mode is interlocked with the vector mode to allow the past positions of a target to appear in the True or Relative Vector mode. In the Relative Vector mode, the target's relative past position is displayed. In the True Vector mode, the target's true past position is calculated from its relative bearing and range and own ship's course and speed and is displayed.



An example of display is shown in Fig.5.1 and the definitions of symbols on the radar display in Table 5.2.

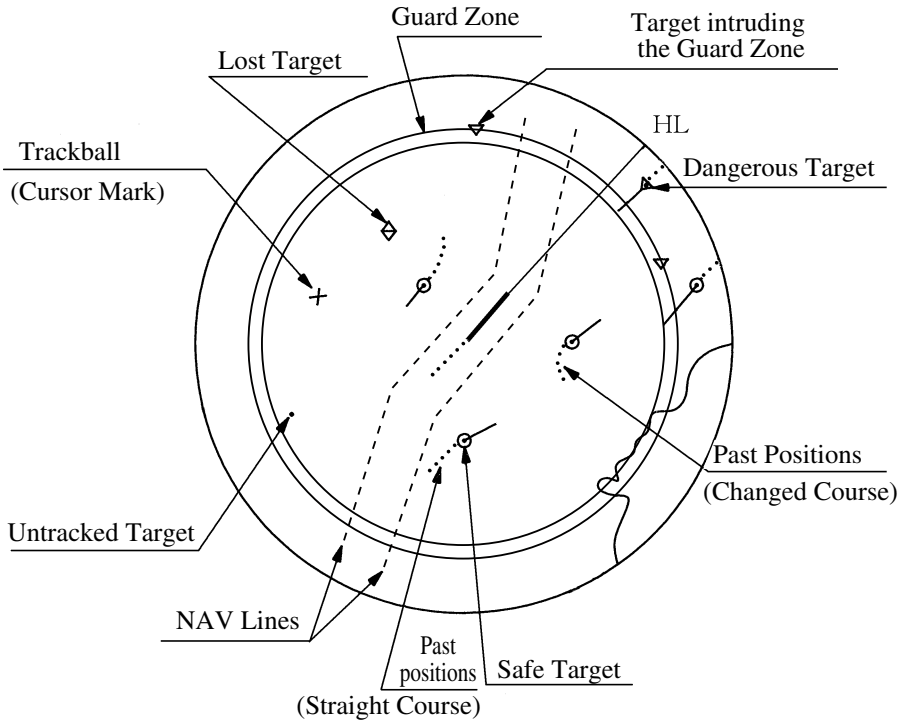
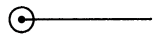
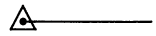
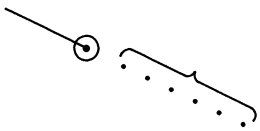


Fig.5.1 Example of Display (in North-up and True Vector mode)

In addition to the marks and symbols shown above, fixed/variable range markers, electronic bearing lines, etc. are presented on an actual video.

Table 5.2 Definitions of Symbols

Vector/Symbol	Definition	Remarks
	Tracked target	
	Dangerous target (CPA/TCPA)	Alarm characters (CPA/TCPA) appear and an alarm sounds. The vector and symbol blinks.
	Initial acquisition mark	Displayed after a target is acquired until its vector is displayed.
	Target with its data indicated	When designating a target's data indication with the trackball, the target's symbol is changed into □ and the target's ID is indicated. However, in case of a lost target or a dangerous target, its corresponding symbol is displayed instead of □.
	Lost target (This symbol appears when a target can not be tracked for any reason)	Alarm characters (LOST) appear and an alarm sounds. No vector is displayed, but the symbol blinks.
	Target that has intruded into the guard zone	Alarm characters (GZ) appear and an alarm sounds. The symbol blinks.
	Trackball cross cursor mark	This mark is used to designate a target when acquiring manually and cancelling it and indicating its numerical data.
	A target's past positions	The symbol and vector is displayed only when [PAST POSN] is ON. The position interval can be set to 0.5, 1, 2 or 4 min.

5.6 DATA DISPLAY

Attention

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

.....Types of Data Display .....

Target Data

Target identification (ID)	ID number of the target
True bearing: T BRG	1° unit
Range: RNG	0.1 NM unit
True course: T CSE	1° unit
True speed: T SPD	0.1 knot unit
Closest point of approach (CPA)	0.1 NM unit
Time to CPA (TCPA)	0.1 min unit
Bow crossing range (BCR)	0.1 NM unit
Bow crossing time (BCT)	0.1 min unit

The target for which its numeric data is displayed is marked with a symbol "□" to distinguish from other targets.

Note

If a target's data is displayed, but without the symbol "□", such a target exists outside the currently displayed radar display.

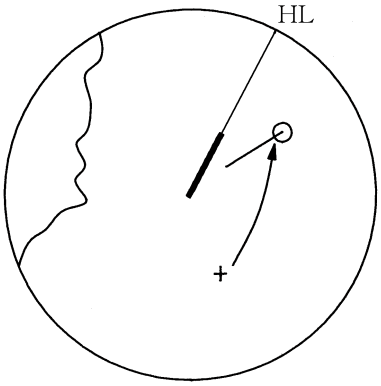
.....Method of Displaying Target Data【TGT DATA】.....

Procedures **1 Press** TGT DATA .

TGT DATA will appear in the CURSOR ( ) at the upper right of the radar display.

2 Move the cross cursor mark to a target (under tracking) to indicate its data using the trackball. Then, press trackball section left button or ENT to set its entry.
(Up to 2 targets settable)

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 disappear, or until another target is designated.
If a target with the mark "⬚" is designated, only its true bearing (BRG) and range (RNG) will appear until its vector appears.



or,

Procedures **1 Press** TGT DATA .

TGT DATA will appear in the CURSOR ( ) at the upper right of the radar display.

2 Enter the identification number of the target to indicate its data from the ten-key.

Then, press ENT **to set its entry. (Up to 2 targets settable)**

.....Clearing Data Display【TGT DATA】.....

Procedures **1 Press** TGT DATA .

TGT DATA will appear in the CURSOR ( ) at the upper right of the radar display.

2 Move the cross cursor to a target to cancel its data (with its ID being indicated) using the trackball. Then, press trackball section right button or CLR to set the clearing of the data.

or,

Procedures **1 Press** TGT DATA .

TGT DATA will appear in the CURSOR ( ) at the upper right of the radar display.

2 Enter the indentification number of the target to cancel its data from the ten-key. Then, press CLR to set the cleaning of the data.

5.7 ALARM DISPLAY

The ARPA system provides the following alarms:

Dangerous target alarm	CPA/TCPA
Guard zone entry alarm	GZ
Lost target alarm	LOST
System function alarm	ARPA (DATA)
Gyro set alarm	SET GYRO

.....Dangerous Target Alarm: CPA/TCPA.....

⚠CAUTION

If either of CPA LIMIT or TCPA LIMIT is set to zero, the dangerous target alarm will not operate.
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.

In the ARPA system, targets are categorized into two types: tracked targets and dangerous targets.
The grade of danger can easily be recognized on the display at a glance. So the officer can easily decide which target he should pay attention to.
The types of target and alarm are shown below.

Dangerous Target Alarm

Status	Symbol on CRT	Alarm characters	Alarm sound	Conditions
Tracking target	○	(OFF)	(OFF)	• CPA > CPA LIMIT • 0 > TCPA • TCPA > TCPA LIMIT
Dangerous target	△	CPA/ TCPA	Beep sound (pee-poh) Acknowledgeable	• CPA≦CPA LIMIT, • 0≦TCPA≦TCPA LIMIT

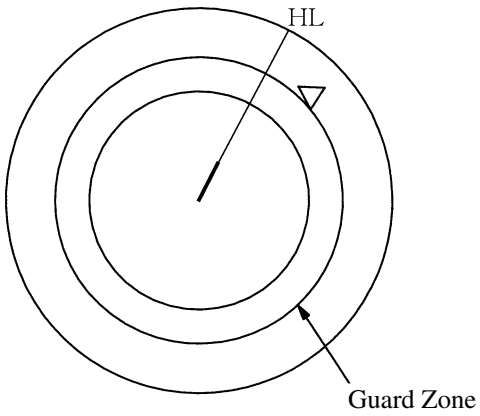
CPA LIMIT and TCPA LIMIT: The Setting Values

..... Guard Zone Alarm【GUARD ZONE】 .....

⚠CAUTION

In setting a guard zone, it is necessary to adjust the radar tune, gain, sea clutter suppression and rain/snow clutter suppression to ensure that target echoes are displayed in the optimum conditions. The guard zone alarm is not generated against the targets that are not detected by radar.

The guard zone functions are to set a zone at an arbitrary range and to deliver an alarm if any target intrudes within this zone.
For the method of setting a guard zone, refer to section 3.4 “Set Guard Zones”.



Guard Zone Alarm

Status	Symbol on CRT	Alarm characters	Alarm sound	Conditions
Target entering the guard zone	▽	GZ	Beep sound (pipipi) Acknowledgeable	An alarm sound is generated while a target has entered into the range of 0.5 NM between the outer and the inner ring.

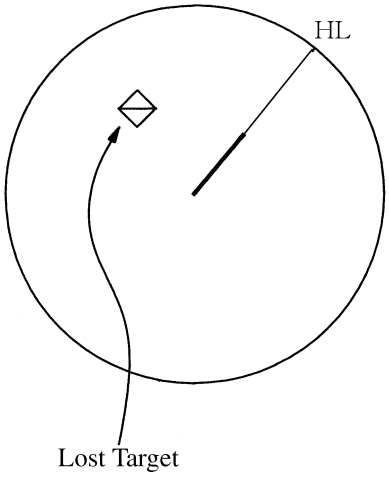
……Lost Target Alarm【LOST TARGET】……

Attention

● If the radar tuning, 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, the LOST target 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.



Lost Target Alarm

Status	Symbol on CRT	Alarm characters	Alarm sound	Conditions
Lost target	◈	LOST	Beep sound (pee) Acknowledgeable	The alarm will sound once when a lost target symbol is displayed.

.....System Function Alarm【ARPA (DATA)】.....

When an abnormal state of an input signal or a trouble in the processing circuitry occurs, an character or alarm is generated. When an alarm occurs against any ARPA function, ARPA (DATA) will appear in the WARNING display area, but no indication is made in the ARPA information display. This status means that there is any operational trouble in the ARPA system. Please, contact the service depot or the manufacturer.

.....Gyro Set Alarm【SET GYRO】.....

The North Stabilizing Kit (NSK) 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	Condition
SET GYRO	Beep sound (pipi)	The signals from the gyro are stopped, but the gyro is recovered.

5.8 TRIAL MANEUVERING

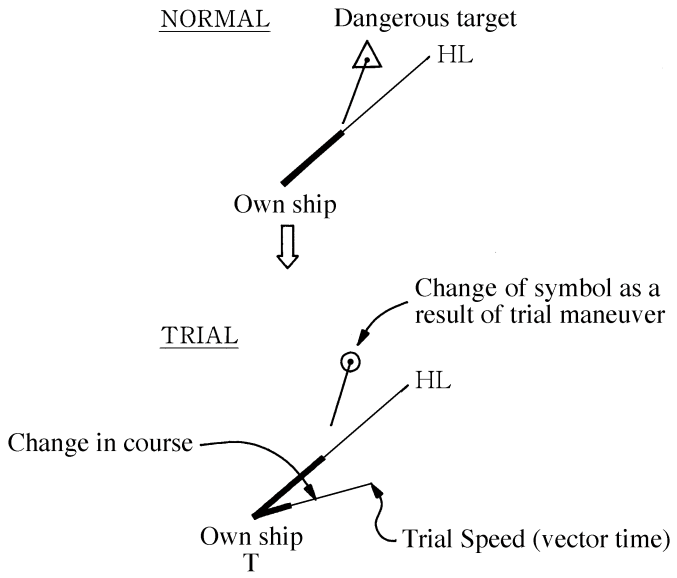
Attention

● 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 manually entering own ship's course and speed against the data of the acquired target, it is checked whether the situation is dangerous or not.
The ranges of course and speed to be entered manually:
Course: 360° (in 0.1° intervals) ……[EBL] control
Velocity: 0 to 100 knots (in 0.1 knot steps)……[VRM] control

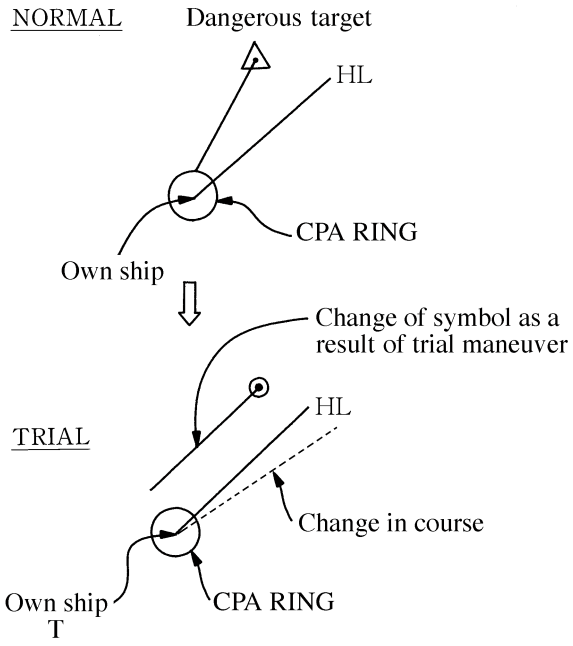
……Trial Maneuvering in the True Vector Mode ……

In the True Vector mode, calculations are performed according to the values set by TRIAL SPEED and TRIAL COURSE, and the result is displayed as a bold-line that represents the change of own ship's vector as shown in the figure below (an example of the course changed to the right).
In this figure, the dangerous target forward right becomes safe as a result of simulation.
The target data display field indicates the current CPA LIMIT and TCPA LIMIT values regardless of the result of simulation.



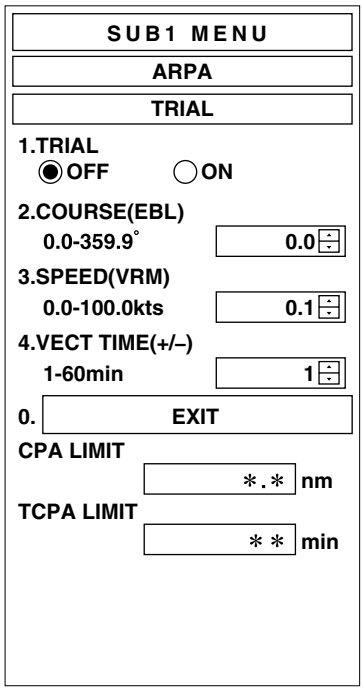
.....Trial Maneuvering in the Relative Vector Mode .....

The result of trial maneuvering in the Relative Vector mode is shown by a change in target vector. In the figure below (in the same conditions as in the True Vector mode in the previous page), it is seen that the acquired target is a dangerous one because its vector is crossing the CPA RING.



The above figure shows that the relative vector of the target has changed as shown in the figure as a result of simulation (course and speed), so that the target's symbol is changed into " ○ ", a safe target.
The data display field indicates the current values of CPA LIMIT and TCPA LIMIT, not those as the result of simulation, same as in the True Vector mode.
The course change of own ship is displayed as a dotted-line.

.....Executing the TRIAL Function .....



Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 8 **, then** 5 **and** 4 **.**

The TRIAL Menu will appear.

3 Press 1 **.**

"ON" in "1.TRIAL" will be set and a character "T" blinks under own ship's mark on display to indicate the trial maneuvering mode.

4 Set a course by rotating the [EBL] control and a speed by rotating the [VRM] control.

5 As the symbol of plot data, a dangerous target is marked with "△" and a safe target with "○".

Cancellation **1 Press** 1 **.**

"OFF" in "1.TRIAL" will be set and the normal display will be restored.

Exit **1 Press** 0 **.**

The ARPA Menu will reappear.

2 Press 0 **.**

The Sub1 Menu will reappear.

3 Press 0 **.**

The Sub1 Menu will be closed.

5.9 DELETING UNWANTED TARGETS

When it becomes unnecessary to continue tracking the acquired and tracked targets with their symbols and vectors displayed, or when it is necessary to reduce the number of vectors to make the video easy to observe, unnecessary targets can be cancelled one by one.
When all targets are re-acquired from the beginning, all the targets on display can be cancelled once.

.....Deleting Targets .....

Deleting one target

Procedures **1 Press** ACQ CANCEL .

2 Set the cross cursor mark to a target to be deleted.

3 Press trackball section left button or ENT .

The symbol and vector of the target will be deleted and only the target echo remains.

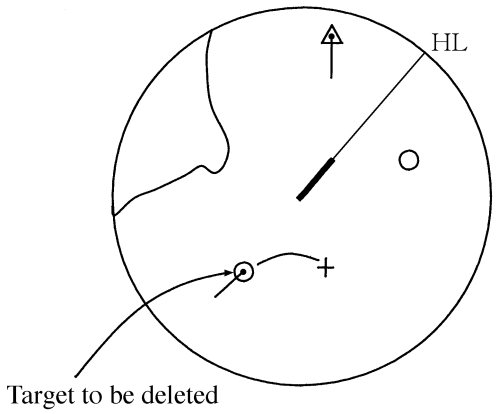
or,

Procedures **1 Press** ACQ MANUAL .

2 Set the cross cursor mark to a target to be deleted.

3 Press trackball section right button or CLR .

The symbol and vector of the target will be deleted and only the target echo remains.



Attention

- When all targets are deleted, the system stops tracking all the targets and targets have to be acquired again automatically or manually. So, do not use this method except when it is necessary to delete all targets.

Deleting all targets

Procedures **1 Press** ACQ CANCEL **continuously for 2 seconds or more.**

All the symbols and vectors of all targets will be deleted.

5.10 ARPA SETTING

⚠CAUTION

Simulation is a function to check whether the ARPA system is operating normally. Do not use this function except when checking the ARPA operation.
In particular, if this mode is used during navigation, pseudo targets appear on the radar display, which may be confused with the actual targets. Do not use this mode during navigation.
Otherwise, this may cause accidents to occur.

The following constants to be used for ARPA can be referred to and modified:

[Ⅰ] SIMULATOR	: Pseudo targets are generated on the radar display to check whether the ARPA functions are operating normally.
[Ⅱ] VD LEVEL	: Quantizing level for the video to be inputted to the target detection circuit.
[Ⅲ] VECTOR CONSTANT	: Constant to calculate the ARPA vectors.
[Ⅳ] GATE	: Gate size to acquire and track targets.
[Ⅴ] TEST VIDEO	: Test video for use in checking the operation of the target detection circuit.

Each of the constants will be described in detail below.

.....Simulation.....

⚠CAUTION

Do not change VD LEVEL and VECTOR CONSTANT carelessly because those are set to the optimum values. Otherwise, this may deteriorate the ARPA performance and cause accidents to occur.

Pseudo targets can be generated in certain known positions to check whether the ARPA processing circuits are operating normally. Since the pseudo targets move depending on known parameters, the values for these pseudo targets can be compared with the known values if the pseudo targets are acquired and tracked, and displayed. Thus, it can be checked if the ARPA system is operating normally. This function should be operated only in the standby mode.

Procedures

1 Press TX/STBY **to set the standby mode.**

2 Press TEST **.**

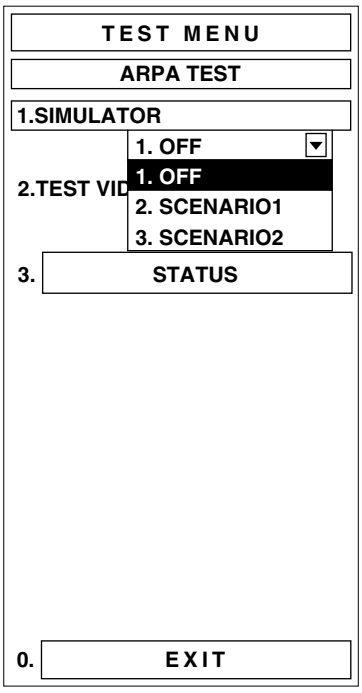
The TEST Menu will appear.

3 Press 3 **.**

The ARPA TEST Menu will appear.

4 Press 1 **.**

1.SIMULATOR will be selected and the pull-down menu will appear.



5 When moving the pseudo target:

[I] Stopped Target

Press 2 **, then** TX/STBY **to set the transmission mode.**

2. SCENARIO1 will be set to generate a pseudo target at the true bearing of 0° and the relative range of 6 NM. Characters "XX" appear blinking at the lower of the radar display, showing that the system is executing the simulation mode.

[II] Approaching Target

Press 3 , then TX/STBY to set the transmission mode.

3. SCENARIO2 will be set to generate a pseudo target at the true bearing of 0º and the relative range of 6 NM. The target will then approach own ship at a relative speed of 10 kts in a relative course of 180º. Characters "XX" appear blinking at the lower of the radar display, showing that the system is executing the simulation mode.

Note: When the range between own ship and the pseudo target is 0, the target will disappear.

6 When finishing the simulation, press TX/STBY to set the standby mode, then press 1 .

1. OFF will be set.

Exit **1 Press 0 or TEST .**

The TEST Menu will be closed.

Pseudo Target Parameters

MODE	1	2	3
Operation	No indication	Stop	Approach
Range generated	– – – –	6 NM	6 NM
Speed	– – – –	0 KTS	10 KTS

.....Gate Size .....

⚠CAUTION

Do not change the preset gate size carelessly. If the gate value is improper, the ARPA acquisition and tracking functions may deteriorate.
Otherwise, this may cause accidents to occur.

The Gate Size is defined as an "Area within which targets are watched by the ARPA" processing circuit.
If the gate size is too large, targets are not lost but may be swapped with other close targets.
If the gate size is too small, targets are not easily swapped, but may be lost.
The ARPA processing circuit is designed to detect target sizes and set an accurate gate size depending on the ranges and sizes of those targets (NARROW is the standard size). However, change the setting parameters to select the best size in the following conditions:

Set [2. NARROW] in normal operation.

- When acquiring and tracking targets that spread widely in the angular direction

  (The angular direction of the gate aperture is important) ..... [1. WIDE]

- When many targets are densely congested and swapped within 3 NM in a port

  (The gate size should be reduced) ..... [3. SMALL]

Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 8 **, then** 5 .

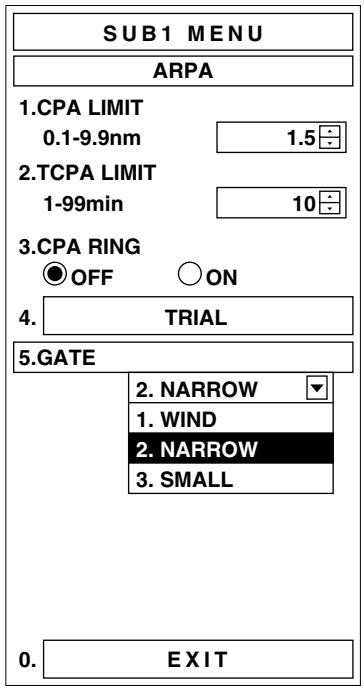
The ARPA Menu will appear.

3 Press 5 .

5.GATE will be selected and the pull-down menu will appear.

4 Press any of 1 **to** 3 .

Enter the number of gate type to change.



5

Exit **1 Press** 0 .

The Sub1 Menu will reappear.

2 Press 0 .

The Sub1 Menu will be closed.

.....Test Video .....

Attention

● TEST VIDEO may not appear for targets that are not acquired nor tracked, or if the controls [GAIN] or [SEA] control are adjusted properly.

Test Video is used to check whether the video signals under target acquisition and tracking are inputted to and processed in the target processing circuit normally.
However, it is sufficient to check that [3. VDH] in TEST VIDEO is displayed.
The start of the Test Video mode is available only in the Standby mode.

Procedures

1 Press TX/STBY to set the standby mode.

2 Press TEST.

The TEST Menu will appear.

3 Press 3.

The ARPA TEST Menu will appear.

4 Press 2.

[2.TEST VIDEO] will be selected and the pull-down menu will appear.

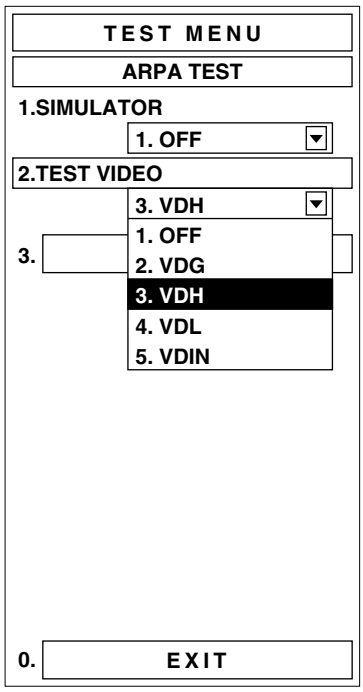
5 Press 3.

[3. VDH] will be set.

Test video for [3. VDH] (video input in quantizing HIGH level) will appear on the radar display.

6 Press TX/STBY to set the transmission mode.

7 When changing the type of the test video, press TX/STBY to set the standby mode, then enter the test video number with the ten-key.



Note: If 1. OFF **is set, any test video will not appear.**

Exit **1 Press** **0** **or** **TEST** **.**

The TEST Menu will be closed.

Execute TEST VIDEO in 3. VDH normally.

Note: If any target displayed clearly in the radar display is not displayed in the Test Video mode, the target detection circuit of the ARPA system may have a trouble.

SECTION 6
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 displays, 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.

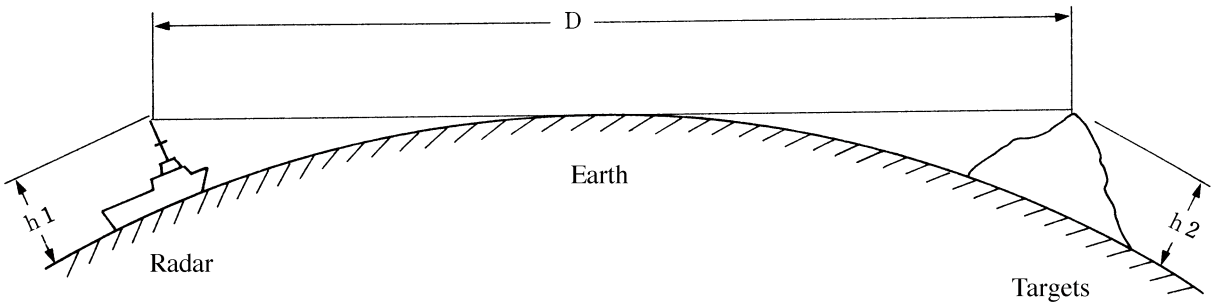
.....Radar Wave with the Holizon .....

Radar beam radiation has the nature of propagating nearly along the curved surface of the earth.
The propagation varies with the property of the air layer through which the radar beam propagates.
In the normal propagation, the distance (D) of the radar wave to the horizon is approximately 10% longer than the distance to the optical horizon. The distance (D) is given by the following formula:

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

h1: Height (m) of radar scanner above sea level
h2: Height (m) of a target above sea level

Fig.6.1 is a diagram for determining the maximum detection range of a target that is limited by the curve of the earth surface in the normal propagation.



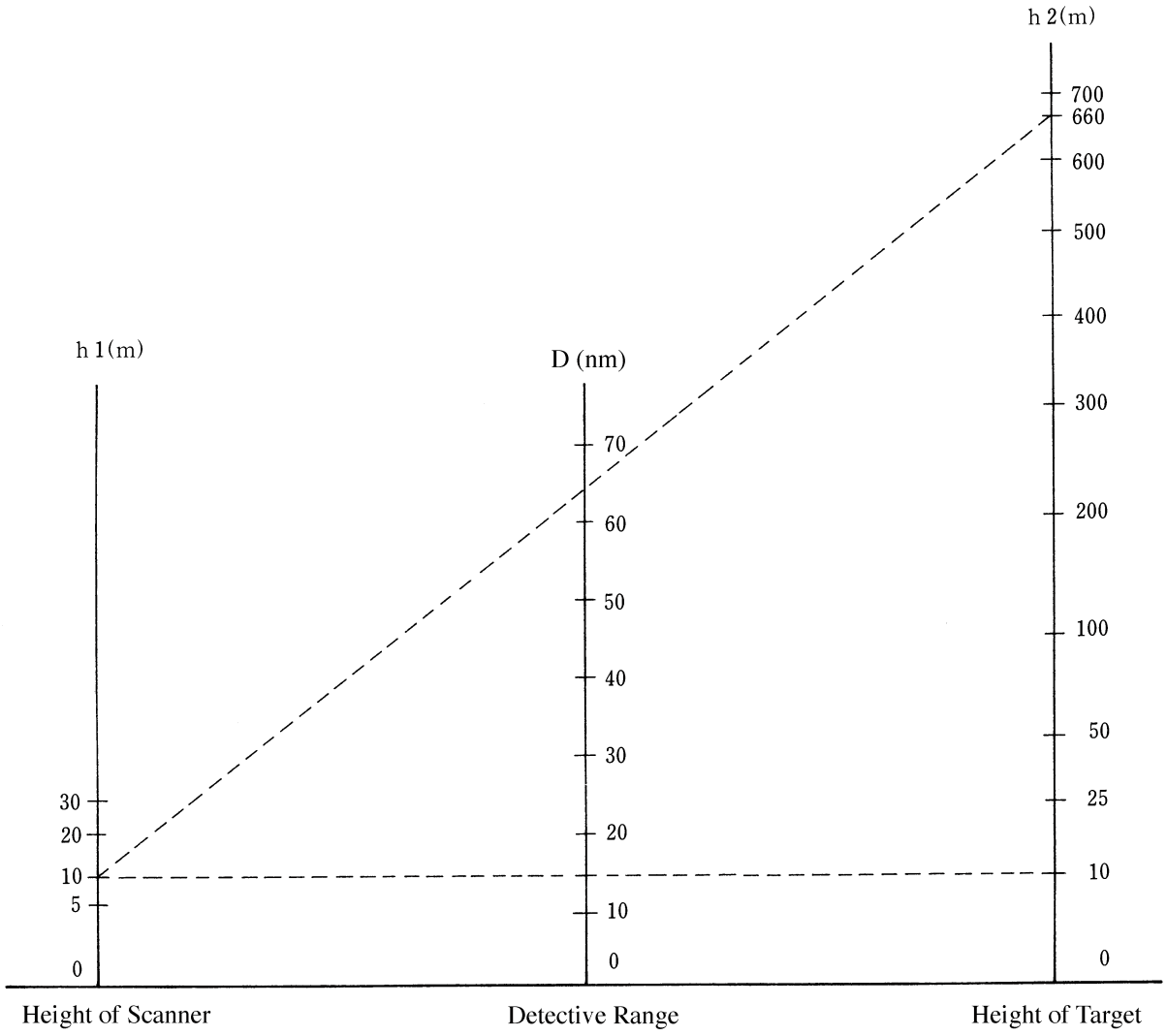


Fig.6.1

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

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

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

.....Strength of Reflection from the Targets .....

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 on the inland appears on the radar display. Therefore, the distance to the coast line should be measured carefully.

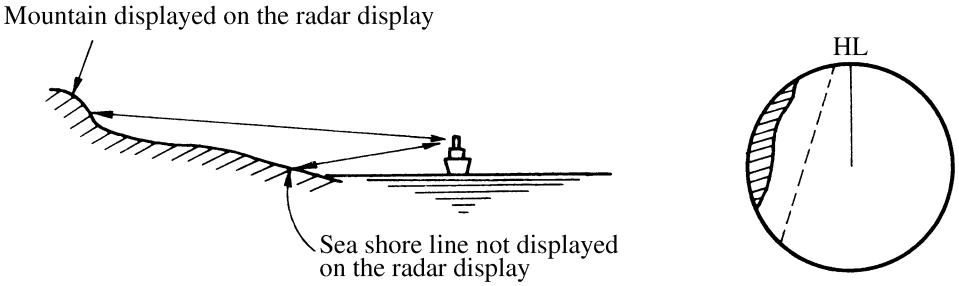


Fig.6.2

.....Sea Clutters .....

When the sea surface ruffles, bright echo returns spread around the center of the radar display.

The higher the waves are, the echo returns are larger.

Swirling currents may appear as a smooth line like a coastal line.

.....False Echoes .....

The radar observer may be embarrassed with some echoes that do not exist actually. These false echoes appear by the following causes that are well known:

[I] Shadow

When the radar scanner is installed near a funnel or mast, the echo of a target that exists in the direction of the funnel or mast cannot appear on the radar display because the radar beam is reflected on the funnel or mast. Whether there are some false echoes due to shadows can be checked by monitoring the sea clutter returns, in which there may be a part of weak or no returns.

Such shadows appear always in the same directions, which the operator should have in mind in radar operation.

[Ⅱ] Side Lobe Effect

A broken-line circular arc may appear at the same range as the main lobe of the radar beam on the radar display. This type of false echo can easily be discriminated when a target echo appears isolated. (See Fig.6.3)

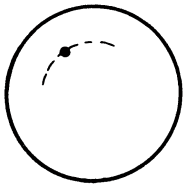


Fig.6.3

[Ⅲ] False Echo by Secondary Reflection

When a target exists near own ship, two echoes from the single target may appear on the radar display. One of those echoes is the direct echo return from the target and the other is the secondary reflection return from a mast or funnel that stands in the same direction as shown in Fig.6.4.

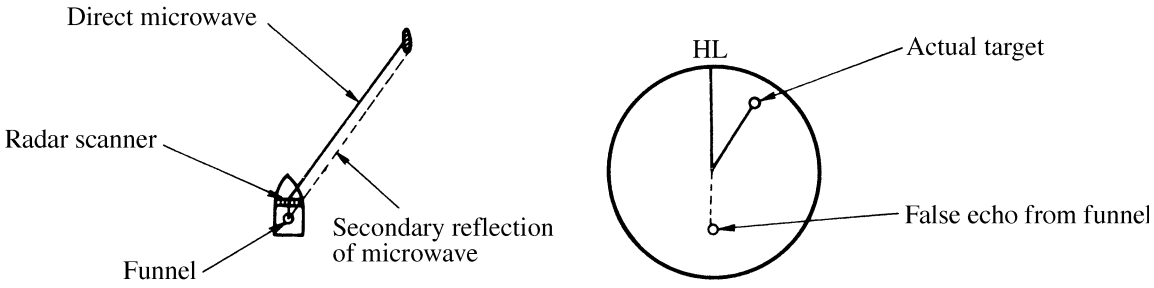


Fig.6.4

[Ⅳ] False Echo by Multiple Reflection

When there is a large structure or ship with a high vertical surface near own ship as shown in Fig.6.5, multiple reflection returns may appear on the radar display. These echoes appear in the same intervals, of which the nearest echo is the true echo of the target.

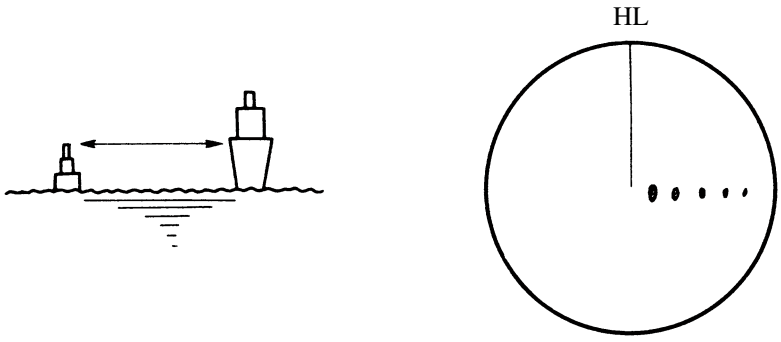


Fig.6.5

[V] Abnormal Propagation

The maximum radar detection range depends upon the height of the scanner and the height of a target as described in the section of “The Horizon for Radar Beam Radiation”. If a so-called “duct” occurs on the sea surface due to a certain weather condition, however, the radar beam may propagate to a abnormally long distance, at which a target may be detected by the radar.

For instance, assuming that the radar range is 6 NM (on the repetition frequency of 1100 Hz), the first pulse is reflected from a target at about 76 NM or more and received during the next pulse repetition time. In this case, a false echo appears at a position that is about 76 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 + 76 = 81 NM.

On the radar range scale of 1.5 NM (on the repetition frequency of 1900 Hz), a false echo may appear at a position that is about 43 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.

[VI] Radar Interference

When another radar equipment using the same frequency band as that on own ship is near own ship, a radar interference pattern may appear on the radar display. This interference pattern consists of a number of spots which appear in various forms. These spots do not always appear at the same places, so that they can be discriminated from the target echoes. (See Fig.6.6)

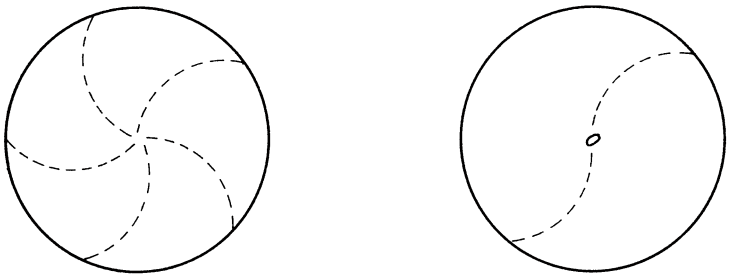


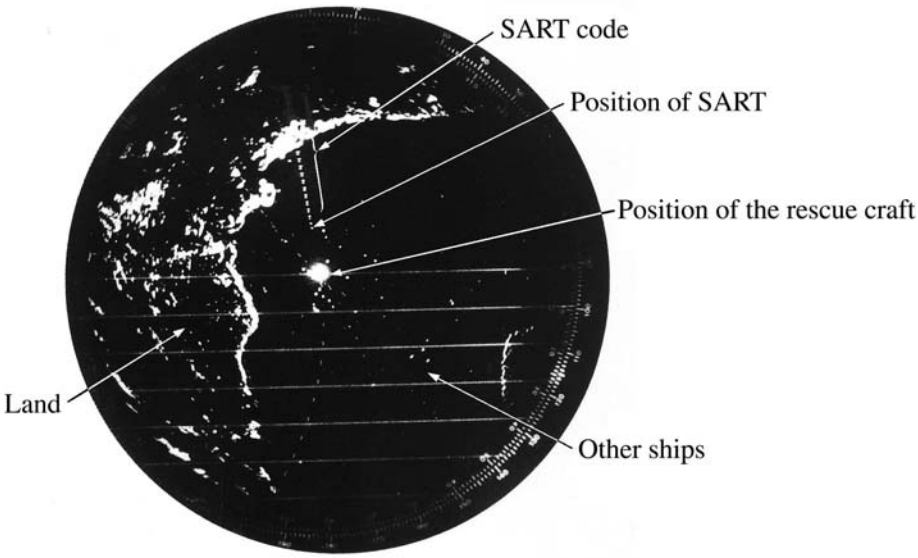
Fig.6.6

.....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.

