



M2I Corporation

Industrial Remote I/O Coupler Module MIO-CMR0A

Hardware Manual

Thank you for using Industrial Remote I/O Coupler Module of M2I corporation. Please read this manual carefully to know installing, wiring, operating, servicing and inspecting this equipment.





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Chapter 1 Safety Precautions

■ Before using the product





To ensure the safe and efficient use of the product, please read this manual thoroughly and completely before use. The safety precautions must be followed to prevent accidents and hazards. These precautions are divided into "Warning" and "Caution" sections. The meanings of each category are as follows.

 Warning	Violating the instruction may result in serious personal injury or death.
 Caution	Violating the instruction may result in slight personal injury or product damage.
	Be cautious, for danger may be present.
	Be cautious, for there is a possibility of an electric shock.






■ General Precautions **Caution**

-  Do not push hard, or use thick and sharp tools like gimlet, screwdriver, pen, etc.). It can cause a malfunction.
-  Do not use or store the product in highly vibrating environment.
-  Keep the foreign substances (water, liquid, metal powders, etc.) out of the product. These can crack the product or cause an electric shock.
-  Make sure to keep the distance minimum 30cm from product when you use radio or cell phone.
-  Do not touch the product or adapter with wet hand. It can cause an electric shock.
-  Do not use the product in flammable environment with combustible liquid, gas or dust.
-  When you store the product long term without any use, keep the product out of the direct sunlight and humid condition.

■ Design Precautions **Warning**

-  Install protection circuit on the outside of Products to protect the entire control system when external power supply or Products have problems.
-  As the malfunction & incorrect result of Products could damage the stability of the entire systems and human body, you must install damage preventing interlock circuit such as emergency stop, Protective circuits, positioning upper and lower limit switch and interlock for forward/reverse operation.
-  When computer or other controllers communicate and exchange data with products or change operation mode of products, set up protective sequence program in PC or Controller for protecting system from communication error.
-  The output signal or communication lines should be separated from the power line or high tension wire. They should be installed 100mm (3.94 Inch) or more from each other.

■ Wiring Precautions **Warning**

-  Be sure the wiring is done correctly by checking the product's rated voltage and the terminal layout. Incorrect wiring could result in fire, damage or malfunctions.
-  Tighten the terminal screw with the specified torque. If the screws of terminal are loose, it could result in short circuit, fire, malfunctions.
-  Always use grounding for the FG terminal. Failure to do so may result in malfunction.
-  a. Grounding should be the Class 3 grounding. The cable for grounding should be more than 0.812mm²(20AWG).
-  b. grounding point be closed to the products and make short the distance to the ground cable if possible.

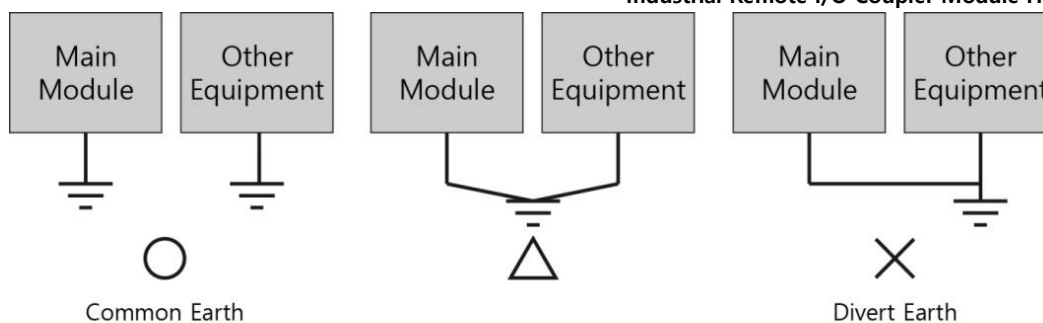









Fig. Grounding Example Diagram

■ Installation Precautions Caution

-  Do not install the location where exceeds allowed temperature. Product can be damaged or shorten the life. Especially Install environment as below should be avoided.
-  Do not install in locations with the following installation environments.
 - A place where the ambient temperature is within the range of -10 to 50°C
 - The surface of the operating panel where the high-voltage equipment is installed
-  Do not install to the place where strong shock or vibration continuously have impacted on product.
-  Use the product under 2000M altitude.
-  The space between back of product and back of control board must be more than 100mm for maintenance and ventilation. If this product is installed in sealed area, a cooling fan must be installed also.
-  Use the product Indoor only.
-  The length of power cable should be 3m(10 feet) or less.

■ Disposal Precaution Caution

When you dispose of product, please treat it as industrial waste. It can create poisonous substances or explosion.

■ Wiring connection specifications

Wiring to the product must be from an insulated secondary source of 24 Vdc or less with limited voltage/limited current, output fuse, or from a secondary circuit rated for Class 2.

