

## **CHAPTER 6. MAINTENANCE AND INSPECTION**

A qualified engineer should carry out most of maintenance work on this radar. If your radar set has any problem, contact your local dealer for repair.



### **WARNING**

**Very High Voltage is present inside the radar set. Do not attempt to open the display rear cover or disassemble internal module. When you open the radome, make sure to turn off the main power supply at switch board.**

**Even if the radar is switched OFF, the radar set is still powered with very small amount of current.**

The following table shows the maintenance by user. Please check each item periodically.

**Tab. 6-1 Maintenance**

| Inspection Interval | Inspection Item                          | Method of Inspection and Maintenance                                                                                                                                                              |
|---------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3-6 months          | Rust and looseness in scanner unit       | Check if the scanner's fitting bolts are corroded.                                                                                                                                                |
|                     | Display screen of LCD display            | Clean the filter plate and LCD screen surfaces with a soft and wet cloth. Avoid organic solvent.                                                                                                  |
| 6-12 months         | Grease application to antenna drive gear | Apply an even coating of grease* to the entire surface of the antenna drive gear with a spatula or brush.                                                                                         |
|                     | Check for contact of connectors          | Check whether connectors are properly connected. If not, redo connection or make good contact by using a contact restoring chemical agent or by polishing or replace with a new one if necessary. |
|                     | Antenna motor brush(RA52/53/54)          | Check the length of brushes. If the length is less than 6mm, replace both brushes with new one.                                                                                                   |

### **Articles of consumption**

The radar uses the life-limited parts as listed below that require periodic replacement.

#### **(1) Magnetron**

This part is used in the scanner unit. If distant echo images have become weak, the magnetron probably may have degraded. In such a case, you need to replace this item. Consult your local service agent for replacement.

Practical life to replacement: 3000hour(typ.) (500hour guaranteed by the magnetron manufacturer)

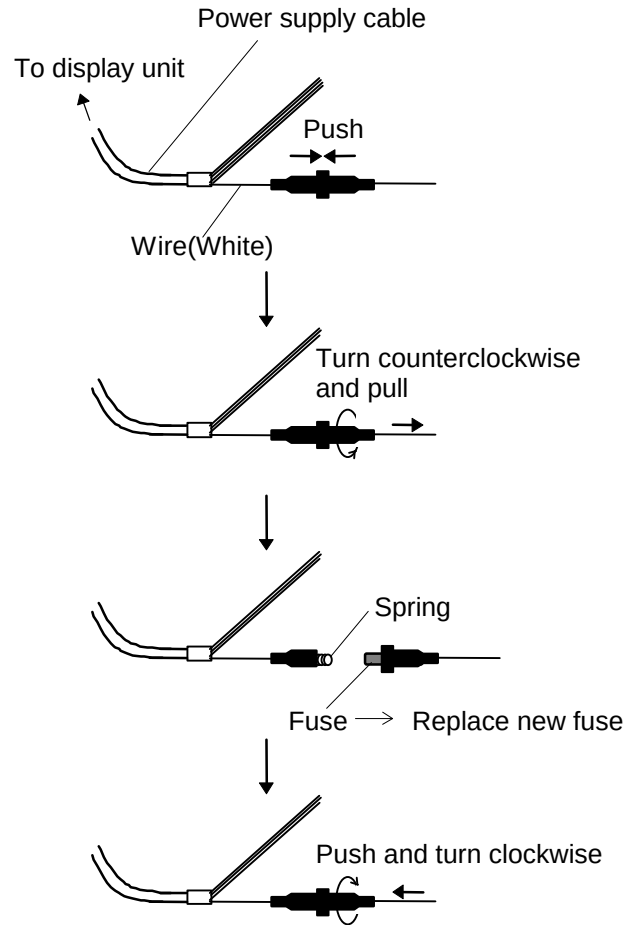
#### **(2) LCD back-light**

This part used in the display unit. If the display screen is extremely dark and its illumination cannot be corrected by adjusting the screen brightness, the LCD backlighting lamp may be faulty or may have burnt out. In such a case, you need to replace it. Consult your local agent for replacement.