The SART position can be displayed on the radar video by setting the radar as follows:

① Radar range scale : 6 NM or 12 NM
② Sea clutter control : Minimum (Most counterclockwise)
③ AUTO SEA function : OFF
④ TUNE control : No tuning (to weaken clutter echoes)
⑤ Interference rejector (IR) : OFF
⑥ PROCESS : OFF



[Example of Display]

Attention

- When the radar is set as in ① to ⑥ above to detect the SART signal, the 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 monitoring targets around own ship, checking on own ship's position and avoidance of stranding.
  After end of detecting the SART signal, it is necessary to readjust the radar for normal navigation.

SECTION 7
MAINTENANCE

7.1 ROUTINE MAINTENANCE

⚠WARNING

Never carry out internal inspection or repair work of the equipment by a user.
Inspection or repair work by unauthorized person may cause a fire or an electric shock.
Ask your nearest branch, business office or a dealer for inspection and repair.

Turn off the main power source before starting maintenance.
Otherwise, an electric shock may result.

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 as often as possible.
Common points of maintenance for each unit are as follows:

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.

7.2 MAINTENANCE ON EACH UNIT

.....Scanner NKE-1079/1075/1059/1052 .....

⚠WARNING

Turn off the main power source before starting maintenance.
Otherwise, an electric shock or injury may result.

Set the Safety Switch for Stopping the Scanner to cents ⌈ OFF ⌋.
Otherwise, an accidental contact with the rotating scanner may result in injury.

After finishing the maintenance work, set the safety switch for stopping the scanner to “ON”.

Precautions on Mounting the Cover

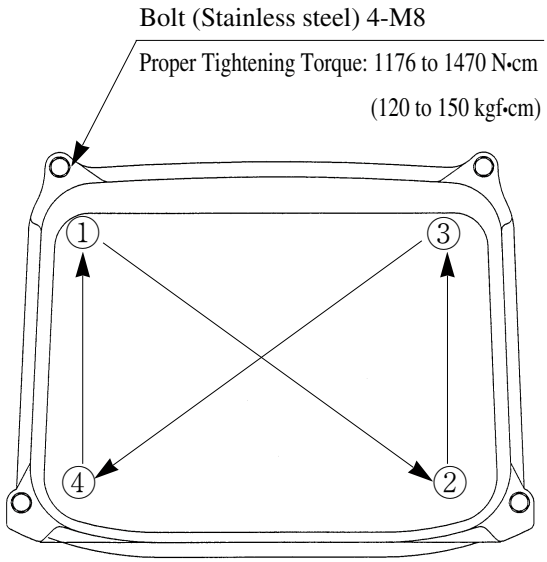
When the cover is removed for regular checkup and replacement of parts and refitted after such work, the procedures of fastening bolts shall be taken with the following precautions:

(a) The proper fastening torque of the fitting bolts (M8) is 1176 to 1470 N•cm (120 to 150 kgf•cm) (which makes the inside water-tight and protects the packings against permanent compressive strain).
The packings start producing from the cover at the torque of approximately 1470N•cm (150 kgf•cm) or more.
Do not fasten the bolts with a torque exceeding the specified value. Otherwise, the screws may be broken.

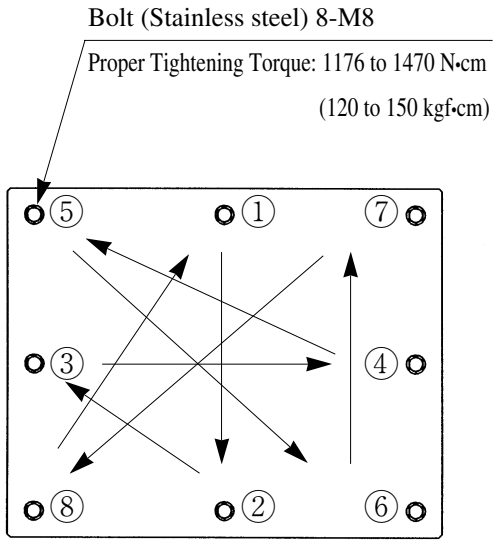
(b) Use an offset wrench of 11 mm × 13 mm or a double-ended wrench of 13 mm × 17 mm (not longer than 200 mm).

(c) Screw all the bolts by hand first to prevent them playing, then fasten them evenly in 4 to 5 steps to reach the final torque in accordance with the fastening procedures 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.



Cover of NKE-1059/1052
Bolt Tightening Procedure



Cover of NKE-1079/1075
Bolt Tightening Procedure

(1) Radiator

Attention

- If the radiator front face (radiation plane) is soiled with smoke, salt, dust, paint or birds' droppings, wipe it with a piece of soft cloth wetted with alcohol or water and try to keep it clean at all times. Otherwise, radar beam radiation may attenuate or reflect on it, resulting in deterioration of radar performance.

- Never use solvents of gasoline, benzine, trichloroethylene and ketone for cleaning. Otherwise, the radiation plane may deteriorate.

Check up and clean the radiator.

(2) Scanner Mechanism

a) Supply Oil Seal
When there is not a grease nipple, the replenishment of grease oil is unnecessary.
Remove the cap of the grease nipple on the front of the S band radiator support and supply it with a grease gun. Make the oiling every six months. The oil quantity shall be approximately 100 g that is as much as the grease comes out of the oil seal. Use the grease of Mobilux 2 of Mobil Oil.

(b) Oiling gears
Apply grease evenly to the tooth surfaces of the main shaft drive gear and the encoder drive gear with a spreader or brush. Greasing in short intervals is more effective to prevent the gears from wear and tear and extend their service life, but grease those at least every six months. Use Mobilux2 of Mobile Oil.

(c) Mounting legs
Check the mounting legs and mounting bolts of the scanner unit case on corrosion sometimes and keep them in order not to cause any danger. Apply paint to them once a half year because painting is the best measure against corrosion.

……Transmitter-receiver Unit NTG-3037/3027 ……

Wipe dust on the transmitter and receiver sections with a piece of dry cloth or feather.

……Display Unit NCD-4111 ……

Cleaning of CRT Screen Surface

Attention

● Do not wipe the CRT screen surface strongly with a piece of dry cloth or do not use gasoline or thinner for cleaning. Otherwise, the screen surface may be damaged.

Dust accumulated on the CRT 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.

……Coaxial Cable (JMA-9833-SA) ……

(1) The coaxial pipe gland of the coaxial cable will be provided with perfect water-tight treatment at the time of installation. Check it and ensure that no water leak occurs from the connection parts. In particular it is recommended to apply paint to the coaxial pipe gland every six months.

Attention

● Do not give strong impact to the coaxial cable by hitting it with any tool or hammer. Otherwise, it may be broken.

● Do not put any heavy article on the coaxial cable. Otherwise, it may be broken.

● Do not twist or pull the coaxial cable. Otherwise, it may be broken.

(2) For further details, refer to the Coaxial Cable Connection Procedures for the S band Radar.

.....Wave Guide (JMA-9823-7XA/9XA) .....

Attention

● Connect the wave guide properly with no gaps. Otherwise, such gaps may cause water leaks or corrosion later.

SECTION 8
COUNTERMEASURES FOR TROUBLE AND ADJUSTMENT

8.1 FUNCTION CHECK

Make operational check on the radar equipment regularly and if any problem is found, investigate it immediately. Pay special attention to the high voltage sections in checking and take full care that no trouble is caused by any error or carelessness in measurement. Take note of the results of checking, which can be used effectively in the next check work.
Operational check shall be made in accordance with Table 8.1 Function Check List in the order as specified in it.

Table 8.1 Function Check List

Equipment	Check Item	Criteria	Remarks
Transmitter-receiver Unit	Tuning LED of Receiver	The LED is lighting during operation	48 NM range
Display Unit	Video and echoes on the screen Sensitivity CRT brilliance can be controlled correctly Various markers Various numerical indications Lighting	Can be correctly controlled	
	Safety Switch, Various Currents and Voltages, and Communication Lines	(1) Refer to Check of Safety Switch, Various Currents and Voltages, and Communication Lines	
	Panel	(2) Refer to Check of Panel	
	ARPA	(3) Refer to Check of ARPA	
	Magnetron current	(4) Refer to Check of Magnetron Current	
	Performance Monitor	(5) Refer to Check with Performance Monitor	
	Error Logging Display	(6) Refer to Error Logging Display	
	System Information Display	(7) Refer to System Information Display	

.....8.1.1 Function Check on Test Menu .....

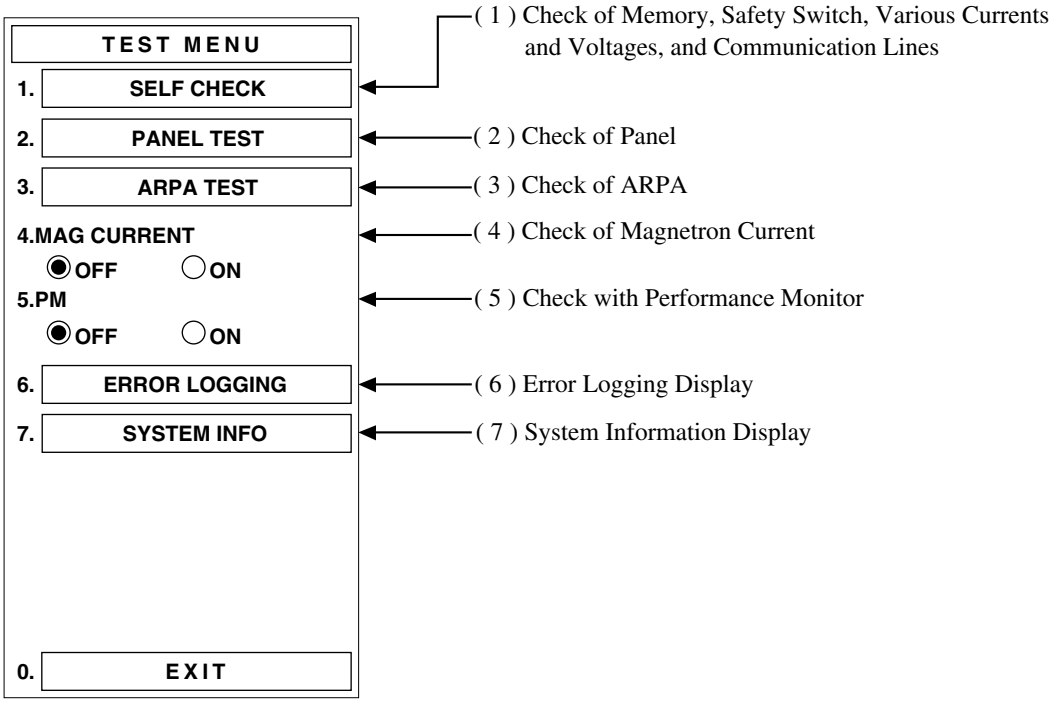
The function status of this radar equipment can be checked on the TEST Menu.

Procedures **1 Press** TEST .

The TEST Menu will appear.

2 Select any check item on the Menu and press 1 **to** 8 .

The list of items will appear.



Exit **1 Press** 0 **or** TEST .

The TEST Menu will be closed.

8

(1) Check of Safety Switch, Various Currents and Voltages, and Communication Lines

a Check of Safety Switch, Various Currents, and Voltages

Procedures

1 Press TEST .

The TEST Menu will appear.

2 Press 1 .

The SELF CHECK Menu will appear.

3 Press 2 .

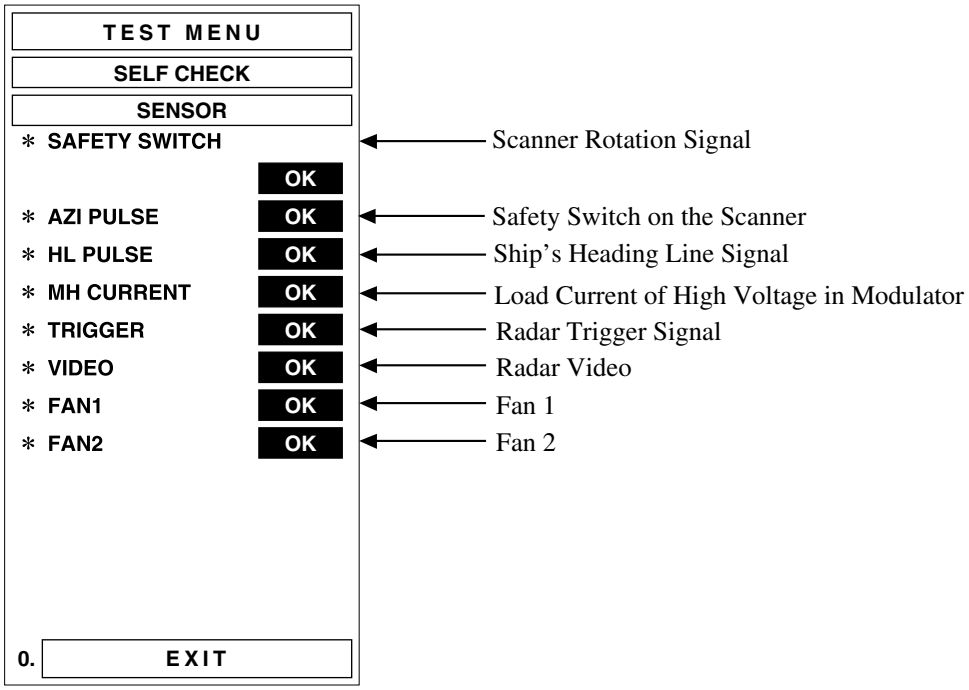
The SENSOR Menu will appear.

4 Check OK **on each item.**

If any item is no good, NG will be selected.

In the standby mode, ＊＊ will be selected for VIDEO.

If the safety switch on the scanner is OFF, OFF will be selected.



Exit

1 Press (0) .

The SELF CHECK Menu will reappear.

2 Press (0) .

The TEST Menu will reappear.

3 Press (0) .

The TEST Menu will be closed.

b Check of Communication Lines

Procedures

1 Press TEST .

The TEST Menu will appear.

2 Press 1 .

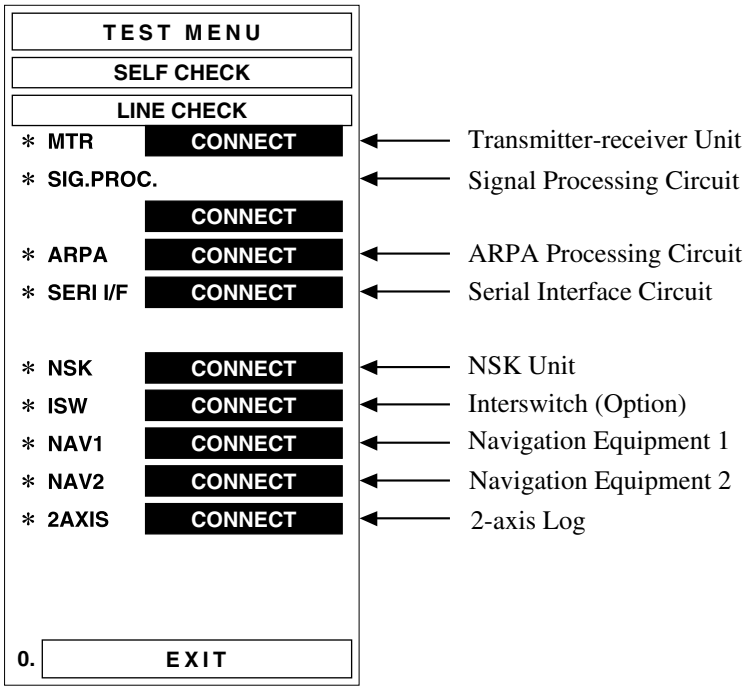
The SELF CHECK Menu will appear.

3 Press 3 .

The LINE CHECK Menu will appear.

4 Check whether each communication line is connected.

- When it is connected: CONNECT
- When it is not connected: DISCONNECT



Exit

1 Press (0) .

The SELF CHECK Menu will reappear.

2 Press (0) .

The TEST Menu will reappear.

3 Press (0) .

The TEST Menu will be closed.

(2) Check of Panel

The operation panel can be simple check. For the operating procedures of the operation panel, refer to "Check Operation Status" in Section 3.4 BASIC OPERATIONS.

(3) Check of ARPA

Procedures

1 Press [TEST] .

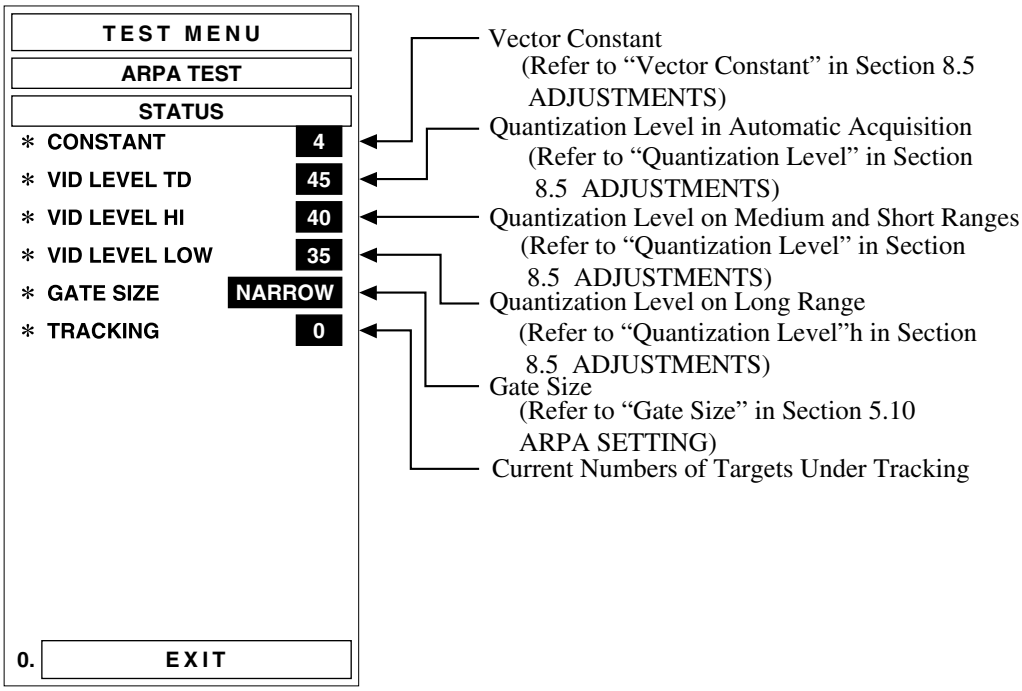
The TEST Menu will appear.

2 Press (3) .

The ARPA TEST Menu will appear.

3 Press (3) .

The STATUS Menu will appear to indicate the ARPA setting values and conditions.



Exit

1 Press (0) .

The ARPA TEST Menu will reappear.

2 Press (0) .

The TEST Menu will reappear.

3 Press (0) .

The TEST Menu will be closed.

(4) Check of Magnetron Current

The Magnetron Current can be checked through the level of the "MAG" indicator bar in the TEST Menu.

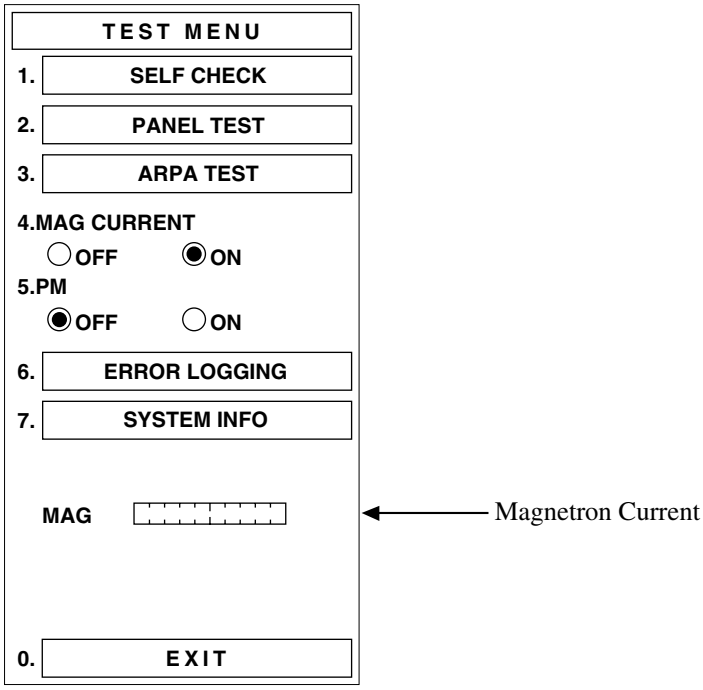
Procedures

1 Press [TEST] .

The TEST Menu will appear.

2 Press (4) .

"ON" in "4.MAG CURRENT" will be set. The magnetron current is displayed at the bar-graph on the TEST Menu.



Check "5 - 9.5" in the 24 NM range.

Exit

1 Press (0) .

The TEST Menu will be closed.

(5) Check with Performance Monitor

The transmitted power and the receiving sensitivity can be checked relatively using the Performance Monitor. For the operating procedures of the Performance Monitor, refer to "Operation of Performance Monitor" in Section 3.4 BASIC OPERATIONS.

(6) Error Logging Display

If any system error occurs, the communication line in which the error is caused will be indicated by the selected characters. The errors that are released will also be indicated in time sequence.

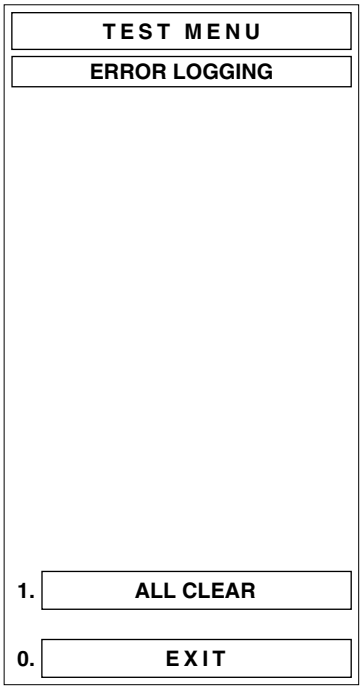
Procedures

1 Press TEST .

The TEST Menu will appear.

2 Press 6 .

The ERROR LOGGING Menu will appear and the location in which an error has occurred will appear by selected characters.



List of System Error Message

Message	Description
MTR (AZI)	Bearing signal error
MTR (HL)	Ship's heading line signal error
MTR (MHV)	Modulator's high voltage error
MTR (DATA)	Communications error with the transmitter-receiver unit
MTR (HEATER)	Magnetron heater voltage is abnormal
MRT (REVERSE)	Antenna rotation is reversed
MTR STATUS	Transceiver status error
SSW OFF	The safety switch is OFF during switchover of the scanners
NSK (GYRO)	Gyro signal OFF
ISW (DATA)	Communications error with the interswitch
LOG	Log signal OFF
NAV (DATA)	Data from navigation equipment OFF
DLOG	2-axis log signal OFF
ARPA (DATA)	Communications error with the ARPA unit
NSK (DATA)	Communications error with the NSK unit
VIDEO	Radar video OFF
TRIGGER	Trigger signal OFF
FAN1	Fan alarm 1
FAN2	Fan alarm 2
PROC (DATA)	Signal processing circuit error
SERI (DATA)	Serial interface circuit error
LAN (DATA)	LAN I/F circuit error
232C (DATA)	RS-232C communications error
MTR (VIB)	Abnormal scanner vibrations
MTR (TMP)	Abnormal scanner temperature
COM1	Com port1 failure
COM2	Com port2 failure
COM3	Com port3 failure
COM4	Com port4 failure
COM5	Com port5 failure
COM6	Com port6 failure
COM7	Com port7 failure
COM8	Com port8 failure
COM9	Com port9 failure
COM10	Com port10 failure
MAG (HDG)	Data from Mag compass have been cut off
PROC (AZI)	Bearing pulse is abnormal

Exit

1 Press (0) .

The TEST Menu will reappear.

2 Press (0) .

The TEST Menu will be closed.

(7) System Information Display

The current system information will be indicated.

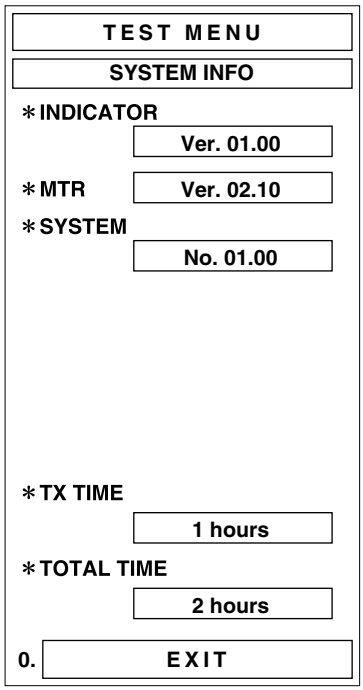
Procedures

1 Press [TEST] .

The TEST Menu will appear.

2 Press (7) .

The SYSTEM INFO Menu will appear and the current system information will appear.



Exit

1 Press (0) .

The TEST Menu will reappear.

2 Press (0) **.**

The TEST Menu will be closed.

……8.1.2 List of Alarms and other Indications ……

Table 8.2 List of Gyro Alarms

Message	Description
SET GYRO	Requires initialization of NSK or setting of initial values for gyro.
TM RESET	Own ship's position has reached at approx. 60% of the radar PPI radius in the TM mode.
POSN RST	Change the latitude and longitude sentence.

Table 8.3 List of ARPA Alarms

Message	Description
CPA/TCPA	CPA/TCPA of a target (ARPA)
GZ	A target approaching own ship exists in a guard zone.
LOST	A target under acquisition can not be tracked.

Table 8.4 List of Operational Error Messages and Warnings

Message	Description
OUT OF RANGE	Tried to create a guard zone outside the specified range.
CHANGE RANGE	The range is set outside the specified in creating a guard zone.
MAX POINT	Tried to enter navigation information beyond the specified.
CAN'T TRANSMIT	Tried to transmit within 1 second after standby or when the transmitter-receiver has any trouble.
MAX MARK	Tried to enter more than 20 plot marks.
CAN'T USE	Key in with the [+] or [-] at any place where only a numerical value can be entered.
CAN'T CHANGE	Tried to make any operation that cannot be changed.
NO GYRO DATA	Any operation requiring Gyro data was made without it.
INVALID DATA	Tried to enter any data beyond its range.
NO POSITION DATA	Any operation requiring position data was made without it.
CHG REL VECTOR	Tried to display a CPA ring in TRUE mode.
MAX TARGET	The maximum number of targets (50 targets) is under acquisition.
SELECT STRAIGHT	The operator set PM to ON without selecting straight.
NOT ALLOWED	Improper operation

Note:

1) An error message and a warning will appear at the lower right of the radar display.

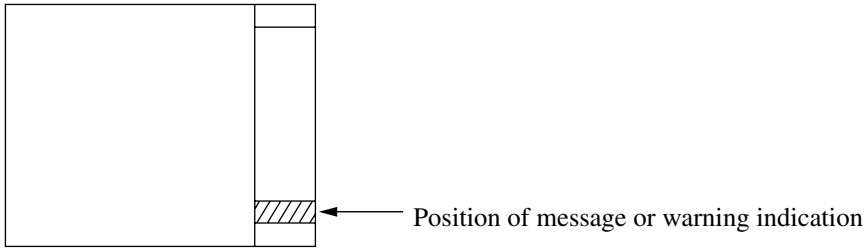


Table 8.5 List of Interswitch Alarms and Messages

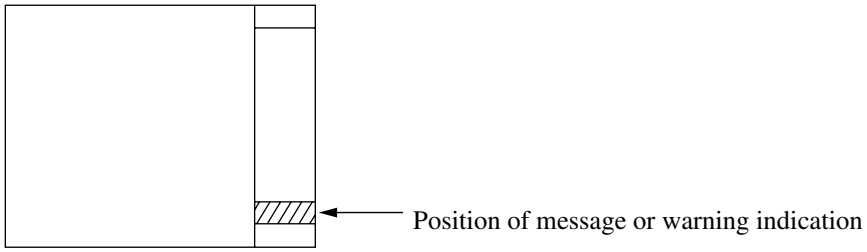
Message	Description
MASTER RANGE CHG	Tried to change the master range.
ALREADY SELECTED	Selected the already selected pattern.
ISW END!	The switchover of the Interswitch ended normally.
ISW BUSY!	Access to the ISW menu was made during interswitching.
MTR ST-BY!	The master MTR is in the standby mode.
ISW STRAIGHT	Failed in straight connection when the Interswitch system stops operating.
ISW STAND-BY!	The Interswitch recovered normally.
ISW TIME OUT	Communication error ocurred between interswitch and display.
ISW ERROR!	The interswitch is disabled.

Table 8.6 List of System Alarms

Message	Description
MTR (AZI)	Bearing signal error
MTR (HL)	Ship's heading line signal error
MTR (MHV)	Modulator's high voltage error
MTR (DATA)	Communications error with the transmitter-receiver unit
MTR (HEATER)	Magnetron heater voltage is abnormal
MRT (REVERSE)	Antenna rotation is reversed
MTR STATUS	Transceiver status error
SSW OFF	The safety switch is OFF during switchover of the scanners
NSK (GYRO)	Gyro signal OFF
ISW (DATA)	Communications error with the interswitch
LOG	Log signal OFF
NAV (DATA)	Data from navigation equipment OFF
DLOG	2-axis log signal OFF
ARPA (DATA)	Communications error with the ARPA unit
NSK (DATA)	Communications error with the NSK unit
VIDEO	Radar video OFF
TRIGGER	Trigger signal OFF
FAN1	Fan alarm 1
FAN2	Fan alarm 2
PROC (DATA)	Signal processing circuit error
SERI (DATA)	Serial interface circuit error
LAN (DATA)	LAN I/F circuit error
232C (DATA)	RS-232C communications error
MTR (VIB)	Abnormal scanner vibrations
MTR (TMP)	Abnormal scanner temperature
COM1	Com port1 failure
COM2	Com port2 failure
COM3	Com port3 failure
COM4	Com port4 failure
COM5	Com port5 failure
COM6	Com port6 failure
COM7	Com port7 failure
COM8	Com port8 failure
COM9	Com port9 failure
COM10	Com port10 failure
MAG (HDG)	Data from Mag compass have been cut off
PROC (AZI)	Bearing pulse is abnormal

Note:

1) An error message will appear at the lower right of the radar display.



8.2 TROUBLESHOOTING

In case of semiconductor circuits, it is deemed that there is 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.

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 this case, note that there is some dispersion in the fusing characteristics. Table 8.7 shows a list of fuses used in the equipment.

Table 8.7 Fuse List

Location	Parts No.	Nominal Current	Protection Circuit	Type
Transmitter-receiver Unit	F1	1A	Rectifier circuit PC1001	MF51NN-1A
Display Unit (NSK)	F1 to F4	0.5A	LOG.NSK circuit PC4201	MF60NR-0.5A

8.3 COUNTERMEASURES TO TROUBLE

As this radar equipment includes complicated circuits, it is necessary to request a specialist engineer for repair or instructions for countermeasure 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 treated, so that it is earthed or contacts with another terminal.
c) Disconnected cable wire

2 Poor Contact of Connector within Unit

Reference:
This radar equipment is provided with the standard spares as shown in Table 8.8.

Table 8.8 Spares (6ZXRD00198)

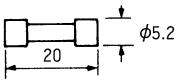
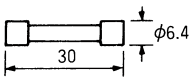
Name	Type/Code	Shape (mm)	In use	Spare	Parts No.	Location
Fuse	MF51NN-1A (5ZFAD00042)		1	3	F1	Transmitter-receiver PC1001
Fuse	MF60NR-0.5A (5ZFAD00013)		4	12	F1 to F4	Display NSK Circuit

Table 8.9 Special Parts

[Ⅰ] JMA-9833-SA

Parts No.	Name	Type	Manufacturer	Location	Code
V201	Magnetron	M1302	NJRC	Transmitter-receiver	5VMAA00032
A201	Circulator	NJC3310	NJRC	Transmitter-receiver	5AJBV00002
A202	TRHPL	TL378A	NJRC	Transmitter-receiver	5VLAA00032

[Ⅱ] JMA-9832-SA

Parts No.	Name	Type	Manufacturer	Location	Code
V101	Magnetron	M1302	NJRC	Scanner	5VMAA00032
A101	Circulator	NJC3320	NJRC	Scanner	5AJBV00004
A303	TRHPL	TL378A	NJRC	Scanner	5VLAA00032

[Ⅲ] JMA-9823-7XA/9XA

Parts No.	Name	Type	Manufacturer	Location	Code
V1	Magnetron	M1437(A)	NJRC	Transmitter-receiver	5VMAA00074
A201/A202	Circulator	FCX68	Toshiba	Transmitter-receiver	6AJRD00001
A203	Diode Limiter	NJS6928	NJRC	Transmitter-receiver	5EZAA00019
A302	Pin Attenuator	NJS6926	NJRC	Transmitter-receiver	5ENAC00019

[Ⅳ] JMA-9822-6XA/9XA

Parts No.	Name	Type	Manufacturer	Location	Code
V1	Magnetron	M1437(A)	NJRC	Scanner	5VMAA00074
A101	Circulator	FCX68	Toshiba	Scanner	6AJRD00001
A303	Diode Limiter	NJS6928	NJRC	Scanner	5EZAA00019
A302	Pin Attenuator	NJS6926	NJRC	Scanner	5ENAC00019

Table 8.10 Repair Circuit Block

[Ⅰ] JMA-9833-SA

Location	Circuit Block	Type	Remarks
Scanner	Motor with gear	MPEM30030	AC220V 3φ
Scanner	Motor with gear	MPEM30038	AC220V 1φ (MED only)
Scanner	Motor with gear	MPEM30039	AC100/110V 1φ
Transmitter-receiver	Modulator	NMA-446-1	Including PC210 (CPA-209) Including PC220 (CBD-1226) Excluding Magnetron
Transmitter-receiver	Receiver	NRG-88	PC301 (CAE-344-1) PC302 (CAF-424) PC303 (CGH-205) Including PC304 (CBD-1274)
Scanner	Rectifier circuit	CBA-249	PC1001
Scanner	T/R control circuit	CMC-898	PC1101
Display	Power supply circuit	CBD-1514	
Display	Terminal board circuit	CQD-1729	
Display	NSK/LOG I/F circuit	CMJ-431	
Display	Display control circuit	CMC-1096	
Display	Serial I/F circuit	CHM-345	
Display	Keyboard process circuit	CMD-835	
Display	Panel circuit-1	CCK-846	
Display	Panel circuit-2	CCK-847	
Display	Mother board	CQC-969	
Display	Sensor circuit	CHT-63	
Display	PCMCIA kit	MPBX38633A	(Option)
Display	Signal processing circuit	CDC-1066	
Display	ARPA processor circuit	CDC-1065	
Display	DSP MODULE 1	CDC-1073	
Display	DSP MODULE 2	CDC-1081	
Display	Monitor circuit	CCN-326	
Display	Relay unit	CSC-594	
Display	Interswitch circuit	CCL-263	(Option)

[Ⅱ] JMA-9832-SA

Location	Circuit Block	Type	Remarks
Scanner	Motor with gear	MPEM30030	AC220V 3ø
Scanner	Motor with gear	MPEM30038	AC220V 1ø
Scanner	Motor with gear	MPEM30039	AC100/110V 1ø
Scanner	Modulator	NMA-487-1	Including PC210 (CPA-209)
			Including PC220 (CBD-1226)
			Excluding Magnetron
Scanner	Receiver	NRG-222	PC301 (CAE-344-4)
			PC302 (CAF-424)
			PC303 (CGH-205)
			Including PC304 (CBD-1274)
Scanner	Rectifier circuit	CBA-249	PC1001
Scanner	T/R control circuit	CMC-898	PC1101
Display	Power supply circuit	CBD-1514	
Display	Terminal board circuit	CQD-1729	
Display	NSK/LOG I/F circuit	CMJ-431	
Display	Display control circuit	CMC-1096	
Display	Serial I/F circuit	CHM-345	
Display	Keyboard process circuit	CMD-835	
Display	Panel circuit-1	CCK-846	
Display	Panel circuit-2	CCK-847	
Display	Mother board	CQC-969	
Display	Sensor circuit	CHT-63	
Display	PCMCIA I/F circuit	CMH-1715	
Display	Signal processing circuit	CDC-1066	
Display	ARPA processor circuit	CDC-1065	
Display	DSP MODULE 1	CDC-1073	
Display	DSP MODULE 2	CDC-1081	
Display	Monitor circuit	CCN-326	
Display	Relay unit	CSC-594	
Display	Interswitch circuit	CCL-263	(Option)

[Ⅲ] JMA-9823-7XA/9XA

Location	Circuit Block	Type	Remarks
Scanner	Motor with gear	MPEM30037	AC220V 3ø
Scanner	Motor with gear	MPEM30018	AC220V 1ø
Scanner	Motor with gear	MPEM30016	AC100/110V 1ø
Scanner	Modulator	NMA-441-1	Including PC210 (CPA-209)
			Including PC220 (CBD-1226)
			Excluding Magnetron
Scanner	Receiver	NRG-98	Including PC301 (CAE-344)
Scanner	Rectifier circuit	CBA-249	PC1001
Scanner	T/R control circuit	CMC-898	PC1101
Display	Power supply circuit	CBD-1514	
Display	Terminal board circuit	CQD-1729	
Display	NSK/LOG I/F circuit	CMJ-431	
Display	Display control circuit	CMC-1096	
Display	Serial I/F circuit	CHM-345	
Display	Keyboard process circuit	CMD-835	
Display	Panel circuit-1	CCK-846	
Display	Panel circuit-2	CCK-847	
Display	Mother board	CQC-969	
Display	Sensor circuit	CHT-63	
Display	PCMCIA I/F circuit	CMH-1715	
Display	Signal processing circuit	CDC-1066	
Display	ARPA processor circuit	CDC-1065	
Display	DSP MODULE 1	CDC-1073	
Display	DSP MODULE 2	CDC-1081	
Display	Monitor circuit	CCN-326	
Display	Relay unit	CSC-594	
Display	Interswitch circuit	CCL-263	(Option)

[Ⅳ] JMA-9822-6XA/9XA

Location	Circuit Block	Type	Remarks
Scanner	Motor with gear	MPEM30037	AC220V 3ø
Scanner	Motor with gear	MPEM30018	AC220V 1ø
Scanner	Motor with gear	MPEM30016	AC100/110V 1ø
Scanner	Modulator	NMA-441-1	Including PC210 (CPA-209)
			Including PC220 (CBD-1226)
			Excluding Magnetron
Scanner	Receiver	NRG-98	Including PC301 (CAE-344)
Scanner	Rectifier circuit	CBA-249	PC1001
Scanner	T/R control circuit	CMC-898	PC1101
Display	Power supply circuit	CBD-1514	
Display	Terminal board circuit	CQD-1729	
Display	NSK/LOG I/F circuit	CMJ-431	
Display	Display control circuit	CMC-1096	
Display	Serial I/F circuit	CHM-345	
Display	Keyboard process circuit	CMD-835	
Display	Panel circuit-1	CCK-846	
Display	Panel circuit-2	CCK-847	
Display	Mother board	CQC-969	
Display	Sensor circuit	CHT-63	
Display	PCMCIA I/F circuit	CMH-1715	
Display	Signal processing circuit	CDC-1066	
Display	ARPA processor circuit	CDC-1065	
Display	DSP MODULE 1	CDC-1073	
Display	DSP MODULE 2	CDC-1081	
Display	Monitor circuit	CCN-326	
Display	Relay unit	CSC-594	
Display	Interswitch circuit	CCL-263	(Option)

8.4 REPLACEMENT OF MAJOR PARTS

⚠CAUTION

Turn off the main power source before replacing parts.Otherwise, an electric shock or injury may result.