Chapter 2 Overview

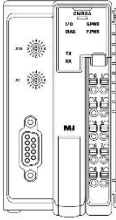

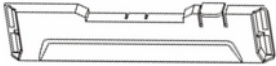
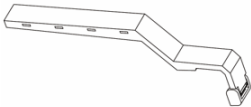
2.1 Product Overview

This industrial remote I/O coupler module is industrial-needed device with high durability. A basic purpose of this item is a communication with industrial remote I/O coupler module.

2.2 Components

Package contents are below.

Make sure that all of components are in the package Series before using.

Components	Figure	Qty
Main Unit (MIO-CMR0A)		1
User Manual		1
End Module		1
Accessories		User Option (Separate sale)

2.3 Explanation of model name

The MIO series product lineup is as follows:

2.3.1 Coupler Module Series

Base Unit	Unit Type	Communication Type	Type
MIO-	C: Coupler unit	MR: MODBUS RTU MT: MODBUS TCP EC: EtherCAT TCP	0A: Basic

2.3.2 I/O Module Series

Base Unit	Data Type	Input / Output	Signal	Point	Type
MIO-	A: Analog D: Digital	I: Input O: Output	N: SINK P: SOURCE R: RTD ^{*1)} , Relay ^{*2)} V: Voltage C: Current	02 04 08 16	-01: Basic

* 1) RTD is only for MIO-A***** units.

* 2) Relay is only for MIO-D***** units.

2.3.3 Expansion Module Series

Base Unit	Functions and Specifications
MIO-	PWR0A: Adding System Power or Field Power PWR0B: Adding Field Power COM0A: Extension of Field Power +24V contacts into 16 COM0B: Extension of Field Power +0V contacts into 16 COM0C: Extension of Field Power +24V / +0V contacts into 8 / 8

Chapter 3 General Specifications

3.1 Electrical Specifications

Input Voltage (Vin)		Insulated 24VDC (20~28VDC), Class 2
Output Voltage (Vout)		5V, 1.4A (Max. 3A limit)s
Power	Consumption	4W
	Voltage endurance	24VDC, 10ms or less
	Insulation Resistance	500VDC, 10MΩ

3.2 Interface and Functions

Coupler Type	MODBUS RTU
Communication Method	RS-232C/422/485 Serial Comm.
Module Connectivity	Max. 255Node Extension
Node Number Setting	16 Rotary Switch x 2EA, No 1~255 Setting
Communication Speed	Max. 187.5Kbps
I/O Module Connectivity	Max. 32 Slots Available
Internal Memory	Input+ Output Max. 256 Byte
Status LED	MODBUS Status, I/O Expansion Module Communication Status, Remote I/O Coupler Status, System Power Status, RX / TX Status, Field Power Status

3.3 Outer Electrical Specification

Input Voltage	24VDC(11~28.8V)
Allowable Current	Maximum 7A

3.4 Environmental Specification

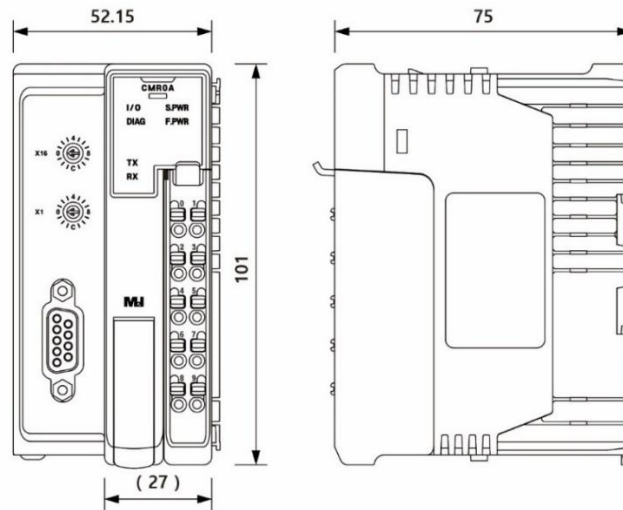
Operation Temperature (°C)	-10 ~ +50
Storage Temperature (°C)	-20 ~ +60
Operation Humidity (%RH)	0 ~ 90 (No dew)
Atmosphere	No corrosive gas
Vibration Endurance	Amplitude: $10 \leq F < 25\text{Hz}$ (2G) X,Y,Z each direction(for 30 minutes)
Noise Immunity	1000Vp-p (Pulse width 1μs)
Static Electricity Discharge	Connective discharge from EN61000-4-2: ±4kV
Shock Endurance	10G X,Y,Z each direction (for 3 times)
Surge Voltage	500V (Line-Line)
Ground Connection	Class 3 (Under 100Ω)
Protection Classification	IP20

3.5 Structure

Cooling	Natural air circulation
Case Material	PC(Resistance to flame)

