

FURUNO

OPERATOR'S MANUAL

PERFORMANCE MONITOR

MODEL PM-30



FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN



(Elemental Chlorine Free)

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SAFETY INSTRUCTION

"**NOTIICE**", "**CAUTION**" and "**WARNING**" notices appear throughout this manual. It is the responsibility of the installer and operator of the equipment to read, understand and follow these notices. If you have any questions regarding these safety instructions, please contact a FURUNO agent or dealer.



WARNING

This notice indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

This notice indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or property damage.

NOTICE

This notice indicates an unsafe practice which, if not avoided, could result in property damage or equipment malfunction.

WARNING



Hazardous voltage.
Can shock, burn, or cause death.

Only qualified personnel should work in the unit.

Turn off the power at the ship's mains switchboard before beginning the installation. Post a warning sign near the switchboard to ensure the power will not be applied while the radar system is being installed.

Electrical shock, fire, serious injury or death can result if the power is not turned off, or is applied while the equipment is being installed.



Prior to switching on the radar or turning on the scanner switch, confirm that no person nor obstacle is in the vicinity of the scanner unit.

Post an appropriate warning sign near the display unit to indicate that work on the scanner unit is being performed, to prevent accidental application of the power to the scanner unit.



Wear a hard hat and a safety belt and always be cognizant of the location of the scanner radiator.

CAUTION



Ground both the display unit and the antenna unit.

Ungrounded equipment can give off or receive interference or cause electrical shock.



Never look into the beam of a transmitting scanner radiator at close range.

The radar antenna emits electromagnetic radio frequency energy which can be harmful, particularly to your eyes.

Confirm that the power supply voltage is compatible with the voltage rating of the equipment.

Connection to the wrong power supply can cause fire or equipment damage. The voltage rating appears on the label at the rear of the display unit.

NOTICE

The installation must be done by a FURUNO representative or suitably qualified radar technician.

Authorities require this.

The mounting location must satisfy the following conditions:

- Useable temperature: -15°C to 55°C
- Out of direct sunlight
- Away from air conditioner vents
- Well ventilated

Keep magnets and magnetic fields away from the equipment.

Magnetic fields will distort the picture and can cause equipment malfunction. Be sure the unit is well away from equipment which gives off magnetic fields (speaker, power transformer, etc.).

TABLE OF CONTENTS

INTRODUCTION	1
SPECIFICATIONS	2

1. OPERATING INSTRUCTIONS

1.1 Operating Procedure	4
1.2 How to Check Radar Performance	5

2. INSTALLATION INSTRUCTIONS

2.1 Mounting of PM-30	7
2.2 Mounting of Switch Box PM-3/5	8
2.3 Cabling	9
2.4 Adjustment at Installation	12

APPENDIX: Installation of PM-30 on the Antenna Unit	A-1
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OUTLINE DRAWING	D-1
INSTALLATION DRAWING	S-1

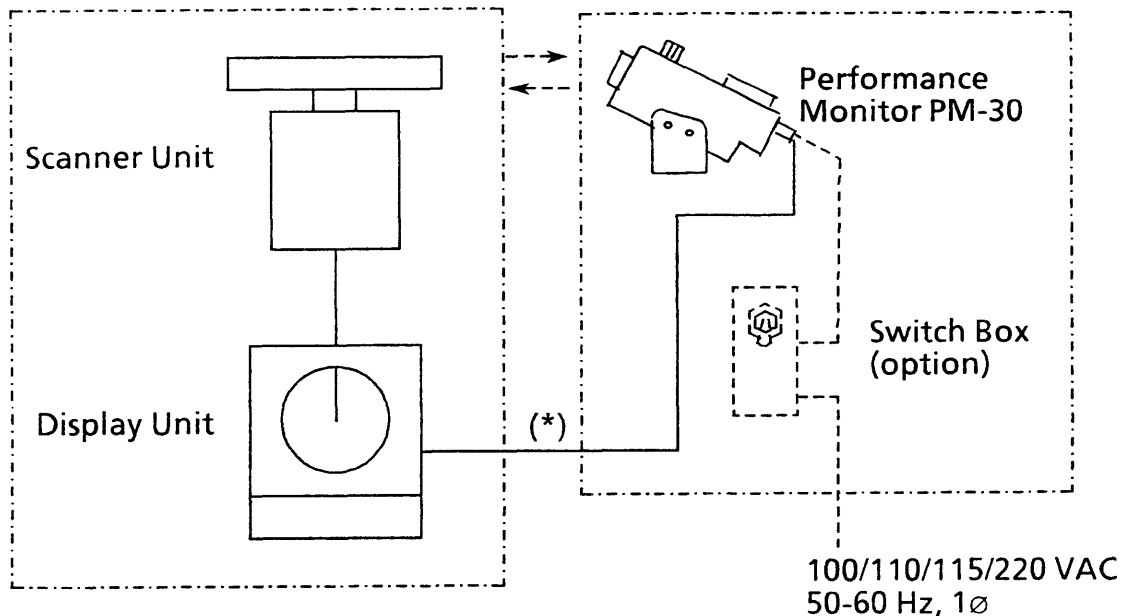
Declaration of conformity to type

INTRODUCTION

The performance Monitor PM-30 provides an effective means of general performance check of a radar installation, as required by the IMO Performance Standards for Radar Equipment.

The PM-30 works like an X-band transponder. Installed in the proximity of the radar antenna, it is triggered by part of the transmitted microwave energy and sends back a coded signal to the antenna for display on the radar screen. Overall performance of a radar installation including the transmitting system, receiving system and waveguide (or transmission cable) section can be checked from the range, size and number of arcs displayed on the radar screen.

Installation of the PM-30 Performance Monitor does not require any modification in the radar. If the radar is provided with a facility to remotely activate the performance monitor, like the FR-1200, FR-1600, FR-1500, FR-2000, FR-2100, and FR-2800 series, the PM-30 can be connected direct to the radar display. If not, a switch box PM-3/5 is required to allow the operator to turn on and off the PM-30 as shown by dotted lines below.



(*) Power supply to PM-30

SPECIFICATIONS

1. Frequency:	9360-9460MHz
2. Maximum Input:	+ 40dBm (1 μ s, 1000 pps)
3. Maximum Output Power:	-40dBm
4. Detection Range of TX Power Deterioration:	0 to 13dB
5. Indication Accuracy of TX Power Deterioration:	\pm 2dB
6. Detection Range of Receiver Sensitivity Deterioration:	0 to 12dB
7. Indication Accuracy of Receiver Sensitivity Deterioration:	\pm 2dB
8. Environmental Conditions	
Ambient Temperature:	-30°C to + 70°C (Performance Monitor) -15°C to + 55°C (Switch Box)
Relative Humidity:	95% at +40°C
Protective Design:	Weatherproof
9. Power Supply:	100/110/115/220VAC, 50-60Hz, 1 ϕ , 10VA
10. Weight and Dimensions:	4.4 kg, 120(W) x 125(H) x 320(D) mm

Equipment List

No.	Name	Q'ty	Weight	Dimensions (mm)
1	Performance Monitor PM-30	1	4.4 kg	120(W) x 125(H) x 320(D) mm
2	Switch Box PM-3/5 (option)	1	0.8 kg	61(W) x 150(H) x 145(D) mm
3	Installation Materials	1 set		
4	Spare Parts	1 set		

Installation Materials

No.	Name	Description	Code No.	Q'ty	Remarks
1	Crimp-on lug	FV2-T3B Blue	000-112-672	8	
2	Grounding wire	RW-4747	000-566-000	1	

Accessories

No.	Name	Description	Code No.	Q'ty	Remarks
1	Mounting bracket	03-025-9021-0 SUS304	100-079-720	1	
2	Hex. bolt	M8x40 SUS304	000-882-071	4	
3	Hex. nut	M8 SUS304	000-863-110	4	
4	Flat washer	M8 SUS304	000-864-130	4	
5	Hex. bolt	M5X14 SUS304	000-801-098	4	
6	Flat washer	M5 SUS304	000-864-128	4	
7	Sealant	THREEBOND #1211 50g	000-854-118	1	
8	Card case	A-7	000-831-481	1	

Spare Parts

No.	Name	Description	Code No.	Q'ty	Remarks
1	Cap bolt	03-025-9013-1 SUS304	100-079-661	2	
2	Seal washer	CW1053DX	000-850-021	2	
3	Lamp	P-6, 40mA	000-540-152	2	For Switch Box
4	Fuse	F-1065, 0.5A	000-547-004	2	For Switch Box

1. OPERATING INSTRUCTIONS

1.1 Operating Procedure

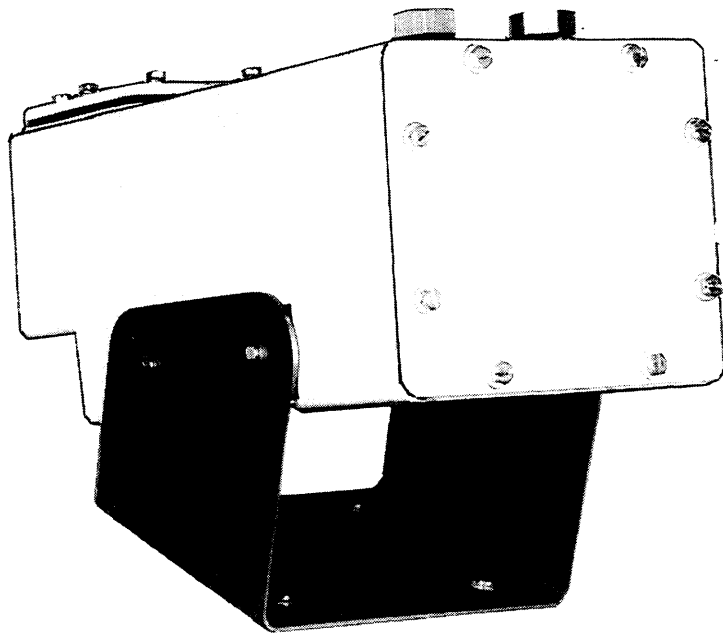


Photo No.2401

Figure 1.1 Performance Monitor

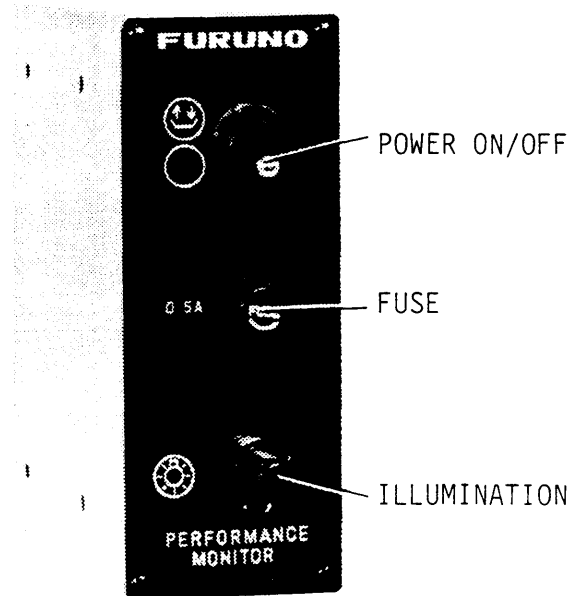


Figure 1.2 Switch Box PM-3/5 (option)

1. Put the radar in transmit mode.
2. Set the radar controls as follows.

RANGE: 24 n.m. *NOTE
BRILLIANCE: For optimum picture brightness (around 2 o'clock position)
GAIN: For a slight noise level on the display (around 2 o'clock position)
STC/FTC: Minimum (fully CCW)
TUNING: Best tuning point
SCANNER: ON (antenna rotating)

NOTE: If FUNCTION switch having "PM (performance monitor)" position is provided, set to the "PM" position, and the range will be automatically set to 24 n.m.

3. Activate the performance monitor by using the switch on the radar display, or by tuning on the POWER switch provided on the Switch Box.
4. To switch off the performance monitor, turn off the same switch.

1.2 How to Check Radar Performance

When the overall performance of the radar installation is normal, four arcs, of which the innermost is located 12 n.m. with the 2nd to 4th arcs following outward at about 1.5 n.m. intervals, are displayed on the radar screen as shown in the examples on the next page.

As the performance of the radar is usually degraded with the lapse of time or by accident from the initial performance at installation, the range and the number of these arcs change representing the degree of performance loss. The performance of the transmitting system is related with the range to the innermost arc, while that of the receiving system can be evaluated by the number of arcs displayed.

Monitoring the transmitter

Range to innermost arc	Transmitter loss
12 nm	0 dB
9 nm	3 dB
6 nm	6 dB
3 nm or less or none	10 dB or more

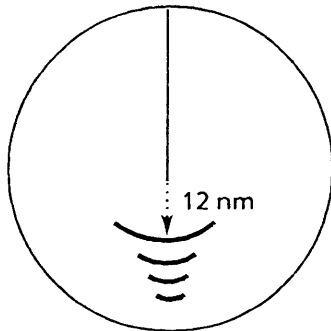
Note: The innermost arc is shifted 1 n.m. inward for every 1 dB loss of the transmitter performance.

Monitoring the receiver

Number of arcs	Receiver loss
4	0 dB
3	3 dB
2	6 dB
1	9 dB or more
nil	12 dB or more

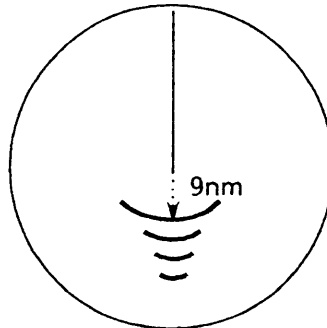
Note: The number of arcs is reduced by one for every 3 dB loss of receiver performance.

Examples of Performance Analysis



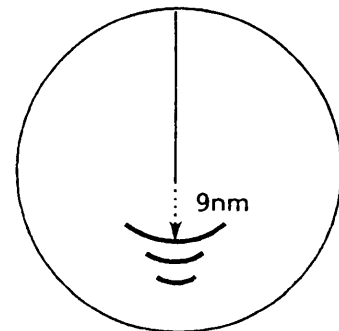
TRANSMITTER: NORMAL

RECEIVER: NORMAL



TRANSMITTER: 3dB loss
(Transmitter system has lost half the initial power. Suspect the magenetron and feeder system.)

RECEIVER: NORMAL



TRANSMITTER: 3dB loss
(Transmitter system has lost half the initial power. Suspect the magenetron and feeder system.)

RECEIVER: 3dB loss
(Receiver system has lost half the normal sensitivity. Suspect receiver front end, water ingress to the feeder system, etc.)

