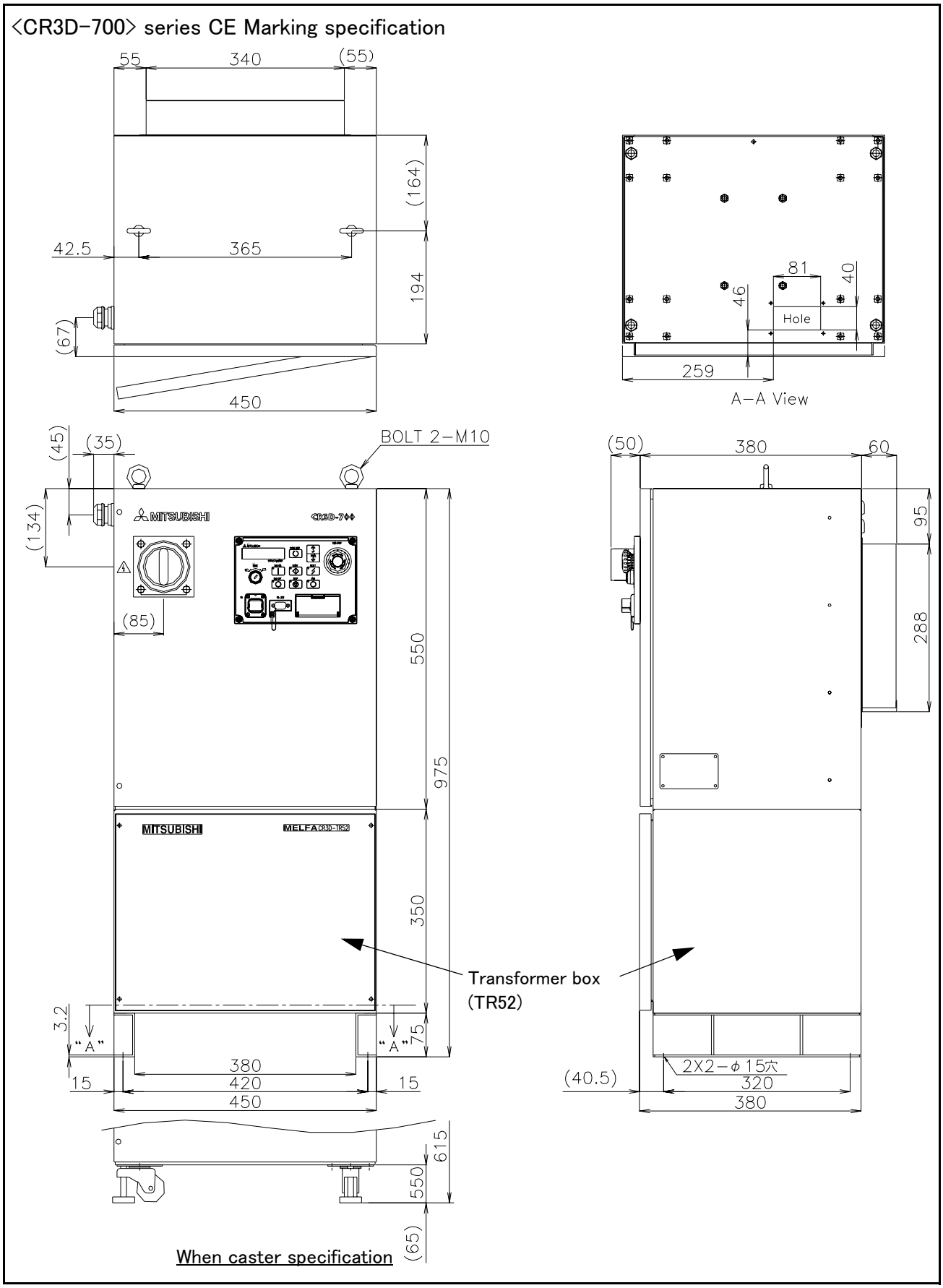
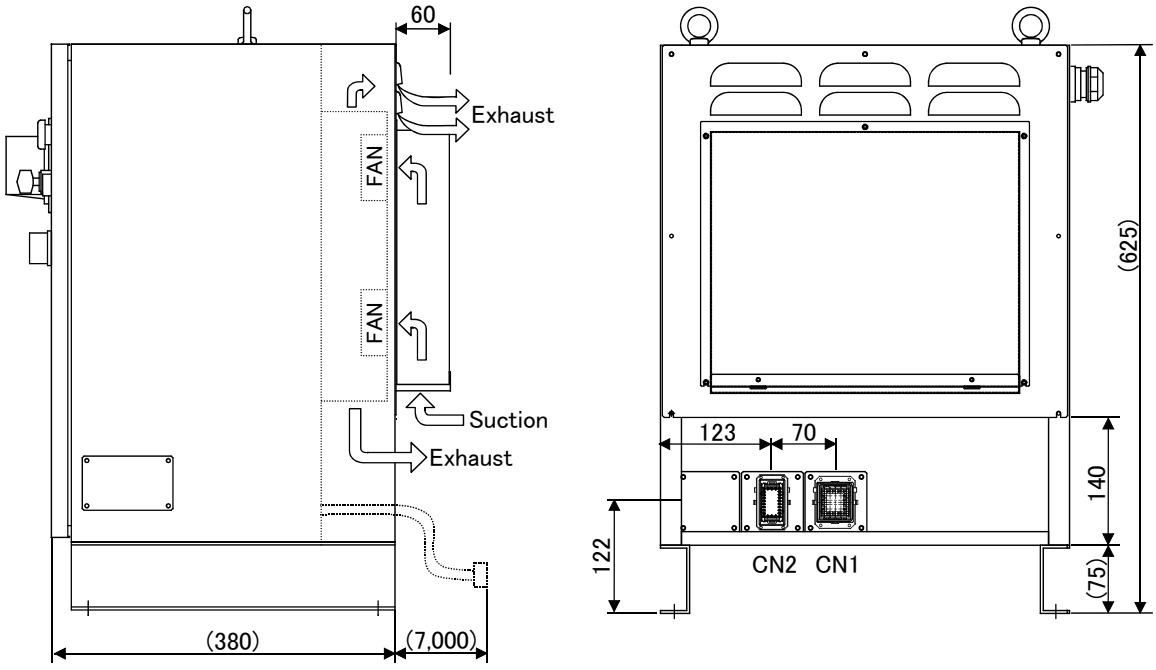


Fig.3-12 : Outside dimensions of controller(CR3D-700 CE Marking)

<CR3D-700M> series

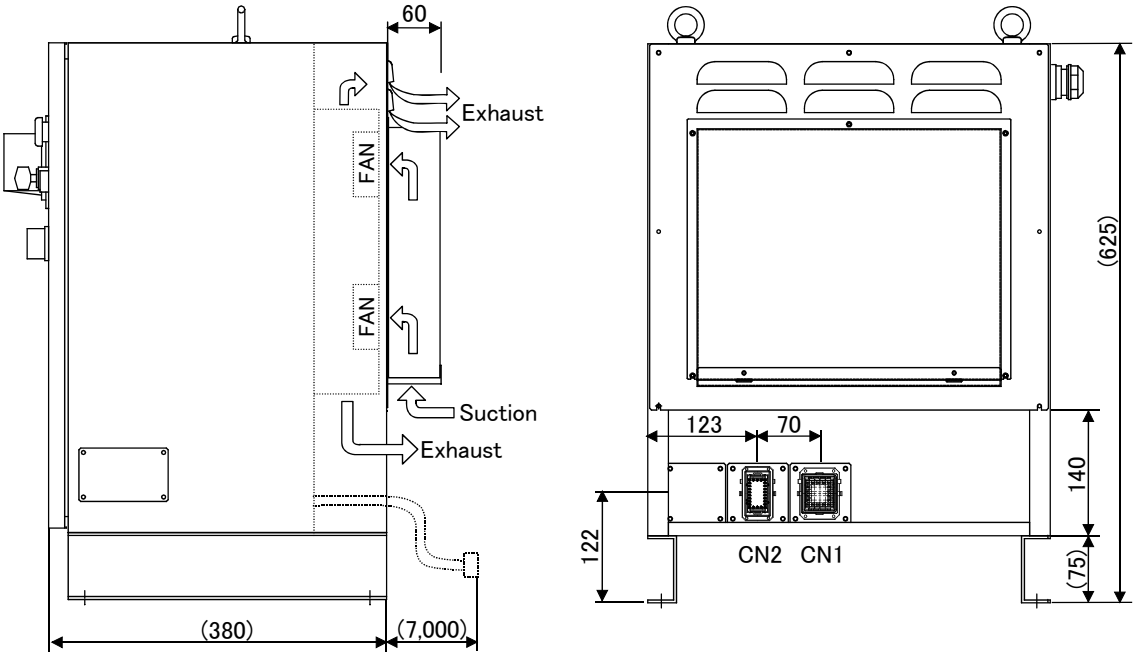


(Right side drawing) (Back drawing)

Note) As for CE specification, the transformer box is installed in the controller bottom.
Refet to Fig. 3-12

Fig.3-13 : Outside dimensions of controller (CR3D-700M Supplement)

<CR3D-700> series



(Right side drawing) (Back drawing)

Note) As for CE specification, the transformer box is installed in the controller bottom.
Refet to Fig. 3-12

図 3-14 : Outside dimensions of controller (CR3D-700 Supplement)

3.3.2 Installation dimensions

<CR1D-700 series>

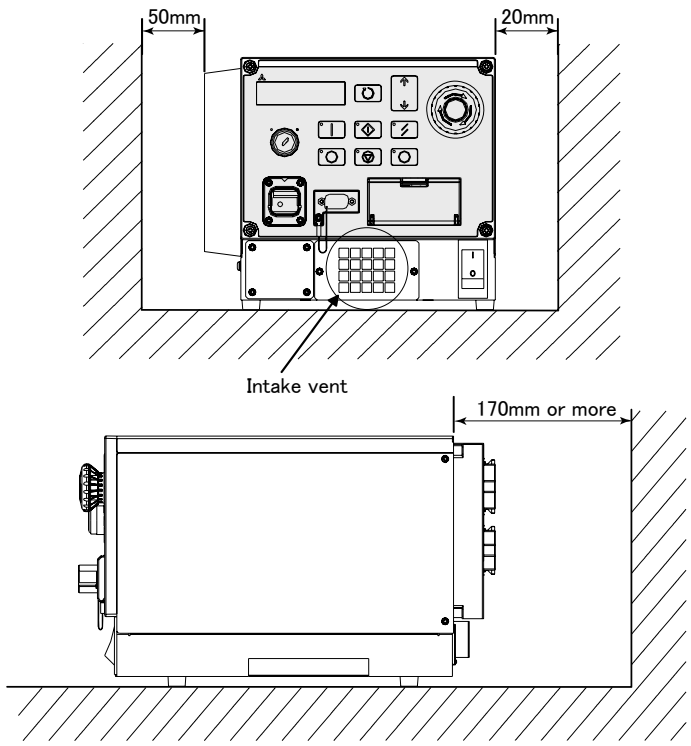
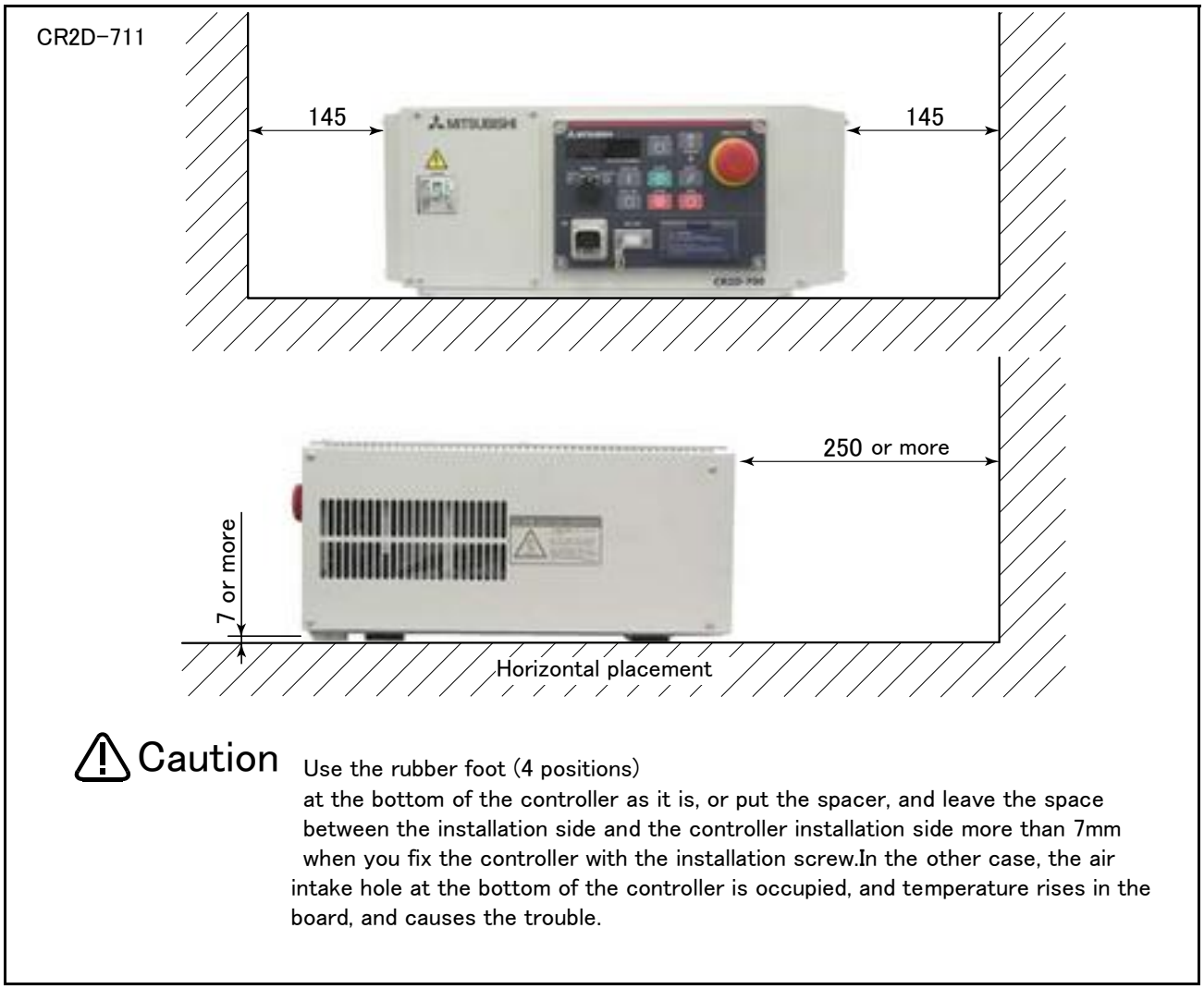


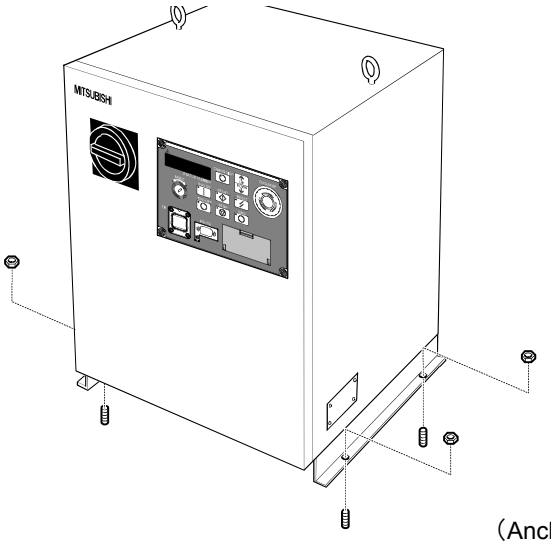
Fig.3-15 : Installation of controller(CR1D-700 series)



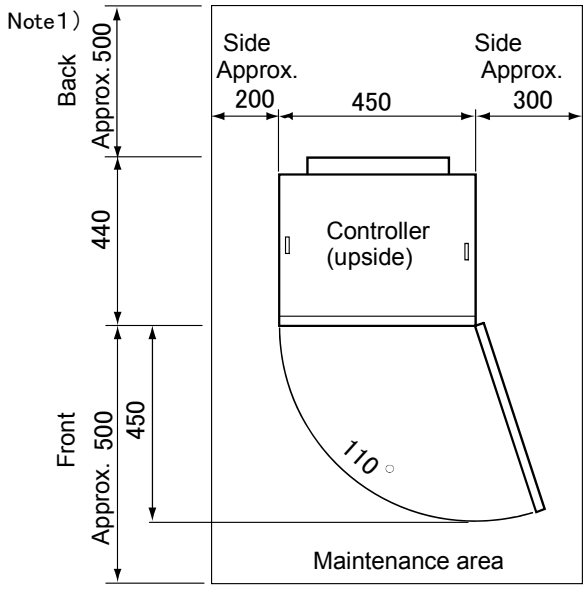
⚠ Caution Use the rubber foot (4 positions)
at the bottom of the controller as it is, or put the spacer, and leave the space between the installation side and the controller installation side more than 7mm when you fix the controller with the installation screw.In the other case, the air intake hole at the bottom of the controller is occupied, and temperature rises in the board, and causes the trouble.

Fig.3-16 : Installation of controller(CR2D-700 series)

<CR3D-700M series>



(Anchor bolt installation: 4 places)



(View from upside)

Note1) The controller sucks in the outside air and discharges the inside air after cooling (Fig. 3-20). The space required for cooling is 100 mm minimum. Reserve approximately 500 mm of space behind the unit as the maintenance work area.

Note) As for CE specification, the transformer box is installed in the controller bottom.
Refet to Fig. 3-12

Fig.3-17 : Installation of controller (CR3D-700M series)

The controller has the openings parts for pulling out the cable as shown in Fig. 3-18, Fig. 3-19 and Fig. 3-20.

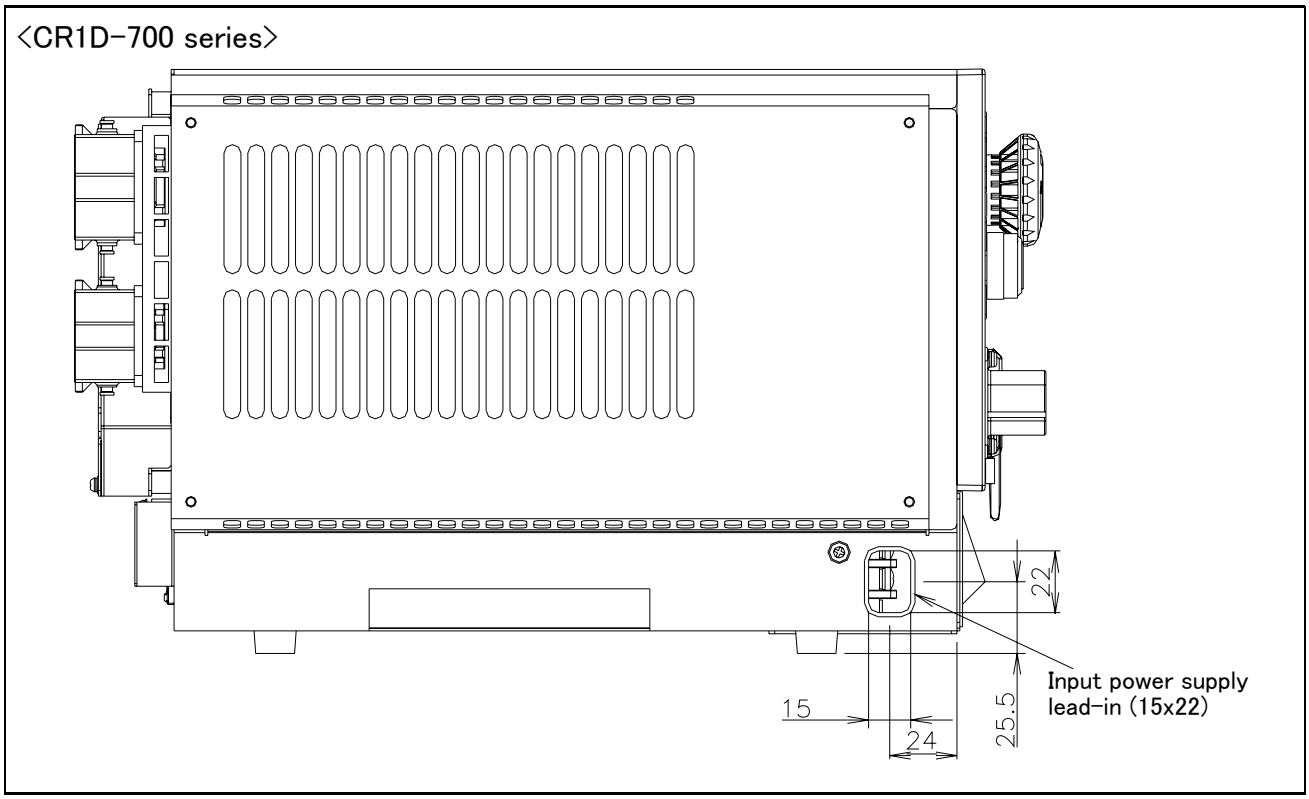


Fig.3-18 : Cable lead-in and dimension of the controller (CR1D-700 series)

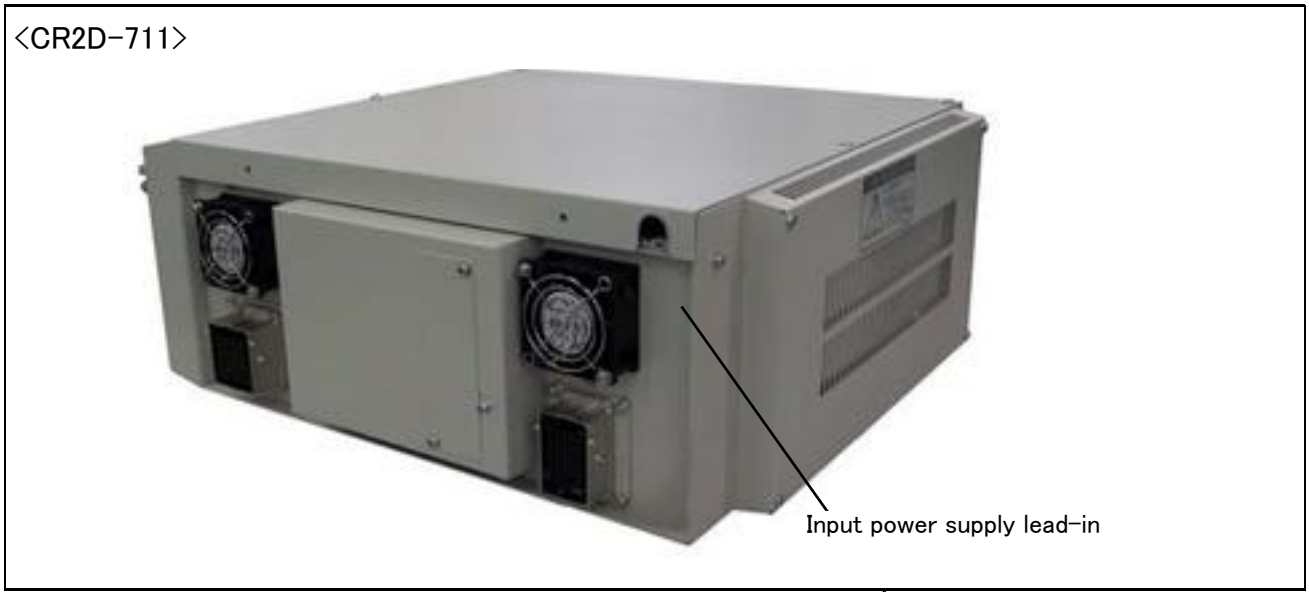
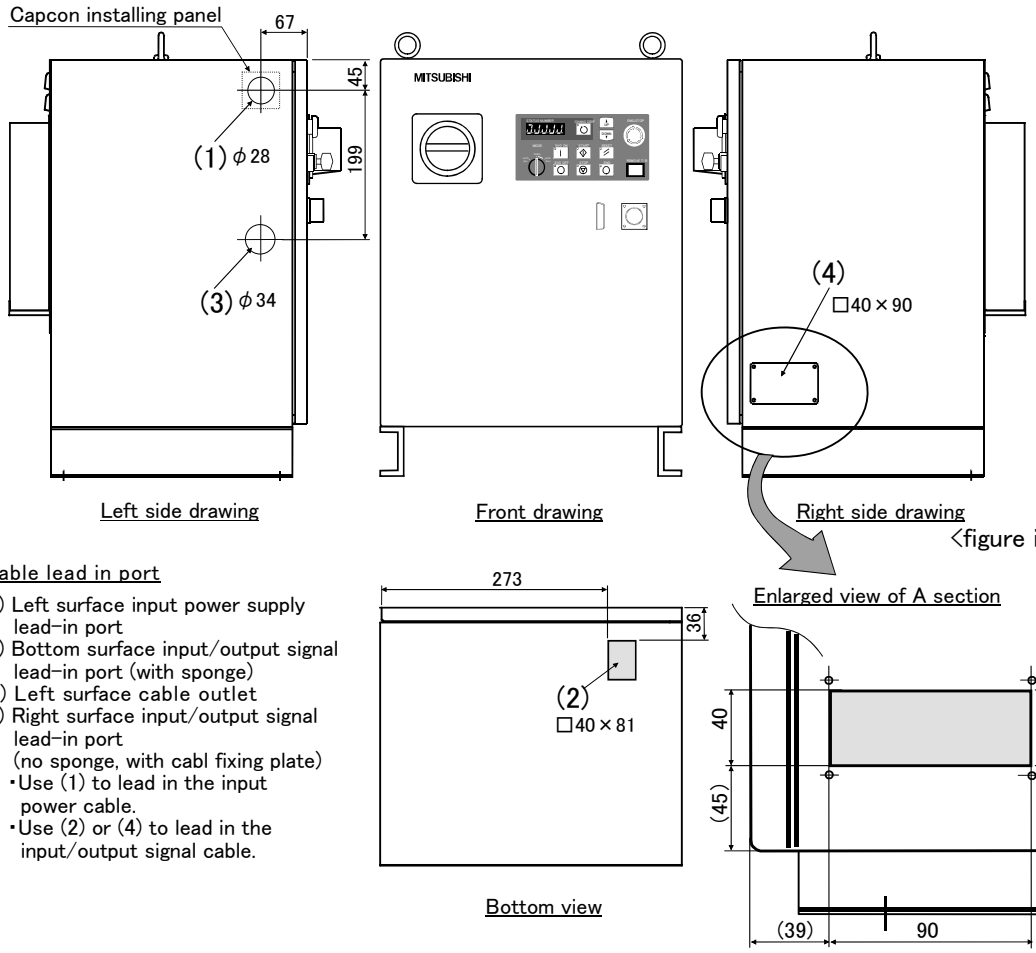


Fig.3-19 : Cable lead-in of the controller (CR2D-700 series)

<CR3D-700M>



Note) As for CE specification, the transformer box is installed in the controller bottom.
Refet to Fig. 3-12

Fig.3-20 : Cable lead-in and dimension of the controller (CR3D-700M Series)

3.4 External input/output

3.4.1 Types

(1) Dedicated input/output ..... These inputs and outputs carry out the robot remote operation and status display.

(2) General-purpose input/output ..... These are inputs and outputs that the customer can program for peripheral device control.

(3) Hand input/output ..... These are inputs and outputs related to the hand that the customer can program. (The hand output is an option. The Page 123, "(2) Pneumatic hand interface" is required.)

Table 3-4 : Emergency stop/Door switch input

Name	No. of input/output points		Connection format
	Input	Output	
Emergency stop	1	1	Connector
Special stop switch	1	-	
Door switch	1	-	
Enabling device	1	-	

The wiring for the safe security of the emergency stop etc. is shown after

The hand output is an option. Refer to Page 123, "(2) Pneumatic hand interface" for details

3.5 Dedicated input/output

Show the main function of dedicated input/output in the Table 3-5. Refer to attached instruction manual "Detailed explanations of functions and operations" in the product for the other functions. Each parameter indicated with the parameter name is used by designated the signal No., assigned in the order of input signal No. and output signal No.

Table 3-5 : Dedicated input/output list

Parameter name	Input		Note1)	Output	
	Name	Function	Level	Name	Function
TEACHMD	None			Teaching mode output signal	Outputs that the teaching mode is entered.
ATTOPMD	None			Automatic mode output signal	Outputs that the automatic mode is entered.
ATEXTMD	None			Remote mode output signal	Outputs that the remote mode is entered.
RCREADY	None			Controller power ON complete signal	Outputs that external input signals can be received.
AUTOENA	Automatic operation enabled input signal	Allows automatic operation.	L	Automatic operation enabled output signal	Outputs the automatic operation enabled state.
START	Start input signal	Starts all slots.	E	Operating output signal	Outputs that the slot is operating.
STOP	Stop input signal	Stops all slots. The input signal No. is fixed to 0. Note) Use the emergency stop input for stop inputs related to safety.	L	Wait output signal	Outputs that the slot is temporarily stopped.
STOP2	Stop input signal	The program during operation is stopped. Unlike the STOP parameter, change of the signal number is possible. Notes) specification is the same as the STOP parameter.	L	Wait output signal	Outputs that the slot is temporarily stopped.
SLOTINIT	Program reset input signal	Resets the wait state.	E	Program selection enabled output signal	Outputs that the slot is in the program selection enabled state.
ERRRESET	Error reset input signal	Resets the error state.	E	Error occurring output signal	Outputs that an error has occurred.
CYCLE	Cycle stop input signal	Carries out cycle stop.	E	In cycle stop operation output signal	Outputs that the cycle stop is operating.
SRVOFF	Servo ON enabled input signal	Turns the servo OFF for all mechanisms.	L	Servo ON enabled output signal	Outputs servo-on disable status. (Echo back)
SRVON	Servo ON input signal	Turns the servo ON for all mechanisms.	E	In servo ON output signal	Outputs the servo ON state.
IOENA	Operation rights input signal	Requests the operation rights for the external signal control.	L	Operation rights output signal	Outputs the operation rights valid state for the external signal control.
MELOCK	Machine lock input signal	Sets/resets the machine lock state for all mechanisms.	E	In machine lock output signal	Outputs the machine lock state.
SAFEPOS	Evasion point return input signal	Requests the evasion point return operation.	E	In evasion point return output signal	Outputs that the evasion point return is taking place.
OUTRESET	General-purpose output signal reset	Resets the general-purpose output signal.	E	None	
EMGERR	None			Emergency stop output signal	Outputs that an emergency stop has occurred.
S1START : S32START	Start input	Starts each slot.	E	In operation output	Outputs the operating state for each slot.
S1STOP : S32STOP	Stop input	Stops each slot.	L	In wait output	Outputs that each slot is temporarily stopped.

Parameter name	Input		Note1)	Output	
	Name	Function	Level	Name	Function
PRGSEL	Program selection input signal	Designates the setting value for the program No. with numeric value input signals.	E	None	
OVRDSEL	Override selection input signal	Designates the setting value for the override with the numeric value input signals.	E	None	
IODATA Note2)	Numeric value input (start No., end No.)	Used to designate the program name, override value., mechanism value.	L	Numeric value output (start No., end No.)	Used to output the program name, override value., mechanism No.
PRGOUT	Program No. output request	Requests output of the program name.	E	Program No. output signal	Outputs that the program name is being output to the numeric value output signal.
LINEOUT	Line No. output request	Requests output of the line No.	E	Line No. output signal	Outputs that the line No. is being output to the numeric value output signal.
OVRDOUT	Override value output request	Requests the override output.	E	Override value output signal	Outputs that the override value is being output to the numeric value output signal.
ERROUT	Error No. output request	Requests the error No. output.	E	Error No. output signal	Outputs that the error No. is being output to the numeric value output signal.
JOGENA	Jog valid input signal	Validates jog operation with the external signals	E	Jog valid output signal	Outputs that the jog operation with external signals is valid.
JOGM	Jog mode input 2-bit	Designates the jog mode.	L	Jog mode output 2-bit	Outputs the current jog mode.
JOG+	Jog feed + side for 8-axes	Requests the + side jog operation.	L	None	
JOG-	Jog feed - side for 8-axes	Requests the - side jog operation.	L	None	
HNDCNTL1 : HNDCNTL3	None			Mechanism 1 hand output signal status : Mechanism 3 hand output signal status	Mechanism 1: Outputs the status of general-purpose outputs 900 to 907. Mechanism 2: Outputs the status of general-purpose outputs 910 to 917. Mechanism 3: Outputs the status of general-purpose outputs 920 to 927.
HNDSTS1 : HNDSTS3	None			Mechanism 1 hand input signal status : Mechanism 3 hand input signal status	Mechanism 1: Outputs the status of hand inputs 900 to 907. Mechanism 2: Outputs the status of hand inputs 910 to 917. Mechanism 3: Outputs the status of hand inputs 920 to 927.
HNDERR1 : HNDERR3	Mechanism 1 hand error input signal : Mechanism 3 hand error input signal	Requests the hand error occurrence.	L	Mechanism 1 hand error output signal : Mechanism 3 hand error output signal	Outputs that a hand error is occurring.
AIRERR1 : AIRERR3	Pneumatic pressure error 1 input signal : Pneumatic pressure error 3 input signal	Request the pneumatic pressure error occurrence.	L	Pneumatic pressure error 1 output signal. : Pneumatic pressure error 3 output signal.	Outputs that a pneumatic pressure error is occurring.
M1PTEXC : M3PTEXC	None		L	Maintenance parts replacement time warning signal	Outputs that the maintenance parts have reached the replacement time.
USER-AREA Note3)	None			User-designated area 8-points	Outputs that the robot is in the user-designated area.

Note1) The level indicates the signal level.
L: Level signal → The designated function is validated when the signal is ON, and is invalidated when the signal is OFF.
E: Edge signal → The designated function is validated when the signal changes from the OFF to ON state, and the function maintains the original state even when the signal then turns OFF.
Note2) Four elements are set in the order of input signal start No., end No., output signal start No. and end No.
Note3) Up to eight points can be set successively in order of start output signal No. and end output signal No.I

3.6 Emergency stop input and output etc.

Do wiring of the external emergency stop, the special stop input, the door switch, and the enabling device from the "special input/output" terminal connector.

Table 3-6 : Special input/output terminal

Item	Name	Function
Input	Emergency stop	Applies the emergency stop. Dual emergency line
Input	Special stop input	Applies the stop. (Refer to Page 106, "3.6.2 Special stop input(SKIP)")
Input	Door switch	Servo-off
Input	Enabling device	Servo-off
Output	Robot error output	Contactor is opening during error occurrence
Output	Mode output	MANUAL mode: contactor is closing, AUTO mode: contactor is opening
Output	Magnet contactor control connector output for addition axes	When an additional axis is used, the servo ON/OFF status of the additional axis can be synchronized with the robot arm.

*At the time of the power supply OFF, the output point of contact is always open.

[Note] The contact capacity of each input/output terminal is DC24V/10mA - 500mA. Don't connect the equipment except for this range. The use exceeding contact capacity causes failure.

Pin number assignment of each terminal and the circuit diagram are shown in Fig. 3-24.

