FANUC Robot series

R-30*i*B Mini Plus CONTROLLER
MAINTENANCE MANUAL

B-84175EN/03

Important notices

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 the "FANUC Robot series SAFETY HANDBOOK"(B-80687EN) .

User

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.

Work 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.

Following table 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 2.1-1 List of work outside the Safeguarded Space

	Operator	Programmer /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		○	○

	Operator	Programmer /Teaching operator	Maintenance technician
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

WARNING AND CAUTION LABEL

Step-on prohibitive label

Figure 2.2-1 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 as well.

High-temperature warning label

Figure 2.2-2 High-temperature warning label

Description

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

High-voltage warning label

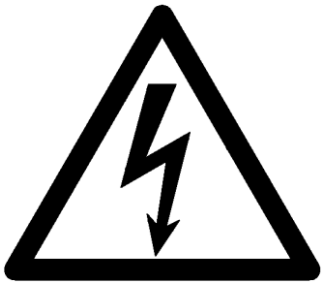


Figure 2.2-3 High-voltage warning label

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

Caution label

Figure 2.2-4 Caution label

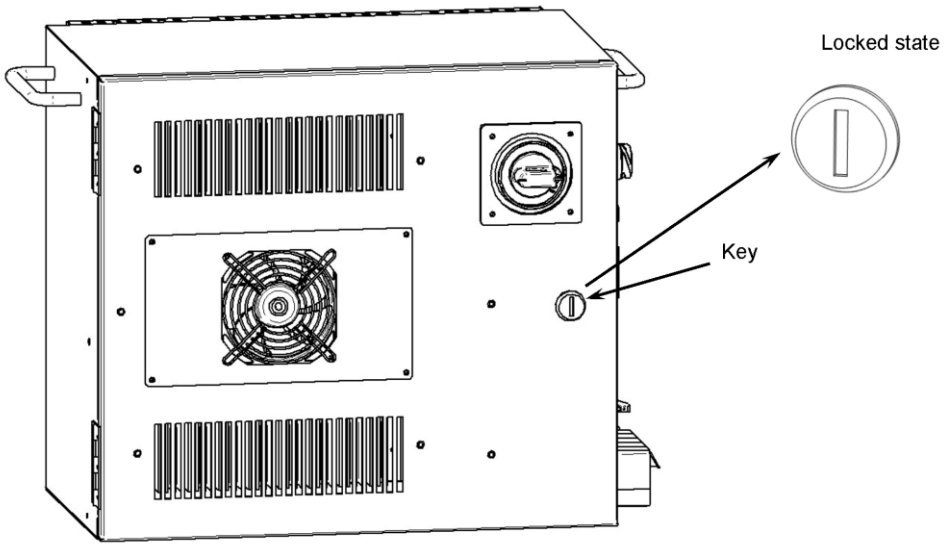
Description

See related contents of this manual.

WARNING AND CAUTION REGARDING USE OF CONTROLLER

⚠WARNING

1. The R-30iB Mini Plus controller has an enclosed structure, and is designed to keep out surrounding dust, oil mist, conductive foreign material, and other substances. Whether or not the controller is in operation, if the door is not locked with the key, the original sealing capacity of the controller cannot be secured. In this case, failure may occur due to internal contamination, and there is the risk of electric shock, electric leakage, and fire due to insulation deterioration.
2. Be sure to lock the controller securely with the key to prohibit any person other than a trained maintenance worker from opening the door of the controller.
3. In order to prevent electrical shocks, do not turn on the controller's power when the door is open.
4. After connecting the input power cable, in order to avoid turning on the main breaker, a padlock can be installed on 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 2.4.2 of II CONNECTION when connecting power supply to the controller.



PREFACE

This manual describes the following models (R-30iB Mini Plus CONTROLLER)

Model	Abbreviation	
FANUC Robot CRX-5iA	CRX-5iA	CRX-5iA
FANUC Robot CRX-10iA	CRX-10iA	CRX-10iA
FANUC Robot CRX-10iA/L	CRX-10iA/L	
FANUC Robot CRX-20iA/L	CRX-20iA/L	CRX-20iA
FANUC Robot CRX-25iA	CRX-25iA	CRX-25iA

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-30iB Mini Plus CONTROLLER are 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))	Polybromin-ated biphenyls (PBB)	Polybromin-ated diphenyl ethers (PBDE)
Mechanical unit	Mechanical unit main body	○	○	○	○	○	○
	Motor	×	○	○	○	○	○
	Cables	×	○	○	○	○	○
Control unit	Teach pendant	×	○	○	○	○	○
	Control unit main body	×	○	○	○	○	○
	Cables	×	○	○	○	○	○

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 usage environment conditions, the environmental protection use period is 20 years after manufacture. The pollution prevention label, which indicates the environmental protection use period, is attached to the door as shown in the following figure.

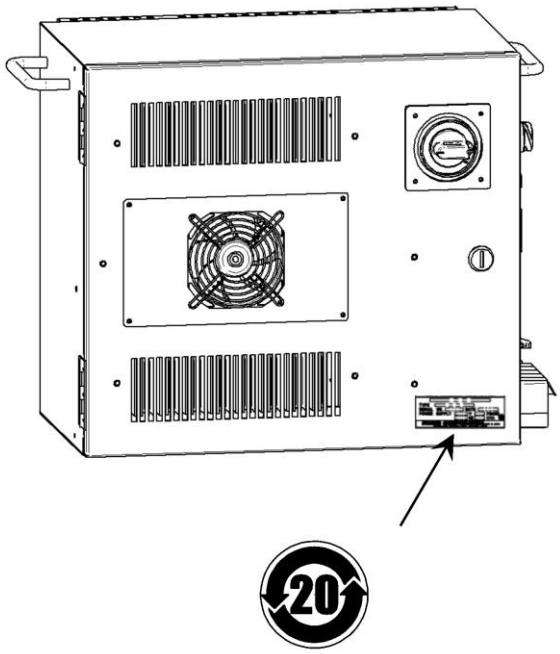
Installation location: Indoor

Ambient temperature: 0°C to 45°C

Ambient humidity: 75%RH or less

Vibration: 4.9 m/s^2 (0.5G) or less

Atmosphere: When there is no corrosive gas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I Maintenance

1. Overview

This manual is applied to R-30iB Mini Plus controller (called R-30iB Mini Plus).

R-30iB Mini Plus meets the UL/CSA standard as described in Table 1-1 and Machinery Directive, Low voltage Directive, EMC Directive to cover the requirement of CE marking as shown in Table 1 (a).

Table 1-1 Applied standards

Functional Safety	EMC Standard	Robot Standard Electrical Standard
ISO 13849-1 IEC 61508	EN 55011 EN 61000-6-2 EN 61000-6-4	EN/ISO 10218-1 UL1740 (NFPA79) CAN/CSA Z434 CAN/CSA C22.2 IEC/EN 60204-1

This manual describes the maintenance and connection of R-30iB Mini Plus.

Maintenance: Troubleshooting, and the setting, adjustment, and replacement of units

Connections: Connection of R-30iB Mini Plus to the robot mechanical unit and peripheral devices, and installation of the controller

⚠WARNING

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. Before you enter the robot working area, be sure to turn off the power to the controller or press the EMERGENCY STOP button.

2. CONFIGURATION

2.1. EXTERNAL VIEW OF THE CONTROLLER

The appearance and components might slightly differ depending on the controlled robot, application, and options used.

Figure 2.1-1 shows the external view of the R-30iB Mini Plus.

Figure 2.1-2 to Figure 2.1-3 show the construction diagram of the R-30iB Mini Plus.

Figure 2.1-4 to Figure 2.1-7 show the external views of the switch box and the teach pendant.

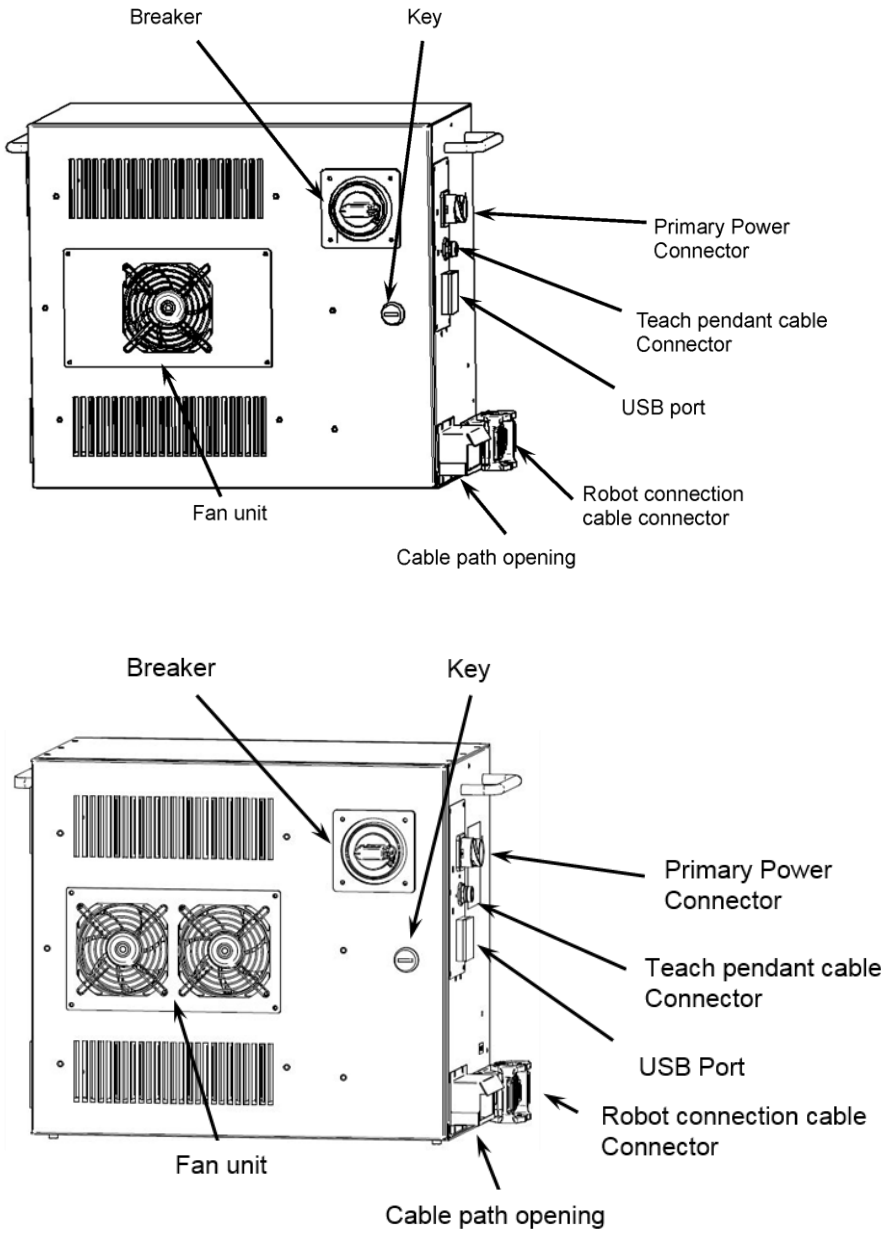


Figure 2.1-1 External view of the R-30iB Mini Plus
(upper: Not for the CRX-25iA, lower: For the CRX-25iA)

⚠WARNING

Before using the controller, be sure to lock the door. See "WARNING AND CAUTION REGARDING USE OF CONTROLLER(P.vi)" in the "SAFETY PRECAUTIONS(P.iii)" and I.2.3. CHECKS AND MAINTENANCE(P.9).

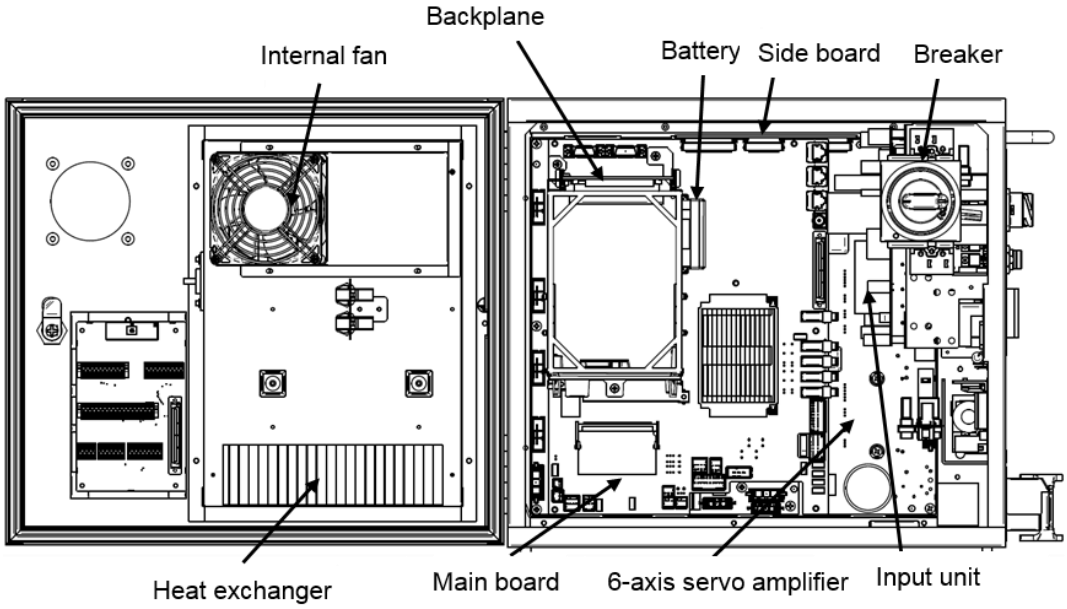


Figure 2.1-2 R-30iB Mini Plus cabinet interior construction diagram

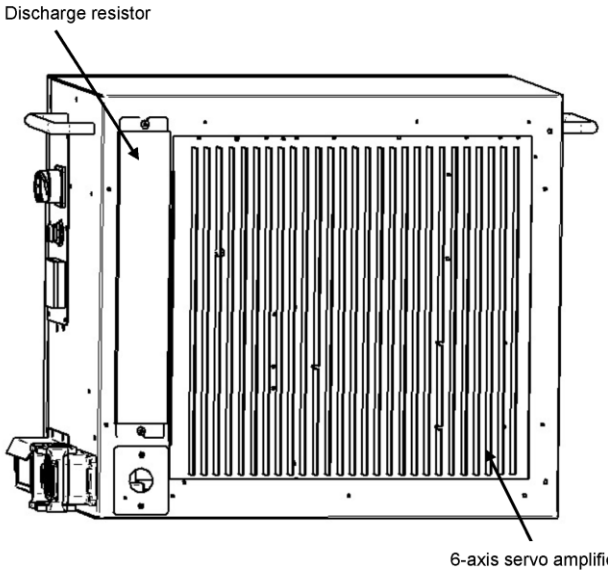


Figure 2.1-3 R-30iB Mini Plus cabinet interior construction diagram (rear)

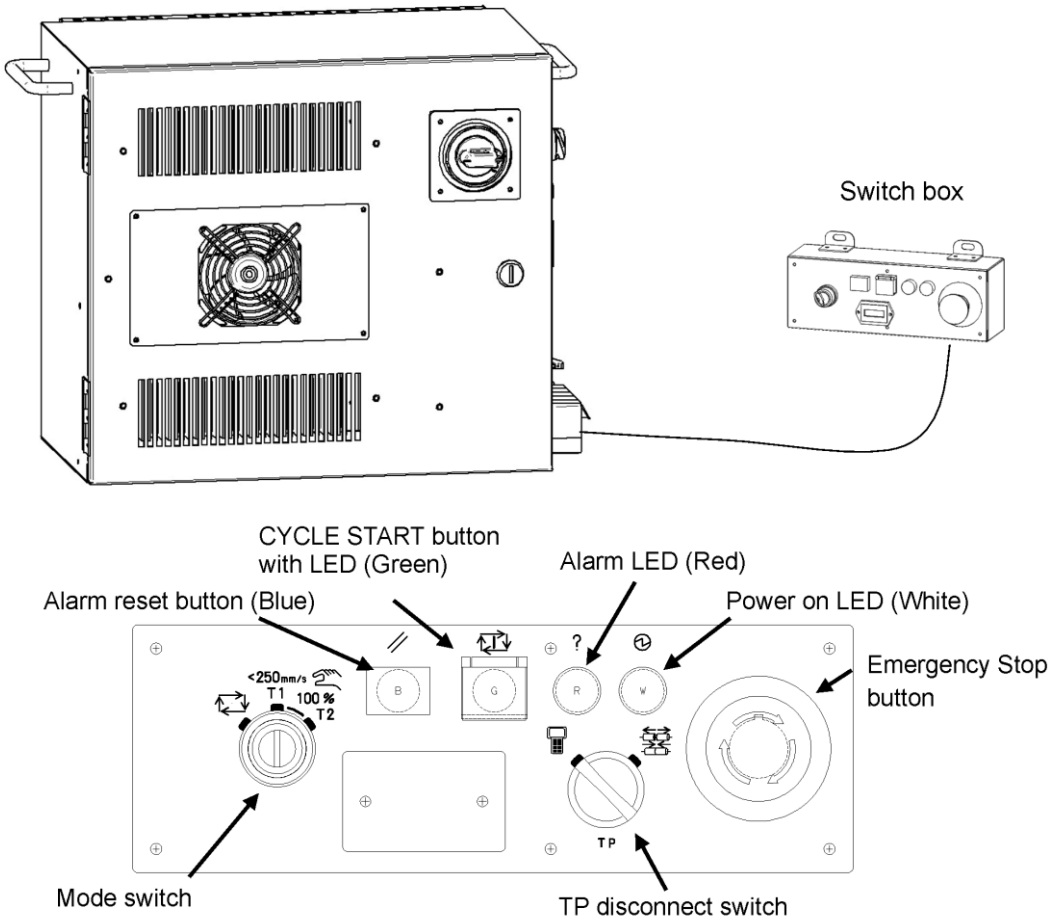
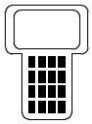
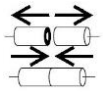
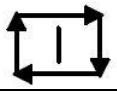


Figure 2.1-4 Switch box

Symbol	Description
	"TP" symbol of the TP disconnect switch. Please turn the disconnect switch to the "TP" position when the teach pendant cable is connected. For details, see F. TEACH PENDANT DISCONNECT FUNCTION (OPTION)(P.209).
	"Connect/disconnect" symbol of the TP disconnect switch. The teach pendant cable can be disconnected by setting the disconnect switch to the "Connect/Disconnect" position. For details, see F. TEACH PENDANT DISCONNECT FUNCTION (OPTION)(P.209).
	Enables the user to select operation mode suitable to the robot operation conditions or the status of its use. Automatic operation mode () Teach mode ()
	Release the alarm state.
	Starts the currently selected program. Lit while the program is being started.
	Indicates that the power of the controller is ON.

Symbol	Description
?	Indicates the alarm state. Press the alarm release button to release the alarm state.

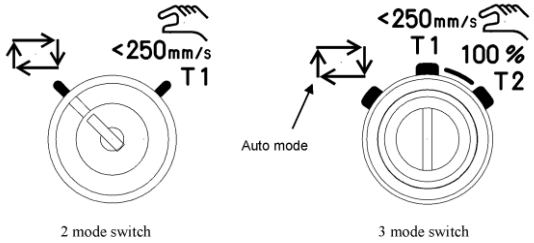


Figure 2.1-5 Mode switch

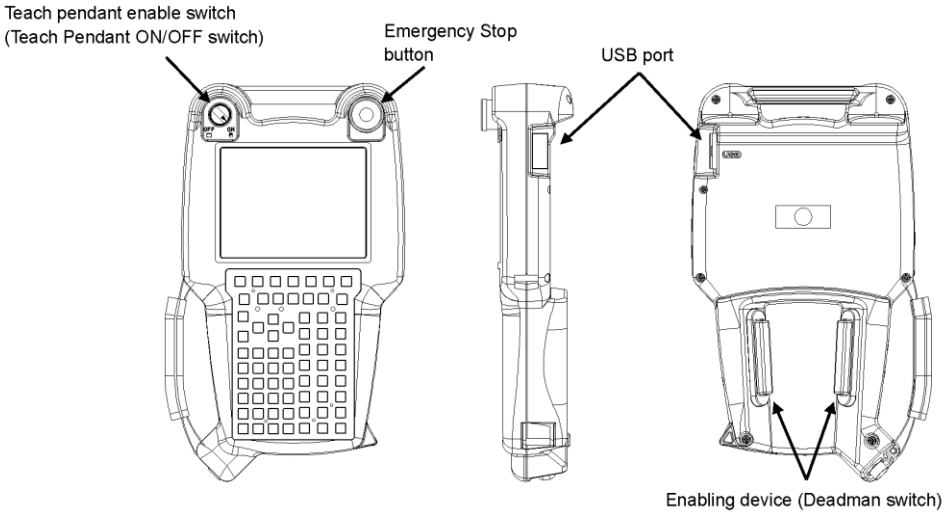


Figure 2.1-6 Teach pendant (iPendant) (Option)

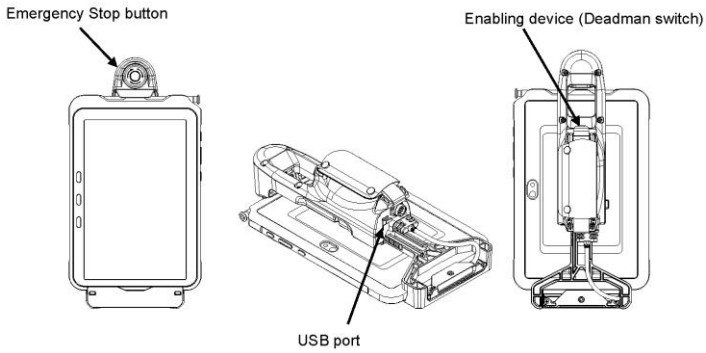


Figure 2.1-7 Teach pendant (tablet TP) (Option)

2.2. COMPONENT FUNCTIONS

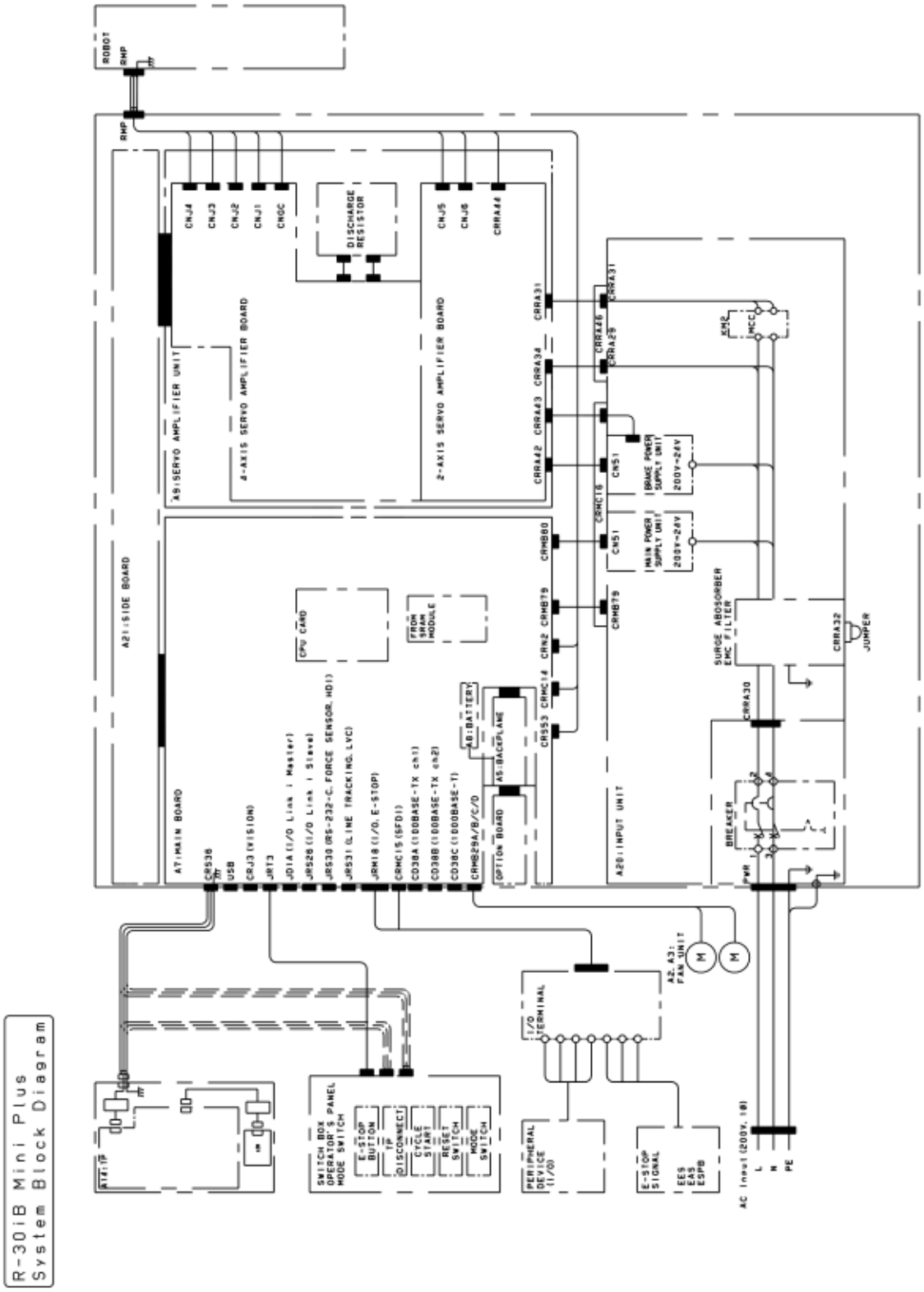


Figure 2.2-1 Block diagram of the R-30iB Mini Plus

- MAIN BOARD

The main board sends control signals to the servo amplifier unit, controls peripheral device and communicate by network. The main board contains a CPU card, a FROM/SRAM module and connectors. (USB, Ethernet, I/O, emergency stop, I/O Link, camera, line tracking)

- Input unit

  This unit contains the input board, the main power supply unit, the brake power supply unit, and the breaker. The input board contains a surge absorber, EMC filter and magnetic contactor for input power. The main power supply unit supply 24V input power to the main board etc. The brake power supply unit supply 24V input power to brakes.

- Teach pendant (iPendant, tablet TP)

  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 unit

  The servo amplifier unit drives the servomotors of a robot. This unit contains the 4-axis servo amplifier unit, the 2-axis servo amplifier unit, the heat sink and the rectifier diodes.

- Fan unit and heat exchanger

  For cooling the inside of the controller.

- Discharge resistor

  Connected to the servo amplifier in order to discharge electricity from the servo motor's counter-electromotive force.

- Side board

  This board connects the main board and the servo amplifier unit. The CRX-10iA sensor I/F circuit is mounted on this board.

- Option (mini) slots

  Two option boards can be installed in these slots.

- BACKPLANE BOARD

  This board connects the main board and the option (mini) slot.

- Switch box

  The switch box contains emergency stop button, LEDs, TP disconnect switch and the connector for TP.

2.3. 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:

   - Before operation

     Check the cable connected to the teach pendant for excessive twisting. Check the controller and peripheral devices for abnormalities.

   - 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.

   - Check that the door is securely locked.

2. Check after one month

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

3. Periodic inspection performed every six months

   - Remove any dirt and dust from the inside of the cabinet. Wipe off dirt and dust from the fan and transformer.

   - 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).

- Open the door and check to make sure the door's gasket has not been damaged or crushed.
- Check the inside of the controller for unusual levels of dirt.
- If there is dirt, take measures to discover the cause, and then clean the dirt.
- With the door locked, check the area around the gasket for gaps.
- Check the path of the cable for gaps as described in G. DUST-PROOFING THE CABLE PATH OPENING(P.213).

4. Battery daily check

   Replace the battery on the front panel of the main board every 4 years. Please refer to I.7.8. REPLACING THE BATTERY(P.91).

5. Maintenance tools

   The following maintenance tools are recommended:

   - Measuring instruments

     AC/DC voltmeter (A digital voltmeter is sometimes required.)

     Oscilloscope with a frequency range of 5 MHz or higher, two channels

   - Tools

     Cross-head screwdrivers: Large, medium, and small

     Straight-head screwdrivers: Large, medium, and small

     Box-head screwdrivers: 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 automatic backup is performed frequently, use the external storage device.

⚠CAUTION

R-30iB Mini Plus 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.

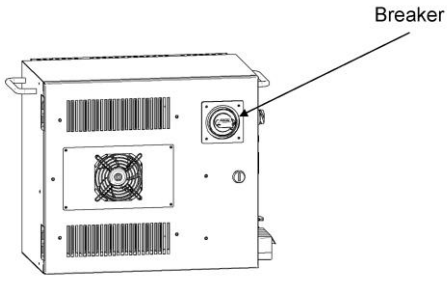
⚠WARNING

1. The R-30iB Mini Plus controller has an enclosed structure, and is designed to keep out surrounding dust, oil mist, conductive foreign material, and other substances. Regardless of whether or not the controller is operating, if the door is not securely locked, it will lose its sealing performance. This can cause the controller to malfunction, or result in an electric shock, leakage current, or even fire due to insulation deterioration.
2. Securely lock the cabinet door of the controller so that only a maintenance technician can open it.
3. In order to prevent electrical shocks, do not turn on the controller's power when the door is open.
4. After connecting the input power cable, in order to avoid turning on the main breaker, a padlock can be installed on the breaker handle.

3. 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.

3.1. POWER CANNOT BE TURNED ON

Inspection and action		Illustration
(Inspection 1)	Check the circuit breaker.	
(Action 1)	(a) If circuit breaker is OFF, turn on the circuit breaker. (b) If the circuit breaker has tripped, find the cause by referencing the total connection diagram presented in the appendix.	

3.1.1. When the Teach Pendant Cannot be Powered on (The LEDs of the Teach Pendant Cannot be Turned on)

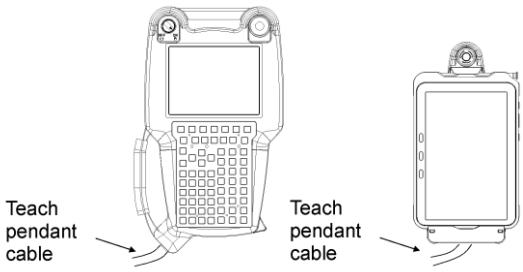
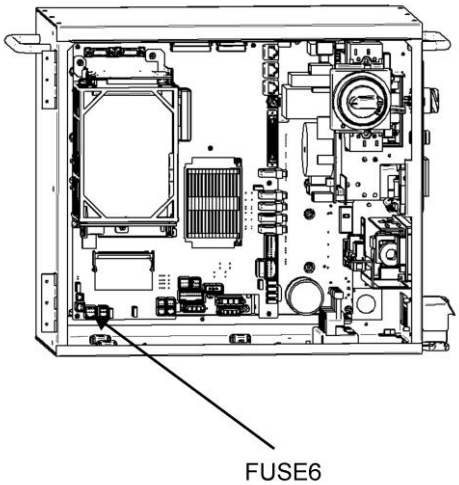
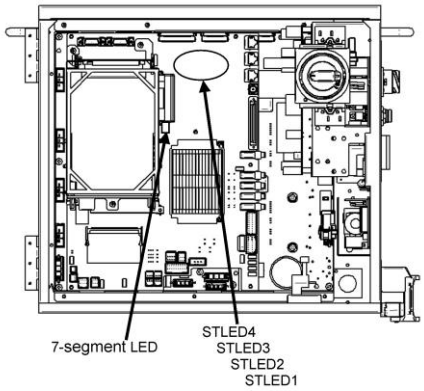
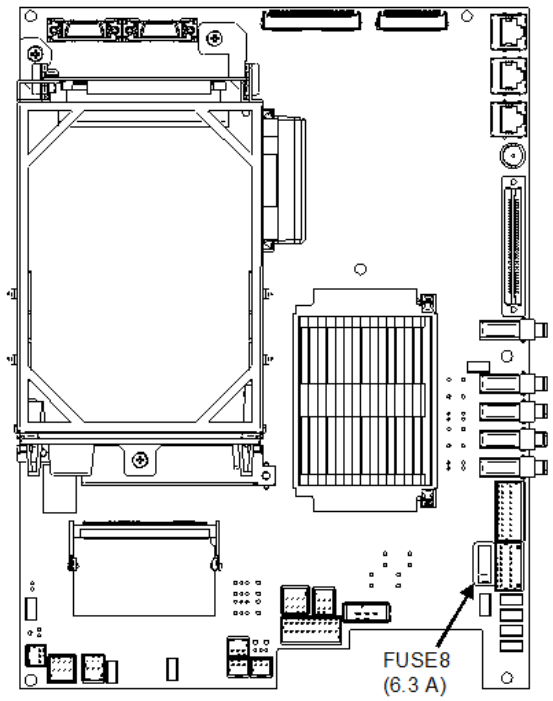
Inspection and action		Illustration
(Inspection 1)	Confirm that the fuse (FUSE6) on the main board is not blown. When the fuse is blown, carry out action 1 and replace the fuse.	
(Inspection 2)	When the fuse (FUSE6) is not blown, carry out Action 2.	
(Action 1)	(a) Check the cable of the teach pendant for failure and replace it as necessary. (b) Check the teach pendant for failure and replace it as necessary. Before executing the (Action 1 (c)), perform a complete controller back-up to save all your programs and settings. (c) Replace the main board.	
(Action 2)	When the LED on the main board lights up, carry out action 1. When the LED on the main board does not light, carry out inspection 2 in I.3.1.2. When the Teach Pendant does not Change from the Initial Screen(P.12).	

Figure 3.1.1-1 Teach pendant



3.1.2. When the Teach Pendant does not Change from the Initial Screen

Inspection and action		Illustration
(Inspection 1)	Check that the status display LED and alarm LED on the interface unit operate normally.	 Status display LED
(Action 1)	Carry out an action according to the LED status. For details, see "TROUBLESHOOTING USING THE LEDS ON THE MAIN BOARD".	

Inspection and action		Illustration
(Inspection 2)	When the LED on the interface plate does not light in inspection 1, check if the fuse (FUSE8) on the main board is blown. (a) When fuse (FUSE8) is blown See Action 1. (b) When fuse (FUSE8) is not blown See Action 2.	 Main board
(Action 1)	(a) Check the cable of the input unit for failure and replace it as necessary. (b) Replace the input unit. Before executing the (Action 1 (c)), perform a complete controller back-up to save all your programs and settings. (c) Replace the main board. (d) When an option board is installed in the mini slot, replace the option board. (e) Replace the backplane board.	
(Action 2)	Before executing the (Action 1 (c)), perform a complete controller back-up to save all your programs and settings. (a) Replace the main board.	

3.2. 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 and other system variables 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.

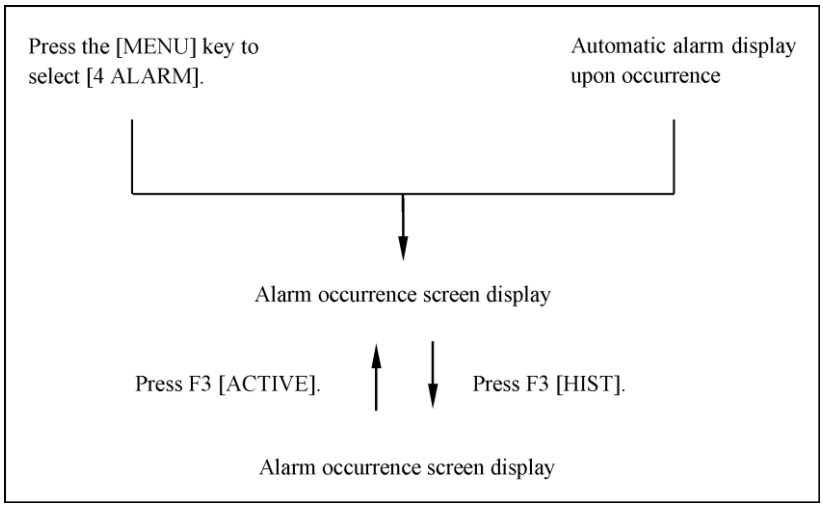


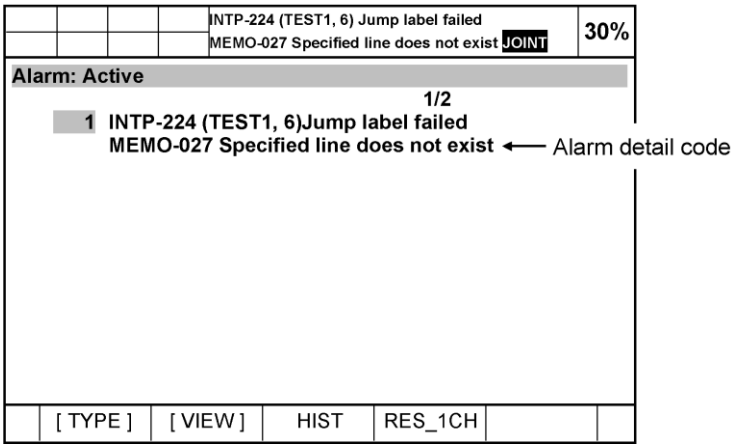
Figure 3.2-1 Alarm occurrence screen and alarm history screen display procedure

Displaying the alarm active/ alarm history/alarm detail information Step

1 Press the [MENU] key to display the screen menu.

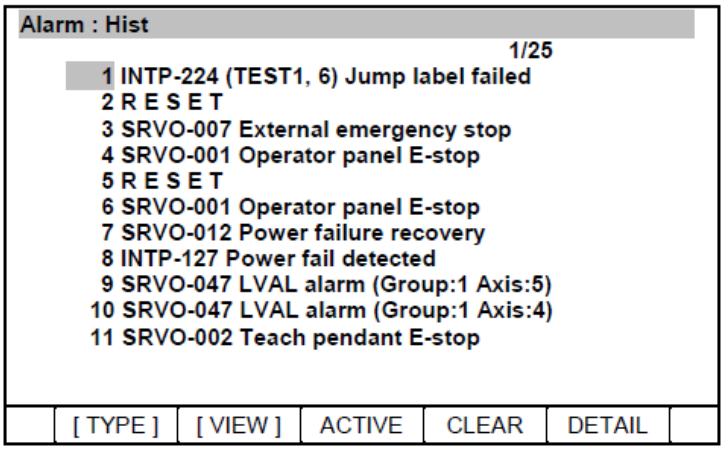
2 Select [4 ALARM]. You will see a screen similar to the following. If an alarm has occurred,

however, the alarm screen appears automatically.



3 To display the alarm history screen, press F3 [HIST].

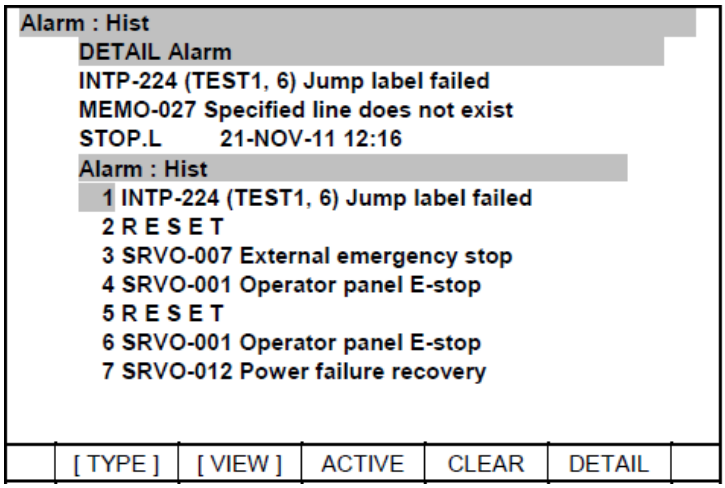
Press F3 [ACTIVE] again, the alarm screen appears.



NOTE

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

4 **To display the alarm detail screen, press F5 [DETAIL].**



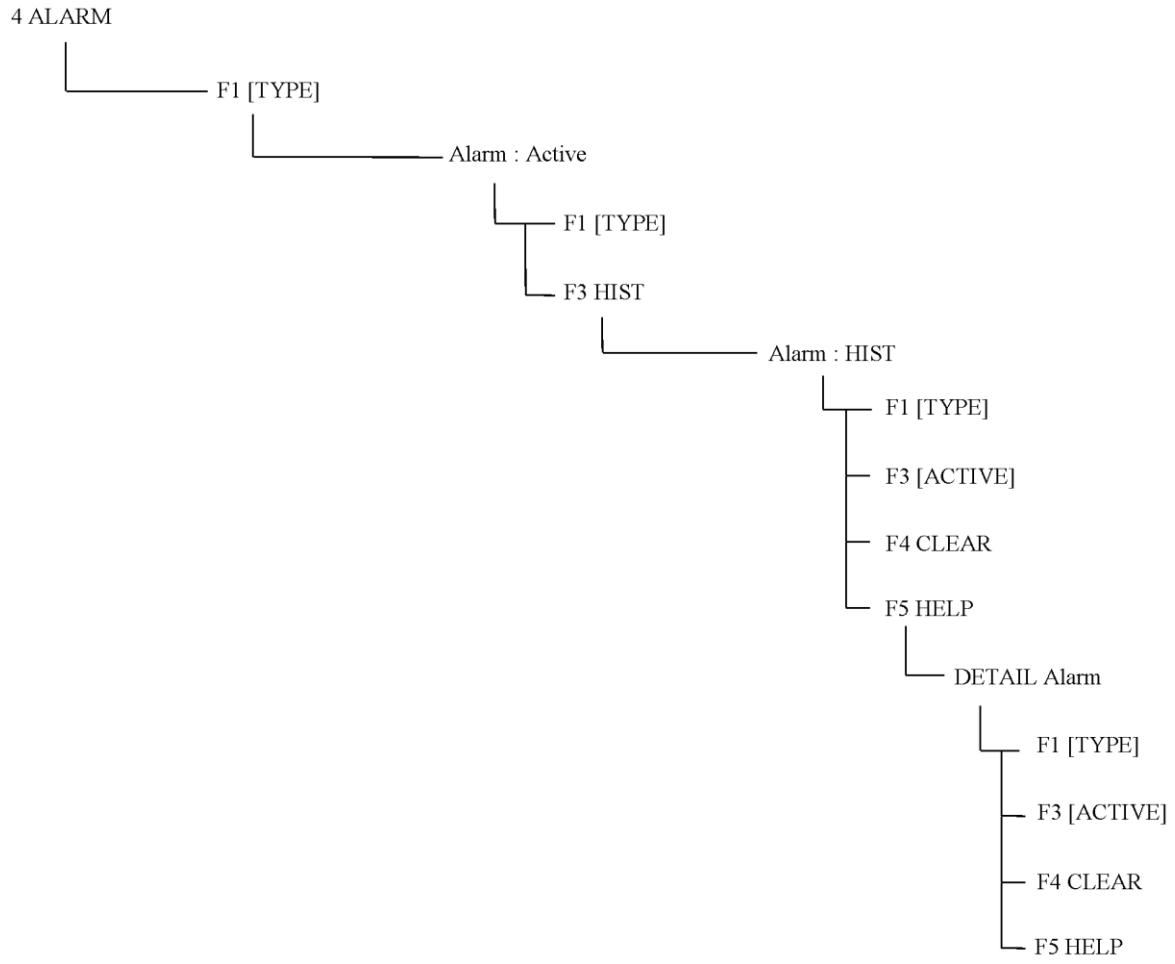
5 **To return to the alarm history screen, press the [PREV] key.**

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.



3.3. STATUS Stop Signal

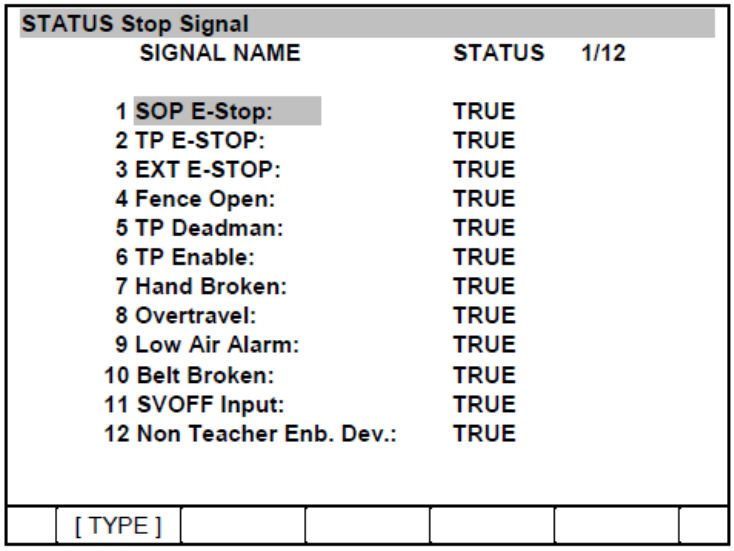
The stop signal screen indicates the state of signals related to stop. To be specific, the screen indicates whether each stop signal is currently on. On this screen, it is impossible to change the state of any stop signal.

Table 3.3-1 STATUS Stop Signal

STATUS Stop Signal	Description
Operator's panel emergency stop	This item indicates the state of the emergency stop button on the switch box. 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 (the deadman switch) on the teach pendant is grasped. If the teach pendant is operable, and the enabling device (the deadman switch) is grasped correctly, the state is indicated as "TRUE". If the enabling device (the 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 enabled signal	This item indicates whether the teach pendant is operable. If the teach pendant is operable, the state is indicated as "TRUE".

Displaying the signal name screen Step

1. **Press the [MENU] key to display the screen menu.**
2. **Select [4 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.**



3.4. MASTERING

Mastering is needed if:

1. The SRVO-062 BZAL or SRVO-038 pulse mismatch alarm occurs, or
2. The Pulsecoder is replaced.

Item (1) requires quick mastering, while item (2) requires single axis or fixture position mastering.

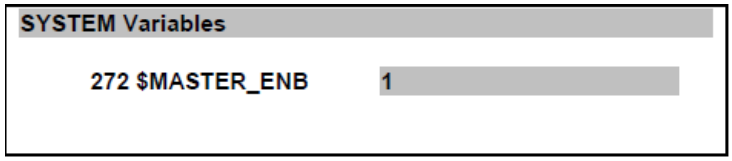
The mastering procedure is described below. For details, refer to the applicable maintenance manual of the mechanical unit or the Mastering chapter of Appendix B of the

"OPERATOR'S MANUAL(Basic Function)"(B-83284EN)

.

Condition

■ System variable $MASTER ENB must be set to 1 or 2.

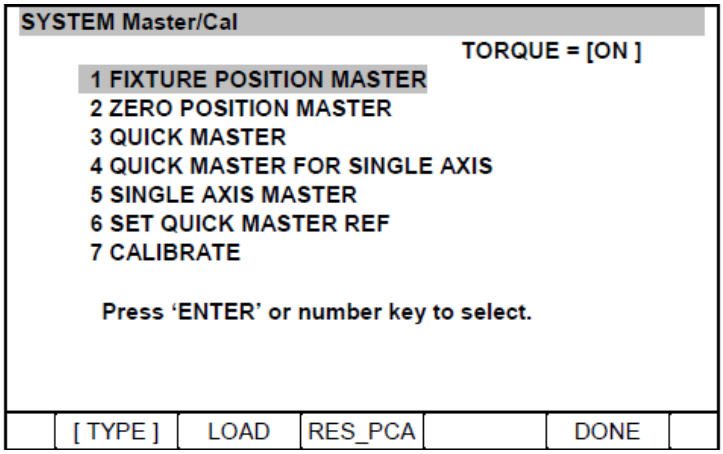


Step

As an example, the following describes the procedures for fixture position mastering.

1. **Press the [MENU] key to display the screen menu.**
2. **Select [6 SYSTEM] on the next page.**
3. **Press F1 [TYPE] to display the screen switching menu.**
4. **Select Master/Cal. You will see a screen similar to the following.**

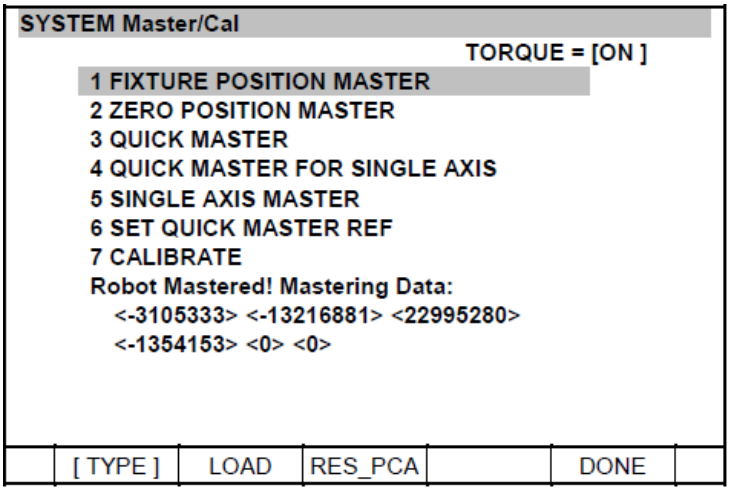
5 **Move the robot by jog feed to the mastering position. Release the brake on the manual brake control screen if necessary.**



NOTE

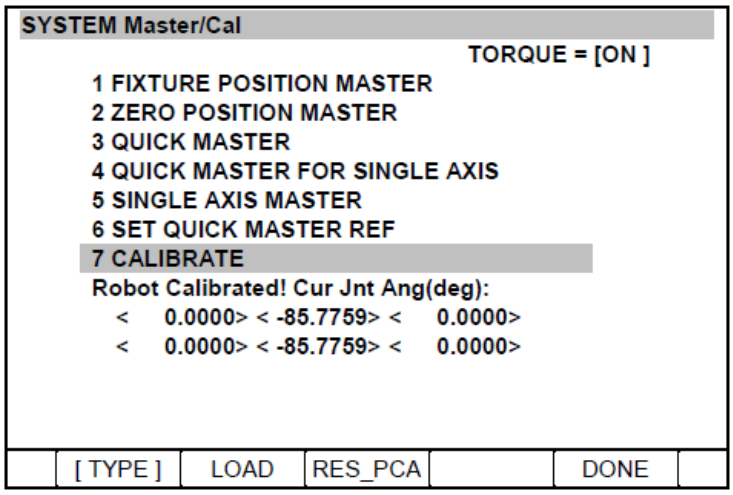
Mastering cannot be performed until the axis is rotated enough to establish a pulse.

6 **Select [1 FIXTURE POSITION MASTER] and press F4 [Yes]. Mastering data is set.**



7 **Select [7 CALIBRATE] and press F4 [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.**

3.5. TROUBLESHOOTING USING THE ALARM CODE

SRVO - 001 Operator panel E-stop	
[Explanation]	The emergency stop button on the switch box is pressed.
[Action 1]	Release the emergency stop button pressed on the switch box.
[Action 2]	Check the voltage between EXT24V and EXT0V. When the voltage becomes low, confirm that fuse (FUSE3) on the front board is not blown.
[Action 3]	Check the wires connecting the switch box and the main board (JRT3) for continuity. If an open wire is found, replace the entire harness.
[Action 4]	Check the wires connecting the teach pendant and the main board (CRS36) for a ground fault. If a ground fault is found, replace the entire harness.
[Action 5]	With the emergency stop in the released position, check for continuity across the terminals of the switch. If continuity is not found, the emergency stop button is broken. Replace the emergency stop button or the switch box.
[Action 6]	Replace the teach pendant.
Before executing the [Action 7], perform a complete controller back up to save all your programs and settings.	
[Action 7]	Replace the main board.

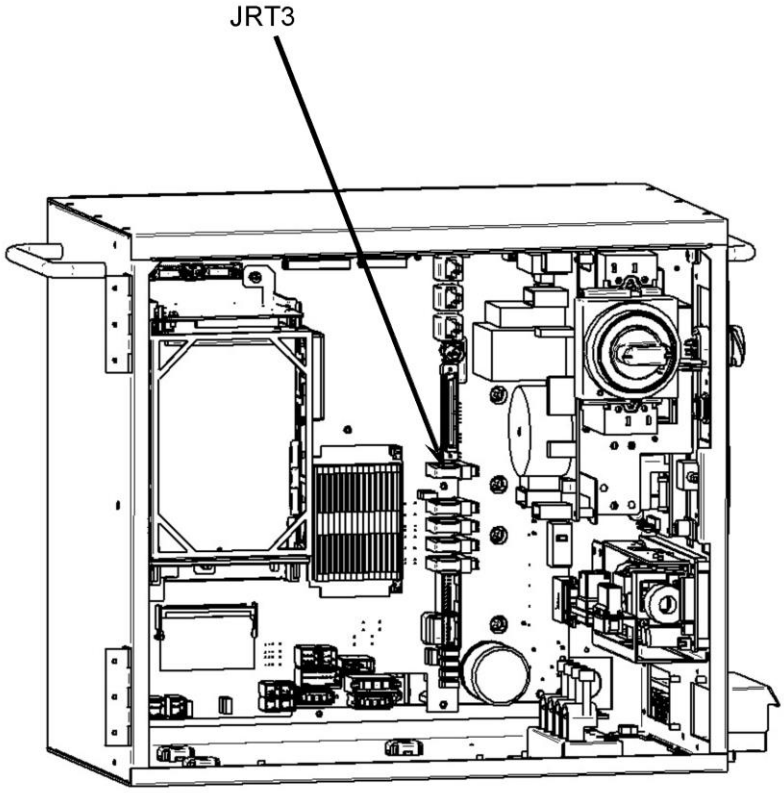


Figure 3.5-1 SRVO-001 Operator panel E-stop

SRVO - 002 Teach pendant E-stop	
[Explanation]	The emergency stop button on the teach pendant was pressed.
[Action 1]	Release the emergency stop button on the teach pendant.
[Action 2]	Replace the teach pendant.

SRVO - 003 Enabling device (Deadman switch)	
[Explanation]	The teach pendant is enabled, but the enabling device (the deadman switch) is not pressed. Alternatively, the enabling device (the deadman switch) is pressed strongly.
[Action 1]	Check the intermediate position of the enabling device (the deadman switch) on the teach pendant.
[Action 2]	Check that the mode switch on the switch box is at the correct position.
[Action 3]	Replace the teach pendant.
[Action 4]	Check the mode switch connection and operation. If trouble is found, replace the mode switch.
Before executing the [Action 5], perform a complete controller back-up to save all your programs and settings.	
[Action 5]	Replace the main board.

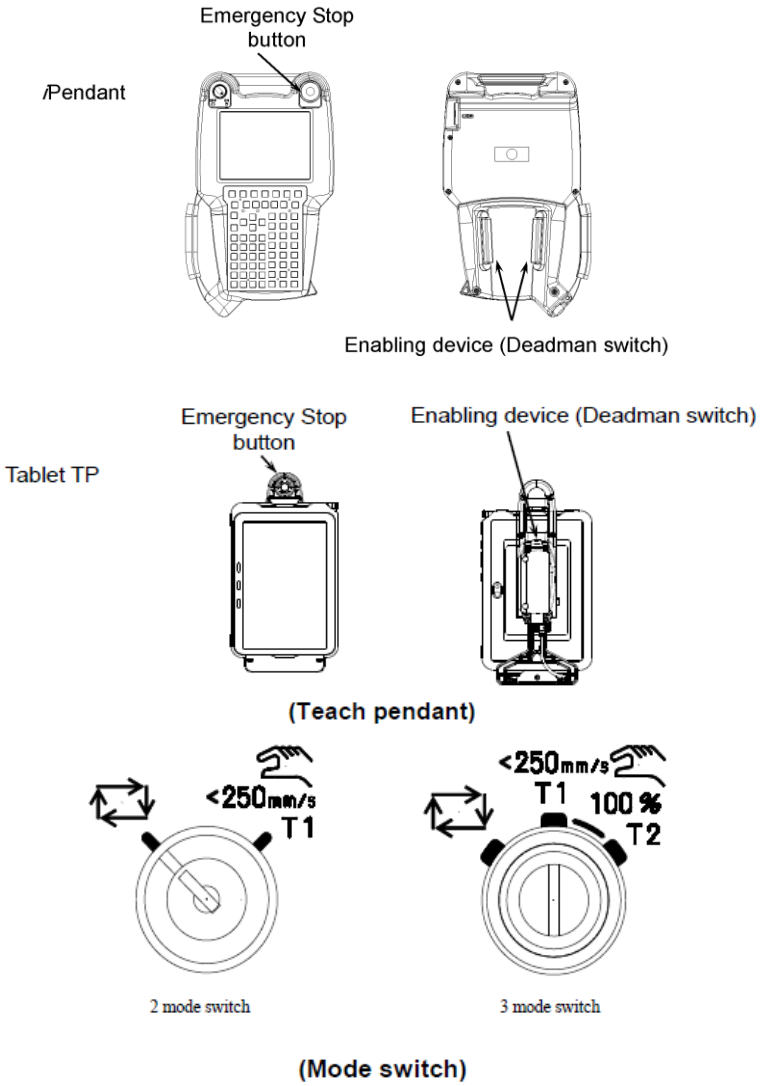
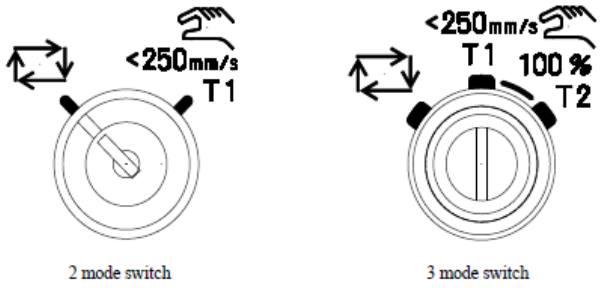


Figure 3.5-2 SRVO-002 Teach pendant E-stop/SRVO-003 Enabling device (Deadman switch)

SRVO - 004 Fence open	
[Explanation]	In the automatic operation mode, the safety fence contact connected to EAS1 - 24V-2 or EAS2 - 0V of the JRM18 connector 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 24V-2 and between EAS2 and 0V of the JRM18 connector on the main board.
[Action 3]	If the safety fence signal is not used, make a connection between EAS1 and 24V-2 and between EAS2 and 0V of the JRM18 connector on the main board.
[Action 4]	Check the mode switch. If trouble is found, replace the mode switch.
Before executing the [Action 5], perform a complete controller back-up to save all your programs and settings.	
[Action 5]	Replace the main board.



2 mode switch 3 mode switch

(Mode switch)

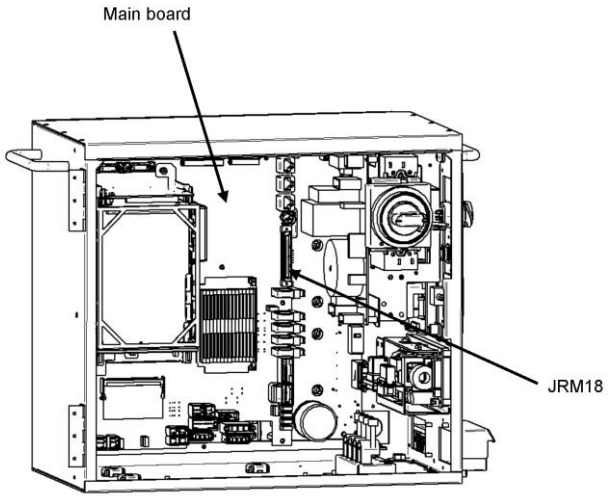


Figure 3.5-3 SRVO-004 Fence open

⚠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 24V-2 and between EAS2 and 0V. Never make such an attempt. If a temporary connection is needed for operation, separate safety measures must be taken.

SRVO - 007 External emergency stops	
[Explanation]	On the JRM18 connector of the main board, no connection of the external emergency stop is made between EES1 and 24V-2, EES2 and 0V.
[Action 1]	If an external emergency stop button is connected, release the switch.
[Action 2]	Check the switch and cable connected to EES1-24V-2 and EES2-0V on the JRM18 connector of the main board.
[Action 3]	When this signal is not used, make a connection between EES1 and 24V-2, EES2 and 0V of JRM18 connector.
Before executing [Action 4], perform a complete controller backup to save all your programs and settings.	
[Action 4]	Replace the main board.

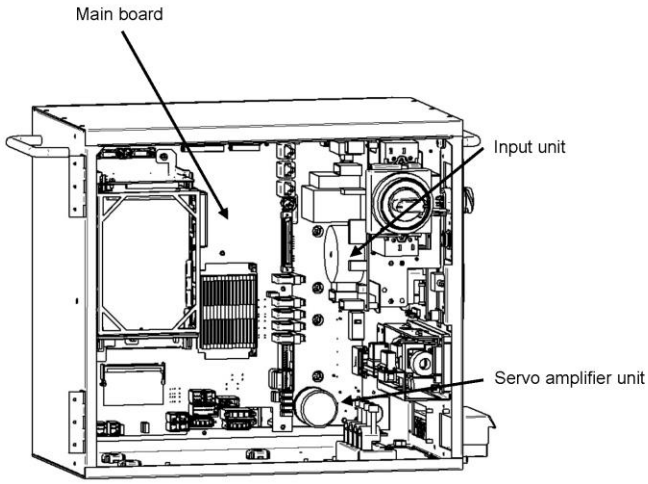


Figure 3.5-4 SRVO-007 External emergency stops

⚠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 EES1－24V-2 and between EES2－0V and 0V. Never make such an attempt. If a temporary connection is needed for operation, separate safety measures must be taken.

SRVO - 014 Fan motor abnormal (n), CPU STOP	
[Explanation]	When a fan motor stops on fan unit, the teach pendant shows the following warning message. One minute later, the robot stops and cannot be operated from TP. The robot can be recovered by replacing a fan motor.
[Action 1]	Confirm the fuse (FUSE 9) is not blown. When the fuse (FUSE 9) is blown, carry out action2~action 5 and replace the fuse.
[Action 2]	Replace the fan unit.
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the main board.
[Action 4]	Replace the servo amplifier unit.
[Action 5]	Replace the side 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 (45°C), cool down the ambient temperature.
[Action 2]	If the fan motor is not running, check the fan unit. Replace it if necessary.
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the main board. (The thermostat on the main board may be faulty.)
[Action 4]	Replace the servo amplifier unit.

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

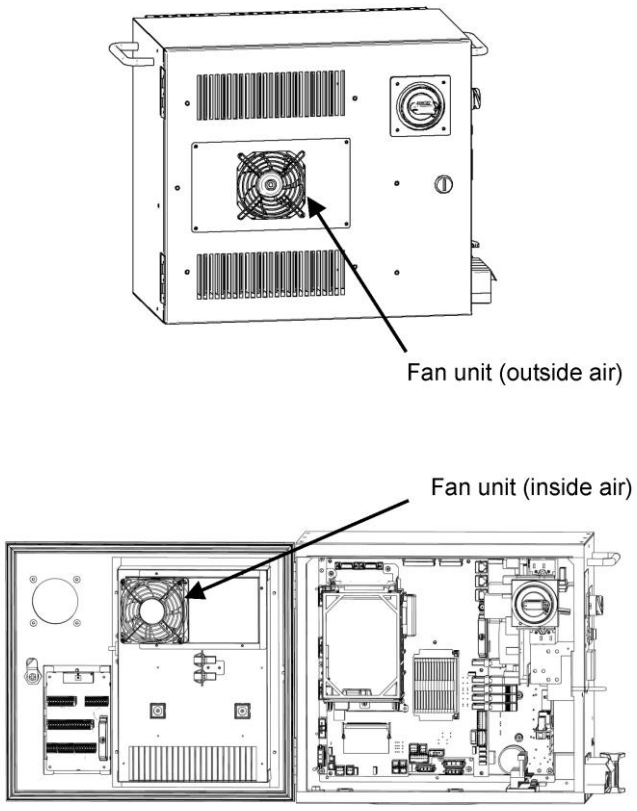


Figure 3.5-5 SRVO-014 Fan motor abnormal/SRVO-015 System over heat

SRVO - 018 Brake abnormal (Group:i Axis:j)	
[Explanation]	An abnormal brake circuit is detected.
[Action 1]	Check the robot connection cable (RMP) and the internal cable of the robot and motor brakes connected to the side of the controller. If a short-circuit or grounding fault is found, replace the failed part.
[Action 2]	Check FUSE12 in the servo amplifier unit. If it has blown, replace the fuse.
[Action 3]	Make sure that the cables between input unit connector CN2 and servo amplifier unit connectors CRRA43 and CRRA44 are securely attached, and connect the connectors if they are disconnected.
[Action 4]	Replace the input unit.
Before executing the [Action 5], perform a complete controller back-up to save all your programs and settings.	
[Action 5]	Replace the servo amplifier unit.
[Action 6]	Replace the main board.

⚠CAUTION

This error can be caused by the brake release unit option if the on/off switch is left in on position while the operator attempts to jog the robot. To recover, turn the brake release unit off and cycle the controller power.

SRVO - 021 SRDY off (G:i A:j)	
[Explanation]	The servo power cannot be turned on although no alarm has been detected.
[Action 1]	Check the alarm history. If any other alarms occur at the same time, refer to their causes/actions.
[Action 2]	When this occurred after an axis setting was added or changed, check the setting and make corrections if necessary. In particular, check if the FSSB line number, hardware start axis number, amplifier number, and amplifier type are correct in the auxiliary axis/independent auxiliary axis setting.
[Action 3]	It is possible that an instant disconnection of power source causes this alarm. Check whether an instant disconnection occurred.
Before executing [Action 4], perform a complete controller backup to save all your programs and settings.	
[Action 4]	Replace the main board.

SRVO - 022 SRDY on (G:i A:j)	
[Explanation]	The main board is mistakenly recognized as being in the servo-on state when servo is off during an emergency stop, etc.
Before executing the [Action], perform a complete controller back-up to save all your programs and settings.	
[Action]	Replace the main board.

SRVO - 023 Stop error excess (G:i A:j)	
[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.	
[Action 1]	If the brake is not released, check the continuity of the brake line in the robot connection cable and the mechanical unit cable.
Before executing the [Action 2], perform a complete controller back up to save all your programs and settings.	
[Action 2]	Replace the servo amplifier unit.
[Action 3]	Replace the main board.
[Action 4]	Replace the side board.
[Action 5]	Replace the input unit.
In case that the brake is released.	
[Action 1]	Check whether the obstacle disturbs the robot motion.
[Action 2]	Check the continuity of the robot connection cable and the internal robot power cable.
[Action 3]	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 issued.)
[Action 4]	Check that the input voltage to the controller is within the rated voltage. (If the input voltage to the servo amplifier unit is low, the output torque also becomes low. As a result, the motor may not be able to follow the command, hence possibly causing an alarm.)
Before executing the [Action 5], perform a complete controller back-up to save all your programs and settings.	
[Action 5]	Replace the servo amplifier unit.
[Action 6]	Replace the motor of the alarm axis.
[Action 7]	Replace the main board.
[Action 8]	Replace the side board.

NOTE
Incorrect setting of the brake number causes this alarm.

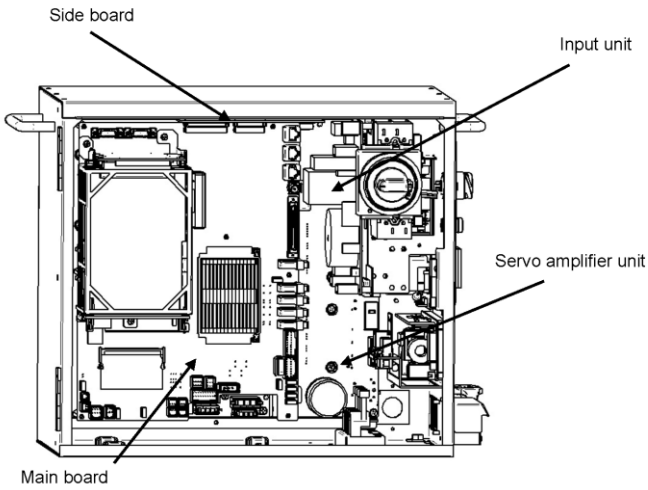


Figure 3.5-6 SRVO-023 Stop error excess

SRVO - 024 Move error excess (G:i A:j)	
[Explanation]	When the robot is running, its position error is greater than the 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:i)	
[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 or additional axis can operate abnormally, set the position data correctly. Otherwise, you could injure personnel or damage equipment.

SRVO - 030 Brake on hold (Group:i)	
[Explanation]	If the temporary halt alarm function is enabled ($SCR.$BRKHOLD ENB=1), SRVO-030 is issued 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:i)	
[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.

SRVO - 033 Robot not calibrated (Group:i)	
	1. Supply power. 2. Set up a quick mastering reference point using [Positioning] on the positioning menu.

SRVO - 034 Ref pos not set (Group:i)	
[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 - 036 Inpos time over (G:i A:j)	
[Explanation]	The robot did not get to the effective area ($PARAM GROUP.$STOPTOL) even after the position check monitoring time ($PARAM GROUP.$INPOS TIME) has elapsed.
[Action]	Take the same actions as for SRVO-023 (large position error at a stop).

SRVO - 037 IMSTP input (Group:i)	
[Explanation]	The *IMSTP signal for a peripheral device interface was input.
[Action]	Turn on the *IMSTP signal.

SRVO - 038 Pulse mismatch (Group:i Axis:j)	
[Explanation]	The pulse count obtained when the power is turned off does not match the pulse count obtained when power is applied. This alarm is Zasserted after exchange the Pulsecoder 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]	If the robot has been moved using the brake release unit while the power is off or when restoring the backup data to the main board, this alarm may occur. Remaster the robot.
[Action 3]	If the robot has been moved because the brake failed, this alarm may occur. Check the cause of the brake trouble. Then remaster the robot.
[Action 4]	Replace the Pulsecoder and master the robot.

SRVO - 043 DCAL alarm (Group:i Axis:j)	
[Explanation]	The regenerative energy of the robot exceeds the controller capacity because the frequency of acceleration/deceleration or the payload of the robot is too high.
(If turning off the robot is needed, please wait 5 minutes with power on for cooling the discharge resistor.)	
[Action 1]	If the frequency of acceleration/deceleration is too high or the payload exceeds the rating of the robot, decrease the operating condition or reduce the payload of the robot.
[Action 2]	The ambient temperature is excessively high, or dust adheres to the fan unit and related fuses that may adversely affect cooling efficiency. Clean up the fan unit and the air filter if they are dirty. Please improve the operating environment.
[Action 3]	Make sure that the main board CRR63 connector is connected. If disconnected, connect it. If connected, detach the cable from CRR63 connector on the main board, and check for continuity between pins 1 and 2 of the cable-end connector. If there is no continuity between the pins, replace the main board.
[Action 4]	Check that the CRRA11A connectors of the servo amplifier unit are connected firmly. Make sure that the discharge resistor CRRA37 is connected tightly, then disconnect the cables from CRRA37 on servo amplifier unit and check the resistance between pins 1 and 3. If the resistance is not 6.5Ω, replace the servo amplifier unit.

SRVO - 043 DCAL alarm (Group:i Axis:j)	
Before executing the [Action 5], perform a complete controller back-up to save all your programs and settings.	
[Action 5]	Replace the servo amplifier unit.
[Action 6]	Replace the main board.
[Action 7]	Replace the side board.
[Action 8]	This alarm may occur because of an incorrect 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 (Group:i Axis:j)	
[Explanation]	The DC voltage (DC link voltage) of the main circuit power supply is abnormally high.
[Action 1]	Check that the input voltage to the controller is lower than the rated voltage. (Maximum applied input voltage is 240V a.c.) (If the input voltage is higher than 240V a.c, the high acceleration/deceleration may cause this alarm.)
[Action 2]	Check whether the load weight is within the rated range. If the weight exceeds the upper limit, decrease it to the limit. (If the load weight is higher than the robot rating, the accumulation of regenerative energy might result in this alarm even if the input voltage is within the controller rating.)
[Action 3]	Check that the CRRA11A connectors of the servo amplifier unit are connected firmly. Next, disconnect the cables then check the continuity between pins 1 and 3. If the resistance is not 6.5, replace the discharge resistor.
Before executing [Action 4], perform a complete controller backup to save all your programs and settings.	
[Action 4]	Replace the servo amplifier unit.
[Action 5]	Replace the main board.
[Action 6]	Replace the side board.

SRVO - 045 HCAL alarm (Group:i Axis:j)	
[Explanation]	Abnormally high current flowed in the main circuit of the servo amplifier unit.
[Action 1]	Turn off the power and disconnect the robot connection cable (RMP) from the controller, and check the insulation of the alarm axis between U, V, W phase and the GND lines. If there is a short circuit, replace the power cable.
[Action 2]	Measure the resistance of the alarm axis between U-V, V-W, and W-U with a milliohm meter that has a very low resistance range. If the resistances at the three points are different from each other, the motor or the power cable may be defective. Find the short circuit point in detail and replace it.
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the servo amplifier unit.
[Action 4]	Replace the main board.
[Action 5]	Replace the side board.