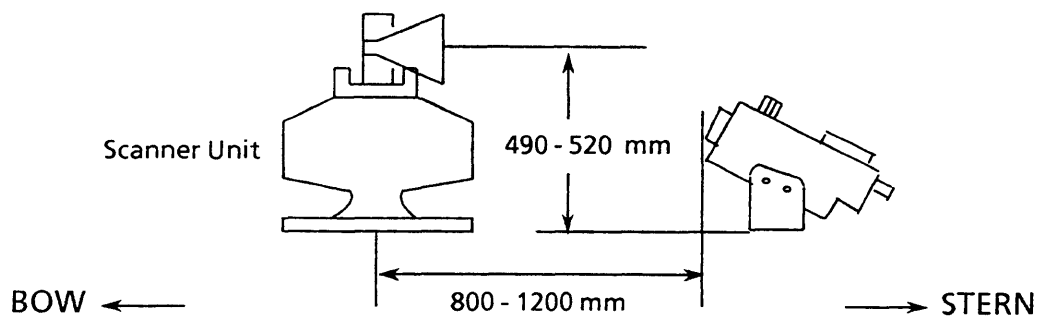
2. INSTALLATION INSTRUCTIONS

2.1 Mounting of PM-30

General Considerations on Unit Siting

The performance monitor should be installed near the radar antenna, either on the same platform or on a separate platform with the antenna, with the following geometrical arrangement:

- The difference in height from the base of the performance monitor to the center of the antenna aperture should be between 490 mm and 520 mm.
- The front (upward-looking square face) of the performance monitor should face direct to the antenna as shown, and the horizontal distance from the center of the scanner unit should be 800-1200 mm. The arc patterns are presented in the direction corresponding to the performance monitor's geometrical location with respect to the radar antenna. The most preferable location for the PM-30 is therefore the stern side of antenna in most cases to prevent important targets from being masked by the arcs.

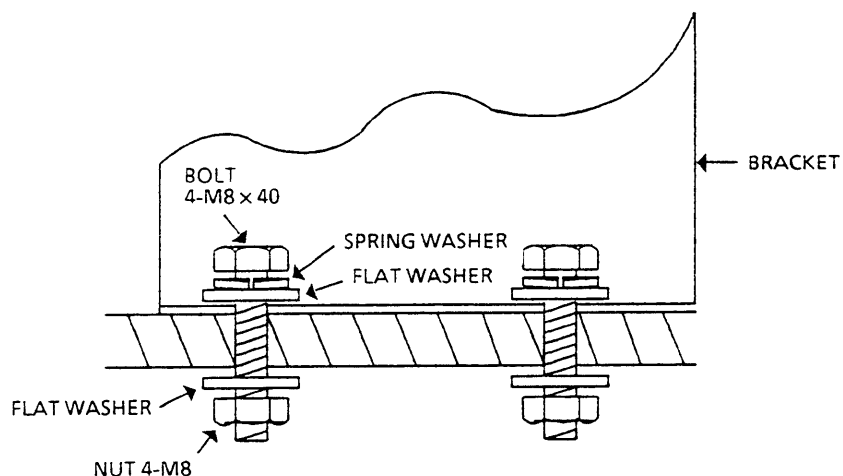


Mounting Procedure

PRECAUTION
Do not open or paint the front end of the performance monitor.

1. Put the mounting bracket in place and mark the positions of 4 bolt holes on the platform.
2. Drill 4 holes of 10 mm dia. at the positions marked in step 1 above.

- Secure the bracket in position with four each M8x40 bolts, nuts and washers. Then, fix the Performance Monitor to the bracket with four each M5x14 bolts and washers.



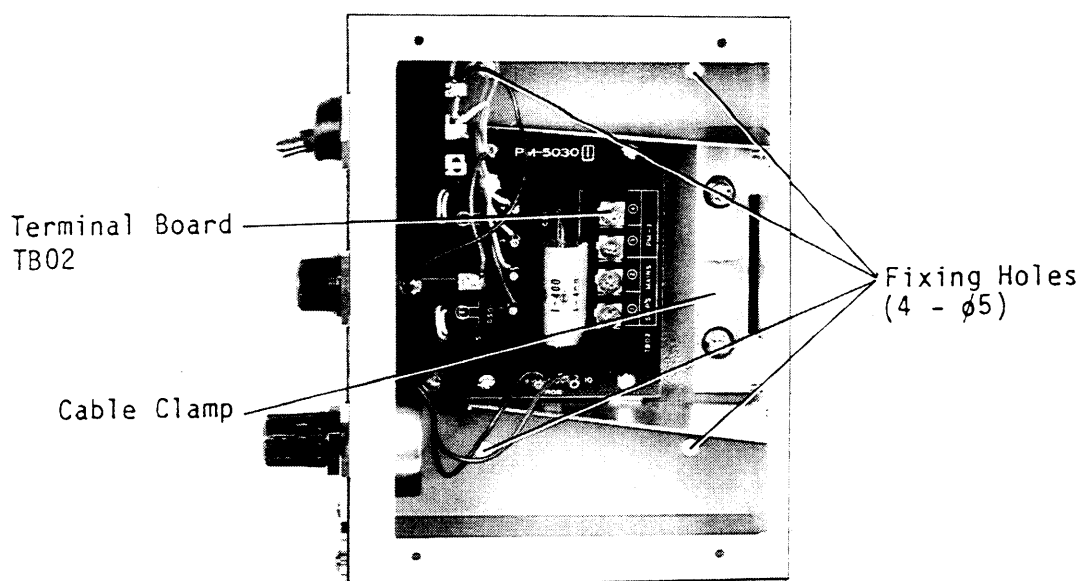
NOTE: When fixing the performance monitor to the bracket, apply the sealant (Threabond #1211) to the thread of fixing bolts.

2.2 Mounting of Switch Box PM-3/5

The switch box is required when the radar display does not incorporate a facility for switching on and off the performance monitor. It may be mounted at any convenient location in the wheelhouse.

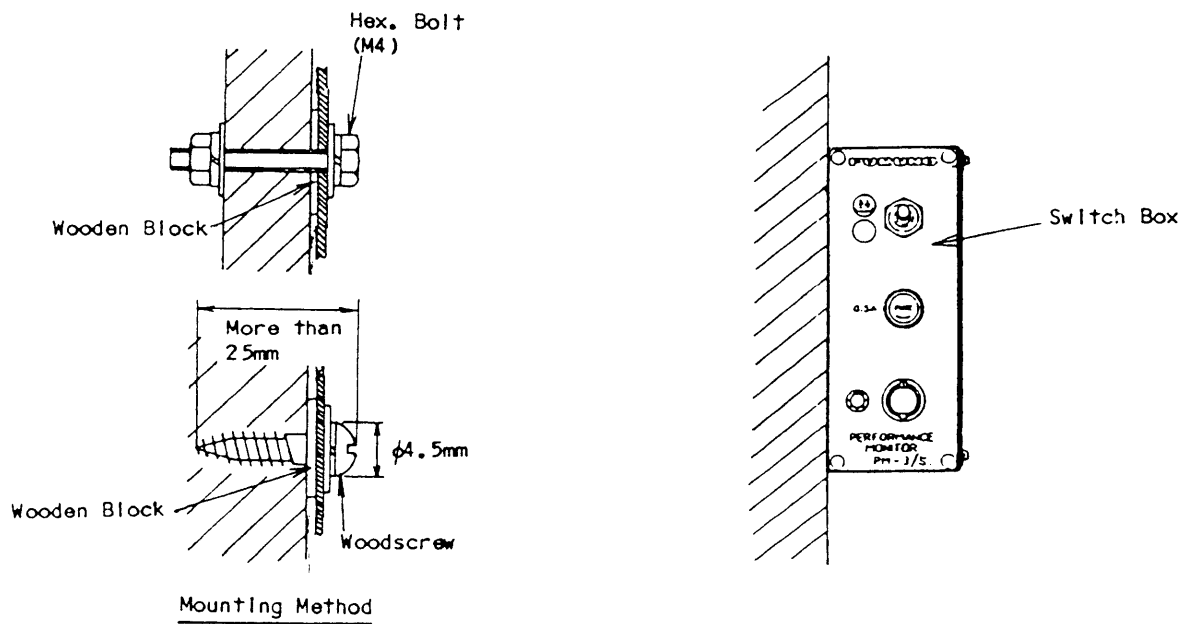
The switch box mounting procedure is as follows:

- Loosen four panhead screws on the right side of the unit and remove the cover.



N Photo No.1328

2. Mount the unit by hex. bolts or woodscrews at the desired position.



3. Put back the right side cover temporarily.

2.3 Cabling

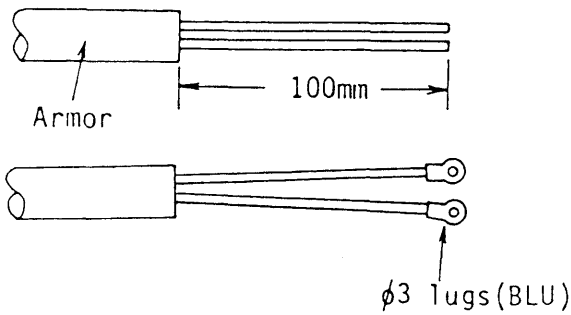
If special power supply terminals for the performance monitor are provided in the radar display, the only cable required is a twin-core armored power cable to connect between the Performance Monitor and the radar display. If not, the Performance Monitor should be connected to AC mains via the switch box, thus requiring two cables. In either case the cable type should be 250V-DPYCY-1.25 or the equivalent (shipyard supply).

Interconnection by the use of the switch box is described in the cabling diagram on page 11. If the Performance Monitor is connected to the radar display without the switch box, necessary information on connections in the radar display unit is included in the manuals for the respective radar models.

Jumper connections at terminal strip TB101 and power cable connecting terminals in the Performance Monitor vary depending on the AC supply voltage fed through the radar display unit or the switch box.

Cable fabrication procedures are shown in the following page for the Performance Monitor and switch box respectively.

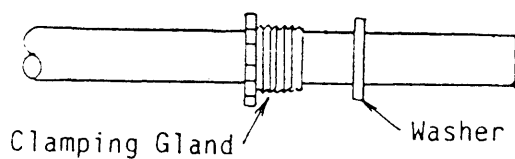
Fabrication of Cable 250V-DPYCY-1.25 at Switch Box Side



(1) Remove the armor and vinyl sheath for 100mm with care not to damage the cable cores.

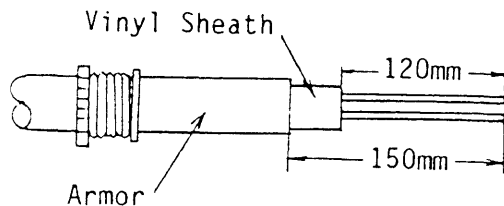
(2) Remove the vinyl insulators of the cable cores for 5 mm and fit crimp-on lugs (supplied as installation materials) to the conductor ends.)

Fabrications of Cable 250V-DPYCY-1.25 at Performance Monitor Side



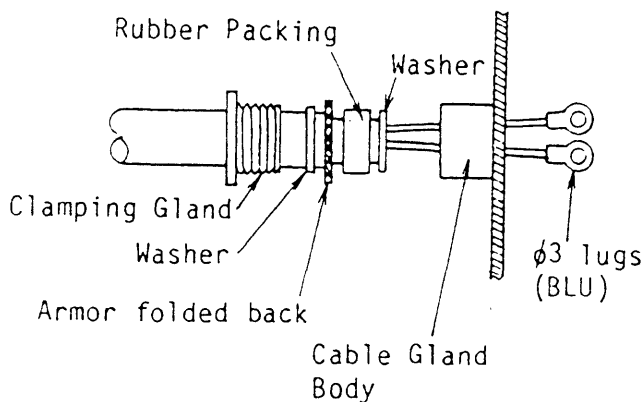
(1) Put the clamping gland and washer over the cable.

(2) Remove the armor for 150 mm.



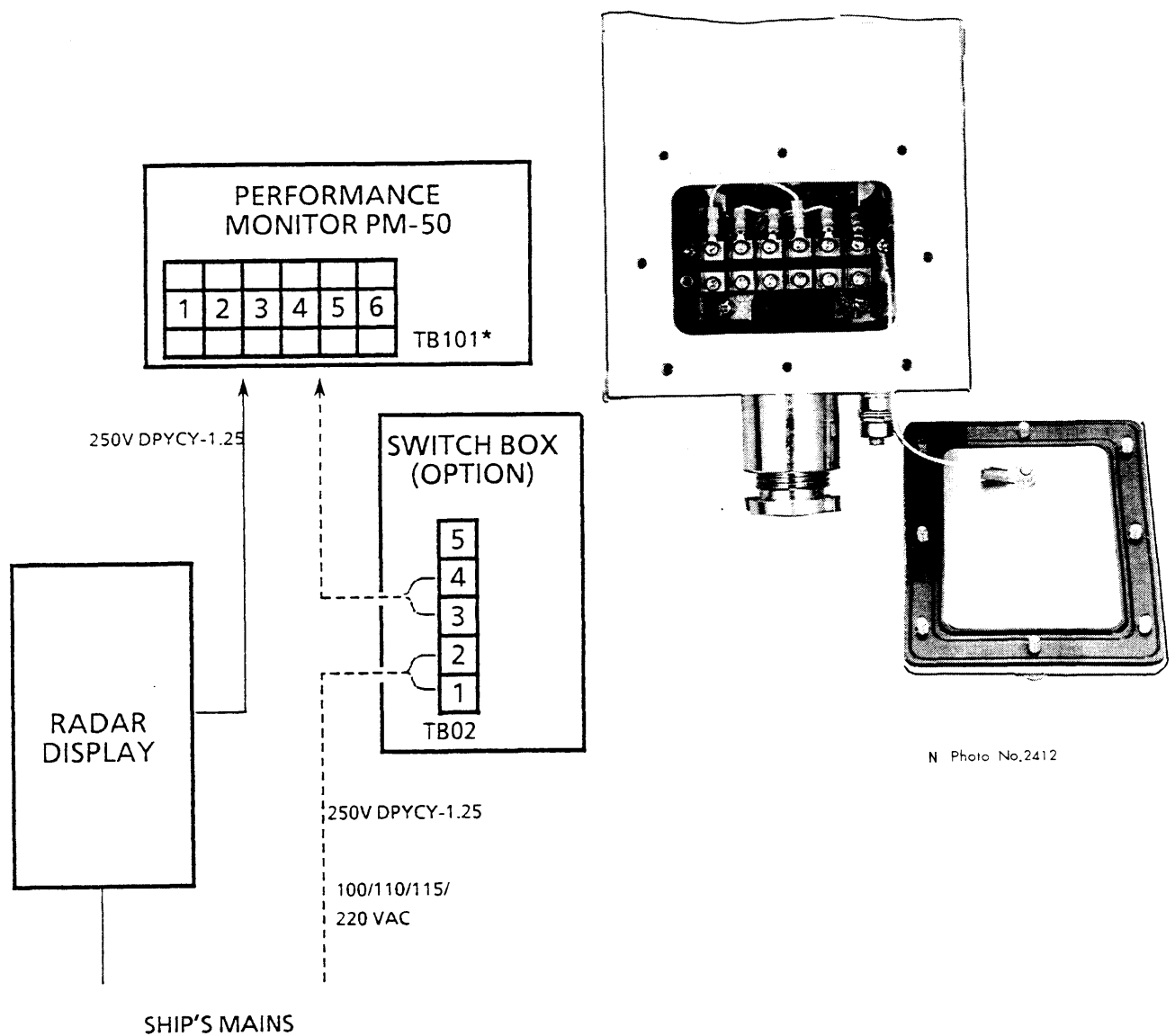
(3) Peel off the vinyl sheath and jute for 120 mm with care not to damage the cable cores.

(4) Remove the vinyl insulator of the cable cores for 5 mm and fit the crimp-on lugs to them.

