FANUC Robot series

R-30*i*B Compact Plus CONTROLLER

MAINTENANCE MANUAL

B-84035EN/04

- **Original Instructions**

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

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

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

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

SAFETY PRECAUTIONS

This chapter must be read before using the robot.

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

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

1 DEFINITION OF USER

The 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 safety fence

Maintenance technician:
- Operates the robot
- Teaches the robot inside the safety fence
- Maintenance (repair, adjustment, replacement)

- Operator is not allowed to work in the safety fence.
- Programmer/Teaching operator and maintenance technician is allowed to work in the safety fence. Works carried out in the safety fence include transportation, installation, teaching, adjustment, and maintenance.
- To work inside the safety fence, the person must be trained on proper robot operation.

Table 1 (a) lists the work outside the safety fence. In this table, the symbol "O" means the work allowed to be carried out by the worker.

Table 1 (a) List of work outside the fence

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

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

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

2 DEFINITION OF SAFETY NOTATIONS

To ensure the safety of users and prevent damage to the machine, this manual indicates each precaution on safety with "**WARNING**" or "**CAUTION**" according to its severity. Supplementary information is indicated by "**NOTE**". Read the contents of each "**WARNING**", "**CAUTION**" and "**NOTE**" before using the robot.

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

- Check this manual thoroughly, and keep it handy for the future reference.

3 WARNING & CAUTION LABEL

(1) Step-on prohibitive label

Fig.3 (a) Step-on prohibitive label

Description

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

(2) High-temperature warning label

Fig.3 (b) High-Temperature warning label

Description

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

(3) High-voltage warning label

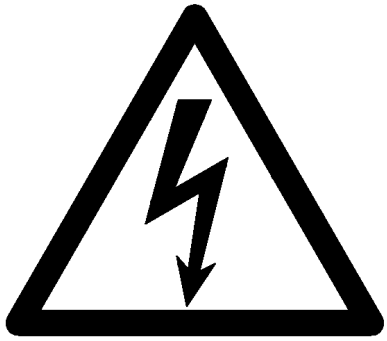


Fig.3 (c) High-voltage warning label

Description

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

(4) Caution label

Fig.3 (d) Caution label

Description

See related contents of this manual.

PREFACE

This manual describes the following models (R-30*i*B Compact Plus CONTROLLER).

Model	Abbreviation	
FANUC Robot SR-3*i*A	SR-3*i*A	SR-3*i*A
FANUC Robot SR-3*i*A/H	SR-3*i*A/H	
FANUC Robot SR-6*i*A	SR-6*i*A	SR-6*i*A
FANUC Robot SR-6*i*A/H	SR-6*i*A/H	
FANUC Robot SR-12*i*A	SR-12*i*A	
FANUC Robot SR-20*i*A	SR-20*i*A	

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

The hazardous substances contained in the R-30*i*B Compact Plus CONTROLLER as listed in the table below.

The names and contents of hazardous substances in the product

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

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

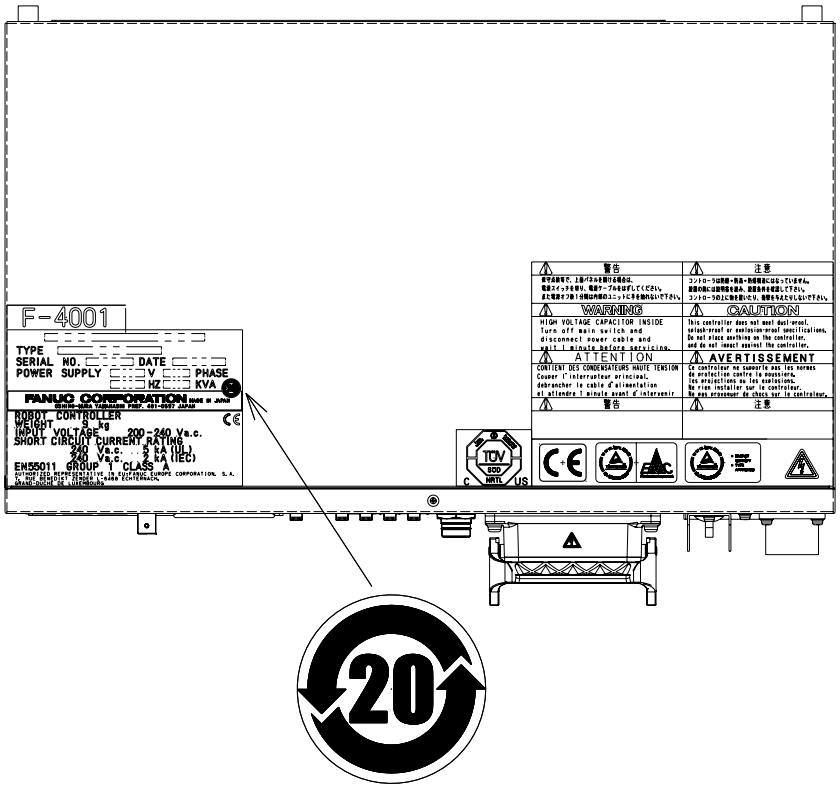
○: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

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

Environmental Protection Use Period

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

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



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I. MAINTENANCE

1 OVERVIEW

This manual is applied to R-30*i*B Compact Plus controller (called R-30*i*B Compact Plus).

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

Table 1 (a) 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/UL 61010-1 IEC/EN 60204-1

This manual describes the maintenance and connection of R-30*i*B Compact Plus.

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

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

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.
Fig.2.1 (a) to (d) show the view of R-30*i*B Compact Plus.
Fig.2.1 (e) to (g) show the construction of the R-30*i*B Compact Plus.
Fig.2.1 (h) to (j) show the external view of the switch box and teach pendant.

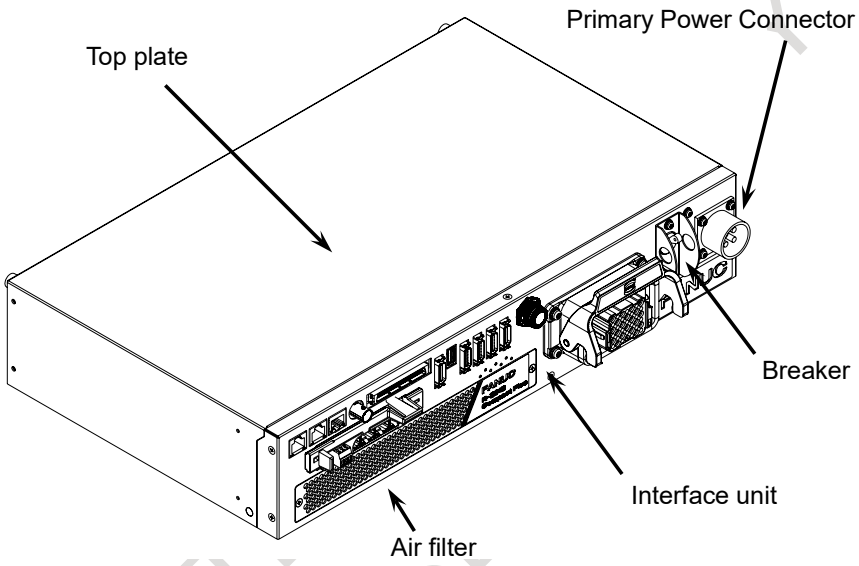


Fig.2.1 (a) External view of the R-30*i*B Compact Plus

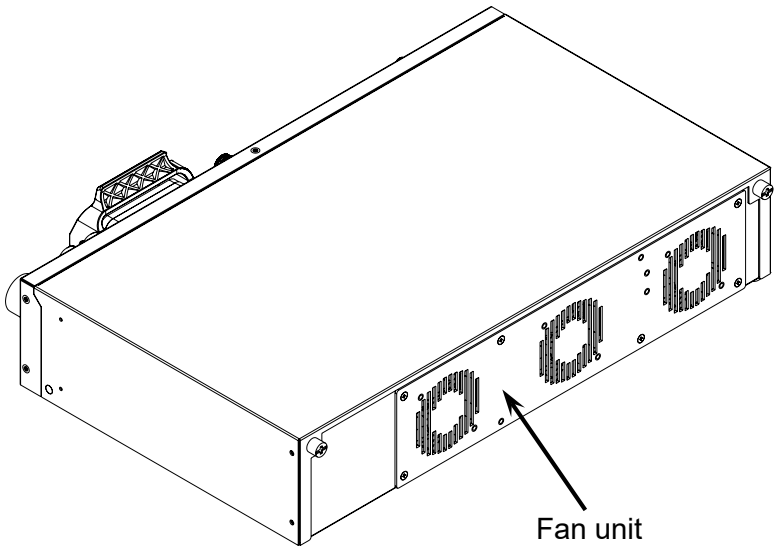


Fig.2.1 (b) External view of the R-30*i*B Compact Plus (Rear)

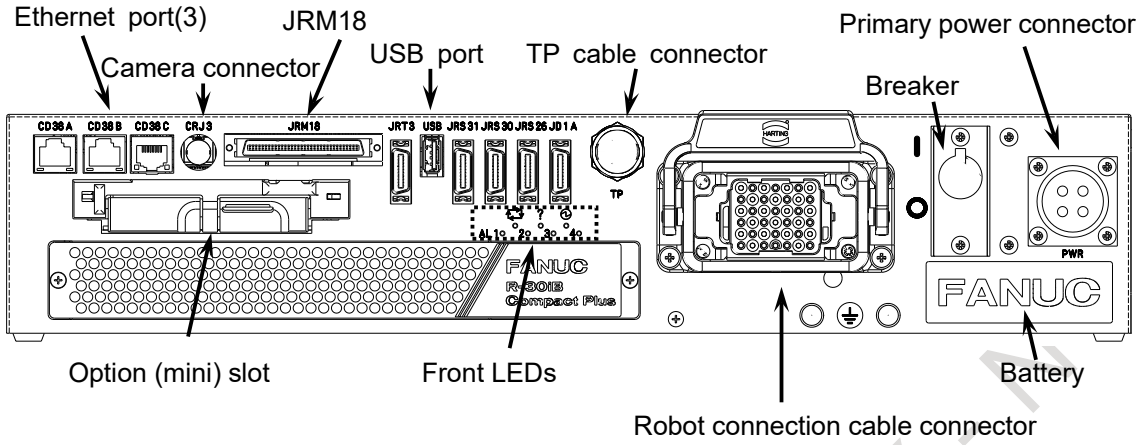


Fig.2.1 (c) Front view of the R-30*i*B Compact Plus

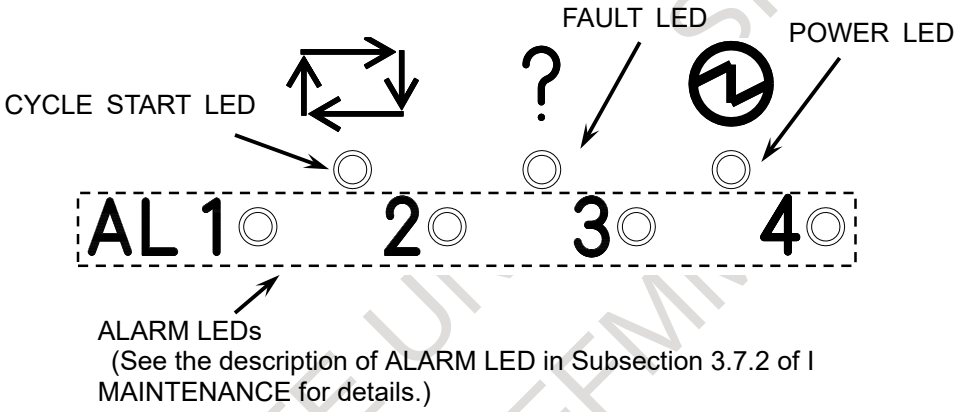


Fig.2.1 (d) Front LEDs

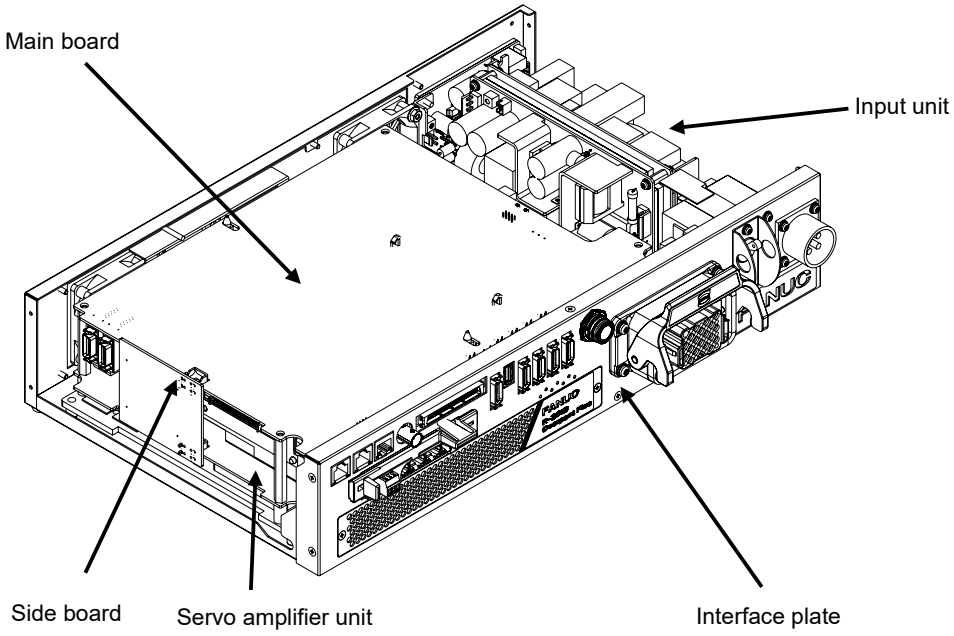


Fig.2.1 (e) R-30*i*B Compact Plus cabinet interior (Front-1)

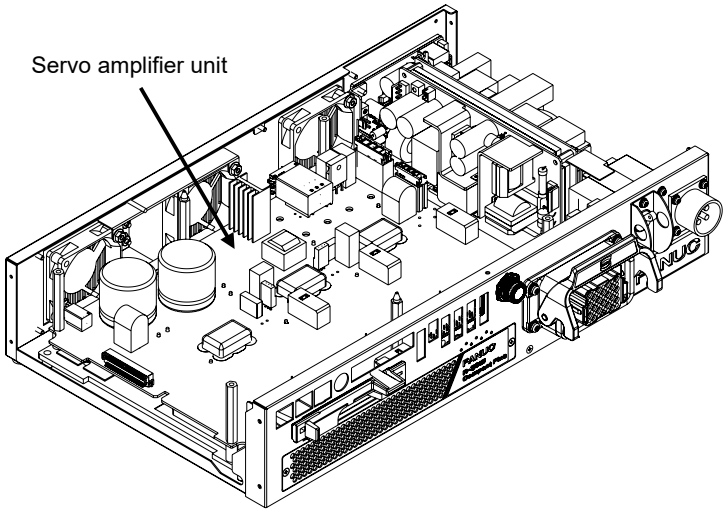


Fig.2.1 (f) R-30*i*B Compact Plus cabinet interior (Front-2)

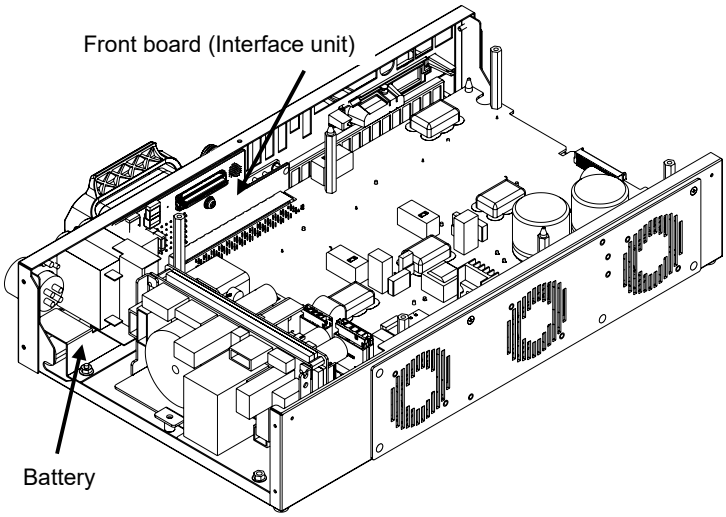


Fig.2.1 (g) R-30*i*B Compact Plus cabinet interior (Rear)

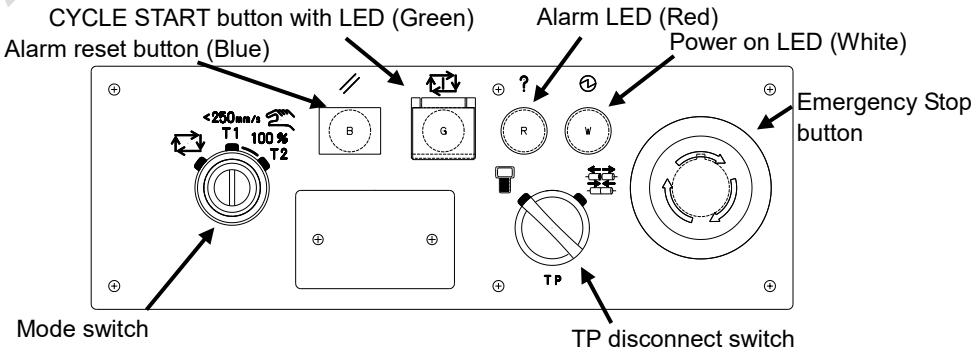
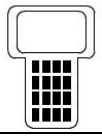
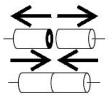
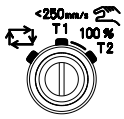
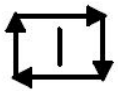


Fig.2.1 (h) R-30*i*B Compact Plus switch box

Symbol	Description
	“TP” symbol of the TP disconnect switch. Please turn the disconnect switch to “TP” position when teach pendant cable is connected. See Chapter D in APPENDIX.
	“Connect/disconnect” symbol of the TP disconnect switch. Teach pendant cable can be disconnected by setting the disconnect switch to the “Connect/Disconnect” position. See Chapter D in APPENDIX.
	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.
	Indicates the alarm state. Press the alarm release button to release the alarm state.
	When the alarm condition has occurred in the controller, the LEDs are turned on. The four LEDs indicate the contents of the alarm. Please see the Subsection 3.7 TROUBLESHOOTING BASED ON INDICATIONS in II MAINTENANCE.
	Enable operation of the robot controller breaker.
	Disable operation of the robot controller breaker.

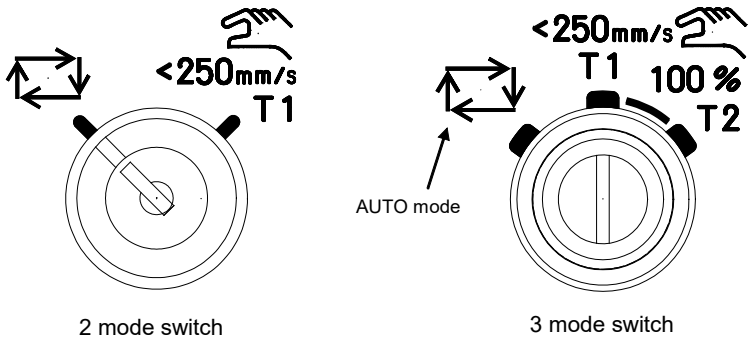


Fig.2.1 (i) Mode switch

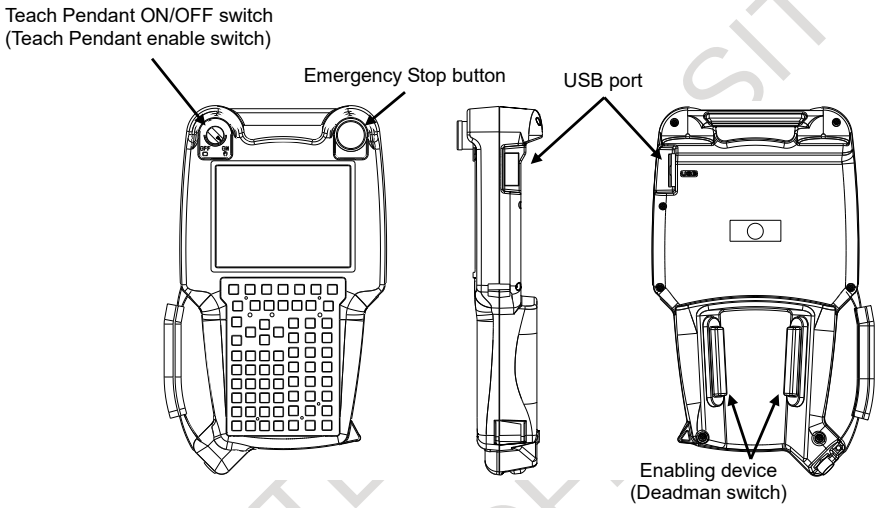
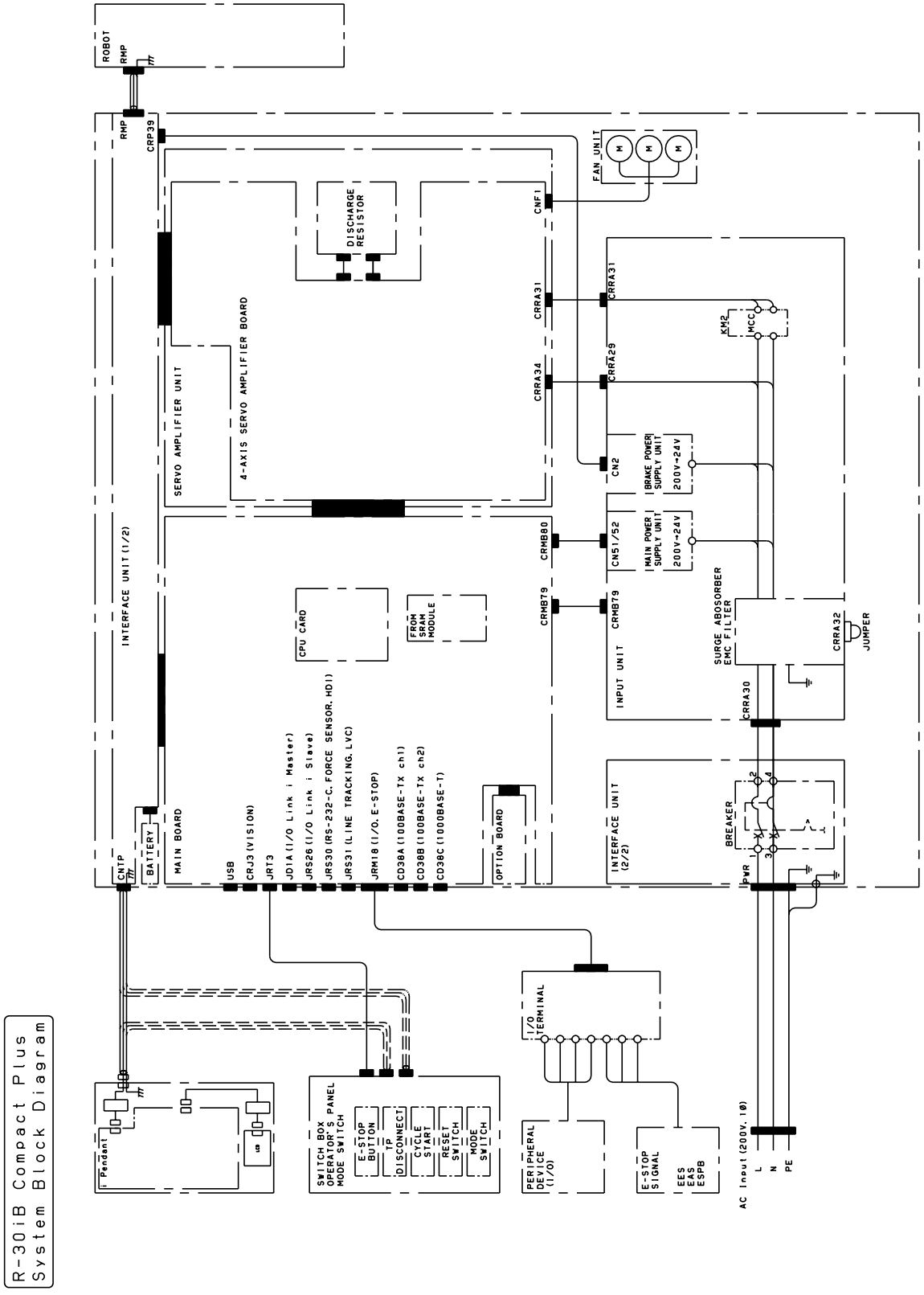


Fig.2.1 (j) Teach pendant (*i*Pendant) (Option)

2.2 COMPONENT FUNCTIONS



R-30iB Compact Plus
System Block Diagram

Fig.2.2 (a) Block diagram of the R-30*i*B Compact 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. 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.
- *i* Pendant (Teach pendant, 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 servomotors of a robot. This unit contains the 4-axis servo amplifier unit, the discharge resistor, the heat sink and the rectifier diodes.
- Interface unit
  This unit contains the primary power connector, the breaker, the battery, the TP cable connector, the robot connection cable connector, the air filter.
- Fan unit
  This unit is placed on the back of the controller and cools the inside of it.
- Side board
  This board connects the main board and the servo amplifier unit.
- Option (mini) slot
  An option board can be installed in this slot.
- 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:
(a) Before operation
Check the cable connected to the teach pendant for excessive twisting. Check the controller and peripheral devices for abnormalities.
(b) After operation
At the end of operation, return the robot to the specified position, and then turn off the controller. Clean each part, and check for any damage or cracks. If the ventilation port of the controller is dusty, clean it.

(2) Check after one month
Check that the fan is rotating normally. If the fan 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.
To confirm that the safety function can work correctly, please check the alarm detection by inputting emergency stop, or please check the system operation by cycling power (refer to the following CAUTION).

(4) Battery daily check
Replace the battery on the front panel of the main board every 4 years. Please refer to the Section 7.8.

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

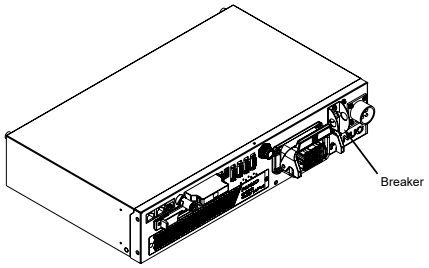
(6) Automatic backup
When the automatic backup area (FRA:) of F-ROM in the controller is specified as a backup copy destination and automatic backup is performed frequently, F-ROM may be damaged. If the automatic backup is performed frequently, use the external storage device.

> ⚠ **CAUTION**
> R-30*i*B Compact 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.

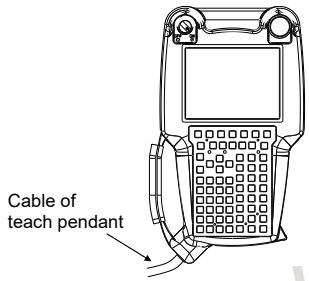
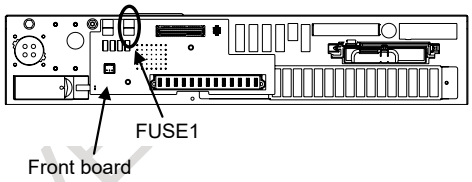
3 TROUBLESHOOTING

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.

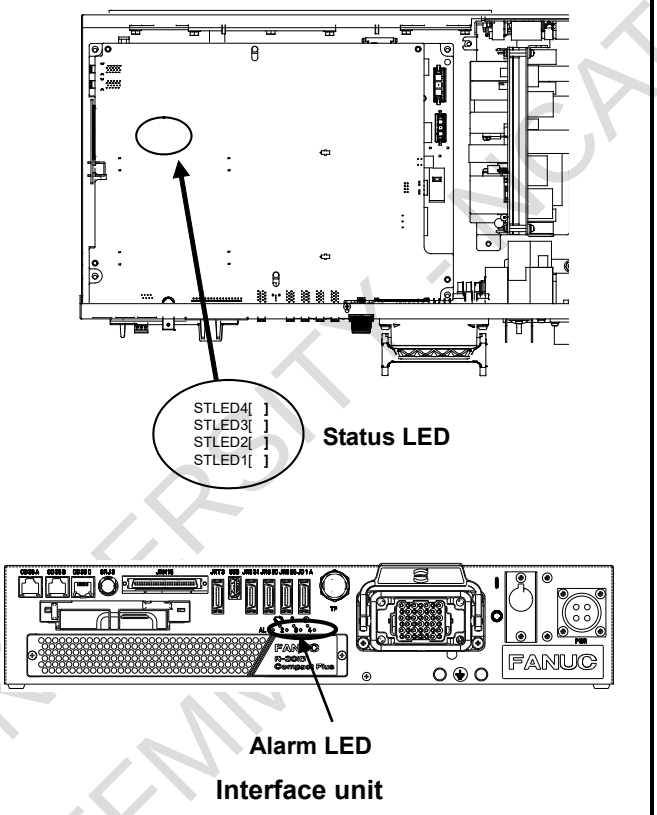
3.1 POWER CANNOT BE TURNED ON

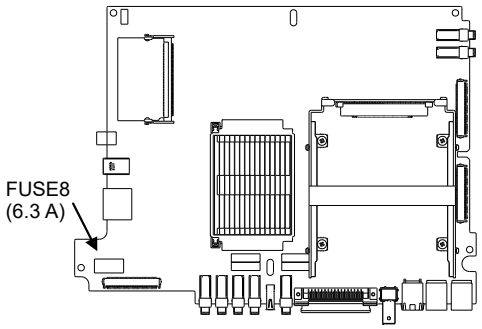
Inspection and action	Figure
(Inspection 1) Check the circuit breaker. (Action 1) (a) If circuit breaker is OFF, turn on the circuit breaker. (b) If the circuit breaker has tripped (the circuit breaker trip state is identical to OFF state), find the cause by referencing the total connection diagram presented in the appendix. (Inspection 2) Check the POWER LED of the front LEDs. When the LED is turned off, carry out Action 2. (Action 2) (a) Check the connection of the internal cable of the controller. (b) Replace the input unit.	

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 fuse (FUSE1) on the front board is not blown. When fuse (FUSE1) is blown, carry out action 1 and replace the fuse. (Inspection 2) When fuse (FUSE1) 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), Action 2), perform a complete controller back-up to save all your programs and settings. (c) Replace the interface unit. (Action 2) When the LED on the main board does not light, replace the interface unit. When the LED on the main board lights, carry out action 1.	 **Teach pendant**  **Interface unit (Rear)**

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. (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 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. (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 2(a)), perform a complete controller back-up to save all your programs and settings. (a) Replace the main board.	 **Main board (Side-B)**

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 system variable appropriately.
If two or more alarms have occurred, the display begins with the most recent alarm.
Up to 100 lines can be displayed.
If an alarm has a cause code, it is displayed below the line indicating the alarm.

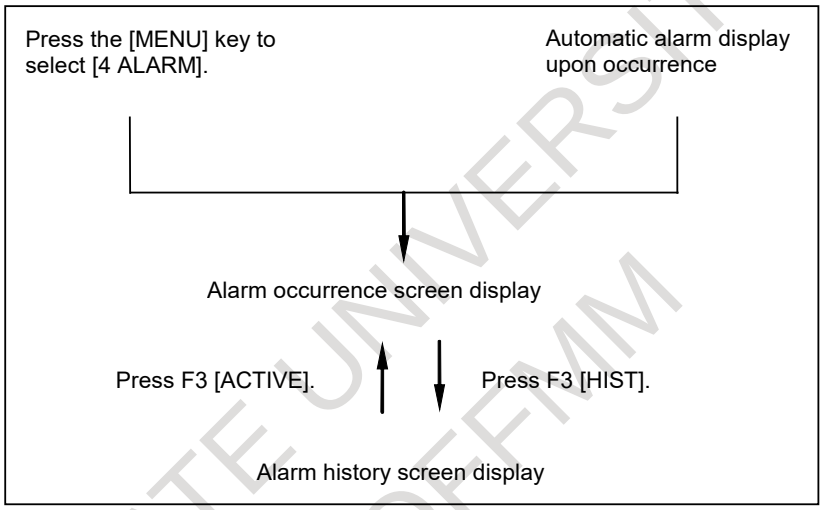
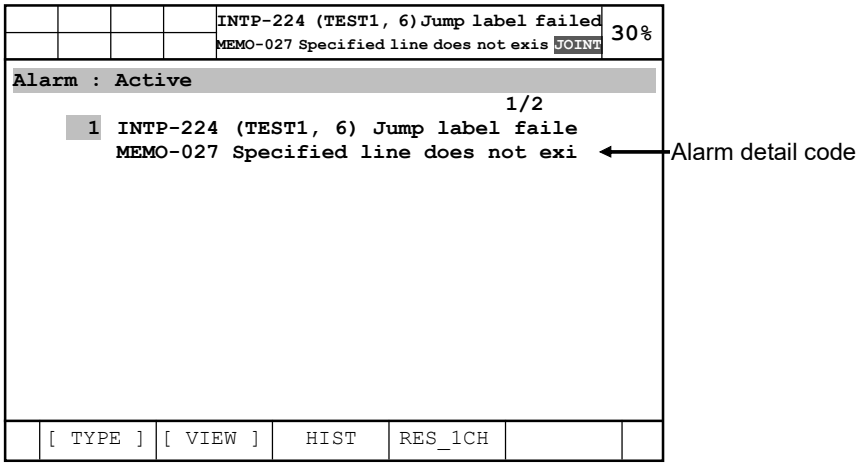


Fig.3.2 (a) Alarm occurrence screen and alarm history screen display procedure

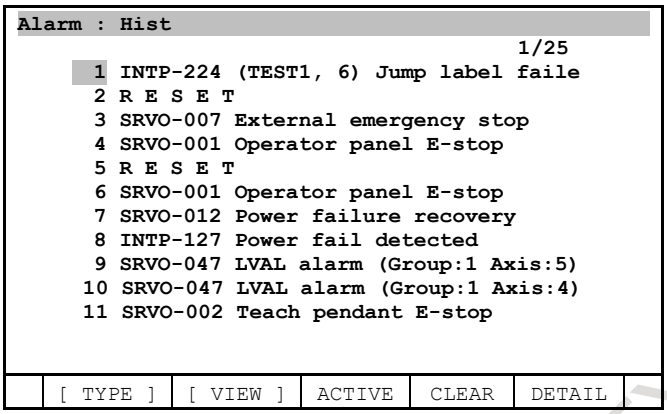
Displaying the alarm active/ alarm history/alarm detail information

Step

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

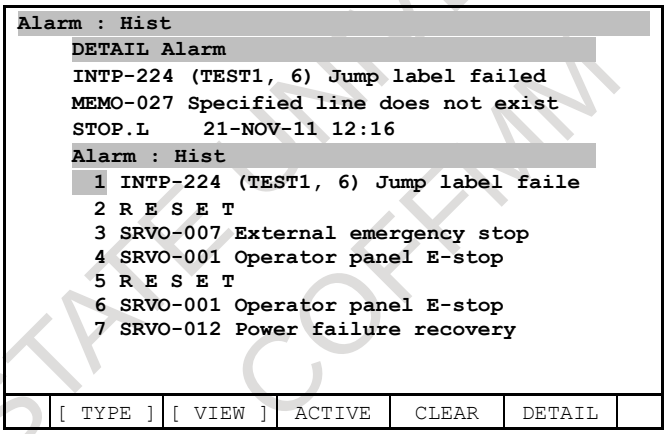


(3) To display the alarm history screen, press F3, [HIST].
Press F3 [ACTIVE] again, the alarm screen appears.



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].

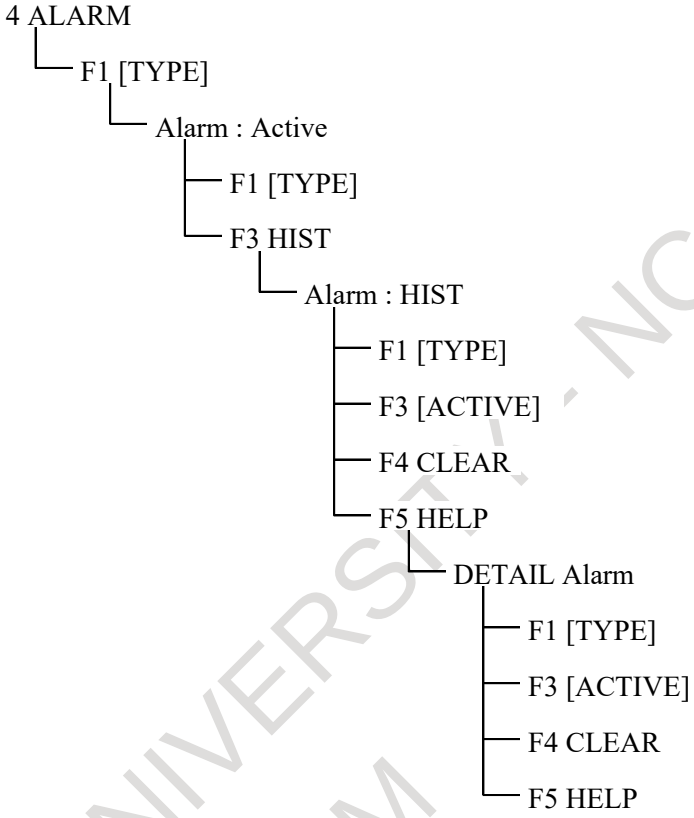


(5) To return to the alarm history screen, press the [PREV] key.

(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 STOP SIGNALS

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

Table 3.3 (a) Stop signals

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 operable	This item indicates whether the teach pendant is operable. If the teach pendant is operable, the state is indicated as "TRUE".
Abnormal air pressure	This item indicates the state of the air pressure. The abnormal air pressure signal is connected to the air pressure sensor. If the air pressure is not higher than the specified value, the state is indicated as "TRUE".

Displaying the signal name screen

Step

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

```
STATUS Stop Signal
          SIGNAL NAME            STATUS   1/12

        1 SOP E-Stop:             FALSE
        2 TP E-STOP:              FALSE
        3 EXT E-STOP:             FALSE
        4 Fence Open:             FALSE
        5 TP Deadman:             TRUE
        6 TP Enable:              TRUE
        7 Hand Broken:            FALSE
        8 Overtravel:             FALSE
        9 Low Air Alarm:          FALSE
       10 Belt Broken:            FALSE
       11 SVOFF Input:            FALSE
       12 Non Teacher Enb. Dev.: FALSE

    [ TYPE ]
```

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 an applicable maintenance manual of mechanical unit or Mastering chapter of the Appendix B of the OPERATOR'S MANUAL (BASIC OPERATION) (B-83284EN).

Condition

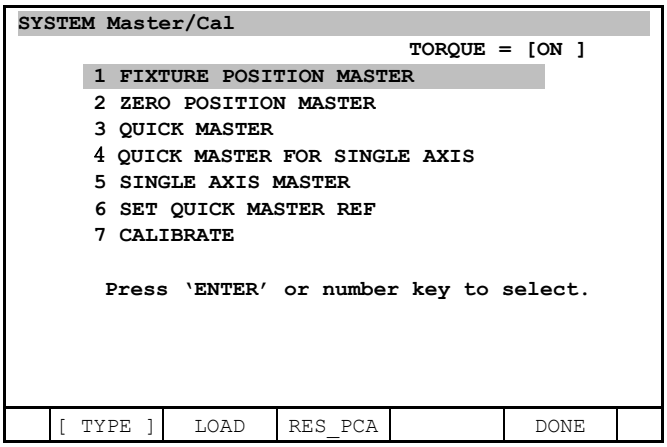
System variable $MASTER_ENB must be set to 1 or 2.

```
SYSTEM Variables

     272 $MASTER_ENB      1
```

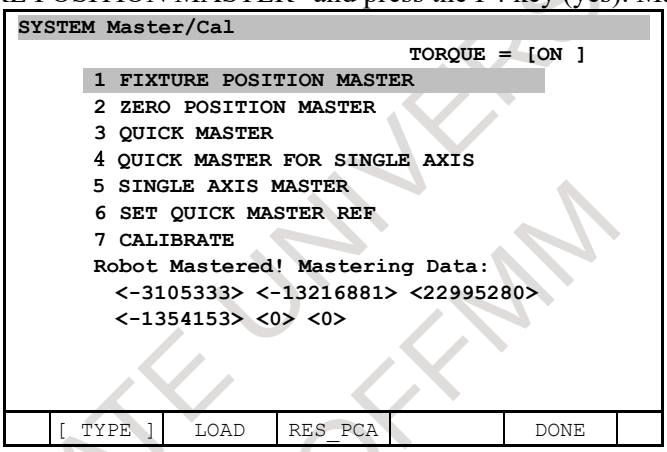
Step

(1) Press the [MENU] key to display the screen menu.
(2) Select 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.

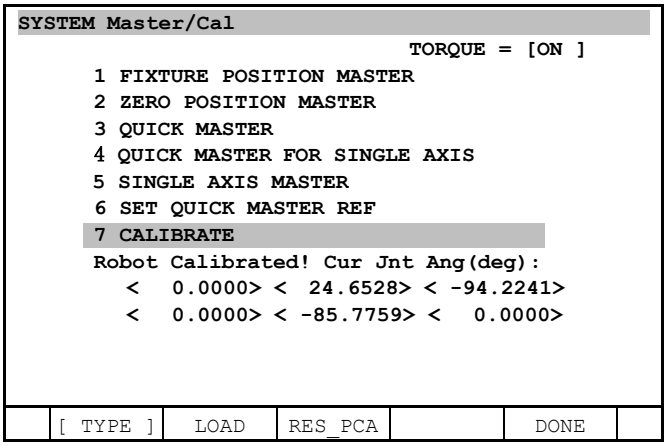


NOTE
Mastering cannot be performed until axis is rotated enough to establish a pulse.

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



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



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

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 between 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 between the teach pendant and the interface unit (TP) for continuity. 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 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.

(Action 8) Replace the interface unit.

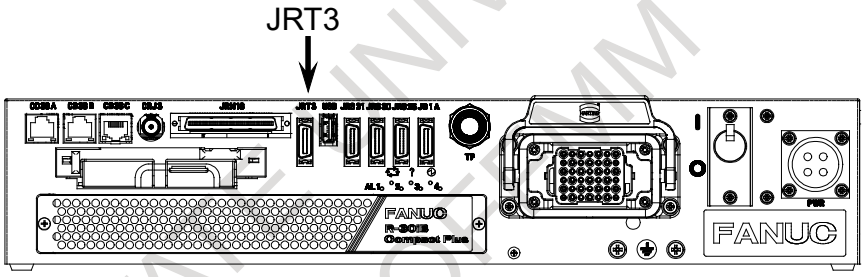


Fig.3.5 (a) SRVO-001 Operator panel E-stop

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) released

(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 positions.
(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.
(Action 6) Replace the interface unit.

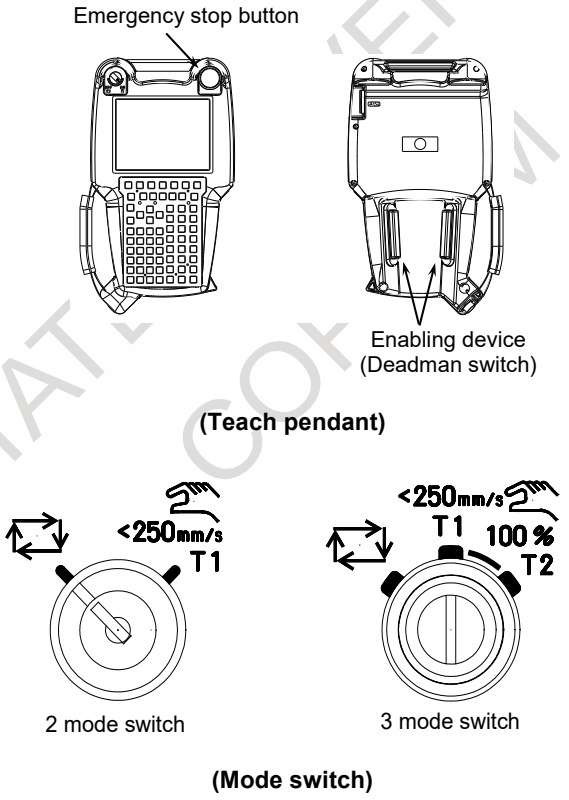


Fig.3.5 (b) SRVO-002 Teach pendant E-stop
SRVO-003 Enabling device (Deadman switch) released

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.

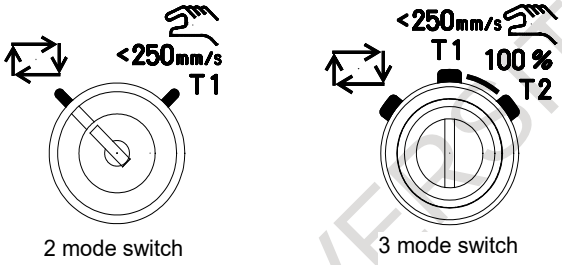
(Action 2) Check the cables and switches connected between EAS1 and 24V-2 and between EAS2 and 0V of the JRM18 connector on the main board.

(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.



(Mode switch)

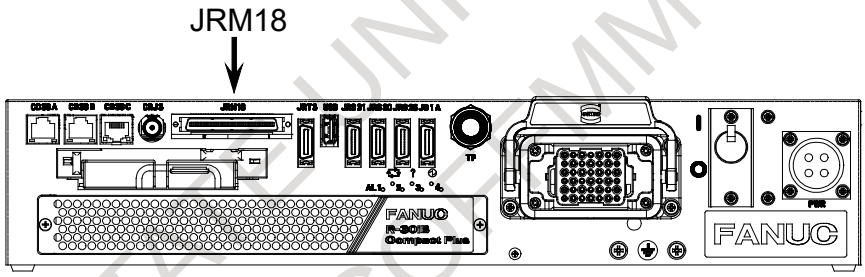


Fig.3.5 (c) SRVO-004 Fence open

> ⚠ **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 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 the (Action 4), perform a complete controller back-up to save all your programs and settings.

(Action 4) Replace the main board.

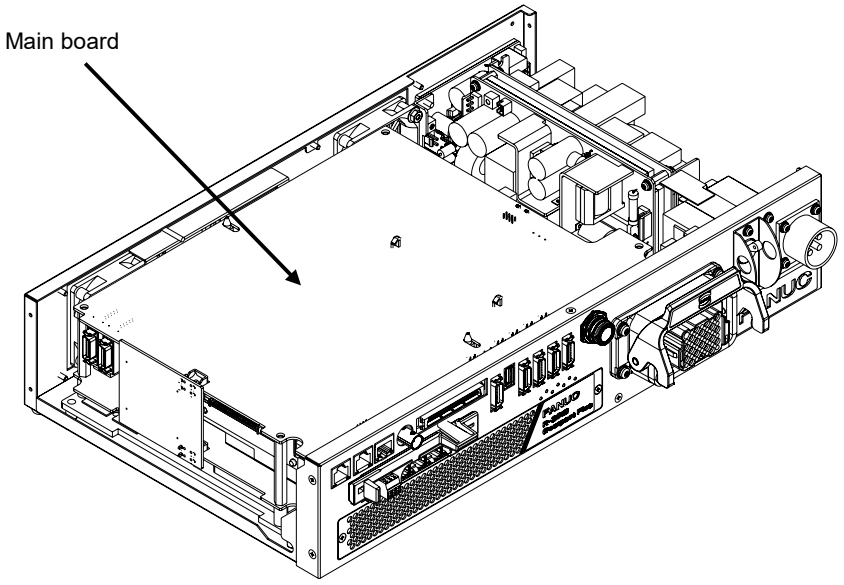


Fig.3.5 (d) SRVO-007 External emergency stops

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

SRVO-009 Pneumatic pressure alarm

(Explanation) An abnormal air pressure was detected. The input signal is located on the end EE interface of the robot. Refer to the manual of your robot.

(Action 1) If an abnormal air pressure is detected, check the cause.

(Action 2) Check the EE connector.

(Action 3) Check the robot connection cable (RMP) and the internal cable of the robot for a ground fault or a cable disconnection. If a fault or a disconnection is detected, replace the cable.

Before executing the (Action 4), perform a complete controller back-up to save all your programs and settings.

(Action 4) Replace the main board.

(Action 5) Replace the interface unit.

(Action 6) Replace the internal cables of the robot.

NOTE

Pneumatic pressure alarm input is on the EE interface. Please refer to the manual of your robot.

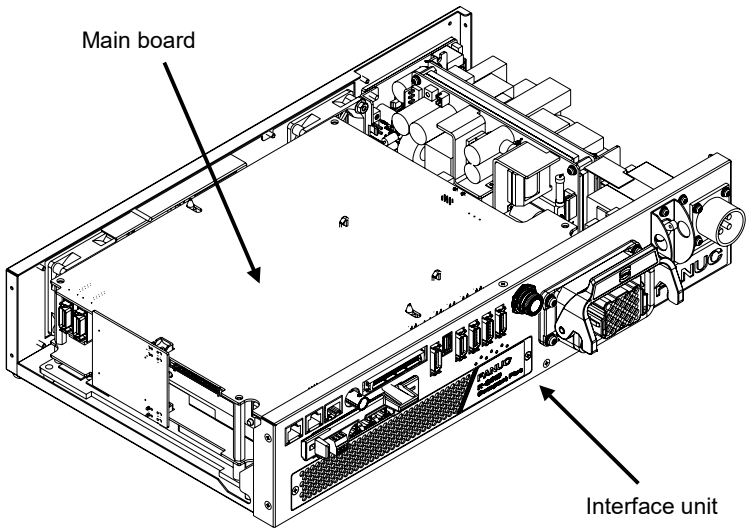


Fig.3.5 (e) SRVO-009 Pneumatic pressure alarm

SRVO-014 Fan motor abnormal (n), CPU STOP

(Explanation) When a fan motor stops on fan unit, Teach pendant shows the following message. In one minutes from occurring of alarm, 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 back up 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.

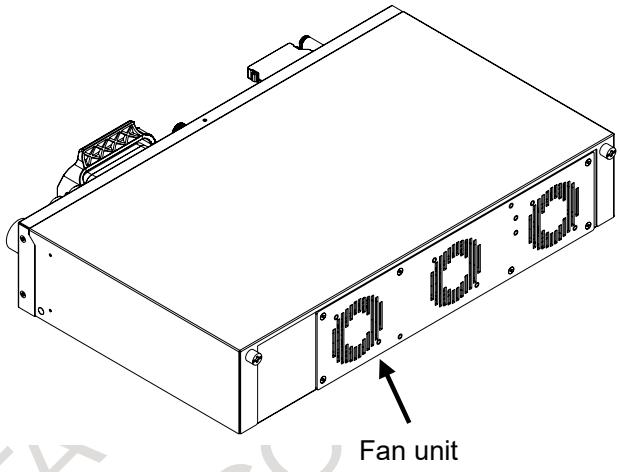


Fig.3.5 (f) SRVO-014 Fan motor abnormal

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 (40°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.

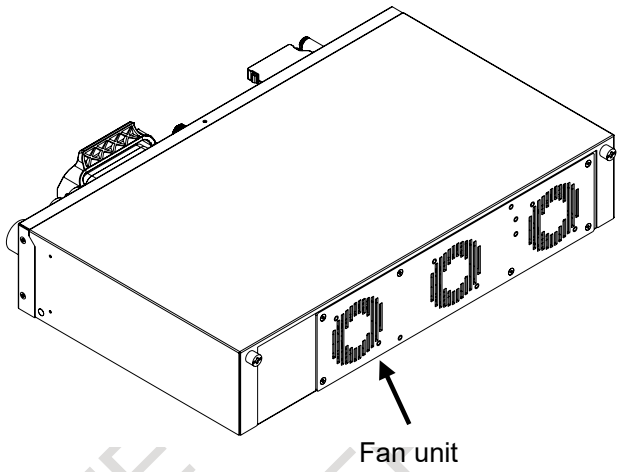


Fig.3.5 (g) SRVO-015 System over heat

SRVO-018 Brake abnormal (G:i A:j)

(Explanation) An abnormal brake current is detected.
(Action 1) Check the robot connection cable (RMP) and the internal cable of the robot and motor brakes connected to the interface unit.
If a short-circuit or grounding fault is found, replace the failed part.
(Action 2) Check FUSE6 in the input unit. If it has blown, replace the fuse.
(Action 3) Make sure that the input unit connector CN2 is securely attached to the input unit and interface unit connector CRP39 is securely attached to the interface unit.
(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 interface unit.
(Action 6) Replace the main board.

> ⚠ **CAUTION**
> This error can be caused by the brake release button 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 (Group:i Axis:j)

(Explanation) The servo power cannot be turned on although no alarm has been detected.
(Action 1) It is possible that an instant disconnection of power source causes this alarm. Check whether an instant disconnection occurred.
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-022 SRDY on (Group:i Axis: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 1), perform a complete controller back-up to save all your programs and settings.
(Action 1) 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 interface 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 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 become unable 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.

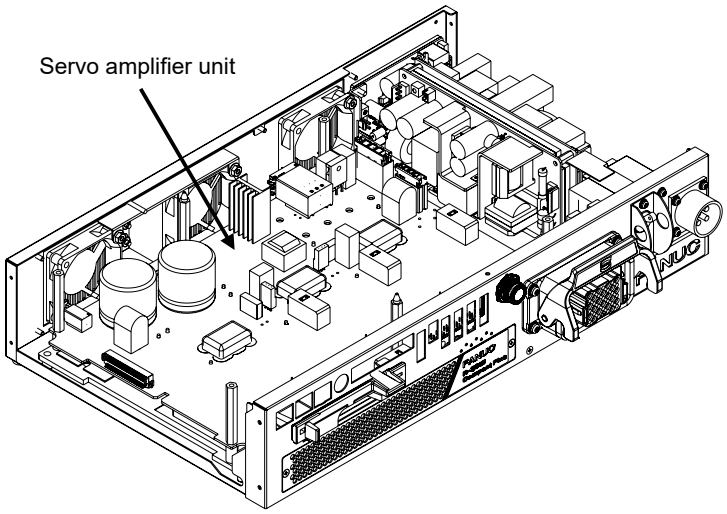


Fig.3.5 (h) SRVO-023 Stop error excess

SRVO-024 Move error excess (G:i A:j)

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

(Action 1) 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.

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) 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 power is turned off does not match the pulse count obtained when power is applied. This alarm is asserted 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) In case the robot has been moved by using the brake release button while the power is off or when restoring the back-up 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 robot exceeds the controller capacity because the frequency of acceleration/deceleration or the payload of 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 robot, decrease the operating condition or reduce the payload of robot.

(Action 2) The ambient temperature is excessively high, or the dust adhering 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 servo amplifier unit CRR63 connector is connected. If disconnected, connect it. If connected, detach the cable from CRR63 connector on the servo amplifier unit, and check for continuity between pins 1 and 2 of the cable-end connector. If there is no continuity between the pins, replace the servo amplifier unit.

(Action 4) Make sure that the servo amplifier unit 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.

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%s alarm (G:i A:j)

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

(Action 1) Check the input voltage to the controller is lower than the rated voltage (Maximum applied input voltage is 240Va.c.). If the input voltage is higher than 240Va.c, the high acceleration/deceleration may cause this alarm.

(Action 2) Check that the load weight is within the robot rating. If it is higher than the rating, reduce it to within the rating. (If the load weight is higher than the robot rating, the accumulation of regenerative energy might result this alarm even if the input voltage is within the controller rating.)

(Action 3) Check that the CRRA37 connectors of servo amplifier unit are connected firmly. Next, disconnect the cables then check the continuity between pins 1 and 3. If the resistance is not 6.5Ω, replace the servo amplifier unit.

Before executing the (Action 4), perform a complete controller back-up 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 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 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 back-up to save all your programs and settings.

(Action 3) Replace the servo amplifier unit.

(Action 4) Replace the Interface unit.

(Action 5) Replace the main board.
(Action 6) 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 whether the voltage input 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.

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 servo motor of the corresponding axis.
(Action 7) Replace the Interface unit
(Action 8) Replace the motor power cable (robot connection cable) of the corresponding axis.
(Action 9) Replace the motor power cable and brake line (internal cable of the robot) of the corresponding axis.
(Action 10) Replace the main board.
(Action 11) Replace the side board.

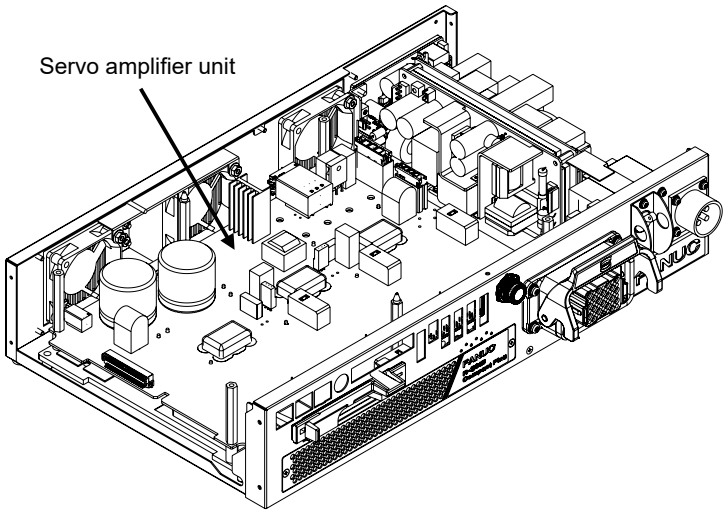


Fig.3.5 (i) **SRVO-044 DCHVAL%s alarm**
SRVO-045 HCAL alarm
SRVO-046 OVC alarm

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 high current flow in a power transistor momentarily due to abnormality or noise in the control circuit, the power transistor and rectifier diodes might be damaged, or the magnet of the motor might be degaussed. The HC alarm is intended to prevent such failures.
2) OVC and OHAL alarms (overcurrent and overload alarms)
   The OVC and OHAL alarms are intended to prevent overheat that may lead to the burnout of the motor winding, the breakdown of the servo amplifier transistor, and the separate discharge resistor.
   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 (l), the temperature rise in the motor is steeper than that in the thermal relay, thus causing the motor to burn before the thermal relay detects an abnormally high temperature.

