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## II. CONTROL UNIT CONNECTION (R-J2 Mate)

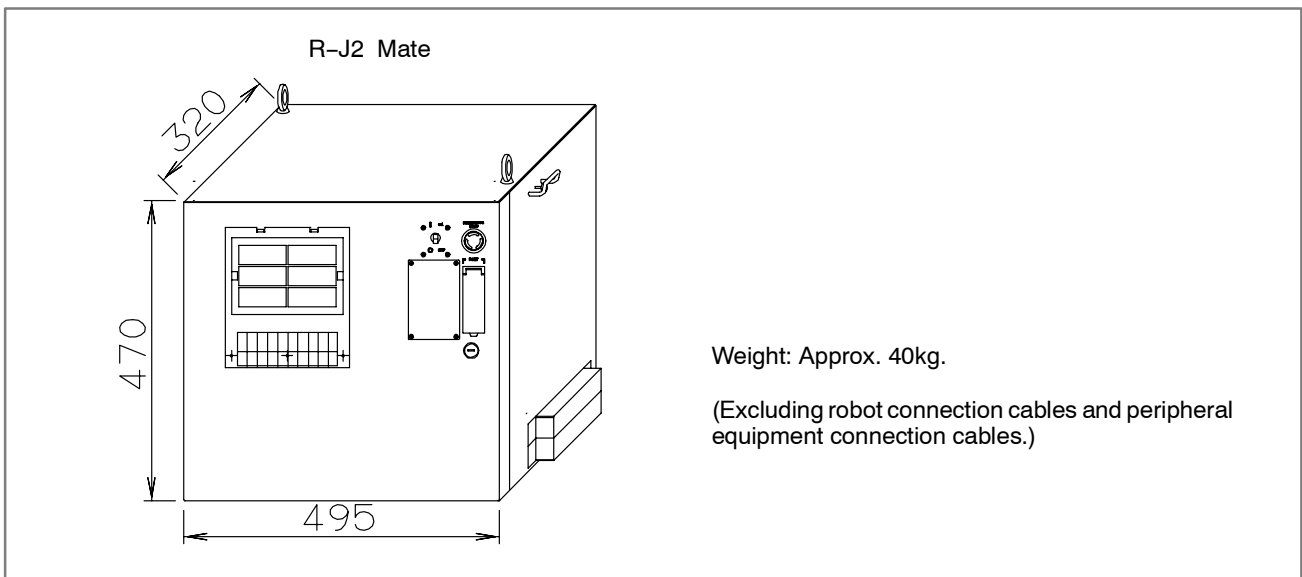
# 1

## GENERAL

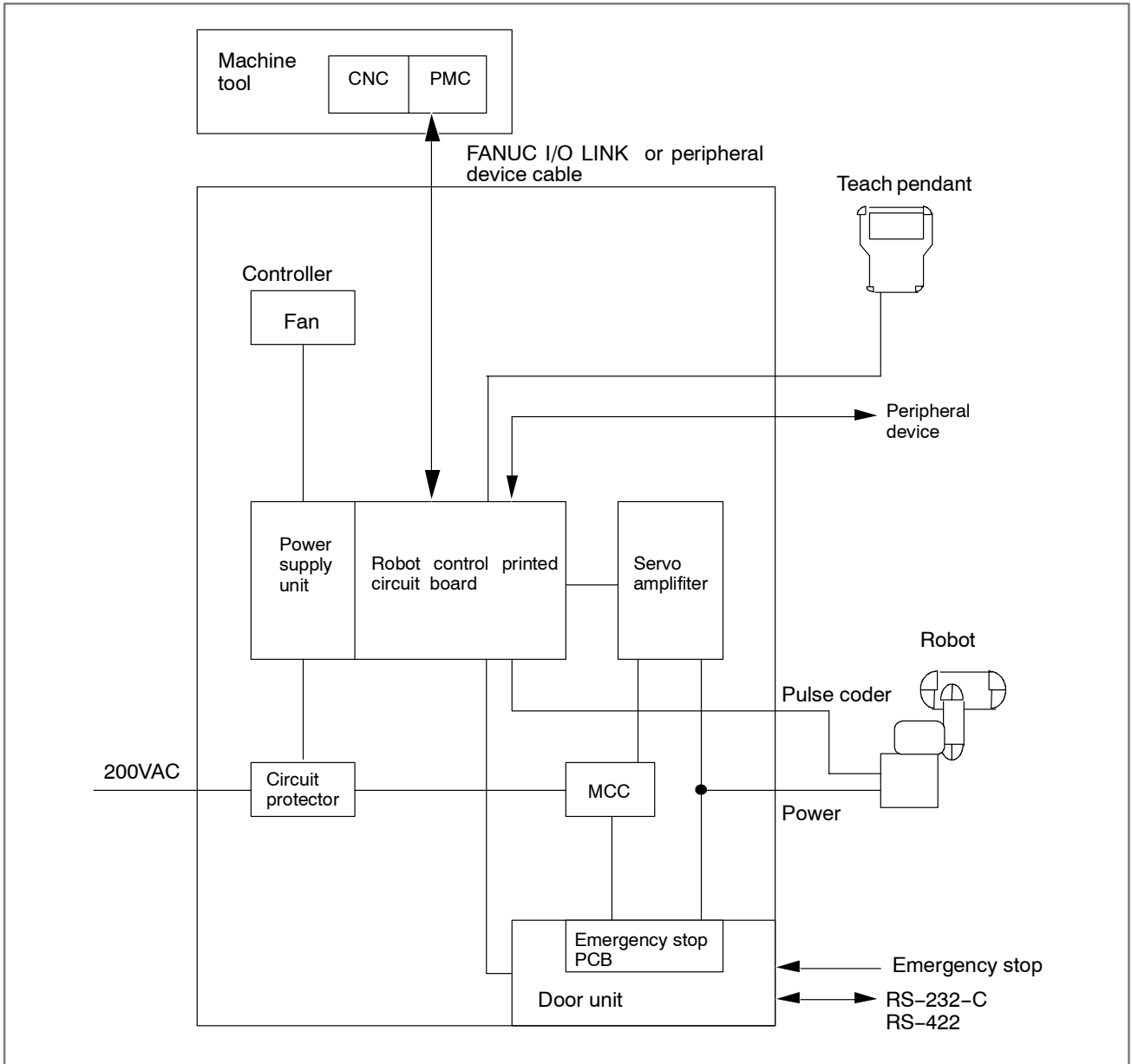


# 1.1 SPECIFICATIONS OF CONTROLLER

	R-J2 Mate wide cabinet
External diagram	495 × 470 × 320 (W) (H) (D)
Peripheral device Digital input	20 points These signals include eight dedicated signals: *HOLD, RESET, START, ENBL, PNS1, PNS2, PNS3, and PNS4
Digital output	16 points These signals include four dedicated signals: CMDENBL, FAULT, BATALM, and BUSY
Hand signals Digital input	4 points
Digital output	4 points
Abnormal air pressure input	1 point
Hand breakage input	1 point
FANUC I/O link	Use with selection of master mode and slave mode software parameter standard : slave mode
External ON/OFF control	An input terminal is provided on the back of the door.
External emergency stop input	An input terminal is provided on the back of the door.
External emergency stop output	An output terminal is provided on the back of the door.

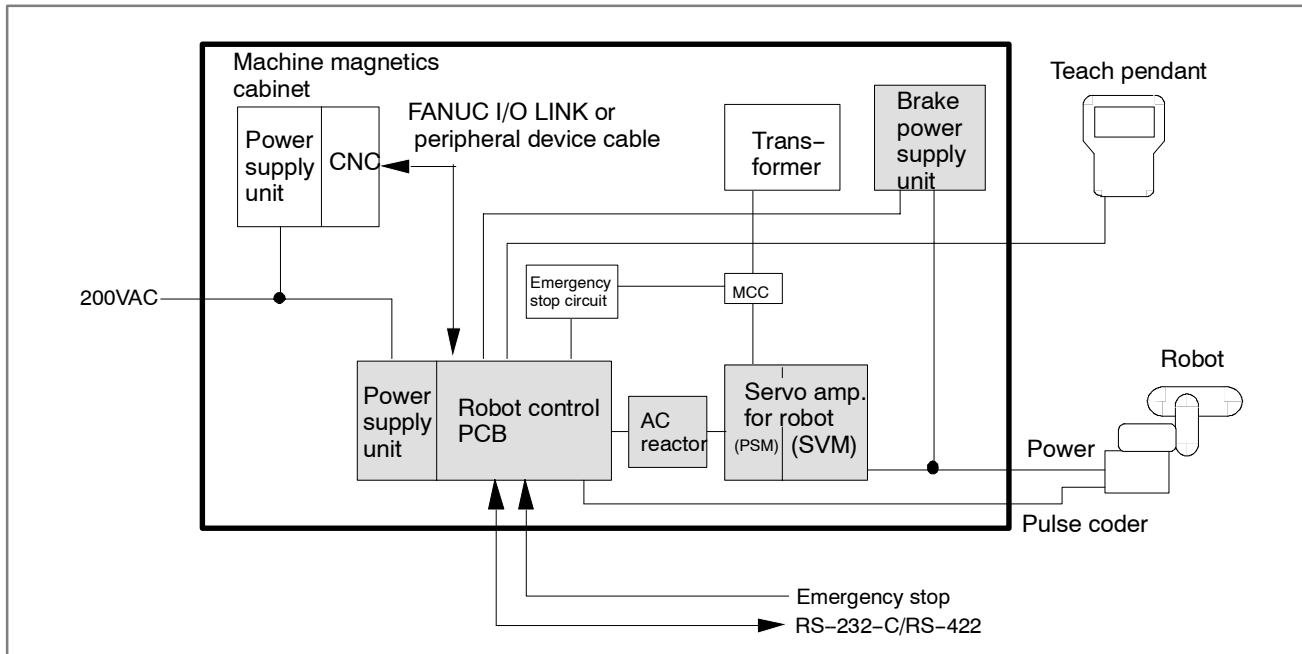


# 1.2 CONNECTION TO CNC



**NOTE**  
CNC is connected by I/O link cable or peripheral device cable.

### 1.3 PANEL MOUNT TYPE



Units to be added (those with shadow)

· Backplane for robot	A05B-2330-C010
· Power supply unit	A16B-1212-0900/0901
· Robot control PCB	A16B-3200-0070/0071
· Brake Power unit	A05B-2330-C001
· $\alpha$ series amp. for robot	
Power supply module ( <b>Note</b> )	A06B-6081-H103
Servo amp. module(3 axes)	A06B-6079-H301 2pcs
AC reactor	A81L-0001-0083#3C A81L-0001-0126
	(The out ward from is different.)

#### NOTE

When the  $\alpha$  series amplifier is used in a machine tool, the power supply module can be shared. (Note, however, that its capacity must be examined.)

- **Required space (in mm)**

Robot control PCB :	125 × 380 × 250(including power supply unit)
Brake power unit :	110 × 100 × 150
Servo amplifier :	250 × 390 × 250 (including the PSM and SVM)
- **Power capacity of Robot** 1.2kVA
- **Other notices**
  1. Brake power unit needs 100VAC.
  2. Emergency stop and brake control circuit are required.
  3. Use I/O link to connect to CNC.
  4. Teach pendant has two types those are high-function type and simplified type.

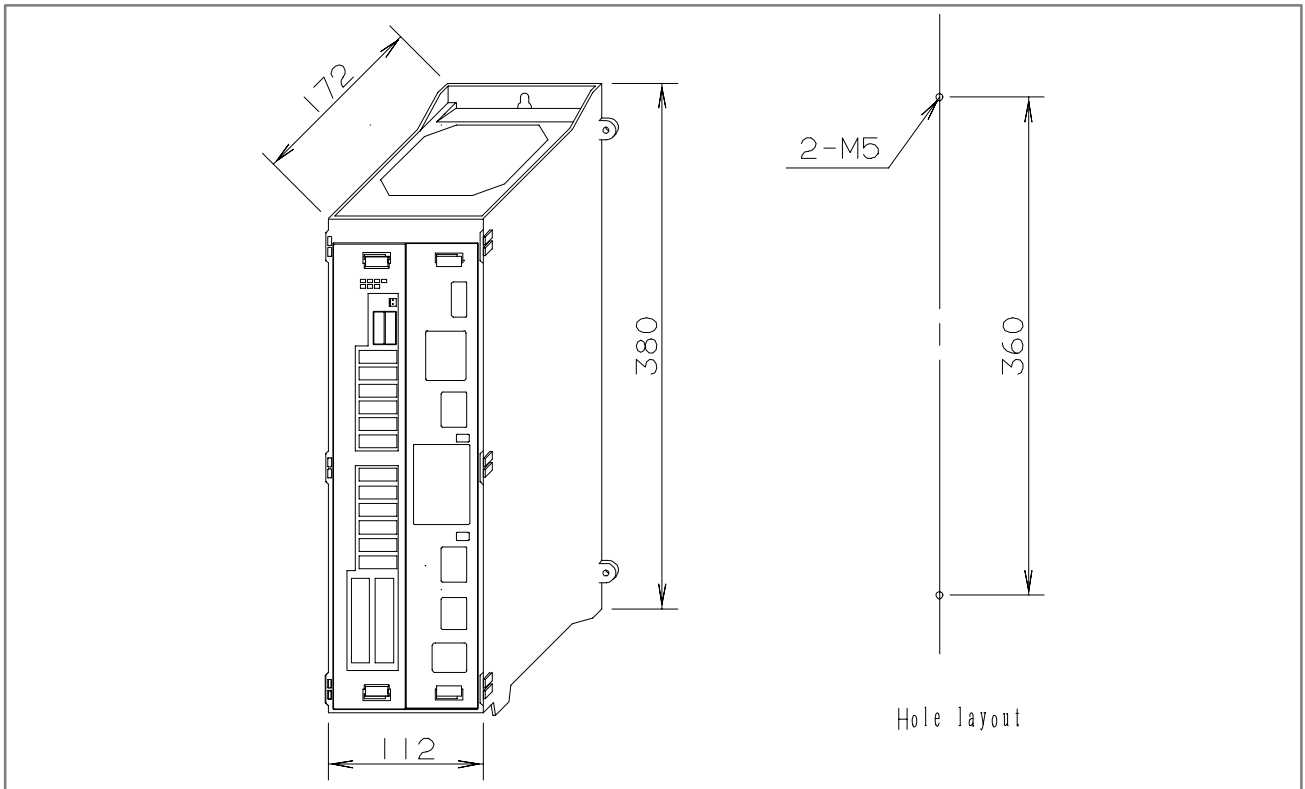


Fig. 1.3 (a) Panel mounting type control unit

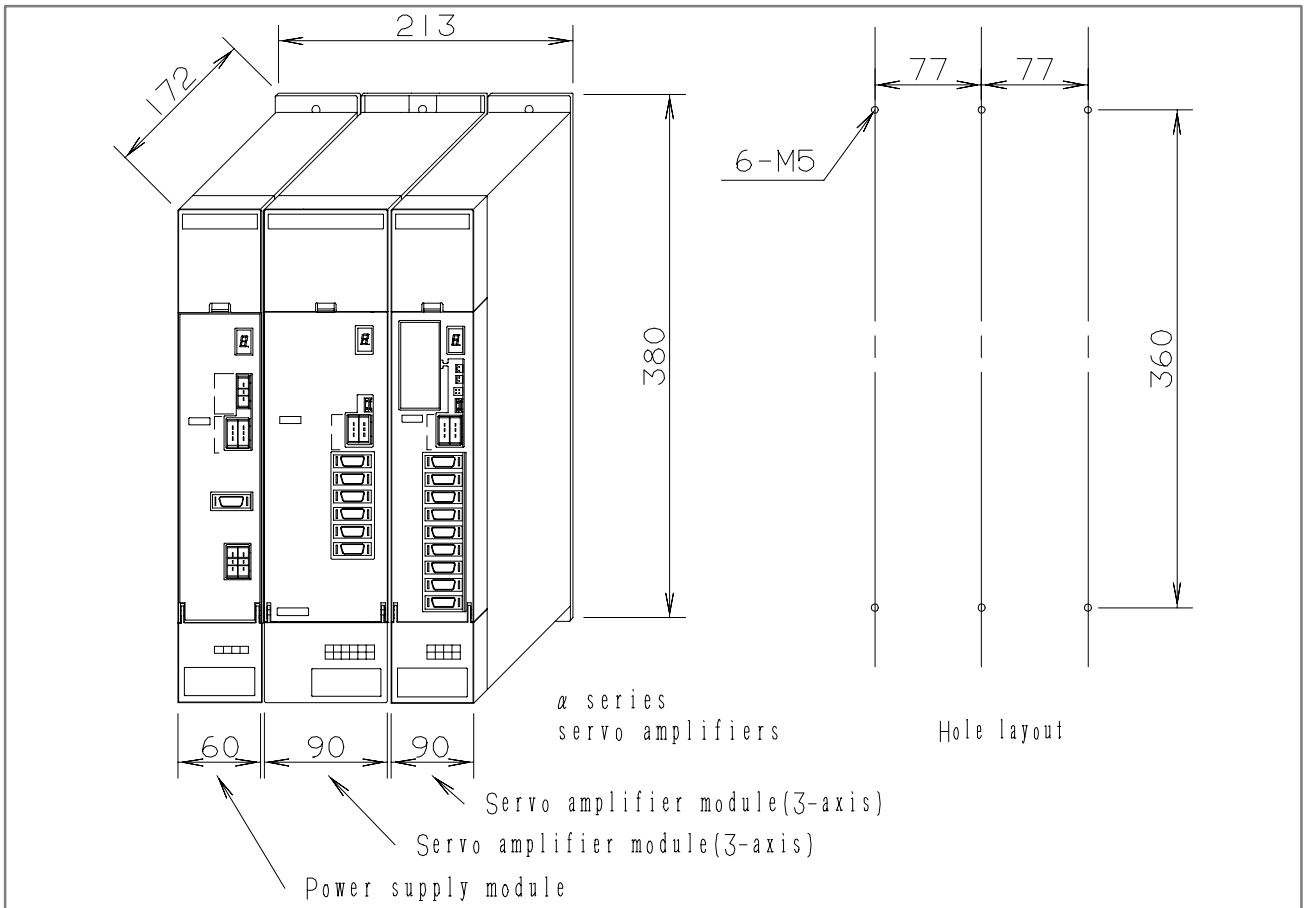
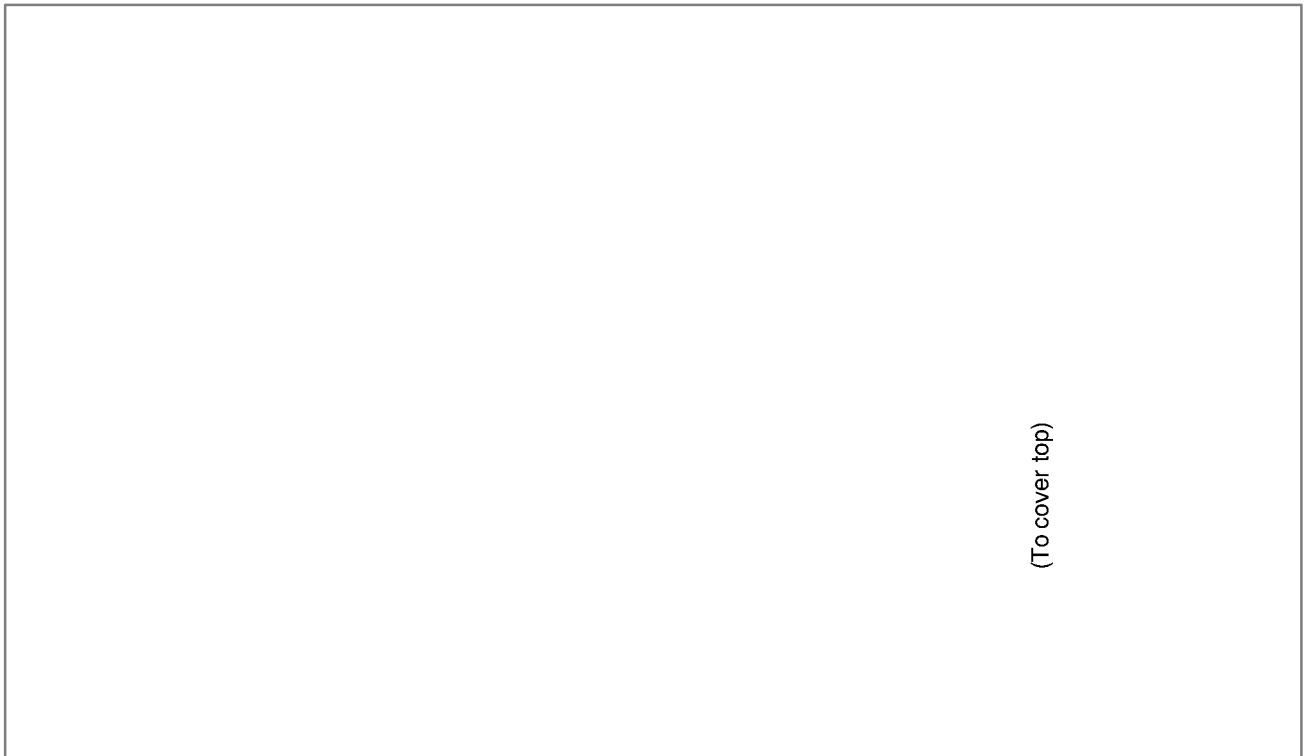


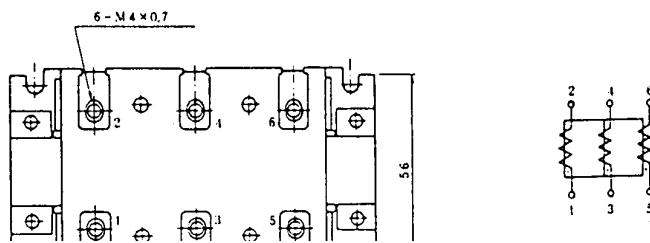
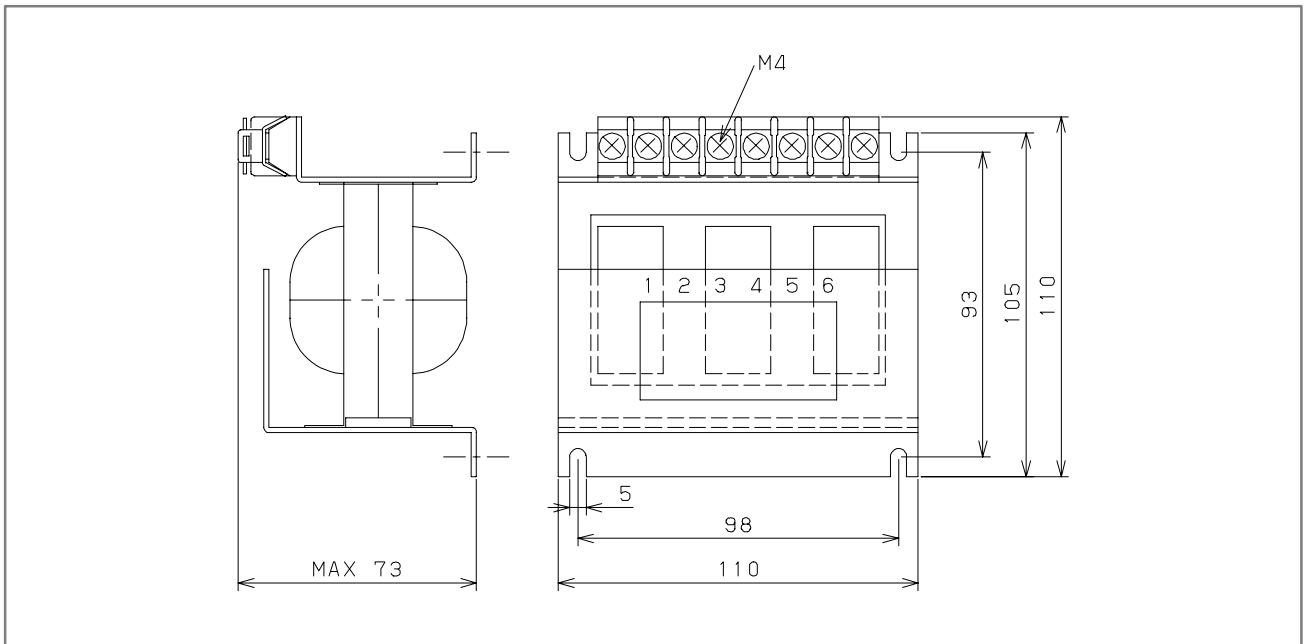
Fig. 1.3 (b)  $\alpha$  series servo amplifier

### 1.3.1 External Dimension of AC Reactor

(a) A81L-0001-0083#3C

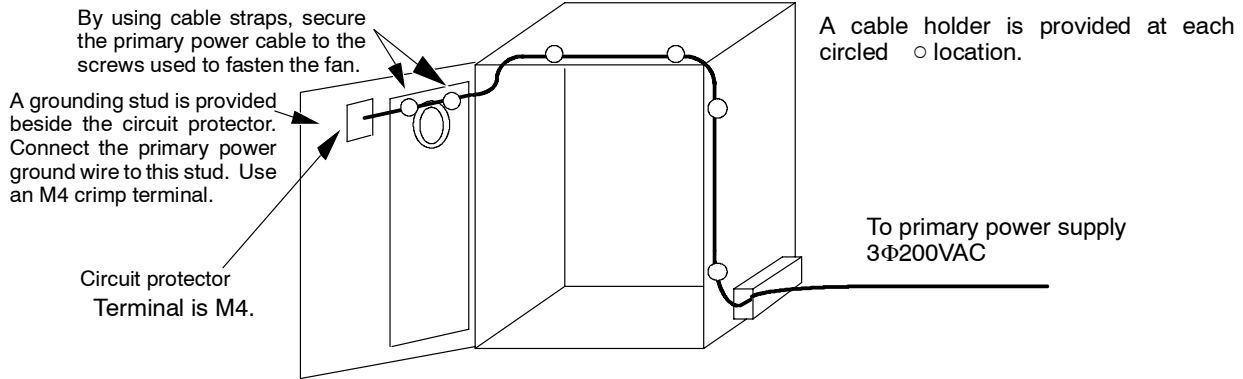


(b) A81L-0001-0126



# 1.4 CONNECTION OF POWER SUPPLY CABLE

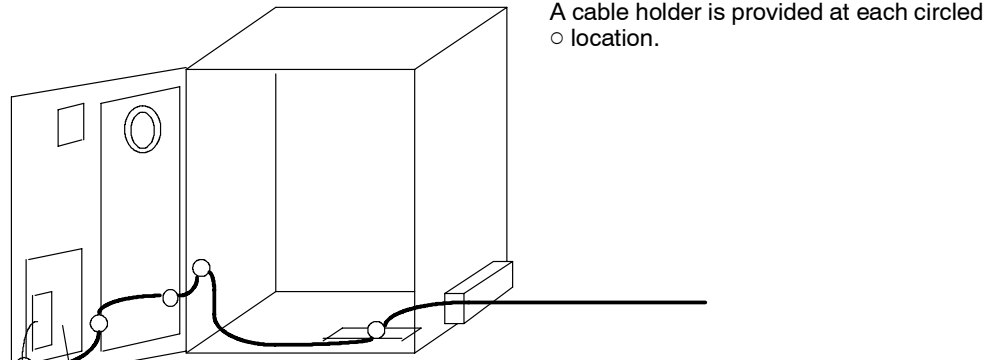
When the stand-alone controller is used, an optional power cable can be specified.



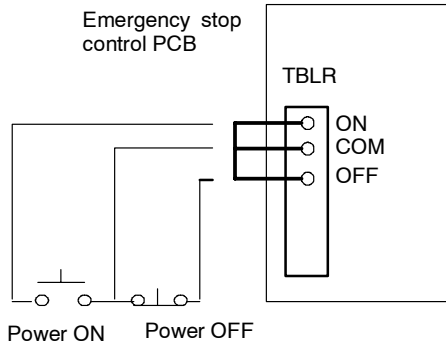
Connect the primary power cable to the circuit protector. After connection, insulate the protector terminal by fitting the provided terminal cover. Connect the primary power ground wire to the grounding stud, located beside the circuit protector.

## External ON/OFF control

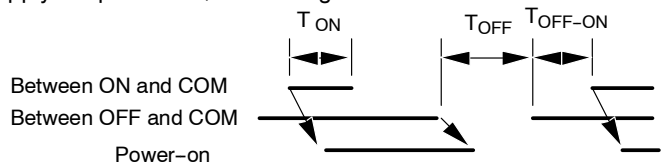
Customer should prepare this cable



When the robot is shipped, ON, COM, and OFF are connected by jumper wires. To enable external ON/OFF control, first disconnect these jumper wires, then make the necessary connections. To enable external ON/OFF control, set the circuit protector switch on the door to ON before setting the external switches.



Apply the power ON/OFF timing shown below.

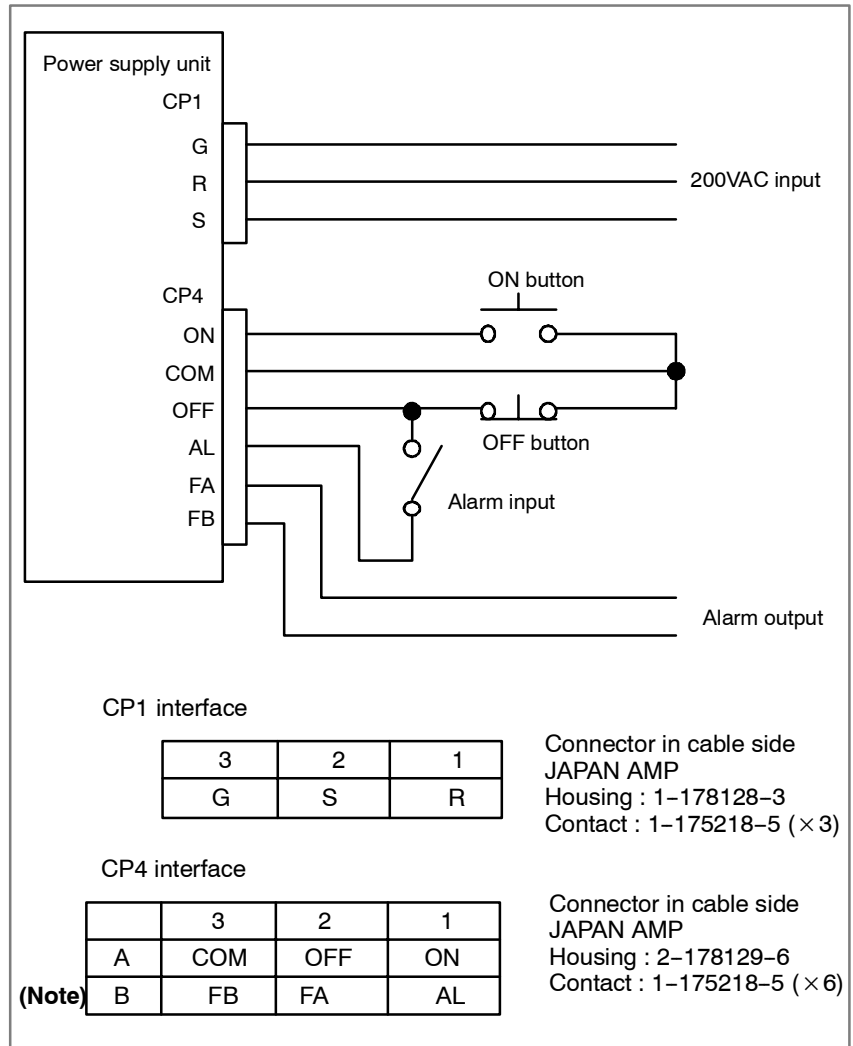


$$T_{ON} \geq 0.5 \text{ second}, T_{OFF} \geq 0.5 \text{ second}, T_{OFF-ON} \geq 10 \text{ seconds}$$

All contacts must be rated at 50 VDC, 100mA or greater.

### 1.5 CONNECTION OF THE POWER SUPPLY CABLE AND THE ON/OFF CABLE (PANEL MOUNT TYPE)

When the panel-mount controller is used, the preparation of a power cable and ON/OFF cable is the customer's responsibility.