Chapter 4 Parts Identification and Specifications

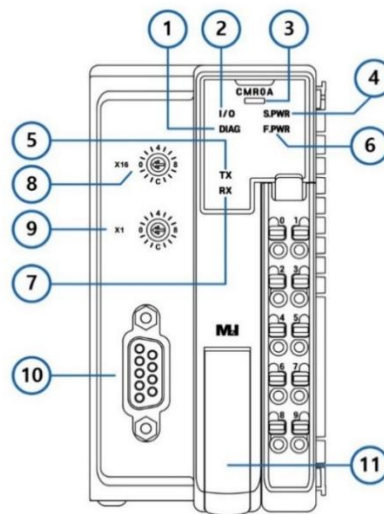
4.1 Product Size



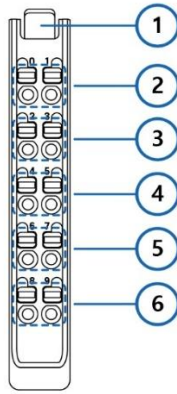
(mm)

Model	W	D	H
MIO-CMR0A	52.15	101	75

4.2 Part Name and Specification

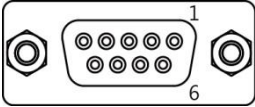


No	Name	Description
①	Diagnostic LED	N/A
②	Extension I/O Module Status LED	I/O Module Communication Status
③	Remote I/O Coupler Status LED	I/O Coupler Module Status
④	System Power LED	System Power Status
⑤	TX Status LED	MODBUS Communication Sending Signal Status
⑥	Field Power Status LED	Field Power Status
⑦	RX Status LED	MODBUS Communication Receiving Signal Status
⑧	Node Number Setting Switch 16x	Setting Node Number of 16 Magnification
⑨	Node Number Setting Switch 1x	Setting Node Number of 1 Magnification
⑩	MODBUS Communication Port	MODBUS Communication DUSB9 Connector
⑪	USB Connector Cover	Mini-USB Port to connect with M2I I/O Master Software



No	Name	Description
①	Detach Hook	Hook part of terminal unit detachment
②	24V	System Power +24V
③	24G	System Power GND
④	F.G	System Power Field Ground
⑤	F24G	Field Power 0V
⑥	F24V	Field Power +24V

4.3 MODBUS Communication Port

Type	Pin No.	Signal	Direction	Meaning
9Pin Female 	1	RDA(RD+)	Input	RS-422/485 Receive Data (+)
	2	RD(RxD)	Input	RS-232C Receive Data
	3	SD(TxD)	Output	RS-232C Send Data
	4	RDB(RD-)	Input	RS-422/485 Receive Data (-)
	5	SG	-	Signal Ground
	6	SDA(SD+)	Output	RS-422/485 Send Data (+)
	7	NC	-	Not Available
	8	NC	-	Not Available
	9	SDB(SD-)	Output	RS-422/485 Send Data (-)

Chapter 5 Input / Output Structure

This product has a memory map data by WORD(2Byte).

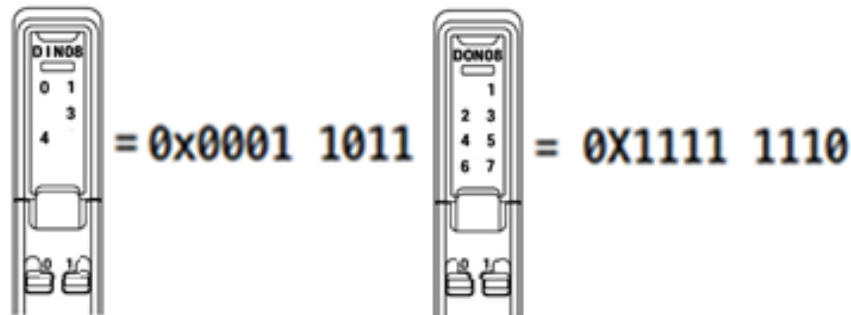
Maximum **N** word size is available and this size is decided by the type and number of connected I/O Module.

I/O Expansion Module	Point/Channel	Memory Map Size (Mode 1)	Memory Map Size (Mode 2)
MIO-D*** (DIGITAL INPUT 8PT)	8P	1 Byte	4 Word
MIO-D*** (DIGITAL OUTPUT 8PT)	8P	1 Byte	
MIO-R*** (RELAY OUTPUT 4PT)	4P	1 Byte	
MIO-A*** (ANALOG OUTPUT 4CH)	4CH	4 Word	
MIO-A*** (ANALOG INPUT 4CH)	4CH	4 Word	

5.1 Data Display

5.1.1 DIGITAL I/O, RELAY I/O Expansion Module

Each point is mapped and displayed in 1 bit. Maximum display point is 8bit. As memory map image manages as Byte base, 1 address can save maximum 2 Module Data in 1Word based MODBUS address system.