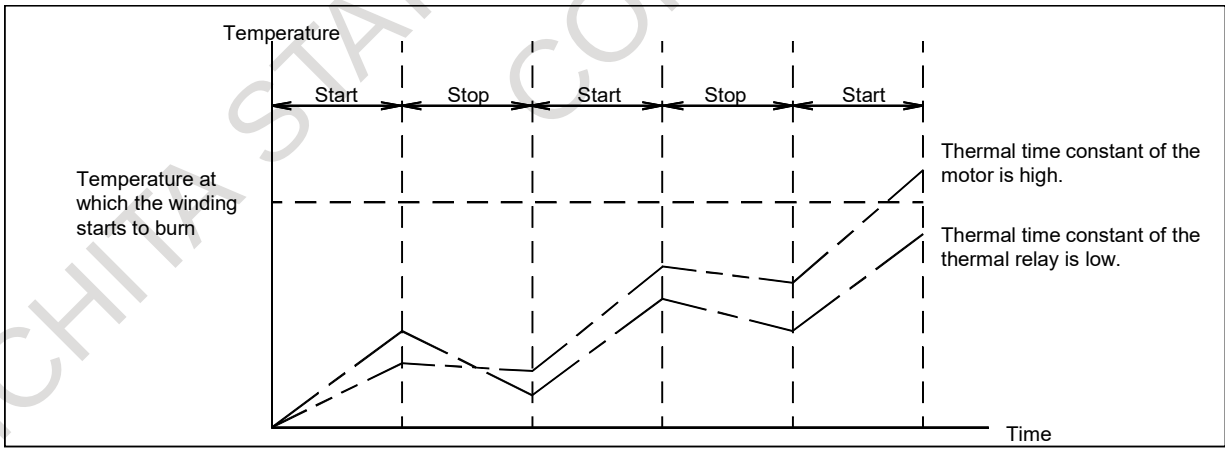


Fig.3.5 (j) Relationship between the temperatures of the motor and thermal relay on start/stop cycles

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 (m).

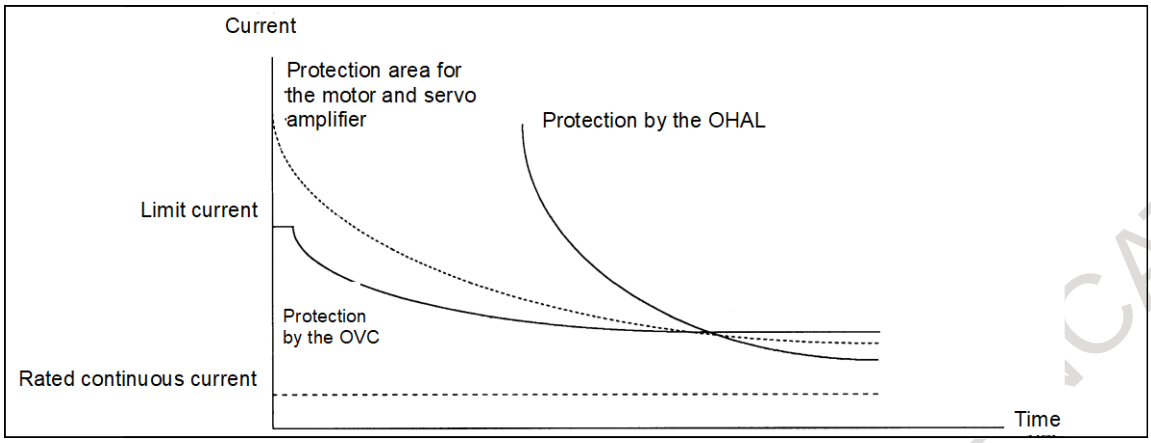


Fig.3.5 (k) Relationship between the OVC and OHAL alarms

> **⚠ CAUTION**
> The relationship shown in Fig.3.5 (m) 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 (G:i A:j)

(Explanation) The disturbance torque estimated by the servo software is abnormally high. (A collision has been detected.)
(Action 1) Check whether the robot has collided and also check whether there is a factor that has increased the mechanical load on the corresponding axis.
(Action 2) Check whether the load settings are valid.
(Action 3) 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 whether the voltage input to the controller is within the rated voltage.
Before executing the (Action 6), perform a complete controller back-up to save all your programs and settings.
(Action 6) Replace the servo amplifier unit.
(Action 7) Replace the motor of the corresponding axis.
(Action 8) Replace the input unit.
(Action 9) Replace the robot connection cable.
(Action 10) Replace the interface unit.
(Action 11) Replace the main board.
(Action 12) 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 the (Action 1), perform a complete controller back-up 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.

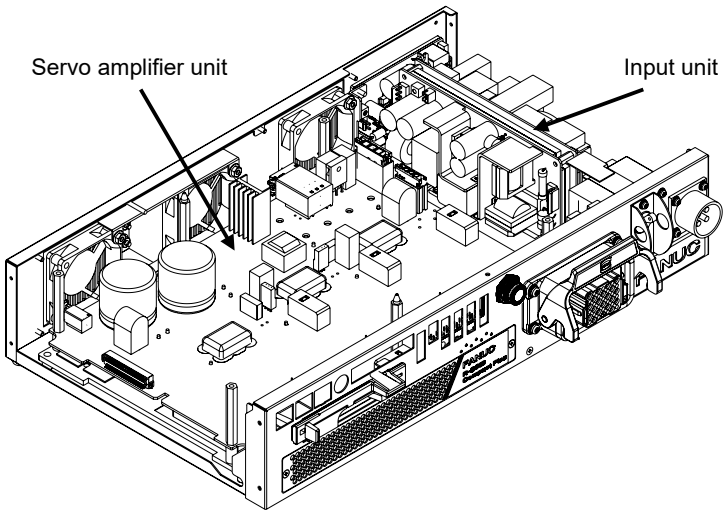


Fig.3.5 (l) SRVO-050 CLALM alarm
SRVO-051 CUER alarm

SRVO-055 FSSB com error 1 (G:i A:j)

(Explanation) A communication error has occurred in the main board.
Before executing the (Action 1), perform a complete controller back-up to save all your programs and settings.
(Action 1) Replace the main board.

SRVO-056 FSSB com error 2 (G:i A:j)

(Explanation) A communication error has occurred in the main board.
Before executing the (Action 1), perform a complete controller back-up to save all your programs and settings.
(Action 1) Replace the main board.

SRVO-057 FSSB disconnect (G:i A:j)

(Explanation) Communication was interrupted in the main board.
Before executing the (Action 1), perform a complete controller back-up to save all your programs and settings.
(Action 1) Replace the main board.
(Action 2) Replace the input unit.

SRVO-058 FSSB xx init error (yy)

(Explanation) Communication was interrupted in the main board.
Before executing the (Action 1), perform a complete controller back up to save all your programs and settings.
(Action 1) Replace the main board.

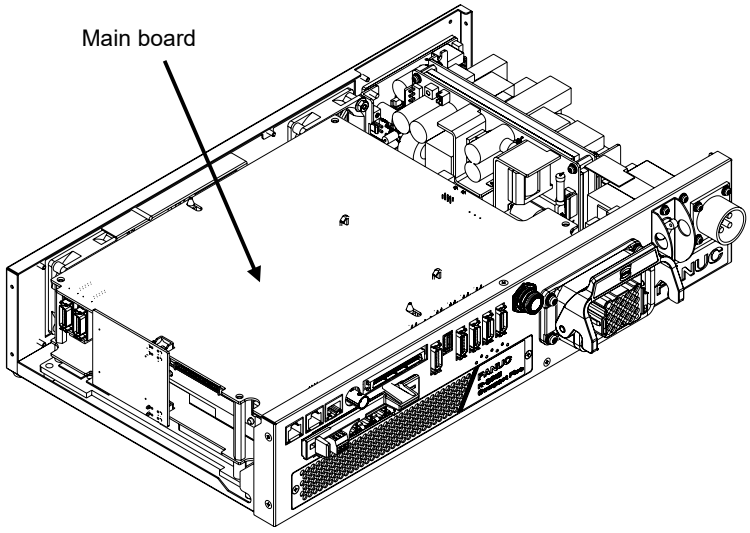


Fig.3.5 (m) **SRVO-055 FSSB com error 1**
SRVO-056 FSSB com error 2
SRVO-057 FSSB disconnect
SRVO-058 FSSB init error

SRVO-059 Servo amp init error (G:i A:j)

(Explanation) Servo amplifier initialization is failed.
Before executing the (Action 1), perform a complete controller back-up 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 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 with 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.
(Action) Replace the Pulsecoder with 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) When power is supplied to the motor after it has become sufficiently cool, if the alarm still occurs, replace the motor.

SRVO-068 DTERR alarm (Grp:i Ax:j)

(Explanation) The serial Pulsecoder does not return 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 the (Action 4), perform a complete controller back-up to save all your programs and settings.
(Action 4) Replace the main board.
(Action 5) Replace the interface unit.
(Action 6) Replace the internal cable of the robot (Pulsecoder/Motor).

SRVO-069 CRCERR alarm (Grp:i Ax:j)

(Explanation) The serial data has 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

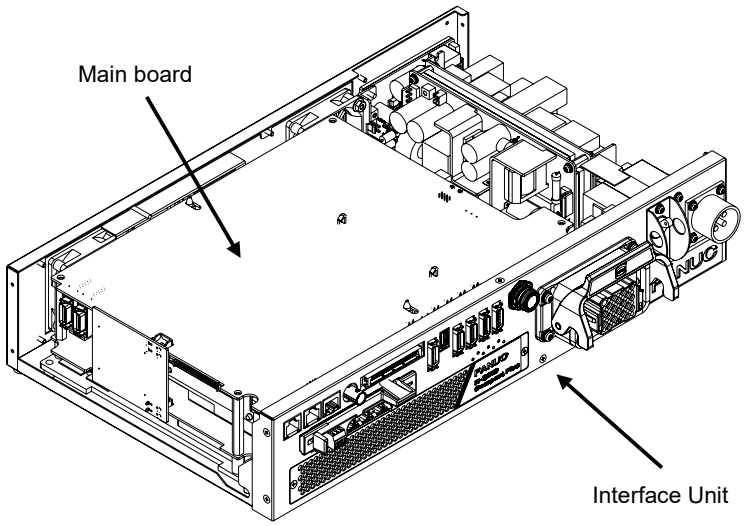


Fig.3.5 (n) SRVO-059 Servo amp init error
SRVO-070 STBERR alarm

SRVO-071 SPHAL alarm (Grp:i Ax:j)

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

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

SRVO-072 PMAL alarm (Group: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.
(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.
(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 check whether the machinery load of the corresponding axis is increased.

(Action 2) Check whether the load settings are valid.

(Action 3) Check whether the brake of the corresponding axis is released.

(Action 4) Check whether the load weight is within the rated range. If the weight exceeds the upper limit, decrease it to the limit.

(Action 5) Check whether the voltage input to the controller is within the rated voltage.

Before executing the (Action 6), perform a complete controller back-up 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.

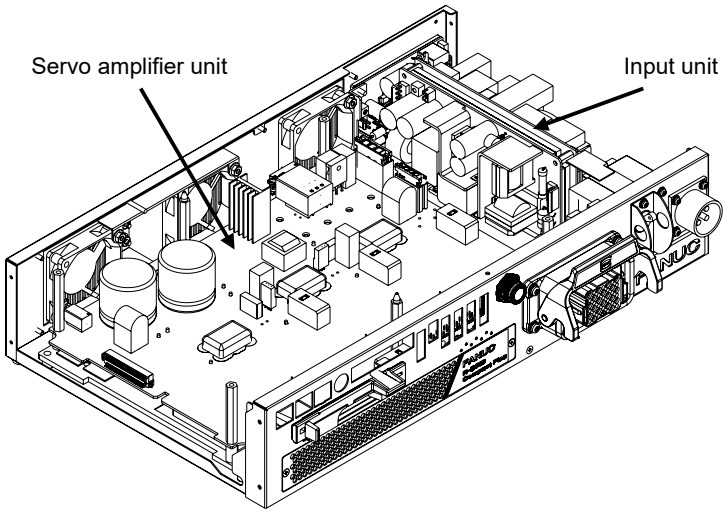


Fig.3.5 (o) SRVO-076 Tip stick detection

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 with 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) When power is supplied to the Pulsecoder after it has become sufficiently cool, if the alarm still occurs, 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 the (Action 4), perform a complete controller back-up 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) Action as same as the SRVO-090.

SRVO-092 STBERR alarm (Track enc:i)

(Explanation) Communication between the Pulsecoder and main board is abnormal.
(Action) Action as same as the 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) Action as same as the 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 1) 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 the (Action 2), perform a complete controller back-up 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.

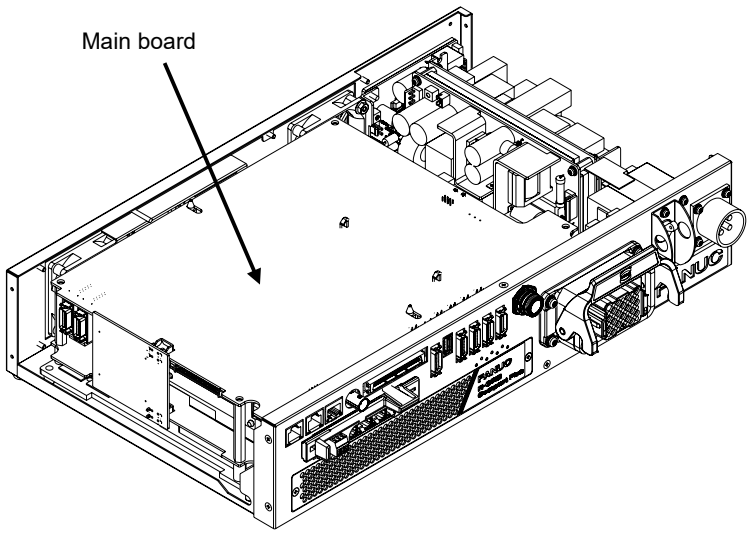


Fig.3.5 (p) SRVO-105 Door open or E-stop

SRVO-123 Fan motor rev slow down(i)

(Explanation) The rotation speed of fan motor is slow 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.

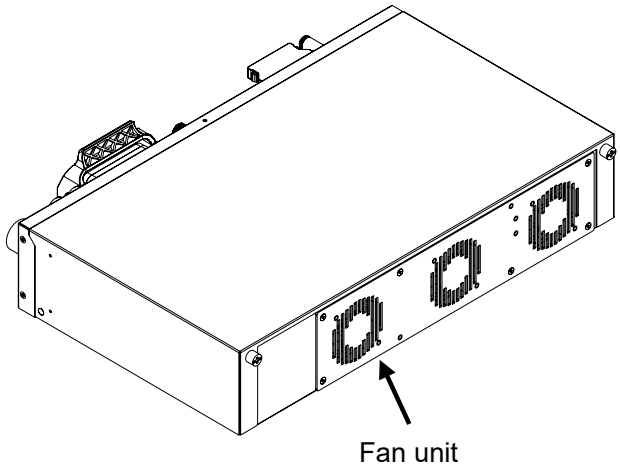


Fig.3.5 (q) SRVO-123 Fan motor rev slow down(i)

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) Decrease the operating condition or reduce the payload of robot.

(Action 2) Check 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 3) It is possible that the glitch of source causes this alarm. Check whether the glitch of power source was occurred.

(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.

(Action 7) 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 the input voltage to the controller is within the rated voltage.

(Action 2) Make sure that the CRRA31 connector of servo amplifier unit and input unit are connected tightly.

(Action 3) Replace the input unit.

Before executing the (Action 4), perform a complete controller back up 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.

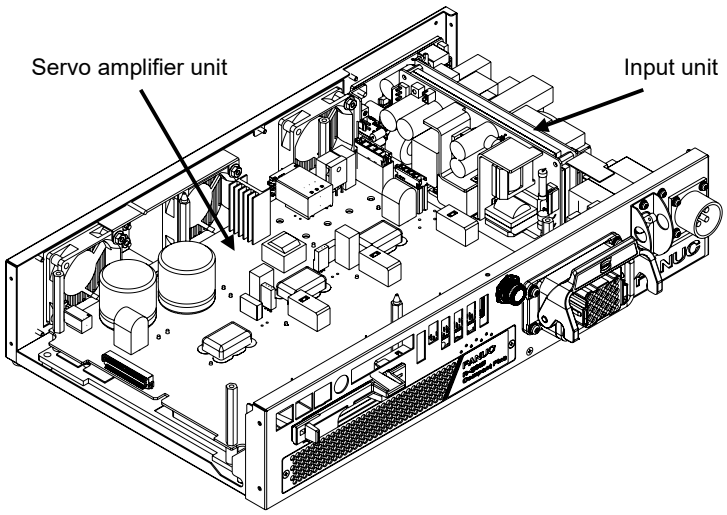


Fig.3.5 (r) SRVO-156 IPMAL alarm
SRVO-157 CHGAL alarm

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.

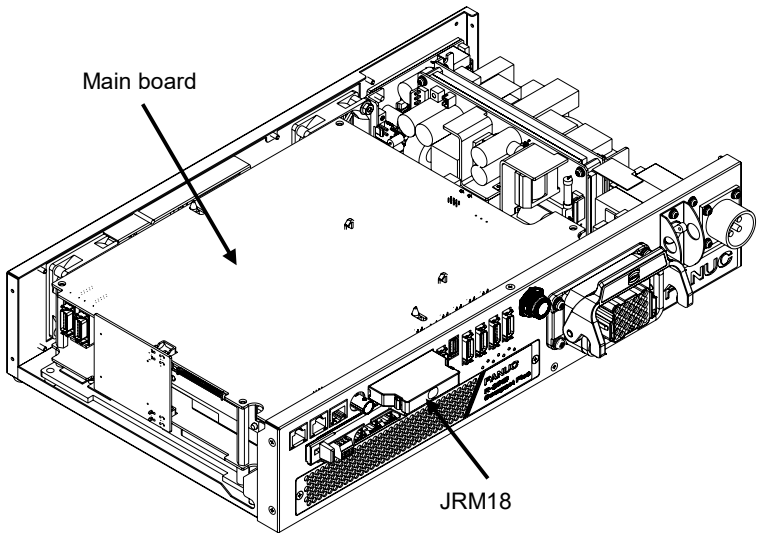


Fig.3.5 (s) SRVO-204 External (SVEMG abnormal) E-stop

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.

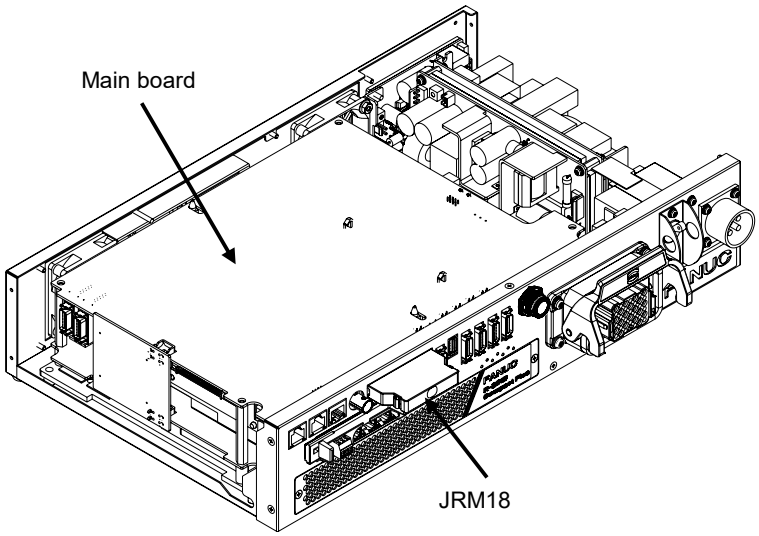


Fig.3.5 (t) SRVO-205 Fence open (SVEMG abnormal)

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.
Before executing the (Action 3), perform a complete controller back up to save all your programs and settings.
(Action 3) Replace the main board.
(Action 4) Replace the interface unit.

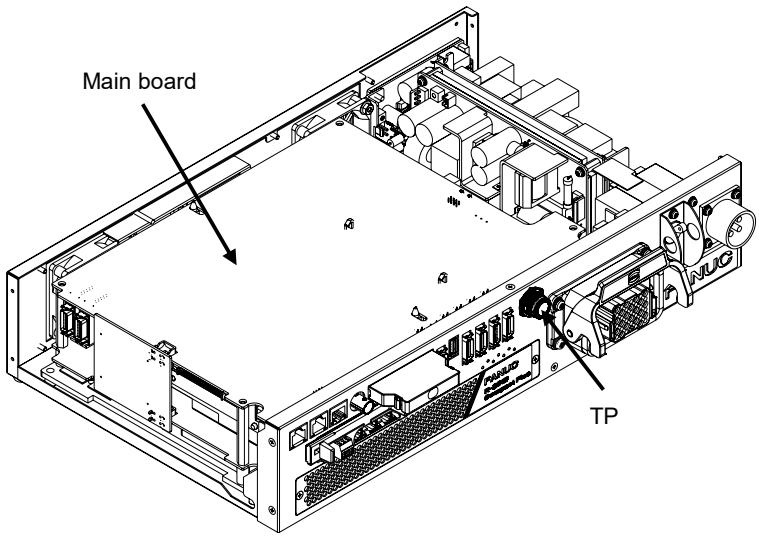


Fig.3.5 (u) SRVO-206 Enabling device (Deadman switch) (SVEMG abnormal)

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 the input voltage to the controller is within the rated voltage.
Before executing the (Action 3), perform a complete controller back up 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 with a card corresponding to the set number of axes.

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.

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 a complete controller back up 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.

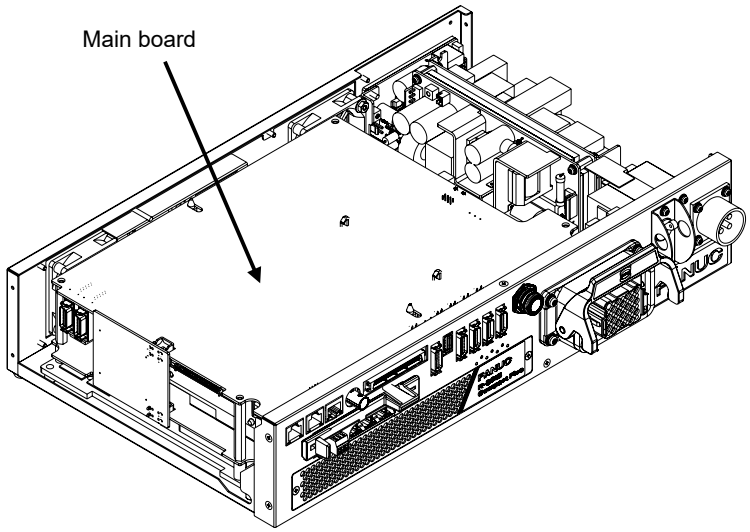


Fig.3.5 (v) **SRVO-216 OVC (total)**
SRVO-221 Lack of DSP
SRVO-223 DSP dry run (a,b)

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, and restore the image backup.

(Action 3) Replace the interface unit.

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 0V 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, and restore the image backup.

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.
If a chain error is detected, correct the cause of the alarm then reset the alarm according to the method described later.

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

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

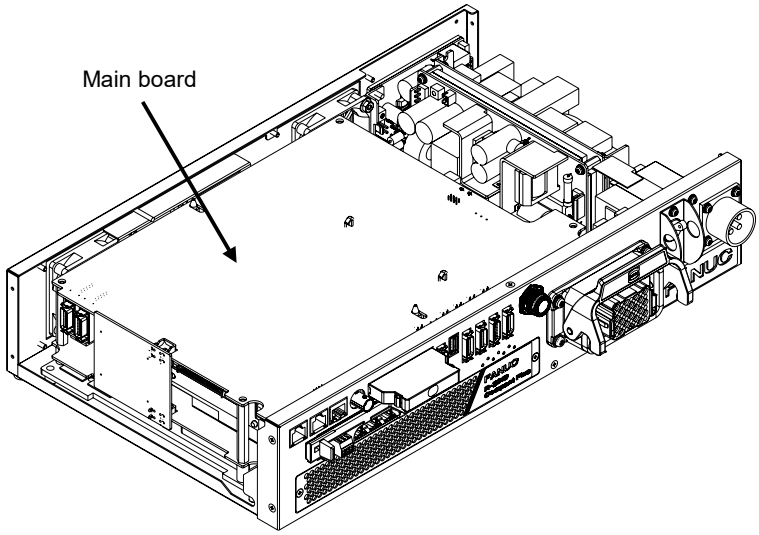


Fig.3.5 (w) **SRVO-230 Chain 1 (+24V) abnormal a, b**
SRVO-231 Chain 2 (0V) abnormal a, b

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) 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.
(Action 6) Replace the interface unit.

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.

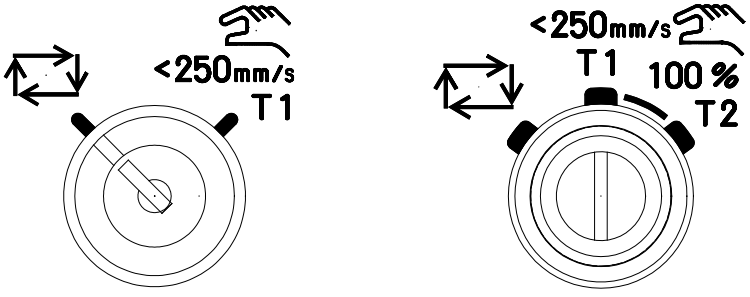
(Action 1) Cause the same error to occur again, and then perform resetting.
(Action 2) Replace the input unit.
Before executing the (Action 3), perform a complete controller back up to save all your programs and settings.
(Action 3) Replace the servo amplifier unit.

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 the (Action 1), perform a complete controller back up 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.



2 mode switch 3 mode switch

(Mode switch)

Fig.3.5 (x) **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 specification (See Fig 2.3.5 (e) in II CONNECTIONS).

Before executing the (Action 3), perform a complete controller back up 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.

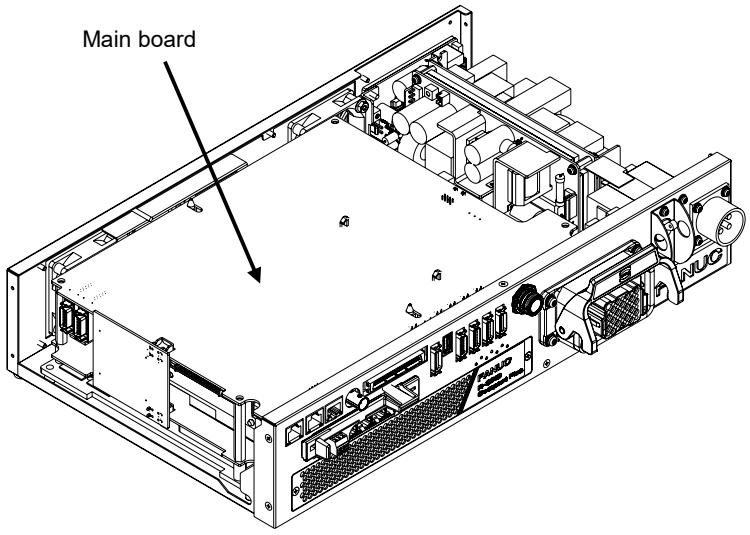


Fig.3.5 (y) SRVO-266 FENCE1 status abnormal
SRVO-267 FENCE2 status abnormal

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 2.3.5 (e) in II CONNECTIONS).
Before executing the (Action 3), perform a complete controller back up 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.

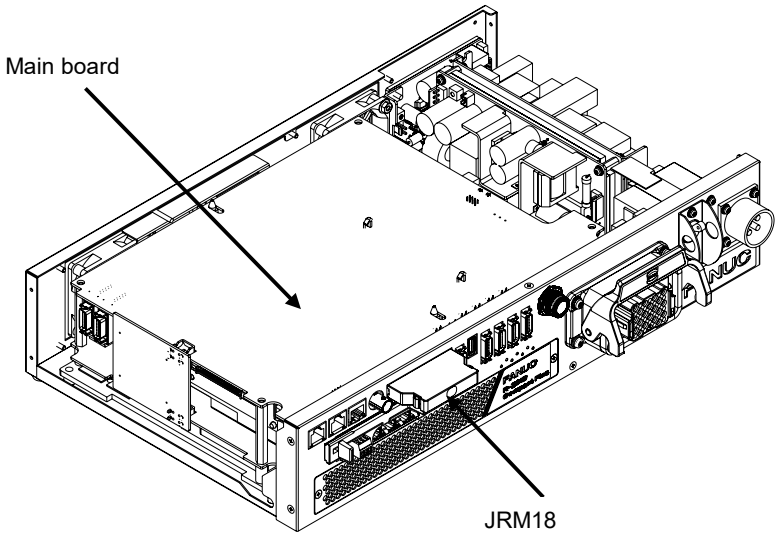


Fig.3.5 (z) SRVO-270 EXEMG1 status abnormal
SRVO-271 EXEMG2 status abnormal

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 t the enabling device (the deadman switch) is pressed to a 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 specification
(See Fig 2.3.5 (e) in II CONNECTIONS).

(Action 4) Check whether fuse (FUSE1) on the front board has blown. If the fuse has blown, replace the front board including the fuse.

(Action 5) Replace the teach pendant cable, NTED cable and jumpers.

(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.

(Action 8) Replace the interface unit.

> ⚠ **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 although the emergency stop button on the switch box was pressed.

Before executing the (Action 1), perform a complete controller back up 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 although the emergency stop button on the teach pendant was pressed.

(Action 1) Replace the teach pendant.

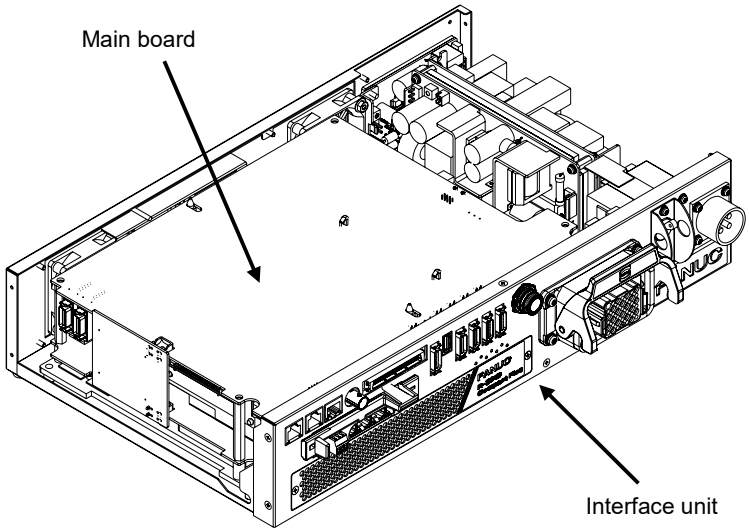
(Action 2) Replace the teach pendant cable, NTED cable and jumpers.

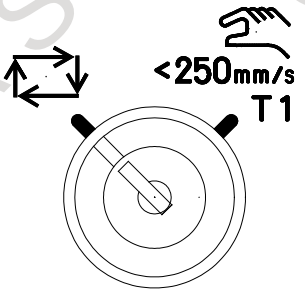
Before executing the (Action 3), perform a complete controller back up to save all your programs and settings.

(Action 3) Replace the main board.

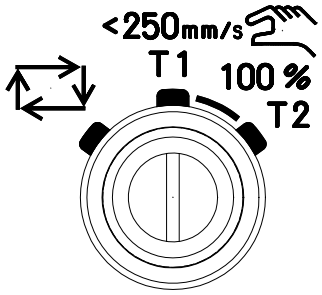
(Action 4) Replace the interface unit.

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





2 mode switch



3 mode switch

(Mode switch)

Fig.3.5 (aa) **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 over heat (G:i A:j)

(Explanation) IPM on the servo amplifier unit is overheated.
(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 back up 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-300 Hand broken/HBK disabled
SRVO-302 Set Hand broken to ENABLE

(Explanation) Although HBK was disabled, the HBK signal was input.
(Action 1) Press RESET on the teach pendant to release the alarm.
(Action 2) Check whether the hand broken signal is connected to the robot. When the hand broken signal circuit is connected, enable hand broken.

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 back up 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.
(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 back up 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 the (Action 1), perform a complete controller back up 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.

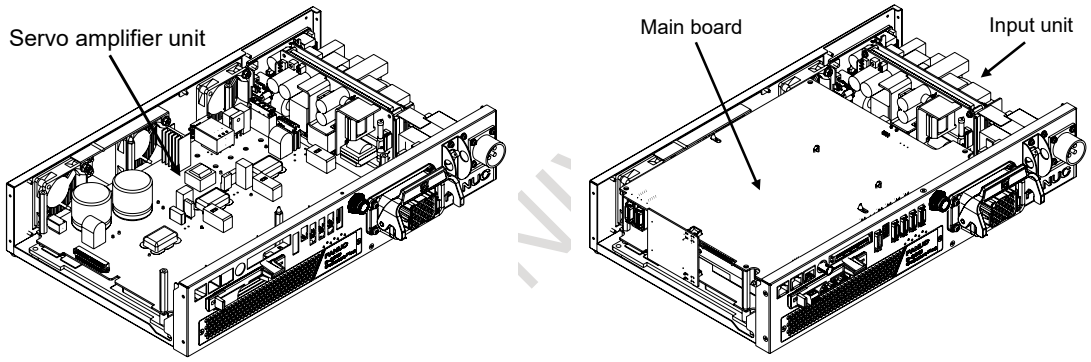


Fig.3.5 (ab)

SRVO-291 IPM over heat
SRVO-295 Amp com error
SRVO-297 Improper input power
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.
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.

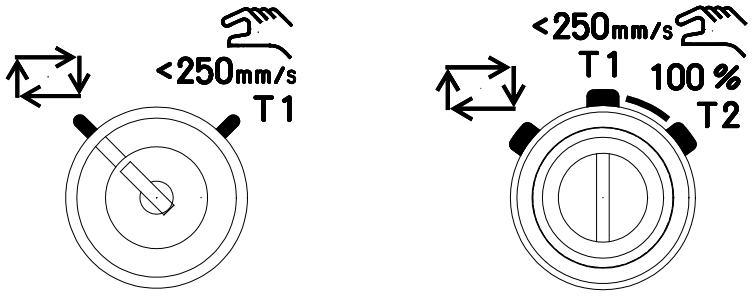
> **NOTE**
> For the procedure of recovery from this alarm, see the descriptions of SRVO-230 and SRVO-231.

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.

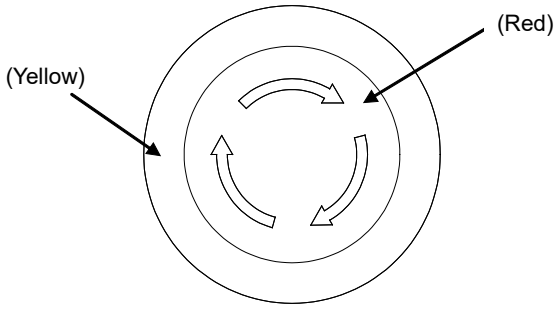
> ⚠ **WARNING**
> If this alarm is issued, do not reset the chain error alarm until the failure is identified and repaired. If robot use is continued with one of the duplicate circuits being faulty, safety may not be guaranteed when the other circuit fails.

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



2 mode switch 3 mode switch

(Mode switch)



(Emergency stop button)

Fig.3.5 (ac) **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.2.3.5 (e) 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.

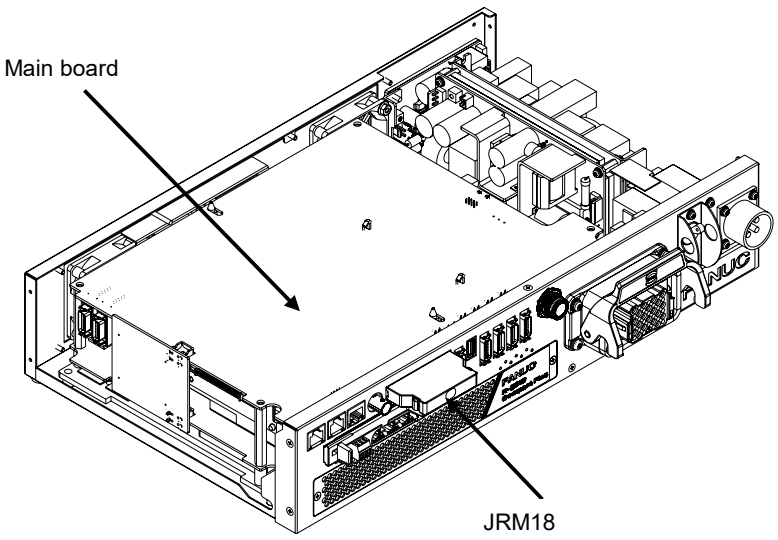


Fig.3.5 (ad) **SRVO-378 SFDIxx status abnormal**

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 1), 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 1), 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 the (Action 1), perform a complete controller back-up 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 the (Action 1), perform a complete controller back-up 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 CPU bus data 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-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%s (G:i A:j)

(Explanation) An error is found in the discharge circuit in the servo amplifier.
Before executing the (Action 1), perform a complete controller back-up 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%s (G:i A:j)

(Explanation) An error is found in the circuit.
Before executing the (Action 1), perform a complete controller back-up 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.

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.
Before executing the (Action 2), perform a complete controller back-up to save all your programs and settings.
(Action 2) Replace the main board.

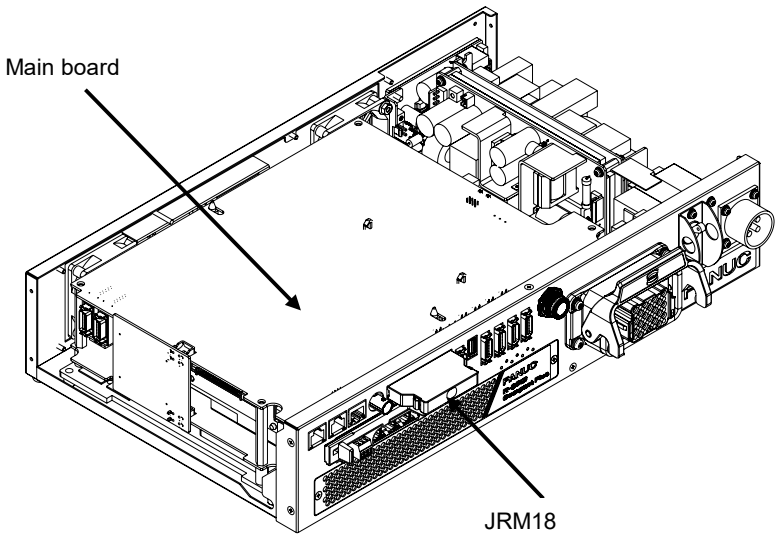


Fig.3.5 (ae) PRIO-095 Overload

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.

(1) Fuses on the main board

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 +24V output for the servo amplifier unit (A60L-0001-0290#LM20C)

Name	Symptom observed when fuse has blown	Action
FUSE7	+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. (*)
FUSE8	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. (*) 4. Replace the option (mini) slot. 5. Replace the backplane board. (*) 6. Replace the interface unit. (*)
FUSE9	Fan motor abnormal alarm and fuse blown alarm occur.	1. Replace the fan unit. 2. Replace the servo amplifier unit. (*) 3. Replace the side board. 4. Replace the main board. (*)

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

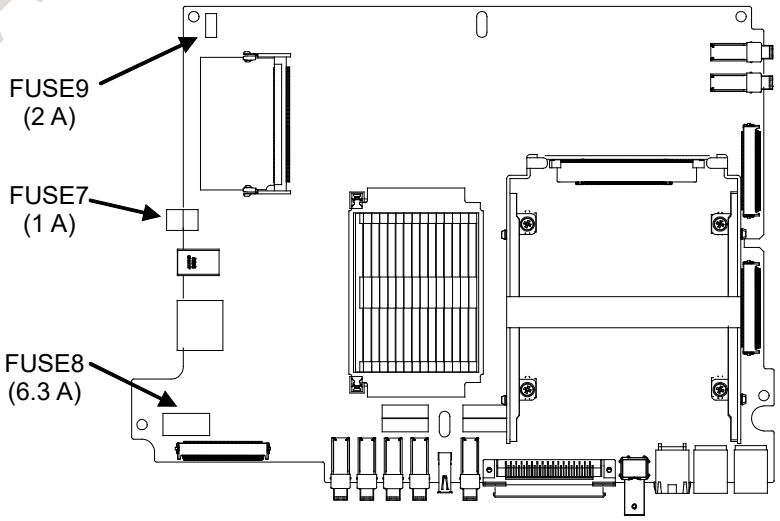


Fig.3.6 (a) Fuse on the main board

(2) Interface unit fuses

FUSE1: For protecting the +24V output for teach pendant (A60L-0001-0290#LM10C)
FUSE2: For protecting the +24 V output of the peripheral device interface (A60L-0001-0290#LM10C)
FUSE3: For emergency stop circuit (A60L-0001-0290#LM10C)
FUSE4: For protecting the +24V output for EE (A60L-0001-0290#LM20C)
FUSE5: For protecting the +5V output for Pulsecoder (A60L-0001-0290#LM20C)
FUSE6: For protecting the +24V output for brake (A60L-0001-0290#LM10C)

Name	Symptom observed when fuse has blown	Action
FUSE1	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. 3. Replace the interface unit. (*)
FUSE2	An 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. (*)
FUSE3	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. . 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 interface unit. (*) 7. Replace the main board. (*)
FUSE4	An 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. (*) 5. Replace the interface unit. (*)
FUSE5	An alarm (SRVO-068) is displayed	1. See the description about (SRVO-068).
FUSE6	An alarm (SRVO-018) is displayed on the teach pendant.	1. See the description about (SRVO-018).

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

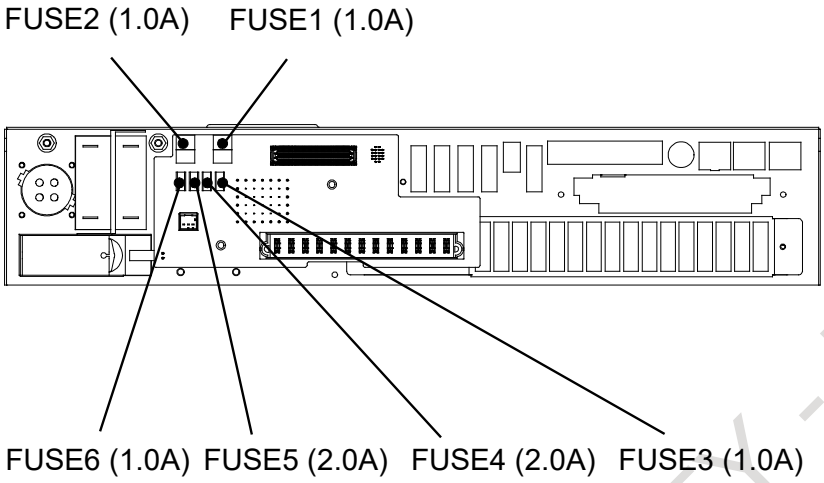


Fig.3.6 (b) Fuse on the interface unit

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

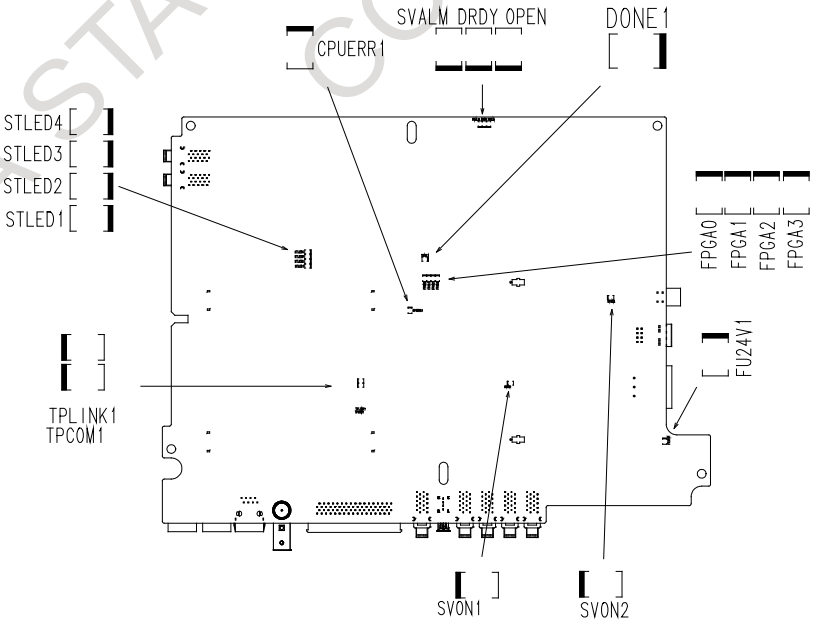


Fig. 3.7.1 (a) Troubleshooting using the LEDs on the main board

Step	LED ■ ON □ OFF ☆ BLINK	Action to be taken
1: After power-on, all LEDs are lit.	■ STLED4 ■ STLED3 ■ STLED2 ■ STLED1	* [Action 1] Replace the CPU card. * [Action 2] Replace the main board.
2: Software operation start-up.	□ STLED4 □ STLED3 □ STLED2 □ STLED1	* [Action 1] Replace the CPU card. * [Action 2] Replace the main board.
3: The initialization of dram on the CPU card is completed.	■ STLED4 □ STLED3 □ STLED2 □ STLED1	* [Action 1] Replace the CPU card. * [Action 2] Replace the main board.
4: The initialization of DRAM on the communication IC is completed.	□ STLED4 ■ STLED3 □ STLED2 □ STLED1	* [Action 1] Replace the CPU card. * [Action 2] Replace the main board. * [Action 3] Replace the FROM/SRAM module.
5: The initialization of the communication IC is completed.	■ STLED4 ■ STLED3 □ STLED2 □ STLED1	* [Action 1] Replace the CPU card. * [Action 2] Replace the main board. * [Action 3] Replace the FROM/SRAM module.
6: The loading of the basic software is completed.	□ STLED4 □ STLED3 ■ STLED2 □ STLED1	* [Action 1] Replace the main board. * [Action 2] Replace the FROM/SRAM module.
7: Basic software start-up.	■ STLED4 □ STLED3 ■ STLED2 □ STLED1	* [Action 1] Replace the main board. * [Action 2] Replace the FROM/SRAM module. [Action 3] Replace the input unit.
8: Start-up of communication with the teach pendant.	□ STLED4 ■ STLED3 ■ STLED2 □ STLED1	* [Action 1] Replace the main board. * [Action 2] Replace the FROM/SRAM module.
9: The loading of optional software is completed.	■ STLED4 ■ STLED3 ■ STLED2 □ STLED1	* [Action 1] Replace the main board. [Action 2] Please check the equipment connected to JRS26 (I/O Link).
10: DI/DO initialization	□ STLED4 □ STLED3 □ STLED2 ■ STLED1	* [Action 1] Replace the FROM/SRAM module. * [Action 2] Replace the main board.

Step	LED ■ ON □ OFF ☆ BLINK	Action to be taken
11: The preparation of the SRAM module is completed.	■ STLED4 □ STLED3 □ STLED2 ■ STLED1	* [Action 1] Replace the main board.
12: Axis control circuit initialization	□ STLED4 ■ STLED3 □ STLED2 ■ STLED1	* [Action 1] Replace the main board.
13: Calibration is completed.	■ STLED4 ■ STLED3 □ STLED2 ■ STLED1	* [Action 1] Replace the main board.
14: Start-up of power application for the servo system	□ STLED4 □ STLED3 ■ STLED2 ■ STLED1	* [Action 1] Replace the main board.
15: Program execution	■ STLED4 □ STLED3 ■ STLED2 ■ STLED1	* [Action 1] Replace the main board. [Action 2] Please check the equipment connected to JRS26 (I/O Link).
16: DI/DO output start-up.	□ STLED4 ■ STLED3 ■ STLED2 ■ STLED1	* [Action 1] Replace the main board.
17: Initialization is terminated.	■ STLED4 ■ STLED3 ■ STLED2 ■ STLED1	Initialization has ended normally.
18: Normal status	■ STLED4 ■ STLED3 ☆ STLED2 ☆ STLED1	Status LEDs 1 and 2 blink when the system is operating normally.

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

LED indication	Description
CPUERR1 (Red)	[Description] CPU card is not working. * [Action 1] Replace the CPU card.
FU24V1 (Red)	[Description] When the LED (red) turned on, 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. [Action 4] Replace the option (mini) slot. * [Action 5] Replace the backplane board. * [Action 6] Replace the interface unit.
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 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.
DRDY (Green)	[Description] Lights 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.
OPEN (Green)	[Description] Lights when the communication in the main board is normal. If the LED does not light: * [Action] Replace the main board.
FPGA0/FPGA1/ FPGA2/FPGA3 (Green)	[Description] These LED indicate the status of the FPGA for vision.
DONE1 (Red)	

* If the main board or CPU card or the backplane board or the interface unit is removed, the contents of memory (parameters, specified data, etc.) will be lost. Before you replace the unit, therefore, make a backup copy of the data.
If an alarm is issued, data backup may be disabled. So, back up the contents of memory routinely.

3.7.2 Troubleshooting Using the LEDS on the Interface Unit

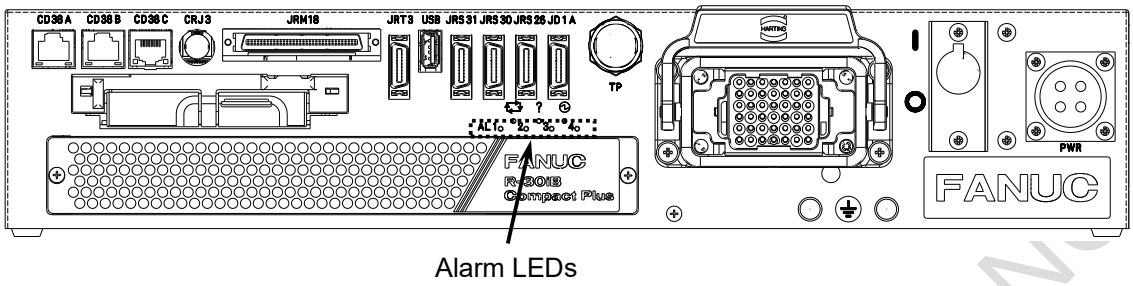


Fig. 3.7.2 (a) Troubleshooting using the LEDs on the interface unit

Alarm LED indicator ● ON ○ OFF	Description
AL 1● 2● 3● 4●	[Description] A parity alarm condition has occurred in DRAM on the CPU card installed on the main board. * [Action1] Replace the CPU card. * [Action2] Replace the main board.
AL 1● 2○ 3● 4●	[Description] A parity alarm condition has occurred in SRAM on the FROM/SRAM module installed on the main board. * [Action1] Replace the FROM/SRAM module. * [Action2] Replace the main board.
AL 1● 2● 3○ 4●	[Description] A bus error has occurred in the communication controller. * [Action] Replace the main board.
AL 1● 2○ 3○ 4●	[Description] A parity alarm condition has occurred in DRAM controlled by the communication controller. * [Action] Replace the main board.
AL 1● 2○ 3● 4○	[Description] A servo alarm condition has occurred on the main board. * [Action1] Replace the main board. [Action2] If an option board is installed, replace the option board. * [Action3] Replace the backplane board.
AL 1● 2● 3○ 4○	[Description] The SYSEMG alarm has occurred. * [Action1] Replace the CPU card. * [Action2] Replace the main board. [Action3] If an option board is installed, replace the option board. * [Action4] Replace the backplane board.
AL 1● 2○ 3○ 4○	[Description] The SYSFAIL alarm has occurred. * [Action1] It is possible that an instant disconnection of power source causes this alarm. Check whether an instant disconnection occurred. * [Action2] Replace the CPU card. * [Action3] Replace the main board. [Action4] If an option board is installed, replace the option board.
AL 1○ 2○ 3○ 4○	[Description] Above alarms do not occur.

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

3.7.3 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.

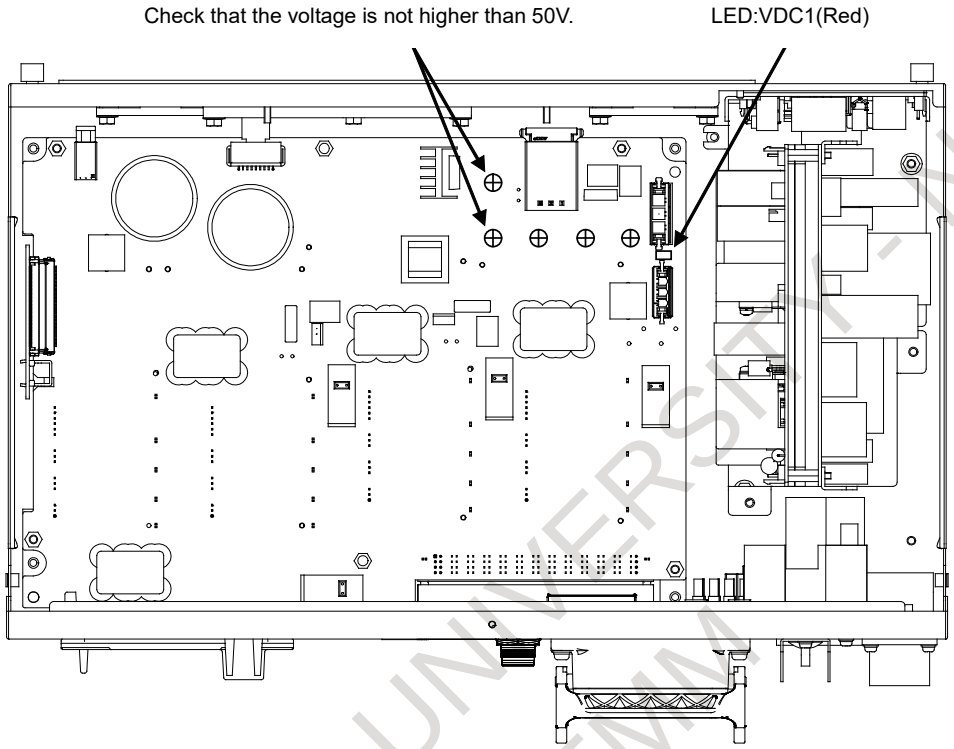


Fig.3.7.3 (a) LEDs on the servo amplifier unit

> ⚠ **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.

LED	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.

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

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) Check and corrective action to be made if manual operation is impossible

(Check 1)	Check whether the teach pendant is enabled.
(Corrective action)	Turn on the teach pendant "enable".
(Check 2)	Check whether the teach pendant is handled correctly.
(Corrective action)	To move an axis by manual operation, press the axis selection key and shift key at the same time. Set the override for manual feed to a position other than the FINE and VFINE positions.
(Check 3)	Check whether the ENBL signal of the peripheral device control interface is set to on.
(Corrective action)	Place the peripheral device control interface in the ENBL status.
(Check 4)	Check whether the HOLD signal of the peripheral device control interface (hold status). (Check whether the hold lamp on the teach pendant is on.)
(Corrective action)	Turn off the HOLD signal of the peripheral device control interface.
(Check 5)	Check whether the previous manual operation has been completed.
(Corrective action)	If the robot cannot be placed in the effective area because of the offset of the speed command voltage preventing the previous operation from being completed, check the position deviation on the status screen, and change the setting.
(Check 6)	Check whether the controller is in the alarm status.
(Corrective action)	Release the alarm.

(2) Check and corrective action to be taken if the program cannot be executed

(Check 1)	Check whether the ENBL signal for the peripheral-device control interface is on.
(Corrective action)	Put the peripheral-device control interface in the ENBL state.
(Check 2)	Check whether the HOLD signal for the peripheral-device control interface is on. Also check whether the HOLD lamp on the teach pendant is on.
(Corrective action)	If the HOLD signal of the peripheral device control interface is on, turn it off.
(Check 3)	Check whether the previous manual operation has been completed.
(Corrective action)	If the robot cannot be placed in the effective area because of the offset of the speed command voltage, which prevents the previous operation from being completed, check the position deviation on the status screen, then change the setting.
(Check 4)	Check whether the controller is in the alarm status.
(Corrective action)	Release the alarm.

