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MP23□□□iec
Hardware Manual



MP2300Siec



MP2310iec

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1 Introduction

1.1 MP23□□□iec Features

MP2300Siec and MP2310iec are small all-in-one machine controllers. They are characterized by the following standard features:

■ Deterministic motion network MECHATROLINK-II

- Controls up to 20 axes of servos or inverters supporting MECHATROLINK-II. Note: If using more than 16 nodes, a Yaskawa repeater must be used for the MECHATROLINK network to operate properly.
- Connects up to 21 total stations including remote I/O.
- Can include 6 virtual axes.

■ Ethernet (100Mbps)

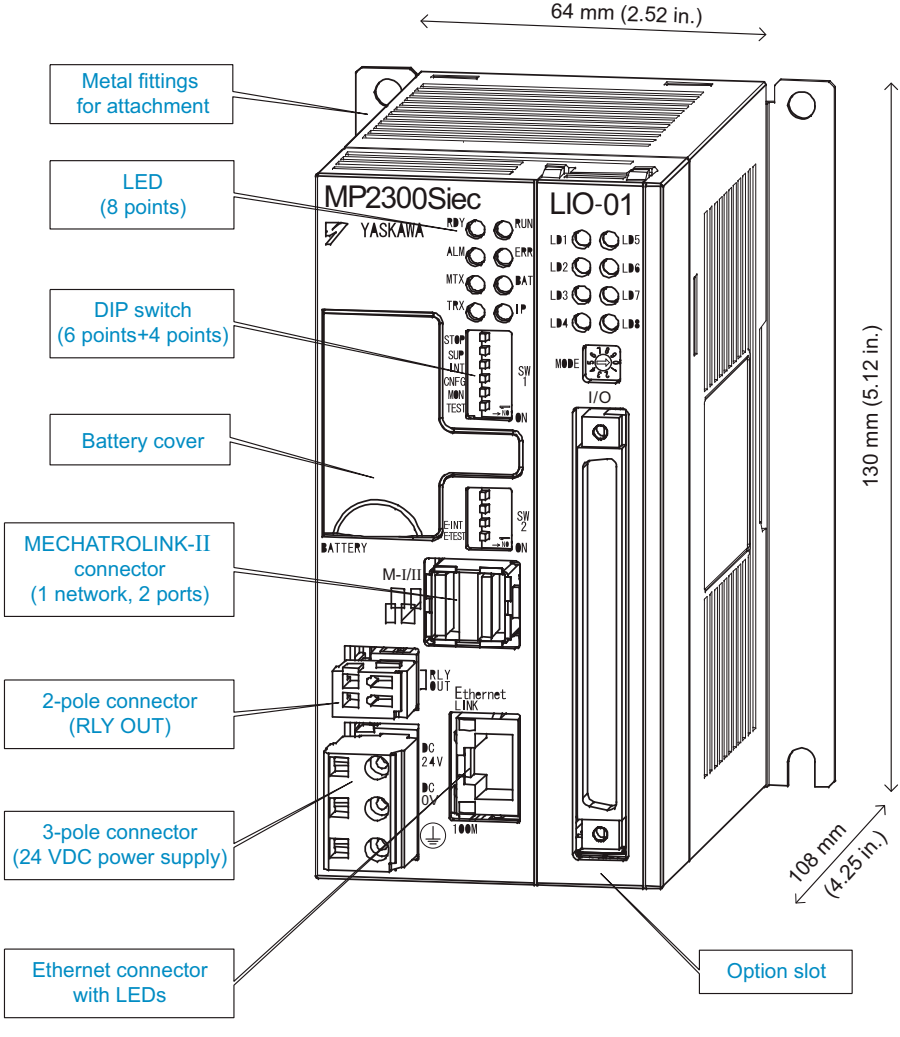
- EtherNet/IP
- Modbus TCP
- Allows high-speed communications with MotionWorks IEC
- Enables communication with the application program by using a touch panel
- Enables communication with the application program from another controller

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1.2 MP23□□□iec Appearance

1.2.1 MP2300Siec Appearance

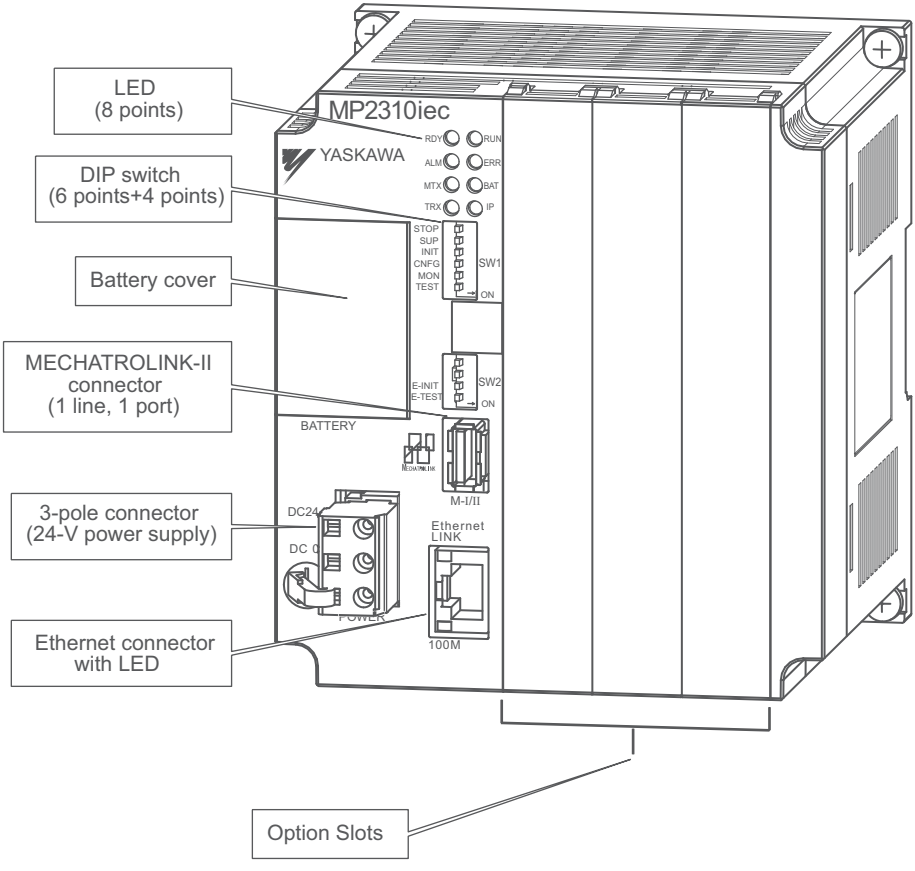
The following figure shows the external appearance of the Controller with metal fittings for attachment. The dimensions in the figure do not include the length of metal fittings.



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1.2.2 MP2310iec Appearance

The following figure shows the external appearance of the Controller



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1.3 MP23□□□iec Modules

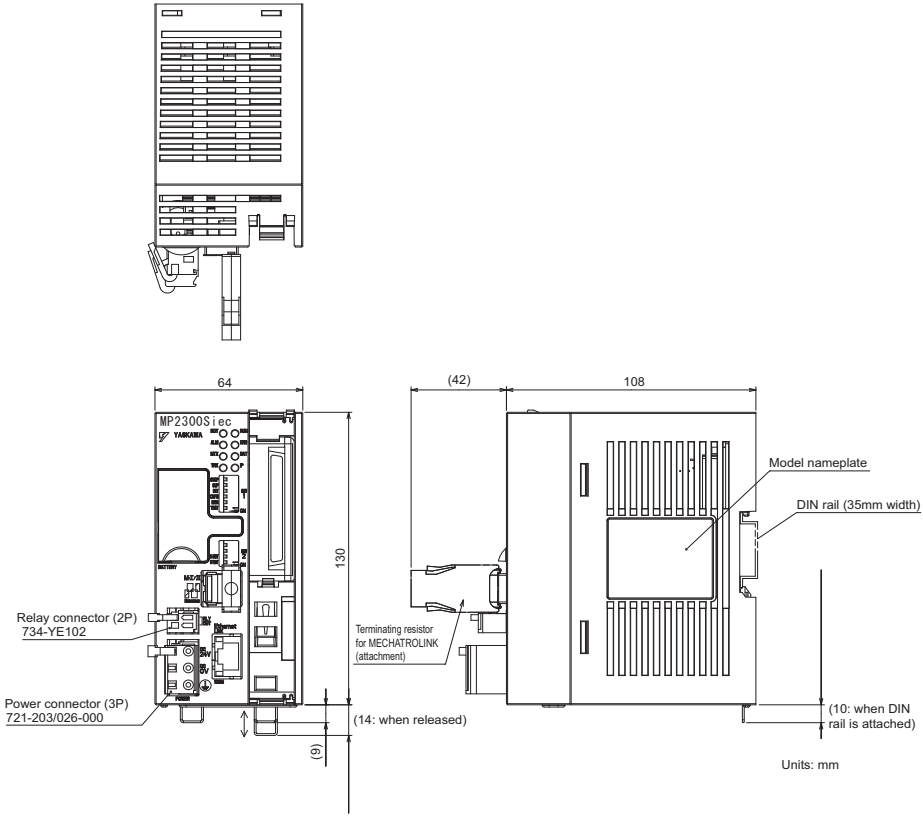
The following table shows the names and specifications of the Controller and Option Modules.

Group		Name	Description	Model	Specifications
Option Modules	Motion Modules	None currently supported			
	I/O Modules	Analog Input Module	AI-01	JAPMC-AN2300	Analog input, 8 channels
		Analog Output Module	AO-01	JAPMC-AN2310	Analog output, 4 channels
		Output Module	DO-01	JAPMC-DO2300	64 outputs (sink mode output)
		I/O Module	LIO-01	JAPMC-IO2300	16 inputs, 16 outputs (sink mode output) 1 encoder input
		I/O Module	LIO-02	JAPMC-IO2301	16 inputs, 16 outputs (source mode output) 1 encoder input
		I/O Module	LIO-04	JAPMC-IO2303	32 inputs, 32 outputs (sink mode output)
		I/O Module	LIO-05	JAPMC-IO2304	32 inputs, 32 outputs (source mode output)
		Multi-function Option Card	LIO-06	JAPMC-IO2305-E	8 digital inputs, 8 digital outputs (sink mode), 1 analog input, 1 analog output, 1 encoder input

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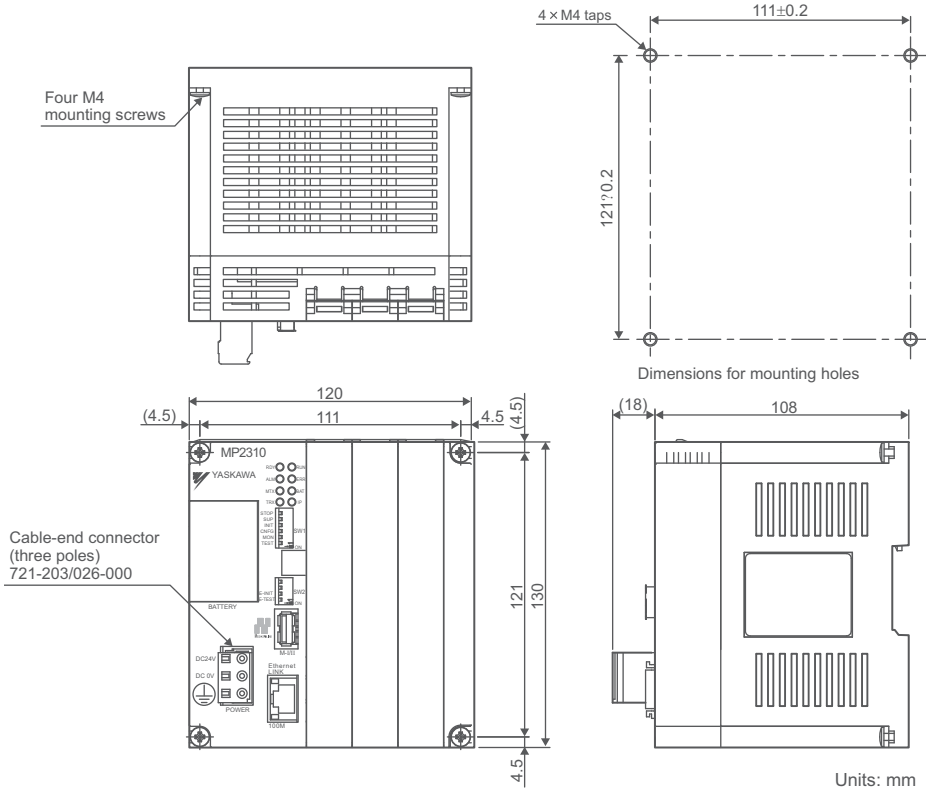
1.4 Dimensions

1.4.1 MP2300Siec Controller



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1.4.2 MP2310iec Controller



* 1. The following cable-side connectors are attached to the power connectors.

- Power connector: 721-203/026-000

Note: Attachment

- Handle for power connector (model: 231-131)
  * These handles are used when connecting a cable to the cable-side connector.

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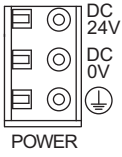
2 Power Connections

2.1 Power Supply Connector

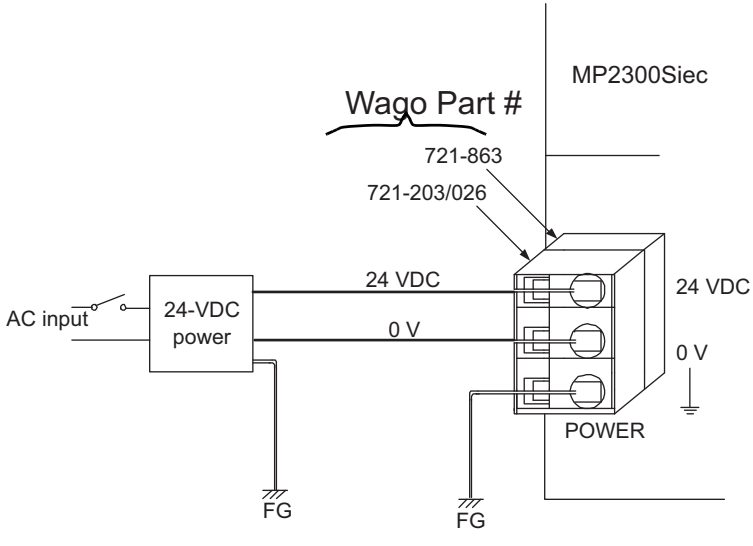
2.1.1 Specifications, Pin Arrangement, and Connection Procedure

Supply 24VDC to the MP23□ □ □ iec. Connect the power supply connector as shown in the diagram below.

Name	Connector Name	# of Pins	Connector Model		
			Module	Cable	Manufacturer
Power Supply Connector	POWER	3	721-863	721-203/026	WAGO



Symbol	Signal Name	Description
24VDC	24V	24VDC input
0VDC	0V	0V input
⏚	FG	Frame ground (Ground to 100 Ω or less.)



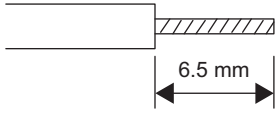
- Use an insulated 24VDC power supply. Attach the power supply switch on the AC side. If the switch is attached on the 24VDC side, there will be an inrush current of approximately 40A when the power is turned ON.

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2.1.2 Connection Procedure

The power supply terminal has a removable connector. Use the following procedure to wire the terminal to the power supply connector. Use 0.2 mm^2 to 0.51 mm^2 (AWG24 to AWG20) twisted-pair cable.

1. Strip approx. 6.5 mm from the end of the wire.



2. Open the wire insert opening on the terminal with the tool shown in Fig. A or Fig. B.

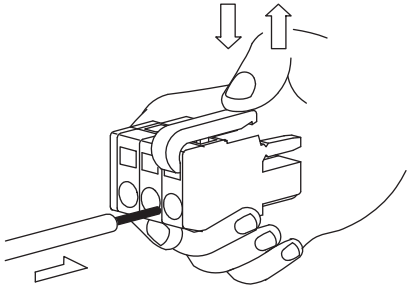


Fig. A (with lever)

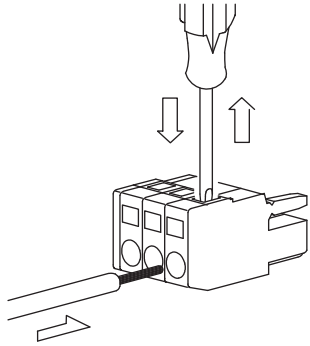


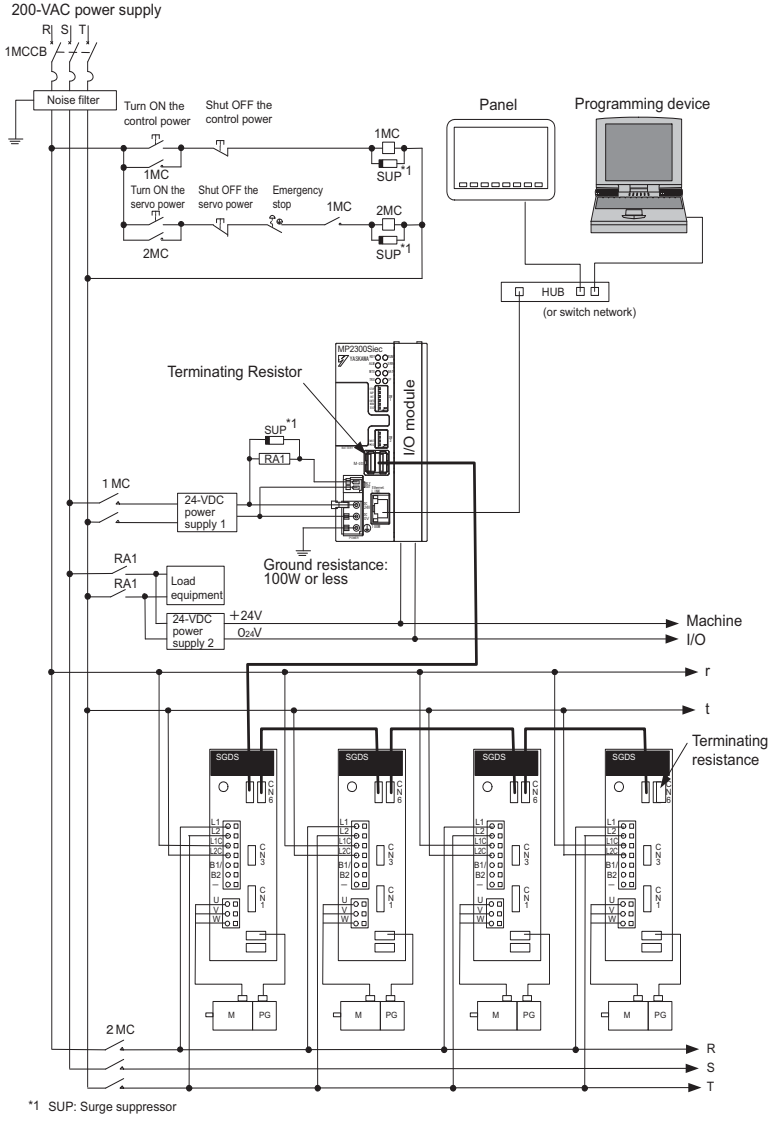
Fig. B (with screwdriver)

3. Insert the wire into the opening and then close the opening by releasing the lever or removing the screwdriver.

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2.2 System Connection Example (with E-Stop)

Note: Only the MP2300Siec is equipped with an E-Stop connector. The following diagram shows a 200 VAC power supply connection example of a system using the MP2300Siec.



* Select the SERVOPACK, 24VDC power supply to use in accordance with the input power supply specification.

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3 Specifications

3.1 General Specifications

Item		Specifications
Environmental Conditions	Ambient Operating Temperature	0 to 55°C
	Ambient Storage Temperature	-25 to 85°C
	Ambient Operating Humidity	30 to 95% (with no condensation)
	Ambient Storage Humidity	5 to 95% (with no condensation)
	Pollution Level	Pollution level 1 (conforming to JIS B 3501)
	Corrosive Gas	There must be no combustible or corrosive gas
	Operating Altitude	2,000 m above sea level or lower
Mechanical Operating Conditions	Vibration Resistance	Conforming to JIS B 3502: • 10 to 57 Hz with single-amplitude of 0.075 mm • 57 to 150 Hz with fixed acceleration of 9.8 m/s^2 • 10 sweeps each in X, Y, and Z directions (sweep time: 1 octave/min)
	Shock Resistance	Conforming to JIS B 3502: Peak acceleration of 147 m/s^2 (15 G) twice for 11 ms each in the X, Y, and Z directions
Electrical Operating Conditions	Noise Resistance	Conforming to EN 61000-6-2, EN 55011 (Group 1, Class A) Power supply noise (FT noise): 2 kV min., for one minute Radiation noise (FT noise): 1 kV min., for one minute
Installation Requirements	Ground	Ground to 100 Ω Max
	Cooling Method	Natural convection cooling

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3.2 Product Specifications

Item		Specification	
		MP2300Siec	MP2310iec
Number of Optional Slots		1 slot	3 slots
Number of Control Axes		Up to 20 axes of servo/inverter stations	
MECHATROLINK-II	Communication System	MECHATROLINK-II (32 byte)	
	Communication Cycle (M-II)	0.5 ms, 1.5 ms, 2.0 ms, 2.5 ms, 3.0 ms, 3.5 ms, and 4.0 ms	
	Maximum Number of Connectable Stations (M-II)	21 Slave nodes (up to 16 servo/inverter stations)	
Ethernet	Ethernet/IP MODBUS TCP	100Base-TX 1 port	
I/O	On-board I/O	(via option card)	
Memory Capacity	SDRAM	32 MB	
	SRAM	512 KB (Battery backup)	
	FLASH	8 MB	
	Program Capacity	5.5 MB	
Programming Language IEC 61131-3	Ladder Language	Yes	
	Structured Text	Yes	
	Function Block Diagram	Yes	
	SFC	Yes	

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3.3 Specifications of Controller

MP2300Siec Hardware Specifications

Item		Specifications
Classification		Controller
Name		MP2300Siec
Model Number		PMC–U–MP23S□□□□ (See page 17)
Power Unit	Input Voltage	24VDC (± 20%)
	Input Current	1A Max (during input/output rating)
	Inrush Current	40A Max (full discharge state, during output rating, or the secondary output of the external 24V power supply is turned ON)
	Rated Voltage	5.0V
	Rated Current	2.0A
	Output Current Range	0.0 to 2.0A
	Constant Voltage Precision	±2% Max (including input voltage and output load fluctuations)
	Battery	Battery for memory retention attachable
Motion Network		MECHATROLINK-II: 1 channel SERVOPACK and I/O for up to 20 slave nodes connectable (SERVOPACK for up to 20 axes) Baud rate: 10 Mbps (MECHATROLINK-II)
Communication Function		Ethernet: 100BASE-TX/10BASE-T
Calendar		Seconds to year timer (Battery backup)
Connectors		Power supply to Ethernet RLY OUT
Indicators		RDY(green), RUN(green), ALM(red), ERR(red), MTX(green), BAT(red), TRX(green), IP(green), LINK(yellow), 100M(green)
Switches		STOP, SUP, INIT, CNFG, MON, TEST, E-INIT, E-TEST
Current Consumption		1A Max
Dimensions (mm)		64 × 130 × 108 (W × H × D)
Mass		390 g



- For the external 24V power supply, select a power supply which satisfies the specifications below as well as the rated current (not more than 1A):
  - Allowable output load capacity: 1200μF or more
  - Overcurrent detection is automatically restored by removing causes
- However, except that the primary side (AC side) of the external 24V power supply is turned ON/OFF.

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MP2310iec Hardware Specifications

Item		Specifications
Classification		Basic Module
Name		MP2310
Model Number		JEPMC-MP2310-E
Power Unit	Input Voltage	24VDC (± 20%)
	Input Current*	1 A max. (during input/output rating)
	Inrush Current*	40 A max. (full discharge state, during output rating, or the secondary output of the external 24V power supply is turned ON)
	Rated Voltage	5.0 V
	Rated Current	2.0 A
	Output Current Range	0.0 to 2.0 A
	Constant Voltage Precision	±2% max. (including input voltage and output load fluctuations)
	Battery	Battery for memory retention attachable
Flash Memory		12 MB (User area 7.5 MBytes)
SDRAM		32 MB
SRAM		2 MB: M registers, S registers, trace memory, alarm history (battery backup)
Motion Network		MECHATROLINK: 1 channel SERVOPACK and I/O for up to 21 stations connectable (SERVOPACK for up to 20 axes) Baud rate: 4 Mbps (MECHATROLINK-I) or 10 Mbps (MECHATROLINK-II)
Communication Function		Ethernet: 100BASE-TX/10BASE-T
Calendar		Seconds to year timer (Battery backup)
Connectors		POWER: Power supply connector M-I/II: MECHATROLINK connector Ethernet: Ethernet connector
Indicators		RDY(green), RUN(green), ALM(red), ERR(red), MTX(green), BAT(red), TRX(green), IP(green), LINK(yellow), 100M(green)
Switches		STOP, SUP, INIT, CNFG, MON, TEST, E-INIT, and E-TEST
Current Consumption		1A max.
Dimensions (mm)		120 × 130 × 108 (W × H × D)
Mass		450 g



- For the external 24V power supply, select a power supply which satisfies the specifications below as well as the rated current (not more than 1A):
  - Allowable output load capacity: 1200μF or more
  - Overcurrent detection is automatically restored by removing causes
- However, except that the primary side (AC side) of the external 24V power supply is turned ON/OFF.

