

# FATEK

# M Series

Programmable Controller

## M-Series PLC CPU Module Hardware User Manual



*NEXT Level SOLUTION*

Since the content of the manual will be revised as the version changes, this version may not be the final version.

To download the latest version of the manual, please go to the technical support area of [www.fatek.com](http://www.fatek.com)

FATEK AUTOMATION CORP.

# INDEX

---

<b>Chapter 1 Overview .....</b>	<b>1-1</b>
1-1 Overview .....	1-1-1
1-2 Manuals Used .....	1-33
<b>Chapter 2 Product Line.....</b>	<b>2-0</b>
2-1 Product Features.....	2-1
2-2 Composition of M-Series PLC Single Model System Types .....	2-3
<b>Chapter 3 System Configuration.....</b>	<b>3-0</b>
3-1 Basic System Configuration .....	3-1
3-2 Precautions for System Configuration.....	3-2
3-3 Motion Control Configuration .....	3-5
3-4 Configuration in Connecting with System Bus.....	3-6
<b>Chapter 4 UperLogic .....</b>	<b>4-0</b>
4-1 Connection Method .....	4-1
<b>Chapter 5 CPU Interface and Peripheral Functions .....</b>	<b>5-0</b>
5-1 Instructions for CPU Panel Interface and Functions.....	5-1
5-2 RUN/STOP Changeover Switch .....	5-3
5-3 Layout Diagram of Ethernet, EtherCAT Pin.....	5-4
5-4 Layout Diagram of RS485, AI Pin.....	5-5
5-5 Display Indicator of LED Status.....	5-6
5-6 CPU Module Box Header Connector Layout.....	5-9
5-7 Memory Card .....	5-10
<b>Chapter 6 M-Series PLC Specifications .....</b>	<b>6-0</b>
6-1 General Specifications.....	6-1
6-2 CPU Specifications .....	6-2
6-3 Digital Input (DI) Circuit.....	6-9

6-4	Digital Output (DO) Circuit.....	6-11
6-5	Dimensions of CPU Module.....	6-15
<b>Chapter 7 Power Supply Wiring &amp; Power Consumption Calculation and Power Sequencing Requirements.....</b>		<b>6-0</b>
7-1	Specifications and Wiring of Power Module.....	6-17
7-2	Maximum Current Consumption of Expansion Module.....	7-5
7-3	Calculation Example of Power Capacity.....	7-7
7-4	Requirement of Power Sequence in CPU Module & Expansion Module .....	7-7
<b>Chapter 8 End Module.....</b>		<b>8-0</b>
8-1	Specifications and Functions.....	8-1
<b>Chapter 9 Steps of Quick Installation.....</b>		<b>9-0</b>
<b>Chapter 10 Hardware Installation and Wiring.....</b>		<b>10-0</b>
10-1	Installation.....	10-1
10-2	Wiring.....	10-6
<b>Chapter 11 Maintenance and Inspections.....</b>		<b>11-0</b>
11-1	Operating Instructions.....	11-1
11-2	Daily Maintenance.....	11-3
11-3	Regular Maintenance.....	11-4

# Manual for FATEK M-Series PLC CPU Module Hardware

## Preface

This Manual provides important information related to the use of the FATEK M-Series PLC CPU Module. Before using the product, be sure to read this Manual carefully in order to get familiar with and understand its content. Should you have any questions or comments, please contact the FATEK distributor for detailed warranty services and responsibility limit.

### Warranty Service

The warranty period provided by FATEK for its product shall last for one year (or other period as otherwise agreed) starting from the date when the product is sold and it will be offered under the pre-conditions that there are no defects in product use.

Please contact FATEK or the local distributor in the event failure occurs on any of the FATEK products for reasons not caused by man-made factors during the aforesaid warranty period. However, the failure due to any of the following reasons shall not be covered by the warranty services:

1. The malfunction is due to the user' s failure in following the conditions, environment, operations, installation and correct wiring method specified in this Manual.
2. The malfunction is due to the user' s failure in following the operating method originally designed.
3. The malfunction is not due to the reasons of the product.
4. The malfunction is not caused by the modification and the maintenance executed by FATEK.
5. The malfunction is caused by other types of *force majeure* factors such as natural disasters or man-made negligence.

In the meantime, the aforesaid warranty services shall be limited to the FATEK product only and the losses resulting from the product failure will not be covered in the warranty scope.

### Limit of responsibilities

Unless it has been confirmed that the product is properly used, stored, installed and serviced and that it has not been contaminated, abused, misused or improperly modified or repaired as being analyzed by FATEK; otherwise, FATEK shall not be liable for any product-related particular damage, consequential damage or derivative damage or even revenue loss or commercial loss that resulted from whatever means.

# Precautions on Using the Product

## Compliance with the application-related conditions

The user shall evaluate the suitability of FATEK product and shall install the product in the well-designed equipment or system.

The user needs to check if the system, machinery or device currently used is compatible with the FATEK product. If the user fails to confirm the compatibility or the suitability, then FATEK shall not be liable for the suitability of the product.

When required by the customer, FATEK shall provide correlated third party certification to define the value rating and the application restrictions that will be applicable for the product. However, the aforesaid certification message shall not be considered as sufficient to determine the suitability of the FATEK product, the final product, the machine, the system and other applications or relevant combinations. Described below are certain applications that should be cautiously treated by the user. In spite of this, the content described below shall neither be considered as having included all of the intended product purposes nor suggesting that all of the following purposes shall be entirely suitable for the product. For example, outdoors use, use in an area subjected to potential chemical contamination or electrical interference or used under conditions or functions not mentioned in this Manual or used with the system, machine and equipment that may create risks to life or properties.

Before working with the product, the user will be required to check if the entire system is marked with a hazard sign and shall select the design that can ensure the safety such as the backup design, etc. Otherwise, the user shall not be allowed to use the product in the application that will present personnel and the property safety concerns. In no event shall FATEK be liable for the specifications, statutory regulations or restrictions that will be used by the customer in the product combination or the product operations.

When using the CPU Module, FATEK shall not be liable for the programs edited by the user or the resulting consequences.

# Disclaimers

## Dimensions and weight

The dimensions and the weight specified in the manual are nominal values only. Even if provided with the tolerance, they cannot be used in the manufacturing purposes.

## Performance data

The data specified in this Manual mean that the performance data obtained under FATEK' s test conditions are provided for the user to confirm its compliance only. Therefore, the user is also required to consider the actual application conditions. Therefore, actual performance shall be defined according to the content of the guarantee and the limit of responsibilities established by FATEK.

## Errors and negligence

The content of this Manual is provided through careful checking process and is considered as correct. However, FATEK shall not be liable for the errors or the negligence that may be found in the text, printing content and proofreading.


## Change of specifications


The product specifications and accessories may be subject to change along with the technical improvement or other reasons. In the event that the published specifications or performance need to be changed or where significant structural change is required, FATEK will change the model number of the product accordingly. If certain specifications of the product have changed, then FATEK will not give the notice under the following situation: when it is required to use a special model number or create particular specifications in order to support the customer' s application according to the instructions given by the customer. To confirm actual specifications of the product to be purchased, please contact the local FATEK distributor.






# Precautions for Safety

Signs and meaning of safety precautions

The following signs will be used in this Manual in order to provide precautions that will be required for using the M-Series PLC safely. These precautions are extremely important for using the product safely. Please read the safety precautions carefully in order to get familiar with and understand the content and the meaning of the aforesaid instructions.

 <b>Warning</b>	Means a potentially dangerous situation that will result in death or serious injury if not avoided. In the meantime, it may also lead to serious property losses.
--	---

 <b>Caution</b>	Means a potentially dangerous situation that may result in minor or medium level injury or property losses if not avoided.
--	--

	Means operations that must not be executed.
	Means operations that must be executed.
	Means general precautions.
	Means the precautions relating to hot surfaces.
	Means the precautions related to the wiring, grounding and electrocution of the electrical system.

