

# FURUNO

## OPERATOR'S MANUAL

RADAR INTERSWITCH UNIT

MODEL RJ-7



**FURUNO ELECTRIC CO., LTD.**  
NISHINOMIYA, JAPAN



© **FURUNO ELECTRIC CO., LTD.**

9-52, Ashihara-cho,  
Nishinomiya, Japan

Telephone: 0798-65-2111  
Telefax: 0798-65-4200

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RJ-7



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RJ-7 Complete Set

	Name	Type	Qty	Remarks
1	Interswitch	RJ-7	1	
2	Interconnection Cable (optional)	RW-9200 *2m* (Code no. 000-132-294)		2m cable for console-type display unit.  One cable per one display unit.
		RW-9200 *10m* (Code no. 000-132-295)		
		RW-9200 *20m* (Code no. 000-132-296)		

# 1. OPERATION

The RJ-7 is operated through the RADAR menu of following radars.

FR-2100 series ;

FR-2110 / 2120 / 2150 / 2120W / 2150W / 2130S /  
2160DS / 2130SW / 2160SW

FR/FAR-2805 series ;

FR/FAR-2815 / 2825 / 2855 / 2825W / 2855W /  
2835S / 2835SW / 2865SW

FR-2105 series;

FR-2115/2125/2155/2125W/2135S/2165DS/2135SW

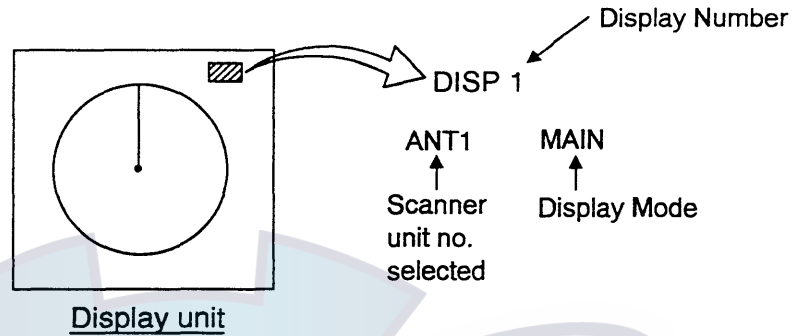
## Note

Take the followings into consideration.

- 1) Interswitching takes about 5 seconds. (The system stops transmitting for about 5 seconds when switching.)
- 2) A scanner unit cannot be controlled from the multiple display units, so one Master display unit should be selected for one scanner unit.
- 3) A scanner unit without a Master display unit cannot be selected on the sub display units.
- 4) Starting and stopping of a scanner is done by the display unit with which it is connected.
- 5) Error messages "WARNING 1" and "WARNING 2" are displayed at the upper right-hand corner (FR-2100 series) or at the middle (FR/FAR-2805 series) in the menu,
  - (1) When the scanner unit is already selected by another display unit. – WARNING 1
  - (2) When the selected scanner unit is not connected to Master display unit or does not transmit.  
– WARNING 2

### Interswitching

You may select display and scanner combination as follows. The selected scanner unit is indicated at the upper right-hand on the screen together with display number and mode.



**All display units must be turned on (set to "ST-BY") to use the RJ-7. Power to a scanner unit is supplied from the display with which it is connected.**

1. Press ( for 2805 series, for 2105 series) in this order. The INTER-SWITCH RJ-7 menu appears, showing current combinations. (The menu differs if the radar is set to "SUB" on the item "Display" of the INITIAL SETTING menu. See Fig. 1-3.)

[INTERSWITCH RJ-7]

1. [SYSTEM SETTING 1]
2. DISP 1 → ANT 1 (M)     ••• 3 •••
3. DISP 2 → ANT 2 (M)     •• 1 •••••
4. DISP 3 → ANT 2 (S)     ••• 2 •••
5. DISP 4 → ANT 4 (M)     •••• 4 ••
6. STORE SETTING
- 7.
- 8.
- 9.
0. INITIAL SETTING

FR-2100 series

[INTERSWITCH RJ-7]

1. [SYSTEM SETTING 1]
2. DISP 1 → ANT 1 (M)
3. DISP 2 → ANT 2 (M)
4. DISP 3 → ANT 2 (S)
5. DISP 4 → ANT 4 (M)
- 3 •••
- 1 •••••
- 2 •••
- 4 ••
6. STORE SETTING
0. INITIAL SETTING

FR/FAR-2805 series

Fig. 1-1 INTERSWITCH RJ-7 menu

Right quarter of the menu shows the scanner locations preset by an installation engineer. The scanner unit number matches the display number as below.

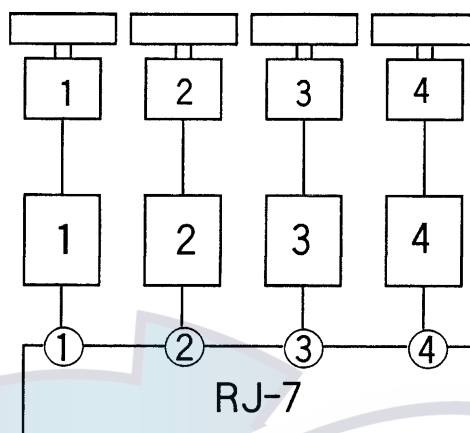


Fig. 1-2 Display unit and scanner unit numbers

2. Select the combination. For example, to control the transmitter in scanner unit no. 1 from display unit no. 2, press the  key to display ANT 1(M) on the DISPLAY 2 line. Each time the  key is pressed the display changes in the following sequence.

ANT 2 (M) → ANT 2 (S) → ANT 3 (M) → ANT 3 (S) →  
ANT 4 (M) → ANT 4 (S) → ANT 1 (M) → ANT 1 (S)

There are two operating modes: Main (M) and Sub (S). Select "Sub" to have display function as monitor which cannot control the transmitter of scanner.

3. Press the  followed by  key to complete the selection.

When the display unit is set to "SUB" on the INITIAL SETTING 2 menu, the following menu appears. Use the 2 key to select the scanner unit. In Fig. 1-3, display unit receives target echoes from scanner unit no. 2.