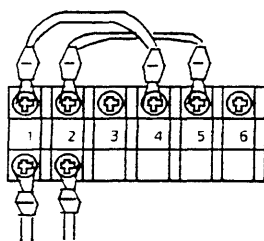


(5) Fold back the armor by 5 mm and put it between washer and rubber packing as shown at left.

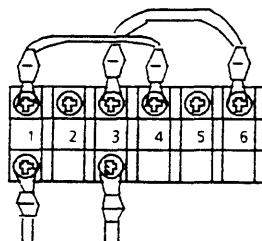
(6) Fasten the clamping gland tightly.



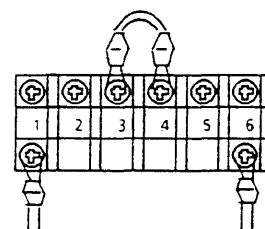
* Power cable connections to terminal strip TB101 in the Performance Monitor vary as shown below depending on the AC supply voltage. Jumper connections are normally preset to suit the user-specified AC voltage, but if necessary, they can be changed to other AC voltages as follows:



(a) 100 VAC



(b) 110/115 VAC



(c) 220 VAC

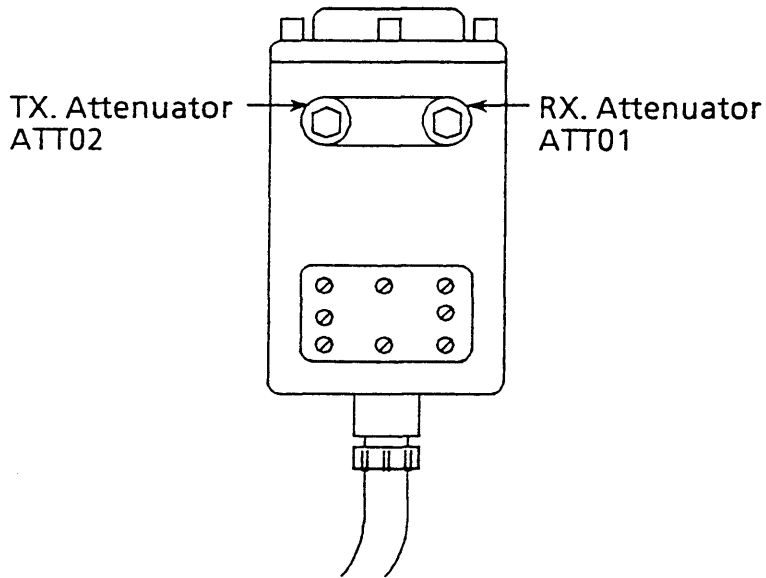
2.4 Adjustment at Installation

The PM-30 monitors the performance of a radar set by comparing its present performance with the initial performance achieved at installation. In order to establish good reference of comparisons, and eventual high-accuracy indications, the PM-30 must be properly adjusted at installation.

Adjustment Procedure

1. Confirm the front cover of the Performance Monitor is firmly secured with 8 fixing screws. (If not, microwave leakage will occur, resulting in misadjustment of attenuator ATT02 and eventual poor indicating accuracy.) Note that it is prohibited to open the front cover.
2. Remove the cap bolts of attenuators ATT01 (RX) and ATT02 (TX) provided on the top side of the Performance Monitor.
3. Put the radar in transmit mode.
4. Set the radar controls as follows:
 - RANGE:** 24 nm
 - BRILLIANCE:** For optimum picture brightness (around 2 o'clock position)
 - GAIN:** For a slight noise level on the display (around 2 o'clock position)
 - STC/FTC:** Minimum (fully CW)
 - TUNING:** Best tuning point
 - SCANNER:** ON (antenna rotating)
5. Activate the Performance Monitor by operating the switch on the radar display, or by turning on the POWER switch of the Switch Box. Wait a while (about one minute) until the arc patterns displayed on the radar completely stabilized.
6. Operating the VRM control, measure the range to the innermost arc displayed on the radar screen.
7. Adjust attenuator ATT01 of the receiving circuit so that the innermost arc is displayed within the range 12 ± 0.5 nm. Clockwise rotation of ATT01 increases the range; counterclockwise rotation decreases it.

Note: Arcs may disappear or freeze when the attenuator setting is out of the adjustment range, and adjustment of the attenuator alone cannot clear the problem. In this case, turn the attenuator fully counterclockwise, turn it about 1 1/2 turns and then turn the power off and on again. Adjust the attenuator slowly in about 5 degree turns; a slight turn yields large change.
8. Adjust transmitting circuit's attenuator ATT02 so that the outermost arc (4th from inside) is slightly visible. Clockwise rotation of ATT02 increases the intensity of the arcs; counterclockwise rotation decreases it.



9. Apply the sealant (Threebond #1211) to the cap bolts and seal washers for the adjusting holes. Then fix the cap bolts tightly.
10. Apply the sealant (Threebond #1211) to the head of fixing screws for the top cover.
11. Record the results obtained through the above adjustment as follows for future reference. (This should be done at least 30 minutes after starting transmission.)

Record of Performance Check (Example)

Radar Installed: December 5, 1987	Date	Temp.	Range to 1st arc	Number of arcs
	Dec. 5, 1987	15°C	12.0 n.m.	4

APPENDIX

Installation of PM-30 on the Antenna Unit

Fix the mounting assy. to the antenna unit chassis when you cannot mount PM-30 near the antenna unit.

Contents of PM-30 Assembling Kits

PM-30 (RSB-0014/0064/0074/0075)
Type: FP03-07200, Code No. 000-030-249

Name	Type	Code No.	Qty	Remarks
Mounting Plate	03-025-9031-0	100-274-740	1	
Hanger	03-025-9032-0	100-274-750	1	
Bracket	03-025-9033-0	100-274-760	2	
Hex Head Bolt	M8X20 SUS304	000-882-076	4	
Hex Head Bolt	M5X12 SUS304	000-801-751	6	
Hex Head Bolt	M5X14 SUS304	000-801-098	4	For mounting PM-30
Flat Washer	M5 SUS304	000-864-128	4	
Three Bond	1211 50G	000-854-118	1	

PM-30 (RSB-0041/0042/0043/0046/0076/0077/0078/0074-I/0075-I*)*
Type: FP03-07210, Code No. 000-030-250

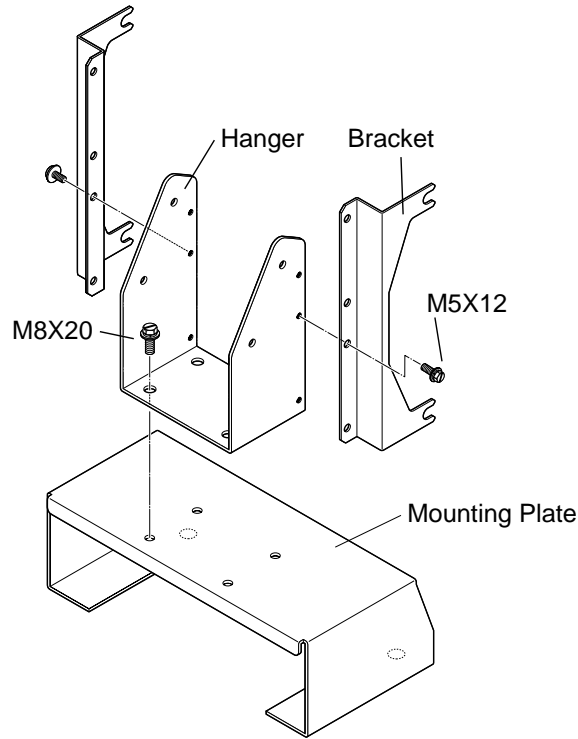
*: With deicing function

Name	Type	Code No.	Qty	Remarks
Mounting Plate	03-025-9041-0	100-274-770	1	
Hanger	03-025-9042-0	100-274-780	1	
Bracket	03-025-9043-0	100-274-790	2	
Hex Head Bolt	M8X20 SUS304	000-882-076	4	
Hex Head Bolt	M5X12 SUS304	000-801-751	6	
Hex Head Bolt	M5X14 SUS304	000-801-098	4	For mounting PM-30
Flat Washer	M5 SUS304	000-864-128	4	
Three Bond	1211 50G	000-854-118	1	

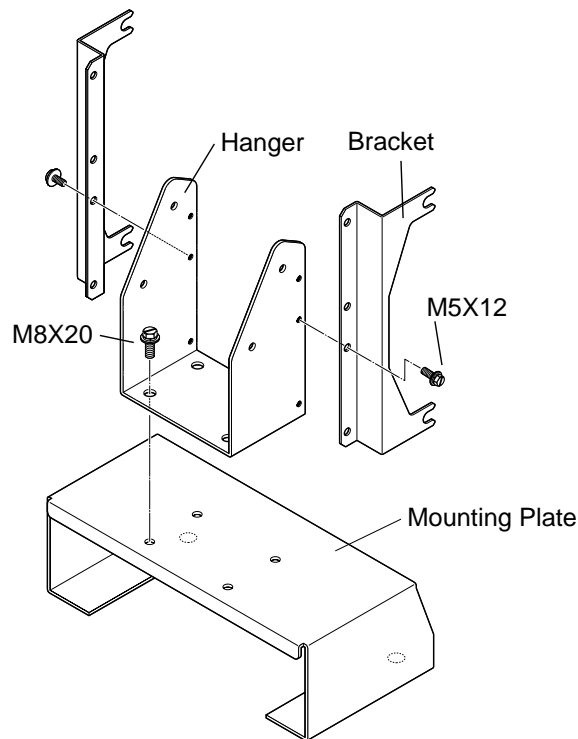
Assembling and Mounting Procedure

The procedure for assembling and mounting the Performance Monitor on the antenna unit is as follows.

1. Assemble the mounting assy. as below.

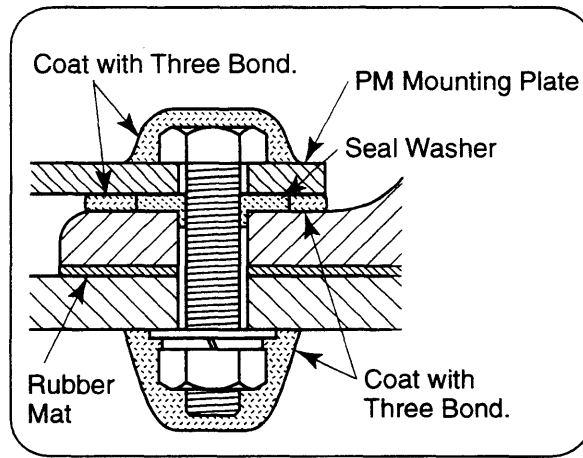


For RSB-0014/0064/0074/0075

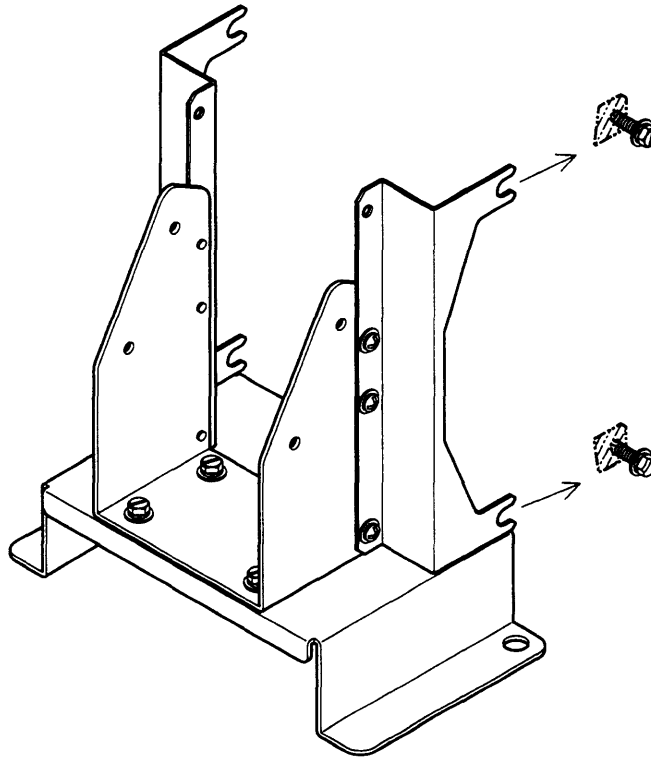


For RSB-0041/0042/0043/0046/0074-I/0075-I/0076/0077/0078

2. Fasten the mounting plate of the mounting assy. to the antenna unit chassis with the bolts on the antenna unit chassis. (See the outline drawing at the end of this manual.)



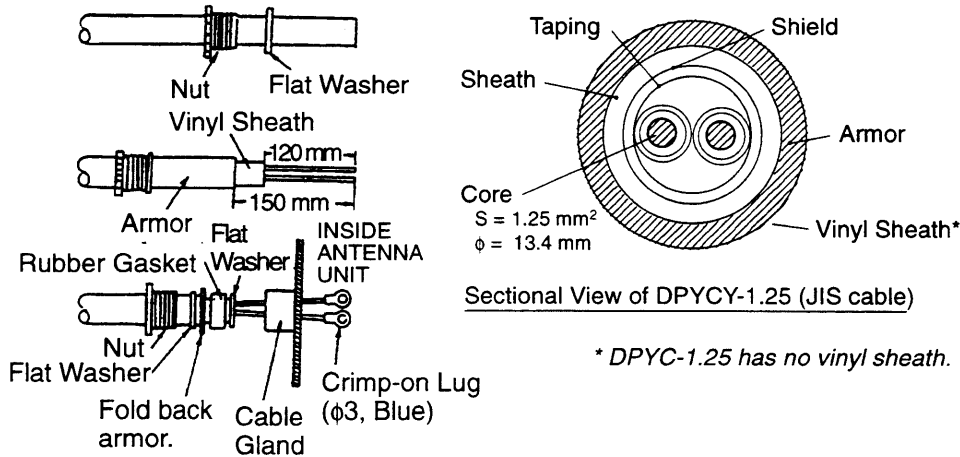
3. Fasten the brackets of the mounting assy. to the antenna unit cover with the screws fixing the cover.



4. Fix the PM-30 to the hanger of the mounting assy. with four hex bolts size M5X14 (supplied) and four M5 washers (supplied). Coat bolts with Three Bond (supplied) referring to the drawing above.

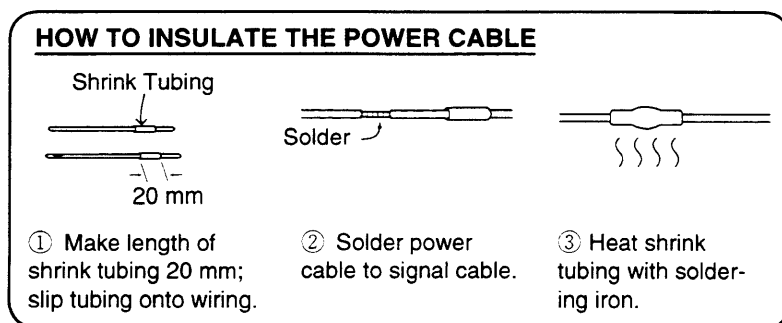
Wiring the Antenna Unit

1. Run the power cable type DPYCY-1.25 (or equivalent) between the PM-30 and the antenna unit. Length should be about 1 m.
2. Unfasten the gland for the PM-30 from the antenna unit. Remove nut, rubber gasket, flat washers (2 pcs.).
3. Set nut and flat washer to power cable. Dress end of cable as below and set rubber gasket and other flat washer to the power cable.