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 result.

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 CRT.
If only one person does this work, he may drop the CRT, resulting in injury.

Even after the main power source is turned off, some high voltages remain for a while. When disconnecting the wires of the high-voltage pack from the CRT, do not contact the core wire (metallic) of the CRT anode cap with bare hands. Otherwise, an electric shock may result.

……Replacement of Magnetron (V1/V101/V201)……

Remove the shield cover of the modulator and check that no charge remains in the high-voltage modulator circuit. Then, remove the socket of the magnetron. The magnetron can be demounted by removing the screws fixing it. When mounting a new magnetron, do not touch the magnet with a screwdriver or put it on an iron plate. After replacement, connect the lead wire correctly.

Handling of Magnetron under Long-Time Storage

The magnetron that has been kept in storage for a long time may cause sparks and operate unstably when its operation is started. Perform the aging in the following procedures:

(1) Warm up the cathode for a longer time than usually. (20 to 30 minutes in the STBY state.)
(2) Start the operation from the short pulse range and shift it gradually to the longer pulse ranges. If the operation becomes unstable during this process, return it to the standby mode immediately. Keep the state for 5 to 10 minutes until the operation is restarted.
(3) After transmission is made for about 15 minutes, conduct the tuning adjustment.
(4) Adjust RV1 within the receiver so that the bar graph of the tuning indicator on the display reaches the reading 10 without saturation.

……Replacement of TRHPL (A202/A303) (JMA-9833-SA/9832-SA)

Remove the 4 screws fixing the TRHPL with the receiver and remove the TRHPL. When mounting the TRHPL, take care of the mounting direction and mount it in the arrow direction facing it the receiver front end.

……Replacement of Diode Limiter (A203/A303) (JMA-9823-7XA/9XA, JMA-9822-6XA/9XA) ……

Remove the 4 screws fixing the TRHPL with the receiver. Remove the 4 screws fixing the diode limiter and remove the 4 screws fixing the diode limiter with the PIN attenuator and remove diode limiter. When mounting the diode limiter, take care of the mounting direction and mount it in the arrow direction facing it the receiver front end.
Connect the wiring in the same way as before the replacement.

……Replacement of PIN Attenuator (A302) (JMA-9823-7XA/9XA, JMA-9822-6XA/9XA) ……

Remove the 12 screws fixing the PIN attenuator and remove it in the way similar to the replacement of TRHPL.
Connect the wiring in the same way as before the replacement.

……Replacement of CRT (V1) ……

Attention

● When replacing the CRT, which is easily broken by a little impact, handle it carefully and do not hit any article against it or put it on a hard article.

1 JMA-9833-SA, JMA-9823-7XA/9XA (Display Unit: NCD-4111)

(1) Remove the three M4 screws fixing the cover under the bottom of the operation panel with the cabinet of the monitor.
(2) Loosen the four M5 screws fixing the operation panel unit by inserting a screwdriver into the small holes.
(3) Slide the entire operation panel unit frontwards (approx. 20 mm).
(4) Remove the front panel by removing the four screws.
(5) Remove the four screws fixing the CRT with its cabinet.
(6) Hold the CRT up carefully and lay its screen surface horizontal. Then, you can let go of your hold because the gas springs work well.
(7) Disconnect all the external cables from the CRT. (Refer to CAUTION above.)
(8) Remove the two screws fixing the gas spring with the CRT cabinet.
During removal of the screws, one service person shall hold the CRT.
(9) Remove the stopper fittings from the T-hinges.
(10) Two service persons shall take out the CRT from the cabinet and lay it on its screen surface downward on a table carefully.
(11) Remove the socket, the deflection coil and the anode terminal.
(12) Remove the four M8 fittings from the CRT.
(13) Attach the CRT fittings to a new CRT paying attention to the position of the anode terminal, and reassemble the CRT in the reverse sequence as described above.

2 JMA-9832-SA, JMA-9822-6XA/9XA (Display Unit: NCD-4111)

(1) Remove the two M4 screws fixing the cover under the bottom of the operation panel unit with the CRT cabinet.
(2) Loosen the four M5 screws fixing the operation panel unit by inserting a screwdriver into the small holes.
(3) Slide the entire operation panel unit frontwards (approx. 20 mm).
(4) Remove the front panel by removing the four M6 screws.
(5) Remove the right side panel by removing the eight M4 screws.
(6) Disconnect all the external cables from the CRT (from the right side panel).
(7) Take out the CRT from its cabinet by removing the four M8 screws.
(8) Reassemble a new CRT in the reverse sequence as described above, paying attention to the position of the This section describes the electrical adjustments of the equipment as the adjustment procedures to be carried out by service persons at the time of installation.anode terminal.

8.5 ADJUSTMENTS

This section describes the electrical adjustments of the equipment as the adjustment procedures to be carried out by service persons at the time of installation.

Attention

- Do not carry out the adjustments of the equipment except authorized service persons. Otherwise, an accident or trouble may result.
- Do not carry out the adjustments during navigation. Otherwise, the radar performance may be affected, resulting in an accident or trouble.
- In order to see the SART or radar beacon mark on the radar display. Set IR OFF and PROCESS OFF.
  See the section 3.2.11 and 3.3.20.

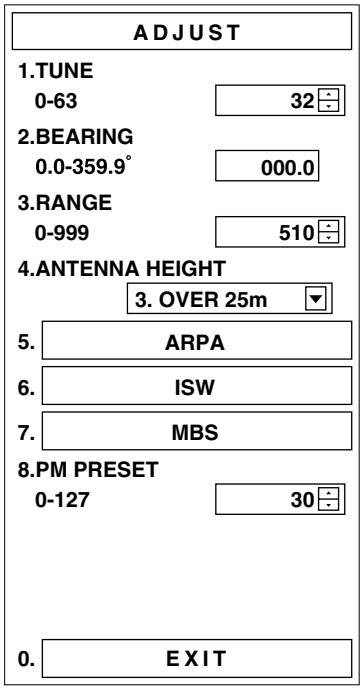
Tuning, bearing and range adjustments can be made from the keyboard, but the Menus for those adjustments will not appear normally. Start the adjustment mode in the following procedures.
The following operation will not be executed unless the menu is closed.

Procedures **1 Continue to press** **MENU** .

The CODE INPUT Menu will appear.

2 Press **0** **, then** **ENT** .

The ADJUST Menu will appear.



Exit **1 Press** **0** .

The ADJUST Menu will be closed.

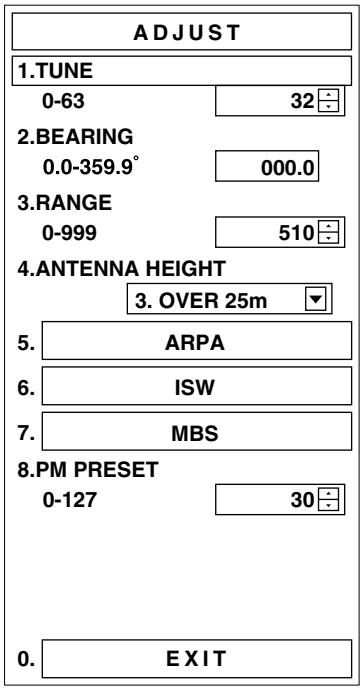
.....Tuning Adjustment .....

Procedures **1 If the AUTO TUNE mode is ON, change the mode to the Manual mode.**

2 Set the range scale to 24 NM and adjust the [TUNE] control to the center.

3 Continue to press **MENU** **.**

The CODE INPUT Menu will appear.



4 Press **0** **, then** **ENT** **.**

The ADJUST Menu will appear.

5 Press **1** **.**

1.TUNE will be selected.

6 Using **+** **and** **–** **, adjust the bar-graph of the tuning indicator on the upper left of the display so that it becomes the longest, and press** **ENT** **to set it.**

Exit **1 Press** **0** **.**

The ADJUST Menu will be closed.

.....Bearing Adjustment .....

Adjust the bearing so that bearing of the target measured with the ship's compass corresponds to that of the target echo on the radar display.

Procedures

1 Press AZI MODE to select the relative bearing presentation (H UP) mode. Set PROC to OFF.

2 Measure the bearing of an adequate target (for example, a ship at anchor, a breakwater or a buoy) relative to own ship's heading. (For instance, assume that the bearing of the target is 25°.)

3 Continue to press MENU .

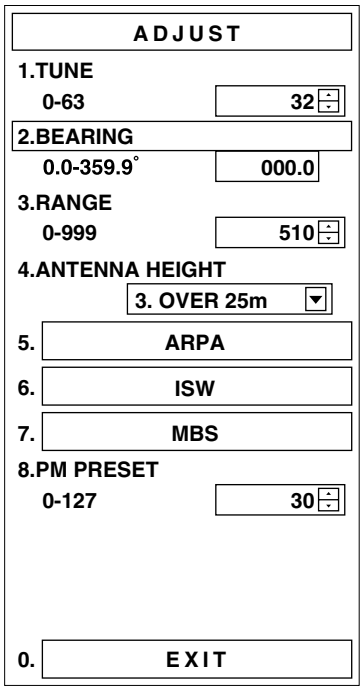
The CODE INPUT Menu will appear.

4 Press 0 , then ENT .

The ADJUST Menu will appear.

5 Press 2 .

2.BEARING will be selected.



6 The EBL for bearing adjustment will appear.

Rotate the [EBL] control and adjust EBL to the target selected in Step 2 above.

Press ENT to set it.

7 Rotate the [EBL] control and adjust the EBL for bearing adjustment to the bearing of the target selected in Step 2 above.

Press ENT to set it.

(Adjust the EBL bearing to 25° as the instance in Step 2 above.)

8 Repeat the procedures from step 5 above if the bearing is not completely coincident with the target's actual bearing.

Exit **1 Press** (0) .

The ADJUST Menu will be closed.

.....Range Adjustment .....

Adjust the range that the range of the target on the radar video is indicated correctly.

Procedures **1 Continue to press** [MENU] .

The CODE INPUT Menu will appear.

2 Press (0) **, then** (ENT) .

The ADJUST Menu will appear.

3 Press (3) .

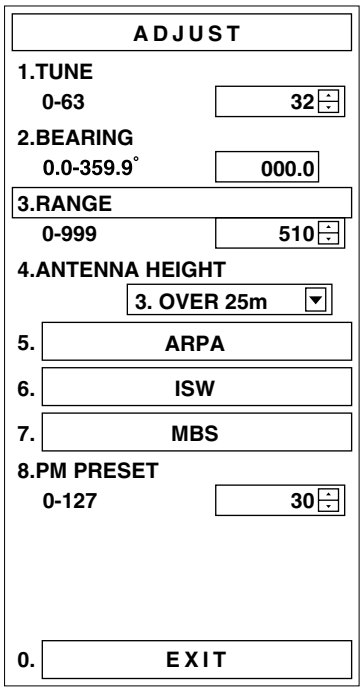
3.RANGE will be selected.

4 Find a target on the radar display the range of which is already known.

(For example, assume that the actual range of the target is 0.33 NM.)

5 Using [+] **and** [−] **, adjust the target echo' position to the position of the target selected in step 4 above. Press** (ENT) **to set it.**

Move the target echo upward by [+] and downward by [−] .



Exit **1 Press** (0) .

The ADJUST Menu will be closed.

.....Antenna Height Setting.....

Set the antenna height above the sea level, but change this setting carelessly.

Procedures **1 Continue to press MENU .**

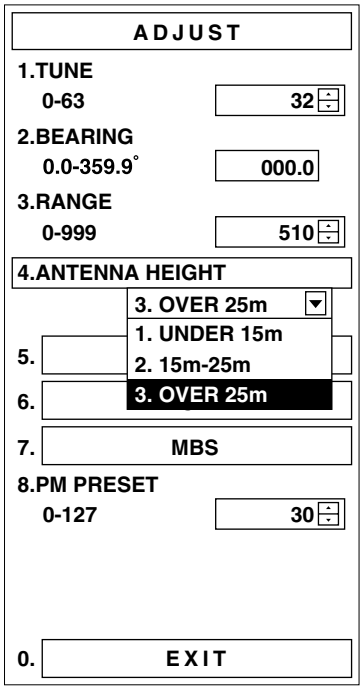
The CODE INPUT Menu will appear.

2 Press 0 , then ENT .

The ADJUST Menu will appear.

3 Press 4 .

4.ANTENNA HEIGHT will be selected and the pull-down menu will appear.



4 Measure the antenna height above the sea level and set it by pressing any of 1 to 3 .

Exit **1 Press 0 .**

The ADJUST Menu will be closed.

8

……Vector Constant (Do not change the set value carelessly) ……

Attention

● The vector constant shall be set to 4 normally. If the vector constant value is higher, a target's vector will be better followed up when the target and own ship change their course or speed, but the vector accuracy will be lower on the contrary.

Procedures

1 Continue to press MENU .

The CODE INPUT Menu will appear.

2 Press 0 , then ENT .

The ADJUST Menu will appear.

3 Press 5 .

The ARPA Menu will appear.

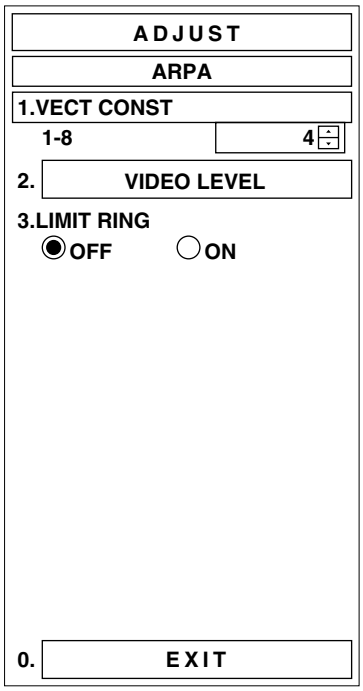
4 Press 1 .

1.VECT CONST will be selected.

5 To change the vector constant, enter a new value

using any of 1 to 8

or + and − , and press ENT to set it.



Exit

1 Press 0 .

The ADJUST Menu will reappear.

2 Press 0 .

The ADJUST Menu will be closed.

.....Quantization Level .....

⚠CAUTION

Do not change the set quantization level carelessly. If the level deviates from the proper value, the ARPA acquisition and tracking functions will deteriorate.
Otherwise, this may cause accidents to occur.

The quantization level determines the minimum signal level of the input video to the ARPA target detection circuit. In this test, the value of the quantization level can be set in a range of 1 to 63.
If the value is set to a lower level, weak target echoes will be inputted to the ARPA target detection circuit, but much radar noise will also be inputted to the circuit together, and target acquisition and tracking may be disabled. Therefore, it is important to set a value that is 4 or 5 higher than the detected noise level.

Procedures

1 Continue to press MENU .

The CODE INPUT Menu will appear.

2 Press 0 , then ENT .

The ADJUST Menu will appear.

3 Press 5 .

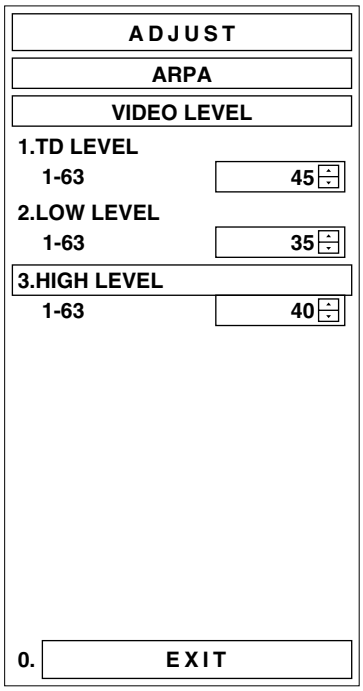
The ARPA Menu will appear.

4 Press 2 .

The VIDEO LEVEL Menu will appear.

5 Press 3 .

3.HIGH LEVEL will be selected.



6 To change the quantization level, enter a new value using any of 0 to 9 or + and − , and press ENT to set it.

8

Exit **1 Press** (0) .

The ARPA Menu will reappear.

2 Press (0) .

The ADJUST Menu will reappear.

3 Press (0) .

The ADJUST Menu will be closed.

Do not change the quantization level LOW LEVEL.

……Adjustment of NSK Unit to Gyro Compass and Log……

The NSK Unit of the radar equipment is of solid-state type and designed to be compatible with almost all types of gyro compass by switch operation (For the step motor type, 35 V DC to 100 V DC, and for the synchro-motor type, the primary excitation voltage is 50 V AC to 115 V AC). Before power-on operation, the switches S101, S102 and S103 and the jumpers J102 to J106 on the NSK Unit (CMJ-431) shall be set to the type of gyro compass in use in accordance with the procedures as described below. The gyro select switch on the NSK Unit is set to the gyration ratio of 360X and to be compatible with the synchro type before delivery from factory. Check the type of the gyro compass used in own ship and make settings in the procedures below. For further details, refer to Fig.127 Setting Table of Gyro Compass and Gyro Select Switches of Display Unit, Type NCD-4111.

① Set the switches and jumper of the NSK Unit (CMJ-431) before turning on the radar equipment.

- S101: Set it to [OFF].
- S102: Set this switch assembly according to the particular type of gyro. Use the S102 Setting table in Table 8.10 to set the switches.

S102-1 .....Type — [OFF] ..... Synchro signal; [ON] ..... Step signal

S102-2, -3 .....Gyration ratio

	360X	180X	90X	36X
S102-2	OFF	ON	OFF	ON
S102-3	OFF	OFF	ON	ON

S102-4 .....Gyration direction — [OFF] ..... Normal (clockwise); [ON] ..... Reverse (counterclockwise)

S102-5 .....Log type-1 — [OFF] ..... Pulse signal; [ON] ..... Synchro signal

S102-6 .....Log type-2 [ON] 1-axis
[OFF]..... 2-axis

S102-7, -8 .....Log ratio

Pulse/NM (pulse signal)		800	400	200	100
Gyration/NM (synchro signal)		360X	180X	90X	30X
	S102-7	OFF	ON	OFF	ON
	S102-8	OFF	OFF	ON	ON

S103-1 .....User mode [ON] .....BSH
[OFF].....Normal

• J102 to J106: Gyro type
(set the jumpers J102 to J106)

Signal \ Jumper	J102	J103	J104	J105	J106
STEP	2,3	1,2	2,3	2,3	2,3
SYNC	1,2	2,3	1,2	1,2	1,2

② Connect the gyro signal and the log signal cables to the Terminal Board Circuit.

③ Set S101 to [ON].

(After power-on operation, the switch S102-4 shall be set to [ON] if the radar video and the indicated value of COURSE (own ship's true bearing) is reversed.)

Table 8.10 Gyro and Log Select Switches (S102 Dip Switch)

S102 Setting Table

		1	2	3	4	5	6	7	8
GYRO SIG.	STEP	0							
	SYNC	1							
	36X		0	0					
	90X		1	0					
	180X		0	1					
	360X		1	1					
	DIRECTION: Reverse (REV)				0				
	DIRECTION: Normal (NOR)				1				
LOG SIG.	TYPE: SYNCHRO					0			
	TYPE: PULSE					1			
	TYPE: 1AXIS						0		
	TYPE: 2AXIS						1		
	PULSE/NM: 100P/30X							0	0
	PULSE/NM: 200P/90X							1	0
	PULSE/NM: 400P/180X							0	1
	PULSE/NM: 800P/360X							1	1

ON: 0
OFF: 1
} to be specified

S103 Setting Table

SW / User Mode	1	2 ~ 8
BSH	0	1
NORMAL	1	

ON: 0
OFF: 1
} to be specified

.....Main Bang Suppression Adjustment.....

This adjustment is intended for suppressing the main bang that is an echo signal from the microwave circuit such as waveguide appearing as a circular echo at the radar video center. It is the optimum level in which the main bang suppression is adjusted so that the main bang remains weak on the video.

Attention

- Do not change the adjusted level carelessly. If the adjustment is improper, the target signals on the short ranges may be cleared.

Procedures

1 Set the radar range scale to the minimum 0.125 NM, set PROCESS, TGT ENH and FUNCTION to OFF, and set the system to the Transmit mode.

2 Adjust the operation controls as follows:
[GAIN] control: Maximum
[SEA] control: Middle (MANUAL)
[RAIN] control: Minimum (MANUAL)

3 Continue to press MENU .

The CODE INPUT Menu will appear.

4 Press 0 , then ENT .

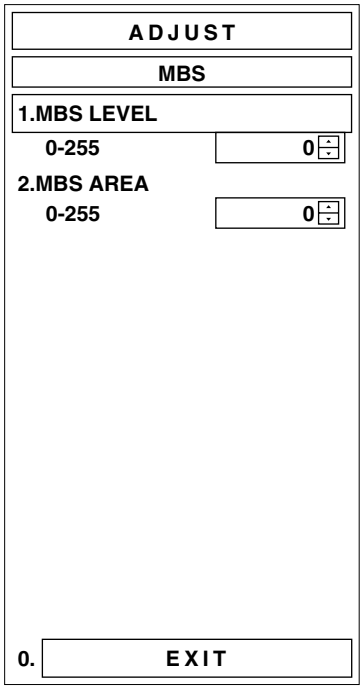
The ADJUST Menu will appear.

5 Press 7 .

The MBS Menu will appear.

6 Press 1 .

1.MBS LEVEL will be selected.



7 Enter any value to adjust the suppression range using 0 to 9

or + and − , and press ENT to set it up.

8

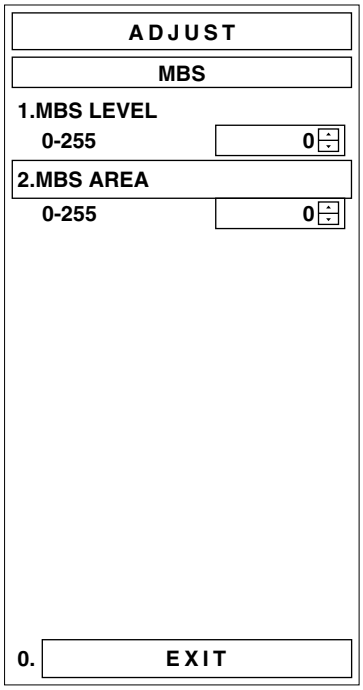
8 Press (2) in the state of step 5.

2.MBS AREA will be selected.

9 Enter any value to adjust the suppression level using

(0) to (9) or [+] and [−], and

press (ENT) to set it up.



Exit

1 Press (0) .

The ADJUST Menu will reappear.

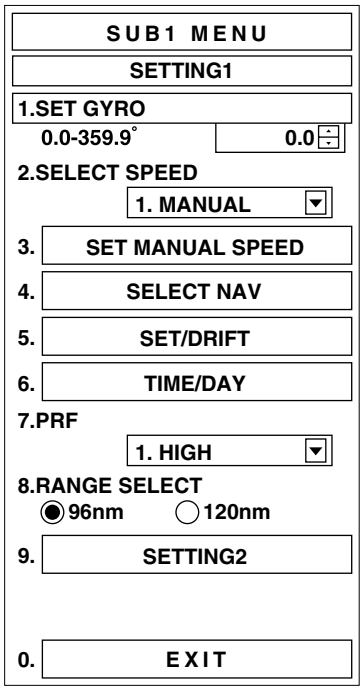
2 Press (0) .

The ADJUST Menu will be closed.

8.6 SETTING

.....True Bearing Setting .....

Adjust the bearing that the bearing angle of the radar is the same as that of the gyro.



Procedures **1 Press** MENU **.**

The Main Menu will appear.

2 Press 8 **, then** 1 **.**

The SETTING1 Menu will appear.

3 Press 1 **.**

1.SET GYRO will be selected.

4 Enter any value using 0 **to** 9 **or**

+ **and** − **to adjust the radar bearing to the gyro bearing, and press**

ENT **to set it up.**

Exit **1 Press** 0 **.**

The Sub1 Menu will reappear.

2 Press 0 **.**

The Sub1 Menu will be closed.

8

.....Ship Speed Setting.....

The ship's speed and various other related values, and manual speed can be set.

Procedures **1 Press** MENU .

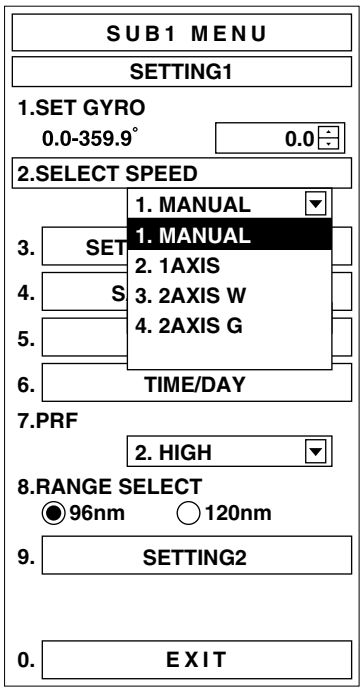
The Main Menu will appear.

2 Press 8 **, then** 1 .

The SETTING1 Menu will appear.

3 Press 2 .

2.SELECT SPEED will be selected and pull-down menu will appear.



4-1 Manual Speed Setting

(1) Press 1 .

1. MANUAL will be set.

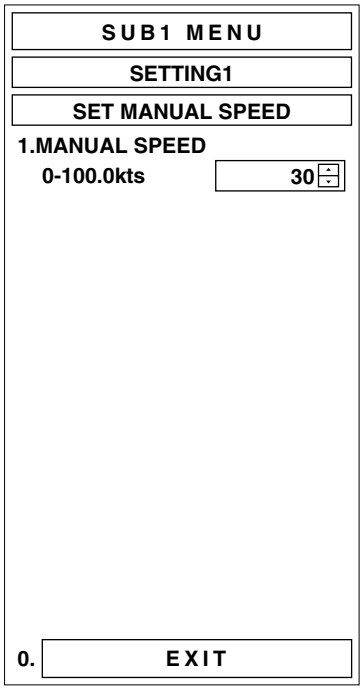
(2) Press 3 after step 2 above is completed.

The SET MANUAL SPEED Menu will appear.

(3) Press any of 0 to 9 or +

and − and press ENT .

The speed (max. 100.0 kts) will be set.



Note: The manually entered speed is effective only when 1. MANUAL is set in 2.SELECT SPEED.

4-2 LOG Setting

(1) Press **2** .

2.SELECT SPEED will be selected.

(2) Press **2** for 1-axis log.

2. 1AXIS will be set.

4-3 Selection of Data against Water for 2-axis Log (NMEA Signal)

(1) Press **3** .

3. 2AXIS W will be set.

4-4 Selection of Data against Ground for 2-axis Log (NMEA Signal)

(1) Press **4** .

4. 2AXIS G will be set.

Attention

- The speed data cannot be selected when the sentence VBW of NMEA0183 is not entered.

Exit

1 Press 0 .

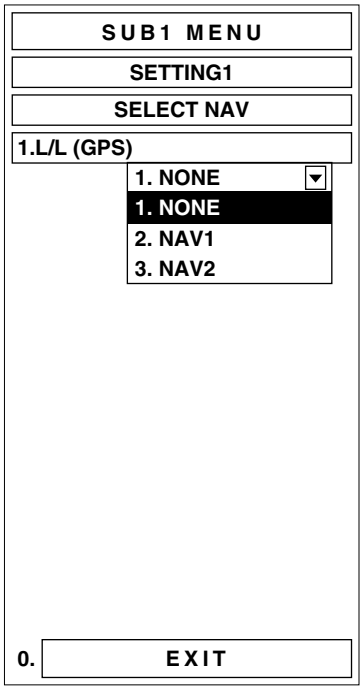
The Sub1 Menu will reappear.

2 Press 0 .

The Sub1 Menu will be closed.

.....Navigation Equipment Setting .....

The data from the navigation equipment such as GPS will be selected.



Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 8 **, then** 1 .

The SETTING1 Menu will appear.

3 Press 4 .

The SELECT NAV Menu will appear.

4 Press 1 .

1.L/L (GPS) will be selected and pull-down menu will appear.

5-1 Navigation Equipment Not Used

(1) Press 1 .

1. NONE will be set.

5-2 Navigation Equipment 1 Used

(1) Press 2 .

2. NAV1 will be set.

5-3 Navigation Equipment 2 Used

(1) Press 3 .

3. NAV2 will be set.

Exit

1 Press (0) **.**

The SETTING1 Menu will reappear.

2 Press (0) **.**

The Sub1 Menu will reappear.

3 Press (0) **.**

The Sub1 Menu will be closed.

……Current Correction (SET/DRIFT) Setting ……

The current set and drift will be set.

Attention

- The manually entered speed is effective only when [1. MANUAL] or [2. 1AXIS] is set in [2.SELECT SPEED] of SETTING1 Menu.

Procedures

1 Press MENU .

The Main Menu will appear.

2 Press 8 , then 1 .

The SETTING1 Menu will appear.

3 Press 5 .

The SET/DRIFT Menu will appear.

4 Press 1 .

"ON" in "1.CORRECTION" will be set to operate the current correction mode.
If the current correction mode is not operated,

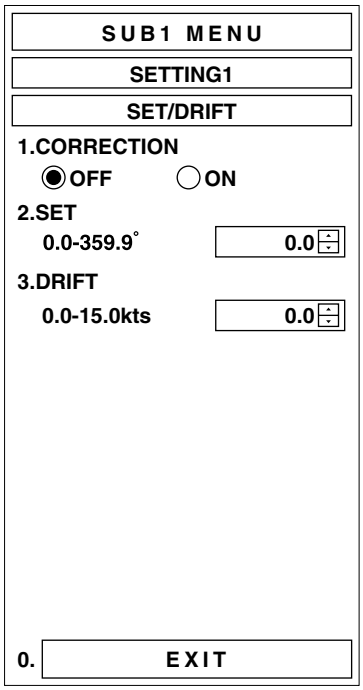
press 1 to set it to "OFF".

5 Set "1.CORRECTION" to "ON" and press 2 .

[2.SET] will be selected.

6 Enter any angle of the current set using 0 to 9 or + and − , and press ENT to set it up.

The current set will be set.



7 Set "1.CORRECTION" to "ON" and press 3 .

3.DRIFT will be selected.

8 Enter any speed of the current drift using 0 to 9 or + and − , and press ENT to set it up.

The current drift will be set.

Exit

1 Press 0 .

The SETTING1 Menu will reappear.

2 Press 0 .

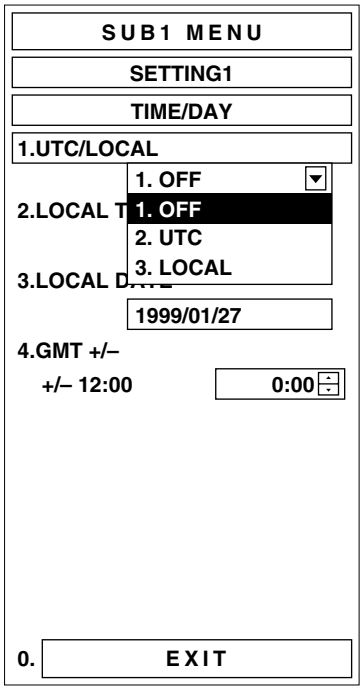
The Sub1 Menu will reappear.

3 Press 0 .

The Sub1 Menu will be closed.

.....Time/Day Display Setting .....

In displaying the time, it is necessary to set the LOCAL TIME, LOCAL DATE and GMT +/–.



Procedures **1 Press** MENU .

The Main Menu will appear.

2 Press 8 **, then** 1 .

The SETTING1 Menu will appear.

3 Press 6 .

The TIME/DAY Menu will appear.

4 Press 1 .

1.UTC/LOCAL will be selected and the pull-down menu will appear.

4-1 Time not Indicated

Press 1 .

1. OFF will be set.

4-2 UTC (Coordinated Universal Time) Indicated

Press 2 .

2. UTC will be set.

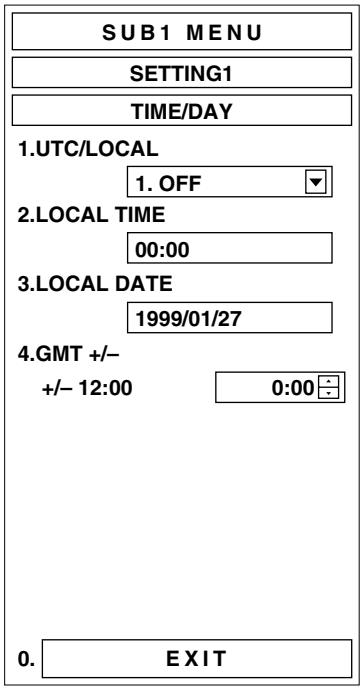
4-3 LOCAL (Local Time) Indicated

Press 3 .

3. LOCAL will be set.

5 Press 2 .

2.LOCAL TIME will be selected.



6 Enter any local time using 0 to 9 and press ENT to set it up.

The LOCAL TIME will be set.

7 Press 3 .

3.LOCAL DATE will be selected.

8 Enter any local date using 0 to 9 and press ENT to set it up.

The LOCAL DATE will be set.

9 Press 4 .

4.GMT +/– will be selected.

10 Enter the time difference between the local time and the UTC using + and – , and press ENT to set it up.

GMT +/– will be set.

In connecting a GPS to the system, the radar time will be set to automatic correction.

Exit **1 Press** (0) .

The SETTING1 Menu will reappear.

2 Press (0) .

The Sub1 Menu will reappear.

3 Press (0) .

The Sub1 Menu will be closed.

Attention

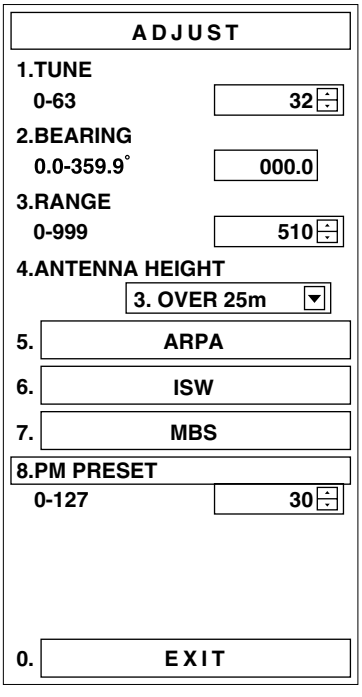
● Time correction is not available when the "ZDA" sentence of NMEA0183 is not received.

……Adjustment of Performance Monitor (NJU-63/64) ……

Procedures **1 Set the radar to Master Radar when the Interswitch is installed.**

2 Press (VRM1) **to display VRM1 and set the range of VRM1 to 16 - 18* NM.**

* Set the range to 16 to 18 NM when a waveguide is installed between the scanner unit and the transmitter-receiver unit. (X band radar)
* Set the range to 18 NM when the transceiver unit is incorporated in the scanner unit or in case of operating the S band radar.



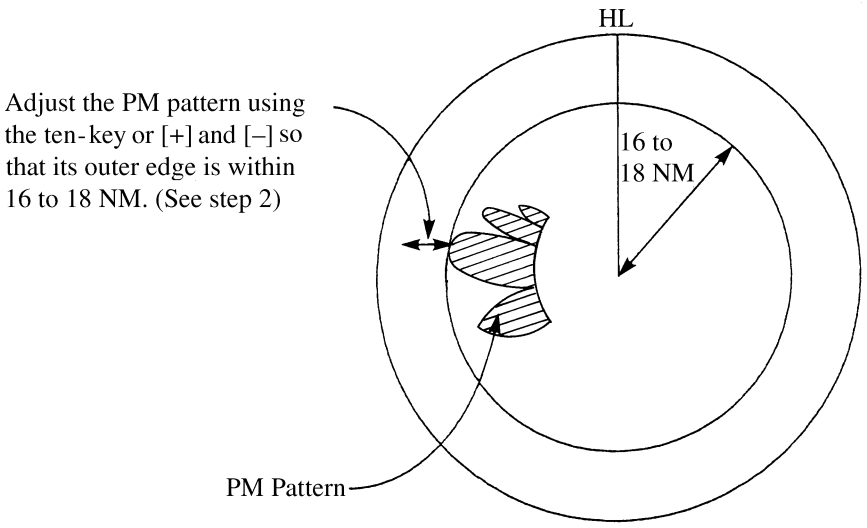
3 Carefully read Section 8.5, adjustments before opening the ADJUST menu.

4 Press (8) .

"8.PM PRESET" will be set and the radar will automatically be set to RM, OFF CENTER OFF, IR OFF, PROCESS OFF, TGT ENH OFF, FUNCTION OFF and 24 NM range.

5 Affix the INFORMATION LABEL as supplied with the Performance Monitor to a suitable position of the board side of the Display Unit.

6 Write down the value of the "PM" indicator in the TEST Menu and the date of checking in the INFORMATION LABEL.



Exit **1 Press** **0** .

The ADJUST Menu will be closed, returing to the state before test.

Note: • All target acquisitions by ARPA functions will be cancelled.
The target acquisition cancelled when PM is ON will not be recovered.
• The radar image is suppressed to make the PM image easier to see.
Therefore, the ADJUST MENU should be always opened after PM check is completed.

……Adjustment of Interswitch ……

[Checking after Installation]

Turn off the ship's mains (switch board) for the radar equipment.

(1) Check that the Interswitch is installed properly after completion of the installation.
In particular, check if the cable is connected correctly and if the shield meshwork of the cable is grounded properly.

(2) Check that the internal settings in each Display Unit are made adequately.

[Checking the Interswitch Operation]

Turn on the ship's mains (switch board) for the radar equipment.

(1) Checking Interswitch Patterns
6 interswitch patterns are available for 2-units of radar system, and 12 interswitch patterns are available for 3-units of radar system.
For the checking procedures, refer to the Instruction Manual for Interswitch Kit as attached hereto.

(2) Checking and adjusting Radar Video
The radar system with the built-in interswitch kit shall be adjusted in the following three parameters:
- Range adjustment (0 NM adjustment)
- Bearing adjustment
- Rough tuning adjustment

These types of adjustment shall be made for each interswitch pattern as follows:
2-units system ••••••• No.1 and No.2

3-units system ••••••• No.1, No.2, No.3 and No.12.

For the method of adjustment, refer to the respective adjustment procedures.