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
Steadily OFF	
Steadily 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 (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 unit of interest 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

Card and Modules

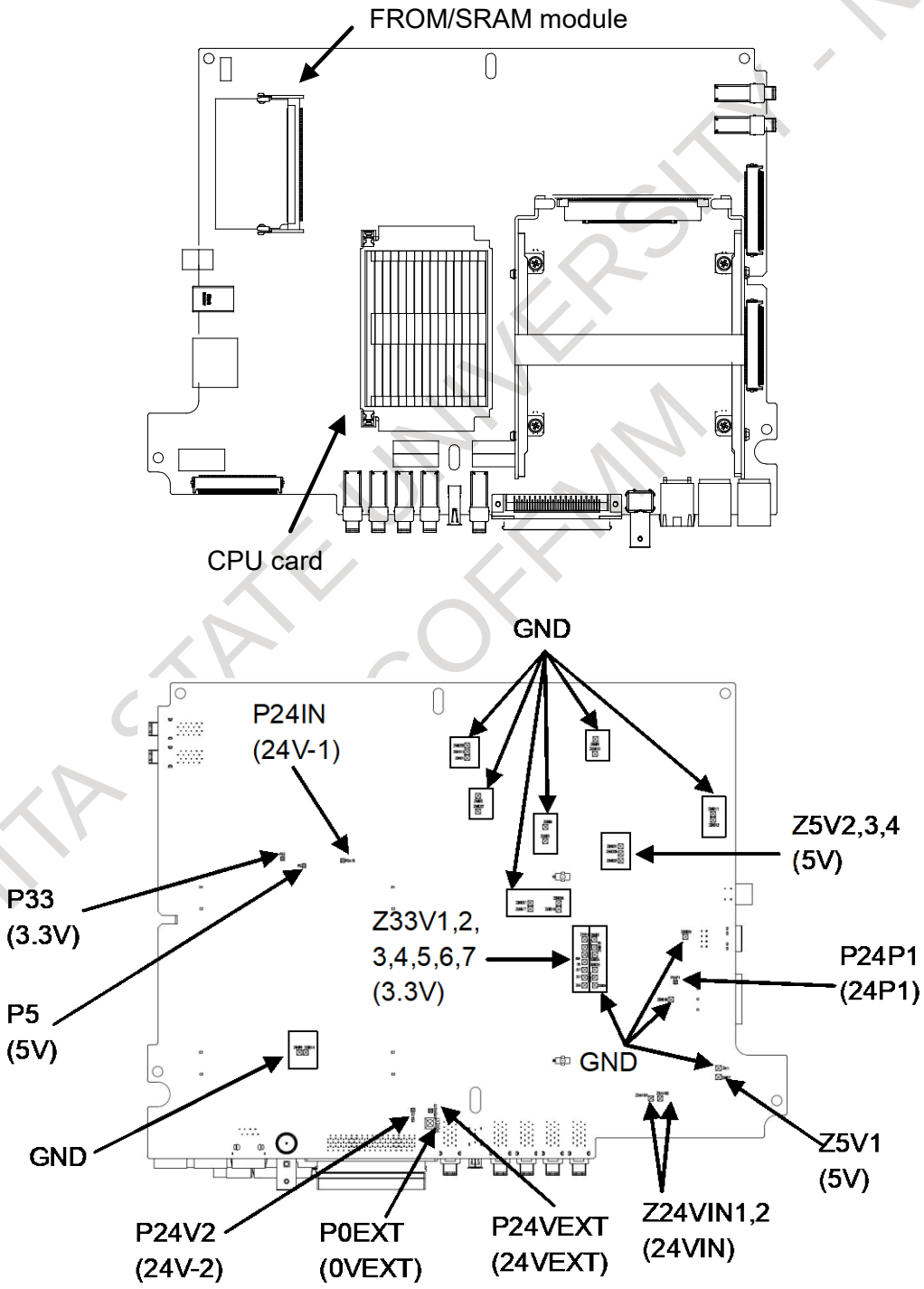


Fig.4.1 (a) Main board

Name	Ordering specification	Maintenance specification	Note
Main board	A05B-2690-H001	A17B-8100-0800	Standard
	A05B-2690-H002	A17B-8100-0801	Vision I/F, Force sensor I/F, Line tracking, HDI
CPU card	A05B-2670-H020	A17B-3301-0250	Standard / DRAM 1GB
FROM/SRAM module	A05B-2600-H063	A20B-3900-0286	FROM 64M/ SRAM 1M
	A05B-2600-H064	A20B-3900-0287	FROM 64M/ SRAM 2M
	A05B-2600-H065	A20B-3900-0288	FROM 64M/ SRAM 3M
	A05B-2600-H066	A20B-3900-0280	FROM 128M/ SRAM 1M
	A05B-2600-H067	A20B-3900-0281	FROM 128M/ SRAM 2M
	A05B-2600-H068	A20B-3900-0282	FROM 128M/ SRAM 3M
	A05B-2600-H069	A20B-3900-0293	FROM 256M/ SRAM 1M
	A05B-2600-H070	A20B-3900-0295	FROM 256M/ SRAM 2M
	A05B-2600-H071	A20B-3900-0296	FROM 256M/ SRAM 3M

LEDs

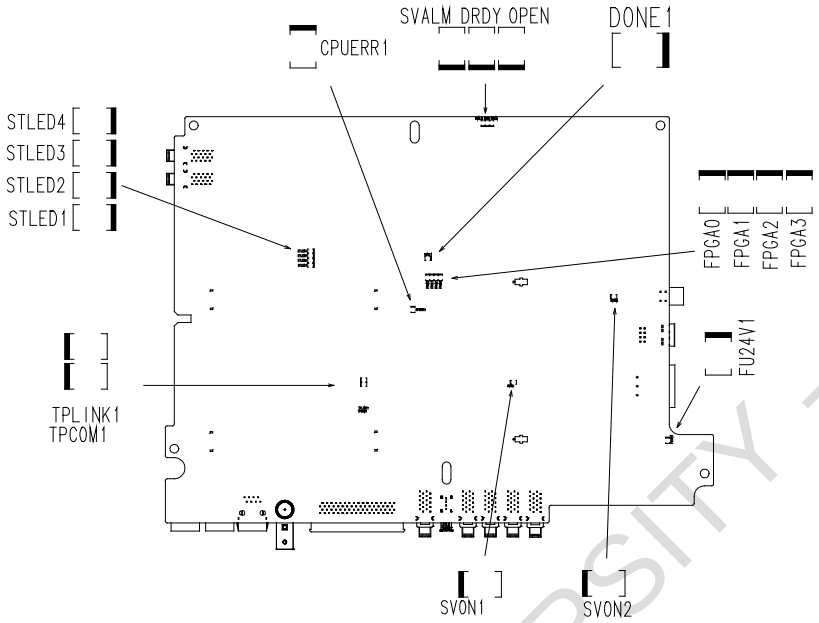


Fig.4.1 (b) Main board (SIDE-A)

ALARM LED	Color	Description
CPUERR1	Red	When the alarm condition has occurred in the CPU card, this LED is turned on. Please see the Section 3.7.TROUBLESHOOTING BASED ON LED INDICATIONS.
FU24V1	Red	When the fuse (FUSE8) is brown, this LED is turned on. Please see the Section 3.7.TROUBLESHOOTING BASED ON LED INDICATIONS.
SVON1/SVON2	Green	When the servo amplifier unit is ready to energize, this LED is turned on. Please see the Section 3.7.TROUBLESHOOTING BASED ON LED INDICATIONS.
SVALM	Red	When the alarm condition has occurred in the servo amplifier unit or main board, this LED is turned on. Please see the Section 3.7.TROUBLESHOOTING BASED ON LED INDICATIONS.
DRDY	Green	When the servo amplifier unit is ready to drive servo motors, this LED is turned on. Please see the Section 3.7.TROUBLESHOOTING BASED ON LED INDICATIONS.
OPEN	Green	Lights when the communication in the main board is normal.
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. Please see the Section 3.7.TROUBLESHOOTING BASED ON LED INDICATIONS.
TPCOM1	Green	Blink during data transmission of TP
TPLINK1	Green	Light when a link of TP is established

Setting of Robot Digital Input (RI) device common voltage

Name	Standard setting	Description
SCOM1	Side A	Robot Digital Input (RI) device common voltage. Side A: +24V common Side B: 0V common

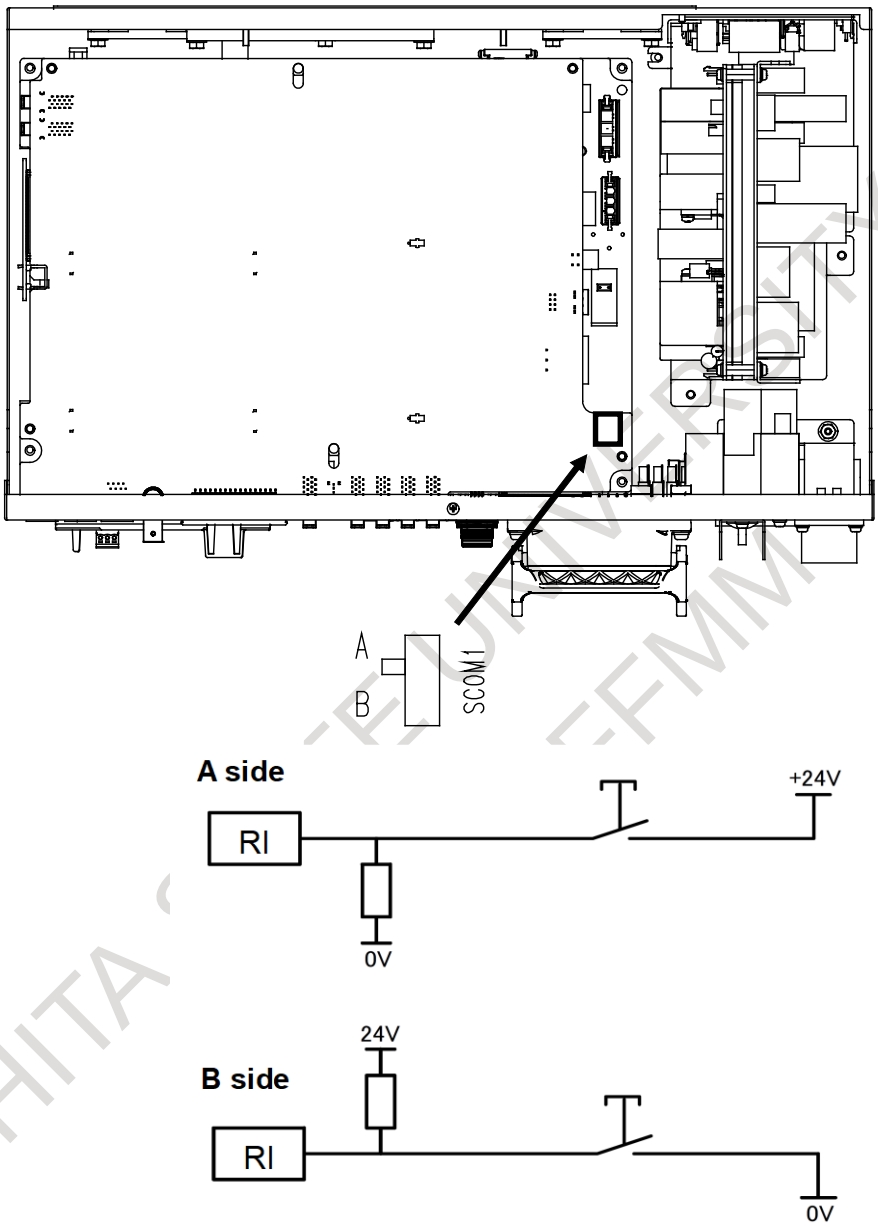


Fig.4.1 (c) Circuit based on jumper pin location or setting of switch

4.2 INPUT UNIT

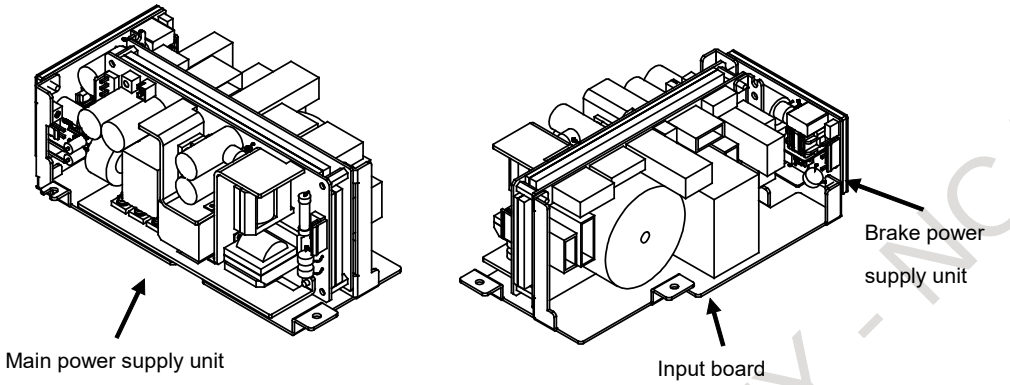


Fig.4.2 (a) Printed circuit boards of the input unit

Name	Ordering specification	Maintenance specification	Note
Input unit	A05B-2690-H040	A05B-2690-C450	
		A20B-1009-0940	Input board

4.3 BACKPLANE BOARD

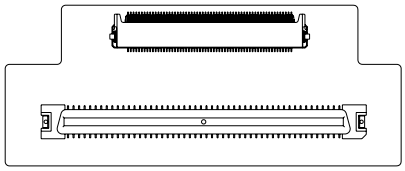


Fig.4.3 (a) Backplane

Name	Ordering specification	Maintenance specification
Backplane board	A05B-2690-H020	A20B-8201-0760

4.4 SIDE BOARD

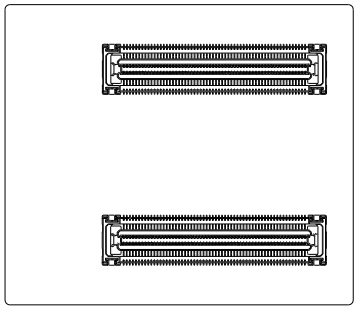


Fig.4.4 (a) Side board

Name	Ordering specification	Maintenance specification
Side board	A05B-2690-H010	A20B-2005-0430

4.5 INTERFACE UNIT

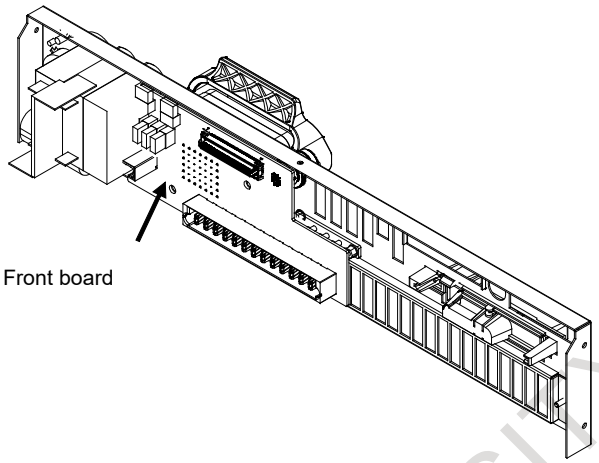


Fig.4.5 (a) Printed circuit board of the interface unit

Name	Ordering specification	Maintenance specification	Note
Interface unit	A05B-2690-H100	A05B-2690-C001	Standard
	A05B-2690-H101	A05B-2690-C002	Vision I/F, Force sensor I/F, Line tracking, HDI

NOTE
Be sure to replace the model name plate when replacing the interface unit.

Name	Ordering specification	Maintenance specification	Note
Model name plate	A05B-2691-H001	A370-0271-0315#A	SR-3*i*A
	A05B-2691-H002	A370-0271-0316#A	SR-6*i*A
	A05B-2691-H003	A370-0271-0326#A	SR-12*i*A
	A05B-2691-H004	A370-0271-0332#A	SR-20*i*A

LED

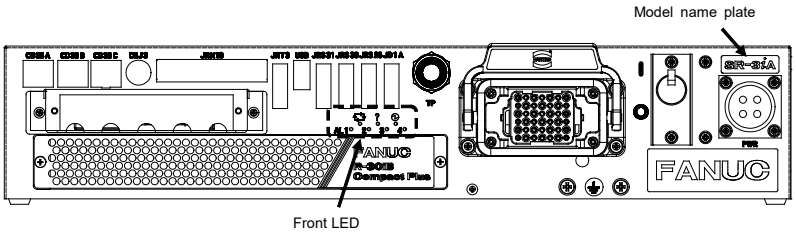
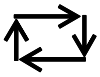


Fig.4.5 (b) LEDs on the interface unit

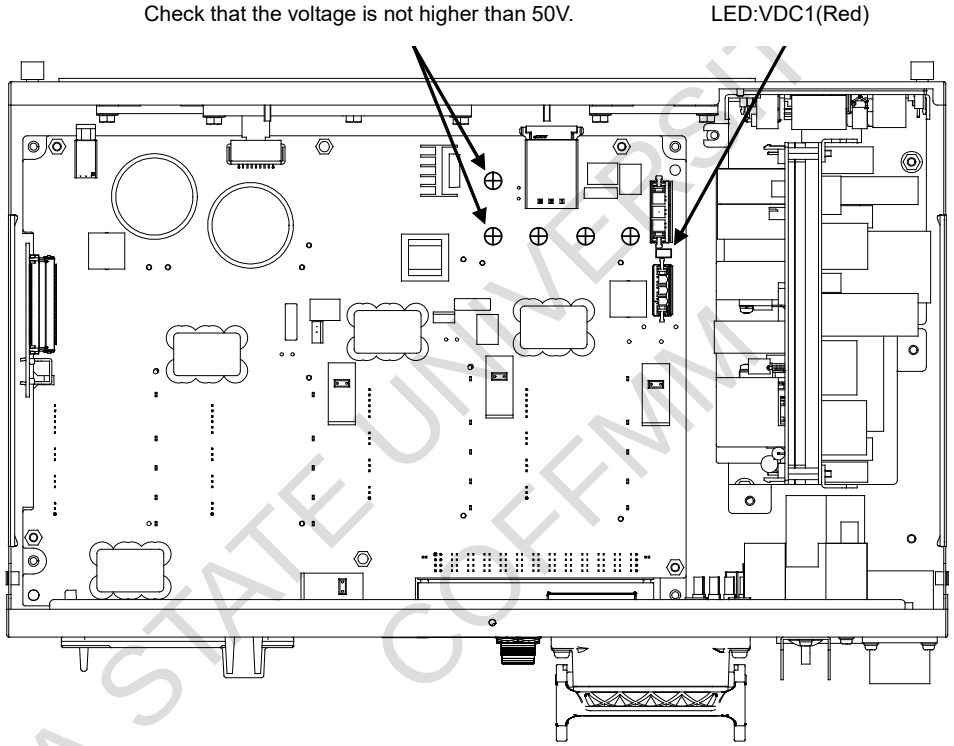
Symbol	Description
	Indicates that the power of the controller is ON.
	Indicates the alarm state. Press the alarm release button to release the alarm state.
	When a program is being executed, this LED is turned on.
AL	When the alarm condition has occurred in the controller, the LEDs are turned on. The four LEDs indicate the contents of the alarm. Please see the Subsection 3.7 TROUBLESHOOTING BASED ON INDICATIONS in II MAINTENANCE.

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.

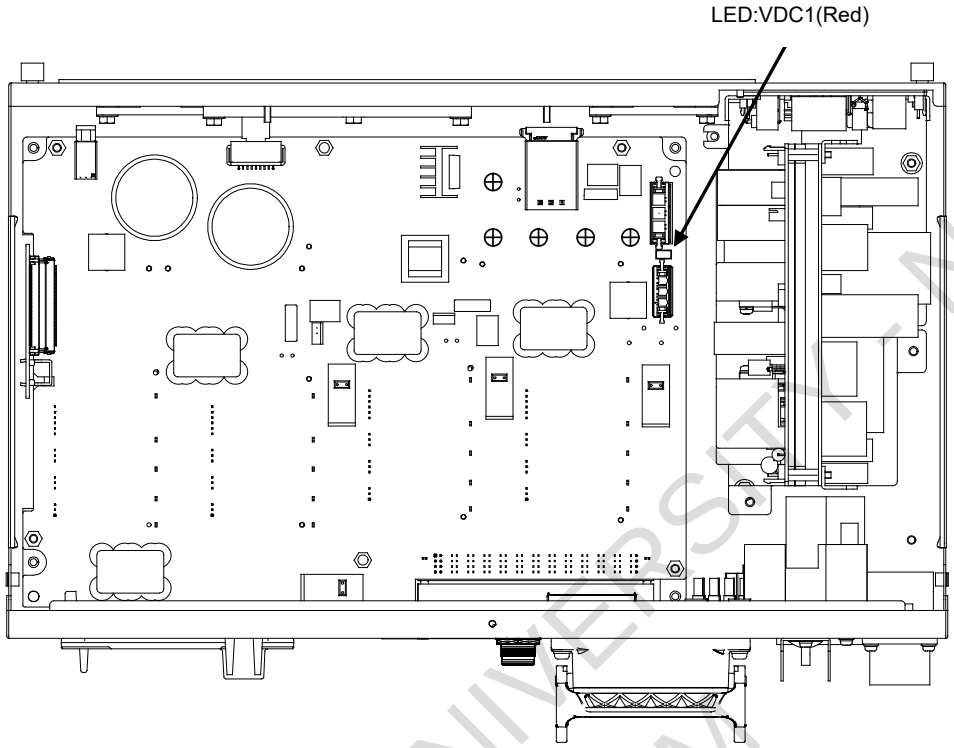
Table 5 (a) Servo amplifier unit specification

Name	Ordering specification	Maintenance specification	ROBOT
Servo amplifier unit	A05B-2690-H050	A06B-6401-C001	SR-3*i*A
	A05B-2690-H051	A06B-6401-C002	SR-6*i*A, SR-12*i*A, SR-20*i*A



⚠ 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.

5.1 LEDS OF SERVO AMPLIFIER UNIT



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

5.2 SERVO AMPLIFIER UNIT SPECIFICATIONS

SPECIFICATIONS TABLE

Servo amplifier unit		A06B-6401-C001	A06B-6401-C002
Output rating	Maximum output voltage	240V ~	
	Output current : J1	20Ap / 3.8Arms	40Ap / 6.1Arms
	Output current : J2	20Ap / 3.8Arms	20Ap / 3.8Arms
	Output current : J3	4Ap / 3.8Arms	20Ap / 3.8Arms
	Output current : J4	4Ap / 3.8Arms	20Ap / 3.8Arms

6 POWER SUPPLY

6.1 BLOCK DIAGRAM OF THE POWER SUPPLY

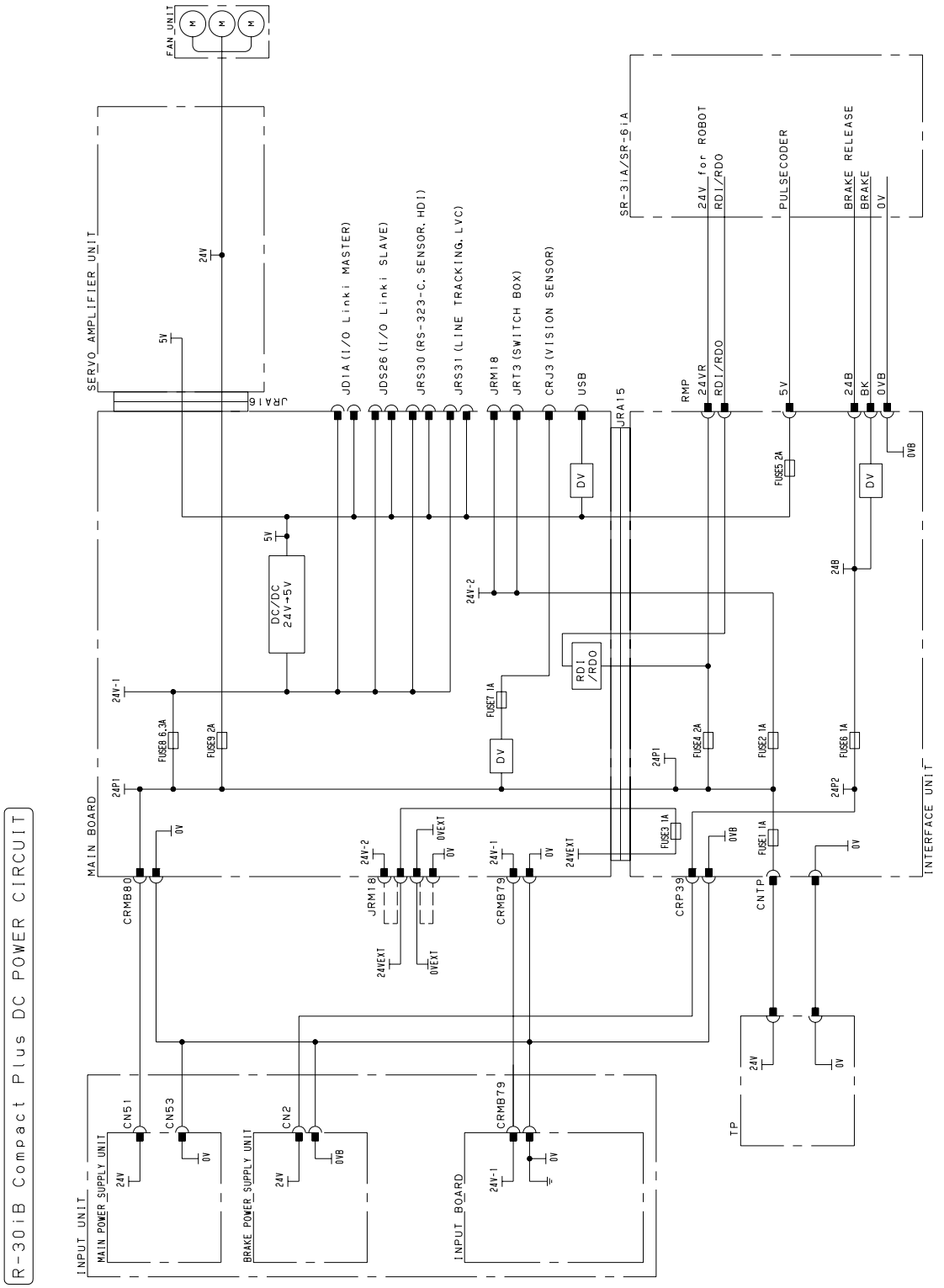


Fig.6.1 (a) Block diagram of the power supply

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" in this manual thoroughly.

⚠ WARNING
Before you start to replace a unit, turn off the controller main power. Also keep all machines in the area of the controller switched. Otherwise, you could injure personnel or damage equipment.

⚠ 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.

⚠ WARNING
Turn off the breaker, disconnect power cable and wait for 1 minute before servicing.

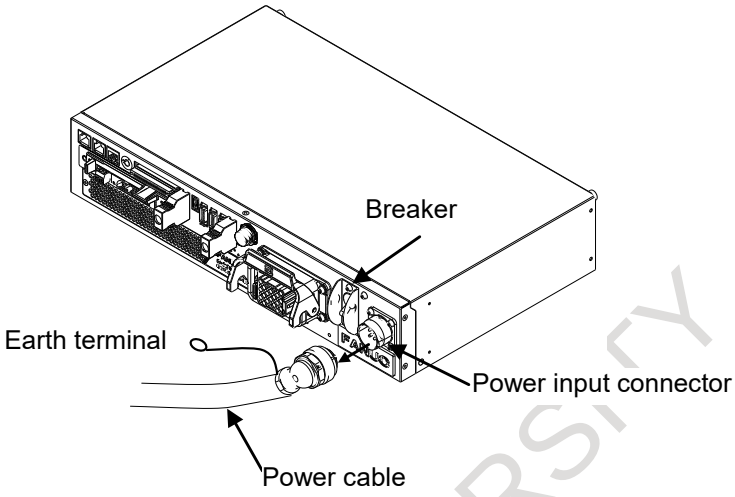
⚠ CAUTION
Components in the controller heat up, so care should be taken. When you have to touch a heated component, prepare a protector such as heat-resistant gloves.

⚠ CAUTION
Be careful not to tighten the countersunk screws too much due to the screw threads will be crushed and the screws cannot be removed if tightening the countersunk screws very strongly.
Recommended tightening torque of M3 countersunk screws is 70cNm.

⚠ CAUTION
1 When you remove a printed-circuit board, do not touch the semiconductor devices on the board with your hand or make 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, interface 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 do not wait for 1 minute after turning off the breaker, it may cause electric shock due to the residual voltage of the internal capacitor.

7.1.1 Removing the Top Plate

(1) Remove the (3) screws fastening the case.
(2) Pull up the board slowly in the arrow direction.

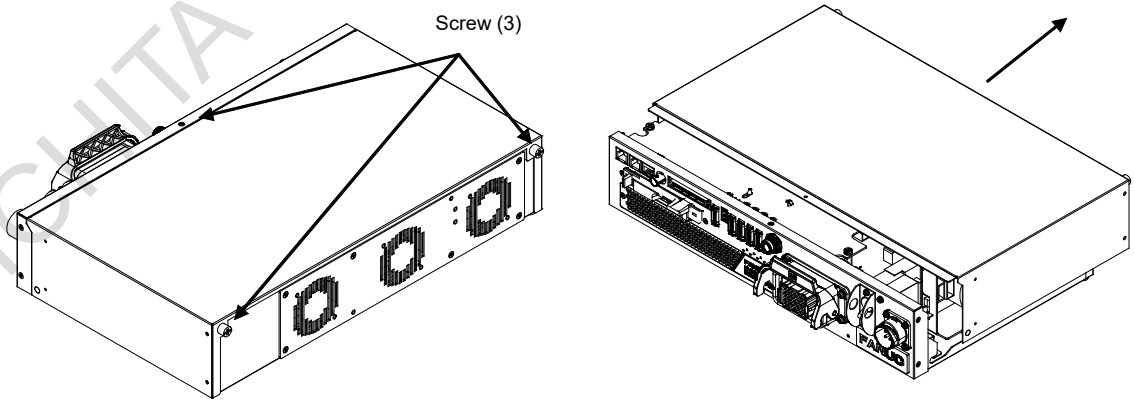


Fig.7.1.1 (a) Removing the top plate

> ⚠ **CAUTION**
> Be careful not to tighten the countersunk screws too much due to the screw threads will be crushed and the screws cannot be removed if tightening the countersunk screws very strongly.
> Recommended tightening torque of M3 countersunk screws is 70cNm.

7.1.2 Removing the Side Board

(1) Remove the top plate. (See Subsection 7.1.1)
(2) Insert a finger into the rear of the board and pull up the board slowly in the arrow direction.

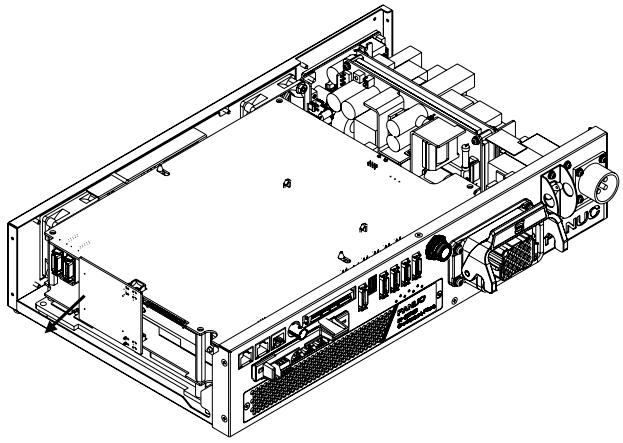


Fig.7.1.2 (a) Removing the side board

7.1.3 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) slot, remove it.
(2) Remove the top plate. (See Subsection 7.1.1)
(3) Remove the side board. (See Subsection 7.1.2)
(4) Detach cables from the connectors CRMB79 and CRMB80 on the main board, and remove the (4) screws fastening the main board.
(5) To disconnect JRA15 connector, move the main board slowly in the arrow direction (Fig. 7.1.3).

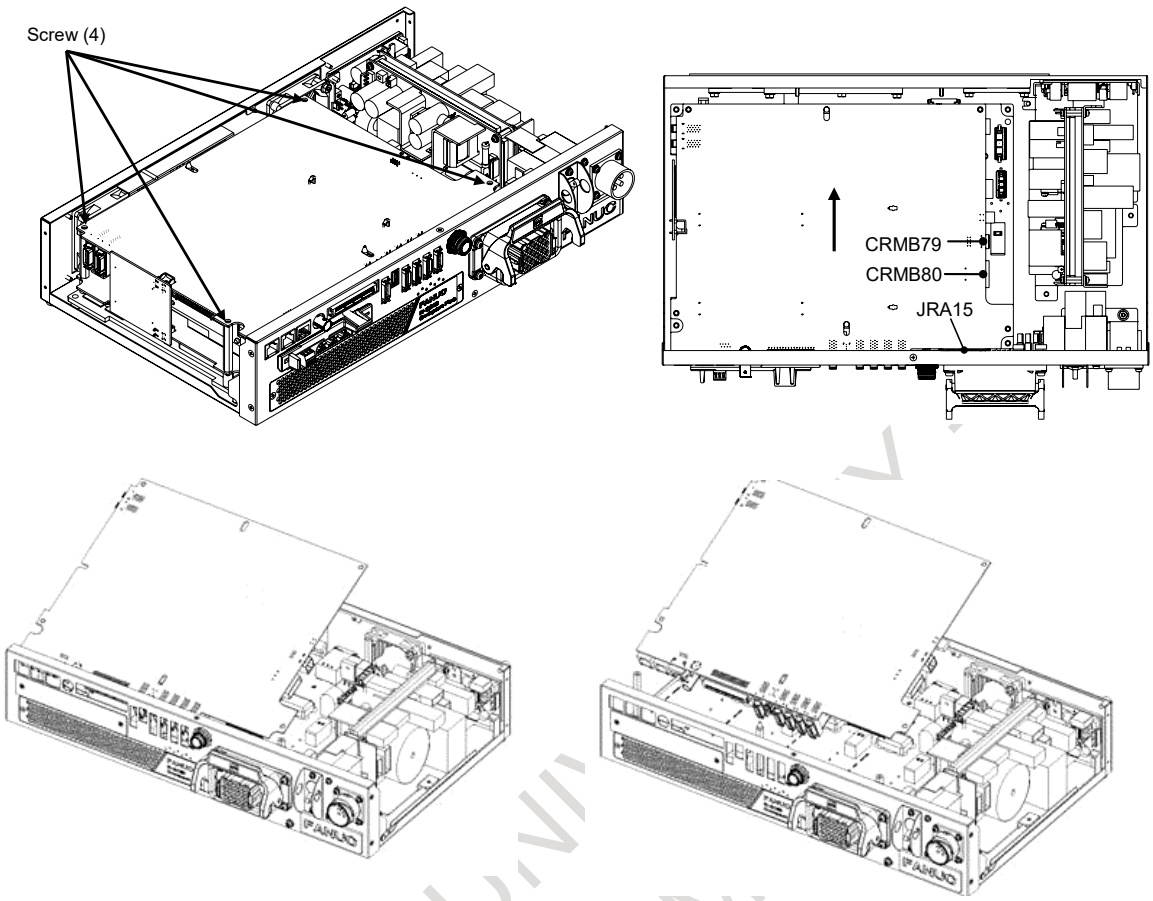


Fig.7.1.3 (a) Removing the main board

(6) Remove the main board carefully.
(7) Replace the main board with a new one.
(8) Install the main board, side board and top plate. (See Subsection 7.1.1 and 7.1.2)

> ⚠ **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.

Demounting a Card Board

1. Pull up the spacer metal fitting. (Fig.7.2 (a))
2. Insert a finger into the rear of the card board and pull up the card board slowly in the arrow direction. (Fig.7.2 (b) (Note: At this time, hold the neighborhood of 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 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.

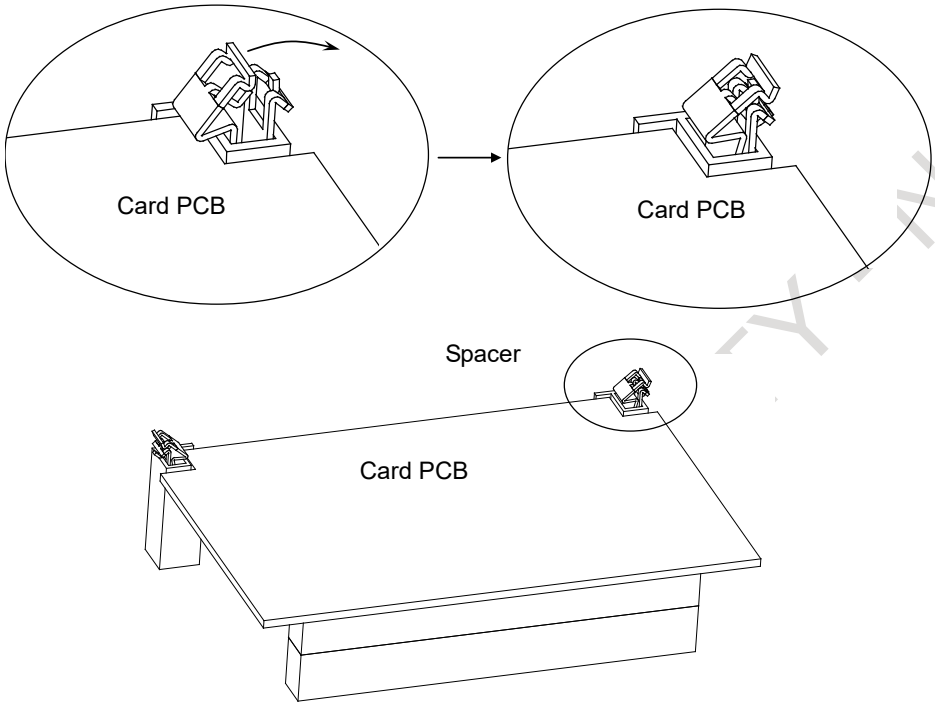


Fig.7.2 (a) Demounting a card board

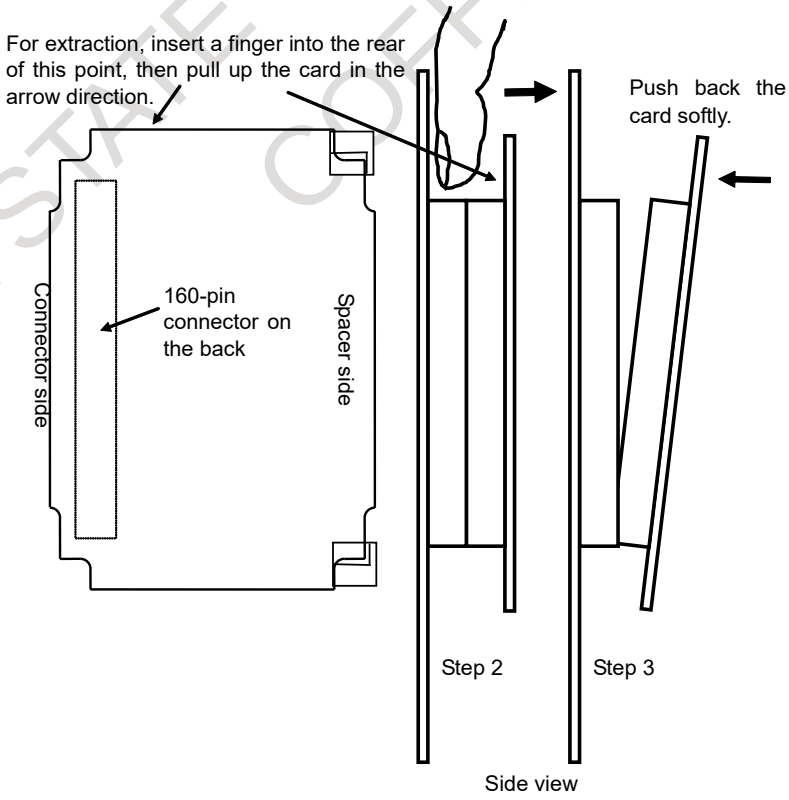


Fig.7.2 (b) Demounting a card board

Mounting a Card Board

1. Check that the metal fittings of the spacers are raised. (Fig.7.2 (c))
2. To align the board insertion position, touch the spacer end faces of the board with the spacer. (Fig.7.2 (d)) (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. (Fig.7.2 (d)) (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. (Fig.7.2 (d))
5. 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. (Fig.7.2 (e))
6. Push in the spacer metal fitting to lock the board in place. (Fig.7.2 (f))

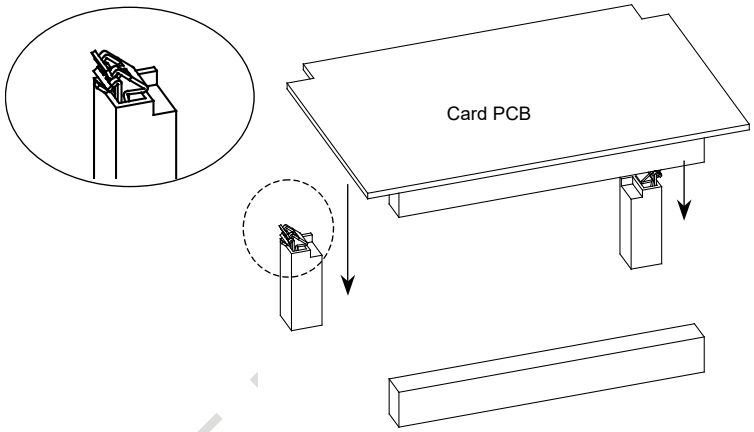


Fig.7.2 (c) Mounting a card board

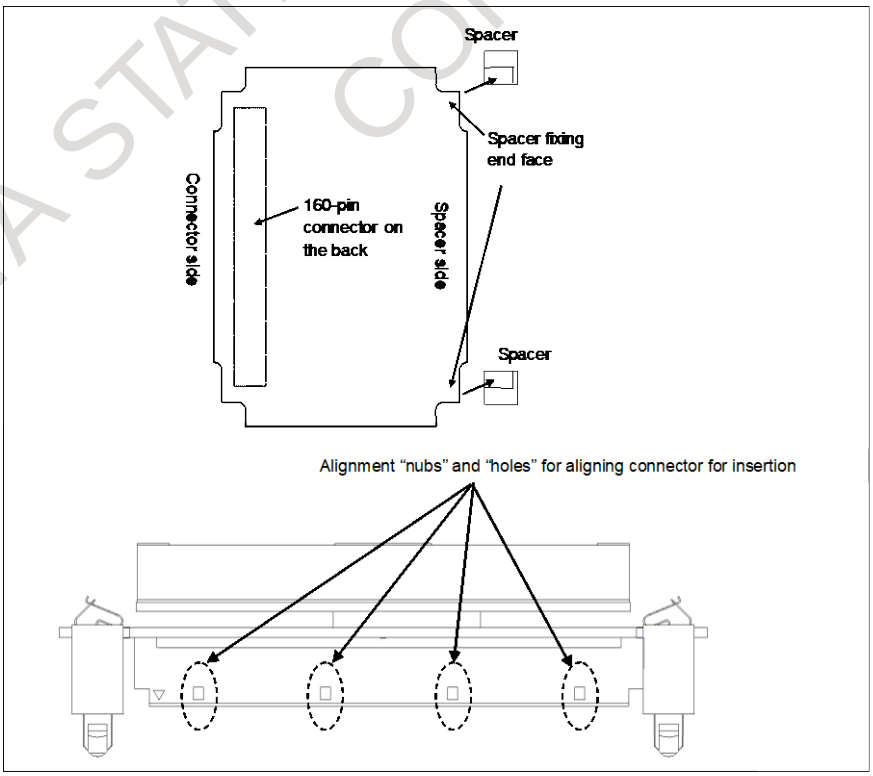
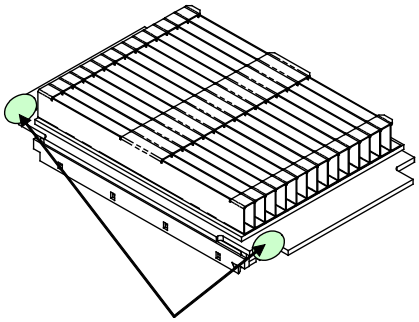


Fig.7.2 (d) Mounting a card board



Press here only for insertion.

Fig.7.2 (e) Mounting a card board

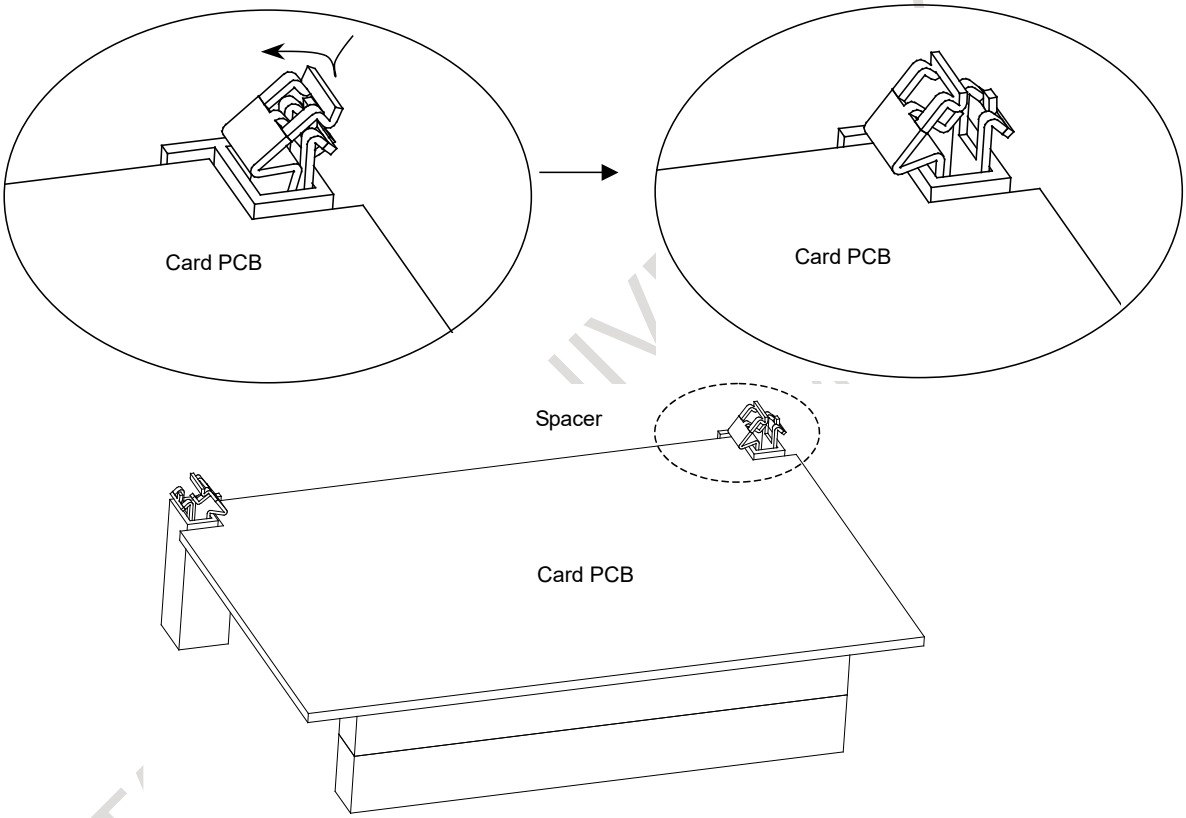


Fig.7.2 (f) Mounting a card board

Demounting a module

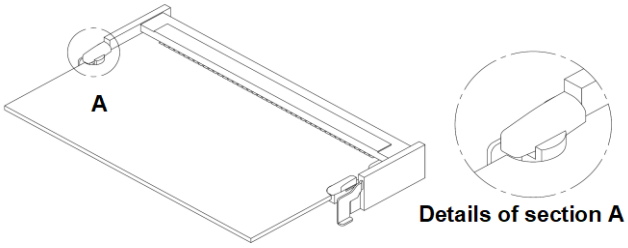
> ⚠ **CAUTION**
> When replacing the module, be careful not to touch the module edge connector. If you touch the edge connector inadvertently, wipe any dirt off of the contact with a clean cloth.

(1) Move the clip of the socket outward. (a)
(2) Extract the module by raising it at a 30 degree slant and pulling outward.

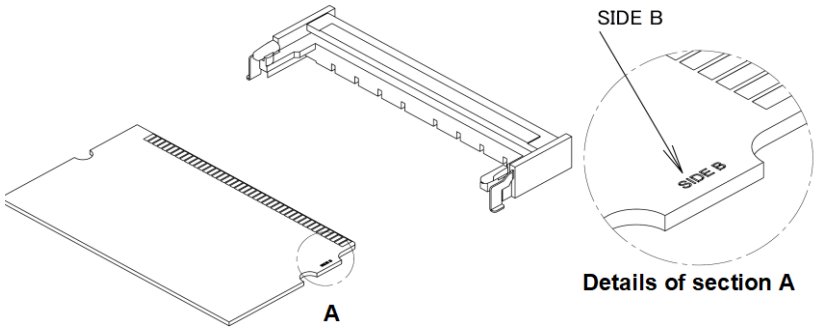
Mounting a module

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

(a)



(b)



(c)

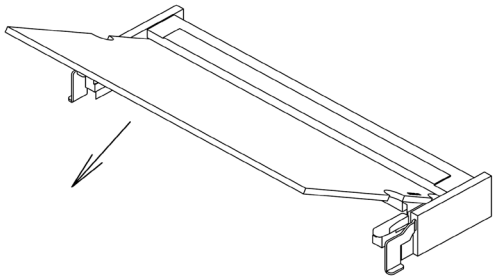


Fig.7.2 (g) Demounting/mounting a module

Replacing backplane

(1) Remove the (4) screws fastening option board guide.
(2) Remove option board guide straight above.
(3) Remove the backplane from the connector JRA14.
(4) Replace the backplane.
(5) Place option board guide straight down to fit the backplane into the gap of the clicks of the plate.
(6) Fasten the (4) screws to fix option board guide.

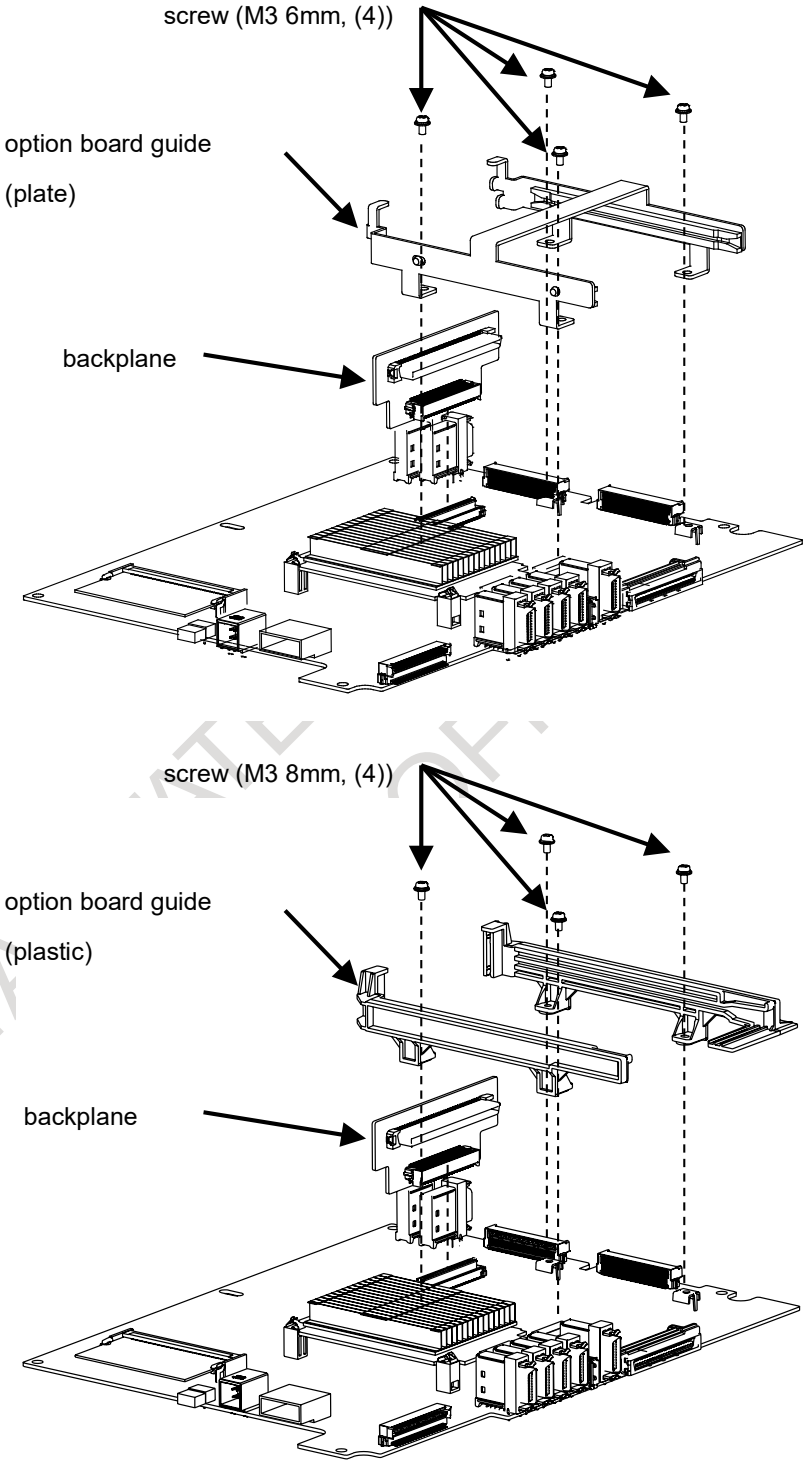


Fig.7.2 (h) Demounting/mounting backplane

Fig. 7.2 (h) shows the locations of the card board, module and backplane.

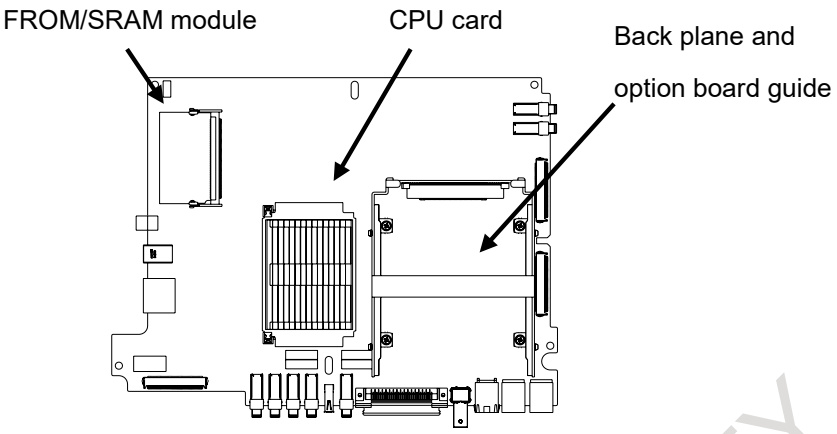


Fig.7.2 (i) Locations of card board, module and backplane

7.3 REPLACING THE INPUT UNIT

(1) Remove the top plate. (See Subsection 7.1.1)
(2) Detach the cables from connector CRMB79 and CRMB80 of the main board.
(3) Detach the cables from connector CRRA31 and CRRA34 of the servo amplifier unit.
(4) Detach the cables from connector CRP39 of the interface unit.
(5) Detach the cable from connector CRRA30 of the input unit.
(6) Remove (3) screws and replace the input unit.
(7) Reconnect the cables.

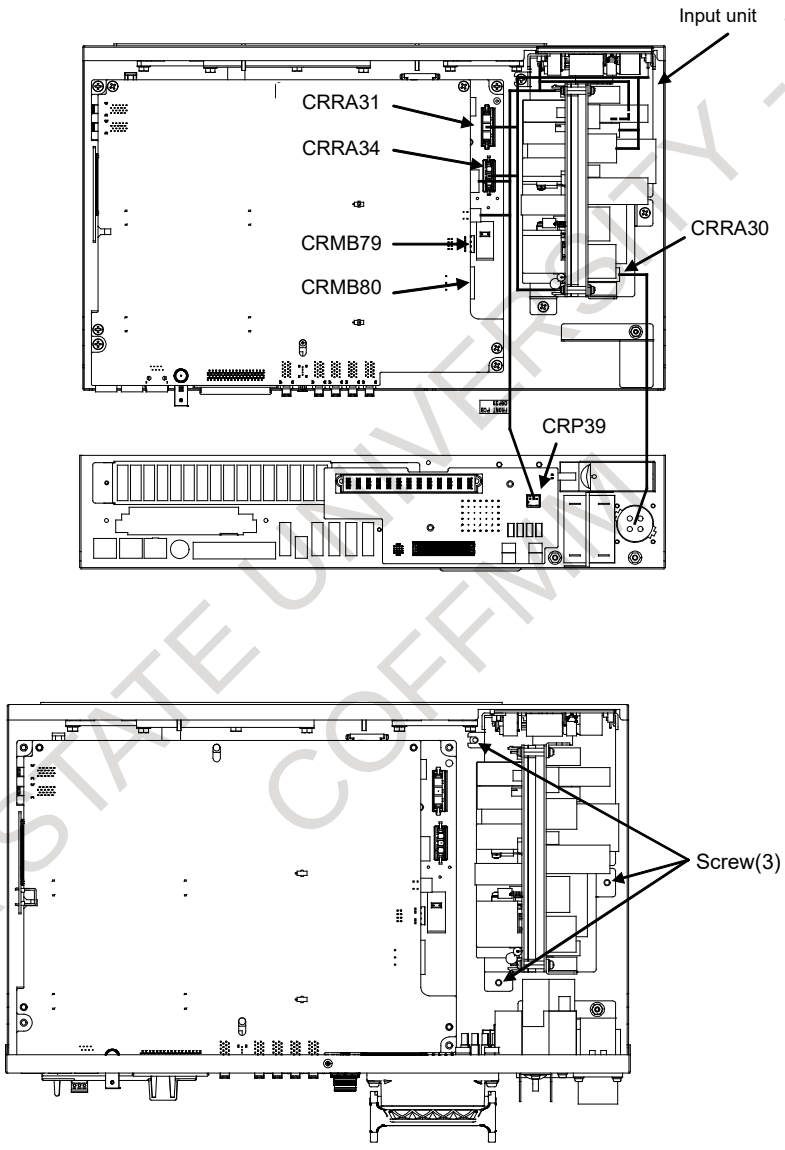


Fig.7.3 (a) Replacing the input unit

7.4 REPLACING THE INTERFACE UNIT

> ⚠ **CAUTION**
> Before you start to replace the interface unit, make a backup copy of robot parameters and programs.