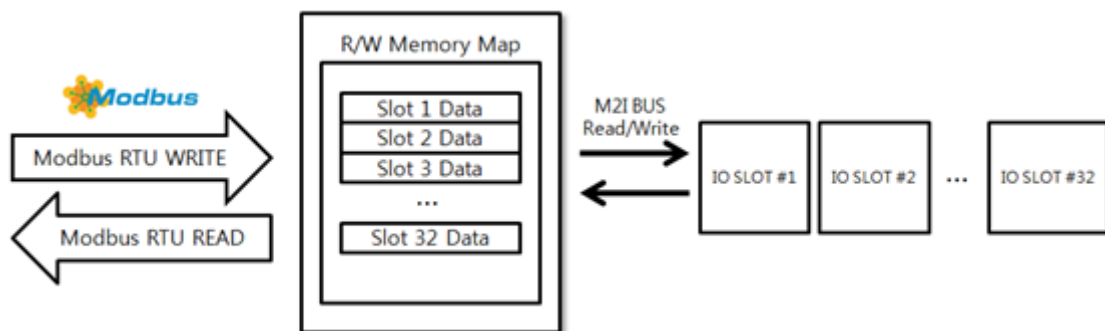
5.1.2 Analog I/O, RTD Module

Analog I/O module is channel base, and each channel is 16bit. 1 address can save maximum 1 Module Data in 1Word based MODBUS address system. Thus, normally a module of Analog 4CH is displayed in memory map through 4 words.

5.2 Image Process

When the power is on, Coupler Module scans current connected Expansion Modules and organize the image used for Modbus communication. This organized image's size is decided by image mode or type, location of Expansion Module. This image processing mode has Mode 1 and 2.

5.3 Image Mode



Example) Below table is the package connected sequence for example about data flow.

No	#0	#1	#2	#3	#4	#5	#6	#7	#8
I/O Model	CMR0A	DO*08	DI*08	AI*04	DOR04	DO*08	AO*04	DI*08	DOR*04

5.3.1 Mode 1 (0x0000 ~ 0x0FFF)

In the Memory Map of Mode 1, one slot has max, 1Word space and next slot's data is placed to next address.

Addr	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
0x0000	SLOT #0 MIO-CMR0A																			
0x0001	EMPTY								SLOT #1 Digital Output											
0x0002	EMPTY								SLOT #2 Digital Input											
0x0003	SLOT #3 Analog Input Ch.0 high byte								SLOT #3 Analog Input Ch.0 low byte											
0x0004	SLOT #3 Analog Input Ch.1 high byte								SLOT #3 Analog Input Ch.1 low byte											
0x0005	SLOT #3 Analog Input Ch.2 high byte								SLOT #3 Analog Input Ch.2 low byte											
0x0006	SLOT #3 Analog Input Ch.3 high byte								SLOT #3 Analog Input Ch.3 low byte											
0x0007	EMPTY								EMPTY				SLOT #4 Relay Output							
0x0008	EMPTY								SLOT #5 Digital Output											
0x0009	SLOT #6 Analog Output Ch.0 high byte								SLOT #6 Analog Output Ch.0 low byte											
0x000A	SLOT #6 Analog Output Ch.1 high byte								SLOT #6 Analog Output Ch.1 low byte											
0x000B	SLOT #6 Analog Output Ch.2 high byte								SLOT #6 Analog Output Ch.2 low byte											
0x000C	SLOT #6 Analog Output Ch.3 high byte								SLOT #6 Analog Output Ch.3 low byte											
0x000D	EMPTY								SLOT #7 Digital Input											
0x000E	EMPTY								EMPTY				SLOT #8 Relay Output							

5.3.2 Mode 2

A Memory Map of Mode 2 has fixed address of each slot. It helps to find an address for each slot, but there are wasted memory address. As maximum 4Word image space is needed If Analog 4CH slot is installed, 4Word space for each slot is registered.

Addr	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
0x0000	SLOT #0 MIO-CMR0A																			
0x0001	EMPTY								SLOT #1 Digital Output											
0x0002	EMPTY								EMPTY											
0x0003	EMPTY								EMPTY											
0x0004	EMPTY								EMPTY											
0x0005	EMPTY								SLOT #2 Digital Input											
0x0006	EMPTY								EMPTY											
0x0007	EMPTY								EMPTY											
0x0008	EMPTY								EMPTY											
0x0009	SLOT #3 Analog Input Ch.0 high byte								SLOT #3 Analog Input Ch.0 low byte											
0x000A	SLOT #3 Analog Input Ch.1 high byte								SLOT #3 Analog Input Ch.1 low byte											
0x000B	SLOT #3 Analog Input Ch.2 high byte								SLOT #3 Analog Input Ch.2 low byte											
0x000C	SLOT #3 Analog Input Ch.3 high byte								SLOT #3 Analog Input Ch.3 low byte											
0x000D	EMPTY								EMPTY				SLOT #4 Relay Output							
0x000E	EMPTY								EMPTY											
0x000F	EMPTY								EMPTY											
0x0010	EMPTY								EMPTY											
0x0011	EMPTY								SLOT #5 Digital Output											
0x0012	EMPTY								EMPTY											
0x0013	EMPTY								EMPTY											
0x0014	EMPTY								EMPTY											
0x0015	SLOT #6 Analog Output Ch.0 high byte								SLOT #6 Analog Output Ch.0 low byte											