### Warning

Do not attempt to dismantle any module or touch the internal side of the module when it is under energized status or it may lead to electrocution injury.



Do not attempt to touch any terminal or terminal board when the module is under energized status, or it may lead to electrocution injury.



To ensure the system safety in order to avoid abnormal actions that may be caused by man-made external factors or false actions resulting from the faulty PLC, it is required to install the following safety measures in the external circuit (not within the PLC procedure); otherwise, it may lead to serious accident.

The externally controlled circuit must be provided with emergency stop switch, interlocking circuit, limit switch and similar safety measures. The PLC will stop outputting the signals when encountering major failure alarm during the operations. However, the errors in the I/O controller and the I/O register as well as other undetectable errors will still trigger unexpected actions. To deal with the aforesaid errors, you are required to install external safety measures to protect the system safety. If the output relay is jammed, burnt or if the output transistor is damaged, then the PLC may still maintain its output at the ON or OFF status.

To solve the aforesaid issues, it is required to install external safety measures to protect the system safety. By installing the corresponding safety measures in the system and the equipment, it allows you to maintain the safety of the entire system in spite of the fact that communication errors or false actions have occurred during the operating process.



The user must take corresponding failure preventive measures in order to ensure safety when the signal line is damaged or when the power is instantly disconnected or when the signal is wrong, missing or abnormal as may be caused by other reasons. If failing to taking the appropriate measures, it may lead to improper operations that may result in serious accidents.





## Precautions

Do not touch the power module when the PLC is under energized status or when the power source is disconnected. At this time, the power module might still present extremely high temperature that can cause a scorching injury.



When connecting with the terminal board of the power module, the cable should be secured with the appropriately sized Ferrule. If the cable is loose, it may lead to burning or the failure of the power module.



The online editing shall be allowed only after confirming that the extended PLC cycle duration will not result in any adverse impact or the system may not be able to read the input signal.



After confirming that the I/O terminal is safe, you may transmit the required parameters to other terminals such as PLC setting, I/O table and I/O register data, etc. Otherwise, it may lead to unexpected actions if transmitting or modifying the aforesaid data before that.



# Precautions for Use

When using the M-Series PLC, please observe the precautions provided below.

## Using the power

- Please use the voltage specified in the Manual. Incorrect voltage will lead to false action or burning damage to the equipment.
- If the number of the module being connected exceeds the current rating of the power module, you may not be able to start the CPU module or other modules.
- Please use the designated power source and then supply the power according to the specified voltage and frequency rating. Special attention should also be given to the location subjected to unsteady power supply, as incorrect power supply may result in false action.
- Before starting any of the following operations, be sure to disconnect the PLC power; or it may lead to false action or electrocution injury.
  - (1) When installing or dismantling power module, I/O module, CPU module or any other type of module.
  - (2) When connecting cables or executing the system wiring.
  - (3) When connecting or disconnecting the connector.
- When using the power module, be sure to observe following precautions.
  - (1) The voltage applied at the equipment output point or the connected load shall not be higher than the rated specifications established for the power module.
  - (2) If it is required to put aside the power module for over 3 months, it shall be stored in a cool and dry location in order to maintain its function at normal status.
  - (3) If the power module is improperly installed, it will result in the accumulation of heat as to cause the aging or the damage of the component within. Therefore, it shall be properly connected and you are also required to use the standard installation method.

## Installation

- Do not install the PLC at the location near a high frequency noise interfering source.
- Confirm that the terminal board, the connector, the memory card, the peripheral communication wires and other buckle-mounted devices are latched in position. Improper latching will result in false action.
- After connecting to the adjacent module, the buckle at the top or the bottom must be securely locked (*i.e.*, properly latched). If failing to lock the buckle tightly, the module may not be able to

achieve the intended function.

## Wiring

- Please follow the instructions provided in the Manual in order to execute the wiring operations correctly.
- Before connecting the power, please check the setting status of all wires and switches. Incorrect wiring may result in burning damage to the equipment.
- After checking the installation position, you may start installing the terminal board and the connector.
- During the wiring process, the label should be tagged on the module. If you tear off the label, foreign matters may get into the module as to cause a false action.
- To ensure normal heat dissipating function, please tear off the label after completing the wiring operations. If retaining the label, it may lead to false action.
- Please use an EU-standard terminal to execute the wiring operations. Do not connect the terminal with bare stranded wires. The aging or the breaking of wires may result in burning damage to the equipment.
- The voltage applied to the input module shall not be higher than the input voltage rating or it may result in burning damage to the equipment.
- The voltage or the load applied to the output module shall not be higher than the maximum switch capacity. The over-voltage or the overload may result in burning damage of the equipment.
- Do not drag or bend the cable excessively. Such action may cause the breaking of the cable.
- Do not place any objects on the cable or other type of wires or it may cause the breaking of the cable.
- Please set the grounding wire correctly for the power module and communication port to avoid communication error and equipment malfunction caused by noise interference.
- It is recommended to use M series dedicated AC power modules to supply power to MPLC related modules.
- It is recommended to use twisted-pair shielded cables for communication cables and ground them properly.

## Operating

- Before supplying power to the MPLC to start the operations, ensure that the setting of the data register is correct without any mistakes.
- Before executing any of the following tasks, confirm that it will not bring about any adverse impact on the system; otherwise, it may result in unexpected action.
  - (1) When changing the operating mode of the PLC (RUN Mode/STOP Mode).
  - (2) When executing compulsory enable/ compulsory disable for any of the data retained in the register.
  - (3) When changing the present value of any bit or setting that has been logged in the register.

- Do not attempt to dismantle, repair or modify any module; or it may result in false action, fire or electrocution.
- It is required to protect the PLC from falling or from excessive vibration or impact.
- If the I/O is located at the “ON” position, when switching the “RUN Mode” to the “STOP Mode,” the system will set the PLC output at the “OFF” position and then all output actions will be disabled. Please ensure that the external load will not generate hazardous factors during the aforesaid process.
- If the CPU module stops running due to catastrophic error, please set all of the output points on the output module at the “OFF” position. The output status will be retained after being set as the holding-type memory configuration parameters.
- If the status monitoring pages or the parameters are improperly set, it may result in unexpected action. Even though the status monitoring pages or the parameters are correct, it is also required to confirm that the controlled system will not be subject to adverse impact before starting.
- When applying maximum level of voltage or when the power supplied to the operating switch is interrupted suddenly during the Insulation Strength Test, it may result in the damage of the CPU module. In this case, please use the variable resistor to increase or reduce the voltage level gradually.
- Before conducting the Withstand Voltage Test or the Insulation Resistance Test, please separate the wire grounding terminal of the power module from the functional grounding terminal. Otherwise, it may result in burning damage to the equipment.

## Precautions for the Application Environment

- Please follow the instructions described in this Manual for carrying out the installation activities correctly.
- Do not operate the control system in any of the following locations:
  - (1) The location exposed to direct sunlight.
  - (2) The location with temperature or humidity exceeding the specified range.
  - (3) The location vulnerable to dewing effect due to abrupt temperature changes.
  - (4) The location exposed to corrosive or combustible gases.
  - (5) The location exposed to dust (especially iron chips) or smoke.
  - (6) The location exposed to water, oil or chemicals.
  - (7) The location vulnerable to impact or vibration.
- When installing the system in any of the following locations, appropriate and effective preventive measures should be taken:
  - (1) The location exposed to electrostatic or other type of noise.
  - (2) The location exposed to strong electromagnetic field.
  - (3) The location that may be exposed to radioactive pollution.
  - (4) The location near the power supply source.