(1) Remove the top plate. (See Subsection 7.1.1)
(2) Detach the cables from connector CRP39 of the interface unit and connector CRRA30 of the input unit.
(3) Remove (5) screws.
(4) To disconnect JRA15 and CRRA36 connector, move the interface unit slowly in the arrow direction (Fig. 7.4 (a)).
(5) Replace the interface unit.
(6) Reconnect the cables.

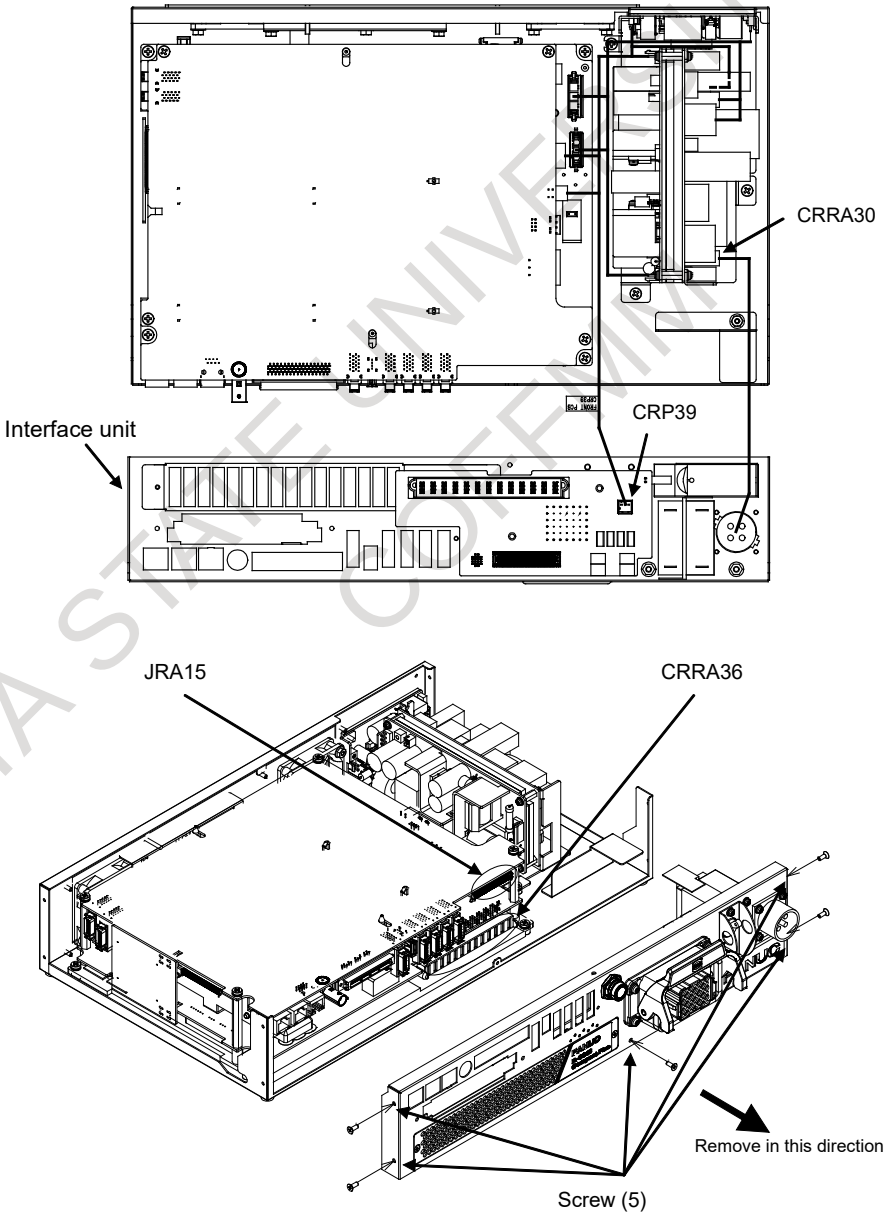


Fig.7.4 (a) Replacing the interface unit

7.5 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.

> ⚠ **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 top plate. (See Subsection 7.1.1)
(2) Remove the side board. (See Subsection 7.1.2.)
(3) Remove the interface unit. (See Subsection 7.4)
(4) Remove the main board. (See Subsection 7.1.3.)
(5) 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.
(6) Detach the cables from connector CRRA31 and CRRA34.
(7) Remove (4) screws fastening the servo amplifier unit.
(8) To disconnect CNF1, move the servo amplifier unit slowly.

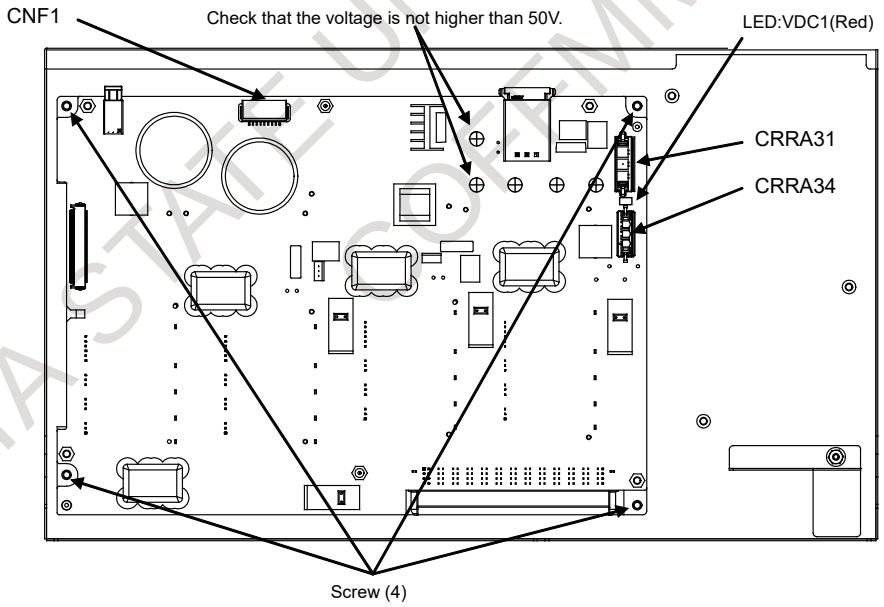


Fig.7.5 (a) Replacing the servo amplifier

(9) Remove servo amplifier unit.
(10) Install a replacement amplifier by reversing above procedure.

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 a robot controller is off.
(2) Detach the cable from the teach pendant.
(3) Replace the teach pendant.

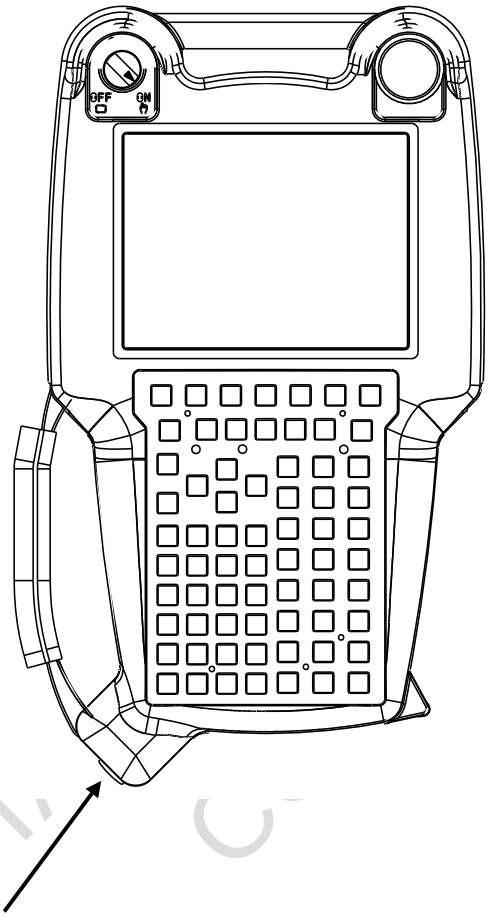


Fig.7.6 (a) Replacing the teach pendant

7.7 REPLACING THE FAN UNIT

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

In the case of fan unit replacement

(1) Remove (6) screws.
(2) Dismount the fan unit.
(3) Mount the replacement fan unit by reversing above procedure. Be careful not to let the cable get caught in the fan.

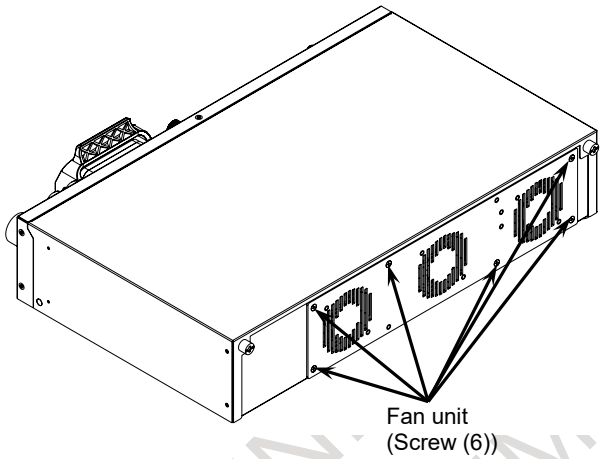


Fig.7.7 (a) Replacing the fan unit

In the case of fan replacement

(1) Remove (6) screws.
(2) Dismount the fan unit.
(3) Please replace the fans.
(4) Mount the fan unit by reversing above procedure. Be careful not to let the cable get caught in the fan.

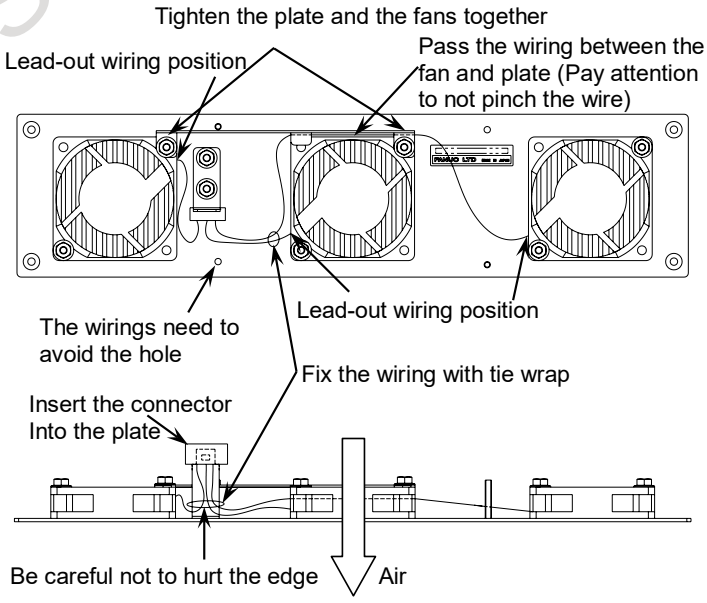


Fig.7.7 (b) Replacing the fans

Name	Ordering specification	Maintenance specification	Note
Fan unit	A05B-2690-H030	A05B-2690-C310	In case of fan unit replacement（Fig.7.7.1）
		A90L-0001-0624	In case of fan replacement（Fig.7.7.2）

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 introduced robot, the battery is factory-installed. Battery replacement may, therefore, be needed within 4 years after the introduction 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) Pull out the battery located in the lower right part of the interface unit. (Hold the left side of the battery, pull out the unit and detach the connector.)

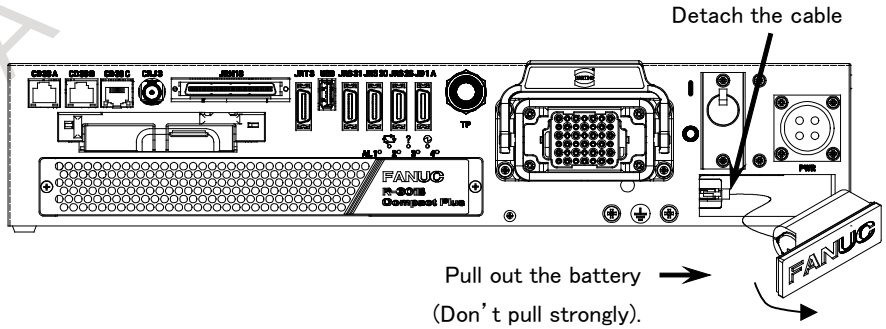


Fig.7.8.1 (a) Replacing the lithium battery

(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-30*i*B Compact Plus. It also includes information about installation of the R-30*i*B Compact Plus.

1.1 SYSTEM CONFIGURATION

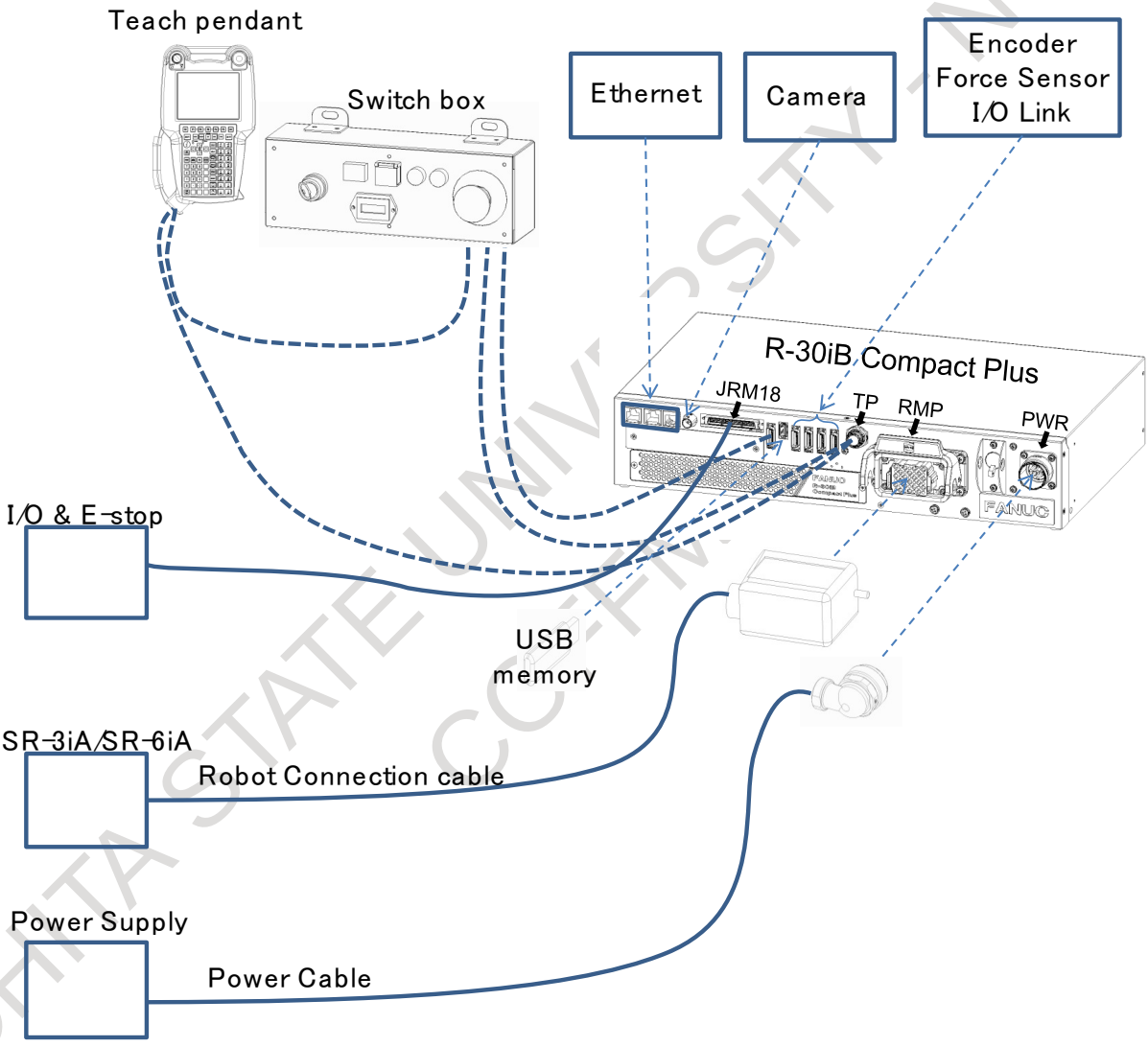


Fig.1.1 (a) System configuration

1.2 EXTERNAL INTERFACE

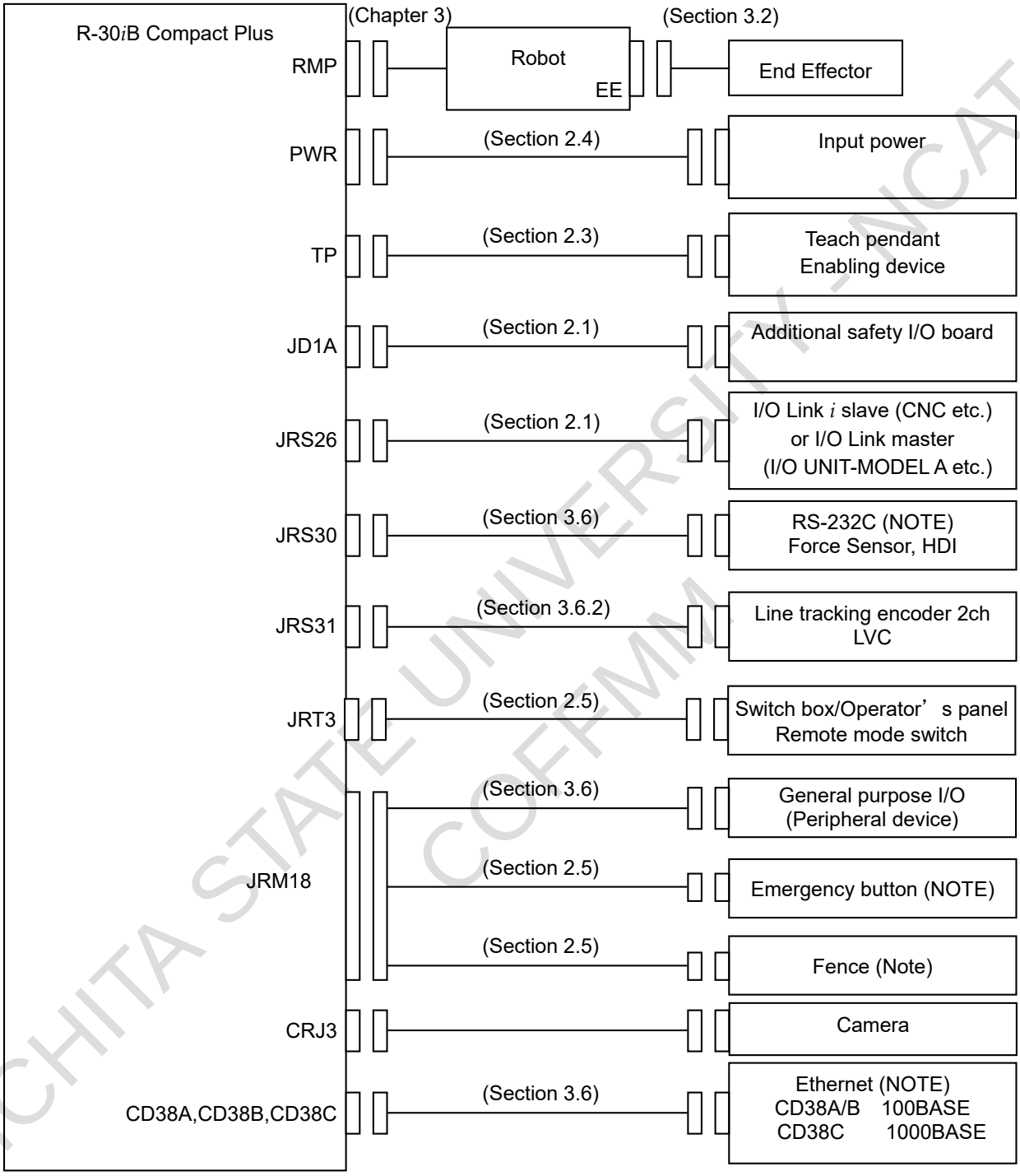


Fig.1.2 (a) Unit-to-unit connection diagram

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.

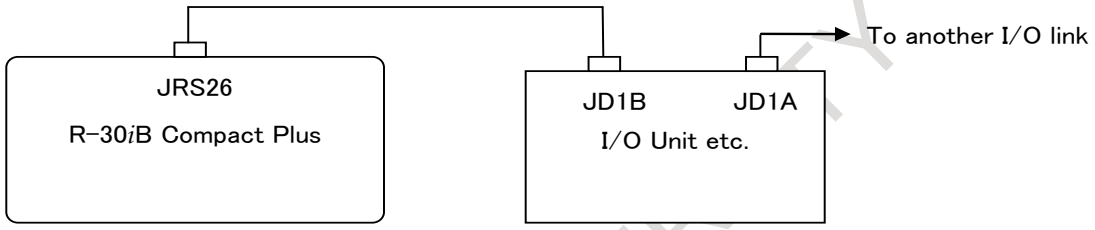
2 CONNECTIONS WITH EQUIPMENT

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

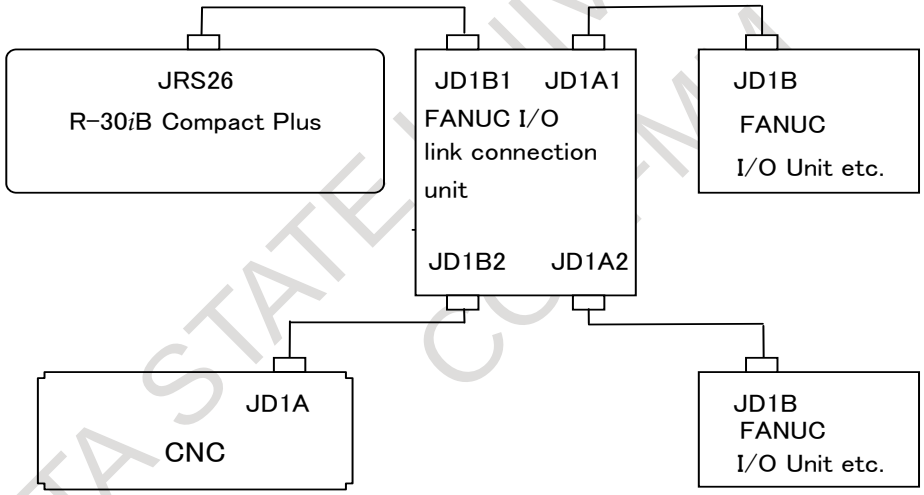
2.1.1 Connection of I/O Link by Using JRS26 Connector

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

1. When the R-30*i*B Compact Plus is used as the I/O link master (default)
   (When the R-30*i*B Compact Plus controls I/O Unit etc.)



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



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

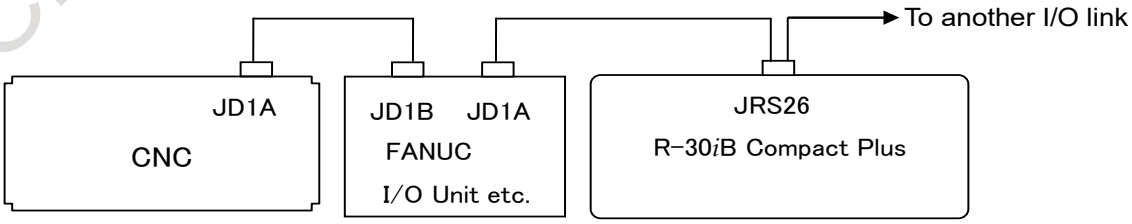


Fig.2.1.1 (a) Connection of I/O link by using JRS26 connector

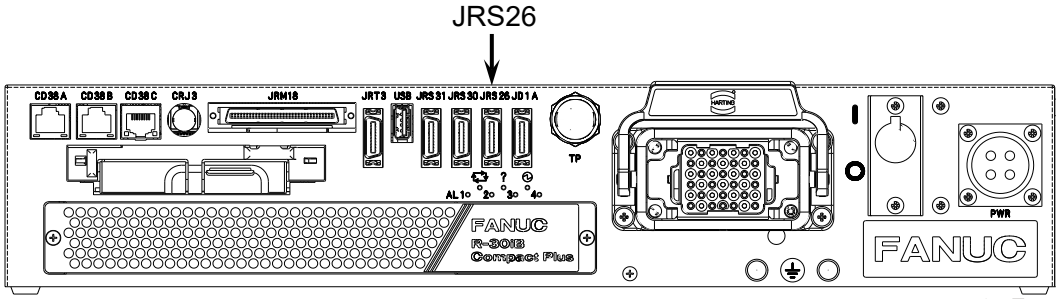


Fig.2.1.1 (b) Path of the I/O link cable by using JRS26 connector

1. Connect the cable according to the system. Be sure to perform shielding.
   Shield the cable collectively and ground the shield on the 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.
a) Slave units and the master must be powered on or off at the same time.
b) If the CNC or robot controller is powered off after startup of the system, I/O Link error occur. To successfully make connection with I/O Link again, power off all of the units and then power them on at the timing indicated in a).

When used as master interface
JRS26
interface

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

Master interface

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

When used as slave interface
JRS26
Interface
Refer to 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-30*i*B Compact Plus is connected to CNC or proceeding I/O Link ***i*** slave unit, use a twisted-pair cable in which wires RXSLC1 (Pin No.1 of JRS26) and XRXSLC1 (Pin No.2 of JRS26) are paired and wires TXSLC1 (Pin No.3 of JRS26) and XTXSLC1 (Pin No.4 of JRS26) are paired.

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

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.

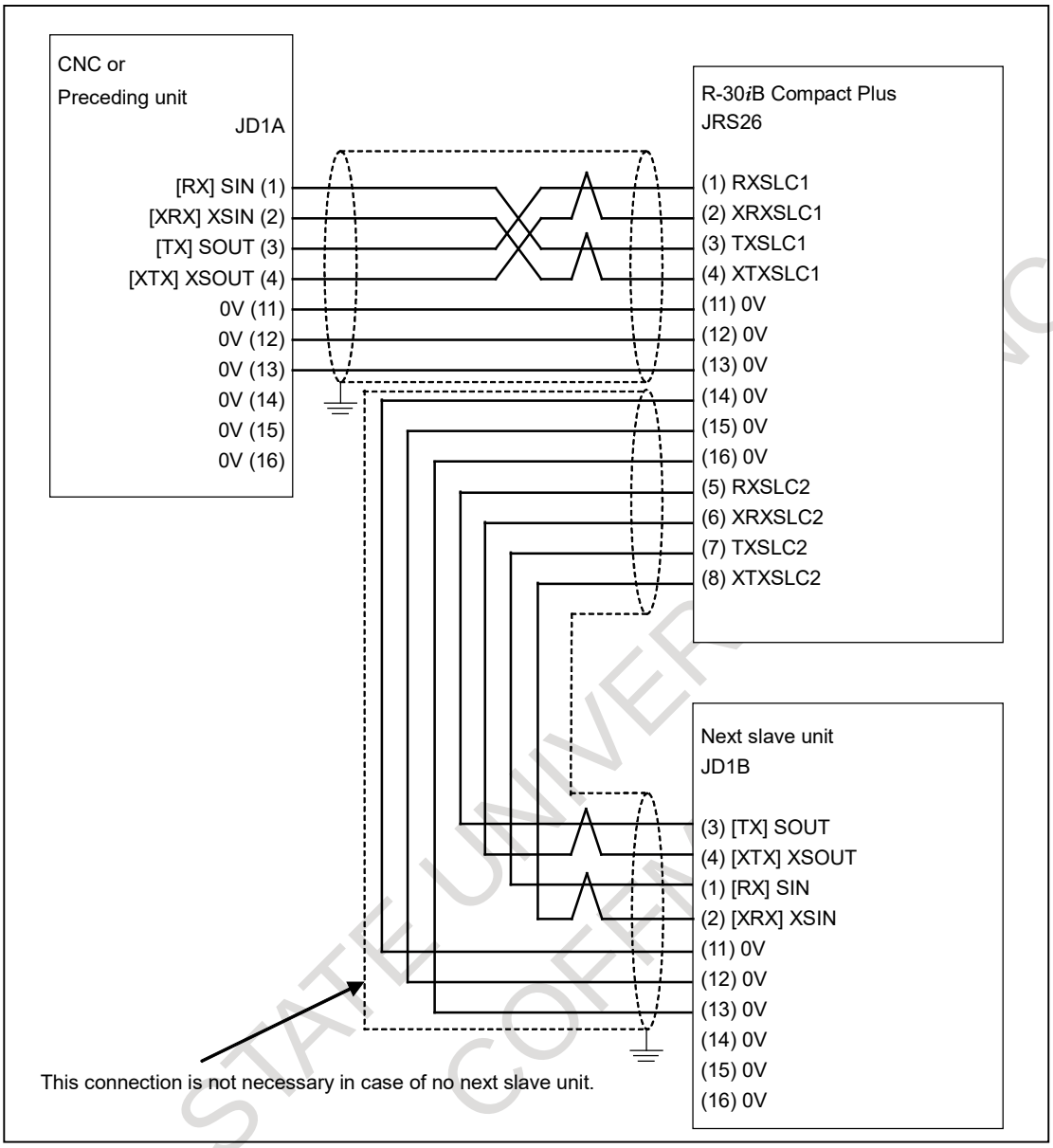


Fig.2.1.1 (c) Cable connection diagram of the I/O Link cable by using JRS26 connector (for the slave unit)

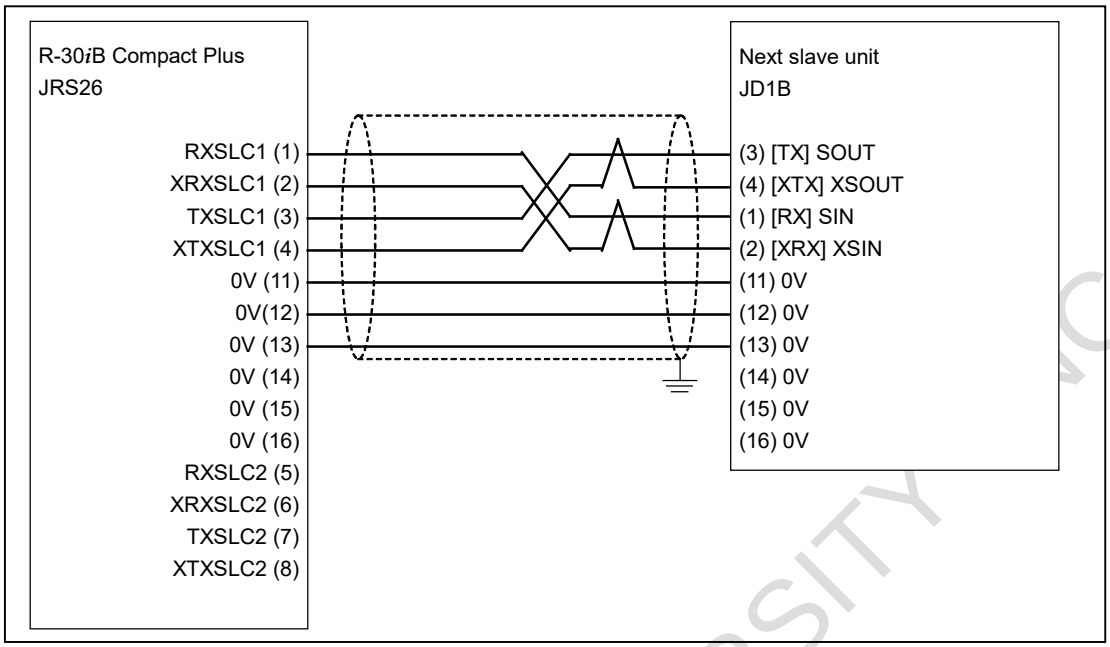


Fig.2.1.1 (d) Cable connection diagram of the I/O Link cable by using JRS26 connector (for the master unit)

2.1.2 Connection of I/O Link Cable for I/O Unit Model A

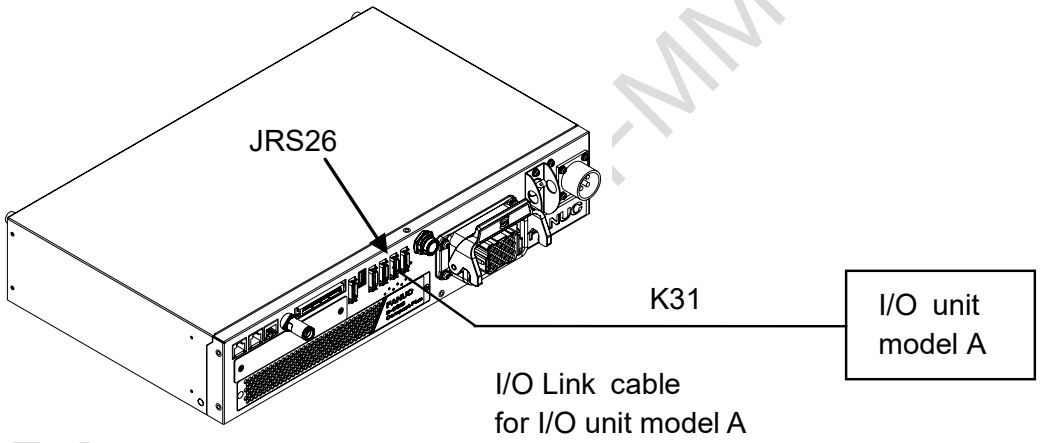


Fig.2.1.2 (a) Connection of I/O Link cable for I/O unit model A

Specification of cable

Cable No.	Name	Ordering specification	Maintenance specification	Length (m)
K31	I/O Link cable for I/O unit model A	A05B-2690-K445	A660-4042-T143#L6R003A	5
		A05B-2690-K446	A660-4042-T143#L11R03A	10

2.1.3 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.

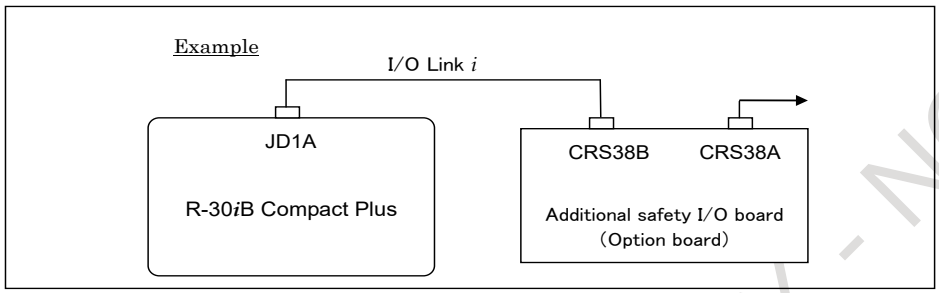


Fig.2.1.3 (a) Connection of JD1A connector

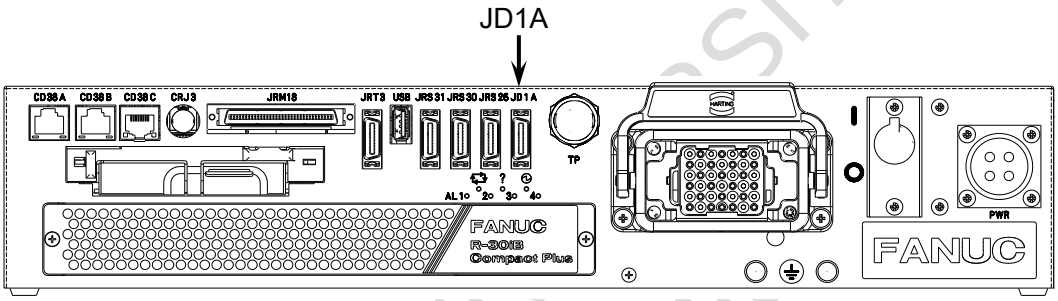


Fig.2.1.3 (b) Path of the I/O Link *i* cable by using JD1A connector

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-30*i*B Compact Plus is connected to 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.

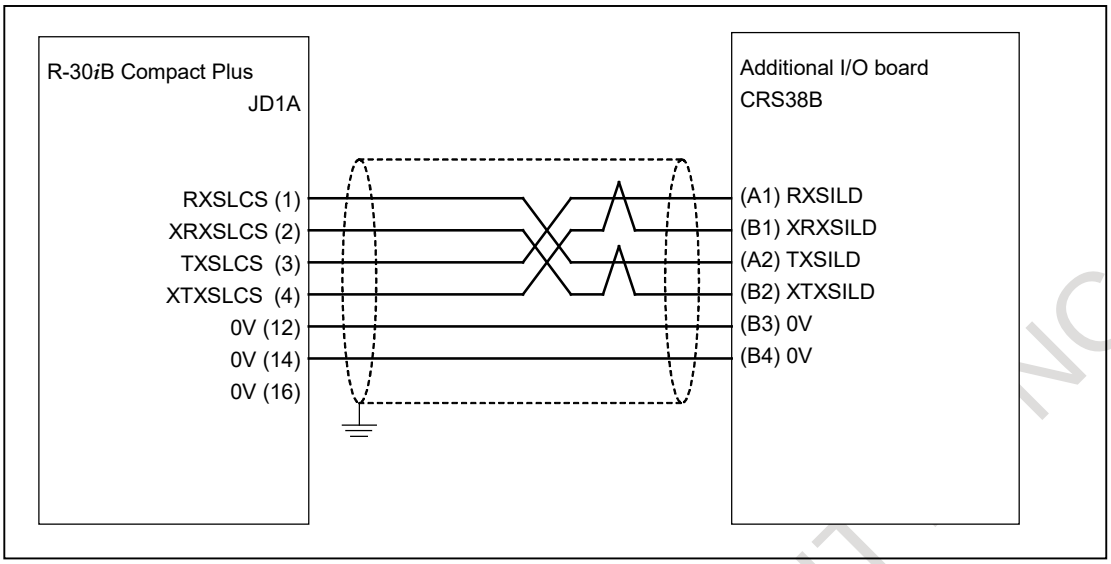


Fig.2.1.3 (c) Cable connection diagram of the I/O Link *i* cable by using JD1A connector

2.2 ROBOT CONNECTION CABLES

2.2.1 Robot Connection Cables

Robot Model: SR-3*i*A, SR-6*i*A, SR-12*i*A, SR-20*i*A

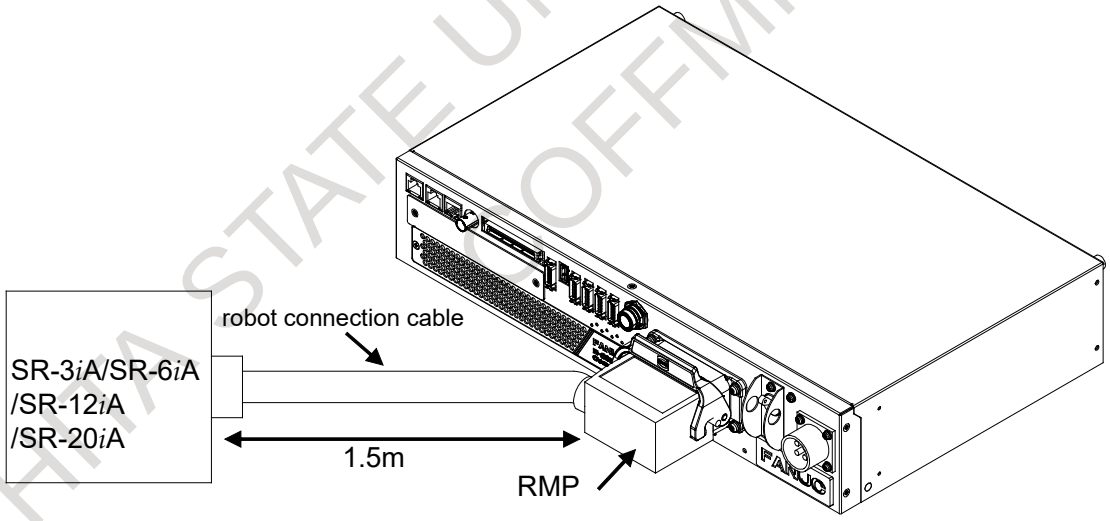


Fig.2.2.1 (a) Robot connection cable

Specification of cable

Name	Robot	Non-flex type			
		Length (m)	Diameter (mm)	Weight (kg/m)	Minimum bending radius(mm)
Robot connection cable	All models	1.5	19.5	0.56	120

NOTE
Refer to Appendix Fig.B (i) “Connection diagram of robot interface” and Fig.B (j) “Robot connection cable connector table” for details of robot connection cables.

2.2.2 Robot Connection Transit Cables

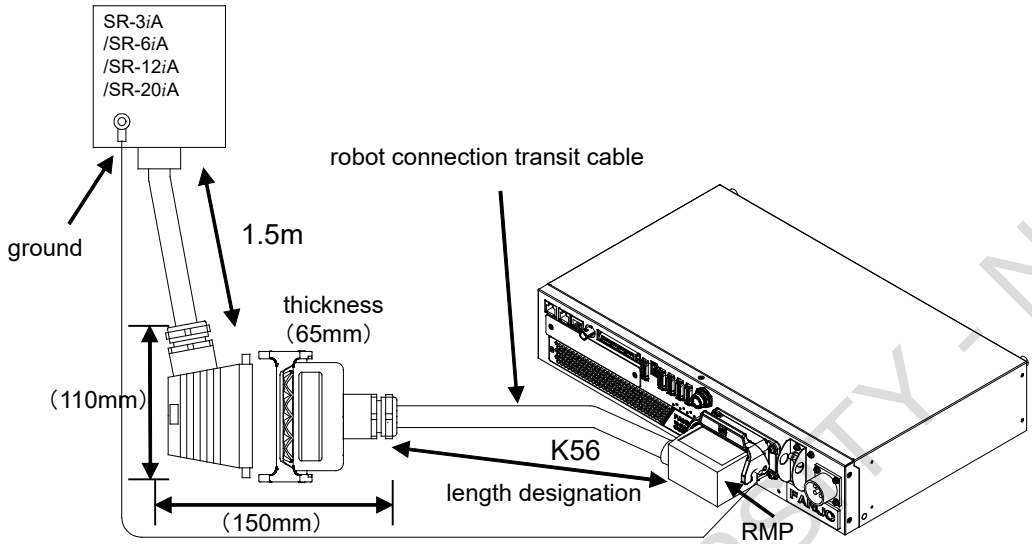


Fig.2.2.2 (a) Robot connection transit cable

Specification of cable

Robot connection transit cable K56				Non-flex type			
Ordering specification	**Part name**	**Maintenance specification**	**Quantity**	**Length (m)**	**Diameter (mm)**	**Weight (kg/m)**	**Minimum bending radius (mm)**
A05B-2691-J103	RMP cable	A660-2008-T367 #L1R003	1	1	19.5	0.56	120
	Earth cable	A660-8011-T210 #L3R003	1	3			
A05B-2691-J100	RMP cable	A660-2008-T367 #L4R003	1	4	19.5	0.56	120
	Earth cable	A660-8011-T210 #L6R003	1	6			
A05B-2691-J101	RMP cable	A660-2008-T367 #L7R003	1	7	19.5	0.56	120
	Earth cable	A660-8011-T210 #L9R003	1	9			
A05B-2691-J102	RMP cable	A660-2008-T367 #L14R03	1	14	19.5	0.56	120
	Earth cable	A660-8011-T210 #L16R03	1	16			

NOTE
Refer to Appendix Fig.B (i) “Connection diagram of robot interface” and Fig.B (j) “Robot connection cable connector table” for details of robot connection cables.

⚠ **WARNING**
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)

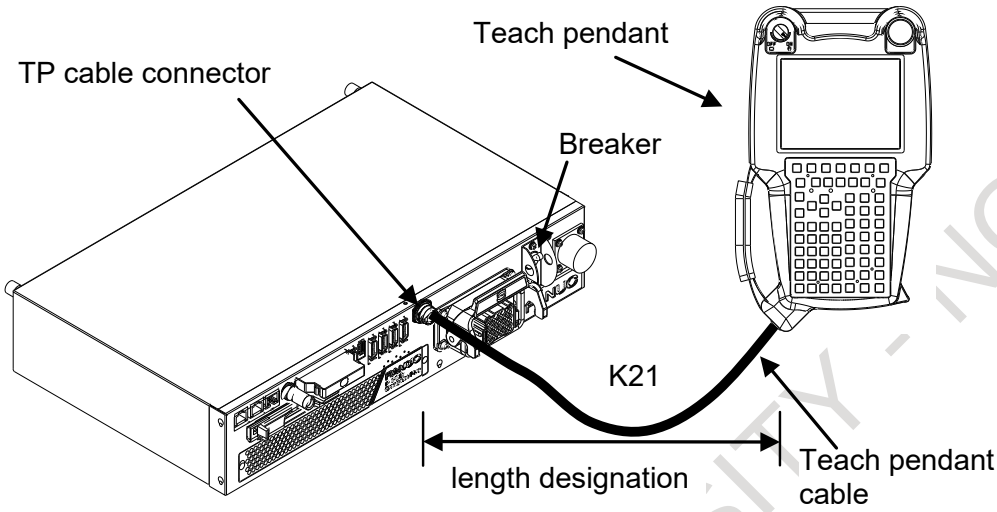


Fig.2.3 (a) Teach pendant cable

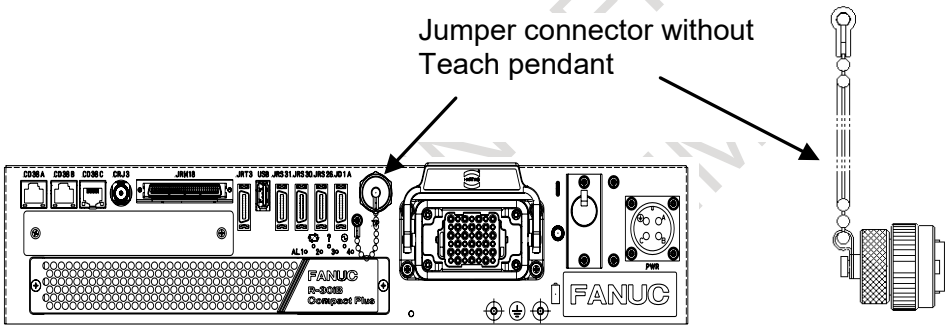


Fig.2.3 (b) Jumper connector without Teach pendant

> ⚠ **CAUTION**
> Turn off the breaker of the controller before disconnecting Teach pendant cable or Jumper connector 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.

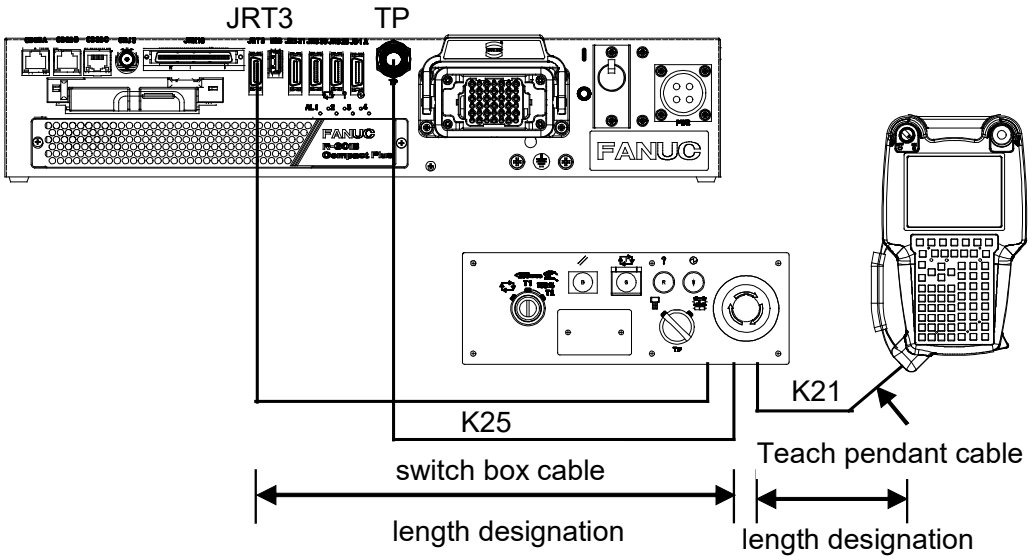


Fig.2.3 (c) Switch box

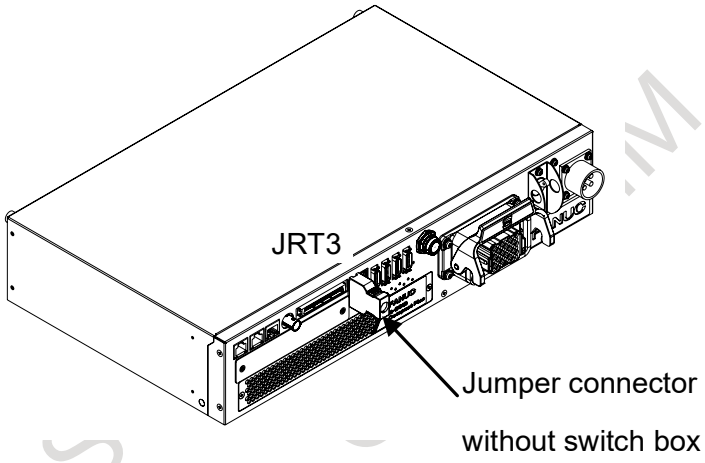


Fig.2.3 (d) Jumper connector without switch box

Specification of cable

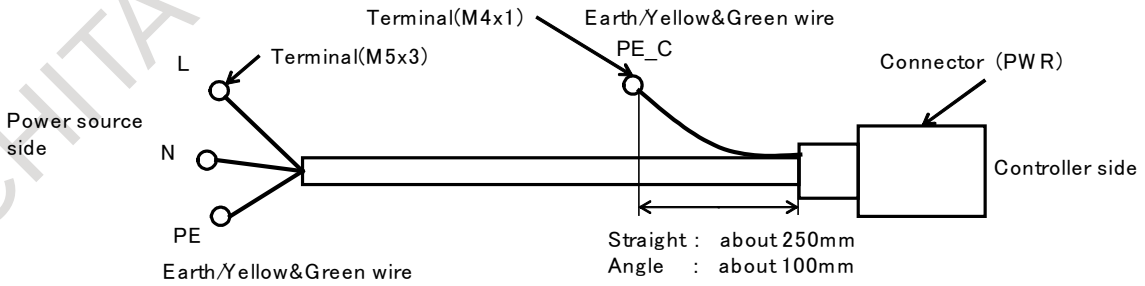
Cable No.	Name	Ordering specification	Part name	Maintenance specification	Length (m)
K21	Teach pendant cable	A05B-2690-H200		A660-2008-T032#L5R503	5
		A05B-2690-H201		A660-2008-T032#L10R53	10
		A05B-2690-H202		A660-2008-T032#L20R53	20
	Jumper connector without Teach pendant	A05B-2690-H210		A660-2007-T391	
K25	Switch box cable	A05B-2690-H450	cable	A05B-2690-D260	1
			screw	A6-SW1NA-3X8S-M-ZN2A	4
		A05B-2690-H451	cable	A05B-2690-D261	2
			screw	A6-SW1NA-3X8S-M-ZN2A	4
		A05B-2690-H452	cable	A05B-2690-D262	5
			screw	A6-SW1NA-3X8S-M-ZN2A	4
		A05B-2690-H453	cable	A05B-2690-D263	10
			screw	A6-SW1NA-3X8S-M-ZN2A	4
		A05B-2690-H454	cable	A05B-2690-D264	20
			screw	A6-SW1NA-3X8S-M-ZN2A	4
	Jumper connector without switch box	A05B-2690-H410		A660-2008-T349	

注
Refer to Appendix F, “Remote Mode Switch Assembly Instruction”.

2.4 CONNECTING THE INPUT POWER

2.4.1 Input Power Cable

Input power cable of R-30*i*B Compact Plus should be ordered the option cable, or should be provided by customer according to the following specification. The power source side of the input power cable should be connected according to the customer’s facility.
The specifications of the power source should be referred to the Section 4.9 in II CONNTECTIONS.



The specification of input power connector (PWR) is as follows.

Table2.4.1 (a) The specification of input power connector(PWR)

Supplier	Series	Shell size Pin assign	Specification	Cable clamp
Japan Aviation Electronics Industry	JL10	18-10	JL10-6A18-10SE-EB(Straight) JL10-8A18-10SE-EB(Right angle)	JL04-18CK type *
	JL04V	18-10	JL04V-6A18-10SE-EB-R(Straight) JL04V-8A18-10SE-EBH-R(Right angle)	JL04-18CK type *
HIROSE ELECTRIC	H/MS	18-10	H/MS3106A18-10S-D-T(73) (Straight) H/MS3108B18-10S-D-T(73) (Right angle)	H/MS3057 type *

*The cable clamp corresponding to the cable diameter should be used.

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

Table2.4.1 (b) The pin assign of input power connector(PWR)

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

Table 2.4.1 (c) The wire material of 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 Input power 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 The 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.
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 Grounding/Bonding to comply with NEC Article 250 or CEC Section 10 as appropriate.
5 The Input wire and terminals of input power cable should be used according to the installation condition and applicable standard.

2.4.2 Connecting the Input Power Cable

(1) Fig.2.4.2 (a) shows how to connect the input power cable.
(2) The connector of input power cable should be connected to the PWR connecter and earth wire (PE) should be connected to the earth terminal as following Fig.2.4.2 (a).

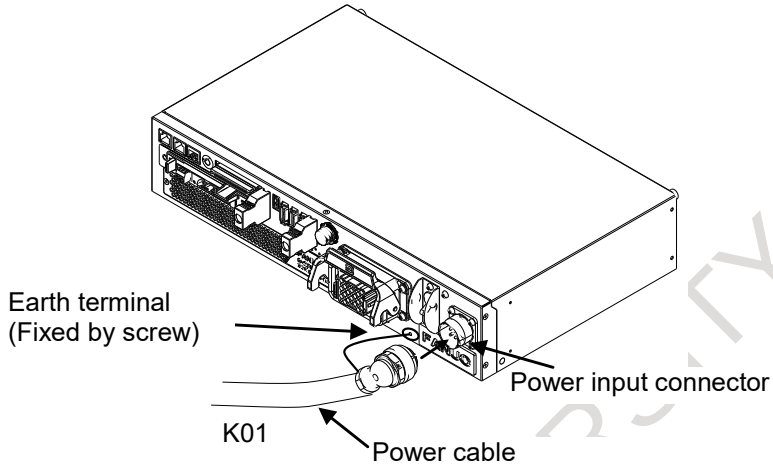


Fig.2.4.2 (a) Connecting the input power cable

Specification of cable

Cable No.	Name	Ordering specification	Maintenance specification	Length (m)	Diameter (mm)	Minimum bending radius (mm)
K01	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

After connecting input power cable, in order to avoid turning on the main breaker, padlocking can be installed to the breaker handle as following Fig.2.4.2 (b).

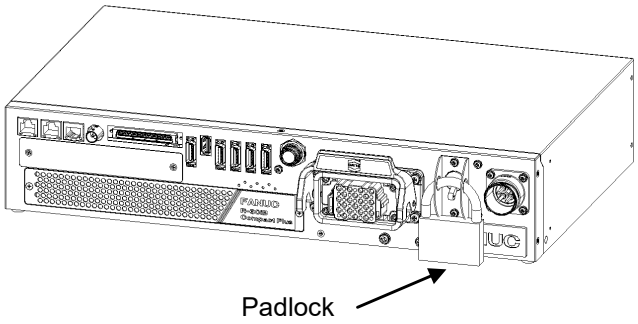


Fig.2.4.2 (b) Padlock for primary power

2.4.3 Leakage Breaker

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

(2) 10 mA or less leakage current 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 (a) Example of leakage current circuit breaker for inverters

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

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.

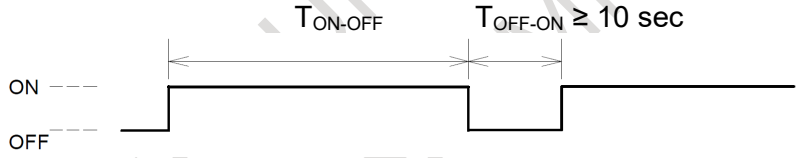


Fig.2.4.4 (a) Turning on the power again ten seconds after turning off

2.5 CONNECTING THE EXTERNAL EMERGENCY STOP

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

・All safety signals stop the robot as intended.

・There is no mistake in connection of safety signals.