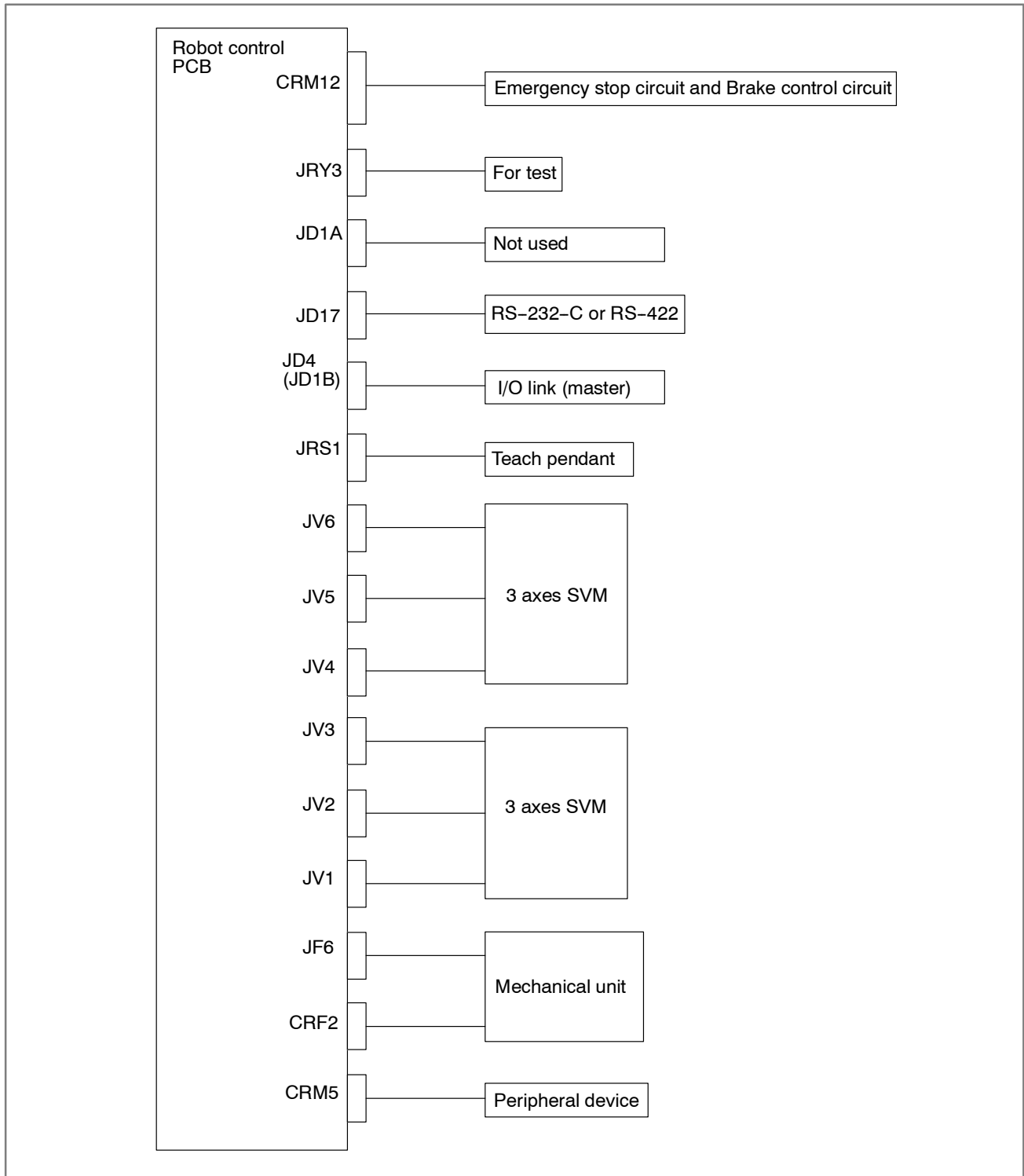


**NOTE**

No connection is required when the AL, FA, and FB of the CP4 interfaces are not used.

## 1.6 CONNECTORS OF ROBOT CONTROL PCB

a) In the case of a 6 axes controller

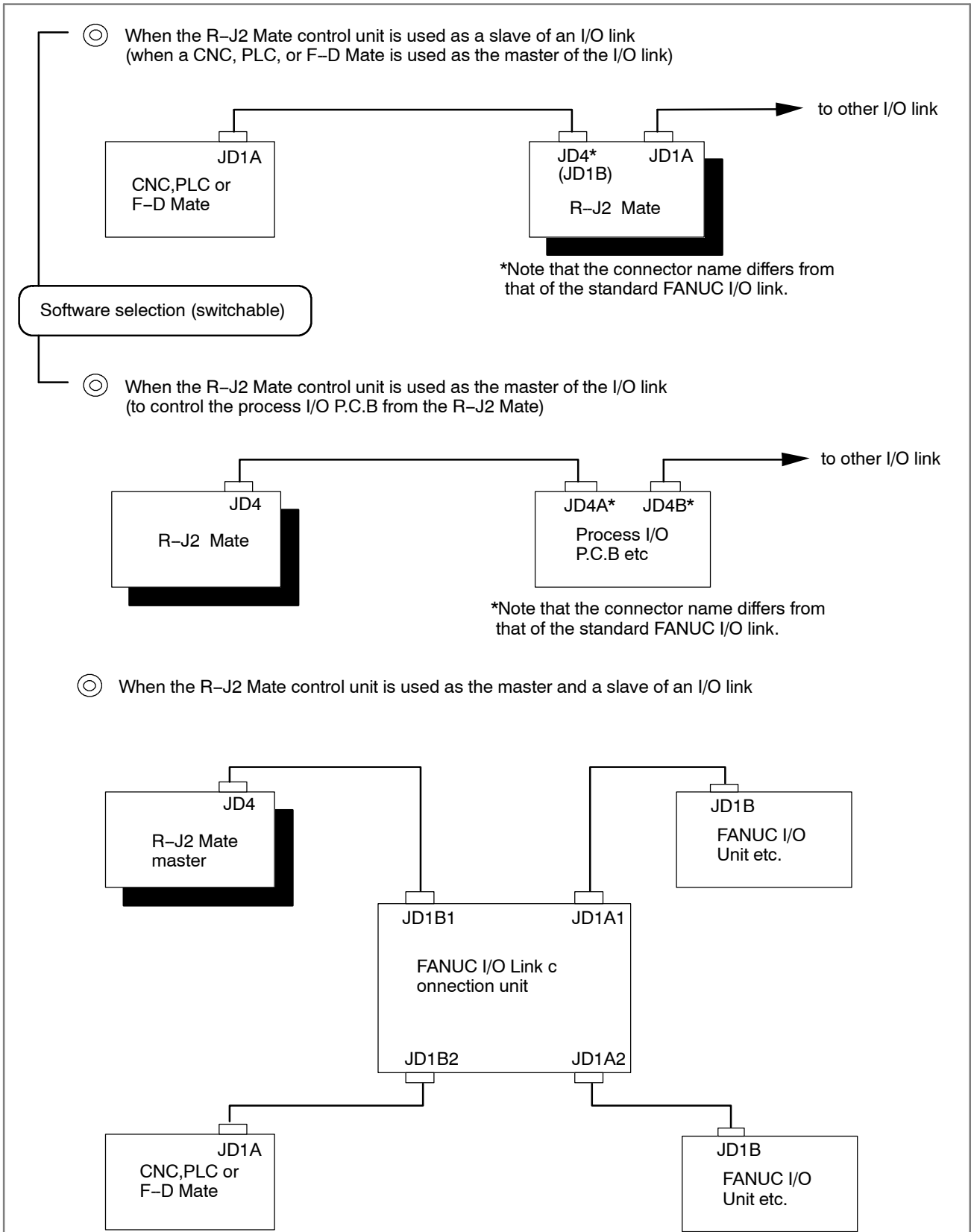


# 2

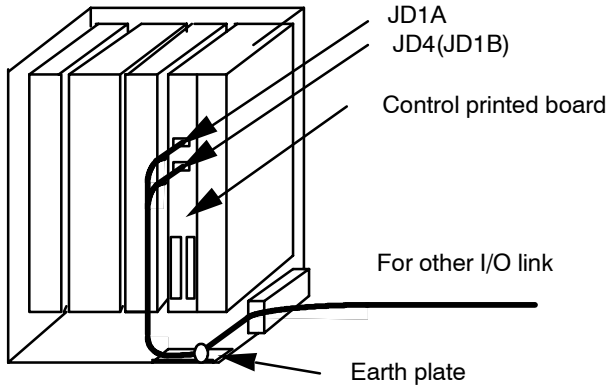
## DETAILS OF CONNECTION



## 2.1 FANUC I/O LINK



## 2.2 CONNECTION OF I/O LINK CABLE



The same interface is used for the panel mount controllers. Cable connections should be made according to the system. The customer is requested to ground the shield.

Peel off the sheath of the shielded cable, then ground the shield here.

I/O Link cable connection (stand-alone controller)

1. Customer should be prepare this cable.
2. Power off when it is connected.

When making a connection with a CNC via an I/O link, apply the following timing to turn the power to the CNC and robot controller on/off:

- a) Turn on the power to the slave units when or before turning on the master power.
- b) If the power to the CNC or robot controller is turned off after the system has been started, an I/O link error will occur. To reestablish normal connection via the I/O link, turn off the power to all units, then turn on the power as explained in a) above.

JD1A interface

11	0V	01	RX
12	0V	02	*RX
13	0V	03	TX
14	0V	04	*TX
15	0V	05	
16	0V	06	
17		07	
18	(+5V)	08	
19		09	(+5V)
20	(+5V)	10	

Note) When using an optical I/O link adaptor, use +5V.

JD4(JD1B) interface

11	0V	01	RX
12	0V	02	*RX
13	0V	03	TX
14	0V	04	*TX
15	0V	05	
16	0V	06	
17	(-15V)	07	(*ENSLC)
18	(+5V)	08	(+15V)
19	(+24V)	09	(+5V)
20	(+5V)	10	(+24V)

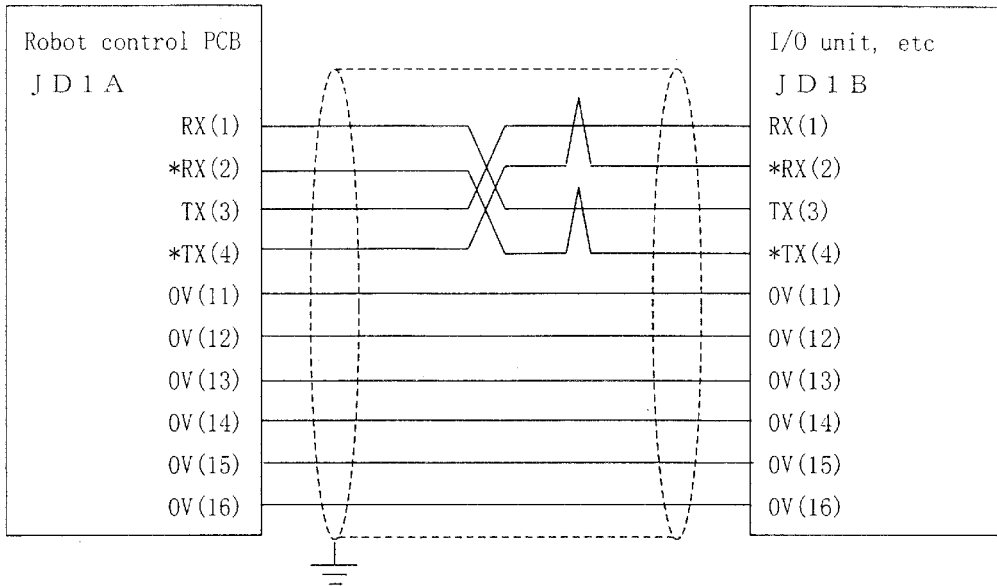
Note) When using I/O signals that are dedicated to the robot, use the signals and power supplies indicated in parentheses. When using an optical I/O link adaptor, use +5V.

Connector in cable side  
 Honda Tsuushin Co.,Ltd  
 Connector: PCR-E20FS  
 Case : PCR-V20LA

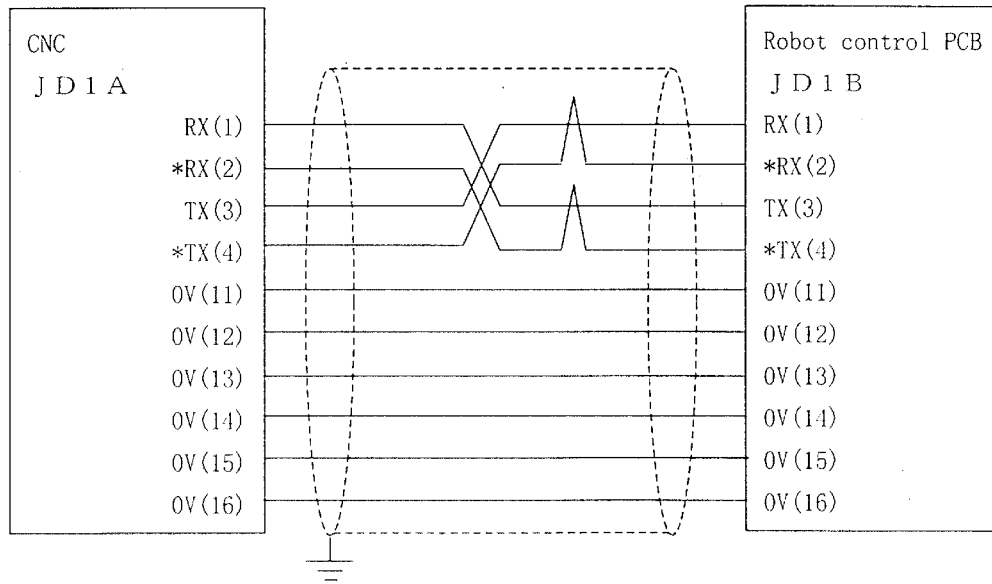
- (1) Twisted-pair cables should be used for pin pairs 1 and 2, and 3 and 4.
- (2) Use unified shielding, and ground the shield on the CNC side.

Connecting diagram of I/O link cable

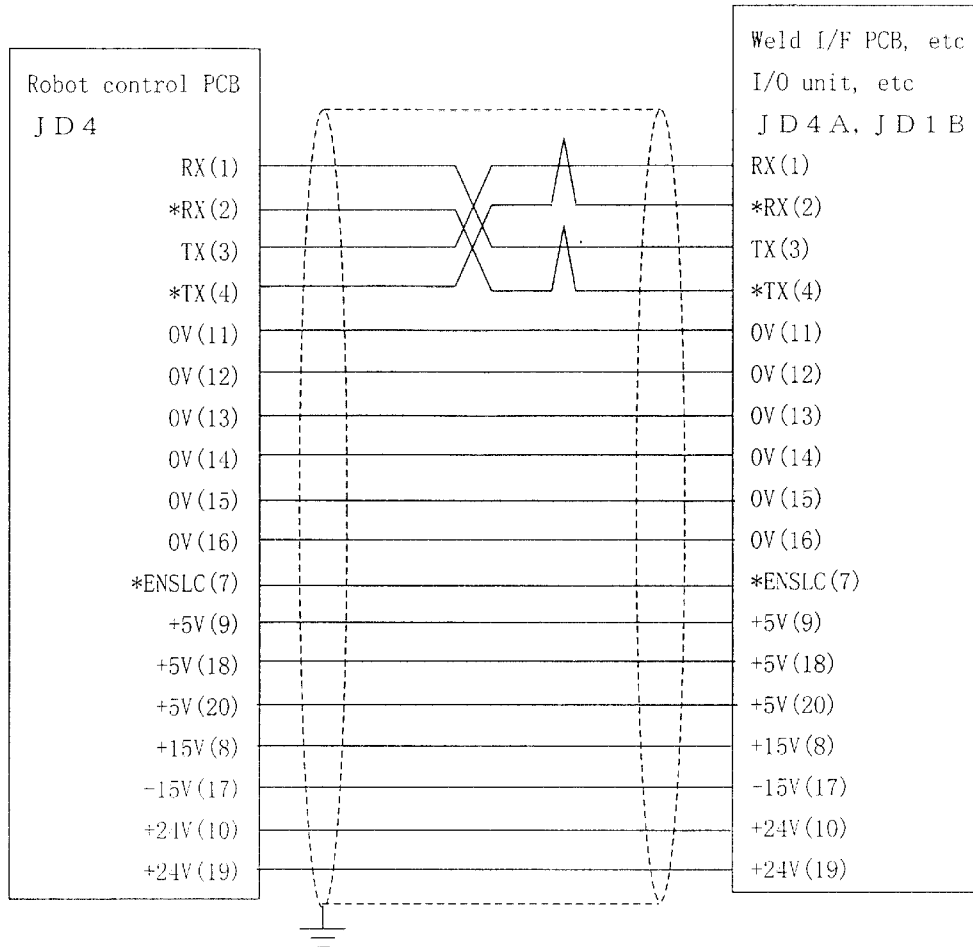
JD1A interface (slave)



JD1B interface (slave)



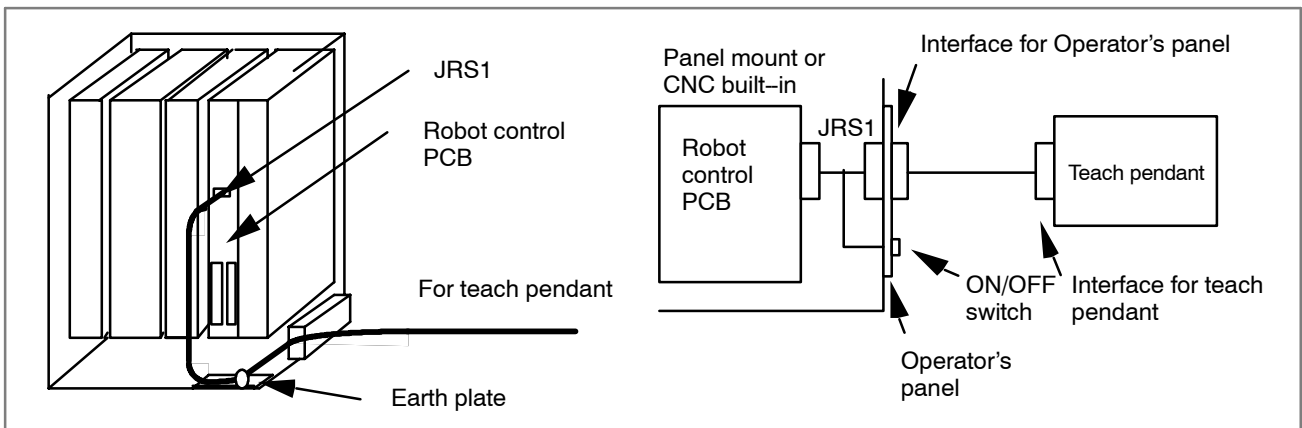
JD4 interface (master)



## 2.3 CONNECTION OF TEACH PENDANT

### 2.3.1 High Performance Type Teach Pendant

- When a panel-mount type controller is used, the teach pendant can be connected or disconnected with the ON/OFF switch.(See 2.3.3)
- To obtain a simple connection, provide a connection interface on the operator's panel of the machine tool. The following shows an example of construction.



#### Teach pendant cable connection (stand-alone controller)

11		01	RXTP
12	0V	02	*RXIP
13		03	TXTP
14	EMGEN	04	*TXTP
15		05	(+5V)
16	EMGDM	06	0V
17		07	
18	EMGTP	08	
19		09	
20	+24E	10	+24V

Connector in cable side  
Hirose electric Co.,Ltd.  
Connector : F140-2015S  
Case : FI-20-CV

01	TXTP	14	*TXTP
02	RXTP	15	*RXTP
03	EMGDM	16	EMGEN
04		17	0V
05		18	
06		19	
07	+24E	20	FG

**(Note)**

**(Note)** High performance type teach pendant does not use +5V interface.

Connector in operator's panel side  
Honda Tsushin Co.,Ltd.  
MR-20RMH(male) or MR-20RFH(female)

Connector in cable side  
Honda Tsushin Co.,Ltd.  
MR-20LMH(male) or MR-20LFH(female)

- (1) Twisted-pair cables should be used for pin pairs RXTP and \*RXTP, and TXTP and \*TXTP.
- (2) Use unified shielding, and ground the shield on the CNC side.

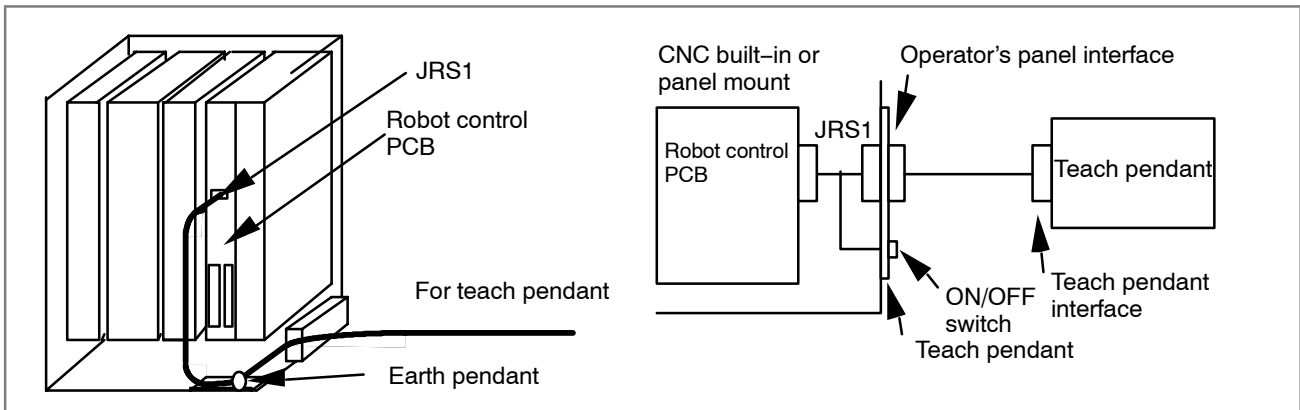
### High-function teach pendant interface

	01	02	03	04	
	TXTP	*TXTP	RXTP	*RXTP	
05	06	07	08	09	10
				+24E	+24E
11	12	13	14	15	16
EMGTP	EMGDM	EMGEN			
	17	18	19	20	
			0V	0V	

Connector in cable side  
 HIROSE ELECTRIC CO.,LTD  
 Connector:HR22-12TPD-20SC  
 Crimped terminal:HR22-SC-122( 11Pairs)

### 2.3.2 Simplified Type Teach Pendant

- When CNC built-in type or a panel-mount type controller is used, the teach pendant can be connected or disconnected with the ON/OFF switch. (See 2.3.3)
- To obtain a simple connection, provide a connection interface on the operator's panel of the machine tool. The following shows an example of construction.



**Teach pendant cable connection (stand-alone controller)**

11		01	RXTP
12	0V	02	*RXTP
13		03	TXTP
14	EMGEN	04	*TXTP
15		05	+5V
16	EMGDM	06	0V
17		07	
18	EMGTP	08	
19		09	
20	(+24E)	10	(+24E)

01	TXTP	08		14	*TXTP
02	RXTP	09		15	*RXTP
03	EMGDM	10		16	EMGEN
04		11		17	0V
05		12	EMGTP	18	
06		13	+5V	19	
(Note) 07	(+24E)			20	FG

**(Note)** Connector in cable side  
HIROSE ELECTRIC CO.,LTD  
Connector:F140-2015S  
Case:F1-20-CV

**(Note)** Operator's panel connector  
HONDA TSUSHIN CO.,LTD  
MR-20RMH(Female) or MR-20RFH(Male)

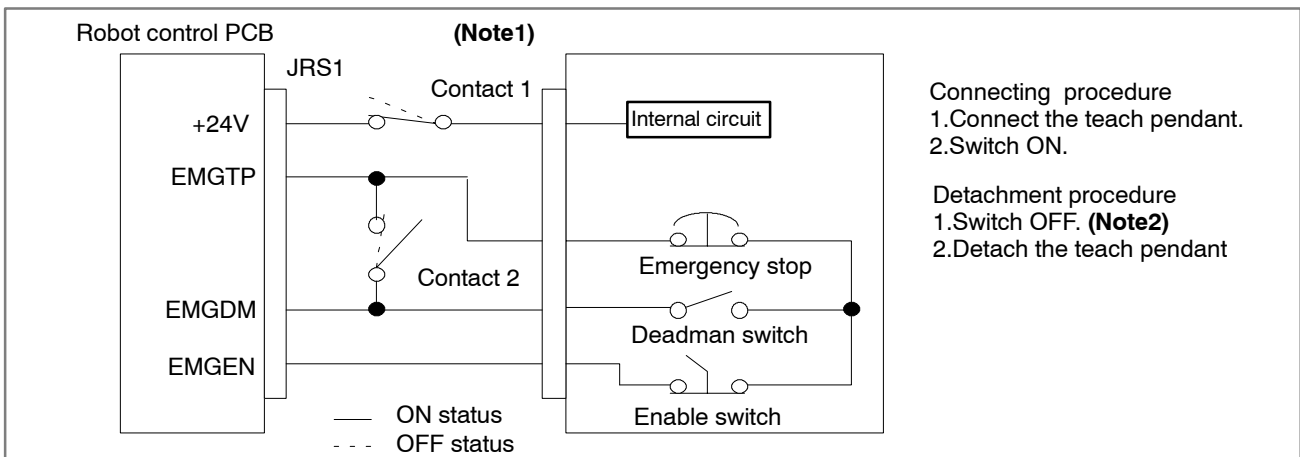
Connector in cable side  
HONDA TSUSHIN CO.,LTD  
MR-20LMH(Female) or MR-20LFH(Male)

**(Note)** Simplified type teach pendant does not use +24V interface.

- (1) Twisted-pair cables should be used for pin pairs 1 and 2, and 3 and 4.
- (2) Use unified shielding, and ground the shield on the CNC side.

**2.3.3 Attaching and Detaching the Teach Pendant**

Prepare the circuit shown below to enable attachment and detachment of the teach pendant. (For the stand-alone controller, an option can be specified.)

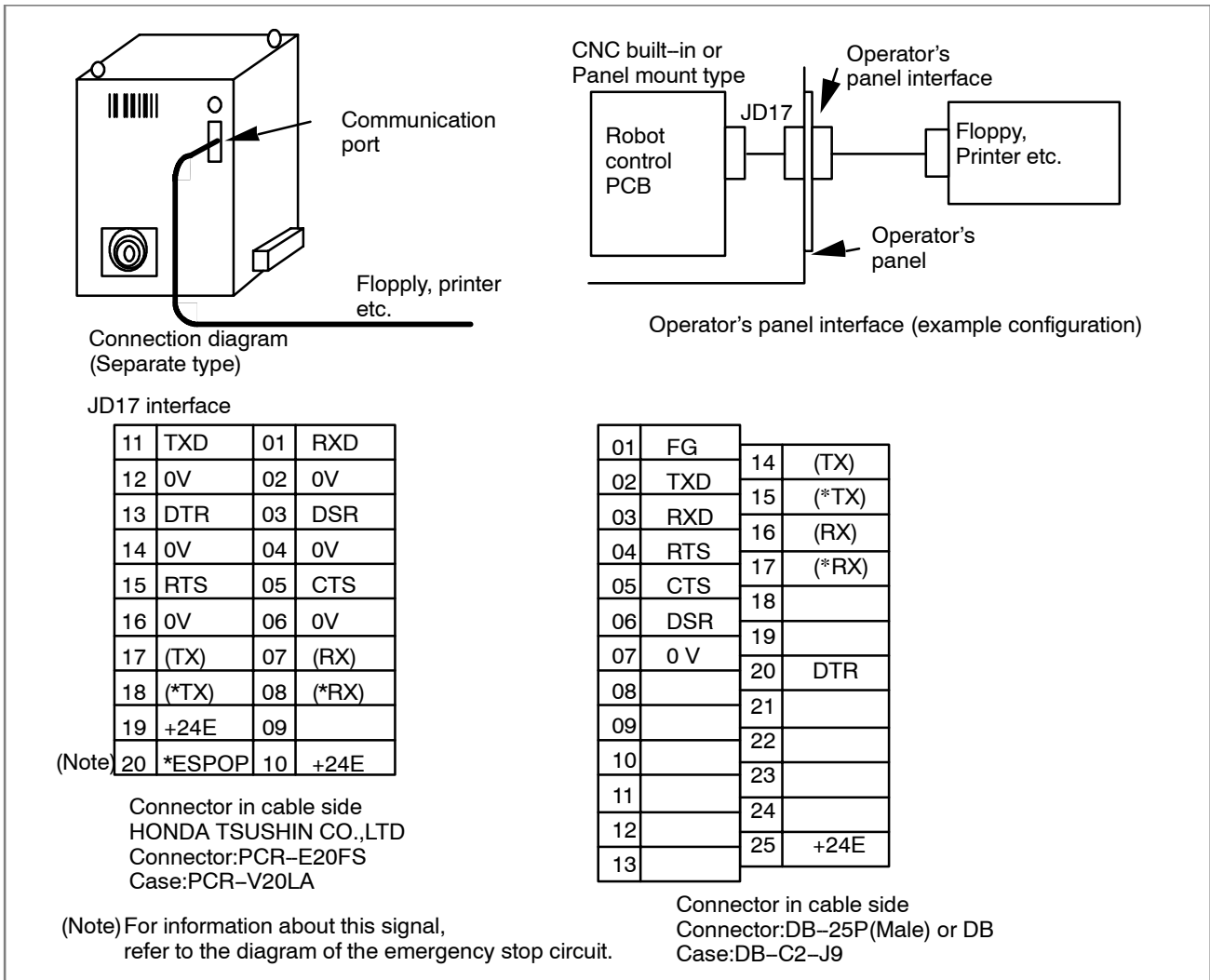


**NOTE**

- 1 Contact 1 is not used when attaching/detaching a simplified teach pendant.
- 2 When the switch is set to OFF, the teach pendants emergency stop function is disabled even if the teach pendant is connected.

## 2.4 CONNECTION OF CABLE FOR RS-232-C/RS-422

- In case of Panel mount type controller, customer should make these cables.
- To obtain a simple connection, provide a connection interface on the operator's panel of the machine tool. The following shows an example of construction.
- Selection of RS-232-C or RS-422 interface need setting on robot control PCB.

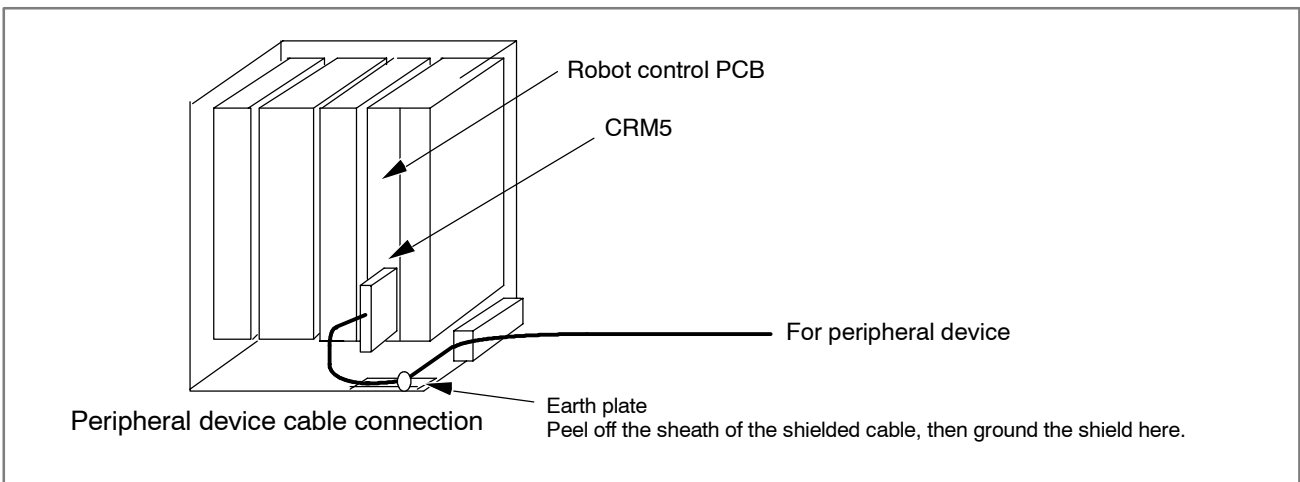


- (1) Signals whose names are enclosed in parentheses are assigned to use the RS-422 interface. The numbers of the interface differ from those of the standard RS-422 interface. Take the caution when designing the interface.
- (2) Twisted-pair cables should be used for pin pairs 1 and 2, and 3 and 4., and ... 19 and 20.