Note: Recommended external 24V power supply: RTW24-2R2 (manufactured by TDK)

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4 Part Numbers

4.1 Component Model Numbers

System Components			
Type	Model	Part Number	Note
Controller Base	MP2300Siec	PMC-U-MP23S04	4 axis, no I/O module
		PMC-U-MP23S08	8 axis, no I/O module
		PMC-U-MP23S16	16 axis, no I/O module
		PMC-U-MP23S20	20 axis, no I/O module
		PMC-U-MP23S04L1	4 axis, LIO-01 module
		PMC-U-MP23S08L1	8 axis, LIO-01 module
		PMC-U-MP23S16L1	16 axis, LIO-01 module
		PMC-U-MP23S04L2	4 axis, LIO-02 module
		PMC-U-MP23S08L2	8 axis, LIO-02 module
		PMC-U-MP23S16L2	16 axis, LIO-02 module
	MP2310iec	PMC-U-MP23104	4 axis, no I/O module
		PMC-U-MP23108	8 axis, no I/O module
		PMC-U-MP23116	16 axis, no I/O module
		PMC-U-MP23120	20 axis, no I/O module
Accessories	Battery	JZSP-BA01	Replacement
	Panel Mounting Bracket	JEPMC-OP2300S-E	Only required for screw mounting
	DIN Rail Clips for MP2000iec	JEPMC-OP300	Set of 2 clips
	RLY OUT Connector	734-YE102	Replacement (MP2300Siec only)
	Power Supply Connector	721-203/026	Replacement
	MECHATROLINK Repeater	JEPMC-REP2000	NOTE: If using more than 16 nodes, a Yaskawa repeater must be used for the MECHATROLINK network to operate properly
I/O Option cards	AI-01 (Analog inputs)	JAPMC-AN2300	MP2300Siec: Select one local I/O module MP2310iec: Select up to 3 local I/O modules
	AO-01 (Analog outputs)	JAPMC-AN2310-E	
	DO-01 (Digital outputs)	JAPMC-DO2300	
	LIO-01 (16 in, 16 out, enc)	JAPMC-IO2300	
	LIO-02 (16 in, 16 out, enc)	JAPMC-IO2301	
	LIO-04 (32 in, 32 out)	JAPMC-IO2303	
	LIO-05 (32 in, 32 out)	JAPMC-IO2304	
	LIO-06 (Multi-function card)	JAPMC-IO2305-E	
Other I/O	IO2310/IO2330 (64 Point I/O Module)	JEPMC-IO2310 JEPMC-IO2330	IO2310: Sinking Output Type IO2330: Sourcing Output Type
Ethernet Cable		N/A	Use common shielded ethernet cable

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System Components			
Type	Model	Part Number	Note
Option Card Cables (Pigtail)	AI-01	JEPMC-W6080-xx	xx denotes length: A5: 0.5 meter 01: 1.0 meter 03: 3.0 meter
	AO-01	JEPMC-W6090-xx	
	LIO-01 / LIO-02	JEPMC-W2061-xx	
	LIO-04 / LIO-05 / DO-01	JEPMC-W6060-xx	
	LIO-06	JEPMC-W2064-xx-E	
Terminal Block Kits	LIO-01 / LIO-02	CBK-U-MP2A-xx	xx denotes length A5: 0.5 meter 01: 1.0 meter 03: 3.0 meter
	LIO-04 / LIO-05 / LIO-06	CBK-U-MP2B-xx	
	IO2310/IO2330 (64 Point I/O Module)	CBK-U-MP2C-xx	
MECHATROLINK-II Cables	Network cable with connector at both ends	JEPMC-W6002-xx	xx denotes length: 0.5 meter 1.0 meter 3.0 meter 5.0 meter 10.0 meter 20.0 meter 30.0 meter 40.0 meter 50.0 meter
	Network cable with connector at both ends, including ferrite core	JEPMC-W6003-xx	
	Network Termination Resistor	JEPMC-W6022	Resistor built into connector plug
Software	MotionWorks IEC Express	PDE-U-IE□Sx	□ denotes MotionWorks IEC Version C = 1 2 = 2 x denotes number of software licenses A = 1 B = 5 C = 10
	MotionWorks IEC Pro	PDE-U-IE□Px	
	OPC Server	PDE-U-OPCPx	x denotes number of software licenses A = 1 B = 5 C = 10 D = 20

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5 Mounting

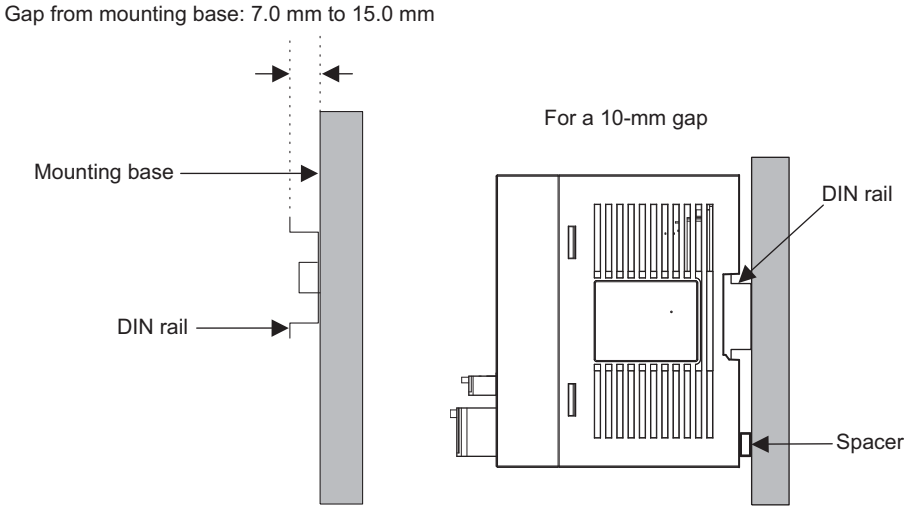
There are two methods for mounting the controller.

- DIN rail (standard method for MP2300Siec)
- Screw mount (standard method for MP2310iec)

5.1 DIN Rail Method

5.1.1 DIN Rails and Spacer

Several types of DIN rails are available: with 7mm to 15mm gap from the mounting base as shown in the following diagram. If mounting a MP23□ □ □ iec using DIN rail with 10 mm gap, install a spacer on the rear of the MP23□ □ □ iec near the bottom to protect the MP23□ □ □ iec from vibration and shock.



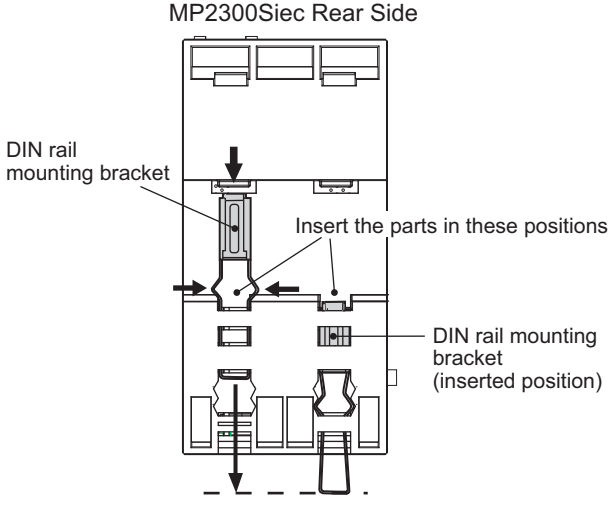
DIN rail clips may be ordered for mounting the MP2310iec (see page 18)

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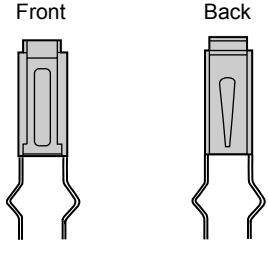
5.1.2 Procedure for Mounting to DIN Rail

Use the following procedure to attach the DIN rail mounting parts to the MP23□ □ □ iec and then mount the MP23□ □ □ iec to the DIN rail.

1. Insert the DIN rails to the dotted line in the two slots on the rear of the MP23□ □ □ iec as shown in the following figure.

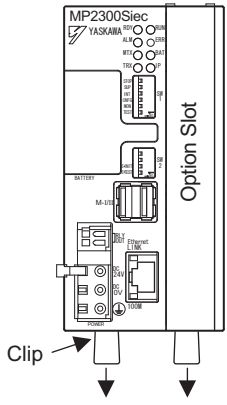


- The following figure shows the front and back of a mounting clip. Insert each clip so that its front faces outward.



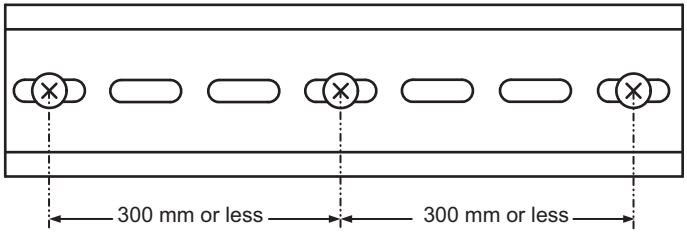
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2. Pull the DIN rail mounting clips down to release them.

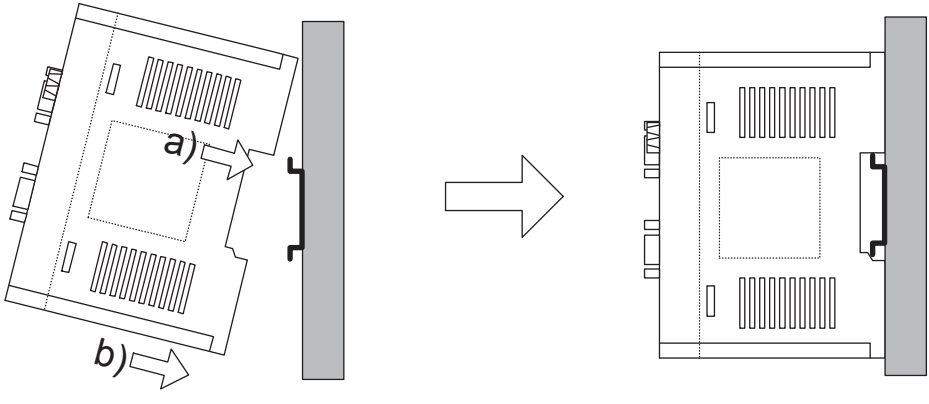


■ Mounting the DIN rail

Make sure to fix a DIN rail at 300mm or less pitch as shown in the figure below.

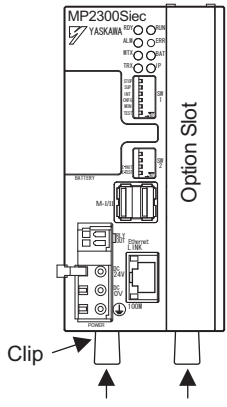


3. Hook the MP23□ □ □ iec to the top of the DIN rail (a), and then push it towards the mounting base to secure it in place (b).

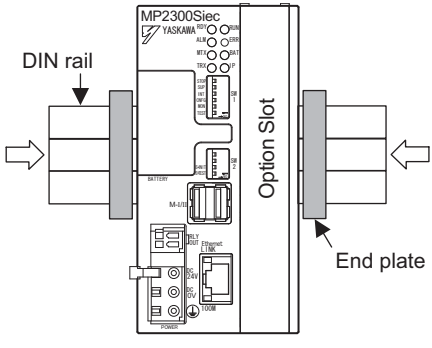


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4. Push the DIN rail mounting clips to lock them in place.



5. Place end plates on both sides of the MP23□ □ □ iec to secure it to the DIN rail.



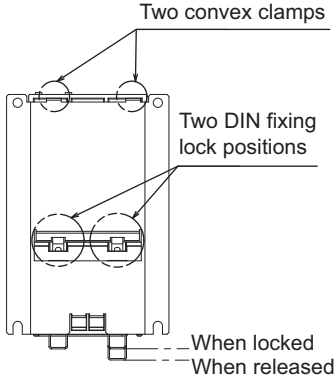
This completes the installation procedure.

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5.1.3 Screw Mount Method

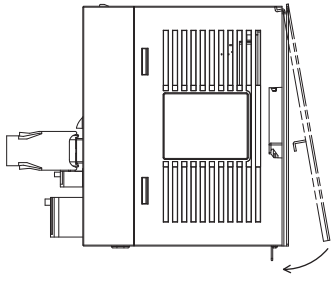
Use a panel mounting bracket (JEPMC-OP2300S-E) using the following procedure to mount an MP23□ □ □ iec on the panel. This adapter is only required if screw mounting an MP2300Siec.

1. Release DIN fixing locks (two) at the center of the panel mounting clamp.



Attachment for mounting bracket

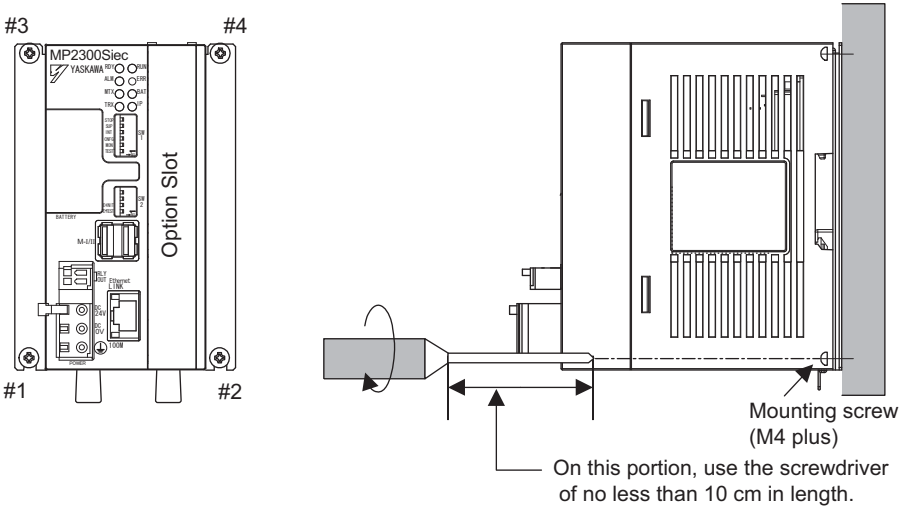
2. Insert two convex portions at the top of the panel mounting clamp into holes of the controller chassis.



3. Push the clamp as indicated by an arrow above onto the controller chassis and use the DIN fixing locks to secure the mounting clamp.

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4. Push the MP2300Siec mounted clamp onto the mounting plate as shown in the figure below, and use four mounting screws to firmly secure the clamp.



Note: Vertically mount as shown.

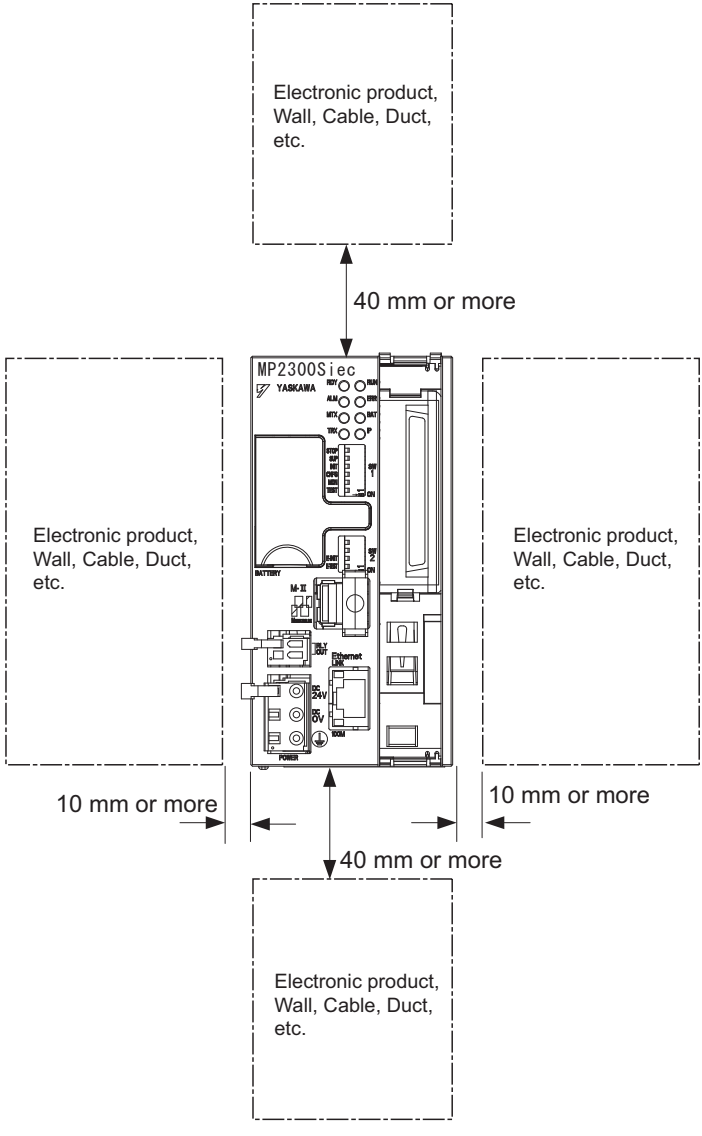
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5.1.4 Space Required for Mounting MP23□ □ □ iec

Install MP23□ □ □ iec so that enough space is left around it as shown in the figure below:

■ Mount condition

- Vertical direction: 40 mm or more
- Horizontal direction: 10 mm or more
- Ambient Temperature: 55°C or less.



5.1.5 Replacing and Adding Option Modules

Preparations

1. Turn OFF the MP23□ □ □ iec Power Supply

2. Remove the MP23□ □ □ iec

   Disconnect all cables from the MP2300Siec. Then remove the MP2300Siec from the panel or rack and place on a workbench or other area with sufficient space.

Removing Option Modules

1. Remove the battery cover.

   Pull the notch on the side of the MP23□ □ □ iec towards you to remove the battery cover.

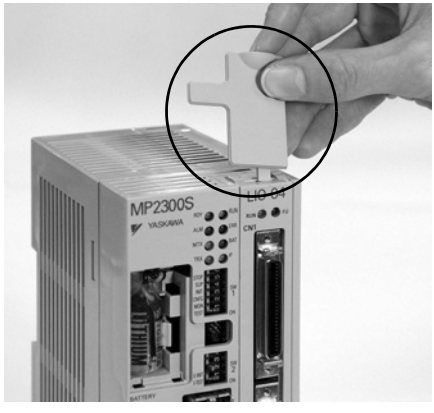


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2. Remove the Option Module Cover

Insert the protruding part of the battery cover into the slot on top of the panel of the Option Module to unhook, as shown in the diagram. Face the front of the battery cover towards you for this operation.

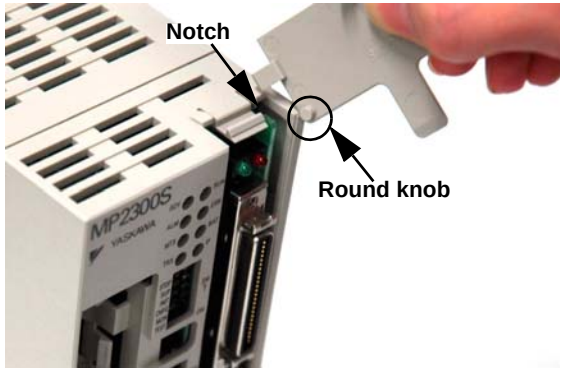
- Remove the front cover from the empty slot before mounting an Option Module in an empty slot.



Unhook the bottom in the same way.

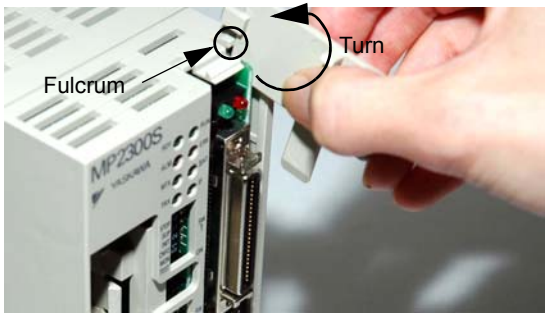
3. Remove the Option Module from the mounting base.

Remove the top panel of the option module by pulling it towards you. A notch on the Option Module will be visible from the gap in the cover. Hook the **round knob** on the battery cover into the **notch** in the Option Module.



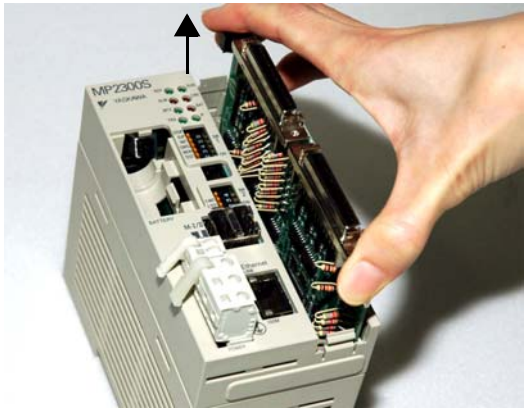
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Hold the center of the battery cover as shown in the following diagram. Push the battery cover down and out, rotating from the round knob to disconnect the Module and mounting base connectors, and then pull the Option Module forward.



4. Pull out the Option Module

Hold the Module on the top and bottom and pull it out straight. Hold the edges of the Module and avoid touching the parts on the Module.



Store the removed Module into the bag that was supplied with it.

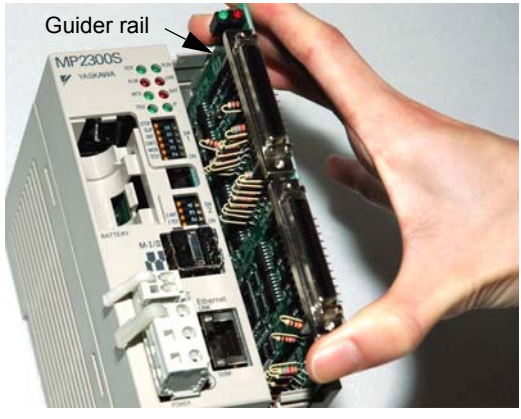
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5.1.6 Installing Option Modules

1. Insert Option Modules

Hold the top and bottom of the Module to be installed, line up the Module on the left-side guide rail inside the Option Slot, and then insert it straight.

- The FG bar on the inside bottom of the Unit Case may be damaged if the Module is not inserted straight.



2. Mount on to the mounting base

Once the Option Module has been completely inserted, place your hand on the front face of the Option Module and push hard until the Option Module has been inserted into the mounting base connectors. The front face of the Option Module and the hook will be aligned when the Option Module has been installed properly.

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3. Install the panel of the Option Module

Place the hole on the bottom of the panel of the Option Module onto the hook on the bottom of the MP23□ □ □ iec. Next, hook the hole at the top of the panel of the Option Module onto the hook at the top of the MP23□ □ □ iec.



This completes the Option Module mounting procedure.

If the option slot is not used, attach the optional cover (model: JEPMC-OP2300).

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6 EStop (RLY OUT) - MP2300Siec only

6.1 RLY OUT Connector Details

The RLY OUT connector is a terminal for outputting state and NO contact relay output. A circuit between terminals is closed when RDY LED is lit, and opens when it is unlit.

- A state when RDY LED is lit indicates that a controller is operating normally. It does not indicate that a user program is running.

RLY OUT Connector Specifications and Pin Array

The following table provides the RLY OUT connector specifications.

Name	Connector Name	Number of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
RLY OUT	RLY OUT	2	734-162	734-YE102	Wago Corporation

The following table shows the RLY OUT connector pin array.



Pin Number	Signal Name	Description
1	OUT	• Operating normally: Closed • Error occurred: Opened
2	OUT	

The following table provides the RLY OUT connector contact ratings.

Input Voltage	Current Capacity
24VDC	0.5A (resistance load) 0.25A (induced load)
125VAC	0.4A (resistance load) 0.2A (induced load)

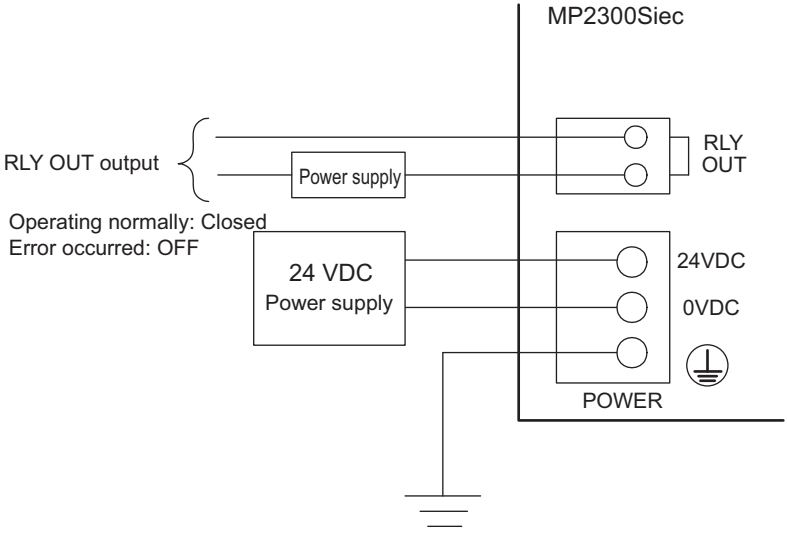
RLY OUT Connection Cable

For the RLY OUT connection cable, use a cable of line size AWG28 to AWG14 (0.08 mm^2 to 1.5 mm^2), maximum sheath diameter of 3.4 mm. The RLY OUT connector cable is similar in manufacture to the 24VDC power supply cable.

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RLY OUT Connection Example

The following figure shows how to connect the RLY OUT connector:



Ground resistance: 100 Ω or less

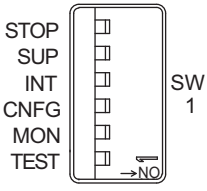
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7 DIP Switches

7.1 Switch Settings

The DIP switch settings are only needed when the power is initially turned ON.

7.1.1 SW1



Switch	Name	Setting	Operating Mode	Default	Details
S1-6	STOP	ON	User program stopped	OFF	Stops the user program execution.
		OFF	User program running		
S1-5	SUP	ON	Firmware Load	OFF	If set to ON, the controller boots up in the mode that can upgrade the firmare. See Section 17.
		OFF	Normal Operation		
S1-4	INIT	ON	For diagnostic purposes only	OFF	Always set to OFF.
		OFF	For diagnostic purposes only		
S1-3	CNFG	ON	Self-configuration Mode	OFF	Set to ON to execute self-configuration for connected devices and option card.
		OFF	Normal Operation		
S1-2	MON	ON	Network Boot	OFF	Always leave set to OFF.
		OFF	ROM Boot		
S1-1	TEST	ON	System Use	OFF	Always leave set to OFF.
		OFF	Normal Operation		

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7.1.2 SW2

Sets the Ethernet port condition and other operating conditions.
The switch setting is read only when the module is first turned ON.



Switch	Switch Name	State	Operation Mode	Default	Description
S2-4	–	ON	Reserved	OFF	Reserved for future use
		OFF			
S2-3	–	ON	Reserved	OFF	Reserved for future use
		OFF			
S2-2	E-INIT	ON	Initialize Transition Parameters for Ethernet	OFF	When ON, transmission parameters such as an IP address are set to default at startup (192.168.1.1.).
		OFF	Normal Operation		
S2-1	E-TEST	ON	Ethernet TEST	OFF	For self-diagnosis of Ethernet
		OFF	Normal Operation		

- If the E-INIT switch is in the “ON” position when the controller is powered up, the IP address of the controller will be 192.168.1.1. If the switch is in the “OFF” position at power on, then the IP address defined in the system configuration setup will be in effect.

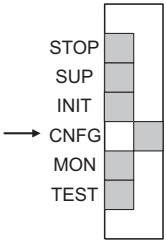
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8 Self-Configuration

8.1 DIP Switch

8.1.1 Self-configuration after Adding Devices such as Servopacks

By performing the following operation, a definition for devices detected on the MECHATROLINK-II network is created. Before performing the operation, turn ON the power supply for each network node.



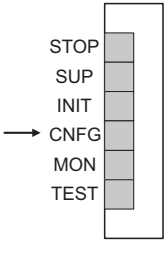
1. Turn OFF the power supply
   Turn OFF the 24 VDC power supply of the MP23□□□iec.

2. Set DIP Switches
   Turn ON CNFG in the DIP switch (SW1) of the MP23□□□iec.

3. Turn ON the power supply
   Turn ON the 24 VDC power supply of the MP23□□□iec.

4. Check the LED Indicators
   Check that LED display of the MP23□□□iec basic module is changed as follows:





5. DIP switch resetting
   Turn the CNFG DIP switch (SW1) of the MP23□□□iec to OFF.

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8.1.2 MotionWorks IEC

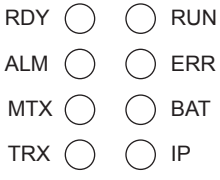
The MotionWorks IEC (Express or Pro) configuration can detect the new configuration and provide the user with configuration choices.

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9 LED Outputs

9.1 Indicators

The following table shows the indicators that show the operating status of the controller and error information.

	Indicator	Color	Status
	RDY	Green	Lit during normal operation.
	RUN	Green	Lit during execution of user program.
	ALM	Red	Lit/blinking when warning occurs.
	ERR	Red	Lit/blinking when malfunction occurs.
	MTX	Green	Lit when transmitting MECHATROLINK-II data.
	BAT	Red	Lit during battery alarm.
	TRX	Green	Lit when transmitting or receiving Ethernet data.
	IP	Green	Lit when an IP address setting is completed.