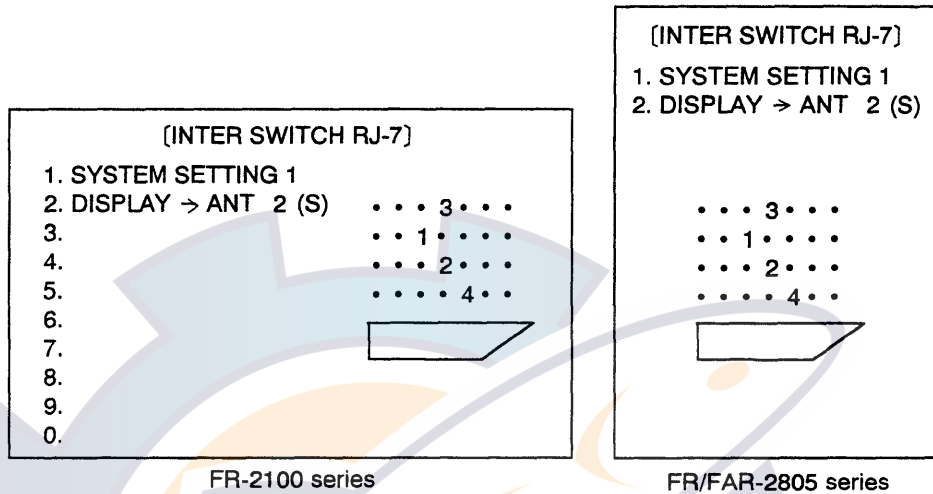


Fig. 1-3 INTERSWITCH RJ-7 menu, when radar functions as slave

## 2. INSTALLATION

### Mounting

The RJ-7 is designed to be mounted inside the console of the FR-2100, FR/FAR-2805 and FR-2105 series radars: Use four M5 threaded holes in the rear panel. See page 2-10.

### Wiring

The figure below shows the connection of the RJ-7 to the radar systems. A display unit is connected to the RJ-7 with a supplied cable of which connectors are factory-wired at both ends. Up to six display units can be connected, but two of them should be "monitors" which have no scanner unit and no capability of controlling the transmitter of the radar systems.

In the console-type display unit the interconnection cable is fastened by the cable clamp close to terminal board DTB-1 which is used for power connection.

#### FR-2100 series

The interconnection cable supplied is fabricated for FR-2100 series radars.

#### FR/FAR-2805 series, FR-2105 series

The cable sheath must be removed at the cable clamp for grounding.

The RJ-7 does not require connection of a power supply.

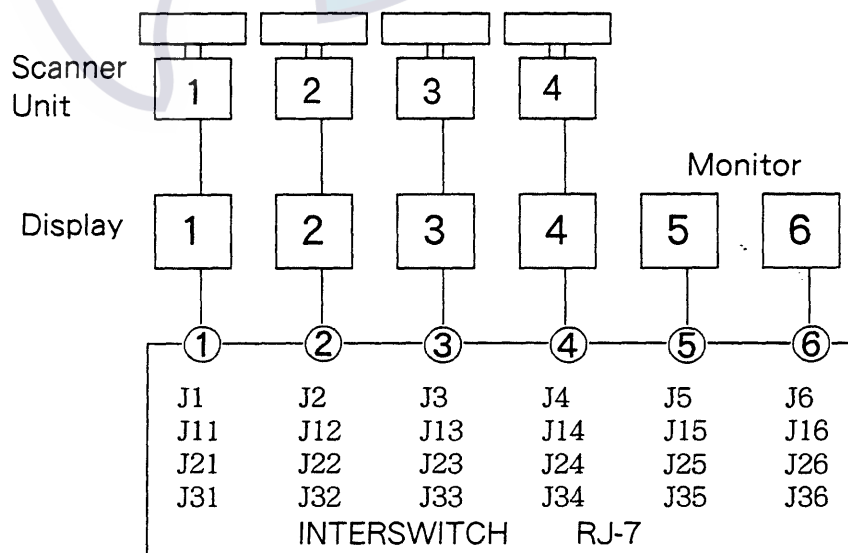
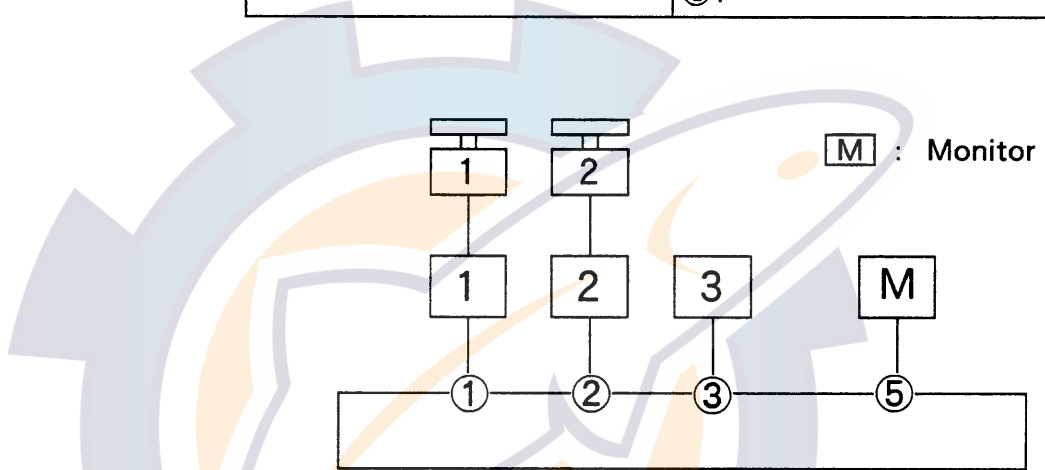


Fig. 2-1 Connection of RJ-7

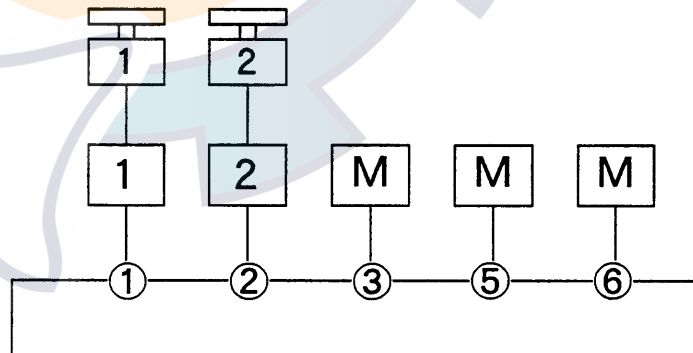


The table below provides connection information of the RJ-7. If some connectors are not used, they should be higher numbers. For example, if the vessel has dual radars only, connect them to ① and ② .