Period of the replacement: 15000 hours (typ.) (1000 hours at 0°C)

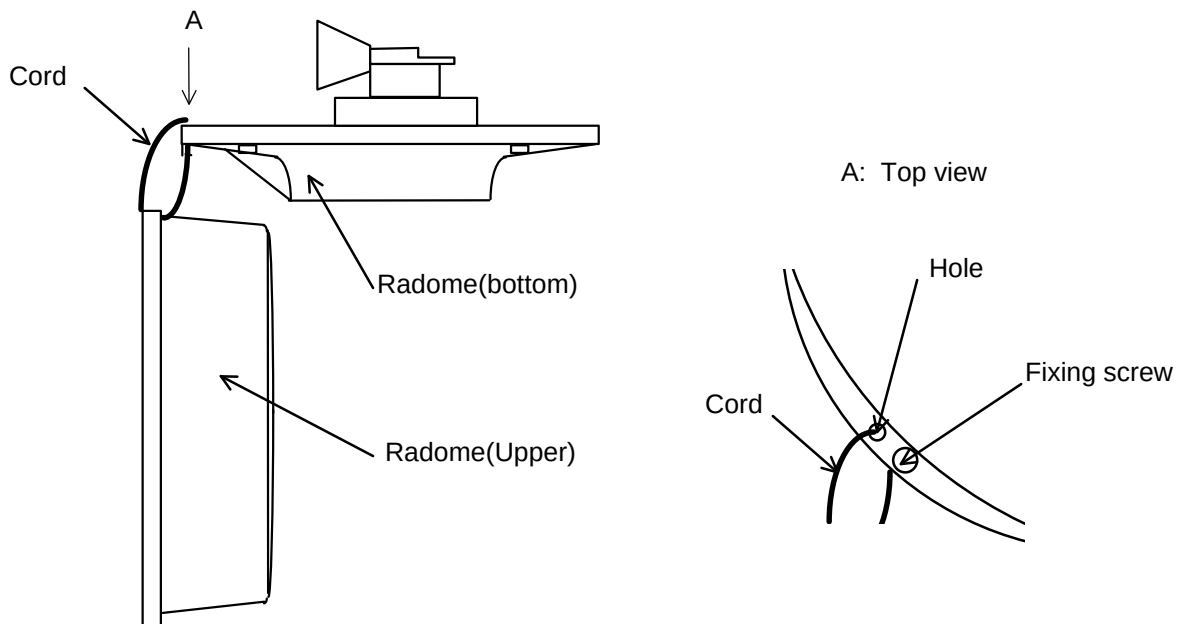
### (3) Fuse

The fuse is in-line type, built in to the power supply cable. If the fuse appears to be blown, check the fuse. If blown, replace it following the procedure shown in Fig.6-2.



**Fig. 6-2 Method for replacing fuse**

Note: Before maintenance of scanner, you can hang a radome (upper) using cord through hole as follows.



**Fig. 6-3 Method for replacing fuse**

## **CHAPTER 7. TROUBLESHOOTING**

This chapter explains how to identify trouble locations when the radar is found faulty and how to request repair.

If there is any trouble, press and hold the POWER key for 3 seconds to power off. Then turn on the equipment again and wait 10 sec at least.

If you find the radar is faulty, check it by the following procedure described below. If you find as a result of inspection that the fault cannot be repaired on board, contact your distributor for repair.

For faster service, please let us know about followings when you request repair:

- (1) Ship's name, place of anchorage, allowable repair period or time
- (2) Radar type (This radar is RA53 or RA54.)
- (3) Manufacturing number (indicated on the back of the display unit)
- (4) Fault symptoms and inspection results



### **WARNING**

**There are high voltage circuits inside of this radar. Do not attempt to open the rear cover of display unit or disassemble internal parts. When you open the radome for installation, power must be off. Even if power switch is OFF, this radar is still supplied with power inside.**

This chapter explains how to identify trouble locations when the radar is found faulty and how to request repair.

### **7.1 Fault Diagnosis by Self-check** ---

The radar incorporates a failure diagnostic function (called "self-check") to diagnose faults by the equipment itself.

Refer to "5.5.4.4 Fault Diagnosis by Self Check (SYSTEM CHECK)" and check whether there is any fault in your radar.

## 7.2 Inspecting Each Part

When you have finished self-check, inspect each part of the radar according to Tab.7-1.