Note: Each adjustment should be performed swiftly after the interswitch is equipped.
These adjustments should be performed on the patterns specified according to the radar quantity of the system.
If the patterns are switched without adjustments and the radar is used, accurate information cannot be obtained from the radar.

2-units System

a. Pattern No.1
① Adjustment between the Display Unit (right) and the MTR (right). (Adjust by operating the panel of the Display Unit (right))
② Adjustment between the Display Unit (left) and the MTR (left). (Adjust by operating the panel of the Display Unit (left))

b. Pattern No.2
① Adjustment between the Display Unit (right) and the MTR (left). (Adjust by operating the panel of the Display Unit (right))
② Adjustment between the Display Unit (left) and the MTR (right). (Adjust by operating the panel of the Display Unit (left))

3-units System

a. Pattern No.1
① Adjustment between the Display Unit (center) and the MTR (center). (Adjust by operating the panel of the Display Unit (center))

② Adjustment between the Display Unit (left) and the MTR (left). (Adjust by operating the panel of the Display Unit (left))
③ Adjustment between the Display Unit (right) and the MTR (right). (Adjust by operating the panel of the Display Unit (right))

b. Pattern No.2
① Adjustment between the Display Unit (center) and the MTR (left). (Adjust by operating the panel of the Display Unit (center))
② Adjustment between the Display Unit (left) and the MTR (center). (Adjust by operating the panel of the Display Unit (left))
③ Adjustment between the Display Unit (right) and the MTR (right). (Unnecessory adjustment)

c. Pattern No.3
① Adjustment between the Display Unit (center) and the MTR (right). (Adjust by operating the panel of the Display Unit (center))
② Adjustment between the Display Unit (left) and the MTR (left). (Unnecessory adjustment)
③ Adjustment between the Display Unit (right) and the MTR (center). (Adjust by operating the panel of the Display Unit (right))

d. Pattern No.12
① Adjustment between the Display Unit (center) and the MTR (center). (Unnecessory adjustment)
② Adjustment between the Display Unit (left) and the MTR (right). (Adjust by operating the panel of the Display Unit (left))
③ Adjustment between the Display Unit (right) and the MTR (left). (Adjust by operating the panel of the Display Unit (right))

SECTION 9
AFTER-SALES SERVICE

……When you Request for Repair ……

If you suppose the product may be out of order, read the description in Section 8 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

It any defective function of the product is recoverable by repair, the repair of it will be made at your own charge upon your request.

● Necessary Information for Repair

☆ Product name, model, manufacturing date and serial number
☆ Trouble conditions (as detailed as possible. Refer to "Radar Failure Check List" in page 9-2.)
☆ Name of company/organization, address and telephone number

……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 futher details of after-sale service, contact the JRC Offices in the list at the end of this manual.

Radar Failure Check List

When placing an order for repair of the product, it is requested that you could confirm the check items and fill the results and sent the sheet to our contact.
If there is any unclear items, contact the ship on which the product is installed, and give the correct information on the product.

Ship name: _____ Phone: _____ Fax: _____
Radar general model name: JMA- _____ Serial No.: _____
(Write the full model name correctly)

(1) Check the following items in the order of the number, and circle the applicable answer between YES or NO. If the item cannot be determined as YES or NO, explain in detail in the item (18), others.
(2) If any of the items (1) to (5) is marked as NO, check the fuse of the product (refer to Section 8.2 and 8.3).
(3) Check the items (4) to (17) while the transmission (TX) is ON.

* Functions mentioned in the items (14), (15) and (17) may be optional, answer is not necessary.

No.	Check Item	Result	
(1)	Power can be turned on. (The lamp on the operation panel is lit)	YES	NO
(2)	A few minutes after powering-on, it will become standby status (TX Ready).	YES	NO
(3)	When powering-on (or TX ON), the CRT displays something (CRT is lit).	YES	NO
(4)	The scanner rotates at the transmission (TX) ON. (Check the following items while transmission is ON)	YES	NO
(5)	Current is supplied to the magnetron. (Refer to the instruction manual)	YES	NO
(6)	Tuning is enabled. (Check with the range of 6 NM or more)	YES	NO
(7)	Fixed marker is displayed.	YES	NO
(8)	VRM is displayed.	YES	NO
(9)	While noise is displayed while set at STC and FTC minimum, GAIN maximum, IR-OFF and range 48 NM.	YES	NO
(10)	Target reflection echo is displayed.	YES	NO
(11)	Sensitivity of reflection echo is normal.	YES	NO
(12)	EBL is displayed.	YES	NO
(13)	Cursor mark moves.	YES	NO
*(14)	GYRO course can be set and normally displayed.	YES	NO
*(15)	LOG speed can be normally displayed.	YES	NO
(16)	ARPA works normally.	YES	NO
*(17)	If equipped with an interswitch, when switching from the straight mode (||) to (×), the failures (items marked NO) in the above (1) to (16), are switched over to the other unit.	YES	NO

(18) Others (Error message, etc.) _____

_____

_____

SECTION 10
DISPOSAL

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 ⊕ and ⊖ terminals.
Otherwise, heat generarion, explosion or a fire may occur.

In this unit, lithium batteries are used for the following parts:
CPU control circuit (CMC-1096): BT1 (Maxell: CR2032)

- Do not store used lithium batteries but dispose of them as non-combustible waste.
- When disposing of used lithium batteries, be sure to insulate the batteries by taping the ⊕ and ⊖ terminals.
  For disposal of batteries, be sure to follow the local laws and regulations.
  For detail, consult with the dealer you purchased the product our business office, or local government.

……10.3 DISPOSAL OF USED MAGNETRON ……

Magnetron is used in the Scanner (NKE-1075/1052) and the Transmitter-receiver unit (NTG-3037/3027) of the unit.

- 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.

SECTION 11
SPECIFICATIONS

SPECIFICATIONS

.....11.1 JMA-9833-SA TYPE RADAR .....

■ General Specification

(1)	Type of Emission:	P0N
(2)	Display:	Color Raster Scan
(3)	Screen:	29-inch Color CRT (Effective Diameter, more than 340 mm)
(4)	Range Scale:	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48 and 96 (or 120) NM
(5)	Range Resolutition:	Less than 30 m
(6)	Minimum Detective Range:	Less than 40 m
(7)	Bearing Accuracy:	Less than 1˚
(8)	Bearing Indication:	North-up/Head-up/Course-up
(9)	Ambient Condition:	Temperature
		Scanner: -25˚C to +55˚C
		(Strage Temperature: -25˚C to +70˚C)
		Other Units except Scanner: -15˚C to +55˚C
		Relative Humidity 93% at +40 ˚C
(10)	Vibration:	2 to 13.2 Hz, amplitude ±1 mm ±10%
		13.2 to 100 Hz, max. acceleration 7 m/s^2 constant
(11)	Power Supply Input:	Scanner: 220 V AC, 50/60 Hz, 3ø
		110 V AC, 50/60 Hz, 1ø
		220 V AC, 50/60 Hz, 1ø (MED only)
(12)	Power Consumption:	Approx. 1 kVA
(13)	Power Supply Input Voltage Fluctuation:	Input Voltage ±10% (at the maximum cable length)
(14)	Pre-heating Time:	Within 4 min
(15)	From Standby up to Operation:	Within 15 sec

■ Scanner (NKE-1079) See 11.5

■ Transmitter-receiver (NTG-3037) See 11.9

■ Display Unit (NCD-4111) See 11.11

■ Performance Monitor (NJU-63J) See 11.13

■ Option

(1)	Scanner with Deicing Heater:	NKE-1079-D (only heater collar)
(2)	Radar Interswitch:	NQE-3015N
(3)	Display Unit (Desktop Type):	NCD-4111-T

■	Distance between Units	Maximum Distance
(1)	Scanner - Transmitter-receiver:	30 m
(2)	Display - Transmitter-receiver:	20 m

■	Compass Safety Distance	Standard
(1)	Scanner:	1.4 m
(2)	Transmitter-receiver:	2.8 m
(3)	Display:	3.2 m

……11.2 JMA-9832-SA TYPE RADAR ……

■ General Specification

(1)	Type of Emission:	P0N
(2)	Display:	Color Raster Scan
(3)	Screen:	29-inch Color CRT (Effective Diameter, more than 340 mm)
(4)	Range Scale:	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48 and 96 (or 120) NM
(5)	Range Resolutition:	Less than 30 m
(6)	Minimum Detective Range:	Less than 25 m
(7)	Bearing Accuracy:	Less than 1˚
(8)	Bearing Indication:	North-up/Head-up/Course-up
(9)	Ambient Condition:	Temperature
		Scanner: -25˚C to +55˚C
		(Strage Temperature: -25˚C to +70˚C)
		Other Units except Scanner: -15˚C to +55˚C
		Relative Humidity 93% at +40 ˚C
(10)	Vibration:	2 to 13.2 Hz, amplitude ±1 mm ±10%
		13.2 to 100 Hz, max. acceleration 7 m/s^2 constant
(11)	Power Supply Input:	Scanner: 220 V AC, 50/60 Hz, 3ø
		110/220 V AC, 50/60 Hz, 1ø
(12)	Power Consumption:	Approx. 1 kVA
(13)	Power Supply Input Voltage Fluctuation:	Input Voltage ±10% (at the maximum cable length)
(14)	Pre-heating Time:	Within 4 min
(15)	From Standby up to Operation:	Within 15 sec

■ Scanner (NKE-1075) — See 11.6

■ Display Unit (NCD-4111) — See 11.11

■ Performance Monitor (NJU-63) — See 11.13

■ Option

(1)	Scanner with Deicing Heater:	NKE-1075-D (only heater collar)
(2)	Radar Interswitch:	NQE-3015N
(3)	Display Unit (Desktop Type):	NCD-4111-T

■	Distance between Units	Maximum Distance
(1)	Scanner - Display:	50 m

■	Compass Safety Distance	Standard
(1)	Scanner:	5.1 m
(2)	Display:	3.2 m

……11.3 JMA-9823-7XA/9XA TYPE RADAR ……

■ General Specification

(1)	Type of Emission:	P0N
(2)	Display:	Color Raster Scan
(3)	Screen:	29-inch Color CRT (Effective Diameter, more than 340 mm)
(4)	Range Scale:	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48 and 96 (or 120) NM
(5)	Range Resolutition:	Less than 30 m
(6)	Minimum Detective Range:	Less than 40 m
(7)	Bearing Accuracy:	Less than 1˚
(8)	Bearing Indication:	North-up/Head-up/Course-up
(9)	Ambient Condition:	Temperature
		Scanner: -25˚C to +55˚C
		(Strage Temperature: -25˚C to +70˚C)
		Other Units except Scanner: -15˚C to +55˚C
		Relative Humidity 93% at +40˚C
(10)	Vibration:	2 to 13.2 Hz, amplitude ±1 mm ±10%
		13.2 to 100 Hz, max. acceleration 7 m/s^2 constant
(11)	Power Supply Input:	Scanner: 220 V AC, 50/60 Hz, 3ø
		110/220 V AC, 50/60 Hz, 1ø
(12)	Power Consumption:	Approx. 800 VA
(13)	Power Supply Input Voltage Fluctuation:	Input Voltage ±10% (at the maximum cable length)
(14)	Pre-heating Time:	Within 4 min
(15)	From Standby up to Operation:	Within 15 sec

■ Scanner (NKE-1059-7/9) See 11.7

■ Transmitter-receiver (NTG-3027) See 11.10

■ Display Unit (NCD-4111) See 11.11

■ Performance Monitor (NJU-64J) See 11.14

■ Option

(1)	Scanner with Deicing Heater:	NKE-1059-7D/9D (only heater collar)
(2)	Radar Interswitch:	NQE-3015N

■	Distance between Units	Maximum Distance
(1)	Scanner - Transmitter-receiver:	30 m
(2)	Display - Transmitter-receiver:	20 m
(3)	Display Unit (Desktop Type)	NCD-4111-T

■	Compass Safety Distance	Standard
(1)	Scanner:	1.05 m
(2)	Transmitter-receiver:	2.8 m
(3)	Display:	3.2 m

……11.4 JMA-9822-6XA/9XA TYPE RADAR ……

■ General Specification

(1)	Type of Emission:	P0N
(2)	Display:	Color Raster Scan
(3)	Screen:	29-inch Color CRT (Effective Diameter, more than 340 mm)
(4)	Range Scale:	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48 and 96 (or 120) NM
(5)	Range Resolutition:	Less than 30 m
(6)	Minimum Detective Range:	Less than 25 m
(7)	Bearing Accuracy:	Less than 1˚
(8)	Bearing Indication:	North-up/Head-up/Course-up
(9)	Ambient Condition:	Temperature
		Scanner: -25˚C to +55˚C
		(Strage Temperature: -25˚C to +70˚C)
		Other Units except Scanner: -15˚C to +55˚C
		Relative Humidity 93% at +40˚C
(10)	Vibration:	2 to 13.2 Hz, amplitude ±1 mm ±10%
		13.2 to 100 Hz, max. acceleration 7 m/s^2 constant
(11)	Power Supply Input:	Scanner: 220 V AC, 50/60 Hz, 3ø
		110/220 V AC, 50/60 Hz, 1ø
(12)	Power Consumption:	Approx. 800 VA
(13)	Power Supply Input Voltage Fluctuation:	Input Voltage ±10% (at the maximum cable length)
(14)	Pre-heating Time:	Within 4 min
(15)	From Standby up to Operation:	Within 15 sec

■ Scanner (NKE-1052-6/9) — See 11.8

■ Display Unit (NCD-4111) — See 11.11

■ Performance Monitor (NJU-64) — See 11.14

■ Option

(1)	Scanner with Deicing Heater:	NKE-1052-6D/9D (only heater collar)
(2)	Radar Interswitch:	NQE-3015N
(3)	Display Unit (Desktop Type)	NCD-4111-T

■	Distance between Units	Maximum Distance
(1)	Scanner - Display:	50 m

■	Compass Safety Distance	Standard
(1)	Scanner:	2.4 m
(2)	Display:	3.2 m

……11.5 SCANNER (NKE-1079)……

(1)	Dimmensions:	Height 837 × Swing Circle 4000 (mm)
(2)	Mass:	Approx. 142 kg
(3)	Polarization:	Horizontal Polarization
(4)	Directional Characteristic:	Horizontal Beam Width: 1.9˚ (-3 dB width) Vertical Beam Width: 30˚ (-3 dB width) Sidelobe Level: Below -26 dB (Within ±10˚) Below -30 dB (Outside ±10˚)
(5)	Revolution:	Approx. 26 rpm (60 Hz) Approx. 21 rpm (50 Hz)
(6)	Drive Motor:	220 V AC, 50/60 Hz, 3ø 110 V AC, 50/60 Hz, 1ø 220 V AC, 50/60 Hz, 1ø (MED only)
(7)	Wind Velocity:	Relative Wind Velocity: 51.5 m/s (100 knots)

……11.6 SCANNER (NKE-1075)……

(1)	Dimmensions:	Height 837 × Swing Circle 4000 (mm)
(2)	Mass:	Approx. 163 kg
(3)	Polarization:	Horizontal Polarization
(4)	Directional Characteristic:	Horizontal Beam Width: 1.9° (-3 dB width) Vertical Beam Width: 30° (-3 dB width) Sidelobe Level: Below -26 dB (Within ±10°) Below -30 dB (Outside ±10°)
(5)	Revolution:	Approx. 26 rpm (60 Hz) Approx. 21 rpm (50 Hz)
(6)	Drive Motor:	220 V AC, 50/60 Hz, 3ø 110/220 V AC, 50/60 Hz, 1ø
(7)	Wind Velocity:	Relative Wind Velocity: 51.5 m/s (100 knots)
(8)	Transmitting Frequency:	3050 ±10 MHz
(9)	Peak Power:	30 kW
(10)	Transmitting Tube:	Magnetron [M1302]
(11)	Pulse Width/Repetition Frequency:	0.07µs/1900 Hz (0.125, 0.25, 0.5 NM) 0.07µs/1900 Hz, 0.15µs/1900 Hz (0.75 NM) By change over PL switch 0.1µs/1900 Hz, 0.2µs/1900 Hz, 0.3µs/1900 Hz (1.5 NM) By change over PL switch 0.2µs/1900 Hz, 0.3µs/1900 Hz, 0.6µs/1100 Hz (3 NM) By change over PL switch 0.6µs/1100 Hz, 1.2µs/570 Hz (6, 12 NM) By change over PL switch 1.2µs/570 Hz (24, 48, 96, 120 NM)
(12)	Moduation:	Solid States Modulator Circuit
(13)	Duplexer:	Circulator + TRHPL
(14)	Front End Module:	Built-in
(15)	Intermediate Frequency Amplifier:	Intermediate Frequency: 60 MHz Band Width: 20/6/3 MHz Gain: More than 90 dB Amplifying Characteristics: Logarithmic Amplifier
(16)	Overall Noise Figure:	7.5 dB (average)
(17)	Tuning:	Manual/Automatic

……11.7 SCANNER (NKE-1059-7/9) ……

(1)	Dimmensions:	7 ft Height 581 × Swing Circle 2288 (mm)
		9 ft Height 581 × Swing Circle 2836 (mm)
(2)	Mass:	7 ft Approx. 45 kg
		9 ft Approx. 48 kg
(3)	Polarization:	Horizontal Polarization
(4)	Directional Characteristic:	Horizontal Beam Width: 7 ft 1˚ (-3 dB width)
		9 ft 0.8˚ (-3 dB width)
		Vertical Beam Width: 25˚ (-3 dB width)
		Sidelobe Level: Below -26 dB (Within ±10˚)
		Below -30 dB (Outside ±10˚)
(5)	Revolution:	Approx. 26 rpm (60 Hz)
		Approx. 21 rpm (50 Hz)
(6)	Drive Motor:	7 ft 220 V AC, 50/60 Hz, 3ø
		110/220 V AC, 50/60 Hz, 1ø
		9 ft 220 V AC, 50/60 Hz, 3ø
		110/220 V AC, 50/60 Hz, 1ø
(7)	Wind Velocity:	Relative Wind Velocity: 51.5 m/s (100 knots)

……11.8 SCANNER (NKE-1052-6/9) ……

(1)	Dimmensions:	6 ft Height 581 × Swing Circle 1910 (mm)
		9 ft Height 581 × Swing Circle 2836 (mm)
(2)	Mass:	6 ft Approx. 50 kg
		9 ft Approx. 55 kg
(3)	Polarization:	Horizontal Polarization
(4)	Directional Characteristic:	Horizontal Beam Width: 6 ft 1.2˚ (-3 dB width)
		9 ft 0.8˚ (-3 dB width)
		Vertical Beam Width: 25˚ (-3 dB width)
		Sidelobe Level: Below -26 dB (Within ±10˚)
		Below -30 dB (Outside ±10˚)
(5)	Revolution:	Approx. 26 rpm (60 Hz)
		Approx. 21 rpm (50 Hz)
(6)	Drive Motor:	6 ft 220 V AC, 50/60 Hz, 3ø
		110/220 V AC, 50/60 Hz, 1ø
		9 ft 220 V AC, 50/60 Hz, 3ø
		110/220 V AC, 50/60 Hz, 1ø
(7)	Wind Velocity:	Relative Wind Velocity: 51.5 m/s (100 knots)
(8)	Transmitting Frequency:	9410 ±30 MHz
(9)	Peak Power:	25 kW
(10)	Transmitting Tube:	Magnetron [M1437(A)]

(11) Pulse Width/Repetition Frequency:

0.07μs/1900 Hz	(0.125, 0.25, 0.5 NM)	
0.07μs/1900 Hz	(0.75 NM)	By change over
0.15μs/1900 Hz		PL switch
0.1μs/1900 Hz		
0.2μs/1900 Hz	(1.5 NM)	By change over
0.3μs/1900 Hz		PL switch
0.2μs/1900 Hz		
0.3μs/1900 Hz	(3 NM)	By change over
0.6μs/1100 Hz		PL switch
0.6μs/1100 Hz	(6, 12 NM)	By change over
1.2μs/570 Hz		PL switch
1.2μs/570 Hz	(24, 48, 96, 120 NM)	

(12) Moduation: Solid States Modulator Circuit

(13) Duplexer: Circulator + Diode Limiter

(14) Front End Module: Built-in

(15) Intermediate Frequency Amplifier: Intermediate
Frequency: 60 MHz
Band Width: 20/6/3 MHz Gain: More than 90 dB
Amplifying Characteristics: Logarithmic Amplifier

(16) Overall Noise Figure: 7.5 dB (average)

(17) Tuning: Manual/Automatic

……11.9 TRANSMITTER-RECEIVER UNIT (NTG-3037) ……

(1)	Dimensions:	W615 × D365 × H615 (mm)
(2)	Structure:	Wall Mount Drip Proof
(3)	Mass:	Approx. 35 kg
(4)	Transmitting Frequency:	3050 ±10 MHz
(5)	Peak Power:	30 kW
(6)	Transmitting Tube:	Magnetron [M1302]
(7)	Pulse Width/Repetition Frequency:	0.07μs/1900 Hz (0.125, 0.25, 0.5 NM)
		0.07μs/1900 Hz, 0.15μs/1900 Hz (0.75 NM) By change over PL switch
		0.1μs/1900 Hz, 0.2μs/1900 Hz, 0.3μs/1900 Hz (1.5 NM) By change over PL switch
		0.2μs/1900 Hz, 0.3μs/1900 Hz, 0.6μs/1100 Hz (3 NM) By change over PL switch
		0.6μs/1100 Hz, 1.2μs/570 Hz (6, 12 NM) By change over PL switch
		1.2μs/570 Hz (24, 48, 96, 120 NM)
(8)	Moduation:	Solid States Modulator Circuit
(9)	Duplexer:	Circulator + TRHPL
(10)	Front End Module:	Built-in
(11)	Intermediate Frequency Amplifier:	Intermediate Frequency: 60 MHz
		Band Width: 20/6/3 MHz
		Gain: More than 90 dB
		Amplifying Characteristics: Logarithmic Amplifier
(12)	Overall Noise Figure:	7.5 dB (average)
(13)	Tuning:	Manual/Automatic

……11.10 TRANSMITTER-RECEIVER UNIT (NTG-3027) ……

(1)	Dimensions:	W460 × D227 × H461 (mm)
(2)	Structure:	Wall Mount Drip Proof
(3)	Mass:	Approx. 19 kg
(4)	Transmitting Frequency:	9410 ±30 MHz
(5)	Peak Power:	25 kW
(6)	Transmitting Tube:	Magnetron [M1437(A)]
(7)	Pulse Width/Repetition Frequency:	0.07μs/1900 Hz (0.125, 0.25, 0.5 NM)
		0.07μs/1900 Hz, 0.15μs/1900 Hz (0.75 NM) By change over PL switch
		0.1μs/1900 Hz, 0.2μs/1900 Hz, 0.3μs/1900 Hz (1.5 NM) By change over PL switch
		0.2μs/1900 Hz, 0.3μs/1900 Hz, 0.6μs/1100 Hz (3 NM) By change over PL switch
		0.6μs/1100 Hz, 1.2μs/570 Hz (6, 12 NM) By change over PL switch
		1.2μs/570 Hz (24, 48, 96, 120 NM)
(8)	Moduation:	Solid States Modulator Circuit
(9)	Duplexer:	Circulator + Diode Limiter
(10)	Front End Module:	Built-in
(11)	Intermediate Frequency Amplifier:	Intermediate Frequency: 60 MHz
		Band Width: 20/6/3 MHz
		Gain: More than 90 dB
		Amplifying Characteristics: Logarithmic Amplifier
(12)	Overall Noise Figure:	7.5 dB (average)
(13)	Tuning:	Manual/Automatic

.....11.11 DISPLAY UNIT (NCD-4111) .....

(1)	Dimensions:	W703 × D1052 × H1100 (mm)
(2)	Structure:	Self-standing Drip Proof
(3)	Mass:	Approx. 170 kg
(4)	Screen:	29-inch Color CRT (Effective Diameter, more than 340 mm)
(5)	Range Scale:	0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48 and 96 (or 120) NM
(6)	Range Marker:	0.025, 0.05, 0.1, 0.25, 0.5, 1, 2, 4, 8 and 16 (or 20) NM
(7)	Range Accuracy:	Less than 1% of the maximum distance of the range scale in use or 30 m whichever is larger
(8)	Variable Range Markers:	2 (VRM1/VRM2)
(9)	VRM Scale:	0.000 - 96.0 NM (or 120.0 NM), Numerical indication in 4 digits
(10)	Bearing Marker:	360˚ in 1˚ steps
(11)	Off Center:	Within 65% of the radius of any range except 96 NM and 120 NM
(12)	Trackball Cursor:	Built-in (Target range, Relative/True bearing presentation)
(13)	Electronic Bearing Lines:	2 (EBL1/EBL2) (Center/Independent)
(14)	EBL Bearing Indication:	000.0˚ - 359.9˚, Numerical indication in 4 digits
(15)	Tuning Indication:	Bar-graph
(16)	Marking Function:	Electronic mark (Max. 20 points)
(17)	Heading Line Indication:	Electronic
(18)	True Motion Unit:	Built-in (0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24 and 48 NM)
(19)	STC (SEA):	Auto/Manual
(20)	FTC (RAIN):	Auto/Manual
(21)	Display Mode:	North-up/Head-up/Course-up
(22)	Trails Indication:	0.5 min/1 min/3 min/6 min/OFF
(23)	Video Process:	Built-in
(24)	Interference Rejection:	Built-in (ON/OFF)
(25)	Guard Zone:	Ring
(26)	Navigation Lines:	Built-in (256 points × 10 types) (only with navigation equipment is connected)
(27)	Self-diagnostic Function:	Built-in
(28)	Own Ship's Track Indication:	Built-in (only with navigation equipment is connected)
(29)	Parallel Lines Cursor:	Built-in
(30)	Interface:	Sub display Loran-C NMEA0183 GPS Radar buoy Total navigator (option) LOG GYRO Radar Interswitch (option) External alarm output

(Reference) NMEA0183 Interface

① Receivable sentence:

- BWC
- BWR
- GNS
- GGA
- GLL
- RMA
- RMB
- RMC
- VBW
- ZDA
- VTG

② Priority
(1) Latitude/Longitude: GGA>RMC>RMA>GNS>GLL
(2) Waypoint: RMB>BWC (BWR)

Note: The speed measuring accuracy of the speed sensor shall conform to IMO Resolution A.824 (19).

.....11.12 ARPA .....

(1) Acquisition
- Acquisition Mode: Auto/Manual Acquisition (Targets are acquired within guard zone in the automatic acquisition mode)
- Manual Cancellation of Unwanted Target: Each One Target or All Target at once

(2) Tracking
- Number of Targets: 50 Targets (Auto Tracking)
- Acquisition and Tracking Range: 32 NM

(3) Presentation
- Display Modes: TM (True Motion)/RM (Relative Motion)
- Bearing Modes: North-up/Head-up/Course-up
- Vector Modes: True/Relative Vector Display
  Vector Length: Adjustable from 1 to 60 min
- Past Position Display: True/Relative Display
  Number of Dots: 6 points
  Display Time: 30 sec, 1 min, 2 min, 4 min
- Time to Display Vector: Within 1 min
- Time to Stabilize Vector: Within 3 min

(4) Alarm
- Guard Zone: 2
- Setting Ranges: Guard Zone 1 (0.5 - 32 NM), Guard Zone 2 (0.5 - 32 NM)
- Alarm Indication: ▽ mark on CRT with Visible/Audible alarm

(5) Safe Limits (CPA/TCPA)
- Setting Condition: CPA LIMIT (0.1 - 9.9 NM)
  TCPA LIMIT (1 - 99 min)
- Alarm Condition:

Safe target:	• CPA>CPA LIMIT • 0>TCPA • TCPA>TCPA LIMIT
Danger Target:	• CPA≦CPA LIMIT, 0≦TCPA≦TCPA LIMIT

- Alarm Display:

Status	CRT Symbol	Alarm	Buzzer
Safe Ship	○	OFF	OFF
Danger Ship	△	CPA/TCPA	ON

- Lost Target: ◇ mark on CRT
  Visible/Audible Alarms

(6) Data Indication

- Target Data: Simultaneous and Continuous Display for 2 targets
  True Bearing, Range, True Course, True Speed, CPA, TCPA, BCR and BCT
- Own Ship's Data: Course and Speed

(7) Trial Maneuver: Manual Setting
- Trial Course: 0˚ - 360˚
- Trial Speed: 0 - 100 knots

(8) Accuracy of Display: Complied with IMO Technical Requirements

(9) System Failure Alarm: Visible/Audible Alarms

(10) Speed Input: Manual/Auto (log)

……11.13 PERFORMANCE MONITOR (NJU-63) ……

(1) Dimensions: W150 × D249 × H56 (mm)

(2) Mass: Approx. 1.5 kg

(3) Operation Frequency: 3050 ±30 MHz

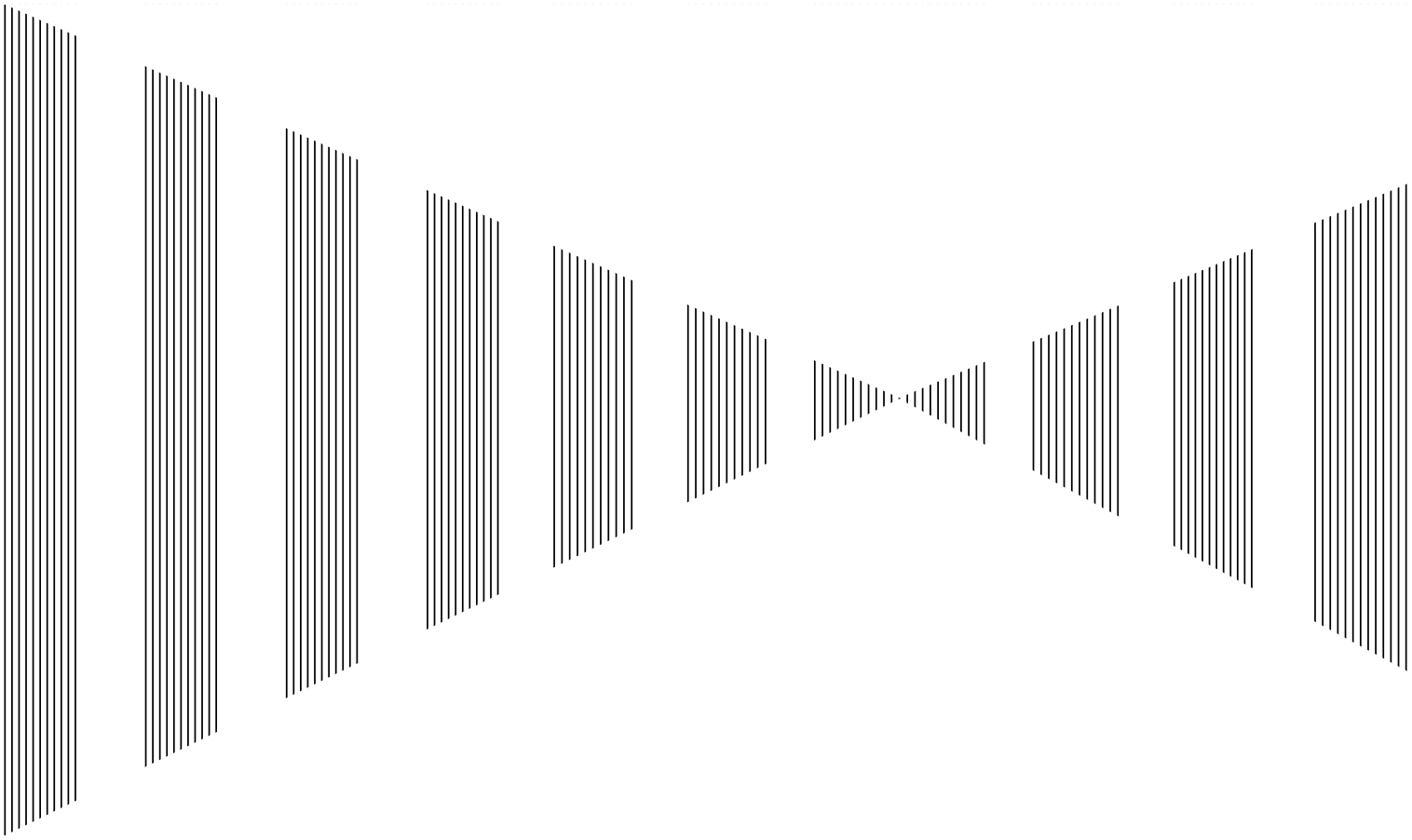
……11.14 PERFORMANCE MONITOR (NJU-64) ……

(1) Dimensions: W150 × D215 × H56 (mm)

(2) Mass: Approx. 1.5 kg

(3) Operation Frequency: 9410 ±30 MHz

APPENDIX



APPENDIX

……JMA-9800 ARPA Series Radar System Composition……

Table A-1 S band System Composition

Equipment Type	JMA-9833-SA	JMA-9832-SA
Type of Scanner	NKE-1079 (*1)	NKE-1075 (*1)
Type of Performance Monitor	NJU-63	NJU-63
Type of Transmitter-receiver Unit	NTG-3037	————
Type of Transmitter Unit	NMA-446	NMA-487
Type of Receiver Unit	NRG-88	NRG-222
Type of Display Unit	NCD-4111 (*2)	

*1 NKE-1079 (110 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø)
NKE-1079-D (110 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø) (Option with deicing heater collar)
NKE-1075 (100/110/115/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø)
NKE-1075-D (100/110/115/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø) (Option with deicing heater collar)

*2 NCD-4111: Self-standing type
NCD-4111-T: Desktop type (NWU-228: Monitor Unit, NDC-1097: Control Unit, NCE-7292: Keyboard Unit) (Option)

Note: The ARPA unit have the approbation by the Ministry of Transport Automatic equipment for Prevention of collision JAS-9800.

Table A-2 X band System Composition

Equipment Type	JMA-9823-7XA	JMA-9823-9XA	JMA-9822-6XA	JMA-9822-9XA
Type of Scanner	NKE-1059-7 (*1)	NKE-1059-9 (*2)	NKE-1052-6 (*3)	NKE-1052-9 (*4)
Type of Performance Monitor	NJU-64		NJU-64	
Type of Transmitter-receiver Unit	NTG-3027		————	
Type of Transmitter Unit	NMA-441			
Type of Receiver Unit	NRG-98			
Type of Display Unit	NCD-4111 (*5)			

*1 NKE-1059-7 (7 ft 110/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø)
NKE-1059-7D (7 ft 110/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø) (Option with deicing heater collar)

*2 NKE-1059-9 (9 ft 110/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø)
NKE-1059-9D (9 ft 110/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø) (Option with deicing heater collar)

*3 NKE-1052-6 (6 ft 110/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø)
NKE-1052-6D (6 ft 110/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø) (Option with deicing heater collar)

*4 NKE-1052-9 (9 ft 110/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø)
NKE-1052-9D (9 ft 110/220 V AC 50/60 Hz 1ø, 220 V AC 50/60 Hz 3ø) (Option with deicing heater collar)

*5 NCD-4111: Self-standing type
NCD-4111-T: Desktop type (NWU-228: Monitor Unit, NDC-1097: Control Unit, NCE-7292: Keyboard Unit) (Option)

Note: The ARPA unit have the approbation by the Ministry of Transport Automatic equipment for Prevention of collision JAS-9800.