4. Set the cable to the gland and tighten the nut.
5. Open the antenna unit cover.
6. **For the RSB-0014/0064/0074/0075**, dismount the transceiver module.
7. **For the RSB-0014/0064/0074/0075**, solder the white wire(DJ1-9) and yellow wire(DJ1-19) of the signal cable to the power cable of the PM-30.
For the RSB-0041/0042/0043/0046/0076/0077/0078, disconnect at the antenna unit the #5 (Spare) and #12 (Spare) wires of the cable 250/660V-MPYCY-12 which runs between the antenna unit and the power supply unit. Solder them to the power cable coming from the PM-30.

Cover connection point with shrink tubing as below. See the interconnection diagram at the end of this manual for details.



8. **For the RSB-0014/0064/0074/0075**, mount the transceiver module.
9. Close the antenna unit cover.
10. Seal the cable gland with putty.

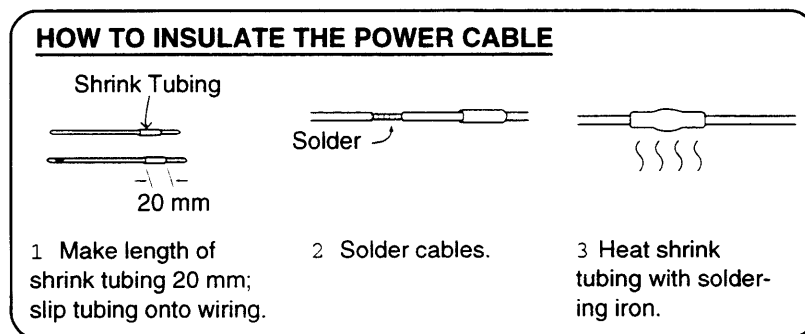
Wiring the Display Unit/Power Supply Unit

See the interconnection diagram at the end of this manual for details.

For FR-2115/2125

Wire the PM Board (03P9225) and signal cable inside the display unit to supply power to the PM-30. Power for the PM-30 is fed to the antenna unit via the signal cable.

1. Run the power cable DPYC-1.25 (local supply) between the display unit and ship's mains.
2. Solder the power cable DPYC-1.25 from the ship's mains to the cable of J402 on the PM Board (inside the display unit).
3. Disconnect the white (DJ1-9) and yellow (DJ1-19) wires of the signal cable from the connector DJ1.
4. Solder wires disconnected at step 3 to the cable of J403 on the PM Board. Cover connection point with shrink tubing as below.



For FR-2125W

The PM Board (03P9225) in the display unit supplies power to the PM-30 via the power supply unit (PSU-004) and the antenna unit.

1. Run the power cable DPYC(Y)-1.25 (local supply) between both the display unit and the power supply unit and display unit and ship's mains.
2. At the display unit, solder the power cable DPYC(Y)-1.25 from the ship's mains to the cable of J402 on the PM Board.
3. Solder the power cable DPYC(Y)-1.25 from the power supply unit to the cable of J403 on the PM Board.
4. At the terminal PTB-14 in the power supply unit, disconnect the cable of the #5 wire (Spare) of the power cable 250/660V-MPYCY-12.
5. To the power cable DPYCY-1.25 connected to the cable of J403 on the PM Board, solder both the #5 wire of the cable disconnected from the PTB-14 and the #12 wire (Spare) of the power cable. Cover connection point with shrink tubing.

For FR-1505/1510/1525 MARK-3, FR-1710/1725

Wire the PM Board (03P9225) and the signal cable inside the display unit to supply power to the PM-30. Power for the PM-30 is fed to the antenna unit via the signal cable.

1. Run the power cable DPYC-1.25 (local supply) between the display unit and ship's mains.
2. Solder the power cable DPYC-1.25 to the cable of J402 on the PM Board at the rear panel of the display unit.
3. Disconnect the white (DJ1-9) and yellow (DJ1-19) wires of the signal cable from the DJ1 connector.
4. Solder wires disconnected at step 3 to the cable of J403 on the PM Board. Cover connection point with shrink tubing.

For FR-2815/2825

Wire the pcb PCT-9106 and the signal cable inside the display unit to supply power to the PM-30. Power for the PM-30 is fed to the antenna unit via the signal cable.

1. Disconnect the white line (DJ1-9) and yellow line (DJ1-19) of the signal cable from the DJ1 connector.
2. Solder lines disconnected at step 1 to J105 on the pcb PCT-9106 in the display unit. Cover connection point with shrink tubing.

For FR-2825W/2855W

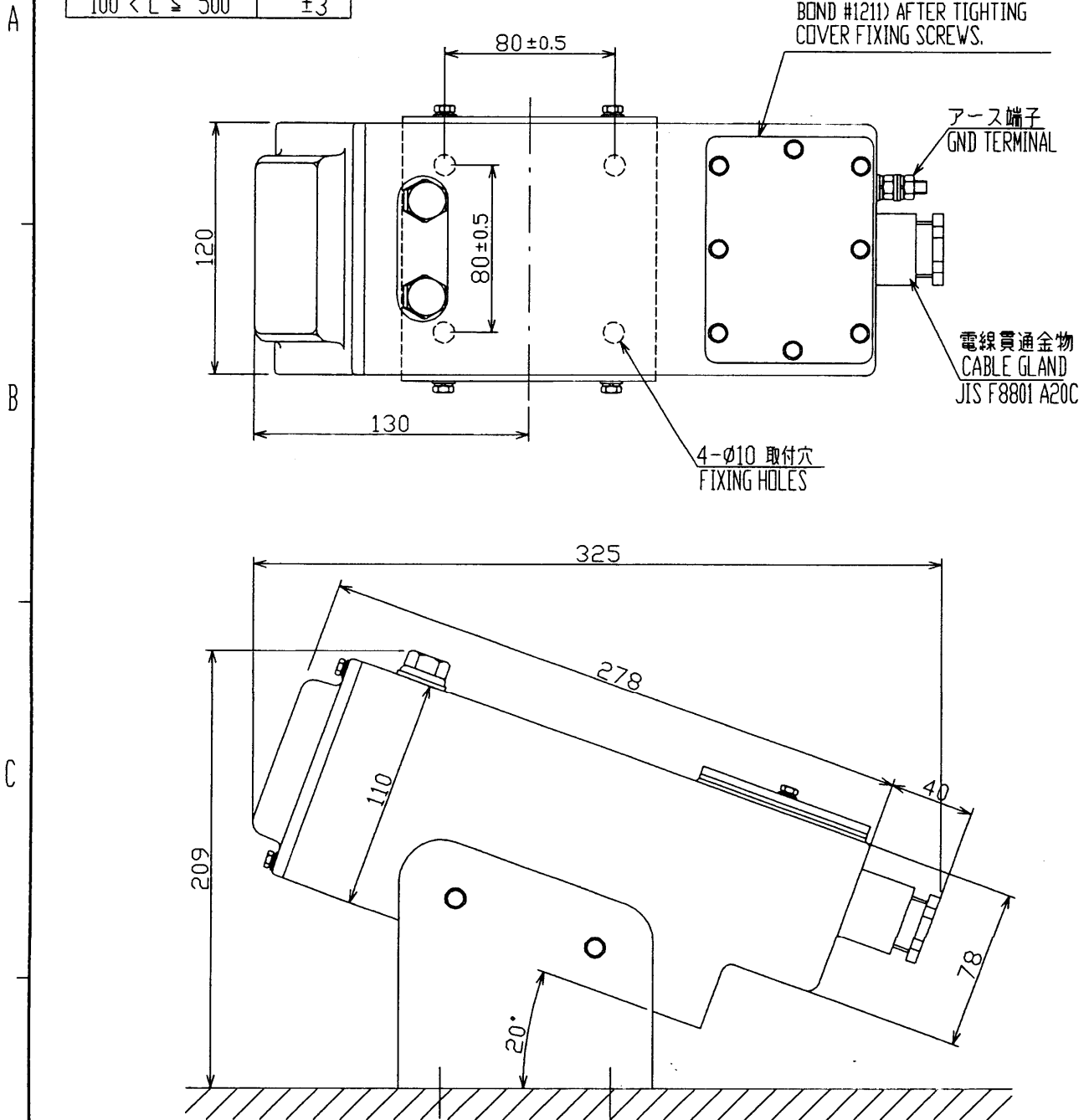
Power for the PM-30 is fed from the pcb PCT-9106 to the antenna unit via the power supply unit (PSU-004).

1. Run the power cable DPYC(Y)-1.25 (local supply) between the display unit and the power supply unit.
2. Solder the power cable DPYC(Y)-1.25 to J105 on the pcb PCT-9106 in the display unit.
3. At the power supply unit, disconnect the #5 wire (Spare) of the power cable 250/660V-MPYCY-12 from the terminal PTB-14.
4. To the power cable DPYC(Y)-1.25 connected to J105 on the pcb PCT-9106, solder both the #5 wire of the cable disconnected from the PTB-14 and the #12 wire (Spare) of the power cable. Cover connection point with shrink tubing.

表1 TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
$0 < L \leq 50$	± 1.5
$50 < L \leq 100$	± 2.5
$100 < L \leq 500$	± 3

カバー取付ボルト締付後
スリーボンド1211を塗布すること。
APPLY SILICONE SEALANT (THREE
BOND #1211) AFTER TIGHTING
COVER FIXING SCREWS.



注記

1) 指定なき寸法公差は表1による。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

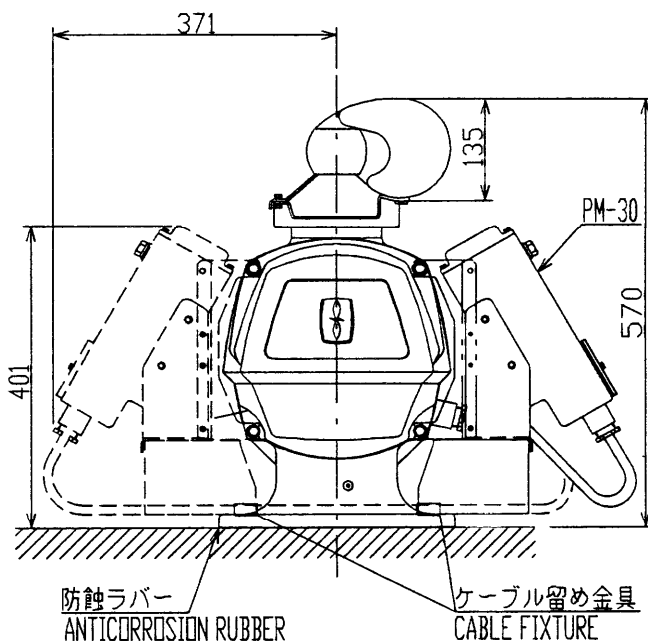
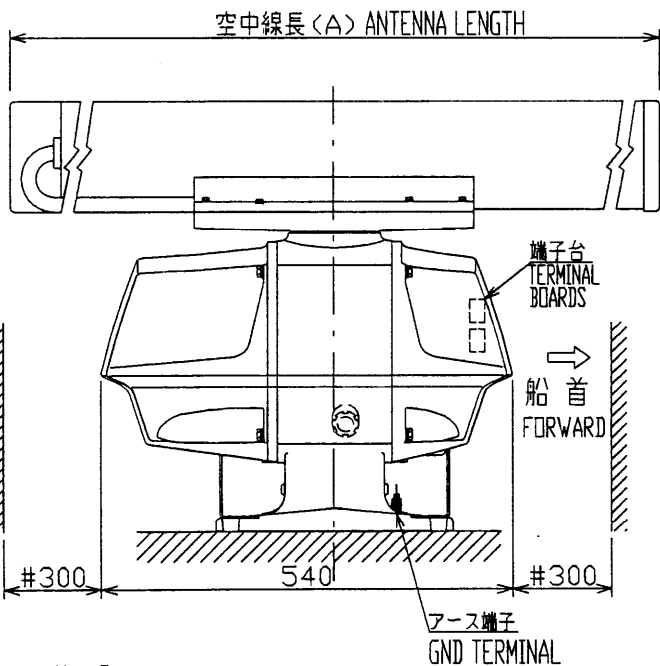
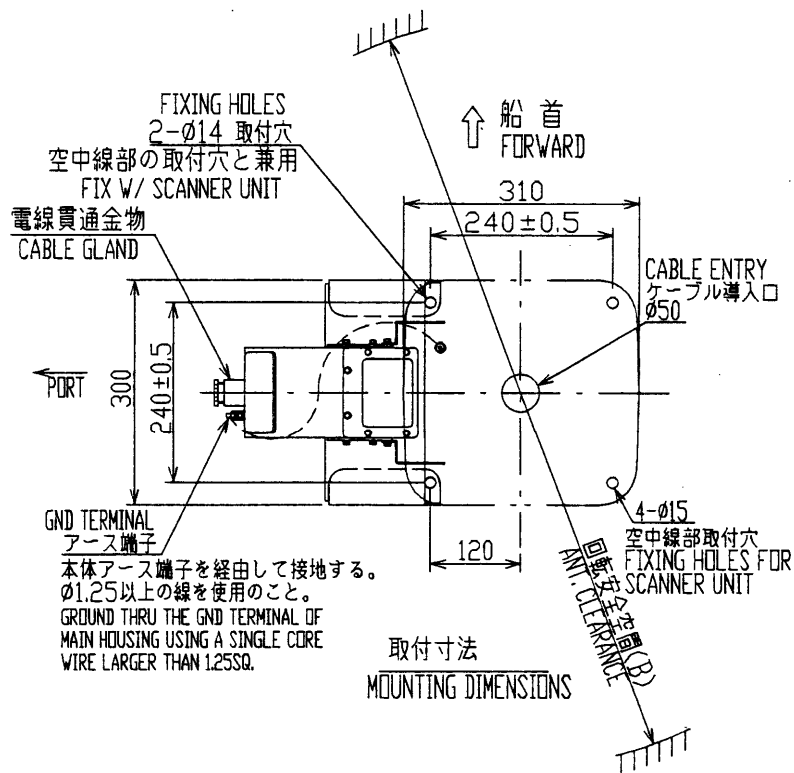
DRAWN Sep. 12 '02 T. YAMASAKI		TITLE PM-30/50
CHECKED Sep. 12 '02 Y. K. I.		名称 パフォーマンスモニター
APPROVED Sep. 12 '02 Y. K. I.		外寸図
SCALE 1/3	MASS 4.4 ±10% kg	NAME PERFORMANCE MONITOR
DWG.No. C3020-004-F		OUTLINE DRAWING

寸法範囲 (mm) DIMENSION	公差 (mm) TOLERANCE
0 < L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3
500 < L ≤ 1000	±4
1000 < L ≤ 2000	±5
2000 < L ≤ 4000	±7

表1 TABLE 1

種類 ANT TYPE	200cm型 TYPE (XN-3A)	240cm型 TYPE (XN-4A)
空中線長(A) ANT LENGTH (mm)	2070	2570
回転安全空間(B) ANTENNA CLEARANCE (mm)	2200	2700
質量(PM-30除く) MASS (kg±10%) V/T: PM-30	39.5	42

表2 TABLE 2



注記

- 1) 指定なき寸法公差は表1による。
- 2) #: 推奨するサービス空間寸法。
- 3) PM-30を右舷側に取付けるときは、ケーブルを留金具で固定すること。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. #: RECOMMENDED SERVICE CLEARANCE.
3. FIX CABLE TO SCANNER UNIT WITH FIXTURE WHEN PM-30 MOUNTED TO STARBOARD SIDE.