**Tab. 7-1 Troubleshooting**

| Symptom                                                      | Cause                                              | Corrective action                                        |
|--------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|
| (1) Radar cannot be powered on.                              | Power cable is disconnected.                       | Connect power cable correctly.                           |
|                                                              | Power supply voltage is outside of specified value | Use Specified power supply. (See Section 3.2)            |
|                                                              | Fuse in power cable is blown.                      | Replace fuse. (See Chapter 6)                            |
| (2) Nothing is displayed although radar is powered on.       | Brightness is improperly adjusted.                 | Use BRIL key to adjust. (See Section 5.3.)               |
|                                                              | LCD is faulty.                                     | Contact your dealer.                                     |
| (3) Screen is dark.                                          | Brightness is improperly adjusted.                 | Use BRIL key to adjust. (See Section 5.3.)               |
|                                                              | Backlight is faulty.                               | Contact your dealer.                                     |
| (4) Video does not appear although characters are displayed. | Interconnecting cable is out of place.             | Connect interconnecting cable correctly.                 |
| (5) Echo image on screen differs from actual image.          | Ship's heading is incorrectly set.                 | Set ship's heading correctly. (See Section 5.5.4.5.4)    |
|                                                              | Timing adjustment is incorrectly set.              | Set timing adjustment correctly. (See Section 5.5.4.5.4) |
| (6) Echo images are blurred.                                 | GAIN, STC, or FTC is improperly set.               | Adjust. (See Section 5.3.6 to 5.3.8.)                    |
|                                                              | Magnetron has degraded.                            | Contact your dealer.                                     |
| (7) Too much noise.                                          | Radar is not tuned correctly                       | Adjust TUNE. (See Section 5.5.3.4)                       |
|                                                              | Radar set is not grounded to earth.                | Connect grounding wire. (See Section 3.4 to 3.6.)        |
| (8) No response to key pressing.                             | Panel keys are not in contact.                     | Contact your dealer.                                     |
|                                                              | Power supply circuit is faulty.                    | Contact your dealer.                                     |

## **CHAPTER 8. PRODUCT SPECIFICATIONS**

### **8.1 General**

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|                                            |                                                                                                                                                                                                                          |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type:                                      | RA53 and RA54                                                                                                                                                                                                            |
| Power supply voltage and power consumption |                                                                                                                                                                                                                          |
| Power supply voltage:                      | 24Vdc (nominal)<br>(10.2 to 41.6 Vdc)                                                                                                                                                                                    |
| Power consumption:                         | 100 W or less (RA53)<br>110 W or less (RA54)                                                                                                                                                                             |
| Distance range:                            | 0.125 to 64 NM, 11 ranges<br>(RA53)<br>0.125 to 72 NM, 11 ranges<br>(RA54)<br>(Continual variable range also possible)                                                                                                   |
| Distance resolution:                       | Within 25 m                                                                                                                                                                                                              |
| Distance accuracy:                         | Better than 0.9% of maximum range of the scale in use, or 8m, whichever is the greater                                                                                                                                   |
| Minimum detecting distance:                | Within 25 m                                                                                                                                                                                                              |
| Bearing resolution:                        | Within 2.5° (w/4 ft)<br>Within 1.8° (w/6 ft)                                                                                                                                                                             |
| Bearing accuracy:                          | 1° or less                                                                                                                                                                                                               |
| Warm-up time:                              | 2 minutes                                                                                                                                                                                                                |
| Environment conditions                     |                                                                                                                                                                                                                          |
| Ambient temperature range                  | (S/U): -25 to 55 °C<br>(D/U): 0 to 55 °C                                                                                                                                                                                 |
| Humidity:                                  | 93% RH at +40 °C                                                                                                                                                                                                         |
| Vibration:                                 | (S/U): 3 mm( 300 to 500 rpm)<br>1.2 mm(500 to 1500 rpm)<br>0.3 mm(1500 to 3000 rpm)<br>14.7m/s <sup>2</sup> (1.5G) Resonance test<br>(D/U): 3 mm(300 to 500 rpm)<br>0.75 mm(500 to 1500 rpm)<br>0.2 mm(1500 to 3000 rpm) |
| Wind resistance:                           | 100 knots (max.)                                                                                                                                                                                                         |
| Waterproof standard:                       | (D/U): IPX-5<br>(S/U): IPX-6                                                                                                                                                                                             |
| Interconnecting cable:                     | 100 m in max.                                                                                                                                                                                                            |
| Noise:                                     | (D/U): 65 dB or less<br>(S/U): 70 dB or less                                                                                                                                                                             |

