

# ***DENSO ROBOT***

**RC7M**

**CONTROLLER MANUAL**

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# Preface

Thank you for purchasing this high-speed, high-accuracy assembly robot.

This manual describes the RC7M controller configured in the \*\*G robot system. It also covers interfacing required when you integrate your robot system into your facilities, as well as providing the maintenance & inspection procedures.

Before use, read this manual carefully together with related manuals to safely get the maximum benefit from your robot in your assembling operations.

**Note:** The name of this manual has changed from the "RC7M Controller INTERFACE MANUAL" to the "RC7M CONTROLLER MANUAL."

## Robot controller covered by this manual

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RC7M controller

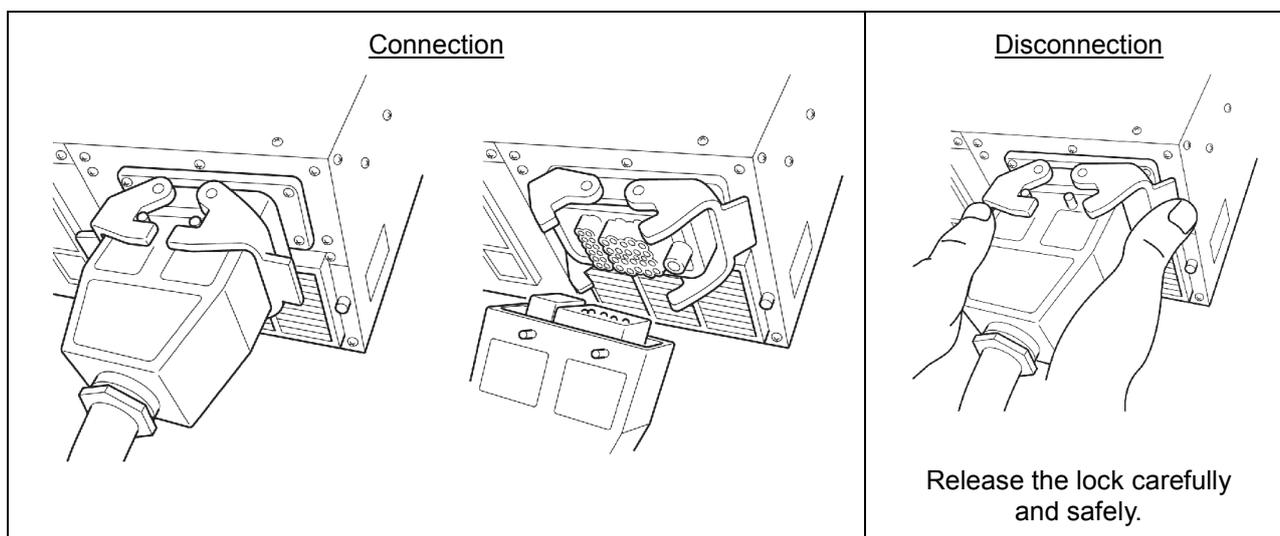
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## Caution in connecting/disconnecting the motor & encoder cable

The CN7 (MOTOR) connector for the motor & encoder cable on the RC7M controller uses a rigid structure.

Connection: Lock the connector properly.

Disconnection: Release the lock carefully and safely. It cannot be easily released.



## Important

To ensure operator safety, be sure to read the precautions and instructions in "SAFETY PRECAUTIONS."

### NOTE:

Robots and controllers that will be exported to South Korea after March 1st 2013 need to have KCs mark for each equipment.

# How this book is organized

This book is just one part of the robot documentation set. This book consists of SAFETY PRECAUTIONS and chapters one through eight.

## **Chapter 1 Outline of the RC7M Controller**

Provides an outline of the RC7M controller. The robot controller is available in several models that will differ in detailed specifications to match robot models to be connected.

## **Chapter 2 General Information about the Interface**

Introduces you to the interface required for connecting the robot controller with a PLC or other external equipment.

## **Chapter 3 System I/O Signals**

Describes system I/O signals, and describes I/O signals that execute I/O commands.

## **Chapter 4 I/O Circuits and Connectors (NPN type)**

Describes the I/O circuits and connector pin layout of an NPN I/O board (source input and sink output). The NPN I/O board is designed for the use in Japan.

## **Chapter 5 I/O Circuits and Connectors (PNP type)**

Describes the I/O circuits and connector pin layout of a PNP I/O board (sink input and source output).

## **Chapter 6 Installation & Maintenance for the RC7M controller**

Provides instructions for installing the robot controller, and maintenance & inspection procedures.

## **Chapter 7 I/O Allocation for I/O Extension Board(s)**

Lists the I/O allocation tables to apply when I/O extension boards are mounted.

## **Chapter 8 I/O Allocation for I/O Conversion Box (only for standard type of controller)**

Lists the I/O allocation tables to apply when the I/O conversion box is mounted.

Using the I/O conversion box on the RC7M controller with an optional parallel I/O board mounted allows the "INPUT (CN8)," "OUTPUT (CN10)," and "I/O POWER (CN7)" used on the RC5 controller to be used on the RC7M controller as is.

**Note:** The I/O conversion box cannot be used for the global type of the controller.

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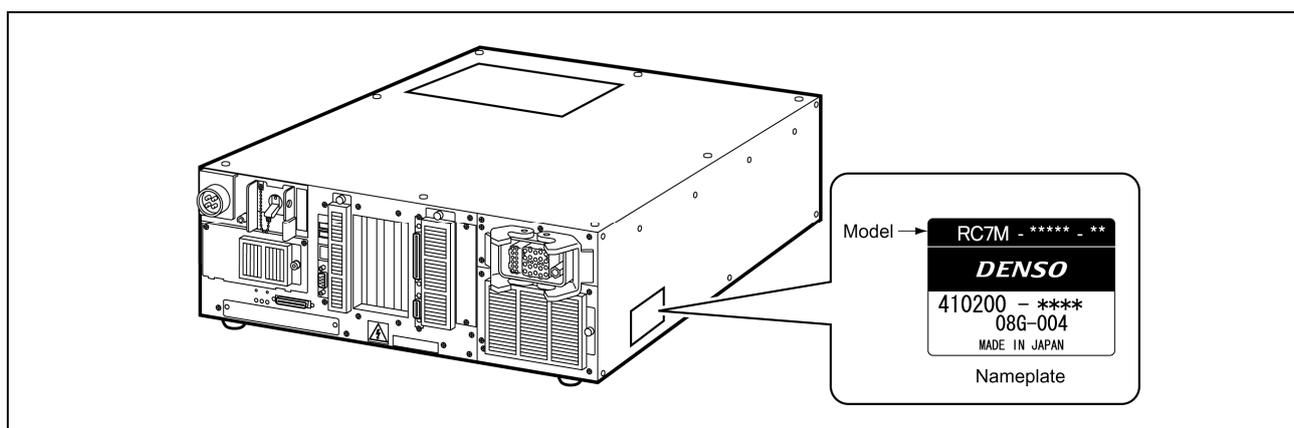
# Chapter 1

## General Information about RC7M Controller

The RC7M controller is available in several models which differ in detailed specifications to match robot models.

### 1.1 Controller Model Name on Nameplate

The model name of the controller is printed on the nameplate attached to the rear side of the controller as shown below. The model name is coded as listed below.



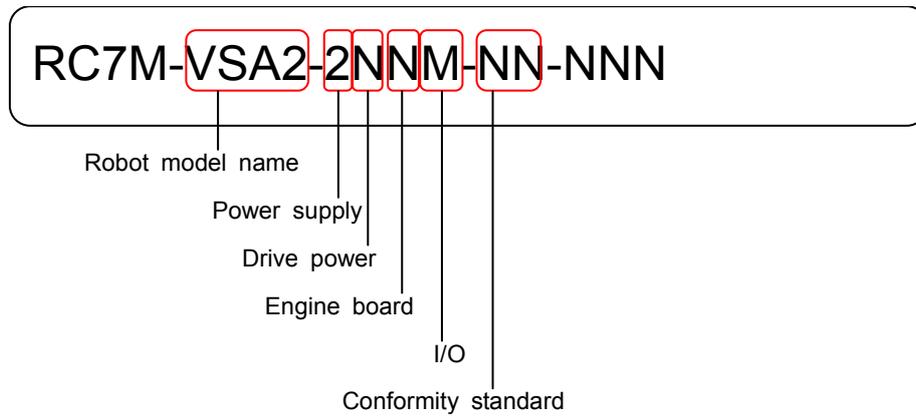
Coding of RC7M Controller Model Name (G Type Robot)

RC7M - <u>VSG</u> <u>6</u> <u>B</u> <u>A</u> <u>  </u> - <u>B</u> <u>P</u>			
(a)      (b)      (c)      (d)      (e)      (f)      (g)			
Position	Code sample	Denotes:	Coding
(a)	VSG	Robot model name	VMG: VM-G series, VSG: VS-G series, VPG: VP-G series, HMG: HM-G series, HSG: HS-G series, XRG: XR-G series, XYCG: XYC-4G series
(b)	6	No. of controllable axes	4: 4 axes, 5/6: 5 or 6 axes, 6: 6 axes
(c)	B	Engineering symbol 1	A: Encoder A B: Encoder B C: Encoder C
(d)	A	Engineering symbol 2	A: 24V brake
(e)		Engineering symbol 3	Blank: 200 VAC power A: 100 VAC power
(f)	B	Controller type (Note)	Blank: Standard type B: Global type (with safety board) C: Global type (with safety box) D: Global type, UL-Listed (with safety board) E: Global type, UL-Listed (with safety box)
(g)	P	I/O type	Blank or N: NPN I/O P: PNP I/O

**(Note)** Regarding global type controllers, see "Differences between Global and Standard Types of Robot Controllers".

## 1.1.1 RC7M Robot Controller Model for VS-\*\*\* Series

Robot controller models are as follows.



### Robot model name

VSA2 VS-068 / VS-087

VSA1 VS-050 / VS-060

### Power supply

2 200V

### Drive power

N Standard

### Engine board

N Standard

### I/O

M Negative common (NPN)

P Positive common (PNP)

### Conformity standards

NN -

NB CE (Safety category: 3, safety board attached) Note 1

NC CE (Safety category: 4, safety box attached) Note 1

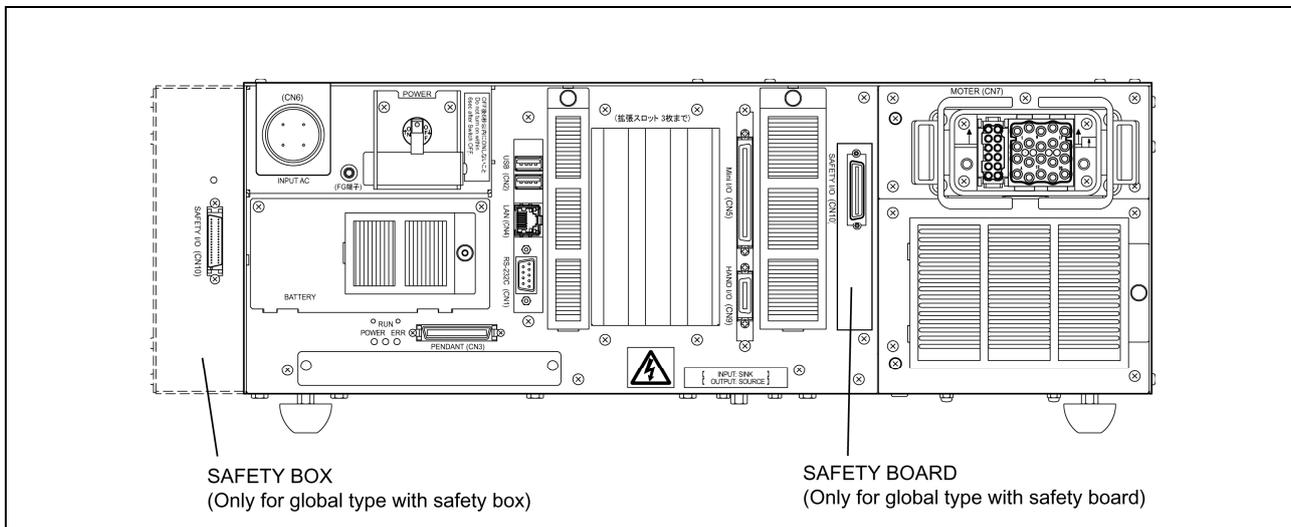
UB CE, UL (Safety category: 3, safety board attached) Note 1

UC CE, UL (Safety category: 4, safety box attached) Note 1

**Note1:** Global type controller

## Differences between Global and Standard Types of Robot Controllers

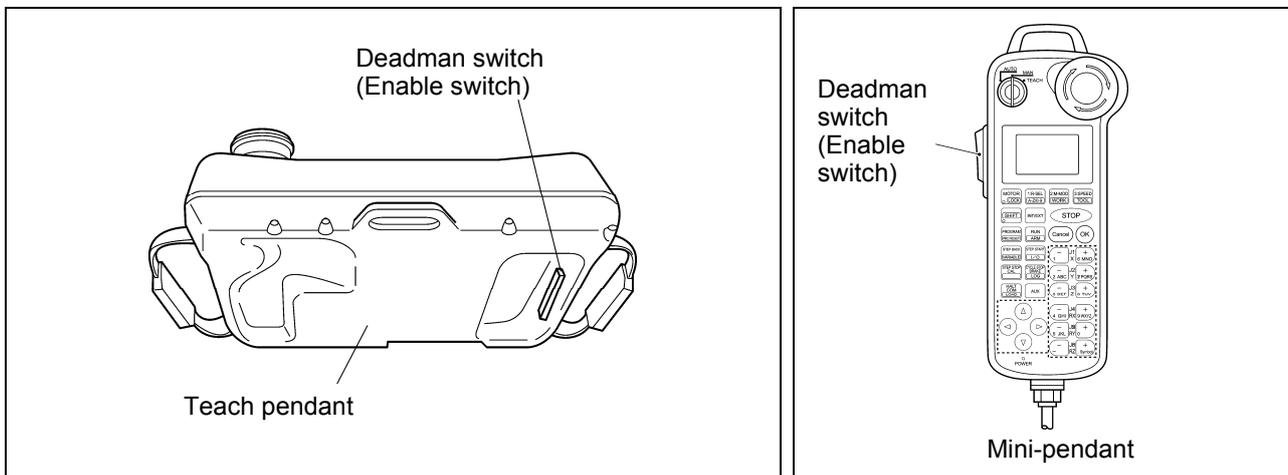
The global type of the robot controller has either a safety board or safety box which the standard type has not. Described below are the functional differences between the global and standard types.



### [ 1 ] Deadman switch function (Enable switch function)

The global type controls the deadman switch provided on the teach pendant or mini-pendant in a partially different way than the standard type does. When reading the instruction manuals that are prepared for the standard type, be careful with the following differences.

#### (1) Location of deadman switches (enable switches) on the teach pendant and mini-pendant



#### (2) Difference in deadman switch operation

The table below lists the functional differences of the teach pendant and mini-pendant between the global and standard types in Manual mode and Teach check mode.

Global type	Standard type (described in the instruction manuals)
(1) Unless the deadman switch is held down, you can <u>neither</u> operate the robot <u>nor</u> turn the motor power <u>ON</u> .	(1) Unless the deadman switch is held down, you cannot operate the robot, <u>but you can</u> turn the motor power <u>ON</u> .
(2) When the robot is in operation, releasing the deadman switch will stop not only the robot but also turn the motor power <u>OFF</u> .	(2) When the robot is in operation, releasing the deadman switch will stop the robot <u>but not</u> turn the motor power <u>OFF</u> (servo lock).

## [ 2 ] "Single point of control" function

The global type of the robot controller supports the "single point of control" function, while other types do not.

### (1) Single point of control

The "single point of control" function, which is one of the robot safety functions, limits the robot control sources (command sources) to only one. This function is specified by the parameter "Single point of control" that limits the control to either "Internal Auto" or "External Auto" limited mode.

#### ■ Internal Auto limited mode

The "Auto mode" is limited to the "Internal Auto" limited mode in which a program start can be triggered from the teach pendant, but cannot from external equipment.

#### ■ External Auto limited mode

The "Auto mode" is limited to the "External Auto" limited mode in which a program start can be triggered from external equipment, but cannot from the teach pendant.

**Note:** In this mode, the controller running software version 2.801 or earlier cannot use the teach pendant operation panel editor "Panel Designer" in External Auto.

### (2) Setting the Internal/External Auto Limited Mode Parameters

Using the teach pendant, set the parameters with the following access.

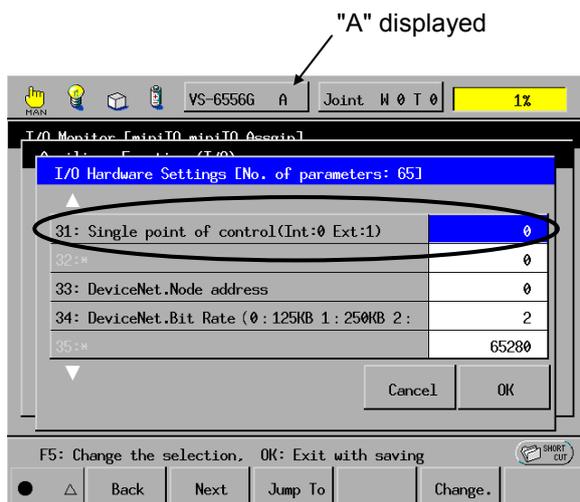
Note 1: The "External Auto Limited Mode" is the factory default.

Note 2: The global type displays letter "A" following the robot type on the teach pendant screen.

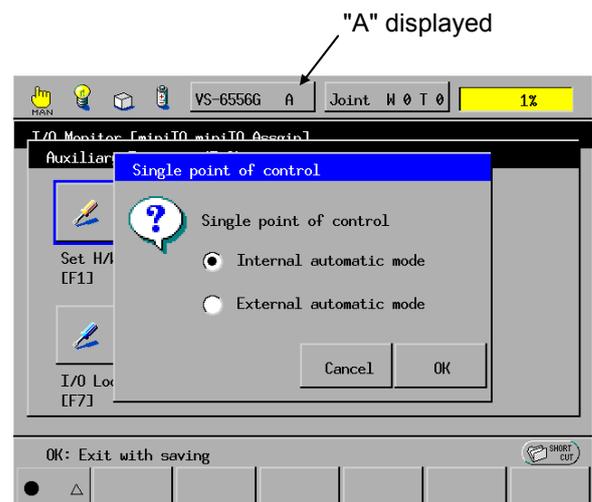
**Access:** [Top screen]—[F4 I/O]—[F6 Aux.]—[F1 Set H/W]—[F3 Jump To]—"31"

In Ver. 2.3 or later:

**Access:** [Top screen]—[F4 I/O]—[F6 Aux.]—[F4 Int/Ext]



Setting on the "I/O Hardware Settings" window

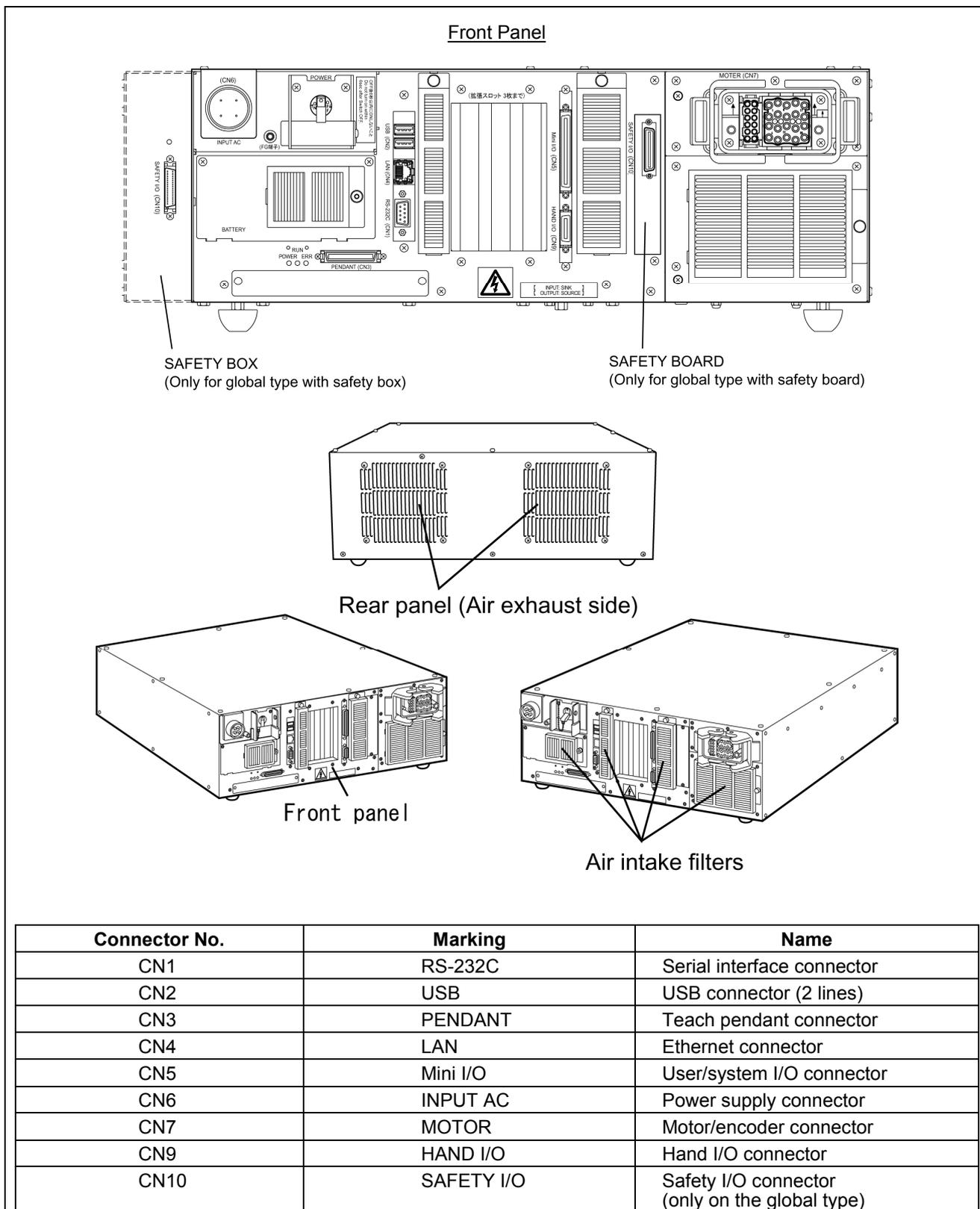


Setting on the "Single point of control" window (Ver. 2.3 or later)

## 1.2 Names of the Controller Components

### 1.2.1 Controller Components

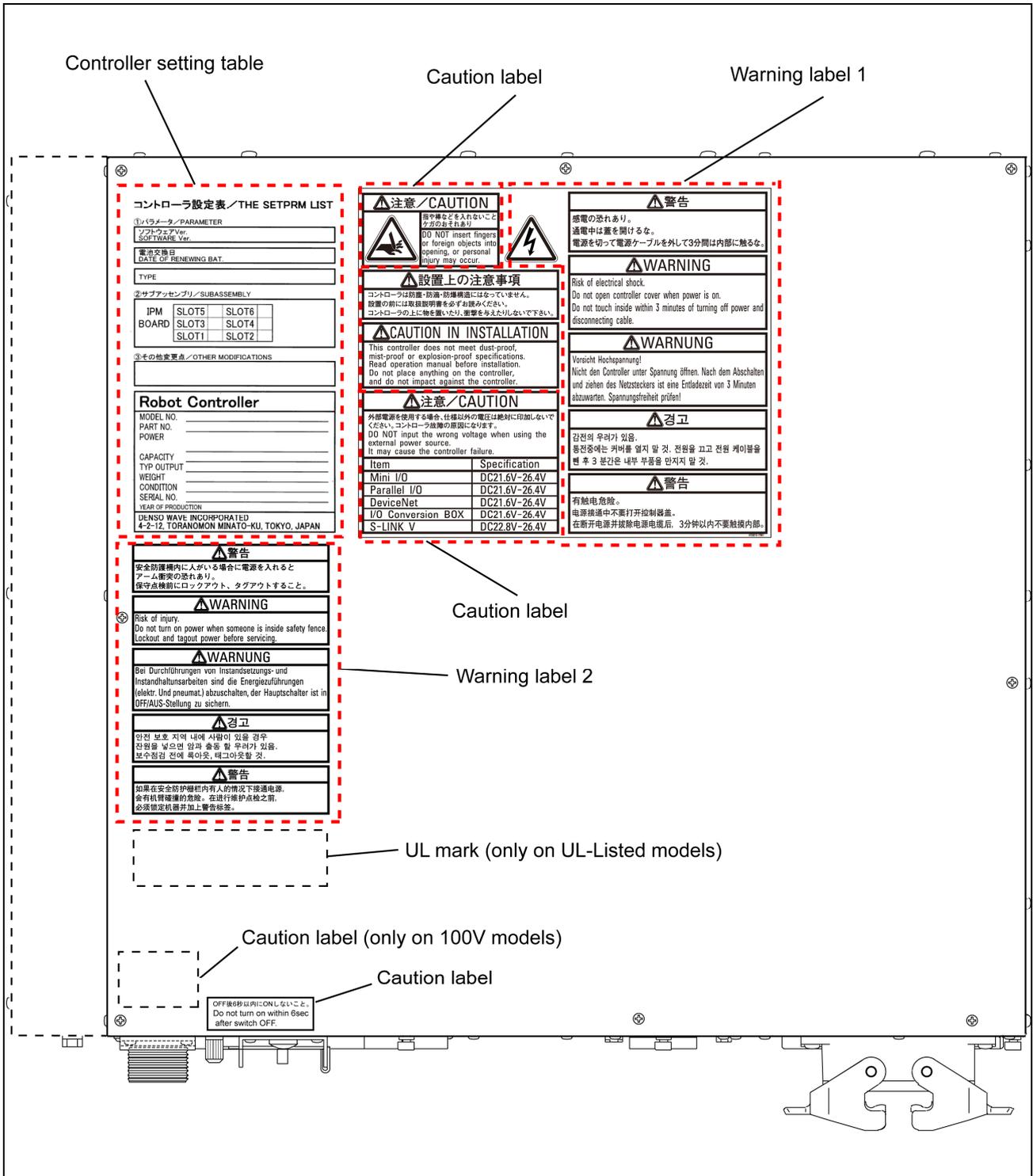
The following figures show the names of the robot controller components.



Names of RC7M Robot Controller

## 1.2.2 Warning and Caution Labels

The robot unit has warning and caution labels pasted as shown below. They alert the user to the dangers of the areas on which they are pasted. Be sure to observe the instructions printed on those labels.



Location of Labels on the Controller

## Warning and Caution Labels on the Robot Controller

Warning and caution labels on the controller	Contents												
<p>Warning label 1</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ WARNING</b></p> <p>Risk of electrical shock. Do not open controller cover when power is on. Do not touch inside within 3 minutes of turning off power and disconnecting cable.</p> </div>	<p>(For maintenance of the controller) Risk of electrical shock. Never open the controller cover when the power is ON. Never touch the inside of the controller for at least 3 minutes even after turning the power OFF and disconnecting the power cable.</p>												
<p>Warning label 2</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ WARNING</b></p> <p>Risk of injury. Do not turn on power when someone is inside safety fence. Lockout and tagout power before servicing.</p> </div>	<p>(For controller power switch) Risk of injury. Be sure to perform lockout/tagout before starting servicing. Turning the power ON may move the arm, causing injuries if a person is inside the safety fence.</p>												
<p>Caution label</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ 注意 / CAUTION</b></p> <div style="display: flex; align-items: center;">  <div style="font-size: small;"> <p>指や棒などを入れないこと ケガのおそれあり</p> <p>DO NOT insert fingers or foreign objects into opening, or personal injury may occur.</p> </div> </div> </div>	<p>(For cooling fans) Risk of injury. Do not insert fingers, sticks or other foreign objects through the openings.</p>												
<p>Caution label</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ 設置上の注意事項</b></p> <p style="font-size: x-small;">コントローラは防塵・防滴・防爆構造にはなっていません。 設置の前には取扱説明書を必ずお読みください。 コントローラの上に物を置いたり、衝撃を与えたりしないで下さい。</p> <hr/> <p style="text-align: center;"><b>⚠ CAUTION IN INSTALLATION</b></p> <p style="font-size: x-small;">This controller does not meet dust-proof, mist-proof or explosion-proof specifications. Read operation manual before installation. Do not place anything on the controller, and do not impact against the controller.</p> </div>	<p>The controller is not designed to be dust-, splash-, or explosion-proof. Before installation, be sure to read the user's manual. Do not put anything on the controller or apply any impact or shock to it.</p>												
<p>Caution label</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ 注意 / CAUTION</b></p> <p style="font-size: x-small;">外部電源を使用する場合、仕様以外の電圧は絶対に印加しないでください。コントローラ故障の原因になります。 DO NOT input the wrong voltage when using the external power source. It may cause the controller failure.</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <thead> <tr> <th style="text-align: left;">Item</th> <th style="text-align: left;">Specification</th> </tr> </thead> <tbody> <tr> <td>Mini I/O</td> <td>DC21.6V~26.4V</td> </tr> <tr> <td>Parallel I/O</td> <td>DC21.6V~26.4V</td> </tr> <tr> <td>DeviceNet</td> <td>DC21.6V~26.4V</td> </tr> <tr> <td>I/O Conversion BOX</td> <td>DC21.6V~26.4V</td> </tr> <tr> <td>S-LINK V</td> <td>DC22.8V~26.4V</td> </tr> </tbody> </table> </div>	Item	Specification	Mini I/O	DC21.6V~26.4V	Parallel I/O	DC21.6V~26.4V	DeviceNet	DC21.6V~26.4V	I/O Conversion BOX	DC21.6V~26.4V	S-LINK V	DC22.8V~26.4V	<p>When using an external power source, never apply the voltage not specified. Doing so can result in a controller failure.</p>
Item	Specification												
Mini I/O	DC21.6V~26.4V												
Parallel I/O	DC21.6V~26.4V												
DeviceNet	DC21.6V~26.4V												
I/O Conversion BOX	DC21.6V~26.4V												
S-LINK V	DC22.8V~26.4V												
<p>Caution label</p> <div style="border: 1px solid black; padding: 5px;"> <p>OFF後6秒以内にONしないこと。 Do not turn on within 6sec after switch OFF.</p> </div>	<p>After turning the power switch OFF, do not turn it ON for at least six seconds.</p>												

# 1.3 Controller Specifications

## [ 1 ] Specifications

The table below lists the robot controller specifications.

**RC7M Robot Controller Specifications**

Item		Specifications	
Model		VS-*** series      RC7M-VSA*_****_**_*** VM-G series        RC7M-VMG6***_** VS-G series        RC7M-VSG6***_** VP-G series        RC7M-VPG5/6***_** HM-G series        RC7M-HMG4***_** HS-G series        RC7M-HSG4***_** XYC-4G series     RC7M-XYCG4***_** XR-G series        RC7M-XRG4***_**	
Controllable axes		6 axes                : VS-*** series, VS-G series, VM-G series 5 or 6 axes         : VP-G series 4 axes                : HM-G series, HS-G series, XYC-4G series, XR-G series	
Control system		PTP, CP 3-dimensional linear, 3-dimensional circular	
Drive system		All axes: Full-digital AC servo	
Language used		DENSO robot language (conforming to SLIM)	
Memory capacity		3.25 MB (equivalent to 10,000 steps, 30,000 points)	
Teaching system		1) Remote teaching 2) Numerical input (MDI) 3) Direct teaching (HM-G series and HS-G series only)	
External signals (I/O)	Standard I/O	Mini I/O	Input: 8 user open points + 11 fixed system points Output: 8 user open points + 14 fixed system points (Note: The global type of the controller cannot use system-fixed emergency stop I/Os.)
		HAND I/O	Input: 8 user open points Output: 8 fixed system points
	SAFETY I/O (only on global type)		Input: 6 fixed system points Output: 5 fixed system points
	Parallel I/O extension boards (option)	2 boards mounted	Input: 80 user open points Output: 96 user open points (addition possible)
		Single board mounted	Input: 40 user open points Output: 48 user open points (addition possible)
	DeviceNet board (option)	Master/Slave	Input: 1024 points (master) + 256 points (slave) Output: 1024 points (master) + 256 points (slave)
		Master	Input: 1024 points Output: 1024 points
		Slave	Input: 256 points Output: 256 points
	CC-Link board (option)	Slave	Input: 384 points Output: 384 points (including remote registers RWw and RWr)
	External communication		RS-232C: 1 line Ethernet: 1 line USB: 2 lines (Supporting flash memory)
Extension slots		3 (For optional boards)	
Self-diagnosis function		Overrun, servo error, memory error, input error, etc.	
Timer function		0.02 to 10 sec. (in units of 1/60 sec.)	
Error display		Error codes will be outputted on the external I/O. Error messages will be displayed in English on the teach pendant (option). Error codes will be displayed on the mini-pendant (option).	
Cables	Robot control cable (option)	2m, 4m, 6m, 12m, 20m (4m and 6m only with the XYC-4G series)	
	I/O cable (option)	8 m, 15 m (for Mini I/O, HAND I/O, parallel I/O extension boards, safety I/O board)	
	Power cable	5 m	

Item		Specifications		
Environmental conditions (in operation)		Temperature: 0 to 40°C Humidity: 90% RH or less (no condensation allowed) Altitude: 1,000m or less		
Power source	VS-050/060	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz, 1.15 kVA Single-phase, 230 VAC -10% to 230 VAC +10%, 50/60 Hz, 1.15 kVA		
	VS-068/087	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz, 2.78 kVA Single-phase, 230 VAC -10% to 230 VAC +10%, 50/60 Hz, 2.78 kVA		
	VM-G series	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz, 3.3 kVA		
	VS-G series	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz, 1.85 kVA Single-phase, 230 VAC -10% to 230 VAC +10%, 50/60 Hz, 1.85 kVA		
	VP-G series	200 VAC type	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz, 1 kVA Single-phase, 230 VAC -10% to 230 VAC +10%, 50/60 Hz, 1 kVA	
		100 VAC type	Single-phase, 100 VAC -10% to 110 VAC +10%, 50/60 Hz, 1 kVA	
	HM-G series	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz, 2.45 kVA Single-phase, 230 VAC -10% to 230 VAC +10%, 50/60 Hz, 2.45 kVA		
	HS-G series	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz, 1.8 kVA Single-phase, 230 VAC -10% to 230 VAC +10%, 50/60 Hz, 1.8 kVA		
	XYC-4G series	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz, 1.15 kVA Single-phase, 230 VAC -10% to 230 VAC +10%, 50/60 Hz, 1.15 kVA		
XR-G series	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz, 1.8 kVA Single-phase, 230 VAC -10% to 230 VAC +10%, 50/60 Hz, 1.8 kVA			
I/O power source	External power source	A 24 VDC ±10% should be supplied from external equipment.	<b>Note:</b> Refer to Sections 4.2.1 and 5.2.1 "Setting up Mini I/O Power Supply."	
	Internal power source	A 24 VDC ±10% should be supplied internally in the robot controller.		
Rated output current		VS-050/060: Approx. 9A , VS-068/087: Approx. 20 A , VM-G series: Approx. 20 A , VS-G series: Approx. 11 A , VP-G series: Approx. 5 A , HM-G series: Approx. 19 A , HS-G series: Approx. 14 A , XR-G series: Approx. 10A , XYC-4G series: Approx. 8 A		
Safety performance (Note 1)		With safety board (Only the controller with safety box is available to the XYC-4G series of robots)	Structure: Category 3 Performance Level: d MTTFd: $1.87 \times 10^4$ years DCavg: 95.1%	
		With safety box	Structure: Category 4 Performance Level: e MTTFd: $2.03 \times 10^3$ years (Emergency stop) $0.76 \times 10^3$ years (Protective stop) DCavg: 99%	
Stop category		With safety board/with safety box: Category 1 (Only safety box is available for the XYC-4G series) (See IEC60204-1 for details of stop category)		
Weight (Mass)		4-axis standard type: Approx. 17 kg 6-axis standard type: Approx. 18 kg 4-axis global type, UL-Listed (w/ safety board): Approx. 18 kg 6-axis global type, UL-Listed (w/ safety board): Approx. 19 kg 4-axis global type, UL-Listed (w/ safety box): Approx. 21 kg 6-axis global type, UL-Listed (w/ safety box): Approx. 22 kg		
(Note1) Safety performance of robot stopping functions (emergency stop and protective stop). Input devices to be supplied by customers such as Safety door switch are not included in the PL calculation. Calculation conditions: - This calculation is based on ISO 13849-1:2006 and IEC 62061:2005. - Operating time 24 hours/day and 365 days/year - Frequency of actuation 1 time/day (Emergency stop), 10 times/day (Protective stop)				

## Controller Handling Notes

### **WARNING**

- **DO NOT touch fins. Their hot surfaces may cause severe burns.**
- **DO NOT insert fingers or foreign objects into openings. Doing so may cause bodily injury.**
- **Before opening the controller cover and accessing the inside of the controller for maintenance, be sure to turn off the power switch, disconnect the power cable, and wait 3 minutes or more. This is for protecting you from electric shock.**
- **DO NOT connect or disconnect connectors to/from the controller when the AC power or the 24 VDC power for I/O is being supplied. Doing so may cause electric shock or controller failure.**

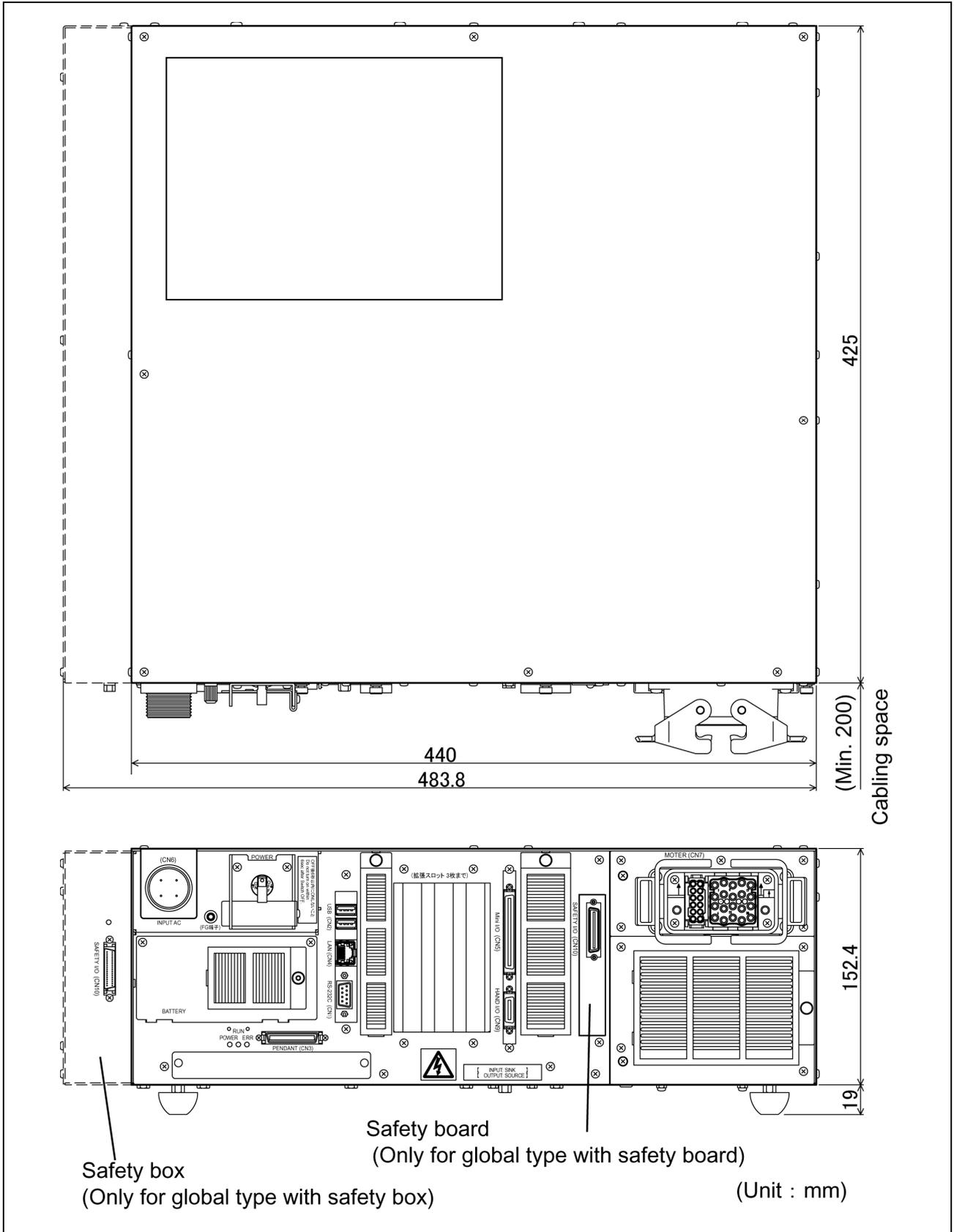
### **CAUTION IN INSTALLATION**

- **This controller is not designed to be dust-, splash-, or explosion-proof.**
- **Read operation manuals before installation.**
- **Do not place anything on the controller or apply an impact or shock to the controller.**
- **Avoid mounting the controller in an environment where excessive vibration is applied to the controller.**

 **CAUTION:** The robot controller connectors are of a screw-lock type or ring-lock type. Lock the connectors securely. If even one of the connectors is not locked, weak contact may result thereby causing an error. Be sure to turn the robot controller OFF before connecting/ disconnecting the power connector or motor connector. Otherwise, the internal circuits of the robot controller may be damaged.

## [ 2 ] Outer Dimensions

The outer dimensions of the robot controller are shown below.

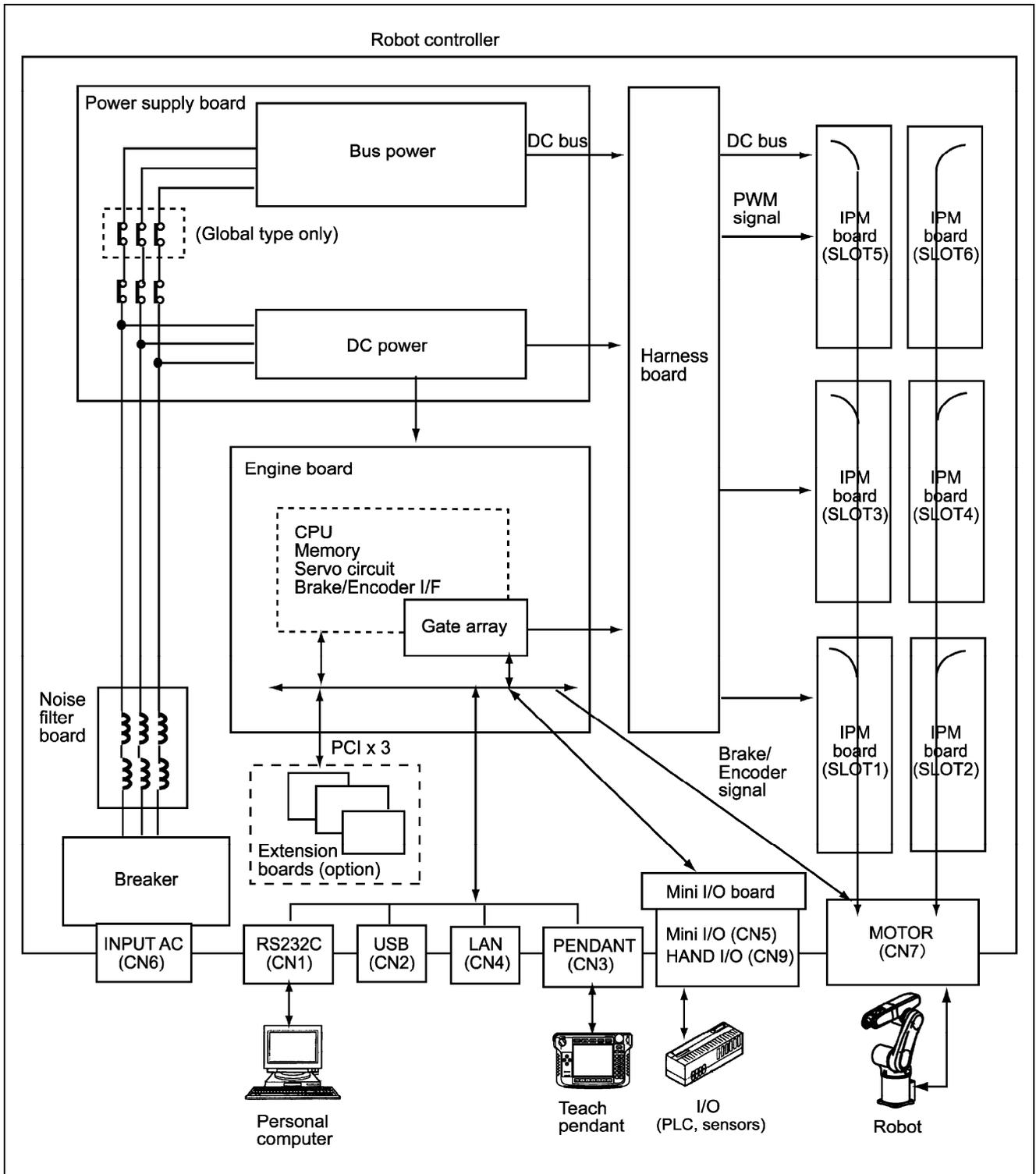


Outer Dimensions of RC7M Robot Controller

# 1.4 Controller System Configuration

## 1.4.1 Internal Circuits of the Controller (Typical configuration)

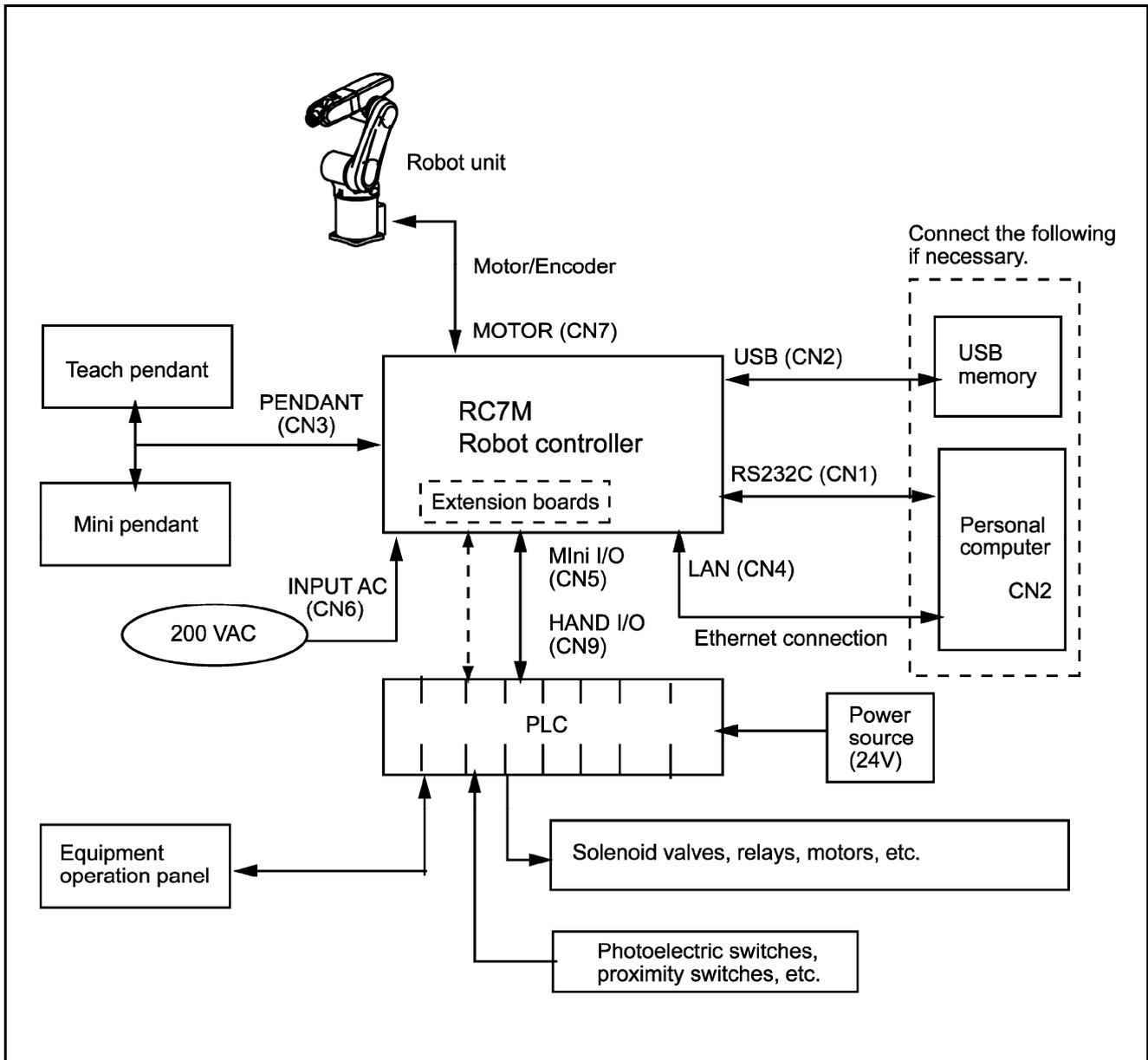
The block diagram below shows the internal circuits of the RC7M controller designed for a 6-joint robot.



Block Diagram of the RC7M Controller

## 1.4.2 Typical Robot System Configuration

The block diagram below shows a typical robot system configuration.



**Robot System Configuration**

# Chapter 2

## General Information about the Interface

### 2.1 Types and General Information about I/O Signals

This section describes the I/O signals for the Robot Controller.  
The I/O signals are grouped into user I/O signals and system I/O signals.

**Note:** For the interface to apply when an I/O extension board or I/O conversion box is mounted, refer to Chapter 7 or 8 in this manual, respectively, and the OPTIONS MANUAL.

#### 2.1.1 Types of System I/O Signals (Standard type of controller)

Seven input points for command execution are used to direct program start and other instructions as I/O commands.

The table below lists the types of system I/O signals.

**Types of System I/O Signals (Standard type of controller)**

Fixed by system		
Type	No. of points	Function
System input	4	<i>External Emergency Stop 1, External Emergency Stop 2, Enable Auto, Step Stop (All tasks)</i>
System output	13 (Note)	<i>Auto Mode, Robot Initialized, Robot Running, CPU Normal, Robot Error, Operation Preparation Completed, Battery Warning, Emergency Stop 1, Emergency Stop 2, Deadman SW 1 [Enable SW 1], Deadman SW 2 [Enable SW 2], Pendant Emergency Stop 1, Pendant Emergency Stop 2, Continue Start Permission (selectable by I/O hardware setting) (See Note below.)</i>
Input for command execution	7	<i>Command (3 bits), data area (3 bits), and Strobe Signal</i>
Output for command execution	1	<i>Command Processing Completed</i>
Controlled by user program		
Type	No. of points	Function
User input	8	<i>Inputs to read the external I/O status with an IN command or IO [ ] variable. Used for analysis condition identification, condition satisfaction wait, data input from the external device, etc.</i>
User output	8 (Note)	<i>Outputs to issue a signal to the external device during program execution with SET and RESET commands, etc.</i>
HAND input	8	<i>Inputs to read the external I/O status with an IN command or IO [ ] variable. Used for checking the hand status.</i>
HAND output	8	<i>Outputs to issue signals to the external devices with SET and RESET commands, etc. Used for controlling the hand to open or close.</i>

**Note:** Terminal #53 on CN5 (port 24) is assigned a user output by factory default. It can be assigned the *Continue Start Permission* output signal with the I/O hardware setting.

## 2.1.2 Types of System I/O Signals (Global type of controller)

The global type of the controller concentrates emergency stop related system I/Os on the safety I/O (CN10), so it does not use the Mini I/O (CN5). (Refer to Sections 4.1.3, 4.1.4, 5.1.3, and 5.1.4.)

It issues PROGRAM START commands as I/O commands by using seven command execution inputs.

The table below lists the types of system I/O signals.

**Types of System I/O Signals (Global type of controller)**

Fixed by system		
Type	No. of points	Function
System input	7	<i>External Emergency Stop 1, External Emergency Stop 2, Enable Auto 1, Enable Auto 2, Step Stop (All tasks), Protective Stop 1, Protective Stop 2</i>
System output	12 (Note)	<i>Auto Mode, Robot Initialized, Robot Running, CPU Normal, Robot Error, Operation Preparation Completed, Battery Warning, Pendant Emergency Stop 1, Pendant Emergency Stop 2, Deadman SW 1 [Enable SW 1], Deadman SW 2 [Enable SW 2], Contactor Contact Monitor, Continue Start Permission (selectable by I/O hardware setting) (Note)</i>
Input for command execution	7	Command (3 bits), data area (3 bits), and <i>Strobe Signal</i>
Output for command execution	1	<i>Command Processing Completed</i>
Controlled by user program		
Type	No. of points	Function
User input	8	Inputs to read the external I/O status with an IN command or IO [ ] variable. Used for analysis condition identification, condition satisfaction wait, data input from the external device, etc.
User output	7 (Note)	Outputs to issue a signal to the external device during program execution with SET and RESET commands, etc.
HAND input	8	Inputs to read the external I/O status with an IN command or IO [ ] variable. Used for checking the hand status.
HAND output	8	Outputs to issue signals to the external devices with SET and RESET commands, etc.  Used for controlling the hand to open or close.

**Note:** Terminal #53 on CN5 (port 24) is assigned a user output by factory default. It can be assigned the *Continue Start Permission* output signal with the I/O hardware setting.

## 2.2 Usage of User I/O Signals

User I/O signals are used as I/O type variables. Access the user I/O by writing it to the I/O type variables or reading it.

### 2.2.1 I/O Type Variable Declaration

I/O type variables are classified into I/O type global variables that are available without any declaration, and I/O type local variables that are not available without a declaration.

### 2.2.2 I/O Type Global Variables

I/O type global variables are used to refer to or change user I/O signals bit by bit. Since they are global variables, they can be used without any declaration.

I/O type global variables are expressed in either of the following two ways:

IO [nn] (nn denotes I/O port number) Example: IO [104]

IOnn (nn denotes I/O port number) Example: IO104

### 2.2.3 I/O Type Local Variables

I/O type local variables are used to collectively refer to or change 1-bit, 8-bit, 16-bit or 32-bit user I/O signals starting from a specified terminal number.

I/O type local variables require a declaration, which will be made with a DEFIO command, before they are used. For further information about declarations with a DEFIO command, refer to the PROGRAMMER'S MANUAL (I), Chapter 9, Section 9.7 "DEFIO (Statement) [Conforms to SLIM]."

### 2.2.4 User Input Commands

There are two types of user input commands, IN and WAIT. The IN command substitutes the input result for a variable. The WAIT command waits until the input result meets specified conditions.

- **IN Command**

The IN command inputs a signal from the user input specified by an IO type variable and substitutes it for an arithmetic variable.

For further information about the IN command, refer to the PROGRAMMER'S MANUAL (I), Chapter 13, Section 13.1 "IN."

- **WAIT Command**

The WAIT command suspends the execution of the program until specified conditions are met. If an I/O type variable is used for the conditional statement, this command suspends the execution of the program until the status of the signal from a specified user input is checked and meets the specified conditions. For further information about the WAIT command, refer to the PROGRAMMER'S MANUAL (I), Chapter 12, Section 12.5 "WAIT."

## 2.2.5 User Output Commands

There are three types of user output commands, SET, RESET and OUT. The SET and RESET commands turn ON and OFF all user outputs specified by I/O type variables. The OUT command outputs data to a specified user output.

- **SET Command**

The SET command turns ON all user outputs specified by I/O type variables.

For further information about the SET command, refer to the PROGRAMMER'S MANUAL (I), Chapter 13, Section 13.1 "SET."

- **RESET Command**

The RESET command turns OFF all user outputs specified by I/O type variables.

For further information about the RESET command, refer to the PROGRAMMER'S MANUAL (I), Chapter 13, Section 13.1 "RESET."

- **OUT Command**

The OUT command outputs data to the user output specified by an I/O type variable.

For further information about the OUT command, refer to the PROGRAMMER'S MANUAL (I), Chapter 13, Section 13.1 "OUT."

# Chapter 3 System I/O Signals

## 3.1 Types and Functions of System Output Signals

The table below lists the system output signals.

**Types and Functions of System Output Signals**

Application	Output signal name	Function
Start-up	<i>Robot Initialized</i>	Outputs to the external device that the OPERATION PREPARATION command is executable.
	<i>Auto Mode</i>	Outputs when the robot is in Auto mode.
	<i>Operation Preparation Completed</i>	Outputs when the motor power is turned on and the robot is in External auto mode.
Program execution	<i>Robot Running</i>	Outputs when the robot is in operation (one or more tasks are being executed).
Error/Warning	<i>CPU Normal</i>	Outputs when the CPU of the robot controller is normal.
	<i>Robot Error</i>	Outputs when a servo error, program error, or any other serious error occurs.
	<i>Battery Warning</i>	Outputs when the voltage of the encoder or memory backup battery drops below the specified level.
Continue	<i>Continue Start Permission</i> Note: It is necessary to specify this output signal by I/O hardware setting beforehand.	Outputs when Continue Start is permitted.
Emergency stop circuit (Standard type of controller)	<i>Emergency Stop</i> (dual line)	Outputs when the robot is emergency-stopped.
	<i>Pendant Emergency Stop</i> (dual line)	Outputs the status of the emergency stop button on the teach pendant or mini-pendant.
	<i>Deadman SW [Enable SW]</i> (dual line)	Outputs the status of the deadman switch (enable switch) on the teach pendant or mini-pendant.
Safety circuit (Global type of controller)	<i>Pendant Emergency Stop</i> (dual line)	Outputs the status of the emergency stop button on the teach pendant or mini-pendant.
	<i>Deadman SW [Enable SW]</i> (dual line)	Outputs the status of the deadman switch (enable switch) on the teach pendant or mini-pendant.
	<i>Contactors Contact Monitor</i>	Outputs the status of the auxiliary contact of the motor contactor in the robot controller. This signal comes on when the motor is turned on; it comes off when the motor is turned off.