Type of Display Unit	Connectors to be used in RJ-7
Display unit with scanner unit	① thru ④
Display unit without scanner unit	② thru ④
Monitor (Display unit capable only of receiving target echoes)	⑤ and ⑥ ; When connecting more than 3 monitors, use ② thru ④ .



*Fig. 2-2 Example 1) Two radar systems, one display without scanner unit, and one monitor*



*Fig. 2-3 Example 2) Two radar systems and three monitors*

Connect the radar systems to the RJ-7, referring to the table on the next page.

## Connection of RJ-7 to Radars

Radar Display Unit			Type of Interconnection Cable	RJ-7		
Display Number	Connector on INT-9113	No. of Pins		Connector on RJ-9118	No. of Pins	
No.1	J457	15P	RW-9200 ( $\phi$ 15.2) • 2m, 10m or 20m • Connectors factory-wired	①	J1	10P
	J458	8P			J11	4P
J21					8P	
J31	3P					
No.2	J457	15P	ditto	②	J2	10P
	J458	8P			J12	4P
J22					8P	
J32	3P					
No.3	J457	15P	ditto	③	J3	10P
	J458	8P			J13	4P
J23					8P	
J33	3P					
No.4	J457	15P	ditto	④	J4	10P
	J458	8P			J14	4P
J24					8P	
J34	3P					
No.5	J457	15P	ditto	⑤	J5	10P
	J458	8P			J15	4P
J25					8P	
J35	3P					
No.6	J457	15P	ditto	⑥	J6	10P
	J458	8P			J16	4P
J26					8P	
J36	3P					

**Modification  
(FR-2100,FAR/  
FR-2805 series  
only)**

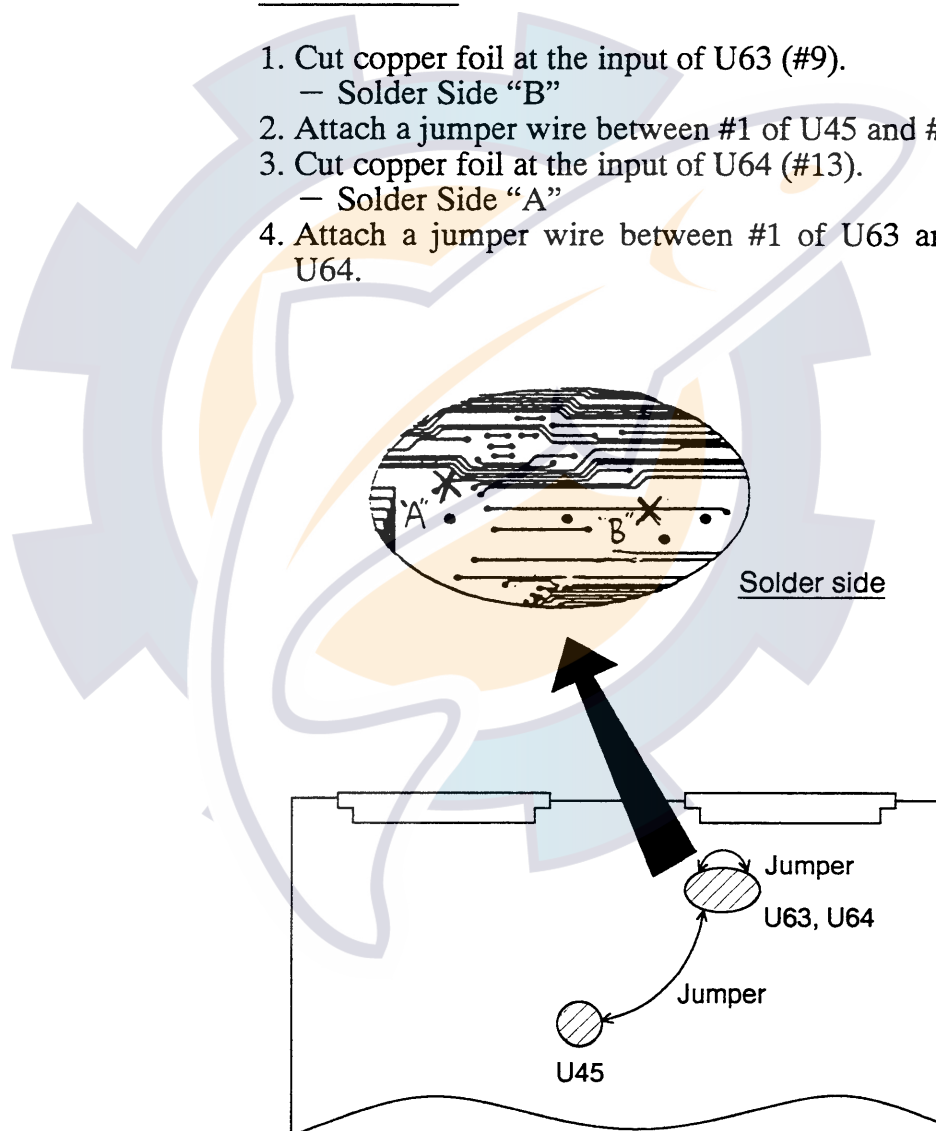
The SPU Board (03P9111) in the radar display unit may be modified for the connection of the RJ-7. Use a very sharp soldering tip.

Board level-0:

1. Cut copper foil at the input of U64 (#13).  
– Solder Side “A”
2. Attach a jumper wire between #1 of U63 and #13 of U64.

Board level-1:

1. Cut copper foil at the input of U63 (#9).  
– Solder Side “B”
2. Attach a jumper wire between #1 of U45 and #9 of U63.
3. Cut copper foil at the input of U64 (#13).  
– Solder Side “A”
4. Attach a jumper wire between #1 of U63 and #13 of U64.