## 8.2 Scanner Unit

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|                                    |                                                                  |
|------------------------------------|------------------------------------------------------------------|
| Type:                              | RB717A (RA53)<br>RB718A (RA54)                                   |
| Antenna type:                      | Slotted-array                                                    |
| Antenna characteristics            |                                                                  |
| Beam width (horizontal):           | 1.8° ± 0.2° (with 4ft antenna)<br>1.2° ± 0.2° (with 6ft antenna) |
| Beam width (vertical):             | 22° (typ.)                                                       |
| Pulse width and peak power output: |                                                                  |

| RA53               |                  | RA54               |                   |
|--------------------|------------------|--------------------|-------------------|
| Pulse width (μsec) | Peak Power (kW)  | Pulse width (μsec) | Peak Power (kW)   |
| 0.08               | 6 (-50% to +20%) | 0.08               | 12 (-50% to +20%) |
| 0.3                | 6 (-50% to +20%) | 0.3                | 12 (-50% to +20%) |
| 0.6                | 6 (-50% to +20%) | 0.6                | 12 (-50% to +20%) |
| 1.0                | 6 (-50% to +20%) | 1.0                | 12 (-50% to +20%) |

|                                     |                                   |
|-------------------------------------|-----------------------------------|
| Radio wave type and frequency:      | P0N, 9410 ± 30 MHz                |
| Antenna revolution: 24 rpm or 48rpm |                                   |
| Transmit/receive switching:         | Circulator and limiter type       |
| Intermediate frequency:             | 60 MHz<br>(logarithmic amplifier) |
| Noise figure:                       | 6.5 dB or less                    |

## 8.3 Display Unit

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|                    |                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------|
| Type:              | RF720A                                                                                           |
| Indication system: | PPI, PPI+semi-3D,<br>Split radar range                                                           |
| Indicator:         | 15-inch color LCD(TFT)<br>640 x 480 dots<br>Four(4 ) levels                                      |
| Cursor Control:    | Analog cursor key<br>and rotary encoder                                                          |
| VRM:               | 2 lines (One line can be offset.)<br>Unit of distance can be<br>selected from NM, KM, and<br>SM. |
| EBL:               | 2 lines (One line can be offset.)                                                                |
| Display modes:     | HU, HS, NU, CU, and TM                                                                           |

|                   |                                                                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Off-center:       | Can be 100% off-centered over the full range.                                                                                               |
| Guard zone:       | Can be set at any desired distance and angle in any desired width. IN and OUT modes are available.                                          |
| Stretch:          | 2 modes                                                                                                                                     |
| Echo track:       | 15, 30 sec, 1, 3, 6 min. and continuous.                                                                                                    |
| Other functions:  | Interference rejection, Zoom, Sleep mode, Hold mode, Course error display, Parallel cursors, Stern marker, and Navigation data display mode |
| Panel brightness: | 4 levels                                                                                                                                    |
| Language support: | Chinese, Danish, English, French, German, Greek, Italian, Japanese, Korean, Norwegian, Portuguese, Russian, Spanish, Swedish, and Turkish   |

## 8.4 ATA Unit

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### The ATA Board Specifications

|     |                           |                                                                                                                                                                                       |
|-----|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) | Acquisition               | Manual<br>(A target is acquired manually by a cross cursor driven by the Pointing Device.)                                                                                            |
| (2) | Tracking                  | Automatic                                                                                                                                                                             |
| (3) | Number of tracked targets | 10 targets maximum                                                                                                                                                                    |
| (4) | ATA data output           | (Target Number, distance, bearing, speed, course, CPA and TCPA)                                                                                                                       |
| (5) | Alarm                     | Collision alarm, activated when a target enters the preset CPA and TCPA ranges.<br>Lost alarm, activated when a target can no longer be tracked.                                      |
| (6) | Display                   | Symbols: Predicted point and target number<br>Vector : Predicted motion of a target as a result of own ship's direction and speed input.<br>Display modes: Relative (REL)/True (TRUE) |
| (7) | Tracking range            | 0.5 to 40 NM                                                                                                                                                                          |
| (8) | PRF                       | 2,000 Hz maximum                                                                                                                                                                      |
| (9) | Bearing signal            | 1,080 or 2,048 pulses / rev<br>(Switched automatically) See                                                                                                                           |

Note.

