FANUC Robot series

R-30*i*B Mate/R-30*i*B Mate Plus CONTROLLER

Open Air

MAINTENANCE MANUAL

B-83555EN/08

- **Original Instructions**

Thank you very much for purchasing FANUC Robot.
Before using the Robot, be sure to read the "FANUC Robot series SAFETY HANDBOOK (B-80687EN)" and understand the content.

The products in this manual are controlled based on Japan's “Foreign Exchange and Foreign Trade Law". The export from Japan may be subject to an export license by the government of Japan. Further, re-export to another country may be subject to the license of the government of the country from where the product is re-exported. Furthermore, the product may also be controlled by re-export regulations of the United States government.
Should you wish to export or re-export these products, please contact FANUC for advice.

The products in this manual are manufactured under strict quality control. However, when using any of the products in a facility in which a serious accident or loss is predicted due to a failure of the product, install a safety device.

In this manual, we endeavor to include all pertinent matters. There are, however, a very large number of operations that must not or cannot be performed, and if the manual contained them all, it would be enormous in volume. It is, therefore, requested to assume that any operations that are not explicitly described as being possible are "not possible".

SAFETY PRECAUTIONS

This chapter describes the precautions which must be followed to enable the safe use of the robot. Before using the robot, be sure to read this chapter thoroughly.

For detailed functions of the robot operation, read the relevant operator's manual to understand fully its specification.

For the safety of the operator and the system, follow all safety precautions when operating a robot and its peripheral equipment installed in a work cell.
For safe use of FANUC robots, you must read and follow the instructions in “FANUC Robot series SAFETY HANDBOOK (**B-80687EN)**”.

1 PERSONNEL

Personnel can be classified as follows.

Operator:
- Turns the robot controller power ON/OFF
- Starts the robot program from operator panel

Programmer or Teaching operator:
- Operates the robot
- Teaches the robot inside the safeguarded space

Maintenance technician:
- Operates the robot
- Teaches the robot inside the safeguarded space
- Performs maintenance (repair, adjustment, replacement)

- The operator is not allowed to work in the safeguarded space.
- The programmer or teaching operator and maintenance technician are allowed to work in the safeguarded space. Works carried out in the safeguarded space include transportation, installation, teaching, adjustment, and maintenance.
- To work inside the safeguarded space, the person must be trained on proper robot operation.

Table 1 (a) lists the work outside the safeguarded space. In this table, the symbol "○" means the work allowed to be carried out by the specified personnel.

Table 1 (a) List of work outside the Safeguarded Space

	Operator	Programmer or Teaching operator	Maintenance technician
Turn power ON/OFF to Robot controller	○	○	○
Select operating mode (AUTO/T1/T2)		○	○
Select remote/local mode		○	○
Select robot program with teach pendant		○	○
Select robot program with external device		○	○
Start robot program with operator's panel	○	○	○
Start robot program with teach pendant		○	○
Reset alarm with operator's panel		○	○
Reset alarm with teach pendant		○	○
Set data on teach pendant		○	○
Teaching with teach pendant		○	○
Emergency stop with operator's panel	○	○	○
Emergency stop with teach pendant	○	○	○
Operator's panel maintenance			○
Teach pendant maintenance			○

During robot operation, programming and maintenance, the operator, programmer, teaching operator and maintenance technician take care of their safety using at least the following safety protectors.

- Use clothes, uniform, overall adequate for the work
- Safety shoes
- Helmet

2 DEFINITION OF SAFETY NOTATIONS

To ensure the safety of users and prevent damage to the machine, this manual indicates each precaution on safety with "**Warning**" or "**Caution**" according to its severity. Read the contents of each "**Warning**", "**Caution**" before attempting to use the robot.

Symbol	Definitions
⚠**WARNING**	Used if hazard resulting in the death or serious injury of the user will be expected to occur if he or she fails to follow the approved procedure.
⚠**CAUTION**	Used if a hazard resulting in the minor or moderate injury of the user, or equipment damage may be expected to occur if he or she fails to follow the approved procedure.
NOTE	Used if a supplementary explanation not related to any of WARNING and CAUTION is to be indicated.

3 WARNING & CAUTION LABEL

(1) Step-on prohibitive label

Fig.3 (a) Step-on prohibitive label

Description

Do not step on or climb the robot or controller as it may adversely affect the robot or controller and you may get hurt if you lose your footing.

(2) High-temperature warning label

Fig.3 (b) High-Temperature warning label

Description

Be cautious about a section where this label is affixed, as the section generates heat. If you must touch such a section when it is hot, use a protective provision such as heat-resistant gloves.

(3) High-voltage warning label

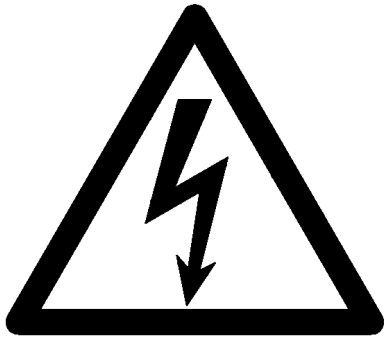


Fig.3 (c) High-voltage warning label

Description

A high voltage is applied to the places where this label is attached.
Before starting maintenance, turn the power to the controller off, and turn the circuit breaker off to avoid electric shock hazards. Take additional precautions with the servo amplifier and other equipment, because high-voltage remains in these units for a certain amounts of time

(4) Caution label

Fig.3 (d) Caution label

Description

See related contents of this manual.

4 WARNING & CAUTION REGARDING USE OF CONTROLLER

⚠ WARNING

1 The R-30*i*B Mate/R-30*i*B Mate Plus controller (Open Air) does not designed to be a sealed structure. It should be installed in a clean environment such as an office. When the controller is used in an industrial environment, please install it in the sealing structure so that dust, oil mist, conductive foreign particulate, etc. around the controller do not enter the interior of the controller.
2 Do not remove the top plate of the cabinet by anyone other than the trained maintenance worker.
3 To prevent electric shock, do not energize the controller without the top plate. In addition, do not place the controller without the top plate.
4 After connecting input power cable, in order to avoid turning on the main breaker, padlocking can be installed to the breaker handle.
5 Install one or more necessary quantity of EMERGENCY STOP button(s) within the operator's reach in appropriate location(s) based on the system layout.
6 Be sure to connect the ground wire according to Section 1.6 when connecting power supply to the controller.
7 Do not connect or disconnect connectors to/from the controller while the power switch is on. Doing so may cause electric shock or controller failure.

PREFACE

This manual describes R-30*i*B Mate/R-30*i*B Mate Plus controller (Open Air) for the following robot models.

Open air controller (Small size)

Model	Abbreviation	
FANUC Robot LR Mate 200*i*D	LR Mate 200*i*D	LR Mate 200*i*D
FANUC Robot LR Mate 200*i*D/4S	LR Mate 200*i*D/4S	
FANUC Robot LR Mate 200*i*D/4SC	LR Mate 200*i*D/4SC	
FANUC Robot LR Mate 200*i*D/4SH	LR Mate 200*i*D/4SH	
FANUC Robot LR Mate 200*i*D/7L	LR Mate 200*i*D/7L	
FANUC Robot LR Mate 200*i*D/7C	LR Mate 200*i*D/7C	
FANUC Robot LR Mate 200*i*D/7H	LR Mate 200*i*D/7H	
FANUC Robot LR Mate 200*i*D/7LC	LR Mate 200*i*D/7LC	
FANUC Robot LR Mate 200*i*D/7WP	LR Mate 200*i*D/7WP	
FANUC Robot LR Mate 200*i*D/14L	LR Mate 200*i*D/14L	
FANUC Robot ER-4*i*A**	ER-4*i*A	ER-4*i*A
FANUC Robot M-1*i*A/0.5A	M-1*i*A/0.5A	M-1*i*A
FANUC Robot M-1*i*A/0.5S	M-1*i*A/0.5S	
FANUC Robot M-1*i*A/0.5AL	M-1*i*A/0.5AL	
FANUC Robot M-1*i*A/0.5SL	M-1*i*A/0.5SL	
FANUC Robot M-1*i*A/1H	M-1*i*A/1H	
FANUC Robot M-1*i*A/1HL	M-1*i*A/1HL	
FANUC Robot CR-4*i*A**	CR-4*i*A	CR-4*i*A
FANUC Robot CR-7*i*A**	CR-7*i*A	CR-7*i*A
FANUC Robot CR-7*i*A/L**	CR-7*i*A/L	
FANUC Robot CR-14*i*A/L**	CR-14*i*A/L	CR-14*i*A

Open air controller (Large size)

Model	Abbreviation	
FANUC Robot M-2*i*A/3S	M-2*i*A/3S	M-2*i*A
FANUC Robot M-2*i*A/3SL	M-2*i*A/3SL	
FANUC Robot M-2*i*A/6H	M-2*i*A/6H	
FANUC Robot M-2*i*A/6HL	M-2*i*A/6HL	
FANUC Robot M-2*i*A/3A	M-2*i*A/3A	
FANUC Robot M-2*i*A/3AL	M-2*i*A/3AL	
FANUC Robot M-3*i*A/6A	M-3*i*A/6A	M-3*i*A
FANUC Robot M-3*i*A/6S	M-3*i*A/6S	
FANUC Robot M-3*i*A/12H	M-3*i*A/12H	
FANUC Robot DR-3*i*B/8L**	DR-3*i*B/8L	DR-3*i*B

** Models do not correspond to R-30*i*B Mate controller (Open Air).

Name and content of hazardous substances in products based on the "Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (Chinese RoHS2)"

The hazardous substances contained in the R-30*i*B Mate/R-30*i*B Mate Plus controller (Open Air) as listed in the table below.

The names and contents of hazardous substances in the product

Part name		Hazardous substances					
		Lead (Pb)	**Mercury (Hg)**	**Cadmium (Cd)**	**Hexavalent Chromium (Cr (VI))**	**Polybrominated biphenyls (PBB)**	**Polybrominated diphenyl ethers (PBDE)**
Mechanical unit	Mechanical unit main body	○	○	○	○	○	○
	Motor	×	○	○	○	○	○
	Cables	×	○	○	○	○	○
Control unit Mechanical unit	Teach pendant	×	○	○	○	○	○
	Control unit main body	×	○	○	○	○	○
	Mechanical unit main body	×	○	○	○	○	○

This table is prepared in accordance with the provisions of SJ/T 11364.

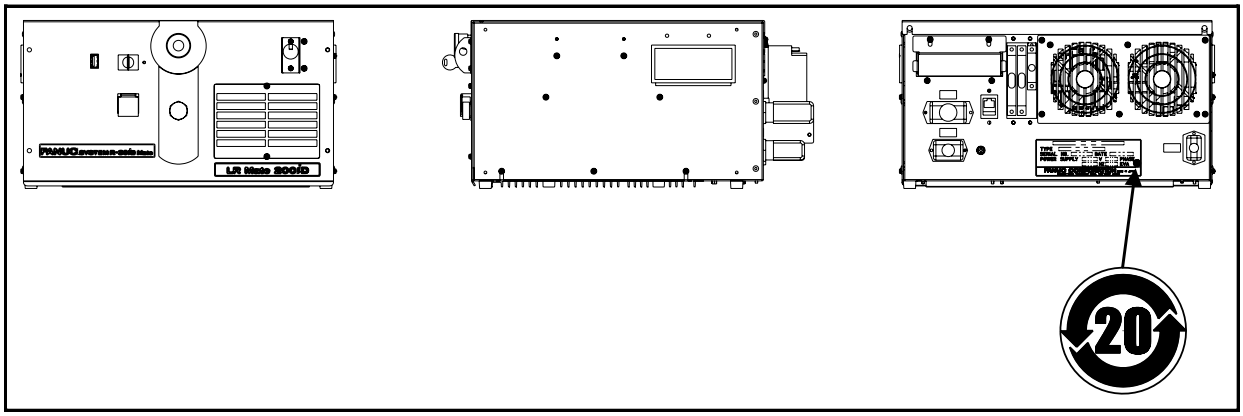
○: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

×: Indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.

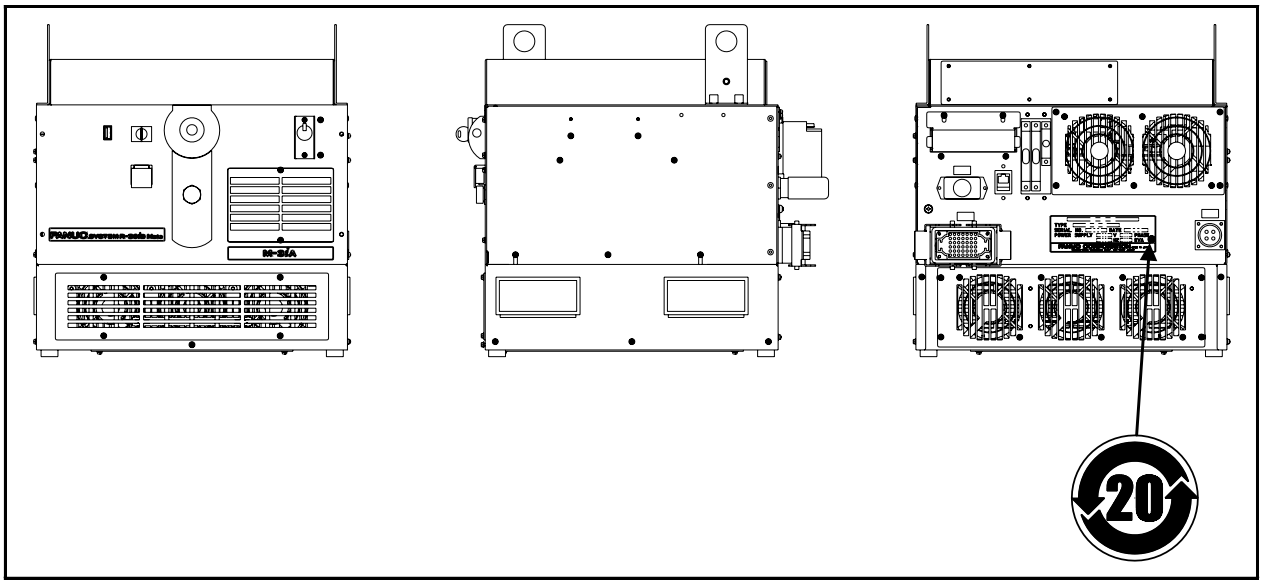
Environmental Protection Use Period

In the following proper use environmental conditions, Environmental Protection Use Period is 20 years after manufacture. The pollution prevention label, which indicates the environmental protection use period, is attached as shown in the figure below.

Installation location	: Indoor
Ambient temperature	: 0°C to 40°C
Ambient humidity	: 75%RH or less
Vibration	: 4.9m/s^2 (0.5G) or less
Atmosphere	: It corrosive gas is not



(a) In case of Open Air controller (Small size)



(b) In case of Open Air controller (Large size)

TABLE OF CONTENTS

I. MAINTENANCE

1 OVERVIEW

This manual is applied to R-30*i*B Mate/R-30*i*B Mate Plus controller (Open Air).

R-30*i*B Mate/R-30*i*B Mate Plus (Open Air) has different controller depending on the required standards.

NRTL controller: To meet UL/CSA standard.
CE controller: To meet Machinery Directive, Low voltage Directive, EMC Directive to cover the requirement of CE standard.

This manual covers these controllers of the R-30*i*B Mate/R-30*i*B Mate Plus (Open Air).
The difference of NRTL and CE controller from the Basic controller is small as shown in Table 1 (a) (ex. EMC parts, Breakers).
And the specific descriptions of CE and NRTL controller have notifications in this manual.

Table 1 (a) Applied standards

	Functional Safety	EMC Standard	Robot Standard Electrical Standard	Requirement	Difference
Basic controller	ISO 13849-1 IEC 61508	-	-	-	-
NRTL controller			UL1740 CAN/CSA Z434 NFPA79	UL standard CSA standard •USA and Canada	•UL listed main breaker
CE controller		EN 55011 EN 61000-6-2 EN 61000-6-4	EN/ISO 10218-1 EN 60204-1	CE standard •Europe	•Shielded cable

This manual describes the maintenance and connection of the R-30*i*B Mate/R-30*i*B Mate Plus controller (Open Air).

・Maintenance Part: Troubleshooting, and the setting, adjustment, and replacement of units
・Connection Part: Connection of R-30*i*B Mate/R-30*i*B Mate Plus controller (Open Air) to the robot mechanical unit and peripheral devices, and installation of the controller

> ⚠ **WARNING**
> Before you enter the robot working area, be sure to turn off the power to the controller or press the EMERGENCY STOP button on the controller or teach pendant.
> Otherwise, you could injure personnel or damage equipment.

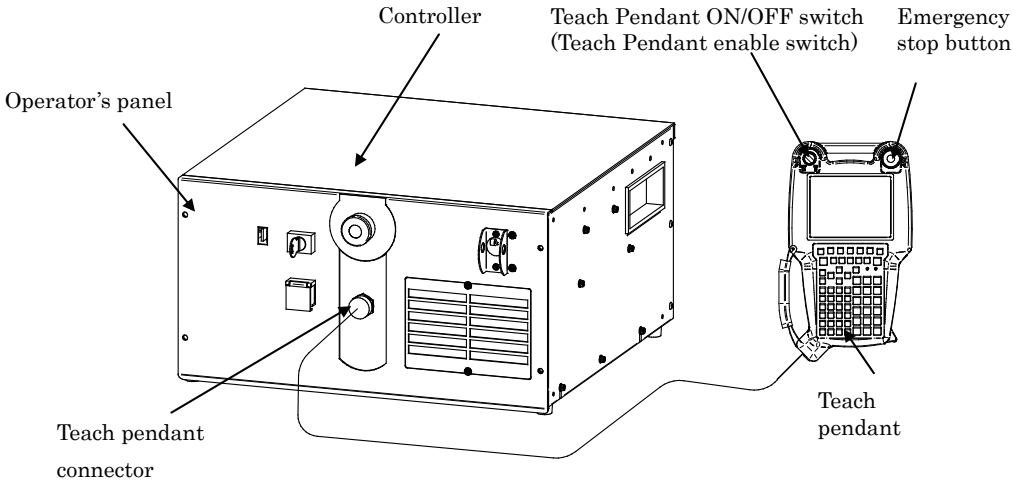
2 CONFIGURATION

2.1 EXTERNAL VIEW OF THE CONTROLLER

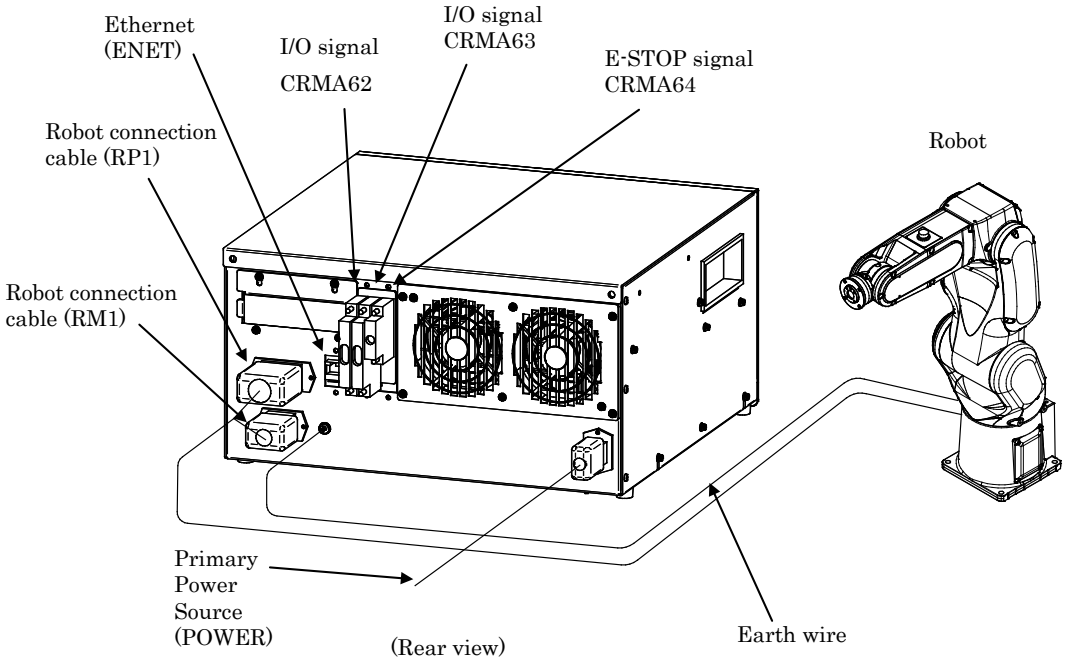
Explanation of Controller size

Abbreviation	Controller Size	Dimension	Breaker capacity	Single phase /Three phase
LR Mate 200*i*D, ER-4*i*A, M-1*i*A	Small	370X350X200	6A	Single phase
	Small+ top hat	370X350X254.4		
CR-4*i*A, CR-7*i*A, CR-14*i*A	Small+ top hat (for collaborative robot)	370X350X270	6A	Single phase
M-2*i*A, M-3*i*A, DR-3*i*B	Large	370X350X356	20A	Three phase

In case of Open Air controller (Small size)



(Front view)

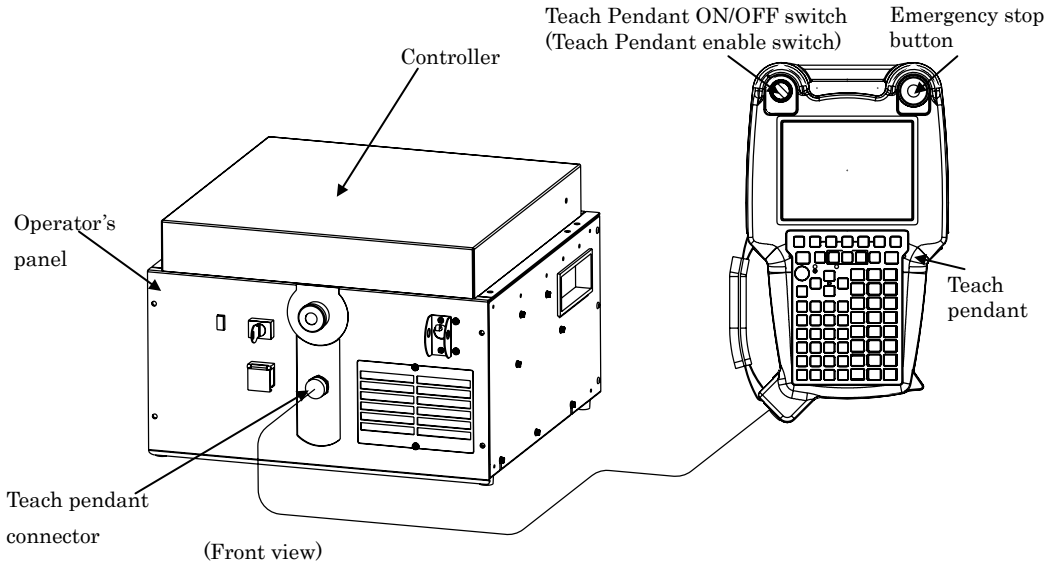


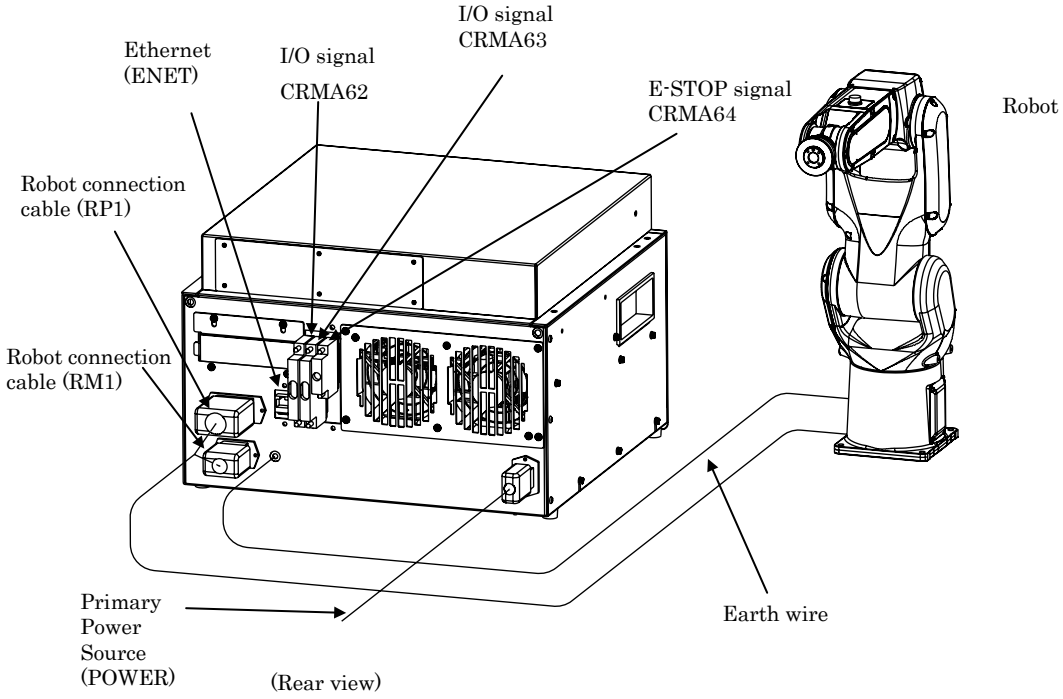
(Rear view)

⚠ WARNING

1. Do not touch radiation of heat fins of controller. Their hot surfaces may cause severe burns.
2. Do not insert fingers or foreign objects into controller. Doing so may cause electric shock or bodily injury.
3. Do not place anything on the controller.

In case of Open Air controller (Small size + top hat)

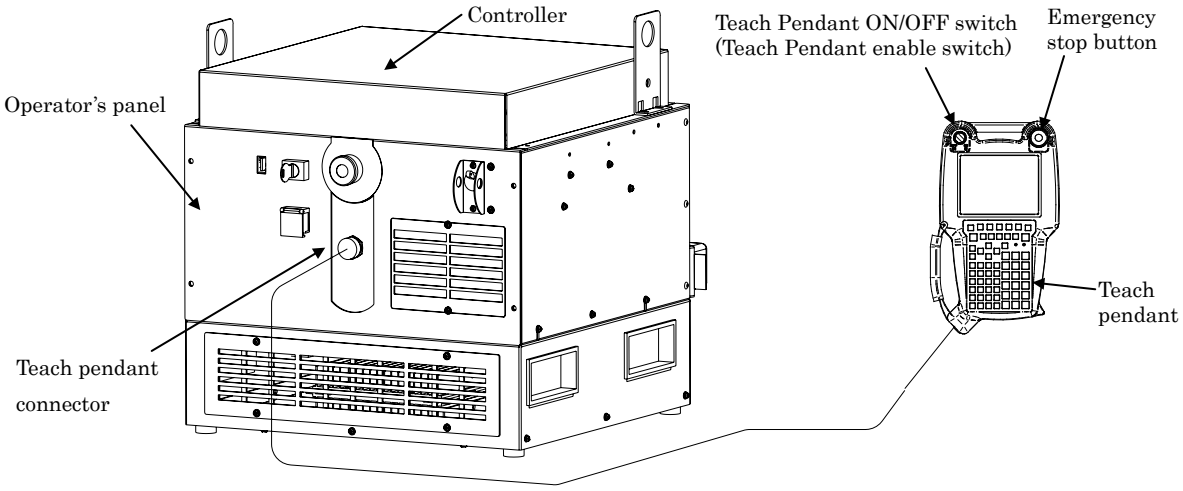




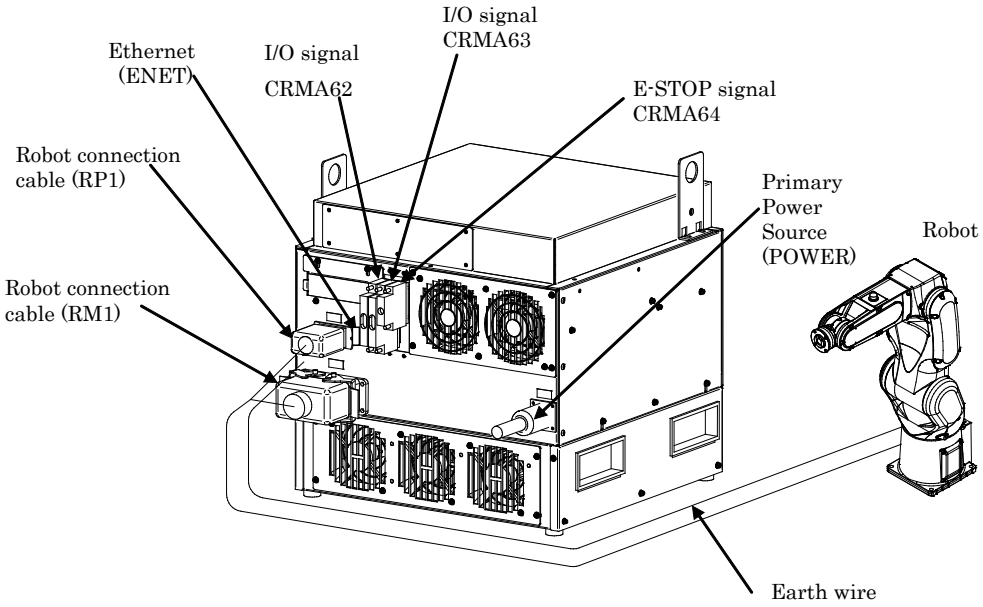
⚠ WARNING

1. Do not touch radiation of heat fins of controller. Their hot surfaces may cause severe burns.
2. Do not insert fingers or foreign objects into controller. Doing so may cause electric shock or bodily injury.
3. Do not place anything on the controller.

In case of Open Air controller (Large size)



(Front view)

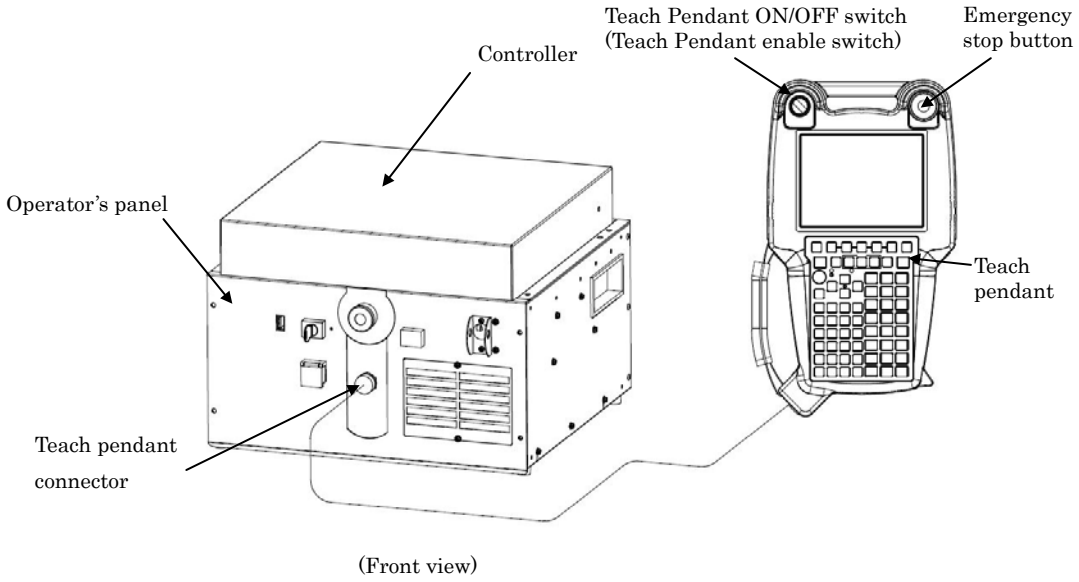


(Rear view)

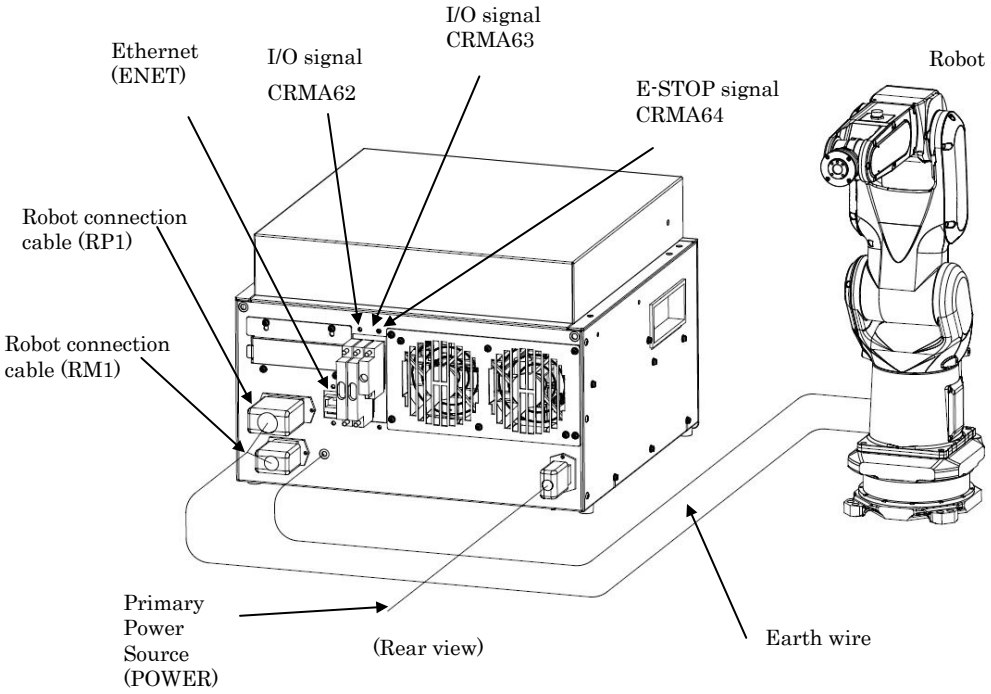
⚠ WARNING

1. Do not touch radiation of heat fins of controller. Their hot surfaces may cause severe burns.
2. Do not insert fingers or foreign objects into controller. Doing so may cause electric shock or bodily injury.
3. Do not place anything on the controller.

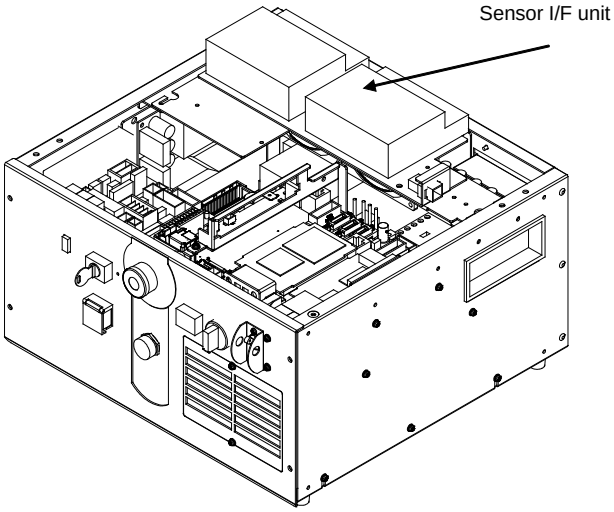
In case of Open Air controller (for collaborative robot)



(Front view)



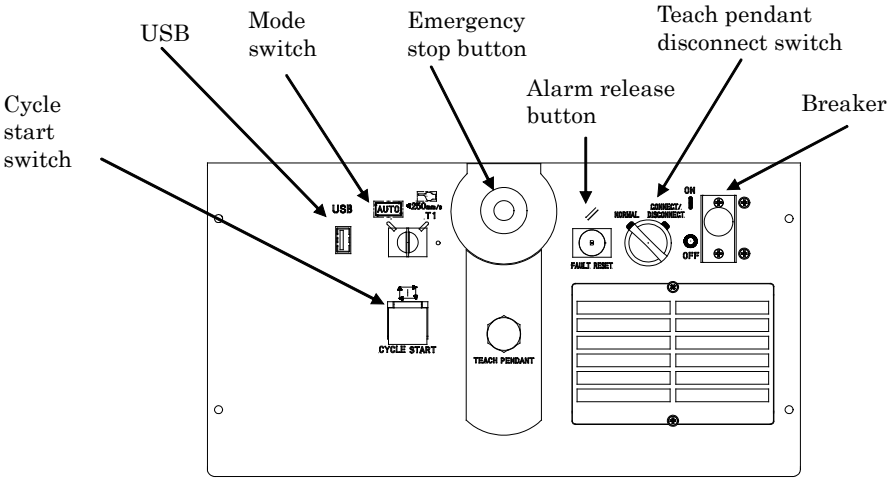
(Rear view)



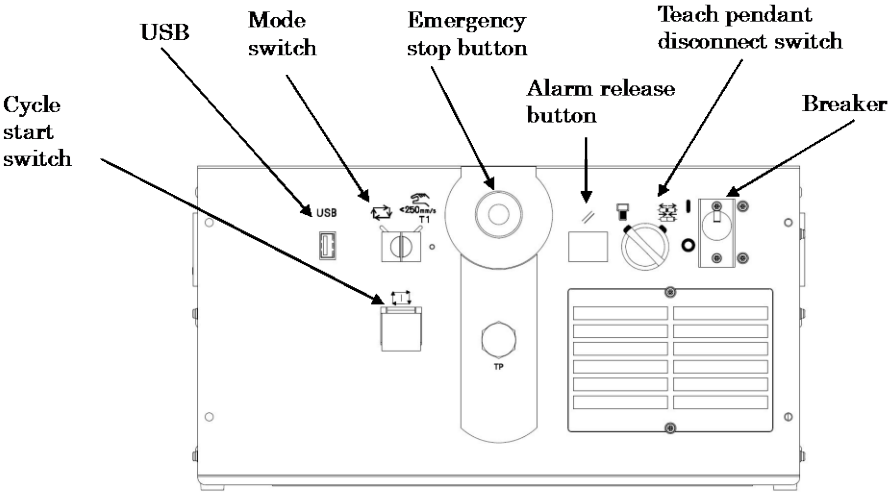
⚠ WARNING

1. Do not touch radiation of heat fins of controller. Their hot surfaces may cause severe burns.
2. Do not insert fingers or foreign objects into controller. Doing so may cause electric shock or bodily injury.
3. Do not place anything on the controller.

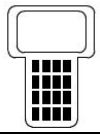
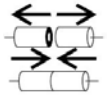
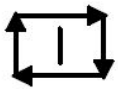
2.2 OPERATOR'S PANEL



R-30*i*B Mate operator's panel



R-30*i*B Mate Plus operator's panel

Symbol	Description
	“TP” symbol of the TP disconnect switch. Please turn the disconnect switch to “TP” position when teach pendant cable is connected.
	“Connect/disconnect” symbol of the TP disconnect switch. Teach pendant cable can be disconnected by setting the disconnect switch to the “Connect/Disconnect” position.
	Enables the user to select operation mode suitable to the robot operation conditions or the status of its use. Automatic operation mode ( ) Teach mode ( )
	Enables the user to select operation mode suitable to the robot operation conditions or the status of its use. Automatic operation mode (AUTO) Teach mode ( )
	Release the alarm state.
	Starts the currently selected program. Lit while the program is being started.
	Enable operation of the robot controller breaker.
	Disable operation of the robot controller breaker.
USB	USB symbol.

2.3 COMPONENT FUNCTIONS

- Main board
  The main board contains a microprocessor, its peripheral circuits, memory, and operator's panel control circuit. The main CPU controls servo mechanism positioning.
- E-stop board and MCC
  This board controls the emergency stop system for both of the magnetic contactor and the precharge of the servo amplifier.
- Power supply unit
  The power supply unit converts the AC power to various levels of DC power.
- Backplane printed circuit board
  The various control printed circuit boards are mounted on the backplane printed circuit board.
- Teach pendant
  All operations including robot programming are performed with this unit. The controller status and data are indicated on the liquid-crystal display (LCD) on the pendant.
- Servo amplifier
  The servo amplifier controls servomotor, Pulsecoder signal, brake control, overtravel and hand broken.
- Operator's panel
  Buttons and LEDs on the operator's panel are used to start the robot and to indicate the robot status. The controller has an interface to connect the memory card for data backup. It also controls the emergency stop control circuit.
- Fan motor
  These components cool the inside of the controller.
- Circuit breaker
  If the electric system in the controller malfunctions, or if abnormal input power causes high current in the system, the input power is connected to the circuit breaker to protect the equipment.
- Discharge resistor
  To discharge the counter electromotive force from the servo motor, connect a discharge resistor to the servo amplifier.

2.4 CHECKS AND MAINTENANCE

Daily maintenance and periodic maintenance/inspection ensure reliable robot performance for extended periods of time.

(1) Daily maintenance
Before operating the system each day, clean each part of the system and check the system parts for any damage or cracks. Also, check the following:
  (a) Before operation
  Check the cable connected to the teach pendant for excessive twisting. Check the controller and peripheral devices for abnormalities.
  (b) After operation
  At the end of operation, return the robot to the specified position, and then turn off the controller. Clean each part, and check for any damage or cracks. If the ventilation port of the controller is dusty, clean it.

(2) Check after one month
Check that the fan is rotating normally. If the fan and filter have dirt and dust built up, clean the fan and filter according to step (3) described below for inspection to be performed every 6 months.

(3) Periodic inspection performed every 6 months.
  (a) Wipe off dirt and dust from the fan motor and filter.

(b) To confirm that the safety function can work correctly, please check the alarm detection by inputting emergency stop, or please check the system operation by cycling power (refer to the following CAUTION).

(4) Battery daily check
Replace the battery of the main board every 4 years. Please refer to the section 3.2.

(5) Maintenance tools
The following maintenance tools are recommended:
(a) Measuring instruments
AC/DC voltmeter (A digital voltmeter is sometimes required.)
Oscilloscope with a frequency range of 5 MHz or higher, two channels
(b) Tools
Cross-head screwdrivers : Large, medium, and small
Straight-head screwdrivers: Large, medium, and small
Nut driver set (Metric) : Large, medium, and small
Pliers
Cutting pliers
Diagonal cutting pliers

(6) Automatic backup
When the automatic backup area (FRA:) of F-ROM in the controller is specified as a backup copy destination and automatic backup is performed frequently, F-ROM may be damaged. If the automatic backup is performed frequently, please use the external storage device.

⚠ CAUTION
R-30*i*B Mate/R-30*i*B Mate Plus (Open Air) is evaluated as a system with the high demand mode of operation defined in IEC61508. To confirm that the safety function can work correctly, please check the alarm detection by inputting emergency stop twice or more in a year, or please check the system operation by cycling power twice or more in a year.

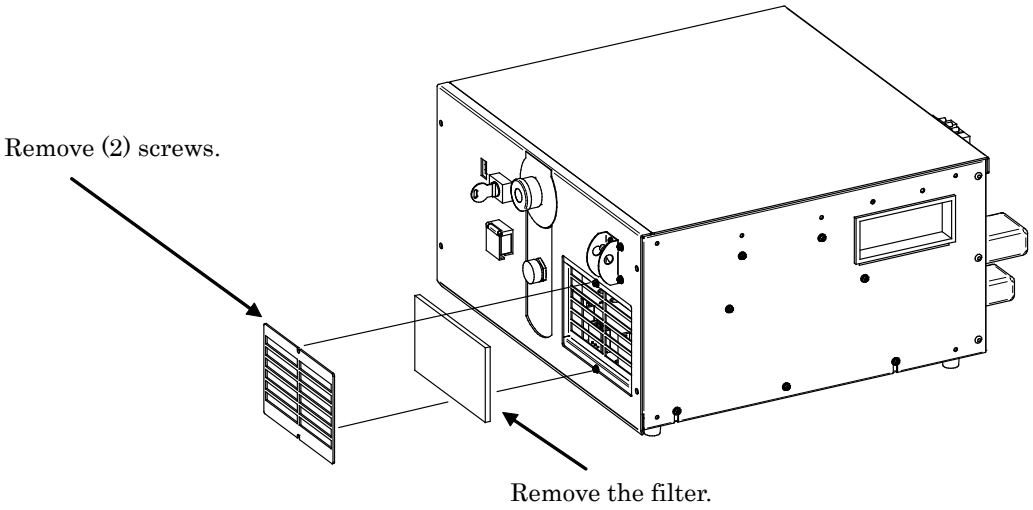
⚠ WARNING
1 The R-30*i*B Mate/R-30*i*B Mate Plus controller (Open Air) does not designed to be a sealed structure. It should be installed in a clean environment such as an office. When the controller is used in an industrial environment, please install it in the sealing structure so that dust, oil mist, conductive foreign particulate, etc. around the controller do not enter the interior of the controller.
2 Do not remove the top plate of the cabinet by anyone other than the trained maintenance worker.
3 To prevent electric shock, do not energize the controller without the top plate. In addition, do not place the controller without the top plate.
4 After connecting input power cable, in order to avoid turning on the main breaker, padlocking can be installed to the breaker handle.

3 REPLACING UNITS

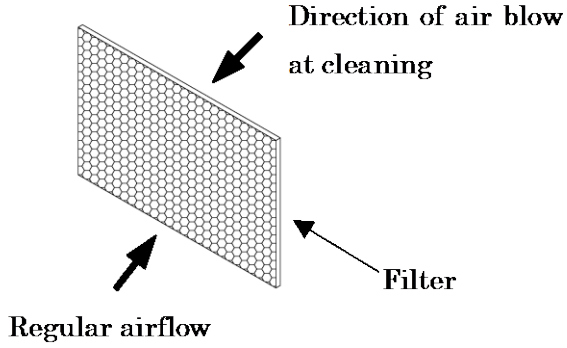
> ⚠ **WARNING**
> Before opening the controller cover and accessing the inside of the controller for maintenance, be sure to turn off the power switch, disconnect the power cable, and wait 1 minute or more. This is for protecting you from electric shock.

3.1 CLEANING THE FILTER

- Remove (2) screws.
- Remove the plate and filter.



- Blow compressed air to the filter in the direction opposite to the regular airflow.



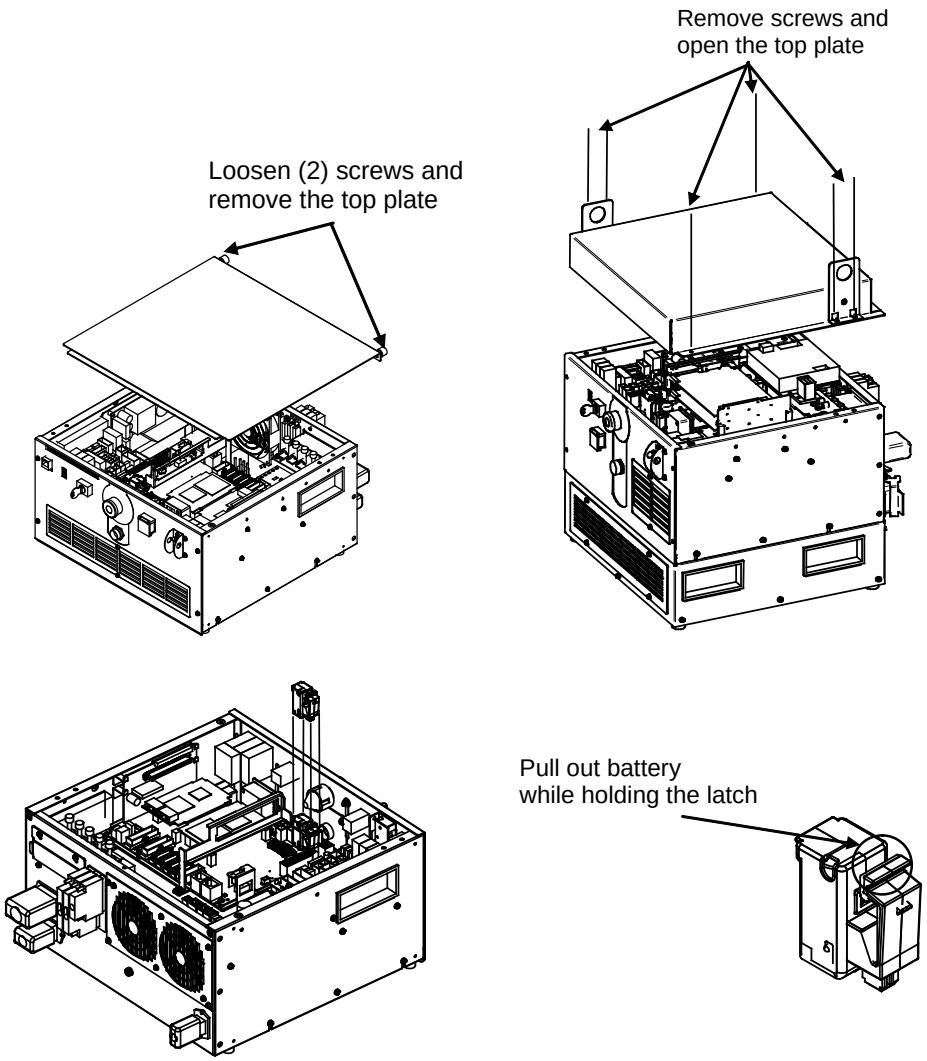
- If the filter is excessively dirty, wash it with water or warm water (40℃ or lower). A neutral detergent is most effective.

> ⚠ **CAUTION**
> Use dehumidified, oil-free, pure compressed air for cleaning.

> ⚠ **CAUTION**
> Dry the washed filter completely before replacing it. If the filter is still dirty after air blowing or washing, replace it with new one (specification: A05B-2655-K001).

3.2 REPLACING THE BATTERY

- Use a specified lithium battery (specification : A05B-2650-K030, A98L-0031-0028) include lithium dry cell.
- Turn the controller on for more than 30 seconds.
- Turn the controller off.
- Remove the top plate and pull out the battery.
  (Hold the latch of the battery, and pull out the battery from the plate.)
- Install a new battery. (Insert the battery until the latch snaps into the plate.)
  Check that the battery is latched securely.



⚠ WARNING
Using other than the specified battery may result in the battery explosion. Replace the battery only with the specified battery (A05B-2650-K030, A98L-0031-0028).

⚠ CAUTION
Install a new battery within 30 minutes after turning the controller off. To prevent possible data loss, it is recommended that the robot data such as programs and system variables be backed up before battery replacement.

NOTE
Dispose of the replaced battery as an industrial waste, according to the laws and other rules in the country where the controller is installed and those established by the municipality and other organizations that have jurisdiction over the area where the controller is installed.

3.3 REPLACING THE FUSES

- The following fuses are in the main board.
  FUSE1 : Fuse for protecting the +24V output for peripheral equipment interfaces
  : A60L-0001-0290#LM10
  Spare-fuse-kit specification : A05B-2650-K001

  FUSE9: For protecting the +24E output for vision : A60L-0001-0290#LM10
  (This fuse is installed on the R-30*i*B Mate Plus main board.)

- The following fuses are in the servo amplifier.
  FS1 : For generation of the power to the amplifier control circuit : A60L-0001-0290#LM32C
  FS2 : For protection of the 24V output to the end effecter, ROT, and HBK
  For protection of the 24V output to the mechanical unit fan motor (Option)
  (In case of M-3*i*A) : A60L-0001-0290#LM32C
  FS3 : For protection of the 24V output to the discharge resistor : A60L-0001-0290#LM32C
  Spare-fuse-kit specification : A05B-2650-K001

- The following fuses are in the E-STOP board.
  FUSE2 : For protecting +24V to the E-STOP circuit (24EXT) : A60L-0001-0290#LM10C
  FUSE3 : For protecting +24V to the teach pendant (24T) : A60L-0001-0290#LM10C
  FUSE4 : For protecting +24V to the E-STOP circuit (24V-2) : A60L-0001-0290#LM20C
  FUSE5 : For protecting +24V to the main board (24V-3) : A60L-0001-0290#LM50C
  FUSE6, FUSE7 : For protecting AC200V output : A60L-0001-0175#3.2A
  Spare-fuse-kit specification : A05B-2650-K002

  FUSE8 : For 200V power monitor circuit : A60L-0001-0175#0.3A
  (This fuse is installed on the E-STOP board for R-30*i*B Mate Plus.)

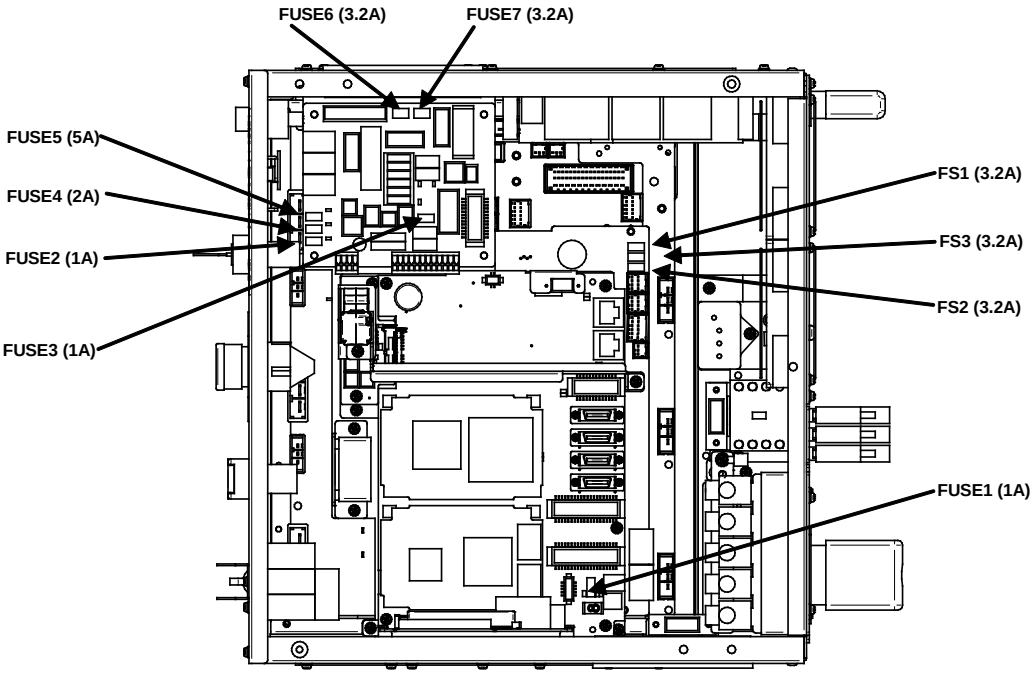


Fig.3.3 (a) Replacing the fuses (R-30*i*B Mate)

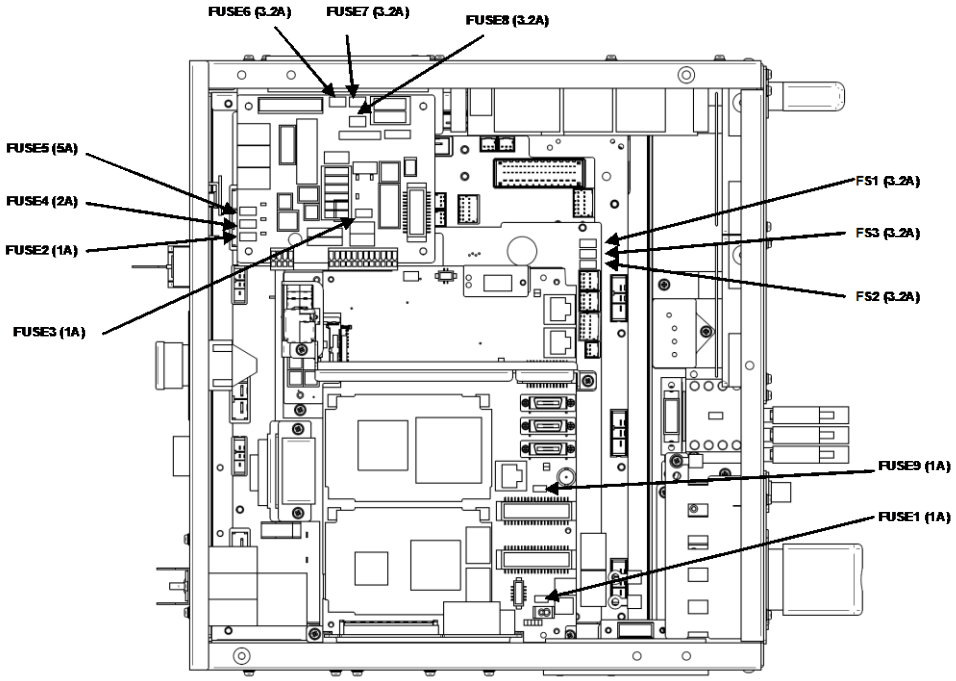


Fig.3.3 (b) Replacing the fuses (R-30*i*B Mate Plus)

- The following fuses are in the safety I/O board.
  FU1 : For protecting +24V to the safety signal input (SFDI) : A60L-0001-0290#LM10C
  FU2 : For protecting +24V to the safety signal output (SFDO) : A60L-0001-0290#LM32C

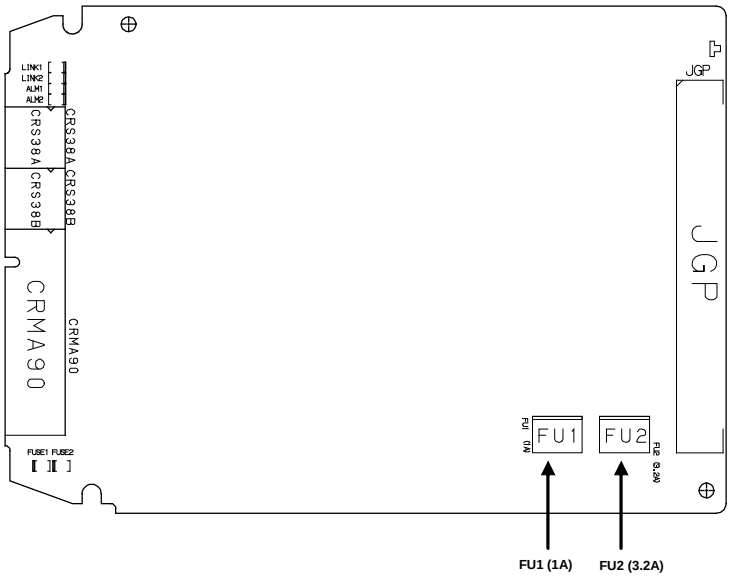
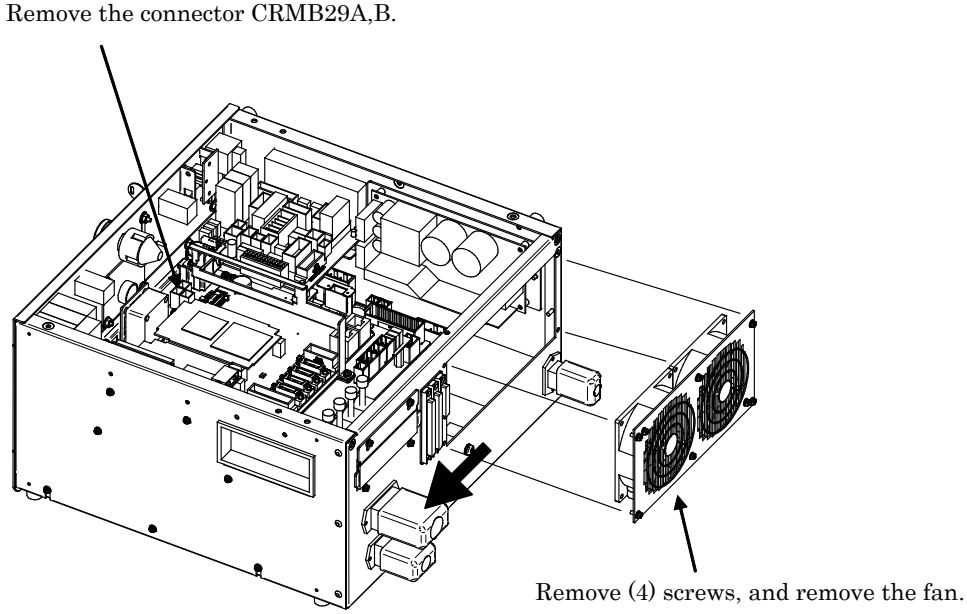


Fig.3.3 (c) Additional safety I/O board (Option)

3.4 REPLACING THE FAN MOTOR

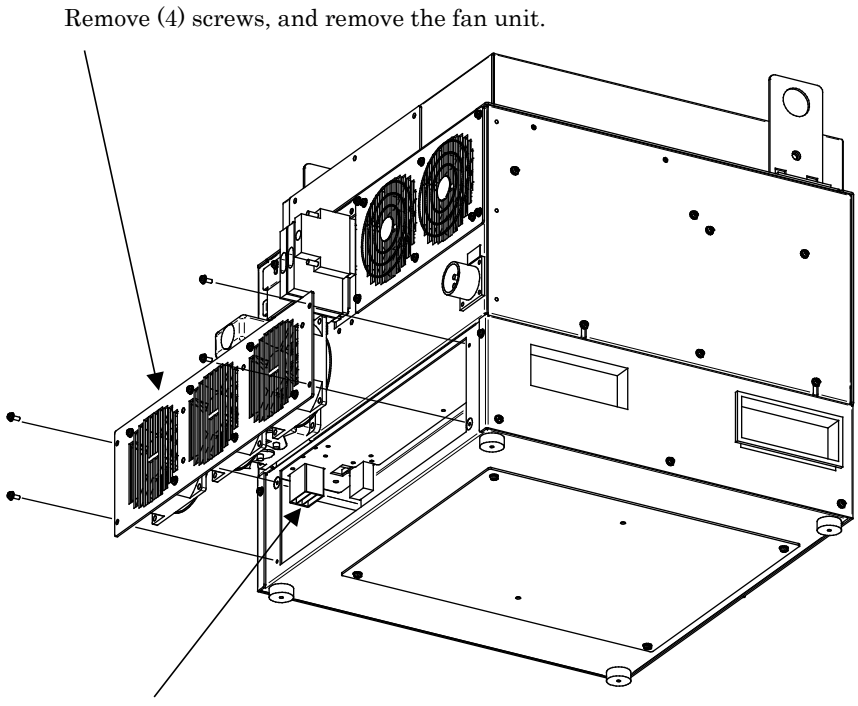
Replacing rear fan unit

- Remove the connector CRMB29A,B on the main board.
- Remove (4) screws, and remove the fan unit.



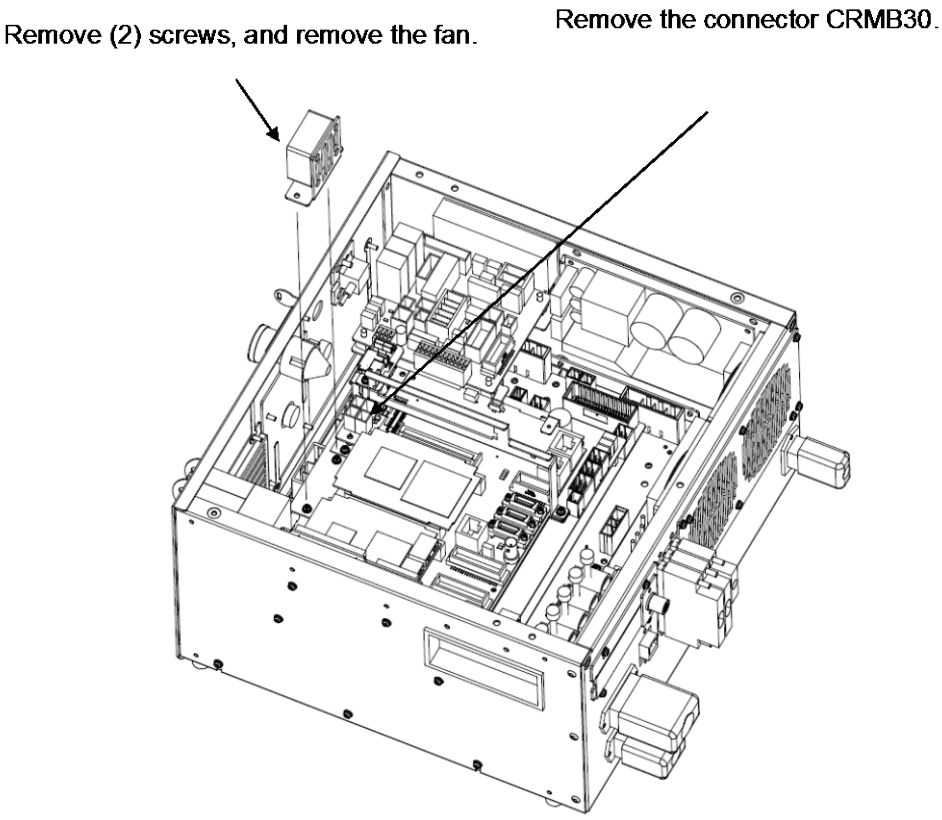
Replacing discharge register fan unit

- Remove the connector CRRA22.
- Remove (4) screws, and remove the fan unit.



Replacing CPU fan

- Remove the connector CRMB30 on the main board.
- Remove (2) screws, and remove the fan.



4 TROUBLESHOOTING

This chapter describes the checking method and corrective action for each alarm code indicated if a hardware alarm occurs. Refer to the OPERATOR'S MANUAL (ALARM CODE LIST) (B-83284EN-1) to release program alarms.

4.1 POWER CANNOT BE TURNED ON

Check that the circuit breaker is on and has not tripped. Turn on the circuit breaker.

4.1.1 When the Teach Pendant cannot be Powered on

Parts to cause this trouble;
- Teach pendant
- Teach pendant cable
- E-stop board
- Fuse (FUSE3) on the E-stop board

4.1.2 When the Teach Pendant does not Change from the Initial Screen

Parts to cause this trouble;
- Backplane board
- Main board
- Fuse(FUSE5) on the E-stop board
- Option board
- E-stop board
- Controller internal cables

4.2 ALARM OCCURRENCE SCREEN

The alarm occurrence screen displays only the alarm conditions that are currently active. If an alarm reset signal is input to reset the alarm conditions, the alarm occurrence screen displays the message "PAUSE or more serious alarm has not occurred."
The alarm occurrence screen displays only the alarm conditions (if any) that occur after the most recently entered alarm reset signal. To erase all alarm displays from the alarm occurrence screen. Press the CLEAR key (+ shift) on the alarm history screen.
The alarm occurrence screen is intended to display PAUSE or alarms that are more serious. It will not display WARN, NONE, or a reset. It is possible to disable PAUSE and some of more serious alarms from being displayed by setting the $ER_NOHIS system variable appropriately.
If two or more alarms have occurred, the display begins with the most recent alarm.
Up to 100 lines can be displayed.
If an alarm has a cause code, it is displayed below the line indicating the alarm.

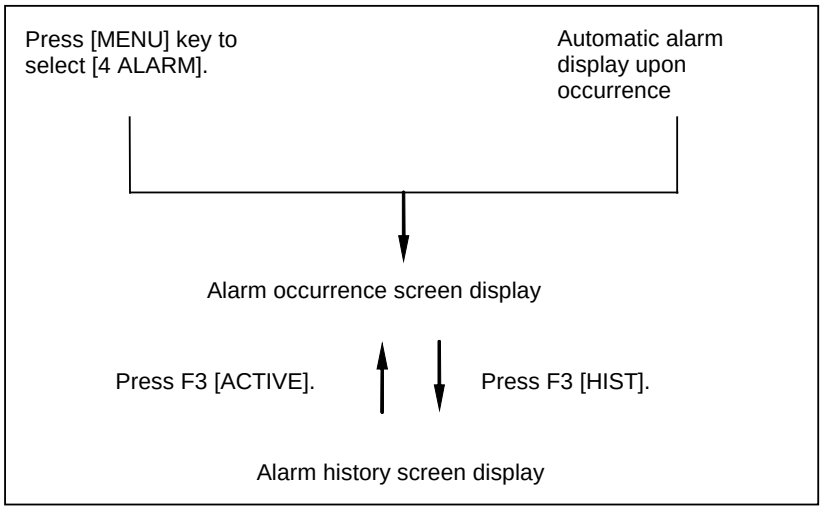
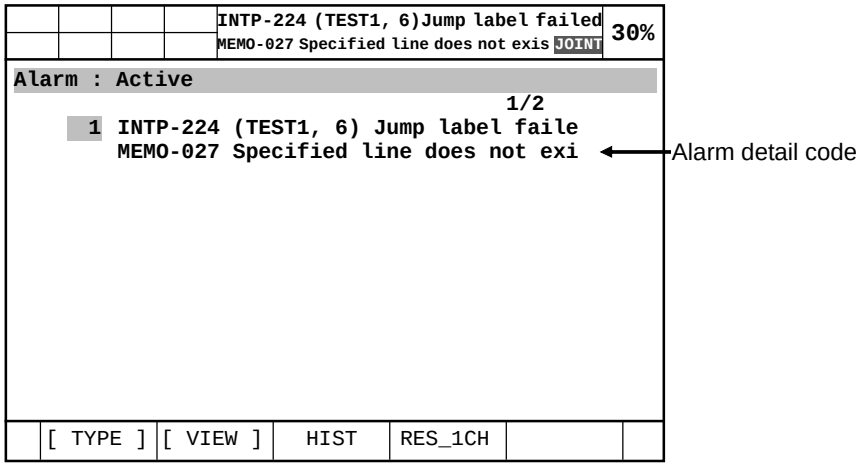


Fig.4.2 (a) Alarm occurrence screen and alarm history screen display procedure

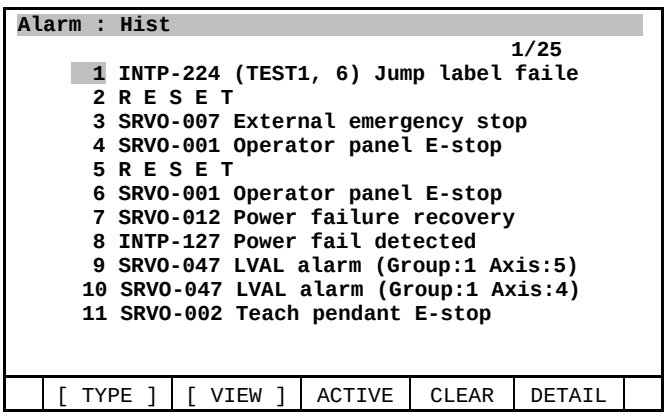
Displaying the alarm history/alarm detail information

Step

(1) Press [MENU] key to display the screen menu.
(2) Select [ALARM].
You will see a screen similar to the following.
If an alarm has occurred, however, the alarm screen appears automatically.

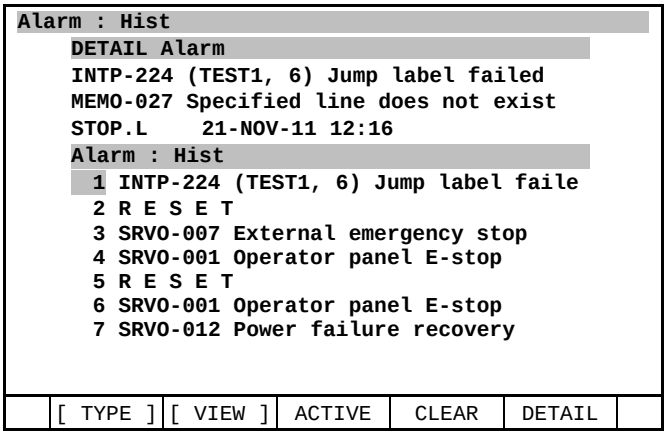


(3) To display the alarm history screen, press F3, [HIST].
Press F3 [ACTIVE] again, the alarm screen appears.



NOTE
The latest alarm is assigned number 1. To view messages that are currently not on the screen, press the F5, HELP, and then press the right arrow key.

(4) To display the alarm detail screen, press F5, [HELP].

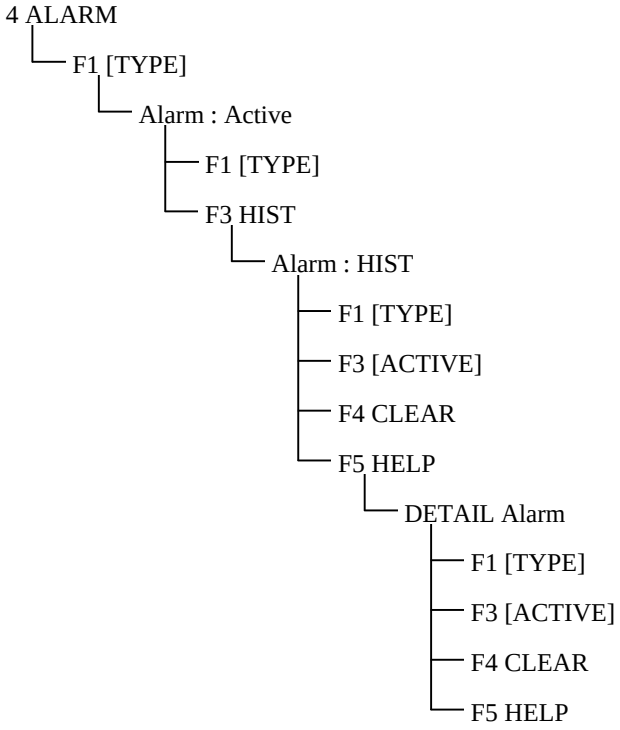


(5) To return to the alarm history screen, press the PREV key.

(6) To delete all the alarm histories, press and hold down the SHIFT key, then press F4, [CLEAR].

NOTE
When system variable $ER_NOHIS = 1, NONE alarms or WARN alarms are not recorded. When $ER_NOHIS=2, resets are not recorded in the alarm history. When $ER_NOHIS=3, resets, WARN alarms, and NONE alarms are not recorded.

The following map indicates teach pendant operations used to check an alarm.



4.3 STOP SIGNALS

The stop signal screen indicates the state of signals related to stop.
To be specific, the screen indicates whether each stop signal is currently on. On this screen, it is impossible to change the state of any stop signal.

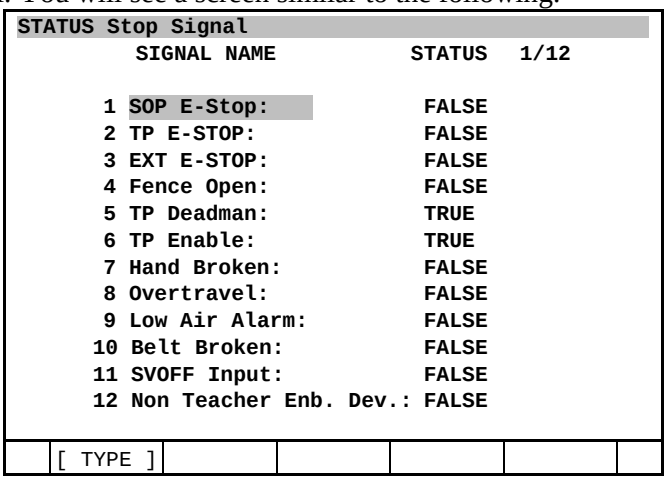
Table 4.3 (a) Stop signals

Stop signal	Description
Operator's panel emergency stop	This item indicates the state of the emergency stop button on the operator's panel. If the EMERGENCY STOP button is pressed, the state is indicated as "TRUE".
Teach pendant emergency stop	This item indicates the state of the emergency stop button on the teach pendant. If the EMERGENCY STOP button is pressed, the state is indicated as "TRUE".
External emergency stop	This item indicates the state of the external emergency stop signal. If the EMERGENCY STOP signal is asserted, the state is indicated as "TRUE".
Fence open	This item indicates the state of the safety fence. If the safety fence is open, the state is indicated as "TRUE".
Enabling device (Deadman switch)	This item indicates whether the Enabling device (Deadman switch) on the teach pendant is grasped. If the teach pendant is operable, and the Enabling device (Deadman switch) is grasped correctly, the state is indicated as "TRUE". If the Enabling device (Deadman switch) is released or is grasped tightly when the teach pendant is operable, an alarm occurs, causing the servo power to be switched off.
Teach pendant operable	This item indicates whether the teach pendant is operable. If the teach pendant is operable, the state is indicated as "TRUE".
Hand broken	This item indicates the state of the hand safety joint. If the hand interferes with a workpiece or anything like this, and the safety joint is opened, the state is indicated as "TRUE". In this case, an alarm occurs, causing the servo power to be switched off.
Robot overtravel	This item indicates whether the current position of the robot is out of the operation range. If any robot articulation goes out of the operation range beyond the overtravel switch, the state is indicated as "TRUE". In this case, an alarm occurs, causing the servo power to be switched off.
Abnormal air pressure	This item indicates the state of the air pressure. The abnormal air pressure signal is connected to the air pressure sensor. If the air pressure is not higher than the specified value, the state is indicated as "TRUE".

Displaying the stop signal screen

Step

(1) Press the [MENU] key to display the screen menu.
(2) Select STATUS on the next page.
(3) Press F1, [TYPE] to display the screen switching menu.
(4) Select Stop Signal. You will see a screen similar to the following.

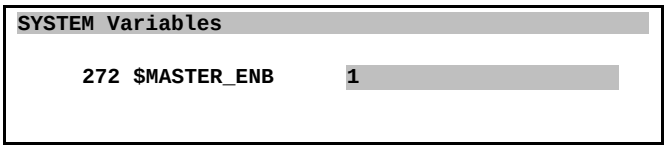


4.4 MASTERING

Mastering is needed if:
(1) The SRVO-062 BZAL or SRVO-038 pulse mismatch alarm occurs, or
(2) The Motor is replaced.
Item (1) requires quick mastering, while item (2) requires single axis or fixture position mastering.
The mastering procedure is described below. For details, refer to an applicable maintenance manual of mechanical unit or Mastering chapter of the Appendix B of the OPERATOR'S MANUAL (BASIC OPERATION) (B-83284EN) .

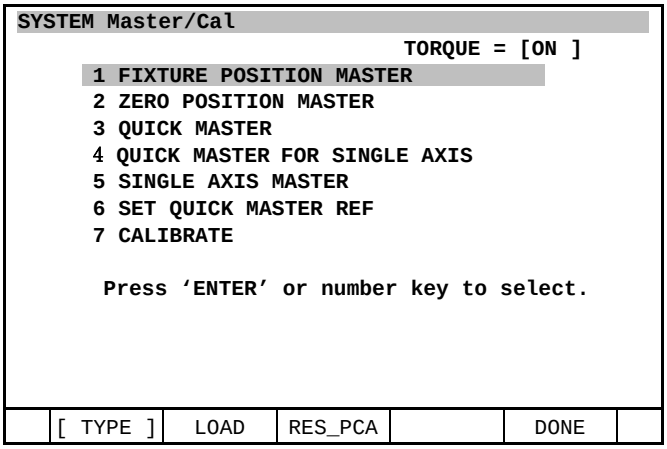
Condition

System variable $MASTER_ENB must be set to 1 or 2.



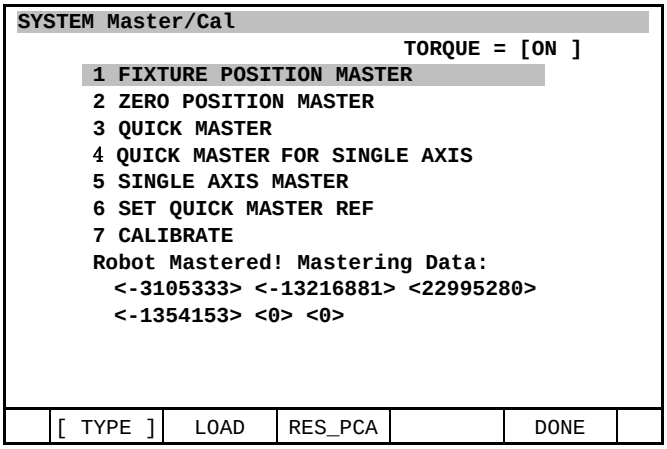
Step

1 Press the [MENU] key.
2 Select SYSTEM.
3 Press F1, TYPE.
4 Select Master/Cal you will see a screen similar to the following.
5 Move the robot by jog feed to the mastering position. Release the brake on the manual brake control screen if necessary.

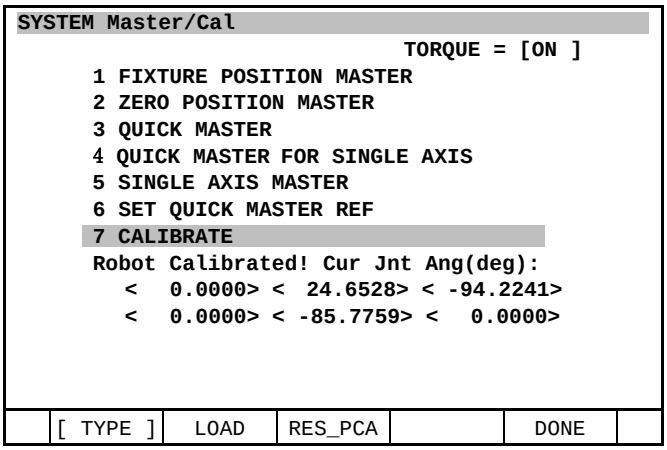


NOTE
Mastering can not be performed until axis is rotated enough to establish a pulse.

6 Select "1 FIXTURE POSITION MASTER" and press the F4 key (yes). Mastering data is set.



7 Select "7 CALIBRATE" and press the F4 key (yes). Calibration is performed.
Alternatively, to perform positioning, turn the power off, and then turn it on again. Calibration is performed whenever the power is turned on.



8 Press F5 "DONE", after mastering.
9 Restore the brake condition to its original condition.

4.5 TROUBLESHOOTING USING THE ALARM CODE

PRIO-095 Overload <Connector name>

(Explanation) The DO of the specified connector might be grounded.
(Action) Check the connection of the DO of the specified connector.

Parts to cause this alarm;
・Main board

SRVO-001 Operator panel E-stop

(Explanation) The emergency stop button on the controller is pressed.
(Action) Release the emergency stop button pressed on the controller.
Parts to cause this alarm;
・Emergency stop button
・Teach pendant cable
・Teach pendant
・E-stop board
・Main board
・Controller internal cables

SRVO-002 Teach pendant E-stop

(Explanation) The emergency stop button on the teach pendant was pressed.
(Action) Release the emergency stop button on the teach pendant.
Parts to cause this alarm;
・Teach pendant

SRVO-003 Enabling device (Deadman switch) released

(Explanation) The teach pendant is enabled, but the enabling device (deadman switch) is not pressed. Alternatively, the enabling device (deadman switch) is pressed strongly.
(Action 1) Check the intermediate position of the enabling device (deadman switch) on the teach pendant.
(Action 2) Check that the mode switch on the controller and the enable switch on the teach pendant are at the correct positions.
Parts to cause this alarm;
・Teach pendant
・Mode switch
・E-stop board
・Main board
・Controller internal cables

SRVO-004 Fence open

(Explanation) In the automatic operation mode, the safety fence contact connected to EAS1-EAS11 or EAS2-EAS21 of CRMA64 or TBOP20 is open.
(Action 1) When a safety fence is connected, close the safety fence.
(Action 2) Check the cables and switches connected between EAS1 and EAS11 and between EAS2 and EAS21 of CRMA64 or TBOP20.
(Action 3) If the safety fence signal is not used, make a connection between EAS1 and EAS11 and between EAS2 and EAS21 of CRMA64 or TBOP20.
Parts to cause this alarm;
・Mode switch
・E-stop board

・Controller internal cables

> ⚠ **WARNING**
> In a system using the safety fence signal, it is very dangerous to disable the signal when a connection is made between EAS1 and EAS11 and between EAS2 and EAS21 of CRMA64 or TBOP20. Never make such an attempt. If a temporary connection is needed for operation, another safety measures must be taken.

SRVO-005 Robot overtravel

(Explanation) The robot has moved beyond a hardware limit switch on the axes.
(Action 1) Select [System OT release] on the overtravel release screen to release each robot axis from the overtravel state.
(Action 2) Hold down the shift key, and press the alarm release button to reset the alarm condition.
(Action 3) Still hold down the shift key, and jog to bring all axes into the movable range.

Parts to cause this alarm;
・Limit switch
・FS2 fuse on the servo amplifier (If SRVO-214 alarm occurred)
・Servo amplifier
・Robot connection cable
・Controller internal cables
・Robot internal cables
・End effector connector
・Jumper connection on the mechanical unit (If in use)

> **NOTE**
> It is factory-placed in the overtravel state for packing purposes.
> If the Overtravel signal is not in use, it may have been disabled by jumper connection on the mechanical unit.

SRVO-006 Hand broken

(Explanation) The safety joint (if in use) might have been broken. Alternatively, the HBK signal on the robot connection cable might be a ground fault or a cable disconnection.
(Action) Hold down the shift key, and press the alarm release button to reset the alarm condition. Still hold down the shift key, and jog the tool to the work area.

Parts to cause this alarm;
・Servo amplifier
・Robot connection cable
・Safety joint
・Safety joint cable
・Controller internal cables
・Robot internal cables

> **NOTE**
> If the Hand broken signal is not in use, it can be disabled by software setting.
> Refer to Subsection 2.7.3 How to Disable/Enable HBK in Part II, "CONNECTIONS" of "Maintenance Manual" to disable the Hand broken signal.

SRVO-007 External E-stop

(Explanation) The switch connected across EES1 – EES11 and EES2 – EES21 on CRMA64 or TBOP20 was pressed.
(Action) When the external emergency stop button is connected, release the button.

Parts to cause this alarm;
- E-stop board
- External emergency stop button
- Cable connected to EES1 – EES11 and EES2 – EES21 on CRMA64 or TBOP20
- Controller internal cables
- Teach pendant
- Teach pendant cable

> ⚠ **WARNING**
> In a system using the external emergency stop signal, it is very dangerous to disable the signal when a connection is made between EES1 and EES11 and between EES2 and EES21. Never make such an attempt. If a temporary connection is needed for operation, separate safety measures must be taken.

SRVO-009 Pneumatic pressure abnormal

(Explanation) An abnormal air pressure was detected. The input signal is located on the end effector of the robot. Refer to the manual of your robot.
(Action) If an abnormal air pressure is detected, check the cause.

Parts to cause this alarm;
- Servo amplifier
- Controller internal cables
- Robot internal cables
- End effector connector
- Robot connection cable

> **NOTE**
> Pneumatic pressure alarm input is on the end effector. Please refer to the manual of your robot.

SRVO-014 Fan motor abnormal (%d), CPU STOP

(Explanation) A fan motor alarm is detected.

Parts to cause this alarm;
- Fan motor
- Main board
- Backplane board

> **NOTE**
> The controller will stop operation after 1 minutes of this alarm.

SRVO-015 SYSTEM OVER HEAT

(Explanation) The temperature in the controller exceeds the specified value.
(Action 1) If the ambient temperature is higher than specified, cool down the ambient temperature.
(Action 2) Clean up the fan motor and the filter if they are dirty.
Parts to cause this alarm;
・Fan motor
・Main board

NOTE
The controller will stop operation after 1 minutes of this alarm.

SRVO-018 Brake abnormal (Group:%d Axis:%d)

(Explanation) An excessive brake current is detected.

Parts to cause this alarm;
・Servo amplifier
・Robot connection cable
・Controller internal cables
・Motor brakes
・Robot internal cables

SRVO-021 SRDY off (Group:%d Axis:%d)

(Explanation) The HRDY is on and the SRDY is off, although there is no other cause of an alarm. (HRDY is a signal with which the host detects the servo system whether to turn on or off the servo amplifier magnetic contactor. SRDY is a signal with which the servo system informs the host whether the magnetic contactor is turned on.) If the servo amplifier magnetic contactor cannot be turned on when directed so, it is most likely that a servo amplifier alarm has occurred. If a servo amplifier alarm has been detected, the host will not generate this alarm (SRDY off). Therefore, this alarm indicates that the magnetic contactor cannot be turned on for an unknown reason.
(Action1) Make sure that the emergency stop board connectors CP5A, CRMA92, CRMB22, and 6-Axis servo amplifier CRMA91 are securely attached to the servo amplifier. In case of using aux. axis amplifier, make sure that the connectors CXA2A (6-axis amplifier) or CXA2B (aux. axis amplifier) are securely attached to the servo amplifier.
(Action 2) There is a possibility that an instant disconnection of power source causes this alarm. Check whether an instant disconnection occurred.

Parts to cause this alarm;
・E-stop unit
・Servo amplifier
・Controller internal cables

SRVO-022 SRDY on (Group:%d Axis:%d)

(Explanation) When the HRDY is about to go on, the SRDY is already on. (HRDY is a signal with which the host directs the servo system whether to turn on or off the servo amplifier magnetic contactor. SRDY is a signal with which the servo system informs the host whether the magnetic contactor is turned on.)

Parts to cause this alarm;
・Servo amplifier

SRVO-023 Stop error excess (G:%d A:%d)

(Explanation) When the servo is at stop, the position error is abnormally large. Check whether the brake is released through the clack sound of the brake or vibration.

In case that the brake is not released.
Parts to cause this alarm;

- Servo amplifier
- Servo motor
- Robot connection cable
- Controller internal cables
- Robot internal cables
- Balancer

In case that the brake is released.

(Action 1) Check whether the obstacle disturbs the robot motion.

(Action 2) Check to see if the load is greater than the rating. If greater, reduce it to within the rating. (If the load is too great, the torque required for acceleration / deceleration becomes higher than the capacity of the motor. As a result, the motor becomes unable to follow the command, and an alarm is generated.)

(Action 3) Check the input voltage to the controller is within the rated voltage and no phase is lack.

Parts to cause this alarm;

- Servo amplifier
- Servo motor
- Robot connection cable
- Controller internal cables
- Robot internal cables
- Balancer

NOTE
Incorrect setting of the brake number causes this alarm.

SRVO-024 Move error excess (G:%d A:%d)

(Explanation) When the robot is running, its position error is greater than a specified value ($PARAM _ GROUP. $MOVER _ OFFST). It is likely that the robot cannot follow the speed specified by program.

(Action) Take the same actions as SRVO-023.

SRVO-027 Robot not mastered (Group:%d)

(Explanation) An attempt was made to calibrate the robot, but the necessary adjustment had not been completed.

(Action) Check whether the mastering is valid. If the mastering is invalid, master the robot.

⚠ WARNING
If the position data is incorrect, the robot moves abnormally, set the position data correctly. Otherwise, you could injure personnel or damage equipment.

SRVO-030 Brake on hold (Group:%d)

(Explanation) If the temporary halt alarm function is enabled ($SCR.$BRKHOLD ENB=1), SRVO-030 occurred when a temporary halt occurs. When this function is not used, disable the setting.

(Action) Disable [Servo-off in temporary halt] on the general item setting screen [6 General Setting Items].

SRVO-033 Robot not calibrated (Group:%d)

(Explanation) An attempt was made to set up a reference point for quick mastering, but the robot had not been calibrated.

(Action) Calibrate the robot. Set up a quick mastering reference point using [Positioning] on the positioning menu.

SRVO-034 Ref pos not set (Group:%d)

(Explanation) An attempt was made to perform quick mastering, but the reference point had not been set up.

(Action) Set up a quick mastering reference point on the positioning menu.

SRVO-036Inpos time over (G:%d A:%d)

(Explanation) The robot did not get to the effective area ($PARAM _ GROUP.$ STOPTOL) even after the position check monitoring time ($PARAM _ GROUP. $INPOS _ TIME) went on.

(Action) Take the same actions as for SRVO-023 (large position error at a stop).

SRVO-038 Pulse mismatch (G:%d A:%d)

(Explanation) The pulse count obtained when power is turned off does not match the pulse count obtained when power is applied. This alarm is asserted after exchange the motor or battery for back up of the Pulsecoder data or loading back up data to the Main Board. Check the alarm history.

(Action 1) If the brake number is set to the non-brake motors, this alarm may occur. Check the software setting of the brake number.

(Action 2) In case the robot has been moved by using the brake release unit while the power is off or when restoring the back-up data to the main board, this alarm may occur. Remaster the robot.

Parts to cause this alarm;

- Pulsecoder
- Motor brake

SRVO-043 DCAL alarm (Group:%d Axis:%d)

(Explanation) The regenerative discharge energy was too high to be dissipated as heat. (To run the robot, the servo amplifier supplies energy to the robot. When going down the vertical axis, the robot operates from the potential energy. If a reduction in the potential energy is higher than the energy needed for acceleration, the servo amplifier receives energy from the motor. A similar phenomenon occurs even when no gravity is applied, for example, at deceleration on a horizontal axis. The energy that the servo amplifier receives from the motor is called the regenerative energy. The servo amplifier dissipates this energy as heat. If the regenerative energy is higher than the energy dissipated as heat, the difference is stored in the servo amplifier, causing an alarm.)

(Action 1) This alarm may occur if the axis is subjected to frequent acceleration/deceleration or if the axis is vertical and generates a large amount of regenerative energy.
If this alarm has occurred, relax the service conditions.

(Action 2) Check fuse (FS3) in the 6-Axis servo amplifier. If it has blown, remove the cause, and replace the fuse.

(Action 3) The ambient temperature is excessively high. Or the discharge resistor can't be cooled effectively. Check the external fan unit and related fuses. Clean up the fun unit, the discharge resistor and the filter if they are dirty.

(Action 4) Make sure that the 6-Axis servo amplifier CRR63A and CRR63B connectors are connected tightly. Then detach the cables from CRR63A and CRR63B connectors on the 6-Axis servo amplifier, and check for continuity between pins 1 and 2 of the cable-end connector. If there is no continuity between the pins, replace the discharge resistor.

(Action 5) Make sure that the 6-Axis servo amplifier CRRA11A and CRRA11B are connected tightly, then detach the cables from CRRA11A and CRRA11B on the 6-Axis servo amplifier and check the resistance between pins 1 and 3 of each cable end connector. If the resistance is not 6.5Ω, replace the discharge resistor. CRRA11B may not be used depending on the robot model.

(Action 6) Replace the 6-Axis servo amplifier.

(Action 7) This alarm may occur because of an incorrect actual input voltage. Measure the input voltage between each phase at the main breaker and make sure that each voltage satisfies the input voltage rating. If each voltage does not satisfy the input voltage rating, check the power supply facility.

SRVO-044 DCHVAL alarm (G:%d A:%d)

(Explanation) The DC voltage (DC link voltage) of the main circuit power supply is abnormally high.

(Action 1) Check the input voltage. If the input voltage is higher than 230 VAC, high acceleration/deceleration is caused in this alarm.

(Action 2) Check that the load weight is within the rating. If it is higher than the rating, reduce it to within the rating. (If the machine load is higher than the rating, the accumulation of regenerative energy might result in the HVAL alarm even when the three-phase input voltage is within the rating.)

Parts to cause this alarm;

- Discharge resistor
- Servo amplifier

SRVO-045 HCAL alarm (Group:%d Axis:%d)

(Explanation) Abnormally high current flowed in the main circuit of the servo amplifier.

Parts to cause this alarm;

- Servo amplifier
- Robot connection cable
- Servo motor
- Controller internal cables
- Robot internal cables

SRVO-046 OVC alarm (Group:%d Axis:%d)

(Explanation) This alarm is generated to prevent the motor from thermal damage that might occur when the root meant square current calculated within the servo system is out of the allowable range.

(Action 1) Check the operating condition for the robot and relax the service condition if possible.
If the load or operating condition has exceeded the rating, reduce the load or relax the operating condition to meet the rating.

(Action 2) Check whether the voltage input to the controller is within the rated voltage.

(Action 3) Check whether there is a factor that has increased the mechanical load on the corresponding axis.

Parts to cause this alarm;
- Servo amplifier
- Servo motor
- E-stop unit
- Robot connection cable
- Controller internal cables
- Robot internal cables

Reference

Relationships among the OVC, OHAL, and HC alarms

- Overview

This section points out the differences among the OVC, OHAL, and HC alarms and describes the purpose of each alarm.

- Alarm detection section

Abbreviation	Designation	Detection section
OVC	Overcurrent alarm	Servo software
OHAL	Overheat alarm	Thermal relay in the motor Thermal relay in the servo amplifier Thermal relay in the separate regenerative discharge unit
HC	High current alarm	Servo amplifier

- Purpose of each alarm

1) HC alarm (high current alarm)
If high current flow in a power transistor momentarily due to abnormality or noise in the control circuit, the power transistor and rectifier diodes might be damaged, or the magnet of the motor might be degaussed. The HC alarm is intended to prevent such failures.

2) OVC and OHAL alarms (overcurrent and overload alarms)
The OVC and OHAL alarms are intended to prevent overheat that may lead to the burnout of the motor winding, the breakdown of the servo amplifier transistor, and the separate discharge resistor for PS.
The OHAL alarm occurs when each built-in thermal relay detects a temperature higher than the rated value. However, this method is not necessarily perfect to prevent these failures. For example, if the motor frequently repeats to start and stop, the thermal time constant of the motor, which has a large mass, becomes higher than the time constant of the thermal relay, because these two components are different in material, structure, and dimension. Therefore, if the motor continues to start and stop within a short time as shown in Fig. 4.5 (a), the temperature rise in the motor is steeper than that in the thermal relay, thus causing the motor to burn before the thermal relay detects an abnormally high temperature.

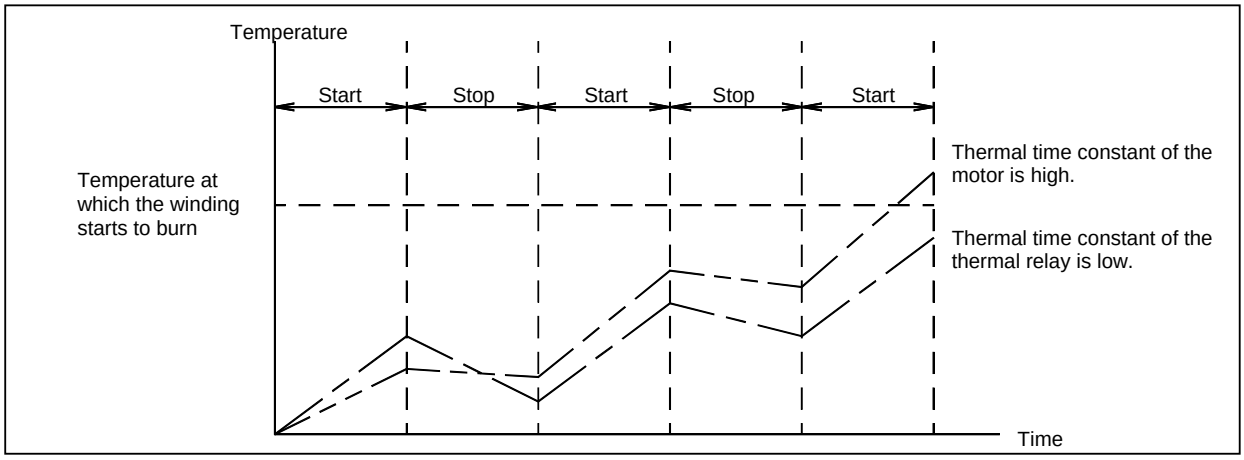


Fig.4.5 (a) Relationship between the temperatures of the motor and thermal relay on start/stop cycles

To prevent the above defects, software is used to monitor the current in the motor constantly in order to estimate the temperature of the motor. The OVC alarm is generated based on this estimated temperature. This method estimates the motor temperature with substantial accuracy, so it can prevent the failures described above.
To sum up, a double protection method is used; the OVC alarm is used for protection from a short-time overcurrent, and the OHAL alarm is used for protection from long-term overload. The relationship between the OVC and OHAL alarms is shown in Fig.4.5 (b).