DRAWN May 28 '02 T.YAMASAKI		TITLE RSB-0014/0064
CHECKED May 29 '02 Y.Kiwa	FAR/ER-2825	名称 空中線部
APPROVED May 29 '02 Y.Kiwa	FR-1525M2 FR-2120	外寸図
SCALE 1/10	MASS 表2参照 TABLE 2	NAME ANTENNA UNIT
DWG.No. C3290-G02-D		OUTLINE DRAWING

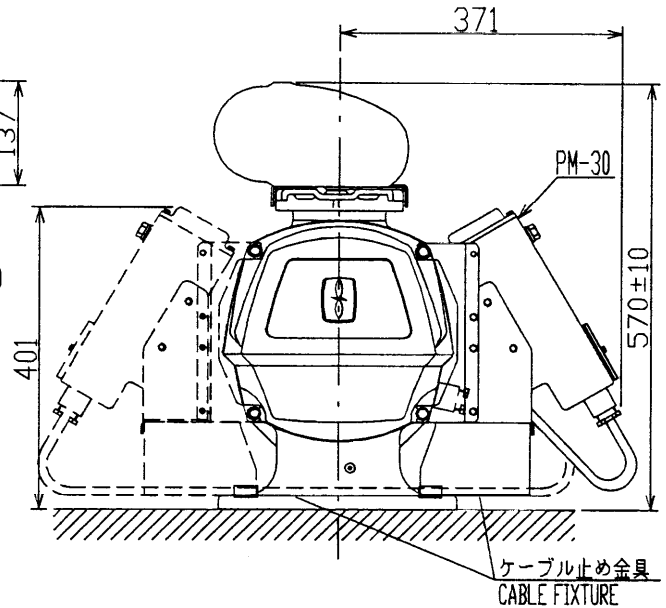
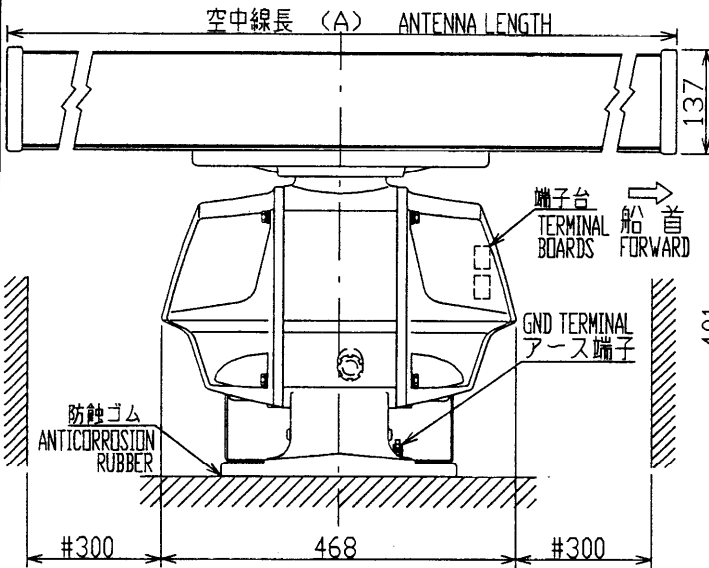
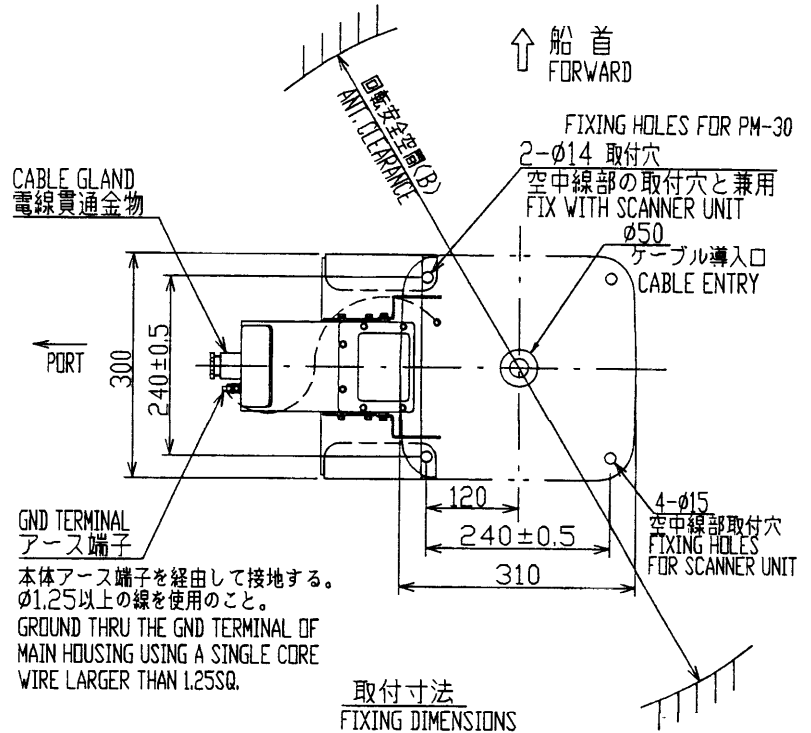
寸法範囲(mm) DIMENSION	公差(mm) TOLERANCE
$0 < L \leq 50$	± 1.5
$50 < L \leq 100$	± 2.5
$100 < L \leq 500$	± 3
$500 < L \leq 1000$	± 4
$1000 < L \leq 2000$	± 5
$2000 < L \leq 4000$	± 7

表1 TABLE 1

種類 ** ANT. TYPE	200cm型TYPE (XN-20AF)	240cm型TYPE (XN-24AF)
空中線長(A) ANT. LENGTH	2,040 \pm 10 mm	2,550 \pm 10 mm
回転安全空間(B) ANT. CLEARANCE	2,200 mm	2,700 mm
質量(PM-30除く) MASS(W/O PM-30)	39 kg	42 kg

** 選択可能な空中線部種類は、レーダー型式により異なる。各仕様を参照のこと。
SELECTABLE ANTENNA TYPE DEPENDS ON RADAR MODEL.
SEE INDIVIDUAL SPECIFICATIONS.

表2 TABLE 2



注記

- 1) 指定なき寸法公差は表1による。
- 2) # : 推奨するサービス空間寸法。
- 3) PM-30を右舷側に取付けるときは、ケーブルを留金具で固定すること。

NOTE

1. REFER DIMENSION TOLERANCE TO TABLE 1.
2. RECOMMENDED SERVICE CLEARANCE
3. FIX CABLE TO SCANNER UNIT WITH FIXTURE WHEN PM-30 MOUNTED TO STARBOARD SIDE.

DRAWN May 28 '02 T. YAMASAKI	TITLE RSB-0074/0075-20/24AF
CHECKED May 29 '02 Y. K.	名称 空中線部
APPROVED May 29 '02 Y. K.	外寸図
SCALE 1/10 MASS 表2参照 TABLE 2	NAME ANTENNA UNIT
DWG.No. C3464-G05-E	OUTLINE DRAWING

寸法範囲(mm)	公差(mm)
DIMENSION	TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3
500 < L ≤ 1000	±4
1000 < L ≤ 2000	±5
2000 < L ≤ 4000	±7

表1 TABLE 1

4

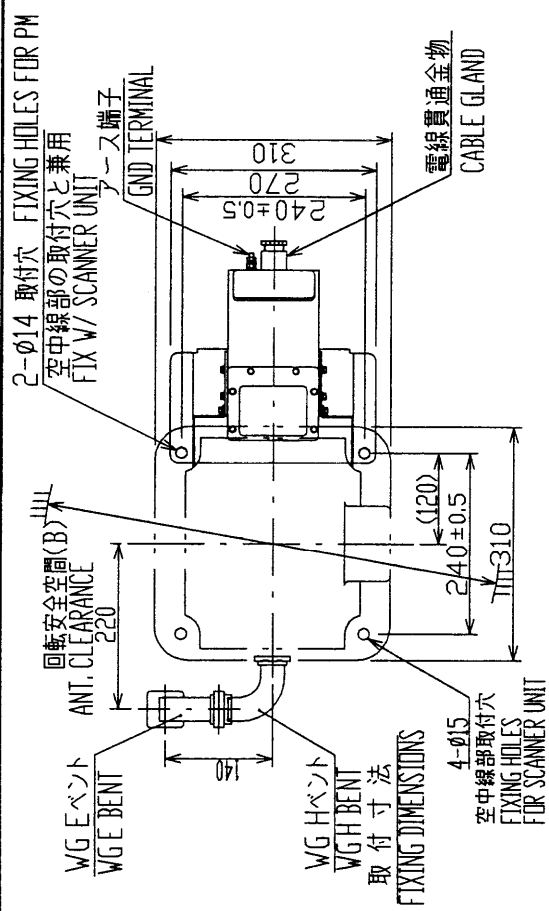
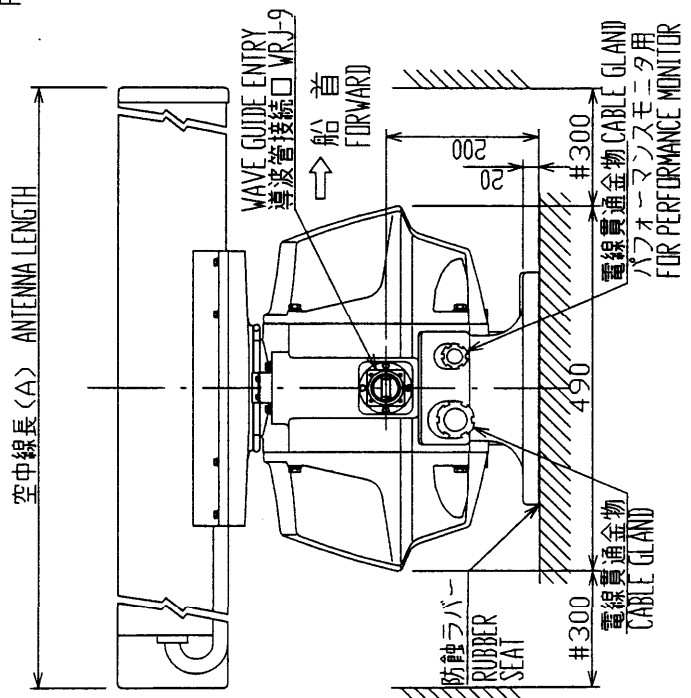


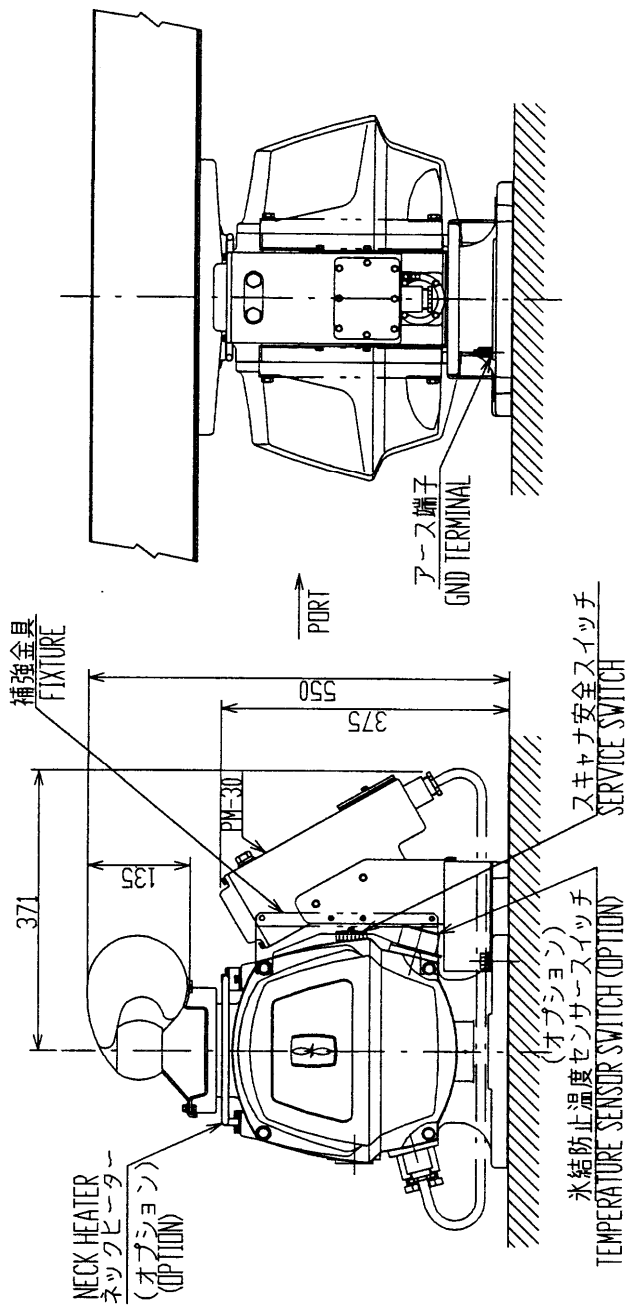
表2 TABLE 2

種類	200cm型 TYPE (XN-3A)	240cm型 TYPE (XN-4A)	300cm型 TYPE (XN-5A)
ANT. TYPE	2070	2570	3210
空中線長(A)	2200	2700	3340
回転安全半径(B) (mm)	39.5	42	44.5
質量(PM-30除く) MASS(kg) W/O PM-30			



2

3



DRAWING NO.	I. YAMASAKI	TITLE	RSB-0041/0042/0043/0046
CHECKED	Y. K.	名称	空中線部
APPROVED	Y. K.	外寸図	
SCALE	1/10	NAME	ANTENNA UNIT
FIG. NO.	C3332-G02-B		OUTLINE DRAWING

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. # RECOMMENDED SERVICE CLEARANCE.

注記

- 1) 指定外の寸法公差は表1による。
- 2) #：推奨するサービス空間寸法。

A

B

C

注記

NOTE 1. 井：推奨するサービス空間寸法。
RECOMMENDED SERVICE CLEARANCE.

NOTE 2

種類 * ANT. TYPE	200cm型 TYPE (AN-200E)	240cm型 TYPE (AN-240E2)
空中線長(A)	2,040±10mm	2,550±10mm
回極安全空間(B)	2,200 mm	2,700 mm (E10%)
質量 (PM-30除く)	39.5 kg	42 kg (E10%)
質量 W/O PM-30		

* 選択可能な空中線部種類は、レーダー型式により異なる。各仕様を参照のこと。
SELECTABLE ANTENNA TYPE DEPEND ON RADAR MODEL.
SEE INDIVIDUAL SPECIFICATIONS.