## 3.2 Usage of System Output Signals

The usage of each system output signal is described below:

### 3.2.1 *Robot Initialized* (output)

#### (1) Function

This signal tells the external device that the OPERATION PREPARATION command is ready to execute.

#### (2) Terminal number

#48 on connector CN5

#### (3) Usage

With this signal and *Auto Mode* output signal being ON, the OPERATION PREPARATION command must be executed.

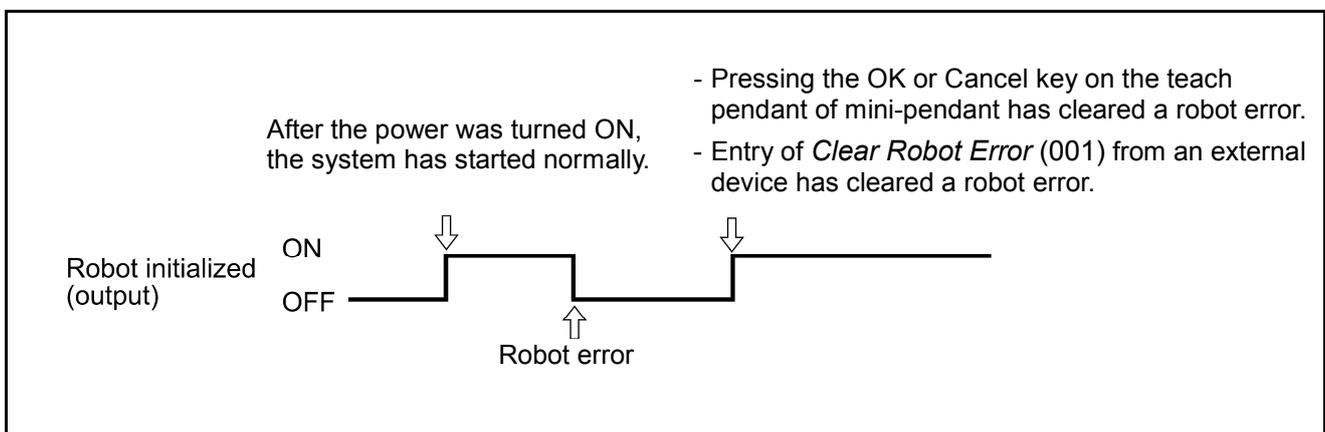
#### (4) ON conditions

This signal will be turned ON when:

- (a) Turning the controller power on normally starts the system program in it and the OPERATION PREPARATION command becomes ready to execute.
- (b) A robot error is cleared by the OK or Cancel key on the teach pendant or mini-pendant or by *Clear Robot Error* (001) after this signal has been turned OFF.

#### (5) OFF condition

This signal will be turned OFF when a robot error occurs.



***Robot Initialized Output***

### 3.2.2 *Auto Mode (output)*

#### (1) Function

This signal tells the external device that the robot is in Auto mode.

#### (2) Terminal number

#49 on connector CN5

#### (3) Usage

With this signal being ON, the OPERATION PREPARATION or PROGRAM START command must be executed.

#### (4) ON condition

This signal will be turned ON when the robot controller enters Auto mode by turning the mode selector switch on the teach pendant or mini-pendant to AUTO with the *Enable Auto* input signal being ON.

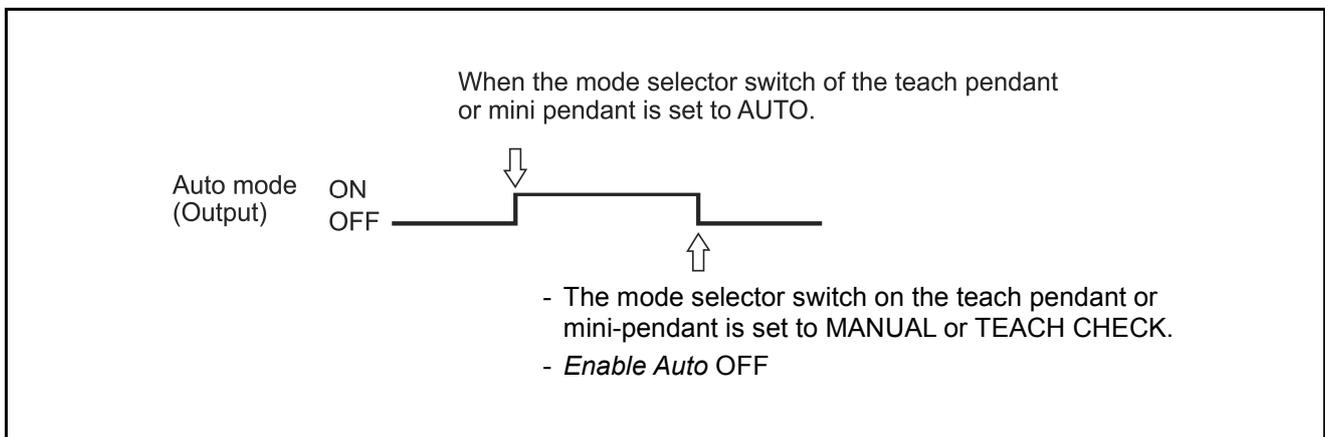
#### (5) OFF conditions

This signal will be turned OFF under the following conditions.

- (a) The operation mode is switched to the Manual or Teach check mode by using the teach pendant or mini-pendant.
- (b) The *Enable Auto* input signal is OFF.

**Note:** The *Enable Auto* input signal will not be turned OFF in the pendantless state described in the OPTIONS MANUAL, Chapter 1, Section 1.3.3.

**Caution:** The *Auto Mode* output signal will not be turned OFF with INSTANTANEOUS STOP, STEP STOP or CYCLE STOP commands.



**Auto Mode Output**

### 3.2.3 *Operation Preparation Completed (output)*

#### (1) **Function**

This signal tells that the motor power is ON and the robot is in External auto mode.

#### (2) **Terminal number**

#50 on connector CN5

#### (3) **Usage**

With this signal being ON, the robot must be in External auto mode and the motor power must be ON to run the robot from the external device.

#### (4) **ON conditions**

The signal will be turned ON under the External auto mode and motor ON.

##### **Operation to switch to External auto mode**

- (a) When the External mode is selected on the teach pendant or mini-pendant.
- (b) When the External mode is turned ON by the OPERATION PREPARATION command from the external device.

##### **Operation to switch the motor ON**

- (a) When the motor key is pushed on the teach pendant or mini-pendant.
- (b) When the motor is turned ON by the OPERATION PREPARATION command from the external device.

#### (5) **OFF conditions**

The signal will be turned OFF under the following conditions;

- Out of the External auto mode
- Under the motor OFF.

##### **Operation to exit External auto mode**

- (a) When internal mode is selected on the teach pendant or mini-pendant.
- (b) When the mode selector switch of the teach pendant or mini-pendant is set to MANUAL or TEACH CHECK in External mode.
- (c) When an *Emergency Stop* input signal is turned ON.
- (d) When a *Robot Error* output signal is turned ON. (Except level 2 error)
- (e) When an *Enable Auto* input signal is turned OFF.
- (f) When a *Protective Stop* input signal is turned OFF. (Only for the global type of controller)

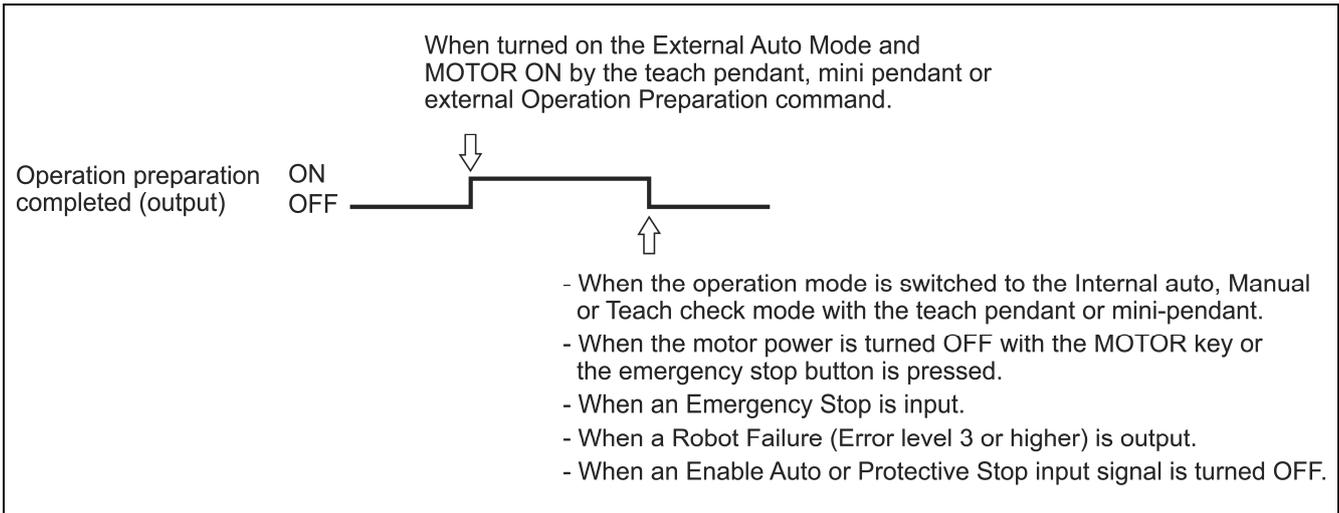
##### **Operation to switch the motor OFF**

- (a) When the motor power is turned off with the MOTOR key or the emergency stop button is pressed on the teach pendant or mini-pendant.
- (b) When a *Robot Error* output signal is turned ON.

**Note:** If any of ERROR 6071 to 607B, 6671 to 667B and 607F occurs in the Manual mode or Teach check mode, the motor power will not be turned OFF.

#### (6) **Note for software version 2.00 or later**

To get the *Operation Preparation Completed* signal status using an SYSSTATE command, AND Bit 2 "*Servo ON*" and Bit 5 "*External Mode*" to use the result of the logical operation.



**Operation Preparation Completed Output**

### 3.2.4 Robot Running (output)

#### (1) Function

This signal tells the external device that the robot is in operation (that is, one or more tasks are being executed).

#### (2) Terminal number

#46 on connector CN5

#### (3) Usage

This signal is used to light the robot operating indicator lamp of an external operating panel.

Performing the "Stop all programs" operation\* turns this signal OFF, allowing you to check that all programs are stopped.

#### (4) ON conditions

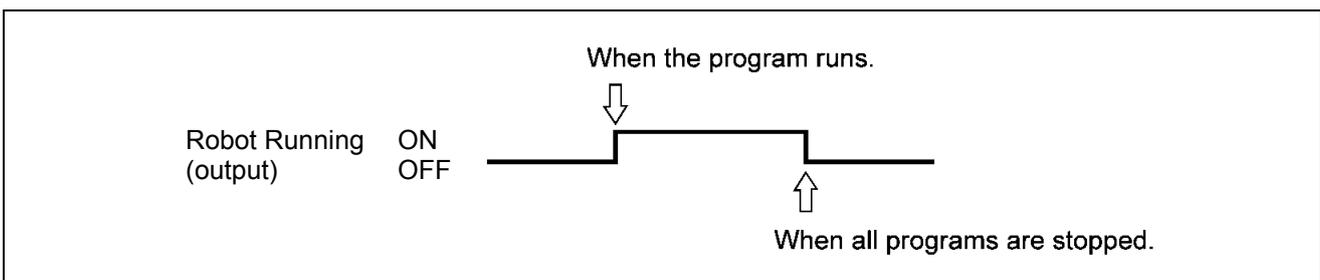
This signal will be turned ON during execution of the program and also in the WAIT STATE with a conditional branch or timer command.

#### (5) OFF conditions

This signal will be turned OFF with the "Stop all programs" operation\*.

#### \* "Stop all programs" operation

This operation includes the following: Depression of the emergency stop button and STOP key and input of Step Stop (All task) and External Emergency Stop signals.



**Robot Running Output**

### 3.2.5 CPU Normal (output)

**(1) Function**

This signal tells the external device that the CPU of the robot controller is normal.

**(2) Terminal number**

#45 on connector CN5

**(3) Usage**

- (a) This signal is used to light the robot controller error indicator lamp on the external operating panel.
- (b) If this signal is turned OFF, perform the error recovery with the PLC.

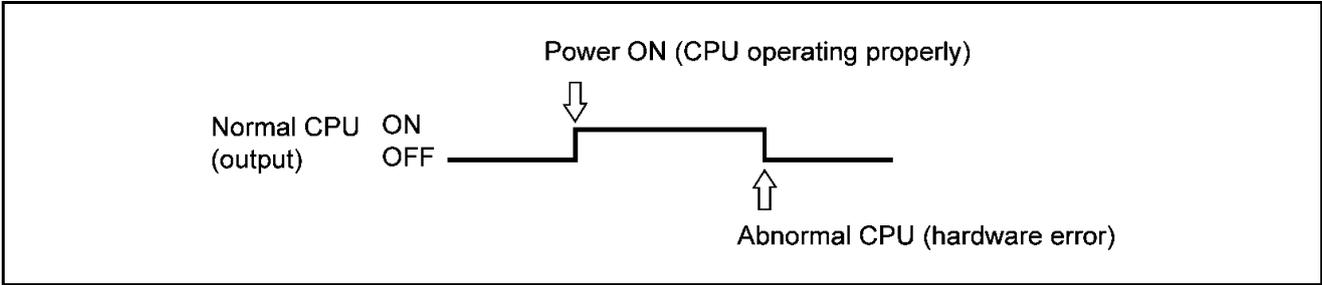
**(4) ON conditions**

This signal will be turned ON by the hardware when the CPU of the robot controller operates normally.

**(5) OFF conditions**

This signal will be turned OFF by the hardware when the CPU does not operate normally.

**Caution: The OFF state of this signal indicates that the robot controller internal arithmetic circuit may be damaged. Therefore, ROBOT ERROR, ERROR NUMBER, and other outputs may not be correct.**



**CPU Normal Output**

### 3.2.6 Robot Error (output)

#### (1) Function

This signal tells the external device that a servo error, program error, or any other serious error has occurred in the robot.

#### (2) Terminal number

#47 on connector CN5

#### (3) Usage

- (a) This signal is used to light the robot error indicator lamp on the external operating panel.
- (b) If this signal is turned ON, perform the error recovery with the PLC.

#### (4) ON conditions

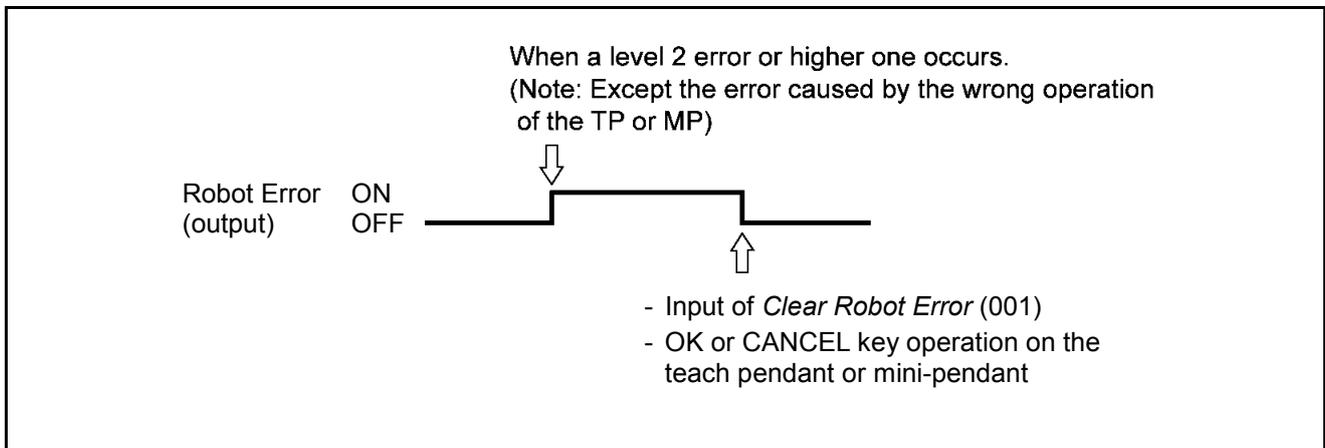
When a level 2 error or higher one occurs.

**Note:** Except the error caused by the wrong operation of the teach pendant or mini-pendant.

#### (5) OFF conditions

As shown below, the signal will be turned OFF under the following conditions.

- (a) When a *Clear Robot Error* (001) signal is inputted and the existing error is cleared.
- (b) When the existing error is cleared by operating the **OK** or **Cancel** key on the teach pendant or the mini-pendant.



**Robot Error Output**

### 3.2.7 Battery Warning (output)

**(1) Function**

This signal tells the external device that the voltage of the encoder or memory backup battery has dropped below the specified level.

**(2) Terminal number**

#51 on connector CN5

**(3) Usage**

This signal is used to check the timing for battery replacement (to check when the battery voltage drops below the specified lower level).

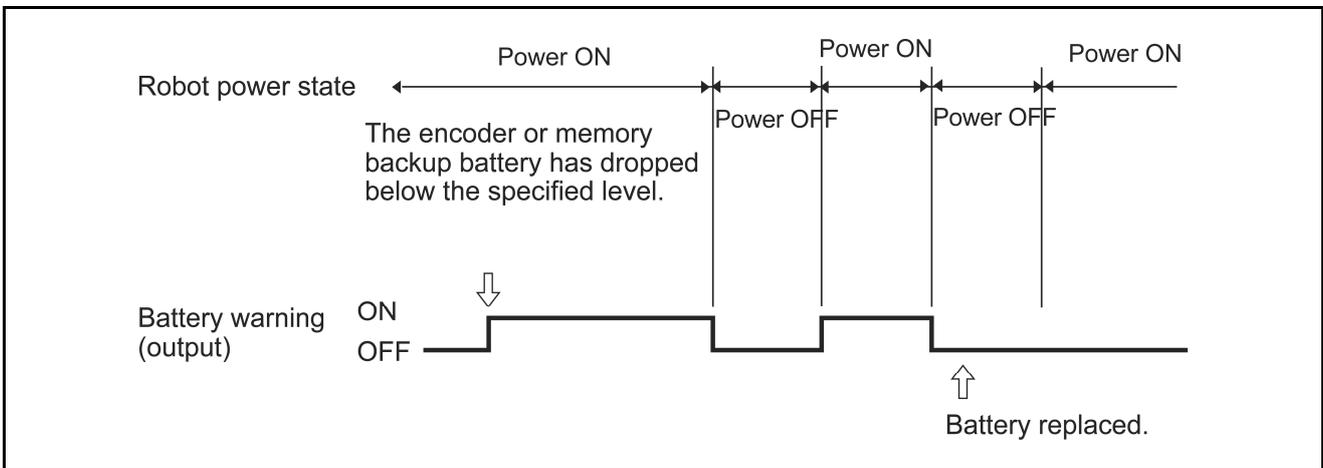
**(4) Output condition**

This signal will be issued when the voltage of the encoder or memory backup battery has dropped below the specified level.

**Note: The teach pendant or mini-pendant shows any of ERROR64A1 to 64A6 when the encoder backup battery voltage is low. Meanwhile, the teach pendant shows ERROR6103 when the memory backup battery voltage is low.**

**(5) OFF condition**

The signal will be turned OFF when the power is turned ON after the dead battery was replaced.



**Battery Warning Output**

### 3.2.8 *Continue Start Permission* (output): Selectable by I/O hardware setting

Terminal #53 on CN5 (port 24) is assigned a user output by factory default. It can be assigned the *Continue Start Permission* output signal with the I/O hardware setting.

**When the "*Continue Start Permission*" is set:**

**(1) Function**

The controller will output this signal when Continue Start is permitted.

**(2) Terminal number**

#53 on connector CN5

**(3) Usage**

Use this signal when you want to know whether Continue Start is permitted.

**(4) ON condition**

This signal comes on when Continue Start is permitted. For details, refer to the SETTING-UP MANUAL, Chapter 3, Section 3.4.5 "Continue Function."

**(5) OFF condition**

This signal goes off by carrying out the "Task Status Change Operation."

### 3.2.9 Emergency Stop Circuit Contact Outputs (Standard type of controller)

#### 3.2.9.1 Emergency Stop (output) (Standard type of controller)

##### (1) Function

This signal outputs the emergency stop status (dual line).

##### (2) Terminal number

Signal name	Terminal number
<i>Emergency Stop 1</i>	#6 and #40 on CN5
<i>Emergency Stop 2</i>	#7 and #41 on CN5

##### (3) Usage

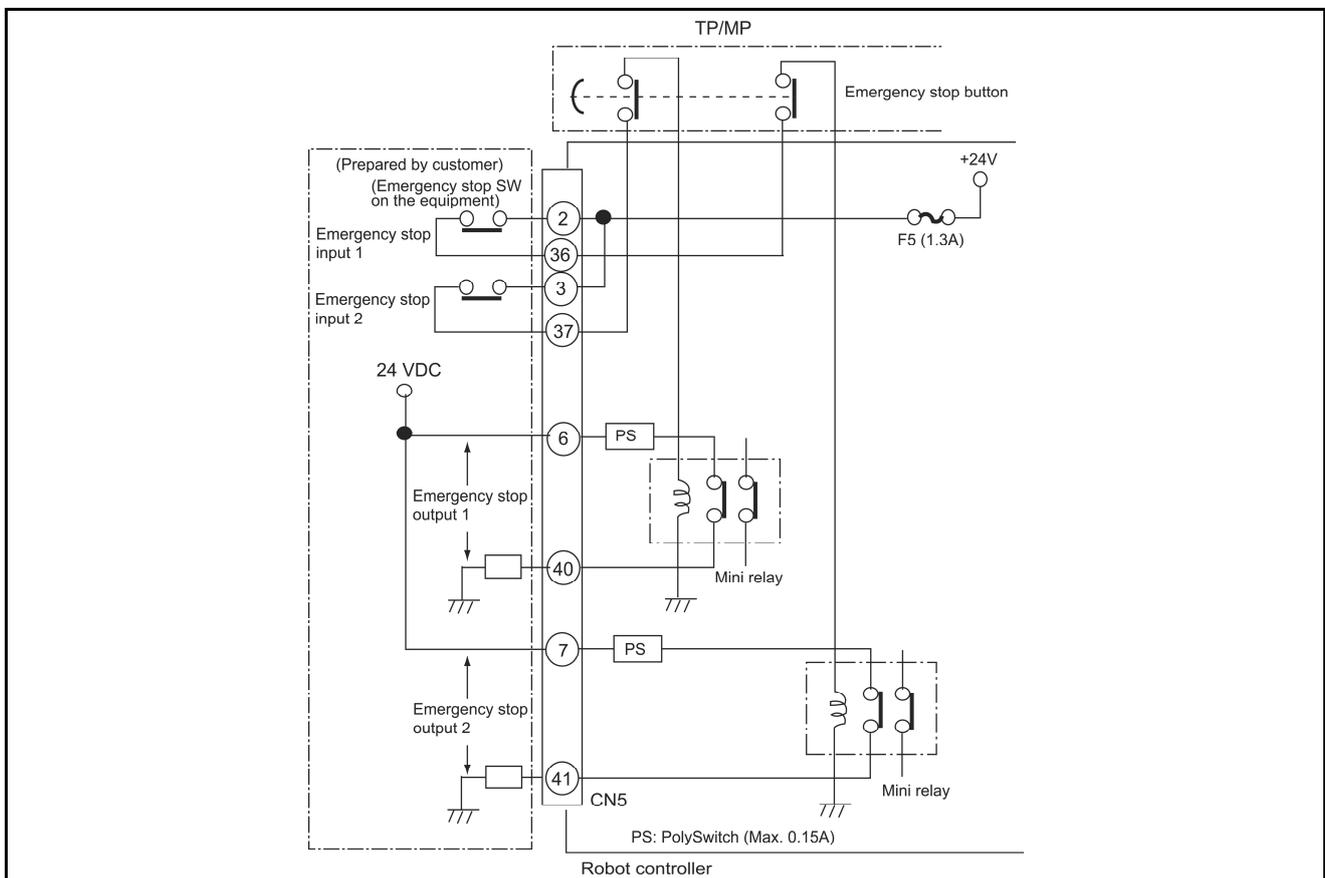
This signal is used to confirm that an *Emergency Stop* input has been entered. For details about the emergency stop circuits, refer to Sections 4.2.4 and 5.2.4.

This signal can emergency-stop the external device when the emergency stop button on the teach pendant or mini-pendant is pressed. Turning the controller power OFF is functionally equivalent to the *Emergency Stop* output.

Note: Do not enter this signal into the controller's *External Emergency Stop* input circuit. Doing so makes it impossible to reset the emergency stop state.

##### (4) Output conditions

Turning an *External Emergency Stop* input signal OFF or pressing the emergency stop button on the teach pendant or mini-pendant turns OFF the *Emergency Stop* output signal (mini relay contact in the controller).



**Emergency Stop Output (Standard type of controller)**

### 3.2.9.2 *Pendant Emergency Stop Output (Standard type of controller)*

**(1) Function**

This signal outputs the status of the emergency stop button on the teach pendant or mini-pendant (dual line).

**(2) Terminal number**

Signal name	Terminal number
<i>Pendant Emergency Stop 1</i>	#28 and #62 on CN5
<i>Pendant Emergency Stop 2</i>	#29 and #63 on CN5

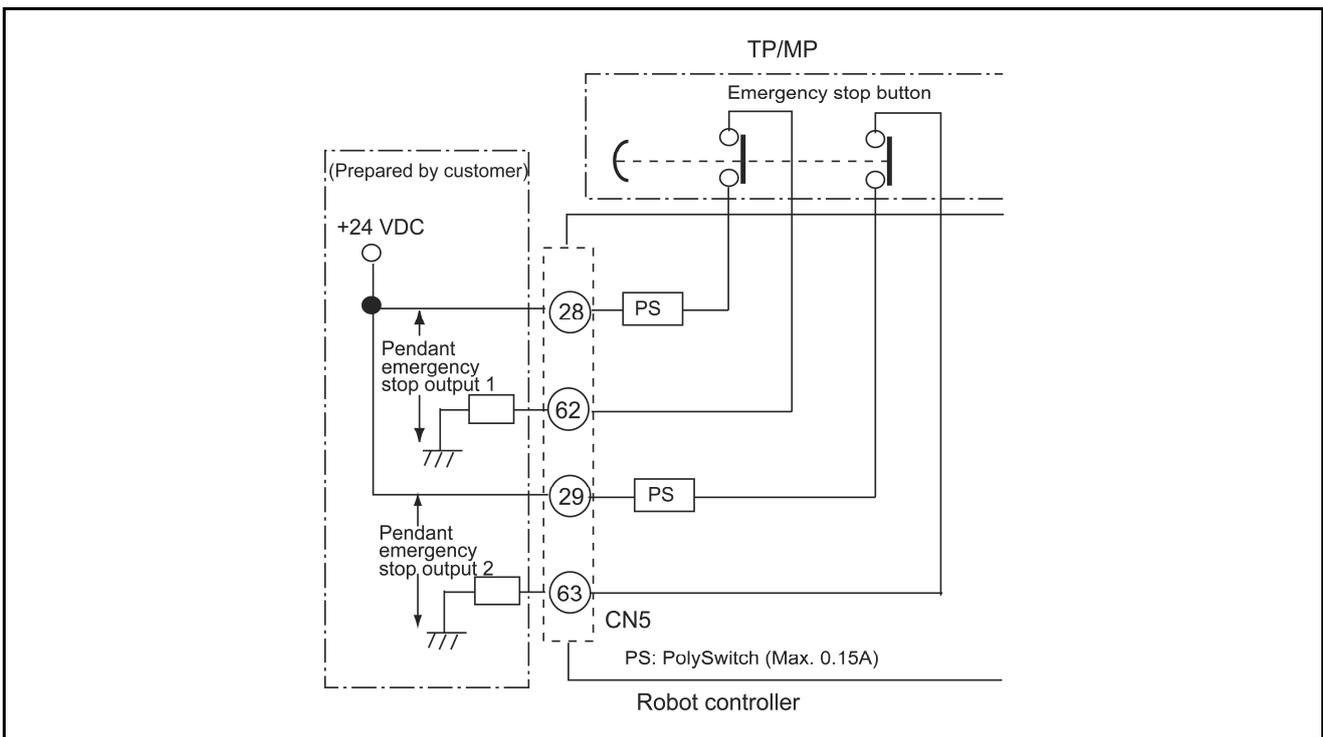
**(3) Usage**

This signal is used to emergency-stop the external device when the emergency stop button on the teach pendant or mini-pendant is pressed. This signal is issued independently of the controller ON/OFF state.

For details about the emergency stop circuits, refer to Sections 4.2.4 and 5.2.4.

**(4) Output conditions (Normal close type, b contact)**

Two contacts of the emergency stop button (4b) on each of the teach pendant or mini-pendant are connected each other. Pressing the emergency stop button turns the *Pendant Emergency Stop* output signal (contacts) OFF.



***Pendant Emergency Stop Output (Standard type of controller)***

### 3.2.9.3 Deadman SW [Enable SW] (output) (Standard type of controller)

#### (1) Function

This signal outputs the status of the deadman switch (enable switch) on the teach pendant or mini-pendant (dual line).

#### (2) Terminal number

Signal name	Terminal number
Deadman SW 1 [Enable SW 1]	#8 and #42 on CN5
Deadman SW 2 [Enable SW 2]	#9 and #43 on CN5

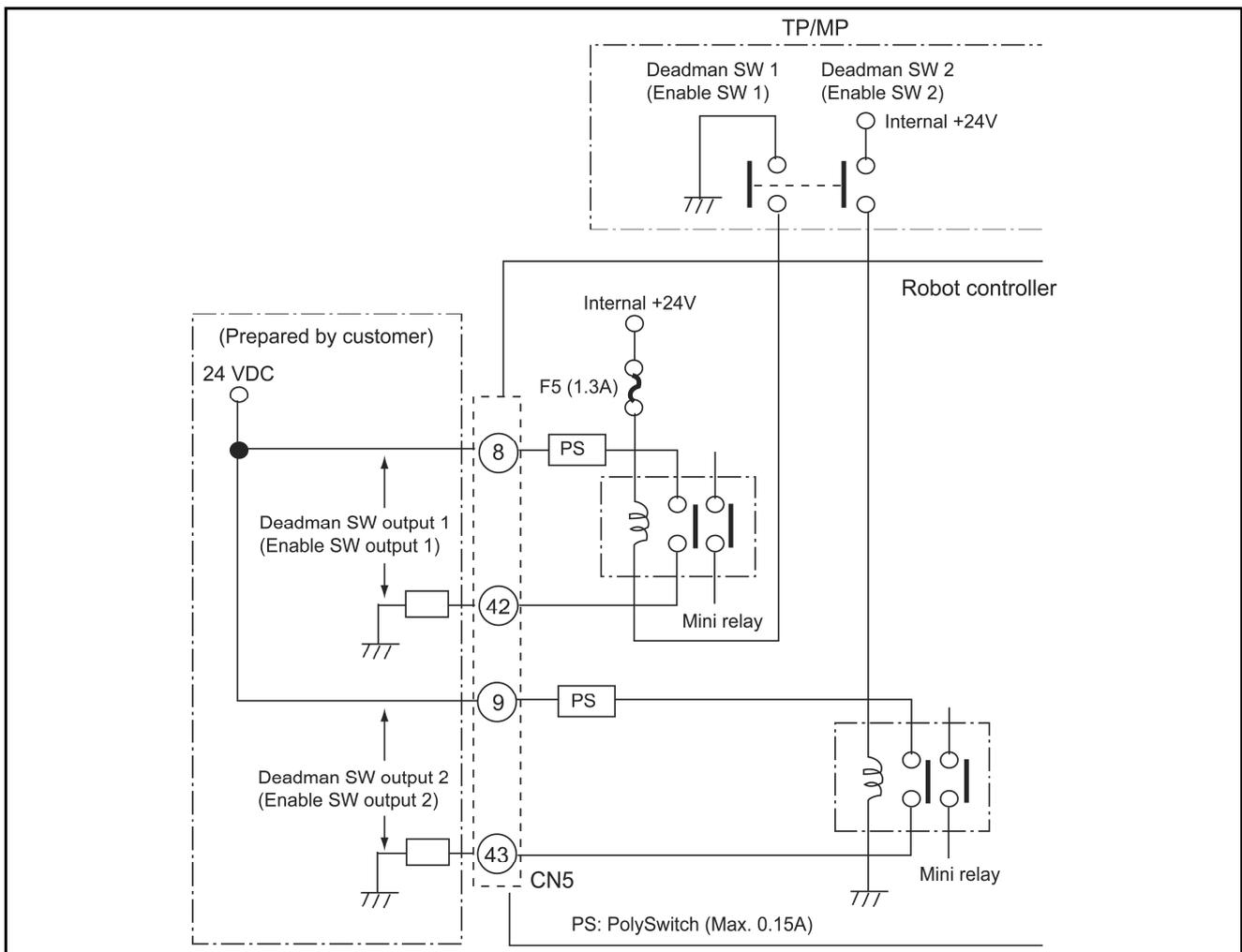
#### (3) Usage

This signal is used to display the operation status of the deadman switch or interlock the deadman switch with other device (e.g., stopping or running the conveyor).

For details about the emergency stop circuits, refer to Sections 4.2.4 and 5.2.4.

#### (4) Output conditions

Holding down the deadman switch closes the mini relay contact in the controller, turning ON the *Deadman SW* output signal (Contact output: close).



**Deadman SW Output (Enable SW Output) (Standard type of controller)**

### 3.2.10 Safety Circuit Contact Outputs (Global type of controller)

#### 3.2.10.1 Pendant Emergency Stop (output) (Global type of controller)

**(1) Function**

This signal outputs the status of the emergency stop button on the teach pendant or mini-pendant (dual line).

**(2) Terminal number**

Signal name	Terminal number
<i>Pendant Emergency Stop 1</i>	#13 and #31 on CN10
<i>Pendant Emergency Stop 2</i>	#14 and #32 on CN10

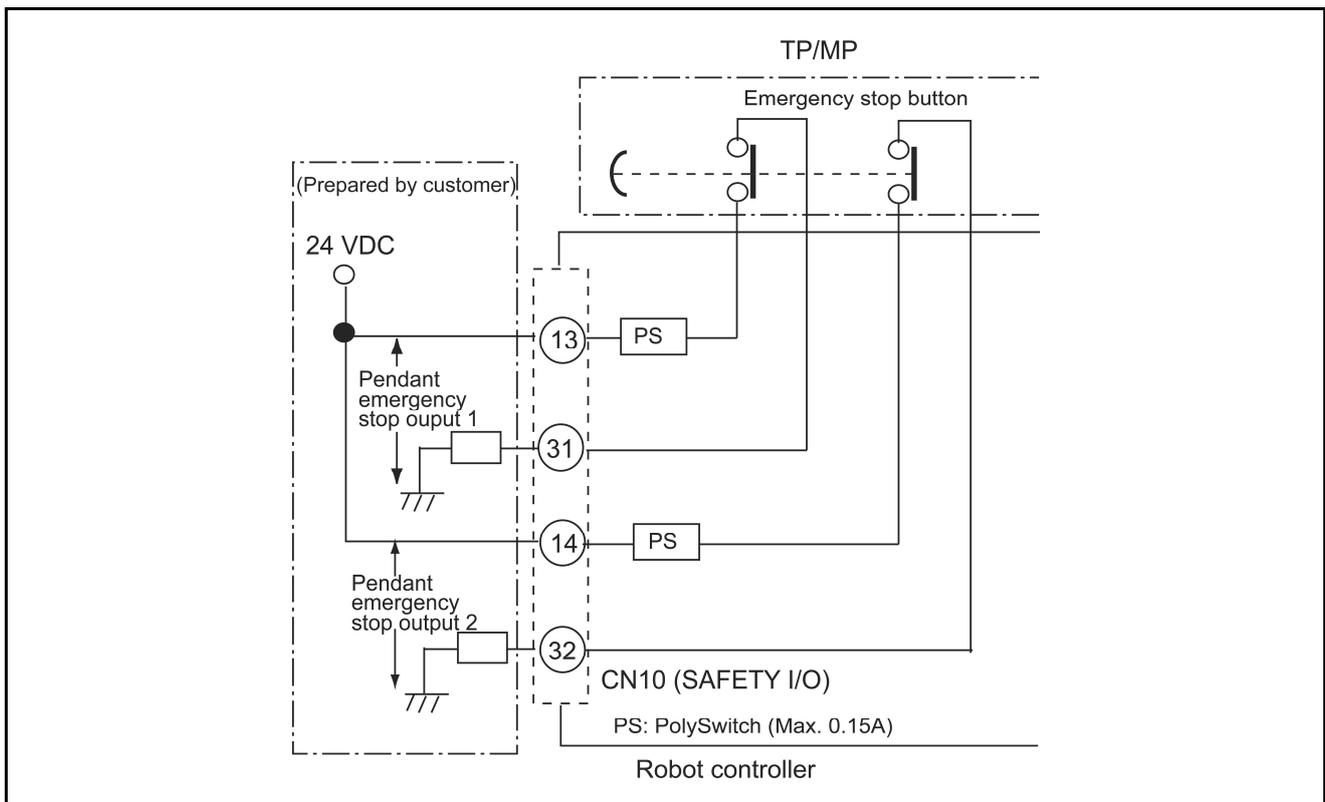
**(3) Usage**

This signal is used to emergency-stop the external device when the emergency stop button on the teach pendant or mini-pendant is pressed. This signal is issued independently of the controller ON/OFF state.

For details about the safety circuits, refer to Sections 4.2.5 and 5.2.5.

**(4) Output conditions (Normal close type, b contact)**

Two contacts of the emergency stop button (4b) on each of the teach pendant or mini-pendant are connected each other. Pressing the emergency stop button turns the *Pendant Emergency Stop* output signal (contacts) OFF.



**Pendant Emergency Stop Output (Global type of controller)**

### 3.2.10.2 Deadman SW [Enable SW] (output) (Global type of controller)

#### (1) Function

This signal outputs the status of the deadman switch (enable switch) on the teach pendant or mini-pendant (dual line).

#### (2) Terminal number

Signal name	Terminal number
Deadman SW 1 [Enable SW 1]	#15 and #33 on CN10
Deadman SW 2 [Enable SW 2]	#16 and #34 on CN10

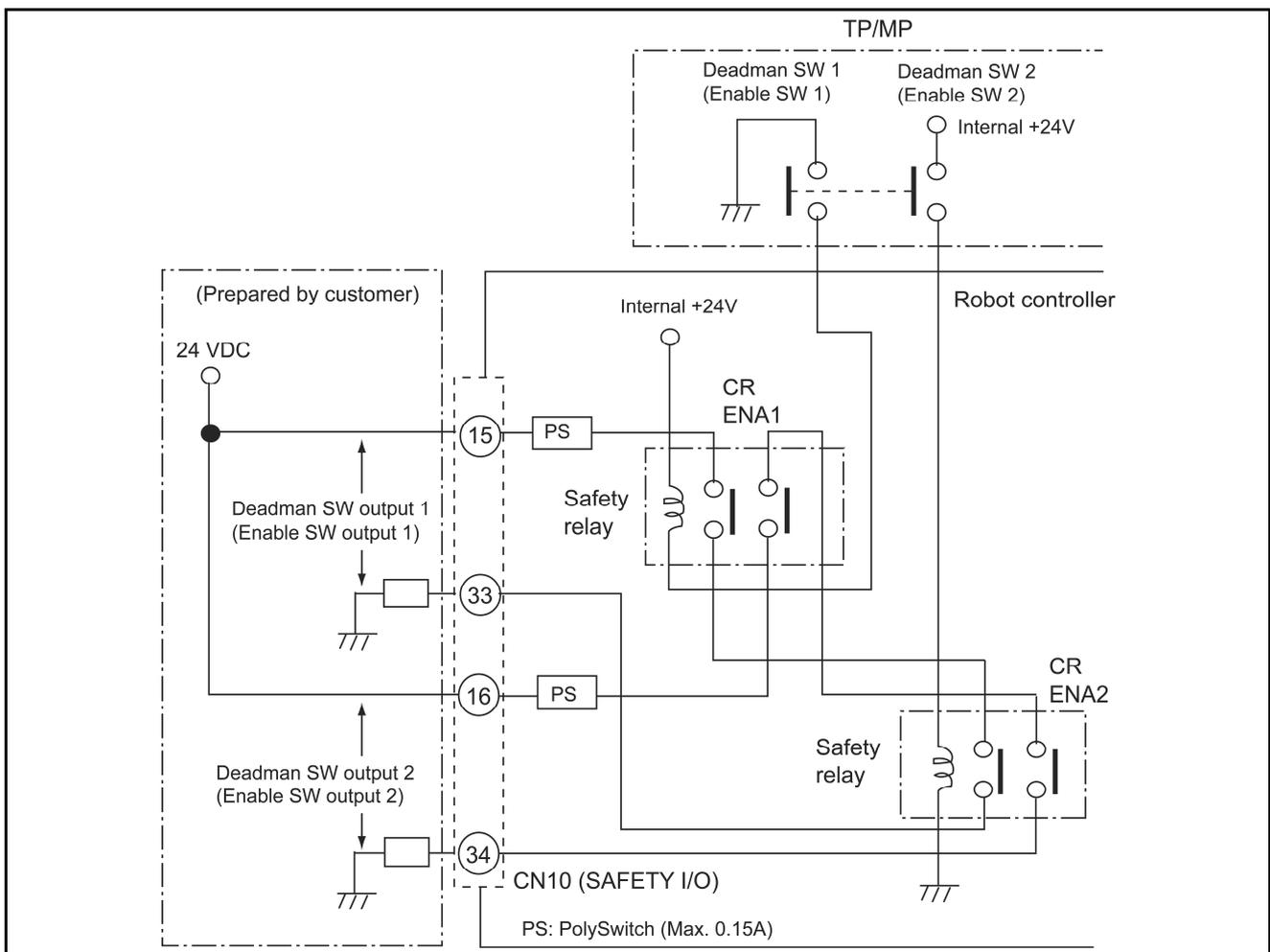
#### (3) Usage

This signal is used to display the operation status of the deadman switch or interlock the deadman switch with other device (e.g., stopping or running the conveyor).

For details about the safety circuits, refer to Sections 4.2.5 and 5.2.5.

#### (4) Output conditions

Holding down the deadman switch closes the safety relay contact in the controller, turning ON the *Deadman SW* output signal (Contact output: close).



**Deadman SW Output (Enable SW Output) (Global type of controller)**

### 3.2.10.3 Contactor Contact Monitor (output) (Global type of controller)

#### (1) Function

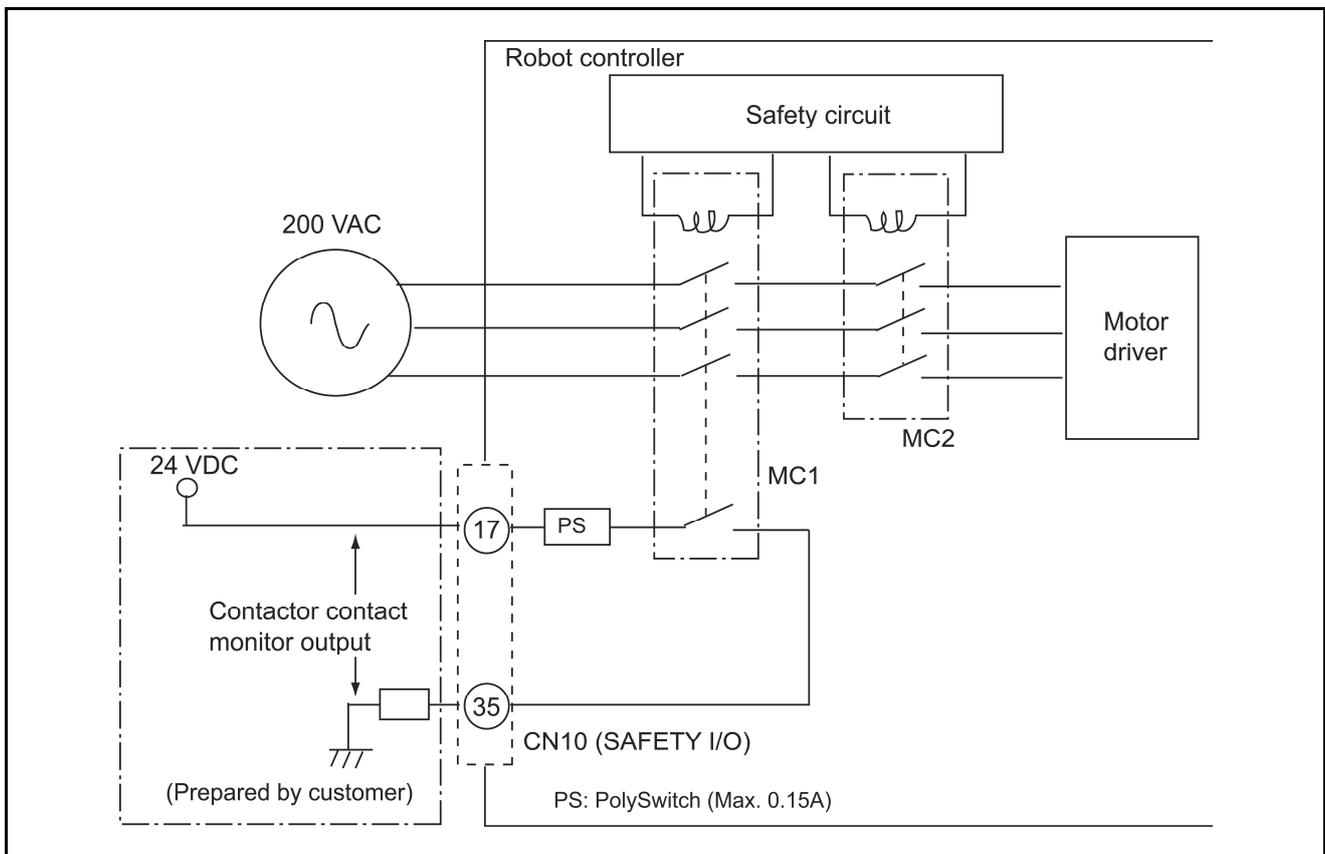
This signal outputs the status of the auxiliary contact of the motor contactor in the robot controller. The contact output signal comes on when the motor is turned on; it comes off when the motor is turned off.

#### (2) Terminal number

#17 and #35 on CN10

#### (3) Usage

This signal is used to confirm the ON/OFF state of the motor on the monitor.  
For details about the safety circuits, refer to Sections 4.2.5 and 5.2.5.



**Contactor Contact Monitor Output (Global type of controller)**

### 3.3 Types and Functions of System Input Signals

The table below lists the system input signals.

**Types and Functions of System Input Signals**

Use to:	Applicable controller type	Signal name	Function
Stop (Note 1)	Any type	<i>Step Stop (All tasks)</i>	Releasing the signal step-stops all programs being executed.
		<i>Instantaneous Stop (All tasks)</i> (Note 2)	Releasing this signal instantaneously stops all programs being executed.
	Standard type	<i>External Emergency Stop (dual line)</i>	Releasing this signal stops the robot in an emergency.
	Global type	<i>External Emergency Stop (dual line)</i>	Releasing this signal stops the robot in an emergency.
Select mode	Standard type	<i>Enable Auto</i>	Short-circuiting this signal enables switching to Auto mode.
	Global type	<i>Enable Auto (dual line)</i>	Short-circuiting this signal enables switching to Auto mode.
		<i>Protective Stop (dual line)</i>	The <i>Enable Auto</i> and <i>Protective Stop</i> input signal circuits are connected in series in the controller, so two types of inputs are available as an automatic operation permission signal.
Prepare for operation Start program Clear error	Any type	<i>Strobe Signal</i>	This signal initiates the processing of the I/O commands set in the data and command areas.
		Data areas (3 bits)	These areas are used to specify I/O commands that enable the following: - Start/stop each task program. - Prepare for operation - Clear robot errors.  Note: For details, refer to Section 3.5.3 "I/O Commands Details"
		Command areas (3 bits)	

(Note 1) In External automatic operation, be careful with the following:

- The moment each of these signals is released, the corresponding stop processing starts.
- As long as it is not necessary to stop the robot, these stop signals should be short-circuited.

(Note 2)

The *Instantaneous Stop* signal becomes available only when an I/O extension board is used and the allocation mode is changed to Standard or Compatible mode. Like other stop signals, this signal should be short-circuited as long as it is not necessary to stop the robot.

## 3.4 Usage of System Input Signals

The usage of each system input signal is described below.

### 3.4.1 *Step Stop (All tasks) (input)*

#### (1) Function

This signal allows the external device to step-stop all tasks being executed, except supervisory tasks.

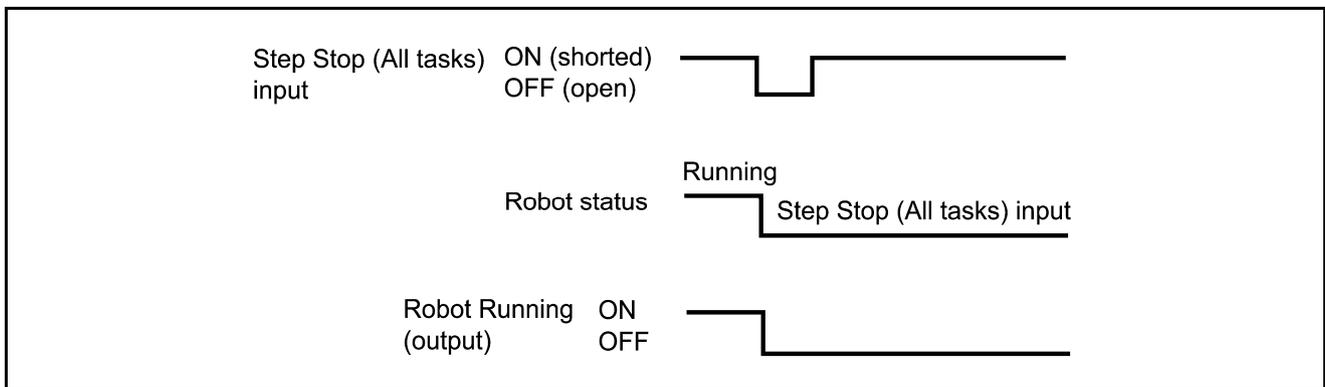
#### (2) Terminal

#11 on connector CN5

#### (3) Input conditions and operation

(a) Turning (opening) this signal OFF stops all tasks upon completion of the on-going step and turns OFF the *Robot Running* output signal.

(b) For resuming the program after a step stop, see Chapter 3, Section 3.5.3.2 "OPERATION PREPARATION (000)."



***Step Stop (All tasks) Input***

### 3.4.2 External Emergency Stop (input)

#### (1) Function

This signal allows the external device to emergency-stop the robot.

#### (2) Terminal number

Controller type	Signal name	Terminal number
Standard type	<i>External Emergency Stop 1</i>	#2 and #36 on CN5
	<i>External Emergency Stop 2</i>	#3 and #37 on CN5
Global type*	<i>External Emergency Stop 1</i>	#1 and #19 on CN10
	<i>External Emergency Stop 2</i>	#2 and #20 on CN10

\* The global type of controller must use two separate contacts to control two *External Emergency Stop* input signals. Two circuits connected in parallel using a single contact or an always-short-circuited circuit will be interpreted as an external circuit failure so that the circuitry will not operate.

#### (3) Input conditions and operation

- (a) Turning (opening) this signal OFF emergency-stops the robot.
  - 1) The OFF signal turns the motor power OFF irrespective of whether the robot is in Manual, Internal auto, or External auto mode.
  - 2) During execution of programs (*Robot Running* signal ON), the OFF signal turns the motor power OFF and places the robot in internal mode after decelerating the robot to a stop. It also resets programs so as not to execute the subsequent and the following steps.
  - 3) When the program is stopped in Manual or Auto mode, the OFF signal produces nothing except it turns the power to the motor OFF.
- (b) This signal must be turned ON (shorted) in order to turn the motor power ON and run the robot in Manual or Auto mode.
- (c) Opening the *External Emergency Stop* input is functionally equivalent to pressing the emergency stop button on the teach pendant or mini-pendant.

#### (4) Input timing

This input signal will be processed prior to all commands and input signals.

Notes
<p>(1) The different status between two emergency stop circuits, if kept for at least approx. one second, will be interpreted as an occurrence of trouble, triggering an error "279E: Inconsistent robot stop input" and shutting down the motor power.</p> <p>(2) The global type of controller should control two external emergency stop inputs with separate contacts. Two circuits connected in parallel with a single contact or either one circuit always short-circuited will be interpreted as an external circuit error, producing no circuit operation.</p>

### 3.4.3 *Enable Auto* (input) (Standard type of controller)

#### (1) Function

- (a) Turning this signal ON (shorting) enables switching to Auto mode.
- (b) Turning this signal OFF (opening) enables switching to Manual or Teach check mode.

#### (2) Terminal number

#1 and #35 on connector CN5

#### (3) Usage

This signal is used to connect the Auto/Teaching selector switch of an external operating panel.

#### (4) Input conditions and operation

- (a) As shown below, the selectable operation mode depends on whether this input is shorted or open.
- (b) If the input becomes open during automatic operation, the mode will be switched to Manual mode and ERROR21FC will be displayed.
- (c) If manual operation or a teach check is conducted with this input shorted, ERROR21F2 will be displayed.
- (d) With this signal being opened, turning the mode selector switch on the teach pendant or mini-pendant from the MANUAL or TEACH CHECK to AUTO position triggers ERROR21F3.  
Since this state is shown as × in the table below, this error will remain displayed until the robot exits this state.
- (e) Although ERROR21FD or ERROR21FC will be displayed when the state is changed from ○ to Δ or ×, they will not be displayed when the state is changed from Δ or × to ○.
- (f) Turning this signal OFF (open) in External mode switches to the internal mode and turns the *Operation Preparation Completed* output signal OFF.

**Relationship Between *Enable Auto* Input and Selectable Mode**

Operation mode	Application	<i>Enable Auto</i>	
		ON (shorted)	OFF (open)
Manual mode	Manual operation with the teach pendant or mini-pendant.	Δ	○
Teach check mode	Program check with the teach pendant or mini-pendant.	Δ	○
Internal auto mode	Automatic operation with the teach pendant or mini-pendant.	○	×
External auto mode	Automatic operation with the external device.	○	×
<p><b>Note:</b> ○ = Mode selectable      × = Mode not selectable            Δ = Mode selectable but manual operation program not executable</p>			
<p><b>Caution:</b> In the pendantless state, auto mode is valid even if the <i>Enable Auto</i> input is open. (The External mode cannot be switched and the program cannot begin execution.)</p> <p>Perform the following when operating the robot in the pendantless state:</p> <ul style="list-style-type: none"> <li>(a) Set the robot so that it will not start to operate when the <i>Enable Auto</i> input is open.</li> <li>(b) <i>Enable Auto</i> input open state and <i>Auto Mode</i> output (See Section 3.2.2 "<i>Auto Mode</i> (output).")</li> </ul> <p>Set the equipment to make an emergency stop in an AND state.</p>			

### 3.4.4 *Enable Auto* (input) (Global type of controller)

#### (1) Function

(a) Turning this signal ON (shorting) enables switching to Auto mode. (Dual line)

Note: The *Enable Auto* and *Protective Stop* input signal circuits are connected in series in the controller and those signals are used as an automatic operation permission signal when turned ON (closed).

(b) Turning this signal OFF (opening) enables switching to Manual or Teach check mode.

#### (2) Terminal number

Signal name	Terminal number
<i>Enable Auto</i> input 1	#7 and #25 on CN10
<i>Enable Auto</i> input 2	#8 and #26 on CN10

Note: For the circuit configuration, refer to Sections 4.2.5 and 5.2.5. Two *Enable Auto* input signal circuits must be controlled with two separate contacts each. Two circuits connected in parallel using a single contact or an always-shortened circuit will be interpreted as an external circuit error so that the circuitry will not operate.

#### (3) Usage

This signal is used to connect the AUTO/TEACHING selector switch of an external operating panel.

#### (4) Input conditions and operation (with *Protective Stop* input signal ON)

(a) As shown below, the selectable operation mode depends on whether this input is shorted or open.

(b) Turning this signal OFF (open) during automatic operation turns the motor power OFF (Continue stop) and displays ERROR21FC.

(c) If manual operation or a teach check is conducted with this input shorted, ERROR21F2 will be displayed.

(d) With this signal being opened, turning the mode selector switch on the teach pendant or mini-pendant from the MANUAL or TEACH CHECK to AUTO position triggers ERROR21F3.

Since this state is shown as × in the table below, this error will remain displayed until the robot exits this state.

(e) Although ERROR21FD or ERROR21FC will be displayed when the state is changed from ○ to Δ or ×, they will not be displayed when the state is changed from Δ or × to ○.

(f) Turning this signal OFF (open) in External mode turns the motor and the *Operation Preparation Completed* output signal OFF.

**Relationship Between *Enable Auto* Input and Selectable Mode**  
(With *Protective Stop* input signal ON)

Operation mode	Application	<i>Enable Auto</i>	
		ON (shorted)	OFF (open)
Manual mode	Manual operation with the teach pendant or mini-pendant.	Δ	○
Teach check mode	Program check with the teach pendant or mini-pendant.	Δ	○
Internal auto mode	Automatic operation with the teach pendant or mini-pendant.	○	×
External auto mode	Automatic operation with the external device.	○	×
<b>Note:</b> ○ = Mode selectable      × = Mode not selectable Δ = Mode selectable but manual operation program not executable			

**Caution:** In the pendantless state, Auto mode is valid even if the *Enable Auto* input is open. (The External mode cannot be switched and the program cannot begin execution.)