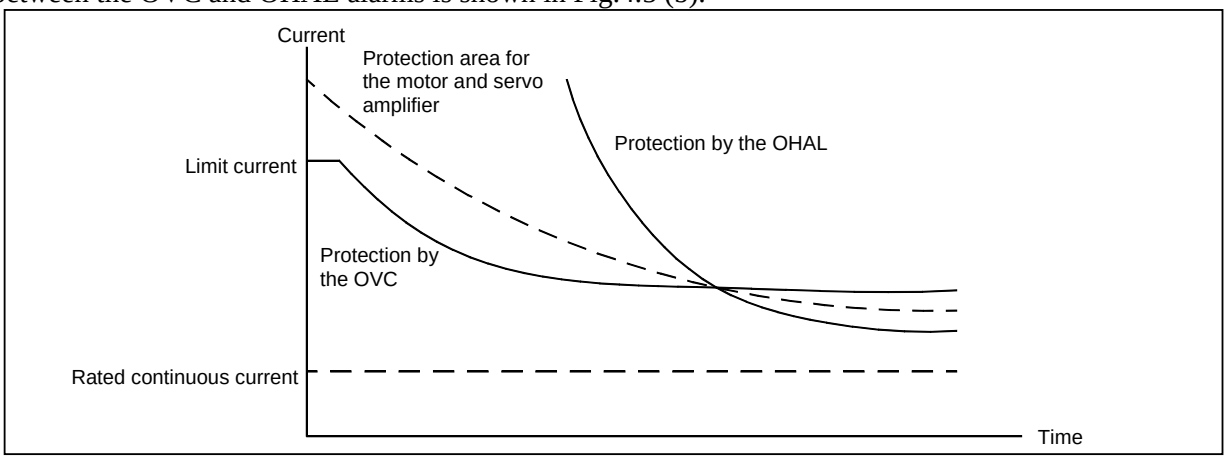


Fig.4.5 (b) Relationship between the OVC and OHAL alarms

NOTE
The relationship shown in Fig.4.5 (b) is taken into consideration for the OVC alarm. The motor might not be hot even if the OVC alarm has occurred. In this case, do not change the parameters to loosen protection.

SRVO-047 LVAL alarm (Group:%d Axis:%d)

(Explanation) The control power supply voltage (+5 V, etc.) supplied from the power supply circuit in the servo amplifier is abnormally low.

Parts to cause this alarm;
- Servo amplifier
- Power supply unit

SRVO-050 CLALM alarm (G:%d A:%d)

(Explanation) The disturbance torque estimated by the servo software is abnormally high. (A collision has been detected.)
(Action 1) Check whether the robot has collided and also check whether there is a factor that has increased the mechanical load on the corresponding axis.
(Action 2) Check whether the load settings are valid.
(Action 3) If the load weight exceeds the rated range, decrease it to within the limit.
(Action 4) Check whether the voltage input to the controller is within the rated voltage.

Parts to cause this alarm;
- Servo amplifier
- Servo motor
- E-stop board
- Robot connection cable
- Controller internal cables
- Robot internal cables
- Reducer
- Balancer

SRVO-051 CUER alarm (Group:%d Axis:%d)

(Explanation) The offset of the current feedback value is abnormally high.

Parts to cause this alarm;
- Servo amplifier

SRVO-055 FSSB com error 1 (G:%d A:%d)

(Explanation) A communication error has occurred between the main board and servo amplifier.

Parts to cause this alarm;
- Optical cable between the main board and servo amplifier
- Servo card on the main board
- Servo amplifier

SRVO-056 FSSB com error 2 (G:%d A:%d)

(Explanation) A communication error has occurred between the main board and servo amplifier.

Parts to cause this alarm;
- Optical cable between the main board and servo amplifier
- Servo card on the main board
- Servo amplifier

SRVO-057 FSSB disconnect (G:%d A:%d)

(Explanation) Communication was interrupted between the main board and servo amplifier. A servo card corresponding to the set number of axes is not mounted. Check whether the set number of axes is valid. If the number is invalid, set the correct number.

Parts to cause this alarm;
- Servo amplifier
- Optical cable between the servo card and servo amplifier
- Servo card on the main board
- Main board

・Robot connection cable
・Controller internal cables
・Robot internal cables

SRVO-058 FSSB %d init error (%d)

(Explanation) Communication was interrupted between the main board and servo amplifier.
(Action 1) Turn off the power and disconnect the CRF8 connector on the 6-axis servo amplifier. Turn on the power supply and then check whether this alarm occurs again. (Ignore the alarm SRVO-068 because of disconnecting the CRF8 connector.)
If this alarm does not occur, the robot connection cable (RMP1, RP1) or the internal cable of the robot may be short-circuited to the ground. Check the cables and replace it if necessary.

Parts to cause this alarm;
・Servo amplifier
・Robot connection cable
・Controller internal cables
・Robot internal cables
・Optical cable between the axis control board and servo amplifier
・Servo card on the main board
・Main board

SRVO-059 Servo amp init error (G:%d A:%d DA:%d Inf:%d)

(Explanation) Servo amplifier initialization is failed.

Parts to cause this alarm;
・Servo amplifier
・Line tracking interface board (Option)
・Pulsecoder
・Robot connection cable
・Controller internal cables
・Robot internal cables

SRVO-062 BZAL alarm (Group:%d Axis:%d)

(Explanation) This alarm occurs if battery for Pulsecoder absolute-position backup is empty.

Parts to cause this alarm;
・Battery in the battery box of the robot base
・Pulsecoder
・Robot internal cable

> ⚠ **CAUTION**
> After correcting the cause of this alarm, set the system variable ($MCR.$SPC_RESET) to TRUE then turn on the power again. Mastering is needed.

SRVO-065 BLAL alarm (Group:%d Axis:%d)

(Explanation) The battery voltage for the Pulsecoder is lower than the rating.
(Action) Replace the battery.

If this alarm occurs, turn on the power and replace the battery as soon as possible. A delay in battery replacement may result in the BZAL alarm being detected. In this case, the position data will be lost. Once the position data is lost, mastering will become necessary.

SRVO-067 OHAL2 alarm (Group:%d Axis:%d)

(Explanation) The temperature inside the Pulsecoder or motor is abnormally high, and the built-in thermostat has operated.
(Action) Check the robot operating conditions. If a condition such as the duty cycle and load weight has exceeded the rating, relax the robot load condition to meet the allowable range.

Parts to cause this alarm;
・Servo motor
(When power is supplied to the motor after it has become sufficiently cool, if the alarm still occurs.)
・Fan motor in the mechanical unit (Option for M-3iA)

SRVO-068 DTERR alarm (Group:%d Axis:%d)

(Explanation) The serial Pulsecoder does not return serial data in response to a request signal.
(Action 1) Make sure that the RMP connector of servo amplifier (motor side) is connected tightly.
(Action 2) Check that the shielding of the robot connection cable is grounded securely in the cabinet.

Parts to cause this alarm;
・Servo amplifier
・Pulsecoder
・Robot connection cable
・Controller internal cables
・Robot internal cables

SRVO-069 CRCERR alarm (Group:%d Axis:%d)

(Explanation) The serial data has disturbed during communication.
-See actions on SRVO-068

SRVO-070 STBERR alarm (Group:%d Axis:%d)

(Explanation) The start and stop bits of the serial data are abnormal.
-See actions on SRVO-068

SRVO-071 SPHAL alarm (Group:%d Axis:%d)

(Explanation) The feedback speed is abnormally high.
(Action) Action as same as the SRVO-068.

NOTE
If this alarm occurs together with the PHAL alarm (SRVO-064), this alarm does not correspond to the major cause of the failure.

SRVO-072 PMAL alarm (Group:%d Axis:%d)

(Explanation) It is likely that the Pulsecoder is abnormal.

Parts to cause this alarm;

・Pulsecoder

SRVO-073 CMAL alarm (Group:%d Axis:%d)

(Explanation) It is likely that the Pulsecoder is abnormal or the Pulsecoder has malfunctioned due to noise.
(Action 1) Check whether the connection of the controller earth is good. Check the earth cable connection between controller and robot. Check whether the shielding of the robot connection cables are connected securely to the grounding plate.
(Action 2) Reinforce the earth of the motor flange.(In case of Auxiliary axis)
(Action 3) Do PULSE RESET operation.

Parts to cause this alarm;
・Pulsecoder
・Robot connection cable
・Controller internal cables
・Robot internal cables

SRVO-074 LDAL alarm (Group:%d Axis:%d)

(Explanation) The LED in the Pulsecoder is broken.

Parts to cause this alarm;
・Pulsecoder

SRVO-075 Pulse not established (G:%d A:%d)

(Explanation) The absolute position of the Pulsecoder cannot be established.
(Action) Reset the alarm, and jog the axis on which the alarm has occurred until the same alarm will not occur again.

SRVO-076 Tip Stick Detection (G:%d A:%d)

(Explanation) An excessive disturbance was assumed in servo software at the start of operation. (An abnormal load was detected. The cause may be welding.)
(Action 1) Check whether the robot has collided. Or check whether the machinery load of the corresponding axis is increased.
(Action 2) Check whether the load settings are valid.
(Action 3) Check whether the brake of the corresponding axis is released.
(Action 4) Check whether the load weight is within the rated range. If the weight exceeds the upper limit, decrease it to the limit.
(Action 5) Check whether the voltage input to the controller is within the rated voltage.

Parts to cause this alarm;
・Servo amplifier
・Servo motor
・E-stop unit
・Robot connection cable
・Controller internal cables
・Robot internal cables

SRVO-081 EROFL alarm (Track enc:%d)

(Explanation) The pulse counter for line tracking has overflowed.
(Action) Check whether the condition of the line tracking exceeds the limitation.

Parts to cause this alarm;
・Line tracking interface board

・Pulsecoder

SRVO-082 DAL alarm (Track enc:%d)

(Explanation) The line tracking Pulsecoder has not been connected.
(Action) Check whether the shielding of the connection cable is connected securely to the grounding plate.

Parts to cause this alarm;
・Line tracking interface board
・Line tracking cable
・Pulsecoder

SRVO-084 BZAL alarm (Track enc:%d)

(Explanation) This alarm occurs if the backup battery for the absolute position of the Pulsecoder has not been connected. See the description about the BZAL alarm (SRVO-062).

SRVO-087 BLAL alarm (Track enc:%d)

(Explanation) This alarm occurs if the voltage of the backup battery for the absolute position of the Pulsecoder is low. See the description about the BLAL alarm (SRVO-065).

SRVO-089 OHAL2 alarm (Track enc:%d)

(Explanation) The motor has overheated. When power is supplied to the Pulsecoder after it has become sufficiently cool, if the alarm still occurs. See the description about the OHAL2 alarm (SRVO-067).

SRVO-090 DTERR alarm (Track enc:%d)

(Explanation) Communication between the Pulsecoder and line tracking interface board is abnormal.
See the SRVO-068 DTERR alarm.
(Action) Check whether the shielding of the connection cable is connected securely to the grounding plate.

Parts to cause this alarm;
・Line tracking interface board
・Line tracking cable
・Pulsecoder

SRVO-091 CRCERR alarm (Track enc:%d)

(Explanation) Communication between the Pulsecoder and line tracking interface board is abnormal.
(Action) Action as same as the SRVO-090.

SRVO-092 STBERR alarm (Track enc:%d)

(Explanation) Communication between the Pulsecoder and line tracking interface board is abnormal.
(Action) Action as same as the SRVO-090.

SRVO-093 SPHAL alarm (Track enc:%d)

(Explanation) This alarm occurs if the current position data from the Pulsecoder is higher than the previous position data.
(Action) Action as same as the SRVO-090.

SRVO-094 PMAL alarm (Track enc:%d)

(Explanation) It is likely that the Pulsecoder is abnormal.

Parts to cause this alarm;
・Pulsecoder

SRVO-095 CMAL alarm (Track enc:%d)

(Explanation) It is likely that the Pulsecoder is abnormal or the Pulsecoder has malfunctioned due to noise. See the description about the CMAL alarm (SRVO-073).
(Action) Verify that the Pulsecoder cable is grounded.

Parts to cause this alarm;
・Pulsecoder

SRVO-096 LDAL alarm (Track enc:%d)

(Explanation) The LED in the Pulsecoder is broken. See the description about the LDAL alarm (SRVO-074).

SRVO-097 Pulse not established (enc:%d)

(Explanation) The absolute position of the Pulsecoder cannot be established. See the description about (SRVO-075). Pulse not established.
(Action) Reset the alarm, and jog the axis on which the alarm has occurred until the same alarm does not occur again. (Jog one motor revolution)

SRVO-105 Door open or E-stop

Parts to cause this alarm;
・E-stop board
・Servo amplifier

SRVO-123 Fan motor rev slow down (%d)

(Explanation) The rotation speed of fan motor is slow down.
(Action) Check the fan motor and its cables. Replace them if necessary.
Parts to cause this alarm;
・Backplane board
・Main board

SRVO-134 DCLVAL alarm (G:%d A:%d)

(Explanation) The servo the DC current of amplifier (DC link voltage) of the main power supply is abnormally low.
(Action 1) Check the input voltage to the controller is within the rated voltage and no phase is lack.
(Action 2) It is possible that an instant disconnection of power source causes this alarm. Check whether an instant disconnection occurred.
(Action 3) Modify the program in order that robot and the auxiliary axis do not accelerate simultaneously in the system with the auxiliary axis.
Parts to cause this alarm;
・E-stop unit
・Servo amplifier.

SRVO-156 IPMAL alarm (G:%d A:%d)

(Explanation) Abnormally high current flowed through the main circuit of the servo amplifier.
(Action) Turn off the power, and disconnect the power cable from the servo amplifier indicated by the alarm message. (And disconnect the brake cable (CRR88 on the servo amplifier) to avoid the axis falling unexpectedly.) Turn on the power.

Parts to cause this alarm;
- Servo amplifier
- Robot connection cable
- Controller internal cables
- Servo motor
- Robot internal cables

SRVO-157 CHGAL alarm (G:%d A:%d)

(Explanation) The capacitor for the condenser voltage of the servo amplifier was not charged within the specified time when the servo power is on.

(Action1) Check the input voltage to the controller is within the rated voltage and no phase is lack.

(Action 2) Make sure that the 6-axis servo amplifier CRRA12 and emergency stop board CRRA12 connector are connected tightly.
In case of single phase, make sure that the connectors CRRB14 is securely attached to the servo amplifier.

Parts to cause this alarm;
- E-stop unit
- Servo amplifier

SRVO-204 External (SVEMG abnormal) E-stop

(Explanation) The emergency stop line was not disconnected when the switch connected to the external emergency stop contacts on CRMA64 or TBOP20 was pressed.
Terminal connection: Between EES1 and EES11 and between EES2 and EES21 on CRMA64 or TBOP20.

(Action) Check the switches and cables connected between terminals on CRMA64 or TBOP20 (between EES1 and EES11 and between EES2 and EES21 on CRMA64 or TBOP20).

Parts to cause this alarm;
- E-stop board
- Servo amplifier
- Controller internal cables
- Switch connected to EES1 – EES11 and EES2 – EES21 on CRMA64 or TBOP20
- Cable connected to EES1 – EES11 and EES2 – EES21 on CRMA64 or TBOP20
- Main board

SRVO-205 Fence open (SVEMG abnormal)

(Explanation) The emergency stop line was not disconnected when the switch connected to the safety fence contacts on CRMA64 or TBOP20 was pressed.
Terminal connection: Between EAS1 and EAS11 and between EAS2 and EAS21 on CRMA64 or TBOP20.

(Action) Check the switches and cables connected between terminals on CRMA64 or TBOP20 (between EAS1 and EAS11 and between EAS2 and EAS21 on CRMA64 or TBOP20)

Parts to cause this alarm;
- E-stop board
- Servo amplifier
- Controller internal cables
- Switch connected to EAS1 – EAS11 and EAS2 – EAS21 on CRMA64 or TBOP20
- Cable connected to EAS1 – EAS11 and EAS2 – EAS21 on CRMA64 or TBOP20
- Main board

SRVO-206 Enabling device (Deadman switch) (SVEMG abnormal)

(Explanation) When the teach pendant was enabled, the enabling device (deadman switch) was released or pressed strongly, but the E-stop line was not disconnected.

Parts to cause this alarm;
- E-stop board
- Servo amplifier
- Teach pendant
- Teach pendant cable
- Controller internal cables
- Main board

SRVO-213 E-STOP Board FUSE2 blown

(Explanation) A fuse (FUSE2) on the emergency stop board has blown, or no voltage is supplied to EXT24V.

(Action) Check whether 24 V is applied to between EXT24V and EXT0V of CRMA64 or TBOP19. If not, check the external power supply circuit.
If no external power supply is used, check whether the terminals above are connected to the INT24V and INT0V terminals, respectively.

Parts to cause this alarm;
- Teach pendant cable
- Teach pendant
- E-stop board

SRVO-214 6ch amplifier fuse blown (R:%d)

(Explanation) A fuse in the servo amplifier has blown.

(Action) A fuse is blown, eliminate the cause, then replace the fuse.

Parts to cause this alarm;
In case that FS2 is blown
- Robot connection cable, Robot internal cables, End effector connector
- Optional FAN in the mechanical unit (M-3*i*A)

In case that FS3 is blown
- Regenerative resister, Servo amplifier

SRVO-216 OVC (total) (%d)

(Explanation) The current (total current for six axes) flowing through the motor is too large.

(Action 1) Slow the motion of the robot where possible. Check the robot operation conditions. If the robot is used with a condition exceeding the duty or load weight robot rating, reduce the load condition value to the specification range.

(Action 2) Check the input voltage to the controller is within the rated voltage and no phase is lack.

Parts to cause this alarm;
- Servo amplifier

SRVO-219 Safety I/O board fuse1 blown %s
Safety I/O board fuse2 blown %s

(Explanation) A fuse on the additional Safety I/O board has blown.
The number of the safety I/O device that the alarm occurs is displayed in the end of the message such as (1). The safety I/O device number is displayed in DCS Safety I/O device menu.

(Action 1) Check whether the fuse (FU1 or FU2) on the additional Safety I/O board has blown. If the fuse has blown, check whether there is ground-fault occurring at the connection destination of CRMA90. Remove the cause of the ground-fault and replace the fuse.
(Action 2) Replace the additional Safety I/O board.

SRVO-220 SDI fuse blown

(Explanation) A fuse (FUSE1) on the main board has blown.
(Action 1) Check whether the fuse (FUSE1) on the main board has blown. If the fuse has blown, 24SDI may be short-circuited to 0V. Take Action 2.
(Action 2) Remove the cause of the 24SDI ground-fault, then check that FUSE1 does not blow. Disconnect the following, then turn on the power.

In case of controller with connector panel
- CRMA62 (on the connector panel)
- CRMA63 (on the connector panel)

In case of controller without connector panel
- CRMA15 (on the main board)
- CRMA16 (on the main board)

If FUSE1 does not blow in this state, 24SDI and 0V may be short-circuited at any of the above locations. Determine the faulty location, then take appropriate action.

Parts to cause this alarm;
・Main board
・Controller internal cables
・E-stop board
・Servo amplifier

SRVO-221 Lack of DSP (G:%d A:%d)

(Explanation) A controlled axis card corresponding to the set number of axes is not mounted.
(Action) Check whether the set number of axes is valid. If the number is invalid, set the correct number.

Parts to cause this alarm;
・Servo card on main board

SRVO-223 DSP dry run (%d, %d)

(Explanation) Servo system initialization was stopped because of a hardware failure or improver software setting. The controller has been started in the DSP dry run mode.
(Action 1) When the value is 1, 5, 6 or 11: An incorrect setting is made. Check whether the dry run mode is set and also check whether the setting of the axis is correct.
(Action 2) When the value is 8 or 10: Take action for an FSSB initialization error that has occurred at the same time.
(Action 3) When the value is 12: Take the same action as an Servo amp init error.

Parts to cause this alarm;
・Servo card on main board
・Optical cable between the servo card and servo amplifier
・Servo amplifier

SRVO-230 Chain 1 abnormal %x, %x
SRVO-231 Chain 2 abnormal %x, %x

(Explanation) A mismatch occurred between duplicate safety signals.
SRVO-230 occurred if such a mismatch that a contact connected on the chain 1 side

(between EES1 and EES11, between EAS1 and EAS11 and so on) is closed, and a contact on the chain 2 side (between EES2 and EES21, between EAS2 and EAS21, and so on) is open occurs.
SRVO-231 is issued if such a mismatch that a contact on the chain 1 side is open, and a contact on the chain 2 side is closed occurs.
If a chain error is detected, correct the cause of the alarm then reset the alarm according to the method described later.

(Action) Check the alarms issued at the same time in order to identify with which signal the mismatch occurred.
SRVO-266 through SRVO-275 and SRVO-370 through SRVO-385 are issued at the same time. Take the action(s) described for each item.

> ⚠ **WARNING**
> If this alarm occurred, do not reset the chain error alarm until the failure is identified and repaired. If robot use is continued with one of the duplicate circuits being faulty, safety may not be guaranteed when the other circuit fails.

> ⚠ **CAUTION**
> 1 The state of this alarm is preserved by software. After correcting the cause of the alarm, reset the chain error alarm according to the chain error reset procedure described later.
> 2 Until a chain error is reset, no ordinary reset operation must be performed. If an ordinary reset operation is performed before chain error resetting, the message "SRVO-237 Chain error cannot be reset" is displayed on the teach pendant.

Alarm history display method

1. Press the screen selection key on the teach pendant.
2. Select [4 ALARM] on the teach pendant.
3. Press F3 [HIST] on the teach pendant.

Chain error reset procedure

> ⚠ **CAUTION**
> Do not perform this operation until the cause of the alarm is corrected.

<Method 1>
1. Press the emergency stop button.
2. Press the screen selection key on the teach pendant.
3. Select [0 NEXT PAGE] on the teach pendant.
4. Press [6 SYSTEM] on the teach pendant.
5. Press [7 SYSTEM SETTING] on the teach pendant.
6. Find "28" Chain Error Reset Execution.
7. Press F3 on the teach pendant to reset "Chain Error".

<Method 2>
1. Press the screen selection key on the teach pendant.
2. Select [4 ALARM] on the teach pendant.
3. Press F4 [CHAIN RESET] on the teach pendant.

SRVO-233 TP OFF in T1, T2

(Explanation) Teach pendant is disabled when the mode switch is T1 or T2.

(Action) Enable the teach pendant in teaching operation. In other case the mode switch should

be AUTO mode.

Parts to cause this alarm;
- Teach pendant
- Teach pendant cable
- Controller internal cables
- Mode switch
- E-stop board
- Servo amplifier

SRVO-235 Short term Chain abnormal

(Explanation) Short term single chain failure condition is detected.
Cause of this alarm is ;
- Half release of enabling device (deadman switch).
- Half operation of E-stop switch.

(Action) Cause the same error to occur again, then perform resetting.

Parts to cause this alarm;
- E-stop board
- Servo amplifier

SRVO-251 DB relay abnormal (G:%d A:%d)

(Explanation) An abnormality was detected in the internal relay (DB relay) of the servo amplifier.

Parts to cause this alarm;
- Servo amplifier
- E-stop unit

SRVO-252 Current detect abnl (G:%d A:%d)

(Explanation) An abnormality was detected in the current detection circuit inside the servo amplifier.

Parts to cause this alarm;
- Servo amplifier

SRVO-253 Amp internal over heat (G:%d A:%d)

(Explanation) An overheat was detected inside the servo amplifier.

Parts to cause this alarm;
- Servo amplifier

SRVO-266 FENCE1 status abnormal
SRVO-267 FENCE2 status abnormal

(Explanation) A chain alarm was detected with the EAS (FENCE) signal.
(Action 1) Check whether the circuitry connected to the dual input signal (EAS) is faulty.
(Action 2) Check whether the timing of the dual input signal (EAS) satisfies the timing specification
(See Section 1.2 of Part III CONNECTIONS).

Parts to cause this alarm;
- E-stop board
- Main board

⚠ WARNING
If this alarm occurred, do not reset the chain error alarm until the failure is identified and repaired. If robot use is continued with one of the duplicate circuits being faulty, safety may not be guaranteed when the other circuit fails.

NOTE
For the procedure of recovery from this alarm, see the descriptions of SRVO-230 and SRVO-231.

SRVO-270 EXEMG1 status abnormal
SRVO-271 EXEMG2 status abnormal

(Explanation) A chain alarm was detected with the EES (EXEMG) signal.
(Action 1) Check whether the circuitry connected to the dual input signal (EES) is faulty.
(Action 2) Check whether the timing of the dual input signal (EES) satisfies the timing specification
(See Section 1.2 of Part III CONNECTIONS).

Parts to cause this alarm;
- Teach pendant
- Teach pendant cable
- Controller internal cables
- E-stop board
- Emergency stop button on the controller
- Main board

⚠ WARNING
If this alarm occurred, do not reset the chain error alarm until the failure is identified and repaired. If robot use is continued with one of the duplicate circuits being faulty, safety may not be guaranteed when the other circuit fails.

NOTE
For the procedure of recovery from this alarm, see the descriptions of SRVO-230 and SRVO-231.

SRVO-277 Panel E-stop (SVEMG abnormal)

(Explanation) The emergency stop line was not disconnected although the emergency stop button on the controller was pressed.

Parts to cause this alarm;
- E-stop board
- Servo amplifier
- Main board

SRVO-278 TP E-stop (SVEMG abnormal)

(Explanation) The emergency stop line was not disconnected although the emergency stop button on the teach pendant was pressed.

Parts to cause this alarm;
- Teach pendant
- Teach pendant cable
- Controller internal cables

・E-stop board
・Servo amplifier

NOTE
This alarm may be issued if the emergency stop button is pressed very slowly.

SRVO-291 IPM over heat (G:%d A:%d)

(Explanation) IPM on the servo amplifier is overheated.
(Action 1) Check whether the fan for cabinet ventilation is stopped and also check whether the vent hole is clogged. If necessary, clean or replace them.
(Action 2) If SRVO-291 is issued when the robot operating condition is severe, check the robot operating condition then relax the condition when possible.

Parts to cause this alarm;
・Servo amplifier
・Fan motor of controller

SRVO- 295 AMP COM alarm(G:%d A:%d)

(Explanation) A communication error occurred in the 6-axis servo amplifier.

Parts to cause this alarm;
・Servo amplifier

SRVO- 297 Improper input power (G:%d A:%d)

(Explanation) The 6-axis servo amplifier has detected the input voltage phase lack.
(Action) Check the input voltage of the controller whether phase is not lack.

Parts to cause this alarm;
・E-stop unit
・Servo amplifier

SRVO-300 Hand broken/HBK disabled
SRVO-302 Set Hand broken to ENABLE

(Explanation) Although HBK was disabled, the HBK signal was input.
(Action 1) Press RESET on the teach pendant to release the alarm.
(Action 2) Check whether the hand broken signal is connected to the robot. When the hand broken signal circuit is connected, enable hand broken.
(See Subsection 2.7.3 in Part II, “CONNECTIONS”.)

SRVO-335 DCS OFFCHK alarm %x, %x

(Explanation) A failure was detected in the safety signal input circuit.

Parts to cause this alarm;
・Main board

SRVO-348 DCS MCC OFF alarm %x, %x

(Explanation) A command was issued to turn off the magnetic contactor, but the magnetic contactor was not turned off.
(Action 1) If a signal is connected to the E-stop unit CRMB8, check whether there is a problem in the connection destination. Make sure that the connector CRMB16 (6-axis amplifier) is securely attached to the servo amplifier.
(Action 2) If DCS MCC OFF alarm (0,2) is occurred , check the connector CRMB27 is

connected to the E-stop board.

Parts to cause this alarm;

- E-stop unit
- Servo amplifier
- Main board

SRVO-349 DCS MCC ON alarm %x, %x

(Explanation) A command was issued to turn on the magnetic contactor, but the magnetic contactor was not turned on.

Parts to cause this alarm;

- E-stop unit
- Servo amplifier
- Main board

SRVO-370 SVON1 status abnormal
SRVO-371 SVON2 status abnormal

(Explanation) A chain alarm was detected with the main board internal signal (SVON).

Parts to cause this alarm;

- E-stop unit
- Servo amplifier
- Main board

⚠ WARNING

If this alarm occurred, do not reset the chain error alarm until the failure is identified and repaired. If robot use is continued with one of the duplicate circuits being faulty, safety may not be guaranteed when the other circuit fails.

NOTE

For the procedure of recovery from this alarm, see the descriptions of SRVO-230 and SRVO-231.

SRVO-372 OPEMG1 status abnormal
SRVO-373 OPEMG2 status abnormal

(Explanation) A chain alarm was detected with the E-stop switch on the controller.

Parts to cause this alarm;

- Controller internal cables
- E-stop board
- Emergency stop button on the controller
- Teach pendant
- Teach pendant cable
- Main board

⚠ WARNING

If this alarm occurred, do not reset the chain error alarm until the failure is identified and repaired. If robot use is continued with one of the duplicate circuits being faulty, safety may not be guaranteed when the other circuit fails.

NOTE
For the procedure of recovery from this alarm, see the descriptions of SRVO-230 and SRVO-231.

SRVO-374 MODE11 status abnormal
SRVO-375 MODE12 status abnormal
SRVO-376 MODE21 status abnormal
SRVO-377 MODE22 status abnormal

(Explanation) A chain alarm was detected with the mode switch signal.

Parts to cause this alarm;
- Mode switch
- E-stop board
- Controller internal cables
- Main board

⚠ **WARNING**
If this alarm occurred, do not reset the chain error alarm until the failure is identified and repaired. If robot use is continued with one of the duplicate circuits being faulty, safety may not be guaranteed when the other circuit fails.

NOTE
For the procedure of recovery from this alarm, see the descriptions of SRVO-230 and SRVO-231.

SRVO-378 SFDIxx status abnormal

(Explanation) A chain alarm was detected with the SFDI signal. xx shows signal name.
(Action 1) Check whether the circuitry connected to the dual input signal (SFDI) is faulty.
(Action 2) Check whether the timing of the dual input signal (SFDI) satisfies the timing specification. (See Subsection 3.3.4, Fig 3.3.4(c) in CONNECTIONS).

Parts to cause this alarm;
- Main board

⚠ **WARNING**
If this alarm is issued, do not reset the chain error alarm until the failure is identified and repaired. If robot use is continued with one of the duplicate circuits being faulty, safety may not be guaranteed when the other circuit fails.

NOTE
For the procedure of recovery from this alarm, see the descriptions of SRVO-230 and SRVO-231.

SRVO-450 Drvoff circuit fail (G:%d A:%d)

(Explanation) The two drive off inputs are not in the same status.
(Action 1) Check the line of the two drive off inputs.
(Action 2) Make sure that the connector CRMB16 (6-axis amplifier) is securely attached to the servo amplifier.

Parts to cause this alarm;
- Servo amplifier

SRVO-451 Internal S-BUS fail (G:%d A:%d)

(Explanation) An error is found in the serial bus communication in the servo amplifier.

Parts to cause this alarm;

・ Servo amplifier

SRVO-452 ROM data failure (G:%d A:%d)

(Explanation) An error is found in the ROM data in the servo amplifier.

Parts to cause this alarm;

・Servo amplifier

SRVO-453 Low volt driver (G:%d A:%d)

(Explanation) Driver supply voltage in the servo amplifier is low.

Parts to cause this alarm;

・Servo amplifier

SRVO-454 CPU BUS failure (G:%d A:%d)

(Explanation) An error was found in CPU bus data in the amplifier.

Parts to cause this alarm;

・ Servo amplifier

SRVO-455 CPU watch dog (G:%d A:%d)

(Explanation) An error occurred in CPU operation in the amplifier.

Parts to cause this alarm;

・Servo amplifier

SRVO-456 Ground fault (G:%d A:%d)

(Explanation) An error is found in the motor current detection data in the servo amplifier.

Parts to cause this alarm;

・Servo amplifier

SRVO-459 Excess regeneration2 (G:%d A:%d)

(Explanation) An error is found in the discharge circuit in the servo amplifier.

Parts to cause this alarm;

・Servo amplifier

SRVO-460 Illegal parameter (G:%d A:%d)

(Explanation) An error is found in the setting of the parameters in the servo amplifier.

Parts to cause this alarm;

・Servo amplifier

SRVO-461 Hardware error (G:%d A:%d)

(Explanation) An error is found in the circuit in the servo amplifier.

Parts to cause this alarm;

・Servo amplifier

SRVO-473 DCS CLLB CC_EXTF alarm

(Explanation) The result is different in 2 CPU for Collaborative Robot.
(Action) Check the other alarms for more information.

Note: You need to cycle power to release this alarm.

SRVO-476 CLLB alarm %x, %x

(Explanation) Internal error of the collaborative robot function.
(Action) Restart the controller. If the error is not cleared, document the events that led to the error and contact your local FANUC representative.

SRVO-477 Calibration data error

(Explanation) The force sensor calibration data are wrong.
(Action) Please load correct force sensor calibration data and apply them again.

SRVO-478 Temperature difference too large

(Explanation) The force sensor temperature difference is too large.
(Action) Please make sure that the environment temperature does not change greatly, and then restart the controller.
If the error is not cleared, document the events that led to the error and contact your FANUC technical representative.

SRVO-479 Temperature changes too fast

(Explanation) The force sensor temperature changes too fast.
(Action) Please make sure that the environment temperature does not change greatly, and then restart the controller.
If the error is not cleared, document the events that led to the error and contact your FANUC technical representative.

SRVO-480 FORCE alarm %x, %x

(Explanation) Force sensor error.
(Action1) Restart the controller.
(Action2) Replace the sensor cable.
If the error is not cleared, document the events that led to the error and contact your FANUC technical representative.

SRVO-486 Hand Guidance E-stop

(Explanation) The EMERGENCY STOP button on the Hand Guidance device was pressed.
(Action1) Release EMERGENCY STOP on the Hand Guidance device, then press the [RESET] key.
(Action2) Check setting and connection to Safety I/O board.

SRVO-487 Hand Guidance Enabling device (Deadman switch)

(Explanation) The enabling device (deadman switch) on the Hand Guidance device was released.
(Action1) Grip the enabling device (deadman switch), then press the [RESET] key.
(Action2) Enable Contact stop, when Collaborative robot is used.
(Action3) Set Hand Guidance disable I/O to ON if you do not use Hand Guidance function.

SRVO-489 Force sensor type error %x, %x

(Explanation) Force sensor type error.
(Action1) Restart the controller.
If the error is not cleared, document the events that led to the error and contact your local FANUC representative.

SRVO-490 FORCE alarm 2%x, %x

(Explanation) Force sensor error.
(Action1) Restart the controller.
(Action2) Replace the force sensor cable.
If the error is not cleared, document the events that led to the error and contact your local FANUC representative.

4.6 TROUBLESHOOTING BASED ON FUSE

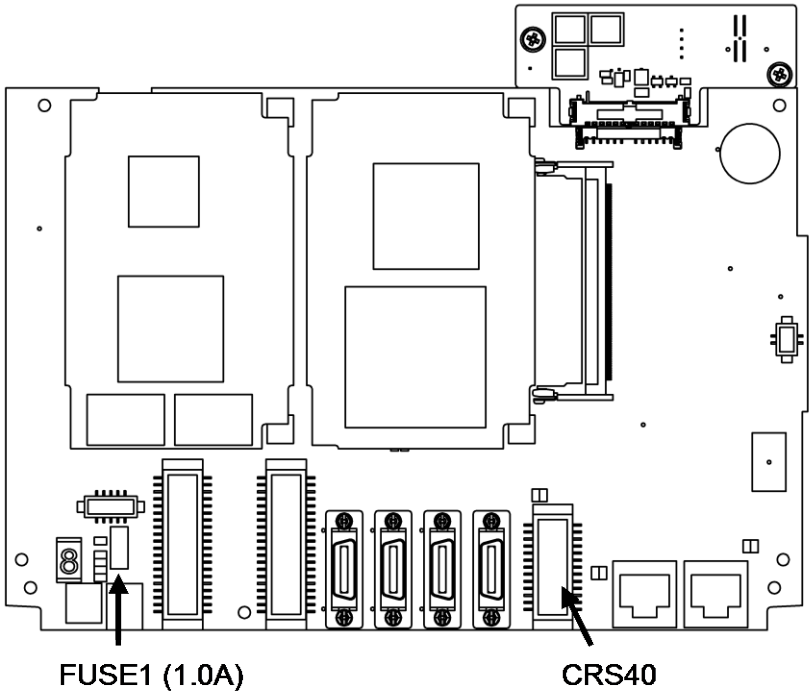
This section describes the alarms and symptoms generated and actions required when the fuses installed on the printed circuit boards and units have blown.

(1) Fuses on the main board

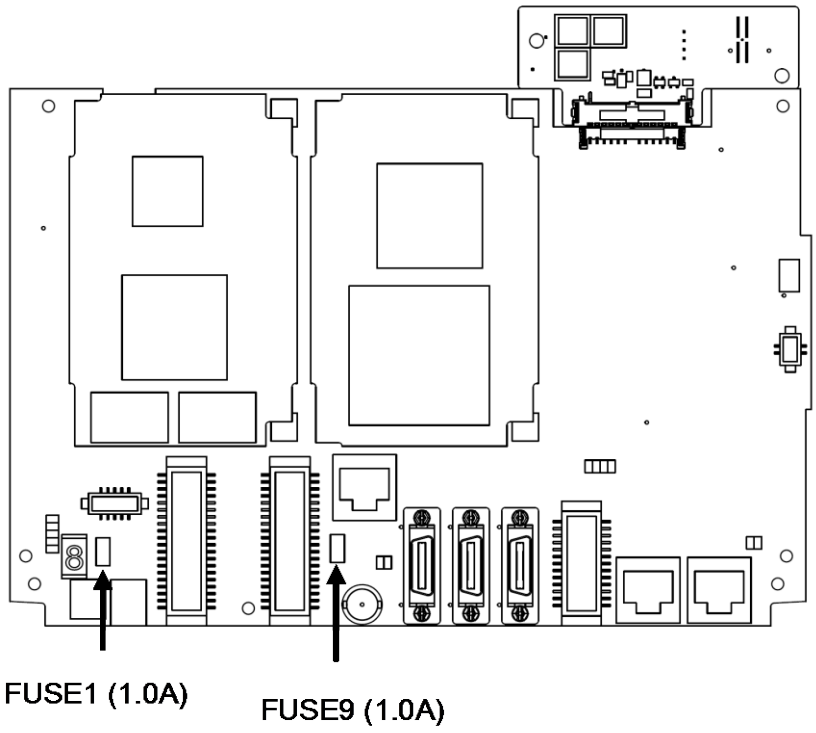
FUSE1: For protecting the +24 V output of the peripheral device interface
(A60L-0001-0290#LM10)

FUSE9: For protecting the +24E output for vision
(This fuse is installed on the R-30*i*B Mate Plus main board only.)
(A60L-0001-0290#LM10)

Name	Symptom observed when fuse has blown	Action
FUSE1	An alarm (SRVO-220) is displayed on the teach pendant.	1. 24SDI and 0 V may be short-circuited. Check the peripheral device cable for any abnormality, and replace it if necessary. 2. Disconnect CRS40. If fuse (FUSE1) still blows, replace the main board. 3. Replace the cable between the emergency stop unit and the servo amplifier. 4. Replace the cable between the main board and the emergency stop unit. 5. Replace the emergency stop unit. 6. Replace the servo amplifier.
FUSE9 (R-30*i*B Mate Plus only)	+24E used for vision is not output.	1. Check +24E used by the vision for a ground fault. 2. Check the cables connecting to the vision camera and the related parts for an abnormally. 3. Replace the main board.



(R-30*i*B Mate)



(R-30*i*B Mate Plus)

Fig.4.6 (a) Fuse on the main board

(2) Servo amplifier fuse

FS1: For generation of the power to the amplifier control circuit (A60L-0001-0290#LM32C)

FS2: For protection of the 24V output to the end effector, XROT, XHBK, and the fan motor inside the robot (M-3*i*A, option). (A60L-0001-0290#LM32C)

FS3: For protection of the 24V output to the regenerative resister (A60L-0001-0290#LM32C)

Name	Symptom observed when fuse has blown	Action
FS1	All LEDs on the servo amplifier go out. The FSSB disconnection alarm (SRVO-057) or FSSB initialization alarm (SRVO-058) is displayed on the teach pendant.	Replace the 6-Axis servo amplifier.
FS2	The 6-Axis servo amplifier fuse blown (SRVO-214), Hand broken (SRVO-006), and Robot overtravel (SRVO-005) are displayed on the teach pendant.	1 Check +24VF used by the end effector for a ground fault. 2 Check the robot connection cable and the robot's internal cable. In case of M-3*i*A, check the fan motor inside the robot (option). 3 Replace the 6-Axis servo amplifier.
FS3	The 6-Axis servo amplifier fuse blown (SRVO-214), DCAL alarm (SRVO-043) are displayed on the teach pendant.	1 Check the regenerative resister, and replace it if required. 2 Replace the 6-Axis servo amplifier.

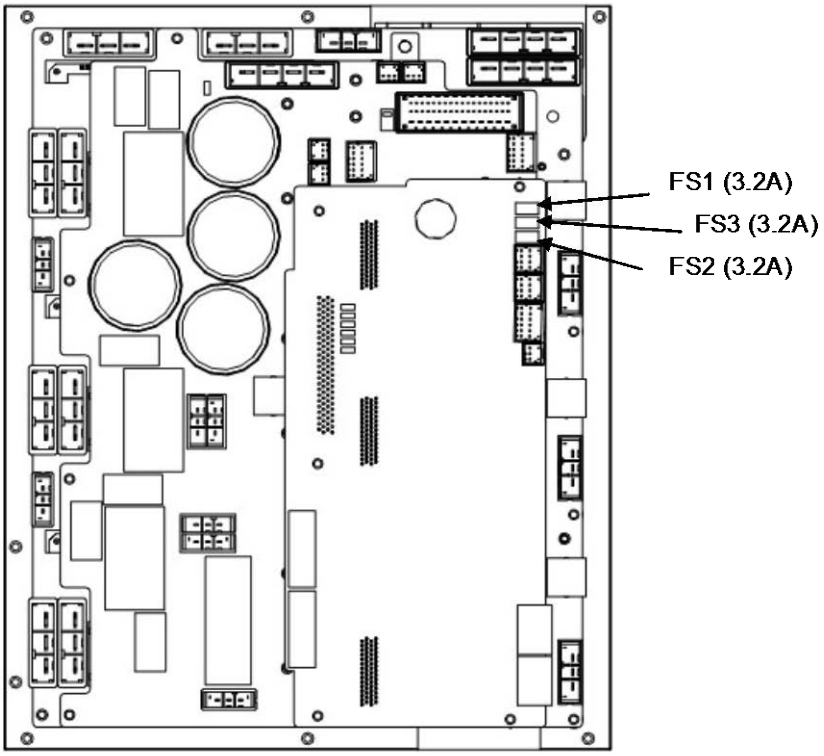


Fig. 4.6 (b) Fuse on the servo amplifier

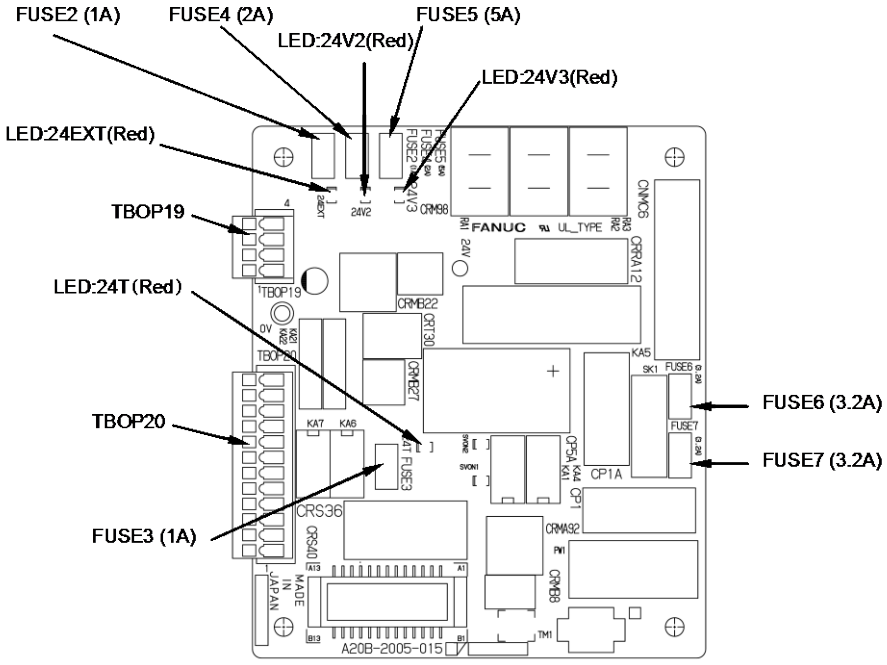
(3) Emergency stop board fuses

FUSE2:	For emergency stop circuit	(A60L-0001-0290#LM10C)
FUSE3:	For +24V of teach pendant protection	(A60L-0001-0290#LM10C)
FUSE4:	For +24V protection	(A60L-0001-0290#LM20C)
FUSE5:	For +24V of mainboard protection	(A60L-0001-0290#LM50C)
FUSE6,FUSE7:	For AC200V of fans protection (door/rear) (Only in case of large size controller)	(A60L-0001-0175#3.2A)
FUSE8:	For 200V power monitor circuit	(A60L-0001-0175#0.3A)

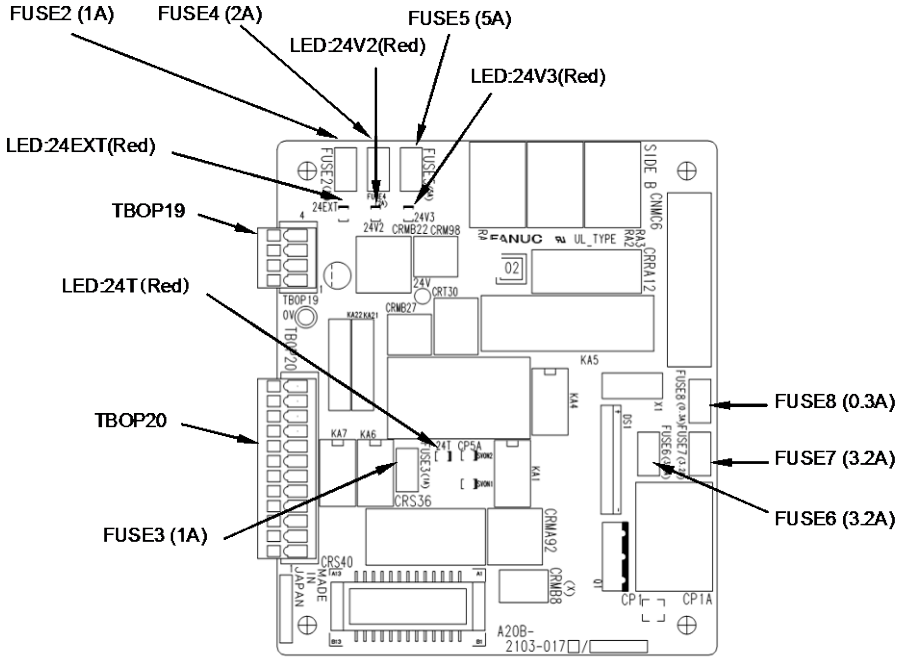
(This fuse is installed on the Emergency stop board for R-30*i*B Mate Plus only.)

Name	Symptom observed when fuse has blown	Action
FUSE2	Alarm (SRVO-007) is displayed on the teach pendant, and the red LED (24EXT) on the emergency stop board lights.	1. Check the voltage between EXT24V and EXT0V (TBOP19). If no external power supply is used, check the jumper pin between EXT24V and INT24V or between EXT0V and INT0V. 2. Check the 24EXT (emergency stop line) for a short circuit or connection to ground. 3. Replace the emergency stop board. 4. Check the teach pendant and replace it if necessary.
FUSE3	The display on the teach pendant disappears, and the red LED (24T) on the emergency stop board lights.	1. Check the teach pendant cable and replace it if necessary. 2. Check the cable between the emergency stop board (CRS40) and the main board (CRS40) , and replace it if necessary. 3. Check the teach pendant and replace it if necessary. 4. Replace the emergency stop board. 5. Replace the main board. (*)
FUSE4	An alarm relating to an input signal that causes an emergency stop is issued, and the red LED (24V2) on the emergency stop board lights.	1. Check the connection on TROP20. 2. Check the cable between the emergency stop board (CRS40) and the main board (CRS40), and replace it if necessary. 3. Check the cable between the emergency stop board (CRMA92) and the 6-Axis servo amplifier (CRMA91), and replace it if necessary. 4. If the cable between the emergency stop board (CRMB22) and the 6-Axis servo amplifier (CRMB16) exist. Check this cable and replace it if necessary. 5. Replace the emergency stop board. 6. Replace the E-stop unit. 7. Replace the main board. (*) 8. Replace the 6-Axis servo amplifier.
FUSE5	The teach pendant can not be operated and the red LED (24V3) on the emergency stop board lights.	1. Check the cable between the emergency stop board (CRS40) and the main board (CRS40), and replace it if necessary. 2. Check the cable between the emergency stop board (CRMA92) and the 6-Axis servo amplifier (CRMA91), and replace it if necessary. 3. Replace the back plane board. 4. Replace the main board. (*) 5. Replace the emergency stop board. 6. Replace the 6-Axis servo amplifier.
FUSE6 FUSE7	The fan stops.	1. Check the fan cable and replace it if necessary. 2. Replace the fan unit. 3. Replace the emergency stop board.
FUSE8 (R-30*i*B Mate Plus only)	The teach pendant can not be operated and the seven segment LED located on the main board displays “7”. If this fuse blows when power-on, the green LEDs “LEDG2” and “LEDG4” of the status LEDs on the main board light. The system does not work correctly.	1. Replace the emergency stop board.

* If the main board or FROM/SRAM module is replaced, the contents of memory (parameters, specified data, etc.) will be lost. Before you replace the unit, therefore, make a backup copy of the data.
If an alarm is issued, data backup may be disabled. So, back up the contents of memory routinely.



(R-30*i*B Mate)



(R-30*i*B Mate Plus)

Fig.4.6 (c) Fuse on the emergency stop board

(4) Safety I/O board fuses

FU1: For protecting +24V to the safety signal input (SFDI) (A60L-0001-0290#LM10C)

FU2: For protecting +24V to the safety signal output (SFDO) (A60L-0001-0290#LM32C)

Name	Symptom observed when fuse has blown	Action
FU1	An alarm “SRVO-219 Safety I/O board fuse1 blown” is displayed on the teach pendant.	1. Check whether there is ground-fault occurring at the connection cable of CRMA90, and replace it if necessary. 2. Replace the additional Safety I/O board.
FU2	An alarm “SRVO-219 Safety I/O board fuse2 blown” is displayed on the teach pendant.	1. Check whether there is ground-fault occurring at the connection cable of CRMA90, and replace it if necessary. 2. Replace the additional Safety I/O board.

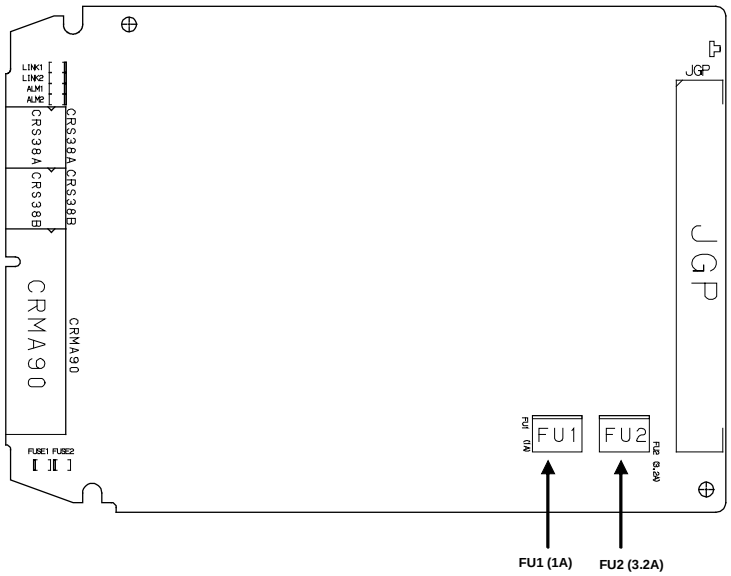


Fig.4.6 (d) Fuse on the safety I/O board

(5) Fuse on the sensor I/F unit for collaborative robot
FUSE: For internal power supply circuit (A60L-0001-0290#LM20)

Name	Symptom observed when fuse has blown	Action
FUSE	The LED of the sensor I/F unit lights.	1. Check if the cables and peripheral devices connected to the sensor I/F unit are normal. 2. Replace the sensor I/F unit.

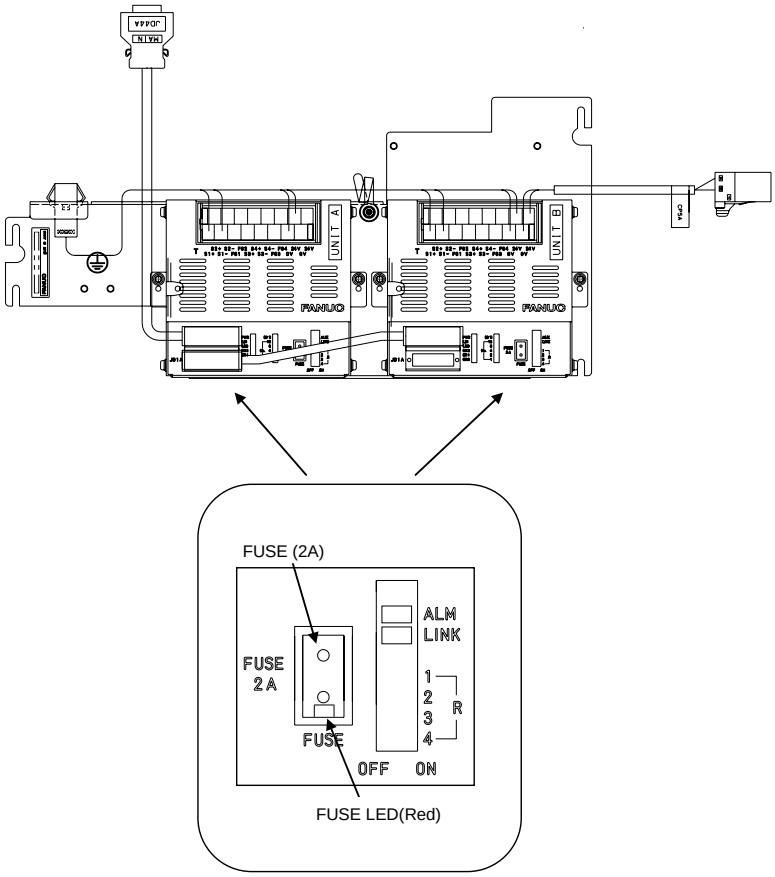


Fig.4.6 (e) Fuse on sensor I/F unit for collaborative robot

4.7 TROUBLESHOOTING BASED ON LED INDICATIONS

The printed circuit boards and servo amplifier are provided with alarm LEDs and status LEDs. The LED status and corresponding troubleshooting procedures are described below.

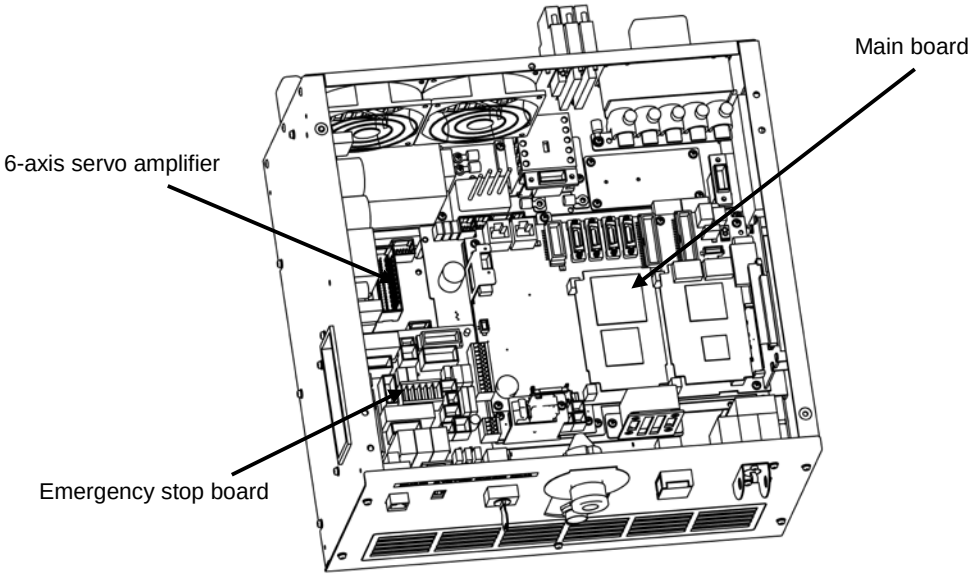


Fig.4.7 (a) Troubleshooting based on LED indication

4.7.1 Troubleshooting Using the LEDs on the Main Board

(1) Troubleshooting using the status display LED
To troubleshoot an alarm that arises before the teach pendant is ready to display, check the status LEDs (green) on the main board at power-on. After power-on, the LEDs light as described in steps 1 to end, in the order described. If an alarm is detected, the step in which the alarm occurred can be determined from which LEDs are lit.

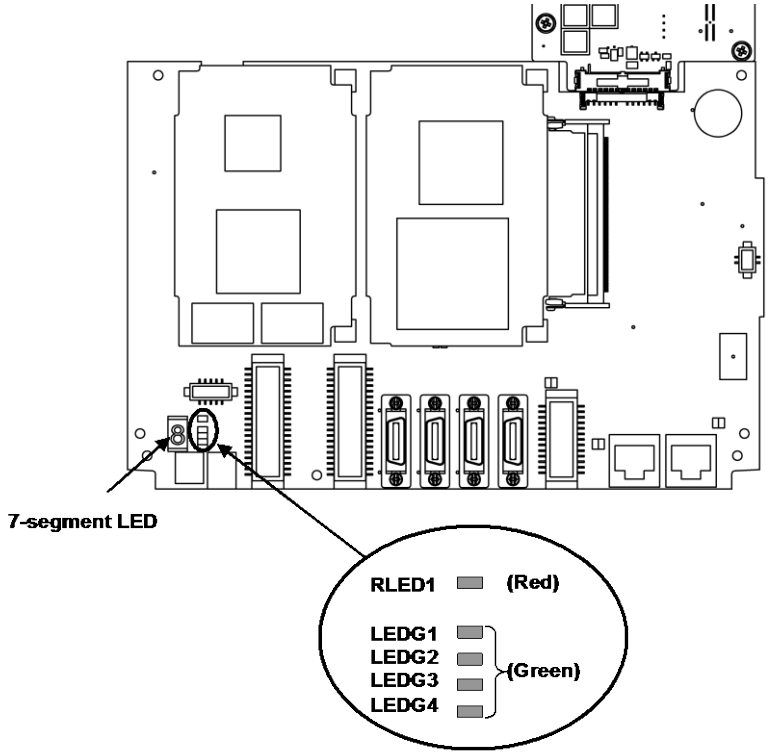
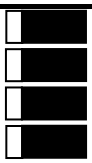
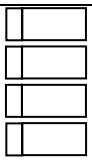
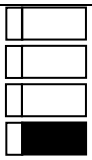
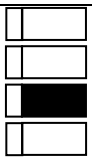
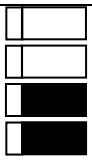
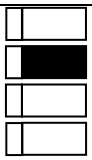
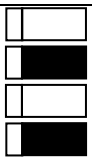
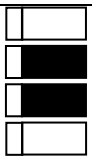
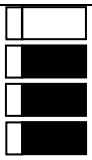


Fig. 4.7.1 (a) Troubleshooting Using the LEDS On the Main Board

Step	LED	Action to be taken
1: After power-on, all LEDs are lit.	 LEDG1 LEDG2 LEDG3 LEDG4	[Action 1] Replace the CPU card. * [Action 2] Replace the main board.
2: Software operation start-up.	 LEDG1 LEDG2 LEDG3 LEDG4	[Action 1] Replace the CPU card. * [Action 2] Replace the main board.
3: The initialization of dram on the CPU card is completed.	 LEDG1 LEDG2 LEDG3 LEDG4	[Action 1] Replace the CPU card. * [Action 2] Replace the main board.
4: The initialization of DPRAM on the communication IC is completed.	 LEDG1 LEDG2 LEDG3 LEDG4	[Action 1] Replace the CPU card. * [Action 2] Replace the main board. * [Action 3] Replace the FROM/SRAM module.
5: The initialization of the communication IC is completed.	 LEDG1 LEDG2 LEDG3 LEDG4	[Action 1] Replace the CPU card. * [Action 2] Replace the main board. * [Action 3] Replace the FROM/SRAM module.
6: The loading of the basic software is completed.	 LEDG1 LEDG2 LEDG3 LEDG4	* [Action 1] Replace the main board. * [Action 2] Replace the FROM/SRAM module.
7: Basic software start-up.	 LEDG1 LEDG2 LEDG3 LEDG4	* [Action 1] Replace the main board. * [Action 2] Replace the FROM/SRAM module. * [Action3] Replace the power supply unit.
8: Start-up of communication with the teach pendant.	 LEDG1 LEDG2 LEDG3 LEDG4	* [Action 1] Replace the main board. [Action 2] Replace the FROM/SRAM module.
9: The loading of optional software is completed.	 LEDG1 LEDG2 LEDG3 LEDG4	* [Action 1] Replace the main board. [Action 2] Replace the process I/O board.
10: DI/DO initialization	 LEDG1 LEDG2 LEDG3 LEDG4	[Action 1] Replace the FROM/SRAM module. [Action 2] Replace the main board.

Step	LED	Action to be taken
11: The preparation of the SRAM module is completed.	■ LEDG1 □ LEDG2 □ LEDG3 ■ LEDG4	[Action 1] Replace the servo card. * [Action 2] Replace the main board. [Action 3] Replace the servo amplifier.
12: Servo card initialization	■ LEDG1 □ LEDG2 ■ LEDG3 □ LEDG4	[Action 1] Replace the servo card. * [Action 2] Replace the main board. [Action 3] Replace the servo amplifier.
13: Calibration is completed.	■ LEDG1 □ LEDG2 ■ LEDG3 ■ LEDG4	[Action 1] Replace the servo card. * [Action 2] Replace the main board. [Action 3] Replace the servo amplifier.
14: Start-up of power application for the servo system	■ LEDG1 ■ LEDG2 □ LEDG3 □ LEDG4	* [Action 1] Replace the main board.
15: Program execution	■ LEDG1 ■ LEDG2 □ LEDG3 ■ LEDG4	* [Action 1] Replace the main board. [Action 2] Replace the process I/O board.
16: DI/DO output start-up.	■ LEDG1 ■ LEDG2 ■ LEDG3 □ LEDG4	* [Action 1] Replace the main board.
17: Initialization is terminated.	■ LEDG1 ■ LEDG2 ■ LEDG3 ■ LEDG4	Initialization has ended normally.
18: Normal status	☆ LEDG1 ☆ LEDG2 ■ LEDG3 ■ LEDG4	Status LEDs 1 and 2 blink when the system is operating normally.

* If the main board or FROM/SRAM module is replaced, the contents of memory (parameters, specified data, etc.) will be lost. Before you replace the unit, therefore, make a backup copy of the data.
If an alarm is issued, data backup may be disabled. So, back up the contents of memory routinely.

LED indication	Description
RLED1 (Red)	[Description] CPU card is not working. [Action 1] Replace the CPU card.

(2) TROUBLESHOOTING BY 7-SEGMENT LED INDICATOR

7-segment LED indicator	Description
	[Description] A parity alarm condition has occurred in DRAM on the CPU card installed on the main board. [Action1] Replace the CPU card.3.7 * [Action2] Replace the main board.
	[Description] A parity alarm condition has occurred in SRAM on the FROM/SRAM module installed on the main board. [Action1] Replace the FROM/SRAM module. * [Action2] Replace the main board.
	[Description] A bus error has occurred in the communication controller. * [Action] Replace the main board.
	[Description] A parity alarm condition has occurred in DRAM controlled by the communication controller. * [Action] Replace the main board.
	[Description] A servo alarm condition has occurred on the main board. [Action1] Replace the servo card. * [Action2] Replace the main board. [Action3] If an option board is installed, replace the option board.
	[Description] The SYSEMG alarm has occurred. [Action1] Replace the servo card. [Action2] Replace the CPU card. * [Action3] Replace the main board.
	[Description] The SYSFAIL alarm has occurred. [Action1] It is possible that an instant disconnection of power source caused this alarm. Check whether an instant disconnection occurred. [Action2] Replace the servo card. [Action3] Replace the CPU card. * [Action4] Replace the main board. [Action5] If an option board is installed, replace the option board.
	[Description] 5V is supplied to Main board. Above alarms do not occur.

* If the main board or FROM/SRAM module is replaced, the contents of memory (parameters, specified data, etc.) will be lost. Before you replace the unit, therefore, make a backup copy of the data.
If an alarm is issued, data backup may be disabled. So, back up the contents of memory routinely.

4.7.2 Troubleshooting by LEDs on the 6-Axis Servo Amplifier

The 6-Axis servo amplifier has alarm LEDs. Troubleshoot the alarm indicated by the LEDs, referring also to the alarm indication on the teach pendant.

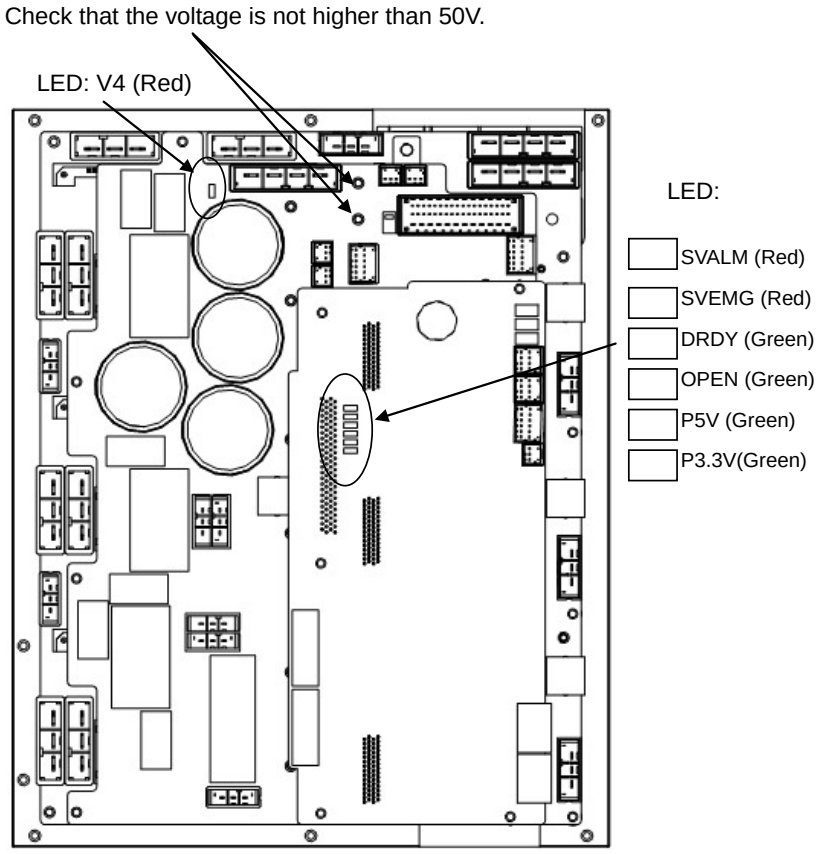


Fig.4.7.2 (a) LEDs on the 6-Axis servo amplifier

> ⚠ **CAUTION**
> Before touching the 6-Axis servo amplifier, check the DC link voltage with the screws located above the LED "V4". By using a DC voltage tester, check that the voltage is 50 V or less.

LED	Color	Description
V4	Red	Lights when the DCLINK circuit inside the servo amplifier is charged to reach the specified voltage. If the LED does not light after pre-charge is finished: [Action 1] The DC Link may be short-circuited. Check for connection. [Action 2] The charge current control resistor may be defective. Replace the emergency stop unit. [Action 3] Replace the servo amplifier.
SVALM	Red	Lights when the servo amplifier detects an alarm. If the LED lights when there is no alarm condition in the machine: [Action] Replace the servo amplifier. If the LED does not light when there is an alarm condition in the machine: [Action] Replace the servo amplifier.

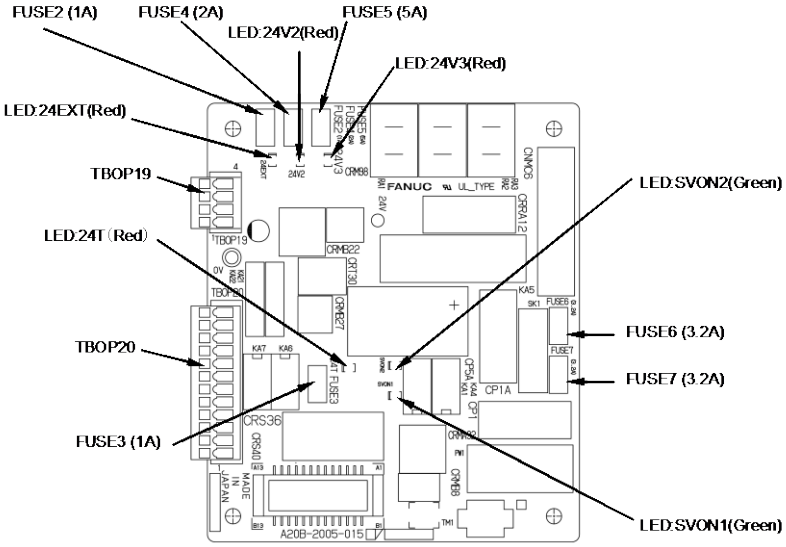
LED	Color	Description
SVEMG	Red	Lights when an emergency stop signal is input to the servo amplifier. If the LED lights when the machine is not at an emergency stop: [Action] Replace the servo amplifier. If the LED does light when the machine is at an emergency stop: [Action] Replace the servo amplifier.
DRDY	Green	Lights when the servo amplifier is ready to drive the servo motor. If the LED does not light when the motor is activated: [Action] Replace the servo amplifier.
OPEN	Green	Lights when the communication between the servo amplifier and the main board is normal. If the LED does not light: [Action 1] Check for the connection of the FSSB optical cable. [Action 2] Replace the servo card. [Action 3] Replace the servo amplifier.
P5V	Green	Lights when the power supply circuit inside the servo amplifier outputs a voltage of +5 V normally. If the LED does not light: [Action 1] Check the robot connection cable (RP1/RMP1) to see if there is a ground fault in the +5V wire. [Action 2] Replace the servo amplifier.
P3.3V	Green	Lights when the power supply circuit inside the servo amplifier outputs a voltage of +3.3 V normally. If the LED does not light: [Action] Replace the servo amplifier.

4.7.3 Troubleshooting by LEDs on the Emergency Stop Board

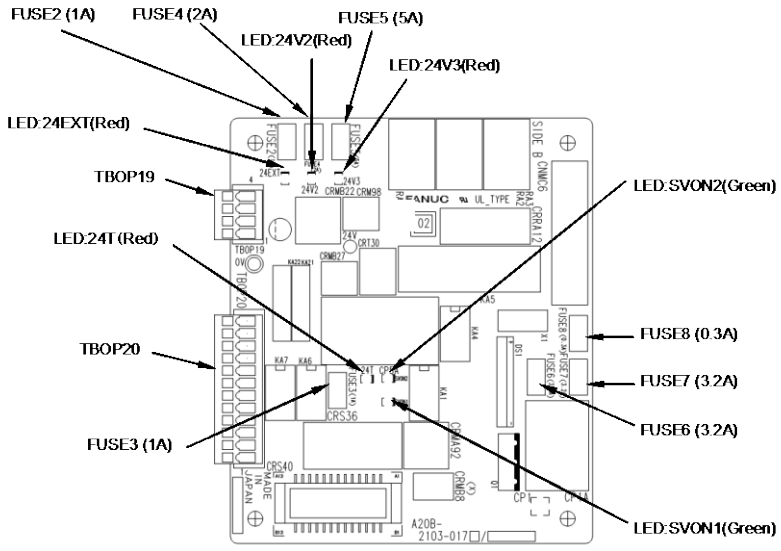
LED indication	Failure description and required measure
24EXT (Red)	[Description] When the LED (red) turned on, the fuse (FUSE2) is brown. 24EXT for the emergency stop circuit is not supplied. [Action 1] If the fuse (FUSE2) has not brown in this state, check the voltage between EXT24V and EXT0V (TBOP19). If no external power supply is used, check the jumper pin between EXT24V and INT24V or between EXT0V and INT0V. [Action 2] Check the 24EXT (emergency stop line) for a short circuit or connection to ground. [Action 3] Replace the emergency stop board. [Action 4] Check the teach pendant, and replace it if required.
24T (Red)	[Description] When the LED (red) turned on, the fuse (FUSE3) is brown. 24T for the teach pendant is not supplied. [Action 1] Check the teach pendant cable (CRS36), and replace it if required. [Action 2] Check the cable between the emergency stop board (CRS40) and the main board (CRS40), and replace it if necessary. [Action 3] Check the teach pendant, and replace it if required. [Action 4] Replace the emergency stop board. *[Action 5] Replace the main board.

LED indication	Failure description and required measure	
24V2 (Red)	[Description]	When the LED (red) turned on, the fuse (FUSE4) is brown. 24V-2 for the emergency stop input signal is not supplied.
	[Action 1]	Check the connection of TBOP20.
	[Action 2]	Check the cable between the emergency stop board (CRS40) and the main board (CRS40), and replace it if necessary.
	[Action 3]	Check the cable between the emergency stop board (CRMA92) and the 6-Axis servo amplifier (CRMA91), and replace it if necessary.
	[Action 4]	If the cable between the emergency stop board (CRMB22) and the 6-Axis servo amplifier (CRMB16) exist. Check this cable and replace it if necessary.
	[Action 5]	Replace the emergency stop board.
	[Action 6]	Replace the E-stop unit.
	*[Action 7]	Replace the main board.
	[Action 8]	Replace the 6-Axis servo amplifier.
24V3 (Red)	[Description]	When the LED (red) turned on, the fuse (FUSE5) is brown. 24V-3 for the main board is not supplied.
	[Action 1]	Check the cable between the emergency stop board (CRS40) and the main board (CRS40), and replace it if necessary.
	[Action 2]	Check the cable between the emergency stop board (CRMA92) and the 6-Axis servo amplifier (CRMA91), and replace it if necessary.
	[Action 3]	Replace the backplane board.
	*[Action 4]	Replace the main board.
	[Action 5]	Replace the emergency stop board.
	[Action 6]	Replace the 6-Axis servo amplifier.
SVON1/SVON2 (Green)	[Description]	These LEDs (green) indicate the status of SVON1/SVON2 signals from the emergency stop board to the servo amplifier. When the SVON1 and SVON2 (green) turned on, the servo amplifier is ready to energize.

* If the main board or FROM/SRAM module is replaced, the contents of memory (parameters, specified data, etc.) will be lost. Before you replace the unit, therefore, make a backup copy of the data.
If an alarm is issued, data backup may be disabled. So, back up the contents of memory routinely.



(R-30*i*B Mate)



(R-30*i*B Mate Plus)

Fig.4.7.3 (a) LEDs on the emergency stop board

4.7.4 Troubleshooting by LEDs on the Sensor I/F Unit for Collaborative Robot

4.7.4.1 Status indication of the I/O Link *i*

The sensor I/F unit for the I/O Link *i* only has the following LEDs to indicate the communication status of the I/O Link *i* and sensor.

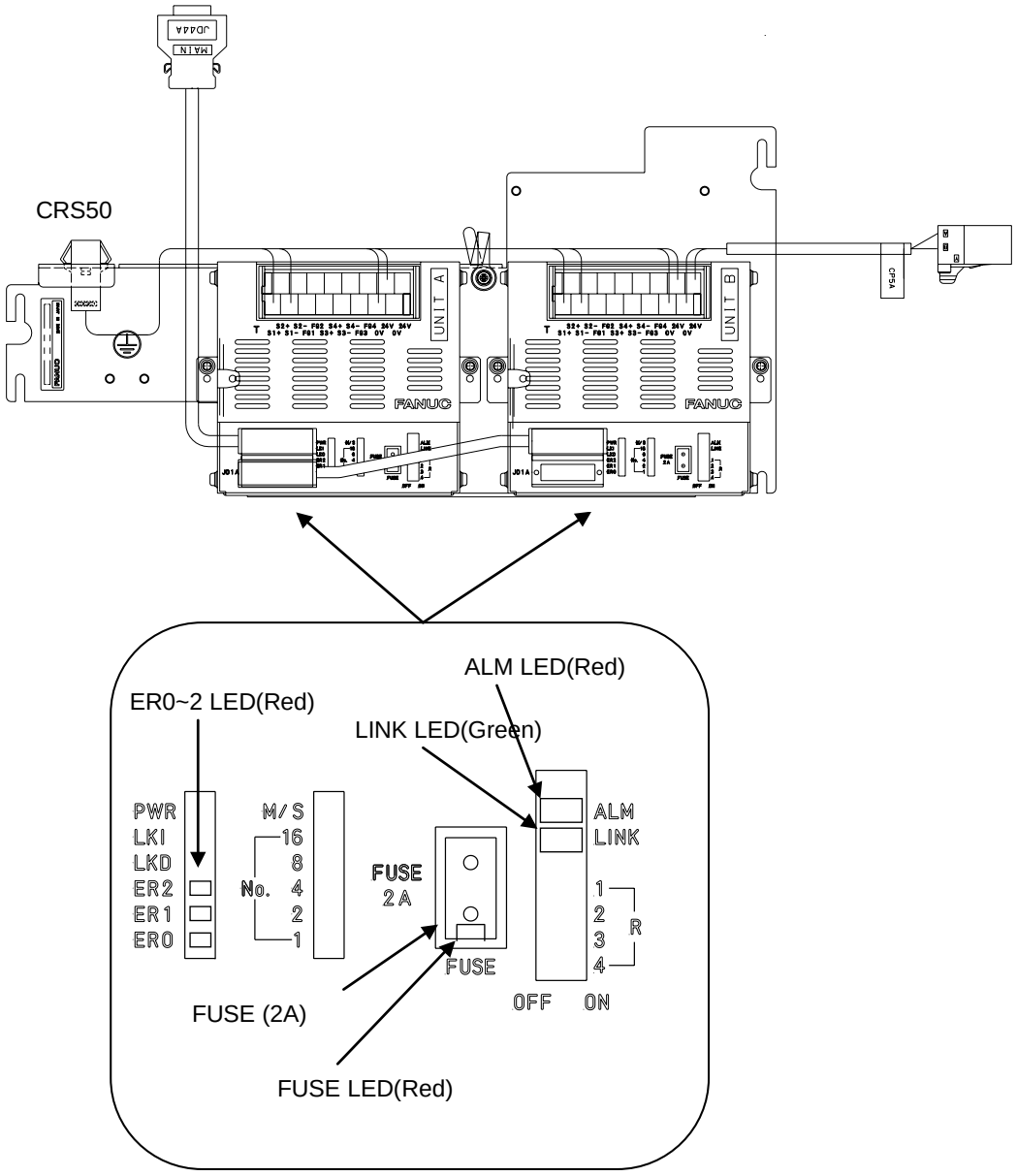


Fig.4.7.4.1 (a) LEDs on the sensor I/F unit for collaborative robot

· ER0~2 LED
Lights when an error occurs in communication with the force sensor.
For confirmation, remove the cable connected to the CRS50 connector, turn on the power, and check whether the ER 0 ~ 2 LEDs change.
When one of the ER 0 to 2 LEDs lights up: Replace the sensor I/F unit.
When all of the ER 0 to 2 LEDs are turned off: Check whether there is any abnormality in the sensor connection cable connected to CRS50.

· FUSE LED
Lights when the fuse blows.
Remove the cause of the blown fuse, and the replace the fuse.

· LINK LED
The LINK LED indicates the group communication status as described below.

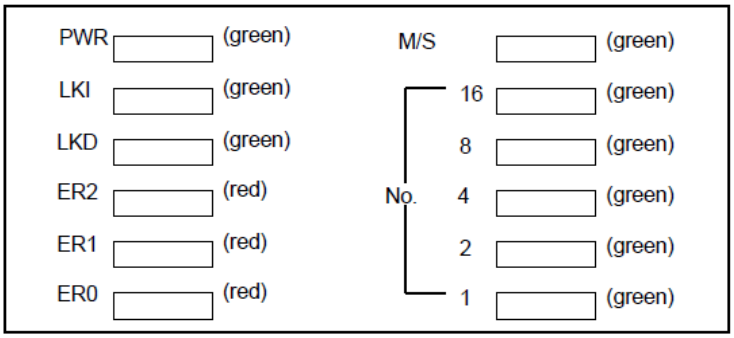
Operation mode	LED Indications	Meaning	Remarks
I/O Link ***i***	OFF	Power OFF	
	ON	Power ON	
	Blink (1:1)	Communication in progress Standard	ON = approx. 0.5 sec OFF = approx. 0.5 sec
	Blink (3:1)	Communication in progress (Dual check safety in use)	ON = approx. 1.5 sec OFF = approx. 0.5 sec
	Blink (1:1 at high speed)	Communication not in progress Watch-dog alarm occurrence	ON = approx. 0.25 sec OFF = approx. 0.25 sec

· ALM LED
The ALM LED indicates the types of I/O Link *i* alarms as described below.

Operation mode	LED Indications	Meaning	Remarks
I/O Link ***i***	OFF	Normal state or power OFF	
	ON	Occurrence of any of a parity alarm, external input alarm, and dual check safety alarm	
	Blink (1:1)	Broken wire between the group of interest and a group subsequent to it	ON = approx. 0.5 sec OFF = approx. 0.5 sec
	Blink (3:1)	Power failure (including instantaneous power failure) in a group subsequent to the group of interest	ON = approx. 1.5 sec OFF = approx. 0.5 sec
	Blink (1:3)	Status alarm	ON = approx. 0.5 sec OFF = approx. 1.5 sec
	Blink (1:1 at high speed)	Alarm occurred due to a command from the master	ON = approx. 0.25 sec OFF = approx. 0.25 sec

4.7.4.2 Status indications of the distributed Link

LEDs are arranged as shown below.



- PWR : Lights when the power is turned on.
- LKI : Lights when the unit communicates with the master of I/O Link or I/O Link *i*.
- LKD : Lights when the unit communicates with the basic unit.
  (Lights dimly if the number of basic units connected is small.)
- ER0 to 2 : Lights if an error occurs.
- M/S : If an error occurs, this LED indicates which of the interface unit and the basic unit the error is detected.
  The indication is made by whether this LED lights or not if an error occurs.

  ON: An error is detected in the interface unit.
  OFF: An error is detected in the basic unit.

The details for the relation between unit number LEDs and errors refer to “FANUC I/O Unit-MODEL B CONNECTION MANUAL (**B-62163E/04)**”.

4.8 POSITION DEVIATION FOUND IN RETURN TO THE REFERENCE POSITION (POSITIONING)

(Check 1) On the status screen, check the position deviation in the stopped state. To display the position deviation, press [MENU] key, and select STATUS from the menu. Press F1, [TYPE], select AXIS from the menu, then press the F4, PULSE.
(Corrective action)
Correct the parameters related to return to the reference position (positioning).

(Check 2) Check whether the motor axis can be positioned normally.
(Corrective action)
If the motor axis can be positioned normally, check the mechanical unit.

(Check 3) Check the mechanical unit for backlash.
(Corrective action)
Replace a faulty key of motor shaft or other faulty parts.

(Check 4) If checks 1 to 3 show normal results
(Corrective action)
Replace the Pulsecoder.

Parts to cause this alarm;
・Main board

If the main board or FROM/SRAM module is replaced, the contents of memory (parameters, specified data, etc.) will be lost. Before you replace the unit, therefore, make a backup copy of the data.

4.9 MANUAL OPERATION IMPOSSIBLE

The following explains checking and corrective action required if the robot cannot be operated manually after the controller is turned on:

(1) Check and corrective action to be made if manual operation is impossible
(Check 1) Check whether the teach pendant is enabled.
(Corrective action)
Turn on the teach pendant "enable".

(Check 2) Check whether the teach pendant is handled correctly.
(Corrective action)
To move an axis by manual operation, press the axis selection key and shift key at the same time.
Set the override for manual feed to a position other than the FINE and VFINE positions.

(Check 3) Check whether the ENBL signal of the peripheral device control interface is on.
(Corrective action)
Place the peripheral device control interface in the ENBL status.

(Check 4) Check whether the HOLD signal of the peripheral device control interface (hold status).
(Check whether the hold lamp on the teach pendant is on.)
(Corrective action)
Turn off the HOLD signal of the peripheral device control interface.

(Check 5) Check whether the previous manual operation has been completed.
(Corrective action)
If the robot cannot be placed in the effective area because of the offset of the speed command voltage preventing the previous operation from being completed, check the position deviation on the status screen, and change the setting.

(Check 6) Check whether the controller is in the alarm status.
(Corrective action)
Release the alarm.

(2) Check and corrective action to be taken if the program cannot be executed
(Check 1) Check whether the ENBL signal for the peripheral-device control interface is on.
(Corrective action)
Put the peripheral-device control interface in the ENBL state.

(Check 2) Check whether the HOLD signal for the peripheral-device control interface is on. Also check whether the HOLD lamp on the teach pendant is on.
(Corrective action)
If the HOLD signal of the peripheral device control interface is on, turn it off.

(Check 3) Check whether the previous manual operation has been completed.
(Corrective action)
If the robot cannot be placed in the effective area because of the offset of the speed command voltage, which prevents the previous operation from being completed, check the position deviation on the status screen, then change the setting.

(Check 4) Check whether the controller is in the alarm status.
(Corrective action)
Release the alarm.

5 PRINTED CIRCUIT BOARDS

The printed circuit boards are factory-set for operation. Usually, you do not need to set or adjust them. This chapter describes the standard settings and adjustment required if a defective printed circuit board is replaced. It also describes the test pins and the LED indications.
The controller printed circuit board includes the main unit printed circuit board and one or more cards or modules installed horizontally to the main-unit printed-circuit board.
These PC boards have interface connectors, LED indicators, and a plastic panel at the front. At the rear, there is a backplane connector.

5.1 MAIN BOARD

Card and Modules

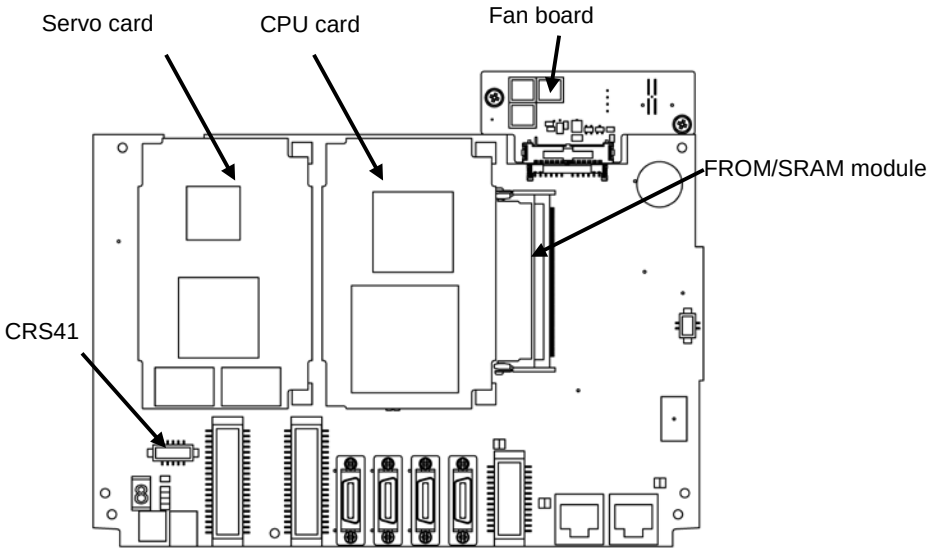


Fig.5.1 (a) Main board (R-30*i*B Mate)

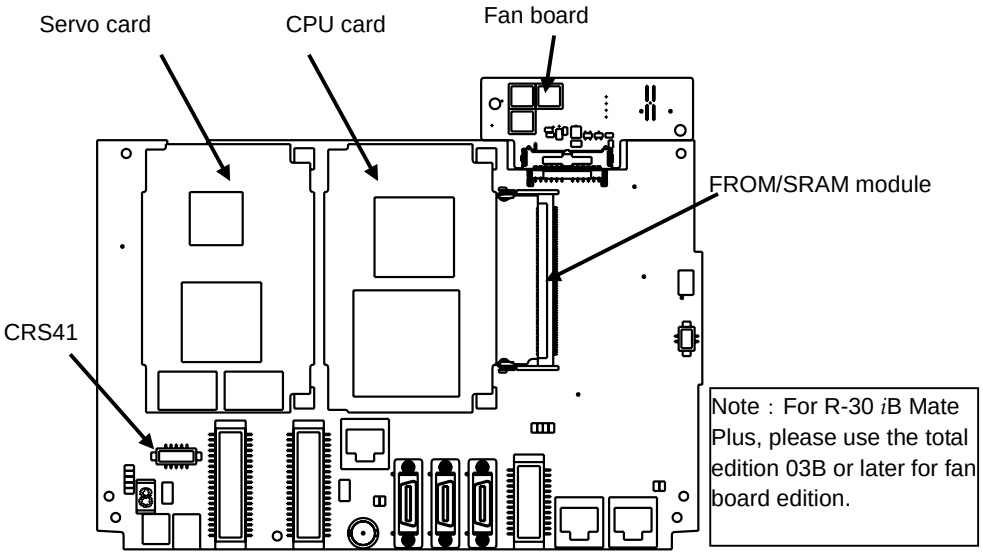


Fig.5.1 (b) Main board (R-30*i*B Mate Plus)

Name	Ordering Specification	Board Specification	Note
Main board + Fan board (R-30*i*B Mate)	A05B-2655-H001	A20B-8200-0790	Standard, Ethernet:1ch
		A20B-8002-0950	
	A05B-2655-H002	A20B-8200-0791	Ethernet:2ch, Vision I/F, Force sensor I/F
		A20B-8002-0950	
	A05B-2655-H003	A20B-8200-0792	Ethernet:2ch, Vision I/F, Force sensor I/F, PMC, HDI
		A20B-8002-0950	
	A05B-2655-H004	A20B-8201-0420	Standard, Ethernet:1ch For I/O Link *i* slave
		A20B-8002-0950	
	A05B-2655-H005	A20B-8201-0421	Ethernet:2ch, Vision I/F, Force sensor I/F For I/O Link *i* slave
		A20B-8002-0950	
	A05B-2655-H006	A20B-8201-0422	Ethernet:2ch, Vision I/F, Force sensor I/F, PMC, HDI For I/O Link *i* slave
		A20B-8002-0950	
Main board + Fan board (R-30*i*B Mate Plus)	A05B-2685-H001	A20B-8201-0750	Standard, Ethernet:2ch For I/O Link *i* slave
		A20B-8002-0950	The total edition 03B or later
	A05B-2685-H002	A20B-8201-0751	Ethernet:3ch, Vision I/F, Force sensor I/F For I/O Link *i* slave
		A20B-8002-0950	The total edition 03B or later
	A05B-2685-H003	A20B-8201-0752	Ethernet:3ch, Vision I/F, Force sensor I/F, PMC, HDI For I/O Link *i* slave
		A20B-8002-0950	The total edition 03B or later
CPU card (R-30*i*B Mate)	A05B-2600-H020	A20B-3300-0686	Standard / SDRAM 32Mbyte
		A17B-3301-0106	
	A05B-2600-H021	A20B-3300-0687	Standard / SDRAM 64Mbyte
		A17B-3301-0107	
	A05B-2600-H022	A20B-3300-0688	Standard / SDRAM 128Mbyte
		A17B-3301-0108	
	A05B-2600-H023	A20B-3300-0683	High speed / SDRAM 32Mbyte
		A17B-3301-0103	
	A05B-2600-H024	A20B-3300-0684	High speed / SDRAM 64Mbyte
		A17B-3301-0104	
	A05B-2600-H025	A20B-3300-0685	High speed / SDRAM 128Mbyte
		A17B-3301-0105	
	A05B-2600-H026	A17B-3301-0109	Standard / SDRAM 32Mbyte For I/O Link *i* slave
	A05B-2600-H027	A17B-3301-0110	Standard / SDRAM 64Mbyte For I/O Link *i* slave
	A05B-2600-H028	A17B-3301-0111	Standard / SDRAM 128Mbyte For I/O Link *i* slave
	A05B-2600-H029	A17B-3301-0112	High speed / SDRAM 32Mbyte For I/O Link *i* slave
	A05B-2600-H030	A17B-3301-0113	High speed / SDRAM 64Mbyte For I/O Link *i* slave
	A05B-2600-H031	A17B-3301-0114	High speed / SDRAM 32Mbyte For I/O Link *i* slave

Name	Ordering Specification	Board Specification	Note
CPU card (R-30*i*B Mate Plus)	A05B-2670-H020	A17B-3301-0250	Standard / DRAM 1GB For I/O Link *i* slave
Servo card (R-30*i*B Mate)	A05B-2600-H040	A20B-3300-0664	6-axis
		A20B-3300-0774	
	A05B-2600-H041	A20B-3300-0663	12-axis
		A20B-3300-0773	
	A05B-2600-H042	A20B-3300-0662	18-axis
		A20B-3300-0772	
	A05B-2600-H043	A20B-3300-0661	24-axis
		A20B-3300-0771	
	A05B-2600-H044	A20B-3300-0660	36-axis
		A20B-3300-0770	
Servo card (R-30*i*B Mate Plus)	A05B-2670-H040	A20B-3300-0819	6-axis
	A05B-2670-H041	A20B-3300-0818	12-axis
	A05B-2670-H042	A20B-3300-0817	18-axis
	A05B-2670-H043	A20B-3300-0816	24-axis
	A05B-2670-H044	A20B-3300-0815	36-axis
FROM/SRAM module (R-30*i*B Mate)	A05B-2600-H060	A20B-3900-0283	FROM 32M/ SRAM 1M
		A20B-3900-0297	
	A05B-2600-H061	A20B-3900-0284	FROM 32M/ SRAM 2M
		A20B-3900-0298	
	A05B-2600-H062	A20B-3900-0285	FROM 32M/ SRAM 3M
		A20B-3900-0299	
FROM/SRAM module (R-30*i*B Mate) (R-30*i*B Mate Plus)	A05B-2600-H063	A20B-3900-0286	FROM 64M/ SRAM 1M
	A05B-2600-H064	A20B-3900-0287	FROM 64M/ SRAM 2M
	A05B-2600-H065	A20B-3900-0288	FROM 64M/ SRAM 3M
	A05B-2600-H066	A20B-3900-0280	FROM 128M/ SRAM 1M
	A05B-2600-H067	A20B-3900-0281	FROM 128M/ SRAM 2M
	A05B-2600-H068	A20B-3900-0282	FROM 128M/ SRAM 3M
FROM/SRAM module (R-30*i*B Mate Plus)	A05B-2600-H069	A20B-3900-0293	FROM 256M/ SRAM 1M
	A05B-2600-H070	A20B-3900-0295	FROM 256M/ SRAM 2M
	A05B-2600-H071	A20B-3900-0296	FROM 256M/ SRAM 3M

⚠CAUTION

In case of using the function of I/O Link *i* slave, the combination of the specification of mainboard, CPU card and software is limited as below.

[Main board (For I/O Link *i* slave)] + [CPU card (For I/O Link *i* slave)]
+ [Software (V8.30P14 or later)]

Except for the above condition, the system does not work correctly as followings.

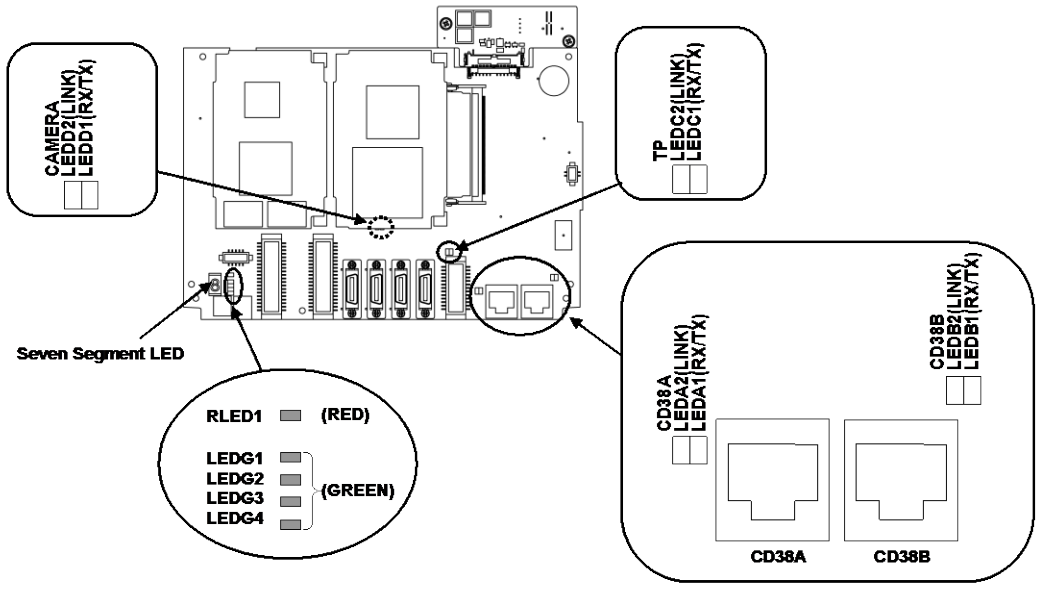
a) [Main board] + [CPU card (For I/O Link *i* slave)]
Neither the function of I/O Link slave nor I/O Link *i* slave work correctly. And the alarm regarding I/O Link or I/O Link *i* occur on the master side.
And in case the software version is not correct, system does not work correctly.
b) [Main board (For I/O Link *i* slave)] + [CPU card]
The system does not work correctly.

In case of using the R-30*i*B Mate Plus, the combination of the specification of mainboard, CPU card and software is limited as below.

[Main board (R-30*i*B Mate Plus)] + [CPU card (R-30*i*B Mate Plus)]
+ [Software (V9.10P01 or later)]

Except for the above condition, the system does not work correctly. And CPU card (R-30*i*B Mate Plus) may be broken.

LEDs



Seven segment LED	Description
8.	When the alarm condition has occurred in the main board, this LED is turned on. Please see the Section 3.7.TROUBLESHOOTING BASED ON LED INDICATIONS.