0x0016	SLOT #6 Analog Output Ch.1 high byte	SLOT #6 Analog Output Ch.1 low byte
0x0017	SLOT #6 Analog Output Ch.2 high byte	SLOT #6 Analog Output Ch.2 low byte
0x0018	SLOT #6 Analog Output Ch.3 high byte	SLOT #6 Analog Output Ch.3 low byte
0x0019	EMPTY	SLOT #7 Digital Input
0x001A	EMPTY	EMPTY
0x001B	EMPTY	EMPTY
0x001C	EMPTY	EMPTY
0x001D	EMPTY	EMPTY SLOT #8 Relay Output
0x001E	EMPTY	EMPTY
0x001F	EMPTY	EMPTY
0x0020	EMPTY	EMPTY

* Memory Map mode can be changed in M2I MIO Master program.

5.4 Product Status Image

Apart from above memory map, we supply a status checking memory map. You can check the status of coupler and I/O module by accessing into status image with MODBUS protocol. This image is divided by coupler status image and I/O status image.

5.4.1 Coupler Status Image (4000)

The error code image is an area that displays error status data at MODBUS address 4000 when an error occurs during operation. The errors displayed in the error code image are as follows.

Address	ERROR Code (High Byte)
4000	0x00: OKAY 0x01: Coupler INIT Fail 0x02: No I/O Card (Empty Slot) 0x03: I/O Module No Response or Hot Swap

5.4.2 I/O Status Image (4001 ~ 4002)

When the error code image indicates an I/O-related error (0x03, 0x04), you can check the ON/OFF status of each bit in the I/O status image to determine which slot the problem occurred in. The I/O status image provides information that can identify the I/O card where the problem occurred. From the 0th bit of address 4001 to the 15th bit of address 4002, a total of 32 bits of data are mapped to slots 1 to 32, respectively.

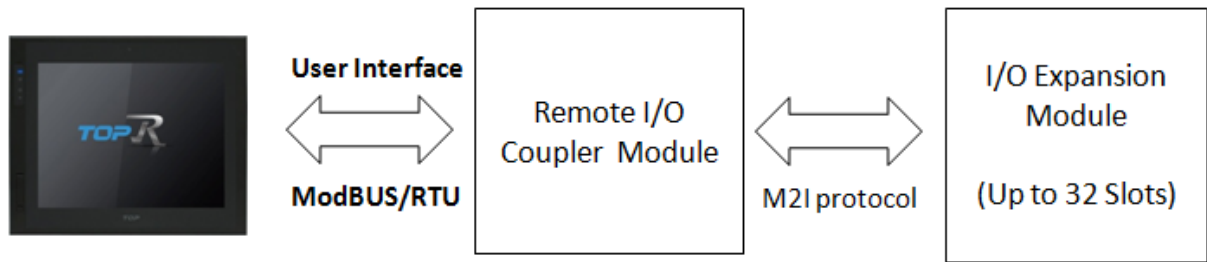
Address	Error Slot (High)								Error Slot (Low)							
4001	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
4002	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

* TDS can display a status image.

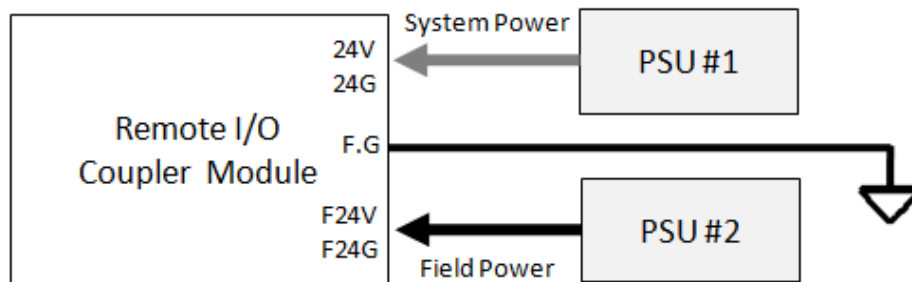
Chapter 6 Operation / Settings

6.1 System Configuration

To communicate with the I/O module, you must connect it by referring to the following.