## 2.5 CABLE CONNECTION TO PERIPHERAL DEVICE

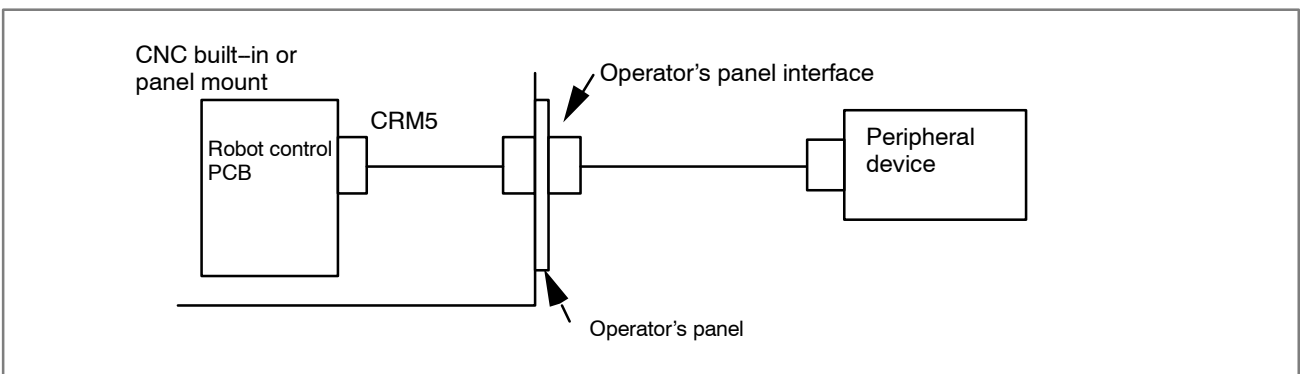
### 2.5.1 Peripheral Device Interface CRM5

- connection to peripheral device (In the case of remote type)



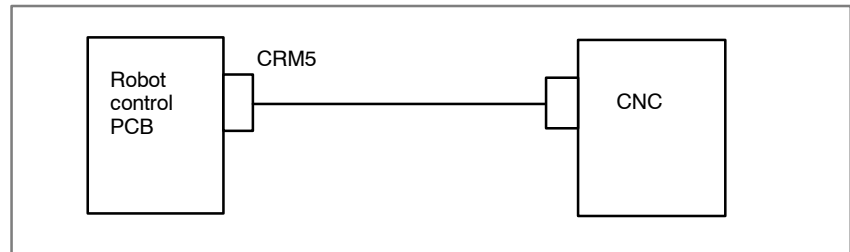
### 2.5.2 When the Robot is Connected to the CNC Machine by a FANUC I/O Link

- When a panel mount type controller is used, customer should prepare this cable.
- Turn off the controller when in operation.



### 2.5.3 When the Robot is Connected to the CNC Machine by a Peripheral Device Cable

- When a panel mount type controller is used, the customer should prepare this cable.
- Turn off the controller when connecting the cable.



CRM5 interface (Specified signals are not allocated and the Robot is connected to CNC machine by a FANUC I/O Link.)

01	SDI101			33	SDO101
02	SDI102			34	SDO102
03	SDI103	19	SDICOM1	35	SDO103
04	SDI104	20	SDICOM2	36	SDO104
05	SDI105	21		37	SDO105
06	SDI106	22	SDI117	38	SDO106
07	SDI107	23	SDI118	39	SDO107
08	SDI108	24	SDI119	40	SDO108
09	SDI109	25	SDI120	41	SDO109
10	SDI110	26		42	SDO110
11	SDI111	27		43	SDO111
12	SDI112	28		44	SDO112
13	SDI113	29	0 V	45	SDO113
14	SDI114	30	0 V	46	SDO114
15	SDI115	31	+24E	47	SDO115
16	SDI116	32	+24E	48	SDO116
17	0 V			49	+24E
18	0 V			50	+24E

Connector in cable side  
HONDA TSUSHIN CO.,LTD  
Connector MR-50LMH(Male)

SDICOM1 and SDICOM2 are the signals used for selecting a common for SDI signals.

To use the +24V common, connect SDICOM1 and SDICOM2 to 0V.

To use the 0V common, connect SDICOM1 and SDICOM2 to +24V.

SDICOM1→Selects a common for SDI101 to SDI108.

SDICOM2→Selects a common for SDI109 to SDI120.

**(Note)** Maximum output current per one SDO signal is 70mA.

## CRM5 interface

(standard allocation of specified signals and the Robot is connected to the CNC machine by a peripheral device cable.)

Connector in cable side  
HONDA TSUUSHIN CO.,LTD  
Connector MR-50LMH (Male)

01	SDI101			33	SDO101
02	SDI102			34	SDO102
03	SDI103	19	SDICOM1	35	SDO103
04	SDI104	20	SDICOM2	36	SDO104
05	SDI105	21		37	SDO105
06	SDI106	22	SDI117	38	SDO106
07	SDI107	23	SDI118	39	SDO107
08	SDI108	24	SDI119	40	SDO108
09	*HOLD	25	SDI120	41	SDO109
10	RESET	26		42	SDO110
11	START	27		43	SDO111
12	ENBL	28		44	SDO112
13	PNS1	29	0 V	45	CMDENBL
14	PNS2	30	0 V	46	FAULT
15	PNS3	31	+24E	47	BATALM
16	PNS4	32	+24E	48	BUSY
17	0 V			49	+24E
18	0 V			50	+24E

SDICOM1 and SDICOM2 signal are common selection signal for SDI.  
When 24 V common is used, connect to 0V.  
When 0V common is used, connect to +24V

SDICOM1"Selects a common for SDI101 to SDI108.

SDICOM2"Selects a common for \*HOLD, RESET, START, ENBL, PNS1 to PNS4, and SDI109 to SDI112.

**NOTE**

- 1 Maximum output current for one SDO signal is 70mA.
- 2 The common (selected with SDICOM2) for a dedicated signal should ideally be the +24V common, but the 0V common can also be used.
- 3 Allocation of the specified signals can be changed from the teach pendant.

In case +24V common at the peripheral device side  
(Specified signals are not allocated.)

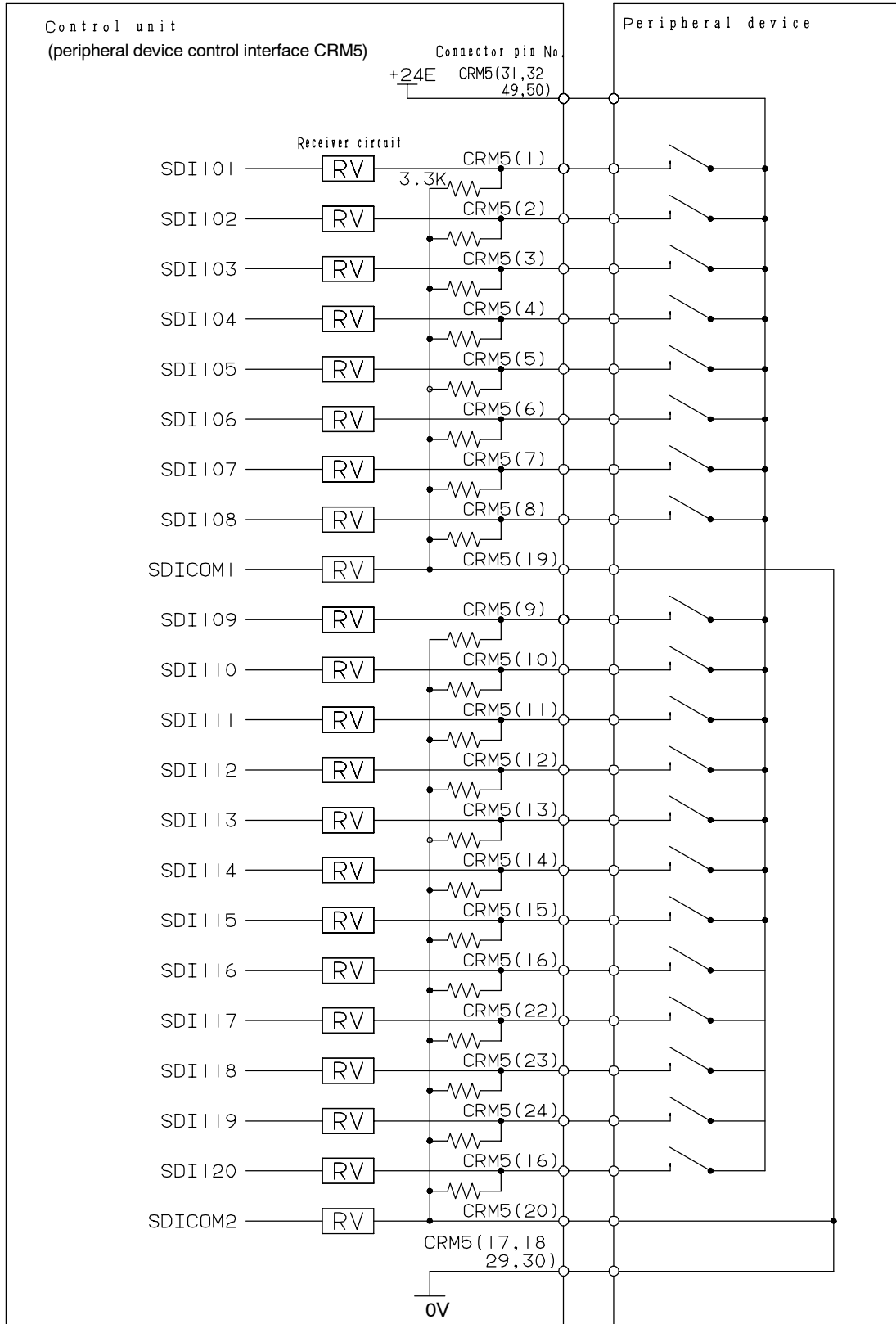


Fig. 2.5.3 (a) Peripheral device control interface (Input signal, +24V common)

In case 0V common at the peripheral device side  
(Specified signals are not allocated.)

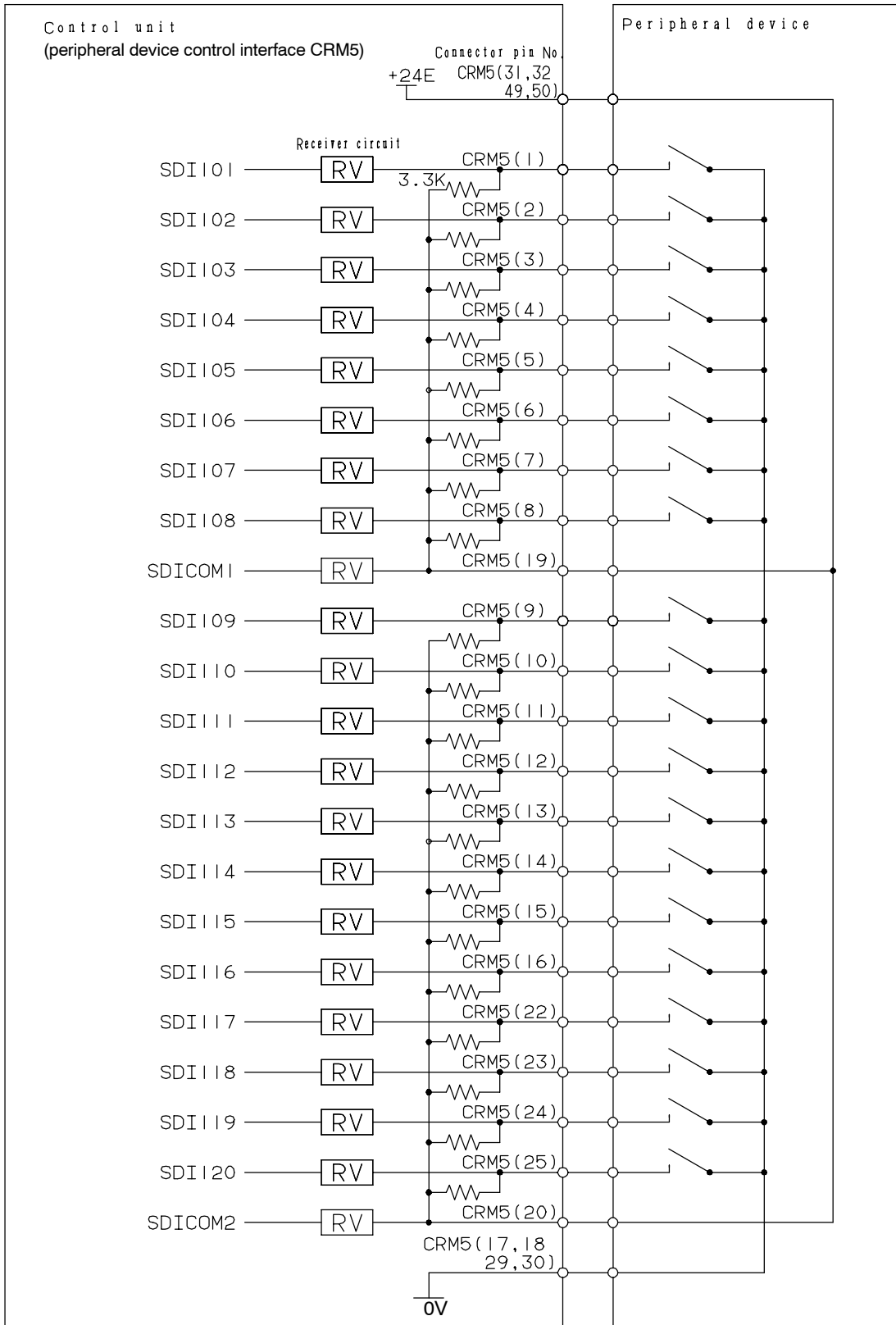


Fig. 2.5.3 (b) Peripheral device control interface (Input signal, 0V common)

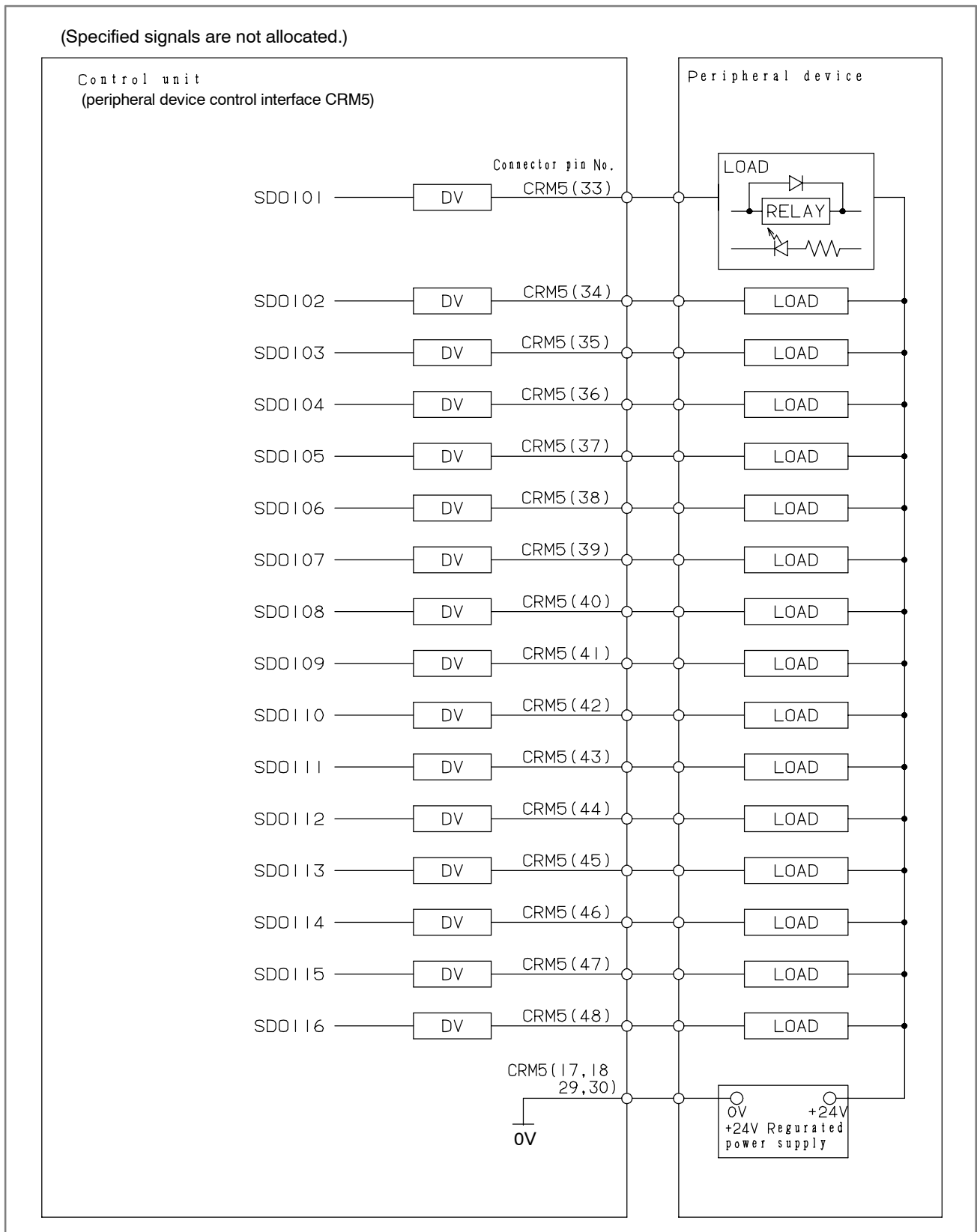


Fig. 2.5.3 (c) Peripheral device control interface (Output signal)

In case +24V common at the peripheral device side (Standard allocation of specified signal)

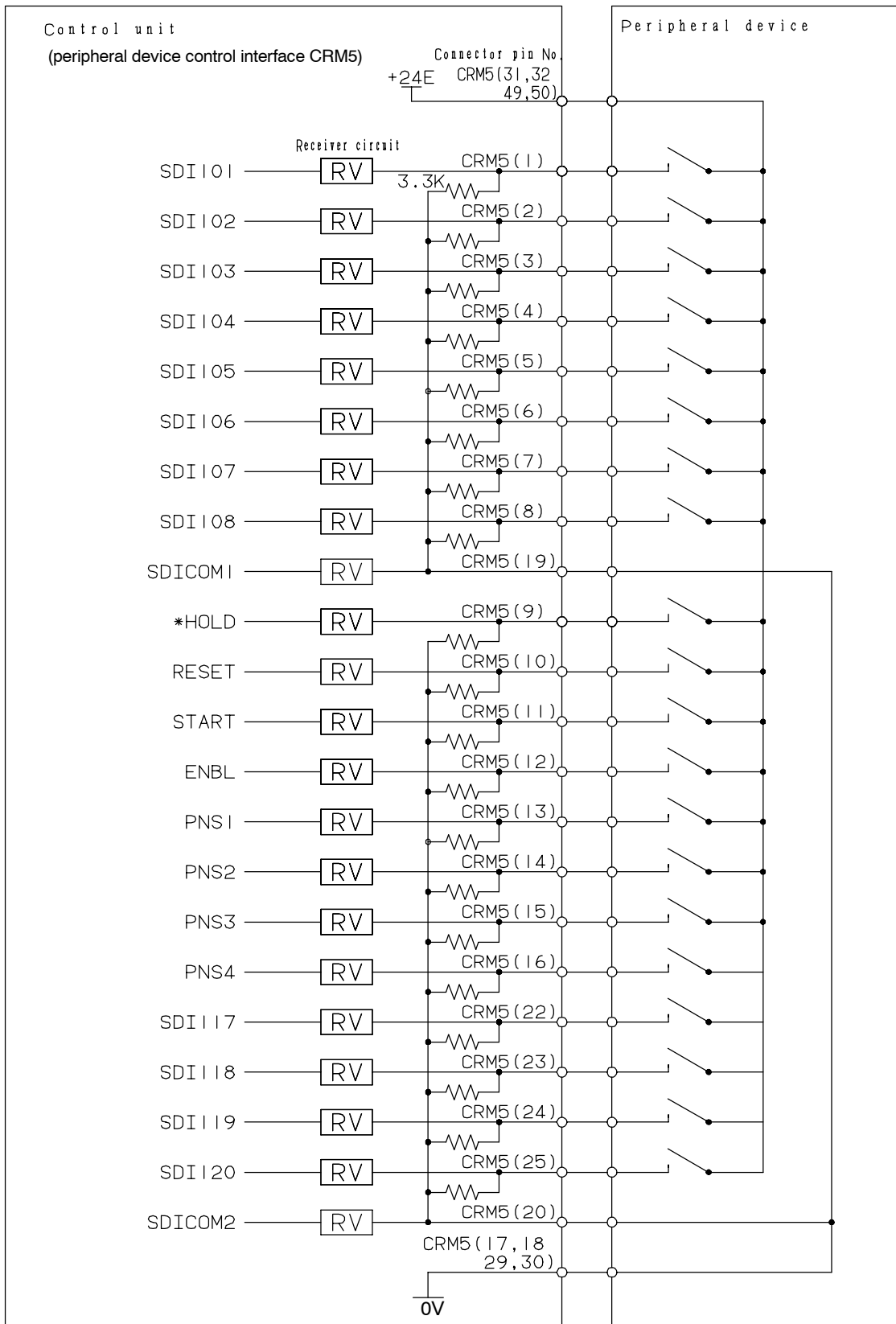
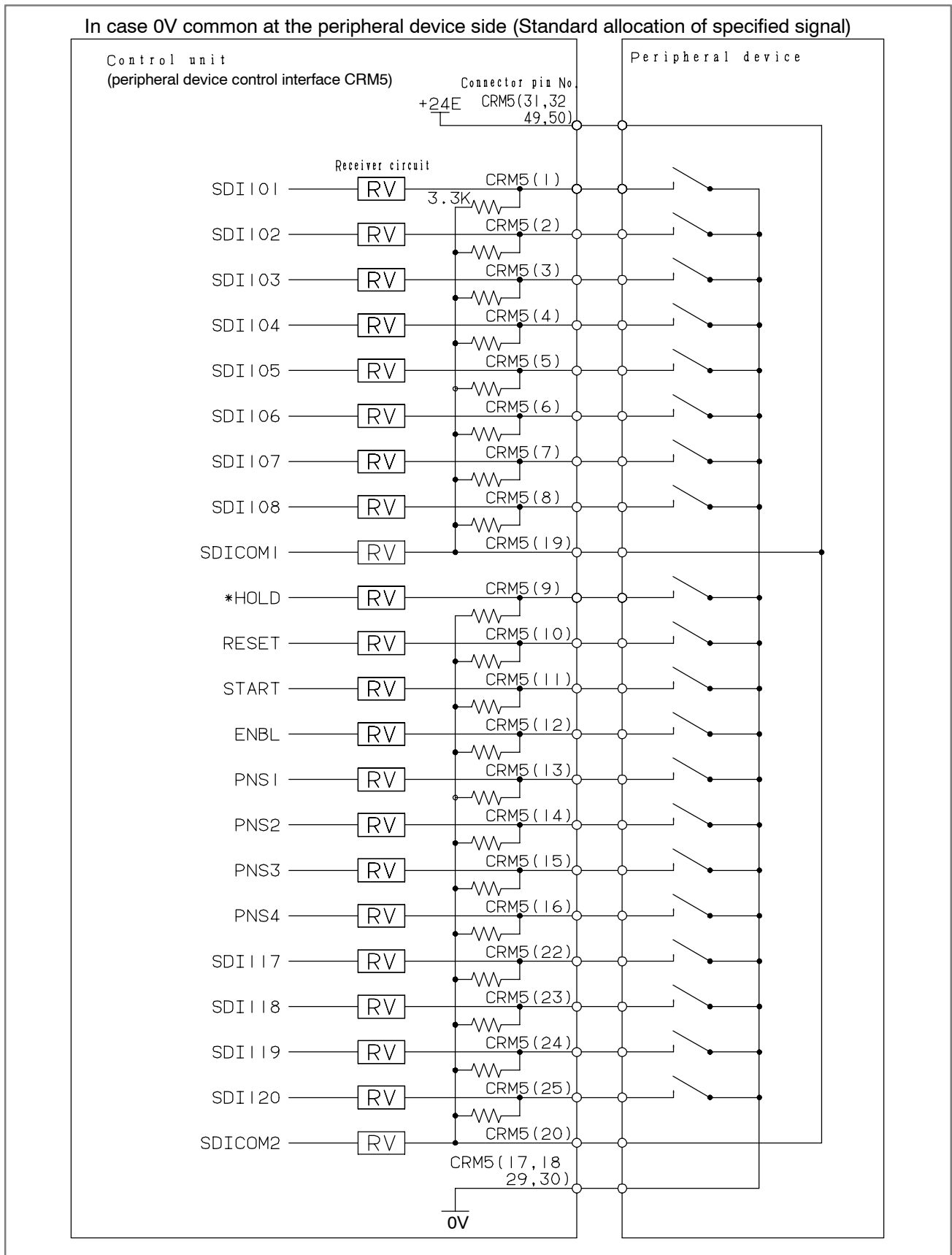


Fig. 2.5.3 (d) Peripheral device control interface (Input signal, +24 common)



**Fig. 2.5.3 (e) Peripheral device control interface (Input signal, 0V common)**

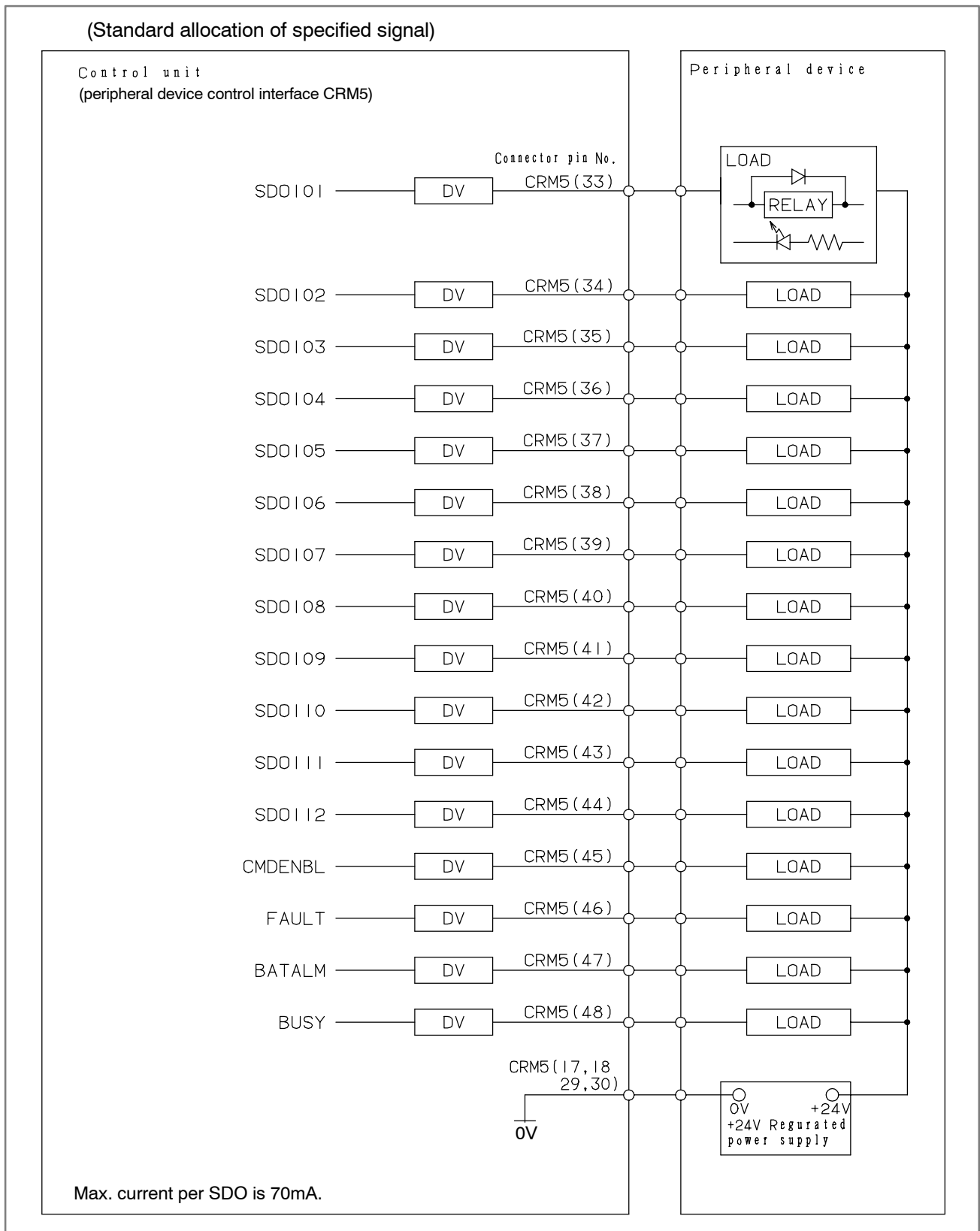


Fig. 2.5.3 (f) Peripheral device control interface (Output signal)

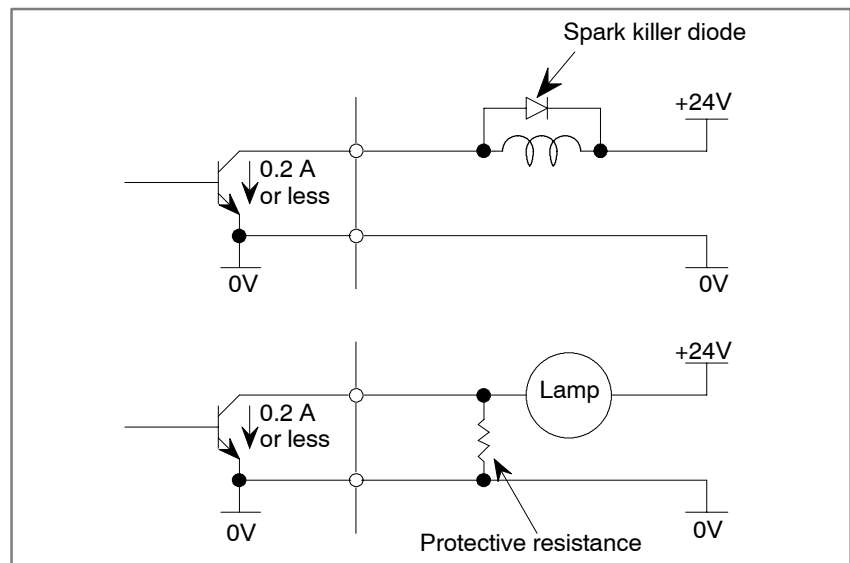
## 2.5.4 Digital I/O Signal Specifications

### Peripheral Device Interface CRMS

- Output signal regulation

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

Example of connection



- Electrical specifications
 

Rated voltage	: 24 VDC
Maximum applied voltage	: 30 VDC
Maximum load current	: 0.2 A
Transistor type	: Open collector NPN
Saturation voltage at connection	: 1.0 V (approx.)
- Spark killer diode
 

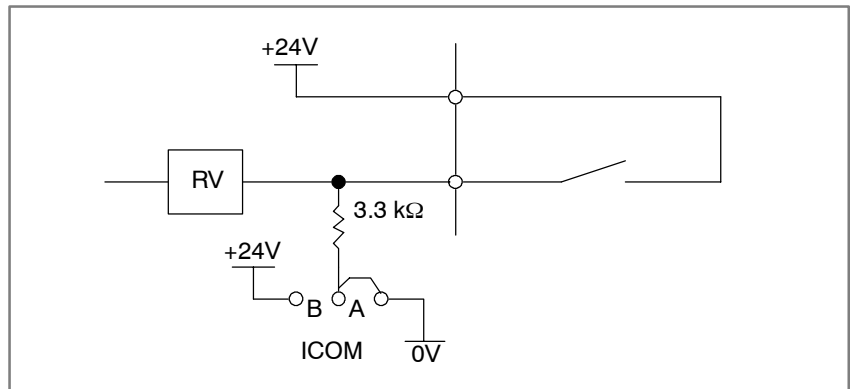
Rated peak reverse voltage	: 100 V or more
Rated effective forward current	: 1 A or more
- Notes on use
 

Do not use the +24 V power supply of the robot.  
When loading a relay, solenoid, and so on directly, connect them in parallel with diodes for preventing back electromotive force.  
If a load causing a surge current such as turning on LED is connected, use a protective resistance.
- Applicable signal
 

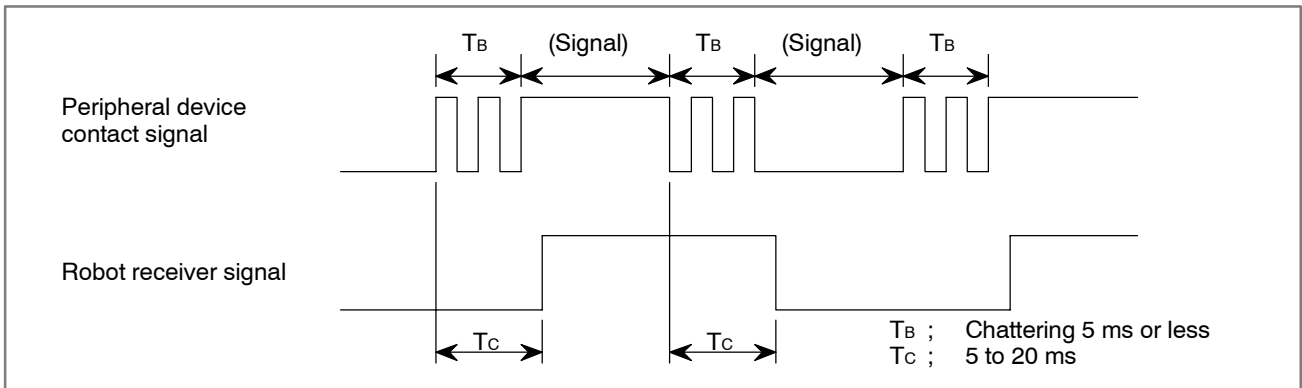
Output signal of peripheral device interface CRMS :  
SDO101 to SDO116

● **Input signal regulation**

Example of connection



- **Electrical specifications of the receiver**
  - Type : Grounded voltage receiver
  - Rated input voltage : Contact close : +20 V to +28 V  
Contact open : 0 V to +4 V
  - Maximum applied input voltage : +28 VDC
  - Input impedance : 3.3 kΩ (approx.)
  - Response time : 5 ms to 20 ms
  