*Fig. 2-4 SPU Board, parts side*

Board level-3 and after:

No modification required.

### Change of Program ROM

Confirm that the program ROMs for the radar and RJ-7 conform to the table below. If not, change the program ROM(s).

*Table 2-1 Program ROM*

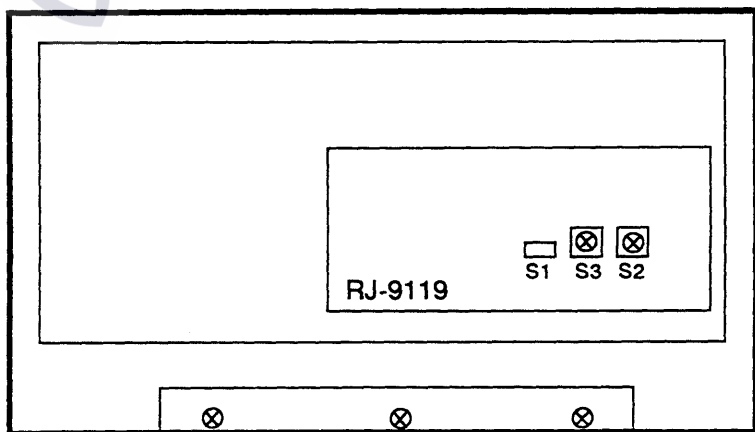
Radar	SPU Board	Parts No. on schematic Diagram	Available Version	RJ-7 (RJ-9119, U10)
FR-2100 series	03P9111	U15	-25 or above (03590761**)	-02 or above (03590661**)
		U58	-32 or above (03590571**)	
FAR/FR-2805 series		U15	-15 or above (03590961**)	
		U58	-32 or above (03590571**)	
FR-2105 series	03P9253	U11	-02 or above (03590491**)	

### Switch setting

There are three switches on the RJ-9119 Board in the RJ-7. These should be set as shown in the table below.

*Table 2-2 DIP switch settings*

Switches	Remarks
S1	#1 "ON"
	#2 Set to "OFF" only when ② is not used or when ② is selected as a monitor (remote radar display).
	#3 Set to "OFF" only when ③ is not used or when ③ is selected as a monitor (remote radar display).
	#4 Set to "OFF" only when ④ is not used or when ④ is selected as a monitor (remote radar display).
S2	Select total number of display units (including monitors) to be connected to RJ-7.
S3	Select total number of scanner units connected to RJ-7.





*Fig. 2-5 RJ-7 with cover removed*

## Menu setting

Set up the RADAR menu as follows.

1. (FR-2100, FAR/FR-2805 series)  
Set switch #4 of S1 on the SPU Board to "ON" position, and after turn on the radar.

(FR-2105 series)

Press  five times while holding  down.

2. Confirm that Radar Position on the INITIAL SETTING1 menu is entered correctly.

3. Set the RJ-7 to "ON" on the INTIAL SETTING 4 menu.

4. If necessary, select "SUB" on the INITIAL SETTING 2 menu.

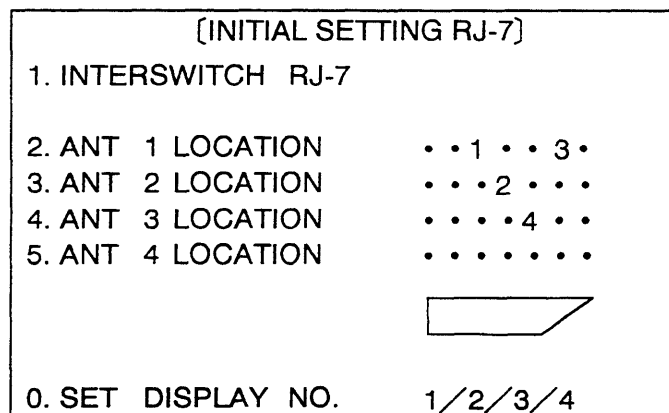
5. Turn off the radar.

6. To call up the INITIAL SETTING RJ-7 menu,

press     for FR-2100 series, press

    for FR/FAR-2805 series or press

     for FR-2105 series.



*Fig. 2-6 INITIAL SETTING RJ-7 menu  
for FR-2100 series*

The trapezoid at the right-hand side of the display depicts the vessel with heading right.

28 scanner locations are selectable by 4 rows  $\times$  7 dots. The top row is the highest location and far right hand dots are the most fore location.

In Fig. 2-6, scanner unit no. 1 is mounted at highest location and far aft of other scanner.

### Display Number Selection

7. Pressing the  key to shift the cursor, place the cursor onto the number corresponding to the display number you want. If you select a display number which you've already entered, an error message appears. Try again.

8. Press the  key to store the selected display number in the memory.

### Antenna Location Input

9. Place the cursor on the dot which represents where the scanner unit is installed. Each press of a numeral key moves the cursor from left to right, and from top to down. Use the  key to select the location of no. 1 scanner unit.

You need only enter antenna locations into one radar, input data is transferred to other radar displays automatically.

10. Press the  key.

11. Do the same for no. 2 thru no. 4 scanner units, using the , , , and  keys.




Note) Enter antenna locations again when the display number is changed.

## Adjustment

After completing the connection of the cable and menu setting, adjust video signal level as follows so that the same echo level is obtained with any display and scanner combinations.

1. To call up the INITIAL SETTING RJ-7 menu,



press    for FR-2100 series,

press    for FR/FAR-2805 series or

press     for FR-2105 series.

2. Set the combination between the display and scanner units as follows (parallel connections).

Display 1	.....	ANT 1 (M)
Display 2	.....	ANT 2 (M)
Display 3	.....	ANT 3 (M)
Display 4	.....	ANT 4 (M)

To select "ANT 1 (M)" on the Display 1, for example, press the  key until the ANT 1 (M) appears. (The  key is used since the Display 1 line is the second row from top.)

Each press changes the scanner unit number and the display operating mode in the following sequence:

ANT 1 (M) → ANT 1 (S) → ANT 2 (M) → ANT 2 (S) →  
ANT 3 (M) → ANT 3 (S) → ANT 4 (M) → ANT 4 (S) →  
ANT 1 (M)

M means Master display; S means Slave display.