Perform the following when operating the robot in the pendantless state:

- (a) Set the robot so that it will not start to operate when the *Enable Auto* input is open.
- (b) *Enable Auto* input open state and *Auto Mode* output (See Section 3.2.2 "Auto Mode (output).")

Set the equipment to make an emergency stop in an AND state.

### 3.4.5 *Protective Stop (input): Global type of controller*

#### (1) Function

Opening this input signal circuit in Auto mode allows the external device to continue-stop the robot. (dual line)

The stop category is category 1. (See IEC60204-1 for details of stop category)

Note: The *Enable Auto* and *Protective Stop* input signal circuits are connected in series in the controller and those signals are used as an automatic operation permission signal when turned ON (closed).

#### (2) Terminal number

Signal name	Terminal number
<i>Protective Stop</i> input 1	#5 and #23 on CN10
<i>Protective Stop</i> input 2	#6 and #24 on CN10

#### (3) Usage

This signal is used for a safety door switch and other safety devices.

#### (4) Input conditions and operation (with *Enable Auto* input signal ON)

Note: The *Enable Auto* and *Protective Stop* input signal circuits are connected in series in the controller and have the same function. (See Section 3.4.4.)

- (a) Turning this signal OFF (open) in Auto mode turns the motor power OFF and continue-stops the robot.
- (b) Turning this signal OFF (open) in Manual mode turns the motor power OFF.

Note: For the circuit configuration, refer to Sections 4.2.5 and 5.2.5. Two *Protective Stop* input signal circuits must be controlled with two separate contacts each. Two circuits connected in parallel using a single contact or an always-short-circuited circuit will be interpreted as an external circuit error so that the circuitry will not operate.

#### (5) Input timing

In Auto mode, this signal will be processed prior to other input signals and all commands.

Note: Switching the *Protective Stop* and *Enable Auto* input signals from open to close does not require temporal conditions, but requires any action to switch.

## 3.5 Command Execution I/O Signals

The I/O commands can be executed using command execution I/O signals. I/O commands execute the following.

- Start/stop each task program.
- Enable running the robot from the external device.
- Clear robot errors.

### 3.5.1 General Information about Commands

The table below shows the I/O commands functions.

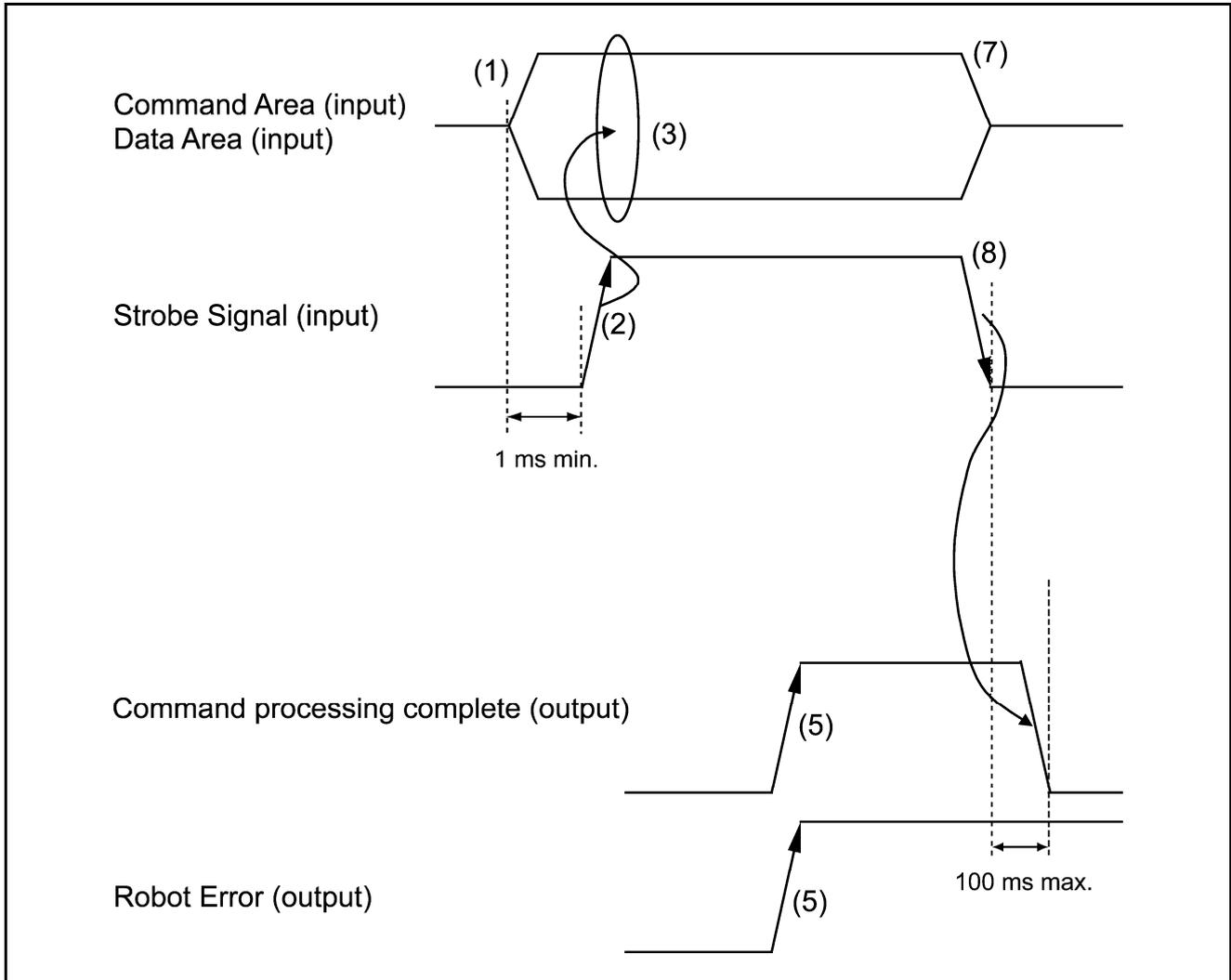
**I/O Command Functions**

Command	Description of function
<i>Program Operation</i>	<ul style="list-style-type: none"><li>· Starts the program cycle (specified program).</li><li>· Step-stops the program (specified program/all programs).</li><li>· Resets the program (specified program/all programs).</li></ul>
<i>Operation Preparation</i>	<ul style="list-style-type: none"><li>· Enables running the robot from the external device.</li></ul>
<i>Clear Robot Error</i>	<ul style="list-style-type: none"><li>· Clears a robot error from the external device.</li></ul>

## 3.5.2 Processing I/O Commands

### 3.5.2.1 General Information about Processing

I/O commands to be executed are processed as shown below.



**Outline of I/O Command Processing**

- (1) Set a command area and a data area (if necessary) for the command execution I/O signal from the external device to the robot controller.

**Note:** The data to be set must be defined at least 1 ms before the *Strobe Signal* is turned ON

- (2) After completion of setting, turn the *Strobe Signal* ON.

**Note:** The command input with a *Strobe Signal* should be preceded by the output of the *Robot Initialized*. If a *Robot Error* signal has been issued, however, execute a *Clear Robot Error* (001) since no *Robot Initialized* will be issued.

- (3) The controller reads the command area and the data area according to the input of *Strobe Signal*.
- (4) The controller starts processing based on the command read.
- (5) After completion of command processing, the controller turns ON the *Command Processing Completed* signal.  
If an error has occurred during processing, a *Robot Error* signal will be outputted together with the *Command Processing Completed* signal.  
**Note:** If the *Strobe Signal* is turned OFF before the *Command Processing Completed* signal is turned ON, the *Command Processing Completed* signal will be output and then turned OFF within 100 ms
- (6) The PLC waits until the *Command Processing Completed* signal is input. In this case, confirm that no error exists with the robot.
- (7) The PLC turns OFF the command and data areas and the *Strobe Signal*.
- (8) As soon as the *Strobe Signal* is turned OFF, the controller turns OFF the *Command Processing Completed* signal.  
The *Robot Error* signal, which is outputted due to a command processing error, remains ON until *Clear Robot Error* (001) is executed.  
**Note:** The maximum allowable time from when the *Strobe Signal* is turned OFF until the *Command Processing Completed* signal is turned OFF, is 100 ms.

### 3.5.2.2 Using Each Signal Line

#### [ 1 ] Command and Data Areas

This section describes the usage of the command area (3 bits, input) and data area (3 bits, input).

##### (1) Function

Specifies the commands to be executed by the Robot Controller.  
Sets the command area at all times, and data area if necessary.

##### (2) Terminal numbers

Command area: #16 to #18 on connector CN5.  
Data area: #13 to #15 on connector CN5.

##### (3) Input conditions and operation

- (a) Set the command area whenever I/O commands are to be executed. Set data for data area if commands require them.
- (b) "Shorted" represents the bit value = 1.  
"Open" represents the bit value = 0.
- (c) Input the command area and data area before the *Strobe Signal* (1 ms or more). Retain the status until the *Command Processing Completed* signal is output.

## [ 2 ] *Strobe Signal (input)*

### (1) Function

This signal informs the Robot Controller that the command area and data area have been set. Additionally it directs the start of command processing.

**Caution: Perform command (Except *Clear Robot Error (001)*) input with a *Strobe Signal* after the system output signal "*Robot Initialized*" is output.**

### (2) Terminal number

#12 on connector CN5.

### (3) Input conditions and operation

By turning ON this input in Auto or External mode, the robot controller reads the command area and data area, and starts processing.

## [ 3 ] *Command Processing Completed (output)*

### (1) Function

This signal outputs to the external device that I/O command processing is completed.

### (2) Terminal number

#52 on connector CN5.

### (3) Usage

The signal is used to confirm that I/O command processing is complete, or as a timing signal for obtaining the result of I/O command processing.

### (4) ON conditions

- (a) The signal will be turned ON upon completion of processing the I/O command given.
- (b) If an error occurs as a result of executing an I/O command, the *Robot Error* signal and the *Command Processing Completed* signal will be turned simultaneously ON.

### (5) OFF conditions

- (a) The signal will be turned OFF when the *Strobe Signal* is turned OFF.
- (b) If the *Strobe Signal* is turned OFF before command processing is completed, the *Command Processing Completed* signal will be output and then turned OFF within 100 ms.

### 3.5.3 I/O Commands Details

#### 3.5.3.1 List of I/O Commands

The table below lists I/O commands.

**List of I/O Commands**

Command area	Data area
000 <i>Operation Preparation</i>	001 Motor Power ON, CAL Execution 010 External speed 100 100 External Mode switching 111 Execution of all above (Motor Power ON→CAL→SP100→External)
001 <i>Clear Robot Error</i>	—
010 <i>Program Start</i>	Program number
011 <i>Continue Start</i>	—
100 <i>Specified Program Reset</i>	Program number
101 <i>All Programs Reset</i>	—

#### 3.5.3.2 OPERATION PREPARATION (000)

##### (1) Function

Prepares to operate the robot by switching the operation mode from the external devices.

##### (2) Format

Command area (3 bits, input)

**000**

Data area (3 bits, input)

**0 bit: Motor Power ON, CAL Execution**

**1 bit: External speed 100**

**2 bit: External mode switching**

These bits can be set at the same time and can be executed. If plural bits are set, the commands are executed in order.

**For example:** If the 0 bit, 1 bit and 2 bit are set, commands are executed as follows;

Motor Power ON, CAL Execution, External speed 100 and External mode switching

##### (3) Description

This command can be executed in Auto mode. In other modes, an error occurs at execution. When executing this command, select the Internal auto mode on the teach pendant or mini-pendant beforehand.

### 3.5.3.3 CLEAR ROBOT ERROR (001)

#### (1) Function

This command clears a robot error that has been caused.

#### (2) Format

Command area (3 bits, input)

001

Data area (3 bits, input):

Nothing will be input.

#### (3) Description

If a robot error occurs, this command clears it. When there is no failure, no processing will take place

When an error is displayed, the same processing as when the **OK** or **Cancel** key of the teach pendant or the mini-pendant is operated will be performed.

### 3.5.3.4 PROGRAM START (010)

#### (1) Function

This command starts the specified program in the data area.

#### (2) Format

Command area (3 bits, input)

010

Data area (3 bits, input)

Program number: Program number to be started.

If the specified number is "n", PRO n starts.

#### (3) Description

This command is executable only in External mode. An error will occur in other modes. This command starts the program of the program number specified in data area. PRO 0 to PRO 7 can be started.

One of the following operations takes place according to the operating status of the program.

- If the specified program is terminated (stopped), it will start from the beginning.
- If the specified program is step-stopped, it will resume from the step following the suspended step.
- If the specified program is instantaneously stopped (Halt), it will resume from the step following the suspended step. When the program is instantaneously stopped in while in execution of an operation command, it will resume from the operation still undone.
- If the specified program is running, an error (ERROR21F5) will be displayed, and the program will stop.

### 3.5.3.5 CONTINUE START (011)

#### (1) Function

This command starts Continue Start.

#### (2) Format

Command area (3 bits, input)

011

Data area (3 bits, input):

Nothing will be input.

#### (3) Description

This command is executable only in External mode. An error will occur in other modes.

An attempt to execute this command when the *Continue Start Permission* signal is off, will cause an error (ERROR 27A8).

### 3.5.3.6 SPECIFIED PROGRAM RESET (100)

#### (1) Function

This command immediately stops and also initializes the program of the program number specified in data area.

#### (2) Format

Command area (3 bits, input)

100

Data area (3 bits, input):

Program number: The program number to be reset.

If the number "n" is specified in data area, resets PRO n.

#### (3) Description

This command can reset the programs for PRO 0 to PRO 7.

One of the following operations takes place according to the operating status of the program.

- When the specified program is terminated (stopped), nothing will happen.
- When the specified program is step-stopped or immediately stopped (halt), it will be initialized. The initialized program will resume from the beginning.
- When the specified program is running, it will immediately stop (halt) and also be initialized. If started after the stop, the stopped program will resume from the beginning.

### 3.5.3.7 ALL PROGRAMS RESET (101)

#### (1) Function

This command immediately stops all programs and also initializes them.

#### (2) Format

Command area (3 bits, input)

101

Data area (3 bits, input):

Nothing will be input.

#### (3) Description

This command can reset all programs.

One of the following operations takes place according to the operating status of the program.

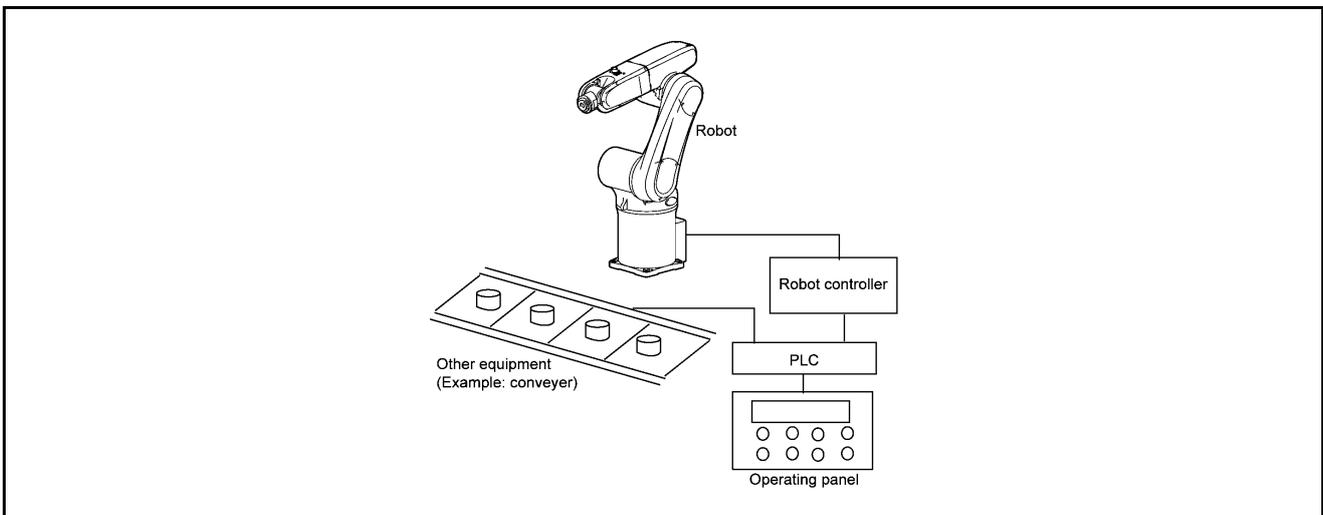
- When the specified program is terminated (stopped), nothing will happen.
- When the specified program is step-stopped or immediately stopped (halt), it will be initialized. The initialized program will resume from the beginning.
- When the specified program is running, it will immediately stop (halt) and also be initialized. If started after the stop, the stopped program will resume from the beginning.

## 3.6 Example of Using System I/O Signals

This section illustrates an example of starting and stopping the robot using system I/O signals.

#### (1) Equipment setup example

This example shown below assumes an equipment setup which allows you to run the robot by operating an external equipment's operation panel connected via the PLC to the robot controller. It is assumed that the operating panel has a display, lamps and switches listed on the next page.



Example of Equipment Setup Using a Robot

### Function Example of External Equipment Operating Panel

Classification	Part	Application
Display	Display	Displays messages, such as ROBOT PREPARATION OK.
Lamp	(1) Automatic operation indicator	- Lights during automatic operation. - Turned OFF when the robot is not in automatic operation.
	(2) Robot external running OK indicator	- Lights when the <i>Operation Preparation Completed</i> signal is ON. - Turned OFF when the <i>Operation Preparation Completed</i> signal is OFF.
	(3) Operation OK indicator	- Lights when the <i>Enable Auto</i> input signal is ON. - Turned OFF when the <i>Enable Auto</i> input signal is OFF.
	(4) Robot home position indicator	- Lights when the robot is in the home position for working. - Turned OFF when the robot is out of the home position for working. (By programming with an user-output)
Switch	(1) Robot preparation button	Starts the preparation of the robot.
	(2) Automatic start button	Starts the operation of the equipment.
	(3) Cycle stop button	Stops the equipment after a cycle of operations is completed.
	(4) Operation/ Adjustment selector switch	Automatic operation of the robot possible when OPERATION is selected. Manual operation or teach check of the robot possible when ADJUSTMENT is selected.
<b>Caution: Actual equipment requires emergency stop, interlock and other functions; however, described here are the necessary functions.</b>		

#### (2) Outline of procedure

Described below is the outline of the procedure for using the equipment taken as an example shown on the previous page.

Follow steps (a) to (d).

##### (a) Operation preparation

The OPERATION PREPARATION command brings to be able to operate the robot into external automatic operation mode. This operation will be completed when the *Operation Preparation Completed* signal is turned ON.

##### (b) Operation start area check

When the robot arm is in the home position for working, the robot home position indicator lights and "ROBOT PREPARATION OK" displays.

##### (c) Automatic operation

Start the program by which the robot starts from the home position for working, performs operations, and returns to the home position.

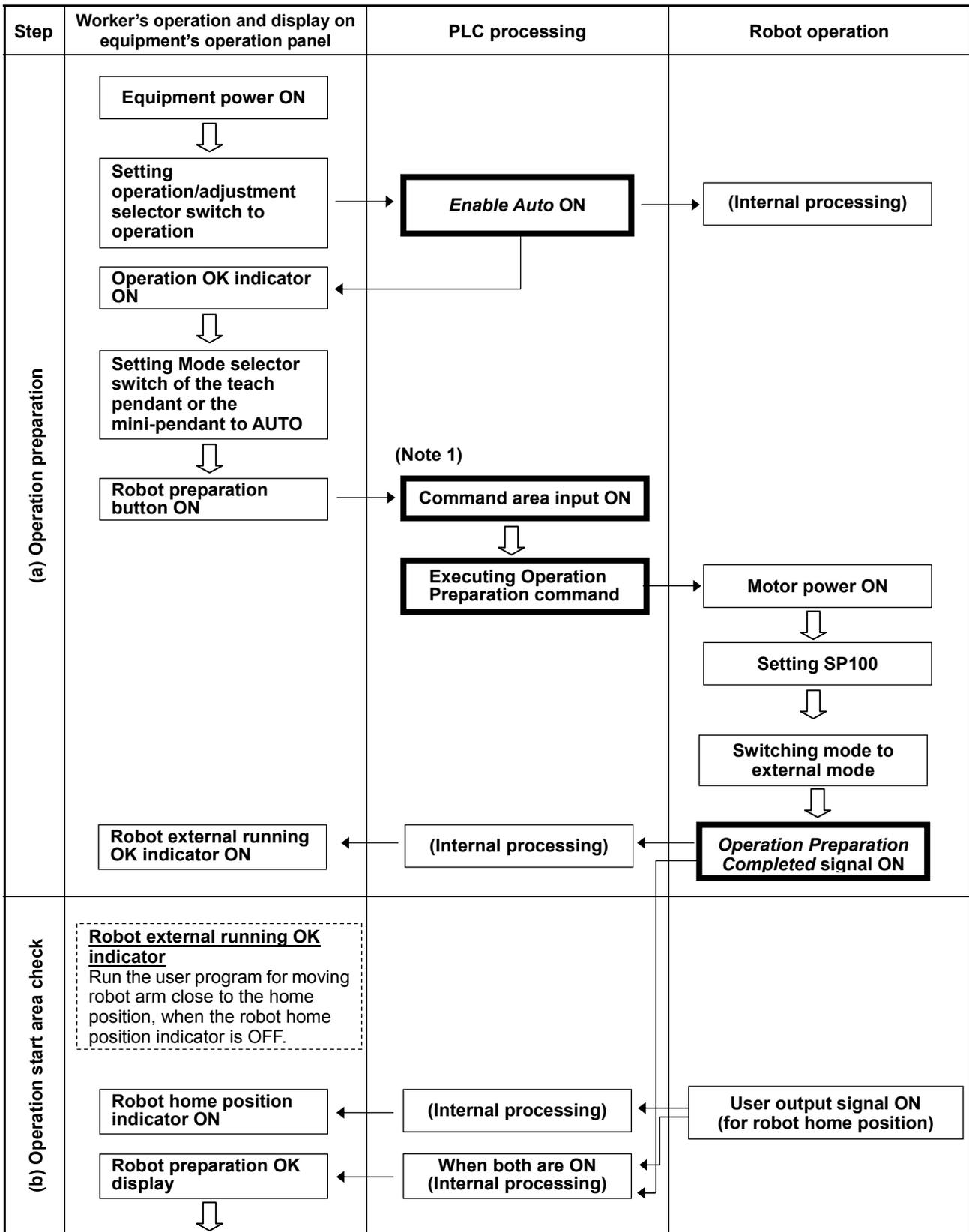
##### (d) Operation end

Terminate the day's operations with a cycle stop, and turn OFF the power.

#### (3) Start and stop procedure, and system I/O signals

The following pages show the relationship between the system I/O signals for start and stop, worker's operation, display on the equipment operation panel, PLC proceeding, and robot motion.

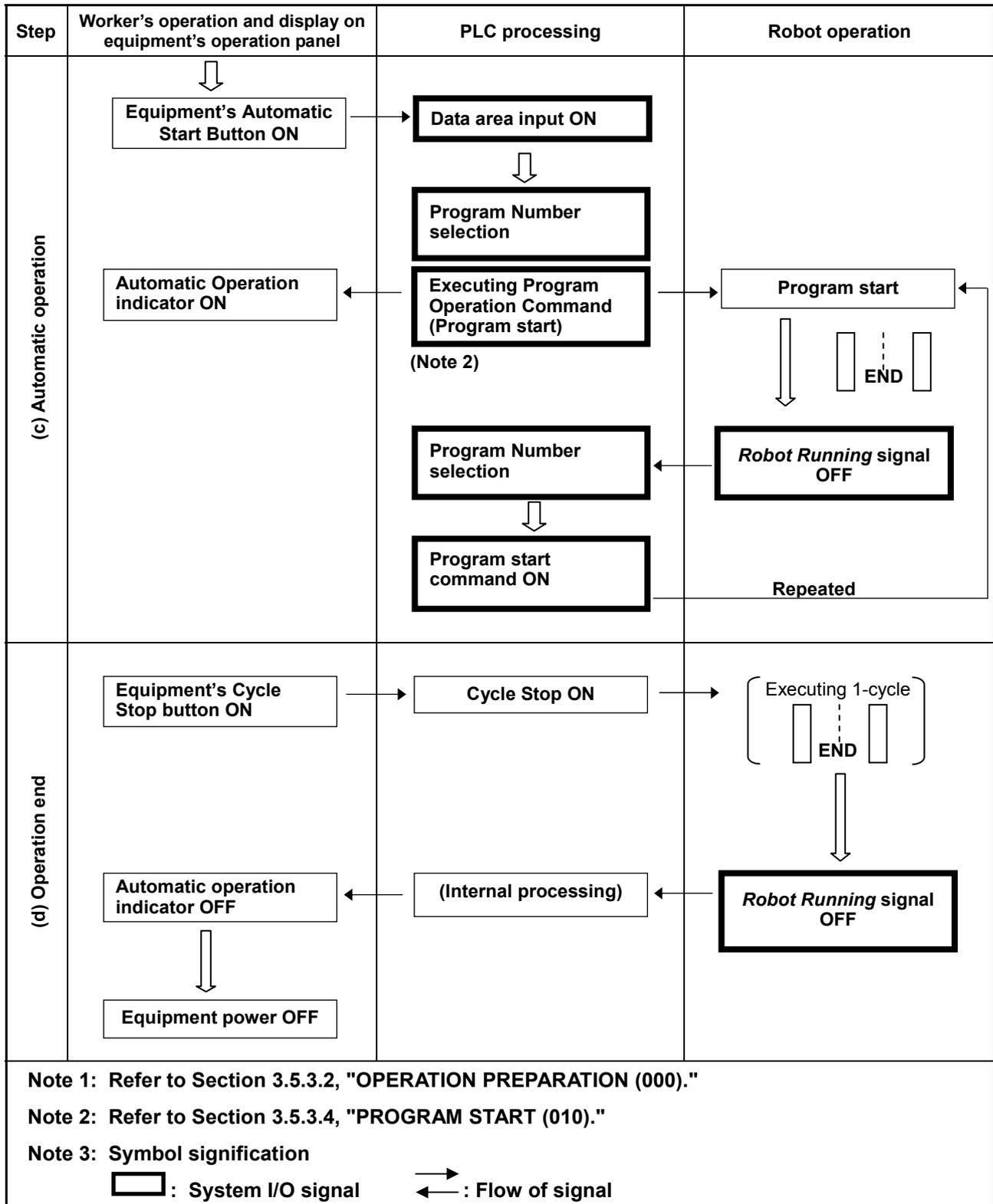
### Start and Stop Procedure and System I/O Signals-1



(Continued on following page)

(Continued from preceding page)

**Start and Stop Procedure and System I/O Signals-2**



# Chapter 4

## Connector Pin Assignment and I/O Circuits (NPN type)

This chapter explains the connector pin assignment and circuits of NPN type (source input and sink output) on an I/O board. I/O boards designed for the use in Japan are of an NPN type.

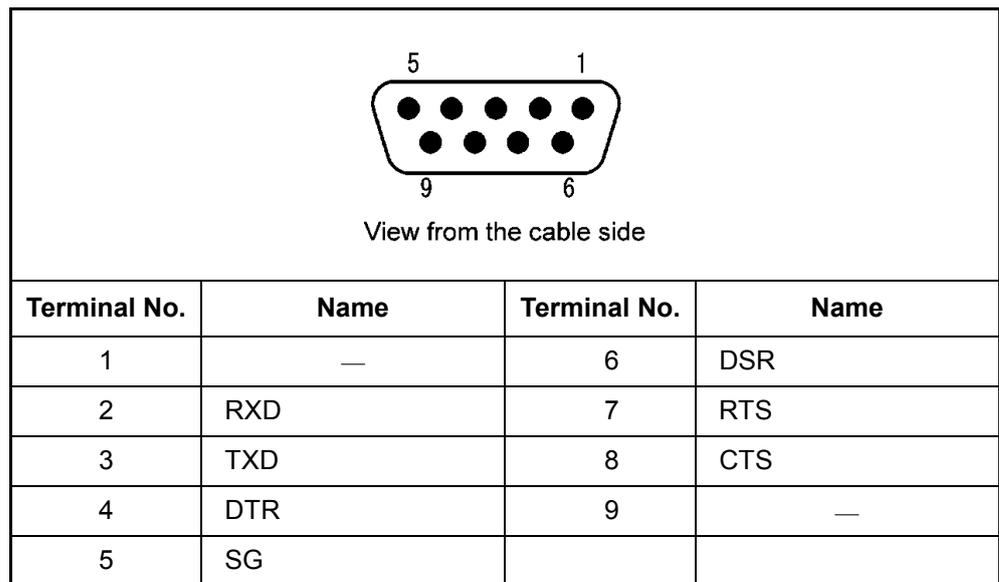
For a PNP type (sink input and source output), refer to Chapter 5, "Connector Pin Assignment and I/O Circuits (PNP type)."

### 4.1 Connector Pin Assignment (NPN type)

This section describes the pin assignment of I/O connectors on the robot controller.

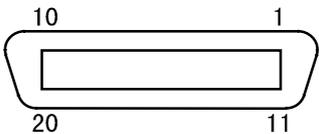
#### 4.1.1 RS-232C (CN1): RS-232C connector

**RS-232C (CN1) Pin Assignment**



## 4.1.2 HAND I/O (CN9)

HAND I/O (CN9) Pin Assignment (NPN type)

 <p style="text-align: center;">View from the cable side</p>									
Terminal No.	Name	Port No.	Wire color		Terminal No.	Name	Port No.	Wire color	
			Standard	Reinforced				Standard	Reinforced
1	Hand output	64	Black	Blue	11	Hand input	50	Pink	White
2	Hand output	65	Brown	Yellow	12	Hand input	51	Pink	White
3	Hand output	66	Black	Green	13	Hand input	52	White	White
4	Hand output	67	Brown	Red	14	Hand input	53	White	White
5	Hand output	68	Red	Violet	15	Hand input	54	White	White
6	Hand output	69	Orange	Blue	16	Hand input	55	White	Brown
7	Hand output	70	Yellow	Yellow	17	Power output (+24 VDC) (External/internal source)	—	White	Brown
8	Hand output	71	Green	Green	18	Power output (+0 VDC) (External/internal source)	—	White	Brown
9	Hand input	48	Blue	Red	19	NC	—	White	Brown
10	Hand input	49	Violet	Violet	20	NC	—	White	Brown

- ⚠ Caution:** The optional I/O cable for the above connector consists of twisted pair wires--pairs of #1 and #11, #2 and #12, #10 and #20.
- ⚠ Caution:** The unused pins should be prevented from direct contact with other pins or conductive part. Direct contact could result in a controller failure or damage.

### 4.1.3 Mini I/O (CN5): User- or System-I/O connector

#### [ 1 ] Standard type of controller

Mini I/O (CN5) Pin Assignment (For standard type of controller)

View from the cable side

Terminal No.	Signal name	Port No.	Wire color	Terminal No.	Signal name	Port No.	Wire color
1	Enable Auto (Internal +24V) (input)	—	Black	35	Enable Auto (input)	—	Pink
2	External Emergency Stop 1, b-1 (Internal +24V) (input)	—	Brown	36	External Emergency Stop 1, b-2 (input)	—	Pink
3	External Emergency Stop 2, b-1 (Internal +24V) (input)	—	Red	37	External Emergency Stop 2, b-2 (input)	—	Pink
4	Reserved.	—	Orange	38	Reserved.	—	Pink
5	Reserved.	—	Yellow	39	Reserved.	—	Pink
6	Emergency Stop 1, -1 (Mini relay) (output)	—	Black	40	Emergency Stop 1, -2 (Mini relay) (output)	—	White
7	Emergency Stop 2, -1 (Mini relay) (output)	—	Brown	41	Emergency Stop 2, -2 (Mini relay) (output)	—	White
8	Deadman SW 1, -1 [Enable SW 1, -1] (Mini relay) (output)	—	Red	42	Deadman SW 1, -2 [Enable SW 1, -2] (Mini relay) (output)	—	White
9	Deadman SW 2, -1 [Enable SW 2, -1] (Mini relay) (output)	—	Orange	43	Deadman SW 2, -2 [Enable SW 2, -2] (Mini relay) (output)	—	White
10	—	—	Yellow	44	—	—	White
11	Step Stop (All tasks) (input)	0	Green	45	CPU Normal (No monitor allowed) (output)	16	White
12	Strobe Signal (input)	1	Blue	46	Robot Running (output)	17	White
13	Data area bit 0 (input)	2	Violet	47	Robot Error (output)	18	White
14	Data area bit 1 (input)	3	Gray	48	Robot Initialized (output)	19	White
15	Data area bit 2 (input)	4	Pink	49	Auto Mode (output)	20	White
16	Command area bit 0 (input)	5	Black	50	Operation Preparation Completed (output)	21	Gray
17	Command area bit 1 (input)	6	Black	51	Battery Warning (output)	22	Violet
18	Command area bit 2 (input)	7	Brown	52	Command Processing Completed (output)	23	Violet
19	User input	8	Red	53	User output/ Continue Start Permission (output)	24	Violet
20	User input	9	Orange	54	User output	25	Violet
21	User input	10	Yellow	55	User output	26	Violet
22	User input	11	Green	56	User output	27	Violet
23	User input	12	Blue	57	User output	28	Violet
24	User input	13	Gray	58	User output	29	Violet
25	User input	14	Pink	59	User output	30	Violet
26	User input	15	Brown	60	User output	31	Gray
27	—	—	Red	61	—	—	Gray
28	Pendant Emergency Stop 1, b-1 (output) (Dry output)	—	Orange	62	Pendant Emergency Stop 1, b-2 (output) (Dry output)	—	Gray
29	Pendant Emergency Stop 2, b-1 (output) (Dry output)	—	Yellow	63	Pendant Emergency Stop 2, b-2 (output) (Dry output)	—	Gray
30	Dedicated to conveyor tracking board (when JP12 on mini I/O board is shorted. Internal power source +24V)	—	Green	64	Dedicated to conveyor tracking board (when JP13 on mini I/O board is shorted. Internal power source 0V)	—	Gray
31	—	—	Blue	65	—	—	Gray
32	DC power input +24V (when external power source is used)	—	Pink	66	DC power input 0V (when external power source is used)	—	Gray
33	DC power output +24V (when internal power source is used)	—	Black	67	DC power output 0V (when internal power source is used)	—	Blue
34	—	—	Brown	68	—	—	Blue

**Note 1:** The optional I/O cable for the above connector consists of twisted pair wires--pairs of #1 and #35, #2 and #36, #34 and #68.

- ⚠ Caution:** The reserved pins and output pins should be prevented from direct contact with other pins or conductive part. Direct contact could result in a controller failure or damage.
- ⚠ Caution:** To use Pendant Emergency Stop output signals, be sure to supply 24 V to terminals #28 and #29.

## [ 2 ] Global type of controller (with safety board or safety box)

The global type of the controller handles stop-related I/Os by using the safety I/O (CN10) given on the next page.

### Mini I/O (CN5) Pin Assignment (For global type of controller)

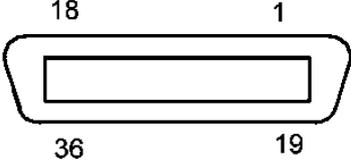
Terminal No.	Signal name	Port No.	Wire color	Terminal No.	Signal name	Port No.	Wire color
1	Reserved.	—	Black	35	Reserved.	—	Pink
2	Reserved.	—	Brown	36	Reserved.	—	Pink
3	Reserved.	—	Red	37	Reserved.	—	Pink
4	Reserved.	—	Orange	38	Reserved.	—	Pink
5	Reserved.	—	Yellow	39	Reserved.	—	Pink
6	Reserved.	—	Black	40	Reserved.	—	White
7	Reserved.	—	Brown	41	Reserved.	—	White
8	Reserved.	—	Red	42	Reserved.	—	White
9	Reserved.	—	Orange	43	Reserved.	—	White
10	—	—	Yellow	44	—	—	White
11	Step Stop (All tasks) (input)	0	Green	45	CPU Normal (No monitor allowed) (output)	16	White
12	Strobe Signal (input)	1	Blue	46	Robot Running (output)	17	White
13	Data area bit 0 (input)	2	Violet	47	Robot Error (output)	18	White
14	Data area bit 1 (input)	3	Gray	48	Robot Initialized (output)	19	White
15	Data area bit 2 (input)	4	Pink	49	Auto Mode (output)	20	White
16	Command area bit 0 (input)	5	Black	50	Operation Preparation Completed (output)	21	Gray
17	Command area bit 1 (input)	6	Black	51	Battery Warning (output)	22	Violet
18	Command area bit 2 (input)	7	Brown	52	Command Processing Completed (output)	23	Violet
19	User input	8	Red	53	User output / Continue Start Permission (output)	24	Violet
20	User input	9	Orange	54	User output	25	Violet
21	User input	10	Yellow	55	User output	26	Violet
22	User input	11	Green	56	User output	27	Violet
23	User input	12	Blue	57	User output	28	Violet
24	User input	13	Gray	58	User output	29	Violet
25	User input	14	Pink	59	User output	30	Violet
26	User input	15	Brown	60	Reserved.	31	Gray
27	—	—	Red	61	—	—	Gray
28	Reserved.	—	Orange	62	Reserved.	—	Gray
29	Reserved.	—	Yellow	63	Reserved.	—	Gray
30	Dedicated to conveyor tracking board (when JP12 on mini I/O board is shorted. Internal power source +24V)	—	Green	64	Dedicated to conveyor tracking board (when JP13 on mini I/O board is shorted. Internal power source 0V)	—	Gray
31	—	—	Blue	65	—	—	Gray
32	DC power input +24V (when external power source is used)	—	Pink	66	DC power input 0V (when external power source is used)	—	Gray
33		—	Black	67		—	Blue
34	DC power output +24V (when internal power source is used)	—	Brown	68	DC power output 0V (when internal power source is used)	—	Blue

**Note 1:** The optional I/O cable for the above connector consists of twisted pair wires--pairs of #1 and #35, #2 and #36, #34 and #68.

**⚠ Caution:** The reserved pins and output pins should be prevented from direct contact with other pins or conductive part. Direct contact could result in a controller failure or damage.

#### 4.1.4 Safety I/O (CN10): System-I/O connector (Global type of controller)

Safety I/O (CN10) Pin Assignment

 <p style="text-align: center;">View from the cable side</p>							
Terminal No.	Signal name	Port No.	Wire color	Terminal No.	Signal name	Port No.	Wire color
1	External Emergency Stop 1, b-1 (input)		Black	19	External Emergency Stop 1, b-2 (input)		Pink
2	External Emergency Stop 2, b-1 (input)		Brown	20	External Emergency Stop 2, b-2 (input)		Pink
3	Reserved.		Red	21	Reserved.		Pink
4	Reserved.		Orange	22	Reserved.		Pink
5	Protective Stop 1, -1 (input)		Yellow	23	Protective Stop 1, -2 (input)		Pink
6	Protective Stop 2, -1 (input)		Green	24	Protective Stop 2, -2 (input)		Pink
7	Enable Auto 1, -1 (input)		Blue	25	Enable Auto 1, -2 (input)		Pink
8	Enable Auto 2, -1 (input)		Black	26	Enable Auto 2, -2 (input)		Gray
9	—		Brown	27	—		Gray
10	Reserved.		Red	28	Reserved.		Gray
11	Reserved.		Orange	29	Reserved.		Gray
12	Reserved.		Yellow	30	Reserved.		Gray
13	Pendant Emergency Stop 1, b-1 (output)		Green	31	Pendant Emergency Stop 1, b-2 (output)		Gray
14	Pendant Emergency Stop 2, b-1 (output)		Blue	32	Pendant Emergency Stop 2, b-2 (output)		Gray
15	Deadman SW 1, -1 (output) [Enable SW 1, -1] (Safety relay)		Violet	33	Deadman SW 1, -2 (output) [Enable SW 1, -2] (Safety relay)		Gray
16	Deadman SW 2, -1 (output) [Enable SW 2, -1] (Safety relay)		Black	34	Deadman SW 2, -2 (output) [Enable SW 2, -2] (Safety relay)		White
17	Contactorm Contact Monitor 1, -1 (output)		Brown	35	Contactorm Contact Monitor 1, -2 (output)		White
18	Reserved.		Red	36	Reserved.		White

**Note 1:** The optional I/O cable for the above connector consists of twisted pair wires--pairs of #1 and #19, #2 and #20, #18 and #36.

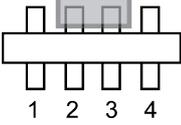
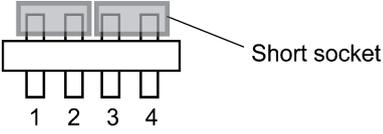
**⚠ Caution:** The reserved pins and output pins should be prevented from direct contact with other pins or conductive part. Direct contact could result in a controller failure or damage.

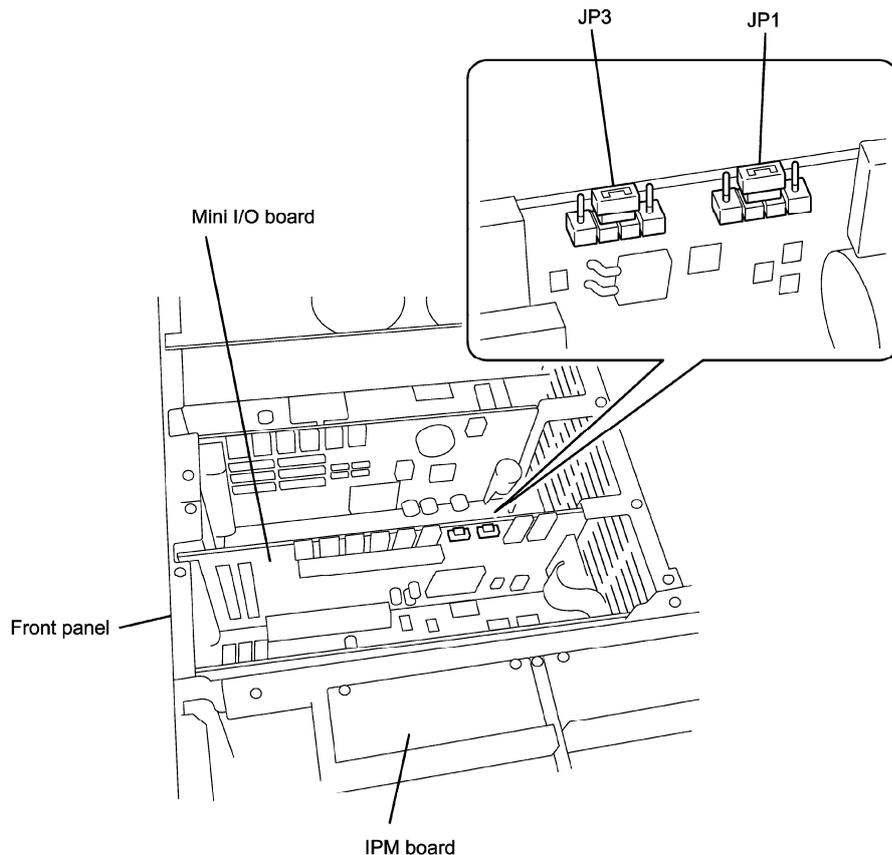
**⚠ Caution:** To use Pendant Emergency Stop output signals, be sure to supply 24 V to terminals #13 and #14.

## 4.2 Robot Controller I/O Circuits (NPN type)

### 4.2.1 Setting up Mini I/O Power Supply

The power supply (+24 VDC) for the Mini I/O can be switched between internal and external power sources by changing the jumper switch setting as listed below. The factory default is external power source setting.

Power supply for I/O	Jumper switches JP1 and JP3 on the controller printed circuit board		Description
External source	Short-circuit pins 2 and 3 (factory default)		Do not change the factory default setting.
Internal source	Short-circuit pins 1 and 2, and pins 3 and 4		Remove the controller top cover and change the JP1 and JP3 settings with short sockets that come with the robot.



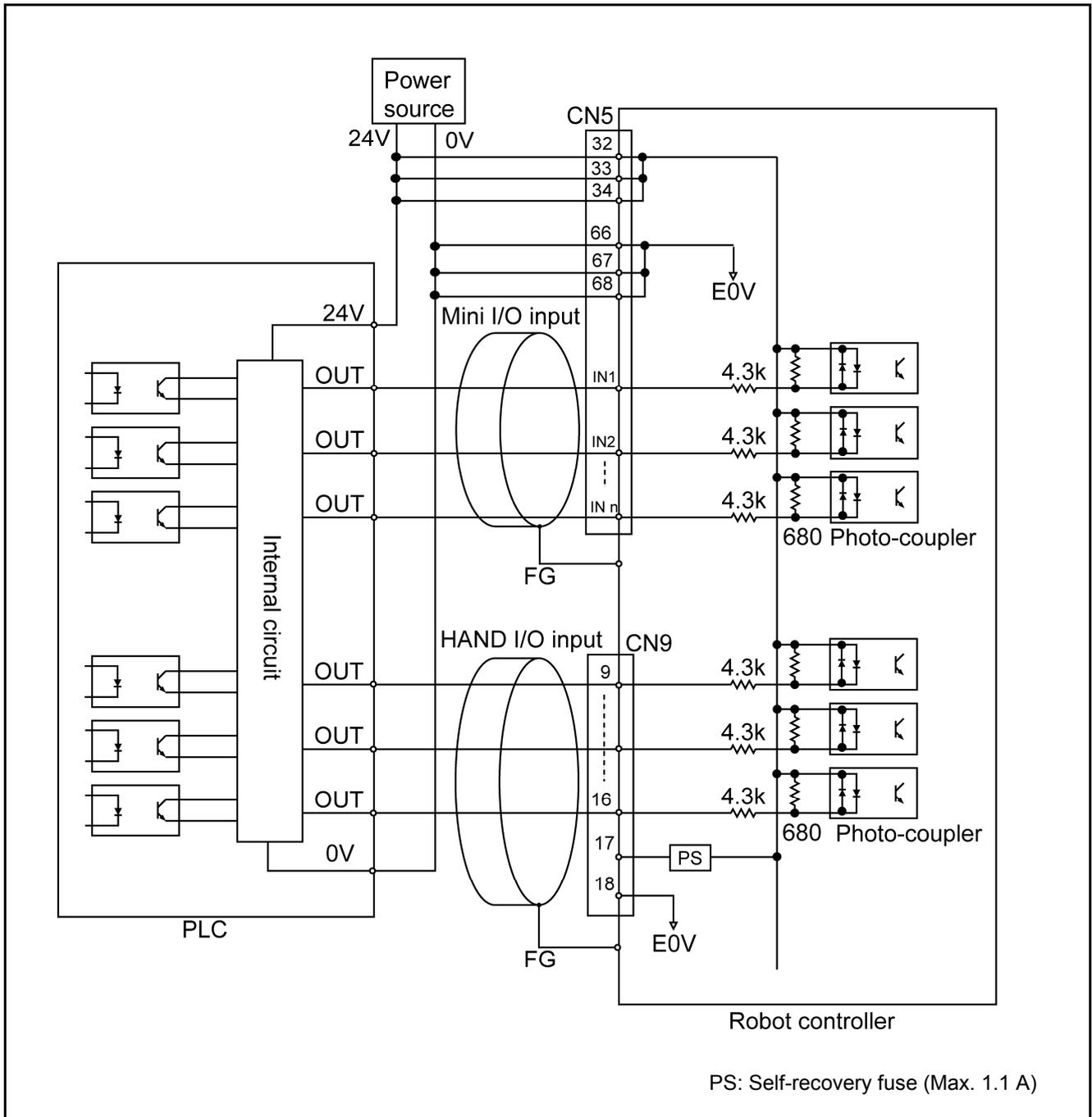
**Note:** Switching the power supply setting for I/O from external to internal changes the assignment to terminals #32 to #34 and #66 to #68 on CN5 from external DC power input to internal DC power output. For details, refer to the circuit configuration examples in Sections 4.2.2 and 4.2.3.

## 4.2.2 User-Input, System-Input and Hand-Input Circuits (NPN type)

The figure below shows examples of the user-input, system-input and hand-input circuit configurations and connections of the robot controller.

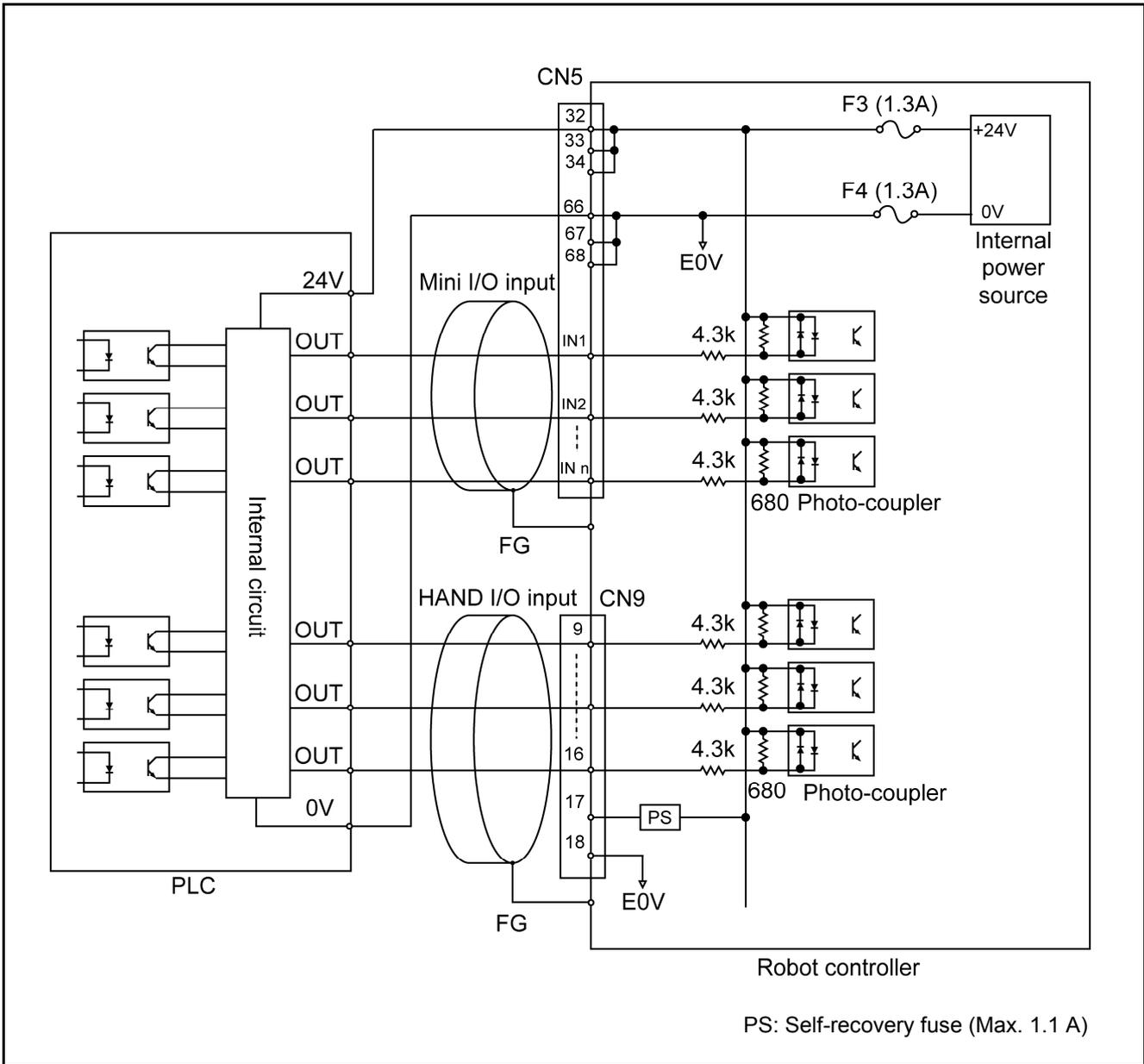
### Notes

- (1) In addition to PLCs, proximity switches and relay contacts can be directly connected to the input terminals of the robot controller. Note that the leakage current from the proximity switches should be 1 mA or below.
- (2) Use multi-core shielding cables for protecting the controller from external noise and ground them at the controller side.



(When the external power source is used)

User-Input, System-Input and Hand-Input Circuits (NPN type)



(When the internal power source is used)

**User-Input, System-Input and Hand-Input Circuits (NPN type)**

### 4.2.3 User-Output, System-Output, and Hand-Output Circuits (NPN type)

The following pages show examples of the configuration and connection of the robot controller's user-output, system-output and hand-output circuits.

(1) The User-Output, System-Output and Hand-Output Circuits are open collector output circuits.

(2) The maximum allowable source current is 70 mA.

Keep the current consumption of a device to be connected to the Robot Controller, such as a PLC and a relay coil, below the allowable current.

(3) Select an induction load, such as a relay coil, which has a built-in diode (for absorbing inverse electromotive force).

To use an induction load without a built-in diode, add a diode equivalent to the 1S1888 (Toshiba) in close vicinity to the coil.

 **Caution:** When externally attaching a diode, connect it with correct polarity. Incorrect polarity may damage the Output circuit.

(4) Connecting a lamp requires a circuit through which dark current flows and use a lamp whose rating is 0.5W or less.

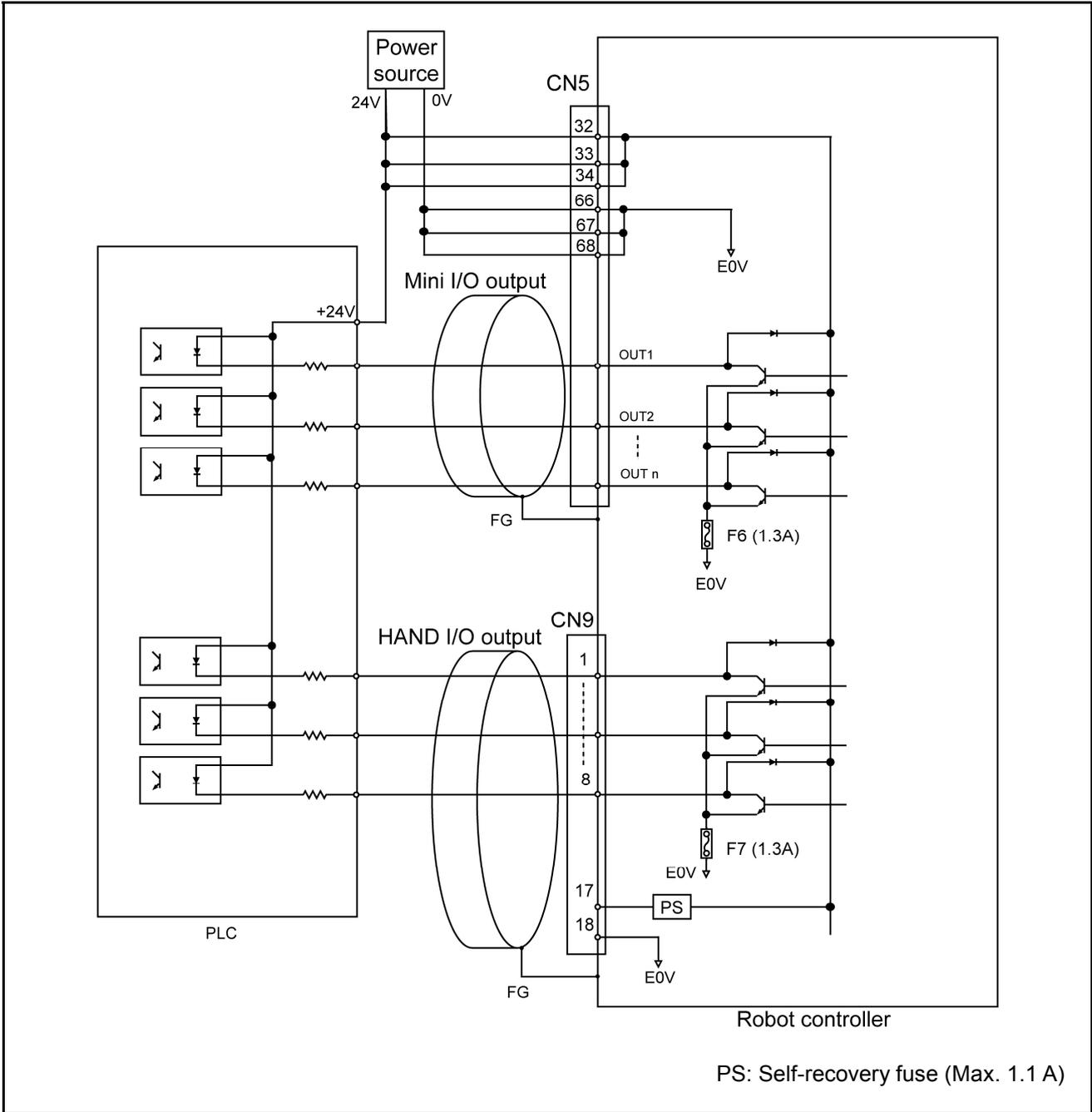
 **Caution:** Since the initial resistance of a lamp is small, the output circuit may be damaged by rush current that flows when the lamp lights. To reduce rush current, select and connect a resistor R that allows dark current 1/3 or less of the rated current to flow when the lamp goes OFF. Refer to next page.

(5) Use a multi-core shielding cable for the purpose of protecting the devices from external noise. Ground it to the robot controller.

(6) +24V internal power source of the robot controller must not be grounded.