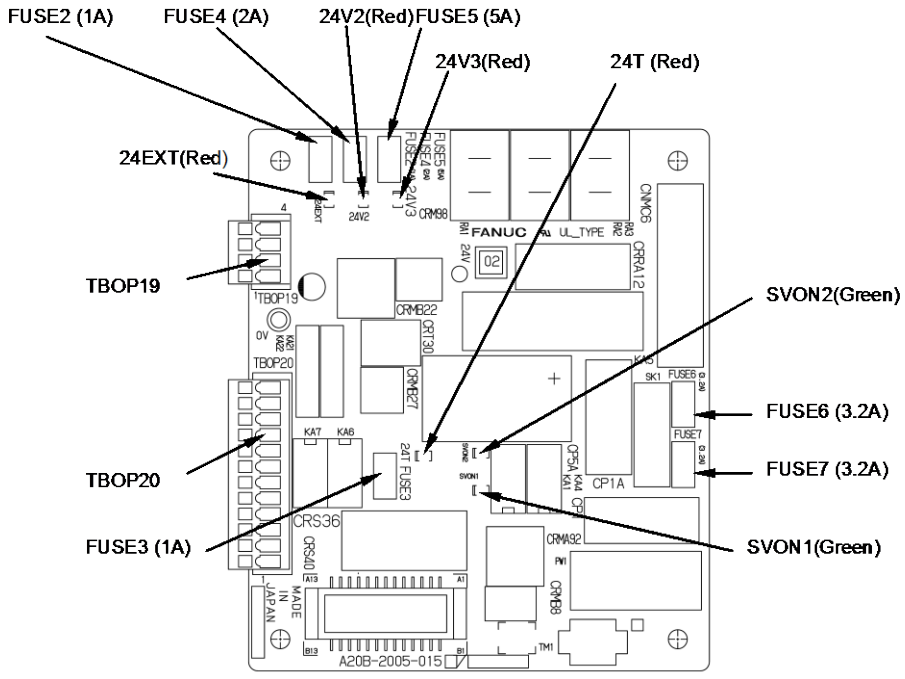
ALARM LED	Color	Description
RLED1	Red	When the alarm condition has occurred in the CPU card, this LED is turned on. Please see the Section 4 TROUBLESHOOTING BASED ON LED INDICATIONS.

STATUS LED	Color	Description
LEDG1	Green	These LEDs show the operating status of the system. Please see the Section 4 TROUBLESHOOTING BASED ON LED INDICATIONS.
LEDG2	Green	
LEDG3	Green	
LEDG4	Green	

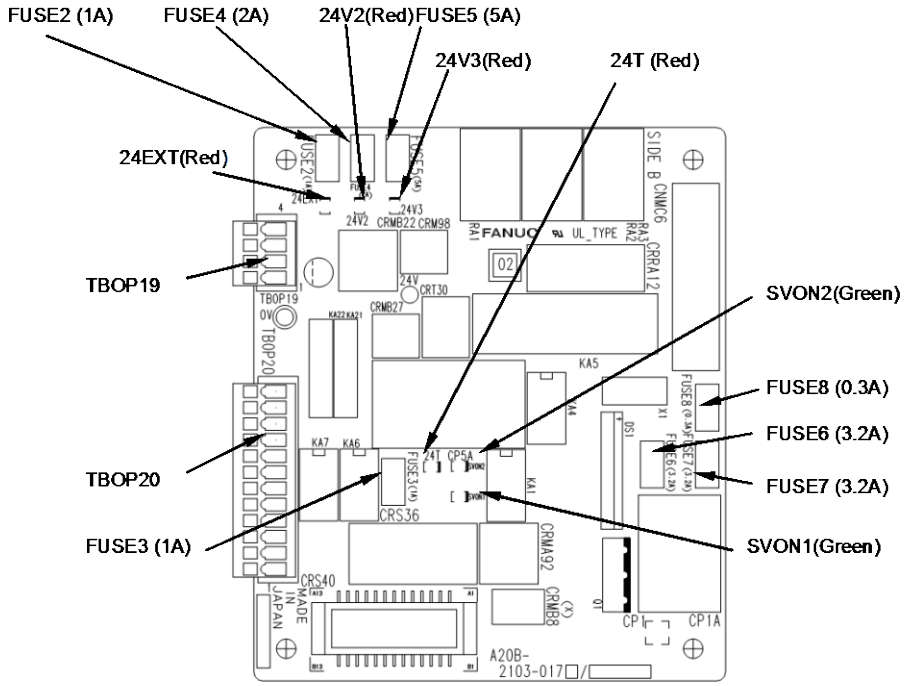
ETHERNET LED	Color	Description
RX/TX	Green	Blink during data transmission of Ethernet TP
LINK	Green	Light when a link of Ethernet is established

Note. TP:For Ethernet TP, CAMERA: For camera

5.2 EMERGENCY STOP BOARD (A20B-2005-0150, A20B-2103-0170)



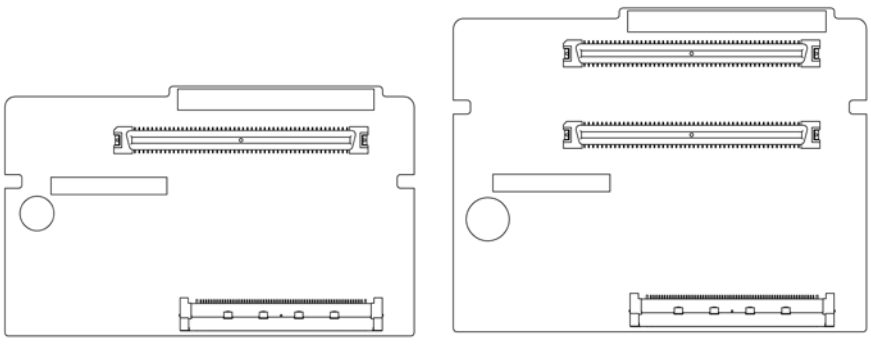
(R-30*i*B Mate A20B-2005-0150)



(R-30*i*B Mate Plus A20B-2103-0170)

Fig.5.2 (a) Emergency stop board

5.3 BACKPLANE



1slot backplane 2slot backplane

Fig.5.3 (a) Backplane

	Name	Ordering Specification	Board specification
R-30*i*B Mate	1 slot backplane	A05B-2655-H080	A20B-8200-0670
	2 slot backplane	A05B-2655-H081	A20B-8200-0680
R-30*i*B Mate Plus (Small size, Small size+ top hat)	1 slot backplane	A05B-2685-H080	A20B-8201-0710
	2 slot backplane	A05B-2685-H081	A20B-8201-0720
R-30*i*B Mate Plus (Large size)	1 slot backplane	A05B-2686-H080	A20B-8201-0710
	2 slot backplane	A05B-2686-H081	A20B-8201-0720

6 SENSOR I/F UNIT FOR COLLABORATIVE ROBOT

Specification of sensor I/F unit: A05B-2687-C200

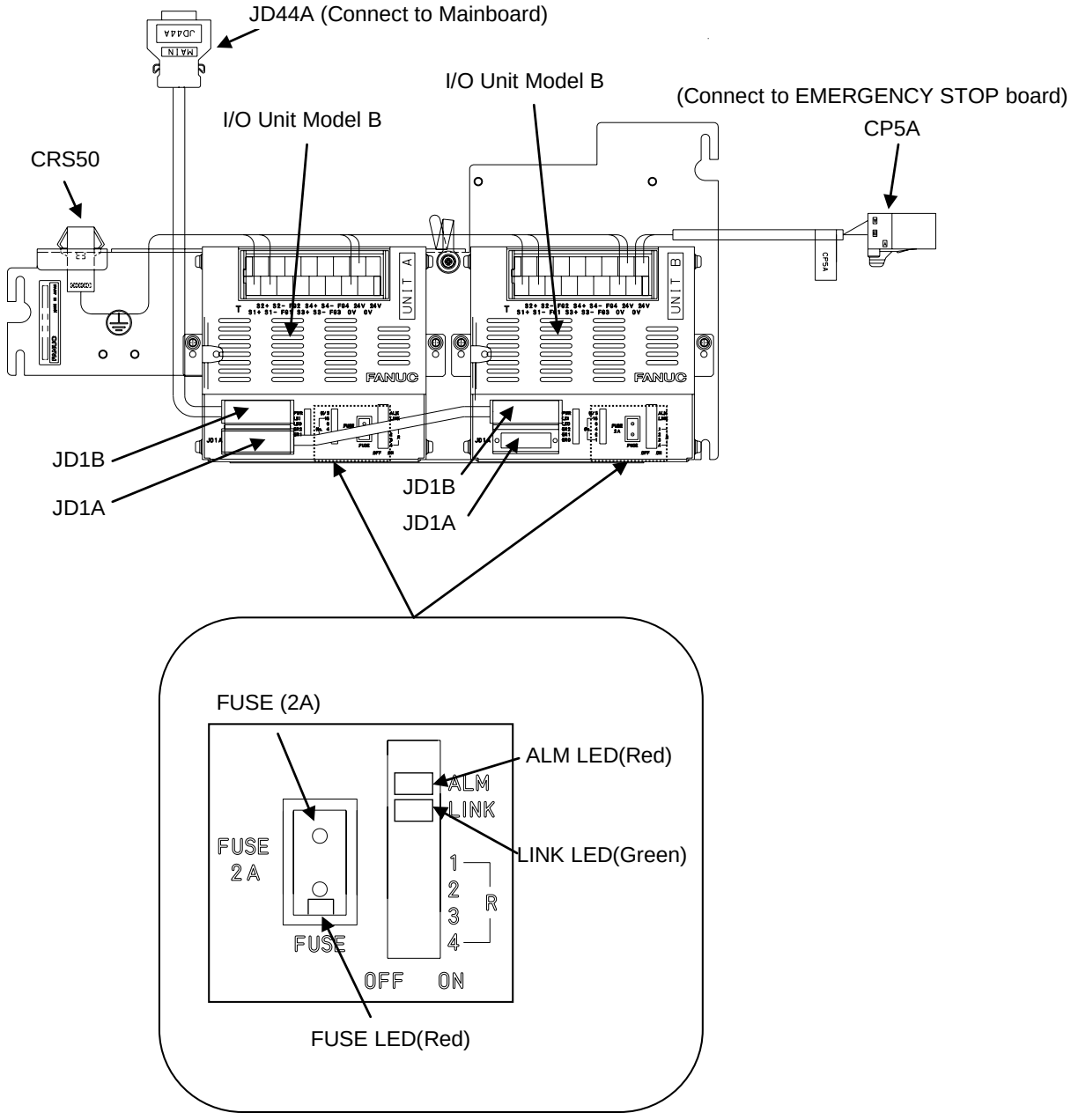
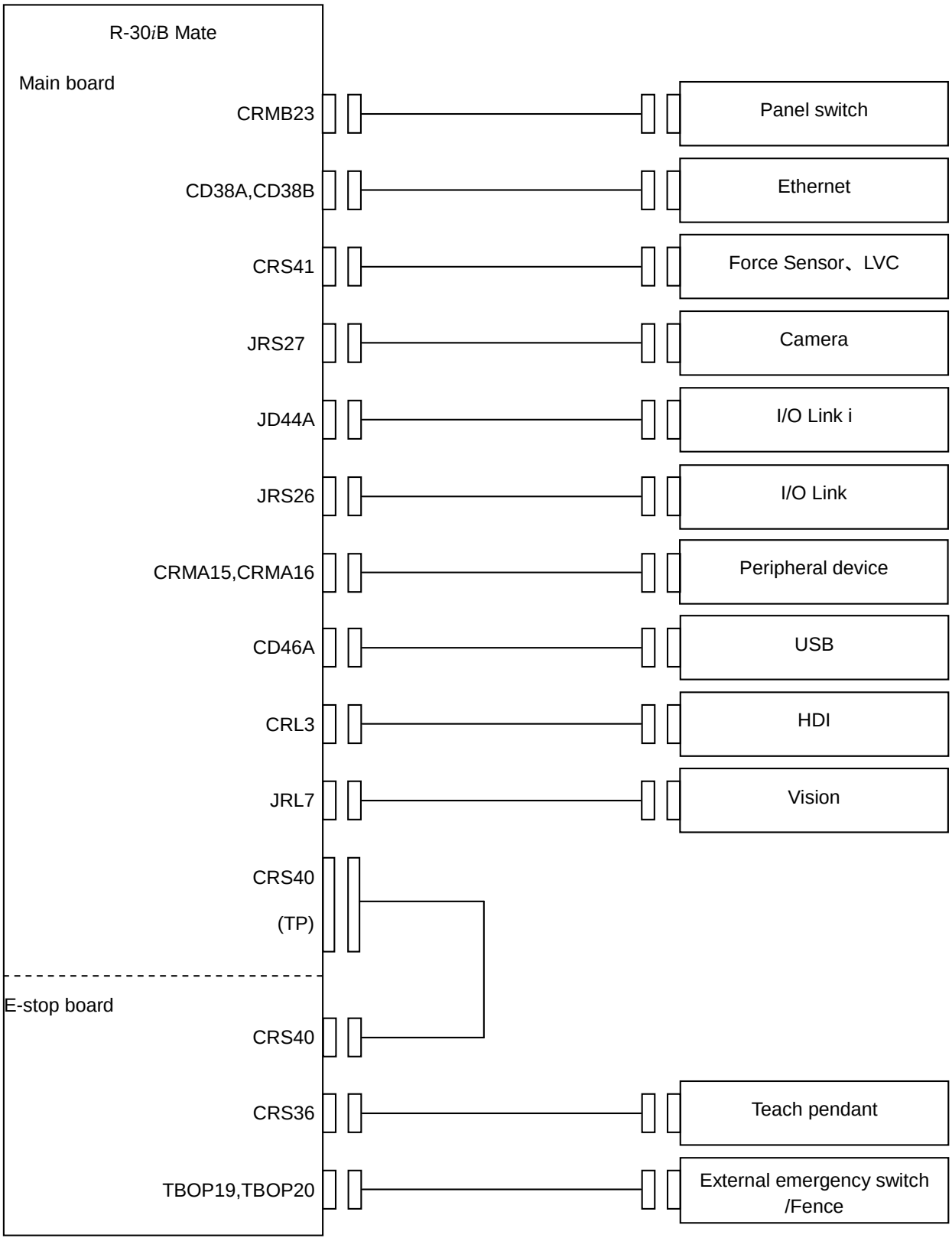


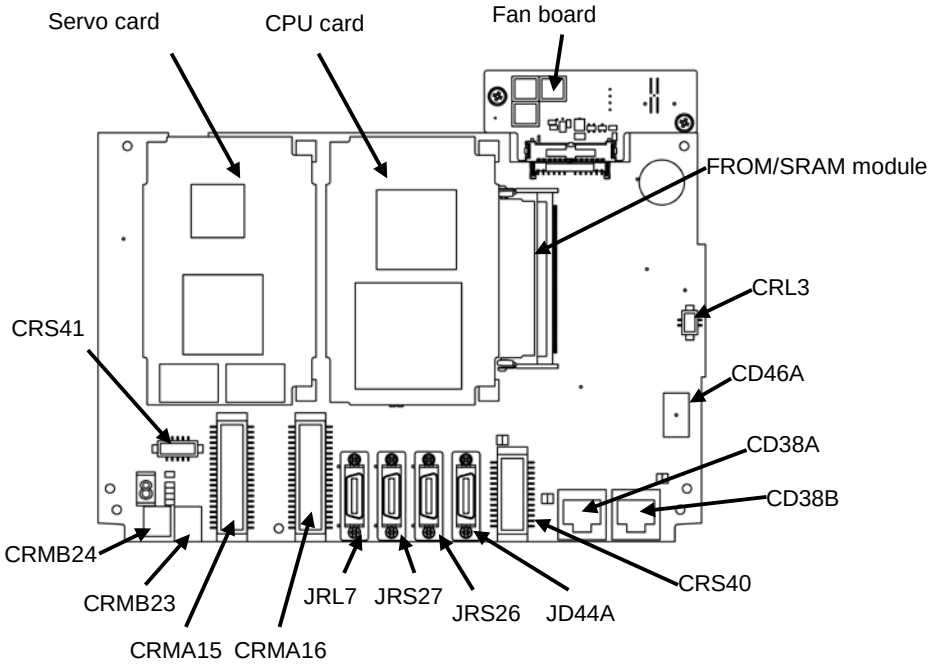
Fig.6 (a) Sensor I/F unit for collaborative robot

II. CONNECTIONS

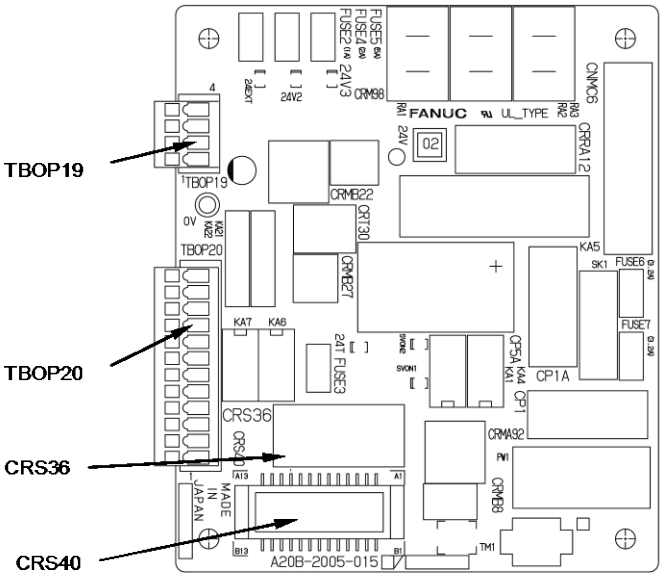
1 ELECTRICAL CONNECTIONS

1.1 CONNECTION DIAGRAM BETWEEN MECHANICAL UNITS

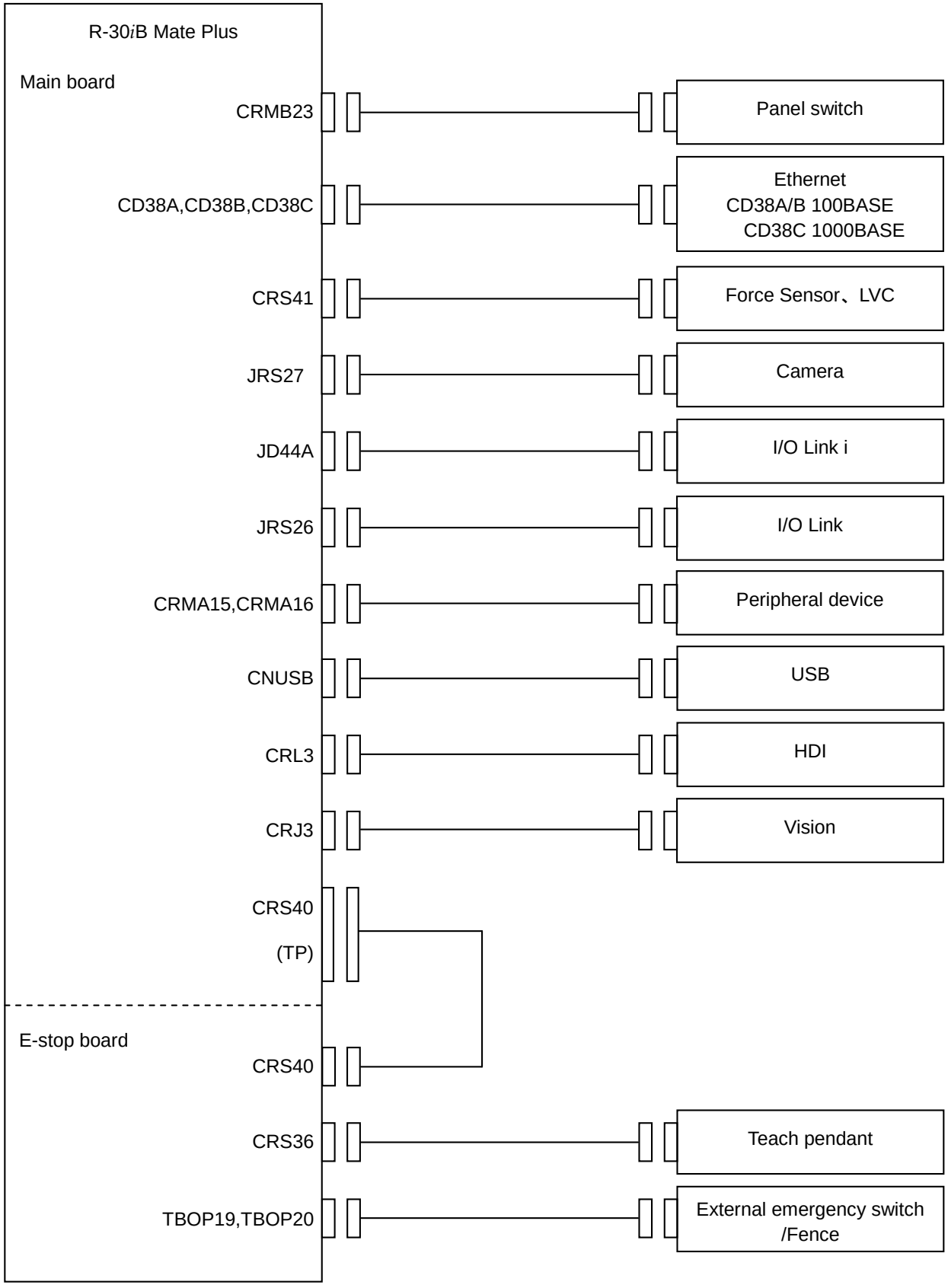


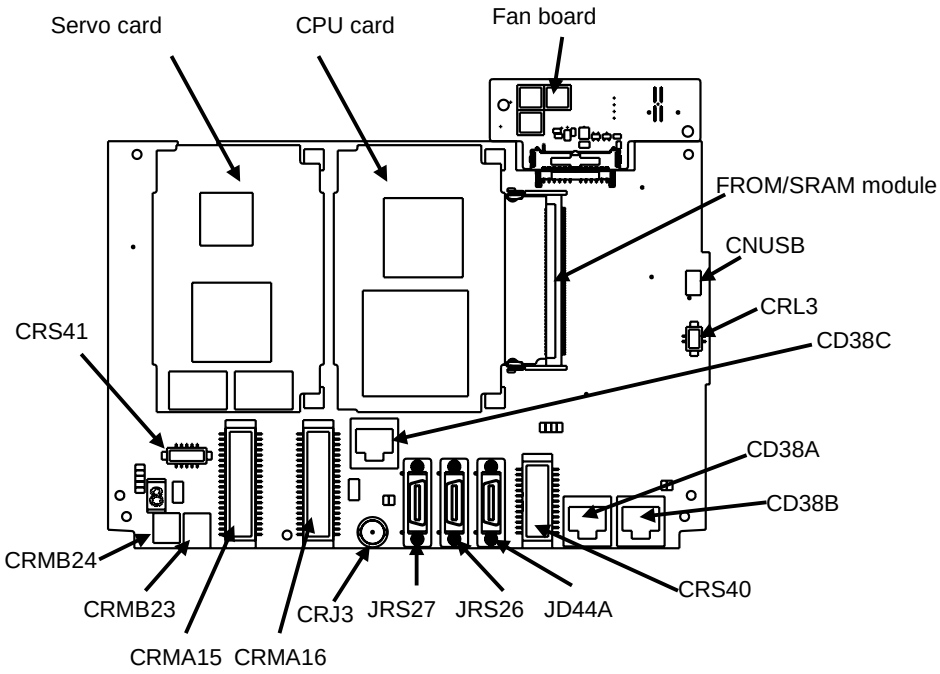


Main board (R-30*i*B Mate)

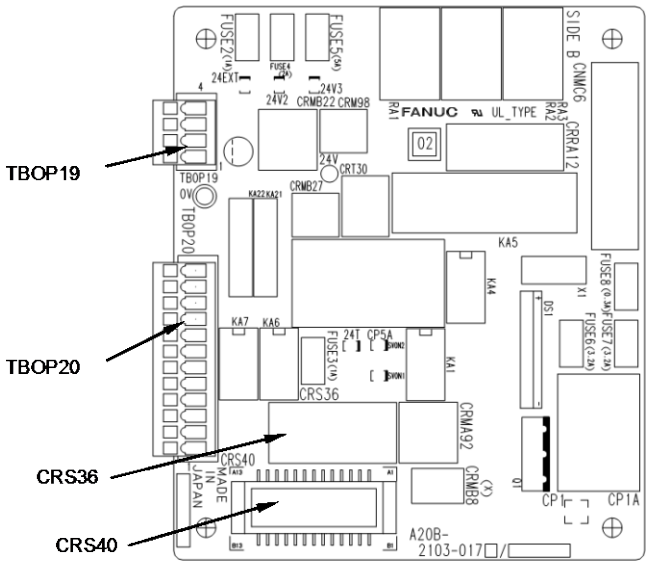


E-stop board (R-30*i*B Mate)


R-30iB Mate Plus
Main board
CRMB23
Panel switch
CD38A,CD38B,CD38C
Ethernet
CD38A/B 100BASE
CD38C 1000BASE
CRS41
Force Sensor、LVC
JRS27
Camera
JD44A
I/O Link i
JRS26
I/O Link
CRMA15,CRMA16
Peripheral device
CNUSB
USB
CRL3
HDI
CRJ3
Vision
CRS40
(TP)
E-stop board
CRS40
CRS36
Teach pendant
TBOP19,TBOP20
External emergency switch
/Fence

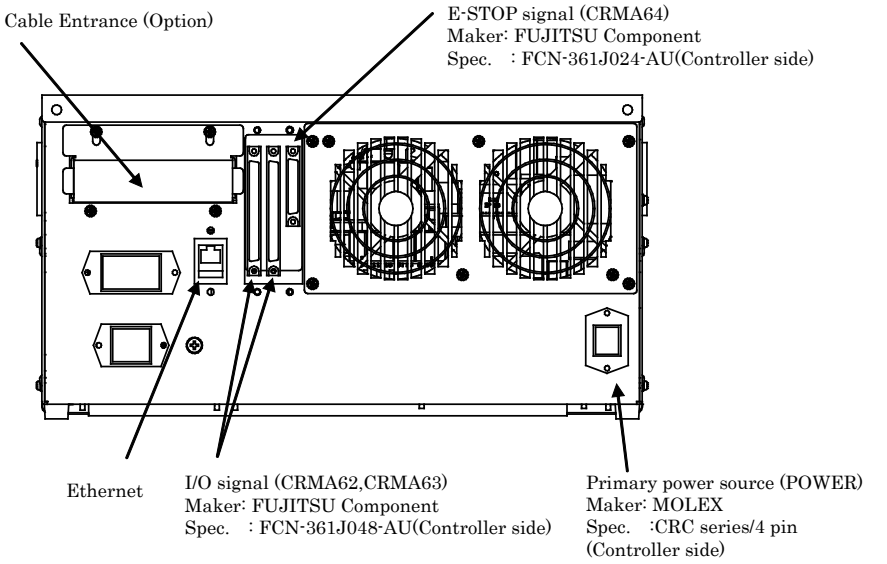


Main board (R-30*i*B Mate Plus)



E-stop board (R-30*i*B Mate Plus)

1.2 ELECTRICAL CONNECTION OF CONNECTOR PANEL (In case of controller with connector panel)



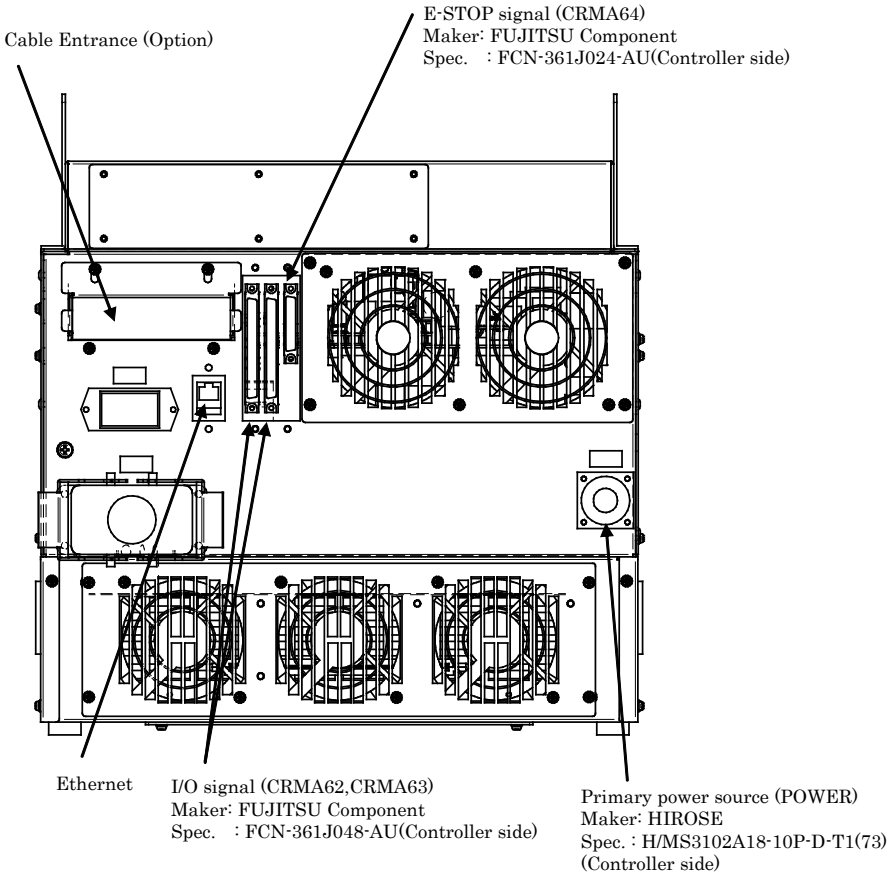


Fig.1.2 (a) Connector panel

Connector table (the connectors of the controller as seen from the connect surface)

CRMA62
DI/DO

	B	A
1	DO101	DI101
2	DO102	DI102
3	DO103	DI103
4	DO104	DI104
5	DO105	DI105
6	DO106	DI106
7	DO107	DI107
8	DO108	DI108
9		SDICOM1
10		DI109
11		DI110
12		DI111
13		DI112
14		DI113
15		DI114
16		DI115
17	DOSRC1	DI116
18	DOSRC1	DI117
19	0V	DI118
20	0V	DI119
21	24F	DI120
22	24F	SDICOM2
23	24F	0V
24	FG	0V

CRMA63
DI/DO

	B	A
1	DO109	*HOLD
2	DO110	RESET
3	DO111	START
4	DO112	ENBL
5	DO113	PNS1
6	DO114	PNS2
7	DO115	PNS3
8	DO116	PNS4
9	DO117	SDICOM3
10	DO118	
11	DO119	
12	DO120	
13	CMDENBL	
14	FAULT	
15	BATALM	
16	BUSY	
17	DOSRC2	
18	DOSRC2	
19	0V	
20	0V	
21	24F	
22	24F	
23	24F	0V
24	FG	0V

CRMA64
E-STOP

	B	A
1	EES1	ESPB1
2	EES11	ESPB11
3	EES2	ESPB2
4	EES21	ESPB21
5	EAS1	
6	EAS11	
7	EAS2	
8	EAS21	
9		EXT24V
10		INT24V
11		INT0V
12		EXT0V

POWER
(Small size controller)

	B	A
1	L	PE
2	N	

POWER
(Large size controller)

D	A
PE	L1
C	B
L3	L2

1.3 CONNECTING THE EXTERNAL EMERGENCY STOP

After connecting the safety signals like external emergency stop signal and/or safety fence signal, verify that,

・All safety signals stop the robot as intended.

・There is no mistake in connection of safety signals.

1.3.1 Connecting the External Emergency Stop

External emergency stop output

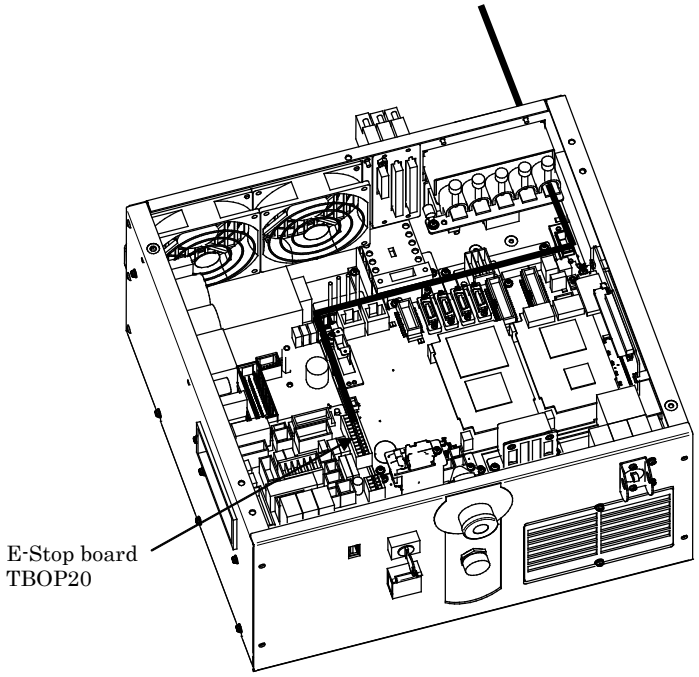


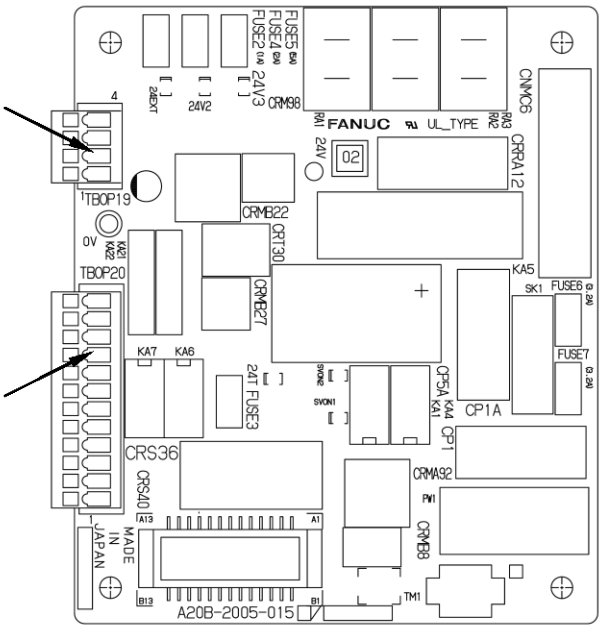
Fig.1.3.1 (a) Connection of the external emergency stop (In case of the controller without connector panel)

TBOP19

No.	Name
4	EXT0V
3	INT0V
2	INT24V
1	EXT24V

TBOP20

No.	Name	
12	E-STOP (ESPB)	21
11		2
10		11
9		1
8	FENCE (EAS)	21
7		2
6		11
5		1
4	EMGIN (EES)	21
3		2
2		11
1		1



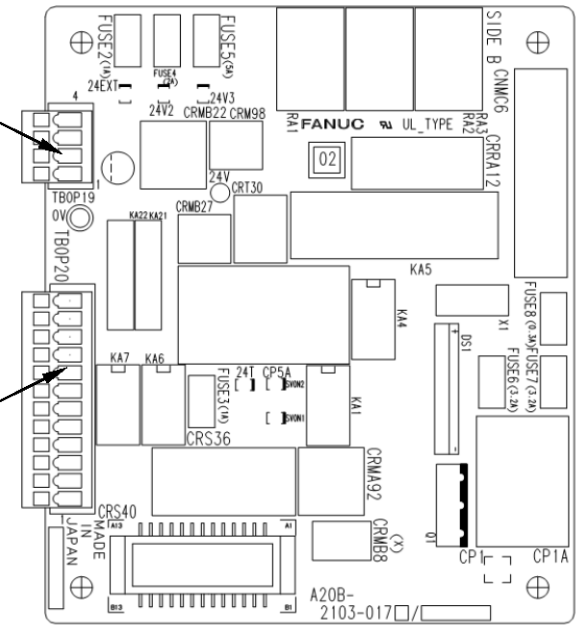
(R-30*i*B Mate)

TBOP19

No.	Name
4	EXT0V
3	INT0V
2	INT24V
1	EXT24V

TBOP20

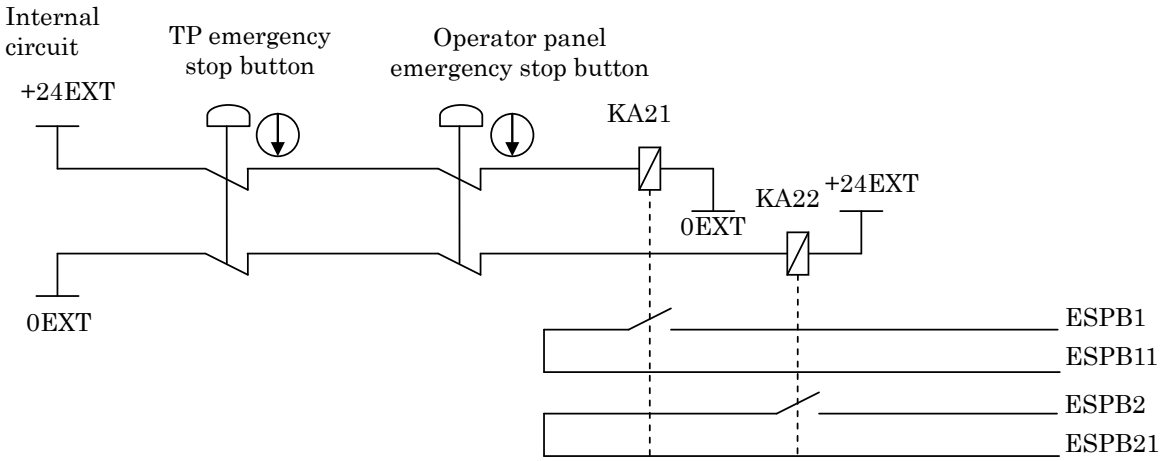
No.	Name	
12	E-STOP (ESPB)	21
11		2
10		11
9		1
8	FENCE (EAS)	21
7		2
6		11
5		1
4	EMGIN (EES)	21
3		2
2		11
1		1



(R-30*i*B Mate Plus)

Fig.1.3.1 (b) E-stop board

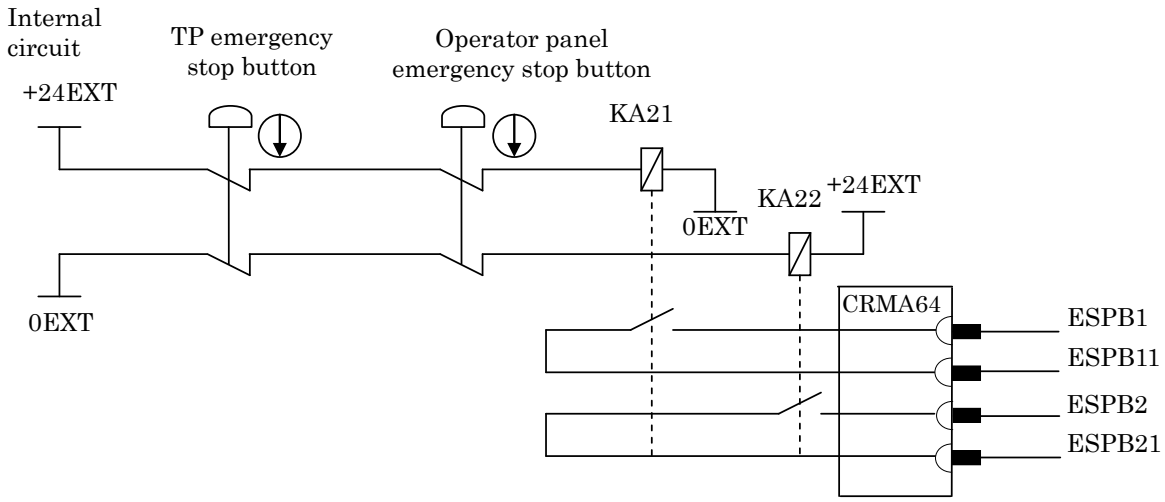
In case of the controller without connector panel



⚠WARNING

Robot controller does not detect the breakdown of the contact of the emergency stop output signal. Take countermeasures such as inspecting the duplicated contacts, or using a safety relay circuit that can detect the breakdown.

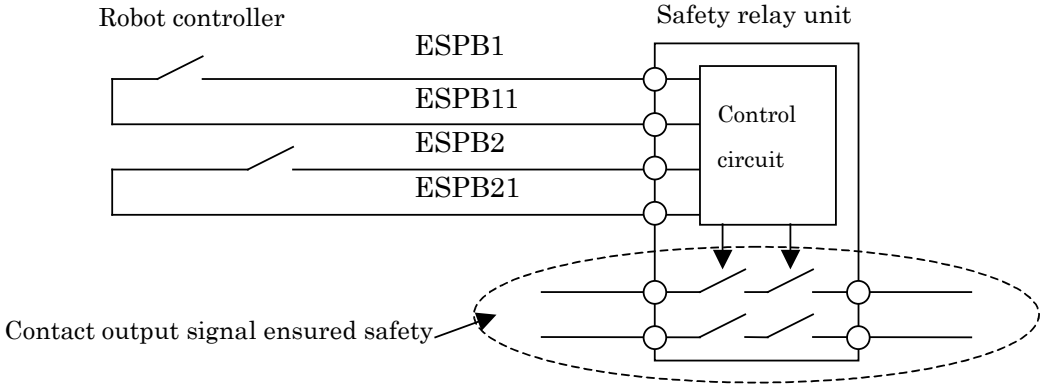
In case of the controller with connector panel



⚠WARNING
Robot controller does not detect the breakdown of the contact of the emergency stop output signal. Take countermeasures such as inspecting the duplicated contacts, or using a safety relay circuit that can detect the breakdown.

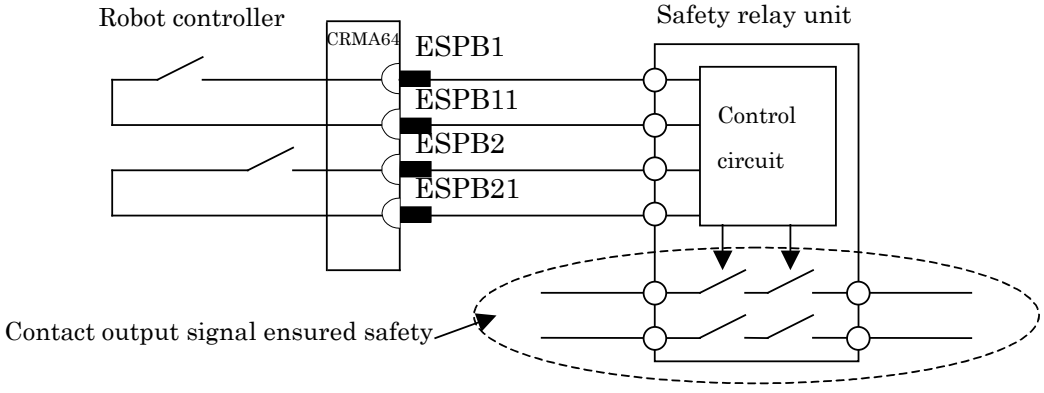
In case of the controller without connector panel

Example of the connection with the safety relay unit



In case of the controller with connector panel

Example of the connection with the safety relay unit



Signal	Description	Current, voltage	Min. load
ESPB1———ESPB11 ESPB2———ESPB21	The contact is open when one of the TP emergency stop button or the Operator panel emergency stop button is pressed. The contact is also open while the controller is powered off regardless of status of emergency stop buttons. By connecting external power supply to the emergency stop circuit, the contact works even while the robot controller is powered off. (See “External power connection” of this section) The contact is closed during normal operation.	Rated contact: 30 VDC, 5A resistor load	(Reference value) DC5V 10mA

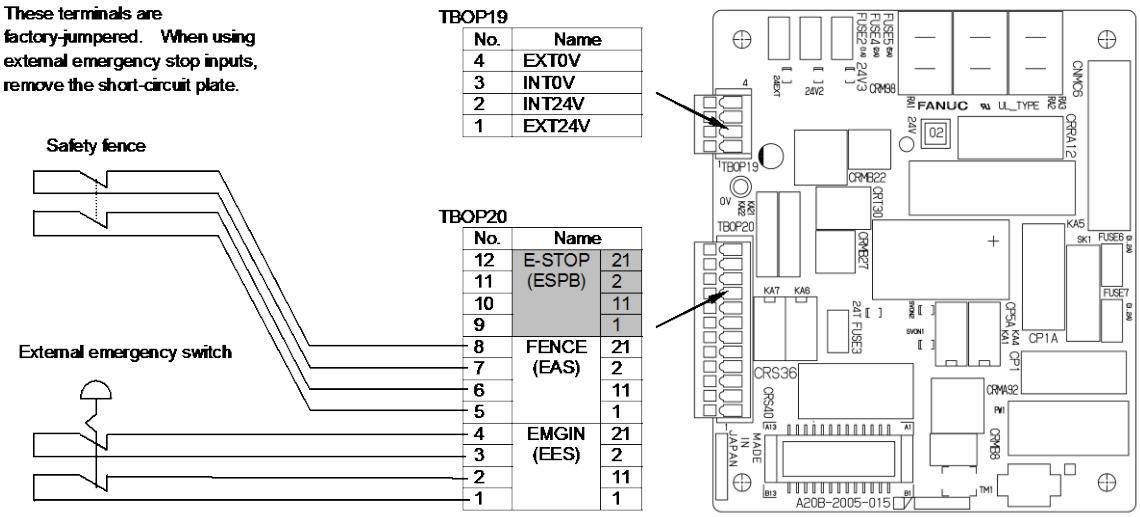
NOTE

For protection against the noise, the shielded cable is recommended for the connection cable.

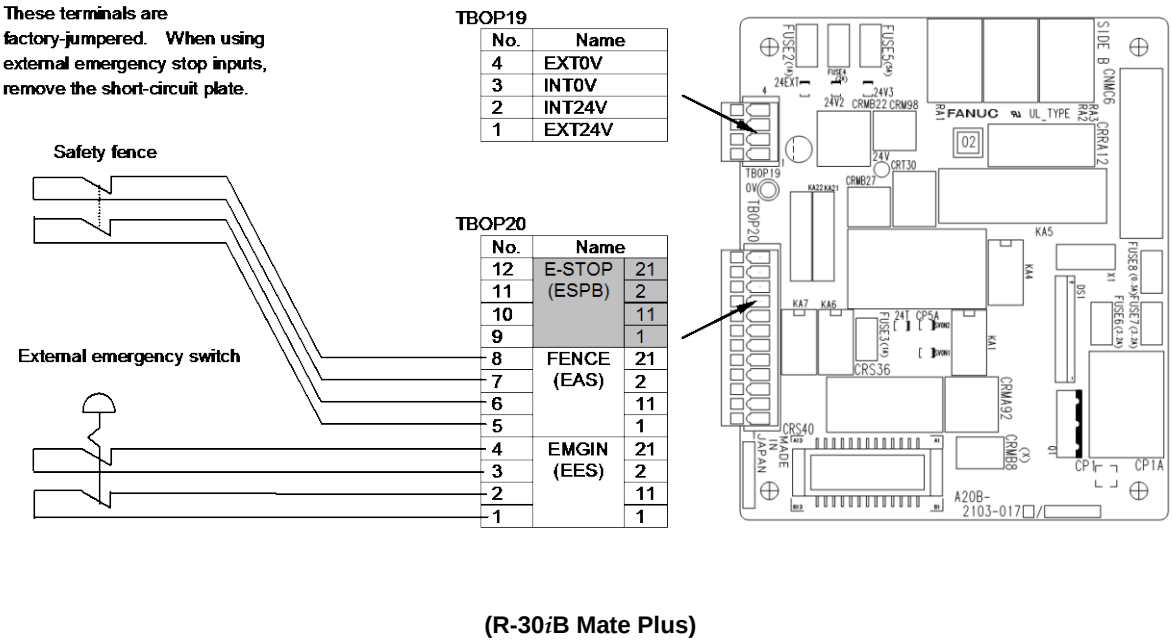
Cut part of the jacket of the cable to expose the shield , and fasten this part to the earth plate with the cable clamp.

External emergency stop input

In case of the controller without connector panel

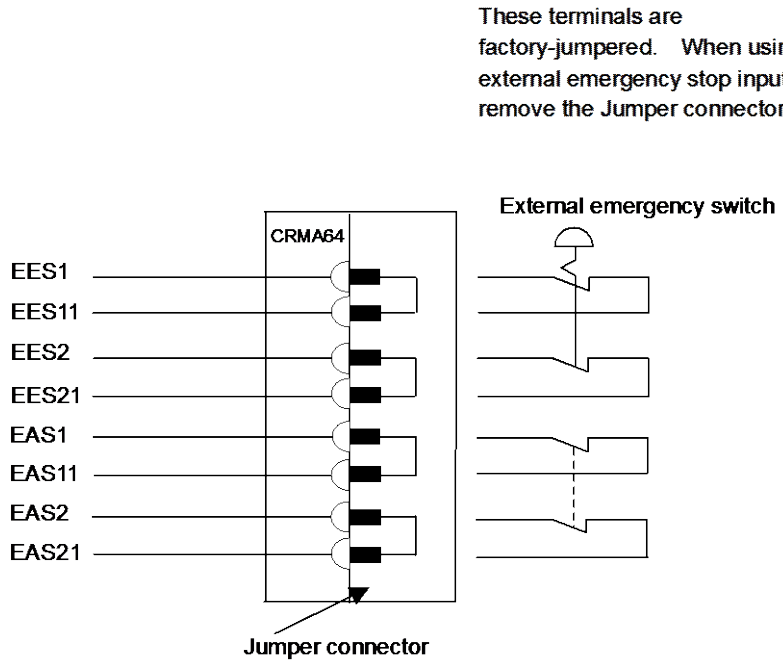


(R-30*i*B Mate)



(R-30*i*B Mate Plus)

In case of the controller with connector panel

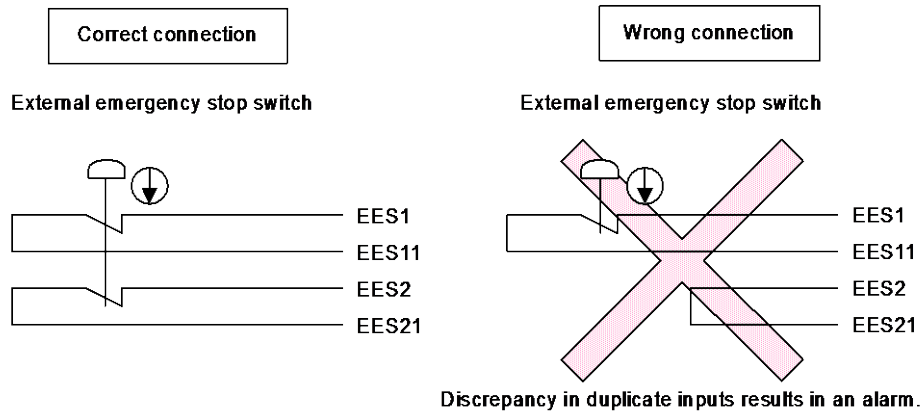


Signal	Description	Current, voltage
EES1 EES11 EES2 EES21	Connect the contacts of the external emergency stop switch to these terminals. When a contact is open, the servo power supply is turned off, and the robot is immediately placed in the emergency stop state. When using the contacts of a relay or contactor instead of the switch, connect a spark killer to the coil of the relay or contactor, to suppress noise. When these terminals are not used, jumper them.	Open and close of 24VDC 0.1A (Note)
EAS1 EAS11 EAS2 EAS21	These signals are used to stop the robot safely when the safety fence gate is opened during operation in the AUTO mode. When a contact is open, the robot decelerates then stops, and the servo power supply is turned off. In the T1 or T2 mode and the enabling device (deadman switch) is held correct position, the robot can be operated even when the safety fence gate is open. When using the contacts of a relay or contactor instead of the switch, connect a spark killer to the coil of the relay or contactor, to suppress noise. When these terminals are not used, jumper them.	Open and close of 24VDC 0.1A (Note)

NOTE
1. Use a contact whose minimum applicable load is 5 mA or less.
2. See Chapter 7 in SAFETY PRECAUTIONS.

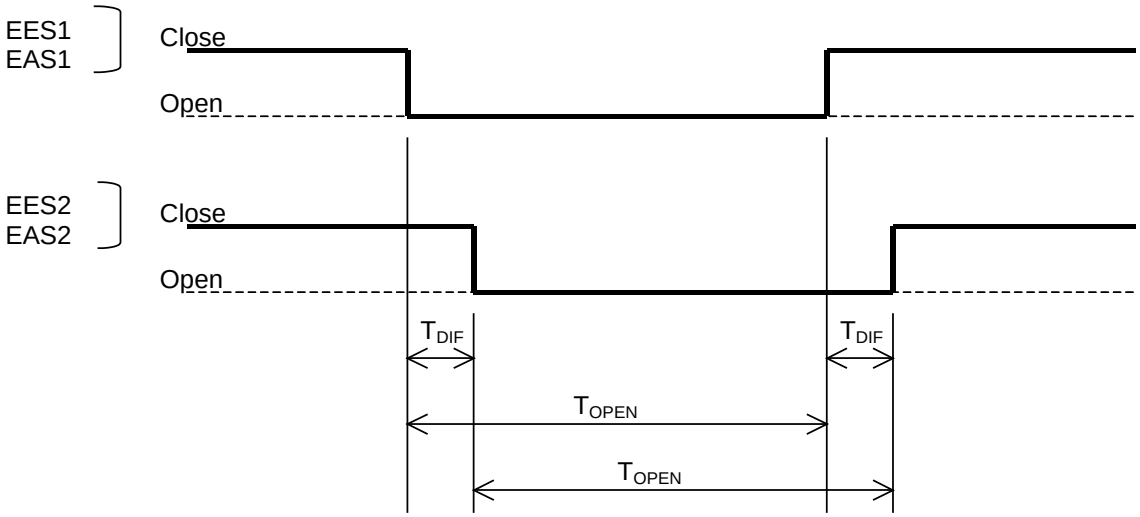
NOTE
For protection against the noise, the shielded cable is recommended for the connection cable.
Cut part of the jacket of the cable to expose the shield , and fasten this part to the earth plate with the cable clamp.

Examples of connection of duplicate safety signals



Input timing of duplicate safety signals

Duplicate inputs are used for signals such as the external emergency stop signal, safety fence signal, and servo off signal so that a response is made even when a single failure occurs. The statuses of these duplicate input signals must always be changed at the same timing according to the timing specifications provided in this section. The robot controller always checks that the statuses of the duplicate inputs are the same, and if the controller finds a discrepancy, it issues an alarm. If the timing specifications are not satisfied, an alarm may be issued because of a signal discrepancy.



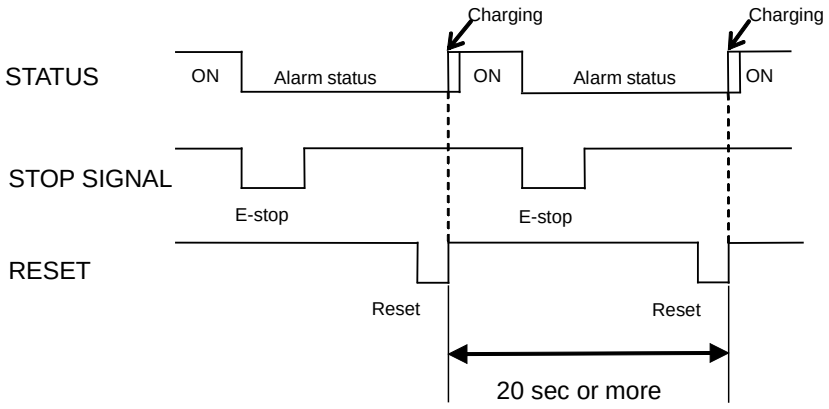
T_{DIF} (input time difference)< 200msec

T_{OPEN} (input hold period) > 2sec

Input timing of duplicate safety signals

The interval of reset signal

If reset is repeated within a short time, the charging circuit to the servo amplifier may break down. After reset, wait for at least 20 seconds before resetting again.



Re-reset interval after reset

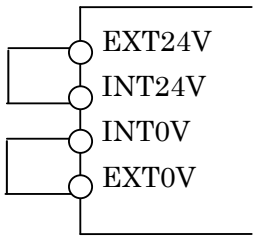
External power connection

The relays for emergency stop input and output can be separated from controller's power. Please connect external +24V instead of internal +24V, if emergency stop output must not be effected controller's power.

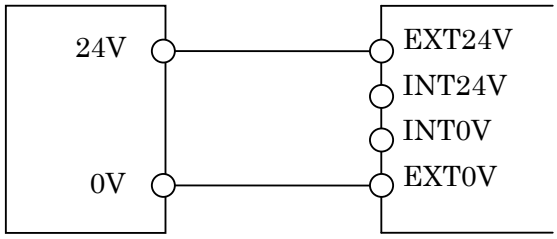
In case of the controller without connector panel

Example of the connection

In case of using the external power source	In case of using the external power source



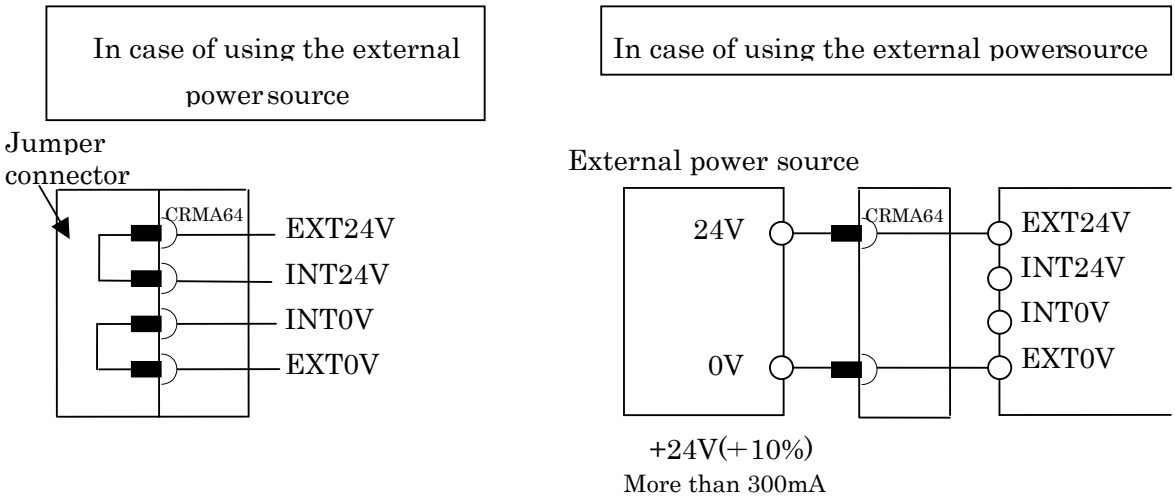
External power source



+24V(+10%)
More than 300mA

In case of the controller with connector panel

Example of the connection



NOTE
For protection against the noise, the shielded cable is recommended for the connection cable.
Cut part of the jacket of the cable to expose the shield, and fasten this part to the earth plate with the cable clamp.

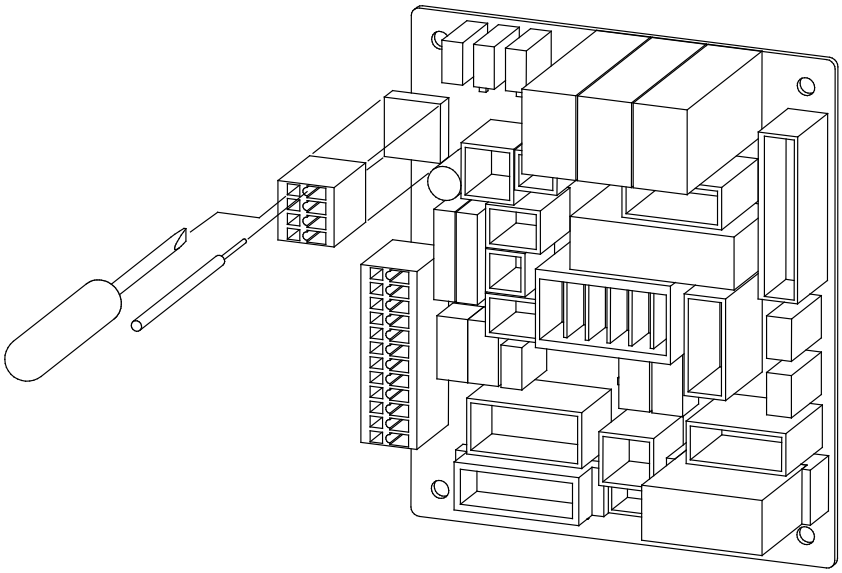
1.4 CONNECTING EXTERNAL ON/OFF AND EXTERNAL EMERGENCY STOP SIGNAL INPUT/OUTPUT WIRES

	FANUC's specification	Manufacturer's specification (WAGO)	Remark
4-pole terminal block (TBOP19)	A63L-0002-0154#104	734-104	
12-pole terminal block (TBOP20)	A63L-0002-0154#112	734-112	
Operation lever	A63L-0002-0154#230-M	734-230	2 pieces of 734-230 and operation manual are included in FANUC's specification

1. Detach the plug connector block from the emergency stop board.
2. Insert the tip of a flat-blade screwdriver into the manipulation slot and push down its handle.
3. Insert the end of the signal wire into the wire slot.
4. Pull out the screwdriver.
5. Attach the plug connector block to the emergency stop board.

⚠ CAUTION
Do not insert a wire into the wire hole of a plug connector or pull it out with the plug connector block mounted on the emergency stop board; otherwise, the emergency stop board may be damaged.

FANUC recommends the lever (A05B-2600-K030) for connecting the signal wire to the plug connector block instead of Flat-blade screwdriver.



1.5 ROBOT CONNECTION CABLES

> ⚠ **WARNING**
> Before operating the robot, uncoil the interconnection cables from their shipping position to prevent excessive heat, which may damage the cable shield (sheath) depending on the behavior of the robot.
> (Coiled part should be shorter than 10 meter.)

There are two types of the robot connection cable;
Non-flex type: usage is restricted to fixed laying
Flex type: possible to use in the cable carrier

Specification of cable

		Robot	Non-flex type			Flex type		
			Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)	Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)
RP1		M-2*i*A, M-3*i*A, DR-3*i*B	15.7	0.45	95	-	-	-
RM1			20.0	0.7	120	-	-	-
RMP	RP	LR Mate 200*i*D, M-1*i*A,ER-4*i*A, CR-4*i*A, CR-7*i*A, CR-14*i*A	14.2	0.31	86	20.5	0.71	200
	RM		15.5	0.315	93	15.5	0.56	200
EARTH		All models	4.7	0.065	30	4.7	0.065	200
R-30iB Camera cable		All models	-	-	-	8.0	0.12	200 (Flex) 60 (Non-flex)
R-30*i*B Plus Camera cable		All models	8.0	0.1	48	-	-	-

Using condition of flex type cable

(1) When routing cables in movable places, use a cable carrier.
(2) The bending radius (R) of the cable carrier is more than 200mm.
(3) The cable should be fixed to the cable carrier by using the clamp. (e.g. foam rubber)
(4) The size of the hole to support a cable in the cable carrier should be more than 110% of the cable size and should have the gap more than 3mm.
(5) When cables are laid in the cable carrier, pay attention for the cable not to be twisted.

Using condition of camera cable

(1) Do not kink the camera cable. Electrical characteristics may be degraded.
(2) In order to prevent connector deformation, before laying the camera cable, keep the minimum bending radius to avoid applying excessive vertical force.

Robot Model: LR Mate 200*i*D, ER-4*i*A, M-1*i*A, CR-4*i*A, CR-7*i*A, CR-14*i*A

Detail of cable connection to servo amplifier

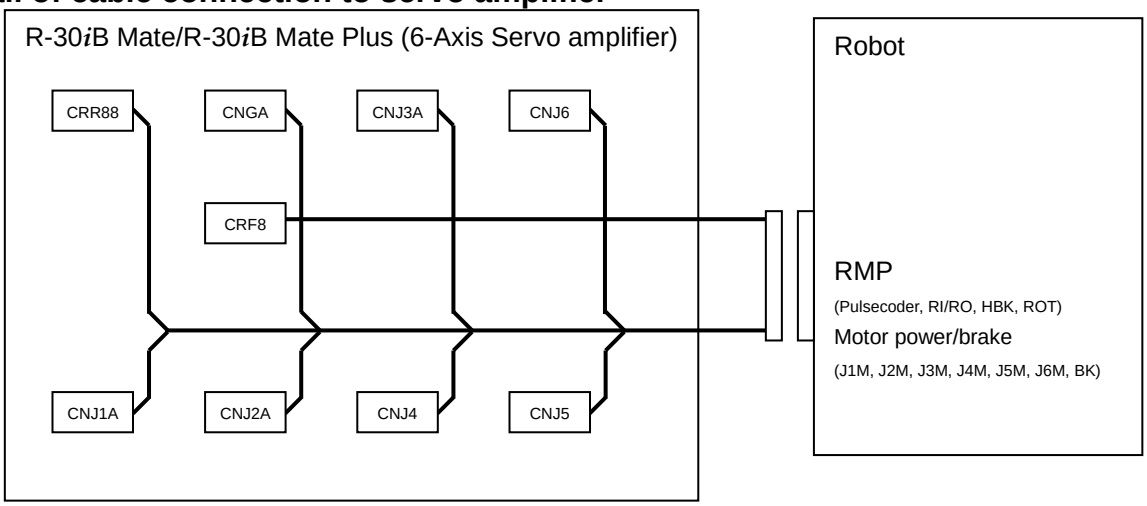


Fig.1.5 (a) Robot connection cable

Robot Model: M-2*i*A, M-3*i*A, DR-3*i*B

Detail of cable connection to servo amplifier

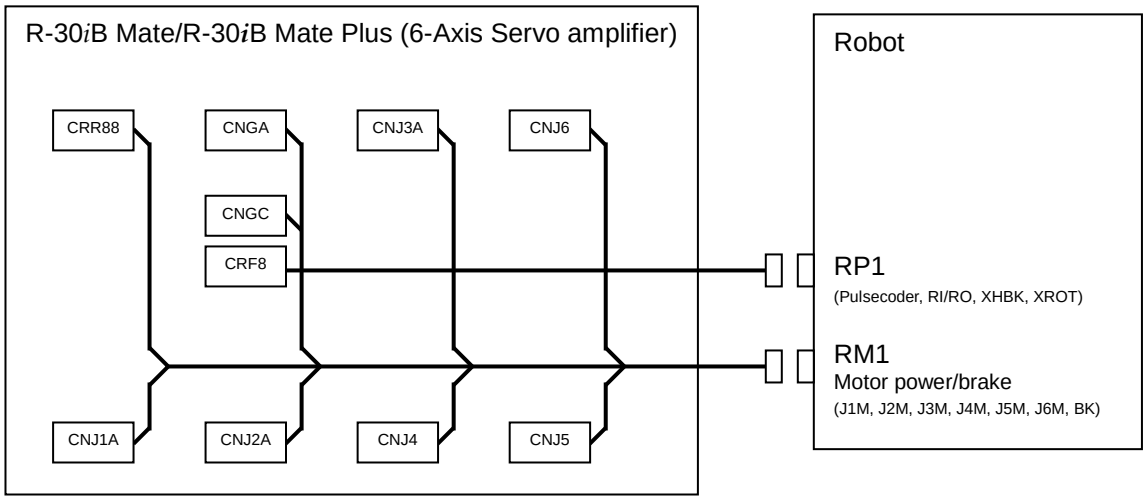


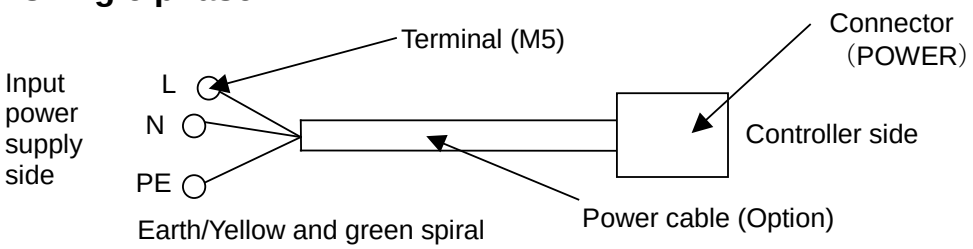
Fig.1.5 (b) Robot connection cable

1.6 CONNECTING THE INPUT POWER SUPPLY

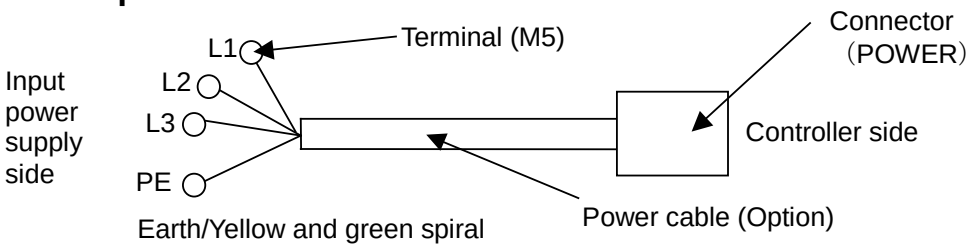
1.6.1 Power Cable (Option)

- Terminals are attached to the power cable.

In case of shingle phase



In case of three phase



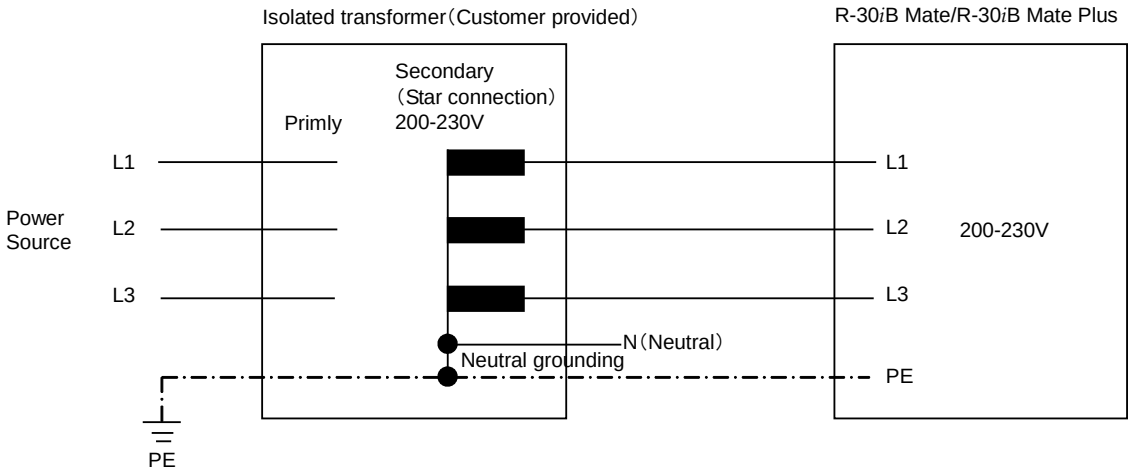
In case of the isolated transformer required (CE Controller)

- According to the voltage of the input power source, an isolated transformer should be required. Refer to table as shown as follow. If required, set up isolated transformer between input power source and controller.
- In case of CE controller, the output of transformer should be the star connection with neutral grounding.

Isolated transformer

Input power source	BASIC	NRTL	CE
200-230VAC single phase	No	No	No (*)
200-230VAC three phase	No	No	Yes
others	Yes	Yes	Yes

* In case of CE/single-phase controller, if this controller is connected to TT-power system, use the leakage breaker with sensitivity current of 30mA or more. (If the isolated transformer is installed, no leakage breaker is required). See the next part “Leakage breaker” about the leakage breaker.



> ⚠ **WARNING**
> In case of CE controller, the output of transformer should be the star connection with neutral grounding.

> **NOTE**
> Example of isolated transformer (In case of M-3*i*A)
> Manufacture: Rist Transformatorenbau GmbH
> Specification: 12kVA-400V200V-3UI210/73LK
> Capacity: 12kVA
> Output: AC200V

Leakage breaker

- The motor is driven by the PWM inverter system using a power transistor bridge. A high-frequency leakage current flows through the stray capacitance between the ground and the motor coils, power cable, and amplifier. This might cause the leakage-current circuit breaker or leakage-protection relay installed in the path of the power supply to cut out. Use the following leakage current circuit breaker for inverters to prevent incorrect operation.
- Leakage breaker using robot controller has sensitive electric current of 30mA.

Example of leakage current circuit breaker for inverters

Manufacture	Type
Fuji Electric Co., Ltd.	EG A series or later SG A series or later
Hitachi, Ltd.	ES100C type or later ES225C type or later
Matsushita Electric Works, Ltd.	Leakage current circuit breaker, C type or later Leakage current circuit breaker, KC type or later

1.7 PERIPHERAL DEVICE CONNECTION

1.7.1 DI/DO Connection (In case of controller with connector panel)

DI/DO connection

SDICOM1 to 3 signal are common selection signal for SDI.
When +24F common is used, connect to 0V.
When 0V common is used, connect to +24F.

SDICOM1 → Selects a common for DI101 to DI108.
SDICOM2 → Selects a common for DI109 to DI120.
SDICOM3 → Selects a common for XHOLD, RESET, START, ENBL, PNS1 to PNS4.

NOTE
1 The peripheral device connection cables are made by customer, connector for these cables are optional.
2 The DOSRC1 and DOSRC2 pins of the CRMA62 and CRMA63 are pins for supplying power to drivers. (None of these pins can be left open.)

DI/DO SIGNALS

There are 28 data inputs (DI) and 24 data outputs (DO) on controller main board.

NOTE
For the meaning of DI/DO signals, refer to Appendix C.

Table 1.7.1 (a) DI/DO signals (Controller with connector panel)

Connector number	Signal name	Standard I/O assignment			Description	Remarks
		UOP auto asg.: Simple(CRMA16)	UOP auto asg.: Full(CRMA16)	UOP auto asg.: None Full Full(Slave) Simple Simple(Slave)		
(DI signals)						
CRMA62-A1	DI101	DI[101]	UI[1] *IMSTP	DI[101]	Peripheral device status	General signal
CRMA62-A2	DI102	DI[102]	UI[2] *HOLD	DI[102]		
CRMA62-A3	DI103	DI[103]	UI[3] *SFSPD	DI[103]		
CRMA62-A4	DI104	DI[104]	UI[4] CSTOPI	DI[105]		
CRMA62-A5	DI105	DI[105]	UI[5] FAULT RESET	DI[105]		
CRMA62-A6	DI106	DI[106]	UI[6] START	DI[106]		
CRMA62-A7	DI107	DI[107]	UI[7] HONE	DI[107]		
CRMA62-A8	DI108	DI[108]	UI[8] ENBL	DI[108]		
CRMA62-A10	DI109	DI[109]	UI[9] RSR1/PNS1/STYLE1	DI[109]		
CRMA62-A11	DI110	DI[110]	UI[10] RSR2/PNS2/STYLE2	DI[110]		
CRMA62-A12	DI111	DI[111]	UI[11] RSR3/PNS3/STYLE3	DI[111]		
CRMA62-A13	DI112	DI[112]	UI[12] RSR4/PNS4/STYLE4	DI[112]		
CRMA62-A14	DI113	DI[113]	UI[13] RSR5/PNS5/STYLE5	DI[113]		
CRMA62-A15	DI114	DI[114]	UI[14] RSR6/PNS6/STYLE6	DI[114]		
CRMA62-A16	DI115	DI[115]	UI[15] RSR7/PNS7/STYLE7	DI[115]		
CRMA62-A17	DI116	DI[116]	UI[16] RSR8/PNS8/STYLE8	DI[116]		
CRMA62-A18	DI117	DI[117]	UI[17] PNSTROBE	DI[117]		
CRMA62-A19	DI118	DI[118]	UI[18] PROD START	DI[118]		
CRMA62-A20	DI119	DI[119]	DI[119]	DI[119]		
CRMA62-A21	DI120	DI[120]	DI[120]	DI[120]		
CRMA63-A1	*HOLD	UI[2] *HOLD	DI[81]	DI[81]	Temporary stop	
CRMA63-A2	RESET	UI[5] RESET	DI[82]	DI[82]	External reset	
CRMA63-A3	START	UI[6] START	DI[83]	DI[83]	Start	
CRMA63-A4	ENBL	UI[8] ENBL	DI[84]	DI[84]	Operation enabled	
CRMA63-A5	PNS1	UI[9] PNS1	DI[85]	DI[85]	Robot service request	
CRMA63-A6	PNS2	UI[10] PNS2	DI[86]	DI[86]		
CRMA63-A7	PNS3	UI[11] PNS3	DI[87]	DI[87]		
CRMA63-A8	PNS4	UI[12] PNS4	DI[88]	DI[88]		

Connector number	Signal name	Standard I/O assignment			Description	Remarks
		UOP auto asg.: Simple(CRMA16)	UOP auto asg.: Full(CRMA16)	UOP auto asg.: None Full Full(Slave) Simple Simple(Slave)		
(DO signals)						
CRMA62-B1	DO101	DO[101]	UO[1] CMDENBL	DO[101]	Peripheral device control signal	General signal
CRMA62-B2	DO102	DO[102]	UO[2] SYSRDY	DO[102]		
CRMA62-B3	DO103	DO[103]	UO[3] PROGRUN	DO[103]		
CRMA62-B4	DO104	DO[104]	UO[4] PAUSED	DO[104]		
CRMA62-B5	DO105	DO[105]	UO[5] HELD	DO[105]		
CRMA62-B6	DO106	DO[106]	UO[6] FAULT	DO[106]		
CRMA62-B7	DO107	DO[107]	UO[7] ATPERCH	DO[107]		
CRMA62-B8	DO108	DO[108]	UO[8] TPENBL	DO[108]		
CRMA63-B1	DO109	DO[109]	UO[9] BATALM	DO[109]		
CRMA63-B2	DO110	DO[110]	UO[10] BUSY	DO[110]		
CRMA63-B3	DO111	DO[111]	UO[11] ACK1/SNO1	DO[111]		
CRMA63-B4	DO112	DO[112]	UO[12] ACK2/SNO2	DO[112]		
CRMA63-B5	DO113	DO[113]	UO[13] ACK3/SNO3	DO[113]		
CRMA63-B6	DO114	DO[114]	UO[14] ACK4/SNO4	DO[114]		
CRMA63-B7	DO115	DO[115]	UO[15] ACK5/SNO5	DO[115]		
CRMA63-B8	DO116	DO[116]	UO[16] ACK6/SNO6	DO[116]		
CRMA63-B9	DO117	DO[117]	UO[17] ACK7/SNO7	DO[117]		
CRMA63-B10	DO118	DO[118]	UO[18] ACK8/SNO8	DO[118]		
CRMA63-B11	DO119	DO[119]	UO[19] SNACK	DO[119]		
CRMA63-B12	DO120	DO[120]	UO[20] Reserve	DO[120]		
CRMA63-B13	CMDENBL	UO[1] CMDENBL	DO[81]	DO[81]	During automatic operation	
CRMA63-B14	FAULT	UO[6] FAULT	DO[82]	DO[82]	Alarm	
CRMA63-B15	BATALM	UO[9] BATALM	DO[83]	DO[83]	Battery voltage drop	
CRMA63-B16	BUSY	UO[10] BUSY	DO[84]	DO[84]	During operation	

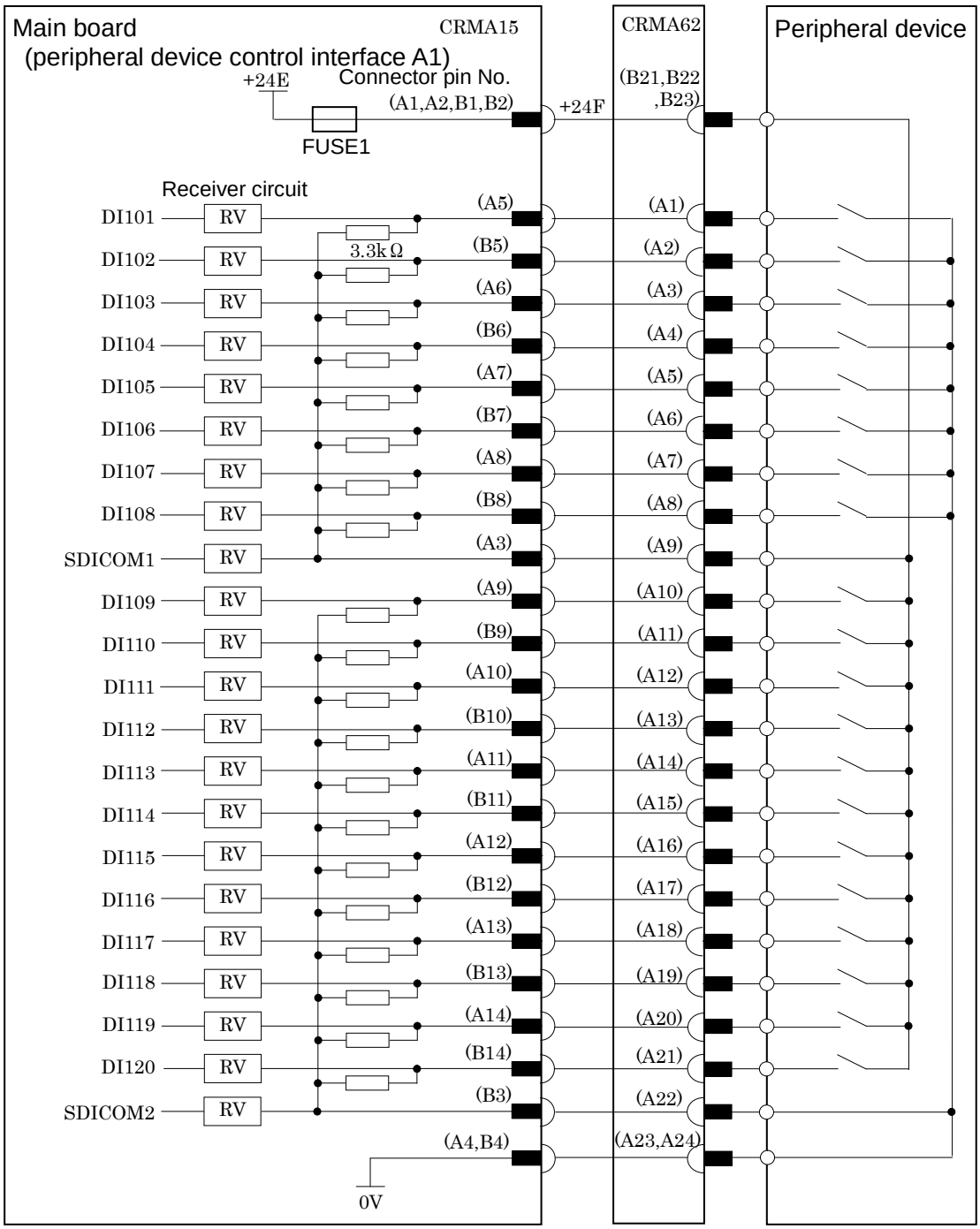


Fig.1.7.1 (a) DI/DO connection (1) (Controller with connector pane)

NOTE

DI signal's common can be changed by SDICOM connection.
This diagram shows (2) case of common connection. DI 101 to DI108 show that common voltage of input devices is 0V. DI 109 to DI120 show that common voltage of input devices is +24V.

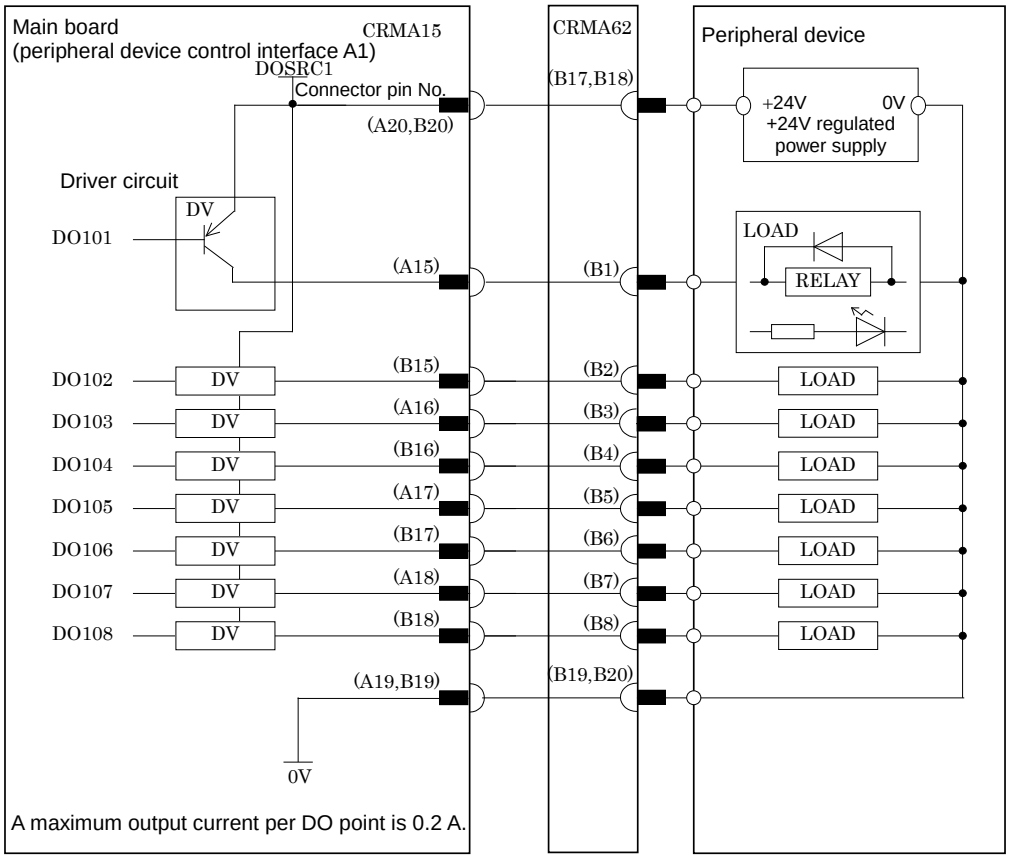


Fig.1.7.1 (b) DI/DO connection (2) (Controller with connector panel)

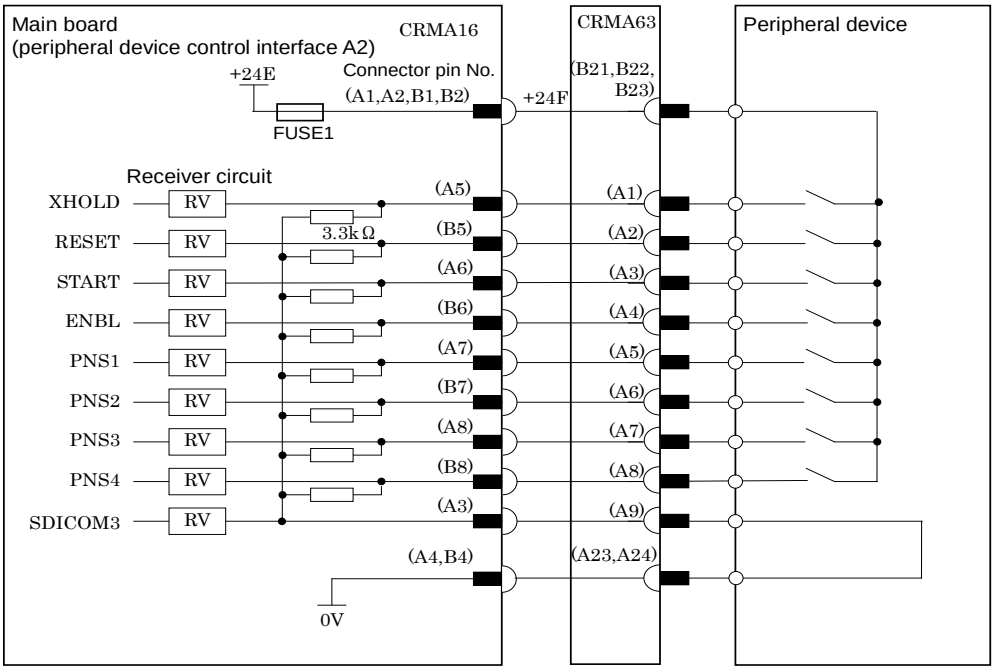


Fig.1.7.1 (c) DI/DO connection (3) (Controller with connector panel)

NOTE
In this diagram, common voltage of input devices is +24V.

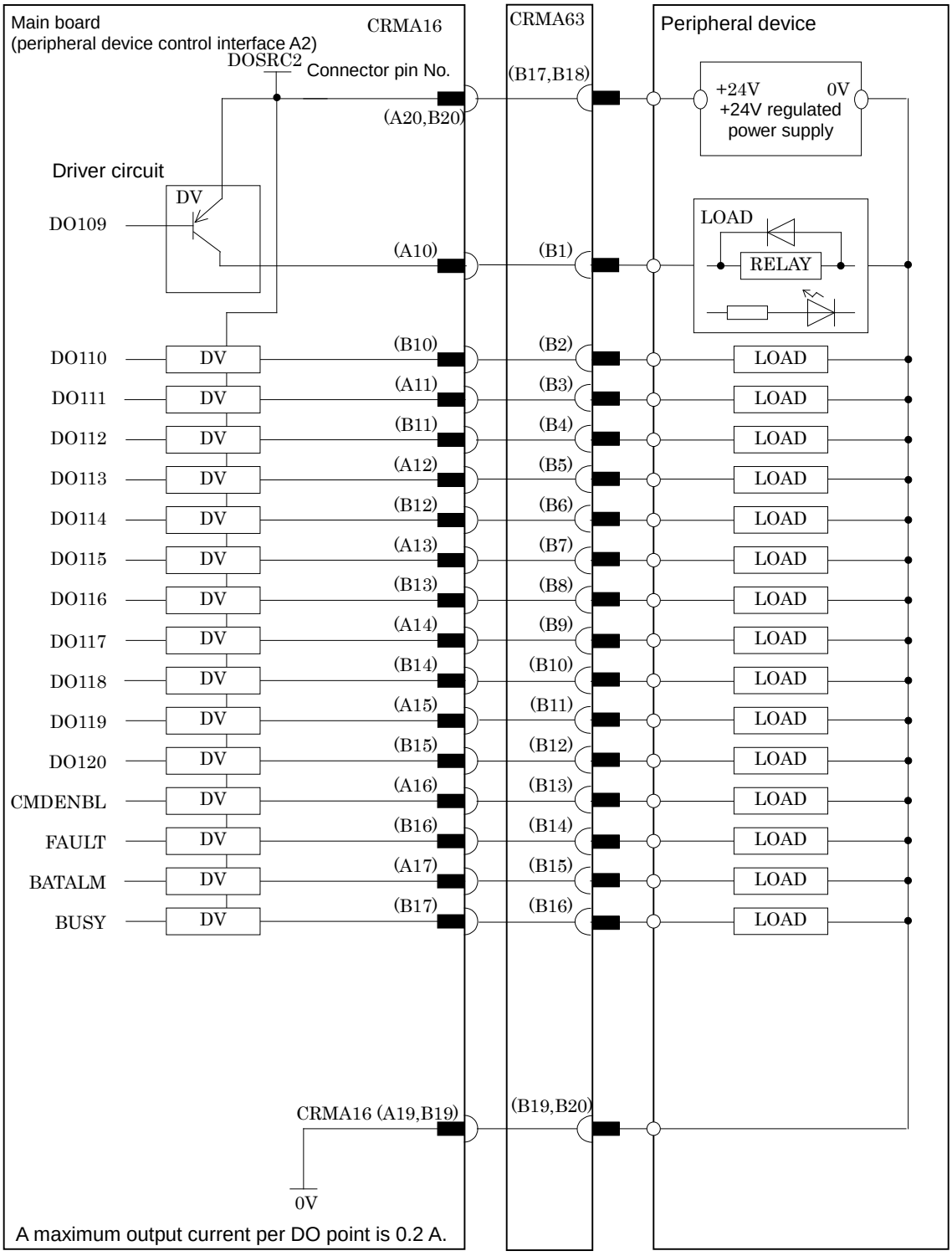


Fig.1.7.1 (d) DI/DO connection (4) (Controller with connector panel)

1.7.2 DI/DO Connection (In case of controller without connector panel)

DI/DO connection

SDICOM1 to 3 signal are common selection signal for SDI.
When +24F common is used, connect to 0V.
When 0V common is used, connect to +24F.

SDICOM1 → Selects a common for DI101 to DI108.
SDICOM2 → Selects a common for DI109 to DI120.
SDICOM3 → Selects a common for XHOLD, RESET, START, ENBL, PNS1 to PNS4.

NOTE
1 The peripheral device connection cables are optional.
2 The DOSRC1 and DOSRC2 pins of the CRMA15 and CRMA16 are pins for supplying power to drivers. (None of these pins can be left open.)

DI/DO SIGNALS

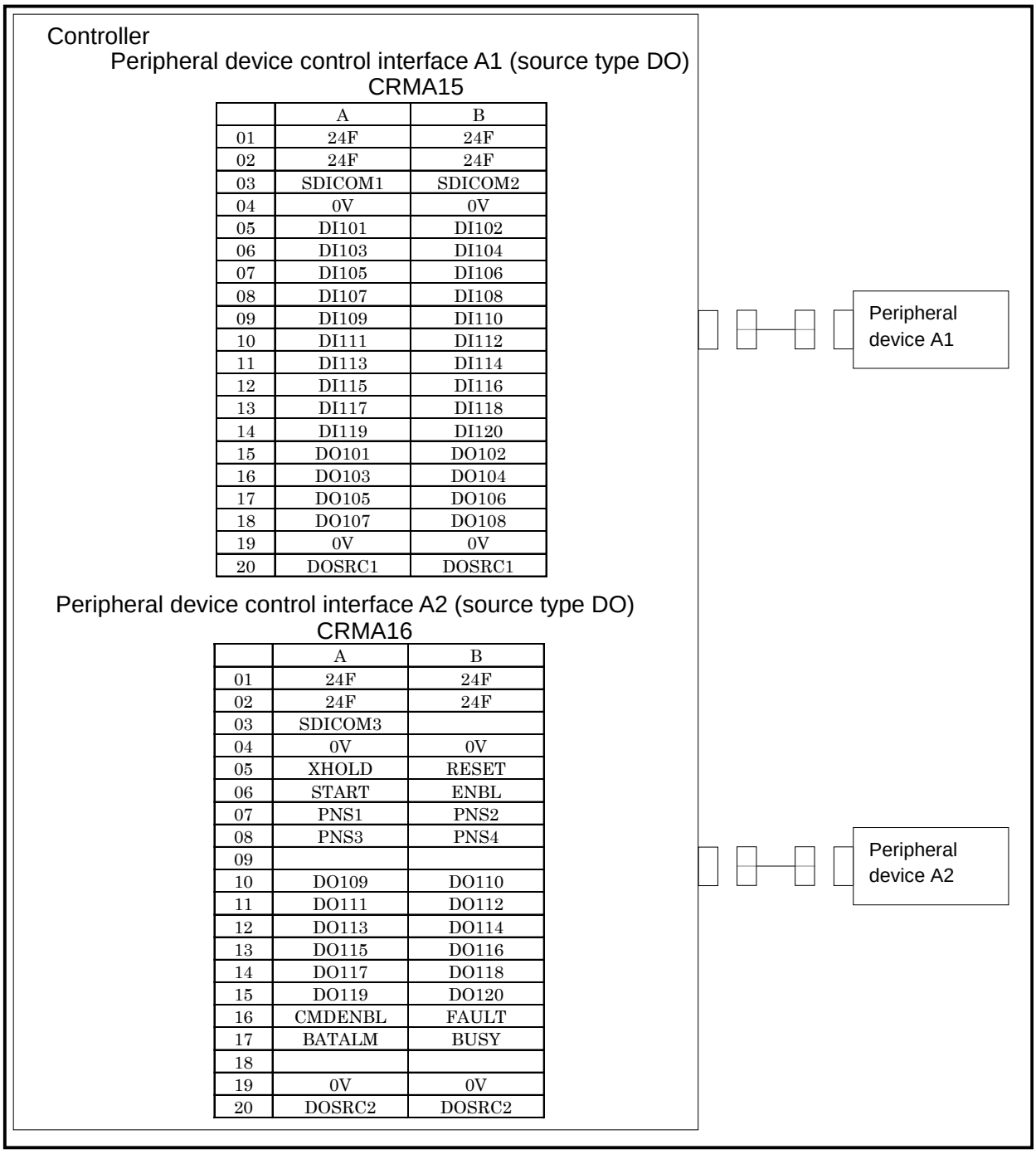
There are 28 data inputs (DI) and 24 data outputs (DO) on main board.

NOTE
For the meaning of DI/DO signals, refer to Appendix C.