SRVO - 046 OVC alarm (Group:i Axis:j)	
[Explanation]	This alarm is issued 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 reduce the operation condition if possible. If the load or operating condition has exceeded the rating, reduce the load or reduce the operating condition to meet the rating.
[Action 2]	Check that the input voltage to the controller is within the rated voltage.
[Action 3]	Check whether the brake of the corresponding axis is released.
[Action 4]	Check whether there is a factor that has increased the mechanical load on the corresponding axis.

SRVO - 046 OVC alarm (Group:i Axis:j)	
Before executing the [Action 5], perform a complete controller back-up to save all your programs and settings.	
[Action 5]	Replace the servo amplifier unit.
[Action 6]	Replace the corresponding servo motor.
[Action 7]	Replace the motor power cable (robot connection cable) of the corresponding axis.
[Action 8]	Replace the internal cable of the robot (power/brake) in which the corresponding axis is connected.
[Action 9]	Replace the main board.
[Action 10]	Replace the side board.

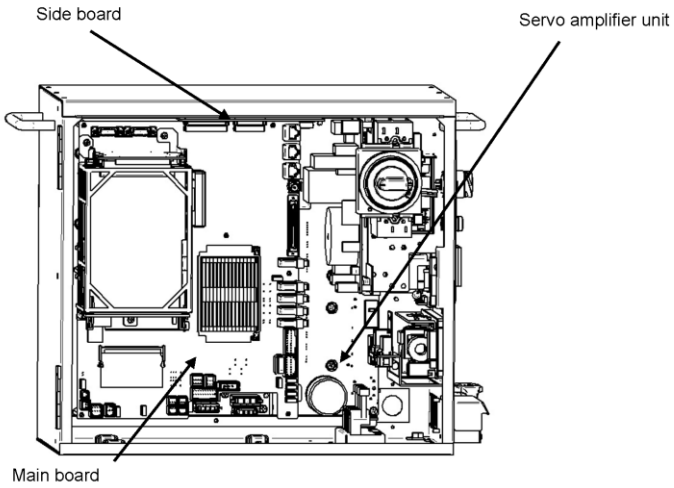


Figure 3.5-7 SRVO-044 DCHVAL alarm/SRVO-045 HCAL alarm/SRVO-046 OVC alarm

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
HC	High current alarm	Servo amplifier

Purpose of each alarm

1. HC alarm (high current alarm)

   If there is 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 overheat alarms)

   The OVC and OHAL alarms are intended to prevent overheating that may lead to the burnout of the motor winding, the breakdown of the servo amplifier transistor, and the separate discharge resistor.

   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.3.5 (h), 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.

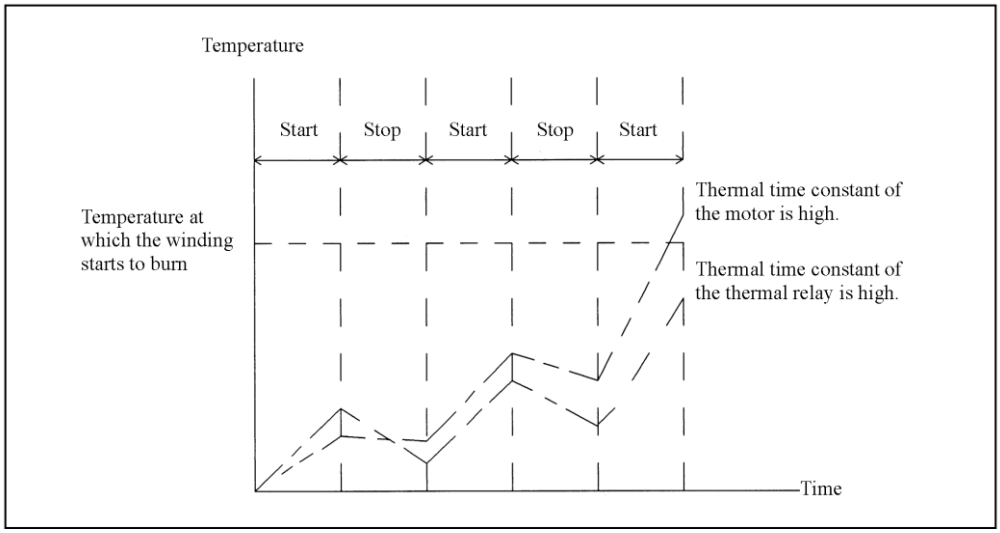


Figure 3.5-8 Relationship between the temperatures of the motor and thermal relay on start/stop cycles

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 issued 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.3.5 (i).

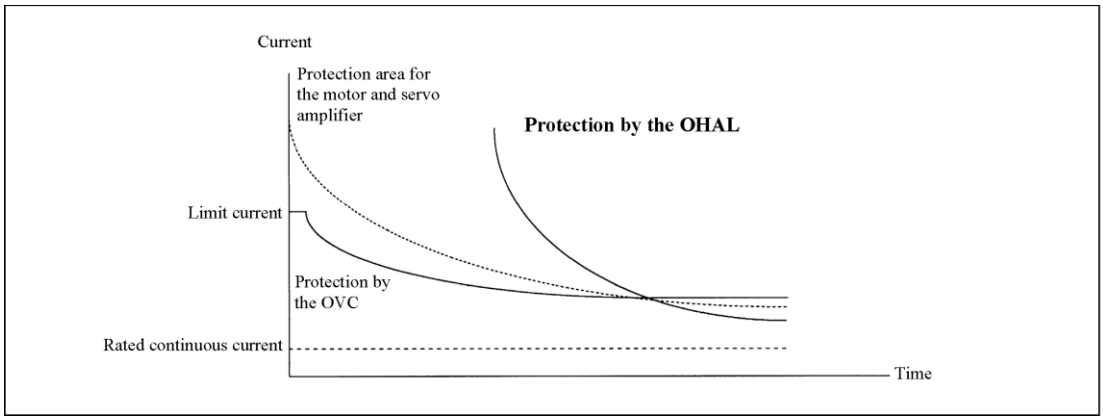


Figure 3.5-9 Relationship between the OVC and OHAL alarms

CAUTION
The relationship shown in Fig.3.5 (i) 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 relax protection.

SRVO - 050 CLALM (Collision Detect) alarm (Group:i Axis:j)
[Explanation] The disturbance torque estimated by the servo software is abnormally high. (A collision has been detected.)

SRVO - 050 CLALM (Collision Detect) alarm (Group:i Axis:j)	
[Action 1]	Check whether the robot has collided or 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]	If the load weight exceeds the rated range, decrease it to within the limit.
[Action 5]	Check that the input voltage to the controller is within the rated voltage.
Before executing [Action 6], perform a complete controller backup to save all your programs and settings.	
[Action 6]	Replace the servo amplifier unit.
[Action 7]	Replace the corresponding servo motor.
[Action 8]	Replace the input unit.
[Action 9]	Replace the robot connection cable.
[Action 10]	Replace the main board.
[Action 11]	Replace the side board.

SRVO - 051 CUER alarm (Group:i Axis:j)	
[Explanation]	The offset of the current feedback value is abnormally high.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the servo amplifier unit.
[Action 2]	Replace the main board.
[Action 3]	Replace the side board.

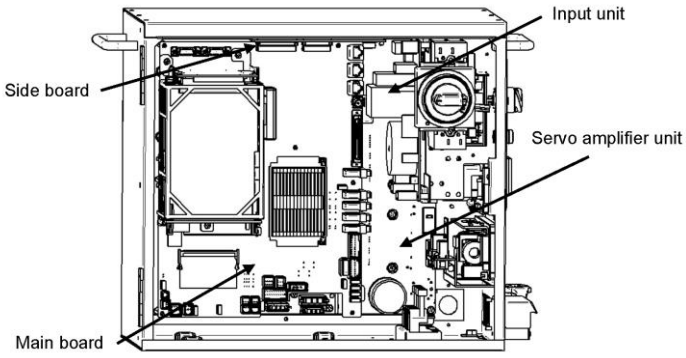


Figure 3.5-10 SRVO-050 CLALM alarm/SRVO-051 CUER alarm

SRVO - 055 FSSB com error 1 (Group:i Axis:j)	
[Explanation]	Communication was interrupted in the main board.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the main board.

SRVO - 056 FSSB com error 2 (Group:i Axis:j)	
[Explanation]	Communication was interrupted in the main board.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the main board.

SRVO - 057 FSSB disconnect (Group:i Axis:j)	
[Explanation]	Communication was interrupted in the main board.

SRVO - 057 FSSB disconnect (Group:i Axis:j)	
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the main board.
[Action 2]	Replace the input unit.

SRVO - 058 FSSB init error	
[Explanation]	Communication was interrupted in the main board.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the main board.

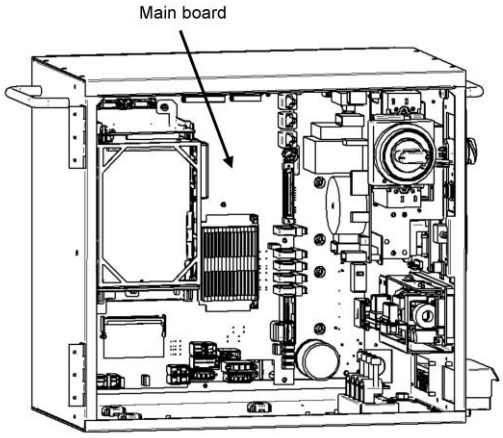


Figure 3.5-11 SRVO-055 FSSB com error 1/SRVO-056 FSSB com error 2/SRVO-057 FSSB disconnect/SRVO-058 FSSB init error

SRVO - 059 Servo amp init error (Group:i Axis:j)	
[Explanation]	Servo amplifier initialization is failed.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the main board.

SRVO - 062 BZAL alarm (Group:i Axis:j)	
[Explanation]	This alarm occurs if the battery for Pulsecoder absolute-position backup is empty. A probable cause is a broken battery cable or no batteries in the robot.
[Action 1]	Replace the battery in the battery box of the robot base.
[Action 2]	Replace the Pulsecoder for which an alarm has been issued.
[Action 3]	Check whether the mechanical unit cable for feeding battery power from the battery to the Pulsecoder is not disconnected and grounded. If an abnormality is found, replace the 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 - 064 PHAL alarm (Group:i Axis:j)	
[Explanation]	This alarm occurs if the phase of the pulses generated in the Pulsecoder is abnormal.

SRVO - 064 PHAL alarm (Group:i Axis:j)	
[Action]	Replace the Pulsecoder for which an alarm has been issued.

NOTE

This alarm might accompany the DTERR, CRCERR, or STBERR alarm. In this case, however, there may be no actual condition for this alarm.

SRVO - 065 BLAL alarm (Group:i Axis:j)	
[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 (Grp:i Ax:j)	
[Explanation]	The temperature inside the Pulsecoder or motor is abnormally high, and the built-in thermostat has operated.
[Action 1]	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.
[Action 2]	If the alarm still occurs when power is supplied to the motor after it has become sufficiently cool, replace the motor.

SRVO - 068 DTERR alarm (Grp:i Ax:j)	
[Explanation]	The serial Pulsecoder does not return the serial data in response to a request signal.
[Action 1]	Make sure that the robot connection cable connector (RMP) of interface unit and the connector (motor side) are connected tightly.
[Action 2]	Replace the Pulsecoder.
[Action 3]	Replace the robot connection cable (RMP).
Before executing [Action 4], perform a complete controller backup to save all your programs and settings.	
[Action 4]	Replace the main board.
[Action 5]	Replace the internal cable of the robot (Pulsecoder/Motor).

SRVO - 069 CRCERR alarm (Grp:i Ax:j)	
[Explanation]	The serial data is disturbed during communication.
[Action]	See actions on SRVO-068.

SRVO - 070 STBERR alarm (Grp:i Ax:j)	
[Explanation]	The start and stop bits of the serial data are abnormal.
[Action]	See actions on SRVO-068.

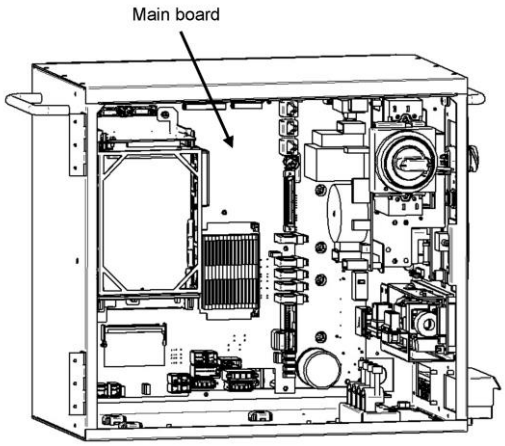


Figure 3.5-12 SRVO-059 Servo amp init error/SRVO-070 STBERR alarm

SRVO - 071 SPHAL alarm (Grp:i Ax:j)	
[Explanation]	The feedback speed is abnormally high.
[Action]	See actions on 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:i Axis:j)	
[Explanation]	It is likely that the Pulsecoder is abnormal.
[Action]	Replace the Pulsecoder, and remaster the robot.

SRVO - 073 CMAL alarm (Group:i Axis:j)	
[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 connection of the grounding wire between the controller and the robot.
[Action 2]	Reinforce the earth of the motor flange. (In case of Auxiliary axis)
[Action 3]	Reset the Pulse count.
[Action 4]	Replace the Pulsecoder.
[Action 5]	Replace the robot connection cable (RMP).
[Action 6]	Replace the internal cable of the robot (Pulsecoder/Motor).

SRVO - 074 LDAL alarm (Group:i Axis:j)	
[Explanation]	The LED in the Pulsecoder is broken.
[Action]	Replace the Pulsecoder, and remaster the robot.

SRVO - 075 Pulse not established (G:i A:j)	
[Explanation]	The absolute position of the Pulsecoder cannot be established.

SRVO - 075 Pulse not established (G:i A:j)	
[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:i A:j)	
[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 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 that the input voltage to the controller is within the rated voltage.
Before executing [Action 6], perform a complete controller backup to save all your programs and settings.	
[Action 6]	Replace the servo amplifier unit.
[Action 7]	Replace the corresponding servo motor.
[Action 8]	Replace the input unit.
[Action 9]	Replace the robot connection cable (RMP).
[Action 10]	Replace the internal cable of the robot (power/brake) in which the corresponding axis is connected.
[Action 11]	Replace the main board.
[Action 12]	Replace the side board.

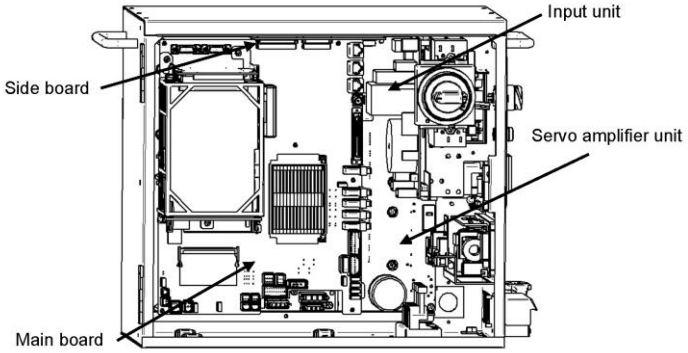


Figure 3.5-13 SRVO-076 Tip stick detection

SRVO - 084 BZAL alarm (Track enc:i)	
[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:i)	
[Explanation]	This alarm occurs if the voltage of the backup battery for the absolute position of the Pulsecoder is low.
[Action 1] See the description about the BLAL alarm (SRVO-065).	
[Action 2]	Replace the Pulsecoder for which an alarm has been issued.
[Action 3]	Check whether the mechanical unit cable for feeding battery power from the battery to the Pulsecoder is not disconnected and grounded. If an abnormality is found, replace the cable.

SRVO - 089 OHAL2 alarm (Track enc:i)	
[Explanation]	The motor has overheated.
[Action] If the alarm still occurs when power is supplied to the Pulsecoder after it has become sufficiently cool, replace the Pulsecoder.	

SRVO - 090 DTERR alarm (Track enc:i)	
[Explanation]	Communication between the Pulsecoder and main board is abnormal.
[Action 1]	Check the connection cable at each end (the main board and the Pulsecoder)
[Action 2]	Replace the Pulsecoder.
[Action 3]	Replace the line tracking cable.
Before executing [Action 4], perform a complete controller backup to save all your programs and settings.	
[Action 4]	Replace the main board.

SRVO - 091 CRCERR alarm (Track enc:i)	
[Explanation]	Communication between the Pulsecoder and main board is abnormal.
[Action]	See actions on SRVO-090.

SRVO - 092 STBERR alarm (Track enc:i)	
[Explanation]	Communication between the Pulsecoder and main board is abnormal.
[Action]	See actions on SRVO-090.

SRVO - 093 SPHAL alarm (Track enc:i)	
[Explanation]	This alarm occurs if the current position data from the Pulsecoder is higher than the previous position data.
[Action]	See actions on SRVO-090.

SRVO - 094 PMAL alarm (Track enc:i)	
[Explanation]	It is likely that the Pulsecoder is abnormal.
[Action]	Replace the Pulsecoder.

SRVO - 095 CMAL alarm (Track enc:i)	
[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 1]	Reinforce the earth of the flange of the Pulsecoder.
[Action 2]	Reset the Pulse count.
[Action 3]	Replace the Pulsecoder.
[Action 4]	Replace the line tracking cable.

SRVO - 096 LDAL alarm (Track enc:i)	
[Explanation]	The LED in the Pulsecoder is broken.
See the description about the LDAL alarm (SRVO-074).	

SRVO - 097 Pulse not established (Enc:i)	
[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 does not occur again. (Jog one motor revolution)

SRVO - 105 Door open or E.Stop	
[Explanation]	A short-time emergency stop signal is detected.
[Action 1]	Press [RESET] key.
Before executing [Action 2], perform a complete controller backup to save all your programs and settings.	
[Action 2]	Replace the main board.
[Action 3]	Replace the servo amplifier unit.
[Action 4]	Replace the side board.

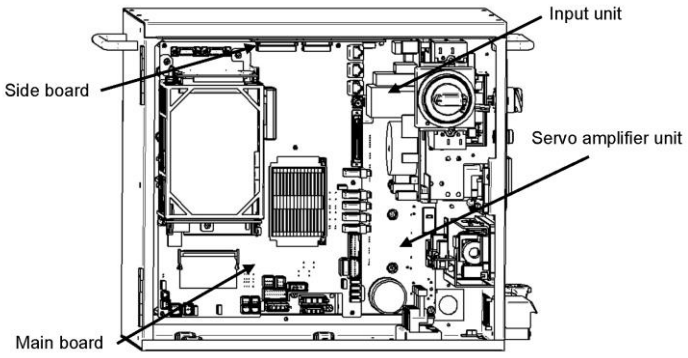


Figure 3.5-14 SRVO-105 Door open or E.Stop

SRVO - 123 Fan motor rev slow down(i)	
[Explanation]	The rotation speed of the fan motor is slowing down.
[Action 1]	Check the fan motor and its cables. Replace them if necessary.
Before executing the [Action 2], perform a complete controller back up to save all your programs and settings.	
[Action 2]	Replace the servo amplifier unit.
[Action 3]	Replace the main board.
[Action 4]	Replace the side board.

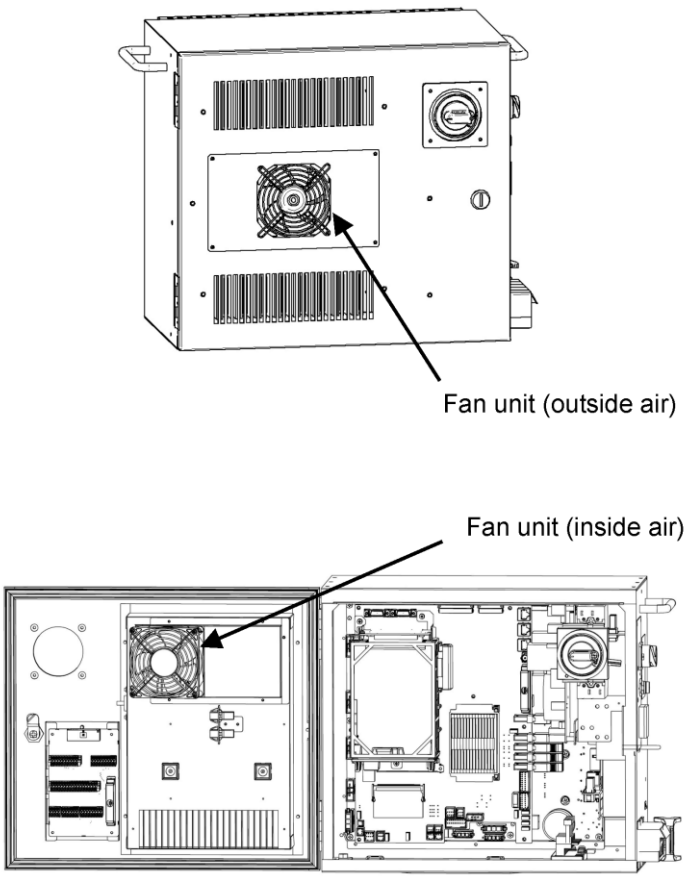


Figure 3.5-15 SRVO-123 Fan motor rev slow down(i)

SRVO - 134 DCLVAL alarm (G:i A:j)	
[Explanation]	The DC voltage (DC link voltage) of the main circuit power supply for the servo amplifier unit is abnormally low. This alarm may be issued when the robot operating condition is severe, or the input voltage is at the low level, or the impedance of the power source is too large, or the glitch of power source was occurred.
[Action 1]	Supply power again.
[Action 2]	Decrease the operating condition or reduce the payload of the robot.
[Action 3]	Check that the input voltage to the controller is within the rated voltage. (If the input voltage is too low, or the impedance of the power source is too large, it is possible to cause this alarm.)
[Action 4]	It is possible that a glitch in the power source has caused this alarm. Check whether there is a glitch in the power source.
[Action 5]	Replace the input unit.
Before executing [Action 6], perform a complete controller backup to save all your programs and settings.	
[Action 6]	Replace the servo amplifier unit.
[Action 7]	Replace the main board.
[Action 8]	Replace the side board.

SRVO - 156 IPMAL alarm (G:i A:j)	
[Explanation]	Abnormally high current flowed through the main circuit of the servo amplifier unit.
[Action 1]	See the description about the HC alarm (SRVO-045).

SRVO - 157 CHGAL alarm (G:i A:j)	
[Explanation]	The capacitor on the servo amplifier was not charged properly within the specified time when the servo power is on.
[Action 1]	Check that the input voltage to the controller is within the rated voltage.
[Action 2]	Make sure that the CRRA31 connector of the servo amplifier unit and input unit are connected tightly.
[Action 3]	Replace the input unit.
Before executing [Action 4], perform a complete controller backup to save all your programs and settings.	
[Action 4]	Replace the servo amplifier unit.
[Action 5]	Replace the main board.
[Action 6]	Replace the side board.

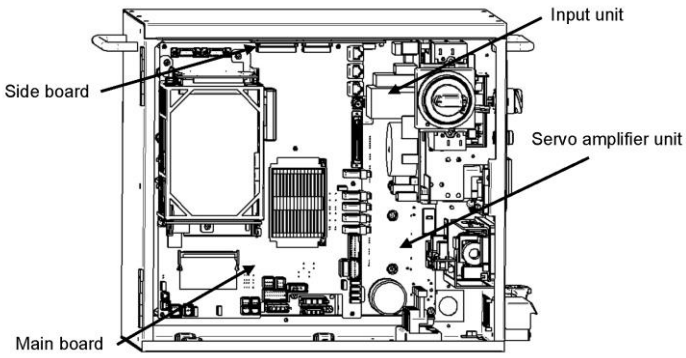


Figure 3.5-16 SRVO-156 IPMAL alarm/SRVO-157 CHGAL alarm

SRVO - 204 External (SVEMG abnormal) E-stop	
[Explanation]	The switch connected across EES1-24V-2 and EES2 - 0V on the JRM18 on the main board was pressed, but the EMERGENCY STOP line was not disconnected.
[Action 1]	Check the switch and cable connected to EES1-24V-2 and EES2 - 0V on the JRM18. If the cable is abnormal, replace it.
Before executing the [Action 2], perform a complete controller back up to save all your programs and settings.	
[Action 2]	Replace the main board.

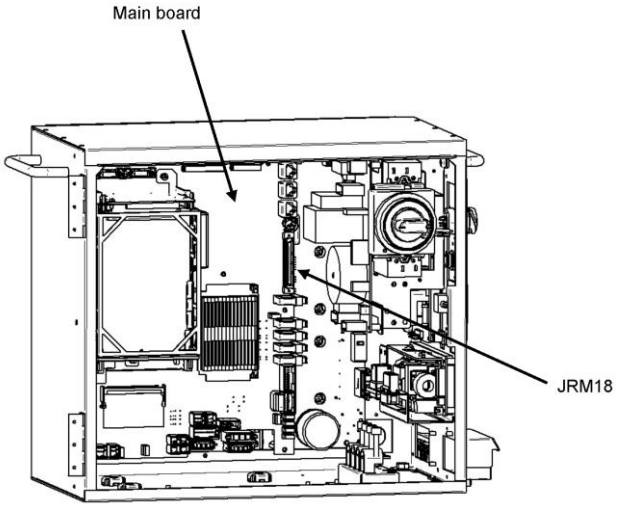


Figure 3.5-17 SRVO-204 External (SVEMG abnormal) E-stop

SRVO - 205 Fence open (SVEMG abnormal)	
[Explanation]	The switch connected across EAS1-24V-2 and EAS2-0V on the JRM18 on the main board was opened, but the EMERGENCY STOP line was not disconnected.
[Action 1]	Check the switch and cable connected to EAS1-24V-2 and EAS2-0V on the JRM18. If the cable is abnormal, replace it.
Before executing the [Action 2], perform a complete controller back up to save all your programs and settings.	
[Action 2]	Replace the main board.

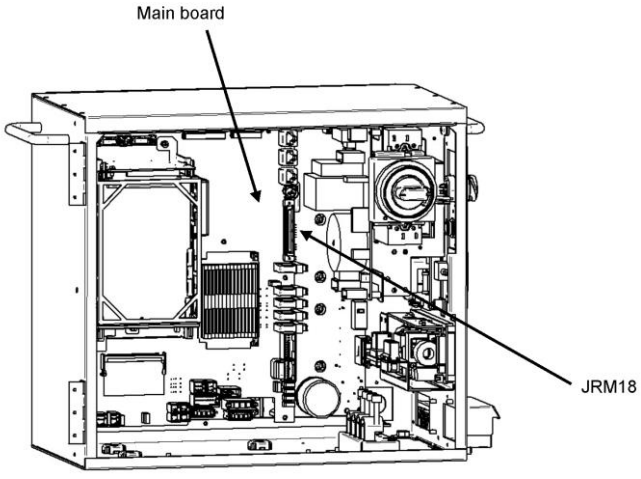


Figure 3.5-18 SRVO-205 Fence open (SVEMG abnormal)

SRVO - 206 Enabling device (Deadman switch) (SVEMG abnormal)	
[Explanation]	When the teach pendant was enabled, the enabling device (the deadman switch) was released or pressed strongly, but the emergency stop line was not disconnected.
[Action 1]	Replace the teach pendant.
[Action 2]	Check the teach pendant cable. If it is inferior, replace the cable.

SRVO - 206 Enabling device (Deadman switch) (SVEMG abnormal)	
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the main board.

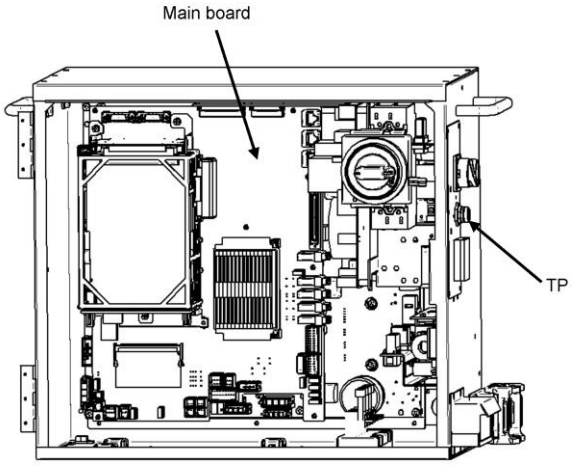


Figure 3.5-19 SRVO-206 Enabling device (Deadman switch) (SVEMG abnormal)

SRVO - 216 OVC (total) (Robot:i)	
[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 that the input voltage to the controller is within the rated voltage.
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the servo amplifier unit.
[Action 4]	Replace the main board.
[Action 5]	Replace the side board.

SRVO - 221 Lack of DSP (G:i A:j)	
[Explanation]	The set number of axes is not correct.
[Action 1]	Check whether the set number of axes is valid. If the number is invalid, set the correct number.
Before executing the [Action 2], perform a complete controller back up to save all your programs and settings.	
[Action 2]	Replace the main board.

SRVO - 223 DSP dry run (a, b)	
[Explanation]	A servo DSP initialization failure occurred due to hardware failure or wrong software setting. Then, the software entered DSP dry run mode. The first number indicates the cause of the failure. The second number is extra information.
[Action]	Perform an action according to the first number that is displayed in the alarm message. 1: This is a warning due to $scr.$startup_cnd=12. 2,3,4,7: Perform a complete controller back up to save all your programs and settings and then replace the main board. 5: Invalid ATR setting. Software axis config (FSSB line number, hardware start axis number, amplifier number, and amplifier type) might be wrong.

SRVO - 223 DSP dry run (a, b)	
	6: SRVO-180 occurs simultaneously. Controllable axis does not exist on any group. Execute aux axis setting to add axis at controlled start. 8,10: SRVO-058 (FSSB init error) occurs simultaneously. Follow the remedy of SRVO-058. 9: There is no amplifier that is detected. Perform the following: • Perform a complete controller backup to save all your programs and settings and then replace the main board. 11: Invalid axisorder setting. Non-existing axis number is specified. Software axis config (FSSB line number) might be wrong. 12: SRVO-059 (Servo amp init error) occurs simultaneously. Follow the remedy of SRVO-059. 13,14,15: Document the events that led to the error, and contact your FANUC technical representative.

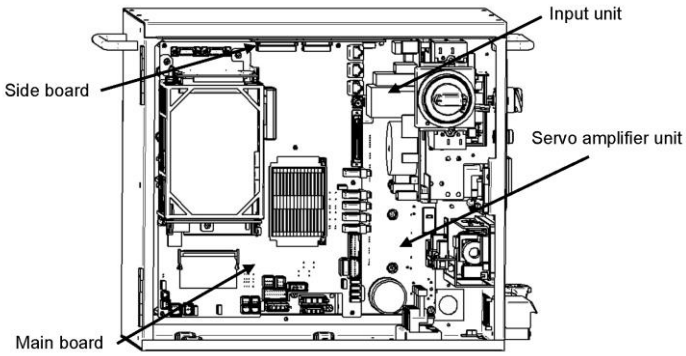


Figure 3.5-20 SRVO-216 OVC (total)/SRVO-221 Lack of DSP/SRVO-223 DSP dry run

SRVO - 228 RI/O fuse blown	
[Explanation]	A fuse (FUSE4) for protecting the +24V output of the end effector interface has blown.
[Action 1]	RI/O or 24VR and 0V may be short-circuited. Check the robot connection cable and end effector cable for any abnormality, and replace it if necessary.
Before executing the [Action 2], perform a complete controller back up as image to save all your programs and settings.	
[Action 2]	Replace the main board.

SRVO - 229 SDI fuse blown	
[Explanation]	A fuse (FUSE2) for protecting the +24V output of the peripheral device interface on the main board has blown.
[Action 1]	24SDI and 0 V may be short-circuited. Check the peripheral device cable for any abnormality, and replace it if necessary.
Before executing the [Action 2], perform a complete controller back up as image to save all your programs and settings.	
[Action 2]	Replace the main board.

SRVO - 230 Chain 1 abnormal a, b **SRVO - 231 Chain 2 abnormal a, b**	
[Explanation]	A mismatch occurred between duplicate safety signals.
SRVO-230 is issued if such a mismatch that a contact connected on the chain 1 side (between EES1 and 24V-2, between EAS1 and 24V-2, and so forth) is closed, and a contact on the chain 2 side (between EES2 and 0V, between EAS2 and 0V, and so forth) 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.	

SRVO - 230 Chain 1 abnormal a, b
SRVO - 231 Chain 2 abnormal a, b

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 that have been issued at the same time to identify the signal for which 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 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.

⚠CAUTION

1. The state of this alarm is retained by the 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.

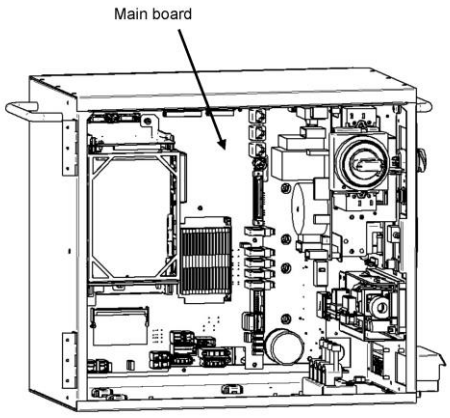


Figure 3.5-21 Fig.3.5 (u) SRVO-230 Chain 1 abnormal a, b/SRVO-231 Chain 2 abnormal a, b

Alarm history display method

1. Press the [MENU] 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 [MENU] 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)

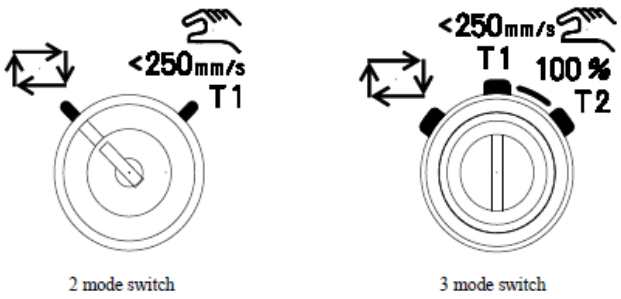
1. Press the [MENU] key on the teach pendant.
2. Select [4 ALARM] on the teach pendant.
3. Press F4 [CHAIN RESET] on the teach pendant.

SRVO - 233 TP OFF in T1/ T2	
[Explanation]	The teach pendant is disabled when the mode switch is T1 or T2.
[Action 1]	Enable the teach pendant in teaching operation. In other case the mode switch should be AUTO mode.
[Action 2]	Replace the teach pendant.
[Action 3]	Replace the teach pendant cable.
[Action 4]	Replace the mode switch.
Before executing the [Action 5], perform a complete controller back-up to save all your programs and settings.	
[Action 5]	Replace the main board.

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 emergency stop button.
[Action 1]	Make the same error occur again, and then perform resetting.
[Action 2]	Replace the input unit.
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the main board.

SRVO - 251 DB relay abnormal (G:i A:j)	
[Explanation]	An abnormality was detected in the internal relay (DB relay) of the servo amplifier.
[Action 1]	Replace the main board.
[Action 2]	Replace the side board.
[Action 3]	Replace the servo amplifier unit.

SRVO - 252 Current detect abnl (G:i A:j)	
[Explanation]	An abnormality was detected in the current detection circuit inside the servo amplifier.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the servo amplifier unit.
[Action 2]	Replace the main board.
[Action 3]	Replace the side board.



(Mode switch)

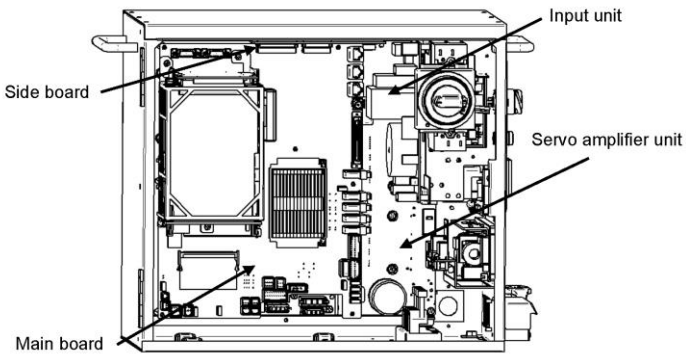


Figure 3.5-22 SRVO-233 TP OFF in T1/ T2/SRVO-235 Short-term chain abnormal/SRVO-251 DB relay abnormal/SRVO-252 Current detect abnl

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 specifications (See Fig.2.5.2 (b) in II CONNECTIONS).
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the 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.

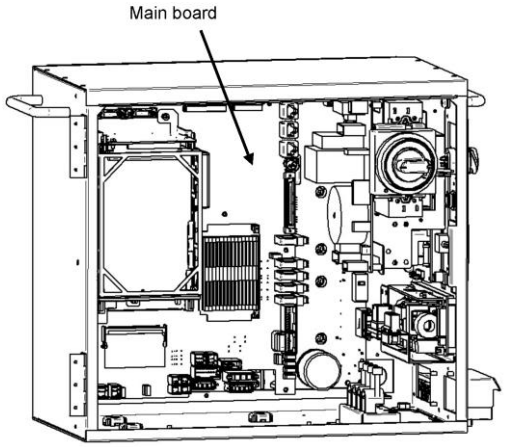


Figure 3.5-23 SRVO-266 FENCE1 status abnormal / SRVO-267 FENCE2 status abnormal

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 Fig.2.5.2 (b) in II CONNECTIONS).
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the 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.

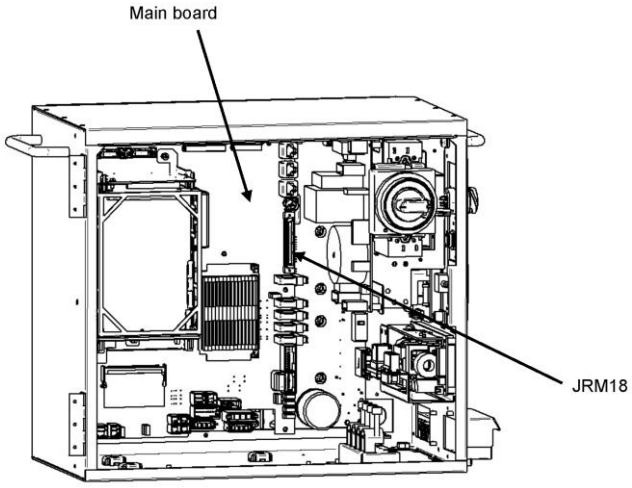


Figure 3.5-24 SRVO-270 EXEMG1 status abnormal / SRVO-271 EXEMG2 status abnormal

SRVO - 274 NTED1 status abnormal **SRVO - 275 NTED2 status abnormal**	
[Explanation]	A chain alarm was detected with the NTED signal.
[Action 1]	This alarm may be issued when the enabling device (the deadman switch) is pressed to the proper position or is operated very slowly. In such a case, release the enabling device (the deadman switch) once completely then press the enabling device (the deadman switch) again.
[Action 2]	Check whether the circuitry connected to the dual input signal (NTED) is faulty.
[Action 3]	Check whether the timing of the dual input signal (NTED) satisfies the timing specifications (See Fig.2.5.2 (b) in II CONNECTIONS).
[Action 4]	Confirm that the fuse (FUSE6) on the main board is not blown.
[Action 5]	Replace the teach pendant cable, NTED cable, and jumpers.
[Action 6]	Replace the teach pendant.
Before executing [Action 7], perform a complete controller backup to save all your programs and settings.	
[Action 7]	Replace the 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 - 277 Panel E-stop (SVEMG abnormal)	
[Explanation]	The emergency stop line was not disconnected even though the emergency stop button on the switch box was pressed.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the main board.
[Action 2]	Replace the switch box.

SRVO - 278 TP E-stop (SVEMG abnormal)	
[Explanation]	The emergency stop line was not disconnected even though the emergency stop button on the teach pendant was pressed.
[Action 1]	Replace the teach pendant.
[Action 2]	Replace the teach pendant cable, NTED cable, and jumpers.
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the main board.

NOTE

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

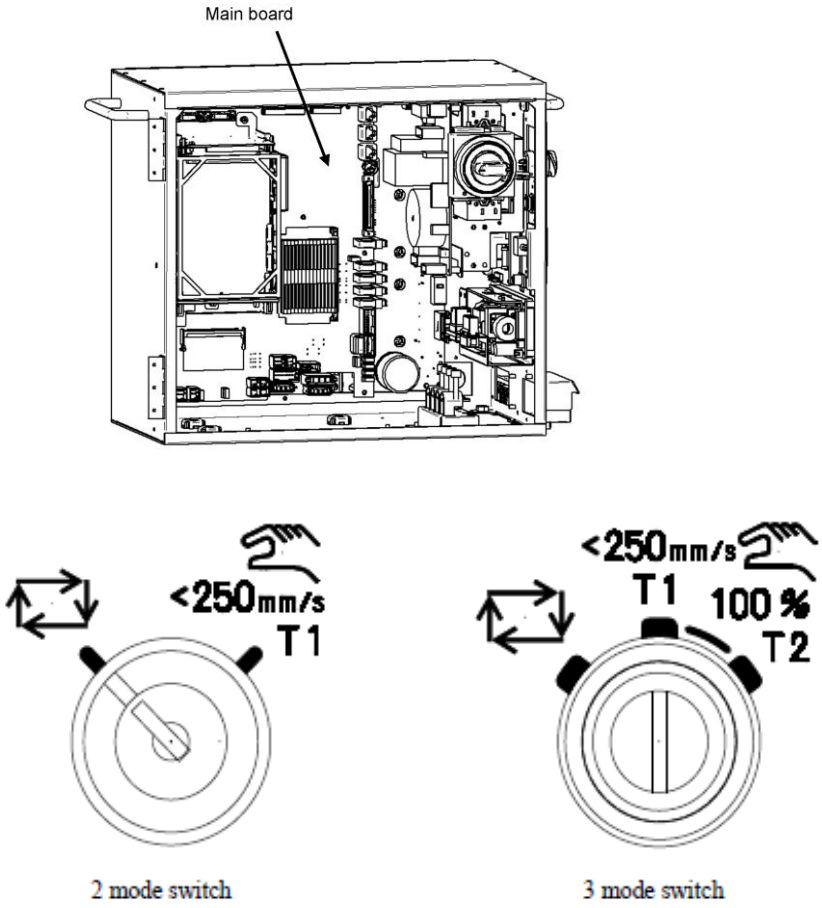


Figure 3.5-25 SRVO-274 NTED1 status abnormal/SRVO-275 NTED2 status abnormal/SRVO-277 Panel E-stop (SVEMG abnormal)/SRVO-278 TP E-stop (SVEMG abnormal)

SRVO - 291 IPM overheat (G:i A:j)	
[Explanation]	IPM on the servo amplifier unit is overheated.

SRVO - 291 IPM overheat (G:i A:j)	
[Action 1]	Check whether the vent hole is clogged. If necessary, clean 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.
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	If SRVO-291 is issued frequently, replace the servo amplifier unit.
[Action 4]	If SRVO-291 is issued frequently, replace the main board.
[Action 5]	If SRVO-291 is issued frequently, replace the side board.

SRVO - 295 Amp com error (G:i A:j)	
[Explanation]	A communication error occurred in the main board.
Before executing the [Action], perform a complete controller back-up to save all your programs and settings.	
[Action]	Replace the main board.

SRVO - 297 Input power source abnormal (G:i A:j)	
[Explanation]	The servo amplifier has detected an abnormality in the input power source.
[Action 1]	Check that the input voltage to the controller is within the rated voltage.
[Action 2]	Make sure that the CRRA31 connector of the servo amplifier unit and input unit are connected tightly.
[Action 3]	Replace the input unit.
Before executing [Action 4], perform a complete controller backup to save all your programs and settings.	
[Action 4]	Replace the servo amplifier unit.
[Action 5]	Replace the main board.
[Action 6]	Replace the side board.

SRVO - 335 DCS OFFCHK alarm a, b	
[Explanation]	A failure was detected in the safety signal input circuit.
Before executing the [Action], perform a complete controller back-up to save all your programs and settings.	
[Action]	Replace the main board.

SRVO - 348 DCS MCC OFF alarm a,b	
[Explanation]	A command was issued to turn off the magnetic contactor, but the magnetic contactor was not turned off.
[Action 1]	Make sure that the connector CRMB79 (servo amplifier unit) is securely attached to the servo amplifier.
[Action 2]	Replace the input unit.
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the main board.

SRVO - 349 DCS MCC ON alarm a,b	
[Explanation]	A command was issued to turn on the magnetic contactor, but the magnetic contactor was not turned on.

SRVO - 349 DCS MCC ON alarm a,b	
[Action 1]	Make sure that the connector CRMB79 (main board, input unit) is securely attached to the main board.
[Action 2]	Replace the input unit.
Before executing the [Action 3], perform a complete controller backup to save all your programs and settings.	
[Action 3]	Replace the 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).
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the 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.

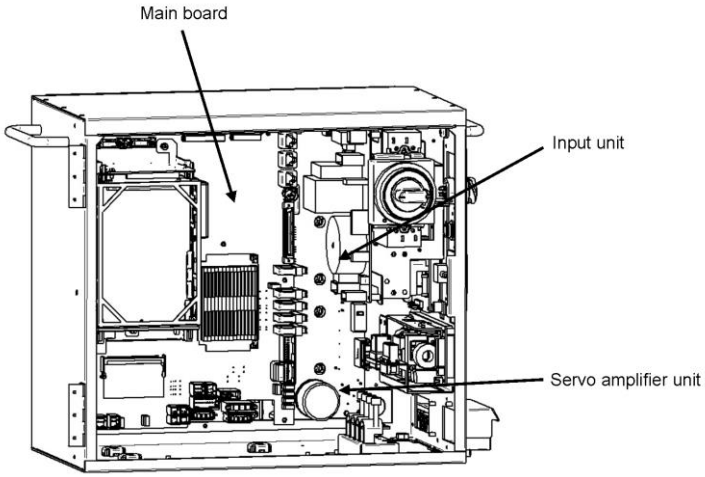


Figure 3.5-26 SRVO-291 IPM overheat/SRVO-295 Amp com error/SRVO-335 DCS OFFCHK alarm a,b/SRVO-348 DCS MCC OFF alarm a,b/SRVO-349 DCS MCC ON alarm a,b/SRVO-370 SVON1 status abnormal/SRVO-371 SVON2 status abnormal

SRVO - 372 OPEMG1 status abnormal **SRVO - 373 OPEMG2 status abnormal**	
[Explanation]	A chain alarm was detected with the emergency stop button on the switch box.
[Action 1]	Check the emergency stop button on the switch box and its cable. Replace them if a defect is found.

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

Before executing the [Action 2], perform a complete controller back up to save all your programs and settings.
[Action 2] Replace the 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 - 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.

[Action 1] Check the mode switch or switch box and its cable. Replace them if a defect is found.

Before executing the [Action 2], perform a complete controller back up to save all your programs and settings.
[Action 2] Replace the 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.

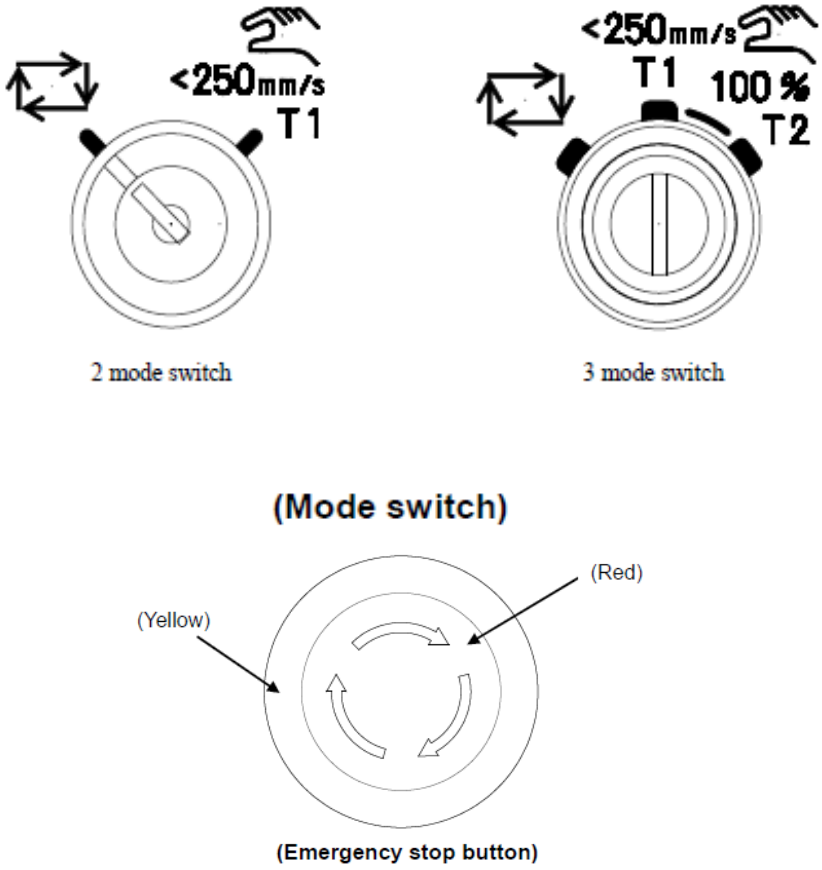


Figure 3.5-27 SRVO-372 OPEMG1 status abnormal/SRVO-373 OPEMG2 status abnormal/SRVO-374 MODE11 status abnormal/SRVO-375 MODE12 status abnormal/SRVO-376 MODE21 status abnormal/SRVO-377 MODE22 status abnormal

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 Fig.2.5.2 (b) in II CONNECTIONS).

⚠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.

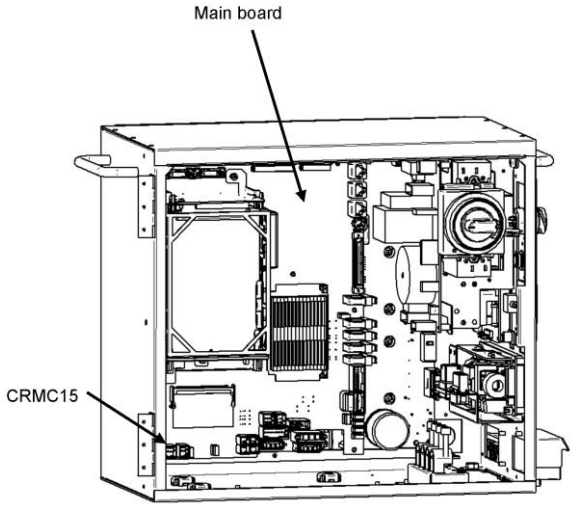


Figure 3.5-28 SRVO-378 SFDIxx status abnormal

SRVO - 450 Drvoff circuit fail (G:i A:j)	
[Explanation]	An error is found in the emergency stop circuit in the main board.
Before executing the [Action], perform a complete controller back-up to save all your programs and settings.	
[Action]	Replace the main board.

SRVO - 451 Internal S-BUS fail (G:i A:j)	
[Explanation]	An error is found in the serial bus communication.
Before executing the [Action], perform a complete controller back-up to save all your programs and settings.	
[Action]	See actions on SRVO-452.

SRVO - 452 ROM data failure (G:i A:j)	
[Explanation]	An error is found in the ROM data in the servo amplifier unit.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the servo amplifier unit.
[Action 2]	Replace the main board.
[Action 3]	Replace the side board.

SRVO - 453 Low volt driver (G:i A:j)	
[Explanation]	Driver supply voltage in the servo amplifier unit is low.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the servo amplifier unit.
[Action 2]	Replace the main board.
[Action 3]	Replace the side board.

SRVO - 454 CPU BUS failure (G:i A:j)	
[Explanation]	An error was found in the CPU bus data in the main board.
Before executing the [Action], perform a complete controller back-up to save all your programs and settings.	

SRVO - 454 CPU BUS failure (G:i A:j)	
[Action]	Replace the main board.

SRVO - 455 CPU watch dog (G:i A:j)	
[Explanation]	An error occurred in CPU operation in the main board.
Before executing the [Action], perform a complete controller back-up to save all your programs and settings.	
[Action]	Replace the main board.

SRVO - 459 Excess regeneration2 (G:i A:j)	
[Explanation]	An error is found in the discharge circuit in the servo amplifier.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the servo amplifier unit.
[Action 2]	Replace the main board.
[Action 3]	Replace the side board.

SRVO - 461 Hardware error (G:i A:j)	
[Explanation]	An error is found in the circuit.
Before executing [Action 1], perform a complete controller backup to save all your programs and settings.	
[Action 1]	Replace the main board.
[Action 2]	Replace the servo amplifier unit.
[Action 3]	Replace the side board.

SRVO - 503 Sensor alarm %x,%x	
[Explanation]	An abnormality has occurred in a sensor inside the robot.
[Action 1]	If the power supply is turned on, off, and then on again in a short time using the breaker, this alarm may occur. In this case, wait for at least 10 seconds after the controller's power is turned off before turning it on again.
[Action 2]	Confirm that the fuse (FUSE10) on the main board is not blown.
[Action 3]	Check the robot connection cable for any abnormality, and replace it if necessary.
[Action 4]	Replace the side board.
Before executing the [Action 5], perform a complete controller back-up to save all your programs and settings.	
[Action 5]	Replace the main board. If the alarm cannot be reset, contact your technical representative and inform them of the alarm message that is displayed.

SRVO - 504 Sensor type error	
[Explanation]	An abnormality has occurred in a sensor inside the robot.
[Action]	Cycle the controller's power. If the alarm cannot be reset, contact your technical representative and inform them of the alarm message that is displayed.

SRVO - 505 Sens temp change too large	
[Explanation]	The temperature has changed too fast in a sensor inside the robot.

SRVO - 505 Sens temp change too large	
[Action]	Check to see whether or not the environmental temperature has changed rapidly, and cycle the controller's power. If the alarm cannot be reset, contact your technical representative and inform them of the alarm message that is displayed.

SRVO - 601 TP/OP E-stop	
[Explanation]	The emergency stop button on the teach pendant (tablet TP) or operator's panel was pressed.
[Action 1]	Release the emergency stop button on the teach pendant (tablet TP) or operator's panel.
[Action 2]	Check the voltage between 24VEXT and 0VEXT. When the voltage becomes low, confirm that the fuse (FUSE6) on the front board is not blown.
[Action 3]	Check the wires connecting the switch box and the main board (JRT3) for a ground fault. If an open wire is found, replace the entire harness.
[Action 4]	Check the wires connecting the teach pendant and the main board (JRS36) for a ground fault. If an open wire is found, replace the entire harness.
[Action 5]	With the emergency stop in the released position, check for continuity across the terminals of the switch. If continuity is not found, the emergency stop button is broken. Replace the switch box.
[Action 6]	Replace the teach pendant (tablet TP).
Before executing the [Action 7], perform a complete controller back up to save all your programs and settings.	
[Action 7]	Replace the main board.

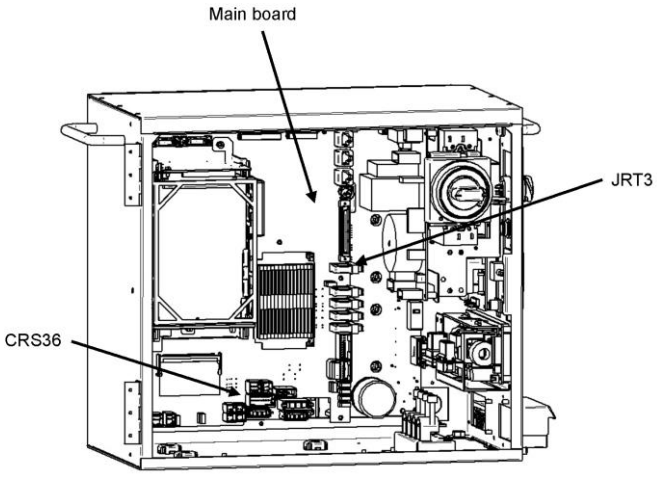


Figure 3.5-29 SRVO-601 TP/OP E-stop

SRVO - 602 Teach pendant/external E-stop	
[Explanation]	The emergency stop button on the teach pendant (tablet TP) or the external emergency stop was pressed.
[Action 1]	Release the emergency stop button on the teach pendant (tablet TP) or the external emergency stop.
[Action 2]	Replace the teach pendant (tablet TP).

PRIO - 095 Overload <Connector>	
[Explanation]	The DO of the specified connector might be grounded.
[Action 1]	Check the connection of the DO of the specified connector.

PRIO - 095 Overload <Connector>
Before executing [Action 2], perform a complete controller backup to save all your programs and settings. [Action 2] Replace the main board.

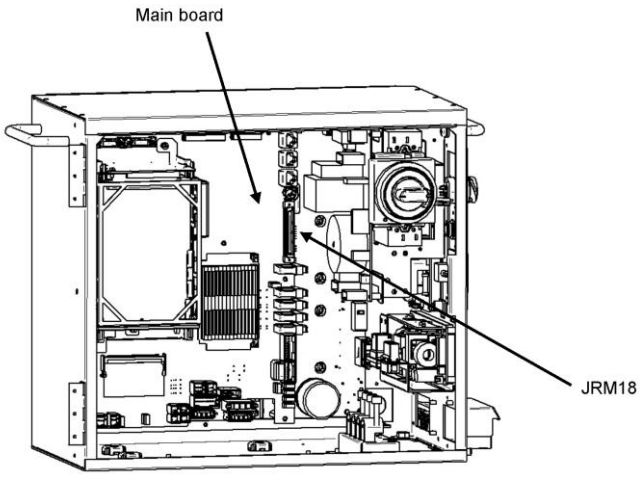


Figure 3.5-30 PRIO-095 Overload

3.6. FUSE-BASED TROUBLESHOOTING

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

Fuses on the input board

FUSE1: For protecting the 200V power monitoring circuit (A60L-0001-0175#0.3A)

Name	Symptom observed when fuse has blown	Action to be taken
FUSE 1	The teach pendant becomes inoperable, and “7” is displayed on the 7-segment LED. When the fuse has blown at power on, the LEDG2 and LEDG4 of the status indicator LED are turned on, and the unit does not turn on correctly.	1. Excess voltage may have been applied to the input unit. Check the input power voltage for abnormalities. 2. Replace the input unit.

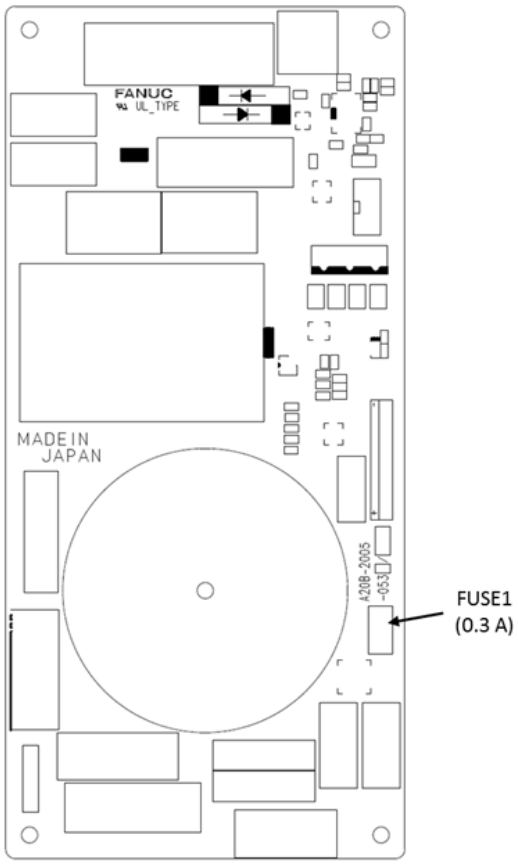


Figure 3.6-1 Fuses on the input board

Fuses on the main board

FUSE2:	For protecting the +24 V output for the peripheral device interface	(A60L-0001-0290#LM10C)
FUSE3:	For protecting the emergency stop circuit	(A60L-0001-0290#LM10C)
FUSE4:	For protecting the +24V for the robot EE	(A60L-0001-0290#LM20C)
FUSE5:	For protecting the +5V for the Pulscoder	(A60L-0001-0290#LM20C)
FUSE6:	For protecting the +24V for the teach pendant	(A60L-0001-0290#LM10C)
FUSE7:	For protecting the +24E output for vision	(A60L-0001-0290#LM10C)
FUSE8:	For +24V of mainboard protection	(A60L-0001-0046#6.3)
FUSE9:	For protecting the +24 V output for the servo amplifier unit board	(A60L-0001-0290#LM20C)
FUSE10:	For protecting the +24V for the Collaborative Robot's sensor	(A60L-0001-0290#LM10C)
FUSE11:	For protecting the +30V for the tool I/F	(A60L-0001-0290#LM50C)

Name	Symptom observed when fuse has blown	Action to be taken
FUSE 2	Alarm (SRVO-229) 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 the JRM18 connector. If the alarm still occurs, replace the main board. (NOTE)
FUSE 3	Alarm (SRVO-001) is displayed on the teach pendant and the alarm condition cannot be reset.	1. Check the voltage between EXT24V and EXT0V (JRM18). If no external power supply is used, check the connection between EXT24V and 24V-2 or between EXT0V and 0V. 2. Check the 24EXT (emergency stop line) for a short circuit or connection to ground.

Name	Symptom observed when fuse has blown	Action to be taken
		3. Check the teach pendant cable and replace it if necessary. 4. Check the teach pendant and replace it if necessary. 5. Replace the switch box. 6. Replace the main board. (NOTE)
FUSE 4	Alarm (SRVO-228) is displayed on the teach pendant. RI/RO signals assigned to robot EE connector are abnormal.	1. Check the RI/RO signal cable for any abnormality, and replace it if necessary. 2. Replace the robot connection cable. 3. Replace the internal cable of the robot. 4. Replace the main board. (NOTE)
FUSE 5	An alarm (SRVO-068) is displayed	1. See the description about (SRVO-068).
FUSE 6	The display on the teach pendant disappears.	1. Check the teach pendant cable and replace it if necessary. 2. Check the teach pendant and replace it if necessary.
FUSE 7	+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, and replace it if necessary. 3. Replace the main board. (NOTE)
FUSE 8	The teach pendant cannot be operated and the red LED (FU24V1) on the main board lights.	1. Check the cable between the input unit (CRMB79) and the main board (CRMB79), and replace it if necessary. 2. Replace the input unit. 3. Replace the main board. (NOTE) 4. Replace the option (mini) slot. 5. Replace the backplane board. (NOTE)
FUSE 9	Fan motor abnormal alarm and fuse blown alarm occur.	1. Replace the fan unit. 2. Replace the servo amplifier unit. (NOTE) 3. Replace the side board. 4. Replace the main board. (NOTE)
FUSE 10	If the contact stop function is enabled, an alarm (SRVO-503) is displayed on the teach pendant.	1. Check the robot connection cable for any abnormality, and replace it if necessary. 2. Replace the internal cable of the robot. 3. Replace the sensor inside the robot. 4. Replace the main board. (NOTE)
FUSE 11	An alarm (HOST-424 or HOST-425) is displayed on the teach pendant.	1. Check the robot connection cable for any abnormality, and replace it if necessary. 2. Replace the internal cable of the robot. 3. Replace the tool I/F board inside the robot. 4. Replace the main board. (NOTE)

NOTE

If the main board or the backplane board is removed, the contents of the memory (parameters, specified data, etc.) will be lost. Therefore, make a backup copy of the data before you replace the unit.

If an alarm is issued, it might be impossible to make a backup copy of the data, so back up the contents of memory routinely.

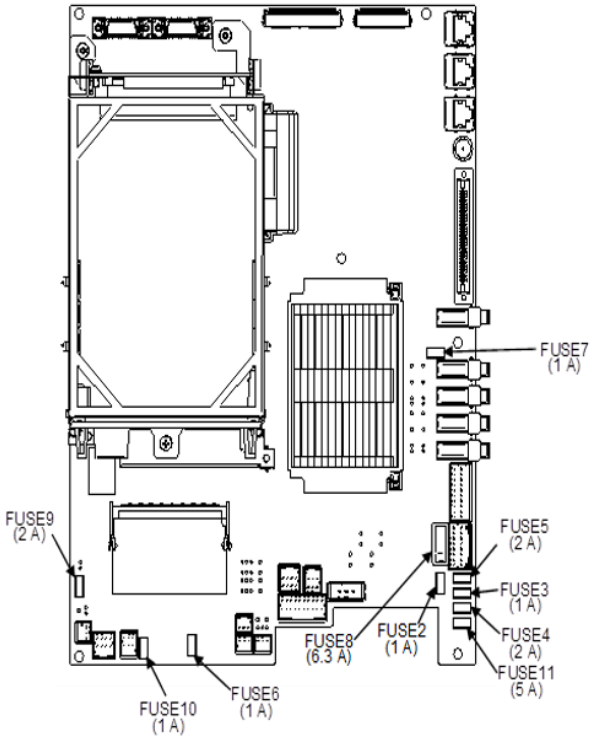


Figure 3.6-2 Fuses on the main board

3.7. 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.

3.7.1. Troubleshooting Using the LEDS on the Main Board

1. Troubleshooting based on status display LED indications

   To troubleshoot an alarm that arises before the teach pendant is ready to display information, 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.

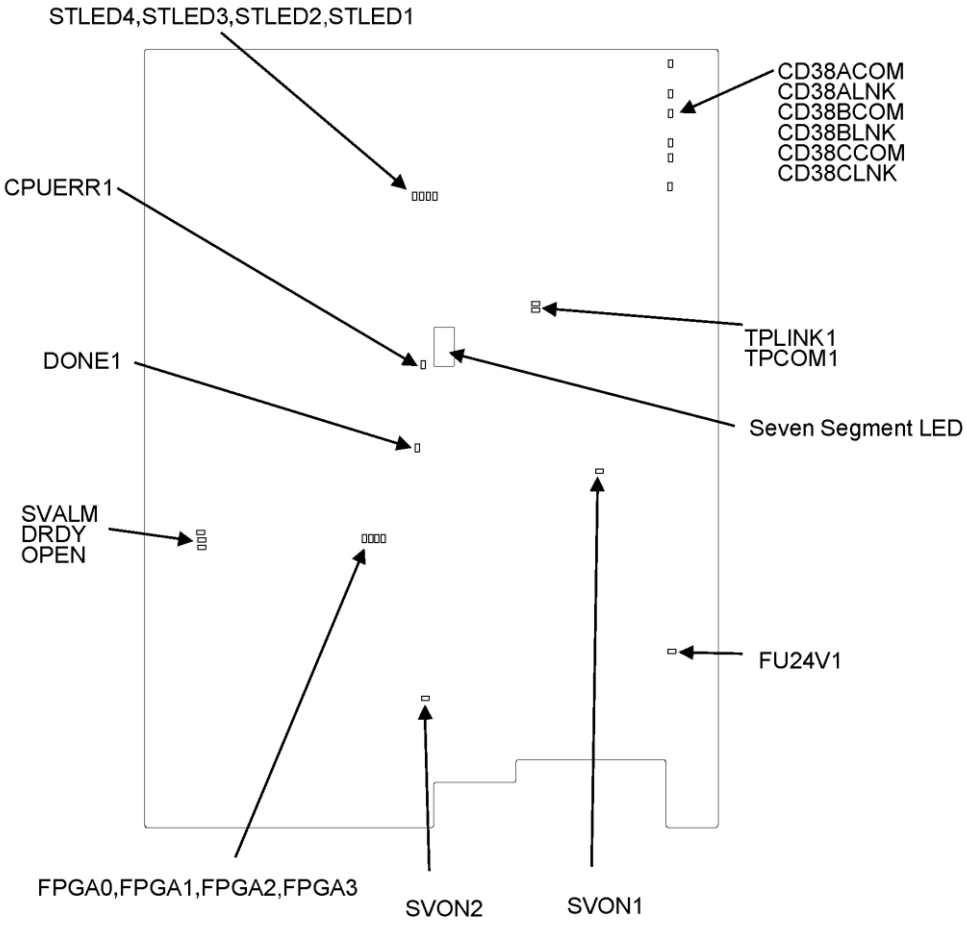


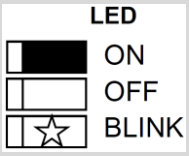
Figure 3.7.1-1 LED on the main board

Step	LED indications LED ON OFF BLINK	Action to be taken
1: After power-on, all LEDs are lit.	STLED4 STLED3 STLED2 STLED1	[Action1] Replace the CPU card. (NOTE) [Action2] Replace the main board. (NOTE)

Step	LED indications LED ON OFF BLINK	Action to be taken
2: Software operation start-up.	STLED4 STLED3 STLED2 STLED1	[Action1] Replace the CPU card. (NOTE) [Action2] Replace the main board. (NOTE)
3: The initialization of dram on the CPU card is completed.	STLED4 STLED3 STLED2 STLED1	[Action1] Replace the CPU card. (NOTE) [Action2] Replace the main board. (NOTE)
4: The initialization of DRAM on the communication IC is completed.	STLED4 STLED3 STLED2 STLED1	[Action1] Replace the CPU card. (NOTE) [Action2] Replace the main board. (NOTE) [Action 3] Replace the FROM/SRAM module. (NOTE)
5: The initialization of the communication IC is completed.	STLED4 STLED3 STLED2 STLED1	[Action1] Replace the CPU card. (NOTE) [Action2] Replace the main board. (NOTE) [Action 3] Replace the FROM/SRAM module. (NOTE)
6: The loading of the basic software is completed.	STLED4 STLED3 STLED2 STLED1	[Action 1] Replace the main board. (NOTE) [Action 2] Replace the FROM/SRAM module. (NOTE)

Step	LED indications LED ON OFF BLINK	Action to be taken
7: Basic software start-up.	STLED4 STLED3 STLED2 STLED1	[Action 1] Replace the main board. (NOTE) [Action 2] Replace the FROM/SRAM module. (NOTE) [Action 3] Replace the FUSE1 on the input board. [Action 4] Replace the input unit.
8: Start-up of communication with the teach pendant.	STLED4 STLED3 STLED2 STLED1	[Action 1] Replace the main board. (NOTE) [Action 2] Replace the FROM/SRAM module. (NOTE)
9: The loading of optional software is completed.	STLED4 STLED3 STLED2 STLED1	[Action 1] Replace the main board. (NOTE) [Action 2] Please check the equipment connected to JRS26 (I/O Link).
10: DI/DO initialization	STLED4 STLED3 STLED2 STLED1	[Action1] Replace the FROM/SRAM module. (NOTE) [Action2] Replace the main board. (NOTE)
11: The preparation of the SRAM module is completed.	STLED4 STLED3 STLED2 STLED1	[Action 1] Replace the main board. (NOTE)

Step	LED indications	Action to be taken
	LED ON OFF BLINK	
12: Axis control circuit initialization		[Action 1] Replace the main board. (NOTE)
13: Calibration is completed.		[Action 1] Replace the main board. (NOTE)
14: Start-up of power application for the servo system		[Action 1] Replace the main board. (NOTE)
15: Program execution		[Action 1] Replace the main board. (NOTE) [Action 2] Please check the equipment connected to JRS26(I/O Link).
16: DI/DO output start-up.		[Action 1] Replace the main board. (NOTE)

Step	LED indications 	Action to be taken
17: Initialization is terminated.		Initialization has ended normally.
18: Normal status		Status LEDs 1 and 2 blink when the system is operating normally.

NOTE

If the main board or CPU card or FROM/SRAM module is removed, the contents of the memory (parameters, specified data, etc.) will be lost. Therefore, make a backup copy of the data before you replace the unit. If an alarm is issued, it might be impossible to make a backup copy of the data, so back up the contents of memory routinely.

LED name	Description
CPUERR1 (Red)	[Description] CPU card is not working. [Action1] Replace the CPU card. (NOTE)
FU24V1 (Red)	[Description] When the LED (red) was lit, the fuse (FUSE8) is brown. 24V-1 for the main board is not supplied. [Action 1] Check the cable between the input unit (CRMB79) and the main board (CRMB79), and replace it if necessary. [Action 2] Replace the input unit. [Action 3] Replace the main board. (NOTE) [Action 4] Replace the option (mini) slot. [Action 5] Replace the backplane board. (NOTE)
SVON1/SVON2 (Green)	[Description] These LEDs (green) indicate the status of SVON1/SVON2 signals from the main board to the servo amplifier unit. When the SVON1 and SVON2 (green) turned on, the servo amplifier unit is ready to energize. When the SVON1 and SVON2 (green) turned off, the robot is in an emergency stop state.
SVALM (Red)	[Description] Lights up when the servo amplifier unit or main board detects an alarm . If the LED lights when there is no alarm condition in the machine: [Action] Replace the main board. (NOTE)
DRDY (Green)	[Description] Lights up when the servo amplifier unit is ready to drive the servo motor. If the LED does not light when the motor is activated: [Action] Replace the main board. (NOTE)
OPEN (Green)	[Description] Lights up when the communication in the main board is normal. If the LED does not light:

LED name	Description
	[Action] Replace the main board. (NOTE)
FPGA0/FPGA1/ FPGA2/FPGA3 (Green)	[Description] These LEDs indicate the status of the FPGA for vision.
DONE1 (Red)	

NOTE

If the main board or CPU card or the backplane board is removed, the contents of the memory (parameters, specified data, etc.) will be lost. Therefore, make a backup copy of the data before you replace the unit.
If an alarm is issued, it might be impossible to make a backup copy of the data, so back up the contents of memory routinely.