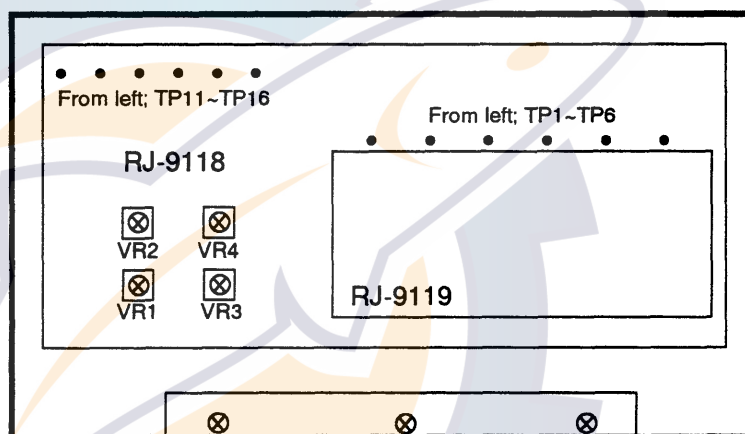
3. Transmit the radar on 48 nm range.

4. Adjust the video output level of the RJ-7 to show 4.2 Vp-p.

The check points and adjusters on the RJ-9118 Board inside the RJ-7 are tabulated below.

*Table 2-3 Adjustment of Video Signal Level (RJ-7)*

Scanner Unit	Check point (video output)	Trigger	Adjuster	Rating
ANT 1	TP11	TP1	VR1	4.2 V <sub>p-p</sub>
ANT 2	TP12	TP2	VR2	
ANT 3	TP13	TP3	VR3	
ANT 4	TP14	TP4	VR4	



*Fig. 2-7 RJ-7 with cover removed*

5. On the INTERSWITCH RJ-7 menu, change the combination between the display and scanner units as shown below (cross connections).

- Display 1 ..... ANT 2 (M)
- Display 2 ..... ANT 1 (M)
- Display 3 ..... ANT 1 (S)
- Display 4 ..... ANT 1 (S)
- MONIT ..... ANT 1 (S)

6. Transmit the radar on 48 nm range.

7. Adjust VR401(VR2) on the INTERFACE Board in the radar display unit so that video output from the INT Board is 4.2 V<sub>p-p</sub>. See table 2-4 for details.