Note: The ATA board does not accept bearing signals other than specified above. In case the ATA board is used in the monitor mode display, make sure an incoming bearing pulse rate agrees with that specified in this specification.

## 8.5 External Interface

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|                      |                                                                                                    |
|----------------------|----------------------------------------------------------------------------------------------------|
| NMEA0183:            | 2 channels<br>(One standard channel;<br>Optional cable is required for<br>2nd-channel connections) |
| L / L                | GGA, GLL, RMA, RMC                                                                                 |
| Heading              | HDT, HDG, HDM, HSC,<br>VHW, VTG                                                                    |
| Speed                | VHW, VTG, RMA, RMC                                                                                 |
| Way point            | RMB, BEC, BWC,<br>BWR, BER, BPI                                                                    |
| Depth                | DBT, DPT                                                                                           |
| Course error         | RMB, XTE                                                                                           |
| Seawater temperature | MTW                                                                                                |

Others (using optional cable):

External buzzer control output, Auxiliary indicator connecting signal  
output and input, Bow direction signal input(SIN/COS signals), and  
compass interface (10/12 bits serial)

## 8.6 Standard set

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|                       |         |
|-----------------------|---------|
| Display unit          | 1       |
| Scanner unit          | 1       |
| Display cover         | 1       |
| Fuse                  | 1 set   |
| Interconnecting cable | 1 (10m) |
| Power supply cable    | 1 (2m)  |
| M12 hexagonal bolt    | 4 sets  |

## 8.7 Options

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|                                                        |            |
|--------------------------------------------------------|------------|
| Interconnecting cable (15, 20, and 30 m)               |            |
| Junction box for external connection (with cable 1.5m) |            |
| Option connector kit                                   | 249J153058 |