NOTE 3. 指定外の寸法公差は、表 1 による。
TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

取付寸法
FIXING DIMENSIONS

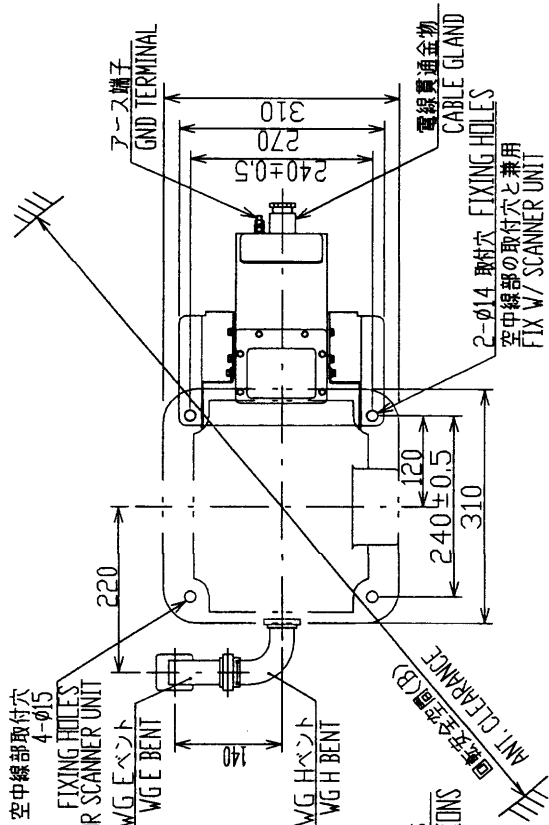
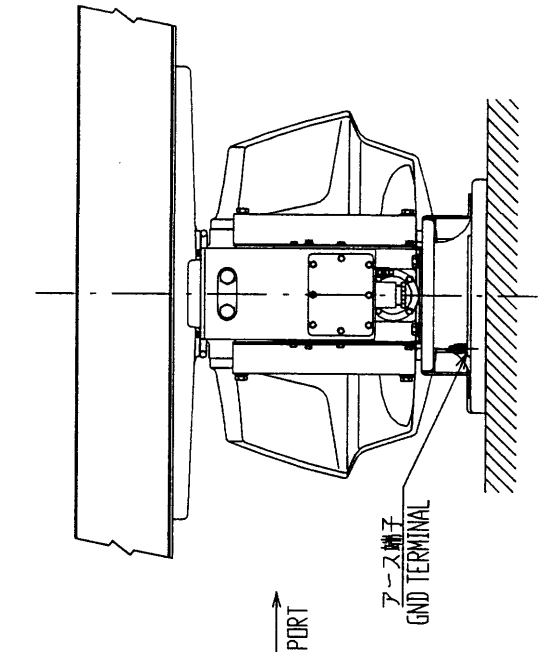
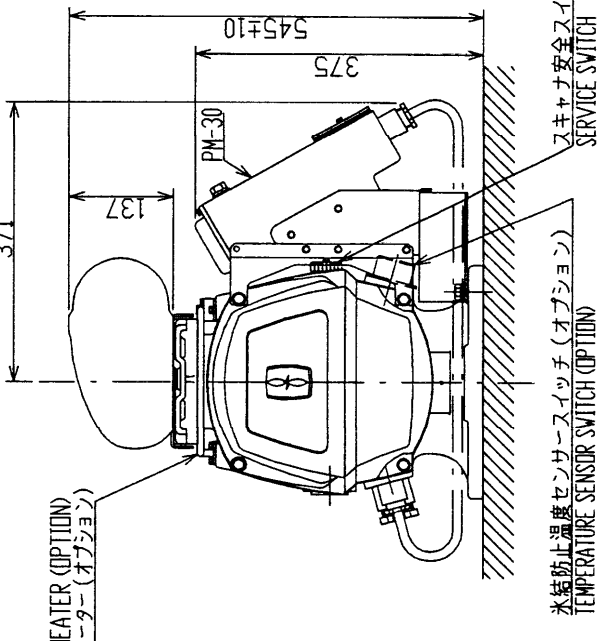
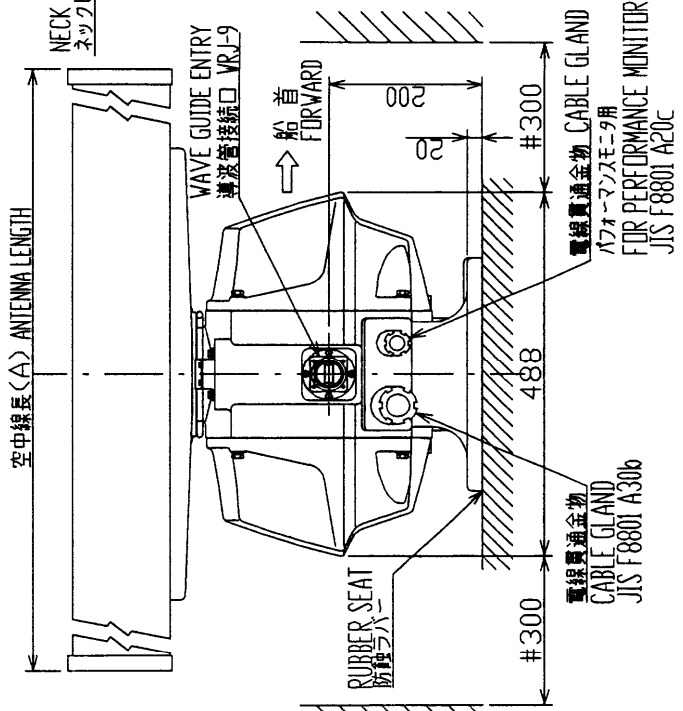


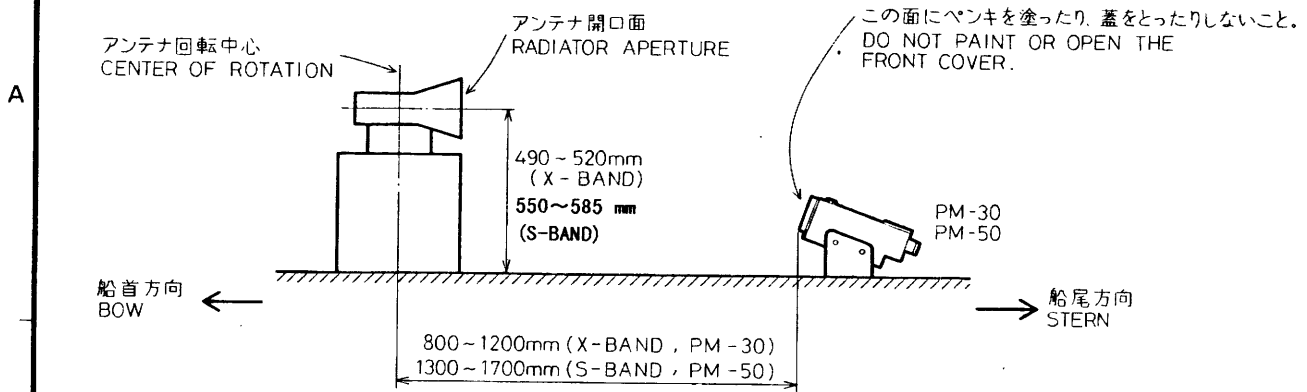
表 1 TABLE 1

寸法範囲 (mm) DIMENSION	公差 (mm) TOLERANCE
0 < L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3
500 < L ≤ 1000	±4
1000 < L ≤ 2000	±5
2000 < L ≤ 4000	±7

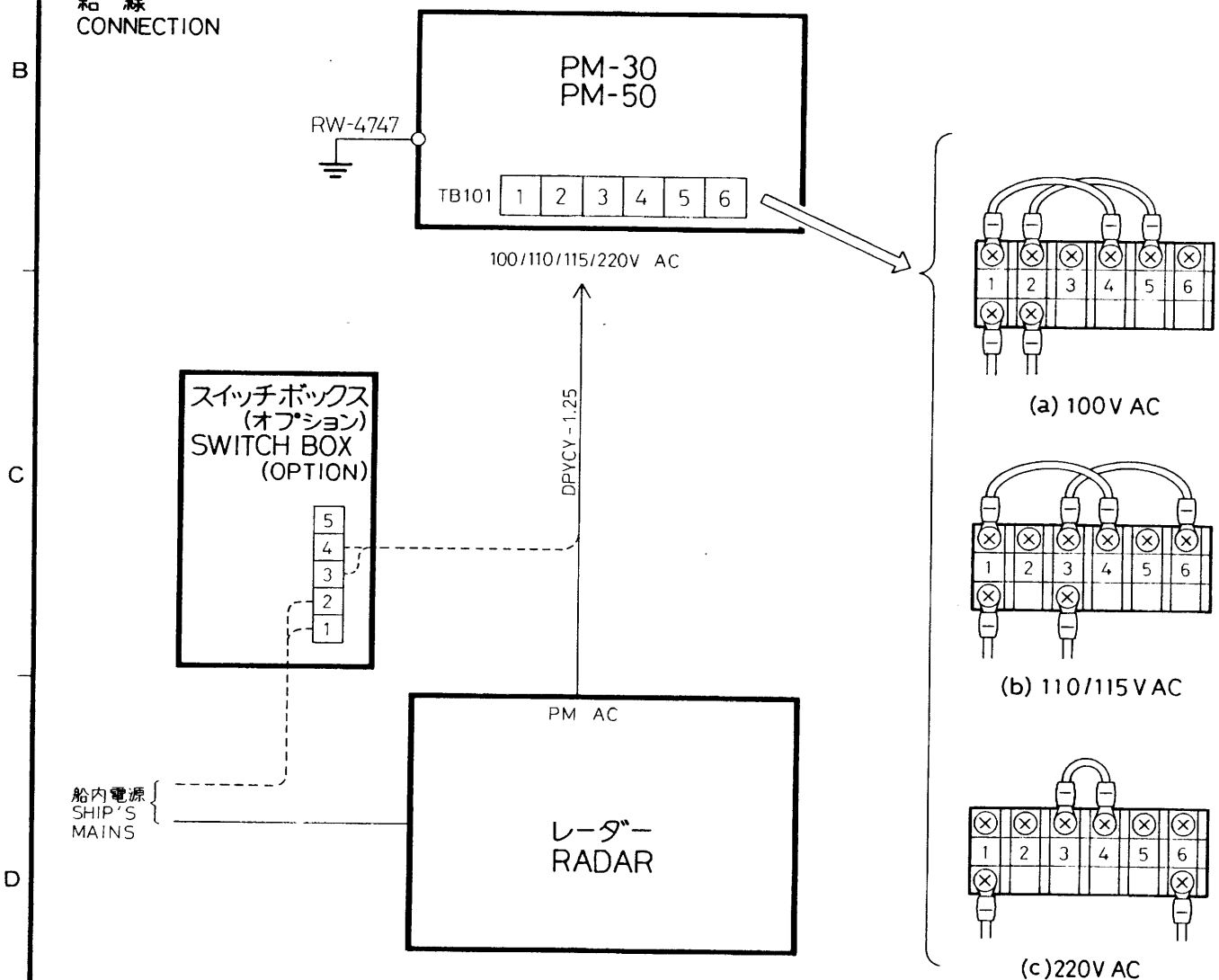


DRAWN	May 28/02	I. YAMASAKI	TITLE	RSB-0076/0077/0078
CHECKED	May 29/02	Y. K. S.	名称	空中線部
APPROVED	May 29/02	Y. K. S.	外寸図	
SCALE	1/10	MASS	NAME	ANTENNA UNIT
DWG No.	C3466-002-D			OUTLINE DRAWING

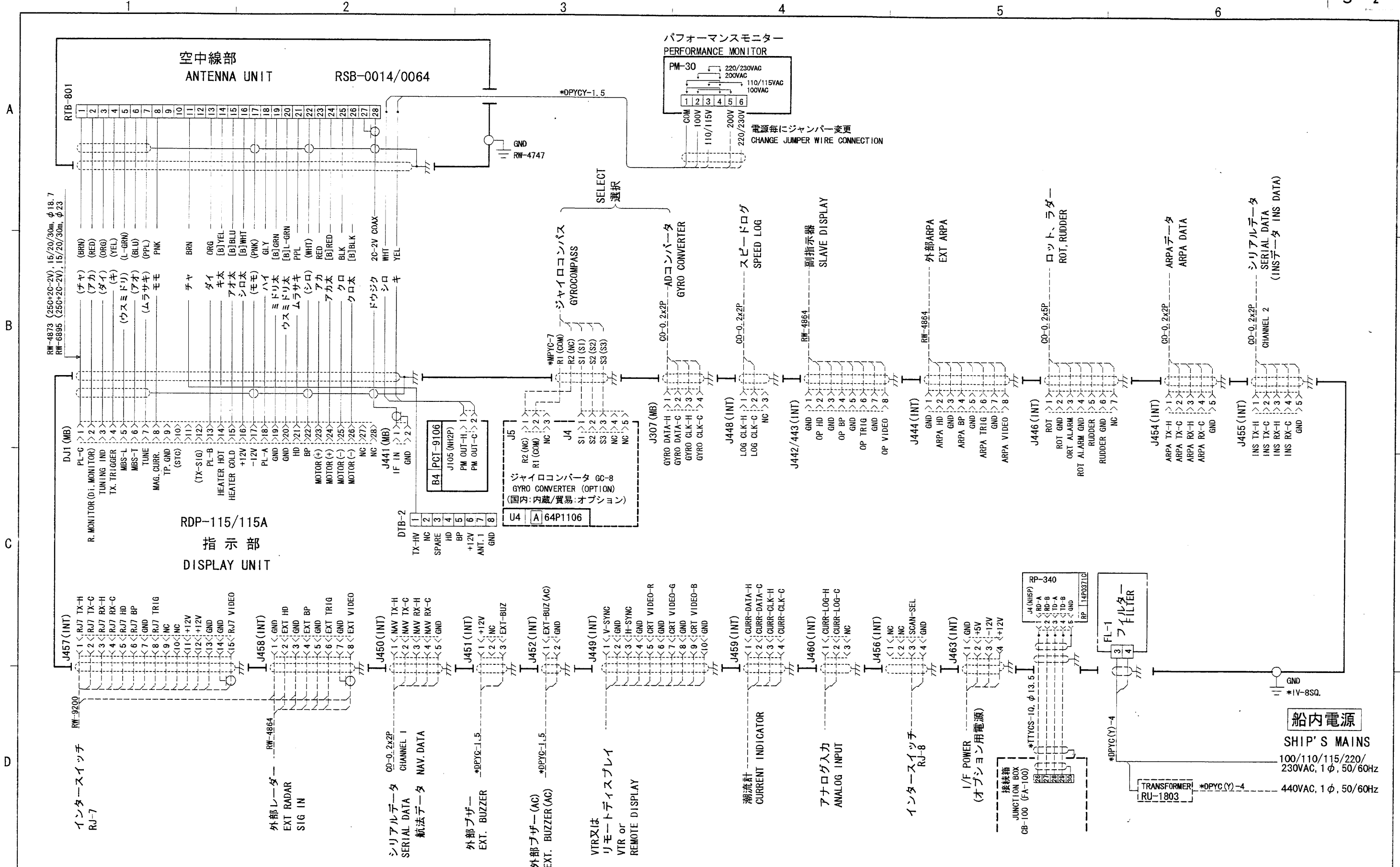
取付場所 MOUNTING POSITION



結線 CONNECTION



DRAWN Sep 30 '97 T. YAMASAKI			TYPE PM-30/PM-50
CHECKED Sep 30 '97 K. Kusunoki			名称 パフォーマンスモニター
APPROVED Sep 30 '97 H. Yamashiki			装備要領
SCALE MASS kg	APPLICABLE TO; (MODEL)	BLOCK NO.	NAME PERFORMANCE MONITOR
DWG NO. C3020-Y01-C			INSTALLATION PROCEDURE