2. Troubleshooting by 7-segment LED Indicator

LED indications	Description
	[Description] A parity alarm condition has occurred in the DRAM on the CPU card installed on the main board. [Action1] Replace the CPU card. [Action2] Replace the main board. (NOTE)
	[Description] A parity alarm condition has occurred in the SRAM on the FROM/SRAM module installed on the main board. [Action1] Replace the FROM/SRAM module. (NOTE) [Action2] Replace the main board. (NOTE)
	[Description] A bus error has occurred in the communication controller. [Action] Replace the main board. (NOTE)
	[Description] A parity alarm condition has occurred in the DRAM controlled by the communication controller. [Action] Replace the main board. (NOTE)
	[Description] A servo alarm condition has occurred on the main board. [Action 1] Replace the main board. (NOTE) [Action2] If an option board is installed, replace the option board.
	[Description] The SYSEMG alarm has occurred. [Action1] Replace the CPU card. [Action2] Replace the main board. (NOTE)
	[Description] The SYSFAIL alarm has occurred. [Action1] Replace the CPU card. [Action2] Replace the main board. (NOTE) [Action 3] Replace the FUSE1 on the input board. [Action 4] Replace the input unit. [Action 5] If an option board is installed, replace the option board.
	[Description] 5V is supplied to the main board and the above alarms do not occur.

NOTE

If the main board or FROM/SRAM module is replaced, the contents of the memory (parameters, specified data, etc.) will be lost. Therefore, make a backup copy of the data before you replace the unit.
If an alarm is issued, it might be impossible to make a backup copy of the data, so back up the contents of memory routinely.

3.7.2. Troubleshooting by LEDs on the Servo Amplifier Unit

The servo amplifier unit has an LED to monitor the DCLINK circuit. Before the maintenance of the servo amplifier unit, check that the LED is turned off.

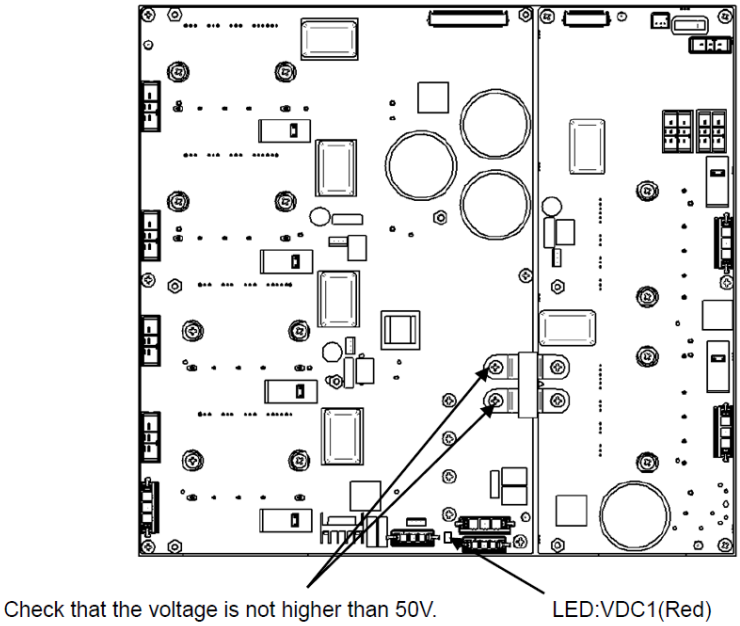


Figure 3.7.2-1 LEDs of the Servo Amplifier Unit

⚠CAUTION
Before touching the servo amplifier unit, check the DC link voltage with the screws located above the LED "VDC1". By using a DC voltage tester, check that the voltage is 50 V or less.

LEDs	Color	Description
VDC1	Red	Lights when the DCLINK circuit inside the servo amplifier unit 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 input unit. [Action 3] Replace the servo amplifier unit. (NOTE)

NOTE
If the main board is removed, the contents of the memory (parameters, specified data, etc.) will be lost. Therefore, make a backup copy of the data before you replace the unit. If an alarm is issued, it might be impossible to make a backup copy of the data, so back up the contents of memory routinely.

3.7.3. Troubleshooting Using the LEDS on the Side Board

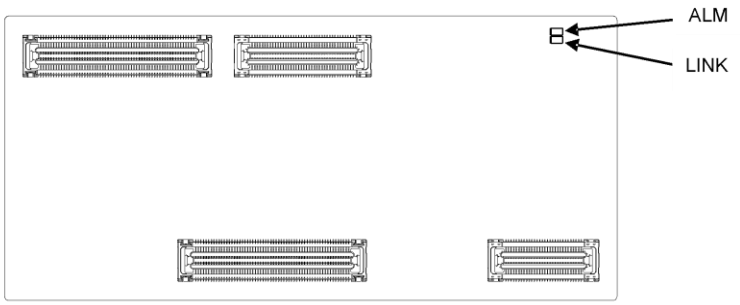


Figure 3.7.3-1 LED on the side board

LEDs	Color	Description
LINK	Green	[Description] Refer to the section "LEDs on units supporting I/O Link i ." If the LINK is blinking (1:1 at high speed), communication halts because this is an alarm. [Action 1] Identify the cause based on the state of ALM LED (red) listed below, as well as the information displayed on the teach pendant.
ALM	Red	[Description] Refer to the section "LEDs on units supporting I/O Link i ." [1] If the ALM is on, It is likely that the hardware may be defective. [Action 1] Replace the side board. [Action2] Replace the main board. (NOTE) [2] If the ALM is blinking (1:1), communication with the unit connected to the main board's I/O Link i halts. The cable may also be affected by noise. [Action 1] Make sure that the connector between the main board and the side board is connected. [Action 2] Check the cable connected between the unit and the main board's I/O Link i, and replace it if necessary. [Action 3] Replace the unit connected to the main board's I/O Link i. [Action 4] Replace the side board. [Action 5] Replace the main board. (NOTE) [3] If the ALM is blinking (3:1), a power abnormality has occurred in the unit connected to the main board's I/O Link i. [Action 1] Check the fuse in the unit connected to the main board's I/O Link i, and replace it if it has blown. [Action 2] Replace the unit connected to the main board's I/O Link i. [Action 3] Replace the main board. (NOTE)

NOTE

If the main board is removed, the contents of the memory (parameters, specified data, etc.) will be lost. Therefore, make a backup copy of the data before you replace the unit.

If an alarm is issued, it might be impossible to make a backup copy of the data, so back up the contents of memory routinely.

3.8. 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. Checks and corrective actions to be made if manual operation is impossible

	Description	Action
1	Check whether the teach pendant is enabled.	Turn on the teach pendant.

	Description	Action
2	Check whether the teach pendant is handled correctly.	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.
3	Check whether the ENBL signal of the peripheral device control interface is set to on.	Put the peripheral-device control interface in the ENBL state.
4	Check whether the HOLD signal of the peripheral device control interface (hold status) is on. (Check whether the hold lamp on the teach pendant is on.)	If the HOLD signal of the peripheral device control interface is on, turn it off.
5	Check whether the previous manual operation has been completed.	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.
6	Check whether the controller is in the alarm status.	Release the alarm.

2. Checks and corrective actions to be taken if the program cannot be executed

	Description	Action
1	Check whether the ENBL signal for the peripheral-device control interface is on.	Put the peripheral-device control interface in the ENBL state.
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.	If the HOLD signal of the peripheral device control interface is on, turn it off.
3	Check whether the previous manual operation has been completed.	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.
4	Check whether the controller is in the alarm status.	Release the alarm.

3.9. LEDS ON UNITS SUPPORTING I/O Link i

3.9.1. Meanings of LEDs on Units Supporting I/O Link i

The standard I/O Link i incorporates three LEDs ("LINK" (green), "ALM" (red), and "FUSE" (red)) for each unit separately. These LEDs indicate the states of the units.

The following table lists the ON/OFF states of the LEDs and their meanings.

LED ON/OFF state	ON and OFF duration
OFF	
ON	
Blink (1:1)	ON = approx. 0.5 sec, OFF = approx. 0.5 sec
Blink (3:1)	ON = approx. 1.5 sec, OFF = approx. 0.5 sec
Blink (1:3)	ON = approx. 0.5 sec, OFF = approx. 1.5 sec
Blink (1:1 at high speed)	ON = approx. 0.25 sec, OFF = approx. 0.25 sec

LED [**LINK**] **(**green**)**

The "LINK" (green) LED indicates the state of communication. The following table lists the meanings of LED states.

Operation mode	LED state	Meaning	Fault location and action
Common	OFF	Power OFF	
	ON	Power ON	

Operation mode	LED state	Meaning	Fault location and action
		(before communication start)	
	Blink (1:1 at high speed)	Communication at halt	Communication is at halt because of an alarm. Identify the cause according to the states of the red LED stated below or information displayed on the controller screen.
I/O Link	Blink (1:3)	Communication in progress	
I/O Link i	Blink (1:1)	Communication in progress	
	Blink (3:1)	Communication in progress (Dual check safety in use)	

LED [**ALM**] **(**red**)**

The "ALM" (red) LED indicates an alarm in the unit of interest or a unit subsequent to it. The following table lists the meanings of LED states.

Operation mode	LED state	Meaning	Fault location and action
Common	OFF	Normal state or power OFF	
I/O Link	ON	Alarm	It is likely that the hardware may be defective. Replace the unit.
I/O Link i	ON	Alarm	It is likely that the hardware may be defective. Replace the unit.
	Blink (1:1)	Broken wire between the unit of interest and a unit subsequent to it	Check for a defective cable or a poor cable connection between JD1A on the relevant unit and JD1B on a unit subsequent to that unit. Alternatively, it is likely that there may be noise. Check to see if there is noise around the cable.
	Blink (3:1)	Power failure (including instantaneous power failure) in a unit subsequent to the unit of interest	Identify and remove the cause of a power failure in a unit subsequent to the unit of interest.
	Blink (1:3)	Status alarm	A status alarm, such as a DO ground fault, has occurred. Identify and remove the cause of the alarm.

4. PRINTED CIRCUIT BOARDS

This chapter describes the ordering specifications and LED indications of printed circuit boards.

4.1. MAIN BOARD

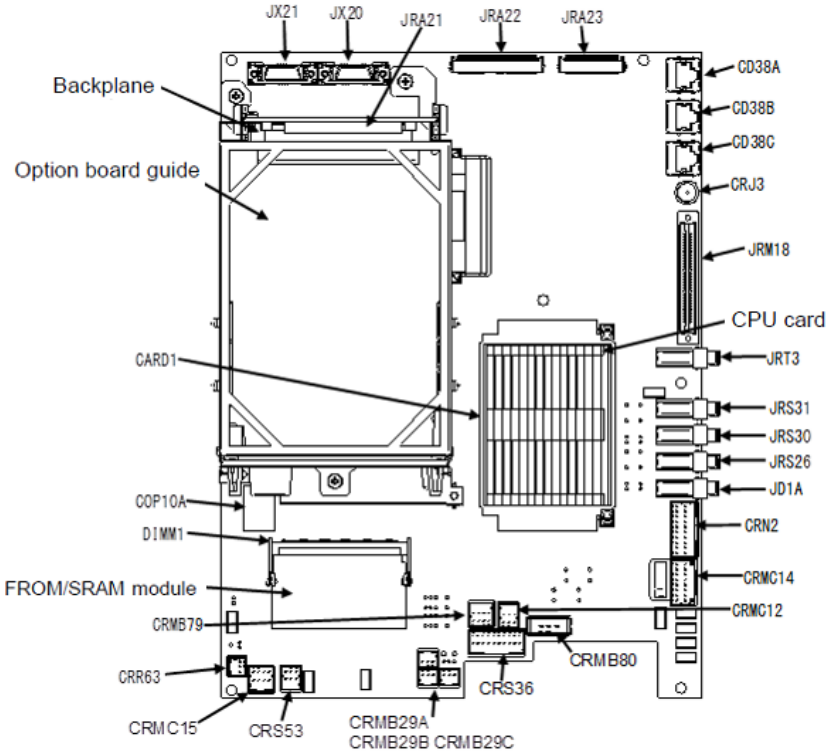


Figure 4.1-1 Main board (SIDE-B)

Name	Order specification	Maintenance specification	Remark
MAIN BOARD	A05B-2695-H001	A17B-8101-0901	Standard/vision, force sensor, line tracking, HDI
CPU card	A05B-2670-H020	A17B-3301-0250	Standard/DRAM 1GB
FROM/SRAM module	-	A20B-3900-0296	FROM 256M/ SRAM 3M

LEDs

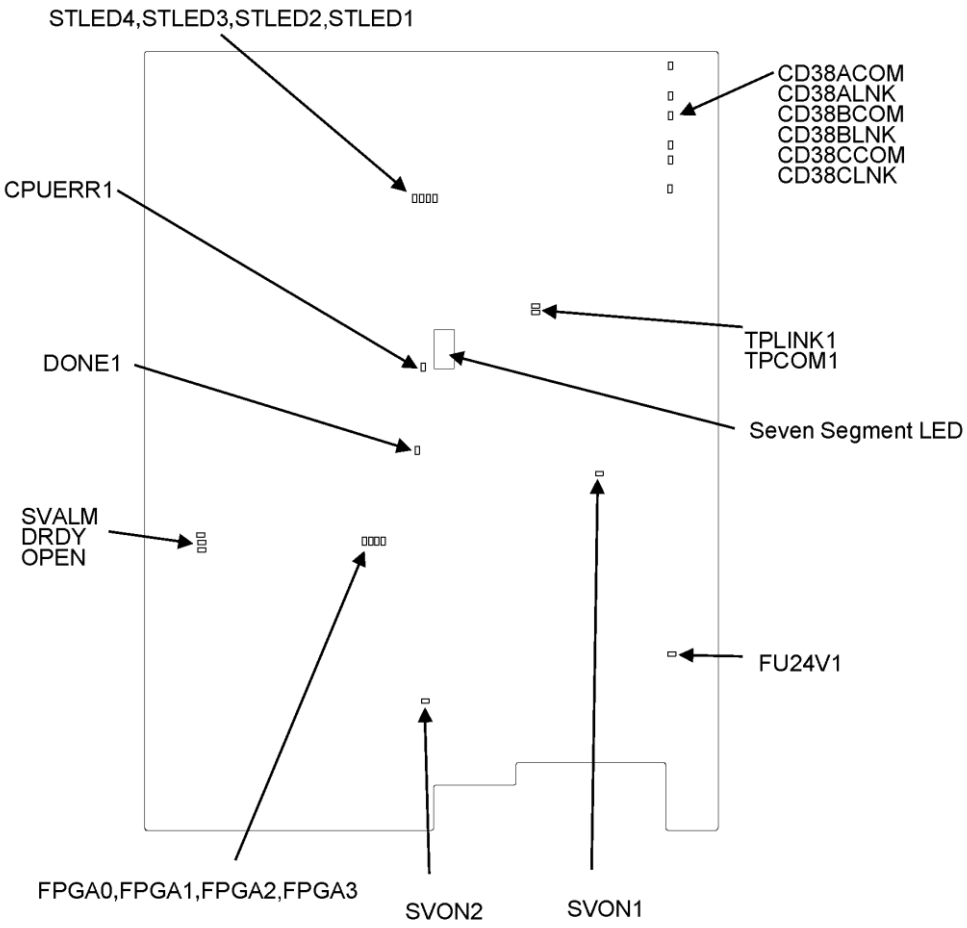


Figure 4.1-2 LED on the main board

LED name	Color	Description
CPUERR1	Red	When the alarm condition has occurred in the CPU card, this LED is turned on. For details, see "I.3.7. TROUBLESHOOTING BASED ON LED INDICATIONS(P.58)."
FU24V1	Red	When the fuse (FUSE8) is brown, this LED is turned on. For details, see "I.3.7. TROUBLESHOOTING BASED ON LED INDICATIONS(P.58)."
SVON1/SVON2	Green	When the servo amplifier unit is ready to energize, this LED is turned on. For details, see "I.3.7. TROUBLESHOOTING BASED ON LED INDICATIONS(P.58)."
SVALM	Red	When the alarm condition has occurred in the servo amplifier unit or main board, this LED is turned on. For details, see "I.3.7. TROUBLESHOOTING BASED ON LED INDICATIONS(P.58)."
DRDY	Green	When the servo amplifier unit is ready to drive servo motors, this LED is turned on. For details, see "3 I.3.7. TROUBLESHOOTING BASED ON LED INDICATIONS(P.58)."
OPEN	Green	Lights when the communication in the main board is normal. For details, see "I.3.7. TROUBLESHOOTING BASED ON LED INDICATIONS(P.58)."
FPGA0/FPGA1/ FPGA2/FPGA3	Green	These LEDs indicate the state of FPGA for vision.
DONE1	Red	
STLED1/STLED2/ STLED3/STLED4	Green	These LEDs show the operating status of the system. For details, see "I.3.7. TROUBLESHOOTING BASED ON LED INDICATIONS(P.58)."

LED name	Color	Description
TPCOM1	Green	Blink during data transmission of TP
TPLINK1	Green	Light when a link of TP is established
CD38ACOM	Green	Blink during data transmission of CD38A
CD38ALNK	Green	Light when a link of CD38A is established
CD38BCOM	Green	Blink during data transmission of CD38B
CD38BLNK	Green	Light when a link of CD38B is established
CD38CCOM	Green	Blink during data transmission of CD38C
CD38CLNK	Green	Light when a link of CD38C is established
Seven segment LED	-	When the alarm condition has occurred in the main board, this LED is turned on. For details, see "I.3.7. TROUBLESHOOTING BASED ON LED INDICATIONS(P.58)."

4.2. Input unit

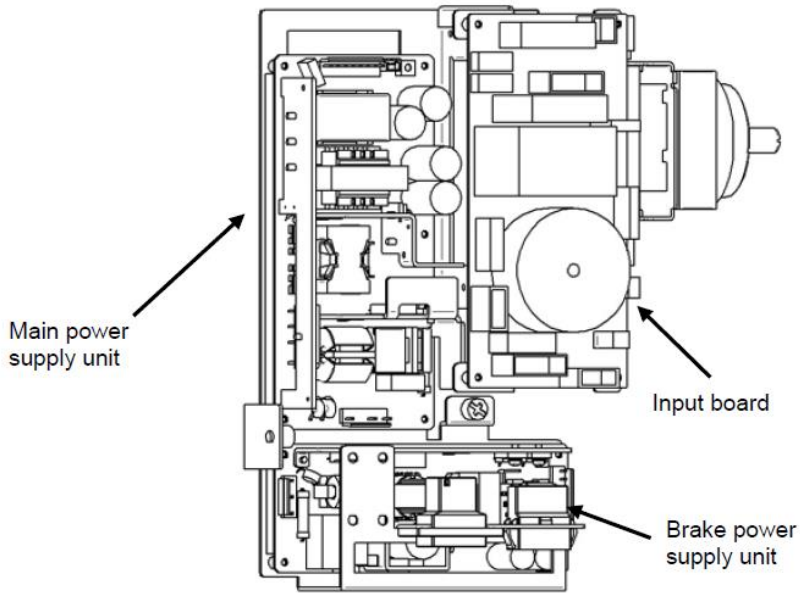


Figure 4.2-1 Printed circuit boards of the input unit

Name	Maintenance specification	Remark
Input unit	A05B-2696-C451	Upward compatible products of the A05B-2696-C450 For CRX-5iA,CRX-10iA,CRX-20iA
	A05B-2696-C452	For CRX-25iA
	A20B-2005-0530	Input board

4.3. BACKPLANE BOARD

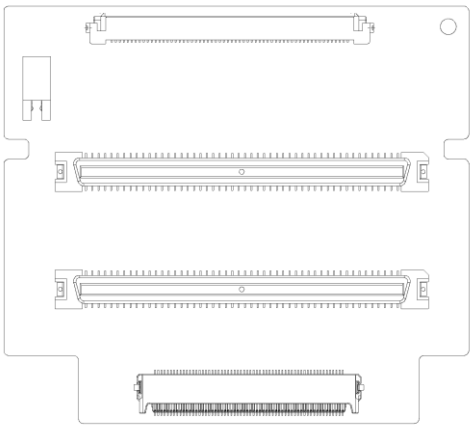


Figure 4.3-1 Backplane board

Name	Order specification	Maintenance specification
2 Slot Backplane	A05B-2695-H020	A20B-8003-0120

4.4. Side board

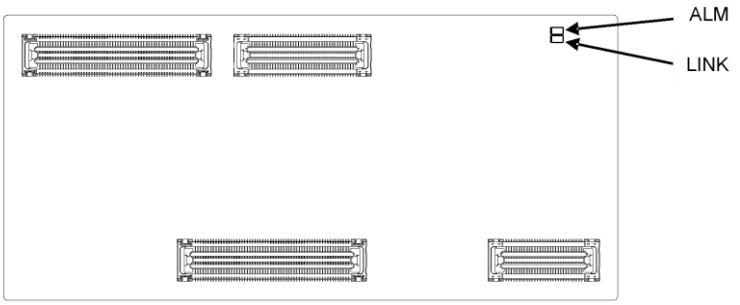


Figure 4.4-1 Side board

Name	Order specification	Maintenance specification
Side board	A05B-2695-H010	A20B-2201-0120

LEDs

The LEDs on the side board indicate the quality of the side board's I/O Link i.

LED [ALM] (red)

The ALM LED shows the type of I/O Link i alarm, as described below.

LED name	LED indications	Description	Remark
ALM (Red)	OFF	Normal state or power OFF	
	ON	Either parity alarm, external input alarm, or dual check safety alarm has occurred	

LED name	LED indications	Description	Remark
	Blink (1:1)	Broken wire between the group of interest and a group subsequent to it	ON = approximately 0.5 seconds OFF = approximately 0.5 seconds
	Blink (3:1)	Power abnormality (including instantaneous power failure) in a group subsequent to the group of interest	ON = approximately 1.5 seconds OFF = approximately 0.5 seconds
	Blink (1:3)	Status alarm	ON = approximately 0.5 seconds OFF = approximately 1.5 seconds
	Blink (1:1 at high speed)	Occurred in command from master	ON = approximately 0.25 seconds OFF = approximately 0.25 seconds

LED [LINK] (green)

The LINK LED shows the state of group communication, as described below.

LED name	LED indications	Description	Remark
LINK (Green)	OFF	Power OFF	
	ON	Power ON	
	Blink (1:1)	Communication in progress When dual check safety is in use	ON = approximately 0.5 seconds OFF = approximately 0.5 seconds
	Blink (3:1)	Communication in progress Standard (when dual check safety is in use)	ON = approximately 1.5 seconds OFF = approximately 0.5 seconds
	Blink (1:1 at high speed)	Communication at halt Watchdog alarm occurred	ON = approximately 0.25 seconds OFF = approximately 0.25 seconds

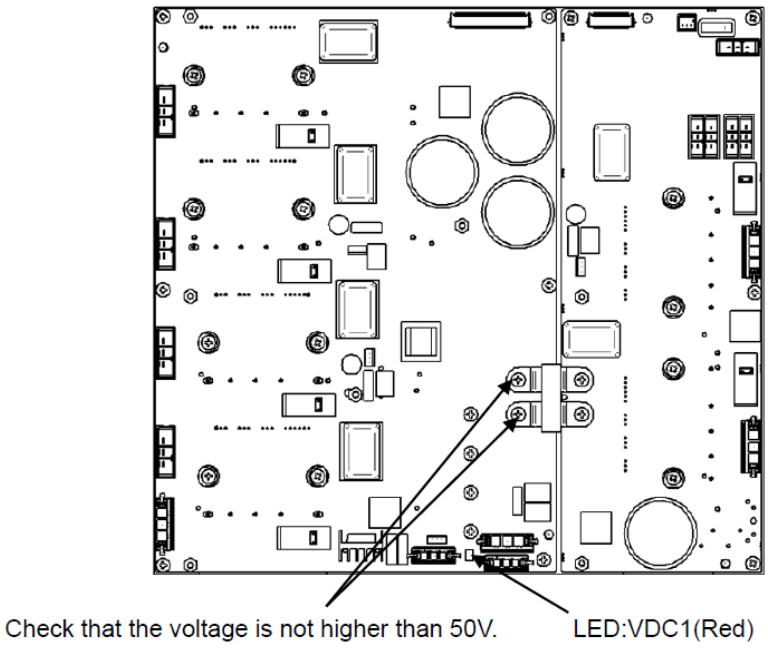
5. Servo amplifier unit

The servo amplifier units 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 servo amplifier unit is replaced. It also describes the use of test pins and meanings of the LED indications.

Table 5-1 Specifications table

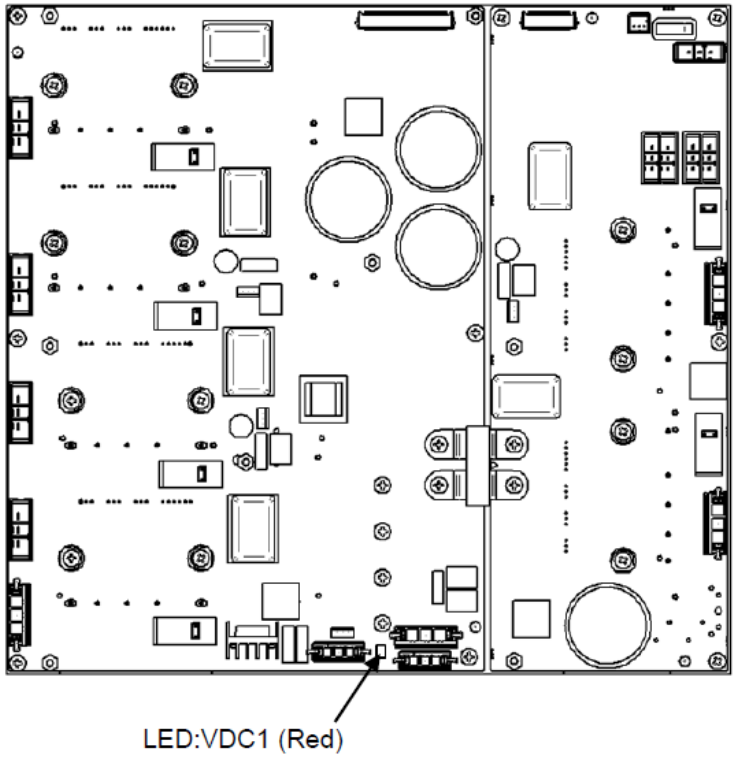
Name	Order specification	Maintenance specification	Robot
Servo amplifier unit	A05B-2695-H050	A06B-6401-C101	CRX-5iA, CRX-10iA, CRX-20iA, CRX-25iA



⚠WARNING

Before touching the servo amplifier unit, for example, for maintenance purposes, check the voltage at the screw near the LED "VDC1" with a DC voltage tester to see if the remaining voltage is not higher than 50V. By using a DC voltage tester, check that the voltage is 50 V or less.

5.1. LEDS OF SERVO AMPLIFIER UNIT



LEDs	Color	Description
VDC1	Red	Lights when the DCLINK circuit inside the servo amplifier is charged to reach a specific voltage.

5.2. SPECIFICATIONS TABLE

Specifications table

Servo amplifier unit		A06B-6401-C101
Output rating	**Maximum output voltage**	240V ~
	Output current: J1	40Ap / 3.7Arms
	Output current: J2	10Ap / 2.3Arms
	Output current: J3	10Ap / 2.3Arms
	Output current: J4	10Ap / 2.3Arms
	Output current: J5	40Ap / 3.7Arms
	Output current: J6	40Ap / 3.7Arms

CRX axis correspondence table

	Axis display (j)	Motor number	Servo amplifier unit connector name
CRX-5iA, CRX-10iA, CRX-20iA, CRX-25iA	**1**	J1	CNJ1
	2	J2	CNJ5
	3	J3	CNJ6
	4	J4	CNJ2
	5	J5	CNJ3
	6	J6	CNJ4

6. Power

6.1. BLOCK DIAGRAM OF THE POWER SUPPLY

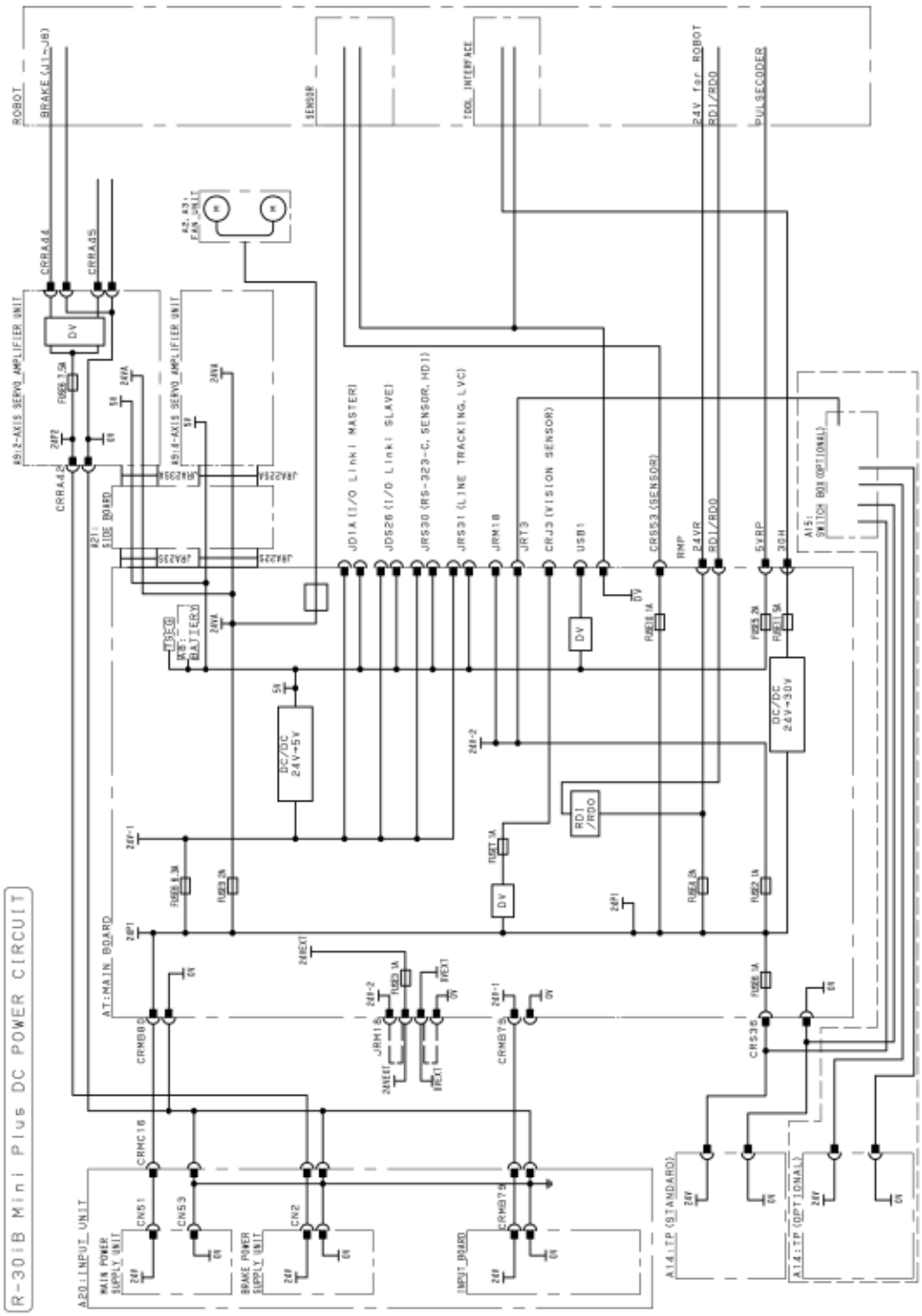


Figure 6.1-1 Block Diagram of the Power Supply

7. REPLACING UNITS

This section explains how to replace each unit in the control section.

Before attempting to replace units, be sure to read the chapter of "SAFETY PRECAUTIONS(P.iii)" in this manual thoroughly, along with "SAFETY HANDBOOK"(B-80687EN).

⚠WARNING

Turn off the breaker, disconnect the power cable and wait for one minute before servicing or replacing a unit or printed circuit board.
Do not touch the internal units or printed circuit board for one minute after turning off the breaker.
Also keep all machines in the area of the controller switched.

⚠WARNING

Before replacing components, read the maintenance manual to understand the replacement procedure. Performing an incorrect replacement procedure can lead to an unpredictable accident, resulting in breakage in the robot or personal injury.

⚠CAUTION

Components in the controller heat up, so care should be taken. When you have to touch a heated component, prepare a protector such as heat-resistant gloves.

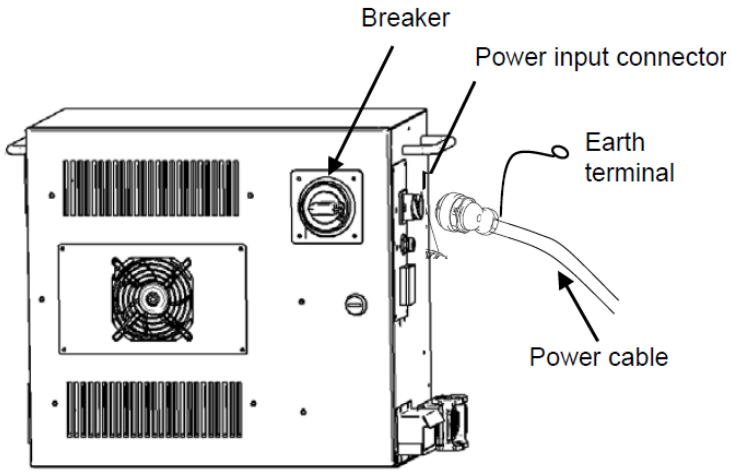
⚠CAUTION

1. When you remove a printed-circuit board, do not touch the semiconductor devices on the board with your hand and avoid letting them touch other components.
2. Make sure that the replacement printed-circuit board has been set up appropriately.
3. After replacing a printed-circuit board, make adjustments correctly if the board needs to be adjusted.
4. If the backplane board, power supply unit, or main board (including card boards and modules) is replaced, it is likely that robot parameters and taught data are lost. Before you start to replace these components, save a backup copy of the robot parameters and taught data to an external memory device.
5. Before you disconnect a cable, note its location. If a cable is detached for replacement, reconnect it exactly as before.

7.1. PROCEDURE BEFORE REPLACEMENT

1 Turn off the breaker.

2 Please disconnect power cable.



⚠WARNING

1. If the power cable is not disconnected after turning off the breaker, a high voltage is connected to the primary side terminal of the breaker, possibly resulting in electric shock.
2. If you do not wait for 1 minute after turning off the breaker, you may receive electric shock due to the residual voltage of the internal capacitor.

7.1.1. Removing the Side Board

1 Pull up the card board slowly in the arrow direction.

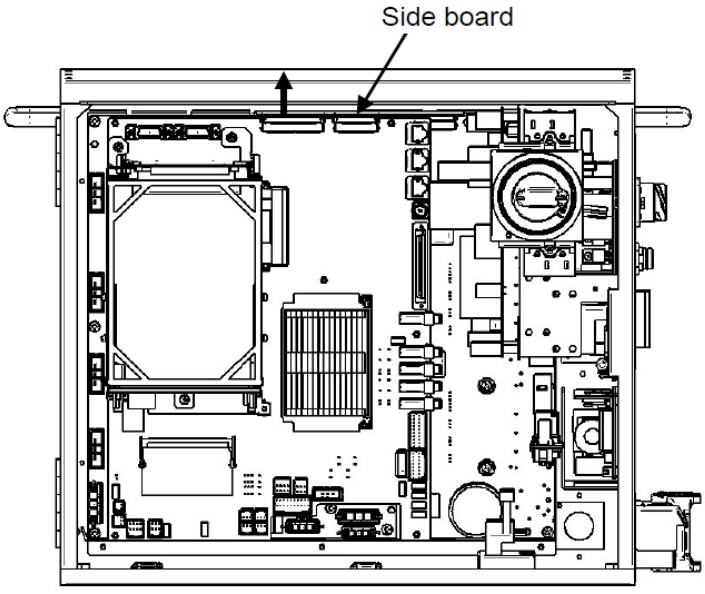


Figure 7.1.1-1 Removing the side board

7.1.2. Replacing the Main Board

⚠CAUTION

Before starting replacement, turn off the main power of the controller. The main board is equipped with battery-backed memory devices for holding robot parameters and taught data. When the main board is replaced, the memory contents are lost.

1 **When an option board is installed in the option (mini) board guide, remove it. (See I.7.2. REPLACING CARD BOARD, MODULE AND BACKPLANE ON THE MAIN BOARD(P.79))**

2 **Remove the side board. (See I.7.1.1. Removing the Side Board(P.78))**

3 **Detach cables from the connectors and plate on the main board, and remove the (7) screws fastening the main board.**

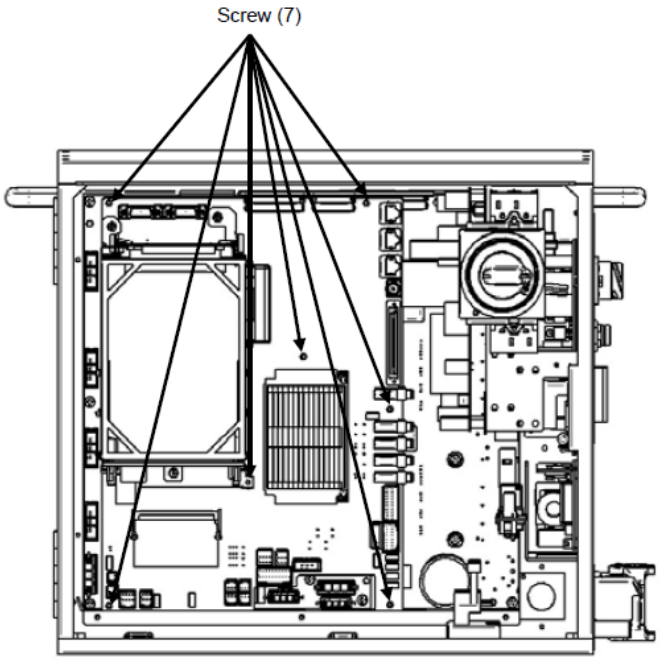


Figure 7.1.2-1 Removing the main board

4 **Remove the main board carefully in order to avoid breaking its connectors.**

5 **Attach the side board after replacing the main board. (See I.7.1.1. Removing the Side Board(P.78))**

⚠CAUTION

While removing the main board, pay attention to the parts of the main board make sure they are not hit the studs.

7.2. REPLACING CARD BOARD, MODULE AND BACKPLANE ON THE MAIN BOARD

⚠CAUTION

Before you start to replace a card board, module or backplane, make a backup copy of robot parameters and programs. If the FROM/SRAM module is replaced, SRAM memory contents are lost.

The locations of the card board, module, and backplane are as shown in the following figure.

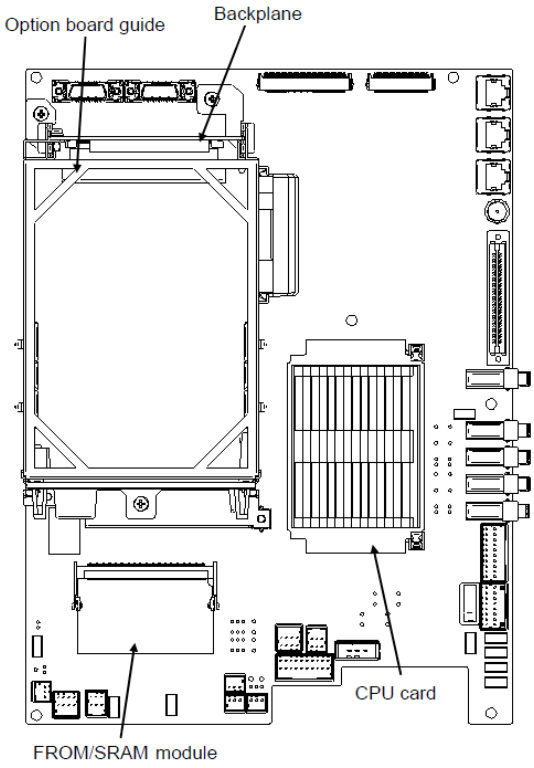


Figure 7.2-1 Locations of card board, module, and backplane

Demounting a card board

1. **Pull up the spacer metal fitting. (Figure 7.2-2)**
2. **Insert a finger into the rear of the card board and pull up the card board slowly in the arrow direction. (Figure 7.2-3) (Note: At this time, hold the area next to the main board on the opposite side with the other hand whenever possible. A force of 7 to 8 kgf is required for extraction. If demounting a standard CPU CARD, do not press on the heat sink installed on the CPU and LSI chip.)**
3. **When one side of the card board is raised slightly by pulling it up, do not fully extract the card board, but push back the card board softly.**
4. **When the card board is pushed back to be parallel with the main board, pinch two sides of the card board and pull up the card board. This completes the extraction of the card board.**

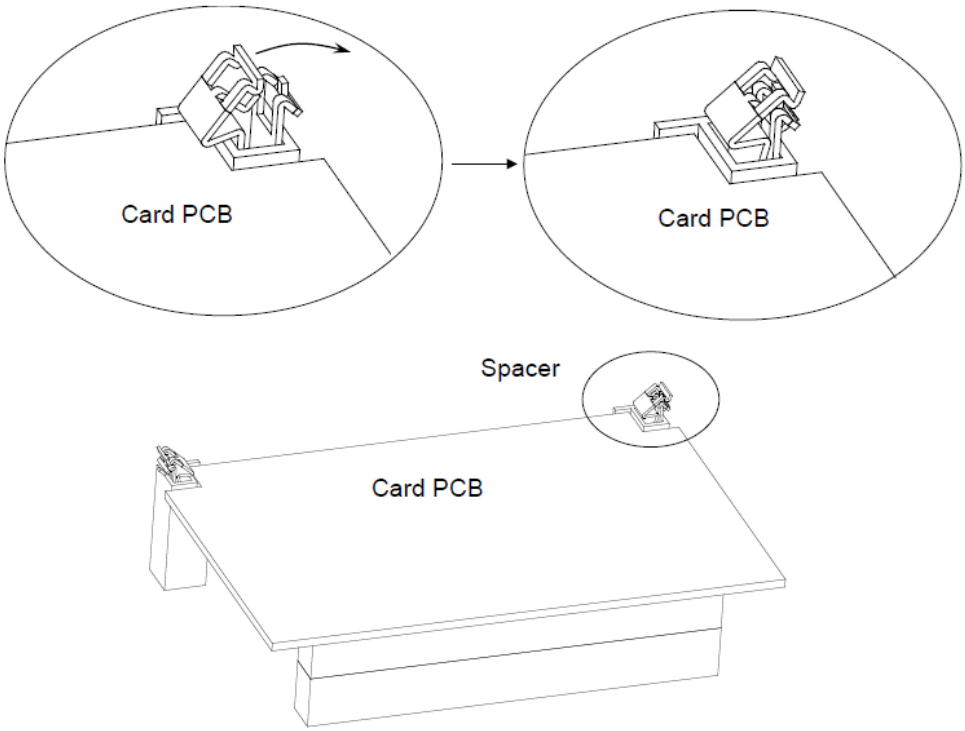


Figure 7.2-2 Demounting a card board (1)

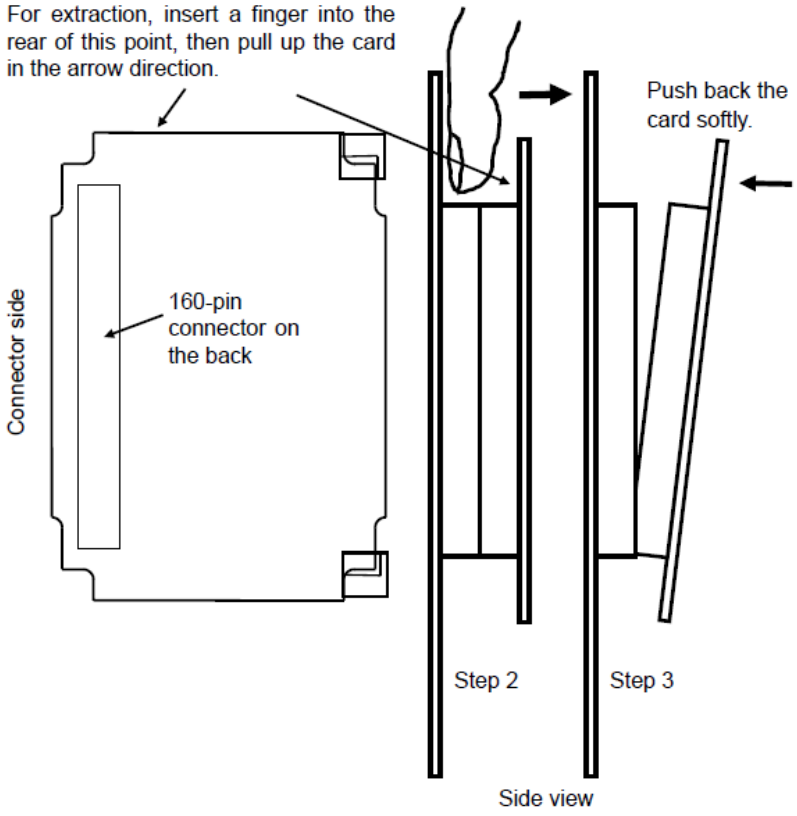


Figure 7.2-3 Demounting a card board (2)

Mounting a card board

1 **Check that the metal fittings of the spacers are raised. (Figure 7.2-4)**

2 **To align the board insertion position, touch the spacer end faces of the board with the spacer as shown in the following figure (Figure 7.2-5). (At this time, the board is touching the spacers only.)**

3 **While aligning the board with the spacers, lower the connector side slowly until the connectors touch each other. (Figure 7.2-5) (do not press until aligned.)**

4 **The mating position can be determined more easily by moving the card board back and forth until the alignment "nubs" and "holes" are aligned on the connectors. The board must be turned to view the board connectors on the side. (Figure 7.2-5)**

5 **Slowly push the connector side of the card board. At this time, push on the back of the board over the connector. The force required for connector insertion is about 10 kgf. If the connector will not insert easily, re-check the alignment of the connector to prevent damaging the connector(s). If installing a standard CPU CARD, do not press on the heat sink installed on the CPU and LSI chip. Otherwise, the CPU or LSI chip can be damaged. (Figure 7.2-6)**

6 **Push in the spacer metal fitting to lock the board in place. (Figure 7.2-7)**

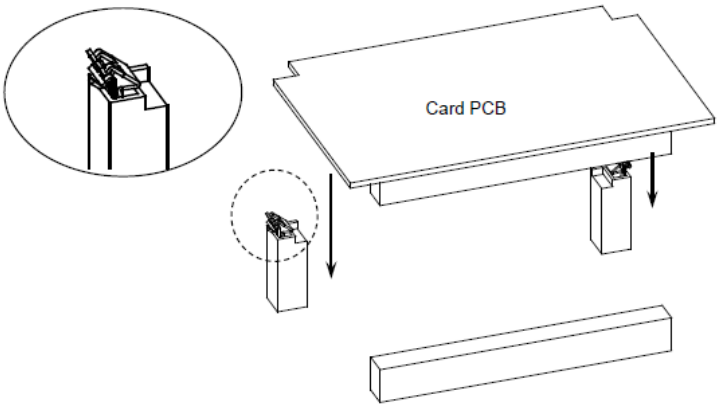


Figure 7.2-4 Mounting a card board (1)

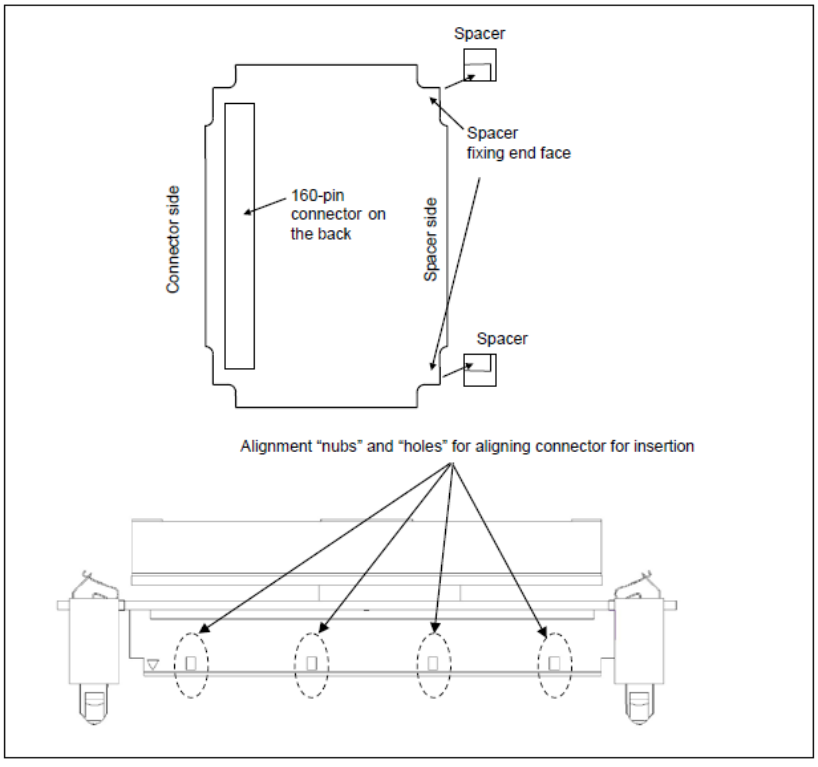


Figure 7.2-5 Mounting a card board (2)

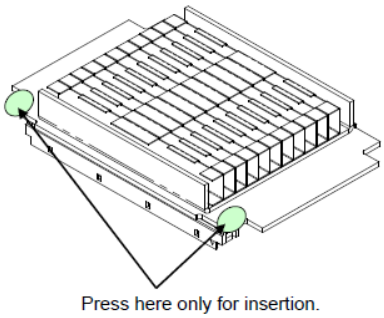


Figure 7.2-6 Mounting a card board (3)

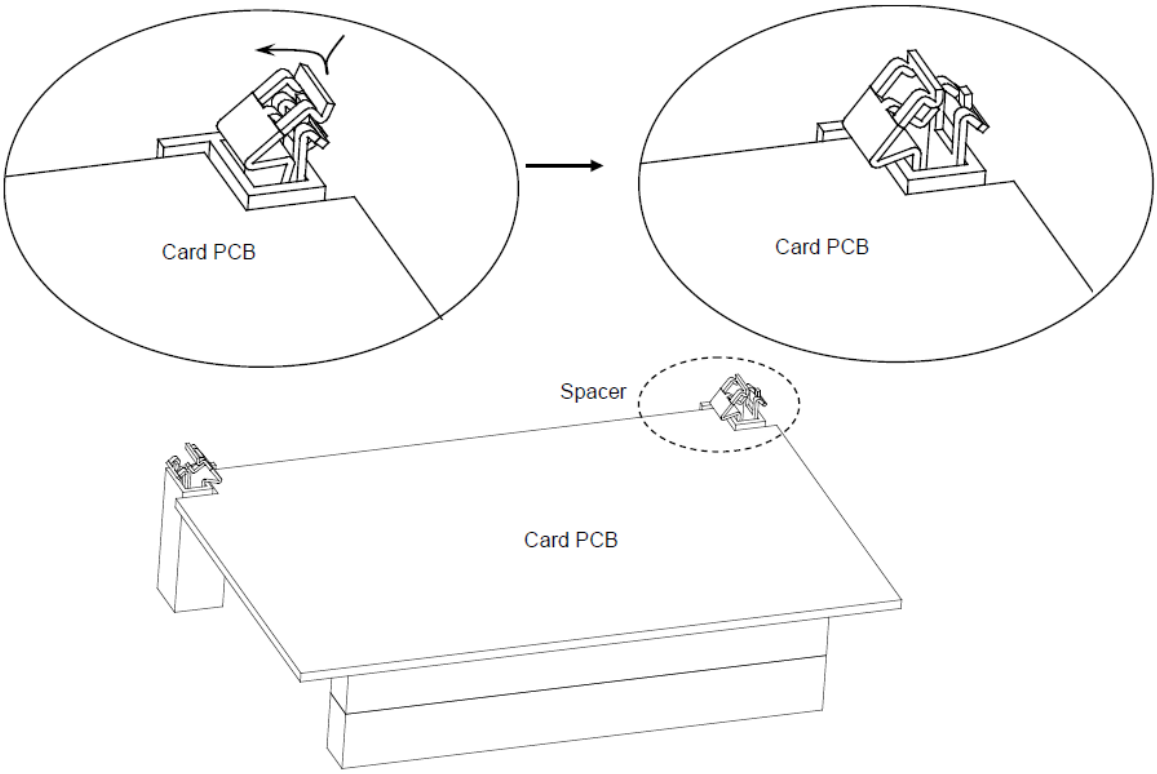


Figure 7.2-7 Mounting a card board (4)

Demounting a module

⚠CAUTION

When replacing the module, be careful not to touch the module edge connector.
If you touch the edge connector inadvertently, wipe any dirt off of the contact with a clean cloth.

1. **Move the clip of the socket outward. ((a) in Figure 7.2-8)**
2. **Extract the module by raising it at a 30 degree slant and pulling outward.**

Mounting a module

1. **Insert the module at about 30 degree slant into the module socket, with side B facing upward. ((b) in Figure 7.2-8)**
2. **Push the module inward and downward until it is locked. ((c) in Figure 7.2-8)**

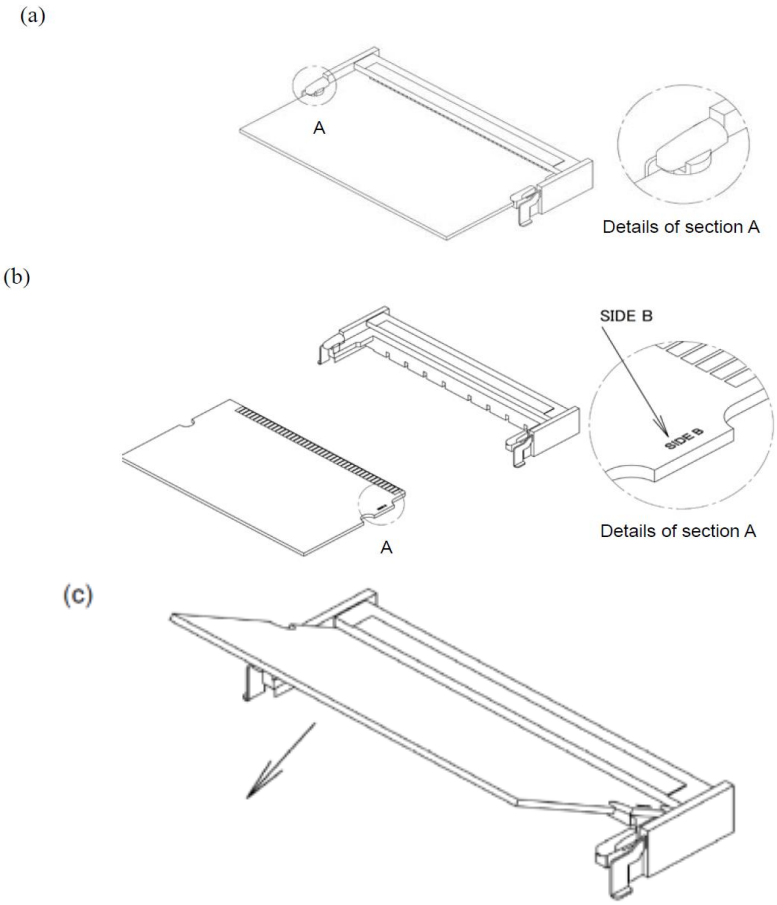


Figure 7.2-8 Demounting/mounting a module

Replacing the backplane

1. **Remove the (3) screws fastening option board guide.**
2. **After removing the backplane from connector JRA21, lift the optional board guide straight up from the main board in a vertical direction and remove it.**
3. **Remove the (1) screw fastening the backplane.**
4. **Replace the backplane. Fasten the screw.**
5. **Fasten the (3) screws to fix option board guide.**

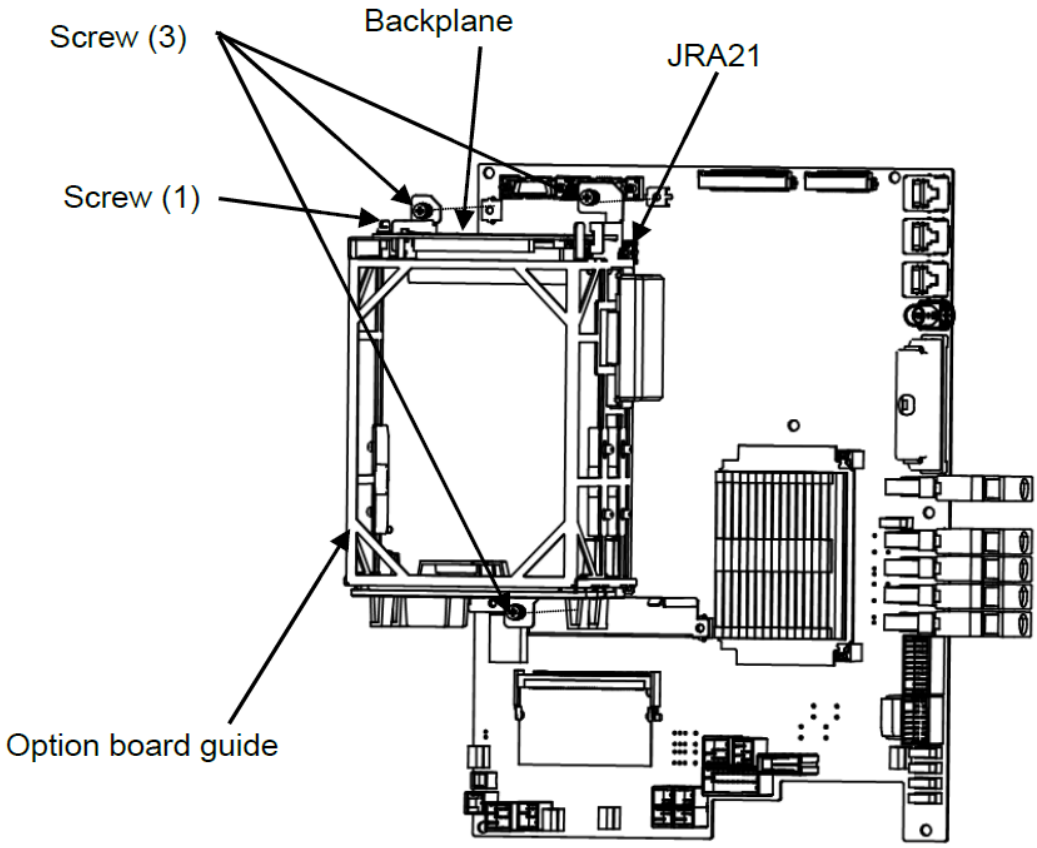
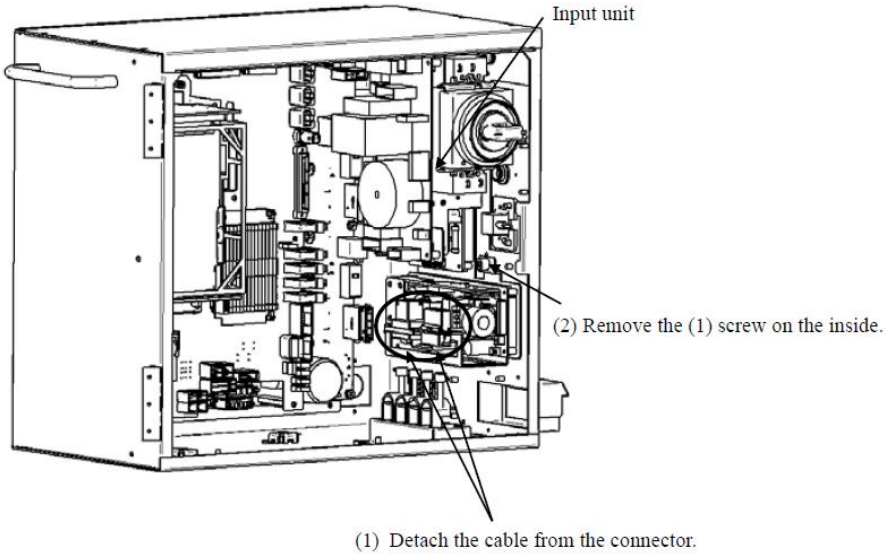
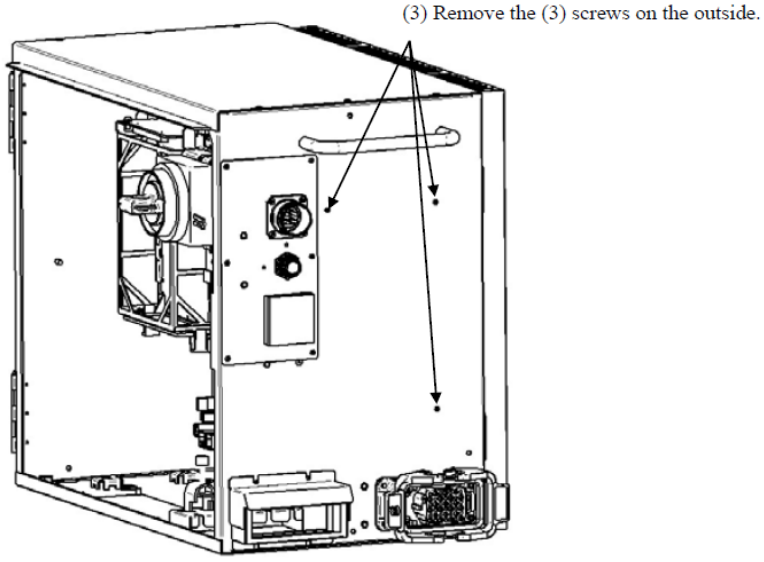


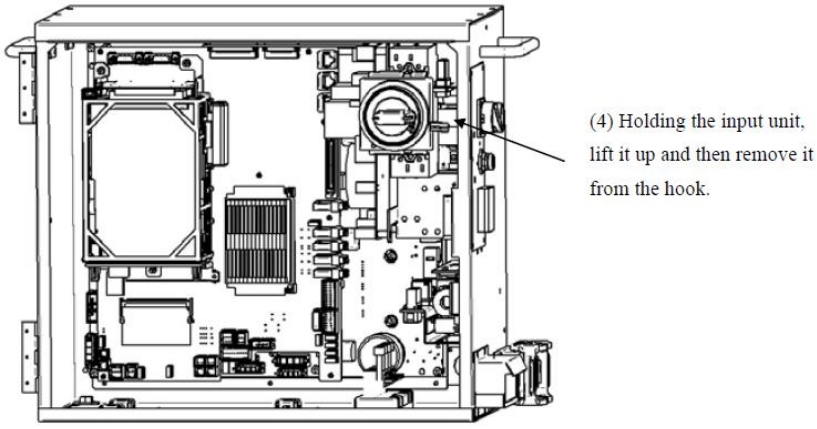
Figure 7.2-9 Demounting/mounting the backplane

7.3. REPLACING THE INPUT UNIT

1. **Detach the cable from connector of the input unit.**
2. **Remove the (1) screw fastening the input unit on the inside.**
3. **Remove the (3) screws fastening the input unit on the outside.**
4. **Holding the input unit, lift it up and then remove it from the hook.**
5. **Pull the input unit forward, remove the CRRA47, and then pull it out it.**
6. **Replace the input unit.**
7. **Install the replacement input unit by reversing steps 1 to 5 in the above procedure.**


Input unit
(2) Remove the (1) screw on the inside.
(1) Detach the cable from the connector.


(3) Remove the (3) screws on the outside.


(4) Holding the input unit,
lift it up and then remove it
from the hook.

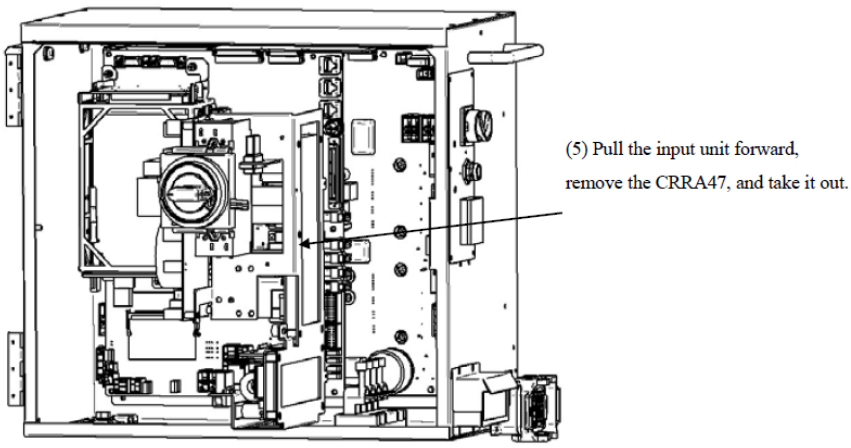


Figure 7.3-1 REPLACING THE INPUT UNIT

7.4. REPLACING THE SERVO AMPLIFIER UNIT

⚠WARNING

Before touching the servo amplifier unit, for example, for maintenance purposes, check the voltage at the screw near the LED "VDC1" with a DC voltage tester to see if the remaining voltage is not higher than 50V. By using a DC voltage tester, check that the voltage is 50 V or less.

⚠CAUTION

Before you start to replace the servo amplifier unit, make a backup copy of robot parameters and programs.
Because the servo amplifier unit is heated immediately after operation, leave the servo amplifier unit until it cools down thoroughly, before replacing it.

1. **Remove the input unit. (See I.7.3. REPLACING THE INPUT UNIT(P.85))**
2. **Remove the side board. (See I.7.1.1. Removing the Side Board(P.78))**
3. **Remove the main board. (See I.7.1.2. Replacing the Main Board(P.78))**
4. **Check the voltage at the screw above the LED "VDC1" with a DC voltage tester to see if the remaining voltage is not higher than 50V.**
5. **Detach the cables from the connectors of the servo amplifier unit.**
6. **Remove (3) screws fastening the servo amplifier unit.**
7. **Remove servo amplifier unit.**
8. **Install a replacement amplifier by reversing above procedure.**

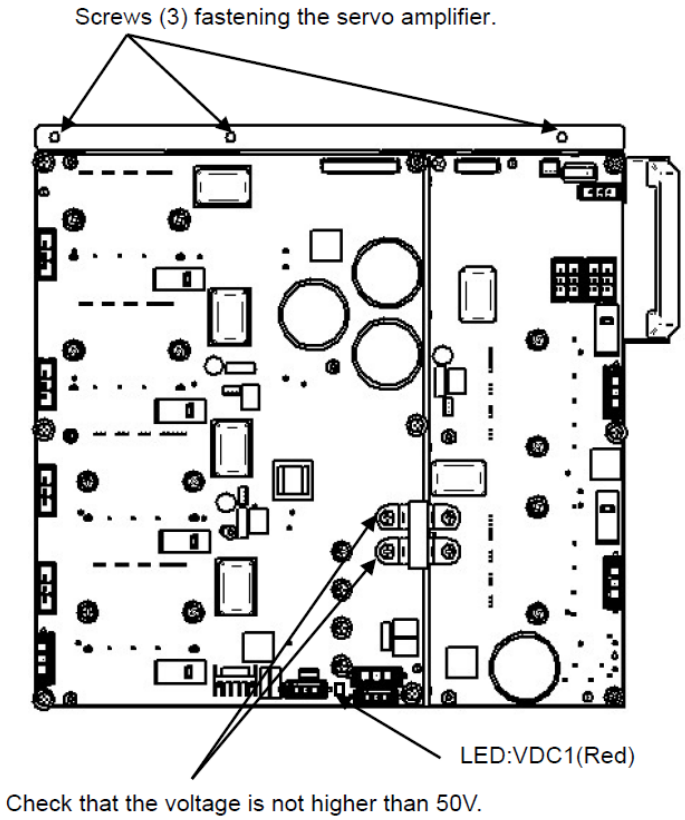


Figure 7.4-1 REPLACING THE SERVO AMPLIFIER UNIT

7.5. REPLACING THE DISCHARGE RESISTOR UNIT

⚠CAUTION

Because the discharge resistor unit is heated immediately after operation, leave the servo amplifier unit until it cools down thoroughly, before replacing it.

1. **Remove the (4) screws fastening the back panel of the cabinet in place, and remove the back panel.**
2. **Remove connector CRR63 from the main board and connector CRRA11A from the servo amplifier.**
3. **Remove the (4) screws fastening the discharge resistor unit in place, and then remove the discharge resistor unit.**
4. **Install the discharge resistor unit by reversing steps 1 to 3 in the above procedure.**

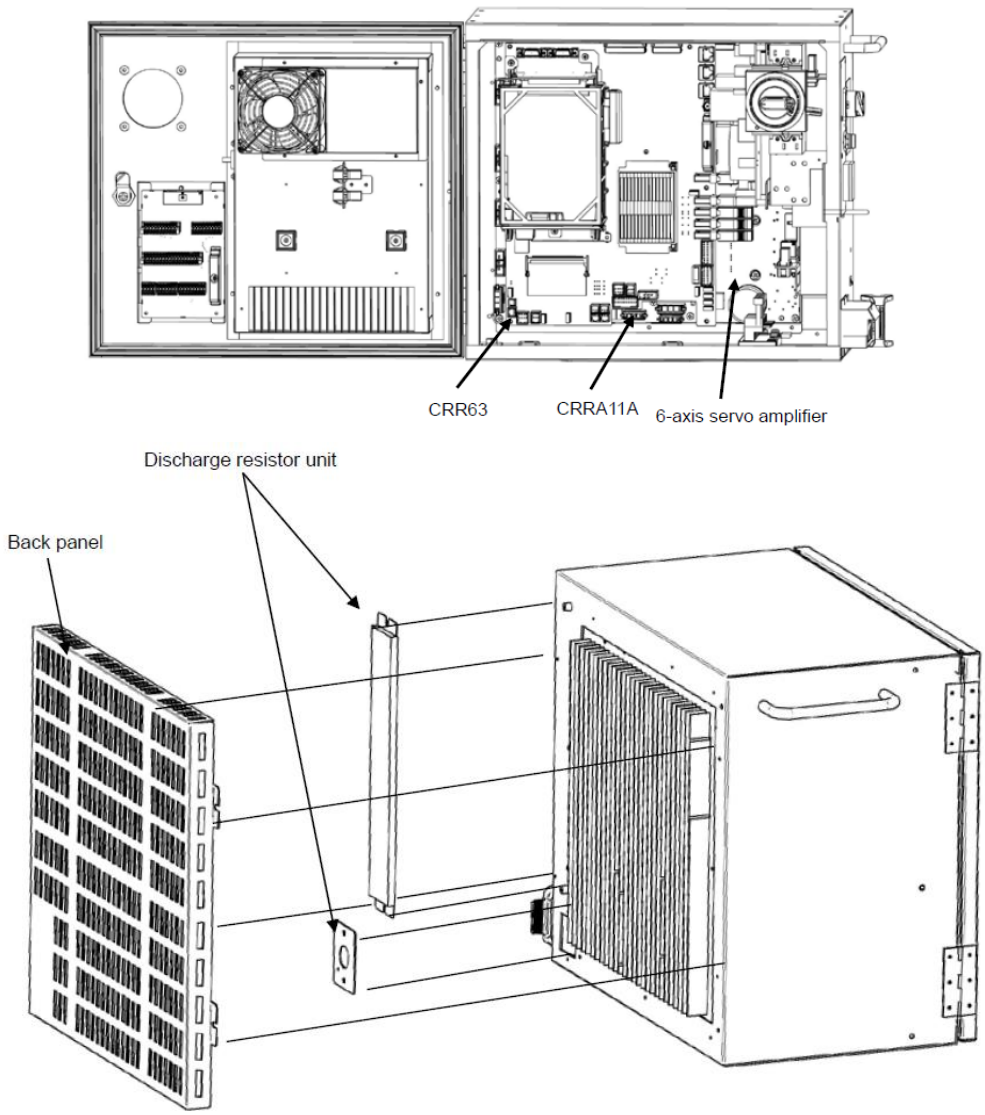


Figure 7.5-1 REPLACING THE DISCHARGE RESISTOR UNIT

7.6. REPLACING THE TEACH PENDANT (OPTION)

The specifications of the teach pendant vary with its use. When you replace the teach pendant, check its specifications carefully.