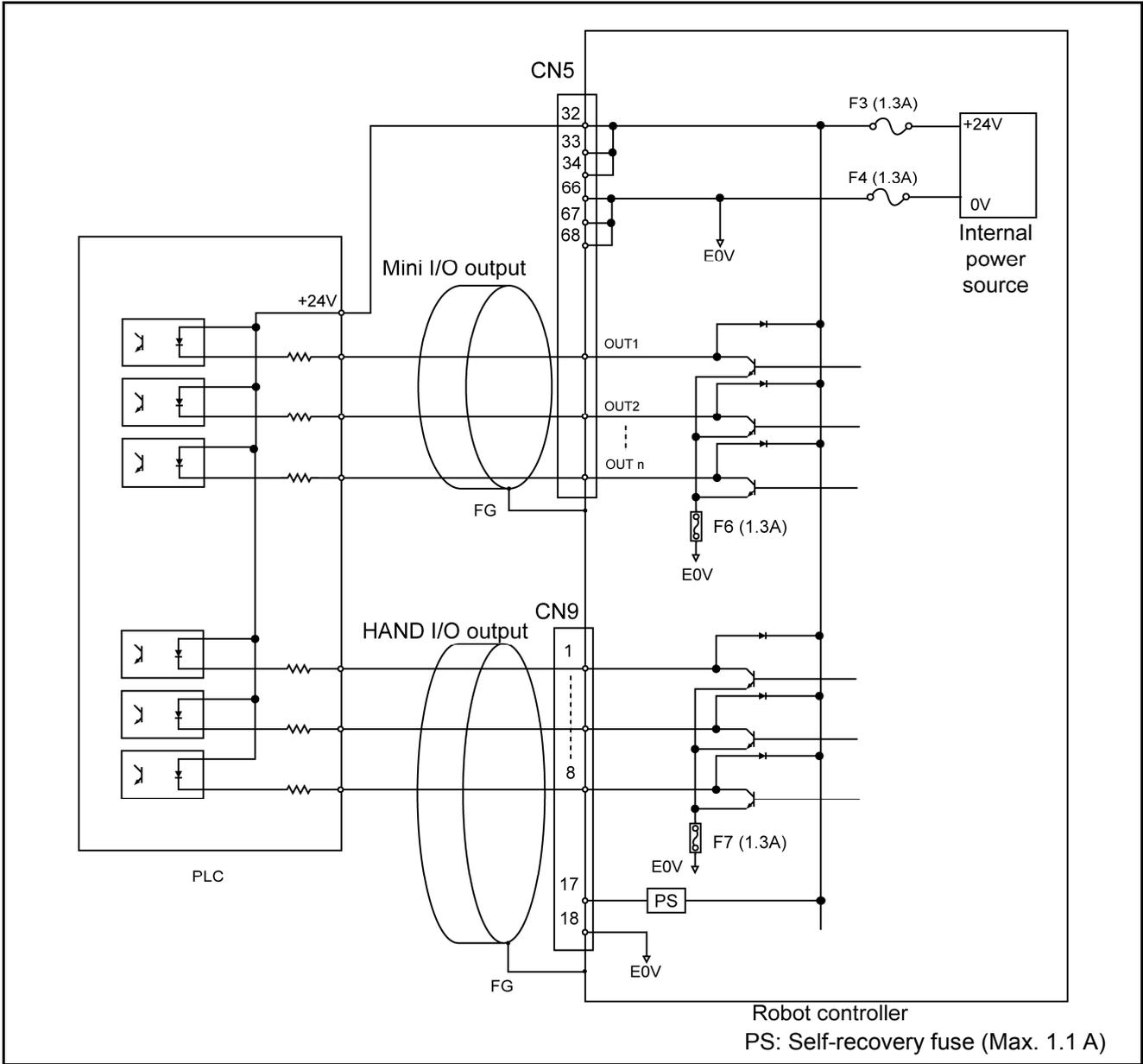
 **Caution:** If the output terminal +24V of internal power source is grounded, there may be a case where the controller is damaged.

(7) For three seconds after the controller power is turned on, the I/O board will be in a transient state, so do not use its output as valid signals.

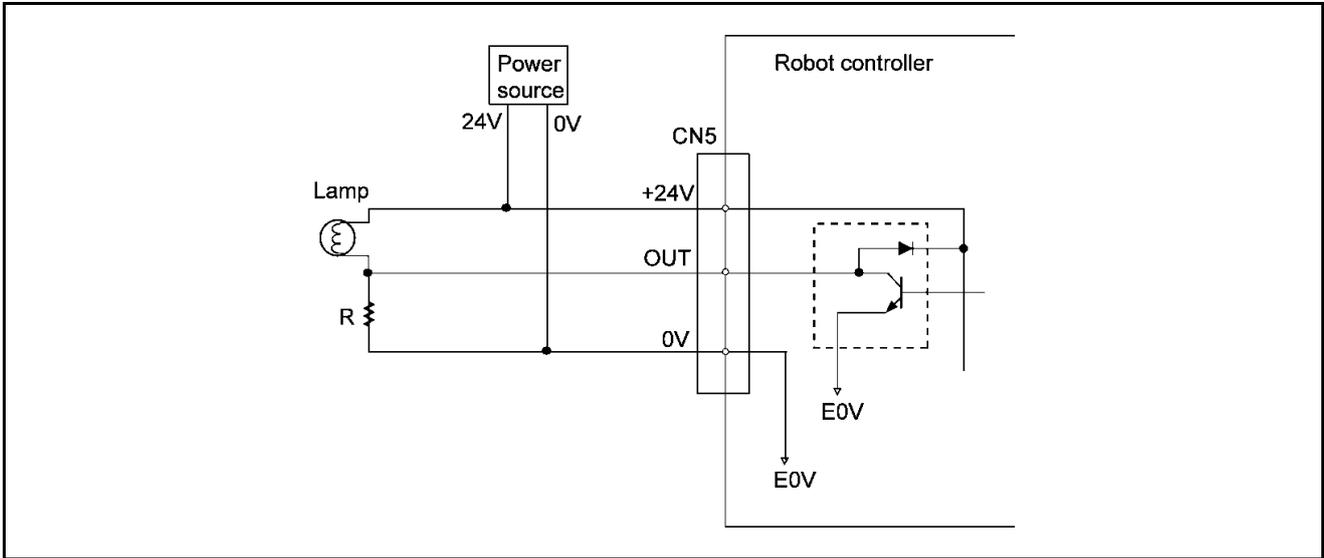


(When the external power source is used)

**User-Output, System-Output and Hand-Output Circuits (NPN type)**



**(When the internal power source is used)**  
**User-Output, System-Output and Hand-Output Circuits (NPN type)**







## 4.2.5 Configuration of Safety Circuit (Global type of controller)

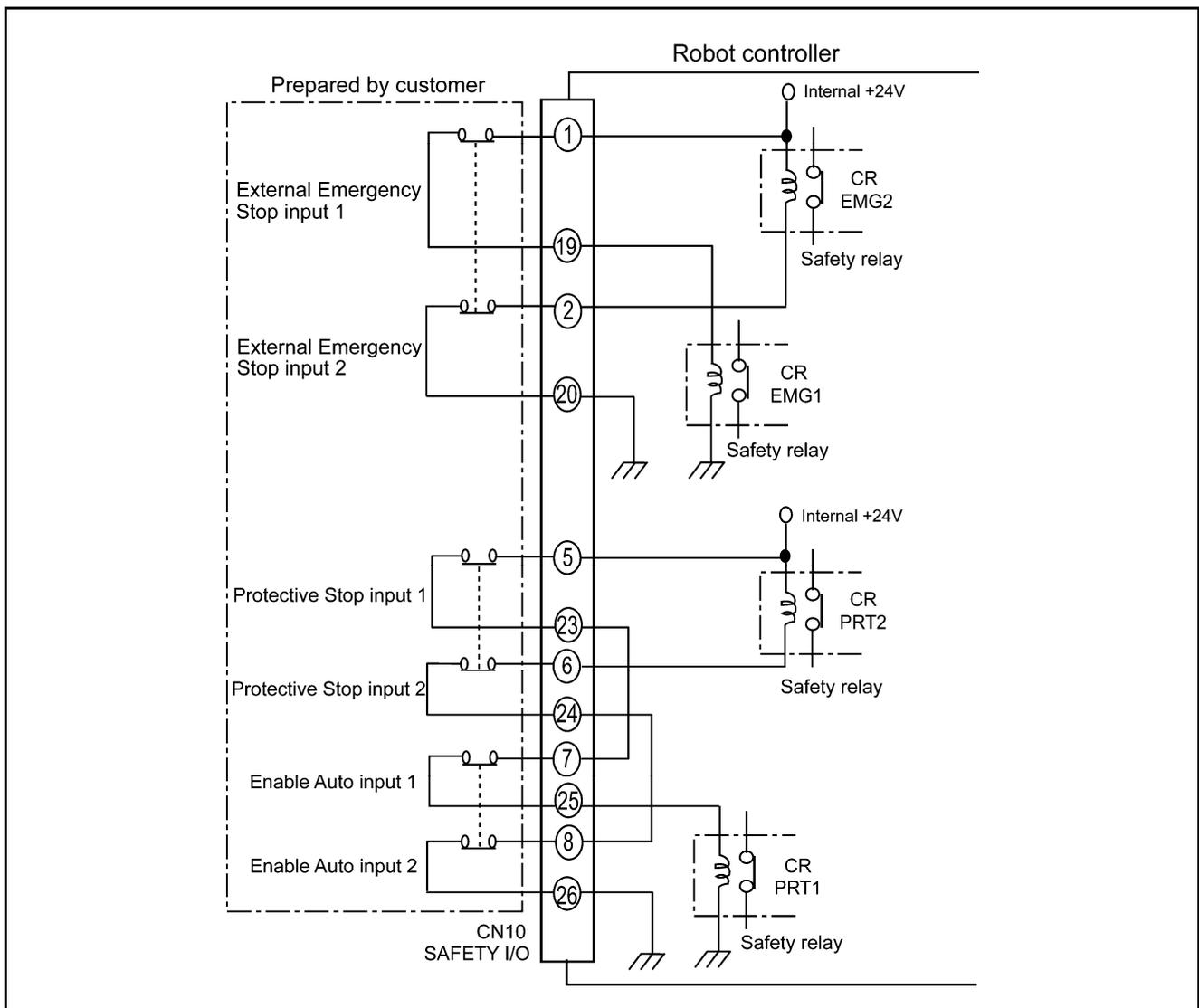
### 4.2.5.1 Input Circuit to the Safety Circuit

Input signals to the safety circuit are important for safety. Be sure to configure their circuits with contacts as shown below, observing the notes given below.

**Note:** For the overall configuration sample of a safety circuitry, refer to Section 4.2.5.2 "Safety Circuit."

#### Precautions on Connecting the Safety I/O (CN10)

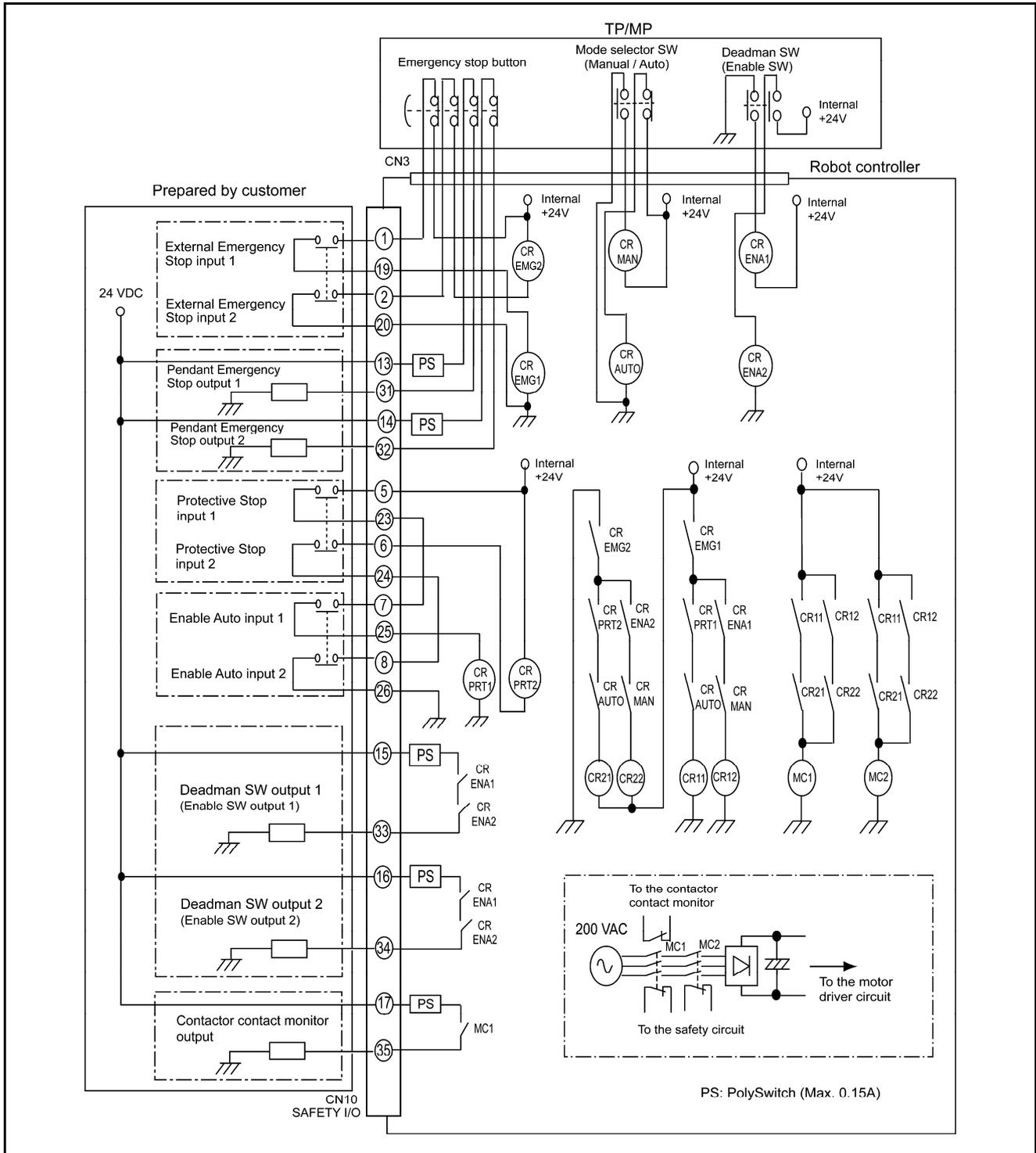
- (1) Two *External Emergency Stop* input signals must be controlled with separate contacts. Two circuits connected in parallel using a single contact or an always-shorted circuit will be interpreted as an external circuit failure so that the emergency stop state cannot be reset.
- (2) Two *Protective Stop* input signals and two *Enable Auto* input signals each must be controlled with separate contacts. Two circuits connected in parallel using a single contact or an always-shorted circuit will be interpreted as an external circuit failure so that the circuitry will not operate.
- (3) The *Enable Auto* and *Protective Stop* input signals are connected in series in the controller, so two types of inputs are available as an automatic operation permission signal.
- (4) Switching the *External Emergency Stop*, *Protective Stop*, and *Enable Auto* input signals from open to close does not require temporal conditions, but requires any action to switch.



Input Circuits to the Safety Circuits (Global type of controller)

## 4.2.5.2 Safety Circuit (Global type of controller)

The figure below shows an internal connection equivalent circuit for the safety circuit in the global type of the controller. The actual safety circuit is configured with safety relays and others.



### Safety Circuit in the RC7M Controller (Global type of controller)

**Note:** Different stop states resulting from emergency stop input, *Protective Stop*, and *Enable Auto (OFF)*

- (1) The emergency stop input (*External Emergency Stop* or teach pendant/mini-pendant input) shuts down the power to the motor and resets the program, provided that the Continue parameter is set to the default (0: Disable) in Continue setting.
- (2) The *Protective Stop* or *Enable Auto (OFF)* input signal shuts down the power to the motor and places the robot in the Continue Stop state.

### 4.3 Wiring Notes for Controller I/O Connectors (NPN type)

After the wiring of the controller's I/O connectors is completed, check the following before turning ON the power:

**Check point (1)**

Using a circuit tester, check across the "+24V terminal" and "0V terminal" of each connector and across the "E24V terminal" and the "E0V terminal" to see that there is no continuity.

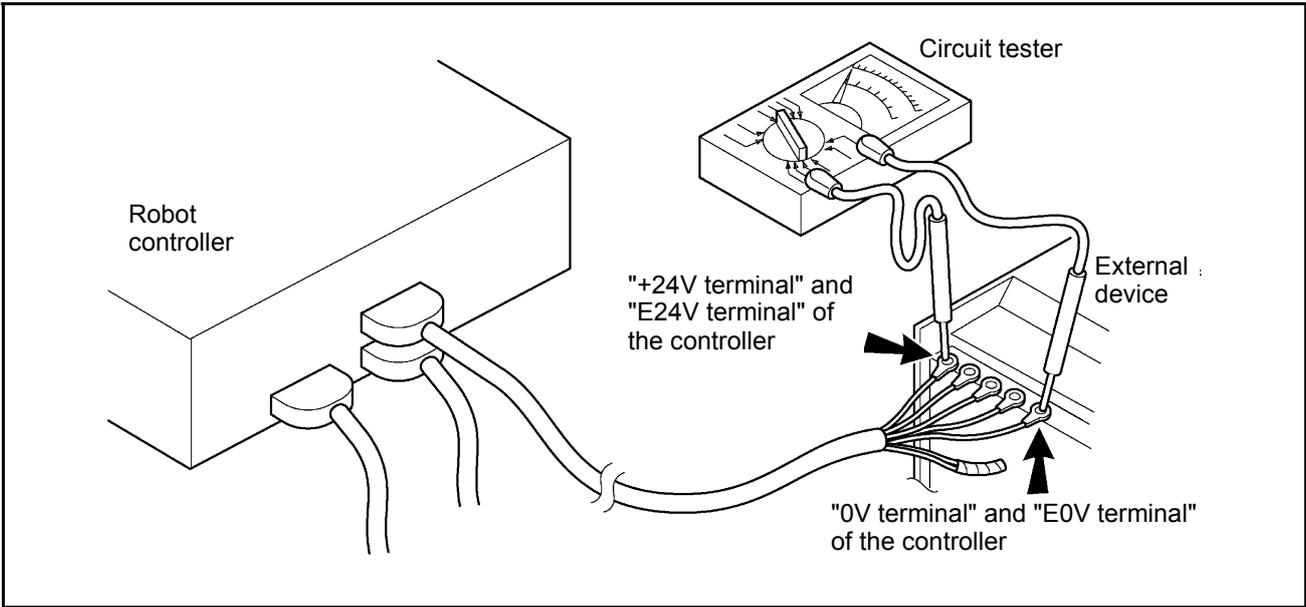
**⚠ Caution:** If the connector wiring between the Robot Controller's "+24V terminal" and "0V terminal" and between the "E24V terminal" and the "E0V terminal" is shorted, damage to the power circuit of the Robot Controller will result.

**Check point (2)**

Using a circuit tester, check across "each signal output terminal" and "+24V terminal" or "E24V terminal" of each connector to see that there is no continuity.

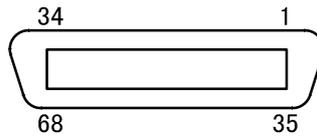
**⚠ Caution:** If the wiring between "each signal output terminal" and "+24V terminal" or "E24V terminal" of each connector is shorted, damage to the output circuit and power circuit of the Robot Controller will result.

**⚠ Caution:** Wind adhesive vinyl tape around all ends of the unconnected wiring of each connector to prevent them from contacting other wiring and parts, which results in shorting.



Checking Example

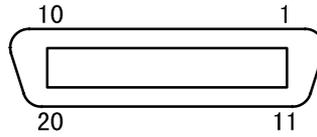
**Mini I/O connector (CN5)**



**View from the cable side**

Terminal Number	Name	Meaning	Check point	
1 to 3	+24V internal power source terminal	+24V internal power output	(1)	
45 to 60	Signal output terminal	0V (GND) at output	(2)	
32 to 34	External power source	+24 VDC power source input	24 VDC power input	(1)
	Internal power source	+24 VDC power source output	24 VDC power output	(1)
66 to 68	External power source	0 VDC power source input	DC power input (GND)	(1)
	Internal power source	0 VDC power source output	DC power output (GND)	(1)

**HAND I/O connector (CN9)**



**View from the cable side**

Terminal Number	Name	Meaning	Check point
1 to 8	Hand output terminal	0V (GND) at output	(2)
17	Power output terminal (+24 VDC) (External/internal source)	24 VDC power output	(1)
18	Power output terminal (+0 VDC) (External/internal source)	DC power output (GND)	(1)

# Chapter 5

## Connector Pin Assignment and I/O Circuits (PNP type)

This chapter explains the connector pin assignment and circuits of PNP type (sink input and source output) on an I/O board.

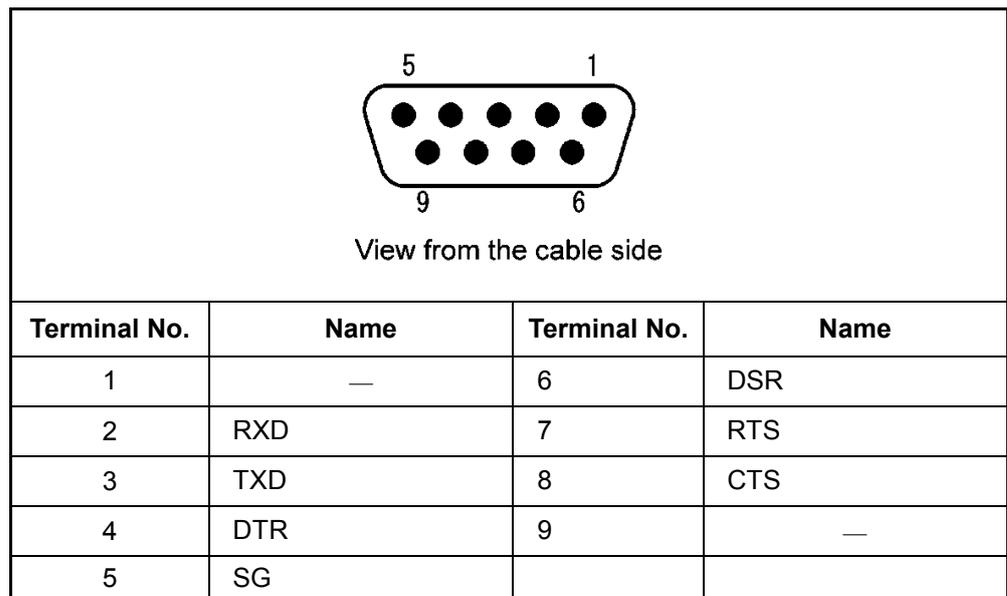
For an NPN type (source input and sink output), refer to Chapter 4, "Connector Pin Assignment and I/O Circuits (NPN type)."

### 5.1 Connector Pin Assignment (PNP type)

This section describes the pin assignment of I/O connectors on the robot controller.

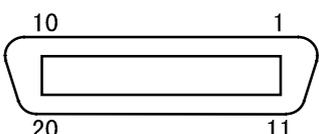
#### 5.1.1 RS-232C (CN1): RS-232C connector

**RS-232C (CN1) Pin Assignment**



## 5.1.2 HAND I/O (CN9)

HAND I/O (CN9) Pin Assignment (PNP type)

<div style="text-align: center;">  <p>View from the cable side</p> </div>									
Terminal No.	Name	Port No.	Wire color		Terminal No.	Name	Port No.	Wire color	
			Standard	Reinforced				Standard	Reinforced
1	Hand output	64	Black	Blue	11	Hand input	50	Pink	White
2	Hand output	65	Brown	Yellow	12	Hand input	51	Pink	White
3	Hand output	66	Black	Green	13	Hand input	52	White	White
4	Hand output	67	Brown	Red	14	Hand input	53	White	White
5	Hand output	68	Red	Violet	15	Hand input	54	White	White
6	Hand output	69	Orange	Blue	16	Hand input	55	White	Brown
7	Hand output	70	Yellow	Yellow	17	Power output (+0 VDC) (External/internal source)	—	White	Brown
8	Hand output	71	Green	Green	18	Power output (+24 VDC) (External/internal source)	—	White	Brown
9	Hand input	48	Blue	Red	19	NC	—	White	Brown
10	Hand input	49	Violet	Violet	20	NC	—	White	Brown

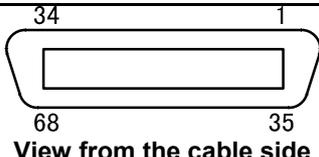
**Note 1:** The optional I/O cable for the above connector consists of twisted pair wires--pairs of #1 and #11, #2 and #12, #10 and #20.

**⚠ Caution:** The unused pins should be prevented from direct contact with other pins or conductive part. Direct contact could result in a controller failure or damage.

### 5.1.3 Mini I/O (CN5): User- or System-I/O connector

#### [ 1 ] Standard type of controller

Mini I/O (CN5) Pin Assignment (For standard type of controller)

 View from the cable side							
Terminal No.	Signal name	Port No.	Wire color	Terminal No.	Signal name	Port No.	Wire color
1	Enable Auto (Internal +24V) (input)	—	Black	35	Enable Auto (input)	—	Pink
2	External Emergency Stop 1, b-1 (input) (Internal +24V)	—	Brown	36	External Emergency Stop 1, b-2 (input)	—	Pink
3	External Emergency Stop 2, b-1 (input) (Internal +24V)	—	Red	37	External Emergency Stop 2, b-2 (input)	—	Pink
4	Reserved.	—	Orange	38	Reserved.	—	Pink
5	Reserved.	—	Yellow	39	Reserved.	—	Pink
6	Emergency Stop 1, -1 (output) (Mini relay)	—	Black	40	Emergency Stop 1, -2 (output) (Mini relay)	—	White
7	Emergency Stop 2, -1 (output) (Mini relay)	—	Brown	41	Emergency Stop 2, -2 (output) (Mini relay)	—	White
8	Deadman SW 1, -1 (output) [Enable SW 1, -1] (Mini relay)	—	Red	42	Deadman SW 1, -2 (output) [Enable SW 1, -2] (Mini relay)	—	White
9	Deadman SW 2, -1 (output) [Enable SW 2, -1] (Mini relay)	—	Orange	43	Deadman SW 2, -2 (output) [Enable SW 2, -2] (Mini relay)	—	White
10	—	—	Yellow	44	—	—	White
11	Step Stop (All tasks) (input)	0	Green	45	CPU Normal (No monitor allowed) (output)	16	White
12	Strobe Signal (input)	1	Blue	46	Robot Running (output)	17	White
13	Data area bit 0 (input)	2	Violet	47	Robot Error (output)	18	White
14	Data area bit 1 (input)	3	Gray	48	Robot Initialized (output)	19	White
15	Data area bit 2 (input)	4	Pink	49	Auto Mode (output)	20	White
16	Command area bit 0 (input)	5	Black	50	Operation Preparation Completed (output)	21	Gray
17	Command area bit 1 (input)	6	Black	51	Battery Warning (output)	22	Violet
18	Command area bit 2 (input)	7	Brown	52	Command Processing Completed (output)	23	Violet
19	User input	8	Red	53	User output/ Continue Start Permission (output)	24	Violet
20	User input	9	Orange	54	User output	25	Violet
21	User input	10	Yellow	55	User output	26	Violet
22	User input	11	Green	56	User output	27	Violet
23	User input	12	Blue	57	User output	28	Violet
24	User input	13	Gray	58	User output	29	Violet
25	User input	14	Pink	59	User output	30	Violet
26	User input	15	Brown	60	User output	31	Gray
27	—	—	Red	61	—	—	Gray
28	Pendant Emergency Stop 1, b-1 (output) (Dry output)	—	Orange	62	Pendant Emergency Stop 1, b-2 (output) (Dry output)	—	Gray
29	Pendant Emergency Stop 2, b-1 (output) (Dry output)	—	Yellow	63	Pendant Emergency Stop 2, b-2 (output) (Dry output)	—	Gray
30	Dedicated to conveyor tracking board (when JP12 on mini I/O board is shorted. Internal power source output +24V)	—	Green	64	Dedicated to conveyor tracking board (when JP13 on mini I/O board is shorted. Internal power source output 0V)	—	Gray
31	—	—	Blue	65	—	—	Gray
32	DC power input +24V (when external power source is used)	—	Pink	66	DC power input 0V (when external power source is used)	—	Gray
33	DC power output +24V (when internal power source is used)	—	Black	67	DC power output 0V (when internal power source is used)	—	Blue
34	—	—	Brown	68	—	—	Blue

**Note 1:** The optional I/O cable for the above connector consists of twisted pair wires--pairs of #1 and #35, #2 and #36, #34 and #68.

**⚠ Caution:** The reserved pins and output pins should be prevented from direct contact with other pins or conductive part. Direct contact could result in a controller failure or damage.

**⚠ Caution:** To use Pendant Emergency Stop output signals, be sure to supply 24 V to terminals #28 and #29.

## [ 2 ] Global type of controller (with safety board or safety box)

The global type of the controller handles stop-related I/Os by using the safety I/O (CN10) given on the next page.

### Mini I/O (CN5) Pin Assignment (For global type of controller)

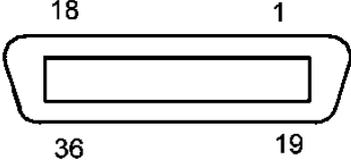
Terminal No.	Signal name	Port No.	Wire color	Terminal No.	Signal name	Port No.	Wire color
1	Reserved.	—	Black	35	Reserved.	—	Pink
2	Reserved.	—	Brown	36	Reserved.	—	Pink
3	Reserved.	—	Red	37	Reserved.	—	Pink
4	Reserved.	—	Orange	38	Reserved.	—	Pink
5	Reserved.	—	Yellow	39	Reserved.	—	Pink
6	Reserved.	—	Black	40	Reserved.	—	White
7	Reserved.	—	Brown	41	Reserved.	—	White
8	Reserved.	—	Red	42	Reserved.	—	White
9	Reserved.	—	Orange	43	Reserved.	—	White
10	—	—	Yellow	44	—	—	White
11	Step Stop (All tasks) (input)	0	Green	45	CPU Normal (No monitor allowed) (output)	16	White
12	Strobe Signal (input)	1	Blue	46	Robot Running (output)	17	White
13	Data area bit 0 (input)	2	Violet	47	Robot Error (output)	18	White
14	Data area bit 1 (input)	3	Gray	48	Robot Initialized (output)	19	White
15	Data area bit 2 (input)	4	Pink	49	Auto Mode (output)	20	White
16	Command area bit 0 (input)	5	Black	50	Operation Preparation Completed (output)	21	Gray
17	Command area bit 1 (input)	6	Black	51	Battery Warning (output)	22	Violet
18	Command area bit 2 (input)	7	Brown	52	Command Processing Completed (output)	23	Violet
19	User input	8	Red	53	User output / Continue Start Permission (output)	24	Violet
20	User input	9	Orange	54	User output	25	Violet
21	User input	10	Yellow	55	User output	26	Violet
22	User input	11	Green	56	User output	27	Violet
23	User input	12	Blue	57	User output	28	Violet
24	User input	13	Gray	58	User output	29	Violet
25	User input	14	Pink	59	User output	30	Violet
26	User input	15	Brown	60	Reserved.	31	Gray
27	—	—	Red	61	—	—	Gray
28	Reserved.	—	Orange	62	Reserved.	—	Gray
29	Reserved.	—	Yellow	63	Reserved.	—	Gray
30	Dedicated to conveyor tracking board (when JP12 on mini I/O board is shorted. Internal power source output +24V)	—	Green	64	Dedicated to conveyor tracking board (when JP13 on mini I/O board is shorted. Internal power source output 0V)	—	Gray
31	—	—	Blue	65	—	—	Gray
32	DC power input +24V (when external power source is used)	—	Pink	66	DC power input 0V (when external power source is used)	—	Gray
33	DC power output +24V (when internal power source is used)	—	Black	67	DC power output 0V (when internal power source is used)	—	Blue
34	DC power output +24V (when internal power source is used)	—	Brown	68	DC power output 0V (when internal power source is used)	—	Blue

**Note 1:** The optional I/O cable for the above connector consists of twisted pair wires--pairs of #1 and #35, #2 and #36, #34 and #68.

**⚠ Caution:** The reserved pins and output pins should be prevented from direct contact with other pins or conductive part. Direct contact could result in a controller failure or damage.

## 5.1.4 Safety I/O (CN10): System-I/O connector (Global type of controller)

Safety I/O (CN10) Pin Assignment

							
Terminal No.	Signal name	Port No.	Wire color	Terminal No.	Signal name	Port No.	Wire color
1	External Emergency Stop 1, b-1 (input)		Black	19	External Emergency Stop 1, b-2 (input)		Pink
2	External Emergency Stop 2, b-1 (input)		Brown	20	External Emergency Stop 2, b-2 (input)		Pink
3	Reserved.		Red	21	Reserved.		Pink
4	Reserved.		Orange	22	Reserved.		Pink
5	Protective Stop 1, -1 (input)		Yellow	23	Protective Stop 1, -2 (input)		Pink
6	Protective Stop 2, -1 (input)		Green	24	Protective Stop 2, -2 (input)		Pink
7	Enable Auto 1, -1 (input)		Blue	25	Enable Auto 1, -2 (input)		Pink
8	Enable Auto 2, -1 (input)		Black	26	Enable Auto 2, -2 (input)		Gray
9	—		Brown	27	—		Gray
10	Reserved.		Red	28	Reserved.		Gray
11	Reserved.		Orange	29	Reserved.		Gray
12	Reserved.		Yellow	30	Reserved.		Gray
13	Pendant Emergency Stop 1, b-1 (output)		Green	31	Pendant Emergency Stop 1, b-2 (output)		Gray
14	Pendant Emergency Stop 2, b-1 (output)		Blue	32	Pendant Emergency Stop 2, b-2 (output)		Gray
15	Deadman SW 1, -1 (output) [Enable SW 1, -1] (Safety relay)		Violet	33	Deadman SW 1, -2 (output) [Enable SW 1, -2] (Safety relay)		Gray
16	Deadman SW 2, -1 (output) [Enable SW 2, -1] (Safety relay)		Black	34	Deadman SW 2, -2 (output) [Enable SW 2, -2] (Safety relay)		White
17	Contactorm Contact Monitor 1, -1 (output)		Brown	35	Contactorm Contact Monitor 1, -2 (output)		White
18	Reserved.		Red	36	Reserved.		White

**Note 1:** The optional I/O cable for the above connector consists of twisted pair wires--pairs of #1 and #19, #2 and #20, #18 and #36.

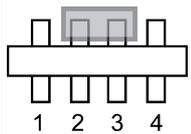
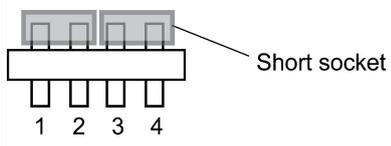
**⚠ Caution:** The reserved pins and output pins should be prevented from direct contact with other pins or conductive part. Direct contact could result in a controller failure or damage.

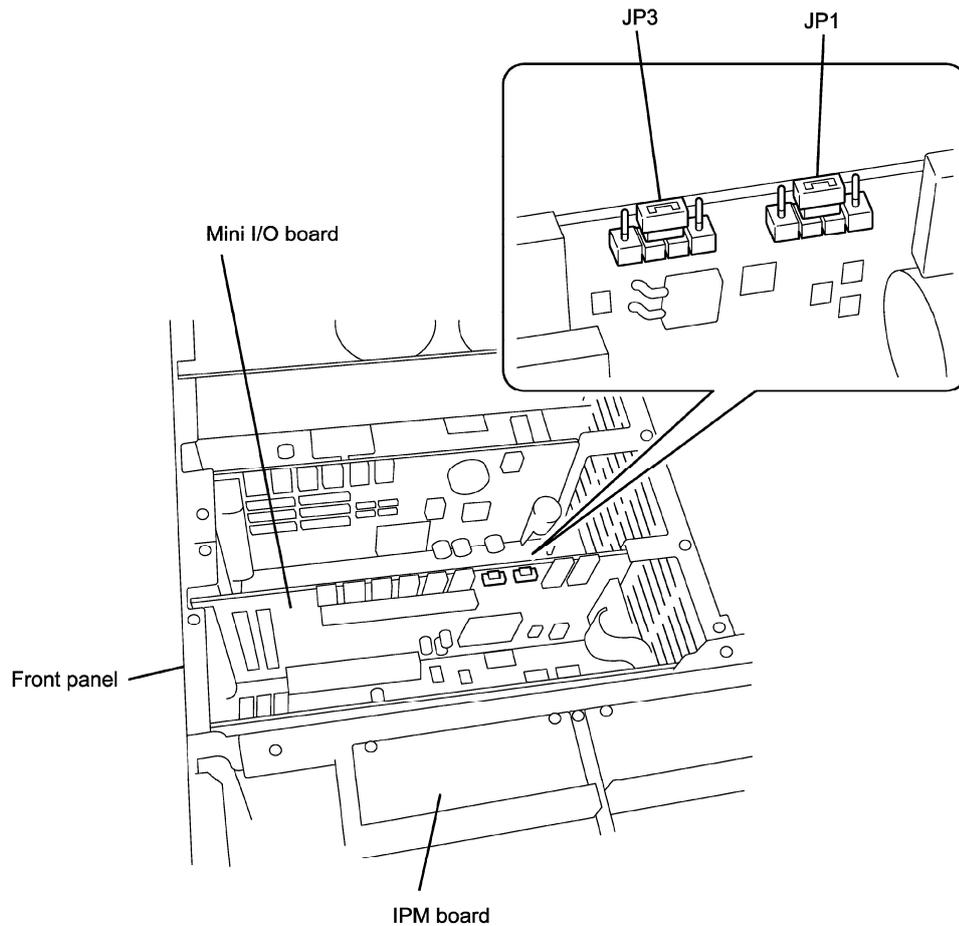
**⚠ Caution:** To use Pendant Emergency Stop output signals, be sure to supply 24 V to terminals #13 and #14.

## 5.2 Robot Controller I/O Circuits (PNP type)

### 5.2.1 Setting up Mini I/O Power Supply

The power supply (+24 VDC) for the Mini I/O can be switched between internal and external power sources by changing the jumper switch setting as listed below. The factory default is external power source setting.

Power supply for I/O	Jumper switches JP1 and JP3 on the controller printed circuit board		Description
External source	Short-circuit pins 2 and 3 (factory default)		Do not change the factory default setting.
Internal source	Short-circuit pins 1 and 2, and pins 3 and 4		Remove the controller top cover and change the JP1 and JP3 settings with short sockets that come with the robot.



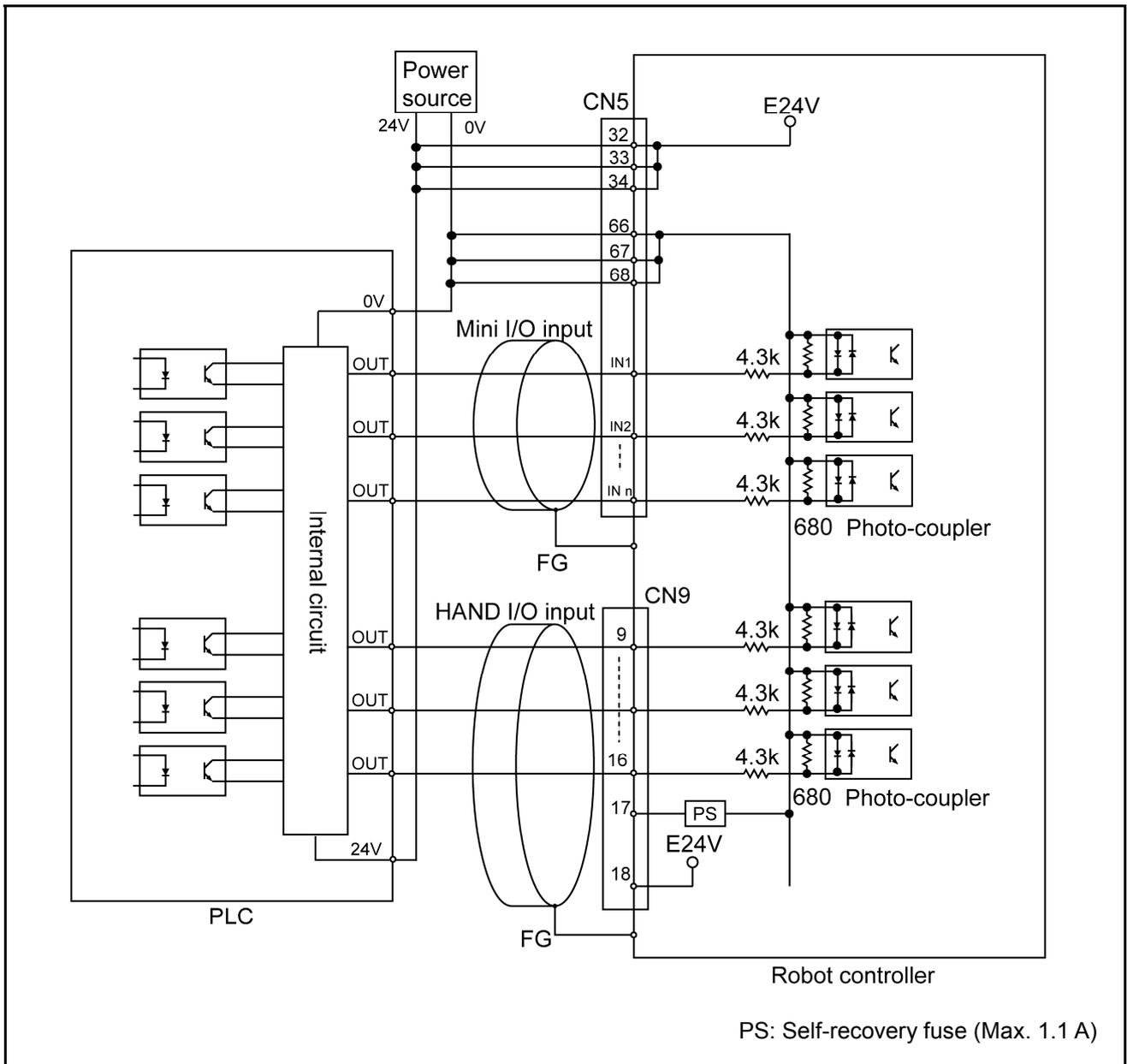
**Note:** Switching the power supply setting for I/O from external to internal changes the assignment to terminals #32 to #34 and #66 to #68 on CN5 from external DC power input to internal DC power output. For details, refer to the circuit configuration examples in Sections 5.2.2 and 5.2.3.

## 5.2.2 User-Input, System-Input and Hand-Input Circuits (PNP type)

The figure below shows examples of the user-input, system-input and hand-input circuit configurations and connections of the robot controller.

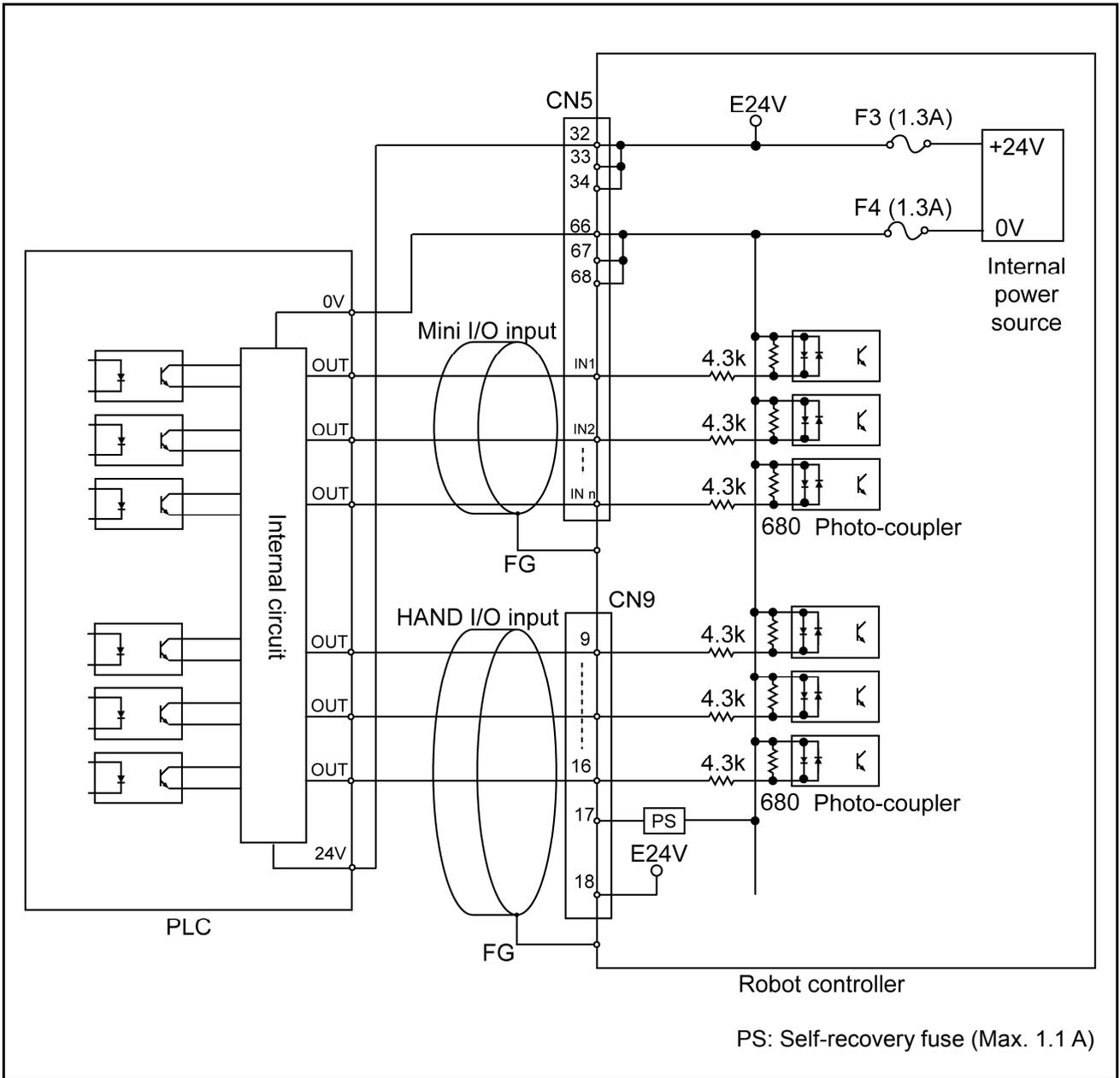
### Notes

- (1) In addition to PLCs, proximity switches and relay contacts can be directly connected to the input terminals of the robot controller. Note that the leakage current from the proximity switches should be 1 mA or below.
- (2) Use multi-core shielding cables for protecting the controller from external noise and ground them at the controller side.



(When the external power source is used)

### User-Input, System-Input and Hand-Input Circuits (PNP type)



(When the internal power source is used)

**User-Input, System-Input and Hand-Input Circuits (PNP type)**

### 5.2.3 User-Output, System-Output, and Hand-Output Circuits (PNP type)

The following pages show examples of the configuration and connection of the robot controller's user-output, system-output and hand-output circuit.

(1) The User-Output, System-Output and Hand-Output Circuits are open collector output circuits.

(2) The maximum allowable source current is 70 mA.

Keep the current consumption of a device to be connected to the Robot Controller, such as a PLC and a relay coil, below the allowable current.

(3) Select an induction load, such as a relay coil, which has a built-in diode (for absorbing inverse electromotive force).

To use an induction load without a built-in diode, add a diode equivalent to the 1S1888 (Toshiba) in close vicinity to the coil.

 **Caution:** When externally attaching a diode, connect it with correct polarity. Incorrect polarity may damage the output circuit.

(4) Connecting a lamp requires a circuit through which dark current flows and use a lamp whose rating is 0.5W or less.

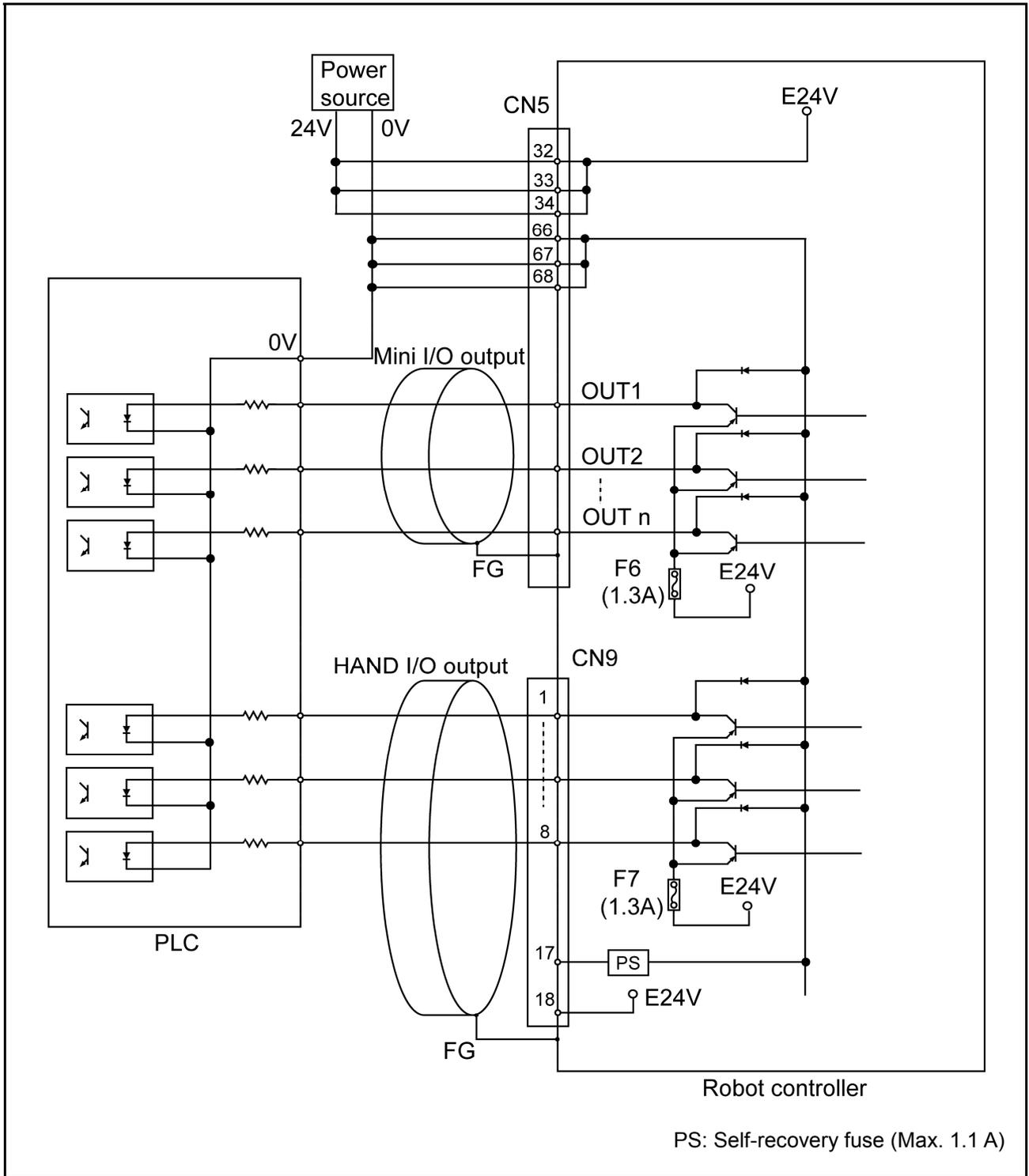
 **Caution:** Since the initial resistance of a lamp is small, the output circuit may be damaged by rush current that flows when the lamp lights. To reduce rush current, select and connect a resistor R that allows dark current 1/3 or less of the rated current to flow when the lamp goes OFF. Refer to next page.

(5) Use a multi-core shielding cable for the purpose of protecting the devices from external noise. Ground it to the robot controller.

(6) +24V internal power source of the robot controller must not be grounded.

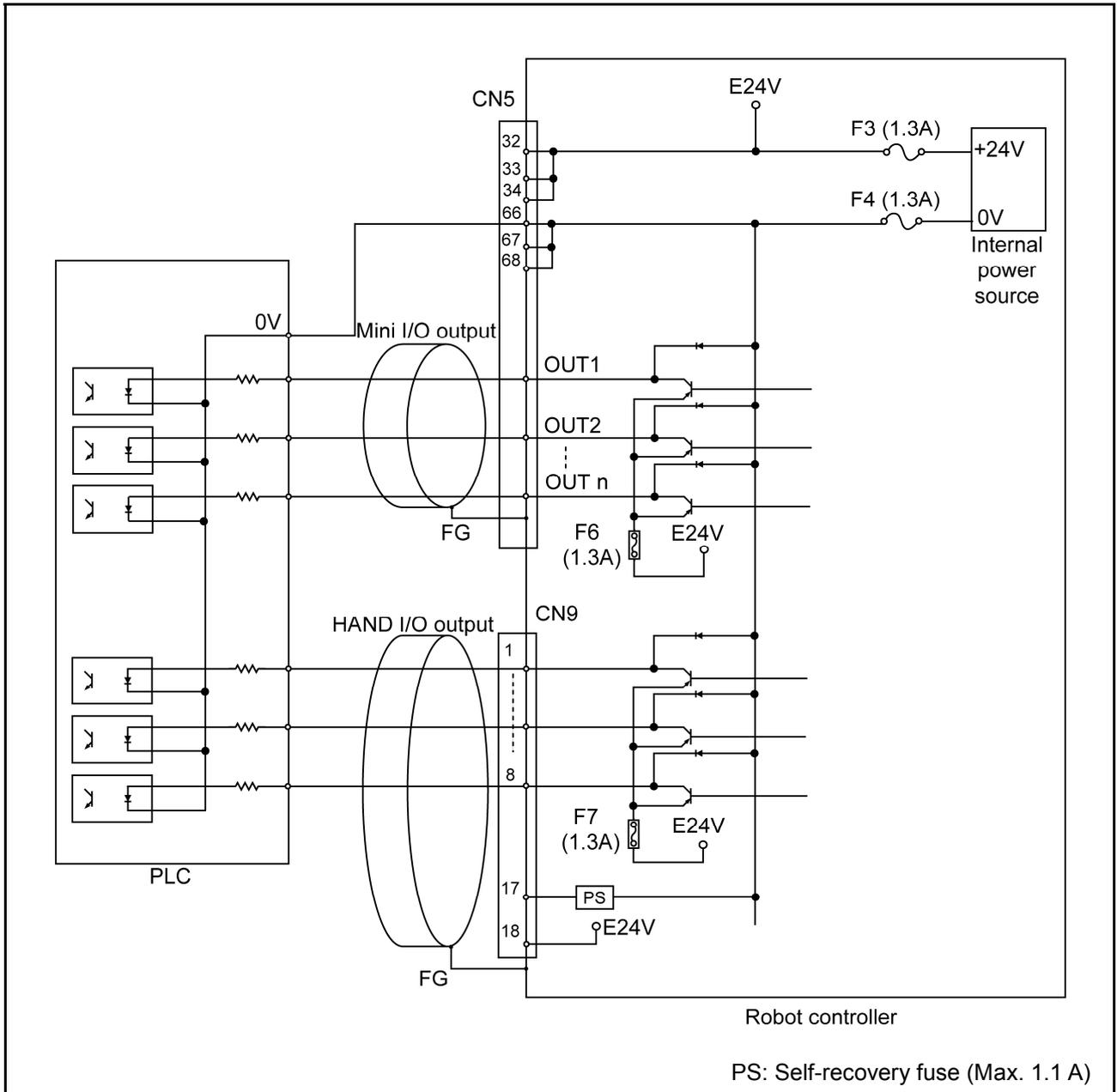
 **Caution:** If the output terminal +24V of internal power source is grounded, there may be a case where the controller is damaged.

(7) For three seconds after the controller power is turned on, the I/O board will be in a transient state, so do not use its output as valid signals.