# 1

## Overview

1-1	Overview .....	錯誤! 尚未定義書籤。
1-2	Manuals Used .....	錯誤! 尚未定義書籤。

# 1-1 Overview

This chapter describes the specifications of the M series PLC modules.

Category	Model	Maximum I/O Points		Total Program Memory		Built-in Ethernet Communication *2	HSC *1	HSPO*1	Total Axes	EtherCAT			
		DIO	AIO	PLC	Motion					Positioning Control	Axes	Circular interpolat.*3	E-CAM*4
Basic CPU	MA1N1-1616◇	512	128	40 KB	-	Slave	2	2	2	2	-	-	-
	MA1N2-1616◇	512	128	40 KB	-	Slave	3	3	3	3	-	-	-
	MA1N3-1616◇	512	128	40 KB	-	Slave	4	4	4	4	-	-	-
	MA1I4-1616◇	512	128	40 KB	-	Slave	4	8*1	8	8*1	-	-	-
	MA1M3-1616◇	512	128	40 KB	-	Master/Slave	4	4	4	4	-	-	-
	MA2M3-1616◇	1024	128	60 KB	-	Master/Slave	4	4	4	4	-	-	-
General Motion CPU	MA3M3-1616◇	2048	256	80 KB	-	Master/Slave	4	4	4	4	-	-	-
	MS1C1-1616◇	512	128	40 KB	370 KB	Slave	8*3	4	6	4	2	●	-
	MS1C2-1616◇	512	128	40 KB	556 KB	Slave	8*3	4	7	4	3	●	-
	MS2C3-1616◇	512	128	60KB	802KB	Master/Slave	8*3	8	12	8	4	●	-
	MS2C4-1616◇	1024	128	60 KB	1.1 MB	Slave	8*3	4	12	4	8	●	-
	MS2C5-1616◇	2048	256	60 KB	1.5 MB	Slave	8*3	4	16	4	12	●	-
Advanced Motion CPU	MS2C6-1616◇	2048	256	60 KB	3 MB	Slave	8*3	4	20	4	16	●	-
	ME1C1-1616◇	1024	128	40 KB	370 KB	Master/Slave	8*3	4	6	4	2	●	●
	ME2C3-1616◇	1024	128	60 KB	742 KB	Master/Slave	8*3	4	8	4	4	●	●
	ME2C4-1616◇	1024	128	60 KB	1.1 MB	Master/Slave	8*3	4	12	4	8	●	●
	ME2C5-1616◇	2048	256	60 KB	1.5 MB	Master/Slave	8*3	4	16	4	12	●	●
ME3C6-1616◇	2048	256	80 KB	3 MB	Master/Slave	8*3	4	20	4	16	●	●	

## Simple description of M series PLC model series

◇: T — transistor SINK (NPN) output;

J — transistor SOURCE (PNP) output;

\*1 200 KHz HSC and HSPO, MA1I4-1616◇ HSPO supports up to 100KHz

\*2 Support Modbus and custom communication, the serial port Master/Slave both support the network port, there is a difference

\*3 The 4-channel HSC is only used for EtherCAT motion control

\*4 Positioning control: including point-to-point, interrupt fixed length/angle; arc interpolation: including functions of straight line/arc interpolation and positioning control;

Electronic cam: including the functions of chasing/flying shear, spiral interpolation, arc interpolation and positioning control

Category	Model	Specifications
Digital I/O Modules	M16X	16 points 24 VDC digital input · Push-in terminal blocks
	M16YT	16 points transistor SINK(NPN) output · Push-in terminal blocks
	M16YJ	16 points transistor SOURCE(PNP) output · Push-in terminal blocks
	M16YR	16 points relay output · Push-in terminal blocks
	M1616XYT	16 points 24 VDC digital input · 16 points transistor SINK(NPN) output · 40 pins header connector
	M1616XYJ	16 points 24 VDC digital input · 16 points transistor SOURCE(PNP) output · 40 pins header connector
Analog I/O Modules	M04ADR	4 channels · Voltage and current input · Resolution:1/160000
	M04AD	4 channels · Voltage and current input · Resolution:1/16383
	M04DA	4 channels · Voltage and current output · Resolution:1/16383
	M04DAR	4-channel 18-bit analog input module (-10V~0V~+10V or -20mA~0mA~+20mA...etc.)
	M0202AH	Analog input and output hybrid modules: 2-channel 14-bit analog input module (-10V~0V~+10V or 0mA~+20mA... etc.) 2-channel 14-bit analog output module (-10V~0V~+10V or 0mA~+20mA... etc.)
Temperature Expansion Module	M04TCR	4 channels · Thermocouple temperature input (K, J, T, E, R, B, N, S, mV) · Resolution: ±0.2% ( 25°C±5°C)
	M04TC	4 channels · Thermocouple temperature input (K, J, T, E, R, B, N, S, mV) · Resolution: ±0.5% ( 25°C±5°C)
	M0202TH	2-channel thermocouple temperature input module (K, J, T, E, R, B, N, S, mV), 0.1°C resolution 2-channel RTD temperature input module (Pt-100, Pt-1000, JPt-100, JPt-1000), 0.1°C resolution
Communication Modules	MHCM25	1 port RS232 + 1 port RS485 serial communication
	MHCM55	2 ports RS485 serial communication
Coupler Unit	MC0MN	Remote I/O Coupler (Modbus / TCP)
Power Supply Modules	MPA024-24	Input: 100~240VAC (50/60Hz) · Output: 24VDC 1A(Internal and external) · 24W
	MPA048-24	Input: 100~240VAC (50/60Hz) · Output: 24VDC 2A(Internal and external) · 48W
專用記憶卡	MFM06	工業規格 Micor-SD 卡 · 資料蒐集容量 : 6GB*2
Peripheral and Accessory	MFT40T	40 pins interface module · Connection method: PID
	MFW40I-50	High density modules connector 40pin socket, 22AWG I/O cable length 50cm
	MFW40N-150	高密度模組牛角端子連接線 ( 一端散線 ) · 40 pin Socket, 22AWG I/O 線 · 長度 150cm
Euroblock	MFT18C	18Pin
	MFT06C	6Pin
	MFT04C	4Pin

Brief Description of M Series Expansion Modules



## 1-2 Manuals Used

Listed below are the manuals produced for the integrated MPLC series-related product and they are provided for reference only.

Name	Code	Description
M PLC CPU Unit User Manual		Describing the CPU hardware configuration specifications, the introduction of interface function, the introduction of quick steps for wire installation, troubleshooting and maintenance inspection, etc.
M PLC Expansion Module Specification Manual		Describing the hardware configuration, function introduction, operating method and troubleshooting, etc. of the expanded module.
M PLC Motion User Manual		Describing the application of EtherCAT communication commands.
M PLC Software User Manual		Introducing the UperLogic Software related interface, operation and functions.
M PLC Instruction User Manual		Introducing the basic commands and functions designed for the MPLC.
M PLC Advanced Function Manual		Introducing the advanced commands and functions designed for the MPLC.