1 **Be sure that the power of the robot controller is off.**

2 **Detach the cable from the teach pendant.**

3 **Replace the teach pendant.**

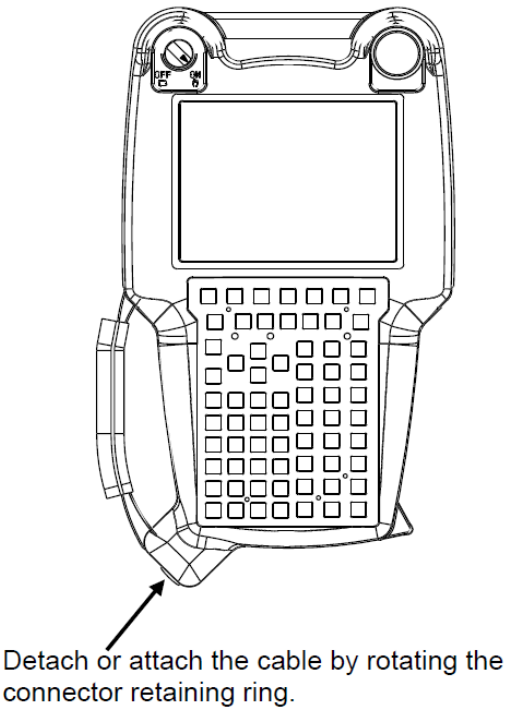


Figure 7.6-1 Replacing the teach pendant (iPendant)

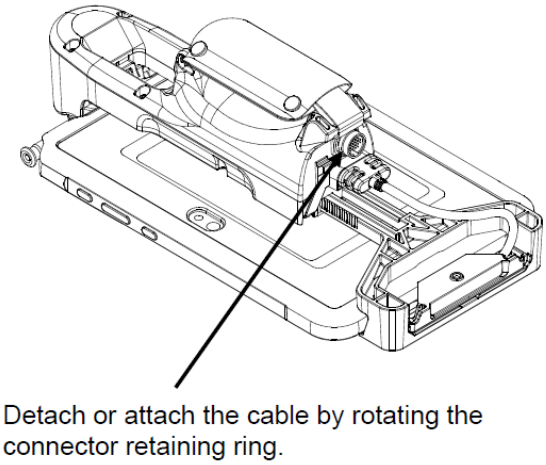


Figure 7.6-2 Replacing the teach pendant (tablet TP)

7.7. REPLACING THE FAN UNIT

⚠CAUTION
Turn off the power, please replace the fans after stopping them from rotating.

7.7.1. REPLACING THE HEAT EXCHANGER AND DOOR FAN UNIT

The heat exchanger is mounted on the inside of the door. Before replacing the heat exchanger, it is necessary to remove the door fan unit.

Door Fan Unit

1. **Remove the (2) M4 nuts used to fasten the plate (for cable connection).**
2. **Remove the cable that is pulled out of the heat exchanger.**
3. **Remove the (4) M4 screws fastening it in place, and remove the fan.**
4. **Mount the replacement fan unit by reversing the above procedure. Be careful not to let the cable get caught in the fan.**

Heat Exchanger Fan Unit

1. **Remove the cable from the heat exchanger's internal fan.**
2. **Remove the (4) M3 screws fastening it in place, and remove the fan.**
3. **Mount the replacement unit by reversing the above procedure.**

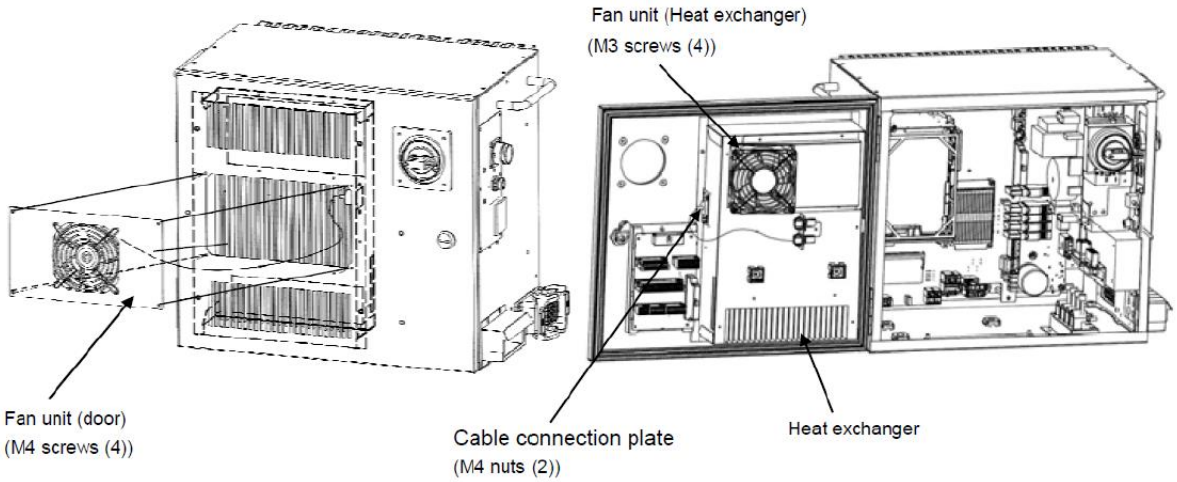


Figure 7.7.1-1 REPLACING THE FAN UNIT

7.8. REPLACING THE BATTERY

7.8.1. Battery for Memory Backup (3 VDC)

The programs and system variables are stored in the SRAM in the main board. The power to the SRAM memory is backed up by a lithium battery mounted on the front panel of the main board. The above data is not lost even when the main power of controller is turned off. A new battery can maintain the contents of memory for about 4 years (NOTE).

When the voltage of the battery becomes low, the low-voltage battery alarm (system-035) is displayed on the teach pendant. When this alarm is displayed, replace the battery as soon as possible. In general, the battery can be replaced within one or two weeks, however, this depends on the system configuration.

If the battery voltage gets lower, it becomes impossible to back up the content of the SRAM. Cycling power to the controller in this state causes the system not to start, and the alarm LED located on the front unit displays because the contents of memory have been lost. Clear the entire SRAM memory and reenter data after replacing the battery. Important data should be saved to the memory card or other external device beforehand in case of emergency.

NOTE

In a newly installed robot, the battery is factory-installed. Therefore, the battery may need to be replaced within 4 years after the installation of the robot.

Replacing the lithium battery

1 **Prepare a new lithium battery. (ordering specification: A02B-0200-K102, maintenance specification: A98L-0031-0012)**

2 **Turn the robot controller on for 30 seconds or more.**

3 **Turn the robot controller off and remove the input power cable.**

4 **Remove the protective battery cover and battery from the upper right corner of the optional board guide, and then remove the connector connected to the backplane.**

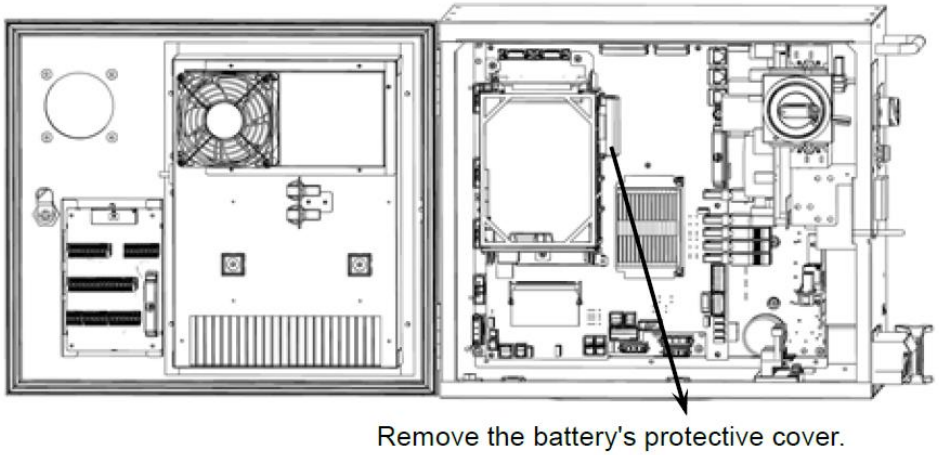


Figure 7.8.1-1 Replacing the lithium battery

5 **Install a new battery.**

⚠CAUTION

Execute steps 3 to 5 within 30 minutes.
Note that keeping the controller unconnected to a battery for a long period of time may result in the memory contents being lost.
For a rainy day, you should make a backup copy of the robot programs and system variables before replacing the battery.

⚠WARNING

Using other than the recommended battery may result in the battery explosion.
Replace the battery only with the specified battery (A02B-0200-K102, A98L-0031-0012).

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.

II Connections

1. Overview

This section describes the electrical interface connections in the R-30iB Mini Plus. It also includes information about the installation of the R-30iB Mini Plus.

1.1. SYSTEM CONFIGURATION

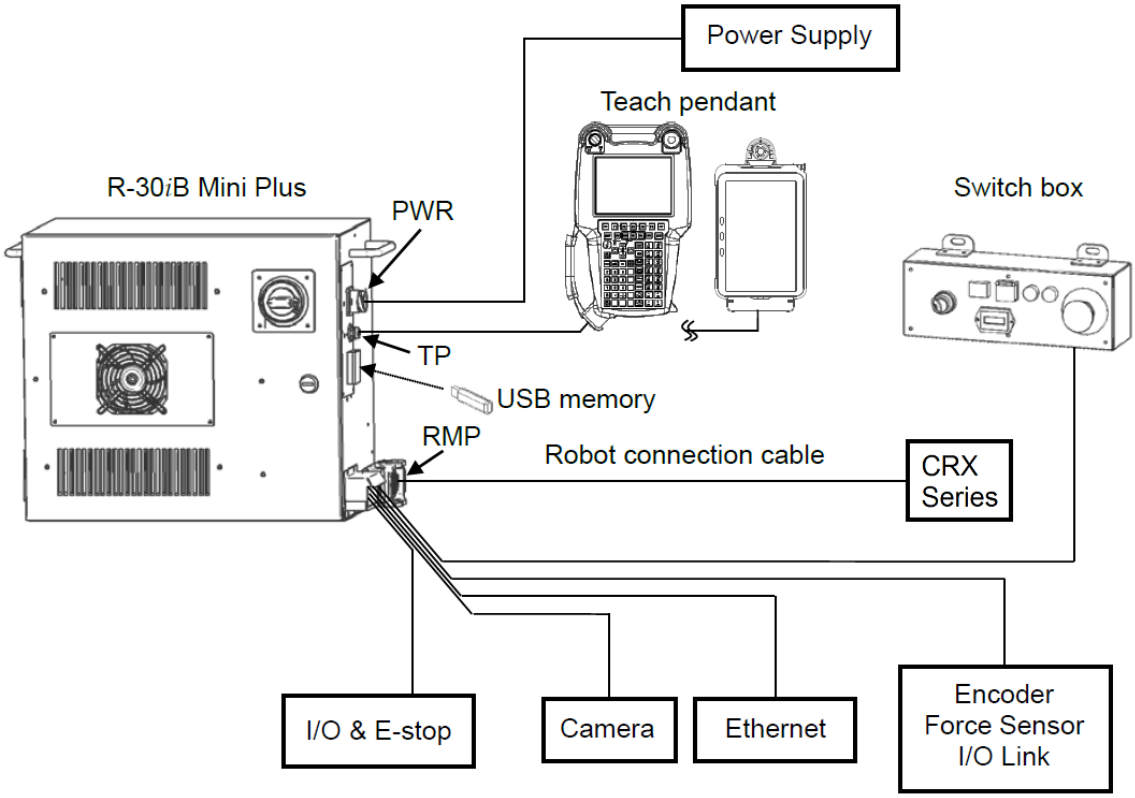


Figure 1.1-1 System configuration

1.2. EXTERNAL INTERFACE

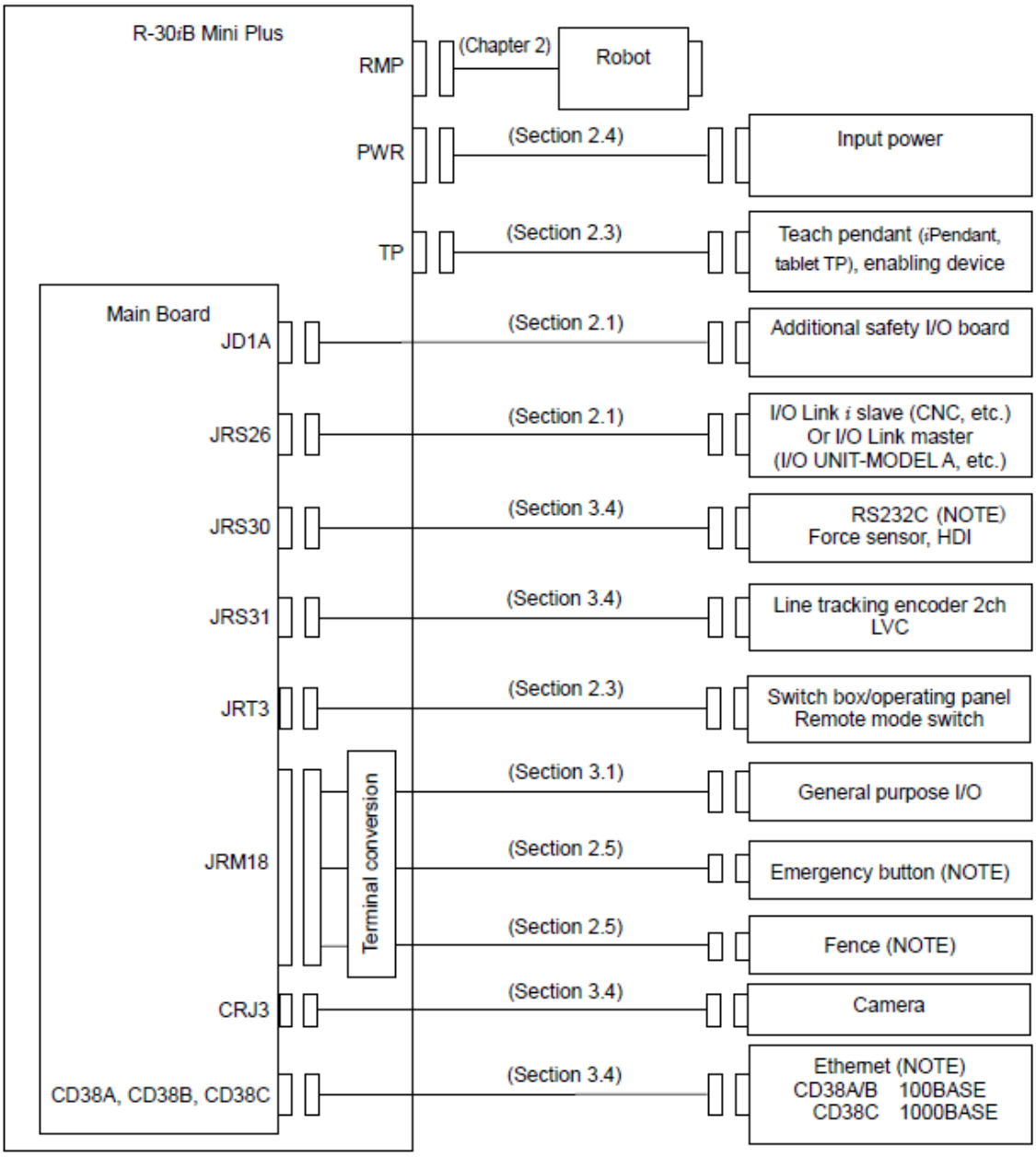


Figure 1.2-1 Unit-to-unit connection diagram

NOTE
This cable is not included. It must be supplied by the customer.

⚠WARNING
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.

2. CONNECTIONS WITH EQUIPMENT

2.1. CONNECTION TO FANUC I/O Link and FANUC I/O Link i

2.1.1. Connection of I/O Link and I/O Link i by using JRS26 connector

The connection of I/O link by using JRS26 connector is shown below.

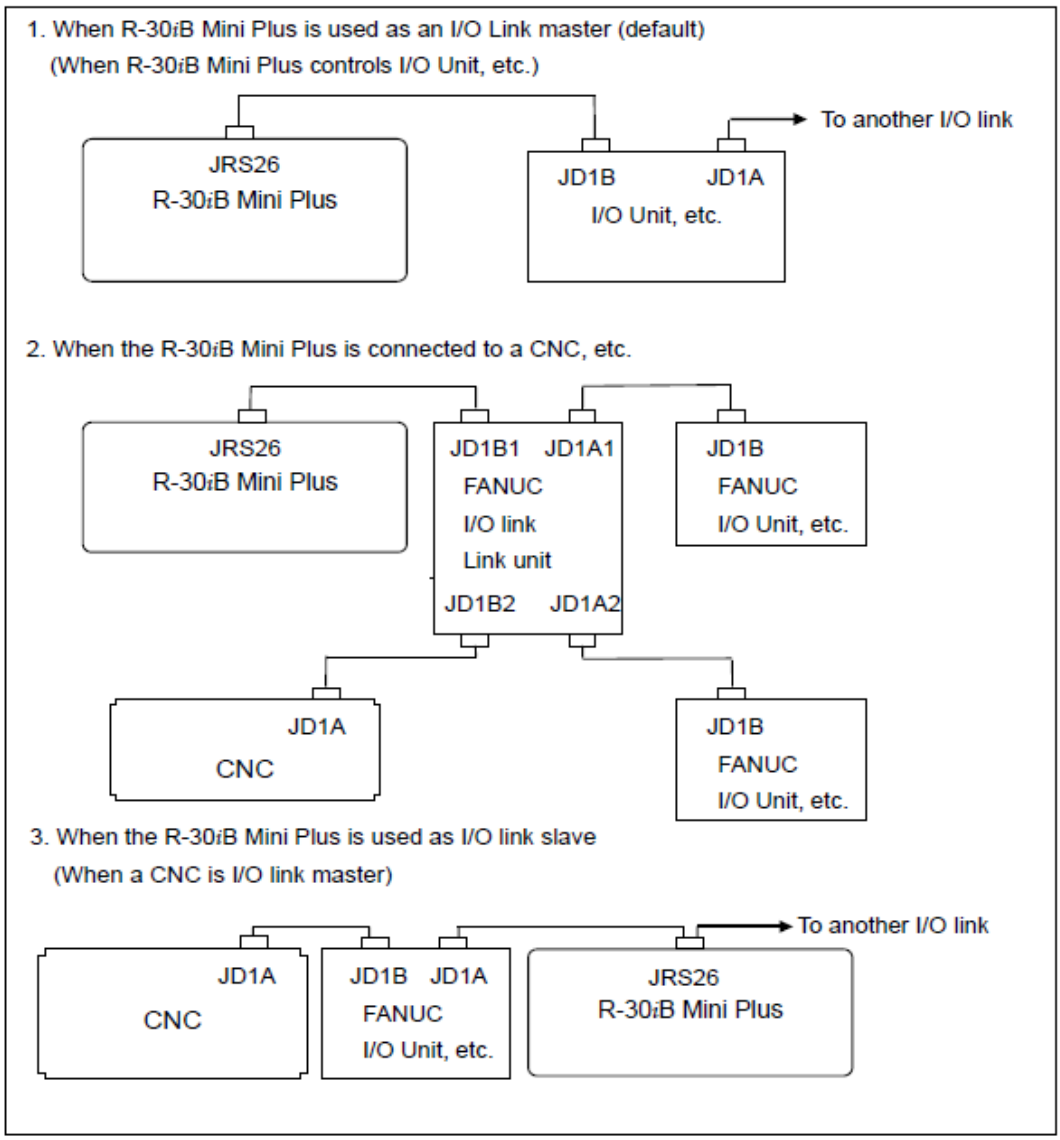


Figure 2.1.1-1 Connection of I/O link by using JRS26 connector

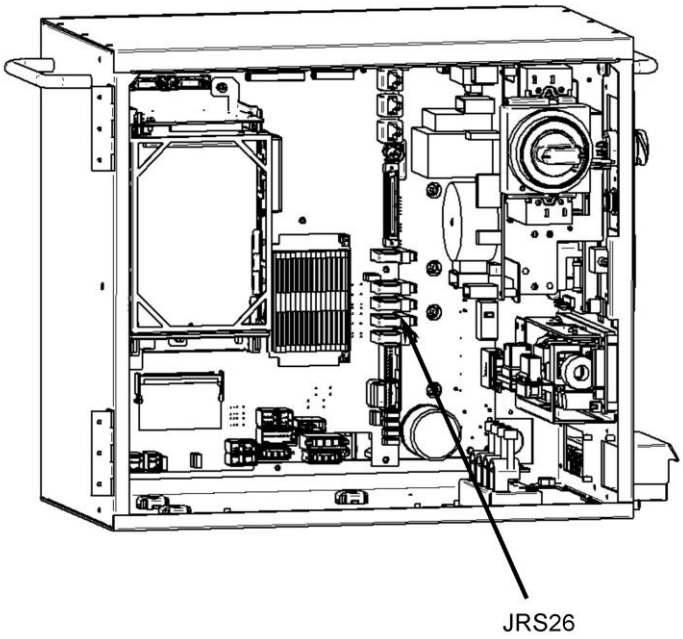


Figure 2.1.1-2 Path of the I/O link cable by using JRS26 connector

1 Connect the cable according to the system and perform shielding.

Shield the cable collectively and ground the shield on the connected device side.

2 Before connection turn off the power.

NOTE

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

1. Slave units and the master must be powered on or off at the same time.
2. If the CNC or robot controller is powered off after starting the system, an I/O Link error occurs. To successfully make connection with I/O Link again, turn off all units and then turn them on at the timing indicated in 1.

When used as master interface
JRS26
Interface

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

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

When used as slave interface
JRS26
Interface
Refer to item 3 of Fig.2.1.1 (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-30iB Mini Plus is connected to CNC or the previous 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-30iB Mini Plus is connected to the 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.

5 When an electric cable is used, the maximum cable length between units is 10 m. If the cable is longer than 10 m, use an optical I/O Link adapter and an optical fiber cable for connecting units.

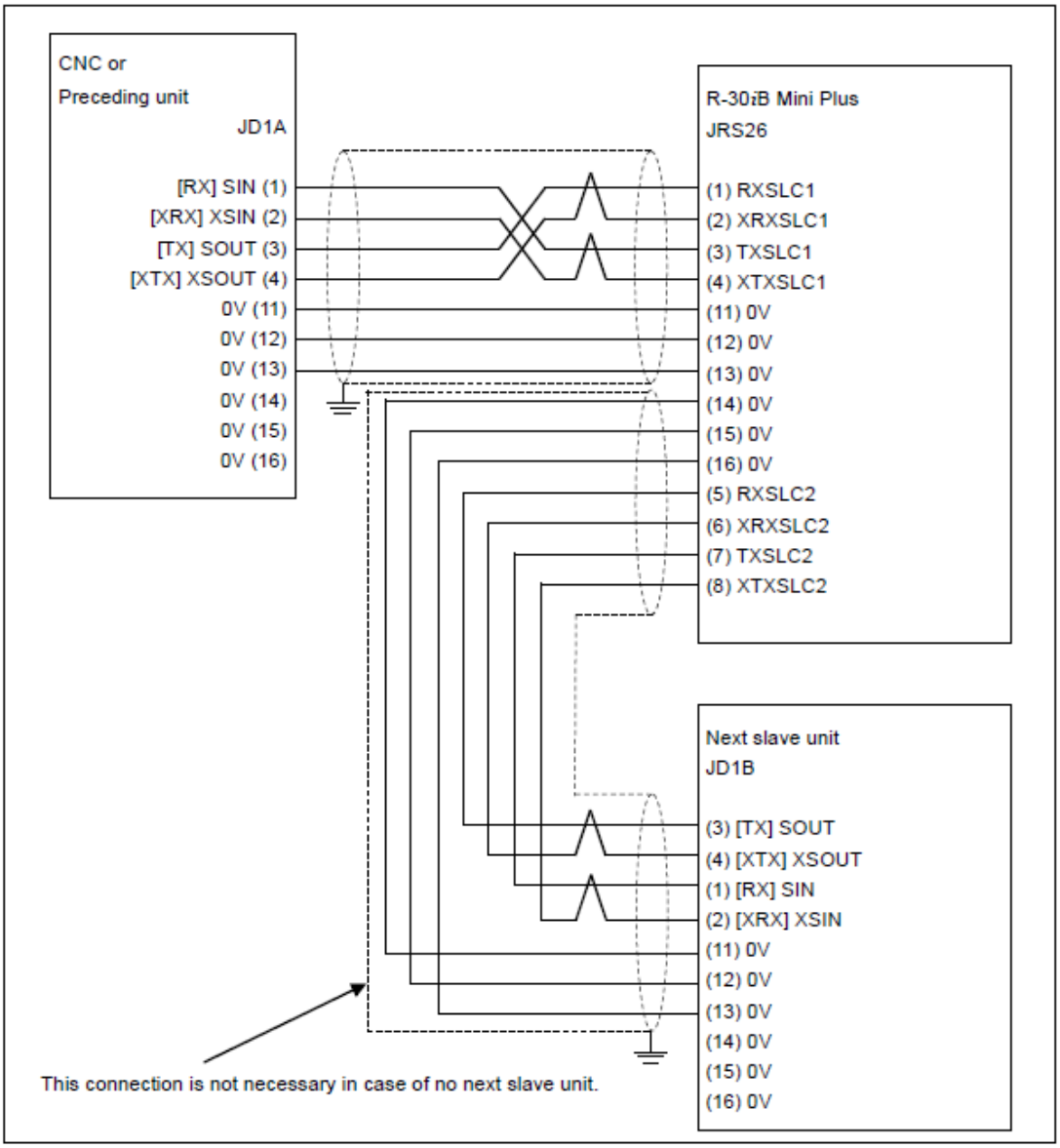


Figure 2.1.1-3 Cable connection diagram of the I/O Link cable by using JRS26 connector (for the slave unit)

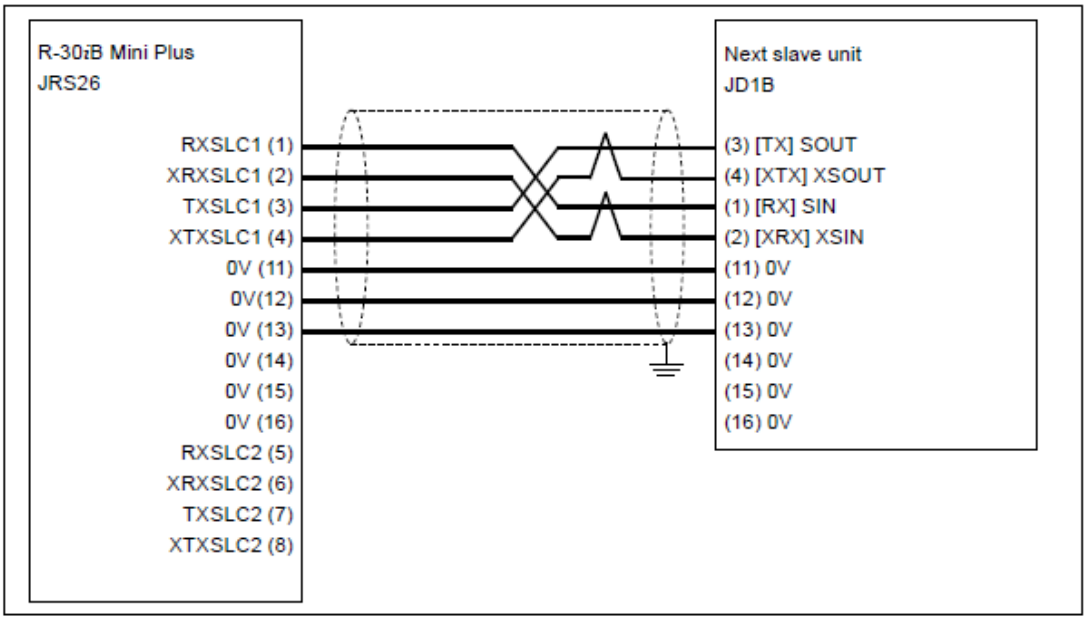


Figure 2.1.1-4 Cable connection diagram of the I/O Link cable by using JRS26 connector (for the master unit)

2.1.2. Connection of I/O Link i by Using JD1A Connector

JD1A is used to connect the Additional safety I/O board (option board).
The connection of JD1A connector is shown below.

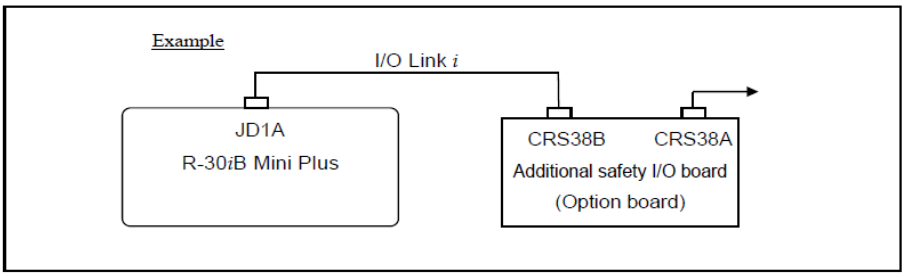


Figure 2.1.2-1 Connection of the JD1A connector

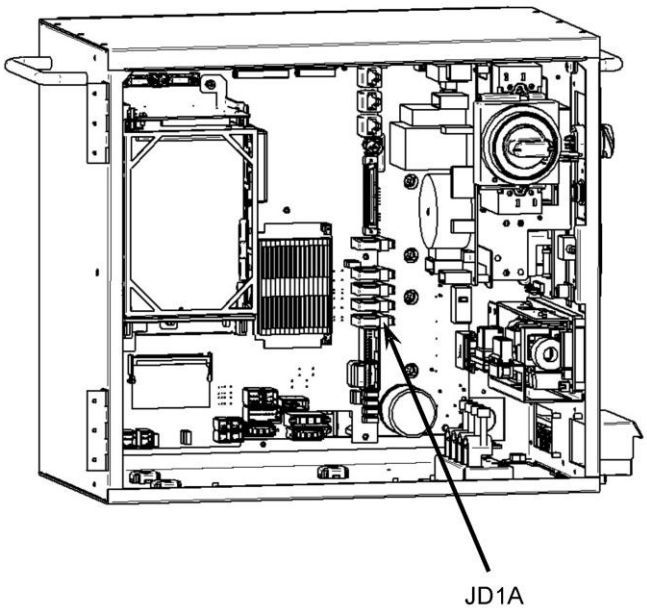


Figure 2.1.2-2 Path of the I/O Link i cable by using JD1A connector

JD1A
Interface

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

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

1. When the R-30iB Mini Plus is connected to an additional I/O board, use a twisted-pair cable in which wires RXSLCS (Pin No.1 of JD1A) and XRXSLCS (Pin No.2 of JD1A) are paired and wires TXSLCS (Pin No.3 of JD1A) and XTXSLCS (Pin No.4 of JD1A) are paired.
2. When an electric cable is used, the maximum cable length between units is 10 m. If the cable is longer than 10 m, use an optical I/O Link *i* adapter and an optical fiber cable for connecting units.

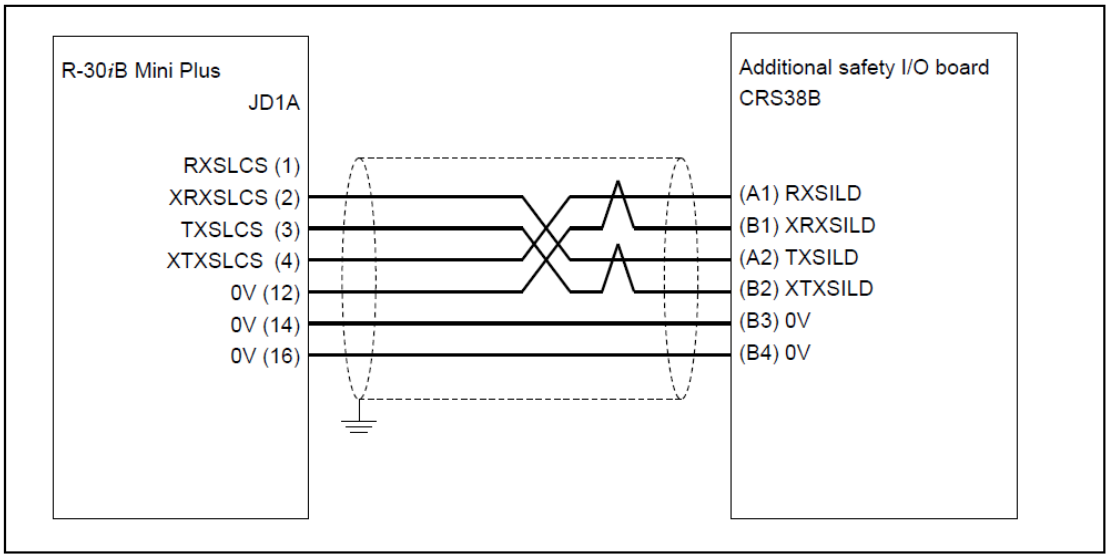


Figure 2.1.2-3 Cable connection diagram of the I/O Link i cable by using JD1A connector

2.2. Robot Connection Cables

2.2.1. Robot Connection Cables

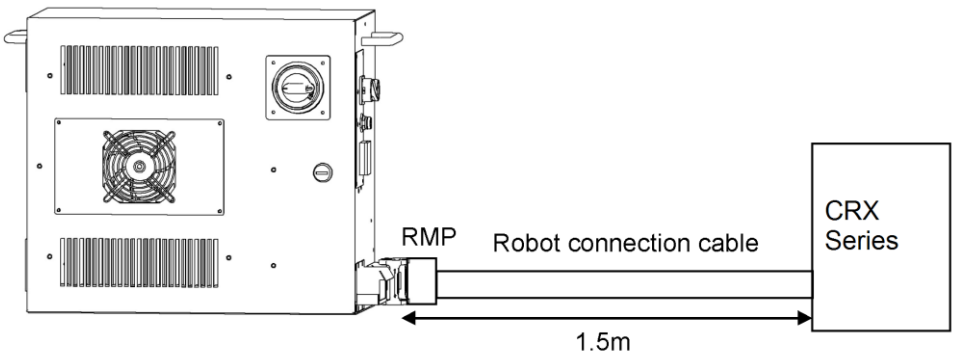


Figure 2.2.1-1 Robot Connection Cables

Specification of cable

		Robot	Non-flex type			
			Length (m)	Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)
RMP	RP	CRX-5iA CRX-10iA CRX-20iA	1.5	15.1	0.38	110
	RM			17.6	0.55	

The CRX-25iA does not come with robot connection cables for the robot. Select from the following models:

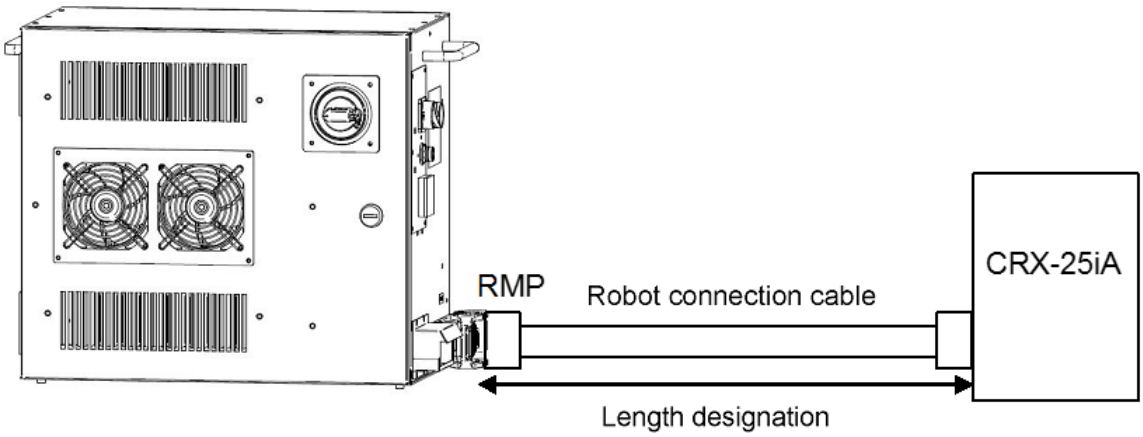


Figure 2.2.1-2 Robot connection cable (CRX-25iA)

Specification of cable (CRX-25iA)

(Non-flex type)

Order specification	Robot Connection Cables			Non-flex type				
	Product Name	Maintenance specification	Quantity		Length (m)	Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)
A05B-2696-H103	RMP cable	A660-2009-T062#L1R003	1	RP	1	15.1	0.38	110
				RM		17.6	0.55	
	Grounding cable	A660-8011-T210#L3R003	1		3			
A05B-2696-H100	RMP cable	A660-2009-T062#L4R003	1	RP	4	15.1	0.38	110
				RM		17.6	0.55	
	Grounding cable	A660-8011-T210#L6R003	1		6			
A05B-2696-H101	RMP cable	A660-2009-T062#L7R003	1	RP	7	15.1	0.38	110
				RM		17.6	0.55	
	Grounding cable	A660-8011-T210#L9R003	1		9			
A05B-2696-H102	RMP cable	A660-2009-T062#L14R03	1	RP	14	15.1	0.38	110
				RM		17.6	0.55	
	Grounding cable	A660-8011-T210#L16R03	1		16			

(Flex type)

Order specification	Robot Connection Cables			Flex type				
	Product Name	Maintenance specification	Quantity		Length (m)	Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)
A05B-2696-H121	RMP cable	A660-4006-T010	1	RP	0.7	19.3	0.61	116
				RM	0.5		0.66	
		A660-4006-T134#L7R003	1	RP	7		0.61	
				RM			0.66	
	Grounding	A660-8011-T210#L10R03	1		10			

Order specification	Robot Connection Cables			Flex type				
	Product Name	Maintenance specification	Quantity		Length (m)	Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)
	cable							
A05B-2696-H122	RMP cable	A660-4006-T010	1	RP	0.7	19.3	0.61	116
				RM	0.5		0.66	
		A660-4006-T134#L14R03	1	RP	14		0.61	
				RM			0.66	
	Grounding cable	A660-8011-T210#L17R03	1		17			
A05B-2696-H124	RMP cable	A660-4006-T010	1	RP	0.7	19.3	0.61	116
				RM	0.5		0.66	
		A660-4006-T134#L20R03	1	RP	20		0.61	
				RM			0.66	
	Grounding cable	A660-8011-T210#L23R03	1		23			
A05B-2696-H125	RMP cable	A660-4006-T010	1	RP	0.7	19.3	0.61	116
				RM	0.5		0.66	
		A660-4006-T134#L30R03	1	RP	30		0.61	
				RM			0.66	
	Grounding cable	A660-8011-T210#L33R03	1		33			

NOTE

For details on the robot connection cables, see the Figure B-9 (P.191) , Figure B-10 (P.192) , and Figure B-11 (P.193) .

2.2.2. Robot connection extension

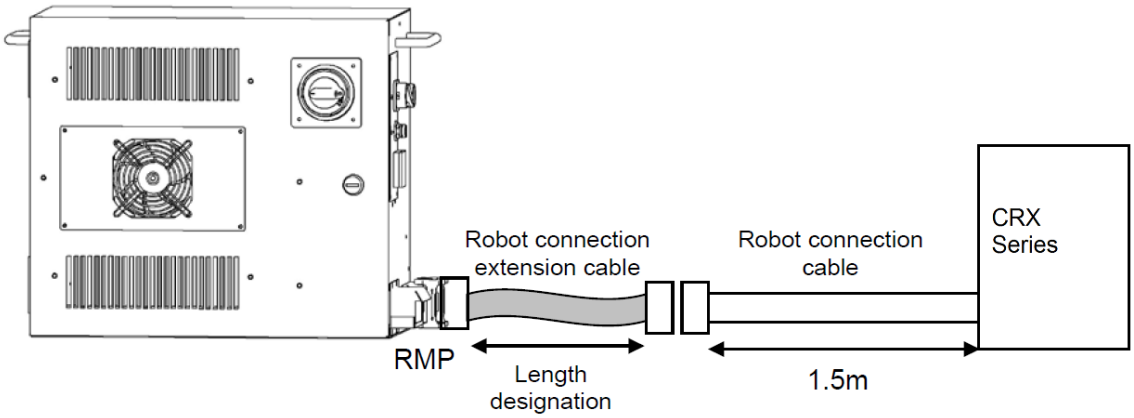


Figure 2.2.2-1 Robot connection extension

Specification of cable (Non-flex type)

・Target: CRX-5iA, CRX-10iA, CRX-20iA

Order specification	Robot connection extension			Non-flex type				
	Product Name	Maintenance specification	Quantity		Length (m)	Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)
A05B-2696-J103	RMP cable	A660-2008-T753#L1R003	1	RP	1	15.1	0.38	110
				RM		17.6	0.55	
	Grounding cable	A660-8011-T210 #L3R003	1		3			
A05B-2696-J100	RMP cable	A660-2008-T753#L4R003	1	RP	4	15.1	0.38	110
				RM		17.6	0.55	
	Grounding cable	A660-8011-T210#L6R003	1		6			
A05B-2696-J101	RMP cable	A660-2008-T753#L7R003	1	RP	7	15.1	0.38	110
				RM		17.6	0.55	
	Grounding cable	A660-8011-T210#L9R003	1		9			
A05B-2696-J102	RMP cable	A660-2008-T753#L14R03	1	RP	14	15.1	0.38	110
				RM		17.6	0.55	
	Grounding cable	A660-8011-T210#L16R03	1		16			

Specification of cable (Flex type)

・Target: CRX-5iA, CRX-10iA, CRX-20iA

Order specification	Robot connection extension			Flex type				
	Product Name	Maintenance specification	Quantity		Length (m)	Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)
A05B-2696-J121	RMP cable	A660-4006-T010	1	RP	0.7	19.3	0.61	116
				RM	0.5		0.66	
		A660-4006-T011#L7R003	1	RP	7		0.61	
				RM			0.66	
	Grounding cable	A660-8011-T210#L10R03	1		10			
A05B-2696-J122	RMP cable	A660-4006-T010	1	RP	0.7	19.3	0.61	116
				RM	0.5		0.66	
		A660-4006-T011#L14R03	1	RP	14		0.61	
				RM			0.66	
	Grounding cable	A660-8011-T210#L17R03	1		17			
A05B-2696-J124	RMP cable	A660-4006-T010	1	RP	0.7	19.3	0.61	116
				RM	0.5		0.66	
		A660-4006-T011#L20R03	1	RP	20		0.61	
				RM			0.66	
	Grounding cable	A660-8011-T210#L23R03	1		23			
	RMP	A660-4006-T010	1	RP	0.7	19.3	0.61	116

Order specification	Robot connection extension			Flex type				
	Product Name	Maintenance specification	Quantity		Length (m)	Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)
A05B-2696-J125	cable	A660-4006-T011#L30R03	1	RM	0.5		0.66	
				RP	30		0.61	
				RM			0.66	
	Grounding cable	A660-8011-T210#L33R03	1		33			

NOTE

For details on the robot connection cables, see the Figure B-9 (P.191) , Figure B-10 (P.192) , and Figure B-11 (P.193) .

⚠WARNING

Keep the cable extended while the robot is in operation. Before operating the robot, uncoil the interconnection cables from their shipping position to prevent excessive heat, which may damage the cables. (Coiled part should be shorter than 10 meter.)

2.3. TEACH PENDANT CABLE AND SWITCH BOX (OPTION)

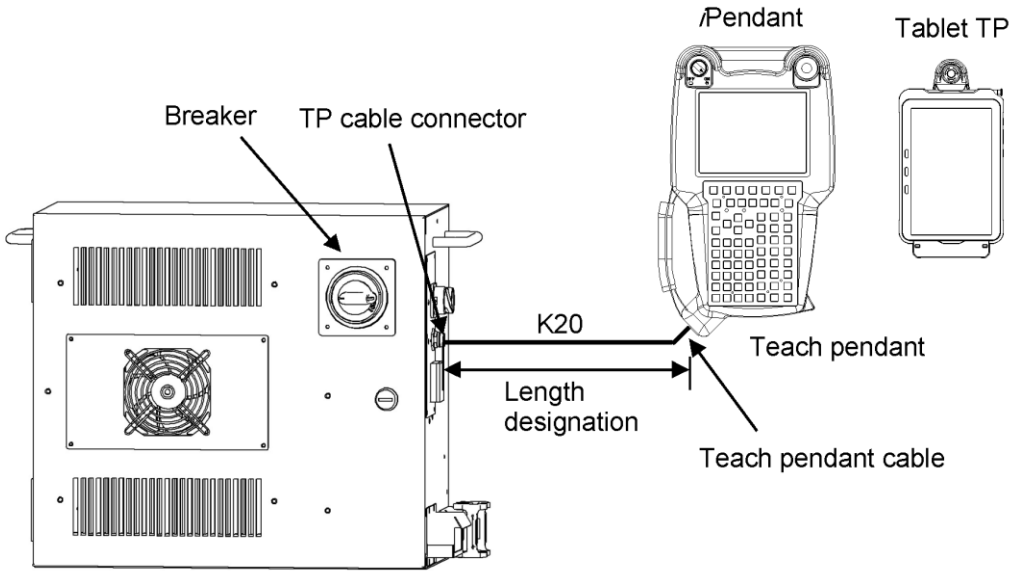


Figure 2.3-1 Connecting the teach pendant cable

⚠CAUTION

Turn off the breaker of the controller before disconnecting Teach pendant cable from TP cable connector. If Teach pendant cable or Jumper connector is disconnected from TP cable connector without turning off the breaker of the controller, alarm may be occurred.

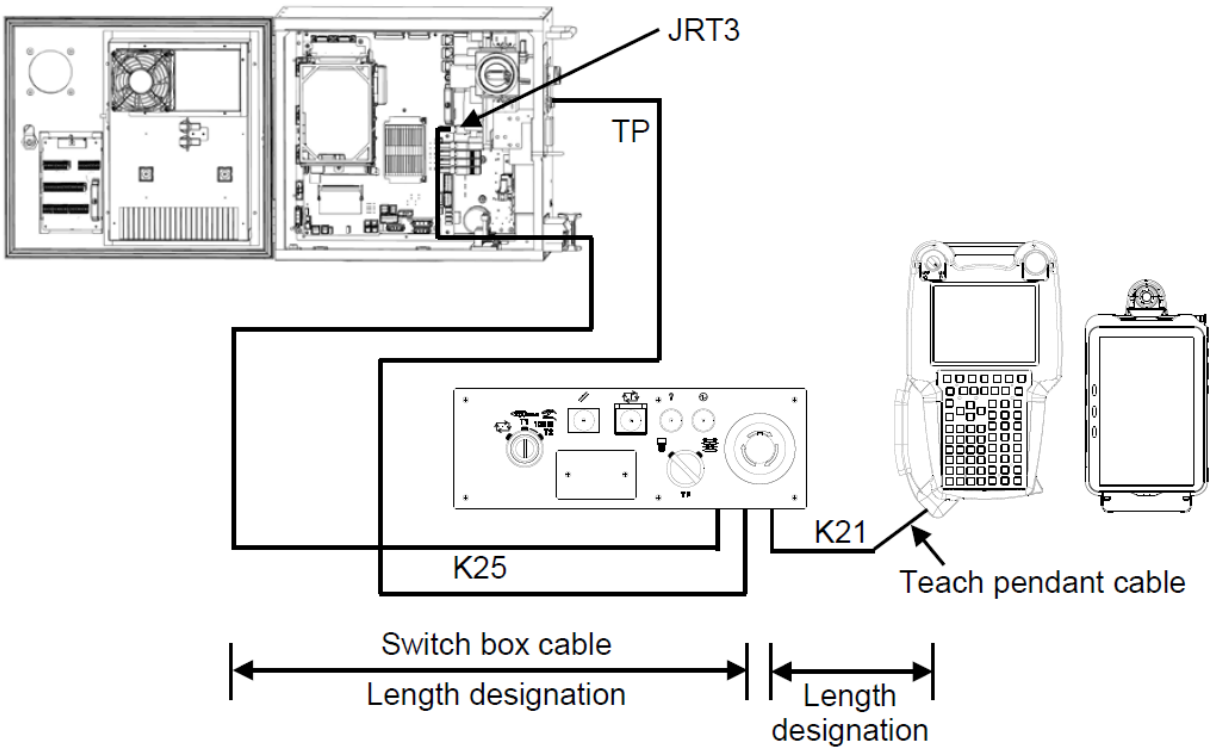


Figure 2.3-2 Switch Box Connection

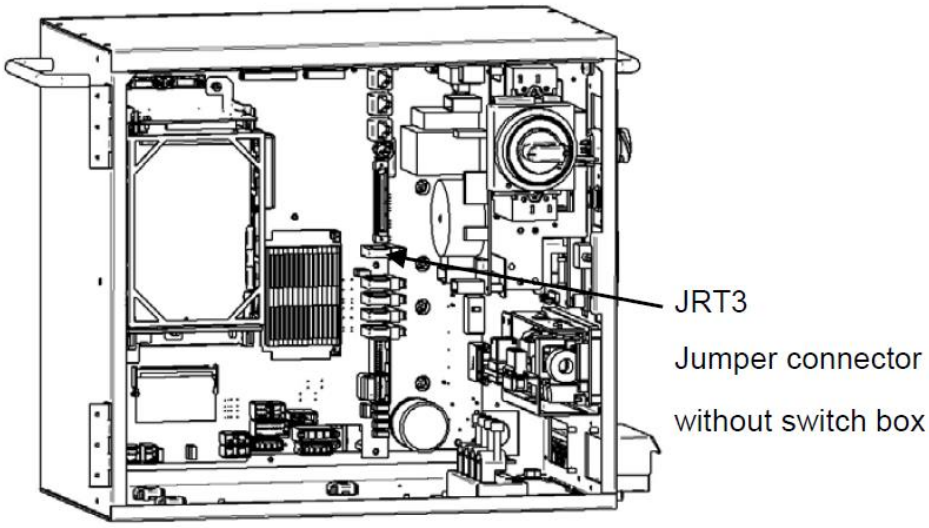


Figure 2.3-3 Jumper connector without switch box

Specification of cable

cable No.	Name	Order specification	Product Name	Maintenance specification	Length (m)
K20	Teach pendant cable	A05B-2690-H200		A660-2008-T032#L5R503	5
		A05B-2690-H201		A660-2008-T032#L10R53	10
		A05B-2690-H202		A660-2008-T032#L20R53	20
	Jumper connector Jumper connector	A05B-2690-H210		A660-2007-T391	
K25	Switch box cable	A05B-2695-H450	cable	A05B-2695-D260	1
			Screw	A6-SW1NA-3X8S-M-ZN2A	4

cable No.	Name	Order specification	Product Name	Maintenance specification	Length (m)
		A05B-2695-H451	cable	A05B-2695-D261	2
			Screw	A6-SW1NA-3X8S-M-ZN2A	4
		A05B-2695-H452	cable	A05B-2695-D262	5
			Screw	A6-SW1NA-3X8S-M-ZN2A	4
		A05B-2695-H453	cable	A05B-2695-D263	10
			Screw	A6-SW1NA-3X8S-M-ZN2A	4
		A05B-2695-H454	cable	A05B-2695-D264	20
			Screw	A6-SW1NA-3X8S-M-ZN2A	4
	Jumper connector without switch box	A05B-2690-H410		A660-2008-T349	

NOTE

Refer to E. REMOTE MODE SWITCH ASSEMBLY INSTRUCTION(P.203).

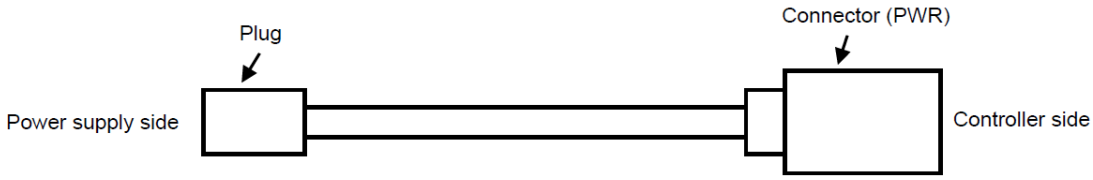
2.4. HOW TO CONNECT INPUT POWER

2.4.1. Input Power Cable

The input power cable of R-30iB Mini Plus should be the optional cable provided by our company, or supplied by the customer. The power supply cable should be prepared according to the following specification. The power source side of the power cable should be connected according to the customer's facility.

Refer to II.4.4. INSTALLATION CONDITION(P.169) for the specifications of the power source.

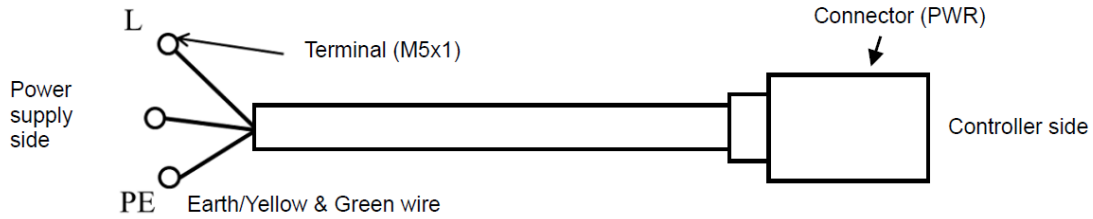
2.4.1.1. IF POWER SUPPLY IS 100V



Specification of cable

cable No.	Name	Order specification	Specification	Maintenance specification	Length (m)
K01	For 100V input Power supply cable	A05B-2695-J100	Act on Product Safety of Electrical Appliances and Materials UL No.498,817 CSA C22.2 No.42,21	A660-8022-T067	2
		A05B-2695-J101		A660-8022-T068	5
		A05B-2695-J102		A660-8022-T069	10
		A05B-2695-J103		A660-8002-T070	15

2.4.1.2. If Power Supply is 200V



The specification of the input power connector (PWR) is as follows and the plug complying with the standard in each region should be connected to the terminals before applying input power.

Table 2.4.1.2-1 Input Power Source Connector Specification

Manufacturer	Series	Shell size Pin assign	Product Name	Cable clamp
Japan Aviation Electronics Industry	JL10	18-10	JL10-6A18-10SE-EB (Straight) JL10-8A18-10SE-EB (Right angle)	JL04-18CK type (Note)
	JL04V	18-10	JL04V-6A18-10SE-EB-R (Straight) JL04V-8A18-10SE-EBH-R (Right angle)	JL04-18CK type (Note)
HIROSE ELECTRIC CO., LTD. !DLT!	H/MS	18-10	H/MS3106A18-10S-D-T (73) (Straight) H/MS3108B18-10S-D-T (73) (Right angle)	H/MS3057 type (Note)

NOTE

A cable clamp corresponding to the cable diameter should be used.

The following table shows the pin assign of the input power connector (PWR).

Table 2.4.1.2-2 Pin assign of the input power connector (PWR)

Pin No.	Signal name
A	L (200V)
B	N (Neutral)
C	- (Not used)
D	PE/PE_C (Earth)

Table 2.4.1.2-3 Wire for the input power cable

	Rated Voltage	Conductor size / Diameter	Supplier / Specification / Standard
Recommended Wire	250Vor more	AWG14-AWG12 Dia.: φ5 -φ14.1	UL817, CSA C22.2 No.21 IEC60227, IEC60245 Refer to the following Waring 5.
FANUC Power supply cable (Option)	600V	AWG14 Dia.: φ10.7 Minimum bend radios: 60mm	LAPP KABEL OLFLEX 150 QUATTRO UL AWM Style 2587 or 21098 CSA AWM I A/B II A/B

⚠WARNING

1. An input power cable according to the breaker or the fuse of the input power supply (power distribution panel) must be used.
2. Provide a grounding conductor of equivalent gauge as the supply conductors.

⚠WARNING

3. Provide a class-D or better ground. The resistance to the ground must not exceed 100Ω. There shall be no switches or disconnects in the grounding conductor.
4. Perform grounding/bonding in compliance with NEC Article 250 or CEC Section 10 as appropriate.
5. The input wire and terminals of the input power cable should be used according to the installation condition and applicable standard.

2.4.2. Connecting the Input Power Cable

1. Figure 2.4.2-1 shows how to connect the input power cable.
2. The connector of the input power cable should be connected to the PWR connector and the earth wire (PE) should be connected to the earth terminal as described in Figure 2.4.2-1 .

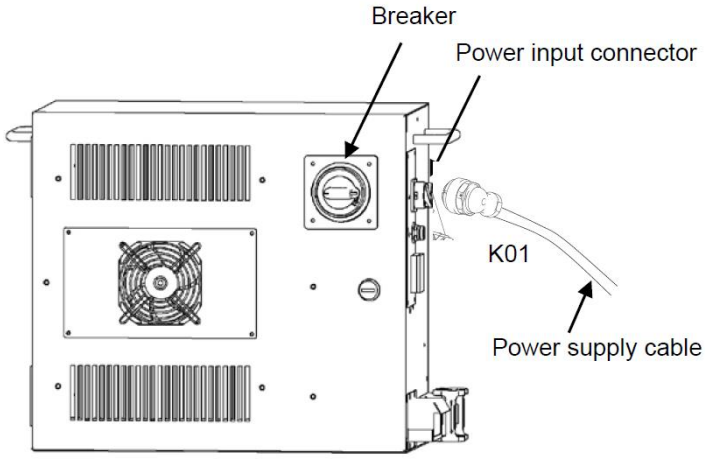


Figure 2.4.2-1 Connecting the Input Power Cable

Specification of cable

Cable No.	Name	Order specification	Maintenance specification	Length (m)	Diameter (mm)	Minimum bending radius (mm)
K02	Power cable	A05B-2690-J100	A660-8020-T889#L2R003	2	10.7	66
		A05B-2690-J101	A660-8020-T889#L5R003	5	10.7	66
		A05B-2690-J102	A660-8020-T889#L10R03	10	10.7	66
		A05B-2690-J103	A660-8020-T889#L20R03	20	10.7	66

2.4.3. Leakage Breaker

1. 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.
2. A leakage current of 10 mA or less flows through the robot controller. When using a common leakage current circuit breaker for multiple units, make sure that the total leakage current does not exceed the sensitive electric current of the leakage current circuit breaker.

Table 2.4.3-1 Example of leakage current circuit breaker for inverters

Manufacturer	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 type C or later Leakage current circuit breaker type KC or later

2.4.4. ON/OFF Timing by the Breaker

If the power supply is turned on, turned off, and then turned on again repeatedly in a short time, the controller may not start up.

If the power is turned off, wait for at least 10 seconds before turning on the power again.

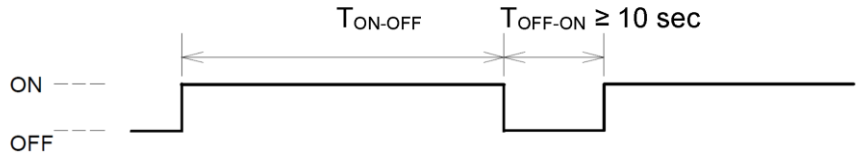


Figure 2.4.4-1 Turning on the power again ten seconds after turning it off

2.5. CONNECTING THE EXTERNAL EMERGENCY STOP

After connecting the safety signals like external emergency stop signal and/or safety fence signal, verify the following:• All safety signals stop the robot as intended.• There is no mistake in the connection of safety signals. Also note that if installation inside the I/O terminal block conversion module control was ordered (A05B-2695-J150), the process will need to be performed on the terminal above the door.

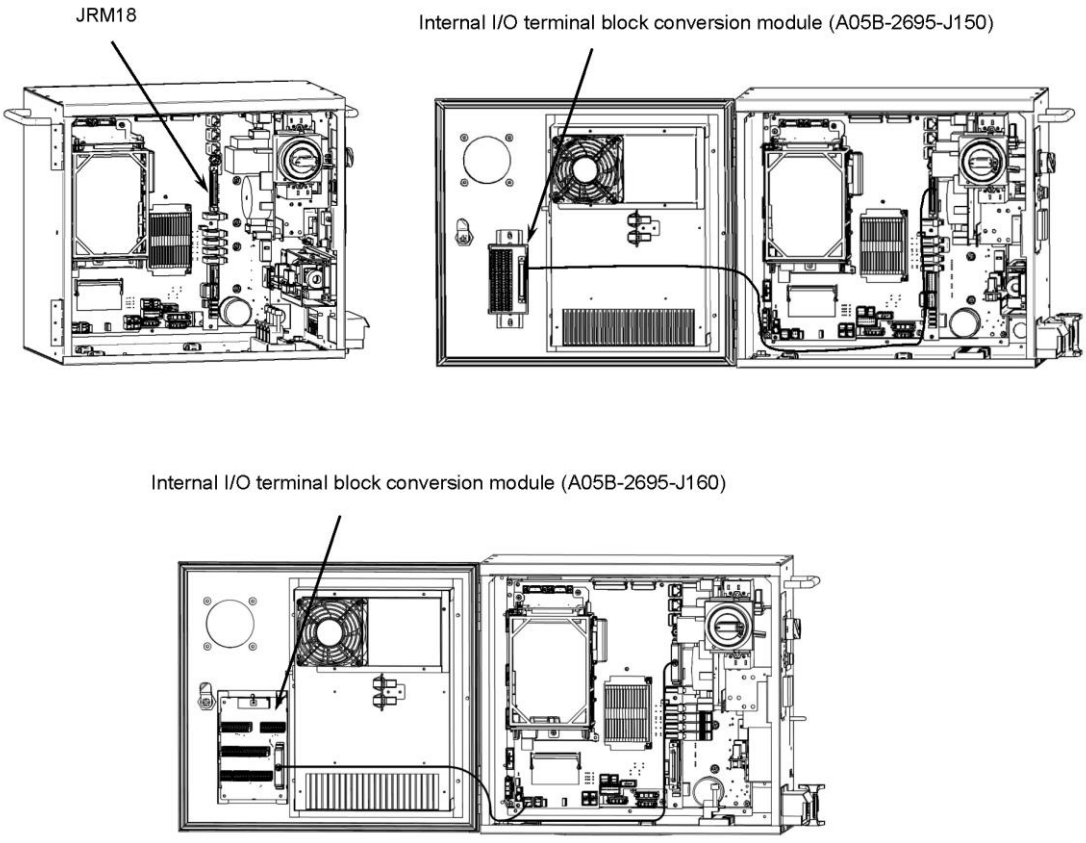


Figure 2.5-1 Connecting the external emergency stop

Upper left figure : no I/O terminal block conversion module

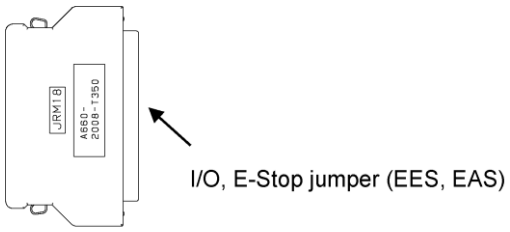
Upper right figure : internal I/O terminal block conversion module (A05B-2695-J150)

Lower figure : internal I/O terminal block conversion module (A05B-2695-J160)

NOTE

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

In the case where there is no I/O terminal block conversion module, when disabling external emergency stop input signal (EES) and safety fence signal (EAS) and operating the robot in manual mode temporarily, please connect I/O E-stop jumper (option). In the case where there is an I/O terminal block conversion module, since the jumpers are set on the I/O terminal block conversion module in order to disable the external emergency stop input (EES) and the safety fence signal (EAS), connect them as necessary.



Name	Order specification	Product Name	Maintenance specification	Quantity
I/O, E-stop jumper (EES, EAS)	A05B-2690-K100	Jumper cable for JRM18	A660-2008-T350	1

⚠WARNING

1. I/O E-stop jumper is limited to temporary use on system startup.
2. 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.

2.5.1. External Emergency Stop Output

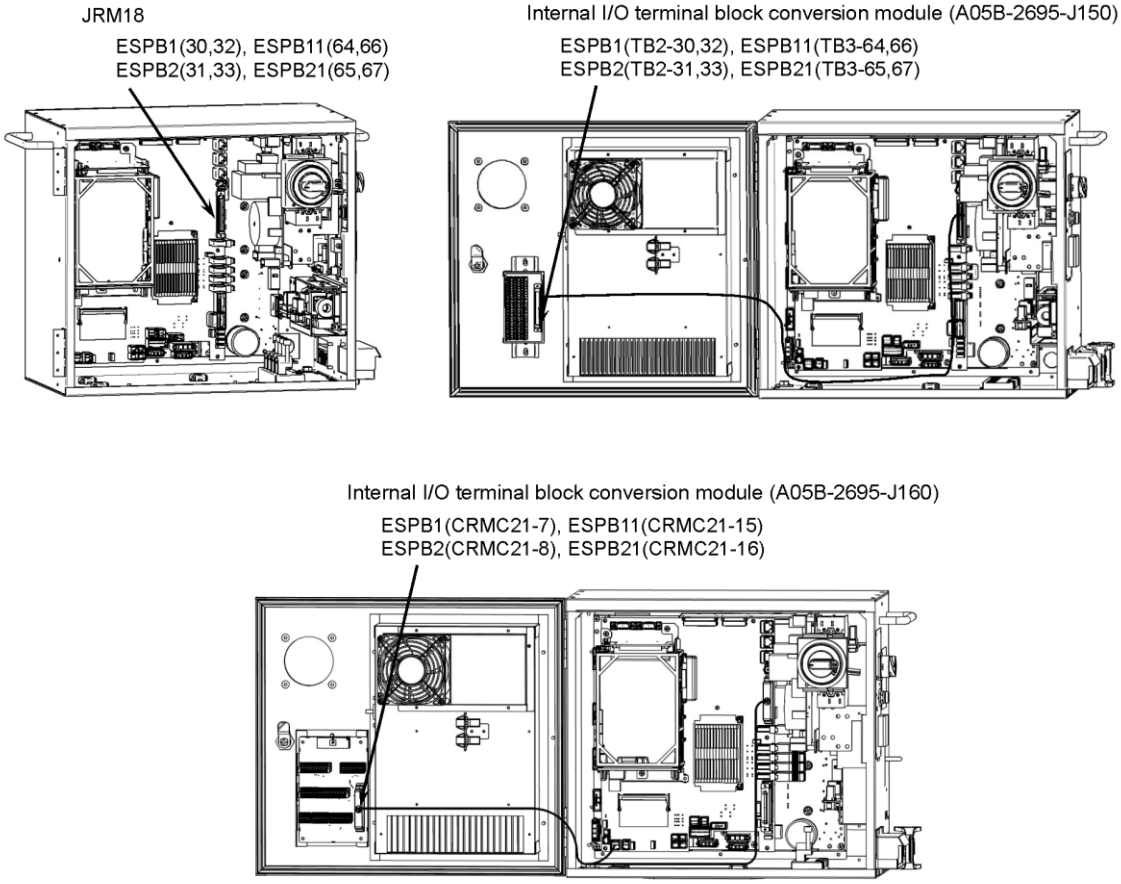


Figure 2.5.1-1 Connecting the external emergency stop output

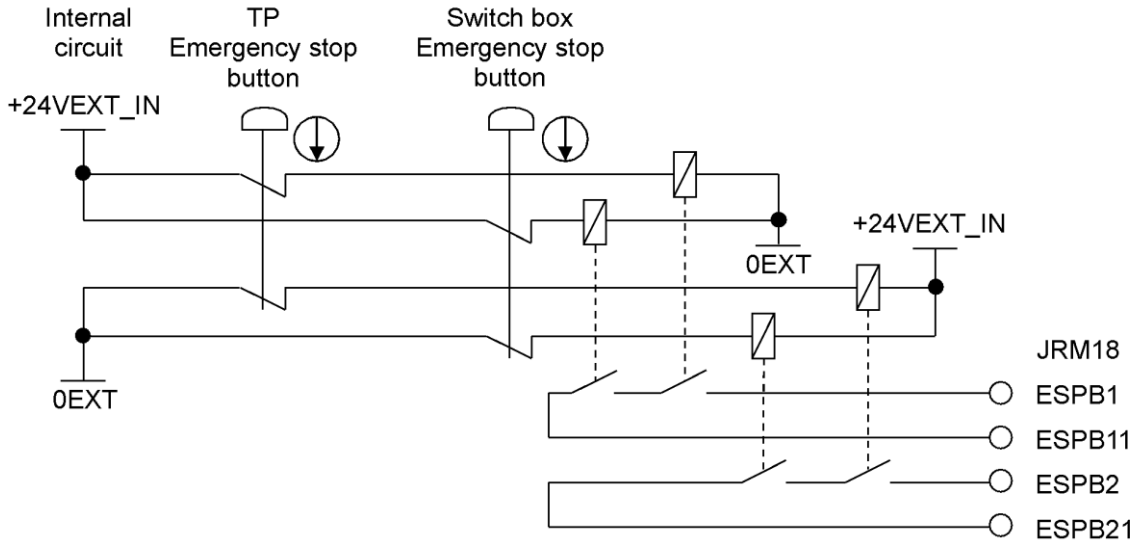
Upper left figure : no I/O terminal block conversion module
Upper right figure : internal I/O terminal block conversion module (A05B-2695-J150)
Lower figure : internal I/O terminal block conversion module (A05B-2695-J160)

For details on the circuit, see Figure B-4 (P.186).

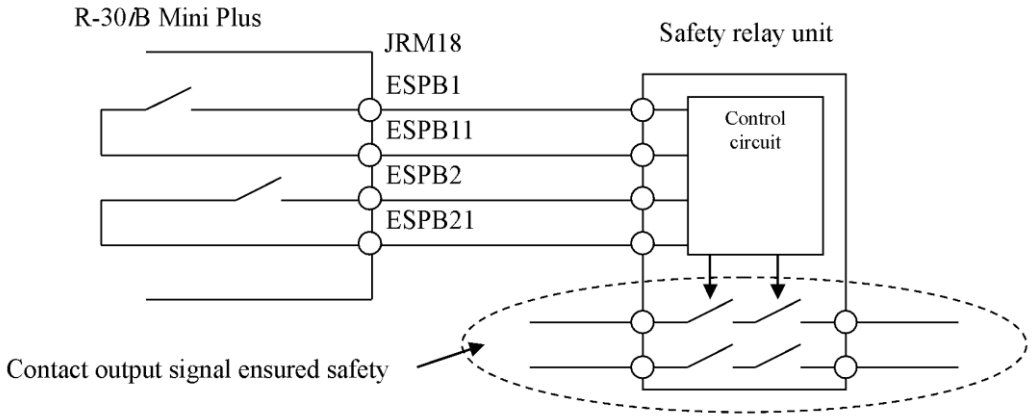
	Signal name	Description	Current, voltage	Min. load
Emergency stop output	ESPB1-ESPB11 ESPB2-ESPB21	The contact is open when one of the TP emergency stop button or the Operator panel emergency stop button is pressed. The contact is also open while the controller is powered off regardless of status of 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.	Resistance load DC24V: 1A 0.5 A/pin (NOTE)	(Reference value) DC5V: 10mA

NOTE

For protection against the noise, the shielded cable is recommended for the connection cable.
For protection against the electric shock, use the circuit protector (1A or less).
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.
An output current per connector pin should be less than 0.5 A. If the output current flows 0.5 A to 1 A, use two connector pins for one signal.



Example of the connection with the safety relay unit



⚠ WARNING
Robot controller does not detect the failure 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.