## 8.8 External dimensions and weight

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See APPENDIX

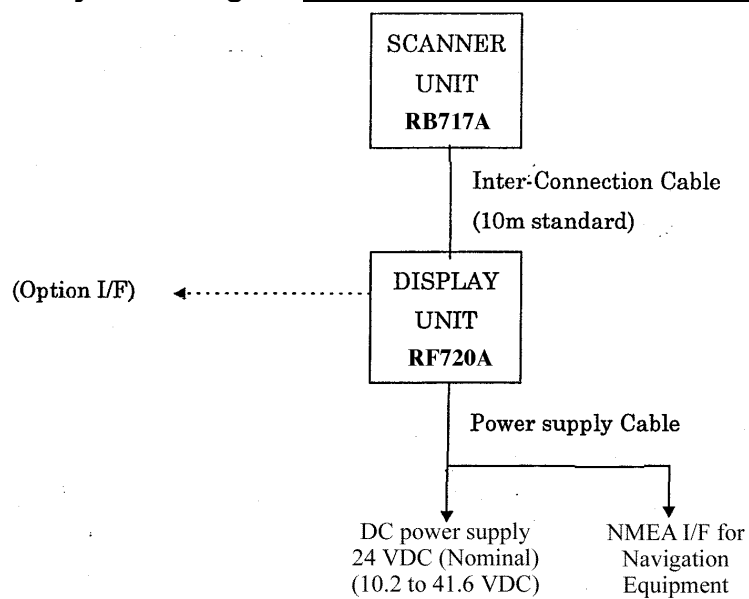
## 8.9 External Connection and function

| X1 | Connector for Option |           |                                                                                      |
|----|----------------------|-----------|--------------------------------------------------------------------------------------|
|    | pin No.              | Name      | function                                                                             |
|    | 1                    | NMEA2-A   | NMEA ch2 data input(A)                                                               |
|    | 19                   | NMEA2-B   | NMEA ch2 data input(B)                                                               |
|    | 2                    | GND       |                                                                                      |
|    | 20                   | EXBUZ+    | Output for External Buzzer                                                           |
|    | 3                    | EXBUZ-    | Output for External Buzzer                                                           |
|    |                      |           | controlled ship's power output                                                       |
|    | 21                   | VIDEO_IN  | Video input for Monitor operation<br>0 to -1V negative video, Zi = 50ohm             |
|    | 4                    | VIDEO_OUT | Video output for External Monitor<br>0 to -1V negative video, Zo = 50ohm             |
|    | 22                   | GND       |                                                                                      |
|    | 5                    | TRIG_IN   | Trigger signal input for Monitor operation<br>0 to 5V positive pulse, rising edge    |
|    | 23                   | TRIG_OUT  | Trigger output for External Monitor<br>0 to 5V positive pulse, rising edge           |
|    | 6                    | SHF_IN    | Heading signal input for Monitor operation<br>0 to 5V negative pulse, falling edge   |
|    | 24                   | SHF_OUT   | Heading signal output for External Monitor<br>0 to 5V negative pulse, falling edge   |
|    | 7                    | AZI_IN    | Bearing Pulse input for Monitor operation<br>0 to 5V positive pulse, rising edge     |
|    | 25                   | AZI_OUT   | Bearing Pulse output for External Monitor<br>0 to 5V positive pulse, rising edge     |
|    | 8                    | GND       |                                                                                      |
|    | 26                   | GYRCK+    | Gyro Interface clock(+) input                                                        |
|    | 9                    | GYRCK-    | Gyro Interface clock(-) input<br>apply 5V pulse between (+) and (-), isolated        |
|    | 27                   | GYRDT+    | Gyro Interface data(+) input                                                         |
|    | 10                   | GYRDT-    | Gyro Interface data(-) input<br>apply 5V pulse between (+) and (-), isolated         |
|    | 28                   | GND       |                                                                                      |
|    | 11                   | MARK_I    | External Marker signal input, ex) Radar Buoy<br>negative video, 0 to -1V Zi = 50ohm  |
|    | 29                   | +12V      | External interface power, 100mA max.                                                 |
|    | 12                   | SIN       | Compass Interface for SIN/COS type                                                   |
|    | 30                   | COS       | Compass Interface for SIN/COS type                                                   |
|    | 13                   | REF       | Compass Interface for SIN/COS type<br>SIN/COS signal: SIN = REF+/-1V, COS = REF+/-1V |
|    | 31                   | --        | not used                                                                             |
|    | 14                   | GND       |                                                                                      |
|    | 32                   | NMEA_OUT  | NMEA data output, ex) MOB data, TARGET data                                          |

## Appendix

### 1. RA53 General System Diagram

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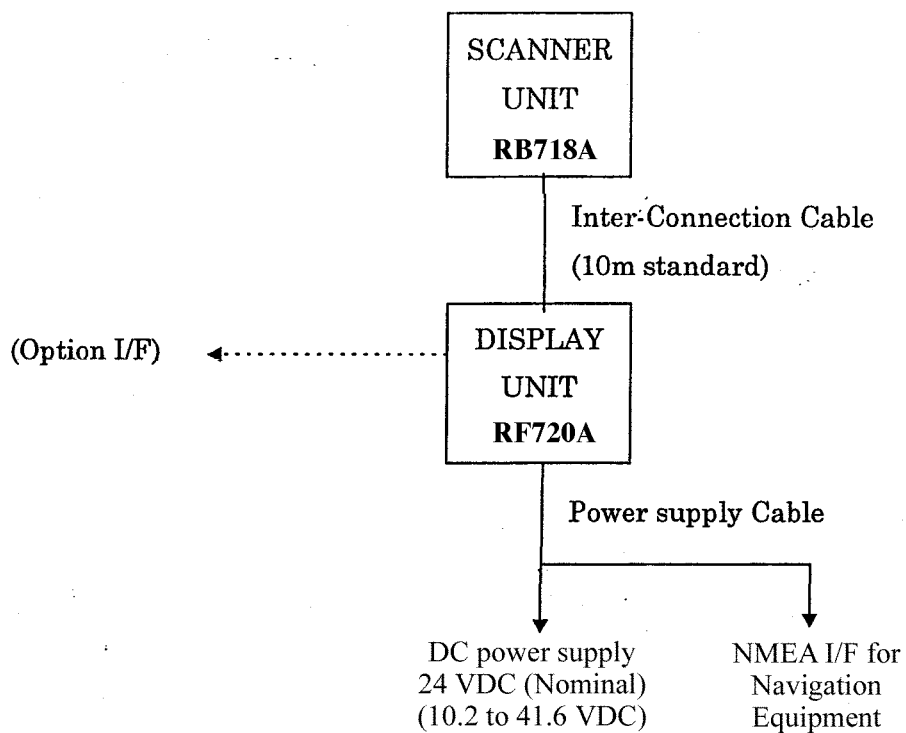