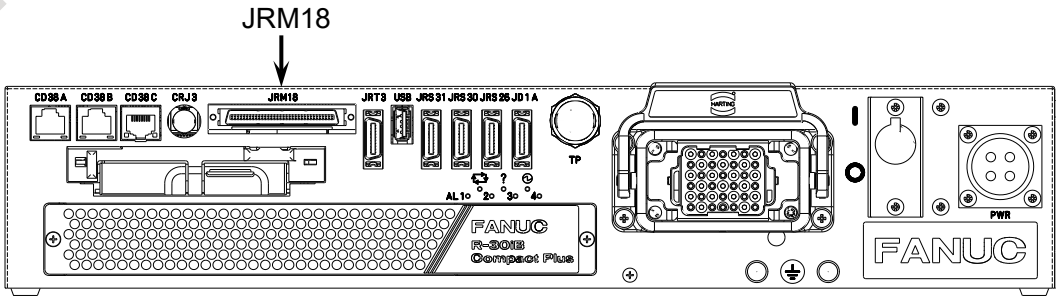
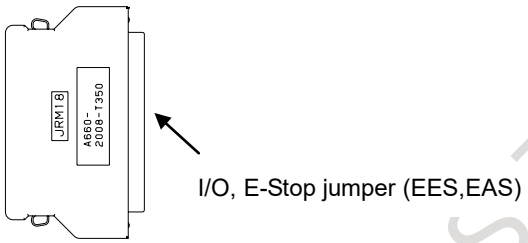


Fig.2.5 (a) Connecting the external emergency stop

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

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).
Please do not use I/O E-stop jumper when equipment is in operation because I/O E-stop jumper connector is used to disable safety signal.



Name	Ordering specification	Part 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

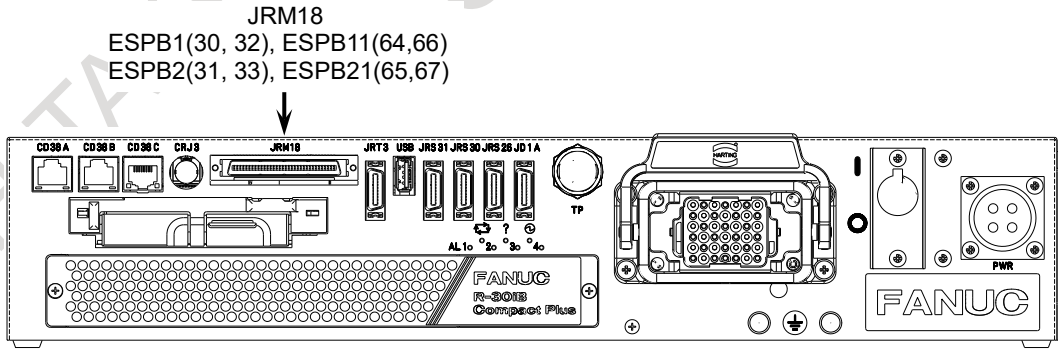


Fig.2.5.1 (a) External emergency stop output

For the circuit, see Fig. B (d) in Appendix B, "TOTAL CONNECTION DIAGRAM".

	Signal	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.	Rated contact: 24 VDC, 1 A resistor load 0.5 A/pin (NOTE)	(Reference value) DC5V 10mA

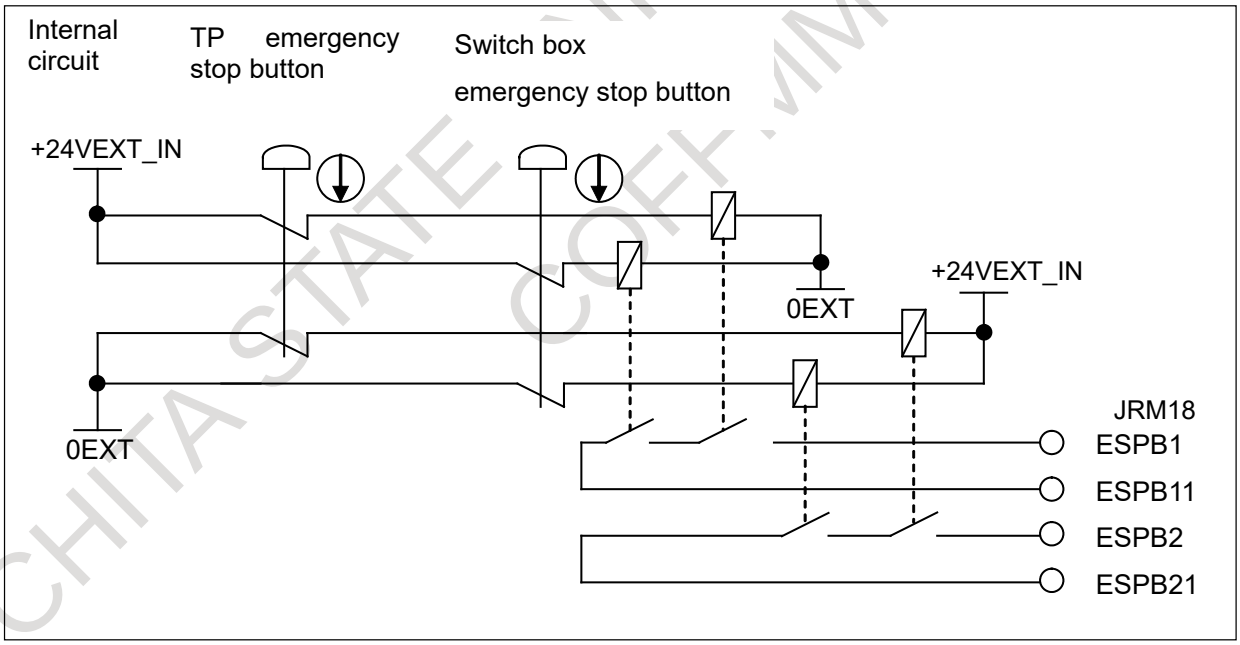
NOTE

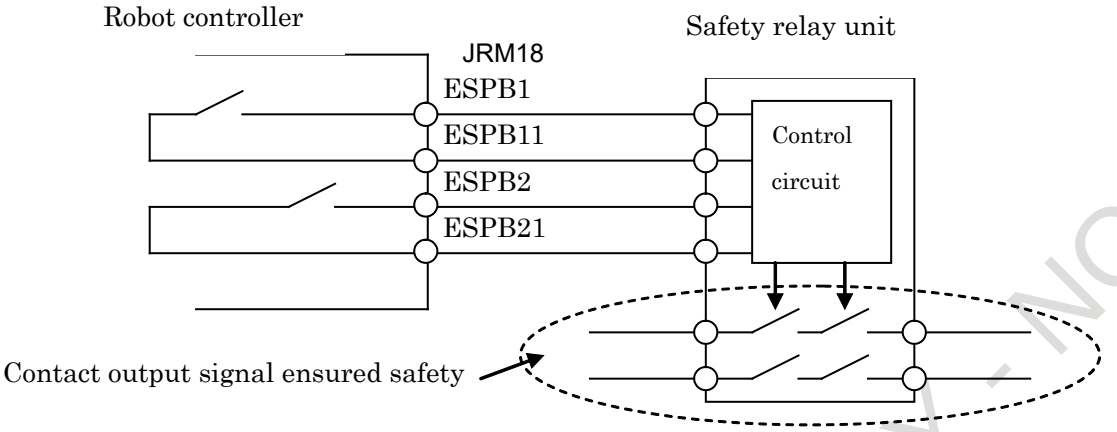
For protection against the noise, the shielded cable is recommended for the connection cable.

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.





⚠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

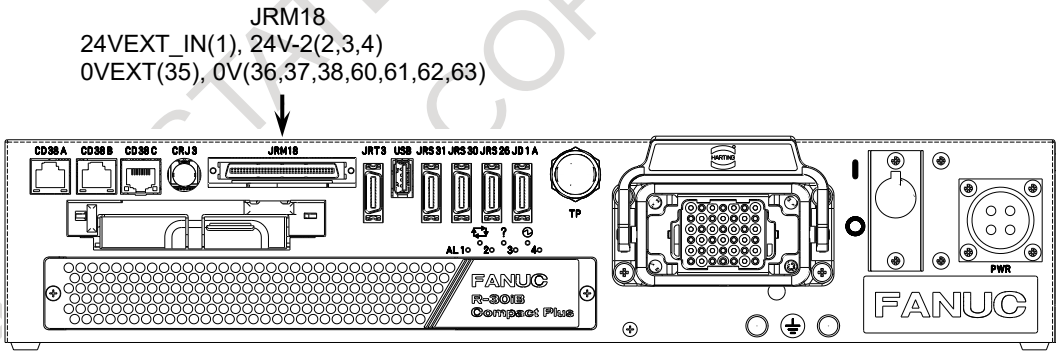
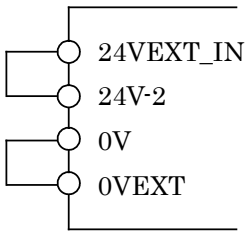


Fig.2.5.1 (b) External power connection

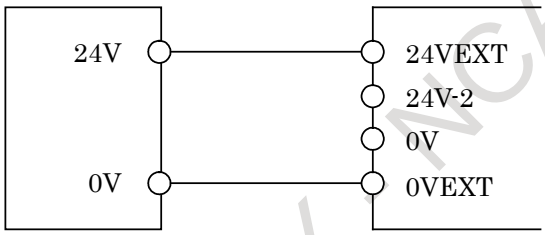
The relays for emergency stop output (ESPB) can be separated from 24V controller's power. In case of emergency stop output must not be effected controller's power even when controller's power is turned OFF, please connect external +24V (24VEXT_IN) instead of internal +24V.

Example of the connection

In case of not using the external power source



In case of using the external power source



+24V(±10%)
more than 300mA

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)

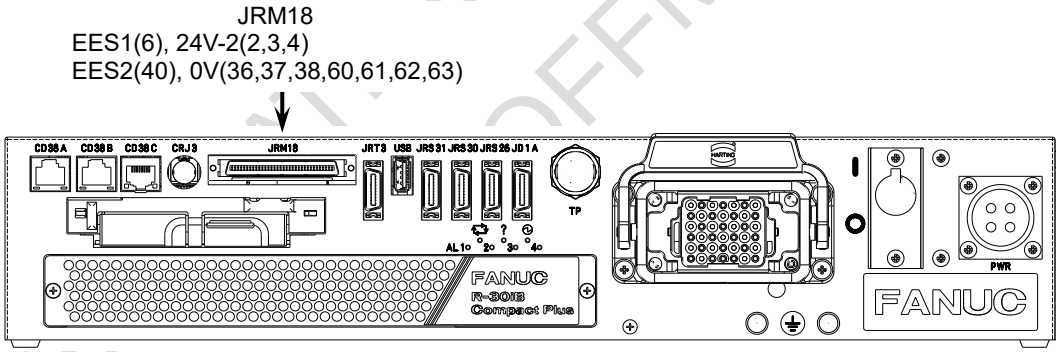


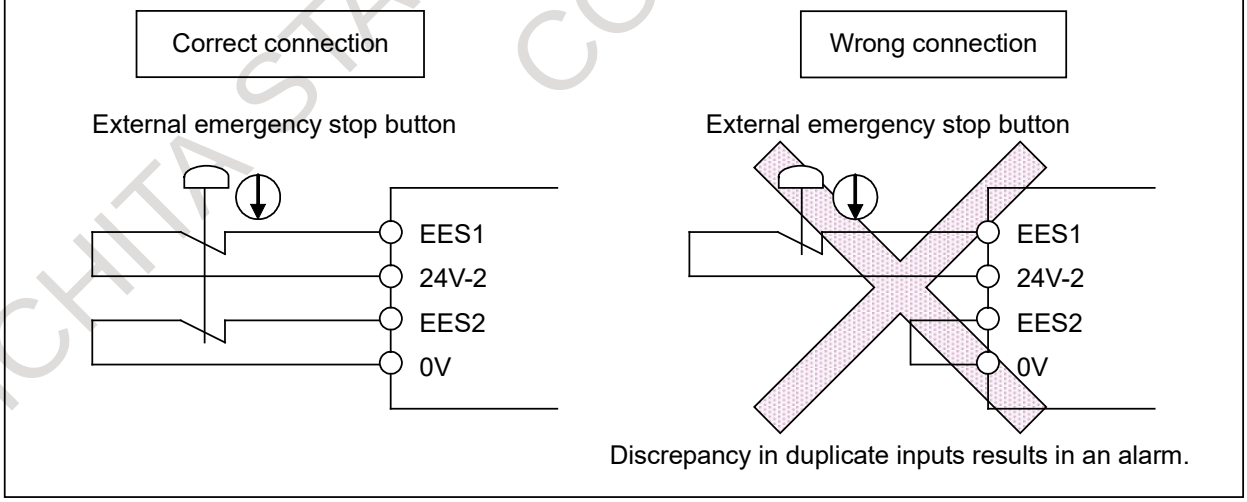
Fig.2.5.2 (a) External emergency stop input

	Signal	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.	Open and close of 24VDC 0.1A (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) 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.	Open and close of 24VDC 0.1A (NOTE 1)

NOTE
1. Use a contact which minimum load is 5 mA less.
2. See the 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



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.

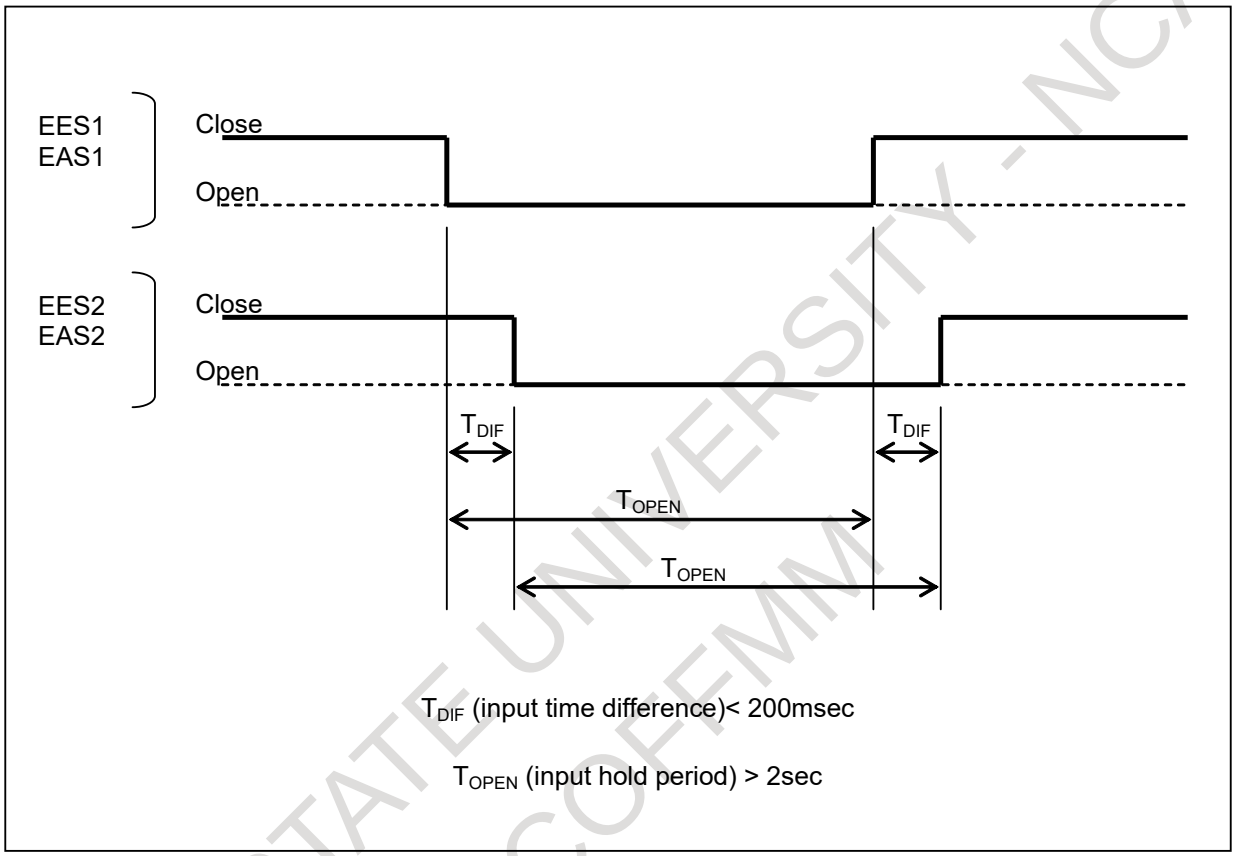


Fig.2.5.2 (b) Input timing of duplicate safety signals

NOTE
Refer to Section 3.1.2 for EES1, EES2, EAS1, EAS2, 24V-2, 24VEXT_IN, 0V, 0VEXT etc. of JRM18.

3 PERIPHERAL DEVICE AND EE INTERFACES

Table 3 (a) shows the peripheral device interface of R-30*i*B Compact Plus.

Table 3 (a) Peripheral device interface types

Name	Ordering specification	Number of I/O points		Remarks
		JRM18		
		DI	DO	
Main board A	A05B-2690-H001	20	16 (Source)	Standard
Main board B	A05B-2690-H002			Vision I/F, Force sensor I/F, Line tracking I/F, HDI

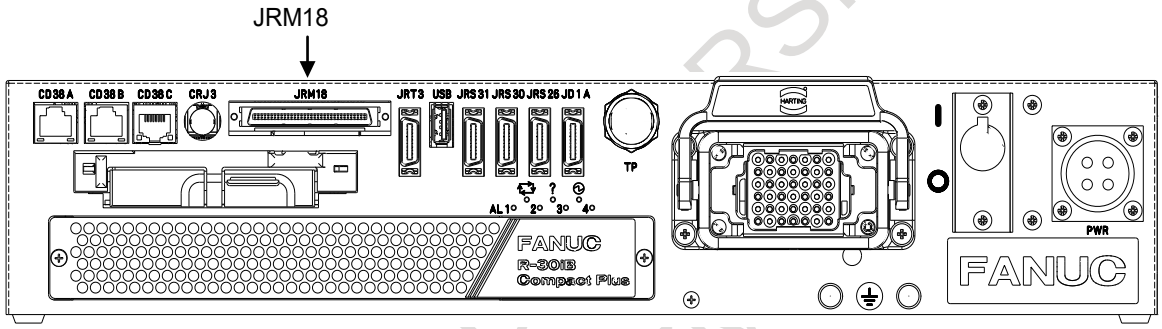


Fig.3 (a) Connecting the peripheral device cable (JRM18)

3.1 PERIPHERAL DEVICE INTERFACE

3.1.1 Peripheral Device interface (JRM18)

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

Table 3.1.1 (a) Input signals of peripheral device interface

Connector number	Signal name	Standard I/O assignment		Description	Remarks
		UOP auto asg.: Simple (JRM18)	UOP auto asg.: None Full Full (Slave) Simple Simple (Slave)		
JRM18-8	DI101	DI[101]	DI[101]	Peripheral device status	General signal
JRM18-42	DI102	DI[102]	DI[102]		
JRM18-9	DI103	DI[103]	DI[103]		
JRM18-43	DI104	DI[104]	DI[104]		
JRM18-10	DI105	DI[105]	DI[105]		
JRM18-44	DI106	DI[106]	DI[106]		
JRM18-11	DI107	DI[107]	DI[107]		
JRM18-45	DI108	DI[108]	DI[108]		
JRM18-12	DI109	DI[109]	DI[109]		
JRM18-46	DI110	DI[110]	DI[110]		
JRM18-13	DI111	DI[111]	DI[111]		
JRM18-47	DI112	DI[112]	DI[112]		
JRM18-14	*HOLD	UI[2] *HOLD	DI[81]	Temporary stop	
JRM18-48	RESET	UI[5] RESET	DI[82]	External reset	
JRM18-15	START	UI[6] START	DI[83]	Start	
JRM18-49	ENBL	UI[8] ENBL	DI[84]	Operation enabled	
JRM18-16	PNS1	UI[9] PNS1	DI[85]	Program number	
JRM18-50	PNS2	UI[10] PNS2	DI[86]		
JRM18-17	PNS3	UI[11] PNS3	DI[87]		
JRM18-51	PNS4	UI[12] PNS4	DI[88]		

Table 3.1.1 (b) Output signals of peripheral device interface

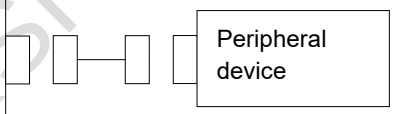
Connector number	Signal name	Standard I/O assignment		Description	Remarks
		UOP auto asg.: Simple (JRM18)	UOP auto asg.: None Full Full (Slave) Simple Simple (Slave)		
JRM18-18	DO101	DO[101]	DO[101]	Peripheral device status	General signal
JRM18-52	DO102	DO[102]	DO[102]		
JRM18-19	DO103	DO[103]	DO[103]		
JRM18-53	DO104	DO[104]	DO[104]		
JRM18-20	DO105	DO[105]	DO[105]		
JRM18-54	DO106	DO[106]	DO[106]		
JRM18-21	DO107	DO[107]	DO[107]		
JRM18-55	DO108	DO[108]	DO[108]		
JRM18-22	DO109	DO[109]	DO[109]		
JRM18-56	DO110	DO[110]	DO[110]		
JRM18-23	DO111	DO[111]	DO[111]		
JRM18-57	DO112	DO[112]	DO[112]		
JRM18-24	CMDENBL	UO[1] CMDENBL	DO[81]	During automatic operation	
JRM18-58	FAULT	UO[6] FAULT	DO[82]	Alarm	
JRM18-25	BATALM	UO[9] BATALM	DO[83]	Battery voltage drop	
JRM18-59	BUSY	UO[10] BUSY	DO[84]	During operation	

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

Peripheral device control interface (source type DO)

JRM18

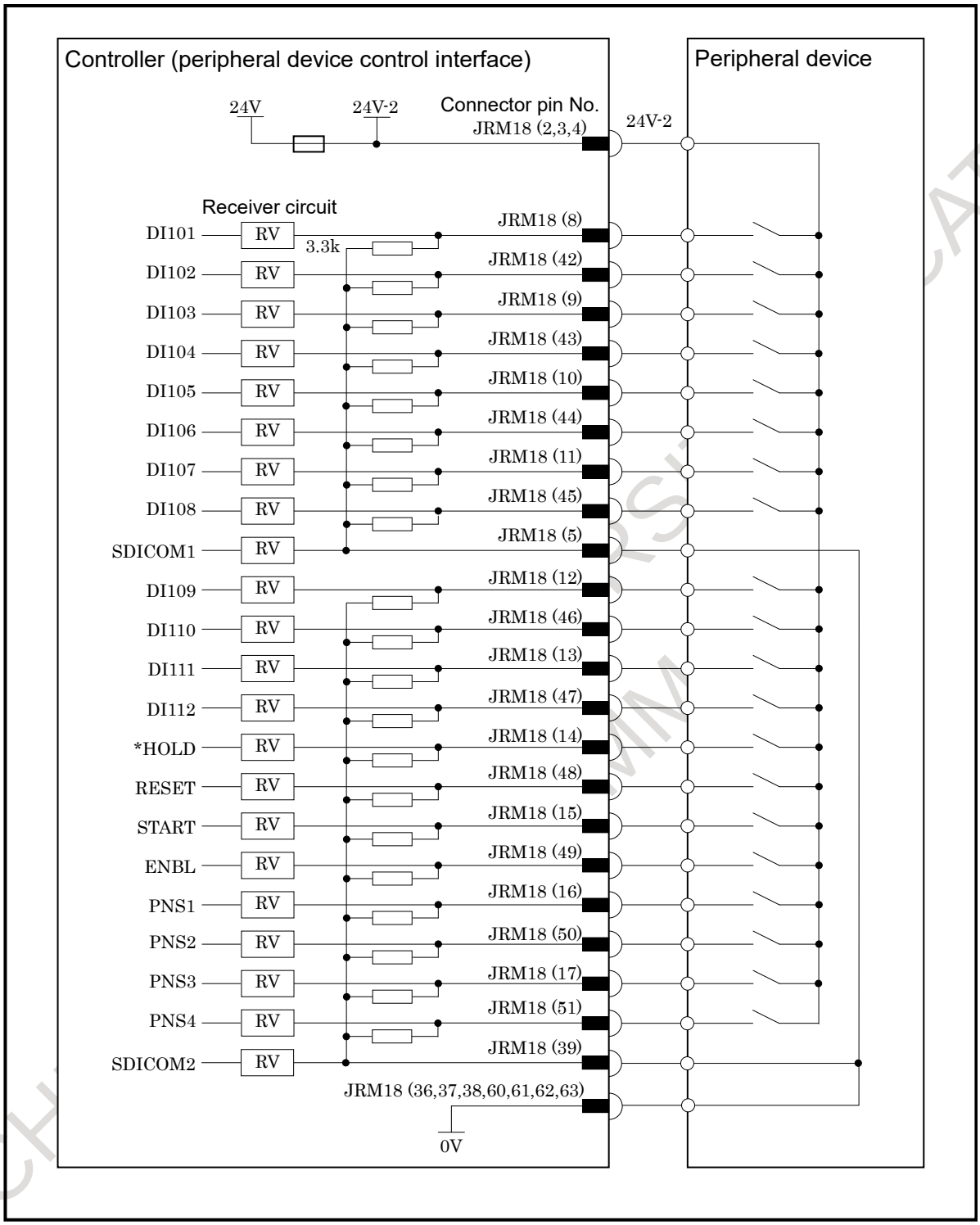
1	24VEXT_IN	35	0VEXT
2	24V-2	36	0V
3	24V-2	37	0V
4	24V-2	38	0V
5	SDICOM1	39	SDICOM2
6	EES1	40	EES2
7	EAS1	41	EAS2
8	DI101	42	DI102
9	DI103	43	DI104
10	DI105	44	DI106
11	DI107	45	DI108
12	DI109	46	DI110
13	DI111	47	DI112
14	*HOLD	48	RESET
15	START	49	ENBL
16	PNS1	50	PNS2
17	PNS3	51	PNS4
18	DO101	52	DO102
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	



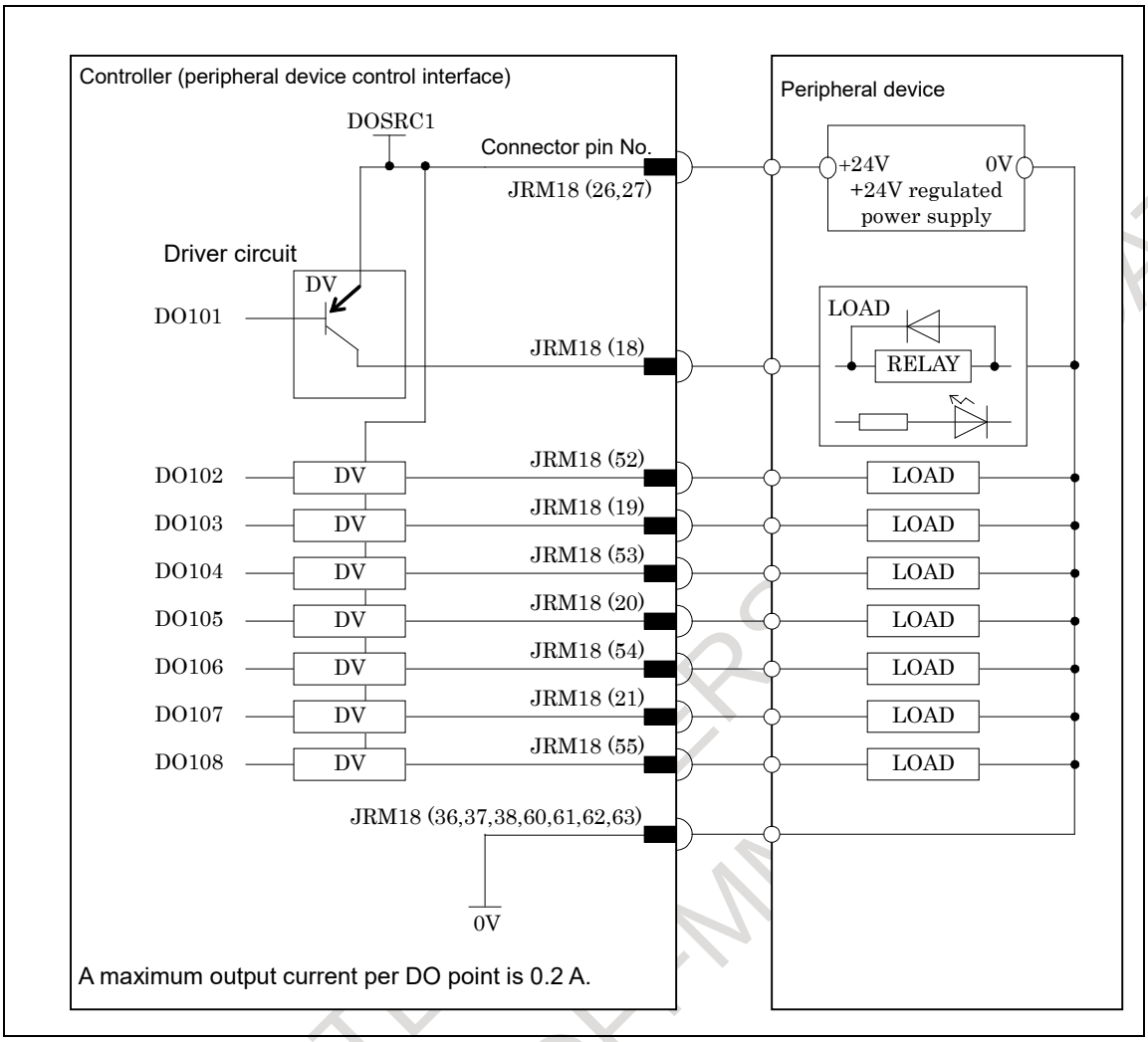
SDICOM1 to 2 signals are common selection signal for SDI.
When 24V-2 common is used, connect to 0V.
When 0V common is used, connect to 24V-2.

SDICOM1 → Selects a common for DI101 to DI108.
SDICOM2 → Selects a common for DI109 to DI112, *HOLD, RESET, START, ENBL, PNS1 to PNS4.

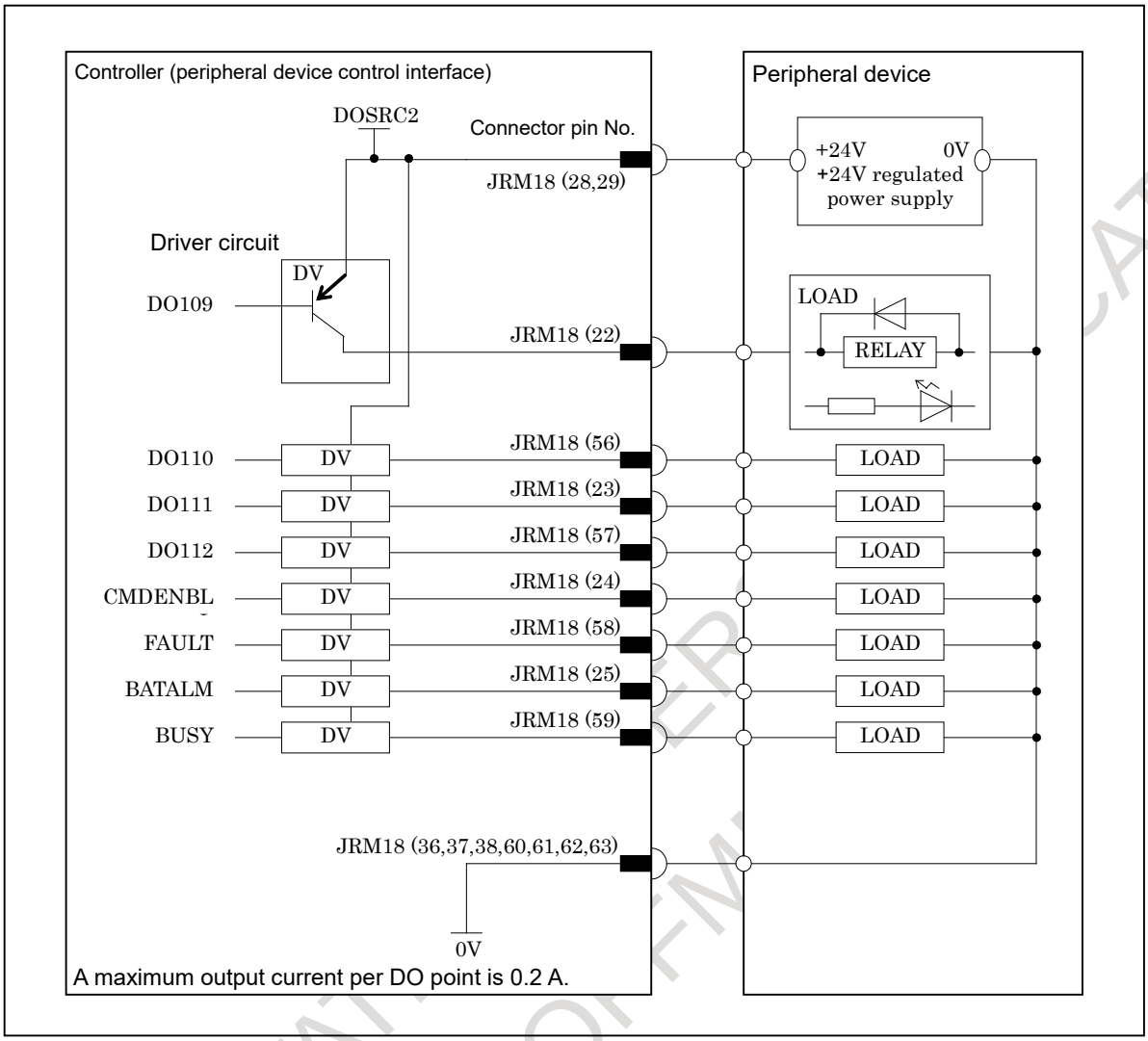
NOTE
1 The peripheral device connection cables are optional.
2 The DOSRC1 and DOSRC2 pins of the JRM18 are pins for supplying power to drivers. (None of these pins can be left open.)



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

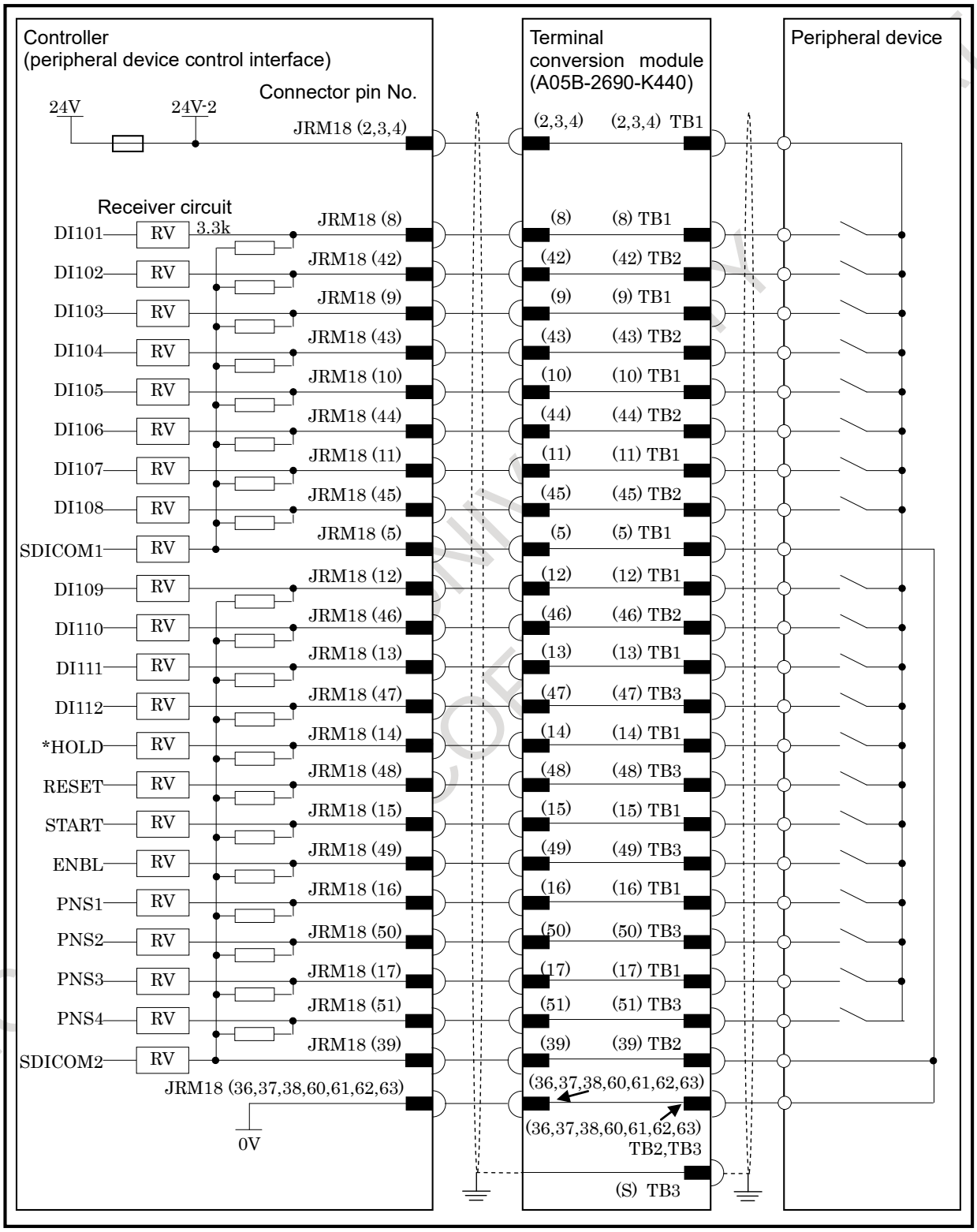


NOTE
Connector pin No.36-38 and No.60-63 of JRM18 are for 0V. None of these pins can be left open.

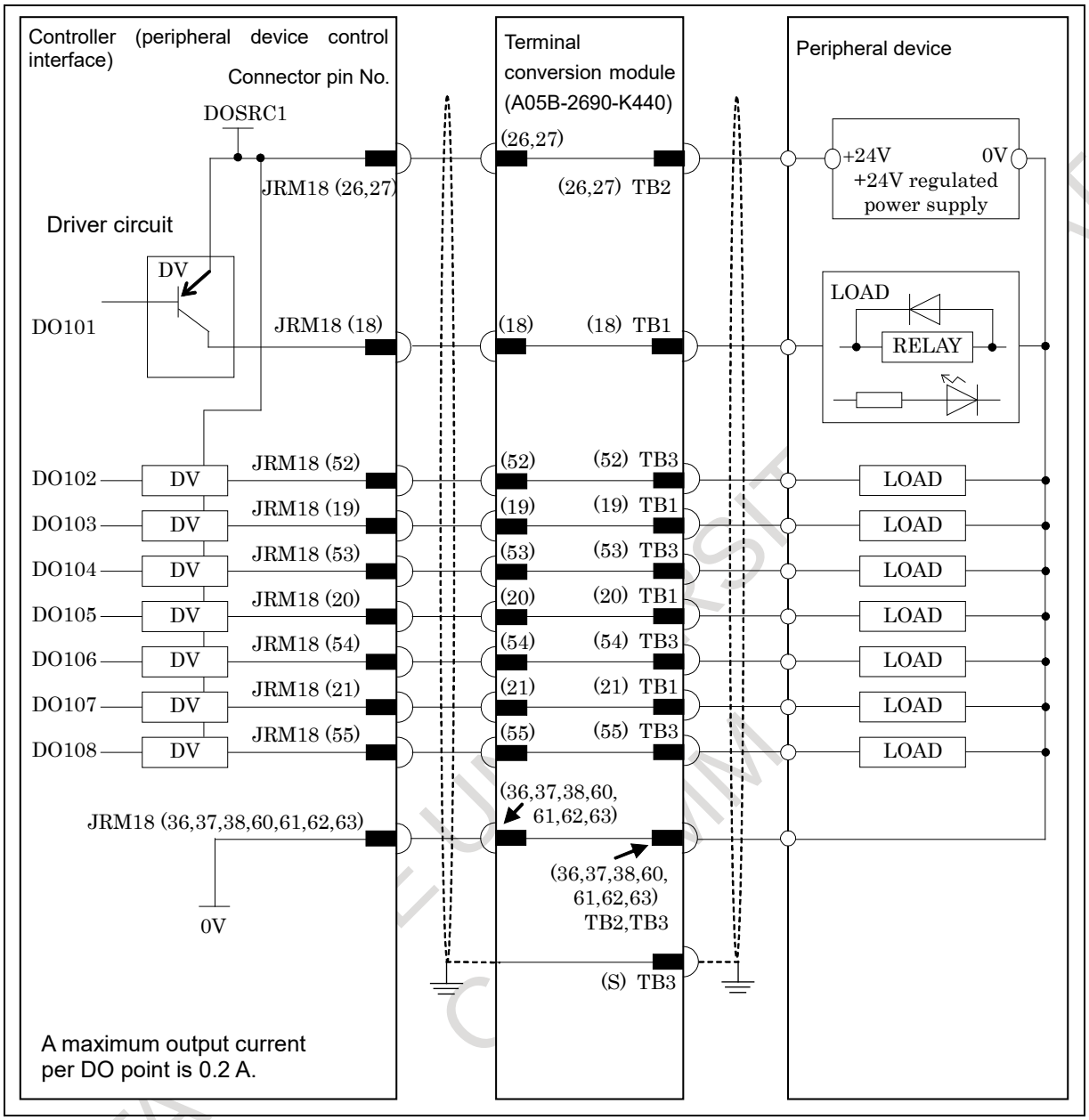


NOTE
Connector pin No.36-38 and No.60-63 of JRM18 are for 0V. None of these pins can be left open.

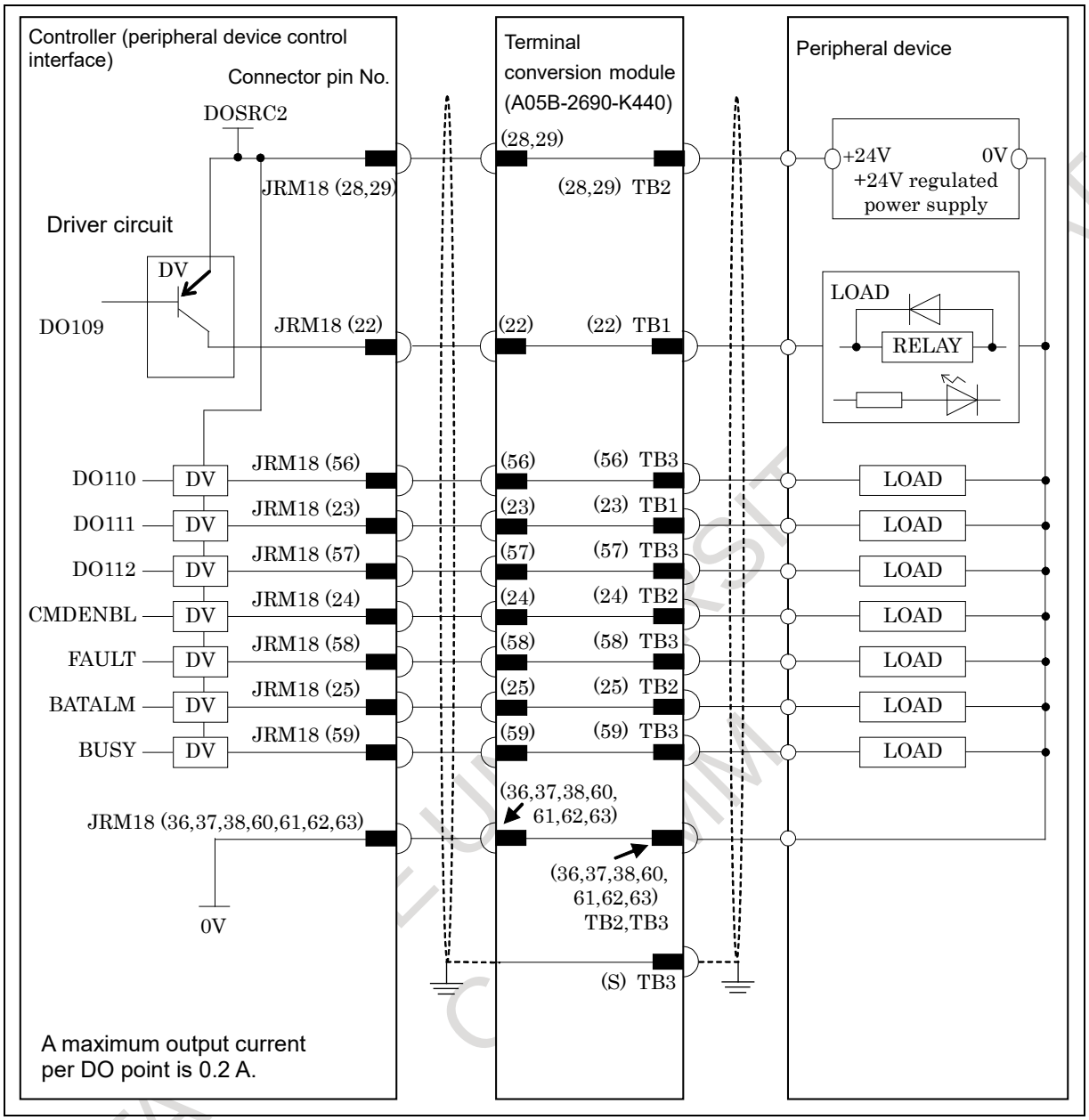
3.1.3 Connection between the Main Board (JRM18) and Peripheral Devices (for Terminal conversion module)



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



NOTE
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 EE INTERFACE

3.2.1 Connection between the Robot and End Effector

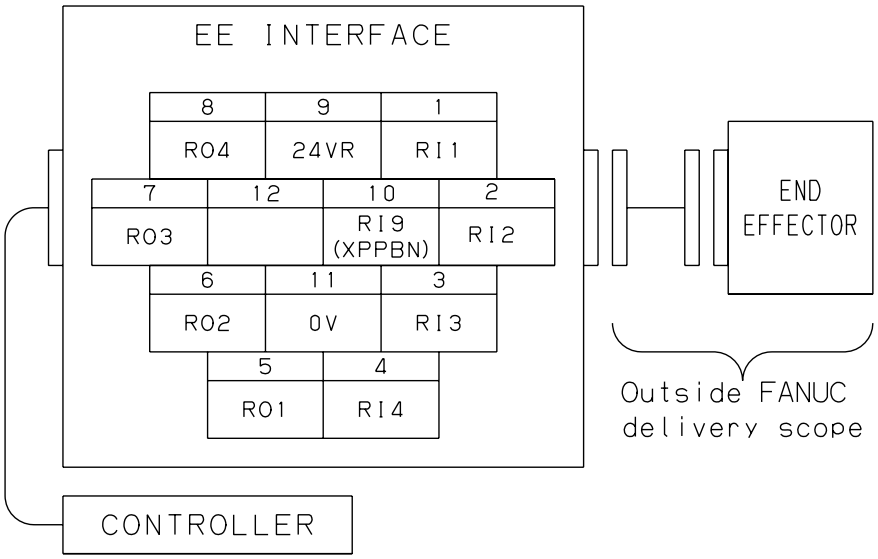
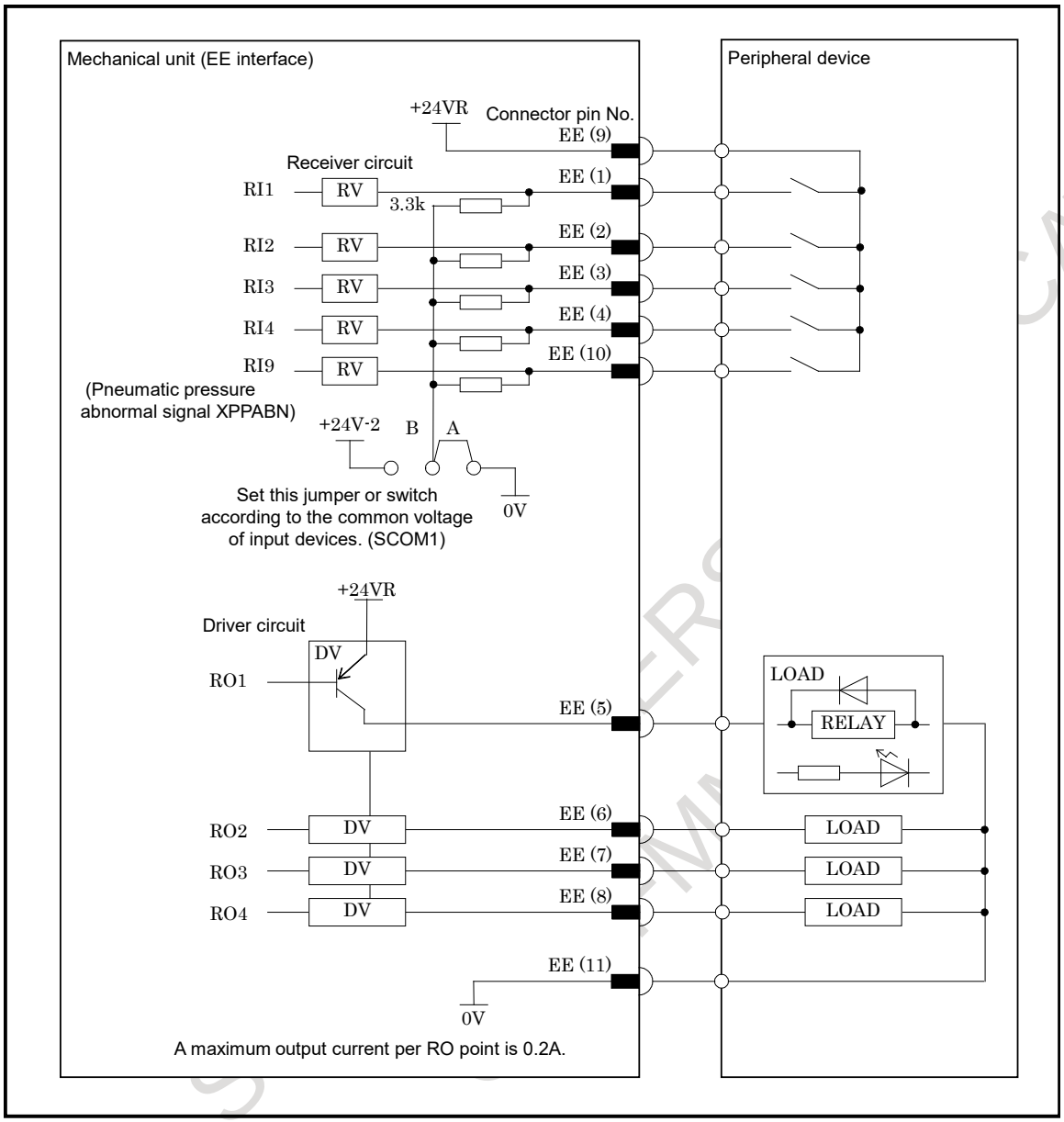


Fig.3.2.1 (a) Connection of End effector

NOTE
RO1 to RO4 are used as the on/off signals of the solenoid valve option.
For details, refer to the operator's manual of each robot.



NOTE
1 In this diagram, common voltage of input devices is +24V.
2 The common-level change-over setting pin or switch (SCOM1) is in the main board. Please see the Section 4.1.MAIN BOARD.

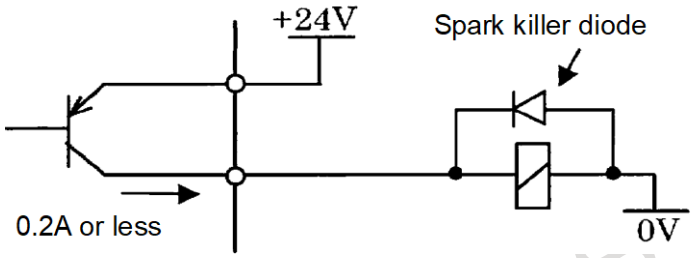
3.3 DIGITAL I/O SIGNAL SPECIFICATIONS

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

3.3.1 Peripheral Device Interface

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

(a) Example of connection



(b) Electrical specifications

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

(c) 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

(d) Spark killer diode

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

(e) Driver for output signals

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

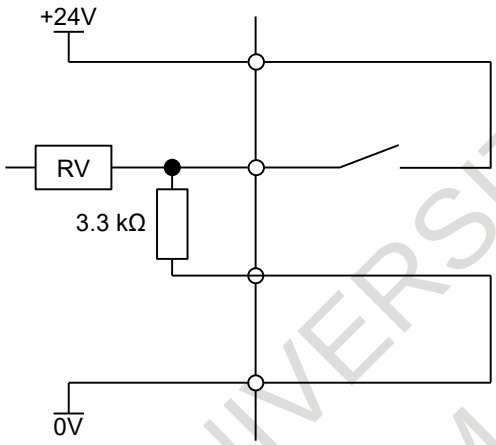
(f) Note on use

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.

(g) Applicable signals
Output signals of main board I/O board JRM18
CMDENBL, FAULT, BATALM, BUSY, DO101 to DO112

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

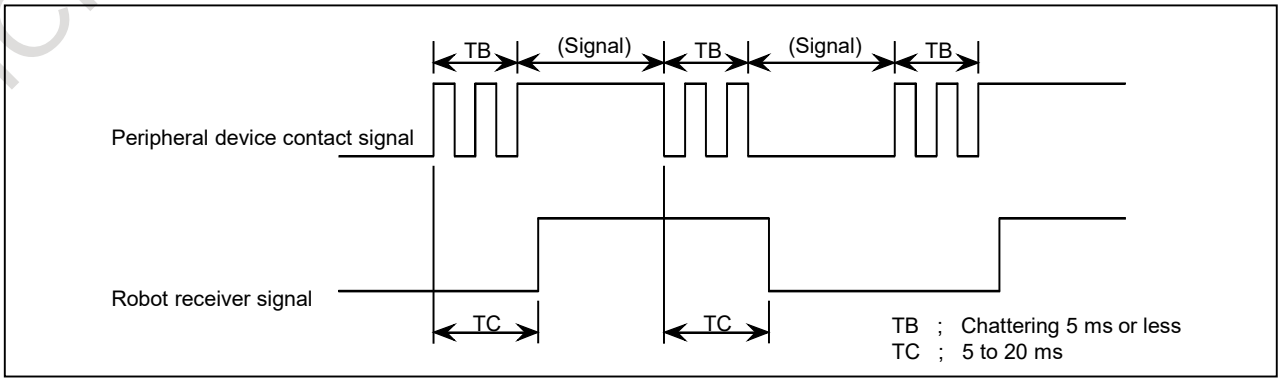


(b) Electrical specifications of the receiver

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

(c) Specifications of the peripheral device contact

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 less
Opened circuit resistance:	100kΩ or more

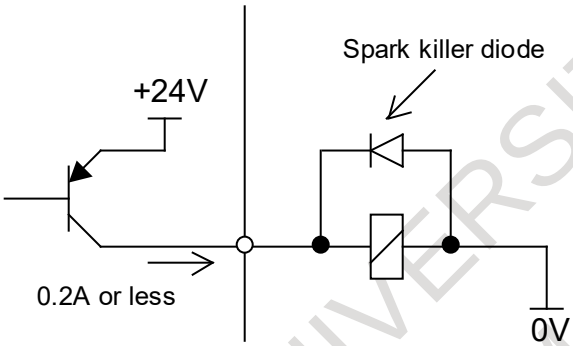


(d) Note on use
Apply the +24 V power at the robot to the receiver.
However, the above signal specifications must be satisfied at the robot receiver.