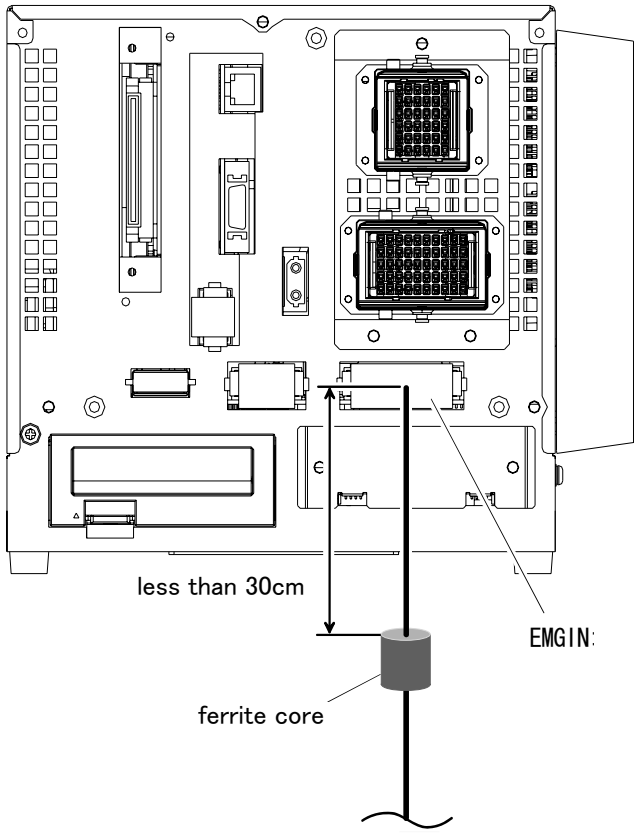
3.6.1 Connection of the external emergency stop

The external emergency stop input and door switch input and enabling device input are opened at shipment as shown in Fig. 3-24.
Connect the external emergency stop switch and door switch with the following procedure.

1) Prepare the "emergency stop switch", "enabling device" and "door switch".
2) Securely connect the external emergency stop's contacts across 3A-4A, 3B-4B, and the door switch's contacts across 8A-9A, 8B-9B, and the enabling device switch's contacts across 10A-11A, 10B-11B, on the terminal block.

[Caution] When wiring the emergency stop switch (double emergency line type), wire both contacts to the two terminal blocks on the controller. If both contacts are wired to only one of the terminal blocks, errors cannot be cancelled using the door switch. The cable uses the shielded cable and installs the ferrite core. Install the ferrite core in less than 30cm from the contact button.

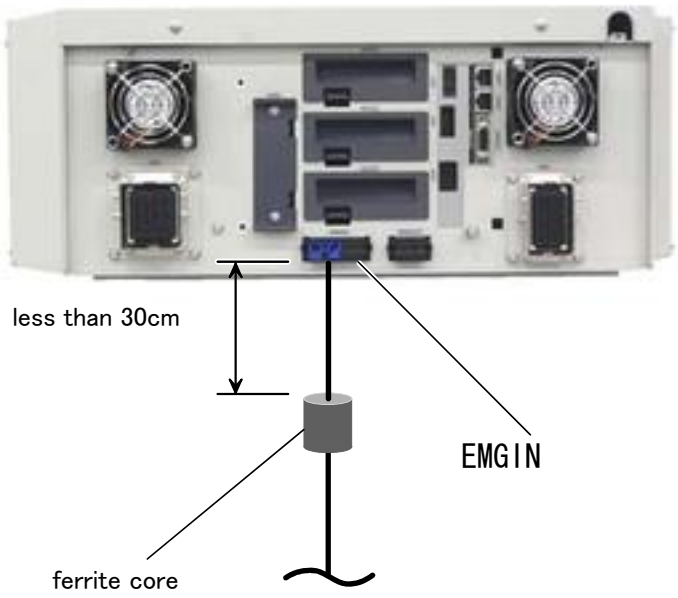
<CR1D-700>



Pin allotment of EMGIN and the EMGOUT connector is shown in Page 105, "Fig.3-24 : External emergency stop connection".

Fig.3-21 : emergency stop cable connection(CR1D-700)

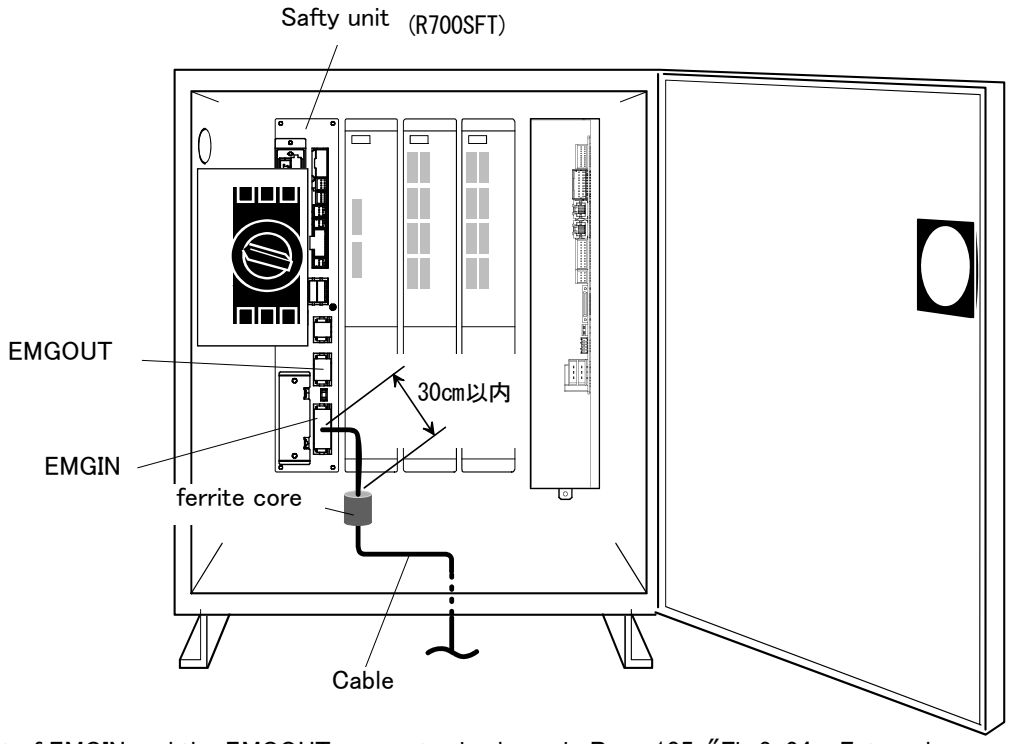
<CR2D-700>



Pin allotment of EMGIN and the EMGOUT connector is shown in Page 105, "Fig.3-24 : External emergency stop connection".

Fig.3-22 : emergency stop cable connection(CR2D-700)

<CR3D-700/700M>



Pin allotment of EMGIN and the EMGOUT connector is shown in Page 105, "Fig.3-24 : External emergency stop connection".

Fig.3-23 : Emergency stop cable connection(CR3D-700)

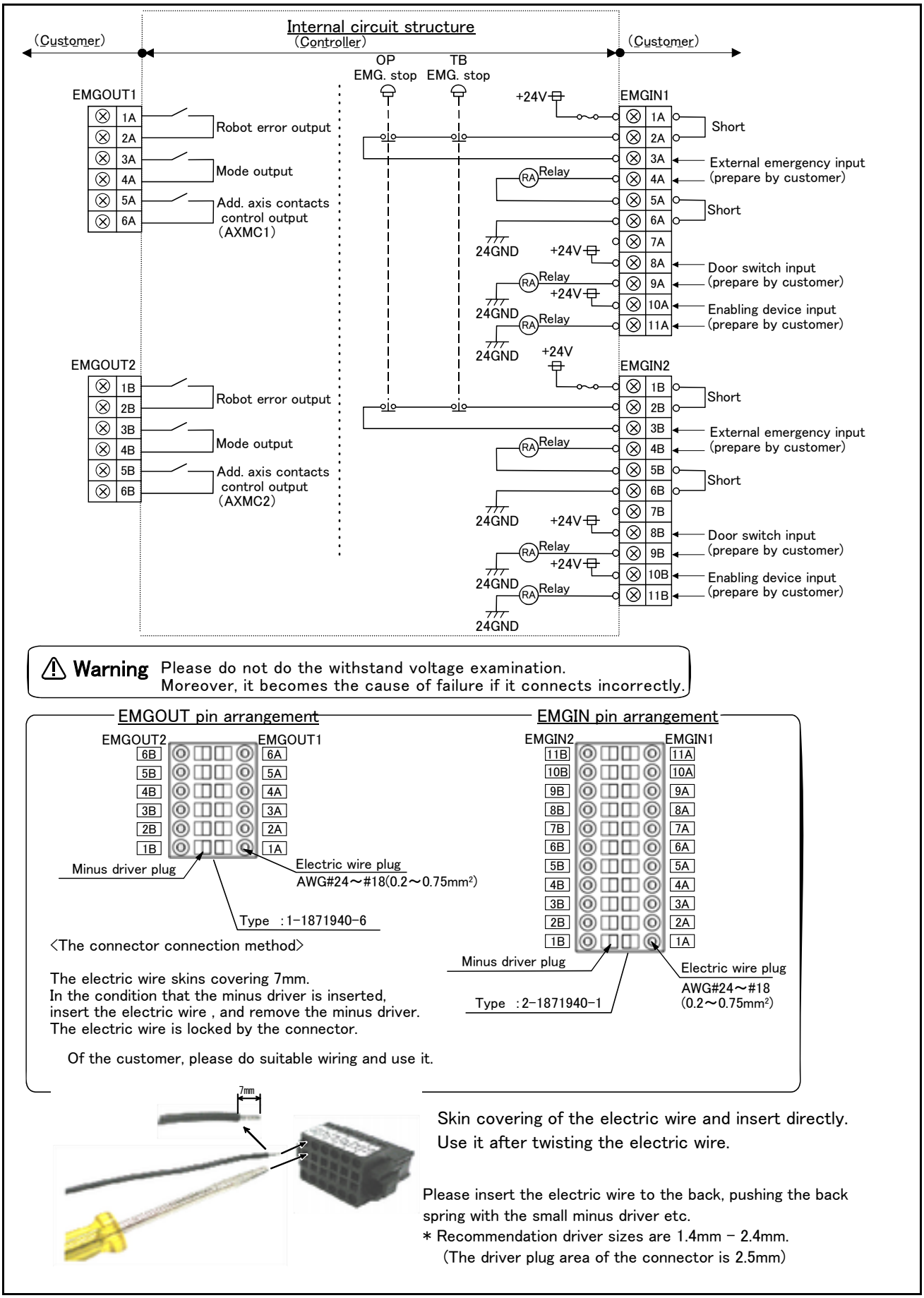


Fig.3-24 : External emergency stop connection

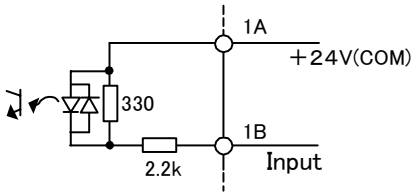
⚠CAUTION Please install the emergency stop switch to the place which is easy to operate it, and when the robots are the abnormalities, stop the robot immediately.

⚠CAUTION Be careful of the short circuit with the next terminal at the time of connection of the electric wire to the EMGIN connector.
Moreover, since solder plating to the electric wire section may wake up loose connection, please do not carry out.

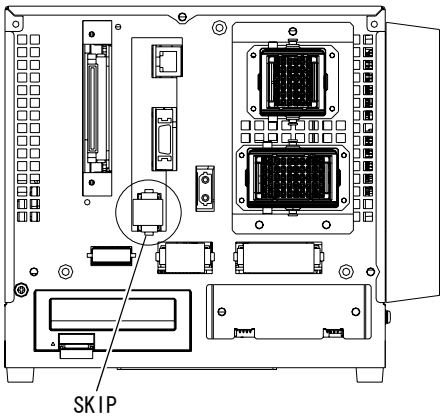
3.6.2 Special stop input(SKIP)

The skip is the input signal to stop the robot. Wire 1A-1B of the special stop connector (SKIP) shown in Page 107, "Fig.3-25 : Connection of the special-stop-input".

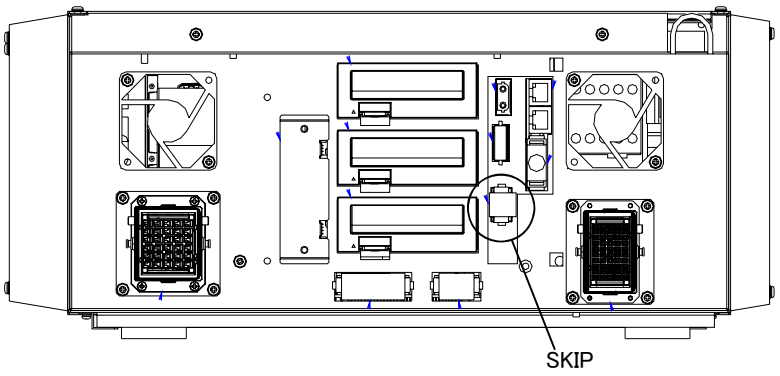
Table 3-7 : Special stop input electric specification

Item		Specifications	Internal circuit
Type		DC input	
No. of input point		1	
Insulation method		Phto-coupler insulation	
Rated inpit voltage		DC24V	
Rated input current		approx. 11mA	
Working voltage range		DC 21.6 ～ 26.4V (Ripple rate within 5 %)	
ON voltage/ON current		DC 8V or more / 2mA or more	
OFF voltage/OFF current		DC 4V or less / 1mA or less	
Input resistance		approx. 2.2 k Ω	
Response time	OFF → ON	1ms or less	
	ON → OFF	1ms or less	
Common method		1 point per common	
External wire connection method		Connector	

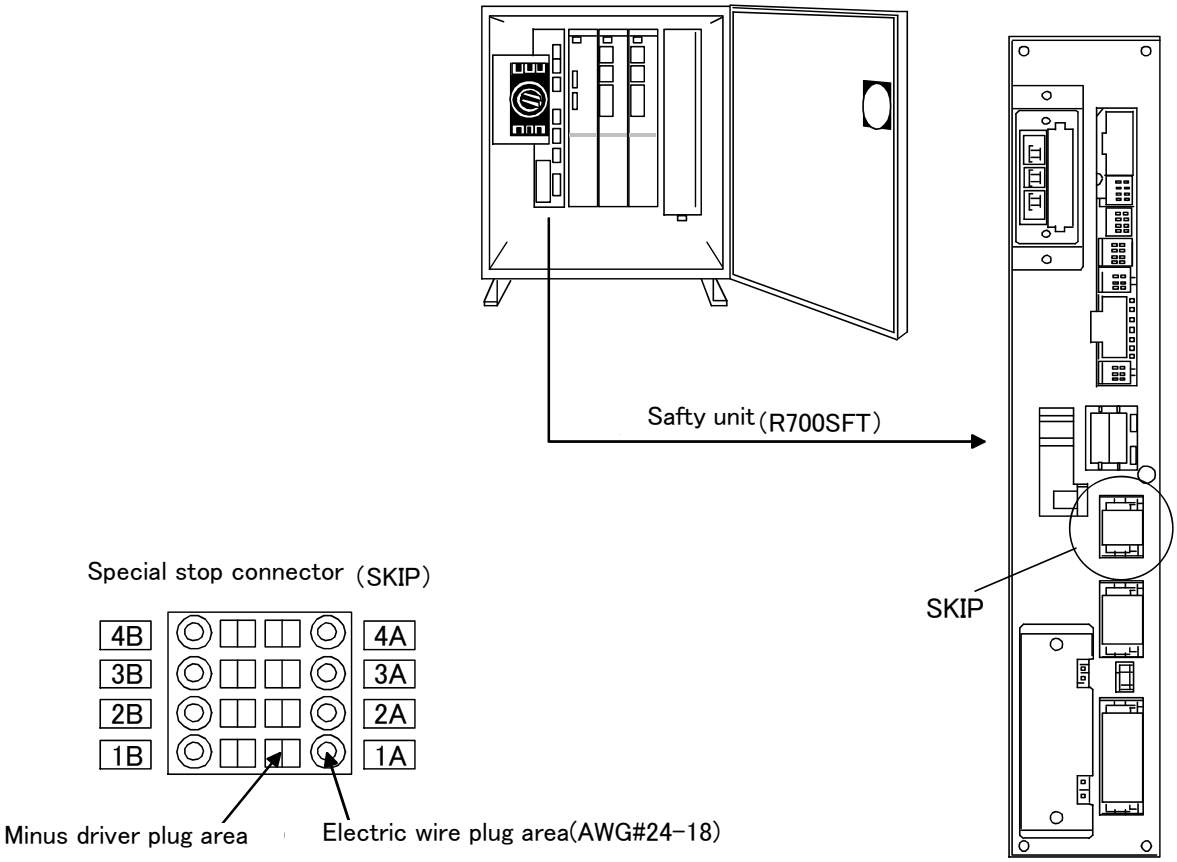
<CR1D-700>



<CR2D-700>



<CR3D-700>



<The connector connection method>
The electric wire skins covering 7mm.
In the condition that the minus driver is inserted, insert the electric wire, and remove the minus driver.
The electric wire is locked by the connector.

Fig.3-25 : Connection of the special-stop-input

3.6.3 Door switch function

This function retrieves the status of the switch installed on the door of the safety fence, etc., and stops the robot when the door is opened. This differs from an emergency stop in that the servo turns OFF when the door is opened and an error does not occur. Follow the wiring example shown in Fig. 3-24, and wire so that the contact closes when the door is closed. Details of this function according to the robot status are shown below.

- During automatic operation .....When the door is opened, the servo turns OFF and the robot stops. An error occurs.
  The process of the restoration : Close the door, reset the alarm, turn on the servo, and restart
- During teaching.....Even when the door is opened, the servo can be turned ON and the robot moved using the teaching pendant.

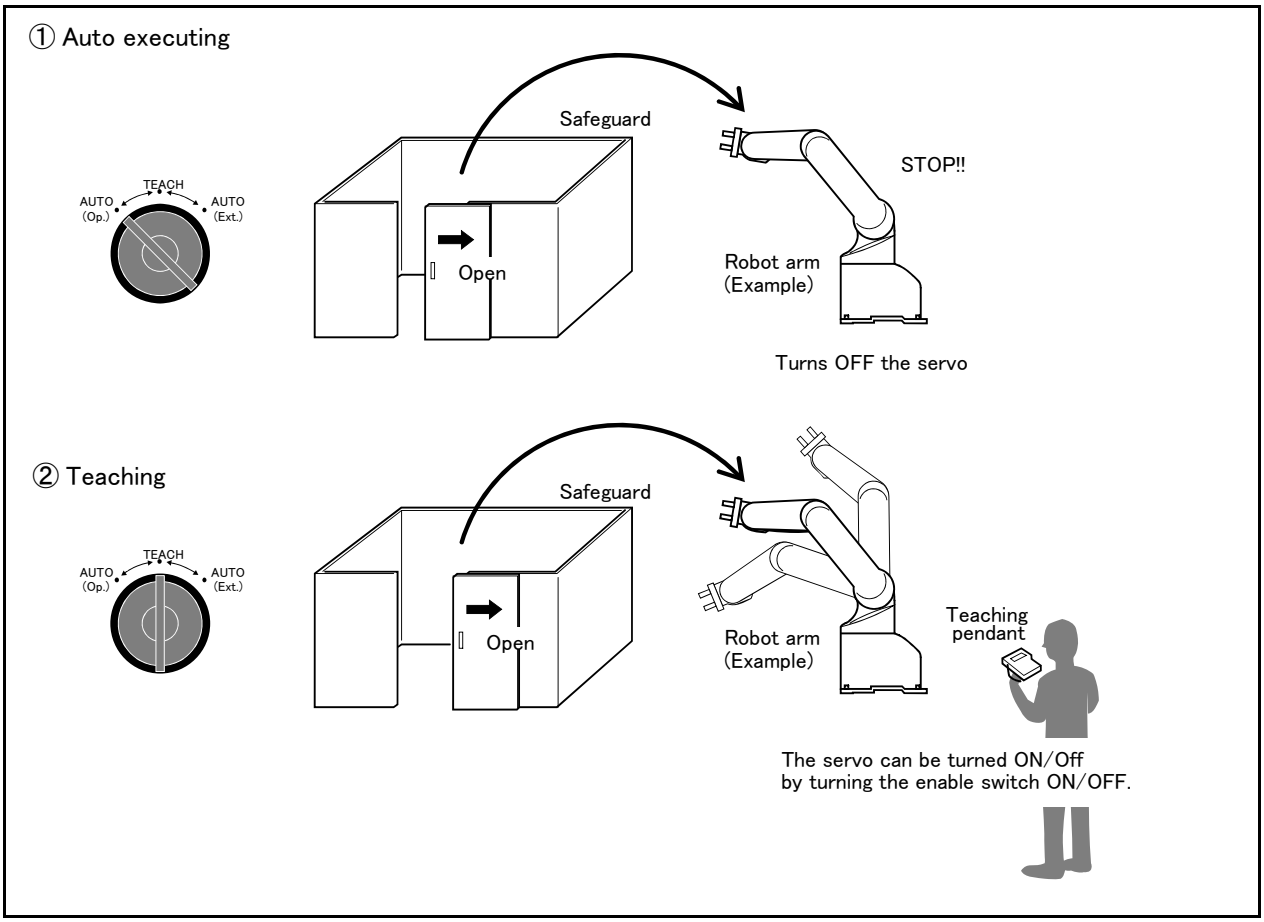


Fig.3-26 : Door switch function

3.6.4 Enabling device function

- When door is opening.....Please do teaching by two-person operations. One person has T/B, the other has enabling device. Turn on the servo power, in the condition that both of switches are pushed. (Enable switch of T/B and enabling device) Then the jog operation will be available.
- When door is closing.....One person operations are available.Turn on the servo power, in the condition that T/B enable switch is pushed. Then the jog operation will be available.

3.7 Additional Axis Function

This controller is equipped with an additional axis interface for controlling an additional axis when a traveling axis or rotary table is added to the robot. A maximum of eight axes of servo motors can be controlled at the same time by connecting a general-purpose servo amplifier (MR-J3-B series) that supports Mitsubishi's SSC Net Ⅲ .
Refer to the separate "Additional axis interface Instruction Manual" for details on the additional axis function.

3.7.1 Wiring of the Additional Axis Interface

Table 3-8 shows the connectors for additional axes inside the controller and shows a connection example (configuration example). The magnet contactor control connector for additional axes, AXMC1, is designed to accommodate circuit connection with improved safety in Mitsubishi's industrial robot systems connecting additional axes.
Please be sure to install the noise filter in the power supply line of addition axis servo amplifier and to use the robot safely. The example of the installation of the noise filter is shown in Page 113, "(1) Example of the installation of the noise filter". Install by one of the methods.
Please implement the appropriate circuit connection by refere to Page 115, "3.8 Magnet contactor control connector output (AXMC) for addition axes".

Table 3-8 : Dedicated Connectors inside the Controller

Name	Connector name	Details
Connector for additional axes	CR1D/CR2D: OPT CR3D: OPT2	This connector is used to connect between general-purpose servo amplifiers and the controller.
Magnet contactor control connector for additional axes	EMGOUT	This contact output is used to turn ON/OFF the motor power by connecting to general-purpose servo amplifiers.

<CR1D-700>

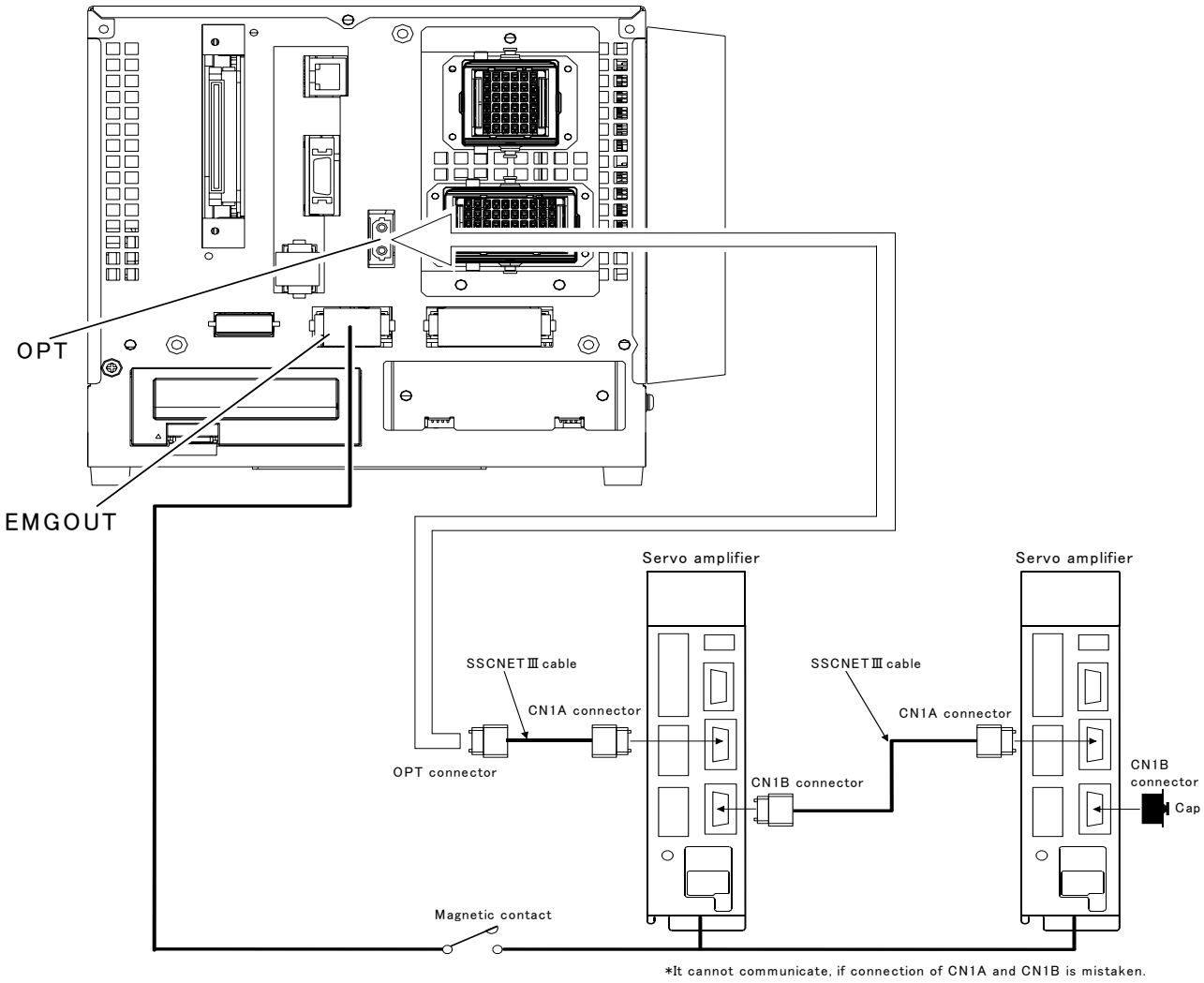


Fig.3-27 : Example of addition axis connection (CR1D-700)

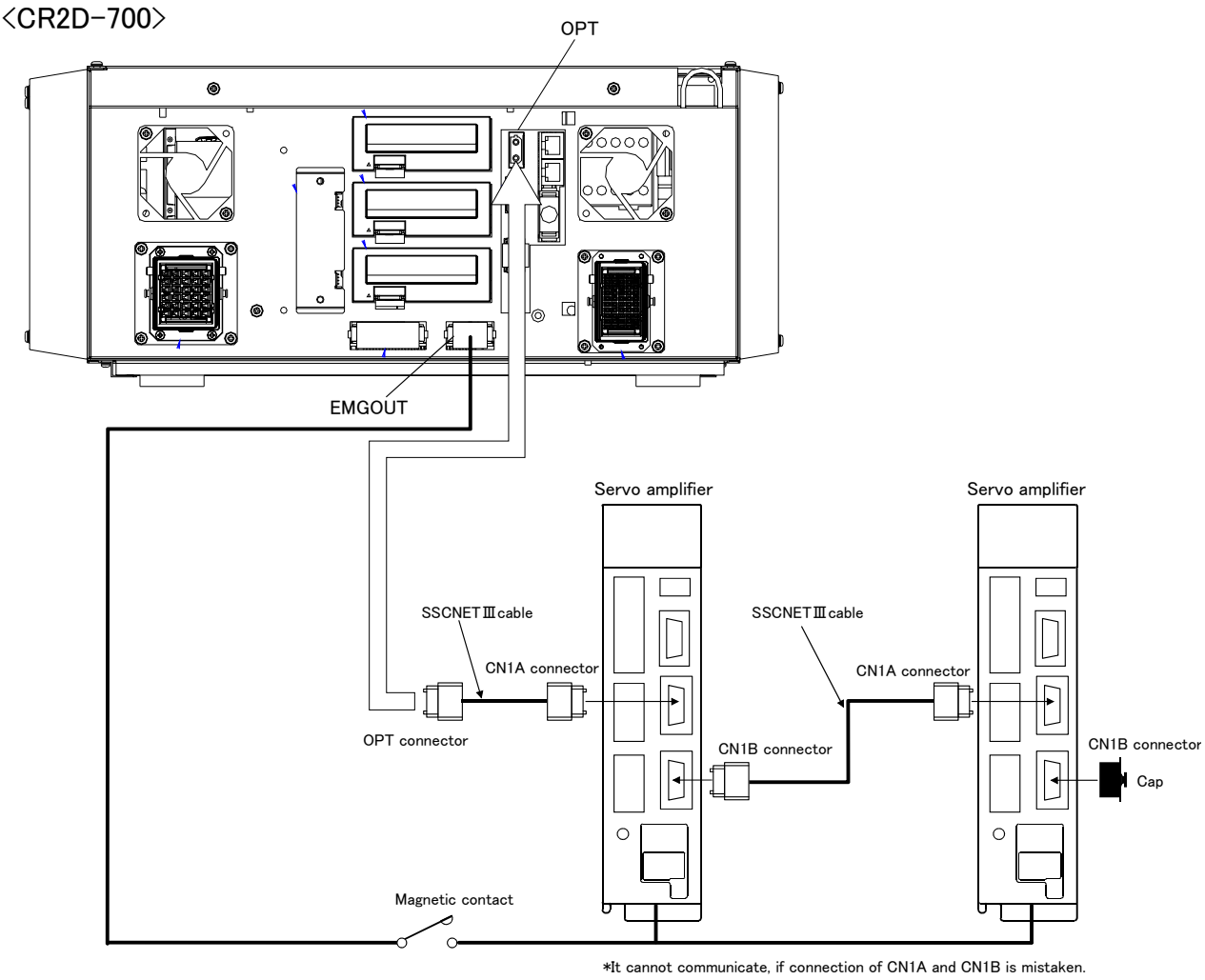


Fig.3-28 : Example of addition axis connection (CR2D-700)

<CR3D-700/700M>

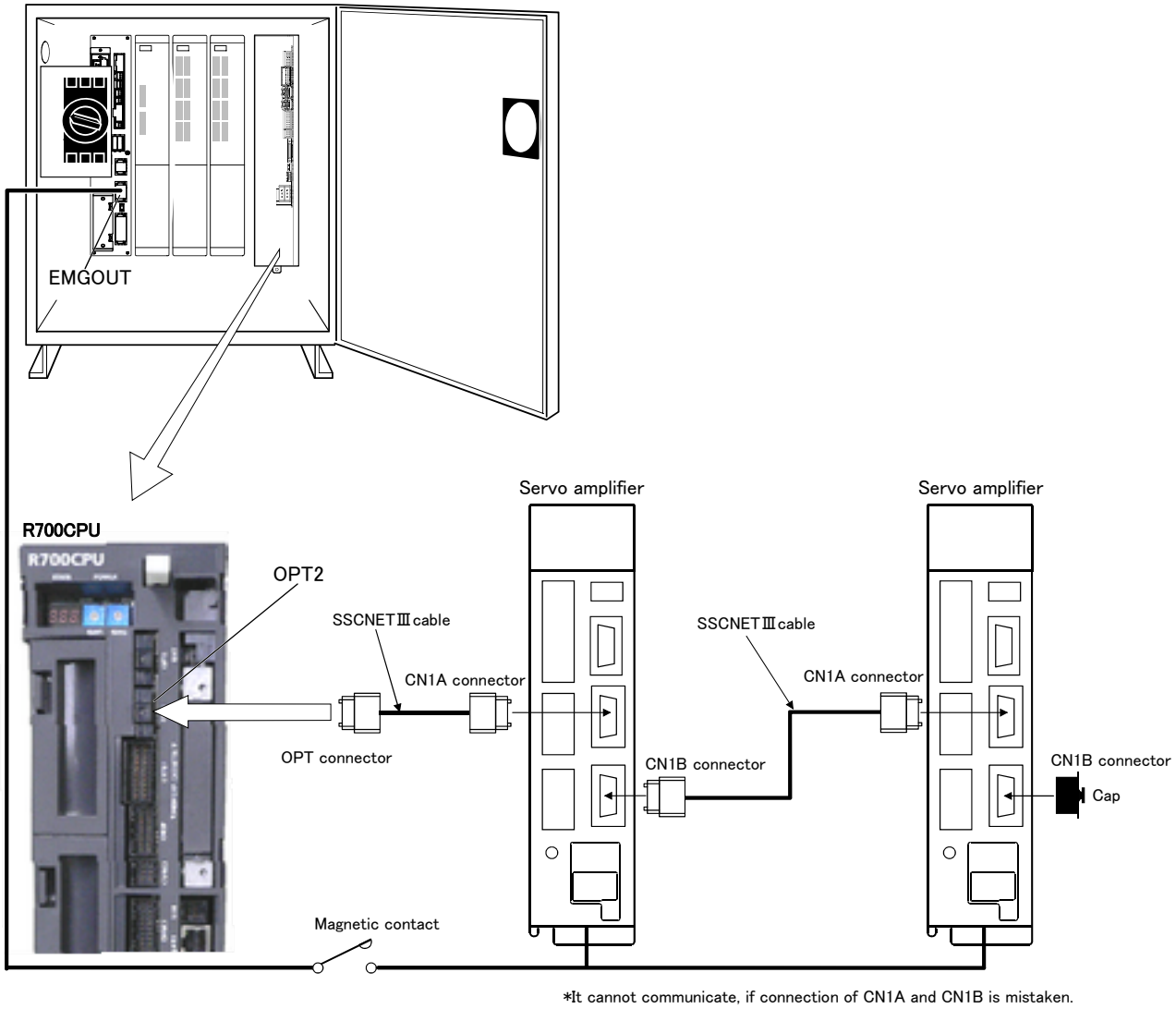


Fig.3-29 : Example of addition axis connection (CR3D-700/700M)

(1) Example of the installation of the noise filter

1) EMC filter (recommended)

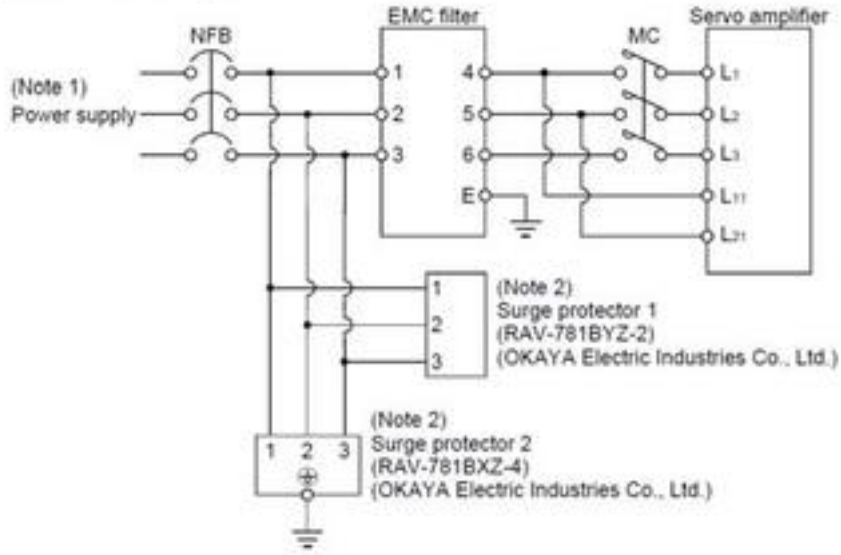
Please install the recommendation filter shown below according to the example of connection. .