- **Specifications of the peripheral device contact**
  - Rated contact capacity : 30 VDC, 50 mA or more
  - Input signal width : 200 ms or more (on/off)
  - Chattering time : 5 ms or less
  - Closed circuit resistance : 100Ω or less
  - Opened circuit resistance : 100 kΩ or more

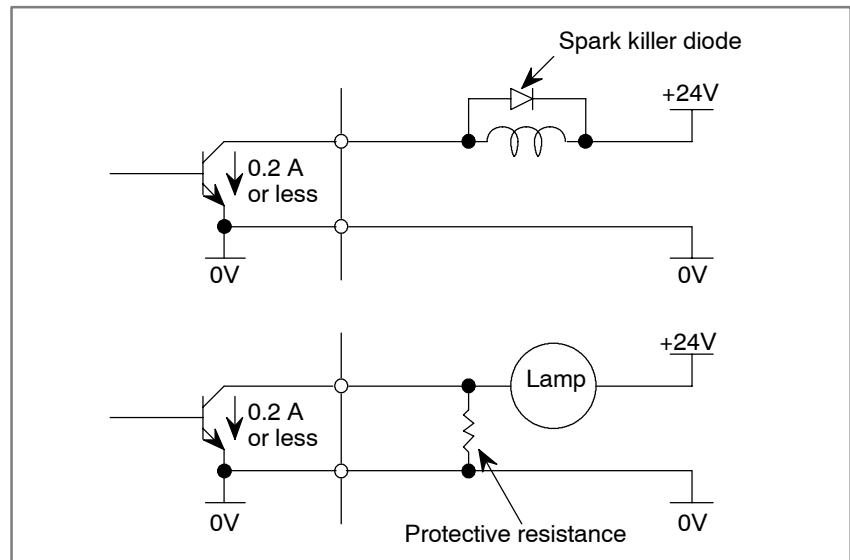


- **Note on use**
  - Apply the +24 V power of the robot to the receiver.
  - However, the above signal regulations must be satisfied at the robot receiver.
- **Applicable signal**
  - Input signal of peripheral device interface CRM5 :
  - SDI101 to SDI120

## End Effector Control Interface

### • Output signal regulation

Example of connection



- Electrical specifications
 

Rated voltage	: 24 VDC
Maximum applied voltage	: 30 VDC
Maximum load current	: 0.2 A
Transistor type	: Open collector NPN
Saturation voltage at connection	: 1.0 V (approx.)
- Spark killer diode
 

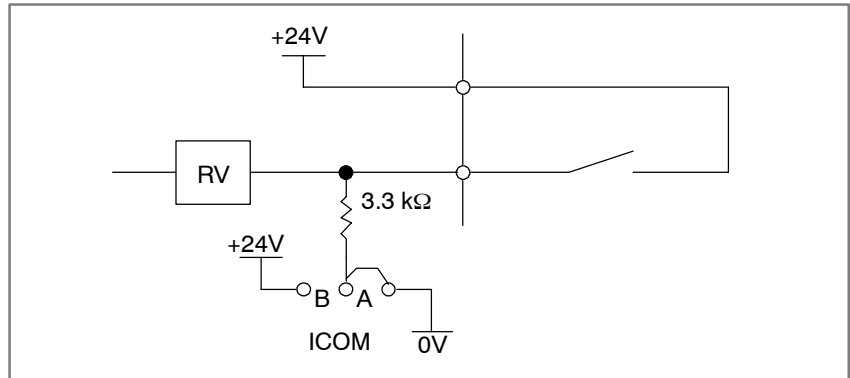
Rated peak reverse voltage	: 100 V or more
Rated effective forward current	: 1 A or more
- Note on use
 

The +24 V power supply of the robot can be used when the endeffector interface is 0.7 A or less.  
 When loading a relay, solenoid, and so on directly, connect them in parallel with diodes for preventing back electromotive force.  
 If a load causing a surge current such as turning on LED is connected, use a protective resistance.
- Applicable signals
 

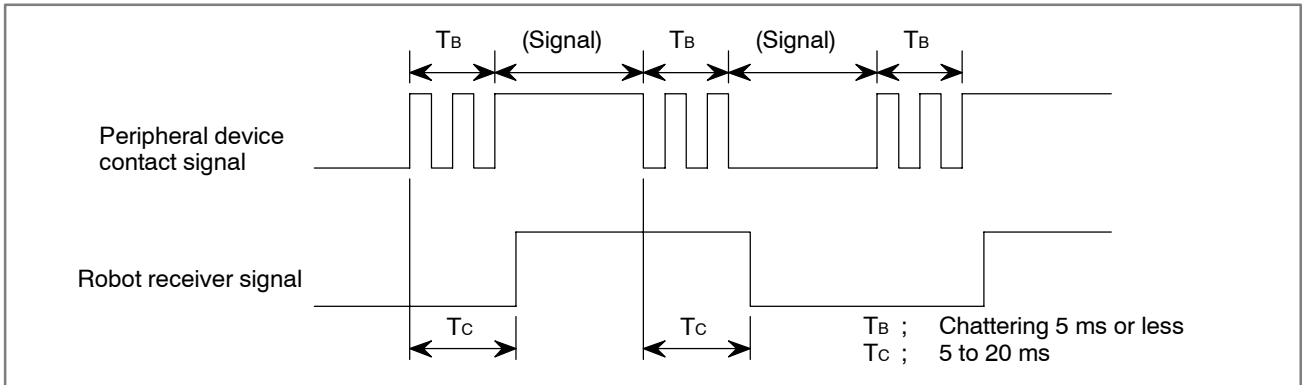
Output signals of the end effector control interface :  
 RDO1 to RDO6

● **Input signal regulation**

Example of connection



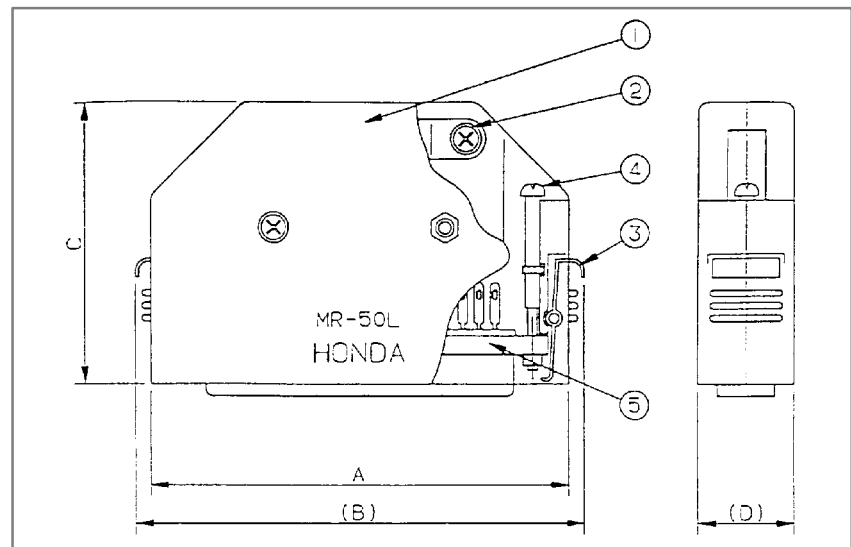
- **Electrical specifications of the receiver**
  - Type : Grounded voltage receiver
  - Rated input voltage : Contact close: +20V to +28V  
Contact open: 0V to +4V
  - Maximum applied input voltage : +28VDC
  - Input impedance : 3.3 kΩ (approx.)
  - Response time : 5 ms to 20 ms
  
- **Specifications of peripheral device contact**
  - Rated contact capacity : 30 VDC, 50 mA or more
  - Input signal width : 200 ms or more (on/off)
  - Chattering time : 5 ms or less
  - Closed circuit resistance : 100 Ω or less
  - Opened circuit resistance : 100 kΩ or more



- **Notes on use**
  - Apply the +24 V power of the robot to the receiver.
  - However, the above signal specifications must be satisfied at the robot receiver.
  
- **Applicable signals**
  - Input signals of the end effector control interface
  - RDI1 to RDI4, \*HBK, \*PPABN

## 2.5.5 Peripheral Device Cable Connector

The figure below shows the connector for peripheral device cable.



Symbol	Name
1	Connector cover
2	Cable clamp screw
3	Connector clamp spring
4	Connector clamp screw
5	Connector 50 pins (male) MR50MH

Connector specification	Applicable interface	Dimensions				Remark
		A	(B)	C	(D)	
MR50LMH	CRM2	67.9	73.5	44.8	18	Honda Tsushin Kogyo 50 pins

## 2.5.6 Recommended Cables

Connect a peripheral device using a completely shielded, heavily protected cable conforming to the specifications in Table 2.5.6. Allow an extra 1.5m for routing the cable in the control unit. The maximum cable length is 30m.

Table 2.5.6 Recommended cable (For peripheral device connection)

Number of wires	Wire specifications (FANUC specifications)	Conductor		Sheath thickness (mm)	Effective outside diameter (mm)	Electrical characteristics	
		Diameter (mm)	Configuration			Conductor resistance ( $\Omega$ /km)	Allowable current (A)
50	A66L-0001-0042	$\phi$ 1.05	7/0.18 AWG24	1.5	$\phi$ 12.5	106	1.6

## 2.6 PERIPHERAL DEVICE INTERFACE (PROCESS I/O PRINTED BOARD)

Item	Name	Drawing number	DI	DO	D/A	A/D	Remarks
1	Robot control printed circuit board CRM5	A16B-3200-0071	20	16	-	-	Standard
2	Process I/O printed circuit board CA	A05B-2300-J030	40	40	2	6	Option (with analog interface)
3	Process I/O printed circuit board CB	A05B-2300-J031	40	40	-	-	Option (without analog interface)
4	Process I/O printed circuit board DA	A05B-2300-J035	96	96	-	-	Option (without analog interface)
5	Welding interface printed circuit board	A05B-2330-J020	8	8	2	2	Option

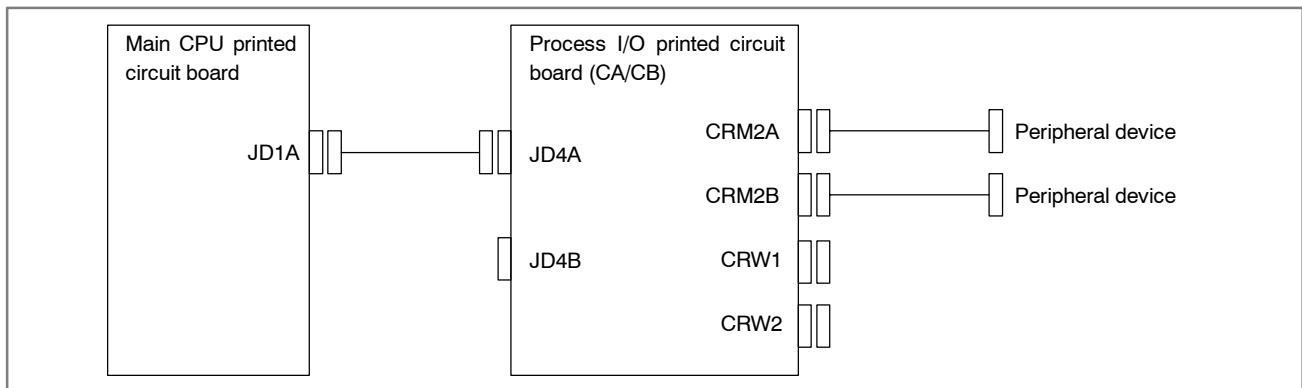
### NOTE

The number of general-purpose I/Os (SDI/SDO) is the number listed in the table, minus the number of dedicated signals.

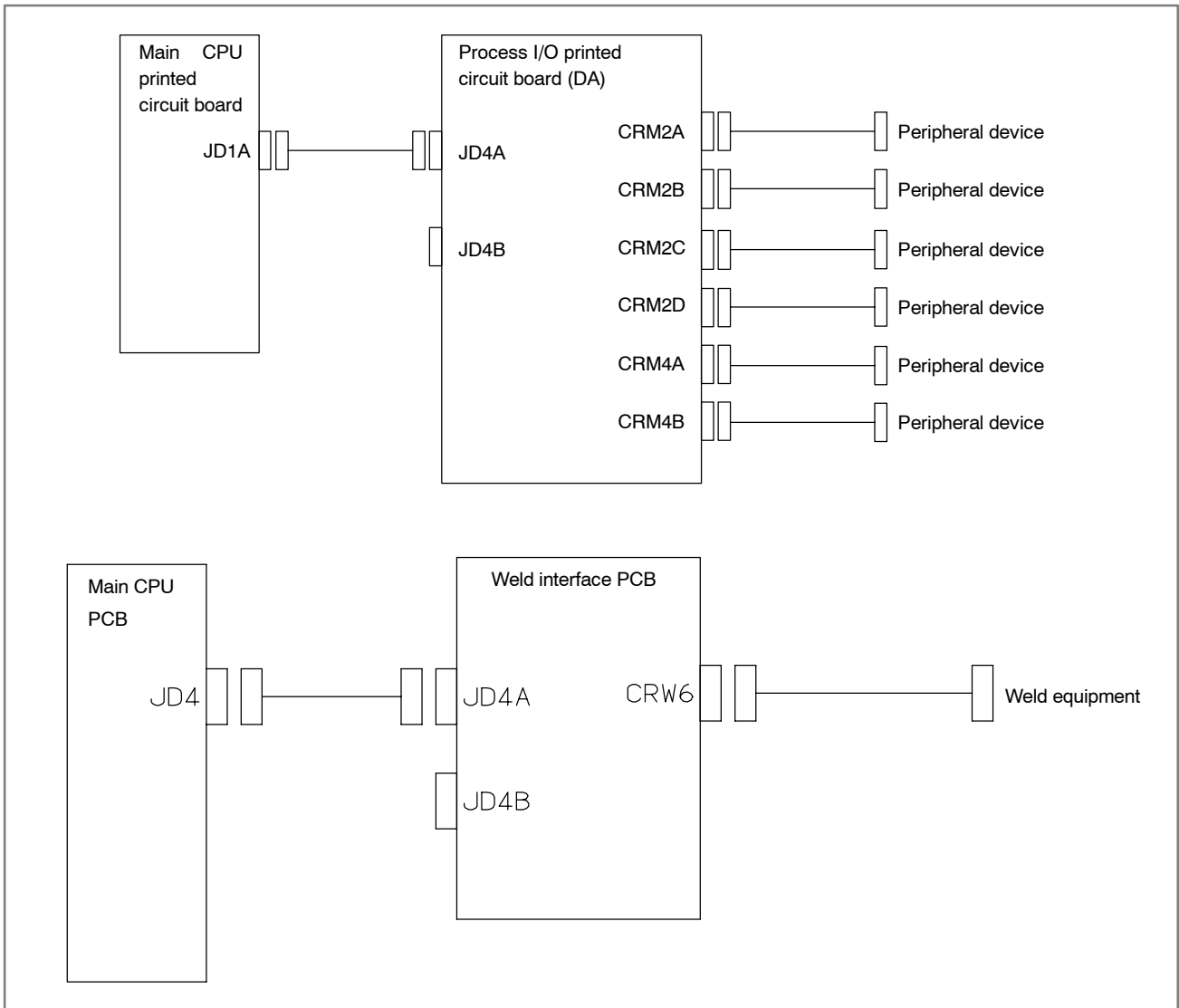
Example: Robot control PC board + process I/O PC board CB

DI:  $20 + 40 - 8 = 52$  points

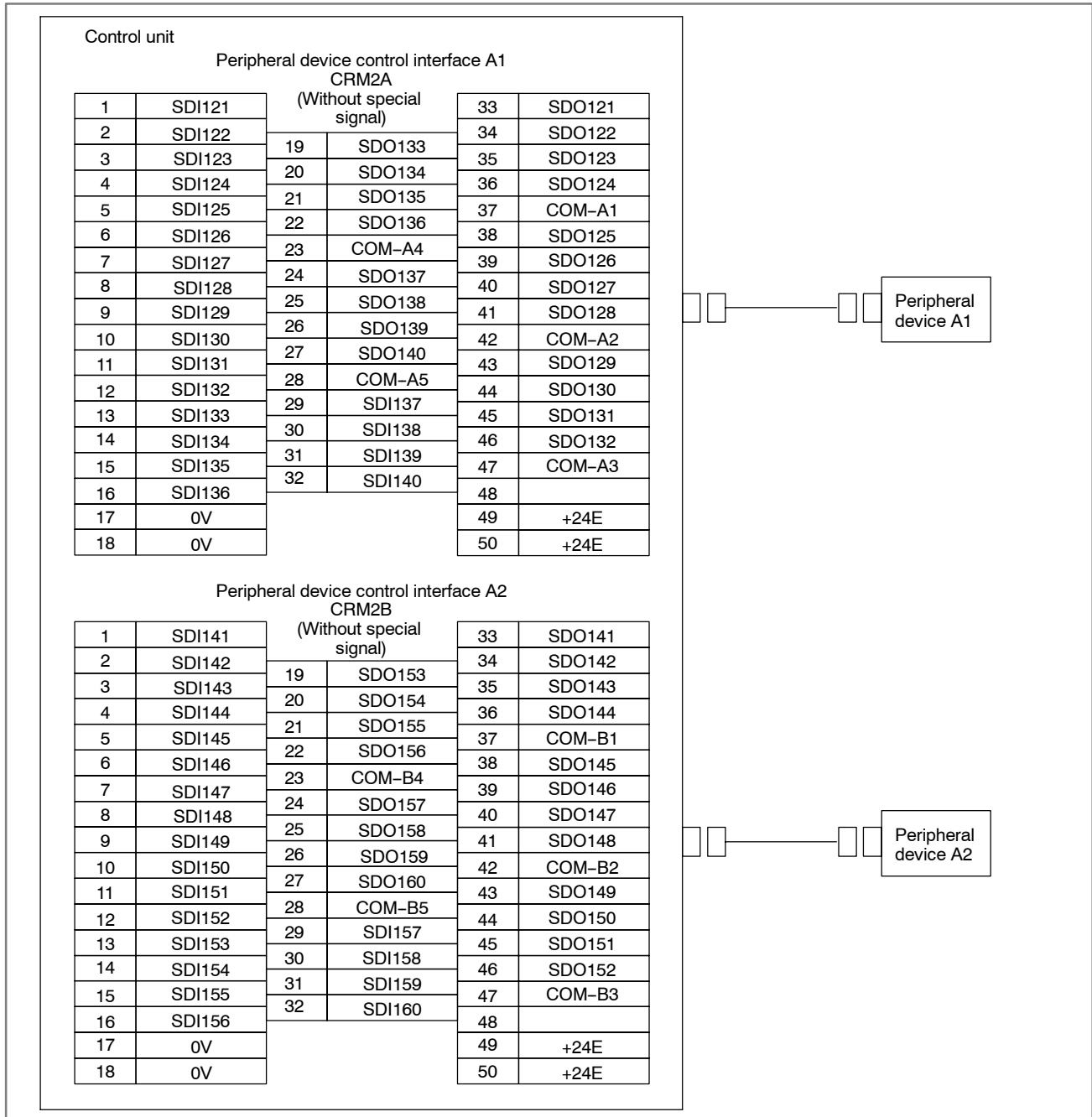
DO:  $16 + 40 - 4 = 52$  points



CRW1 and CRW2 are not provided for process I/O printed circuit board.



### 2.6.1 Peripheral Device and Control Unit Connection

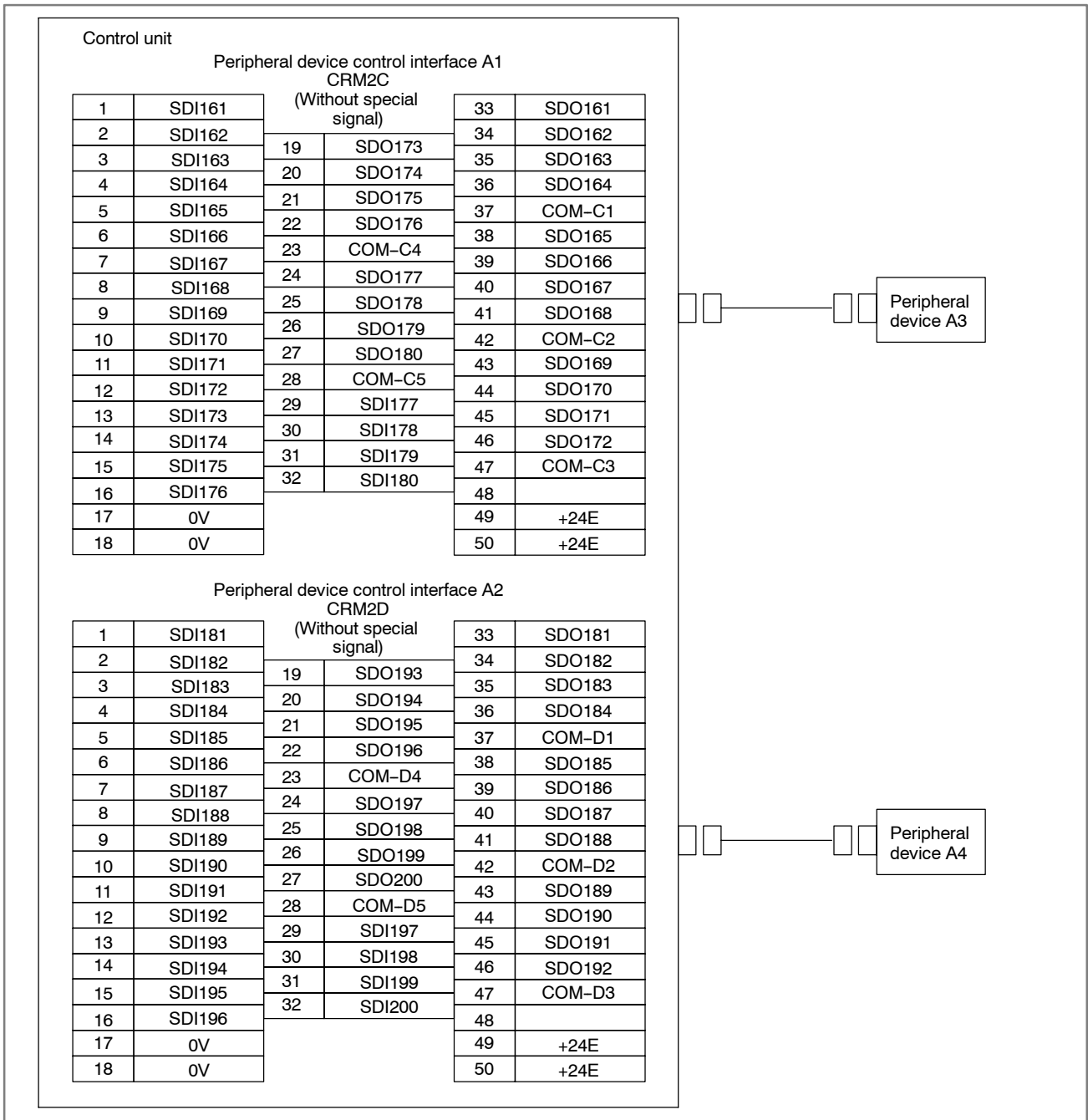


**NOTE**

- 1 The peripheral device connection cables are optional.
- 2 All of COM-\*\* are connected to 0 V.

Applicable process I/O printed circuit board

Type	Specifications	CRM2C	CRM2D
CA	A05B-2300-J030		
CB	A05B-2300-J031		
DA	A05B-2300-J035	○	○



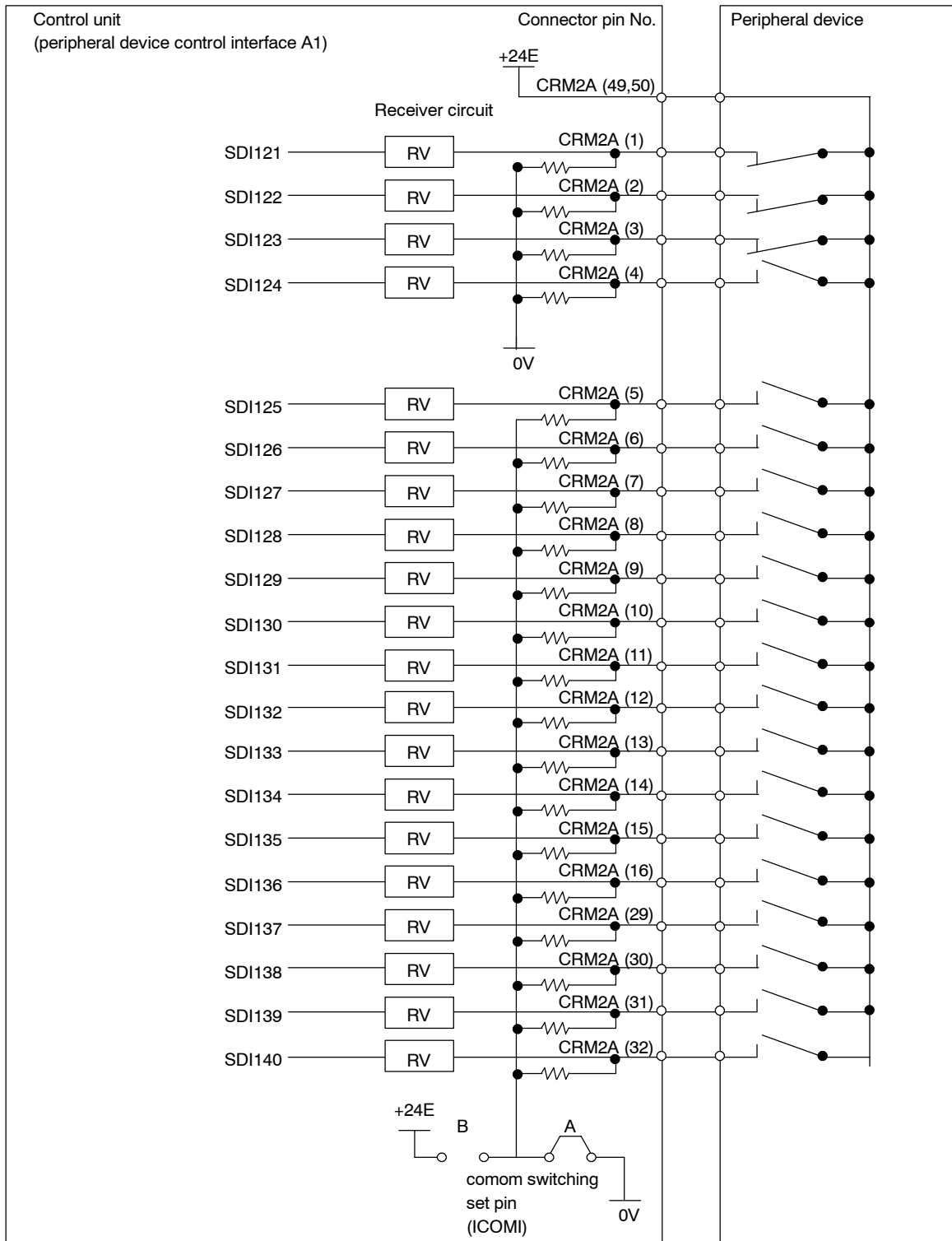
**NOTE**

- 1 The peripheral device connection cables are optional.
- 2 All of COM-\*\* are connected to 0 V.

Applicable process I/O printed circuit board

Type	Specifications	CRM2C	CRM2D
CA	A05B-2300-J030		
CB	A05B-2300-J031		
DA	A05B-2300-J035	○	○

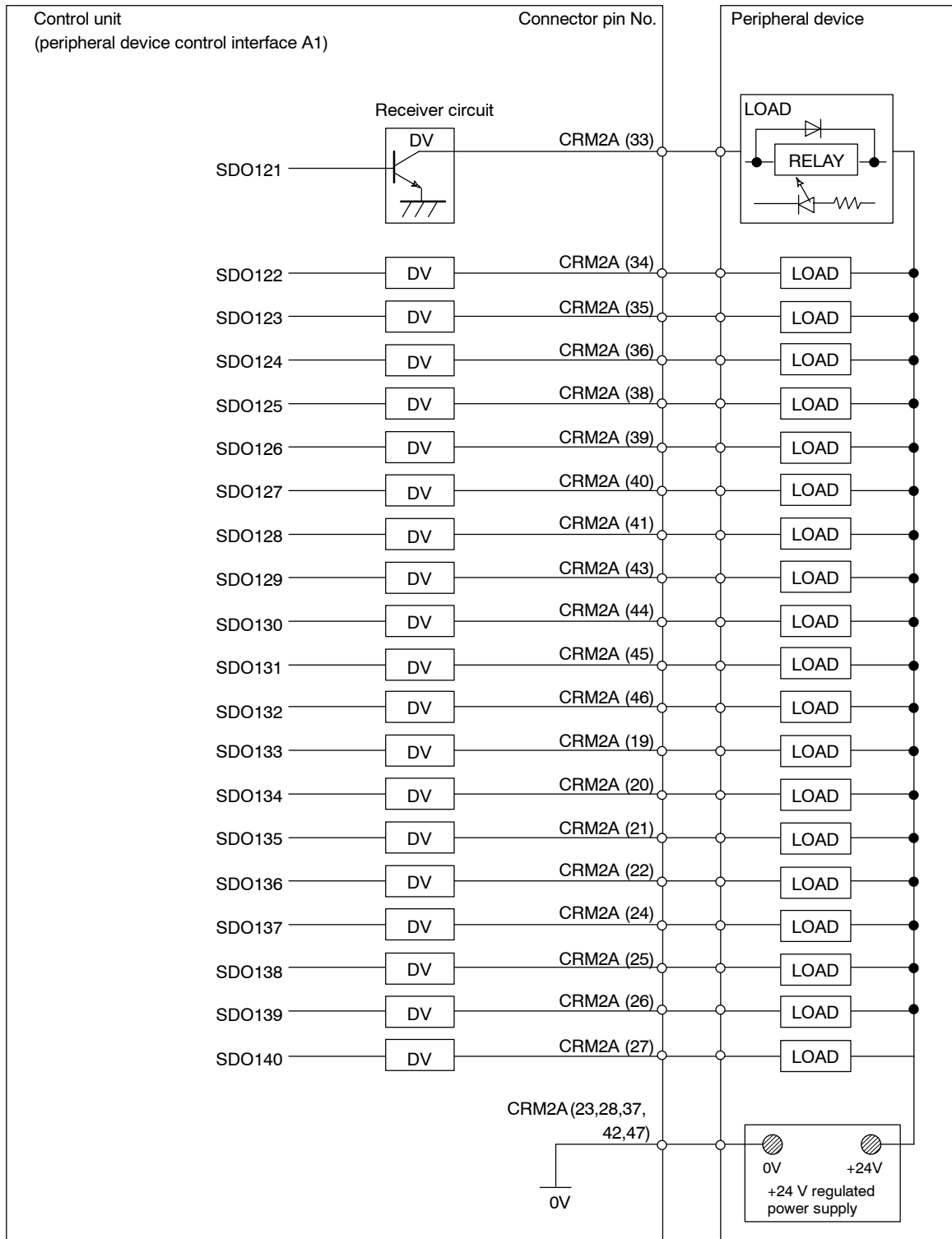
Without special signal for process I/O



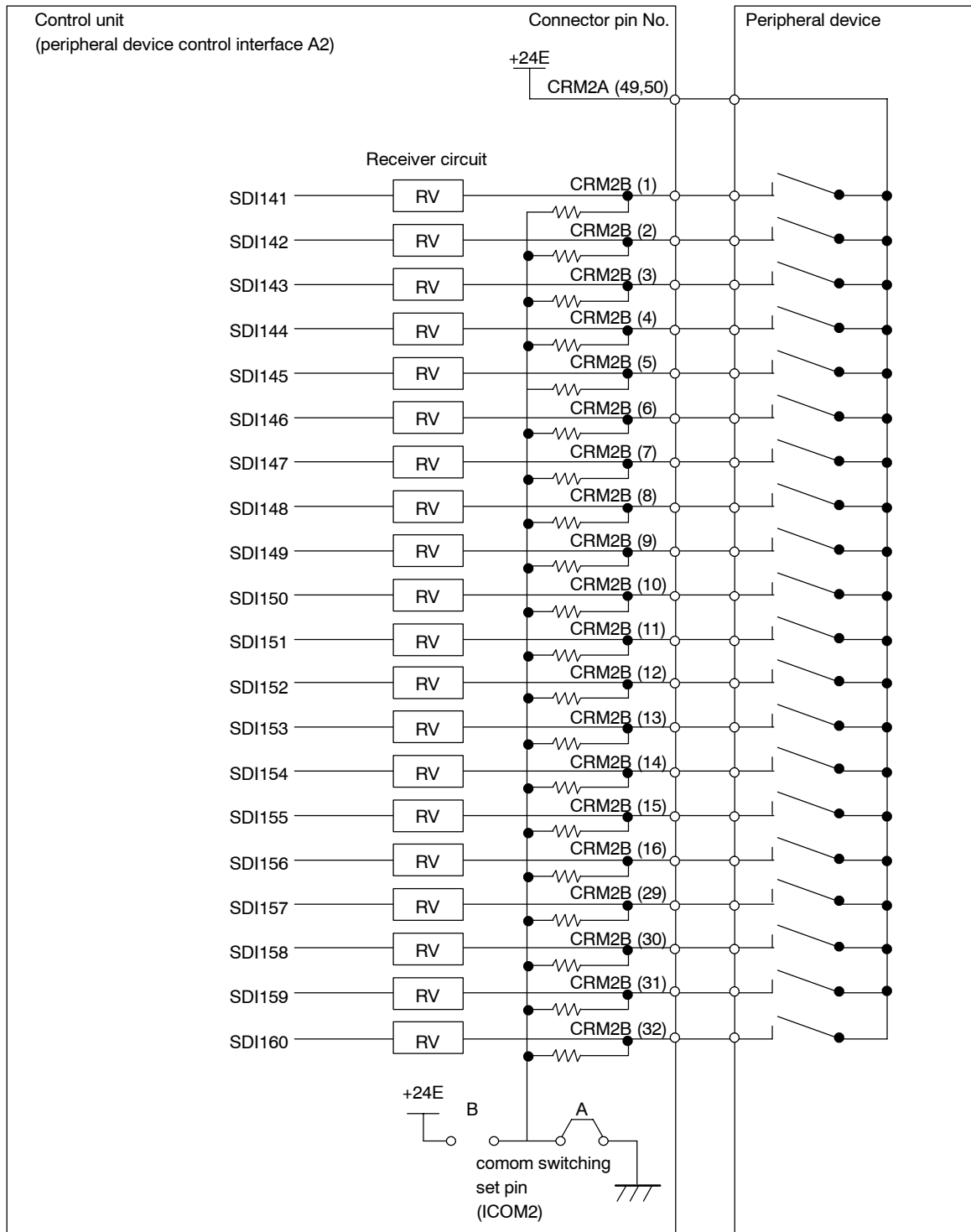
**NOTE**

This is a connection diagram for +24v common.