Table 1.7.2 (a) DI/DO signals (Controller without connector panel)

Connector number	Signal name	Standard I/O assignment			Description	Remarks
		UOP auto asg.: Simple(CRMA16)	UOP auto asg.: Full(CRMA16)	UOP auto asg.: None Full Full(Slave) Simple Simple(Slave)		
(DI signals)						
CRMA15-A5	DI101	DI[101]	UI[1] *IMSTP	DI[101]	Peripheral device status	General signal
CRMA15-B5	DI102	DI[102]	UI[2] *HOLD	DI[102]		
CRMA15-A6	DI103	DI[103]	UI[3] *SFSPD	DI[103]		
CRMA15-B6	DI104	DI[104]	UI[4] CSTOPI	DI[105]		
CRMA15-A7	DI105	DI[105]	UI[5] FAULT RESET	DI[105]		
CRMA15-B7	DI106	DI[106]	UI[6] START	DI[106]		
CRMA15-A8	DI107	DI[107]	UI[7] HONE	DI[107]		
CRMA15-B8	DI108	DI[108]	UI[8] ENBL	DI[108]		
CRMA15-A9	DI109	DI[109]	UI[9] RSR1/PNS1/STYLE1	DI[109]		
CRMA15-B9	DI110	DI[110]	UI[10] RSR2/PNS2/STYLE2	DI[110]		
CRMA15-A10	DI111	DI[111]	UI[11] RSR3/PNS3/STYLE3	DI[111]		
CRMA15-B10	DI112	DI[112]	UI[12] RSR4/PNS4/STYLE4	DI[112]		
CRMA15-A11	DI113	DI[113]	UI[13] RSR5/PNS5/STYLE5	DI[113]		
CRMA15-B11	DI114	DI[114]	UI[14] RSR6/PNS6/STYLE6	DI[114]		
CRMA15-A12	DI115	DI[115]	UI[15] RSR7/PNS7/STYLE7	DI[115]		
CRMA15-B12	DI116	DI[116]	UI[16] RSR8/PNS8/STYLE8	DI[116]		
CRMA15-A13	DI117	DI[117]	UI[17] PNSTROBE	DI[117]		
CRMA15-B13	DI118	DI[118]	UI[18] PROD START	DI[118]		
CRMA15-A14	DI119	DI[119]	DI[119]	DI[119]		
CRMA15-B14	DI120	DI[120]	DI[120]	DI[120]		
CRMA16-A5	*HOLD	UI[2] *HOLD	DI[81]	DI[81]	Temporary stop	
CRMA16-B5	RESET	UI[5] RESET	DI[82]	DI[82]	External reset	
CRMA16-A6	START	UI[6] START	DI[83]	DI[83]	Start	
CRMA16-B6	ENBL	UI[8] ENBL	DI[84]	DI[84]	Operation enabled	
CRMA16-A7	PNS1	UI[9] PNS1	DI[85]	DI[85]	Robot service request	
CRMA16-B7	PNS2	UI[10] PNS2	DI[86]	DI[86]		
CRMA16-A8	PNS3	UI[11] PNS3	DI[87]	DI[87]		
CRMA16-B8	PNS4	UI[12] PNS4	DI[88]	DI[88]		

Connector number	Signal name	Standard I/O assignment			Description	Remarks
		UOP auto asg.: Simple(CRMA16)	UOP auto asg.: Full(CRMA16)	UOP auto asg.: None Full Full(Slave) Simple Simple(Slave)		
(DO signals)						
CRMA15-A15	DO101	DO[101]	UO[1] CMDENBL	DO[101]	Peripheral device control signal	General signal
CRMA15-B15	DO102	DO[102]	UO[2] SYSRDY	DO[102]		
CRMA15-A16	DO103	DO[103]	UO[3] PROGRUN	DO[103]		
CRMA15-B16	DO104	DO[104]	UO[4] PAUSED	DO[104]		
CRMA15-A17	DO105	DO[105]	UO[5] HELD	DO[105]		
CRMA15-B17	DO106	DO[106]	UO[6] FAULT	DO[106]		
CRMA15-A18	DO107	DO[107]	UO[7] ATPERCH	DO[107]		
CRMA15-B18	DO108	DO[108]	UO[8] TPENBL	DO[108]		
CRMA16-A10	DO109	DO[109]	UO[9] BATALM	DO[109]		
CRMA16-B10	DO110	DO[110]	UO[10] BUSY	DO[110]		
CRMA16-A11	DO111	DO[111]	UO[11] ACK1/SNO1	DO[111]		
CRMA16-B11	DO112	DO[112]	UO[12] ACK2/SNO2	DO[112]		
CRMA16-A12	DO113	DO[113]	UO[13] ACK3/SNO3	DO[113]		
CRMA16-B12	DO114	DO[114]	UO[14] ACK4/SNO4	DO[114]		
CRMA16-A13	DO115	DO[115]	UO[15] ACK5/SNO5	DO[115]		
CRMA16-B13	DO116	DO[116]	UO[16] ACK6/SNO6	DO[116]		
CRMA16-A14	DO117	DO[117]	UO[17] ACK7/SNO7	DO[117]		
CRMA16-B14	DO118	DO[118]	UO[18] ACK8/SNO8	DO[118]		
CRMA16-A15	DO119	DO[119]	UO[19] SNACK	DO[119]		
CRMA16-B15	DO120	DO[120]	UO[20] Reserve	DO[120]		
CRMA16-A16	CMDENBL	UO[1] CMDENBL	DO[81]	DO[81]	During automatic operation	
CRMA16-B16	FAULT	UO[6] FAULT	DO[82]	DO[82]	Alarm	
CRMA16-A17	BATALM	UO[9] BATALM	DO[83]	DO[83]	Battery voltage drop	
CRMA16-B17	BUSY	UO[10] BUSY	DO[84]	DO[84]	During operation	



	A	B
01	24F	24F
02	24F	24F
03	SDICOM1	SDICOM2
04	0V	0V
05	DI101	DI102
06	DI103	DI104
07	DI105	DI106
08	DI107	DI108
09	DI109	DI110
10	DI111	DI112
11	DI113	DI114
12	DI115	DI116
13	DI117	DI118
14	DI119	DI120
15	DO101	DO102
16	DO103	DO104
17	DO105	DO106
18	DO107	DO108
19	0V	0V
20	DOSRC1	DOSRC1

	A	B
01	24F	24F
02	24F	24F
03	SDICOM3	
04	0V	0V
05	XHOLD	RESET
06	START	ENBL
07	PNS1	PNS2
08	PNS3	PNS4
09		
10	DO109	DO110
11	DO111	DO112
12	DO113	DO114
13	DO115	DO116
14	DO117	DO118
15	DO119	DO120
16	CMDENBL	FAULT
17	BATALM	BUSY
18		
19	0V	0V
20	DOSRC2	DOSRC2

Fig.1.7.2 (a) DI/DO connection (1) (Controller without connector panel)

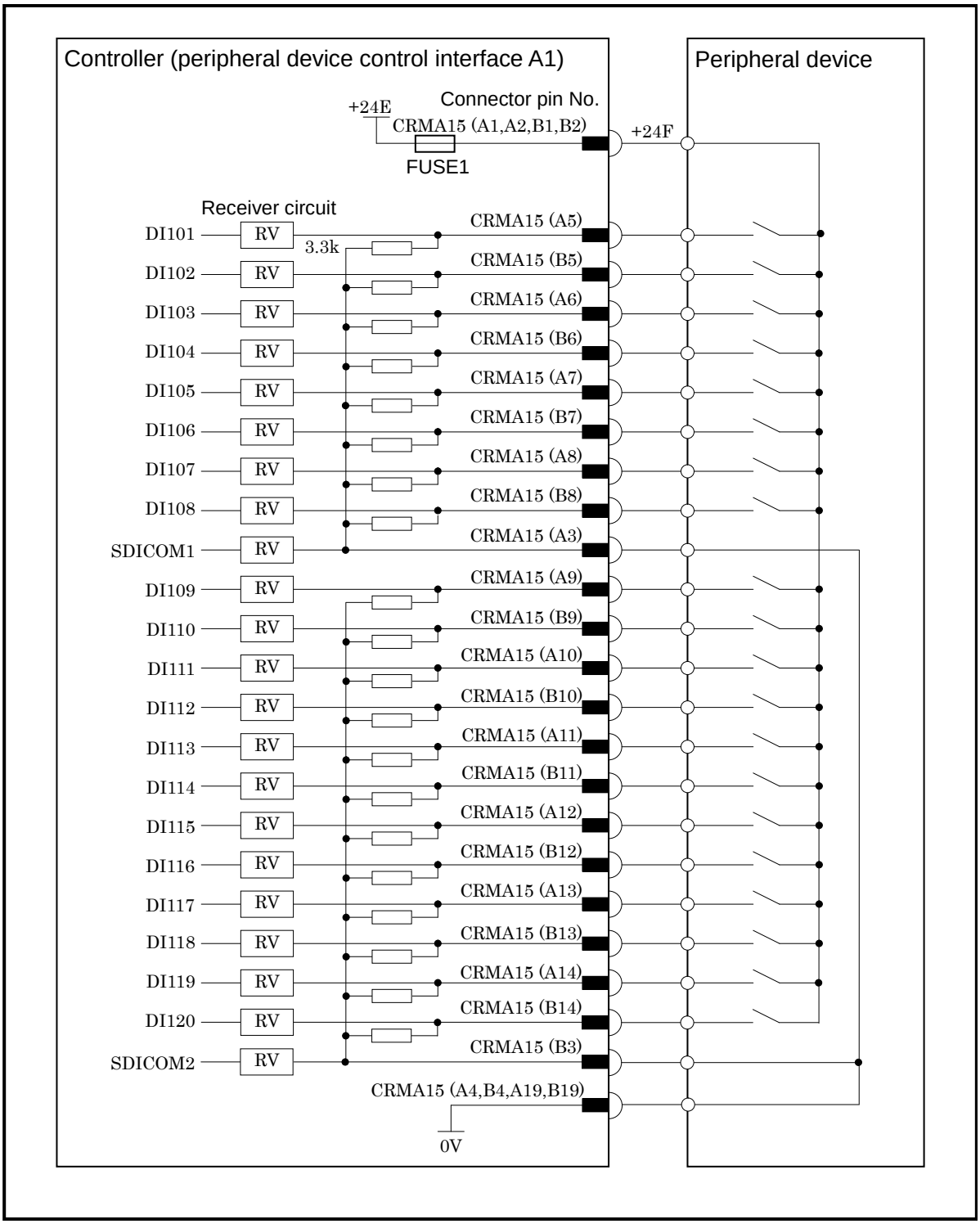


Fig.1.7.2 (b) DI/DO connection (2) (Controller without connector panel)

NOTE
In this diagram, common voltage of input devices is +24V.

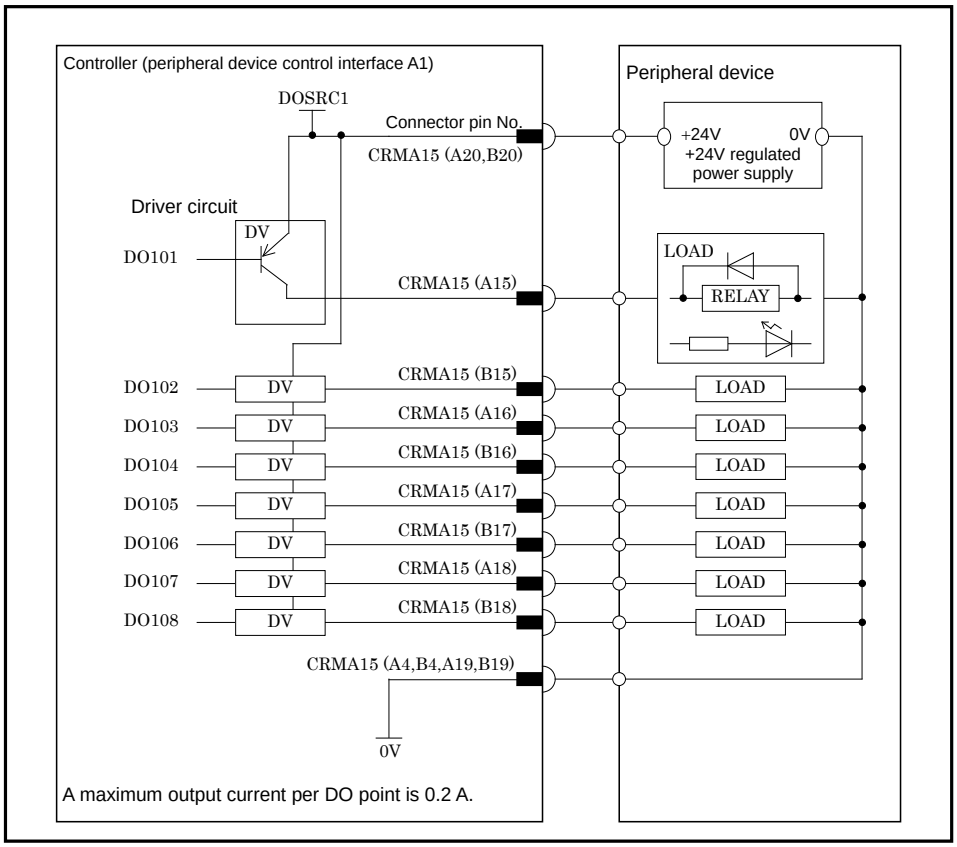


Fig.1.7.2 (c) DI/DO connection (3) (Controller without connector panel)

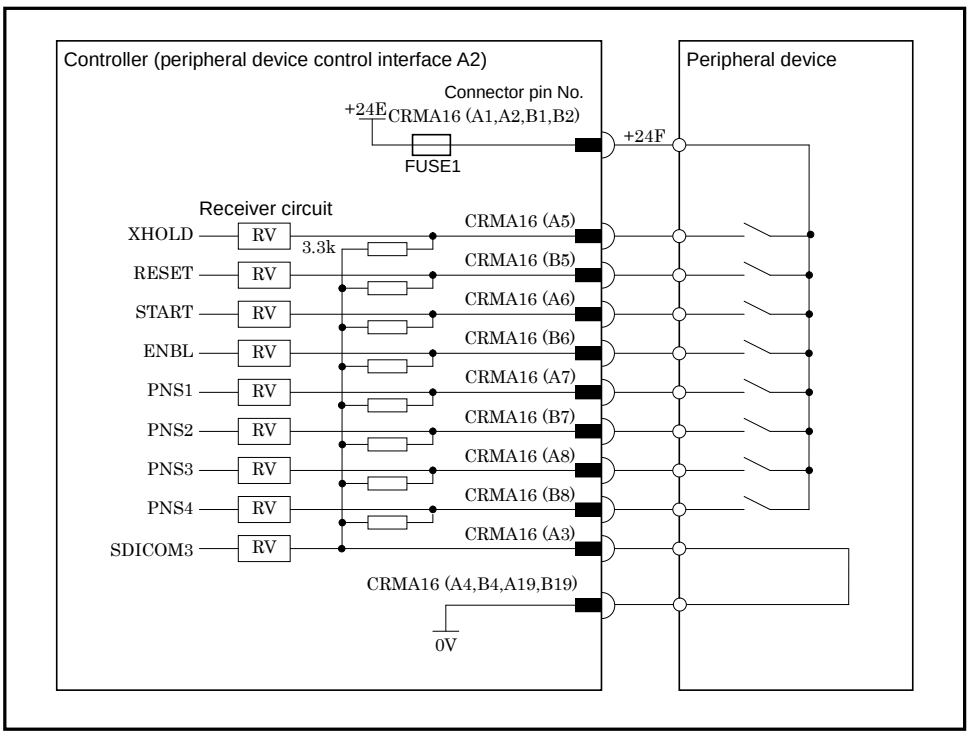


Fig.1.7.2 (d) DI/DO connection (4) (Controller without connector panel)

NOTE
In this diagram, common voltage of input devices is +24V.

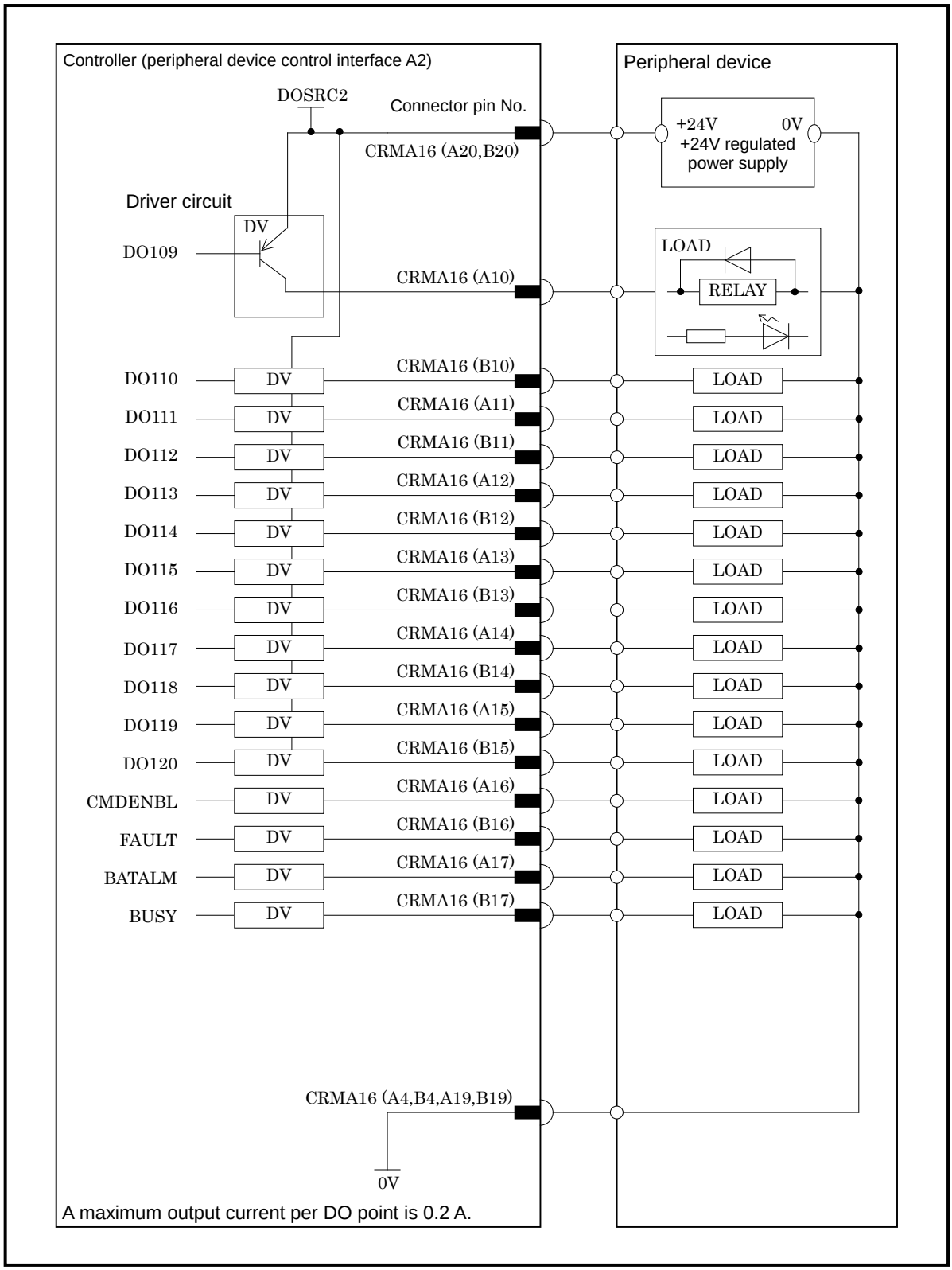


Fig.1.7.2 (e) DI/DO connection (5) (Controller without connector panel)

The following shows the connector interface of the optional peripheral device cables on the peripheral device side.

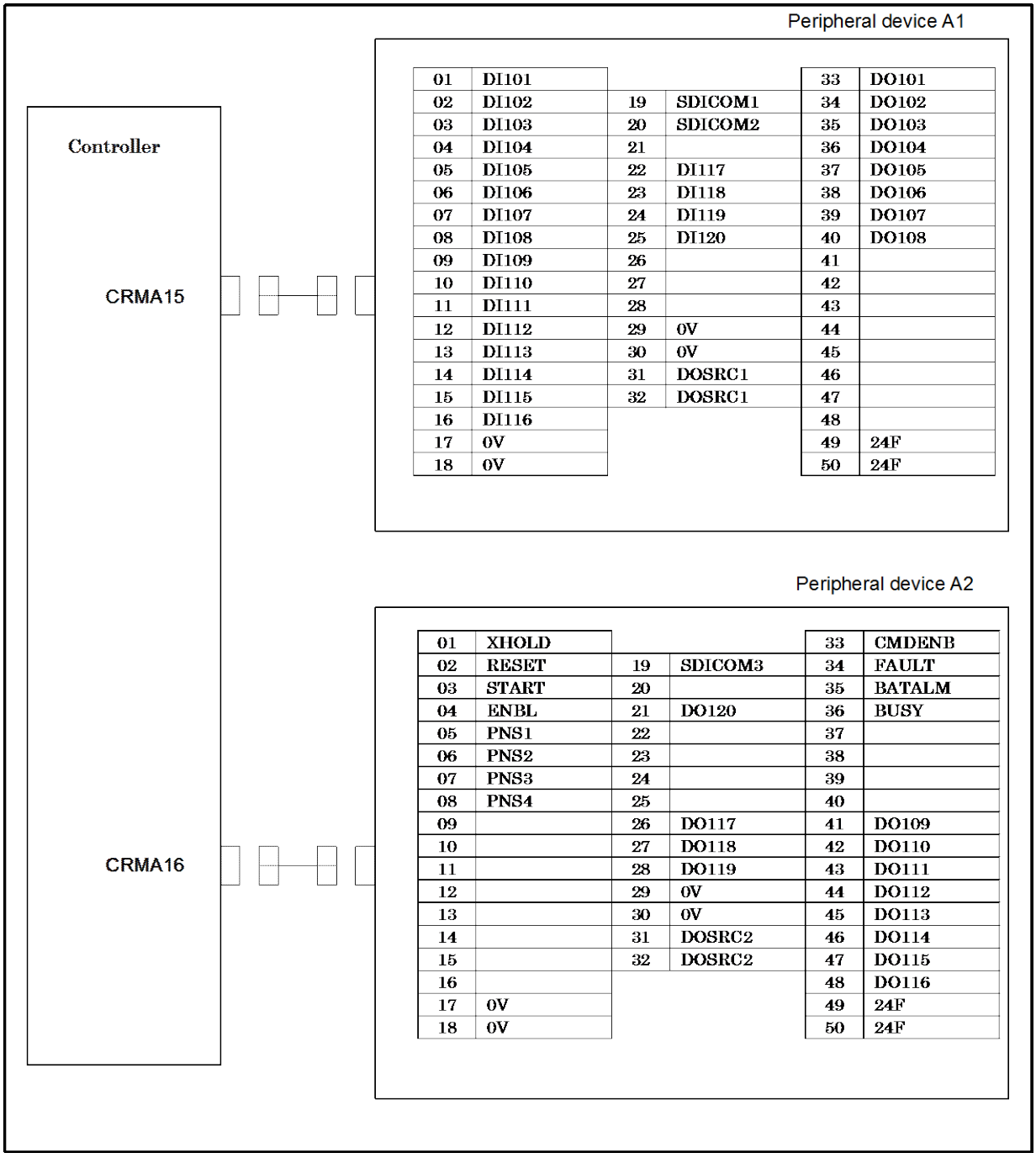


Fig.1.7.2 (f) DI/DO connection (6) (Controller without connector panel)

1.8 INTERFACE FOR EE(END EFFECTOR)

Connection-Between the Mechanical Unit and End Effector

Example of the EE interface of the robot

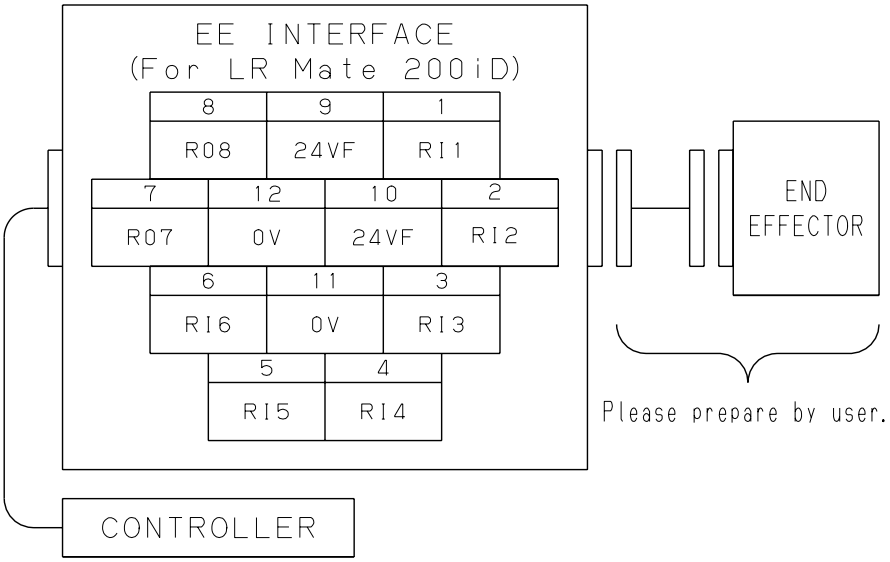
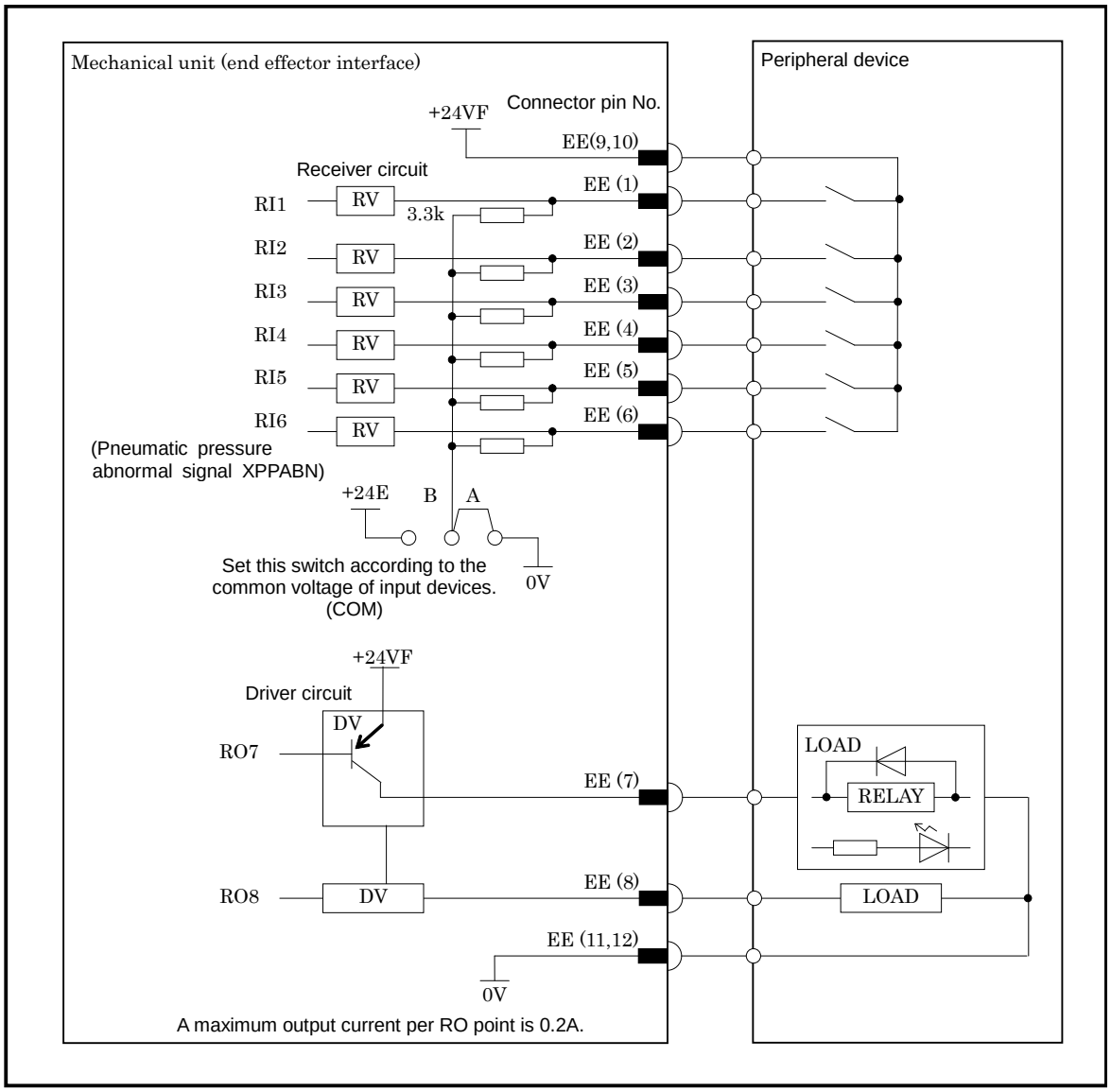


Fig.1.8 (a) End effector interface

NOTE
RO1 to RO6 are used as the on/off signals of the solenoid valve option.
For details, refer to the operator's manual of the mechanical unit.

NOTE
For EE interface figures other than the above, refer to the operator's manual of each robot.



NOTE
1 In this diagram, common voltage of input devices is +24V.
2 The common-level change-over switch (COM) is in the 6-axis servo amplifier.

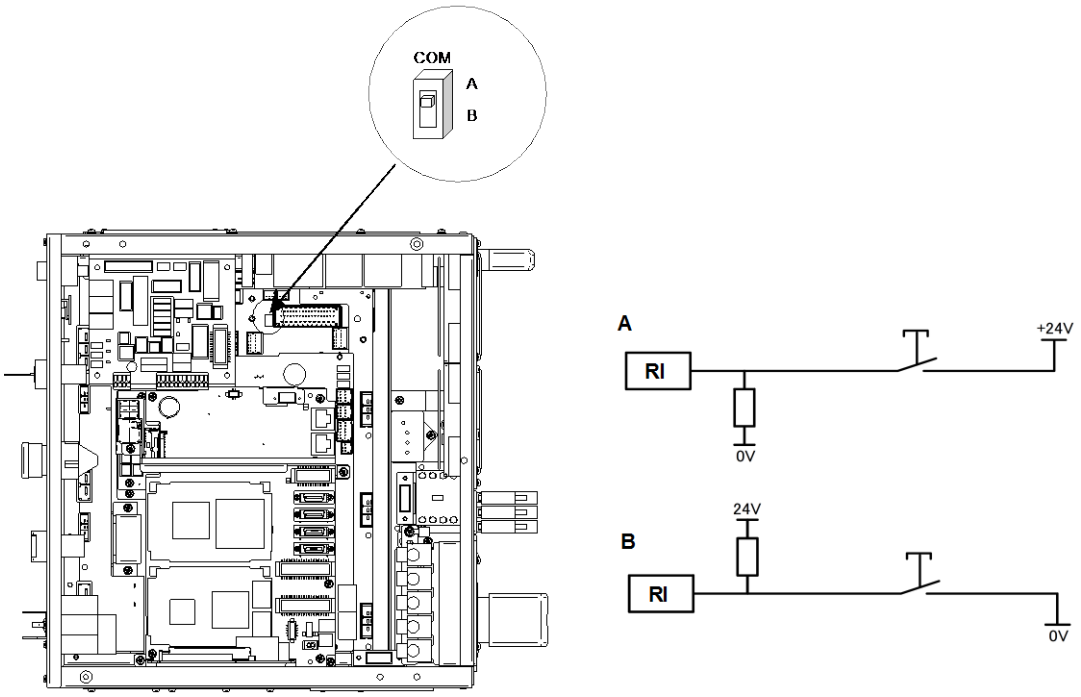


Fig.1.8 (b) Common-level change-over switch

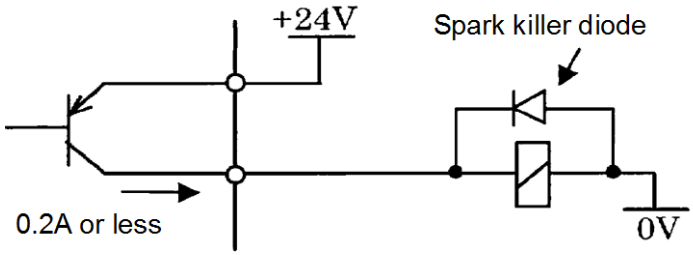
1.9 DIGITAL I/O SIGNAL SPECIFICATIONS

This section describes the specifications of the digital I/O signals interfaced with the peripheral device, end effector, and arc welder.

Peripheral device interface

(1) Output signals in peripheral device interface (Source type DO)

(a) Example of connection



(b) Electrical specifications
Maximum load current when driver is on: 200 mA (including momentary level)
Saturation voltage when driver is on: 1.0 V max.
Dielectric strength: 24 V ±20% (including momentary level)
Leakage current when driver is off: 100 μA

(c) The external power supply to output signals must satisfy the following:
Power supply voltage: +24 V ±10%
Power supply current:
For each printed circuit board of this type
(Total sum of maximum load currents including momentary levels + 100 mA or more)
Power-on timing:
At the same time when the controller is turned on or earlier
Power-off timing:

At the same time when the controller is turned off or later

(d) Spark killer diode
Rated peak reverse voltage : 100 V or more
Rated effective forward current : 1 A or more

(e) Driver for output signals
In the driver device, the current of each output signal is monitored, and when an overcurrent is detected, the relevant output is turned off. After an output has been turned off by overcurrent, the overcurrent state is released because the output is off, so the output on state is restored. Therefore, in the ground fault or overcurrent state, the output is turned on and off repeatedly. Such a condition is found also when a load with a high surge current is connected.
The driver device also includes an overheat detection circuit, which turns off all outputs of the device when the internal temperature of the device has increased as a result of a continued overcurrent state due to a ground fault of an output and so on. The outputs are held off, but their normal states can be restored by turning the power to the controller on and off after the internal temperature of the device has lowered.

(f) Note on use
When adding a relay, solenoid, or the like directly to the circuit, connect a diode for counter electromotive voltage protection in parallel to the load.

(g) Applicable signals

In case of controller with connector panel

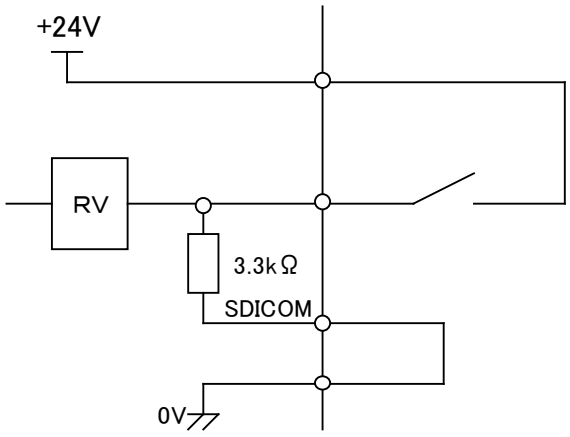
Output signals of CRMA62, CRMA63
CMDENBL, FAULT, BATALM, BUSY,
DO101 to DO120

In case of controller without connector panel

Output signals of main board CRMA15, CRMA16
CMDENBL, FAULT, BATALM, BUSY,
DO101 to DO120

(2) Input signals in peripheral device interface A

(a) Example of connection



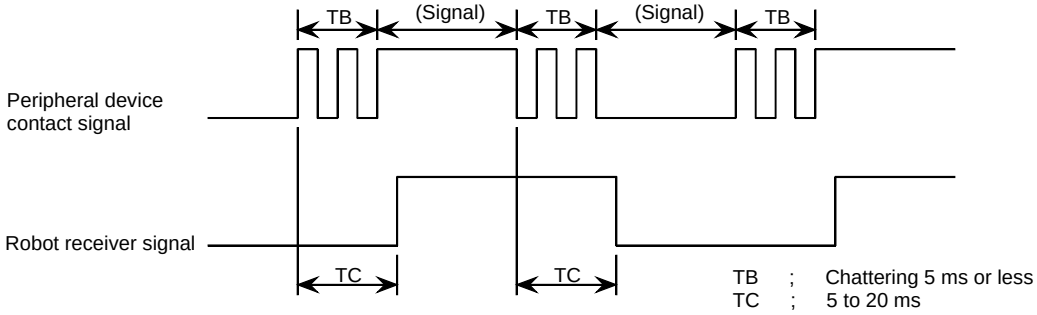
(b) Electrical specifications of the receiver

Type	: Grounded voltage receiver
Rated input voltage	: Contact close +20V to +28V
	: Contact open 0V to +4V
Maximum applied input voltage	: +28VDC
Input impedance	: 3.3kΩ (approx.)
Response time	: 5ms to 20ms

(c) specifications of the peripheral device contact

Rated contact capacity	: DC24V, 0.1A
	(Use a contact whose minimum applicable load is 5mA or less.)

Input signal width	: 200ms or more (on/off)
Chattering time	: 5ms or less
Closed circuit resistance	: 100Ω or less
Opened circuit resistance	: 100kΩ or more



(d) Note on use
Apply the +24 V power at the robot to the receiver.
However, the above signal specifications must be satisfied at the robot receiver.

(e) Applicable signals

In case of controller with connector panel

Input signals of CRMA62, CRMA63 and CRMA64
XHOLD, RESET, START, PNS1 to PNS4, ENBL
DI101 to DI120

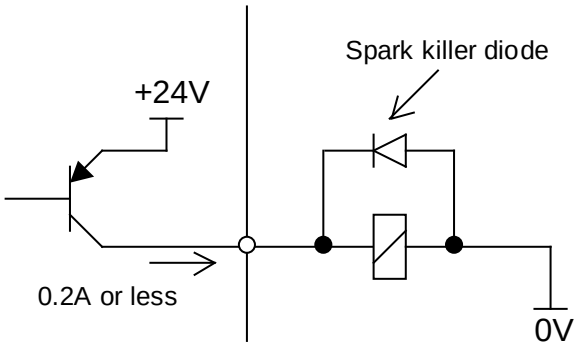
In case of controller without connector panel

Input signals of main board CRMA15 and CRMA16
XHOLD, RESET, START, PNS1 to PNS4, ENBL,
DI101 to DI120

EE(End effector) interface

(1) Output signals in EE interface

(a) Example of connection



(b) Electrical specifications

Maximum load current when driver is on:	200mA (including momentary level)
Saturation voltage when driver is on:	1.0V max.
Dielectric strength:	24V ±20% (including momentary level)
Leakage current when driver is off:	100μA

(c) Power supply to output signals
The +24V power supply on the robot side can be used if the total current level, including the current of the welding interface, is 0.7A or less.

(d) Driver for output signals
In the driver device, the current of each output signal is monitored, and when an overcurrent is detected, the relevant output is turned off. After an output has been turned off by overcurrent, the overcurrent state is released because the output is off, so the output on state is restored.

Therefore, in the ground fault or overcurrent state, the output is turned on and off repeatedly. Such a condition is found also when a load with a high surge current is connected.
The driver device also includes an overheat detection circuit, which turns off all outputs of the device when the internal temperature of the device has increased as a result of a continued overcurrent state due to a ground fault of an output and so on. The outputs are held off, but their normal states can be restored by turning the power to the controller on and off after the internal temperature of the device has lowered.

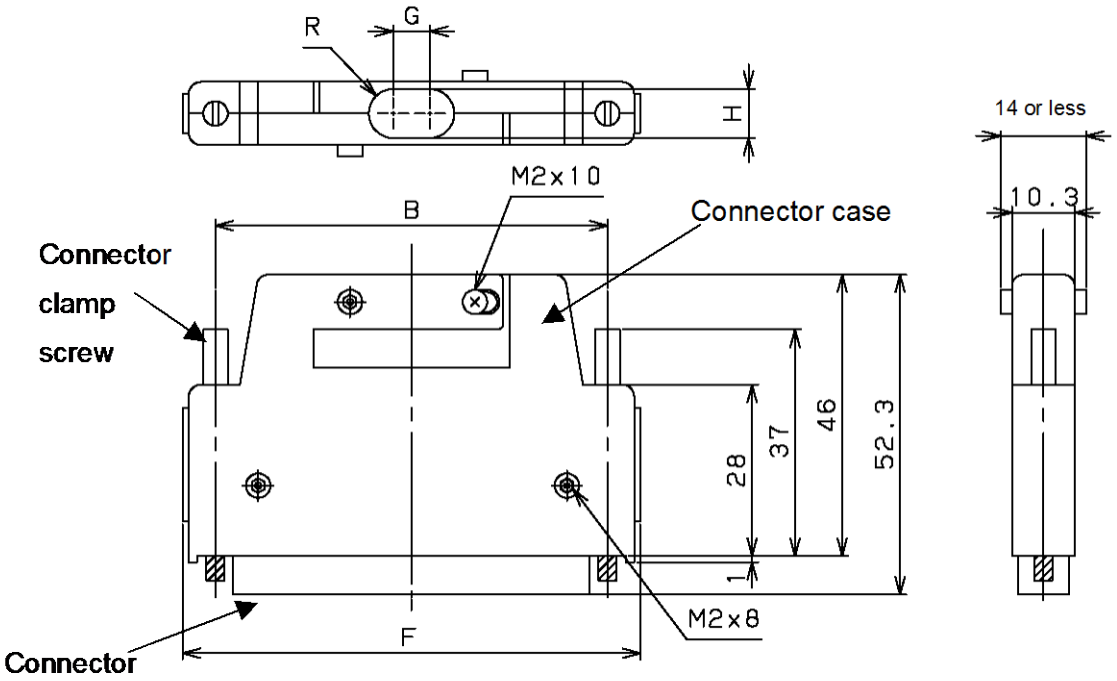
(e) Note on use
When adding a relay, solenoid, or the like directly to the circuit, connect a diode for counter electromotive voltage protection in parallel to the load.
When using a load, such as a lamp, that generates surge current when it is turned on, install a protection resistor.

(f) Applicable signals
RO1 to RO8

(2) Input signal in EE interface
The input signals are the same as other input signal interface.

(a) Applicable signals
RI1 to RI8, XHBK, XPPABN

1.10 I/O SIGNAL CONNECTOR (In case of controller with connector panel)



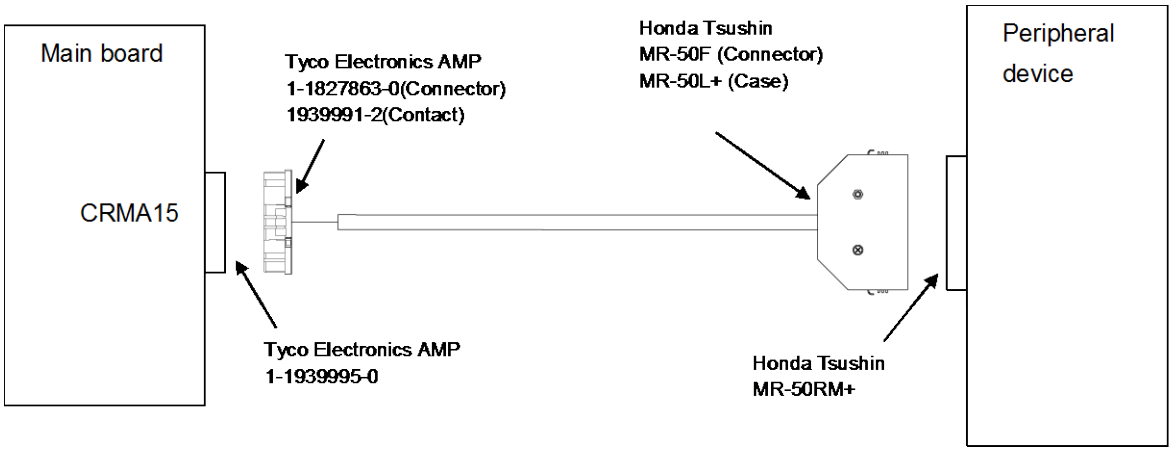
Connector specifications	Applicable interface	Dimensions					Remark
		B	F	G	H	R	
FCN-361P048-AU FCN-360C048-A	CRMA62	74.14	82.88	10.0	8.0	4.0	FUJITSU COMPONENT LIMITED,48 pins
FCN-361P048-AU FCN-360C048-A	CRMA63						FUJITSU COMPONENT LIMITED,48 pins
FCN-361P024-AU FCN-360C024-A	CRMA64	43.66	52.40	-	8.0	4.0	FUJITSU COMPONENT LIMITED,24 pins

・ Applicable wire size：AWG23 or less (ϕ 0.60 or less)

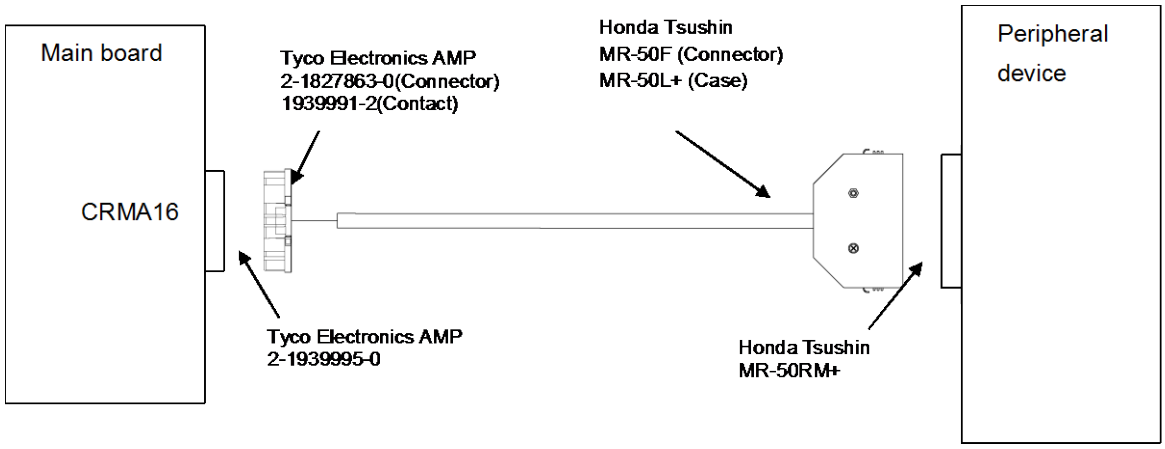
1.11 SPECIFICATIONS OF THE CABLES USED FOR PERIPHERAL DEVICES (In case of controller without connector panel)

If the customer manufactures cables, make sure they conform to the FANUC standard cables described in this section.
(See the description in "Peripheral Device Interface" in this manual for the specifications of the FANUC standard cables.)

1.11.1 Peripheral Device Interface A1 Cable (CRMA15: Tyco Electronics AMP, 40 pins)



1.11.2 Peripheral Device Interface A2 Cable (CRMA16: Tyco Electronics AMP, 40 pins)



1.11.3 Peripheral Device Connection Cable (Controller without connector panel)

Fig.1.11.3 (a) shows the connection of the peripheral device cable in the cabinet.

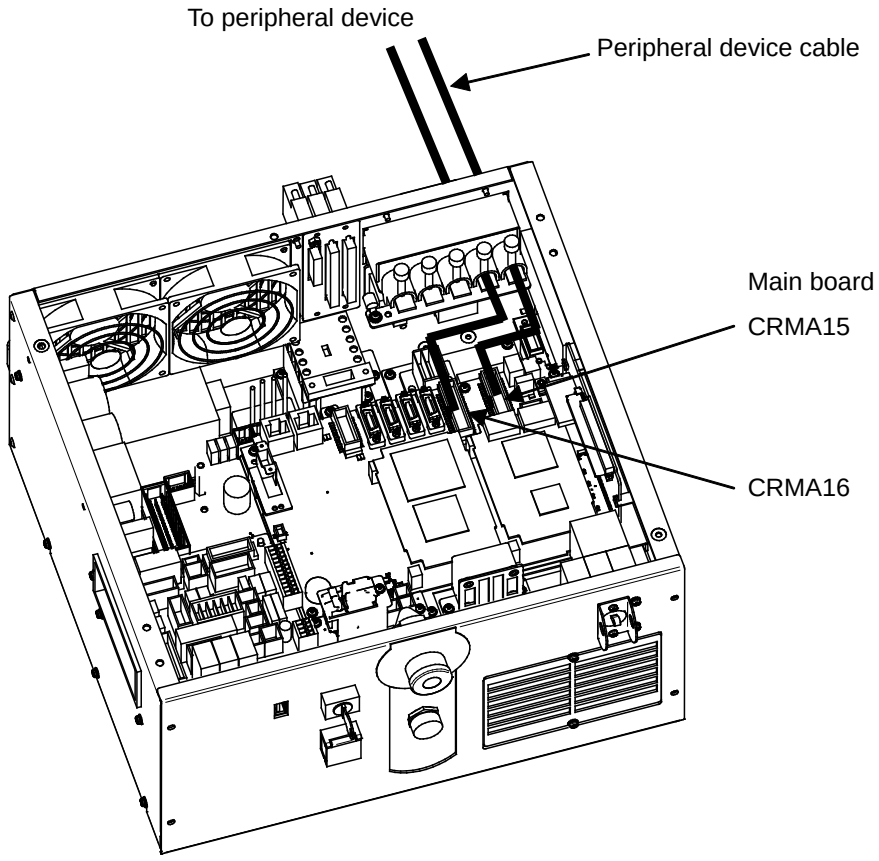
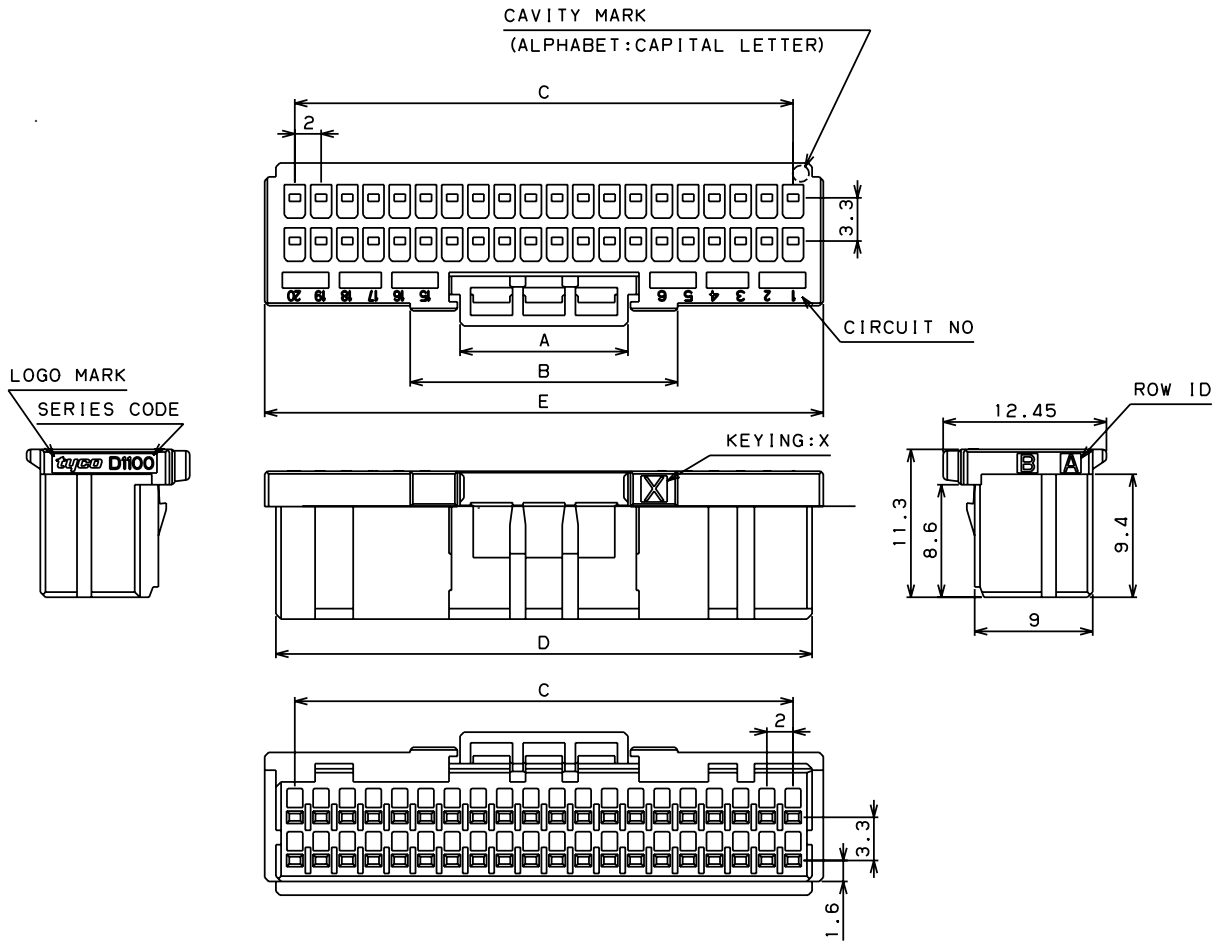


Fig.1.11.3 (a) Peripheral Device Cable Connection (Controller without connector panel)

1.11.4 Peripheral Device Cable Connector (Controller without connector panel)

(1) Fig.1.11.4 (a), (b) show the connector for peripheral device cables.

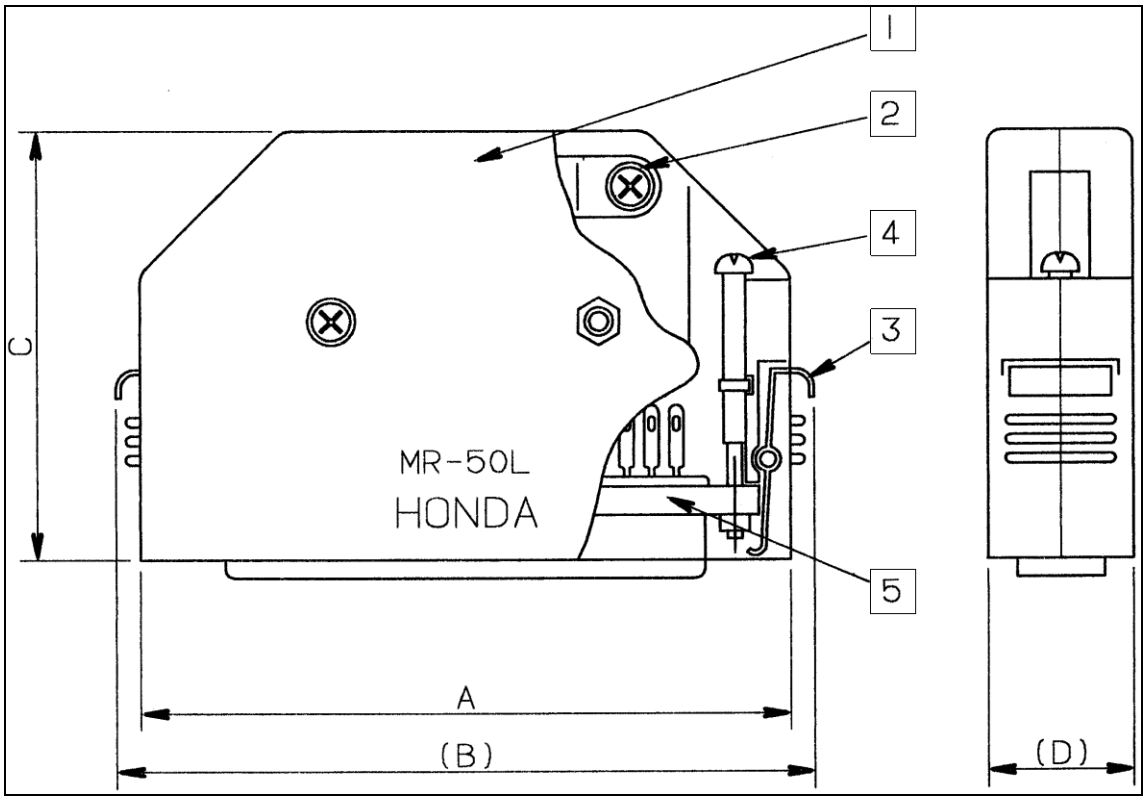


Connector specifications	Applicable interface	Dimensions					Remark
		A	B	C	D	E	
1-1827863-0 (Housing)	CRMA15	12.8	20.4	38.0	40.9	42.6	Tyco Electronics AMP D-1000 series 40pin (X-key)
2-1827863-0 (Housing)	CRMA16						Tyco Electronics AMP D-1000 series 40pin (Y-key)
1939991-2 (Contact)	CRMA15 CRMA16						Tyco Electronics AMP D-1000 series

Fig.1.11.4 (a) Peripheral device cable connector (Tyco Electronics AMP) (Controller without connector panel)

・Maintenance Tools

Crimping Tool (2119141-1): A05B-2550-K064
Extraction Tool (1891526-1): A05B-2550-K061

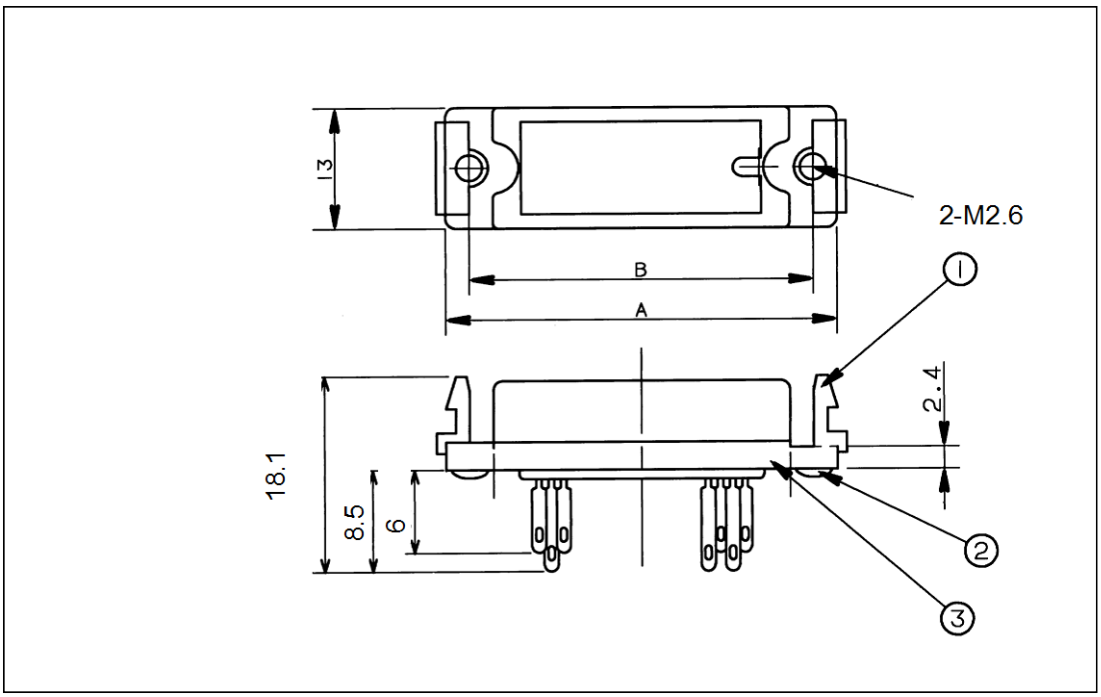


Connector specifications	Applicable interface	Dimensions				Remark
		A	(B)	C	(D)	
MR-50F (Connector) MR-50L+ (Case)	CRMA15 CRMA16	67.9	73.5	44.8	18	Honda Tsushin Kogyo, 50 pins (F) Solder type

Symbol	Name
1	Connector cover
2	Cable clamp screw
3	Connector clamp spring
4	Connector clamp screw
5	Connector 50 pins (female) MR-50F Connector 50 pins (male) MR-50M

Fig.1.11.4 (b) Peripheral device cable connector (Honda Tsushin Kogyo) (Controller without connector panel)

(2) Peripheral device connector



Connector specifications	Applicable interface	Dimensions		Remark
		A	B	
MR-50RM+	Peripheral Device	61.4	56.4	Honda Tsushin Kogyo, 50 pins (F) Solder type

Symbol	Name
1	Connector clamp screw
2	Screw M2.6 x 8
3	Connector

Fig.1.11.4 (c) Peripheral device connector (Honda Tsushin Kogyo) (Controller without connector panel)

1.11.5 Recommended Cables (Controller without connector panel)

(1) Peripheral device connection cable
Connect a peripheral device using a completely shielded, heavily protected cable conforming to the specifications in Table 1.11.5 (a).
Allow an extra 50 cm for routing the cable in the controller.
The maximum cable length is 30 m.

Table 1.11.5 (a) Recommended Cable (for Peripheral Device Connection)

Number of wires	Wire specifications (FANUC specifications)	Conductor		Sheath thickness (mm)	Effective outside diameter (mm)	Electrical characteristics	
		Diameter (mm)	Configuration			Conductor resistance (Ω/km)	Allowable current (A)
50	A66L-0001-0042	ϕ1.05	7/0.18 AWG24	1.5	ϕ12.5	106	1.6A

(2) End effector connection cable
Connect an end effector using a heavily protected cable with a movable wire conforming to the specifications in Table 1.11.5 (b).

The cable length is determined so that the cable will not interfere with the end effector and the wrist can move through its full stroke.

Table 1.11.5 (b) Recommended Cable (for End Effector Connection)

Number of wires	Wire specifications (FANUC specifications)	Conductor		Sheath thickness (mm)	Effective outside diameter (mm)	Electrical characteristics	
		Diameter (mm)	Configuration			Conductor resistance (Ω/km)	Allowable current (A)
6	A66L-0001-0143	ϕ1.1	40/0.08 AWG24	1.0	ϕ5.3	91	3.7
20	A66L-0001-0144	ϕ1.1	40/0.08 AWG24	1.0	ϕ8.6	91	2.3
24	A66L-0001-0459	ϕ0.58	40/0.08 AWG24	1.0	ϕ8.3	93	2.3

NOTE
For protection against the noise, cut part of the jacket of the connection cable to expose the shield, and fasten this part to the earth plate with the cable clamp.

1.11.6 Ethernet Interface

This section describes information relating to the physical Ethernet connection.

⚠ CAUTION
1 Before connecting or disconnecting the cable to or from the FAST Ethernet/FAST Data Server, make sure that the power to the CNC is turned off.
2 Please inquire of each manufacturer about the construction of network or the condition of using the equipment except the FAST Ethernet/FAST Data Server (hub, transceiver, cable etc.). When configuring your network, you must take other sources of electrical noise into consideration to prevent your network from being influenced by electrical noise. Make sure that network wiring is sufficiently separated from power lines and other sources of electrical noise such as motors, and ground each of the devices as necessary. In addition, high and insufficient ground impedance may cause interference during communications. After installing the machine, conduct a communications test before you actually start operating the machine.
We cannot ensure operation that is influenced by network trouble caused by a device other than the FAST Ethernet or FAST Data Server.

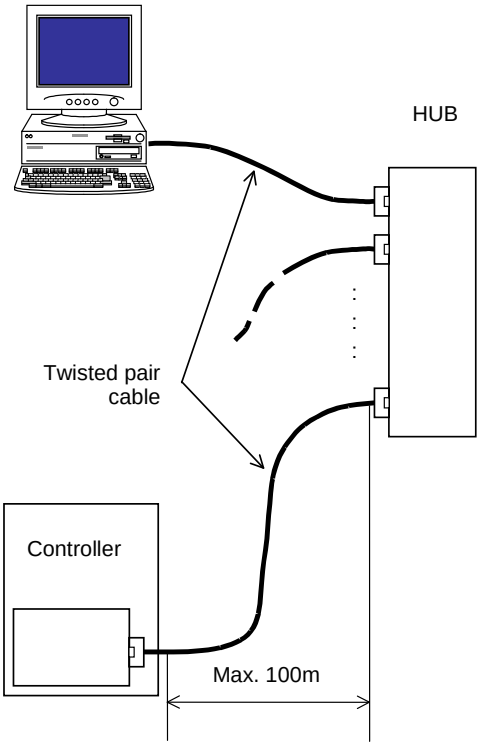
Connection to Ethernet

The robot controller is provided with a 100BASE-TX interface and 1000BASE-T (Only R-30*i*B Mate Plus) interface.
Prepare a hub for connecting the controller to the Ethernet trunk. The following shows an example of a general connection.

To connect the control unit to the CD38C (for R-30*i*B Mate Plus) Ethernet interface in a half duplex communication mode, use a hub which satisfies the following conditions:
- Supports 100BASE-TX/1000BASE-T.
- Has an auto-negotiation function.
- Supports store-and-forward switching.
- Supports flow control.

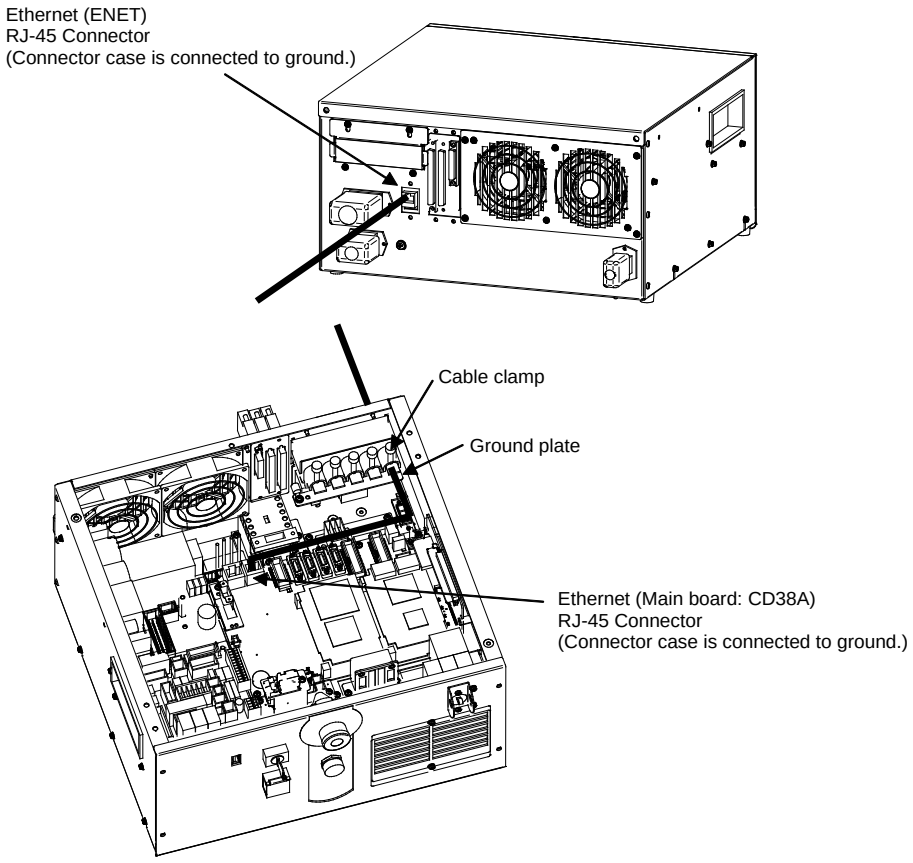
Some devices (hub, transceiver, etc.) that are needed for building a network do not come in a dust-proof construction. Using such devices in an atmosphere where they are subjected to dust or oil mist will

interfere with communications or damage the robot controller. Be sure to install such devices in a dust-proof cabinet.



Leading out the Ethernet Cable

For this type of controller, the Ethernet connectors are located on the back panel and inside of the cabinet (on the main board).



The Ethernet cable must be fastened by a cable clamp to prevent tension being applied to the modular connector (RJ-45) that connects the cable to the controller even if the Ethernet cable is pulled directly.

100BASE-TX Connector Pin Assignments(CD38A,CD38B) / 1000BASE-TConnector Pin Assignments(CD38C)

Table 1.11.6 (a) CD38A, CD38B (R-30*i*B Mate, R-30*i*B Mate Plus)

Pin No.	Signal name	Description
1	TX+	Send +
2	TX-	Send -
3	RX+	Receive +
4		Not used
5		Not used
6	RX-	Receive -
7		Not used
8		Not used

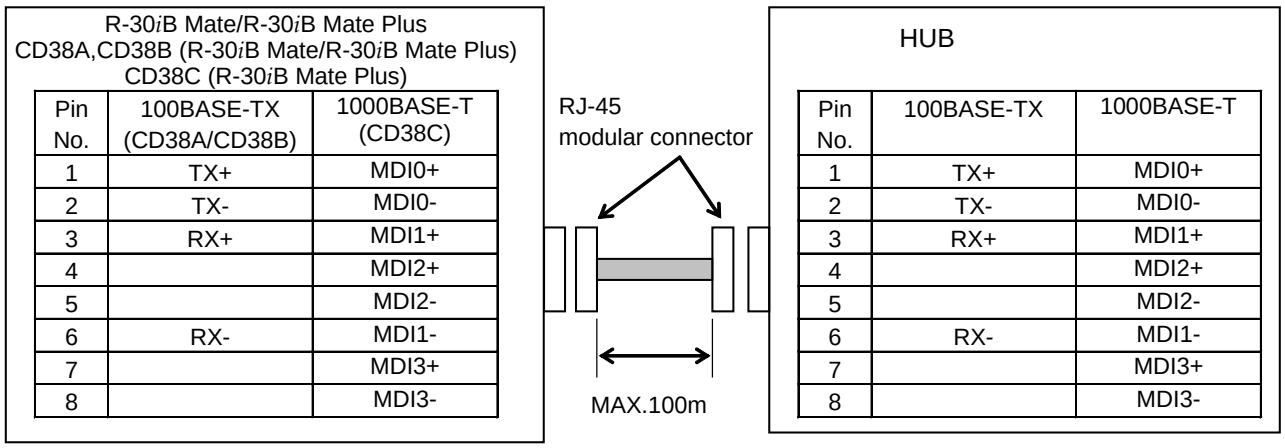
Table 1.11.6 (b) CD38C (1000BASE-T, R-30*i*B Mate Plus only)

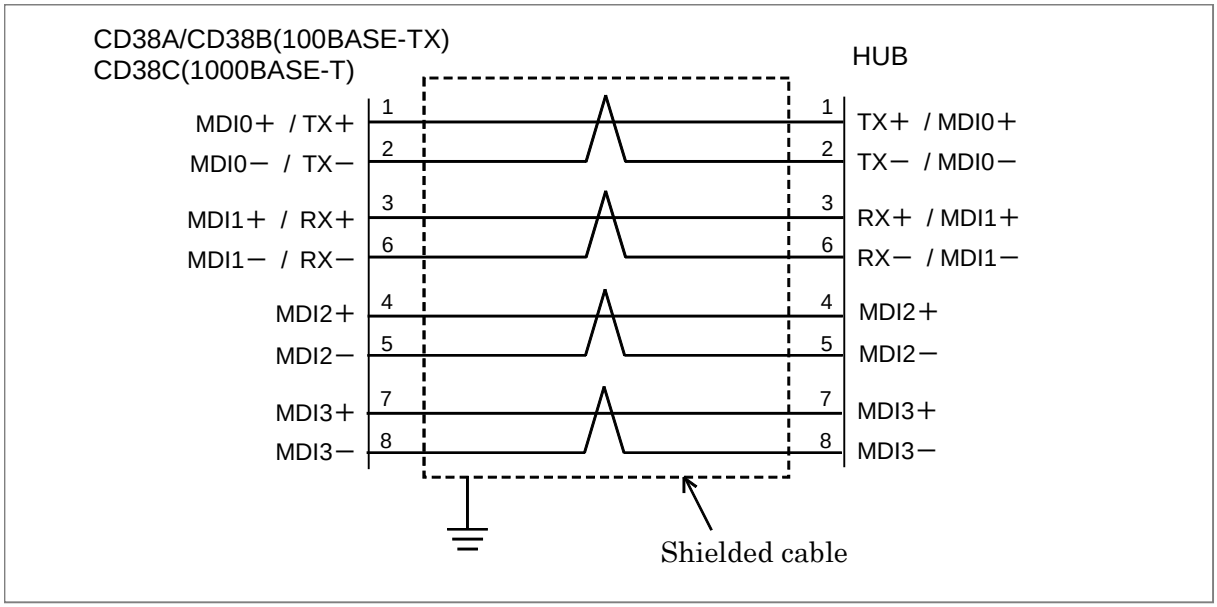
Pin No.	Signal name	Description
1	MDI0+	Bi-directional Data 0+
2	MDI0-	Bi-directional Data 0-
3	MDI1+	Bi-directional Data 1+
4	MDI2+	Bi-directional Data 2+
5	MDI2-	Bi-directional Data 2-
6	MDI1-	Bi-directional Data 1-
7	MDI3+	Bi-directional Data 3+
8	MDI3-	Bi-directional Data 3-

Twisted-pair Cable Specification

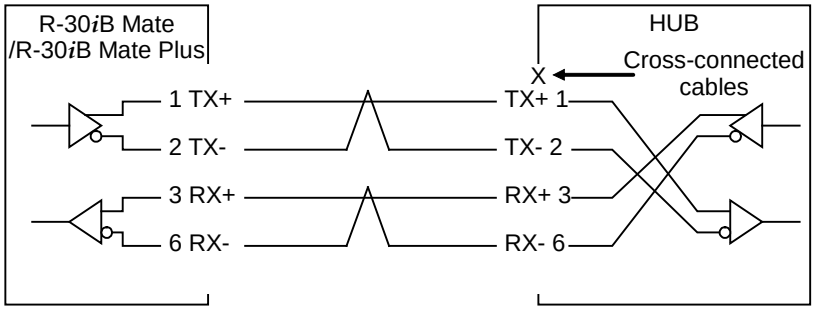
(1) Cable Connection

The cable used for connection between the 100BASE-TX interface CD38A and CD38B of R-30*i*B Mate/R-30*i*B Mate Plus and hub, and the cable used for connection between the 1000BASE-TX interface CD38C of R-30*i*B Mate Plus and the hub are connected as follows:





- Keep the total cable length within 100 m.
  Do not extend the cable more than is necessary.
- The figure above shows the cable connection when cables are crossed in the hub.
  "X" is usually indicated at the port of the hub to signify that cables are crossed in the hub.



(2) Cable Materials

> ⚠ **CAUTION**
> Unshielded cable (UTP cable) is commercially available as 100BASE-TX/ 1000BASE-T twisted-pair cable: You should, however, use shielded Category 5(100BASE-TX) / 5e(1000BASE-T) twisted-pair cable (STP cable) to improve the resistance to electrical noise in an FA environment.

Table 1.11.6 (c) Recommended Cables (Non-flexible cable, 100BASE-TX)

Manufacturer	Specification	Remarks
NISSEI ELECTRIC CO., LTD.	F-4PWWWMF	Single-conductor cable

> **NOTE**
> The recommended cables cannot be connected to moving parts.

Table 1.11.6 (d) Recommended cable (for movable parts, dedicated to FANUC)

Manufacturer	Specification	Remarks
Oki Electric Cable Co., Ltd.	AWG26 4P TPMC-C5E (S-HFR) K	CAT5e (1Gbps capable, For 1000BASE-T)
Oki Electric Cable Co., Ltd.	AWG26 4P TPMC-C5-F (SB)	CAT3, CAT5 (100Mbps capable, For 100BASE-TX)
Shinko Electric Industrial Co., Ltd.	FNC-118	CAT3, CAT5 (100Mbps capable, For 100BASE-TX)

Specification
1. Manufacture: Oki Electric Cable Co., Ltd.
   Manufacture's model number: AWG26 4P TPMC-C5E(S-HFR) K

- Electrical characteristic:
  Complying with EIA/TIA 568B.2 Category 5e.
- Structure:
  Common-shield braided cable with drain wire. The conductors of the cable are AWG26 annealed-copper strand wire, with a sheath 0.6 mm thick and an outer diameter of 6.8 mm.
- Fire resistance:
  UL1581 VW-1
- Oil resistance:
  As per Fanuc's internal standard (Equivalent to conventional oil-resistant electrical cable)

- Flexing resistance:
  Sliding: 3 millions or more sliding cycles with a bending radius of 50 mm.
  bending: 300 thousands or more bending cycles with a bending radius of 20 mm
  Twisting: 5 millions or more sliding cycles. (+/- 180degrees)
- UL style No. :
  AWM20276（80℃/30V/VW-1）

2. Manufacture: Oki Electric Cable Co., Ltd.
   Manufacture's model number: AWG26 4P TPMC-C5-F (SB)
   Manufacture: SHINKO ELECTRIC INDUSTRIES CO., LTD.
   Manufacture's model number: FNC-118

- Electric characteristics:
  Conforms to EIA/TIA 568A Category 3 and Category 5.
  From the viewpoint of attenuation performance, ensure that the length to the hub is 50 m or less.
- Structure:
  Group shielded (braided shield). A drain wire is available.
  The conductor is an AWG26 annealed copper twisted wire, with a sheath thickness of 0.8 mm and an outer diameter of 6.7 mm ±0.3 mm.
- Fire retardancy
  UL1581 VW-1
- Oil resistance
  Conforms to the FANUC internal standards (equivalent to the conventional oil-resistant electric cables).
- Flexing resistance:
  1,000,000 times or more with a bending radius of 50 mm (U-shaped flex test)
- UL style No.
  AWM 20276 (80°C/30V/VW-1)

NOTE
Be sure to use the connector TM21CP-88P (03) manufactured by HIROSE ELECTRIC CO., LTD. or equivalents for this cable.

Cable assembly
Oki Electric Cable Co., Ltd. can also supply the cable assembly mentioned above.
Contact Oki Electric directly to determine the specifications (length, factory test, packing, and so forth) for purchase.

(3) Connector Specification

Use an 8-pin modular connector (RJ-45) with the twisted-pair cable for the Ethernet connection. The following connectors or equivalents must be used.

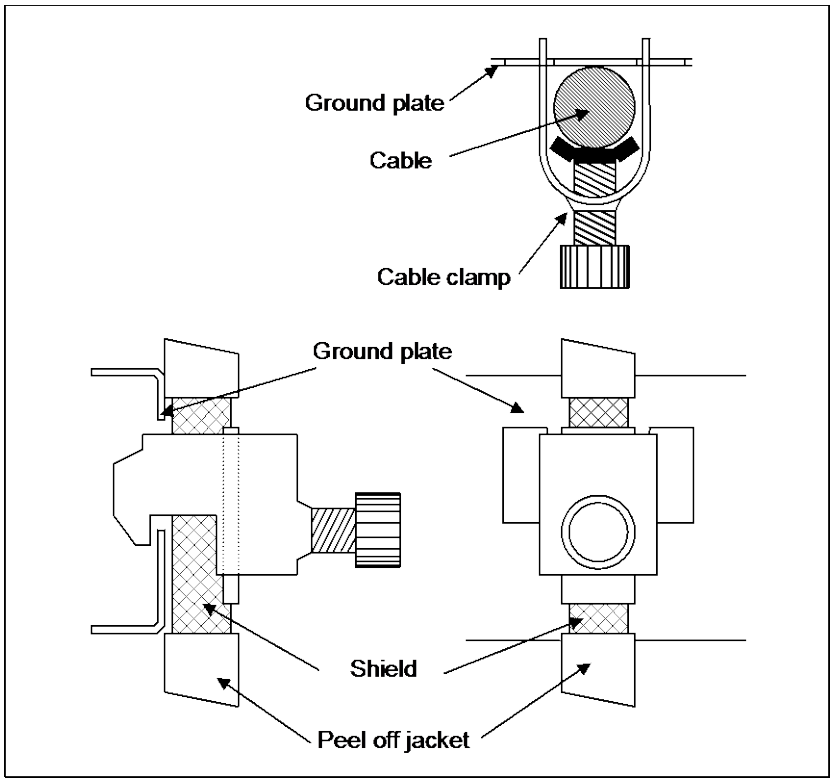
Flex	Specification	Manufacturer	Remarks
AWG26 4P TPMC-C5-F (SB) AWG26 4P TPMC-C5E (S-HFR) K, or FNC-118	TM21CP-88P (03)	HIROSE ELECTRIC CO., LTD.	NOTE

NOTE
Information about TM21CP-88P (03):
Connector (standard product of the manufacturer)
Drawing number: A63L-0001-0823#P
Manufacturer: HIROSE ELECTRIC CO., LTD.
Manufacturer type number: TM21CP-88P (03)
Conforms to EIA/TIA 568A Category 3 and Category 5.
For assembly with a cable, contact HIROSE ELECTRIC CO., LTD. directly.
(From HIROSE ELECTRIC CO., LTD., "TM21CP-88P (03) Connection Procedure Manual (Technical Specification No. ATAD-E2367)" is available as a technical document.)

Electrical Noise Countermeasures

(1) Clamping and Shielding Cables

Clamp an Ethernet twisted pair cable according to the method described below, as with cables that need to be shielded. Clamping cables provides support and shielding and is extremely important to the safe operation of the system. Never overlook cable clamping.
Peel off part of the jacket as shown in the figure to expose the outer coating of the shield, and press this outer coating against the ground plate with the clamp fixture.
The machine manufacturer must prepare the ground plate and install it as follows:



NOTE
To ensure the safe operation of the system, clamp and shield the cables.

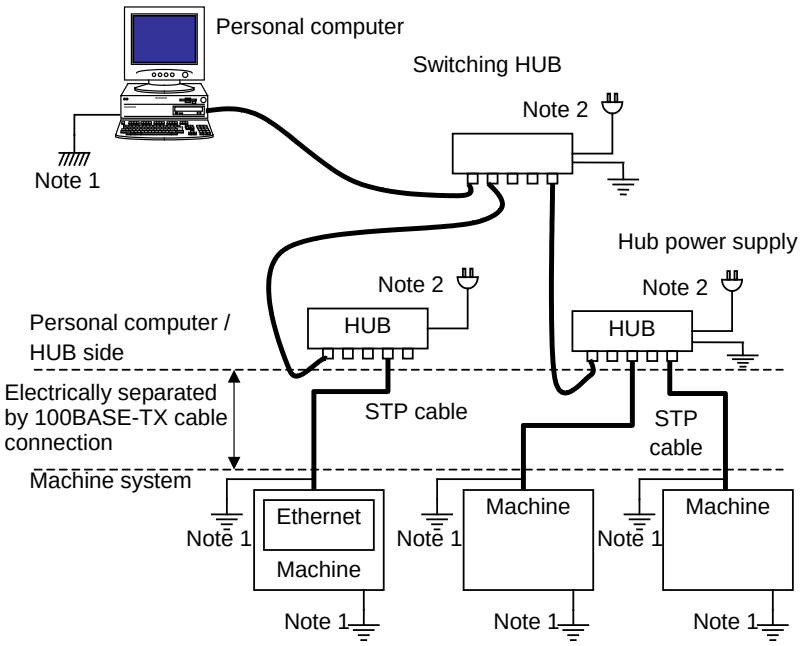
NOTE

1 To secure fast response, FL-net communication is not provided with a retransmission process at intervals of several seconds, unlike normal Ethernet communication. It is, therefore, necessary to provide more noise resistance than that provided by general Ethernet wiring work.

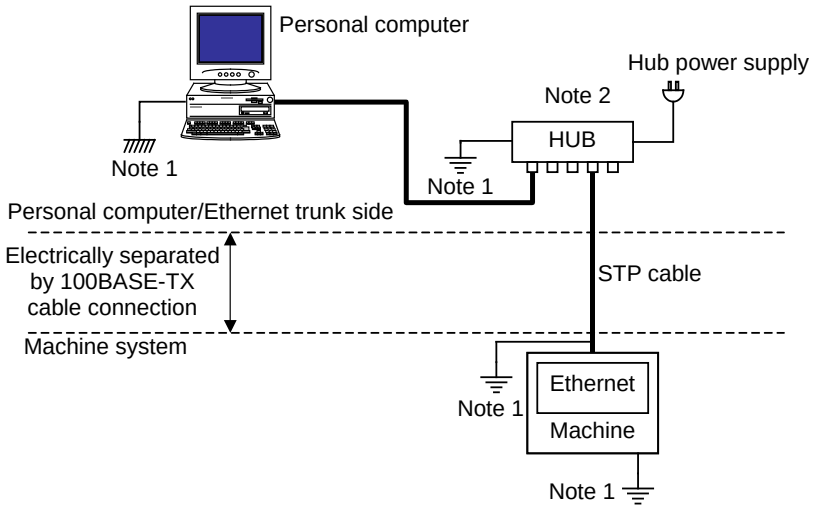
2 After the laying of cables, conduct satisfactory communication tests not only before system operation but after system operation from the viewpoint of noise prevention measures.

(2)Grounding the Network

Even if the grounding condition on the machine side is satisfied, the communication line can pick up noise from the machine, depending on the machine installation condition and environment, thus resulting in a communication error. To protect against such noise, the machine should be separated and insulated from the Ethernet trunk cable and personal computer. Examples of connection are given below.



Large-Scale Network



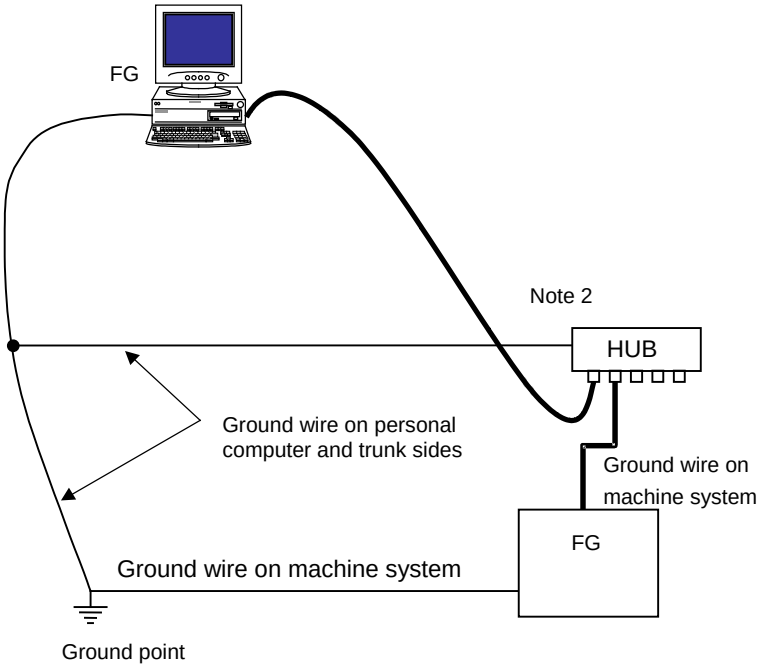
Small-Scale Network

NOTE

1 The ground between PC/HUB side and machine system side must be separated. If it is impossible to separate the ground because there is only one grounding point, connect the ground cable for each system to the grounding point independently. (See figure below.)
The resistance for grounding must be less than 100-ohm (Class D). The thickness of the ground cable is the same as the thickness of AC power cable or more. At least thickness of 5.5mm^2 is necessary.

2 Note that the number of allowable hub-to-hub connections depends on the type of hub.

3 There is possibility that noise makes the obstacle of communication even if the ground is separated using the 100BASE-TX. In the case of using the FAST Ethernet/FAST Data Server under the worst environment, please separate between the PC/Trunk line side and machine system side completely using the 100BASE-FX (Optical fiber media).



Wiring on a single ground point

Check Items at Installation

The following table lists check items at installation.

Check item		Description	Check
Ethernet cable			
	Type	Use cables which satisfies all the following conditions:	
		1) With shielding	
		2) Twisted-pair cable	
		3) Category 5(100 BASE-TX), Category 5e(1000 BASE-T)	
	Length	The cable length shall be within 100 m (50 m (100BASE-TX) or 40m (1000BASE-T) for a movable cable recommended by FANUC).	
	Connection	For a twisted-pair cable of 100BASE-TX, the following pins shall be paired:	
		1) Pin No. 1 (TX+) – pin No. 2 (TX-)	
		2) Pin No. 3 (RX+) – pin No. 6 (RX-)	
		For a twisted-pair cable of 1000BASE-T, the following pins shall be paired:	
		1) Pin No. 1 (MDI0+) – pin No. 2 (MDI0+)	
		2) Pin No. 3 (MDI1+) – pin No. 6 (MDI1+)	
		3) Pin No. 4 (MDI2+) – pin No. 5 (MDI2+)	
		4) Pin No. 7 (MDI3+) – pin No. 8 (MDI3+)	
	Separation	The Ethernet cables shall be bound separately from the following cables or covered with an electromagnetic shield(Note) :	
		1) Group A: AC power lines, power lines for motors, and others	
		2) Group B: Current DC (24 VDC) and others	
	Shielding	For a shielded cable, the part of which outer coating is peeled off and exposed shall be fixed to the ground plate with a clamp fixture.	
	Clamping	The ground plate shall be located as nearest to the CNC as possible (to make the cable between the ground plate and CNC hard to be affected by noise).	
	Connectors	Any cable connector shall not be pulled (to prevent poor contact of the connector).	
	Wiring	No cable shall be laid under a heavy object.	
	Bending radius	The bending radius shall be at least four times as long as the diameter of the cable.	
	For movable part	For a movable part, a cable for a movable part shall be used.	
HUB			
	Use conditions	The "cautions on use" of the hub shall be observed (A terminating resistor shall be mounted properly if required).	
	Grounding	The hub shall be grounded.	
	Cabinet	The hub shall be installed in an enclosed cabinet.	
	Vibration	The hub shall be installed so that it is not affected by vibration.	
	Bending radius	The bending radius shall be at least four times as long as the diameter of the cable.	

NOTE
Covering a group with an electromagnetic shield means that shielding is provided between groups with grounded steel plates.

1.12 CONNECTION TO FANUC I/O Link *i*

1.12.1 Printed circuit boards for I/O Link *i*

In case of using the function of I/O Link ***i*** slave, please use main board for I/O Link ***i*** slave and CPU card for I/O Link ***i*** slave.

Name	Ordering Specification	Board Specification	Available for I/O Link *i* slave	Note
Main board (R-30*i*B Mate)	A05B-2655-H001	A20B-8200-0790		Standard, Ethernet:1ch
	A05B-2655-H002	A20B-8200-0791		Ethernet:2ch, Vision I/F, Force sensor I/F
	A05B-2655-H003	A20B-8200-0792		Ethernet:2ch, Vision I/F, Force sensor I/F, PMC, HDI
	A05B-2655-H004	A20B-8201-0420	○	Standard, Ethernet:1ch For I/O Link ***i*** slave
	A05B-2655-H005	A20B-8201-0421	○	Ethernet:2ch, Vision I/F, Force sensor I/F For I/O Link ***i*** slave
	A05B-2655-H006	A20B-8201-0422	○	Ethernet:2ch, Vision I/F, Force sensor I/F, PMC, HDI For I/O Link ***i*** slave
Main board (R-30*i*B Mate Plus)	A05B-2685-H001	A20B-8201-0750	○	Standard, Ethernet:2ch For I/O Link ***i*** slave
	A05B-2685-H002	A20B-8201-0751	○	Ethernet:3ch, Vision I/F, Force sensor I/F For I/O Link ***i*** slave
	A05B-2685-H003	A20B-8201-0752	○	Ethernet:3ch, Vision I/F, Force sensor I/F, PMC, HDI For I/O Link ***i*** slave
CPU card (R-30*i*B Mate)	A05B-2600-H020	A20B-3300-0686		Standard / SDRAM 32Mbyte
		A17B-3301-0106		
	A05B-2600-H021	A20B-3300-0687		Standard / SDRAM 64Mbyte
		A17B-3301-0107		
	A05B-2600-H022	A20B-3300-0688		Standard / SDRAM 128Mbyte
		A17B-3301-0108		
	A05B-2600-H023	A20B-3300-0683		High speed / SDRAM 32Mbyte
		A17B-3301-0103		
	A05B-2600-H024	A20B-3300-0684		High speed / SDRAM 64Mbyte
		A17B-3301-0104		
	A05B-2600-H025	A20B-3300-0685		High speed / SDRAM 128Mbyte
		A17B-3301-0105		
	A05B-2600-H026	A17B-3301-0109	○	Standard / SDRAM 32Mbyte For I/O Link ***i*** slave
	A05B-2600-H027	A17B-3301-0110	○	Standard / SDRAM 64Mbyte For I/O Link ***i*** slave
	A05B-2600-H028	A17B-3301-0111	○	Standard / SDRAM 128Mbyte For I/O Link ***i*** slave
	A05B-2600-H029	A17B-3301-0112	○	High speed / SDRAM 32Mbyte For I/O Link ***i*** slave
	A05B-2600-H030	A17B-3301-0113	○	High speed / SDRAM 64Mbyte For I/O Link ***i*** slave
	A05B-2600-H031	A17B-3301-0114	○	High speed / SDRAM 128Mbyte For I/O Link ***i*** slave

Name	Ordering Specification	Board Specification	Available for I/O Link *i* slave	Note
CPU card (R-30*i*B Mate Plus)	A05B-2670-H020 (R-30*i*B Mate Plus)	A17B-3301-0250	○	Standard / DRAM 1GB For I/O Link *i* slave

NOTE

In case of using the function of I/O Link *i* slave, the combination of the specification of mainboard, CPU card and software is limited as below.

[Main board (For I/O Link *i* slave)] + [CPU card (For I/O Link *i* slave)]
+ [Software (V8.30P14 or later)]

Except for the above condition, the system does not work correctly as followings.

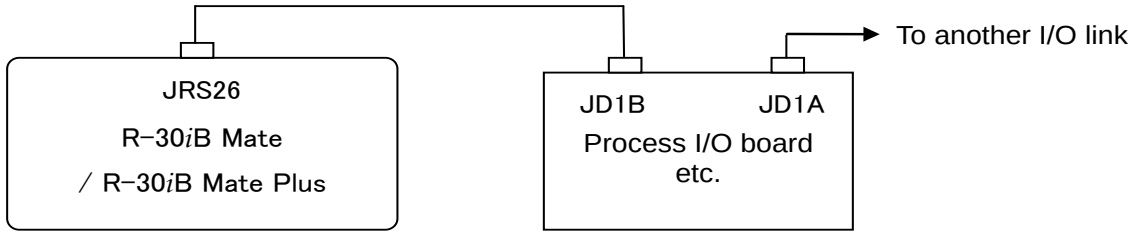
a) [Main board] + [CPU card (For I/O Link *i* slave)]
Neither the function of I/O Link slave nor I/O Link *i* slave work correctly. And the alarm regarding I/O Link or I/O Link *i* occur on the master side.
And in case the software version is not correct, system does not work correctly.

b) [Main board (For I/O Link *i* slave)] + [CPU card]
The system does not work correctly.

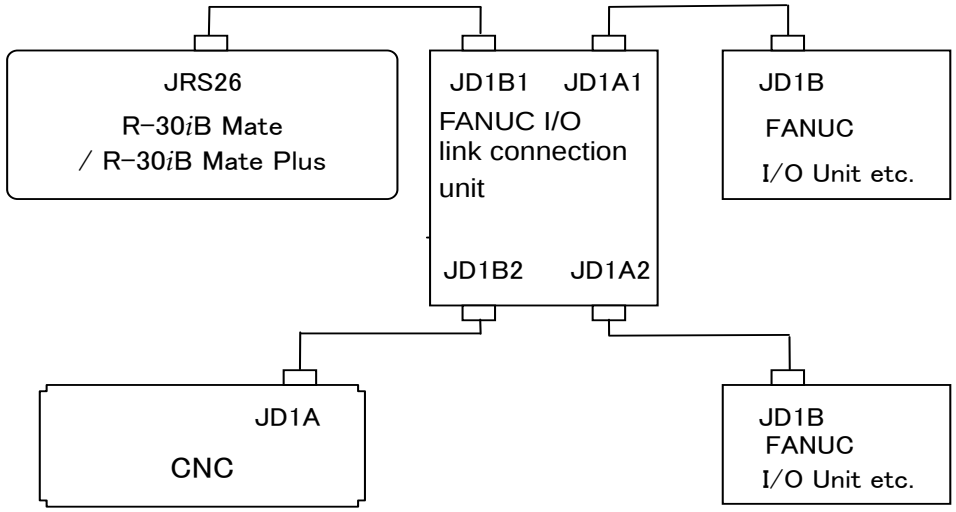
1.12.2 Connection of I/O Link and I/O Link *i* by using JRS26 connector

The connection of I/O Link and I/O Link ***i*** by using JRS26 connector is shown below.

1. When the R-30***i***B Mate/R-30***i***B Mate Plus controller is used as the I/O Link master (default)
(When the R-30***i***B Mate/R-30***i***B Mate Plus controller controls the process I/O board etc.)



2. When the R-30***i***B Mate/R-30***i***B Mate Plus controller is connected to a CNC etc.
via the I/O Link connection unit



3. When the R-30***i***B Mate/R-30***i***B Mate Plus controller is used as an I/O Link and I/O Link ***i*** slave
(When a CNC is the I/O Link and I/O Link ***i*** master)

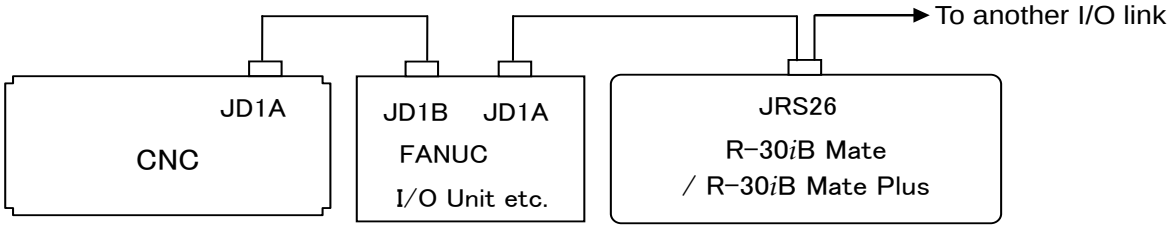


Fig.1.12.2 (a) Connection of I/O Link *i* by using JRS26 connector

1.12.2.1 Connection of the I/O Link cable by using JRS26 connector

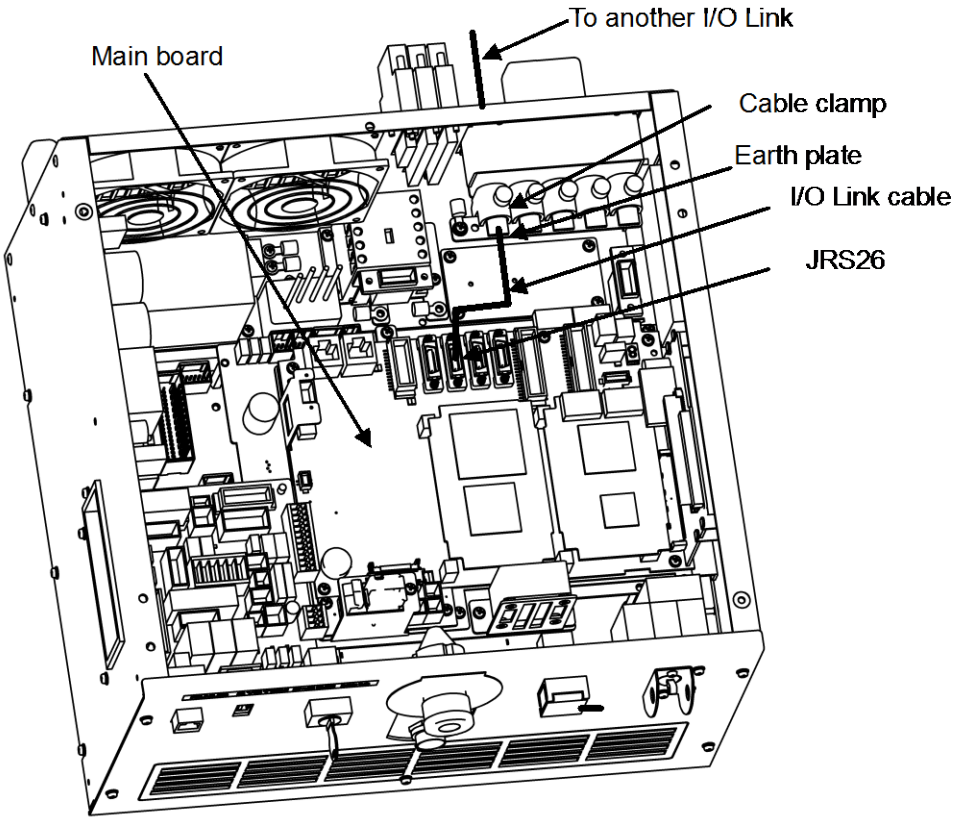


Fig.1.12.2.1 (a) Path of the I/O link cable by using JRS26 connector

1. Connect the cable according to the system. Be sure to perform shielding.
   Shield the cable collectively and ground the shield on the CNC side.

2. Before connection turn off the power.

NOTE

For connection with the CNC with I/O Link and I/O Link i, turn on or off the power of the CNC and the robot controller at the following timing.

a) Slave units and the master must be powered on or off at the same time.
b) If the CNC or robot controller is powered off after startup of the system, I/O Link and I/O Link i error occur. To successfully make connection with I/O Link and I/O Link i again, power off all of the units and then power them on at the timing indicated in a).

When used as master interface
JRS26
Interface
Refer to Fig.1.12.2 (a)

11	0V	01	RXSLC1
12	0V	02	XRXSLC1
13	0V	03	TXSLC1
14	0V	04	XTXSLC1
15	0V	05	(RXSLC2)
16	0V	06	(XRXSLC2)
17		07	(TXSLC2)
18	(+5V)	08	(XTXSLC2)
19	(24V)	09	(+5V)
20	(+5V)	10	(24V)

Master interface

Note: +5V is connected when the optical I/O link adapter is used.

When used as slave interface
JRS26
Interface
Refer to Fig. 1.12.2 (a)

11	0V	01	RXSLC1
12	0V	02	XRXSLC1
13	0V	03	TXSLC1
14	0V	04	XTXSLC1
15	0V	05	RXSLC2
16	0V	06	XRXSLC2
17		07	TXSLC2
18	(+5V)	08	XTXSLC2
19	(24V)	09	(+5V)
20	(+5V)	10	(24V)

From Master controller

To the next I/O link device

Note: +5V is connected when the optical I/O link adapter is used.