1) Combination with the servo amplifier

Servo amplifier	Recommended filter (Soshin Electric)		Mass [kg]([lb])
	Model	Leakage current [mA]	
MR-J3-10B to MR-J3-100B MR-J3-10B1 to MR-J3-40B1	(Note) HF3010A-UN	5	3 (6.61)
MR-J3-250B * MR-J3-350B	(Note) HF3030A-UN		5.5 (12.13)
MR-J3-500B * MR-J3-700B	(Note) HF3040A-UN	1.5	6.0 (13.23)
MR-J3-11KB to MR-J3-22KB	(Note) HF3100A-UN	6.5	15 (33.07)
MR-J3-60B4 * MR-J3-100B4	TF3005C-TX	5.5	6(13.23)
MR-J3-200B4 to MR-J3-700B4	TF3020C-TX		
MR-J3-11KB4	TF3030C-TX		7.5(16.54)
MR-J3-15KB4	TF3040C-TX		12.5(27.56)
MR-J3-22KB4	TF3060C-TX		

Note. A surge protector is separately required to use any of these EMC filters.

2) Connection example



Note 1. For 1-phase 200V to 230VAC power supply, connect the power supply to L_1,L_2 and leave L_3 open.
There is no L_3 for 1-phase 100 to 120VAC power supply. Refer to section 1.3 for the power supply specification.
2. The example is when a surge protector is connected.

Fig.3-30 : Example of EMC noise filter installation

2) Line noise filter

This filter is effective in suppressing noises radiated from the power supply side and output side of the servo amplifier and also in suppressing high-frequency leakage current (zero-phase current) especially within 0.5MHz to 5MHz band.

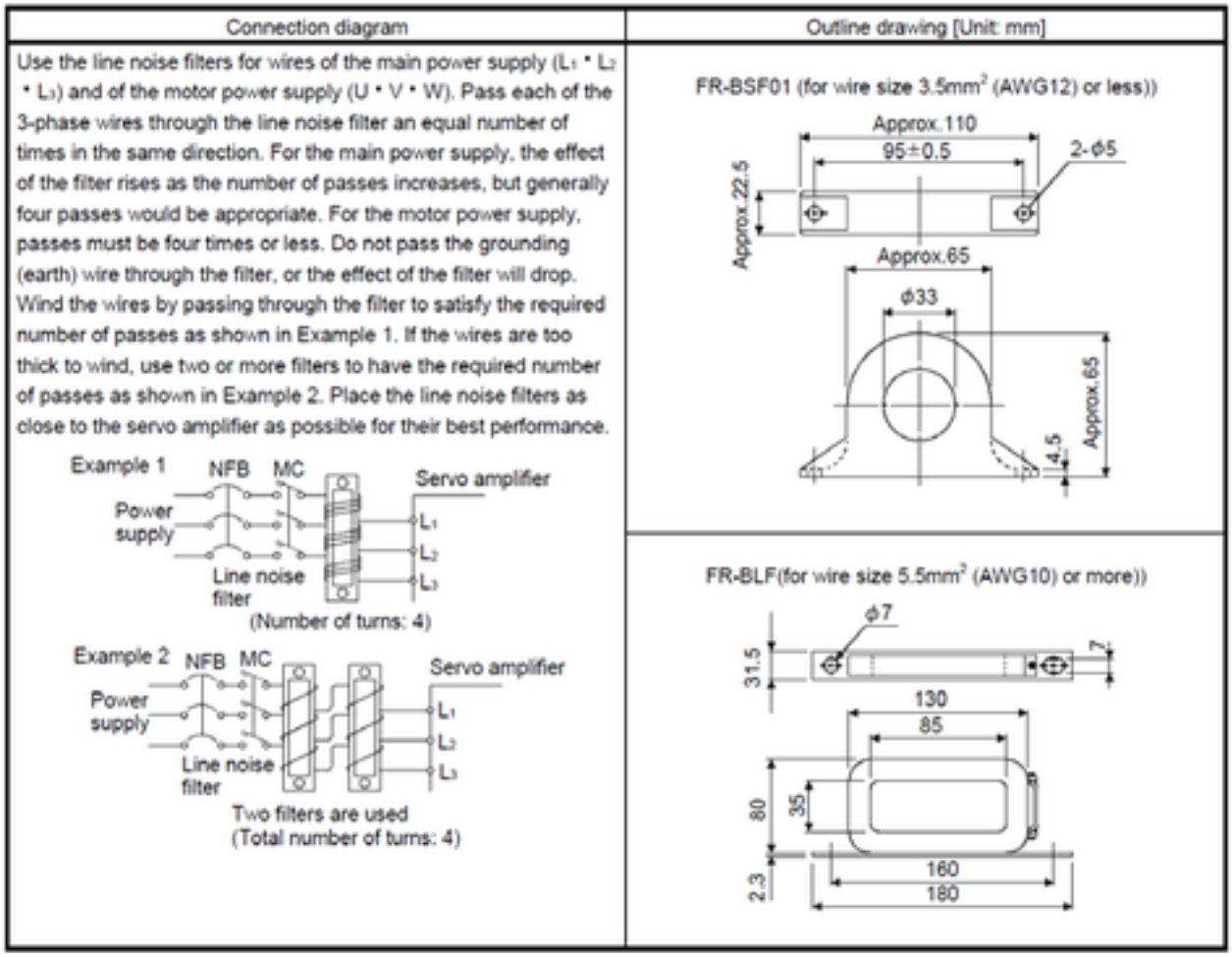


Fig.3-31 : Example of noise filter installation

3.8 Magnet contactor control connector output (AXMC) for addition axes

When an additional axis is used, the servo ON/OFF status of the additional axis can be synchronized with the servo ON/OFF status of the robot itself by using the output contact (AXMC) provided on the rear or inside of the controller and configuring a circuit so that the power to the servo amplifier for the additional axis can be turned off when this output is open.

Fig. 3-32 shows an example of its circuit, and Fig. 3-33、Fig. 3-33、Fig. 3-33 show the layout drawings of the output contact (AXMC1). When you are using an additional axis, please perform appropriate circuit connections by referring to these drawings.

Refer to the separate "Additional axis interface Instruction Manual" for details on the additional axis function.

Note1) you use the addition axis function as a user mechanism who became independent of the robot arm, please do not connect this output signal. Servo-on of the user mechanism may be unable.

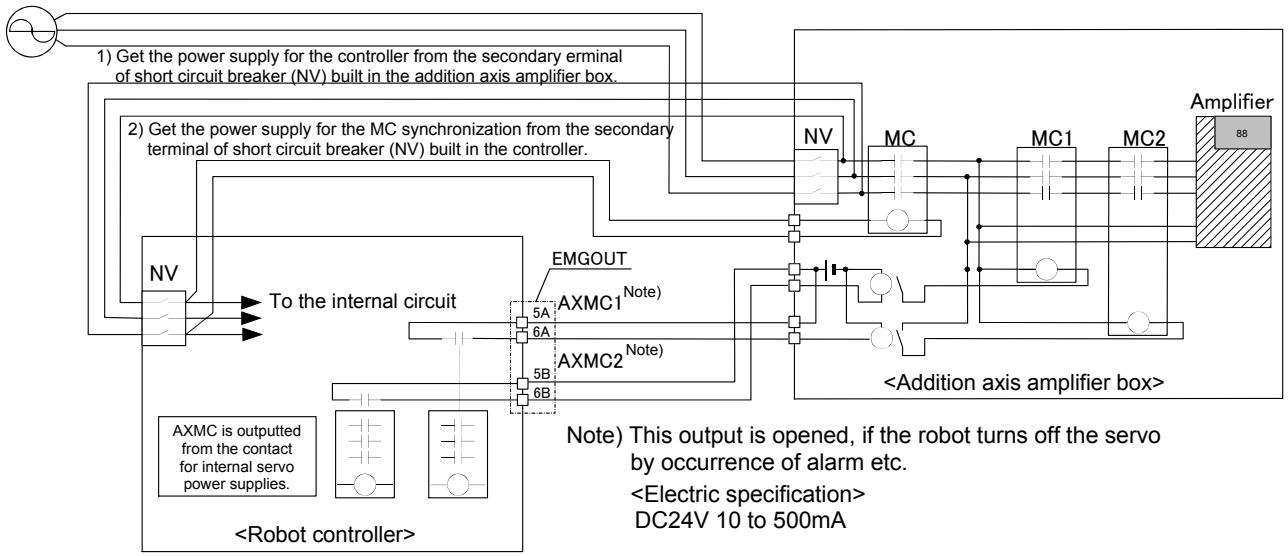


Fig.3-32 : Example of circuit for addition axes of Magnet contactor control output

<CR1D-700>

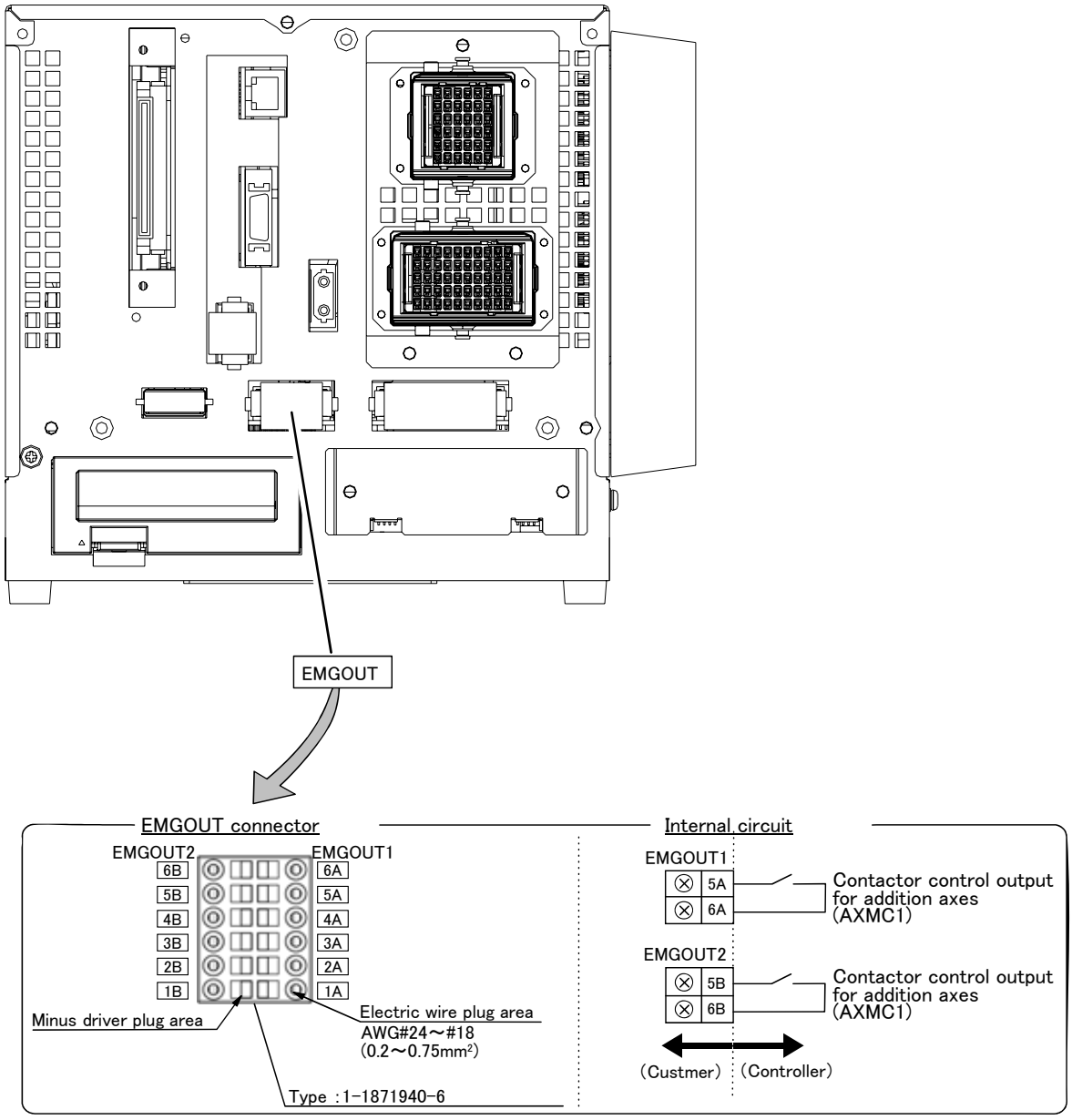


Fig.3-33 : EMGOUT connector (CR1D-700)

<CR2D-700>

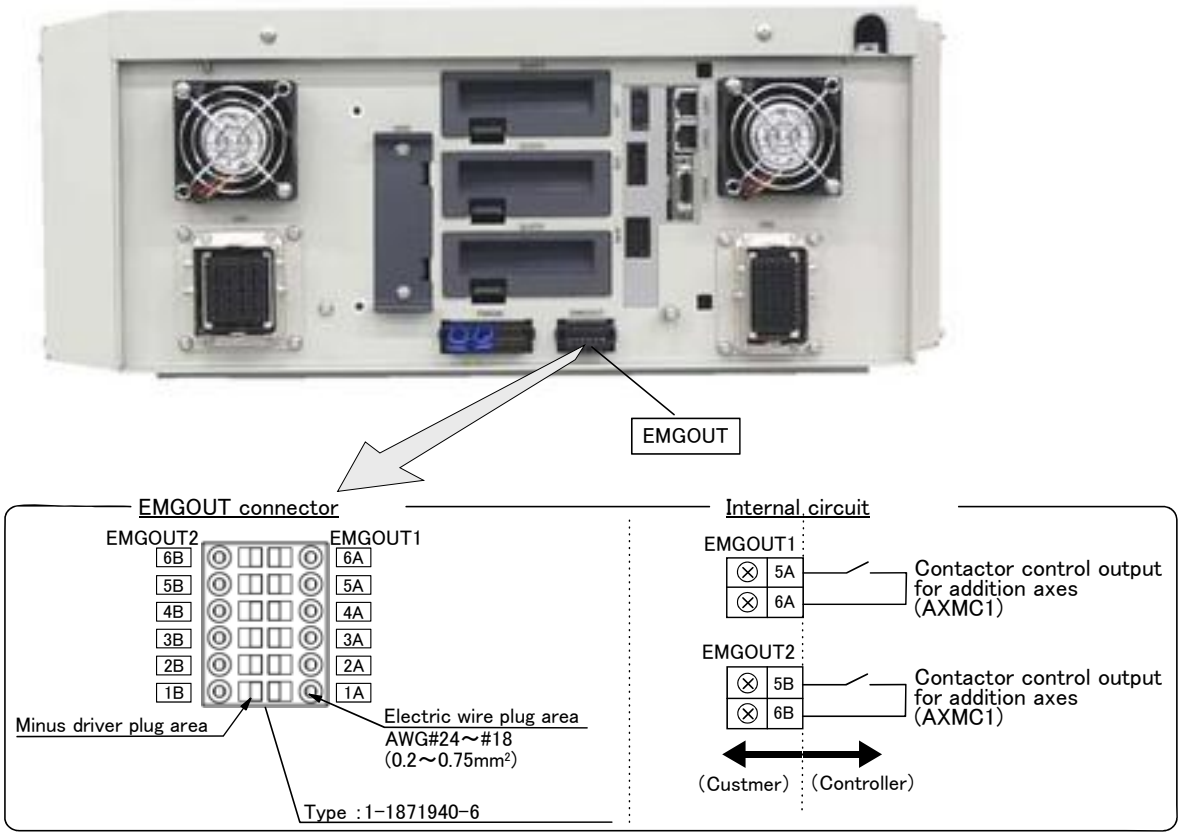


Fig.3-34 : EMGOUT connector (CR2D-700)

<CR3D-700/700M>

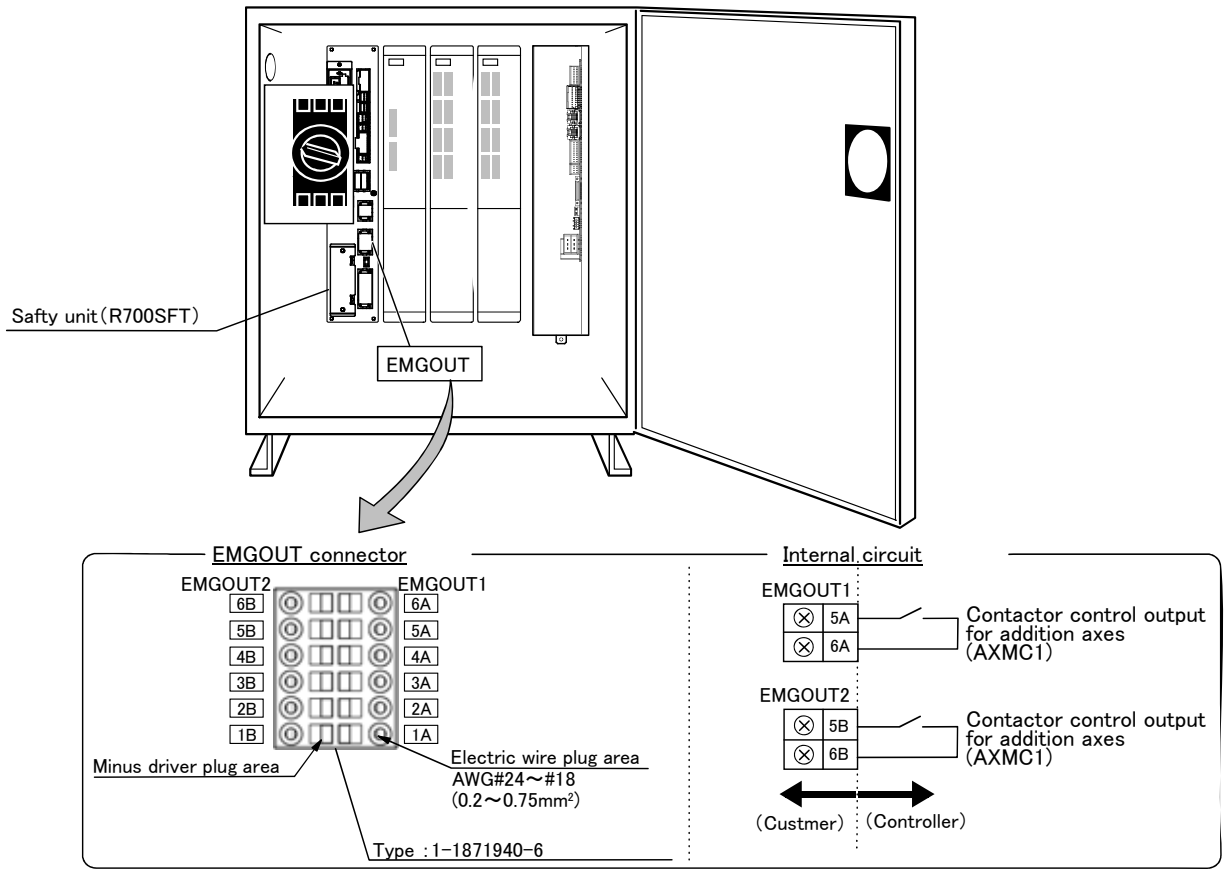


Fig.3-35 : EMGOUT connector (CR3D-700/700M)

3.9 Options

■ What are options?

There are a variety of options for the robot designed to make the setting up process easier for user needs.
User installation is required for the options.
Options come in two types: "set options" and "single options".

1. Set options.....A combination of single options and parts that together, form a set for serving some purpose.
2. Single options.....That are configured from the fewest number of required units of a part. Please choose user's purpose additionally.

(1) Teaching pendant (T/B)

■ Order type: R32TB :Cable length 7m
R32TB-15 :Cable length 15m

■ Outline

This is used to create, edit and control the program, teach the operation position and for jog feed, etc.
For safety proposes, a 3-position enable switch is mounted.[Note1)]

■ Configuration

Table 3-9 : Configuration device

Part name	Type	Qty.	Remarks
Teaching pendant	R32TB	Either one pc.	Cable length is 7m. Hand strap is attached.
	R32TB-15		Cable length is 15m. Hand strap is attached.

■ Specifications

Table 3-10 : Specifications

Items	Specifications	Remarks
Outline dimensions	195(W) x 292(H) x 106(D) (refer to outline drawing)	
Body color	Dark gray	
Mass	Approx. 0.9kg (only arm, excluding cable)	
Connection method	Connection with controller and square connector (24-pin)	
Interface	RS-422	
Display method	LCD method: 24 characters x 8 lines, LCD illumination: with backlight	
Operation section	36 keys	

Note1) <3-position enable switch>
In ISO/10218 (1992) and JIS-B8433 (1993), this is defined as an "enable device". These standards specify that the robot operation using the teaching pendant is enabled only when the "enable device" is at a specified position.
With the Mitsubishi Electric industrial robot, the above "enable device" is configured of an "Enable/Disable switch" and "Deadman switch".
The 3-position deadman switch has three statuses. The following modes are entered according to the switch state.

"Not pressed" ..... The robot does not operate. *)
"Pressed lightly" ..... The robot can be operated and teaching is possible.
"Pressed with force" ..... The robot does not operate. *)

*) Operations, such as program editing and status display, other than robot operation are possible.
Safety is secured as the servo power is turned OFF simultaneously with the input of the emergency stop.

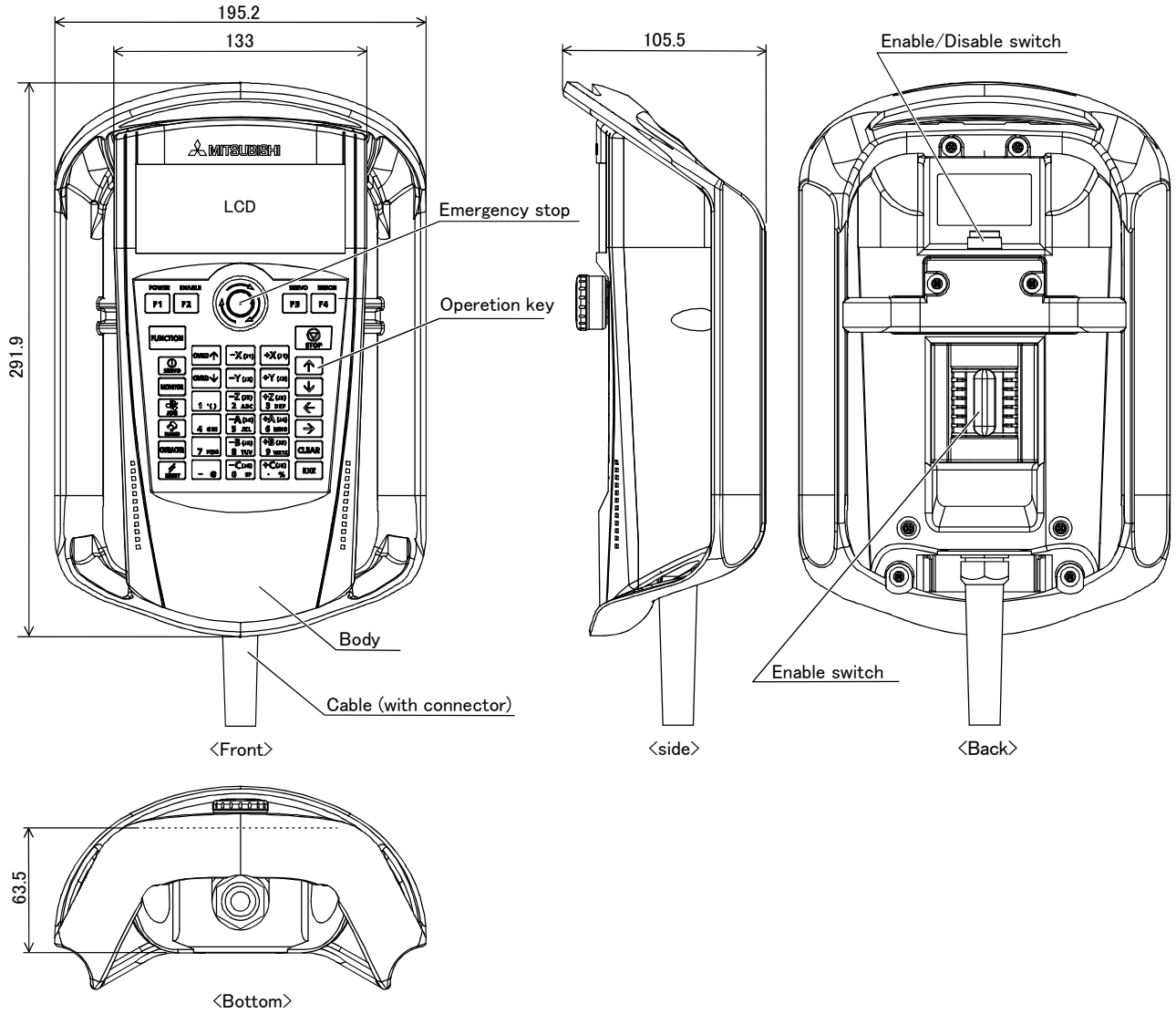
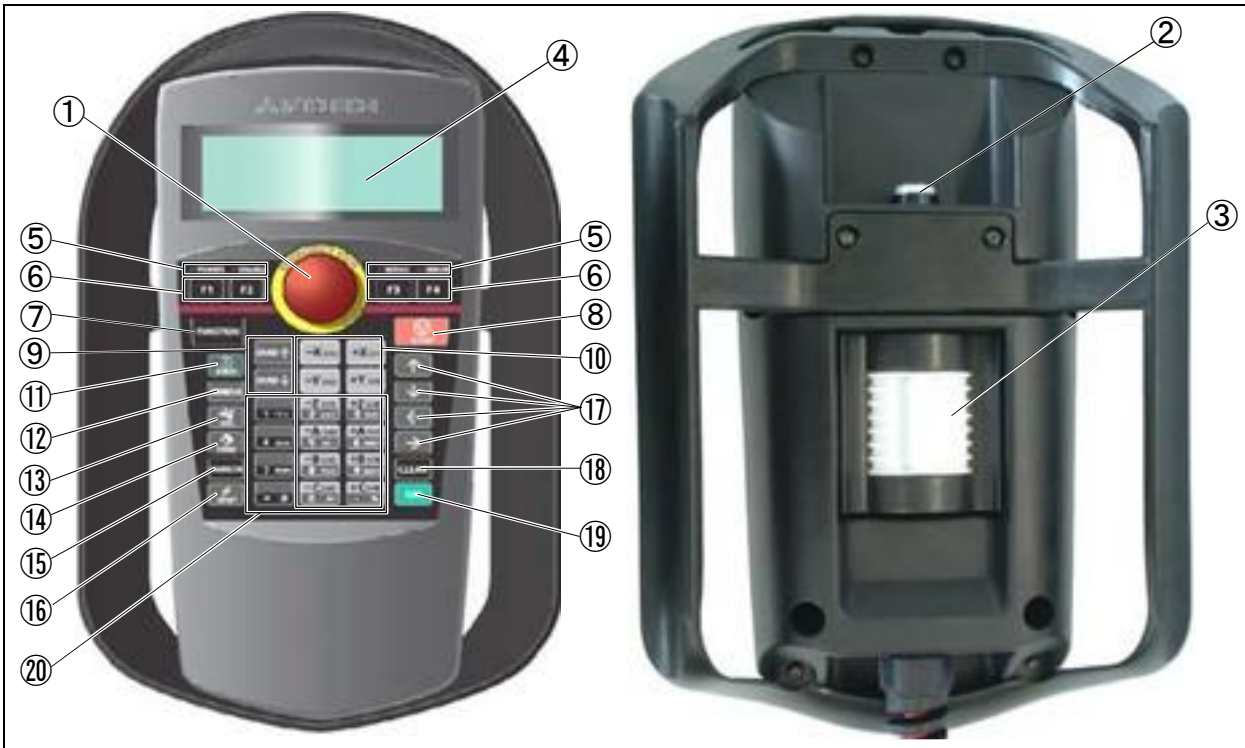


Fig.3-36 : Outside dimensions of teaching pendant

■ Installation method

The teaching pendant is connected to the T/B connector on the front of the controller.

■ Key layout and main functions



1) : [Emergency stop] switch..... The robot servo turns OFF and the operation stops immediately.
2) : [Enable/Disable] switch..... This switch changes the T/B key operation between enable and disable.
3) : [Enable] switch..... When the [Enable/Disable] switch "2)" is enabled, and this key is released or pressed with force, the servo will turn OFF, and the operating robot will stop immediately.
4) : LCD display panel..... The robot status and various menus are displayed.
5) : Status display lamp..... Display the state of the robot or T/B.
6) : [F1], [F2], [F3], [F4]..... Execute the function corresponding to each function currently displayed on LCD.
7) : [FUNCTION]..... Change the function display of LCD.
8) : [STOP] key..... This stops the program and decelerates the robot to a stop.
9) : [OVRD ↑][OVRD ↓] key..... Change moving speed. Speed goes up by [OVRD ↑] key. Speed goes down by [OVRD ↓] key
10) : JOG operation key..... Move the robot according to jog mode. And, input the numerical value.
11) : [SERVO] key..... Press this key with holding AA key lightly, then servo power will turn on.
12) : [MONITOR] key..... It becomes monitor mode and display the monitor menu.
13) : [JOG] key..... It becomes jog mode and display the jog operation.
14) : [HAND] key..... It becomes hand mode and display the hand operation.
15) : [CHAR] key..... This changes the edit screen, and changes between numbers and alphabetic characters.
16) : [RESET] key..... This resets the error. The program reset will execute, if this key and the EXE key are pressed.
17) : [↑][↓][←][→] key..... Moves the cursor each direction .
18) : [CLEAR] key..... Erase the one character on the cursor position .
19) : [EXE] key..... Input operation is fixed. And, while pressing this key, the robot moves when direct mode.
20) : Number/Character key..... Erase the one character on the cursor position . And, inputs the number or character

Fig.3-37 : Teaching pendant key layout and main functions

(2) Pneumatic hand interface

■ Order type: 2A-RZ365(Sink type)/2A-RZ375(Source type)

■ Outline

This interface is required to use the robot arm's hand output signals. This interface is pre-installed on the controller.

- Up to eight hand output points can be used with this interface.
- The eight hand input points can be used without this interface.
- The previous pneumatic hand interface can be used. .

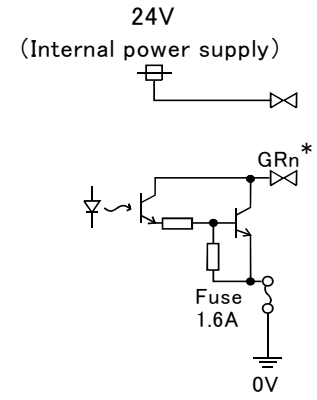
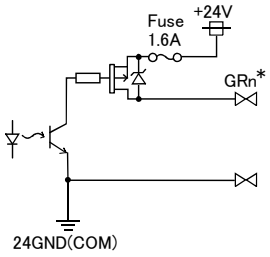
■ Configuration

Table 3-11 : Configuration device

Part name	Type	Qty.	Remarks
Pneumatic hand interface	2A-RZ365(Sink type)	Either one pc.	Output 8 points expansion.
	2A-RZ375(Source type)		

■ Specifications

Table 3-12 : Specifications

Item		Specification	Internal circuit
Type		Transistor output	<Sink type>  <Source type>  * GRn = GR1 ~ GR8
No. of output points		8	
Insulation method		Photo coupler insulation	
Rated load voltage		DC24V	
Rated load voltage range		DC21.6 to 26.4VDC	
Max. current load		0.1A/ 1 point (100%)	
Current leak with power OFF		0.1mA or less	
Maximum voltage drop with power ON		DC0.9V(TYP.)	
Response time	OFF-ON	2ms or less (hardware response time)	
	ON-OFF	2 ms or less (resistance load) (hardware response time)	
Fuse rating		Fuses 1.6A (each one common)	
Common method		8 points, 1 common	

■ Installation method

This is mounted in the controller.

Attach the pneumatic hand interface (2A-RZ365/2A-RZ375) to the CNHNDOUT/CNHND connector of the hand interface relay card (2D-TZ315) securely. Refer to separate "Instruction Manual/ Controller setup, basic operation, and maintenance" for details on the installing method.