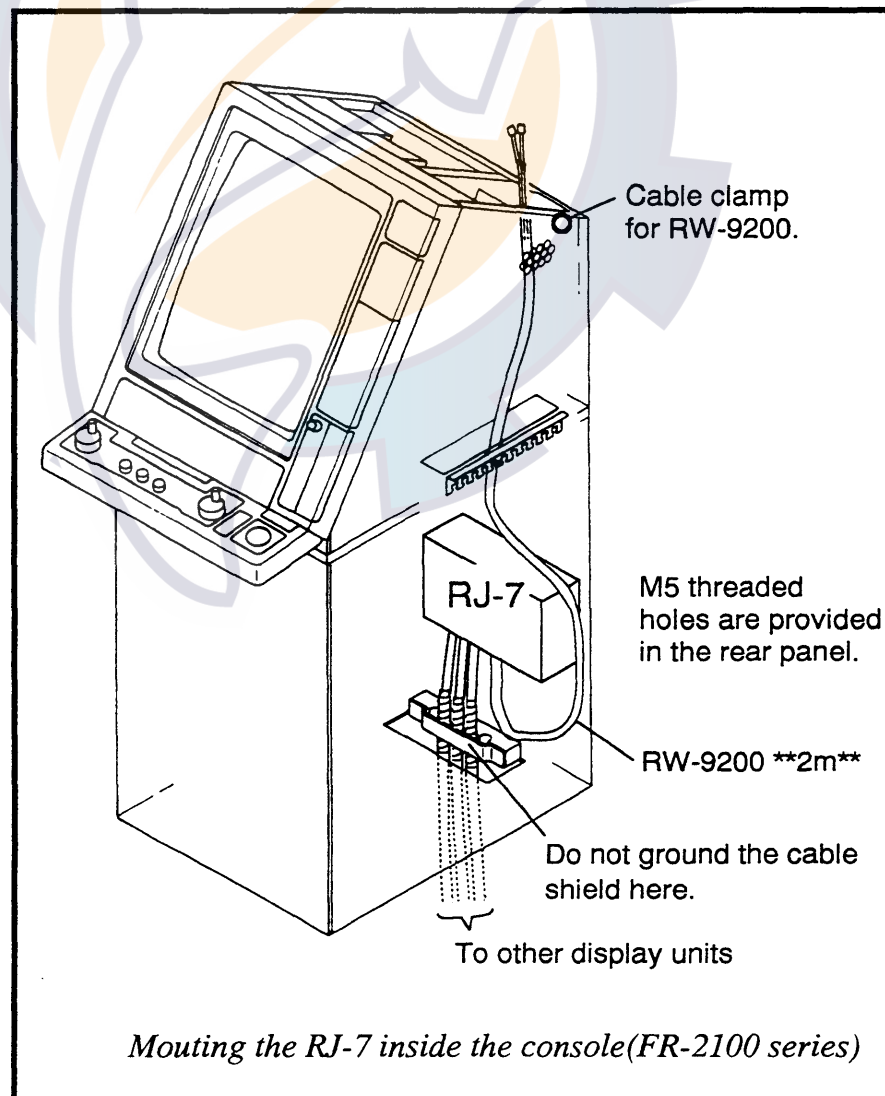


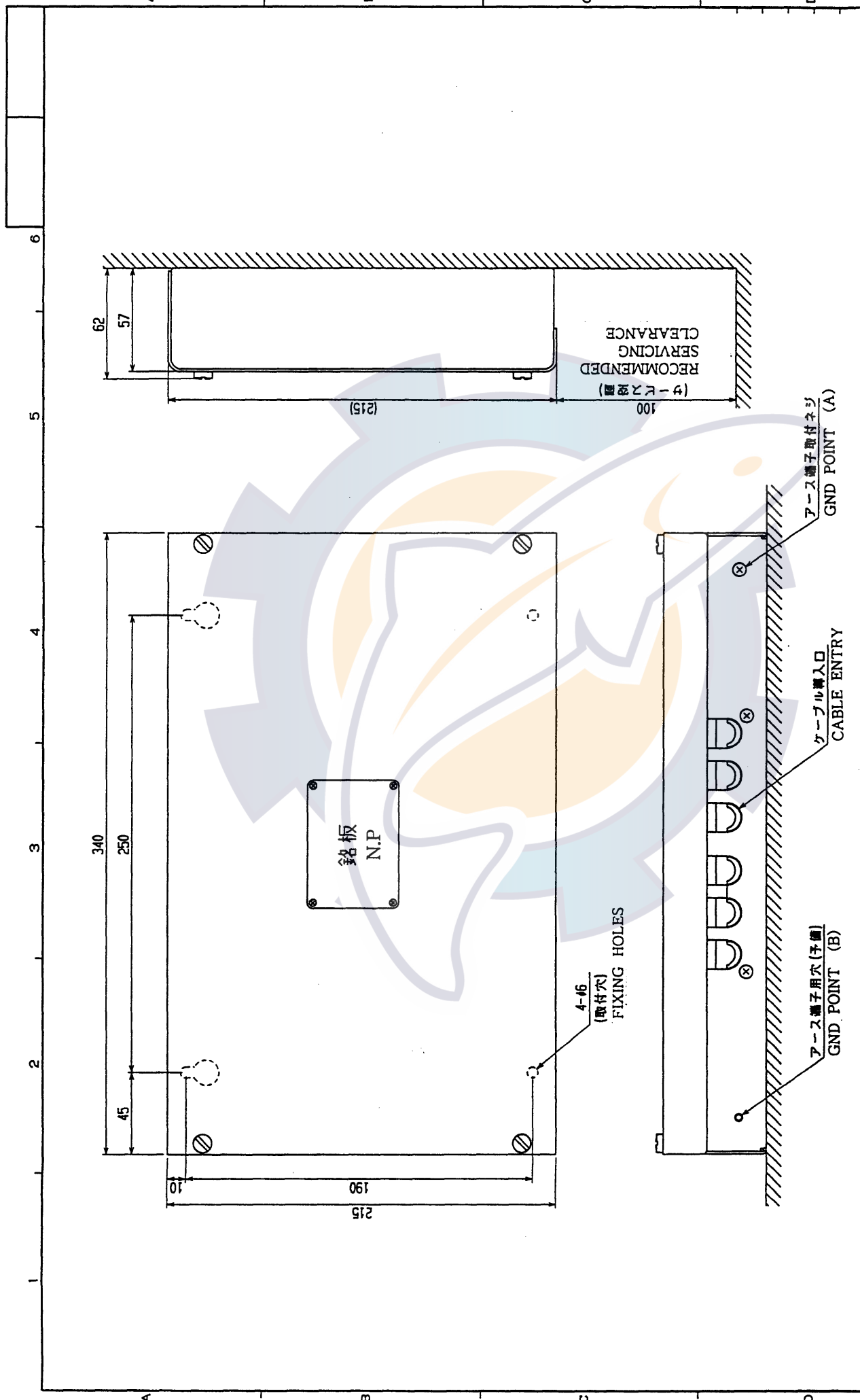
*Table 2-4 Adjustment of video signal level (radar, INT-9113)*

Model	Check point	Trigger	Adjuster	Rating
FR-2100 series	TP406 (INT-9113)	TP401 #C (INT-9113)	VR401 (INT-9113)	4.2 V <sub>p-p</sub>
FR/FAR-2805 series	TP3 (INT-9170)	TP11 (VDA-9114)	VR2 (INT-9170)	4.2V <sub>p-p</sub>
FR-2105 series	TP3 (03P9252)	J458#6 (03P9252)	R143 (03P9252)	4.2V <sub>p-p</sub>

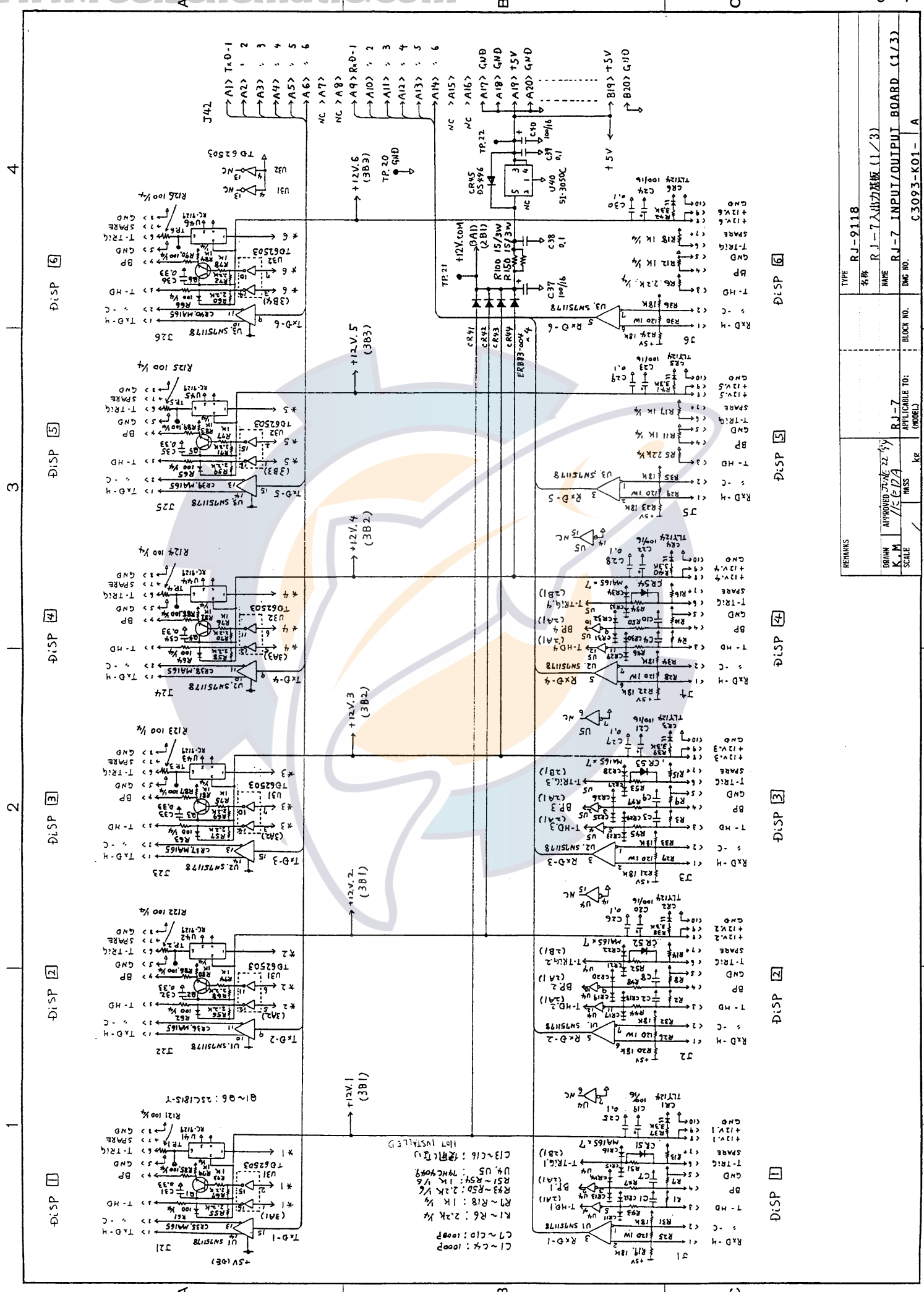
8. (FR-2100 series and FAR/FR-2805 series)  
Set switch #4 of S1 on the SPU Board to "OFF" position.