Without special signal for process I/O



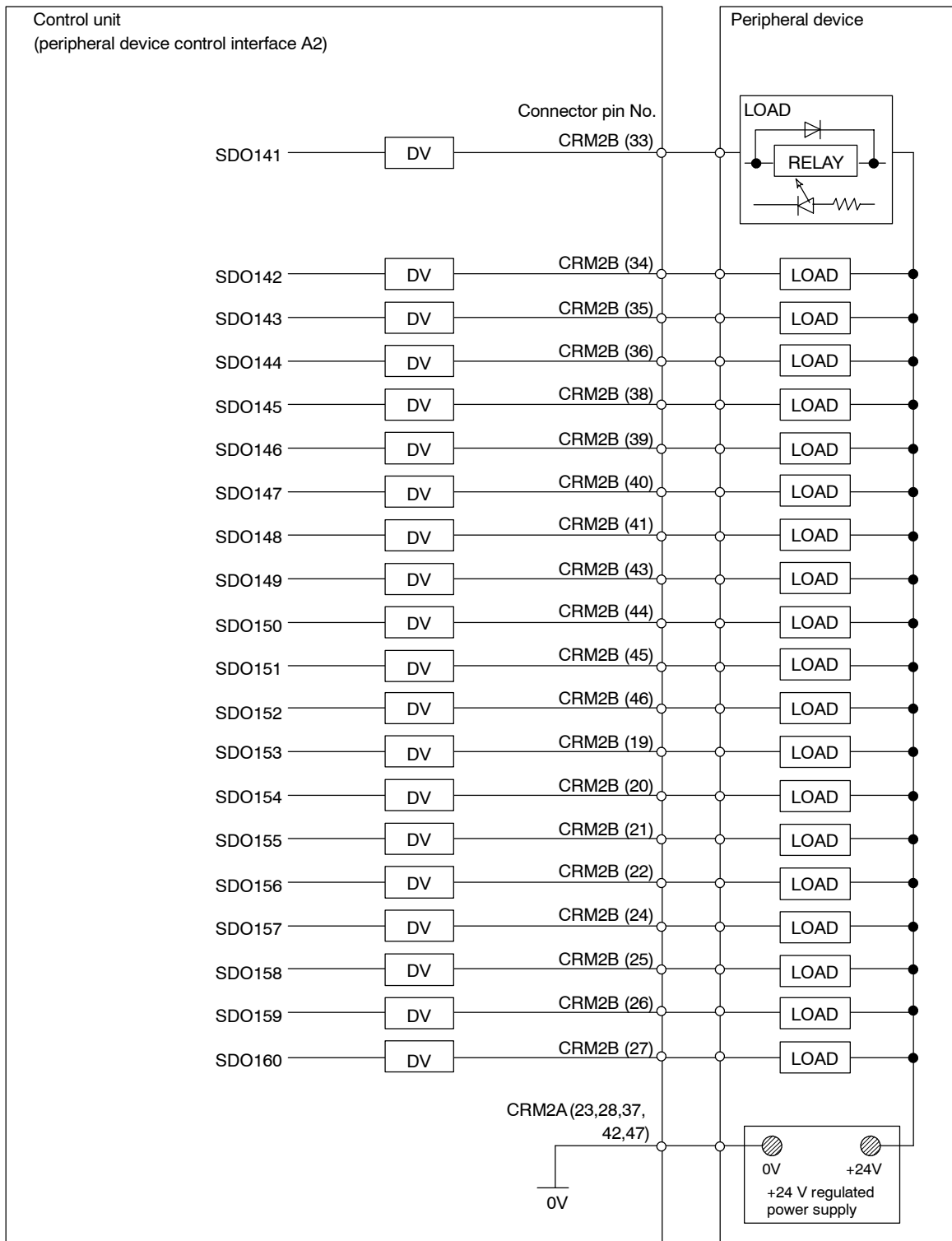
Without special signal for process I/O



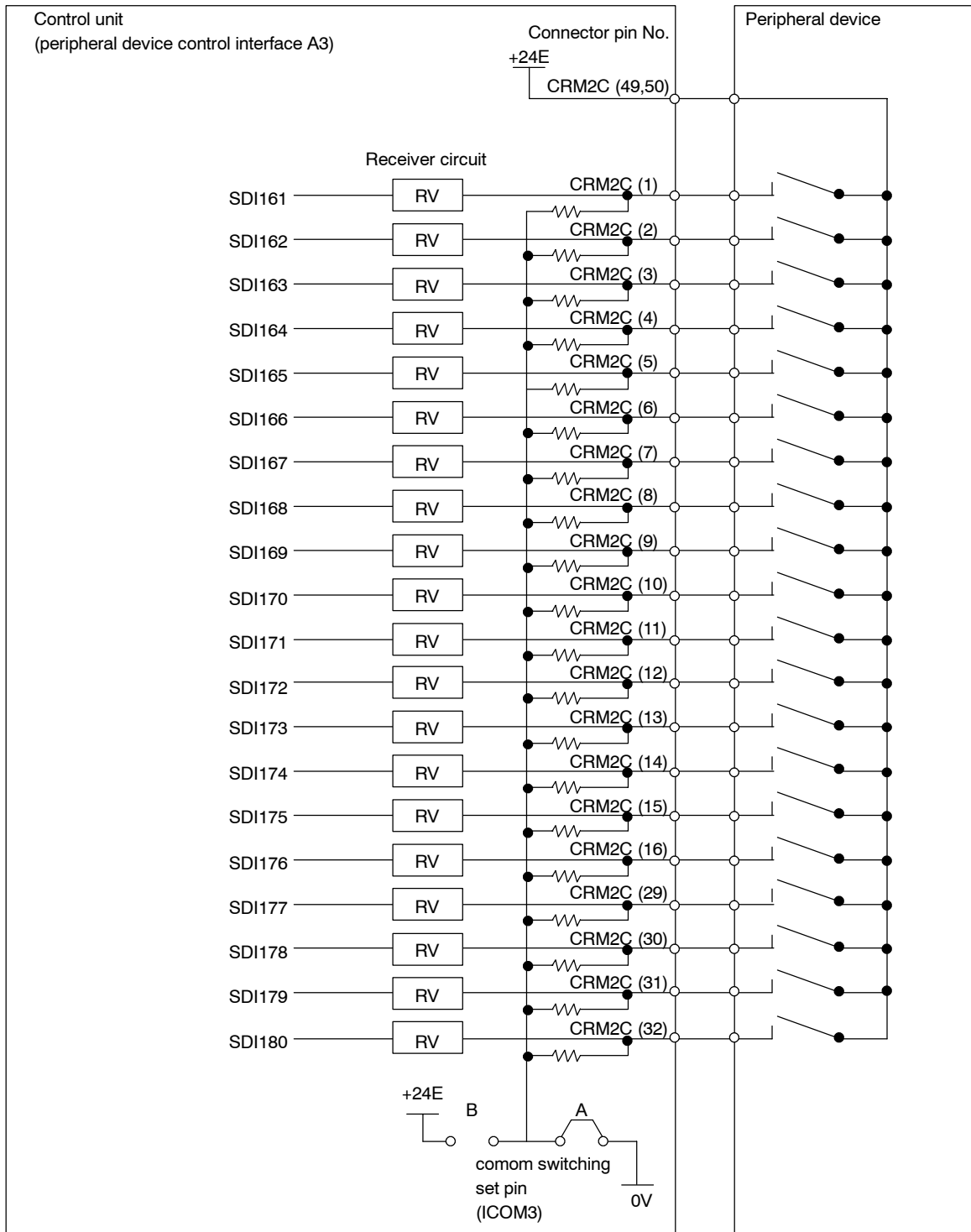
**NOTE**

This is a connection diagram for +24V common.

Without special signal for process I/O



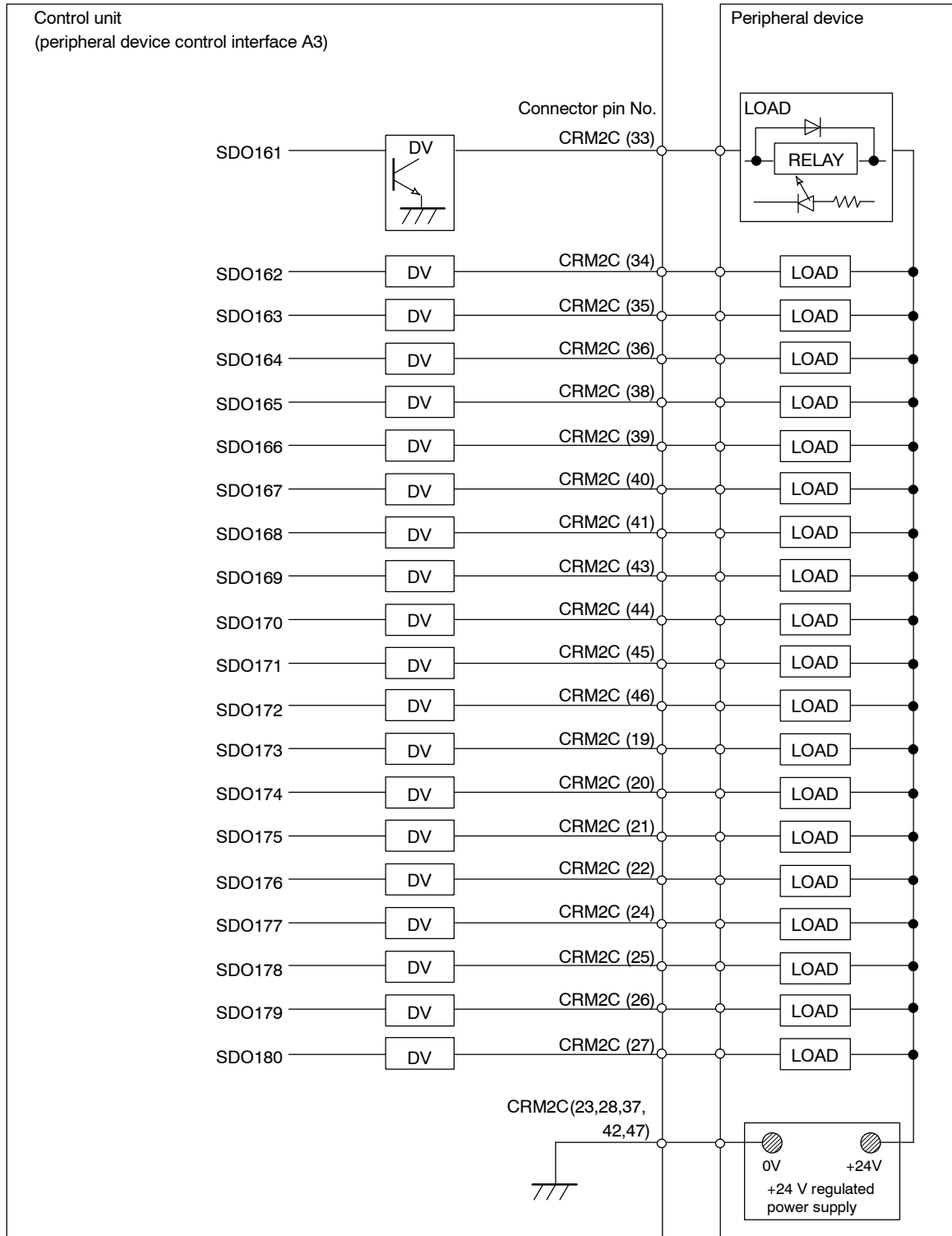
Without special signal for process I/O



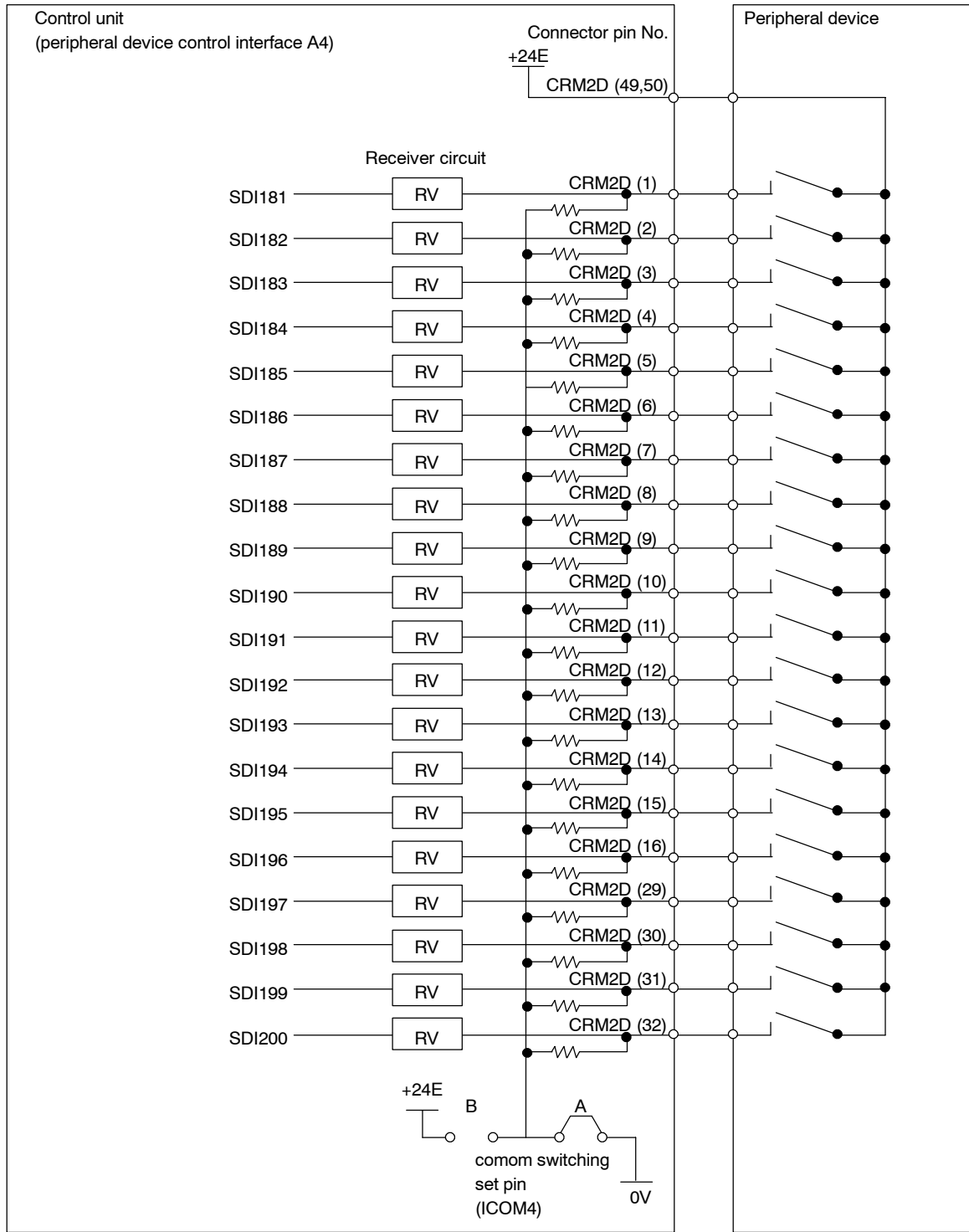
**NOTE**

This is a connection diagram for +24V common.

Without special signal for process I/O



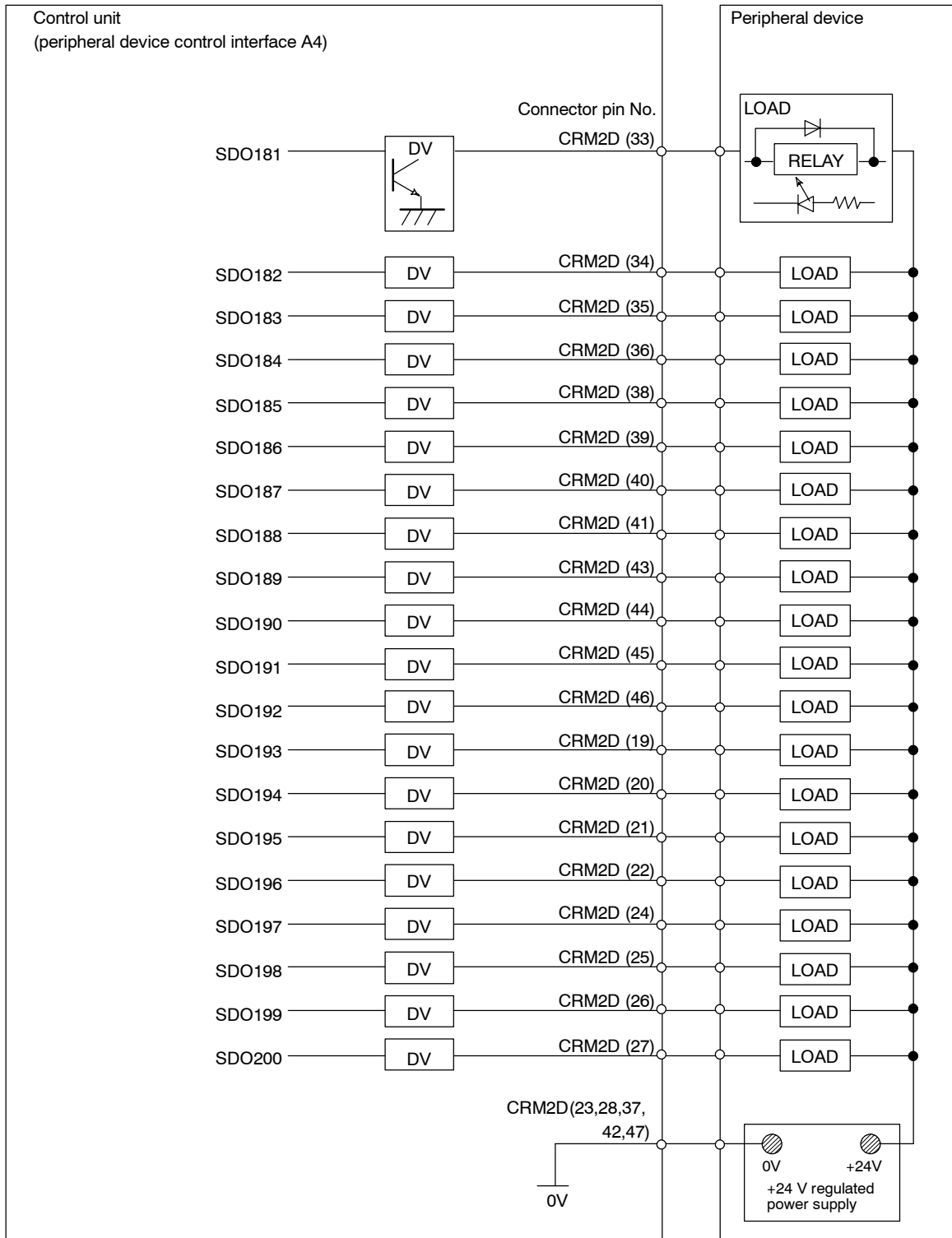
Without special signal for process I/O



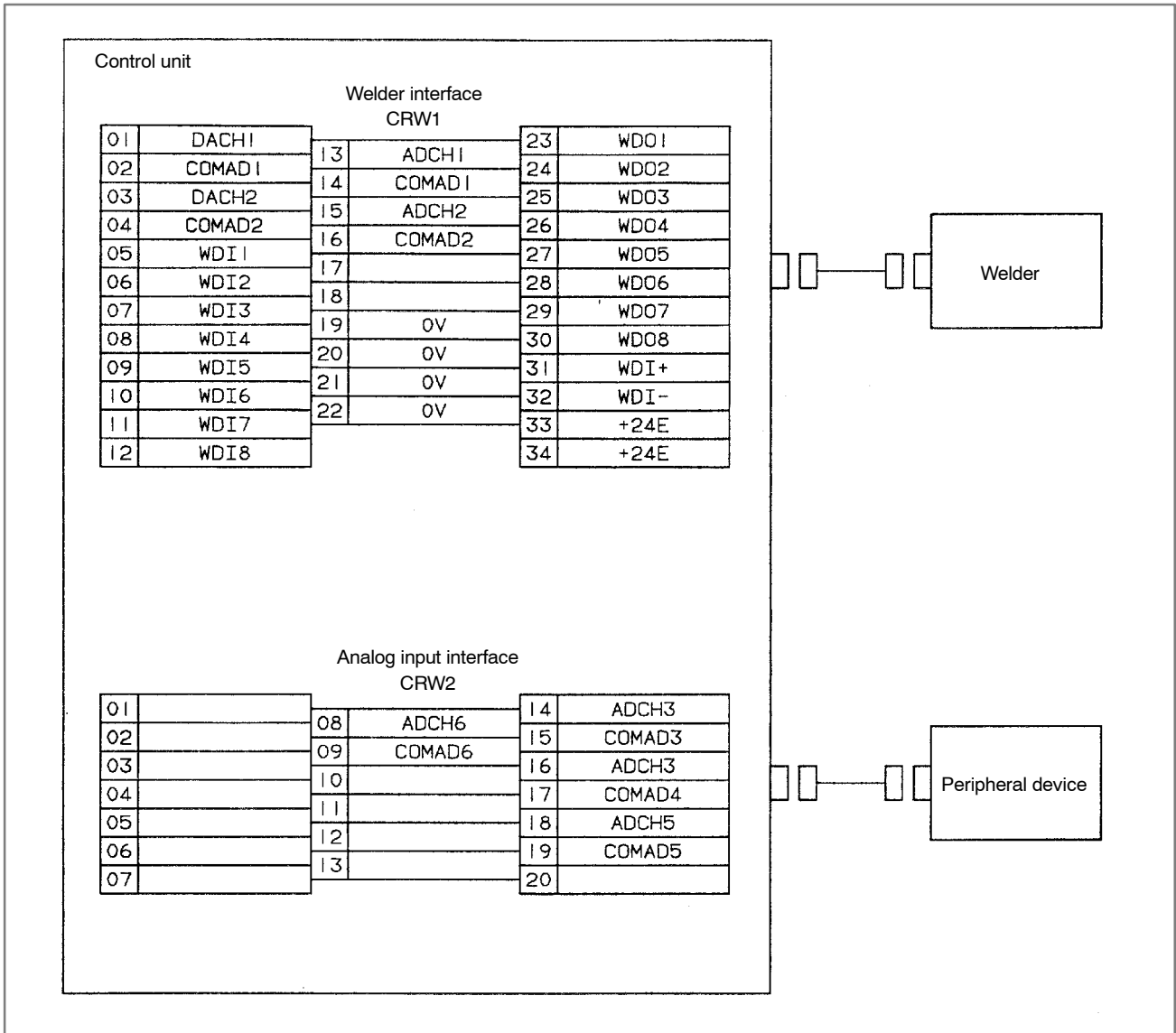
**NOTE**

This is a connection diagram for +24V common.

Without special signal for process I/O



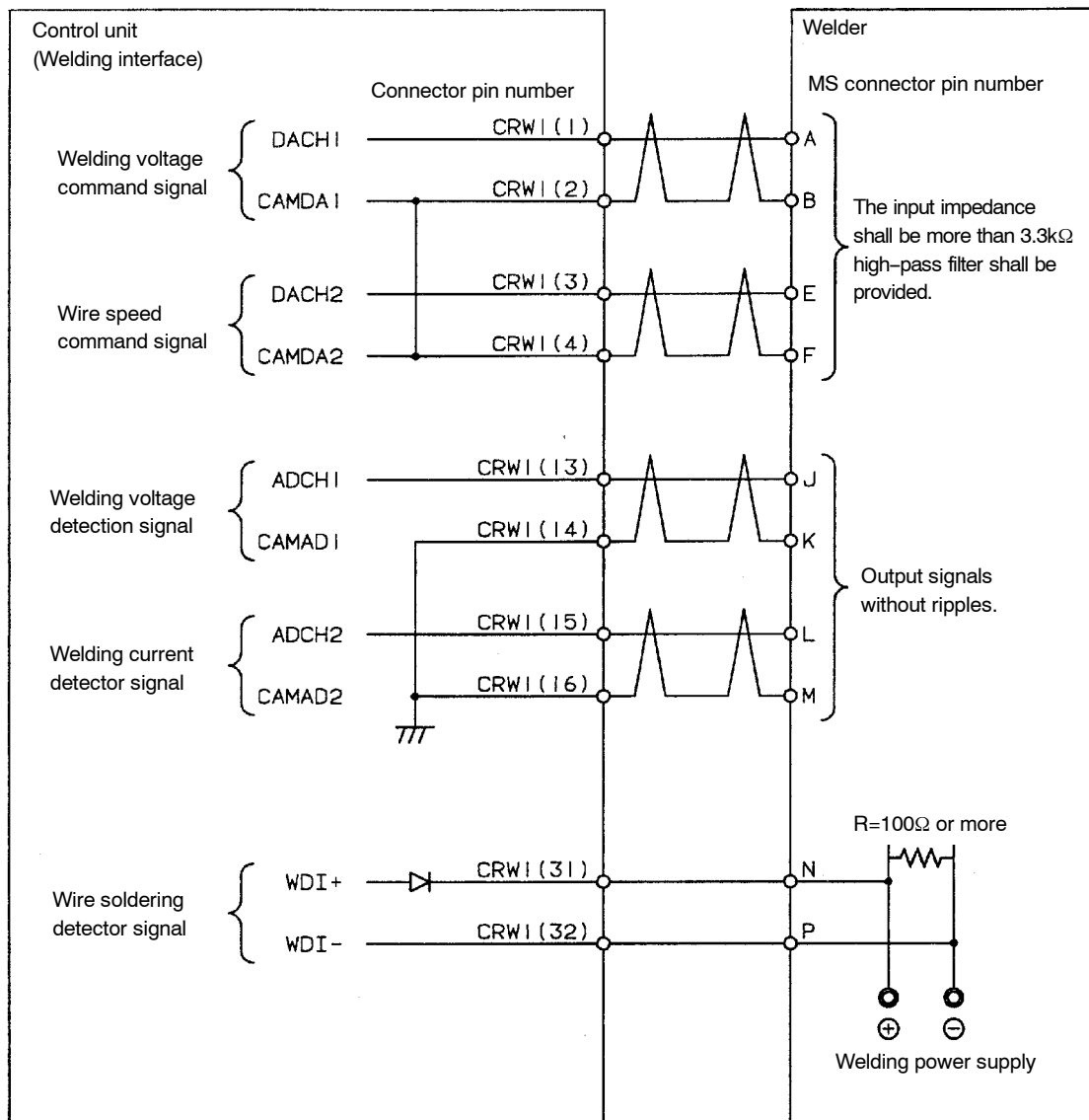
**2.6.2  
Connection Between  
the Control Unit and  
Welder  
(Process I/O CA)**