Table A-3 3-unit Type Scanner (S band)

Type of Scanner	NKE-1079 (110 V AC, 1ø)	NKE-1079* (220 V AC, 1ø)	NKE-1079 (220 V AC, 3ø)	NKE-1079-D (110 V AC, 1ø)	NKE-1079-D* (220 V AC, 1ø)	NKE-1079-D (220 V AC, 3ø)
Inner Antenna	CQC-764	CQC-764	CQC-764	CQC-764	CQC-764	CQC-764
Driving Part	CBP-129	CBP-146	CBP-128	CBP-129	CBP-146	CBP-128
Heater Cont. (option)	———	———	———	CCK-751	CCK-751	CCK-751

* MED only

Table A-4 2-unit Type Scanner (S band)

Type of Scanner	NKE-1075 (110 V AC, 1ø)	NKE-1075 (220 V AC, 1ø)	NKE-1075 (220 V AC, 3ø)	NKE-1075-D (110 V AC, 1ø)	NKE-1075-D (220 V AC, 1ø)	NKE-1075-D (220 V AC, 3ø)
Inner Antenna	CQC-1004	CQC-1004	CQC-1004	CQC-1004	CQC-1004	CQC-1004
Driving Part	CBP-129	CBP-146	CBP-128	CBP-129	CBP-146	CBP-128
IF AMP circuit	CAE-344-4	CAE-344-4	CAE-344-4	CAE-344-4	CAE-344-4	CAE-344-4
Inner Receiver Unit	CMA-554	CMA-554	CMA-554	CMA-554	CMA-554	CMA-554
RF AMP circuit	CAF-424	CAF-424	CAF-424	CAF-424	CAF-424	CAF-424
LO OSC circuit	CGH-205	CGH-205	CGH-205	CGH-205	CGH-205	CGH-205
Bias circuit	CBD-1274	CBD-1274	CBD-1274	CBD-1274	CBD-1274	CBD-1274
Limiter circuit	CNL-23	CNL-23	CNL-23	CNL-23	CNL-23	CNL-23
Modulator circuit	CPA-209	CPA-209	CPA-209	CPA-209	CPA-209	CPA-209
MHPS circuit	CBD-1226	CBD-1226	CBD-1226	CBD-1226	CBD-1226	CBD-1226
Inner Modulator Unit	CNM-173	CNM-173	CNM-173	CNM-173	CNM-173	CNM-173
Filter circuit	CFR-161	CFR-161	CFR-161	CFR-161	CFR-161	CFR-161
T/R control circuit	CMC-898	CMC-898	CMC-898	CMC-898	CMC-898	CMC-898
Rectifier circuit	CBA-249	CBA-249	CBA-249	CBA-249	CBA-249	CBA-249
Heater Cont. (option)	———	———	———	CCK-751	CCK-751	CCK-751

Table A-5 3-unit Type Scanner (X band)

Type of Scanner	NKE-1059-7 (110 V AC, 1ø)	NKE-1059-7 (220 V AC, 1ø)	NKE-1059-7 (220 V AC, 3ø)	NKE-1059-9 (110 V AC, 1ø)	NKE-1059-9 (220 V AC, 1ø)	NKE-1059-9 (220 V AC, 3ø)
Inner Antenna	CQC-788	CQC-788	CQC-788	CQC-788	CQC-788	CQC-788
Driving Part	CBP-122	CBP-123	CBP-132	CBP-122	CBP-123	CBP-132

Table A-6 3-unit Type Scanner (X band) with Heater Collar (Option)

Type of Scanner	NKE-1059-7D (110 V AC, 1ø)	NKE-1059-7D (220 V AC, 1ø)	NKE-1059-7D (220 V AC, 3ø)	NKE-1059-9D (110 V AC, 1ø)	NKE-1059-9D (220 V AC, 1ø)	NKE-1059-9D (220 V AC, 3ø)
Inner Antenna	CQC-788	CQC-788	CQC-788	CQC-788	CQC-788	CQC-788
Driving Part	CBP-122	CBP-132	CBP-132	CBP-122	CBP-122	CBP-132
Heater Controller	CCK-750	CCK-750	CCK-750	CCK-750	CCK-750	CCK-750

Table A-7 2-unit Type Scanner (X band)

Type of Scanner	NKE-1052-6 (110 V AC, 1ø)	NKE-1052-6 (220 V AC, 1ø)	NKE-1052-6 (220 V AC, 3ø)	NKE-1052-9 (110 V AC, 1ø)	NKE-1052-9 (220 V AC, 1ø)	NKE-1052-9 (220 V AC, 3ø)
Inner Antenna	CQC-683	CQC-683	CQC-683	CQC-683	CQC-683	CQC-683
Driving Part	CBP-122	CBP-123	CBP-132	CBP-122	CBP-123	CBP-132
IF AMP circuit	CAE-344	CAE-344	CAE-344	CAE-344	CAE-344	CAE-344
Inner Receiver Unit	CMA-588	CMA-588	CMA-588	CMA-588	CMA-588	CMA-588
Modulator circuit	CPA-209	CPA-209	CPA-209	CPA-209	CPA-209	CPA-209
MHPS circuit	CBD-1226	CBD-1226	CBD-1226	CBD-1226	CBD-1226	CBD-1226
Inner Modulator Unit	CNM-169	CNM-169	CNM-169	CNM-169	CNM-169	CNM-169
Filter circuit	CFR-161	CFR-161	CFR-161	CFR-161	CFR-161	CFR-161
T/R control circuit	CMC-898	CMC-898	CMC-898	CMC-898	CMC-898	CMC-898
Rectifier circuit	CBA-249	CBA-249	CBA-249	CBA-249	CBA-249	CBA-249
Inner Transmitter-receiver Unit	CQC-783	CQC-783	CQC-783	CQC-783	CQC-783	CQC-783

Table A-8 2-unit Type Scanner (X band) with Heater Collar (Option)

Type of Scanner	NKE-1052-6D (110 V AC, 1ø)	NKE-1052-6D (220 V AC, 1ø)	NKE-1052-6D (220 V AC, 3ø)	NKE-1052-9D (110 V AC, 1ø)	NKE-1052-9D (220 V AC, 1ø)	NKE-1052-9D (220 V AC, 3ø)
Inner Antenna	CQC-683	CQC-683	CQC-683	CQC-683	CQC-683	CQC-683
Driving Part	CBP-122	CBP-123	CBP-132	CBP-122	CBP-123	CBP-132
Receiver Unit	CAE-344	CAE-344	CAE-344	CAE-344	CAE-344	CAE-344
Inner Receiver Unit	CMA-588	CMA-588	CMA-588	CMA-588	CMA-588	CMA-588
Modulator circuit	CPA-209	CPA-209	CPA-209	CPA-209	CPA-209	CPA-209
MHPS circuit	CBD-1226	CBD-1226	CBD-1226	CBD-1226	CBD-1226	CBD-1226
Inner Modulator Unit	CNM-169	CNM-169	CNM-169	CNM-169	CNM-169	CNM-169
Filter circuit	CFR-161	CFR-161	CFR-161	CFR-161	CFR-161	CFR-161
T/R control circuit	CMC-898	CMC-898	CMC-898	CMC-898	CMC-898	CMC-898
Rectifier circuit	CBA-249	CBA-249	CBA-249	CBA-249	CBA-249	CBA-249
Inner Transmitter-receiver Unit	CQC-783	CQC-783	CQC-783	CQC-783	CQC-783	CQC-783
Heater Controller	CCK-750	CCK-750	CCK-750	CCK-750	CCK-750	CCK-750

Table A-9 3-unit Type Transmitter-receiver Unit Composition (S band)

Type of Transmitter-receiver Unit	NTG-3037
Modulator Unit	NMA-446
• Modulator circuit • Filter circuit • MHPS circuit • Inner modulator unit	CPA-209 CFR-161 CBC-1226 CNM-173
Receiver Unit	NRG-88
• IF AMP circuit • RF AMP circuit • LO OSC circuit • Bias circuit • Limiter circuit • Inner receiver unit	CAE-344-1 CAF-424 CGH-205 CBD-1274 CNL-23 CMA-554
• Rectifier circuit • T/R control circuit	CBA-249 CMC-898
• Inner transmitter-receiver unit	CQC-748

Table A-10 3-unit Type Transmitter-receiver Unit Composition (X band)

Type of Transmitter-receiver Unit	NTG-3027
Modulator Unit	NMA-441
• Modulator circuit • Filter circuit • MHPS circuit • Inner modulator unit	CPA-209 CFR-161 CBD-1226 CNM-169
Receiver Unit	NRG-98
• IF AMP • Inner receiver unit	CAE-344 CMA-588
• Rectifier circuit • T/R control circuit	CBA-249 CMC-898
• Inner transmitter-receiver unit	CQC-747

Table A-11 NCD-4111 Type Display Unit Circuit Compositions

	Display Unit NCD-4111	JRC Code	Remarks
1	Inner display unit	CWB-1126	
2	NSK/LOG I/F unit NSK/LOG I/F circuit	 CMJ-431	
3	Rack unit Terminal board circuit Display control circuit Signal process circuit DSP MODULE1 DSP MODULE2 Mother board ARPA process circuit Serial I/F circuit	 CQD-1729 CMC-1096 CDC-1066 CDC-1073 CDC-1081 CQC-969 CDC-1065 CHM-345	
4	Inner keyboard unit Keyboard process circuit PCMCIA I/F circuit Panel circuit 1 Panel circuit 2 Sensor	CWB-1125 CMD-835 CMH-1715 CCK-846 CCK-847 CHT-63	(Option)
5	Inner monitor unit Monitor circuit	 CCN-326	
6	Inner power supply unit Power supply circuit	 CBD-1514	
7	Relay unit	CSC-594	
8	Interswitch circuit	CCL-263	(Option)

APPENDIX

Table A-12 NDC-1097 Type Control Unit Circuit Compositions

	Control Unit NDC-1097	JRC Code	Remarks
1	Inner display unit	CWB-1126	
2	NSK/LOG I/F unit NSK/LOG I/F circuit	 CMJ-431	
3	Rack unit Terminal board circuit Display board circuit Signal process circuit DSP MODULE1 DSP MODULE2 Mother board ARPA process circuit Serial I/F circuit	 CQD-1729 CMC-1096 CDC-1066 CDC-1073 CDC-1081 CQC-969 CDC-1065 CHM-345	
4	Inner power supply unit Power supply circuit	 CBD-1514	
5	Relay unit	CSC-594	
6	Interswitch circuit	CCL-263	(Option)

Table A-13 NCE-7292 Type Keyboard Unit Circuit Compositions

	Keyboard Unit NCE-7292	JRC Code	Remarks
1	Inner keyboard unit Keyboard process circuit PCMCIA I/F circuit Panel circuit 1 Panel circuit 2 Sensor	CWB-1125 CMD-835 CMH-1715 CCK-846 CCK-847 CHT-63	(Option)

Table A-14 NWU-228 Type Monitor Unit Circuit Compositions

	Monitor Unit NWU-228	JRC Code	Remarks
1	Inner monitor unit Monitor circuit	 CCN-326	

INTERSWITCH KIT
(NQE-3015N)
OPERATION MANUAL

CONTENTS

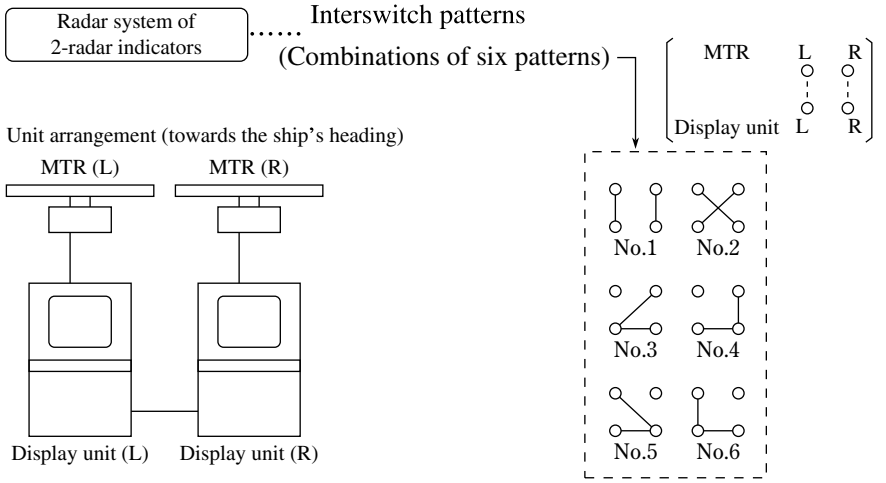
1. GENERAL

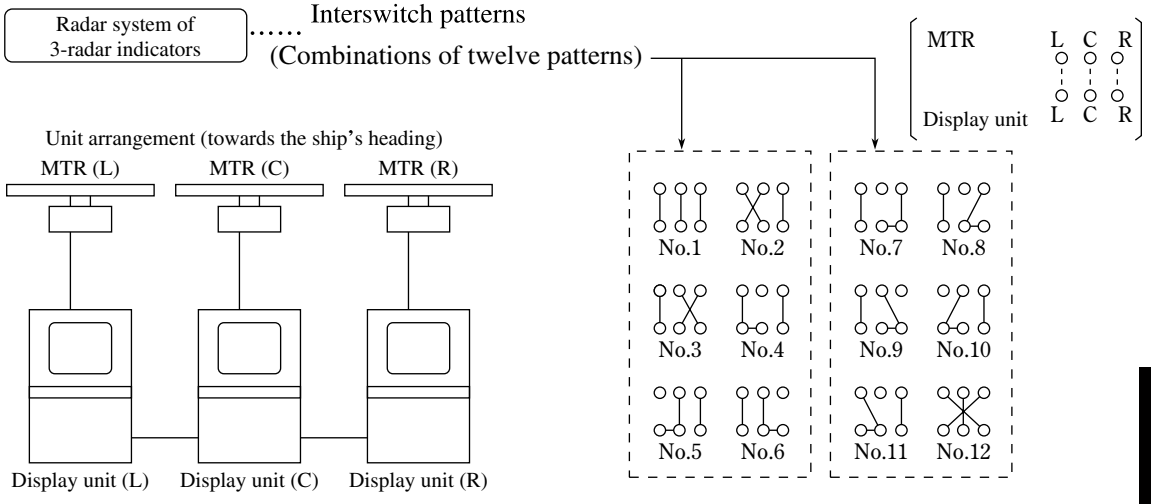
1.1 Outline

The Interswitch Kit enables all possible interconnections between two or more radar display units and two or more scanner units installed on the bridge of a ship that have different characteristics.
The NQE-3015N Interswitch Kit is used for the JMA-9800 series radar system and it is capable of switching over interconnections between three display units and three transmitter-receiver/scanner units (hereinafter called “MTR”).

1.2 Interswitch Construction

The Interswitch Kit is incorporated in the display unit. (Option)
The number of combined display units and MTRs according to the interswitch kit is different between the 2-units system and the 3-units system.
The distinction between the 2-units system and the 3-units system is determined by the internal settings.
The pattern switchover operations can be exercised simply and quickly according to the menus displayed on the display unit. The interswitch patterns as shown below are displayed at the upper left of the radar display. (The position filled on the mark indicates the position of the display unit currently operated.)





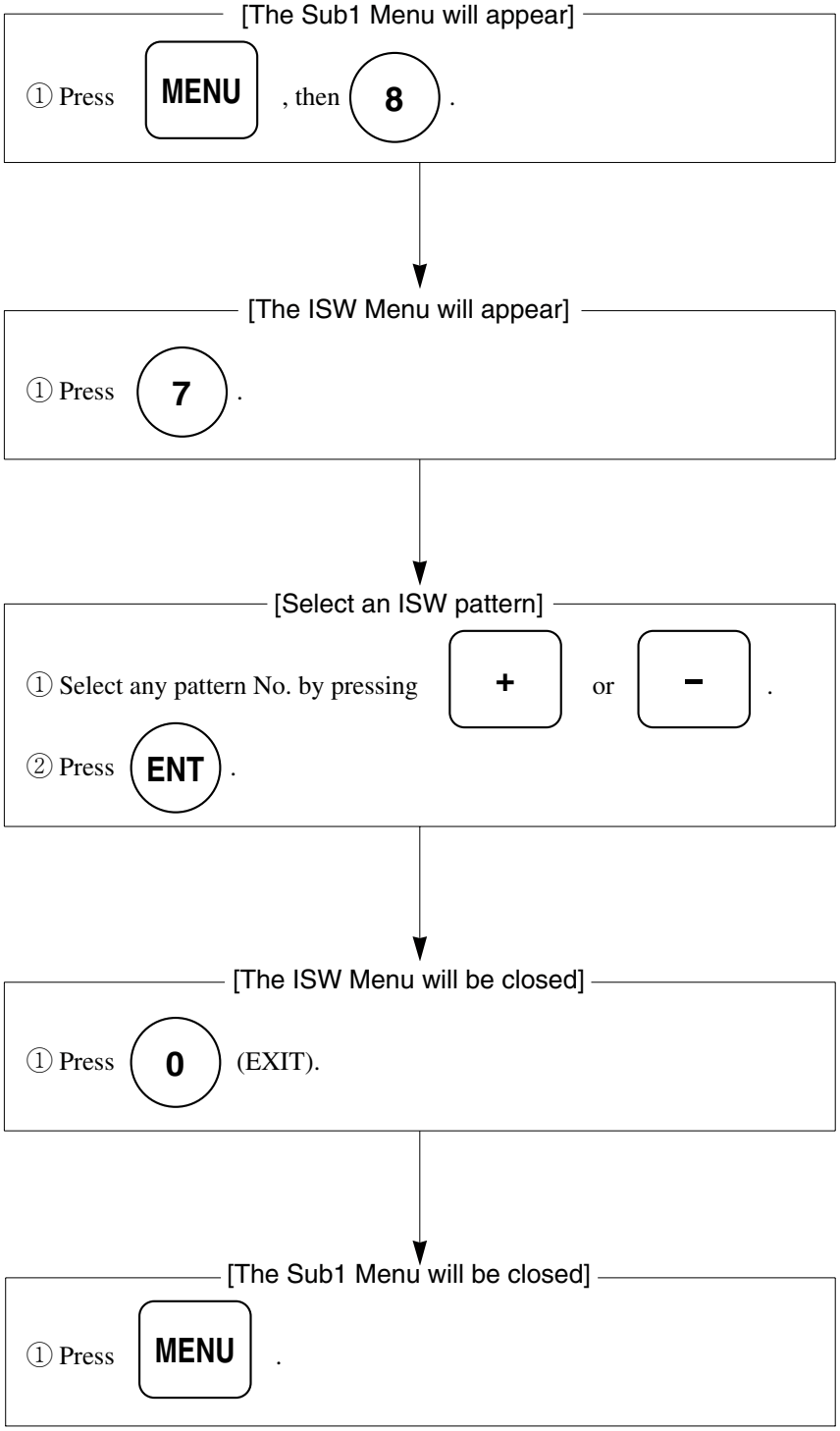
APPENDIX

2. OPERATION

When switching over the interswitch patterns, first set the system to the STBY mode and proceed the switch operations on the operation panel of the Display Unit as shown in the operation flow below.

2.1 Operation Flow

The following flowchart shows the operation flow from menu opening to menu closing.



The radar will be placed in the standby mode. The changed pattern diagram in the center of the display as well as the change menu at the right of the display will be displayed.

2.2 Sub1 Menu

Refer to: (A) [Sub1 Menu display ••• Selection of an ISW Menu]

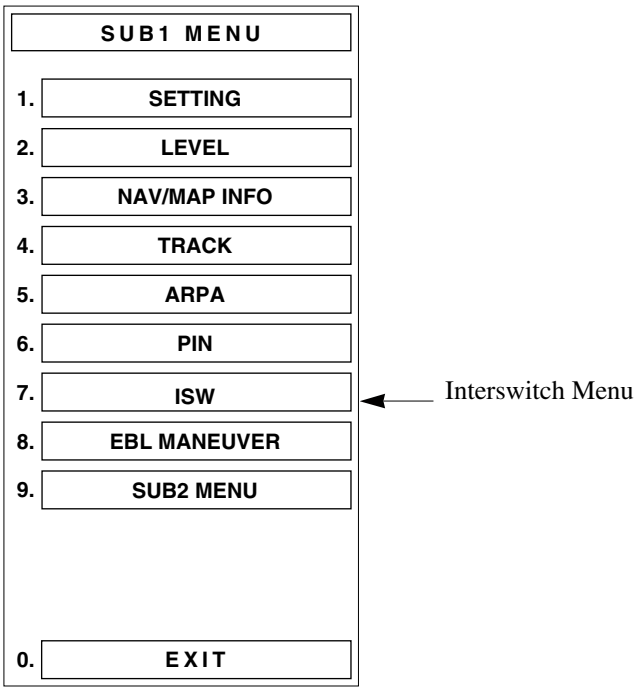
The Sub1 Menu will appear

① Press **MENU** .

② Press **8** .

The Sub1 Menu will appear.

Sub1 Menu



The Sub1 Menu will be closed

③ Press **MENU** .

2.3 ISW (Interswitch) Menu

Refer to: (B) [ISW MENU 1 ••• 2-units (No.1 to No.6)]
(C) [ISW MENU 2 ••• 3-units (No.1 to No.6)]
(D) [ISW MENU 3 ••• 3-units (No.7 to No.12)]

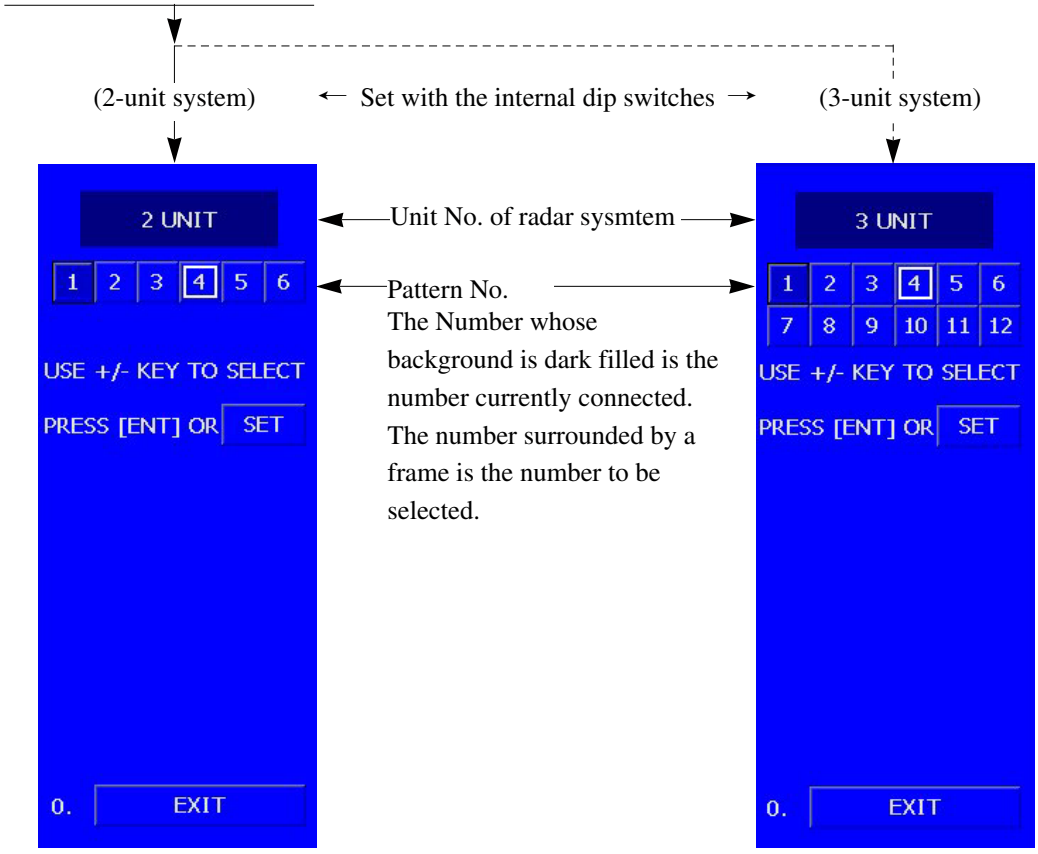
The Interswitch Menu can be selected only when the radar system is set to on the standby mode. Although the Interswitch Menu can be opened during transmission, the radar system will stop transmission and enter the standby state automatically.

The Sub1 Menu will appear

The ISW Menu will appear

① Press **7** .

ISW Menu (on display right)



ISW Menu (Pattern Diagram) (on display center)

The pattern diagrams for the 2-units system is different from the pattern diagrams for the 3-units system.

- 6 pattern diagrams are displayed for 2-units system.
- 12 pattern diagrams (on two pages with 6 patterns per page) are displayed for 3-units system.

In the pattern diagram,

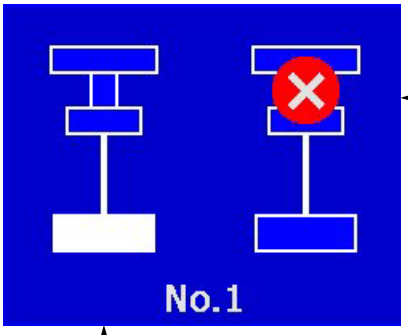
- The pattern diagram dark filled represents the current pattern.
- The display unit currently in operation is highlighted in the reverse black/white view.
- A display unit or MTR marked with " × " is not connected or has a failure.
- The pattern diagram with the mark " × " cannot be selected as described above.

The ISW Menu will be closed

② Press 0 .

The Sub1 Menu will be closed

③ Press 0 .



The MTR not-connected or at fault. (× mark draw)

The MTR currently operated. (filled in reverse video)

APPENDIX

2.4 Changing Interswitch Patterns

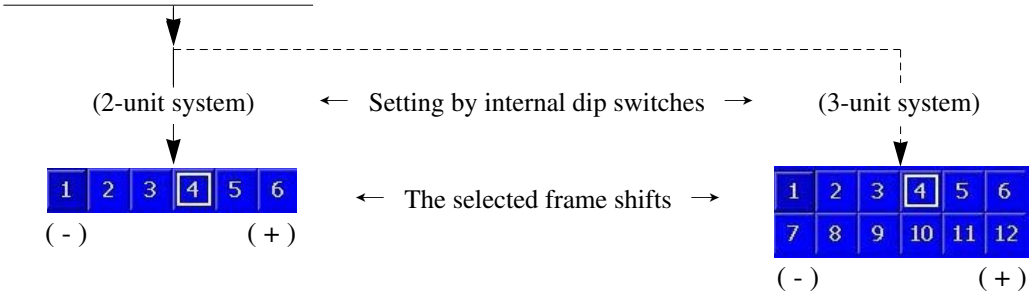
The Sub1 Menu will appear

The ISW Menu will appear

Select an ISW pattern

① Press [+] or [−] to select Pattern No.

ISW Menu (on display right)



ISW Menu (Pattern Diagram) (on display center)

Press [+] or [−], and the pattern diagram will be enclosed by a square line, which signifies "selecting".

② Press [ENT].

Message Area (on display lower right)
"ISW END" is blinking and an alarm buzzer sounds.

ISW Menu (Pattern Diagram) (on display center)
The selected pattern diagram is blinking for about 5 seconds, and if it is established, the pattern is selected.

Note that if the switchover fails, the selected pattern will not appear. The blinking is stopped after about 5 second and the previous pattern diagram will reappear. In this case, "ISW TIME OUT" will appear on the message area on the lower right of the display and an alarm sound is given.
In this state, re-select the pattern diagram and switch over the units. If the re-selection fails, contact JRC service depot.

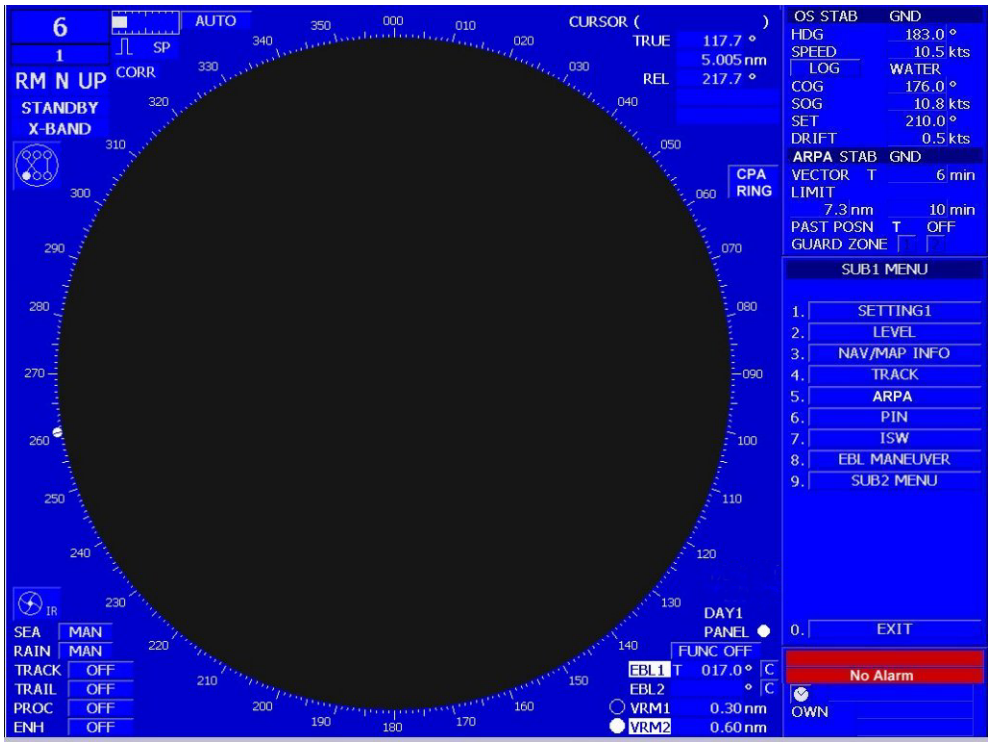
Pre-heat Time Countdown (on display center or the upper part)

When the switchover operation is completed, the timer at the display center or the upper part will start the countdown. At this time, the radar operation state at the upper right of the display indicates “PREHEAT”.

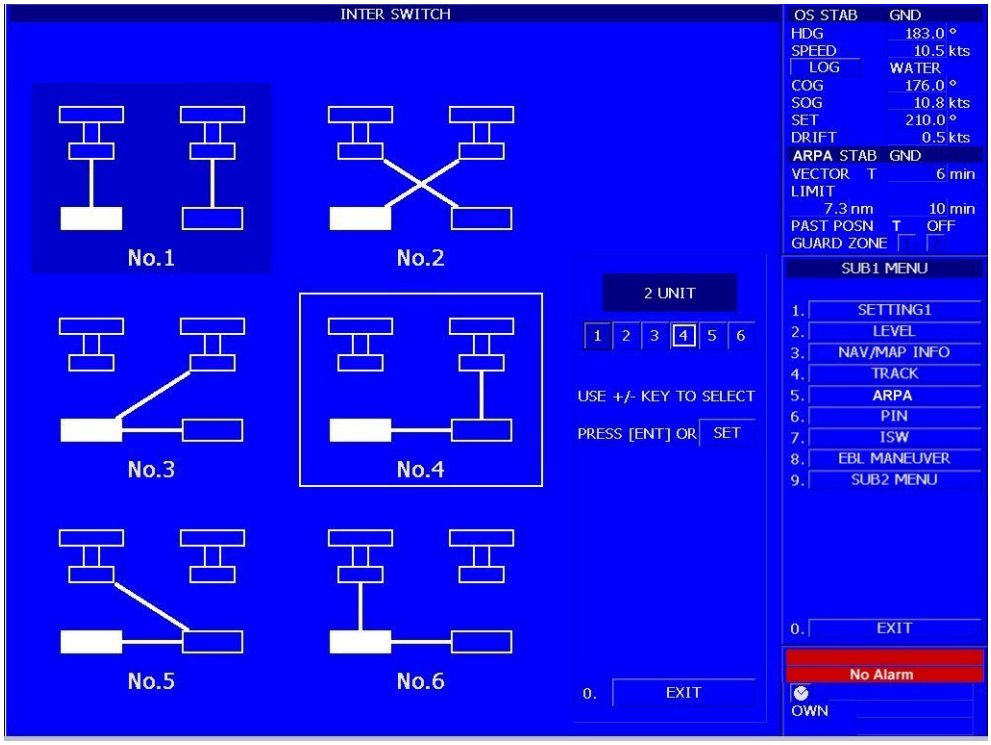
If the count “0:00” is indicated, the indication at the upper right on the radar display is changed from “PREHEAT” to “STANDBY”.

The ISW Menu will be closed

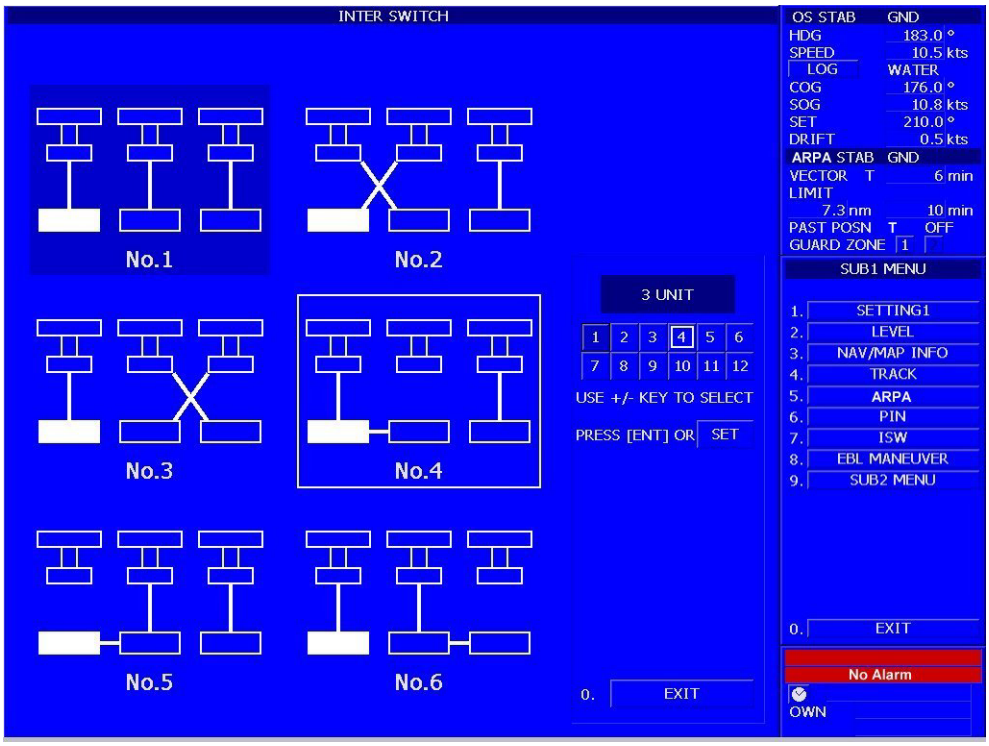
The Sub1 Menu will be closed



(A) [Sub1 Menu display ••• Selection of an ISW Menu]



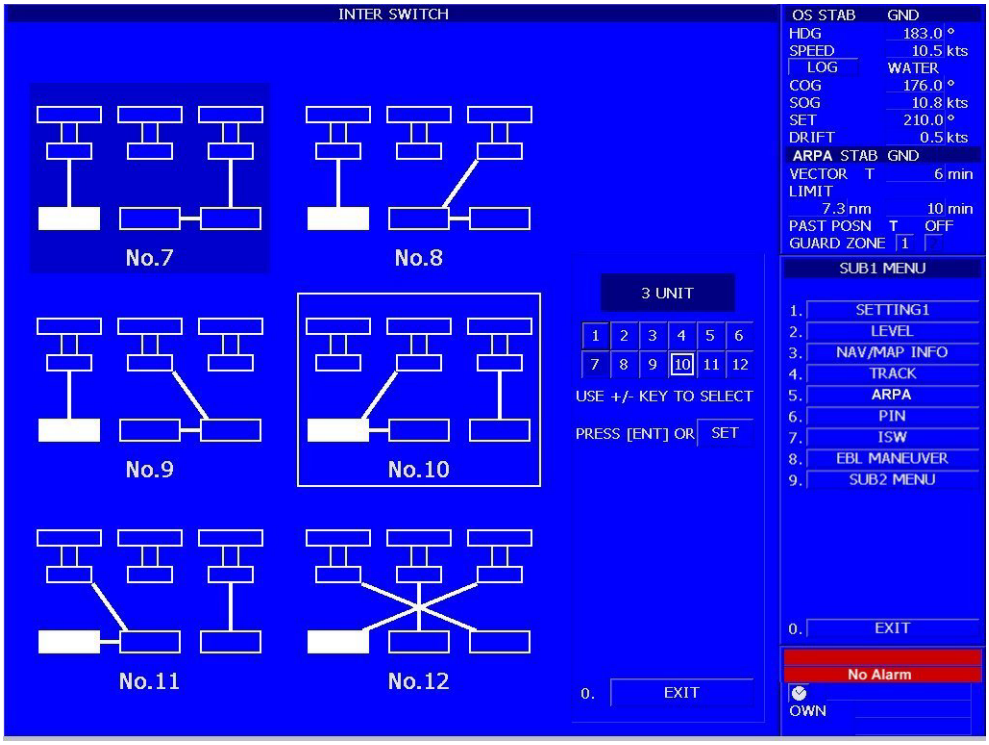
(B) [ISW MENU 1 ••• 2-units (No.1 to No.6)]
The current connection pattern: No.1
The current connection pattern to be selected: No.4



(C) [ISW MENU 2 ••• 3-units (No.1 to No.6)]

The current connection pattern: No.1

The current connection pattern to be selected: No.4



(D) [ISW MENU 3 ••• 3-units (No.7 to No.12)]

The current connection pattern: No.7

The current connection pattern to be selected: No.10

3. REFERENCES

Pre-heat Time after Pattern Selection

After switching over the interswitch patterns, it is necessary to wait for the time as mentioned below because the pre-heat time is different from the previous interconnection between the MTR and the display unit. This measure is taken for protecting the electronic tube emitting radar pulses.

(a) Not changed to the new interconnection condition:.....No preheat time
(b) Changed to the new interconnection condition.
However, the MTR was used before change: .....30 seconds
(c) Changed to the new interconnection condition.
However, the MTR was not used before change: .....3 minutes

Notes on Pattern Selection

Immediately after switching over the patterns, the try to select another pattern may fail. This means that even If the pattern switchover is completed, it takes some time to prepare for the next interswitch operation. In this case, “ISW BUSY” will be indicated in the message area on the display lower right, and the interswitch operation is not available.

Alarm Sound Control

The interswitch alarm continues to sound for about 5 seconds. In setting the alarm sound level, open the Sub1 Menu, press [2] switch to select the “5.BUZZER” in LEVEL Menu. (Refer to page 3 - 61)
When stopping the alarm sound immediately after it sounds, press [ALARM ACK] switch. Even when the alarm sound stops, a certain message will remain in the message area.

Notes on Master/Slave Connection

The Master/Slave connection is a configuration in which the Display Unit connected to the Scanner Unit is the Master Unit, while the Display Unit connected to the Master Unit is a Slave Unit. Of the interswitch patterns, the following pattern numbers includes the Master/Slave connection:
a) 2-unit System: No.3, No.4, No.5 and No.6
b) 3-unit System: No.4, No.5, No.6, No.7, No.8, No.9, No.10 and No.11

If the Master Display Unit is not in the transmission state, it is impossible to set the Slave Display Unit to the transmission state. If the Master Display Unit is changed from the transmission to the standby mode, the Slave Display Unit will also be set to the standby mode forcibly. In this status, “MTR ST-BY” will be indicated in the message area and the alarm will beep.

The Slave Display Unit will not change the radar video even if the tuning control is adjusted because the tuning is controlled by the Master Display Unit. The tuning indicator at the upper left of the display will show “SLAVE”.

The change of the range scale on the Slave Display Unit depends upon the range scale on the Master Display Unit. In general, the Slave Display Unit can not change the range scale into a higher one than that on the Master Display Unit. However, a higher range scale may be selected by the Slave Display Unit if the pulse length/repetition frequency is the same as on the Master Display

Scanner Safety Switch

If the Scanner Units are changed over in the condition that the safety switch of one Scanner Unit is set to “OFF” while the other is set to “ON”, “SSW OFF” will be indicated on both the display.