6.1.1 Power Connection



6.1.2 I/O Module Connection Caution

- (1) A slot number will be registered automatically when you connect the I/O Expansion Module.
- (2) Maximum number of I/O Expansion Module for 1 Coupler should be connected considering current consumption of I/O module and rated current of Coupler module.

I/O Module	Current Consumption	Coupler's Rated Current
MIO-DIN08-01	70mA	1400mA
MIO-DIP08-01	70mA	
MIO-DON08-01	90mA	
MIO-DOP08-01	90mA	
MIO-DOR04-01	200mA	
MIO-DIN16-01	70mA	
MIO-DIP16-01	70mA	
MIO-DON16-01	120mA	
MIO-DOP16-01	120mA	
MIO-AIC04-01	200mA	
MIO-AIV04-01	200mA	
MIO-AOC04-01	200mA	
MIO-AOV04-01	200mA	
MIO-AIR02-01	70mA	

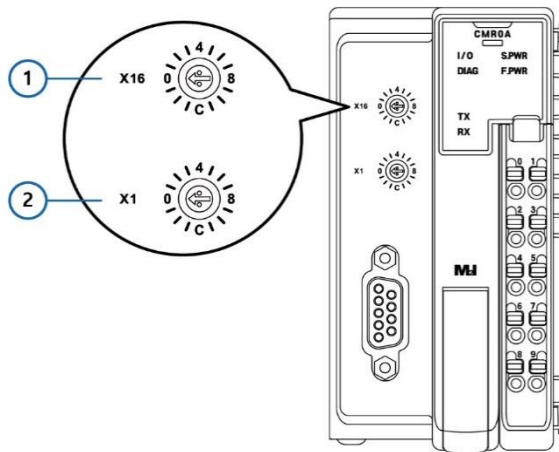
* If you use more than Coupler module's rated current, it can cause fire or malfunction.

6.2 Status LED

Indicates the operating status of the status LED.

Name	LED Color	Status	Description
MOD	Green	Module Status	Normal Operation of Coupler Module
	Red		Error of Coupler Module
RXD	Green	Receive Data	Blink when receiving data is transferred.
TXD	Green	Transmit Data	Blink when sending data is transferred.
I/O	Green	OFF	No connection with I/O Module
		Blink Once	I/O module communication failure or during hot-swap
		Blink Twice	I/O module initialization failure
		ON	Connected with I/O Module
DIAG	Green	OFF	N/A
S.PWR	Green	ON	System Power is connected.
		OFF	System Power is not connected.
F.PWR	Green	ON	Field Power is connected.
		OFF	Field Power is not connected.

6.3 Setting of MODBUS Node Number



No	Name	Description
①	X16	Address Setting 16x
②	X1	Address Setting 1x

Setting Example)

- X1: 1, X16: 0 = 1 Node Number "1"
- X1: 10, X16: 1 = 26 Node Number "26"
- X1: 10, X16: 6 = 106 Node Number "106"

Chapter 7 Installation / Wiring Warning

7.1 Location

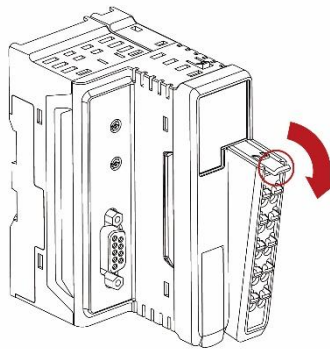
- (1) Keep more than 100mm distance from other devices for safe operation and eliminate mechanical risk factors around.
- (2) Installation environment should be -10~50°C temperature and 10~90%RH humid.
- (3) If an installation is in sealed condition, cooler fan should be installed.
- (4) Keep power cables away from communication cables. A noise can cause a malfunction.
- (5) Install the product keeping distance from cables which has a lot of noise, and wiring length would be short.

7.2 Outer Protection

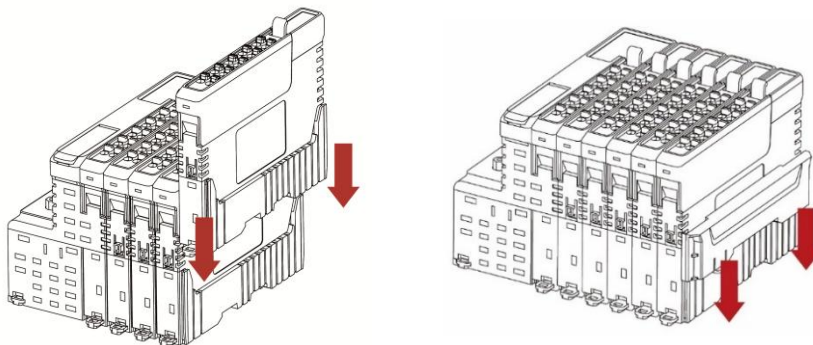
Operation of product may not be normal cause of part malfunctions like relay or transistor. Important output signals are recommended to protected by outer protection device or circuits.