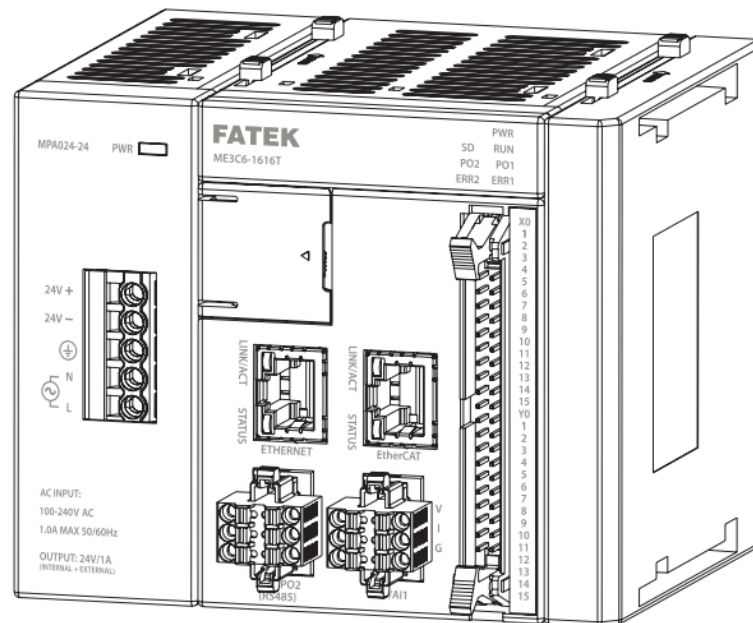
FATEK Manual Table

# 2

## Product Line

- 2-1 Product Features .....錯誤! 尚未定義書籤。
- 2-2 Composition of M-Series PLC Single Model System Types .....錯誤! 尚未定義書籤。

FATEK M-Series PLC is designed as a modularized PLC product that is provided with custom-made, flexible expansion and easier adjustment characteristics to realize the most compact PLC in the world market. In this way, it has conglomerated the control, axial control, communication, data collection and IoT functions in a single compact machine unit.



M-Series Mainframe Diagram

## 2-1 Product Features

1. Inter-connection available between modules  
Through the connector provided at the lateral side of the module, the modules can be connected with each other as required. Therefore, the system expansion can be realized in the minimum space limit.
2. Higher user-friendly for using the newly edited UperLogic program  
Through the Type-C available in the commercial market, the CPU module can be easily connected with the UperLogic program installed in the PC. In the meantime, the programming interface is also designed in a terse and orderly manner for easier understanding.
3. Multiple built-in functions are provided for the CPU module to reduce the system costs.  
The CPU module has been provided with the following built-in functions. It is not required to purchase other modules when used in smaller-sized application environment.
  - Basic input function, control interruption and impulse capture function.
  - Basic output function
  - Ethernet function

- RS485 function
- EtherCAT function (optional)
- High-speed counting function
- NC positioning control function
- AI analog input function (optional)

4. Flexible power source configuration

It can be used with the power module to support an AC220V/100V power supply. It is also not required to replace the battery provided within.

5. Support FATEK micro-SD memory card (it does not support the commercial SD memory card).

The SD memory card slot will be provided for each type of configuration. Through such SD memory card, you will be allowed to use the following functions:

- Data memory function.
- With program data backup and quick restoration functions, you may easily and quickly set up the programs required for several machines.
- Preserve CPU module and module expanding configuration.
- Through the memory card, it allows you to restore the system when updating the PLC firmware and when unrecoverable OS failure occurs.
- The password is provided with a protection program to prevent from decoding.
- Data collection function, allowing the user to upload the data to PC.
- Through the command, you may use the memory card to read and write the address data of the program-specific register.

For detailed introduction on the functions of SD card, please refer to M PLC Function and Application User Manual.

6. CPU modules can be connected with each other through the Ethernet

It uses the network port of PC and the Ethernet port of CPU as the communication interface.

Through the modem or the hub, you may connect several units of programming software or other IoT devices without changing the cable.

7. It expands the system through branch modules and gateway modules

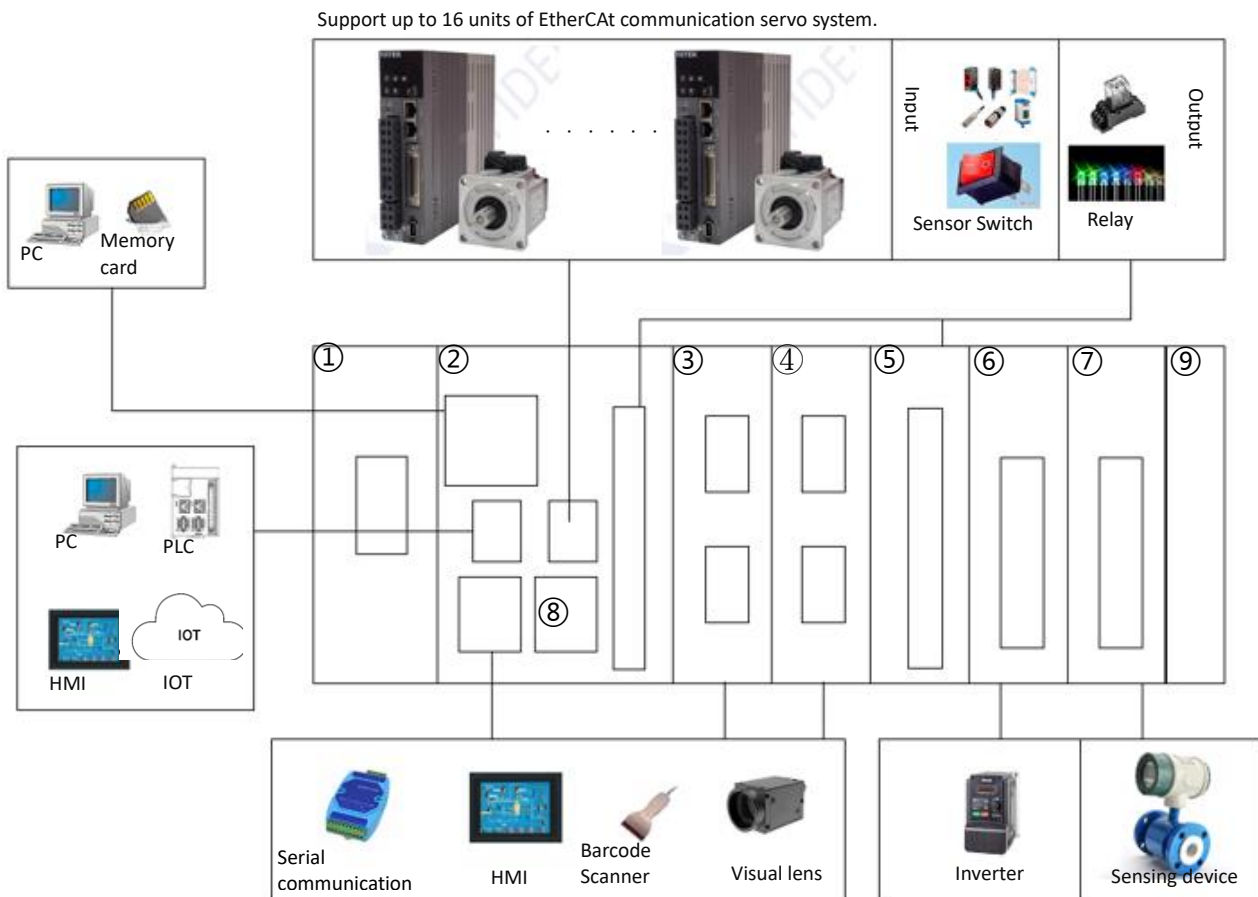
Through the branch modules, it can be equipped with up to 64 units of gateway modules. With the gateway module installed, it will be allowed to use up to 2,048 units of digital I/O points.

8. Application of physical RUN/STOP Switch

Through physical switch, it can define the RUN/STOP status. Through the UperLogic editing procedure, it can determine the RUN/STOP status. For detailed description of combining the aforesaid two methods, please refer to "5.1 CPU Interface" section.

## 2-2 Composition of M-Series PLC Single Model System Types

The single model system refers to the resources (including the max. I/O and communication that can be expanded by the host) that can be controlled by each individual host (CPU module). Indicated below is the resource schematic diagram relating to the M-Series PLC Single Model System.