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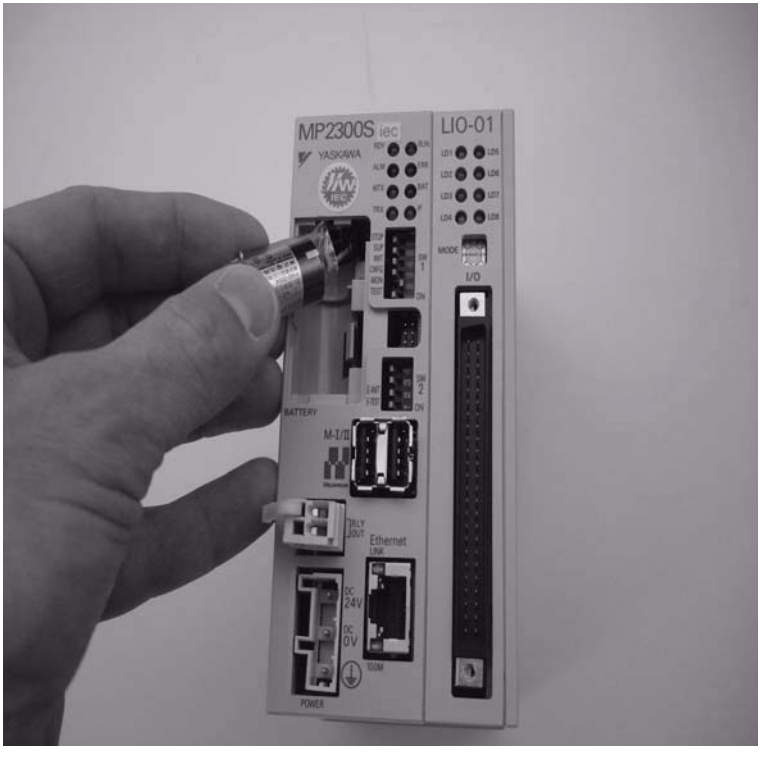
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10 Battery

10.1 Battery Installation

A 3.6V lithium battery must be installed as shown below prior to initial power ON. The battery is necessary for preserving select SRAM settings in the event of power loss, etc. This battery preserves all “Retain” variables and axis position offsets stored when using the MC_SetPosition function blocks with absolute encoders.



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11 MECHATROLINK-II

11.1 MECHATROLINK-II Connectors

The MECHATROLINK-II connector connects the MP23□□□iec and the slave nodes via the MECHATROLINK-II cables.

11.1.1 Specifications and Pin Arrangement

Name	# of Pins	Connector Model Module	Cable
MECHATROLINK-II Connector (M-II)	8	DUSB-ARB82-T11A-FA	DUSB-APA42-B1-C50

M-I/II

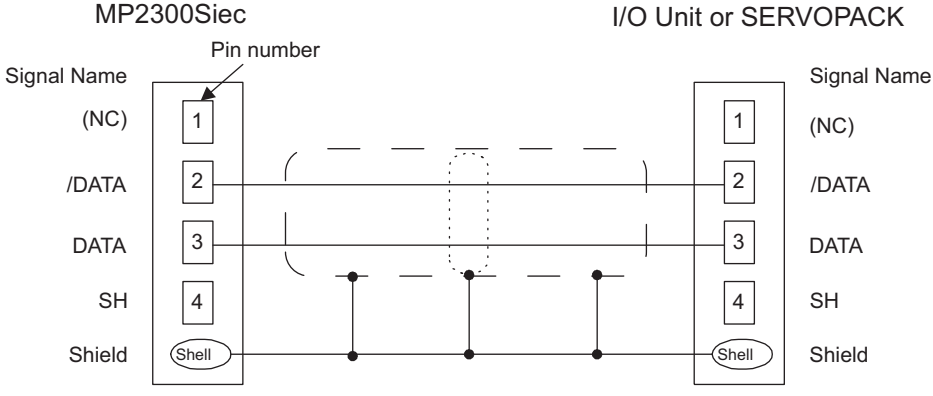


Pin	Signal Name	Description	Pin	Signal Name	Description
A1	–	–	B1	–	–
A2	SRD–	Signal –	B2	SRD–	Signal –
A3	SRD+	Signal +	B3	SRD+	Signal +
A4	SLD	Shield	B4	SLD	Shield

Note: The MP2310iec only has one MECHATROLINK-II connector and includes a built-in network terminator

11.1.2 Cable Connections between the MP23□□□iec, I/O Units or Servopacks

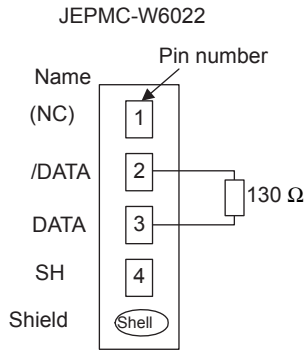
Use the MECHATROLINK-II cable JEPMC-W6002-□□ or JEPMC-W6003-□□ with a ferrite core for connection between the MP23□□□iec and I/O units or Servopacks.



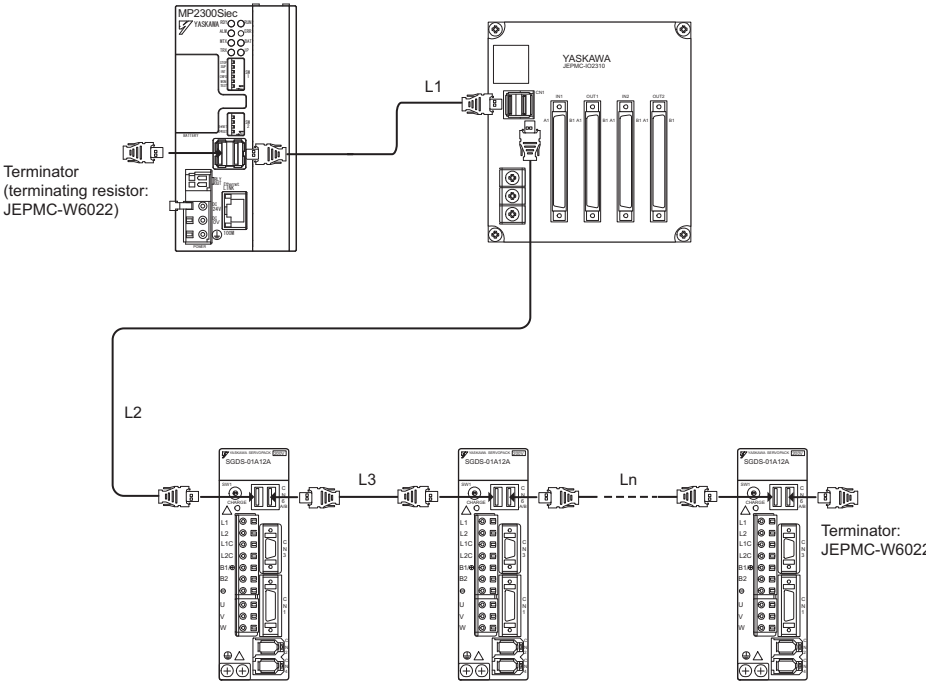
Standard model: JEPMC-W6002-□□ and JEPMC-W6003-□□

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11.1.3 Terminator Connections



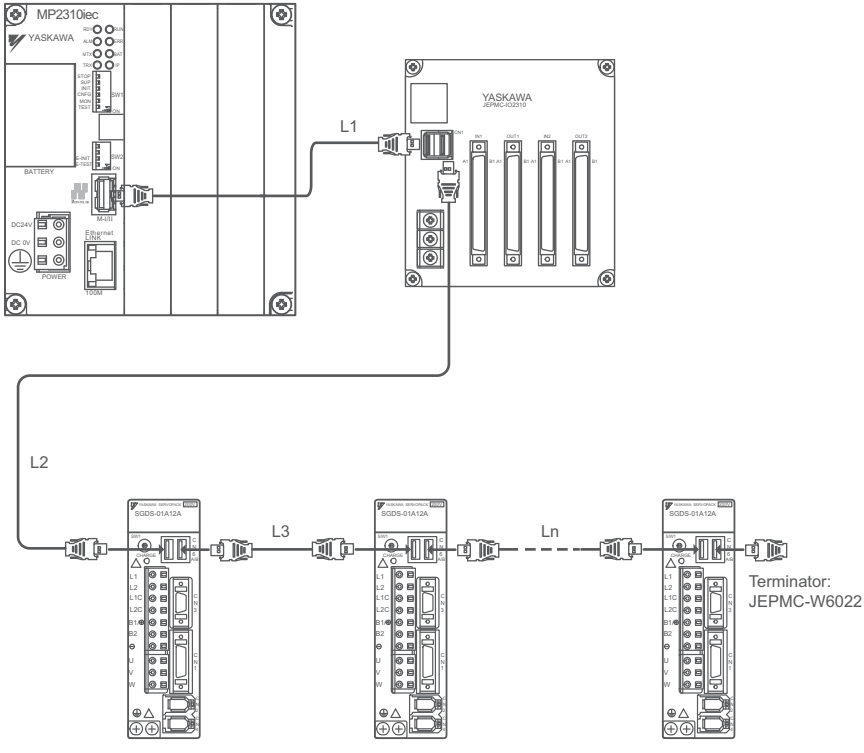
11.1.4 Connection Example between MP2300Siec, SERVOPACK, and IO2310



- Use MECHATROLINK-II cables between modules.
- Use under the conditions where L1 + L2 + L3 + . . . + Ln ≤ 50 m

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11.1.5 Connection Example between MP2310iec, SERVOPACK, and IO2310



- Use MECHATROLINK-II cables between modules.
- Use under the conditions where L1 + L2 + L3 + . . . + Ln ≤ 50 m

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11.2 MECHATROLINK Repeater

11.2.1 Overview

The JEPMC-REP2000 (hereinafter referred to as REP2000 or Repeater) is a repeater for MECHATROLINK-II transmission system and serves as a module to extend the distance of MECHATROLINK-II network and increasethe number of connectable slave stations.

The REP2000 has two MECHATROLINK-II connection ports: One port to connect to the terminal of Masterside network, and the other to connect to the terminal of the extended network. These two ports are functionally identical. A terminator is built in each port.

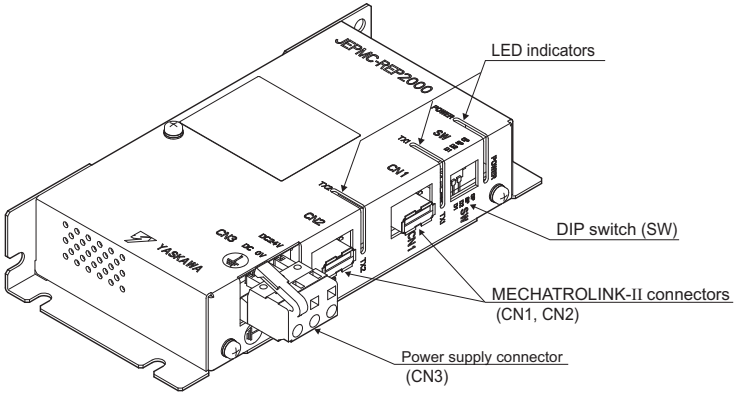
The internal circuit of REP2000 eliminates receive signal waveform deformation caused by radiation and noise on the transmission route.

The REP2000 has three LED indicators to indicate the status: Power-ON, CN1 busy, and CN2 busy.

A +24 VDC power supply is required for operation.

11.2.2 External View and Components

The external view and components of REP2000 are shown below:



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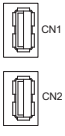
1. LED Indicators

The following LED indicators indicate the REP2000 status.

LED Location		Name	Indicator Color	Meaning When Lit
Front Surface (The surface with the nameplate)	Right Side			
		POWER	Green	Power ON
		TX1	Green	CN1 busy (in transmitting data)
		TX2	Green	CN2 busy (in transmitting data)

2. MECHATROLINK-II Connectors CN1 and CN2

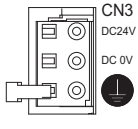
The Master-side MECHATROLINK-II network and the extended line of MECHATROLINK-II network are connected via MECHATROLINK-II connection port connectors CN1 and CN2 on the REP2000..



Pin No.	Signal Name	Description
1	(NC)	Disconnected
2	/S	MECHATROLINK-II
3	S	MECHATROLINK-II
4	FG	Frame ground

3. Power Supply Connector

Connect an external +24 VDC power supply to the power supply connector.



Pin No.	Signal Name	Description
1	FG	Frame ground
2	024V	0 VDC input
3	+24V	24 VDC input

4. DIP Switch

The DIP switch is for future use. All pins should be set to OFF..



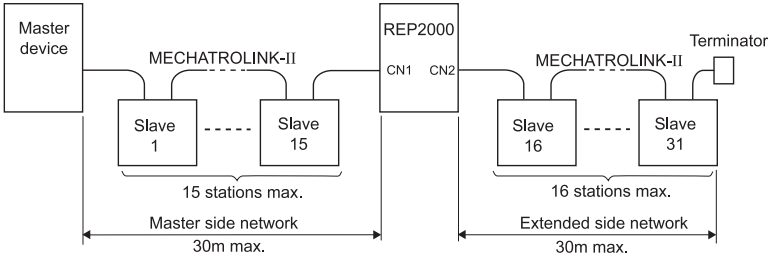
OP	Function	SP	Function	D2	D1	Function
OFF	None (Factory setting)	OFF	None (Factory setting)	OFF	OFF	None (Factory setting)
ON	None	ON	None	OFF	ON	None
				ON	OFF	None
				ON	ON	None

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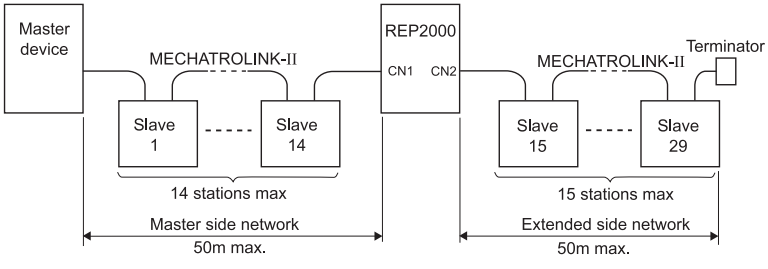
11.2.3 System Configuration Example

The figure below shows the configuration example of MECHATROLINK-II network system with a REP2000.

1. For 30m Maximum Extension of Network Distance .



2. For 50m Maximum Extension of Network Distance .



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11.2.4 Specifications

General Specifications

The table below shows the general specifications of REP2000..

Item		Specifications
Environmental Conditions	Ambient Operating Temperature	0 to +55°C
	Storage Temperature	-25 to +85°C
	Ambient Operating Humidity	30 to 95% RH (without condensation)
	Storage Humidity	5 to 95% RH (without condensation)
	Pollution Level	Conforming to JIS B3501 (Pollution level 1)
	Corrosive Gas	Not subjected to inflammable or corrosive gas
	Operating Altitude	2,000m max. above sea level
Mechanical Operating Conditions	Vibration Resistance	Conforming to JIS B3502 Vibration amplitude at acceleration: $10 \leq f < 57$ Hz with half-amplitude of 0.075 mm $57 \leq f \leq 150$ Hz at constant acceleration of 9.8 m/s^2 10 sweeps in the X, Y, and Z directions (sweep time: 1 octave/min.)
	Shock Resistance	Conforming to JIS B3502 Peak acceleration of 147 m/s^2 twice for 11 ms in the X, Y, and Z directions
Electrical Operating Conditions	Noise Resistance	Conforming to EN 61000-6-2 and EN 55011 (Group1 ClassA) Power supply noise (FT noise): 2 kV or more for 1 min. Radiation noise (FT noise): 1 kV or more for 1 min. Ground noise (Impulse noise): 1 kV or more for 10 min. Static electricity noise (Contact radiation): 4 kV or more 10 times
Installation Requirements	Grounding	Ground to 100 Ω or less
	Cooling Method	Natural cooling

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Hardware Specifications

The table below shows the hardware specifications of REP2000..

Item		Specifications
Name		REP2000 Repeater
Model Number		JEPMC-REP2000
Communication board	Applicable Communication Protocol	MECHATROLINK-II (10 Mbps)
	Number of MECHATROLINK Ports	2 (CN1 and CN2) Connect either CN1 or CN2 to the Master-side network, and the other to the extended network.
	Master-side Port	Connect to the Master-side network No. of connectable slave stations for Master-side network: 15 stations for the network distance of 30m max. 14 stations for the network distance of 50m max. Refer to *Maximum Number of Slave Stations* of *11.2.5 Restrictions* for details
	Extended-network-side Port	Connect to the extended network No. of connectable slave stations for extended network: 16 stations for the network distance of 30m max. 15 stations for the network distance of 50m max. Refer to *Maximum Number of Slave Stations* of *11.2.5 Restrictions* for details
	Arbiter	First request for higher priority. CN1 has a priority at simultaneous requests
	Terminator	One (130 Ω) for each port
Indicator Lamps (LED)	Status Indication	3 LED indicator lamps POWER (green): Power ON TX1 (green): CN1 busy (in transmitting data) TX2 (green): CN2 busy (in transmitting data)
Others	Mounting Orientation	Vertical or horizontal (The nameplate upward)
	Required External Power Supply	+24 VDC (+19.2 to +28.8V), 100 mA
	Dimensions in mm	30× 160× 77 (W× H × D)
	Mass	0.4 kg

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11.2.5 Application

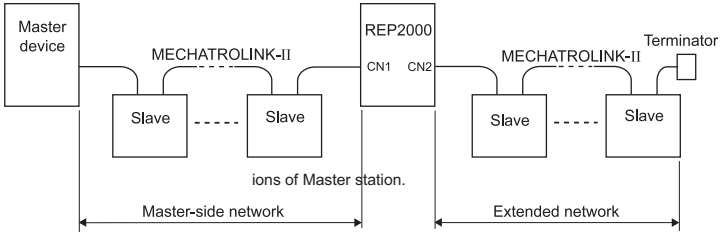
1. Restrictions

Maximum Number of Slave Stations

The number of connectable stave stations in the Master-side network or the extended network is limited by the MECHATROLINK-II cable length as shown in the table below..

Classification	Cable Length	Number of Slave Stations
Master-side Network *1	30m max.	15 stations max.
	50m max.	14 stations max.
Extended-side Network *2	30m max.	16 stations max.
	50m max.	15 stations max.

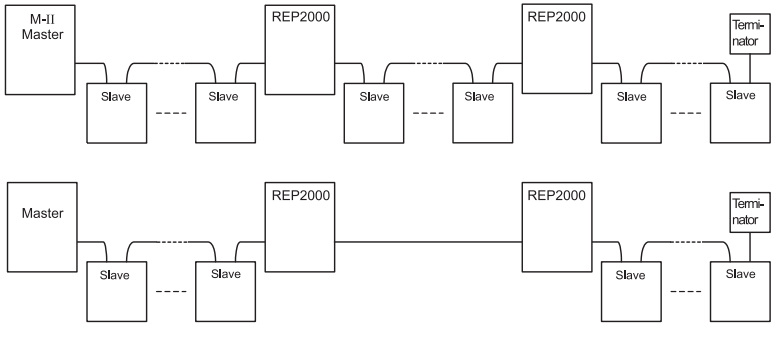
* 1. The number of connectable slave stations (16 stations for 30m cable length, 15 stations for 50m cable length) includes a REP2000 as a REP2000 applies load for one station.
* 2. Install a terminator on the slave station that is the terminal of the extended network.



Note: 1. Total number of slave stations in a whole network depends on the specifications of Master station.
2. The REP2000 is not included in the total number of slave stations specified in the specifications of Master station.
3. The minimum distance between stations is 0.5m no matter whether a REP2000 is connected or not.

Prohibited Use of Multiple Repeaters

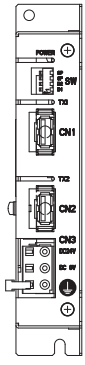
More than one REP2000 cannot be connected in a network. The figure below shows the network examples that must not be designed..



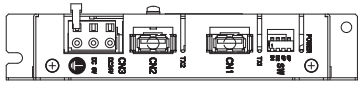
Mounting Orientation

Recommended Mounting Orientation..

The REP2000 can be mounted either vertically or horizontally (with the nameplate upward).



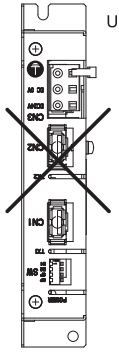
Vertical mounting



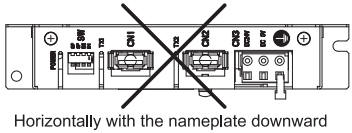
Horizontal mounting with the nameplate upward

Prohibited Mounting Orientation..

Do not mount the REP2000 up-side-down or horizontally with the nameplate downward.



Up-side-down



Horizontally with the nameplate downward

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2. Operation

Connection to MECHATROLINK

Connect either CN1 or CN2 to the Master-side network, and the other to the extended network.

Arbiter

Two ports CN1 and CN2 are normally in the status ready to receive data. The port that starts receiving data firstbecomes the data receiving port, and the other becomes the data transmitting port.

Two ports return to the status ready to receive data after having completed receiving or transmitting data. With the MECHATROLINK-II protocol, the Master station and a slave station transmit data alternately, there will be no conflict of receiving data between two ports.

LED Indicators for Transmission Status

The LED indicator TX1 or TX2 lights when the port CN1 or CN2 is transmitting data respectively: TX2 lights when CN1 is the data receiving port and CN2 is the data transmitting. TX1 lights when CN1 is the data transmitting port and CN2 is the data receiving port. However, data are frequently received and transmitted in a short cycle, you can see both indicators as if they were lit simultaneously. The Master-side LED lights normally darker than the other. It is because the extended side LED lights when either the Master or a Master-side slave station is transmitting data while the Master-side LED lights when an extended side slave is transmitting data. Accordingly, the Master-side LED lights more brightly as the number of extended-side slave stations increases.

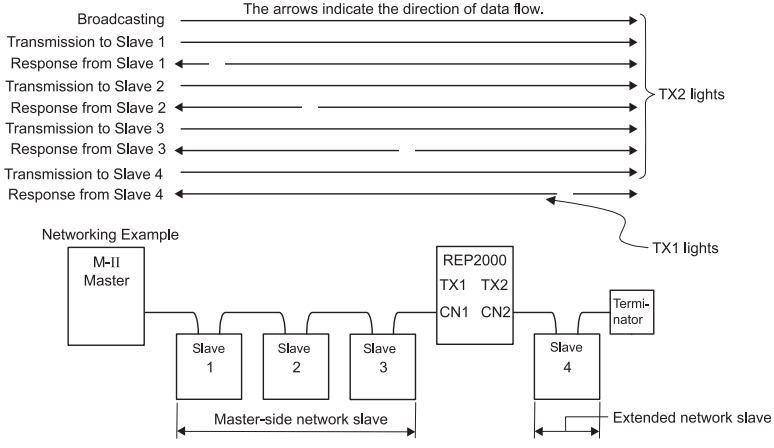
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11.2.5 Application

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- Operation Example of LED Indicators

  In this example, CN1 is connected to the Master-side network.



1. TX2 lights when the MECHATROLINK-II Master station is transmitting data.
2. TX2 lights also when receiving response from Slave 1, 2, or 3.
   Because the signals sent from Slave 1, 2, and 3 are the CN1 receiving signals for the REP2000.
3. When Slave 4 returns a response, TX1 lights.
   As a result, TX2 lights 8 times while TX1 lights once in 1 transmission cycle.

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12 Ethernet

12.1 Ethernet Connector Details

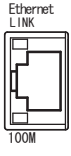
Connects to a personal computer or HMI device by Ethernet (100Base-TX/10Base-T).

12.1.1 Ethernet Connector Specification and Pin Array/ Indicator Light

The following table provides the Ethernet connector specifications.

Connector Name	Number of Pins	Connector Model		
		Module Side	Cable Side	Manufacturer
Ethernet	8	RJ-45 CAT5 Socket	RJ-45 CAT5 Plug	Pulse Engineering

The following table provides Ethernet connector pin array / indicator light details.



Pin Number	Signal Name	Description
1	TXD+	Transmitted data + side
2	TXD-	Transmitted data – side
3	RXD+	Received data + side
4	–	–
5	–	–
6	RXD-	Received data – side
7	–	–
8	–	–

Display Name	Display Color	Description
LINK	Yellow	Lit: Connect Unlit: Unconnected
100M	Green	Lit: Connected at 100Mbps, or automatically negotiating Unlit: Connected at 10Mbps

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12.1.2 Ethernet Cable

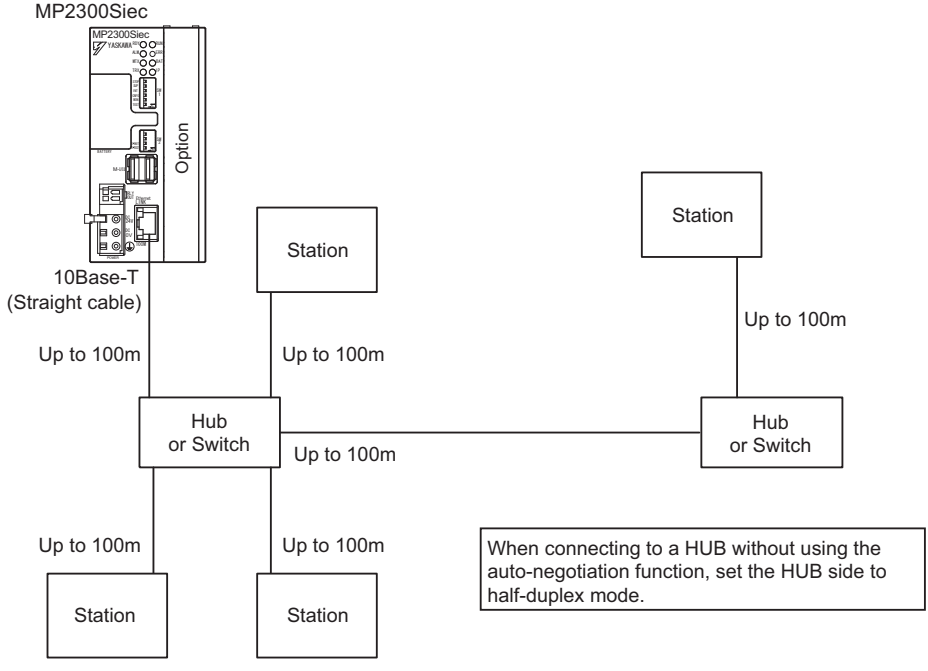
For the Ethernet cable, use a twisted pair cable with RJ-45 connector. Yaskawa strongly recommends the use of shielded ethernet cables.