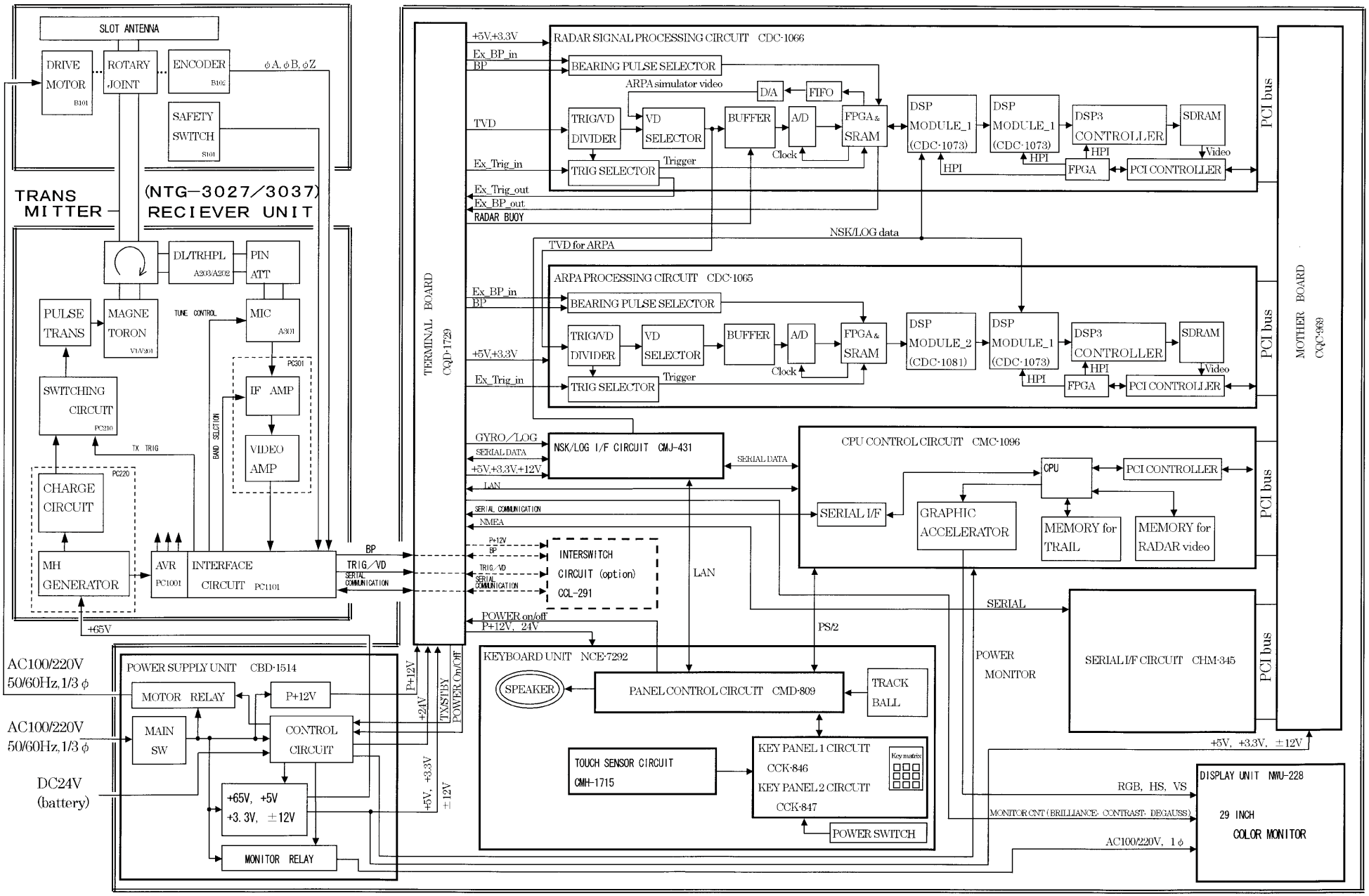
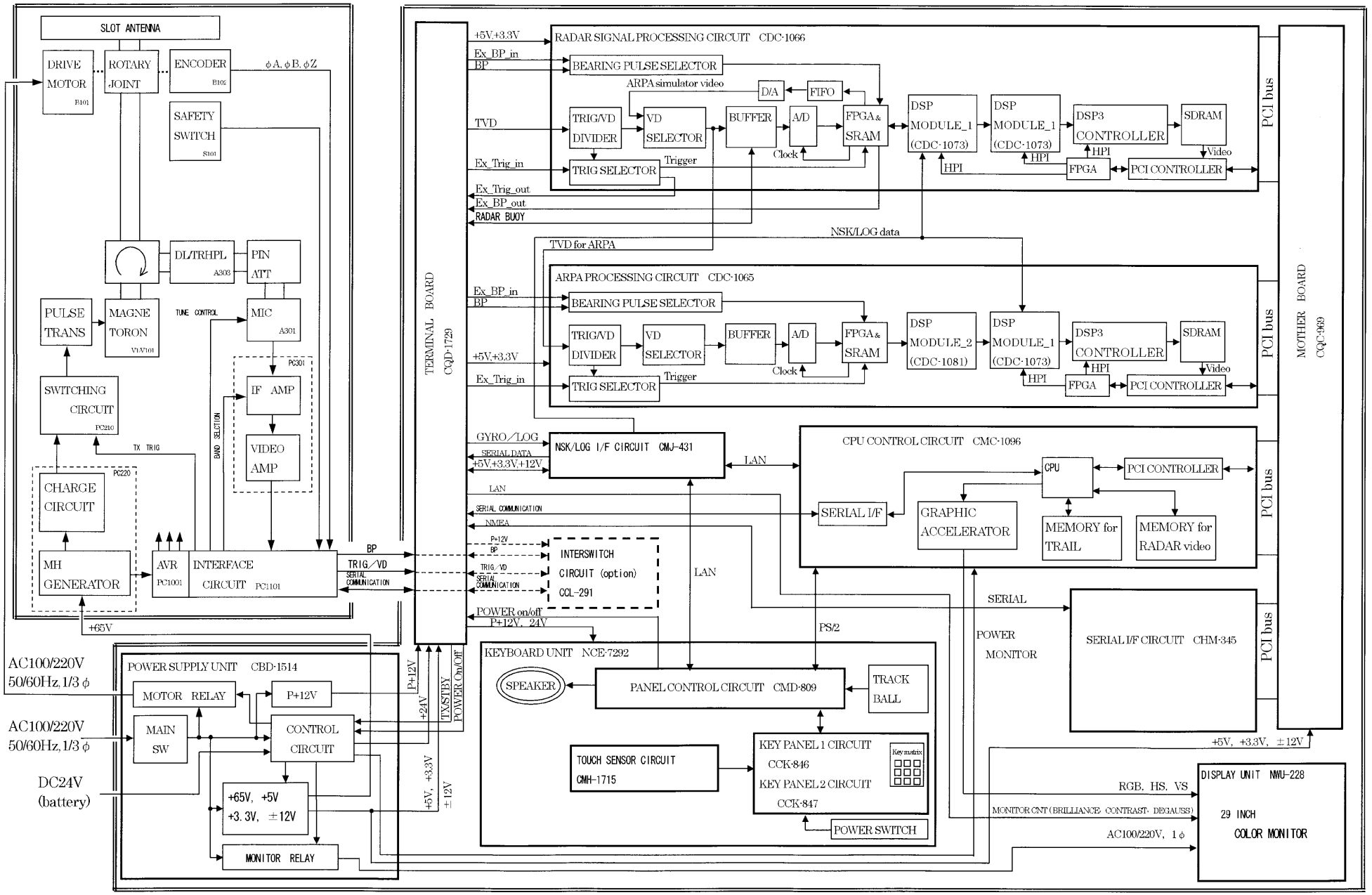