3. When the R-30*i*B Mate/R-30*i*B Mate Plus controller is connected to CNC or preceding I/O link ***i*** slave unit, use a twisted-pair cable in which wires RXSLC1 (Pin No.1 of JRS26) and XRXSLC1 (Pin No.2 of JRS26) are paired and wires TXSLC1 (Pin No.3 of JRS26) and XTXSLC1 (Pin No.4 of JRS26) are paired.

4. When the R-30*i*B Mate/R-30*i*B Mate Plus controller is connected to next I/O link ***i*** slave unit, use a twisted-pair cable in which wires RXSLC2 (Pin No.5 of JRS26) and XRXSLC2 (Pin No.6 of JRS26) are paired and wires TXSLC2 (Pin No.7 of JRS26) and XTXSLC2 (Pin No.8 of JRS26) are paired.

1.12.2.2 Cable connection diagram of the I/O Link cable by using JRS26 connector

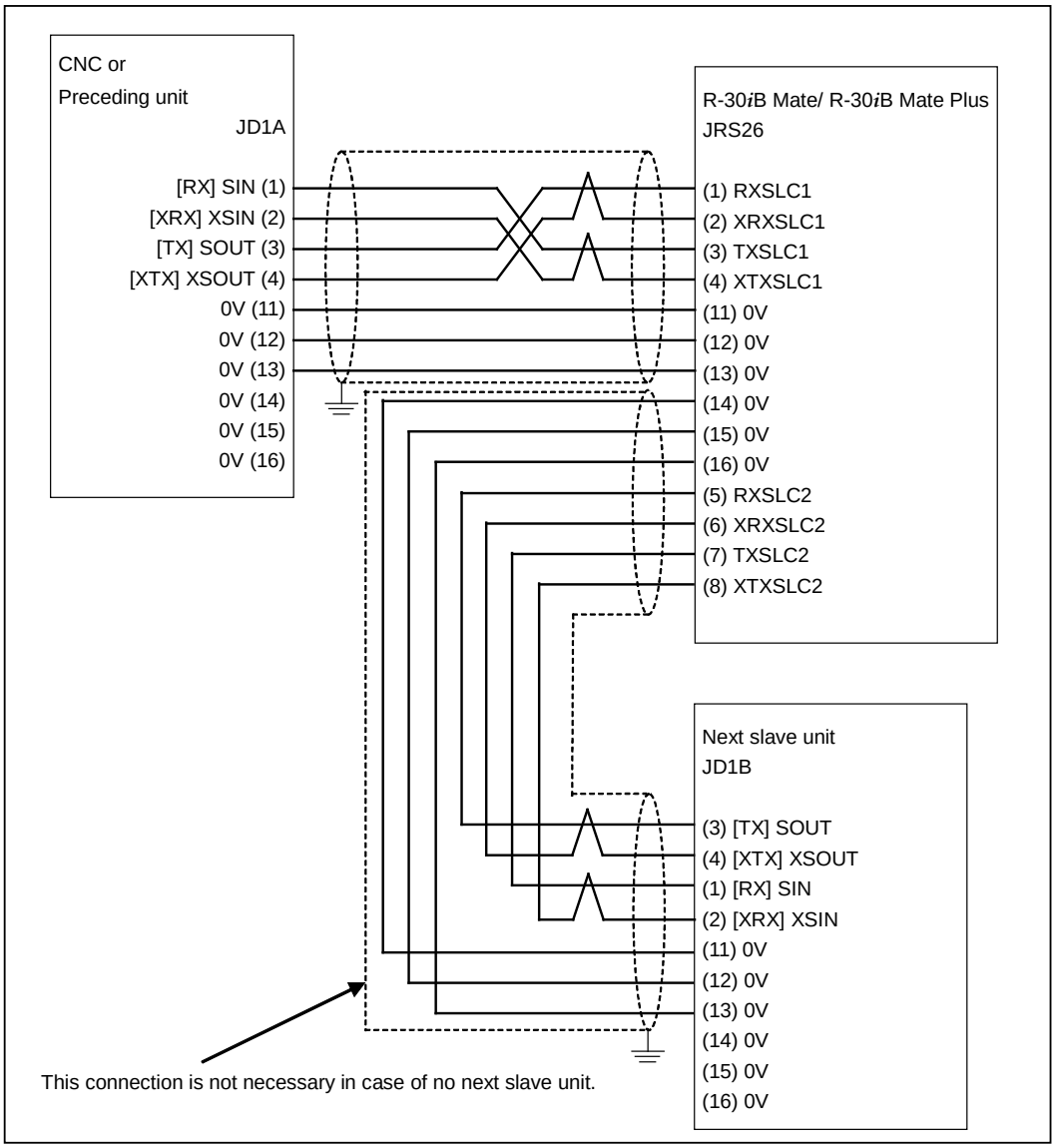


Fig.1.12.2.2 (a) Cable connection diagram of the I/O Link cable by using JRS26 connector (for the slave unit)

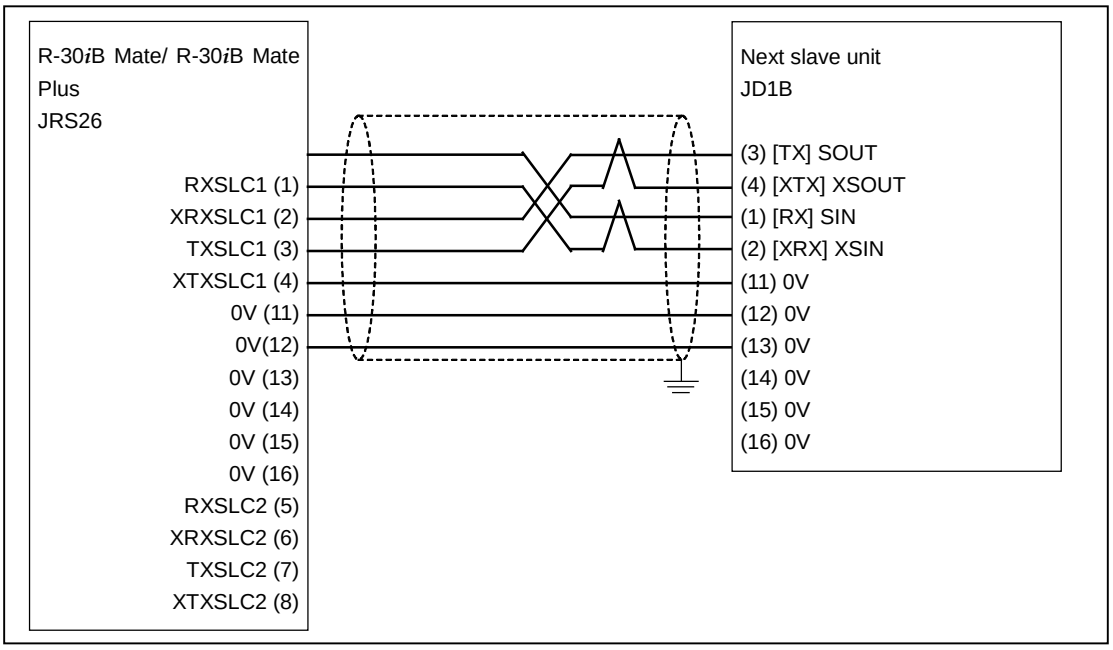


Fig.1.12.2.2 (b) Cable connection diagram of the I/O Link cable by using JRS26 connector (for the master unit)

1.12.3 Connection by using JD44A connector(Option)

The connection of I/O Link *i* by using JD44A connector is shown below.
JD44A is used to connect the Additional safety I/O board (Mini slot)

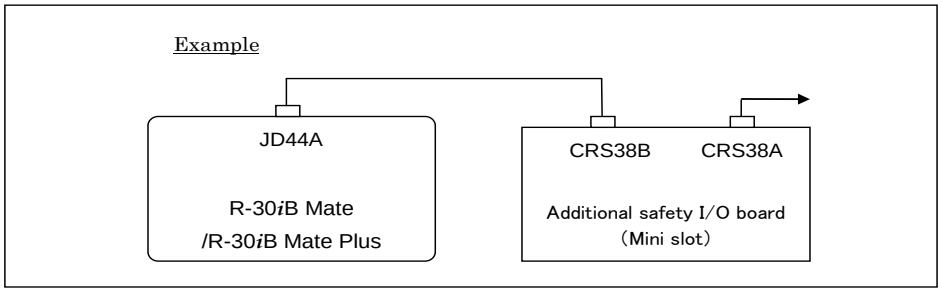


Fig.1.12.3 (a) Connection of JD44A connector

1.12.3.1 Connection of the I/O Link cable by using JD44A connector

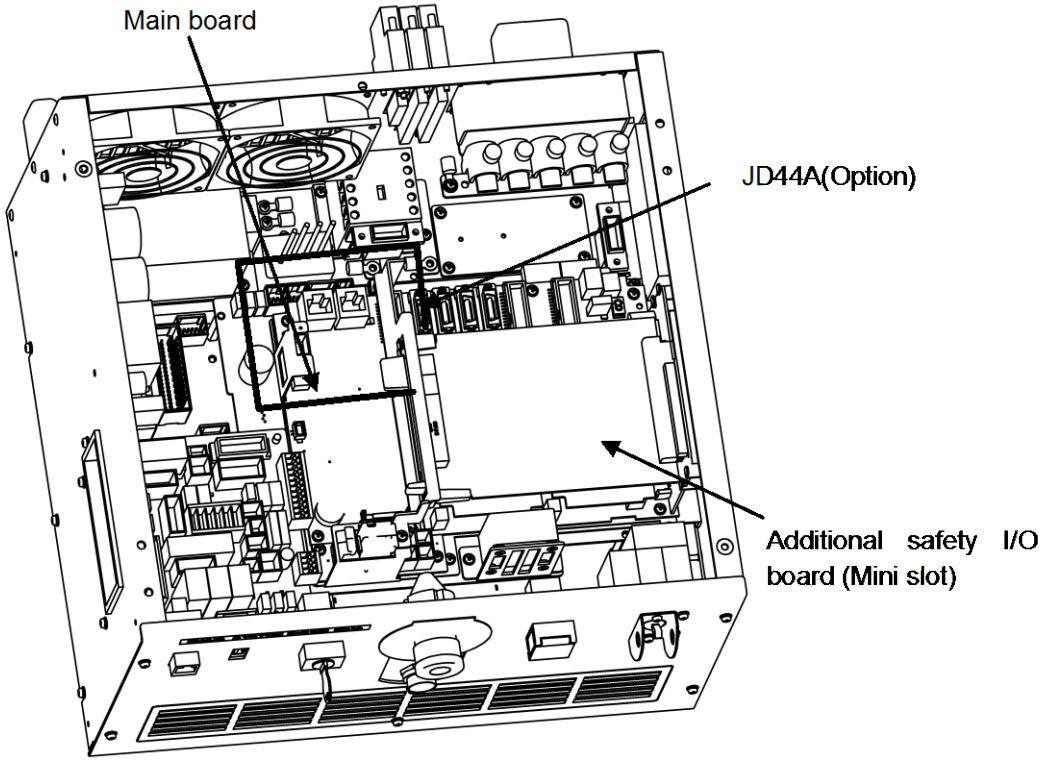


Fig.1.12.3.1 (a) Path of the I/O link cable by using JD44A connector

JD44A
Interface

11	0V	01	(Reserve)
12	0V	02	(Reserve)
13	0V	03	(Reserve)
14	0V	04	(Reserve)
15	0V	05	RXSLCS
16	0V	06	XRXSLCS
17		07	TXSLCS
18	(+5V)	08	XTXSLCS
19	(24V)	09	(+5V)
20	(+5V)	10	(24V)

Note: +5V is connected when the optical I/O link adapter is used.

When the R-30*i*B Mate/R-30*i*B Mate Plus controller is connected to Additional I/O board, use a twisted-pair cable in which wires RXSLCS (Pin No.5 of JD44A) and XRXSLCS (Pin No.6 of JD44A) are paired and wires TXSLCS (Pin No.7 of JD44A) and XTXSLCS (Pin No.8 of JD44A) are paired.

1.12.3.2 Cable connection diagram of the I/O Link cable by using JD44A connector

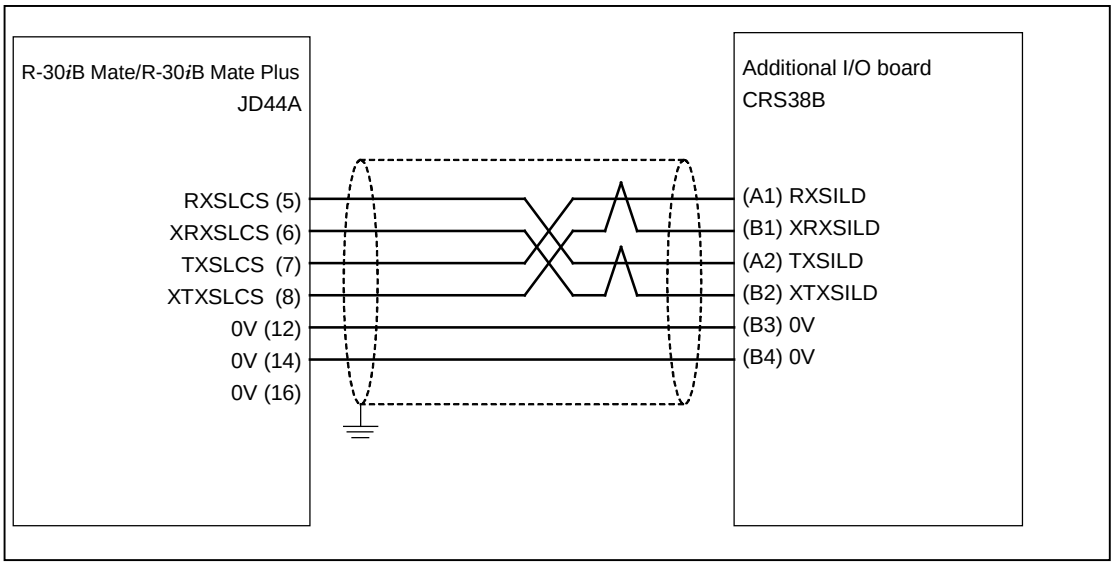


Fig.1.12.3.2 (a) Cable connection diagram of the I/O Link cable by using JD44A connector

2 TRANSPORTATION AND INSTALLATION

2.1 TRANSPORTATION (LARGE SIZE CONTROLLER)

The large size controller is transported by a crane. Attach a sling to sheet metal hole of the controller.

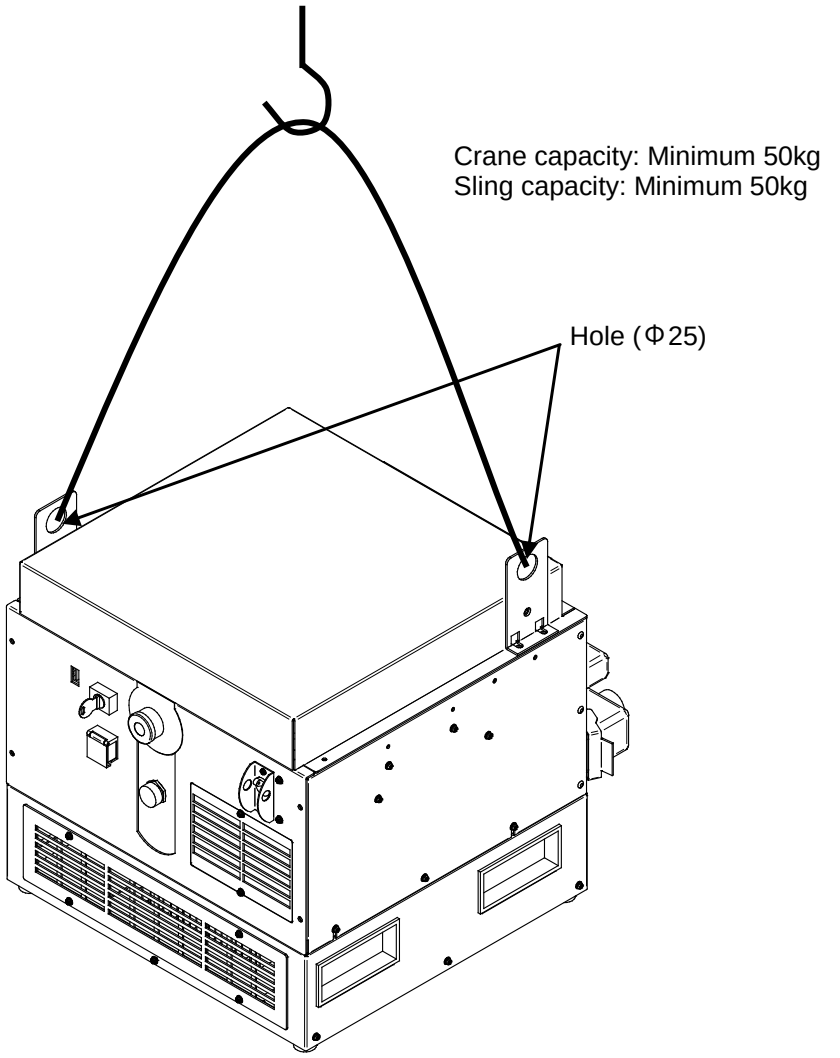
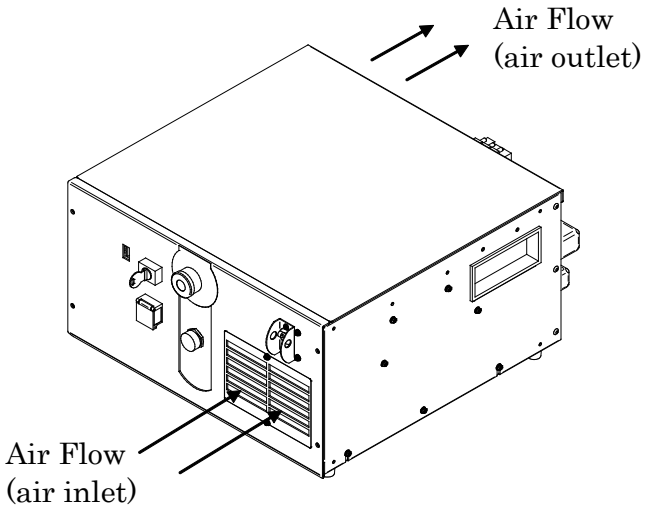


Fig. 2.1 (a) Transportation (Large size controller)

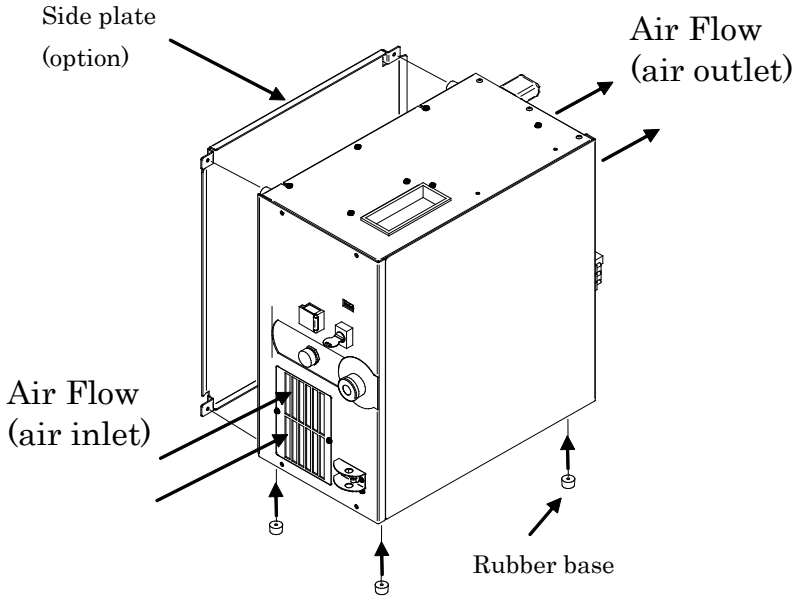
2.2 INSTALLATION

In case of Open Air controller (Small size)

Robot controller can be installed Horizontal or vertical.



(Horizontal installation)



(Vertical installation)

Fig.2.2 (a) Installation of robot controller

> ⚠ **CAUTION**
> Do not place anything within 50mm from the air inlet and 120mm from the air outlet of the robot controller.

In case of Open Air controller (Large size)

Robot controller can be installed Horizontal or vertical.

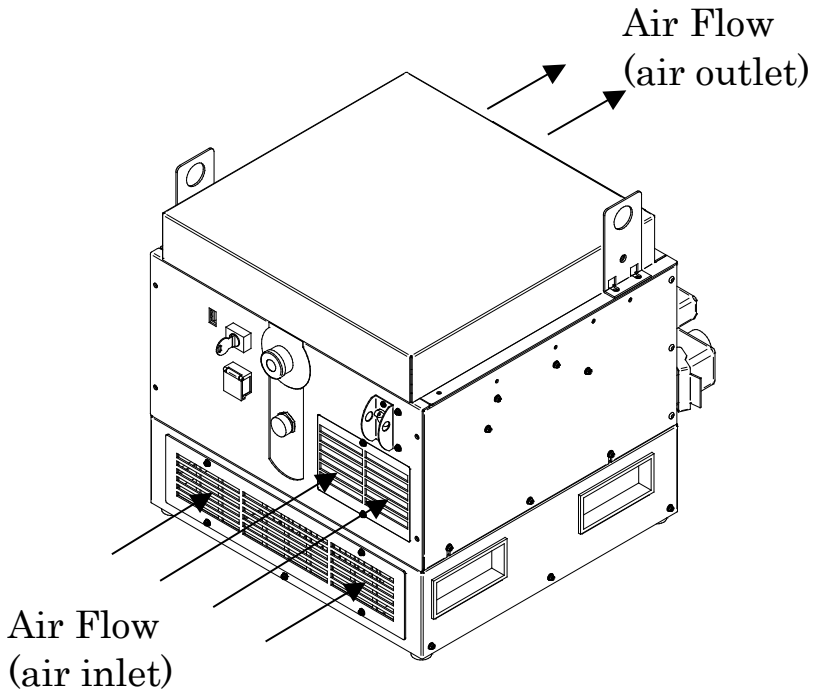


Fig.2.2 (b) Installation of robot controller

> ⚠ **CAUTION**
> Do not place anything within 50mm from the air inlet and 120mm from the air outlet of the robot controller.

2.3 CONTROLLER DIMENSION

In case of Open Air controller (Small size)

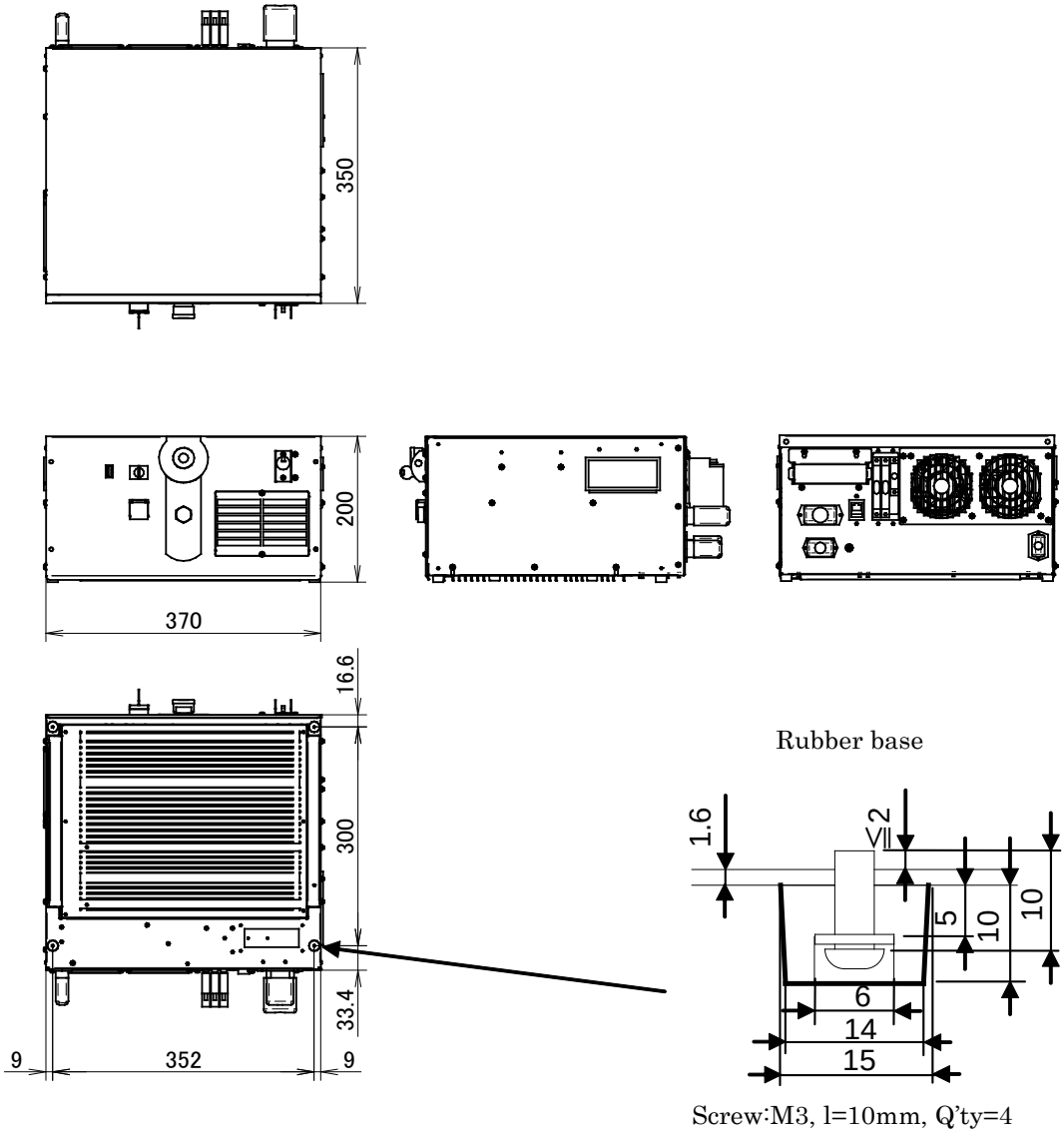


Fig.2.3 (a) External dimensions

> ⚠ **WARNING**
> This controller is not designed to be dust-proof, splash-proof, or explosion-proof.

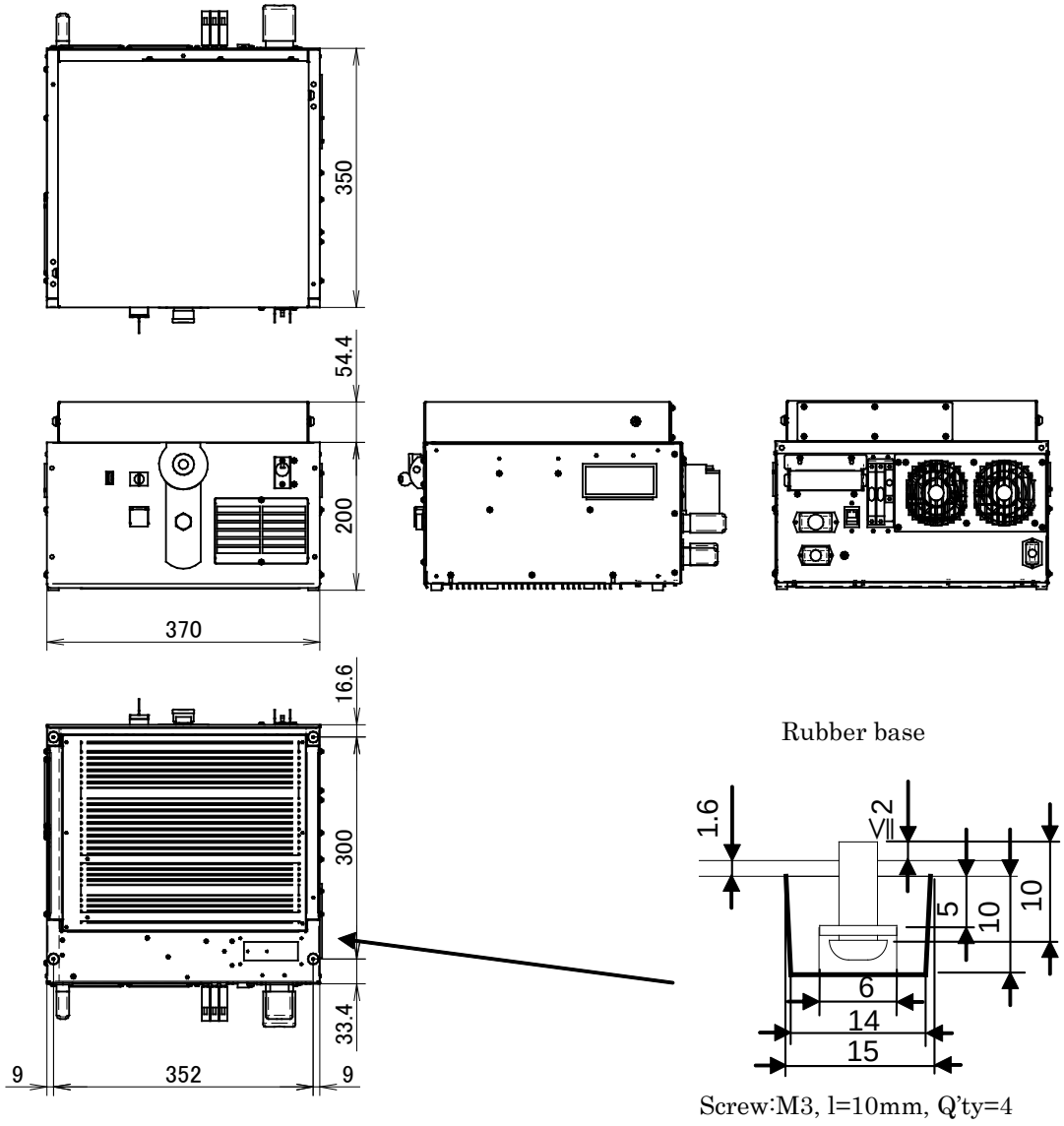


Fig.2.3 (b) External dimensions (with top hat plate)

> ⚠ **WARNING**
> This controller is not designed to be dust-proof, splash-proof, or explosion-proof.

In case of Open Air controller (Large size)

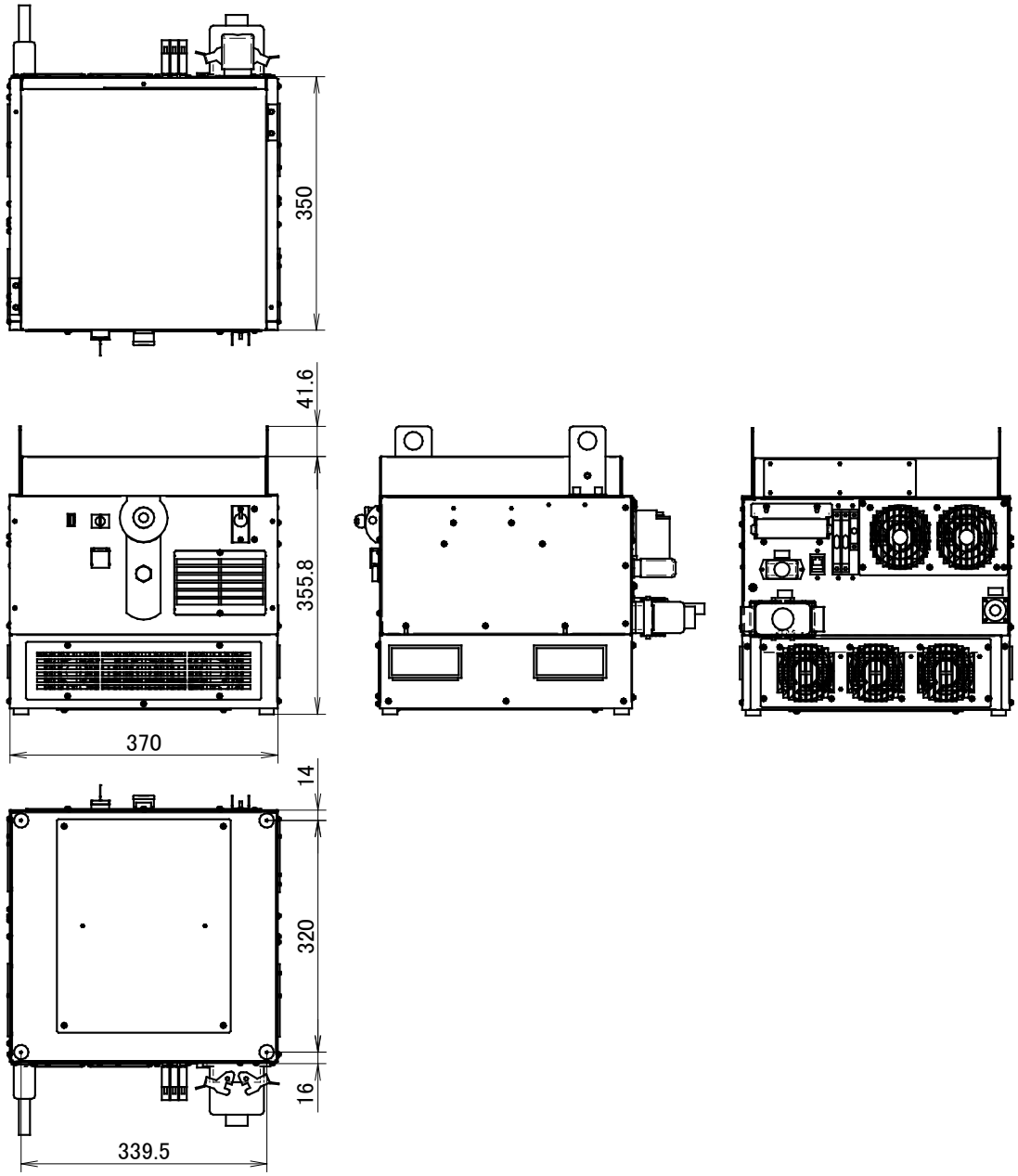


Fig.2.3 (c) External dimensions

> ⚠ **WARNING**
> This controller is not designed to be dust-proof, splash-proof, or explosion-proof.

In case of Open Air controller (for collaborative robot)

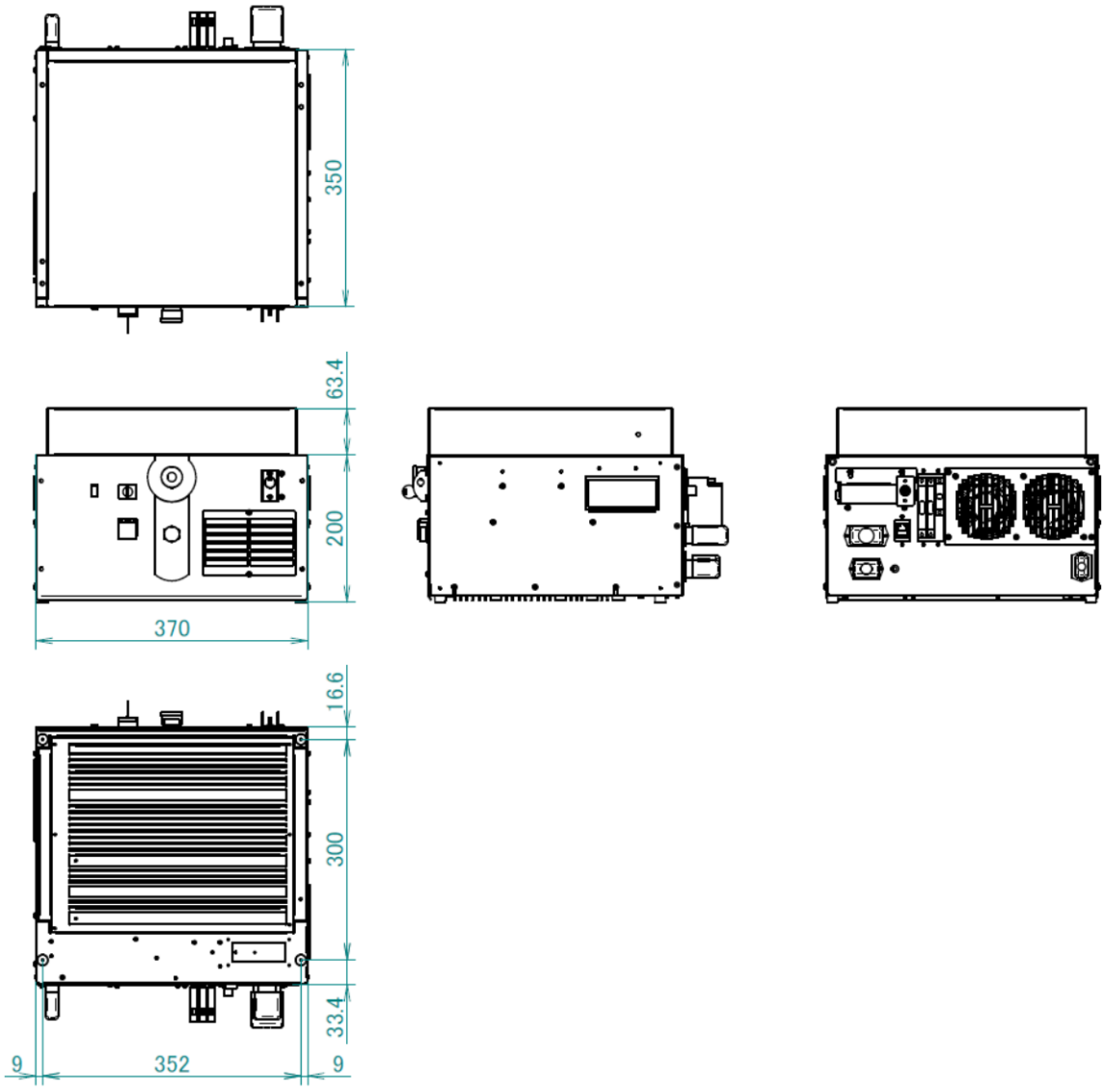


Fig.2.3 (d) External dimensions

> ⚠ **WARNING**
> This controller is not designed to be dust-proof, splash-proof, or explosion-proof.

2.4 INSTALLATION CONDITION

Item	Model	Specification/condition
Rated Voltage	LR Mate 200*i*D, ER-4*i*A, M-1*i*A, CR-4*i*A, CR-7*i*A, CR-14*i*A	200-240VAC +10% -15% 50/60Hz ±1Hz Single phase
	M-2*i*A, M-3*i*A DR-3*i*B	200-230VAC +10% -15% 50/60Hz ±1Hz 3 phase (CAUTION 5)
Tolerant fluctuation	All models	Tolerant voltage fluctuation: +10% -15% Tolerant frequency fluctuation: ±1Hz
Type of power distribution system	All models	TN / TT The TN-power system and TT-power system are based on the AC power distribution system standard IEC60364.
SCCR(IEC)	All models	230VAC: 1kA
Input power source capacity	M-1*i*A	1.0KVA
	LR Mate 200*i*D, ER-4*i*A, CR-4*i*A, CR-7*i*A, CR-14*i*A	1.2KVA
	M-2*i*A, M-3*i*A, DR-3*i*B	12KVA
Average power consumption	M-1*i*A	0.2KW
	LR Mate 200*i*D, ER-4*i*A, CR-4*i*A, CR-7*i*A,CR-14*i*A	0.5KW
	M-2*i*A, M-3*i*A DR-3*i*B	2.5KW
Permissible ambient temperature	All models	Operating 0℃ to 40℃ Storage, Transport -20℃ to 60℃ Temperature change 0.3℃/minute or less
Permissible ambient humidity	All models	Normal：75% RH or less, no condensation Short period(less than 1 month)：95% RH or less, no condensation
Atmosphere	All models	Refer to the caution on this page.
Overvoltage category/ Pollution degree	All models	Overvoltage category II, Pollution degree 2, IEC60664-1, IEC/EN/UL61010-1
Vibration acceleration	All models	4.9m/s^2 (0.5G) or less. When using the robot in a location subject to serious vibration, consult with your FANUC sales representative.
Altitude	All models	Operating：Up to 1,000m Non-operating：Up to 12,000m
Ionized and non-ionized radiation	All models	A shielding provision is necessary if the machine is installed in an environment in which it is exposed to radiation (microwave, ultraviolet rays, laser beams, and/or X-rays).
Mass of controller	LR Mate 200*i*D, ER-4*i*A, M-1*i*A	Approx. 16kg
	CR-4*i*A, CR-7*i*A, CR-14*i*A	Approx. 19kg
	M-2*i*A, M-3*i*A, DR-3*i*B	Approx. 30kg
Degree of protection	All models	IP20 compliant
	Teach pendant	IP54

⚠WARNING
Do not connect or disconnect connectors to/from the controller while the power switch is on. Doing so may cause electric shock or controller failure.

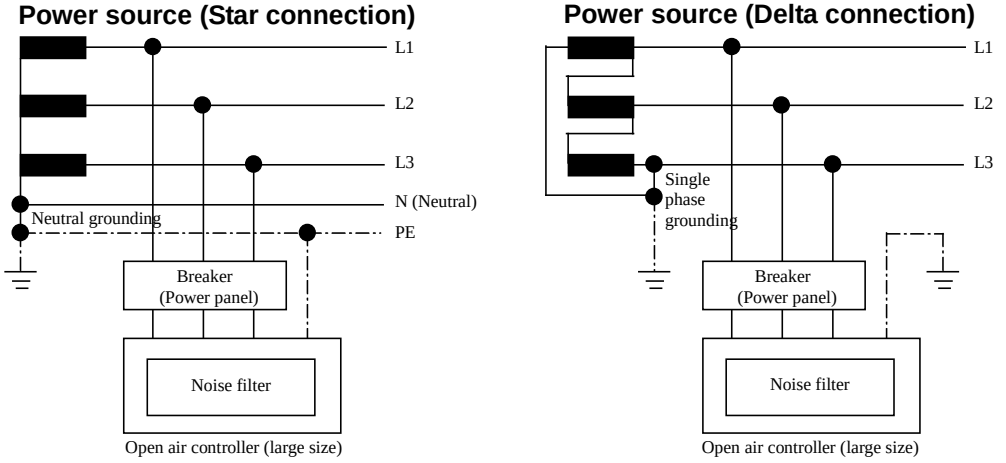
⚠CAUTION
This controller is open air type, it should be installed in the environment of ”Pollution degree 2” regulated in IEC 60664-1, IEC/EN/UL 61010-1 “Pollution degree 2” means cleanly environment like an office.

NOTE
The power rating indicated above is sufficient as the continuous rating. However, when the robot is rapidly accelerating, the instantaneous requirement may increase to several times the continuous rating.
If the acceleration/deceleration override (ACC) greater than 100% is set in the robot program, the extreme current may flow to the robot controller instantaneously and the input voltage of robot controller will drop.
In this case, if the supply voltage is decreased 10% or more per rated voltage, Power supply alarm, Move error excess alarm, DCLV alarm of servo amplifier may occur.

In case that an earth leakage breaker in the power panel tripped

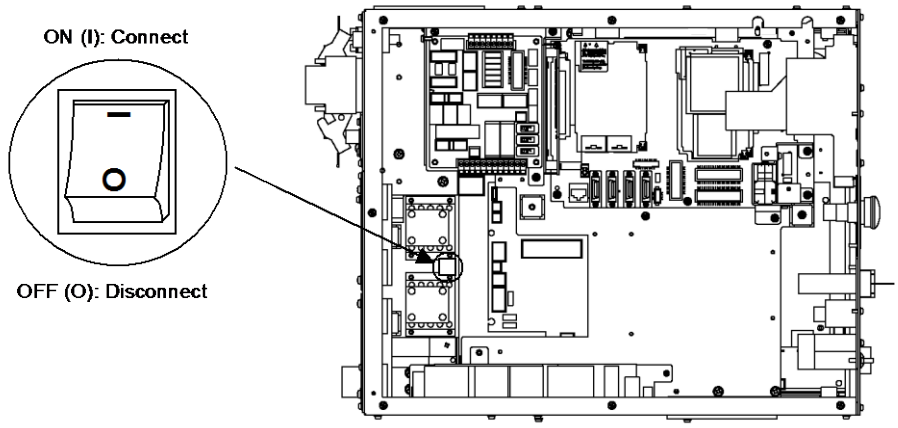
A noise filter is installed in the open air controller (large size). The noise filter is designed to connect to star connection / neutral grounding power system (TN-power system, NOTE.1). In case that the controller is connected to delta connection / single-phase grounding power system (TT-power system NOTE.1), there is a possibility that small leakage current flows via noise filter.
Therefore, if leakage breaker (Rated leakage current: less than 30mA) is installed in a power panel of the building and many controllers are connected to one leakage breaker, the leakage breaker may trip by amount of the leakage current.

NOTE.1) The TN-power system and TT-power system are based on the AC power distribution system standard IEC60364.



In this case, following countermeasures will be effective.
(1) Use leakage breaker that has large rated leakage current. Or reduce the number of controllers that is connected to one leakage breaker.
(2) Install isolated transformer between input power and controller.
(3) In case of large size open air controller, it is possible to reduce the leakage current by turning off a switch at the noise filter. (NOTE.2)

If the controller used in region where CE mark is required, this switch should be ON because European power system is star connection / neutral grounding.



NOTE.2) Open air controller (large size) has a noise filter with switch that connect/disconnect the internal capacitor to the ground. In case that the controller connected to delta connection / single-phase grounding power system (TT-power system), it is possible to reduce the leakage current to less than 10mA by turning off (O-side) the switch at the noise filter.

2.5 CAUTION ON EMC (ELECTROMAGNETIC COMPATIBILITY)

⚠CAUTION
In case of basic controller

This equipment generates, uses, and can radiate radiofrequency energy. Operation of the equipment in a residential area is likely to cause EMC (electromagnetic compatibility) interference, in which case the user will be required to correct the interference at his own expense.

⚠CAUTION
In case of NRTL controller

This equipment generates, uses, and can radiate radiofrequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of the equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measure may be required to correct the interference.

⚠CAUTION
In case of CE controller

1. R-30*i*B Mate/R-30*i*B Mate Plus controller (Open Air) is a group 1, class A product according to EN55011.
   This means that this product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection / analysis purpose and that it is suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.
   There may be potential difficulties in ensuring electromagnetic compatibility in environments other than industrial, due to conducted as well as radiated disturbances.
   This product must not be used in residual areas.
   This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
2. In case of R-30*i*B Mate/R-30*i*B Mate Plus controller (Open Air) large size, set up isolated transformer between input power and controller.

2.6 CHECKS AT INSTALLATION

Check the robot according to the following procedure at installation.

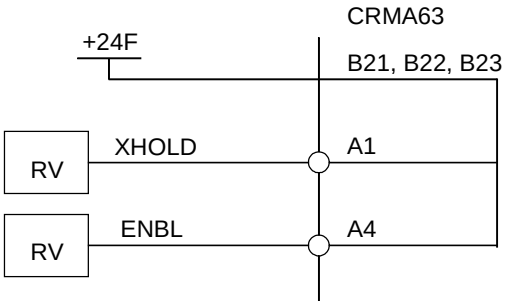
No.	Description
1	Visually check the outside of the controller.
2	Connect controller and mechanical unit cables.
3	The breaker off and connect the input power cable.
4	Check the input power voltage.
5	Press the EMERGENCY STOP button on the controller and turn on the controller.
6	Check the interface signals between controller and robot mechanical unit.
7	Check the parameters. If necessary, set them.
8	Release the EMERGENCY STOP button on the controller.
9	Check the movement along each axis in manual jog mode.
10	Check the end effector interface signals.
11	Check the DI/DO signals.

2.7 RESETTING THE ALARMS AT INSTALLATION

An overtravel and some alarms occur when the robot is operated for the first time after it is installed, the mechanical and controller are wired. This section describes how to reset the alarms.
The robot is also in an alarm state if the peripheral device control interface is not connected.

2.7.1 Peripheral Device Interface Connection

Connect as following if signals XHOLD and ENBL are not used.



2.7.2 Resetting Overtravel

1) Select [OT release] on the overtravel release screen to release each robot axis from the overtravel state.
2) Hold down the shift key, and press the alarm release button to reset the alarm state.
3) Still hold down the shift key, and jog to bring all axes into the movable range.

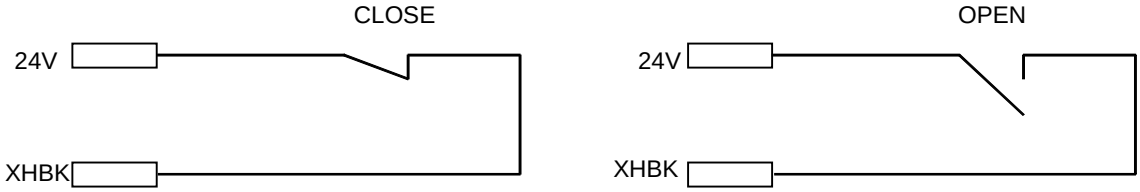
2.7.3 How to Disable/Enable Hand Broken(HBK)

1) Press the [MENU] key on the teach pendant.
2) Select [NEXT] key.
3) Select [SYSTEM].
4) Press "F1" (TYPE) on the teach pendant.
5) Select "Config" to disable/enable HBK.

Status	HBK enable/disable setting	HBK (*1)	HBK detection	Robot operation	Message
1	Enable	CLOSE	Yes	Possible	None
2	Enable	OPEN	Yes	Impossible	SRVO-006
3	Disable	CLOSE	No (NOTE2)	Impossible	SRVO-302
4	Disable	OPEN	No	Possible	At cold start, SRVO-300

NOTE

1 Robot end effector connector



2 The moment the HBK circuit is closed, alarm "Servo 302" occurs. HBK setting needs to be valid manually. When the HBK setting is valid and the HBK circuit is opened, causing alarm "Servo 006".

3 If the power is turned off and on again under the condition stated in NOTE2, status 4 is entered, so the alarm condition is removed.

2.7.4 How to Disable/Enable Pneumatic Pressure Alarm (PPABN)

1) Press the [MENU] key on the teach pendant.
2) Select [NEXT] key.
3) Select [SYSTEM].
4) Press "F1" (TYPE) on the teach pendant.
5) Select "Config" to disable/enable PPABN.

APPENDIX

A SPECIFICATION LIST

Name	Ordering Specification	FANUC Specification	Note
Main board + Fan board (R-30*i*B Mate)	A05B-2655-H001 /A05B-2662-H002	A20B-8200-0790	Standard, Ethernet 1ch
		A20B-8002-0950	
	A05B-2655-H002 /A05B-2662-H002	A20B-8200-0791	Ethernet 2ch, Vision I/F, Force sensor
		A20B-8002-0950	
	A05B-2655-H003 /A05B-2662-H003	A20B-8200-0792	Ethernet 2ch, Vision I/F, Force sensor, PMC, HDI
		A20B-8002-0950	
	A05B-2655-H004 /A05B-2662-H004	A20B-8201-0420	Standard, Ethernet:1ch For I/O Link *i* slave
		A20B-8002-0950	
	A05B-2655-H005 /A05B-2662-H005	A20B-8201-0421	Ethernet:2ch, Vision I/F, Force sensor I/F For I/O Link *i* slave
		A20B-8002-0950	
	A05B-2655-H006 /A05B-2662-H006	A20B-8201-0422	Ethernet:2ch, Vision I/F, Force sensor I/F, PMC, HDI For I/O Link *i* slave
		A20B-8002-0950	
Main board + Fan board (R-30*i*B Mate Plus)	A05B-2685-H001	A20B-8201-0750	Standard, Ethernet:2ch For I/O Link *i* slave
		A20B-8002-0950	The total edition 03B or later
	A05B-2685-H002	A20B-8201-0751	Ethernet:3ch, Vision I/F, Force sensor I/F For I/O Link *i* slave
		A20B-8002-0950	The total edition 03B or later
	A05B-2685-H003	A20B-8201-0752	Ethernet:3ch, Vision I/F, Force sensor I/F, PMC, HDI For I/O Link *i* slave
		A20B-8002-0950	The total edition 03B or later
CPU card (R-30*i*B Mate)	A05B-2600-H020 /A05B-2660-H020	A20B-3300-0686	Standard / SDRAM 32Mbyte
		A17B-3301-0106	
	A05B-2600-H021 /A05B-2660-H021	A20B-3300-0687	Standard / SDRAM 64Mbyte
		A17B-3301-0107	
	A05B-2600-H022 /A05B-2660-H022	A20B-3300-0688	Standard / SDRAM 128Mbyte
		A17B-3301-0108	
	A05B-2600-H023 /A05B-2660-H023	A20B-3300-0683	High speed / SDRAM 32Mbyte
		A17B-3301-0103	
	A05B-2600-H024 /A05B-2660-H024	A20B-3300-0684	High speed / SDRAM 64Mbyte
		A17B-3301-0104	
	A05B-2600-H025 /A05B-2660-H025	A20B-3300-0685	High speed / SDRAM 128Mbyte
		A17B-3301-0105	
	A05B-2600-H026 /A05B-2660-H120	A17B-3301-0109	Standard / SDRAM 32Mbyte For I/O Link *i* slave
	A05B-2600-H027 /A05B-2660-H121	A17B-3301-0110	Standard / SDRAM 64Mbyte For I/O Link *i* slave
	A05B-2600-H028 /A05B-2660-H122	A17B-3301-0111	Standard / SDRAM 128Mbyte For I/O Link *i* slave
	A05B-2600-H029 /A05B-2660-H123	A17B-3301-0112	High speed / SDRAM 32Mbyte For I/O Link *i* slave
	A05B-2600-H030 /A05B-2660-H124	A17B-3301-0113	High speed / SDRAM 64Mbyte For I/O Link *i* slave
	A05B-2600-H031 /A05B-2660-H125	A17B-3301-0114	High speed / SDRAM128Mbyte For I/O Link *i* slave

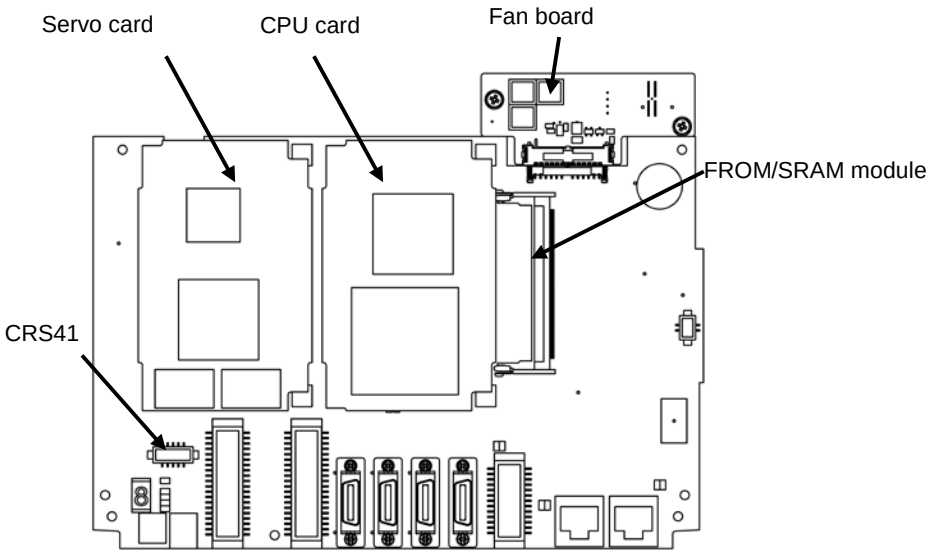
Name	Ordering Specification	FANUC Specification	Note
CPU card (R-30*i*B Mate Plus)	A05B-2670-H020	A17B-3301-0250	Standard / DRAM 1GB For I/O Link *i* slave
Servo card (R-30*i*B Mate)	A05B-2600-H040 /A05B-2660-H040	A20B-3300-0664 A20B-3300-0774	6-axis
	A05B-2600-H041 /A05B-2660-H041	A20B-3300-0663 A20B-3300-0773	12-axis
	A05B-2600-H042 /A05B-2660-H042	A20B-3300-0662 A20B-3300-0772	18-axis
	A05B-2600-H043 /A05B-2660-H043	A20B-3300-0661 A20B-3300-0771	24-axis
	A05B-2600-H044 /A05B-2660-H044	A20B-3300-0660 A20B-3300-0770	36-axis
Servo card (R-30*i*B Mate Plus)	A05B-2670-H040	A20B-3300-0819	6-axis
	A05B-2670-H041	A20B-3300-0818	12-axis
	A05B-2670-H042	A20B-3300-0817	18-axis
	A05B-2670-H043	A20B-3300-0816	24-axis
	A05B-2670-H044	A20B-3300-0815	36-axis
FROM /SRAM module (R-30*i*B Mate)	A05B-2600-H060 /A05B-2660-H060	A20B-3900-0283 A20B-3900-0297	FROM 32M/ SRAM 1M
	A05B-2600-H061 /A05B-2660-H061	A20B-3900-0284 A20B-3900-0298	FROM 32M/ SRAM 2M
	A05B-2600-H062 /A05B-2660-H062	A20B-3900-0285 A20B-3900-0299	FROM 32M/ SRAM 3M
FROM /SRAM module (R-30*i*B Mate) (R-30*i*B Mate Plus)	A05B-2600-H063 /A05B-2660-H063	A20B-3900-0286	FROM 64M/ SRAM 1M
	A05B-2600-H064 /A05B-2660-H064	A20B-3900-0287	FROM 64M/ SRAM 2M
	A05B-2600-H065 /A05B-2660-H065	A20B-3900-0288	FROM 64M/ SRAM 3M
	A05B-2600-H066 /A05B-2660-H066	A20B-3900-0280	FROM 128M/ SRAM 1M
	A05B-2600-H067 /A05B-2660-H067	A20B-3900-0281	FROM 128M/ SRAM 2M
	A05B-2600-H068 /A05B-2660-H068	A20B-3900-0282	FROM 128M/ SRAM 3M
FROM /SRAM module (R-30*i*B Mate Plus)	A05B-2600-H069	A20B-3900-0293	FROM 256M/ SRAM 1M
	A05B-2600-H070	A20B-3900-0295	FROM 256M/ SRAM 2M
	A05B-2600-H071	A20B-3900-0296	FROM 256M/ SRAM 3M
1 slot backplane	A05B-2655-H080	A20B-8200-0670	R-30*i*B Mate
	A05B-2662-H080		
	A05B-2656-H080		
	A05B-2685-H080	A20B-8201-0710	R-30*i*B Mate Plus
	A05B-2686-H080		
2 slot backplane	A05B-2655-H081	A20B-8200-0680	R-30*i*B Mate
	A05B-2662-H081		
	A05B-2656-H081		
	A05B-2685-H081	A20B-8201-0720	R-30*i*B Mate Plus
	A05B-2686-H081		
E-STOP board	A05B-2655-H110	A20B-2005-0150	R-30*i*B Mate
	A05B-2662-H110		
	A05B-2685-H110	A20B-2103-0170	R-30*i*B Mate Plus

Name	Ordering Specification	FANUC Specification	Note
MCC unit	A05B-2655-H160	A05B-2655-C400	
	A05B-2662-H160		
	A05B-2656-H160	A05B-2656-C400	
PSU unit	A05B-2655-H180	A05B-2655-C200	
	A05B-2662-H180		
	A05B-2685-H180	A05B-2685-C200	
Additional Safety I/O board	A05B-2600-J131	A20B-8201-0110	
DeviceNet board/ Slave	A05B-2600-J040	A20B-8101-0330	Mini slot
	A05B-2660-J040		
DeviceNet board/Master	A05B-2600-J042	A20B-8101-0641	DN4 1ch, Mini slot
	A05B-2660-J042		
DeviceNet board/Master	A05B-2600-J043	A20B-8201-0170	DN4 2ch, Mini slot
	A05B-2660-J043		
FL-net board	A05B-2600-J105	A20B-8101-0031	Mini slot
	A05B-2660-J105		
Profinet Mother Board	A05B-2600-J076	A20B-8101-0930	Mini slot
Profinet Daughter Board	A05B-2600-J083	A15L-0001-0150	Mini slot
Profibus board/ Slave	A05B-2600-J070	A20B-8101-0100	Mini slot
	A05B-2660-J070		
Profibus board/ Master	A05B-2600-J071	A20B-8101-0050	Mini slot
	A05B-2660-J071		
CC Link remote device station board	A05B-2600-J110	A20B-8101-0550	Mini slot
	A05B-2660-J110		
EtherCAT Slave Board	A05B-2600-J120	A20B-8101-0821	Mini slot
PC104 Interface Board	A05B-2600-J095	A20B-8101-0350	Wide-mini
	A05B-2660-J095		
DeviceNet DAUGHTER board	A05B-2600-J080	A15L-0001-0130#S	(DN4 1ch)
	A05B-2660-J080		
	A05B-2600-J081	A15L-0001-0130#D	(DN4 2ch)
	A05B-2660-J081		
Profinet Mother Board	A05B-2600-J075	A20B-8201-0020	Without CP1604 Wide-mini
	A05B-2660-J075		
	A05B-2600-J078	A20B-8201-0020	With CP1604 Wide-mini
		A15L-0001-0149	
CC-Link IE Field Slave Board	A05B-2600-J111	A20B-8101-0920	Wide-mini
6-axis servo amplifier	A05B-2656-H031	A06B-6400-H002	
	A05B-2655-H030	A06B-6400-H005	
	A05B-2662-H030		
	A05B-2656-H030	A06B-6400-H102	
Discharge resistor	A05B-2655-H150	A05B-2655-C100	50W
	A05B-2662-H150		
	A05B-2656-H150	A05B-2656-C100	
Brake release unit	A05B-2450-J350	A05B-2400-C151	AC100-115V
	A05B-2560-J460		
	A05B-2450-J351	A05B-2400-C152	AC200-240V
	A05B-2560-J461		
Sensor I/F Unit	A05B-2687-H350	A05B-2687-C200	CR-4*i*A, CR-7*i*A, CR-14*i*A
Fan Unit	A05B-2655-C310		

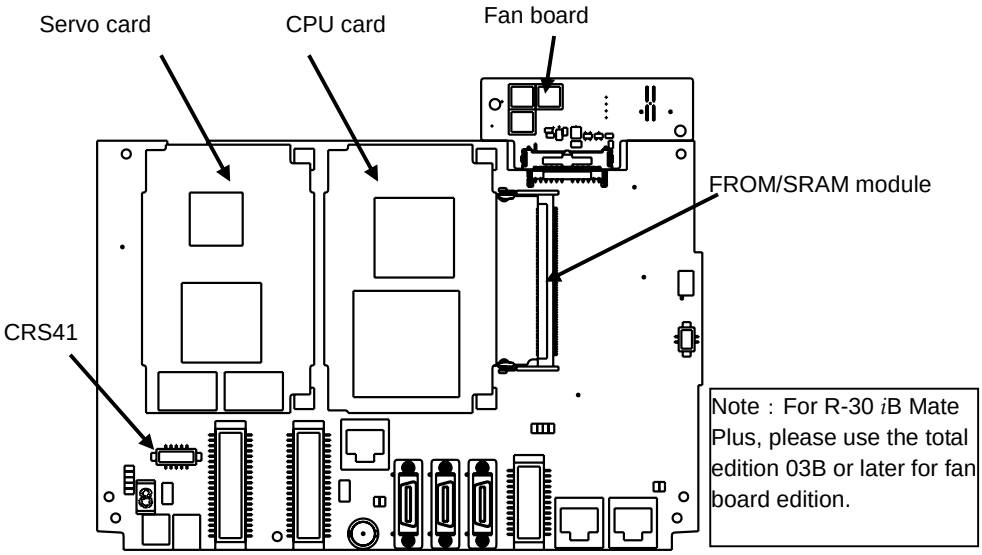
Name	Ordering Specification	FANUC Specification	Note
Fuse (R-30iB Mate)	A05B-2650-K001	A60L-0001-0290#LM10	Main board: FUSE1
		A60L-0001-0290 #LM32C	Servo Amp.: FS1, FS2, FS3
	A05B-2650-K002	A60L-0001-0290 #LM10C	FUSE2, FUSE3
		A60L-0001-0290 #LM20C	FUSE4
		A60L-0001-0290 #LM50C	FUSE5
		A60L-0001-0175#3.2A	FUSE6、FUSE7
	A05B-2450-K001 /A05B-2560-K040	A60L-0001-0101 #P420H	Brake release unit
Fuse (R-30*i*B Mate Plus)	A05B-2680-K001	A60L-0001-0290#LM10	Main board: FUSE1, FUSE9
		A60L-0001-0290 #LM32C	Servo Amp.: FS1, FS2, FS3
	A05B-2680-K002	A60L-0001-0290 #LM10C	FUSE2, FUSE3
		A60L-0001-0290 #LM20C	FUSE4
		A60L-0001-0290 #LM50C	FUSE5
		A60L-0001-0175#0.3A	FUSE8
		A60L-0001-0175#3.2A	FUSE6、FUSE7
	A05B-2450-K001 /A05B-2560-K040	A60L-0001-0101 #P420H	Brake release unit
Teach pendant (R-30*i*B Mate)	A05B-2255-H100#EMH	A05B-2255-C102#EMH	English/ Material handling
	A05B-2255-H102#EMH		
	A05B-2255-H100#EAW	A05B-2255-C102#EAW	English/ ARC welding
	A05B-2255-H102#EAW		
	A05B-2255-H100#ESL	A05B-2255-C102#ESL	English/ Sealing
	A05B-2255-H102#ESL		
	A05B-2255-H100#EGN	A05B-2255-C102#EGN	English/ General
	A05B-2255-H102#EGN		
	A05B-2255-H100#SGN	A05B-2255-C102#SGN	General/ Symbolic
	A05B-2255-H102#SGN		
	A05B-2255-H100#JMH	A05B-2255-C102#JMH	Japanese/ Material handling
	A05B-2255-H102#JMH		
	A05B-2255-H100#JAW	A05B-2255-C102#JAW	Japanese/ ARC welding
	A05B-2255-H102#JAW		
	A05B-2255-H100#JSL	A05B-2255-C102#JSL	Japanese/ Sealing
	A05B-2255-H102#JSL		
	A05B-2255-H100#JGN	A05B-2255-C102#JGN	Japanese/ General
	A05B-2255-H102#JGN		
Teach pendant (R-30*i*B Mate Plus)	A05B-2256-H100#EMH	A05B-2256-C100#EMH	English/ Material handling
	A05B-2256-H100#EAW	A05B-2256-C100#EAW	English/ ARC welding
	A05B-2256-H100#ESL	A05B-2256-C100#ESL	English/ Sealing
	A05B-2256-H100#EGN	A05B-2256-C100#EGN	English/ General
	A05B-2256-H100#SGN	A05B-2256-C100#SGN	General/ Symbolic
	A05B-2256-H100#JMH	A05B-2256-C100#JMH	Japanese/ Material handling
	A05B-2256-H100#JAW	A05B-2256-C100#JAW	Japanese/ ARC welding
	A05B-2256-H100#JSL	A05B-2256-C100#JSL	Japanese/ Sealing
	A05B-2256-H100#JGN	A05B-2256-C100#JGN	Japanese/ General

Name	Ordering Specification	FANUC Specification	Note
Teach pendant (Touch panel) (R-30*i*B Mate)	A05B-2255-H101#EMH	A05B-2255-C101#EMH	English/ Material handling
	A05B-2255-H103#EMH		
	A05B-2255-H101#EAW	A05B-2255-C101#EAW	English/ ARC welding
	A05B-2255-H103#EAW		
	A05B-2255-H101#ESL	A05B-2255-C101#ESL	English/ Sealing
	A05B-2255-H103#ESL		
	A05B-2255-H101#EGN	A05B-2255-C101#EGN	English/ General
	A05B-2255-H103#EGN		
	A05B-2255-H101#SGN	A05B-2255-C101#SGN	General/ Symbolic
	A05B-2255-H103#SGN		
	A05B-2255-H101#JMH	A05B-2255-C101#JMH	Japanese/ Material handling
	A05B-2255-H103#JMH		
	A05B-2255-H101#JAW	A05B-2255-C101#JAW	Japanese/ ARC welding
	A05B-2255-H103#JAW		
	A05B-2255-H101#JSL	A05B-2255-C101#JSL	Japanese/ Sealing
	A05B-2255-H103#JSL		
	A05B-2255-H101#JGN	A05B-2255-C101#JGN	Japanese/ General
	A05B-2255-H103#JGN		
Teach pendant (Touch panel) (R-30*i*B Mate Plus)	A05B-2256-H101#EMH	A05B-2256-C101#EMH	English/ Material handling
	A05B-2256-H101#EAW	A05B-2256-C101#EAW	English/ ARC welding
	A05B-2256-H101#ESL	A05B-2256-C101#ESL	English/ Sealing
	A05B-2256-H101#EGN	A05B-2256-C101#EGN	English/ General
	A05B-2256-H101#SGN	A05B-2256-C101#SGN	General/ Symbolic
	A05B-2256-H101#JMH	A05B-2256-C101#JMH	Japanese/ Material handling
	A05B-2256-H101#JAW	A05B-2256-C101#JAW	Japanese/ ARC welding
	A05B-2256-H101#JSL	A05B-2256-C101#JSL	Japanese/ Sealing
	A05B-2256-H101#JGN	A05B-2256-C101#JGN	Japanese/ General
Teach pendant (Haptic) (R-30*i*B Mate)	A05B-2255-H104#EMH	A05B-2255-C104#EMH	English/ Material handling
	A05B-2255-H104#EAW	A05B-2255-C104#EAW	English/ ARC welding
	A05B-2255-H104#ESL	A05B-2255-C104#ESL	English/ Sealing
	A05B-2255-H104#EGN	A05B-2255-C104#EGN	English/ General
	A05B-2255-H104#SGN	A05B-2255-C104#SGN	General/ Symbolic
	A05B-2255-H104#JMH	A05B-2255-C104#JMH	Japanese/ Material handling
	A05B-2255-H104#JAW	A05B-2255-C104#JAW	Japanese/ ARC welding
	A05B-2255-H104#JSL	A05B-2255-C104#JSL	Japanese/ Sealing
	A05B-2255-H104#JGN	A05B-2255-C104#JGN	Japanese/ General
Teach pendant (Haptic) (R-30*i*B Mate Plus)	A05B-2256-H102#EMH	A05B-2256-C102#EMH	English/ Material handling
	A05B-2256-H102#EAW	A05B-2256-C102#EAW	English/ ARC welding
	A05B-2256-H102#ESL	A05B-2256-C102#ESL	English/ Sealing
	A05B-2256-H102#EGN	A05B-2256-C102#EGN	English/ General
	A05B-2256-H102#SGN	A05B-2256-C102#SGN	General/ Symbolic
	A05B-2256-H102#JMH	A05B-2256-C102#JMH	Japanese/ Material handling
	A05B-2256-H102#JAW	A05B-2256-C102#JAW	Japanese/ ARC welding
	A05B-2256-H102#JSL	A05B-2256-C102#JSL	Japanese/ Sealing
	A05B-2256-H102#JGN	A05B-2256-C102#JGN	Japanese/ General

Name	Ordering Specification	FANUC Specification	Note
Teach pendant (Touch panel, Haptic) (R-30*i*B Mate)	A05B-2255-H105#EMH	A05B-2255-C105#EMH	English/ Material handling
	A05B-2255-H105#EAW	A05B-2255-C105#EAW	English/ ARC welding
	A05B-2255-H105#ESL	A05B-2255-C105#ESL	English/ Sealing
	A05B-2255-H105#EGN	A05B-2255-C105#EGN	English/ General
	A05B-2255-H105#SGN	A05B-2255-C105#SGN	General/ Symbolic
	A05B-2255-H105#JMH	A05B-2255-C105#JMH	Japanese/ Material handling
	A05B-2255-H105#JAW	A05B-2255-C105#JAW	Japanese/ ARC welding
	A05B-2255-H105#JSL	A05B-2255-C105#JSL	Japanese/ Sealing
	A05B-2255-H105#JGN	A05B-2255-C105#JGN	Japanese/ General
Teach pendant (Touch panel, Haptic) (R-30*i*B Mate Plus)	A05B-2256-H103#EMH	A05B-2256-C103#EMH	English/ Material handling
	A05B-2256-H103#EAW	A05B-2256-C103#EAW	English/ ARC welding
	A05B-2256-H103#ESL	A05B-2256-C103#ESL	English/ Sealing
	A05B-2256-H103#EGN	A05B-2256-C103#EGN	English/ General
	A05B-2256-H103#SGN	A05B-2256-C103#SGN	General/ Symbolic
	A05B-2256-H103#JMH	A05B-2256-C103#JMH	Japanese/ Material handling
	A05B-2256-H103#JAW	A05B-2256-C103#JAW	Japanese/ ARC welding
	A05B-2256-H103#JSL	A05B-2256-C103#JSL	Japanese/ Sealing
	A05B-2256-H103#JGN	A05B-2256-C103#JGN	Japanese/ General
Operator's panel (R-30*i*B Mate)	A05B-2655-H100	A05B-2655-C001	English/ 2 mode / without TP disconnect
	A05B-2662-H100		
	A05B-2656-H100	A05B-2656-C001	
	A05B-2655-H101	A05B-2655-C002	Japanese/ 2 mode / without TP disconnect
	A05B-2662-H101		
	A05B-2656-H101	A05B-2656-C002	
	A05B-2655-H102	A05B-2655-C003	English/ 2 mode/ with TP disconnect "Warm mode"
	A05B-2662-H102		
	A05B-2656-H102	A05B-2656-C003	
	A05B-2655-H103	A05B-2655-C004	Japanese/2 mode/ with TP disconnect "Warm mode"
	A05B-2662-H103		
	A05B-2656-H103	A05B-2656-C004	
	A05B-2655-H104	A05B-2655-C005	English/ 2 mode / without TP disconnect / UL489
	A05B-2662-H104		
	A05B-2655-H105	A05B-2655-C006	English/ 2 mode/ with TP disconnect "Warm mode"/ UL489
	A05B-2662-H105		
Operator's panel (R-30*i*B Mate Plus)	A05B-2685-H100	A05B-2685-C001	Symbol/ 2mode / without TP disconnect
	A05B-2685-H101	A05B-2685-C002	Symbol / 2 mode/ with TP disconnect "Warm mode"
	A05B-2685-H104	A05B-2685-C005	Symbol / 2 mode/ with TP jumper "Cold mode"
	A05B-2685-H102	A05B-2685-C003	Symbol/ 2mode / without TP disconnect / UL489
	A05B-2685-H103	A05B-2685-C004	Symbol / 2 mode/ with TP disconnect "Warm mode"/ UL489

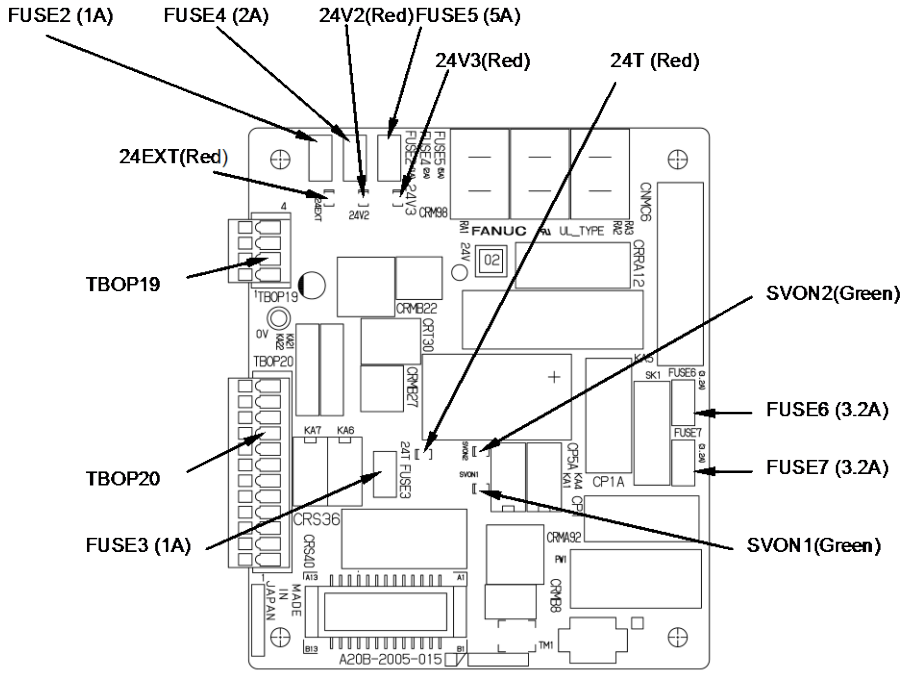


R-30*i*B Mate

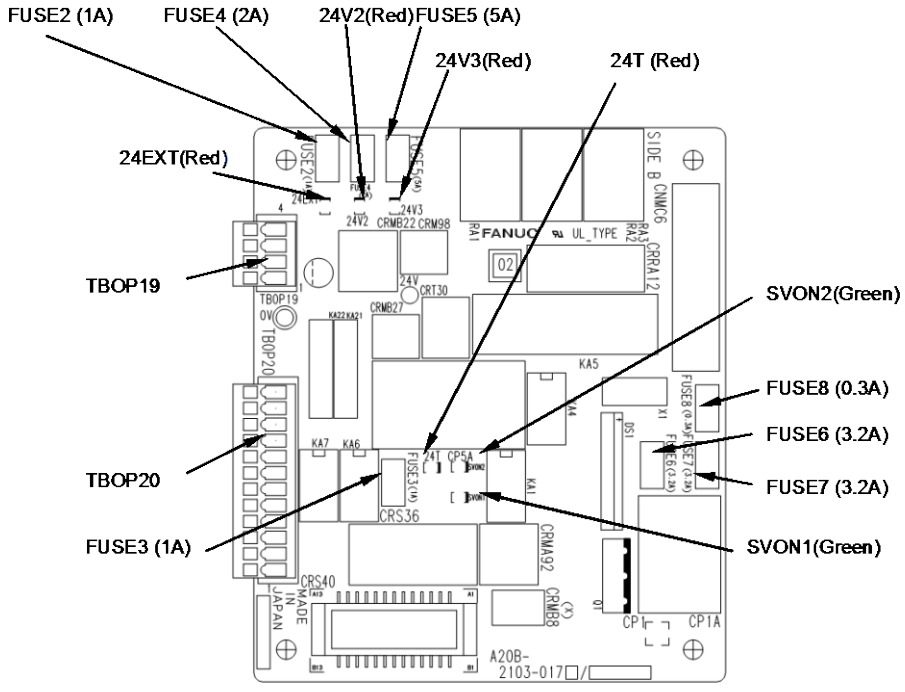


R-30*i*B Mate Plus

Fig.A (a) Main board



(R-30*i*B Mate A20B-2005-0150)



(R-30*i*B Mate Plus A20B-2103-0170)

Fig.A (b) Emergency stop board

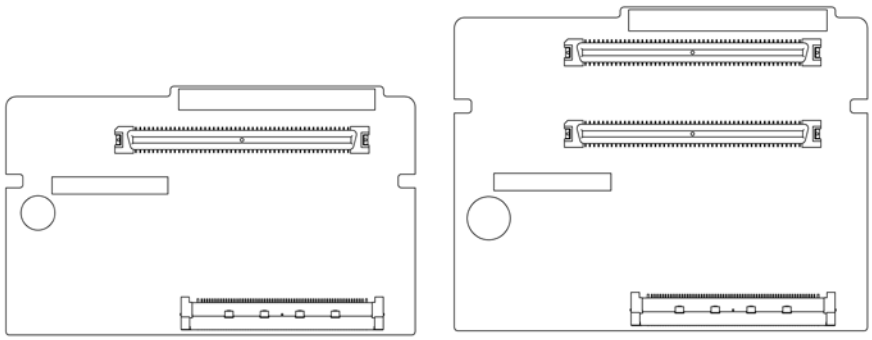


Fig.A (c) Backplane

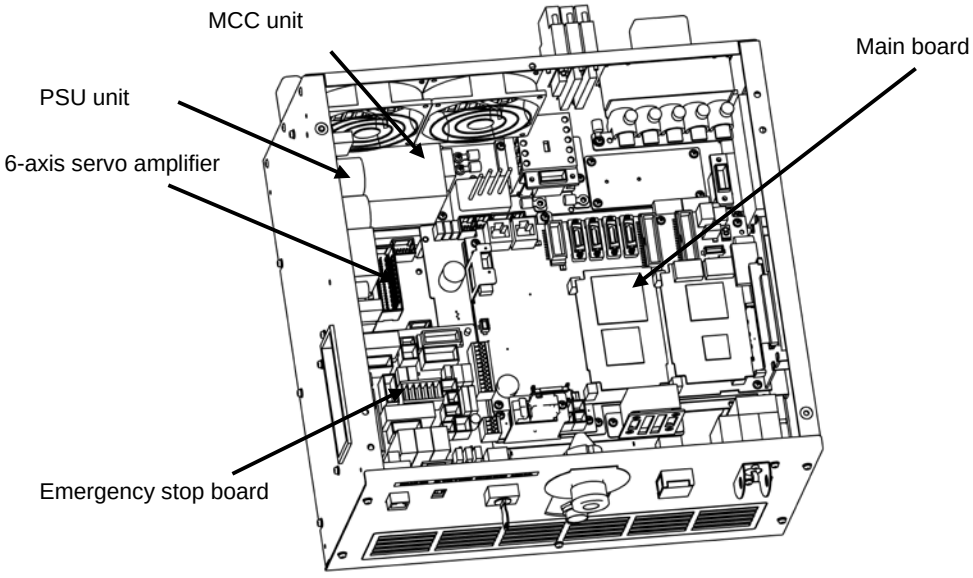


Fig.A (d) Cabinet interior

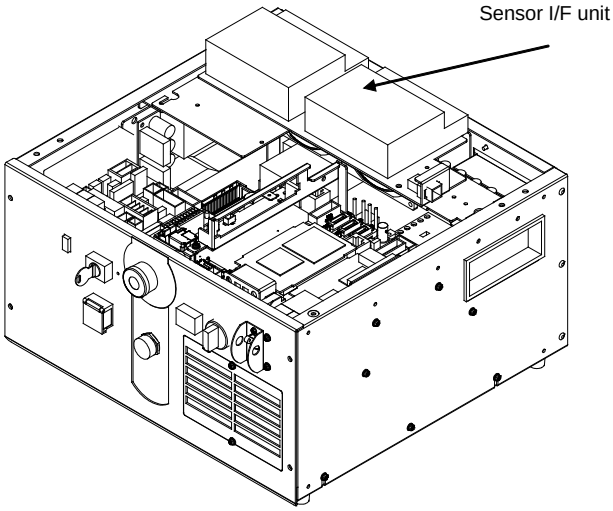
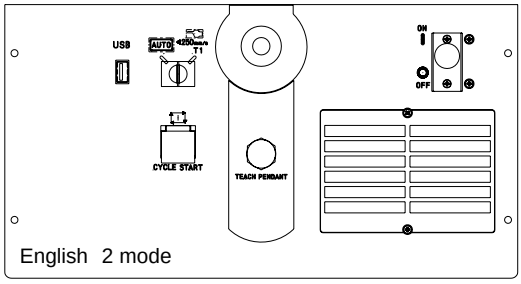


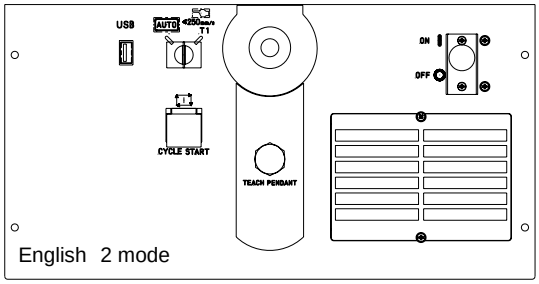
Fig.A (e) Sensor I/F unit

Operator's panel (without TP disconnect)

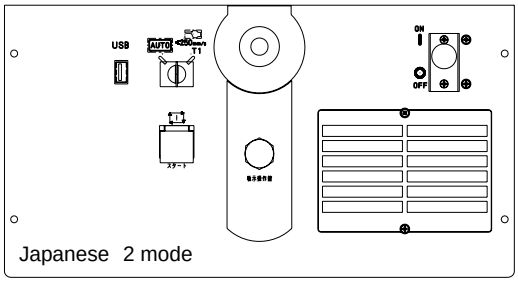
H100:A05B-2655-C001



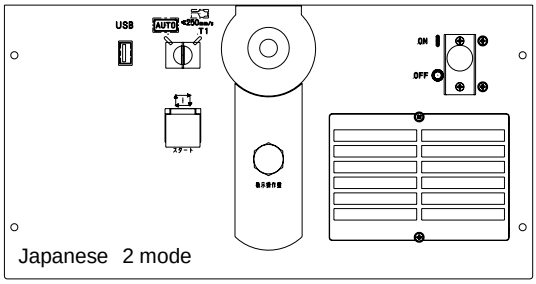
H100:A05B-2656-C001



H101:A05B-2655-C002

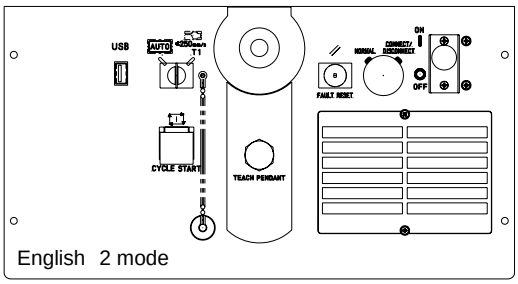


H101:A05B-2656-C002

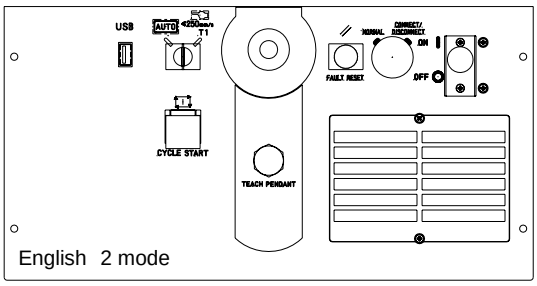


Operator's panel (with TP disconnect)

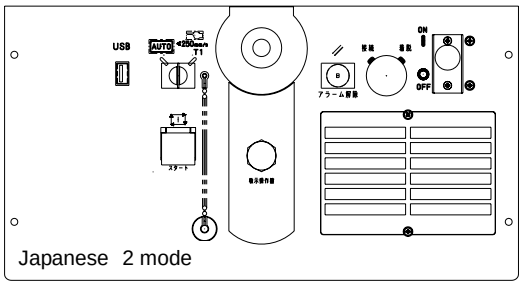
H102:A05B-2655-C003



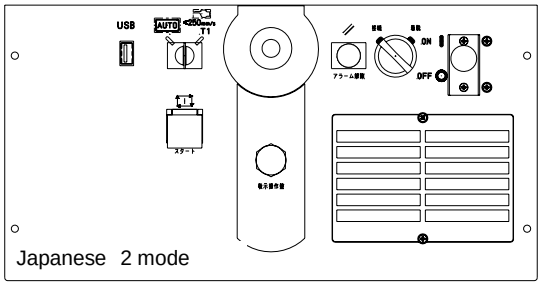
H102:A05B-2656-C003



H103:A05B-2655-C004

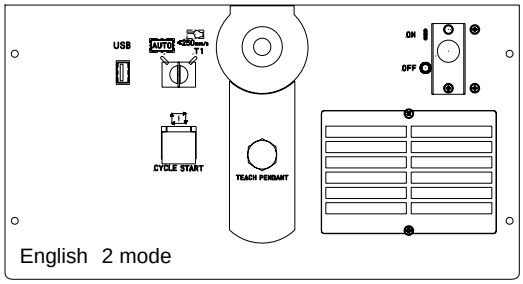


H103:A05B-2656-C004



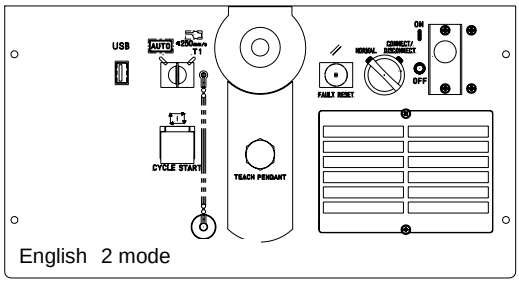
Operator's panel (without TP disconnect)

H100:A05B-2655-C005



Operator's panel (with TP disconnect)

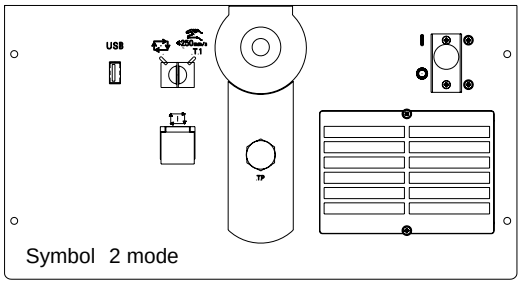
H105:A05B-2655-C006



R-30*i*B Mate

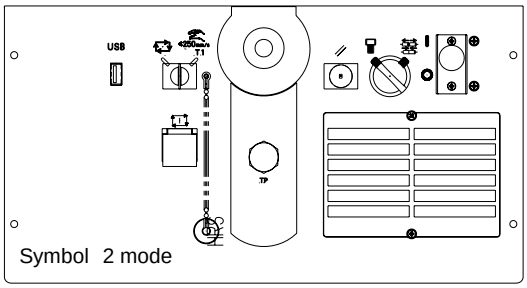
Operator's panel (without TP disconnect)

H100:A05B-2685-C001



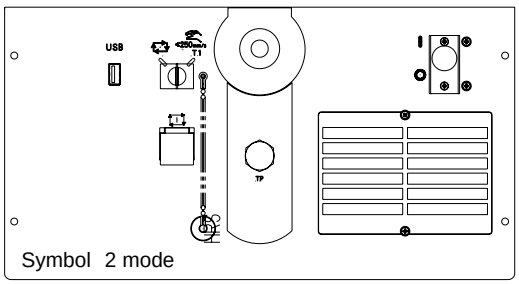
Operator's panel (with TP disconnect)

H101:A05B-2685-C002



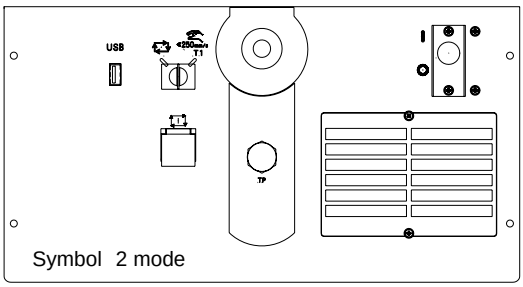
Operator's panel (with TP jumper)

H104:A05B-2685-C005



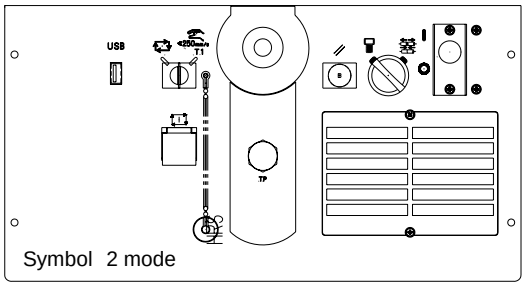
Operator's panel (without TP disconnect)

H102:A05B-2685-C003



Operator's panel (with TP disconnect)

H103:A05B-2685-C004



R-30*i*B Mate Plus

Fig.A (f) Operator's panel

Cable No.	Name	Length(m)	Ordering Specification	FANUC Specification	Note
K30	Peripheral cable (For main board)	10	A05B-2655-J100 /A05B-2662-J100	A660-2006-T686#L10R53C	Main board (CRMA15) ~ Peripheral device
				A660-2006-T687#L10R53C	Main board (CRMA16) ~ Peripheral device
		20	A05B-2655-J101 /A05B-2662-J101	A660-2006-T686#L20R53C	Main board (CRMA15) ~ Peripheral device
				A660-2006-T687#L20R53C	Main board (CRMA16) ~ Peripheral device
K95	Portable Brake release unit Robot connection cable	5	A05B-2560-J480	A660-2006-T474#L5R003	M-1*i*A
		10	A05B-2560-J481	A660-2006-T474#L10R03	
		5	A05B-2525-J047	A660-2006-T881#L5R003	CR-4*i*A,CR-7*i*A, ER-4*i*A, CR-14*i*A,CR-15*i*A, LR Mate 200*i*D
		10	A05B-2525-J048	A660-2006-T881#L10R03	
		5	A05B-2559-J480	A660-2005-T559#L5R003	M-2*i*A, M-3*i*A
		10	A05B-2559-J481	A660-2005-T559#L10R03	
K97	Portable Brake release unit Power cable	5	A05B-2450-J364	A05B-2450-D001	Without Power plug
			A05B-2560-J470	A05B-2450-D001	
		10	A05B-2450-J365	A05B-2450-D002	
			A05B-2560-J471	A05B-2450-D002	
		5	A05B-2525-J010	A05B-2525-D001	With Power plug AC100-115V
			A05B-2560-J472	A05B-2525-D001	
		10	A05B-2525-J011	A05B-2525-D002	
			A05B-2560-J473	A05B-2525-D002	
K01	Power supply cable	4	A05B-2655-J260	A660-8018-T683#L4R003	Single phase
			A05B-2662-J260		
		7	A05B-2655-J261	A660-8018-T683#L7R003	
			A05B-2662-J261		
		14	A05B-2655-J262	A660-8018-T683#L14R03	
			A05B-2662-J262		
		4	A05B-2559-J260	A660-8017-T466#L4R003	Three phase
		7	A05B-2559-J261	A660-8017-T466#L7R003	
		14	A05B-2559-J262	A660-8017-T466#L14R03	
K20	Teach pendant cable	5	A05B-2655-H172	A660-2007-T392#L5R503	Teach pendant ~ controller
			A05B-2662-H172		
		10	A05B-2655-H170	A660-2007-T392#L10R53	
			A05B-2662-H170		
		20	A05B-2655-H171	A660-2007-T392#L20R53	
			A05B-2662-H171		
	Teach pendant cable (With Strain Relief)	5	A05B-2655-H177	A660-2008-T032#L5R503	
			A05B-2662-H177		
		10	A05B-2655-H175	A660-2008-T032#L10R53	
			A05B-2662-H175		
		20	A05B-2655-H176	A660-2008-T032#L20R53	
			A05B-2662-H176		

Cable No.	Name	Length(m)	Ordering Specification	FANUC Specification	Note
K40	Robot connection cable (LR Mate 200*i*D, CR-4*i*A, CR-7*i*A, CR-14*i*A, ER-4*i*A) Non-flex, STD	2	A05B-2655-H204	A660-4005-T406#L2R003	RMP cable
				A660-8011-T210#L2R003	Earth cable
		4	A05B-2655-H200	A660-4005-T406#L4R003	RMP cable
				A660-8011-T210#L4R003	Earth cable
		7	A05B-2655-H201	A660-4005-T406#L7R003	RMP cable
				A660-8011-T210#L7R003	Earth cable
		14	A05B-2655-H202	A660-4005-T406#L14R03	RMP cable
				A660-8011-T210#L14R03	Earth cable
	Robot connection cable (LR Mate 200*i*D, CR-4*i*A, CR-7*i*A, CR-14*i*A, ER-4*i*A) Flex, STD	2	A05B-2655-H214	A660-4005-T423#L2R003	The cable do not correspond to ER-4*i*A, CR-4*i*A, CR-7*i*A, CR-14*i*A.
				A660-8011-T210#L2R003	
		4	A05B-2655-H210	A660-4005-T423#L4R003	RMP cable
				A660-8011-T210#L4R003	Earth cable
		7	A05B-2655-H211	A660-4005-T423#L7R003	RMP cable
				A660-8011-T210#L7R003	Earth cable
		14	A05B-2655-H212	A660-4005-T423#L14R03	RMP cable
				A660-8011-T210#L14R03	Earth cable
	Robot connection cable (LR Mate 200*i*D, CR-4*i*A, CR-7*i*A, CR-14*i*A, ER-4*i*A) Non-flex, CE	2	A05B-2655-H224	A660-4005-T407#L2R003	RMP cable
				A660-8011-T210#L2R003	Earth cable
		4	A05B-2655-H220	A660-4005-T407#L4R003	RMP cable
				A660-8011-T210#L4R003	Earth cable
		7	A05B-2655-H221	A660-4005-T407#L7R003	RMP cable
				A660-8011-T210#L7R003	Earth cable
		14	A05B-2655-H222	A660-4005-T407#L14R03	RMP cable
				A660-8011-T210#L14R03	Earth cable
	Robot connection cable (LR Mate 200*i*D, CR-4*i*A, CR-7*i*A, CR-14*i*A, ER-4*i*A) Flex, CE	2	A05B-2655-H234	A660-4005-T424#L2R003	The cable do not correspond to ER-4*i*A, CR-4*i*A, CR-7*i*A, CR-14*i*A.
				A660-8011-T210#L2R003	
		4	A05B-2655-H230	A660-4005-T424#L4R003	RMP cable
				A660-8011-T210#L4R003	Earth cable
		7	A05B-2655-H231	A660-4005-T424#L7R003	RMP cable
				A660-8011-T210#L7R003	Earth cable
		14	A05B-2655-H232	A660-4005-T424#L14R03	RMP cable
				A660-8011-T210#L14R03	Earth cable
K41	Robot connection cable (M-1*i*A) Non-flex, STD	2	A05B-2662-H204	A660-4005-T429#L2R003	RMP cable
				A660-8011-T210#L2R003	Earth cable
		4	A05B-2662-H200	A660-4005-T429#L4R003	RMP cable
				A660-8011-T210#L4R003	Earth cable
		7	A05B-2662-H201	A660-4005-T429#L7R003	RMP cable
				A660-8011-T210#L7R003	Earth cable
		14	A05B-2662-H202	A660-4005-T429#L14R03	RMP cable
				A660-8011-T210#L14R03	Earth cable
	Robot connection cable (M-1*i*A) Flex, STD	2	A05B-2662-H214	A660-4005-T431#L2R003	RMP cable
				A660-8011-T210#L2R003	Earth cable
		4	A05B-2662-H210	A660-4005-T431#L4R003	RMP cable
				A660-8011-T210#L4R003	Earth cable
		7	A05B-2662-H211	A660-4005-T431#L7R003	RMP cable
				A660-8011-T210#L7R003	Earth cable
		14	A05B-2662-H212	A660-4005-T431#L14R03	RMP cable
				A660-8011-T210#L14R03	Earth cable