External power connection

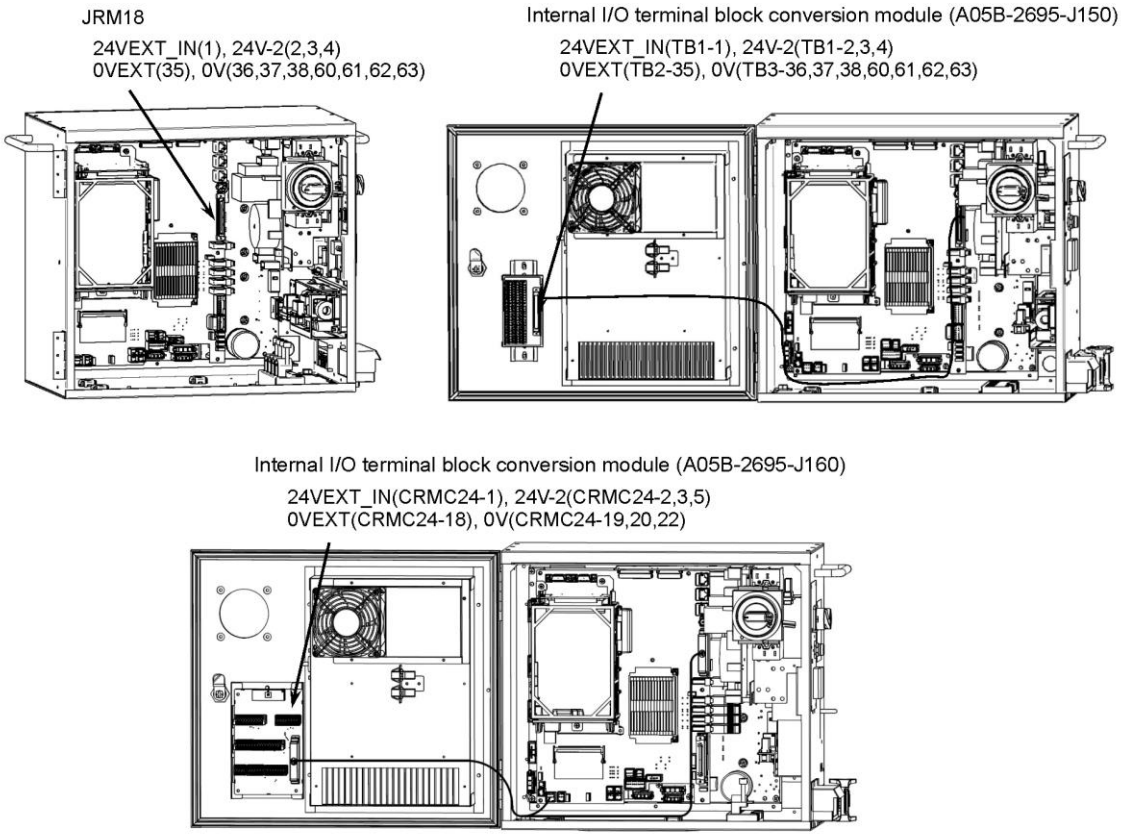


Figure 2.5.1-2 How to connect input power

Upper left figure : no I/O terminal block conversion module

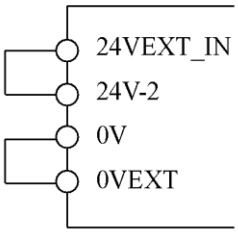
Upper right figure : internal I/O terminal block conversion module (A05B-2695-J150)

Lower figure : internal I/O terminal block conversion module (A05B-2695-J160)

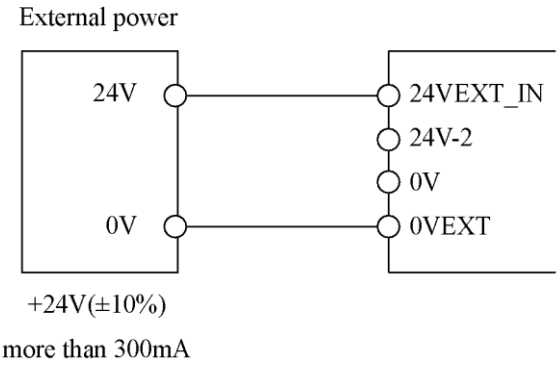
The relays for emergency stop output (ESPB) can be separated from 24V controller's power. To ensure that the emergency stop output is not affected when the controller's power is turned off, please connect external +24V (24VEXT_IN) instead of internal +24V.

Example of the connection

In case of not using the external power source



In case of using the external power source



NOTE

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

2.5.2. External Emergency Stop Input (Emergency Stop Input, Fence Input)

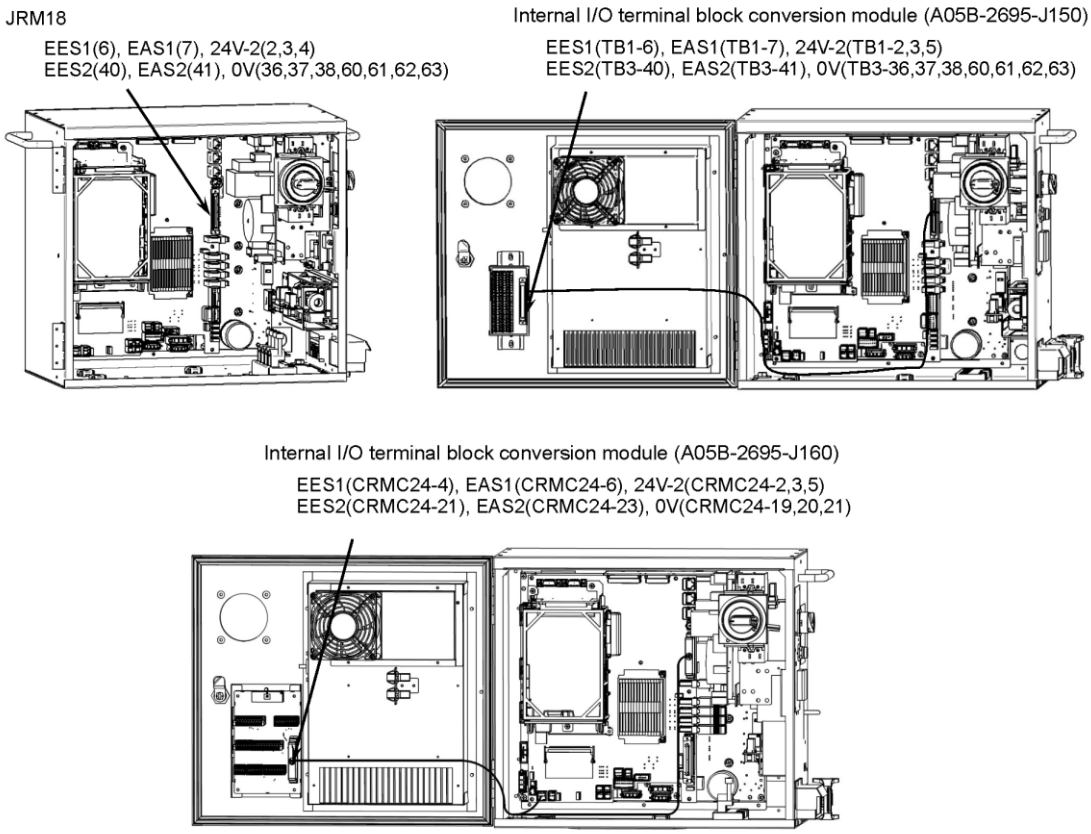


Figure 2.5.2-1 Connecting the external emergency stop input

Upper left figure : no I/O terminal block conversion module
Upper right figure : internal I/O terminal block conversion module (A05B-2695-J150)
Lower figure : internal I/O terminal block conversion module (A05B-2695-J160)

	Signal name	Description	Current, voltage
Emergency stop input	EES1 24V-2 EES2 0V	Connect the contacts of the external emergency stop button to these terminals. When the contacts are open, the robot stops according to predetermined stop pattern. (NOTE 2) 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.	DC24V 0.1A opening/closing (NOTE 1)
Fence input	EAS1 24V-2 EAS2 0V	These signals are used to stop the robot safely when the safety fence gate is opened during operation in the AUTO mode. When the contacts are open in the AUTO mode, the robot stops according to predetermined stop pattern. (NOTE 2)	DC24V 0.1A opening/closing (NOTE 1)

	Signal name	Description	Current, voltage
		In the T1 or T2 mode and the enabling device (the 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.	

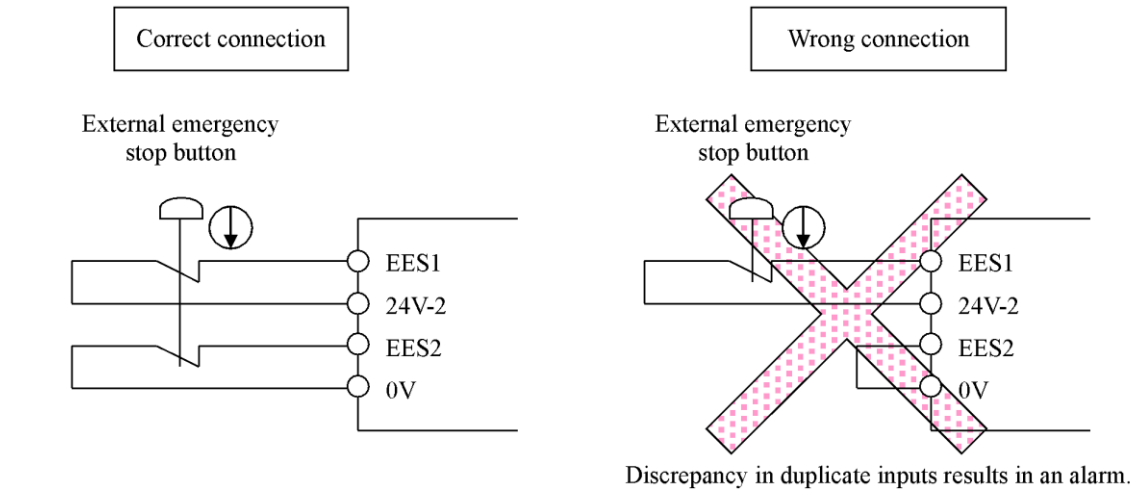
NOTE

1. Use a contact which has a minimum load of 5mA or less.
2. See "SAFETY HANDBOOK"(B-80687EN).

NOTE

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

Examples of connection of duplicate safety signals



Discrepancy in duplicate inputs results in an alarm.

Input timing of duplicate safety signals

Duplicate inputs are used for signals such as the external emergency stop signal and safety fence 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.

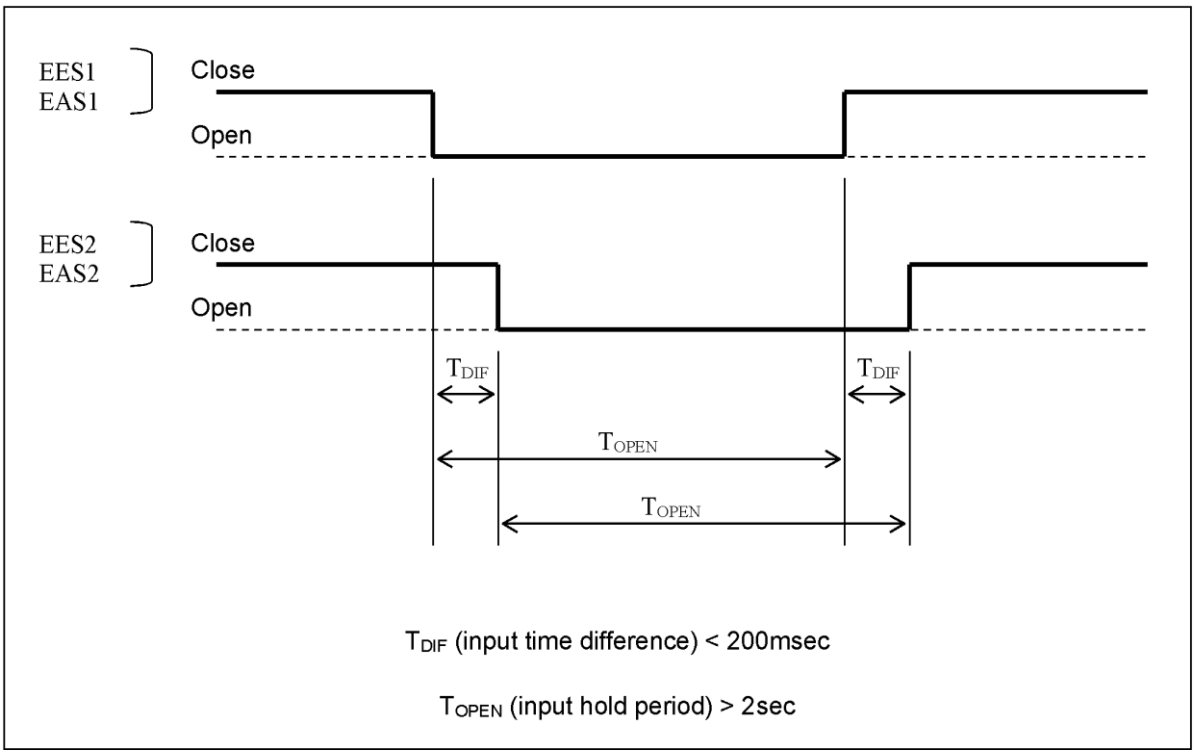


Figure 2.5.2-2 Input timing of duplicate safety signals

NOTE

Refer to II.3.1.2. Connection between the Main Board (JRM18) and Peripheral Devices(P.126) for JRM18's EES1, EES2, EAS1, EAS2, EAS2, 24V-2, 24VEXT_IN, 0V, 0VEXT, and so on.

Reset signal interval

If resets are repeated within a short period of time, this may cause a breakdown in the servo amplifier's charging circuit. Please make sure to wait at least 20 seconds after a reset before issuing another one.

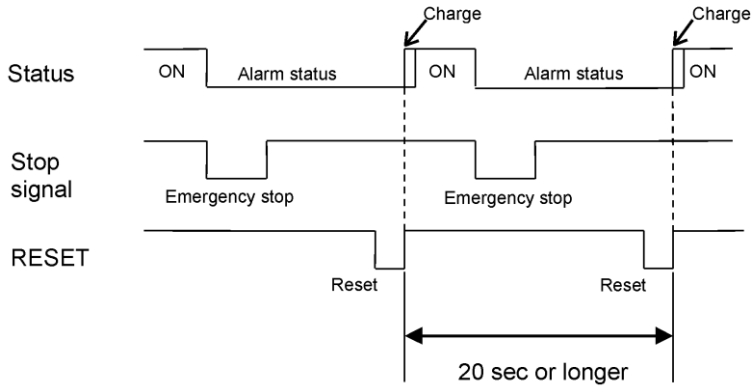


Figure 2.5.2-3 Reset signal interval after previous reset

3. Peripheral device

CAUTION

R-30iB Mini Plus does not assume there is power supply from the controller to external peripheral devices, so there is no connector for it. If power must be supplied to a peripheral device, prepare an external power supply.
For details on the EE interface, see "Tablet UI OPERATOR'S MANUAL"(B-84274EN).

Table 3-1 shows the peripheral device interface of R-30iB Mini Plus.

Table 3-1 Specifications of Peripheral Device Interface

Name	Order specification	Number of I/O points		Remark
		JRM18		
		DI	DO	
Main board A	A05B-2695-H001	20	16 (Source)	With Vision I/F, force sensor I/F, line tracking I/F, HDI

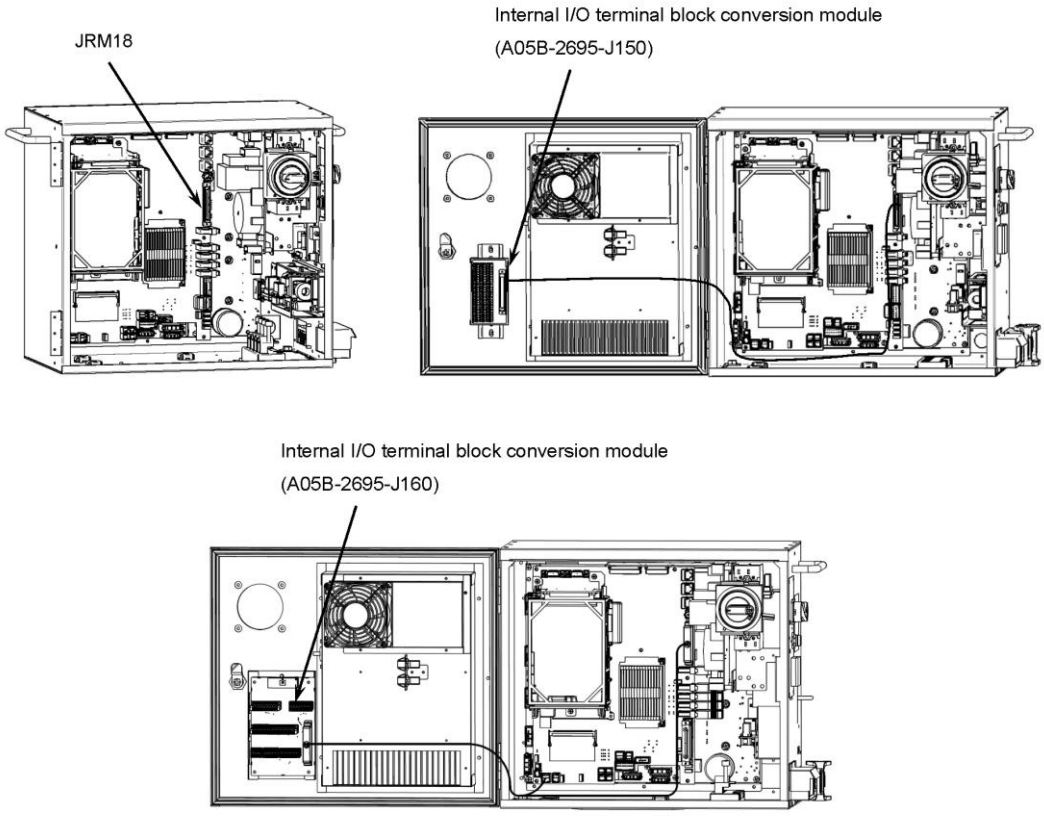


Figure 3-1 Peripheral device interface (JRM18)

Upper left figure : no I/O terminal block conversion module
Upper right figure : internal I/O terminal block conversion module (A05B-0695-J150)
Lower figure : internal I/O terminal block conversion module (A05B-0695-J160)

Name	Order specification	Number of I/O points		Remark
		CRMC15		
		SFDI	SFDO	
Main board A	A05B-2695-H001	2	-	With Vision I/F, force sensor I/F, line tracking I/F, HDI

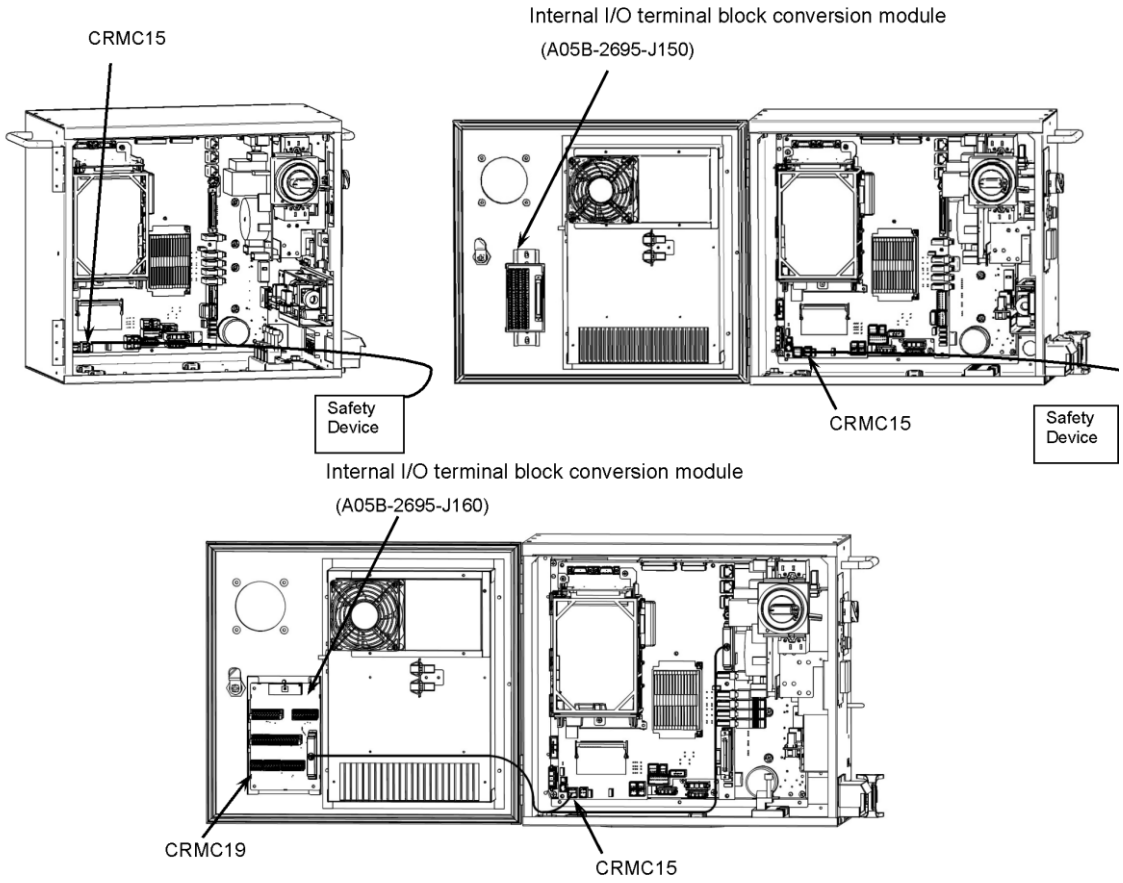


Figure 3-2 Peripheral Device interface (CRMC15)

Upper left figure : no I/O terminal block conversion module
Upper right figure : internal I/O terminal block conversion module (A05B-0695-J150)
Lower figure : internal I/O terminal block conversion module (A05B-0695-J160)

3.1. PERIPHERAL DEVICE INTERFACE

3.1.1. Peripheral Device interface (JRM18)

There are 20 data inputs (DI) and 16 data outputs (DO) on the main board (peripheral device interface (JRM18)). Table 3.1.1-1 shows DI/DO signals of peripheral device interface.

Table 3.1.1-1 Input signals of peripheral device interface

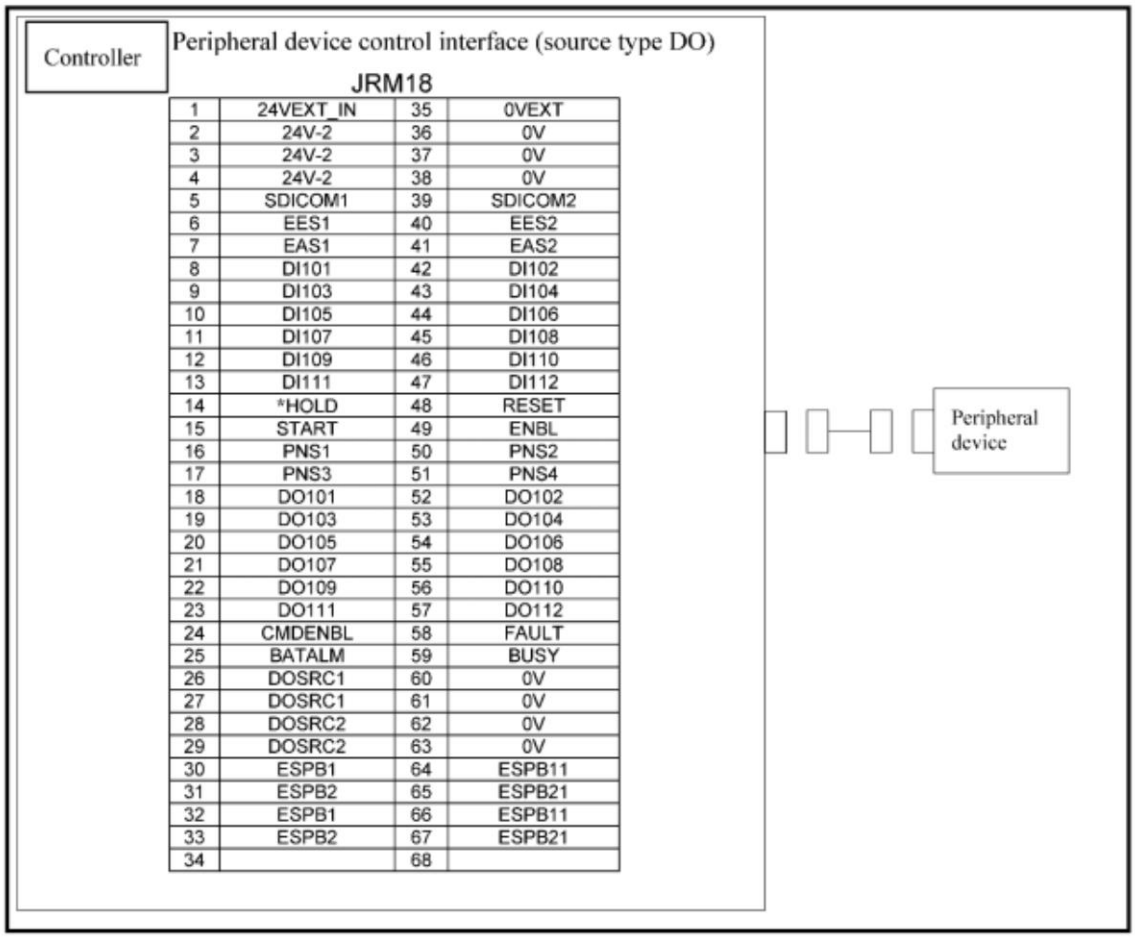
Connector number	Signal name	Standard I/O assignment		Description	Remark
		UOP auto asg.: Simple (JRM18)	UOP auto asg.: None Full Full (Slave) Simple Simple (Slave)		
JRM18-8	DI01	DI[101]	DI[101]	Peripheral device status	General signal
JRM18-42	DI02	DI[102]	DI[102]		
JRM18-9	DI03	DI[103]	DI[103]		
JRM18-43	DI04	DI[104]	DI[104]		
JRM18-10	DI05	DI[105]	DI[105]		
JRM18-44	DI06	DI[106]	DI[106]		
JRM18-11	DI07	DI[107]	DI[107]		
JRM18-45	DI08	DI[108]	DI[108]		
JRM18-12	DI09	DI[109]	DI[109]		
JRM18-46	DI10	DI[110]	DI[110]		
JRM18-13	DI11	DI[111]	DI[111]		
JRM18-47	DI12	DI[112]	DI[112]		
JRM18-14	DI13	UI[2] *HOLD	DI[81]	Hold signal	
JRM18-48	DI14	UI[5] RESET	DI[82]	External reset	
JRM18-15	DI15	UI[6] START	DI[83]	Start	
JRM18-49	DI16	UI[8] ENBL	DI[84]	Operation enabled	
JRM18-16	DI17	UI[9] PNS1	DI[85]	Program number	
JRM18-50	DI18	UI[10] PNS2	DI[86]	Program number	
JRM18-17	DI19	UI[11] PNS3	DI[87]	Program number	
JRM18-51	DI20	UI[12] PNS4	DI[88]	Program number	

Table 3.1.1-2 Output signals of the peripheral device interface

Connector number	Signal name	Standard I/O assignment		Description	Remark
		UOP auto asg.: Simple (JRM18)	UOP auto asg.: None Full Full (Slave) Simple Simple (Slave)		
JRM18-18	DO01	DO[101]	DO[101]	Peripheral device status	General signal
JRM18-52	DO02	DO[102]	DO[102]		
JRM18-19	DO03	DO[103]	DO[103]		
JRM18-53	DO04	DO[104]	DO[104]		
JRM18-20	DO05	DO[105]	DO[105]		
JRM18-54	DO06	DO[106]	DO[106]		
JRM18-21	DO07	DO[107]	DO[107]		
JRM18-55	DO08	DO[108]	DO[108]		
JRM18-22	DO09	DO[109]	DO[109]		
JRM18-56	DO10	DO[110]	DO[110]		
JRM18-23	DO11	DO[111]	DO[111]		
JRM18-57	DO12	DO[112]	DO[112]		
JRM18-24	DO13	UO[1] CMDENBL	DO[81]	During automatic operation	

Connector number	Signal name	Standard I/O assignment		Description	Remark
		UOP auto asg.: Simple (JRM18)	UOP auto asg.: None Full Full (Slave) Simple Simple (Slave)		
JRM18-58	DO14	UO[6] FAULT	DO[82]	Alarm signal	
JRM18-25	DO15	UO[9] BATALM	DO[83]	Battery voltage drop	
JRM18-59	DO16	UO[10] BUSY	DO[84]	During operation	

3.1.2. Connection between the Main Board (JRM18) and Peripheral Devices



1	24VEXT_IN	35	0VEXT
2	24V-2	36	0V
3	24V-2	37	0V
4	24V-2	38	0V
5	SDICOM1	39	SDICOM2
6	EES1	40	EES2
7	EAS1	41	EAS2
8	DI101	42	DI102
9	DI103	43	DI104
10	DI105	44	DI106
11	DI107	45	DI108
12	DI109	46	DI110
13	DI111	47	DI112
14	*HOLD	48	RESET
15	START	49	ENBL
16	PNS1	50	PNS2
17	PNS3	51	PNS4
18	DO101	52	DO102
19	DO103	53	DO104
20	DO105	54	DO106
21	DO107	55	DO108
22	DO109	56	DO110
23	DO111	57	DO112
24	CMDENBL	58	FAULT
25	BATALM	59	BUSY
26	DOSRC1	60	0V
27	DOSRC1	61	0V
28	DOSRC2	62	0V
29	DOSRC2	63	0V
30	ESPB1	64	ESPB11
31	ESPB2	65	ESPB21
32	ESPB1	66	ESPB11
33	ESPB2	67	ESPB21
34		68	

SDICOM1 to 2 signals are common selection signal for SDI.

When 24V-2 common is used, connect to 0V.

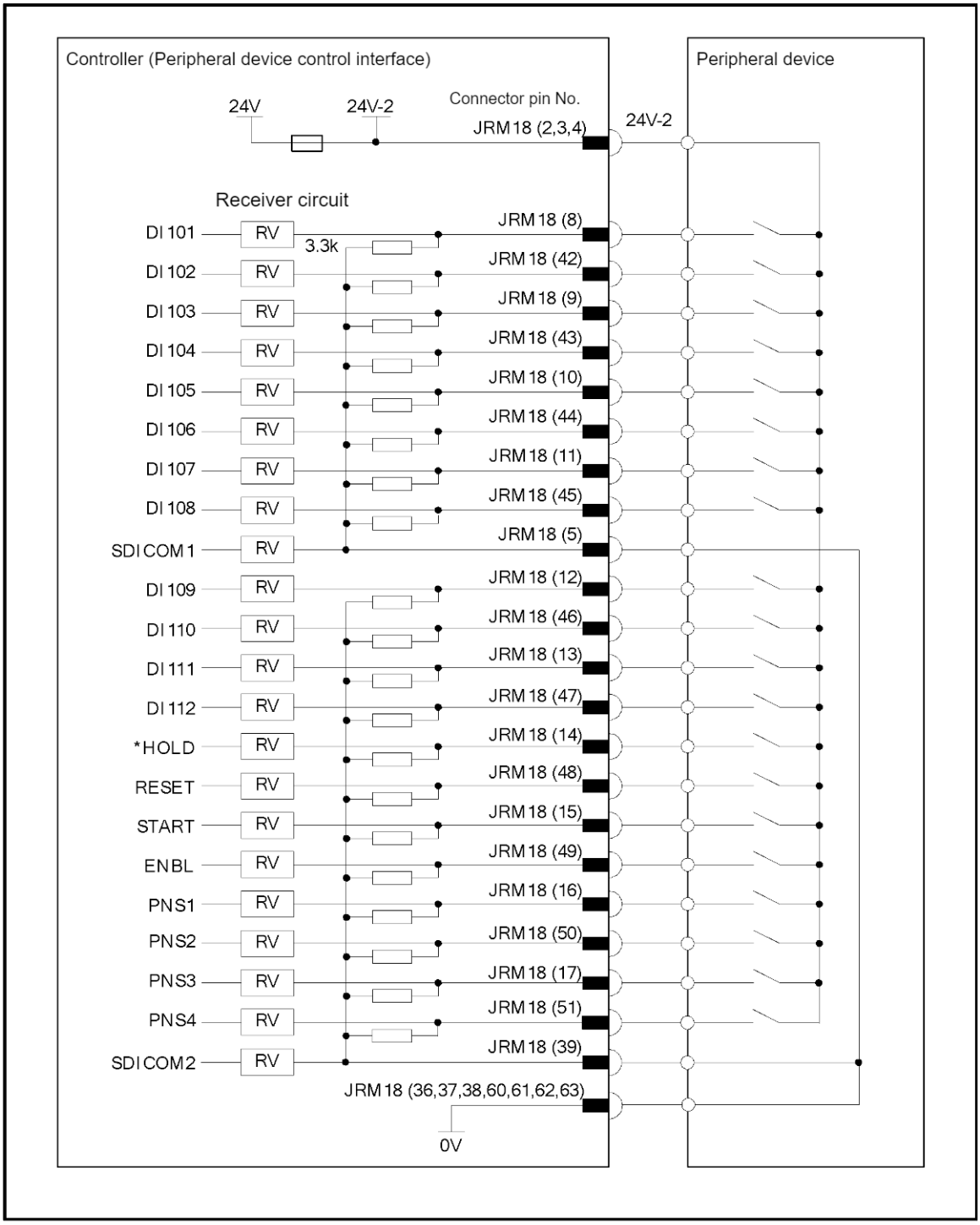
When 0V common is used, connect to 24V-2.

SDICOM1 → Selects a common for DI101 to DI108.

SDICOM2 → Selects a common for DI109 to DI112, *HOLD, RESET, START, ENBL, PNS1 to PNS4.

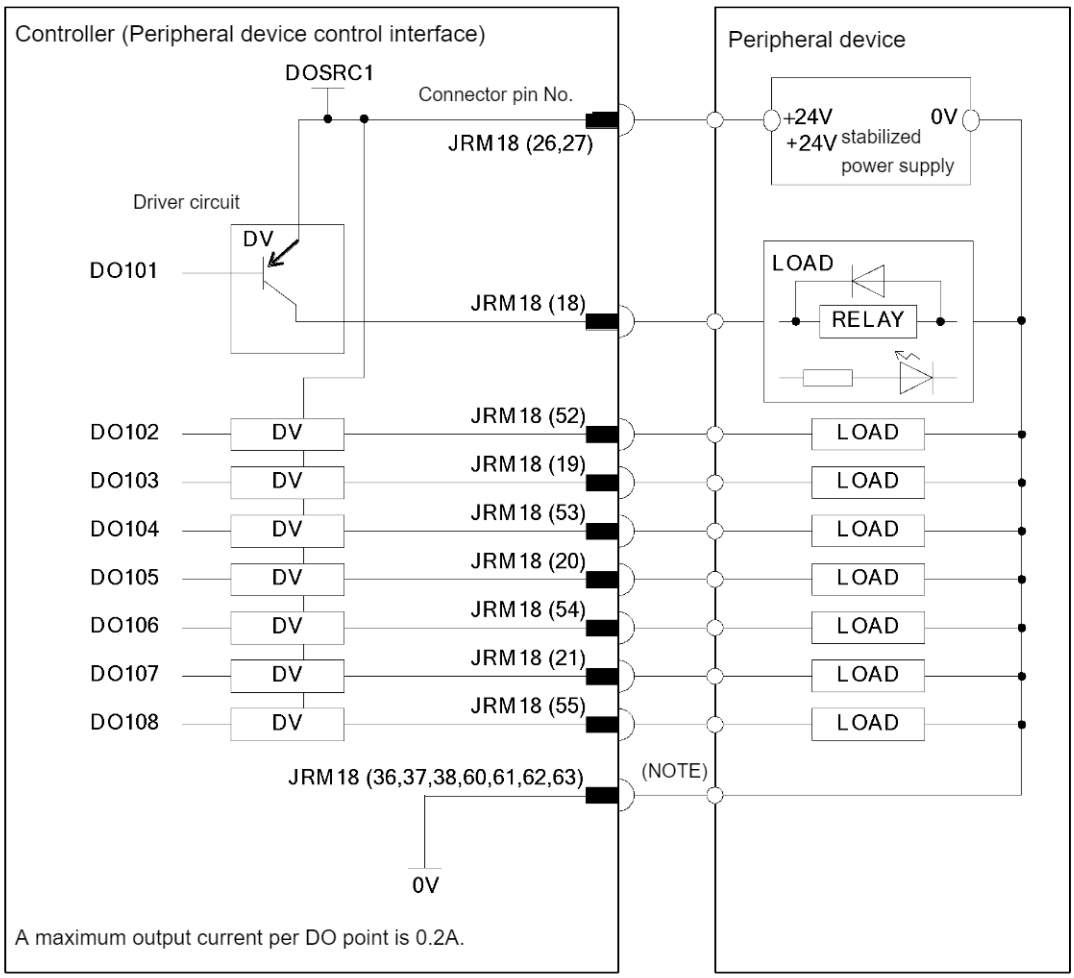
NOTE

1. The peripheral device connection cables are optional.
2. The DOSRC1 and DOSRC2 pins of the JRM18 are pins for supplying power to drivers. (None of these pins can be left open.)



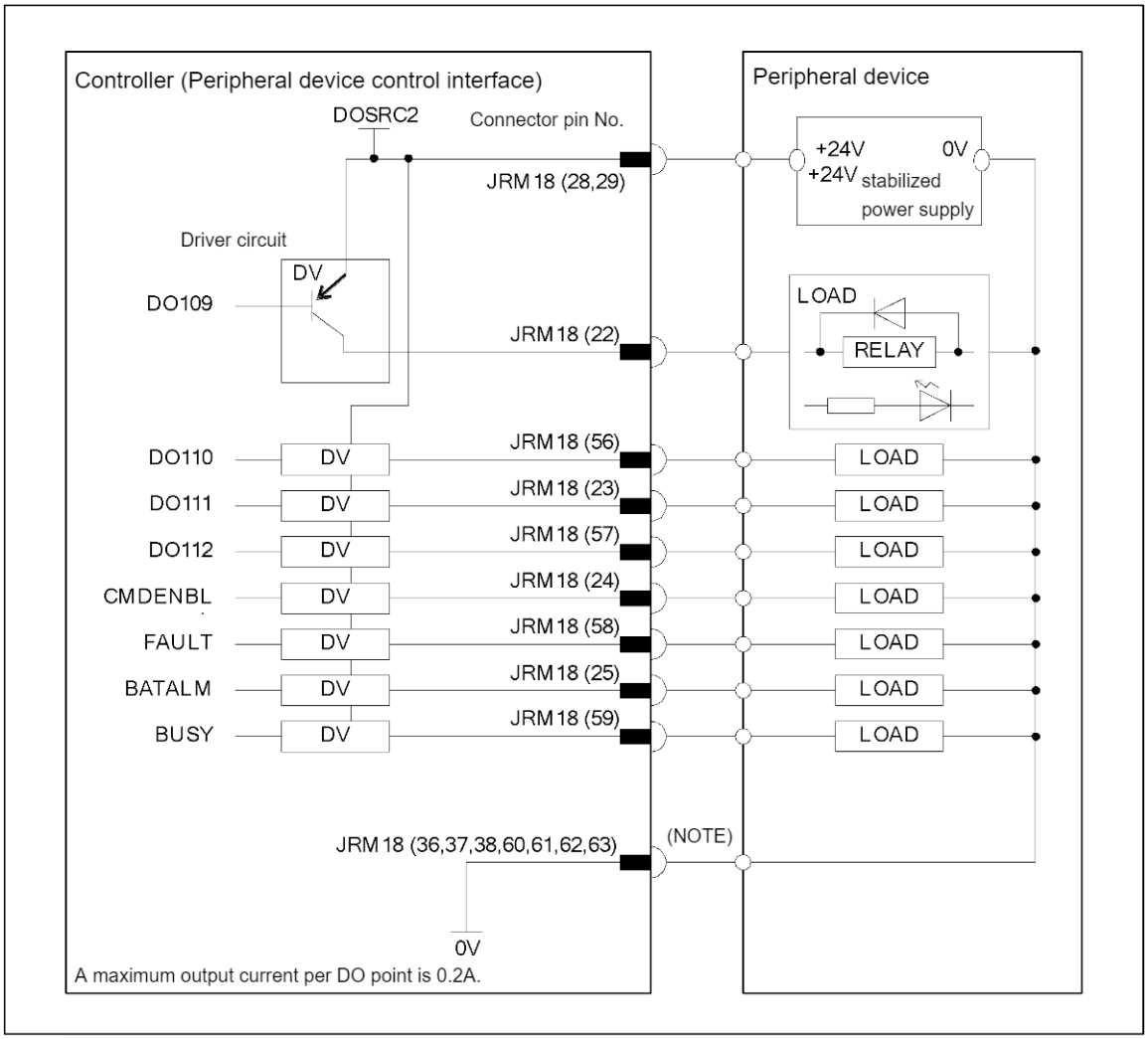
NOTE

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



NOTE

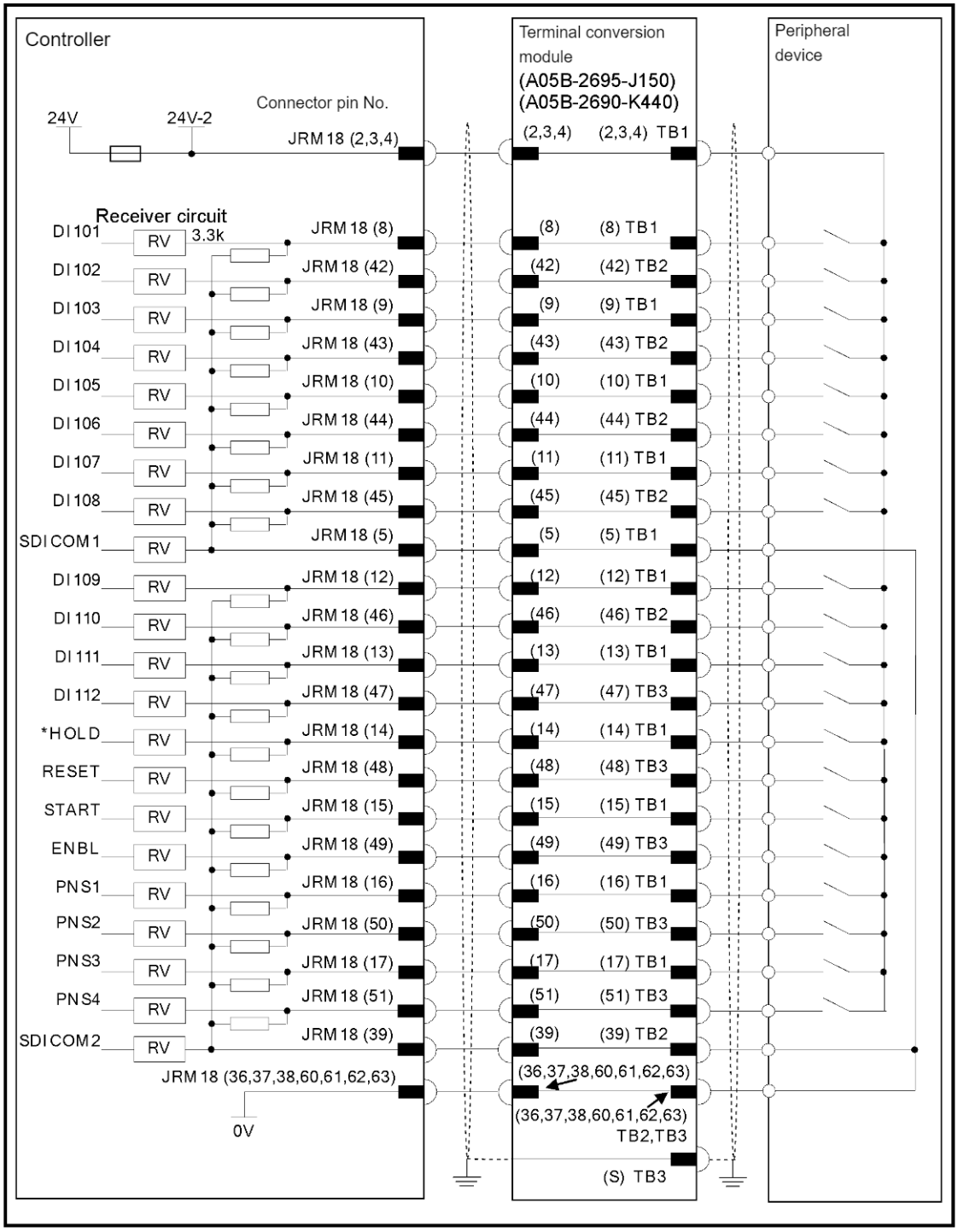
Connector pin No.36-38 and No.60-63 of JRM18 are for 0V. None of these pins can be left open.



NOTE

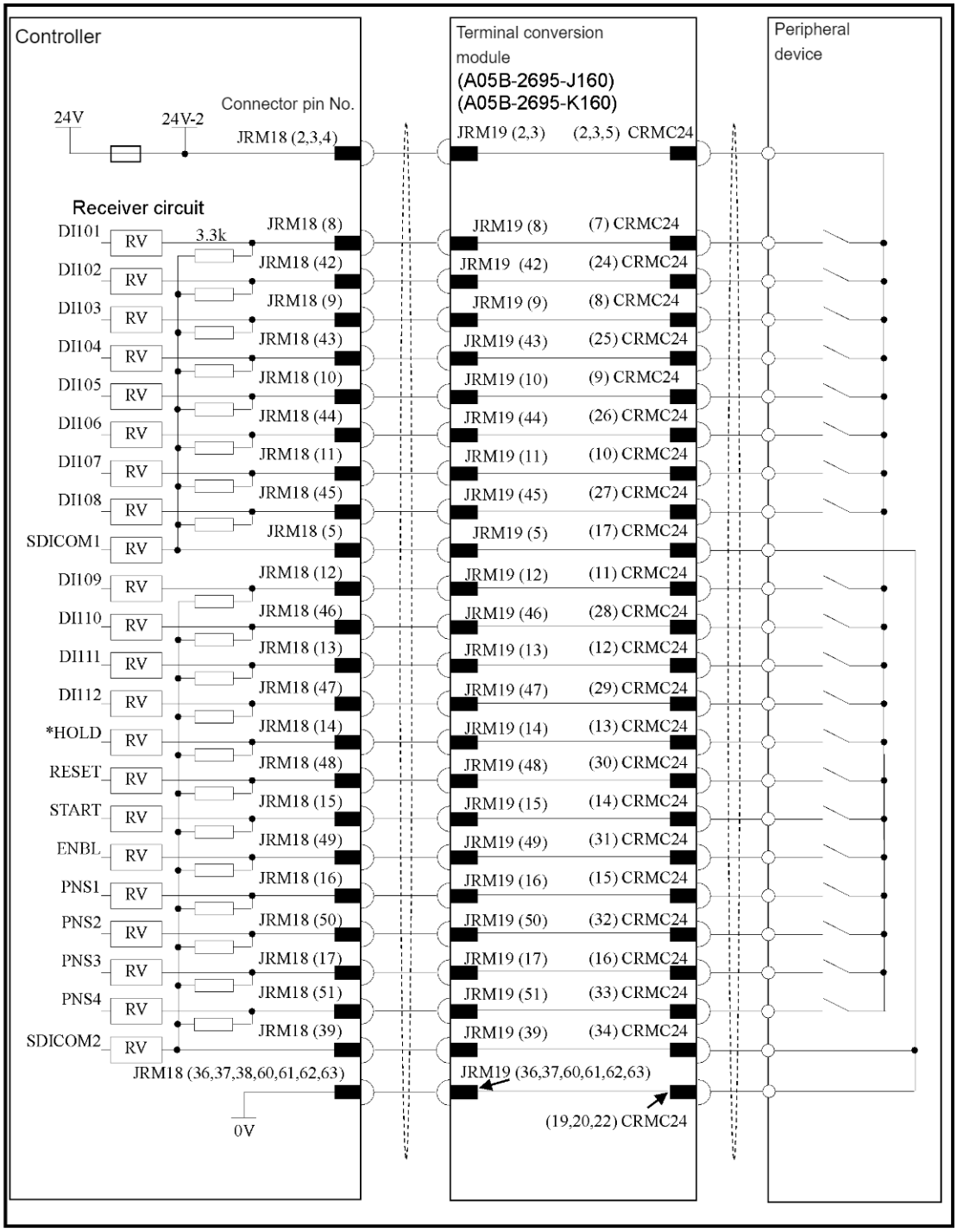
Connector pin No.36-38 and No.60-63 of JRM18 are for 0V. None of these pins can be left open.

3.1.3. Connection between the main board (JRM18) and peripheral devices (for terminal conversion module)



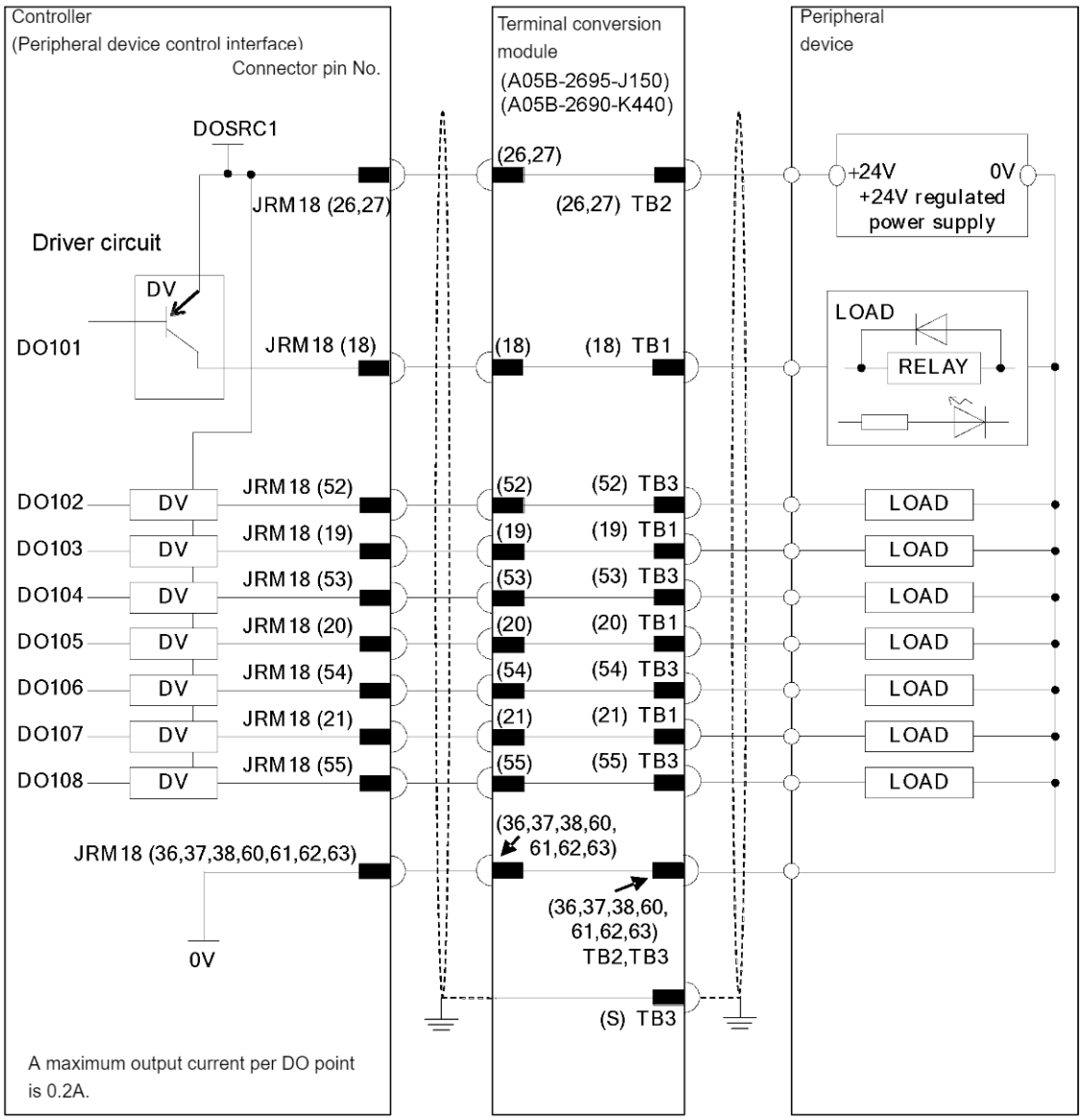
NOTE

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



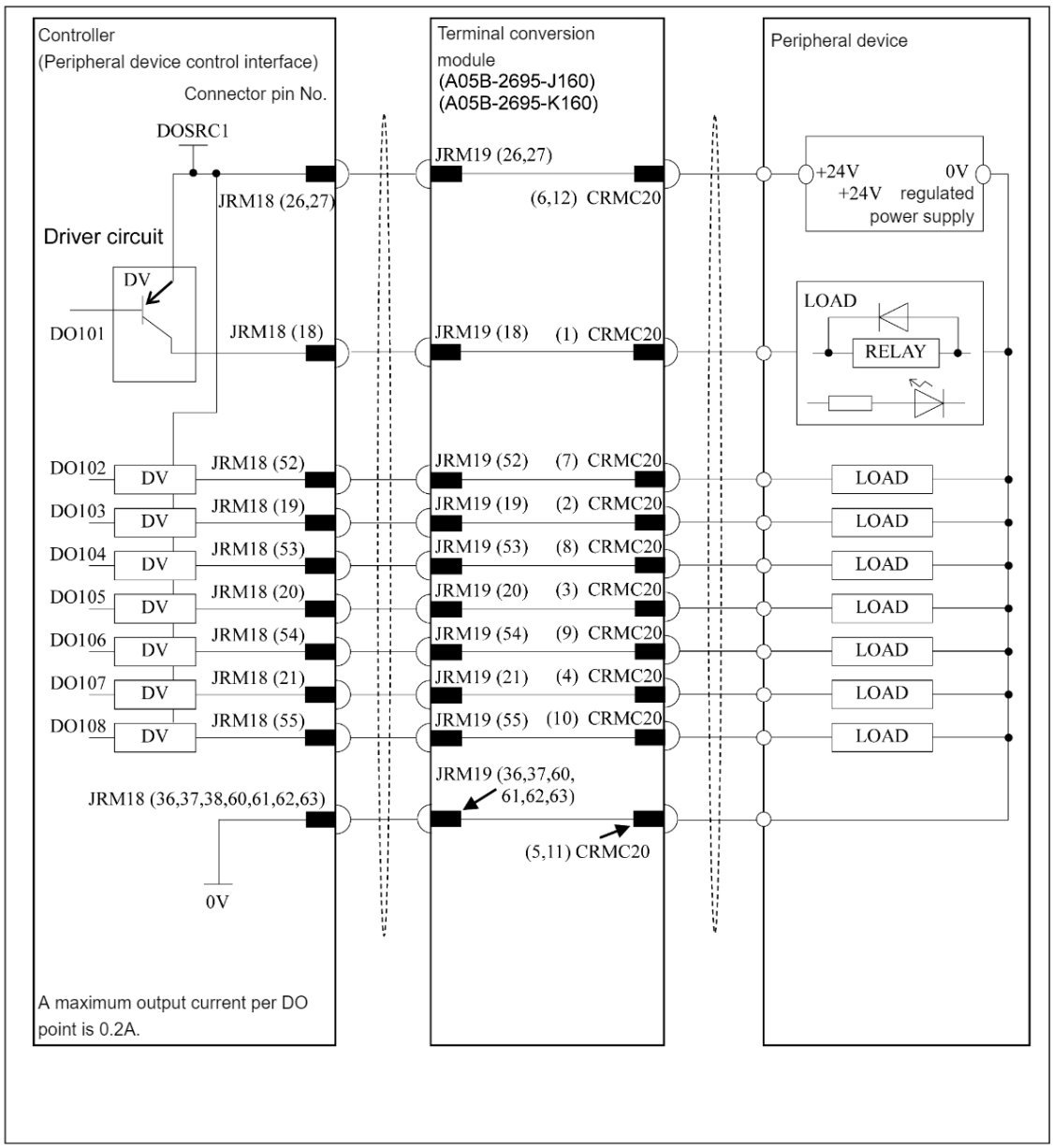
NOTE

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



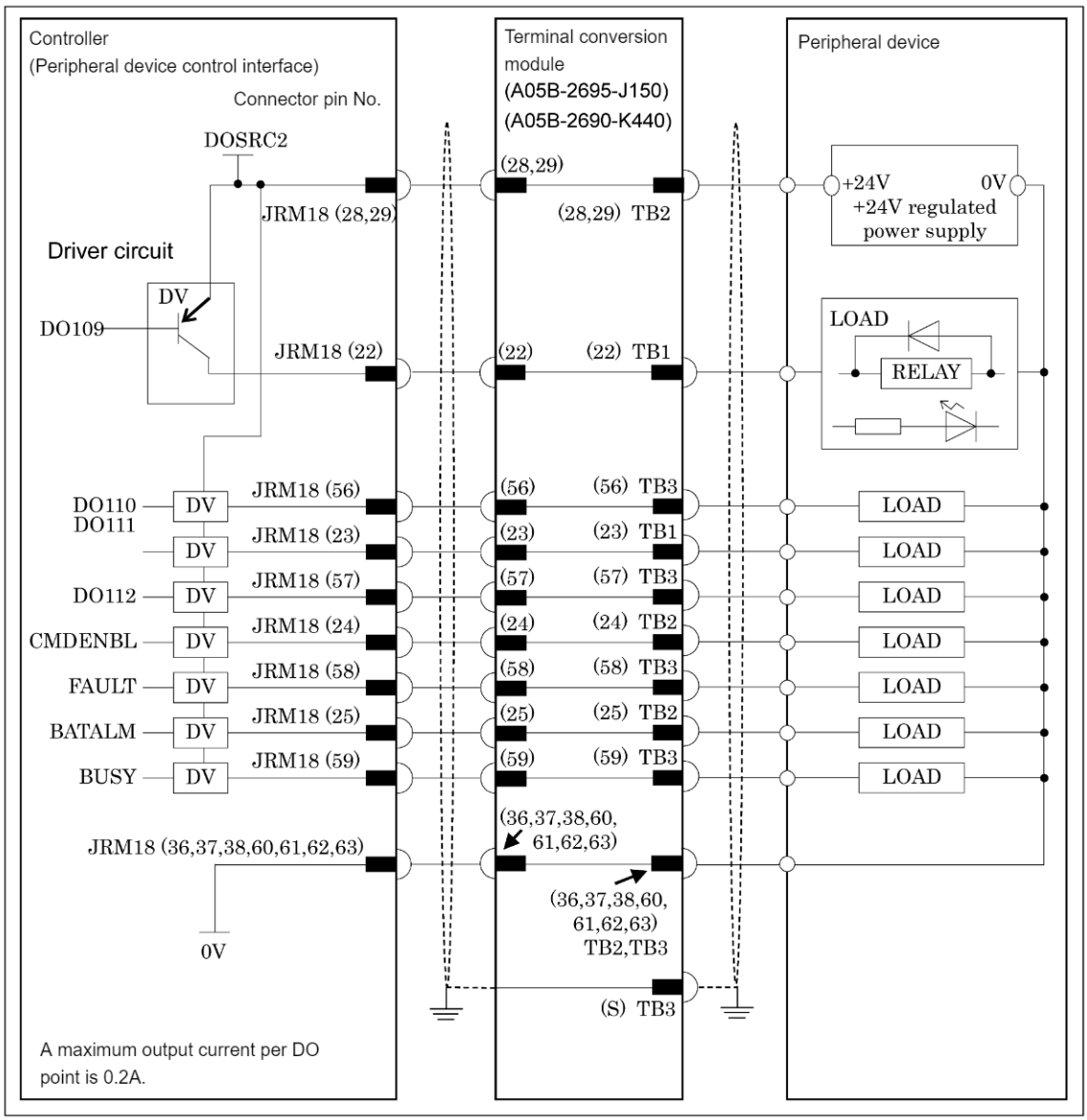
NOTE

Connector pin No.36-38 and No.60-63 of JRM18 are for 0V. None of these pins can be left open.



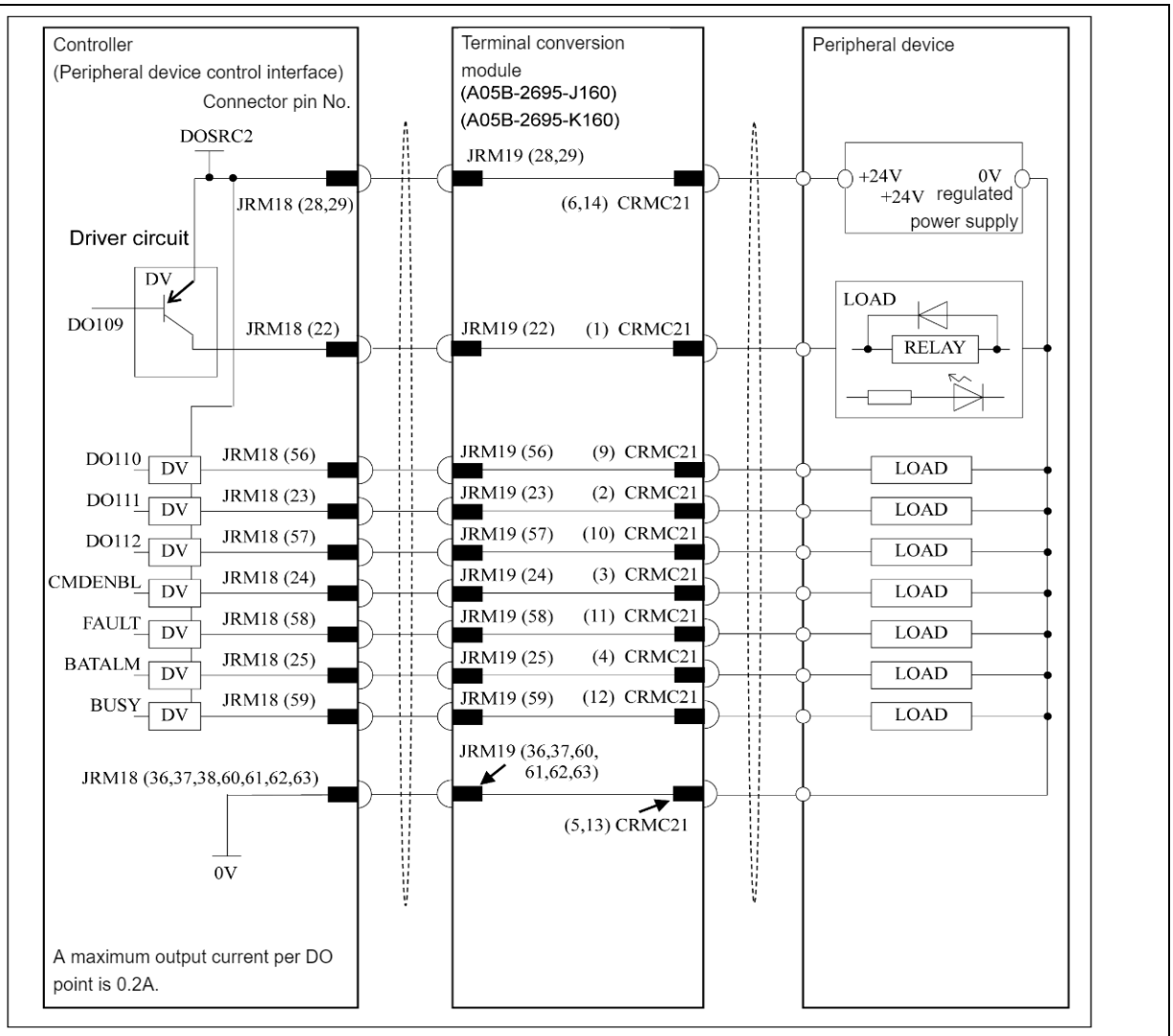
NOTE

Connector pin No.36-38 and No.60-63 of JRM18 are for 0V. None of these pins can be left open.



NOTE

Connector pin No.36-38 and No.60-63 of JRM18 are for 0V. None of these pins can be left open.



NOTE

Connector pin No.36-38 and No.60-63 of JRM18 are for 0V. None of these pins can be left open.

3.2. CONNECTION OF THE PERIPHERAL DEVICES

3.2.1. Peripheral Device Cable Connector

1. The connector for peripheral device cables (Robot controller side).

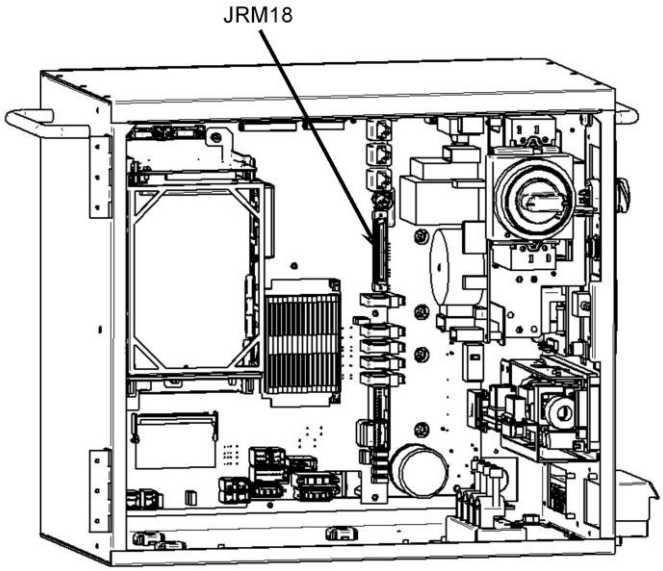


Figure 3.2.1-1 Peripheral device interface (JRM18)

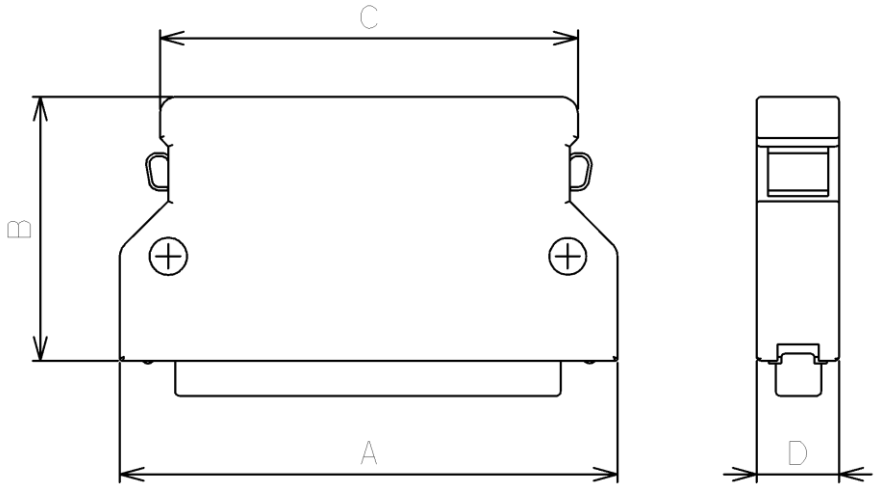


Figure 3.2.1-2 Peripheral device cable connector (JRM18)

SPECIFICATIONS	Applied Interface	Dimensions				Remark
		A	B	C	D	
PCR-E68FS+ (Connector) PCS-E68LA (Case)	JRM18	60.3	32.0	50.6	10.0	Honda Tsushin Kogyo, 68 pins (F) Solder type

Connector name	Maintenance specification
PCR-E68FS+ (Connector)	A63L-0001-0399#68FS
PCS-E68LA (Case)	A63L-0001-0399#68LA

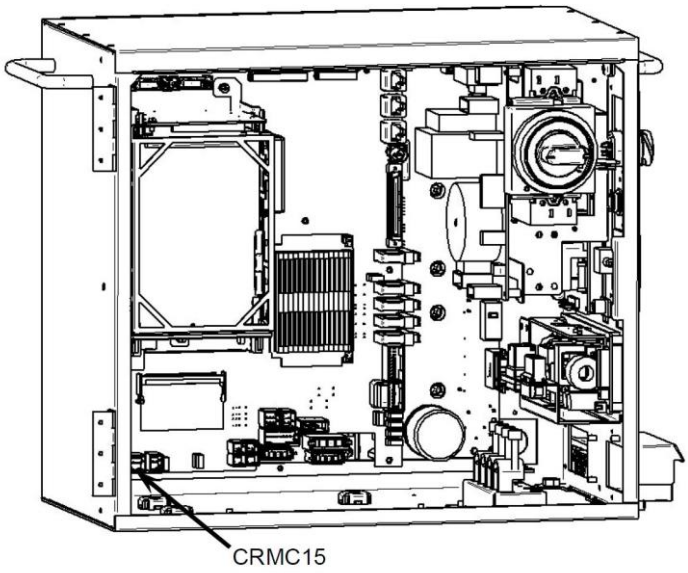


Figure 3.2.1-3 Peripheral Device interface (CRMC15)

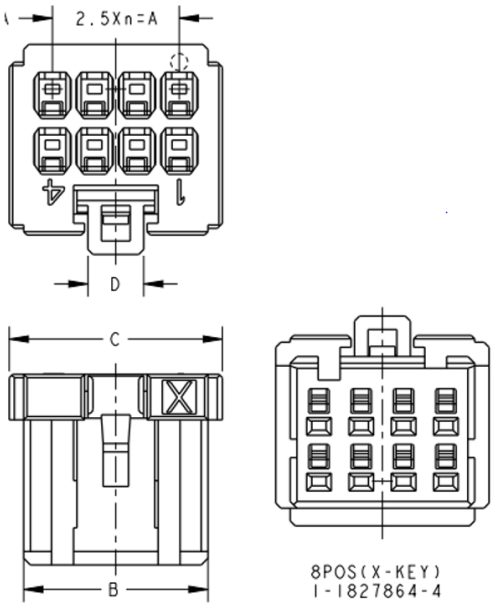
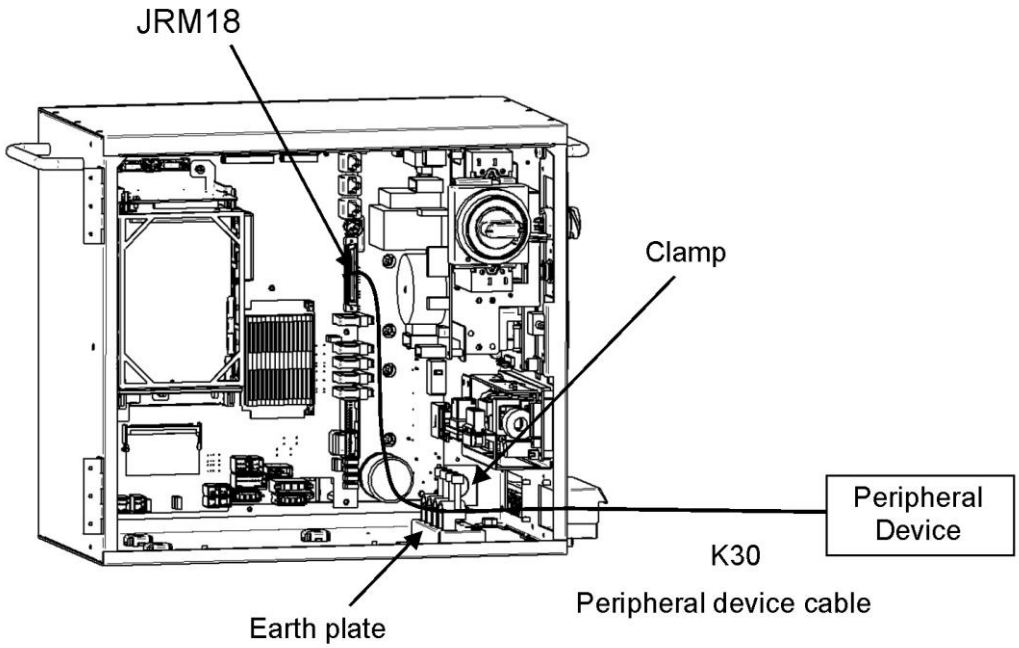


Figure 3.2.1-4 Peripheral device cable connector (CRMC15)

SPECIFICATIONS	Applied Interface	Dimensions				Remark
		A	B	C	D	
1-1827864-4 (receptacle housing)	CRMC15	7.5	10.9	12.6	3.3	TE Connectivity D1000 series 8 pins (X key)
1827569-2 (receptacle contact)	CRMC15	-	-	-	-	TE Connectivity D-1 contact
1827570-2 (receptacle contact)	CRMC15	-	-	-	-	
1827571-2 (receptacle contact)	CRMC15	-	-	-	-	

SPECIFICATIONS	Applied Interface	Dimensions				Remark
		A	B	C	D	
1827572-2 (receptacle contact)	CRMC15	-	-	-	-	

3.2.2. Connecting Terminal Conversion Module



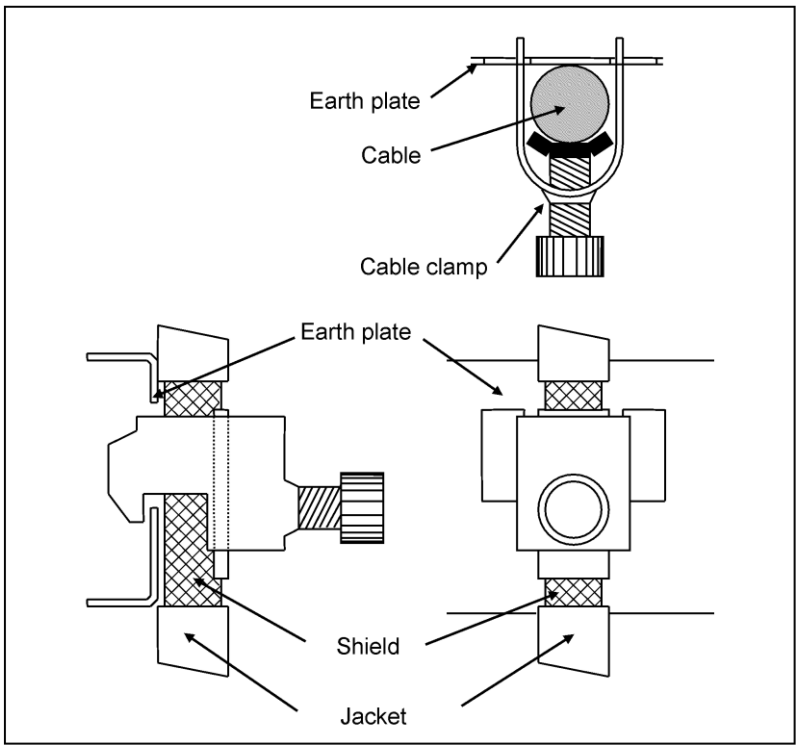


Figure 3.2.2-1 Peripheral device cable connection

NOTE

As a measure to handle noise in the peripheral device's cable, cut off a part of the cable jacket to expose the outer coating of the shield, and fasten it to the shield plate with the cable clamp.