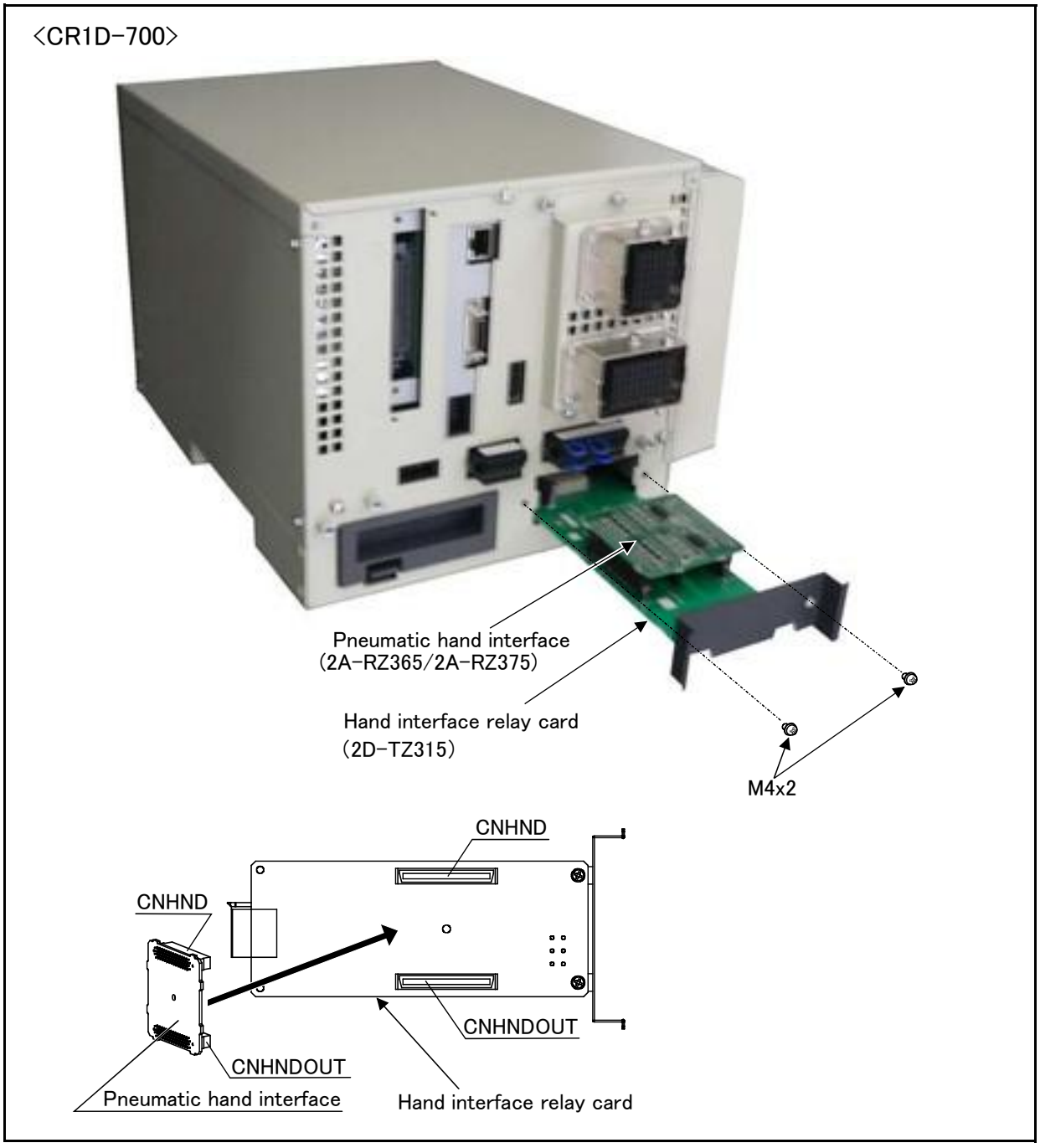


Fig.3-38 : Installation of the pneumatic hand interface （CR1D-700）

<CR2D-700>

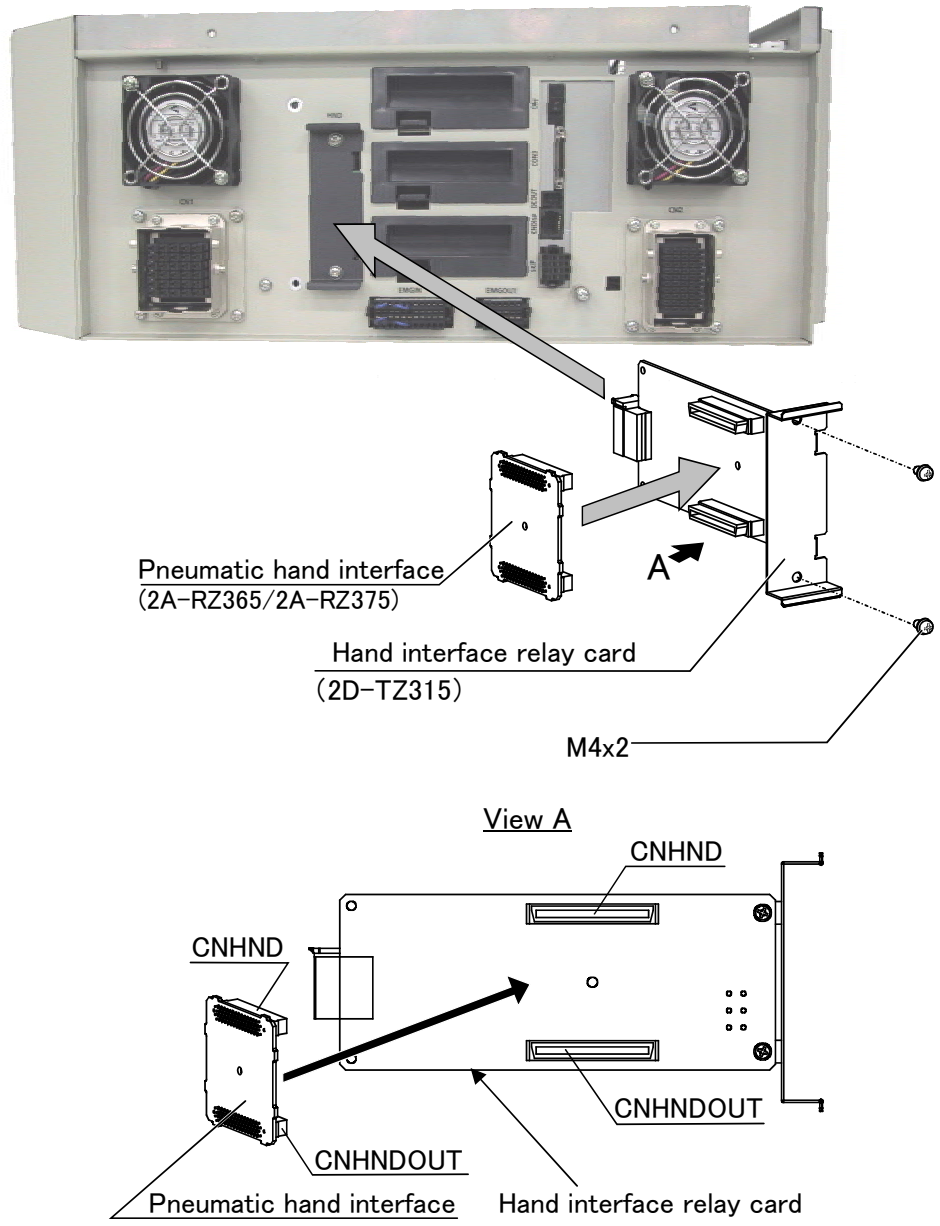


Fig.3-39 : Installation of the pneumatic hand interface (CR2D-700)

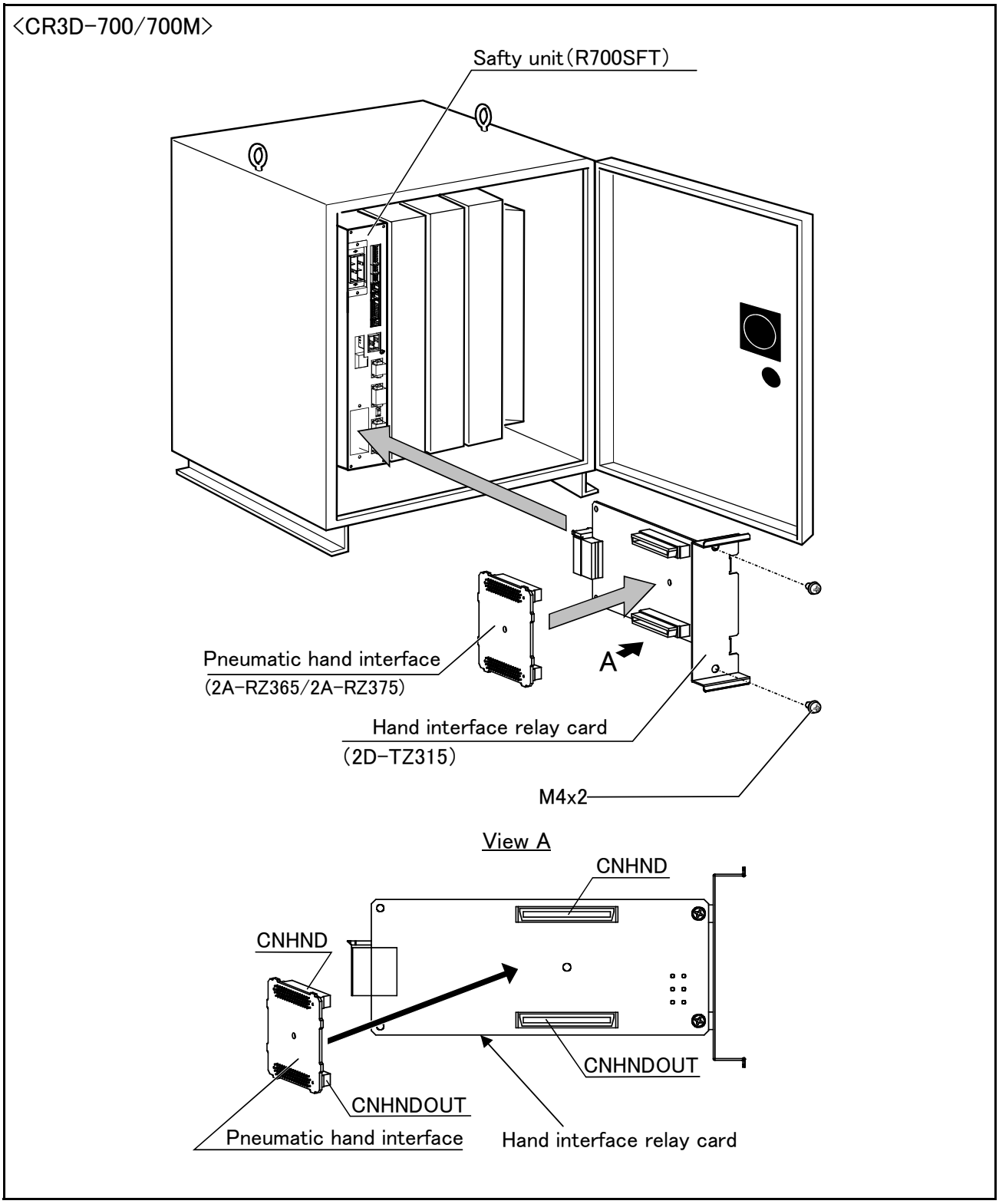


Fig.3-40 : Installation of the pneumatic hand interface (CR3D-700/700M)

(3) Parallel I/O interface

■ Order type ： ● 2D-TZ368 (Sink type) /2D-TZ378 (Source type)
*One 2D-TZ378(Source type) is installed for CE Marking specification at shipping. (Only S312 and S12 specification)

■ Outline

This is used to expand the external inputs and outputs
・The connecting cable with external equipment is not attached. Since we are preparing the external input-and-output cable (2D-CBL05 or 2D-CBL15) as the option, please use.
Notes)Although the combined use with the parallel input-and-output unit (2A-RZ361/2A-RZ371) of another option is also possible, please use the setup of the station number by the different number separately. The station number is automatically determined by the position of the option slot which installed this interface. (station number 0 to 2)

■ Configuration

Table 3-13 : Configuration device

Part name	Type	Qty.	Remarks
Parallel I/O interface	2D-TZ368	Either one pc.	Input/output 32 points/32 points 2D-TZ368 is sink type. 2D-TZ378 is source type.
	2D-TZ378		

■仕様

1) The CR1D-700 series controller can connect this one interface.
2) The CR2D-700 and CR3D-700 series controller can connect this three interfaces.

Table 3-14 : Electrical specifications of input circuits

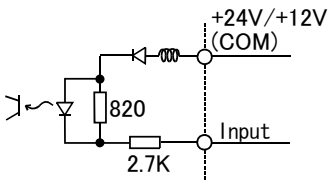
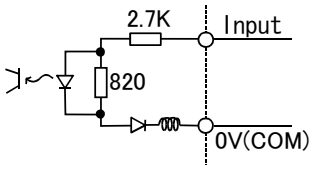
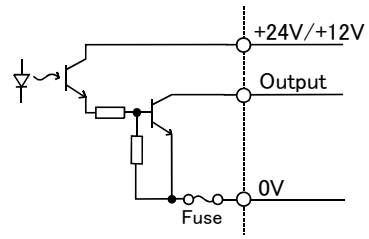
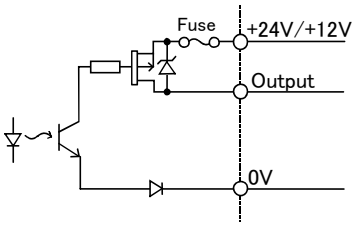
Item		Specification	Internal circuit
Type		DC input	<Sink type>  <Source type> 
Number of input points		32	
Insulation method		Photo coupler insulation	
Rated input voltage		DC12V/DC24V	
Rated input current		Approx. 3mA/7mA	
Working voltage range		DC10.2 ～ 26.4V (Ripple factor should be less than 5%)	
ON voltage/ON current		DC4V or more/1mA or more	
OFF voltage/ OFF current		DC0.1V or less/0.02mA or less	
Input resistance		Approx. 2.7kΩ	
Response time	OFF-ON	10ms or less(DC24V)	
	ON-OFF	10ms or less(DC24V)	
Common method		8points per common	
External cable connection method		Connector	

Table 3-15 : Electrical specifications for the output circuits

Item		Specification	Internal circuit
Type		Transistor output	<Sink type>  <Source type> 
No. of output points		32	
Insulation method		Photo-coupler insulation	
Rated load voltage		DC12V/DC24V	
Rated load voltage range		DC10.2 ～ 30V(peak voltage DC30V)	
Max. load current		0.1A/point (100%)	
Leakage current at OFF		0.1mA or less	
Max. voltage drop at ON		DC0.9V(TYP.)	
Response time	OFF-ON	10ms or less (hardware response time)	
	ON-OFF	10ms or less(Resistance load) (hardware response time)	
Fuse rating		Fuse 1.6A(one per common) Replacement possible (max. 3)	
Common method		8per common(common terminal : 4 points)	
External wire connection method		Connector	
External power supply	Voltage	DC12/24V(DC10.2 ～ 30V)	
	Current	60mA(TYP.DC24V per common)(base drive current)	

⚠ Caution The protection fuse of the output circuit prevents the failure at the time of the load short circuit and incorrect connection. The load connected of the customer should be careful not to exceed maximum rating current. The internal transistor may be damaged if maximum rating current is exceeded.

■ Installation method

The expansion parallel input/output interface is installed in the controller. Refer to separate "Instruction Manual/ Controller setup, basic operation, and maintenance" for details on the installing method.

If it installs in the option SLOT of the controller, the station number will be assigned automatically.

SLOT1: station number 0(0 to 31)
SLOT2: station number 1(32 to 63)
SLOT3: station number 2(64 to 95)
Notes) SLOT2 and SLOT3 are only CR2D or CR3D controller.

⚠ Caution If it uses together with parallel input-and-output unit 2A-RZ361/2A-RZ371, please do not overlap with the station number of the parallel input-and-output interface.

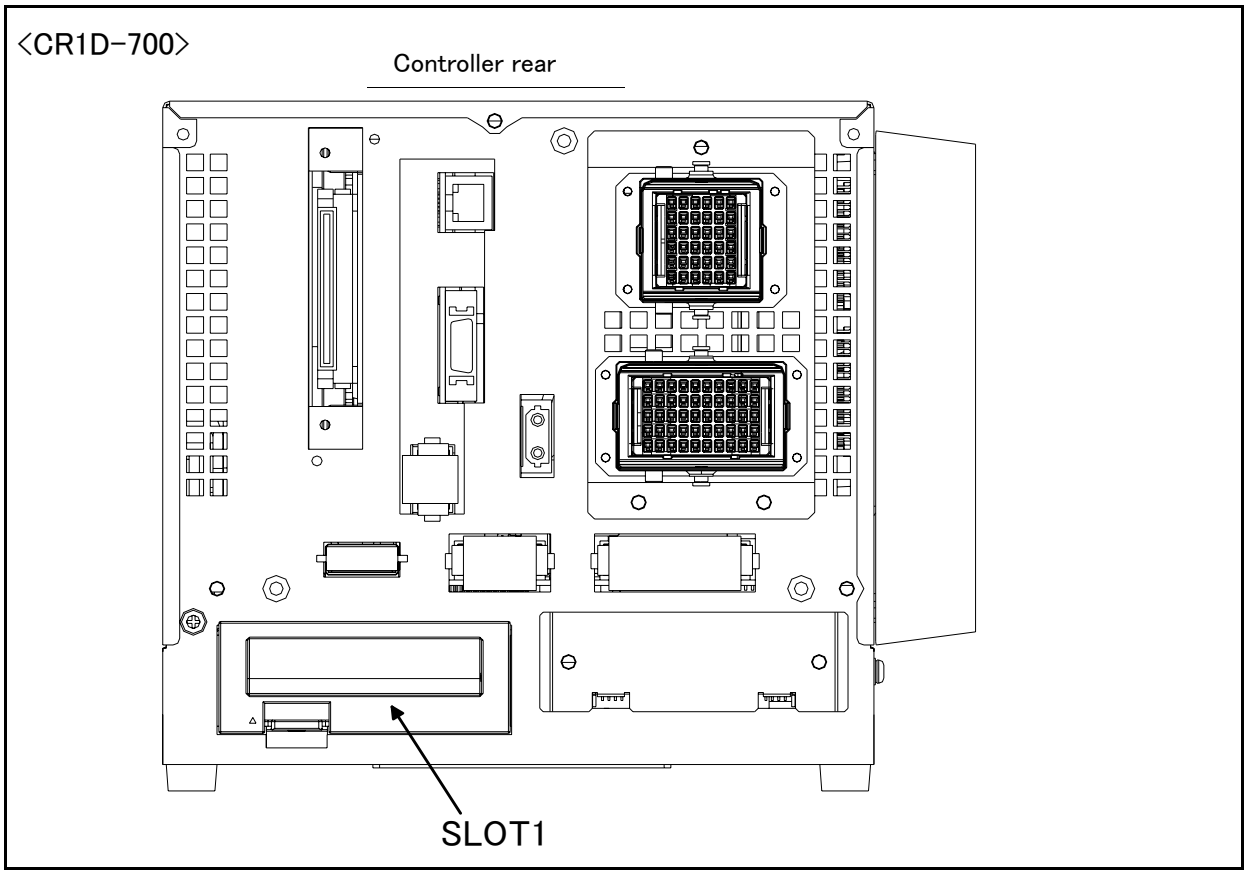


Fig.3-41 : Parallel I/O interface installation position (CR1D-700)

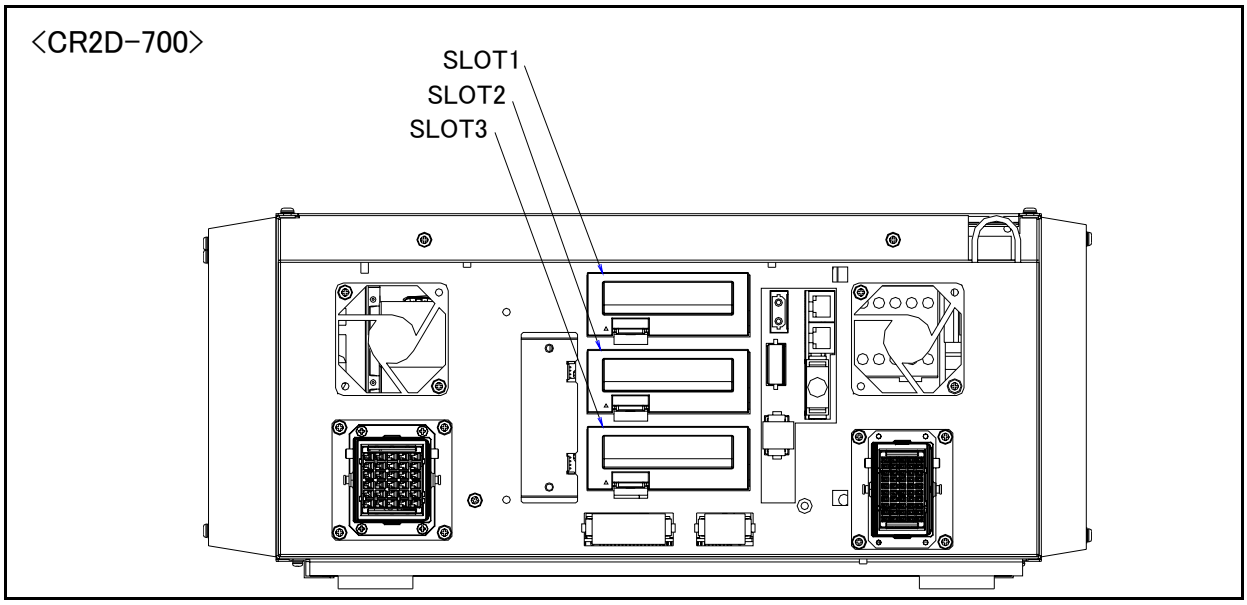


Fig.3-42 : Parallel I/O interface installation position (CR2D-700)

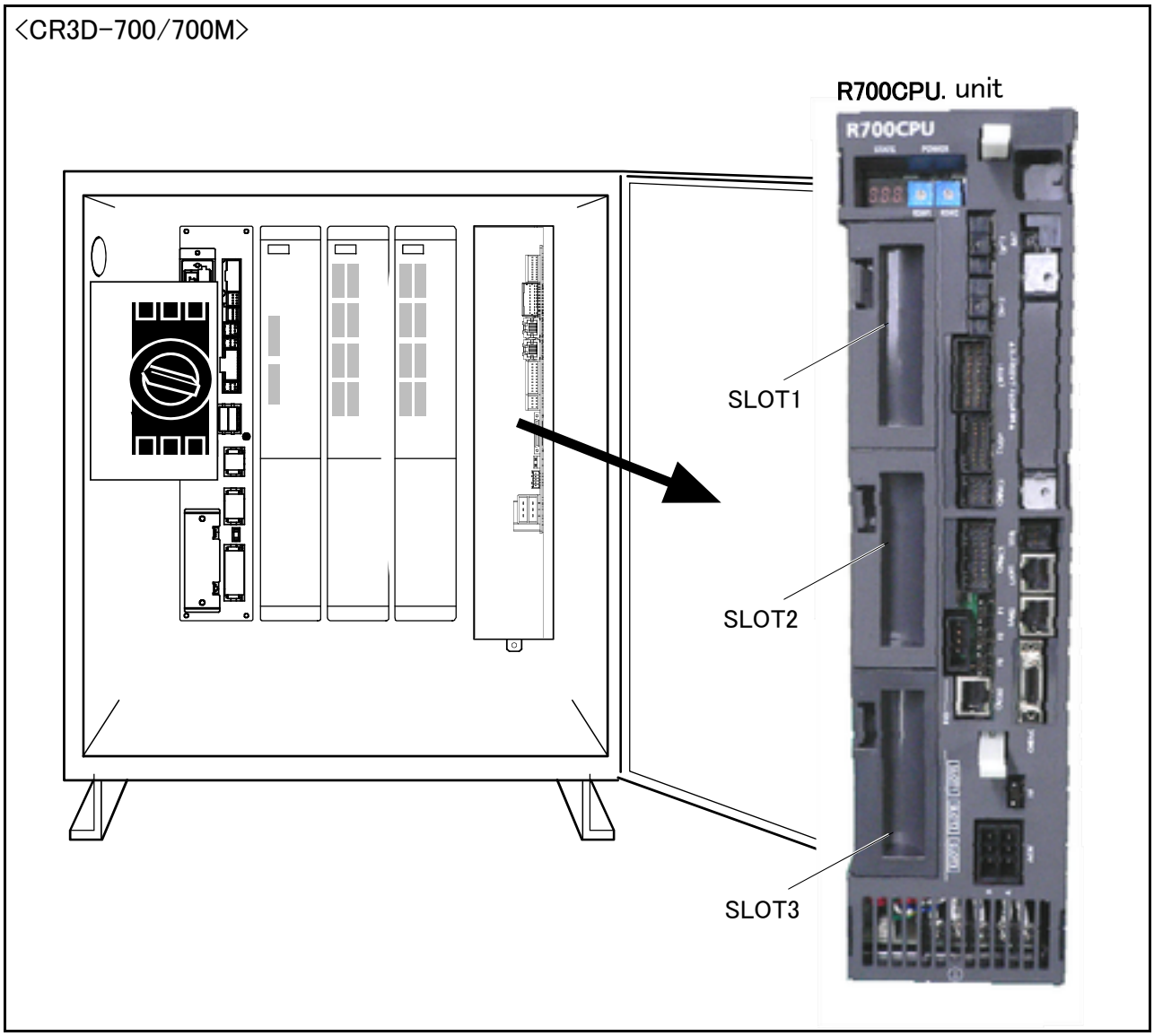


Fig.3-43 : Parallel I/O interface installation position (CR3D-700/700M)

■ Pin layout of connector

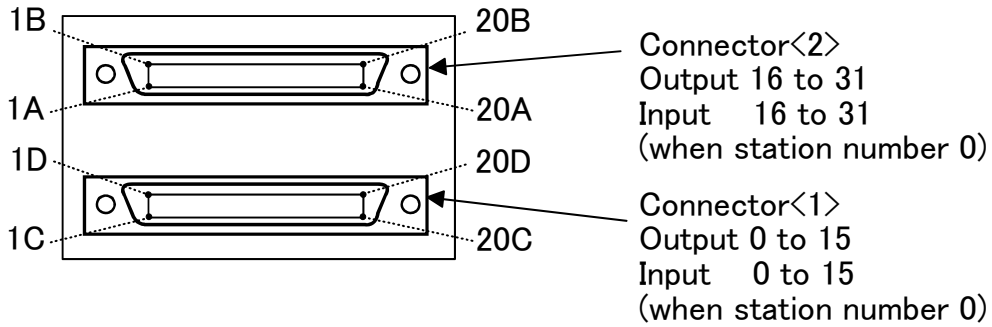


Fig.3-44 : Pin layout of connector

■ Connector pin No. and signal assignment

The station number is fixed by the slot to install and the allocation range of the general-purpose input-and-output signal is fixed.

Table 3-16 : The slot number and the station number

Slot number[Note1)]	Station number	Range of the general-purpose input-and-output signal	
		Connector <1>	Connector <2>
SLOT1	0	Input : 0 to 15 Output : 0 to 15	Input : 16 to 31 Output : 16 to 31
SLOT2	1	Input : 32 to 47 Output : 32 to 47	Input : 48 to 63 Output : 48 to 63
SLOT3	2	Input : 64 to 79 Output : 64 to 79	Input : 80 to 95 Output : 80 to 95

Note1)In case of the CR1D controller, the available slot is only SLOT1.

The connector pin number of the parallel input-and-output interface installed in SLOT1 and signal number allocation are shown in Table 3-17 and Table 3-18. If it installs in other slots, please interpret and utilize.

Table 3-17 : Connector<1> pin assignment list and external I/O cable (2D-CBL**) color(SLOT1)

Pin No.	Line color	Function name		Pin No.	Line color	Function name	
		General-purpose	power supply, common			General-purpose	power supply, common
1C	Orange/Red a		0V : For pins 5D-20D	1D	Orange/Black a		12V/24V : For pins 5D-20D
2C	Gray/Red a		COM : For pins 5C-20C[Note1)]	2D	Gray/Black a		Reserved
3C	White/Red a		Reserved	3D	White/Black a		Reserved
4C	Yellow/Red a		Reserved	4D	Yellow/Black a		Reserved
5C	Pink/Red a	General-purpose input 15		5D	Pink/Black a	General-purpose output 15	
6C	Orange/Red b	General-purpose input 14		6D	Orange/Black b	General-purpose output 14	
7C	Gray/Red b	General-purpose input 13		7D	Gray/Black b	General-purpose output 13	
8C	White/Red b	General-purpose input 12		8D	White/Black b	General-purpose output 12	
9C	Yellow/Red b	General-purpose input 11		9D	Yellow/Black b	General-purpose output 11	
10C	Pink/Red b	General-purpose input 10		10D	Pink/Black b	General-purpose output 10	
11C	Orange/Red c	General-purpose input 9		11D	Orange/Black c	General-purpose output 9	
12C	Gray/Red c	General-purpose input 8		12D	Gray/Black c	General-purpose output 8	
13C	White/Red c	General-purpose input 7		13D	White/Black c	General-purpose output 7	
14C	Yellow/Red c	General-purpose input 6		14D	Yellow/Black c	General-purpose output 6	
15C	Pink/Red c	General-purpose input 5		15D	Pink/Black c	General-purpose output 5	
16C	Orange/Red d	General-purpose input 4		16D	Orange/Black d	General-purpose output 4	
17C	Gray/Red d	General-purpose input 3		17D	Gray/Black d	General-purpose output 3	
18C	White/Red d	General-purpose input 2		18D	White/Black d	General-purpose output 2	
19C	Yellow/Red d	General-purpose input 1		19D	Yellow/Blackc d	General-purpose output 1	
20C	Pink/Red d	General-purpose input 0		20D	Pink/Black d	General-purpose output 0	

Note1)Sink type:12V/24V(COM),Source type:0V(COM)

Table 3-18 : Connector<2> pin assignment list and external I/O cable (2D-CBL**) color(SLOT1)

Pin No.	Line color	Function name		Pin No.	Line color	Function name	
		General-purpose	power supply, common			General-purpose	power supply, common
1A	Orange/Red a		0V : For pins 5B-20B	1B	Orange/Black a		12V/24V : For pins 5B-20B
2A	Gray/Red a		COM : For pins 5A-20A[Note1)]	2B	Gray/Black a		Reserved
3A	White/Red a		Reserved	3B	White/Black a		Reserved
4A	Yellow/Red a		Reserved	4B	Yellow/Black a		Reserved
5A	Pink/Red a	General-purpose input 31		5B	Pink/Black a	General-purpose output 31	
6A	Orange/Red b	General-purpose input 30		6B	Orange/Black b	General-purpose output 30	
7A	Gray/Red b	General-purpose input 29		7B	Gray/Black b	General-purpose output 29	
8A	White/Red b	General-purpose input 28		8B	White/Black b	General-purpose output 28	
9A	Yellow/Red b	General-purpose input 27		9B	Yellow/Black b	General-purpose output 27	
10A	Pink/Red b	General-purpose input 26		10B	Pink/Black b	General-purpose output 26	
11A	Orange/Red c	General-purpose input 25		11B	Orange/Black c	General-purpose output 25	
12A	Gray/Red c	General-purpose input 24		12B	Gray/Black c	General-purpose output 24	
13A	White/Red c	General-purpose input 23		13B	White/Black c	General-purpose output 23	
14A	Yellow/Red c	General-purpose input 22		14B	Yellow/Black c	General-purpose output 22	
15A	Pink/Red c	General-purpose input 21		15B	Pink/Black c	General-purpose output 21	
16A	Orange/Red d	General-purpose input 20		16B	Orange/Black d	General-purpose output 20	
17A	Gray/Red d	General-purpose input 29		17B	Gray/Black d	General-purpose output 19	
18A	White/Red d	General-purpose input 18		18B	White/Black d	General-purpose output 18	
19A	Yellow/Red d	General-purpose input 17		19B	Yellow/Blackc d	General-purpose output 17	
20A	Pink/Red d	General-purpose input 16		20B	Pink/Black d	General-purpose output 16	

Note1)Sink type:12V/24V(COM),Source type:0V(COM)

<Reference> The example of connection with our PLC

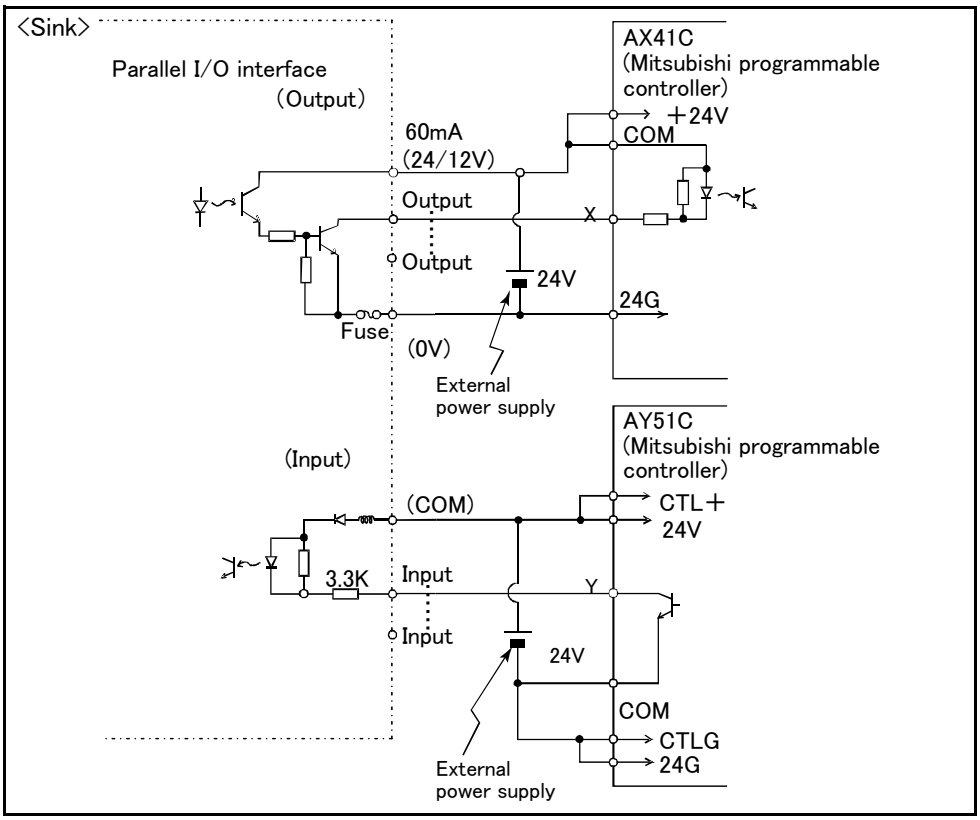


Table 3-19 : Connection with a Mitsubishi PLC (Example of sink type)

*The input/output circuit external power supply (24 VDC) must be prepared by the customer.

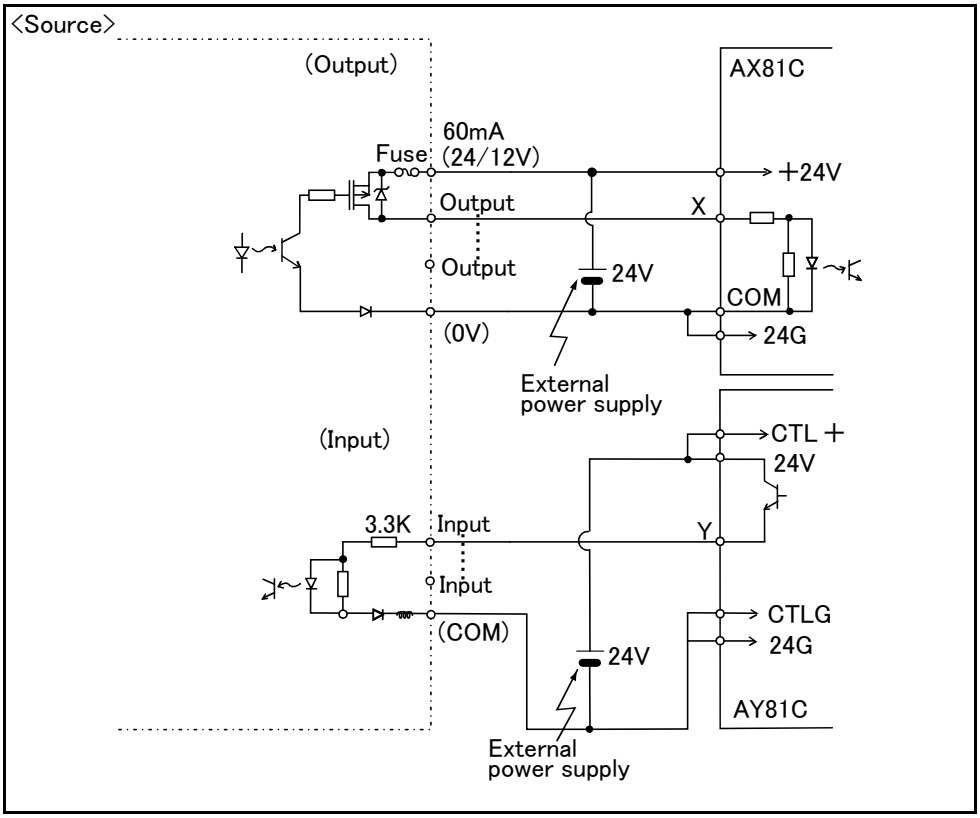


Table 3-20 : Connection with a Mitsubishi PLC (Example of source type)
*The input/output circuit external power supply (24 VDC) must be prepared by the customer.