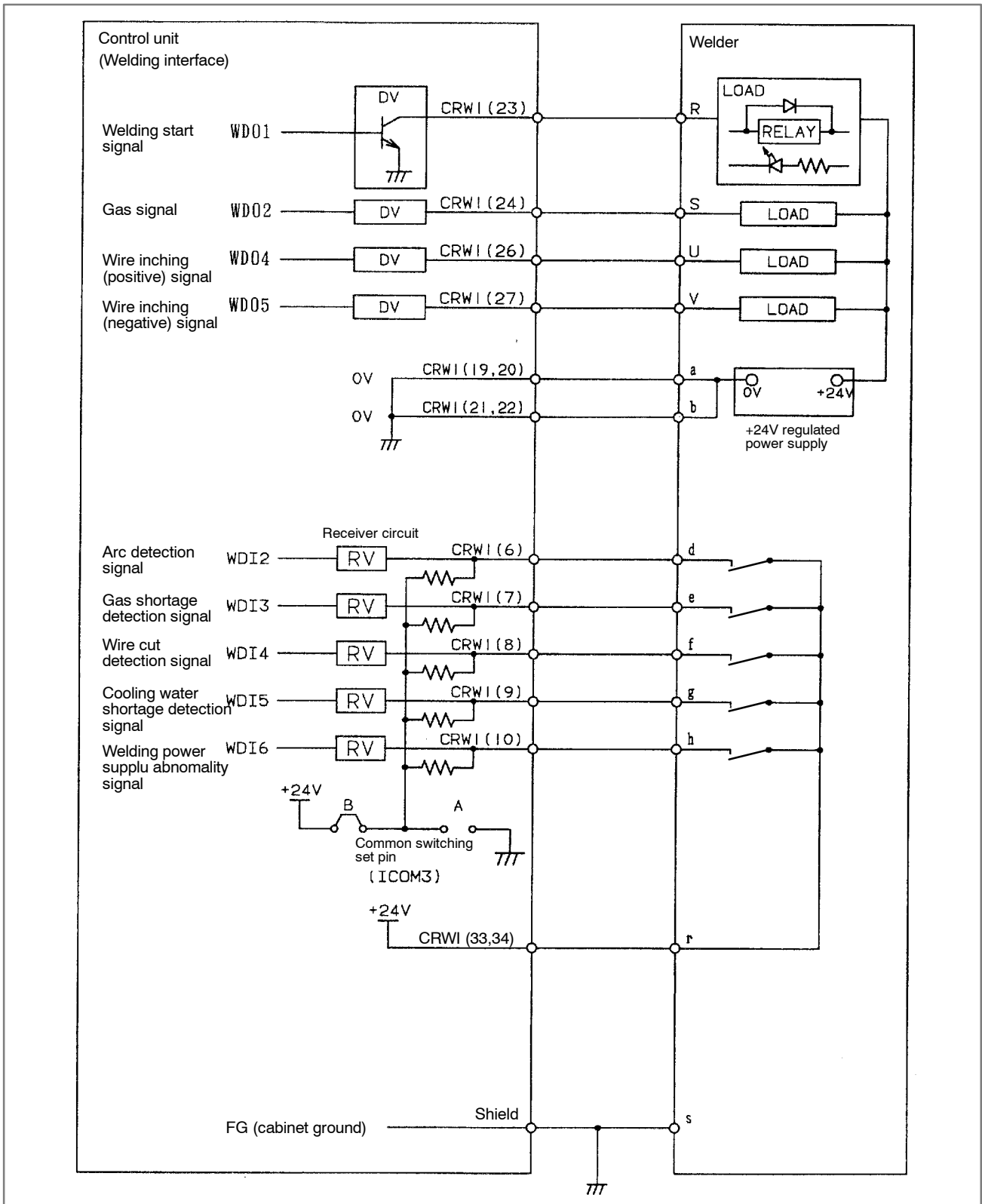


**NOTE**  
Welder and peripheral device connection cable is option.

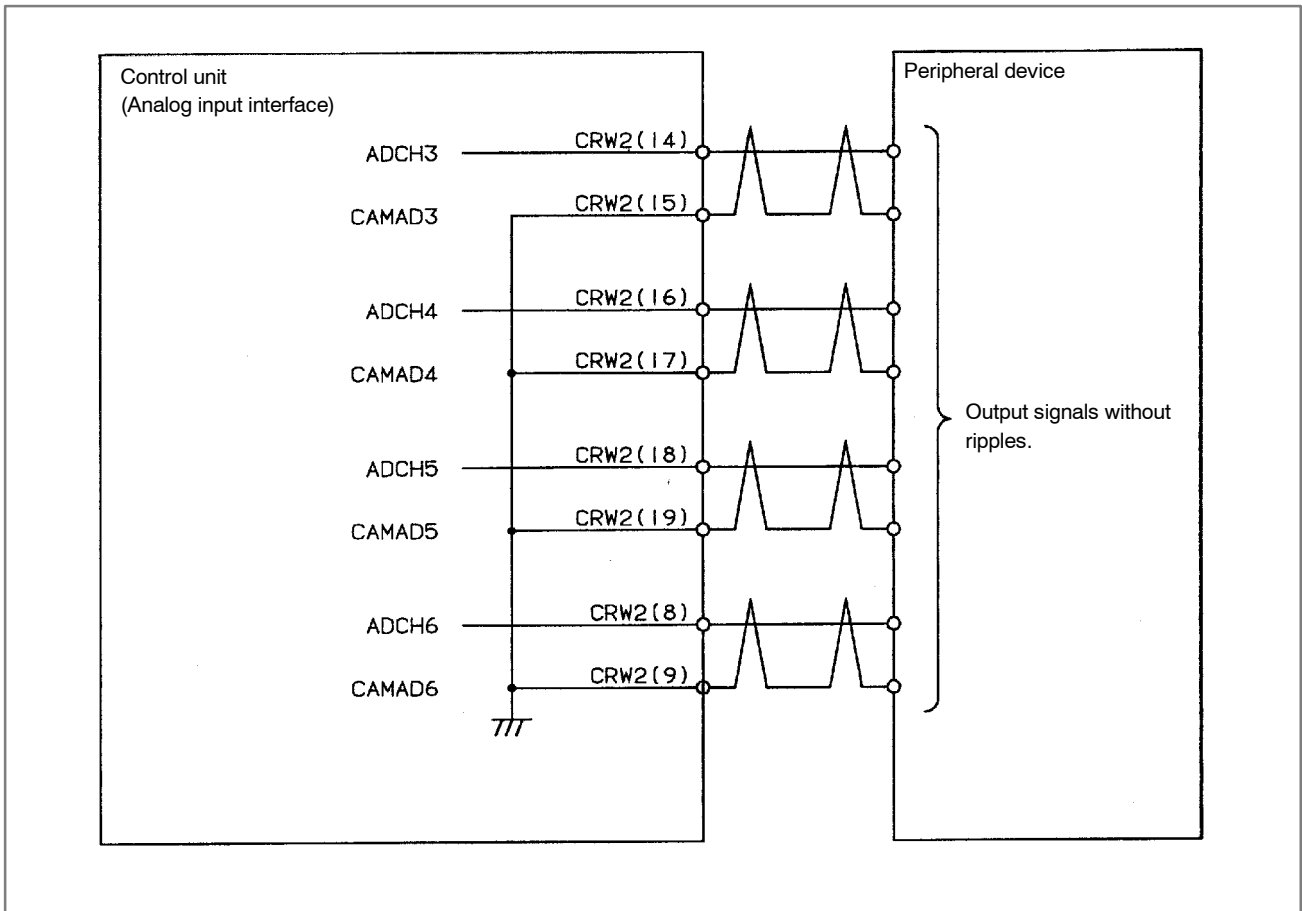
Applicable process I/O board type

CA

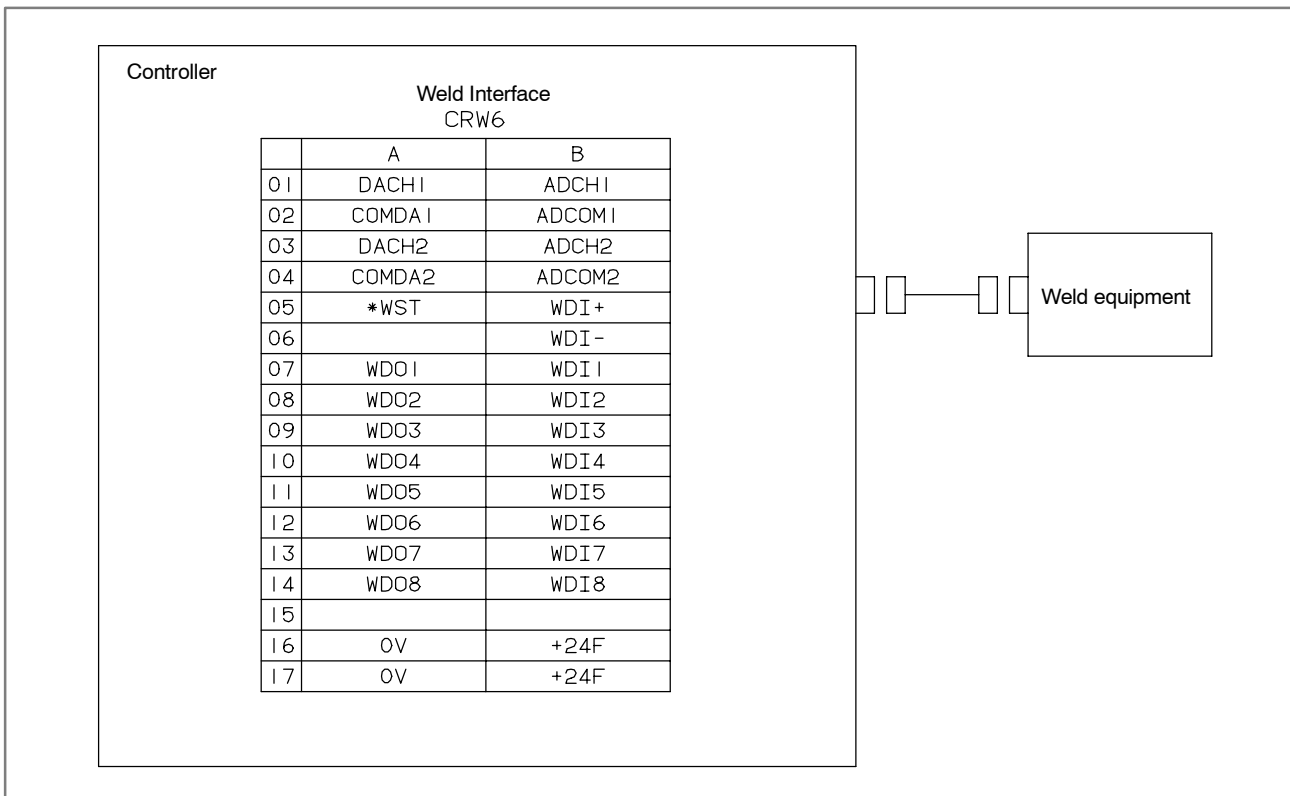


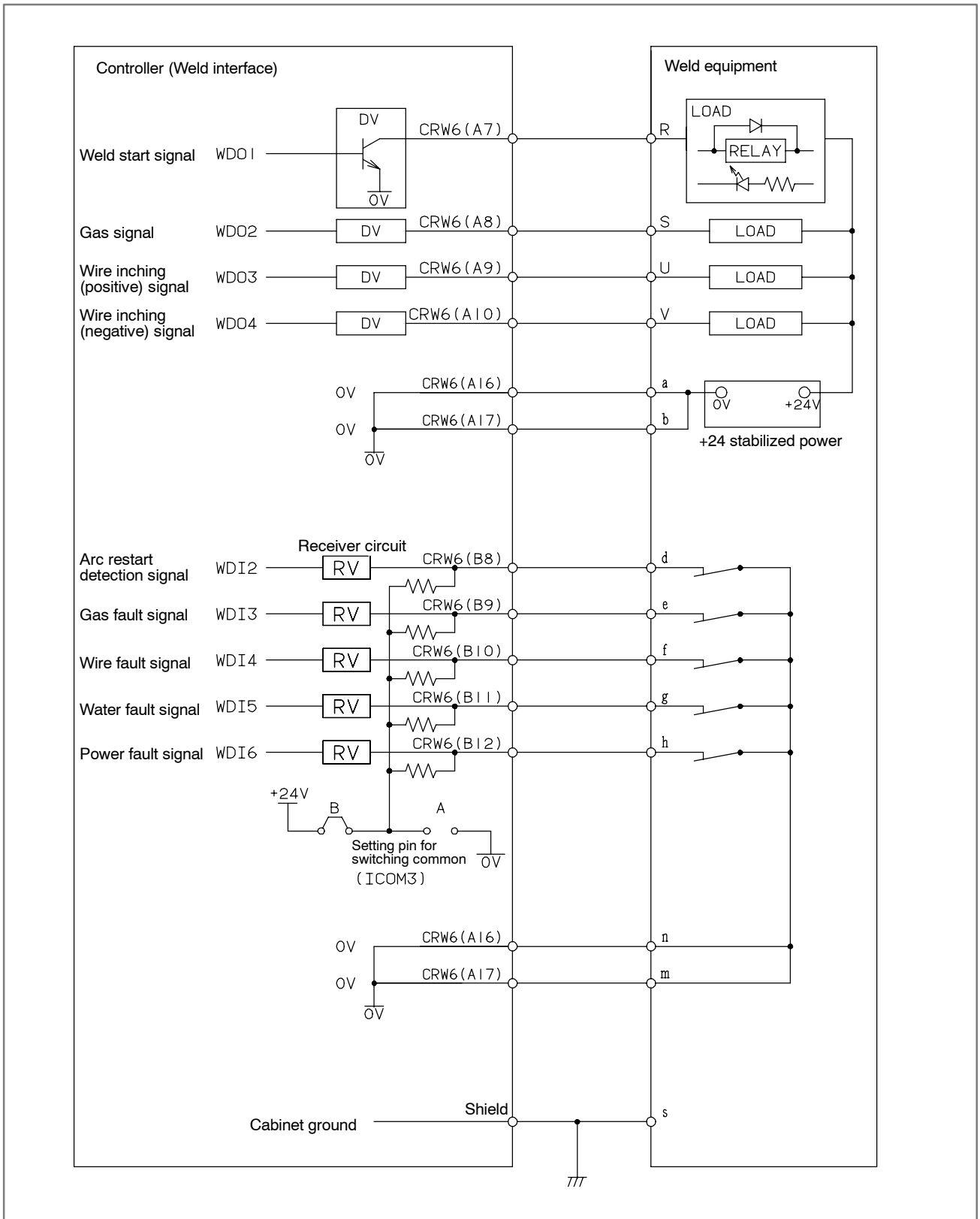


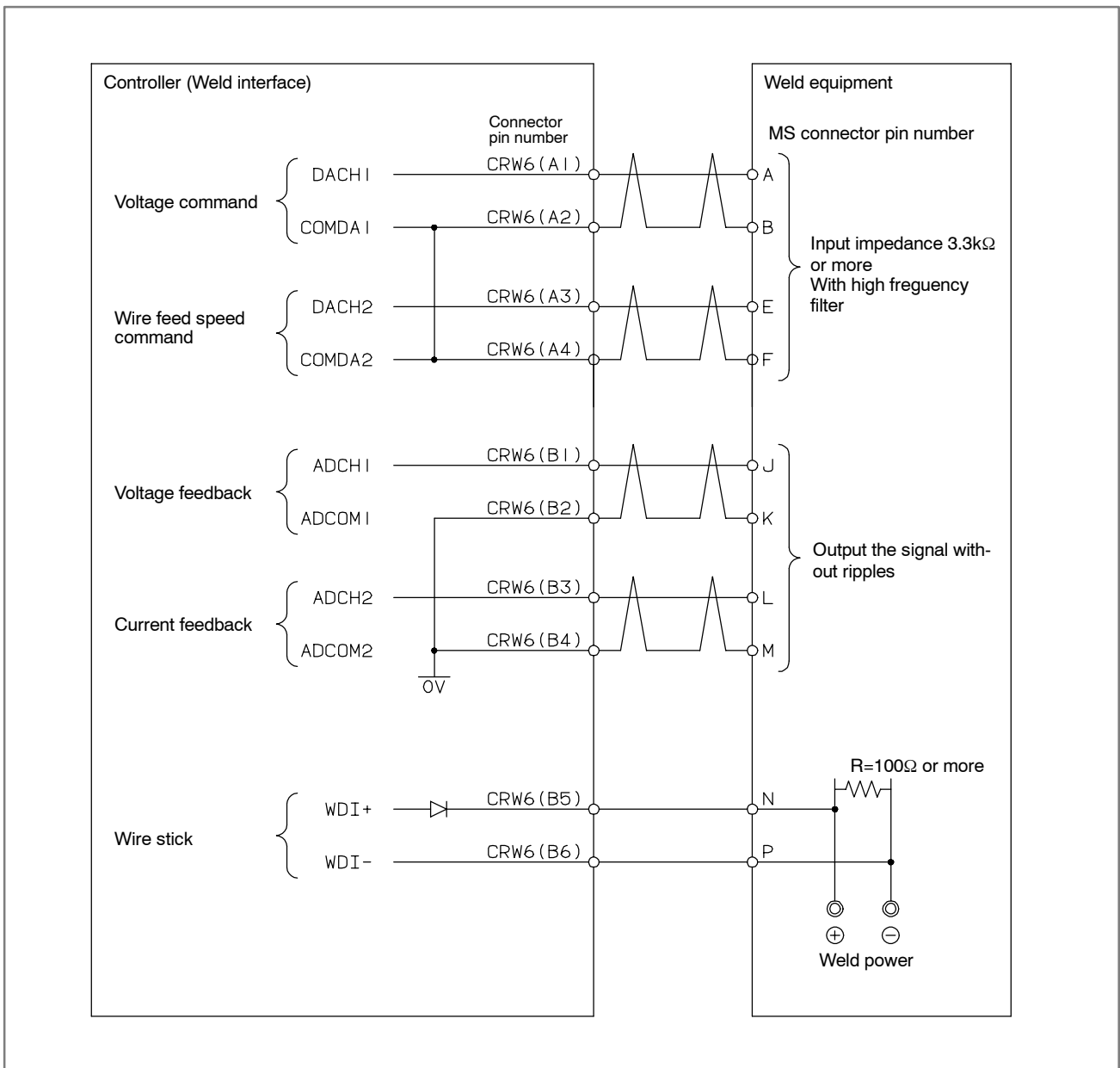
**NOTE**  
This is the connection for +24V.



**2.6.3  
 Connection Between  
 Controller and Weld  
 Equipment  
 (Weld Interface Printed  
 Circuit Board)**





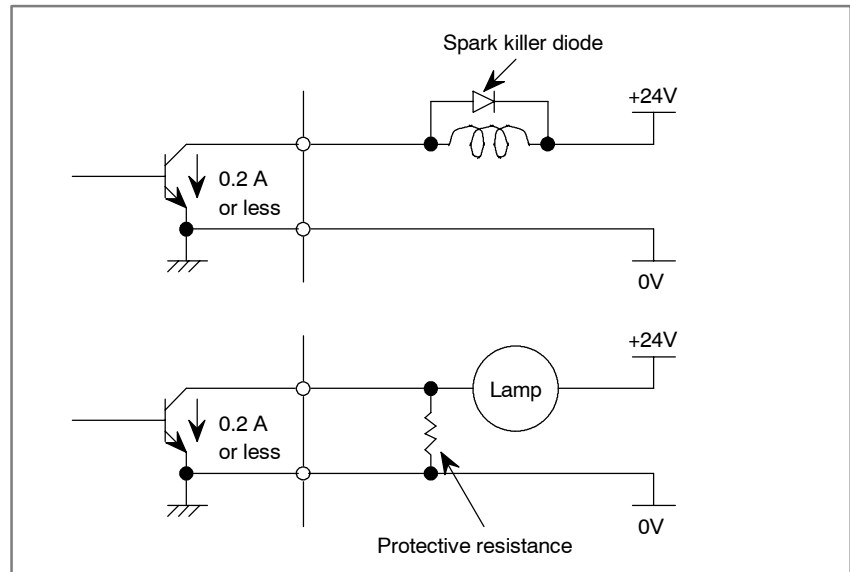


## 2.6.4 Digital I/O Signal Specifications

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

### Peripheral Device Interface

#### (1) Output signals in peripheral device interface A Example of connection



#### Electrical specifications

Rated voltage	: 24 VDC
Maximum applied voltage	: 30 VDC
Maximum load current	: 0.2 A
Transistor type	: Open collector NPN
Saturation voltage at connection	: 1.0 V (approx.)

#### Spark killer diode

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

#### Note on use

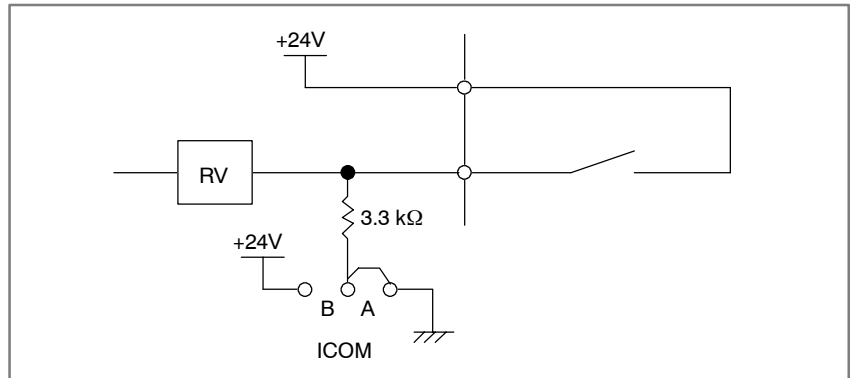
Do not use the +24 V power supply of the robot.  
When loading a relay, solenoid, and so on directly, connect them in parallel with diodes for preventing back electromotive force.  
If a load is connected causing a surge current when a lamp is turned on, use a protective resistance.

#### Applicable signals

Output signals of process I/O printed circuit board CRM2  
SDO121 and later

(2) Input signals in peripheral device interface A

Example of connection

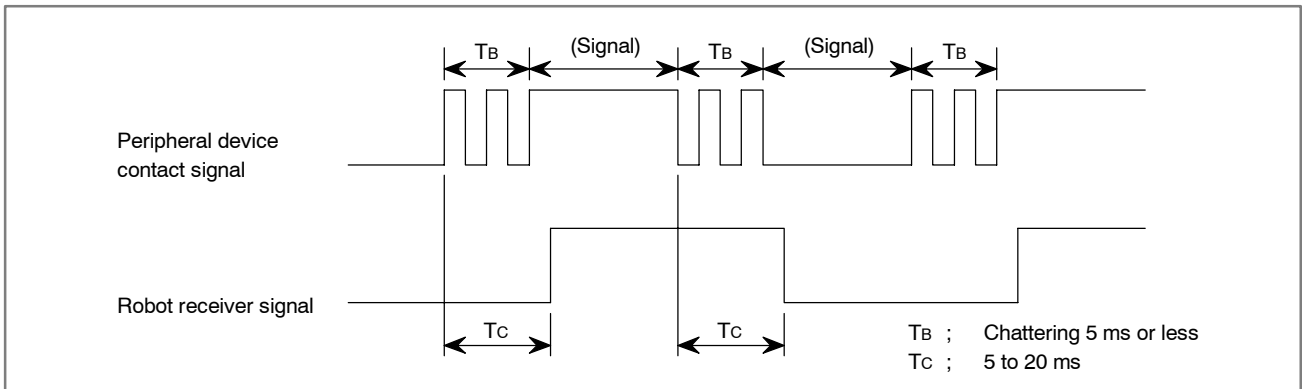


Electrical specifications of the receiver

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

Specifications of the peripheral device contact

- Rated contact capacity : 30 VDC, 50 mA or more
- Input signal width : 200 ms or more (on/off)
- Chattering time : 5 ms or less
- Closed circuit resistance : 100 Ω or less
- Opened circuit resistance : 100 kΩ or more



Note on use

Apply the +24 V power at the robot to the receiver.  
 However, the above signal specifications must be satisfied at the robot receiver.

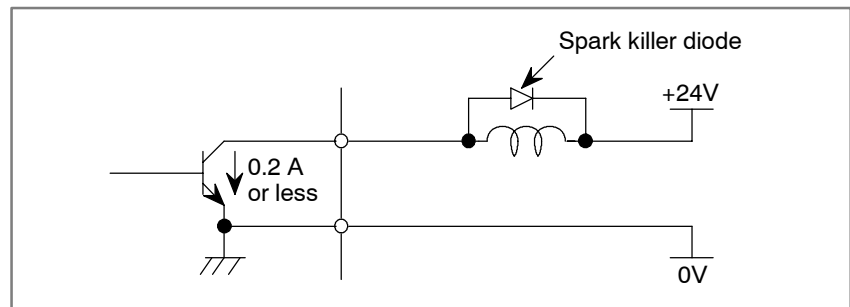
Applicable signals

Input signals of process I/O printed circuit board CRM2  
 SDI121 and later

## 2.6.5 Input/Output Signal Regulations

- **Output signal regulation**

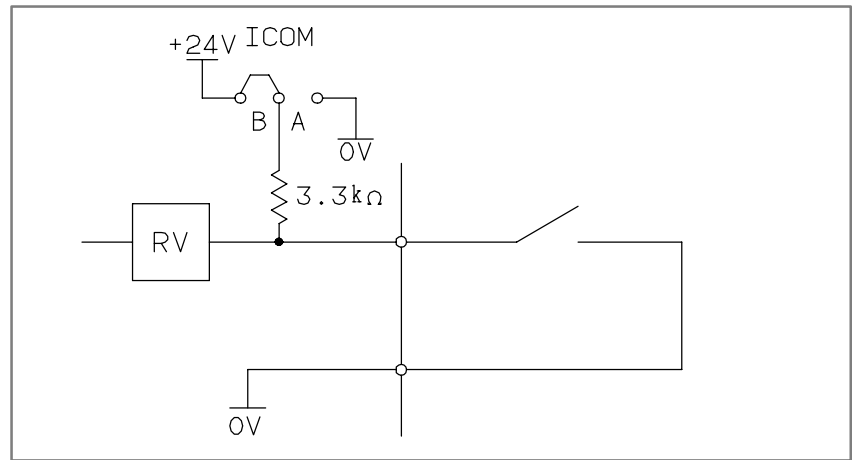
Example connection



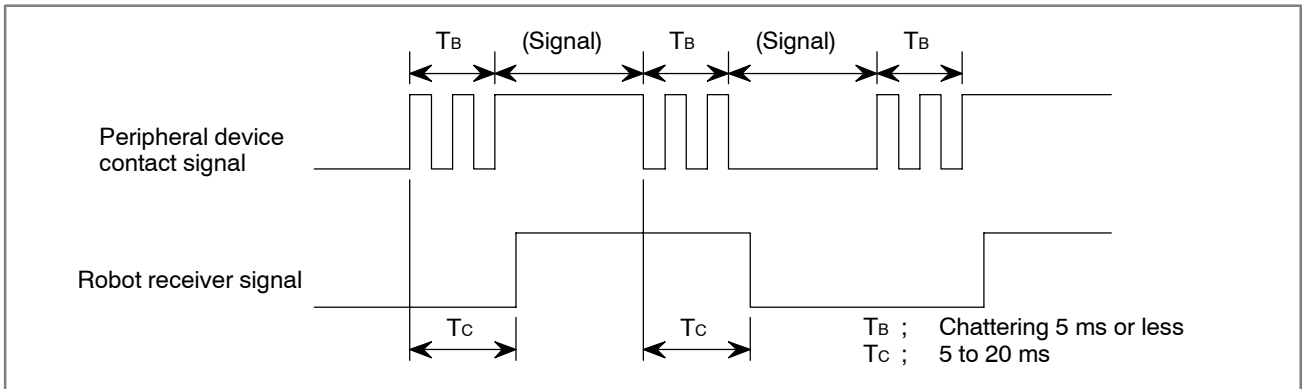
- **Electrical specifications**
  - Rated voltage : 24 VDC
  - Maximum applied voltage : 30 VDC
  - Maximum load current : 0.2 A
  - Transistor type : Open collector NPN
  - Saturation voltage at connection : 1.0 V (approx.)
- **Spark killer diode**
  - Rated peak reverse voltage : 100 V or more
  - Rated effective forward current : 1 A or more
- **Note on use**
  - The +24 V power supply of the robot can be used when the endeffector interface is 0.7 A or less.
  - When loading a relay, solenoid, and so on directly, connect them in parallel with diodes to prevent back electromotive force.
  - If a load causing a surge current such as turning on LED is connected, use a protective resistance.
- **Applicable signals**
  - Output signals of the end effector control interface : WDO1-8

● **Input signal regulation**

Example connection

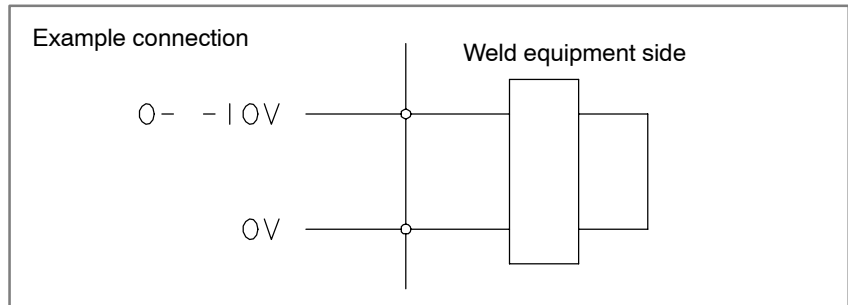


- **Electrical specifications of the receiver**
  - Type : Grounded voltage receiver
  - Rated input voltage : Contact close: +20V to +28V  
Contact open : 0V to +4V
  - Maximum applied input voltage : +28 VDC
  - Input impedance : 3.3 kΩ (approx.)
  - Response time : 5 ms to 20 ms
  
- **Specifications of peripheral device contact**
  - Rated contact capacity : 30 VDC, 50 mA or more
  - Input signal width : 200 ms or more (on/off)
  - Chattering time : 5 ms or less
  - Closed circuit resistance : 100 Ω or less
  - Opened circuit resistance : 100 kΩ or more



- **Notes on use**
  - Apply the +24 V power of the robot to the receiver.
  - However, the above signal specifications must be satisfied at the robot receiver.
  
- **Applicable signals**
  - Input signals of the arc welding interface
  - WD11-8

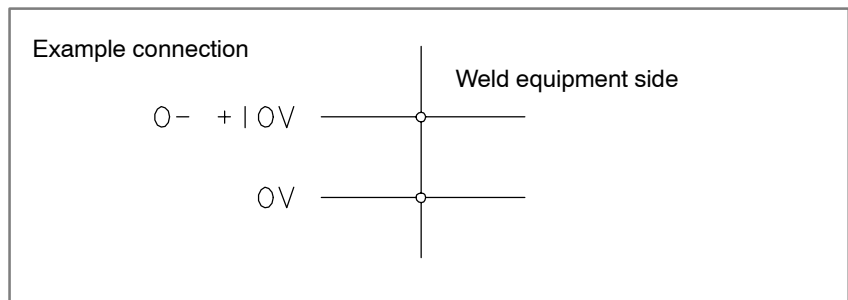
- **Analog output signal regulation (Voltage command, wire feed speed command)**



**NOTE**

Input impedance ; 3.3kΩ or more  
Provide the high-frequency filter.

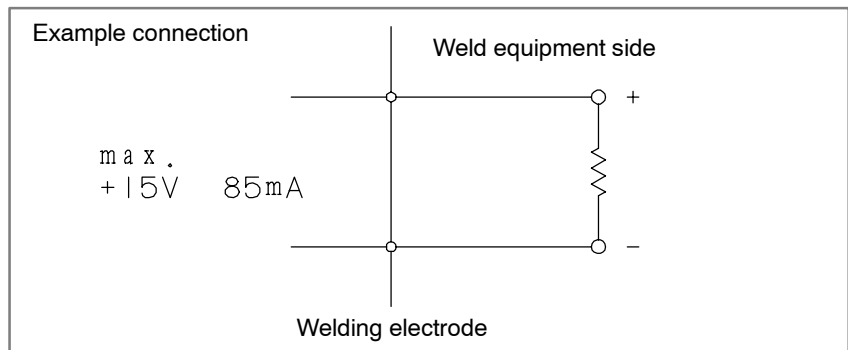
- **Analog input signal regulation (Voltage feedback, Current feedback)**



**NOTE**

Output the signal without ripples

(Wire stick ; WDI+, WDI-)



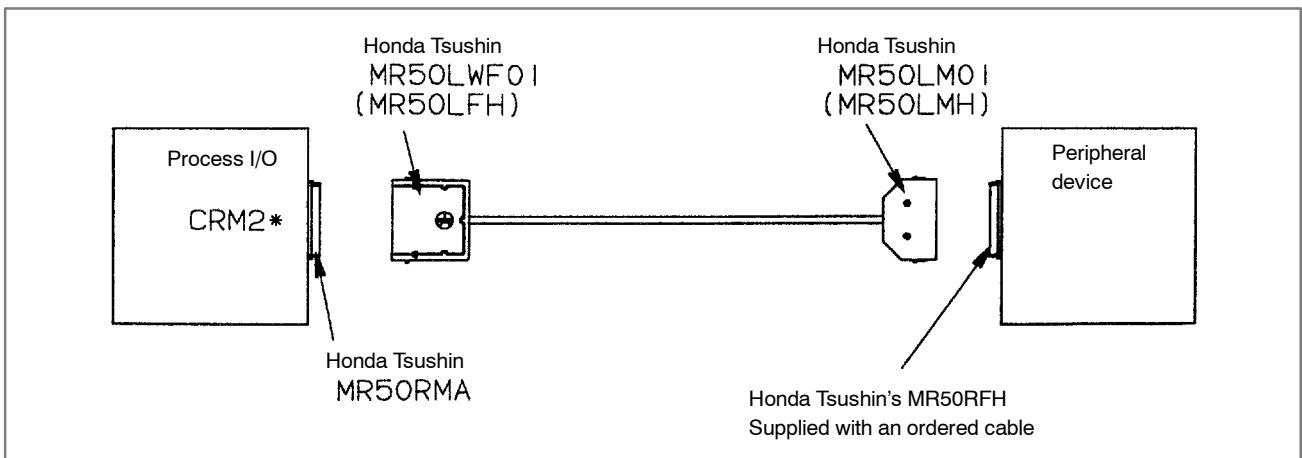
**NOTE**

The resistance between the positive (+) and negative (-) terminals on the weld equipment side should be 100Ω or more.  
The wire stick detection signal in TIG welding should be connected insulating from the weld circuit (high-frequency).  
The withstand voltage of this circuit is 80V.

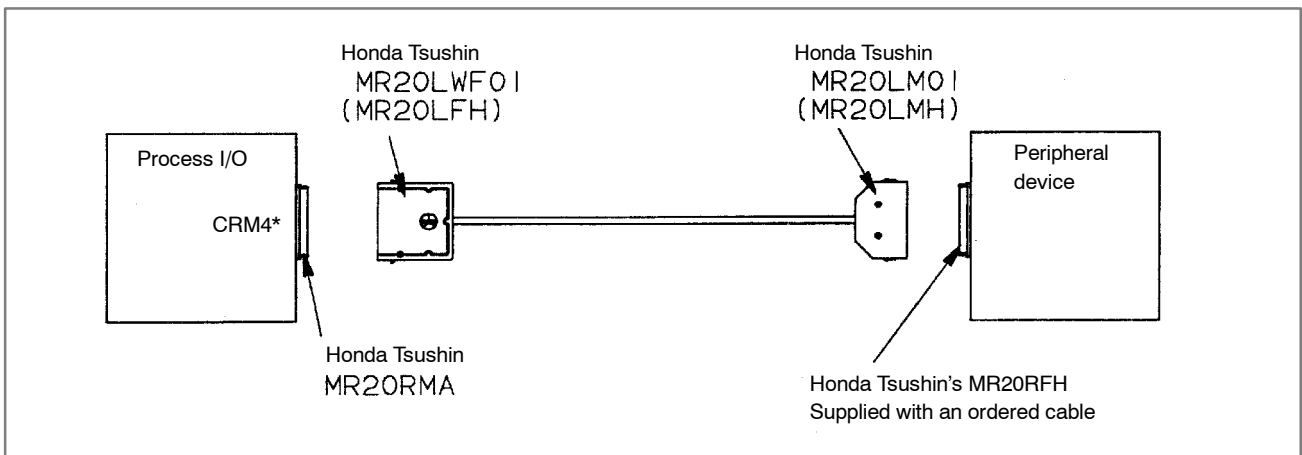
**2.6.6  
Peripheral Devices and  
Welder**

If the customer manufactures cables, conform to the FANUC standard cables described in this section.