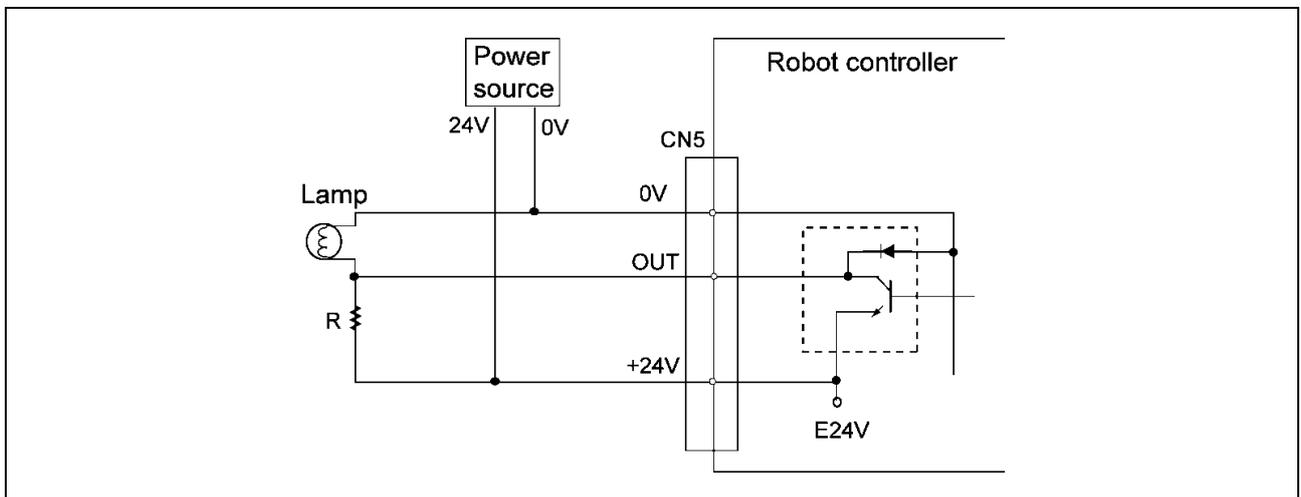


(When the external power source is used)

**User-Output, System-Output and Hand-Output Circuits (PNP type)**



**(When the internal power source is used)**  
**User-Output, System-Output and Hand-Output Circuits (PNP type)**



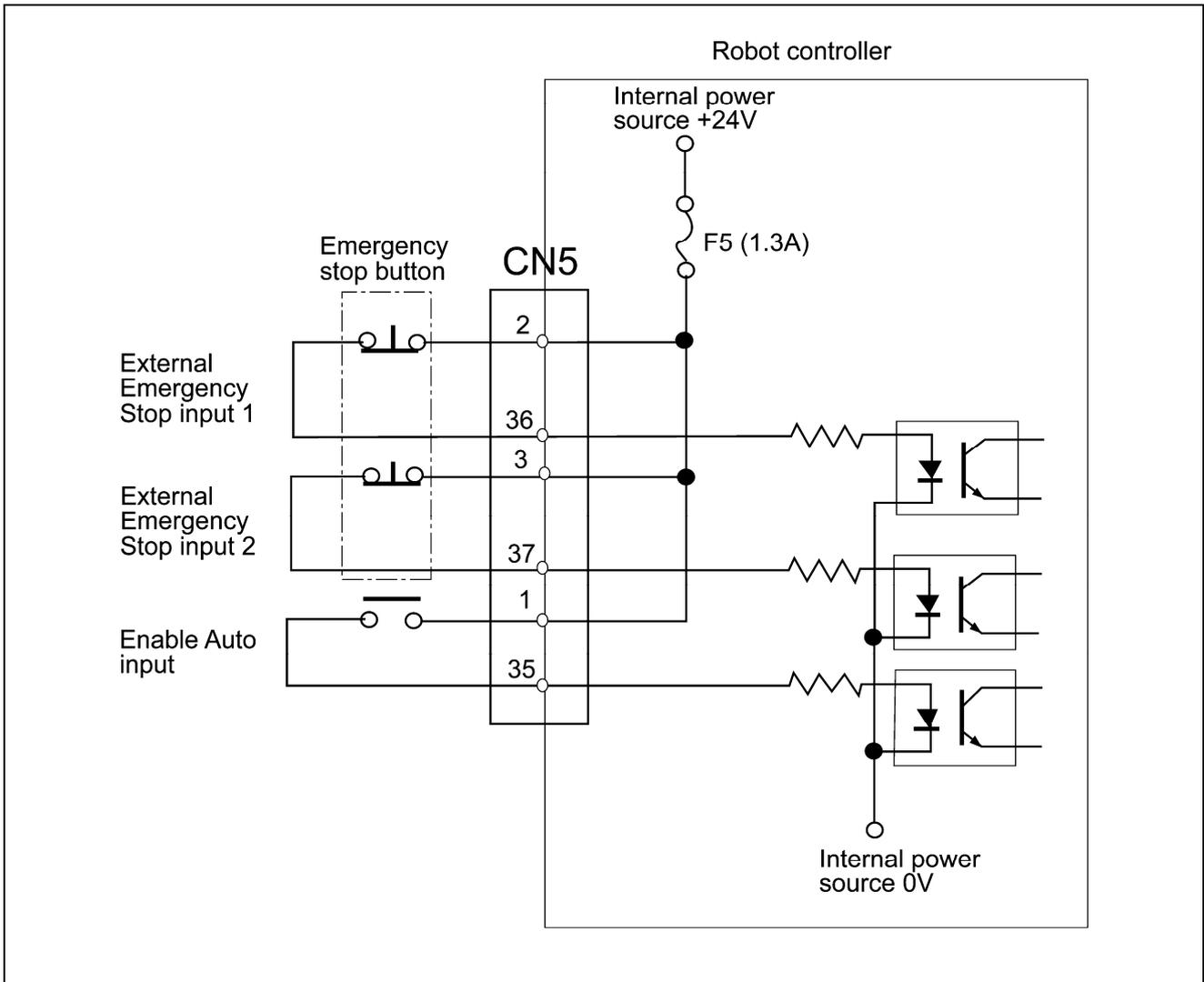
**Example of Circuit with Lamp (PNP type)**

## 5.2.4 Configuration of Emergency Stop Circuitry (Standard type of controller)

### 5.2.4.1 External Emergency Stop and Enable Auto Input Circuits (Standard type of controller)

The *External Emergency Stop* and *Enable Auto* input signals are important for safety. Be sure to configure their circuits with contacts as shown below.

**TIP:** For the overall configuration sample of an emergency stop circuitry, refer to Section 5.2.4.2 "Emergency Stop Circuit."



**External Emergency Stop and Enable Auto Input Circuits (Standard type of controller)**

## 5.2.4.2 Emergency Stop Circuit (Standard type of controller)

The following figure shows the example of configuration and connection of emergency stop circuit on the standard type of the controller. In the RC7M controller, the emergency stop circuit consists of dual safety circuits.

The emergency stop button on the teach pendant can be used also as an emergency stop switch of the equipment.

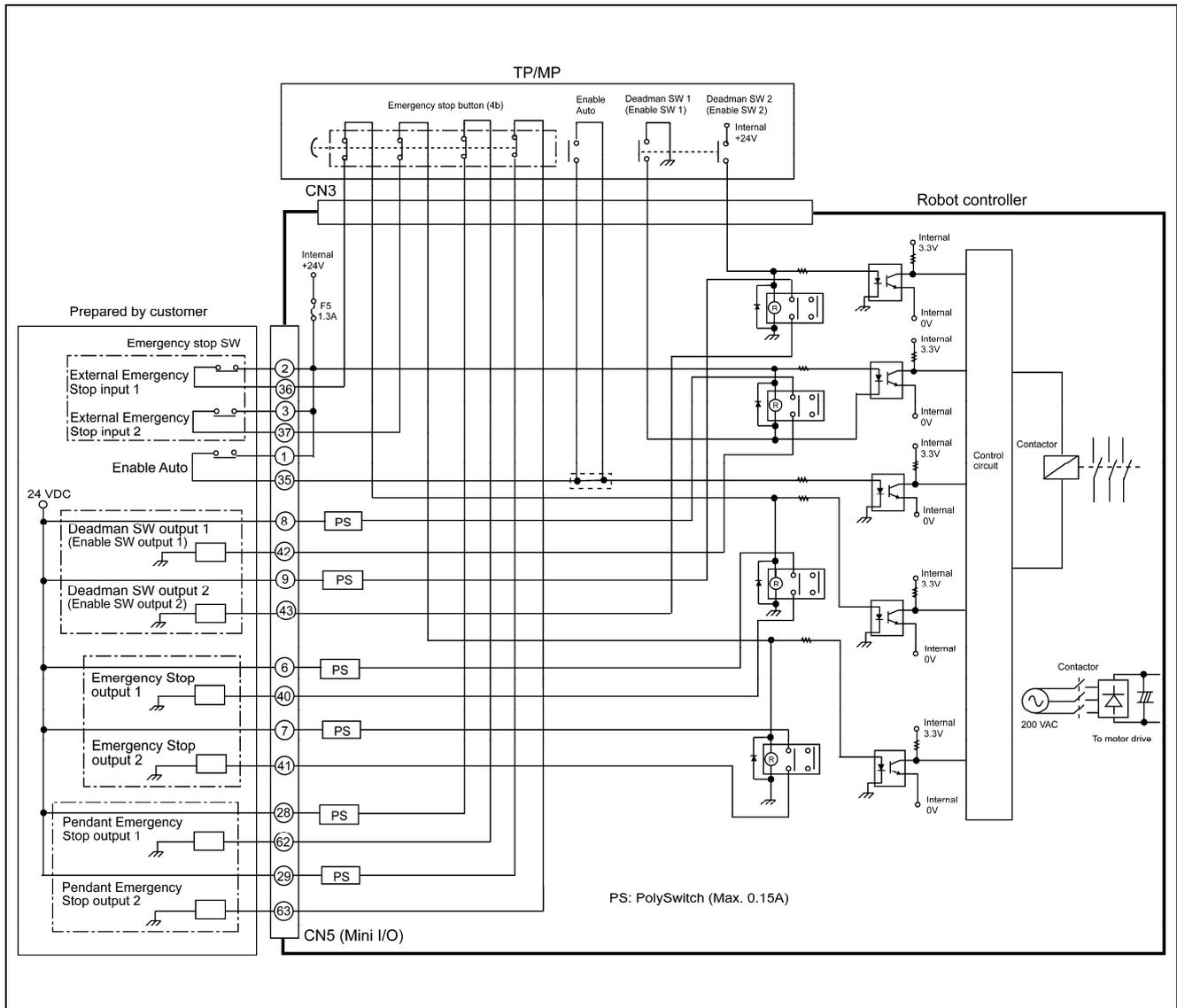
### Emergency Stop and Pendant Emergency Stop output signals

#### (1) Emergency Stop output signal

The internal relay receives the *External Emergency Stop* input signal and the emergency stop input from the teach pendant to output this signal. When the power is turned OFF, the controller is in the emergency stop state.

#### (2) Pendant Emergency Stop output signal (Dry output)

The two contacts on the emergency stop button (4b) on the teach pendant are connected. This signal will be issued independent of the ON/OFF state of the controller power.



Emergency Stop Circuit in the RC7M Controller (Standard type of controller)

## 5.2.5 Configuration of Safety Circuit (Global type of controller)

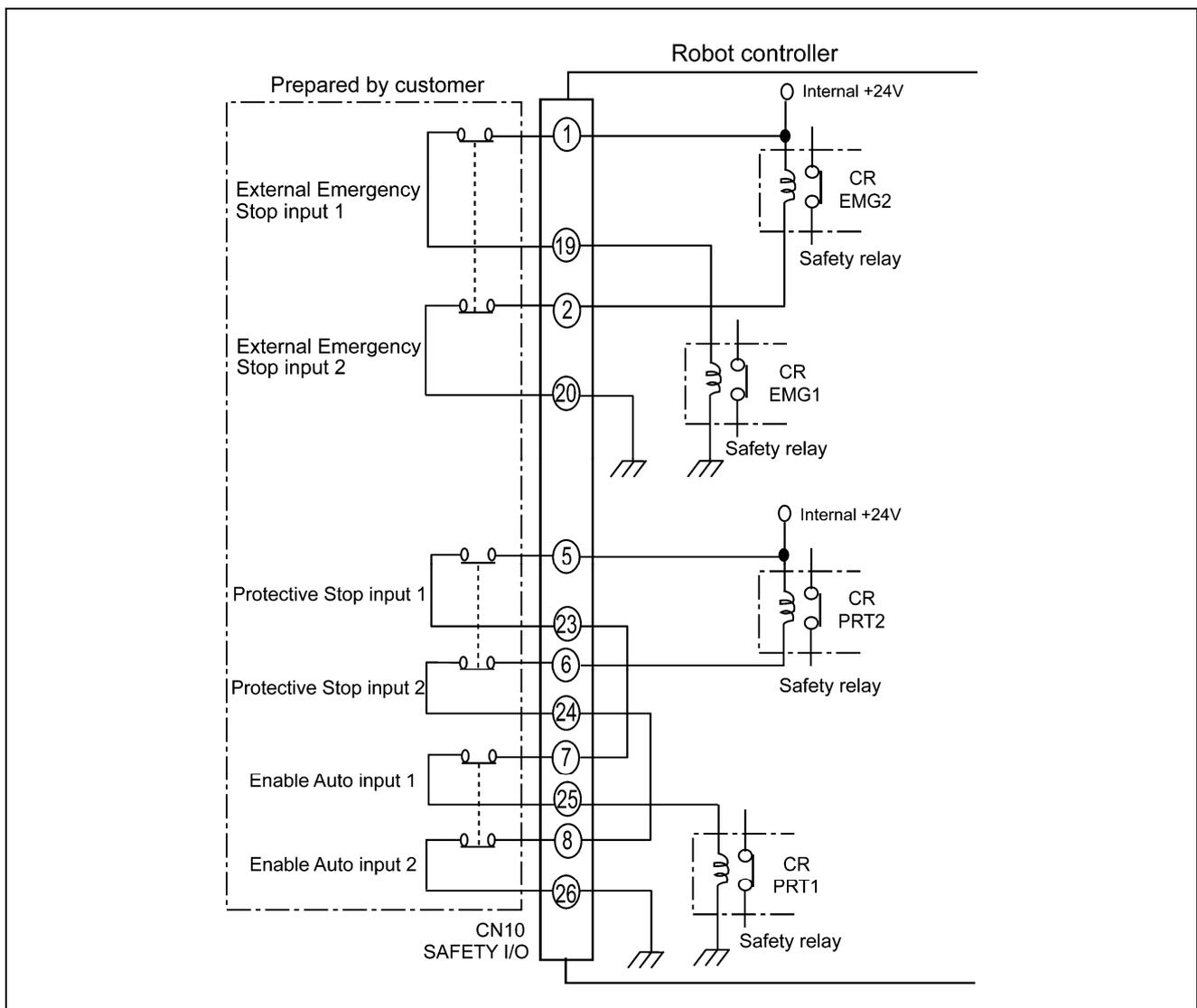
### 5.2.5.1 Input Circuit to the Safety Circuit

Input signals to the safety circuit are important for safety. Be sure to configure their circuits with contacts as shown below, observing the notes given below.

**Note:** For the overall configuration sample of a safety circuitry, refer to Section 5.2.5.2 "Safety Circuit."

#### Precautions on Connecting the Safety I/O (CN10)

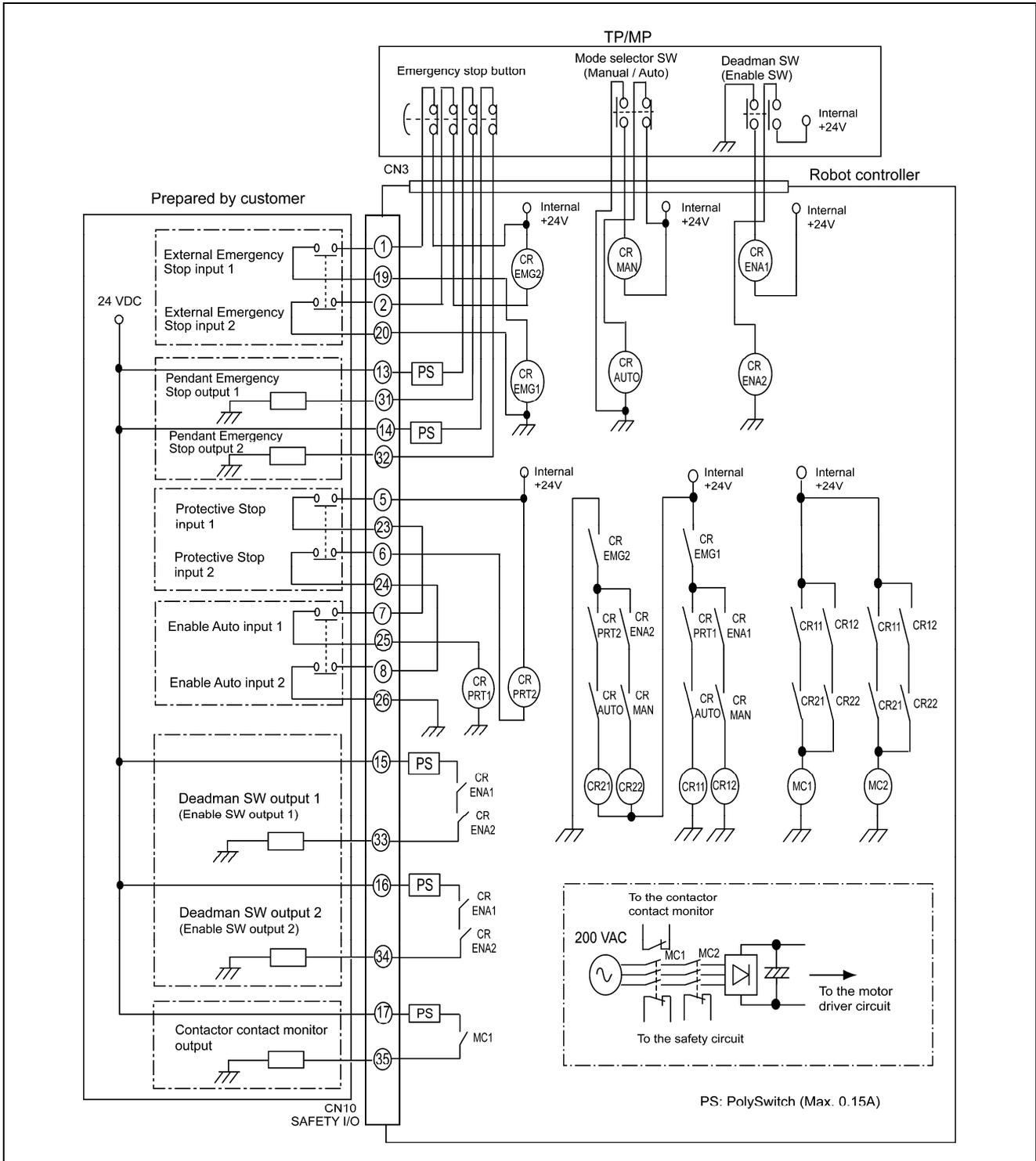
- (1) Two *External Emergency Stop* input signals must be controlled with separate contacts. Two circuits connected in parallel using a single contact or an always-shorted circuit will be interpreted as an external circuit failure so that the emergency stop state cannot be reset.
- (2) Two *Protective Stop* input signals and two *Enable Auto* input signals each must be controlled with separate contacts. Two circuits connected in parallel using a single contact or an always-shorted circuit will be interpreted as an external circuit failure so that the circuitry will not operate.
- (3) The *Enable Auto* and *Protective Stop* input signals are connected in series in the controller, so two types of inputs are available as an automatic operation permission signal.
- (4) Switching the *External Emergency Stop*, *Protective Stop*, and *Enable Auto* input signals from open to close does not require temporal conditions, but requires any action to switch.



Input Circuits to the Safety Circuits (Global type of controller)

## 5.2.5.2 Safety Circuit (Global type of controller)

The figure below shows an internal connection equivalent circuit for the safety circuit in the global type of the controller. The actual safety circuit is configured with safety relays and others.



### Safety Circuit in the RC7M Controller (Global type of controller)

**Note:** Different stop states resulting from emergency stop input, *Protective Stop*, and *Enable Auto (OFF)*

- (1) The emergency stop input (*External Emergency Stop* or teach pendant/mini-pendant input) shuts down the power to the motor and resets the program, provided that the Continue parameter is set to the default (0: Disable) in Continue setting.
- (2) The *Protective Stop* or *Enable Auto (OFF)* input signal shuts down the power to the motor and places the robot in the Continue Stop state.

### 5.3 Wiring Notes for Controller I/O Connectors (PNP type)

After the wiring of the controller's I/O connectors is completed, check the following before turning ON the power:

**Check point (1)**

Using a circuit tester, check across the "+24V terminal" and "0V terminal" of each connector and across the "E24V terminal" and the "E0V terminal" to see that there is no continuity.

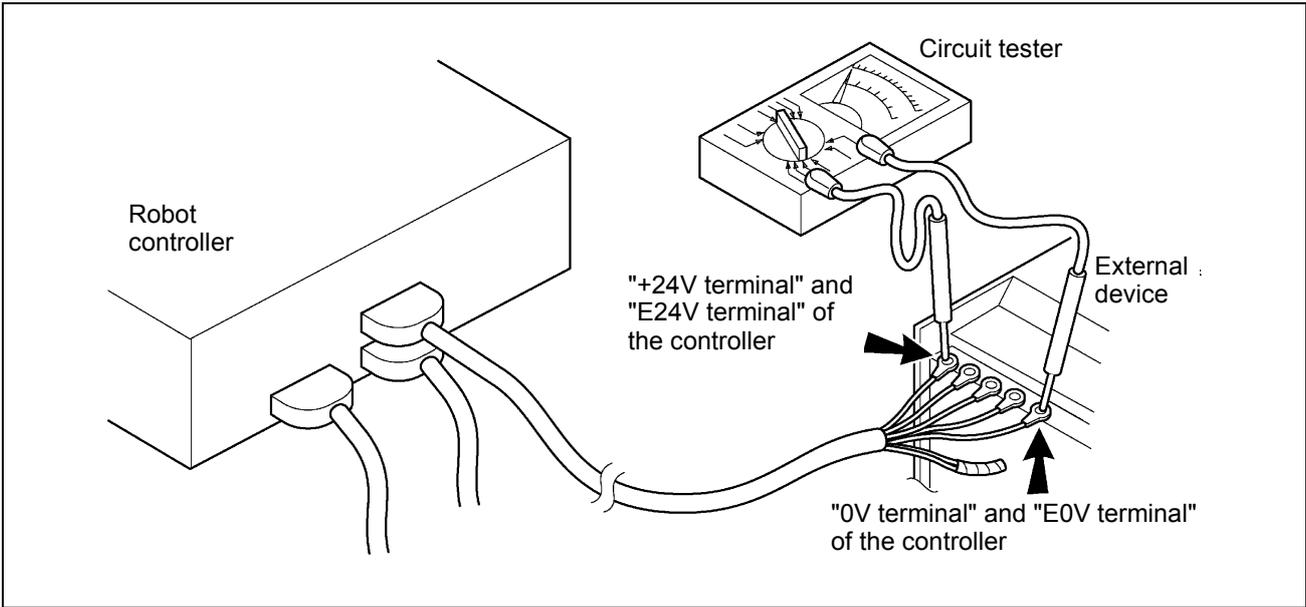
**⚠ Caution:** If the connector wiring between the Robot Controller's "+24V terminal" and "0V terminal" and between the "E24V terminal" and the "E0V terminal" is shorted, damage to the power circuit of the Robot Controller will result.

**Check point (2)**

Using a tester, check across "each signal output terminal" and "+24V terminal" or "E24V terminal" of each connector to see that there is no continuity.

**⚠ Caution:** If the wiring between "each signal output terminal" and "+24V terminal" or "E24V terminal" of each connector is shorted, damage to the Output circuit and power circuit of the Robot Controller will result.

**⚠ Caution:** Wind adhesive vinyl tape around all ends of the unconnected wiring of each connector to prevent them from contacting other wiring and parts, which results in shorting.



Checking Example

<b>Mini I/O connector (CN5)</b>				
<p style="text-align: center;"><b>View from the cable side</b></p>				
Terminal Number	Name		Meaning	Check point
1 to 3	+24V internal power source terminal		+24V internal power output	(1)
45 to 60	Signal output terminal		24 V at output	(2)
32 to 34	External power source	+24 VDC power source input	24 VDC power input	(1)
	Internal power source	+24 VDC power source output	24 VDC power output	(1)
66 to 68	External power source	0 VDC power source input	DC power input (GND)	(1)
	Internal power source	0 VDC power source output	DC power output (GND)	(1)

<b>HAND I/O connector (CN9)</b>				
<p style="text-align: center;"><b>View from the cable side</b></p>				
Terminal Number	Name		Meaning	Check point
1 to 8	Hand output terminal		24 V at output	(2)
17	Power output terminal (+0 VDC) (External/internal source)		DC power output (GND)	(1)
18	Power output terminal (+24 VDC) (External/internal source)		24 VDC power output	(1)

# Chapter 6 Installation and Maintenance of the RC7M Controller

## 6.1 Supplies for the Controller

The table below lists the supplies for the RC7M controller.

**List of Supplies for the RC7M Controller**

No.	Name	Part Number	Remarks
1	Air inlet filter set	410053-0100	For standard type (FS-1705W)
		410053-0110	For global type (FS-1705)
2	Memory backup battery	410076-0261	For backup of the controller memory
3	Fuse (1.3A)	410054-0230	Fuse (LM13) for controller I/O
4	IC for output (NPN)	410077-0010	IC (M54522P) for controller output
5	IC for output (PNP)	410077-0020	IC (M54564P) for controller output

## 6.2 Mounting the Controller

### 6.2.1 Installation Requirements for the Controller

The table below lists the installation requirements for the RC7M controller.

**Installation Requirements for the RC7M Controller**

Item	Environmental Requirements
Installation type	Stand-alone and Wall-mount
Ambient temperature	In operation: 0 to 40°C In storage or during transportation: -10 to 60°C
Humidity	In operation: 90% or less (No dew condensation is allowed.) In storage or during transportation: 75% or less (No dew condensation is allowed.)
Safe installation environment	The robot should not be installed in an environment where: <ul style="list-style-type: none"> <li>• there are flammable gases or liquids,</li> <li>• there are any acidic, alkaline or other corrosive material,</li> <li>• there is a mist, or</li> <li>• there are any large-sized inverters, high output/high frequency transmitters, large contactors, welders, or other sources of electrical noise.</li> </ul>
Working space	Sufficient service space must be available for inspection and disassembly.
Grounding conditions	Grounding resistance (protective ground): 100Ω or less

## 6.2.2 Mounting the Robot Controller

Before mounting the robot controller to the target position, you need to secure the robot controller to the controller mounting panel.

The robot controller supported by the mounting panel may be either stand-alone or wall-mounted.

**⚠ Caution** (1) When using the robot controller in any environment where there is mist, put the controller in an optional robot controller protective box. The robot controller is not dust-proof, splash-proof, or explosion-proof. Set up the controller at the place where it is easy to replace the memory backup battery and air filters.

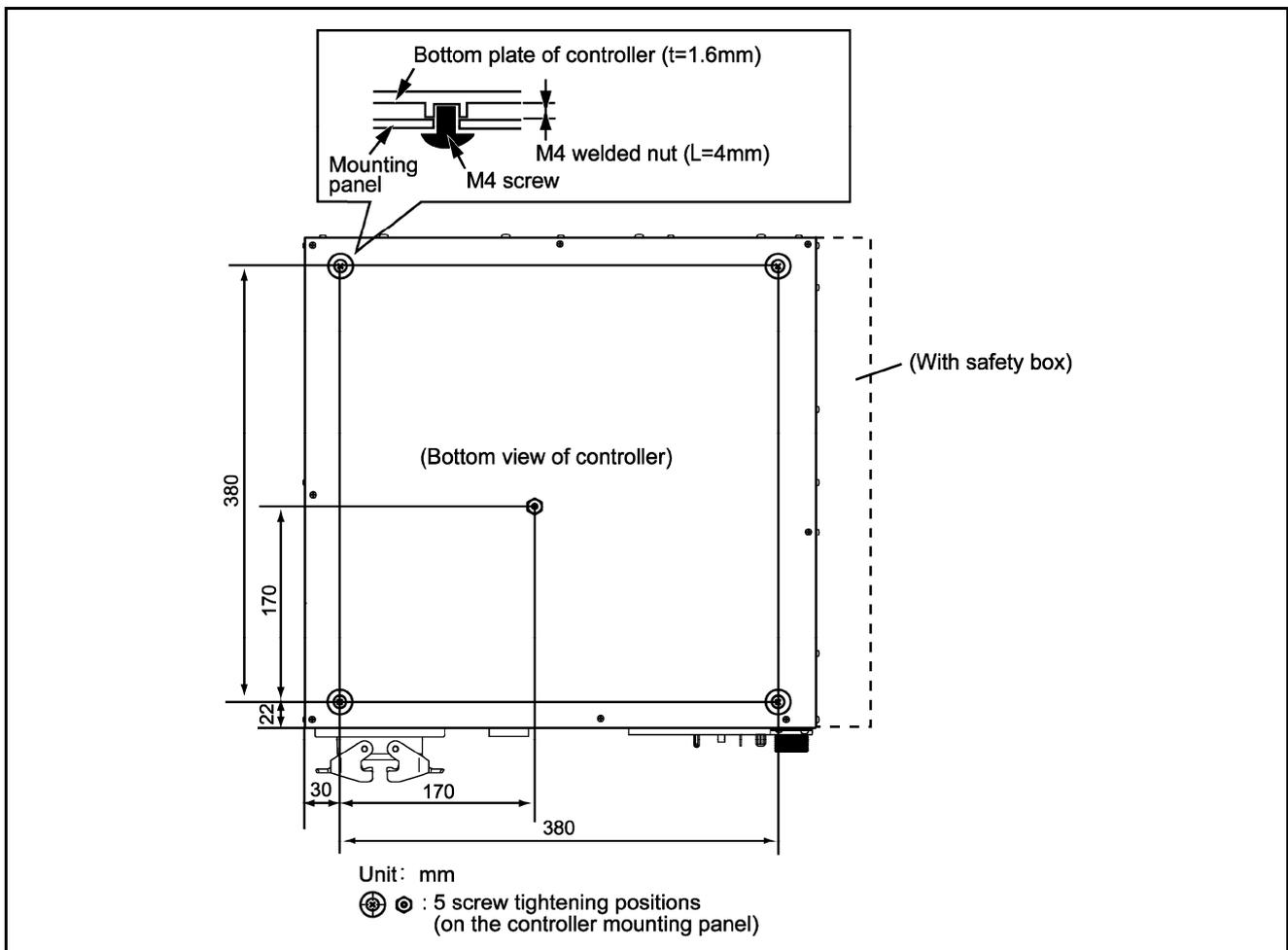
(2) The installation jobs should be handled by at least two persons.

### [ 1 ] Securing the Robot Controller to the Controller Mounting Panel

- (1) The figure below shows the bottom view of the robot controller. Five M4-nut welded holes may be used for securing the robot controller to the mounting panel.
- (2) Prepare a mounting panel large enough for mounting the robot controller and secure the robot controller onto the mounting panel using five screws.

**⚠ Caution** (1) The controller mounting screws must not be more than the thickness of the mounting panel plus 4 mm in length. If their length is out of the specified range, the nut welded holes may be damaged.

(2) Fix the robot controller at all of the five nut-welded holes.



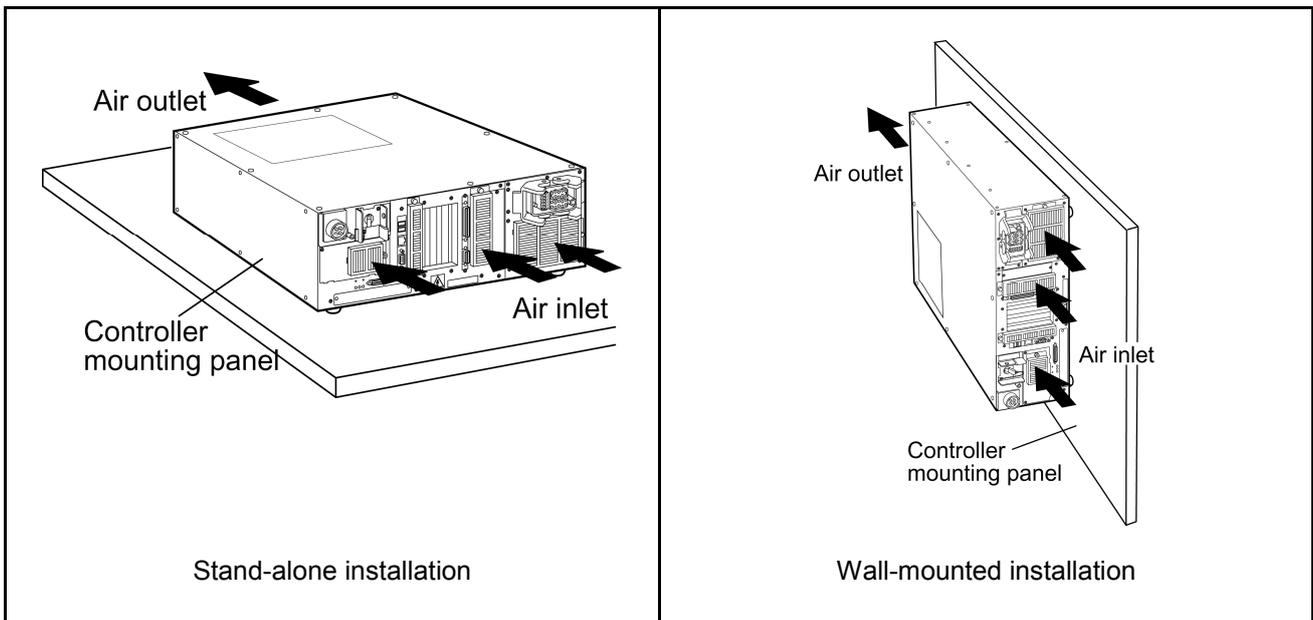
Location of Mounting Screw Holes (on the bottom of the robot controller)

## [ 2 ] Installing the Robot Controller

The robot controller can be installed stand-alone or on the wall.  
Set up the robot controller as shown in the figure below.

**⚠ Caution** Do not place anything within 200 mm from the air inlet and outlet of the robot controller.

**⚠ Caution** The robot controller has no air filter on the air outlet side. In wall-mounted installation, therefore, to prevent free-fall dust or dirt from getting into the controller, set up the controller with the air outlet side not facing upward as shown below.



Setting up the Robot Controller

## 6.3 I/O and AC Input Wiring

### 6.3.1 Multi-core Cables with Connectors

Multi-core cables with connectors to be used for the I/O wiring of the Robot Controller are options. Select an appropriate cable from the table given below if necessary.

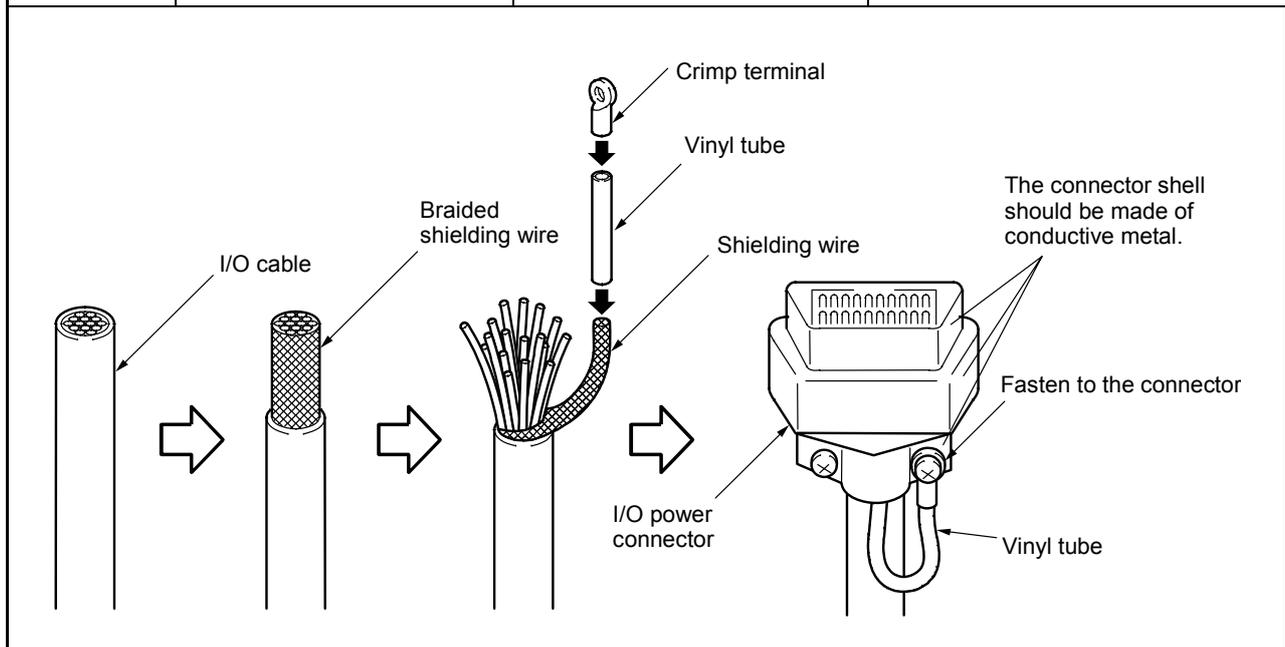
I/O Cables (Options)

No.	Name	Part Number	Remarks
1	Standard I/O cable set (8m)	410149-0940	Including Nos. 1-1 and 1-2
1-1	Mini I/O cable set (8m)	410141-2700	Connector set: 410159-0190
1-2	Hand I/O cable set (8m)	410141-1740	
2	Standard I/O cable set (15m)	410149-0950	Including Nos. 2-1 and 2-2
2-1	Mini I/O cable set (15m)	410141-2710	Connector set: 410159-0190
2-2	Hand I/O cable set (15m)	410141-1750	

If you do not use optional cables listed above, use the recommended connectors and cables listed below.

Recommended Connectors for I/O Cables and Cable Standards

Connector name	Connector model/manufacturer	Cable Standards	Remarks
Mini I/O	PCR-E68FS connector PCS-E68LPA-1E cover (HONDA TSUSHIN KOGYO Co., LTD)	UL2789 - With shield Equivalent to AWG28x34P	<b>Caution:</b> Be sure to modify the shielding wire at the end of the cable to be used, as shown below. Without this modification, the robot may malfunction due to noise.
HAND I/O	PCR-E20FS connector PCS-E20LA cover (HONDA TSUSHIN KOGYO Co., LTD)	UL2789 - With shield Equivalent to AWG28x20P	



Modifying the Shielding Wire (Example)

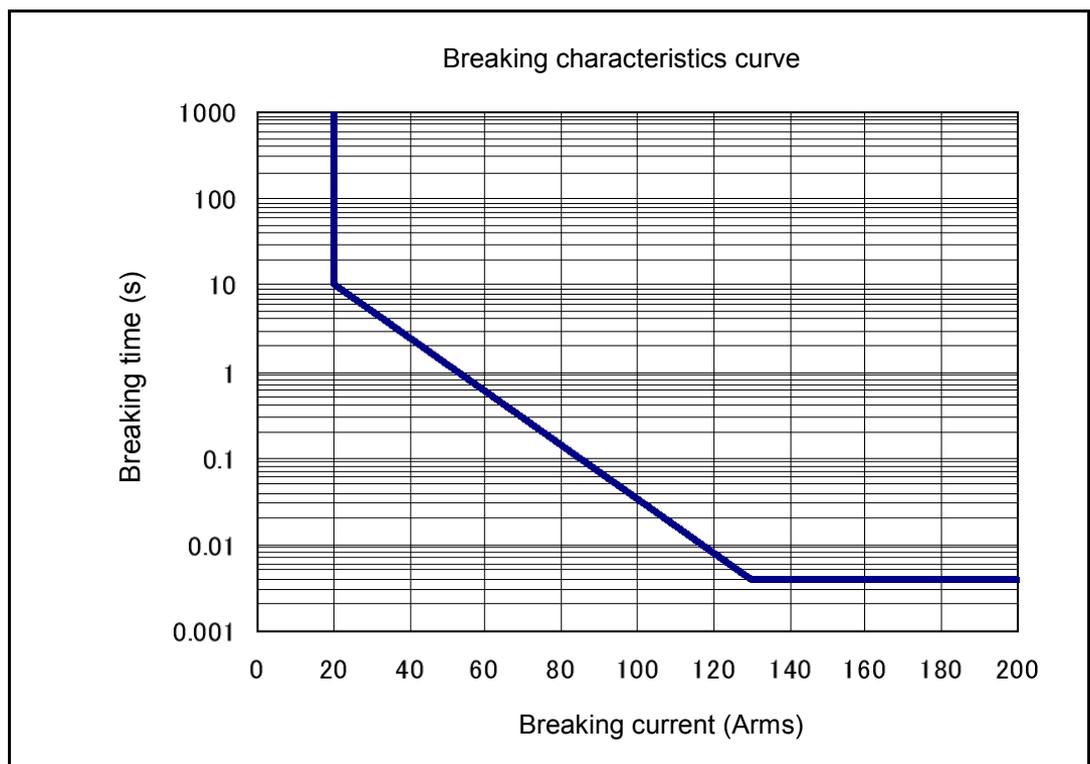
## 6.3.2 Wiring of Primary Power Source

Observe the following precautions when wiring the primary power source of the robot controller:

- (1) Connect the robot power cable to a power source separate from the welder power source.
- (2) Ground the protective grounding wire (green/yellow) of the robot power cable.
- (3) Ground the functional grounding terminal of the robot controller using a wire of 1.25 mm<sup>2</sup> or more in size.
- (4) For the robot power supply, use a protective grounding wire with grounding resistance of 100Ω or less.
- (5) If the supply power source for the robot controller requires a leakage breaker, use a high frequency-proof leakage breaker for inverters.
- (6) When inserting a circuit breaker between the robot and the AC input power supply, select the circuit breaker with breaking capacity higher than the following specification.

Recommended circuit breaker example: CP33V/20 (Fuji Electric FA Components & Systems Co., Ltd.)

**Caution:** Using a circuit breaker with breaking capacity lower than the following specification may cause the circuit breaker to be shut down due to robot operation.



**Circuit Breaker Characteristics**

- (7) Prepare wires of an appropriate capacity for the 200/100 VAC main line and other cables according to the tables given below.

### Robot Controller Power Supply Specifications

Item		Specifications	Pin assignment on power connector (CN6) (View from the pin face of cable)		
Power supply	Three-phase, 200 VAC	Three-phase, 200 VAC -15% to 230 VAC +10%, 50/60 Hz		A: 200 VAC, phase R B: 200 VAC, phase S C: 200 VAC, phase T D: Protective ground	
	Power supply capacity	VMG6BA: 3.3 kVA			VSG6BA: 1.85 kVA
		VPG5/6CA: 1 kVA			HMG4BA: 2.45 kVA
		HSG4BA: 1.8 kVA			XYCG4AA: 1.15 kVA
		XRG4BA: 1.8 kVA			VS-050/060: 1.15 kVA
			VS-068/087: 2.78 kVA		
	Single-phase, 200 VAC	Single-phase, 230 VAC -10% to 230 VAC +10%, 50/60 Hz		A: 200 VAC, phase R B: 200 VAC, phase S D: Protective ground	
	Power supply capacity	VSG6BA: 1.85 kVA			VPG5/6CA: 1 kVA
		HMG4BA: 2.45 kVA			HSG4BA: 1.8 kVA
		XYCG4AA: 1.15 kVA			XRG4BA: 1.8 kVA
VS-050/060: 1.15 kVA					
VS-068/087: 2.78 kVA					
Single-phase, 100 VAC	Single-phase, 100 VAC -10% to 110 VAC +10%, 50/60 Hz		A: 100 VAC, phase R B: 100 VAC, phase S D: Protective ground		
Power supply capacity	VPG5/6CAA: 1 kVA				
Max. rush current when the power is turned ON		40 A (for 1/50 or 1/60 second)			

**Caution: If ERROR6102 (power voltage drop) occurs when the robot is in operation, then it may be due to an insufficient capacity of the primary power source.**

- (8) Do not bundle the teach pendant cables, I/O cables or motor cables together with high power lines such as 200/100 VAC lines and peripheral device cables, or route the motor cables near high power devices (motor, welder, parts feeder, etc.).
- (9) Do not route any additional cables or air tubes of end-effectors through the robot unit. Doing so will result in broken cables or tubes.
- (10) Use the correct power source (200 VAC or 100 VAC) for the controller specification.

### 6.3.3 Disconnecting the Robot from the Power Source

If you need to cut off the power supply from the robot unit for maintenance or transportation purpose, follow the steps below for safety.

**Step 1** | Turn OFF the power switch of the robot controller.

**Step 2** | Check that the motor ON lamp is OFF.

**Step 3** | Disconnect the power cable from connector CN6 on the robot controller.

## 6.4 Cleaning the Air Intake Filters

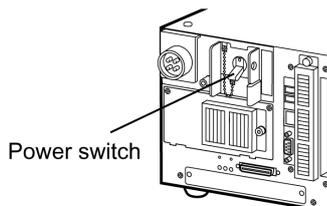
The robot controller has three air intake filters.

If those filters are clogged, the robot controller becomes insufficiently ventilated so that the internal electronic devices may be damaged due to heat.

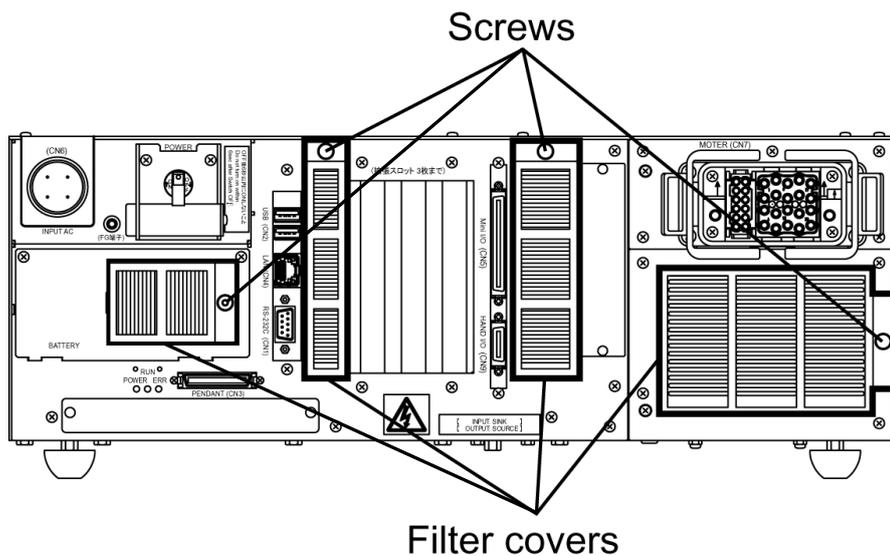
If a power module error appears, it may be caused by clogged filter, so clean the filter.

### <Cleaning Procedures>

**Step 1** Turn the controller power OFF.

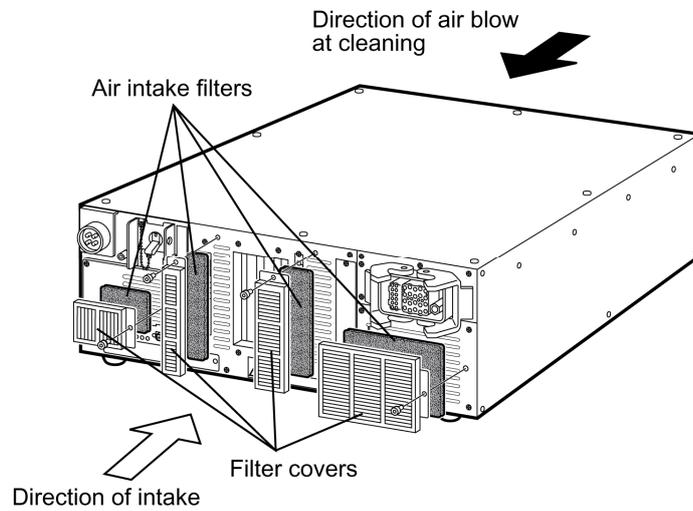


**Step 2** Remove the four filter covers from the front panel by loosening the screw each.



**Step 3** Blow compressed air to the filter in the direction opposite to the regular air- flow.

**Note:** Use dehumidified, oil-free, pure compressed air for cleaning.



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

**Notes** (1) Dry the washed filter completely before mounting it.  
(2) If the filter is still dirty after air blowing or washing, replace it with new one.

**Step 4** Set the filters back into place in the reverse order of removal.

## 6.5 Replacing the Memory Backup Battery

Programs, parameters, CAL data, etc. are stored in the internal memory of the robot controller.

The memory backup battery retains the above data while the power to the robot controller is turned OFF. However, the battery has a limited lifetime and must, therefore, be replaced regularly.

**Note:** If two years elapse from replacement of backup battery, the "Time to change controller backup battery" message will appear on the teach pendant.

**⚠ Caution: Without replacing the memory backup battery, important robot-specific data held in the memory will be lost.**

**This caution applies ONLY in CALIFORNIA, USA.  
Perchlorate Material – special handling may apply,  
See [www.dtsc.ca.gov/hazardouswaste/perchlorate](http://www.dtsc.ca.gov/hazardouswaste/perchlorate)**

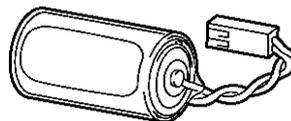
### 6.5.1 Replacing procedures

This section gives an example of replacing the memory backup battery.

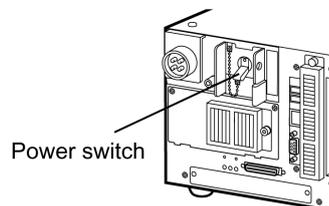
**Caution: Before replacing the memory backup battery, be sure to save the memory data in the robot controller to the PC.**

**Step 1** Save the memory data held in the controller to the PC.

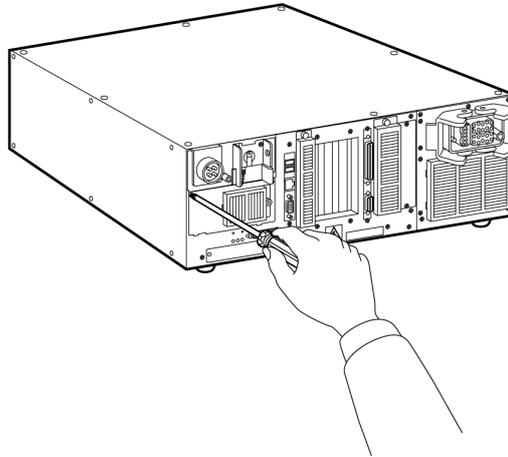
**Step 2** Make a new memory backup battery ready for use.



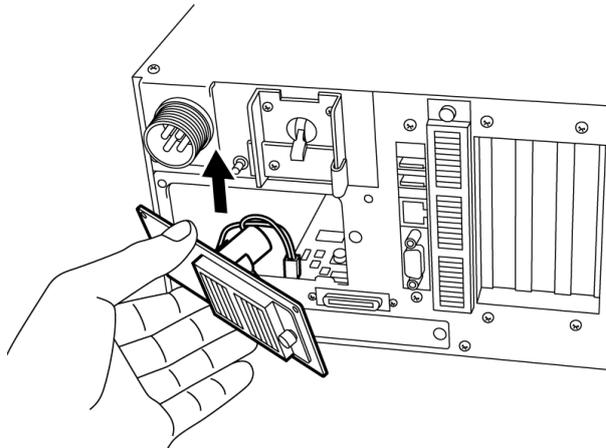
**Step 3** Turn the controller power ON, wait at least one minute, and then turn it OFF again.



**Step 4** Remove two screws from the battery cover and pull them out together with the backup battery.

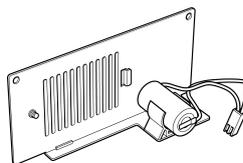


**Step 5** Disconnect the backup battery harness.

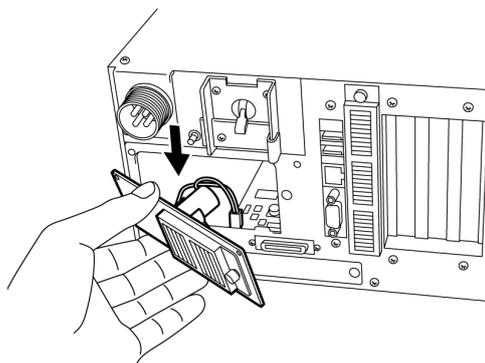


**⚠ Caution** Complete Steps 5 through 7 within three minutes. Taking more time will lose the memory data.

**Step 6** Set the new memory backup battery ready for use in Step 2 on the battery cover.



**Step 7** Connect the backup battery harness to the controller.



**Step 8** Mount the battery cover with the new backup battery into the controller and secure the cover with the screw.

**⚠ Caution** Take care not to pinch the battery lead wires between covers or internal parts. Shorting may occur, resulting in an unexpected failure.

## 6.5.2 Setting the Next Battery Replacement Date

After replacing the memory backup battery, set the next battery replacement date from the teach pendant, according to the following procedure.

**Note:** Check that the system clock of the robot controller shows the correct date beforehand. If it is incorrect, the next replacement date will also become incorrect.

**Step 1** | **On the top screen of the teach pendant, press [F6 Set].**  
The Settings (Main) window appears.

**Step 2** | **Press [F6 Maint.] in the Settings (Main) window.**  
The Maintenance menu appears.

**Step 3** | **Press [F4 Battery] in the Maintenance menu.**  
The Next Battery Replacement Date window appears.  
In the top of the window, the current setting is displayed.  
The date entry areas show the default replacement date that is two years later the current data at which you open this window, assuming that the battery service life is two years.

**Step 4** | **Press OK.**  
**Note:** If you do not want to change the replacement date, press Cancel.  
The message "Are you sure you want to set the next battery replacement date?" appears.

**Step 5** | **Press OK.**  
The screen returns to the Settings (Main) window.

## 6.6 Replacing Fuses and Output ICs

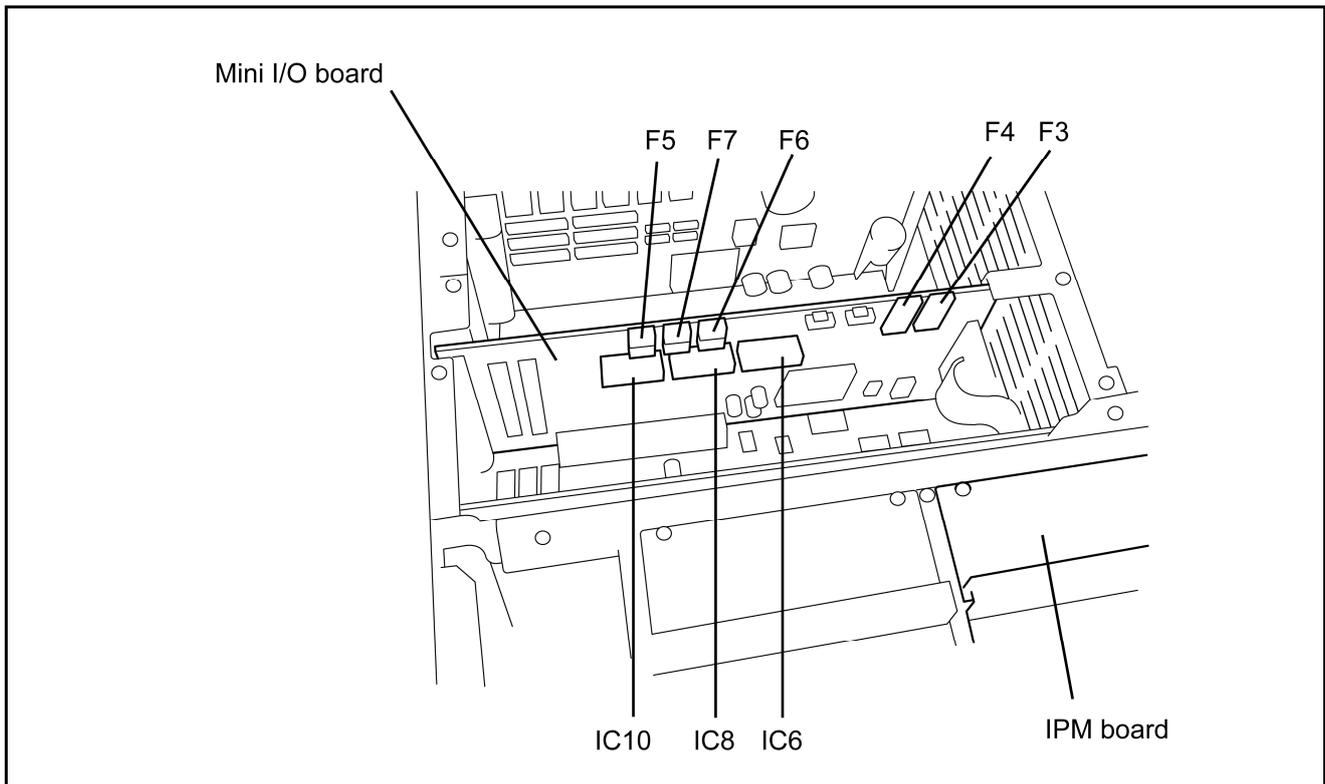
### 6.6.1 Positions of Fuses and Output ICs

The robot controller is equipped with fuses to protect it from external wiring shorted.

If any fuse is blown, replace it according to the following procedure.

If an output signal error persists even after replacement of the output fuse, the related output IC needs to be replaced.

Fuses and output ICs are located in the robot controller as shown in the figure below.



**Positions of Fuses (with the controller top cover removed)**

Fuse	Capacity	Corresponding output connector and terminal No.	Signal name	I/O port No.
F3	1.3 A	Mini I/O, terminals 32 to 34	DC power input +24V (E24V)	---
F4	1.3 A	Mini I/O, terminals 66 to 68	DC power input 0V (E0V)	---
F5	1.3 A	Mini I/O, terminal 1	Power supply for <i>Enable auto</i> (Internal +24V)	---
		Mini I/O, terminal 2	<i>External emergency stop 1b-1</i> (Internal +24V)	---
		Mini I/O, terminal 3	<i>External emergency stop 2b-1</i> (Internal +24V)	---
F6	1.3 A	Mini I/O, terminals 45 to 60	System output/User output	16 to 31
F7	1.3 A	Hand I/O, terminals 1 to 8	Hand output	64 to 70

**⚠ Caution** F2 fuse is provided for protecting the circuitry from getting damaged if a voltage of 30V or above is applied to the 24V external power source terminals. F2 fuse is not mounted on a Mini I/O board in controllers whose product number is 02H018 or later (short-circuited instead).

The table below lists the output ICs and fuses for the Mini I/O (CN5) and HAND I/O (CN9). If an output signal error occurs, check the corresponding fuse.

**Note:** The Emergency Stop and Deadman output circuits use PolySwitches (resettable fuses) that trip in an overcurrent condition to open the circuits. If a PolySwitch trips, turn the power off and check the related circuit. (As long as the power is on, a PolySwitch keeps tripping. After checking, therefore, turn the controller power off and on, then check the circuit again.