(4) External I/O cable

■ Order type : ● 2D-CBL ☐☐ Note) The numbers in the boxes ☐☐ refer to the length. (05: 5m、15: 15m)

■ Outline

This is the dedicated cable used to connect an external peripheral device to the connector on the parallel I/O interface. For parallel I/O unit is another option 2A-CBL.**. One end matches the connector on the parallel input/output unit, and the other end is free. Connect the peripheral device's input/output signal using the free end.
One cable correspond to the input 16 points and output 16 points.
Two cables are needed to connection of (input 32 points and output 32 points) with built-in standard.

■ Configuration

Table 3-21 : Configuration device

Part name	Type	Qty.	Remarks
External I/O cable	2D-CBL ☐☐	1 pc.	5m or 15m

■ Specifications

Table 3-22 : Specifications

Items	Specifications
Number of cables x cable size	AWG #28 x 20P (40 pairs)
Total length	5m、15m

■ Connector pin numbers and cable colors

Table 3-23 : Connector pin numbers and cable colors

Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors
1A/C	Orange/Red a	11A/C	Orange/Red c	1B/D	Orange/Black a	11B/D	Orange/Black c
2A/C	Gray/Red a	12A/C	Gray/Red c	2B/D	Gray/Black a	12B/D	Gray/Black c
3A/C	White/Red a	13A/C	White/Red c	3B/D	White/Black a	13B/D	White/Black c
4A/C	Yellow/Red a	14A/C	Yellow/Red c	4B/D	Yellow/Black a	14B/D	Yellow/Black c
5A/C	Pink/Red a	15A/C	Pink/Red c	5B/D	Pink/Black a	15B/D	Pink/Black c
6A/C	Orange/Red b	16A/C	Orange/Red d	6B/D	Orange/Black b	16B/D	Orange/Black d
7A/C	Gray/Red b	17A/C	Gray/Red d	7B/D	Gray/Black b	17B/D	Gray/Black d
8A/C	White/Red b	18A/C	White/Red d	8B/D	White/Black b	18B/D	White/Black d
9A/C	Yellow/Red b	19A/C	Yellow/Red d	9B/D	Yellow/Black b	19B/D	Yellow/Black d
10A/C	Pink/Red b	20A/C	Pink/Red d	10B/D	Pink/Blackb	20B/D	Pink/Blackd

Notes) Pin number of connector<1> are 1C, 2C, ...20C, 1D, 2D, ...20D, connector<2> are 1A, 2A, ...20A, 1B, 2B, ...20B.

■ Connections and outside dimensions

The sheath of each signal cable (40 lines) is color indicated and marked with dots. Refer to the cable color specifications in "Table 3-32: Connector pin numbers and cable colors" when making the connections.

(Eg.) Pin number: color indication

1 : Orange ／ Red ／ A

- Type of dot mark (see figure below)
- Color of dot mark
- Color of sheath

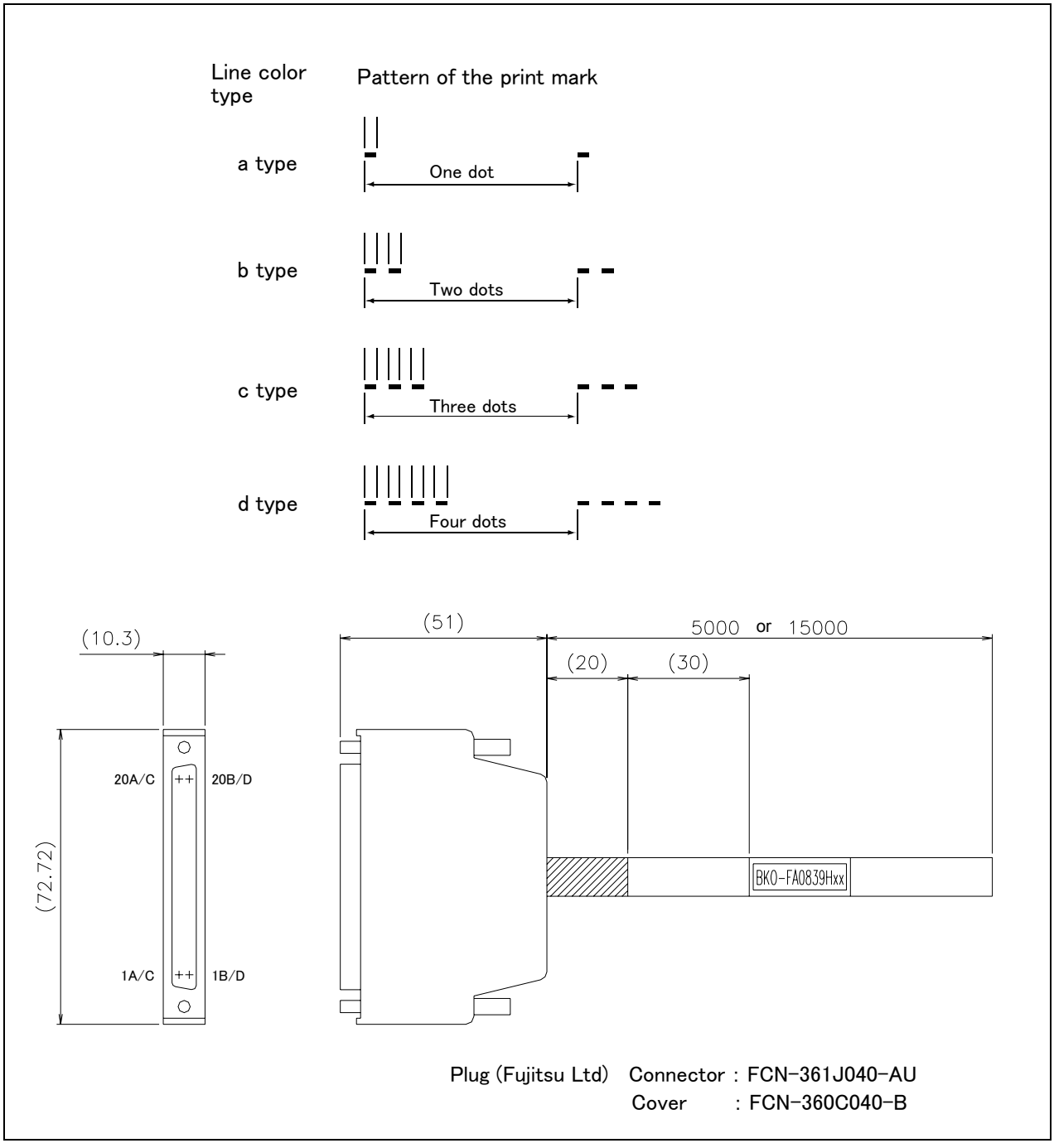


Fig.3-45 : Connections and outside dimensions

(5) Parallel I/O unit

■ Order type: 2A-RZ361(Sink type)
2A-RZ371(Source type)

■ Outline

This is used to expand the external inputs and outputs. One one equal with this unit is built into the control unit among controllers the standard.

- The connection cable is not included. .Prepare the optional external input/output cable (2A-CBL05 or 2A-CBL15).
- Use 2A-RZ361 if the external input/output signal logic is of the sink type and 2A-RZ371 for source type signal logic.

Notes) Although the combined use with the parallel I/O interface (2D-TZ368) of another option is also possible, please use the setup of the station number by the different number separately. The station number is automatically fixed by the position of the option slot which installed the parallel I/O interface in 0-2.

■ Configuration

Table 3-24 : Configuration device

Part name	Type	Qty.	Remarks
Parallel I/O unit	2A-RZ361	Either one pc.	Input/output 32 points/32 points 2A-RZ361 is the sink type. 2A-RZ371 is the source type.
	2A-RZ371		
Robot I/O link connection connector	NETcable-1	2 sets	Connector with pins. The cable must be prepared and wired by the customer.
Power connection connector	DCcable-2	1 set	Connector with pins. The cable must be prepared and wired by the customer.
Terminator	R-TM	1 pc.	100Ω(1/4W)

■ Specifications

1) The parallel I/O interface (2D-TZ368) of another option, and the a maximum of eight pieces in all. (One station occupies one unit.)
2) The power supply (24V) must be prepared by the customer and connected with the power connection cable (DCcable-2)
A separate 24V power supply is required for the input/output circuit wiring.

Table 3-25 : Electrical specifications of input circuits

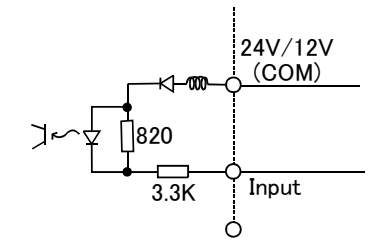
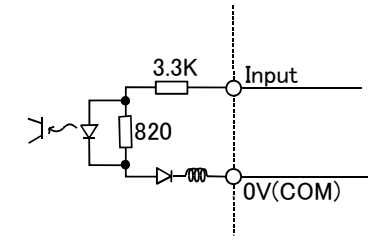
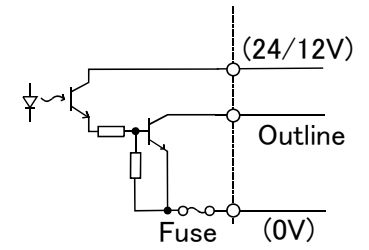
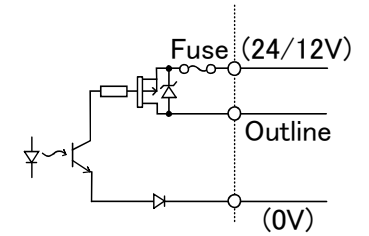
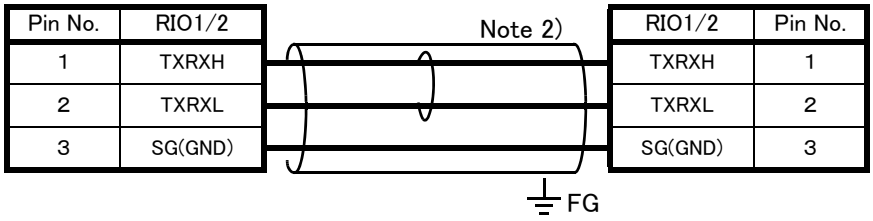
Item		Specification	Internal circuit
Type		DC input	<Sink type>  <Source type> 
Number of input points		32	
Insulation method		Photo coupler insulation	
Rated input voltage		12VDC/24VDC	
Rated input current		Approx 3mA/7mA	
Working voltage range		10.2 to 26.4VDC(Ripple factor should be less than 5%.)	
ON voltage/ON current		8VDC or more/ 2mA or more	
OFF voltage/ OFF current		4VDC or less/ 1mA or less	
Input resistance		Approx. 3.3kΩ	
Response time	OFF-ON	10ms or less (24VDC)	
	ON-OFF	10ms or less (24VDC)	
Common method		8 points per common	
External cable connection method		Connector	

Table 3-26 : Electrical specifications for the output circuits

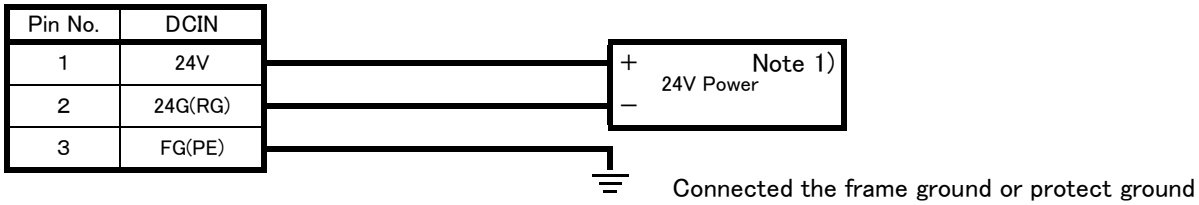
Item		Specification	Internal circuit
Type		Transistor output	<Sink type>  <Source type> 
No. of output points		32	
Insulation method		Photo-coupler insulation	
Rated load voltage		12VDC/24VDC	
Rated load voltage range		10.2 to 30VDC(peak voltage 30VDC)	
Max. load current		0.1A/point (100%)	
Leakage current at OFF		0.1mA or less	
Max. voltage drop at ON		0.9VDC(TYP.)	
Response time	OFF-ON	2ms or less (hardware response time)	
	ON-OFF	2ms or less (Resistance load) (hardware response time)	
Fuse rating		Fuse 3.2A (one per common) Replacement not possible	
Common method		8 points per common (common terminal: 8 points)	
External wire connection method		Connector	
External power supply	Voltage	12VDC/24VDC(10.2 to 30VDC)	
	Current	60mA (TYP. 24VDC per common) (base drive current)	

⚠ CAUTION The output circuit protective fuses prevent failure in case of load short-circuit and improper connections. Please do not connect loads that cause the current to exceed the maximum rated current. If the maximum rated current is exceeded, the internal transistors may be damaged.

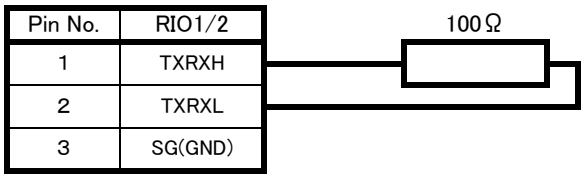
NETcable-1 (Network cable)



DCcable-2 (Power cable)



R-TM (Terminator)



List of parts and manufacturer

Type	Connector type	Contact type	Resistant	Manufacturer
NETcable-1	1-178288-3 (2)	175218-3 (6)	—	AMP
DCcable-2	2-178288-3 (1)	175218-3 (3)	—	AMP
R-TM	1-178288-3 (1)	175218-3 (2)	100Ω(1/4W) (1)	Equivalent to KOA.

Note 1) The 24V power supply is prepared by customer (The power consumption is approx. 0.3A.)
Note 2) The cable for general purpose can be used to the network cable. However, use the twisted shield cable of AWG#22(0.3mm^2) or more.

Fig.3-46 : Spacifications for the connection cable

■ Installation method

The expansion parallel input/output unit is installed outside of the controller. Connect with the network connection cable (NETcable-1) from the RIO connector in the rear/into of the controller.(Terminator is connected at the time of shipment)

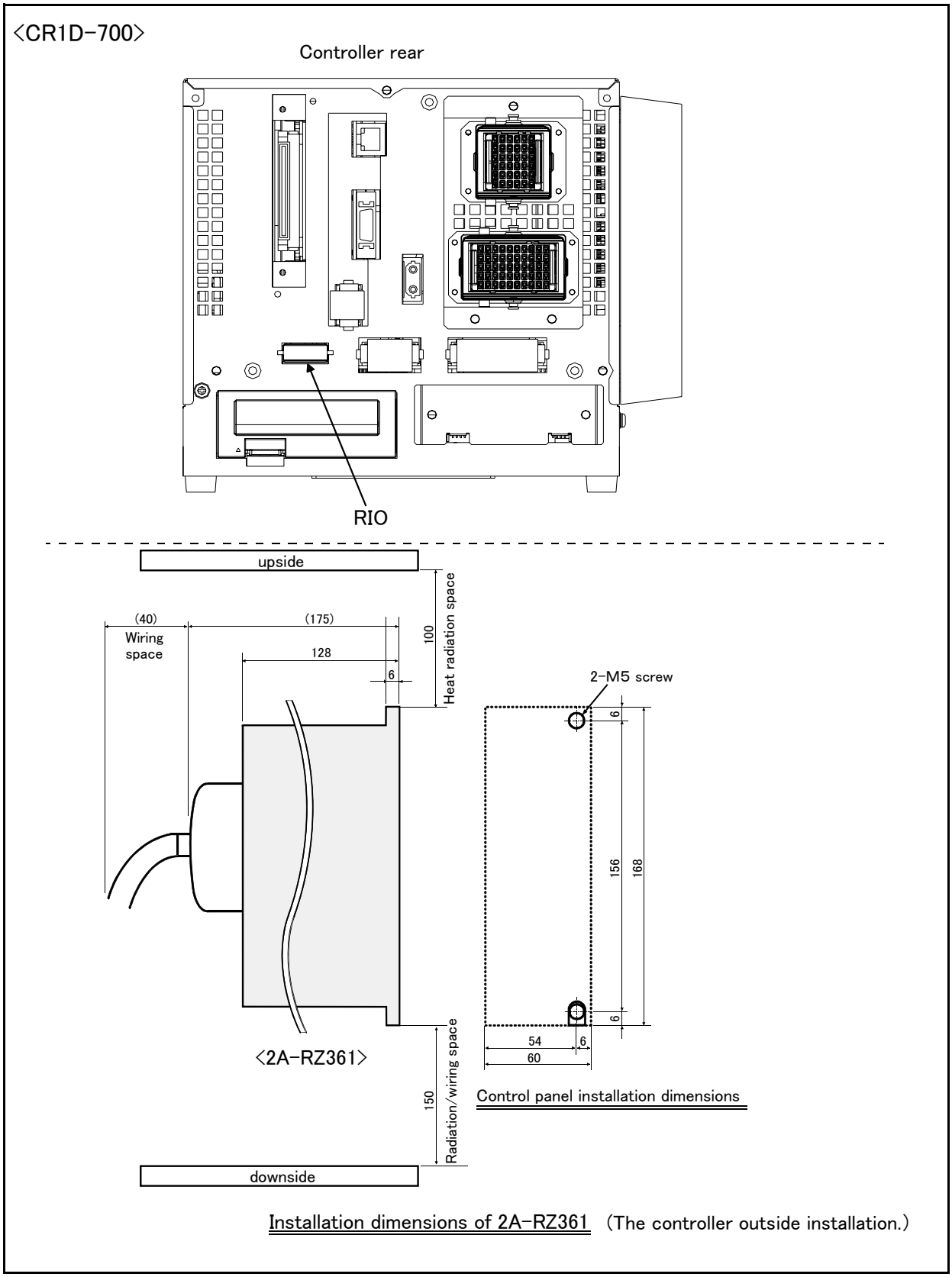
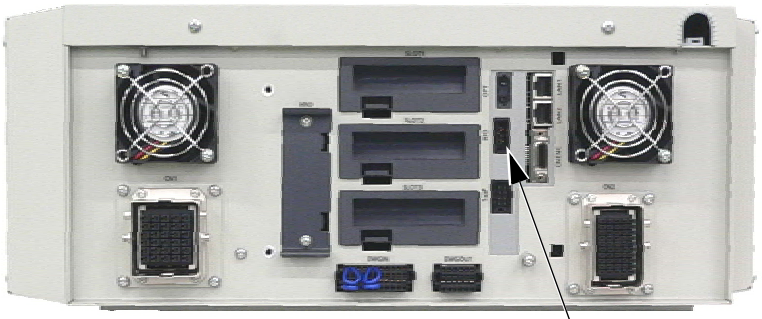
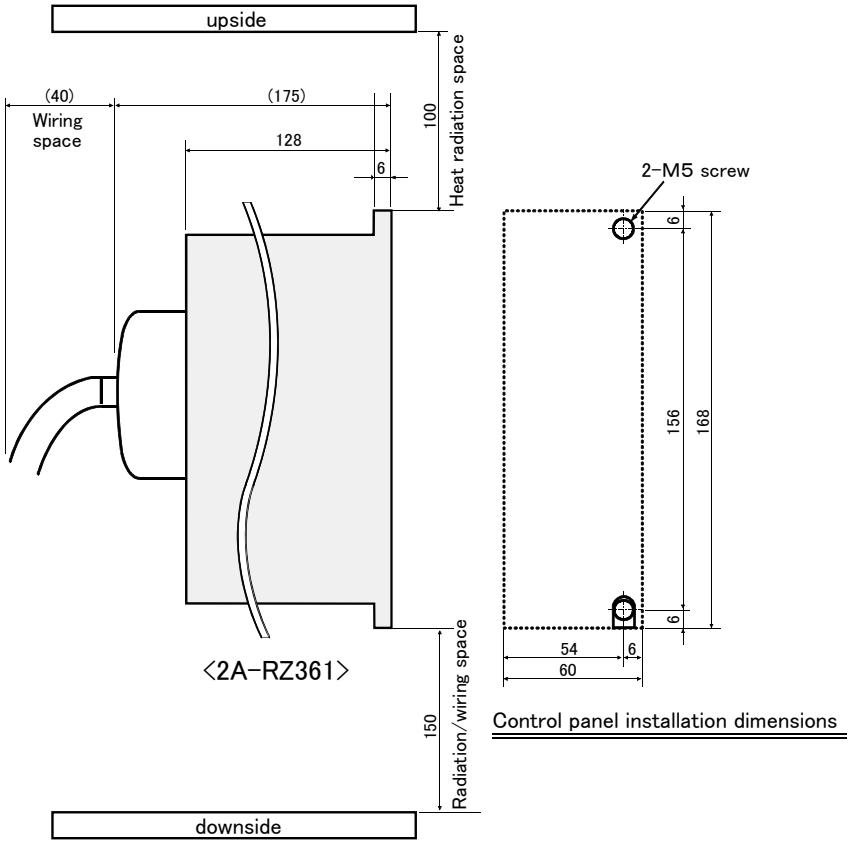


Fig.3-47 : Installing the parallel I/O unit (CR1D-700)

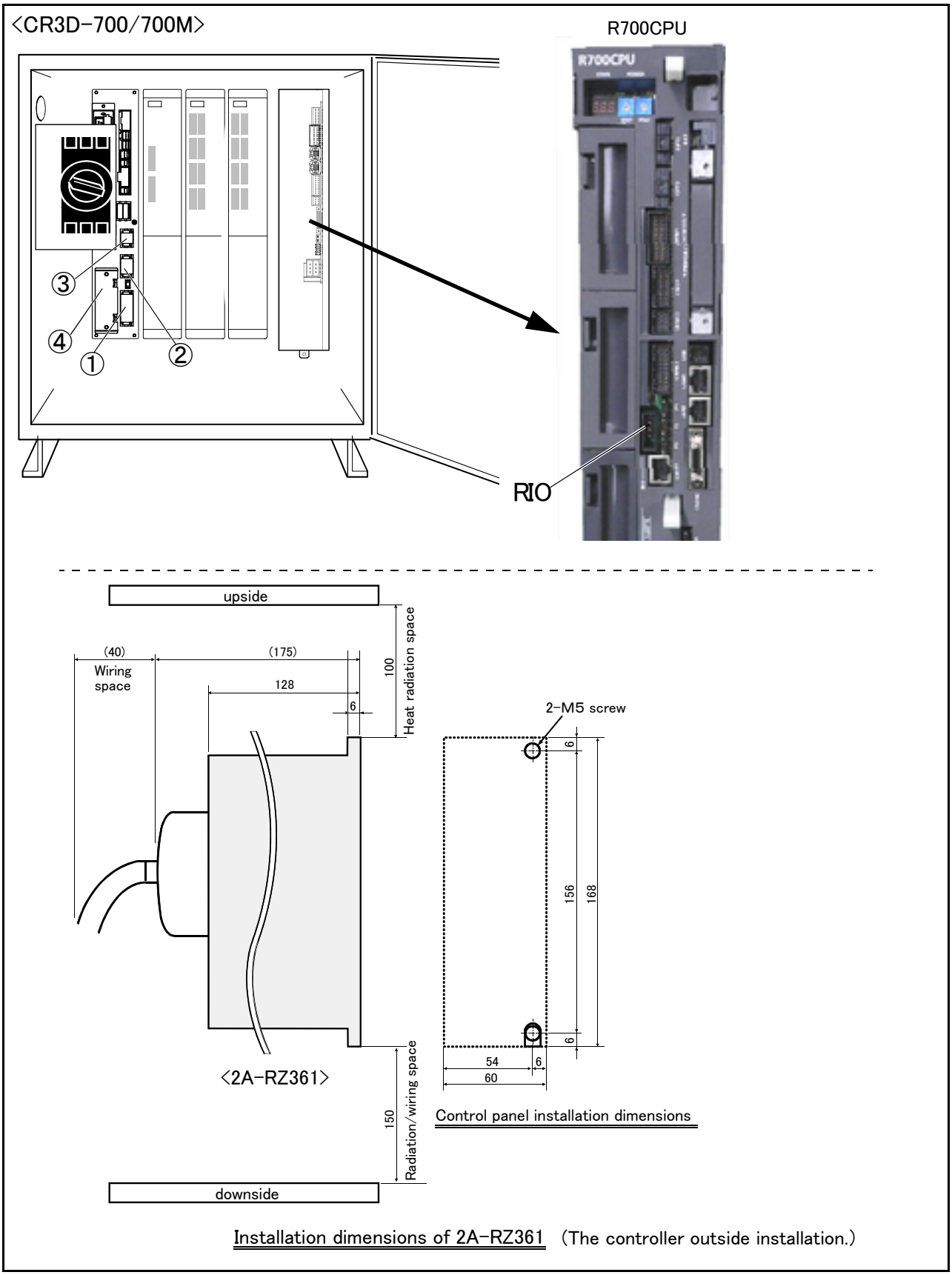
<CR2D-700>





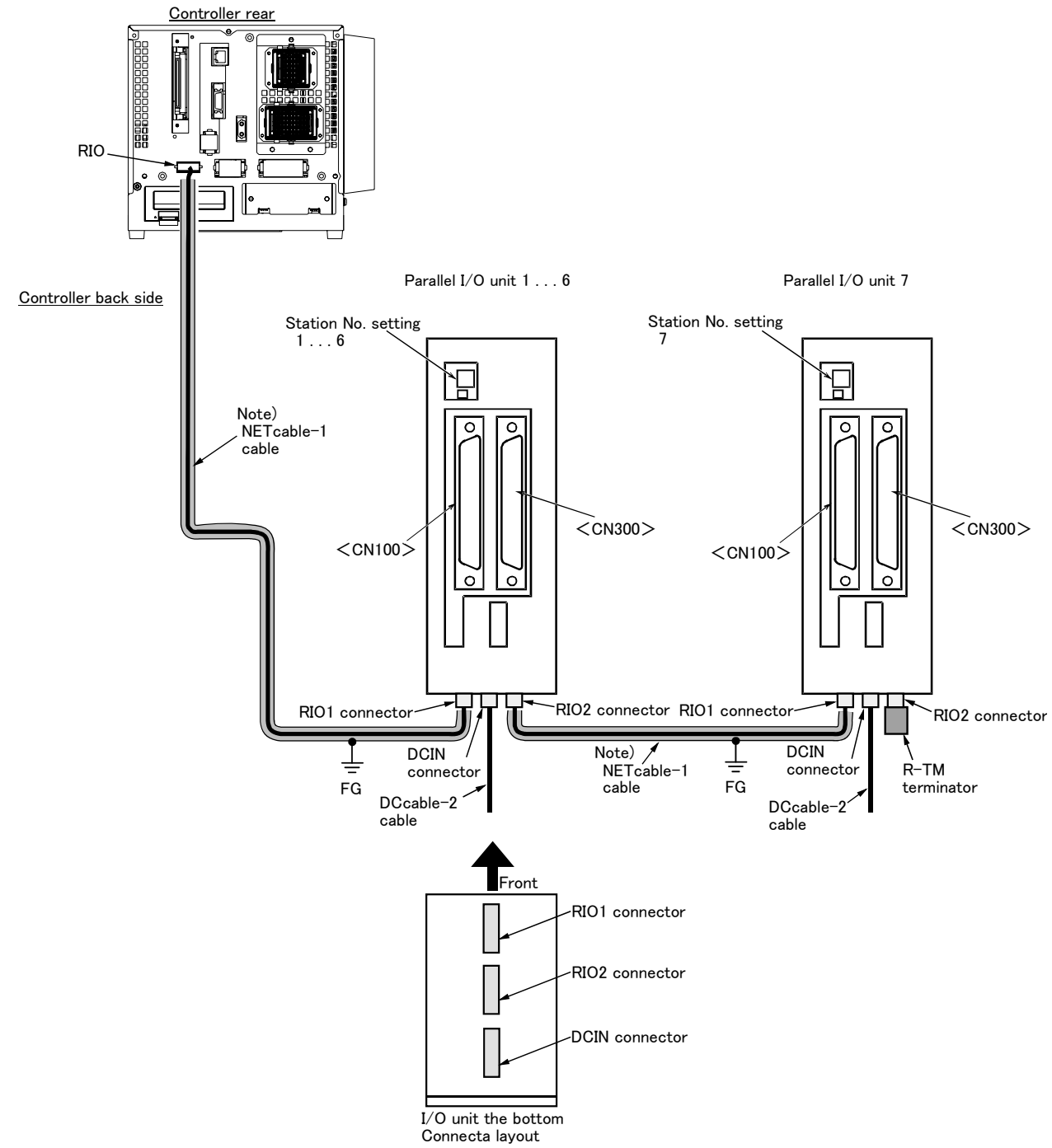
Installation dimensions of 2A-RZ361 (The controller outside installation.)

Fig.3-48 : Installing the parallel I/O unit (CR2D-700)



Installation dimensions of 2A-RZ361 (The controller outside installation.)

Fig.3-49 : Installing the parallel I/O unit (CR3D-700/700M)



Connect the NET cable-1 to the RIO connector on the back of the controller. Each unit is connected to from a daisy chain.

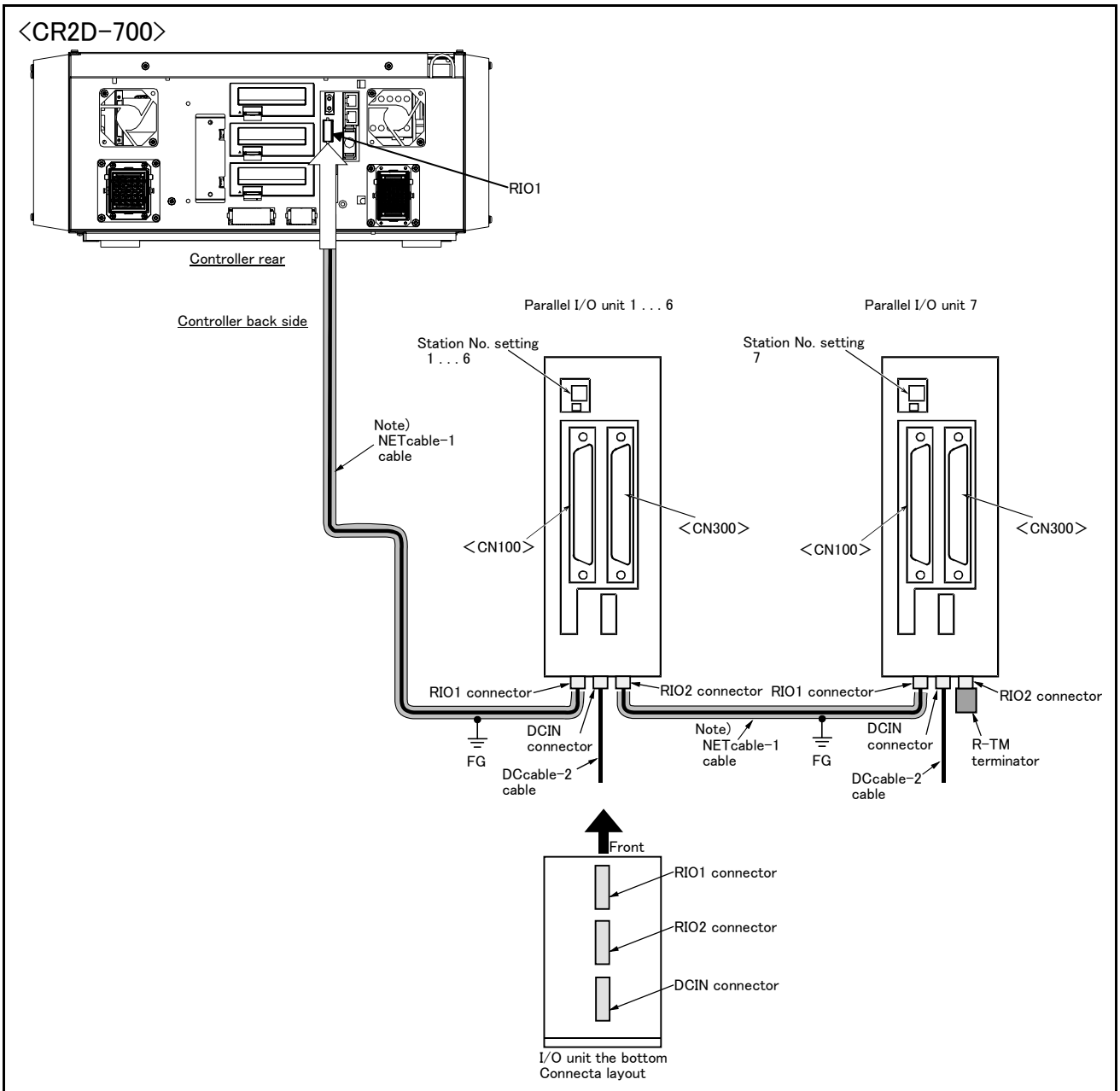
Always install a terminator (R-TM) to the last unit.

Note) Use a shield cable for NET cable-1 as a measure against noise.

Always connect the shield to FG. Install the attached ferrite core in both ends.

The unit could malfunction because of noise if the shield cable is not used.

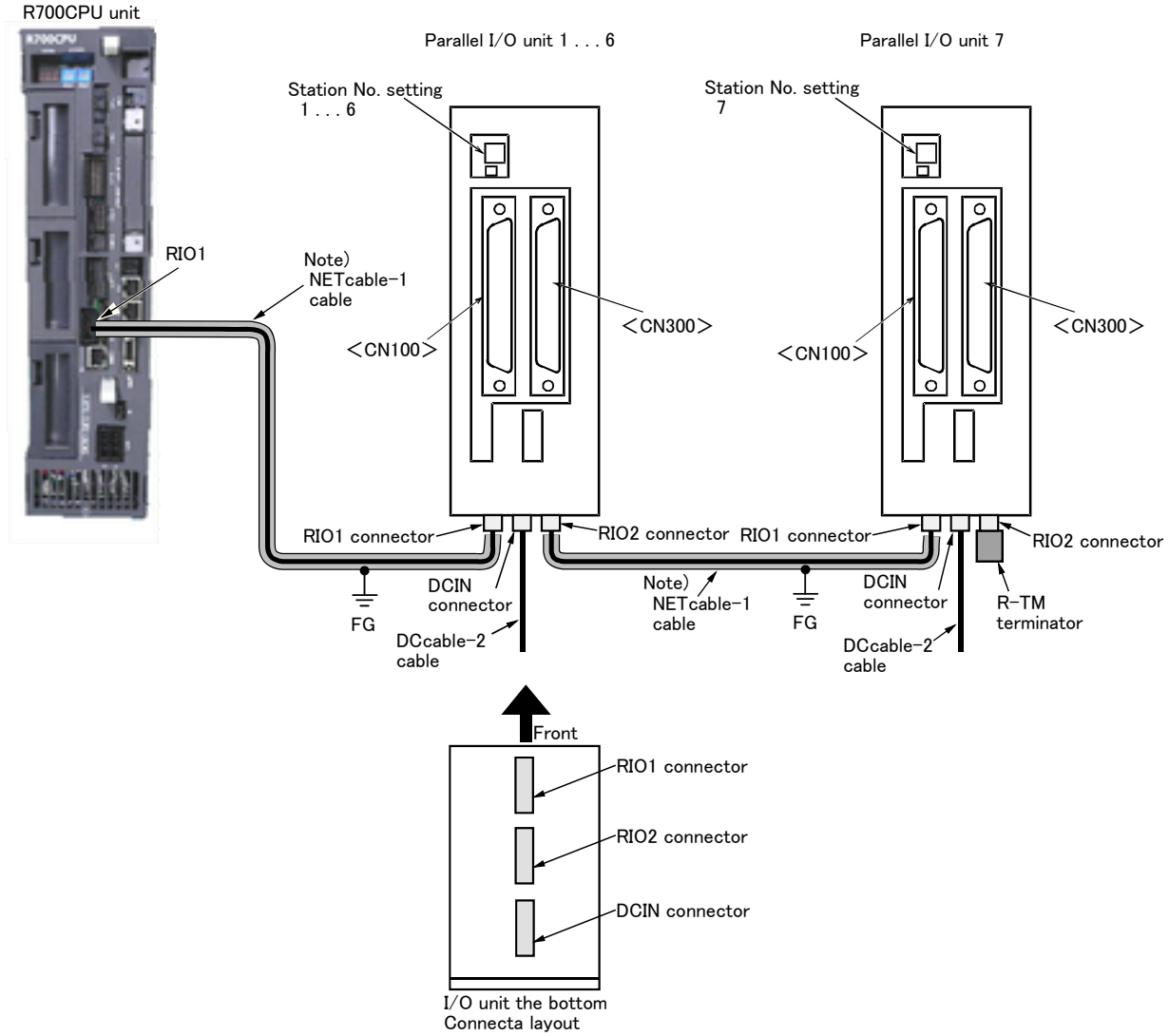
Fig.3-50 : Connection method of expansion parallel I/O unit (CR1D-700)



Connect the NET cable-1 to the RIO connector on the back of the controller. Each unit is connected to from a daisy chain.
Always install a terminator (R-TM) to the last unit.
Note) Use a shield cable for NET cable-1 as a measure against noise.
Always connect the shield to FG. Install the attached ferrite core in both ends.
The unit could malfunction because of noise if the shield cable is not used.