Single Model System Diagram

①	Power module
②	CPU module
③	RS485 module
④	RS232 module
⑤	DI/DO module
⑥	AO (DA) module
⑦⑧	AI (AD) module
⑨	End module

# 3

## System Configuration

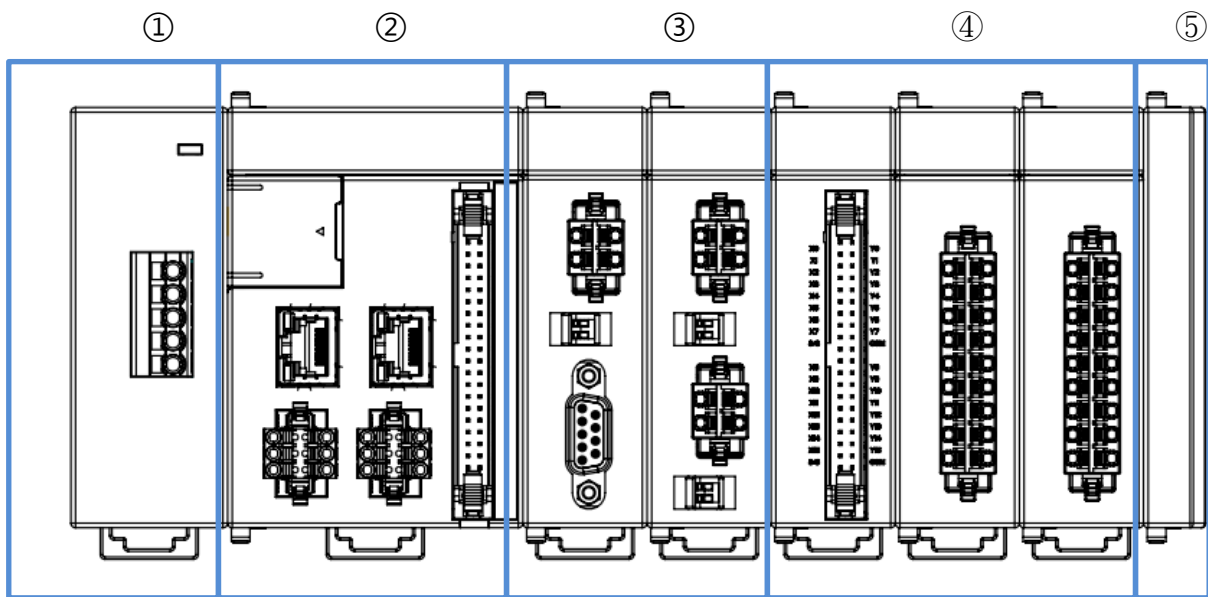
---

- 3-1 Basic System Configuration .....錯誤! 尚未定義書籤。
- 3-2 Precautions for System Configuration .....錯誤! 尚未定義書籤。
- 3-3 Motion Control Configuration .....錯誤! 尚未定義書籤。
- 3-4 Configuration in Connecting with System Bus .....錯誤! 尚未定義書籤。

This section describes the precautions when installing the basic system as well as the content related to the peripheral devices.

## 3-1 Basic System Configuration

You may add the M-series module at the right-hand side of the M-Series PLC CPU Module. The available modules shall comprise the digital I/O module, analog I/O module, temperature module, network module and load module, etc. Indicated below is the system configuration of each area equipped with part of the M-Series module systems.



System Configuration Schematic Diagram

No.	Name	Remarks for installation:
1	Power module	Installed at the left-hand side expansion field.
2	CPU module	Main function field
3	Communication module	It belongs to the high-speed expansion module. Installed at the right-hand side of CPU module and the right-hand side of the high-speed module expansion field. (During the installation, it is not allowed to install a Regular Module between the CPU module and the high-speed expansion module; or the high-speed expansion module will become inactive).
4	DIOexpansion module AIOexpansion module	Installed at the right-hand side of the CPU module or high-speed expansion module. It belongs to the Regular Module expansion field.
5	End module	It should be installed at the rightmost end of each field. If such End module is not installed, then the system will signal an error warning message.

Basic system configuration

## 3-2 Precautions for System Configuration

This section describes the content of the precautions that should be followed during the system configuration process.

### 1. Number of modules and number of branch modules that can be installed

The maximum module expansion number shall vary according to the number of branch modules.

Listed below are the number of branch modules of the CPU module and the number of the module blocks that can be installed.

Type of CPU host	Max. number of branch field	Max. number of module allowed for installing in each field *1	Max. number of expansion module to be used
M-Series PLC	Max. 6 fields	Basic field: Max. 16 units of modules Expansion field: Max. 16 units of modules	64 units of modules.

\*1: Excluding the power module, CPU module, branch module and End module.

If the number of the connected modules exceeds the limit, the CPU will detect such "Error" .

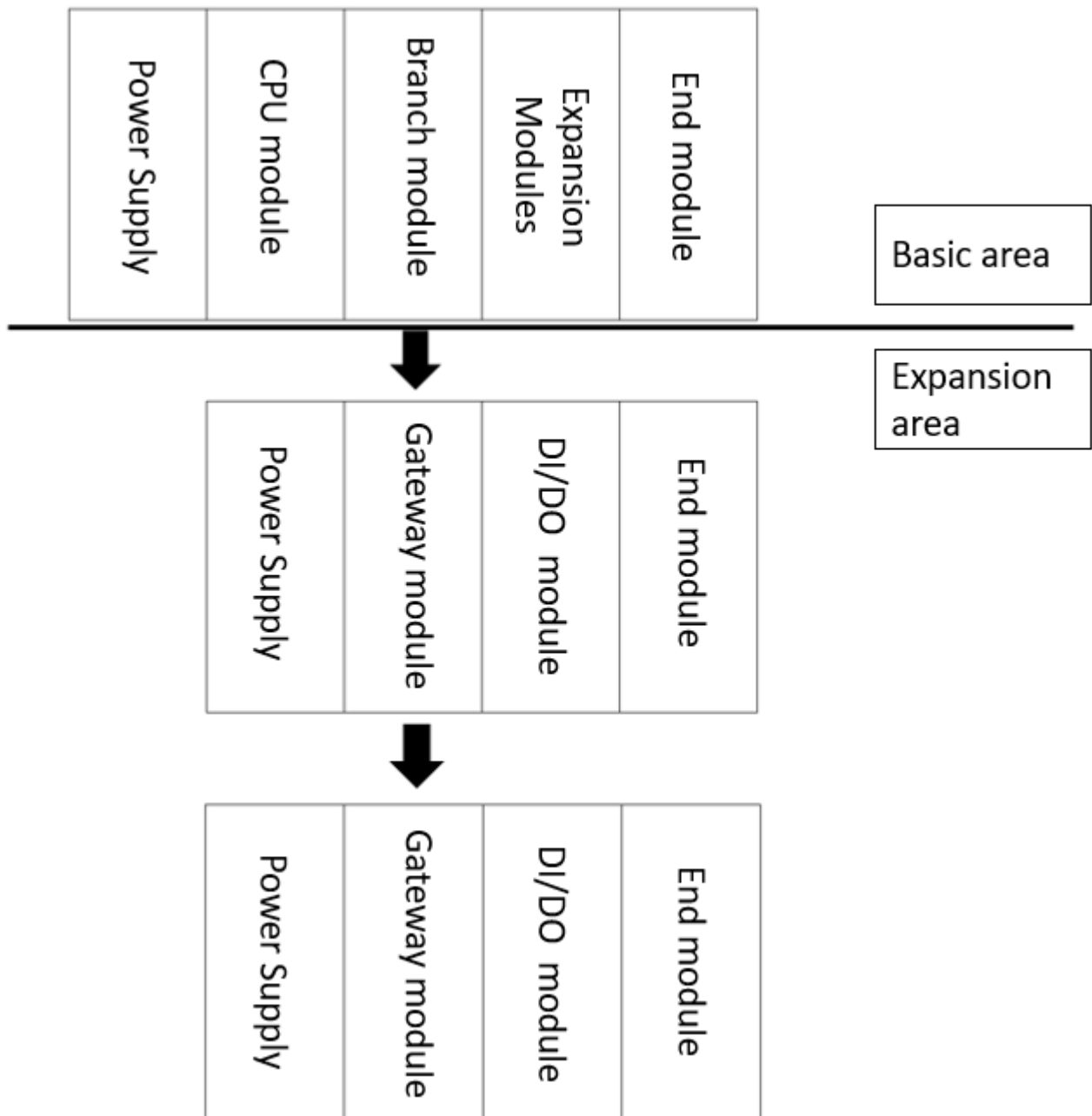
In the meantime, the number and the position of the module to be installed in the module of each field are also limited. Listed below are the restricted module positions and number of modules to be installed.