(e) Applicable signals
Input signals of main board JRM18
XHOLD, RESET, START, ENBL, DNS1 to DNS4
DI101 to DI112

3.3.2 EE Interface

(1) Output signals in EE interface
(a) Example of connection



(b) Electrical specifications

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

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

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

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

(f) Applicable signals
RO1 to RO4

(2) Input signal in peripheral device interface
The input signals are the same as those of other I/O boards. (Refer to Subsection 3.3.1 in II CONNECTIONS.)
(a) Applicable signals
RI1 to RI4, XPPABN (RI9)

3.4 CONNECTION OF THE PERIPHERAL DEVICES

3.4.1 Peripheral Device Cable Connector

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

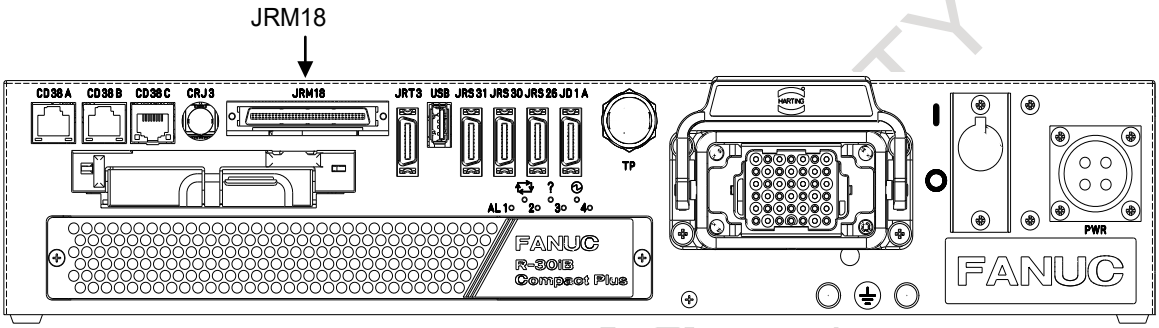
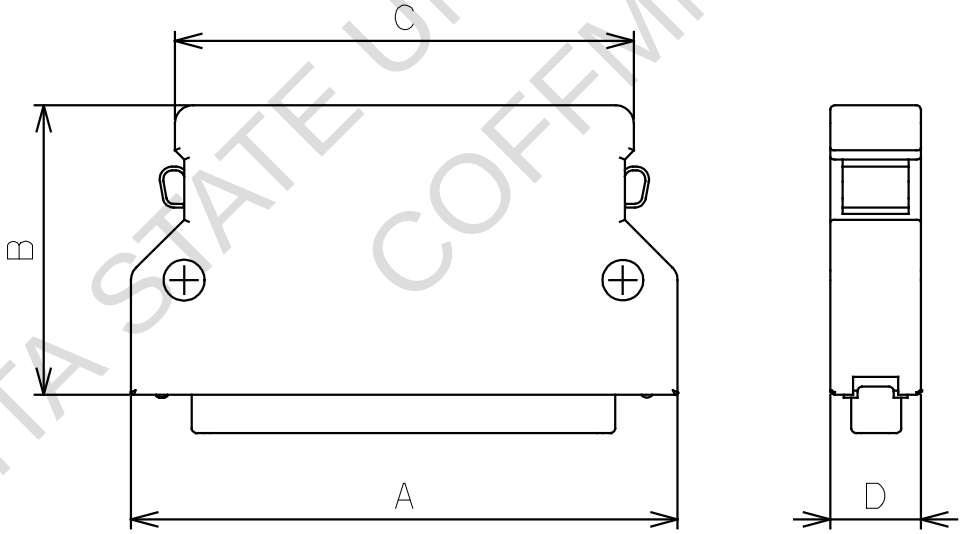


Fig.3.4.1 (a) Peripheral device interface (JRM18)



Connector specifications	Applicable 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

Fig.3.4.1 (b) Peripheral device cable connector

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

3.4.2 Connecting Terminal Conversion Module

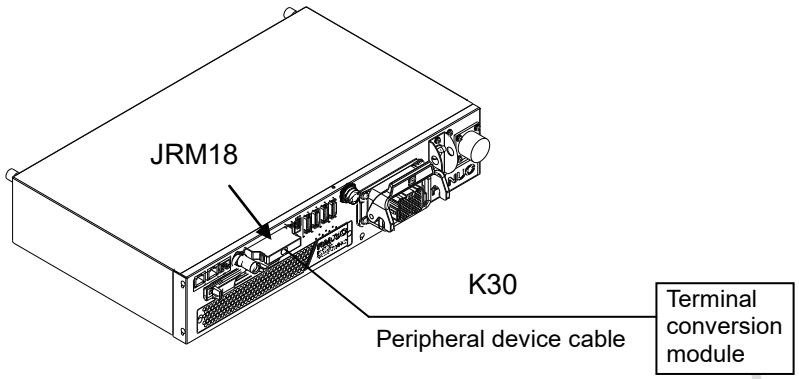


Fig.3.4.2 (a) Peripheral device cable connection

Specification of cable

Cable No.	Name	Ordering specification	Maintenance specification	Length (m)
K30	Peripheral Cable	A05B-2690-K430	A660-2008-T414#L1R003	1
		A05B-2690- K431	A660-2008-T414#L5R003	5
		A05B-2690- K432	A660-2008-T414#L10R03	10

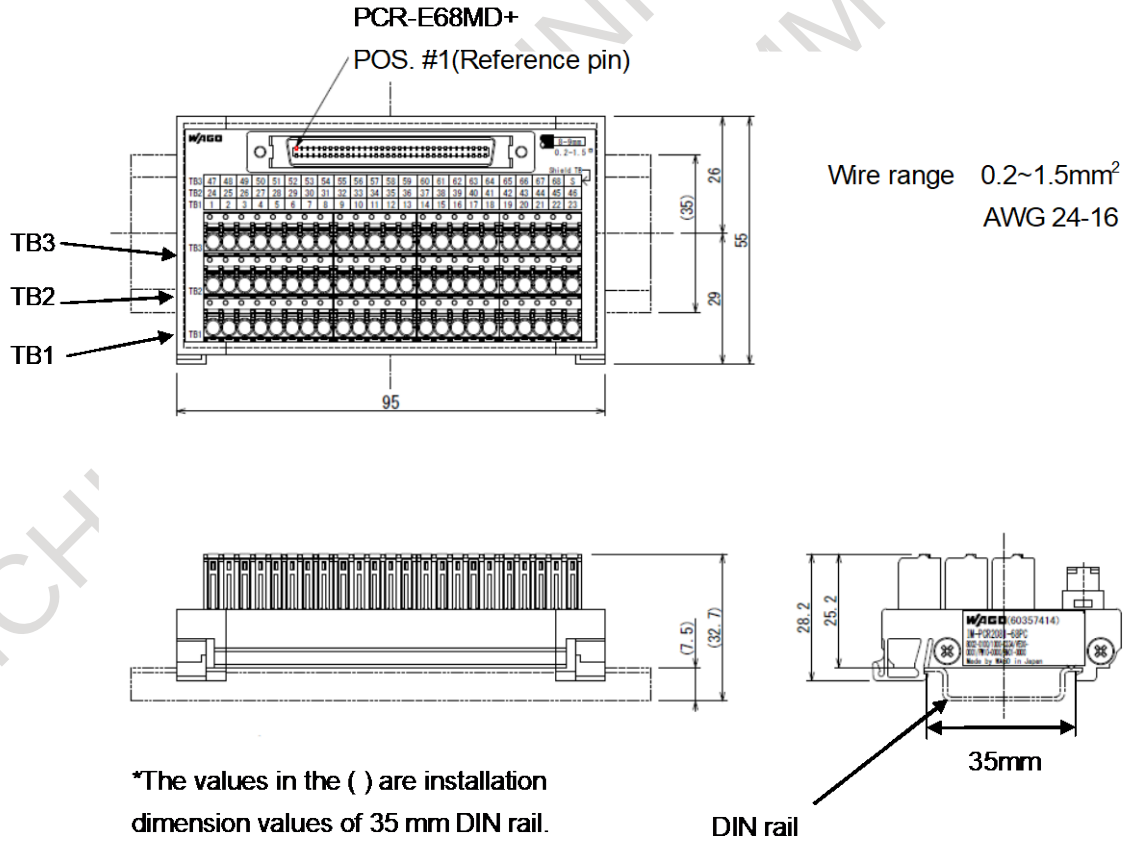


Fig.3.4.2 (b) Terminal conversion module (A05B-2690-K440)

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

Terminal conversion module

	TB1		TB2		TB3
1	24VEXT_IN	24	CMDENBL	47	DI112
2	24V-2	25	BATALM	48	RESET
3	24V-2	26	DOSRC1	49	ENBL
4	24V-2	27	DOSRC1	50	PNS2
5	SDICOM1	28	DOSRC2	51	PNS4
6	EES1	29	DOSRC2	52	DO102
7	EAS1	30	ESPB1	53	DO104
8	DI101	31	ESPB2	54	DO106
9	DI103	32	ESPB1	55	DO108
10	DI105	33	ESPB2	56	DO110
11	DI107	34		57	DO112
12	DI109	35	0VEXT	58	FAULT
13	DI111	36	0V	59	BUSY
14	*HOLD	37	0V	60	0V
15	START	38	0V	61	0V
16	PNS1	39	SDICOM2	62	0V
17	PNS3	40	EES2	63	0V
18	DO101	41	EAS2	64	ESPB11
19	DO103	42	DI102	65	ESPB21
20	DO105	43	DI104	66	ESPB11
21	DO107	44	DI106	67	ESPB21
22	DO109	45	DI108	68	
23	DO111	46	DI110	S	SHIELD

3.4.3 Connecting Additional Safety I/O Terminal Conversion Board

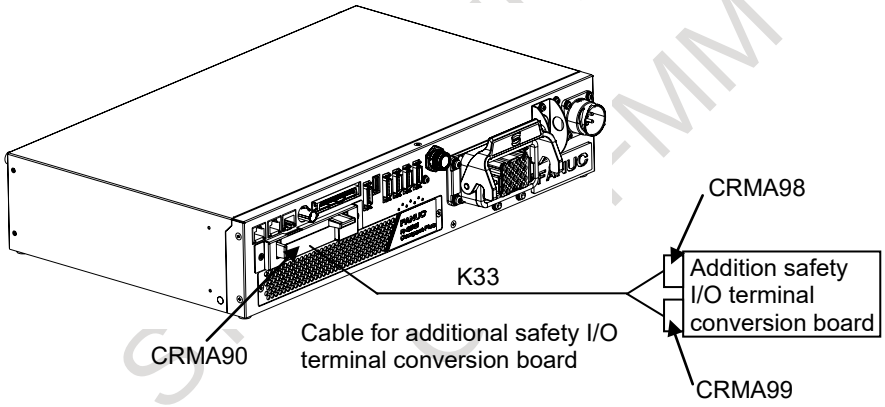


Fig.3.4.3 (a) Connecting additional safety I/O terminal conversion board

Name	Ordering specification	Part name	Cable No.	Maintenance specification	Length (m)	Quantity
Additional safety I/O terminal conversion board	A05B-2690-K132	Additional safety I/O terminal conversion unit		A05B-2690-C132		1
		Cable for additional safety I/O terminal conversion board	K33	A660-4005-T389 #L5R003	5	1
	A05B-2690-K133	Additional safety I/O terminal conversion unit		A05B-2690-C132		1
		Cable for additional safety I/O terminal conversion board	K33	A660-4005-T389 #L10R03	10	1

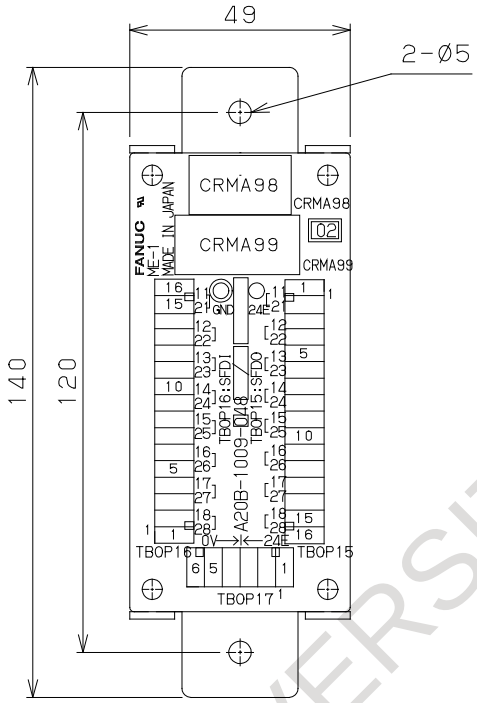


Fig.3.4.3 (b) Additional safety I/O terminal conversion board

Additional safety I/O terminal conversion unit

TBOP15 Terminal

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

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

1	24E
2	24E
3	24E
4	0V
5	0V
6	0V

3.4.4 Connecting CC-Link Board

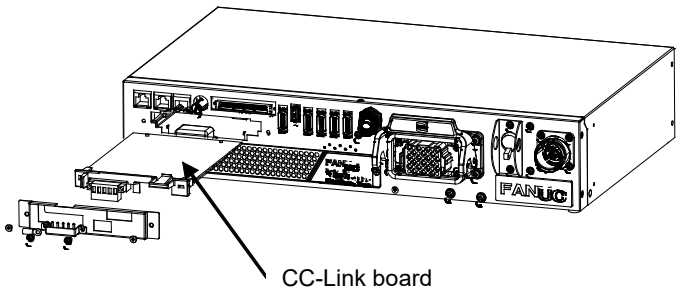


Fig.3.4.4 (a) CC-Link board mounting method

Name	Ordering specification	Part name	Maintenance specification	Quantity
CC-Link board	A05B-2690-J110	PCB	A20B-8101-0550	1
		Plate for fixing	A230-0676-V011	1
		Earth cable	A660-8021-T108	1
		Screw	A6-SSA-3X6S-M-ZN2A	2

When using the CC-Link board, it is necessary to connect the earth cable.

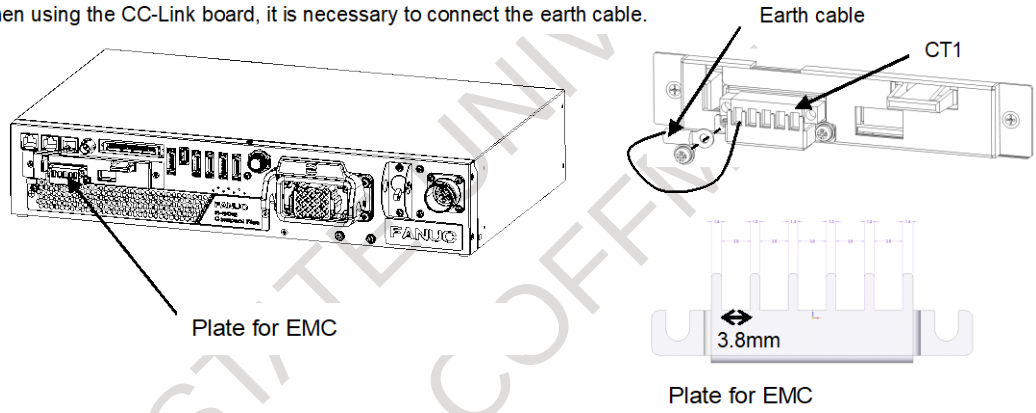
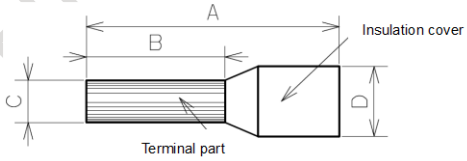


Fig.3.4.4 (b) Fixing plate for EMC and connection method of earth cable

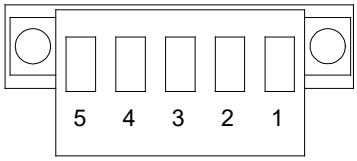
Recommended AWG 20 for the CC-Link cable
The dimensions of the recommended ferrule terminal (H sleeve) are shown below.



Dimension	Specified dimension	Note
A	Unspecified	
B	6～7mm	Due to the terminal part (B) is hidden inside the terminal block, please use the terminal part (B) of a sufficient length to ensure that enough connection is obtained.
C	Unspecified	Please use the dimension suitable for AWG20.
D	3.8mm or less	Constraint of plate for EMC.

Fig.3.4.4 (c) Recommended CC-Link cable and ferrule terminal (H sleeve)

Interface CT1



Terminal sequence	5	4	3	2	1
Signal name	FG	SLD	DG	DB	DA

Fig.3.4.4 (d) Interface CT1

3.4.5 Connecting DeviceNet Board

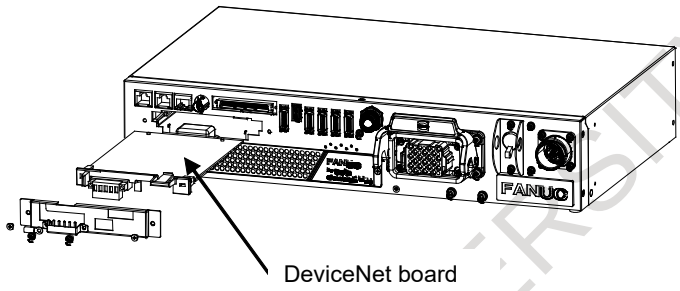


Fig.3.4.5 (a) DeviceNet board mounting method

Name	Ordering specification	Part name	Maintenance specification	Quantity
DeviceNet board slave	A05B-2690-J040	PCB	A20B-8101-0330	1
		Plate for fixing	A230-0676-V012	1
		Screw	A6-SSA-3X6S-M-ZN2A	2
		Connector terminal block	A63L-0001-0471/PB2FAMB5	1

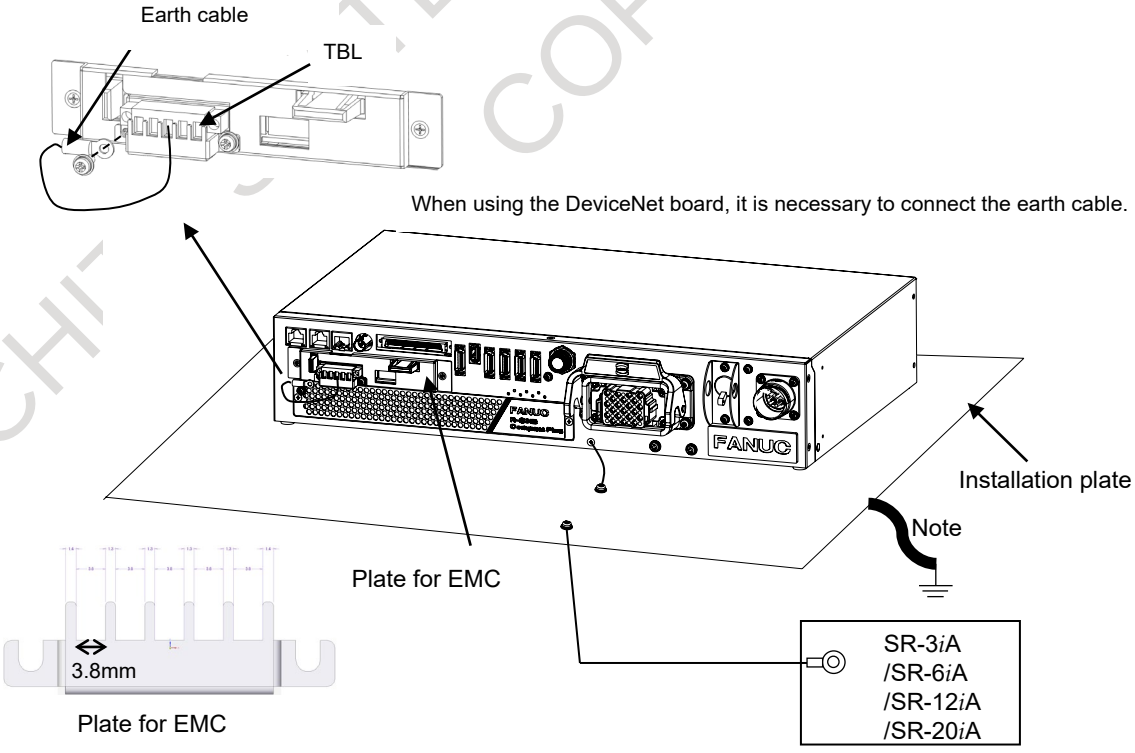
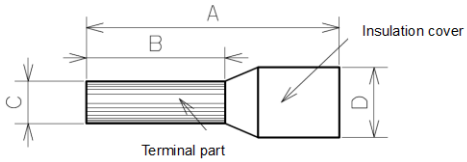


Fig.3.4.5 (b) Fixing plate for EMC and connection method of earth cable

NOTE
Please connect the installation plate to the ground.

The dimensions of the recommended ferrule terminal (H sleeve) are shown below.



Dimension	Specified dimension	Note
A	Unspecified	
B	6～7mm	Due to the terminal part (B) is hidden inside the terminal block, please use the terminal part (B) of a sufficient length to ensure that enough connection is obtained.
C	Unspecified	Please use the dimension suitable for AWG20.
D	3.8mm or less	Constraint of plate for EMC. There is no limitation on the vertical dimension of the plate.

Fig.3.4.5 (c) Recommended ferrule terminal (H sleeve)

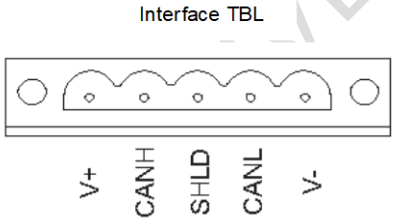


Fig.3.4.5 (d) Interface TBL

3.5 CONNECTION OF HDI

3.5.1 Connecting HDI

The HDI signals are used in combination with special application software. The HDI signals cannot be used as general-purpose DIs.

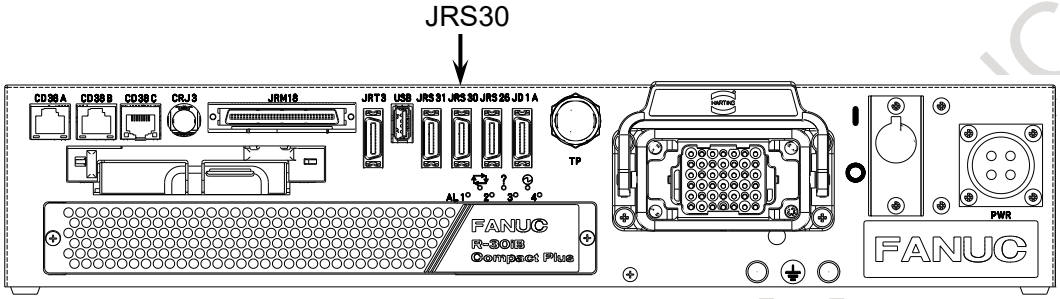
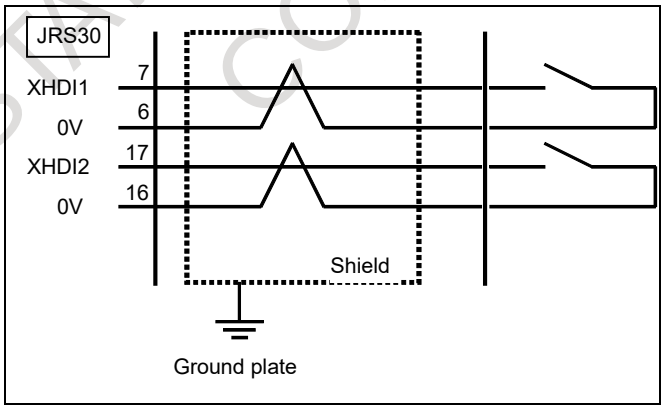


Fig.3.5.1 (a) Connecting HDI (JRS30)

JRS30

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

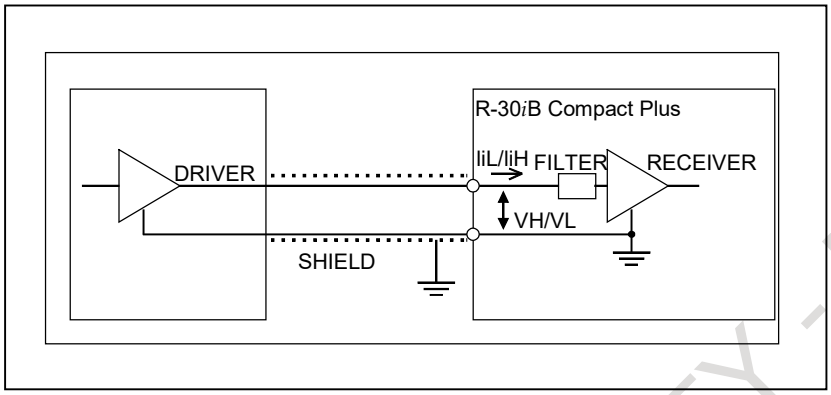
Cable connections



NOTE
Please specify main board A05B-2690-H002 by using the HDI signal.

3.5.2 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

Unit	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 = 0 V
Input signal pulse duration		20 (min)	μ s	
Input signal delay or variations		20 (max)	μ 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.

3.6 CONNECTING THE COMMUNICATION UNIT

3.6.1 RS232C Interface

3.6.1.1 Interface

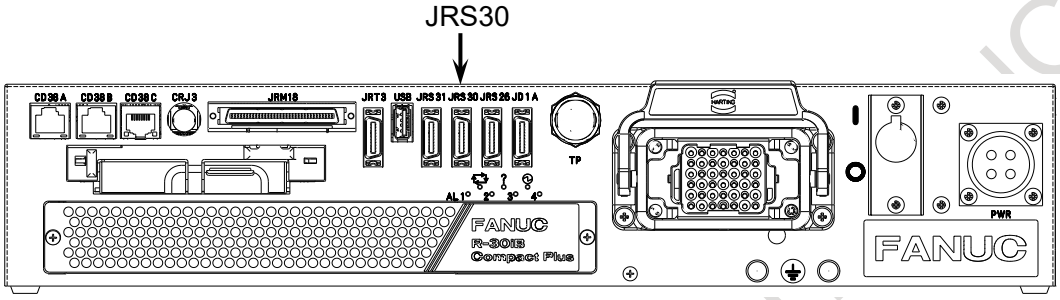


Fig.3.6.1.1 (a) RS232C interface (JRS30)

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.
2 Do not connect anything to those pins for which signal names are not indicated.

3.6.1.2 RS232C interface signals

Generally signals as follows are used in RS232C interface.

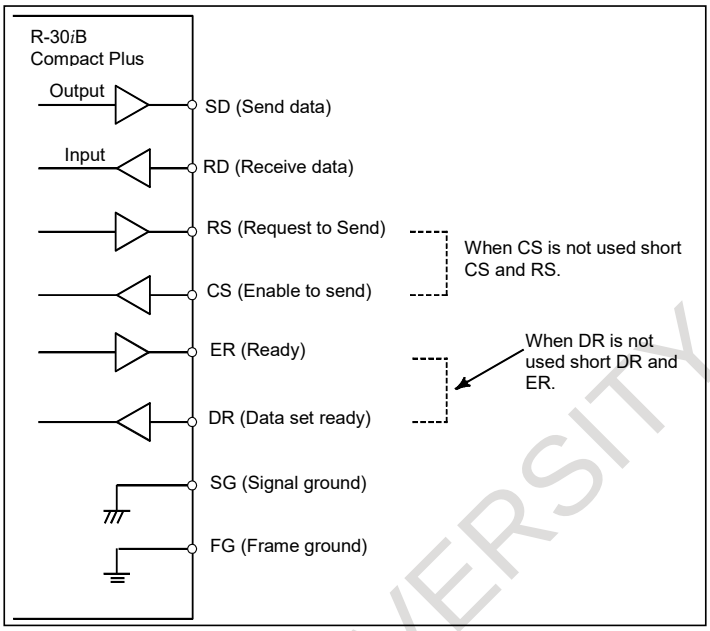
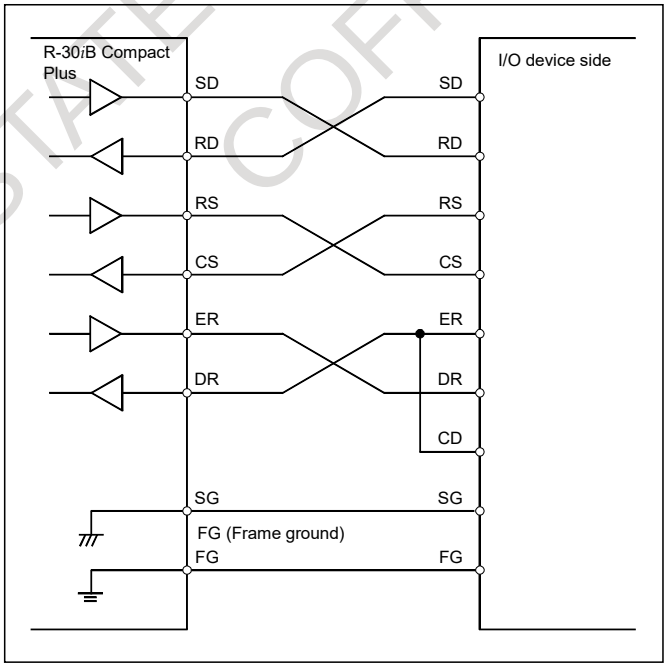


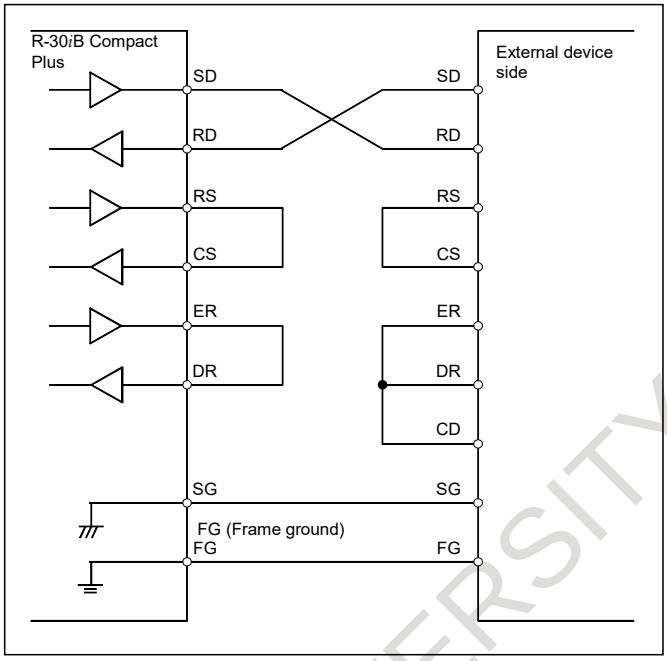
Fig.3.6.1.2 (a) RS232C interface

3.6.1.3 Connection between RS232C interface and I/O device

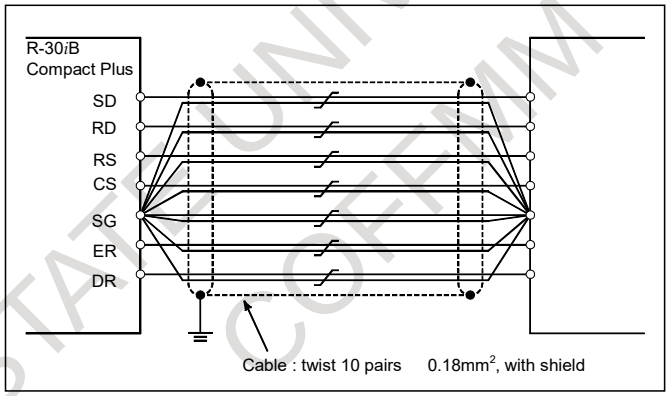
The figure below shows a connection with the handshaking of the ER/DR, RS/CS signals.



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



Cable connection



Pair each signal with SG.

3.6.2 LVC Line Tracking Encoder 2ch

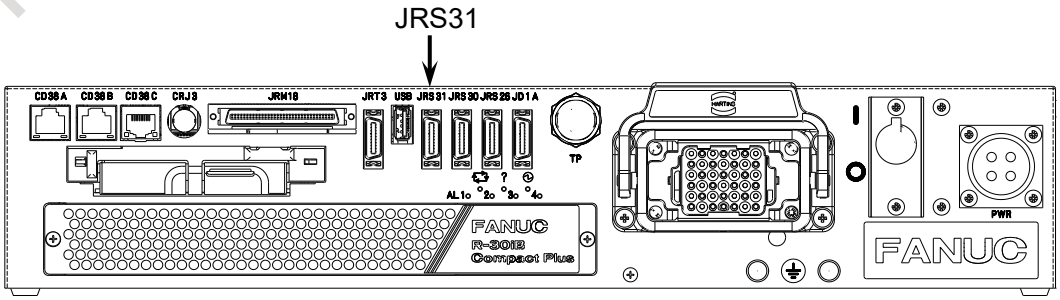


Fig.3.6.2 (a) LVC line tracking encoder 2ch (JRS31)

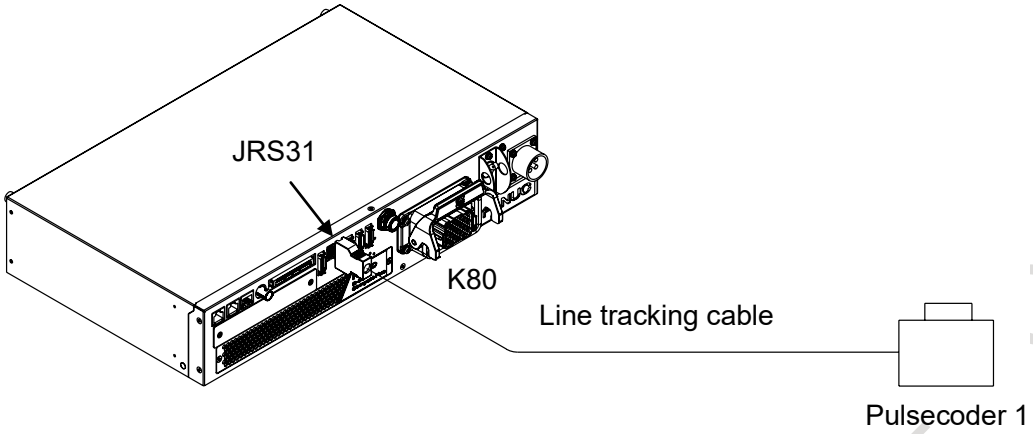


Fig.3.6.2 (b) Line tracking encoder (for 1 Pulsecoder)

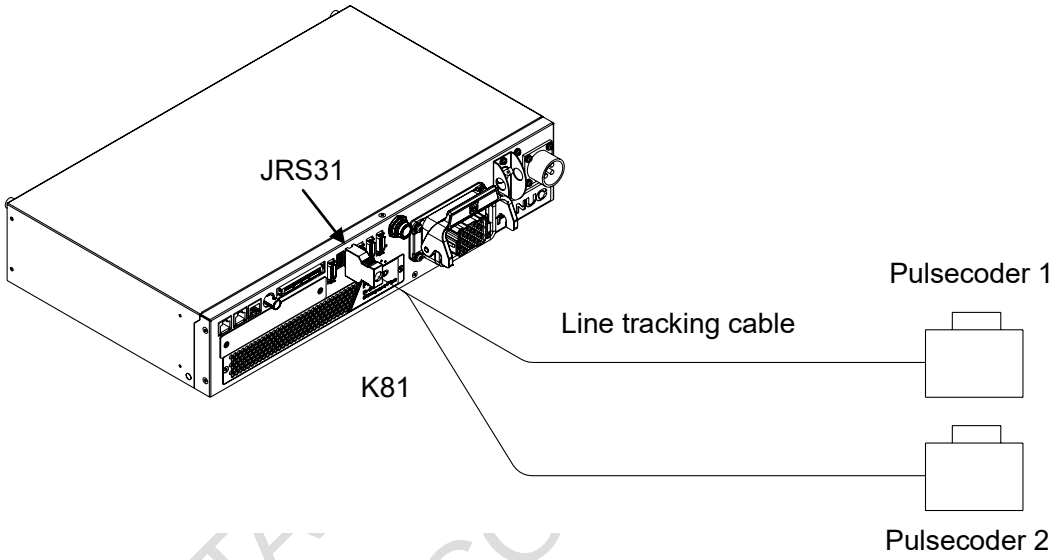


Fig.3.6.2 (c) Line tracking encoder (for 2 Pulsecoders)

Specification of cable

Cable No.	Name	Ordering specification	Maintenance specification	Length (m)
K80	Line tracking cable (for 1 pulsecoder)	A05B-2690-J300	A660-2008-T303#L7R003	7
		A05B-2690-J301	A660-2008-T303#L14R003	14
		A05B-2690-J302	A660-2008-T303#L20R003	20
K81	Line tracking cable (for 2 pulsecoders)	A05B-2690-J310	A660-4005-T713#L7R003	7
		A05B-2690-J311	A660-4005-T713#L14R003	14
		A05B-2690-J312	A660-4005-T713#L20R003	20

NOTE
Please specify main board A05B-2690-H002 by using line tracking encoder.

3.6.3 Ethernet Interface

This section describes information relating to the physical Ethernet connection.

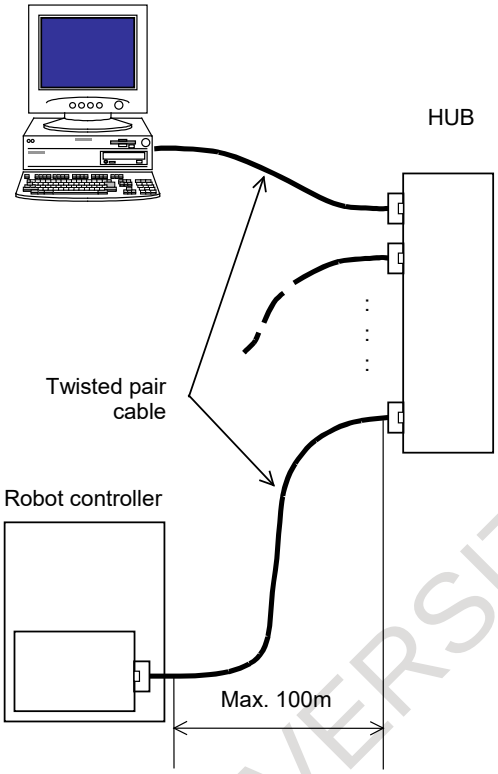
> ⚠ **CAUTION**
> Please inquire of each manufacturer (of hub, transceiver, cable etc.) about the construction of network or the condition of using the equipment. When configuring your network, you must take other sources of electrical noise into consideration to prevent your network from being influenced 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.

3.6.3.1 Connection to Ethernet

The robot controller is provided with a 100BASE-TX interface and 1000BASE-T interface.
Prepare a hub for connecting the controller to the Ethernet trunk. The following shows an example of a general connection.

To connect the controller 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.



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

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

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-
6	MDI1-	Bi-directional Data 1-
7	MDI3+	Bi-directional Data 3+
8	MDI3-	Bi-directional Data 3-

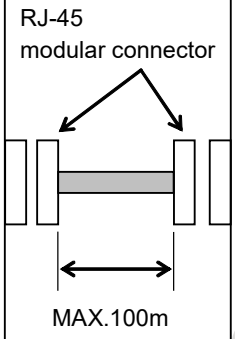
3.6.3.2 Twisted-pair cable specification

Cable Connection

The cable used for connection between the CD38A/CD38B/CD38C and the HUB is connected as follows:

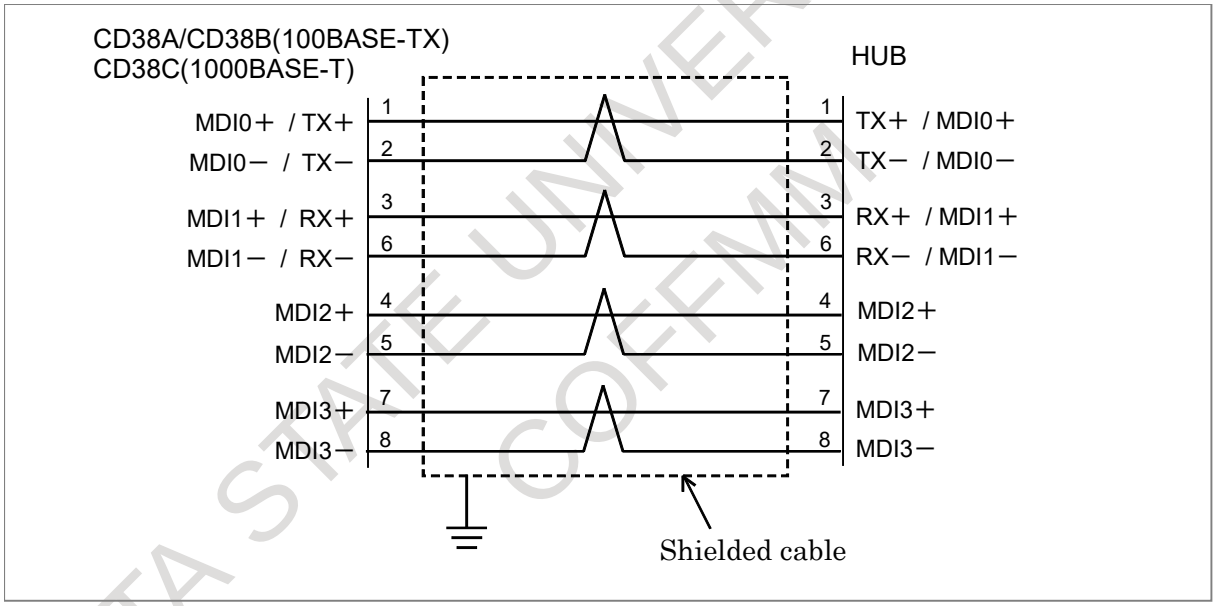
R-30*i*B Compact Plus
CD38A,CD38B,CD38C

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-

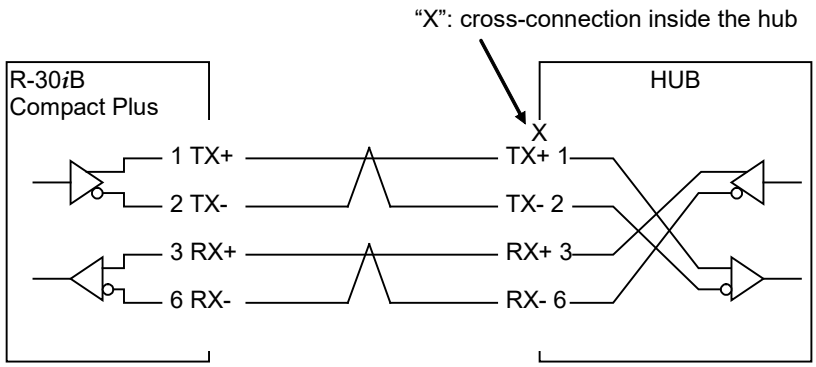


HUB

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 40m.) 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.

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

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

> **NOTE**
> The recommended cables cannot be used for flexible parts.

Recommended cable (for flexible parts, dedicated to FANUC)

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

Specification

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

- Electrical characteristic:
  Complying with EIA/TIA 568B.2 Category 5e.
  From the viewpoint of attenuation performance, ensure that the length to the hub is 40 m or less.
- Structure:
  Common-shield braided cable with drain wire. 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 thousands or more bending cycles with a bending radius of 20 mm
  Twisting: 5 million or more sliding cycles. (+/- 180degrees)
- UL style No. :
  AWM20276（80℃/30V/VW-1）

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

- Electric characteristics:
  Conforms to EIA/TIA 568A Category 3 and Category 5.
  From the viewpoint of attenuation performance, ensure that the length to the hub is 50 m or less.
- Structure:
  Group shielded (braided shield). A drain wire is available.
  The conductor is an AWG26 annealed copper twisted wire, with a 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:
  1,000,000 times or more with a bending radius of 50 mm (U-shaped flex test)
- UL style No.
  AWM 20276 (80°C/30V/VW-1)

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

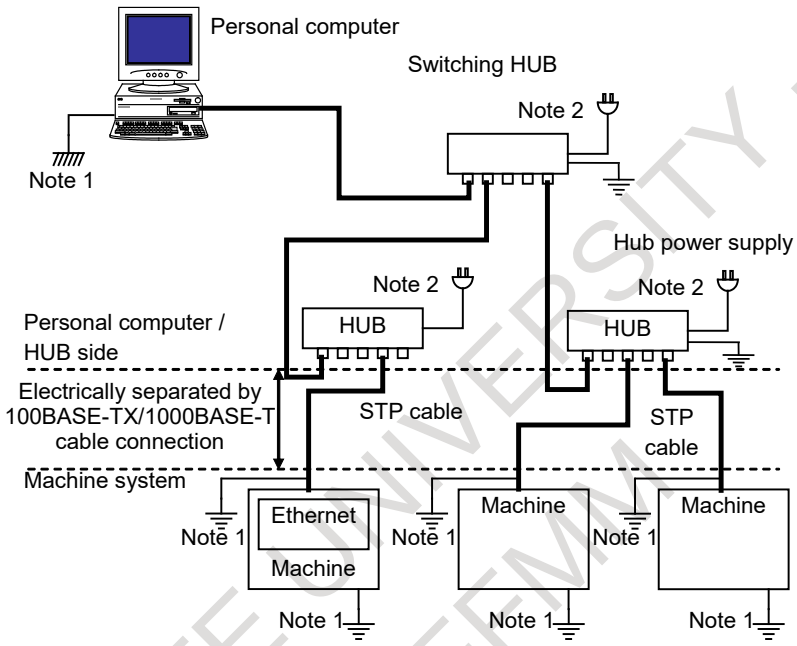
Flex	Specification	Manufacturer	Remarks
AWG26 4P TPMC-C5-F (SB) AWG26 4P TPMC-C5E (S-HFR) K, or FNC-118	TM21CP-88P (03)	HIROSE ELECTRIC CO., LTD.	NOTE

NOTE
Information about TM21CP-88P (03):
Connector (standard product of the manufacturer)
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.)

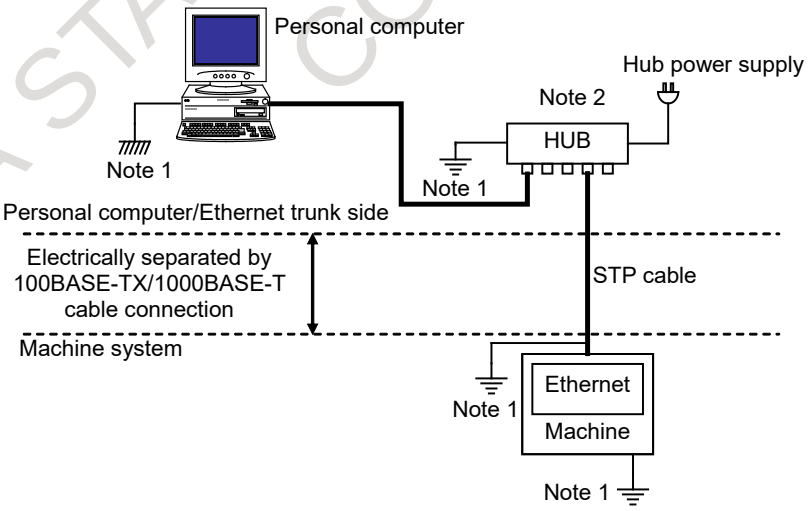
3.6.3.3 Electrical noise countermeasures

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. If Ethernet cable is longer than 30m, Ethernet cable must be grounded on machine system side as provision for surge. Examples of connection are given below.



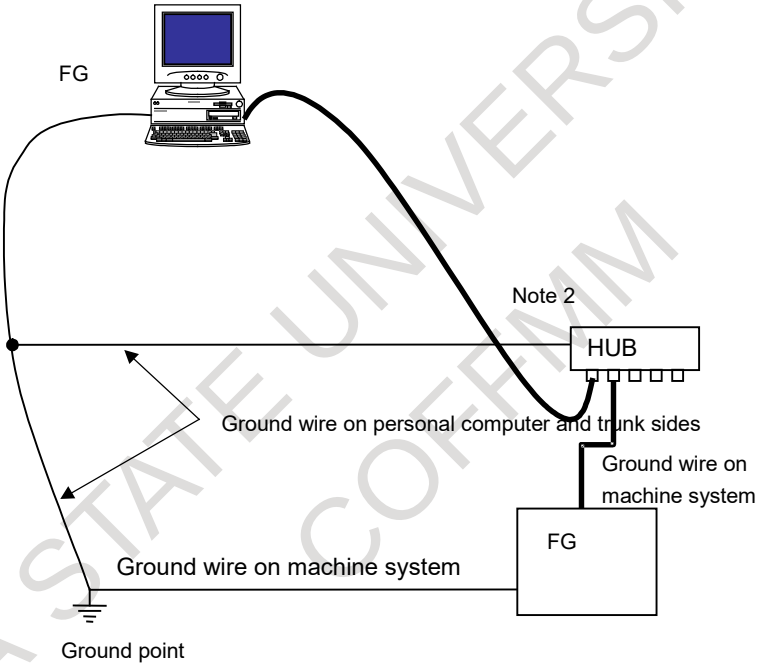
Large-Scale Network



Small-Scale Network

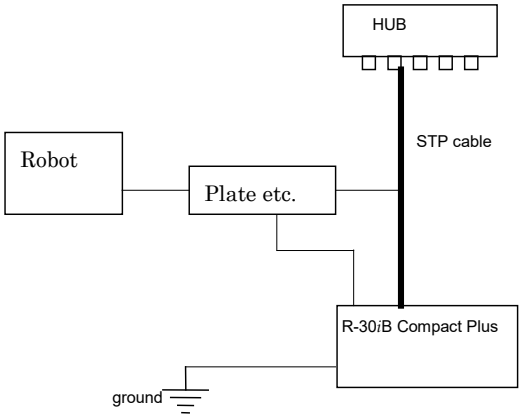
NOTE

1 The ground between PC/HUB side and machine system side must be separated. If it is impossible to separate the ground because there is only one grounding point, connect the ground cable for each system to the grounding point independently. (See figure below.)
The resistance for grounding must be less than 100-ohm (Class D). The thickness of the ground cable is the same as the thickness of AC power cable or more. At least thickness of 5.5mm^2 is necessary.
2 Note that the number of allowable hub-to-hub connections depends on the type of hub.
3 There is possibility that noise makes the obstacle of communication even if the ground is separated using the 100BASE-TX/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).

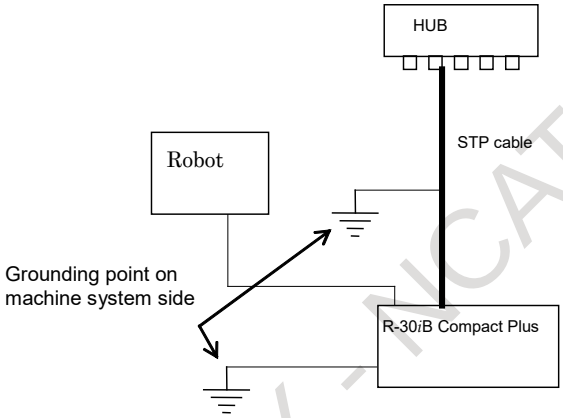


Wiring on a single ground point

See figure below when Ethernet cable is grounded on R-30*i*B Compact Plus system.



Example 1 (Using plate to avoid connecting two cable at the same point)



Example 2 (Using two grounding point))

3.6.3.4 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 40m (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+)	
	Grounding	Cable which is longer than 30m shall be grounded on machine system side. Please see Fig.3.6.3.5 (a).	
	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	
	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 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).	
	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.

3.6.3.5 Shielding Ethernet cable

Please shielding cable as shown in the following figure when using the safety network function and CE certification is required.

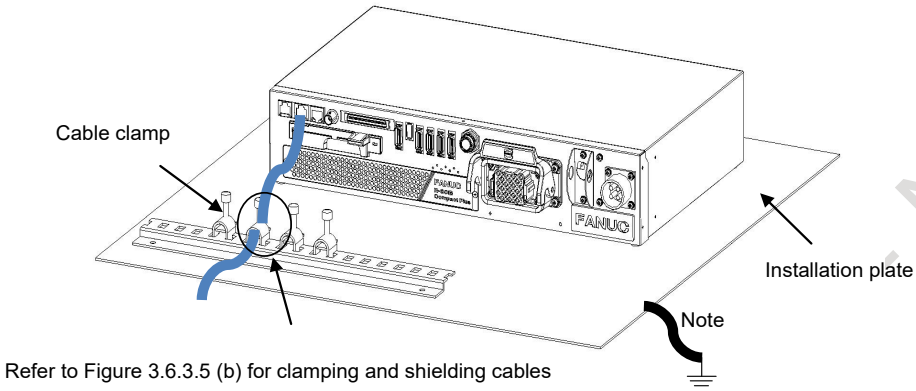


Fig.3.6.3.5 (a) Shielding Ethernet cable

NOTE
Please connect the installation plate to the ground.

Peel off part of the Ethernet cable jacket as shown in Fig.3.6.3.5 (b) to expose the outer coating of the shield, and press this outer coating against the earth plate with the cable clamp.

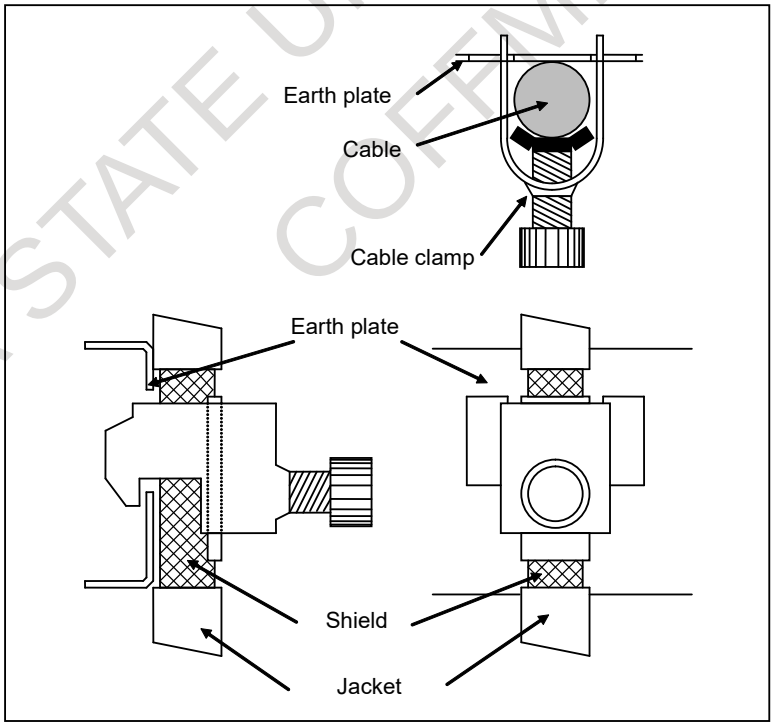


Fig.3.6.3.5 (b) Clamping and shielding cable

3.6.4 Camera Interface

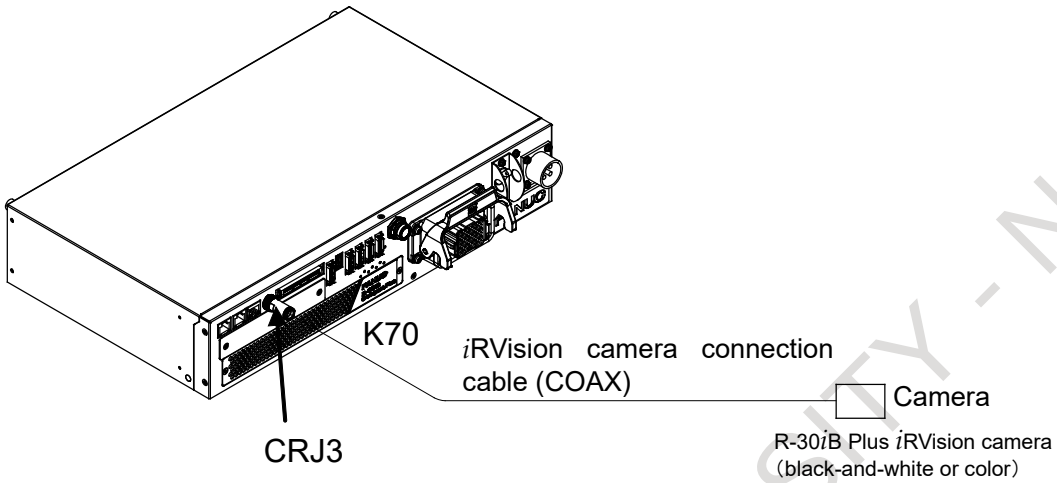


Fig.3.6.4 (a) *i*RVision camera cable connection

Specification of cable

Cable No.	Name	Ordering specification	Maintenance specification	Length (m)
K70	*i*RVision camera connection cable (COAX) (Non-Flex)	A05B-2690-J340	A660-2008-T534#L7R003E	7
		A05B-2690-J341	A660-2008-T534#L14R03E	14
		A05B-2690-J342	A660-2008-T534#L20R03E	20
		A05B-2690-J343	A660-2008-T534#L25R03E	25
	*i*RVision camera connection cable (COAX) (for cable carrier)	A05B-2690-J320	A660-2008-T435#L7R003E	7
		A05B-2690-J321	A660-2008-T435#L14R03E	14
		A05B-2690-J322	A660-2008-T435#L20R03E	20
		A05B-2690-J323	A660-2008-T435#L25R03E	25

NOTE
Please specify main board A05B-2690-H002 by using vision I/F.

	Robot	Non-flex type			Flex type		
		Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)	Diameter (mm)	Weight (kg/m)	Minimum bending radius (mm)
Camera cable	All models	8.0	0.1	48	9.6	0.13	200 (Flex) 60 (Non-flex)

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.

3.6.5 Other Network Interfaces

3.6.5.1 Shielding of other network interface cables

Please shielding cable as shown in the following figure when using the safety network function and CE certification is required.

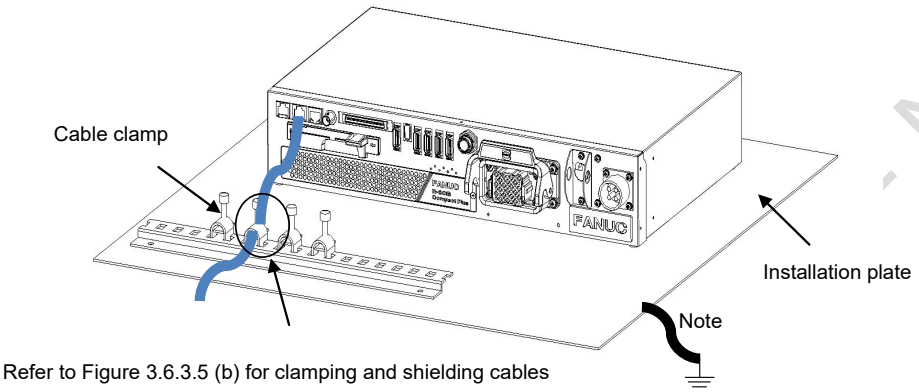


Fig.3.6.5.1 (a) Shielding of other network interface cables

NOTE
Please connect the installation plate to the ground.

Peel off part of the cable jacket as shown in Fig.3.6.5.1 (b) to expose the outer coating of the shield, and press this outer coating against the earth plate with the cable clamp.