Specification of cable

Cable No.	Name	Order specification	Maintenance specification	Length (m)
K30	Peripheral device cable	A05B-2695-J430	A660-2008-T414#L1R003A	1
		A05B-2695-J431	A660-2008-T414#L5R003A	5
		A05B-2695-J432	A660-2008-T414#L10R03A	10

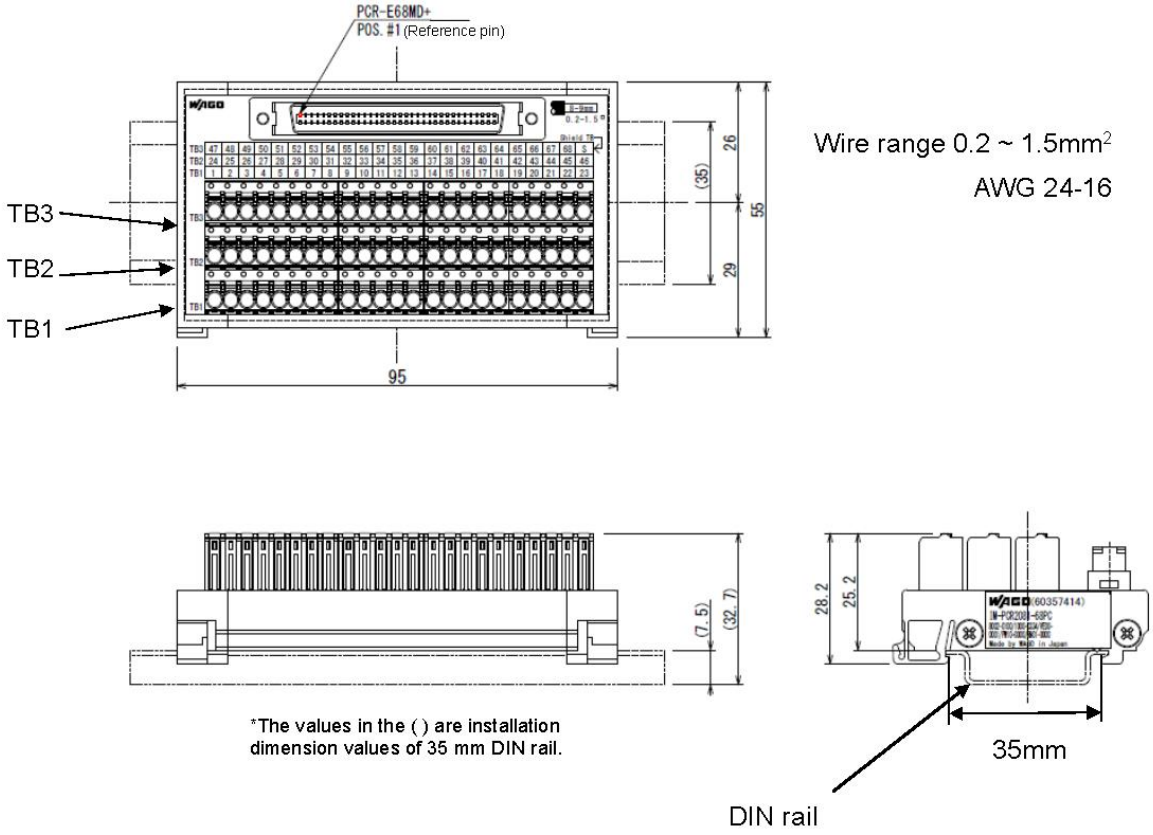


Figure 3.2.2-2 Terminal conversion module (A05B-2690-K440)

Name	Order specification	Maintenance specification
Terminal conversion module	A05B-2690-K440	A15L-0001-0167

Table 3.2.2-1 Terminal conversion module (A05B-2695-K440)

TB1	
1	24VEXT_IN
2	24V-2
3	24V-2
4	24V-2
5	SDICOM1
6	EES1
7	EAS1
8	DI01
9	DI03

TB2	
24	DO13
25	DO15
26	DOSRC1
27	DOSRC1
28	DOSRC2
29	DOSRC2
30	ESPB1
31	ESPB2
32	ESPB1

TB3	
47	DI12
48	DI14
49	DI16
50	DI18
51	DI20
52	DO02
53	DO04
54	DO06
55	DO08

10	DI05
11	DI07
12	DI09
13	DI11
14	DI13
15	DI15
16	DI17
17	DI19
18	DO01
19	DO03
20	DO05
21	DO07
22	DO09
23	DO11

33	ESPB2
34	
35	0VEXT
36	0V
37	0V
38	0V
39	SDICOM2
40	EES2
41	EAS2
42	DI02
43	DI04
44	DI06
45	DI08
46	DI10

56	DO10
57	DO12
58	DO14
59	DO16
60	0V
61	0V
62	0V
63	0V
64	ESPB11
65	ESPB21
66	ESPB11
67	ESPB21
68	
S	SHIELD

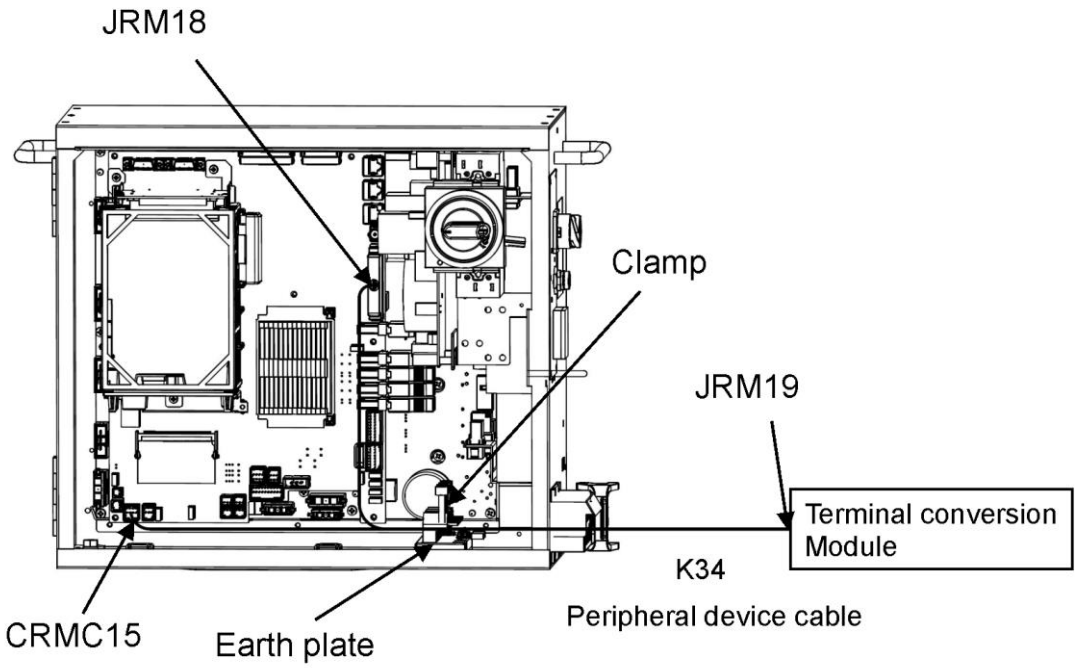


Figure 3.2.2-3 Peripheral device cable (JRM19) connection

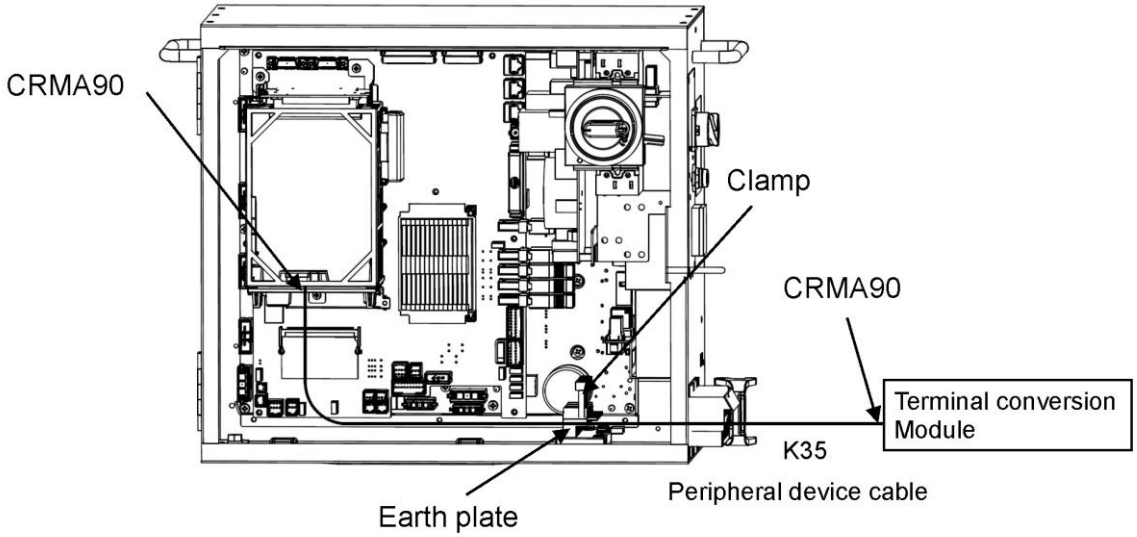


Figure 3.2.2-4 Peripheral device cable (CRMA90) connection

Specification of cable

Cable No.	Name	Order specification	Maintenance specification	Length (m)
K34	Peripheral device cable (JRM19)	A05B-2695-J165	A660-4005-T981#L5R203B	5
		A05B-2695-J166	A660-4005-T981#L10R03B	10
K35	Peripheral device cable (CRMA90)	A05B-2695-J162	A660-2008-T830#L5R703B	5
		A05B-2695-J163	A660-2008-T830#L10R73B	10

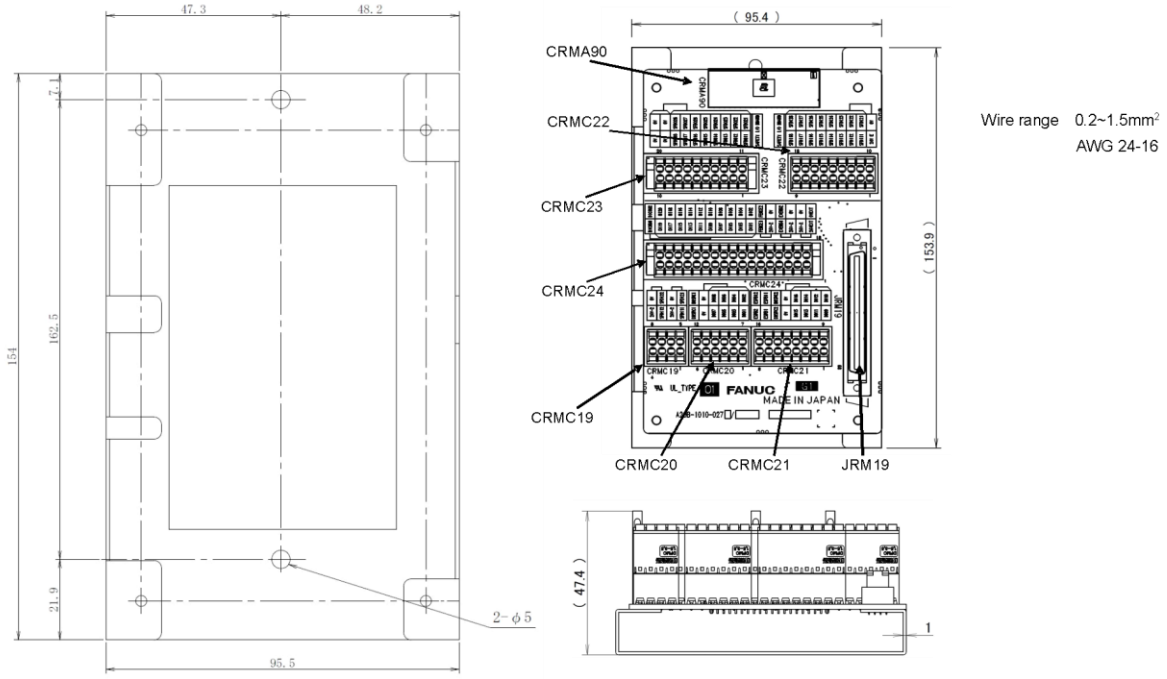


Figure 3.2.2-5 Terminal conversion module (A05B-2695-K160)

Name	Order specification	Maintenance specification
Terminal conversion module	A05B-2695-K160	A20B-1010-0270

Table 3.2.2-2 Terminal conversion module (A05B-2695-K160)

Main board (JRM18, CRMC15) ⇔Terminal conversion module (JRM19)

CRMC19

1	SFDI11	5	SFDI21
2	24V-2	6	0V
3	SFDI12	7	SFDI22
4	24V-2	8	0V

CRMC20

1	DO01	7	DO02
2	DO03	8	DO04
3	DO05	9	DO06
4	DO07	10	DO08
5	0V	11	0V
6	DOSRC1	12	DOSRC1

CRMC21

1	DO09	9	DO10
2	DO11	10	DO12
3	DO13	11	DO14
4	DO15	12	DO16
5	0V	13	0V
6	DOSRC2	14	DOSRC2
7	ESPB1	15	ESPB11
8	ESPB2	16	ESPB21

CRMC24

1	24VETX_IN	18	0VEXT
2	24V-2	19	0V
3	24V-2	20	0V
4	EES1	21	EES2
5	24V-2	22	0V
6	EAS1	23	EAS2
7	DI01	24	DI02
8	DI03	25	DI04
9	DI05	26	DI06
10	DI07	27	DI08
11	DI09	28	DI10
12	DI11	29	DI12
13	DI13	30	DI14

14	DI15	31	DI16
15	DI17	32	DI18
16	DI19	33	DI20
17	SDICOM1	34	SDICOM2

Additional safety I/O board (CRMA90) ⇔Terminal conversion module (CRMA90)

CRMC22

1	24E	10	0V
2	SFDI11	11	SFDI21
3	SFDI12	12	SFDI22
4	SFDI13	13	SFDI23
5	SFDI14	14	SFDI24
6	SFDI15	15	SFDI25
7	SFDI16	16	SFDI26
8	SFDI17	17	SFDI27
9	SFDI18	18	SFDI28

CRMC23

1	SFDO11	11	SFDO21
2	SFDO12	12	SFDO22
3	SFDO13	13	SFDO23
4	SFDO14	14	SFDO24
5	SFDO15	15	SFDO25
6	SFDO16	16	SFDO26
7	SFDO17	17	SFDO27
8	SFDO18	18	SFDO28
9	0V	19	0V
10	0V	30	0V

3.2.3. Connecting Additional Safety I/O Terminal Conversion Board

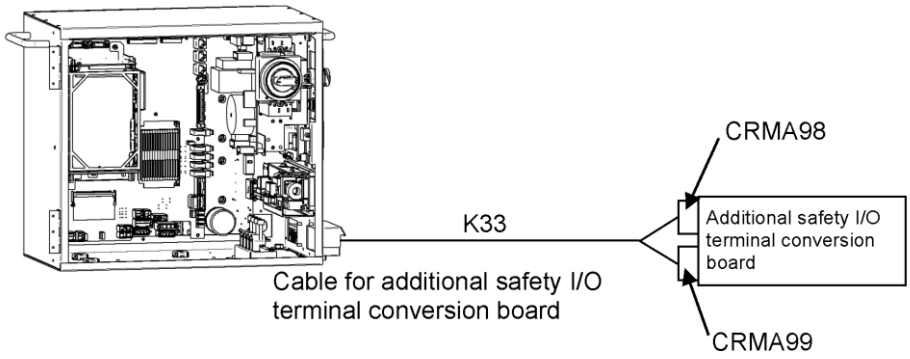


Figure 3.2.3-1 Connecting Additional Safety I/O Terminal Conversion Board

Name	Order specification	Product Name	cable No.	Maintenance specification	Length (m)	Quantity
Additional safety I/O terminal block conversion unit	A05B-2695-K130	Additional safety I/O terminal conversion unit		A05B-2690-C132		1
	A05B-2695-J182	Additional safety I/O terminal conversion board cable	K33	A660-4005-T389#L5R703A	5	1
	A05B-2695-K130	Additional safety I/O terminal conversion unit		A05B-2690-C132		1
	A05B-2695-J183	Additional safety I/O terminal conversion board cable	K33	A660-4005-T389#L10R73A	10	1

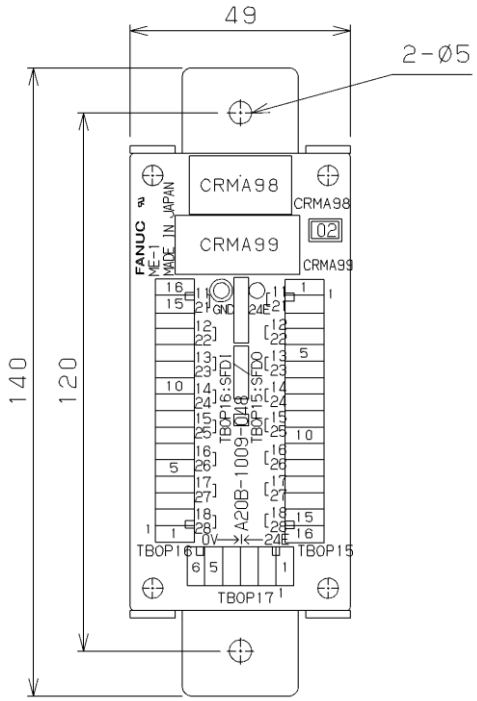


Figure 3.2.3-2 Additional safety I/O terminal conversion unit

Additional safety I/O terminal conversion unit

TBOP15 terminal block	
1	SFDO11
2	SFDO21
3	SFDO12
4	SFDO22
5	SFDO13
6	SFDO23
7	SFDO14
8	SFDO24
9	SFDO15
10	SFDO25
11	SFDO16
12	SFDO26
13	SFDO17
14	SFDO27
15	SFDO18
16	SFDO28

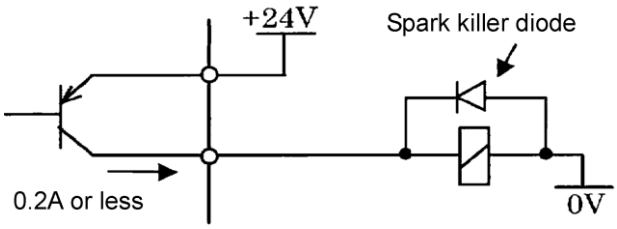
TBOP16 terminal block	
1	SFDI28
2	SFDI18
3	SFDI27
4	SFDI17
5	SFDI26
6	SFDI16
7	SFDI25
8	SFDI15
9	SFDI24
10	SFDI14
11	SFDI23
12	SFDI13
13	SFDI22
14	SFDI12
15	SFDI21
16	SFDI11

TBOP17 terminal block	
1	24E
2	24E
3	24E
4	0V
5	0V
6	0V

3.2.4. Digital I/O signal specifications of Peripheral Device

This section describes the specifications of the digital I/O signals interfaced with the peripheral device.

1. Output signals in the peripheral device interface (Source type DO)
    1. Connection example



2. 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:	100⌠A

3. The external power supply to output signals must satisfy the following:

Power supply voltage:	+24V □10%
Power supply current:	For each printed circuit board of this type (Total sum of maximum load currents including momentary levels + 100mA 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 unit is turned off or later

4. Spark killer diode

Rated peak reverse voltage:	100V or more
Rated effective forward current:	1A or more

5. 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.

6. Safety Precautions

   Do not use the +24V power supply of the robot.

   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.

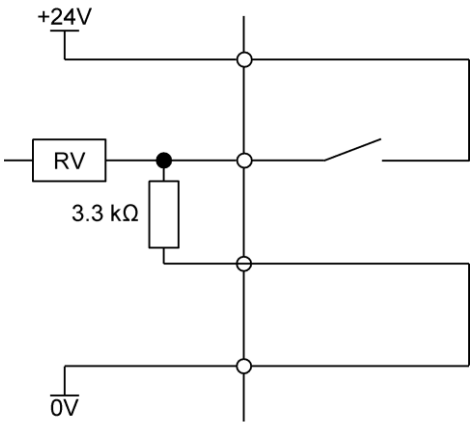
   When using a load, such as a lamp, that generates surge current when it is turned on, install a protection resistor.

7. Applied signal

   Output signals of main board JRM18

   CMDENBL, FAULT, BATALM, BUSY, DO101 to DO112

2. Input signals in peripheral device interface
   1. Example of connection (+24V common)

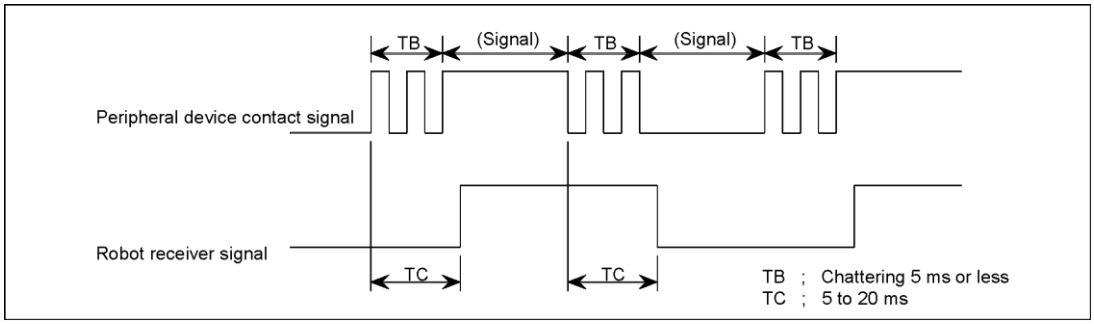


2. Electrical specifications of the receiver

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

3. Specifications of the peripheral device contact

Voltage and Current:	DC24V, 0.1A (Use a contact which minimum load is 5mA or less.)
Input signal width:	200ms or more (on/off)
Chattering time:	5ms or less
Closed circuit resistance:	100Ω or lower
Opened circuit resistance:	100kΩ or more



4. Safety Precautions

   Apply the +24 V power at the robot to the receiver.

   However, the above signal specifications must be satisfied at the robot receiver.

5. Applied signal

   Input signals of main board JRM18

   XHOLD, RESET, START, ENBL, DNS1 to DNS4, DI101 to DI112

3.3. CONNECTION OF HDI

3.3.1. Connecting HDI

The HDI signals are used in combination with special application software.

The HDI signals cannot be used as general-purpose DIs.

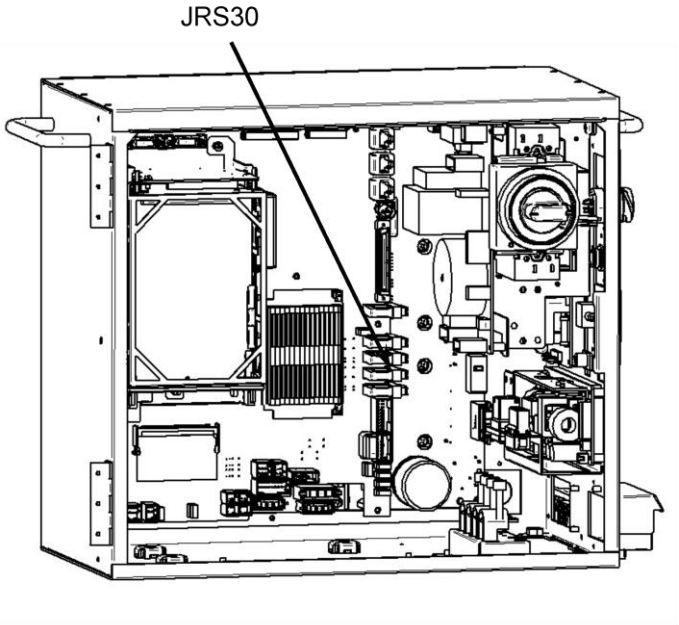
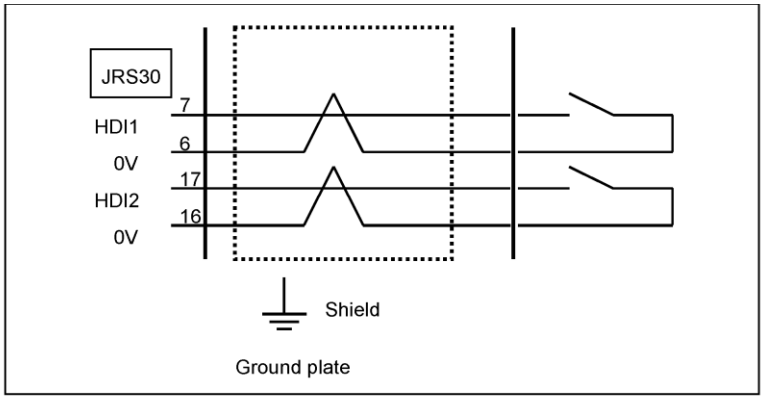


Figure 3.3.1-1 Connecting HDI (JRS30)

JRS30				
1	RXD	11	TXDB	Honda Tsushin Kogyo CONNECTOR: PCR-E20FS COVER: PCS-E20LA, or compatible connector
2	0V	12	0V	
3	DSRB	13	DTRB	
4	0V	14	0V	
5	CTS	15	RTSB	
6	0V	16	0V	
7	XHDI1	17	XHDI2	
8	SDATA	18	XSDATA	
9	5V	19	24V-1	
10	24V-1	20	5V	

Cable Connection

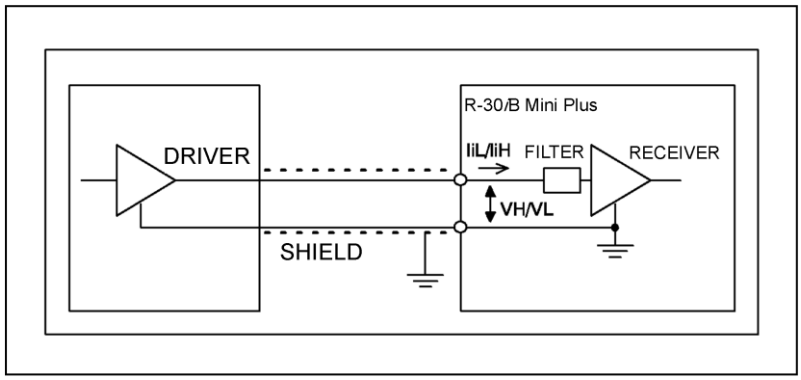


NOTE

Please specify main board A05B-2695-H001 by using the HDI signal.

3.3.2. Input Signal Rules for the High-speed Skip (HDI)

Circuit configuration



Absolute maximum rating

Input voltage range Vin: -3.6 to +10 V

Input characteristics

Item	Symbol	Specification	Unit	Remark
High level input voltage	VH	3.6 to 11.6	V	
Low level input voltage	VL	0 to 1.0	V	
High level input current	IiH	2 (max)	mA	Vin=5 V
		11 (max)	mA	Vin = 10 V
Low level input current	IiL	-8.0 (max)	mA	Vin=0V
Input signal pulse duration		20 (min)	⌠s	
Input signal delay or variations		20 (max)	⌠s	

NOTE

1. The plus (+) sign of IiH/IiL represents the direction of flow into the receiver. The minus (-) sign of IiH/IiL represents the direction of flow out of the receiver.
2. The high-speed skip signal is assumed to be 1 when the input voltage is at the low level and 0 when it is at the high level.

3.4. CONNECTING THE COMMUNICATION UNIT

3.4.1. RS232C Interface

3.4.1.1. Interface

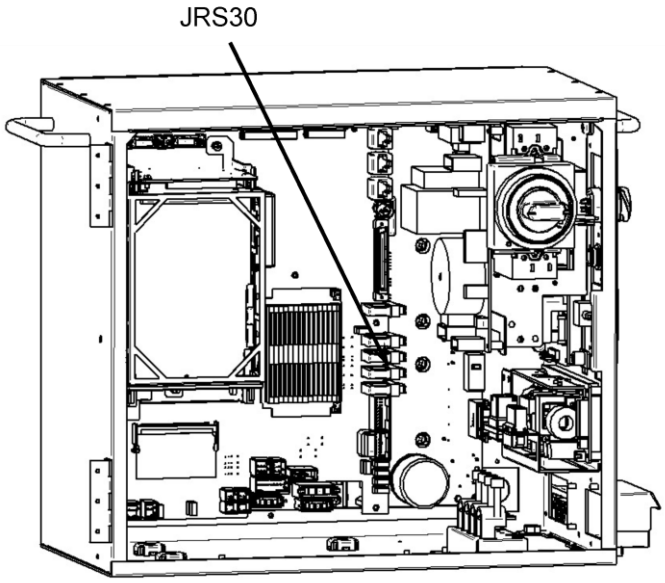


Figure 3.4.1.1-1 RS232C interface (JRS30)

JRS30				
1	RD(RXD)	11	SD(TXD)	Honda Tsushin Kogyo CONNECTOR: PCR-E20FS COVER: PCS-E20LA, or compatible connector
2	SG(0V)	12	SG(0V)	
3	DR(DSR)	13	ER(DTR)	
4	SG(0V)	14	SG(0V)	
5	CS(CTS)	15	RS(RTS)	
6	SG(0V)	16	SG(0V)	
7	XHDI1	17	XHDI2	
8	SDATA	18	XSDATA	
9	5V	19	+24V(24V-1)	
10	+24V(24V-1)	20	5V	

NOTE

1. +24 V can be used as the power supply for FANUC RS232C equipment.

3.4.1.2. RS232C interface signals

Generally signals as follows are used in RS232C interface.

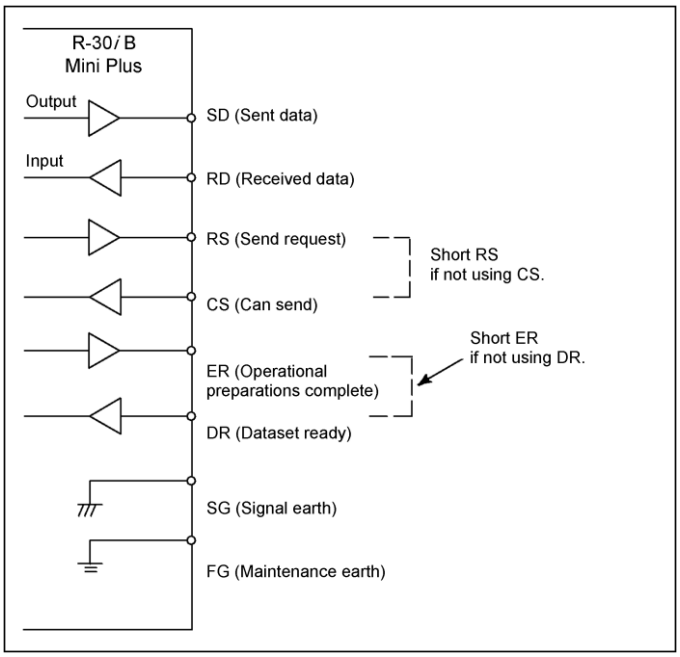
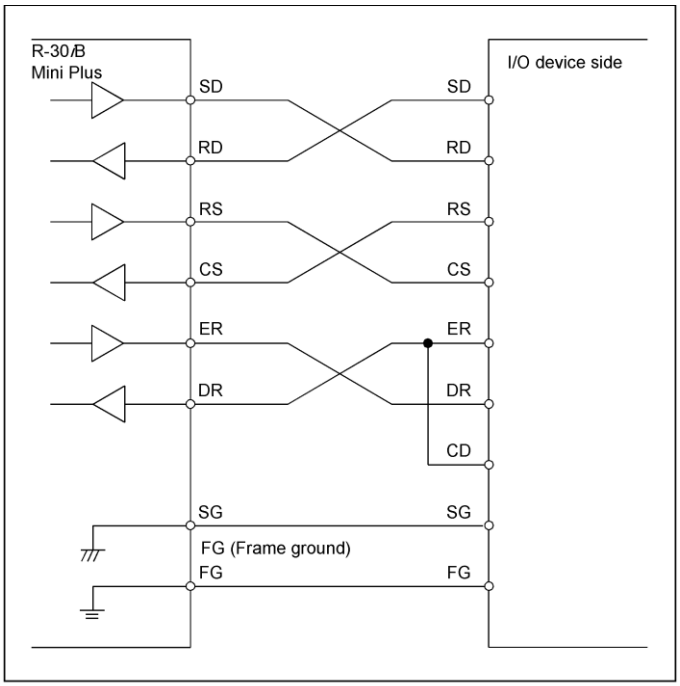


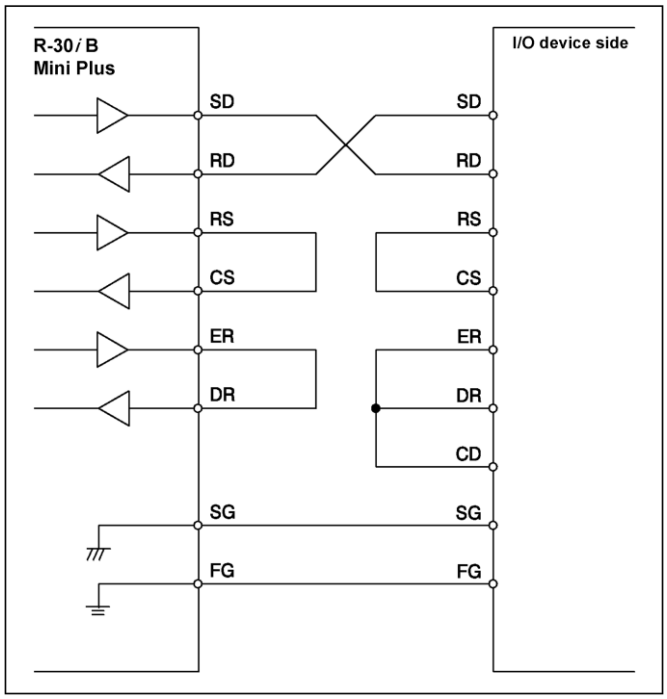
Figure 3.4.1.2-1 RS232C Interface

3.4.1.3. Connection between RS232C interface and I/O device

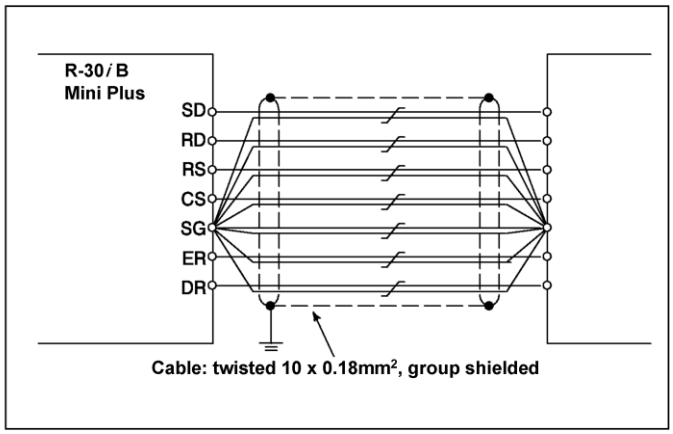
The figure below shows a connection with the handshaking of the ER/DR, RS/CS signals.



The figure below shows a connection without the handshaking of the RS/CS, ER/DR signals.



Cable Connection



Pair each signal with SG.

3.4.2. LVC Line Tracking Encoder 2ch

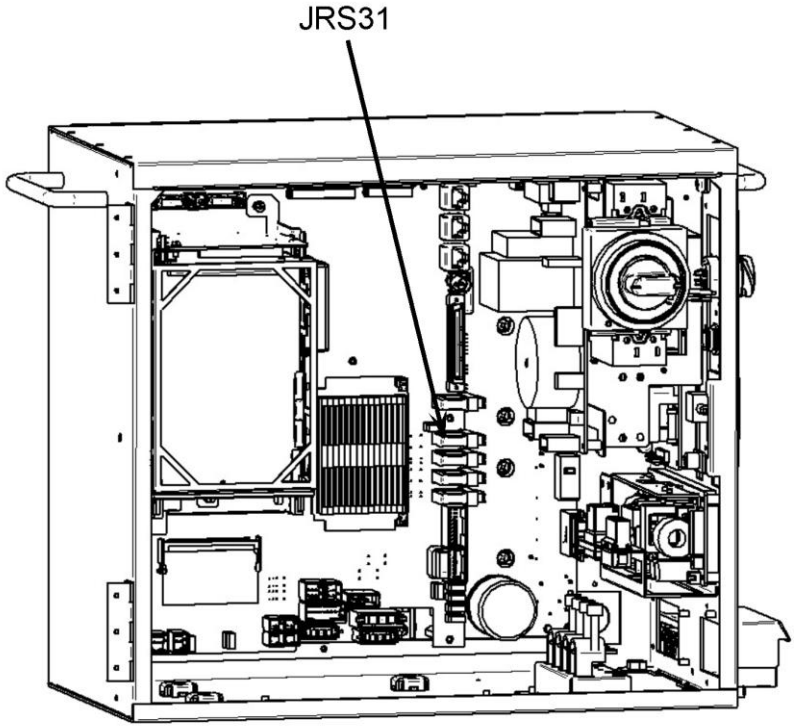


Figure 3.4.2-1 LVC Line Tracking Encoder 2ch (JRS31)

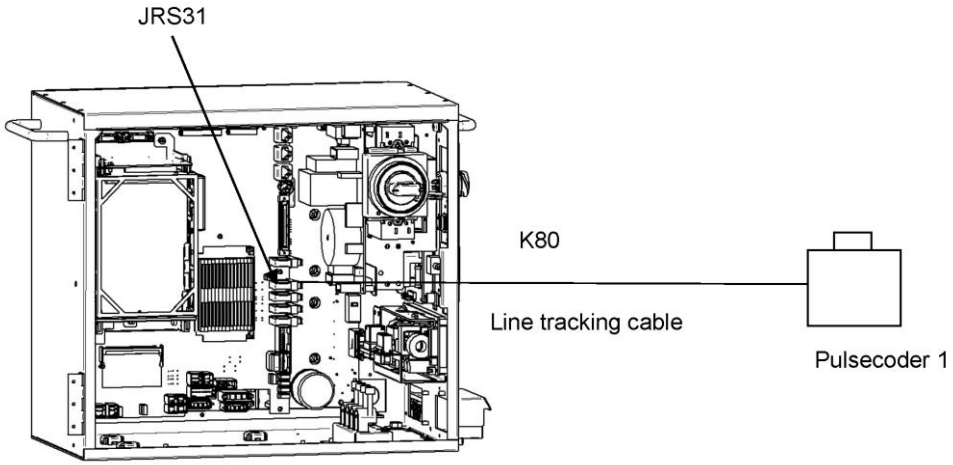


Figure 3.4.2-2 Line tracking cable (for 1 pulsecoder)

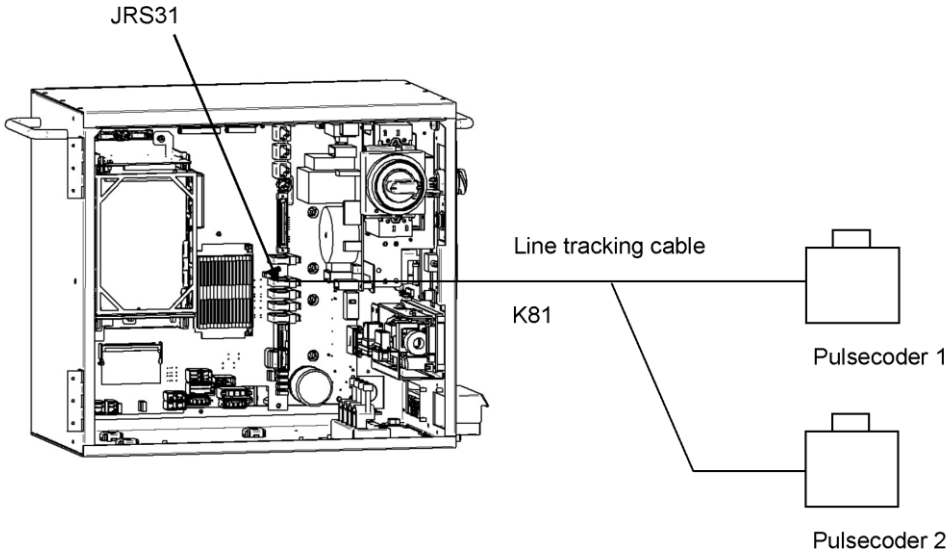


Figure 3.4.2-3 Line tracking cable (for 2 pulsecoders)

Specification of cable

Cable No.	Name	Order specification	Maintenance specification	Length (m)
K80	Line tracking cable (for 1 pulsecoder)	A05B-2696-J300	A660-2008-T752#L7R003A	7
		A05B-2696-J301	A660-2008-T752#L14R03A	14
		A05B-2696-J302	A660-2008-T752#L20R03A	20
K81	Line tracking cable (for 2 pulsecoders)	A05B-2696-J310	A660-4005-T923#L7R003A	7
		A05B-2696-J311	A660-4005-T923#L14R03A	14
		A05B-2696-J312	A660-4005-T923#L20R03A	20

3.4.3. Ethernet Interface

This section describes information relating to the physical Ethernet connection.

⚠CAUTION

1. When connecting or disconnecting the cable to the robot controller, first turn off the power on the controller's main unit, and then verify that the power is off.
2. Please inquire of each manufacturer (of hub, transceiver, cable etc.) about the construction of network or the condition of using the equipment. 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 robot, conduct a communications test before you actually start operating the robot. We cannot ensure operation that is influenced by network trouble caused by a device other than the robot controller.

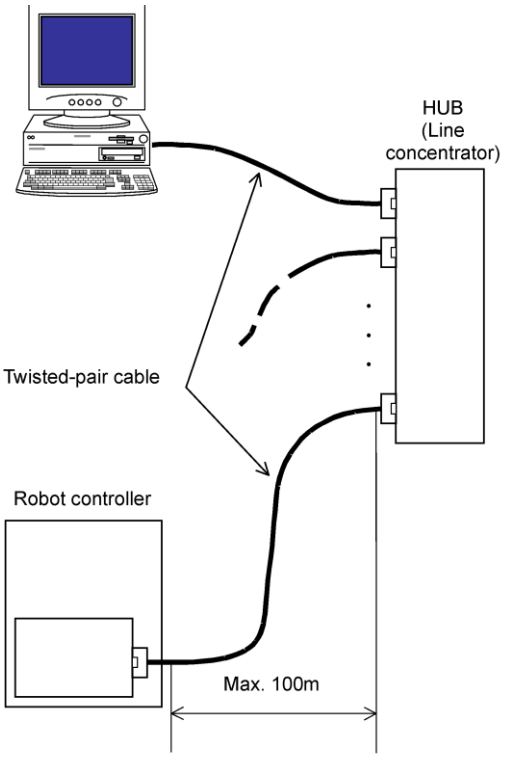
3.4.3.1. Connection to Ethernet

The R-30iB Mini Plus is provided with a 100BASE-TX interface and 1000BASE-T interface (R-30**i**B Mini Plus only) and supports Auto MDI/MDI-X. Prepare a hub for connecting the controller to the Ethernet trunk. The following shows an example of a general connection.

To connect the R-30iB Mini Plus to the CD38C 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.



Excluding the FANUC recommended adjustable cable

100BASE-TX connector (CD38A, CD38B) / 1000BASE-T connector (CD38C) pin assignments

Table 3.4.3.1-1 CD38A CD38B

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 3.4.3.1-2 CD38C (1000BASE-T)

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-

Pin No.	Signal name	Description
6	MDI1-	Bi-directional Data 1-
7	MDI3+	Bi-directional Data 3+
8	MDI3-	Bi-directional Data 3-

3.4.3.2. Ethernet cable path

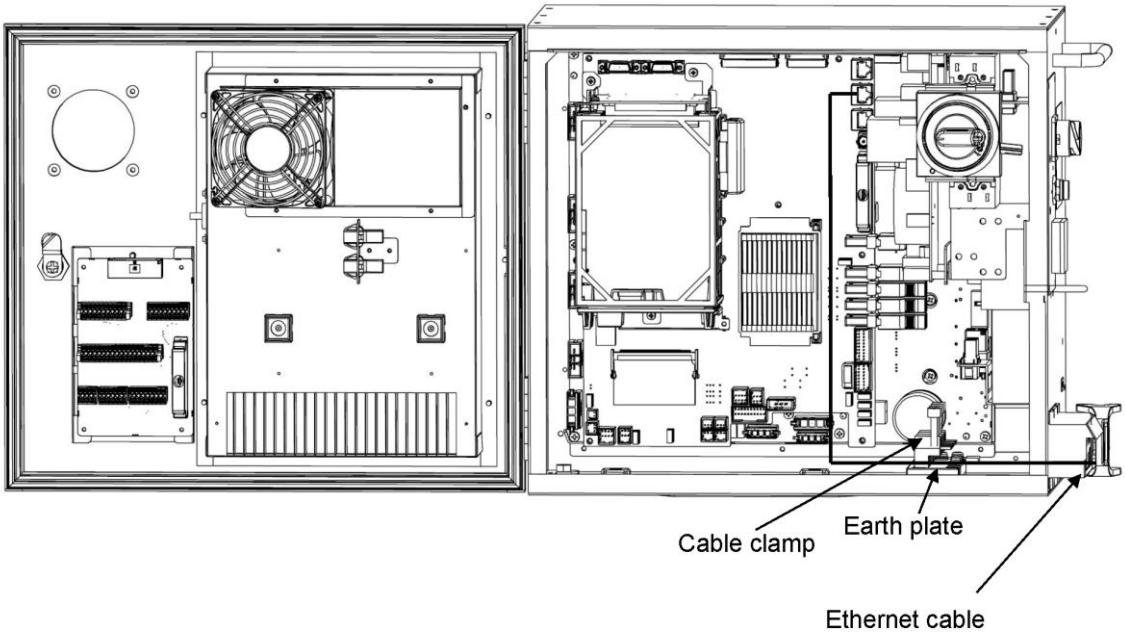


Figure 3.4.3.2-1 Ethernet cable path

It is necessary to fasten the cable in place with a clamp or other device so that no tensile force is applied to the end of the Ethernet cable, even if it is pulled. This clamp will also serve as grounding for the cable shield.

3.4.3.3. Twisted-pair cable specification

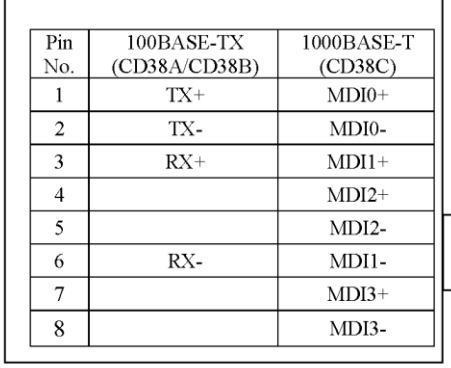
Cable Connection

The cable used for connection between the R-30iB Mini Plus's CD38A/CD38B/CD38C and the HUB is connected as follows:

R-30*i*B Mini Plus

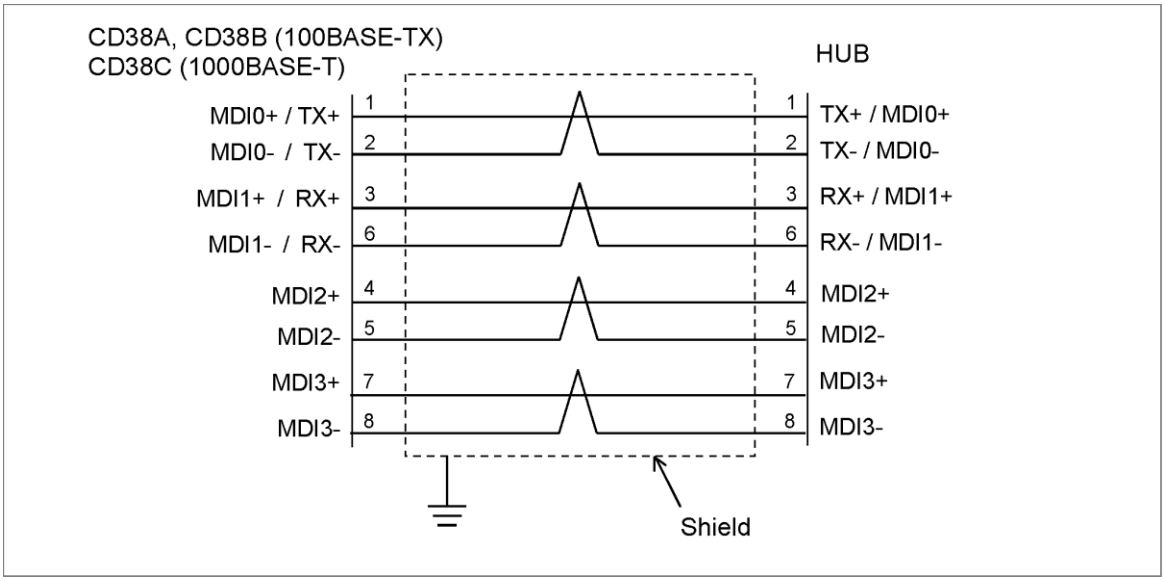
CD38A, CD38B/ CD38C

Pin No.	100BASE-TX (CD38A/CD38B)	1000BASE-T (CD38C)
1	TX+	MDI0+
2	TX-	MDI0-
3	RX+	MDI1+
4		MDI2+
5		MDI2-
6	RX-	MDI1-
7		MDI3+
8		MDI3-



HUB

Pin No.	100BASE-TX	1000BASE-T
1	TX+	MDI0+
2	TX-	MDI0-
3	RX+	MDI1+
4		MDI2+
5		MDI2-
6	RX-	MDI1-
7		MDI3+
8		MDI3-

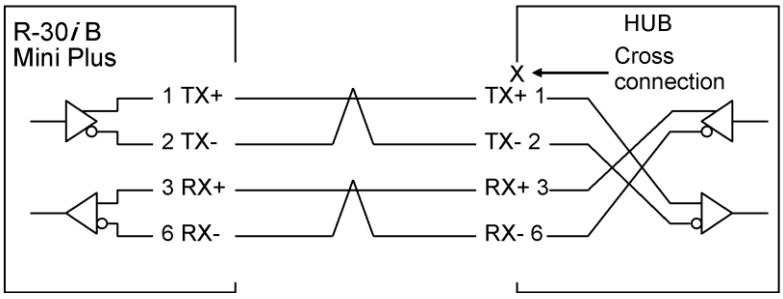


- Keep the total cable length within 100 m. (The maximum cable length of the flexible cable recommended by FANUC is 40 m.)

  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.



(1) 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 3.4.3.3-1 Recommended cables (Non-flexible cable, 100BASE-TX)

Manufacturer	SPECIFICATIONS	Remark
NISSEI ELECTRIC CO., LTD.	F-4PWWWMF	Single-conductor cable

NOTE

The recommended cables cannot be used for flexible parts.

Table 3.4.3.3-2 Recommended cable (for flexible parts, dedicated to FANUC)

Manufacturer	SPECIFICATIONS	Remark
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)

SPECIFICATIONS

1. Manufacturer: Oki Electric Cable Co., Ltd. Manufacture's model number: AWG26 4P TPMC-C5E(S-HFR) K
- Electrical characteristics: Conforms to EIA / TIA 568B.2 Category 5e.
  From the viewpoint of attenuation performance, ensure that the length to the hub is 40m or less.
- Structure: Group shielded (braided shield). A drain wire is available. The conductors of the cable are AWG26 annealed-copper strand wire, with a cable jacket 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 million or more sliding cycles with a bending radius of 50 mm. Bending: 300,000 or more bending cycles with a bending radius of 20 mm. Twisting: 5 million or more sliding cycles (+/- 180 degrees)
- UL style No. : AWM20276 (80°C / 30V / VW-1)

2. Manufacturer: Oki Electric Cable Co., Ltd. Manufacture's model number: AWG26 4P TPMC-C5-F (SB)
SHINKO ELECTRIC INDUSTRIES CO., LTD. Manufacture's model number: FNC-118
- Electrical 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 cable jacket thickness of 0.8 mm and an outer diameter of 6.7 mm ±0.3 mm.
- Fire resistance: UL1581 VW-1
- Oil resistance: Conforms to the FANUC internal standards (equivalent to the conventional oil-resistant electric cables).
- Flexing resistance: 1 million 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. 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.

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

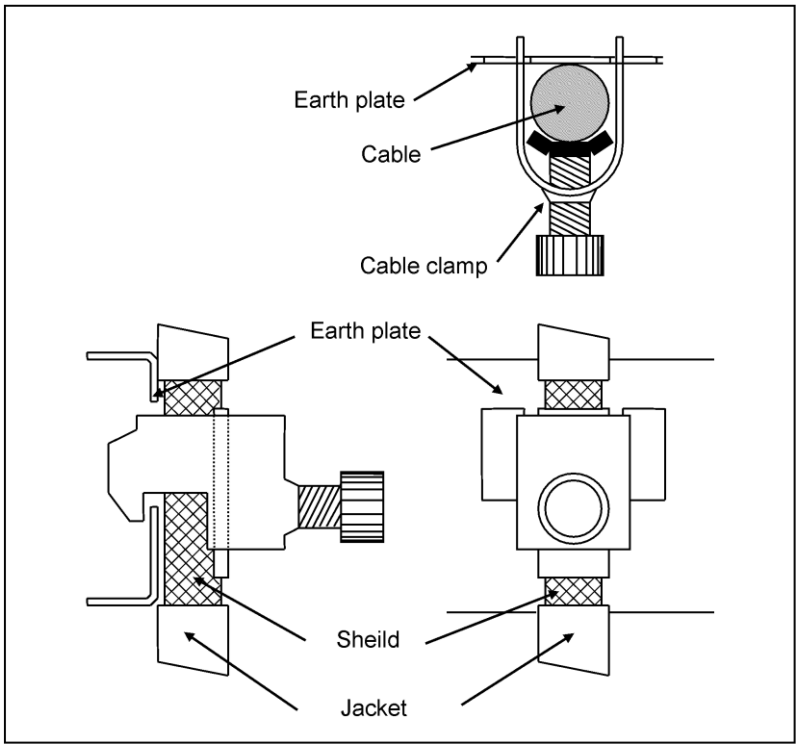
NOTE
Information about TM21CP-88P (03): Connector (standard product of the manufacturer) Maintenance specification: A63L-0001-0823#P Manufacturer: HIROSE ELECTRIC CO., LTD. Manufacturer type number: TM21CP-88P (03) Conforms to EIA/TIA 568B.2 Category 5e. For assembly with a cable, contact HIROSE ELECTRIC 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.)

3.4.3.4. Electrical noise countermeasures

Clamping and shielding cable

Clamp the Ethernet twisted-pair cable as shown in the following figure, as with other cables that require shielding. This clamp both supports as well as shields the cable, and is extremely important to assure stable system operation. Be sure to complete this procedure.

Peel off part of the Ethernet cable jacket as shown in the figure to expose the outer coating of the shield, and press this outer coating against the earth plate with the cable clamp.



NOTE

Be sure to clamp and shield the cable in order to ensure stable system operation.

NOTE

1. FL-net's communication provides high-speed responsiveness by not reprocessing every several seconds as in the case of ordinary Internet communication. Therefore, noise immunity must be at a higher level than in the case of ordinary Ethernet wiring.
2. From the perspective of noise countermeasures, when testing communication after laying the cable, be sure to perform sufficient communication testing not only before system operation, but after system operation as well.

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.

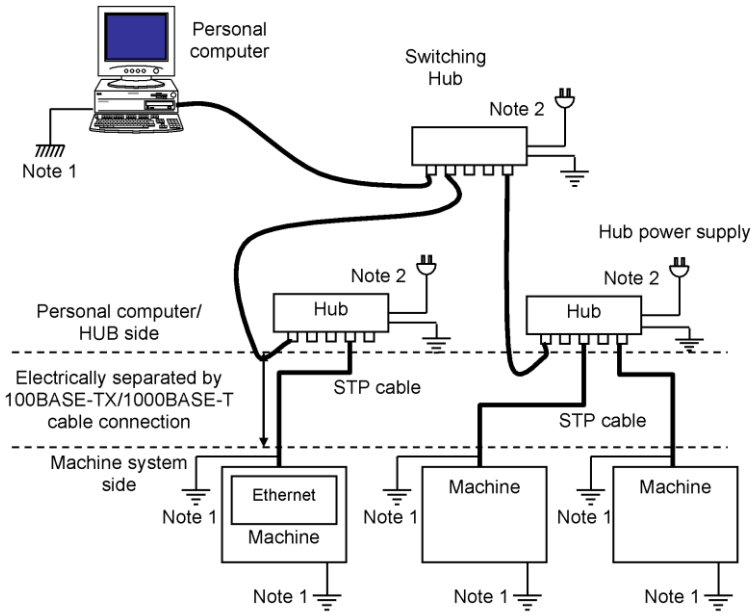


Figure 3.4.3.4-1 Large-Scale Network

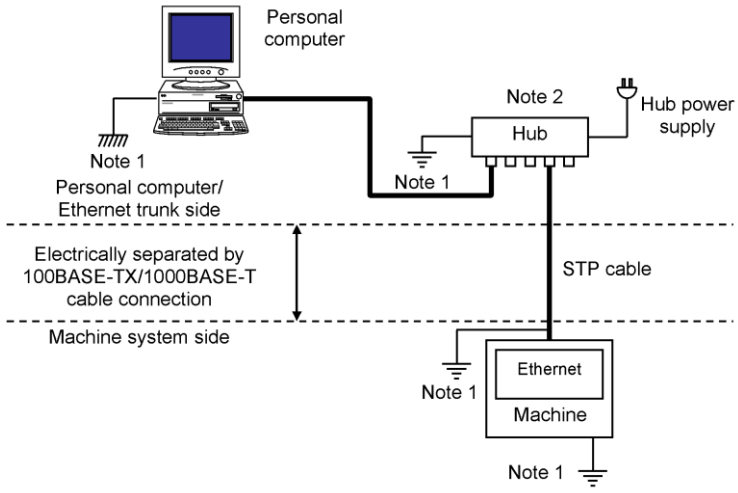


Figure 3.4.3.4-2 Small-Scale Network

NOTE

1. The ground between the PC/HUB side and the 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 the AC power cable or more. A thickness of at least 5.5 mm^2 is necessary.
2. Note that the number of allowable hub-to-hub connections depends on the type of hub.
3. There is a possibility that noise will impede proper communication even if the ground is separated using the 100BASE-TX/1000BASE-T. 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/1000BASE-SX/LX (Optical fiber media).

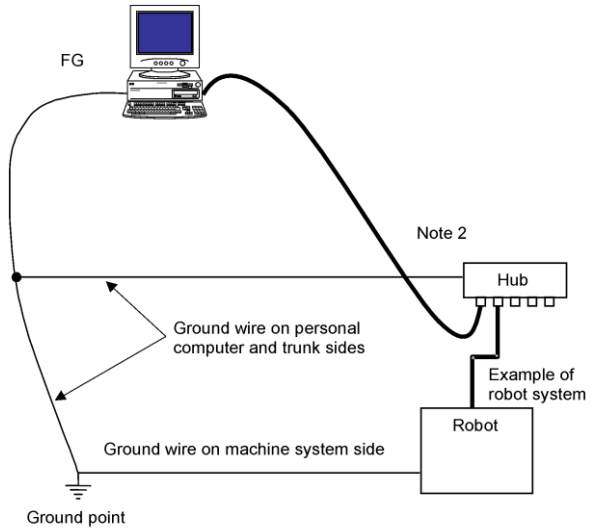


Figure 3.4.3.4-3 Wiring on a single ground point

3.4.3.5. 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 (100BASE-TX), Category 5e (1000BASE-T)	
	Length	The cable length shall be within 100 m (50 m (100BASE-TX) or 40 m (1000BASE-T) for a flexible 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: DC power lines (24 VDC) and others	
	Shielding cable	Verify that the shield part exposed with the peeled back coating is securely fastened to the earth plate with the clamp.	
	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 other cases, follow the specifications of the cable manufacturer.	
	For flexible part	For a flexible part, a cable for a flexible 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).	

Check item		Description	Check
	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.

3.4.4. Camera Interface

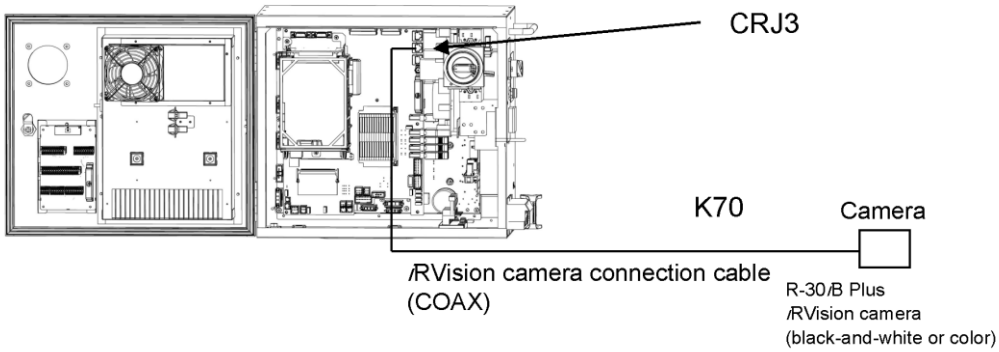


Figure 3.4.4-1 iRVision camera cable connection

Specification of cable

Cable No.	Name	Order specification	Maintenance specification	Length (m)
K70	iRVision camera connection cable (COAX) (Non-Flex)	A05B-2696-J340	A660-2008-T534#L1R503G	1.5
		A05B-2696-J341	A660-2008-T534#L2R503G	2.5
		A05B-2696-J342	A660-2008-T534#L5R503G	5.5
		A05B-2696-J343	A660-2008-T534#L8R503G	8.5
		A05B-2696-J344	A660-2008-T534#L15R53G	15.5
K72	iRVision camera connection cable (COAX) (for the traveling axis)	A05B-2696-J323	A660-2008-T435#L8R503H	8.5
		A05B-2696-J324	A660-2008-T435#L15R53H	15.5
		A05B-2696-J325	A660-2008-T435#L21R53H	21.5
		A05B-2696-J326	A660-2008-T435#L25R03H	25

	Robot	Non-flex type		
		Diameter (mm)	Weight (kg/m)	Minimum bend radios (mm)
Camera cable	All models	8.0	0.1	48

	Robot	For the traveling axis		
		Diameter (mm)	Weight (kg/m)	Minimum bend radios (mm)
Camera cable	All models	9.6	0.13	200 (Flex) 60 (Non-flex type)

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.

4. TRANSPORTATION AND INSTALLATION

This chapter describes the transportation and installation of the controller.

4.1. TRANSPORTATION PROCEDURE

Affix a belt sling to the handle on top of the controller, and transport it with a crane.

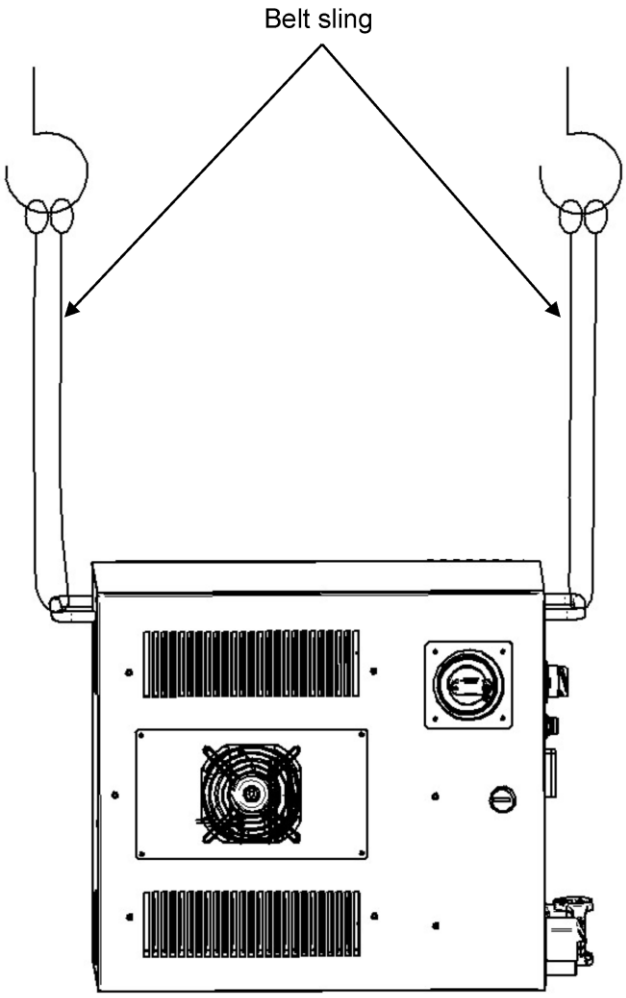
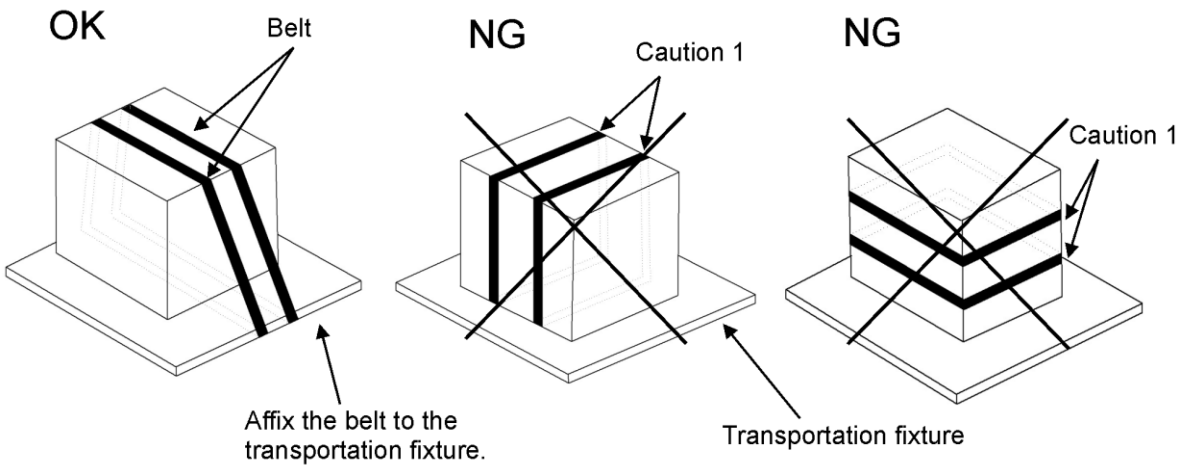


Figure 4.1-1 Transportation procedure

4.2. NOTES REGARDING PACKAGING AND SHIPMENT

Refer to the following figure when tightening the belt for transportation.



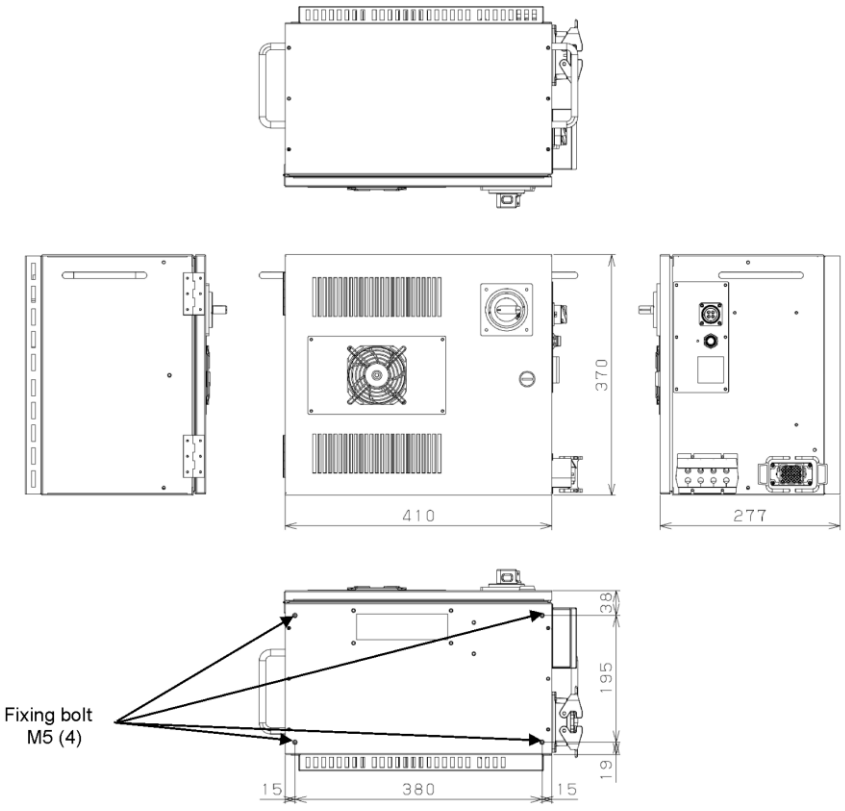
⚠CAUTION

1. Closing the cabinet door too forcefully with the belt can crush the door's gasket, and even after the belt is removed, the gasket will remain crushed. This can make it impossible to ensure the sealing performance of the cabinet during subsequent usage.
2. Use suitable cushioning material so that stress is not applied to the cable or the cover sheet metal of the cable path opening.

4.3. INSTALLATION

4.3.1. Installation Procedure

The procedure for installing the cabinet is shown below.
The external dimensions are common among all models.
Install the controller in such a way as to secure a zone for maintenance.



	Munsell symbol	Color
Main body	N1.5	Black
Door	N1.5	Black

Figure 4.3.1-1 External dimensions

⚠WARNING

If there is a risk of the cabinet overturning, use a fixing bolt when installing the cabinet.