Note 1. 点線はオプション

----- : Option

### 2. RA54 General System Diagram

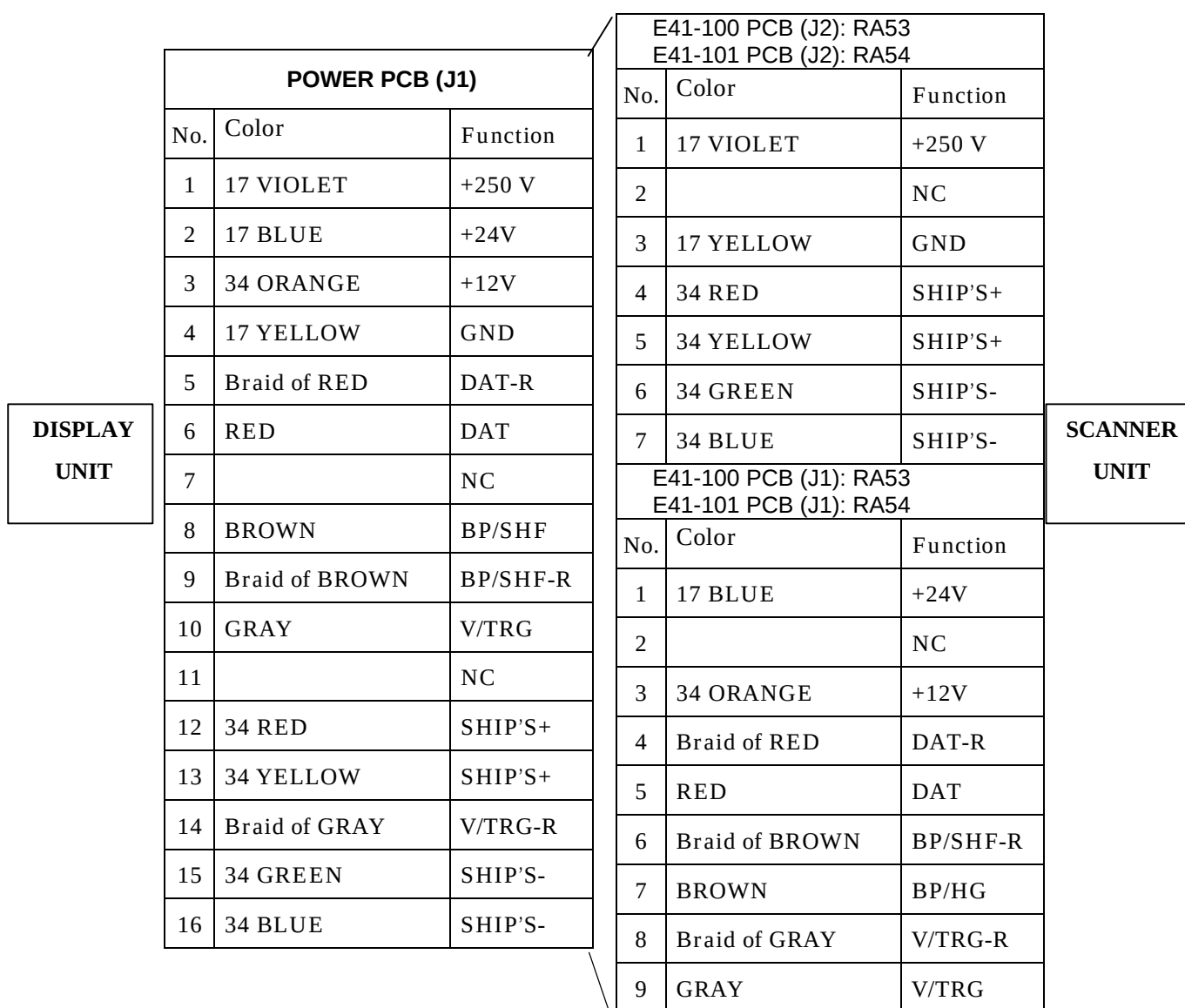
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Note 1. 点線はオプション

----- : Option

### 3. Interconnection Diagram



## A

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