Cable No.	Name	Length(m)	Ordering Specification	FANUC Specification	Note
K41	Robot connection cable (M-1*i*A) Non-flex, CE	2	A05B-2662-H224	A660-4005-T430#L2R003	RMP cable
				A660-8011-T210#L2R003	Earth cable
		4	A05B-2662-H220	A660-4005-T430#L4R003	RMP cable
				A660-8011-T210#L4R003	Earth cable
		7	A05B-2662-H221	A660-4005-T430#L7R003	RMP cable
				A660-8011-T210#L7R003	Earth cable
		14	A05B-2662-H222	A660-4005-T430#L14R03	RMP cable
				A660-8011-T210#L14R03	Earth cable
	Robot connection cable (M-1*i*A) Flex, CE	2	A05B-2662-H234	A660-4005-T432#L2R003	RMP cable
				A660-8011-T210#L2R003	Earth cable
		4	A05B-2662-H230	A660-4005-T432#L4R003	RMP cable
				A660-8011-T210#L4R003	Earth cable
		7	A05B-2662-H231	A660-4005-T432#L7R003	RMP cable
				A660-8011-T210#L7R003	Earth cable
		14	A05B-2662-H232	A660-4005-T432#L14R03	RMP cable
				A660-8011-T210#L14R03	Earth cable
K42	Robot connection cable (M-2*i*A, M-3*i*A) Non-flex, STD	7	A05B-2656-H200	A660-2007-T661#L7R003	RP1 cable
				A660-2006-T947#L7R003	RM1 cable
				A660-8011-T182#L7R003	Earth cable
		14	A05B-2656-H201	A660-2007-T661#L14R03	RP1 cable
				A660-2006-T947#L14R03	RM1 cable
				A660-8011-T182#L14R03	Earth cable
		20	A05B-2656-H202	A660-2007-T661#L20R03	RP1 cable
				A660-2006-T947#L20R03	RM1 cable
				A660-8011-T182#L20R03	Earth cable
	Robot connection cable (M-2*i*A, M-3*i*A) Non-flex, CE	7	A05B-2656-H220	A660-2007-T661#L7R003	RP1 cable
				A660-2006-T948#L7R003	RM1 cable
				A660-8011-T182#L7R003	Earth cable
		14	A05B-2656-H221	A660-2007-T661#L14R03	RP1 cable
				A660-2006-T948#L14R03	RM1 cable
				A660-8011-T182#L14R03	Earth cable
		20	A05B-2656-H222	A660-2007-T661#L20R03	RP1 cable
				A660-2006-T948#L20R03	RM1 cable
				A660-8011-T182#L20R03	Earth cable
K43	Robot connection cable (DR-3*i*B) Non-flex, STD	7	A05B-2686-H200	A660-2008-T599#L7R003	RP1 cable
				A660-2008-T713#L7R003	RM1 cable
				A660-8011-T210#L7R003	Earth cable
		14	A05B-2686-H201	A660-2008-T599#L14R03	RP1 cable
				A660-2008-T713#L14R03	RM1 cable
				A660-8011-T210#L14R03	Earth cable
		20	A05B-2686-H202	A660-2008-T599#L20R03	RP1 cable
				A660-2008-T713#L20R03	RM1 cable
				A660-8011-T210#L20R03	Earth cable
	Robot connection cable (DR-3*i*B) Non-flex, CE	7	A05B-2686-H220	A660-2008-T599#L7R003	RP1 cable
				A660-2008-T714#L7R003	RM1 cable
				A660-8011-T182#L7R003	Earth cable
		14	A05B-2686-H221	A660-2008-T599#L14R03	RP1 cable
				A660-2008-T714#L14R03	RM1 cable
				A660-8011-T182#L14R03	Earth cable
		20	A05B-2686-H222	A660-2008-T599#L20R03	RP1 cable
				A660-2008-T714#L20R03	RM1 cable
				A660-8011-T182#L20R03	Earth cable

Cable No.	Name	Length(m)	Ordering Specification	FANUC Specification	Note
K81	Line Tracking Cable	7	A05B-2655-J200 A05B-2662-J200	A660-2007-T611#L7R103A	(Pulsecoder 1 pcs ~ controller), Incremental
		14	A05B-2655-J201 A05B-2662-J201	A660-2007-T611#L14R13A	
		20	A05B-2655-J202 A05B-2662-J202	A660-2007-T611#L20R13A	
K82		7	A05B-2655-J210 A05B-2662-J210	A660-2007-T613#L7R103A	(Pulsecoder 2pcs ~ controller)), Incremental
		14	A05B-2655-J211 A05B-2662-J211	A660-2007-T613#L14R13A	
		20	A05B-2655-J212 A05B-2662-J212	A660-2007-T613#L20R13A	
K81		7	A05B-2655-J205 A05B-2662-J205	A660-2007-T612#L7R103A	αA1000S 1 pcs
		14	A05B-2655-J206 A05B-2662-J206	A660-2007-T612#L14R13A	
		20	A05B-2655-J207 A05B-2662-J207	A660-2007-T612#L20R13A	
K82		7	A05B-2655-J215 A05B-2662-J215	A660-4005-T373#L7R103A	αA1000S 2pcs
		14	A05B-2655-J216 A05B-2662-J216	A660-4005-T373#L14R13A	
		20	A05B-2655-J217 A05B-2662-J217	A660-4005-T373#L20R13A	
K83		7	A05B-2655-J220 A05B-2662-J220	A660-2007-T613#L7R103A	αA1000S/ Main board
		14	A05B-2655-J221 A05B-2662-J221	A660-2007-T613#L14R13A	
		20	A05B-2655-J222 A05B-2662-J222	A660-2007-T613#L20R13A	

B TOTAL CONNECTION DIAGRAM

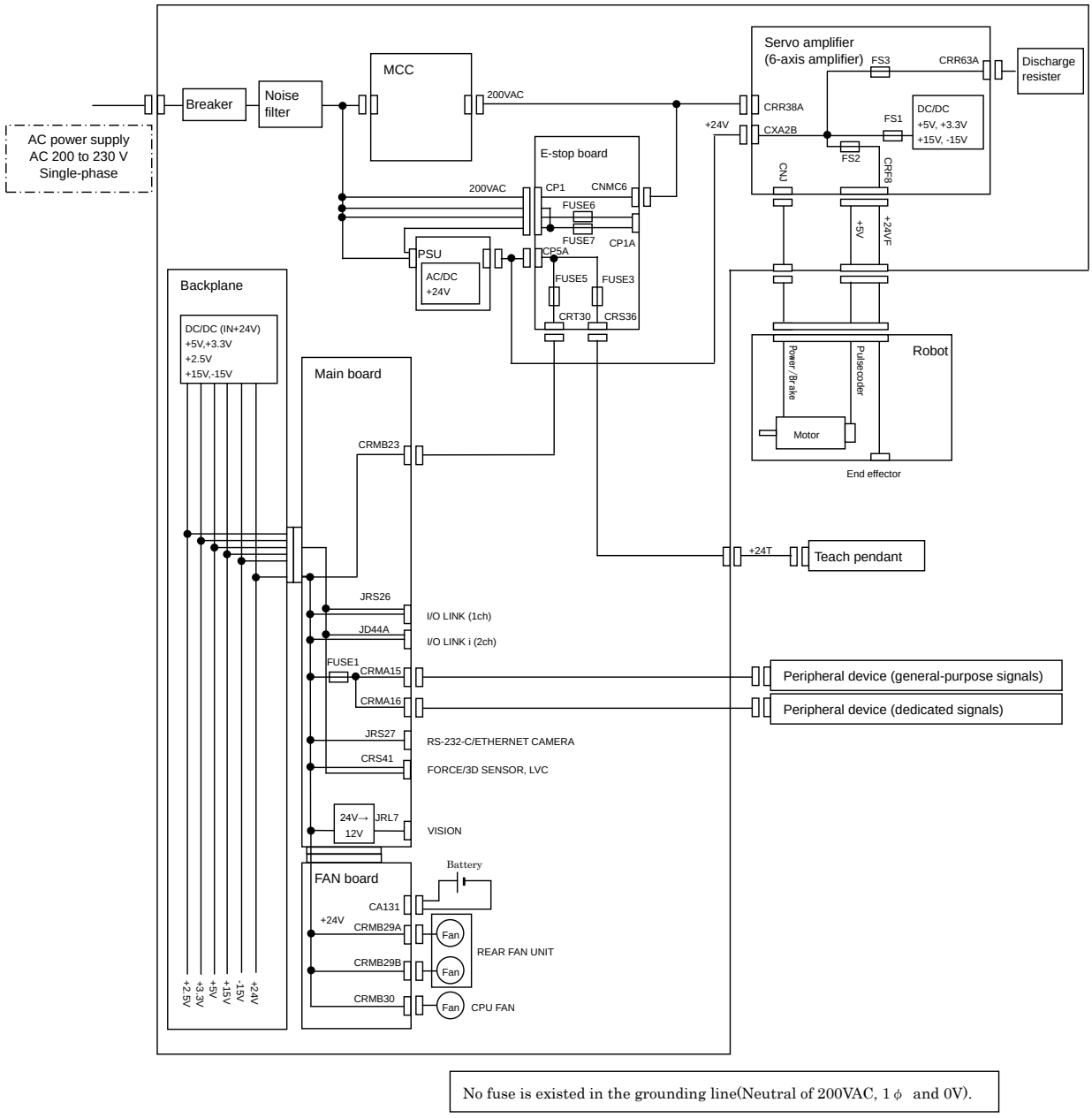


Fig.B (a) Block diagram of the power supply (R-30*i*B Mate, Small size)

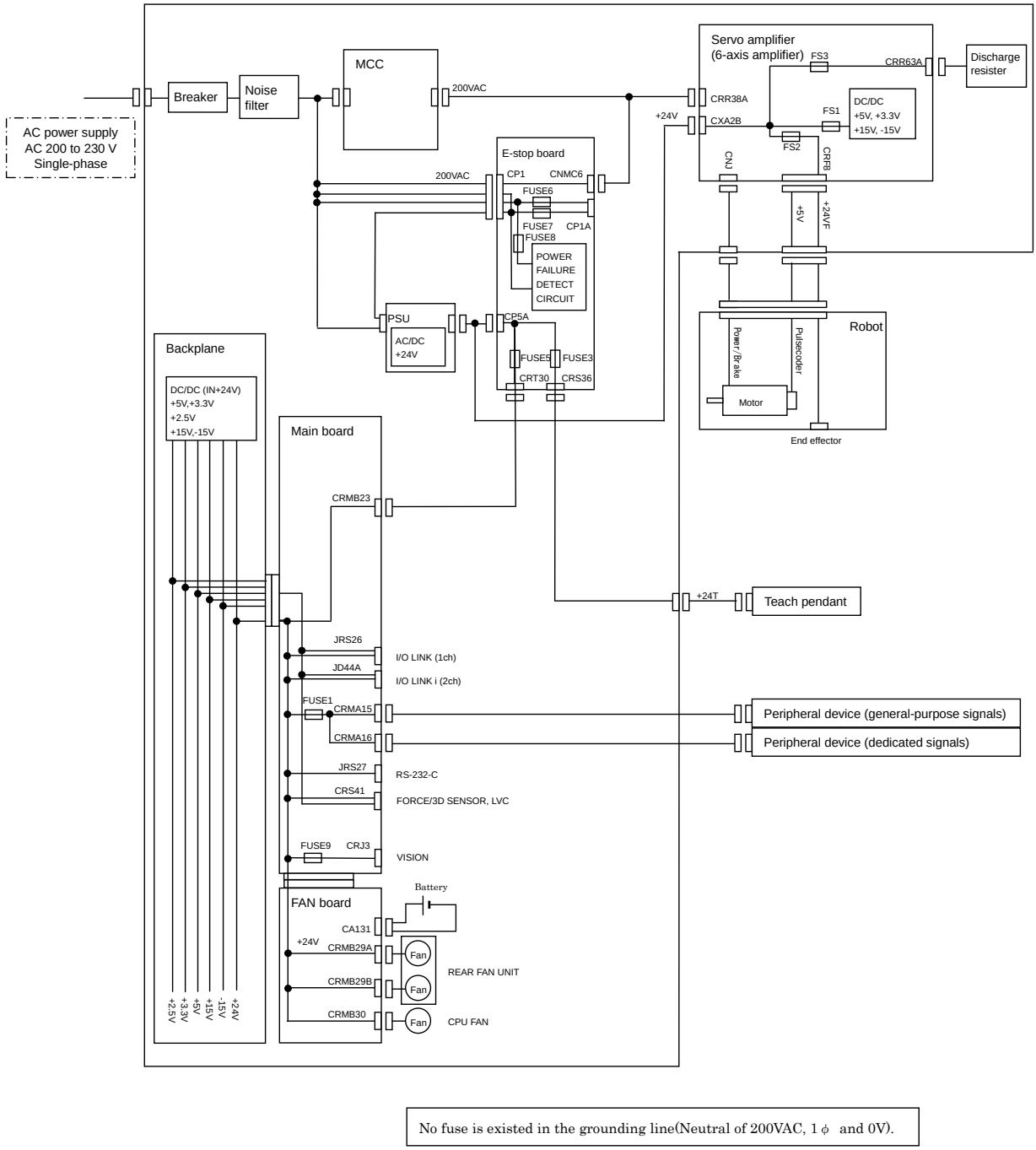


Fig.B (b) Block diagram of the power supply (R-30*i*B Mate Plus, Small size)

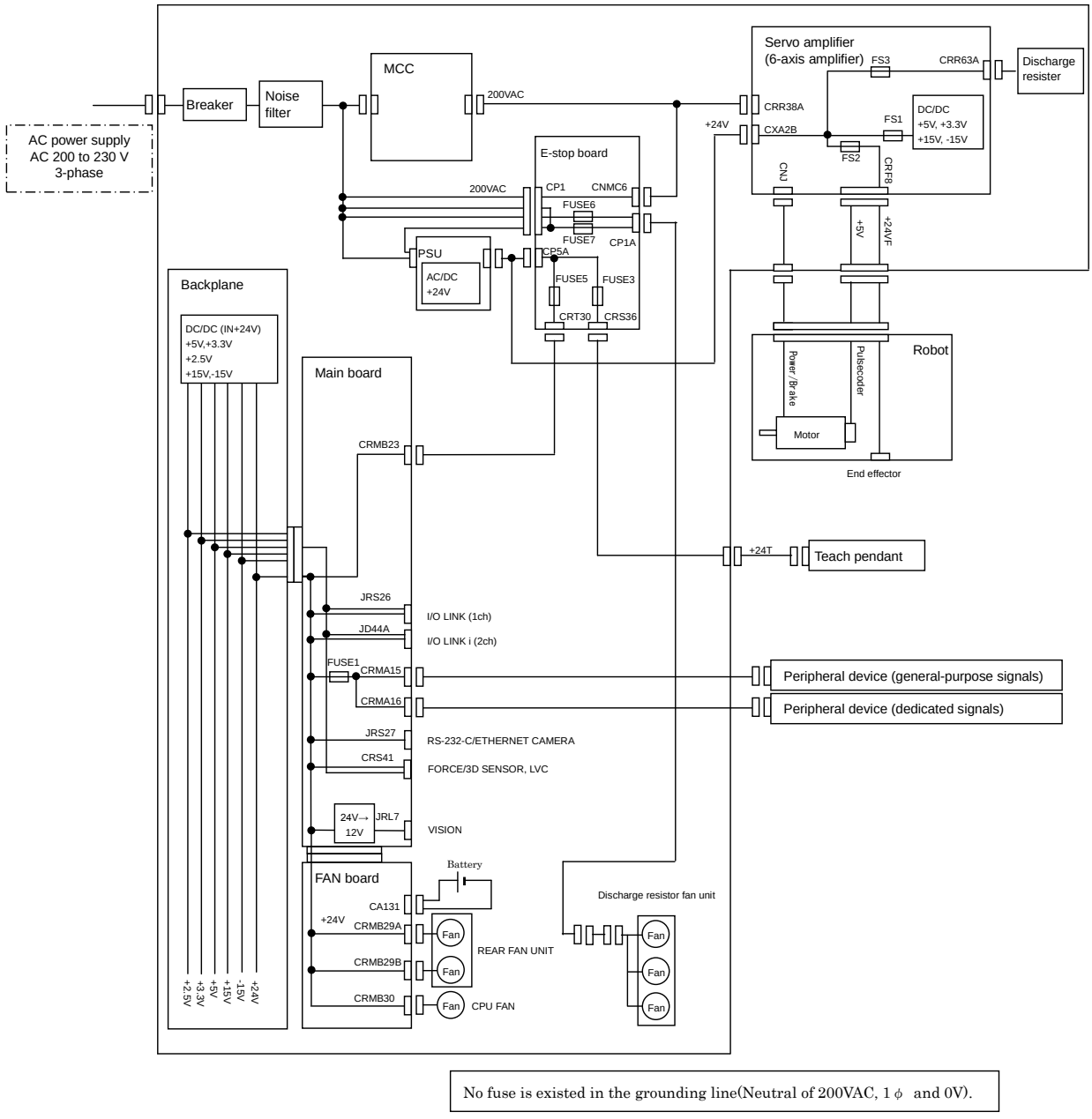


Fig.B (c) Block diagram of the power supply (R-30*i*B Mate, Large size)

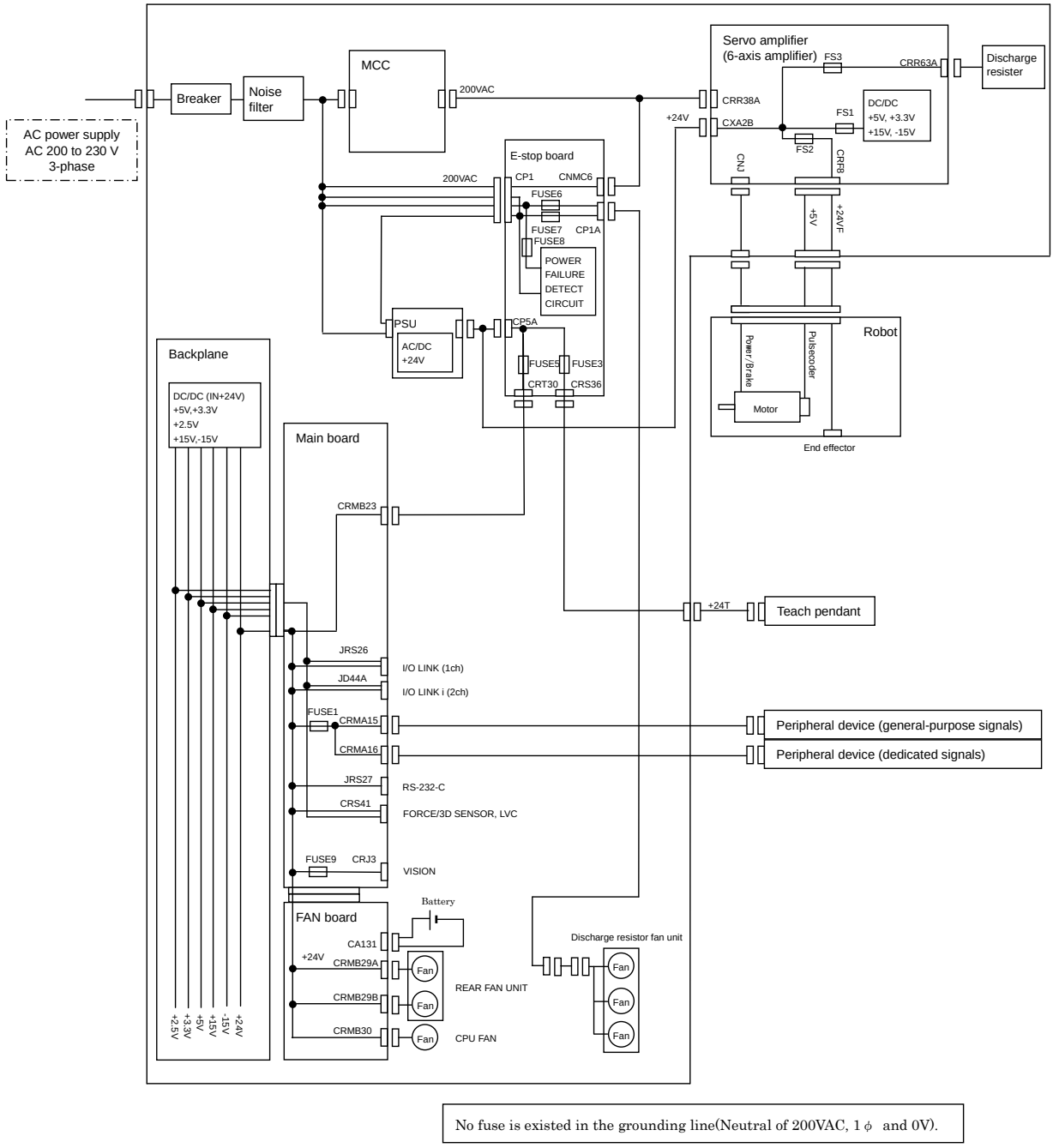


Fig.B (d) Block diagram of the power supply (R-30*i*B Mate Plus, Large size)

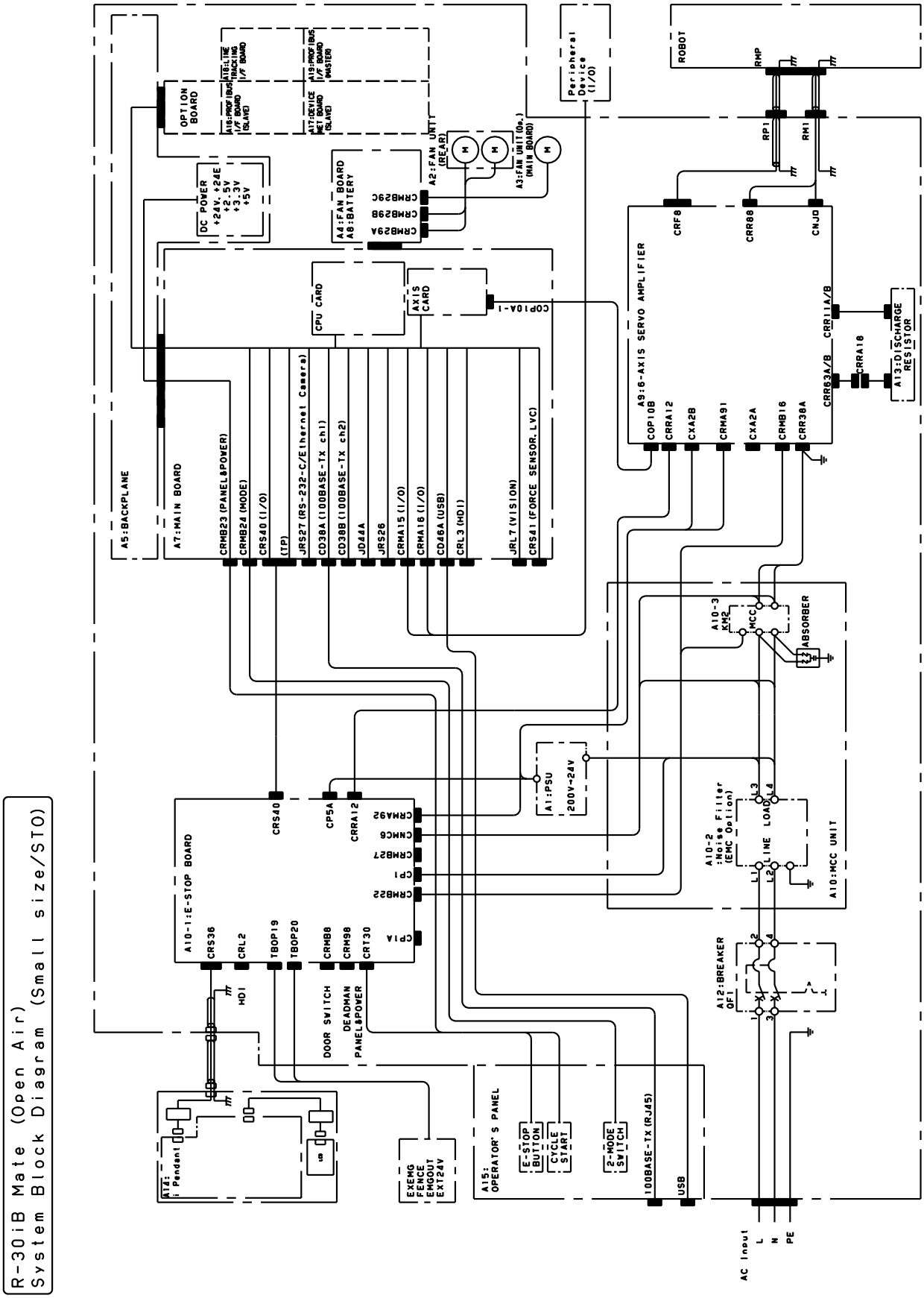


Fig.B (e) System block diagram (R-30*i*B Mate, Small size)

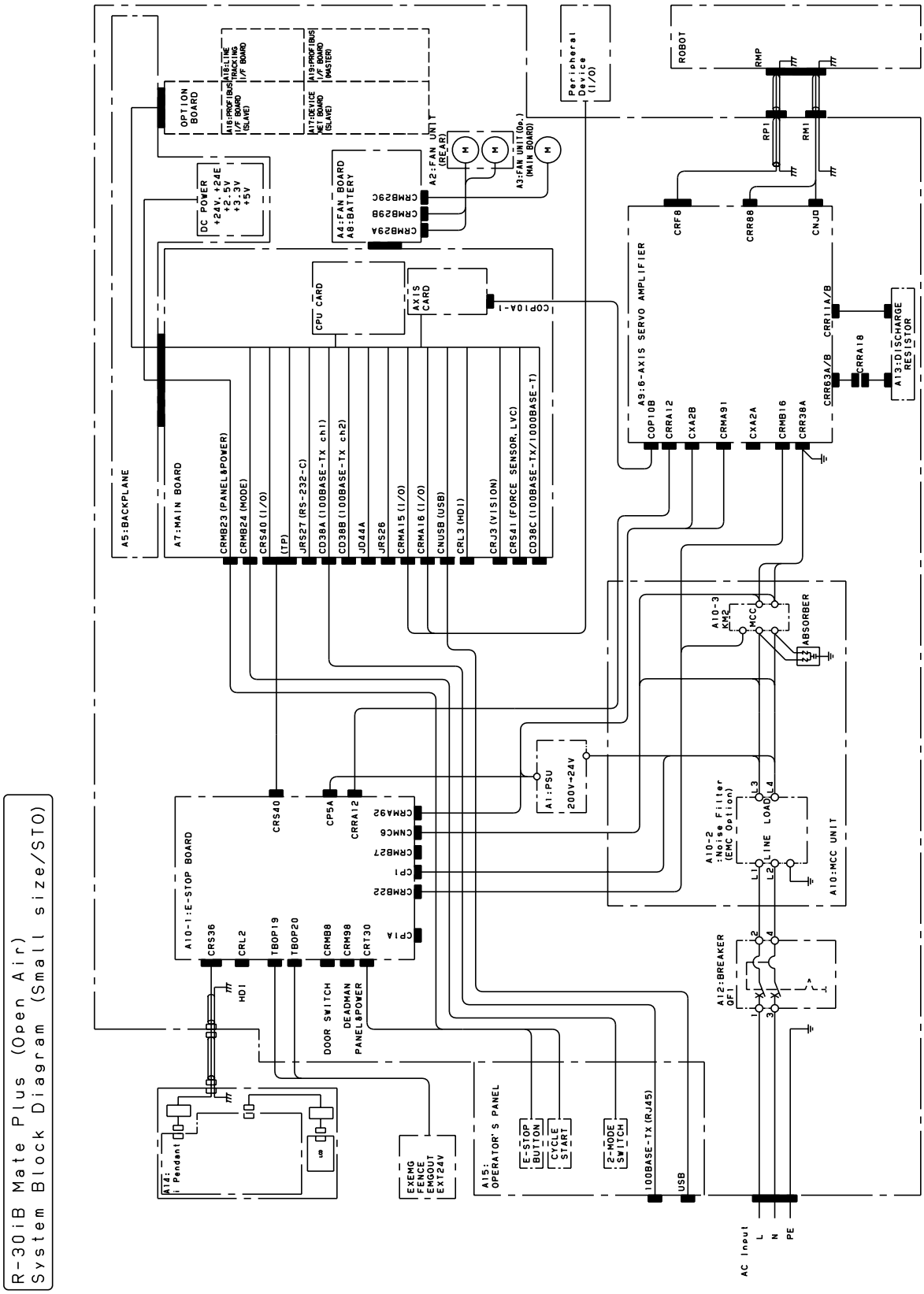


Fig.B (f) System block diagram (R-30*i*B Mate Plus, Small size)

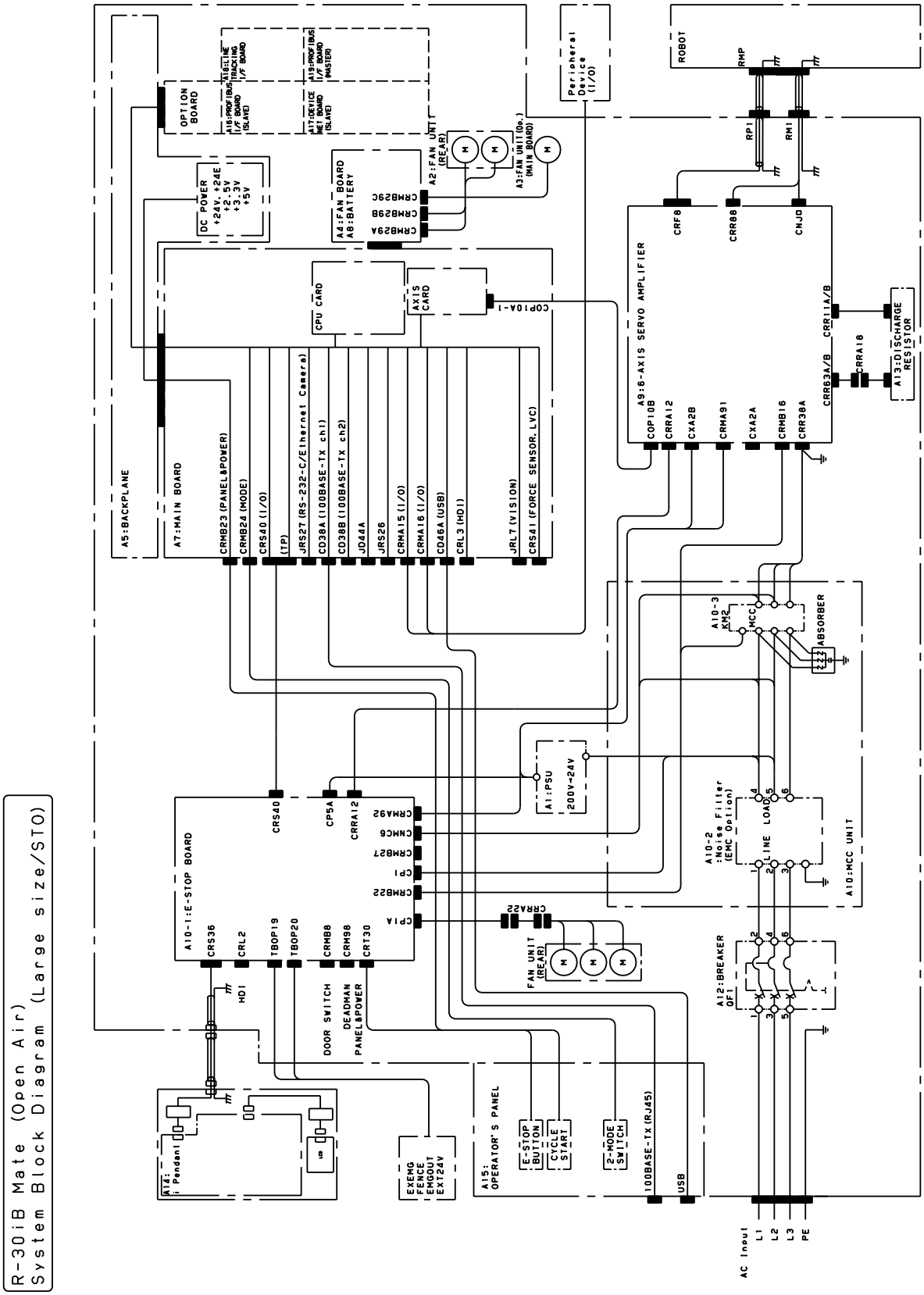


Fig.B (g) System block diagram (R-30*i*B Mate, Large size)

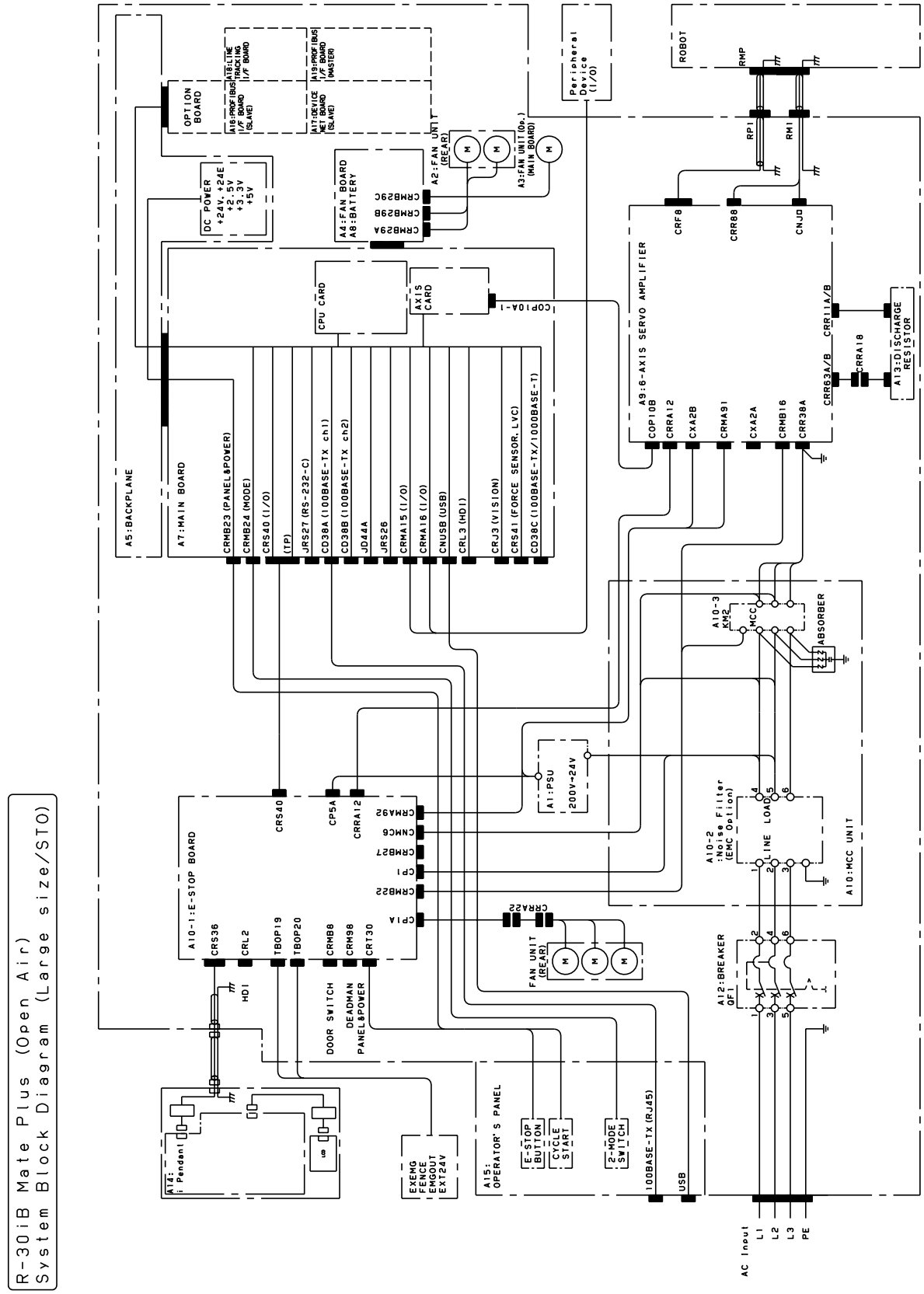


Fig.B (h) System block diagram (R-30*i*B Mate Plus, Large size)

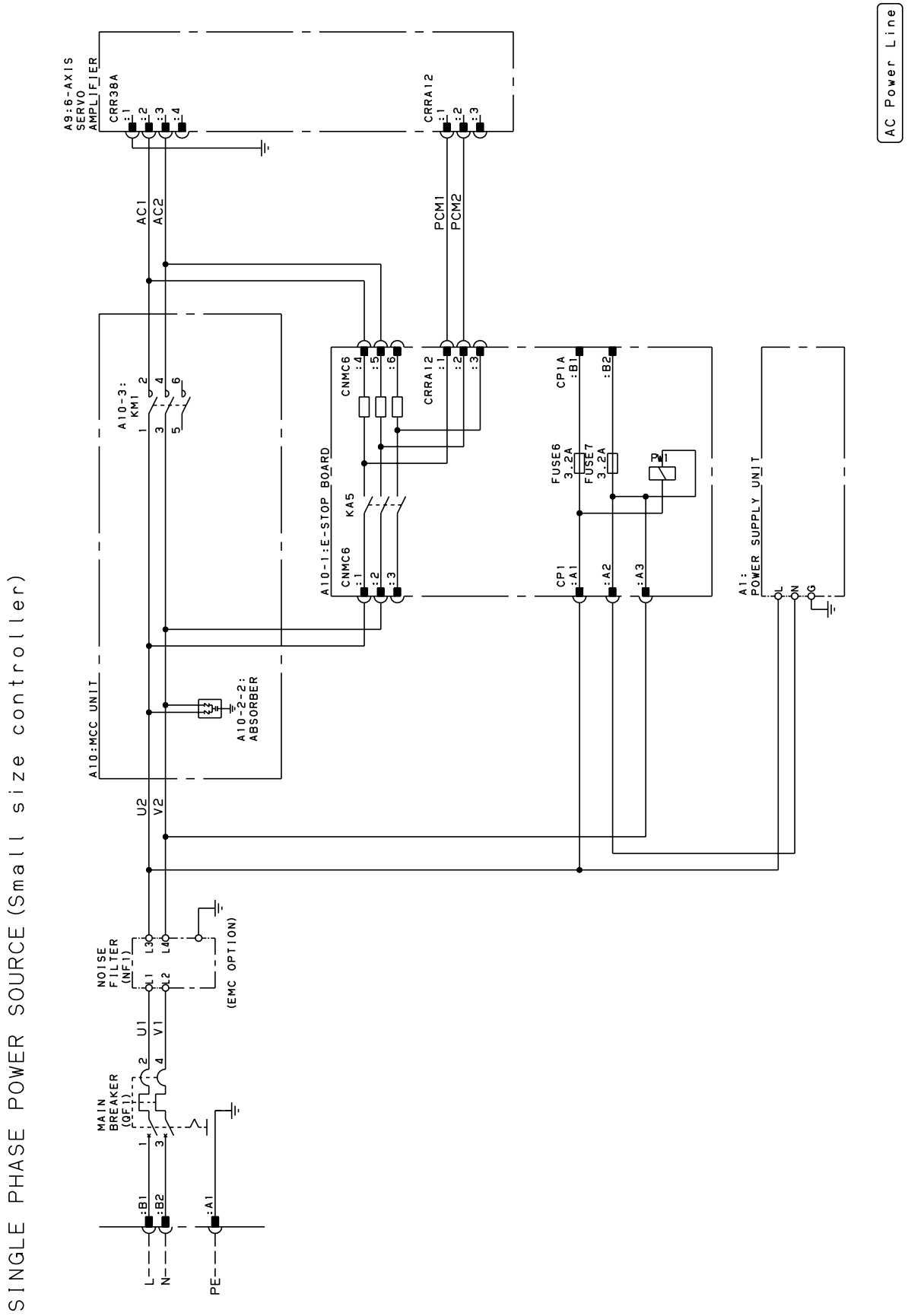


Fig.B(i) AC power line connection diagram (R-30*i*B Mate, Small size)

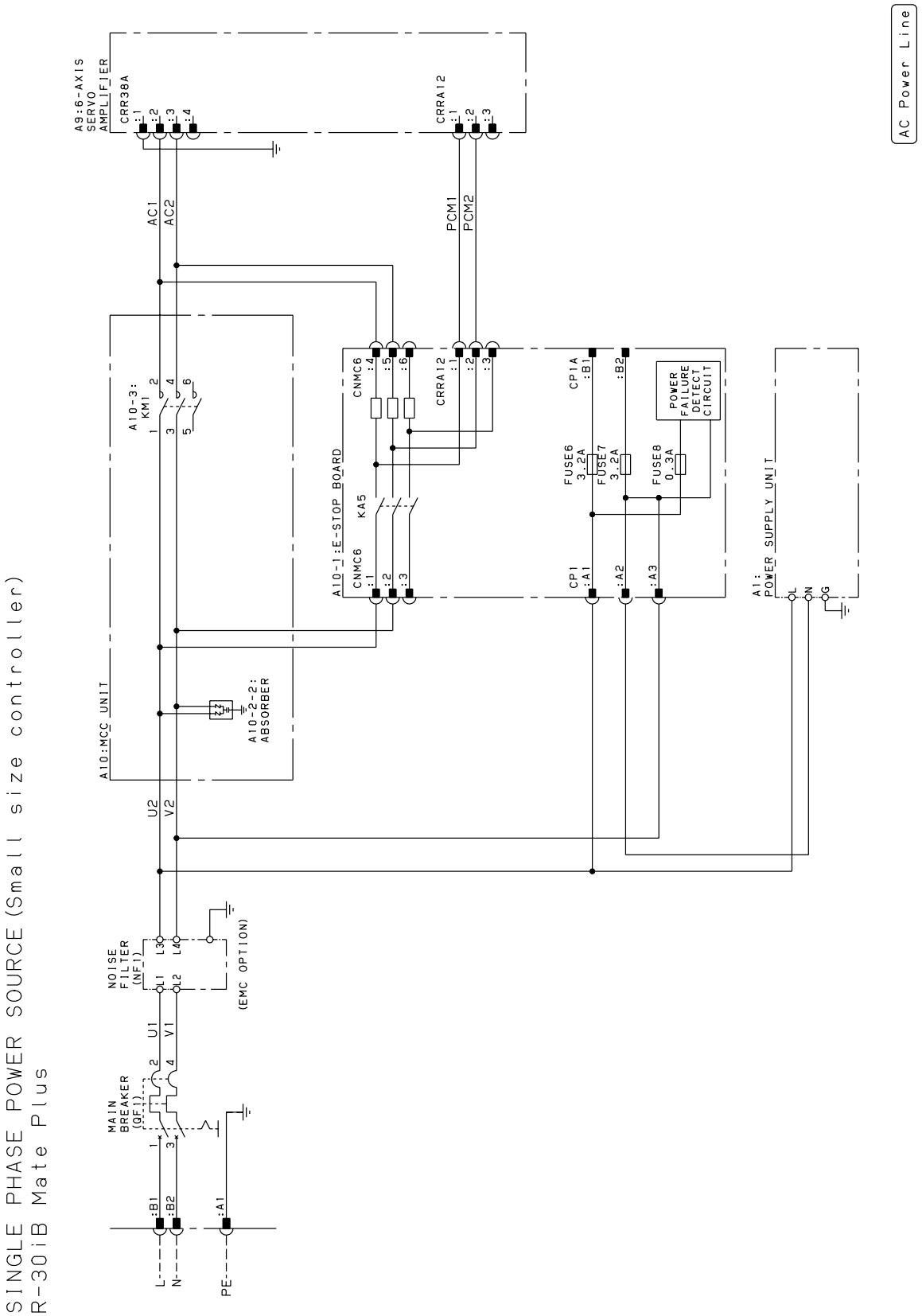


Fig.B(j) AC power line connection diagram (R-30*i*B Mate Plus, Small size)

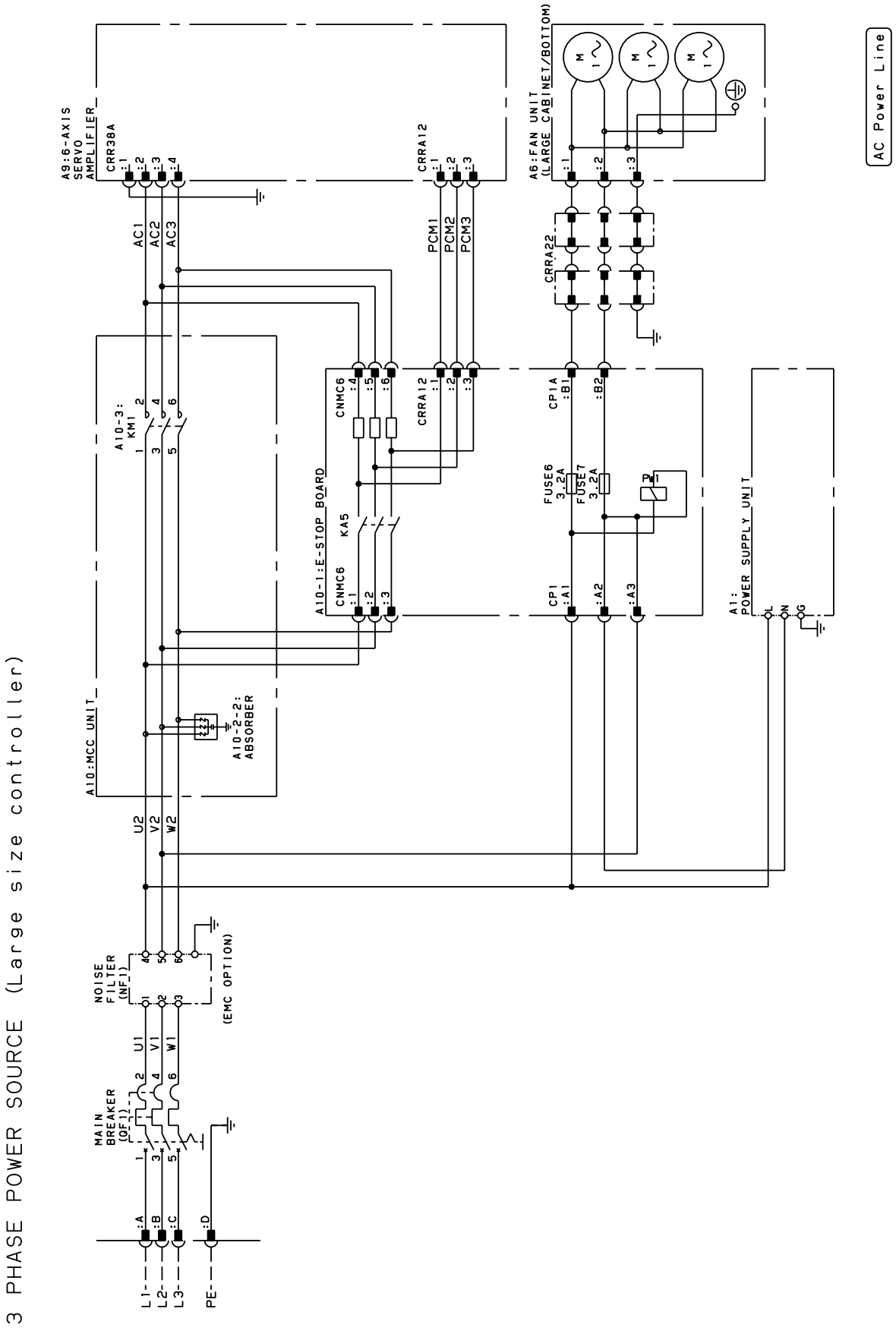


Fig.B(k) AC power line connection diagram (R-30*i*B Mate, Large size)

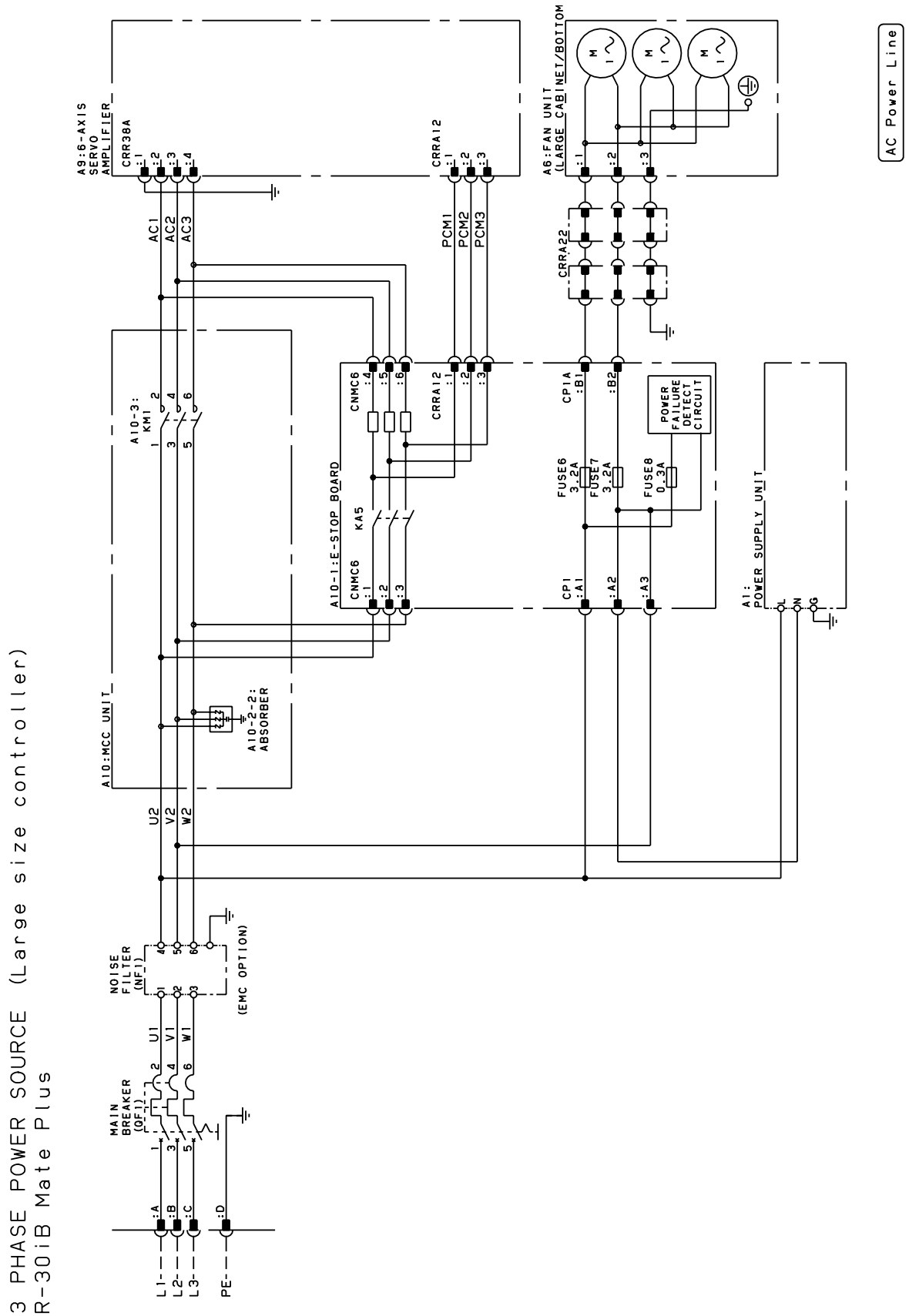


Fig.B(l) AC power line connection diagram (R-30*i*B Mate Plus, Large size)

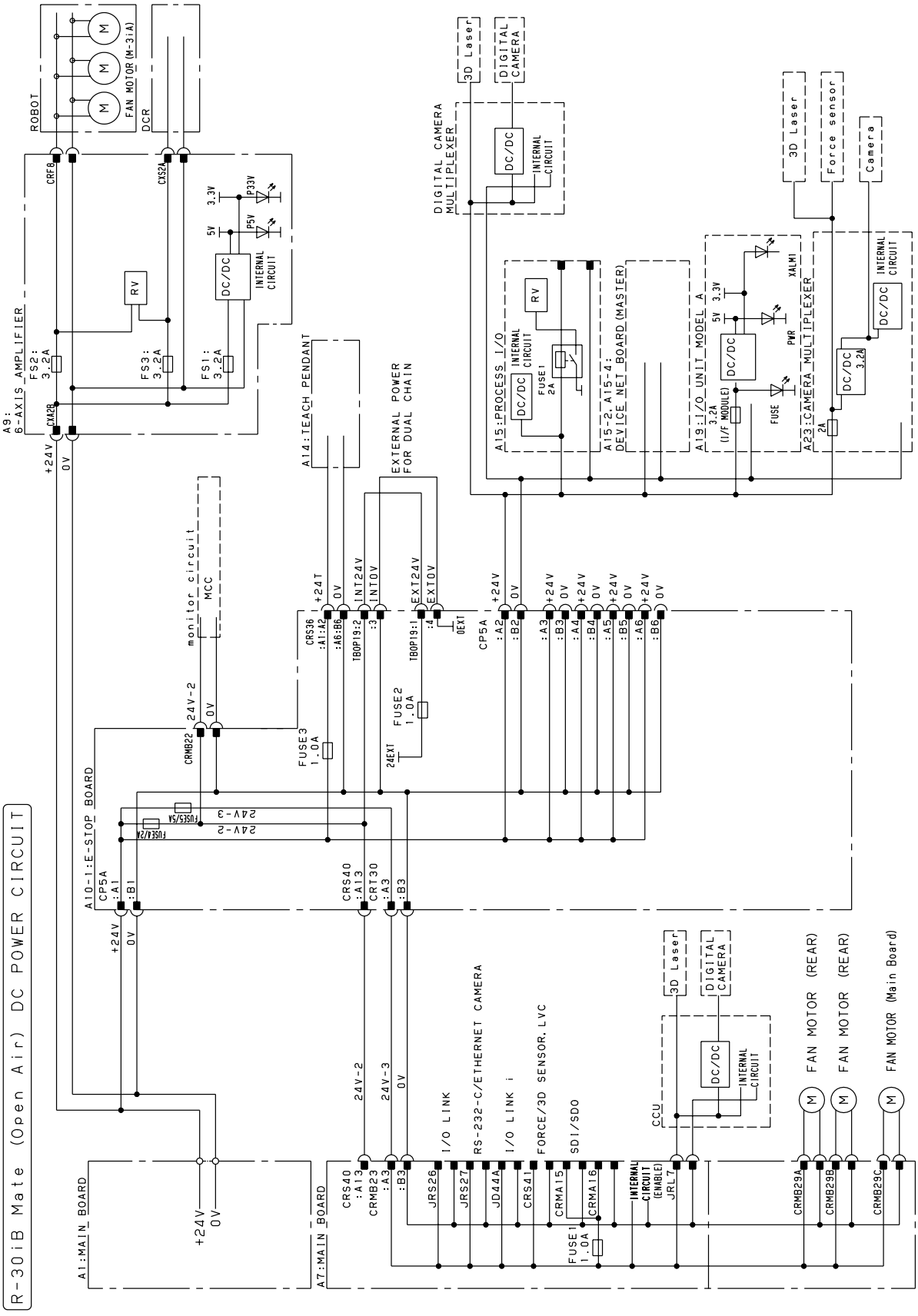


Fig.B (m) DC power line connection diagram (R-30*i*B Mate)

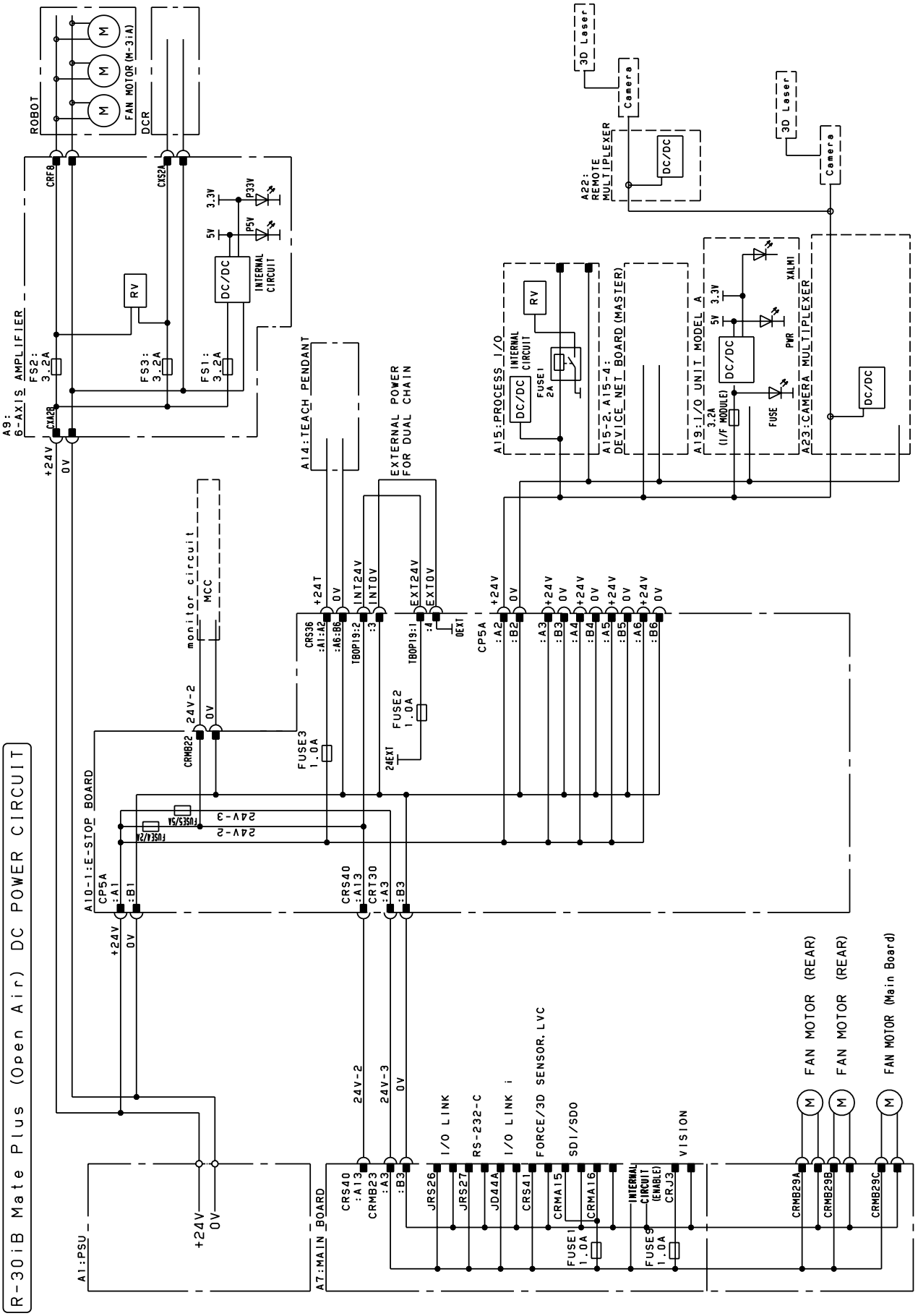


Fig.B (n) DC power line connection diagram (R-30*i*B Mate Plus)

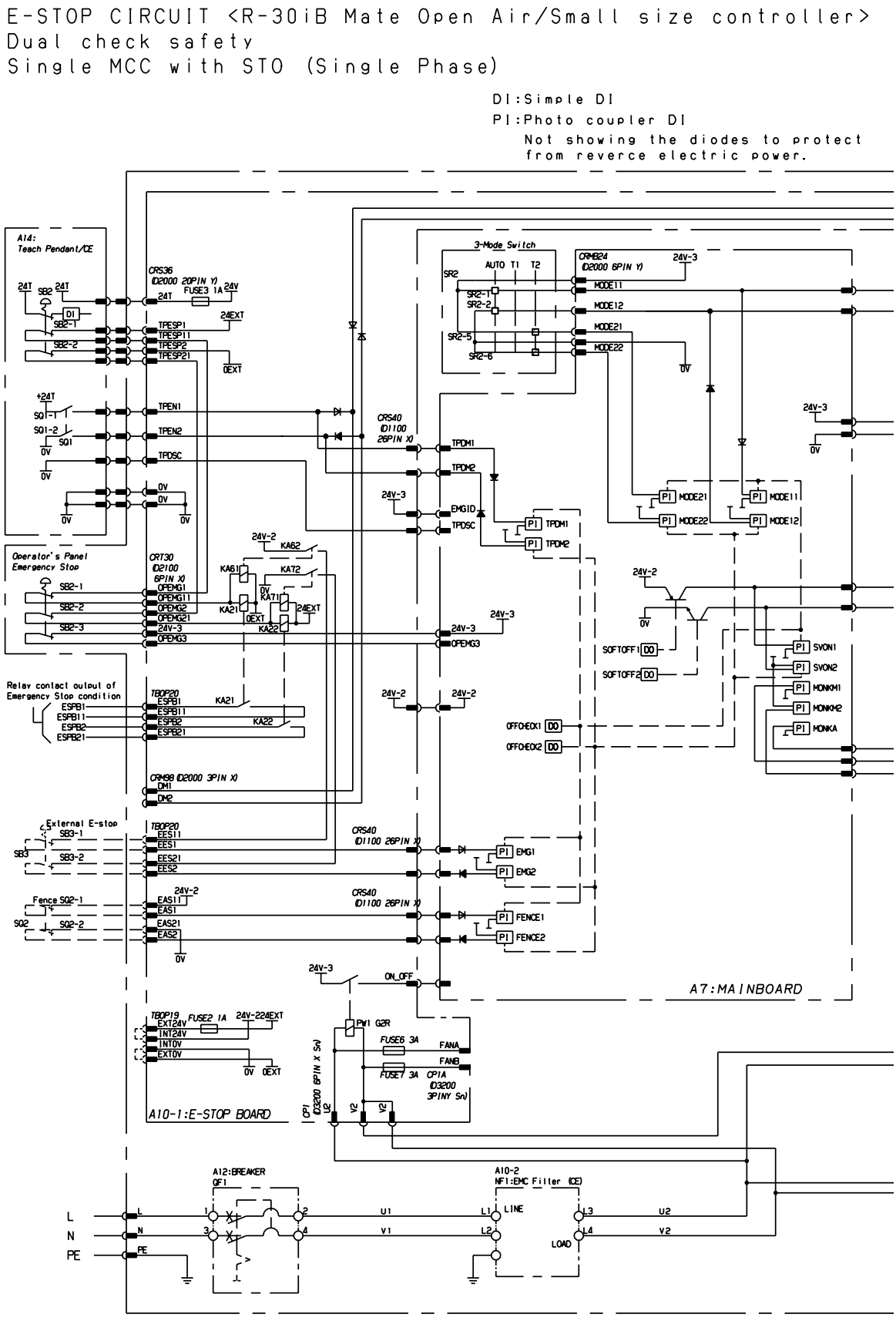
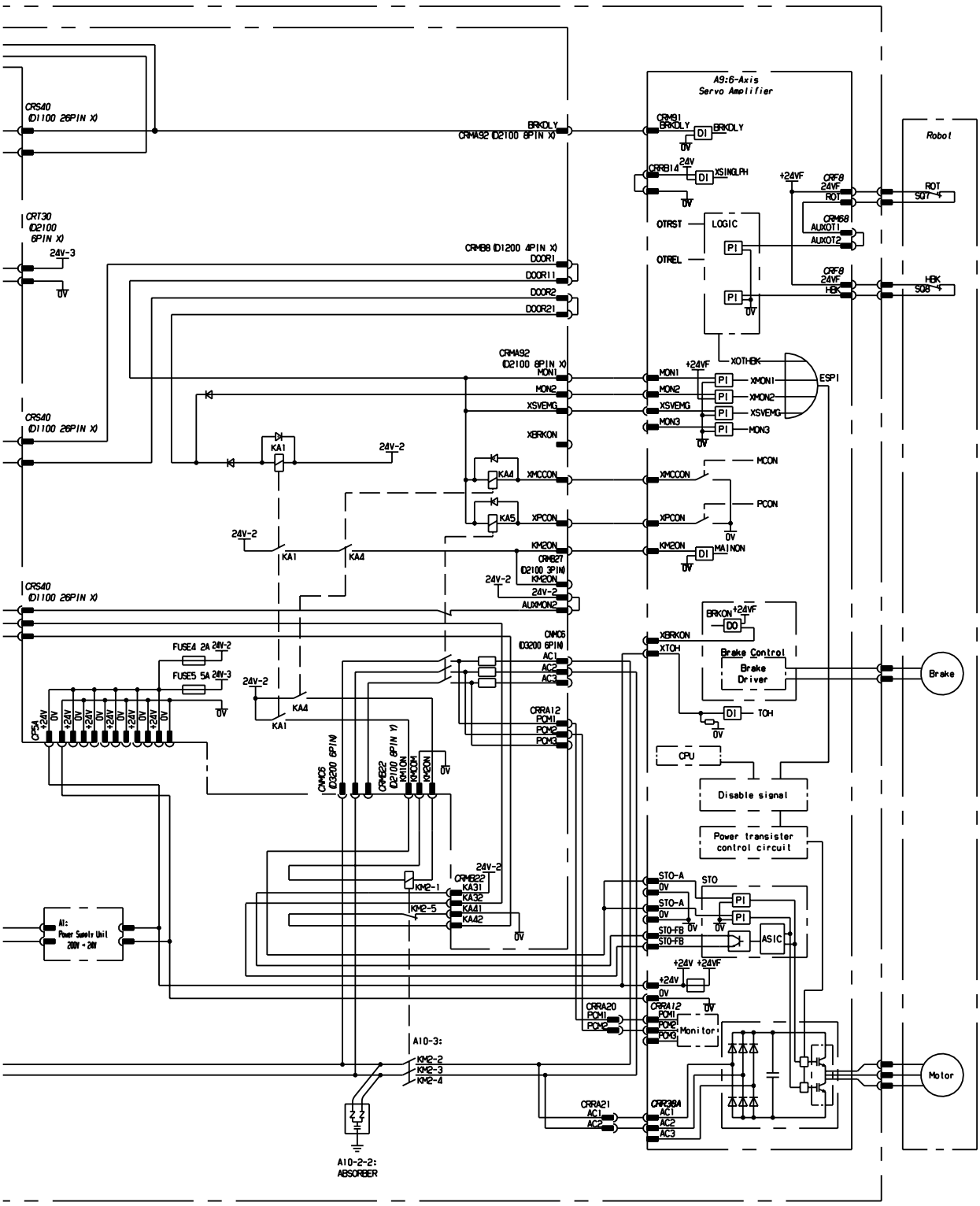


Fig.B (o) Emergency stop circuit connection diagram (R-30*i*B Mate, Small size)


A9:6-Axis
Servo Amplifier
Robot
CRS40
(D1100 26PIN X)
CRMA92 (D2100 8PIN X)
BRKDLY
CRM91
DI
XSINGLPH
CRF8
24VF
ROT
SQT-4
CRT30
(D2100
6PIN X)
24V-3
0V
CRM88 (D1200 4PIN X)
DOOR1
DOOR11
DOOR2
DOOR21
OTRST
LOGIC
OTREL
CRM58
AUXOT1
AUXOT2
HBK
SQB-4
XOTHBK
ESPI
MON1
MON2
XSVEMG
MON3
XMON1
XMON2
XMON3
XBRKON
KA1
KA4
KA5
XMCCON
XPCON
MCON
PCON
KM2ON
MAINON
CRMB27
(D2100 3PIN)
ALMMON2
CMM6
(D3200 6PIN)
AC1
AC2
AC3
XTOH
BRKON
DO
Brake Control
Brake Driver
TOH
Brake
FUSE4 2A
FUSE5 5A
24V-2
24V-3
CPS4
CPU
Disable signal
Power transister
control circuit
CRMB22
KA31
KA32
KA41
KA42
KM2-1
KM2-5
STO-A
STO
STO-FB
ASIC
AI:
Power Supply Unit
200V - 28V
CRRA12
POW1
POW2
POW3
Monitor
CRRA20
CRRA21
CRR38A
Motor
AI0-3:
KM2-2
KM2-3
KM2-4
AI0-2-2:
ABSORBER

E-STOP CIRCUIT <R-30iB Mate Plus Open Air/Small size controller>
Dual check safety
Single MCC with STO (Single Phase)

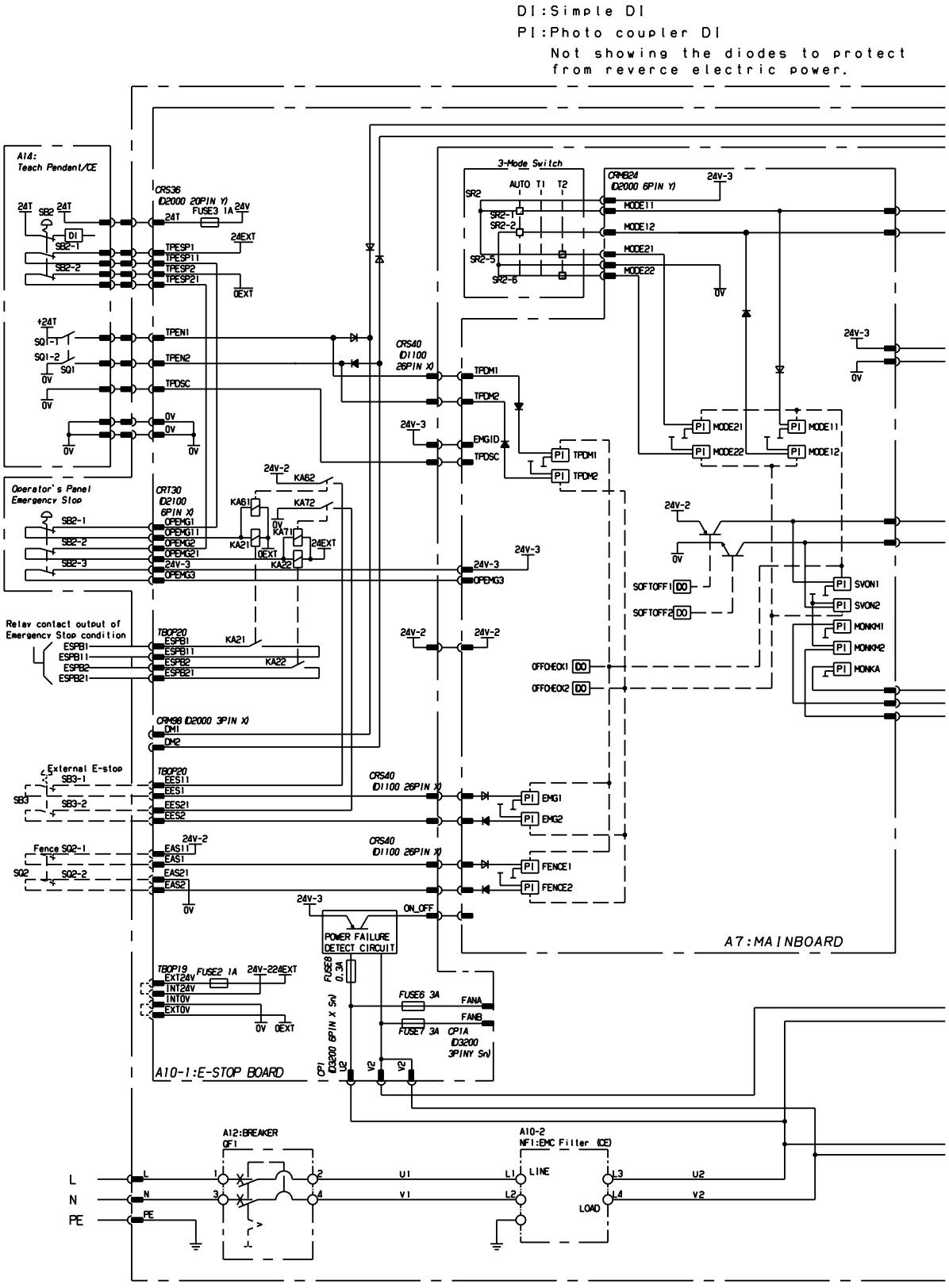
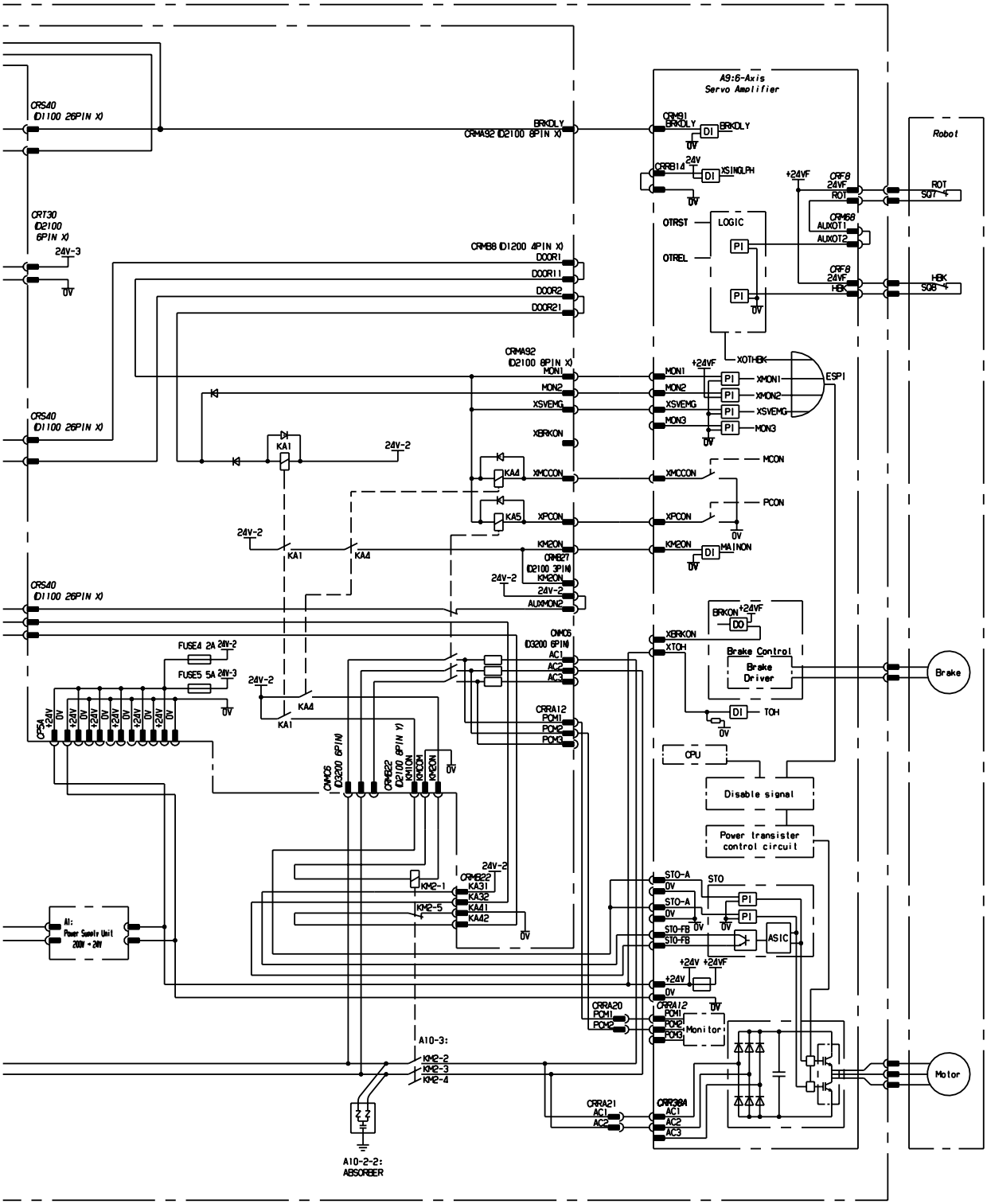


Fig.B (p) Emergency stop circuit connection diagram (R-30*i*B Mate Plus, Small size)


A9:6-Axis
Servo Amplifier
Robot
CRS40
ID1100 26PIN X)
CRT30
ID2100
6PIN X)
CRMA92 ID2100 8PIN X)
CRMB8 ID1200 4PIN X)
CRMA92
ID2100 8PIN X)
CRMB27
ID2100 3PIN)
CRM05
ID3200 6PIN)
CRMB22
ID2100 9PIN Y)
CRRA12
CRRA20
CRRA21
CRR38A
CRF8
CRM68
BRKDLY
XSINGLPH
OTRST
OTREL
LOGIC
XOTHBK
ESP1
XMON1
XMON2
XSVEMG
MON3
XBRKON
XMCCON
XPCON
KM2CON
MAINON
AUXMON2
BRKON
XBRKON
XTOH
Brake Control
Brake
Driver
TOH
CPU
Disable signal
Power transister
control circuit
STO-A
STO
STO-FB
ASIC
Monitor
Brake
Motor
ROT
HBK
AUXOT1
AUXOT2
FUSE4 2A 24V-2
FUSE5 5A 24V-3
24V-2
24V-3
KA1
KA4
KA5
KM2-1
KM2-5
KM2-2
KM2-3
KM2-4
A10-3:
A10-2-2:
ABSORBER
A1:
Power Supply Unit
200V → 24V

E-STOP CIRCUIT <R-30iB Mate Open Air/Large size controller>
Dual check safety
Single MCC with STO (3 Phase)

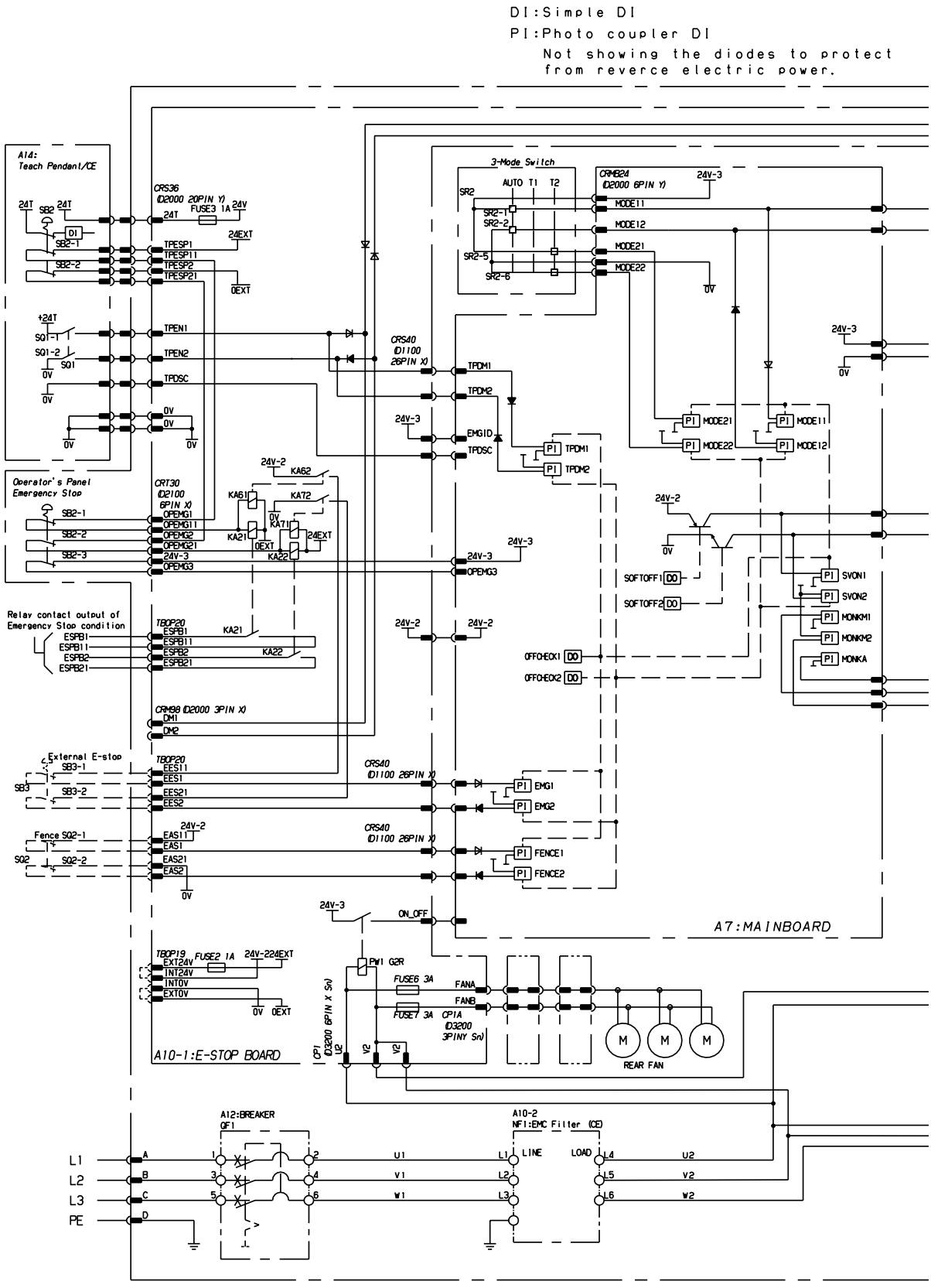
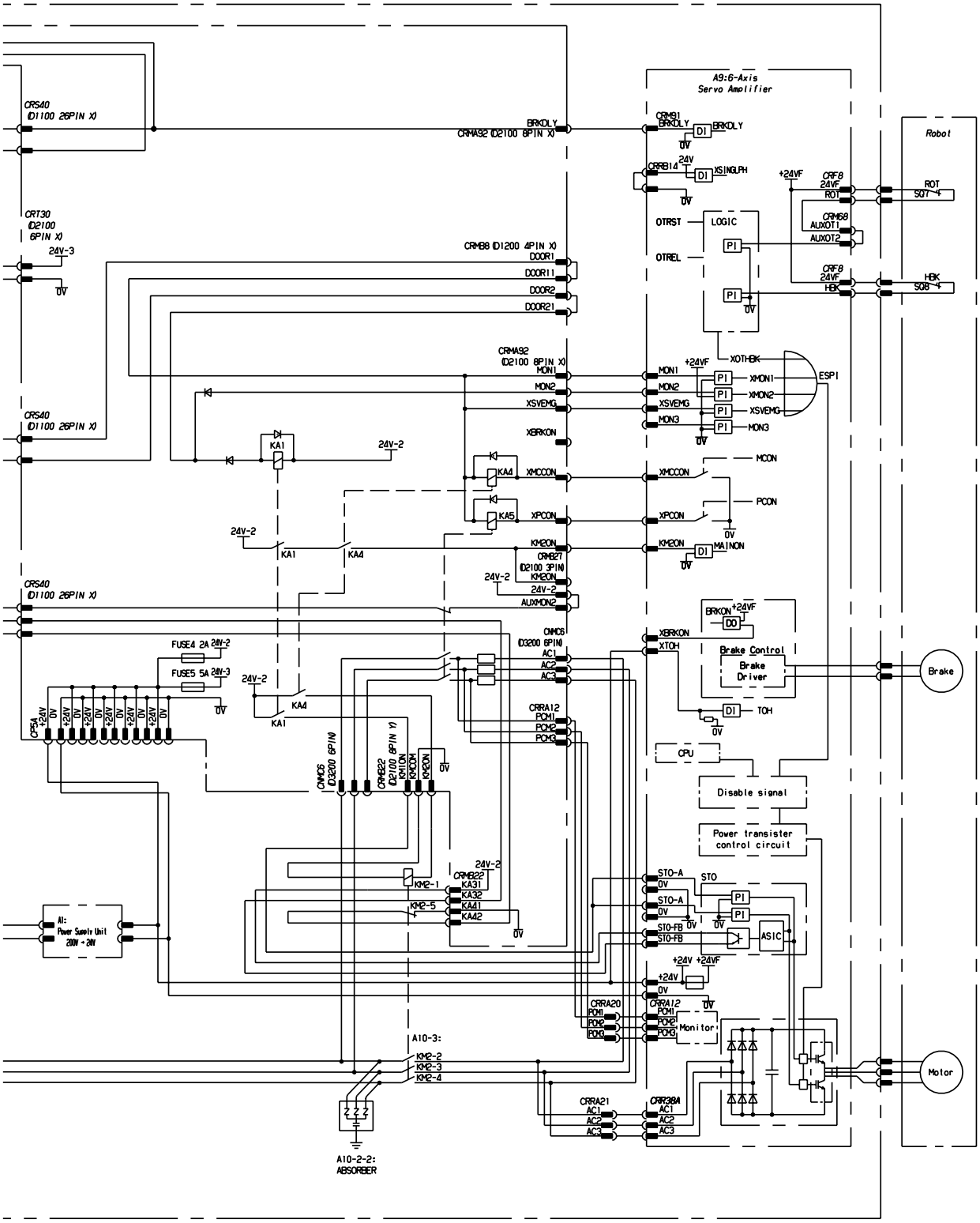


Fig.B (q) Emergency stop circuit connection diagram (R-30*i*B Mate, Large size)


A9:6-Axis
Servo Amplifier
Robot
CRS40
(D1100 26PIN X)
CRMA92 (D2100 8PIN X)
BRKDLY
CRM91
BRKDLY
DI
0V
CRRB14
24V
XSINGLPH
+24VF
CRF8
24VF
ROT
SOT 4
CRM68
AUXOT1
AUXOT2
CRF8
24VF
HBK
SOB 4
OTRST
LOGIC
OTREL
PI
CRT30
(D2100
6PIN X)
24V-3
CRMB8 (D1200 4PIN X)
DOOR1
DOOR11
DOOR2
DOOR21
CRMA92
(D2100 8PIN X)
MON1
MON2
XSVEMG
MON3
XOTHBK
XMON1
XMON2
XSVEMG
MON3
ESP1
XBRKON
KA1
KA4
KA5
24V-2
XMCCON
XPCON
KM2ON
MCON
PCON
MAINON
CRMB2T
(D2100 3PIN)
KM2ON
AUXMON2
CRMC6
(D3200 6PIN)
AC1
AC2
AC3
BRKON
DO
XBRKON
XTOH
Brake Control
Brake
Driver
Brake
FUSE4 2A
FUSE5 5A
24V-3
CP5A
CRRA12
POM1
POM2
POM3
CPU
Disable signal
Power transister
control circuit
CRMB22
(D2100 6PIN Y)
KM1ON
KM2ON
KM2-1
KM2-5
KA31
KA32
KA41
KA42
STO-A
STO
STO-FB
ASIC
A1:
Power Supply Unit
200V → 28V
CRRA20
CRRA12
Monitor
A10-3:
KM2-2
KM2-3
KM2-4
Motor
CRRA21
CRR38A
A10-2-2:
ABSORBER

E-STOP CIRCUIT <R-30iB Mate Plus Open Air/Large size controller>
Dual check safety
Single MCC with STO (3 Phase)

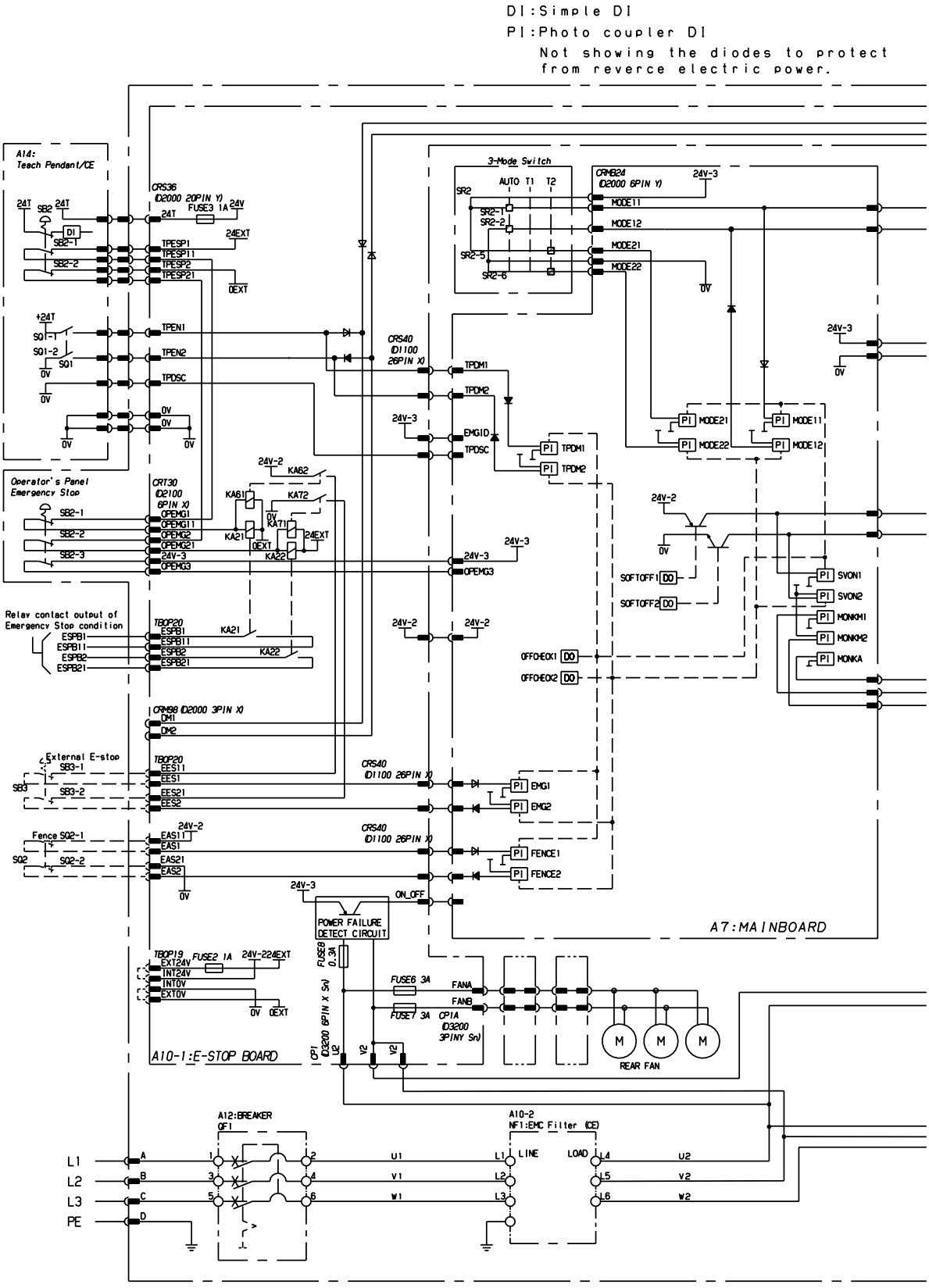
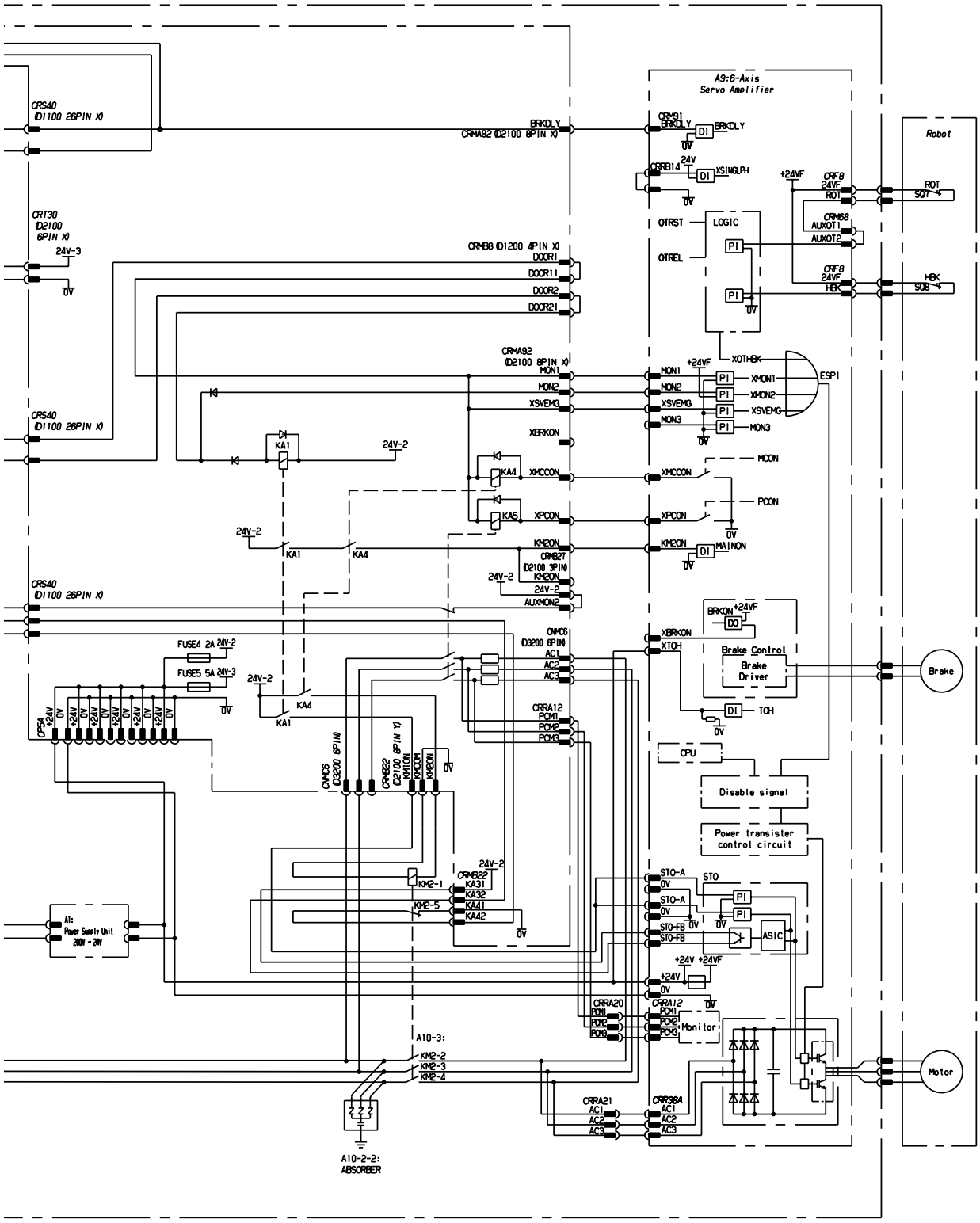


Fig.B (r) Emergency stop circuit connection diagram (R-30*i*B Mate Plus, Large size)


A9:6-Axis
Servo Amplifier
Robot
CRS40
(D1100 26PIN X)
CRT30
(D2100
6PIN X)
24V-3
0V
BRKDLY
CRMA92 (D2100 8PIN X)
CRM91
BRKDLY
DI
CRM88 (D1200 4PIN X)
DOOR1
DOOR11
DOOR2
DOOR21
CRMA92
(D2100 8PIN X)
MON1
MON2
XSVEMG
MON3
XBRKON
KA1
KA4
KA5
XMCCON
XPCON
KM2ON
CRM27
(D2100 3PIN)
AUXMON2
24V-2
CRS40
(D1100 26PIN X)
FUSE4 2A
FUSE5 5A
CRS4
CMC6
(D3200 6PIN)
AC1
AC2
AC3
CRA12
PCM1
PCM2
PCM3
CRM22
(D2100 6PIN Y)
KMION
KM2ON
KM2-1
KM2-5
KA31
KA32
KA41
KA42
A1:
Power Supply Unit
200V - 24V
A10-3:
KM2-2
KM2-3
KM2-4
A10-2-2:
ABSORBER
XSINGLPH
+24VF
CRF8
24VF
ROT
SOT
CRM68
AUXOT1
AUXOT2
HBK
SOB
OTRST
OTREL
LOGIC
PI
XOTHBK
ESPI
XMON1
XMON2
XSVEMG
MON3
MCON
PCON
MAINON
BRKON
DO
XTCH
Brake Control
Brake
Driver
TCH
CPU
Disable signal
Power transister
control circuit
STO-A
STO-FB
STO
ASIC
+24V
CRA20
CRA21
CRA38A
Monitor
Brake
Motor

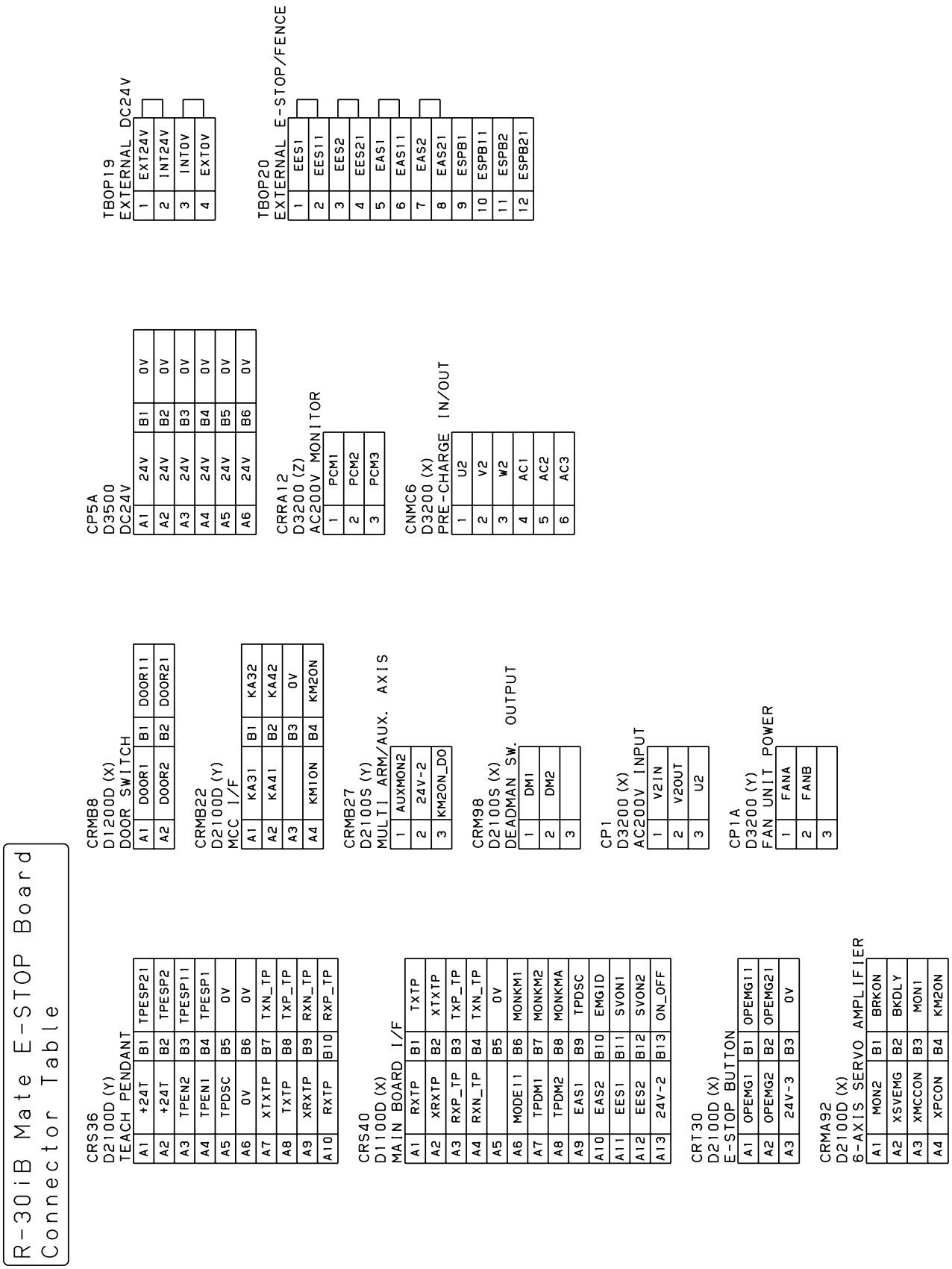


Fig.B (s) E-stop board connector table (R-30*i*B Mate)