### Output ICs and Fuses

Connector Name	Application	Pin No.	I/O Port No.	Output IC	Fuse		
HAND I/O CN9	For output	1	64	IC10	F7 (1.3A)		
		2	65				
		3	66				
		4	67				
		5	68				
		6	69				
		7	70				
		8	71				
	For power output	17, 18	–	–	F8 (1.3A)		
Mini I/O CN5	For output	45	16	IC6	F6 (1.3A)		
		46	17				
		47	18				
		48	19				
		49	20				
		50	21				
		51	22				
		52	23				
		53	24	IC8			
		54	25				
		55	26				
		56	27				
		57	28				
		58	29				
		59	30				
		60	31				
	For 24 VDC					External power supply	Internal power supply
			32	–	–	–	F3 (1.3A)
			33	–	–	–	
			34	–	–	–	
			66	–	–	–	F4 (1.3A)
			67	–	–	–	
			68	–	–	–	
	1, 35	–	–	–	F5 (1.3A)		
	2, 36	–	–	–			
	3, 37	–	–	–			
Reference: PolySwitch on Mini I/O (CN5)	Emergency stop and Deadman output	6, 40	–	–	PS5 (0.15A)		
		7, 41	–	–	PS6 (0.15A)		
		8, 42	–	–	PS3 (0.15A)		
		9, 43	–	–	PS4 (0.15A)		

## 6.6.2 Replacing procedures

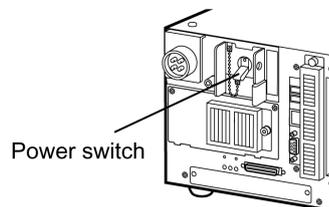
Replace fuses and output ICs according to the following procedure:

**⚠Warning** Do not touch the inside of controller before turning off the power switch and waiting 3 minutes or more, or you can easily receive an electric shock.

**⚠Caution** (1) Wear a wristband and connect its terminal to a grounded portion before starting work.  
(2) Do not touch elements or their terminals on any printed circuit board with bare hand (elements could be destroyed by static electricity).

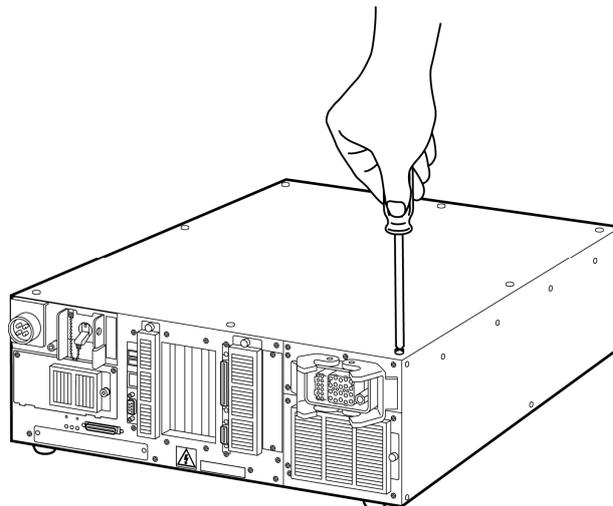
### <Replacing fuses>

**Step 1** Turn the controller power OFF.

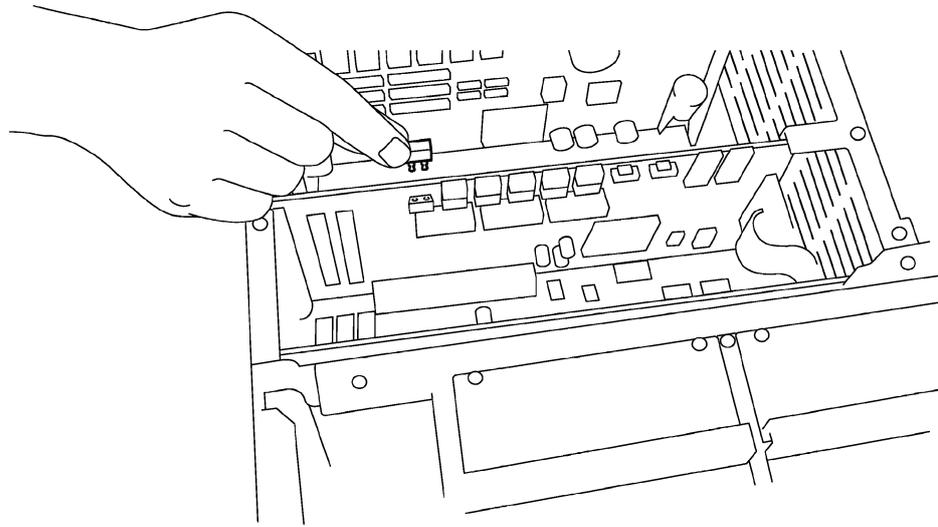


**Step 2** Remove the controller upper cover by unscrewing eight screws.

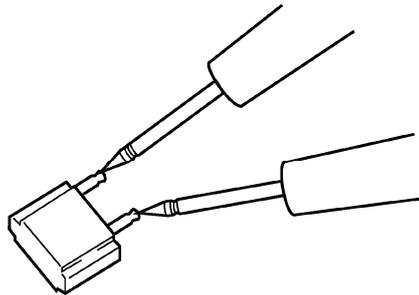
**⚠Warning** Do not touch the inside of controller before turning off the power switch and waiting 3 minutes or more, or you can easily receive an electric shock.



**Step 3** Pull out the fuse to check.



**Step 4** Using a circuit tester, check the removed fuse for continuity.



**Step 5** If no continuity is observed with the fuse in Step 4:

- (1) Check the wiring of the corresponding output connector and remove the cause of the blown fuse.
- (2) Insert a new fuse into place in the controller.

If continuity is observed with the fuse in Step 4, set the removed fuse back into place in the controller.

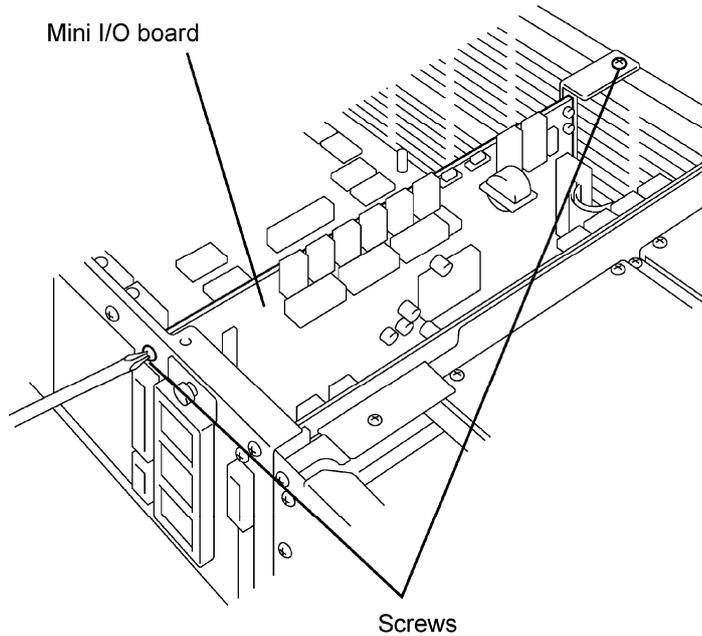
**Step 6** Set the controller upper cover back into place and restart the controller in the reverse order of Steps 1 through 3.

**Proceed to the following steps when replacing output ICs**

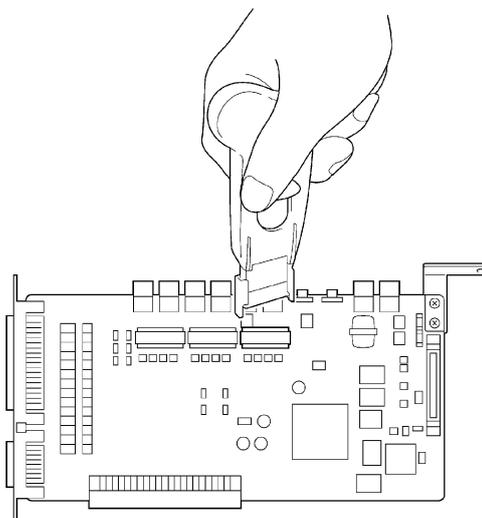
**Step 7** If an output signal error persists even after replacement of the output fuse, the related output IC needs to be replaced.

**⚠ Caution (1) When replacing a damaged output IC, fix the cause that damages the IC before replacement.**  
**(2) Do not directly touch the electronic devices and their terminals on printed circuit boards by hand.**

Remove the three screws and take the Mini I/O board out of the controller.



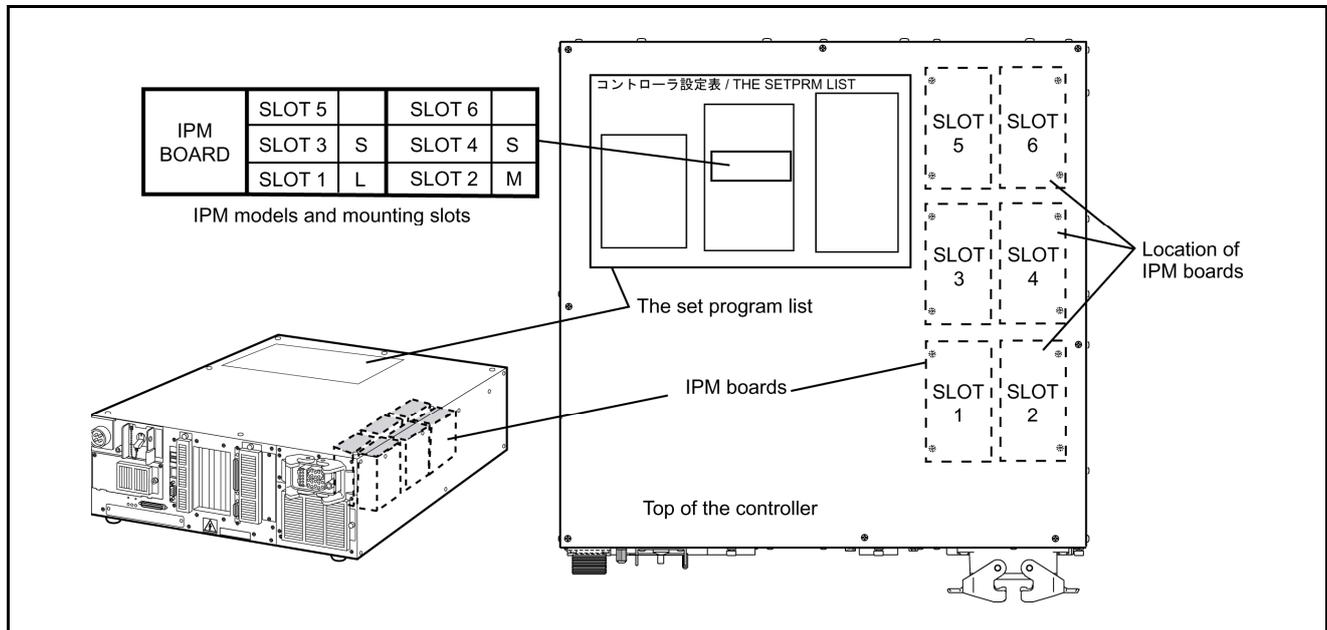
**Step 8** Check the IC No. on the printed circuit board and pull out the target output IC with an IC pull-out jig. Mount a new output IC.



## 6.7 Replacing IPM Boards

### 6.7.1 Location of IPM Boards

The IPM boards are located in the robot controller as shown below.



Robot series	SLOT	SLOT					
		SLOT 6	SLOT 5	SLOT 4	SLOT 3	SLOT 2	SLOT 1
VM-G	Joint #	6	5	4	3	1	2
	IPM model	SS	SS	SS	S	L	M
	Motor capacity (W)	100	200	200	400	1500	750
VS-050/060	Joint #	6	5	4	3	2	1
	IPM model	SS	SS	SS	SS	S	S
	Motor capacity (W)	50	50	50	150	200	400
VS-068/087	Joint #	6	5	4	3	2	1
	IPM model	SS	SS	SS	S	L	L
	Motor capacity (W)	80	100	200	400	750	1000
VS-G	Joint #	6	5	4	3	2	1
	IPM model	SS	SS	SS	S	S	M
	Motor capacity (W)	50	80	100	200	400	750
VP-G	Joint #	6	5	4	3	2	1
	IPM model	SS	SS	SS	SS	SS	SS
	Motor capacity (W)	30	30	30	50	80	80
HM-G	Joint #	--	--	4	3	2	1
	IPM model	--	--	M	M	L	LL
	Motor capacity (W)	--	--	300	300	600	1000
HS-G	Joint #	--	--	4	3	2	1
	IPM model	--	--	S	S	M	L
	Motor capacity (W)	--	--	150	200	400	750
XYC-G	Joint #	--	--	4	3	2	1
	IPM model	--	--	SS	S	S	S
	Motor capacity (W)	--	--	100	200	200	400
XR-G	Joint #	--	--	4	3	2	1
	IPM model	--	--	SS	S	S	M(S) *
	Motor capacity (W)	--	--	50	400	400	750(400) *

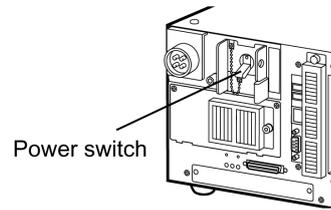
**Note:** The "--" in the above table denotes no board installed.

\* Differs depending on the controller model.

## 6.7.2 Replacing the IPM board

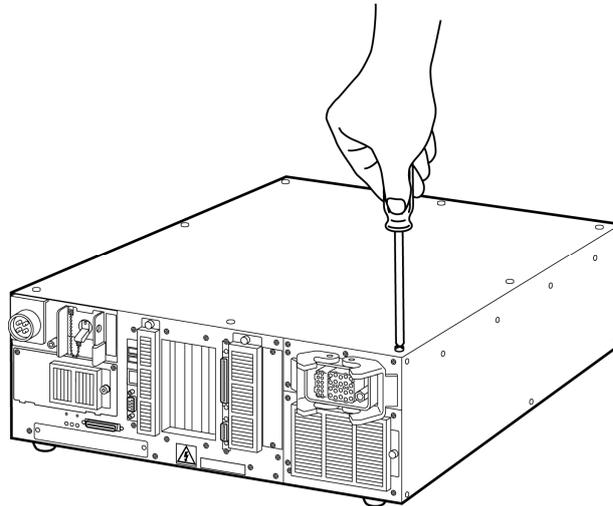
Replace the IPM board with the procedure below.

**Step 1** Turn the controller power OFF.

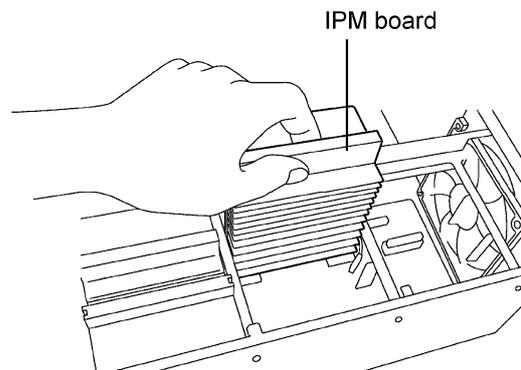
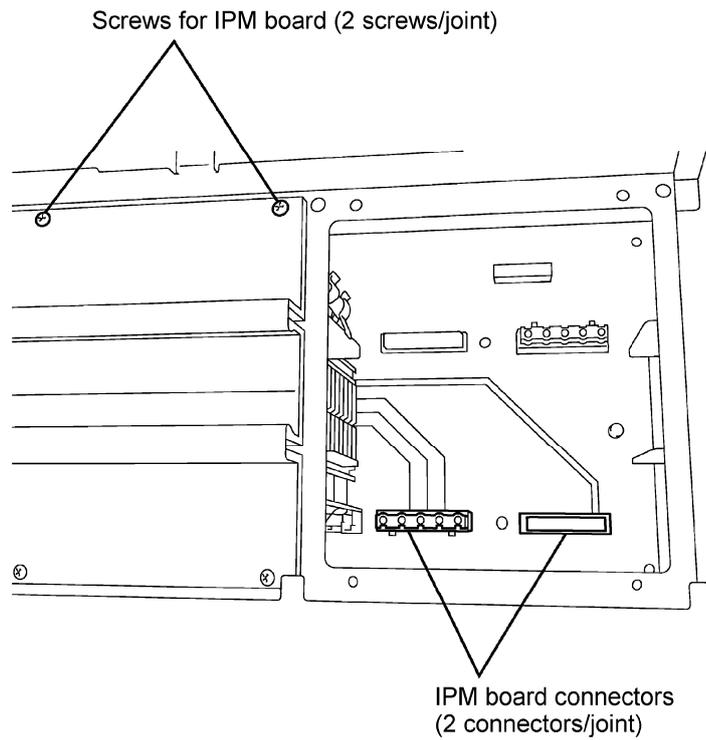


**Step 2** Remove the eight screws and take off the top cover of the controller.

**⚠Warning** Do not touch the inside of controller before turning off the power switch and waiting 3 minutes or more, or you can easily receive an electric shock.



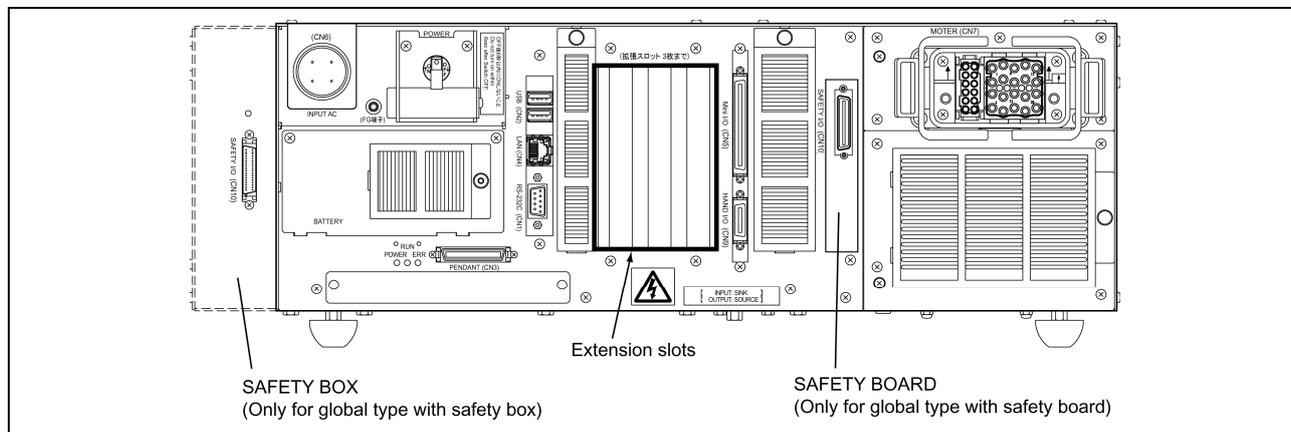
**Step 3** Remove the two screws from the IPM board to be replaced. Disconnect the board from its two connectors and connect a new one.



**Step 4** Secure the top cover of the controller with eight screws.  
Tightening torque: 1.35 to 1.45 Nm

# Chapter 7 I/O Allocation for I/O Extension Board(s)

This chapter lists the I/O allocation tables to apply when I/O extension boards are mounted on the controller. For details about I/O extension boards, refer to the RC7M CONTROLLER OPTIONS MANUAL.



## 7.1 Combination of I/O Extension Boards and Allocation Modes

The table below lists the permitted combination of I/O extension boards and selectable allocation modes.

**Combination of I/O Extension Boards**

Combination #	I/O extension boards (Max. 2 boards)			Allocation modes			
	Extension 1	Extension 2	Extension 3	Mini I/O dedicated	Allocated to Extension 1		All user I/O
					Compatible	Standard	
0	-	-	-	√			
1	-	S-LINK V board	-	√			√
2	-	DeviceNet master board	-				√
3	-	DeviceNet master board	Parallel I/O board				√
4	-	DeviceNet master board	S-LINK V board				√
5	Parallel I/O board	-	-	√	√	√	
6	Parallel I/O board	Parallel I/O board	-	√	√	√	
7	Parallel I/O board	S-LINK V board	-	√	√	√	√
8	DeviceNet slave board	-	-		√	√	
9	DeviceNet slave board	Parallel I/O board	-		√	√	
10	DeviceNet slave board	S-LINK V board	-		√	√	√
11	DeviceNet master/slave board	-	-		√	√	√
12	DeviceNet master/slave board	Parallel I/O board	-		√	√	√
13	DeviceNet master/slave board	S-LINK V board	-		√	√	√
14	CC-Link board	-	-		√	√	
15	CC-Link board	Parallel I/O board	-		√	√	
16	CC-Link board	DeviceNet master board	-		√	√	√
17	CC-Link board	S-LINK V board	-		√	√	√
18	PROFIBUS-DP slave board	-	-		√	√	
19	PROFIBUS-DP slave board	Parallel I/O board	-		√	√	
20	PROFIBUS-DP slave board	DeviceNet master board	-		√	√	√
21	PROFIBUS-DP slave board	S-LINK V board	-		√	√	√
22	EtherNet/IP Adapter	-	-		√	√	
23	EtherNet/IP Adapter	Parallel I/O board	-		√	√	
24	EtherNet/IP Adapter	DeviceNet master board	-		√	√	√
25	EtherNet/IP Adapter	S-LINK V board	-		√	√	√

Note 1: Out of check-marked modes in the "Allocation modes" column, only one mode can be selected.

Note 2: Up to two I/O extension boards can be mounted on the controller. There are no restrictions on the choice of extension slots or the mounting order.

Note 3: When two I/O extension boards are mounted, the controller recognizes the one inserted in the left-hand extension slot as Extension 1. The allocation I/O port numbers on Extension 1 and 2 boards differ with each other.

## 7.2 I/O Allocation in Individual Allocation Modes

The table below lists the I/O allocation for extension boards in individual allocation modes. For details, refer to Section 7.5 "I/O Allocation Tables for Individual Allocation Modes."

**Note:** For the I/O allocation for the DeviceNet master/slave board, see the allocation tables for the DeviceNet master and slave boards.

**I/O Allocation of Extension Boards in Individual Allocation Modes**

Allocation modes	Allocation for CN5 and extension boards	
	I/O	Allocation tables to apply
Mini I/O dedicated mode	CN5	Tables for mini I/O board in mini I/O dedicated mode
	Extensions 1, 2, 3	Tables for extension boards in all user I/O mode
Compatible mode	CN5	Tables for mini I/O board in compatible, standard and all user I/O modes
	Extension 1	Tables for extension boards in compatible mode
	Extensions 2, 3	Tables for extension boards in all user I/O mode
Standard mode	CN5	Tables for mini I/O boards in compatible, standard and all user I/O modes
	Extension 1	Tables for extension boards in standard mode
	Extensions 2, 3	Tables for extension boards in all user I/O mode
All user I/O mode	CN5	Tables for mini I/O board in compatible, standard and all user I/O modes
	Extensions 1, 2, 3	Tables for extension boards in all user I/O mode
<p><b>Note:</b> Extensions 1, 2, and 3 correspond to the ones listed in the "Combination of I/O Extension Boards" table on the previous page.</p>		

## 7.3 Notes on Using I/O Extension Boards

### (1) Parameter change for switching between allocation modes

To switch between the compatible, standard, and all user I/O modes, you need to change parameters using the teach pendant or WINCAPSIII. For the changing procedure, refer to the RC7M Controller OPTIONS MANUAL, Section 4.6.

### (2) Power supply setting for mini I/O board (CN5) or parallel I/O board

When using the mini I/O board (CN5) or parallel I/O board, you need to set up the 24 V power supply (internal or external). The factory default is external power supply.

For details about the mini I/O board, see Section 4.2.1 or 5.2.1.

For details about the parallel I/O board, refer to the RC7M Controller OPTIONS MANUAL, Section 5.2.2.

## 7.4 Hand I/O (CN9): Common to All Allocation Modes

The RC7M controller supports hand I/O signals (CN9) as standard. This hand I/O is common to all allocation modes.

### ■ HAND I/O (CN9): NPN type

Terminal No.	Signal name	Port No.	Terminal No.	Signal name	Port No.
1	Hand output	64	11	Hand input	50
2	Hand output	65	12	Hand input	51
3	Hand output	66	13	Hand input	52
4	Hand output	67	14	Hand input	53
5	Hand output	68	15	Hand input	54
6	Hand output	69	16	Hand input	55
7	Hand output	70	17	Power output for hand (+24 VDC) (External/internal source)	—
8	Hand output	71	18	Power output for hand (+0 VDC) (External/internal source)	—
9	Hand input	48	19	No connection	—
10	Hand input	49	20	No connection	—

### ■ HAND I/O (CN9): PNP type

Terminal No.	Signal name	Port No.	Terminal No.	Signal name	Port No.
1	Hand output	64	11	Hand input	50
2	Hand output	65	12	Hand input	51
3	Hand output	66	13	Hand input	52
4	Hand output	67	14	Hand input	53
5	Hand output	68	15	Hand input	54
6	Hand output	69	16	Hand input	55
7	Hand output	70	17	Power output for hand (+0 VDC) (External/internal source)	—
8	Hand output	71	18	Power output for hand (+24 VDC) (External/internal source)	—
9	Hand input	48	19	No connection	—
10	Hand input	49	20	No connection	—

## 7.5 I/O Allocation Tables for Individual Allocation Modes

### 7.5.1 Mini I/O Board (CN5 on standard type of controller) in Mini I/O Dedicated Mode

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1	<i>Enable Auto</i> (Internal +24V) (input)	—	35	<i>Enable Auto</i> (input)	—
2	<i>External Emergency Stop 1, b-1</i> (Internal +24V) (input)	—	36	<i>External Emergency Stop 1, b-2</i> (input)	—
3	<i>External Emergency Stop 2, b-1</i> (Internal +24V) (input)	—	37	<i>External Emergency Stop 2, b-2</i> (input)	—
4	Reserved.	—	38	Reserved.	—
5	Reserved.	—	39	Reserved.	—
6	<i>Emergency Stop 1, -1</i> (Mini relay) (output)	—	40	<i>Emergency Stop 1, -2</i> (Mini relay) (output)	—
7	<i>Emergency Stop 2, -1</i> (Mini relay) (output)	—	41	<i>Emergency Stop 2, -2</i> (Mini relay) (output)	—
8	<i>Deadman SW 1, -1</i> (output) [ <i>Enable SW 1, -1</i> ] (Mini relay)	—	42	<i>Deadman SW 1, -2</i> (output) [ <i>Enable SW 1, -2</i> ] (Mini relay)	—
9	<i>Deadman SW 2, -1</i> (output) [ <i>Enable SW 2, -1</i> ] (Mini relay)	—	43	<i>Deadman SW 2, -2</i> (output) [ <i>Enable SW 2, -2</i> ] (Mini relay)	—
10	—	—	44	—	—
11	<i>Step Stop (All tasks)</i> (input)	0	45	<i>CPU Normal</i> (No monitor allowed) (output)	16
12	<i>Strobe Signal</i> (input)	1	46	<i>Robot Running</i> (output)	17
13	Data area bit 0 (input)	2	47	<i>Robot Error</i> (output)	18
14	Data area bit 1 (input)	3	48	<i>Robot Initialized</i> (output)	19
15	Data area bit 2 (input)	4	49	<i>Auto Mode</i> (output)	20
16	Command area bit 0 (input)	5	50	<i>Operation Preparation Completed</i> (output)	21
17	Command area bit 1 (input)	6	51	<i>Battery Warning</i> (output)	22
18	Command area bit 2 (input)	7	52	<i>Command Processing Completed</i> (output)	23
19	User input	8	53	User output/ <i>Continue Start Permission</i> (output)	24
20	User input	9	54	User output	25
21	User input	10	55	User output	26
22	User input	11	56	User output	27
23	User input	12	57	User output	28
24	User input	13	58	User output	29
25	User input	14	59	User output	30
26	User input	15	60	User output	31
27	—	—	61	—	—
28	<i>Pendant Emergency Stop 1, b-1</i> (Dry output) (output)	—	62	<i>Pendant Emergency Stop 1, b-2</i> (Dry output) (output)	—
29	<i>Pendant Emergency Stop 2, b-1</i> (Dry output) (output)	—	63	<i>Pendant Emergency Stop 2, b-2</i> (Dry output) (output)	—
30	Dedicated to conveyor tracking board (when JP12 on mini I/O board is shorted. Internal power source +24V)	—	64	Dedicated to conveyor tracking board (when JP13 on mini I/O board is shorted. Internal power source 0V)	—
31	—	—	65	—	—
32	DC power input +24V (when external power source is used)	—	66	DC power input 0V (when external power source is used)	—
33		—	67		—
34	DC power output +24V (when internal power source is used)	—	68	DC power output 0V (when internal power source is used)	—

## 7.5.2 Mini I/O Board (CN5 on global type of controller) in Mini I/O Dedicated Mode

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1	Reserved.	—	35	Reserved.	—
2	Reserved.	—	36	Reserved.	—
3	Reserved.	—	37	Reserved.	—
4	Reserved.	—	38	Reserved.	—
5	Reserved.	—	39	Reserved.	—
6	Reserved.	—	40	Reserved.	—
7	Reserved.	—	41	Reserved.	—
8	Reserved.	—	42	Reserved.	—
9	Reserved.	—	43	Reserved.	—
10	—	—	44	—	—
11	<i>Step Stop (All tasks)</i> (input)	0	45	<i>CPU Normal (No monitor allowed)</i> (output)	16
12	<i>Strobe Signal</i> (input)	1	46	<i>Robot Running</i> (output)	17
13	Data area bit 0 (input)	2	47	<i>Robot Error</i> (output)	18
14	Data area bit 1 (input)	3	48	<i>Robot Initialized</i> (output)	19
15	Data area bit 2 (input)	4	49	<i>Auto Mode</i> (output)	20
16	Command area bit 0 (input)	5	50	<i>Operation Preparation Completed</i> (output)	21
17	Command area bit 1 (input)	6	51	<i>Battery Warning</i> (output)	22
18	Command area bit 2 (input)	7	52	<i>Command Processing Completed</i> (output)	23
19	User input	8	53	User output/ <i>Continue Start Permission</i> (output)	24
20	User input	9	54	User output	25
21	User input	10	55	User output	26
22	User input	11	56	User output	27
23	User input	12	57	User output	28
24	User input	13	58	User output	29
25	User input	14	59	User output	30
26	User input	15	60	Reserved.	31
27	—	—	61	—	—
28	Reserved.	—	62	Reserved.	—
29	Reserved.	—	63	Reserved.	—
30	Dedicated to conveyor tracking board (when JP12 on mini I/O board is shorted. Internal power source +24V)	—	64	Dedicated to conveyor tracking board (when JP13 on mini I/O board is shorted. Internal power source 0V)	—
31	—	—	65	—	—
32	DC power input +24V (when external power source is used)	—	66	DC power input 0V (when external power source is used)	—
33		—	67		—
34	DC power output +24V (when internal power source is used)	—	68	DC power output 0V (when internal power source is used)	—

### 7.5.3 Mini I/O Board (CN5 on standard type of controller) in Compatible, Standard and All User I/O Modes

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1	<i>Enable Auto</i> (Internal +24V) (input)	—	35	<i>Enable Auto</i> (input)	—
2	<i>External Emergency Stop 1, b-1</i> (Internal +24V) (input)	—	36	<i>External Emergency Stop 1, b-2</i> (input)	—
3	<i>External Emergency Stop 2, b-1</i> (Internal +24V) (input)	—	37	<i>External Emergency Stop 2, b-2</i> (input)	—
4	Reserved.	—	38	Reserved.	—
5	Reserved.	—	39	Reserved.	—
6	<i>Emergency Stop 1, -1</i> (Mini relay) (output)	—	40	<i>Emergency Stop 1, -2</i> (Mini relay) (output)	—
7	<i>Emergency Stop 2, -1</i> (Mini relay) (output)	—	41	<i>Emergency Stop 2, -2</i> (Mini relay) (output)	—
8	<i>Deadman SW 1, -1</i> (output) [ <i>Enable SW 1, -1</i> ] (Mini relay)	—	42	<i>Deadman SW 1, -2</i> (output) [ <i>Enable SW 1, -2</i> ] (Mini relay)	—
9	<i>Deadman SW 2, -1</i> (output) [ <i>Enable SW 2, -1</i> ] (Mini relay)	—	43	<i>Deadman SW 2, -2</i> (output) [ <i>Enable SW 2, -2</i> ] (Mini relay)	—
10	—	—	44	—	—
11	User input	0	45	<i>CPU Normal</i> (No monitor allowed) (output)	16
12	User input	1	46	User output	17
13	User input	2	47	User output	18
14	User input	3	48	User output	19
15	User input	4	49	User output	20
16	User input	5	50	User output	21
17	User input	6	51	User output	22
18	User input	7	52	User output	23
19	User input	8	53	User output	24
20	User input	9	54	User output	25
21	User input	10	55	User output	26
22	User input	11	56	User output	27
23	User input	12	57	User output	28
24	User input	13	58	User output	29
25	User input	14	59	User output	30
26	User input	15	60	User output	31
27	—	—	61	—	—
28	<i>Pendant Emergency Stop 1, b-1</i> (Dry output) (output)	—	62	<i>Pendant Emergency Stop 1, b-2</i> (Dry output) (output)	—
29	<i>Pendant Emergency Stop 2, b-1</i> (Dry output) (output)	—	63	<i>Pendant Emergency Stop 2, b-2</i> (Dry output) (output)	—
30	Dedicated to conveyor tracking board (when JP12 on mini I/O board is shorted. Internal power source +24V)	—	64	Dedicated to conveyor tracking board (when JP13 on mini I/O board is shorted. Internal power source 0V)	—
31	—	—	65	—	—
32	DC power input +24V (when external power source is used)	—	66	DC power input 0V (when external power source is used)	—
33		—	67		—
34	DC power output +24V (when internal power source is used)	—	68	DC power output 0V (when internal power source is used)	—

## 7.5.4 Mini I/O Board (CN5 on global type of controller) in Compatible, Standard, and All User I/O Modes

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1	Reserved.	—	35	Reserved.	—
2	Reserved.	—	36	Reserved.	—
3	Reserved.	—	37	Reserved.	—
4	Reserved.	—	38	Reserved.	—
5	Reserved.	—	39	Reserved.	—
6	Reserved.	—	40	Reserved.	—
7	Reserved.	—	41	Reserved.	—
8	Reserved.	—	42	Reserved.	—
9	Reserved.	—	43	Reserved.	—
10	—	—	44	—	—
11	User input	0	45	CPU Normal (No monitor allowed) (output)	16
12	User input	1	46	User output	17
13	User input	2	47	User output	18
14	User input	3	48	User output	19
15	User input	4	49	User output	20
16	User input	5	50	User output	21
17	User input	6	51	User output	22
18	User input	7	52	User output	23
19	User input	8	53	User output	24
20	User input	9	54	User output	25
21	User input	10	55	User output	26
22	User input	11	56	User output	27
23	User input	12	57	User output	28
24	User input	13	58	User output	29
25	User input	14	59	User output	30
26	User input	15	60	Reserved.	31
27	—	—	61	—	—
28	Reserved.	—	62	Reserved.	—
29	Reserved.	—	63	Reserved.	—
30	Dedicated to conveyor tracking board (when JP12 on mini I/O board is shorted. Internal power source +24V)	—	64	Dedicated to conveyor tracking board (when JP13 on mini I/O board is shorted. Internal power source 0V)	—
31	—	—	65	—	—
32	DC power input +24V (when external power source is used)	—	66	DC power input 0V (when external power source is used)	—
33		—	67		—
34	DC power output +24V (when internal power source is used)	—	68	DC power output 0V (when internal power source is used)	—

## 7.5.5 Parallel I/O Board in Compatible Mode

Terminal No.	Signal Name	Port No.	Direction	Terminal No.	Signal Name	Port No.	Direction
1	Reserved.	3840	OUT	49	Error in the hundreds place, bit 0	3864	OUT
2	<i>Robot Running</i>	3841	OUT	50	Error in the hundreds place, bit 1	3865	OUT
3	<i>Robot Error</i>	3842	OUT	51	Error in the hundreds place, bit 2	3866	OUT
4	<i>Auto Mode</i>	3843	OUT	52	Error in the hundreds place, bit 3	3867	OUT
5	<i>External Mode</i>	3844	OUT	53	<i>SS Mode</i>	3868	OUT
6	<i>Program Start Reset</i>	3845	OUT	54	Reserved.	3869	OUT
7	Reserved.	3846	OUT	55	Reserved.	3870	OUT
8	Reserved.	3847	OUT	56	Reserved.	3871	OUT
9	<i>Robot Power ON Completed</i>	3848	OUT	57	User output	3872	OUT
10	<i>Servo ON</i>	3849	OUT	58		3873	OUT
11	<i>CAL Completed</i>	3850	OUT	59		3874	OUT
12	<i>Teaching ON</i>	3851	OUT	60		3875	OUT
13	<i>1 Cycle End</i>	3852	OUT	61		3876	OUT
14	<i>Battery Warning</i>	3853	OUT	62		3877	OUT
15	<i>Robot Warning</i>	3854	OUT	63		3878	OUT
16	<i>Continue Start Permission</i>	3855	OUT	64		3879	OUT
17	Error in the units place, bit 0	3856	OUT	65		3880	OUT
18	Error in the units place, bit 1	3857	OUT	66		3881	OUT
19	Error in the units place, bit 2	3858	OUT	67		3882	OUT
20	Error in the units place, bit 3	3859	OUT	68		3883	OUT
21	Error in the tens place, bit 0	3860	OUT	69		3884	OUT
22	Error in the tens place, bit 1	3861	OUT	70		3885	OUT
23	Error in the tens place, bit 2	3862	OUT	71		3886	OUT
24	Error in the tens place, bit 3	3863	OUT	72		3887	OUT
25	<i>Step Stop (All tasks)</i>	3584	IN	73	<i>Clear Robot Error</i>	3604	IN
26	<i>Continue Start</i>	3585	IN	74	User input	3605	IN
27	<i>Instantaneous Stop (All tasks) [Halt]</i>	3586	IN	75		3606	IN
28	<i>Operation Preparation Start</i>	3587	IN	76		3607	IN
29	<i>Interruption Skip</i>	3588	IN	77		3608	IN
30	<i>Program Start</i>	3589	IN	78		3609	IN
31	Program No. selection bit 0	3590	IN	79		3610	IN
32	Program No. selection bit 1	3591	IN	80		3611	IN
33	Program No. selection bit 2	3592	IN	81		3612	IN
34	Program No. selection bit 3	3593	IN	82		3613	IN
35	Program No. selection bit 4	3594	IN	83		3614	IN
36	Program No. selection bit 5	3595	IN	84	3615	IN	
37	Program No. selection bit 6	3596	IN	85	3616	IN	
38	Program No. selection parity bit	3597	IN	86	3617	IN	
39	<i>Motor Power ON</i>	3598	IN	87	3618	IN	
40	<i>CAL Execution</i>	3599	IN	88	3619	IN	
41	Reserved.	3600	IN	89	3620	IN	
42	<i>SP100</i>	3601	IN	90	3621	IN	
43	<i>External Mode Change</i>	3602	IN	91	3622	IN	
44	<i>Program Reset</i>	3603	IN	92	3623	IN	
45	Power +24V	—	IN	93	Power 0V	—	IN
46	Power +24V	—	IN	94	Power 0V	—	IN
47	Power +24V	—	IN	95	Power 0V	—	IN
48	Power +24V	—	IN	96	Power 0V	—	IN

## 7.5.6 Parallel I/O Board in Standard Mode

Terminal No.	Signal Name	Port No.	Direction	Terminal No.	Signal Name	Port No.	Direction
1	Reserved.	3840	OUT	49	Status area bit 8	3864	OUT
2	<i>Robot Running</i>	3841	OUT	50	Status area bit 9	3865	OUT
3	<i>Robot Error</i>	3842	OUT	51	Status area bit 10	3866	OUT
4	<i>Servo ON</i>	3843	OUT	52	Status area bit 11	3867	OUT
5	<i>Robot Initialized</i>	3844	OUT	53	Status area bit 12	3868	OUT
6	<i>Auto Mode</i>	3845	OUT	54	Status area bit 13	3869	OUT
7	<i>External Mode</i>	3846	OUT	55	Status area bit 14	3870	OUT
8	<i>Battery Warning</i>	3847	OUT	56	Status area bit 15	3871	OUT
9	<i>Robot Warning</i>	3848	OUT	57	User output	3872	OUT
10	<i>Continue Start Permission</i>	3849	OUT	58		3873	OUT
11	<i>SS Mode</i>	3850	OUT	59		3874	OUT
12	Reserved.	3851	OUT	60		3875	OUT
13	Reserved.	3852	OUT	61		3876	OUT
14	Reserved.	3853	OUT	62		3877	OUT
15	<i>Command Processing Completed</i>	3854	OUT	63		3878	OUT
16	Status area odd parity	3855	OUT	64		3879	OUT
17	Status area bit 0	3856	OUT	65		3880	OUT
18	Status area bit 1	3857	OUT	66		3881	OUT
19	Status area bit 2	3858	OUT	67		3882	OUT
20	Status area bit 3	3859	OUT	68		3883	OUT
21	Status area bit 4	3860	OUT	69		3884	OUT
22	Status area bit 5	3861	OUT	70		3885	OUT
23	Status area bit 6	3862	OUT	71		3886	OUT
24	Status area bit 7	3863	OUT	72		3887	OUT
25	<i>Step Stop (All tasks)</i>	3584	IN	73	Data area 2 bit 6	3604	IN
26	Reserved.	3585	IN	74	Data area 2 bit 7	3605	IN
27	<i>Instantaneous Stop (All tasks) [Halt]</i>	3586	IN	75	Data area 2 bit 8	3606	IN
28	<i>Strobe Signal</i>	3587	IN	76	Data area 2 bit 9	3607	IN
29	<i>Interruption Skip</i>	3588	IN	77	Data area 2 bit 10	3608	IN
30	Command data area odd parity	3589	IN	78	Data area 2 bit 11	3609	IN
31	Data area 1 bit 0	3590	IN	79	Data area 2 bit 12	3610	IN
32	Data area 1 bit 1	3591	IN	80	Data area 2 bit 13	3611	IN
33	Data area 1 bit 2	3592	IN	81	Data area 2 bit 14	3612	IN
34	Data area 1 bit 3	3593	IN	82	Data area 2 bit 15	3613	IN
35	Data area 1 bit 4	3594	IN	83	Command area bit 0	3614	IN
36	Data area 1 bit 5	3595	IN	84	Command area bit 1	3615	IN
37	Data area 1 bit 6	3596	IN	85	Command area bit 2	3616	IN
38	Data area 1 bit 7	3597	IN	86	Command area bit 3	3617	IN
39	Data area 2 bit 0	3598	IN	87	User input	3618	IN
40	Data area 2 bit 1	3599	IN	88		3619	IN
41	Data area 2 bit 2	3600	IN	89		3620	IN
42	Data area 2 bit 3	3601	IN	90		3621	IN
43	Data area 2 bit 4	3602	IN	91		3622	IN
44	Data area 2 bit 5	3603	IN	92		3623	IN
45	Power +24V	—	IN	93	Power 0V	—	IN
46	Power +24V	—	IN	94	Power 0V	—	IN
47	Power +24V	—	IN	95	Power 0V	—	IN
48	Power +24V	—	IN	96	Power 0V	—	IN

## 7.5.7 Parallel I/O Board (1st) in All User I/O Mode

Terminal No.	Signal Name	Port No.	Direction	Terminal No.	Signal Name	Port No.	Direction
1	User output	3840	OUT	49	User output	3864	OUT
2		3841	OUT	50		3865	OUT
3		3842	OUT	51		3866	OUT
4		3843	OUT	52		3867	OUT
5		3844	OUT	53		3868	OUT
6		3845	OUT	54		3869	OUT
7		3846	OUT	55		3870	OUT
8		3847	OUT	56		3871	OUT
9		3848	OUT	57		3872	OUT
10		3849	OUT	58		3873	OUT
11		3850	OUT	59		3874	OUT
12		3851	OUT	60		3875	OUT
13		3852	OUT	61		3876	OUT
14		3853	OUT	62		3877	OUT
15		3854	OUT	63		3878	OUT
16		3855	OUT	64		3879	OUT
17		3856	OUT	65		3880	OUT
18		3857	OUT	66		3881	OUT
19		3858	OUT	67		3882	OUT
20		3859	OUT	68		3883	OUT
21		3860	OUT	69		3884	OUT
22		3861	OUT	70		3885	OUT
23		3862	OUT	71		3886	OUT
24		3863	OUT	72		3887	OUT
25	User input	3584	IN	73	User input	3604	IN
26		3585	IN	74		3605	IN
27		3586	IN	75		3606	IN
28		3587	IN	76		3607	IN
29		3588	IN	77		3608	IN
30		3589	IN	78		3609	IN
31		3590	IN	79		3610	IN
32		3591	IN	80		3611	IN
33		3592	IN	81		3612	IN
34		3593	IN	82		3613	IN
35		3594	IN	83		3614	IN
36		3595	IN	84		3615	IN
37		3596	IN	85		3616	IN
38		3597	IN	86		3617	IN
39		3598	IN	87		3618	IN
40		3599	IN	88		3619	IN
41		3600	IN	89		3620	IN
42		3601	IN	90		3621	IN
43		3602	IN	91		3622	IN
44		3603	IN	92		3623	IN
45	Power +24V	—	IN	93	Power 0V	—	IN
46	Power +24V	—	IN	94	Power 0V	—	IN
47	Power +24V	—	IN	95	Power 0V	—	IN
48	Power +24V	—	IN	96	Power 0V	—	IN

## 7.5.8 Parallel I/O Board (2nd) in All User I/O Mode

Terminal No.	Signal Name	Port No.	Direction	Terminal No.	Signal Name	Port No.	Direction
1	User output	3888	OUT	49	User output	3912	OUT
2		3889	OUT	50		3913	OUT
3		3890	OUT	51		3914	OUT
4		3891	OUT	52		3915	OUT
5		3892	OUT	53		3916	OUT
6		3893	OUT	54		3917	OUT
7		3894	OUT	55		3918	OUT
8		3895	OUT	56		3919	OUT
9		3896	OUT	57		3920	OUT
10		3897	OUT	58		3921	OUT
11		3898	OUT	59		3922	OUT
12		3899	OUT	60		3923	OUT
13		3900	OUT	61		3924	OUT
14		3901	OUT	62		3925	OUT
15		3902	OUT	63		3926	OUT
16		3903	OUT	64		3927	OUT
17		3904	OUT	65		3928	OUT
18		3905	OUT	66		3929	OUT
19		3906	OUT	67		3930	OUT
20		3907	OUT	68		3931	OUT
21		3908	OUT	69		3932	OUT
22		3909	OUT	70		3933	OUT
23		3910	OUT	71		3934	OUT
24		3911	OUT	72		3935	OUT
25	User input	3624	IN	73	User input	3644	IN
26		3625	IN	74		3645	IN
27		3626	IN	75		3646	IN
28		3627	IN	76		3647	IN
29		3628	IN	77		3648	IN
30		3629	IN	78		3649	IN
31		3630	IN	79		3650	IN
32		3631	IN	80		3651	IN
33		3632	IN	81		3652	IN
34		3633	IN	82		3653	IN
35		3634	IN	83		3654	IN
36		3635	IN	84		3655	IN
37		3636	IN	85		3656	IN
38		3637	IN	86		3657	IN
39		3638	IN	87		3658	IN
40		3639	IN	88		3659	IN
41		3640	IN	89		3660	IN
42		3641	IN	90		3661	IN
43		3642	IN	91		3662	IN
44		3643	IN	92		3663	IN
45	Power +24V	—	IN	93	Power 0V	—	IN
46	Power +24V	—	IN	94	Power 0V	—	IN
47	Power +24V	—	IN	95	Power 0V	—	IN
48	Power +24V	—	IN	96	Power 0V	—	IN

## 7.5.9 DeviceNet Slave Board in Compatible Mode

Note: The table below applies also to the allocation of the slave area on the DeviceNet master/slave board.

Input data	
Port No.	Signal name
512	<i>Step Stop (All tasks)</i>
513	<i>Continue Start</i>
514	<i>Instantaneous Stop (All tasks) [Half]</i>
515	<i>Operation Preparation Start</i>
516	<i>Interruption Skip</i>
517	<i>Program Start</i>
518	—
519	—
520	Program No. selection bit 0
521	Program No. selection bit 1
522	Program No. selection bit 2
523	Program No. selection bit 3
524	Program No. selection bit 4
525	Program No. selection bit 5
526	Program No. selection bit 6
527	Program selection parity
528	<i>Motor Power ON</i>
529	<i>CAL Execution</i>
530	Reserved.
531	<i>SP100</i>
532	<i>External Mode Change</i>
533	<i>Program Reset</i>
534	<i>Clear Robot Error</i>
535	—
536	INPUT 536
537	INPUT 537
538	INPUT 538
539	INPUT 539
540	INPUT 540
541	INPUT 541
542	INPUT 542
543	INPUT 543
544	INPUT 544
545	INPUT 545
546	INPUT 546
547	INPUT 547
548	INPUT 548
549	INPUT 549
:	(INPUT 550 to INPUT 764)
765	INPUT 765
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	Reserved.
769	<i>Robot Running</i>
770	<i>Robot Error</i>
771	<i>Auto Mode</i>
772	<i>External Mode</i>
773	<i>Program Start Reset</i>
774	Reserved.
775	Reserved.
776	<i>Robot Power ON Completed</i>
777	<i>Servo ON</i>
778	<i>CAL Completed</i>
779	<i>Teaching ON</i>
780	<i>1 Cycle End</i>
781	<i>Battery Warning</i>
782	<i>Robot Warning</i>
783	<i>Continue Start Permission</i>
784	Error in the units place, bit 0
785	Error in the units place, bit 1
786	Error in the units place, bit 2
787	Error in the units place, bit 3
788	Error in the tens place, bit 0
789	Error in the tens place, bit 1
790	Error in the tens place, bit 2
791	Error in the tens place, bit 3
792	Error in the hundreds place, bit 0
793	Error in the hundreds place, bit 1
794	Error in the hundreds place, bit 2
795	Error in the hundreds place, bit 3
796	<i>SS Mode</i>
797	Reserved.
798	Reserved.
799	Reserved.
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	
:	(OUTPUT 806 to OUTPUT 1020)
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023

## 7.5.10 DeviceNet Slave Board in Standard Mode

Note: The table below applies also to the allocation of the slave area on the DeviceNet master/slave board.

Input data	
Port No.	Signal name
512	<i>Step Stop (All tasks)</i>
513	Reserved.
514	<i>Instantaneous Stop (All tasks) [Half]</i>
515	<i>Strobe Signal</i>
516	<i>Interruption Skip</i>
517	—
518	—
519	Command data odd parity
520	Data area 1 bit 0
521	Data area 1 bit 1
522	Data area 1 bit 2
523	Data area 1 bit 3
524	Data area 1 bit 4
525	Data area 1 bit 5
526	Data area 1 bit 6
527	Data area 1 bit 7
528	Data area 2 bit 0
529	Data area 2 bit 1
530	Data area 2 bit 2
531	Data area 2 bit 3
532	Data area 2 bit 4
533	Data area 2 bit 5
534	Data area 2 bit 6
535	Data area 2 bit 7
536	Data area 2 bit 8
537	Data area 2 bit 9
538	Data area 2 bit 10
539	Data area 2 bit 11
540	Data area 2 bit 12
541	Data area 2 bit 13
542	Data area 2 bit 14
543	Data area 2 bit 15
544	Command area bit 0
545	Command area bit 1
546	Command area bit 2
547	Command area bit 3
548 to 551	—
552	INPUT 552
553	INPUT 553
:	(INPUT 554 to INPUT 765)
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	Reserved.
769	<i>Robot Running</i>
770	<i>Robot Error</i>
771	<i>Servo ON</i>
772	<i>Robot Initialized</i>
773	<i>Auto Mode</i>
774	<i>External Mode</i>
775	<i>Battery Warning</i>
776	<i>Robot Warning</i>
777	<i>Continue Start Permission</i>
778	<i>SS Mode</i>
779	Reserved.
780	Reserved.
781	Reserved.
782	<i>Command Processing Completed</i>
783	Status area odd parity
784	Status area bit 0
785	Status area bit 1
786	Status area bit 2
787	Status area bit 3
788	Status area bit 4
789	Status area bit 5
790	Status area bit 6
791	Status area bit 7
792	Status area bit 8
793	Status area bit 9
794	Status area bit 10
795	Status area bit 11
796	Status area bit 12
797	Status area bit 13
798	Status area bit 14
799	Status area bit 15
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
806	OUTPUT 806
:	(OUTPUT 807 to OUTPUT 1021)
1022	OUTPUT 1022
1023	OUTPUT 1023

## 7.5.11 DeviceNet Slave Board in All User I/O Mode

Note: The table below applies also to the allocation of the slave area on the DeviceNet master/slave board.

Input data	
Port No.	Signal name
512	INPUT 512
513	INPUT 513
514	INPUT 514
515	INPUT 515
516	INPUT 516
517	INPUT 517
518	INPUT 518
519	INPUT 519
520	INPUT 520
521	INPUT 521
522	INPUT 522
523	INPUT 523
524	INPUT 524
525	INPUT 525
526	INPUT 526
527	INPUT 527
528	INPUT 528
529	INPUT 529
530	INPUT 530
531	INPUT 531
532	INPUT 532
533	INPUT 533
534	INPUT 534
535	INPUT 535
536	INPUT 536
537	INPUT 537
538	INPUT 538
539	INPUT 539
540	INPUT 540
541	INPUT 541
542	INPUT 542
543	INPUT 543
544	INPUT 544
545	INPUT 545
546	INPUT 546
547	INPUT 547
548	INPUT 548
549	INPUT 549
:	(INPUT 550 to INPUT 764)
765	INPUT 765
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	OUTPUT 768
769	OUTPUT 769
770	OUTPUT 770
771	OUTPUT 771
772	OUTPUT 772
773	OUTPUT 773
774	OUTPUT 774
775	OUTPUT 775
776	OUTPUT 776
777	OUTPUT 777
778	OUTPUT 778
779	OUTPUT 779
780	OUTPUT 780
781	OUTPUT 781
782	OUTPUT 782
783	OUTPUT 783
784	OUTPUT 784
785	OUTPUT 785
786	OUTPUT 786
787	OUTPUT 787
788	OUTPUT 788
789	OUTPUT 789
790	OUTPUT 790
791	OUTPUT 791
792	OUTPUT 792
793	OUTPUT 793
794	OUTPUT 794
795	OUTPUT 795
796	OUTPUT 796
797	OUTPUT 797
798	OUTPUT 798
799	OUTPUT 799
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
:	(OUTPUT 806 to OUTPUT 1020)
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023

## 7.5.12 CC-Link Board (2 stations occupied) in Compatible Mode

Input data		
Port No.	Signal name	Remote output (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	<i>Continue Start</i>	RYn1
514	<i>Instantaneous Stop (All tasks) [Half]</i>	RYn2
515	<i>Operation Preparation Start</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	<i>Program Start</i>	RYn5
518	—	RYn6
519	—	RYn7
520	Program No. selection bit 0	RYn8
521	Program No. selection bit 1	RYn9
522	Program No. selection bit 2	RYnA
523	Program No. selection bit 3	RYnB
524	Program No. selection bit 4	RYnC
525	Program No. selection bit 5	RYnD
526	Program No. selection bit 6	RYnE
527	Program No. selection parity bit	RYnF
528	<i>Motor Power ON</i>	RY(n+1)0
529	<i>CAL Execution</i>	RY(n+1)1
530	Reserved.	RY(n+1)2
531	<i>SP100</i>	RY(n+1)3
532	<i>External Mode Change</i>	RY(n+1)4
533	<i>Program Reset</i>	RY(n+1)5
534	<i>Clear Robot Error</i>	RY(n+1)6
535	Reserved.	RY(n+1)7
536	User input (INPUT m) (Note 2)	RY(n+1)8
:		:
559		RY(n+2)F
560	Not used.	RY(n+3)0
:		:
575		RY(n+3)F

Output data		
Port No.	Signal name	Remote input (Note 1)
768	Reserved.	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Auto Mode</i>	RXn3
772	<i>External Mode</i>	RXn4
773	<i>Program Start Reset</i>	RXn5
774	Reserved.	RXn6
775	Reserved.	RXn7
776	<i>Robot Power ON Completed</i>	RXn8
777	<i>Servo ON</i>	RXn9
778	<i>CAL Completed</i>	RXnA
779	<i>Teaching ON</i>	RXnB
780	<i>1 Cycle End</i>	RXnC
781	<i>Battery Warning</i>	RXnD
782	<i>Robot Warning</i>	RXnE
783	<i>Continue Start Permission</i>	RXnF
784	Error in the units place, bit 0	RX(n+1)0
785	Error in the units place, bit 1	RX(n+1)1
786	Error in the units place, bit 2	RX(n+1)2
787	Error in the units place, bit 3	RX(n+1)3
788	Error in the tens place, bit 0	RX(n+1)4
789	Error in the tens place, bit 1	RX(n+1)5
790	Error in the tens place, bit 2	RX(n+1)6
791	Error in the tens place, bit 3	RX(n+1)7
792	Error in the hundreds place, bit 0	RX(n+1)8
793	Error in the hundreds place, bit 1	RX(n+1)9
794	Error in the hundreds place, bit 2	RX(n+1)A
795	Error in the hundreds place, bit 3	RX(n+1)B
796	<i>SS Mode</i>	RX(n+1)C
797	Reserved.	RX(n+1)D
798	Reserved.	RX(n+1)E
799	Reserved.	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
815		RX(n+2)F
816	Not used.	RX(n+3)0
:		:
825		RX(n+3)9
826	Error status flag (Note 3)	RX(n+3)A
827	Remote station ready (Note 4)	RX(n+3)B
828	Not used.	RX(n+3)C
:		:
831		RX(n+3)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #782).