Product name	Number of module that can be installed
CPU module	Only one set in basic field.
※ Branch module (under development)	Only one set in basic field. Inactive when installing in the expansion field.
Gateway module	Only one set in the expansion field. Inactive when installing in the basic field.
RS232 expansion / RS485 expansion	Being the high-speed module, it can only be installed in the basic field and maximum 6 units can be installed. Besides, it can only be connected to the right-hand side of the CPU module and cannot be connected to the right-hand side of the Regular Module.
DIO modula	Used in conjunction with the branch or gateway module, maximum limit of 64 units.
AIO modula	Used in conjunction with the branch or gateway module, maximum limit of 64 units.
Load Cell module	Used in conjunction with the branch or gateway



	module, maximum limit of 64 units.
Temperature Measurement module	Used in conjunction with the branch or gateway module, maximum limit of 64 units.

Branch module expansion installation schematic diagram:

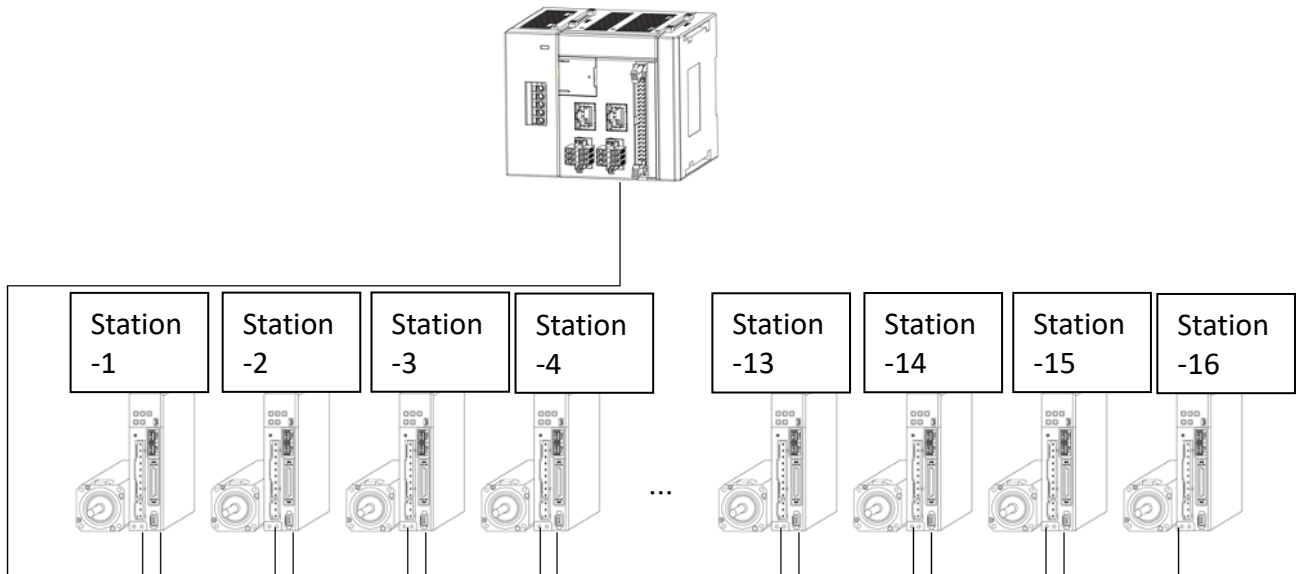


Module expansion installation schematic diagram

※ Each row of modules can be installed with a maximum 16 units of modules and it can be expanded to 6 rows, at most. However, the maximum number of modules shall be 64 units.

## 3-3 Motion Control Configuration

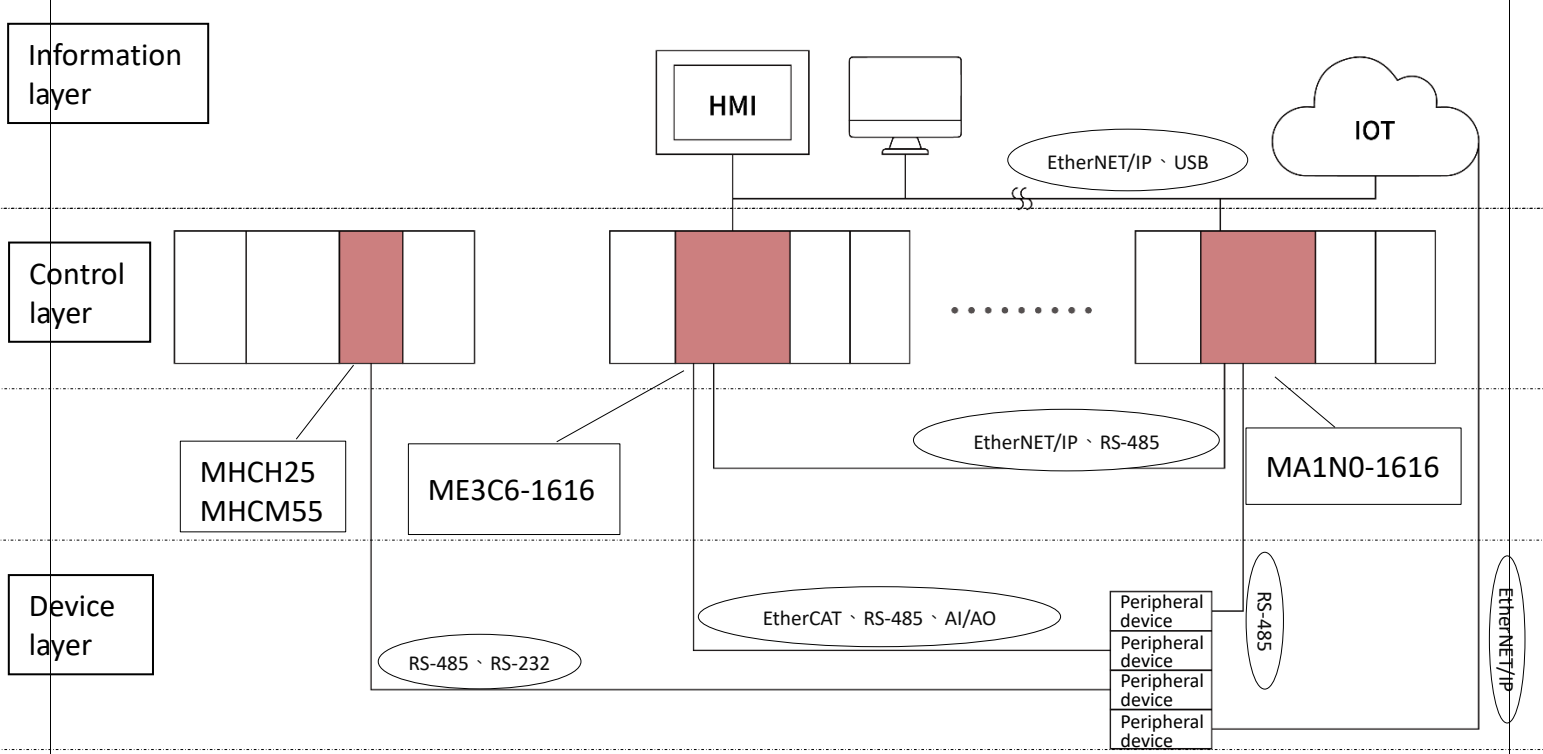
Through the standard commercial RJ-45 (Ethernet) connector rated with the shielding class above CAT5, it connects the EtherCAT port of the M-Series CPU Module with the servo actuator supporting the EtherCAT communication protocol. The servo actuator being firstly connected is pre-set as Station-1. For detailed online method that will be established with the UperLogic and servo actuator, please refer to the M-Series PLC Motion Control Software Manual.