**Peripheral Device  
Interface A Cable  
(CRM2: Honda  
Tsushin, 50 pins)**

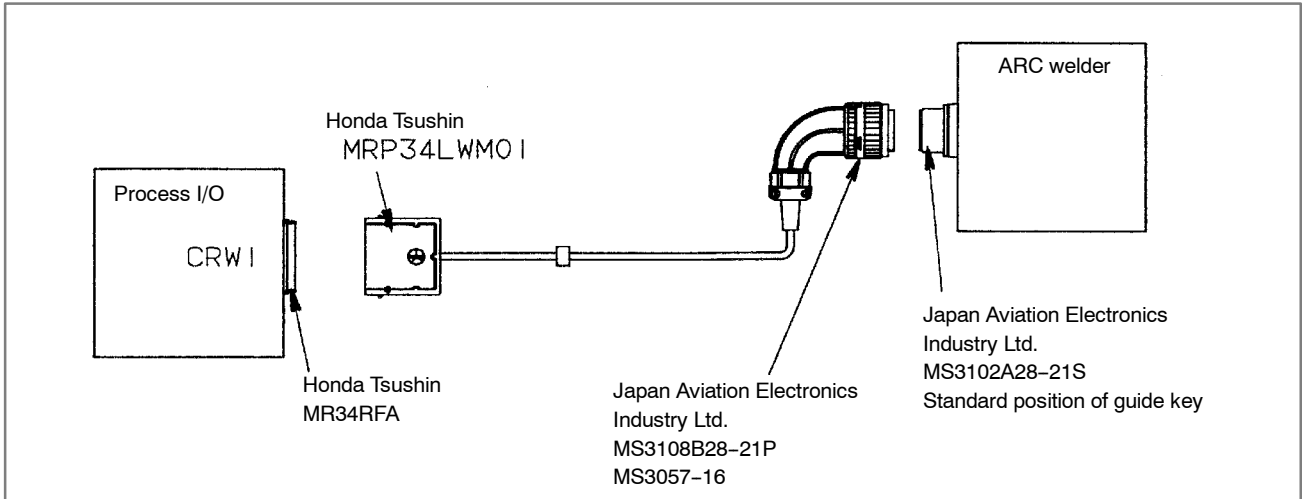


**Peripheral Device  
Interface B Cable  
(CRM4: Honda  
Tsushin, 20 pins)**



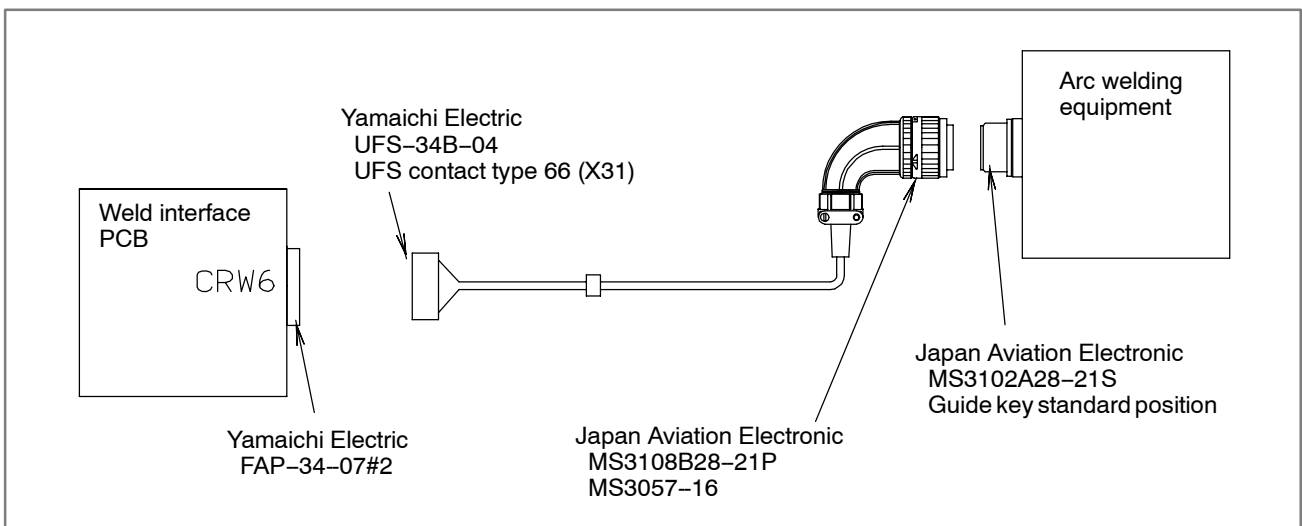
**ARC Weld Connection  
Cable (CRW1: Honda  
Tsushin, 34 pins)**

Be sure to use our cable to connect the welder.



**Connecting cable for  
arc welding equipment  
(CRW6: 34 pins,  
manufactured by  
Yamaichi Electric)**

To connect welding equipment, use a cable which conforms to the FANUC specifications.



**2.6.7  
Peripheral Device  
Cable Connector**

(1) Fig.2.6.7 (a) (b) show the connector for peripheral device cables A and B.

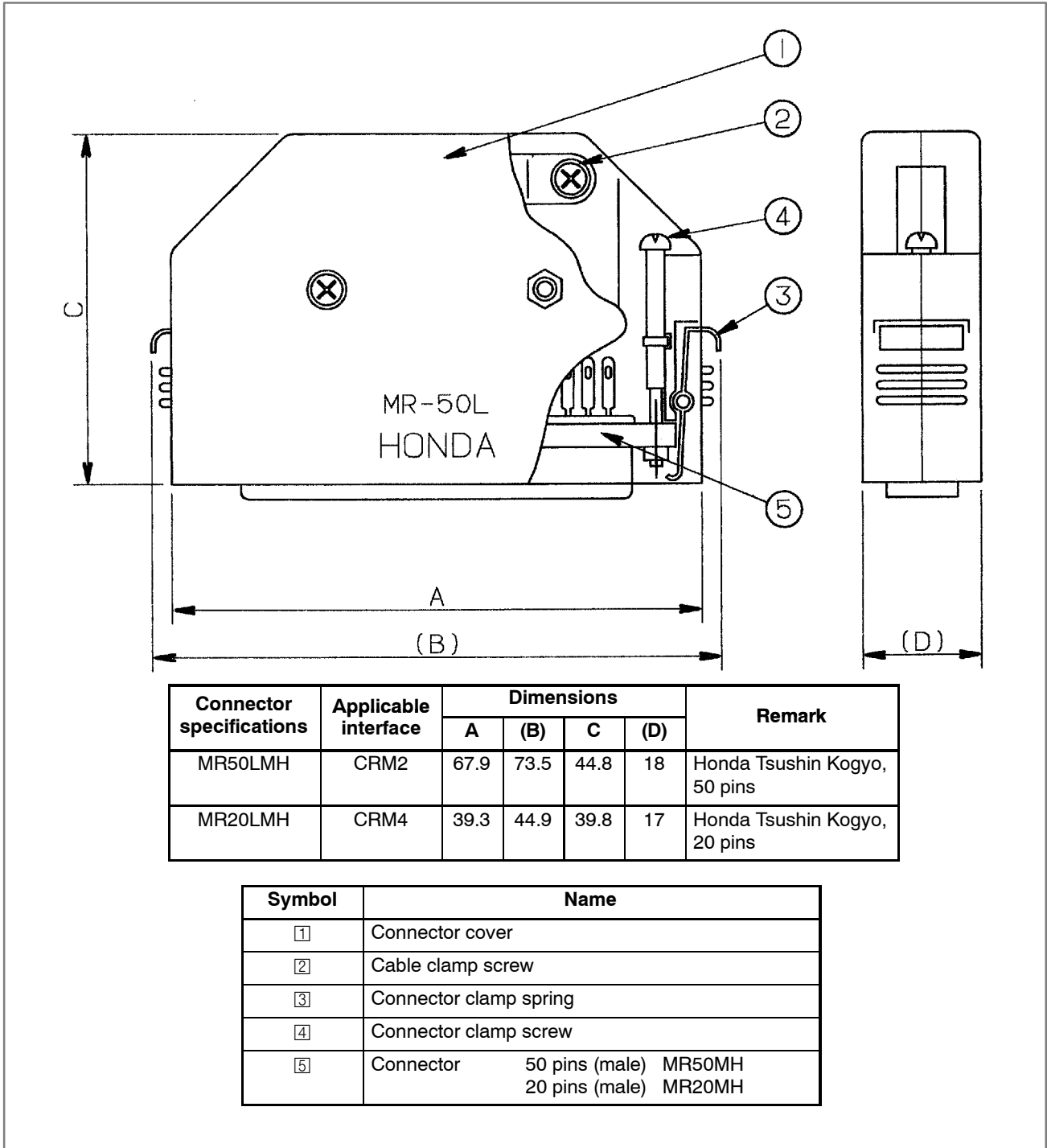
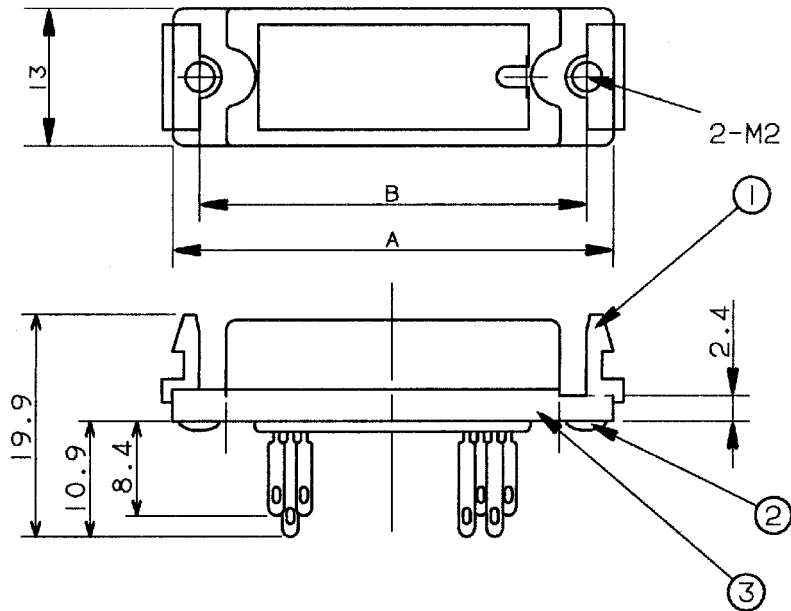


Fig. 2.6.7 (a) Peripheral device cable connector (Honda Tsushin Kogyo)

(2) Peripheral device connector

MR50RFH, MR20RFH



Connector specifications	Applicable interface	Dimensions		Remark
		A	B	
MR50RFH	(CRM2)	61.4	56.4	Honda Tsushin Kogyo, 50 pins
MR20RFH	(CRM4)	39.3	44.9	Honda Tsushin Kogyo, 20 pins

Symbol	Name
①	Connector clamp screw
②	Screw $\phi 2.6\_8$
③	Connector (MR50RFH) (MR20RFH)

Fig. 2.6.7 (b) Peripheral device connector (Honda Tsushin Kogyo)

## 2.6.8 Recommended Cables

### (1) Peripheral device connection cable

Connect a peripheral device using a completely shielded, heavily protected cable conforming to the specifications in Table 2.6.8.

Allow an extra 50 cm for routing the cable in the control unit.

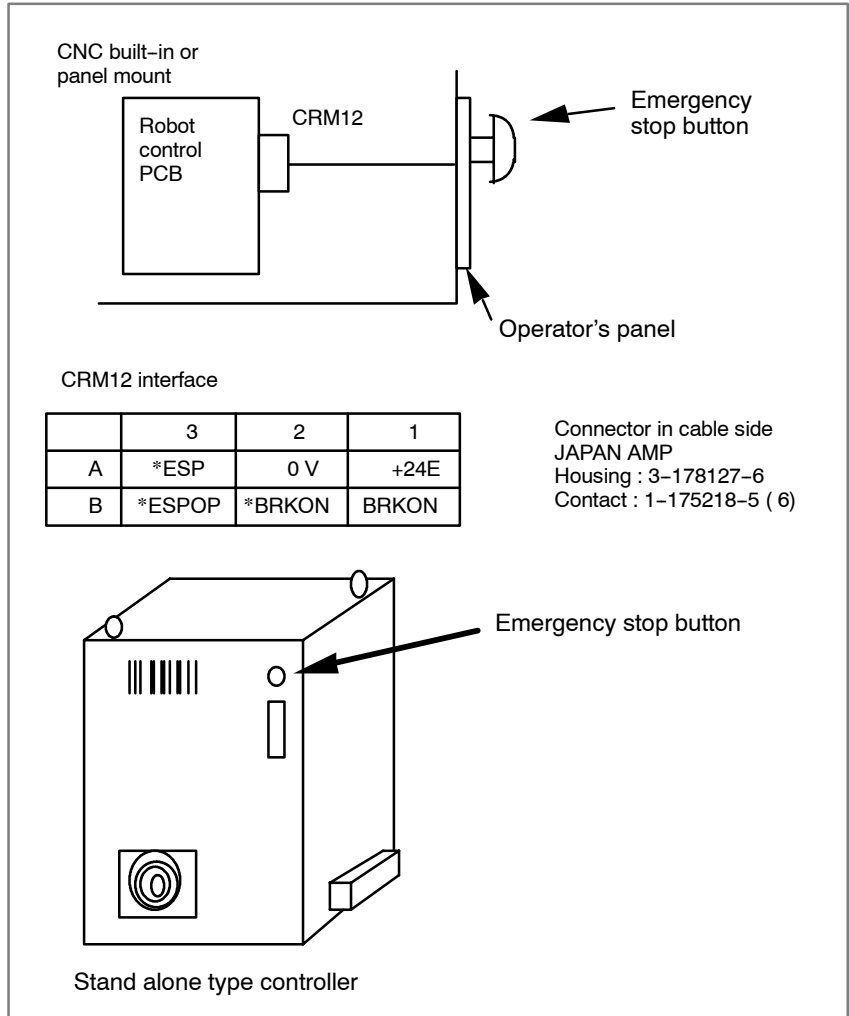
The maximum cable length is 30 m.

**Table 2.6.8 Recommended cable (for peripheral device connection)**

Number of wires	Wire specifications (FANUC specifications)	Conductor		Sheath thickness (mm)	Effective outside diameter (mm)	Electrical characteristics	
		Diameter (mm)	Configuration			Conductor resistance ( $\Omega$ /km)	Allowable current (A)
50	A66L-0001-0042	$\phi$ 1.05	7/0.18 AWG24	1.5	$\phi$ 12.5	106	1.6
20	A66L-0001-0041	$\phi$ 1.05	7/0.18 AWG24	1.5	$\phi$ 10.5	106	1.6

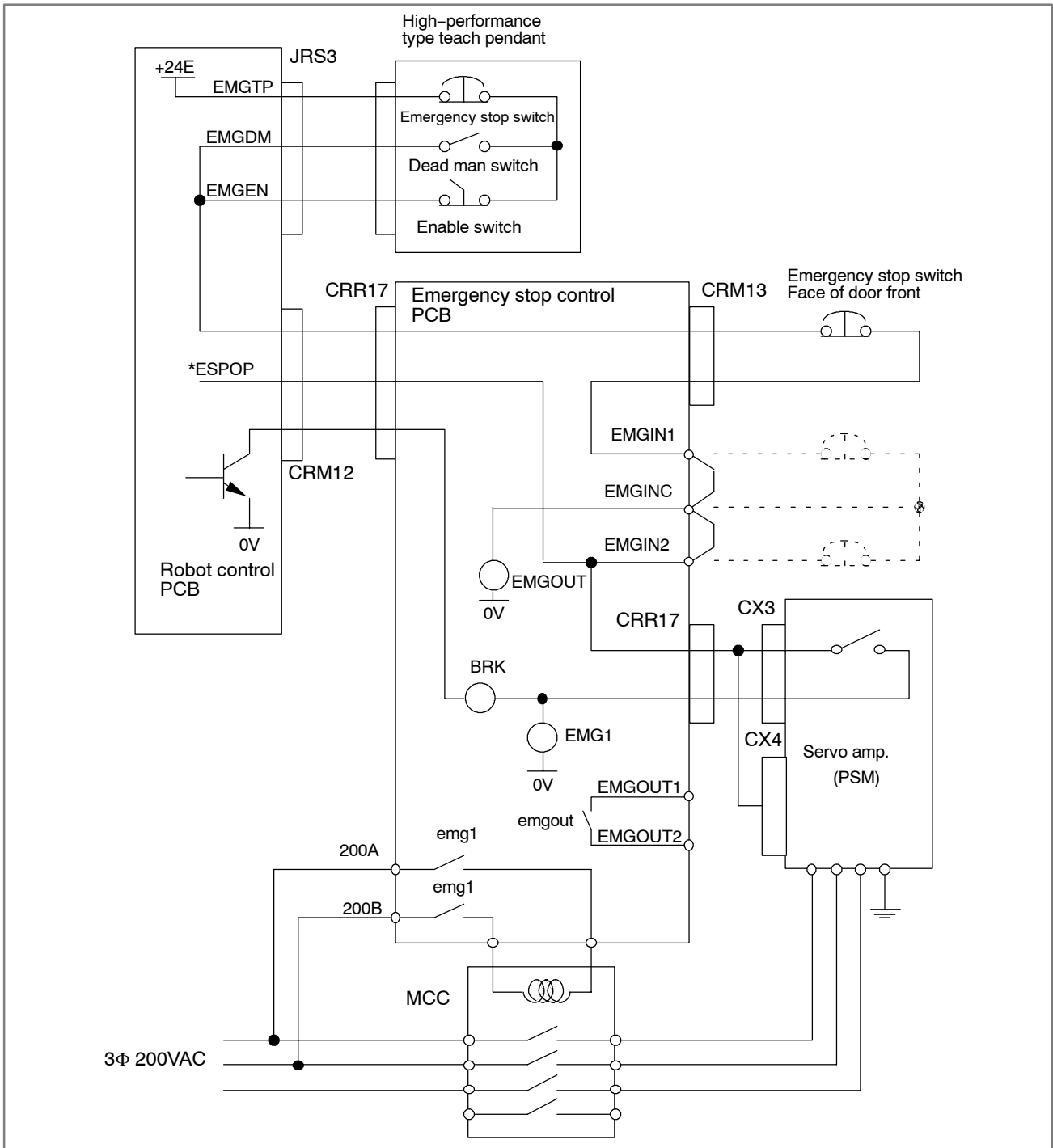
## 2.7 EMERGENCY STOP SIGNAL CONNECTION

- The customer should prepare this cable, when a panel mount type controller is used.
- Turn off the controller when connecting the cable.
- Design the system so that the power to the servo amplifier is turned off when an emergency stop occurs, irrespective of the input of the emergency stop signal.

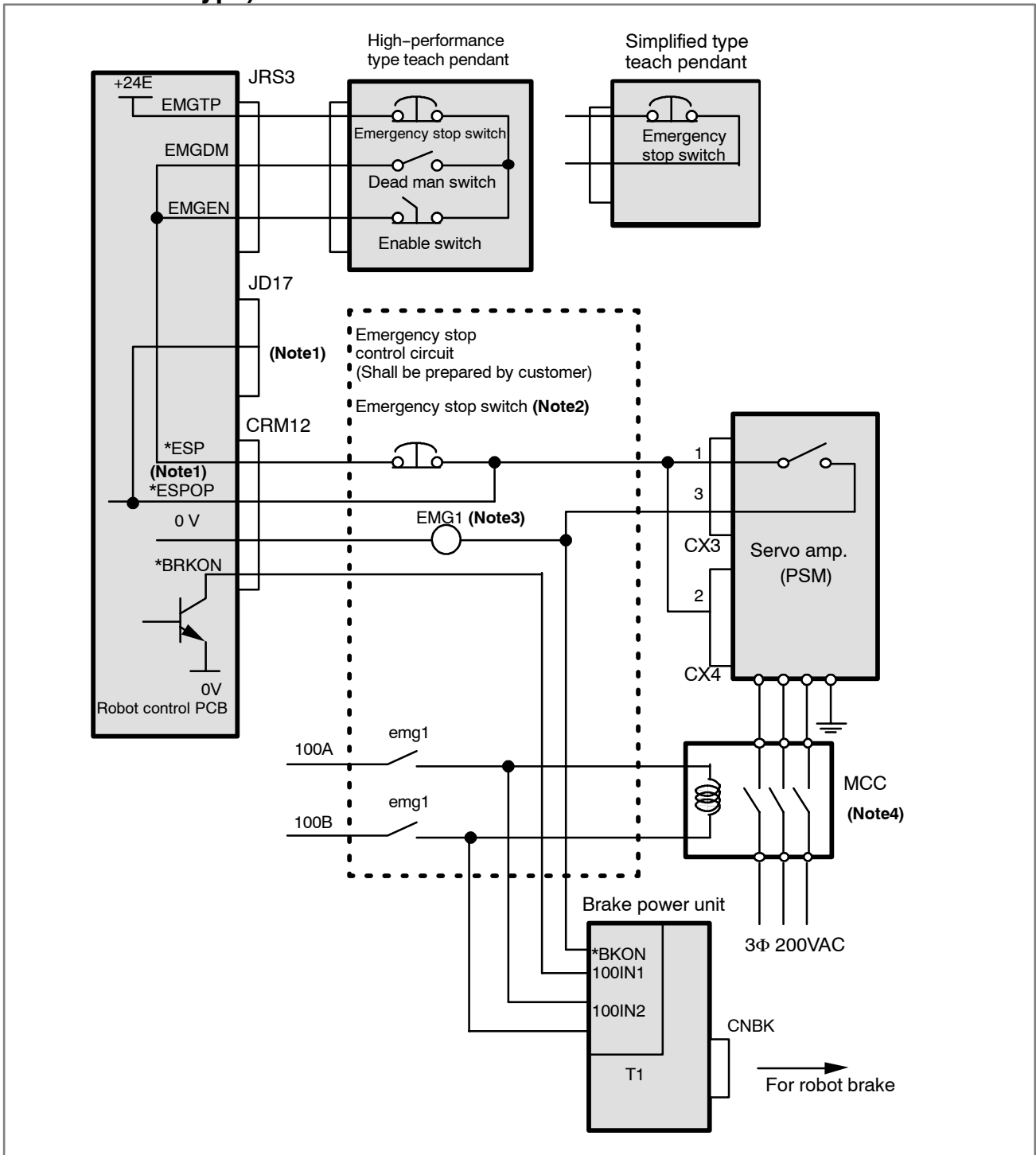


## 2.8 EMERGENCY STOP CIRCUIT

### 2.8.1 Circuit Diagram of Emergency Stop (In the Case of Remote Type)

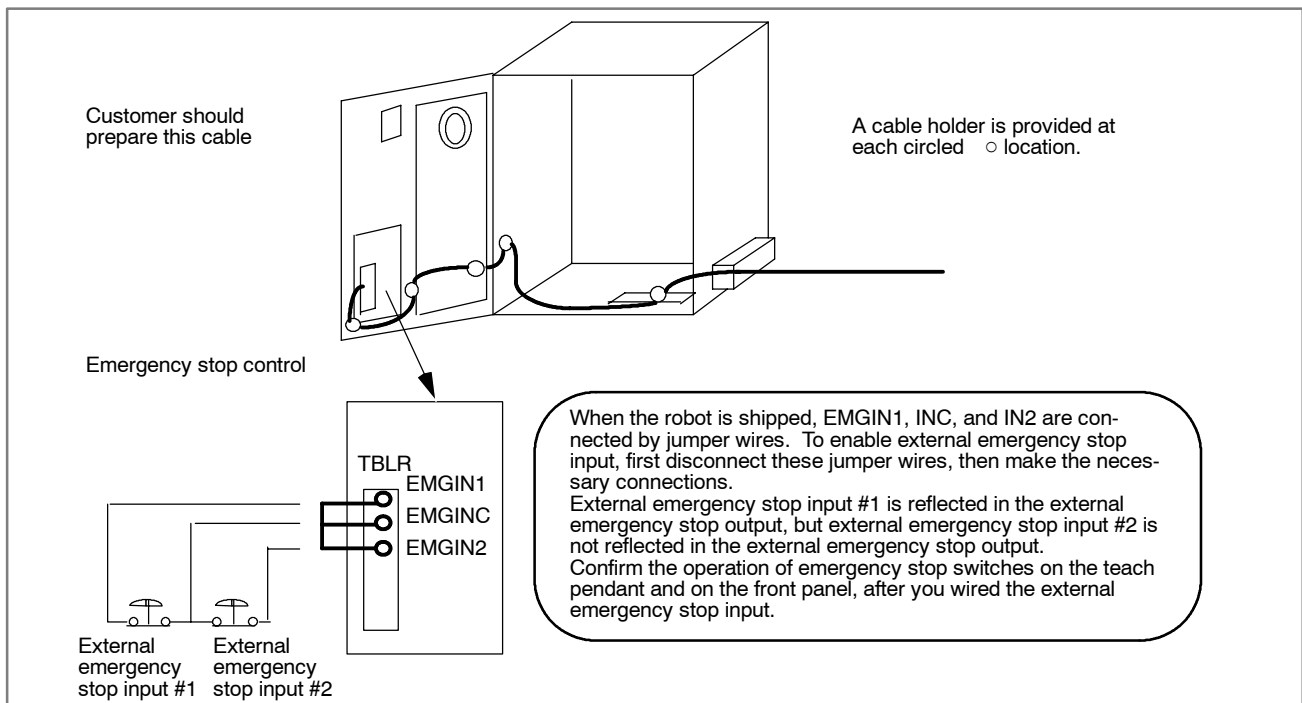


### 2.8.2 Circuit Diagram of Emergency Stop (CNC Built-in Type or Panel Mount Type)

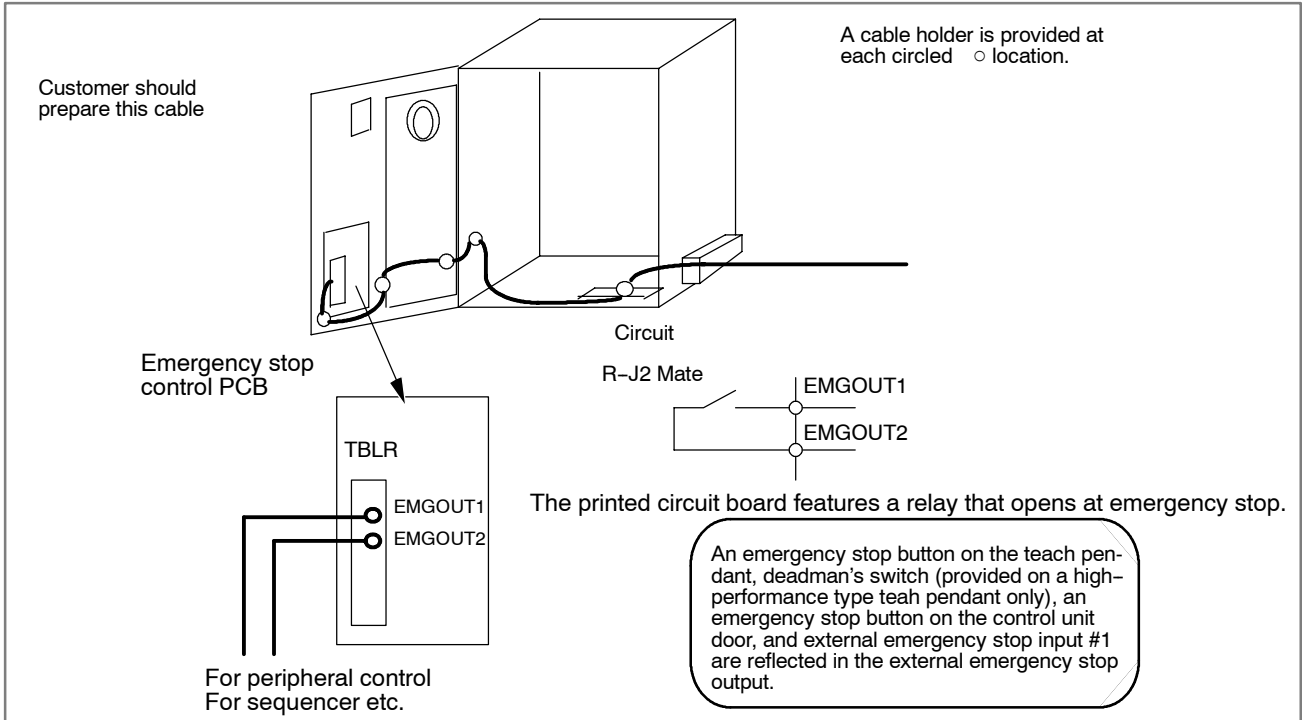


**NOTE**

- 1 Draw \*ESPOP from a location between the emergency stop switch and the contact of the servo amplifier. Connect \*ESPOP to either CRM12 or JD17.
- 2 Position the emergency stop switch at a location prior to the servo amplifier contact. For the emergency stop switch, use a contact with a rating of 250V/10A or greater.
- 3 Relay specifications  
Rated voltage of coil: 24VDC  
Max. contact current: 10A  
Max. contact voltage: 380VAC  
Use a relay with a built-in diode.
- 4 MCC specifications  
Rated coil voltage: 100VAC  
Rated current: 20A
- 5 Those items that are available from FANUC are indicated by the shading.

**2.8.3****External Emergency Stop Input (In the Case of Remote Type)**

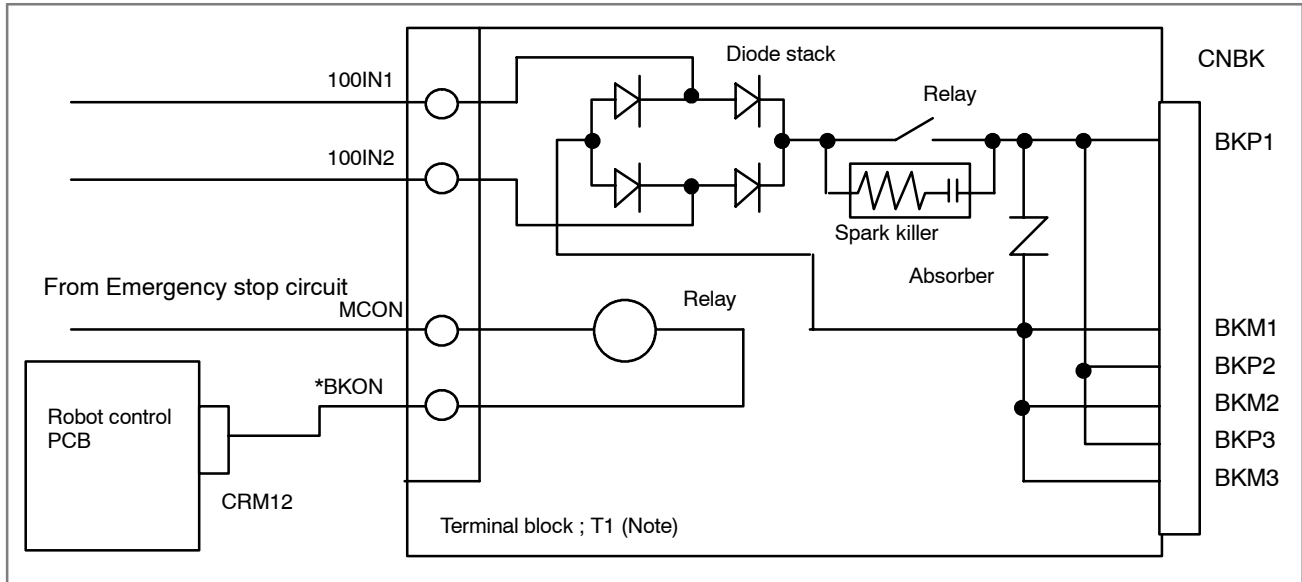
### 2.8.4 External Emergency Stop Output (In the Case of Remote Type)



**2.9**

Turn off the controller when connecting the cables.

**CONNECTION OF BRAKE POWER UNIT**



**NOTE**

For terminal block (T1) connection, use an M4 crimp terminal.

CRM12 interface

	3	2	1
A	*ESP	0 V	+24E
B	*ESPOP	*BRKON	BRKON

Connector in cable side  
 JAPAN AMP  
 Housing : 3-178127-6  
 Contact : 1-175218-5 ( 6)

CNBK interface

1	2	3
BKP1	BKP2	BKP3
4	5	6
BKM1	BKM2	BKM3

Connector in cable side  
 BURNDY JAPAN  
 Housing : SMS6P-1  
 Contact : RM16M-23( 6)

The customer is required to make the BKP1-3 and BKM1-3 connections. When the optional robot connection cable is specified, the BKP1-3 and BKM1-3 connections are made by using robot connection cable M1.