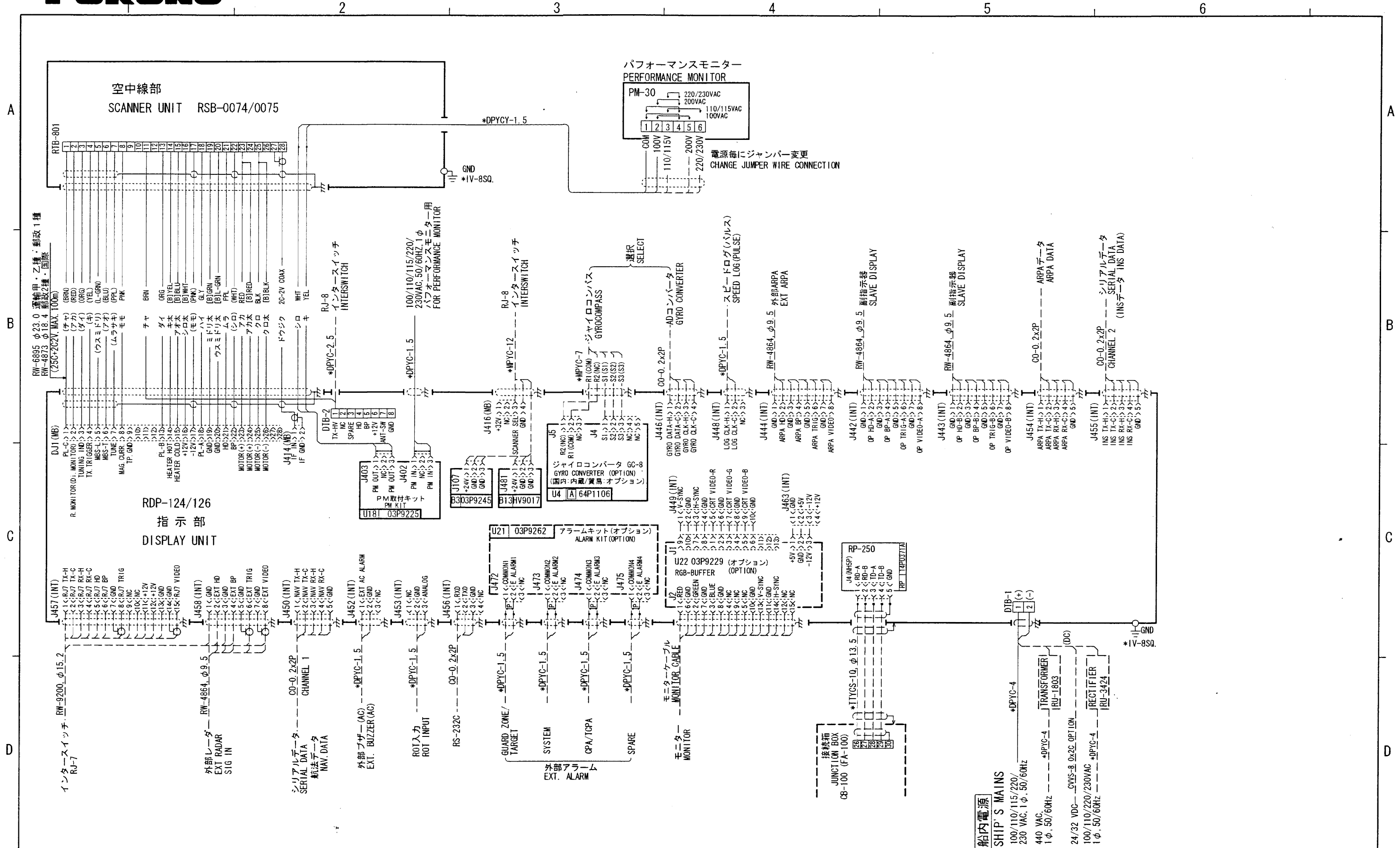


注記
 1) *:造船所手配
 2) () 内のカラーコードは内側シールド内の線を示す。

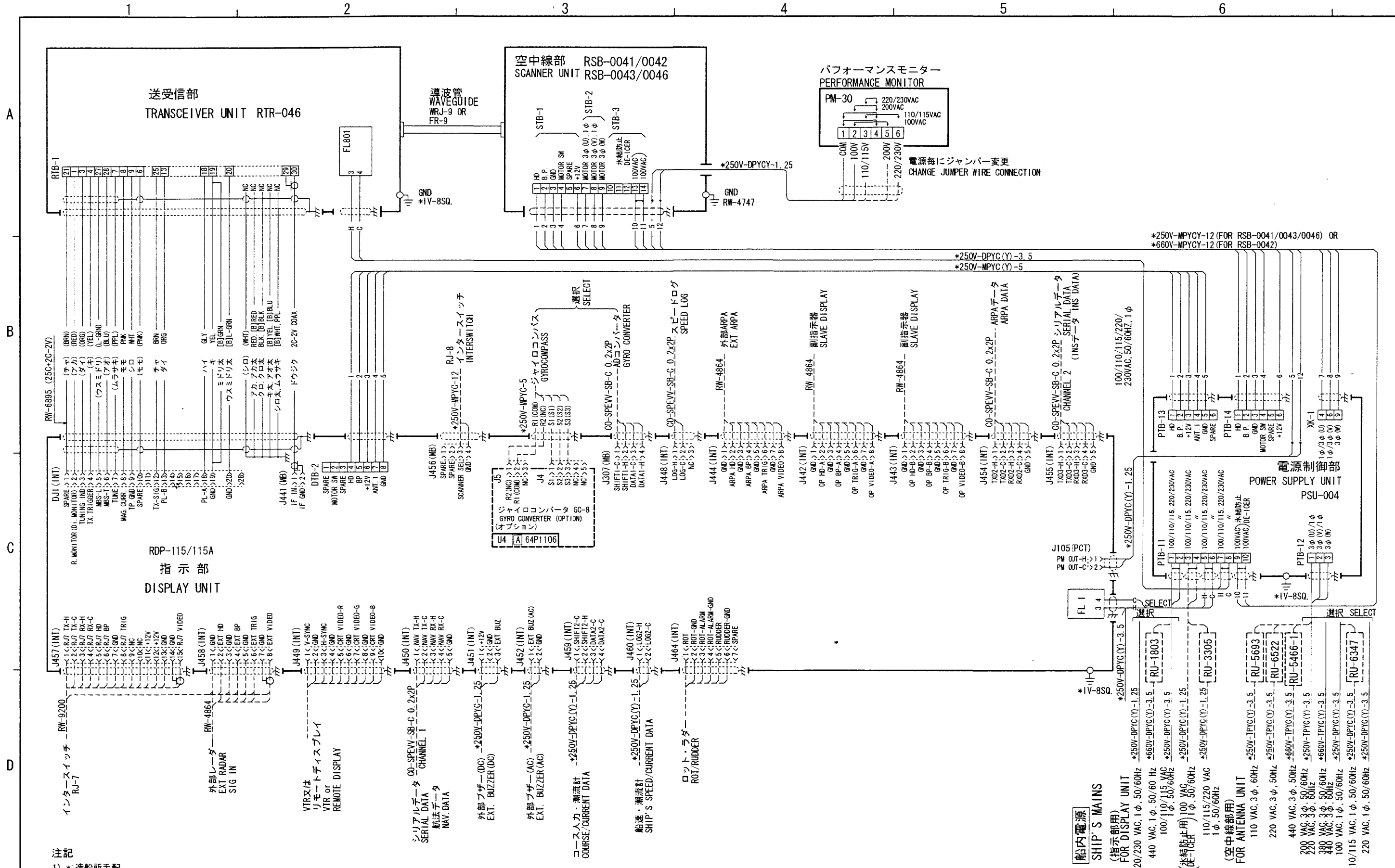
NOTE
 1. *:SHIPYARD SUPPLY
 2. WIRE COLOR CODE (): INSIDE WIRES. [B]: BIG WIRES, L-: LIGHT COLOR.

CO-0.2x2P: CO-SPEVV-SB-C 0.2x2P, φ 10.5
 CO-0.2x5P: CO-SPEVV-SB-C 0.2x5P, φ 13.5

DRAWN	Aug 20 '02 E. Kishima	TYPE	FR/FAR-2815/2825
CHECKED	Aug 20 '02 T. YAMASAKI	名称	船舶用レーダー
APPROVED	Aug 20 '02 E. Kishima		相互結線図
SCALE	MASS kg	NAME	MARINE RADAR
DWL No.	C3404-C04- E 03-131-6001-3		INTERCONNECTION DIAGRAM

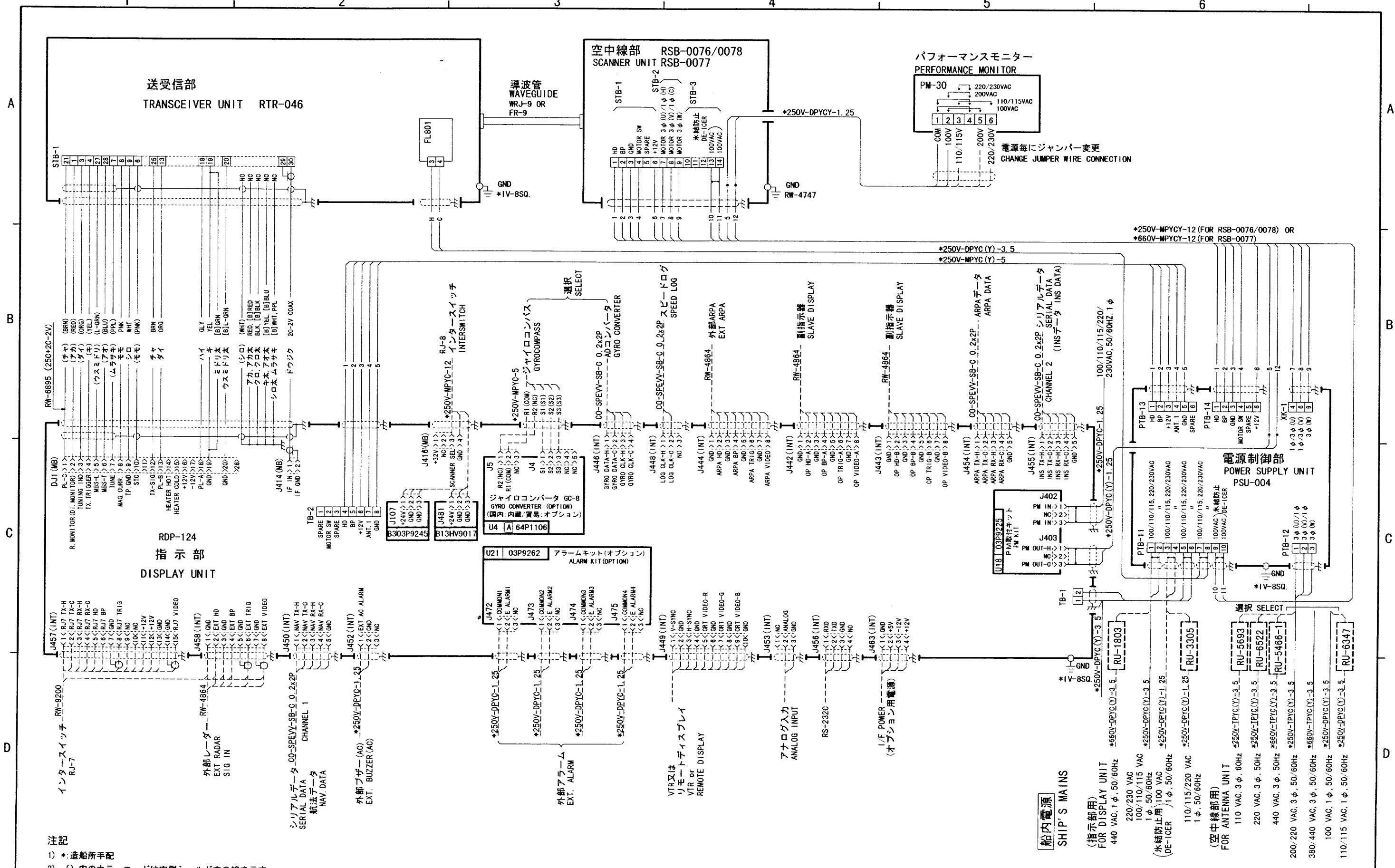


DRAWN July 11 '02 T. YAMASAKI	TYPE FR-2115/2125/2125V
CHECKED July 12 '02 S. K.	名称 船舶用レーダー
APPROVED July 12 '02 S. K.	相互結線図
SCALE MASS kg	NAME MARINE RADAR
DWG No. C3464-C02-G 03-144-6001-8	INTERCONNECTION DIAGRAM



注記
 1) *:造船所手配
 2) () 内のカラーコードは内側シールド内の線を示す。
NOTE
 1. *:SHIPYARD SUPPLY
 2. WIRE COLOR CODE (): INSIDE WIRES. [B]: BIG WIRES. L-: LIGHT COLOR.