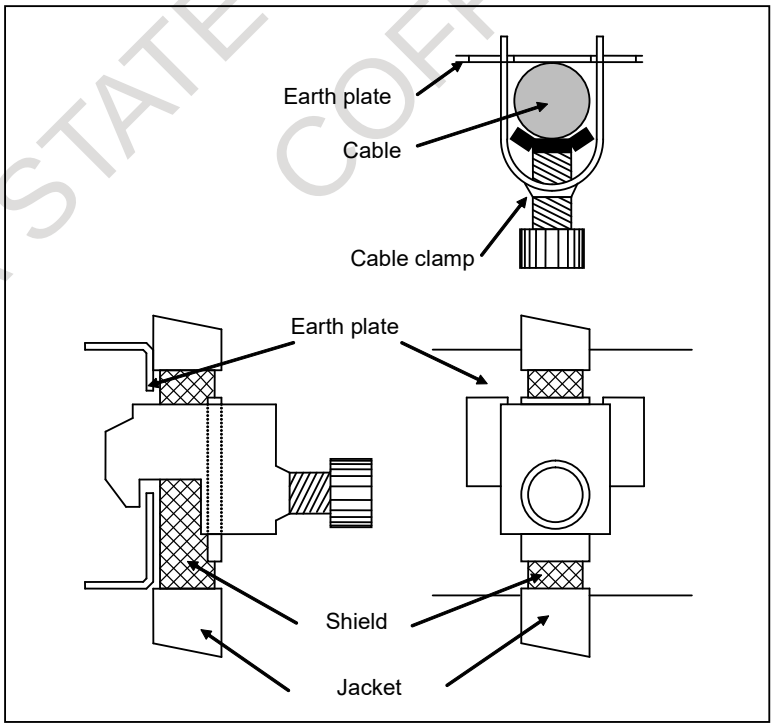


Fig.3.6.5.1 (b) Clamping and shielding cable

4 INSTALLATION

This chapter describes the installation for the controller.

4.1 EXTERNAL DIMENSIONS

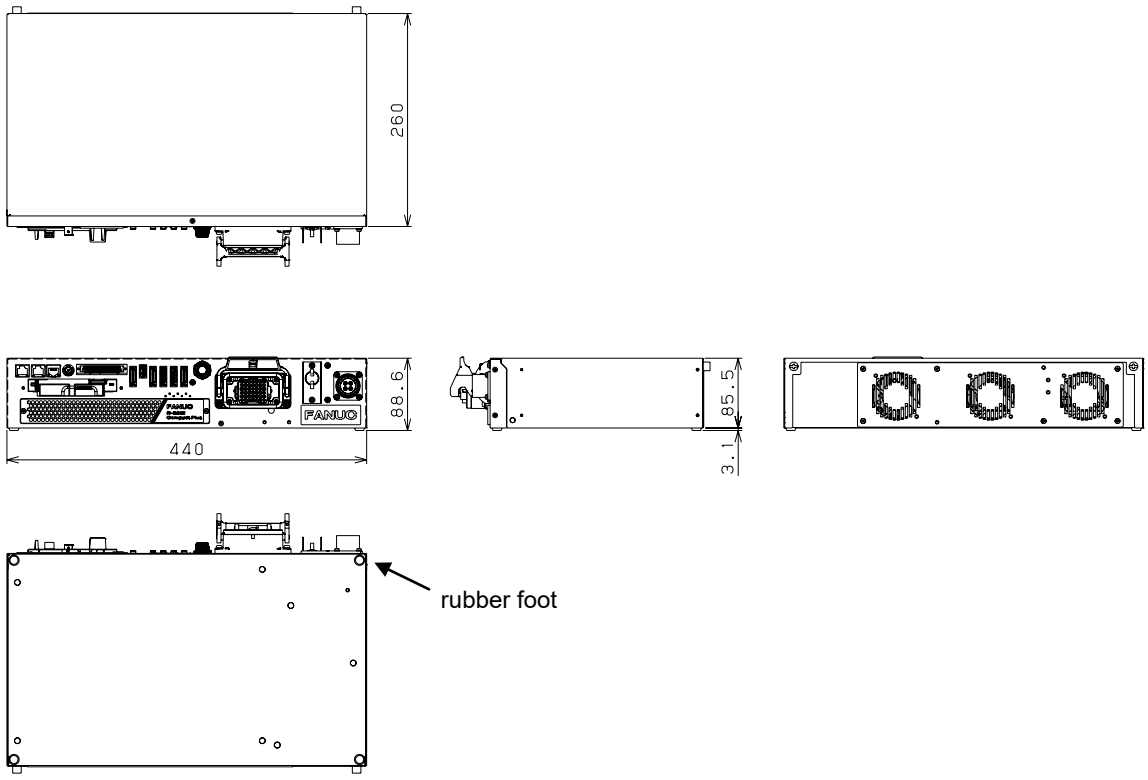


Fig.4.1 (a) External dimensions

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

4.2 INSTALLATION SPACE

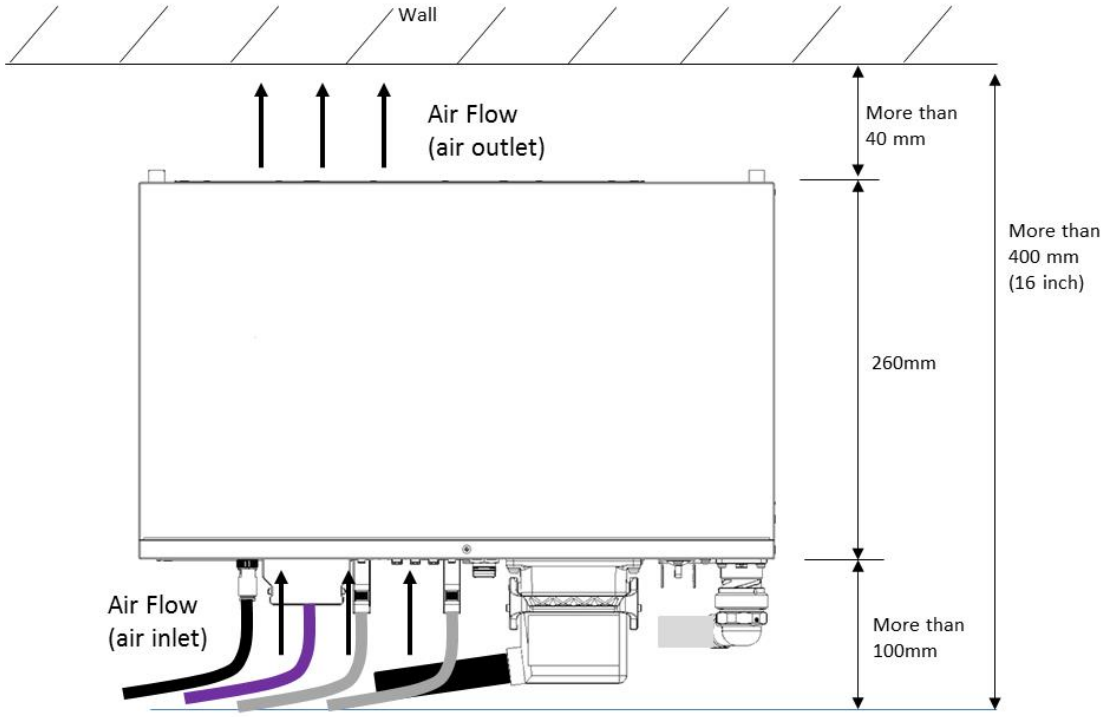


Fig.4.2 (a) Installation of robot controller

> ⚠ **CAUTION**
> Do not place anything within 100mm of the intake port and within 40mm of the exhaust port of the robot controller.

4.3 AIR INLET AND AIR OUTLET OF ROBOT CONTROLLER

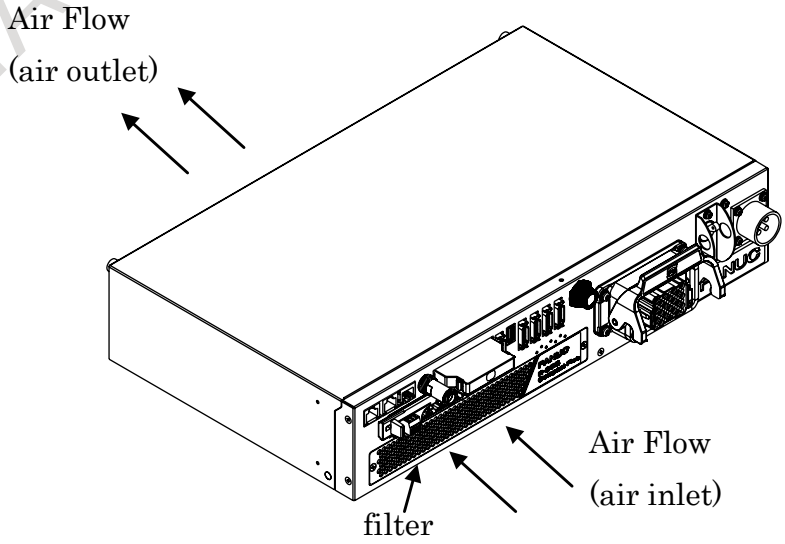


Fig.4.3 (a) Air inlet and air outlet

Name	Ordering specification	Part name	Maintenance specification	Quantity
Intake air filter in interface unit for replacement	A05B-2690-K300	Spare filter	A230-0676-X011	1

⚠ CAUTION
Please clean the dust that has accumulated on the filter.

4.4 STACKING

The robot controllers can be stack up to 4 stages. Stacking plate and screw fixation is required separately.

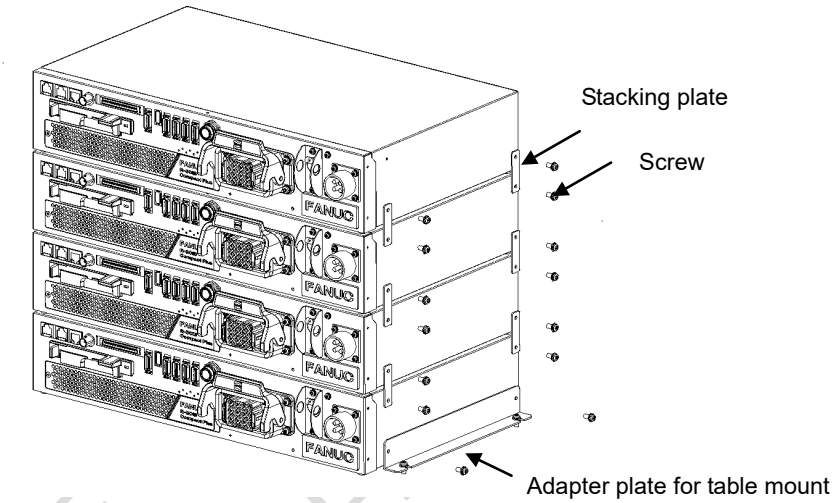


Fig.4.4 (a) Stacking

Name	Ordering specification	Part name	Maintenance specification	Quantity
Stacking plate	A05B-2690-K351	Plate	A230-0676-X019	4
		Screw	A6-SW2NA-3X8S-M-ZN2A	8
Adapter plate for table mount	A05B-2690-K352	Plate	A230-0676-X020	2
		Screw	A6-SW2NA-3X8S-M-ZN2A	4

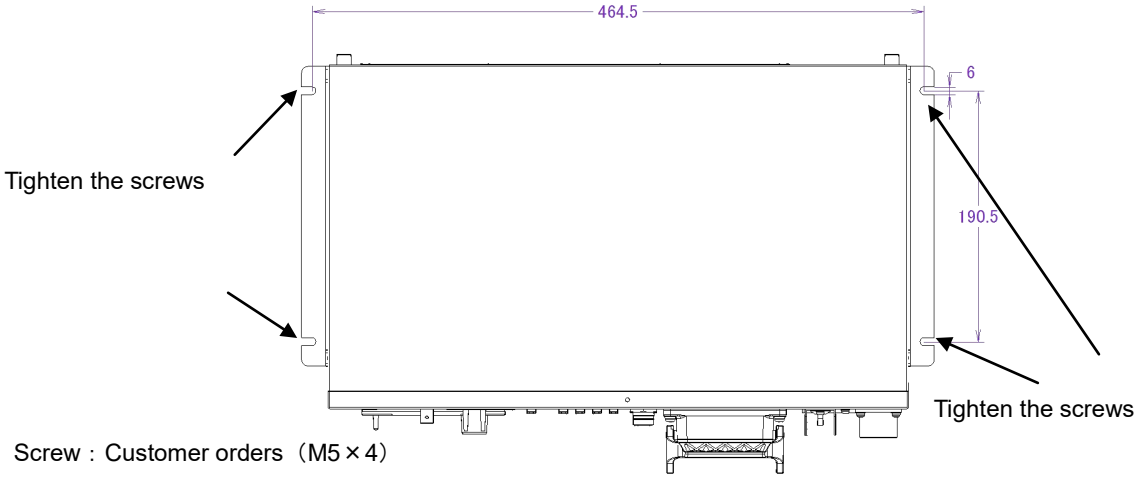


Fig.4.4 (b) Stacking

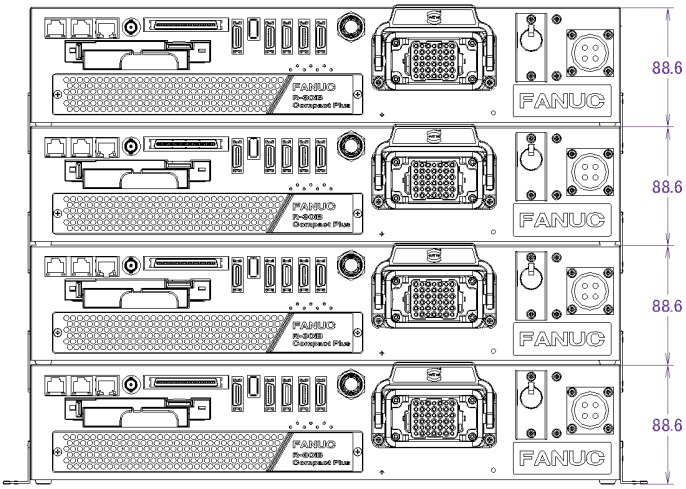
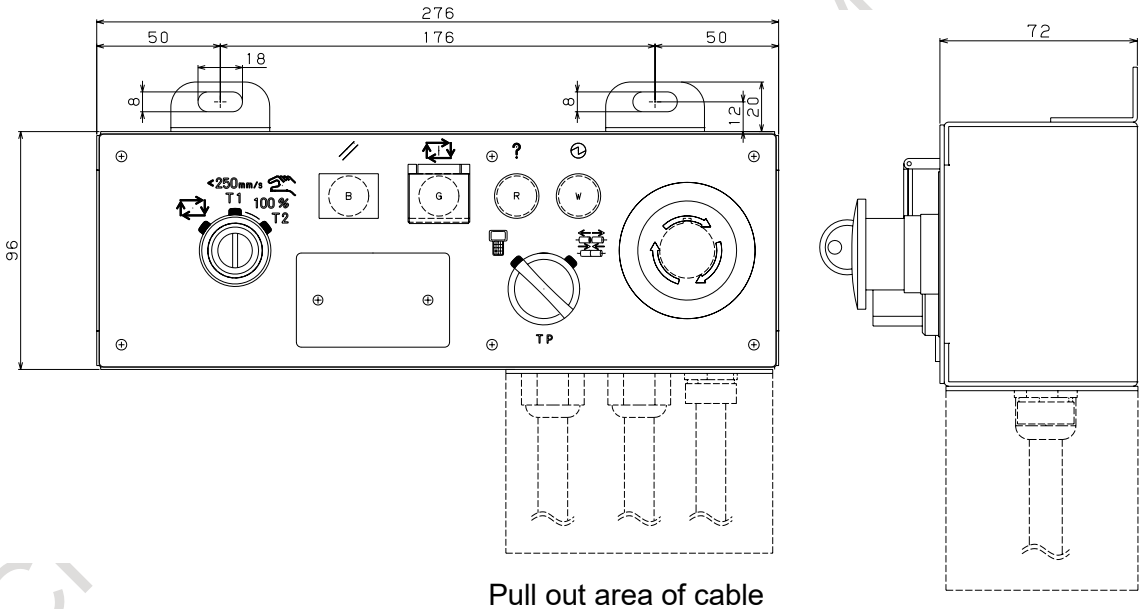


Fig.4.4 (c) Stacking

> ⚠ **CAUTION**
> Do not place anything on top of the stack controllers.

4.5 EXTERNAL DIMENSIONS OF SWITCH BOX



Pull out area of cable

4.6 19 INCH RACK MOUNTING

The robot controller designed to be placed in a 19 inch rack. The screw holes can be used for fixing with 19 inch rack.

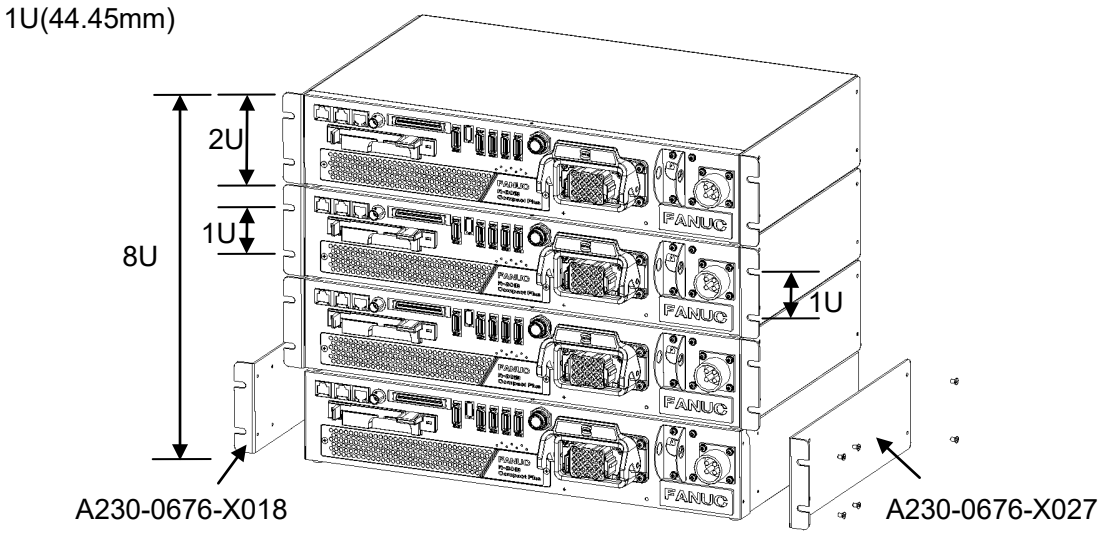


Fig.4.6 (a) 19 inch rack mounting

Name	Ordering specification	Part name	Maintenance specification	Quantity
19 inch rack fixing plate	A05B-2690-K350	Plate	A230-0676-X018	1
		Plate	A230-0676-X027	1
		Screw	A6-SW2NA-3X8S-M-2N2A	12

4.7 VERTICAL INSTALLATION

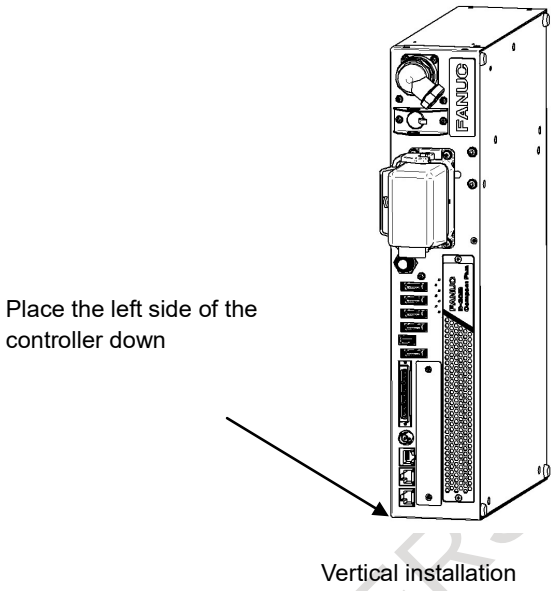


Fig.4.7 (a) Vertical installation

> ⚠ **CAUTION**
> In case of using controller in a vertical position, users must take measures to prevent falling.

4.8 TRANSPORTATION

> ⚠ **CAUTION**
> 1 Do not place anything on top of the robot controller during transportation.
> 2 Do not stack the robot controllers during transportation.
> Transport the robot controller laying down flat.

4.9 INSTALLATION CONDITION

Item	Model	Specification/condition
Rated Voltage	All models	200-240Va.c. 50/60Hz Single phase
Tolerant fluctuation	All models	Tolerant voltage fluctuation: +10% -15% Tolerant frequency fluctuation: ±1Hz
Type of power distribution system	All models	TN / TT The TN-power system and TT-power system are based on the AC power distribution system standard IEC60364.
SCCR(IEC)	All models	240VAC: 2kA
Input power source capacity	All models	2kVA
Average power consumption	SR-3*i*A	0.25kW
	SR-6*i*A	0.35kW
	SR-12*i*A	0.45kW
	SR-20*i*A	0.55kW

Item	Model	Specification/condition
Permissible ambient temperature	All models	Operating 0°C to 40°C Storage, 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
Atmosphere	All models	Refer to the following CAUTION.
Overvoltage category /Pollution degree	All models	Overvoltage category Ⅱ,Ⅲ*1, Pollution degree 2, IEC60664-1, IEC/EN/UL61010-1
Vibration acceleration	All models	4.9m/s^2 (0.5G) or less When using the robot in a location subject to serious vibration, consult with your 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	9kg
Degree of protection	All models	IP20 compliant Refer to the following CAUTION.
	Teach pendant	IP54
Short circuit current rating	All models	CE: 240Va.c., 2kArms UL/CSA: 240Va.c., 5kArms
Leakage current	All models	10 mA or less

*1: Overvoltage category Ⅱ IEC 60664-1
Overvoltage category Ⅲ IEC/EN/UL 61010-1

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

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

⚠CAUTION

R-30*i*B Compact 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.

4.10 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 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.
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	Ordering specification	Maintenance specification	Note
Main board	A05B-2690-H001	A17B-8100-0800	Standard
	A05B-2690-H002	A17B-8100-0801	Vision I/F, Force sensor, Line tracking, HDI
CPU card	A05B-2670-H020	A17B-3301-0250	Standard / DRAM 1GB
FROM/SRAM module	A05B-2600-H063	A20B-3900-0286	FROM 64M/ SRAM 1M
	A05B-2600-H064	A20B-3900-0287	FROM 64M/ SRAM 2M
	A05B-2600-H065	A20B-3900-0288	FROM 64M/ SRAM 3M
	A05B-2600-H066	A20B-3900-0280	FROM 128M/ SRAM 1M
	A05B-2600-H067	A20B-3900-0281	FROM 128M/ SRAM 2M
	A05B-2600-H068	A20B-3900-0282	FROM 128M/ SRAM 3M
	A05B-2600-H069	A20B-3900-0293	FROM 256M/ SRAM 1M
	A05B-2600-H070	A20B-3900-0295	FROM 256M/ SRAM 2M
	A05B-2600-H071	A20B-3900-0296	FROM 256M/ SRAM 3M
Side board	A05B-2690-H010	A20B-2005-0430	See Fig.4.4.
Backplane board	A05B-2690-H020	A20B-8201-0760	See Fig.4.3.
Fan unit	A05B-2690-H030	A05B-2690-C310	
		A90L-0001-0624	
Input unit	A05B-2690-H040	A05B-2690-C450	
		A20B-1009-0940	Input board
Model name plate	A05B-2691-H001	A370-0271-0315#A	SR-3*i*A
	A05B-2691-H002	A370-0271-0316#A	SR-6*i*A
	A05B-2691-H003	A370-0271-0326#A	SR-12*i*A
	A05B-2691-H004	A370-0271-0332#A	SR-20*i*A
Servo amplifier unit	A05B-2690-H050	A06B-6401-C001	SR-3*i*A
	A05B-2690-H051	A06B-6401-C002	SR-6*i*A, SR-12*i*A, SR-20*i*A
Interface unit	A05B-2690-H100	A05B-2690-C001	Standard
	A05B-2690-H101	A05B-2690-C002	Vision I/F, Force sensor, Line tracking, HDI
Profinet daughter board	A05B-2600-J083	A15L-0001-0150	
Profinet mother board	A05B-2690-J076	A20B-8101-0930	
DeviceNet board	A05B-2690-J042	A20B-8101-0641	1ch
	A05B-2690-J043	A20B-8201-0170	2ch
CC-Link board	A05B-2690-J110	A20B-8101-0550	
EtherCAT board	A05B-2690-J120	A20B-8101-0821	
Additional safety I/O board	A05B-2690-J131	A20B-8201-0110	
Additional safety I/O terminal conversion unit	A05B-2690-K132	A05B-2690-C132	
	A05B-2690-K133	A20B-1009-0480	
Terminal conversion module	A05B-2690-K440	A15L-0001-0167	
I/O emergency stop jumper cable	A05B-2690-K100	A660-2008-T350	See section 2.5 in CONNECTIONS.
Spare fuse kit	A05B-2690-K001	A60L-0001-0290#LM10C	1 A, 2 pieces
		A60L-0001-0290#LM20C	2 A, 2 pieces
Spare battery	A02B-0200-K102	A98L-0031-0012	For memory backup. See section 7.8.1 in Ⅰ MAINTENANCE.
Intake air filter	A05B-2690-K300	A230-0676-X011	See section 4.3 in Ⅱ CONNECTIONS.

Name	Ordering specification	Maintenance specification	Note
19 inch rack fixing plate	A05B-2690-K350		See section 4.4 in Ⅱ CONNECTIONS.
Stacking plate	A05B-2690-K351		
Adapter plate for table mount	A05B-2690-K352		
Cover plate for mini-slot	A05B-2690-J010	A230-0676-X023	
Teach pendant	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 jumper connector	A05B-2690-H210	A660-2007-T391	See Subsection D in Appendix.
Switch box	A05B-2690-H400	A05B-2690-C400	
Switch box jumper connector	A05B-2690-H410	A660-2008-T349	

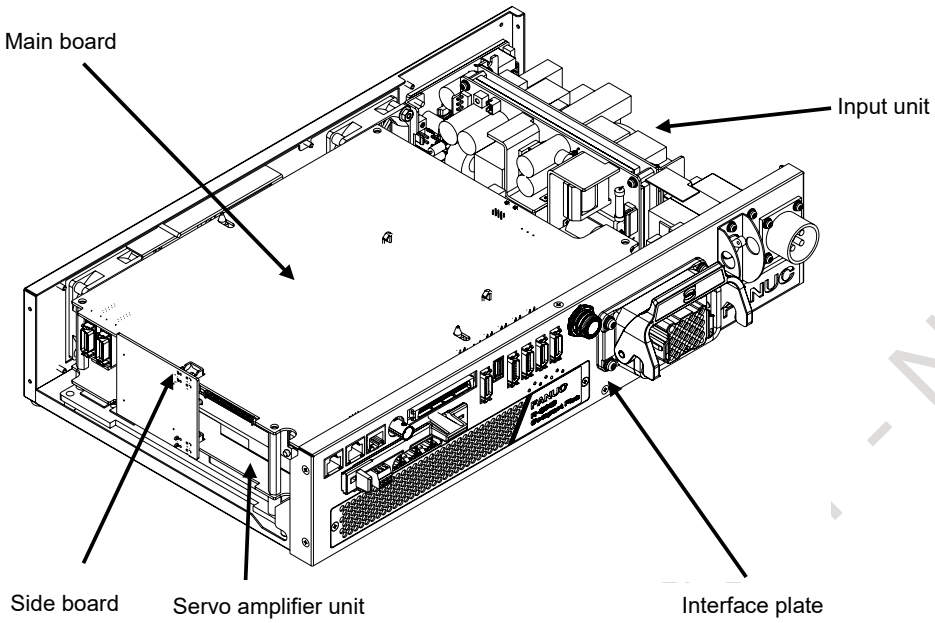


Fig.A (a) R-30*i*B Compact Plus cabinet interior (Front-1)

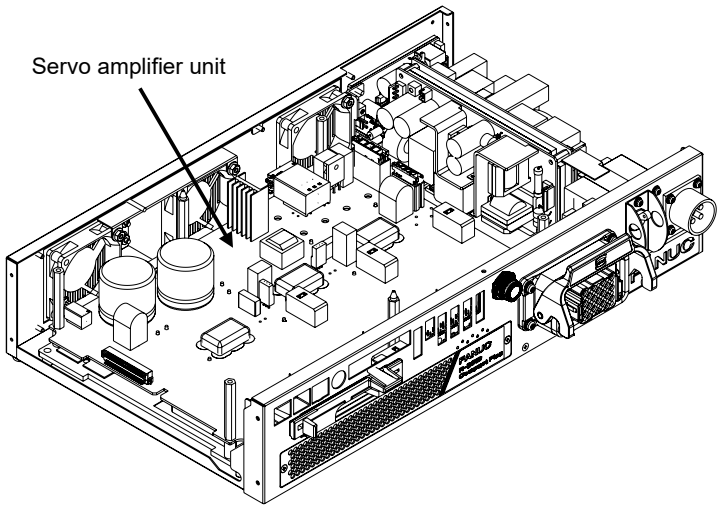


Fig.A (b) R-30*i*B Compact Plus cabinet interior (Front-2)

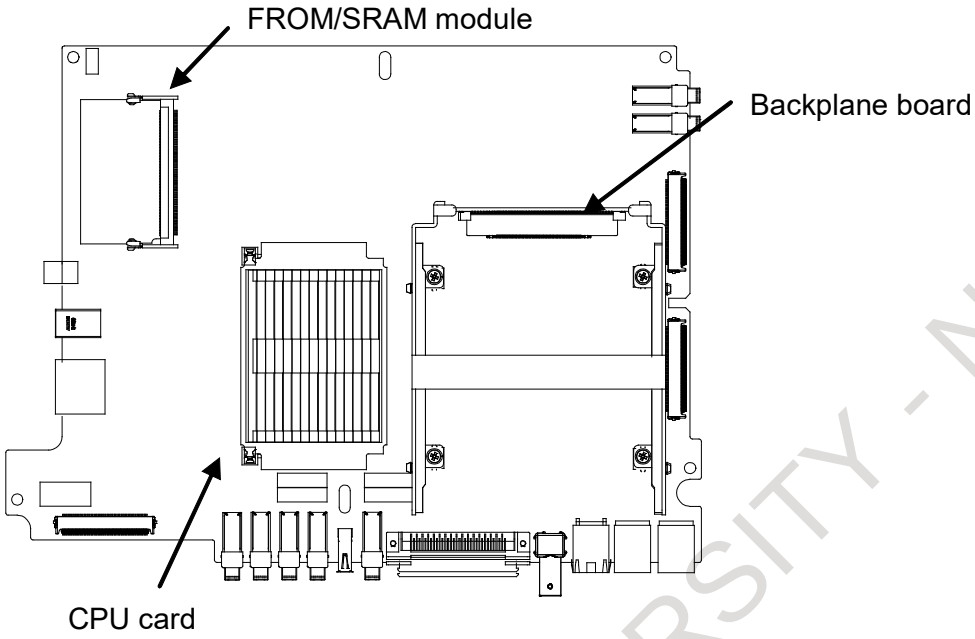


Fig.A (c) Main board

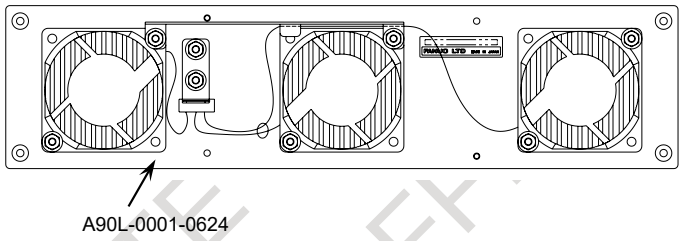


Fig.A (d) Fan unit

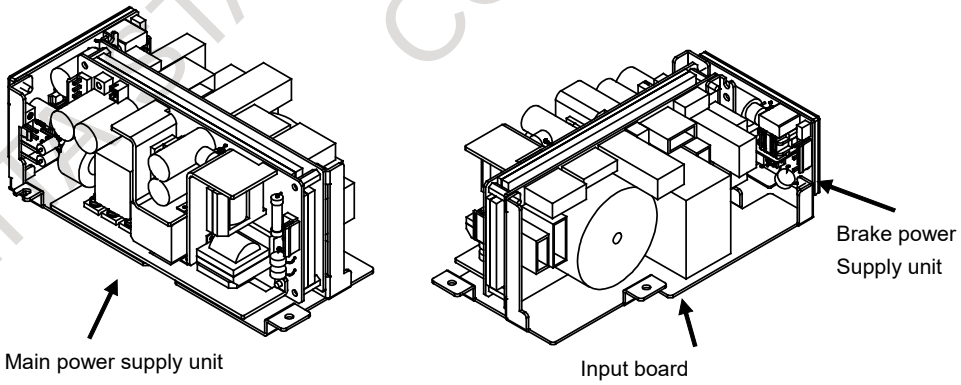


Fig.A (e) Printed circuit boards of the input unit

Cable No.	Name	Length (m)	Ordering specification	Maintenance specification	Note
K01	Power supply cable	2	A05B-2690-J100	A660-8020-T889#L2R003	Power～ Controller (PWR) Connect the ground wire (PE) to the ground terminal.
		5	A05B-2690-J101	A660-8020-T889#L5R003	
		10	A05B-2690-J102	A660-8020-T889#L10R03	
		20	A05B-2690-J103	A660-8020-T889#L20R03	

Cable No.	Name	Length (m)	Ordering specification	Maintenance specification	Note
K21	Teach pendant cable	5	A05B-2690-H200	A660-2008-T032#L5R503	*i*Pendant～ 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-2690-H450	A05B-2690-D260	Switch box CRT27～ Controller (JRT3) Switch box CRT46～ Controller (TP connector)
		2	A05B-2690-H451	A05B-2690-D261	
		5	A05B-2690-H452	A05B-2690-D262	
		10	A05B-2690-H453	A05B-2690-D263	
		20	A05B-2690-H454	A05B-2690-D264	
K26	Remote mode switch retrofit kit	5	A05B-2690-K400	A660-8020-T887#L5R003	3 mode remote mode switch～Controller (JRT3)
		10	A05B-2690-K401	A660-8020-T887#L10R03	
		20	A05B-2690-K402	A660-8020-T887#L20R03	
		5	A05B-2690-K410	A660-8020-T888#L5R003	2 mode emote mode switch～Controller (JRT3)
		10	A05B-2690-K411	A660-8020-T888#L10R03	
		20	A05B-2690-K412	A660-8020-T888#L20R03	
K30	Peripheral device cable	1	A05B-2690-K430	A660-2008-T414#L1R003	Terminal conversion module ～ Controller (JRM18)
		5	A05B-2690-K431	A660-2008-T414#L5R003	
		10	A05B-2690-K432	A660-2008-T414#L10R03	
K31	I/O Link cable for I/O unit model A	5	A05B-2690-K445	A660-4042-T143#L6R003A	I/O unit model A ～Controller (JRS26)
		10	A05B-2690-K446	A660-4042-T143#L11R03A	
K32	Cable for additional safety I/O board		A05B-2690-J180	A660-2008-T366#L200R0	Additional safety I/O board ～Controller (JD1A)
K33	Cable for additional safety I/O terminal conversion board	5	A05B-2690-K132	A660-4005-T389#L5R003	Additional safety I/O terminal conversion board (CRMA98,CRMA99) ～Controller (CRMA90)
		10	A05B-2690-K133	A660-4005-T389#L10R03	
K56	Robot connection transit cable	1	A05B-2691-J103	A660-2008-T367#L1R003	RMP cable (non-flex, CE)
				A660-8011-T210#L3R003	Earth cable
		4	A05B-2691-J100	A660-2008-T367#L4R003	RMP cable (non-flex, CE)
				A660-8011-T210#L6R003	Earth cable
		7	A05B-2691-J101	A660-2008-T367#L7R003	RMP cable (non-flex, CE)
				A660-8011-T210#L9R003	Earth cable
		14	A05B-2691-J102	A660-2008-T367#L14R03	RMP cable (non-flex, CE)
				A660-8011-T210#L16R03	Earth cable
K70	iRVision camera connection cable (COAX) (Non-Flex)	7	A05B-2690-J340	A660-2008-T534#L7R003E	Camera ～ Controller (CRJ3)
		14	A05B-2690-J341	A660-2008-T534#L14R03E	
		20	A05B-2690-J342	A660-2008-T534#L20R03E	
		25	A05B-2690-J343	A660-2008-T534#L25R03E	
	*i*RVision camera connection cable （COAX） (for cable carrier)	7	A05B-2690-J320	A660-2008-T435#L7R003E	
		14	A05B-2690-J321	A660-2008-T435#L14R03E	
		20	A05B-2690-J322	A660-2008-T435#L20R03E	
		25	A05B-2690-J323	A660-2008-T435#L25R03E	
K80	Line tracking cable	7	A05B-2690-J300	A660-2008-T303#L7R003	1 pulsecoder ～ Controller (JRS31)
		14	A05B-2690-J301	A660-2008-T303#L14R03	
		20	A05B-2690-J302	A660-2008-T303#L20R03	
K81		7	A05B-2690-J310	A660-4005-T713#L7R003	2 pulsecoders ～ Controller (JRS31)
		14	A05B-2690-J311	A660-4005-T713#L14R03	
		20	A05B-2690-J312	A660-4005-T713#L20R03	

NOTE
Ordering specification may include parts other than maintenance specifications.

B TOTAL CONNECTION DIAGRAM

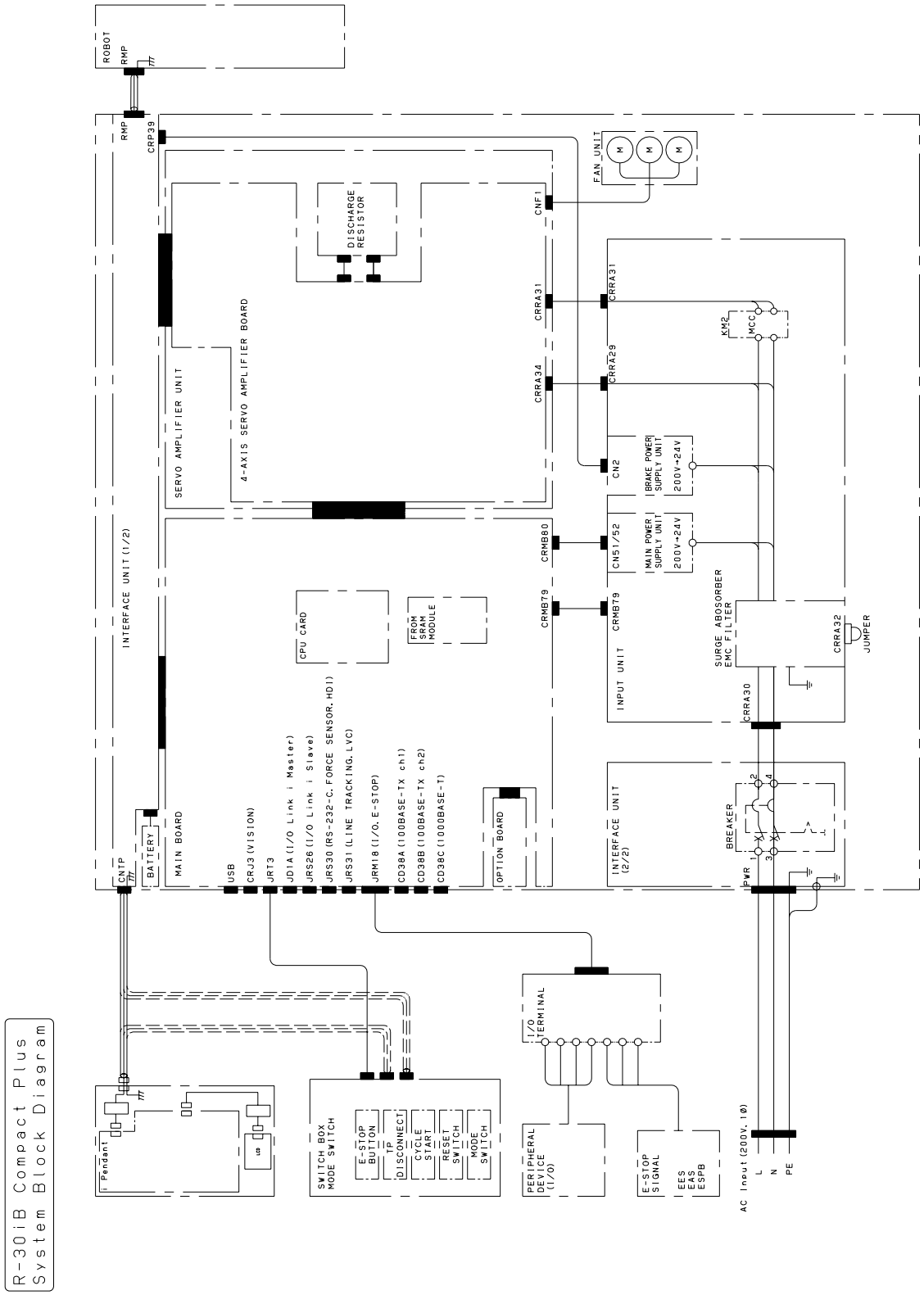


Fig. B (a) System block diagram

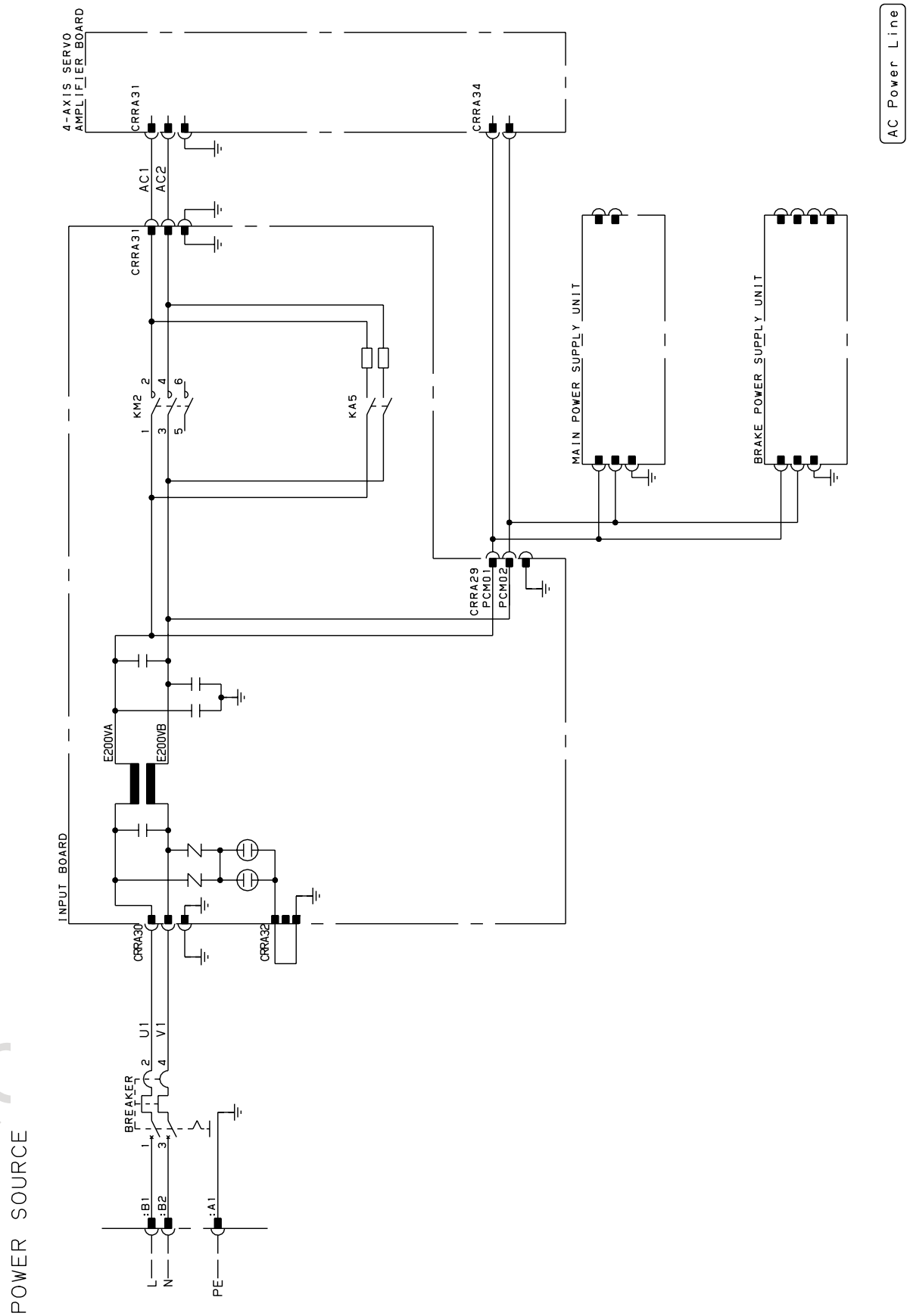


Fig. B (b) AC power line connection diagram

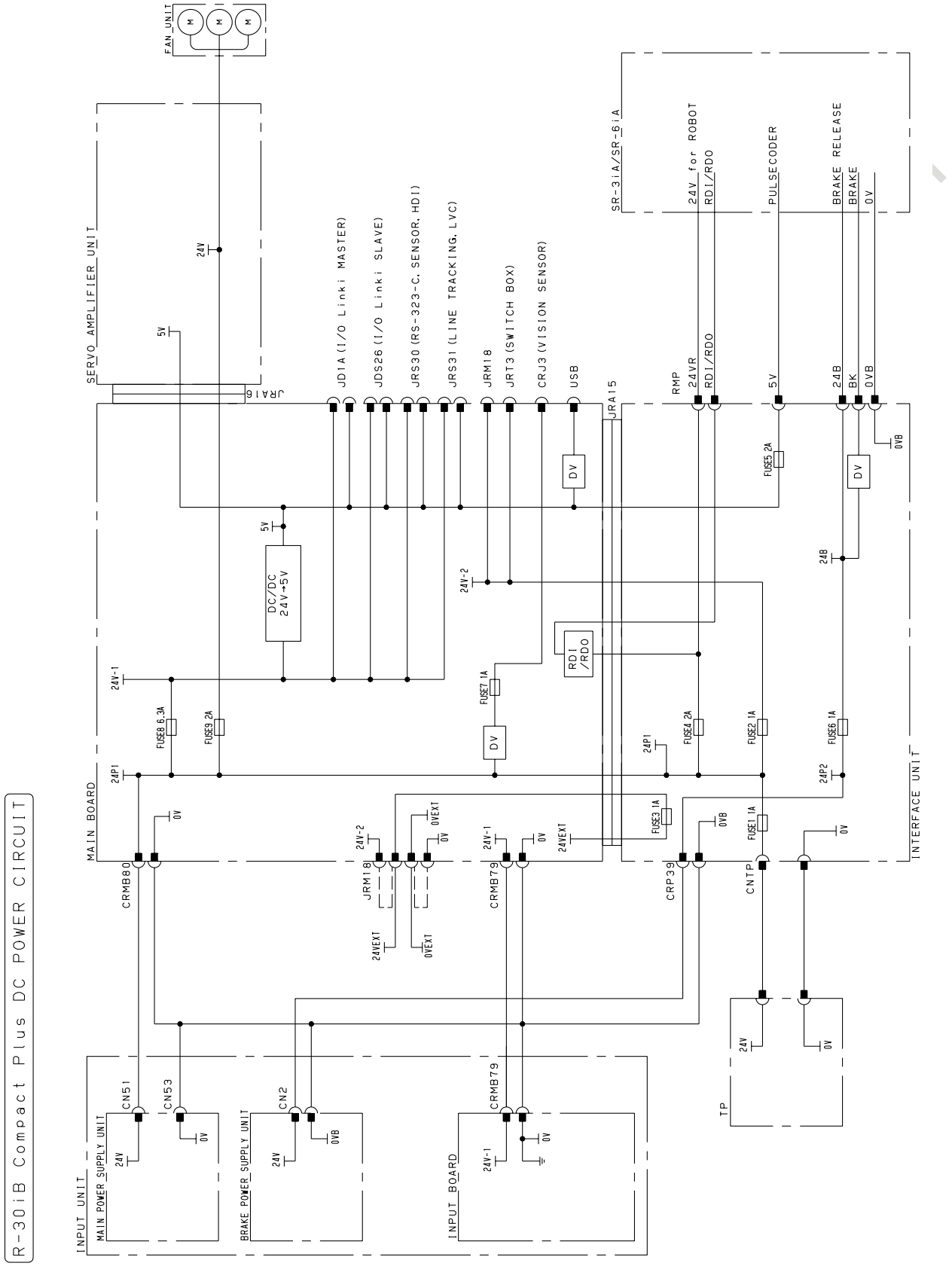


Fig. B (c) DC power line connection diagram

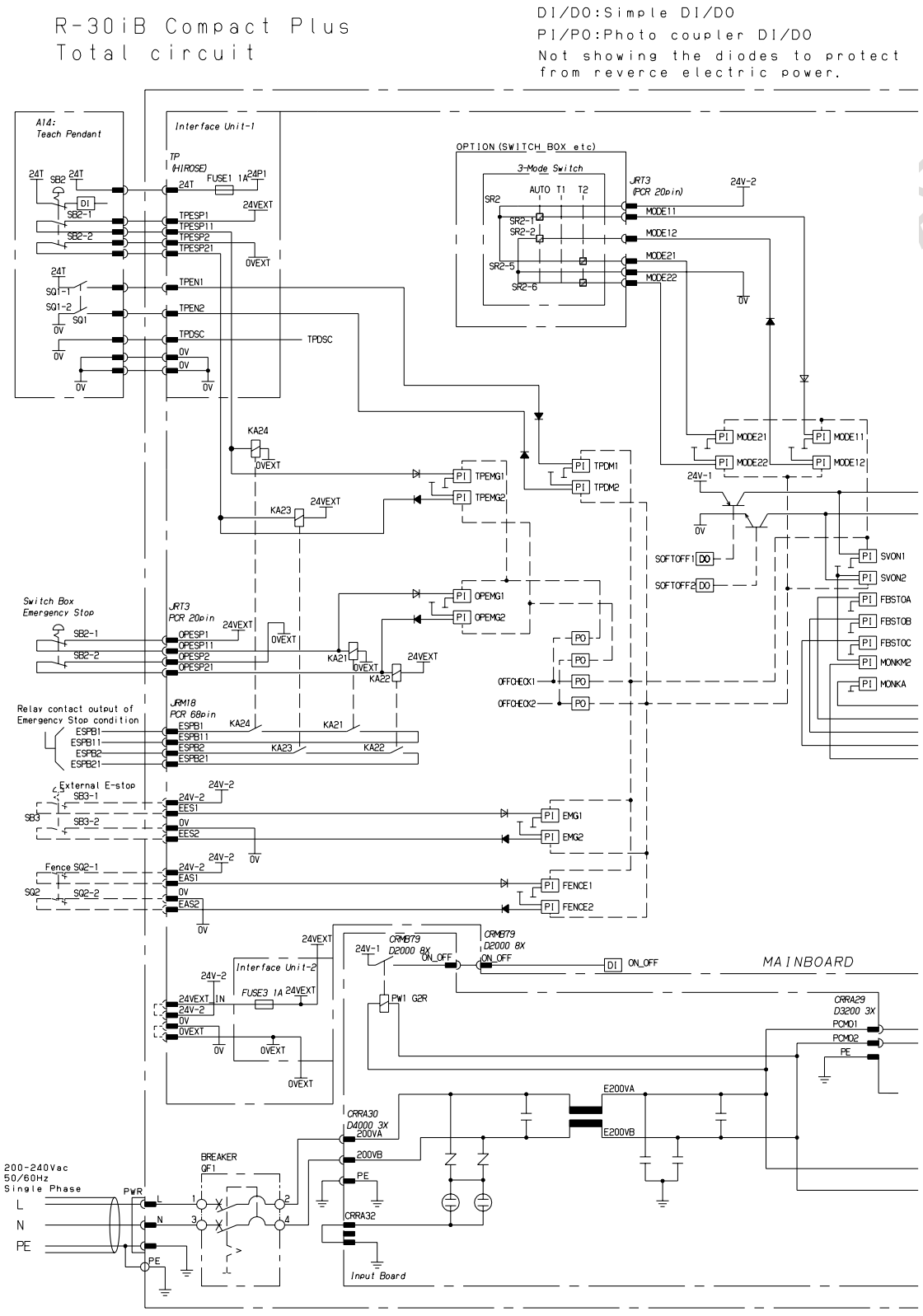
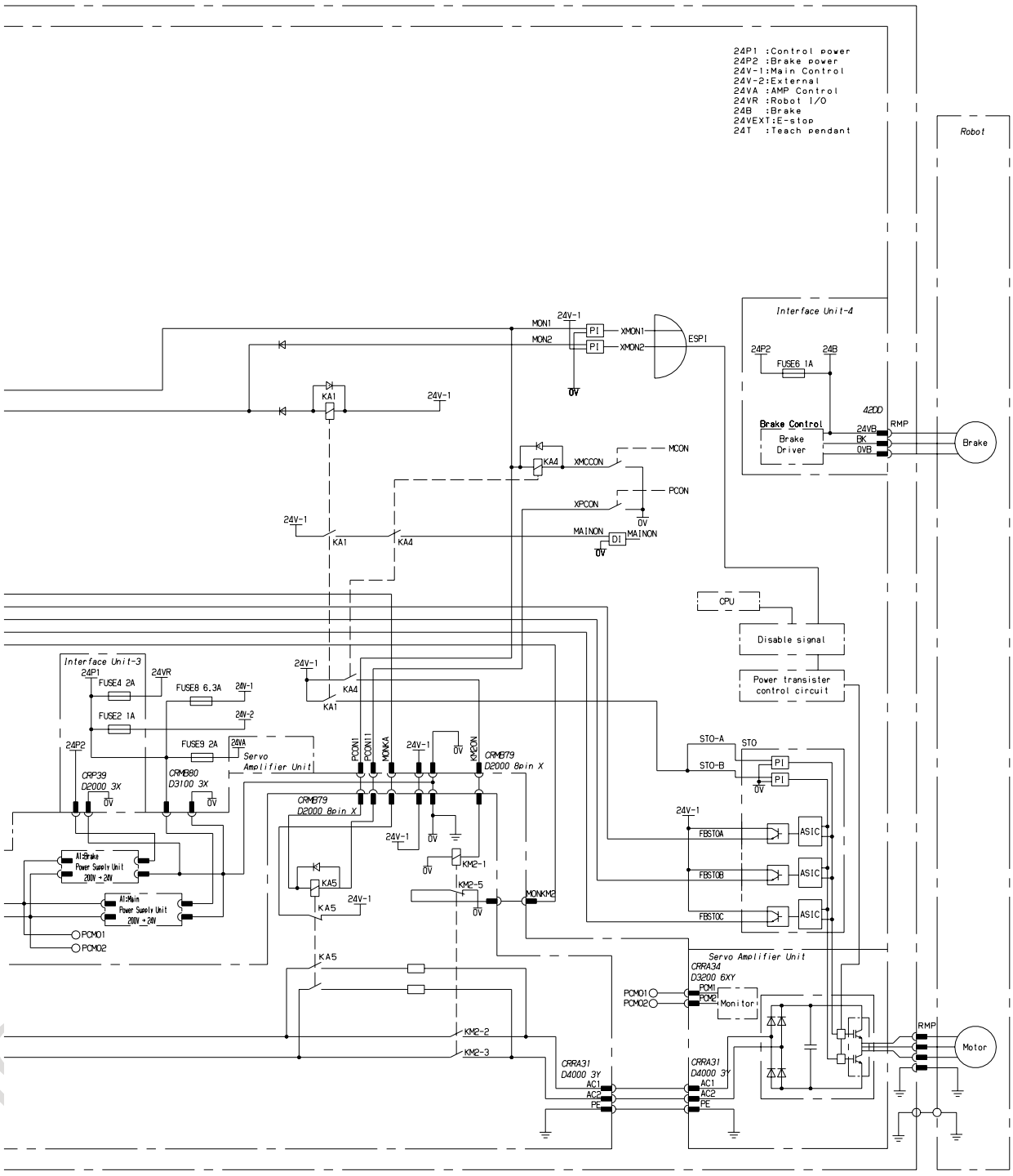


Fig. B (d) Emergency stop circuit connection diagram


24P1 :Control power
24P2 :Brake power
24V-1:Main Control
24V-2:External
24VA :AMP Control
24VR :Robot I/O
24B :Brake
24VEXT:E-stop
24T :Teach pendant
Robot
Interface Unit-4
24P2
24B
FUSE6 1A
Brake Control
Brake Driver
24VB
BK
0VB
RMP
Brake
MON1
MON2
24V-1
PI
XMON1
XMON2
ESPI
0V
KA1
MCON
KA4
XMCCON
PCON
XPCON
MAINON
DI
CPU
Disable signal
Power transister control circuit
Interface Unit-3
24P1
FUSE4 2A
24VR
FUSE8 6.3A
FUSE2 1A
24V-2
24P2
FUSE9 2A
24VA
Servo Amplifier Unit
CRP39 D2000 3X
CRMB80 D3100 3X
CRMB79 D2000 Bain X
PCON11
MONKA
KMCON
STO-A
STO
STO-B
FBSTOA
FBSTOB
FBSTOC
ASIC
A1:Brake Power Supply Unit 200V→24V
A1:Main Power Supply Unit 200V→24V
PCMO1
PCMO2
KM2-1
KM2-5
MONKM2
KA5
Servo Amplifier Unit
CRRA34 D3200 6XY
Monitor
KM2-2
KM2-3
CRRA31 D4000 3Y
AC1
AC2
PE
Motor