Ethernet Type	Category	Remarks
10Base-T	Category 3 or more	• When connecting to remote equipment through a hub: Straight cable • When connecting to remote equipment without using a hub: Cross cable
100Base-T	Category 5 or more	

12.1.3 Ethernet Connection Examples

The following are examples of Ethernet network connections via 10Base-Tx cable:

Connection Example 1 (When using a repeater HUB)



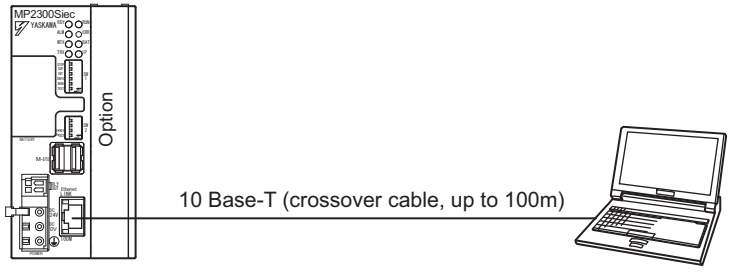
Specification

Item	When Connecting to a Repeater HUB	When Connecting to a Switching HUB
Cable Length between Node-HUB	100m or less	100 m or less
Cable Length between HUBs	100m or less	100 m or less
Number of HUBs between Nodes	Up to four	Unlimited

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Connection Example 2

MP23□□□iec



The following are examples of Ethernet network connections via 100Base-Tx cable:

■ Caution

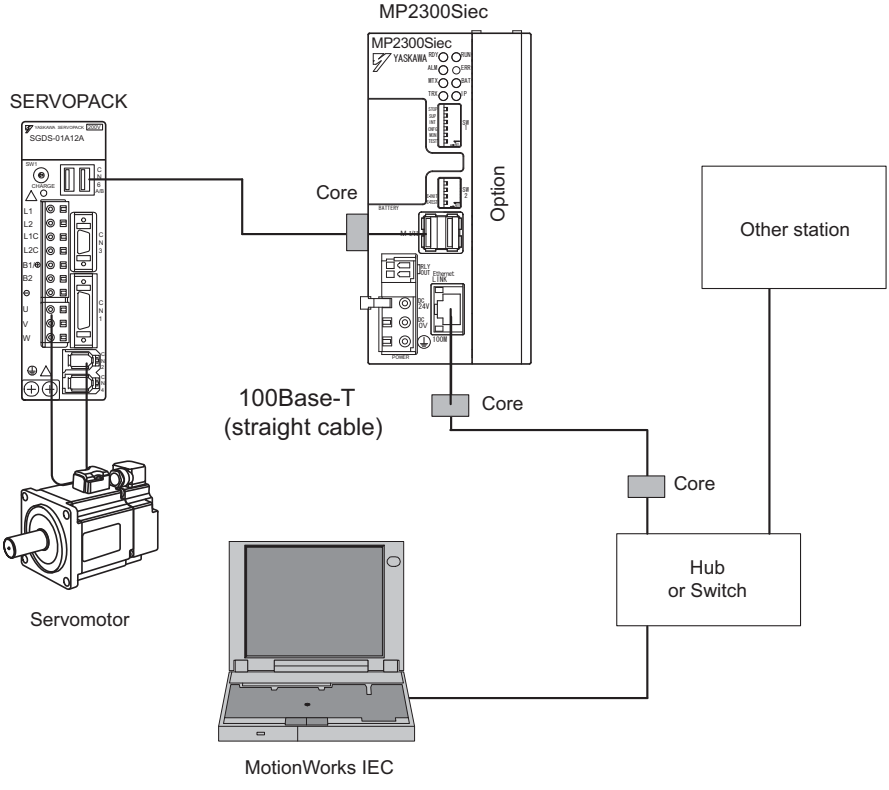
High frequency wave noise from other devices in the installation environment may cause errors in communications using Ethernet or MECHATROLINK-II connections. When designing a system, use protective measures to avoid the influence of high frequency wave noise as follows:

1. Wiring
   Wire Ethernet or MECHATROLINK-II cables so that they are well-separated from other cable systems such as the main circuit or power lines.
2. Communication system (Ethernet)
   - Communicate data to a remote device through TCP/IP communication.
   - If necessary, increase the number of communication retries.
   - Yaskawa strongly recommends shielded Ethernet cables.
3. Attach a ferrite core.
   Ethernet: Attach it to the communication port side and the external equipment side of the MP23□ □ □ iec unit.

* MECHATROLINK-II: Attach it only to the communication port side of the MP23□ □ □ iec unit.

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12.1.3 Ethernet Connection Examples



Note: Recommended ferrite core

Model	Manufacturer
E04SR301334	Seiwa Electric Mfg. Co., Ltd

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13 MECHATROLINK-II Devices

13.1 Devices Connectable via MECHATROLINK-II

The devices that are compatible with MECHATROLINK-II and can be connected to the controller are listed below. The MP2300Siec supports devices with 10MB/sec communication speed only.

13.1.1 Servopacks

The following table shows Servopacks that are compatible with MECHATROLINK-II and can be connected to the controller.

Model	Details
SGDH-□□□E JUSP-NS115	Sigma II Series SGDH Servo amplifiers with NS115 MECHATROLINK-II Interface Unit
SGDS-□□□1□□	Sigma III Series AC Servo amplifiers
SGDV-□□□□-1□□	Σ–V Series AC Servo amplifiers

13.1.2 I/O Modules

The following table shows the module that is compatible with MECHATROLINK-II and can be connected to the controller.

Model	Details
JEPMC-IO2310	64-point I/O Module 24VDC, 64 inputs, 64 outputs

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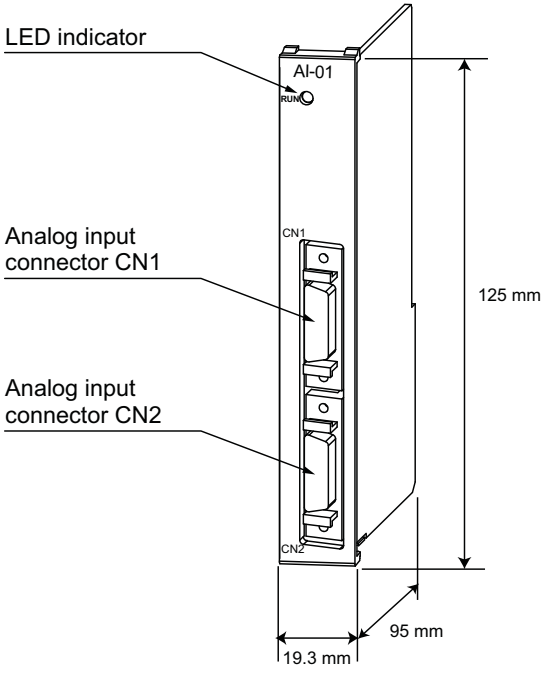
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14 Option Cards

14.1 AI-01 (Analog Input) Module

14.1.1 Appearance



14.1.2 Module Functions

The AI–01 module is an analog input module with voltage and/or current input modes.

14.1.3 Module Specifications

The following table shows the AI-01 Module hardware specifications.

Item			Specifications		
Classification			I/O Module		
Name			AI-01		
Model			JAPMC-AN2300		
Analog Input	Analog Input Range		−10 to +10V	0 to +10V	0 to 20 mA
	Number of Channels		8 ((4/ connector)×2)		
	Number of Channels to be Used		Any number from 1 to 8		
	Isolation		Between channels: Not isolated. Between input connector and system power supply: Photocoupler isolation		
	Max. Rated Input		±15V		±30 mA
	Input Impedance		20 kΩ		250 kΩ
	Resolution		16-bit (−31276 to +31276)		15-bit (0 to +31276)
	Absolute Accuracy		100 mV Max		0.3 mA Max
	Accuracy	25°C	±0.1% (±10 mV)		±0.1% (±0.02 mA)
		0 to 55°C	±0.3% (±30 mV)		±0.3% (±0.06 mA)
	Input Conversion Time		1.4 msec Max		
Connectors			CN1: Input connector CN2: Input connector		
LED Indicator			RUN (green)		
Current Consumption			500 mA Max		
Dimensions			125×95 (H×D)		
Mass			100 g		

14.1.4 LED Indicator



Indicator	Indicator Color	Status when Lit	Status when not Lit
RUN	Green	Normal operation	Operation stopped (no access from CPU)

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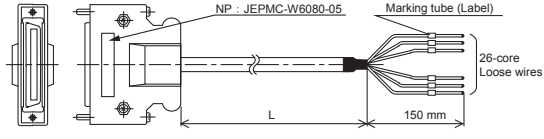
14.1.5 Connector Specifications



Connector Name	# of Pins	Connector Model		
		Module Side	Cable Side	Manufacturer
CN1/CN2	26	10226-52A3PL	• Connector 10126-3000VE • Shell 10326-52A0-008 (Screw locking), or 10326-52F0-008 (One-touch locking)	Sumitomo 3M Corporation

Applicable Cable: JEPMC-W6080-☐☐

14.1.6 Standard Cable Model and External Appearance

Model	Length	External Appearance (JEPMC-W6080-☐☐)
JEPMC-W6080-05	0.5 m	
JEPMC-W6080-10	1.0 m	
JEPMC-W6080-30	3.0 m	

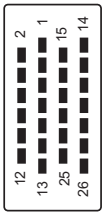
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14.1.7 Connector Pin Arrangement

The AI-01 Module Connector (CN1/CN2) pin arrangement is shown below.

CN1 Connector Pin Arrangement

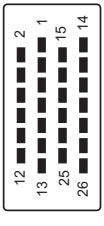
Pin Arrangement Viewed from Wiring Side



2	G1	1	V1	15	G1	14	MDP1
4	V2	3	A1	17	MDP2	16	MDN1
6	A2	5	G2	19	MDN2	18	G2
8	G3	7	V3	21	G3	20	MDP3
10	V4	9	A3	23	MDP4	22	MDN3
12	A4	11	G4	25	MDN4	24	G4
		13				26	

CN2 Connector Pin Arrangement

Pin Arrangement Viewed from Wiring Side



2	G5	1	V5	15	G5	14	MDP5
4	V6	3	A5	17	MDP6	16	MDN5
6	A6	5	G6	19	MDN6	18	G6
8	G7	7	V7	21	G7	20	MDP7
10	V8	9	A7	23	MDP8	22	MDN7
12	A8	11	G8	25	MDN8	24	G8
		13				26	

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14.1.8 Standard Cable Wiring Table

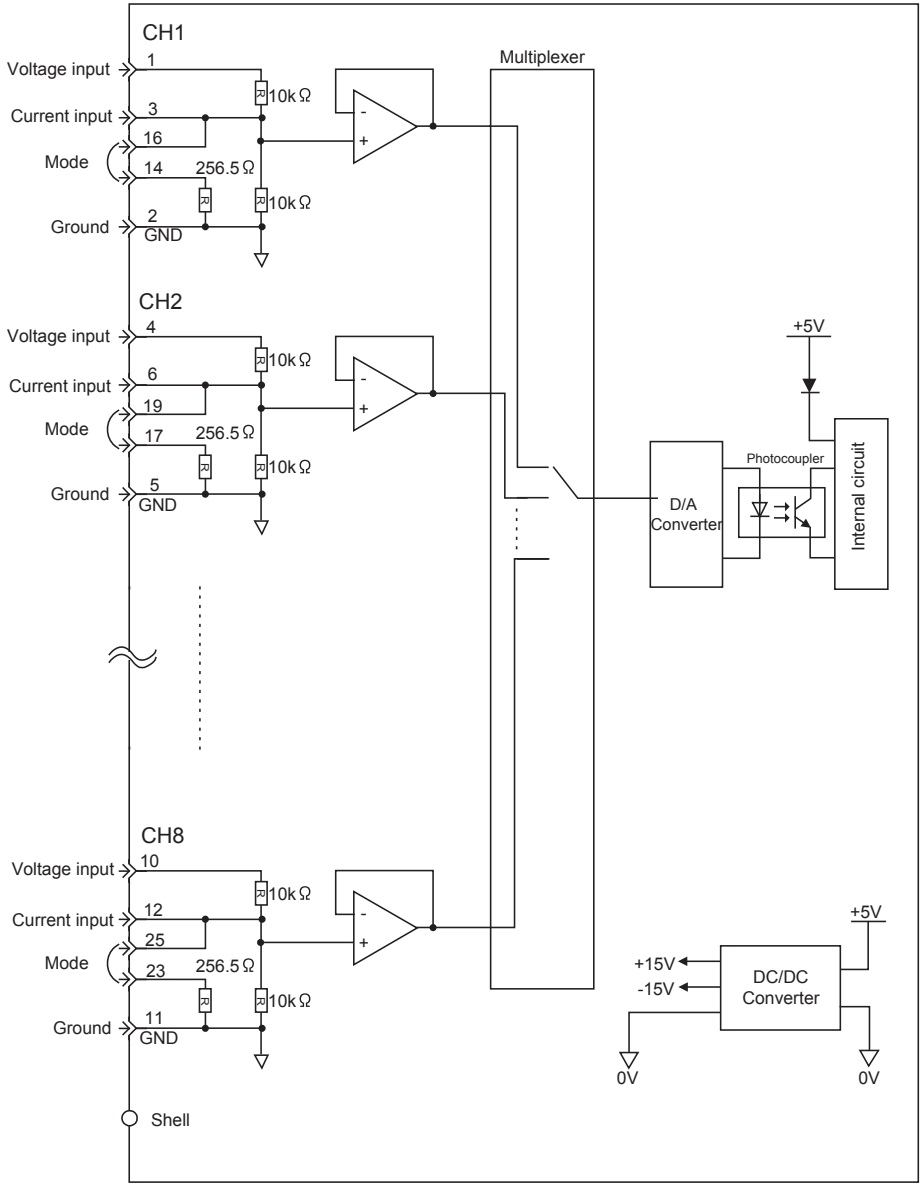
The wiring table for the standard cable JEPMC-W6080-☐☐ is shown below.

Pin	Wire Color	Marking		Label on Marking Tube	Signal Name	Function
		Color	Marking			
1	Gray	Red	– – –	V1/V5	V1/V5	Voltage input 1/5
2	Gray	Black	– – –	G1V/G5V	G1/G5	Ground 1/5
	Orange	Red	– – –	G1A/G5A		
3	Orange	Black	– – –	A1/A5	A1/A5	Current input 1/5
14	Yellow	Red	–	DP1/DP5	MDP1/ MDP5	Mode switching terminal 1/5
16	Yellow	Black	–	DN1/DN5	MDN1/ MDN5	Mode switching terminal 1/5
4	Pink	Red	– –	V2/V6	V2/V6	Voltage input 2/6
5	Pink	Black	– –	G2V/G6V	G2/G6	Ground 2/6
	Yellow	Black	– –	G2A/G6A		
6	Yellow	Black	– –	A2/A6	A2/A6	Current input 2/6
17	White	Red	–	DP2/DP6	MDP2/ MDP6	Mode switching terminal 2/6
19	White	Black	–	DN2/DN6	MDN2/ MDN6	Mode switching terminal 2/6
7	White	Red	– –	V3/V7	V3/V7	Voltage input 3/7
8	White	Black	– –	G3V/G7V	G3/G7	Ground 3/7
	Gray	Red	– –	G3A/G7A		
9	Gray	Black	– –	A3/A7	A3/A7	Current input 3/7
20	Gray	Red	–	DP3/DP7	MDP3/ MDP7	Mode switching terminal 3/7
22	White	Black	–	DN3/DN7	MDN3/ MDN7	Mode switching terminal 3/7
10	Orange	Red	– –	V4/V8	V4/V8	Voltage input 4/8
11	Orange	Black	– –	GV4/GV8	G4/G8	Ground 4/8
	Pink	Red	– –	G4A/G8A		
12	Pink	Black	– –	A4/A8	A4/A8	Current input 4/8
23	Orange	Red	– –	DP4/DP8	MDP4/ MDP8	Mode switching terminal 4/8
25	Orange	Black	– –	DN4/DN8	MDN4/ MDN8	Mode switching terminal 4/8

- Columns “Label on Marking Tube”, “Signal Name”, and “Function” display the values for connectors CN1 and CN2 in the format “CN1/CN2”, respectively.

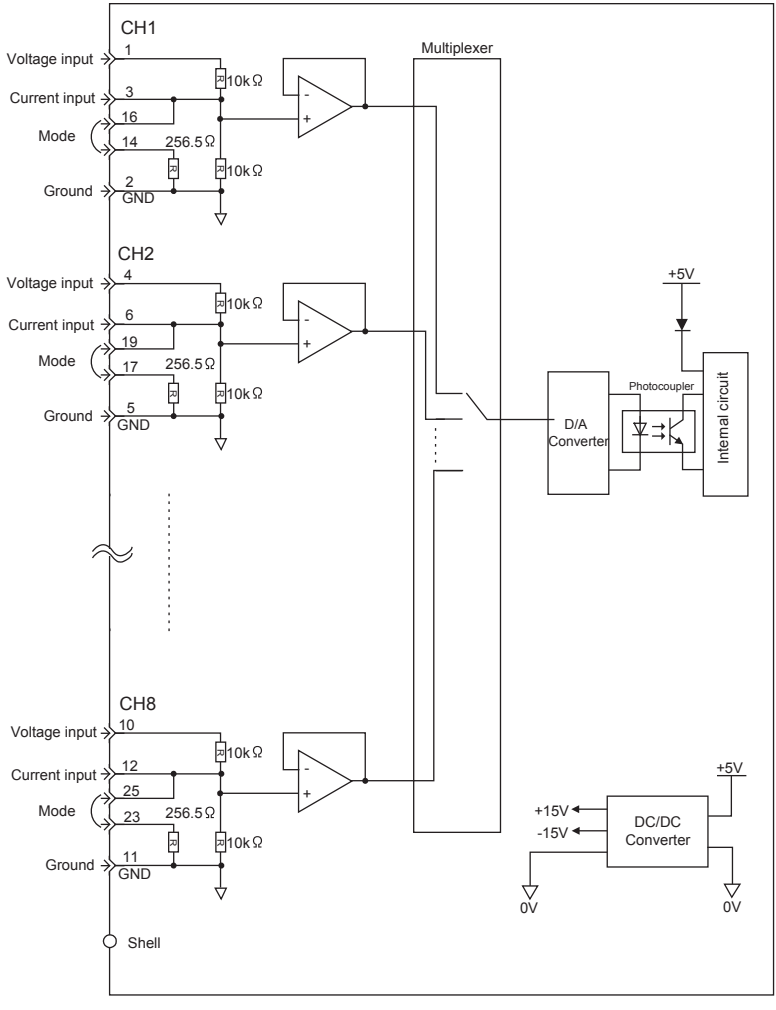
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14.1.9 Circuit Configuration



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14.1.10 CN1 Connector Connection Example

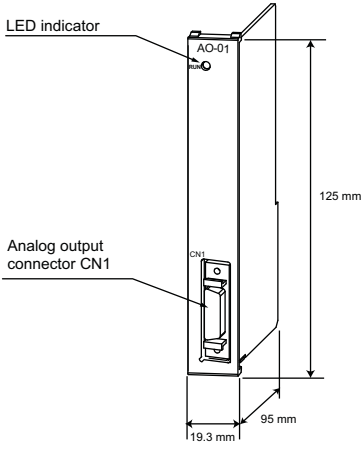


- Use the standard cable (JEPMC-W6080-□□) for AI-01 Modules to connect to external devices. Use a relay terminal block to connect the AI-01 module to external devices because the wiring distance varies between the AI-01 module and each external device.
- Ground the cable shield between an external device and the relay terminal block on the external device side.

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14.2 AO–01 (Analog Output) Module

14.2.1 Appearance



14.2.2 Module Functions

The AO-01 module has four channels for analog output. Two types of analog output ranges are available; -10 to +10V and 0 to +10V.

14.2.3 Module Specifications

The following table shows the AO-01 Module hardware specifications..

Item			Specifications	
Name			AO-01	
Model			JAPMC-AN2310-E	
Analog Output	Number of Channels		4	
	Isolation		Between channels: Not isolated. Between output connector and system power supply: Photocoupler isolation	
	Analog Output Range		±10V	0 to +10V
	Resolution		16-bit (-31276 to +31276)	15-bit (0 to +31276)
	Absolute Accuracy		100 mV Max	0.3 mA Max
	Accuracy	25°C	±0.1% (±10 mV)	
		0 to 55°C	±0.3% (±30 mV)	
	Input Conversion Time		1.2 msec Max	
Connectors			CN1: Output connector	
LED Indicator			RUN (green)	
Current Consumption			500 mA Max	
Dimensions			125 × 95 (H×D)	
Mass			90 g	

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14.2.4 Indicators



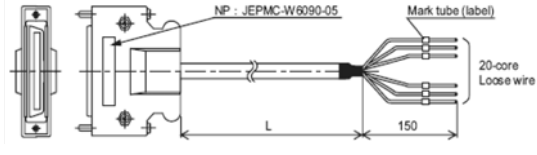
Indicator	Indicator Color	Status when Lit	Status when not Lit
RUN	Green	Normal operation	Operation stopped (no access from CPU)

14.2.5 Connector Specifications



Name	Connector Name	# of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
Analog Output Connector	CN1	20	10220-52A3PL	• Connector 10126-3000VE • Shell 10326-52A0-008 (Screw locking), or 10326-52F0-008 (One-touch locking)	Sumitomo 3M Corporation

Applicable Cable: JEPMC-W6090-☐☐ Standard Cable Model and External Appearance

Model	Length	External Appearance (JEPMC-W6090-☐☐)
JEPMC-W6090-05	0.5 m	
JEPMC-W6090-10	1.0 m	
JEPMC-W6090-30	3.0 m	

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14.2.6 CN1 Pin Layout Diagram



2	AO1	1	AO0	12	N.C.	11	N.C.
4	AO1G	3	AO0G	14	N.C.	13	N.C.
6	AO2	5	N.C.	16	N.C.	15	N.C.
8	AO2G	7	AO3	18	N.C.	17	N.C.
10	N.C.	9	AO3G	20	N.C.	19	N.C.

14.2.7 Standard Cable Wiring Table

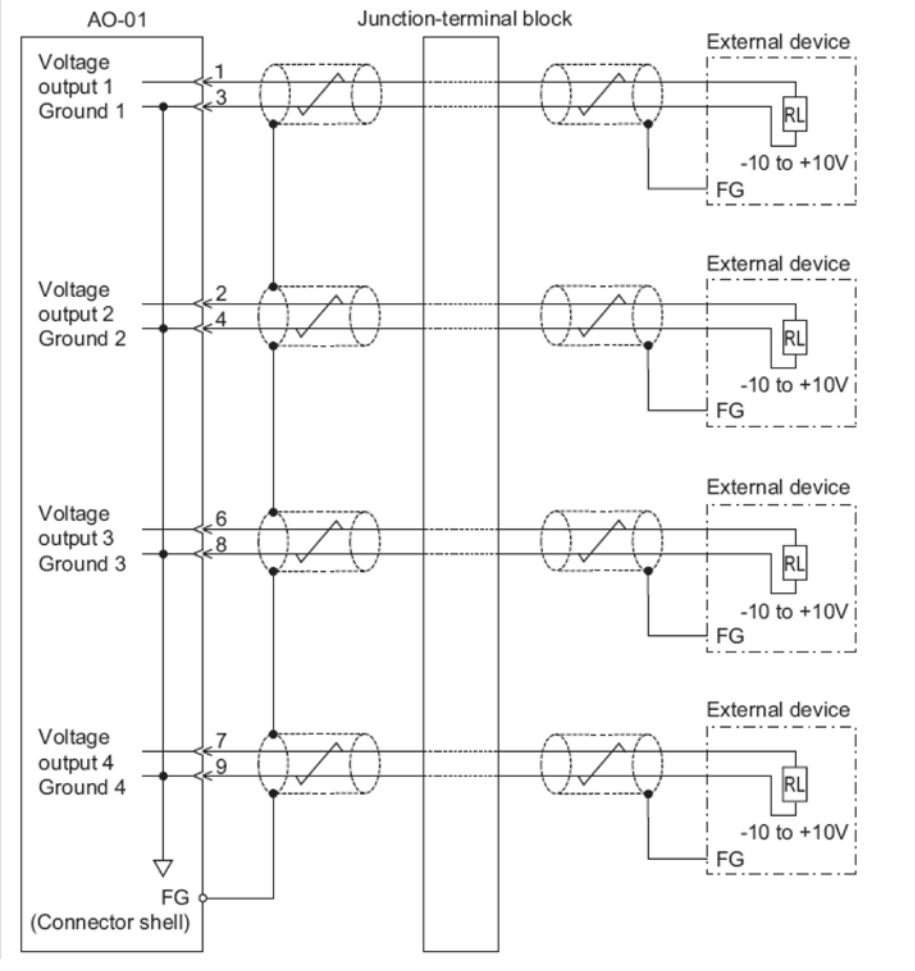
The following shows the pin arrangement for standard cable JEPMC-W6090.

Pin	Wire Color	Marking Color	Function
1	Orange	Red	Analog Output 0
2	Gray	Red	Analog Output 1
3	Orange	Black	Ground 0
4	Gray	Black	Ground 1
5			
6	White	Red	Analog Output 2
7	Yellow	Red	Analog Output 3
8	White	Black	Ground 2
9	Yellow	Black	Ground 3
10~20	Twisted-pair cable		

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14.2.8 AO-01 Module Connector Connection Example

■ CN1 Connector Connection Example



- Use the AO-01 standard cable (JEPMC-W6090-☐☐) for the connection to the external device. Use the junction terminal block because the distance between the external devices and the module are different as seen on the above diagram.
- Ground the cable shield between the external devices and the junction terminal block by the external device side.

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14.3 DO–01 (Digital Output) Module

14.3.1 Appearance/Indicators

14.3.2 Module Functions

The DO–01 module is equipped with 64 digital outputs.

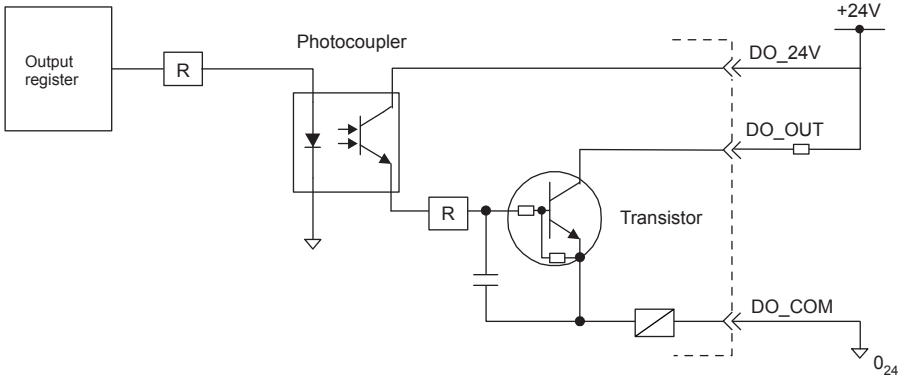
14.3.3 Output Circuit Specifications

The following table shows the DO-01 Module output circuit specifications.

Item	Specifications
Outputs	64 points
Output Format	Transistor/open collector, sink mode output
Isolation Method	Photocoupler
Output Voltage	+ 24VDC (+19.2 to +28.8V)
Output Current	100 mA Max
Leakage Current When OFF	0.1 mA Max
ON Time/OFF Time	ON: 0.5 ms Max OFF: 1 ms Max
Number of Commons	8 points
Protection Circuit	Fuse connected to each common line
Fuse Rating	1A
Error Detection	Fuse blowout detection

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14.3.4 DO-01 Digital Output Circuit (Sink Mode Output) Connection Example



- A fuse is inserted into the output common line of the DO-01 Module for circuit protection. However, the fuse may not be blown out in the cases such as layer shorts in outputs. To ensure the circuit protection, provide a protective element such as fuse in each output as shown in the above diagram.

14.3.5 DO-01 Module Connections

Connects the DO-01 Module to external output signals.