Note 4: The output timing is the same as that of *Robot Power ON Completed* (I/O port #776).

Note 5:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual "Remote Resistors (RWw and RWr)"

## 7.5.13 CC-Link Board (3 stations occupied) in Compatible Mode

Input data		
Port No.	Signal name	Remote output (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	<i>Continue Start</i>	RYn1
514	<i>Instantaneous Stop (All tasks) [Halt]</i>	RYn2
515	<i>Operation Preparation Start</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	<i>Program Start</i>	RYn5
518	—	RYn6
519	—	RYn7
520	Program No. selection bit 0	RYn8
521	Program No. selection bit 1	RYn9
522	Program No. selection bit 2	RYnA
523	Program No. selection bit 3	RYnB
524	Program No. selection bit 4	RYnC
525	Program No. selection bit 5	RYnD
526	Program No. selection bit 6	RYnE
527	Program No. selection parity bit	RYnF
528	<i>Motor Power ON</i>	RY(n+1)0
529	<i>CAL Execution</i>	RY(n+1)1
530	Reserved.	RY(n+1)2
531	<i>SP100</i>	RY(n+1)3
532	<i>External Mode Change</i>	RY(n+1)4
533	<i>Program Reset</i>	RY(n+1)5
534	<i>Clear Robot Error</i>	RY(n+1)6
535	Reserved.	RY(n+1)7
536	User input (INPUT m) (Note 2)	RY(n+1)8
:		:
591		RY(n+4)F
592	Not used.	RY(n+5)0
:		:
607		RY(n+5)F

Output data		
Port No.	Signal name	Remote input (Note 1)
768	Reserved.	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Auto Mode</i>	RXn3
772	<i>External Mode</i>	RXn4
773	<i>Program Start Reset</i>	RXn5
774	Reserved.	RXn6
775	Reserved.	RXn7
776	<i>Robot Power ON Completed</i>	RXn8
777	<i>Servo ON</i>	RXn9
778	<i>CAL Completed</i>	RxnA
779	<i>Teaching ON</i>	RXnB
780	<i>1 Cycle End</i>	RXnC
781	<i>Battery Warning</i>	RXnD
782	<i>Robot Warning</i>	RxnE
783	<i>Continue Start Permission</i>	RXnF
784	Error in the units place, bit 0	RX(n+1)0
785	Error in the units place, bit 1	RX(n+1)1
786	Error in the units place, bit 2	RX(n+1)2
787	Error in the units place, bit 3	RX(n+1)3
788	Error in the tens place, bit 0	RX(n+1)4
789	Error in the tens place, bit 1	RX(n+1)5
790	Error in the tens place, bit 2	RX(n+1)6
791	Error in the tens place, bit 3	RX(n+1)7
792	Error in the hundreds place, bit 0	RX(n+1)8
793	Error in the hundreds place, bit 1	RX(n+1)9
794	Error in the hundreds place, bit 2	RX(n+1)A
795	Error in the hundreds place, bit 3	RX(n+1)B
796	<i>SS Mode</i>	RX(n+1)C
797	Reserved.	RX(n+1)D
798	Reserved.	RX(n+1)E
799	Reserved.	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
847		RX(n+4)F
848	Not used.	RX(n+5)0
:		:
857		RX(n+5)9
858	Error status flag (Note 3)	RX(n+5)A
859	Remote station ready (Note 4)	RX(n+5)B
860		RX(n+5)C
:	Not used.	:
863		RX(n+5)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #782).

Note 4: The output timing is the same as that of *Robot Power ON Completed* (I/O port #776).

Note 5:   indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 7.5.14 CC-Link Board (4 stations occupied) in Compatible Mode

Input data		
Port No.	Signal name	Remote output (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	<i>Continue Start</i>	RYn1
514	<i>Instantaneous Stop (All tasks) [Half]</i>	RYn2
515	<i>Operation Preparation Start</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	<i>Program Start</i>	RYn5
518	—	RYn6
519	—	RYn7
520	Program No. selection bit 0	RYn8
521	Program No. selection bit 1	RYn9
522	Program No. selection bit 2	RYnA
523	Program No. selection bit 3	RYnB
524	Program No. selection bit 4	RYnC
525	Program No. selection bit 5	RYnD
526	Program No. selection bit 6	RYnE
527	Program No. selection parity bit	RYnF
528	<i>Motor Power ON</i>	RY(n+1)0
529	<i>CAL Execution</i>	RY(n+1)1
530	Reserved.	RY(n+1)2
531	<i>SP100</i>	RY(n+1)3
532	<i>External Mode Change</i>	RY(n+1)4
533	<i>Program Reset</i>	RY(n+1)5
534	<i>Clear Robot Error</i>	RY(n+1)6
535	Reserved.	RY(n+1)7
536	User input (INPUT m) (Note 2)	RY(n+1)8
:		:
623		RY(n+6)F
624		RY(n+7)0
:	:	
639	RY(n+7)F	

Output data		
Port No.	Signal name	Remote input (Note 1)
768	Reserved.	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Auto Mode</i>	RXn3
772	<i>External Mode</i>	RXn4
773	<i>Program Start Reset</i>	RXn5
774	Reserved.	RXn6
775	Reserved.	RXn7
776	<i>Robot Power ON Completed</i>	RXn8
777	<i>Servo ON</i>	RXn9
778	<i>CAL Completed</i>	RxnA
779	<i>Teaching ON</i>	RXnB
780	<i>1 Cycle End</i>	RXnC
781	<i>Battery Warning</i>	RXnD
782	<i>Robot Warning</i>	RxnE
783	<i>Continue Start Permission</i>	RXnF
784	Error in the units place, bit 0	RX(n+1)0
785	Error in the units place, bit 1	RX(n+1)1
786	Error in the units place, bit 2	RX(n+1)2
787	Error in the units place, bit 3	RX(n+1)3
788	Error in the tens place, bit 0	RX(n+1)4
789	Error in the tens place, bit 1	RX(n+1)5
790	Error in the tens place, bit 2	RX(n+1)6
791	Error in the tens place, bit 3	RX(n+1)7
792	Error in the hundreds place, bit 0	RX(n+1)8
793	Error in the hundreds place, bit 1	RX(n+1)9
794	Error in the hundreds place, bit 2	RX(n+1)A
795	Error in the hundreds place, bit 3	RX(n+1)B
796	<i>SS Mode</i>	RX(n+1)C
797	Reserved.	RX(n+1)D
798	Reserved.	RX(n+1)E
799	Reserved.	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
879		RX(n+6)F
880		RX(n+7)0
:	:	
889	RX(n+7)9	
890	Error status flag (Note 3)	RX(n+7)A
891	Remote station ready (Note 4)	RX(n+7)B
892		RX(n+7)C
:	Not used.	:
895		RX(n+7)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #782).

Note 4: The output timing is the same as that of *Robot Power ON Completed* (I/O port #776).

Note 5:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 7.5.15 CC-Link Board (2 stations occupied) in Standard Mode

Input data		
Port No.	Signal name	Remote output (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	Reserved.	RYn1
514	<i>Instantaneous Stop (All tasks) [Half]</i>	RYn2
515	<i>Strobe Signal</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	—	RYn5
518	—	RYn6
519	Command data area odd parity	RYn7
520	Data area 1 bit 0	RYn8
521	Data area 1 bit 1	RYn9
522	Data area 1 bit 2	RYnA
523	Data area 1 bit 3	RYnB
524	Data area 1 bit 4	RYnC
525	Data area 1 bit 5	RYnD
526	Data area 1 bit 6	RYnE
527	Data area 1 bit 7	RYnF
528	Data area 2 bit 0	RY(n+1)0
529	Data area 2 bit 1	RY(n+1)1
530	Data area 2 bit 2	RY(n+1)2
531	Data area 2 bit 3	RY(n+1)3
532	Data area 2 bit 4	RY(n+1)4
533	Data area 2 bit 5	RY(n+1)5
534	Data area 2 bit 6	RY(n+1)6
535	Data area 2 bit 7	RY(n+1)7
536	Data area 2 bit 8	RY(n+1)8
537	Data area 2 bit 9	RY(n+1)9
538	Data area 2 bit 10	RY(n+1)A
539	Data area 2 bit 11	RY(n+1)B
540	Data area 2 bit 12	RY(n+1)C
541	Data area 2 bit 13	RY(n+1)D
542	Data area 2 bit 14	RY(n+1)E
543	Data area 2 bit 15	RY(n+1)F
544	Command area bit 0	RY(n+2)0
545	Command area bit 1	RY(n+2)1
546	Command area bit 2	RY(n+2)2
547	Command area bit 3	RY(n+2)3
548	Reserved.	RY(n+2)4
549	Reserved.	RY(n+2)5
550	Reserved.	RY(n+2)6
551	Reserved.	RY(n+2)7
552	User input (INPUT m) (Note 2)	RY(n+2)8
:		:
559		RY(n+2)F
560	Not used.	RY(n+3)0
:		:
575		RY(n+3)F

Output data		
Port No.	Signal name	Remote input (Note 1)
768	Reserved.	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Servo ON</i>	RXn3
772	<i>Robot Initialized</i>	RXn4
773	<i>Auto Mode</i>	RXn5
774	<i>External Mode</i>	RXn6
775	<i>Battery Warning</i>	RXn7
776	<i>Robot Warning</i>	RXn8
777	<i>Continue Start Permission</i>	RXn9
778	<i>SS Mode</i>	RXnA
779	Reserved.	RXnB
780	Reserved.	RXnC
781	Reserved.	RXnD
782	<i>Command Processing Completed</i>	RXnE
783	Status area odd parity	RXnF
784	Status area bit 0	RX(n+1)0
785	Status area bit 1	RX(n+1)1
786	Status area bit 2	RX(n+1)2
787	Status area bit 3	RX(n+1)3
788	Status area bit 4	RX(n+1)4
789	Status area bit 5	RX(n+1)5
790	Status area bit 6	RX(n+1)6
791	Status area bit 7	RX(n+1)7
792	Status area bit 8	RX(n+1)8
793	Status area bit 9	RX(n+1)9
794	Status area bit 10	RX(n+1)A
795	Status area bit 11	RX(n+1)B
796	Status area bit 12	RX(n+1)C
797	Status area bit 13	RX(n+1)D
798	Status area bit 14	RX(n+1)E
799	Status area bit 15	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
815		RX(n+2)F
816	Not used.	RX(n+3)0
:		:
825		RX(n+3)9
826	Error status flag (Note 3)	RX(n+3)A
827	Remote station ready (Note 4)	RX(n+3)B
828	Not used.	RX(n+3)C
:		:
829		RX(n+3)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #776).

Note 4: The output timing is the same as that of *Robot Initialized* (I/O port #772).

Note 5:   indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 7.5.16 CC-Link Board (3 stations occupied) in Standard Mode

Input data			Output data		
Port No.	Signal name	Remote output. (Note 1)	Port No.	Signal name	Remote input (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0	768	Reserved.	RXn0
513	Reserved.	RYn1	769	<i>Robot Running</i>	RXn1
514	<i>Instantaneous Stop (All tasks) [Half]</i>	RYn2	770	<i>Robot Error</i>	RXn2
515	<i>Strobe Signal</i>	RYn3	771	<i>Servo ON</i>	RXn3
516	<i>Interruption Skip</i>	RYn4	772	<i>Robot Initialized</i>	RXn4
517	—	RYn5	773	<i>Auto Mode</i>	RXn5
518	—	RYn6	774	<i>External Mode</i>	RXn6
519	Command data area odd parity	RYn7	775	<i>Battery Warning</i>	RXn7
520	Data area 1 bit 0	RYn8	776	<i>Robot Warning</i>	RXn8
521	Data area 1 bit 1	RYn9	777	<i>Continue Start Permission</i>	RXn9
522	Data area 1 bit 2	RYnA	778	<i>SS Mode</i>	RxnA
523	Data area 1 bit 3	RYnB	779	Reserved.	RXnB
524	Data area 1 bit 4	RYnC	780	Reserved.	RXnC
525	Data area 1 bit 5	RYnD	781	Reserved.	RXnD
526	Data area 1 bit 6	RYnE	782	<i>Command Processing Completed</i>	RxnE
527	Data area 1 bit 7	RYnF	783	Status area odd parity	RXnF
528	Data area 2 bit 0	RY(n+1)0	784	Status area bit 0	RX(n+1)0
529	Data area 2 bit 1	RY(n+1)1	785	Status area bit 1	RX(n+1)1
530	Data area 2 bit 2	RY(n+1)2	786	Status area bit 2	RX(n+1)2
531	Data area 2 bit 3	RY(n+1)3	787	Status area bit 3	RX(n+1)3
532	Data area 2 bit 4	RY(n+1)4	788	Status area bit 4	RX(n+1)4
533	Data area 2 bit 5	RY(n+1)5	789	Status area bit 5	RX(n+1)5
534	Data area 2 bit 6	RY(n+1)6	790	Status area bit 6	RX(n+1)6
535	Data area 2 bit 7	RY(n+1)7	791	Status area bit 7	RX(n+1)7
536	Data area 2 bit 8	RY(n+1)8	792	Status area bit 8	RX(n+1)8
537	Data area 2 bit 9	RY(n+1)9	793	Status area bit 9	RX(n+1)9
538	Data area 2 bit 10	RY(n+1)A	794	Status area bit 10	RX(n+1)A
539	Data area 2 bit 11	RY(n+1)B	795	Status area bit 11	RX(n+1)B
540	Data area 2 bit 12	RY(n+1)C	796	Status area bit 12	RX(n+1)C
541	Data area 2 bit 13	RY(n+1)D	797	Status area bit 13	RX(n+1)D
542	Data area 2 bit 14	RY(n+1)E	798	Status area bit 14	RX(n+1)E
543	Data area 2 bit 15	RY(n+1)F	799	Status area bit 15	RX(n+1)F
544	Command area bit 0	RY(n+2)0	800	User output (OUTPUT m) (Note 2)	RX(n+2)0
545	Command area bit 1	RY(n+2)1	:		:
546	Command area bit 2	RY(n+2)2	847		RX(n+4)F
547	Command area bit 3	RY(n+2)3	848	Not used.	RX(n+5)0
548	Reserved.	RY(n+2)4	:		:
549	Reserved.	RY(n+2)5	857		RX(n+5)9
550	Reserved.	RY(n+2)6	858	Error status flag (Note 3)	RX(n+5)A
551	Reserved.	RY(n+2)7	859	Remote station ready (Note 4)	RX(n+5)B
552	User input (INPUT m) (Note 2)	RY(n+2)8	860	Not used.	RX(n+5)C
:		:	:		:
591		RY(n+4)F	863		RX(n+5)F
592	Not used.	RY(n+5)0			
:		:			
607		RY(n+5)F			

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #776).

Note 4: The output timing is the same as that of *Robot Initialized* (I/O port #772).

Note 5:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual "Remote Resistors (RWw and RWr)"

## 7.5.17 CC-Link Board (4 stations occupied) in Standard Mode

Input data		
Port No.	Signal name	Remote output. (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	Reserved.	RYn1
514	<i>Instantaneous Stop (All tasks) [Half]</i>	RYn2
515	<i>Strobe Signal</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	—	RYn5
518	—	RYn6
519	Command data area odd parity	RYn7
520	Data area 1 bit 0	RYn8
521	Data area 1 bit 1	RYn9
522	Data area 1 bit 2	RYnA
523	Data area 1 bit 3	RYnB
524	Data area 1 bit 4	RYnC
525	Data area 1 bit 5	RYnD
526	Data area 1 bit 6	RYnE
527	Data area 1 bit 7	RYnF
528	Data area 2 bit 0	RY(n+1)0
529	Data area 2 bit 1	RY(n+1)1
530	Data area 2 bit 2	RY(n+1)2
531	Data area 2 bit 3	RY(n+1)3
532	Data area 2 bit 4	RY(n+1)4
533	Data area 2 bit 5	RY(n+1)5
534	Data area 2 bit 6	RY(n+1)6
535	Data area 2 bit 7	RY(n+1)7
536	Data area 2 bit 8	RY(n+1)8
537	Data area 2 bit 9	RY(n+1)9
538	Data area 2 bit 10	RY(n+1)A
539	Data area 2 bit 11	RY(n+1)B
540	Data area 2 bit 12	RY(n+1)C
541	Data area 2 bit 13	RY(n+1)D
542	Data area 2 bit 14	RY(n+1)E
543	Data area 2 bit 15	RY(n+1)F
544	Command area bit 0	RY(n+2)0
545	Command area bit 1	RY(n+2)1
546	Command area bit 2	RY(n+2)2
547	Command area bit 3	RY(n+2)3
548	Reserved.	RY(n+2)4
549	Reserved.	RY(n+2)5
550	Reserved.	RY(n+2)6
551	Reserved.	RY(n+2)7
552	User input (INPUT m)	RY(n+2)8
:	(Note 2)	:
623		RY(n+6)F
624	Not used.	RY(n+7)0
:		:
639		RY(n+7)F

Output data		
Port No.	Signal name	Remote input (Note 1)
768	Reserved.	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Servo ON</i>	RXn3
772	<i>Robot Initialized</i>	RXn4
773	<i>Auto Mode</i>	RXn5
774	<i>External Mode</i>	RXn6
775	<i>Battery Warning</i>	RXn7
776	<i>Robot Warning</i>	RXn8
777	<i>Continue Start Permission</i>	RXn9
778	<i>SS Mode</i>	RxnA
779	Reserved.	RXnB
780	Reserved.	RXnC
781	Reserved.	RXnD
782	<i>Command Processing Completed</i>	RxnE
783	Status area odd parity	RXnF
784	Status area bit 0	RX(n+1)0
785	Status area bit 1	RX(n+1)1
786	Status area bit 2	RX(n+1)2
787	Status area bit 3	RX(n+1)3
788	Status area bit 4	RX(n+1)4
789	Status area bit 5	RX(n+1)5
790	Status area bit 6	RX(n+1)6
791	Status area bit 7	RX(n+1)7
792	Status area bit 8	RX(n+1)8
793	Status area bit 9	RX(n+1)9
794	Status area bit 10	RX(n+1)A
795	Status area bit 11	RX(n+1)B
796	Status area bit 12	RX(n+1)C
797	Status area bit 13	RX(n+1)D
798	Status area bit 14	RX(n+1)E
799	Status area bit 15	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
879		RX(n+6)F
880	Not used.	RX(n+7)0
:		:
889		RX(n+7)9
890	Error status flag (Note 3)	RX(n+7)A
891	Remote station ready (Note 4)	RX(n+7)B
892		RX(n+7)C
:	Not used.	:
895		

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #776).

Note 4: The output timing is the same as that of *Robot Initialized* (I/O port #772).

Note 5:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers R<sub>Ww</sub> and R<sub>Wr</sub>, refer to the Options Manual " Remote Resistors (R<sub>Ww</sub> and R<sub>Wr</sub>)"

## 7.5.18 CC-Link Board (2 stations occupied) in All User I/O Mode

Input data		
Port No.	Signal name	Remote output. (Note 1)
512	INPUT 512	RYn0
513	INPUT 513	RYn1
514	INPUT 514	RYn2
515	INPUT 515	RYn3
516	INPUT 516	RYn4
517	INPUT 517	RYn5
518	INPUT 518	RYn6
519	INPUT 519	RYn7
520	INPUT 520	RYn8
521	INPUT 521	RYn9
522	INPUT 522	RYnA
523	INPUT 523	RYnB
524	INPUT 524	RYnC
525	INPUT 525	RYnD
526	INPUT 526	RYnE
527	INPUT 527	RYnF
528	INPUT 528	RY(n+1)0
529	INPUT 529	RY(n+1)1
530	INPUT 530	RY(n+1)2
531	INPUT 531	RY(n+1)3
532	INPUT 532	RY(n+1)4
533	INPUT 533	RY(n+1)5
534	INPUT 534	RY(n+1)6
535	INPUT 535	RY(n+1)7
536	User input (INPUT m) (Note 2)	RY(n+1)8
:		:
559		RY(n+2)F
560	Not used.	RY(n+3)0
:		:
575		RY(n+3)F

Output data		
Port No.	Signal name	Remote input (Note 1)
768	OUTPUT 768	RXn0
769	OUTPUT 769	RXn1
770	OUTPUT 770	RXn2
771	OUTPUT 771	RXn3
772	OUTPUT 772	RXn4
773	OUTPUT 773	RXn5
774	OUTPUT 774	RXn6
775	OUTPUT 775	RXn7
776	OUTPUT 776	RXn8
777	OUTPUT 777	RXn9
778	OUTPUT 778	RXnA
779	OUTPUT 779	RXnB
780	OUTPUT 780	RXnC
781	OUTPUT 781	RXnD
782	OUTPUT 782	RXnE
783	OUTPUT 783	RXnF
784	OUTPUT 784	RX(n+1)0
785	OUTPUT 785	RX(n+1)1
786	OUTPUT 786	RX(n+1)2
787	OUTPUT 787	RX(n+1)3
788	OUTPUT 788	RX(n+1)4
789	OUTPUT 789	RX(n+1)5
790	OUTPUT 790	RX(n+1)6
791	OUTPUT 791	RX(n+1)7
792	OUTPUT 792	RX(n+1)8
793	OUTPUT 793	RX(n+1)9
794	OUTPUT 794	RX(n+1)A
795	OUTPUT 795	RX(n+1)B
796	OUTPUT 796	RX(n+1)C
797	OUTPUT 797	RX(n+1)D
798	OUTPUT 798	RX(n+1)E
799	OUTPUT 799	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
815		RX(n+2)F
816	Not used.	RX(n+3)0
:		:
825		RX(n+3)9
826	Error status flag	RX(n+3)A
827	Remote station ready	RX(n+3)B
828		RX(n+3)C
:	Not used.	:
831		RX(n+3)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3:   indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 7.5.19 CC-Link Board (3 stations occupied) in All User I/O Mode

Input data		
Port No.	Signal name	Remote output. (Note 1)
512	INPUT 512	RYn0
513	INPUT 513	RYn1
514	INPUT 514	RYn2
515	INPUT 515	RYn3
516	INPUT 516	RYn4
517	INPUT 517	RYn5
518	INPUT 518	RYn6
519	INPUT 519	RYn7
520	INPUT 520	RYn8
521	INPUT 521	RYn9
522	INPUT 522	RYnA
523	INPUT 523	RYnB
524	INPUT 524	RYnC
525	INPUT 525	RYnD
526	INPUT 526	RYnE
527	INPUT 527	RYnF
528	INPUT 528	RY(n+1)0
529	INPUT 529	RY(n+1)1
530	INPUT 530	RY(n+1)2
531	INPUT 531	RY(n+1)3
532	INPUT 532	RY(n+1)4
533	INPUT 533	RY(n+1)5
534	INPUT 534	RY(n+1)6
535	INPUT 535	RY(n+1)7
536	User input (INPUT m) (Note 2)	RY(n+1)8
:		:
591		RY(n+4)F
592		RY(n+5)0
:	Not used.	:
607	Not used.	RY(n+5)F

Output data		
Port No.	Signal name	Remote input (Note 1)
768	OUTPUT 768	RXn0
769	OUTPUT 769	RXn1
770	OUTPUT 770	RXn2
771	OUTPUT 771	RXn3
772	OUTPUT 772	RXn4
773	OUTPUT 773	RXn5
774	OUTPUT 774	RXn6
775	OUTPUT 775	RXn7
776	OUTPUT 776	RXn8
777	OUTPUT 777	RXn9
778	OUTPUT 778	RXnA
779	OUTPUT 779	RXnB
780	OUTPUT 780	RXnC
781	OUTPUT 781	RXnD
782	OUTPUT 782	RXnE
783	OUTPUT 783	RXnF
784	OUTPUT 784	RX(n+1)0
785	OUTPUT 785	RX(n+1)1
786	OUTPUT 786	RX(n+1)2
787	OUTPUT 787	RX(n+1)3
788	OUTPUT 788	RX(n+1)4
789	OUTPUT 789	RX(n+1)5
790	OUTPUT 790	RX(n+1)6
791	OUTPUT 791	RX(n+1)7
792	OUTPUT 792	RX(n+1)8
793	OUTPUT 793	RX(n+1)9
794	OUTPUT 794	RX(n+1)A
795	OUTPUT 795	RX(n+1)B
796	OUTPUT 796	RX(n+1)C
797	OUTPUT 797	RX(n+1)D
798	OUTPUT 798	RX(n+1)E
799	OUTPUT 799	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
847		RX(n+4)F
848		Not used.
:	Not used.	:
857	Not used.	RX(n+5)9
858	Error status flag	RX(n+5)A
859	Remote station ready	RX(n+5)B
860	Not used.	RX(n+5)C
:	Not used.	:
863	Not used.	RX(n+5)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 7.5.20 CC-Link Board (4 stations occupied) in All User I/O Mode

Input data			
Port No.	Signal name	Remote output. (Note 1)	
512	INPUT 512	RYn0	
513	INPUT 513	RYn1	
514	INPUT 514	RYn2	
515	INPUT 515	RYn3	
516	INPUT 516	RYn4	
517	INPUT 517	RYn5	
518	INPUT 518	RYn6	
519	INPUT 519	RYn7	
520	INPUT 520	RYn8	
521	INPUT 521	RYn9	
522	INPUT 522	RYnA	
523	INPUT 523	RYnB	
524	INPUT 524	RYnC	
525	INPUT 525	RYnD	
526	INPUT 526	RYnE	
527	INPUT 527	RYnF	
528	INPUT 528	RY(n+1)0	
529	INPUT 529	RY(n+1)1	
530	INPUT 530	RY(n+1)2	
531	INPUT 531	RY(n+1)3	
532	INPUT 532	RY(n+1)4	
533	INPUT 533	RY(n+1)5	
534	INPUT 534	RY(n+1)6	
535	INPUT 535	RY(n+1)7	
536	User input (INPUT m) (Note 2)	RY(n+1)8	
:		:	
623		RY(n+6)F	
624		Not used.	RY(n+7)0
:			:
639			RY(n+7)F

Output data			
Port No.	Signal name	Remote input (Note 1)	
768	OUTPUT 768	RXn0	
769	OUTPUT 769	RXn1	
770	OUTPUT 770	RXn2	
771	OUTPUT 771	RXn3	
772	OUTPUT 772	RXn4	
773	OUTPUT 773	RXn5	
774	OUTPUT 774	RXn6	
775	OUTPUT 775	RXn7	
776	OUTPUT 776	RXn8	
777	OUTPUT 777	RXn9	
778	OUTPUT 778	RXnA	
779	OUTPUT 779	RXnB	
780	OUTPUT 780	RXnC	
781	OUTPUT 781	RXnD	
782	OUTPUT 782	RXnE	
783	OUTPUT 783	RXnF	
784	OUTPUT 784	RX(n+1)0	
785	OUTPUT 785	RX(n+1)1	
786	OUTPUT 786	RX(n+1)2	
787	OUTPUT 787	RX(n+1)3	
788	OUTPUT 788	RX(n+1)4	
789	OUTPUT 789	RX(n+1)5	
790	OUTPUT 790	RX(n+1)6	
791	OUTPUT 791	RX(n+1)7	
792	OUTPUT 792	RX(n+1)8	
793	OUTPUT 793	RX(n+1)9	
794	OUTPUT 794	RX(n+1)A	
795	OUTPUT 795	RX(n+1)B	
796	OUTPUT 796	RX(n+1)C	
797	OUTPUT 797	RX(n+1)D	
798	OUTPUT 798	RX(n+1)E	
799	OUTPUT 799	RX(n+1)F	
800	User output (OUTPUT m) (Note 2)	RX(n+2)0	
:		:	
879		RX(n+6)F	
880		Not used.	RX(n+7)0
:			:
889			RX(n+7)9
890	Error status flag	RX(n+7)A	
891	Remote station ready	RX(n+7)B	
892		RX(n+7)C	
:	Not used.	:	
895		RX(n+7)F	

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 7.5.21 PROFIBUS-DP Slave Board in Compatible Mode

Input data	
Port No.	Signal name
512	<i>Step Stop (All tasks)</i>
513	<i>Continue Start</i>
514	<i>Instantaneous Stop (All tasks) [Halt]</i>
515	<i>Operation Preparation Start</i>
516	<i>Interruption Skip</i>
517	<i>Program Start</i>
518	—
519	—
520	Program No. selection bit 0
521	Program No. selection bit 1
522	Program No. selection bit 2
523	Program No. selection bit 3
524	Program No. selection bit 4
525	Program No. selection bit 5
526	Program No. selection bit 6
527	Program No. selection parity bit
528	Motor power ON
529	<i>CAL Execution</i>
530	Reserved.
531	<i>SP100</i>
532	<i>External Mode Change</i>
533	<i>Program Reset</i>
534	<i>Clear Robot Error</i>
535	Reserved.
536	INPUT 536
537	INPUT 537
538	INPUT 538
539	INPUT 539
540	INPUT 540
541	INPUT 541
542	INPUT 542
543	INPUT 543
544	INPUT 544
545	INPUT 545
546	INPUT 546
547	INPUT 547
548	INPUT 548
549	INPUT 549
⋮	(INPUT 550 to INPUT 764)
765	INPUT 765
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	Reserved.
769	<i>Robot Running</i>
770	<i>Robot Error</i>
771	<i>Auto Mode</i>
772	<i>External Mode</i>
773	<i>Program Start Reset</i>
774	Reserved.
775	Reserved.
776	<i>Robot Power ON Completed</i>
777	<i>Servo ON</i>
778	<i>CAL Completed</i>
779	<i>Teaching ON</i>
780	<i>1 Cycle End</i>
781	<i>Battery Warning</i>
782	<i>Robot Warning</i>
783	<i>Continue Start Permission</i>
784	Error in the units place, bit 0
785	Error in the units place, bit 1
786	Error in the units place, bit 2
787	Error in the units place, bit 3
788	Error in the tens place, bit 0
789	Error in the tens place, bit 1
790	Error in the tens place, bit 2
791	Error in the tens place, bit 3
792	Error in the hundreds place, bit 0
793	Error in the hundreds place, bit 1
794	Error in the hundreds place, bit 2
795	Error in the hundreds place, bit 3
796	<i>SS Mode</i>
797	Reserved.
798	Reserved.
799	Reserved.
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
⋮	(OUTPUT 806 to OUTPUT 1020)
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 7.5.22 PROFIBUS-DP Slave Board in Standard Mode

Input data	
Port No.	Signal name
512	<i>Step Stop (All tasks)</i>
513	Reserved.
514	<i>Instantaneous Stop (All tasks) [Halt]</i>
515	<i>Strobe Signal</i>
516	<i>Interruption Skip</i>
517	—
518	—
519	Command data area odd parity
520	Data area 1 bit 0
521	Data area 1 bit 1
522	Data area 1 bit 2
523	Data area 1 bit 3
524	Data area 1 bit 4
525	Data area 1 bit 5
526	Data area 1 bit 6
527	Data area 1 bit 7
528	Data area 2 bit 0
529	Data area 2 bit 1
530	Data area 2 bit 2
531	Data area 2 bit 3
532	Data area 2 bit 4
533	Data area 2 bit 5
534	Data area 2 bit 6
535	Data area 2 bit 7
536	Data area 2 bit 8
537	Data area 2 bit 9
538	Data area 2 bit 10
539	Data area 2 bit 11
540	Data area 2 bit 12
541	Data area 2 bit 13
542	Data area 2 bit 14
543	Data area 2 bit 15
544	Command area bit 0
545	Command area bit 1
546	Command area bit 2
547	Command area bit 3
548 to 551	—
552	INPUT 552
553	INPUT 553
⋮	(INPUT 554 to INPUT 765)
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	Reserved.
769	<i>Robot Running</i>
770	<i>Robot Error</i>
771	<i>Servo ON</i>
772	<i>Robot Initialized</i>
773	<i>Auto Mode</i>
774	<i>External Mode</i>
775	<i>Battery Warning</i>
776	<i>Robot Warning</i>
777	<i>Continue Start Permission</i>
778	<i>SS Mode</i>
779	Reserved.
780	Reserved.
781	Reserved.
782	<i>Command Processing Completed</i>
783	Status area odd parity
784	Status area bit 0
785	Status area bit 1
786	Status area bit 2
787	Status area bit 3
788	Status area bit 4
789	Status area bit 5
790	Status area bit 6
791	Status area bit 7
792	Status area bit 8
793	Status area bit 9
794	Status area bit 10
795	Status area bit 11
796	Status area bit 12
797	Status area bit 13
798	Status area bit 14
799	Status area bit 15
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
806	OUTPUT 806
⋮	(OUTPUT 807 to OUTPUT 1021)
1022	OUTPUT 1022
1023	OUTPUT 1023

### 7.5.23 PROFIBUS-DP Slave Board in All User I/O Mode

Input data	
Port No.	Signal name
512	INPUT 512
513	INPUT 513
514	INPUT 514
515	INPUT 515
516	INPUT 516
517	INPUT 517
518	INPUT 518
519	INPUT 519
520	INPUT 520
521	INPUT 521
522	INPUT 522
523	INPUT 523
524	INPUT 524
525	INPUT 525
526	INPUT 526
527	INPUT 527
528	INPUT 528
529	INPUT 529
530	INPUT 530
531	INPUT 531
532	INPUT 532
533	INPUT 533
534	INPUT 534
535	INPUT 535
536	INPUT 536
537	INPUT 537
538	INPUT 538
539	INPUT 539
540	INPUT 540
541	INPUT 541
542	INPUT 542
543	INPUT 543
544	INPUT 544
545	INPUT 545
546	INPUT 546
547	INPUT 547
548	INPUT 548
549	INPUT 549
:	(INPUT 550 to INPUT 764)
765	INPUT 765
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	OUTPUT 768
769	OUTPUT 769
770	OUTPUT 770
771	OUTPUT 771
772	OUTPUT 772
773	OUTPUT 773
774	OUTPUT 774
775	OUTPUT 775
776	OUTPUT 776
777	OUTPUT 777
778	OUTPUT 778
779	OUTPUT 779
780	OUTPUT 780
781	OUTPUT 781
782	OUTPUT 782
783	OUTPUT 783
784	OUTPUT 784
785	OUTPUT 785
786	OUTPUT 786
787	OUTPUT 787
788	OUTPUT 788
789	OUTPUT 789
790	OUTPUT 790
791	OUTPUT 791
792	OUTPUT 792
793	OUTPUT 793
794	OUTPUT 794
795	OUTPUT 795
796	OUTPUT 796
797	OUTPUT 797
798	OUTPUT 798
799	OUTPUT 799
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
:	(OUTPUT 806 to OUTPUT 1020)
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023

## 7.5.24 DeviceNet Master Board in All User I/O Mode

Note: The table below applies also to the allocation of the master area on the DeviceNet master/slave board.

Input data	
Port No.	Signal name
1024	INPUT 1024
1025	INPUT 1025
1026	INPUT 1026
1027	INPUT 1027
1028	INPUT 1028
1029	INPUT 1029
1030	INPUT 1030
1031	INPUT 1031
1032	INPUT 1032
1033	INPUT 1033
1034	INPUT 1034
1035	INPUT 1035
1036	INPUT 1036
1037	INPUT 1037
1038	INPUT 1038
1039	INPUT 1039
1040	INPUT 1040
1041	INPUT 1041
1042	INPUT 1042
1043	INPUT 1043
1044	INPUT 1044
1045	INPUT 1045
1046	INPUT 1046
1047	INPUT 1047
1048	INPUT 1048
1049	INPUT 1049
1050	INPUT 1050
1051	INPUT 1051
1052	INPUT 1052
1053	INPUT 1053
1054	INPUT 1054
1055	INPUT 1055
1056	INPUT 1056
1057	INPUT 1057
1058	INPUT 1058
1059	INPUT 1059
1060	INPUT 1060
1061	INPUT 1061
:	(INPUT 1062 to INPUT 2044)
2045	INPUT 2045
2046	INPUT 2046
2047	INPUT 2047

Output data	
Port No.	Signal name
2048	OUTPUT 2048
2049	OUTPUT 2049
2050	OUTPUT 2050
2051	OUTPUT 2051
2052	OUTPUT 2052
2053	OUTPUT 2053
2054	OUTPUT 2054
2055	OUTPUT 2055
2056	OUTPUT 2056
2057	OUTPUT 2057
2058	OUTPUT 2058
2059	OUTPUT 2059
2060	OUTPUT 2060
2061	OUTPUT 2061
2062	OUTPUT 2062
2063	OUTPUT 2063
2064	OUTPUT 2064
2065	OUTPUT 2065
2066	OUTPUT 2066
2067	OUTPUT 2067
2068	OUTPUT 2068
2069	OUTPUT 2069
2070	OUTPUT 2070
2071	OUTPUT 2071
2072	OUTPUT 2072
2073	OUTPUT 2073
2074	OUTPUT 2074
2075	OUTPUT 2075
2076	OUTPUT 2076
2077	OUTPUT 2077
2078	OUTPUT 2078
2079	OUTPUT 2079
2080	OUTPUT 2080
2081	OUTPUT 2081
2082	OUTPUT 2082
2083	OUTPUT 2083
2084	OUTPUT 2084
2085	OUTPUT 2085
:	(OUTPUT 2086 to OUTPUT 3068)
3069	OUTPUT 3069
3070	OUTPUT 3070
3071	OUTPUT 3071

## 7.5.25 S-Link V Master Board in All User I/O Mode

Input data	
Port No.	Signal name
3072	INPUT 3072
3073	INPUT 3073
3074	INPUT 3074
3075	INPUT 3075
3076	INPUT 3076
3077	INPUT 3077
3078	INPUT 3078
3079	INPUT 3079
3080	INPUT 3080
3081	INPUT 3081
3082	INPUT 3082
3083	INPUT 3083
3084	INPUT 3084
3085	INPUT 3085
3086	INPUT 3086
3087	INPUT 3087
3088	INPUT 3088
3089	INPUT 3089
3090	INPUT 3090
3091	INPUT 3091
3092	INPUT 3092
3093	INPUT 3093
3094	INPUT 3094
3095	INPUT 3095
3096	INPUT 3096
3097	INPUT 3097
3098	INPUT 3098
3099	INPUT 3099
3100	INPUT 3100
3101	INPUT 3101
3102	INPUT 3102
3103	INPUT 3103
3104	INPUT 3104
3105	INPUT 3105
3106	INPUT 3106
3107	INPUT 3107
3108	INPUT 3108
3109	INPUT 3109
:	(INPUT 3110 to INPUT 3324)
3325	INPUT 3325
3326	INPUT 3326
3327	INPUT 3327

Output data	
Port No.	Signal name
3328	OUTPUT 3328
3329	OUTPUT 3329
3330	OUTPUT 3330
3331	OUTPUT 3331
3332	OUTPUT 3332
3333	OUTPUT 3333
3334	OUTPUT 3334
3335	OUTPUT 3335
3336	OUTPUT 3336
3337	OUTPUT 3337
3338	OUTPUT 3338
3339	OUTPUT 3339
3340	OUTPUT 3340
3341	OUTPUT 3341
3342	OUTPUT 3342
3343	OUTPUT 3343
3344	OUTPUT 3344
3345	OUTPUT 3345
3346	OUTPUT 3346
3347	OUTPUT 3347
3348	OUTPUT 3348
3349	OUTPUT 3349
3350	OUTPUT 3350
3351	OUTPUT 3351
3352	OUTPUT 3352
3353	OUTPUT 3353
3354	OUTPUT 3354
3355	OUTPUT 3355
3356	OUTPUT 3356
3357	OUTPUT 3357
3358	OUTPUT 3358
3359	OUTPUT 3359
3360	OUTPUT 3360
3361	OUTPUT 3361
3362	OUTPUT 3362
3363	OUTPUT 3363
3364	OUTPUT 3364
3365	OUTPUT 3365
:	(OUTPUT 3366 to OUTPUT 3580)
3581	OUTPUT 3581
3582	OUTPUT 3582
3583	OUTPUT 3583

## 7.5.26 Ethernet/IP Module in Standard Mode

Input data	
Port No.	Signal name
512	Step Stop (All tasks)
513	—
514	Halt (All tasks)
515	Strobe Signal
516	Interruption Skip
517	—
518	—
519	Command data area odd parity
520	Data area 1, bit 0
521	Data area 1, bit 1
522	Data area 1, bit 2
523	Data area 1, bit 3
524	Data area 1, bit 4
525	Data area 1, bit 5
526	Data area 1, bit 6
527	Data area 1, bit 7
528	Data area 2, bit 0
529	Data area 2, bit 1
530	Data area 2, bit 2
531	Data area 2, bit 3
532	Data area 2, bit 4
533	Data area 2, bit 5
534	Data area 2, bit 6
535	Data area 2, bit 7
536	Data area 2, bit 8
537	Data area 2, bit 9
538	Data area 2, bit 10
539	Data area 2, bit 11
540	Data area 2, bit 12
541	Data area 2, bit 13
542	Data area 2, bit 14
543	Data area 2, bit 15

Input data	
Port No.	Signal name
544	Command area, bit 0
545	Command area, bit 1
546	Command area, bit 2
547	Command area, bit 3
548	—
549	—
550	—
551	—
552	INPUT 552
553	INPUT 553
554	INPUT 554
555	INPUT 555
556	INPUT 556
557	INPUT 557
558	INPUT 558
559	INPUT 559
:	(INPUT 560 to INPUT 759)
760	INPUT 760
761	INPUT 761
762	INPUT 762
763	INPUT 763
764	INPUT 764
765	INPUT 765
766	INPUT 766
767	INPUT 767
4096	INPUT 4096
4097	INPUT 4097
:	(INPUT 4098 to INPUT 7869)
7870	INPUT 7870
7871	INPUT 7871

**Note:** In main system software versions earlier than 3.2, data is assigned up to port number 767.

Output data	
Port No.	Signal name
768	—
769	Robot Running
770	Robot Error
771	Servo ON
772	Robot Initialized
773	Auto Mode
774	External Mode
775	Battery Warning
776	Robot Warning
777	Continue Start Permission
778	SS Mode
779	—
780	—
781	—
782	Command Processing Completed
783	Status area, odd parity
784	Status area, bit 0
785	Status area, bit 1
786	Status area, bit 2
787	Status area, bit 3
788	Status area, bit 4
789	Status area, bit 5
790	Status area, bit 6
791	Status area, bit 7
792	Status area, bit 8
793	Status area, bit 9
794	Status area, bit 10
795	Status area, bit 11
796	Status area, bit 12
797	Status area, bit 13
798	Status area, bit 14
799	Status area, bit 15

Output data	
Port No.	Signal name
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
806	OUTPUT 806
807	OUTPUT 807
808	OUTPUT 808
809	OUTPUT 809
810	OUTPUT 810
811	OUTPUT 811
812	OUTPUT 812
813	OUTPUT 813
814	OUTPUT 814
815	OUTPUT 815
:	(OUTPUT 816 to OUTPUT 1015)
1016	OUTPUT 1016
1017	OUTPUT 1017
1018	OUTPUT 1018
1019	OUTPUT 1019
1020	OUTPUT 1020
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023
7872	OUTPUT 7872
7873	OUTPUT 7873
:	(OUTPUT 7874 to OUTPUT 11645)
11646	OUTPUT 11646
11647	OUTPUT 11647

**Note:** In main system software versions earlier than 3.2, data is assigned up to port number 1023.

## 7.5.27 Ethernet/IP Module in Compatible Mode

Input data	
Port No.	Signal name
512	Step Stop (All tasks)
513	Continue Start
514	Halt (All tasks)
515	Operation Preparation Start
516	Interruption Skip
517	Program Start
518	—
519	—
520	Program No. selection bit 0
521	Program No. selection bit 1
522	Program No. selection bit 2
523	Program No. selection bit 3
524	Program No. selection bit 4
525	Program No. selection bit 5
526	Program No. selection bit 6
527	Program No. selection parity bit
528	Motor Power ON
529	CAL Execution
530	—
531	SP100
532	External Mode Change
533	Program Reset
534	Clear Robot Error
535	—

Input data	
Port No.	Signal name
536	INPUT 536
537	INPUT 537
538	INPUT 538
539	INPUT 539
540	INPUT 540
541	INPUT 541
542	INPUT 542
543	INPUT 543
544	INPUT 544
545	INPUT 545
546	INPUT 546
547	INPUT 547
548	INPUT 548
549	INPUT 549
550	INPUT 550
551	INPUT 551
552	INPUT 552
553	INPUT 553
554	INPUT 554
555	INPUT 555
556	INPUT 556
557	INPUT 557
558	INPUT 558
559	INPUT 559
:	(INPUT 560 to INPUT 759)
760	INPUT 760
761	INPUT 761
762	INPUT 762
763	INPUT 763
764	INPUT 764
765	INPUT 765
766	INPUT 766
767	INPUT 767
4096	INPUT 4096
4097	INPUT 4097
:	(INPUT 4098 to INPUT 7869)
7870	INPUT 7870
7871	INPUT 7871

**Note:** In main system software versions earlier than 3.2, data is assigned up to port number 767.

Output data	
Port No.	Signal name
768	—
769	Robot Running
770	Robot Error
771	Auto Mode
772	External Mode
773	Program Start Reset
774	—
775	—
776	Robot Power ON Completed
777	Servo ON
778	CAL Completed
779	Teaching ON
780	1 Cycle End
781	Battery Warning
782	Robot Warning
783	Continue Start Permission
784	Error in the units place, bit 0
785	Error in the units place, bit 1
786	Error in the units place, bit 2
787	Error in the units place, bit 3
788	Error in the tens place, bit 0
789	Error in the tens place, bit 1
790	Error in the tens place, bit 2
791	Error in the tens place, bit 3
792	Error in the hundreds place, bit 0
793	Error in the hundreds place, bit 1
794	Error in the hundreds place, bit 2
795	Error in the hundreds place, bit 3
796	—
797	—
798	—
799	—

Output data	
Port No.	Signal name
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
806	OUTPUT 806
807	OUTPUT 807
808	OUTPUT 808
809	OUTPUT 809
810	OUTPUT 810
811	OUTPUT 811
812	OUTPUT 812
813	OUTPUT 813
814	OUTPUT 814
815	OUTPUT 815
:	(OUTPUT 816 to OUTPUT 1015)
1016	OUTPUT 1016
1017	OUTPUT 1017
1018	OUTPUT 1018
1019	OUTPUT 1019
1020	OUTPUT 1020
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023
7872	OUTPUT 7872
7873	OUTPUT 7873
:	(OUTPUT 7874 to OUTPUT 11645)
11646	OUTPUT 11646
11647	OUTPUT 11647

**Note:** In main system software versions earlier than 3.2, data is assigned up to port number 1023.

## 7.5.28 Ethernet/IP Module in All User I/O Mode

Input data	
Port No.	Signal name
512	INPUT 512
513	INPUT 513
514	INPUT 514
515	INPUT 515
516	INPUT 516
517	INPUT 517
518	INPUT 518
519	INPUT 519
520	INPUT 520
521	INPUT 521
522	INPUT 522
523	INPUT 523
524	INPUT 524
525	INPUT 525
526	INPUT 526
527	INPUT 527
528	INPUT 528
529	INPUT 529
:	(INPUT 530 to INPUT 764)
765	INPUT 765
766	INPUT 766
767	INPUT 767
4096	INPUT 4096
4097	INPUT 4097
:	(INPUT 4098 to INPUT 7869)
7870	INPUT 7870
7871	INPUT 7871

Output data	
Port No.	Signal name
768	OUTPUT 768
769	OUTPUT 769
770	OUTPUT 770
771	OUTPUT 771
772	OUTPUT 772
773	OUTPUT 773
774	OUTPUT 774
775	OUTPUT 775
776	OUTPUT 776
777	OUTPUT 777
778	OUTPUT 778
779	OUTPUT 779
780	OUTPUT 780
781	OUTPUT 781
782	OUTPUT 782
783	OUTPUT 783
784	OUTPUT 784
785	OUTPUT 785
:	(OUTPUT 786 to OUTPUT 1020)
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023
7872	OUTPUT 7872
7873	OUTPUT 7873
:	(OUTPUT 7874 to OUTPUT 11645)
11646	OUTPUT 11646
11647	OUTPUT 11647

**Note:** In main system software versions earlier than 3.2, input data is assigned up to port number 767 and output data, up to port number 1023.

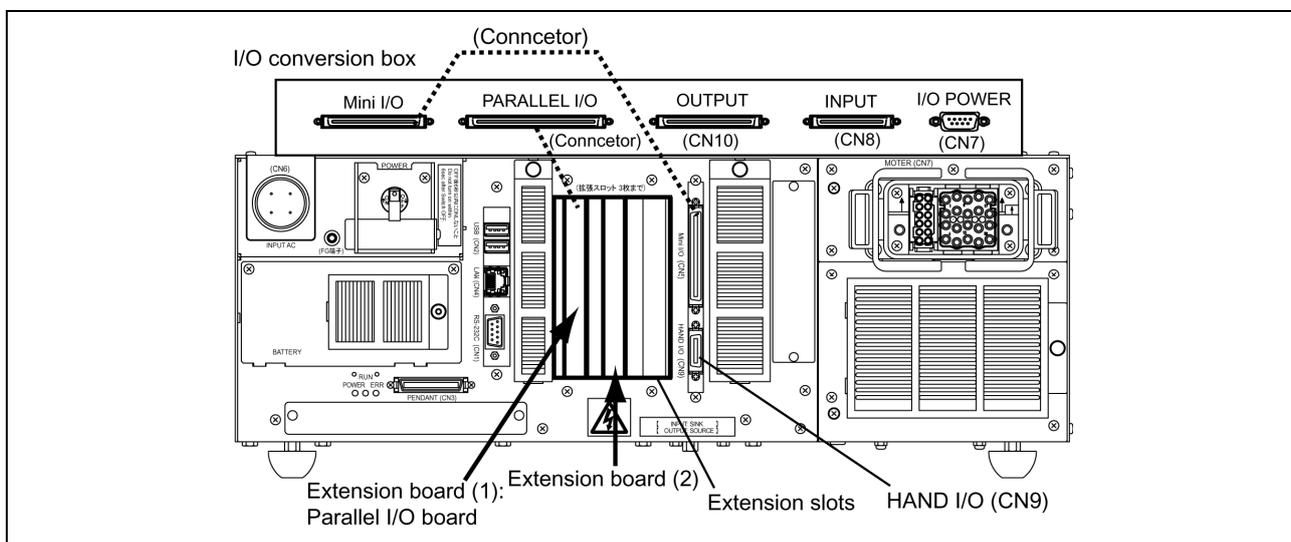
# Chapter 8 I/O Allocation for I/O Conversion Box (only for standard type of controller)

This chapter lists the I/O allocation tables to apply when the I/O conversion box is mounted on the controller.

The I/O conversion box should be used with an optional parallel I/O board mounted so that the "INPUT (CN8)," "OUTPUT (CN10)," and "I/O POWER (CN7)" used on the RC5 controller can be used as is.

**Note:** The I/O conversion box cannot be used for the global type of the controller.

For details about the I/O conversion box, refer to the RC7M Controller OPTIONS MANUAL, Chapter 4, Section 4.7 "I/O Conversion Box."



## 8.1 I/O Allocation Modes with I/O Conversion Box Mounted

Using the I/O conversion box requires an optional parallel I/O board to be mounted, for compatibility with the RC5 controller. The ports on the parallel I/O board offset the shortage of standard mini I/O ports.

The table below lists the selectable allocation modes when the I/O conversion box is used.

**Allocation Mode Available with the I/O Conversion Box**

No.	I/O extension boards		Allocation modes		
	Extension 1	Extension 2	I/O conversion box		
			Compatible	Standard	All user I/O
1	Parallel I/O board	—	√	√	
2	Parallel I/O board	Parallel I/O board	√	√	
3	Parallel I/O board	DeviceNet slave board	√	√	
4	Parallel I/O board	DeviceNet master board			√
5	Parallel I/O board	DeviceNet master/slave board	√	√	√
6	Parallel I/O board	CC-Link board	√	√	
7	Parallel I/O board	PROFIBUS-DP slave board	√	√	
8	Parallel I/O board	S-LINK V board	√	√	√
9	Parallel I/O board	Ethernet/IP adapter	√	√	

## 8.2 I/O Allocation in Individual Allocation Modes

The table below lists the I/O allocation for extension boards in individual allocation modes. For details, refer to Section 8.5 "I/O Allocation Tables for Individual Allocation Modes."

**Note:** For the I/O allocation for the DeviceNet master/slave board, see the allocation tables for the DeviceNet master and slave boards.

**I/O Allocation of Extension Boards in Individual Allocation Modes**

I/O extension boards		Allocation modes	Allocation for CN8, CN10, and extension boards	
Extension 1	Extension 2		I/O	Allocation tables to apply
Parallel I/O board	-	I/O-box compatible mode	CN8	INPUT (CN8) in I/O-box compatible mode
			CN10	OUTPUT (CN10) in I/O-box compatible mode
	-	I/O-box standard mode	CN8	INPUT (CN8) in I/O-box standard mode
			CN10	OUTPUT (CN10) in I/O-box standard mode
	DeviceNet slave board	I/O-box compatible mode	CN8	INPUT (CN8) in I/O-box all user I/O mode
			CN10	OUTPUT (CN10) in I/O-box all user I/O mode
	CC-Link board	I/O-box compatible mode	Extension 2	Extension boards in I/O-box compatible mode
	PROFIBUS-DP slave board	I/O-box standard mode	CN8	INPUT (CN8) in I/O-box all user I/O mode
			CN10	OUTPUT (CN10) in I/O-box all user I/O mode
EtherNet/IP Adapter	I/O-box standard mode	Extension 2	Extension boards in I/O-box standard mode	
Parallel I/O board	I/O-box compatible mode	CN8	INPUT (CN8) in I/O-box compatible mode	
		CN10	OUTPUT (CN10) in I/O-box compatible mode	
DeviceNet master board	I/O-box compatible mode	Extension 2	Extension boards in I/O-box all user I/O mode	
S-LINK V board	I/O-box standard mode	CN8	INPUT (CN8) in I/O-box standard mode	
		CN10	OUTPUT (CN10) in I/O-box standard mode	
		Extension 2	Extension boards in I/O-box all user I/O mode	

**Note:** Extensions 1 and 2 correspond to the ones listed in the "Allocation Mode Available with the I/O Conversion Box" table on the previous page.

## 8.3 Notes on Using the I/O Conversion Box

### (1) Parameter change for switching between allocation modes

To switch to the I/O-box compatible or standard mode, you need to change parameters using the teach pendant or WINCAPSIII. For the changing procedure, refer to the RC7M Controller OPTIONS MANUAL, Section 4.6.

### (2) Power supply setting for mini I/O board (CN5) or parallel I/O board

To use the I/O conversion box, select 24 V power supply (internal or external) on I/O POWER (CN7). You also need to set up the power supply for the mini I/O board and parallel I/O board to match the power supply setting on I/O POWER (CN7). The factory default is external power supply.

For details about the mini I/O board, see Section 4.2.1 or 5.2.1.

For details about the parallel I/O board, refer to the RC7M Controller OPTIONS MANUAL, Section 5.2.2.

## 8.4 Allocation Common to All Allocation Modes

The RC7M controller supports hand I/O signals (CN9) as standard. This hand I/O and I/O POWER (CN7) are common to all allocation modes.