Fig.3-51 : Connection method of expansion parallel I/O unit (CR2D-700)

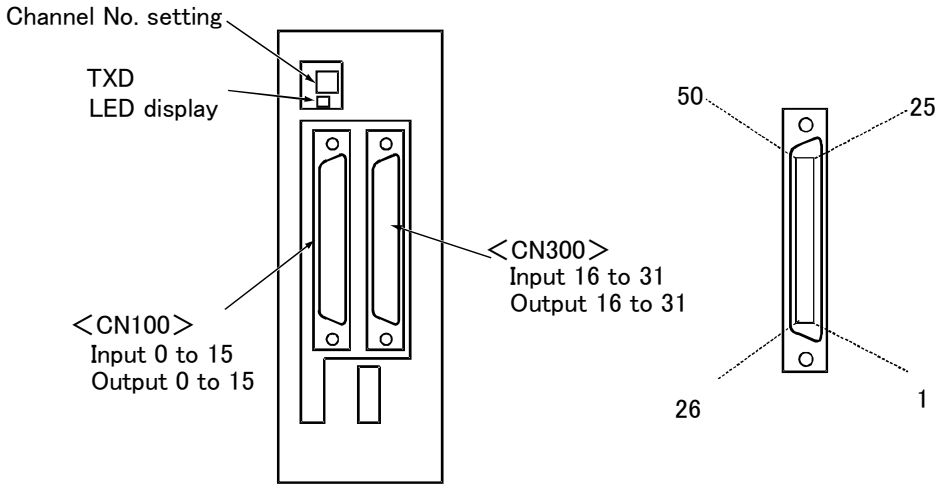
<CR3D-700/700M>



Connect the NET cable-1 to the RIO connector on the back of the controller. Each unit is connected to from a daisy chain.
Always install a terminator (R-TM) to the last unit.
Note) Use a shield cable for NET cable-1 as a measure against noise.
Always connect the shield to FG. Install the attached ferrite core in both ends.
The unit could malfunction because of noise if the shield cable is not used.

Fig.3-52 : Connection method of expansion parallel I/O unit (CR3D-700/700M)

■ Pin arrangement of the connector



*2A-RZ361/2 A-RZ371 are 32/32 input-and-output units. (One-station occupancy)

Fig.3-53 : Pin arrangement of the parallel I/O unit

■ Assignment of pin number and signal

The assignment range of the general-purpose input-and-output signal is fixed by the setup of the station number.

Table 3-27 : Assignment of pin number and signal

Unit Number	Station number	CN100	CN300
1st set	0	Input : 0 to 15 Output : 0 to 15	Input : 16 to 31 Output : 16 to 31
2nd set	1	Input : 32 to 47 Output : 32 to 47	Input : 48 to 63 Output : 48 to 63
3rd set	2	Input : 64 to 79 Output : 64 to 79	Input : 80 to 95 Output : 80 to 95
4th set	3	Input : 96 to 111 Output : 96 to 111	Input : 112 to 127 Output : 112 to 127
5th set	4	Input : 128 to 143 Output : 128 to 143	Input : 144 to 159 Output : 144 to 159
6th set	5	Input : 160 to 175 Output : 160 to 175	Input : 176 to 191 Output : 176 to 191
7th set	6	Input : 192 to 207 Output : 192 to 207	Input : 208 to 223 Output : 208 to 223
8th set	7	Input : 224 to 239 Output : 224 to 239	Input : 240 to 255 Output : 240 to 255

The connector pin number of the parallel I/O unit of the station number 0 and signal number assignment are shown in Table 3-28 and Table 3-29. If it is set as other station number, please interpret and utilize.

■ Parallel I/O interface (First expansion unit)

Table 3-28 : Connector CN100pin No. and signal assignment list (2A-CBL □□)

Pin No.	Line color	Function name		Pin No.	Line color	Function name	
		General-purpose	Dedicated/power supply, common			General-purpose	Dedicated/power supply, common
1	Orange/Red A		FG	26	Orange/Blue A		FG
2	Gray/Red A		0V:For pins 4-7, 10-13	27	Gray/Blue A		0V:For pins 29-32, 35-38
3	White/Red A		12V/24V:For pins 4-7	28	White/Blue A		12V/24V:For pins 29-32
4	Yellow/Red A	General-purpose output 0		29	Yellow/Blue A	General-purpose output 4	
5	Pink/Red A	General-purpose output 1		30	Pink/Blue A	General-purpose output 5	
6	Orange/Red B	General-purpose output 2		31	Orange/Blue B	General-purpose output 6	
7	Gray/Red B	General-purpose output 3		32	Gray/Blue B	General-purpose output 7	
8	White/Red B		0V:For pins 4-7, 10-13	33	White/Blue B		0V:For pins 29-32, 35-38
9	Yellow/Red B		12V/24V:For pins 10-13	34	Yellow/Blue B		12V/24V:For pins 35-38
10	Pink/Red B	General-purpose output 8		35	Pink/Blue B	General-purpose output 12	
11	Orange/Red C	General-purpose output 9		36	Orange/Blue C	General-purpose output 13	
12	Gray/Red C	General-purpose output 10		37	Gray/Blue C	General-purpose output 14	
13	White/Red C	General-purpose output 11		38	White/Blue C	General-purpose output 15	
14	Yellow/Red C		COM0:For pins 15-22 Note1)	39	Yellow/Blue C		COM1:For pins 40-47 Note1)
15	Pink/Red C	General-purpose input 0		40	Pink/Blue C	General-purpose input 8	
16	Orange/Red D	General-purpose input 1		41	Orange/Blue D	General-purpose input 9	
17	Gray/Red D	General-purpose input 2		42	Gray/Blue D	General-purpose input 10	
18	White/Red D	General-purpose input 3		43	White/Blue D	General-purpose input 11	
19	Yellow/Red D	General-purpose input 4		44	Yellow/Blue D	General-purpose input 12	
20	Pink/Red D	General-purpose input 5		45	Pink/Blue D	General-purpose input 13	
21	Orange/Red E	General-purpose input 6		46	Orange/Blue E	General-purpose input 14	
22	Gray/Red E	General-purpose input 7		47	Gray/Blue E	General-purpose input 15	
23	White/Red E		Reserved	48	White/Blue E		Reserved
24	Yellow/Red E		Reserved	49	Yellow/Blue E		Reserved
25	Pink/Red E		Reserved	50	Pink/Blue E		Reserved

Note1)Sink type:12V/24V(COM),Source type:0V(COM)

Table 3-29 : Connector CN300pin No. and signal assignment list (2A-CBL □□)

Pin No.	Line color	Function name		Pin No.	Line color	Function name	
		General-purpose	Dedicated/power supply, common			General-purpose	Dedicated/power supply, common
1	Orange/Red A		FG	26	Orange/Blue A		FG
2	Gray/Red A		0V:For pins 4-7, 10-13	27	Gray/Blue A		0V:For pins 29-32, 35-38
3	White/Red A		12V/24V:For pins 4-7	28	White/Blue A		12V/24V:For pins 29-32
4	Yellow/Red A	General-purpose output 16		29	Yellow/Blue A	General-purpose output 20	
5	Pink/Red A	General-purpose output 17		30	Pink/Blue A	General-purpose output 21	
6	Orange/Red B	General-purpose output 18		31	Orange/Blue B	General-purpose output 22	
7	Gray/Red B	General-purpose output 19		32	Gray/Blue B	General-purpose output 23	
8	White/Red B		0V:For pins 4-7, 10-13	33	White/Blue B		0V:For pins 29-32, 35-38
9	Yellow/Red B		12V/24V:For pins 10-13	34	Yellow/Blue B		12V/24V:For pins 35-38
10	Pink/Red B	General-purpose output 24		35	Pink/Blue B	General-purpose output 28	
11	Orange/Red C	General-purpose output 25		36	Orange/Blue C	General-purpose output 29	
12	Gray/Red C	General-purpose output 26		37	Gray/Blue C	General-purpose output 30	
13	White/Red C	General-purpose output 27		38	White/Blue C	General-purpose output 31	
14	Yellow/Red C		COM0:For pins 15-22Note1)	39	Yellow/Blue C		COM1:For pins 40-47 Note1)
15	Pink/Red C	General-purpose input 16		40	Pink/Blue C	General-purpose input 24	
16	Orange/Red D	General-purpose input 17		41	Orange/Blue D	General-purpose input 25	
17	Gray/Red D	General-purpose input 18		42	Gray/Blue D	General-purpose input 26	
18	White/Red D	General-purpose input 19		43	White/Blue D	General-purpose input 27	
19	Yellow/Red D	General-purpose input 20		44	Yellow/Blue D	General-purpose input 28	
20	Pink/Red D	General-purpose input 21		45	Pink/Blue D	General-purpose input 29	
21	Orange/Red E	General-purpose input 22		46	Orange/Blue E	General-purpose input 30	
22	Gray/Red E	General-purpose input 23		47	Gray/Blue E	General-purpose input 31	
23	White/Red E		Reserved	48	White/Blue E		Reserved
24	Yellow/Red E		Reserved	49	Yellow/Blue E		Reserved
25	Pink/Red E		Reserved	50	Pink/Blue E		Reserved

Note1)Sink type:12V/24V(COM),Source type:0V(COM)

(6) External I/O cable

■ Order type: 2A-CBL □□　　Note) The numbers in the boxes □□ refer to the length. (05: 5m、15: 15m)

■ Outline

This is the dedicated cable used to connect an external peripheral device to the connector on the parallel input/output unit.
One end matches the connector on the parallel input/output unit, and the other end is free. Connect the peripheral device's input/output signal using the free end.
One cable correspond to the input 16 points and output 16 points.
Two cables are needed to connection of (input 32 points and output 32 points) with built-in standard.

■ Configuration

Table 3-30 : Configuration device

Part name	Type	Qty.	Remarks
External I/O cable	2A-CBL □□	1pc.	5m or 15m

■ Specifications

Table 3-31 : Specifications

Items	Specifications
Number of cables x cable size	50 pairs x AWG #28
Total length	5m or 15m

■ Connector pin numbers and cable colors

Table 3-32 : Connector pin numbers and cable colors

Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors
1	Orange/Red A	11	Orange/Red C	21	Orange/Red E	31	Orange/Blue B	41	Orange/Blue D
2	Gray/Red A	12	Gray/Red C	22	Gray/Red E	32	Gray/Blue B	42	Gray/Blue D
3	White/Red A	13	White/Red C	23	White/Red E	33	White/Blue B	43	White/Blue D
4	Yellow/Red A	14	Yellow/Red C	24	Yellow/Red E	34	Yellow/Blue B	44	Yellow/Blue D
5	Pink/Red A	15	Pink/Red C	25	Pink/Red E	35	Pink/Blue B	45	Pink/Blue D
6	Orange/Red B	16	Orange/Red D	26	Orange/Blue A	36	Orange/Blue C	46	Orange/Blue E
7	Gray/Red B	17	Gray/Red D	27	Gray/Blue A	37	Gray/Blue C	47	Gray/Blue E
8	White/Red B	18	White/Red D	28	White/Blue A	38	White/Blue C	48	White/Blue E
9	Yellow/Red B	19	Yellow/Red D	29	Yellow/Blue A	39	Yellow/Blue C	49	Yellow/Blue E
10	Pink/Red B	20	Pink/Red D	30	Pink/Blue A	40	Pink/Blue C	50	Pink/Blue E

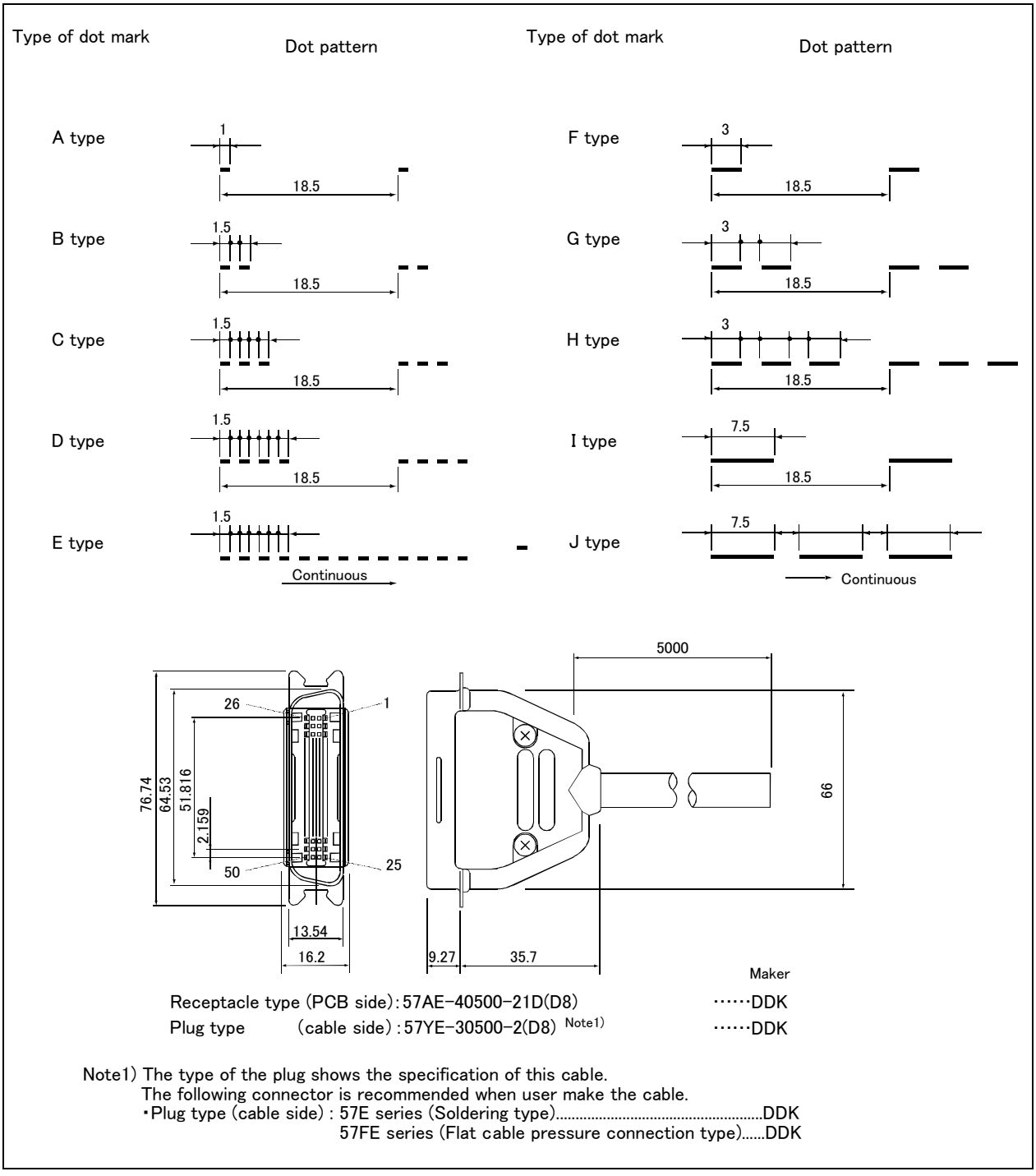
■ Connections and outside dimensions

The sheath of each signal cable (50 lines) is color indicated and marked with dots. Refer to the cable color specifications in "Table 3-32: Connector pin numbers and cable colors" when making the connections.

(Eg.) Pin number: color indication

1 : Orange ／ Red ／ A

- Type of dot mark (see figure below)
- Color of dot mark
- Color of sheath



Note1) The type of the plug shows the specification of this cable.
The following connector is recommended when user make the cable.
・Plug type (cable side) : 57E series (Soldering type).....DDK
57FE series (Flat cable pressure connection type).....DDK

Fig.3-54 : Connections and outside dimensions

(7) Personal computer cable

■ Order type: ● For PC/AT : 2D-232CBL03M

■ Outline

This is the RS-232 interface cable used for connecting the controller with a personal computer. The personal computer on hand may be usable with the above interface cable. Confirm the connection specifications when placing an order.
Personal computer cables for the PC/AT compatible model is available.

■ Configuration

Table 3-33 : Configuration device

Part name	Type	Qty.	Remarks
Personal computer cable (for PC/AT)	2D-232CBL03M	1pc.	3m, D-SUB 9 pin

■ Specifications

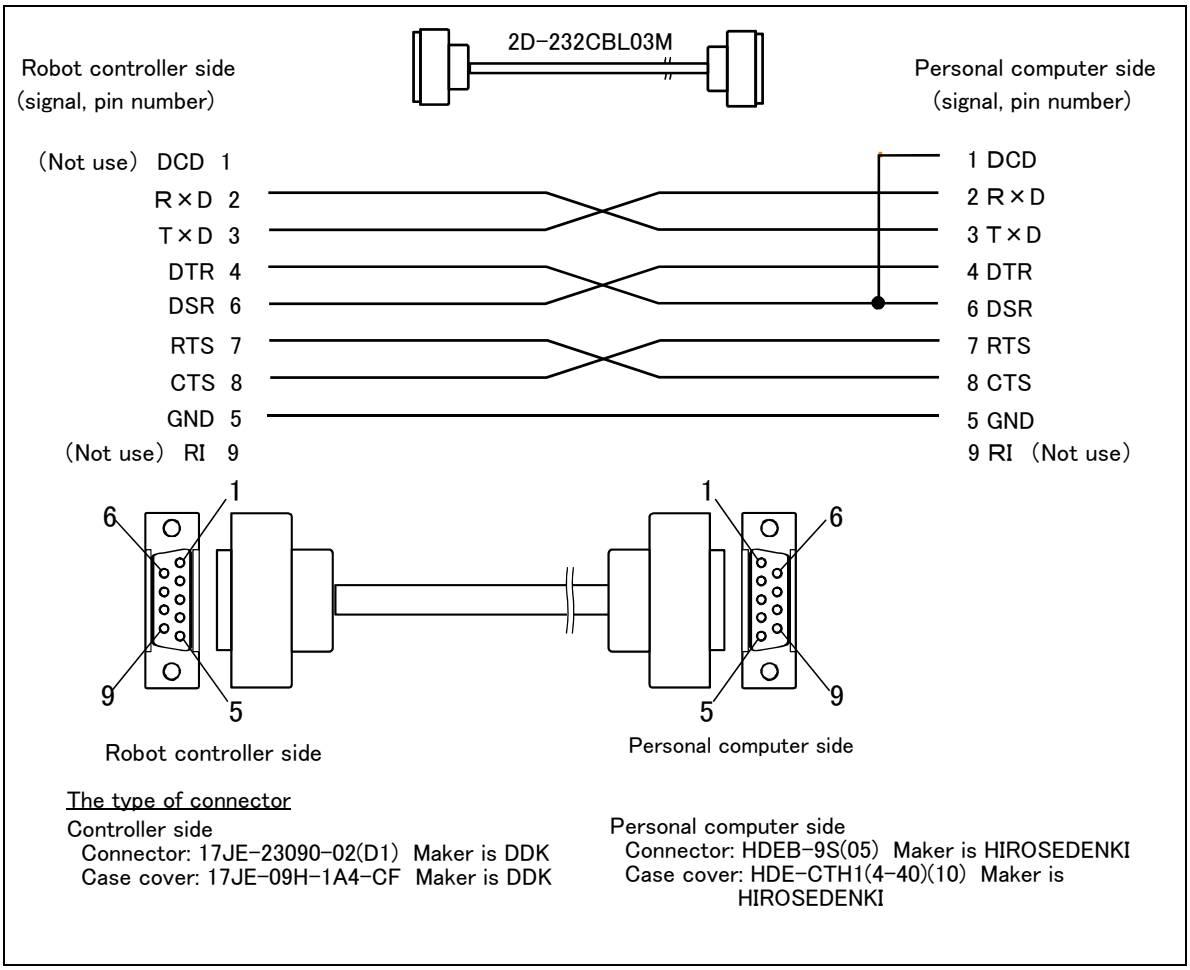


Fig.3-55 : Personal computer cabe connection

(8) CC-Link interface

■ Order type: ● 2D-TZ576

■ Outline

The CC-Link interface is the optioninterface to not only add bit data to the robot controller. but also to add CC-Link field network function that allows cyclic transmission of word data.

■ Configuration

Table 3-34 : Configuration deviceon

Part name	Type	Qty.	Remarks
CC-Link interface	2D-TZ576	1	
Ferrite core	E04SR301334	2	Be sure to install this for noise countermeasure.

Table 3-35 : Procured by the customer

Part name	Type	Qty.	Remarks
Master station	QJ61BT11(Q series)	1	FX series products are not supported.
	AJ61QBT11(QnA series)		
	A1SJ61QBT11(QnAS series)		
	AJ61BT11(A series)		
	A1SJ61BT11(AnS series)		
	A80BD-J61BT11(personal computer board)		
Communication cable	-	1	Shielded 3-core twisted cable This cable may be manufactured by the customer.
Terminal resistor	-	1	110Ω or 130Ω is recommended.

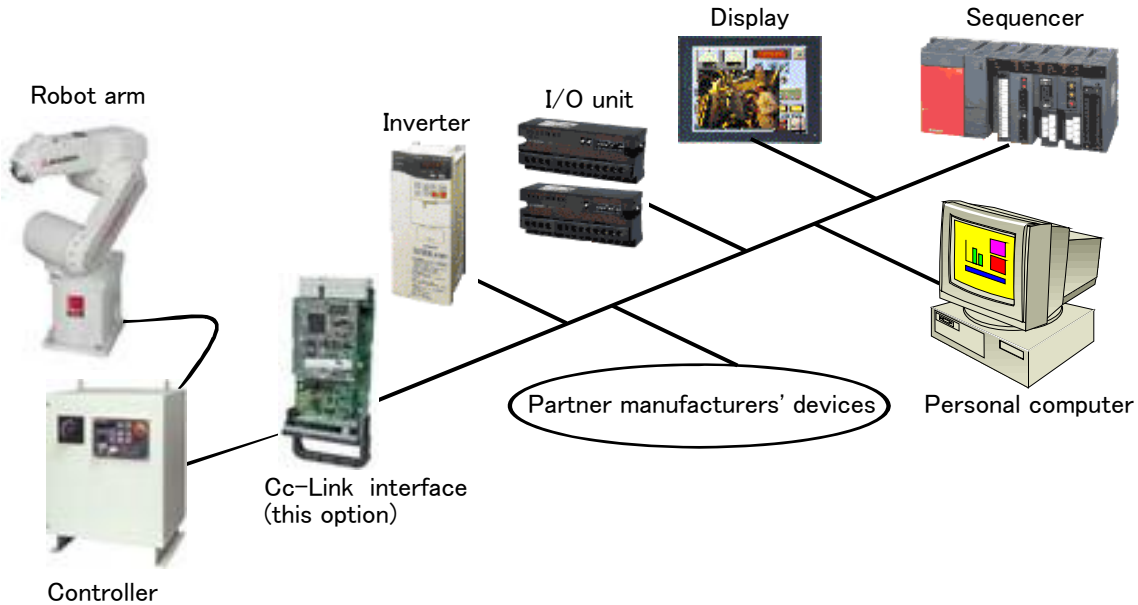


Fig.3-56 : Example of CC-Link Product Configuration

■ Specifications

Table 3-36 : Specifications

Item			Specifications				Remarks
Communication function			Bit data and word data can be transmitted.				Word data are used by the registers.
Station type			Intelligent device station Note1)				
Support station			Local station				No master station function
The version corresponding to CC-Link			Ver.2				The extended cyclic setup is possible.
Mountable option slot			Slot 1, 2, 3				
Number of mountable CC-Link interface cards			1				Multiple CC-Link interface cards cannot be inserted.
Number of stations			1 to 64 stations				When four stations are occupied, continuous station numbers are used. The station numbers are set by a DIP switch.
Transmission speed			10M/5M/2.5M/625K/156K bps				This is set by the rotary SW.
Station number			1 to 64				When four stations are occupied, continuous station numbers are used.
Number of occupied stations			One or four occupied stations can be set.				
Extended cyclic setup			1/2/4/8				
Maximum link point		Remote I/O (RX, RY).	Each 896 points				The two last cannot be used.
		Remote register (RWr, RWw)	Each 128 register				16 bits/register
Extended cyclic setup		–	1 fold setup	2 fold setup	3 fold setup	4 fold setup	
Link point per set	When one station is occupied	Remote I/O (RX, RY).	32 point	32 point	64 point	128 point	
		Remote register (RWw)	4 word	8 word	16 word	32 word	
		Remote register (RWr)	4 word	8 word	16 word	32 word	
	When two stations is occupied	Remote I/O (RX, RY).	64 point	96 point	192 point	384 point	
		Remote register (RWw)	8 word	16 word	32 word	64 word	
		Remote register (RWr)	8 word	16 word	32 word	64 word	
	When three stations is occupied	Remote I/O (RX, RY).	96 point	160 point	320 point	640 point	
		Remote register (RWw)	12 word	24 word	48 word	96 word	
		Remote register (RWr)	12 word	24 word	48 word	96 word	
	When four stations is occupied	Remote I/O (RX, RY).	128 point	224 point	448 point	896 point	
		Remote register (RWw)	16 word	32 word	64 word	128 word	
		Remote register (RWr)	16 word	32 word	64 word	128 word	
Number of the maximum occupancy station			4 stations				
The I/O first number of the robot controller.			No. 6000 –. The number corresponding to the station number by the setup of the parameter "CCFIX."				

Note1)The CC-Link interface supports neither the transient transmission function nor the FX series.

■ Functions

(1) Communication function

- The number of usable points is 126 points maximum for bit control and 16 points maximum for word control.
- Up to 2,048 points of input bit data can be monitored by a unit being connected. (Input only, output is disabled.)
- Up to 256 points of input word data can be monitored by a unit being connected. (Input only, output is disabled.)

(2) Easy setup

- The CC-Link interface card can be set by a rotary switch or DIP switch.
- No separate space is required to mount the CC-Link interface card as it is embedded in the robot controller (can only be mounted into slot 2).
- Easy wiring since only four terminals need to be connected.
- Dedicated commands have been added to MELFA-BASIC Ⅴ (robot programming language); thus, no complex interface programming is required.

(3) High-speed response

- The link scan time when connecting 64 stations is approximately 7.2 ms, achieving superior high-speed response performance.
- A transmission speed can be selected from 10M, 5M, 2.5M, 625K and 156K bps according to the transmission distance.

(9) Extension memory cassette

■ Order type: ● 2D-TZ454

■ Outline

Used to increase the total number of teaching points in the robot program.

■ Configuration

Table 3-37 : Configuration device

Part name	Type	Qty.	Remarks
Extension memory cassette	2D-TZ454	1	

■ Specifications

Table 3-38 : Specifications

Items	Specifications	Remarks
External dimensions	Approx. 94(W)X65(D)X15(H) mm	Excluding the connection connector
Mass	Approx. 0.2 kg	
Connection method	Connection using a special connector	
Memory size Note1)	Teaching point number: 37,800 Steps number: 75,600 Program number: 256	The sum total value combined with the standard are Teaching point number: 50,800 Steps number: 101,600 Program number: 512
Backup	Backup using the controller's internal battery	

Note1) As for the standard points, after adding an expansion memory cassette, the information in all backup memory areas in the controller is copied into the expansion memory cassette. Therefore, please note that if the expansion memory cassette is removed after it has been added, there will be no program left in the controller.

[CAUTION]

・Inserting and removing the memory cassette

A memory cassette cannot be inserted or removed while the control power is on. Please turn off the control power before handling the memory cassette to avoid destroying the memory information in the cassette.

(10) RT ToolBox2/RT ToolBox2 mini

■ Order type : ● RT ToolBox2
*For windows CD-ROM : 3D-11C-WINE
● RT ToolBox2 mini
*For windows CD-ROM : 3D-12C-WINE

■ Outline

This is handy software that fully uses the personal computer functions. It can be used in various stages from the robot specifications study (tact study, etc.) to the design support (creation and editing of programs), start up support (execution, control and debugging of program), and maintenance (remote maintenance.)
The "personal computer support software" which supports these function fully, and the "personal computer support software mini" which does not have the simulation function are available.

■ Configuration

Table 3-39 : Product configuration

Part name	Type	Medium	Remarks
RT ToolBox2	3D-11C-WINE	CD-ROM	
RT ToolBox2 mini	3D-12C-WINE	CD-ROM	

■ Features

(1) Simple operation with guidance method and menu method
The Windows standard is used for windows operation, so the controller initialization and startup operations can be carried out easily by following the instructions given on the screen. Even a beginner can easily carry out the series of operations from program creation to execution.

(2) Increased work efficiency with ample support functions
The work efficiency is greatly improved with the multi-window method that carries out multiple steps and displays in parallel. The renumbering function, and copy, search, syntax check and step execution are especially sufficient, and are extremely useful when editing or debugging the program.
With the simulation function support, the program can be debugged and the tact checked before starting the machine at the site. This allows the on-site startup work efficiently to be greatly improved.

(3) Increased maintenance efficiency with remote maintenance function
With remote operations over a telephone line, the robot's operation status can be monitored without going to the site. Losses incurred while moving to the site can be reduced, and the time required to investigate the trouble and determine measures to be taken can be shortened.

(4) The maintenance forecast function increases the efficiency of maintenance work. Analyze the load condition while the robot is actually operating. Based on this analysis, calculate the time for maintenance, such as lubrication and belt replacement. By utilizing this information, the line stop time as well as the maintenance costs can be reduced.

(5) The position recovery support function increases the recovery efficiency in the event of origin position displacement. This function compensates the origin settings and position data by just reproducing several previous teaching points when hand and/or arm displacement occurs, when replacing the motor and the belts, or when reloading the robot. This function can reduce the time required for recovery.

■ Functions

Table 3-40 : Functions

Function		Functional existence[Note1)]		Details
Compatible model		○	○	Personal computer running Microsoft Windows2000/XP/Vista.
Program editing functions	Editing functions	○	○	・MELFA BASIC Ⅴ language compatible ・Multiple editing screen simultaneously display ・Command input, comment writing ・Position data editing ・File operation (writing to controller, floppy disk, personal computer) ・Search and replace function (using characters, line Nos., labels) ・Copy, cut, paste, insert (per character, line), undo (per command statement, position conversion) ・Line No. automatic generation, renumbering ・Batch syntax check ・Command template ・Position conversion batch editing ・Position variable template ・Print, print preview
	Control functions	○	○	・Program file control (list, copy, movement, delete, content comparison, name change, protect)
	Debugging functions	○	○	・Direct editing of program in controller ・Confirmation of robot program operation (step execution, direct execution) ・Tact time measurement[Note2)]
Simulation function		○	×	・Off-line simulation of robot program operation using CG (computer graphics) ・Tact time calculation
Monitor functions		○	○	・Robot operation monitor (robot operation state, stop signal, error monitor, program monitor (execution program, variables), general-purpose input/output signals (forced output possible), dedicated input/output signals, operation confirmation (operation range, current position, hand, etc.) ・Operation monitor (working time statistics, production information, robot version) ・Servo monitor (position, speed, current, load, power)
Maintenance function		○	○	・Parameter setting ・Batch, divided backup
Remote maintenance function		○	○	・Monitoring and maintenance of robot state at remote site using telephone line. (A separate modem is required for this function.)

RT ToolBox2 mini
(3D-12C-WINE)

RT ToolBox2
(3D-11C-WINE)

Note1)The functions included with the RT ToolBox2 and the RT ToolBox2 mini are shown below.
○ : Function provided × : Function not provided

Note2)When using the RT ToolBox2 mini, connect with the controller and measure.

(11) Instruction Manual(bound edition)

■ Order type : ● 5S-DD00-PE01 (RH-6SDH/12SDH/18SDH series)
■ Outline

This is a printed version of the CD-ROM (instruction manual) supplied with this product.

■ Configuration

Table 3-41 : Product configuration(RH-6SDH/12SDH/18SDH series)

Name		Type	Specifications
Instruction Manual		5S-DD00-PE01	
	Safety Manual	BFP-A5948	Items relating to safety in handling the robot
	Standard Specifications	BFP-A8658	Specification of the robot arm and controller
	Robot Arm Setup & Maintenance	BFP-A8659	Installation method of the robot arm, jog operation, and maintenance and inspection procedures
	Controller Setup, Basic Operation and Maintenance	BFP-A8660	Installation method of the controller, basic operation, and maintenance and inspection procedures
	Detailed Explanation of Functions and Operations	BFP-A8661	Functions of the controller and T/B, operation method, and explanation of MELFA-BASIC Ⅴ
	Troubleshooting	BFP-A8662	Causes of errors occurred and their countermeasures

3.10 Maintenance parts

The consumable parts used in the controller are shown in Table 3-42. Purchase these parts from your dealer when required. Some Mitsubishi-designated parts differ from the maker's standard parts. Thus, confirm the part name, robot arm and controller serial No. and purchase the parts from your dealer.

Table 3-42 : Contloller consumable parts list

No.	Name	Type Note1)	Qty.	Usage place	Supplier
CR1D-700 controller					
1	Lithium battery	Q6BAT	1	Front operation panel	Mitsubishi Electric System Service;Co.,Ltd
2	Filter		1	Front of the controller	
CR2D-700 controller					
1	Lithium battery	Q6BAT	1	Front operation panel	Mitsubishi Electric System Service;Co.,Ltd
2	Filter		1	Front of the controller	
CR3D-700 controller					
1	Lithium battery	Q6BAT	1	Front operation panel	Mitsubishi Electric System Service;Co.,Ltd
2	Fan (40 square)		5	Amplifier unit Converter unit	
3	Fan (90 square)		1	Control unit	
4	Filter		1	Controller rear	

Note1)Confirm the robot arm serial No., and contact the dealer or service branch of Mitsubishi Electric Co., for the type.