External outputs: 64 points

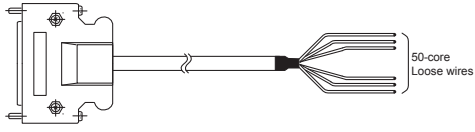


Name	Connector Name	No of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
External I/O Connector	CN1/CN2	50	10250-52A2JL	• Connector • 10150-3000VE • Shell • 10350-52A0-008 • (Screw locking), or • 10350-52F0-008 • (One-touch locking)	Sumitomo 3M Corporation

Applicable Cable: JEPMC-W6060-☐☐

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14.3.6 Standard Cable Model and External Appearance

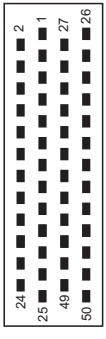
Name	Model	Length	External Appearance (JEPMC-W6060-□□)
Cables for DO-01 Modules	JEPMC-W6060-05	0.5 m	
	JEPMC-W6060-10	1.0 m	
	JEPMC-W6060-30	3.0 m	

14.3.7 Connector Pin Arrangement

The DO-01 Module Connector (CN1 and CN2) pin arrangement is shown below.

CN1 Connector Pin Arrangement

Pin Arrangement Viewed from Wiring Side

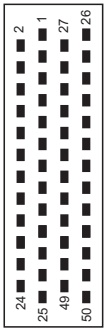


2	DO_00	1	+24V_1	27	DO_01	26	OV_1
4	DO_04	3	DO_02	29	DO_15	28	DO_03
6	OV_1	5	DO_06	31	OV_1	30	DO_07
8	DO_08	7	+24V_2	33	DO_09	32	OV_2
10	DO_12	9	DO_10	35	DO_13	34	DO_11
12	OV_2	11	DO_14	37	OV_2	36	DO_15
14	DO_16	13	+24V_3	39	DO_17	38	OV_3
16	DO_20	15	DO_18	41	DO_21	40	DO_19
18	OV_3	17	DO_22	43	OV_3	42	DO_23
20	DO_24	19	+24V_4	45	DO_25	44	OV_4
22	DO_28	21	DO_26	47	DO_29	46	DO_27
24	OV_4	23	DO_30	49	OV_4	48	DO_31
		25	N.C.			50	N.C.

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CN2 Connector Pin Arrangement

Pin Arrangement Viewed from Wiring Side



2	DO_32	1	+24V_5	27	DO_33	26	OV_5
4	DO_36	3	DO_34	29	DO_37	28	DO_35
6	OV_5	5	DO_38	31	OV_5	30	DO_39
8	DO_40	7	+24V_6	33	DO_41	32	OV_6
10	DO_44	9	DO_42	35	DO_45	34	DO_43
12	OV_6	11	DO_46	37	OV_6	36	DO_47
14	DO_48	13	+24V_7	39	DO_49	38	OV_7
16	DO_52	15	DO_50	41	DO_53	40	DO_51
18	OV_7	17	DO_54	43	OV_7	42	DO_55
20	DO_56	19	+24V_8	45	DO_57	44	OV_8
22	DO_60	21	DO_58	47	DO_61	46	DO_59
24	OV_8	23	DO_62	49	OV_8	48	DO_63
		25	N.C.			50	N.C.

14.3.8 Standard Cable Wiring Table

The wiring table for the standard cable JEPMC-W6060-☐☐ is shown below.

Pin	Wire Color	Marking	Signal Name	Function
1	Orange	–	+24V_1/5	24V power supply 1/5
2	Gray	–	DO_00/32	Digital output 0/32
3	White	–	DO_02/34	Digital output 2/34
4	Yellow	–	DO_04/36	Digital output 4/36
5	Pink	–	DO_06/38	Digital output 6/38
6	Orange	– –	0V_1/5	Common ground 1/5
7	Gray	– –	+24V_2/6	24V power supply 2/6
8	White	– –	DO_08/40	Digital output 8/40
9	Yellow	– –	DO_10/42	Digital output 10/42
10	Pink	– –	DO_12/44	Digital output 12/44
11	Orange	– – –	DO_14/46	Digital output 14/46
12	Gray	– – –	0V_2/6	Common ground 2/6
13	White	– – –	+24V_3/7	24V power supply 3/7
14	Yellow	– – –	DO_16/48	Digital output 16/48
15	Pink	– – –	DO_18/50	Digital output 18/50
16	Orange	– – – –	DO_20/52	Digital output 20/52
17	Gray	– – – –	DO_22/54	Digital output 22/54
18	White	– – – –	0V_3/7	Common ground 3/7
19	Yellow	– – – –	+24V_4/8	24V power supply 4/8
20	Pink	– – – –	DO_24/58	Digital output 24/58

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14.3.8 Standard Cable Wiring Table

Pin	Wire Color	Marking	Signal Name	Function
21	Orange	– – – – Continuous	DO_26/68	Digital output 26/60
22	Gray	– – – – Continuous	DO_28/60	Digital output 28/62
23	White	– – – – Continuous	DO_30/62	Digital output 30/64
24	Yellow	– – – – Continuous	0V_4/8	Common ground 4/8
25	Pink	– – – – Continuous	N.C	
26	Orange	—	0V_1/5	Common ground 1/5
27	Gray	—	DO_01/33	Digital output 1/33
28	White	—	DO_03/35	Digital output 3/35
29	Yellow	—	DO_05/37	Digital output 5/37
30	Pink	—	DO_07/39	Digital output 7/39
31	Orange	— —	0V_1/5	Common ground 1/5
32	Gray	— —	0V_2/6	Common ground 2/6
33	White	— —	DO_09/41	Digital output 9/41
34	Yellow	— —	DO_11/43	Digital output 11/43
35	Pink	— —	DO_13/45	Digital output 13/45
36	Orange	— — —	DO_15/47	Digital output 15/47
37	Gray	— — —	0V_2/6	Common ground 2/6
38	White	— — —	0V_3/7	Common ground 3/7
39	Yellow	— — —	DO_17/49	Digital output 17/49
40	Pink	— — —	DO_19/51	Digital output 19/51
41	Orange	— — — Continuous	DO_21/53	Digital output 21/53
42	Gray	— — — Continuous	DO_23/55	Digital output 23/55
43	White	— — — Continuous	0V_3/7	Common ground 3/7
44	Yellow	— — — Continuous	0V_4/8	Common ground 4/8
45	Pink	— — — Continuous	DO_25/57	Digital output 25/57
46	Orange	— — — —	DO_27/59	Digital output 27/59
47	Gray	————————	DO_29/61	Digital output 29/61
48	White	————————	DO_31/63	Digital output 31/63
49	Yellow	————————	0V_4/8	Common ground 4/8
50	Pink	————————	N.C	

- Columns “Signal Name” and “Function” display the values for connectors CN1 and CN2 in the format “CN1/CN2” respectively.

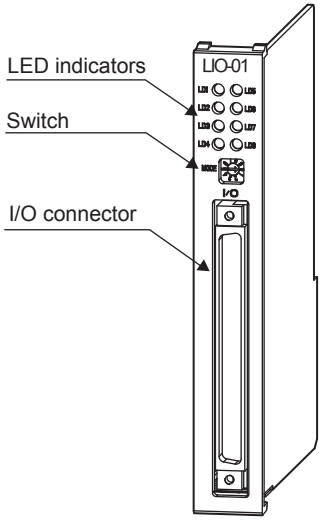
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14.4 LIO-01/02 Module

14.4.1 Appearance

External Appearance

The following figure shows the external appearance of the LIO-01/02 Modules



14.4.2 Outline of Functions

The LIO-01 Module provides digital I/O and encoder input functions. There are 16 digital inputs (DI) and 16 digital outputs (DO) for the digital I/O function. There is also one encoder input.

These option cards also have a high speed output capability, which can set an output within 13μs of passing a specified encoder position.

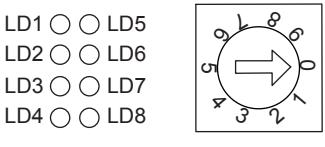
The following diagram gives an outline of the LIO-01 Module functions. The only functional difference betwteen the LIO-01 and the LIO-02 is the active state of the output circuits (See 14.4.8 LIO-01 Digital Output Circuit (Sink Mode Output) Connection Example and 14.4.9 LIO-02 Digital Output Circuit (Source Mode Output) Connection Example).

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14.4.3 LED Indicators and Switch Settings

The LIO-02 Module status display LED indicators (LD1 to LD8) change based on the SW1 rotary switch settings. The following table shows the ON/OFF indicator display for digital input and digital output.

<table>
<tr><th>Indicator</th><th>Color</th><th>SW1</th><th colspan="4">Status when Lit</th></tr>
<tr><td rowspan="14">LD1 to LD8</td><td rowspan="14">Green</td><td rowspan="9">0</td><td colspan="4">Board Status Indicators</td></tr>
<tr><td>LD1</td><td colspan="3">Normal operation: Lit, Error: Not lit</td></tr>
<tr><td>LD2</td><td colspan="3">DI-00 to DI-07 status. Lit when any digital input is turned ON.</td></tr>
<tr><td>LD3</td><td colspan="3">DO-00 to DO-07 status. Lit when any digital output is turned ON.</td></tr>
<tr><td>LD4</td><td colspan="3">Pulse A/B input. Lit when phase A/B is turned ON.</td></tr>
<tr><td>LD5</td><td colspan="3">Normal operation: Lit, Error: Not lit</td></tr>
<tr><td>LD6</td><td colspan="3">DI-08 to DI-15 status. Lit when any digital input is turned ON.</td></tr>
<tr><td>LD7</td><td colspan="3">DO-08 to DO-15 status. Lit when any digital output is turned ON.</td></tr>
<tr><td>LD8</td><td colspan="3">Pulse Z input. Lit when phase Z is turned ON.</td></tr>
<tr><td>1</td><td colspan="4">Digital input indicators: When DI00 to DI07 turn ON, corresponding indicators (LD1 to LD8) are lit.</td></tr>
<tr><td>2</td><td colspan="4">Digital input indicators: When DI08 to DI15 turn ON, corresponding indicators (LD1 to LD8) are lit.</td></tr>
<tr><td>3</td><td colspan="4">Digital output indicators: When DO00 to DO07 turn ON, corresponding indicators (LD1 to LD8) are lit.</td></tr>
<tr><td>4</td><td colspan="4">Digital output indicators: When DO08 to DO15 turn ON, corresponding indicators (LD1 to LD8) are lit.</td></tr>
<tr><td rowspan="2">5</td><td colspan="4">PI input Indicators</td></tr>
<tr><td>LD1
LD2
LD3
LD4</td><td>Pulse A input
Pulse B input
Pulse Z input
–</td><td>LD5
LD6
LD7
LD8</td><td>High speed output set
Phase-Z latch
Digital input latch
–</td></tr>
</table>



Indicators SW1

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14.4.4 Specifications

Module Specifications

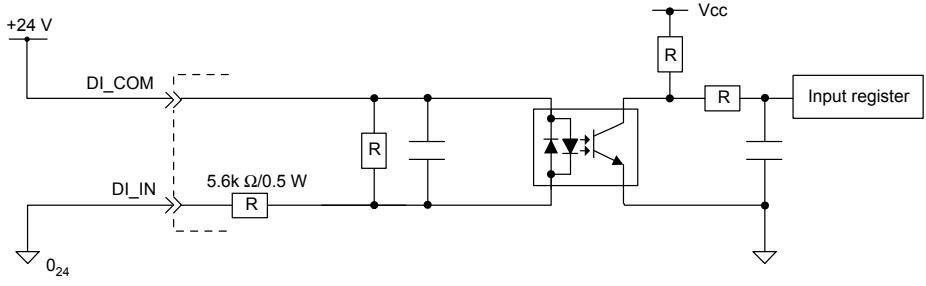
Item	Specifications
Name	LIO-01/02
Model	JAPMC-IO2300/JAPMC-IO2301
Digital Inputs	16 inputs 24VDC, 4.1 mA, combined sink mode/source mode inputs (DI_01 also used for position registation latch.)
Digital Outputs	16 outputs 24VDC transistor open-collector outputs, sink mode (-01)/Source mode (-02) outputs. DO_01 has high speed output capability, which can set an output within 13μs of passing a specified encoder position. See axis parameters in the PLCopen Plus Function Block Manual to configure.
Encoder Input	Phase A/B/Z inputs Phase-A/B: 5V differential input, not isolated, Max frequency: 4 MHz Phase-Z: 5V/12V photocoupler input, Max frequency: 500 kHz Latch input Position registration latch on phase-C or DI_01.
Switches	Rotary switch (SW1)
Dimensions (mm)	125 × 95 (H × D)
Mass	80 g

Input Circuit Specifications

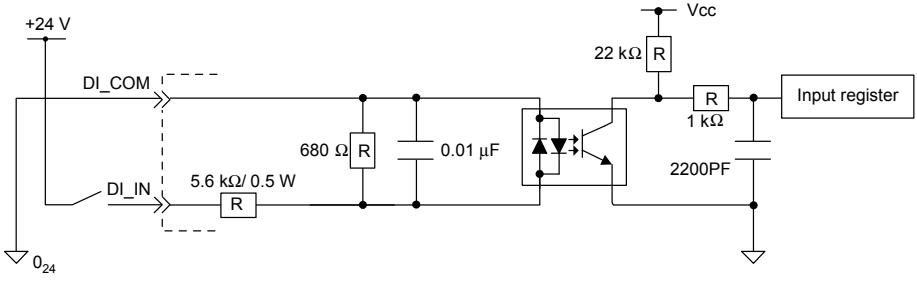
Item	Specifications
Inputs	16 points
Input Format	Sink mode/Source mode input
Isolation Method	Photocoupler
Input Voltage	±24VDC, ±20mv
Input Current	4.1 mA (typ.)
ON Voltage/Current	15V min./2.0 mA min.
OFF Voltage/Current	5V Max/1.0 mA Max
ON Time/OFF Time	ON: 0.5 ms Max OFF: 0.5 ms Max
Number of Commons	8 points (DI_COM0: DI_00 to DI_07, DI_COM1: DI_08 to DI_15)
Other Functions	• DI_01 is shared with position registration latch. If DI_01 is turned ON while position registration latch inputs are enabled, the encoder position will be latched.

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14.4.5 Digital Input Circuit (Sink Mode Input) Connection Example



14.4.6 Digital Input Circuit (Source Mode Input) Connection Example



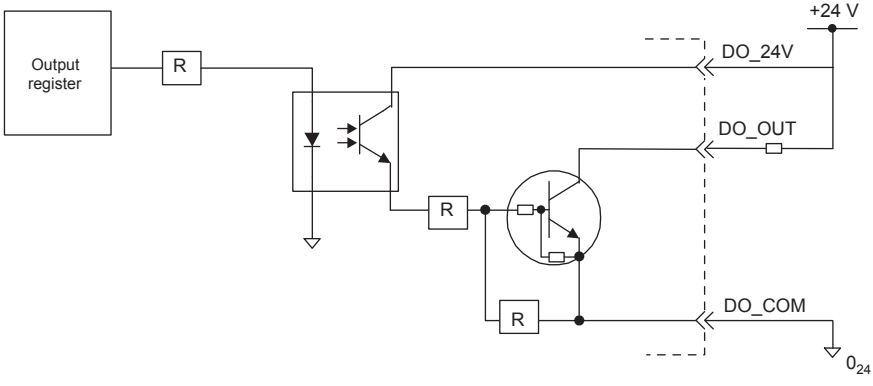
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14.4.7 Output Circuit

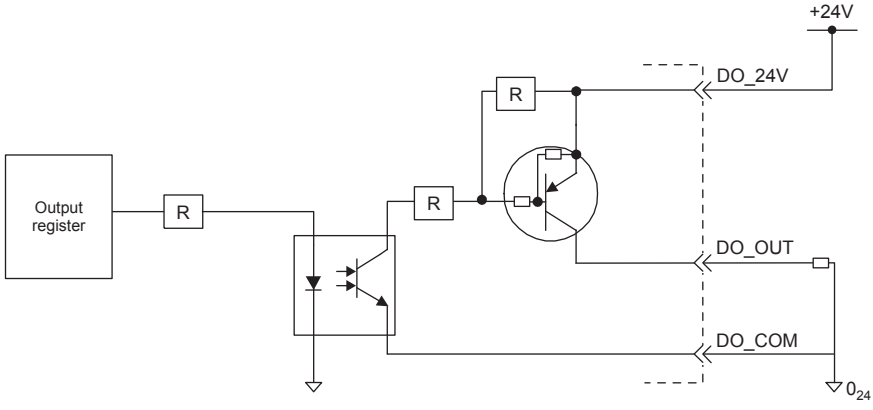
The following table shows the LIO-01/02 Module output circuit specifications.

Item	Specifications	
Outputs	16 points	
Output Format	LIO-01	Transistor, open collector sink mode outputs
	LIO-02	Transistor, open collector source mode outputs
Isolation Method	Photocoupler	
Output Voltage	+24VDC, ±20mv	
Output Current	100 mA Max	
Leakage Current When OFF	0.1 mA Max	
ON Time/OFF Time	ON: 1 ms Max OFF: 1 ms Max	
Number of Commons	16 points	
Protection Circuit	The fuses are not for circuit protection. They are for fire protection at output shorts. Attach a fuse externally to each output if circuit protection is required.	
Error Detection	Blown fuse detection	
Other Functions	DO_01 is shared with encoder position detection	

14.4.8 LIO-01 Digital Output Circuit (Sink Mode Output) Connection Example



14.4.9 LIO-02 Digital Output Circuit (Source Mode Output) Connection Example

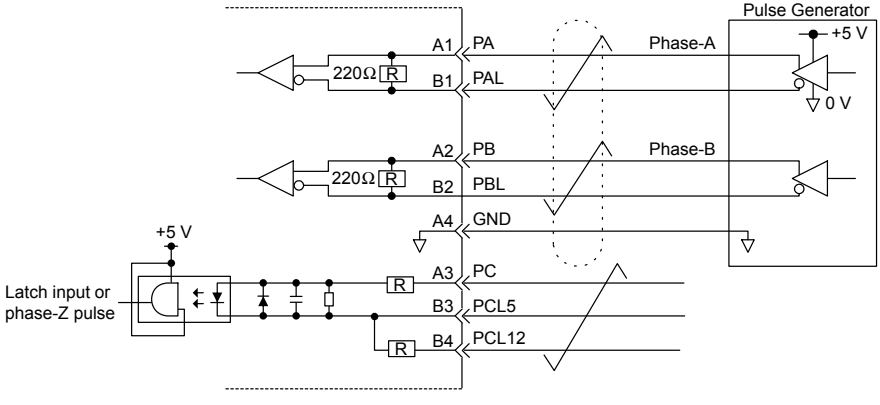


14.4.10 Pulse Input Circuit

The following table shows the LIO-01/02 Module encoder circuit specifications.

Item	Specifications
Number of Encoders	1 (Phase-A/B/Z input)
Encoder Circuit	Phase-AB: 5V differential input, not isolated, Max frequency: 4 MHz Phase-Z: 5V/12V photocoupler input, Max frequency: 500 kHz
Input Mode	Phase-A/B, signed, incremental/decremental
Latch Input	Position registration latch on phase-Z or DI_01. Response time: 5 μs Max for phase-Z input; 60 μs Max for DI_01 input.

14.4.11 Encoder Circuit Connection Example

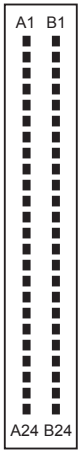


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14.4.12 LIO–01/02 Standard Cable Wiring Table

Connector Pin Arrangement

The following table shows the connector pin arrangement for LIO-01/02 Modules viewed from the wiring side.



Pin	Wire Color	Wire Marking		Signal Name	I/O	Function
		Color	Marking			
A1	Orange	Red	–	PA	I	Phase-A pulse (+)
A2	Gray	Red	–	PB	I	Phase-B pulse (+)
A3	White	Red	–	PC	I	Phase-C pulse (+)
A4	Yellow	Red	–	GND	I	Pulse input ground
A5	Pink	Red	–	DO_COM	P	Output common
A6	Orange	Red	– –	DO_24V	P	+24VDC input
A7	Gray	Red	– –	DO_15	O	Output 15
A8	White	Red	– –	DO_13	O	Output 13
A9	Yellow	Red	– –	DO_11	O	Output 11
A10	Pink	Red	– –	DO_09	O	Output 9
A11	Orange	Red	– – –	DO_07	O	Output 7
A12	Gray	Red	– – –	DO_05	O	Output 5
A13	White	Red	– – –	DO_03	O	Output 3
A14	Yellow	Red	– – –	DO_01	O	Output 1
A15	Pink	Red	– – –	DI_15	I	Input 15
A16	Orange	Red	– – – –	DI_13	I	Input 13
A17	Gray	Red	– – – –	DI_11	I	Input 11
A18	White	Red	– – – –	DI_09	I	Input 9
A19	Yellow	Red	– – – –	DI_07	I	Input 7
A20	Pink	Red	– – – –	DI_05	I	Input 5
A21	Orange	Red	– – – – Continuous	DI_03	I	Input 3
A22	Gray	Red	– – – – Continuous	DI_01	I	Input 1
A23	White	Red	– – – – Continuous	DI_COM0	P	Input common 0
A24	Shield			FG	–	Frame ground
B1	Orange	Black	–	PAL	I	Phase-A pulse (–)
B2	Gray	Black	–	PBL	I	Phase-B pulse (–)
B3	White	Black	–	PCL5	I	Phase-C pulse (–5V input)
B4	Yellow	Black	–	PCL12	I	Phase-C pulse (–12V input)
B5	Pink	Black	–	DO_COM	P	Output common
B6	Orange	Black	– –	DO_24V	P	+24V input
B7	Gray	Black	– –	DO_14	O	Output 14
B8	White	Black	– –	DO_12	O	Output 12
B9	Yellow	Black	– –	DO_10	O	Output 10

Pin	Wire Color	Wire Marking		Signal Name	I/O	Function
		Color	Marking			
B10	Pink	Black	– –	DO_08	O	Output 8
B11	Orange	Black	– – –	DO_06	O	Output 6
B12	Gray	Black	– – –	DO_04	O	Output 4
B13	White	Black	– – –	DO_02	O	Output 2
B14	Yellow	Black	– – –	DO_00	O	Output 0
B15	Pink	Black	– – –	DI_14	I	Input 14
B16	Orange	Black	– – – –	DI_12	I	Input 12
B17	Gray	Black	– – – –	DI_10	I	Input 10
B18	White	Black	– – – –	DI_08	I	Input 8
B19	Yellow	Black	– – – –	DI_06	I	Input 6
B20	Pink	Black	– – – –	DI_04	I	Input 4
B21	Orange	Black	– – – – Continuous	DI_02	I	Input 2
B22	Gray	Black	– – – – Continuous	DI_00	I	Input 0
B23	White	Black	– – – – Continuous	DI_COM1	P	Input common 1
B24	Shield			FG	–	Frame ground

- P: Power supply input; I: Input signal; O: Open-collector output

14.4.13 Connector Specifications

Connects the external I/O signals and encoder input signals.
External output: 16 points, Encoder input: 1 channel

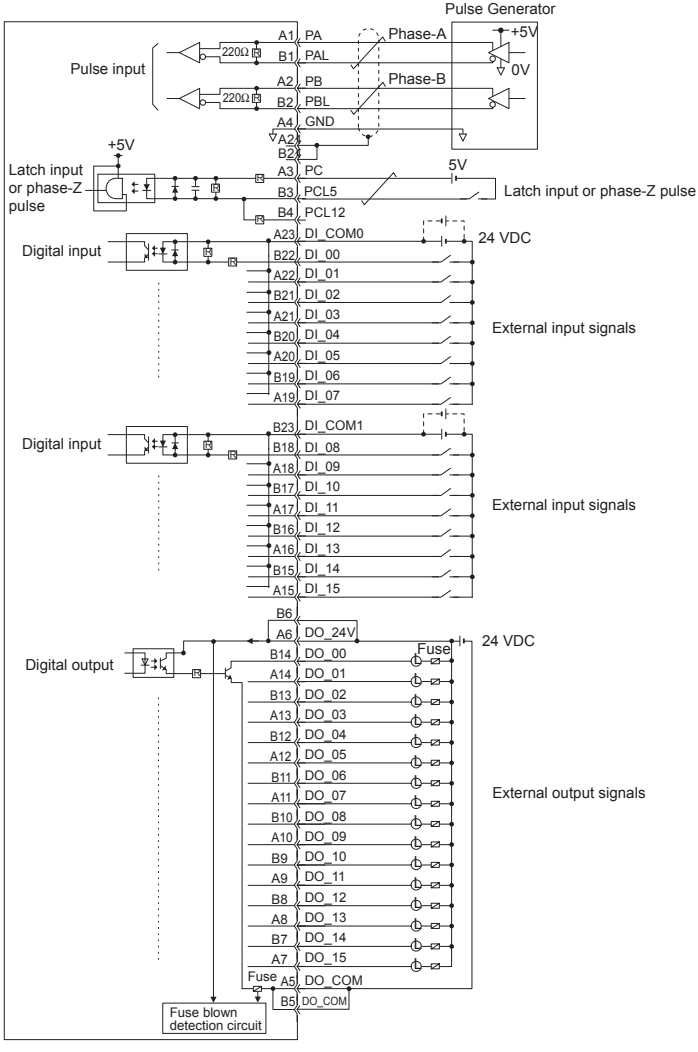
Name	Connector Name	# of Pins	Connector Model		
			Module	Cable	Manufacturer
I/O Connector	I/O	48	FCN-365P048-AU	FCN-360C048-E (cover), FCN-361J048-AU (jack)	Fujitsu component

14.4.14 Cables

Name	Model Number	Length	(JEPMC-W2061-□□)
Cable for LIO-01/02 Modules	JEPMC-W2061-A5	0.5 m	
	JEPMC-W2061-01	1.0 m	
	JEPMC-W2061-03	3.0 m	

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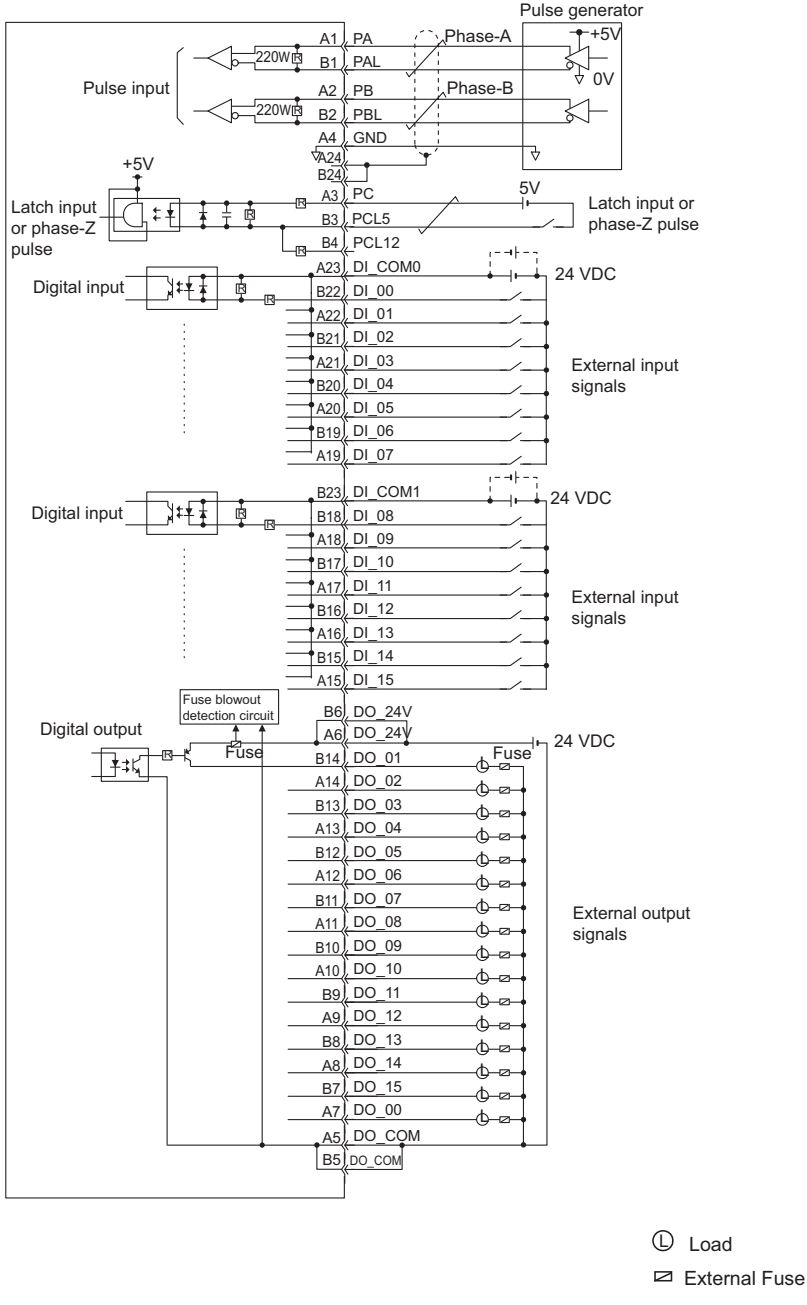
14.4.15 LIO-01 Module Connections



- Connect a fuse suitable for the load specifications in the output signal circuit in series with the load. If an external fuse is not connected, load shorts or overloads could result in fire, destruction of the load device, or damage to the output element.
- The pins A5 and B5, and the pins A6 and B6 are internally connected. Connect them external as well.