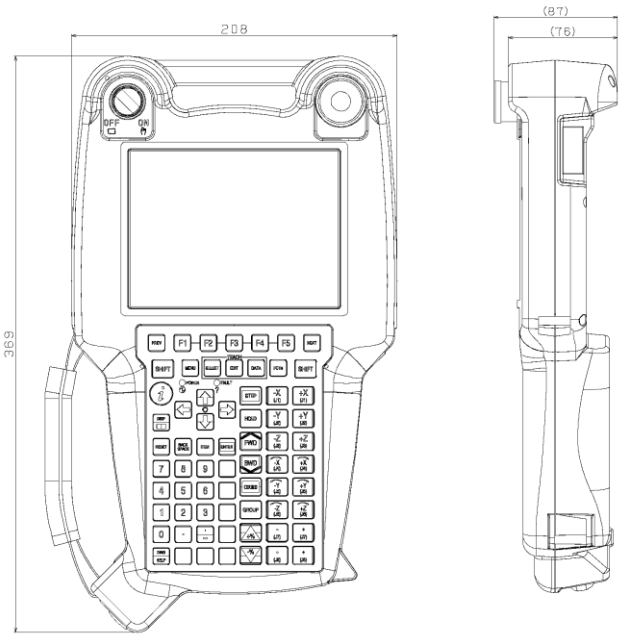


Figure 4.3.1-2 External dimensions (teach pendant: iPendant)

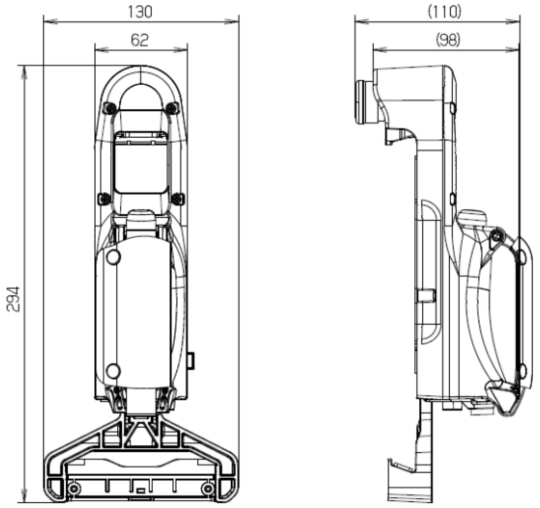


Figure 4.3.1-3 External dimensions (teach pendant: tablet TP)

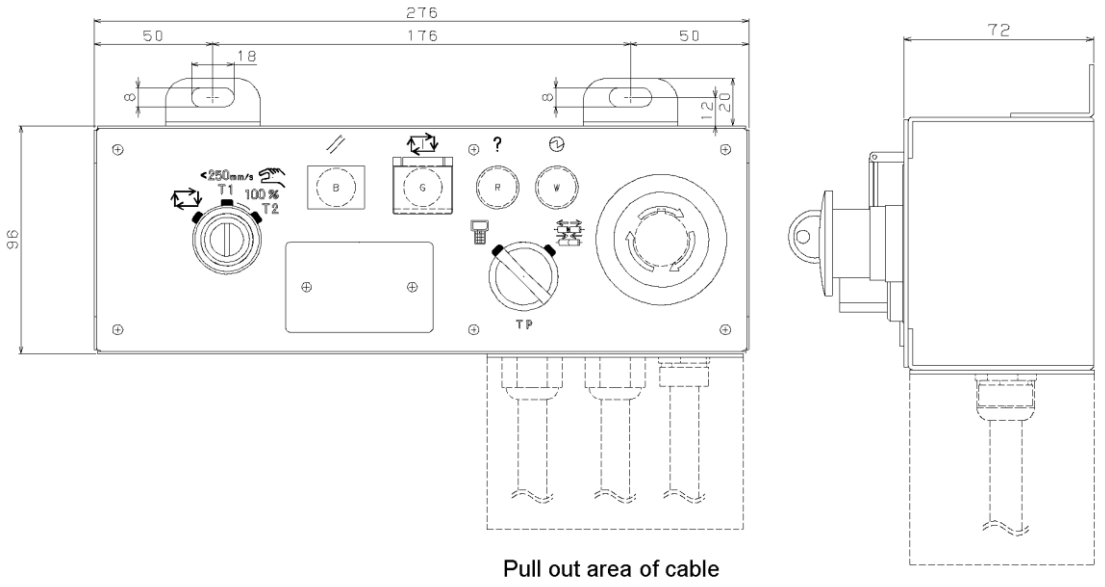


Figure 4.3.1-4 Switch box external dimensions

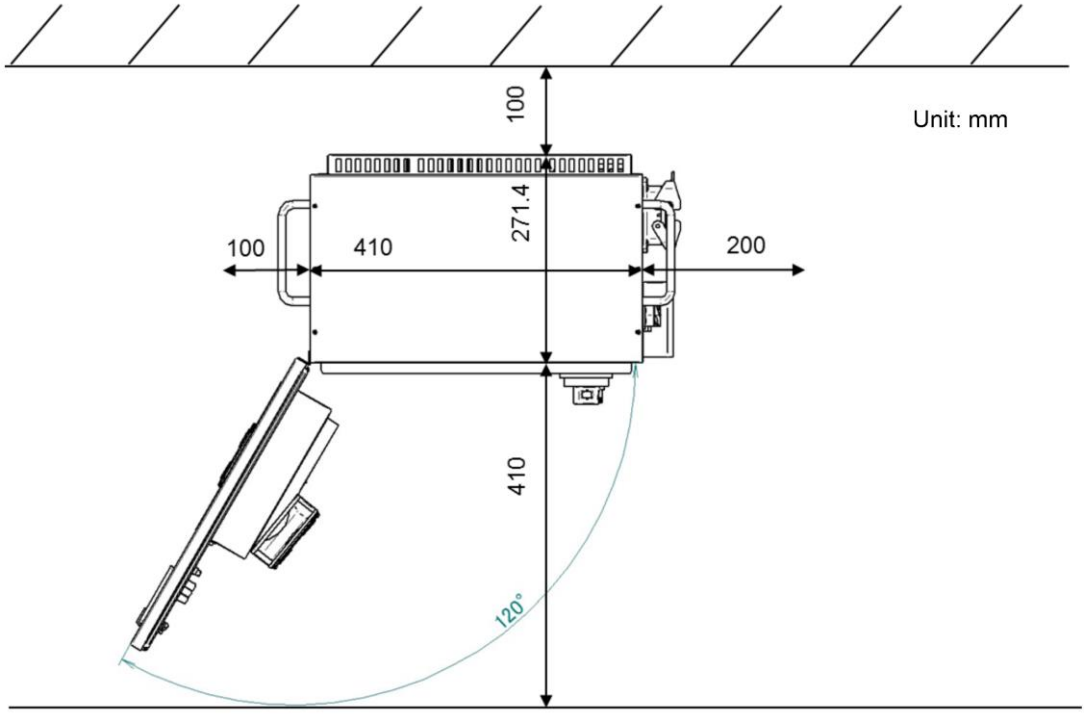


Figure 4.3.1-5 Installed dimensions

CAUTION
1. Secure the zone shown above for the sake of maintenance and heat dissipation. 2. When installing the controller, make sure there is good ventilation and that it is located in an open space. if the controller is installed in a closed space, its cooling function will not work, it will become hot, its reliability will degrade, and faults may occur.

4.3.2. Assembly During Installation

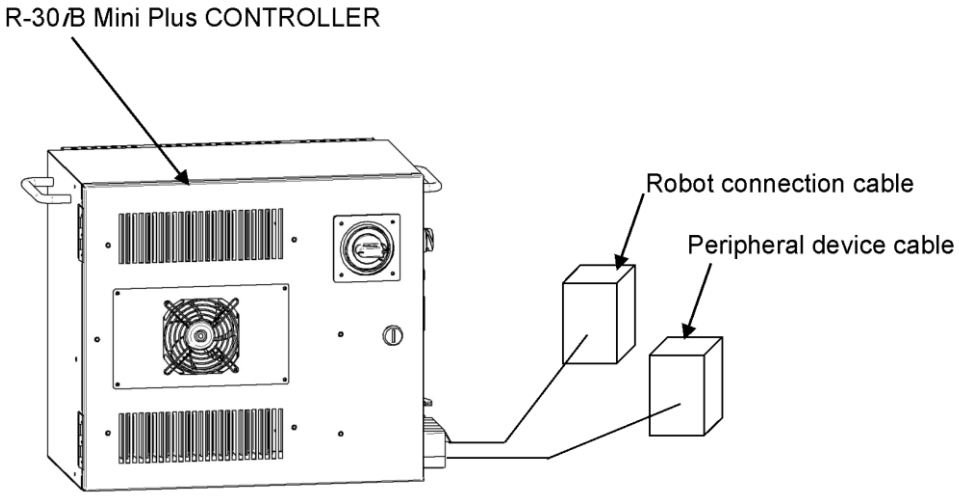


Figure 4.3.2-1 Assembly During Installation

4.4. INSTALLATION CONDITION

Item	Model	Specification/condition
Input power source	All models	NRTL (UL1740) 110-120VAC +10%, -15% (*1) (*2) 200-240VAC +10%, -15% (*1) NRTLOthers(IEC60204-1) 100-120VAC +10%, -10% (*1) (*2) 200-240VAC +10%, -15% (*1) 50/60Hz ± 1Hz (*1) "+10%, -15%(-10%)" is the tolerant for temporary voltage fluctuation. (*2) It is defined as device input voltage when the maximum length of the power supply cable is 15 m and a rated current of 15 Arms is flowing.
Input power source capacity	CRX-5iA, CRX-10iA, CRX-20iA, CRX-25iA	1.5kVA
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. A leakage breaker is required for TT connection.
SCCR(IEC)	All models	240VAC: 5kA
Average power consumption	CRX-5iA	0.3kW
	CRX-10iA	0.3kW
	CRX-20iA	0.4kW
	CRX-25iA	0.4kW
Permissible ambient temperature	All models	When operating: 0°C to 45°C During storage or transport: -20°C to 60°C Temperature change: 0.3°C/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	Further consideration is required if the usage environment includes comparatively large amounts

Item	Model	Specification/condition
		of contaminants (dust, cutting oil, organic solvents, corrosive gas, silicone-based mold release agents, phosphorus compounds [such as insecticides, etc.], alkaline cleaners, salt, and so on).
Overvoltage category /Pollution degree	All models	Overvoltage category III/Pollution degree 3 IEC60664-1 and IEC/EN/UL61010-1
Vibration acceleration	All models	4.9 m/s^2 (0.5G) or less When using the robot in a location that is subject to serious vibrations, consult with your local FANUC representative.
Altitude	All models	Operating: Up to 1000m Non-operating: Up to 12000m
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	All models	Other than the controller for CRX-25iA: 20 kg Controller for CRX-25iA: 22 kg
Degree of protection	All models	IP54
	Teach pendant	
Short circuit current rating	All models	CE, UL/CSA: 240V a.c., 5 kArms
Leakage current	All models	10 mA or less

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.

⚠CAUTION

R-30iB Mini Plus controller 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.

This device does not malfunction when exposed to the harmonics that occur in a typical factory environment, but problems can occur if it is connected to a distorted power supply that includes harmonics.

In this situation, implement a countermeasure to deal with the harmonics of the power supply equipment.

If a ground fault type main breaker trips on the facility side

Fault current might flow through the noise filter into the R-30iB Mini Plus. For this reason, if a ground fault type main breaker is used as the breaker on the facility side (with a current sensitivity of less than 30 mA), or if a shared facility-side ground fault type main breaker is used for multiple controllers, then the ground fault type main breaker might trip when the controller's power is turned on.

If the facility-side ground fault type main breaker trips as described above, then implement one of the following countermeasures.

1. Use a facility-side ground fault type main breaker with a large current sensitivity. Or split facility-side ground fault type main breakers between individual controllers.
2. Install an isolation transformer between the controller and the facility-side ground fault type main breaker.

4.5. ADJUSTMENT AND CHECKS AT INSTALLATION

Adjust the robot according to the following procedure at installation.

No.	Description
1	Visually check the inside and outside of the controller.
2	Check the screw terminals for proper connection.
3	Check that the connectors and printed circuit boards are firmly connected.
4	Connect controller and mechanical unit cables.
5	The breaker off and connect the input power cable.
6	Check the input power voltage.
7	Press the EMERGENCY STOP button on the operator's panel and turn on the controller.
8	Check the interface signals between controller and robot mechanical unit.
9	Check the parameters. If necessary, set them.
10	Release the EMERGENCY STOP button on the operator's panel.
11	Check the movement along each axis in manual jog mode.
12	Check the signals of EE interface.
13	Check the peripheral device control interface signals.

Appendix

A. SPECIFICATION LIST

Name	Order specification	Maintenance specification Printed circuit board or unit	Remark
Main board A	A05B-2695-H001	A17B-8101-0901	Standard/vision, force sensor, line tracking, HDI
CPU card	A05B-2670-H020	A17B-3301-0250	Standard/DRAM 1GB
FROM/SRAM module	-	A20B-3900-0296	FROM 256M/ SRAM 3M
Side board	A05B-2695-H010	A20B-2201-0120	
BACKPLANE BOARD	A05B-2695-H020	A20B-8003-0120	2 slots
Input unit	A05B-2696-C451	A05B-2696-C451	For CRX-5iA, CRX-10iA, CRX-20iA (Upward compatible products of the A05B-2696-C450)
		A20B-2005-0530	Input board
	A05B-2696-C452	A05B-2696-C452	For CRX-25iA
		A20B-2005-0530	Input board
Fan unit	A05B-2696-K310		Inner fan
	A05B-2696-K315		Outer fan
	A05B-2696-K316		For the outer fan CRX-25iA
Model name plate	A05B-2695-H220	A370-0271-0327#A	Control unit name plate R-30iB Mini Plus
	A05B-2696-H001	A370-0271-0328#A	Control unit model name plate CRX-10iA
	A05B-2696-H002	A370-0271-0335#A	Control unit model name plate CRX-5iA
	A05B-2696-H003	A370-0271-0336#A	Control unit model name plate CRX-20iA
	A05B-2696-H004	A370-0271-0337#A	Control unit model name plate CRX-25iA
Servo amplifier unit	A05B-2695-H050	A06B-6401-C101	6 axes
Additional safety I/O terminal block conversion unit	A05B-2695-K130	A05B-2690-C132	
Internal I/O terminal block conversion module (internal)	A05B-2695-J150	A05B-2695-C150	With FENCE and EXEMG jumpers
Internal I/O terminal block conversion module (internal)	A05B-2695-J160	A20B-1010-0270	
Internal I/O terminal block conversion module (external)	A05B-2690-K440	A15L-0001-0167	
Internal I/O terminal block conversion module (external)	A05B-2695-K160	A20B-1010-0270	
I/O emergency stop jumper cable	A05B-2690-K100	A660-2008-T350	JRM18 jumper connector
Spare fuse kit	A05B-2695-K001	-	1 A (1), 2 A (1), 5 A (1), 6.3 A (1)
Spare battery	A02B-0200-K102	-	

Name	Order specification	Maintenance specification Printed circuit board or unit	Remark
Teach pendant iPendant	A05B-2256-H100#EGN	A05B-2256-C100#EGN	English/General
	A05B-2256-H100#EMH	A05B-2256-C100#EMH	English/Material handing
	A05B-2256-H100#JGN	A05B-2256-C100#JGN	Japanese/General
	A05B-2256-H100#JMH	A05B-2256-C100#JMH	Japanese/Material handing
	A05B-2256-H100#SGN	A05B-2256-C100#SGN	Symbolic/General
	A05B-2256-H101#EGN	A05B-2256-C101#EGN	English/General, Touch panel
	A05B-2256-H101#EMH	A05B-2256-C101#EMH	English/Material handing, Touch panel
	A05B-2256-H101#JGN	A05B-2256-C101#JGN	Japanese/General, Touch panel
	A05B-2256-H101#JMH	A05B-2256-C101#JMH	Japanese/Material handing, Touch panel
	A05B-2256-H101#SGN	A05B-2256-C101#SGN	Symbolic/General, Touch panel
	A05B-2256-H102#EGN	A05B-2256-C102#EGN	English/General Haptic
	A05B-2256-H102#EMH	A05B-2256-C102#EMH	English/Material handing Haptic
	A05B-2256-H102#JGN	A05B-2256-C102#JGN	Japanese/General Haptic
	A05B-2256-H102#JMH	A05B-2256-C102#JMH	Japanese/Material handing Haptic
	A05B-2256-H102#SGN	A05B-2256-C102#SGN	Symbolic/General Haptic
	A05B-2256-H103#EGN	A05B-2256-C103#EGN	English/General, Touch panel Haptic
	A05B-2256-H103#EMH	A05B-2256-C103#EMH	English/Material handing, Touch panel Haptic
	A05B-2256-H103#JGN	A05B-2256-C103#JGN	Japanese/General, Touch panel Haptic
	A05B-2256-H103#JMH	A05B-2256-C103#JMH	Japanese/Material handing, Touch panel Haptic
	A05B-2256-H103#SGN	A05B-2256-C103#SGN	Symbolic/General, Touch panel Haptic
Teach pendant Tablet TP	A05B-2256-K301	A05B-2256-C310 (Base unit) A66L-2008-0658 (USB cable) A05B-2256-C351 (Tablet)	with tablet
	A05B-2256-K302	A05B-2256-C310	without tablet

Name	Order specification	Maintenance specification Printed circuit board or unit	Remark
		(Base unit) A66L-2008-0658 (USB cable)	
Switch box	A05B-2690-H400	A05B-2690-C400	
Switch box Jumper connector	A05B-2690-H410	A660-2008-T349	
Discharge resistor	A05B-2696-C100	A05B-2696-C100	
Brake Release unit	A05B-2695-J350	A05B-2600-C353	

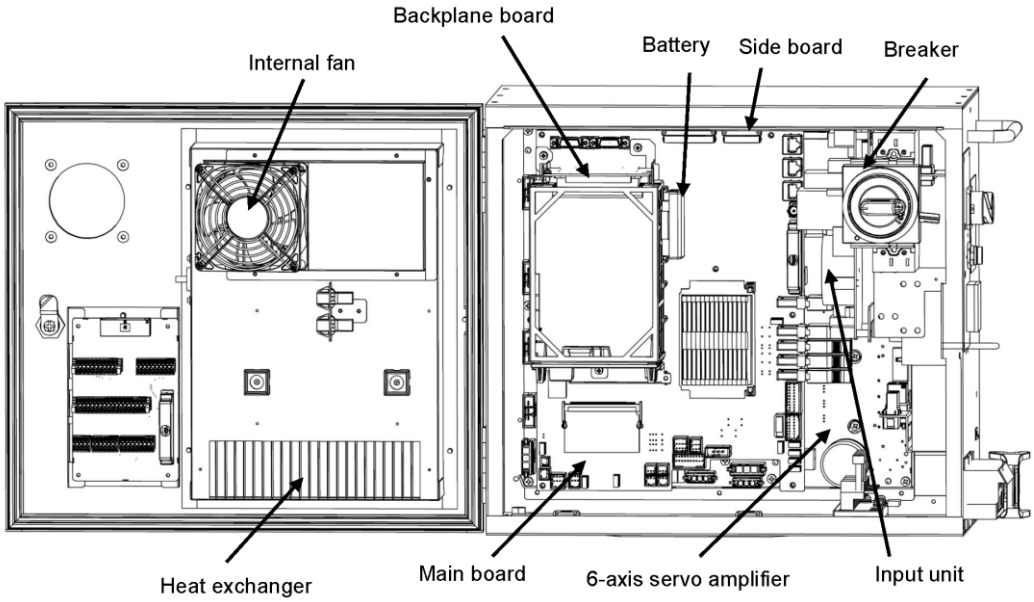


Figure A-1 R-30iB Mini Plus cabinet interior construction diagram

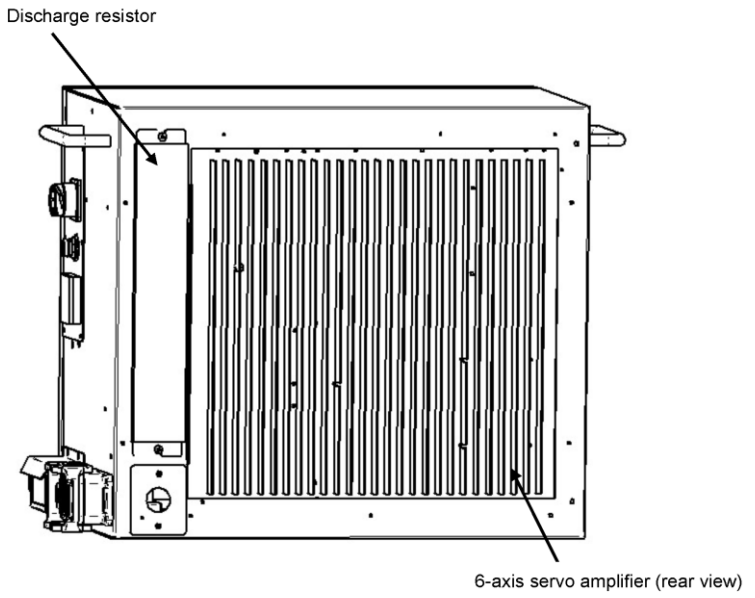


Figure A-2 R-30iB Mini Plus cabinet interior construction diagram (rear)

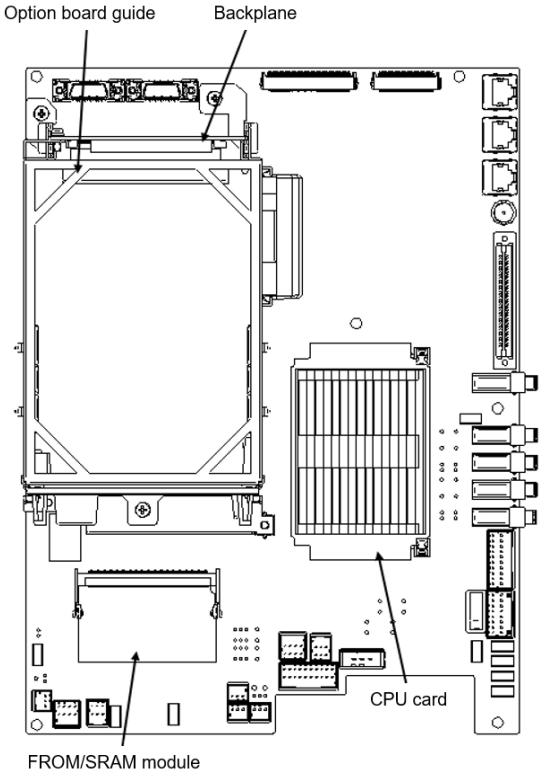


Figure A-3 MAIN BOARD

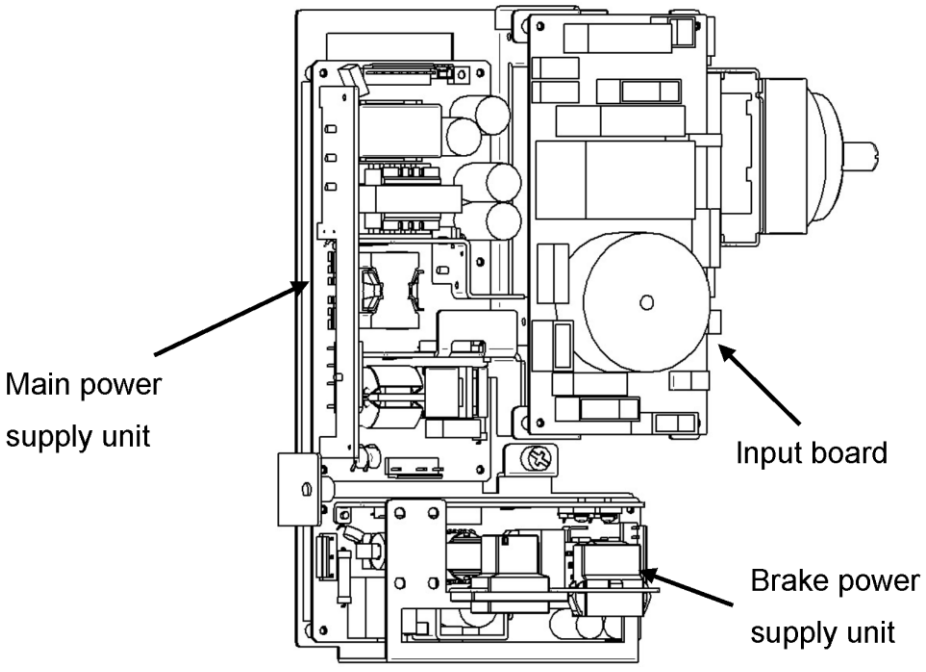


Figure A-4 Input unit

Cable No.	Name	Length (m)	Order specification	Maintenance specification	Remark
K01	Power supply cable 100V/Single phase	2	A05B-2695-J100	A660-8022-T067	Right angle, With Power Plug
		5	A05B-2695-J101	A660-8022-T068	
		10	A05B-2695-J102	A660-8022-T069	

Cable No.	Name	Length (m)	Order specification	Maintenance specification	Remark
		15	A05B-2695-J103	A660-8022-T070	
K02	Power supply cable 200V/Single phase	2	A05B-2690-J100	A660-8020-T889#L2R003	Right angle, without plug
		5	A05B-2690-J101	A660-8020-T889#L5R003	
		10	A05B-2690-J102	A660-8020-T889#L10R03	
		20	A05B-2690-J103	A660-8020-T889#L20R03	
K20	Teach pendant cable 5m with flexing protection	5	A05B-2690-H200	A660-2008-T032#L5R503	iPendant - Controller (TP connector)
		10	A05B-2690-H201	A660-2008-T032#L10R53	
		20	A05B-2690-H202	A660-2008-T032#L20R53	
K25	Switch box cable	1	A05B-2695-H450	A05B-2690-D260	Switch box CRT27 - - Controller (JRT3) Switch box CRT46 Controller (TP connector)
		2	A05B-2695-H451	A05B-2690-D261	
		5	A05B-2695-H452	A05B-2690-D262	
		10	A05B-2695-H453	A05B-2690-D263	
		20	A05B-2695-H454	A05B-2690-D264	
K26	Remote mode switch retrofit kit	5	A05B-2695-K400	A660-8020-T887#L5R003A	3-mode Remote mode switch - Controller (JRT3)
		10	A05B-2695-K401	A660-8020-T887#L10R03A	
		20	A05B-2695-K402	A660-8020-T887#L20R03A	
		5	A05B-2695-K410	A660-8020-T888#L5R003A	2-mode Remote mode switch - Controller (JRT3)
		10	A05B-2695-K411	A660-8020-T888#L10R03A	
		20	A05B-2695-K412	A660-8020-T888#L20R03A	
K30	Peripheral device cable	1	A05B-2695-J430	A660-2008-T414#L1R003A	Terminal conversion module - Controller (JRM18)
		5	A05B-2695-J431	A660-2008-T414#L5R003A	
		10	A05B-2695-J432	A660-2008-T414#L10R03A	
K32	Cable for additional safety I/O board		A05B-2695-J180	A660-2007-T595/L600R0A	Additional safety I/O board - Controller (JD1A)
K33	Additional safety I/O terminal conversion board cable	5	A05B-2695-J182	A660-4005-T389#L5R703A	Additional safety I/O terminal conversion board (CRMA98,CRMA99) - Controller (CRMA90)
		10	A05B-2695-J183	A660-4005-T389#L10R73A	
K34	Peripheral device cable (JRM19)	5	A05B-2695-J165	A660-4005-T981#L5R203B	Terminal conversion module (A05B-2695-K160) - Controller (JRM18,CRMC15)
		10	A05B-2695-J166	A660-4005-T981#L10R03B	
K35	Peripheral device cable (CRMA90)	5	A05B-2695-J162	A660-2008-T830#L5R703B	Terminal conversion module (A05B-2695-K160) - Additional safety I/O board (CRMA90)
		10	A05B-2695-J163	A660-2008-T830#L10R73B	
K50	Robot connection extension cable (Non-flex type) (Target: CRX-5iA, CRX-10iA, CRX-20iA)	1	A05B-2696-J103	A660-2008-T753#L1R003	RMP cable (non-flex, CE)
				A660-8011-T210 #L3R003	Earth cable
		4	A05B-2696-J100	A660-2008-T753#L4R003	RMP cable (non-flex, CE)
				A660-8011-T210#L6R003	Earth cable
		7	A05B-2696-J101	A660-2008-T753#L7R003	RMP cable (non-flex, CE)
				A660-8011-T210#L9R003	Earth cable
		14	A05B-2696-J102	A660-2008-T753#L14R03	RMP cable (non-flex, CE)
				A660-8011-T210#L16R03	Earth cable
	Robot connection cable (Non-flex type) (target: CRX-25iA)	1	A05B-2696-H103	A660-2009-T062#L1R003	RMP cable (non-flex, CE)
				A660-8011-T210 #L3R003	Earth cable
		4	A05B-2696-H100	A660-2009-T062#L4R003	RMP cable (non-flex, CE)
				A660-8011-T210#L6R003	Earth cable
		7	A05B-2696-H101	A660-2009-T062#L7R003	RMP cable (non-flex, CE)
				A660-8011-T210#L9R003	Earth cable

Cable No.	Name	Length (m)	Order specification	Maintenance specification	Remark
		14	A05B-2696-H102	A660-2009-T062#L14R03	RMP cable (non-flex, CE)
				A660-8011-T210#L16R03	Earth cable
K51	Robot connection extension cable (Flex) (Target: CRX-5iA, CRX-10iA, CRX-20iA)	7	A05B-2696-J121	A660-4006-T010	RMP cable (flex CE, controller side)
				A660-4006-T011#L7R003	RMP cable (flex CE, robot side)
				A660-8011-T210#L10R03	Earth cable
		14	A05B-2696-J122	A660-4006-T010	RMP cable (flex CE, controller side)
				A660-4006-T011#L14R03	RMP cable (flex CE, robot side)
				A660-8011-T210#L17R03	Earth cable
		20	A05B-2696-J124	A660-4006-T010	RMP cable (flex CE, controller side)
				A660-4006-T011#L20R03	RMP cable (flex CE, robot side)
				A660-8011-T210#L23R03	Earth cable
		30	A05B-2696-J125	A660-4006-T010	RMP cable (flex CE, controller side)
				A660-4006-T011#L30R03	RMP cable (flex CE, robot side)
				A660-8011-T210#L33R03	Earth cable
	Robot connection cable (Flex) (target: CRX-25iA)	7	A05B-2696-H121	A660-4006-T010	RMP cable (flex CE, controller side)
				A660-4006-T134#L7R003	RMP cable (flex CE, robot side)
				A660-8011-T210#L10R03	Earth cable
		14	A05B-2696-H122	A660-4006-T010	RMP cable (flex CE, controller side)
				A660-4006-T134#L14R03	RMP cable (flex CE, robot side)
				A660-8011-T210#L17R03	Earth cable
		20	A05B-2696-H124	A660-4006-T010	RMP cable (flex CE, controller side)
				A660-4006-T134#L20R03	RMP cable (flex CE, robot side)
				A660-8011-T210#L23R03	Earth cable
		30	A05B-2696-H125	A660-4006-T010	RMP cable (flex CE, controller side)
				A660-4006-T134#L30R03	RMP cable (flex CE, robot side)
				A660-8011-T210#L33R03	Earth cable
K70	Camera connection cable (waterproof, Non-Flex)	1.5	A05B-2696-J340	A660-2008-T534#L1R503G	Camera - Controller (CRJ3)
		2.5	A05B-2696-J341	A660-2008-T534#L2R503G	
		5.5	A05B-2696-J342	A660-2008-T534#L5R503G	
		8.5	A05B-2696-J343	A660-2008-T534#L8R503G	
		15.5	A05B-2696-J344	A660-2008-T534#L15R53G	
K71	Force sensor connection cable (waterproof, adjustable)	1.5	A05B-2696-J350	A660-2008-T785#L1R503	Force sensor - controller (JRS30)
		2.5	A05B-2696-J351	A660-2008-T785#L2R503	
		5.5	A05B-2696-J352	A660-2008-T785#L5R503	
		8.5	A05B-2696-J353	A660-2008-T785#L8R503	
		15.5	A05B-2696-J354	A660-2008-T785#L15R53	
K80	Line tracking	7	A05B-2696-J300	A660-2008-T752#L7R003A	1 pulsecoder

Cable No.	Name	Length (m)	Order specification	Maintenance specification	Remark
	cable	14	A05B-2696-J301	A660-2008-T752#L14R03A	- Controller (JRS31)
		20	A05B-2696-J302	A660-2008-T303#L20R03A	
K81		7	A05B-2696-J310	A660-4005-T923#L7R003A	2 pulsecoders - Controller (JRS31)
		14	A05B-2696-J311	A660-4005-T923#L14R03A	
		20	A05B-2696-J312	A660-4005-T923#L20R03A	
K95	Portable Brake Release unit Robot connection cable	5	A05B-2695-J360	A660-2008-T825#L5R003	For CRX-5iA, CRX-10iA, CRX-20iA
		10	A05B-2695-J361	A660-2008-T825#L10R03	
		5	A05B-2695-J362	A660-2009-T095#L5R003	For CRX-25iA
		10	A05B-2695-J363	A660-2009-T095#L10R03	
K97	Portable Brake Release unit Power supply cable	5	A05B-2695-J101	A660-8022-T068	For AC100-120V With Power Plug
		10	A05B-2695-J102	A660-8022-T069	
		5	A05B-2690-J101	A660-8020-T889/L5R003	For AC200-240V Without Power Plug
		10	A05B-2690-J102	A660-8020-T889/L10R03	

B. TOTAL CONNECTION DIAGRAM

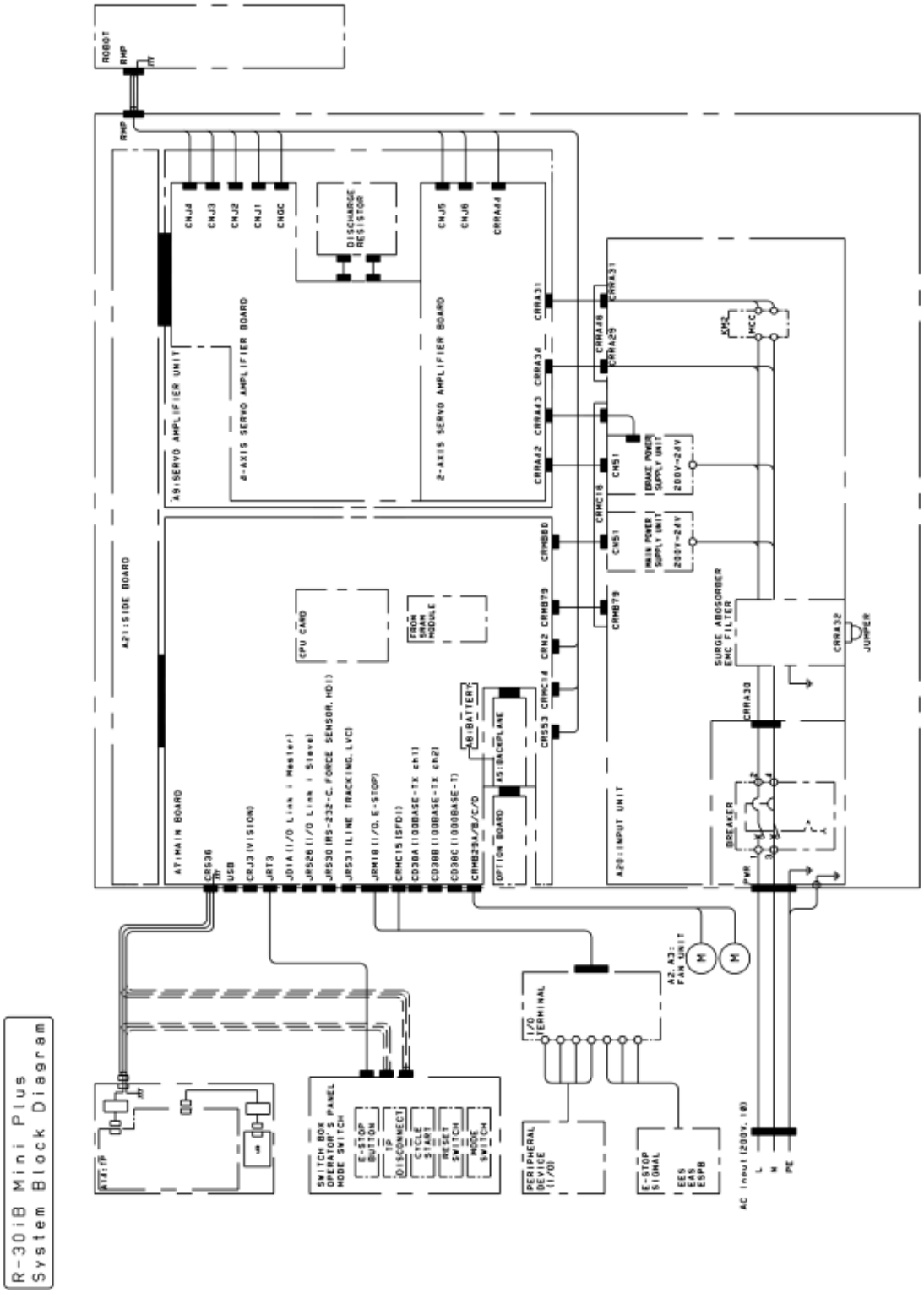


Figure B-1 System block diagram

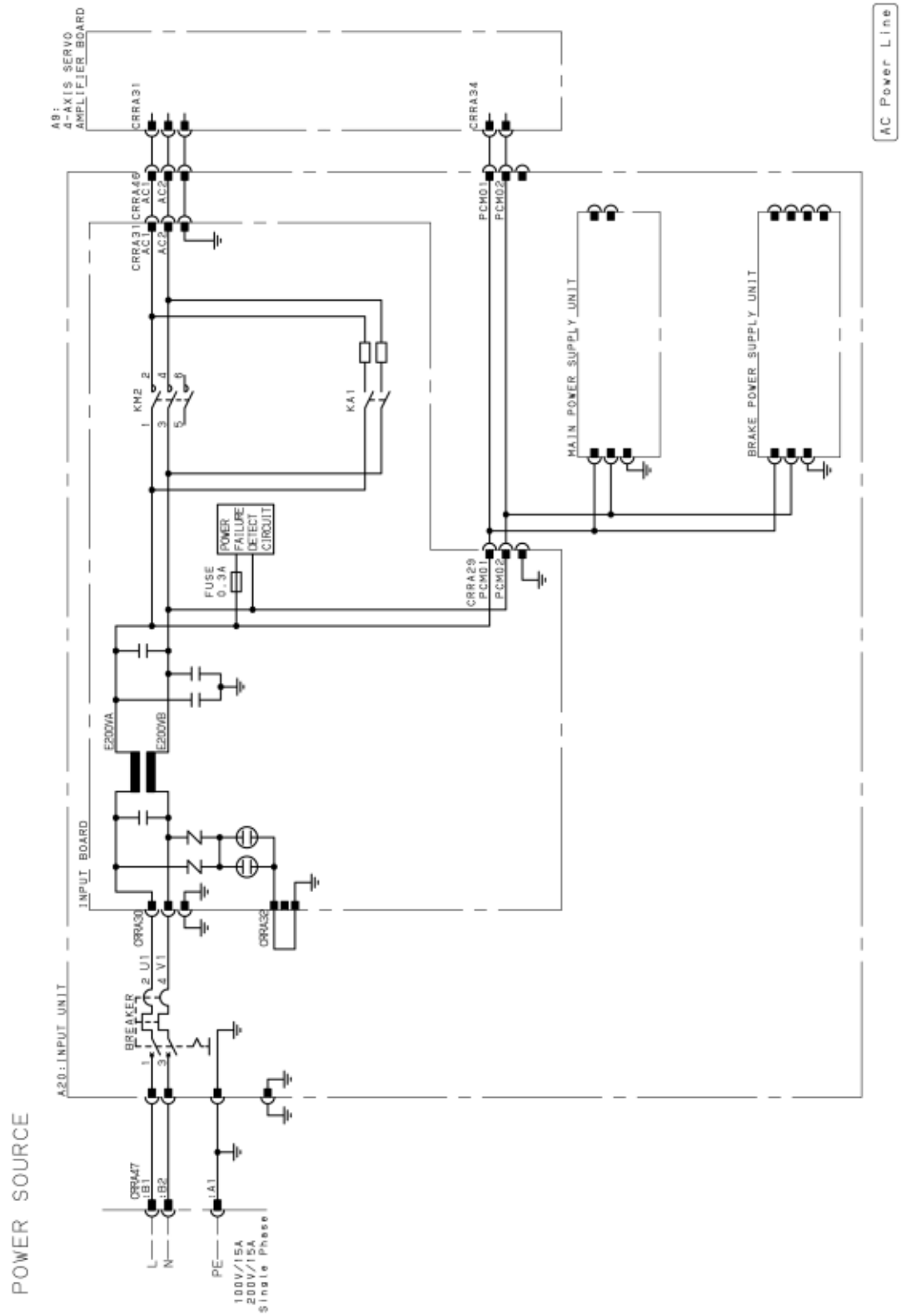


Figure B-2 AC power line connection diagram

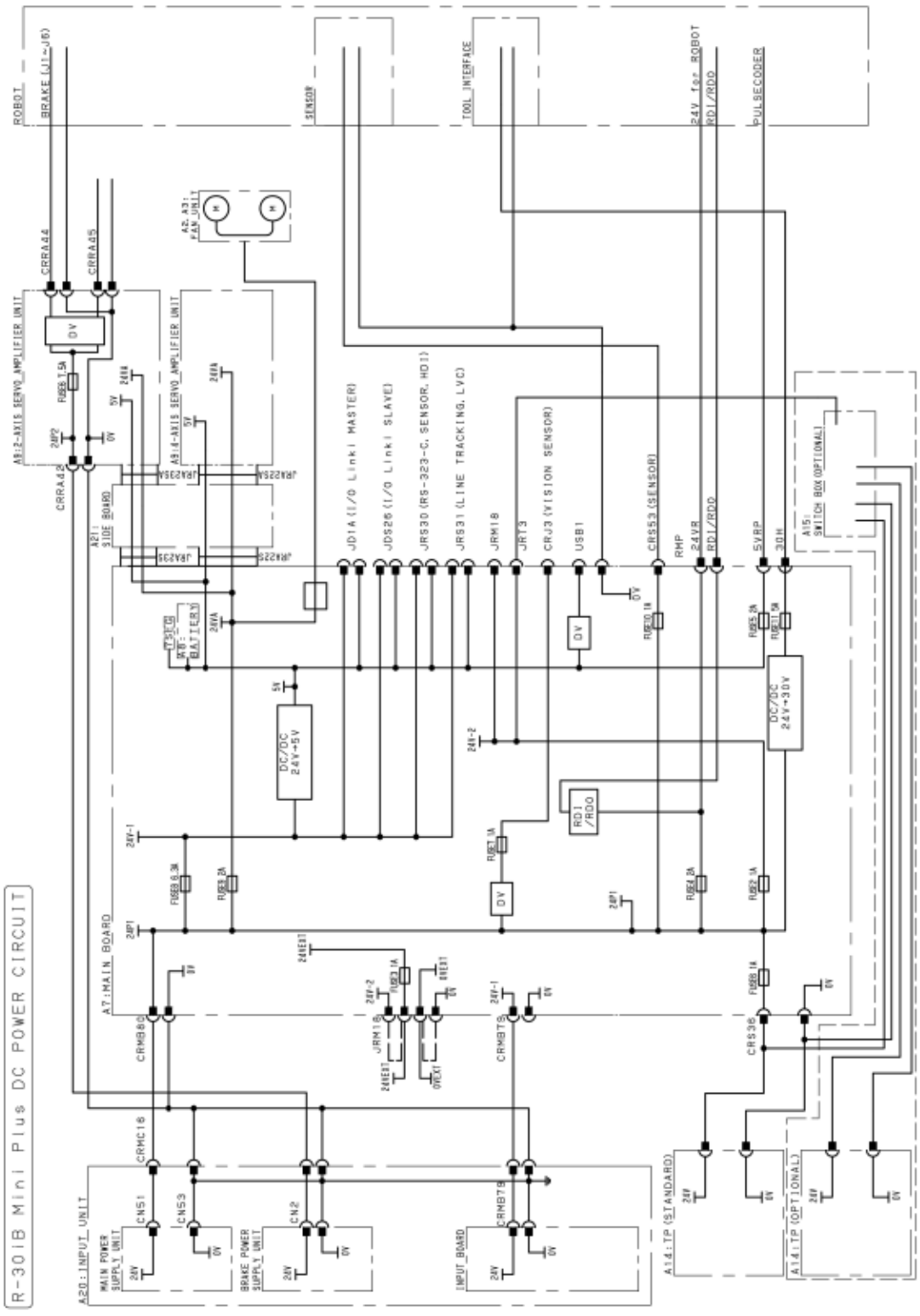


Figure B-3 DC power line connection diagram

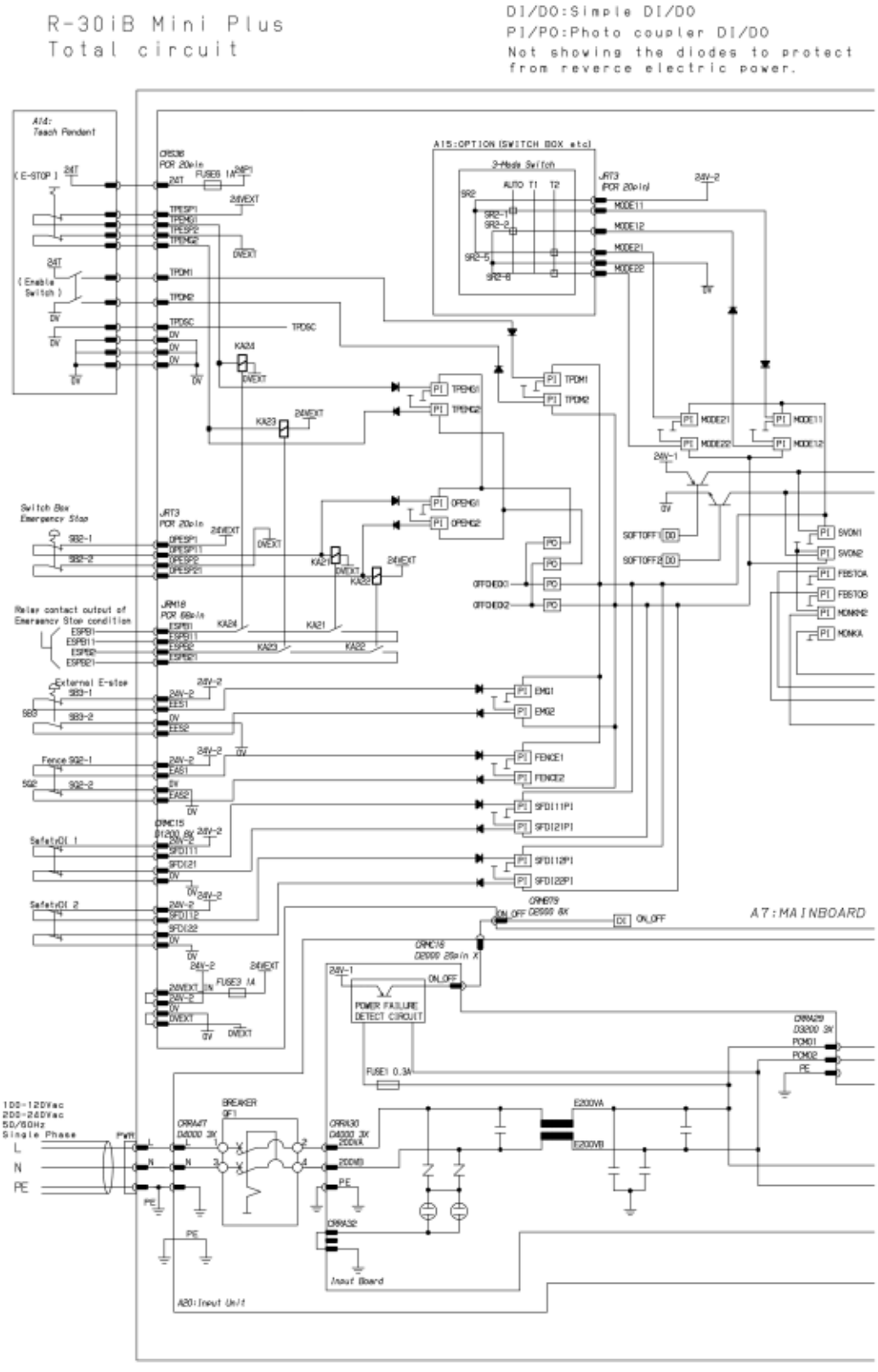
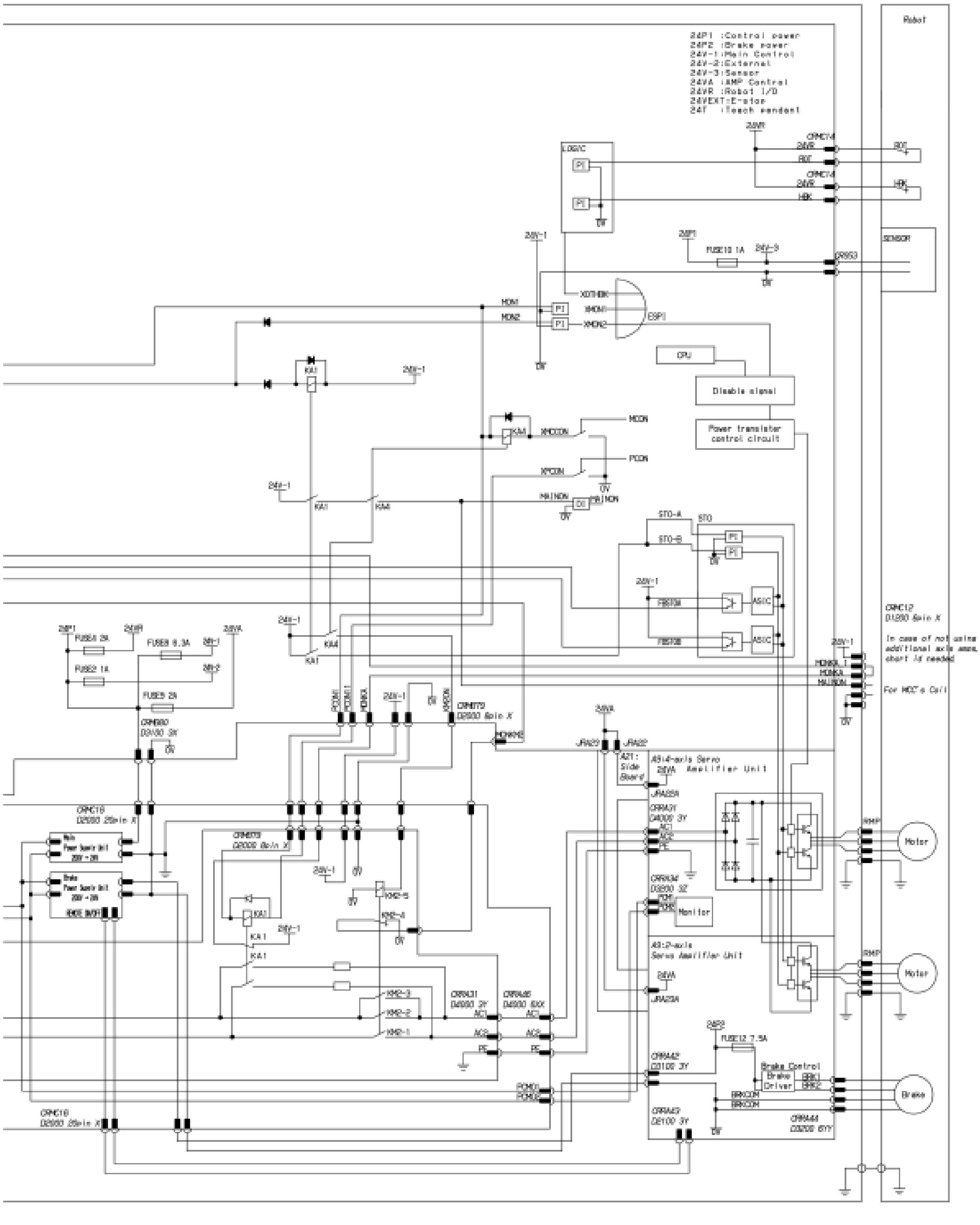
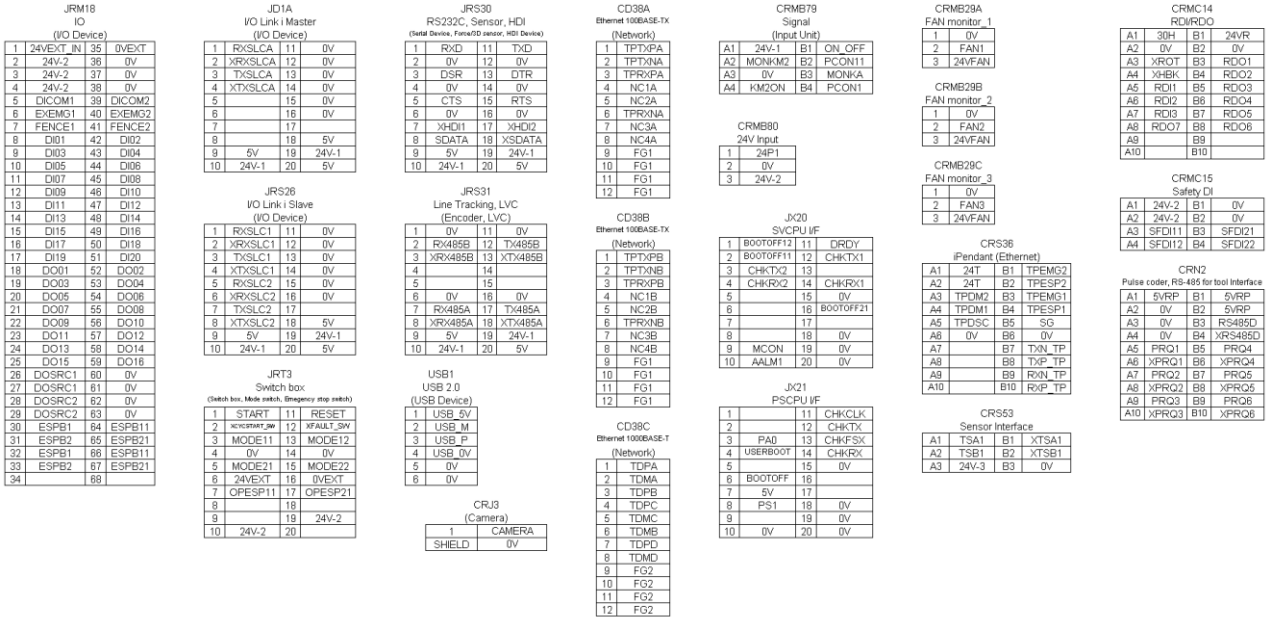


Figure B-4 Emergency stop circuit connection diagram


Robot
24P1 :Control power
24P2 :Brake power
24V-1 :Main Control
24V-2 :External
24V-3 :Sensor
24VA :AMP Control
24VR :Robot I/O
24VEXT :E-stop
24T :Teach pendant
SENSOR
CPU
Disable signal
Power transistor control circuit
Motor
Brake

MAIN BOARD



JRM18
IO
(I/O Device)

1	24VEXT_IN	35	0VEXT
2	24V-2	36	0V
3	24V-2	37	0V
4	24V-2	38	0V
5	DICOM1	39	DICOM2
6	EXEMG1	40	EXEMG2
7	FENCE1	41	FENCE2
8	DI01	42	DI02
9	DI03	43	DI04
10	DI05	44	DI06
11	DI07	45	DI08
12	DI09	46	DI10
13	DI11	47	DI12
14	DI13	48	DI14
15	DI15	49	DI16
16	DI17	50	DI18
17	DI19	51	DI20
18	DO01	52	DO02
19	DO03	53	DO04
20	DO05	54	DO06
21	DO07	55	DO08
22	DO09	56	DO10
23	DO11	57	DO12
24	DO13	58	DO14
25	DO15	59	DO16
26	DOSRC1	60	0V
27	DOSRC1	61	0V
28	DOSRC2	62	0V
29	DOSRC2	63	0V
30	ESPB1	64	ESPB11
31	ESPB2	65	ESPB21
32	ESPB1	66	ESPB11
33	ESPB2	67	ESPB21
34		68	

JD1A
I/O Link i Master
(I/O Device)

1	RXSLCA	11	0V
2	XRXSLCA	12	0V
3	TXSLCA	13	0V
4	XTXSLCA	14	0V
5		15	0V
6		16	0V
7		17	
8		18	5V
9	5V	19	24V-1
10	24V-1	20	5V

JRS26
I/O Link i Slave
(I/O Device)

1	RXSLC1	11	0V
2	XRXSLC1	12	0V
3	TXSLC1	13	0V
4	XTXSLC1	14	0V
5	RXSLC2	15	0V
6	XRXSLC2	16	0V
7	TXSLC2	17	
8	XTXSLC2	18	5V
9	5V	19	24V-1
10	24V-1	20	5V

JRT3
Switch box
(Switch box, Mode switch, Emegency stop switch)

1	START	11	RESET
2	XCYCSTART_SW	12	XFAULT_SW
3	MODE11	13	MODE12
4	0V	14	0V
5	MODE21	15	MODE22
6	24VEXT	16	0VEXT
7	OPESP11	17	OPESP21
8		18	
9		19	24V-2
10	24V-2	20	

JRS30
RS232C, Sensor, HDI
(Serial Device, Force/3D sensor, HDI Device)

1	RXD	11	TXD
2	0V	12	0V
3	DSR	13	DTR
4	0V	14	0V
5	CTS	15	RTS
6	0V	16	0V
7	XHDI1	17	XHDI2
8	SDATA	18	XSDATA
9	5V	19	24V-1
10	24V-1	20	5V

JRS31
Line Tracking, LVC
(Encoder, LVC)

1	0V	11	0V
2	RX485B	12	TX485B
3	XRX485B	13	XTX485B
4		14	
5		15	
6	0V	16	0V
7	RX485A	17	TX485A
8	XRX485A	18	XTX485A
9	5V	19	24V-1
10	24V-1	20	5V

USB1
USB 2.0
(USB Device)

1	USB_5V
2	USB_M
3	USB_P
4	USB_0V
5	0V
6	0V

CRJ3
(Camera)

1	CAMERA
SHIELD	0V

CD38A
Ethernet 100BASE-TX
(Network)

1	TPTXPA
2	TPTXNA
3	TPRXPA
4	NC1A
5	NC2A
6	TPRXNA
7	NC3A
8	NC4A
9	FG1
10	FG1
11	FG1
12	FG1

CD38B
Ethernet 100BASE-TX
(Network)

1	TPTXPB
2	TPTXNB
3	TPRXPB
4	NC1B
5	NC2B
6	TPRXNB
7	NC3B
8	NC4B
9	FG1
10	FG1
11	FG1
12	FG1

CD38C
Ethernet 1000BASE-T
(Network)

1	TDPA
2	TDMA
3	TDPB
4	TDPC
5	TDMC
6	TDMB
7	TDPD
8	TDMD
9	FG2
10	FG2
11	FG2
12	FG2

CRMB79
Signal
(Input Unit)

A1	24V-1	B1	ON_OFF
A2	MONKM2	B2	PCON11
A3	0V	B3	MONKA
A4	KM2ON	B4	PCON1

CRMB80
24V Input

1	24P1
2	0V
3	24V-2

JX20
SVCPU I/F

1	BOOTOFF12	11	DRDY
2	BOOTOFF11	12	CHKTX1
3	CHKTX2	13	
4	CHKRX2	14	CHKRX1
5		15	0V
6		16	BOOTOFF21
7		17	
8		18	0V
9	MCON	19	0V
10	AALM1	20	0V

JX21
PSCPU I/F

1		11	CHKCLK
2		12	CHKTX
3	PA0	13	CHKFSX
4	USERBOOT	14	CHKRX
5		15	0V
6	BOOTOFF	16	
7	5V	17	
8	PS1	18	0V
9		19	0V
10	0V	20	0V

CRMB29A
FAN monitor_1

1	0V
2	FAN1
3	24VFAN

CRMB29B
FAN monitor_2

1	0V
2	FAN2
3	24VFAN

CRMB29C
FAN monitor_3

1	0V
2	FAN3
3	24VFAN

CRS36
iPendant (Ethernet)

A1	24T	B1	TPEMG2
A2	24T	B2	TPESP2
A3	TPDM2	B3	TPEMG1
A4	TPDM1	B4	TPESP1
A5	TPDSC	B5	SG
A6	0V	B6	0V
A7		B7	TXN_TP
A8		B8	TXP_TP
A9		B9	RXN_TP
A10		B10	RXP_TP

CRS53
Sensor Interface

A1	TSA1	B1	XTSA1
A2	TSB1	B2	XTSB1
A3	24V-3	B3	0V

CRMC14
RDI/RDO

A1	30H	B1	24VR
A2	0V	B2	0V
A3	XROT	B3	RDO1
A4	XHBK	B4	RDO2
A5	RDI1	B5	RDO3
A6	RDI2	B6	RDO4
A7	RDI3	B7	RDO5
A8	RDO7	B8	RDO6
A9		B9	
A10		B10	

CRMC15
Safety DI

A1	24V-2	B1	0V
A2	24V-2	B2	0V
A3	SFDI11	B3	SFDI21
A4	SFDI12	B4	SFDI22

CRN2
Pulse coder, RS-485 for tool Interface

A1	5VRP	B1	5VRP
A2	0V	B2	5VRP
A3	0V	B3	RS485D
A4	0V	B4	XRS485D
A5	PRQ1	B5	PRQ4
A6	XPRQ1	B6	XPRQ4
A7	PRQ2	B7	PRQ5
A8	XPRQ2	B8	XPRQ5
A9	PRQ3	B9	PRQ6
A10	XPRQ3	B10	XPRQ6

Figure B-5 Main board connector table

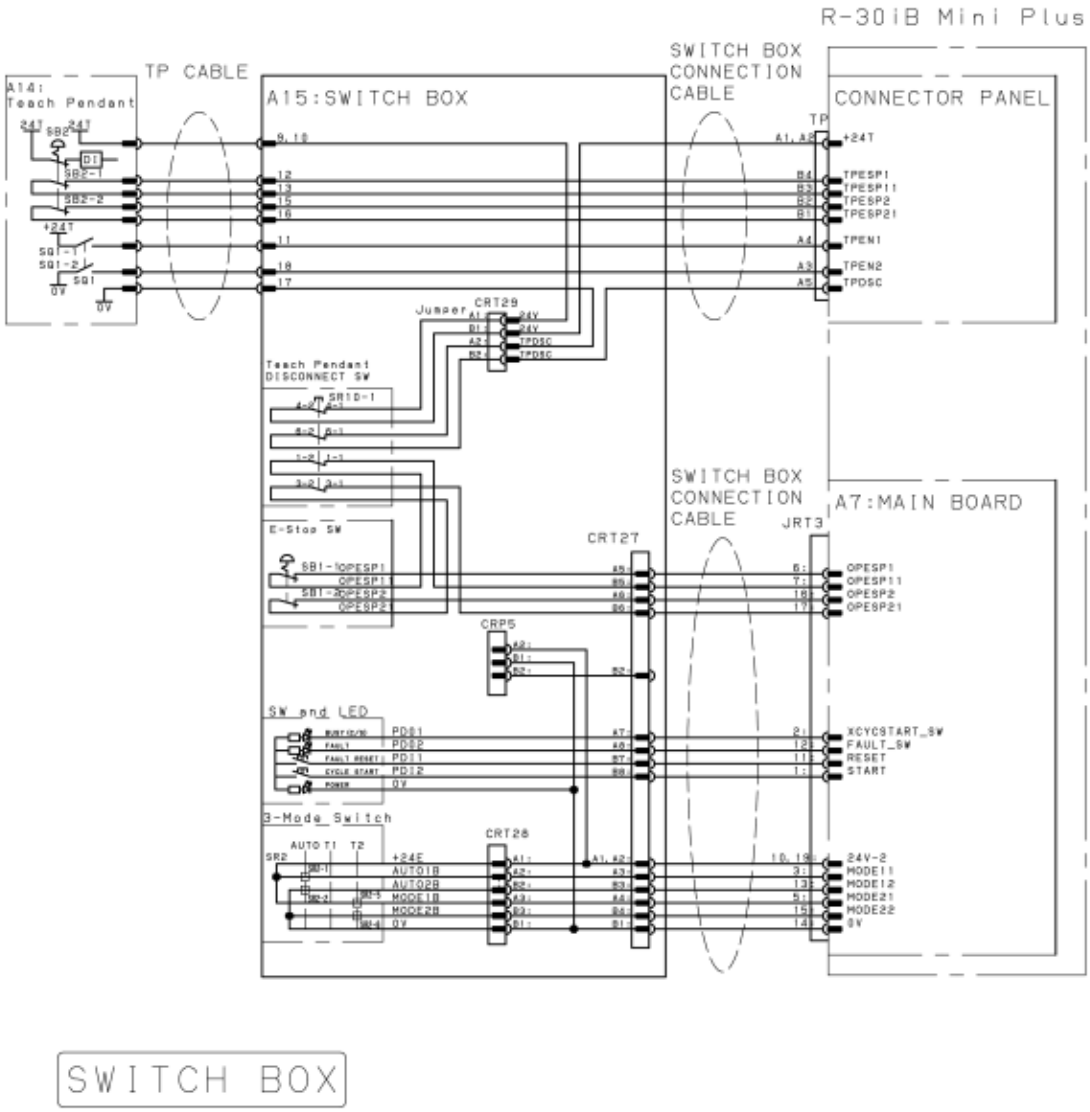


Figure B-6 Switch box connection diagram

INPUT UNIT

CRRA29
POWER_OUT

A1	
A2	PCM01
A3	PCM02

CRRA30
POWER_IN
(Breaker)

1	EARTH
2	200V_A
3	200V_B

CRRA31
POWER

A1	EARTH
A2	AC1
A3	AC2

CRRA32
EARTH
(Cabinet)

1	EARTH
2	
3	EARTH JUMPER

CRMB79
Signal
(Main board)

A1	24V-1	B1	ON_OFF
A2	MONKM2	B2	PCON11
A3	0V	B3	MONKA
A4	KM2ON	B4	PCON1

CRRA46
POWER

A1	EARTH	B1	
A2	AC1	B2	PCM01
A3	AC2	B3	PCM02

CRRA47
POWER_IN
(Breaker)

1	EARTH
2	L
3	N

CRMC16
Signal
(Main board)

A1	24V-1	B1	ON_OFF
A2	MONKM2	B2	PCON11
A3	0V	B3	MONKA
A4	KM2ON	B4	PCON1
A5		B5	
A6	PSUON	B6	0V
A7	24V_2	B7	0V2
A8	24V_2	B8	0V2
A9	24P1	B9	0V
A10	24P1	B10	0V

Figure B-7 Input unit connector table

4 Axis Board

CRRA31
POWER

1	EARTH
2	AC1
3	AC2

CRRA34
Input Unit

1	
2	VS
3	VR

CRRA11A
Resistor

A1	DCP
A2	
A3	XDCON1

CNJ1
POWER_OUT(MOTOR)

1	U
2	V
3	W

CNJ2
POWER_OUT(MOTOR)

1	U
2	V
3	W

CNJ3
POWER_OUT(MOTOR)

1	U
2	V
3	W

CNJ4
POWER_OUT(MOTOR)

1	U
2	V
3	W

CNGC
EARTH
(MOTOR)

1	G
2	G
3	G

2 Axis Board

CRRA44
POWER_OUT(BRAKE)

A1	BRK1	B1	BRKCOM
A2	BRK2	B2	BRKCOM
A3		B3	

CRRA45
POWER_OUT
(EX BRAKE)

A1	BRK3	B1	BRK4
A2		B2	
A3	BRKCOM	B3	BRKCOM

CRRA43
POWER_CTRL
(Input Unit)

1	PSUON
2	0V
3	

CNJ5
POWER_OUT(MOTOR)

1	U
2	V
3	W

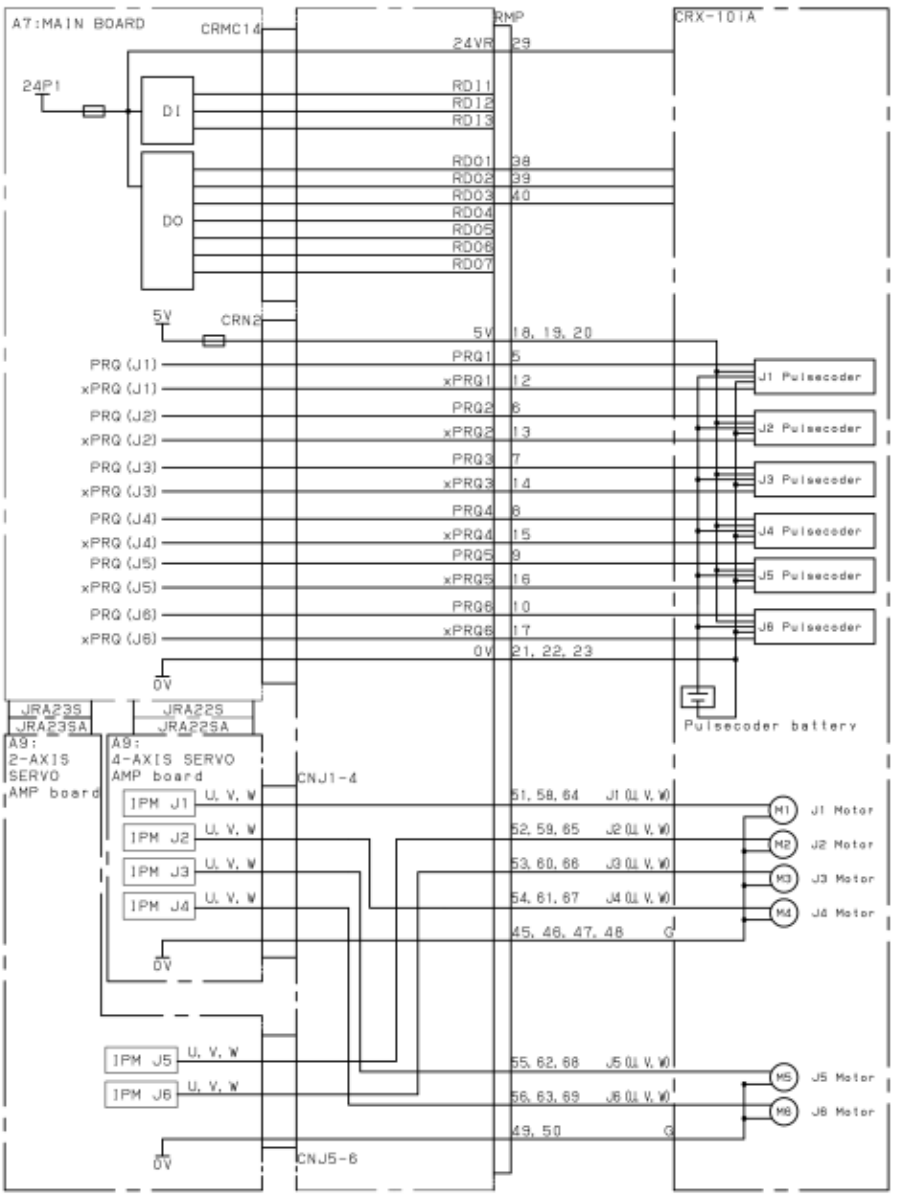
CNJ6
POWER_OUT(MOTOR)

1	U
2	V
3	W

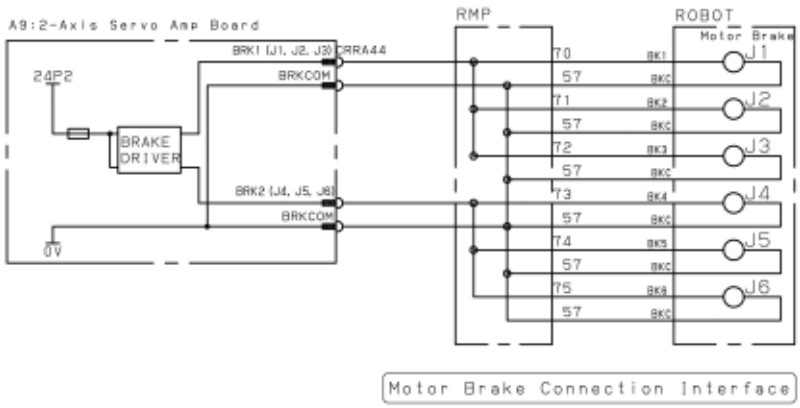
CRRA42
POWER_IN(Input Unit)

1	24V_2
2	0V2
3	

Figure B-8 Servo amplifier unit connector table



Motor power, RI/RO, Pulsecoder signal connection diagram



Motor Brake Connection Interface

Figure B-9 Connection diagram of the robot interface

RMP
(Pulsecoder Feedback Signal & RI/RO)
(MOTOR Power & Brake)
Sensor Interface
Tool Interface

		1		2		
		TSA1		TSB1		
		3	PE	4		
		XTSA1	SHIELD	XTSB1		
5	6	7	8	9	10	11
PRQJ1	PRQJ2	PRQJ3	PRQJ4	PRQJ5	PRQJ6	RS485_C+
12	13	14	15	16	17	
XPRQJ1	XPRQJ2	XPRQJ3	XPRQJ4	XPRQJ5	XPRQJ6	
18	19	20	21	22	23	24
5V(J1,J2)	5V(J3,J4)	5V(J5,J6)	0V(J1,J2)	0V(J3,J4)	0V(J5,J6)	XRS485_C+
25	26	27	28	29	30	
24V_T	0V_T	30V_C+	0V_C+	24V_DI/DO	0V_DI/DO	
31	32	33	34	35	36	37
					XROT	
38	39	40	41	42	43	44
RDO1	RDO2	RDO3				SHIELD
45	46	47	48	49	50	
J1G	J2G	J3G	J4G	J5G	J6G	
51	52	53	54	55	56	57
J1U	J2U	J3U	J4U	J5U	J6U	BKC
58	59	60	61	62	63	
J1V	J2V	J3V	J4V	J5V	J6V	
64	65	66	67	68	69	70
J1W	J2W	J3W	J4W	J5W	J6W	BK1
		71	72	73		
		BK2	BK3	BK4		
		74		75		
		BK5		BK6		

Figure B-10 Robot connection cable connector table (CRX-5iA,-10iA,-20iA)

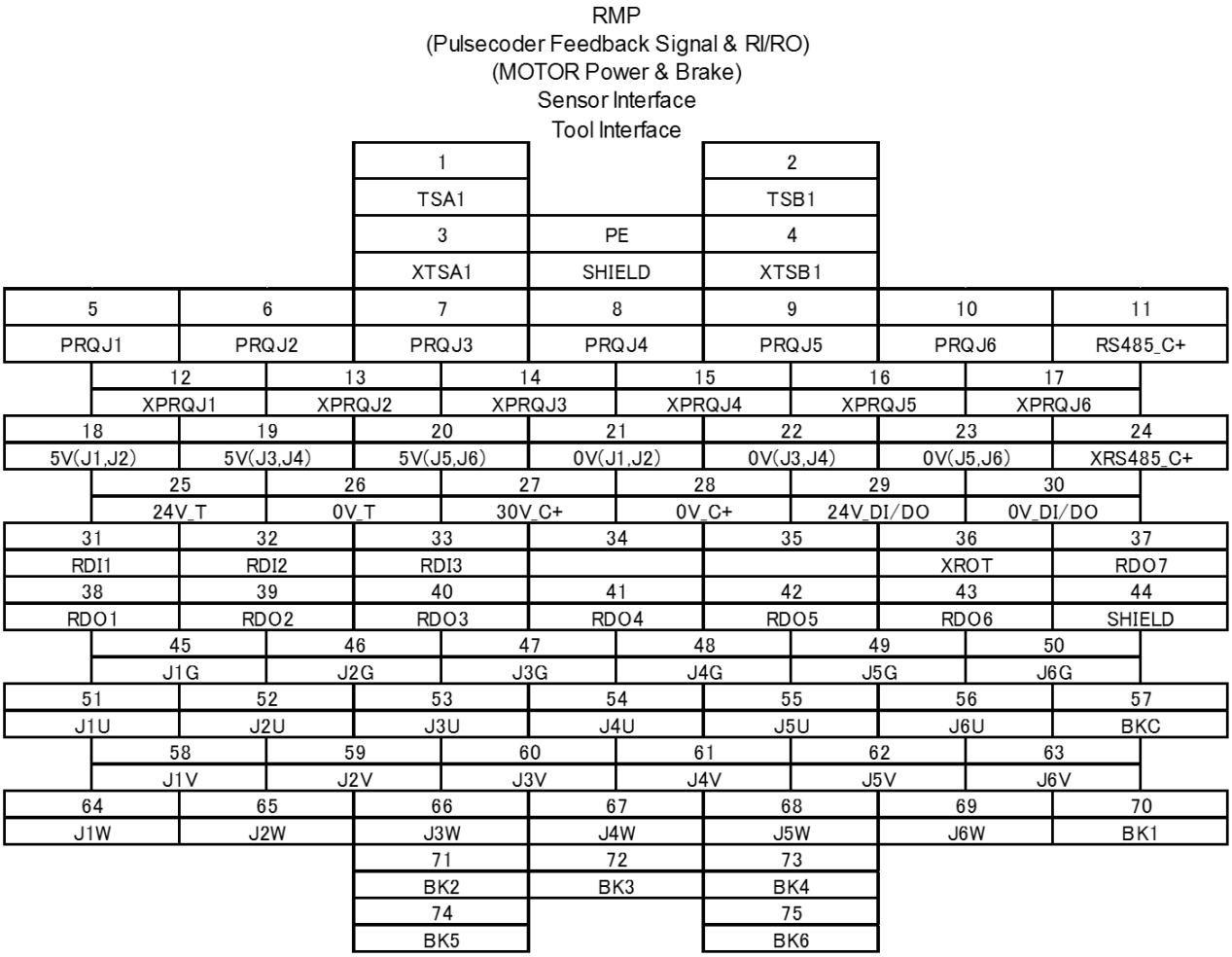


Figure B-11 Robot connection cable connector table (CRX-25iA)

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 Mini Plus.