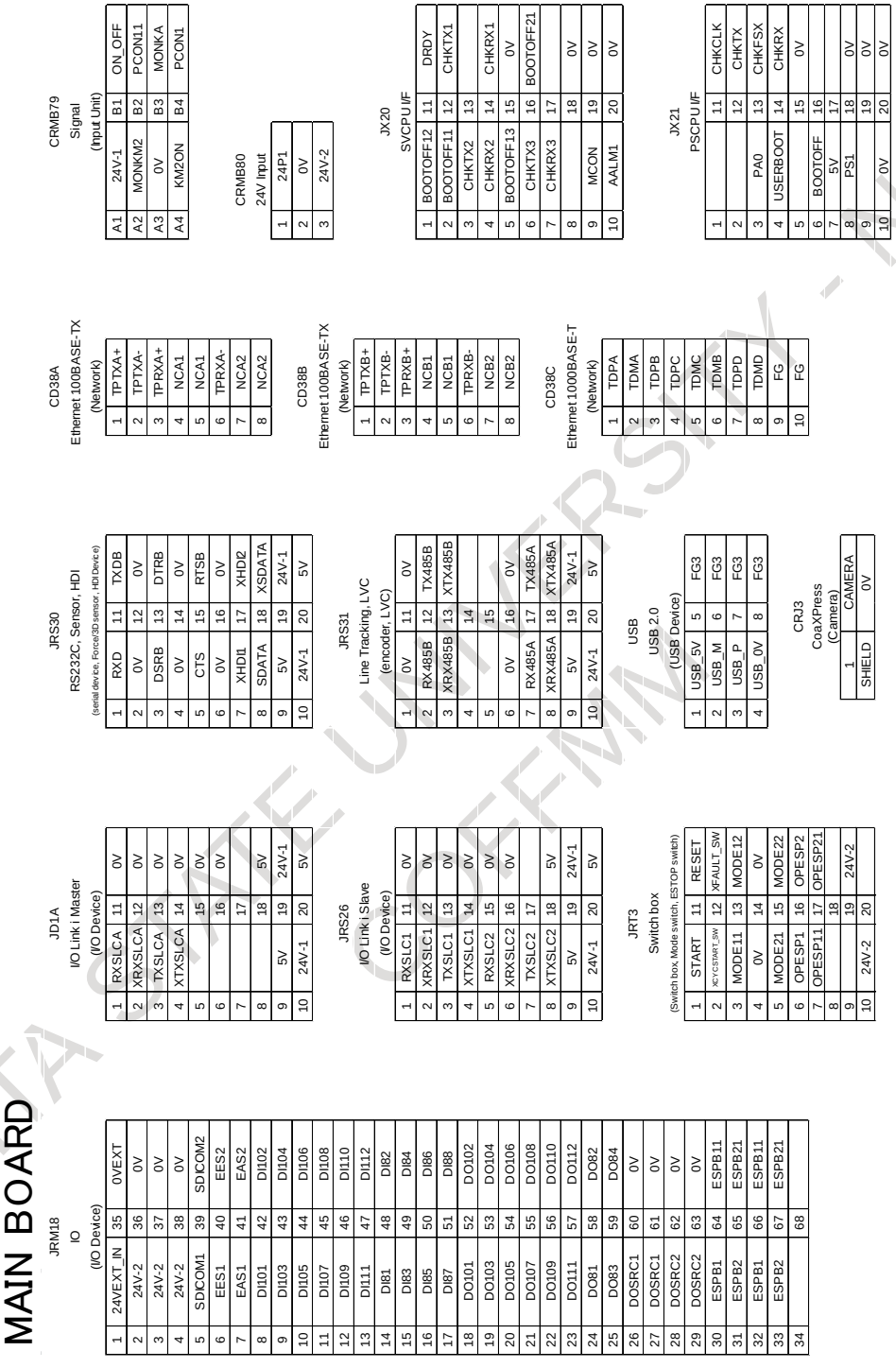


Fig. B (e) Main board connector table

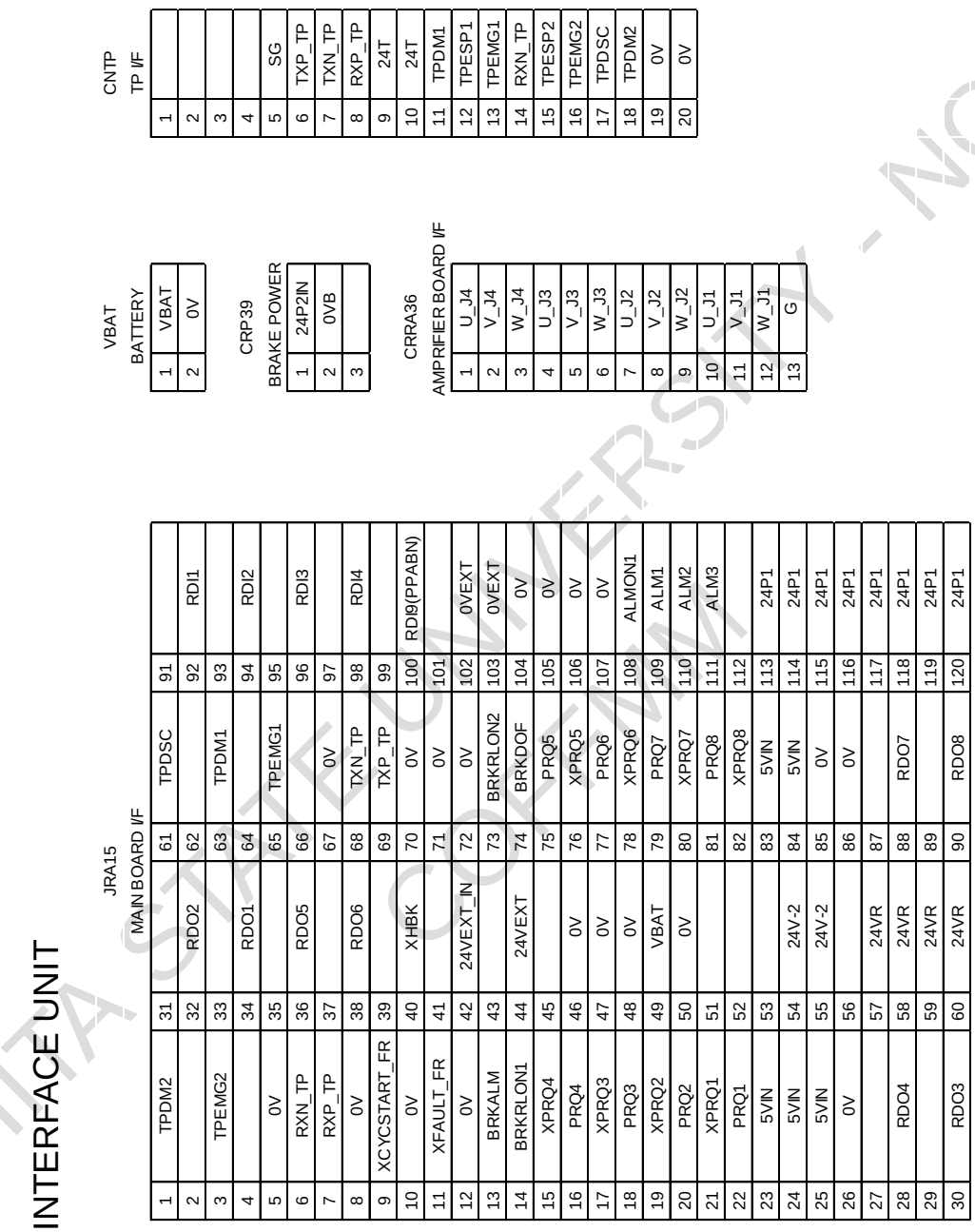


Fig. B (f) Front board connector table

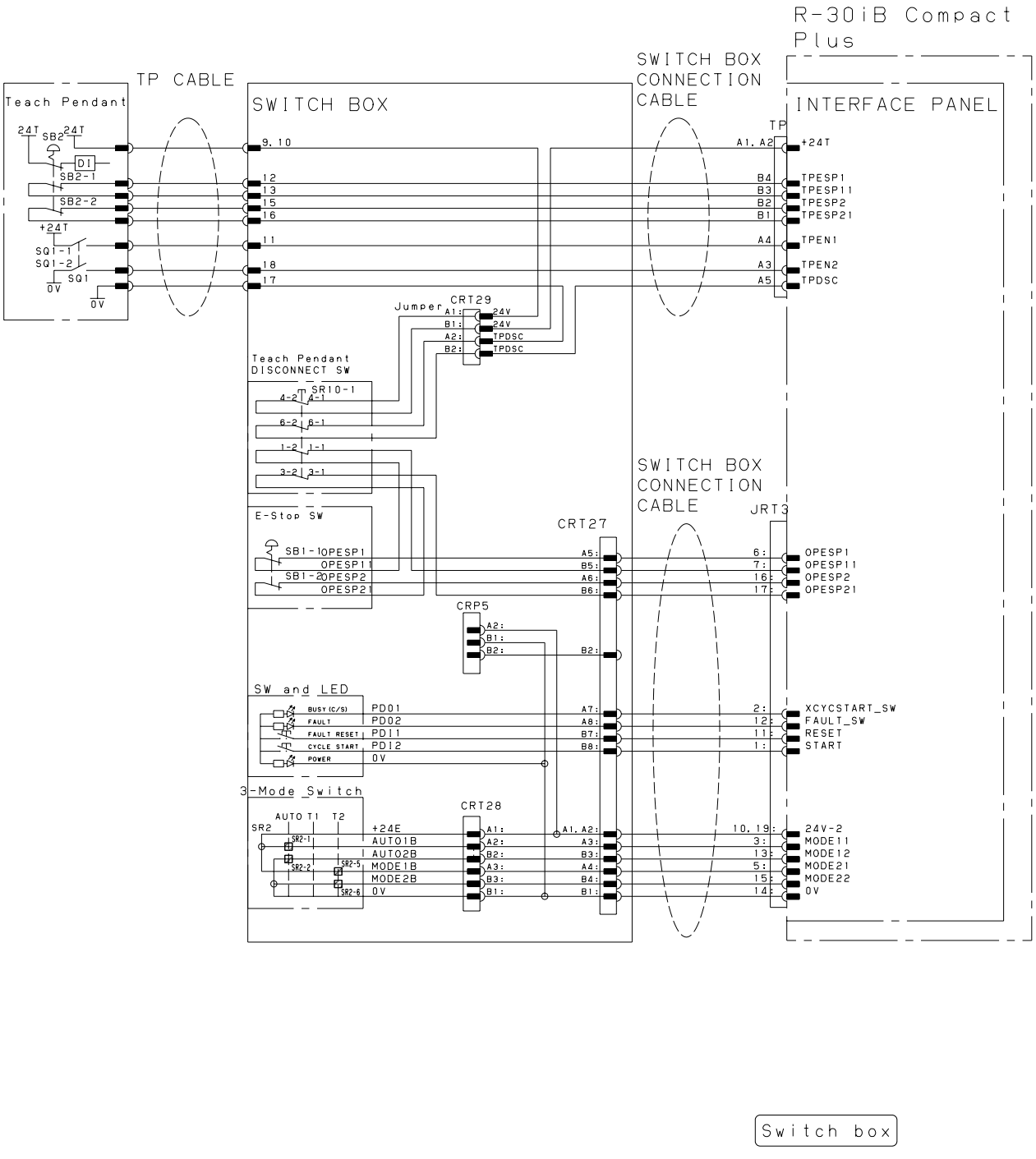


Fig. B (g) Switch box connection diagram

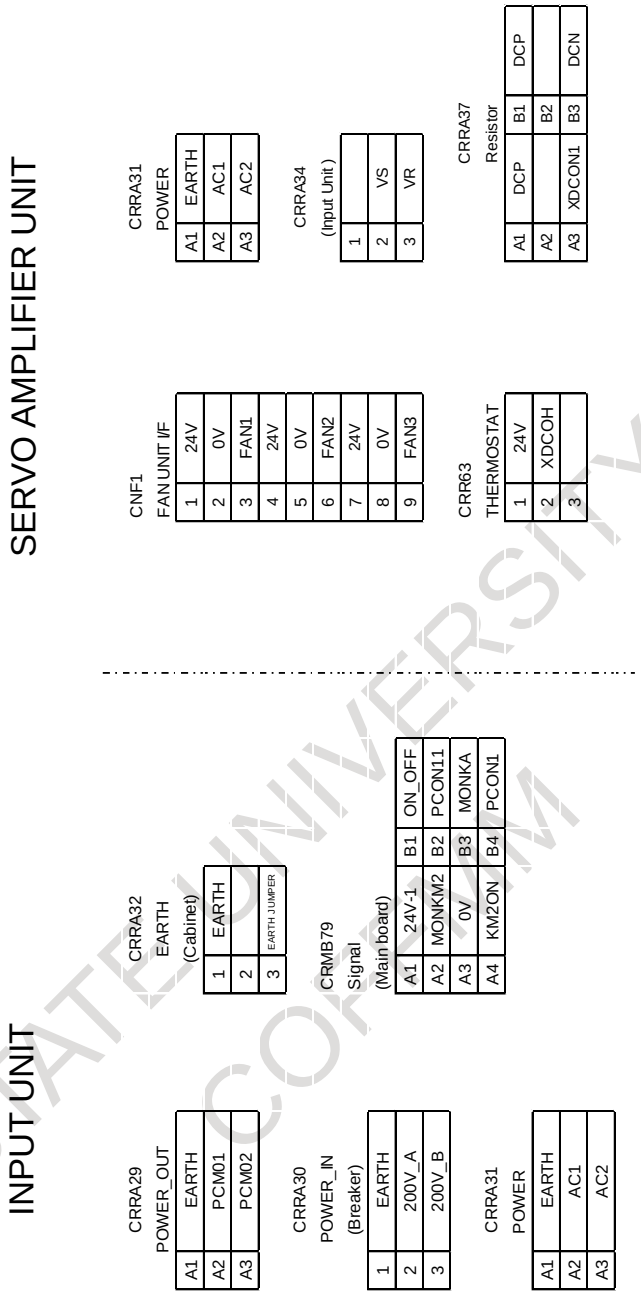


Fig. B (h) Input unit/ Servo amplifier unit connector table

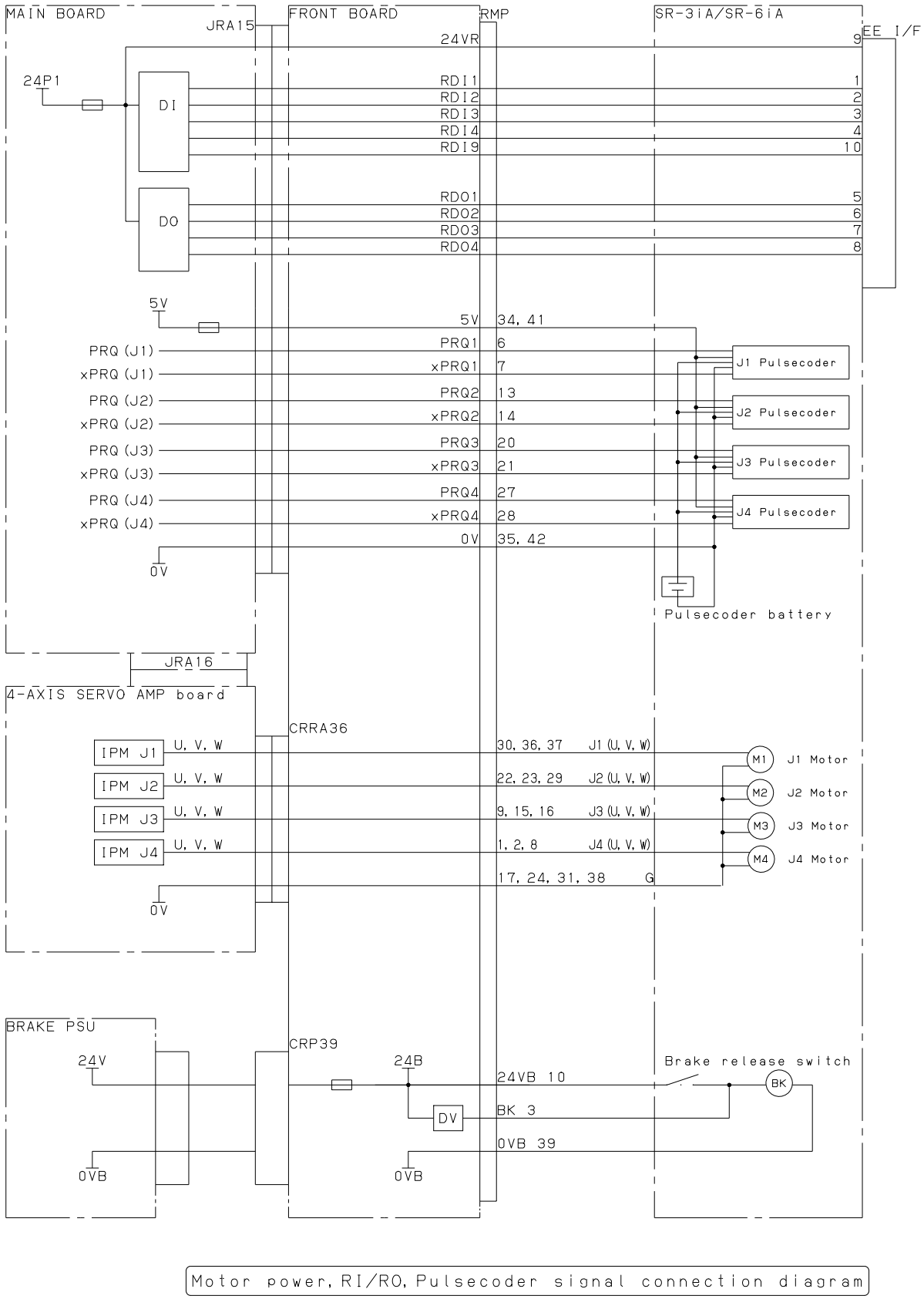


Fig. B (i) Connection diagram of robot interface

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

1	U_J4	2	V_J4	3	BK	4	RDI1	5	RDI3	6	PRQ1	7	XPRQ1
8	W_J4	9	U_J3	10	24VB	11	RDI2	12	RDI4	13	PRQ2	14	XPRQ2
15	V_J3	16	W_J3	17	G	18	RDI9(PPABN)	19	RDO1	20	PRQ3	21	XPRQ3
22	U_J2	23	V_J2	24	G	25	24VR	26	RDO2	27	PRQ4	28	XPRQ4
29	W_J2	30	V_J1	31	G	32	0V	33	RDO3	34	5V	35	0V
36	U_J1	37	W_J1	38	G	39	0VB	40	RDO4	41	5V	42	0V

Fig. B (j) Robot connection cable connector table

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 Compact Plus.

Input signals (Refer to C.2.1)

Signal	Description
*IMSTP	Instantaneous stop signal
*HOLD	Hold signal
*SFSPD	Safety speed signal
CSTOPI	Cycle stop signal
FAULT_RESET	Alarm release signal
START	Cycle start signal
HOME	Return to home position
ENBL	Enabling signal
RSR1/PNS1	Robot service request/program number select signal (NOTE)
RSR2/PNS2	Robot service request/program number select signal (NOTE)
RSR3/PNS3	Robot service request/program number select signal (NOTE)
RSR4/PNS4	Robot service request/program number select signal (NOTE)
RSR5/PNS5	Robot service request/program number select signal (NOTE)
RSR6/PNS6	Robot service request/program number select signal (NOTE)
RSR7/PNS7	Robot service request/program number select signal (NOTE)
RSR8/PNS8	Robot service request/program number select signal (NOTE)
PNSTROBE	PNS strobe signal
PROD_START	Automatic operation start signal

NOTE
RSR: Robot Service Request (RSR5 to RSR8 are optional)
PNS: Program Number Select Input (optional)
Whether RSR is used or PNS is used can be preset.

Output signals (Refer to C.2.2)

Signal	Description
CMDENBL	Command acceptance enabled signal
SYSRDY	System ready signal
PROGRUN	Program run signal
PAUSED	Program paused signal
HELD	Held signal
FAULT	Alarm signal
ATPERCH	Reference point signal
TPENBL	Teach pendant enabled signal
BATALM	Battery alarm signal
BUSY	Operating signal
ACK1/SNO1	RSR acknowledge/Selected program number signal
ACK2/SNO2	RSR acknowledge/Selected program number signal
ACK3/SNO3	RSR acknowledge/Selected program number signal
ACK4/SNO4	RSR acknowledge/Selected program number signal
ACK5/SNO5	RSR acknowledge/Selected program number signal
ACK6/SNO6	RSR acknowledge/Selected program number signal

Signal	Description
ACK7/SNO7	RSR acknowledge/Selected program number signal
ACK8/SNO8	RSR acknowledge/Selected program number signal
SNACK	PNS acknowledge signal
_____	Not used (for future expansion)

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 Section C.2.2 (1) for details.
Function: This input signal starts the selected program at the falling edge when the signal is turned off after being turned on. Its function differs according to the setting of parameter $SHELL_CFG. $CONT_ONLY.
- If parameter $SHELL_CFG.$CONT_ONLY is set to DISABLED, the START signal starts the program which has been selected from the teach pendant. By default, the program starts from the current cursor position.
- If parameter $SHELL_CFG.$CONT_ONLY is set to ENABLED, the START signal only resumes the execution of the temporarily held program. To execute an inactivated program from the start, input the PROD_START signal.

(5) Cycle stop signal (input) CSTOPI
Effective: At any time
Function:
- If parameter $SHELL_CFG.$USE_ABORT is set to DISABLED, the CSTOPI signal releases the program from the wait status caused by an RSR. It does not stop the execution of the current program and allows it to continue processing (by default).

- If parameter $SHELL_CFG.$USE_ABORT is set to ENABLED, the CSTOPI signal immediately cancels the execution of the current program. The program returns to the status in which it was before execution, and the information for the subprogram to return to the main program is lost. At the same time, this signal also releases the program from the wait status caused by RSR.

(6) Enabling signal (input) ENBL
Effective: At any time
Function: If the ENBL signal is turned off, the operation of the robot or the activation of a program is inhibited, and the execution of the current program is suspended.

(7) Safety speed signal (input) *SFSPD
Effective: At any time
Function:

- Use the normally-closed switch because it is a reverse signal. Usually this switch should be connected to safety fence. It must be set normally on.
- Since the *SFSPD signal is counted as a remote condition, such input signals as RSR and START to the peripheral device interface cannot take effect unless this signal is turned on.
- If this signal is turned from on to off during robot operation, the execution of the current program is suspended. At the same time, the overriding value is switched to a preset value (parameter $SCR. $FENCEOVER.)
- As long as this signal is off, the overriding value cannot be increased beyond the preset value ($SCR.$SFJOGOVLIM: For jog, $SCR. $SFRUNOVLIM : For test execution.)

(8) Robot service request signal (input) RSR1/RSR2/RSR3/RSR4
Effective: When the command acceptance enabled signal (output) CMDENBL is turned on. See the description of CMDENBL in Section C.2.2 (1) for details.
Function:

- The user can choose between RSR and PNS (optional), although they cannot be used simultaneously.
- Four input signals, RSR1 to RSR4, are used.
- If a signal is input to an RSR input, a specified program is started. The program number can be set by a menu.
- If another program has already started processing, the newly activated program enters the wait status. As soon as the current program terminates, the waiting program starts processing.
- By using an RSR instruction, each RSR in a program can be enabled or disabled.
- A menu is provided to register the program number of a specified program when each RSR is input. (Refer to the manual about software (for example, OPERATOR'S MANUAL (Basic Operation**)**) for details of the menu)

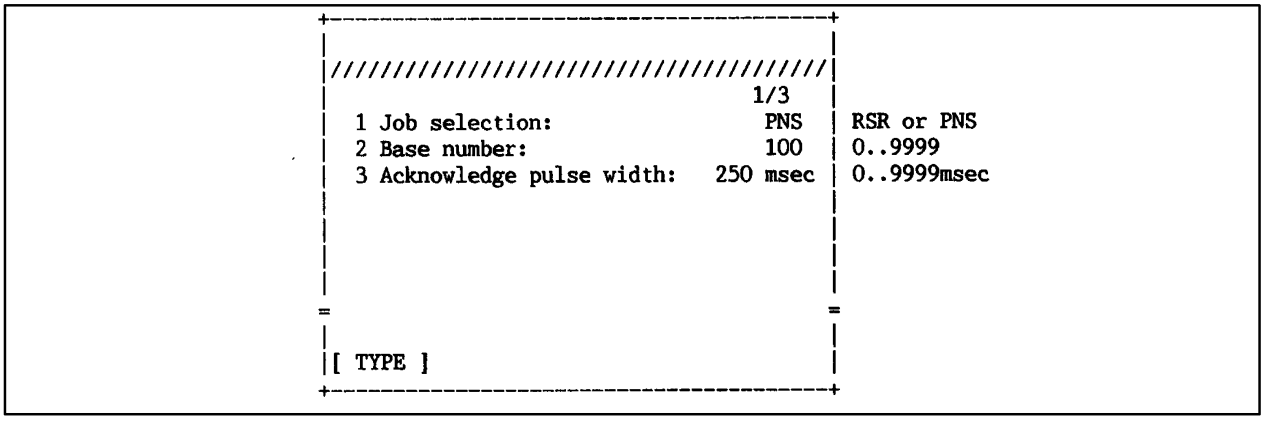
```
+--------------------------------------+
|                                      |
|//////////////////////////////////////|
|                                 1/8  |
|  1 Job selection:               RSR  | RSR or PNS
|  2 RSR1 program number:          12  | 0..9999
|  3 RSR2 program number:          23  | 0..9999
|  4 RSR3 program number:           5  | 0..9999
|  5 RSR4 program number:          64  | 0..9999
|  6 Base number:                 100  | 0..9999
|  7 Acknowledge:             Enabled  | Enabled or disabled
|  8 Acknowledge pulse width: 250 msec | 0..9999msec
=                                      =
|                                      |
|[ TYPE ]                              |
+--------------------------------------+
```

- When an RSR is input, the program whose program name consists of the specified program number plus a base value is started. For example, if a signal is input to RSR2 when program number 23 is registered in RSR2, the program to be started is the one with the program name calculated from the expression RSR + (RSR2 program number + base number), i.e., RSR0123.
  The base number is stored in parameter $SHELL_CFG.$JOB_BASE, and can be changed in a program with a parameter instruction. (For example, $SHELL_ CFG. $JOB_BASE =100). In this way, the combination of programs which can be started by RSRs can be changed.
- Whether the system should output an acknowledge signal to an RSR can be selected from the menu. If so specified, a pulse is output from the signal corresponding to the RSR, one of signals ACK1 to ACK4, when the input of the RSR is accepted. From the same menu, the width of the pulse can also be specified.
  It is possible to accept other RSRs while outputting an acknowledge signal.
- Input of a CSTOPIT signal can clear the program queue waiting for execution after acceptance of RSRs.

(9) PNS/PNSTROBE (input)
Signal name: PNS: Program number select
PNSTROBE: Strobe input for PNS
Effective: When the command acceptance enabled signal (output) CMDENBL is turned on. See the description of CMDENBL in Section C.2.2 (1) for details.

Function:

- The PNS/PNSTROBE signal selects whether the RSR function is used or the PNS function (optional) is used. If the PNS function is enabled, the RSR function cannot be used.
- The eight signals PNS1 to PNS8 are used to specify a program at the instant the strobe signal PNSTROBE raises.
- A menu is provided to specify the information about PNS.



If a number other than zero is entered to PNS input, a program is selected whose program number is the entered value plus the base number. For example, if the PNS value is 23, the program to be started has the program name calculated from the expression
PNS + (entered PNS value + base number), i.e., PNS0123.
If zero is entered to PNS input, it is cleared as if no selection has been made.

- A PNS signal, which can only select a program, cannot execute the selected program. The execution of the selected program can only be started after input of automatic operation start signal PROD_START.
- For safety, the selected program cannot be changed from the teach pendant unless PNSTROBE is turned off.
- If a program is selected by PNS, the program number is output to selected program number signal (output) SNO, and a pulse is output to program selection acknowledge signal SNACK. Using these signals, peripheral devices can confirm the correct program has been selected. For the timing of these signals, see the sections describing SNO and SNACK.
- The following operations are effective for the program selected by PNS. You can:
  - Start up a program by input of automatic operation start signal PROD_START
  - Restart the program that has been suspended.
    Inputting the START signal restarts the program selected by PNS when $SHELL_CFG.$CONT_ ONLY is set to ENABLED.
  - Input of CSTOPI cancels execution of the pro-grams selected by PNS when $SHELL_CFG.$USE_ ABORT is set to ENABLED.

(10) Automatic operation start signal (input) PROD_START
Effective: When the command acceptance enabled signal (output) CMDENBL is turned on. See the description of CMDENBL in Section C.2.2 (1) for details.
Function: This input signal executes the selected program at the falling edge when the signal is turned off after being turned on.

C.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 go on in warning.
Turned off: When the alarm status is released by an alarm release operation.

(7) Reference point signal (output) ATPERCH
Turned on: When the robot is in the reference position specified in the parameter. (The reference point No.1 in reference point setup screen.)
Turned off: When the robot is not in the reference position specified in the parameter. (The reference point No.1 in reference point setup screen.) Up to three reference positions can be specified, but this signal is output when the robot is in the first reference position. For the other two reference positions, general-purpose signals can be assigned to output as such. (They can be set from the setup screen.)

(8) Teach pendant enabled signal (output) TPENBL
Turned on: When the teach pendant is enabled.
Turned off: When the teach pendant is disabled.

(9) Battery alarm signal (output) BATALM
Turned on: When the voltage of the battery for the CMOS memory backup drops below the reference.
Turned off: When the voltage of the battery for the CMOS memory backup is at the normal level.

(10) Operating signal (output) BUSY

Turned on: When a program is being executed or is being processed from operation panels such as the teach pendant. (This has the same function as that of the BUSY lamp on the teach pendant.)

Turned off: When a program is not being executed nor is being processed from operation panels such as the teach pendant.

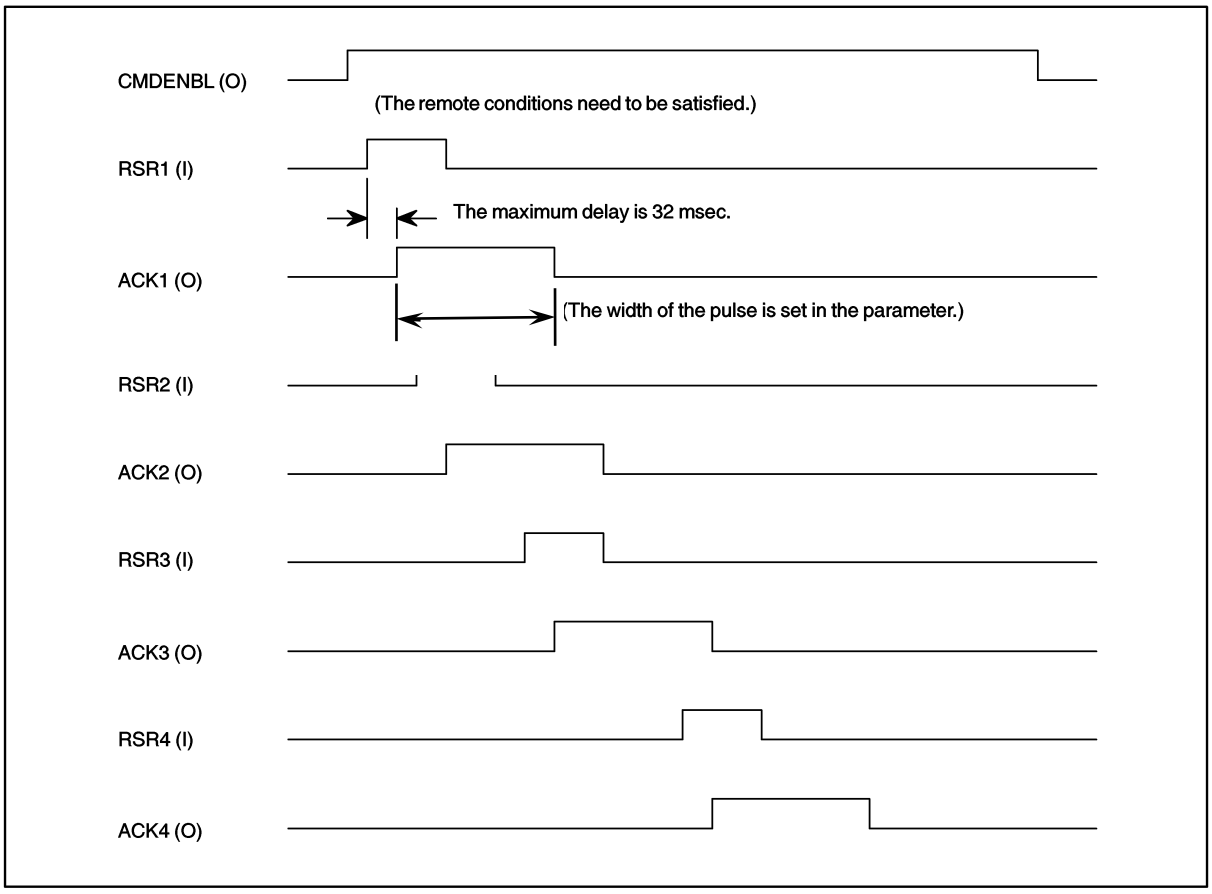
(11) RSR acknowledge signals (output) ACK1/ACK2/ACK3/ACK4

These signals are used together with the RSR function. They can be specified to be enabled or disabled from the RSR setup menu.

Turned on: When one of the signals from RSR1 to RSR4 is input and accepted. A pulse whose width is specified from the menu is output to acknowledge the signal.

Turned off: Normally. Since these signals are always output as pulses, they are normally in the off status.

The following chart shows the timing of the RSR input and ACK output.

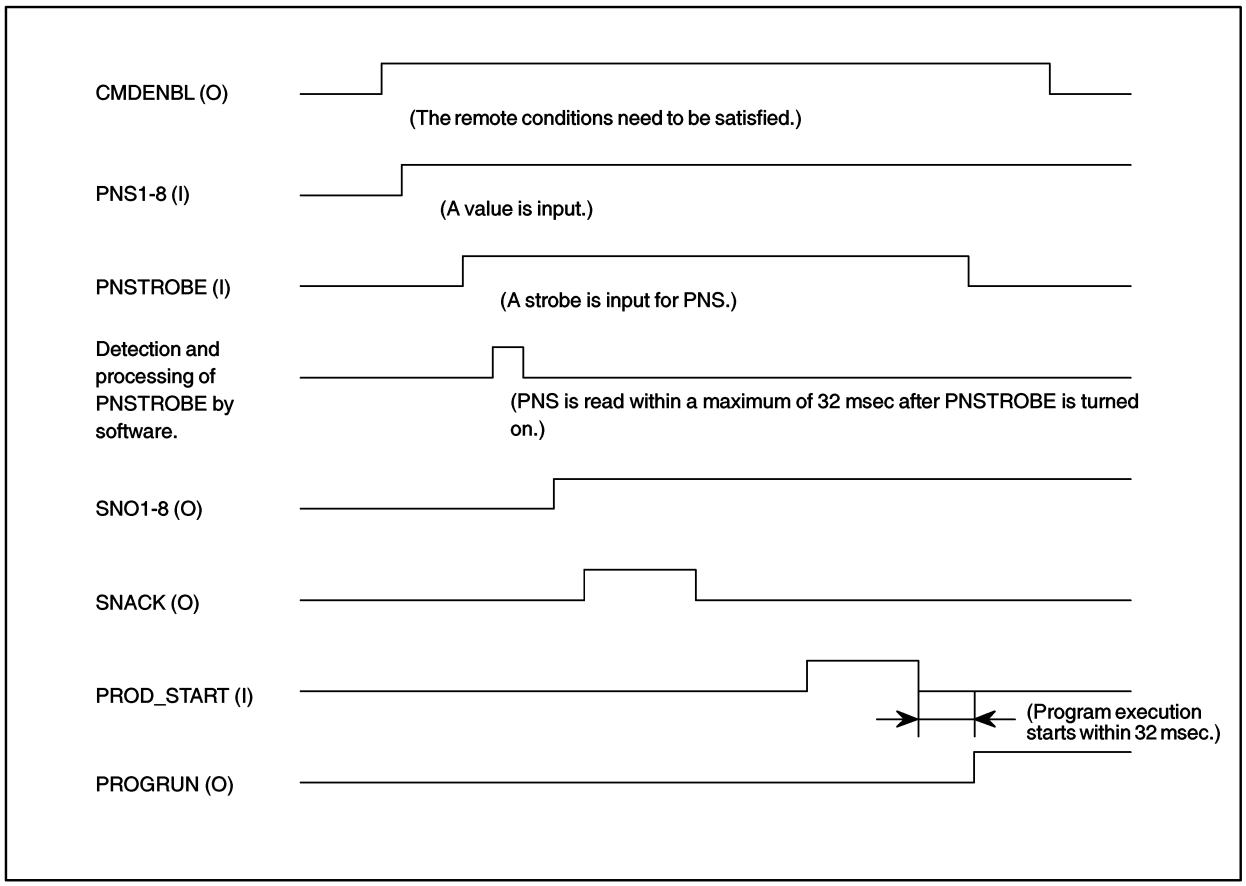


* Other RSR signals can be accepted even when the ACK signal is being output.

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

These signals are used together with the PNS function.

Turned on: Whenever the PNS function is enabled. The selected program number is displayed in binary code (SN01 to SN08) on the teach pendant. If the number cannot be represented as an eight-bit number, it becomes zero. After selecting a program by PNS, a pulse is output from signal SNACK as a part of the PNS operation. The width of the pulse can be specified from the menu. See the timing chart below.



C.3 SPECIFICATIONS OF DIGITAL INPUT/OUTPUT

C.3.1 Overview

This section describes the external specifications of digital and analog input/output in the R-30*i*B Compact Plus.

C.3.2 Input/Output Hardware Usable in the R-30*i*B Compact Plus

The R-30*i*B Compact Plus can use up to 512 digital input and output points or an equivalent number of analog input and output points. One analog input/output point uses the resources equivalent to those used by 16 digital I/O points.
The R-30*i*B Compact Plus can use a total of up to 512 I/O points.

The R-30*i*B Compact Plus can use the following external I/O hardware.
- I/O unit model A

C.3.3 Software Specifications

(1) RI/RO
These are signals sent to the connector at the wrist of the robot.
They cannot be assigned (redefined) and are fixed.
The standard format is four inputs and four outputs. The number of points that can be used for the connector at the wrist depends on the individual robot.

(2) DI/DO
The signal No. that is determined at hardware can be changed by software operation.

(3) Analog I/O
An analog I/O signal can access the analog I/O port (optional) on the process I/O board or the I/O port on the analog I/O module (used together with the I/O unit model A).
It reads and writes the digital value converted from the analog value of the I/O voltage. It means that the value does not always represent the real I/O voltage.

(4) Group I/O
Group I/O is a function, which can input or output multiple DI/DO signals as binary codes. Any number of continuous signals of up to 16 bits can be set for its use. It can be set in the menu DETAILS on the group I/O screen.

D TEACH PENDANT DISCONNECT FUNCTION (OPTION)

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

D.1 CONFIGURATION

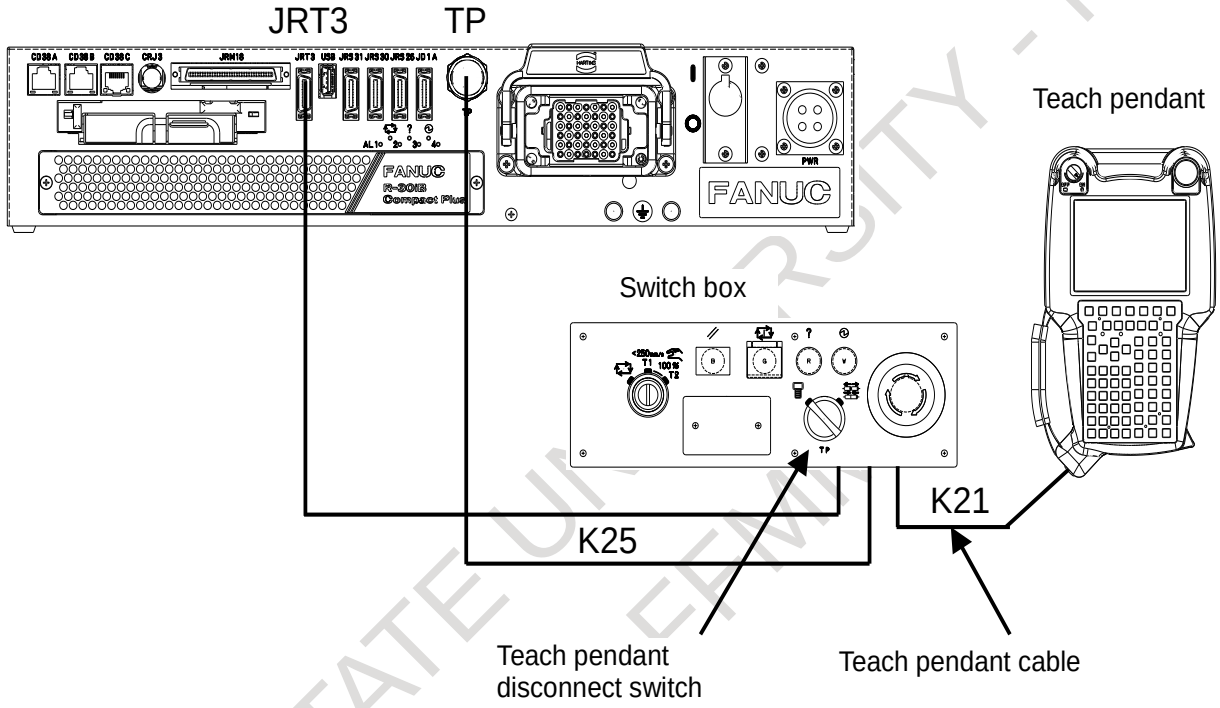


Fig.D.1 (a) Switch box function

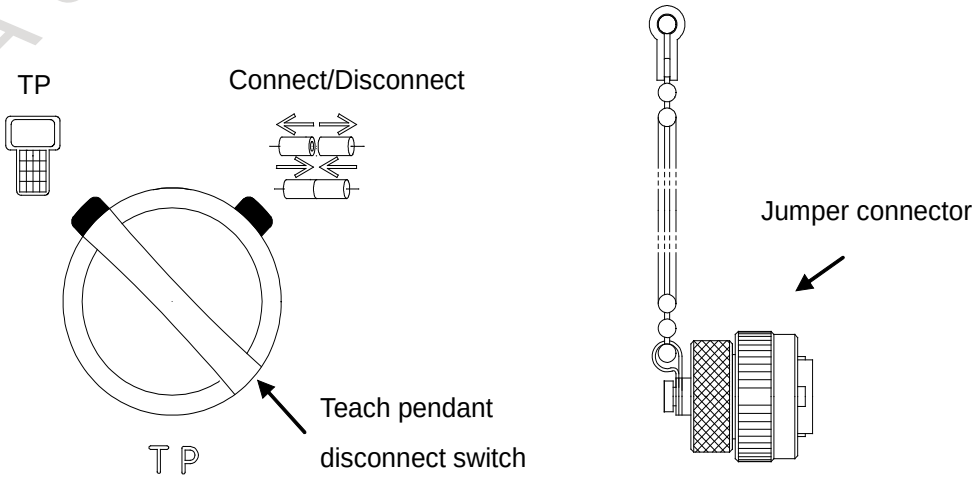


Fig.D.1 (b) Teach pendant disconnect switch and Jumper connector

Name	Ordering specification	Part 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
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

D.2 PROCEDURE OF TEACH PENDANT DISCONNECT

D.2.1 Teach Pendant Disconnect

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

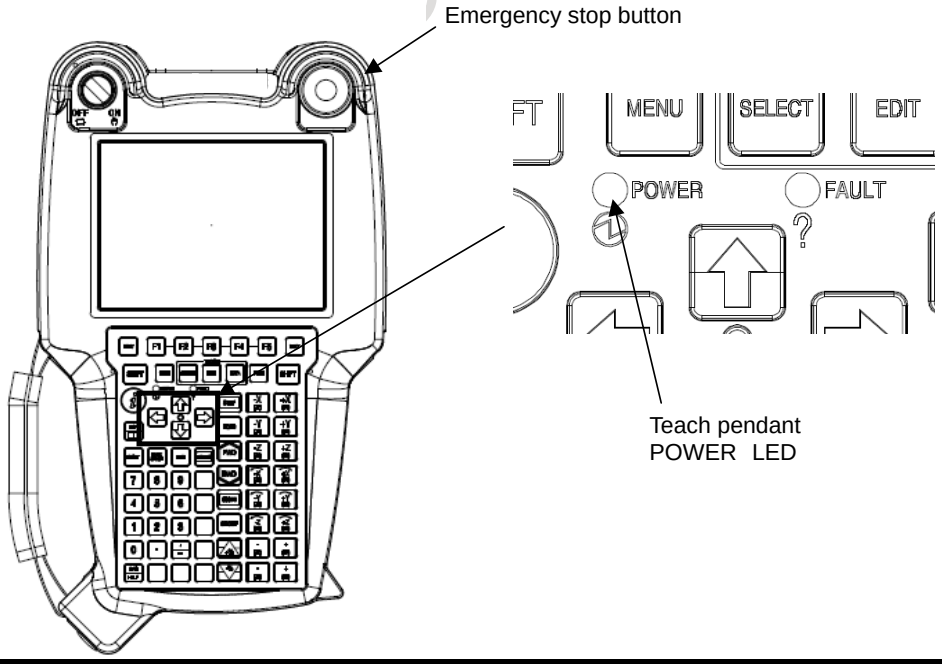
D.2.2 Teach Pendant Connect

(1) Set AUTO mode.
(2) Turn the TP disconnect switch to "Connect/Disconnect" symbol position. (Robot stops because Operator's panel E-stop Alarm occurs.)
(3) Disconnect the jumper connector.
(4) Connect the teach pendant cable with the teach pendant.
(5) Turn the 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.

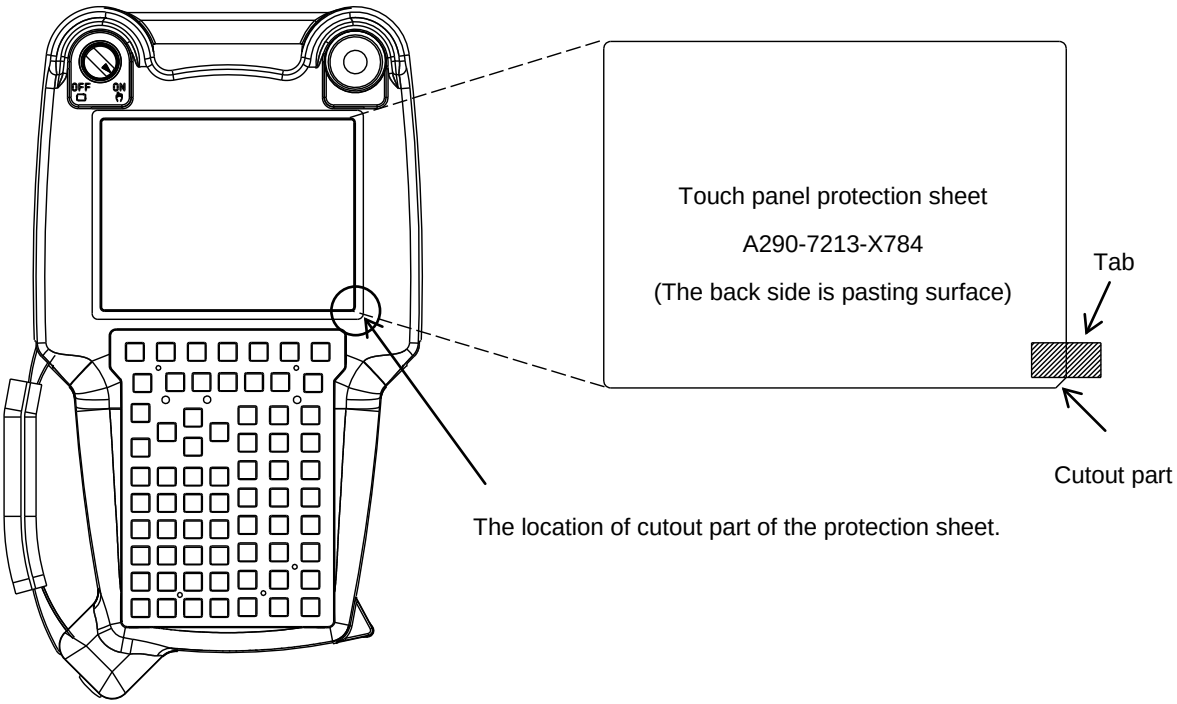


E REPLACING THE PROTECTION SHEET

This appendix shows an instruction for replacing the protection sheet of the *i*Pendant with touch panel.

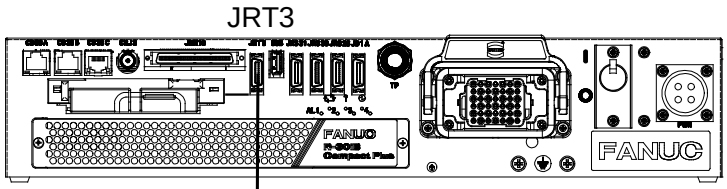
Replacement procedure

1. Remove old protection sheet.
2. Peel 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.



F REMOTE MODE SWITCH ASSEMBLY INSTRUCTION

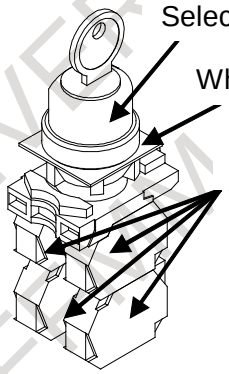
F.1 CONFIGURATION



K26 Remote mode switch cable length designation

Remote mode switch

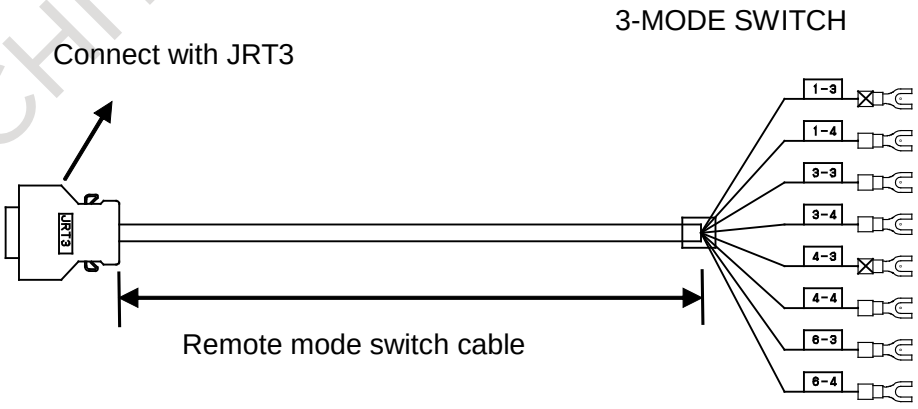
Parts
- Remote mode switch cable
- Label
- Selector switch
- Whirl-stop plate
- Contact block
- Add. contact block
- Bridge



Remote mode switch

F.2 CONNECTION

3 mode switch



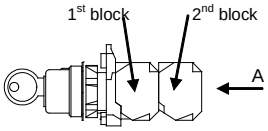
Mode switch SR2

1st contact block

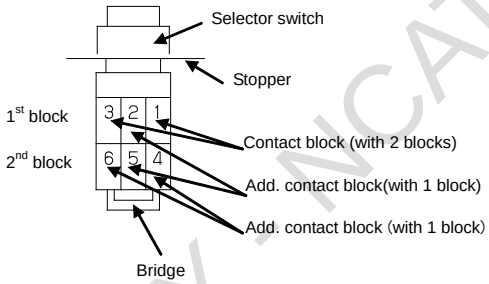
	NO	NC	NO
Up	3-3	(2-1)	1-3
Bottom	3-4	(2-2)	1-4

2nd contact block

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

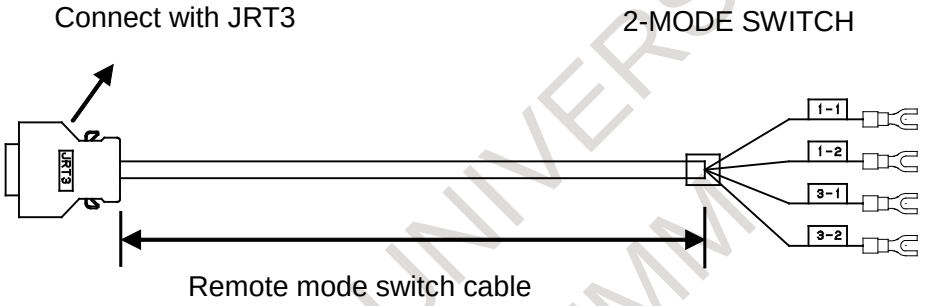


（View from A）



Note) The signals with ( ) has no actual connection.

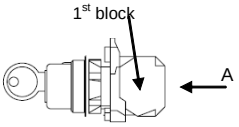
2 mode switch



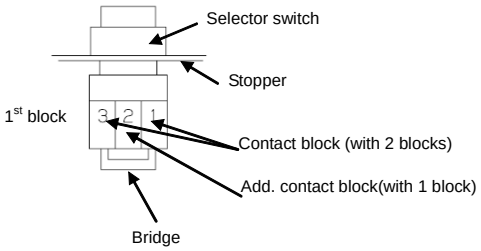
Mode switch SR2

1st contact block

	NC	NC	NC
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.

F.3 MOUNTING HOLE / CHARACTER PRINTED LABEL

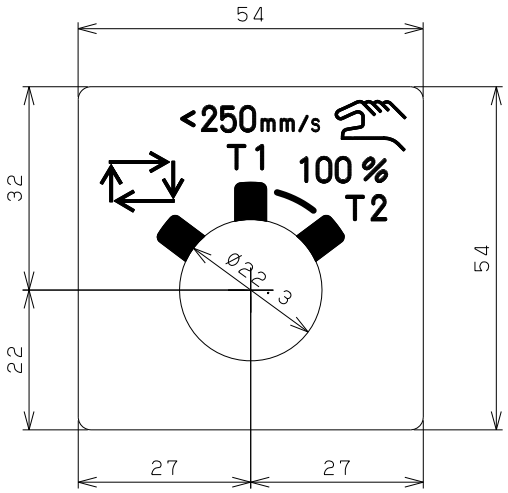
F.3.1 Mounting Hole

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

F.3.2 Character Printed Label

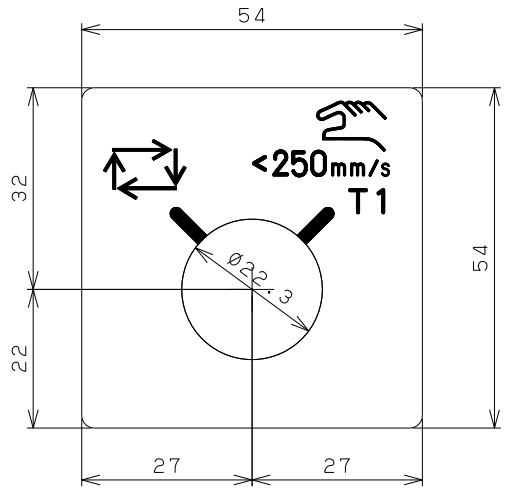
Put the Character printed label included in the retrofit kit to this hole.

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	Ordering specification	Part name	Maintenance specification	Quantity
K26	Remote mode switch retrofit kit (3 mode, 5m)	A05B-2690-K400	Cable	A660-8020-T887#L5R003	1
			Label	A370-3070-0149	1
			Selector switch	A55L-0001-0278#AGO	1
			Stopper	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-2690-K401	Cable	A660-8020-T887#L10R03	1
			Label	A370-3070-0149	1
			Selector switch	A55L-0001-0278#AGO	1
			Stopper	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-2690-K402	Cable	A660-8020-T887#L20R03	1
			Label	A370-3070-0149	1
			Selector switch	A55L-0001-0278#AGO	1
			Stopper	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-2690-K410	Cable	A660-8020-T888#L5R003	1
			Label	A370-3070-0169	1
			Selector switch	A55L-0001-0278#AG4M	1
			Stopper	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, 10m)	A05B-2690-K411	Cable	A660-8020-T888#L10R03	1
			Label	A370-3070-0169	1
			Selector switch	A55L-0001-0278#AG4M	1
			Stopper	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-2690-K412	Cable	A660-8020-T888#L20R03	1
			Label	A370-3070-0169	1
			Selector switch	A55L-0001-0278#AG4M	1
			Stopper	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.

INDEX

REVISION RECORD

Edition	Date	Contents
04	Feb.,2021	・Addition of SR-3*i*A/H, SR-6*i*A/H, SR-20*i*A. ・Addition of maintenance information. ・Correction of errors.
03	Mar.,2020	・Addition of SR-12*i*A. ・Correction of errors.
02	Feb.,2019	・Addition of maintenance information. ・Correction of errors.
01	Jan.,2018	

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