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14.4.16 LIO-02 Module Connections

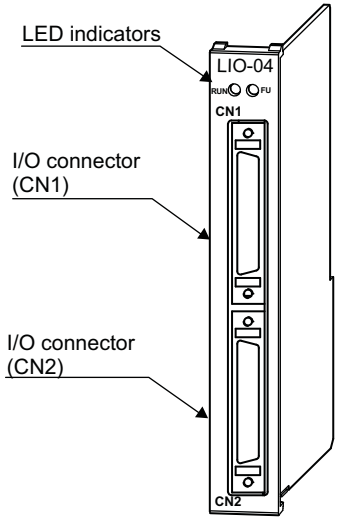


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14.5 LIO-04/05 Modules

14.5.1 External Appearance

The following figure shows the external appearance of the LIO-04/05 Modules.



14.5.2 Outline of Functions

The LIO-04/05 Modules are Optional Boards for the MP2300Siec which provide a digital I/O function. There are 32 digital inputs (DI) and 32 digital outputs (DO) (sink mode outputs) for the digital I/O function.

14.5.3 Indicators

The following table shows the status of LIO-04/05 Module LED indicators.

RUN FU

Indicator Name	Indicator Color	Status
RUN	Green	Lit: Module normal Not lit: Module error
FU	Red	Lit: One of the output protection fuses is blown. Not lit: All of the output protection fuses are normal.

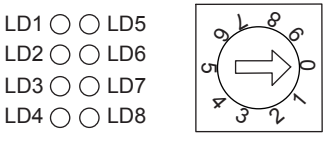
- The burnout detection circuit will not function when there is no external 24V power supply.

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14.5.4 Switch Settings

The LIO-04/05 Module status display the LED indicators (LD1 to LD8) change based on the SW1 rotary switch setting. The following table shows the ON/OFF indicator display for digital input and digital output.

<table>
<tr><th>Indicator</th><th>Color</th><th>SW1</th><th colspan="4">Status when Lit</th></tr>
<tr><td rowspan="14">LD1 to LD8</td><td rowspan="14">Green</td><td rowspan="9">0</td><td colspan="4">Board Status Indicators</td></tr>
<tr><td>LD1</td><td colspan="3">Normal operation: Lit, Error: Not lit</td></tr>
<tr><td>LD2</td><td colspan="3">DI_00 to DI_07 status. Lit when any digital input is turned ON.</td></tr>
<tr><td>LD3</td><td colspan="3">DO_00 to DO_07 status. Lit when any digital output is turned ON.</td></tr>
<tr><td>LD4</td><td colspan="3">Pulse A/B input. Lit when phase A/B is turned ON.</td></tr>
<tr><td>LD5</td><td colspan="3">Normal operation: Lit, Error: Not lit</td></tr>
<tr><td>LD6</td><td colspan="3">DI_08 to DI_15 status. Lit when any digital input is turned ON.</td></tr>
<tr><td>LD7</td><td colspan="3">DO_08 to DO_15 status. Lit when any digital output is turned ON.</td></tr>
<tr><td>LD8</td><td colspan="3">Pulse Z input. Lit when phase Z is turned ON.</td></tr>
<tr><td>1</td><td colspan="4">Digital input indicators: When DI_00 to DI_07 turn ON, corresponding indicators LD1 to LD8 are lit.</td></tr>
<tr><td>2</td><td colspan="4">Digital input indicators: When DI_08 to DI_15 turn ON, corresponding indicators LD1 to LD8 are lit.</td></tr>
<tr><td>3</td><td colspan="4">Digital output indicators: When DO_00 to DO_07 turn ON, corresponding indicators LD1 to LD8 are lit.</td></tr>
<tr><td>4</td><td colspan="4">Digital output indicators: When DO_08 to DO_15 turn ON, corresponding indicators LD1 to LD8 are lit.</td></tr>
<tr><td rowspan="5">5</td><td colspan="4">PI Input Indicators</td></tr>
<tr><td>LD1
LD2
LD3
LD4</td><td>Pulse A input
Pulse B input
Pulse Z input
–</td><td>LD5
LD6
LD7
LD8</td><td>Coincidence detection
Phase-Z latch
Digital input latch
–</td></tr>
</table>



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14.5.5 Module Specifications

The following table shows the hardware specifications of the LIO-04/05 Module.

Item	Specifications
Name	LIO-04/LIO-05
Model	JAPMC-IO2303/JAPMC-IO2304
Digital Inputs	32 inputs 24VDC, 4.1 mA, combined sink mode/source mode inputs (DI_00, 01, 16, and 17 also used for interrupts.)
	Simultaneously ON Inputs 16 points (8 inputs/common): At ambient temperature of 55°C and 24VDC 10 points (5 inputs/common): At ambient temperature of 55°C and 28.8VDC Refer to the following characteristics graph for details.
Digital Outputs	32 outputs 24VDC transistor open-collector outputs, sink mode outputs
Indicators	RUN (green) ERR (red)
Dimensions (mm)	125 × 95 (H × D)
Mass	80 g

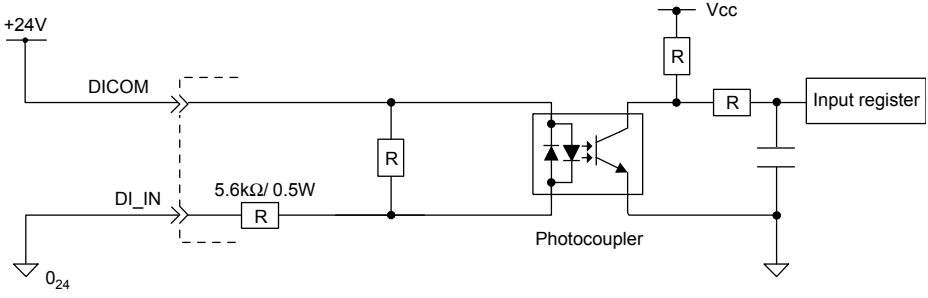
14.5.6 Input Circuit Specifications

The following table shows the LIO-04/05 Modules input circuit specifications.

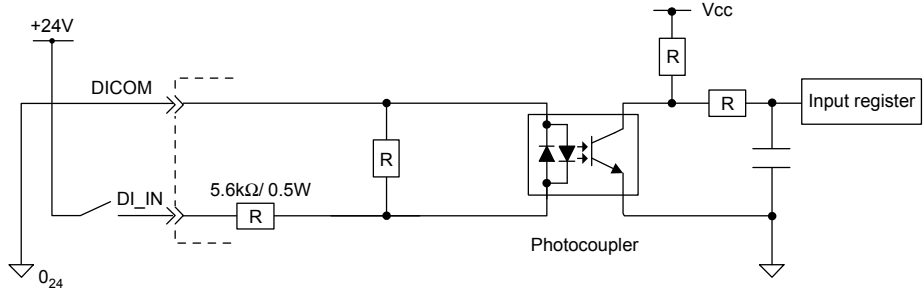
Item	Specifications
Inputs	32 points
Input Format	Sink mode, source mode input
Isolation Method	Photocoupler (PS2805-4)
Input Voltage	±24VDC (+19.2 to +28.8V)
Input Current	4.1 mA (typ.)
ON Voltage/Current	15VDC min./2.0 mA min.
OFF Voltage/Current	5VDC min./1.0 mA min.
ON Time/OFF Time	ON: 0.5 ms Max OFF: 0.5 ms Max
Number of Commons	8 points

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14.5.7 Digital Input Circuit (Sink Mode Input) Connection Example



14.5.8 Digital Input Circuit (Source Mode Input) Connection Example



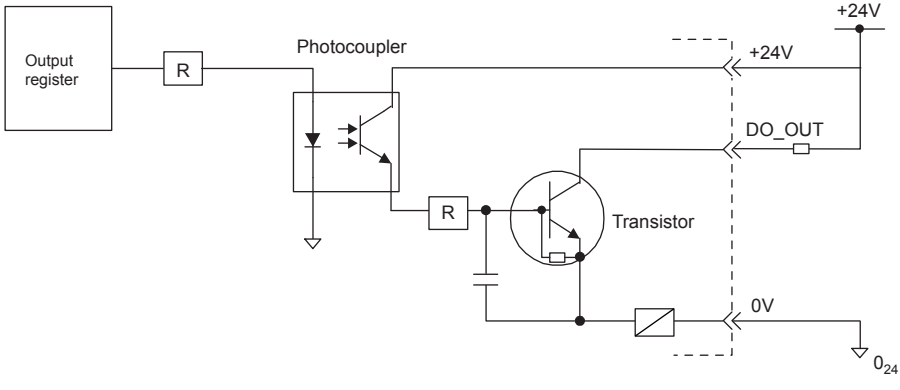
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14.5.9 Output Circuit

The following table shows the LIO-04/05 Module's output circuit specifications.

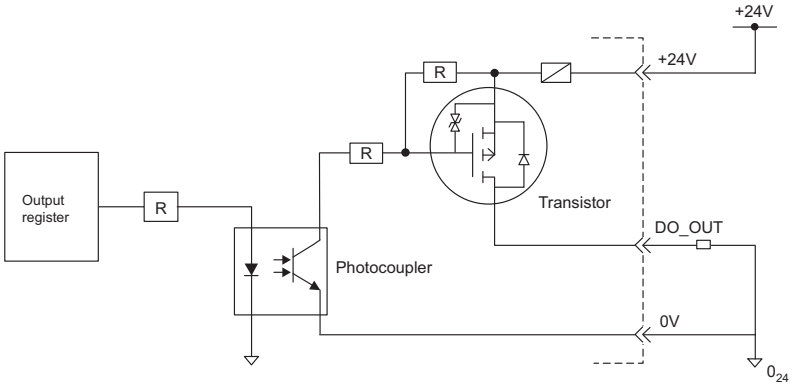
Item	Specifications	
Outputs	32 points	
Output Format	LIO-04	Transistor, sink mode output
	LIO-05	Transistor, source mode output
Isolation Method	Photocoupler	
Output Voltage	+24VDC (+19.2 to +28.8VDC)	
Output Current	100 mA Max	
Leakage Current When OFF	0.1 mA Max	
ON Time/OFF Time	ON: 0.5 ms Max OFF: 1 ms Max	
Number of Commons	1 per 8 outputs	
Protection Circuit	The fuses are not for circuit protection. They are for fire protection at output shorts. Attach a fuse externally to each output if circuit protection is required.	
Fuse Rating	1A	
Error Detection	Fuse blowout detection	

14.5.10 LIO-04 Digital Output Circuit (Sink Mode Output) Connection Example



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14.5.11 LIO-05 Digital Output Circuit (Source Mode Output) Connection Example

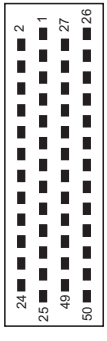


14.5.12 LIO-04 Module Connector Pin Arrangement

The LIO-04 Module Connector (CN1 and CN2) pin arrangements are shown below.

CN1 Connector Pin Arrangement

Pin Arragement Viewed from Wiring Side

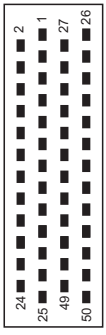


2	DI_00	1	DICOM_1	27	DI_01	26	N.C.
4	DI_04	3	DI_02	29	DI_05	28	DI_03
6	DICOM_2	5	DI_06	31	N.C.	30	DI_07
8	DI_10	7	DI_08	33	DI_11	32	DI_09
10	DI_14	9	DI_12	35	DI_15	34	DI_13
12	DO_00	11	N.C.	37	DO_01	36	N.C.
14	N.C.	13	DO_02	39	OV_1	38	DO_03
16	DO_04	15	+24V_1	41	DO_05	40	N.C.
18	N.C.	17	DO_06	43	N.C.	42	DO_07
20	DO_10	19	DO_08	45	DO_11	44	DO_09
22	+24V_2	21	N.C.	47	N.C.	46	OV_2
24	DO_14	23	DO_12	49	DO_15	48	DO_13
		25	N.C.			50	OV_2

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CN2 Connector Pin Arrangement

Pin Arrangement Viewed from Wiring Side



2	DI_16	1	DICOM_3	27	DI_17	26	N.C.
4	DI_20	3	DI_18	29	DI_21	28	DI_19
6	DICOM_4	5	DI_22	31	N.C.	30	DI_23
8	DI_26	7	DI_24	33	DI_27	32	DI_25
10	DI_30	9	DI_28	35	DI_31	34	DI_29
12	DO_16	11	N.C.	37	DO_17	36	N.C.
14	N.C.	13	DO_18	39	OV_3	38	DO_19
16	DO_20	15	+24V_3	41	DO_21	40	N.C.
18	N.C.	17	DO_22	43	N.C.	42	DO_23
20	DO_26	19	DO_24	45	DO_27	44	DO_25
22	+24V_4	21	N.C.	47	N.C.	46	OV_4
24	DO_30	23	DO_28	49	DO_31	48	DO_29
		25	N.C.			50	OV_4

- P: Power supply input, I: Input signal, O: Open collector output

14.5.13 Standard Cable Wiring Table

The wiring table for the standard cable JEPMC-W6060-☐☐ is shown below.

Pin	Wire Color	Markings	Signal Name	I/O	Function
1	Orange	–	DICOM_1/3	P/P	Digital Input common 1/3
2	Gray	–	DI_00/16	I/I	Digital input 0/16 (shared with interrupt input)
3	White	–	DI_02/18	I/I	Digital input 2/18
4	Yellow	–	DI_04/20	I/I	Digital input 4/20
5	Pink	–	DI_06/22	I/I	Digital input 6/22
6	Orange	– –	DICOM_2/4	P/P	Digital Input common 2/4
7	Gray	– –	DI_08/24	I/I	Digital input 8/24
8	White	– –	DI_10/26	I/I	Digital input 10/26
9	Yellow	– –	DI_12/28	I/I	Digital input 12/28
10	Pink	– –	DI_14/30	I/I	Digital input 14/30
11	Orange	– – –	N.C.		
12	Gray	– – –	DO_00/16	O/O	Digital output 0/16
13	White	– – –	DO_02/18	O/O	Digital output 2/18
14	Yellow	– – –	N.C.		
15	Pink	– – –	+24V_1/3	P/P	Digital output 24V supply 1/3
16	Orange	– – – –	DO_04/20	O	Digital output 4/20
17	Gray	– – – –	DO_06/22	O	Digital output 6/22
18	White	– – – –	N.C.		

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14.5.13 Standard Cable Wiring Table

Pin	Wire Color	Markings	Signal Name	I/O	Function
19	Yellow	– – – –	DO_08/24	O/O	Digital output 8
20	Pink	– – – –	DO_10/26	O/O	Digital output 10
21	Orange	– – – – Continuous	N.C.		
22	Gray	– – – – Continuous	+24V_2/4	P	Digital Output 24V supply 2/4
23	White	– – – – Continuous	DO_12/28	O	Digital output 12/28
24	Yellow	– – – – Continuous	DO_14/30	O	Digital output 14/30
25		– – – – Continuous	N.C.		
26	Orange	—	N.C.		
27	Gray	—	DI_01/17	I/I	Digital input 1/17 (shared with interrupt input)
28	White	—	DI_03/19	I/I	Digital input 3/19
29	Yellow	—	DI_05/21	I/I	Digital input 5/21
30	Pink	—	DI_07/23	I/I	Digital input 7/23
31	Orange	— —	N.C.		
32	Gray	— —	DI_09/25	I/I	Digital input 9/25
33	White	— —	DI_11/27	I/I	Digital input 11/27
34	Yellow	— —	DI_13/29	I/I	Digital input 13/29
35	Pink	— —	DI_15/31	I/I	Digital input 15/31
36	Orange	— — —	N.C.		
37	Gray	— — —	DO_01/17	O/O	Digital output 1/17
38	White	— — —	DO_03/19	O/O	Digital output 3/19
39	Yellow	— — —	0V_1/3	P/P	Digital Output 0VDC common 1/3
40	Pink	— — —	N.C.		
41	Orange	— — — Continuous	DO_05/21	O/O	Digital output 5/21
42	Gray	— — — Continuous	DO_07/23	O/O	Digital output 7/23
43	White	— — — Continuous	N.C.		
44	Yellow	— — — Continuous	DO_09/25	O/O	Digital output 9/25
45	Pink	— — — Continuous	DO_11/27	O/O	Digital output 11/27
46	Orange	— — — —	0V_2/4	P/P	Digital Output 0VDC common 2/4
47	Gray	————————	N.C.		
48	White	————————	DO_13/29	O/O	Digital output 13/19
49	Yellow	————————	DO_15/31	O/O	Digital output 15/31
50	Pink	————————	N.C.		

- Columns “Signal Name”, “I/O”, and “Function” display the values for connectors CN1 and CN2 in the format “CN1/CN2” respectively.

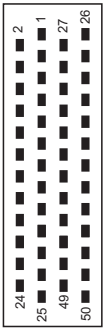
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14.5.14 LIO-05 Module Connector Pin Arrangement

The LIO-05 Module Connector (CN1 and CN2) pin arrangements are shown below.

CN1 Connector Pin Arrangement

Pin Arrangement Viewed from Wiring Side

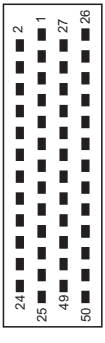


2	DI_00	1	DICOM_1	27	DI_01	26	N.C.
4	DI_04	3	DI_02	29	DI_05	28	DI_03
6	DICOM_2	5	DI_06	31	N.C.	30	DI_07
8	DI_10	7	DI_08	33	DI_11	32	DI_09
10	DI_14	9	DI_12	35	DI_15	34	DI_13
12	DO_00	11	N.C.	37	DO_01	36	N.C.
14	N.C.	13	DO_02	39	OV_1	38	DO_03
16	DO_04	15	+24V_1	41	DO_05	40	+24V_1
18	N.C.	17	DO_06	43	N.C.	42	DO_07
20	DO_10	19	DO_08	45	DO_11	44	DO_09
22	+24V_2	21	N.C.	47	+24V_2	46	OV_2
24	DO_14	23	DO_12	49	DO_15	48	DO_13
		25	N.C.			50	N.C.

- P: Power supply input, I: Input signal, O: Open collector output

CN2 Connector Pin Arrangement

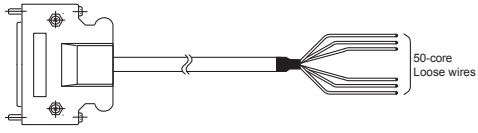
Pin Arrangement Viewed from Wiring Side



2	DI_16	1	DICOM_3	27	DI_17	26	N.C.
4	DI_20	3	DI_18	29	DI_21	28	DI_19
6	DICOM_4	5	DI_22	31	N.C.	30	DI_23
8	DI_26	7	DI_24	33	DI_27	32	DI_25
10	DI_30	9	DI_28	35	DI_31	34	DI_29
12	DO_16	11	N.C.	37	DO_17	36	N.C.
14	N.C.	13	DO_18	39	OV_3	38	DO_19
16	DO_20	15	+24V_3	41	DO_21	40	+24V_3
18	N.C.	17	DO_22	43	N.C.	42	DO_23
20	DO_26	19	DO_24	45	DO_27	44	DO_25
22	+24V_4	21	N.C.	47	+24V_4	46	N.C.
24	DO_30	23	DO_28	49	DO_31	48	DO_29
		25	N.C.			50	N.C.

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14.5.15 Standard Cable Model and External Appearance

Name	Model	Length	External Appearance (JEPMC-W6060-□□)
Cable for LIO-04 / LIO-05 Module (Single loose wire)	JEPMC-W6060-A5	0.5 m	
	JEPMC-W2064-01	1 m	
	JEPMC-W2064-03	3 m	

14.5.16 Standard Cable Wiring Table

The wiring table for the standard cable JEPMC-W6060-□□ is shown below.

Pin	Wire Color	Markings	Signal Name	I/O	Function
1	Orange	–	DICOM_1/3	I/I	Digital Input common 1/3
2	Gray	–	DI_00/16	I/I	Digital input 0/16
3	White	–	DI_02/18	I/I	Digital input 2/18
4	Yellow	–	DI_04/20	I/I	Digital input 4/20
5	Pink	–	DI_06/22	I/I	Digital input 6/22
6	Orange	– –	DICOM_2/4	P/P	Digital Input common 2/4
7	Gray	– –	DI_08/24	I/I	Digital input 8/24
8	White	– –	DI_10/26	I/O	Digital input 10/26
9	Yellow	– –	DI_12/28	I/O	Digital input 12/28
10	Pink	– –	DI_14/30	I/O	Digital input 14/30
11	Orange	– – –	N.C.		
12	Gray	– – –	DO_00/16	O/O	Digital output 0/16
13	White	– – –	DO_02/18	O/O	Digital output 2/18
14	Yellow	– – –	N.C.		
15	Pink	– – –	+24V_1/3	P/P	Digital Output 24V supply 1/3
16	Orange	– – – –	DO_04/20	O	Digital output 4/20
17	Gray	– – – –	DO_06/22	O	Digital output 6/22
18	White	– – – –	N.C.		
19	Yellow	– – – –	DO_08/24	O	Digital output 8/24
20	Pink	– – – –	DO_10/26	O	Digital output 10/26
21	Orange	– – – – Continuous	N.C.		
22	Gray	– – – – Continuous	+24V_2/4	P	Digital Output 24V supply 2/4
23	White	– – – – Continuous	DO_12/28	O	Digital output 12/28
24	Yellow	– – – – Continuous	DO_14/30	O	Digital output 14/30
25	Pink	– – – – Continuous	N.C.		
26	Orange	—	N.C.		
27	Gray	—	DI_01/17	I/I	Digital input 1/17
28	White	—	DI_03/19	I/I	Digital input 3/19
29	Yellow	—	DI_05/21	I/I	Digital input 5/21
30	Pink	—	DI_07/23	I/I	Digital input 7/23

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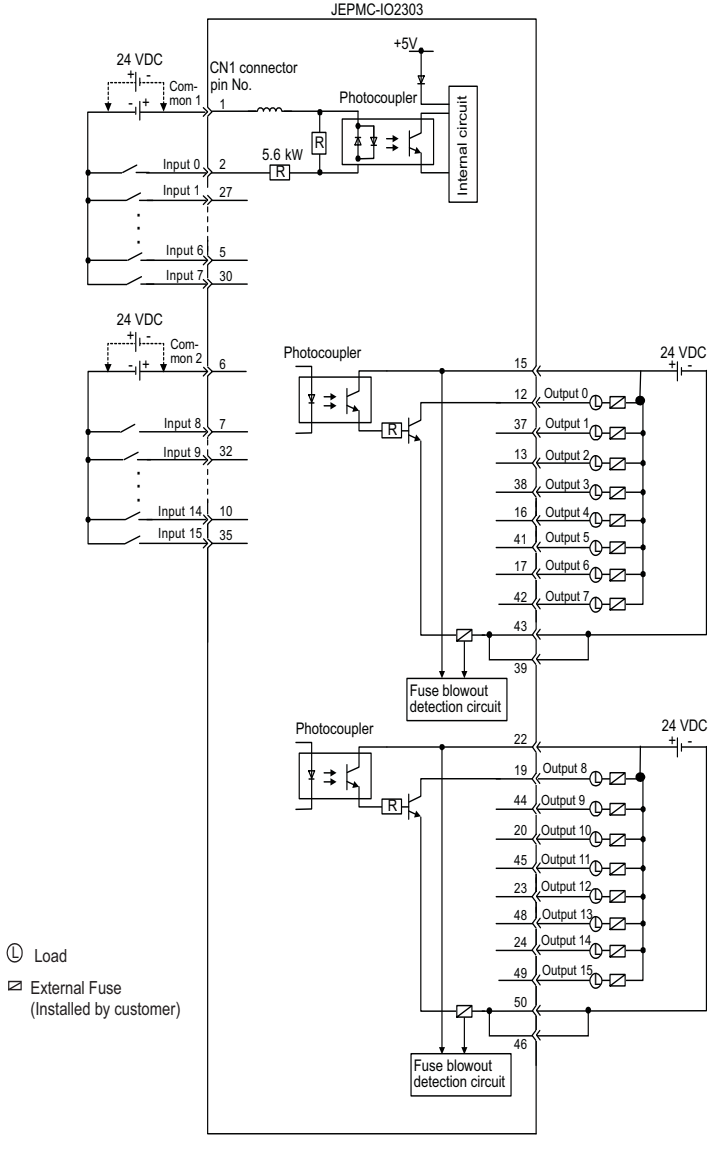
Pin	Wire Color	Markings	Signal Name	I/O	Function
31	Orange	— —	N.C.		
32	Gray	— —	DI_09/25	I/I	Digital input 9/25
33	White	— —	DI_11/27	I/I	Digital input 11/27
34	Yellow	— —	DI_13/29	I/I	Digital input 13/29
35	Pink	— —	DI_15/31	I/I	Digital input 15/31
36	Orange	— — —	N.C.		
37	Gray	— — —	DO_01/17	O/O	Digital output 1/17
38	White	— — —	DO_03/19	O/O	Digital output 3/19
39	Yellow	— — —	0V_1/3	P/P	Digital Output 0VDC common 1/3
40	Pink	— — —	+24V_1/3	P/P	Digital Output 24V supply 1/3
41	Orange	— — — Continuous	DO_05/21	O/O	Digital output 5/21
42	Gray	— — — Continuous	DO_07/23	O/O	Digital output 7/23
43	White	— — — Continuous	N.C.		
44	Yellow	— — — Continuous	DO_09/25	O/O	Digital output 9/25
45	Pink	— — — Continuous	DO_11/26	O/O	Digital output 11/26
46	Orange	————————	0V_2/4		Digital Output 0VDC common 2/4
47	Gray	————————	+24V_2/4		Digital Output 24V supply 2/4
48	White	————————	DO_13/29	O/O	Digital output 13/29
49	Yellow	————————	DO_15/31	O/O	Digital output 15/31
50	Pink	————————	N.C.		