(FR-2105 series)  
Turn the power off.



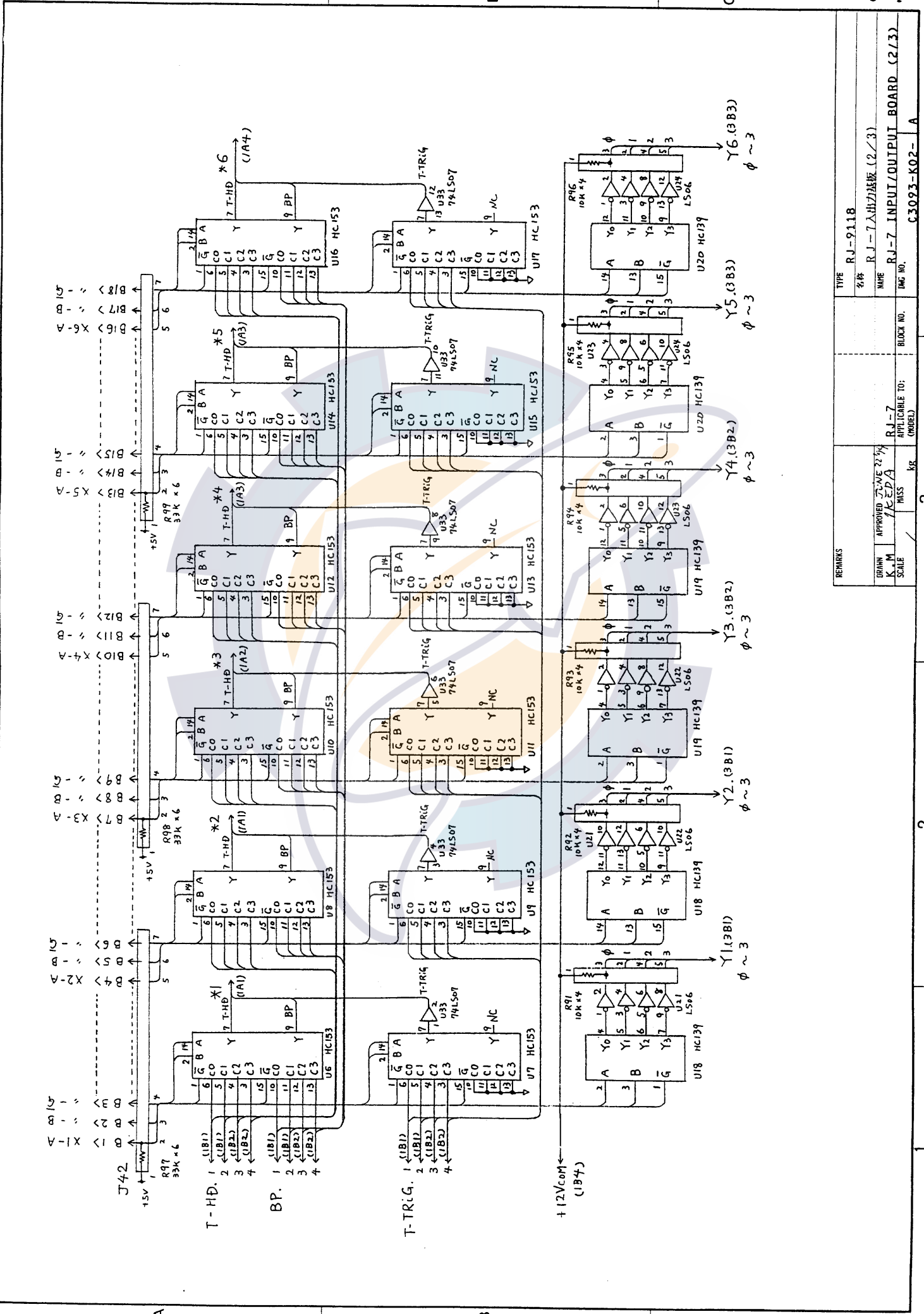


REMARKS		TYPE	
注記：取付ネジは+トラスタッピング径5×20を使用のこと NOTE: FIX THE UNIT BY USING FOUR TAPPING SCREWS (φ5×20).		RJ-7	
DRAWN K.M		名称 インタースイッチ外形図	
SCALE 1:1		NAME INTER SWITCH UNIT	
APPROVED 50/16 22/9 KEDA		BLOCK NO.	
MASS 1.7 kg		DWG NO. C3093-G01-A	
APPL. CABLE TO: (MODEL)			