Fig.101 Block Diagram of Radar, Type JMA-9833-SA and JMA-9823-7XA/9XA

JMA-9823-7XA/9XA···MAG:V1 , DL:A203 , PIN ATT:A302
JMA-9833-SA ···MAG:V201 , TRHPL:A202



JMA-9822-6XA/9XA···MAG;V1 , DL;A303 , PIN ATT;A302
JMA-9832-SA ···MAG;V101 , TRHPL;A303

Fig.102 Block Diagram of Radar, Type JMA-9832-SA and JMA-9822-6XA/9XA

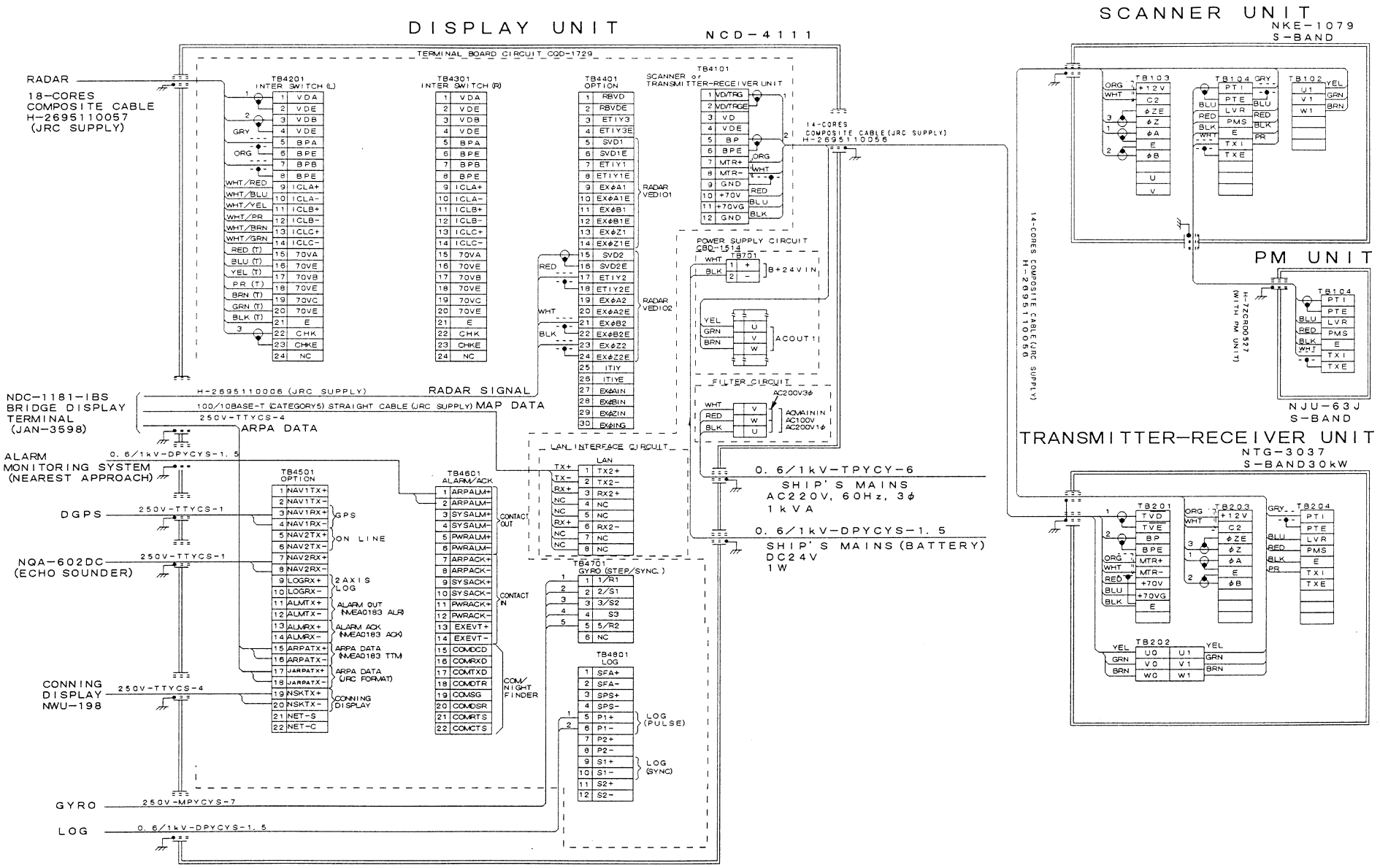


Fig.103 Terminal Board Connection Diagram of Radar, Type JMA-9833-SA

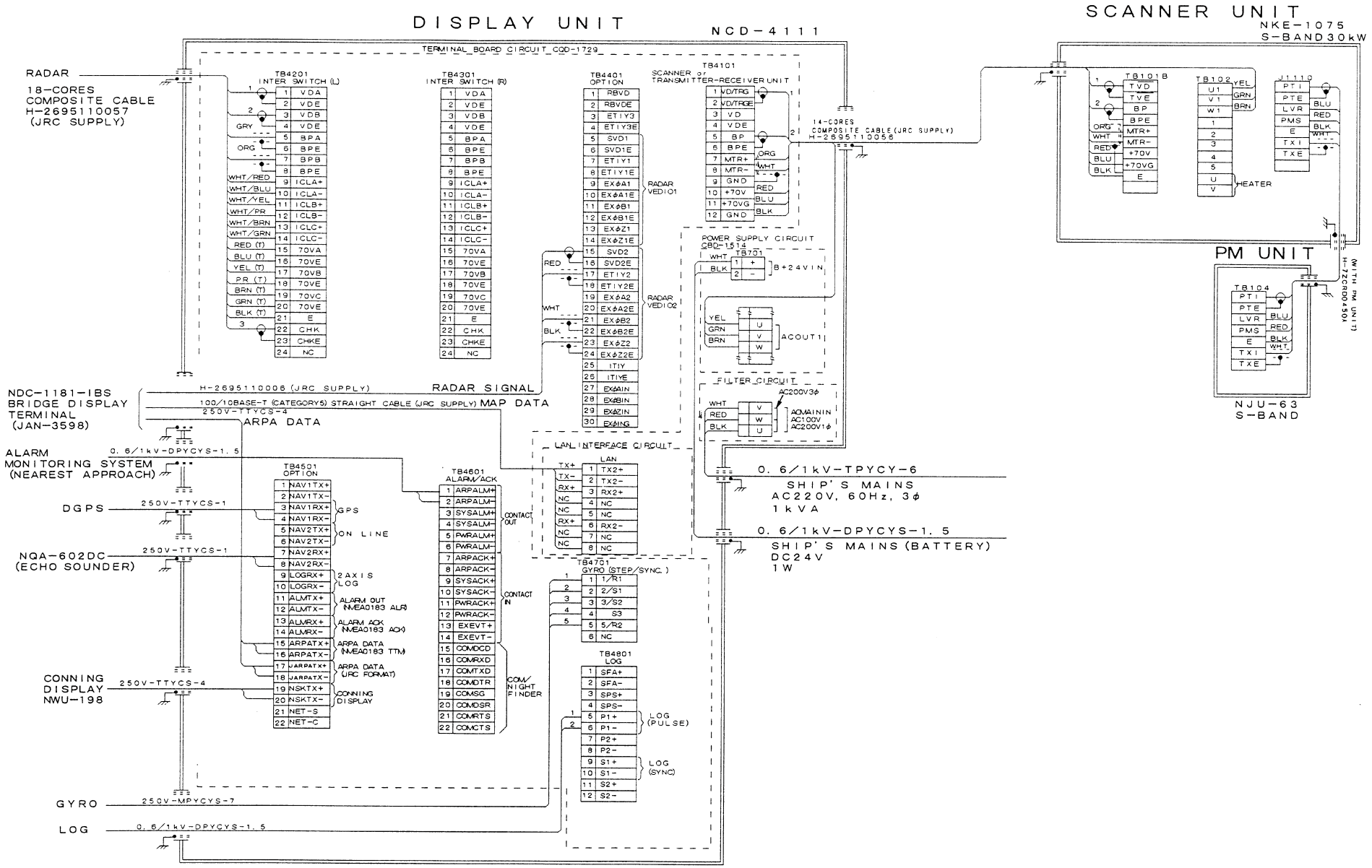


Fig.104 Terminal Board Connection Diagram of Radar, Type JMA-9832-SA

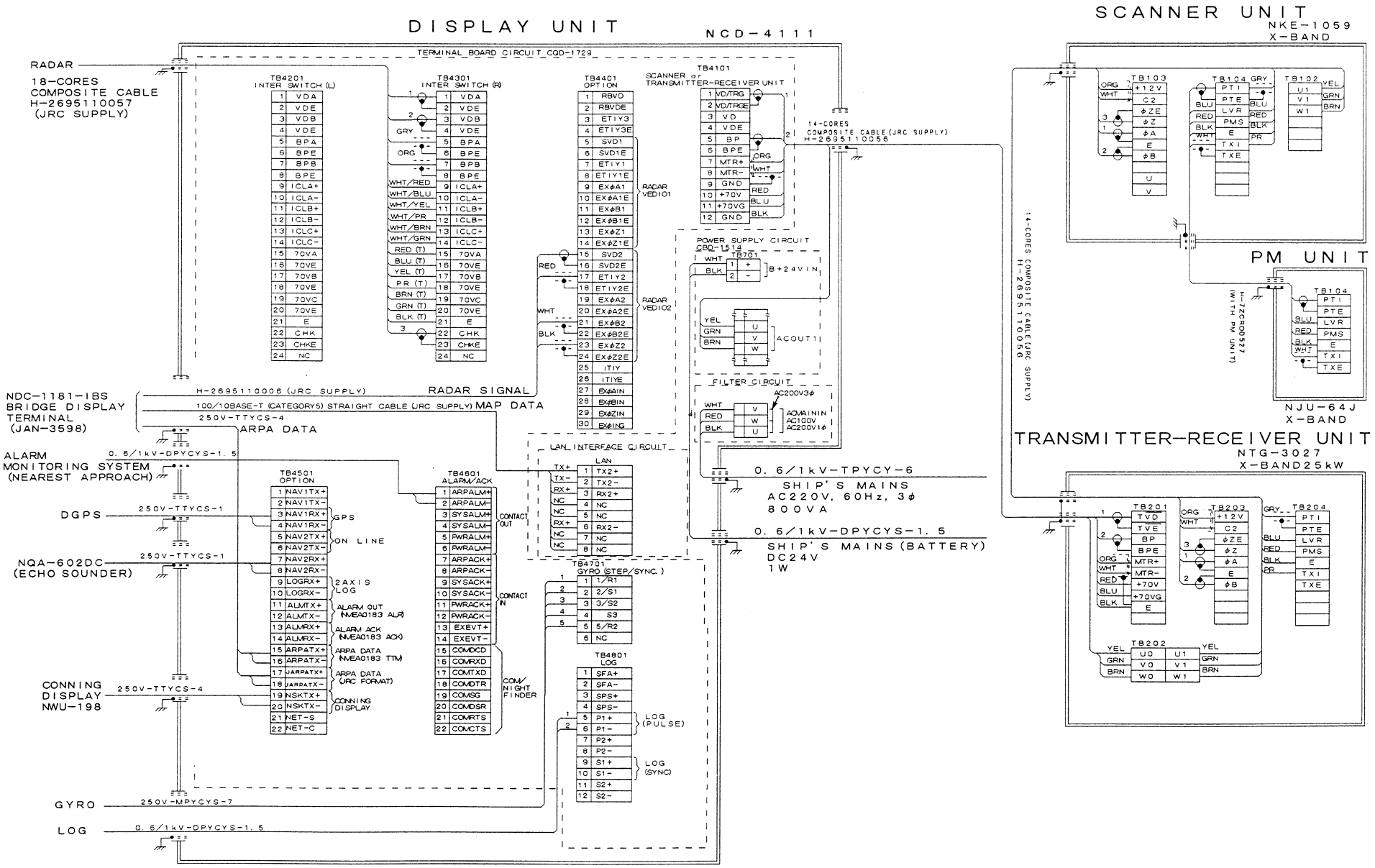


Fig.105 Terminal Board Connection Diagram of Radar, Type JMA-9823-7XA/9XA

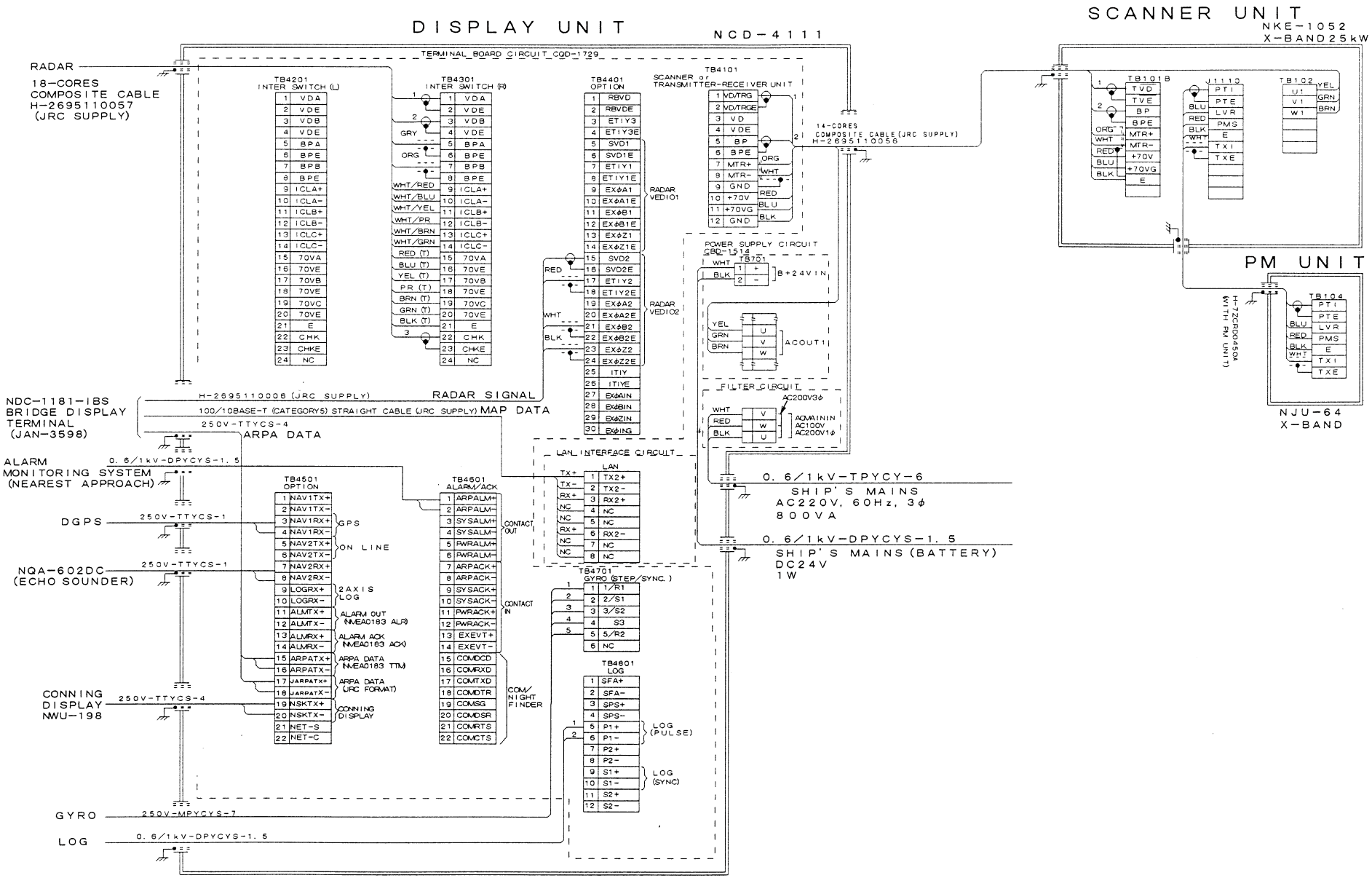


Fig.106 Terminal Board Connection Diagram of Radar, Type JMA-9822-6XA/9XA

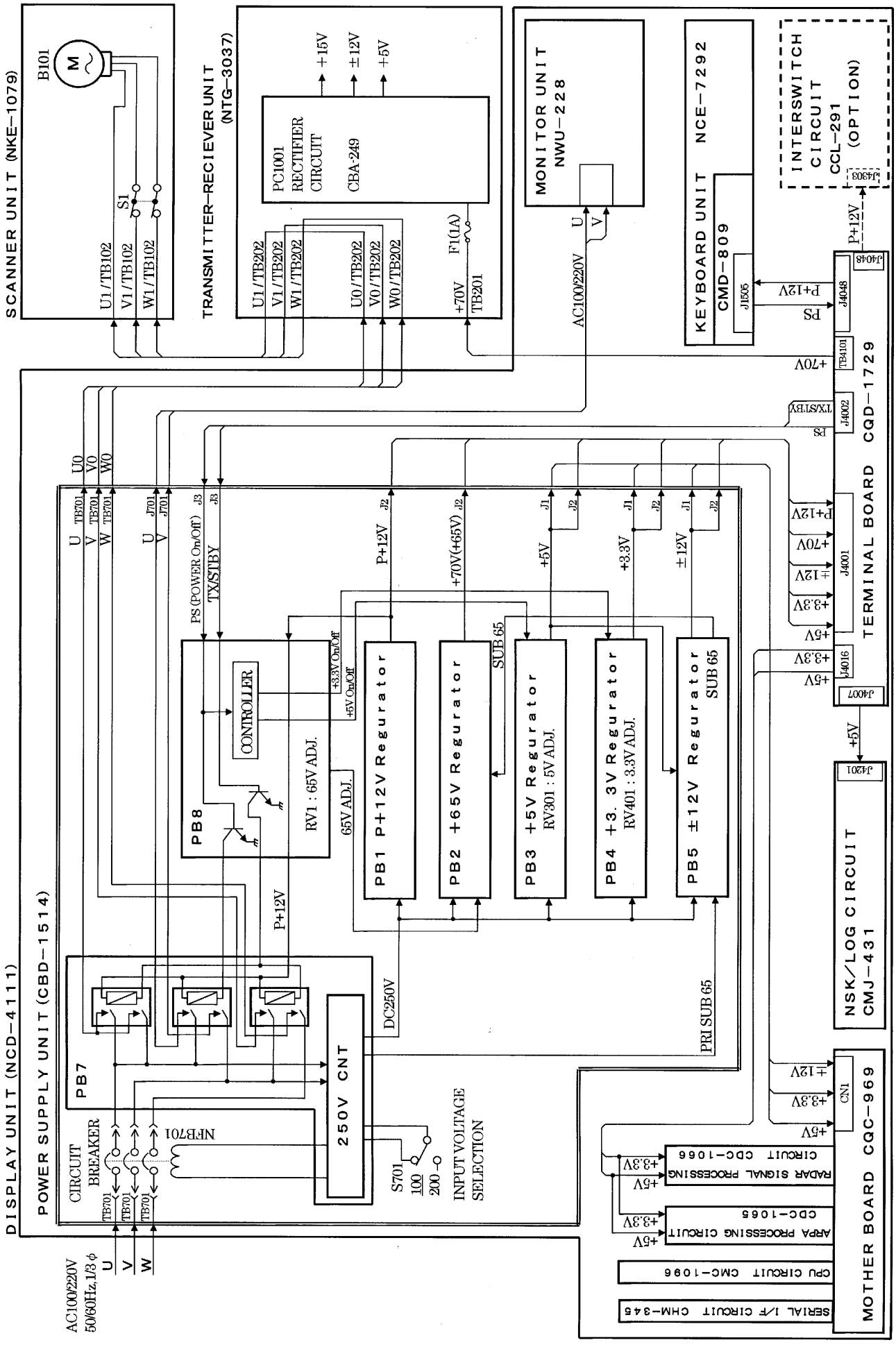


Fig.107 Primary Power Supply Block Diagram of Radar, Type JMA-9833-SA

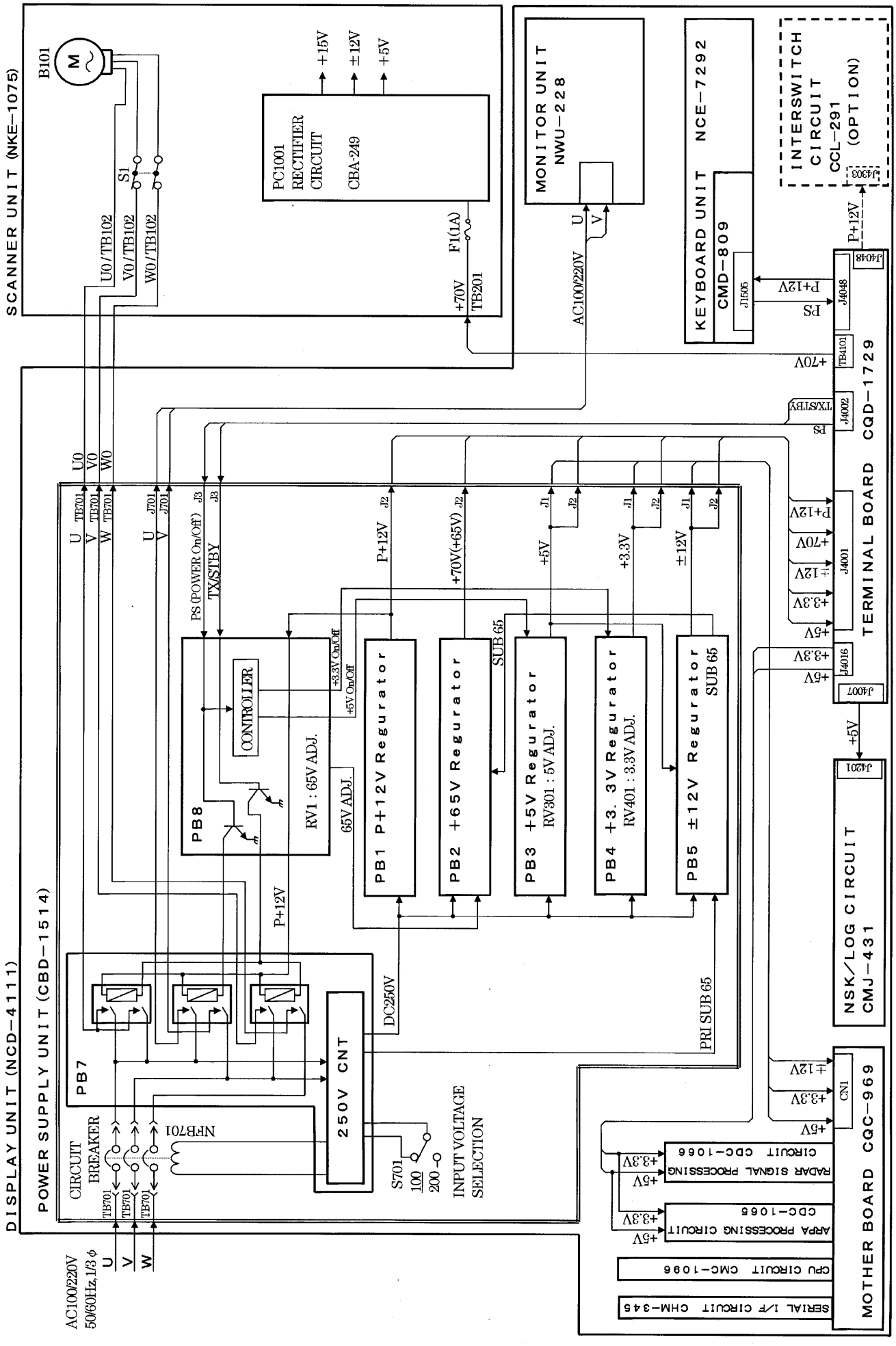


Fig.108 Primary Power Supply Block Diagram of Radar, Type JMA-9832-SA

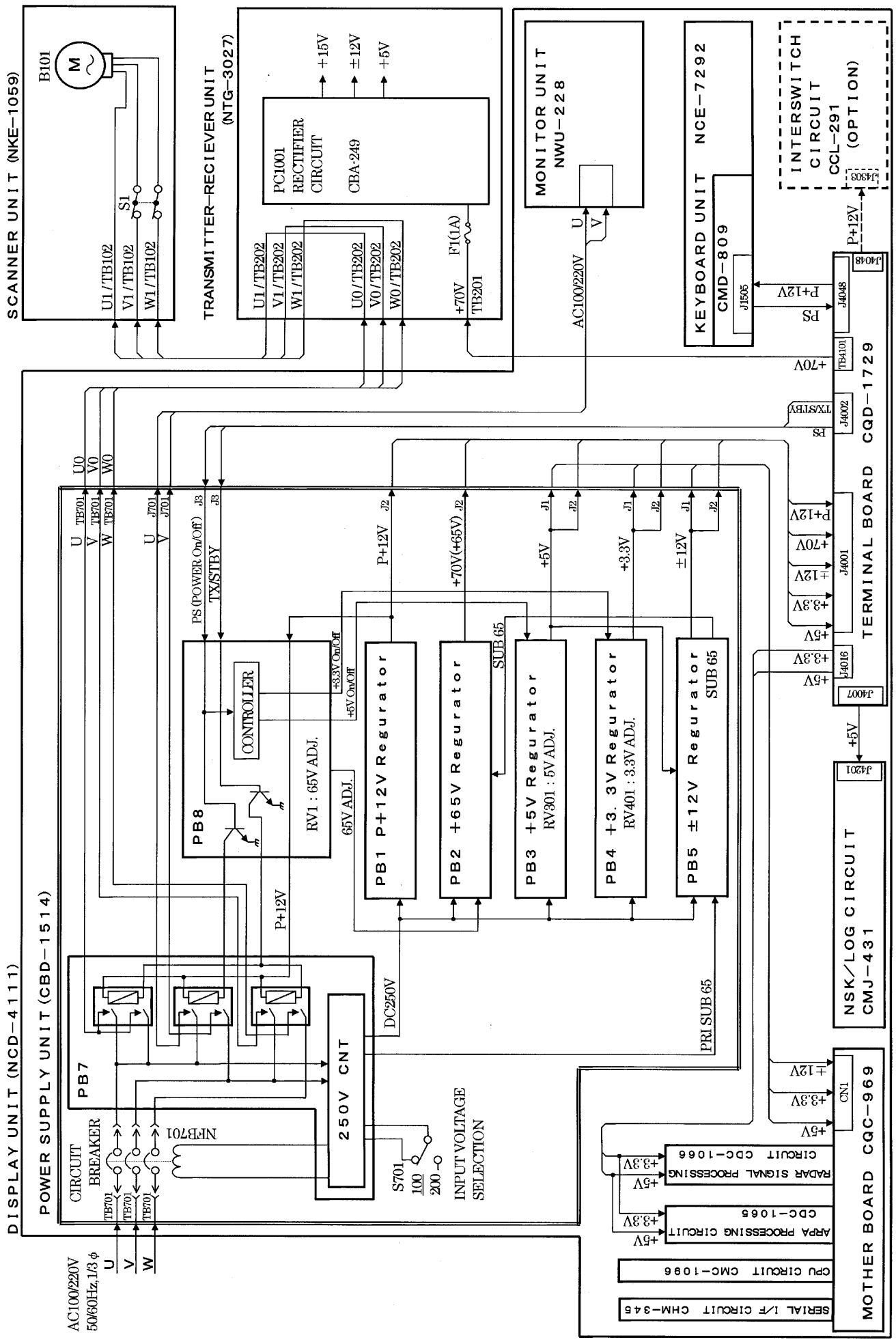


Fig.109 Primary Power Supply Block Diagram of Radar, Type JMA-9823-7XA/9XA

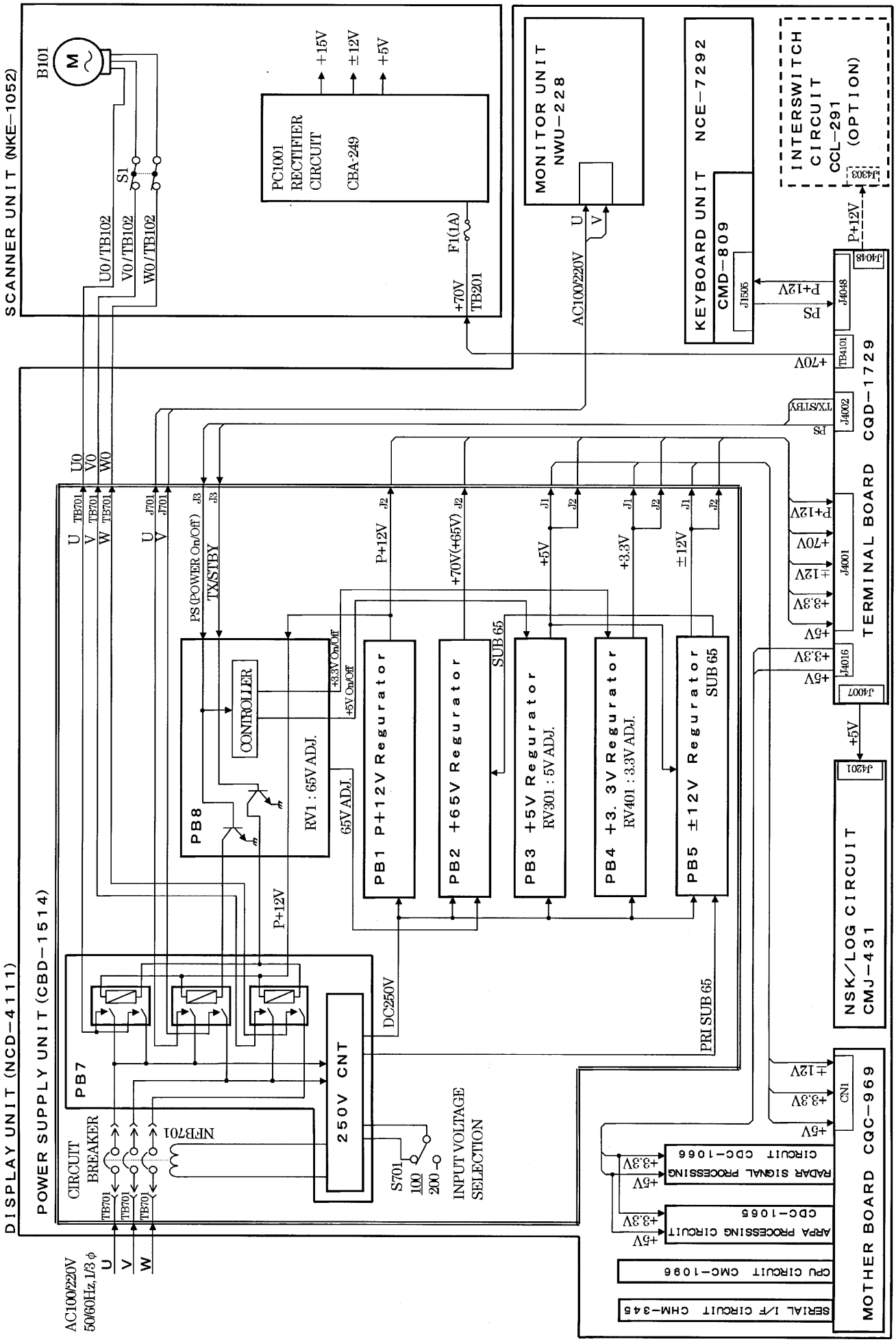


Fig.110 Primary Power Supply Block Diagram of Radar, Type JMA-9822-6XA/9XA

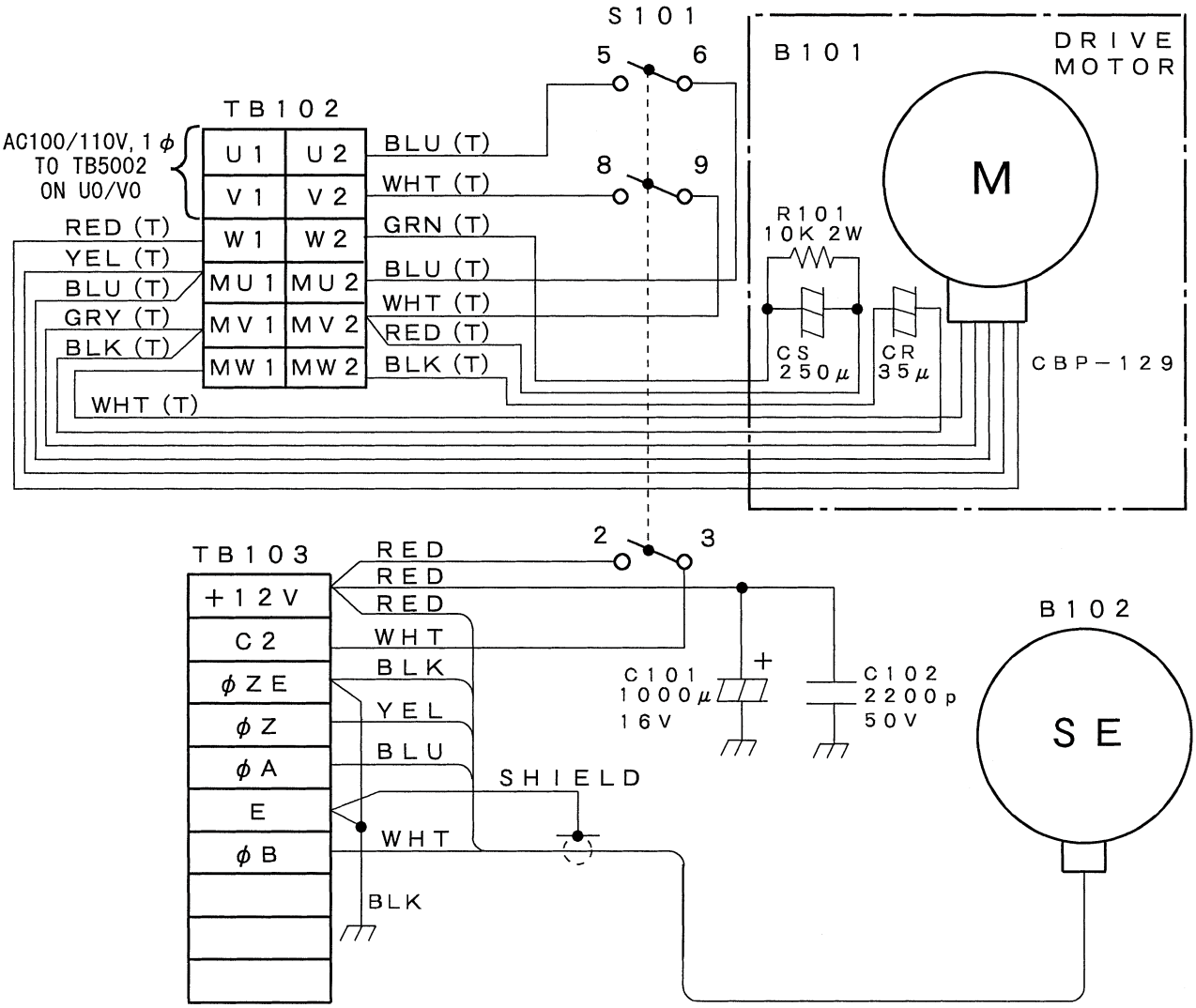


Fig.111 Internal Connection Diagram of Scanner Unit, Type NKE-1079

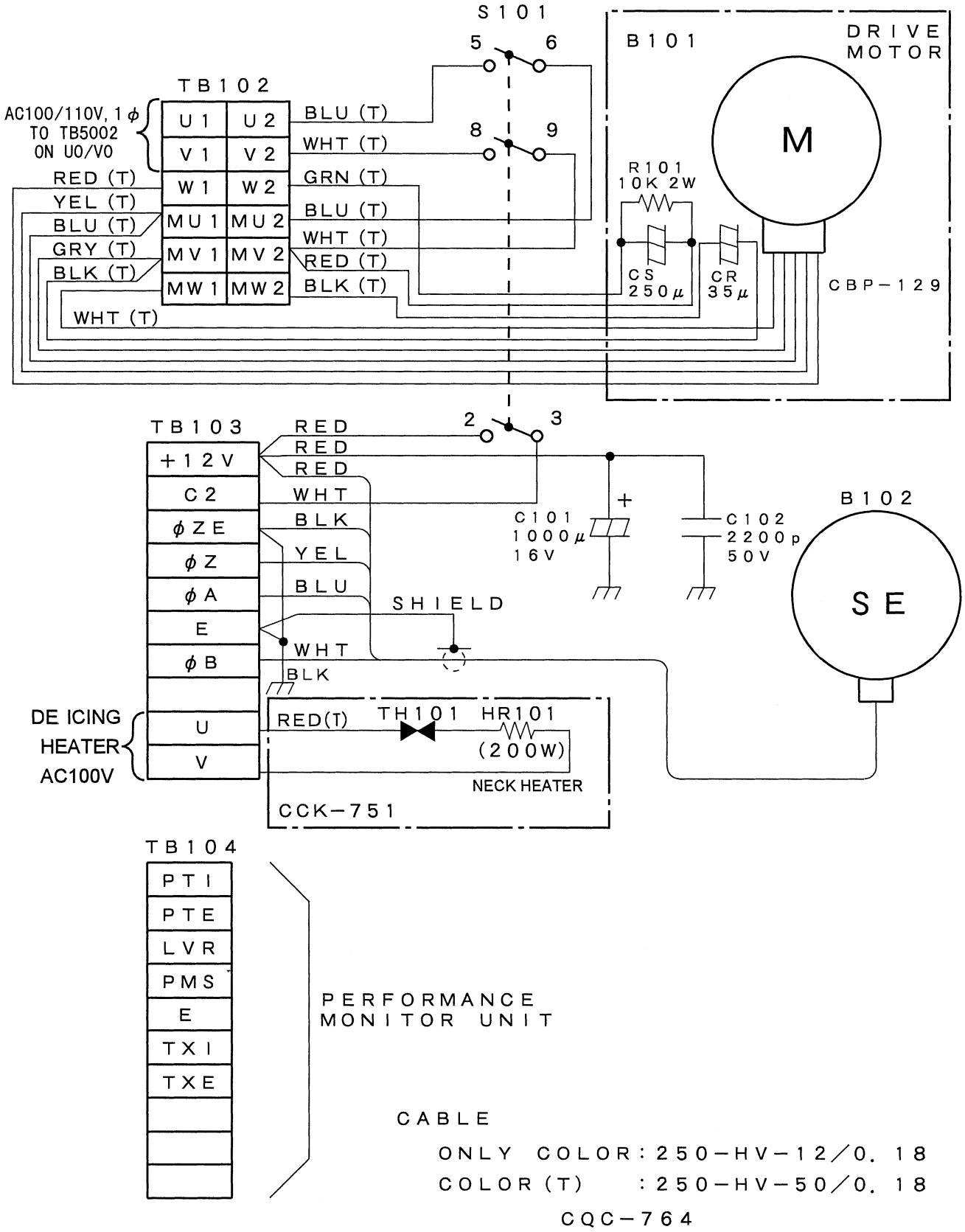


Fig.112 Internal Connection Diagram of Scanner Unit, Type NKE-1079-D

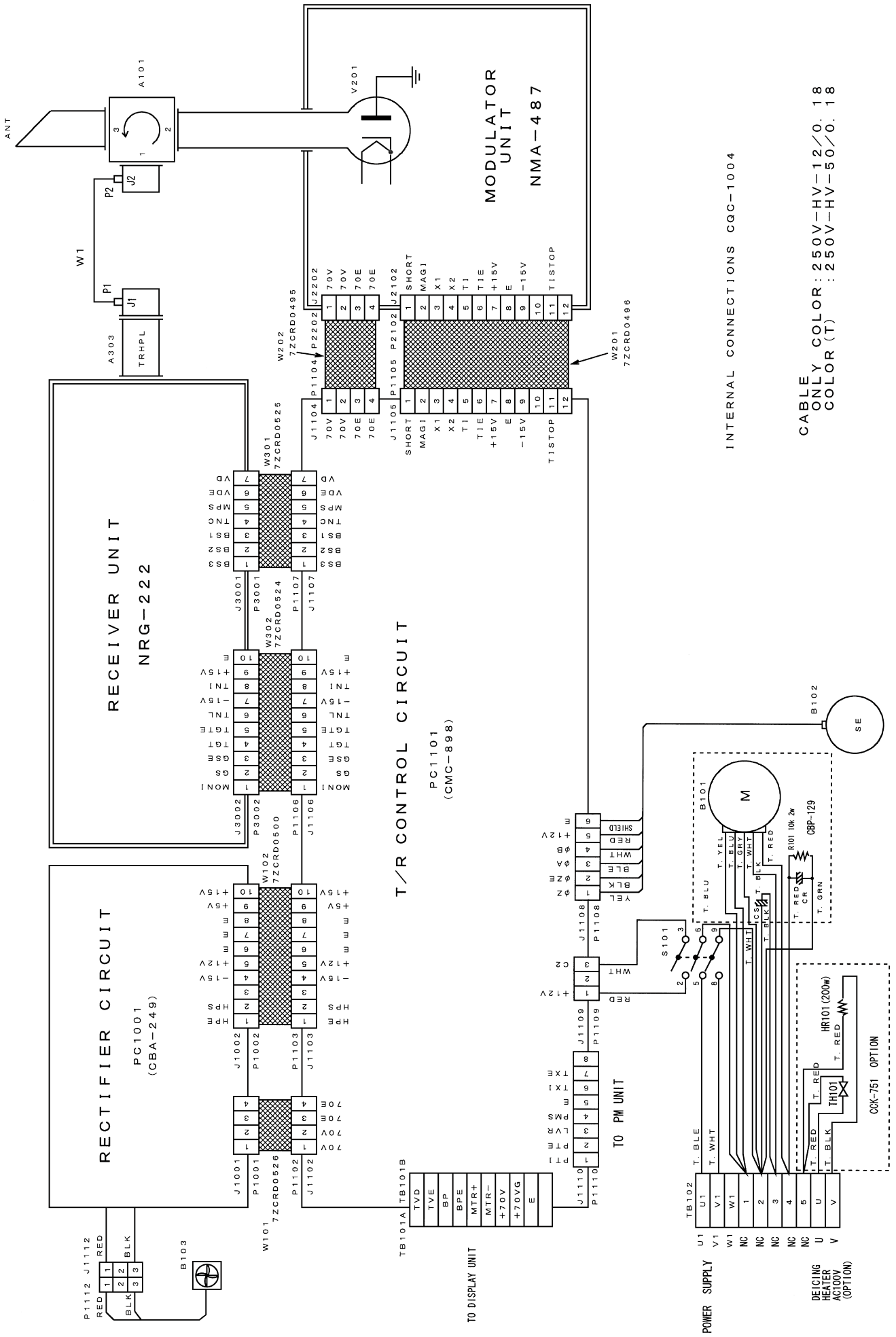


Fig.113 Internal Connection Diagram of
Scanner Unit, Type NKE-1075 (100 V AC, 1-phase)

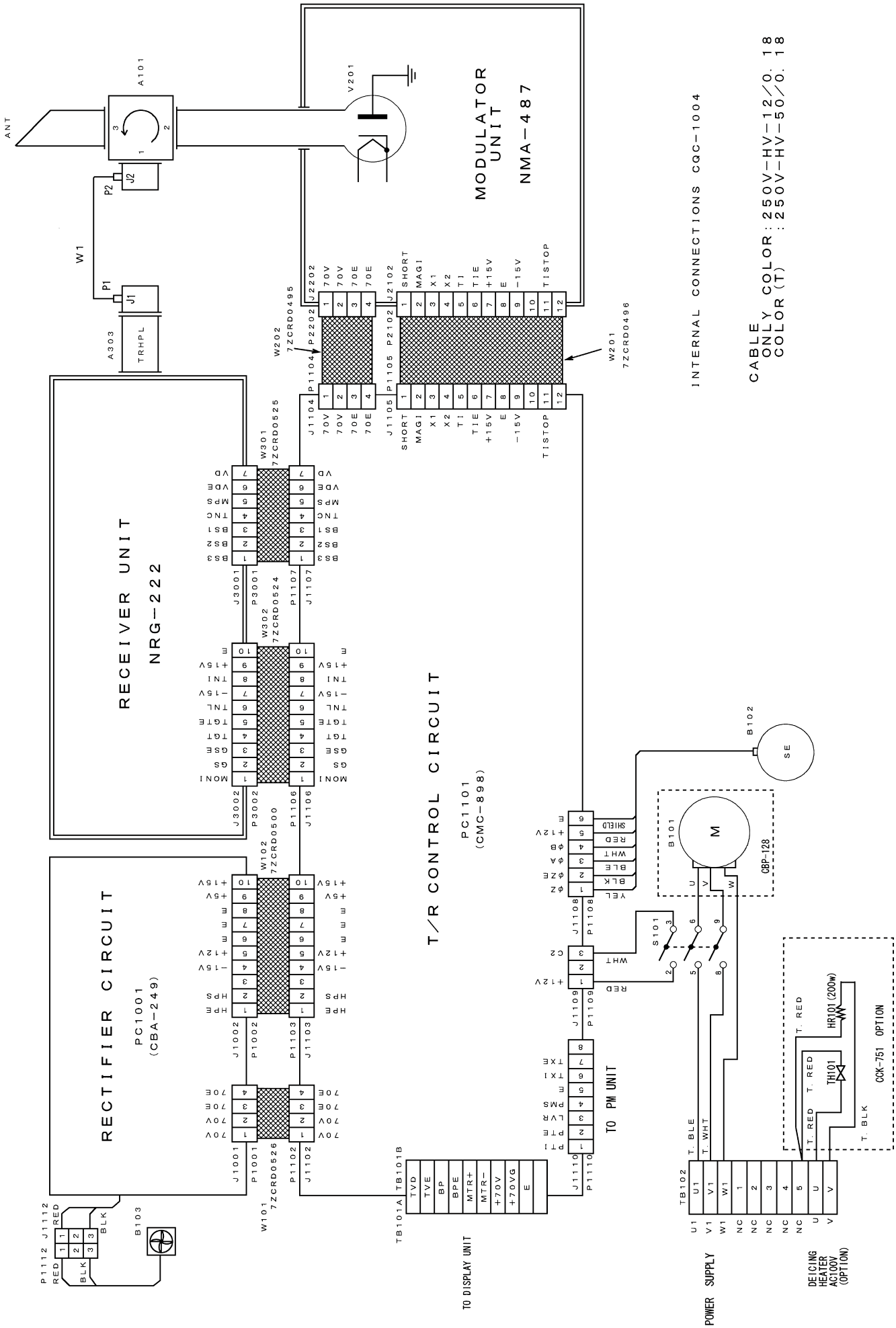


Fig.114 Internal Connection Diagram of
Scanner Unit, Type NKE-1075 (220 V AC, 3-phase)

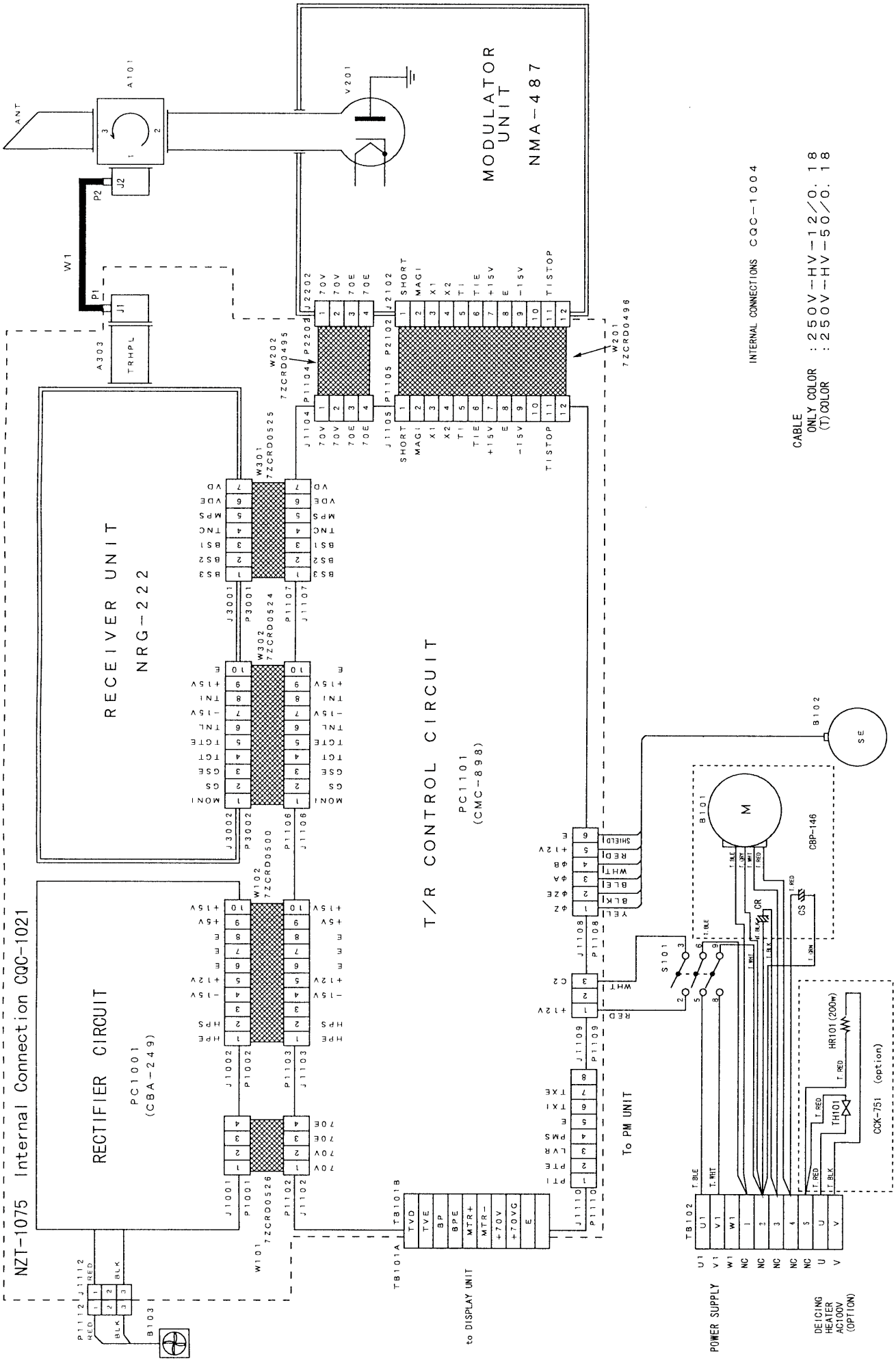
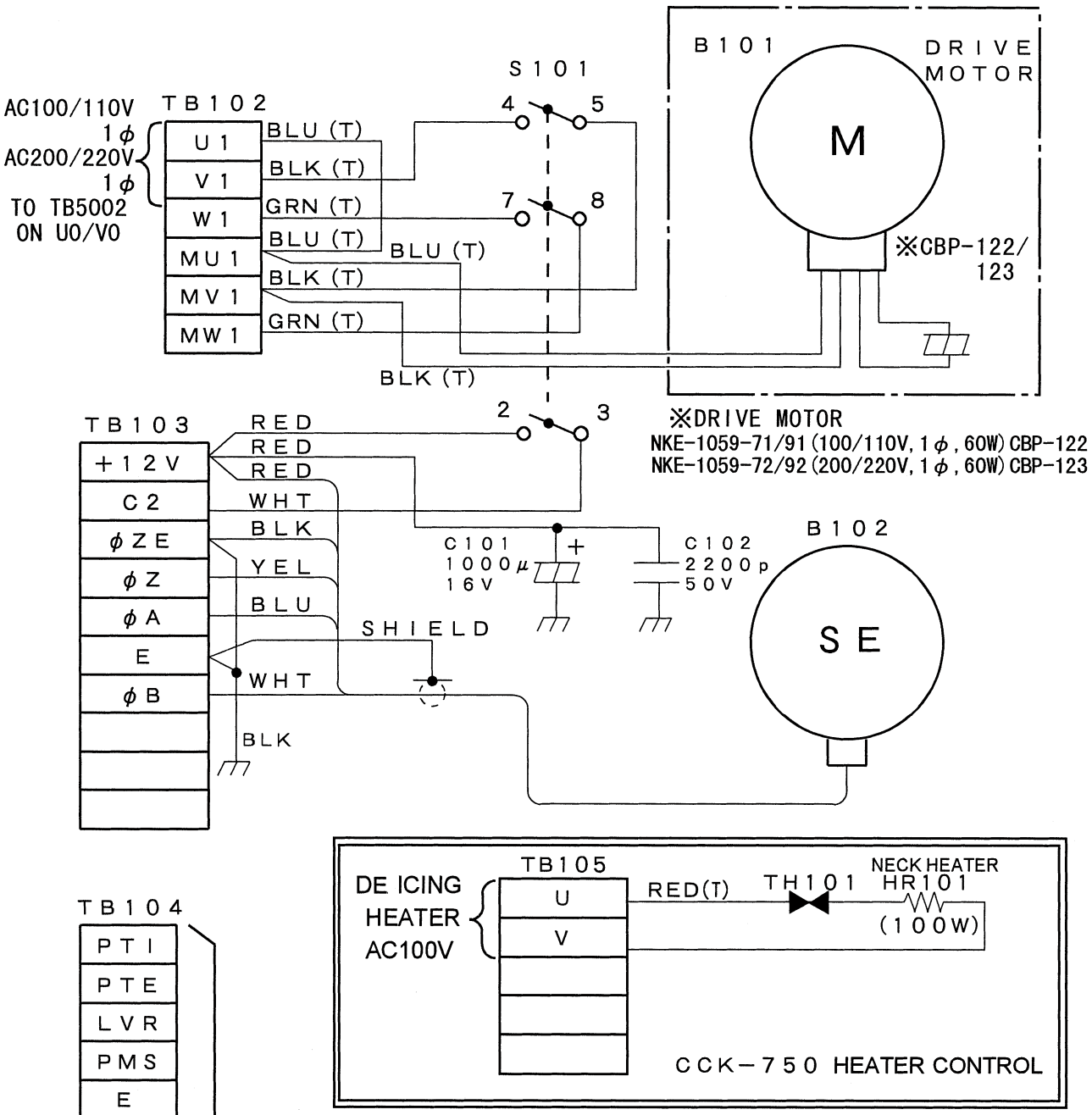


Fig.115 Internal Connection Diagram of
Scanner Unit, Type NKE-1075 (220 V AC, 1-phase)



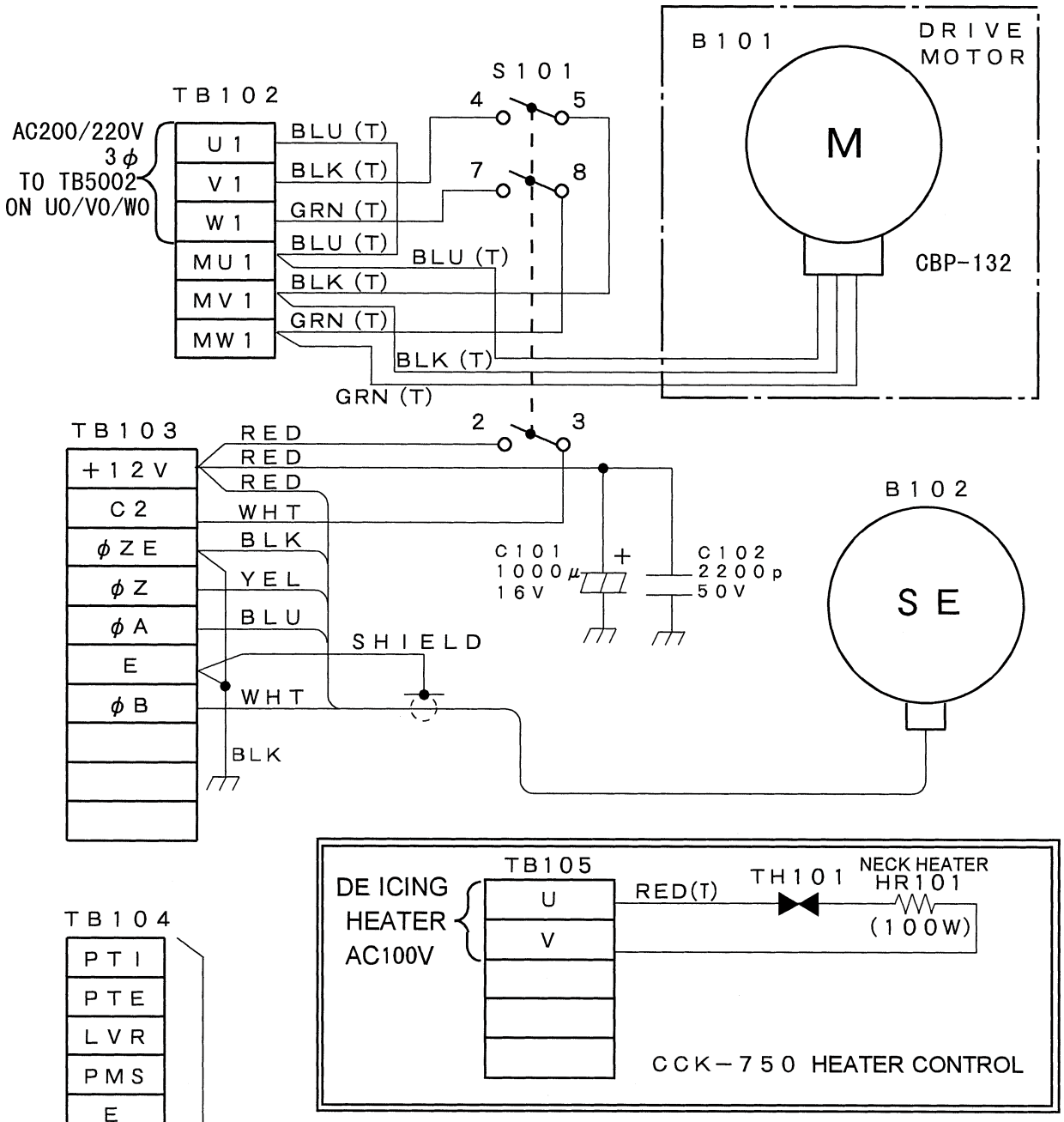
CABLE

ONLY COLOR : 250V-HV-12/0.18

COLOR (T) : 250V-HV-50/0.18

CQC-788

Fig.116 Internal Connection Diagram of Scanner Unit, Type NKE-1059-7/9 (1-phase)



CABLE

ONLY COLOR : 250V-HV-12/0.18

COLOR (T) : 250V-HV-50/0.18

CQC-788

Fig.117 Internal Connection Diagram of Scanner Unit, Type NKE-1059-7/9 (3-phase)

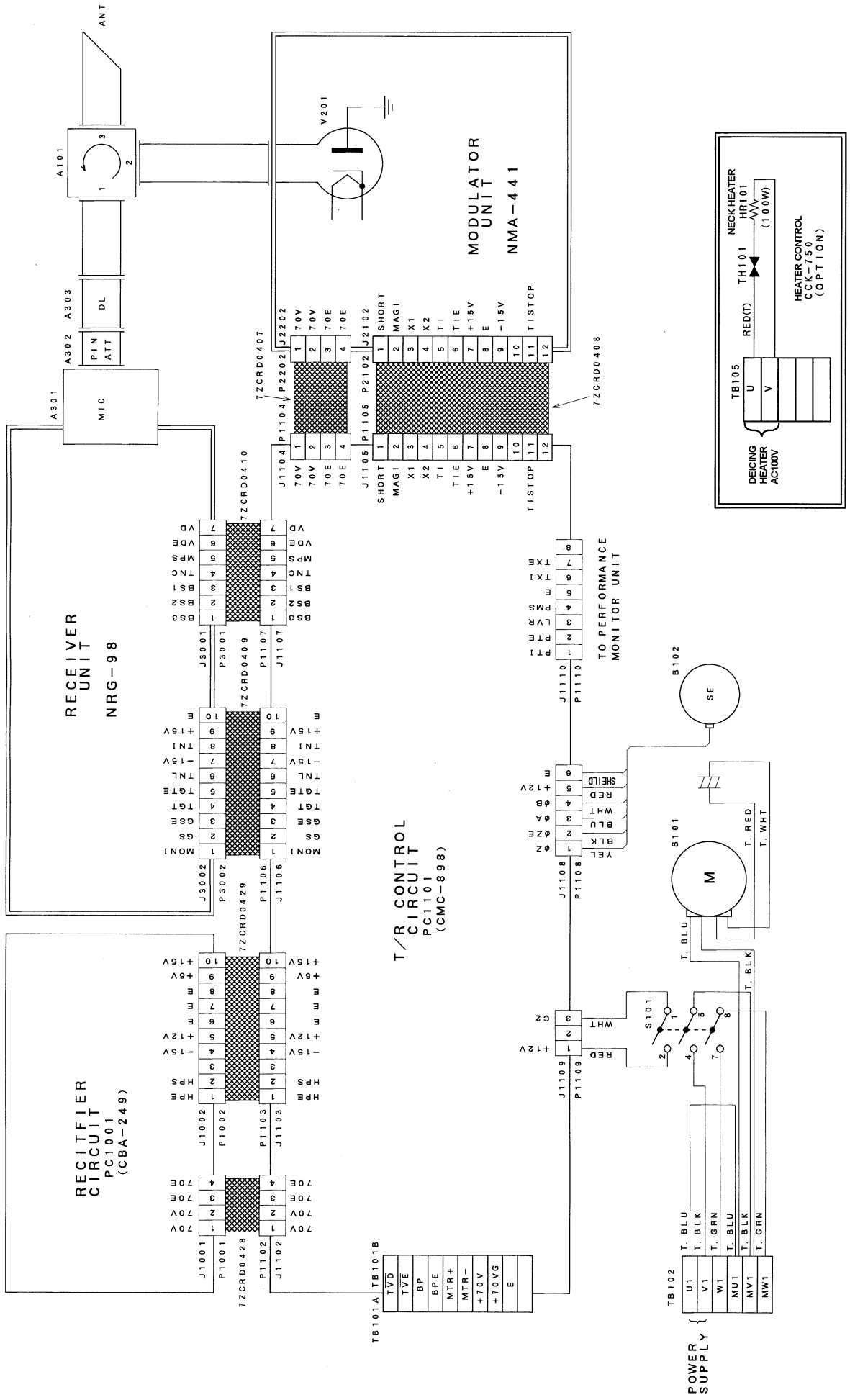


Fig.118 Internal Connection Diagram of Scanner Unit, Type NKE-1052-6/9 (1-phase)

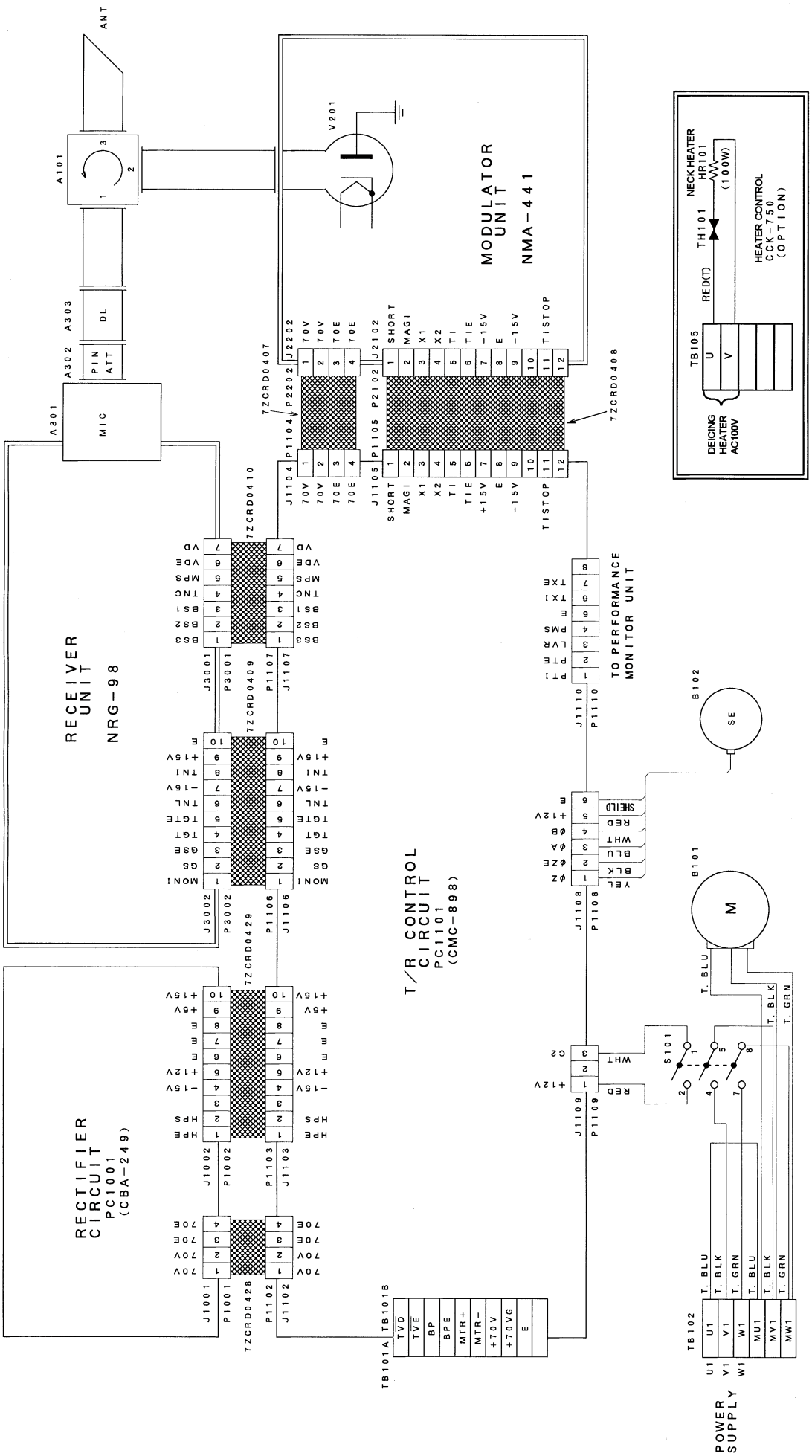


Fig.119 Internal Connection Diagram of Scanner Unit, Type NKE-1052-6/9 (3-phase)