7.3 Module Detachment and Replacement

M2I's I/O module supports HOT SWAP function (replacing parts without power off), and each part can be detached as below images.

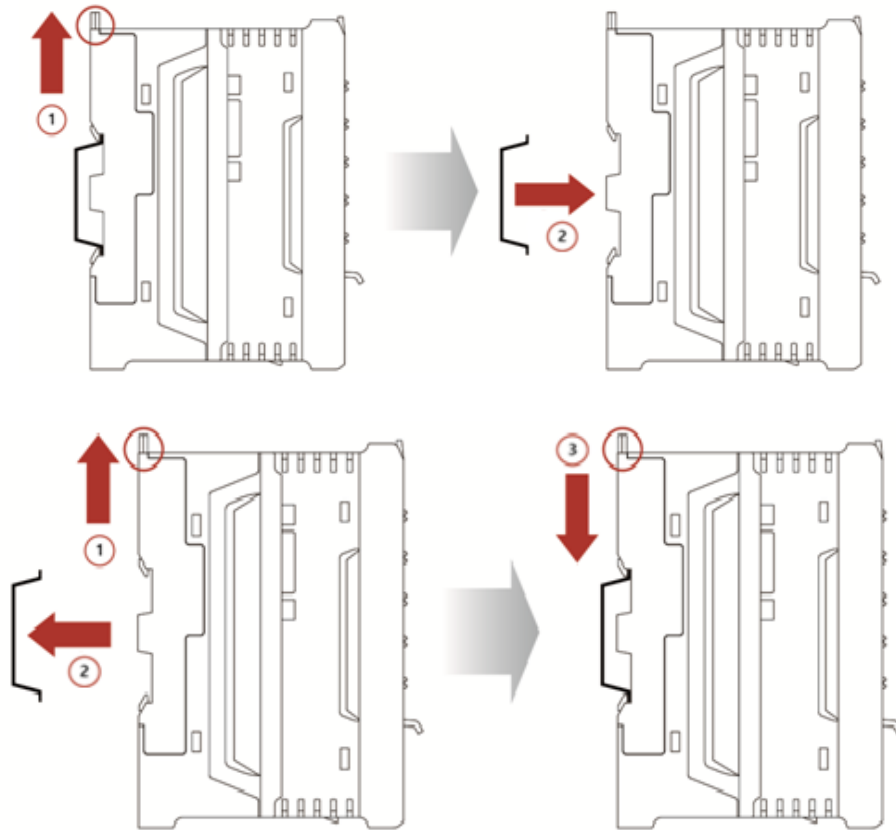


7.4 I/O Module Attachment



7.5 DIN RAIL Attachment

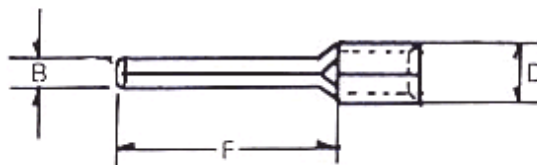
This product has DIN RAIL(35mm) Hook as standard.



7.6 Power, Ground, Communication Cable Specification

7.5.1 Pin Terminal Attachment

Caution: Using Pin Terminal when wiring power and ground cable is important point for keeping a condition of product's condition. If you do not follow below table's standard of Pin Terminal, it can cause cable's malfunction and electric shock.



Category	B	F	D	AWG Spec.
Available	1.1 ~ 1.5mm	8 ~ 10mm	3mm or less	26 ~ 20
Recommended	1.5mm	10 mm		20

7.7 Ground Wiring Warning

(1) This product has enough anti-noise measure, so except that there are many noises. Specially, the ground is not needed. When doing ground, please refer to the followings.

(2) The ground should be the exclusive ground. The ground should be type 3 ground (ground resistor is less than 100Ω)

(3) When not doing the exclusive ground, do common ground like figure B.

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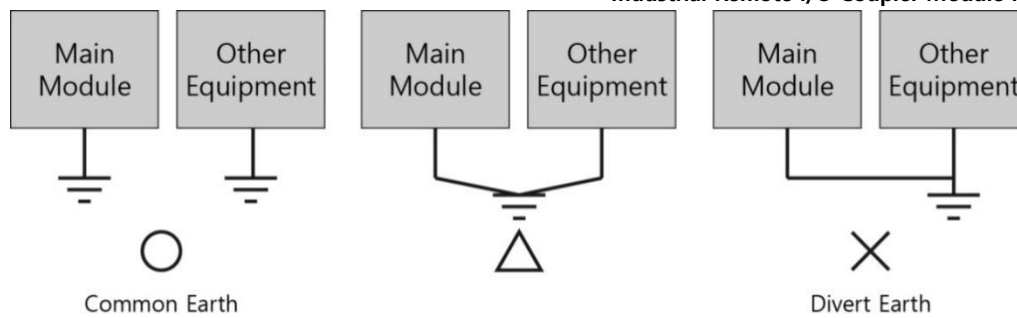


Fig. Grounding Example Diagram

(4) Put the point of the ground near product and shorten a Ground line.