REMARKS	TYPE R.J-9118
NAME R.J-7输入/输出板(1/3)	
APPLICABLE TO: R.J-7 (MODEL)	
BLOCK NO. C3093-K01-A	
SCALE 1/10	
DATE 2002.12.22	
DRAWN K.M	
CHECKED C.M	
APPROVED Z.M	

DISP 1	DISP 2	DISP 3	DISP 4	DISP 5	DISP 6	DISP 7	DISP 8
--------	--------	--------	--------	--------	--------	--------	--------



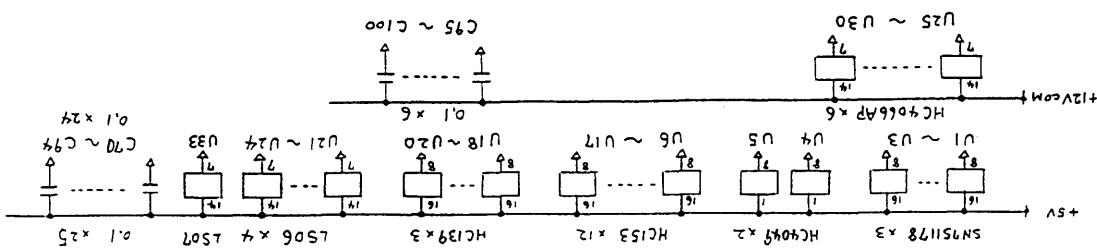
REMARKS		TYPE	
DRAWN	APPROVED	名称	RJ-9.1.18
K.M.	7/2/79	图号	RJ-7 输入/输出板 (2/3)
SCALE	MISS	图号	RJ-7 INPUT/OUTPUT BOARD (2/3)
		BLOCK NO.	3
		APPLICABLE TO:	(MODEL)
		BLOCK NO.	3
		图号	C3093-K02-A

4

3

2

1



D:SP 6

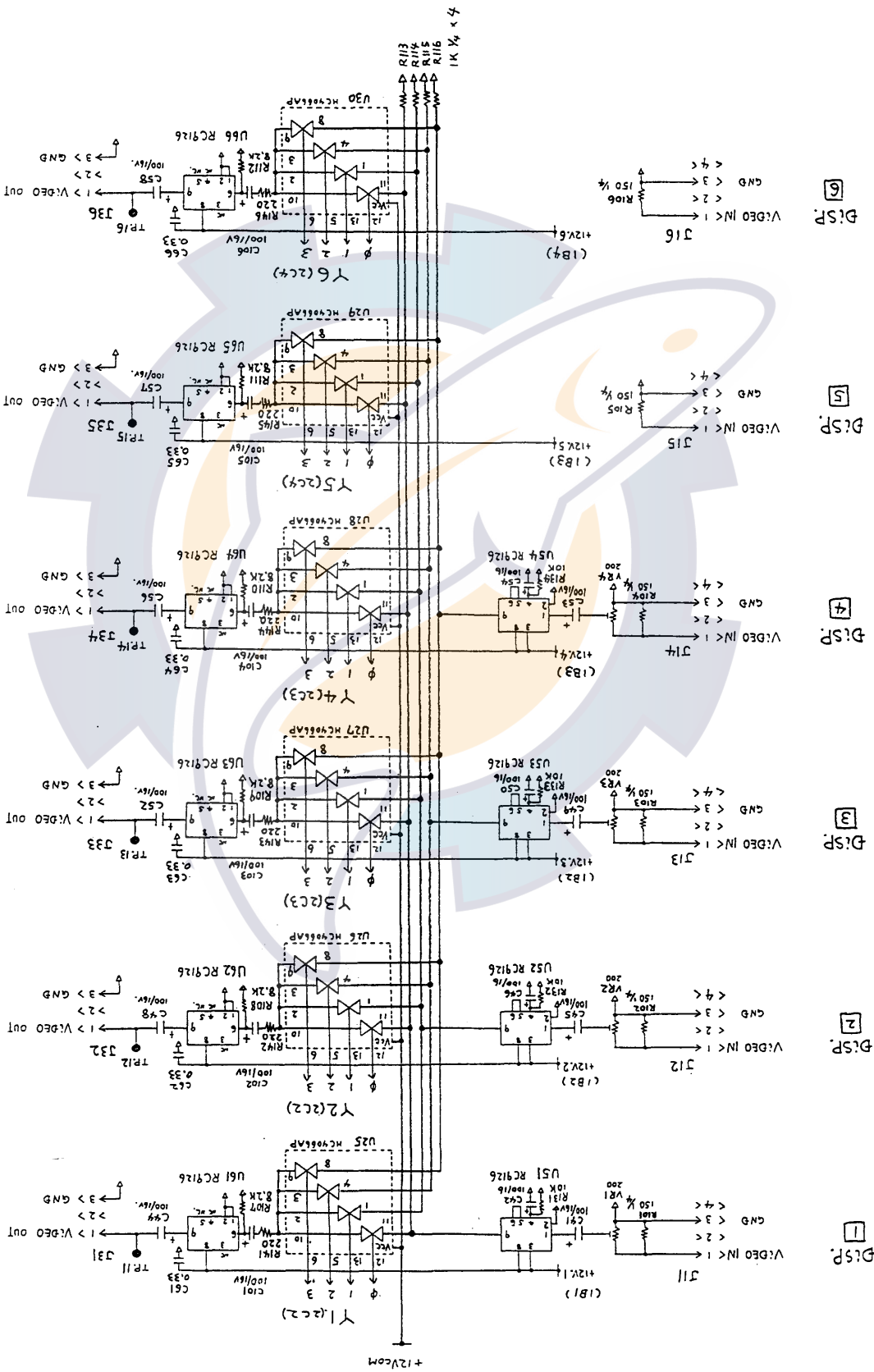
D:SP 5

D:SP 4

D:SP 3

D:SP 2

D:SP 1



REVISIONS	APPROVED: P. HE 2.2.74 K. M. SCHULZ	APPLICABLE TO: R J-7 (MODEL)	BLOCK NO.	TYPE: RJ-9118
	NAME: R J-7 INPUT/OUTPUT BOARD (3/3)	DATE: 3/3/73		NAME: R J-7 INPUT/OUTPUT BOARD (3/3)
				DATE: 3/3/73
				DATE: 3/3/73

3

2

1