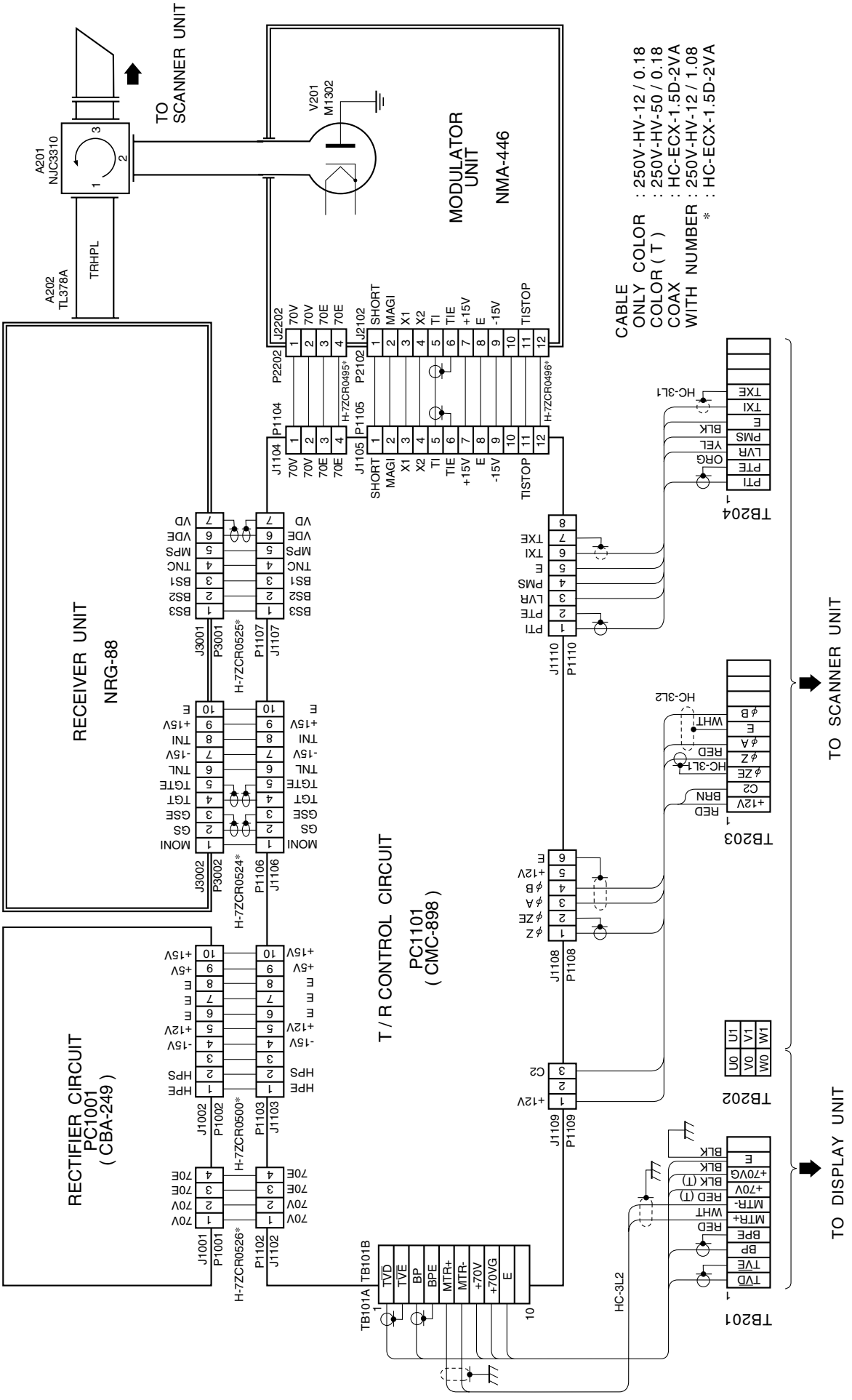


Fig.120 Internal Connection Diagram of Transmitter-receiver Unit, Type NTG-3037

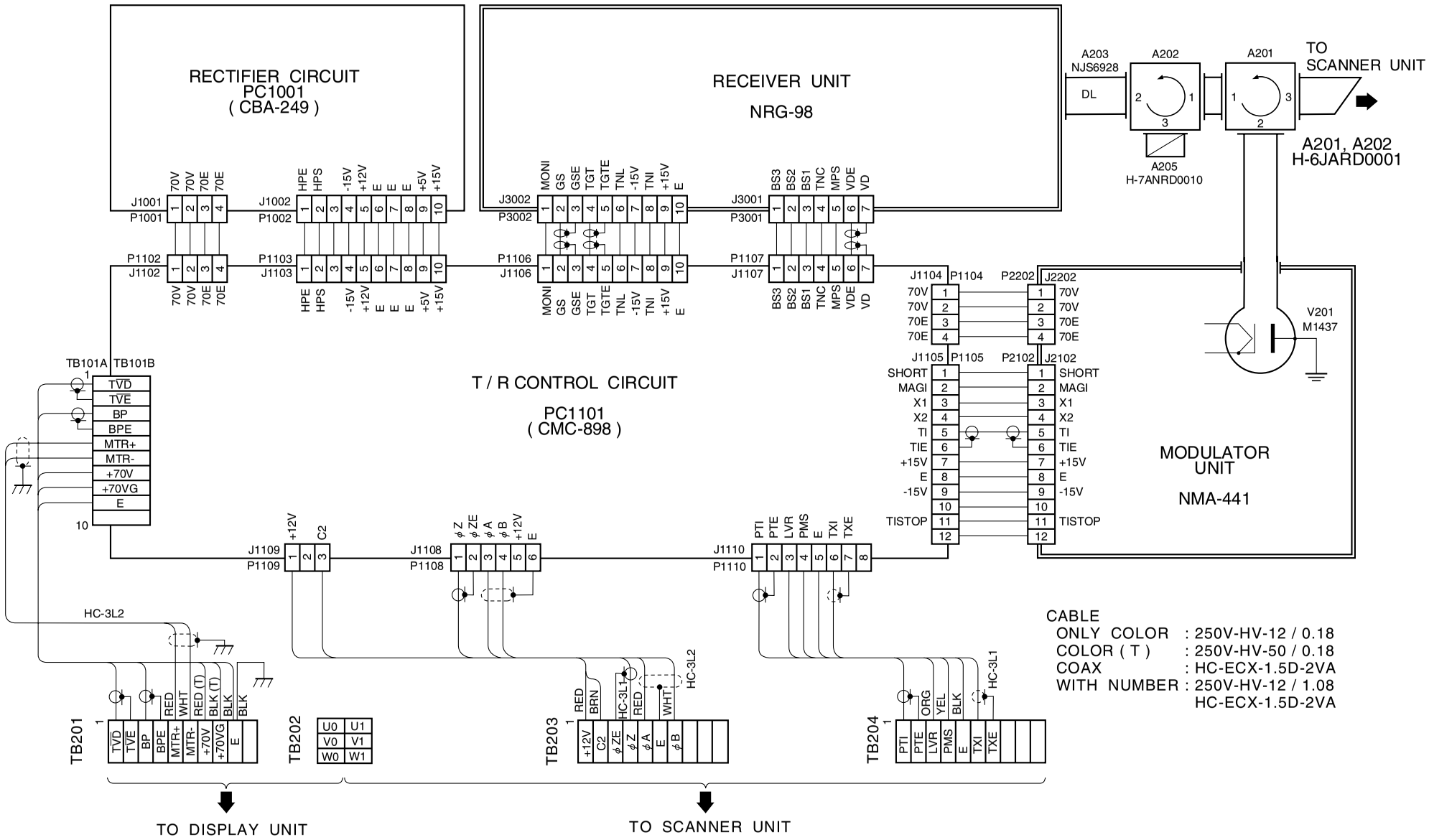


Fig.121 Internal Connection Diagram of Transmitter-receiver Unit, Type NTG-3027

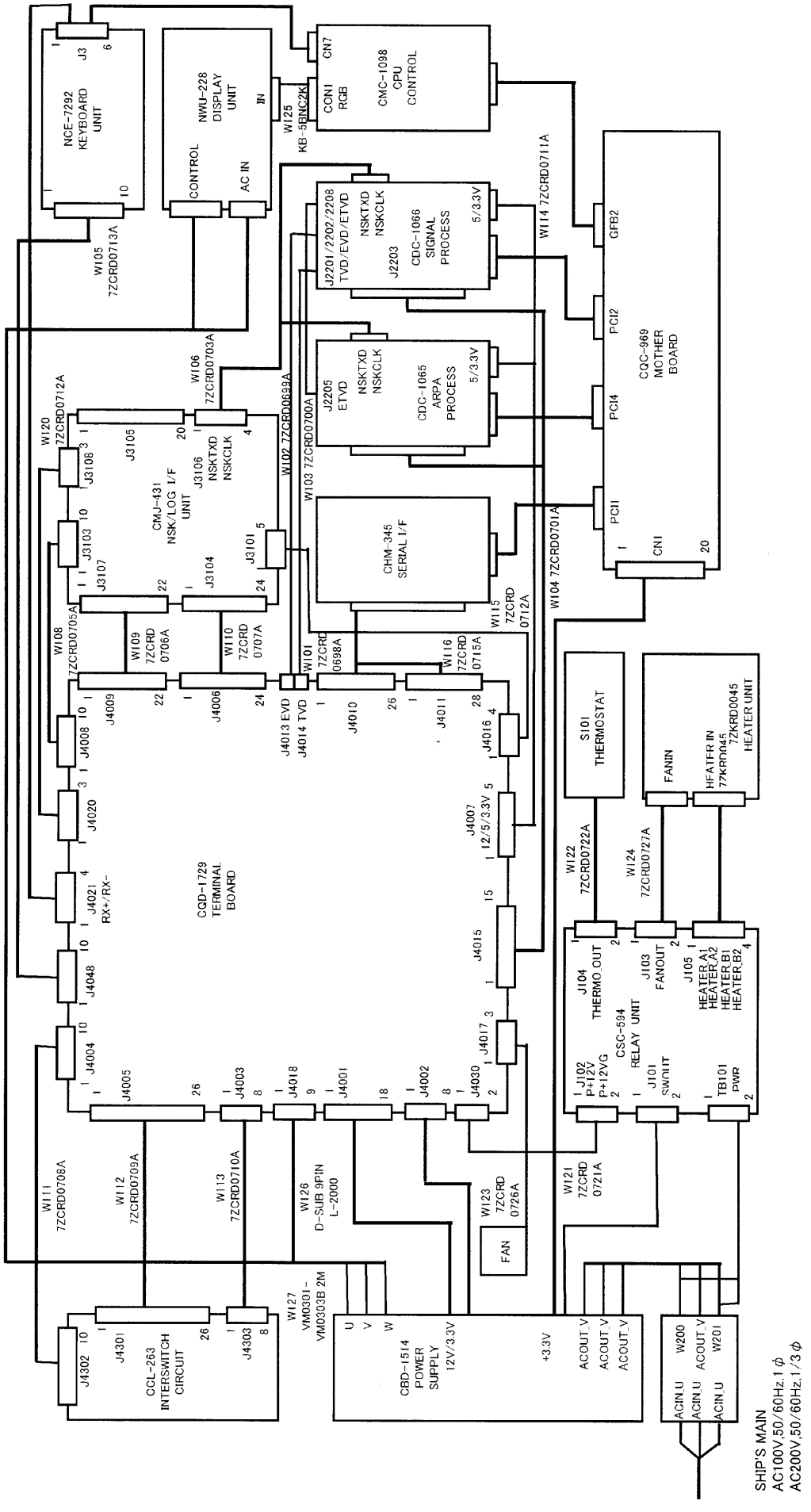


Fig.122 Internal Connection Diagram of Display Unit, Type NCD-4111

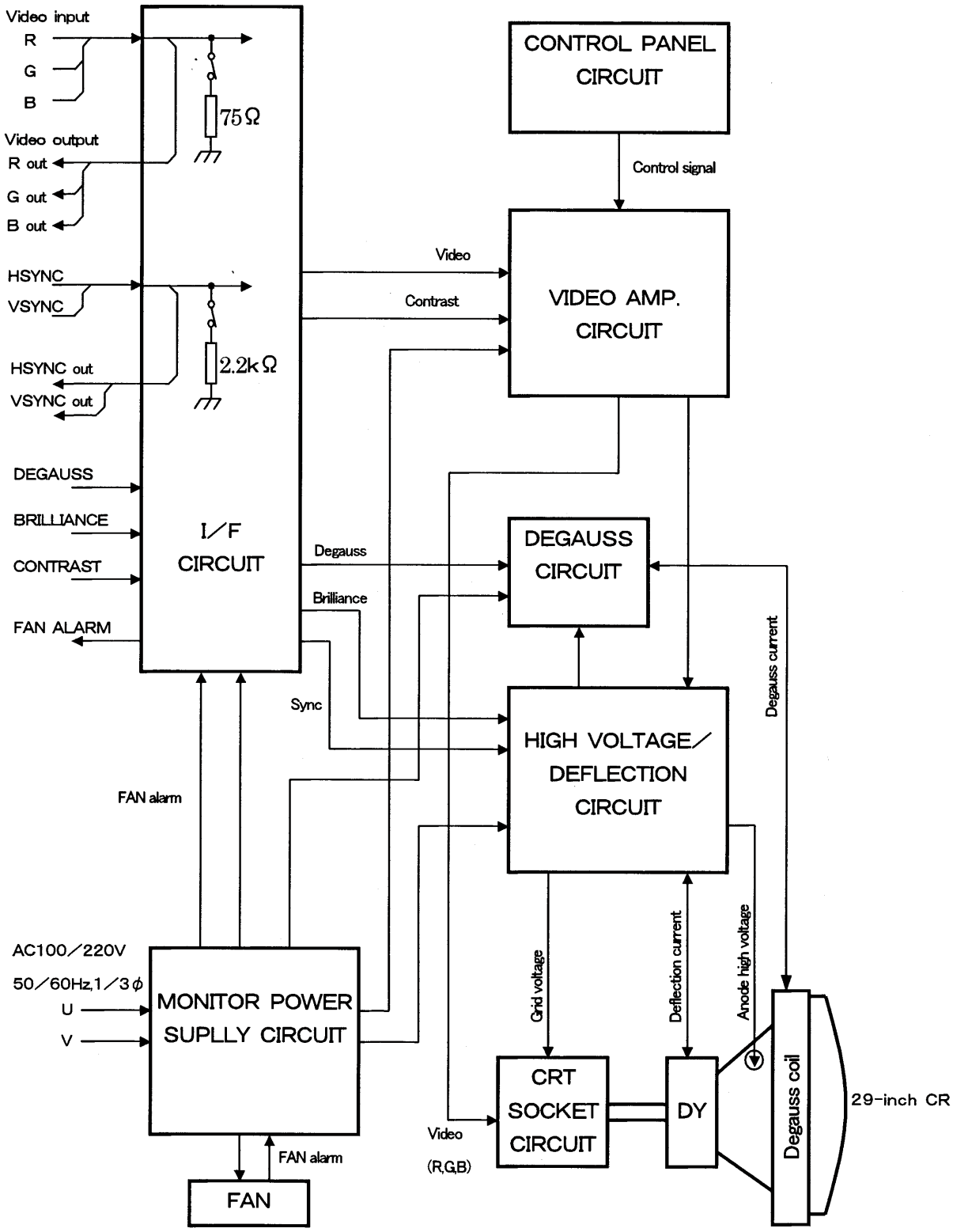


Fig.123 Internal Connection Diagram of
CRT Monitor of Display Unit, Type NCD-4111

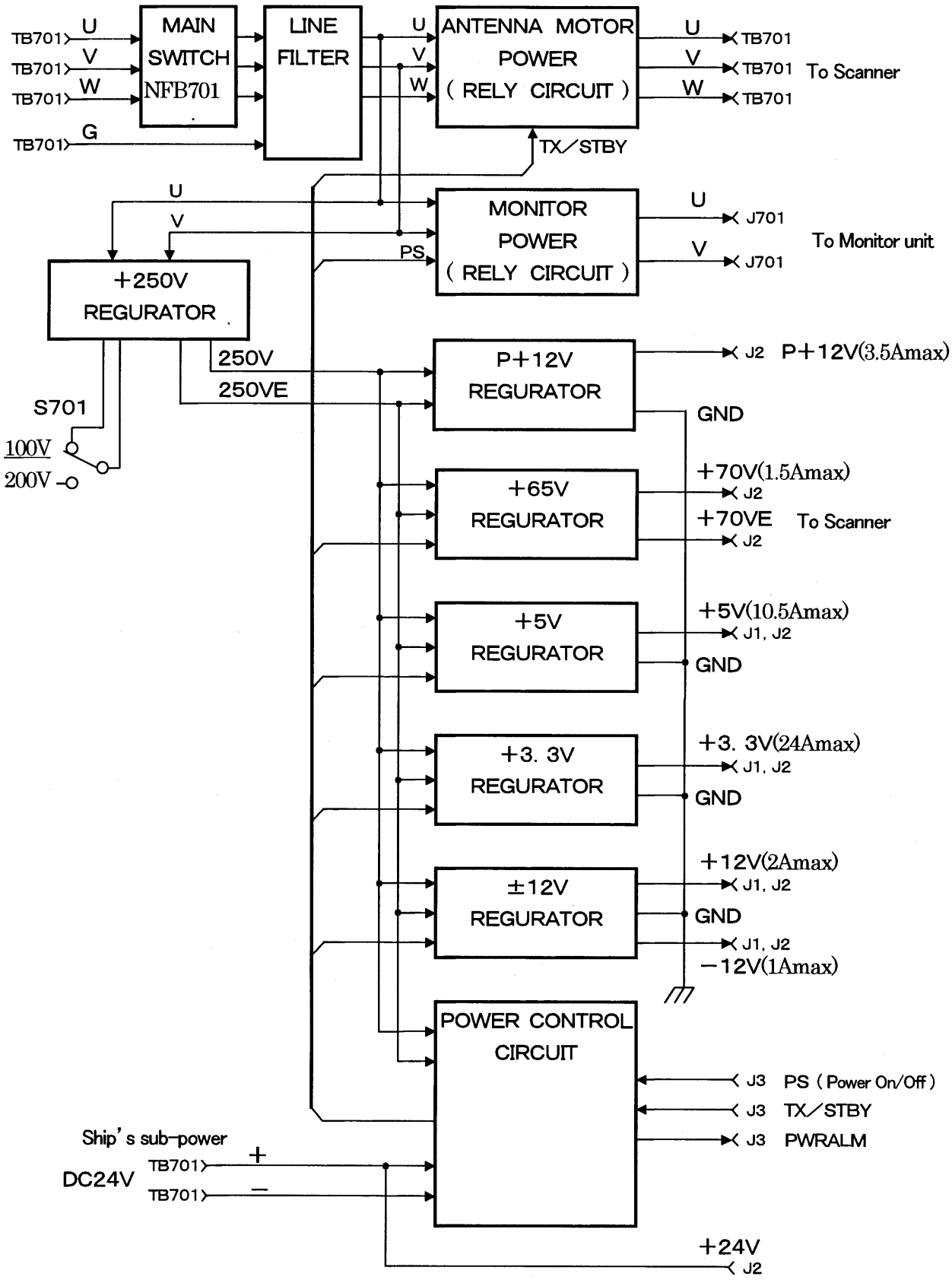
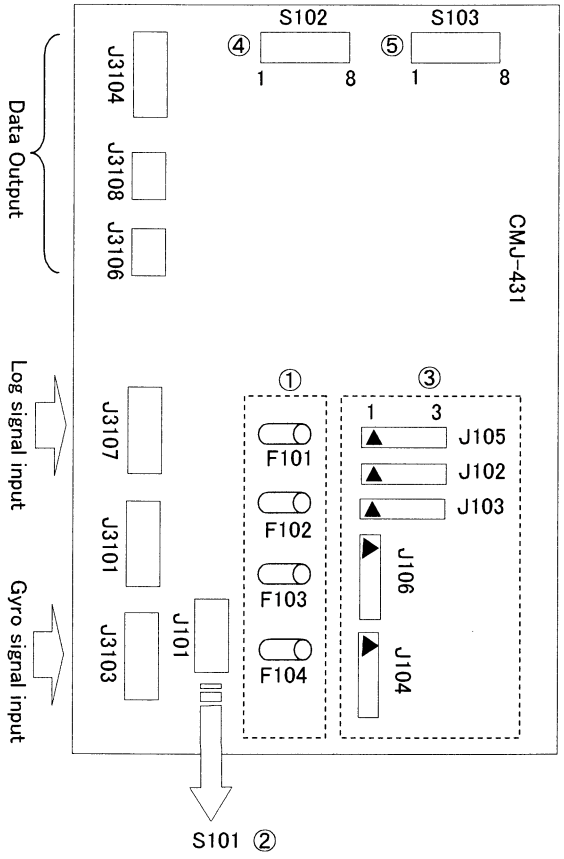


Fig.124 Internal Connection Diagram of Power Supply of Display Unit, Type NCD-4111

NOTE: When removing or touching the CMJ-431.
Set the gyro power supply switch S101 to OFF or cutoff the gyro signal input to TB4701(Terminal Board Circuit) in order to prevent damages to ICs and to avoid electrical shocks.



NOTE1 : Do not forget to select the switch S101(②) to OFF before performing the connection of gyro.
When setting the switch S101(②) to ON, following settings must be all completed.

NOTE2 : Fuses are F101～F104(①) and are used in each lines of gyro signals and exterior power supply line.
When the fuse has burned out,replace with same type fuse after investigating the cause of burn out.
Fuse is MF60NR-0.5A.

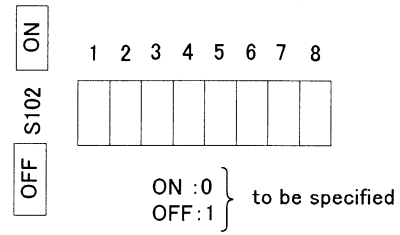
NOTE3 : Selector of applicable gyro.Setting of S102(④) and J102～J106(③) should be made correctly in accordance with the setting table.
The revolution direction(bit8) of S102(④)-4 after energized and if the revolution is reversed. If should be changed over.

NOTE4 : S102(④)-5～8 are setting for speed log signals of the ships.

NOTE5 : The electoric current for gyro signals is as follows.
Step Type 100mA(DC24V)
70mA(DC35V)
Synchro Thpe 50mA(AC100V)

SETTING GYRO SWITCH

a.S102(④) Gyro/Log Type selector switch.
S102 setting to be mode according to setting table.



S102 SETTING TABLE

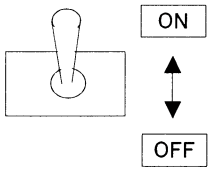
		1	2	3	4	5	6	7	8
GYRO SIGNAL	STEP	0							
	SYNC	1							
	36X		0	0					
	90X		1	0					
	180X		0	1					
	360X		1	1					
	DIRECTION		Reverse(REV)		0				
			Normal(NOR)		1				
LOG SIGNAL	TYPE		SYNCHRO			0			
			PULSE			1			
			1AXIS				0		
			2AXIS				1		
	PULSE/NM		100P/30X					0	0
			200P/90X					1	0
			400P/180X					0	1
			800P/360X					1	1

b. J102～J106(③) Gyro Type Selector

Signal \ Jumper	J102	J103	J104	J105	J106
STEP	2,3	1,2	2,3	2,3	2,3
SYNC	1,2	2,3	1,2	1,2	1,2

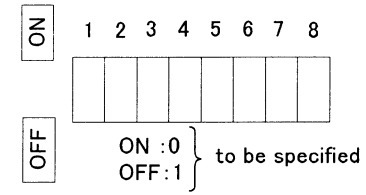
STEP : Step
SYNC : Synchro Type

c. S101(②) Gyro power supply switch



After confirming the completion of all settings, set to ON .

d. S103(⑤) User Type selector switch.



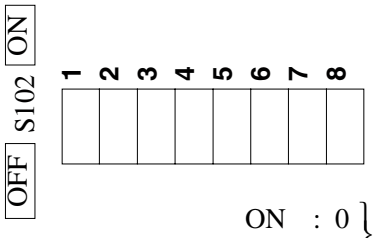
User Mode \ sw	1	2～8
BSH	0	1
NORMAL	1	

Fig.125 List of NSK and LOG Select Switches of Display Unit, Type NCD-4111

Setting the speed log switches

1. This radar uses the six types of standard speed log signals listed below.
   Pulse type: 800 pulse/NM, 400 pulses/NM, 200 pulses/NM, or 100 pulses/NM
   Synchro type: 360X/NM, 180X/NM, 90X/NM, or 30X/NM
   Set Gyro/Log Selection Switch S102 (④) using the S102 setting table.
2. Connect the speed log signal line to, for the pulse type, the [PULSE] side, or for the synchro type, the [SYNCRO] side, of terminal block TB4801 (Terminal Board Circuit).

3. S102 (④): Gyro/Log Selection Switch
   Set the switch assembly in accordance with the S102 setting table.



ON : 0
OFF : 1
} to be specified

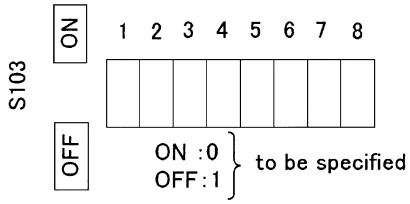
S102 SETTING TABLE

		1	2	3	4	5	6	7	8
GYRO SIGNAL	STEP	0							
	SYNC	1							
	36X		0	0					
	90X		1	0					
	180X		0	1					
	360X		1	1					
	DIRECTION		Reverse(REV)		0				
			Normal(NOR)		1				
LOG SIGNAL	TYPE		SYNCHRO			0			
			PULSE			1			
			1AXIS				0		
			2AXIS				1		
	PULSE/NM		100P/30X					0	0
			200P/90X					1	0
			400P/180X					0	1
			800P/360X					1	1

4. Light-emitting diode CD116 (1-axis) and CD117 (2-axis) are provided to check pulse-type log input signals.
   This LED lights if the log signal level is +2V or more (or under a non-connected status of the log signal line), or it dose not light if the log signal level is +2V or less.

5. The S103 (⑤) operation mode select switch is set according to the S103 setting table.

S103(⑤) User Type selector switch.



sw / User Mode	1	2～8
BSH	0	1
NORMAL	1	

S103-1 ON: BSH
OFF: NORMAL

S103-2 to -8 ALL OFF

Fig.126 Setting Table of Speed LOG Select Switches of Display Unit, Type NCD-4111

Item / Manufactuer	Gyro compasses	Repeater motors (For reference only)	PCMJ-431 / Excitation voltate	Gyro select switches (S102, J102 ~ J106 located on the CMJ-431)								
				S5 setting								J102 ~ J106 setting
				1	2	3	4	5	6	7	8	
TOKIMEC (JAPAN) Sperry (U.S.A.)	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 TSAN60E11 (90X)	110 VAC 60Hz	OFF	OFF	ON						SYNC
	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						STEP
	ES-16, SR-120/220	Step motor GA-2001G Drawing # 103590820 150 excitation (180X)	35 VDC	ON	ON	OFF						STEP
	CMZ-700D ES-140/160, PR-26＊＊/6＊6＊/6＊7＊, SR-140/160, TG-6000		24 VDC									
YOKOGAWA (JAPAN)	C-1A/2/3/E, HOKUSHIN PLATH-55/C, PLATH HKRK-C3	Synchro motor YM-14 TS-19 (360X)	60 VDC 60Hz	OFF	OFF	OFF						SYNC
	C1JR, C-1 JUNIOR, 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
ARMA BROWN (France)	1351, MK-1 ~ 7/10/20, MKL-1, MOD-4, NB-23-88, SERIE, SGB-1000	Step motor BZ-2191 (180X)	50 VDC	ON	ON	OFF						STEP
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
C. PLATH (Germany)	NAVIGAT 763-331E, PLATH NAVIGAT-Ⅱ/Ⅲ	Synchro motor YM14A (360X)	50 VAC 60Hz	OFF	OFF	OFF						SYNC

OFF

Note: Must be set to ON if the radar picture and the [COURSE] indication turn Reverse.

＊：Numeric number

Fig.127 Setting Table of Gyro Compass and Gyro Select Switches of Display Unit, Type NCD-4111

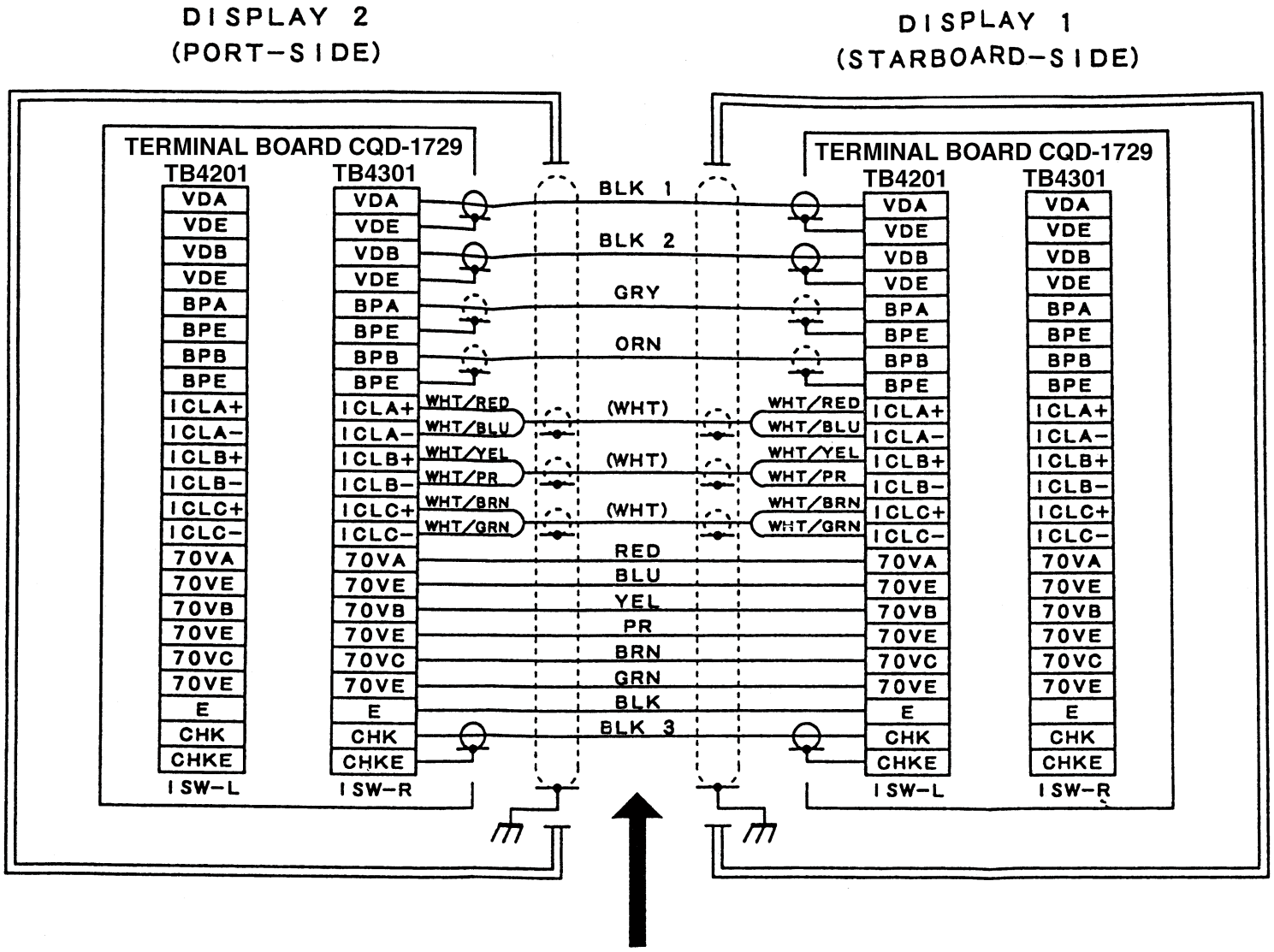


Fig.128 Terminal Board Connection Diagram of 2-unit Interswitches System, Type NQE-3015N

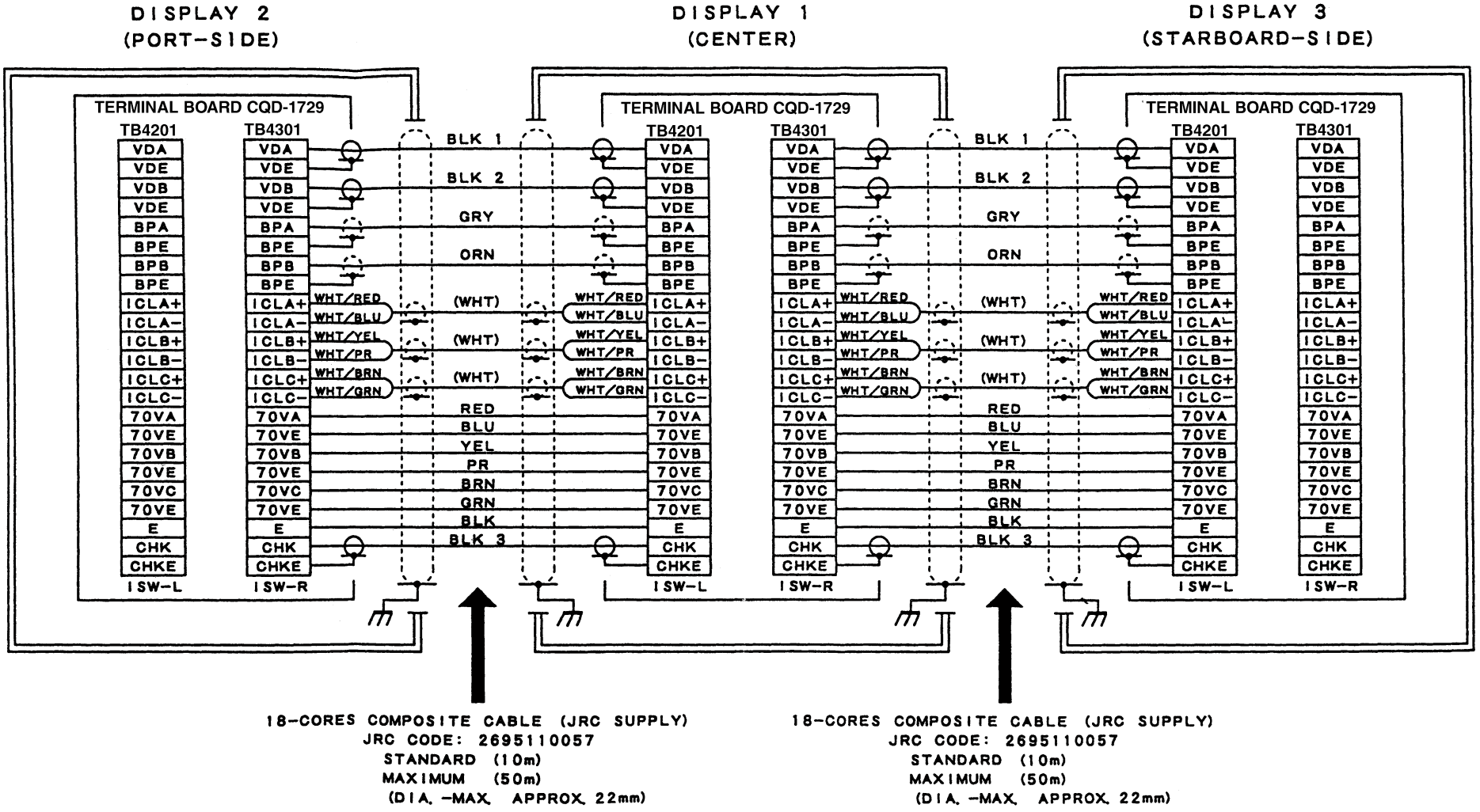


Fig.129 Terminal Board Connection Diagram of 3-unit Interswitches System, Type NQE-3015N

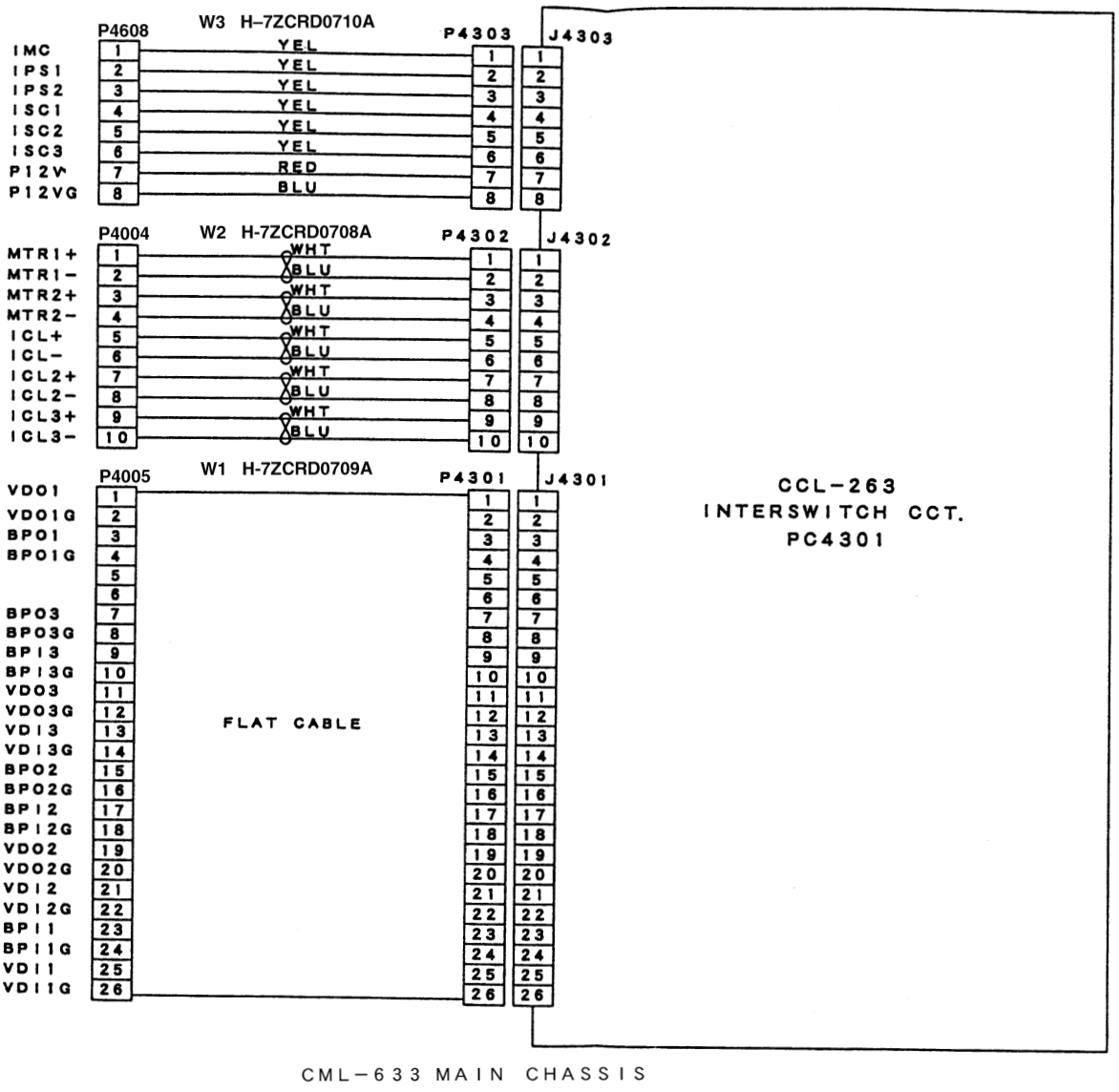


Fig.130 Internal Connection Diagram of Interswitch, Type NQE-3015N

END-USER LICENSE AGREEMENT

FOR JMA-9800 SERIES RADAR SOFTWARE

IMPORTANT-READ CAREFULLY: This End-User License Agreement ("EULA") is a legal agreement between you (either an individual or a single entity) and Japan Radio Co., Ltd. ("JRC") for the JRC Radar equipment that includes Microsoft software products.

- You have acquired a device ("DEVICE") that includes software licensed by JRC from Microsoft Licensing Inc. or its affiliates ("MS"). Those installed software products of MS origin, as well as associated media, printed materials, and "online" or electronic documentation ("SOFTWARE") are protected by international intellectual property laws and treaties. The SOFTWARE is licensed, not sold.All rights reserved.

- IF YOU DO NOT AGREE TO THIS EULA, DO NOT USE THE DEVICE OR COPY THE SOFTWARE. INSTEAD, PROMPTLY CONTACT JRC FOR INSTRUCTIONS ON RETURN OF THE UNUSED DEVICE(S) FOR A REFUND. **ANY USE OF THE SOFTWARE, INCLUDING BUT NOT LIMITED TO USE ON THE DEVICE, WILL CONSTITUTE YOUR AGREEMENT TO THIS EULA (OR RATIFICATION OF ANY PREVIOUS CONSENT).**

- **GRANT OF SOFTWARE LICENSE.** This EULA grants you the following license:

  - You may use the SOFTWARE only on the DEVICE.

  - **NOT FAULT TOLERANT.** THE SOFTWARE IS NOT FAULT TOLERANT. JRC HAS INDEPENDENTLY DETERMINED HOW TO USE THE SOFTWARE IN THE DEVICE, AND MS HAS RELIED UPON JRC TO CONDUCT SUFFICIENT TESTING TO DETERMINE THAT THE SOFTWARE IS SUITABLE FOR SUCH USE.

  - **NO WARRANTIES FOR THE SOFTWARE. THE SOFTWARE is provided "AS IS" and with all faults. THE ENTIRE RISK AS TO SATISFACTORY QUALITY, PERFORMANCE, ACCUARACY, AND EFFORT (INCLUDING LACK OF NEGLIGENCE) IS WITH YOU. ALSO THERE IS NO WARRANTY AGAINST INTERFERENCE WITH YOUR ENJOYMENT OF THE SOFTWARE OR AGAINST INFRINGEMENT.** IF YOU HAVE RECEIVED ANY WARRANTIES REGARDING THE DEVICE OR THE SOFTWARE, THOSE WARRANTIES DO NOT ORIGINATE FROM, AND ARE NOT BINDING ON, MS.

  - **Note on Java Support.** The SOFTWARE may contain support for programs written in Java. Java technology is not fault tolerant and is not designed, manufactured, or intended for use or resale as online control equipment in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines, or weapons systems, in which the failure of Java technology could lead directly to death, personal injury, or severe physical or environmental damage. Sun Microsystems, Inc. has contractually obligated MS to make this disclaimer.

  - No Liability for Certain Damages. **EXCEPT AS PROHIBITED BY LAW, MS SHALL HAVE NO LIABILITY FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES ARISING FROM OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE SOFTWARE. THIS LIMITATION SHALL APPLY EVEN IF ANY REMEDY FAILS OF ITS ESSENTIAL PURPOSE. IN NO EVENT SHALL MS BE LIABLE FOR ANY AMOUNT IN EXCESS OF U.S. TWO HUNDRED FIFTY DOLLARS (U.S.$250.00).**

  - **Limitations on Reverse Engineering, Decompilation, and Disassembly.** You may not reverse engineer, decompile, or disassemble the SOFTWARE, except and only to the extent that such activity is expressly permitted by applicable law notwithstanding this limitation.

  - **SOFTWARE TRANSFER ALLOWED BUT WITH RESTRICTIONS.** You may permanently transfer rights under this EULA only as part of a permanent sale or transfer of the Device, and only if the recipient agrees to this EULA. If the SOFTWARE is an upgrade, any transfer must also include all prior versions of the SOFTWARE.

  - **EXPROT RESTRICTIONS.** You acknowledge that SOFTWARE is of US-origin. You agree to comply with all applicable international and national laws that apply to the SOFTWARE, including the U.S. Export Administration Regulations, as well as end-user, end-use and country destination restrictions issued by U.S. and other governments. For additional information on exporting the SOFTWARE, see **http://www.microsoft.com/exporting/.**

For further information contact:

JRC Japan Radio Co., Ltd.
Since 1915

HEAD OFFICE & SALES DEPT.
Akasaka Twin Tower (Main),
17-22, Akasaka 2-chome, Minato-ku,
Tokyo 107-8432 JAPAN
Phone : +81-3-3584-8711
Fax : +81-3-3584-8715
Telex : 0242-5420 JRCTOK J

MAIN PLANT
1-1, Shimorenjaku 5-chome, Mitaka-shi,
Tokyo 181-8510 JAPAN
Phone : +81-422-45-9111
Fax : +81-422-45-9110
Telex : 02822-351 JRCMTK J

FIRST EDITION
MAY. 2001
JRC

CODE No. 7ZPRD0510