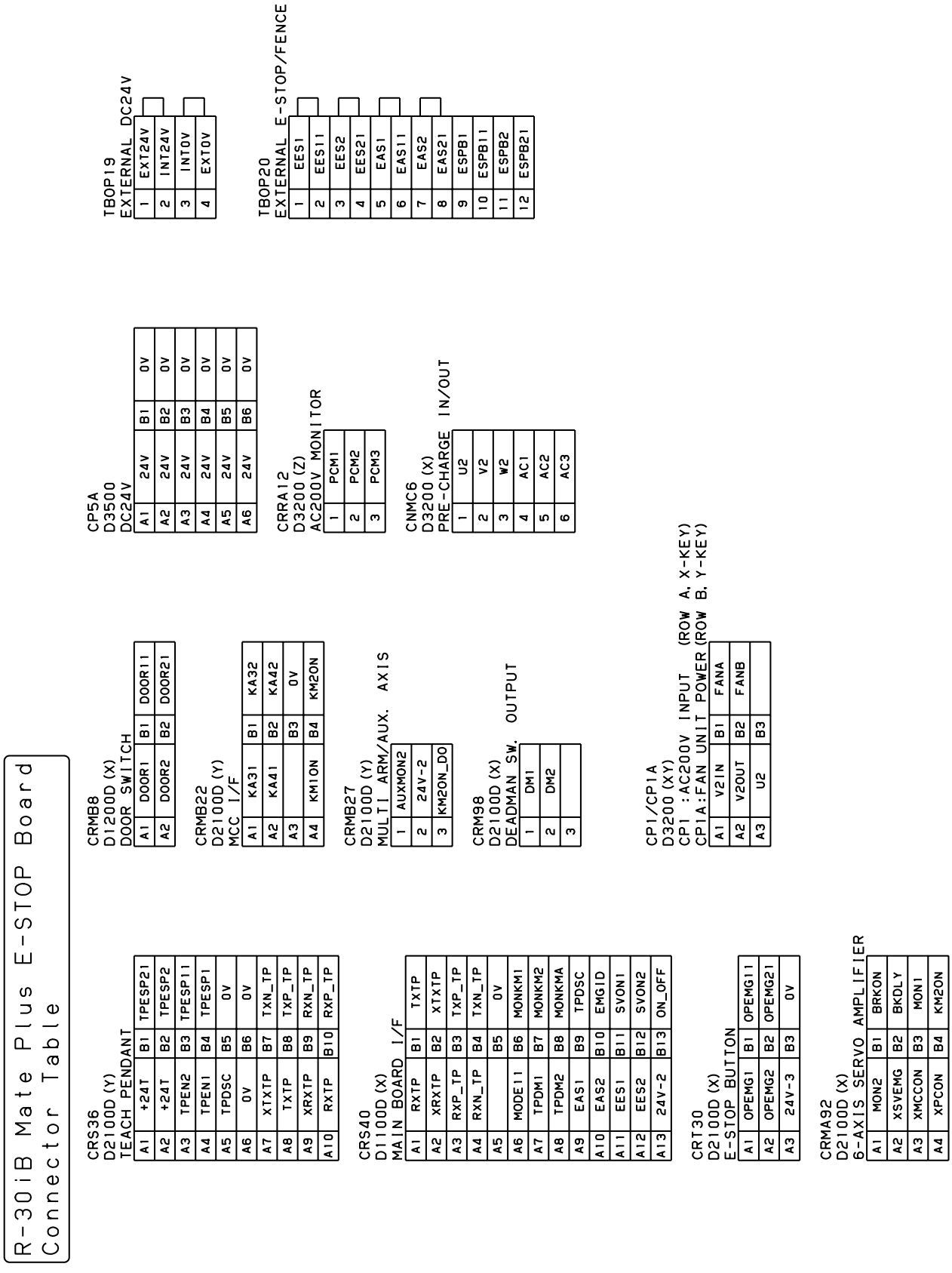


Fig.B (t) E-stop board connector table (R-30*i*B Mate Plus)

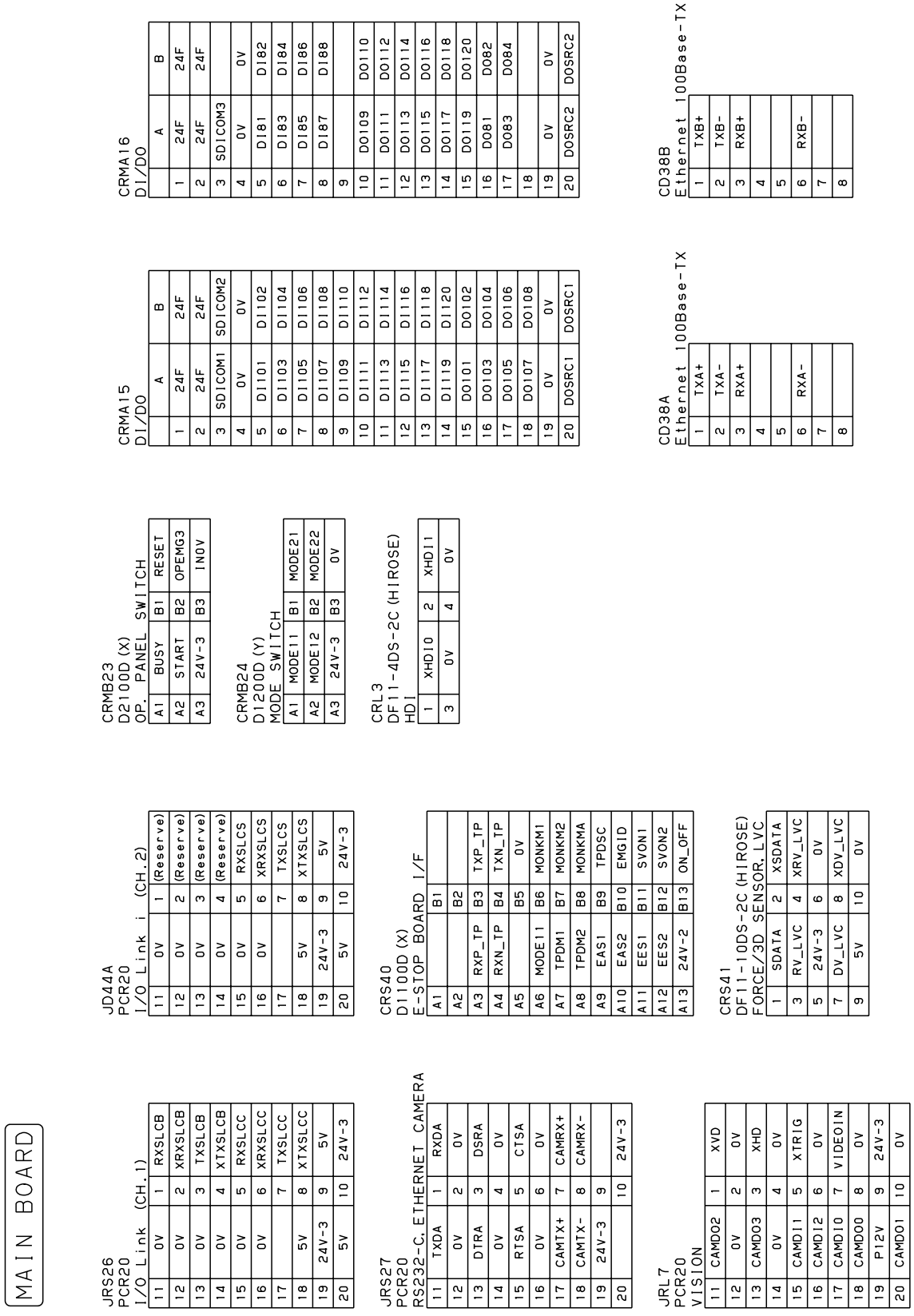


Fig.B (u) Main board connector table (R-30*i*B Mate)

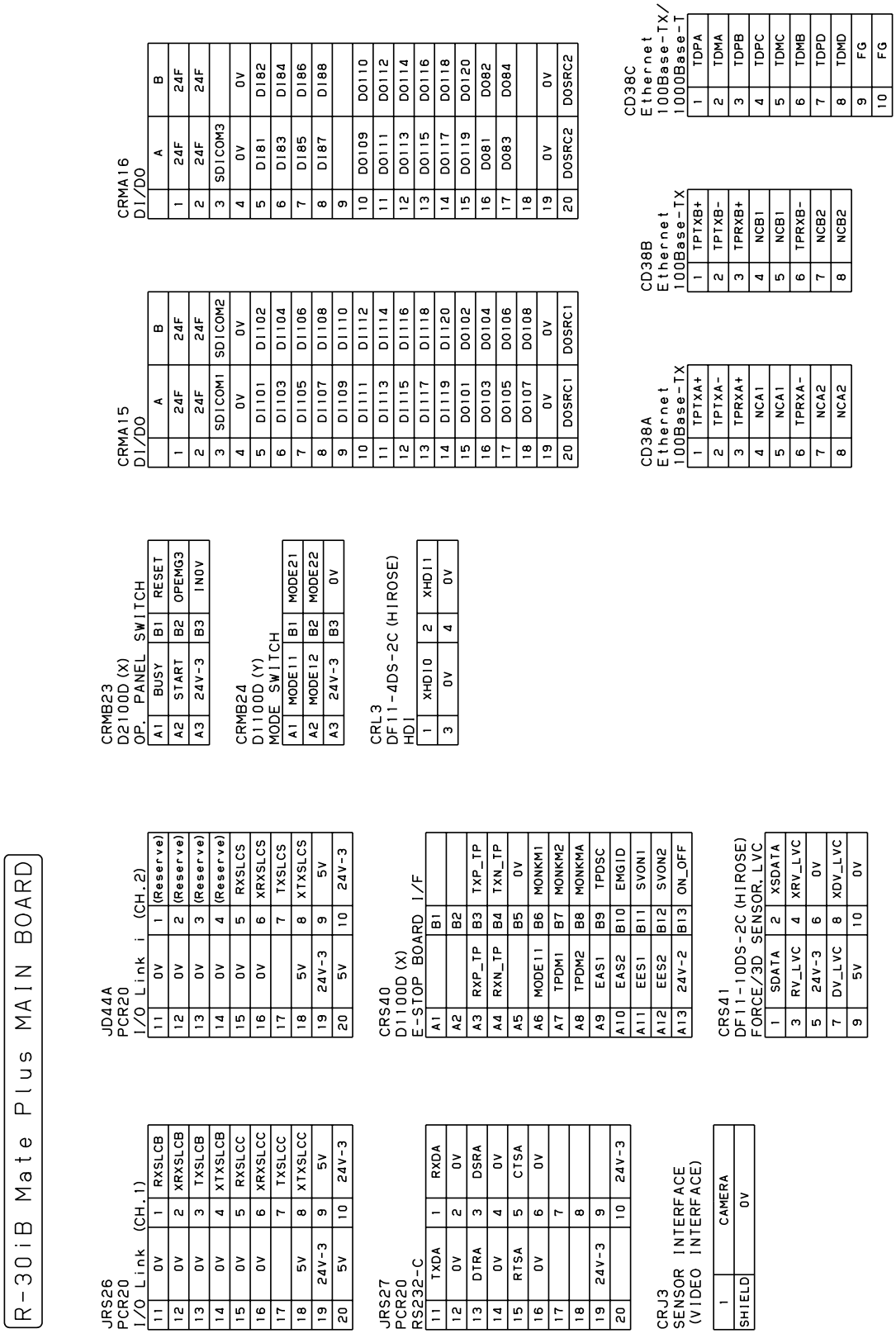


Fig.B (v) Main board connector table (R-30*i*B Mate Plus)

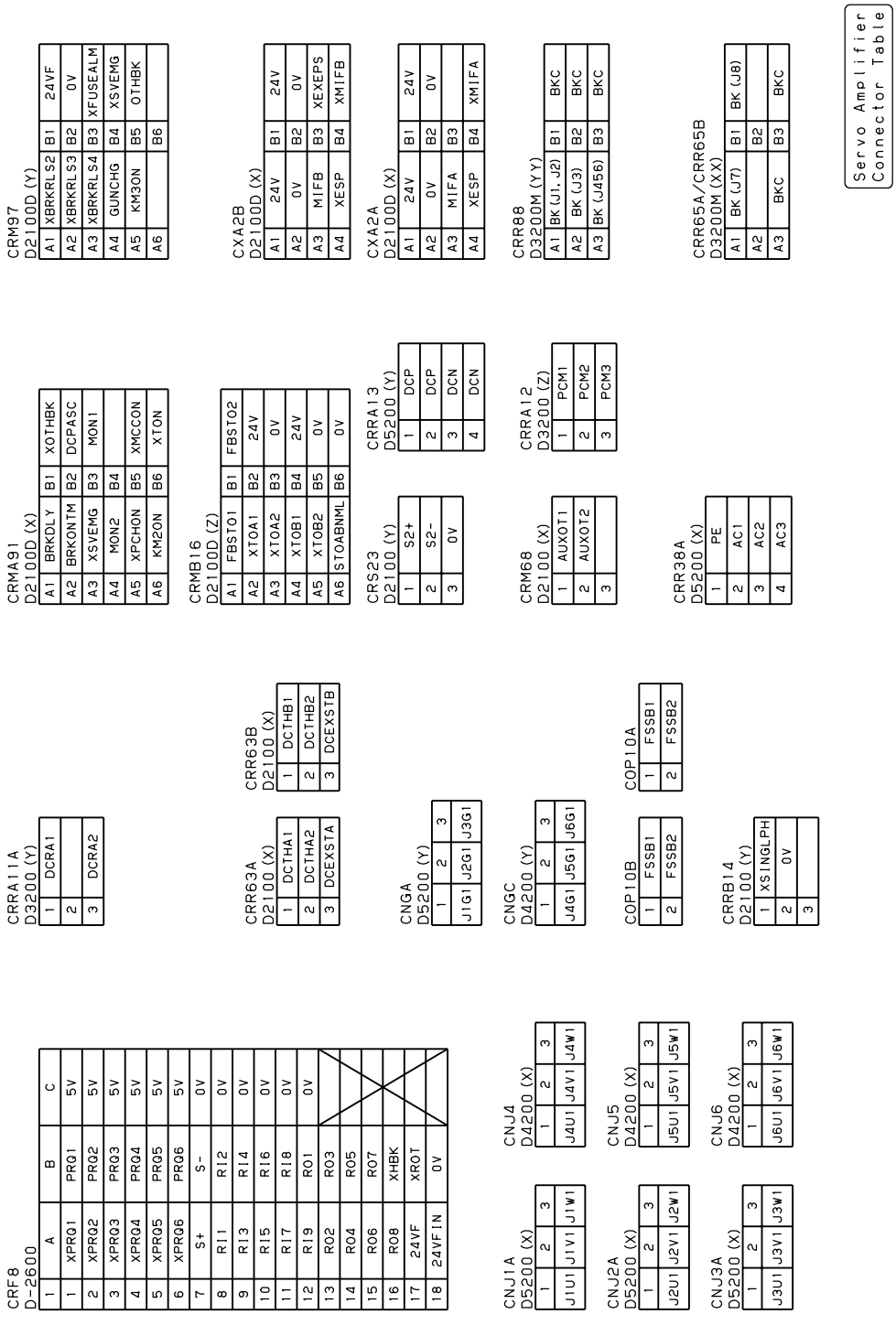


Fig.B (w) Servo amplifier connector table

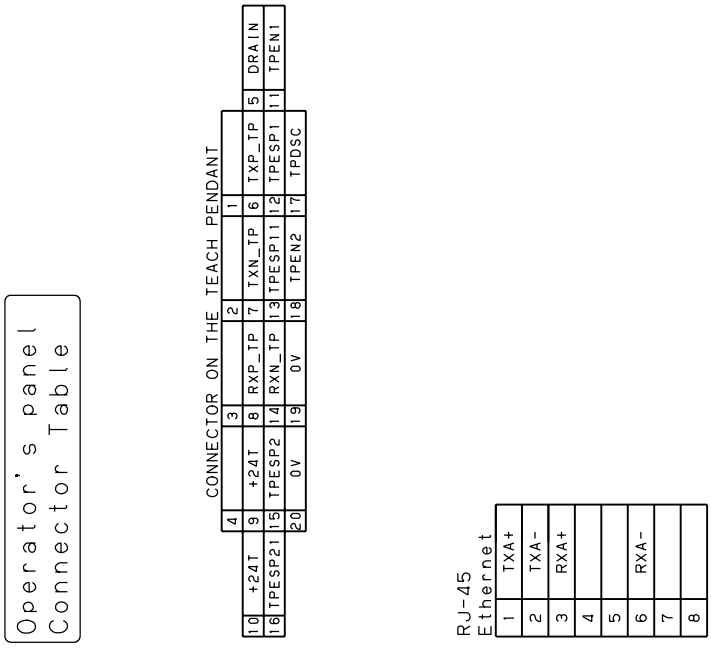


Fig.B (x) Operator's panel connection diagram

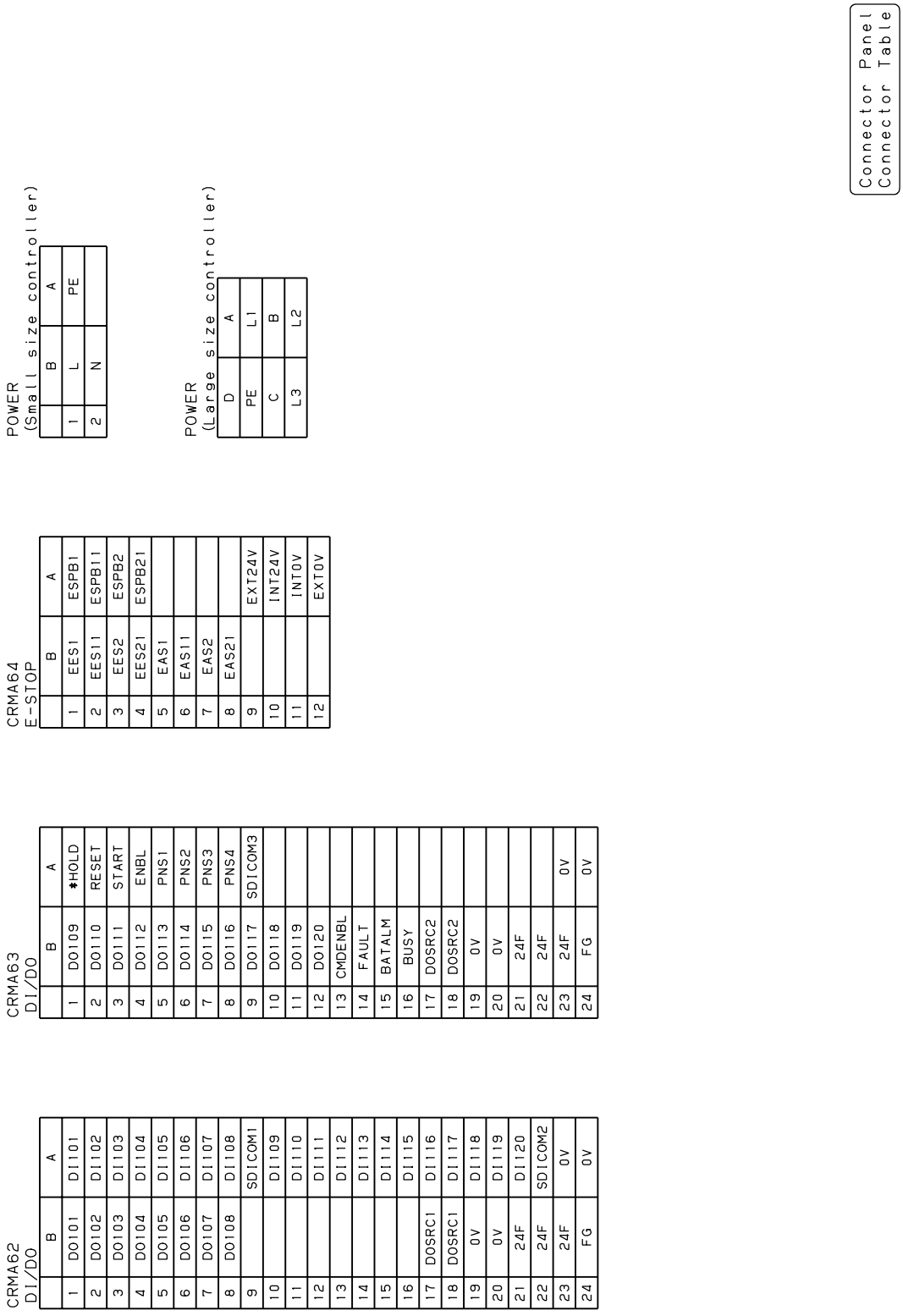


Fig.B (y) Rear side connector panel connector table

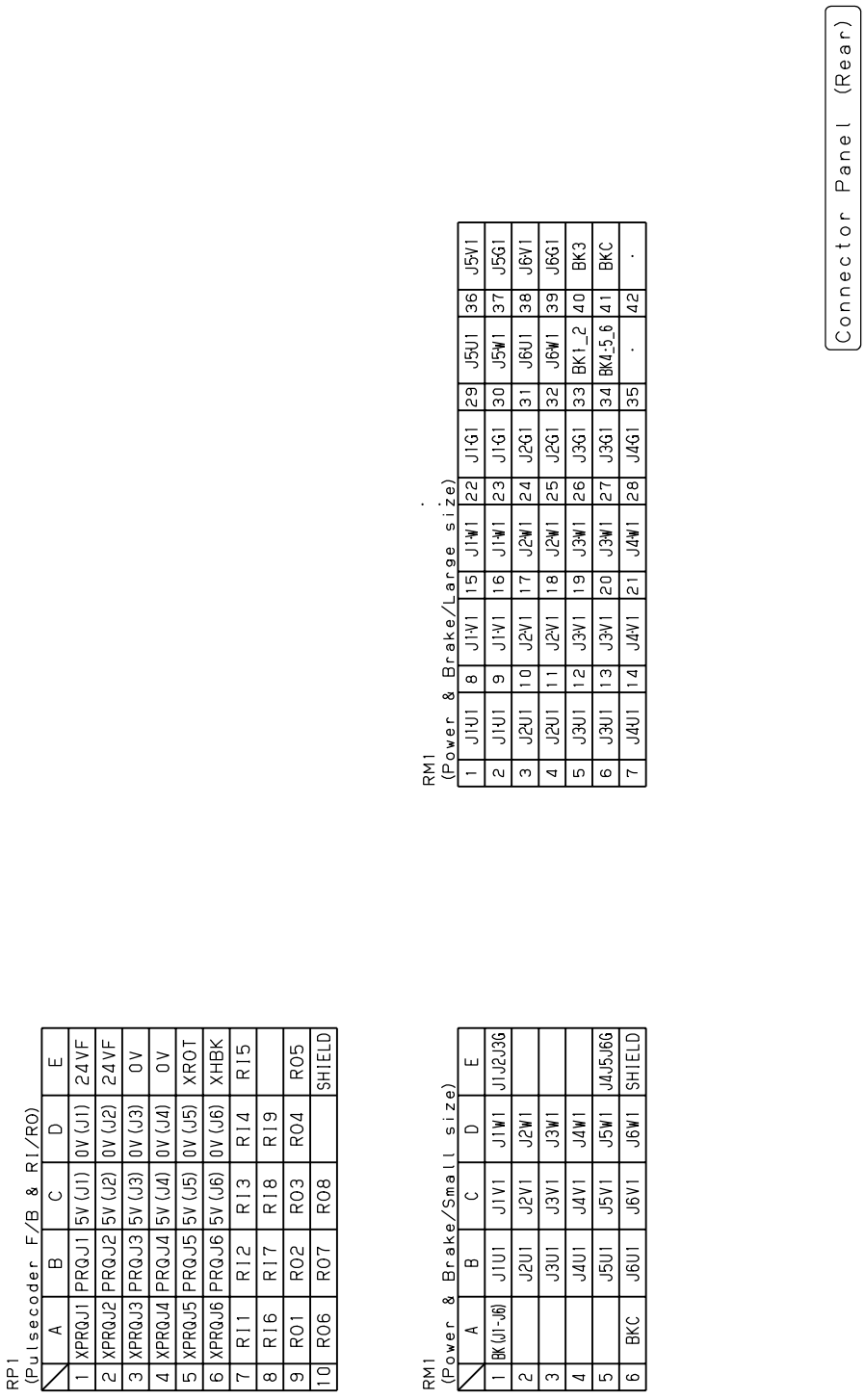


Fig.B (z) Rear side connector panel connector table (RP1, RM1)

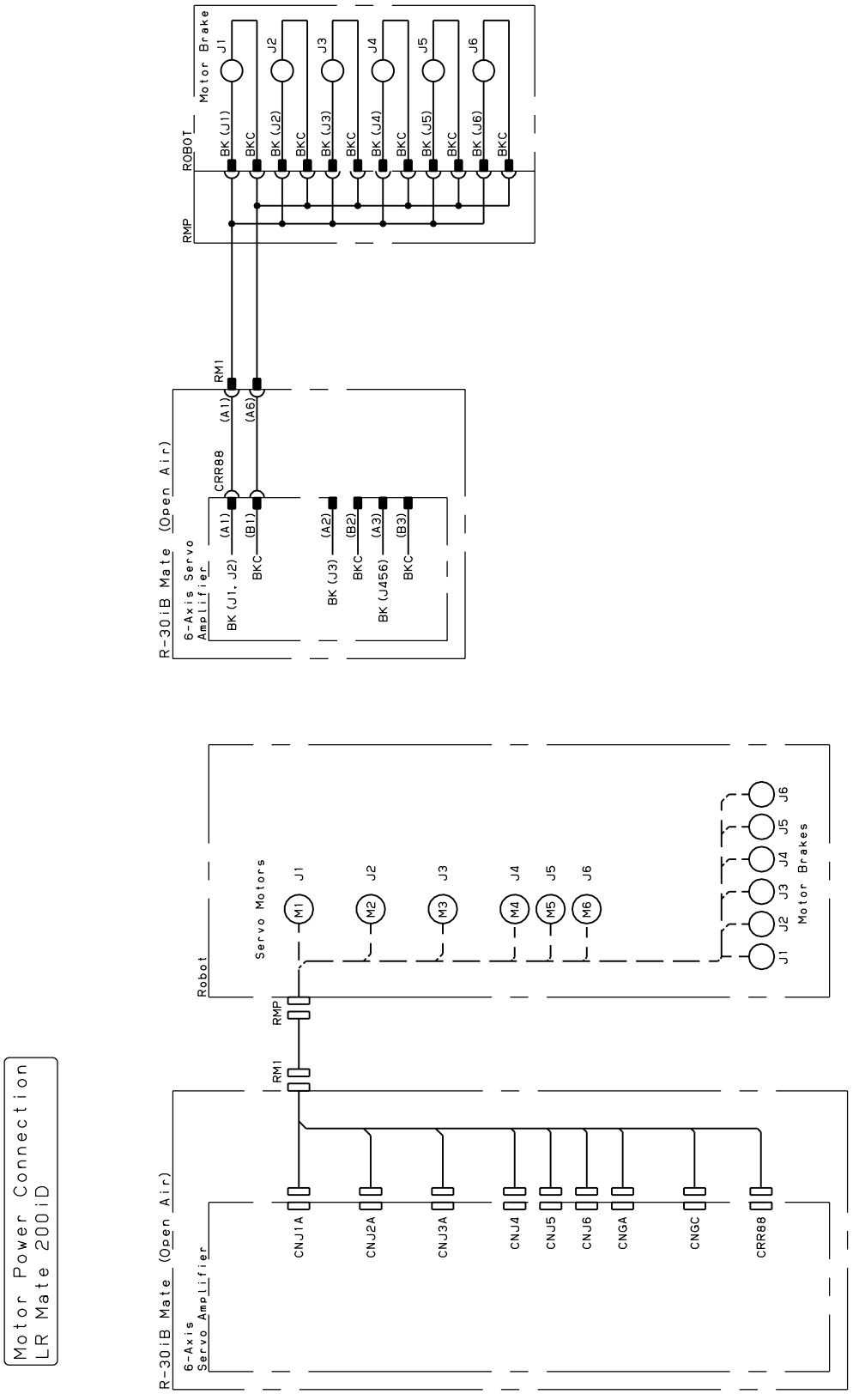


Fig.B (aa) Motor power connection (LR Mate 200*i*D(6-Axis), ER-4*i*A,M-1*i*A/0.5A,CR-4*i*A,CR-7*i*A,CR-14*i*A)

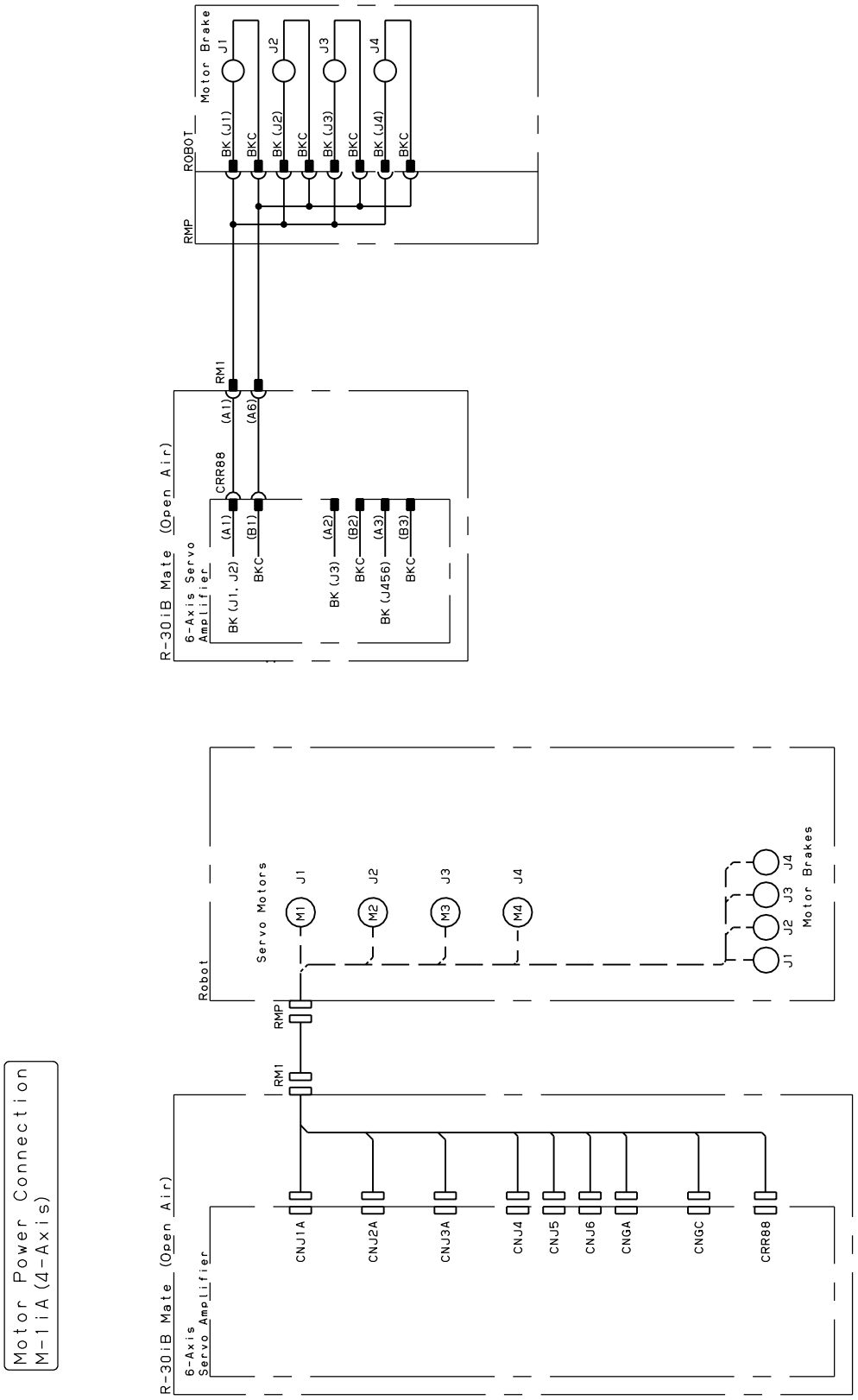


Fig.B (ab) Motor power connection (M-1*i*A/0.5S(4-Axis))

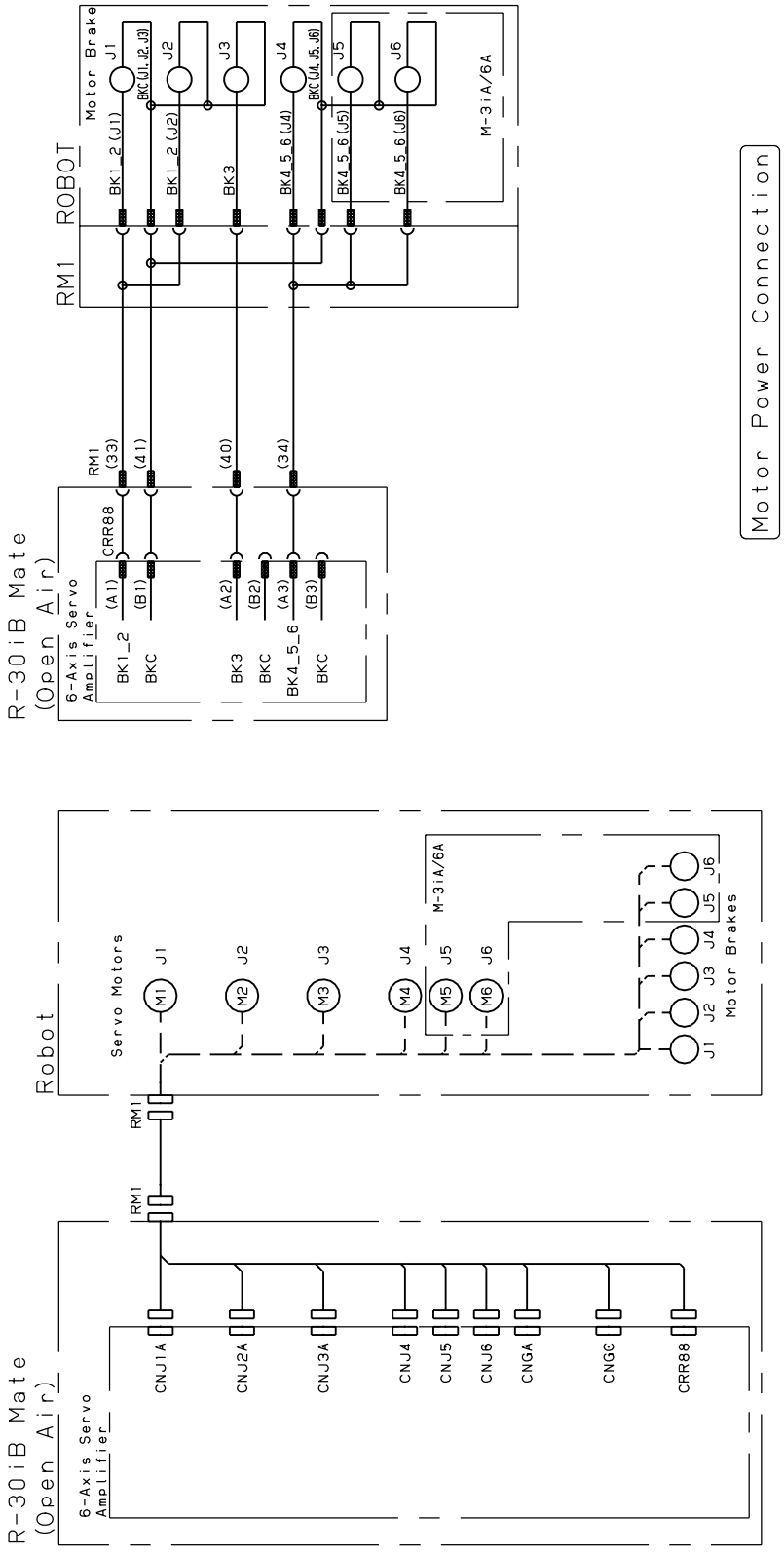


Fig.B (ac) Motor power connection (M-2*i*A, M-3*i*A)

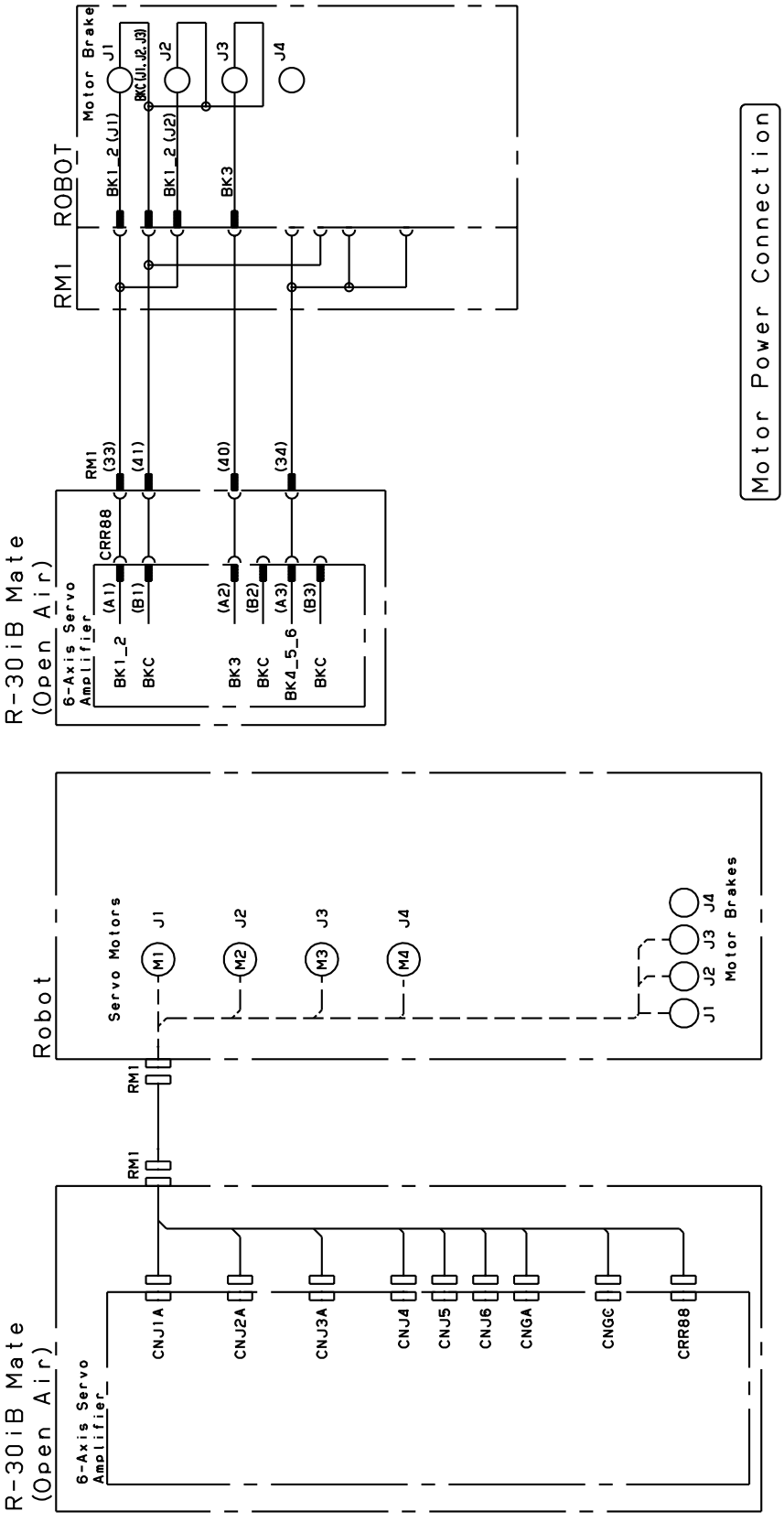


Fig.B (ad) Motor power connection (DR-3*i*B)

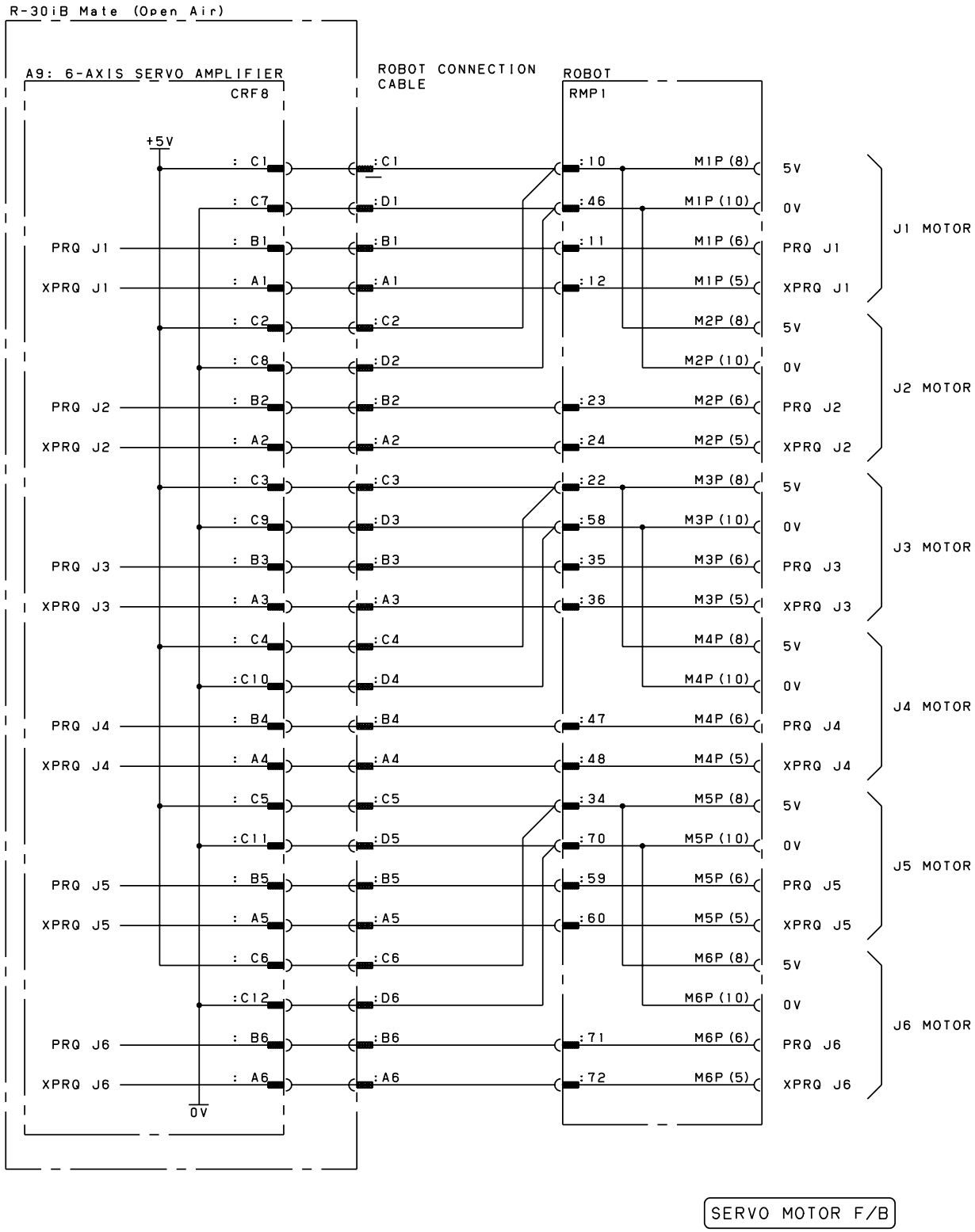


図 B(ae) Pulsecoder signal connection diagram
(LR Mate 200*i*D, ER-4*i*A, CR-4*i*A, CR-7*i*A, CR-14*i*A)

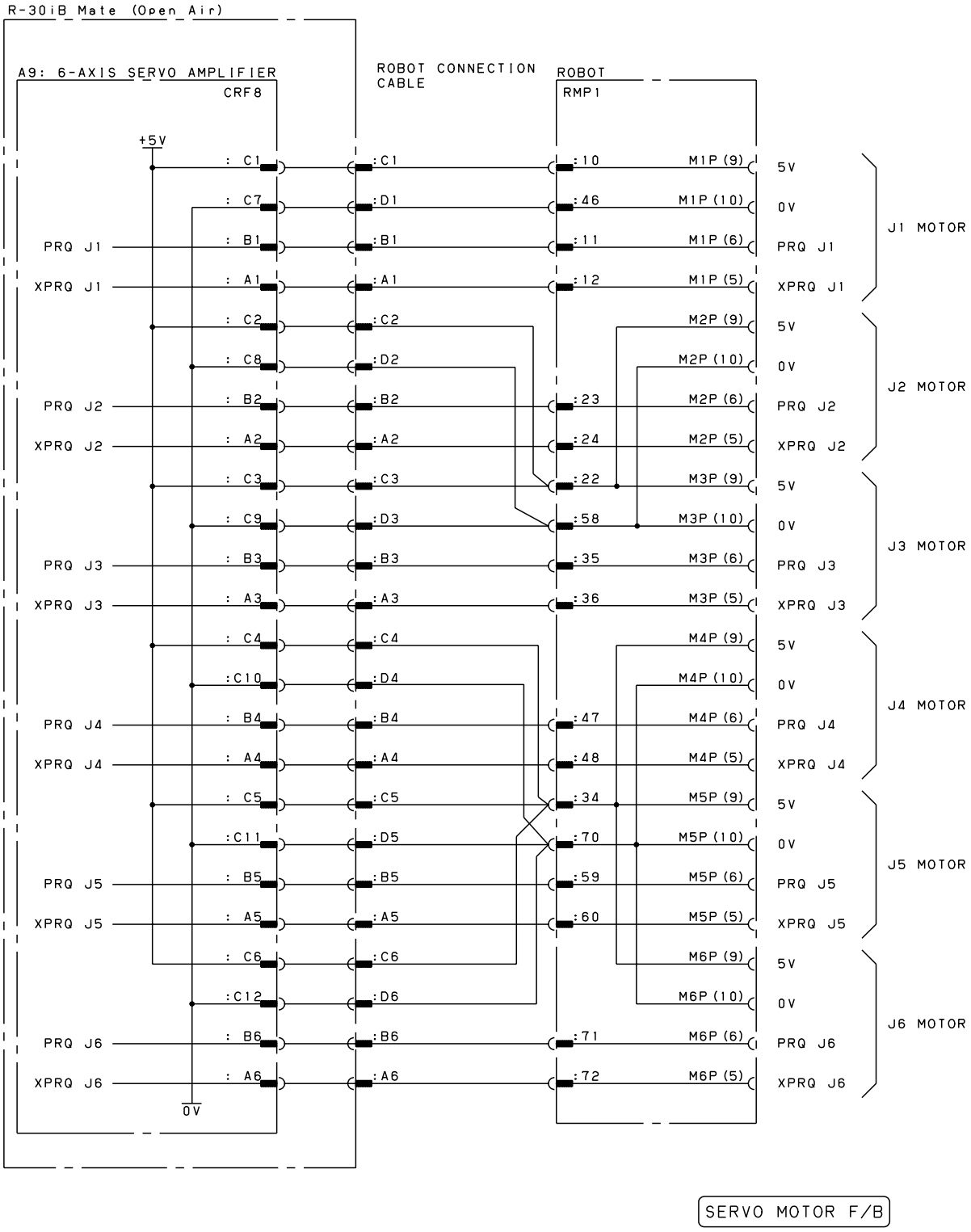


図 B(af) Pulsecoder signal connection diagram
(M-1*i*A)

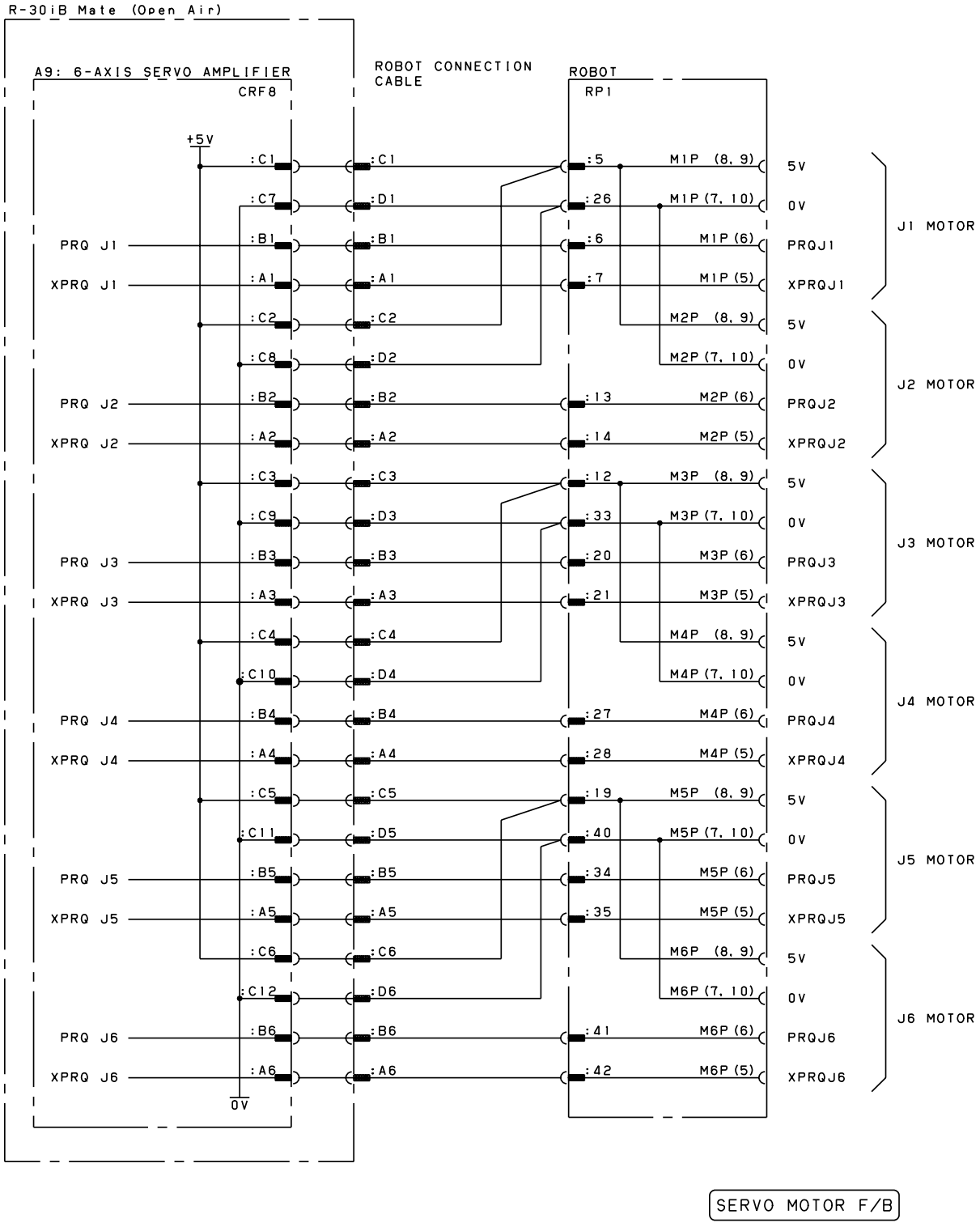


図 B(ag) Pulsecoder signal connection diagram
(M-2*i*A, M-3*i*A, DR-3*i*B)

Fig.B (ah) Mechanical unit interface (LR Mate 200*i*D, ER-4*i*A, M-1*i*A, CR-4*i*A, CR-7*i*A, CR-14*i*A)

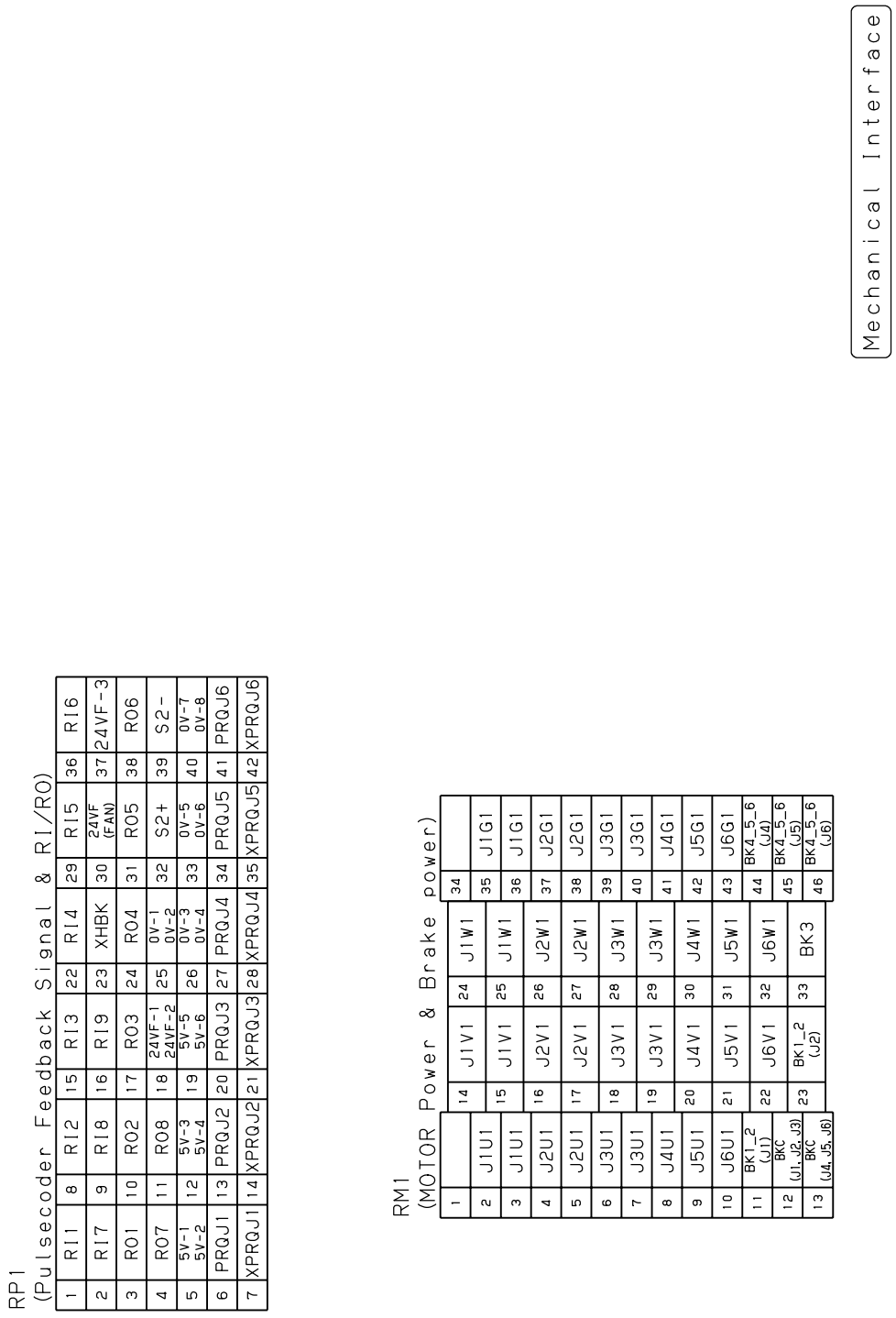


Fig.B (ai) Mechanical unit interface (M-2*i*A, M-3iA)

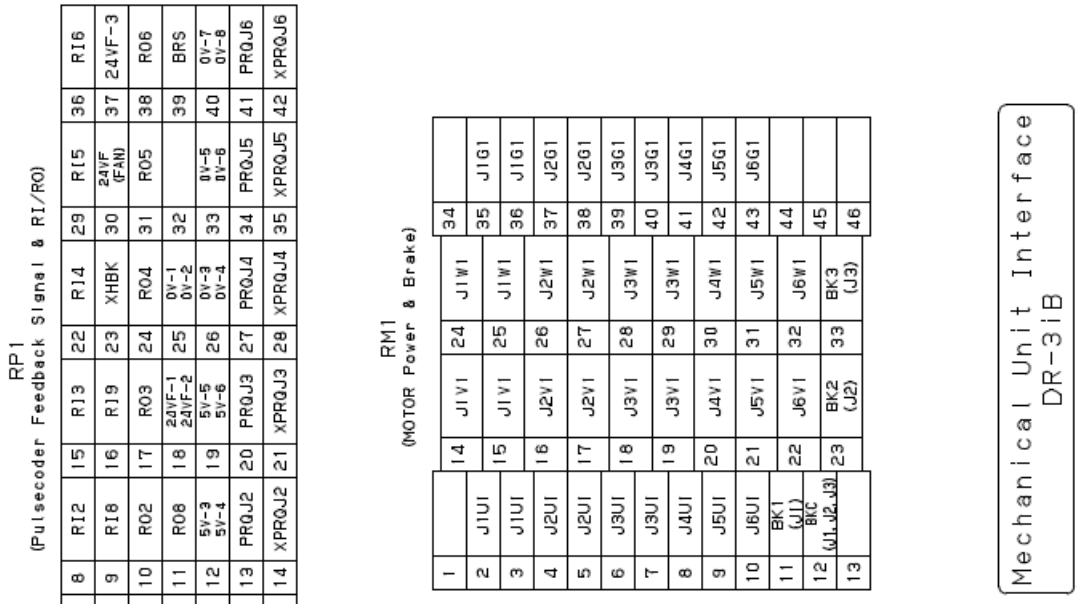


Fig.B (aj) Mechanical unit interface (DR-3*i*B)

C SPECIFICATIONS OF PERIPHERAL DEVICE INTERFACE

C.1 SIGNAL

The following table lists the I/O signals used for the peripheral device interface in the R-30*i*B Mate/ R-30*i*B Mate Plus controller.

Input signals (Refer to C.3.1)

Signal	Description
*IMSTP	Instantaneous stop signal
*HOLD	Hold signal
*SFSPD	Safety speed signal
CSTOPI	Cycle stop signal
FAULT_RESET	Alarm release signal
START	Cycle start signal
HOME	Return to home position
ENBL	Enabling signal
RSR1/PNS1	Robot service request/program number select signal (NOTE)
RSR2/PNS2	Robot service request/program number select signal (NOTE)
RSR3/PNS3	Robot service request/program number select signal (NOTE)
RSR4/PNS4	Robot service request/program number select signal (NOTE)
RSR5/PNS5	Robot service request/program number select signal (NOTE)
RSR6/PNS6	Robot service request/program number select signal (NOTE)
RSR7/PNS7	Robot service request/program number select signal (NOTE)
RSR8/PNS8	Robot service request/program number select signal (NOTE)
PNSTROBE	PNS strobe signal
PROD_START	Automatic operation start signal
DI01	General-purpose input signal
DI02	General-purpose input signal
DI03	General-purpose input signal
DI04	General-purpose input signal
DI05	General-purpose input signal
DI06	General-purpose input signal
DI07	General-purpose input signal
DI08	General-purpose input signal
DI09	General-purpose input signal
DI10	General-purpose input signal
DI11	General-purpose input signal
DI12	General-purpose input signal
DI13	General-purpose input signal
DI14	General-purpose input signal
DI15	General-purpose input signal
DI16	General-purpose input signal
DI17	General-purpose input signal
DI18	General-purpose input signal
DI19	General-purpose input signal
DI20	General-purpose input signal
DI21	General-purpose input signal
DI22	General-purpose input signal

NOTE
RSR: Robot Service Request (RSR5 to RSR8 are optional)
PNS: Program Number Select Input (optional)
Whether RSR is used or PNS is used can be preset.

Output signals (Refer to C.3.2)

Signal	Description
CMDENBL	Command acceptance enabled signal
SYSRDY	System ready signal
PROGRUN	Program run signal
PAUSED	Program paused signal
HELD	Held signal
FAULT	Alarm signal
ATPERCH	Reference point signal
TPENBL	Teach pendant enabled signal
BATALM	Battery alarm signal
BUSY	Operating signal
ACK1/SNO1	RSR acknowledge/Selected program number signal
ACK2/SNO2	RSR acknowledge/Selected program number signal
ACK3/SNO3	RSR acknowledge/Selected program number signal
ACK4/SNO4	RSR acknowledge/Selected program number signal
ACK5/SNO5	RSR acknowledge/Selected program number signal
ACK6/SNO6	RSR acknowledge/Selected program number signal
ACK7/SNO7	RSR acknowledge/Selected program number signal
ACK8/SNO8	RSR acknowledge/Selected program number signal
SNACK	PNS acknowledge signal
_____	Not used (for future expansion)
DO01	General-purpose output signal
DO02	General-purpose output signal
DO03	General-purpose output signal
DO04	General-purpose output signal
DO05	General-purpose output signal
DO06	General-purpose output signal
DO07	General-purpose output signal
DO08	General-purpose output signal
DO09	General-purpose output signal
DO10	General-purpose output signal
DO11	General-purpose output signal
DO12	General-purpose output signal
DO13	General-purpose output signal
DO14	General-purpose output signal
DO15	General-purpose output signal
DO16	General-purpose output signal
DO17	General-purpose output signal
DO18	General-purpose output signal
DO19	General-purpose output signal
DO20	General-purpose output signal

C.2 SETTING COMMON VOLTAGE

All process I/O boards have a jumper to set the common voltage of input signals to 0 V or 24 V. The system automatically adjusts the polarity by software according to the status of this pin. Therefore, you can operate the system without being concerned about the setting of the common voltage.

To ensure safety, the common reference voltage of the following four signals, is remains at +24V.

*IMSTP
*HOLD
*SFSPD
CSTOPI

C.3 I/O SIGNALS

C.3.1 Input Signals

This section describes the specifications of each input signal.

(1) Instantaneous stop signal (input) *IMSTP
Effective: At any time
Function: Use the normally closed switch because it is a reverse signal. The system turns off power to the servo unit when the *IMSTP is open (turned off). Do not use *IMSTP as safety relevant signal. For safety purpose, use the external emergency stop signal.

(2) Alarm release signal (input) FAULT RESET
Effective: In the alarm status
Function: The FAULT RESET signal releases the alarm status. If the servo unit has been turned off, it also turns on the unit. At the same time, the alarm display on the teach pendant (the top line) is cleared.
Description: This signal releases only the alarm status. It does not re-start execution of the program. The robot will keep running if the signal is triggered "ON" during operation.

(3) Hold signal (input) *HOLD
Effective: At any time
Function: Use the normally-closed switch because it is a reverse signal. The *HOLD signal has the same function as the hold button on the teach pendant. It halts the current program and stops the operation of the robot. While this signal is being input, the held signal (output) HELD is turned on and the robot cannot be operated.

(4) Start signal (input) START
Effective: When the command acceptance enabled signal (output) CMDENBL is turned on. See the description of CMDENBL in Section C.3.2 (1) for details.
Function: This input signal starts the selected program at the falling edge when the signal is turned off after being turned on. Its function differs according to the setting of parameter $SHELL_CFG. $CONT_ONLY.
- If parameter $SHELL_CFG.$CONT_ONLY is set to DISABLED, the START signal starts the program which has been selected from the teach pendant. By default, the program starts from the current cursor position.
- If parameter $SHELL_CFG.$CONT_ONLY is set to ENABLED, the START signal only resumes the execution of the temporarily held program. To execute an inactivated program from the start, input the PROD_START signal.

(5) Cycle stop signal (input) CSTOPI
Effective: At any time
Function:
- If parameter $SHELL_CFG.$USE_ABORT is set to DISABLED, the CSTOPI signal releases the program from the wait status caused by an RSR. It does not stop the execution of the current program and allows it to continue processing (by default).
- If parameter $SHELL_CFG.$USE_ABORT is set to ENABLED, the CSTOPI signal immediately cancels the execution of the current program. The program returns to the status in which it was before execution, and the information for the subprogram to return to the main program is lost. At the same time, this signal also releases the program from the wait status caused by RSR.

(6) Enabling signal (input) ENBL
Effective: At any time
Function: If the ENBL signal is turned off, the operation of the robot or the activation of a program is inhibited, and the execution of the current program is suspended.

(7) Safety speed signal (input) *SFSPD
Effective: At any time
Function:
- Use the normally-closed switch because it is a reverse signal. Usually this switch should be connected to safety fence. It must be set normally on.
- Since the *SFSPD signal is counted as a remote condition, such input signals as RSR and START to the peripheral device interface cannot take effect unless this signal is turned on.
- If this signal is turned from on to off during robot operation, the execution of the current program is suspended. At the same time, the overriding value is switched to a preset value (parameter $SCR. $FENCEOVER.)
- As long as this signal is off, the overriding value cannot be increased beyond the preset value ($SCR.$SFJOGOVLIM: For jog, $SCR. $SFRUNOVLIM : For test execution.)

(8) Robot service request signal (input) RSR1/RSR2/RSR3/RSR4
Effective: When the command acceptance enabled signal (output) CMDENBL is turned on. See the description of CMDENBL in Section C.3.2 (1) for details.
Function:
- The user can choose between RSR and PNS (optional), although they cannot be used simultaneously.
- Four input signals, RSR1 to RSR4, are used.
- If a signal is input to an RSR input, a specified program is started. The program number can be set by a menu.
- If another program has already started processing, the newly activated program enters the wait status. As soon as the current program terminates, the waiting program starts processing.
- By using an RSR instruction, each RSR in a program can be enabled or disabled.
- A menu is provided to register the program number of a specified program when each RSR is input. (Refer to the application manual for details of the menu).

```
+--------------------------------------+
|                                      |
|//////////////////////////////////////|
|                                 1/8  |
|  1 Job selection:               RSR  | RSR or PNS
|  2 RSR1 program number:          12  | 0..9999
|  3 RSR2 program number:          23  | 0..9999
|  4 RSR3 program number:           5  | 0..9999
|  5 RSR4 program number:          64  | 0..9999
|  6 Base number:                 100  | 0..9999
|  7 Acknowledge:             Enabled  | Enabled or disabled
|  8 Acknowledge pulse width: 250 msec | 0..9999msec
=                                      =
|                                      |
|[ TYPE ]                              |
+--------------------------------------+
```

- When an RSR is input, the program whose program name consists of the specified program number plus a base value is started. For example, if a signal is input to RSR2 when program number 23 is registered in RSR2, the program to be started is the one with the program name calculated from the expression RSR + (RSR2 program number + base number), i.e., RSR0123.
  The base number is stored in parameter $SHELL_CFG.$JOB_BASE, and can be changed in a program with a parameter instruction. (For example, $SHELL_ CFG. $JOB_BASE =100). In this way, the combination of programs which can be started by RSRs can be changed.
- Whether the system should output an acknowledge signal to an RSR can be selected from the menu. If so specified, a pulse is output from the signal corresponding to the RSR, one of signals ACK1 to ACK4, when the input of the RSR is accepted. From the same menu, the width of the pulse can also be specified.
  It is possible to accept other RSRs while outputting an acknowledge signal.
- Input of a CSTOPIT signal can clear the program queue waiting for execution after acceptance of RSRs.

(9) PNS/PNSTROBE (input)

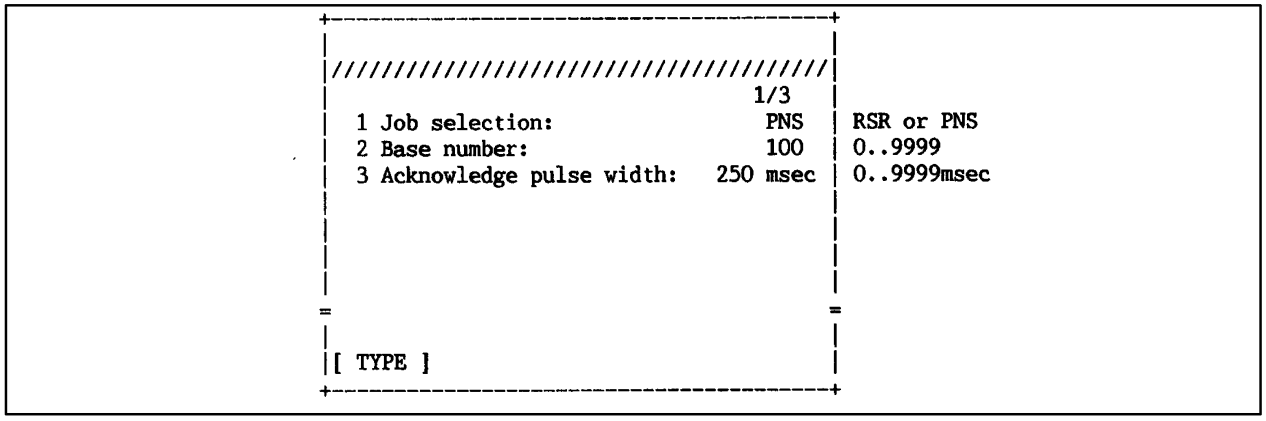
Signal name: PNS: Program number select

PNSTROBE: Strobe input for PNS

Effective: When the command acceptance enabled signal (output) CMDENBL is turned on. See the description of CMDENBL in Section C.3.2 (1) for details.

Function:

- The PNS/PNSTROBE signal selects whether the RSR function is used or the PNS function (optional) is used. If the PNS function is enabled, the RSR function cannot be used.
- The eight signals PNS1 to PNS8 are used to specify a program at the instant the strobe signal PNSTROBE rises.
- A menu is provided to specify the information about PNS.



If a number other than zero is entered to PNS input, a program is selected whose program number is the entered value plus the base number. For example, if the PNS value is 23, the program to be started has the program name calculated from the expression
PNS + (entered PNS value + base number), i.e., PNS0123.
If zero is entered to PNS input, it is cleared as if no selection has been made.

- A PNS signal, which can only select a program, cannot execute the selected program. The execution of the selected program can only be started after input of automatic operation start signal PROD_START.
- For safety, the selected program cannot be changed from the teach pendant unless PNSTROBE is turned off.
- If a program is selected by PNS, the program number is output to selected program number signal (output) SNO, and a pulse is output to program selection acknowledge signal SNACK. Using these signals, peripheral devices can confirm the correct program has been selected. For the timing of these signals, see the sections describing SNO and SNACK.
- The following operations are effective for the program selected by PNS. You can:
  - Start up a program by input of automatic operation start signal PROD_START
  - Restart the program that has been suspended.
    Inputting the START signal restarts the program selected by PNS when $SHELL_CFG.$CONT_ ONLY is set to ENABLED.
  - Input of CSTOPI cancels execution of the pro-grams selected by PNS when $SHELL_CFG.$USE_ ABORT is set to ENABLED.

(10) Automatic operation start signal (input) PROD_START
Effective: When the command acceptance enabled signal (output) CMDENBL is turned on. See the description of CMDENBL in Section C.3.2 (1) for details.
Function: This input signal executes the selected program at the falling edge when the signal is turned off after being turned on.

C.3.2 Output Signals

This section describes the specifications of output signals for the peripheral device interface.

(1) Command acceptance enabled signal (output) CMDENBL
Turned on: When the remote conditions are satisfied and the system is not in the alarm status.
Turned off: When the remote conditions are not satisfied or the system is in the alarm status. The remote conditions are satisfied when all of the following are satisfied.
- The teach pendant is in the DISABLED status.
- The remote/local setting is set to REMOTE.
- Parameter $RMT_MASTER is set to 0 (external interface).

- Signal *SFSPD is set to on, or in the normal status.

(2) System ready signal (output) SYSRDY
Turned on: When power is applied to the motor of the robot.
Turned off: When power is not applied to the motor of the robot.

(3) Program run signal (output) PROGRUN
Turned on: When the program is being executed.
Turned off: When the program is not being executed.

(4) Held signal (output) HELD
This signal is used to check the status of the hold input.
Turned on: When the hold button on the teach pendant (or input) is being pressed down (or turned on).
Turned off: When the hold button on the teach pendant (or input) is not being pressed down (or is turned off).

(5) Program paused signal (output) PAUSED
This signal is used together with output signal PROGRUN to determine whether a program can be restarted while it is being held.
Turned on: When a program is held and has not been restarted yet. While this signal is on, the program can be restarted and retains information such as that to return from a subprogram to the main program.
Turned off: When a program is being executed or is ready to start. If signal PROGRUN is on, the program is being executed. If signal PROGRUN is off, the program has not been executed and can be started from this status.

(6) Alarm status signal (output) FAULT
Turned on: When the system is in the alarm status (or an alarm which can stop a program execution is detected.) The indicator lamp does not go on in warning.
Turned off: When the alarm status is released by an alarm release operation.

(7) Reference point signal (output) ATPERCH
Turned on: When the robot is in the reference position specified in the parameter. (The reference point No.1 in reference point setup screen.)
Turned off: When the robot is not in the reference position specified in the parameter. (The reference point No.1 in reference point setup screen.) Up to three reference positions can be specified, but this signal is output when the robot is in the first reference position. For the other two reference positions, general-purpose signals can be assigned to output as such. (They can be set from the setup screen.)

(8) Teach pendant enabled signal (output) TPENBL
Turned on: When the teach pendant is enabled.
Turned off: When the teach pendant is disabled.

(9) Battery alarm signal (output) BATALM
Turned on: When the voltage of the battery for the CMOS memory backup drops below the reference.
Turned off: When the voltage of the battery for the CMOS memory backup is at the normal level.

(10) Operating signal (output) BUSY

Turned on: When a program is being executed or is being processed from operation panels such as the teach pendant. (This has the same function as that of the BUSY lamp on the teach pendant.)

Turned off: When a program is not being executed nor is being processed from operation panels such as the teach pendant.

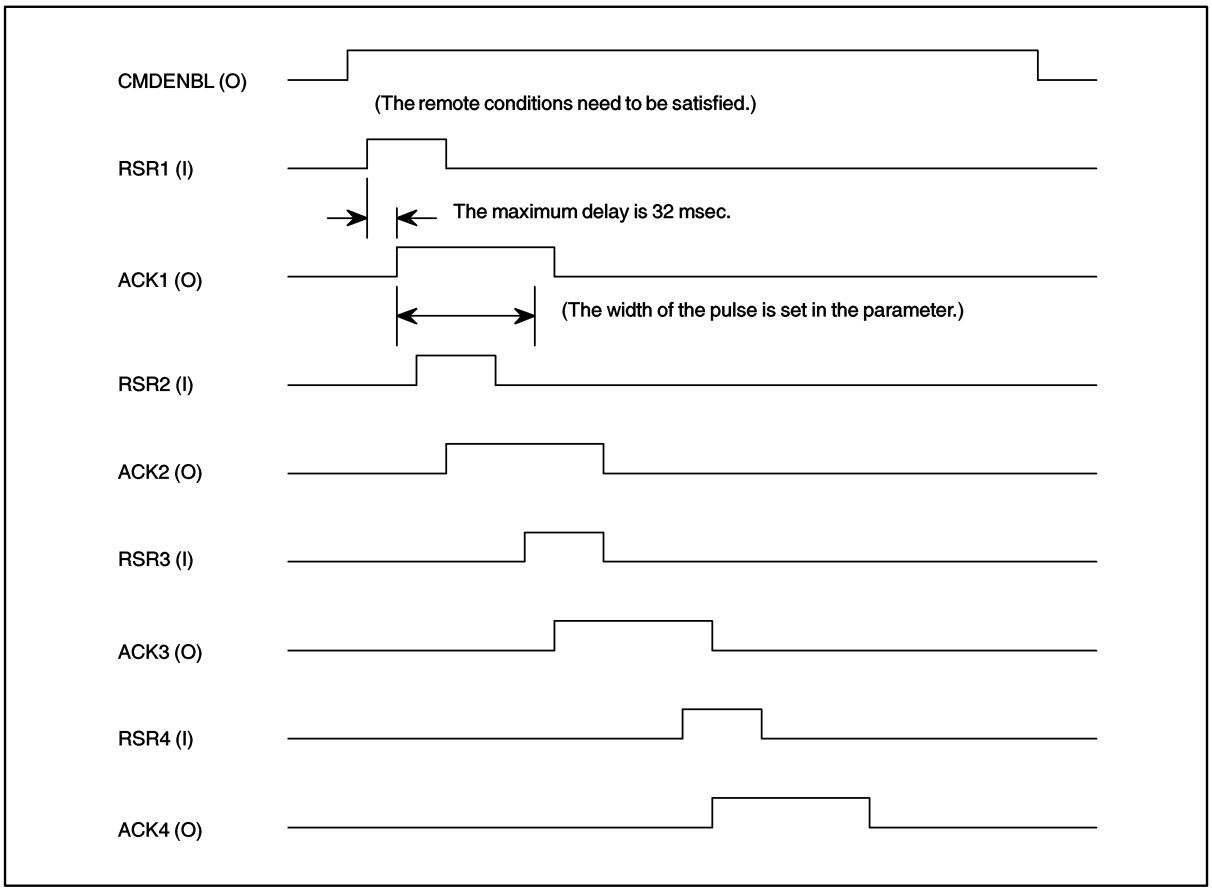
(11) RSR acknowledge signals (output) ACK1/ACK2/ACK3/ACK4

These signals are used together with the RSR function. They can be specified to be enabled or disabled from the RSR setup menu.

Turned on: When one of the signals from RSR1 to RSR4 is input and accepted. A pulse whose width is specified from the menu is output to acknowledge the signal.

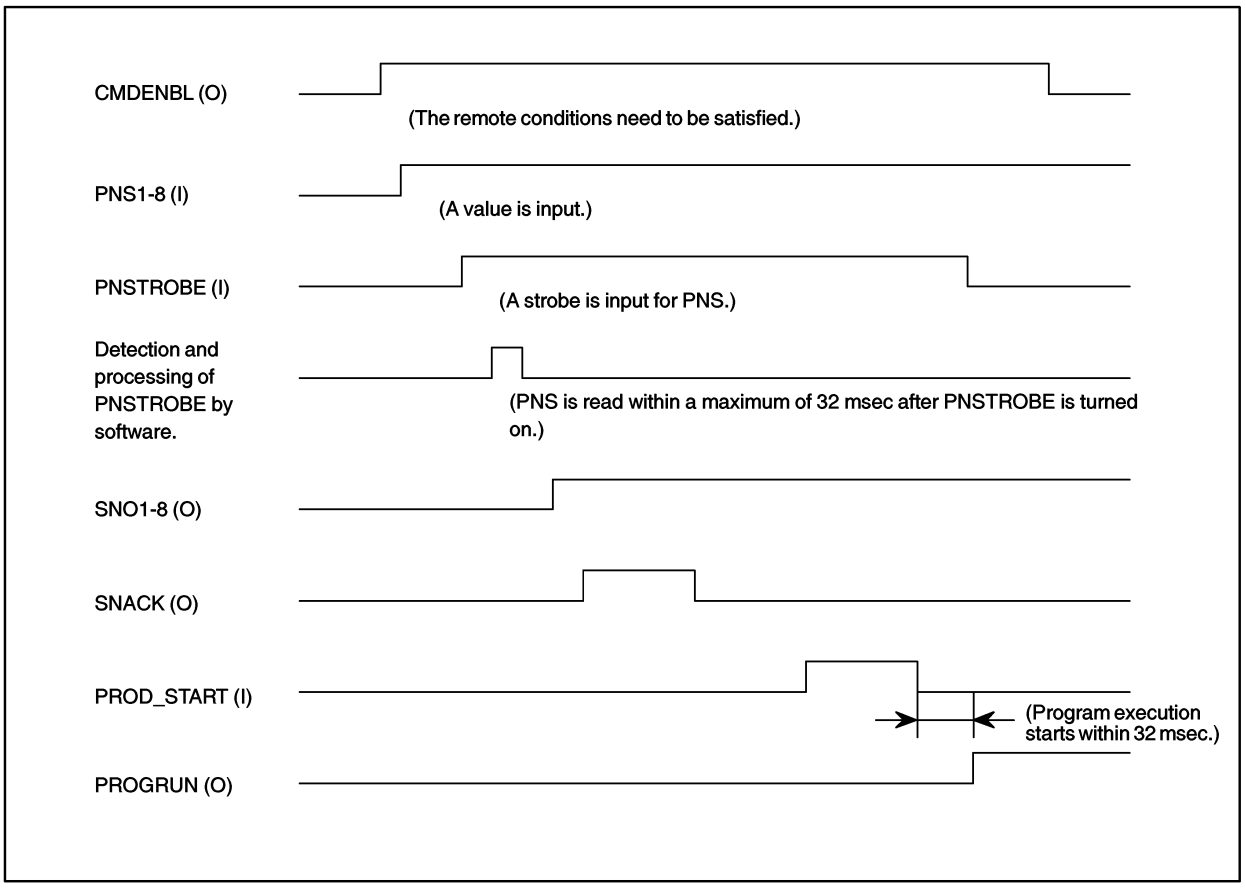
Turned off: Normally. Since these signals are always output as pulses, they are normally in the off status.

The following chart shows the timing of the RSR input and ACK output.



* Other RSR signals can be accepted even when the ACK signal is being output.

(12) PNS acknowledge signal (output) SNO/SNACK
These signals are used together with the PNS function.
Turned on: Whenever the PNS function is enabled. The selected program number is displayed in binary code (SN01 to SN08) on the teach pendant. If the number cannot be represented as an eight-bit number, it becomes zero. After selecting a program by PNS, a pulse is output from signal SNACK as a part of the PNS operation. The width of the pulse can be specified from the menu. See the timing chart below.



C.4 SPECIFICATIONS OF DIGITAL INPUT/OUTPUT

C.4.1 Overview

This section describes the external specifications of digital and analog input/output in the R-30*i*B Mate/ R-30*i*B Mate Plus controller.

C.4.2 Input/Output Hardware Usable in the R-30*i*B Mate/ R-30*i*B Mate Plus Controller

The R-30*i*B Mate/R-30*i*B Mate Plus controller can use up to 512 digital input and output points or an equivalent number of analog input and output points. One analog input/output point uses the resources equivalent to those used by 16 digital I/O points.
The R-30*i*B can use a total of up to 512 I/O points.

The R-30*i*B controller can use the following I/O hardware.
- Process I/O printed board
- I/O unit model A

The process I/O board and the I/O unit model A can be used together.

C.4.3 Software Specifications

(1) RI/RO
These are signals sent to the connector at the wrist of the robot.
They cannot be assigned (redefined) and are fixed.
The standard format is eight inputs and eight outputs. The number of points that can be used for the connector at the wrist depends on the individual robot.

(2) DI/DO
The signal No. that is determined at hardware can be changed by software operation.

(3) Analog I/O
An analog I/O signal can access the analog I/O port (optional) on the process I/O board or the I/O port on the analog I/O module (used together with the I/O unit model A).
It reads and writes the digital value converted from the analog value of the I/O voltage. It means that the value does not always represent the real I/O voltage.

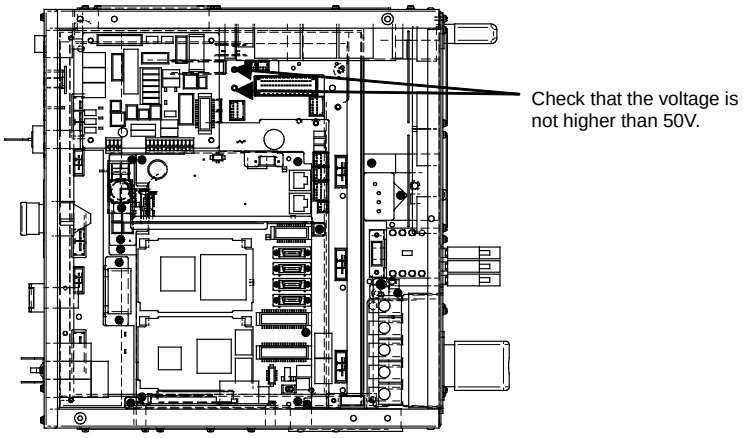
(4) Group I/O
Group I/O is a function, which can input or output multiple DI/DO signals as binary codes. Any number of continuous signals of up to 16 bits can be set for its use. It can be set in the menu DETAILS on the group I/O screen.

D DISASSEMBLE PROCEDURE

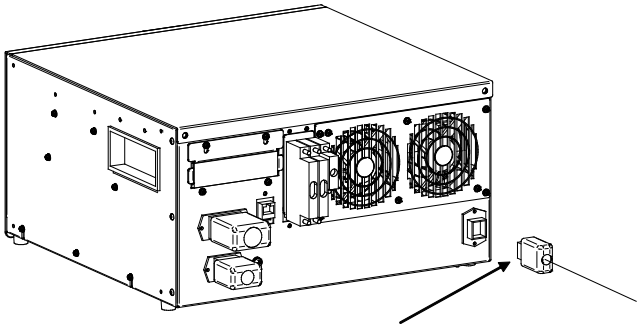
D.1 DISASSEMBLE PROCEDURE

⚠ WARNING
Before opening the controller cover and accessing the inside of the controller for maintenance, be sure to turn off the power switch, disconnect the power cable, and wait 1 minute or more. This is for protecting you from electric shock.

⚠ WARNING
Before touching the servo amplifier, for example, for maintenance purposes, check the voltage at the screws (shown in the figure below) with a DC voltage tester to see if the remaining voltage is not higher than 50V.



D.1.1 Turn off the Breaker and Disconnect the Power Cable.

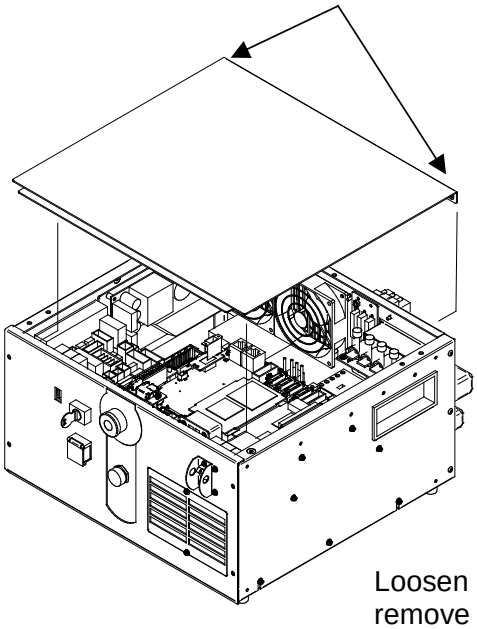


Turn off the breaker
and disconnect the power cable.

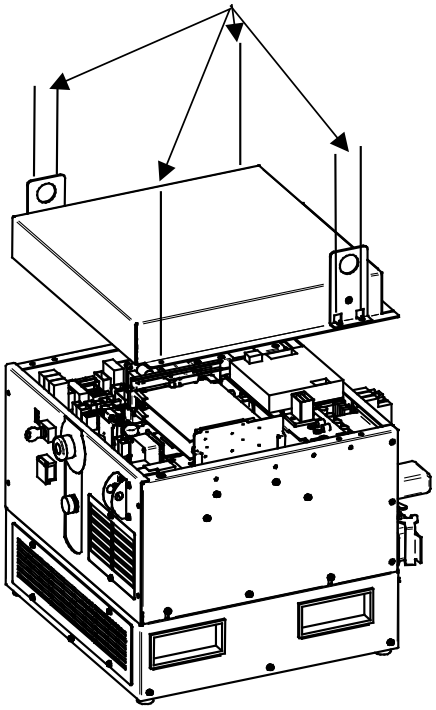
⚠ WARNING
Disconnect the plug connected to the power supply before disconnecting power cable of controller.

D.1.2 Remove the Top Plate.

Loosen (2) screws and
remove the top plate



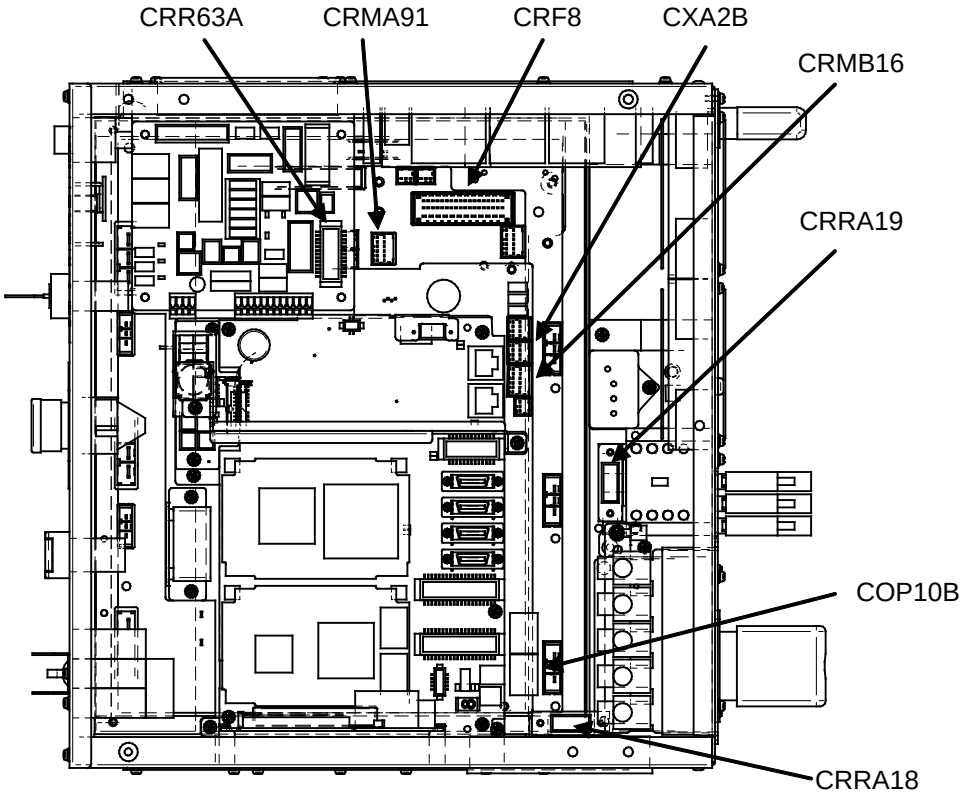
Loosen (6) screws and
remove the top plate

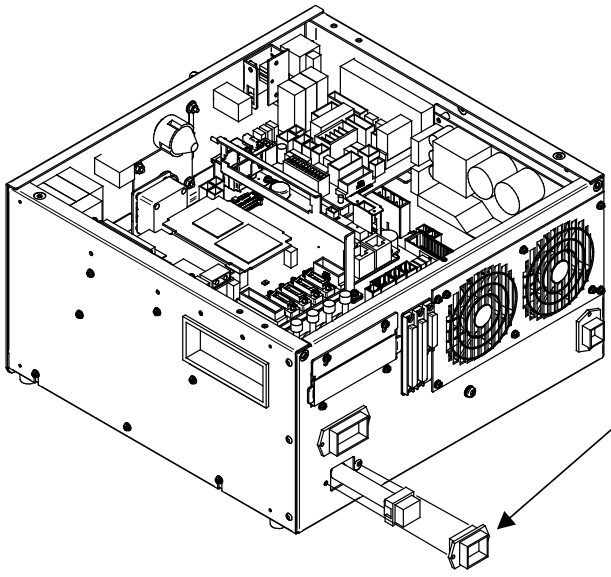


D.2 REMOVING THE UNIT

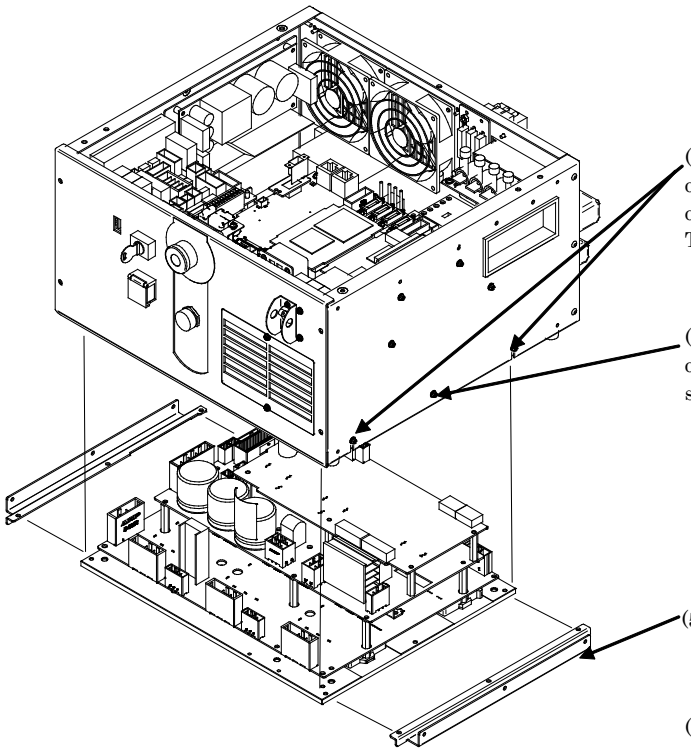
D.2.1 Remove 6-Axis Servo Amplifier (Small size)

(1)Disconnect all connectors shown below.
(Yellow nylon bands are attached to these cables.)



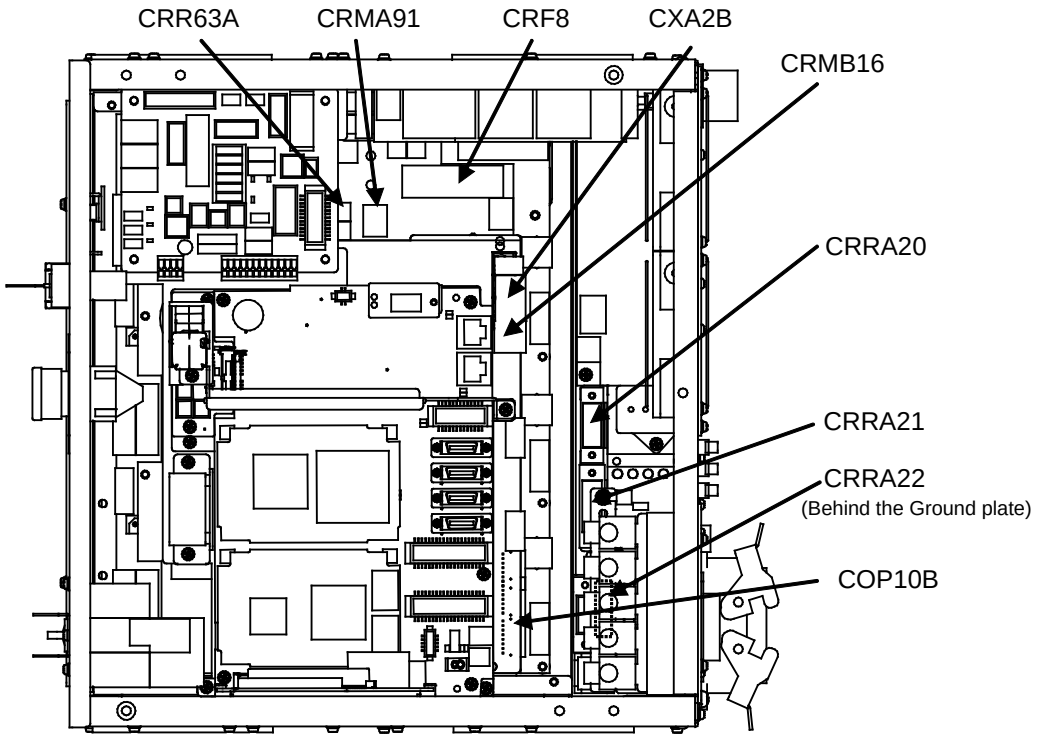


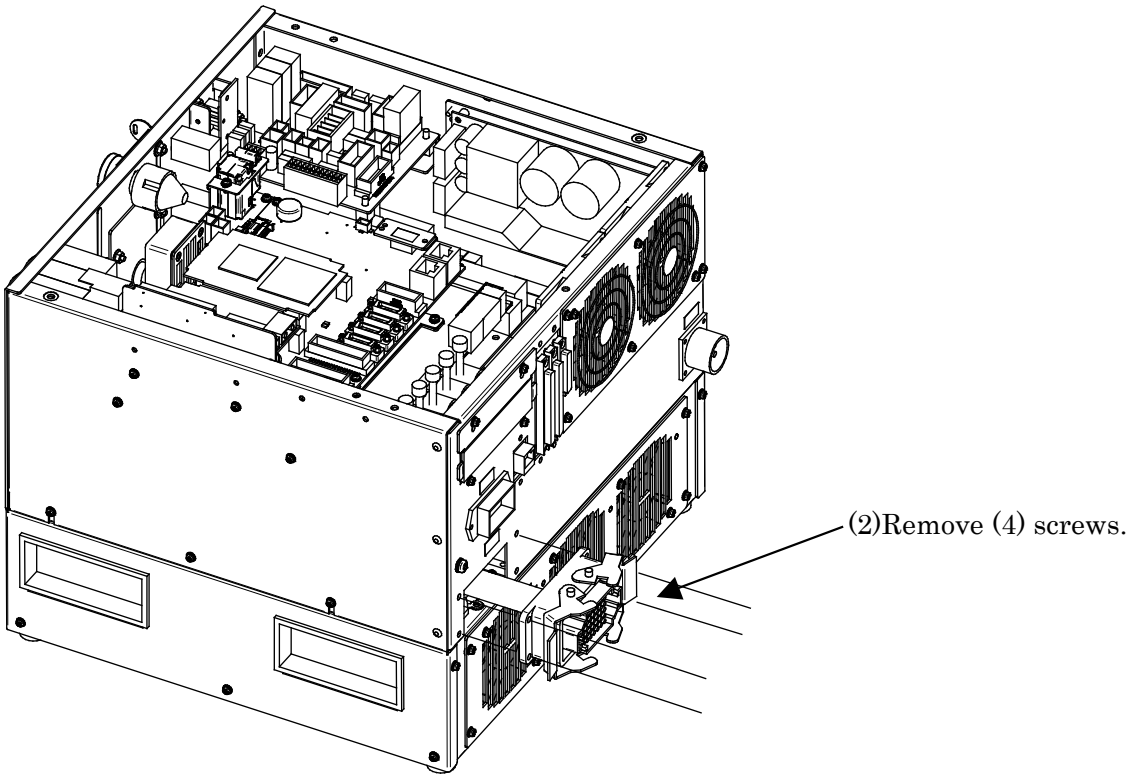
(2) Pull out RM1 connector and separate inner housing from outer frame. Push back the housing and its wirings into the cabinet.