### 8.4.1 I/O POWER (CN9): Common to All Modes

NPN type I/O		PNP type I/O	
Terminal No.	Signal name	Terminal No.	Signal name
1	Internal power source output (+24V)	1	Internal power source output (+24V)
2	Internal power source output (+24V)	2	Internal power source output (+24V)
3	Internal power source output (0V)	3	Internal power source output (0V)
4	Internal power source output (0V)	4	Internal power source output (0V)
5	FG	5	FG
6	Power input +24V	6	Power input 0V
7	Power input +24V	7	Power input 0V
8	Power input 0V	8	Power input +24V
9	Power input 0V	9	Power input +24V

### 8.4.2 HAND I/O (CN9): Common to All Modes

#### ■ NPN type

Terminal No.	Signal name	Port No.	Terminal No.	Signal name	Port No.
1	Hand output	64	11	Hand input	50
2	Hand output	65	12	Hand input	51
3	Hand output	66	13	Hand input	52
4	Hand output	67	14	Hand input	53
5	Hand output	68	15	Hand input	54
6	Hand output	69	16	Hand input	55
7	Hand output	70	17	Power output for hand (+24 VDC) (External/internal source)	—
8	Hand output	71	18	Power output for hand (+0 VDC) (External/internal source)	—
9	Hand input	48	19	No connection	—
10	Hand input	49	20	No connection	—

#### ■ PNP type

Terminal No.	Signal name	Port No.	Terminal No.	Signal name	Port No.
1	Hand output	64	11	Hand input	50
2	Hand output	65	12	Hand input	51
3	Hand output	66	13	Hand input	52
4	Hand output	67	14	Hand input	53
5	Hand output	68	15	Hand input	54
6	Hand output	69	16	Hand input	55
7	Hand output	70	17	Power output for hand (+0 VDC) (External/internal source)	—
8	Hand output	71	18	Power output for hand (+24 VDC) (External/internal source)	—
9	Hand input	48	19	No connection	—
10	Hand input	49	20	No connection	—

## 8.5 I/O Allocation Tables for Individual Allocation Modes

### 8.5.1 OUTPUT (CN10) in I/O-Box Compatible Mode

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1	<i>CPU Normal</i> (No monitor allowed)	72	35	User output	106
2	<i>Robot Running</i>	73	36	User output	107
3	<i>Robot Error</i>	74	37	User output	108
4	<i>Auto Mode</i>	75	38	User output	109
5	<i>External Mode</i>	76	39	User output	110
6	<i>Program Start Reset</i>	77	40	User output	111
7	Reserved.	78	41	User output	112
8	Reserved.	79	42	User output	113
9	<i>Robot Power ON Completed</i>	80	43	User output	114
10	<i>Servo ON</i>	81	44	User output	115
11	<i>CAL Completed</i>	82	45	User output	116
12	<i>Teaching ON</i>	83	46	User output	117
13	<i>1 Cycle End</i>	84	47	User output	118
14	<i>Battery Warning</i>	85	48	User output	119
15	<i>Robot Warning</i>	86	49	User output	120
16	<i>Continue Start Permission</i>	87	50	User output	121
17	Error in the units place, bit 0	88	51	User output	122
18	Error in the units place, bit 1	89	52	User output	123
19	Error in the units place, bit 2	90	53	User output	124
20	Error in the units place, bit 3	91	54	User output	125
21	Error in the tens place, bit 0	92	55	User output	126
22	Error in the tens place, bit 1	93	56	User output	127
23	Error in the tens place, bit 2	94	57	Not used.	—
24	Error in the tens place, bit 3	95	58	Not used.	—
25	Error in the hundreds place, bit 0	96	59*	(Power supply for <i>Robot Stop 1</i> (Internal power source +24V))	—
26	Error in the hundreds place, bit 1	97	60*	( <i>Robot Stop 1</i> )	—
27	Error in the hundreds place, bit 2	98	61*	(Power supply for <i>Robot Stop 2</i> (Internal power source +24V))	—
28	Error in the hundreds place, bit 3	99	62*	( <i>Robot Stop 2</i> )	—
29	<i>SS Mode</i>	100	63*	( <i>Emergency Stop 1 (+)</i> )	—
30	Reserved.	101	64*	( <i>Emergency Stop 1 (-)</i> )	—
31	Reserved.	102	65	<i>Emergency Stop 2 (+)</i>	—
32	Reserved.	103	66	<i>Emergency Stop 2 (-)</i>	—
33	User output	104	67*	( <i>Deadman SW (+)</i> )	—
34	User output	105	68*	( <i>Deadman SW (-)</i> )	—

**Note:** Terminal numbers with asterisks (\*) are used only in the dual-safety emergency stop circuit version.

## 8.5.2 INPUT (CN8) in I/O-Box Compatible Mode

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1*	Power supply for <i>Robot Stop</i> (Internal +24V)	—	26	User input	21
2*	<i>Robot Stop</i>	—	27	User input	22
3	Power supply for <i>Enable Auto</i> (Internal +24V)	—	28	User input	23
4	<i>Enable Auto</i>	—	29	User input	24
5	<i>Step Stop (All tasks)</i>	0	30	User input	25
6	<i>Continue Start</i>	1	31	User input	26
7	<i>Instantaneous Stop (All tasks) [Halt]</i>	2	32	User input	27
8	<i>Operation Preparation Start</i>	3	33	User input	28
9	<i>Interruption Skip</i>	4	34	User input	29
10	<i>Program Start</i>	5	35	User input	30
11	Program No. selection bit 0	6	36	User input	31
12	Program No. selection bit 1	7	37	User input	32
13	Program No. selection bit 2	8	38	User input	33
14	Program No. selection bit 3	9	39	User input	34
15	Program No. selection bit 4	10	40	User input	35
16	Program No. selection bit 5	11	41	User input	36
17	Program No. selection bit 6	12	42	User input	37
18	Program No. selection parity bit	13	43	User input	38
19	<i>Motor Power ON</i>	14	44	User input	39
20	<i>CAL Execution</i>	15	45	User input	40
21	Reserved.	16	46	User input	41
22	<i>SP100</i>	17	47	User input	42
23	<i>External Mode Change</i>	18	48	User input	43
24	<i>Program Reset</i>	19	49	User input	44
25	<i>Clear Robot Error</i>	20	50	User input	45

**Note:** Terminal numbers with asterisks (\*) are NOT used in the dual-safety emergency stop circuit version.

### 8.5.3 OUTPUT (CN10) in I/O-Box Standard Mode

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1	<i>CPU Normal</i> (No monitor allowed)	72	35	User output	106
2	<i>Robot Running</i>	73	36	User output	107
3	<i>Robot Error</i>	74	37	User output	108
4	<i>Servo ON</i>	75	38	User output	109
5	<i>Robot Initialized</i>	76	39	User output	110
6	<i>Auto Mode</i>	77	40	User output	111
7	<i>External Mode</i>	78	41	User output	112
8	<i>Battery Warning</i>	79	42	User output	113
9	<i>Robot Warning</i>	80	43	User output	114
10	<i>Continue Start Permission</i>	81	44	User output	115
11	<i>SS Mode</i>	82	45	User output	116
12	Reserved.	83	46	User output	117
13	Reserved.	84	47	User output	118
14	Reserved.	85	48	User output	119
15	<i>Command Processing Completed</i>	86	49	User output	120
16	Status area odd parity	87	50	User output	121
17	Status area bit 0	88	51	User output	122
18	Status area bit 1	89	52	User output	123
19	Status area bit 2	90	53	User output	124
20	Status area bit 3	91	54	User output	125
21	Status area bit 4	92	55	User output	126
22	Status area bit 5	93	56	User output	127
23	Status area bit 6	94	57	Not used.	—
24	Status area bit 7	95	58	Not used.	—
25	Status area bit 8	96	59*	(Power supply for <i>Robot Stop 1</i> (Internal power source +24V))	—
26	Status area bit 9	97	60*	( <i>Robot Stop 1</i> )	—
27	Status area bit 10	98	61*	(Power supply for <i>Robot Stop 2</i> (Internal power source +24V))	—
28	Status area bit 11	99	62*	( <i>Robot Stop 2</i> )	—
29	Status area bit 12	100	63*	( <i>Emergency Stop 1 (+)</i> )	—
30	Status area bit 13	101	64*	( <i>Emergency Stop 1 (-)</i> )	—
31	Status area bit 14	102	65	<i>Emergency Stop 2 (+)</i>	—
32	Status area bit 15	103	66	<i>Emergency Stop 2 (-)</i>	—
33	User output	104	67*	( <i>Deadman SW (+)</i> )	—
34	User output	105	68*	( <i>Deadman SW (-)</i> )	—

**Note:** Terminal numbers with asterisks (\*) are used only in the dual-safety emergency stop circuit version.

## 8.5.4 INPUT (CN8) in I/O-Box Standard Mode

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1*	Power supply for <i>Robot Stop</i> (Internal +24V)	—	26	Data area 2 bit 7	21
2*	<i>Robot Stop</i>	—	27	Data area 2 bit 8	22
3	Power supply for <i>Enable Auto</i> (Internal +24V)	—	28	Data area 2 bit 9	23
4	<i>Enable Auto</i>	—	29	Data area 2 bit 10	24
5	<i>Step Stop (All tasks)</i>	0	30	Data area 2 bit 11	25
6	Reserved.	1	31	Data area 2 bit 12	26
7	<i>Instantaneous Stop (All tasks) [Halt]</i>	2	32	Data area 2 bit 13	27
8	<i>Strobe Signal</i>	3	33	Data area 2 bit 14	28
9	<i>Interruption Skip</i>	4	34	Data area 2 bit 15	29
10	Command data area odd parity	5	35	Command area bit 0	30
11	Data area 1 bit 0	6	36	Command area bit 1	31
12	Data area 1 bit 1	7	37	Command area bit 2	32
13	Data area 1 bit 2	8	38	Command area bit 3	33
14	Data area 1 bit 3	9	39	User input	34
15	Data area 1 bit 4	10	40	User input	35
16	Data area 1 bit 5	11	41	User input	36
17	Data area 1 bit 6	12	42	User input	37
18	Data area 1 bit 7	13	43	User input	38
19	Data area 2 bit 0	14	44	User input	39
20	Data area 2 bit 1	15	45	User input	40
21	Data area 2 bit 2	16	46	User input	41
22	Data area 2 bit 3	17	47	User input	42
23	Data area 2 bit 4	18	48	User input	43
24	Data area 2 bit 5	19	49	User input	44
25	Data area 2 bit 6	20	50	User input	45

**Note:** Terminal numbers with asterisks (\*) are NOT used in the dual-safety emergency stop circuit version.

## 8.5.5 OUTPUT (CN10) in I/O-Box All User I/O Mode

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1	<i>CPU Normal</i> (No monitor allowed)	72	35	User output	106
2	<i>Robot Running</i>	73	36	User output	107
3	<i>Robot Error</i>	74	37	User output	108
4	User output	75	38	User output	109
5	User output	76	39	User output	110
6	User output	77	40	User output	111
7	User output	78	41	User output	112
8	User output	79	42	User output	113
9	User output	80	43	User output	114
10	User output	81	44	User output	115
11	User output	82	45	User output	116
12	User output	83	46	User output	117
13	User output	84	47	User output	118
14	User output	85	48	User output	119
15	User output	86	49	User output	120
16	User output	87	50	User output	121
17	User output	88	51	User output	122
18	User output	89	52	User output	123
19	User output	90	53	User output	124
20	User output	91	54	User output	125
21	User output	92	55	User output	126
22	User output	93	56	User output	127
23	User output	94	57	Not used.	—
24	User output	95	58	Not used.	—
25	User output	96	59*	(Power supply for <i>Robot Stop 1</i> (Internal power source +24V))	—
26	User output	97	60*	( <i>Robot Stop 1</i> )	—
27	User output	98	61*	(Power supply for <i>Robot Stop 2</i> (Internal power source +24V))	—
28	User output	99	62*	( <i>Robot Stop 2</i> )	—
29	User output	100	63*	( <i>Emergency Stop 1 (+)</i> )	—
30	User output	101	64*	( <i>Emergency Stop 1 (-)</i> )	—
31	User output	102	65	<i>Emergency Stop 2 (+)</i>	—
32	User output	103	66	<i>Emergency Stop 2 (-)</i>	—
33	User output	104	67*	( <i>Deadman SW (+)</i> )	—
34	User output	105	68*	( <i>Deadman SW (-)</i> )	—

**Note:** Terminal numbers with asterisks (\*) are used only in the dual-safety emergency stop circuit version.

## 8.5.6 INPUT (CN8) in I/O-Box All User I/O Mode

Terminal No.	Signal Name	Port No.	Terminal No.	Signal Name	Port No.
1*	Power supply for Robot stop (Internal +24V)	—	26	User input	21
2*	Robot stop	—	27	User input	22
3	Power supply for <i>Enable Auto</i> (Internal +24V)	—	28	User input	23
4	<i>Enable Auto</i>	—	29	User input	24
5	User input	0	30	User input	25
6	User input	1	31	User input	26
7	User input	2	32	User input	27
8	User input	3	33	User input	28
9	User input	4	34	User input	29
10	User input	5	35	User input	30
11	User input	6	36	User input	31
12	User input	7	37	User input	32
13	User input	8	38	User input	33
14	User input	9	39	User input	34
15	User input	10	40	User input	35
16	User input	11	41	User input	36
17	User input	12	42	User input	37
18	User input	13	43	User input	38
19	User input	14	44	User input	39
20	User input	15	45	User input	40
21	User input	16	46	User input	41
22	User input	17	47	User input	42
23	User input	18	48	User input	43
24	User input	19	49	User input	44
25	User input	20	50	User input	45

**Note:** Terminal numbers with asterisks (\*) are NOT used in the dual-safety emergency stop circuit version.

## 8.5.7 DeviceNet Slave Board in I/O-Box Compatible Mode

Input data	
Port No.	Signal name
512	<i>Step Stop (All tasks)</i>
513	<i>Continue Start</i>
514	<i>Instantaneous Stop (All tasks) [Half]</i>
515	<i>Operation Preparation Start</i>
516	<i>Interruption Skip</i>
517	<i>Program Start</i>
518	Not used.
519	Not used.
520	Program No. selection bit 0
521	Program No. selection bit 1
522	Program No. selection bit 2
523	Program No. selection bit 3
524	Program No. selection bit 4
525	Program No. selection bit 5
526	Program No. selection bit 6
527	Program No. selection parity bit
528	<i>Motor Power ON</i>
529	<i>CAL Execution</i>
530	Reserved.
531	<i>SP100</i>
532	<i>External Mode Change</i>
533	<i>Program Reset</i>
534	<i>Clear Robot Error</i>
535	Not used.
536	INPUT 536
537	INPUT 537
538	INPUT 538
539	INPUT 539
540	INPUT 540
541	INPUT 541
542	INPUT 542
543	INPUT 543
544	INPUT 544
545	INPUT 545
546	INPUT 546
547	INPUT 547
548	INPUT 539
549 to 763	INPUT 549 to INPUT 763
764	INPUT 764
765	INPUT 765
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	Reserved.
769	<i>Robot Running</i>
770	<i>Robot Error</i>
771	<i>Auto Mode</i>
772	<i>External Mode</i>
773	<i>Program Start Reset</i>
774	Reserved.
775	Reserved.
776	<i>Robot Power ON Completed</i>
777	<i>Servo ON</i>
778	<i>CAL Completed</i>
779	<i>Teaching ON</i>
780	<i>1 Cycle End</i>
781	<i>Battery Warning</i>
782	<i>Robot Warning</i>
783	<i>Continue Start Permission</i>
784	Error in the units place, bit 0
785	Error in the units place, bit 1
786	Error in the units place, bit 2
787	Error in the units place, bit 3
788	Error in the tens place, bit 0
789	Error in the tens place, bit 1
790	Error in the tens place, bit 2
791	Error in the tens place, bit 3
792	Error in the hundreds place, bit 0
793	Error in the hundreds place, bit 1
794	Error in the hundreds place, bit 2
795	Error in the hundreds place, bit 3
796	<i>SS Mode</i>
797	Reserved.
798	Reserved.
799	Reserved.
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805 to 1019	OUTPUT 805 to OUTPUT 1019
1020	OUTPUT 1020
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023

## 8.5.8 DeviceNet Slave Board in I/O-Box Standard Mode

Input data	
Port No.	Signal name
512	<i>Step Stop (All tasks)</i>
513	Reserved.
514	<i>Instantaneous Stop (All tasks) [Half]</i>
515	<i>Strobe Signal</i>
516	<i>Interruption Skip</i>
517	Not used.
518	Not used.
519	Command data area odd parity
520	Data area 1 bit 0
521	Data area 1 bit 1
522	Data area 1 bit 2
523	Data area 1 bit 3
524	Data area 1 bit 4
525	Data area 1 bit 5
526	Data area 1 bit 6
527	Data area 1 bit 7
528	Data area 2 bit 0
529	Data area 2 bit 1
530	Data area 2 bit 2
531	Data area 2 bit 3
532	Data area 2 bit 4
533~540	Data area 2 bit 5 to Data area 2 bit 12
541	Data area 2 bit 13
542	Data area 2 bit 14
543	Data area 2 bit 15
544	Command area bit 0
545	Command area bit 1
546	Command area bit 2
547	Command area bit 3
548	Not used.
549	Not used.
550	Not used.
551	Not used.
552	INPUT 552
553	INPUT 553
554	INPUT 554
555	INPUT 555
556 to 763	INPUT 556 to INPUT 763
764	INPUT 764
765	INPUT 765
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	Reserved.
769	<i>Robot Running</i>
770	<i>Robot Error</i>
771	<i>Servo ON</i>
772	<i>Robot Initialized</i>
773	<i>Auto Mode</i>
774	<i>External Mode</i>
775	<i>Battery Warning</i>
776	<i>Robot Warning</i>
777	<i>Continue Start Permission</i>
778	<i>SS Mode</i>
779	Reserved.
780	Reserved.
781	Reserved.
782	<i>Command Processing Completed</i>
783	Status area odd parity
784	Status area bit 0
785	Status area bit 1
786	Status area bit 2
787	Status area bit 3
788	Status area bit 4
789	Status area bit 5
790	Status area bit 6
791	Status area bit 7
792	Status area bit 8
793	Status area bit 9
794	Status area bit 10
795	Status area bit 11
796	Status area bit 12
797	Status area bit 13
798	Status area bit 14
799	Status area bit 15
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805 to 1019	OUTPUT 805 to OUTPUT 1019
1020	OUTPUT 1020
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023

## 8.5.9 CC-Link Board (2 stations occupied) in I/O-Box Compatible Mode

Input data		
Port No.	Signal name	Remote output. (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	<i>Continue Start</i>	RYn1
514	<i>Instantaneous Stop (All tasks) [Halt]</i>	RYn2
515	<i>Operation Preparation Start</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	<i>Program Start</i>	RYn5
518	Reserved.	RYn6
519	Reserved.	RYn7
520	Program No. selection bit 0	RYn8
521	Program No. selection bit 1	RYn9
522	Program No. selection bit 2	RYnA
523	Program No. selection bit 3	RYnB
524	Program No. selection bit 4	RYnC
525	Program No. selection bit 5	RYnD
526	Program No. selection bit 6	RYnE
527	Program No. selection parity bit	RYnF
528	<i>Motor Power ON</i>	RY(n+1)0
529	<i>CAL Execution</i>	RY(n+1)1
530	Reserved.	RY(n+1)2
531	<i>SP100</i>	RY(n+1)3
532	<i>External Mode Change</i>	RY(n+1)4
533	<i>Program Reset</i>	RY(n+1)5
534	<i>Clear Robot Error</i>	RY(n+1)6
535	Reserved.	RY(n+1)7
536		RY(n+1)8
:	User input (INPUT m) (Note 2)	:
559		RY(n+2)F
560	Not used.	RY(n+3)0
:		:
575		RY(n+3)F

Output data		
Port No.	Signal name	Remote input (Note 1)
768	—	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Auto Mode</i>	RXn3
772	<i>External Mode</i>	RXn4
773	<i>Program Start Reset</i>	RXn5
774	Reserved.	RXn6
775	Reserved.	RXn7
776	<i>Robot Power ON Completed</i>	RXn8
777	<i>Servo ON</i>	RXn9
778	<i>CAL Completed</i>	RXnA
779	<i>Teaching ON</i>	RXnB
780	<i>1 Cycle End</i>	RXnC
781	<i>Battery Warning</i>	RXnD
782	<i>Robot Warning</i>	RXnE
783	<i>Continue Start Permission</i>	RXnF
784	Error in the units place, bit 0	RX(n+1)0
785	Error in the units place, bit 1	RX(n+1)1
786	Error in the units place, bit 2	RX(n+1)2
787	Error in the units place, bit 3	RX(n+1)3
788	Error in the tens place, bit 0	RX(n+1)4
789	Error in the tens place, bit 1	RX(n+1)5
790	Error in the tens place, bit 2	RX(n+1)6
791	Error in the tens place, bit 3	RX(n+1)7
792	Error in the hundreds place, bit 0	RX(n+1)8
793	Error in the hundreds place, bit 1	RX(n+1)9
794	Error in the hundreds place, bit 2	RX(n+1)A
795	Error in the hundreds place, bit 3	RX(n+1)B
796	<i>SS Mode</i>	RX(n+1)C
797	Reserved.	RX(n+1)D
798	Reserved.	RX(n+1)E
799	Reserved.	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
815		RX(n+2)F
816	Not used.	RX(n+3)0
:		:
825		RX(n+3)9
826	Error status flag (Note 3)	RX(n+3)A
827	Remote station ready (Note 4)	RX(n+3)B
828		RX(n+3)C
:	Not used.	:
831		RX(n+3)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #782).

Note 4: The output timing is the same as that of *Robot Power ON Completed* (I/O port #776).

Note 5:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 8.5.10 CC-Link Board (3 stations occupied) in I/O-Box Compatible Mode

Input data		
Port No.	Signal name	Remote output. (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	<i>Continue Start</i>	RYn1
514	<i>Instantaneous Stop (All tasks) [Halt]</i>	RYn2
515	<i>Operation Preparation Start</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	<i>Program Start</i>	RYn5
518	Reserved.	RYn6
519	Reserved.	RYn7
520	Program No. selection bit 0	RYn8
521	Program No. selection bit 1	RYn9
522	Program No. selection bit 2	RYnA
523	Program No. selection bit 3	RYnB
524	Program No. selection bit 4	RYnC
525	Program No. selection bit 5	RYnD
526	Program No. selection bit 6	RYnE
527	Program No. selection parity bit	RYnF
528	<i>Motor Power ON</i>	RY(n+1)0
529	<i>CAL Execution</i>	RY(n+1)1
530	Reserved.	RY(n+1)2
531	<i>SP100</i>	RY(n+1)3
532	<i>External Mode Change</i>	RY(n+1)4
533	<i>Program Reset</i>	RY(n+1)5
534	<i>Clear Robot Error</i>	RY(n+1)6
535	Reserved.	RY(n+1)7
536	User input (INPUT m) (Note 2)	RY(n+1)8
:		:
591		RY(n+4)F
592	Not used.	RY(n+5)0
:		:
607		RY(n+5)F

Output data		
Port No.	Signal name	Remote input. (Note 1)
768	—	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Auto Mode</i>	RXn3
772	<i>External Mode</i>	RXn4
773	<i>Program Start Reset</i>	RXn5
774	Not used.	RXn6
775	Not used.	RXn7
776	<i>Robot Power ON Completed</i>	RXn8
777	<i>Servo ON</i>	RXn9
778	<i>CAL Completed</i>	RXnA
779	<i>Teaching ON</i>	RXnB
780	<i>1 Cycle End</i>	RXnC
781	<i>Battery Warning</i>	RXnD
782	<i>Robot Warning</i>	RxnE
783	<i>Continue Start Permission</i>	RXnF
784	Error in the units place, bit 0	RX(n+1)0
785	Error in the units place, bit 1	RX(n+1)1
786	Error in the units place, bit 2	RX(n+1)2
787	Error in the units place, bit 3	RX(n+1)3
788	Error in the tens place, bit 0	RX(n+1)4
789	Error in the tens place, bit 1	RX(n+1)5
790	Error in the tens place, bit 2	RX(n+1)6
791	Error in the tens place, bit 3	RX(n+1)7
792	Error in the hundreds place, bit 0	RX(n+1)8
793	Error in the hundreds place, bit 1	RX(n+1)9
794	Error in the hundreds place, bit 2	RX(n+1)A
795	Error in the hundreds place, bit 3	RX(n+1)B
796	<i>SS Mode</i>	RX(n+1)C
797	Reserved.	RX(n+1)D
798	Reserved.	RX(n+1)E
799	Reserved.	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
847		RX(n+4)F
848	Not used.	RX(n+5)0
:		:
857		RX(n+5)9
858	Error status flag (Note 3)	RX(n+5)A
859	Remote station ready (Note 4)	RX(n+5)B
860	Not used.	RX(n+5)C
:		:
863		RX(n+5)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #782).

Note 4: The output timing is the same as that of *Robot Power ON Completed* (I/O port #776).

Note 5:   indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 8.5.11 CC-Link Board (4 stations occupied) in I/O-Box Compatible Mode

Input data		
I/O port number	Signal number	Remote output. (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	<i>Continue Start</i>	RYn1
514	<i>Instantaneous Stop (All tasks) [Halt]</i>	RYn2
515	<i>Operation Preparation Start</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	<i>Program Start</i>	RYn5
518	Reserved.	RYn6
519	Reserved.	RYn7
520	Program No. selection bit 0	RYn8
521	Program No. selection bit 1	RYn9
522	Program No. selection bit 2	RYnA
523	Program No. selection bit 3	RYnB
524	Program No. selection bit 4	RYnC
525	Program No. selection bit 5	RYnD
526	Program No. selection bit 6	RYnE
527	Program No. selection parity bit	RYnF
528	<i>Motor Power ON</i>	RY(n+1)0
529	<i>CAL Execution</i>	RY(n+1)1
530	Reserved.	RY(n+1)2
531	<i>SP100</i>	RY(n+1)3
532	<i>External Mode Change</i>	RY(n+1)4
533	<i>Program Reset</i>	RY(n+1)5
534	<i>Clear Robot Error</i>	RY(n+1)6
535	Reserved.	RY(n+1)7
536		RY(n+1)8
:	User input (INPUT m) (Note 2)	:
623		RY(n+6)F
624	Not used.	RY(n+7)0
:		:
639		RY(n+7)F

Output data		
I/O port number	Signal number	Remote input. (Note 1)
768	—	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Auto Mode</i>	RXn3
772	<i>External Mode</i>	RXn4
773	<i>Program Start Reset</i>	RXn5
774	Reserved.	RXn6
775	Reserved.	RXn7
776	<i>Robot Power ON Completed</i>	RXn8
777	<i>Servo ON</i>	RXn9
778	<i>CAL Completed</i>	RxnA
779	<i>Teaching ON</i>	RXnB
780	<i>1 Cycle End</i>	RXnC
781	<i>Battery Warning</i>	RXnD
782	<i>Robot Warning</i>	RxnE
783	<i>Continue Start Permission</i>	RXnF
784	Error in the units place, bit 0	RX(n+1)0
785	Error in the units place, bit 1	RX(n+1)1
786	Error in the units place, bit 2	RX(n+1)2
787	Error in the units place, bit 3	RX(n+1)3
788	Error in the tens place, bit 0	RX(n+1)4
789	Error in the tens place, bit 1	RX(n+1)5
790	Error in the tens place, bit 2	RX(n+1)6
791	Error in the tens place, bit 3	RX(n+1)7
792	Error in the hundreds place, bit 0	RX(n+1)8
793	Error in the hundreds place, bit 1	RX(n+1)9
794	Error in the hundreds place, bit 2	RX(n+1)A
795	Error in the hundreds place, bit 3	RX(n+1)B
796	<i>SS Mode</i>	RX(n+1)C
797	Reserved.	RX(n+1)D
798	Reserved.	RX(n+1)E
799	Reserved.	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
879		RX(n+6)F
880	Not used.	RX(n+7)0
:		:
889		RX(n+7)9
890	Error status flag (Note 3)	RX(n+7)A
891	Remote station ready (Note 4)	RX(n+7)B
892		RX(n+7)C
:	Not used.	:
895		RX(n+7)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #782).

Note 4: The output timing is the same as that of *Robot Power ON Completed* (I/O port #776).

Note 5:   indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual "Remote Resistors (RWw and RWr)"

## 8.5.12 CC-Link Board (2 stations occupied) in I/O-Box Standard Mode

Input data		
Port No.	Signal name	Remote output. (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	Reserved.	RYn1
514	<i>Instantaneous Stop (All tasks) [Half]</i>	RYn2
515	<i>Strobe Signal</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	—	RYn5
518	—	RYn6
519	Command data area odd parity	RYn7
520	Data area 1 bit 0	RYn8
521	Data area 1 bit 1	RYn9
522	Data area 1 bit 2	RYnA
523	Data area 1 bit 3	RYnB
524	Data area 1 bit 4	RYnC
525	Data area 1 bit 5	RYnD
526	Data area 1 bit 6	RYnE
527	Data area 1 bit 7	RYnF
528	Data area 2 bit 0	RY(n+1)0
529	Data area 2 bit 1	RY(n+1)1
530	Data area 2 bit 2	RY(n+1)2
531	Data area 2 bit 3	RY(n+1)3
532	Data area 2 bit 4	RY(n+1)4
533	Data area 2 bit 5	RY(n+1)5
534	Data area 2 bit 6	RY(n+1)6
535	Data area 2 bit 7	RY(n+1)7
536	Data area 2 bit 8	RY(n+1)8
537	Data area 2 bit 9	RY(n+1)9
538	Data area 2 bit 10	RY(n+1)A
539	Data area 2 bit 11	RY(n+1)B
540	Data area 2 bit 12	RY(n+1)C
541	Data area 2 bit 13	RY(n+1)D
542	Data area 2 bit 14	RY(n+1)E
543	Data area 2 bit 15	RY(n+1)F
544	Command area bit 0	RY(n+2)0
545	Command area bit 1	RY(n+2)1
546	Command area bit 2	RY(n+2)2
547	Command area bit 3	RY(n+2)3
548	Reserved.	RY(n+2)4
549	Reserved.	RY(n+2)5
550	Reserved.	RY(n+2)6
551	Reserved.	RY(n+2)7
552	User input (INPUT m) (Note 2)	RY(n+2)8
:		:
559		RY(n+2)F
560	Not used.	RY(n+3)0
:		:
575		RY(n+3)F

Output data		
Port No.	Signal name	Remote input (Note 1)
768	Reserved.	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Servo ON</i>	RXn3
772	<i>Robot Initialized</i>	RXn4
773	<i>Auto Mode</i>	RXn5
774	<i>External Mode</i>	RXn6
775	<i>Battery Warning</i>	RXn7
776	<i>Robot Warning</i>	RXn8
777	<i>Continue Start Permission</i>	RXn9
778	<i>SS Mode</i>	RXnA
779	Reserved.	RXnB
780	Reserved.	RXnC
781	Reserved.	RXnD
782	<i>Command Processing Completed</i>	RXnE
783	Status area odd parity	RXnF
784	Status area bit 0	RX(n+1)0
785	Status area bit 1	RX(n+1)1
786	Status area bit 2	RX(n+1)2
787	Status area bit 3	RX(n+1)3
788	Status area bit 4	RX(n+1)4
789	Status area bit 5	RX(n+1)5
790	Status area bit 6	RX(n+1)6
791	Status area bit 7	RX(n+1)7
792	Status area bit 8	RX(n+1)8
793	Status area bit 9	RX(n+1)9
794	Status area bit 10	RX(n+1)A
795	Status area bit 11	RX(n+1)B
796	Status area bit 12	RX(n+1)C
797	Status area bit 13	RX(n+1)D
798	Status area bit 14	RX(n+1)E
799	Status area bit 15	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
815		RX(n+2)F
816	Not used.	RX(n+3)0
:		:
825		RX(n+3)9
826	Error status flag (Note 3)	RX(n+3)A
827	Remote station ready (Note 4)	RX(n+3)B
828	Not used.	RX(n+3)C
:		:
829		RX(n+3)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #776).

Note 4: The output timing is the same as that of *Robot Initialized* (I/O port #772).

Note 5:   indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

### 8.5.13 CC-Link Board (3 stations occupied) in I/O-Box Standard Mode

Input data		
Port No.	Signal name	Remote output (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	Reserved.	RYn1
514	<i>Instantaneous Stop (All tasks) [Halt]</i>	RYn2
515	<i>Strobe Signal</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	—	RYn5
518	—	RYn6
519	Command data area odd parity	RYn7
520	Data area 1 bit 0	RYn8
521	Data area 1 bit 1	RYn9
522	Data area 1 bit 2	RYnA
523	Data area 1 bit 3	RYnB
524	Data area 1 bit 4	RYnC
525	Data area 1 bit 5	RYnD
526	Data area 1 bit 6	RYnE
527	Data area 1 bit 7	RYnF
528	Data area 2 bit 0	RY(n+1)0
529	Data area 2 bit 1	RY(n+1)1
530	Data area 2 bit 2	RY(n+1)2
531	Data area 2 bit 3	RY(n+1)3
532	Data area 2 bit 4	RY(n+1)4
533	Data area 2 bit 5	RY(n+1)5
534	Data area 2 bit 6	RY(n+1)6
535	Data area 2 bit 7	RY(n+1)7
536	Data area 2 bit 8	RY(n+1)8
537	Data area 2 bit 9	RY(n+1)9
538	Data area 2 bit 10	RY(n+1)A
539	Data area 2 bit 11	RY(n+1)B
540	Data area 2 bit 12	RY(n+1)C
541	Data area 2 bit 13	RY(n+1)D
542	Data area 2 bit 14	RY(n+1)E
543	Data area 2 bit 15	RY(n+1)F
544	Command area bit 0	RY(n+2)0
545	Command area bit 1	RY(n+2)1
546	Command area bit 2	RY(n+2)2
547	Command area bit 3	RY(n+2)3
548	Reserved.	RY(n+2)4
549	Reserved.	RY(n+2)5
550	Reserved.	RY(n+2)6
551	Reserved.	RY(n+2)7
552	User input (INPUT m) (Note 2)	RY(n+2)8
:		:
591		RY(n+4)F
:		:
592	Not used.	RY(n+5)0
:		:
607		RY(n+5)F

Output data		
Port No.	Signal name	Remote output (Note 1)
768	Reserved.	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Servo ON</i>	RXn3
772	<i>Robot Initialized</i>	RXn4
773	<i>Auto Mode</i>	RXn5
774	<i>External Mode</i>	RXn6
775	<i>Battery Warning</i>	RXn7
776	<i>Robot Warning</i>	RXn8
777	<i>Continue Start Permission</i>	RXn9
778	<i>SS Mode</i>	RxnA
779	Reserved.	RXnB
780	Reserved.	RXnC
781	Reserved.	RXnD
782	<i>Command Processing Completed</i>	RxnE
783	Status area odd parity	RXnF
784	Status area bit 0	RX(n+1)0
785	Status area bit 1	RX(n+1)1
786	Status area bit 2	RX(n+1)2
787	Status area bit 3	RX(n+1)3
788	Status area bit 4	RX(n+1)4
789	Status area bit 5	RX(n+1)5
790	Status area bit 6	RX(n+1)6
791	Status area bit 7	RX(n+1)7
792	Status area bit 8	RX(n+1)8
793	Status area bit 9	RX(n+1)9
794	Status area bit 10	RX(n+1)A
795	Status area bit 11	RX(n+1)B
796	Status area bit 12	RX(n+1)C
797	Status area bit 13	RX(n+1)D
798	Status area bit 14	RX(n+1)E
799	Status area bit 15	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
847		RX(n+4)F
:		:
848	Not used.	RX(n+5)0
:		:
857		RX(n+5)9
858	<i>Error status flag (Note 3)</i>	RX(n+5)A
859	<i>Remote station ready (Note 4)</i>	RX(n+5)B
860	Not used.	RX(n+5)C
:		:
863		RX(n+5)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #776).

Note 4: The output timing is the same as that of *Robot Initialized* (I/O port #772).

Note 5:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 8.5.14 CC-Link Board (4 stations occupied) in I/O-Box Standard Mode

Input data		
Port No.	Signal name	Remote output. (Note 1)
512	<i>Step Stop (All tasks)</i>	RYn0
513	Reserved.	RYn1
514	<i>Instantaneous Stop (All tasks) [Half]</i>	RYn2
515	<i>Strobe Signal</i>	RYn3
516	<i>Interruption Skip</i>	RYn4
517	—	RYn5
518	—	RYn6
519	Command data area odd parity	RYn7
520	Data area 1 bit 0	RYn8
521	Data area 1 bit 1	RYn9
522	Data area 1 bit 2	RYnA
523	Data area 1 bit 3	RYnB
524	Data area 1 bit 4	RYnC
525	Data area 1 bit 5	RYnD
526	Data area 1 bit 6	RYnE
527	Data area 1 bit 7	RYnF
528	Data area 2 bit 0	RY(n+1)0
529	Data area 2 bit 1	RY(n+1)1
530	Data area 2 bit 2	RY(n+1)2
531	Data area 2 bit 3	RY(n+1)3
532	Data area 2 bit 4	RY(n+1)4
533	Data area 2 bit 5	RY(n+1)5
534	Data area 2 bit 6	RY(n+1)6
535	Data area 2 bit 7	RY(n+1)7
536	Data area 2 bit 8	RY(n+1)8
537	Data area 2 bit 9	RY(n+1)9
538	Data area 2 bit 10	RY(n+1)A
539	Data area 2 bit 11	RY(n+1)B
540	Data area 2 bit 12	RY(n+1)C
541	Data area 2 bit 13	RY(n+1)D
542	Data area 2 bit 14	RY(n+1)E
543	Data area 2 bit 15	RY(n+1)F
544	Command area bit 0	RY(n+2)0
545	Command area bit 1	RY(n+2)1
546	Command area bit 2	RY(n+2)2
547	Command area bit 3	RY(n+2)3
548	Reserved.	RY(n+2)4
549	Reserved.	RY(n+2)5
550	Reserved.	RY(n+2)6
551	Reserved.	RY(n+2)7
552	User input (INPUT m) (Note 2)	RY(n+2)8
:		:
623		RY(n+6)F
624		RY(n+7)0
:	Not used.	:
639		RY(n+7)F

Output data		
Port No.	Signal name	Remote input (Note 1)
768	Reserved.	RXn0
769	<i>Robot Running</i>	RXn1
770	<i>Robot Error</i>	RXn2
771	<i>Servo ON</i>	RXn3
772	<i>Robot Initialized</i>	RXn4
773	<i>Auto Mode</i>	RXn5
774	<i>External Mode</i>	RXn6
775	<i>Battery Warning</i>	RXn7
776	<i>Robot Warning</i>	RXn8
777	<i>Continue Start Permission</i>	RXn9
778	<i>SS Mode</i>	RxnA
779	Reserved.	RXnB
780	Reserved.	RXnC
781	Reserved.	RXnD
782	<i>Command Processing Completed</i>	RxnE
783	Status area odd parity	RXnF
784	Status area bit 0	RX(n+1)0
785	Status area bit 1	RX(n+1)1
786	Status area bit 2	RX(n+1)2
787	Status area bit 3	RX(n+1)3
788	Status area bit 4	RX(n+1)4
789	Status area bit 5	RX(n+1)5
790	Status area bit 6	RX(n+1)6
791	Status area bit 7	RX(n+1)7
792	Status area bit 8	RX(n+1)8
793	Status area bit 9	RX(n+1)9
794	Status area bit 10	RX(n+1)A
795	Status area bit 11	RX(n+1)B
796	Status area bit 12	RX(n+1)C
797	Status area bit 13	RX(n+1)D
798	Status area bit 14	RX(n+1)E
799	Status area bit 15	RX(n+1)F
800	User output (OUTPUT m) (Note 2)	RX(n+2)0
:		:
879		RX(n+6)F
880		Not used.
:	:	
889	Error status flag (Note 3)	RX(n+7)9
890		RX(n+7)A
891	Remote station ready (Note 4)	RX(n+7)B
892	Not used.	RX(n+7)C
:		:
895		RX(n+7)F

Note 1: n denotes (station number - 1) × 2 (hexadecimal notation).

Note 2: m denotes I/O port number.

Note 3: The output timing is the same as that of *Robot Error* (I/O port #770) and *Robot Warning* (I/O port #776).

Note 4: The output timing is the same as that of *Robot Initialized* (I/O port #772).

Note 5:  indicates the system area that cannot be used for user I/O.

Additional note

For remote registers RWw and RWr, refer to the Options Manual " Remote Resistors (RWw and RWr)"

## 8.5.15 PROFIBUS-DP Slave Board in I/O-Box Compatible Mode

Input data	
Port No.	Signal name
512	<i>Step Stop (All tasks)</i>
513	<i>Continue Start</i>
514	<i>Instantaneous Stop (All tasks) [Halt]</i>
515	<i>Operation Preparation Start</i>
516	<i>Interruption Skip</i>
517	<i>Program Start</i>
518	Reserved.
519	Reserved.
520	Program No. selection bit 0
521	Program No. selection bit 1
522	Program No. selection bit 2
523	Program No. selection bit 3
524	Program No. selection bit 4
525	Program No. selection bit 5
526	Program No. selection bit 6
527	Program No. selection parity bit
528	Motor power ON
529	<i>CAL Execution</i>
530	Reserved.
531	<i>SP100</i>
532	<i>External Mode Change</i>
533	<i>Program Reset</i>
534	<i>Clear Robot Error</i>
535	Reserved.
536	INPUT 536
537	INPUT 537
538	INPUT 538
539	INPUT 539
540	INPUT 540
541	INPUT 541
542	INPUT 542
543	INPUT 543
544	INPUT 544
545	INPUT 545
546	INPUT 546
547	INPUT 547
548	INPUT 548
549	INPUT 549
⋮	(INPUT 550 to INPUT 764)
765	INPUT 765
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	—
769	<i>Robot Running</i>
770	<i>Robot Error</i>
771	<i>Auto Mode</i>
772	<i>External Mode</i>
773	<i>Program Start Reset</i>
774	Reserved.
775	Reserved.
776	<i>Robot Power ON Completed</i>
777	<i>Servo ON</i>
778	<i>CAL Completed</i>
779	<i>Teaching ON</i>
780	<i>1 Cycle End</i>
781	<i>Battery Warning</i>
782	<i>Robot Warning</i>
783	<i>Continue Start Permission</i>
784	Error in the units place, bit 0
785	Error in the units place, bit 1
786	Error in the units place, bit 2
787	Error in the units place, bit 3
788	Error in the tens place, bit 0
789	Error in the tens place, bit 1
790	Error in the tens place, bit 2
791	Error in the tens place, bit 3
792	Error in the hundreds place, bit 0
793	Error in the hundreds place, bit 1
794	Error in the hundreds place, bit 2
795	Error in the hundreds place, bit 3
796	<i>SS Mode</i>
797	Reserved.
798	Reserved.
799	Reserved.
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
⋮	(OUTPUT 806 to OUTPUT 1020)
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023

## 8.5.16 PROFIBUS-DP Slave Board in I/O-Box Standard Mode

Input data	
Port No.	Signal name
512	<i>Step Stop (All tasks)</i>
513	Reserved.
514	<i>Instantaneous Stop (All tasks) [Halt]</i>
515	<i>Strobe Signal</i>
516	<i>Interruption Skip</i>
517	—
518	—
519	Command data area odd parity
520	Data area 1 bit 0
521	Data area 1 bit 1
522	Data area 1 bit 2
523	Data area 1 bit 3
524	Data area 1 bit 4
525	Data area 1 bit 5
526	Data area 1 bit 6
527	Data area 1 bit 7
528	Data area 2 bit 0
529	Data area 2 bit 1
530	Data area 2 bit 2
531	Data area 2 bit 3
532	Data area 2 bit 4
533	Data area 2 bit 5
534	Data area 2 bit 6
535	Data area 2 bit 7
536	Data area 2 bit 8
537	Data area 2 bit 9
538	Data area 2 bit 10
539	Data area 2 bit 11
540	Data area 2 bit 12
541	Data area 2 bit 13
542	Data area 2 bit 14
543	Data area 2 bit 15
544	Command area bit 0
545	Command area bit 1
546	Command area bit 2
547	Command area bit 3
548 to 551	Reserved.
552	INPUT 552
553	INPUT 553
⋮	(INPUT 554 to INPUT 765)
⋮	
766	INPUT 766
767	INPUT 767

Output data	
Port No.	Signal name
768	Reserved.
769	<i>Robot Running</i>
770	<i>Robot Error</i>
771	<i>Servo ON</i>
772	<i>Robot Initialized</i>
773	<i>Auto Mode</i>
774	<i>External Mode</i>
775	<i>Battery Warning</i>
776	<i>Robot Warning</i>
777	<i>Continue Start Permission</i>
778	<i>SS Mode</i>
779	Reserved.
780	Reserved.
781	Reserved.
782	<i>Command Processing Completed</i>
783	Status area odd parity
784	Status area bit 0
785	Status area bit 1
786	Status area bit 2
787	Status area bit 3
788	Status area bit 4
789	Status area bit 5
790	Status area bit 6
791	Status area bit 7
792	Status area bit 8
793	Status area bit 9
794	Status area bit 10
795	Status area bit 11
796	Status area bit 12
797	Status area bit 13
798	Status area bit 14
799	Status area bit 15
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
806	OUTPUT 806
⋮	(OUTPUT 807 to OUTPUT 1021)
⋮	
1022	OUTPUT 1022
1023	OUTPUT 1023

### 8.5.17 Parallel I/O Board in I/O-Box AI User I/O Mode

Terminal No.	Signal name	Port No.	Direction	Terminal No.	Signal name	Port No.	Direction
1	User output	3840	OUT	49	User output	3864	OUT
2		3841	OUT	50		3865	OUT
3		3842	OUT	51		3866	OUT
4		3843	OUT	52		3867	OUT
5		3844	OUT	53		3868	OUT
6		3845	OUT	54		3869	OUT
7		3846	OUT	55		3870	OUT
8		3847	OUT	56		3871	OUT
9		3848	OUT	57		3872	OUT
10		3849	OUT	58		3873	OUT
11		3850	OUT	59		3874	OUT
12		3851	OUT	60		3875	OUT
13		3852	OUT	61		3876	OUT
14		3853	OUT	62		3877	OUT
15		3854	OUT	63		3878	OUT
16		3855	OUT	64		3879	OUT
17		3856	OUT	65		3880	OUT
18		3857	OUT	66		3881	OUT
19		3858	OUT	67		3882	OUT
20		3859	OUT	68		3883	OUT
21		3860	OUT	69		3884	OUT
22		3861	OUT	70		3885	OUT
23		3862	OUT	71		3886	OUT
24		3863	OUT	72		3887	OUT
25	User input	3584	IN	73	User input	3604	IN
26		3585	IN	74		3605	IN
27		3586	IN	75		3606	IN
28		3587	IN	76		3607	IN
29		3588	IN	77		3608	IN
30		3589	IN	78		3609	IN
31		3590	IN	79		3610	IN
32		3591	IN	80		3611	IN
33		3592	IN	81		3612	IN
34		3593	IN	82		3613	IN
35		3594	IN	83		3614	IN
36		3595	IN	84		3615	IN
37		3596	IN	85		3616	IN
38		3597	IN	86		3617	IN
39		3598	IN	87		3618	IN
40		3599	IN	88		3619	IN
41		3600	IN	89		3620	IN
42		3601	IN	90		3621	IN
43		3602	IN	91		3622	IN
44		3603	IN	92		3623	IN
45	Power +24V	—	IN	93	Power 0V	—	IN
46	Power +24V	—	IN	94	Power 0V	—	IN
47	Power +24V	—	IN	95	Power 0V	—	IN
48	Power +24V	—	IN	96	Power 0V	—	IN

## 8.5.18 DeviceNet Master Board in I/O-Box All User I/O Mode

Note: The table below applies also to the allocation of the master area on the DeviceNet master/slave board.

Input data	
Port No.	Signal name
1024	INPUT 1024
1025	INPUT 1025
1026	INPUT 1026
1027	INPUT 1027
1028	INPUT 1028
1029	INPUT 1029
1030	INPUT 1030
1031	INPUT 1031
1032	INPUT 1032
1033	INPUT 1033
1034	INPUT 1034
1035	INPUT 1035
1036	INPUT 1036
1037	INPUT 1037
1038	INPUT 1038
1039	INPUT 1039
1040	INPUT 1040
1041	INPUT 1041
1042	INPUT 1042
1043	INPUT 1043
1044	INPUT 1044
1045	INPUT 1045
1046	INPUT 1046
1047	INPUT 1047
1048	INPUT 1048
1049	INPUT 1049
1050	INPUT 1050
1051	INPUT 1051
1052	INPUT 1052
1053	INPUT 1053
1054	INPUT 1054
1055	INPUT 1055
1056	INPUT 1056
1057	INPUT 1057
1058	INPUT 1058
1059	INPUT 1059
1060	INPUT 1060
1061	INPUT 1061
:	(INPUT 1062 to INPUT 2044)
2045	INPUT 2045
2046	INPUT 2046
2047	INPUT 2047

Output data	
Port No.	Signal name
2048	OUTPUT 2048
2049	OUTPUT 2049
2050	OUTPUT 2050
2051	OUTPUT 2051
2052	OUTPUT 2052
2053	OUTPUT 2053
2054	OUTPUT 2054
2055	OUTPUT 2055
2056	OUTPUT 2056
2057	OUTPUT 2057
2058	OUTPUT 2058
2059	OUTPUT 2059
2060	OUTPUT 2060
2061	OUTPUT 2061
2062	OUTPUT 2062
2063	OUTPUT 2063
2064	OUTPUT 2064
2065	OUTPUT 2065
2066	OUTPUT 2066
2067	OUTPUT 2067
2068	OUTPUT 2068
2069	OUTPUT 2069
2070	OUTPUT 2070
2071	OUTPUT 2071
2072	OUTPUT 2072
2073	OUTPUT 2073
2074	OUTPUT 2074
2075	OUTPUT 2075
2076	OUTPUT 2076
2077	OUTPUT 2077
2078	OUTPUT 2078
2079	OUTPUT 2079
2080	OUTPUT 2080
2081	OUTPUT 2081
2082	OUTPUT 2082
2083	OUTPUT 2083
2084	OUTPUT 2084
2085	OUTPUT 2085
:	(OUTPUT 2086 to OUTPUT 3068)
3069	OUTPUT 3069
3070	OUTPUT 3070
3071	OUTPUT 3071

## 8.5.19 S-Link V Master Board in I/O-Box All User I/O Mode

Input data	
Port No.	Signal name
3072	INPUT 3072
3073	INPUT 3073
3074	INPUT 3074
3075	INPUT 3075
3076	INPUT 3076
3077	INPUT 3077
3078	INPUT 3078
3079	INPUT 3079
3080	INPUT 3080
3081	INPUT 3081
3082	INPUT 3082
3083	INPUT 3083
3084	INPUT 3084
3085	INPUT 3085
3086	INPUT 3086
3087	INPUT 3087
3088	INPUT 3088
3089	INPUT 3089
3090	INPUT 3090
3091	INPUT 3091
3092	INPUT 3092
3093	INPUT 3093
3094	INPUT 3094
3095	INPUT 3095
3096	INPUT 3096
3097	INPUT 3097
3098	INPUT 3098
3099	INPUT 3099
3100	INPUT 3100
3101	INPUT 3101
3102	INPUT 3102
3103	INPUT 3103
3104	INPUT 3104
3105	INPUT 3105
3106	INPUT 3106
3107	INPUT 3107
3108	INPUT 3108
3109	INPUT 3109
:	(INPUT 3110 to INPUT 3324)
3325	INPUT 3325
3326	INPUT 3326
3327	INPUT 3327

Output data	
Port No.	Signal name
3328	OUTPUT 3328
3329	OUTPUT 3329
3330	OUTPUT 3330
3331	OUTPUT 3331
3332	OUTPUT 3332
3333	OUTPUT 3333
3334	OUTPUT 3334
3335	OUTPUT 3335
3336	OUTPUT 3336
3337	OUTPUT 3337
3338	OUTPUT 3338
3339	OUTPUT 3339
3340	OUTPUT 3340
3341	OUTPUT 3341
3342	OUTPUT 3342
3343	OUTPUT 3343
3344	OUTPUT 3344
3345	OUTPUT 3345
3346	OUTPUT 3346
3347	OUTPUT 3347
3348	OUTPUT 3348
3349	OUTPUT 3349
3350	OUTPUT 3350
3351	OUTPUT 3351
3352	OUTPUT 3352
3353	OUTPUT 3353
3354	OUTPUT 3354
3355	OUTPUT 3355
3356	OUTPUT 3356
3357	OUTPUT 3357
3358	OUTPUT 3358
3359	OUTPUT 3359
3360	OUTPUT 3360
3361	OUTPUT 3361
3362	OUTPUT 3362
3363	OUTPUT 3363
3364	OUTPUT 3364
3365	OUTPUT 3365
:	(OUTPUT 3366 to OUTPUT 3580)
3581	OUTPUT 3581
3582	OUTPUT 3582
3583	OUTPUT 3583

## 8.5.20 Ethernet/IP Module in I/O-Box Compatible Mode

Input data	
Port No.	Signal name
512	Step Stop (All tasks)
513	Continue Start
514	Halt (All tasks)
515	Operation Preparation Start
516	Interruption Skip
517	Program Start
518	—
519	—
520	Program No. selection bit 0
521	Program No. selection bit 1
522	Program No. selection bit 2
523	Program No. selection bit 3
524	Program No. selection bit 4
525	Program No. selection bit 5
526	Program No. selection bit 6
527	Program No. selection parity bit
528	Motor Power ON
529	CAL Execution
530	—
531	SP100
532	External Mode Change
533	Program Reset
534	Clear Robot Error
535	—

Input data	
Port No.	Signal name
536	INPUT 536
537	INPUT 537
538	INPUT 538
539	INPUT 539
540	INPUT 540
541	INPUT 541
542	INPUT 542
543	INPUT 543
544	INPUT 544
545	INPUT 545
546	INPUT 546
547	INPUT 547
548	INPUT 548
549	INPUT 549
550	INPUT 550
551	INPUT 551
552	INPUT 552
553	INPUT 553
554	INPUT 554
555	INPUT 555
556	INPUT 556
557	INPUT 557
558	INPUT 558
559	INPUT 559
:	(INPUT 560 to INPUT 759)
760	INPUT 760
761	INPUT 761
762	INPUT 762
763	INPUT 763
764	INPUT 764
765	INPUT 765
766	INPUT 766
767	INPUT 767
4096	INPUT 4096
4097	INPUT 4097
:	(INPUT 4098 to INPUT 7869)
7870	INPUT 7870
7871	INPUT 7871

**Note:** In main system software versions earlier than 3.2, data is assigned up to port number 767.

Output data	
Port No.	Signal name
768	—
769	Robot Running
770	Robot Error
771	Auto Mode
772	External Mode
773	Program Start Reset
774	—
775	—
776	Robot Power ON Completed
777	Servo ON
778	CAL Completed
779	Teaching ON
780	1 Cycle End
781	Battery Warning
782	Robot Warning
783	Continue Start Permission
784	Error in the units place, bit 0
785	Error in the units place, bit 1
786	Error in the units place, bit 2
787	Error in the units place, bit 3
788	Error in the tens place, bit 0
789	Error in the tens place, bit 1
790	Error in the tens place, bit 2
791	Error in the tens place, bit 3
792	Error in the hundreds place, bit 0
793	Error in the hundreds place, bit 1
794	Error in the hundreds place, bit 2
795	Error in the hundreds place, bit 3
796	—
797	—
798	—
799	—

Output data	
Port No.	Signal name
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
806	OUTPUT 806
807	OUTPUT 807
808	OUTPUT 808
809	OUTPUT 809
810	OUTPUT 810
811	OUTPUT 811
812	OUTPUT 812
813	OUTPUT 813
814	OUTPUT 814
815	OUTPUT 815
:	(OUTPUT 816 to OUTPUT 1015)
1016	OUTPUT 1016
1017	OUTPUT 1017
1018	OUTPUT 1018
1019	OUTPUT 1019
1020	OUTPUT 1020
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023
7872	OUTPUT 7872
7873	OUTPUT 7873
:	(OUTPUT 7874 to OUTPUT 11645)
11646	OUTPUT 11646
11647	OUTPUT 11647

**Note:** In main system software versions earlier than 3.2, data is assigned up to port number 1023.

## 8.5.21 Ethernet/IP Module in I/O-Box Standard Mode

Input data	
Port No.	Signal name
512	Step Stop (All tasks)
513	—
514	Halt (All tasks)
515	Strobe Signal
516	Interruption Skip
517	—
518	—
519	Command data area odd parity
520	Data area 1, bit 0
521	Data area 1, bit 1
522	Data area 1, bit 2
523	Data area 1, bit 3
524	Data area 1, bit 4
525	Data area 1, bit 5
526	Data area 1, bit 6
527	Data area 1, bit 7
528	Data area 2, bit 0
529	Data area 2, bit 1
530	Data area 2, bit 2
531	Data area 2, bit 3
532	Data area 2, bit 4
533	Data area 2, bit 5
534	Data area 2, bit 6
535	Data area 2, bit 7
536	Data area 2, bit 8
537	Data area 2, bit 9
538	Data area 2, bit 10
539	Data area 2, bit 11
540	Data area 2, bit 12
541	Data area 2, bit 13
542	Data area 2, bit 14
543	Data area 2, bit 15

Input data	
Port No.	Signal name
544	Command area, bit 0
545	Command area, bit 1
546	Command area, bit 2
547	Command area, bit 3
548	—
549	—
550	—
551	—
552	INPUT 552
553	INPUT 553
554	INPUT 554
555	INPUT 555
556	INPUT 556
557	INPUT 557
558	INPUT 558
559	INPUT 559
:	(INPUT 560 to INPUT 759)
760	INPUT 760
761	INPUT 761
762	INPUT 762
763	INPUT 763
764	INPUT 764
765	INPUT 765
766	INPUT 766
767	INPUT 767
4096	INPUT 4096
4097	INPUT 4097
:	(INPUT 4098 to INPUT 7869)
7870	INPUT 7870
7871	INPUT 7871

**Note:** In main system software versions earlier than 3.2, data is assigned up to port number 767.

Output data	
Port No.	Signal name
768	—
769	Robot Running
770	Robot Error
771	Servo ON
772	Robot Initialized
773	Auto Mode
774	External Mode
775	Battery Warning
776	Robot Warning
777	Continue Start Permission
778	SS Mode
779	—
780	—
781	—
782	Command Processing Completed
783	Status area, odd parity
784	Status area, bit 0
785	Status area, bit 1
786	Status area, bit 2
787	Status area, bit 3
788	Status area, bit 4
789	Status area, bit 5
790	Status area, bit 6
791	Status area, bit 7
792	Status area, bit 8
793	Status area, bit 9
794	Status area, bit 10
795	Status area, bit 11
796	Status area, bit 12
797	Status area, bit 13
798	Status area, bit 14
799	Status area, bit 15

Output data	
Port No.	Signal name
800	OUTPUT 800
801	OUTPUT 801
802	OUTPUT 802
803	OUTPUT 803
804	OUTPUT 804
805	OUTPUT 805
806	OUTPUT 806
807	OUTPUT 807
808	OUTPUT 808
809	OUTPUT 809
810	OUTPUT 810
811	OUTPUT 811
812	OUTPUT 812
813	OUTPUT 813
814	OUTPUT 814
815	OUTPUT 815
:	(OUTPUT 816 to OUTPUT 1015)
1016	OUTPUT 1016
1017	OUTPUT 1017
1018	OUTPUT 1018
1019	OUTPUT 1019
1020	OUTPUT 1020
1021	OUTPUT 1021
1022	OUTPUT 1022
1023	OUTPUT 1023
7872	OUTPUT 7872
7873	OUTPUT 7873
:	(OUTPUT 7874 to OUTPUT 11645)
11646	OUTPUT 11646
11647	OUTPUT 11647

**Note:** In main system software versions earlier than 3.2, data is assigned up to port number 1023.



## **RC7M CONTROLLER**

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### **INTERFACE MANUAL**

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DENSO WAVE INCORPORATED

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The purpose of this manual is to provide accurate information in the handling and operating of the robot. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.

In no event will DENSO WAVE INCORPORATED be liable for any direct or indirect damages resulting from the application of the information in this manual.