Table C.1-1 Input signal (See C.2.1. Input Signals(P.195))

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	
RSR3/PNS3	
RSR4/PNS4	
RSR5/PNS5	
RSR6/PNS6	
RSR7/PNS7	
RSR8/PNS8	
PNSTROBE	PNS strobe signal
PROD_START	Automatic operation start signal

NOTE

RSR: Robot Service Request
PNS: Program Number Select Input
(Whether RSR is used or PNS is used can be preset.)

Table C.1-2 Output signal (See C.2.2. Output Signals(P.198))

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	
ACK3/SNO3	
ACK4/SNO4	
ACK5/SNO5	
ACK6/SNO6	

Signal	Description
ACK7/SNO7	
ACK8/SNO8	
SNACK	PNS acknowledge signal
---	Not used (for future expansion)

C.2. I/O SIGNALS

C.2.1. 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 C.2.2. Output Signals(P.198) for details.

Function: This input signal executes the selected program at the falling edge
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 that has been selected from the teach pendant. (by default).
- 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:

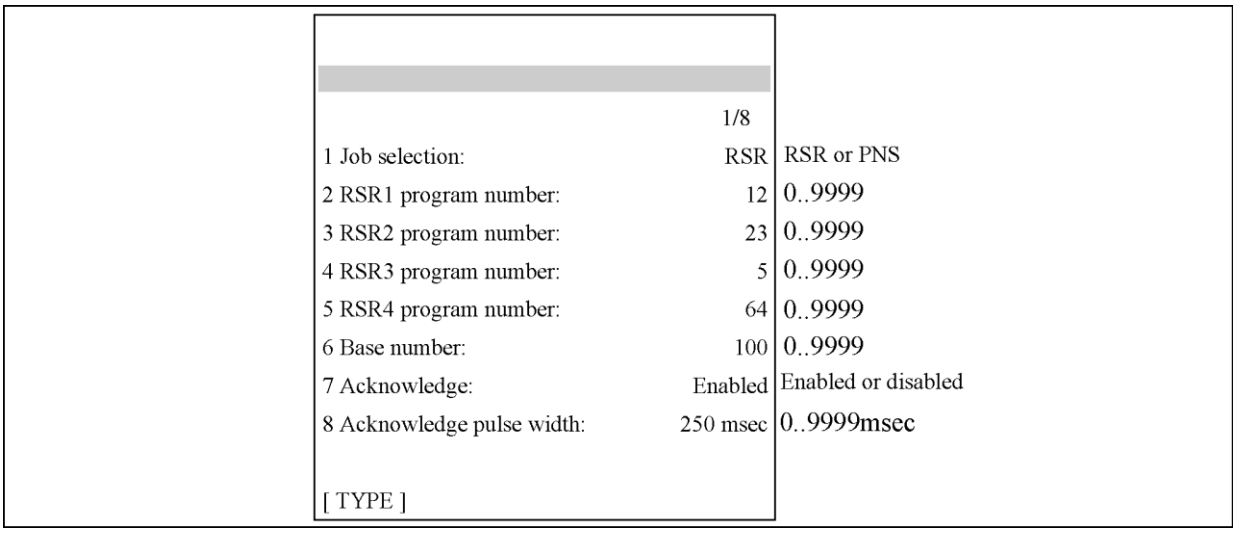
- Use the normally-closed switch because it is a reverse signal. Usually this switch should be connected to safety fence. It must be set normally on.
- Since the *SFSPD signal is counted as a remote condition, input signals such as RSR and START to the peripheral device interface cannot take effect unless this signal is turned on.
- If this signal is turned 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 C.2.2. Output Signals(P.198) 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, the 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 manual about software (for example, OPERATOR'S MANUAL (Basic Operation)) for details of the menu)



- 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,
“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.

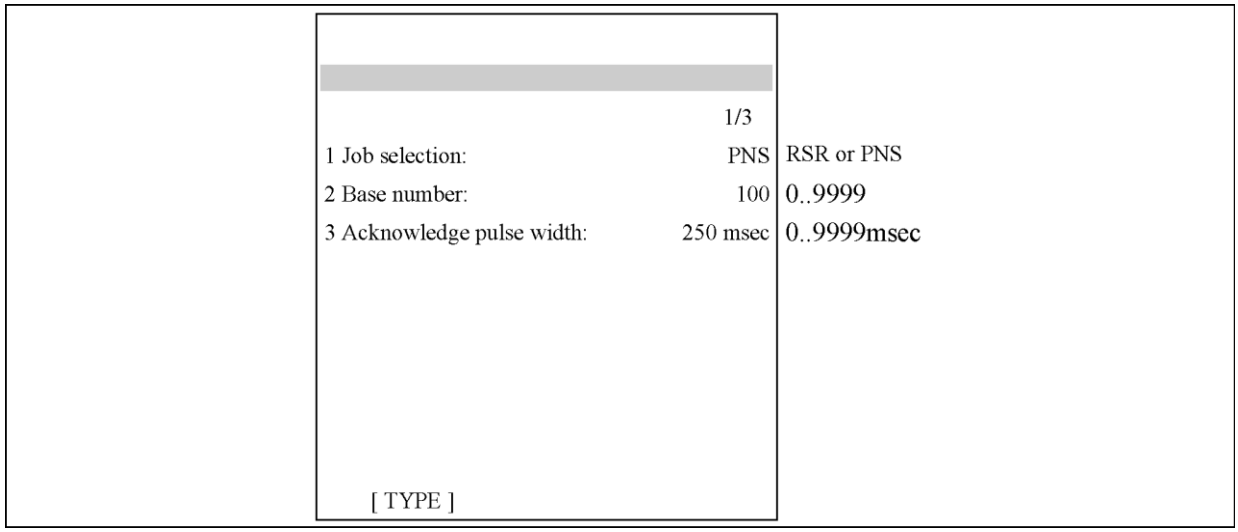
(9) PNS/PNSTROBE (input)

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 C.2.2. Output Signals(P.198) 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 of PNS1 to PNS8 are used to specify a program at the instant the strobe signal PNSTROBE is raised.
- 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 can only select a program and 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 the selected program number signal (output) SNO, and a pulse is output to the 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 description of SNO/SNACK in C.2.2. Output Signals(P.198) .
- The following operations are effective for the program selected by PNS.

- 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 C.2.2. Output Signals(P.198) 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.2.2. 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 light up 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

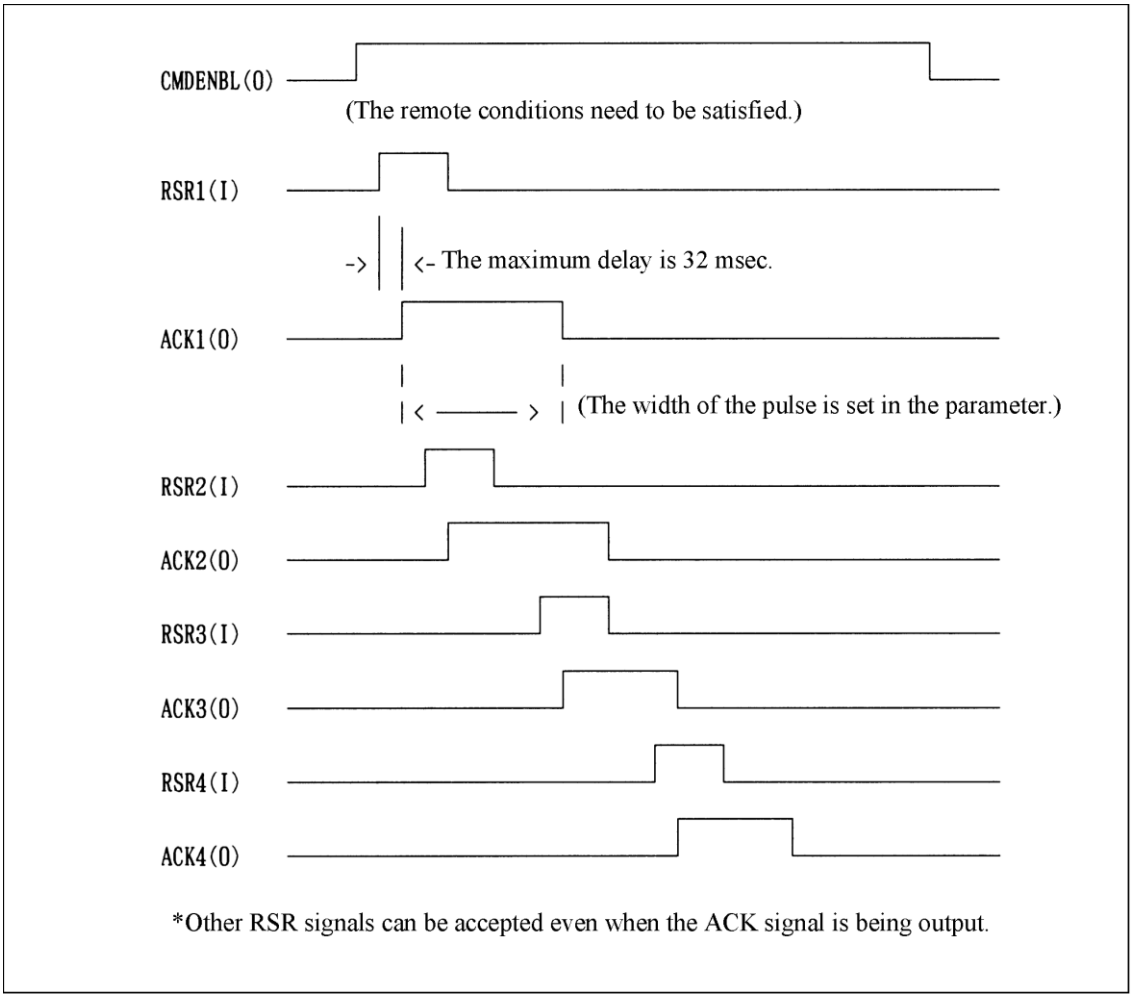
Turned on:	When a program is being executed or is being processed from operation panels such as the teach pendant. (This has the same function as that of the BUSY lamp on the teach pendant.)
Turned off:	When a program is not being executed nor is being processed from operation panels such as the teach 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.

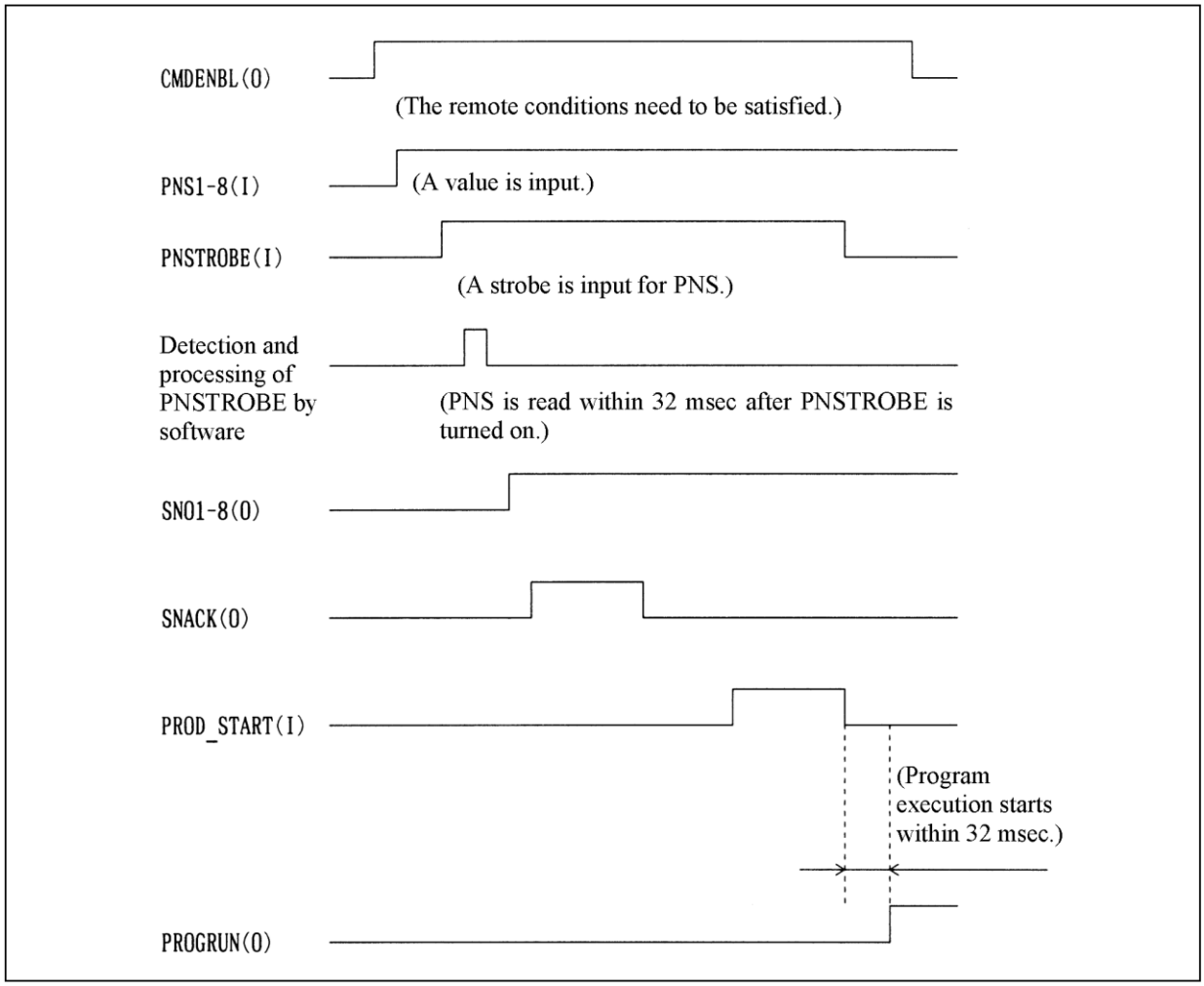


(12) PNS acknowledge signal (output) SNO/SNACK

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.

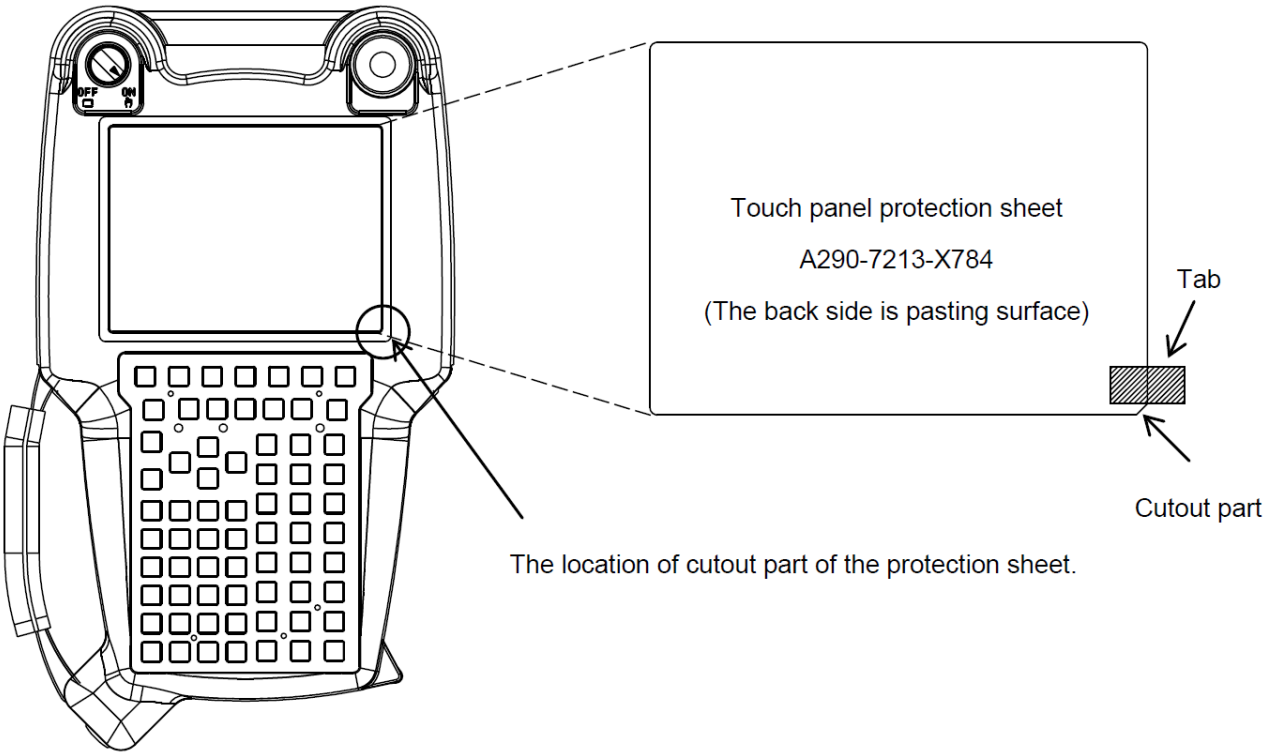

CMDENBL(O)
(The remote conditions need to be satisfied.)
PNS1-8(I)
(A value is input.)
PNSTROBE(I)
(A strobe is input for PNS.)
Detection and processing of PNSTROBE by software
(PNS is read within 32 msec after PNSTROBE is turned on.)
SNO1-8(O)
SNACK(O)
PROD_START(I)
(Program execution starts within 32 msec.)
PROGRUN(O)

D. REPLACING THE PROTECTION SHEET

This appendix shows an instruction for replacing the protection sheet of the iPendant with touch panel.

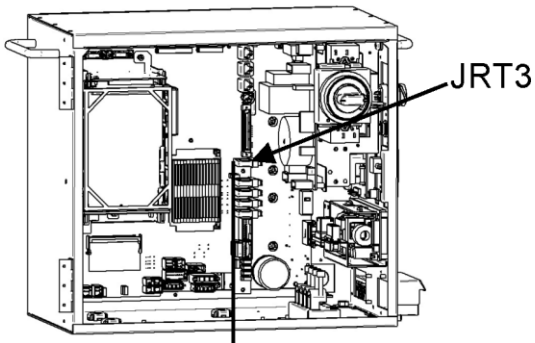
Replacement procedure

1. Remove the old protection sheet.
2. Peel the clear sheets pasted on the back of the new protection sheet.
3. Paste the protection sheet so that the cutout part is placed on the lower right portion.



E. REMOTE MODE SWITCH ASSEMBLY INSTRUCTION

E.1. Configuration

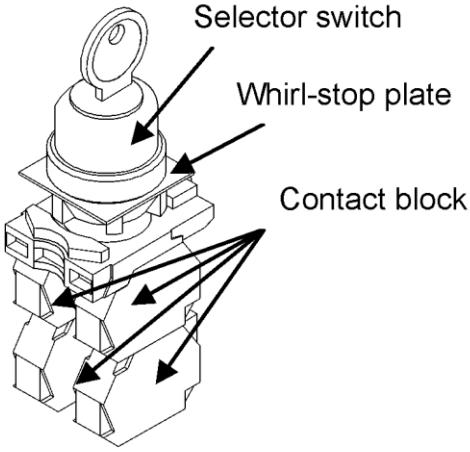


K26 Remote mode switch cable length designation

Remote mode switch

Parts

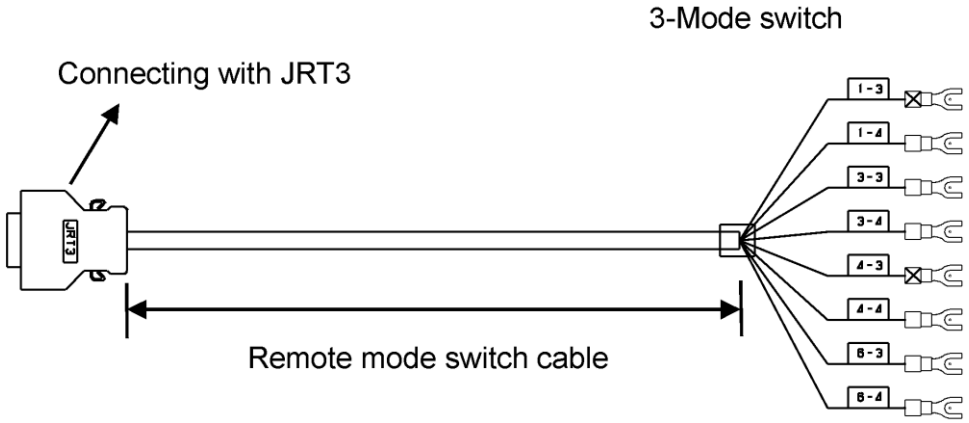
- Remote mode switch cable
- Label
- Selector switch
- Whirl-stop plate
- Contact block
- Add. contact block
- Bridge



Remote mode switch

E.2. CONNECTION

3 mode switch



Mode switch SR2

1st contact block

	NO Contact	NC Contact	NO Contact
Up	3-3	(2-1)	1-3
Bottom	3-4	(2-2)	1-4

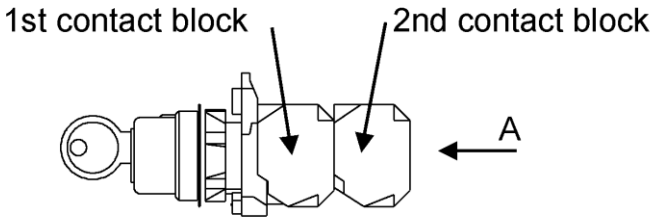
2nd contact block

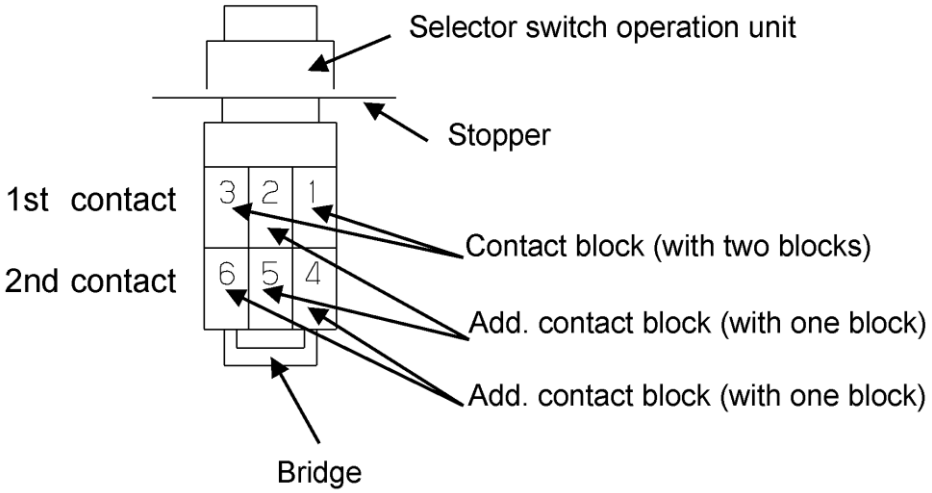
	NO Contact	NC Contact	NO Contact
Up	6-3	(5-1)	4-3
Bottom	6-4	(5-2)	4-4

(View from A)

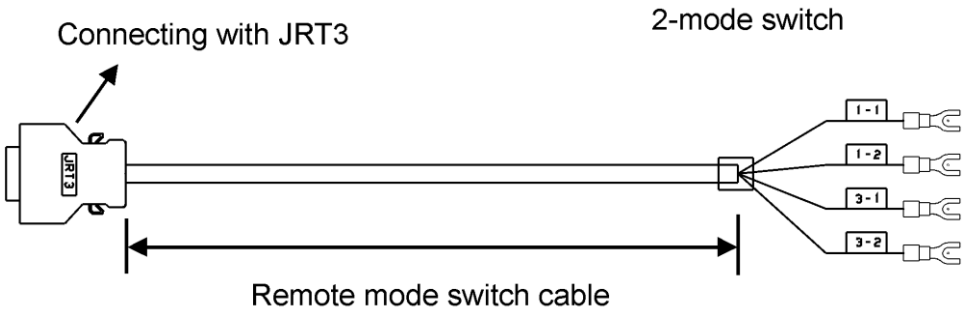
NOTE

The signals with ( ) has no actual connection.





2 mode switch



Mode switch SR2

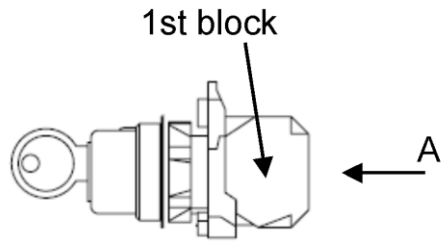
1st contact block

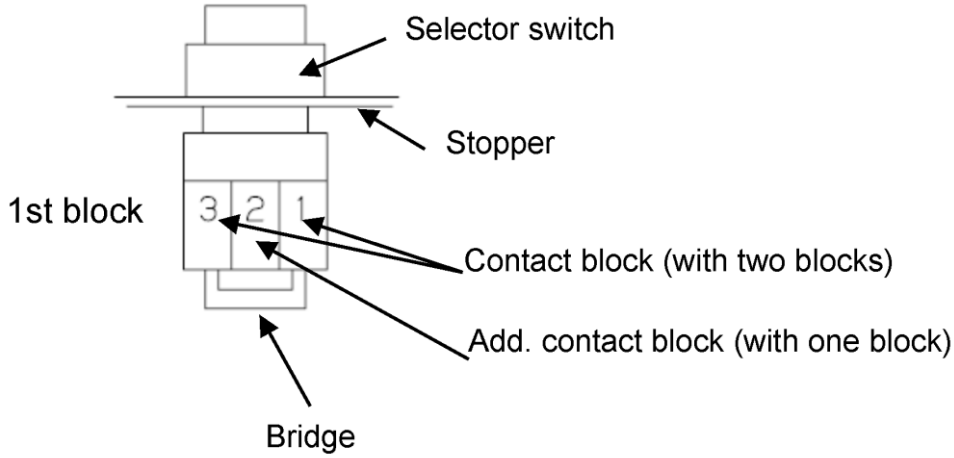
	NC Contact	NC Contact	NC Contact
Up	3-1	(2-1)	1-1
Bottom	3-2	(2-2)	1-2

(View from A)

NOTE

The signals with ( ) has no actual connection.





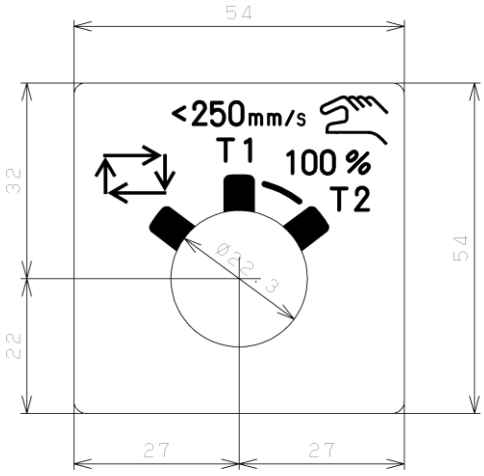
E.3. MOUNTING HOLE / CHARACTER PRINTED LABEL

E.3.1. Mounting Hole

Drilling hole (Diameter: 22.3mm) is necessary for mounting.

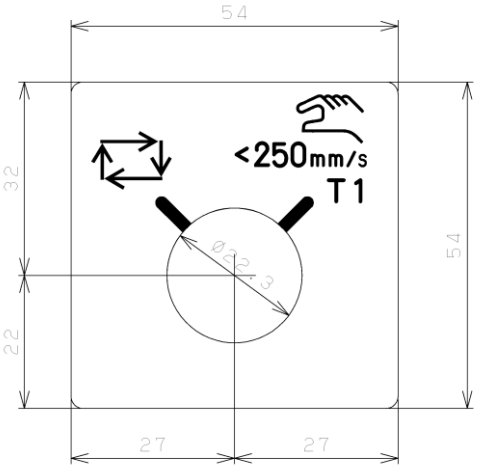
E.3.2. Character Printed Label

Put the Character printed label included in the retrofit kit to this hole.
a) Character printed label for 3 mode switch



Base color: Cream
Character color: Black

b) Character printed label for 2 mode switch



Base color: Cream
Character color: Black

Cable No.	Name	Order specification	Product Name	Maintenance specification	Quantity
K26	Remote mode switch retrofit kit (3 mode, 5m)	A05B-2695-K400	cable	A660-8020-T887#L5R003	1
			Label	A370-3070-0441	1
			Selector switch	A55L-0001-0278#AGO	1
			Whirl-stop plate	A55L-0001-0278#AZ902	1
			Contact block	A55L-0001-0278#AZ103	1
			Add. contact block	A55L-0001-0278#ZBE101	2
			Add. contact block	A55L-0001-0278#ZBE102	2
			Bridge	A55L-0001-0278#ZBE007	1
	Remote mode switch retrofit kit (3 mode, 10m)	A05B-2695-K401	cable	A660-8020-T887#L10R03	1
			Label	A370-3070-0441	1
			Selector switch	A55L-0001-0278#AGO	1
			Whirl-stop plate	A55L-0001-0278#AZ902	1
			Contact block	A55L-0001-0278#AZ103	1
			Add. contact block	A55L-0001-0278#ZBE101	2
			Add. contact block	A55L-0001-0278#ZBE102	2
			Bridge	A55L-0001-0278#ZBE007	1
	Remote mode switch retrofit kit (3 mode, 20m)	A05B-2695-K402	cable	A660-8020-T887#L20R03	1
			Label	A370-3070-0441	1
			Selector switch	A55L-0001-0278#AGO	1
			Whirl-stop plate	A55L-0001-0278#AZ902	1
			Contact block	A55L-0001-0278#AZ103	1
			Add. contact block	A55L-0001-0278#ZBE101	2
			Add. contact block	A55L-0001-0278#ZBE102	2
			Bridge	A55L-0001-0278#ZBE007	1
	Remote mode switch retrofit kit (2 mode, 5m)	A05B-2695-K410	cable	A660-8020-T888#L5R003	1
			Label	A370-3070-0442	1
			Selector switch	A55L-0001-0278#AG4M	1
			Whirl-stop plate	A55L-0001-0278#AZ902	1
			Contact block	A55L-0001-0278#AZ104	1
			Add. contact block	A55L-0001-0278#ZBE102	1
			Bridge	A55L-0001-0278#ZBE007	1

Cable No.	Name	Order specification	Product Name	Maintenance specification	Quantity
	Remote mode switch retrofit kit (2 mode, 10m)	A05B-2695-K411	cable	A660-8020-T888#L10R03	1
			Label	A370-3070-0442	1
			Selector switch	A55L-0001-0278#AG4M	1
			Whirl-stop plate	A55L-0001-0278#AZ902	1
			Contact block	A55L-0001-0278#AZ104	1
			Add. contact block	A55L-0001-0278#ZBE102	1
			Bridge	A55L-0001-0278#ZBE007	1
	Remote mode switch retrofit kit (2 mode, 20m)	A05B-2695-K412	cable	A660-8020-T888#L20R03	1
			Label	A370-3070-0442	1
			Selector switch	A55L-0001-0278#AG4M	1
			Whirl-stop plate	A55L-0001-0278#AZ902	1
			Contact block	A55L-0001-0278#AZ104	1
			Add. contact block	A55L-0001-0278#ZBE102	1
			Bridge	A55L-0001-0278#ZBE007	1

⚠WARNING

This circuit is included in emergency circuit. After reconstruction, check mode switch function carefully to prevent a miss wiring.

F. TEACH PENDANT DISCONNECT FUNCTION (OPTION)

This appendix shows an instruction for Teach pendant disconnect function (Option).

F.1. Configuration

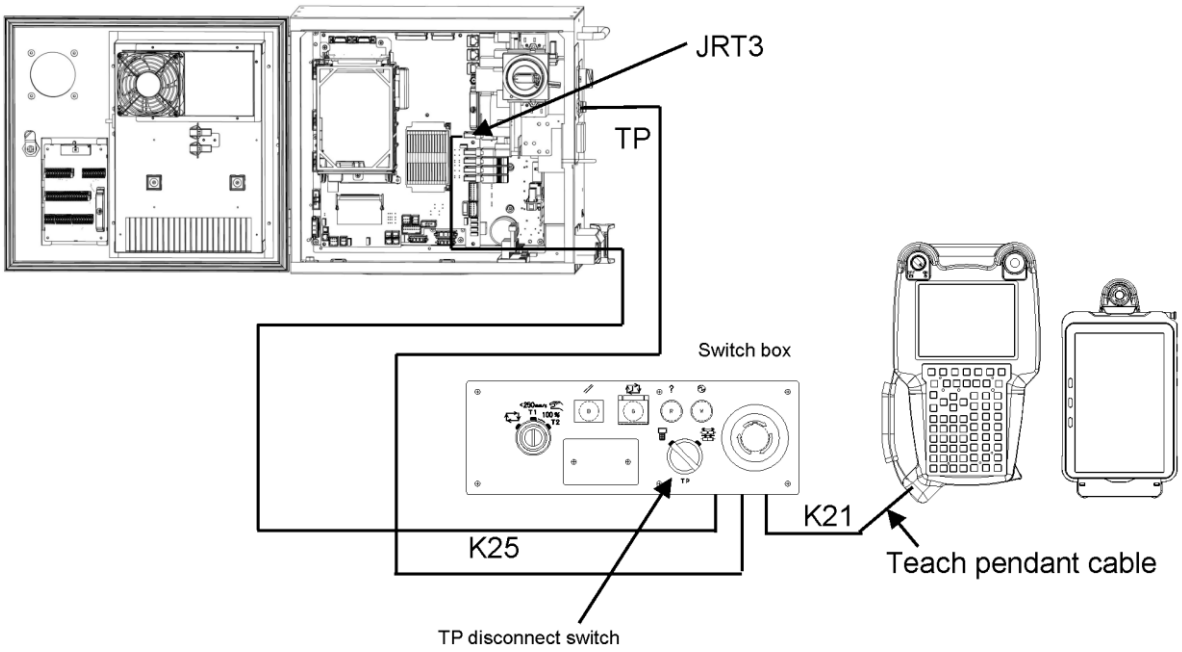


Figure F.1-1 Switch box function

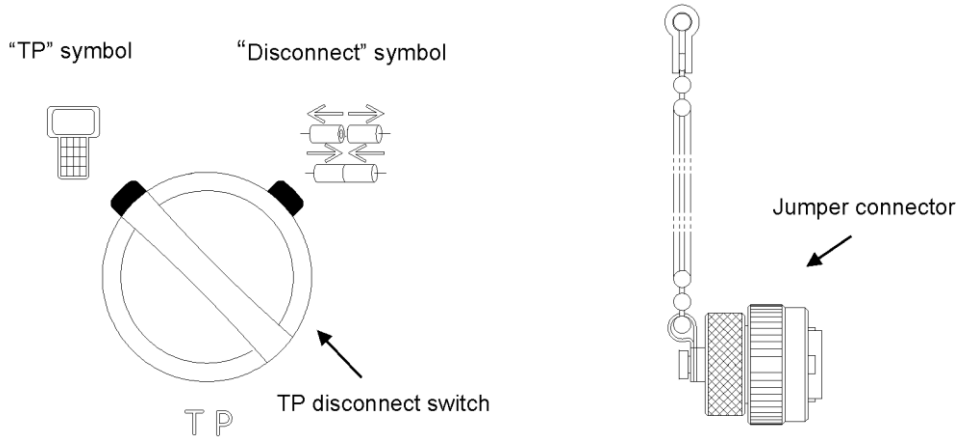


Figure F.1-2 Teach pendant disconnect switch and jumper connector

Name	Order specification	Product Name	Maintenance specification	Quantity
Switch box	A05B-2690-H400	Panel	A05B-2690-C400	1
		Screw	A6-SW1NA-3X8S-M-ZN2A	6
		Plate	A230-0653-V025	1
No Switch box, Jumper connector	A05B-2690-H410	Jumper connector	A660-2008-T349	1

Name	Order specification	Product Name	Maintenance specification	Quant ity
Teach pendant	A05B-2256-H100#EGN	English/General	A05B-2256-C100#EGN	1
	A05B-2256-H100#EMH	English/Material handing	A05B-2256-C100#EMH	1
	A05B-2256-H100#JGN	Japanese/General	A05B-2256-C100#JGN	1
	A05B-2256-H100#JMH	Japanese/Material handing	A05B-2256-C100#JMH	1
	A05B-2256-H100#SGN	Symbolic/General	A05B-2256-C100#SGN	1
Teach pendant (Touch panel)	A05B-2256-H101#EGN	English/General	A05B-2256-C101#EGN	1
	A05B-2256-H101#EMH	English/Material handing	A05B-2256-C101#EMH	1
	A05B-2256-H101#JGN	Japanese/General	A05B-2256-C101#JGN	1
	A05B-2256-H101#JMH	Japanese/Material handing	A05B-2256-C101#JMH	1
	A05B-2256-H101#SGN	Symbolic/General	A05B-2256-C101#SGN	1
Teach pendant (Haptic)	A05B-2256-H102#EGN	English/General	A05B-2256-C102#EGN	1
	A05B-2256-H102#EMH	English/Material handing	A05B-2256-C102#EMH	1
	A05B-2256-H102#JGN	Japanese/General	A05B-2256-C102#JGN	1
	A05B-2256-H102#JMH	Japanese/Material handing	A05B-2256-C102#JMH	1
	A05B-2256-H102#SGN	Symbolic/General	A05B-2256-C102#SGN	1
Teach pendant (Haptic) (Touch panel)	A05B-2256-H103#EGN	English/General	A05B-2256-C103#EGN	1
	A05B-2256-H103#EMH	English/Material handing	A05B-2256-C103#EMH	1
	A05B-2256-H103#JGN	Japanese/General	A05B-2256-C103#JGN	1
	A05B-2256-H103#JMH	Japanese/Material handing	A05B-2256-C103#JMH	1
	A05B-2256-H103#SGN	Symbolic/General	A05B-2256-C103#SGN	1
No Teach pendant, Jumper connector	A05B-2690-H210	Jumper connector	A660-2007-T391	1
Tablet TP (with tablet)	A05B-2256-K301	Tablet TP with tablet	A05B-2256-C310 (Base unit) A66L-2008-0658 (USB cable) A05B-2256-C351 (Tablet)	1
Tablet TP (without tablet)	A05B-2256-K302	Tablet TP without tablet	A05B-2256-C310 (Base unit) A66L-2008-0658 (USB cable)	1

F.2. PROCEDURE OF TEACH PENDANT DISCONNECT

F.2.1. Teach Pendant Disconnect

1. **Set AUTO mode.**
2. **Turn the TP disconnect switch to "Connect/Disconnect" symbol position. (Robot stops because the operator's panel E-stop alarm occurs and the power LED of the teach pendant is OFF.)**
3. **Disconnect the teach pendant cable.**
4. **Connect the jumper connector.**

5 **Turn the TP disconnect switch to "TP" symbol position.**

6 **Administrator should store the teach pendant and the teach pendant cable in the storage in order to avoid incorrect operation.**

F.2.2. Teach Pendant Connect

1 **Set AUTO mode.**

2 **Turn the TP disconnect switch to "Connect/Disconnect" symbol position. (Robot stops because the operator's panel E-stop alarm occurs)**

3 **Disconnect the jumper connector.**

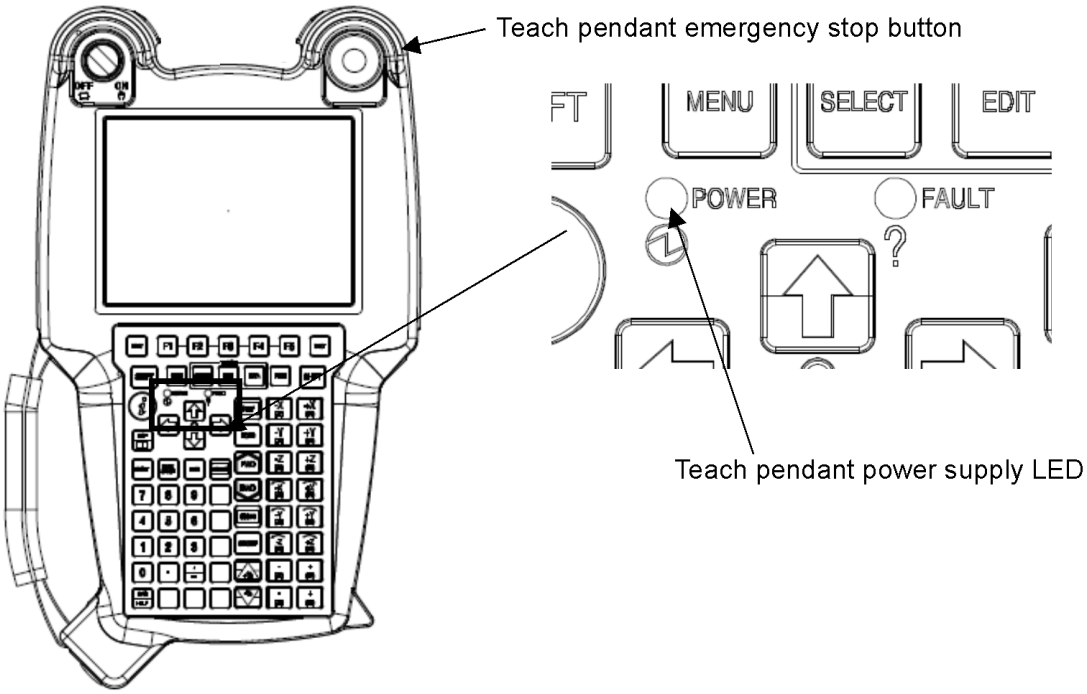
4 **Connect the teach pendant cable with the teach pendant.**

5 **Turn the TP disconnect switch to "TP" symbol position.**

⚠WARNING

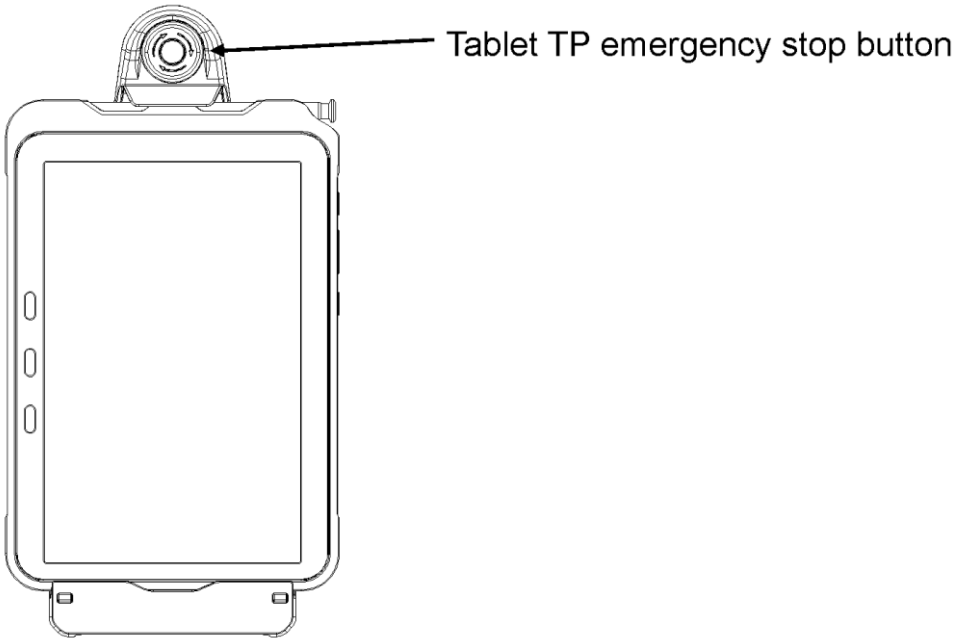
When the LED (POWER) on the teach pendant turned on, this teach pendant is connected to the robot controller and emergency stop button of the teach pendant is active.

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.



If the LED on the tablet TP's emergency stop button is on, then the tablet TP is connected to the controller, and the tablet TP's emergency stop button is enabled.
When the emergency stop button on the tablet TP is enabled, the LED of the emergency stop button is always on and does not go off even when pressed.
If the LED on the tablet TP's emergency stop button is off, then the tablet TP is not connected to the controller, and the tablet TP's emergency stop button is disabled.

⚠WARNING



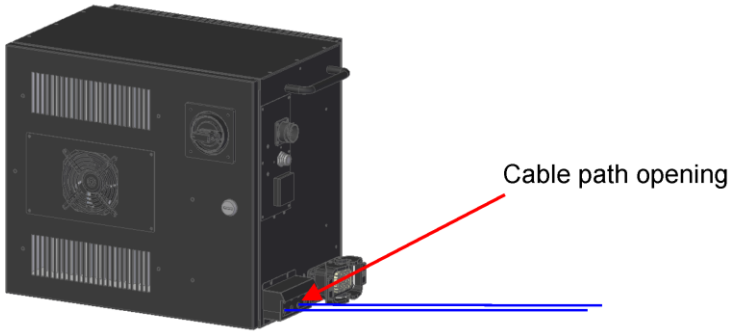
G. DUST-PROOFING THE CABLE PATH OPENING

G.1. CABLE PATH OPENING OF THE MINI PLUS CABINET

When pathing an external cable into the controller, use the cable path opening on the back.

The cable path opening is comprised of a cover, a packing restraint sheet metal piece, and sponge packing with holes for pathing the cable. The hole shapes differ depending on the robot.

When pathing your own cable through the cable path opening into the controller, it is necessary to use a cable with a suitable outer diameter. Also note that the number of cables you can insert will differ depending on the robot and the option configuration. It is necessary to verify whether or not cables can be pathed through the entire system, including all options.



⚠CAUTION

If the outer diameter of the cable is not suitable, then the controller will not be sufficiently sealed, conductive foreign material or other substances may enter the controller, and this may cause faults to occur.

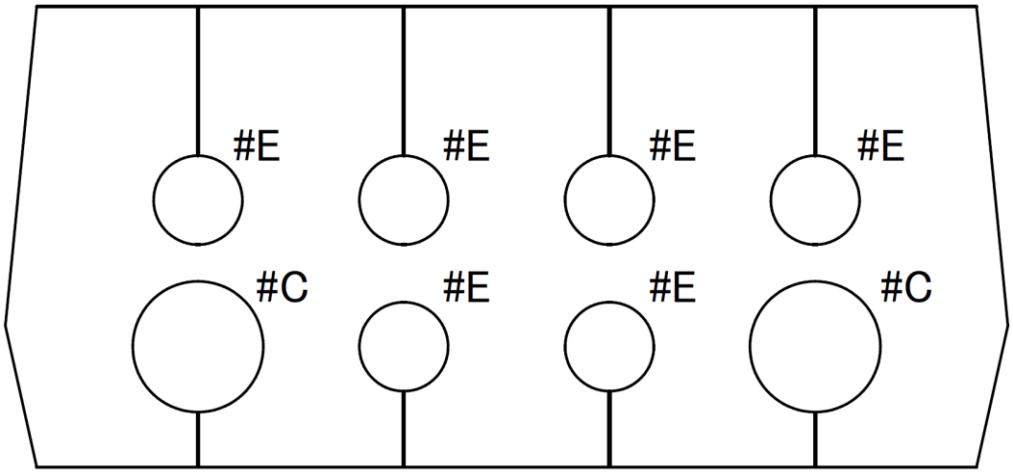
It is necessary to adjust the outer diameter of your cable before pathing it.

G.2. PACKING SHAPE OF CABLE PATH OPENING

The shape of the cable entrance packing (rear view) is shown below.

Packing type (A230-0691-X010#A)

CRX-5iA, CRX-10iA, CRX-20iA, CRX-25iA



G.3. SUITABLE CABLE OUTER DIAMETER

The following outer diameter is suitable for use in a cable:

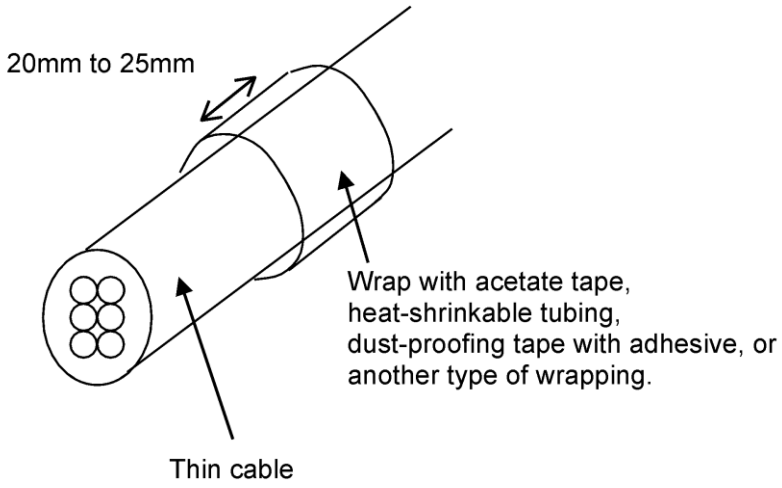
Hole type	Authenticated width (mm)	Allowable range (mm)	Allowable outer diameter (mm)	Maximum number of holes
#C	φ12.5	±1	φ11.5-φ13.5	2
#E	φ8.5	±1	φ7.5-φ9.5	6

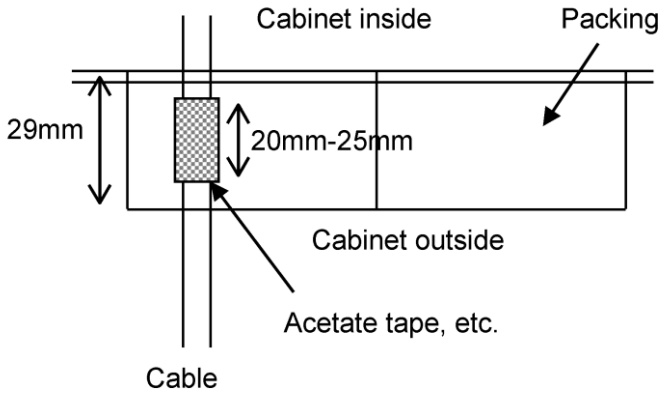
⚠CAUTION

The total of all optional cables must be equal to or less than the maximum number of holes.

G.4. HOW TO ADJUST THE CABLE OUTER DIAMETER

In order to maintain the controller's seal, it is necessary to adjust the cable's outer diameter to a suitable width. If the cable outer diameter is thinner than the allowable outer diameter, adjust the cable outer diameter as shown in the following figure by wrapping the cable sheath with acetate tape, heat-shrinkable tubing, dust-proofing tape with adhesive, or another type of wrapping. When using foam-type dust-proofing tape, adjust it so that the outer diameter is within the allowance after compression. Block all unused cable ports in order to maintain the controller's seal. Attach the packing restraint sheet metal piece to the cable path opening.


20mm to 25mm
Wrap with acetate tape,
heat-shrinkable tubing,
dust-proofing tape with adhesive, or
another type of wrapping.
Thin cable


Cabinet inside
Packing
29mm
20mm-25mm
Cabinet outside
Acetate tape, etc.
Cable

H. Brake release unit

H.1. SAFETY PRECAUTIONS

⚠WARNING

- Support the robot arm by mechanical means to prevent it from falling down when the 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 base to prevent the falling down and unexpected movement of robot.
- Confirm that an outlet with earth is used for the power supply of the brake release unit and the earth of the brake release unit is connected properly to the earth of the power supply. There is danger of getting an electric shock if earth is not connected.
- Store the unit in a proper place.

H.2. CONFIRMATIONS BEFORE OPERATION

Confirm the followings before operation.

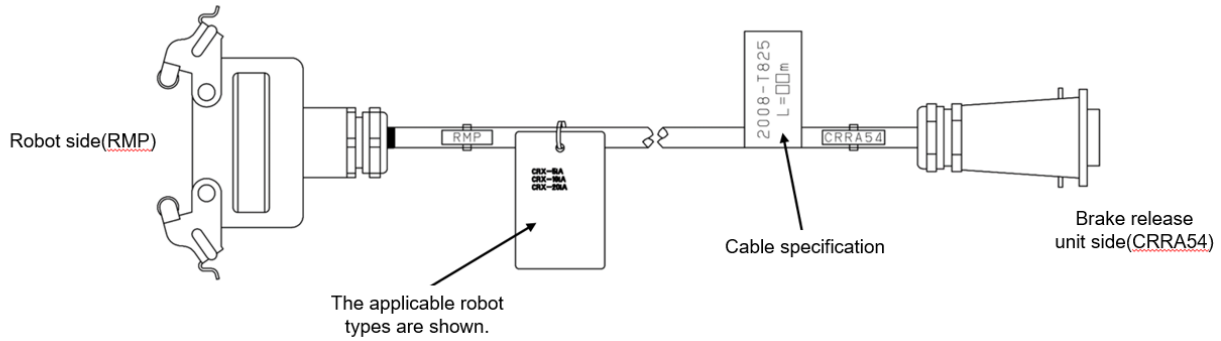
1. Confirm the exterior of the brake release unit and the power cable. Do not use it when there are damages in the unit and the cable.
2. Confirm that the power supply of the robot controller is disconnected.
3. The brake release unit supports two types of input voltage as shown in the following table.

Table H.2-1 Specification of the brake release unit

Product Name	Unit specifications	Remark
Brake release unit	A05B-2600-C353	Input voltage AC100-120V, AC200-240V single phase

4. The brake release unit connection cable is different in each robot. Confirm the cable specification corresponding to the robot by referring to the following table.

<CRX-5iA, -10iA, -20iA>



<CRX-25iA>

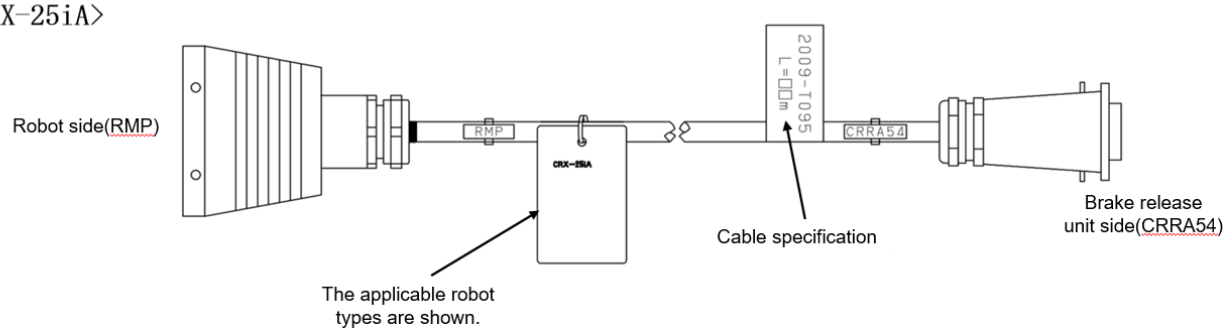


Figure H.2-1 Brake release unit connection cable

Table H.2-2 Specification of brake release unit connection cable

Controller	Robot Type	Specification of cable
R-30iB Mini Plus	CRX-5iA, CRX-10iA, CRX-20iA	A660-2008-T825
	CRX-25iA	A660-2009-T095

H.3. OPERATION

H.3.1. In Case of Operating to the Robot

Operate the brake release unit according to the following procedures.

1. **Support the robot arm by mechanical means to prevent it from falling down when the brake is released. Refer to the Operator's manual for each robot.**
2. **Connect the brake release unit connection cable to the brake release unit.**
3. **Disconnect the RMP connector from the robot, and connect the brake release unit connection cable to the robot.**
4. **Connect the power cable of the brake release unit to the power supply.**
5. **Press and hold the enabling device (the deadman switch) in the middle position.**
6. **Press the brake switch (1 to 6) according to the axis that is trying to release the brake, then the brake will be released. (See Table H.3.1-1 .)**

   Two axes or more cannot be operated at the same time.

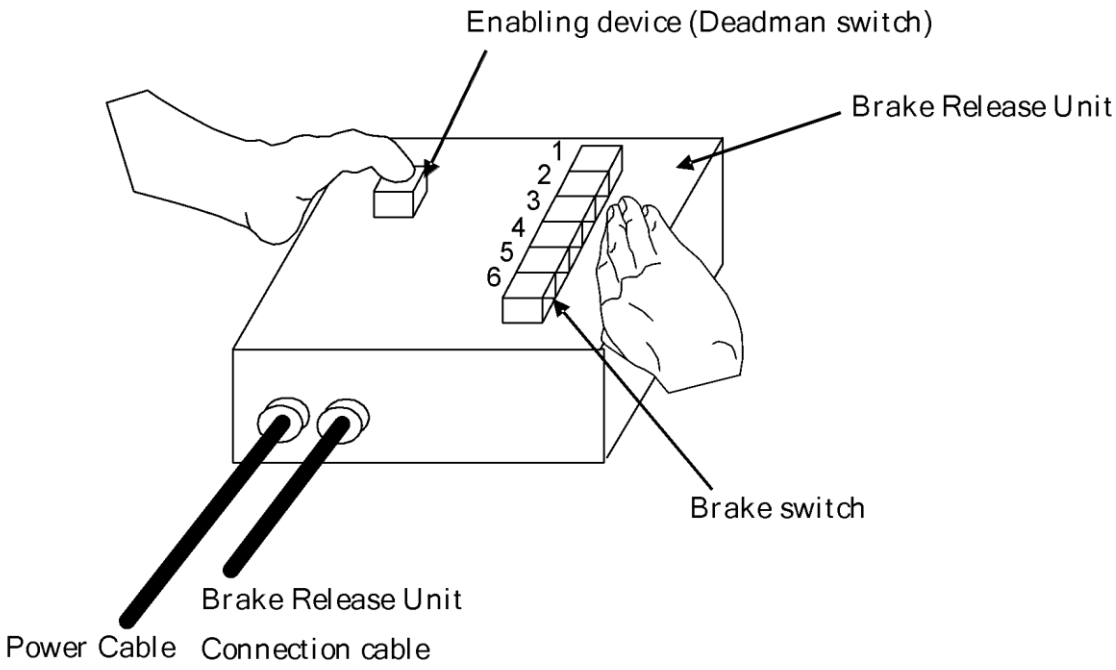


Figure H.3.1-1 Brake release unit

Table H.3.1-1 The relation between brake switch and robot axis

Robot Type	Brake Unit Button					
	1	2	3	4	5	6
CRX-5iA, CRX-10iA, CRX-20iA, CRX-25iA	J1	J2	J3	J4	J5	J6

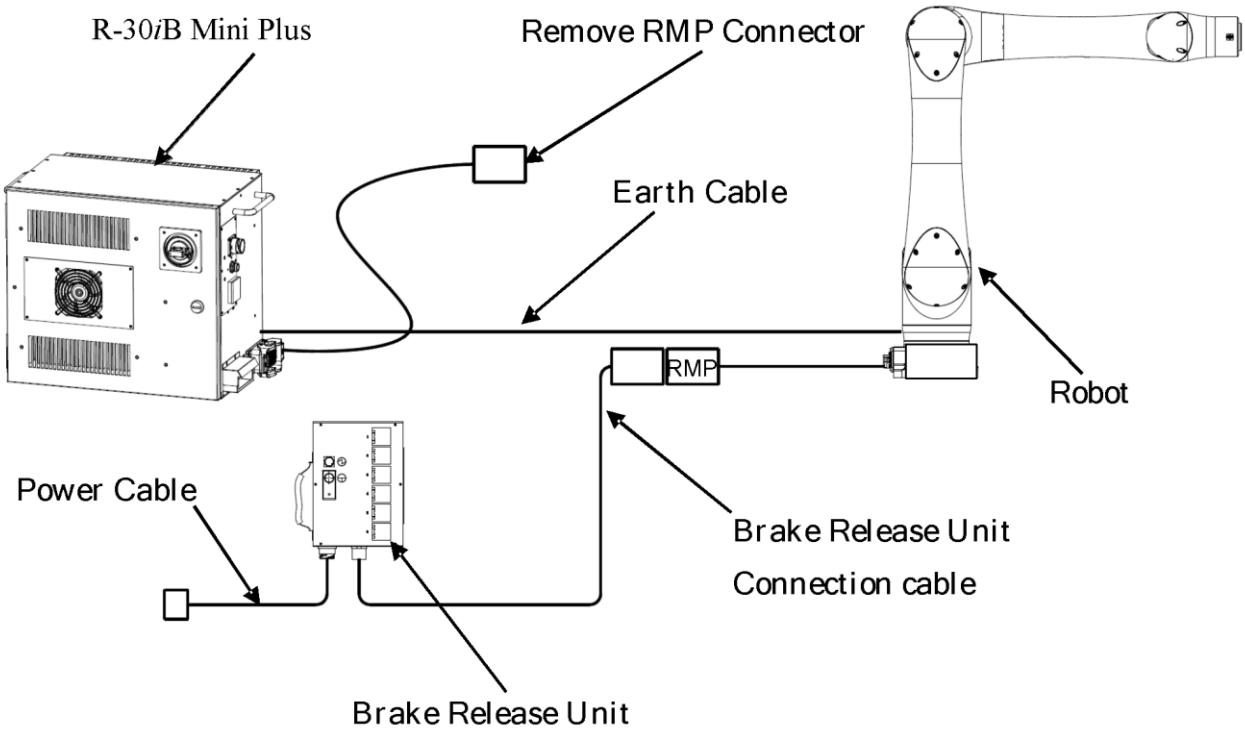


Figure H.3.1-2 How to connect the brake release unit

H.4. How to Connect Input Power

The power supply cable to connect to R-30iB Mini Plus can be used to connect to the brake release unit.
Use FANUC's optional cable, or prepare one yourself.
See II.2.4. HOW TO CONNECT INPUT POWER(P.109) for details on input power connection.

⚠WARNING

- Only a specialist with the relevant expertise knowledge is permitted to connect the plug to the power cable.
- Only a plug that complies with the standard in each region can be used.
- Do not install plugs without a protective earth pin.

H.5. DIMENSION

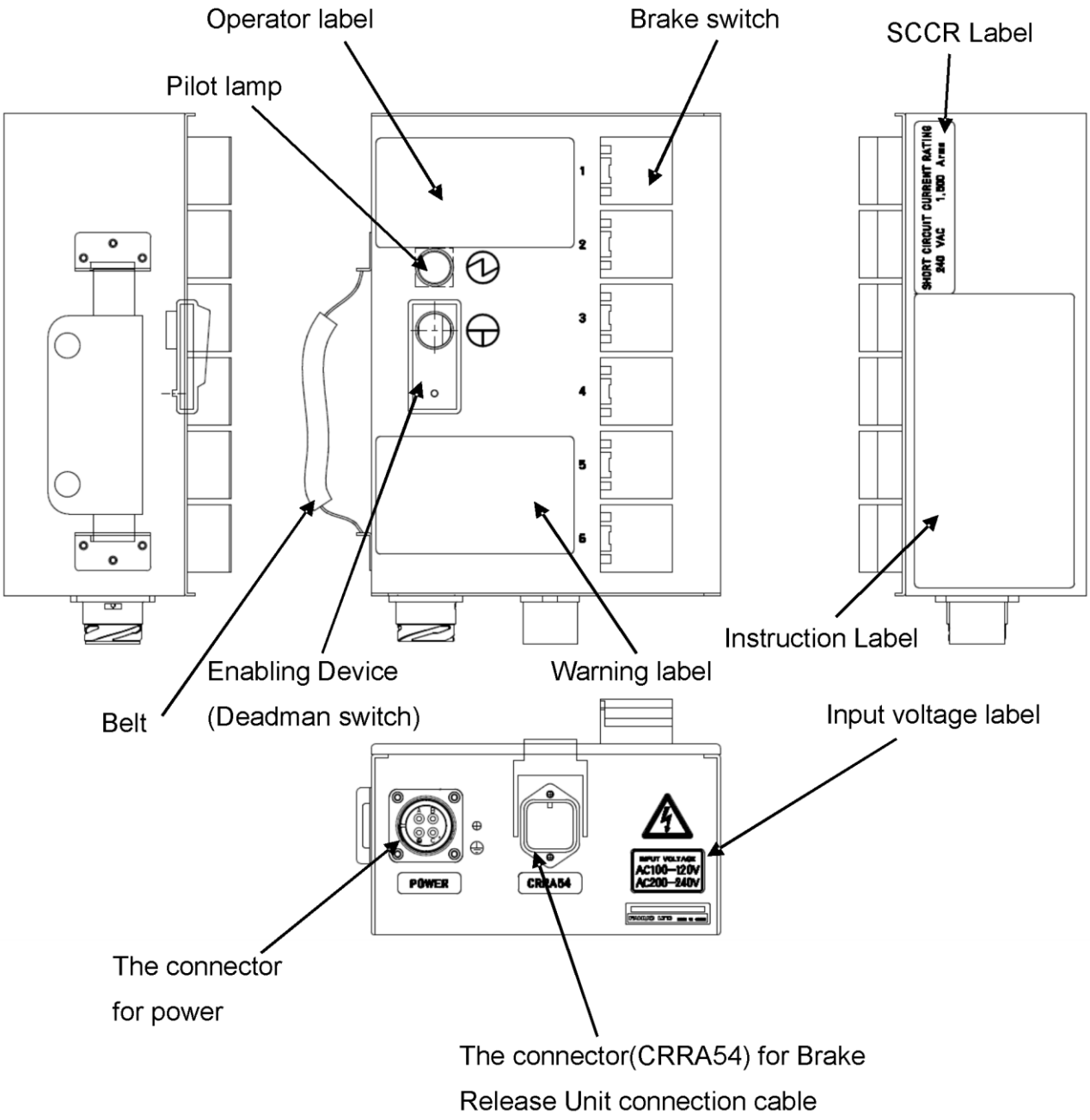


Figure H.5-1 Dimension of brake release unit

H.6. FUSE

The fuses are mounted inside this unit. Please check the fuse when the pilot lamp does not light up even if the enabling device (deadman switch) is pressed. When the fuse is blown, exchange the fuse after finding the root cause of the failure and take the appropriate countermeasures.

Manufacturer: Daito Communication Co.
Specification: GP20
Rating: 2A

⚠WARNING
When the fuse is replaced, the power cable of the brake release unit must be disconnected.

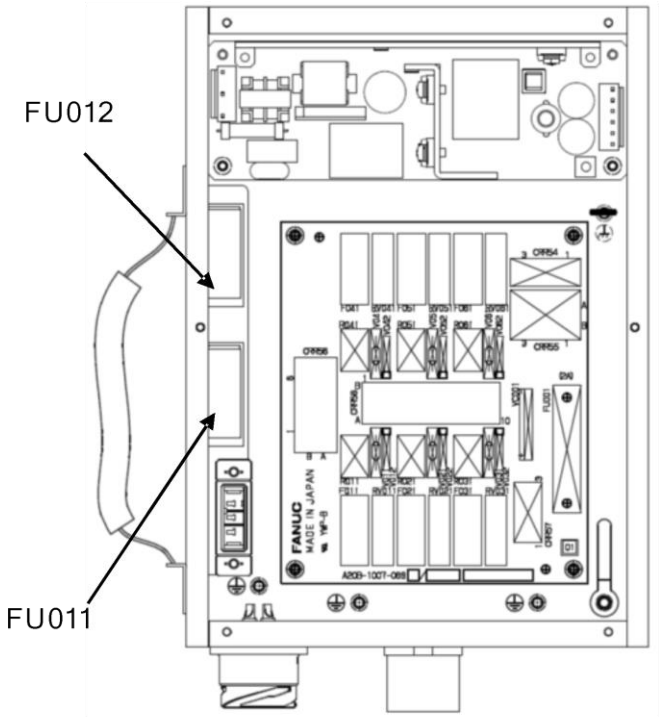


Figure H.6-1 Location of fuses

H.7. SPECIFICATIONS

(a) Input power supply
AC100-120V, 50/60Hz±1Hz, single phase, +10%/-15%, 1A
AC200-240V, 50/60Hz±1Hz, single phase, +10%/-15%, 1A

(b) Weight
Brake Release Unit : 1.6 kg

Revision record

Edition	Date	Contents
03	Jun., 2022	• CRX-5iA, CRX-20iA/L, CRX-25iA added
02	Feb., 2021	• Addition of maintenance information. • Correction of errors.
01	Jun., 2020	

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