- Columns “Signal Name”, “I/O”, and “Function” display the values for connectors CN1 and CN2 in the format “CN1/CN2” respectively.

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14.5.17 LIO-04 Module Connector Connection Examples

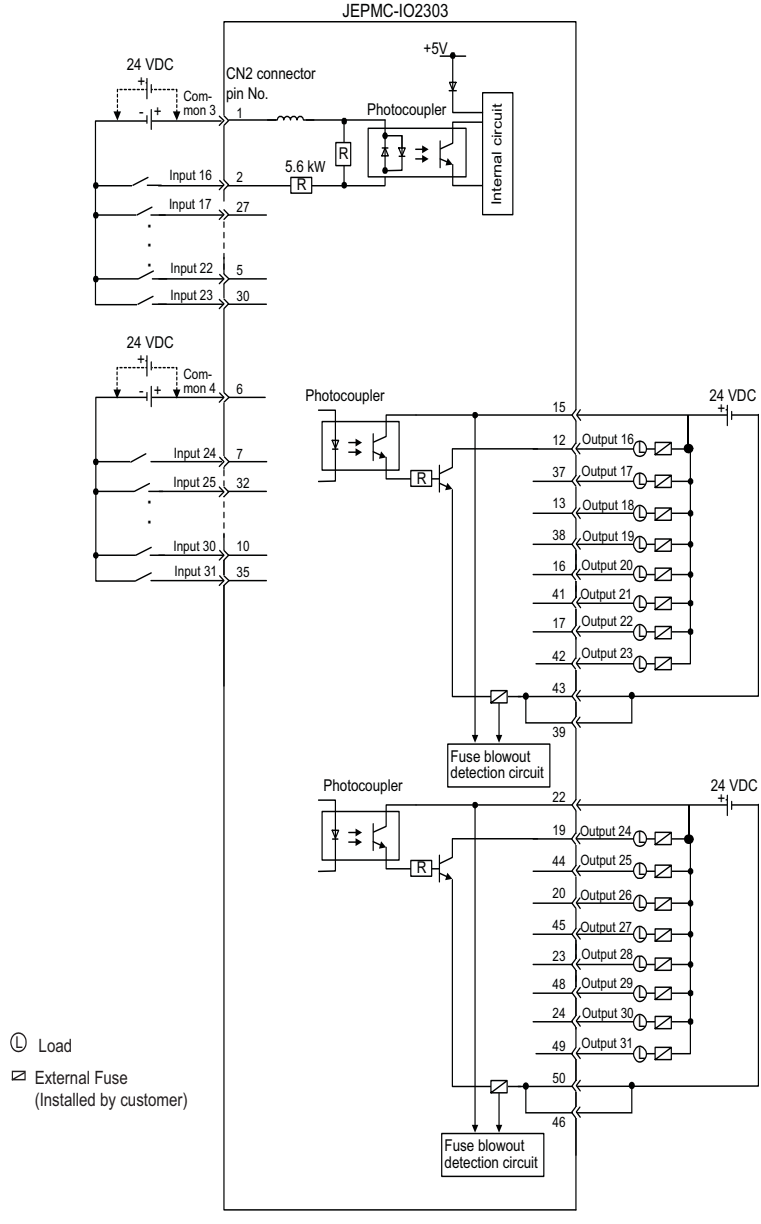
■ CN1 Connector Connection Example



- Check the polarity of the external power supply when wiring. An adverse connection may cause a load malfunction.
- The pins 39 and 43 and the pins 46 and 50 are internally connected. Connect them externally as well.

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■ CN2 Connector Connection Example

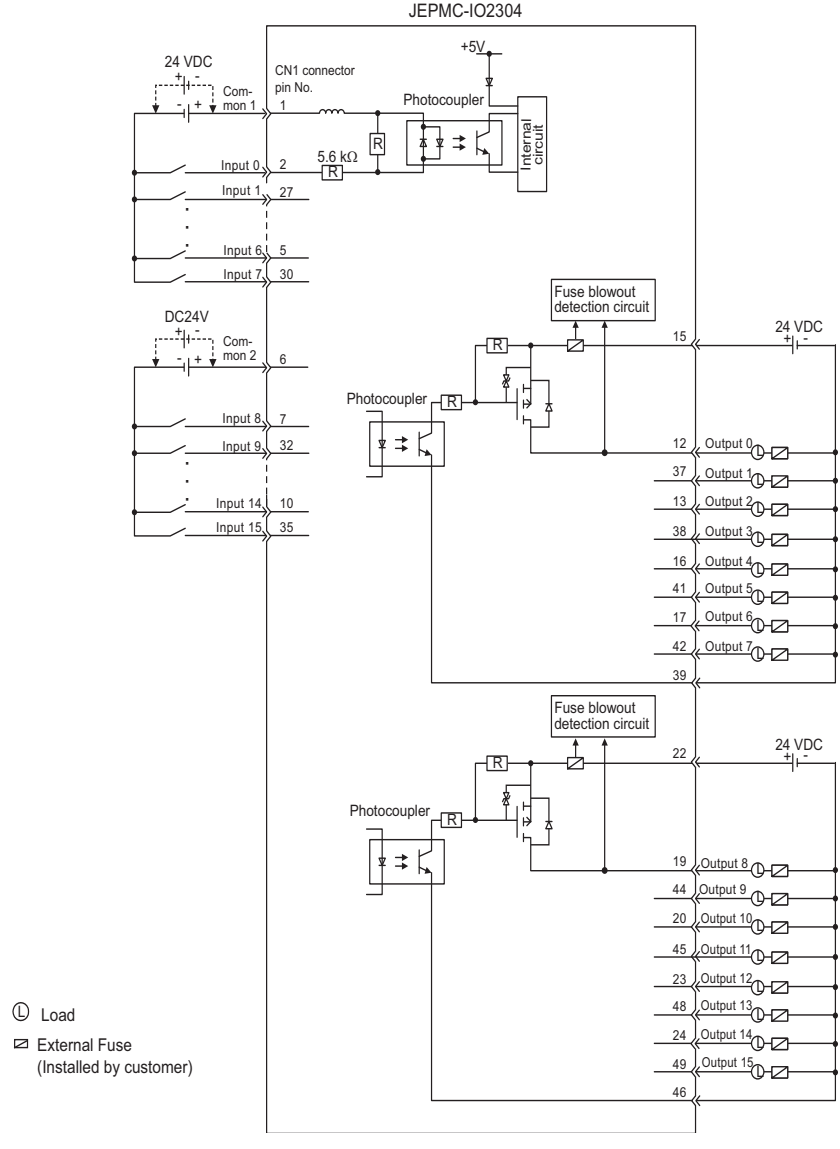


- Check the polarity of the external power supply when wiring. An adverse connection may cause a load malfunction.
- The pins 39 and 32 and the pins 46 and 50 are internally connected. Connect them externally as well.

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14.5.18 LIO-05 Module Connector Connection Examples

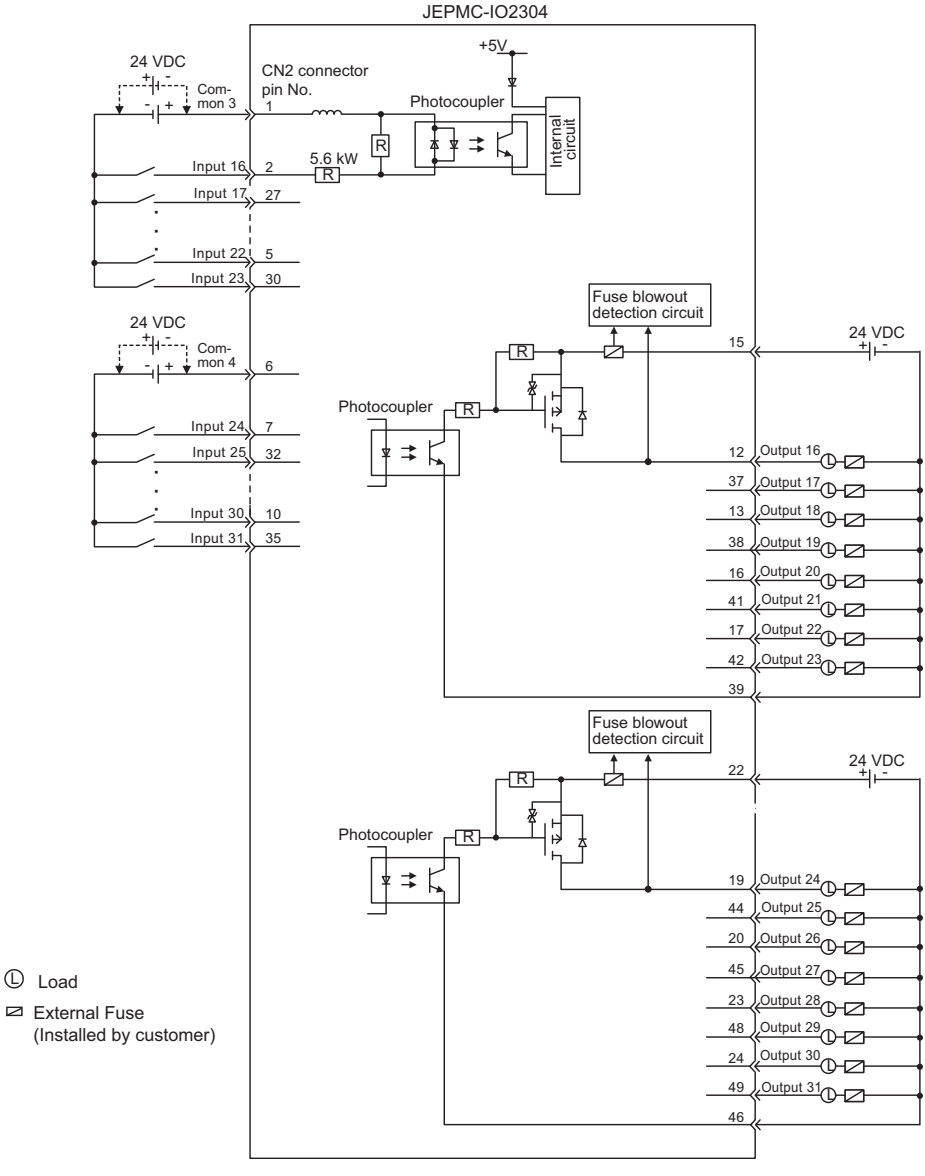
■ CN1 Connector Connection Example



- Check the polarity of the external power supply when wiring. An adverse connection may cause a load malfunction.

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■ CN2 Connector Connection Example

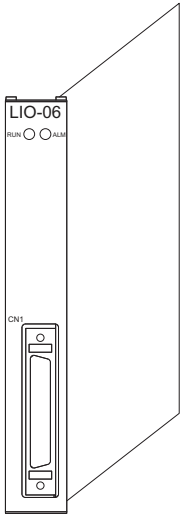


- Check the polarity of the external power supply when wiring. An adverse connection may cause a load malfunction.

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14.6 LIO-06 Module

14.6.1 Module External Appearance



14.6.2 Outline of Functions

The LIO-06 Module has digital I/O, analog I/O, and pulse encoder functionality, including a registration latch input. The LIO-06 Module is fully compatible with the MP940 I/O connector. This option card also has a high speed output capability, which can set an output within 13μs of passing a specified encoder position.

- When converting equipment from the prior generation MP940 controller, users should bear in mind that the analog inputs that had previously been wired to the V-REF and T-REF inputs on the SGDH must now be connected directly to the LIO-06 option module.

14.6.3 LED Indicators and Switch Settings

Display Name	Color	Status when Lit	Staus when OFF
RUN	Green	Normal	Stopped. (No access by CPU)
ALM	Red	Fault	Normal operation

The ALM light indicates the following conditions

- Fuse fault
- ASIC error
- A-phase disconnect
- B-phase disconnect

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14.6.4 Option Board Specifications

Item			Specification
Digital Input	Number of Inputs		8/Common
	Input Method		Sink/Source
	Isolation		Photocoupler Isolation
	Input Voltage		DC24V±20% (DC19.2 to 28.8V)
	Input Current		4.1mA (TYP)
	ON Voltage/Current		At least 15V/At least 2mA
	OFF Voltage/Current		5V Max/1mA Max
	ON/OFF Time		ON= 0.5ms Max/OFF= 0.5ms Max
	Interrupt		1 (used together with DI_00)
Digital Output	Number of Outputs		8/Common
	Output Method		Transistor Sink Output
	Isolation		Photocoupler Isolation
	External Power Supply Voltage		DC24V±20% (DC19.2 to 28.8V)
	Output Current		100mA (Max)
	ON Voltage		1V Max
	Leak Current at OFF		0.1mA Max
	ON/OFF Time		ON= 0.25ms Max/OFF= 1ms Max
	Protection Classification		Unprotected output
	Error Detection		Blown fuse detection
	High Speed Output		DO_07 has high speed output capability, which can set an output within 13μs of passing a specified encoder position. See axis parameters in the PLCopen Plus Function Block Manual to configure.
Analog Input	Number of Channels		1
	Isolation		Non-isolated
	Analog Input Range		-10 to +10V
	Maximum Rated Input		±15V
	Input Impedance		Approx. 20kΩ
	Resolution		16bit (-31276 to +31276)
	Absolute Accuracy		100mV Max
	Accuracy	25℃	±0.1% (±10mV)
		0 to 55℃	±0.3% (±30mV)
	Input Filter	Time Constant	0.2×10^{-3}
		Delay Time	1ms(Max) (when -10 to 10V)
	Input Conversion Speed		50μs
Analog Output	Number of Channels		1
	Isolation		Non-isolated
	Analog Output Range		-10 to +10V
	Output Impedance		20Ω Max
	Resolution		16bit (-31276 to +31276)
	Accuracy	25℃	±0.1% (±10mV)
		0 to 55℃	±0.3% (±30mV)
	Maximum Permissible Load Current		±5mA
	Output Delay Time		1.2ms (Time of change from -10+10V)

- The time constant shows the characteristics according to the input filter equivalent to the time to reach 0.632 × the input voltage.

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14.6.4 Option Board Specifications

Item			Specification	
Encoder Input	Encoder Input	Number of Channels	1	
		Input Method	5V Differential Max Frequency 4MHz quadrature	
		Isolation	Non-isolated	
		Counting System	A/B Phase Pulse/Direction UP/DOWN Counter	
	Latch Input	Number of Input Circuits	2 (C-Phase latch or digital input latch) The digital input latch is used in conjunction with DI-01 on pin 39.	
			C-Phase Latch	Digital Input Latch
		Input Method	Source Photocoupler I/F	Sink/Source Photocoupler I/F
		Isolation	Photocoupler Isolation	Photocoupler Isolation
		Input Voltage	24VDC±20% 12VDC±20% 5VDC±20% 24VDC/12VDC/5VDC are switched by connector wiring	DC24V±20%
		Input Current	DC24V: 11mA (TYP) DC12V: 12mA (TYP) DC5V: 13mA (TYP)	4.1mA (TYP)
		ON Voltage	DC24V: 17V Min DC12V: 9V Min DC5V: 3.9V Min	15V Min
		OFF Voltage	DC24V: 1.6V Max DC12V: 1.1V Max DC5V: 0.9V Max	5V Max
		Response Time	1μs Max	60μs Max
		Minimum ON Pulse Width	1μs	60μs
	COIN Output		1, digital output Used together with DO-07 (software switching)	
Current Consumption			5V, 1A Max	
Hot Swapping (Modules)			Not Possible	
Connector			CN1: Digital I/O, Analog I/O, Encoder Input	
Indicators			RUN (Green), ALM (Red)	

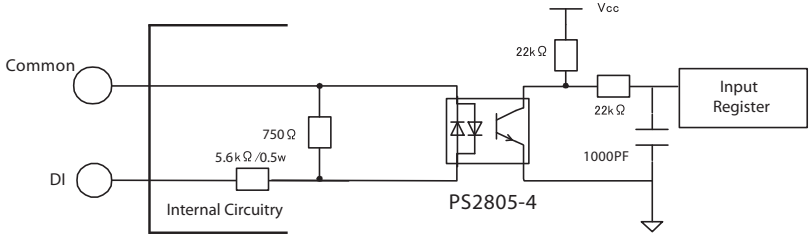
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14.6.5 Digital Input Circuit

The specifications of the LIO-06 module digital input circuit are shown below.

Item	Specification
Number of Inputs	8
Input Method	Sink/Source
Isolation	Photocoupler Isolation
Input Voltage	DC24V±20%
Input Current	4.1mA (TYP)
ON Voltage/Current	At least 15V/2.0mA
OFF Voltage/Current	5V Max/1.0mA Max
ON Time/OFF Time	ON=0.5ms Max/OFF=0.5ms Max
Number of Commons	1
Other Functions	• DI_01 is used together with the position registration latch input, and when enabled, the position registration latch input latches with the pulse encoder when SI_01 is "ON".

14.6.6 Digital Input Circuit Connection Example

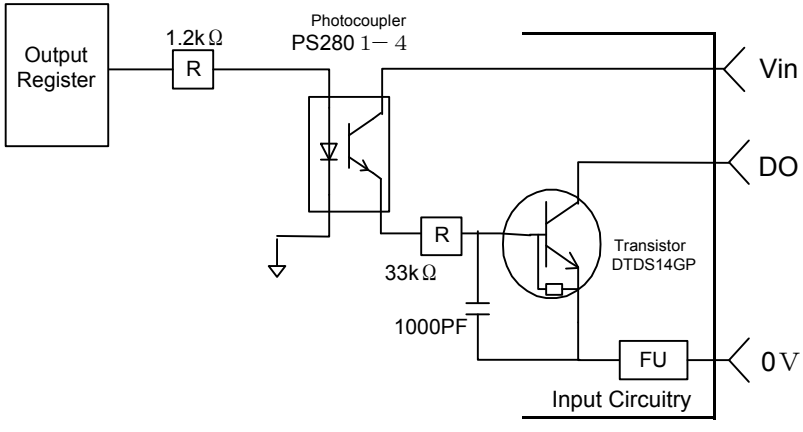


14.6.7 Digital Output Circuit

The specifications of the LIO-06 digital output circuit are shown below.

Item	Specification
Number of Outputs	8
Output Method	Transistor Open Collector Sink Output
High Speed Output	DO_07 has high speed output capability, which can set an output within 13μs of passing a specified encoder position. See axis parameters in the PLCopen Plus Function Block Manual to configure.
Isolation	Photocoupler Isolation
External Power Supply Voltage	DC24V±20%
Output Current	100mA Max
Leak Current at OFF	0.1mA Max
ON Time/OFF Time	ON=0.25ms Max/OFF=1ms Max
Number of Commons	1
Protection Circuit	The fuses are not for circuit protection. They are for fire protection at output shorts. A fuse should be attached outside each output when a protective circuit is necessary.
Fuse Rating	1A
Error Detection	Blown fuse detection

14.6.8 Digital Output Circuit Connection Example



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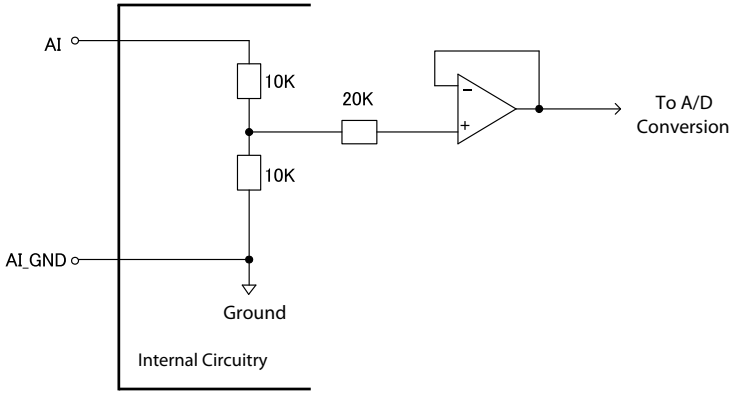
14.6.9 Analog Input Circuit

The specifications of the LIO-06 analog input circuit are shown below.

Item		Specification
Analog Input Range		-10 to +10V
Number of Input Channels		1
Isolation		Non-isolated
Maximum Rated Input		±15V
Input Impedance		Approx. 20kΩ
Resolution		16-bit (-31276 to +31276)
Accuracy	25ºC	±0.1%(±10mV)
	0 to 55ºC	±0.3%(±30mV)
Input Filter	Time Constant	0.2×10^{-2}
	Delay Time	1ms (Max) (When -10+10V)
Conversion Speed		50μs

- The time constant shows the characteristics according to the input filter equivalent to the time to reach 0.632 × the input voltage.

14.6.10 Analog Input Circuit Connection Example



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14.6.11 Analog Input Characteristics Response Chart

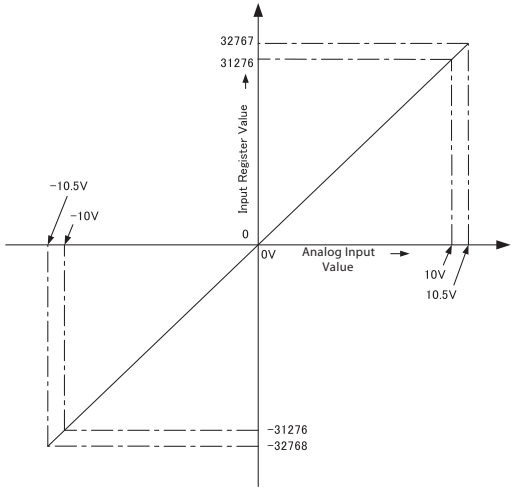
The following shows an analog input response chart and input characteristics diagram for the LIO-06 module.

Input Characteristics Response Chart

Analog Input Value	Input Register Value
-10.5V	-32768
-10.0V	-31276
-5.0V	-15638
0.0V	0
+5.0V	15638
+10.0V	31276
+10.5V	32767

* Minimum linearity of +10.0V cannot be assured.

Voltage Input Characteristics Diagram



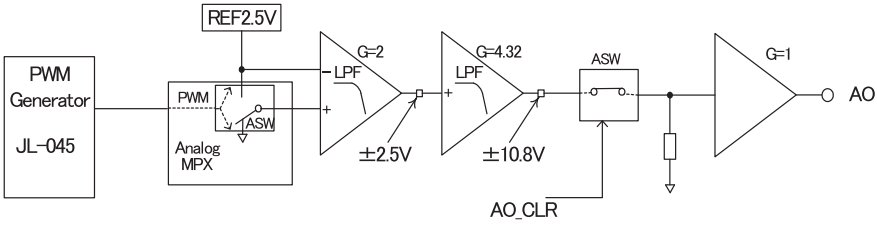
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14.6.12 Analog Output Circuit

The specifications of the LIO-06 analog output circuit are shown below.

Item		Specification
Output Range		-10 to +10V
Number of Output Channels		1
Isolation		Non-isolated
Maximum Permissible Load Current		±5mA
Resolution		16-Bit (-31276 to +31276)
Absolute	25°C	±0.1% (±10mV)
	0 to 55°C	±0.3% (±30mV)
Output Delay Time		1.2ms (Time of change from -10+10V)

14.6.13 Analog Output Circuit Connection Example



14.6.14 Analog Output Characteristics Response Chart

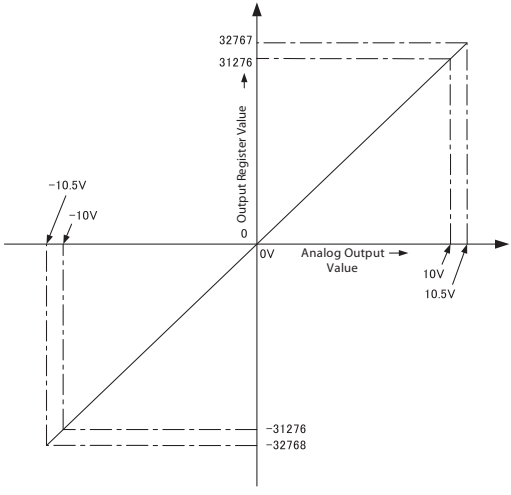
The following shows an analog output response chart and output characteristics diagram for the LIO-06 module.

Output Characteristics Response Chart

Analog Output Value	Output Register Value
-10.5V	-32768
-10.0V	-31276
-5.0V	-15638
0.0V	0
+5.0V	15638
+10.0V	31276
+10.5V	32767

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Voltage Output Characteristics Diagram



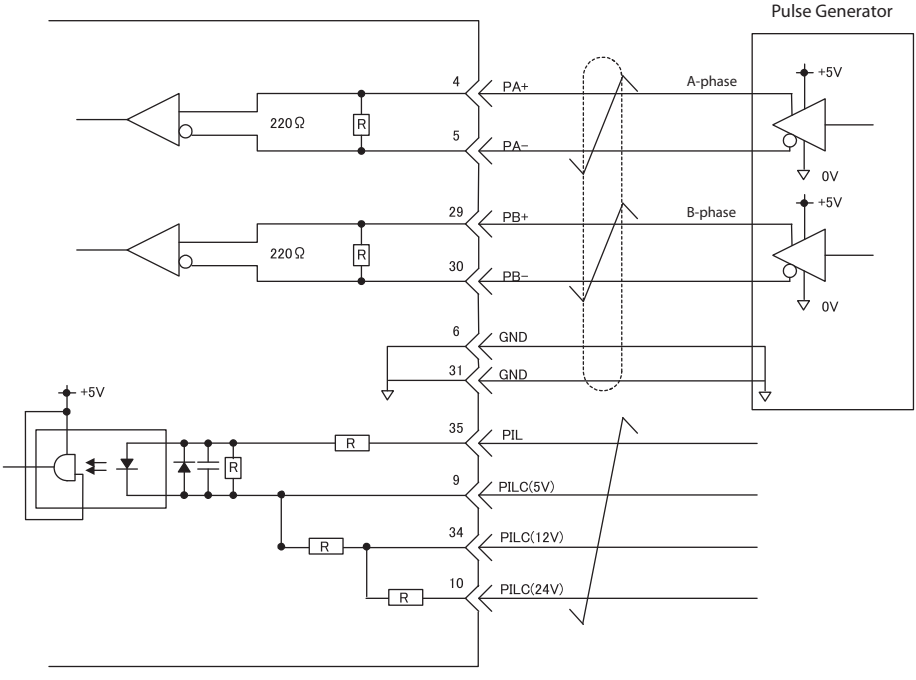
14.6.15 Encoder Circuit

The specifications of the LIO-06 encoder circuit are shown below.