Chapter 8 Utility

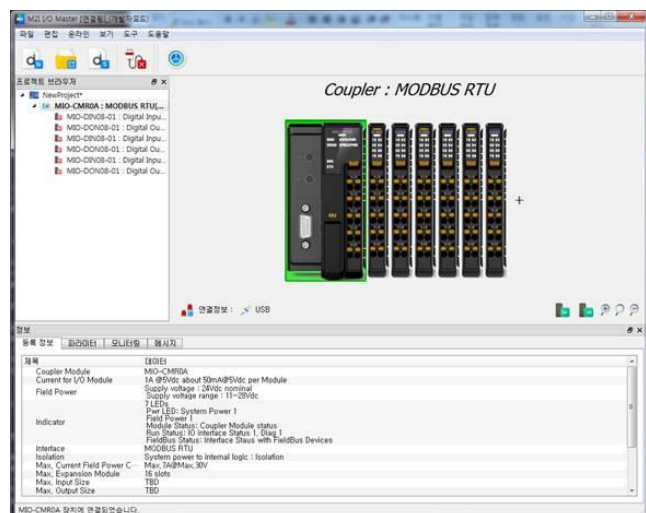
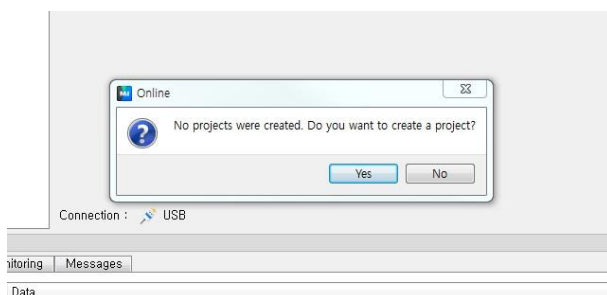
M2I MIO Master' software can be downloaded in M2I's website.

8.1 Connection

Launch the software, connect the PC and Coupler module by USB cable and click the 'Online Mode' button.



Then software will ask to create a new project. By pressing 'Yes' button, setting display of current connection status will be displayed.



8.2 Functions

8.2.1 Specification

Information about connected Coupler Module and I/O Expansion Modules.

8.2.2 Parameter

Monitor or Set the communication options of connected Coupler Module.

8.2.3 Monitoring

If a Coupler Module is selected, data of connected I/O Expansion Modules' data can be monitored. Each I/O Expansion Module's data can be monitored or edited when each module is selected.

8.2.4 Messages

Tracking System's operation status.

Chapter 9 Maintenance Warning

8.1 Cleaning the Display

When the surface or frame of the display become dirty, spray the cleaning solution onto a soft cloth and wipe the device.

8.2 Periodic Check Points

Check the followings periodically for best condition of the device.

(1) Environment

- 1) Is the operating temperature within the allowable range (-10 ~ 50°C)?
- 2) Is the operating humidity within the allowable range (0 ~ 90%RH)?
- 3) Is the Surrounding pollution no corrosive gas?

(2) Power

- 1) Is the input voltage within the change range?

(3) Related Items

- 1) Check any foreign containments or pollutions on contact points.
- 2) Check the status of assemble after detachment.
- 3) Use status LED to check the product.

8.3 Trouble Guide Warning

- (1) If there is any trouble of product, stop the operation and inform about the trouble to a repair department of M2I Corporation.
- (2) Inspection and Repair is allowed to the people who is authorized or approved from M2I Corporation.
- (3) If the trouble is not cleared in operation field, a product can collect and repaired in M2I Corporation.
- (4) Crashes or Malfunctions from operations or operation conditions beyond the standards of this manual, is not belong to M2I Corporation.

Chapter 10 Products Label



Manufacture (AS): M2I Corporation

11-35, Simin-daero 327beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055 , Republic of Korea

Device Type: Industrial Remote I/O Coupler Module

Model Name: MIO-CMR0A

Operating Temp: $-10^{\circ}\text{C} \leq T_a \leq +50^{\circ}\text{C}$

Power: 24VDC, 4W, Class 2 Power Only

KC Certificates No:

Serial No:

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- When using M2I equipment, thoroughly read this datasheet and associated manuals introduced in this datasheet, also pay careful attention to safety and handle the module properly.
- Store this datasheet in a safe place so that you can take it out read it whenever necessary.

User Guide
This product has Relevant Assessments for business environment. If this product is used in home environment, there can be an interference.