4 Software

4.1 List of commands

The available new functions in MELFA-BASIC Ⅴ are given in Table 4-1.

Table 4-1 : List of MELFA-BASIC Ⅴ commands

Type	Class	Function	Input format (example)
Position and operation control	Joint interpolation	Moves to the designated position with joint interpolation.	Mov P1
	Linear interpolation	Moves to the designated position with linear interpolation.	Mvs P1
	Circular interpolation	Moves along a designated arc (start point → passing point → start point (end point)) with 3-dimensional circular interpolation (360 degrees).	Mvc P1,P2,P1
		Moves along a designated arc (start point → passing point → end point) with 3-dimensional circular interpolation.	Mvr P1,P2,P3
		Moves along the arc on the opposite side of a designated arc (start point → reference point → end point) with 3-dimensional circular interpolation.	Mvr2 P1,P9,P3
		Moves along a set arc (start point → end point) with 3-dimensional circular interpolation.	Mvr3 P1,P9,P3
	Speed designation	Designates the speed for various interpolation operations with a percentage (0.1% unit).	Ovrd 100
		Designate the speed for joint interpolation operation with a percentage (0.1% unit).	JOvrd 100
		Designates the speed for linear and circular interpolation with a numerical value (mm/s unit).	Spd 123.5
		Designates the acceleration/deceleration time as a percentage in respect to the predetermined maximum acceleration/deceleration. (1% unit)	Accel 50,80
		Automatically adjusts the acceleration/deceleration according to the parameter setting value.	Oadl ON
		ets the hand and work conditions for automatic adjustment of the acceleration/deceleration.	LoadsetT 1,1
	Operation	Performance of movement is upgraded corresponding to the application.	MvTune 2
		Adds a process unconditionally to the operation.	Wth
		Adds a process conditionally to the operation.	Wthif
		Designates smooth operation.	Cnt 1,100,200
		Designates the positioning completion conditions with a No. of pulses.	Fine 200
		Designates the positioning completion conditions with a joint interpolation.	Fine 0.5, J, 2
		Designates the positioning completion conditions with a distance in a straight line	Fine 1, P
		Turns the servo power ON/OFF for all axes.	Servo OFF
		Limits the operation of each axis so that the designated torque is not exceeded.	Torq 4,10
	Position control	Designates the base conversion data.	Base P1
		Designates the tool conversion data.	Tool P1
	Float control	The robot arm rigidity is lowered and softened. (XYZ coordinate system)	Cmp Pos ,&B00000011
		The robot arm rigidity is lowered and softened. (JOINT coordinate system)	Cmp Jnt ,&B00000011
		The robot arm rigidity is lowered and softened. (TOOL coordinate system)	Cmp Tool ,&B00000011
		The robot arm rigidity is returned to the normal state.	Cmp Off
		The robot arm rigidity is designated.	Cmpg 1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0
	Pallet	Defines the pallet.	Def Plt 1,P1,P2,P3,P4,5,3,1
		Operates the pallet grid point position.	Plt 1,M1
	Singular point passage	Move to a specified position using linear interpolation passing through a singular point.	Mvs P1 TYPE 0,2

Type	Class	Function	Input format (example)
Program control	Branching	Branches unconditionally to the designated place.	GoTo 120
		Branches according to the designated conditions.	If M1=1 Then GoTo 100 Else GoTo 20 End If
		Repeats until the designated end conditions are satisfied.	For M1=1 TO 10 Next M1
		Repeats while the designated conditions are satisfied.	While M1<10 Wend
		Branches corresponding to the designated expression value.	On M1 GOTO 100,200,300
		Executes program block corresponding to the designated expression value..	Select Case 1 Break Case 2 Break End Select
		Moves the program process to the next line.	Skip
Program control	Impact detection	Set to enable/disable the impact detection.	ColChk ON/OFF
		Set the detection level of the impact detection.	ColLvl 100,80,,,,,,
	Subroutine	Executes the designated subroutine. (Within program)	GoSub 200
		Returns from the subroutine.	Return
		Executes the designated program.	CallP "P10",M1,P1
		Defines the program argument executed with the CALLP command.	FPrm M10,P10
		Executes the subroutine corresponding to the designated expression value.	On M1 GOSUB 100,200,300
	Interrupt	Defines the interrupt conditions and process.	Def Act 1, M1=1 GOTO 100
		Enables/disables the interrupt.	Act 1=1
		Defines the start line of the program to be executed when an interrupt is generated from the communication line.	On Com(1) GOSUB 100
		Enables the interrupt from the communication line.	Com(1) ON
		Disables the interrupt from the communication line.	Com(1) OFF
		Stops the interrupt from the communication line.	Com(1) STOP
	Wait	Designates the wait time, and the output signal pulse output time. (0.01s unit)	Dly 0.5
		Waits until the variable becomes the designated value.	Wait M_IN(1)=1
	Stop	Stops the program execution.	Hlt
		Generates an error. During program execution, continue, stop or servo OFF can be designated.	Error 9000
	End	Ends the program execution.	End
Hand	Hand open	Opens the designated hand.	HOpen 1
	Hand close	Closes the designated hand.	HClose 1
Input/output	Assignment	Defines the input/output variables.	Def IO PORT1=BIT,0
	Input	Retrieves the general-purpose input signal.	M1=M_IN (1)
	Output	Calls out the general-purpose output signal.	M_Out(1) =0
Parallel execution	Mechanism designation	Acquires the mechanism with the designated mechanism No.	GetM 1
		Releases the mechanism with the designated mechanism No.	RelM 1
	Selection	Selects the designated program for the designated slot.	XLoad 2,"P102"
	Start/stop	Carries out parallel execution of the designated program.	XRun 3,"100",0
		Stops parallel execution of the designated program.	XStp 3
		Returns the designated program's execution line to the head and enters the program selection enabled state.	XRst 3

Type	Class	Function	Input format (example)
Others	Definition	Defines the integer type or real number type variable.	Def Inte KAISUU
		Defines the character string variable.	Def Char MESSAGE
		efines the layout variable. (Up to 3-dimensional possible)	Dim PDATA(2,3)
		Defines the joint variable.	Def Jnt TAIHI
		Defines the position variable.	Def Pos TORU
		Defines the function.	Def FN TASU(A,B)=A+B
	Clear	Clears the general-purpose output signal, variables in program, variables between programs, etc.	Clr 1
	File	Opens a file.	Open "COM1:" AS #1
		Closes a file.	Close #1
		Inputs data from a file.	Input# 1,M1
		Outputs data to a file.	Print# 1,M1
	Comment	Describes a comment.	Rem "ABC"
	Label	Indicates the branching destination.	*SUB1

4.2 List of parameters

show the main parameter in the Table 4-2.

Table 4-2 : List of parameters

Parameter		Details
Standard tool coordinates.	MEXTL	Set the default value for the tool data. Unit: mm or deg.
Standard base coordinates	MEXBS	Set the relation of the world coordinate system and robot coordinate system. Unit: mm or deg.
XYZ operation range	MEPAR	Designate the overrun limit value for the world coordinate system.
JOINT operation range	MEJAR	Set the overrun limit value for each joint axis.
Free plane limit		This is the overrun limit set with the free plane. Create a plane with the three coordinates x1, y1, z1 to x3, y3, z3, and set the outer side of the plane as the outside operation range (error). The following three types of parameters are used.
	SFC1P : SFC8P	Eight types of free plane limits can be set in SFC1P to SFC8P. There are nine elements, set in the order of x1, y1, z1, x2, y2, z2, x3, y3, z3.
	SFC1ME : SFC8ME	Designate which mechanism to use eight types of set free plane limits. The mechanism No. to use is set with 1 to 8.
	SFC1AT : SFC8AT	Set the validity of the eight types of set free plane limits. (Valid 1/Valid 2/invalid = 1/-1/0)
User-defined area		An area (cube) defined with two XYZ coordinate points can be designated and that area set as the outside operation range. Furthermore, a signal can be output when the axis enters that area. Up to eight types of area can be designated.
	AREA1P1 : AREA8P1	Designated the 1st point of the area. There are eight elements, set in the order of x, y, z, a, b, c, L1, L2. (L1 and L2 are the additional axes.)
	AREA1P2 : AREA8P2	Designated the 2nd point of the area. There are eight elements, set in the order of x, y, z, a, b, c, L1, L2. (L1 and L2 are the additional axes.)
	AREA1ME : AREA8ME	Designate which mechanism to use the eight types of set area. The mechanism No. to use is set with 1 to 8
	AREA1AT : AREA8AT	Designate the area check type. (Invalid/zone/interference = 0/1/2) Zone: The dedicated output signal USRAREA turns ON. Interference: An error occurs..
Automatic return setting	RETPATH	Set to restart the program after returning to the interrupt position when resuming operation after an interruption.
Buzzer ON/OFF	BZR	Designate whether to the turn buzzer ON or OFF.
Jog setting	JOGJSP	Designate the joint jog and step operation speed. (Set dimension H/L amount, max. override.)
	JOGPSP	Designate the linear jog and step operation speed. (Set dimension H/L amount, max. override.)
Jog speed limit value	JOGSPMX	Limit the operation speed during the teaching mode. Max. 250[mm/s]

Parameter		Details
Hand type	HANDTYPE	Set the hand type of the single/double solenoid, and the signal No. (Single/double = S/D) Set the signal No. after the hand type. Example) D900
Stop input B contact desig-nation	INB	Change the dedicated input (stop) between the A contact and B contact.
User-designated origin	USERORG	Designate the user-designated origin position.
Program selection memory	SLOTON	Select the program selected previously when initializing the slot. The non-selected state will be entered when not set.
Communication setting	CBAU232	Set the baud rate.
	CLEN232	Set the character length.
	CPRTY232	Set the parity.
	CSTOP232	Set the stop bit.
	CTERM232	Set the end code.
Slot table	SLT1 : SLT32	Make settings (program name, operation type, order of priority, etc.) for each slot during slot initialization.
No. of multi-tasks	TASKMAX	Designate the No. of programs to be executed simultaneously. (Max. 32)
Select the function of singular point adjacent alarm	MESNGLSW	Designate the valid/invalid of the singular point adjacent alarm. (Invalid/Valid = 0/1) When this parameter is set up "VALID", this warning sound is buzzing even if parameter: BZR (buzzer ON/OFF) is set up "OFF".
Specification of singular point passage jog mode	FSPJOGMD	Specify an operation mode for singular point passage jog.
Display language.	LNG	Change the language to display on the LCD display of teaching pendant.

5 Instruction Manual

5.1 The details of each instruction manuals

The contents and purposes of the documents enclosed with this product are shown below. Use these documents according to the application.
Instruction manuals enclosed in dashed lines in the list below are for optional products.
For special specifications, a separate instruction manual describing the special section may be enclosed.

Safety Manual	Explains the common precautions and safety measures to be taken for robot handling, system design and manufacture to ensure safety of the operators involved with the robot.
Standard Specifications	Explains the product's standard specifications, factory-set special specifications, option configuration and maintenance parts, etc. Precautions for safety and technology, when incorporating the robot, are also explained.
Robot Arm Setup & Maintenance	Explains the procedures required to operate the robot arm (unpacking, transportation, installation, confirmation of operation), and the maintenance and inspection procedures.
Controller Setup, Basic Operation and Maintenance	Explains the procedures required to operate the controller (unpacking, transportation, installation, confirmation of operation), basic operation from creating the program to automatic operation, and the maintenance and inspection procedures.
Detailed Explanation of Functions and Operations	Explains details on the functions and operations such as each function and operation, commands used in the program, connection with the external input/output device, and parameters, etc.
Troubleshooting	Explains the causes and remedies to be taken when an error occurs. Explanations are given for each error No.

6 Safety

6.1 Safety

Measures to be taken regarding safety of the industrial robot are specified in the "Labor Safety and Sanitation Rules". Always follow these rules when using the robot to ensure safety.

6.1.1 Self-diagnosis stop functions

This robot has the self-diagnosis stop functions shown in Table 6-1 and the stop functions shown in Table 6-2 for safe use.

Table 6-1 : Self-diagnosis stop functions

No.	Function		Details	Remarks
1	Overload protection function		Activates when the total servo current time exceeds the specified value.	The drive circuit is shut off. The robot stops, and an alarm displays.
2	Overcurrent diagnosis function		Activates when an overcurrent flows to the motor circuit.	The drive circuit is shut off. The robot stops, and an alarm displays.
3	Encoder disconnection diagnosis function		Activates when the encoder cable is disconnected.	The drive circuit is shut off. The robot stops, and an alarm displays.
4	Deflection over diagnosis function		Activates when an error occurs between the command value and actual position, and the error exceeds the specified amount.	The drive circuit is shut off. The robot stops, and an alarm displays.
5	AC power voltage drop diagnosis function		Activates when the AC power voltage drops below the specified value.	The drive circuit is shut off. The robot stops, and an alarm displays.
6	CPU error detection function		Activates when an error occurs in the CPU.	The drive circuit is shut off. The robot stops, and an alarm displays.
7	Overrun prevention function	Software limit detection	This is the limit provided by the software to enable operation only in the operation range.	The drive circuit is shut off. The robot stops, and an alarm displays.
		Mechanical stopper	This is the mechanical stopper provided outside the software.	The robot mechanically stops, and function 1 or 2 activates.

Table 6-2 : List of stop functions

Stop function	Operation panel	Teaching pendant	External input	Details
Emergency stop	○	○	○	This is the stop with the highest degree of emergency. The servo power is shut off, and the mechanical brakes (all axes) activate to stop the robot. To recover, reset the alarm, and turn the servo ON with the servo ON command.
Stop	○	○	○	This is a stop operation with a high degree of emergency. The robot immediately decelerates and stops. Note that the servo power is not shut off. Use this when using the collision evasion sensor, etc.

6.1.2 External input/output signals that can be used for safety protection measures

Table 6-3 : External input/output signals that can be used for safety protection measures

Signal		Command	Functions	Usage method
Input	External emergency stop	Terminal (EMG IN)	This servo power is shut off, and the robot stops immediately.	Externally installed emergency stop switch. Door switch on safety protection fence. Stopping at high-level error occurrence.
	Door switch			The door switch of the safe protection fence
	Enabling device input			Enabling device. The safety switch during teaching work
	Stop	STOP	The program execution is stopped, and the robot stops. The servo power is not shut off.	The robot is stopped when a peripheral device fault occurs. The servo power is not shut off.
	Servo OFF	SRVOFF	The servo power can be shut off.	The robot is stopped when a peripheral device fault occurs. The servo power is not shut off.
	Automatic operation enable	AUTOENA	Disables automatic operation when inactive.	Door switch on safety protection fence
Output	In servo ON	SRVON	The servo power ON/OFF state is output.	The servo power ON/OFF state is shown and alerted with the display lamps.
	Waiting	STOP	Outputs that the robot is temporarily stopped.	The temporary stop state is shown and alerted with the display lamps.
	In alarm	ERRRESET	Outputs when an alarm occurs in the robot.	The alarm state is shown and alerted with the display lamps.

[Caution] The external emergency stop input is prepared as a b contact for safety proposes. Thus, if the emergency stop input circuit is opened when the robot is started up, the robot will not operate. Refer to "Fig. 6-1 Example of safety measures (Case 1)" for details.

6.1.3 Precautions for using robot

The safety measures for using the robot are specified in the "Labor Safety and Sanitation Rules". An outline of the rules is given below.

(1) Robot installation
- Secure sufficient work space required to safely perform work such as teaching and maintenance related to the robot.
- Install the controller outside the robot's motion space. (If a safety fence is provided, install outside the fence.)
- Install the controller where the entire robot operation can be viewed.
- Install display lamps, etc., to indicate the robot's operation state.
- Securely fix the robot arm onto the fixing table with the designated bolts.

(2) Prevention of contact with operator
- Install a safety fence or enclosure so that the operator cannot easily enter the robot's motion space.
- Install an interlock function that will stop the robot if the safety fence or enclosure door is opened.

(3) Work procedures
- Create and observe work procedures for the robot teaching, operation, inspection and emergencies.
- Create hand signals to be followed when several operators are working together.
- Create displays such as "Teaching in Progress" and "Inspection in Progress" to be put up when an operator is in the robot's motion space so that other operators will not operate the operation panel (controller, control panel).

(4) Training
- Train the operators about the operations, maintenance and safety required for the robot work.
- Only trained and registered operators must operate the robot.
  Participation in the "Special training for industrial robots" sponsored by the Labor Safety and Sanitation Committee, etc., is recommended for safety training.

(5) Daily inspection and periodic inspection
- lways inspect the robot before starting daily operations and confirm that there are no abnormalities.
- Set the periodic inspection standards in view of the robot's ambient environment and operation frequency, and perform periodic inspections.
- Make records when periodic inspections and repairs have been done, and store the records for three or more years.

6.1.4 Safety measures for automatic operation

(1) Install safety fences so that operators will not enter the operation area during operation and indicate that automatic operation is in progress with lamps, etc.
(2) Create signals to be given when starting operation, assign a person to give the signal, and make sure that the operator follows the signals.

6.1.5 Safety measures for teaching

Observe the following measures when teaching, etc., in the robot's operation range.

(1) Specify and follow items such as procedures related to teaching work, etc.
(2) Take measures so that operation can be stopped immediately in case of trouble, and measures so that operation can be restarted.
(3) Take measures with the robot start switch, etc., to indicate that teaching work is being done.
(4) Always inspect that stop functions such as the emergency stop device before starting the work.
(5) Immediately stop the work when trouble occurs, and correct the trouble.
(6) Take measures so that the work supervisor can immediately stop the robot operation when trouble occurs.
(7) The teaching operator must have completed special training regarding safety. (Training regarding industrial robots and work methods, etc.)
(8) Create signals to be used when several operators are working together.

6.1.6 Safety measures for maintenance and inspections, etc.

Turn the power OFF and take measures to prevent operators other than the relevant operator from pressing the start switch when performing inspections, repairs, adjustments, cleaning or oiling.

If operation is required, take measures to prevent hazards caused by unintentional or mistaken operations.

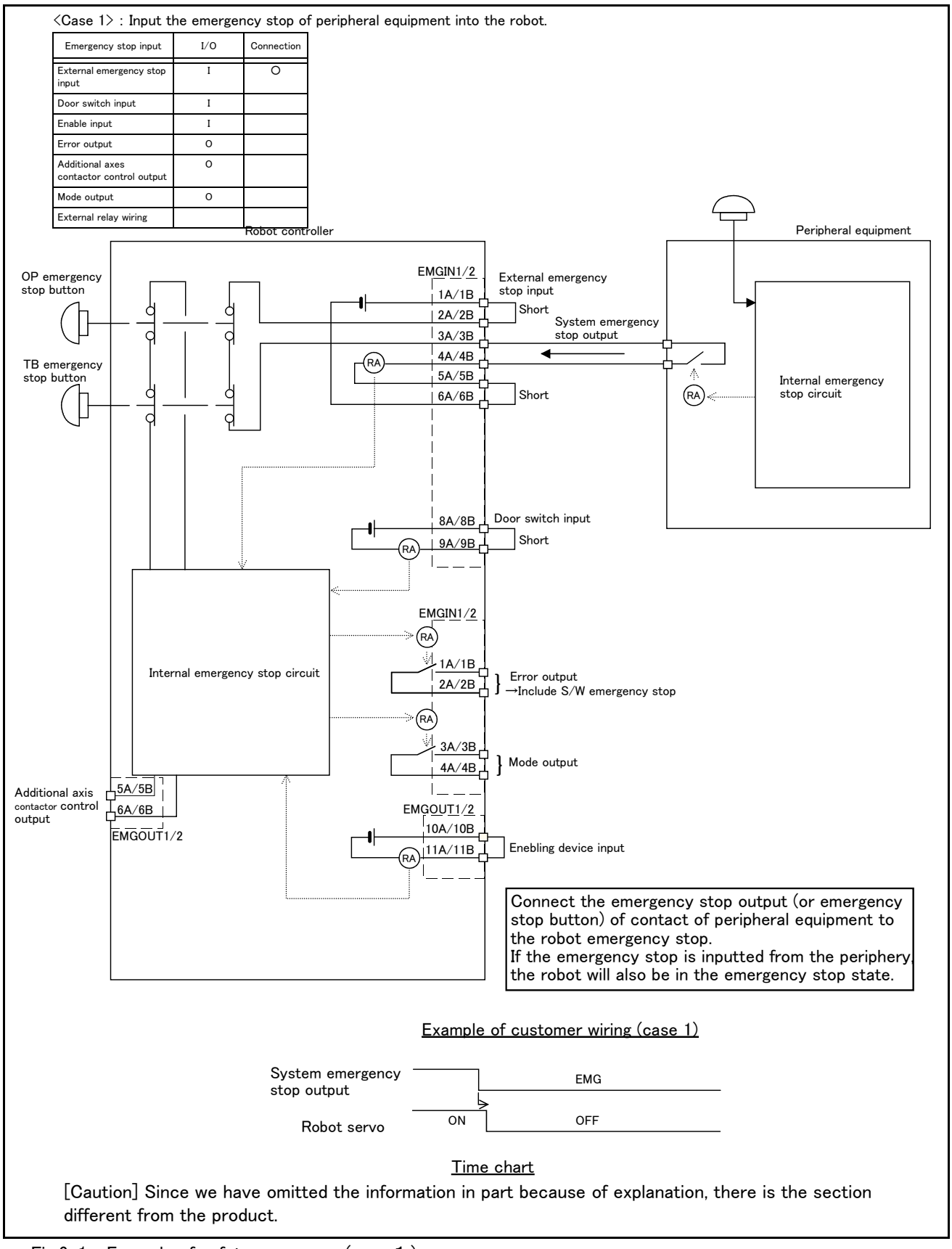
(1) Specify and follow items such as procedures related to maintenance work, etc.
(2) Take measures so that operation can be stopped immediately in case of trouble, and measures so that operation can be restarted.
(3) Take measures with the robot start switch, etc., to indicate that work is being done.
(4) Take measures so that the work supervisor can immediately stop the robot operation when trouble occurs.
(5) The operator must have completed special training regarding safety. (Training regarding industrial robots and work methods, etc.)
(6) Create signals to be used when several operators are working together.

6.1.7 Examples of safety measures

Two emergency stop input circuits are prepared on the user wiring terminal block of the controller. Create a circuit as shown below for safety measures

<Case 1> : Input the emergency stop of peripheral equipment into the robot.

Emergency stop input	I/O	Connection
External emergency stop input	I	○
Door switch input	I	
Enable input	I	
Error output	O	
Additional axes contactor control output	O	
Mode output	O	
External relay wiring		



Example of customer wiring (case 1)

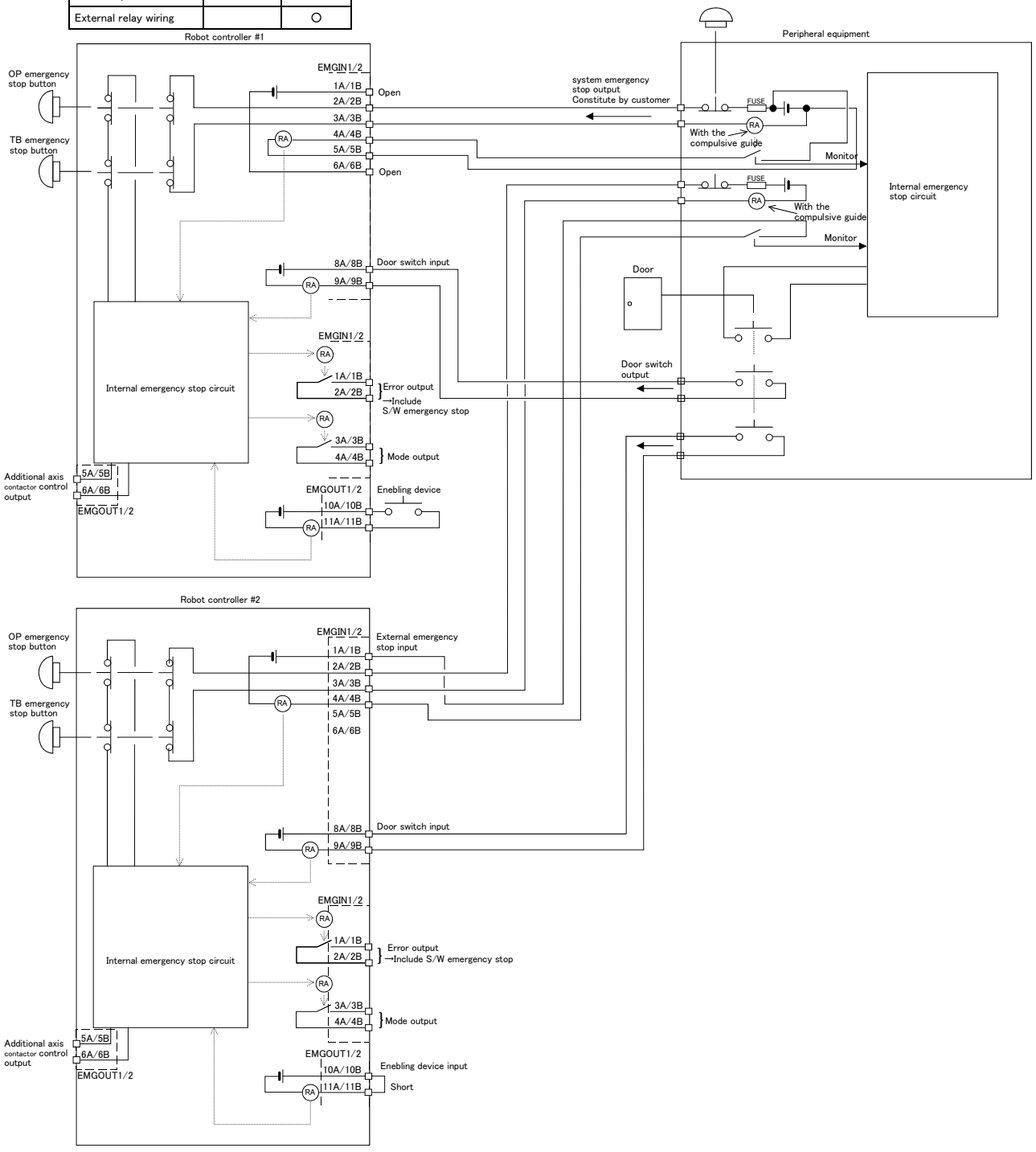
Time chart

[Caution] Since we have omitted the information in part because of explanation, there is the section different from the product.

Fig.6-1 : Example of safety measures （Case 1）

<Case 2 > : Two robot controller linkage. External power supply use. The door switch, enabling device connection

Emergency stop input	I/O	Connection
External emergency stop input	I	○
Door switch input	I	○
Enable input	I	○
Error output	O	
Additional axes contactor control output	O	
Mode output	O	
External relay wiring		○



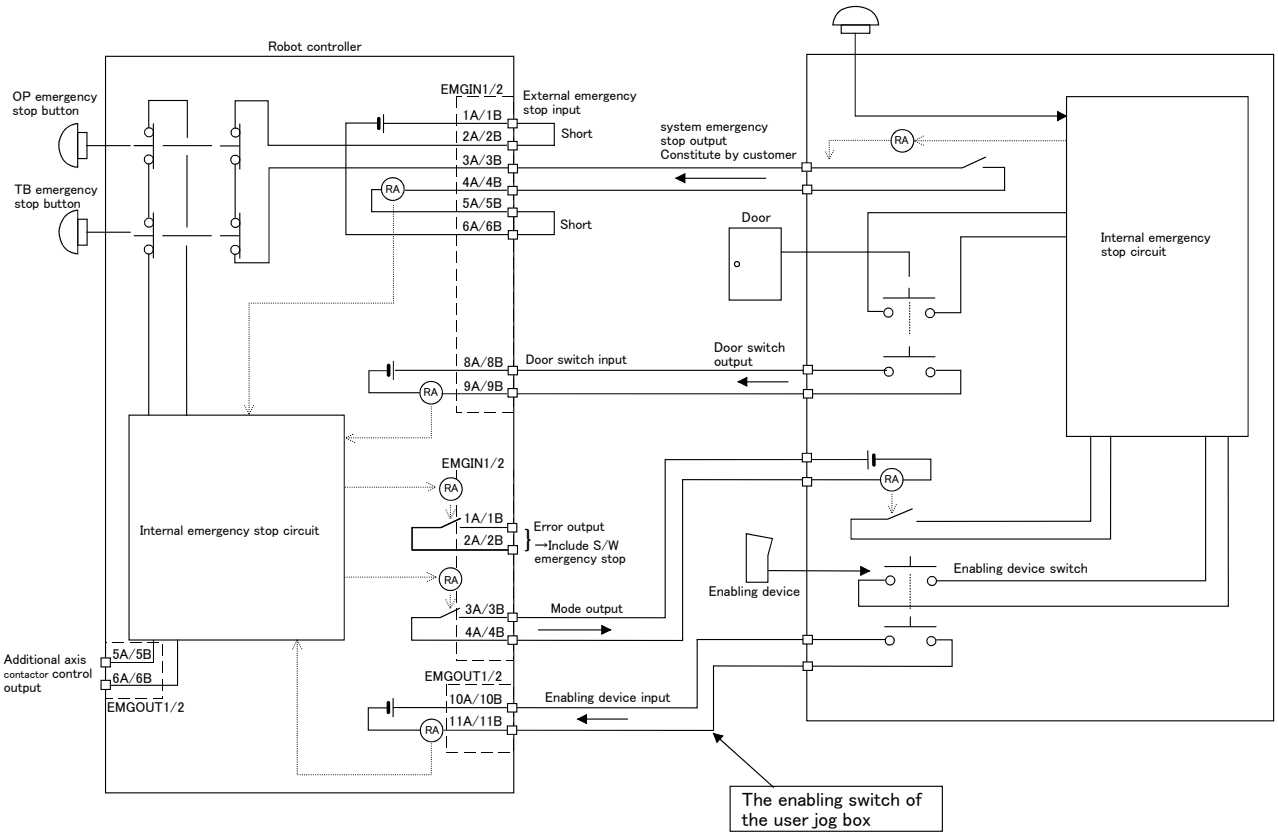
Example of customer wiring (case 2)

[Caution] Since we have omitted the information in part because of explanation, there is the section different from the product.

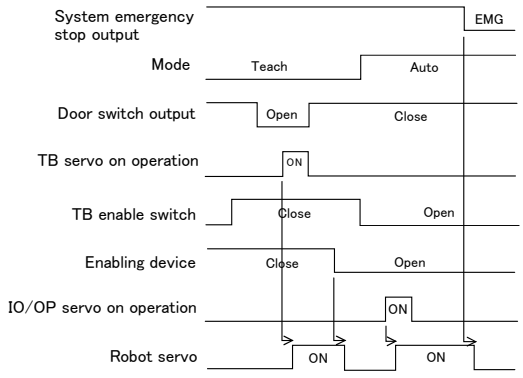
Fig.6-2 : Example of safety measures （Case 2）

<Case 3> : Use the mode output of the robot controller.

Emergency stop input	I/O	Connection
External emergency stop input	I	O
Door switch input	I	O
Enable input	I	O
Error output	O	
Additional axes contactor control output	O	
Mode output	O	O
External relay wiring		



Example of customer wiring (case 3)



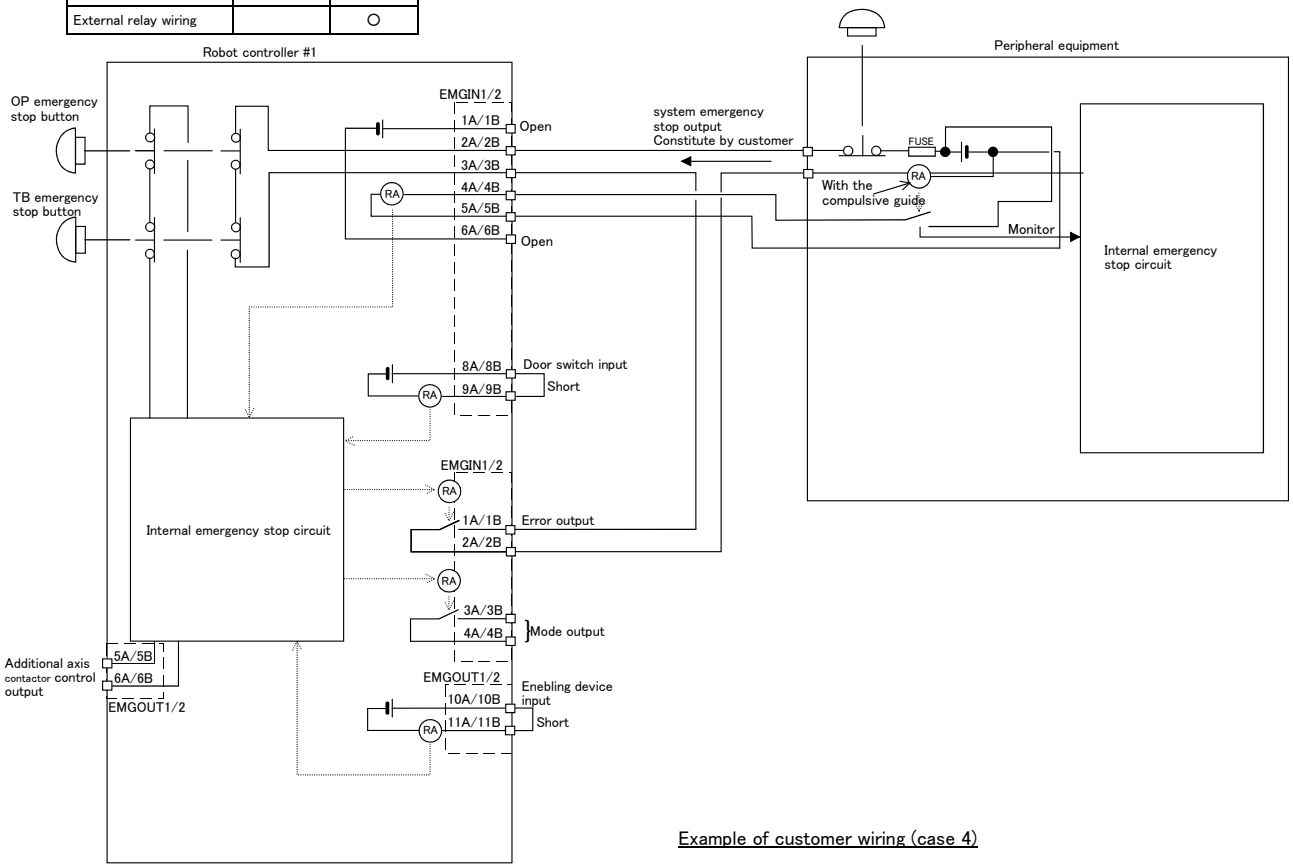
Time chart

[Caution] Since we have omitted the information in part because of explanation, there is the section different from the product.