Item	Specification
Number of Encoders	1 channel (A/B/C-Phase Input)
Input Circuits	A/B-phase: 5V differential input, non-isolated, max frequency 4MHz C-Phase: 5V/12V/24V photocoupler input, max frequency 500kHz
Input Mode	A/B-phase, code, UP/DOWN counter, pulse, and direction
Latch Input	Position registration latch with C-Phase of DI_01 Response Time: Max 5μs during C-Phase input, During DI_01 Input: Max 60μs

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14.6.16 Encoder Input Circuit Connection Example



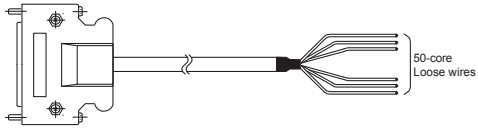
14.6.17 LIO–06 Connectors and Pin Layouts

■ Connectors

Item	Description	
Use Connector	10250-52A3PL (Sumitomo 3M)	LIO-06 Connector (RoHS-compatible)
Mating Connector	10150-3000VE (Sumitomo 3M)	Connector unit
	10150-3000PE (Sumitomo 3M)	Connector Unit (RoHS-compatible)
	10350-52A0-008 (Sumitomo 3M)	Shell screw lock type
	10350-52F0-008 (Sumitomo 3M)	One-touch lock type
Standard Cable	JEPMC-W2064-□□-E	Pigtail

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14.6.18 Standard Cable Model and External Appearance

Name	Model	Length	External Appearance (JEPMC-W2064-□□-E)
Cable for LIO-06 Module (Single loose wire)	JEPMC-W2064-A5-E	0.5 m	
	JEPMC-W2064-01-E	1 m	
	JEPMC-W2064-03-E	3 m	

14.6.19 Standard Cable Wiring Table

The following shows the standard cable wiring for the JEPMC-W2064 cable.

Pin	Wire Color	Markings	Signal Name	Function
1	Orange	–	AO	Analog Output
2	Gray	–	AI	Analog Input
3	White	–	N.C.	
4	Yellow	–	PA+	A_Pulse+
5	Pink	–	PA-	A_Pulse-
6	Orange	– –	GND	Pulse Input Ground
7	Gray	– –	N.C.	
8	White	– –	N.C.	
9	Yellow	– –	PILC5V	C-Phase Latch Input Common (5V)
10	Pink	– –	PILC24V	C-Phase Latch Input Common (24V)
11	Orange	– – –	N.C.	
12	Gray	– – –	N.C.	
13	White	– – –	DICOM	Digital Input Common
14	Yellow	– – –	DI_00	Digital Input 0
15	Pink	– – –	DI_02	Digital Input 2
16	Orange	– – – –	DI_04	Digital Input 4
17	Gray	– – – –	DI_06	Digital Input 6
18	White	– – – –	N.C.	
19	Yellow	– – – –	N.C.	
20	Pink	– – – –	DO_24V	Digital Output 24V Power Supply
21	Orange	– – – – Continuous	DO_00	Digital Output 0
22	Gray	– – – – Continuous	DO_02	Digital Output 2
23	White	– – – – Continuous	DO_04	Digital Output 4
24	Yellow	– – – – Continuous	DO_06	Digital Output 6
25	Pink	– – – – Continuous	DO_GND	Digital Output Common Ground
26	Orange	—	AO_GND	Analog Output Ground
27	Gray	—	AI_GND	Analog Input Ground

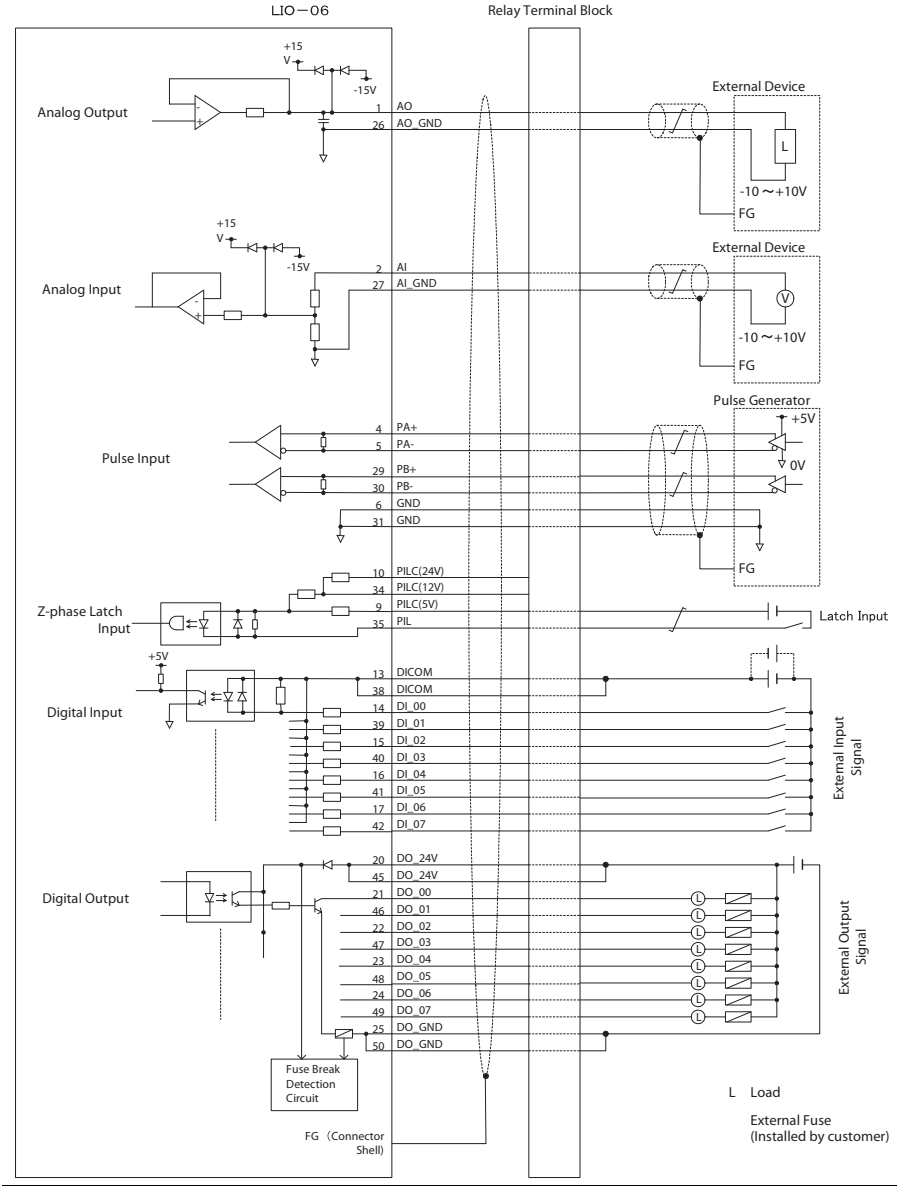
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Pin	Wire Color	Markings	Signal Name	Function
28	White	—	N.C.	
29	Yellow	—	PB+	B_Pulse+
30	Pink	—	PB-	B_Pulse-
31	Orange	— —	GND	Pulse input ground
32	Gray	— —	N.C.	
33	White	— —	N.C.	
34	Yellow	— —	PILC12V	C-Phase latch input common (12V)
35	Pink	— —	PIL	C-Phase latch input
36	Orange	— — —	N.C.	
37	Gray	— — —	N.C.	
38	White	— — —	DICOM	Digital Input Common
39	Yellow	— — —	DI_01	Digital Input 1
40	Pink	— — —	DI_03	Digital Input 3
41	Orange	— — — Continuous	DI_05	Digital Input 5
42	Gray	— — — Continuous	DI_07	Digital Input 7
43	White	— — — Continuous	N.C.	
44	Yellow	— — — Continuous	N.C.	
45	Pink	— — — Continuous	DO_24V	Digital output 24V Power Supply
46	Orange	————————	DO_01	Digital Output 1
47	Gray	————————	DO_03	Digital Output 3
48	White	————————	DO_05	Digital Output 5
49	Yellow	————————	DO_07	Digital Output 7
50	Pink	————————	DO_GND	Digital output common ground
Shell				Shield Wire

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14.6.20 LIO-06 Module Connector Connection Example

An example of LIO-06 module connector connection is shown below.



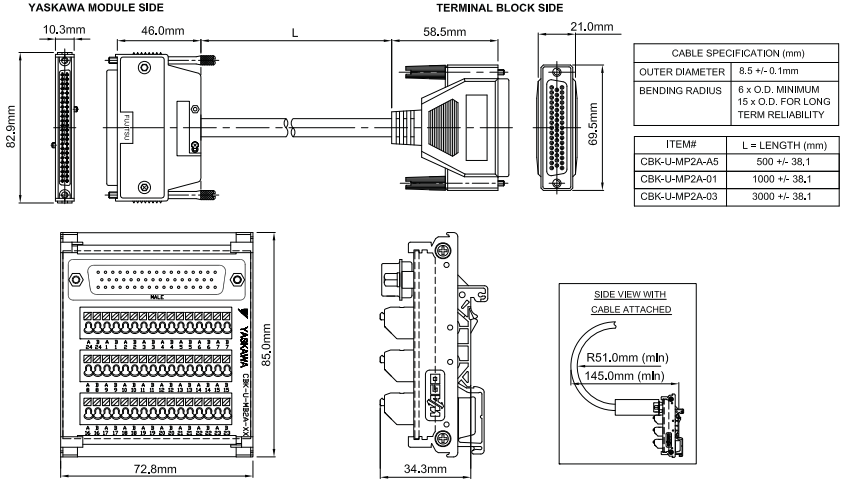
- The cable shield between the external equipment and the junction terminal block should be installed on the external device side.

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15 Terminal Block Kits

15.1 CBK-U-MP2A-xx

Terminal Block Kit for LIO-01/LIO-02



CABLE SPECIFICATION (mm)	
OUTER DIAMETER	8.5 +/- 0.1mm
BENDING RADIUS	6 x O.D. MINIMUM 15 x O.D. FOR LONG TERM RELIABILITY

ITEM#	L = LENGTH (mm)
CBK-U-MP2A-A5	500 +/- 38.1
CBK-U-MP2A-01	1000 +/- 38.1
CBK-U-MP2A-03	3000 +/- 38.1

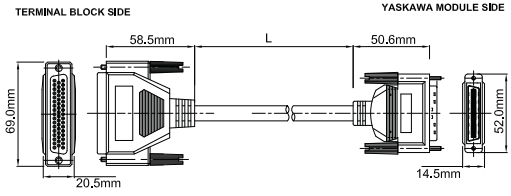
Functionality Chart for CBK-U-MP2A-xx

Pin No.	LIO-01 (JAPMC-IO2300) LIO-02 (JAPMC-IO2301)		Pin No.	LIO-01 (JAPMC-IO2300) LIO-02 (JAPMC-IO2301	
	Signal	Function		Signal	Function
A1	PA	Phase-A pulse (+)	A13	DO_03	Output 3
B1	PAL	Phase-A pulse (-)	B13	DO_02	Output 2
A2	PB	Phase-B pulse (+)	A14	DO_01	Output 1 (Shared with high speed output (COIN) function)
B2	PBL	Phase-B pulse (-)	B14	DO_00	Output 0
A3	PC	Phase-C latch pulse (+)	A15	DI_15	Input 15
B3	PCL5	Phase-C latch pulse (-) for 5vdc input	B15	DI_14	Input 14
A4	GND	Encoder input ground	A16	DI_13	Input 13
B4	PCL12	Phase-C latch pulse (-) for 12vdc input	B16	DI_12	Input 12
A5	DO_COM	Output 0V common	A17	DI_11	Input 11
B5	DO_COM	Output 0V common	B17	DI_10	Input 10
A6	DO_24V	Digital output +24V supply	A18	DI_09	Input 9
B6	DO_24V	Digital output +24V supply	B18	DI_08	Input 8
A7	DO_15	Output 15	A19	DI_07	Input 7
B7	DO_14	Output 14	B19	DI_06	Input 6
A8	DO_13	Output 13	A20	DI_05	Input 5
B8	DO_12	Output 12	B20	DI_04	Input 4
A9	DO_11	Output 11	A21	DI_03	Input 3
B9	DO_10	Output 10	B21	DI_02	Input 2
A10	DO_09	Output 9	A22	DI_01	Input 1 (Shared with pulse latch input)
B10	DO_08	Output 8	B22	DI_00	Input 0
A11	DO_07	Output 7	A23	DI_COM0	Input common 0
B11	DO_06	Output 6	B23	DI_COM1	Input common 1
A12	DO_05	Output 5	A24	FG	Frame ground
B12	DO_04	Output 4	B24	FG	Frame ground

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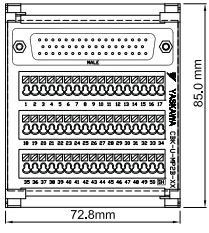
15.2 CBK-U-MP2B-xx

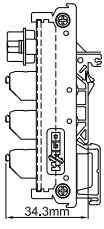
Terminal Block Kit for LIO-04/LIO-05/LIO-06



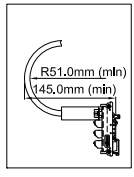
CABLE SPECIFICATION (mm)	
OUTER DIAMETER	8.5 +/- 0.1mm
BENDING RADIUS	6 x O.D. MINIMUM 15 x O.D. FOR LONG TERM RELIABILITY

ITEM#	L = LENGTH (mm)
CBK-U-MP2B-A5	500 +/- 38.1
CBK-U-MP2B-01	1000 +/- 38.1
CBK-U-MP2B-03	3000 +/- 38.1





SIDE VIEW WITH CABLE ATTACHED



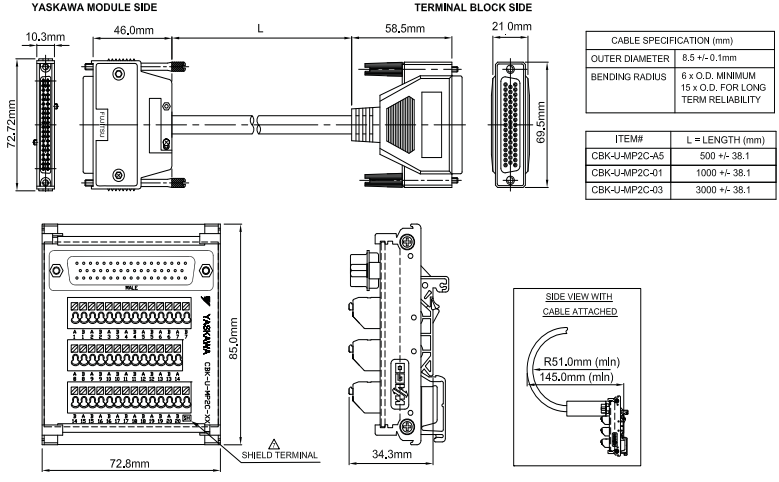
Functionality Chart for CBK-U-MP2B-xx

Pin	LIO-04 (JAPMC-IO2303) / LIO-05 (JAPMC-IO2304)				LIO-06 (JAPMC- IO2305-E)	
No.	CN1 Signal	CN1 Function	CN2 Signal	CN2 Function	Signal	Function
1	DICOM_1	Digital input common 1	DICOM_3	Digital input common 3	AO	Analog output
2	DI_00	Digital input 0	DI_16	Digital input 16	AI	Analog input
3	DI_02	Digital input 2	DI_18	Digital input 18	-	-
4	DI_04	Digital input 4	DI_20	Digital input 20	PA+	Phase A pulse (+)
5	DI_06	Digital input 6	DI_22	Digital input 22	PA-	Phase A pulse (-)
6	DICOM_2	Digital input common 2	DICOM_4	Digital input common 4	GND	Encoder input ground
7	DI_08	Digital input 8	DI_24	Digital input 24	-	-
8	DI_10	Digital input 10	DI_26	Digital input 26	-	-
9	DI_12	Digital input 12	DI_28	Digital input 28	PILC5V	Phase-C latch pulse (-) for 5VDC input
10	DI_14	Digital input 14	DI_30	Digital input 30	PILC24V	Phase-C latch pulse (-) for 24VDC input
11	-	-	-	-	-	-
12	DO_00	Digital output 0	DO_16	Digital output 16	-	-
13	DO_02	Digital output 2	DO_18	Digital output 18	DICOM	Digital input common
14	-	-	-	-	DI_00	Digital input 0
15	+24V_1	Digital output supply 1	+24V_3	Digital output supply 3	DI_02	Digital input 2
16	DO_04	Digital output 4	DO_20	Digital output 20	DI_04	Digital input 4
17	DO_06	Digital output 6	DO_22	Digital output 22	DI_06	Digital input 6
18	-	-	-	-	-	-
19	DO_08	Digital output 8	DO_24	Digital output 24	-	-
20	DO_10	Digital output 10	DO_26	Digital output 26	DO_24V	Digital output 24V supply
21	-	-	-	-	DO_00	Digital output 0
22	+24V_2	Digital output supply 2	+24V_4	Digital output supply 4	DO_02	Digital output 2
23	DO_12	Digital output 12	DO_28	Digital output 28	DO_04	Digital output 4
24	DO_14	Digital output 14	DO_30	Digital output 30	DO_06	Digital output 6
25	-	-	-	-	DO_GND	Digital output 0V common
26	-	-	-	-	AO_GND	Analog output ground
27	DI_01	Digital input 1	DI_17	Digital input 17	AI_GND	Analog input ground
28	DI_03	Digital input 3	DI_19	Digital input 19	-	-
29	DI_05	Digital input 5	DI_21	Digital input 21	PB+	Phase-B pulse (+)
30	DI_07	Digital input 7	DI_23	Digital input 23	PB-	Phase-B pulse (-)
31	-	-	-	-	GND	Encoder input ground
32	DI_09	Digital input 9	DI_25	Digital input 25	-	-
33	DI_11	Digital input 11	DI_27	Digital input 27	-	-
34	DI_13	Digital input 13	DI_29	Digital input 29	PILC12V	Phase-C latch pulse (-) for 12VDC input
35	DI_15	Digital input 15	DI_31	Digital input 31	PIL	Phase-C latch pulse (+)
36	-	-	-	-	-	-
37	DO_01	Digital output 1	DO_17	Digital output 17	-	-
38	DO_03	Digital output 3	DO_19	Digital output 19	DICOM	Digital input common
39	0V_1	Digital output 0VDC 1	0V_3	Digital output 0VDC 3	DI_01	Digital input 1 (shared with pulse latch input)
40	-	-	-	-	DI_03	Digital input 3
41	DO_05	Digital output 5	DO_21	Digital output 21	DI_05	Digital input 5
42	DO_07	Digital output 7	DO_23	Digital output 23	DI_07	Digital input 7
43	-	-	-	-	-	-
44	DO_09	Digital output 9	DO_25	Digital output 25	-	-
45	DO_11	Digital output 11	DO_27	Digital output 27	DO_24V	Digital output 24V supply
46	0V_2	Digital output 0VDC 2	0V_4	Digital output 0VDC 4	DO_01	Digital output 1
47	-	-	-	-	DO_03	Digital output 3
48	DO_13	Digital output 13	DO_29	Digital output 29	DO_05	Digital output 5
49	DO_15	Digital output 15	DO_31	Digital output 31	DO_07	Digital output 7 (shared with position agreement 'COIN' signal)
50	-	-	-	-	DO_GND	Digital output 0V common

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15.3 CBK-U-MP2C-xx

Terminal Block Kit for IO2310/IO2330 (64-Point I/O Module)



CABLE SPECIFICATION (mm)	
OUTER DIAMETER	8.5 +/- 0.1mm
BENDING RADIUS	6 x O.D. MINIMUM 15 x O.D. FOR LONG TERM RELIABILITY

ITEM#	L = LENGTH (mm)
CBK-U-MP2C-A5	500 +/- 38.1
CBK-U-MP2C-01	1000 +/- 38.1
CBK-U-MP2C-03	3000 +/- 38.1

Functionality Chart for CBK-U-MP2C-xx

Pin No.	JEPMC-IO2310 and JEPMC-IO2330							
	IN1 signal	IN1 function	IN2 signal	IN2 function	OUT1 signal	OUT1 function	OUT2 signal	OUT2 function
A1	-	-	-	-	024V_6	Common ground 6	024V_8	Common ground 8
B1	-	-	-	-	024V_6	Common ground 6	024V_8	Common ground 8
A2	+24V_2	24V power supply 2	+24V_4	24V power supply 4	+24V_6	24V power supply 6	+24V_8	24V power supply 8
B2	+24V_2	24V power supply 2	+24V_4	24V power supply 4	+24V_6	24V power supply 6	+24V_8	24V power supply 8
A3	IN32	Input 32	IN64	Input 64	OUT32	Output 32	OUT64	Output 64
B3	IN31	Input 31	IN63	Input 63	OUT31	Output 31	OUT63	Output 63
A4	IN30	Input 30	IN62	Input 62	OUT30	Output 30	OUT62	Output 62
B4	IN29	Input 29	IN61	Input 61	OUT29	Output 29	OUT61	Output 61
A5	IN28	Input 28	IN60	Input 60	OUT28	Output 28	OUT60	Output 60
B5	IN27	Input 27	IN59	Input 59	OUT27	Output 27	OUT59	Output 59
A6	IN26	Input 26	IN58	Input 58	OUT26	Output 26	OUT58	Output 58
B6	IN25	Input 25	IN57	Input 57	OUT25	Output 25	OUT57	Output 57
A7	IN24	Input 24	IN56	Input 56	OUT24	Output 24	OUT56	Output 56
B7	IN23	Input 23	IN55	Input 55	OUT23	Output 23	OUT55	Output 55
A8	IN22	Input 22	IN54	Input 54	OUT22	Output 22	OUT54	Output 54
B8	IN21	Input 21	IN53	Input 53	OUT21	Output 21	OUT53	Output 53
A9	IN20	Input 20	IN52	Input 52	OUT20	Output 20	OUT52	Output 52
B9	IN19	Input 19	IN51	Input 51	OUT19	Output 19	OUT51	Output 51
A10	IN18	Input 18	IN50	Input 50	OUT18	Output 18	OUT50	Output 50
B10	IN17	Input 17	IN49	Input 49	OUT17	Output 17	OUT49	Output 49
A11	IN16	Input 16	IN48	Input 48	OUT16	Output 16	OUT48	Output 48
B11	IN15	Input 15	IN47	Input 47	OUT15	Output 15	OUT47	Output 47
A12	IN14	Input 14	IN46	Input 46	OUT14	Output 14	OUT46	Output 46
B12	IN13	Input 13	IN45	Input 45	OUT13	Output 13	OUT45	Output 45
A13	IN12	Input 12	IN44	Input 44	OUT12	Output 12	OUT44	Output 44
B13	IN11	Input 11	IN43	Input 43	OUT11	Output 11	OUT43	Output 43
A14	IN10	Input 10	IN42	Input 42	OUT10	Output 10	OUT42	Output 42
B14	IN09	Input 9	IN41	Input 41	OUT09	Output 9	OUT41	Output 41
A15	IN08	Input 8	IN40	Input 40	OUT08	Output 8	OUT40	Output 40
B15	IN07	Input 7	IN39	Input 39	OUT07	Output 7	OUT39	Output 39
A16	IN06	Input 6	IN38	Input 38	OUT06	Output 6	OUT38	Output 38
B16	IN05	Input 5	IN37	Input 37	OUT05	Output 5	OUT37	Output 37
A17	IN04	Input 4	IN36	Input 36	OUT04	Output 4	OUT36	Output 36
B17	IN03	Input 3	IN35	Input 35	OUT03	Output 3	OUT35	Output 35
A18	IN02	Input 2	IN34	Input 34	OUT02	Output 2	OUT34	Output 34
B18	IN01	Input 1	IN33	Input 33	OUT01	Output 1	OUT33	Output 33
A19	-	-	-	-	024V_5	Common ground 5	024V_7	Common ground 7
B19	-	-	-	-	024V_5	Common ground 5	024V_7	Common ground 7
A20	+24V_1	24V power supply 1	+24V_3	24V power supply 3	+24V_5	24V power supply 5	+24V_7	24V power supply 7
B20	+24V_1	24V power supply 1	+24V_3	24V power supply 3	+24V_5	24V power supply 5	+24V_7	24V power supply 7

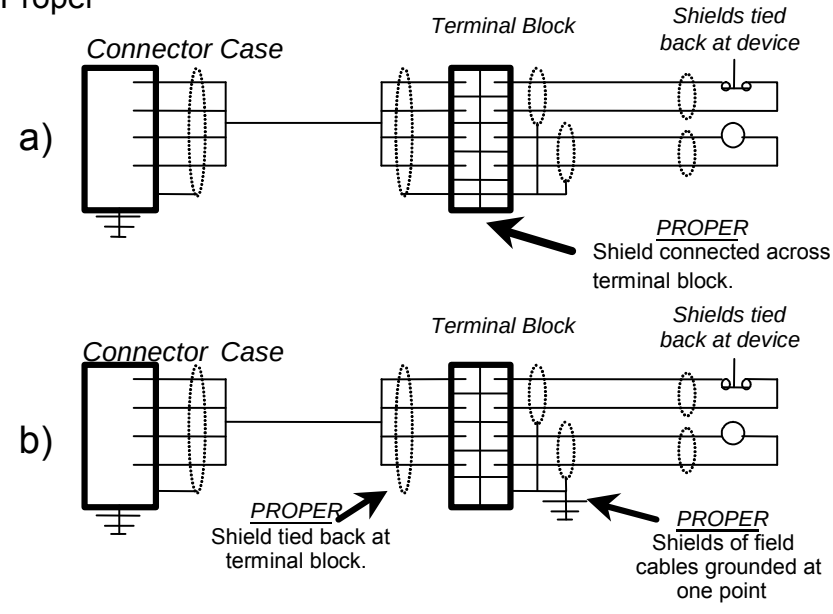
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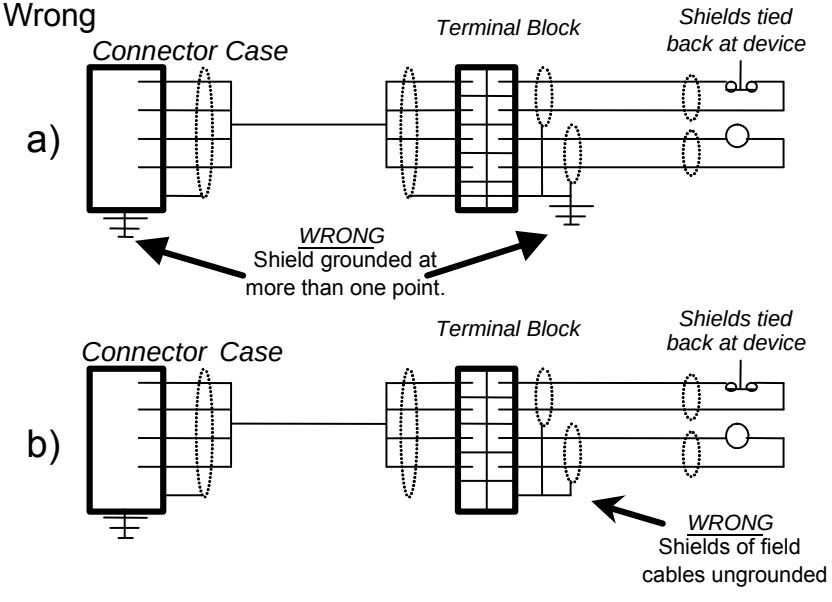
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16 Cable Shielding, Segregation & Noise Immunity

Proper



Wrong



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17 Firmware Upgrade Procedure

1) Turn on the SUP DIP Switch.

2) Reboot the controller.

3) Use Internet Explorer to connect to the MP23□ □ □ iec Web server. Type in the IP address of the controller in the brower's address bar.

4) Under the "Maintenance" section at the left of the screen, select "Upgrade Firmware."

5) Browse the appropiate firmware "zip" file.

6) Press the "upload" button.

7) When the controller upgrade is complete, the screen will indicate to switch off the SUP DIP switch and reboot the controller.

8) The firmware update is complete.

More detailed instructions (including firmware history) are available for download from Yaskawa's website: www.yaskawa.com/iecSupport

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