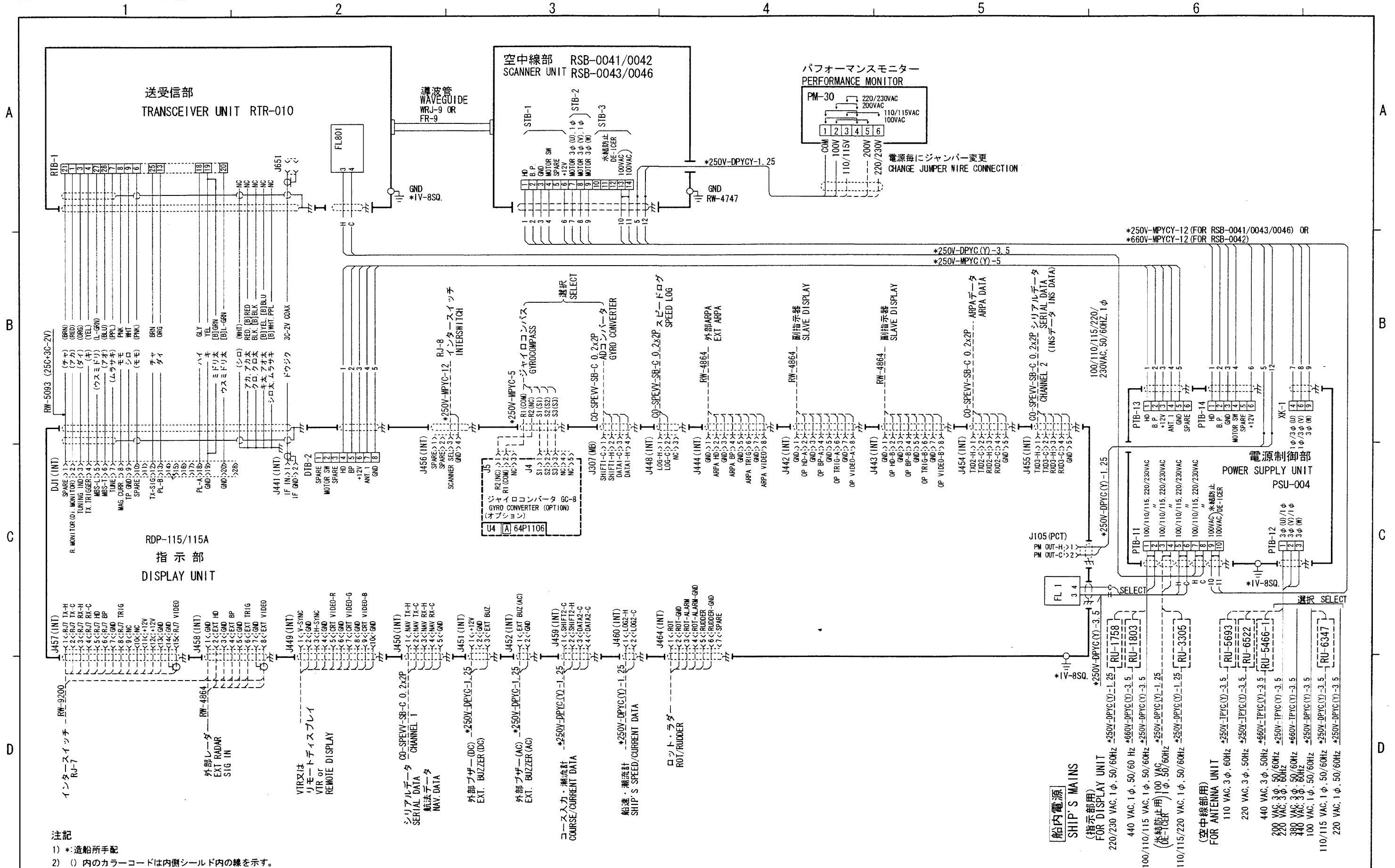
DRAW Aet 17'02 T. YAMASAKI	TYPE FR/FAR-2825W
CHECKED Apr 17'02 Y. K.	名称 船舶用レーダー/衝突予防援助レーダー
APPROVED Apr 17'02 Y. K.	相互結線図
SCALE MASS kg	NAME MARINE RADAR / ARPA
DWG. No. C3405-C04- D 03-130-6002-2	INTERCONNECTION DIAGRAM



注記
 1) * 造船所手配
 2) () 内のカラーコードは内側シールド内の線を示す。

NOTE
 1. *: SHIPYARD SUPPLY
 2. WIRE COLOR CODE (): INSIDE WIRES. [B]: BIG WIRES, L-: LIGHT COLOR.

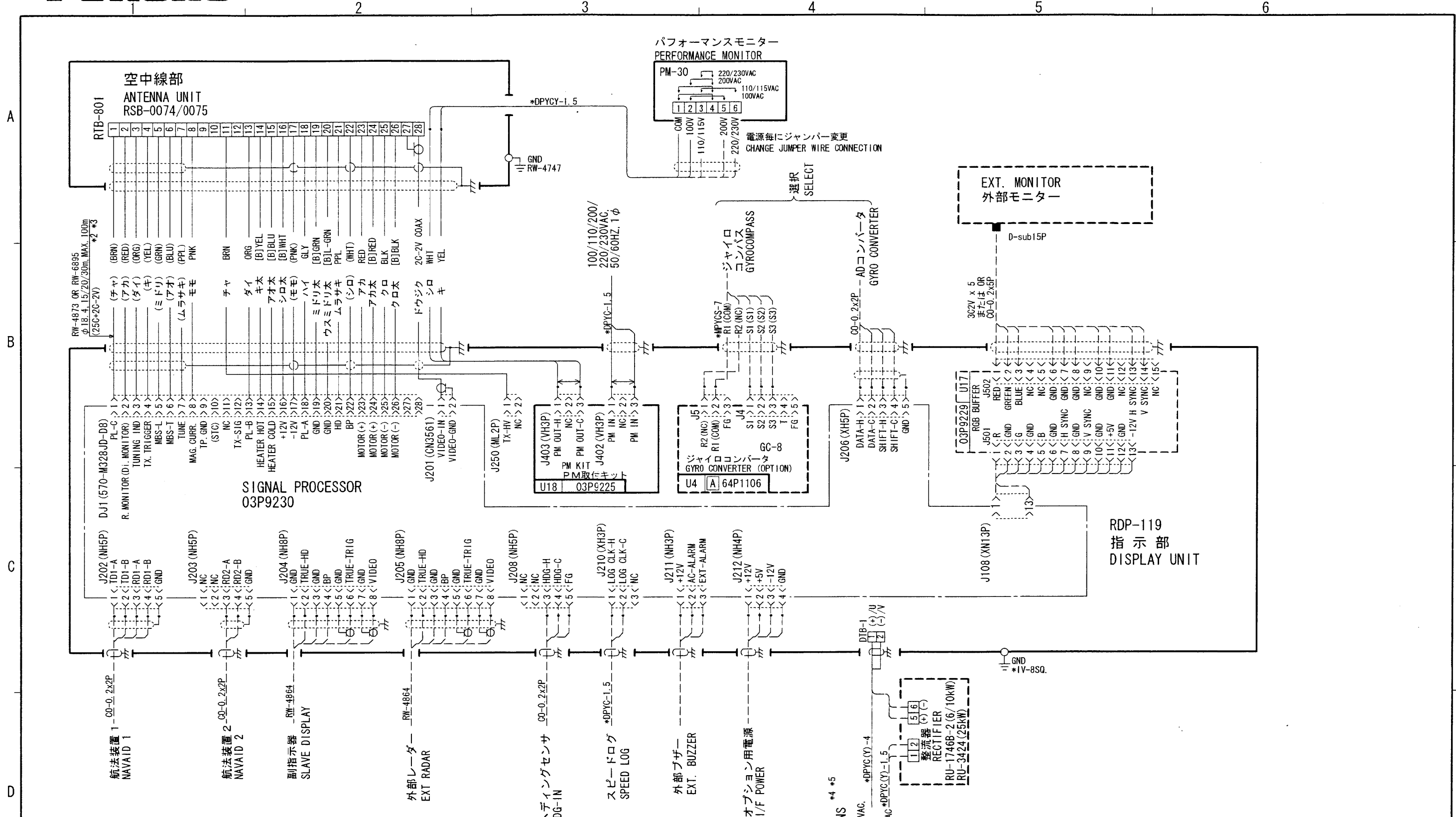
DRAWN Feb 9 '99 T.JAMASAKI	TYPE FR-2125W
CHECKED Feb 9 '99 K.Kusunoki	名称 船舶用レーダー
APPROVED Feb 9 '99 K.Kusunoki	相互結線図
SCALE MASS kg	NAME MARINE RADAR
DWG. No. C3466-C02-B	03-144-6003-2
INTERCONNECTION DIAGRAM	



注記
 1) *造船所手配
 2) () 内のカラーコードは内側シールド内の線を示す。

NOTE
 1. *SHIPYARD SUPPLY
 2. WIRE COLOR CODE () : INSIDE WIRES. [B] : BIG WIRES. L- : LIGHT COLOR.

DRAWN Apr. 17 '02 T. YAMASAKI	TYPE FR/FAR-2855W
CHECKED Apr. 17 '02 Y. K.	名称 船舶用レーダー/衝突予防援助レーダー
APPROVED Apr. 17 '02 Y. K.	相互結線図
SCALE MASS kg	NAME MARINE RADAR / ARPA
DWG. No. C3406-C03- C 03-130-6003-2	INTERCONNECTION DIAGRAM

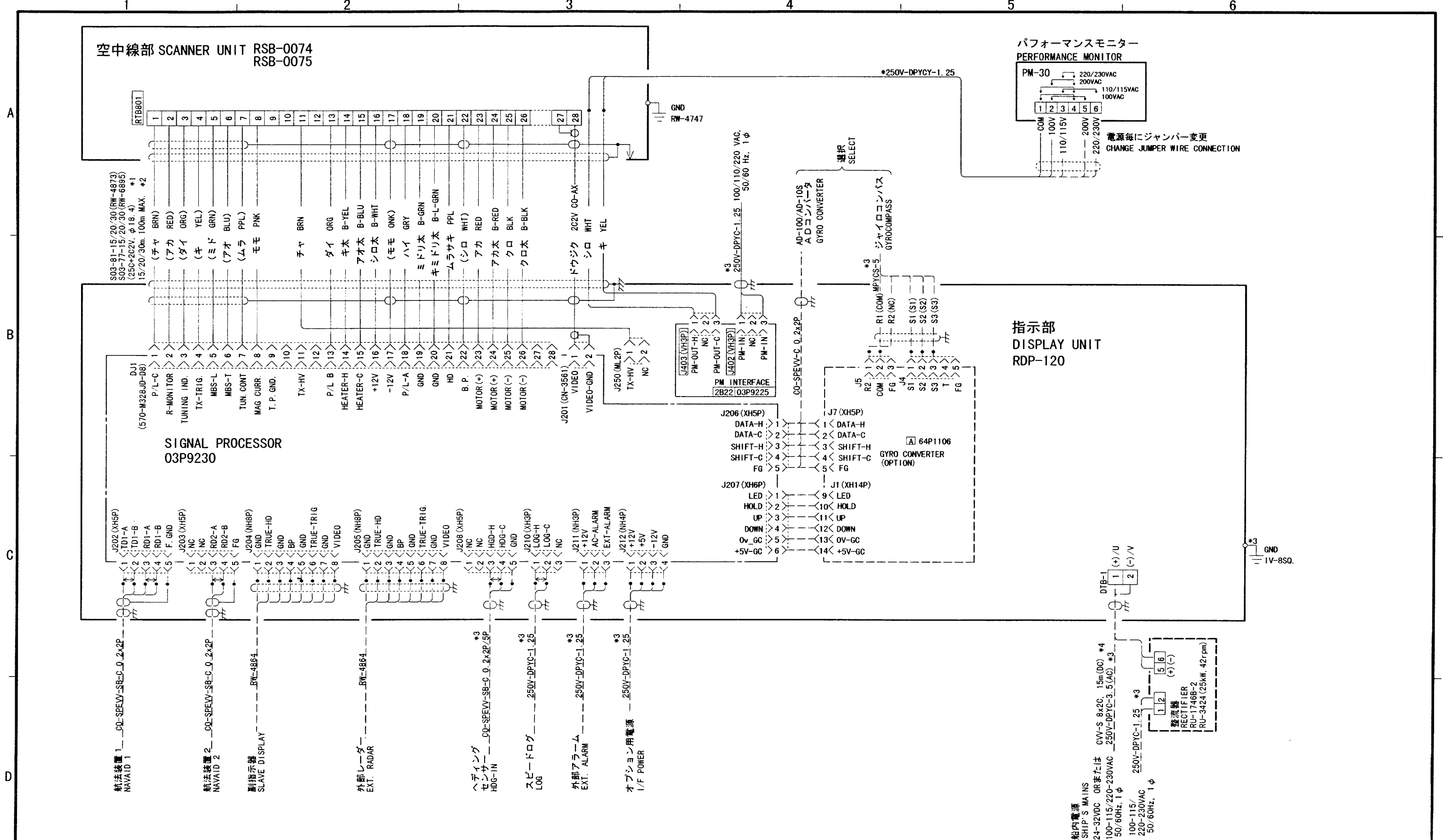


- 注記
- 1) *:造船所手配
 - 2) ()内のカラーコードは内側シールド内の線を示す。
 - 3) シールドは両ユニット側で完全に接地すること。
 - 4) AC入力、DC入力では指示部内の電源部が異なる。
 - 5) 25kW出力または42RPMのとき、DC12V仕様はありません。

- NOTE
1. *:SHIPYARD SUPPLY
 2. WIRE COLOR CODE (): INSIDE WIRES. [B]: BIG WIRES, L-: LIGHT COLOR.
 3. SHIELD SHOULD BE EFFECTIVELY GROUNDED AT BOTH UNIT ENDS.
 4. POWER PCBs FOR AC SUPPLY AND DC SUPPLY DIFFER.
 5. 12VDC MAIN IS NOT AVAILABLE FOR 25kW OR 42 RPM.

CO-0.2x2P: CO-SPEVW-SB-C 0.2x2P, φ10.5
 CO-0.2x5P: CO-SPEVW-SB-C 0.2x5P, φ13.5
 CO-0.2x10P: CO-SPEVW-SB-C 0.2x10P, φ16.5

DRAWN	Oct. 10 '02 T. YAMASAKI	TYPE	FR-1505/1510/1525 MARK-3
CHECKED	Oct. 10 '02 Y. KIMURA	名称	船舶用レーダー
APPROVED	Oct. 10 '02 Y. Kimura		相互結線図
SCALE	MASS kg	NAME	MARINE RADAR
DWG. No.	C3449-C02- G 03-141-6001-2		INTERCONNECTION DIAGRAM



注記
 *1) () で示す線は、内側シールド内の線を示す。
 *2) シールドは両ユニット側で完全に接地すること。
 *3) 造船所手配
 *4) AC入力、DC入力では指示部内の電源部が異なる。

NOTE
 *1: WIRES IN () ARE INNER WIRES.
 *2: SHIELD SHOULD BE EFFECTIVELY GROUNDED AT BOTH UNIT ENDS.
 *3: SHIPYARD SUPPLY.
 *4: POWER PCB'S FOR AC SUPPLY AND DC SUPPLY DIFFER.

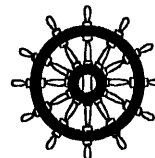
DRAWN June 22 '99 T.YAMASAKI	TITLE FR-1710/1725
CHECKED Jun 22 '99 K.Kawamura	名称 船舶用レーダー
APPROVED Jun 22 '99 K.Kawamura	相互結線図
SCALE MASS	NAME MARINE RADAR
DWG. No. C3453-C02- B	03-142-6001-2 INTERCONNECTION DIAGRAM

FURUNO®

FURUNO ELECTRIC CO., LTD.9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan
Tel: +81 798-65-2111 Fax: +81 798-65-4200

Pub NO. DOC-256

Declaration of conformity to type

We **FURUNO ELECTRIC CO., LTD.**

(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address)

hereby declare under our sole responsibility that the product

Performance monitor model PM-30 for X-band shipborne radars

(Model names, type numbers)

to which this declaration relates conforms to the following standard(s) or normative document(s)

StandardTest standardIMO Resolution A.477 (XII)
IMO Resolution A.694 (17)
IMO Resolution MSC.64(67) Annex 4IEC 60936
IEC 60945

(title and/or number and date of issue of the standard(s) or other normative document(s))

For assessment, see EC – type approval certificate no. 050560/99 of 01 October 1999 issued by Federal Maritime and Hydrographic Agency, the Federal Republic of Germany

This declaration is issued according to the provisions of European Council Directive 96/98/EC on marine equipment modified by Commission Directive 98/85/EC.

On behalf of Furuno Electric Co., Ltd.

Hiroaki Komatsu
Manager,
International Rules and RegulationsNishinomiya City, Japan
December 14, 1999

(Place and date of issue)

(name and signature or equivalent marking of authorized person)