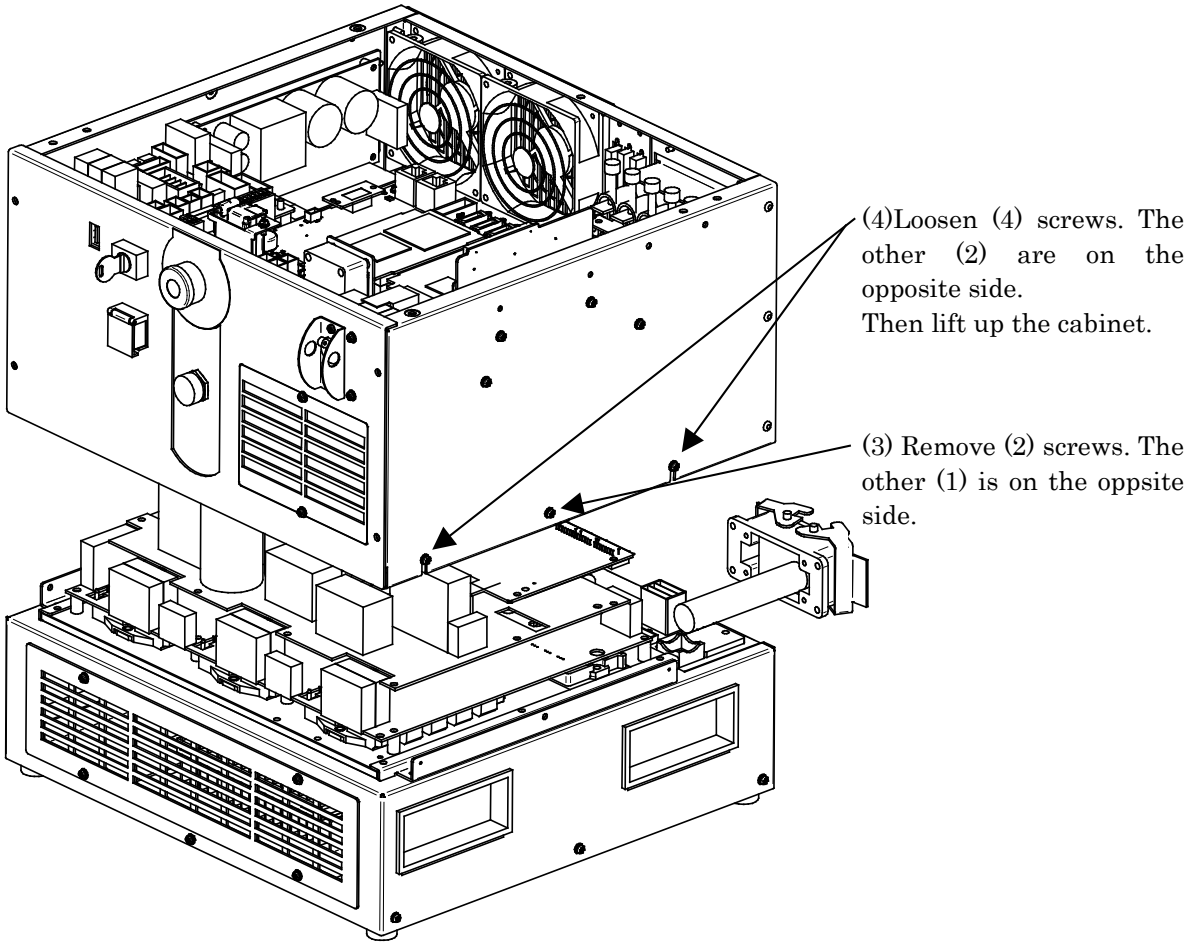


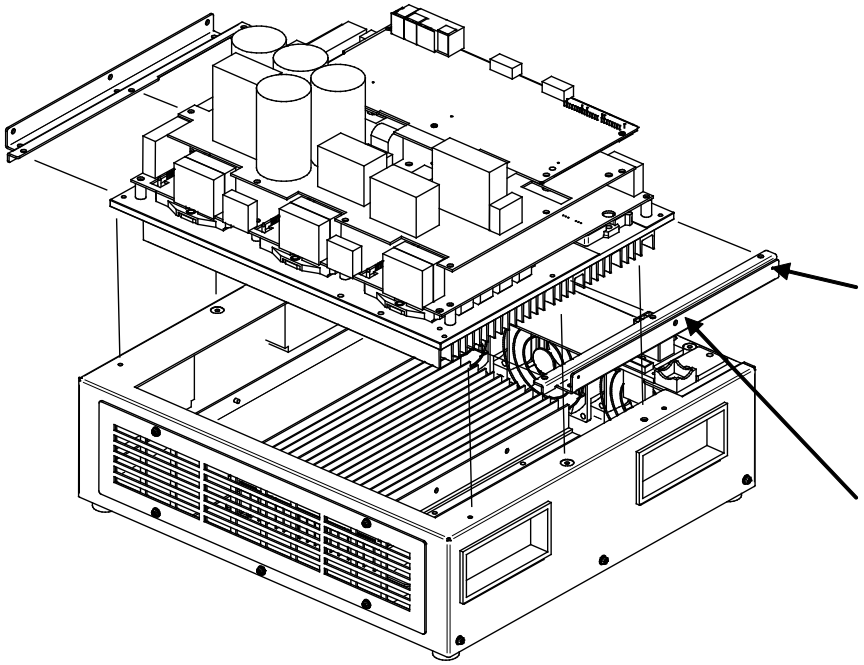
D.2.2 Remove 6-Axis Servo Amplifier (Large size)

(1)Disconnect all connectors shown below.
(Yellow nylon bands are attached to these cables.)




(2)Remove (4) screws.


(4)Loosen (4) screws. The other (2) are on the opposite side.
Then lift up the cabinet.
(3) Remove (2) screws. The other (1) is on the oppsite side.



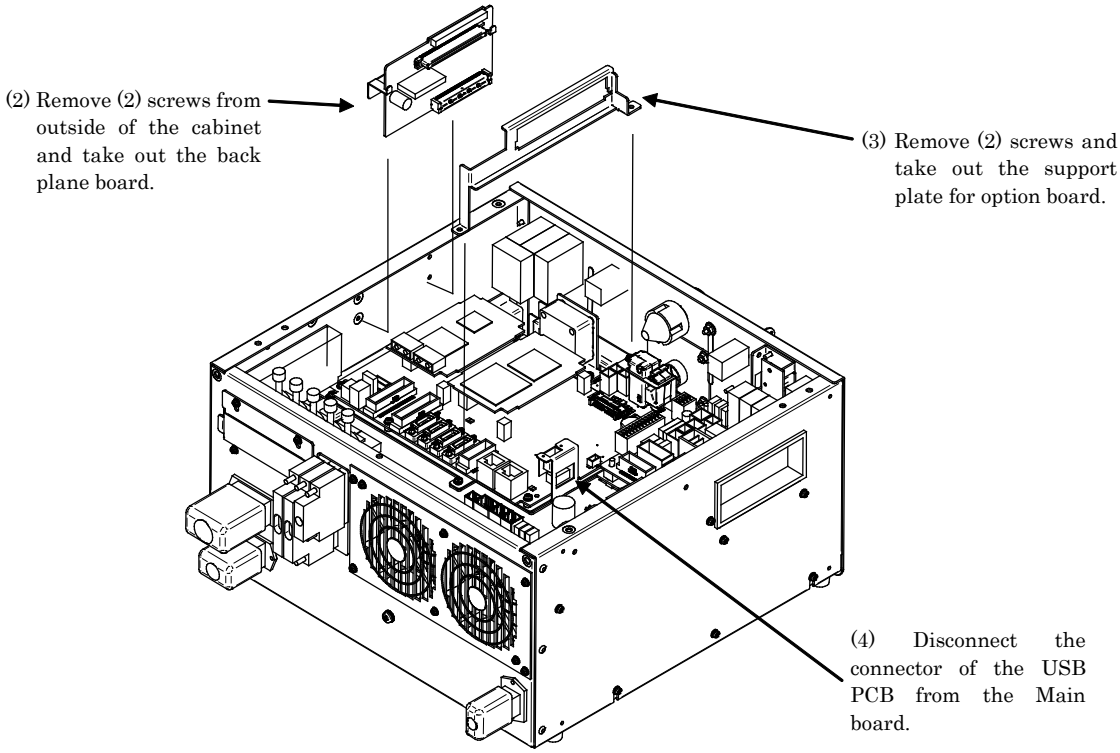
(5)Remove (6) screws. The other (3) are on the opposite side.
Then lift up the servo amplifier

(6) Remove the adapter plates at the both side of the amplifier.

(7) Remove RM1 cable from the servo amplifier.

D.2.3 Remove the Main Board and FAN Board

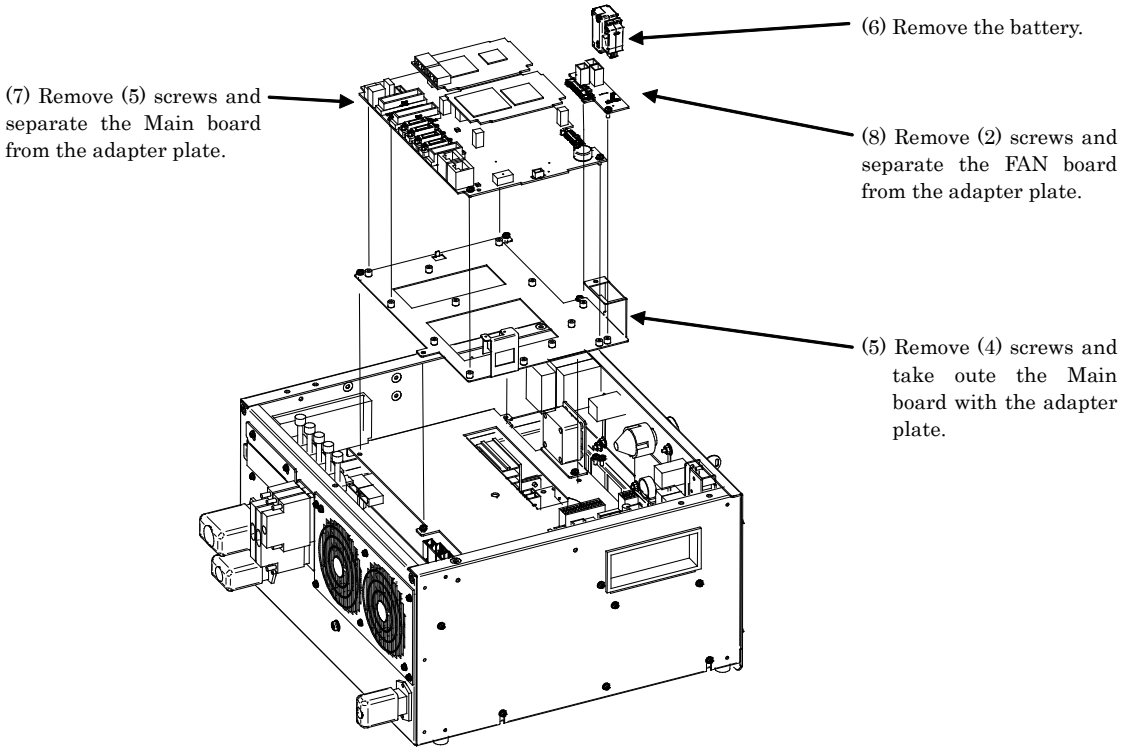
(1)Disconnect all cables connected to the Main board and FAN board.



(2) Remove (2) screws from outside of the cabinet and take out the back plane board.

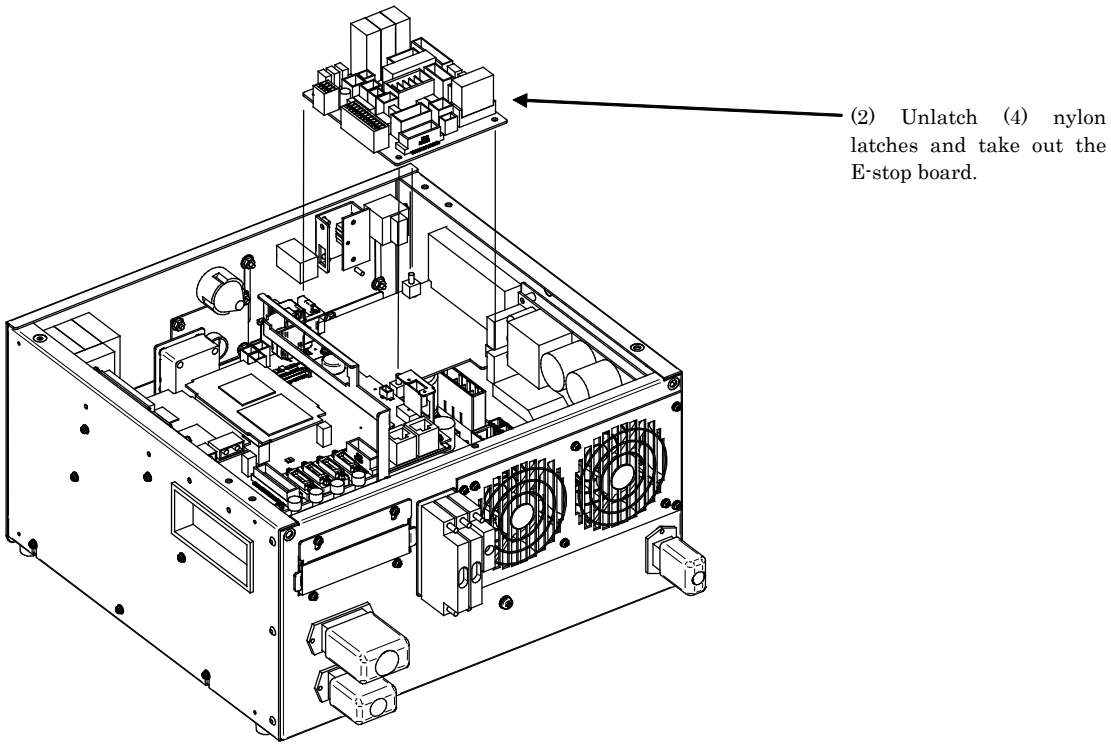
(3) Remove (2) screws and take out the support plate for option board.

(4) Disconnect the connector of the USB PCB from the Main board.



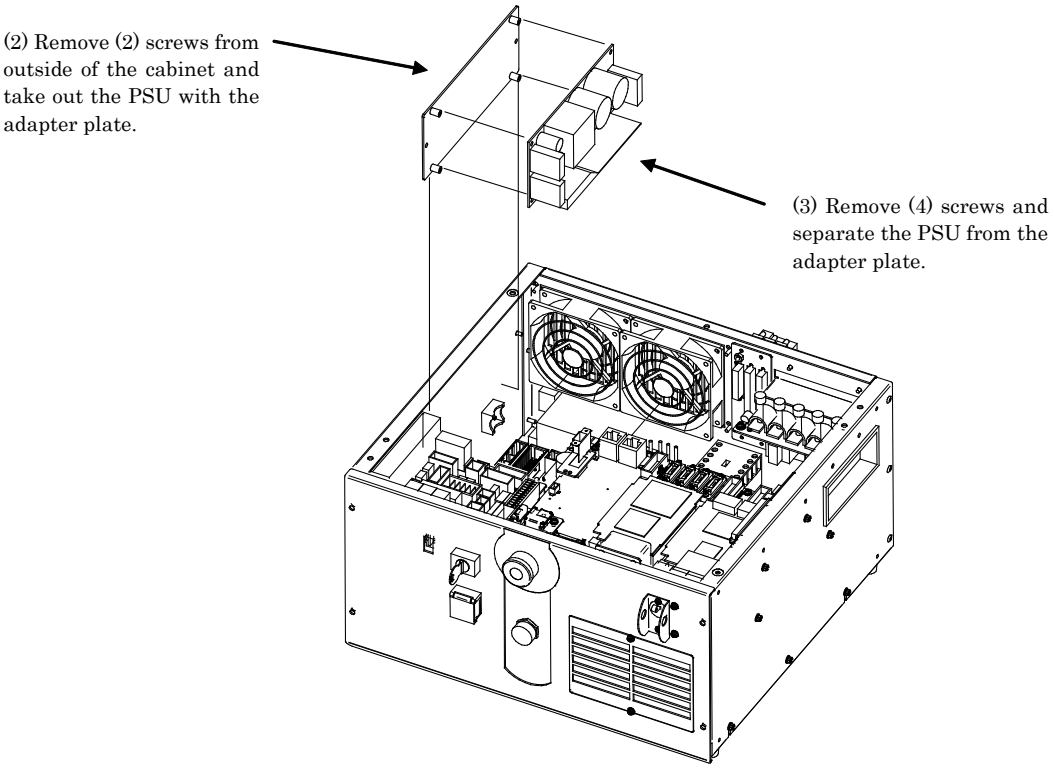
D.2.4 Remove the E-stop Board

(1)Disconnect all cables connected to the E-stop board.



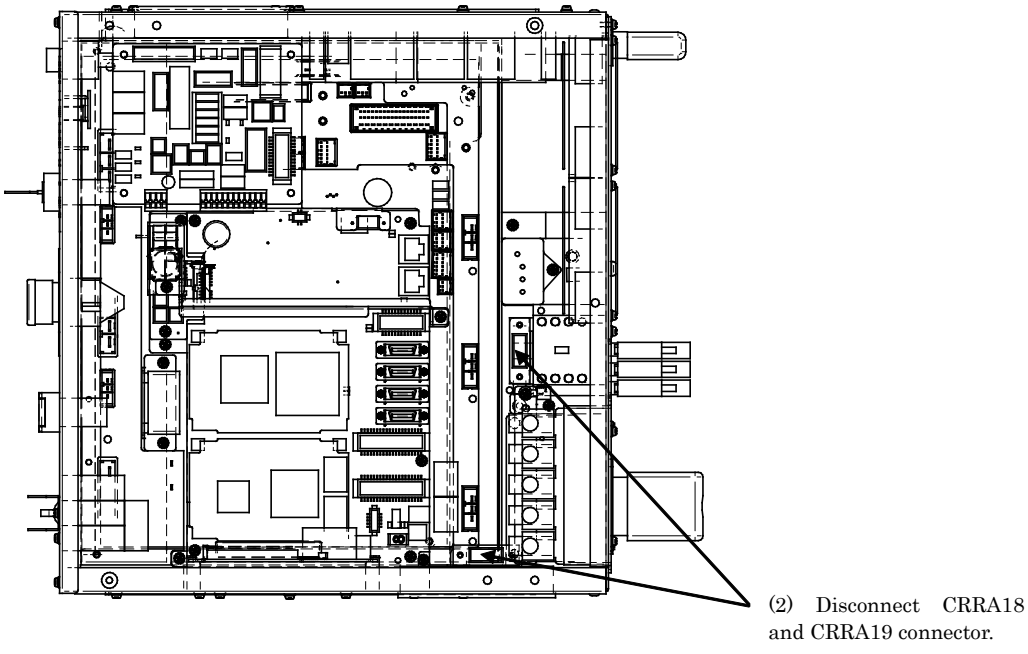
D.2.5 Remove the PSU

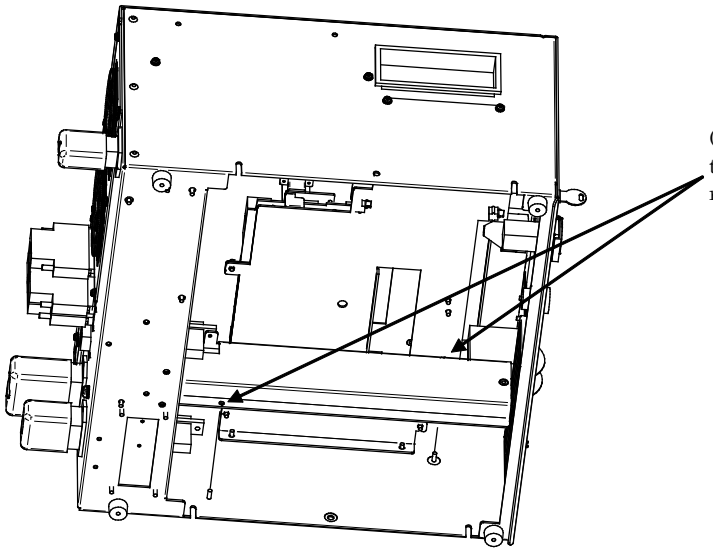
(1)Disconnect all cables connected to the PSU.



D.2.6 Remove the Discharge Resister (Small size)

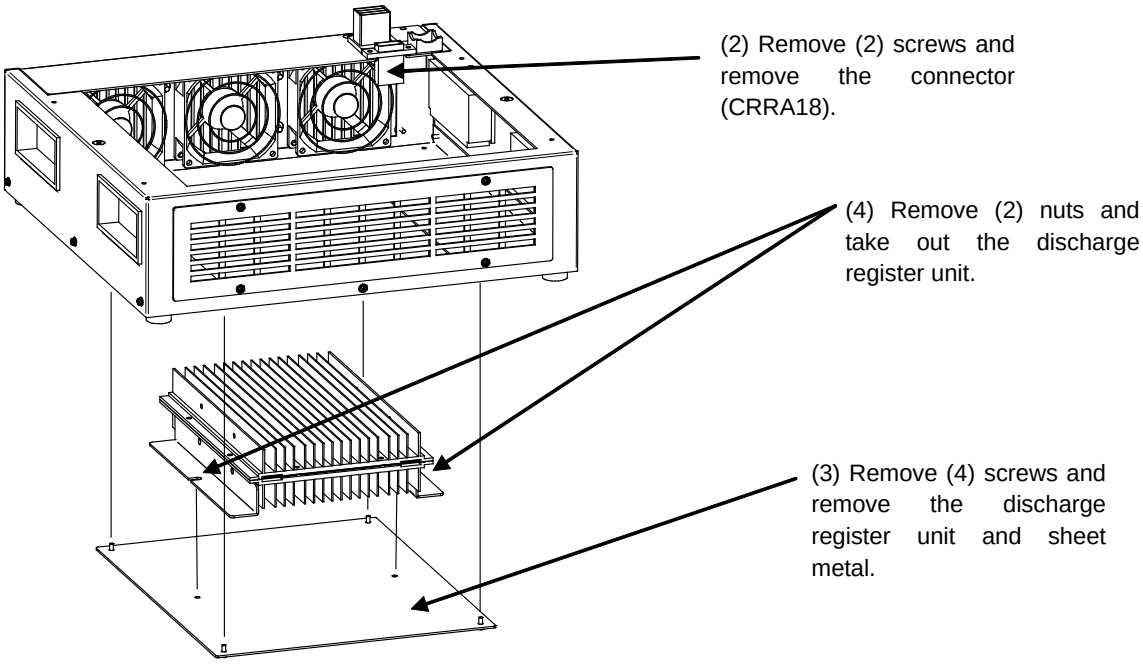
(1) Remove the servo amplifier as shown in C.2.1.





D.2.7 Remove the Discharge Resister (Large size)

(1) Remove the servo amplifier as shown in C.2.2.



E SPECIFICATION OF AMPLIFIER

Robot		M-2*i*A, M-3*i*A	LR Mate 200*i*D, ER-4*i*A, M-1*i*A, CR-4*i*A, CR-7*i*A, CR-14*i*A
Servo amplifier (Part number)		A06B-6400-H002	A06B-6400-H005 Note） Serial number:V136XXXXX and later is applicable for the open air type controller.
INPUT RATINGS	VOLTAGE	AC200~AC240V (+10% / -15%), 50/60Hz, 3phase	AC200~AC240V (+10% / -15%), 50/60Hz, 3/1phase
	POWER CAPACITY	5.1KVA	1.3/1.4 (3/1phase)
OUTPUT RATINGS	MAXIMUM OUTPUT	240V ~	
	CURRENT : J1	80Ap / 23.0Arms	20Ap / 3.6Arms
	CURRENT : J2	80Ap / 23.0Arms	20Ap / 3.6Arms
	CURRENT : J3	80Ap / 23.0Arms	20Ap / 3.6Arms
	CURRENT : J4	40Ap / 13.4Arms	20Ap / 3.6Arms
	CURRENT : J5	40Ap / 13.4Arms	10Ap / 2.0Arms
	CURRENT : J6	40Ap / 13.4Arms	10Ap / 2.0Arms
	TOTAL CURRENT	70Arms	18.4Arms

Robot		DR-3*i*B
Servo amplifier (Part number)		A06B-6400-H102
INPUT RATINGS	VOLTAGE	AC200~AC240V (+10% / -15%), 50/60Hz, 3phase
	POWER CAPACITY	5.1KVA
OUTPUT RATINGS	MAXIMUM OUTPUT	240V ~
	CURRENT : J1	80Ap / 23.0Arms
	CURRENT : J2	80Ap / 23.0Arms
	CURRENT : J3	80Ap / 23.0Arms
	CURRENT : J4	40Ap / 13.4Arms
	CURRENT : J5	40Ap / 13.4Arms
	CURRENT : J6	40Ap / 13.4Arms
	TOTAL CURRENT	70Arms

F BRAKE RELEASE UNIT

F.1 SAFETY PRECAUTIONS

⚠WARNING

- Support the robot arm by mechanical means to prevent it from falling down or rising up when brake is released. Before using the brake release unit, read the Operator's manual of the robot that tries to release the brake.
- Confirm that the robot is fixed tightly to the floor to prevent the falling down and unexpected movement of robot.
- Confirm that the outlet with earth is used for the power supply of brake release unit and earth of brake release unit is surely connected to earth of power supply. There is danger of getting an electric shock if earth is not connected.

F.2 CONFIRMATIONS BEFORE OPERATION

Confirm the followings before operation.

(1) Confirm the exterior of the brake release unit and the power cable. Do not use it when there are damages in the unit and the cable.
(2) Confirm that the power supply of the robot controller is disconnected.
(3) There are Two types of brake release units according to the input voltage as shown in Table F.2(a).Confirm the input voltage of the unit to refer to the input voltage label put to the unit (Fig. F.5(a)).
(4) Confirm that the voltage of power supply before connecting the power supply to the brake release unit. There is possibility to give the damaging to the brake or the brake release unit when the incorrect power supply is connected to the unit.

Table F.2 (a) Specification of Brake release unit

Brake release unit	Remarks
Brake release unit (AC 100V)	Input voltage AC100-115V, single phase
Brake release unit (AC 200V)	Input voltage AC200-240V, single phase

(5) The brake release unit connection cable is different in each robot. Confirm the cable specification corresponding to the robot referring to Table F.2 (b).

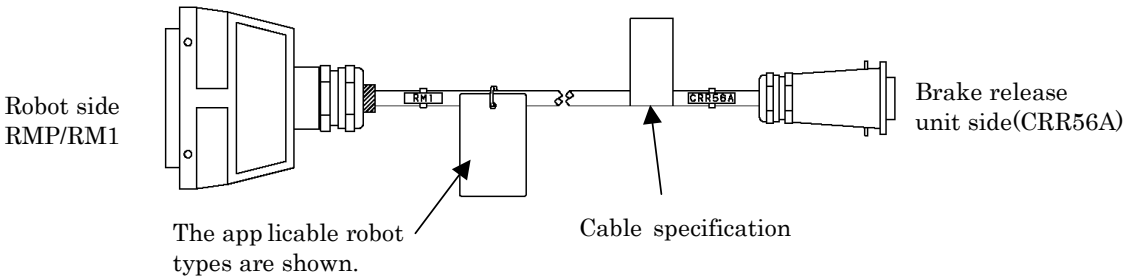


Fig. F.2 (a) Brake release unit connection cable

Table F.2 (b) Specification of brake release unit connection cable

Applicable robot types	Specification of cable
LR Mate 200*i*D, CR-4 *i*A, CR-7 *i*A, CR-14*i*A, ER-4*i*A	A660-2006-T881
M-1*i*A	A660-2006-T474
M-2*i*A, M-3*i*A, DR-3*i*B	A660-2005-T559

F.3 OPERATION

Operate the brake release unit according to the following procedures.

(1) Support the robot arm by mechanical means to prevent it from falling down or rising up when brake is released. Refer to the Operator's manual for each robot.
(2) Connect the Brake Release Unit connection cable to Brake Release Unit.
(3) Disconnect the RMP connector from Robot, and connect the Brake Release Unit connection cable to the Robot. Keep the connection of Robot connection cable except RMP cable.
(4) Connect the power cable of Brake release unit to power supply.
(5) Press and hold the enabling device (deadman switch) in the middle position.
(6) Press the brake switch '1'..'6' according to the axis that tries to release the brake, then brake will be released. (Refer to Table F.3 (a))

⚠CAUTION
Do not release two axes or more at the same time.

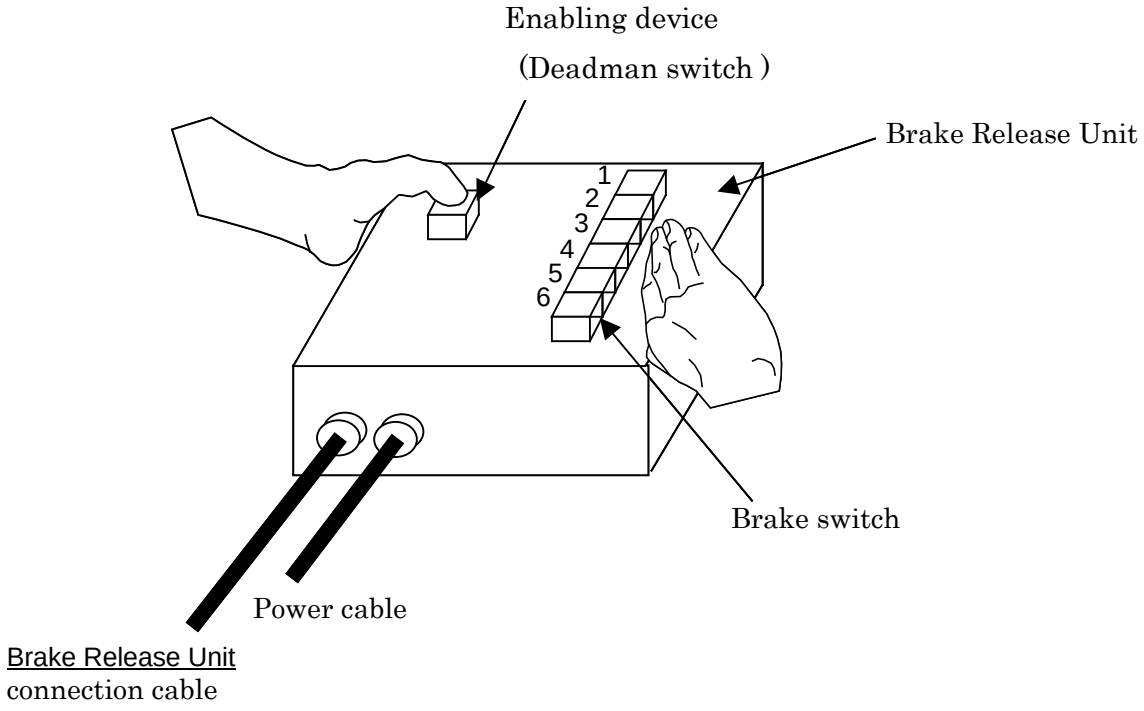


Fig. F.3 (a) Brake Release Unit

Table F.3 (a) The relation between brake switch and robot axis

	Brake switch					
	1	2	3	4	5	6
LR Mate 200*i*D(6 axes), M-1*i*A (6 axes) M-2*i*A (6 axes), M-3*i*A (6 axes), ER-4*i*A (6 axes) CR-4*i*A (6 axes), CR-7*i*A (6 axes), CR-14*i*A (6 axes),	J1	J2	J3	J4	J5	J6
M-1*i*A (4 axes), M-2*i*A (4 axes), M-3*i*A (4 axes)	J1	J2	J3	J4	-	-
DR-3*i*B (3 axes)	J1	J2	J3	-	-	-

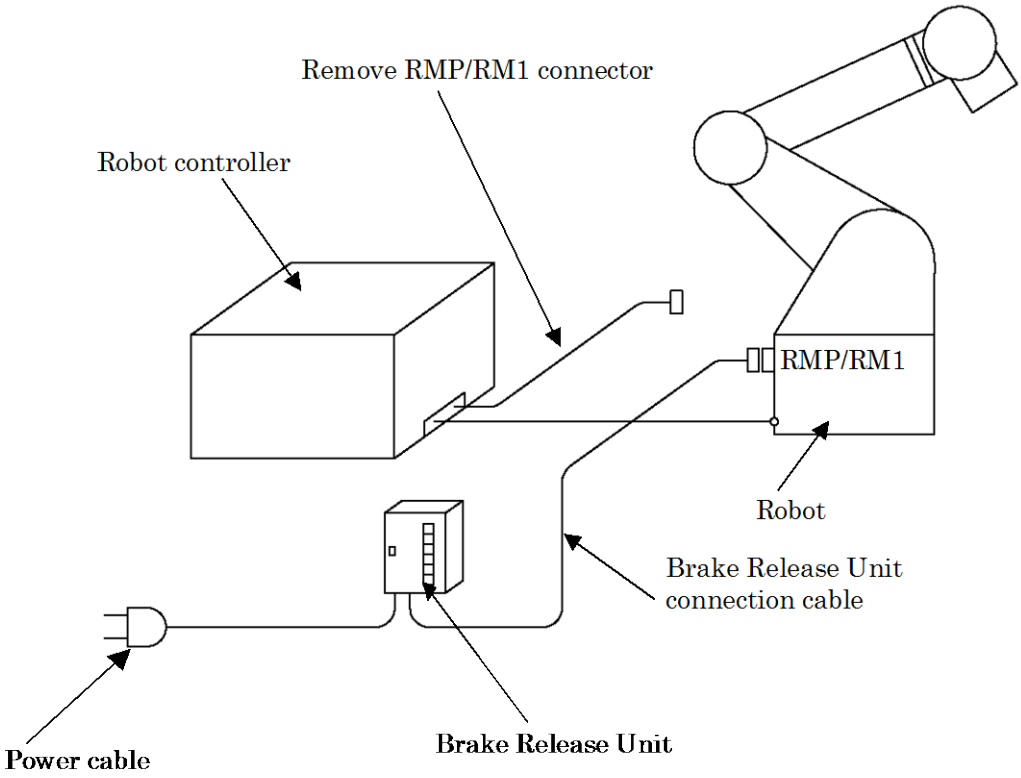
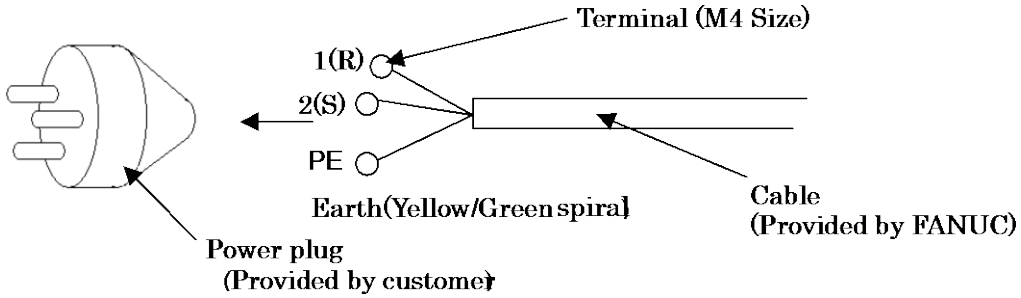


Fig. F.3 (b) How to connect Brake Release Unit

F.4 HOW TO CONNECT THE PLUG TO THE POWER CABLE (IN CASE OF NO POWER PLUG)

Connect the plug to the power cable as follows. This plug is provided by customer.



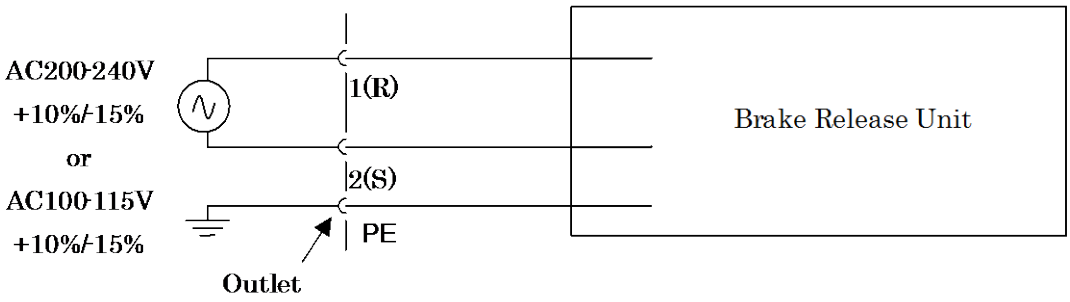


Fig. F.4 (a) How to connect the plug to the power cable

⚠WARNING
- Only a specialist having the relevant expertise knowledge is permitted to connect the plug to the power cable.
- In the EU area, only plug complying with the relevant European product standard can be used.
- Do not install the plugs without protective earth pin.

F.5 DIMENSION

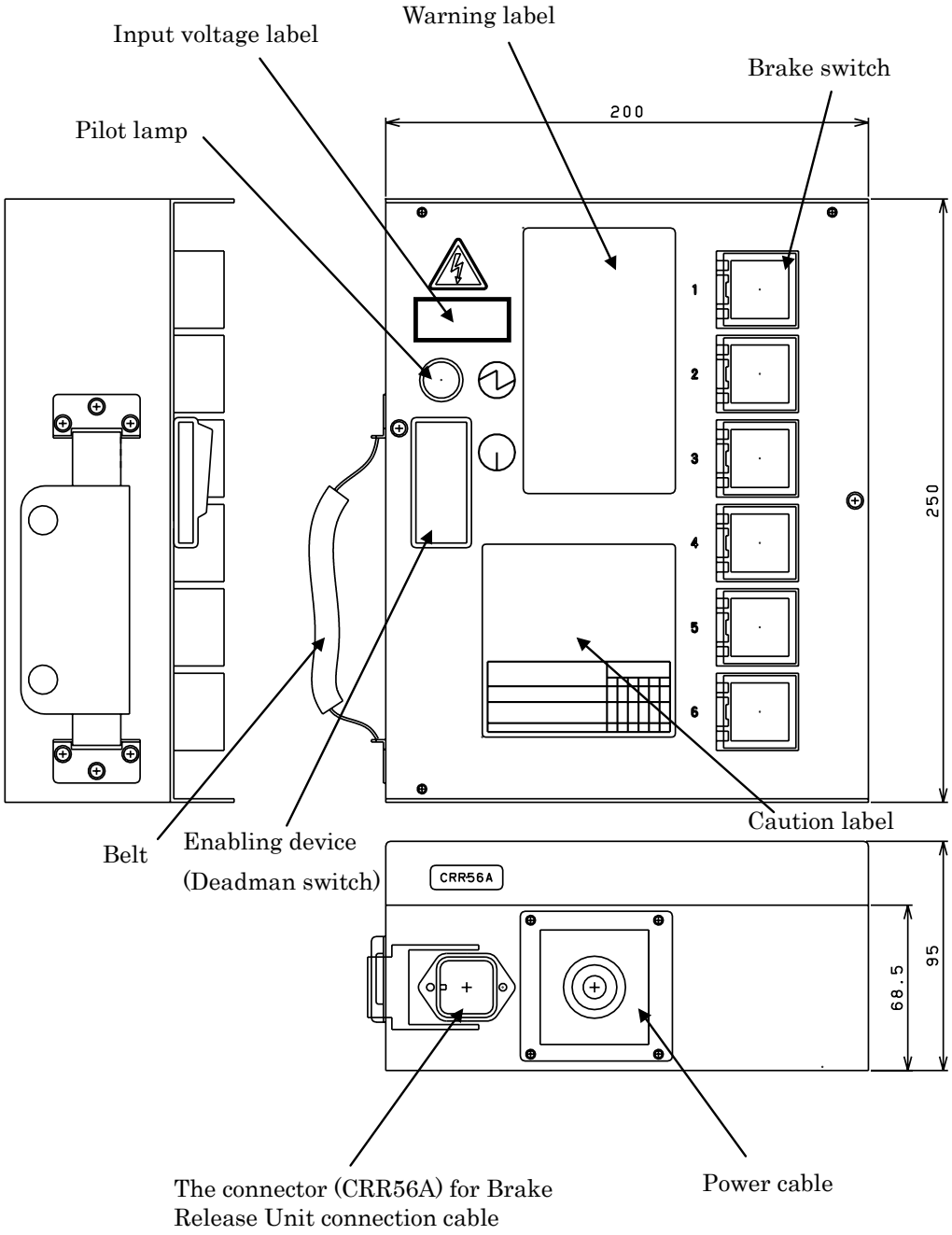


Fig. F.5 (a) Dimension of Brake Release Unit (Front view)

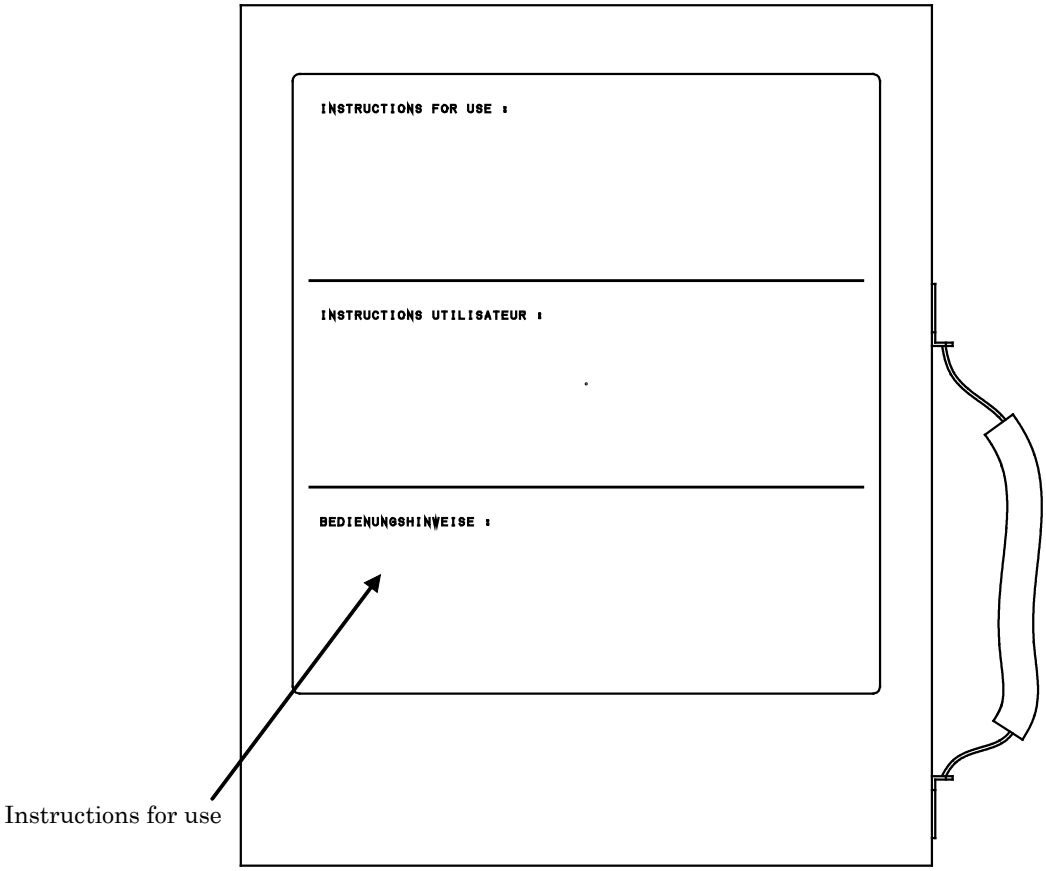


Fig. F.5 (b) Dimension of Brake Release Unit(Rear view)

F.6 FUSE

The fuses are mounted inside this unit. Please check the fuse when the pilot lamp doesn't light even if enabling device (deadman switch) is pressed. When the fuse is blown, exchange the fuse after finding the root cause of failure, and taking the appropriate countermeasures.

Manufacturer : Daito Communication Co.
Specification : P420H (FANUC Spec. : A60L-0001-0101#P420H)
Rating : 2A

⚠WARNING
When the fuse is replaced, the power cable of brake release unit must be disconnected.

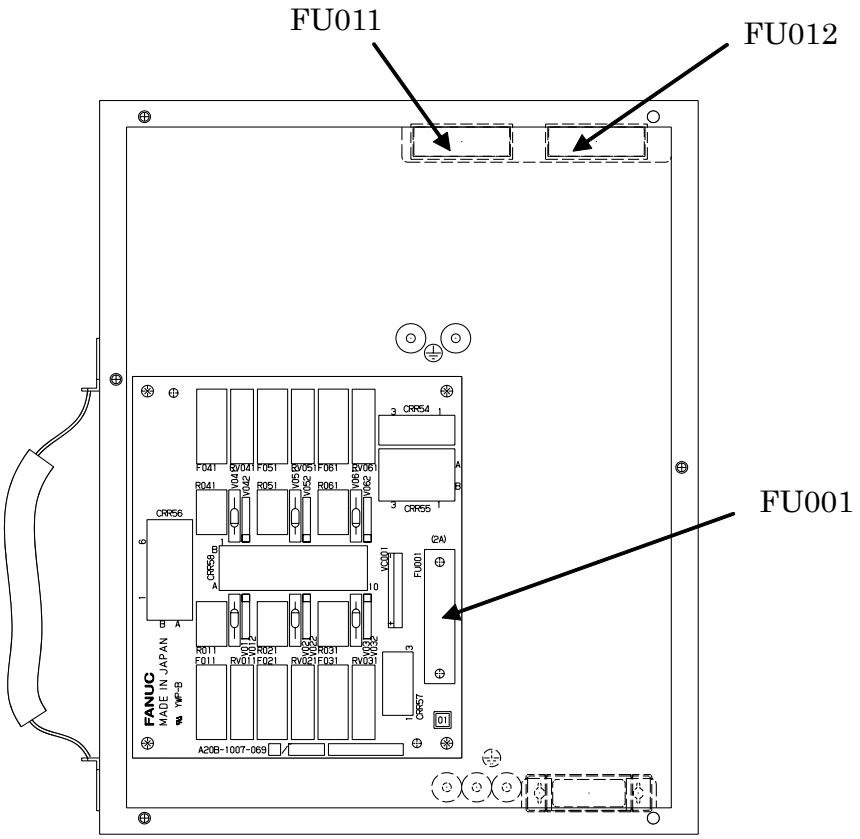


Fig. F.6 (a) The location of fuses

F.7 SPECIFICATIONS

(a) Input power supply

AC100-115V, 50/60Hz±1Hz, single phase, +10%/-15%, 1A
AC200-240V, 50/60Hz±1Hz, single phase, +10%/-15%, 1A

(b) Weight

Brake Release Unit (AC 100V) ; 2.3 kg
Brake Release Unit (AC 200V) ; 3.5 kg

G TEACH PENDANT DISCONNECT FUNCTION (OPTION)

This appendix shows an instruction for Teach pendant disconnect function (Option).

G.1 CONFIGURATION

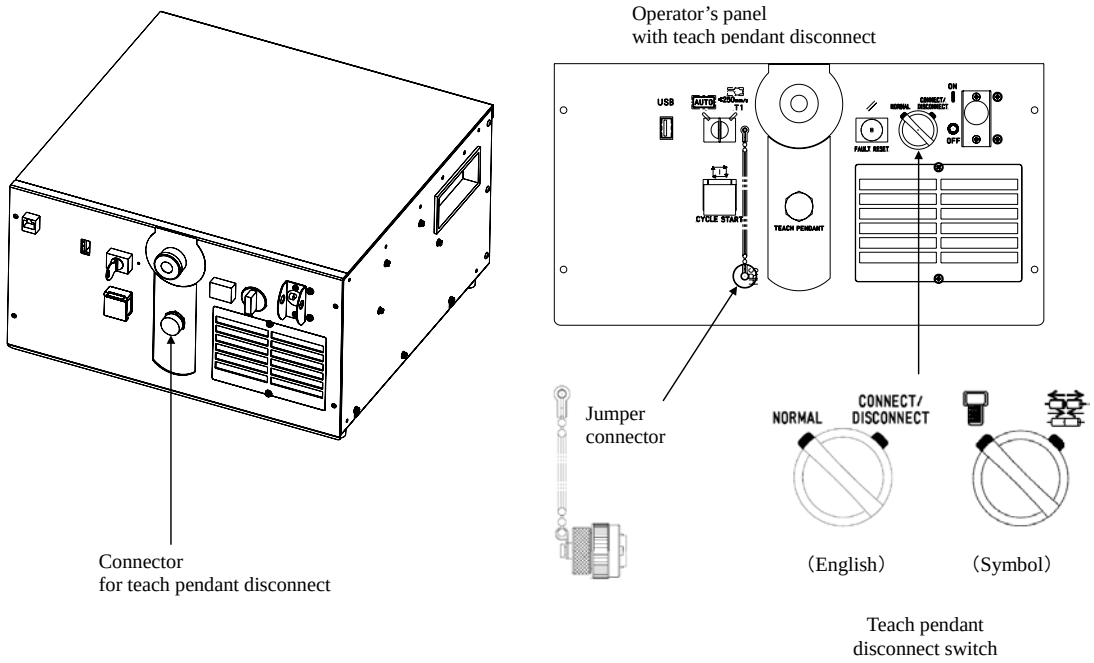


Fig. G.1 (a) Teach pendant disconnect function

G.2 PROCEDURE OF TEACH PENDANT DISCONNECT

G.2.1 Teach Pendant Disconnect

(1) Set AUTO mode.
(2) Turn the disconnect switch to "Connect/Disconnect" position. (Robot stops because Operator's panel E-stop Alarm occurs and Power LED of the teach pendant is OFF.)
(3) Disconnect the teach pendant cable.
(4) Connect the jumper connector.
(5) Turn the disconnect switch to "Normal" position.
(6) Administrator should store the teach pendant and the teach pendant cable in the storage in order to avoid incorrect operation.

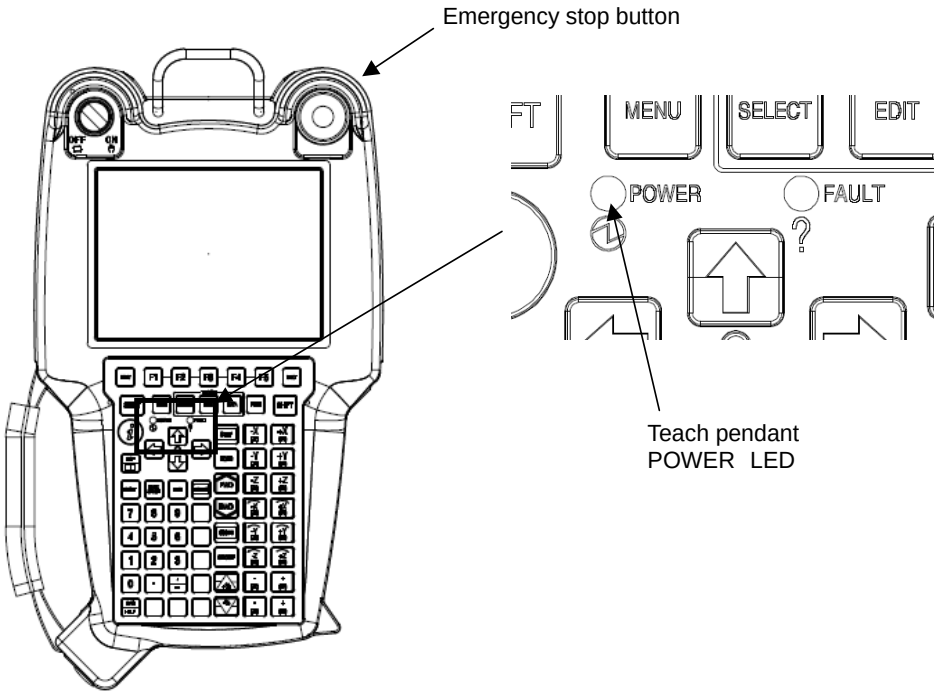
G.2.2 Teach Pendant Connect

(1) Set AUTO mode.
(2) Turn the disconnect switch to “Connect/Disconnect” position. (Robot stops because Operator’s panel E-stop Alarm occurs.)
(3) Disconnect the jumper connector.
(4) Connect the teach pendant cable with the teach pendant.
(5) Turn the disconnect switch to “Normal” position.

⚠WARNING

When the LED (POWER) on the teach pendant turned on, this teach pendant is connected to the robot controller and emergency stop button of the teach pendant is active.

When the LED (POWER) on the teach pendant turned off, This teach pendant is not connected to robot controller and emergency stop button of the teach pendant is not active.

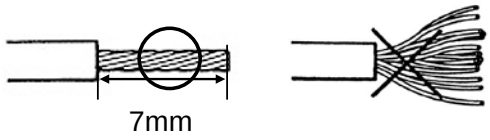


H INSTRUCTION FOR TERMINAL BLOCK

This appendix shows an instruction for external on/off and external emergency stop signal input/output terminal block.

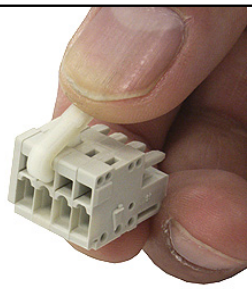
Stripping of Wire

Available wire size AWG 28 -14 (0.08 - 1.5mm^2)



- Please check a strip length carefully.
- Please readjust a loose end.

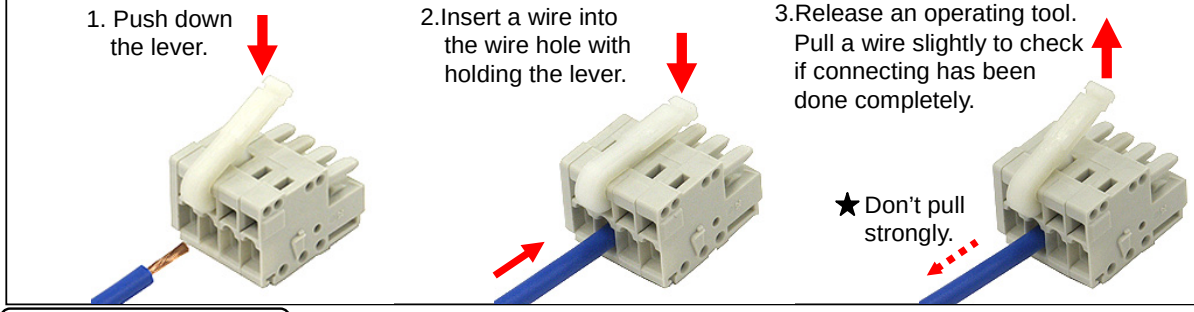
Handling of the lever



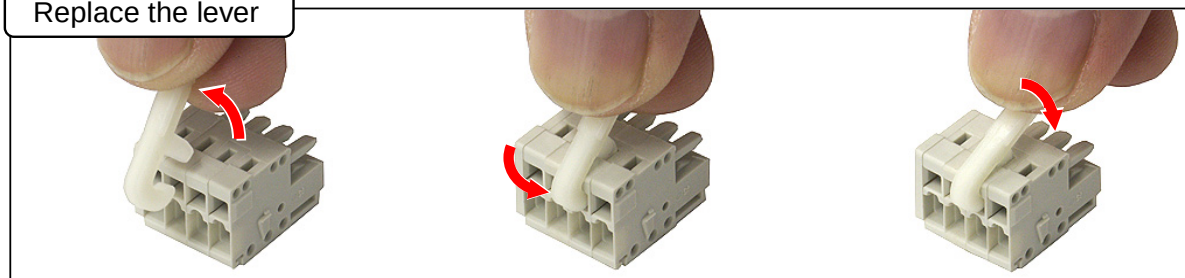
- Hold the connector, and push down the lever by finger.
- Don't handle the lever after fit the connector into PCB, otherwise PCB will be damaged by handling stress.

Operating Lever
Item No. **734-230**

Wiring



Replace the lever



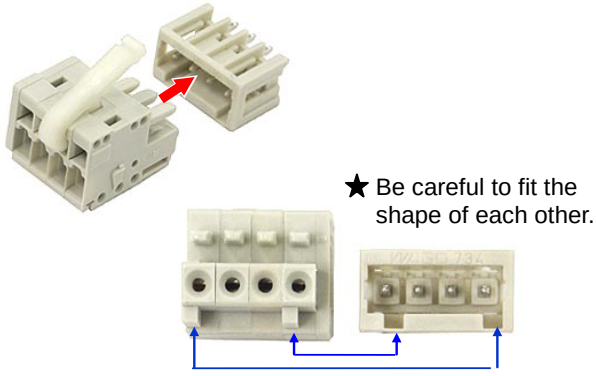
1.Pull of the lever.

2.Hook the lever to the rectangle hole.

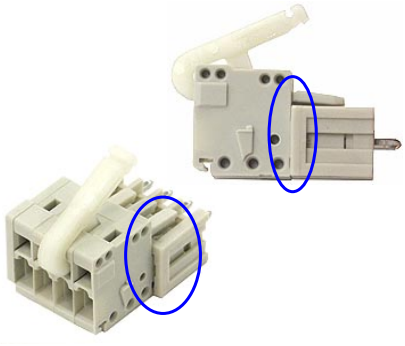
3.Push down the lever until click in.

Fit to header

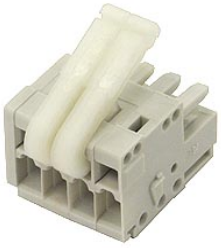
1.Push in the connector to the header.



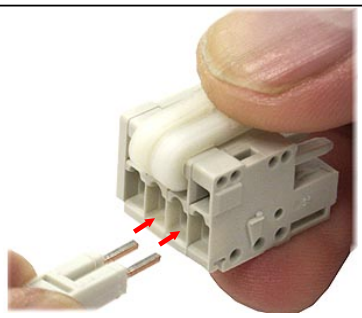
2.Please check if the latch is hooked to header.



Installation of Jumper



1. Attach two levers to the connector.

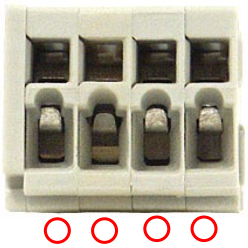


2.Hold down levers at the same time, then put the jumper into the connector.

★ Please confirm that the jumper is fully inserted.

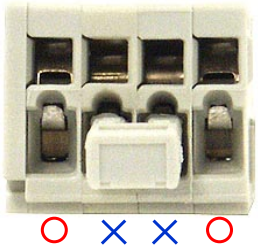
Availability of wires

Without jumpers



Max wire size 1.0mm^2 (AWG18) (with Ferrule)

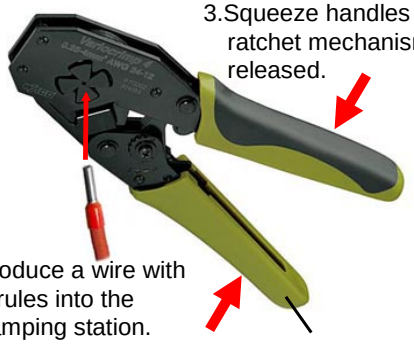
With jumpers



The wire cannot connect, when attached the jumper.

Installation of Ferrules

1.Put a wire through the hole of ferrules.

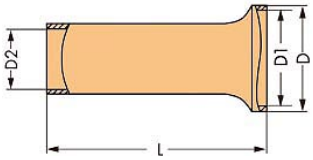


3.Squeeze handles until ratchet mechanism is released.

2.Introduce a wire with ferrules into the cramping station.

4.Please check if the wire crimped correctly.

Specifications of Ferrules



WAGO Item No.	Sleeve for mm^2 (AWG)	Color	Stripped length(mm)	L (mm)	L1	D	D1	D2
216-301	0.25 (24)	Yellow	9.5	12.5	8.0	2.5	2.0	0.8
216-302	0.34 (24)	Turquoise	9.5	12.5	8.0	2.5	2.0	0.8
216-201	0.5 (22)	White	9.5	13.5	8.0	3.0	2.5	1.1
216-202	0.75 (20)	Gray	10.0	14.0	8.0	3.3	2.8	1.3
216-203	1.0 (18)	Red	10.0	14.5	8.0	3.6	3.0	1.5

Pack-unit 100

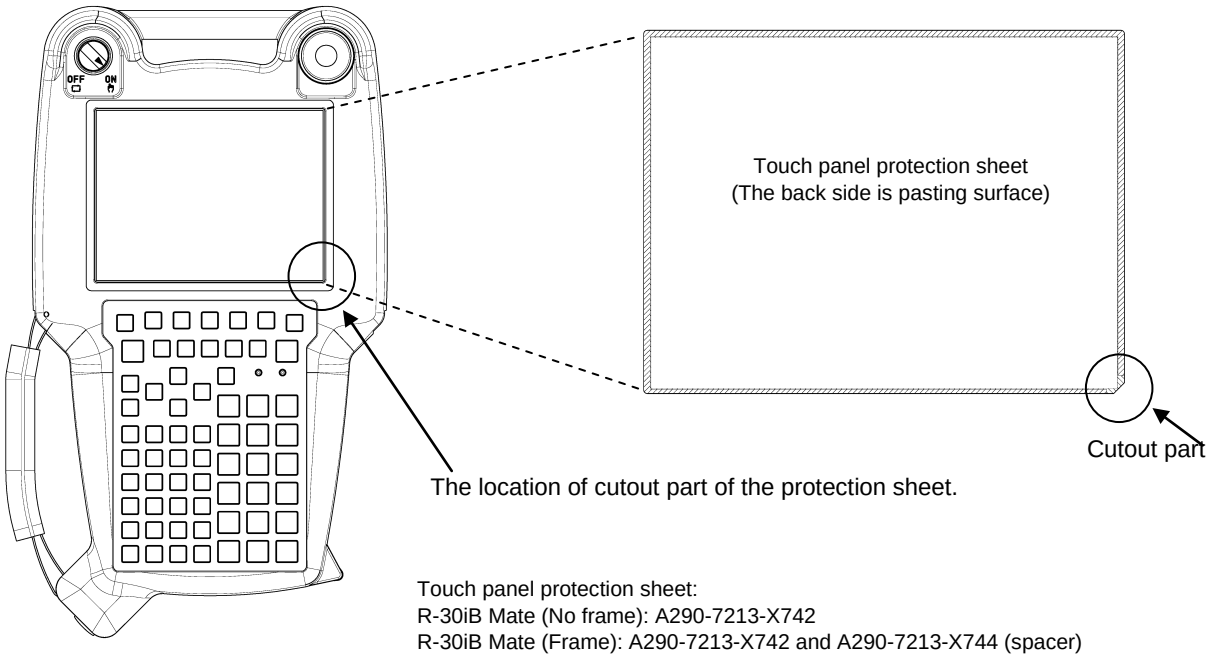
★ **CAUTION!** Please make sure to use WAGO 206-204 to crimp the ferrules.

REPLACING THE PROTECTION SHEET

This appendix shows an instruction for replacing the protection sheet of the *i*Pendant with touch panel.

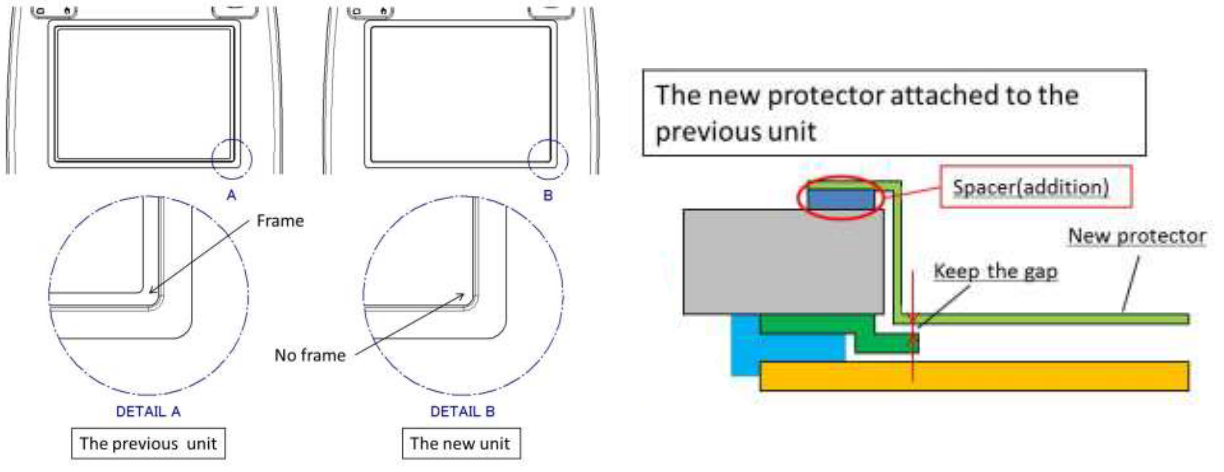
Replacement procedure

1 Remove old protect sheet.
2 Peel clear sheets pasted on one side of the new protect sheet.
3 Paste the protect sheet so that the cutout part is placed on the lower right portion.



Touch panel protection sheet:
R-30iB Mate (No frame): A290-7213-X742
R-30iB Mate (Frame): A290-7213-X742 and A290-7213-X744 (spacer)
R-30iB Mate Plus: A290-7213-X784

<In case of R-30iB>



J FLEX CABLE CONDITION

J.1 MINIMUM BEND RADIUS OF CABLE

The minimum bend radius of Flex Cable is 200(mm).

J.2 FLEX CABLE

Flex cable must be used with cable carrier for moving part. The problem such as shortening of the longevity of Cable if Cable carrier is not used occurs.

J.3 CABLE CARRIER

Cable carrier

① The radius (R) of cable carrier should be more than 200mm.
② The cable should be Non-Flex to cable carrier by using the clamp. (e.g. Rubber packing)
③ The size of hole to support cable inside cable carrier should be more than 110% of cable size and should have more than 3mm gap.
④ The cable should be mounted inside cable carrier without twisting.

J.4 CABLE DURABILITY TEST

The result of cable durability test (U form bending test) is indicated as follows.

1 Tighten the two places of the cable as shown in Fig.J.4(a) and make sure there is no movement between wire cores and between wire core and shield. Repeat the parallel movement of cable in the left/right direction.
2 Count the times of parallel movement (one round trip as one time).
3 Connect all wires and shield in series, and measure the resistance of wire and shield.
If resistance of wire and shield is 20% larger than initial resistance, the test is regarded as failure.

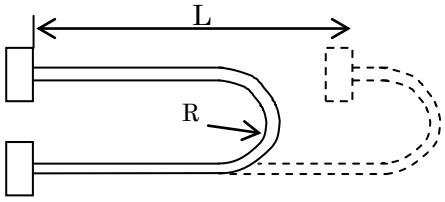


Fig J.4 (a) Cable durability test

J.5 EXPERIMENTAL RESULT

Experimental results are as follows.

Table J.5 (a) Experimental results

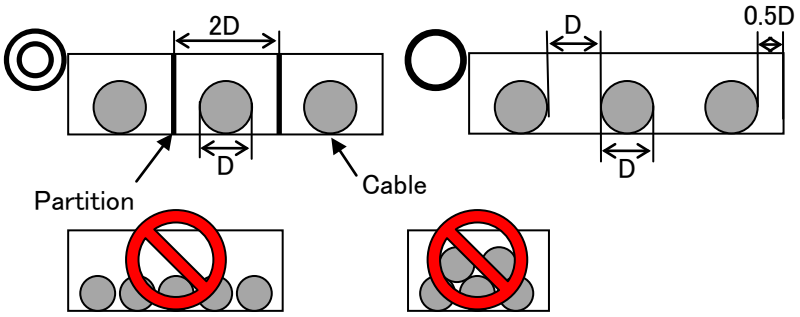
Material No.	Point	Result after 500,000 times	
		Resistance up (%)	Sample dismantlement result
No.1	Wire	0	There is no disconnection
	Shield	0	
No.2	Wire	0	There is no disconnection

J.6 WRING IN THE CABLE CARRIER

NOTE:
- If the precautions described in this section are not fulfilled, meandering or disconnection of cable may occur.
- Confirm the usage and notifications of cable carrier.
- If cutting fluid(oil) or chips are possible to adhered to the cable, use the fully enclosed cable carrier.
- Confirm that the cable is installed without twisting after installation and operation.

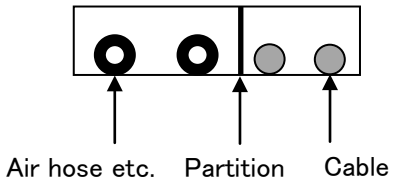
1. Partition of cable carrier

Separate each cable by a partition in the cable carrier.
Do not cross the cable or overlap each other.
Select the cable carrier which has enough space and keep cable occupancy to 30% or less. If partition is used, keep the interval 2D or more. And if partition is not used, keep the clearance of each cables D or more. (D is the diameter of cable).

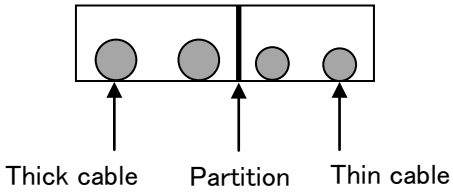


NOTE: In case of below, use the partition.

- In case of mixing with the air hose etc.
  Be sure to separate the cable and the air hose etc. with the partition when the oil pressure and air hose etc. is wired to the cable carrier.



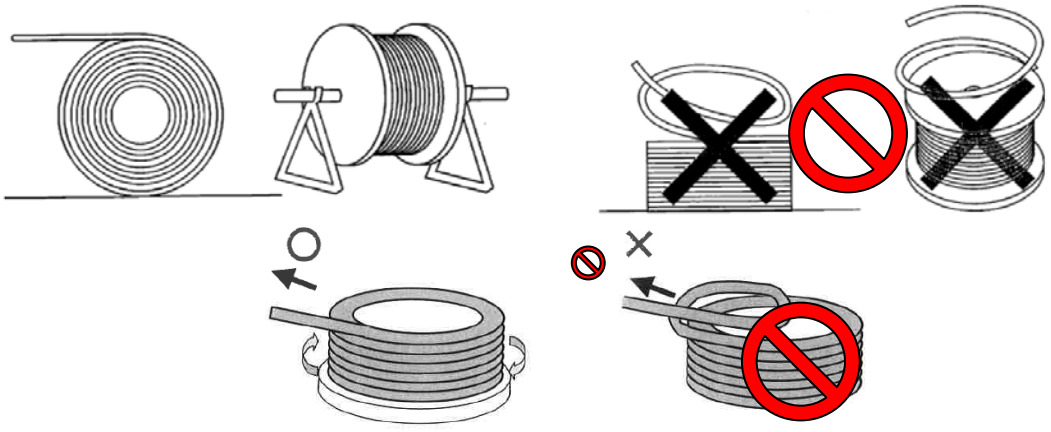
- In case of mixing with the cable of much different thickness
  Since the thick cable affect the thin cable, the thin cable may be occurred the issue.
  Be sure to separate the thin cable and the thick cable with the partition when the cable of much different thickness is wired to the cable carrier.



2. Install procedure of cable to the cable carrier

① Extract the cable with the turntable etc. Confirm that the cable is not twisted and put straight without twisting.

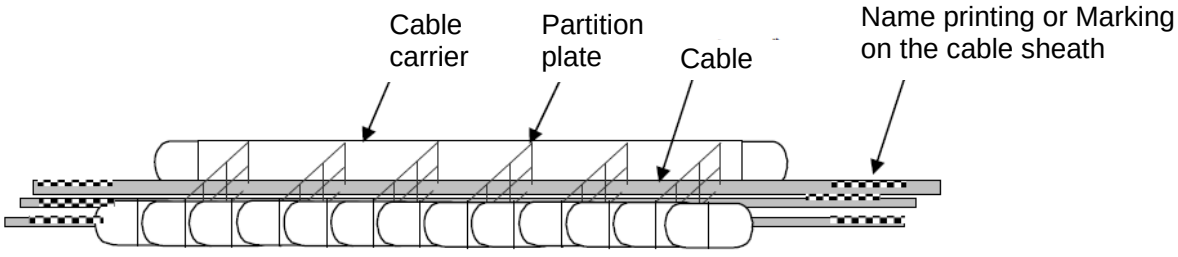
NOTE:
Extracting the cable with the turntable etc. as below drawing can avoid twisting of cable.
Extracting straight the cable without the turntable etc. cause meandering or decreasing the bending characteristics because twisting remain in the cable.



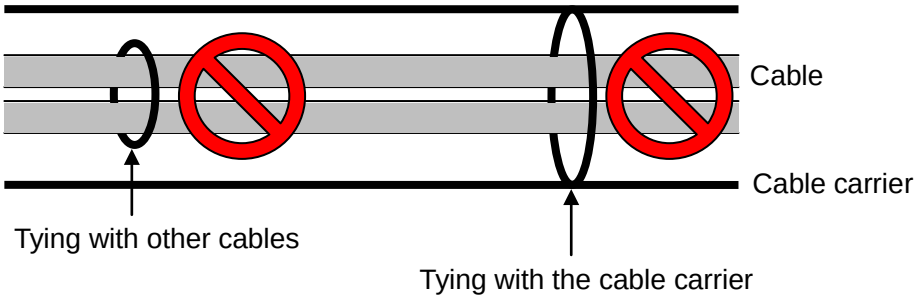
Correct extraction method wrong extraction method

② Install the cable into the cable carrier without twisting.

③ Install the cable according to name printing or marking on the cable sheath, and confirm that the cable is installed without twisting after installation and operation.



NOTE: Do not tie with other cables in the cable carrier.

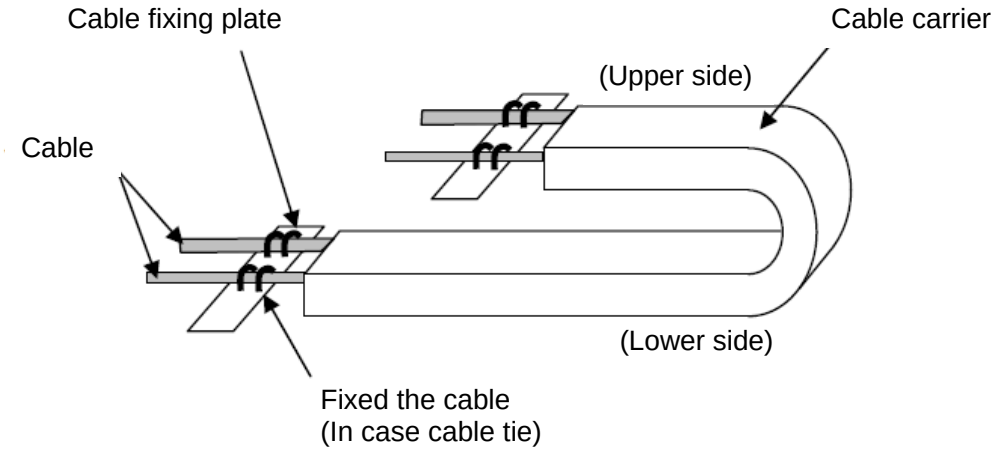


3. Fixing the cable

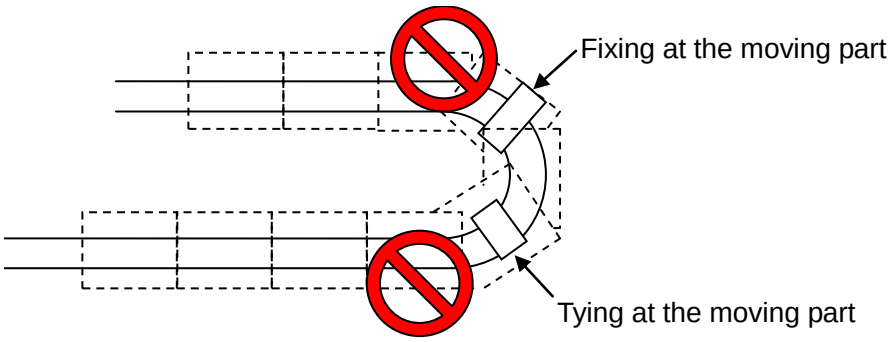
After installing the cable to cable carrier, fix the cable by the following procedure.

① Fixing the cable at the upper side

Fix the cable individually at the upper termination side as below drawing.
Do not fix the cable at moving part.
If cable tie is used to fix the cable, recommend to use two set of cable tie.

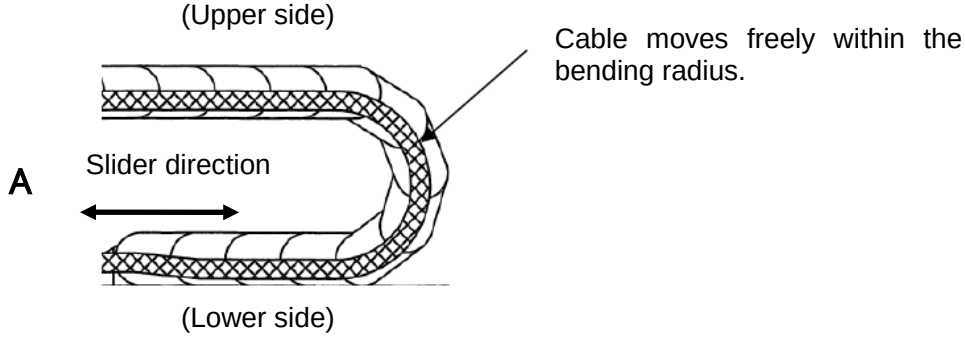


If the cable is fixed at the moving part of cable carrier, the cable life is decreased by stress to the cable.

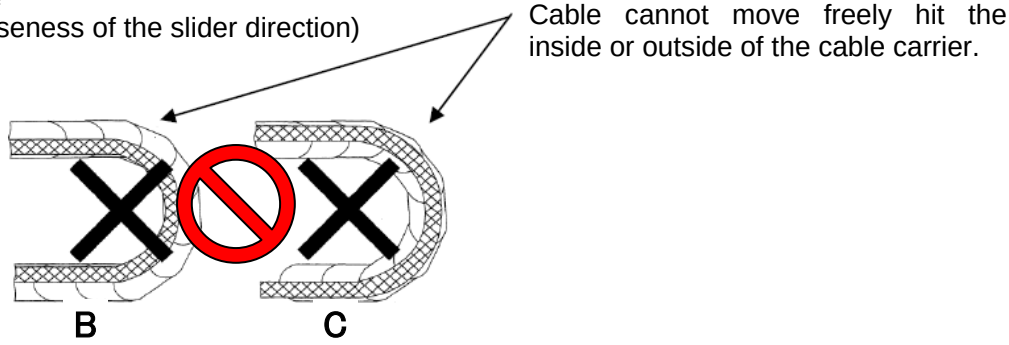


② Adjusting the cable length
Adjust that the cable is installed with some looseness of the slider direction.
The cable should not contact to the inner surface of the cable carrier at the moving part tightly (Below drawing A).
It becomes easier to adjust to the state of the below drawing A by the adjusting the position of the lower side cable and the adjusting the position of the cable to the middle of the below drawing B and C.
If the cable is too short as the below drawing B or too long as the below drawing C, the cable sheath is damaged because the cable is rubbed the cable carrier and the cable is contacted with the other cables.

Good example (with looseness of the slider direction)



Bad example
(without looseness of the slider direction)



③ Fixing the cable at the lower side
Fix the cable individually at the lower termination side.

K BRAKE RELEASE UNIT FOR DR-3*i*B

Additional document about the brake release option for the DR-3*i*B.

K.1 CONFIGURATION

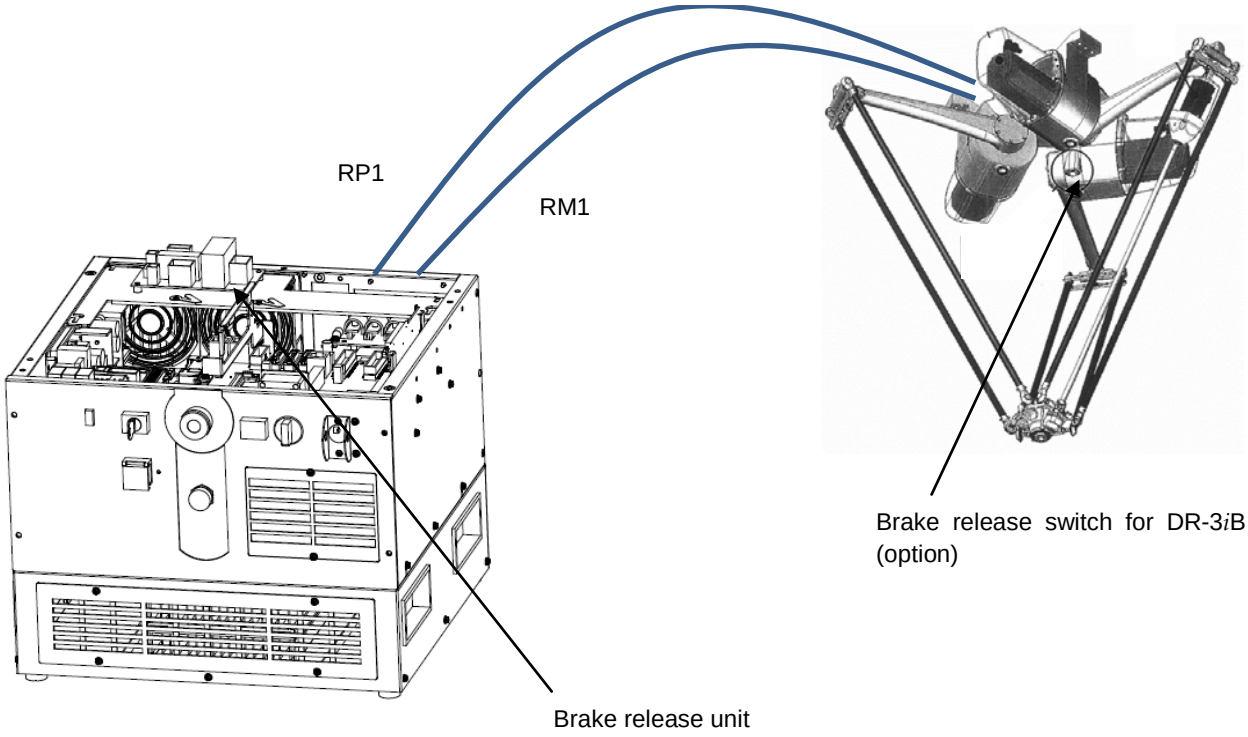


Fig.K.1 (a) DR-3*i*B CONTROLLER (R-30*i*B Mate Plus Open Air)

K.2 BRAKE RELEASE OPERATION

(1) The purpose of brake release is only used for evacuation (such as temporary position movement) and not for manual guided teaching.
(2) When using this function, set the robot into emergency stop state first.
(3) In the state of (2), enter inside the fence and press the brake release switch of the robot, the J1 to J3 brakes are released and the arms can be moved.
(4) Since the brake release switch is a momentary switch, the brakes are released only while the switch is pressed.

K.3 BRAKE RELEASE UNIT

Brake release unit (A05B-2686-C200)

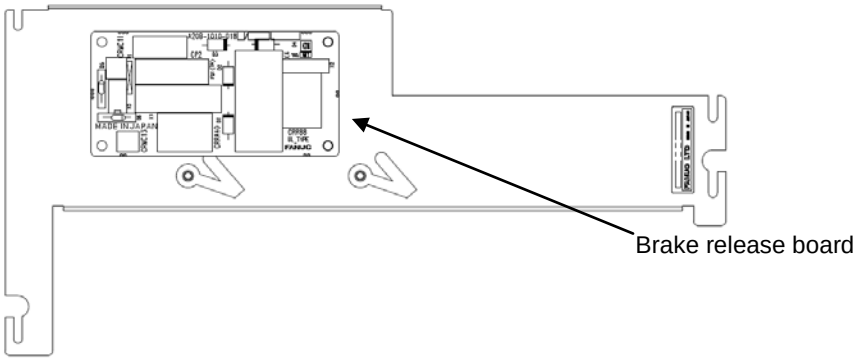


Fig.K.3 (a) Brake release unit (R-30*i*B Mate Plus Open Air)

K.4 REPLACING THE FUSE

Brake release board fuse.
FU1: A60L-0001-0245#GP20
(This fuse is mounted on the brake release board.)

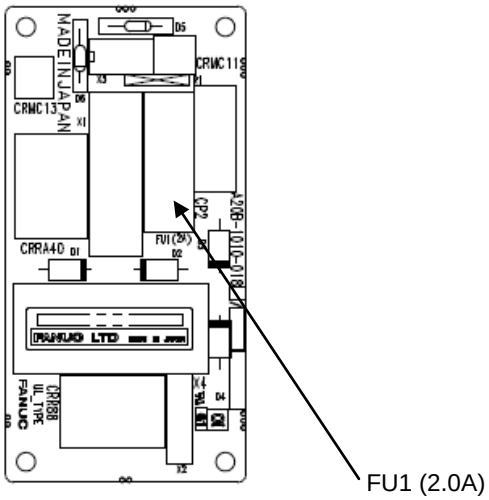


Fig.K.4 (a) Brake release board

This fuse has a window for judging fuse blowing. The window turns white, if the fuse blows.

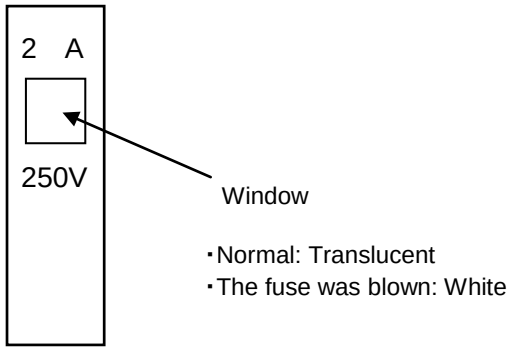


Fig.K.4 (b) Brake release board fuse

> ⚠ **CAUTION**
> If this fuse was blown because a faulty on the brake release board or brake cable. Replace the fuse after taking the measures.

K.5 ROBOT CONNECTION CABLE

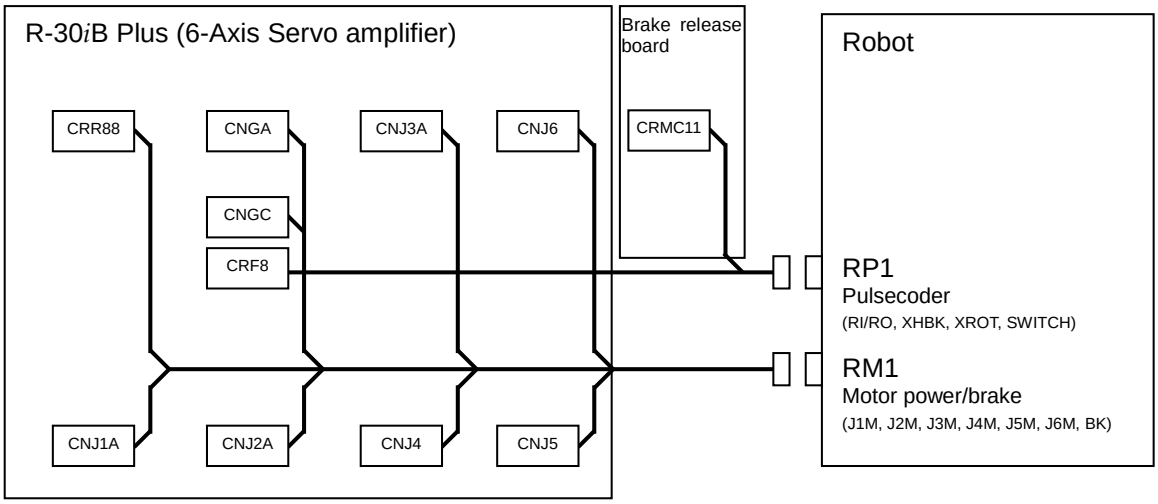


Fig.K.5 (a) Robot connection cable (DR-3*i*B, with brake release unit option, R-30*i*B Mate Plus Open Air)

K.6 TOTAL CONNECTION DIAGRAM

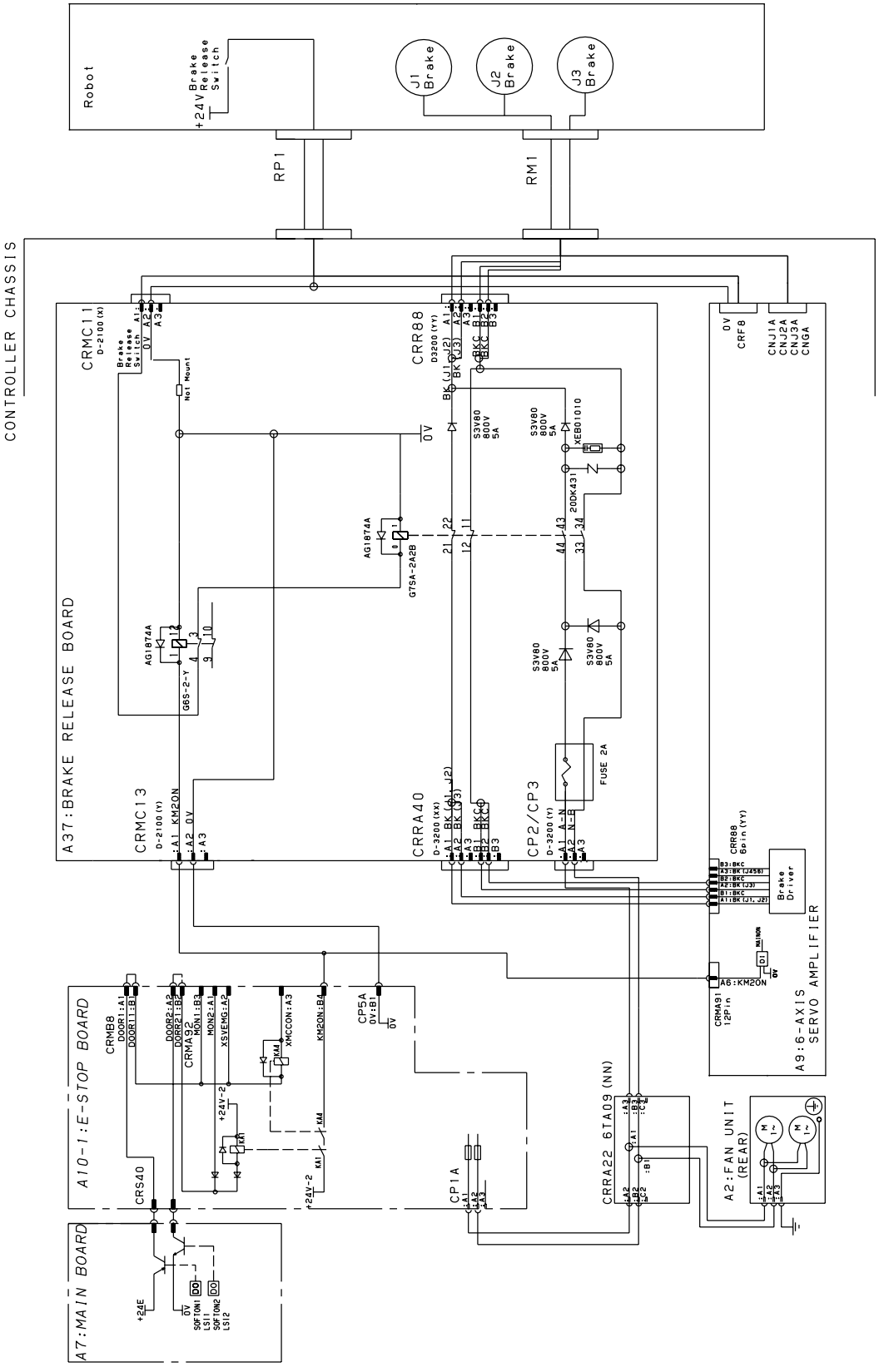


Fig.K.6 (a) System block diagram for brake release (DR-3*i*B, R-30*i*B Mate Plus Open Air)

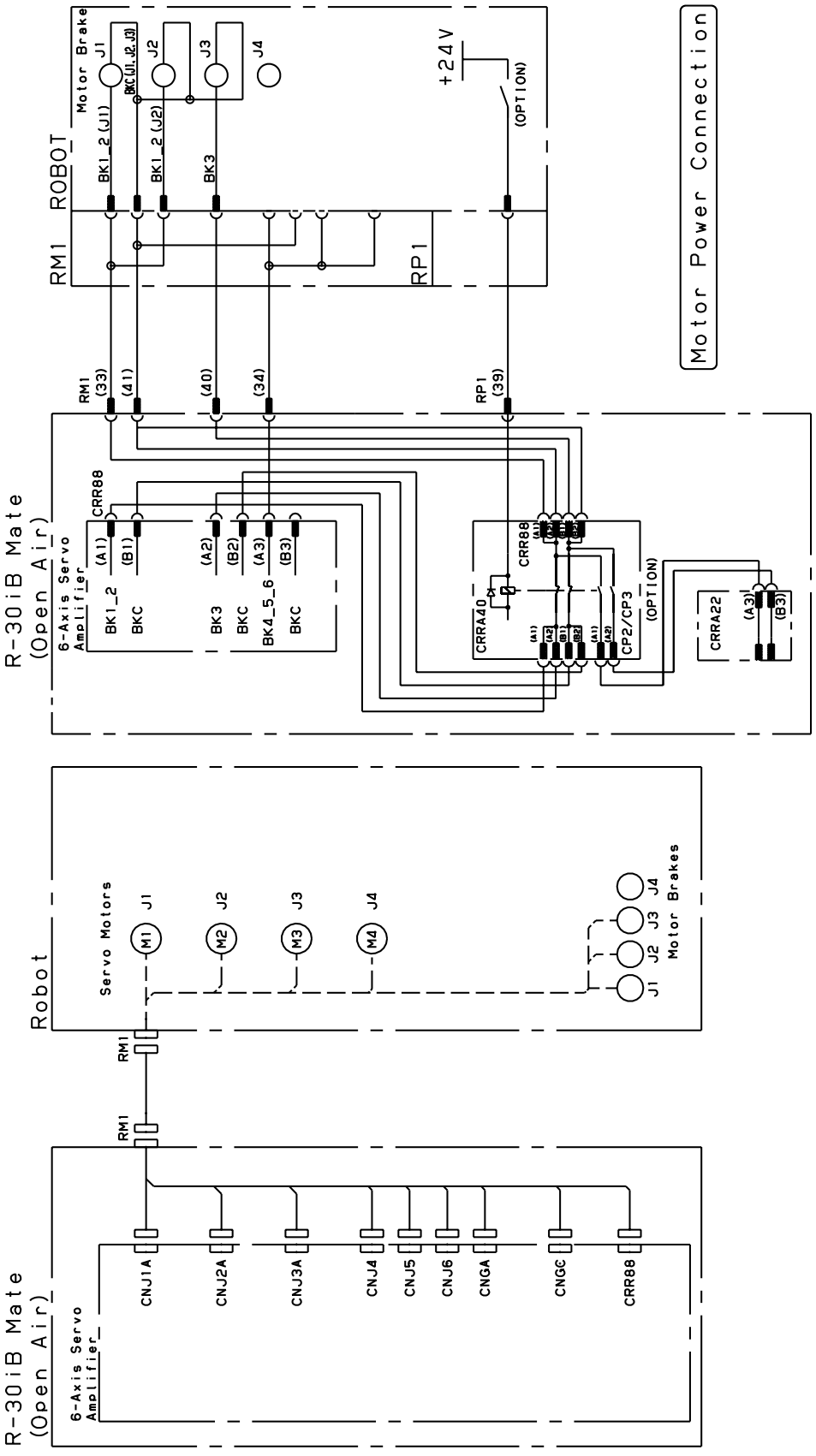


Fig.K.6 (b) Motor power connection (DR-3*i*B, with brake release unit option, R-30*i*B Mate Plus Open Air)

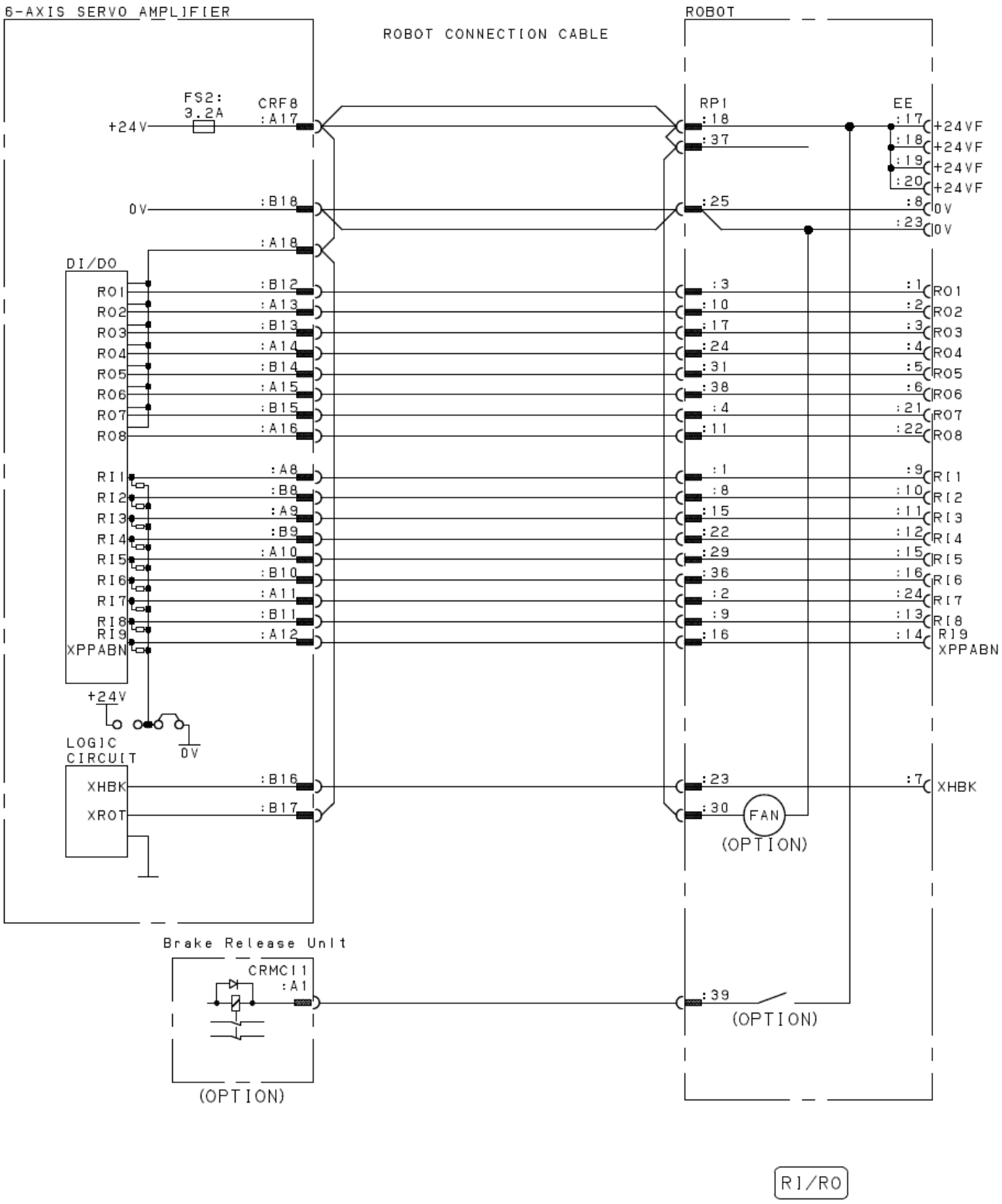


Fig.K.6 (c) RI/RO connection diagram (DR-3*i*B, with brake release unit option, R-30*i*B Mate Plus Open Air)

INDEX

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<W>

REVISION RECORD

Edition	Date	Contents
08	Feb., 2021	• Addition of maintenance information. • Correction of errors.
07	Jan., 2020	• Addition LR Mate 200 *i*D/14L, CR-14*i*A/L, ER-4*i*A, DR-3*i*B/8L. • Correction of errors.
06	Sep., 2018	• Addition of specification of R-30*i*B Mate Plus • Correction of errors.
05	Apr., 2016	• Addition of specification of Main board and CPU card • Correction of errors.
04	Jul.,2015	• Addition of specification of FROM/SRAM module.
03	Apr., 2015	• Addition LR Mate 200***i***D/4SC/4SH/7C/7H/7LC, M-1***i***A/0.5AL/0.5SL/1HL, M-2***i***A/3A/3AL • Correction of errors.
02	Jul., 2013	• Addition of M-2*i*A, M-3*i*A • Correction of errors.
01	May, 2013	

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