Motion control connection schematic diagram

## 3-4 Configuration in Connecting with System Bus

To connect with the M-Series PLC, the aforesaid device or other system may select either USB, RS-485 or EtherNET port for executing the intended connection. Further, the aforesaid device or other system may also connect with the M-Series PLC through the UperLogic Software. For detailed connection and setting method, please refer to the M-Series Software Manual.



Connection Layout between other systems and the M-Series Module

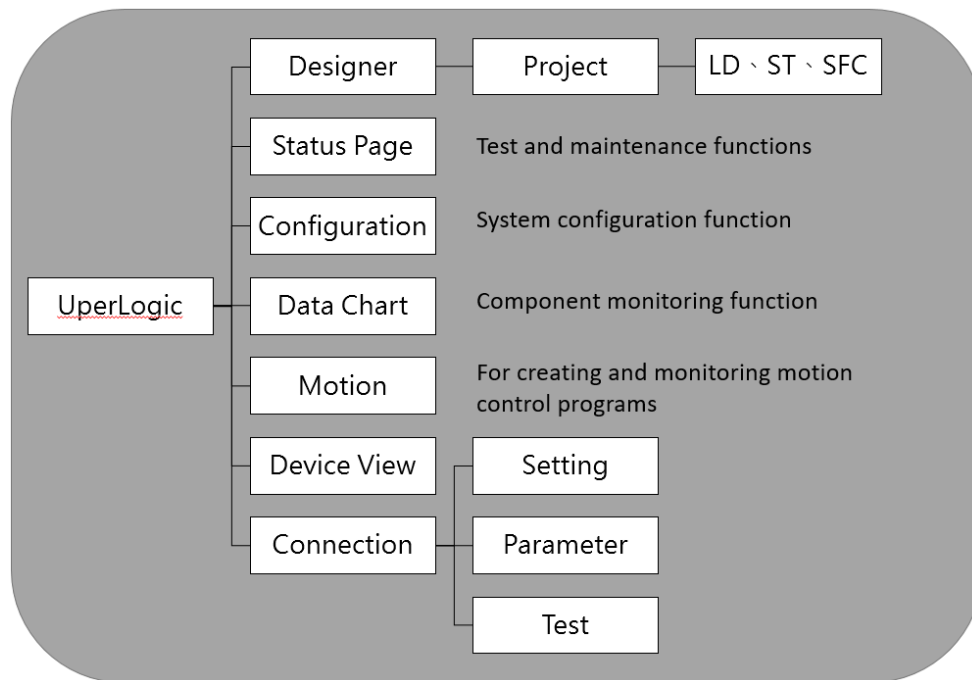
# 4



## UperLogic

4-1 Connection Method .....錯誤! 尚未定義書籤。

The “UperLogic” is the name of logic edit and test application software that will be used with FATEK M-Series PLC. Here, the “UperLogic” can be used for setting up the PLC logic edit network as well as executing server control, temperature control and other functions.



UperLogic function diagram

## 4-1 Connection Method

You may start the online communication by connecting TYPE-C USB connector or RJ-45 (Ethernet) connector to M-Series PLC Module and the PC (preferably the operating system above Window 7) installed with UperLogic edit software.

### 4-1-1 Connection through USB

Connection method: Please use the commercial USB connector to connect with M-Series PLC USB port through standard PC USB port. You may also connect with the M-Series PLC USB port through the UperLogic edit software.

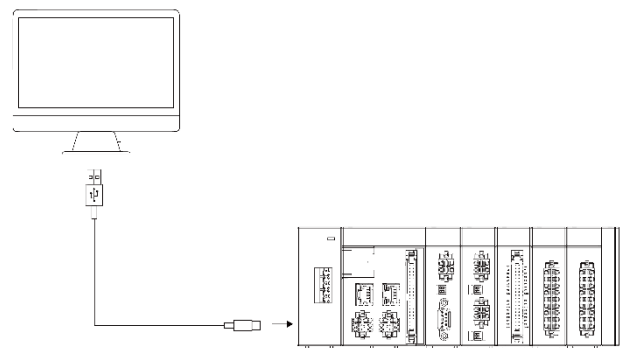
Before connection: When connecting the PLC through the USB and PC, you must install the USB drive on the PC.

Listed below is the USB drive route:

C:\Program Files (x86)\Fatek\UperLogic\utility

#### UperLogic setting

You may set the PLC and the PC connection method through UperLogic. For detailed setting method, please refer to the M\_PLC\_Software Introduction Manual.



Commercial Type-C USB connector: Shorter than 2m (meeting USB 2.0 and 1.x standard)

## 4-1-2 Connection through Ethernet

With the Ethernet double-shield stranded cable being connected to the PC, you may connect with the PLC Ethernet port through the router. You may also use the UperLogic edit software to connect with the aforesaid PLC Ethernet port.

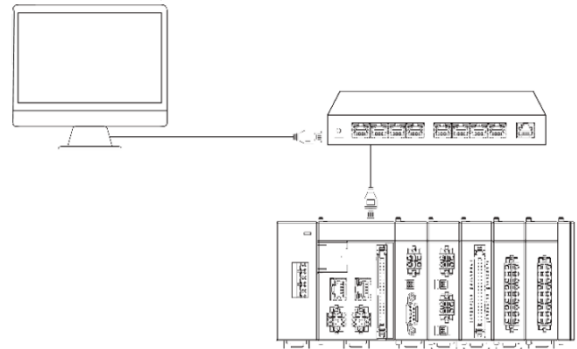
Before connection:

When executing the connection through the Ethernet, please set up the IP address of the PC and the sub-net mask.

Pre-set IP: 192.168.2.4

Pre-set sub-net mask: 255.255.255.0

Pre-set Gateway: 192.168.2.1



UperLogic setting:

Through UperLogic, you may set up the connection method between the PLC and PC. If several M-Series CPU modules should be connected to the PC on the router, you may change the IP address of the CPU module in order that these PLCs will be connected with the UperLogic alternately. For detailed setting method, please refer to the M\_PLC\_Software Interface Manual.