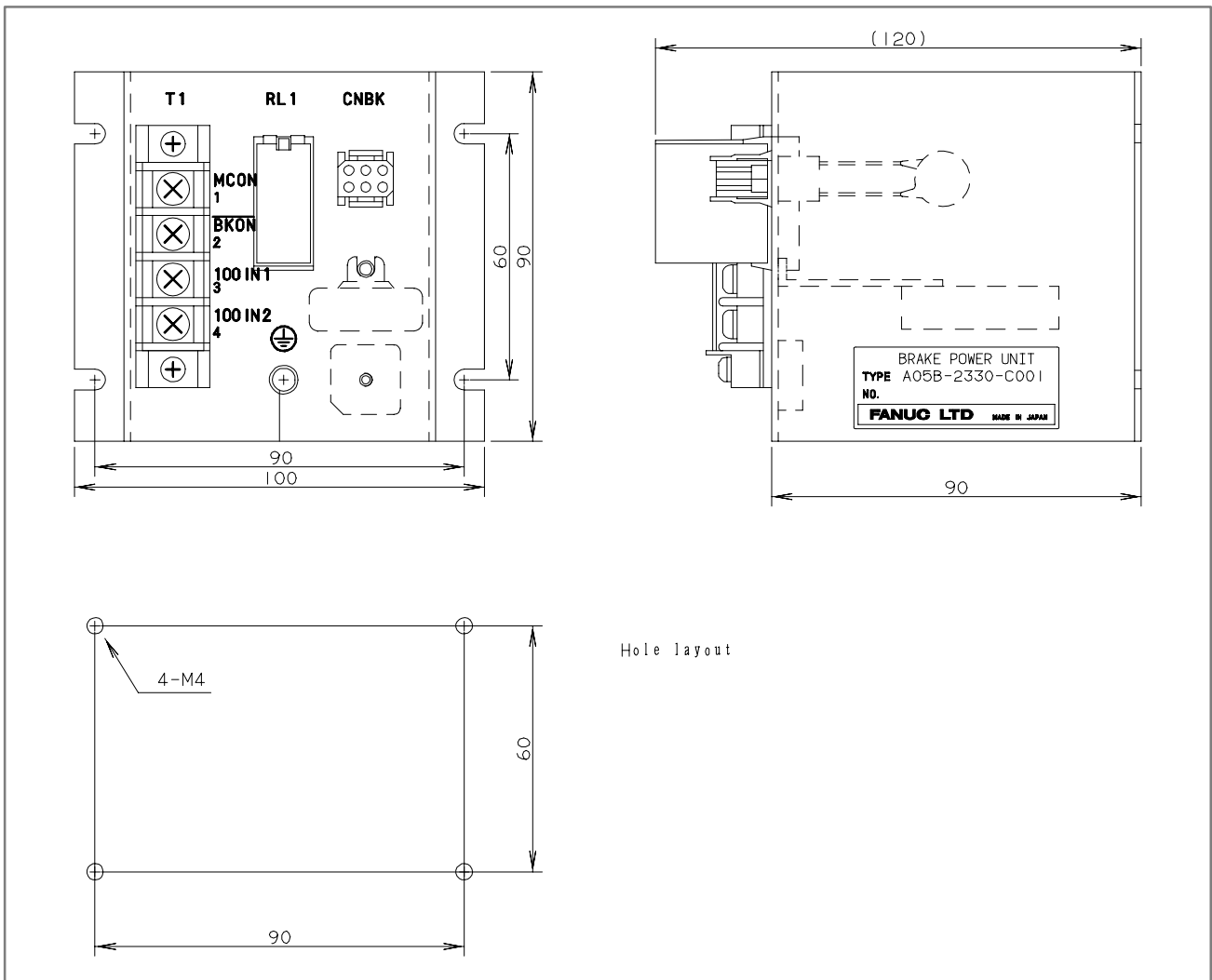
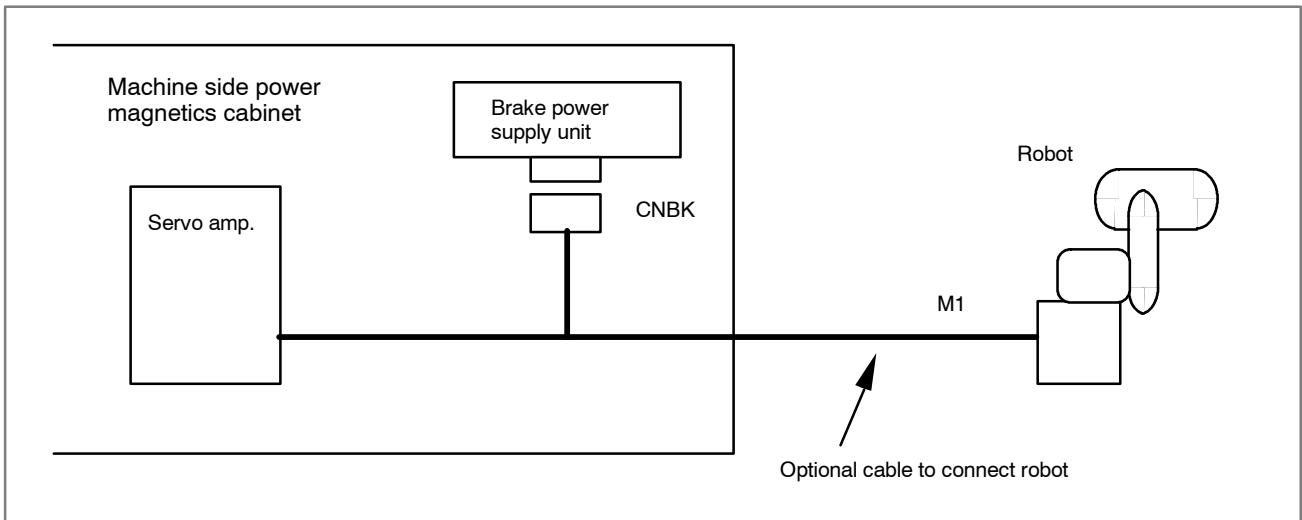
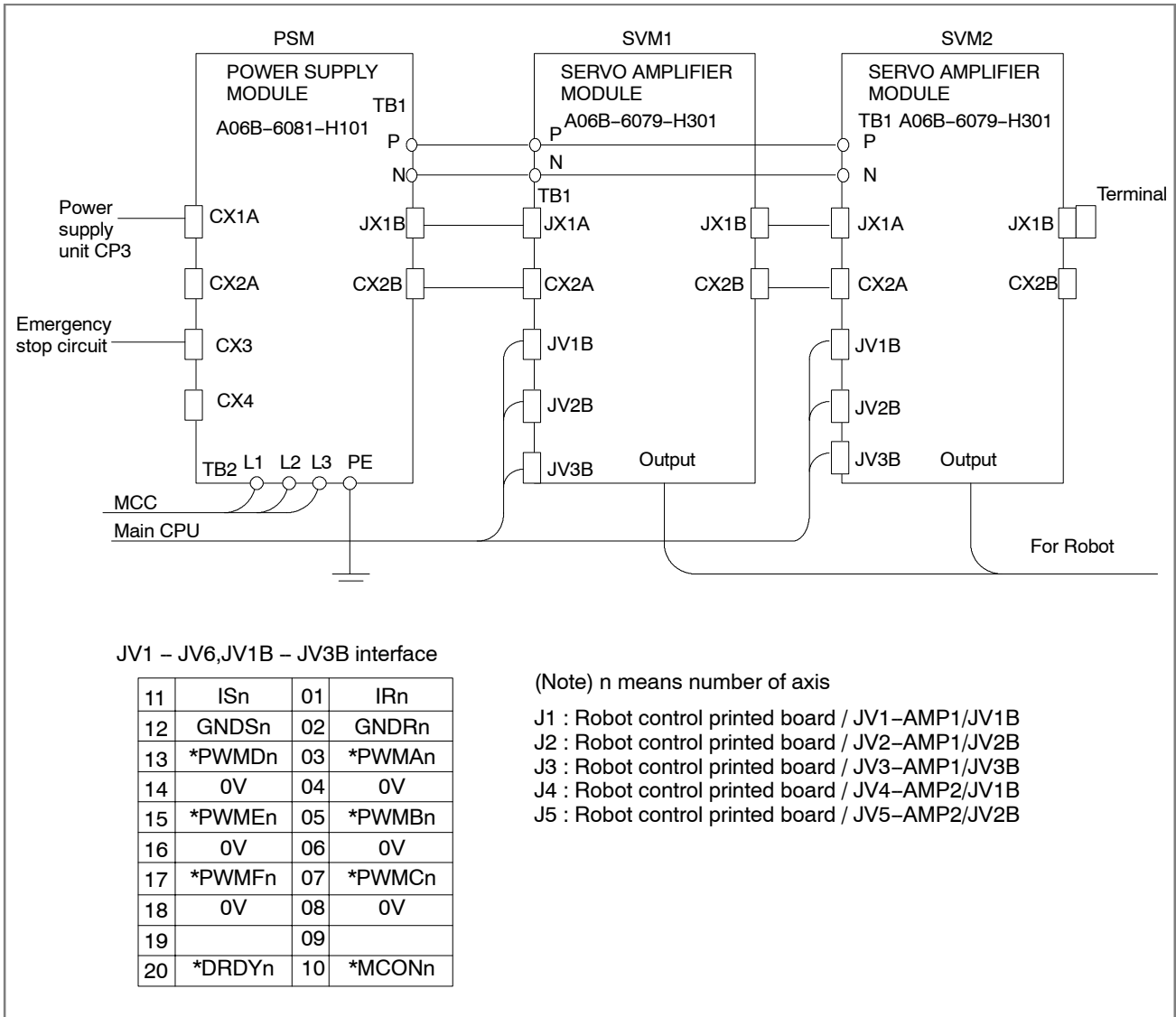


Fig. 2.9 Outline drawing of the brake power unit

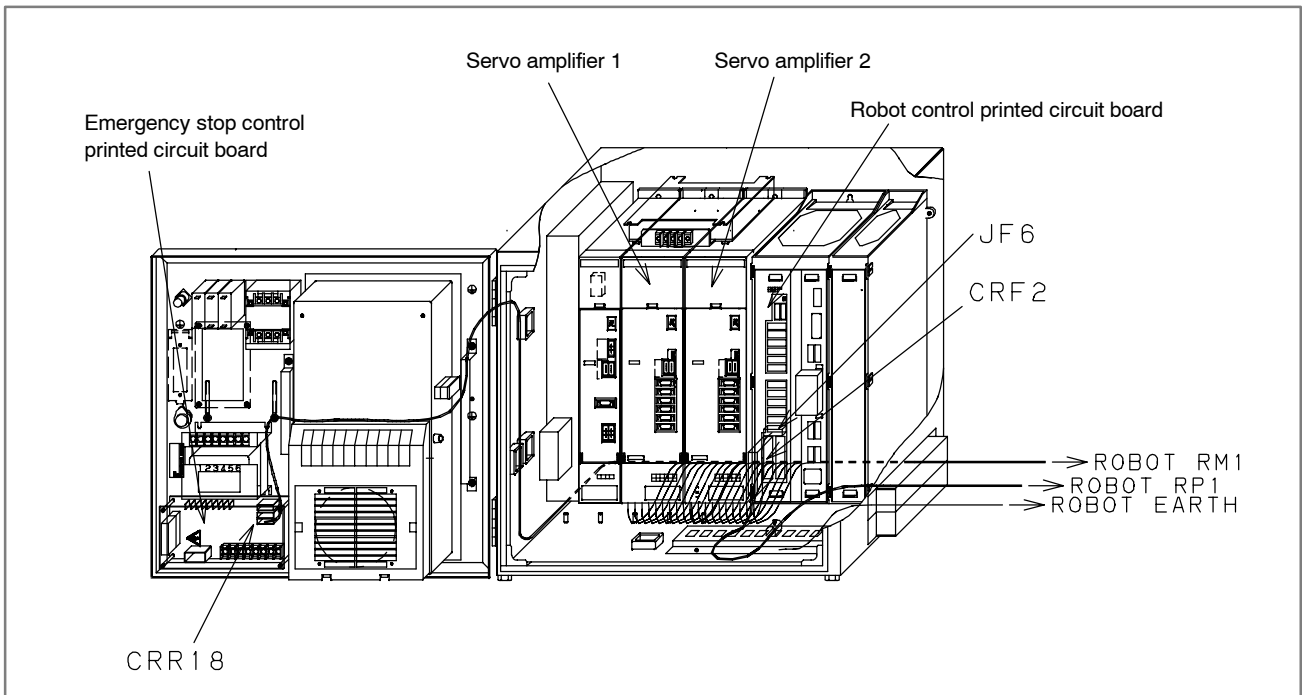
## 2.10 CONNECTION OF SERVO AMPLIFIER

Customer should prepare this cable when a panel mount type controller is used.  
Also refer to descriptions of servo amplifier for connection on this type of controller.



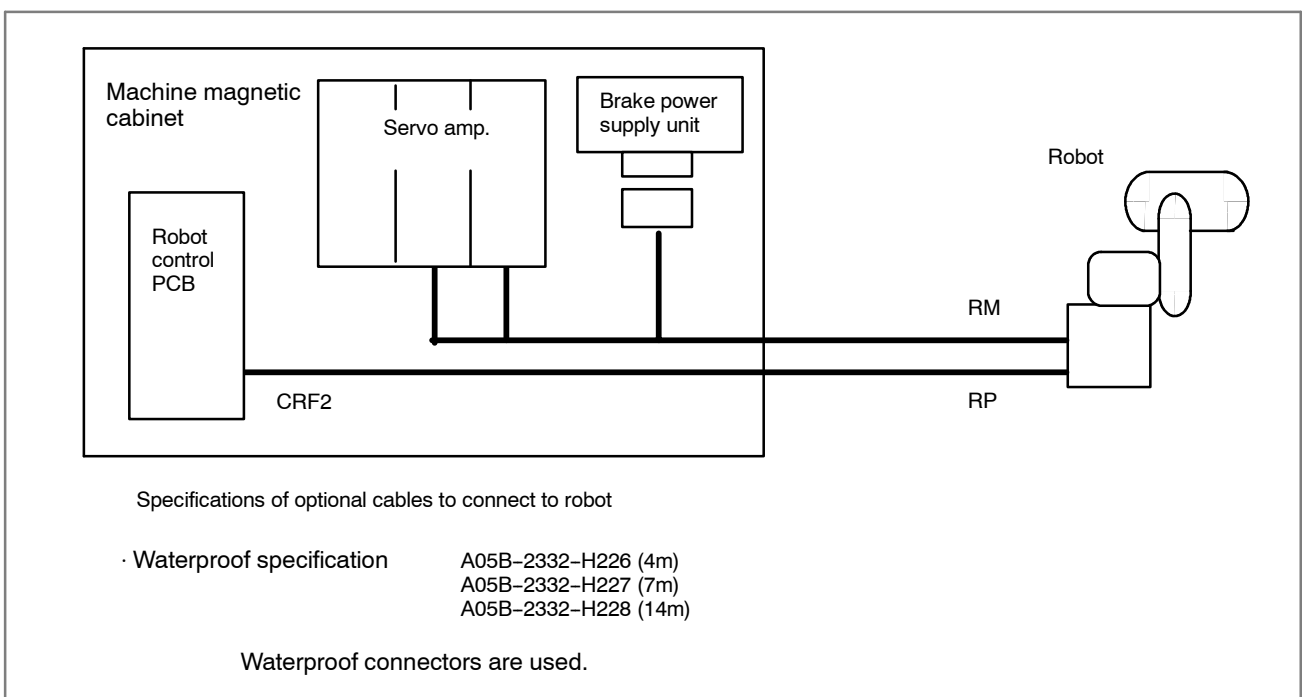
- (1) Twisted-pair cables should be used for pin pairs 1 and 2, and 3 and 4, ...19 and 20.
- (2) Use unified shielding, and ground the shield on the CNC side.

## 2.11 CONNECTION TO ROBOT (IN THE CASE OF REMOTE TYPE)



### Connection to robot

Customer should prepare these cables when optional robot connection cables are not used with panel mount type controller is equipped.



- Connection of cable RP

CRF2 interface

33	PD4			01	PD1
34	*PD4			02	*PD1
35	PRQ4	19	PD3	03	PRQ1
36	*PRQ4	20	*PD3	04	*PRQ1
37	PD5	21	PRQ3	05	PD2
38	*PD5	22	*PRQ3	06	*PD2
39	PRQ5	23	0V	07	PRQ2
40	*PRQ5	24	0V	08	*PRQ2
41	RDO01	25	0V	09	RDI01
42	RDO02	26	0V	10	RDI02
43	RDO03	27	0V	11	RDI03
44	RDO04	28	+5V	12	RDI04
45	RDO05	29	+5V	13	RDI05
46	RDO06	30	+5V	14	RDICOM
47		31	+5V	15	*ROT
48		32	+5V	16	*HBK
49	+24E			17	*PPABN
50	+24E			18	0V

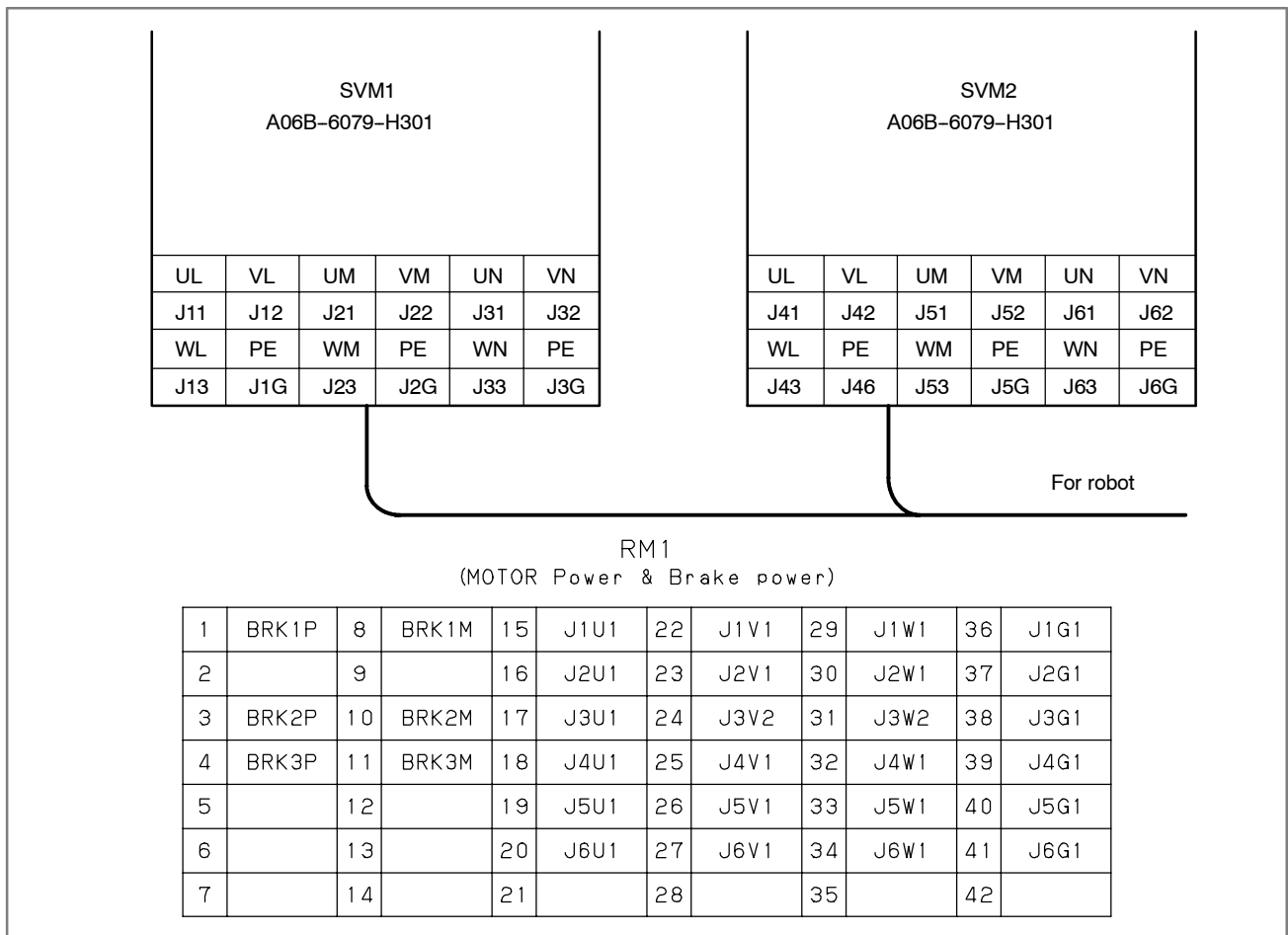
  

11		01	PD6
12	0V	02	*PD6
13		03	
14	0V	04	
15		05	PRQ6
16	0V	06	*PRQ6
17		07	
18	+5V	08	
19		09	+5V
20	+5V	10	

RP 1  
(Pulse Coder Feedback Signal & RDI/RD0)

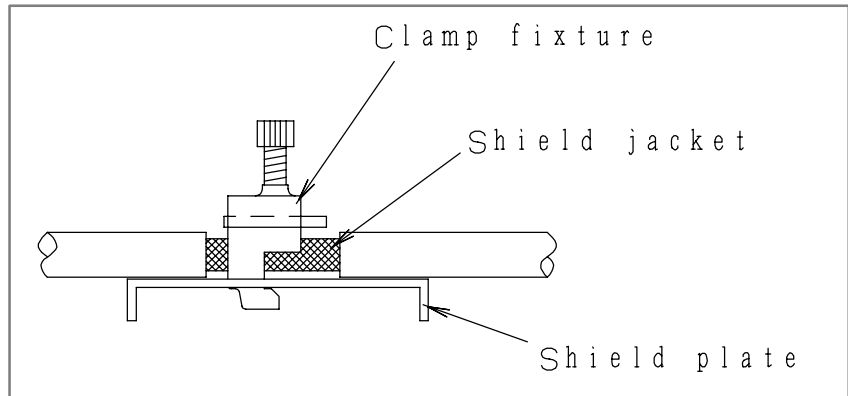
1	RDI1	13	RDI2	25	RDI3	37	RDI4	49		61	
2		14	RDI8	26	+24E	38	+24E	50	+24E (FOR ROT)	62	0V
3	RD01	15	RD02	27	RD03	39	RD04	51	RD05	63	RD06
4		16		28	*ROT	40	*HBK	52	RDI9	64	RDICOM
5	+5V	17	+5V	29	+5V	41	0V	53	0V	65	0V
6	+5V	18	+5V	30	+5V	42	0V	54	0V	66	0V
7	+5V	19	+5V	31	+5V	43	0V	55	0V	67	0V
8	+5V	20	+5V	32	+5V	44	0V	56	0V	68	0V
9	SPDJ1	21	SPDJ2	33	SPDJ3	45	SPDJ4	57	SPDJ5	69	SPDJ6
10	*SPDJ1	22	*SPDJ2	34	*SPDU	46	*SPDJ4	58	*SPDJ5	70	*SPDJ6
11	SPRQJ1	23	SPRQJ2	35	SPRQJ3	47	SPRQJ4	59	SPRQJ5	71	SPRQJ6
12	*SPRQJ1	24	*SPRQJ2	36	*SPRQJ3	48	*SPRQJ4	60	*SPRQJ5	72	*SPRQJ6

● Connection of cable RM



## 2.12 TREATMENT FOR THE SHIELDED CABLE

In this manual the treatment for the shielded cable is shown on several pages. Partly cut off the shielded cable to expose the shield jacket, and fasten the jacket to the shield plate with a clamp to protect against noise. (In case of stand-alone type a shield plate is installed in the controller, but in case of panel-mounting type the shield should be prepared by customer.)



**Fig. 2.12 Shielded cable treatment**

# 3

## TRANSPORTATION AND INSTALLATION



### 3.1 TRANSPORTATION

The control unit should be transported by a crane. Attach a rope to eye bolts at the top of the control unit.

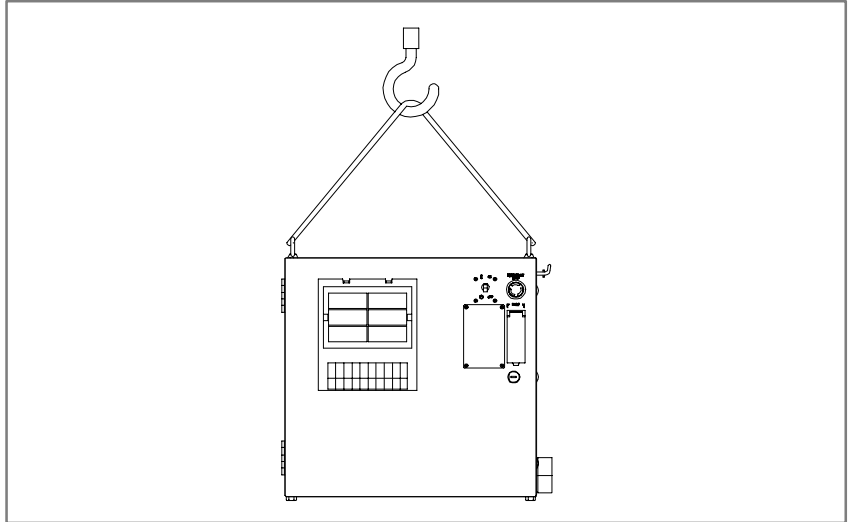


Fig. 3.1 Transportation

### 3.2 INSTALLATION

Installation area  
When the control unit is installed, allow the space for maintenance shown in the following figure.

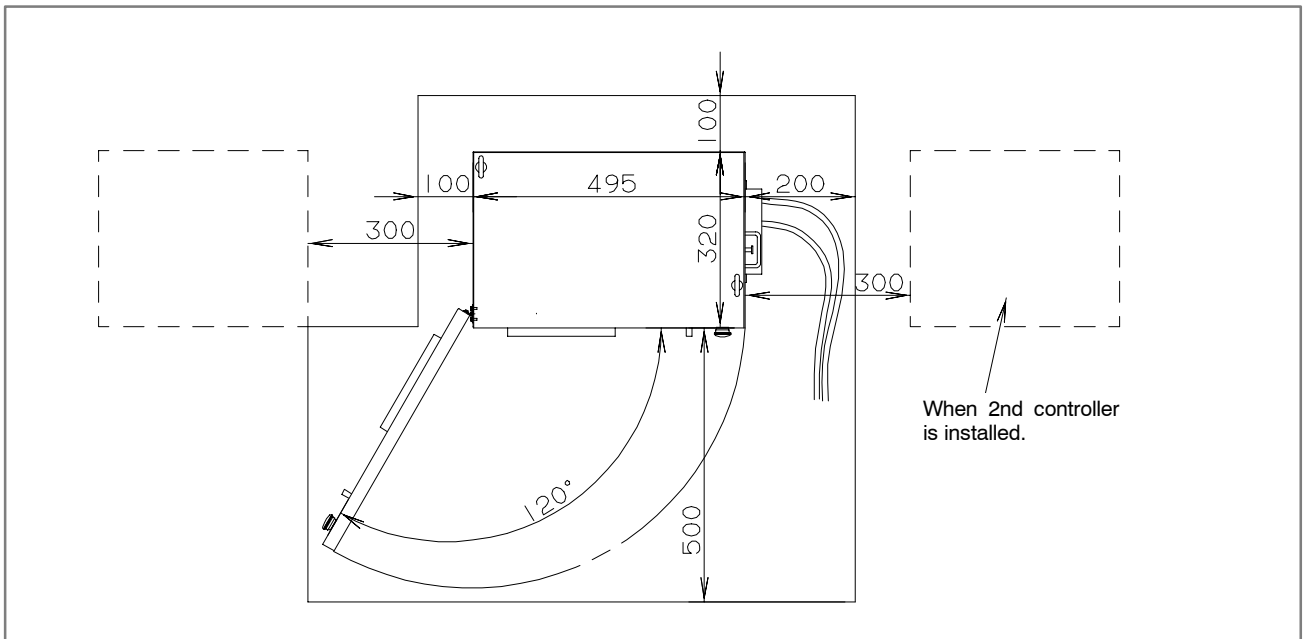


Fig. 3.2 Installation

### 3.3 EXTERNAL CONTROLLER DIMENSIONS

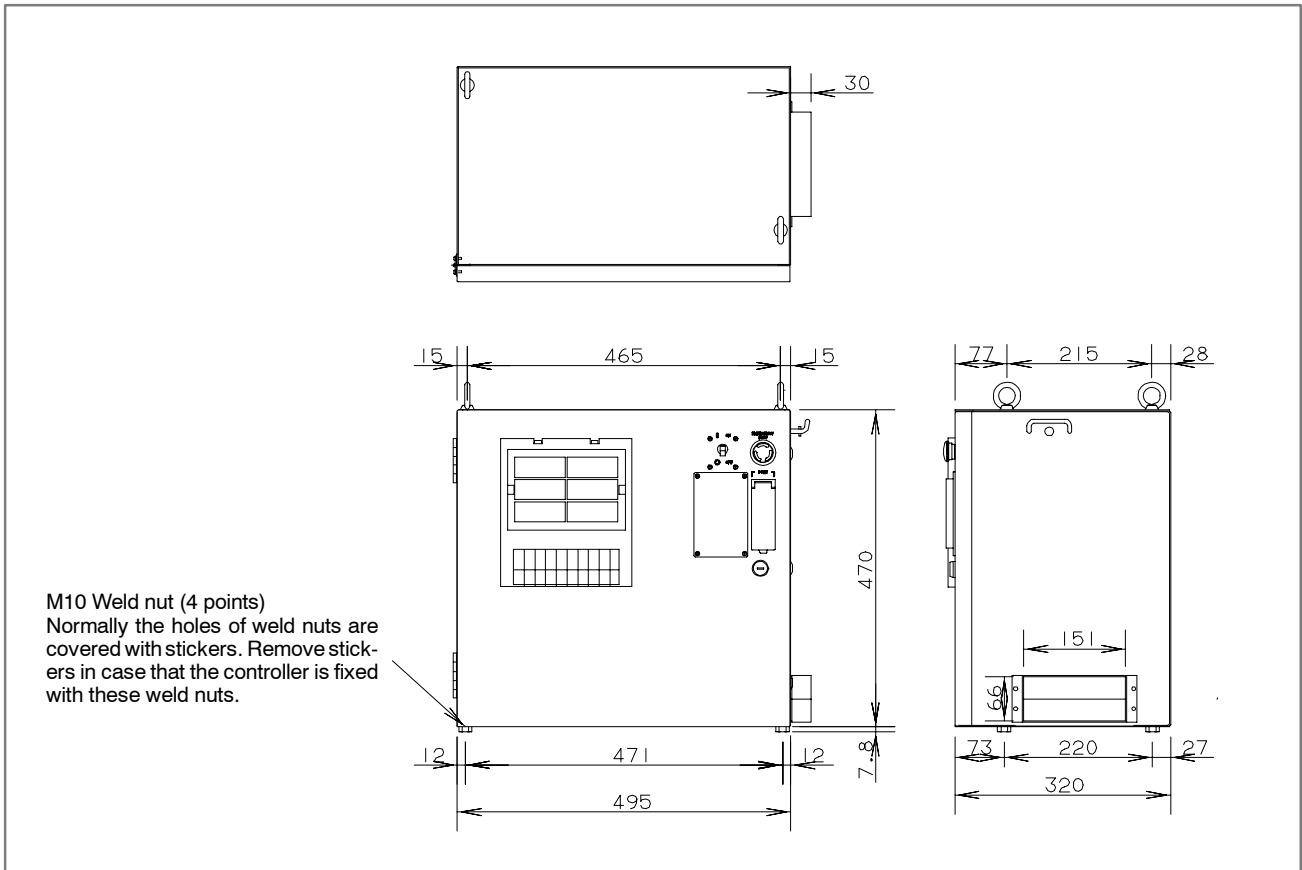


Fig. 3.3 External drawing of robot controller

### 3.4 INSTALLATION CONDITION

Item	Specifications/condition
Transformer	50Hz; 200VAC, +10%, -15% 60Hz; 200VAC to 220 VAC, +10%, -15% 50/60 Hz ± 1Hz, 3-phase
Input power supply capacity	1.2 kVA
Average power consumption	0.5 kW
Ambient temperature range	0 to 45 n
Ambient humidity range	75% RH max. No condensation 95% RH maximum for up to 1 month.
Atmosphere	No corrosive gases Contact FANUC when operating the unit where there is a lot of dust or cutting oil.
Vibration	0.5G max. Contact us when operating the unit where vibration frequently occurs.
Weight of control unit	40kg

### 3.5 ADJUSTMENT AND CHECKS AT INSTALLATION

Adjust and check according to following procedure at installation.

No.	Description
1	Visually check the inside and outside of the control unit.
2	Check if the screwed terminal is connected properly.
3	Check that the connectors and printed circuit boards are inserted correctly.
4	Connect control unit and mechanical unit cables.
5	Turn the breaker off and connect the input power cable.
6	Check the input power voltage.
7	Press the EMERGENCY STOP button on the operator's panel and turn the power on. Check the output voltage.
8	Check the interface signals between control unit and robot mechanical unit.
9	Check the parameters. If necessary, set them.
10	Release the EMERGENCY STOP button on the operator's panel. Turn the power on.
11	Check the movement along each axis in the manual jog mode.
12	Check the end effector interface signals.
13	Check the peripheral device control interface signals.

### **3.6 RESETTING OVERTRAVEL AND EMERGENCY STOP AT INSTALLATION**

An overtravel and emergency stop occur when the robot is operated for the first time after it is installed and the mechanical and control units are wired. This section describes how to reset the overtravel and emergency stop.

Remove the red plate fastening the swiveling axis beforehand.

The J2 and J3 axes are pressed against the hard stops at shipment. Therefore, an overtravel alarm occurs when the power is turned on after installation.

### **3.7 RESETTING OVERTRAVEL**

Press the reset key on the teach pendant.

Manually move an axis that has overtraveled into the operating range while pressing the shift key on the teach pendant.