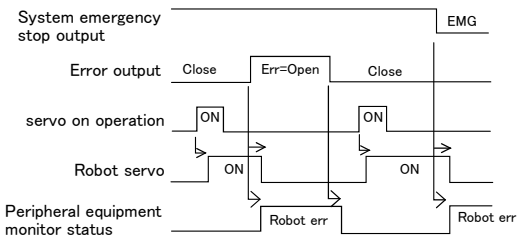
Fig.6-3 : Example of safety measures (Case 3)

<Case 4> : Use of the error output

Emergency stop input	I/O	Connection
External emergency stop input	I	○
Door switch input	I	
Enable input	I	
Error output	O	○
Additional axes contactor control output	O	
Mode output	O	
External relay wiring		○



Example of customer wiring (case 4)



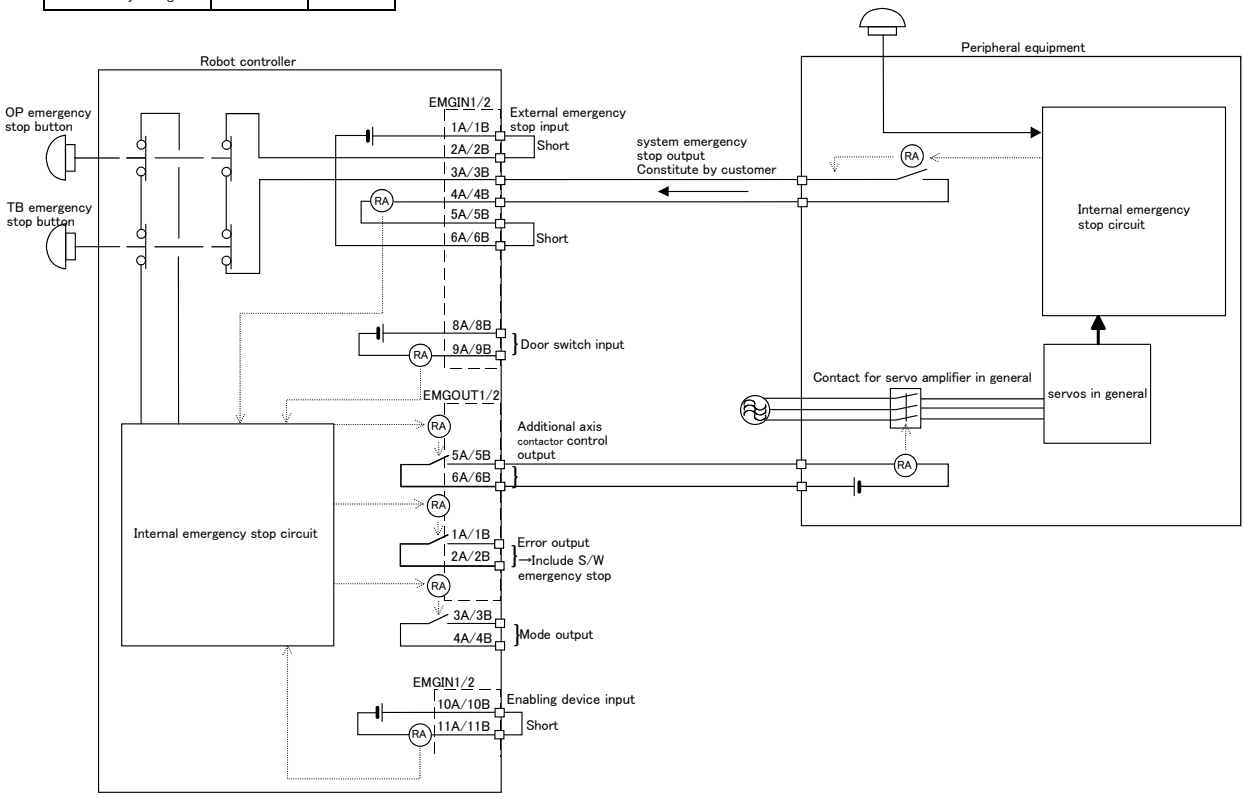
Time chart

[Caution] Since we have omitted the information in part because of explanation, there is the section different from the product.

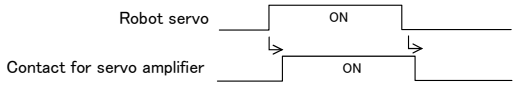
Fig.6-4 : Example of safety measures (Case 4)

<Case 5> : The synchronization with the servo amplifier for addition axes

Emergency stop input	I/O	Connection
External emergency stop input	I	O
Door switch input	I	
Enable input	I	
Error output	O	
Additional axes contactor control output	O	O
Mode output	O	
External relay wiring		



Example of customer wiring (case 5)



Time chart

[Caution] Since we have omitted the information in part because of explanation, there is the section different from the product.

Fig.6-5 : Example of safety measures (Case 5)

(1) Use a 2-contact type switch for all switches.
(2) Install a limit switch on the safety fence's door. With a constantly open contact (a contact), wire to the door switch input terminal so that the switch turns ON (is conducted) when the door is closed, and turns OFF (is opened) when the door is open.
(3) Use a manual-return type 2b-contact for the emergency stop button.
(4) Classify the faults into minor faults (faults that are easily restored and that do not have a great effect) and major faults (faults that cause the entire system to stop immediately, and that require care in restoration), and wire accordingly.

[Caution] The emergency stop input(terminal block) on the user wiring in the controller can be used for safety measures as shown in Fig. 6-1. Note that there are limits to the No. of switch contacts, capacity and cable length, so refer to the following and install.

- Switch contact ..... Prepare a 2-contact type.
- Switch contact capacity..... Use a contact that operates with a switch contact capacity of approx. 1mA to 100mA/24V. Note1)
- Cable length..... The length of the wire between the switch and terminal block must be max. 15m or less. Please use the shield line, in case of the cable may receive the noise etc. by other equipment, such as servo amplifier. And, since the ferrite core is attached as noise measures parts, please utilize.

Note1)The minimum load electric current of the switch is more than 5mA/24V.

6.2 Working environment

Avoid installation in the following places as the equipment's life and operation will be affected by the ambient environment conditions. When using in the following conditions, the customer must pay special attention to the preventive measures.

(1) Power supply
- Where the voltage fluctuation will exceed the input voltage range.
- Where a momentary power failure exceeding 20ms may occur.
- Where the power capacity cannot be sufficiently secured.

⚠CAUTION Please use the controller with an input power supply voltage fluctuation rate of 10% or less. In the case of 200 VAC input, for example, if the controller is used with 180 VAC during the day and 220 VAC during the night, turn the servo off once and then on again. If this is not performed, an excessive regeneration error may occur.

(2) Noise
- Where a surge voltage exceeding 1000V, 1 μ s may be applied on the primary voltage. Near large inverters, high output frequency oscillator, large contactors and welding machines. Static noise may enter the lines when this product is used near radios or televisions. Keep the robot away from these items.

(3) Temperature and humidity
- Where the atmospheric temperature exceeds 40 degree , lower than 0 degree.
- Where the relative humidity exceeds 85%, lower than 45%, and where dew may condense.
- Where the robot will be subject to direct sunlight or near heat generating sources such as heaters.

(4) Vibration
- Where excessive vibration or impact may be applied. (Use in an environment of 34m/s^2 or less during transportation and 5m/s^2 or less during operation.)

(5) Installation environment
- Where strong electric fields or magnetic fields are generated.
- Where the installation surface is rough. (Avoid installing the robot on a bumpy or inclined floor.)
- Where there is heavy powder dust and oil mist present.

6.3 Precautions for handling

(1) The RH-6SDH/12SDH series has brakes on J3 axis. The RH-18SDH series has brakes on J3 axis and J4 axes. The precision of the robot may drop, looseness may occur and the reduction gears may be damaged if the robot is moved with force with the brakes applied.

(2) Avoid moving the robot arm by hand. When unavoidable, gradually move the arm. If moved suddenly, the accuracy may drop due to an excessive backlash, or the backed up data may be destroyed.

(3) Note that depending on the posture, even when within the movement range, the shaft section could interfere with the base section. Take care to prevent interference during jog. Note1)

(4) The robot arm is configured of precision parts such as bearings. Grease is used for lubricating these parts. When cold starting at low temperatures or starting operation after long-term stoppage, the position accuracy may drop or servo alarms may occur. If these problems occur, perform a 5 to 10 minute running-in operation at a low speed (about a half of normal operating speed).

(5) The robot arm and controller must be grounded with Class D grounding to secure the noise resistance and to prevent electric shocks.

(6) The items described in these specifications are conditions for carrying out the periodic maintenance and inspections described in the instruction manual.

(7) When using the robot arm on a mobile axis or elevating table, the machine cables enclosed as standard configuration may break due to the fixed installation specifications. In this case, use the machine cable extension (for flexed)" factory shipment special specifications or options.

(8) If this robot interferes with the workpiece or peripheral devices during operation, the position may deviate, etc. Take care to prevent interference with the workpiece or peripheral devices during operation.

(9) Do not attach a tape or a label to the robot arm and the controller. If a tape or a label with strong adhesive power, such as a packaging tape, is attached to the coated surfaces of the robot arm and controller, the coated surface may be damaged when such tape or label is peeled off.

(10) If the robot is operated with a heavy load and at a high speed, the surface of the robot arm gets very hot. It would not result in burns, however, it may cause secondary accidents if touched carelessly.

(11) Do not shut down the input power supply to stop the robot. If the power supply is frequently shut down during a heavy load or high-speed operation, the speed reducer may be damaged, backlash may occur, and the program data may be destroyed.

(12) During the robot's automatic operation, a break is applied to the robot arm when the input power supply is shut down by a power failure, for instance. When a break is applied, the arm may deviate from the operation path predetermined by automatic operation and, as a result, it may interfere with the mechanical stopper depending on the operation at shutdown. In such a case, take an appropriate measure in advance to prevent any dangerous situation from occurring due to the interference between the arm and peripheral devices.
Example) Installing a UPS (uninterruptible power supply unit) to the primary power source in order to reduce interference.

(13) Do not conduct an insulated voltage test. If conducted by mistake, it may result in a breakdown. If conducting an insulation test, although it is not covered by warranty, set the leakage current to 100 mA. If a leakage current of 10 mA is set, a low measurement value will be shown due to the leakage current of the built-in AC line filter.

(14) The fretting may occur on the axis which moving angle is the 30 degree or less, or moving distance is the 30mm or less, or not moves. The fretting is that the required oil film becomes hard to be formed if the moving angle is small, and wear occurs. The axis which not moved is moving slightly by vibration etc. To prevent the fretting, recommends to move these axes about once every day the 30 degree or more, or the 30mm or more.

⚠CAUTION To the users of the RH-A series
The coordinate system of axis J3 of the RH-SD series has been changed from the conventional RH-A series.Note2) For this reason, axis J3 may move to a wrong position if a conventional program is executed when an RH-A series robot is replaced by an RH-SD series robot. Please be sure to check the robot operation position via step operation and teach the robot again if the position is wrong.

Note1) Jog operation refers to operating the robot manually using the teaching pendant.

Note2) In the conventional RH-A series, there was a gap between the XYZ coordinate value and JOINT coordinate value of axis J3, which is eliminated in the RH-S series.
RH-5AH series.....When the XYZ coordinate value is 0mm, the JOINT coordinate value is 97mm
RH-10AH/15AH series ...When the XYZ coordinate value is 0mm, the JOINT coordinate value is -10mm
RH-SDH series.....JOINT coordinate value = XYZ coordinate value

7 Appendix

Appendix 1 : Specifications discussion material

■ Customer information

Company name		Name	
Address		Telephone	

■ Purchased mode

Item	Specification											
Load	☐ 6kg				☐ 12kg				☐ 18kg			
Environment Note1)	☐ General	☐ C	☐ M	☐ SM	☐ General	☐ C	☐ M	☐ SM	☐ General	☐ C	☐ M	☐ SM
Arm length	☐ 350mm	☐ 450mm	☐ 550mm		☐ 550mm	☐ 700mm	☐ 850mm		☐ 850mm			
Stroke	■ 200mm	■ 170mm			■ 350mm	■ 300mm			■ 350mm	■ 300mm		
Robot type name	RH- ☐☐ SDH ☐☐☐☐☐ - ☐☐☐											
CE Marking	☐ Not provided ☐ Provided											

Note1) C: Clean、M: Oil mist、SM: Protection specification controller
Refer to the Page 2, "1.2 Model type combination of robot" 2-page for the details of the robot arm type name.

■ Shipping special specifications (Settings can be made only at time of shipment)

Item		Standard specifications	Special shipping specifications
Robot arm	Machine cable	☐ 5m fixed type	☐ 2m fixed type : 1S-02UCBL-03(RH6SDH series)/ 1S-02UCBL-01(RH-12SDH/18SDH series)

■ Options (Installable after shipment)

Item		Type	Provision, and specifications when provided.
Robot arm	Machine cable extention	1S- ☐☐ CBL-03	RH-6SDH Fixing : ☐ Not provided ☐ 5m ☐ 10m ☐
		1S- ☐☐ LCBL-03	RH-6SDH Bending : ☐ Not provided ☐ 5m ☐ 10m ☐
		1S- ☐☐ CBL-01	RH-12SDH/18SDH Fixing : ☐ Not provided ☐ 5m ☐ 10m ☐
		1S- ☐☐ LCBL-01	RH-12SDH/18SDH Bending : ☐ Not provided ☐ 5m ☐ 10m ☐
	Solenoid valve set	1S-VD04M-04	RH-6SDH : ☐ Not provided ☐ Provided
		1S-VD04ME-04	RH-6SDH : ☐ Not provided ☐ Provided
		1S-VD04M-03	RH-12SDH/18SDH : ☐ Not provided ☐ Provided
		1S-VD04ME-03	RH-12SDH/18SDH : ☐ Not provided ☐ Provided
	Hand input cable	1S-HC35C-02	☐ Not provided ☐ Provided
	Hand output cable	1S-GR35S-02	☐ Not provided ☐ Provided
	Hand curl tube	1E-ST0408C-300	RH-6SDH : ☐ Not provided ☐ Provided
		1N-ST0608C	RH-12SDH/18SDH : ☐ Not provided ☐ Provided
Controller	Simple teaching pendant	R32TB- ☐☐	☐ Not provided ☐ 7m ☐ 15m
	Highly efficient teaching pendant	R56TB- ☐☐	☐ Not provided ☐ 7m ☐ 15m
	Pneumatic hand interface	2A-RZ365	☐ Not provided ☐ Provided
		2A-RZ375	☐ Not provided ☐ Provided
	Parallel I/O interface	2D-TZ368	☐ Not provided ☐ -1pc. ☐ -2pc. ☐ -3pc.
		2D-TZ378	☐ Not provided ☐ -1pc. ☐ -2pc. ☐ -3pc.
	External I/O cable	2D-CBL ☐☐ (For 2D-TZ368/TZ378)	☐ Not provided ☐ 5m-( )pc. ☐ 15m-1( )pc.
	Parallel I/O unit	2A-RZ361	☐ Not provided ☐ Provided ( )unit
		2A-RZ371	☐ Not provided ☐ Provided ( )unit
	External I/O cable	2A-CBL ☐☐ (For 2A-RZ361/RZ371)	☐ Not provided ☐ 5m-( )pc. ☐ 15m-1( )pc.
	CC-Link interface	2D-TZ576	☐ Not provided ☐ Provided
	Expansion memory	2D-TZ454	☐ Not provided ☐ Provided
	RT ToolBox2	3D-11C-WINE	☐ Not provided ☐ Windows2000/XP/Vista Englishi CD-ROM
	RT ToolBox2 mini	3D-12C-WINE	☐ Not provided ☐ Windows2000/XP/Vista Englishi CD-ROM
	Personal computer cable	2D-232CBL03M	☐ Not provided ☐ Provided
	Network vision sensor	4D-2CG5***-PKG	☐ Not provided ☐ Provided
	Instructions manual	5S-DD00-PE01	☐ Not provided ☐ Provided ( ) set

■ Maintenance parts (Consumable parts)

Maintenance parts	☐ Backup batteries A6BAT ( ) pcs. ☐ Backup batteries Q6BAT ( ) pcs. ☐ Grease ( ) cans

■ Robot selection check list

Work description	☐ Material handring ☐ Assembly ☐ Machining L/UL ☐ Sealing ☐ Testing and inspection ☐ Other ( )	
Workpiece mass ( ) g	Hand mass ( ) g	Atmosphere ☐ General enveronment ☐ Clean ☐ Dust provided ☐ Other( )
Remarks		

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ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Product Service

EC-Statement of Compliance

No. E6 08 10 25554 013

Holder of Certificate: **Mitsubishi Electric Corporation**
Tokyo BILD., 2-7-3 Marunouchi,
Chiyoda-ku
Tokyo
100-8310 JAPAN

Name of Object: **Industrial, Scientific and Medical equipment**
Industrial Robot

Model(s): **SD series**
(See Attachment for details)

Description of Object:

Rated Voltage:	230 VAC(1 phase)/ 230, 400 VAC(3 phases)
Rated Power:	1.7 kW (230 VAC)/ 3.4 kW (230, 400 VAC)
Protection Class:	I

Tested according to: EN 61000-6-4:2007; EN 61000-6-2:2005

This EC-Statement of Compliance is issued according to the Directive 2004/108/EC relating to electromagnetic compatibility. It confirms that the listed apparatus complies with such aspects of the essential requirements of the EMC directive as specified by the manufacturer or his authorized representative in the European Community and applies only to the sample and its technical documentation submitted to TÜV SÜD Product Service GmbH for testing and certification. See also notes overleaf.

Technical report no.: TYOEMC22751A

222104

Date, 2008-10-29

TÜV SÜD Product Service GmbH is Notified Body to the Directive 2004/108/EC of the European Parliament and of the council with the identification number 0123.

TÜV SÜD Product Service GmbH · Zertifizierstelle · Ridlerstrasse 65 · 80339 München · Germany

Attachment
Statement No.

Product Service

E6 08 10 25554 013

Grouping Items 1:
AC 400V /230V 3 phase 3.4kW

RV-12SD(-S**), RV-12SDL(-S**),
RV-12SDC(-S**), RV-12SDLC(-S**),
RV-12SD-SUL**, RV-12SDL-SUL**,
RV-12SDC-SUL**, RV-12SDLC-SUL**,
RV-6SD-SM6**, RV-6SDL-SM6**,
RV-6SD-SULM6**, RV-6SDL-SULM6**,
RV-3SD-SM6**, RV-3SDB-SM6**,
RV-3SDB-SULM6**, RV-3SDJ-SM6**,
RV-3SDJB-SM6**, RV-3SDJB-SULM6**,
RH-6SDH4517M-SM6**, RH-6SDH3517M-SM6**,
RH-6SDH5517M-SM6**, RH-6SDH4517M-SULM6**,
RH-6SDH3517M-SULM6**, RH-6SDH5517M-SULM6**,
RH-12SDH7030M-SM6**, RH-12SDH5530M-SM6**,
RH-12SDH8530M-SM6**, RH-18SDH8530M-SM6**,
RH-12SDH7030M-SULM6**, RH-12SDH5530M-SULM6**,
RH-12SDH8530M-SULM6**, RH-18SDH8530M-SULM6**

Attachment
Statement No.

Product Service

E6 08 10 25554 013

Grouping Items 2:
AC 230V 1 phase 1.7kW

RV-6SD(-S**), RV-6SDL(-S**),
RV-6SDC(-S**), RV-6SDLC(-S**),
RV-6SD-SUL**, RV-6SDL-SUL**,
RV-6SDC-SUL**, RV-6SDLC-SUL**,
RV-3SD-S3**, RV-3SDC-S3**,
RV-3SDB-S3**, RV-3SDBC-S3**,
RV-3SDB-SUL3**, RV-3SDBC-SUL3**,
RV-3SDJ-S3**, RV-3SDJC-S3**,
RV-3SDJB-S3**, RV-3SDJBC-S3**,
RV-3SDJB-SUL3**, RV-3SDJBC-SUL3**,
RH-6SDH4520-S3**, RH-6SDH3520-S3**,
RH-6SDH5520-S3**, RH-6SDH4517M-S3**,
RH-6SDH3517M-S3**, RH-6SDH5517M-S3**,
RH-6SDH4517C-S3**, RH-6SDH3517C-S3**,
RH-6SDH5517C-S3**, RH-6SDH4520-SUL3**,
RH-6SDH3520-SUL3**, RH-6SDH5520-SUL3**,
RH-6SDH4517M-SUL3**, RH-6SDH3517M-SUL3**,
RH-6SDH5517M-SUL3**, RH-6SDH4517C-SUL3**,
RH-6SDH3517C-SUL3**, RH-6SDH5517C-SUL3**,
RH-12SDH7035(-S**), RH-12SDH5535(-S**),
RH-12SDH8535(-S**), RH-18SDH8535(-S**),
RH-12SDH7030M(-S**), RH-12SDH5530M(-S**),
RH-12SDH8530M(-S**), RH-18SDH8530M(-S**),
RH-12SDH7030C(-S**), RH-12SDH5530C(-S**),
RH-12SDH8530C(-S**), RH-18SDH8530C(-S**),
RH-12SDH7035-SUL**, RH-12SDH5535-SUL**,
RH-12SDH8535-SUL**, RH-18SDH8535-SUL**,
RH-12SDH7030M-SUL**, RH-12SDH5530M-SUL**,
RH-12SDH8530M-SUL**, RH-18SDH8530M-SUL**,
RH-12SDH7030C-SUL**, RH-12SDH5530C-SUL**,
RH-12SDH8530C-SUL**, RH-18SDH8530C-SUL**

Attachment
Statement No.

Product Service

E6 08 10 25554 013

Nomenclature

Group A, B Model name description is shown as follows.

R V - x SD x - x
(1) (2) (3) (4) (5)

(1) V: Vertical Robot
(2) Maximum Payload specification:
6 : 6kg
12 : 12kg
(3) SD : SD series robot
(4) L : Arm extension model
C : Clean room model
LC : Clean room arm
extension model
(5) Dimension and Ambient specification:
[none] : driven by R/C
CR3D-7*1M (for RV-12SD)
CR2D-7*1 (for RV-6SD)
SM6xx: Oil mist model driven by R/C
CR3D-7*1M-SM6xx (only RV-6SD)
SULxx:UL specification/driven by R/C
CR3D-7*1M-SULxx (for RV-12SD)
CR2D-7*1-SULxx (for RV-6SD)
SULM6xx:UL specification/
Oil mist model driven by R/C
CR3D-7*1M-SULM6xx(only RV-6SD)

Group C Model name description is shown as follows.

RV-3 SD J B x - x
(1) (2) (3) (4) (5) (6) (7)

(1) V: Vertical Robot
(2) Rated Payload specification:
3 : 3kg
(3) SD : SD series robot
(4) J : 5 axes exist
[none] : 6 axes exist
(5) B : All axes are equipped with brake
[none] : Basic model
J4 axis and J6 axis are not equipped with brake.
(6) C : Clean room model
[none] : Basic model

Attachment

Statement No.

Product Service

E6 08 10 25554 013

(7) Special specification number
Pilot number and specification as follows
S3xx : driven by R/C CR2D-7*1-S3xx
SM6xx : R/C Oil mist model
driven by R/C CR3D-7*1M-SM6xx
SUL3xx : UL specification and R/C Oil mist model
driven by R/C CR2D-7*1-SUL3xx
SULM6xx: UL specification R/C Oil mist model
driven by R/C CR3D-7*1M-SULM6xx

Group D Model name description is shown as follows.
RH-x SDH xx xx x - xx
(1)(2) (3) (4) (5) (6) (7)
(1)H: Horizontal Robot
(2) Maximum Payload specification:
6 : 6kg
12 : 12kg
18 : 18kg
(3) SD : SD series robot
(4) Arm length(No1 and No2 arm) specification:
35 : 350 mm arm
45 : 450 mm arm
55 : 550 mm arm
70 : 700 mm arm
(5) Z axis working area specification:
17 : 170 mm arm
20 : 200 mm arm
30 : 300 mm arm
32 : 320 mm arm
(6) Dimension and Ambient specification:
M : Oil mist model
C : Clean room model
[none] : Basic model
(7) Optional specification:
S3xx : driven by R/C CR2D-7*1-S3xx
(only RH-6SDH)
SM6xx: Oil mist model driven by R/C
CR3D-7*1-SM6xx
SULxx: UL specification driven by R/C
CR3D-7*1M-SULxx
(only RH-12 / 18SDH)
SUL3xx: UL specification driven by R/C
CR2D-7*1-SUL3xx (only RH-6SDH)
SULM6xx:UL specification /
Oil mist model driven by R/C
CR3D-7*1M-SULM6xx
(only RV-12 / 18SDH)

MITSUBISHI ELECTRIC
Changes for the Better

EC Declaration of Conformity

We, the undersigned.

Manufacturer	MITSUBISHI ELECTRIC CORPORATION NAGOYA WORKS
Address, City	1-14,Yada-minami 5-chome, Higashi-ku, Nagoya 461-8670
Country	Japan
Phone number	+81 52 712 2354
Fax number/e-mail	+81 52 722 0384
Authorized representative in Europe	Mr. N.Hirai Manager, MITSUBISHI Electric Europe B.V
Address, City	40880 Ratingen
Country	Germany

Certify and declare under our sole responsibility that the following apparatus:

Type Name	Industrial Robot
Manufacturer	MITSUBISHI ELECTRIC CORPORATION NAGOYA WORKS
Brand	MELFA
Model No.	SD series
Restrictive use	For industrial environment only

Conforms with the essential requirements of the **EMC Directive 2004/108/EC** and the **Machinery** Directive **98/37/EC**, based on the following specifications applied:

EU Harmonized Standards		Non-harmonized Standard
EMC(2004/108/EC)	EN61000-6-4:2007	CISPR Pub11:2005
	EN61000-6-2:2005	
Machinery(98/37/EC)	Type A:Fundamental safety standards	N/A
	EN ISO12100-1:2003	
	EN ISO12100-2:2003	
	EN 1050:1996	
	Type B:Group safety standards	
	B1:Safety aspects	
	EN60204-1:2006, EN294:1992, EN349:1993	
	Type C:Machine Safety standard	
	ISO10218-1:2006	

and therefore complies with the essential requirements and provisions of the EMC Directive and the Machinery Directive.

MITSUBISHI ELECTRIC
Changes for the Better

The Technical documentation is kept at the following address:

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Date	September 22, 2008
Name and position of person binding the manufacturer	Takaaki Nishimura Takaaki Nishimura Manager Robot Manufacturing Department MITSUBISHI ELECTRIC CORPORATION NAGOYA WORKS

■ Declaration Type of models

Table 1 : The list of RV12SD series for grouping certification. :A group

No.	Classification	Model name 12kg-Load	Robot Controller
1	Oil mist basic model	RV-12SD(-S**)	CR3D-701M(-S**)
2	Oil mist arm extension model	RV-12SDL(-S**)	
3	Clean room basic model (Class 10)	RV-12SDC(-S**)	CR3D-701(-S**)
4	Clean room arm extension model (Class 10)	RV-12SDLC(-S**)	
5	UL specification oil mist basic model including oil mist model robot controller	RV-12SD-SUL**	CR3D-701M-SUL**
6	UL specification oil mist arm extension model including oil mist model robot controller	RV-12SDL-SUL**	
7	UL specification clean room basic model (Class 10)	RV-12SDC-SUL**	CR3D-701-SUL**
8	UL specification clean room arm extension model (Class 10)	RV-12SDLC-SUL**	

Table 2 : The list of RV-6SD series for grouping certification. B group

No.	Classification	Model name 6kg-Load	Robot Controller
1	Oil mist basic model	RV-6SD(-S**)	CR2D-711(-S**)
2	Oil mist arm extension model	RV-6SDL(-S**)	
3	Clean room basic model (Class 10)	RV-6SDC(-S**)	
4	Clean room arm extension model (Class 10)	RV-6SDLC(-S**)	
5	Oil mist basic model including oil mist model robot controller	RV-6SD-SM6**	CR3D-711M(-S**)
6	Oil mist arm extension model including oil mist model robot controller	RV-6SDL-SM6**	
7	UL specification oil mist basic model	RV-6SD-SUL**	CR2D-711-SUL**
8	UL specification oil mist arm extension model	RV-6SDL-SUL**	
9	UL specification clean room basic model (Class 10)	RV-6SDC-SUL**	
10	UL specification clean room arm extension model (Class 10)	RV-6SDLC-SUL**	
11	UL specification oil mist basic model including oil mist model robot controller	RV-6SD-SULM6**	CR3D-711M-SULM6**
12	UL specification oil mist arm extension model including oil mist model robot controller	RV-6SDL-SULM6**	

Table 3 : The list of RV-3SD series robots for grouping certificat on: C group

No.	Classification	Model name	Robot Controller
		6-axis	
1	Basic model (standard)	RV-3SD-S3**	CR2D-721-S3**
2	Clean room basic model (standard)	RV-3SDC-S3**	
3	Basic model with brakes on all ax s (standard)	RV-3SDB-S3**	
4	Clean room basic model with brakes on all axis (standard)	RV-3SDBC-S3**	
5	Oil mist basic model including robot controller *1	RV-3SD-SM6**	CR3D-721M-SM6**
6	Oil mist basic model with brakes on all axis including robot controller	RV-3SDB-SM6**	
7	UL specification and basic model with brakes on all axis (standard)	RV-3SDB-SUL3**	CR2D-721-SUL3**
8	UL specification clean room basic model with brakes on all axis (standard)	RV-3SDBC-SUL3**	
9	JL specification oil mist basic model with brakes on all axis including robot controller	RV-3SDB-SULM6**	CR3D-721M-SULM6**

Table 4 : The list of robots for grouping certification. C group -2.

No.	Classification	Mode name	Robot Controller
		5 axis	
10	Basic model (standard)	RV-3SDJ-S3**	CR2D-731-S3**
11	Clean room bas c model (standard)	RV-3SDJC-S3**	
12	Basic model with brakes on all axis (standard)	RV-3SDJB-S3**	
13	Clean room basic model with brakes on all axis (standard)	RV-3SDJBC-S3**	
14	Oil mist basic model including robot controller *1	RV-3SDJ-SM6**	CR3D-731M-SM6**
15	Oil mist basic model with brakes on all axis including robot controller	RV-3SDJB-SM6**	
16	JL specification basic model with brakes on all axis (standard)	RV-3SDJB-SUL3**	CR2D-731-SUL3**
17	JL specification clean room basic model with brakes on all axis (standard)	RV-3SDJBC-SUL3**	
18	UL specification oil mist basic model with brakes on all axis including robot controller	RV-3SDJB-SULM6**	CR3D-731M-SULM6**

Table 5 : The list of RH-xSDH robots for grouping certification: D group.

No.	Classification	Model name 6kg-Load	Robot Controller
1	Basic model	RH-6SDH4520-S3**	CR2D-761 -S3**
2	Short arm model	RH-6SDH3520-S3**	
3	Long arm model	RH-6SDH5520-S3**	
4	Oil mist model	RH-6SDH4517M-S3**	
5	Short arm/Oil mist model	RH-6SDH3517M-S3**	
6	Long arm/Oil mist model	RH-6SDH5517M-S3**	
7	Clean room model (Class 10)	RH-6SDH4517C-S3**	
8	Short arm/Clean room model	RH-6SDH3517C-S3**	
9	Long arm/Clean room model	RH-6SDH5517C-S3**	
10	Oil mist model including R/C	RH-6SDH4517M-SM6**	CR3D-761M -SM6**
11	Short arm/Oil mist model including R/C	RH-6SDH3517M-SM6**	
12	Long arm/Oil mist model including R/C	RH-6SDH5517M-SM6**	
13	UL specification basic model	RH-6SDH4520-SUL3**	CR2D-761 -SUL3**
14	UL specification short arm model	RH-6SDH3520-SUL3**	
15	UL specification long arm model	RH-6SDH5520-SUL3**	
16	UL specification oil mist model	RH-6SDH4517M-SUL3**	
17	UL specification short arm/Oil mist model	RH-6SDH3517M-SUL3**	
18	UL specification long arm/Oil mist model	RH-6SDH5517M-SUL3**	
19	UL specification clean room model (Class 10)	RH-6SDH4517C-SUL3**	
20	UL specification short arm/Clean room model	RH-6SDH3517C-SUL3**	
21	UL specification long arm/Clean room model	RH-6SDH5517C-SUL3**	
22	UL specification oil mist model including R/C	RH-6SDH4517M-SULM6**	CR3D-761M -SULM6**
23	UL specification short arm/Oil mist model including R/C	RH-6SDH3517M-SULM6**	
24	UL specification long arm/Oil mist model including R/C	RH-6SDH5517M-SULM6**	

Table 6 : The list of RH-xSDH robots for grouping certification: D group *2

No	Classification	Model name 12／18kg-Load	Robot Controller
25	Basic model	RH-12SDH7035(-S**)	CR2D-741(-S**)
26	Short arm model	RH-12SDH5535(-S**)	
27	Long arm model	RH-12SDH8535(-S**)	
28	Long arm and heavy load model	RH-18SDH8535(-S**)	CR2D-751(-S**)
29	Oil mist model	RH-12SDH7030M(-S**)	CR2D-741(-S**)
30	Short arm／Oil mist model	RH-12SDH5530M(-S**)	
31	Long arm／Oil mist model	RH-12SDH8530M(-S**)	
32	Long arm and heavy load／Oil mist model	RH-18SDH8530M(-S**)	CR2D-751(-S**)
33	Clean room model (Class 10)	RH-12SDH7030C(-S**)	CR2D-741(-S**)
34	Short arm／Clean room model	RH-12SDH5530C(-S**)	
35	Long arm／Clean room model	RH-12SDH8530C(-S**)	
36	Long arm and heavy load／Clean room model (Class 10)	RH-18SDH8530C(-S**)	CR2D-751(-S**)
37	Oil mist model including R/C	RH-12SDH7030M-SM6**	CR3D-741M-SM6**
38	Short arm／Oil mist model including R/C	RH-12SDH5530M-SM6**	
39	Long arm／Oil mist model including R/C	RH-12SDH8530M-SM6**	
40	Long arm and heavy load／Oil mist model including R/C	RH-18SDH8530M-SM6**	CR3D-751M-SM6**
41	UL specification basic model	RH-12SDH7035-SUL**	CR2D-741-SUL**
42	UL specification short arm model	RH-12SDH5535-SUL**	
43	UL specification long arm model	RH-12SDH8535-SUL**	
44	UL specification long arm and heavy load model	RH-18SDH8535-SUL**	CR2D-751-SUL**
45	UL specification oil mist model	RH-12SDH7030M-SUL**	CR2D-741-SUL**
46	UL specification short arm／Oil mist model	RH-12SDH5530M-SUL**	
47	UL specification long arm／Oil mist model	RH-12SDH8530M-SUL**	
48	UL specification long arm and heavy load／Oil mist model	RH-18SDH8530M-SUL**	CR2D-751-SUL**
49	UL specification clean room model (Class 10)	RH-12SDH7030C-SUL**	CR2D-741-SUL**
50	UL specification short arm／Clean room model	RH-12SDH5530C-SUL**	
51	UL specification long arm／Clean room model	RH-12SDH8530C-SUL**	
52	UL specification long arm and heavy load／Clean room model (Class 10)	RH-18SDH8530C-SUL**	CR2D-751-SUL**
53	UL specification oil mist model including R/C	RH-12SDH7030M-SULM6**	CR3D-741M-SULM6**
54	UL specification short arm／Oil mist model including R/C	RH-12SDH5530M-SULM6**	
55	UL specification long arm／Oil mist model including R/C	RH-12SDH8530M-SULM6**	
56	UL specification long arm and heavy load／Oil mist model including R/C	RH-18SDH8530M-SULM6**	CR3D-751M-SULM6**

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