# 5

## CPU Interface and Peripheral Functions

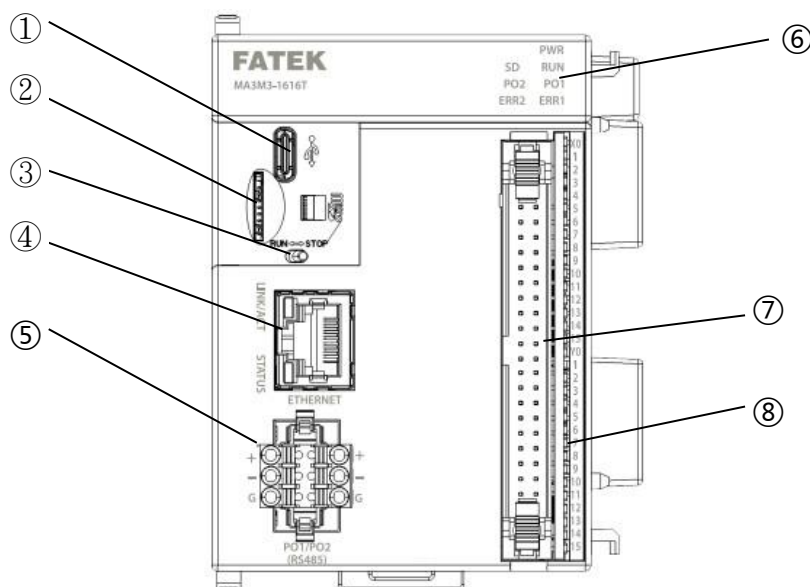
---

5-1	Instructions for CPU Panel Interface and Functions.....	5-1
5-2	RUN/STOP Changeover Switch.....	5-3
5-3	Layout Diagram of Ethernet, EtherCAT Pin .....	5-4
5-4	Layout Diagram of RS485, AI Pin .....	5-5
5-5	Display Indicator of LED Status .....	5-6
5-6	CPU Module Box Header Connector Layout .....	5-9
5-7	Memory Card.....	5-10



## 5-1 Instructions for CPU Panel Interface and Functions

### 5-1-1 Module without Motion Control

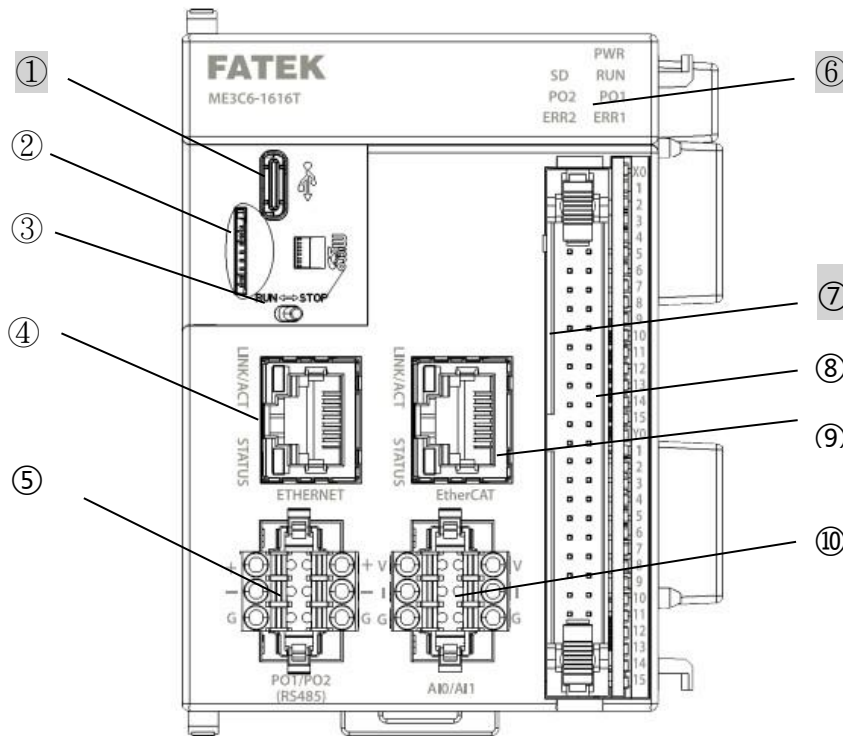


CPU Module diagram (without Motion Control)

No.	Name	Function
1.	USB connector	For connecting Type C data cable
2.	Memory card slot	The slot is designed for inserting FATEK MicroSD memory card.
3.	RUN/STOP changeover switch	For switching between the RUN Mode and STOP Mode.
4.	RJ-45 (Ethernet) connector	The connector (RJ-45) designed for network cable connection. The interface designed for connection purposes (for 10BASE-T/100BASETX).
5.	RS45 communication port	RS485 communication port.
6.	LED status indicator	Display CPU status.
7.	Digital input/output box header connector	Digital I/O.
8.	I/O output status indicator	Display the action status of digital I/O.

CPU panel function introduction (Basic type)

5-1-2 Module with Motion Control



CPU Module diagram (with Motion Control)

No.	Name	Function
1.	USB connector	For connecting Type C data cable
2.	Memory card slot	The slot is designed for inserting FATEK MicroSD memory card.
3.	RUN/STOP changeover switch	For switching between the RUN Mode and STOP Mode.
4.	RJ-45 (Ethernet) connector	The connector (RJ-45) is designed for network cable connection. The interface is designed for connection purpose (for 10BASE-T/100BASETX).
5.	RS45 communication port	RS485 communication port.
6.	LED status indicator	Display CPU status.
7.	Digital input/output box header connector	Digital I/O.
8.	I/O output status indicator	Display the action status of the digital I/O.
9.	EtherCAT connector	EtherCAT communication port
10.	Analog input AI	Simulation quantity input (such function is under development).

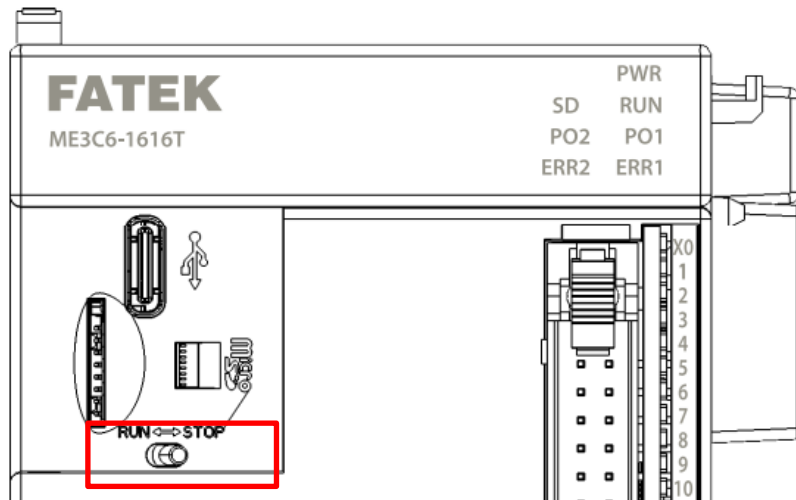
CPU panel function introduction (General or Motion Control type)

## 5-2 RUN/STOP Changeover Switch

The M-Series CPU Module comprises RUN/STOP modes. Both of them can be shifted with each other through the RUN/STOP Changeover Switch located in the left-hand side cover plate of the machine.

RUN Mode: Run the program

STOP Mode: Stop running the program



### 1. RUN/STOP operation method

The RUN/STOP method of MPLC can be operated with the following two methods:

(1) Operate through the physical RUN/STOP switch. With the RUN/STOP switch of the CPU Module, you may execute the run/stop procedure. When setting the switch to the RUN position, it means running. When setting the switch to the STOP position, it means stop running.

(2) Execute remote RUN/STOP operation from UperLogic

The UperLogic is designed with a remote operation function to execute the compulsory RUN/STOP of the programming controller (the remote RUN/STOP function). After being restarted, however, the previous remote RUN/STOP function will become inactive. In this case, the RUN/STOP status will be decided by the action of the physical RUN/STOP switch.

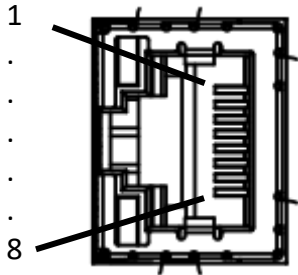
### 2. Combined operations of several RUN/STOP methods

When operating the module with the physical RUN/STOP switch and when the STOP command is given by UperLogic, you may output the RUN command again through the UperLogic or through the STOP→RUN operation of the built-in RUN/STOP switch and the programming control will return to the RUN status.

<Notice> When setting the built-in RUN/STOP switch at the STOP position, the remote RUN function will remain inactive.

## 5-3 Layout Diagram of Ethernet, EtherCAT Pin

### 1. RJ-45(Ethernet)

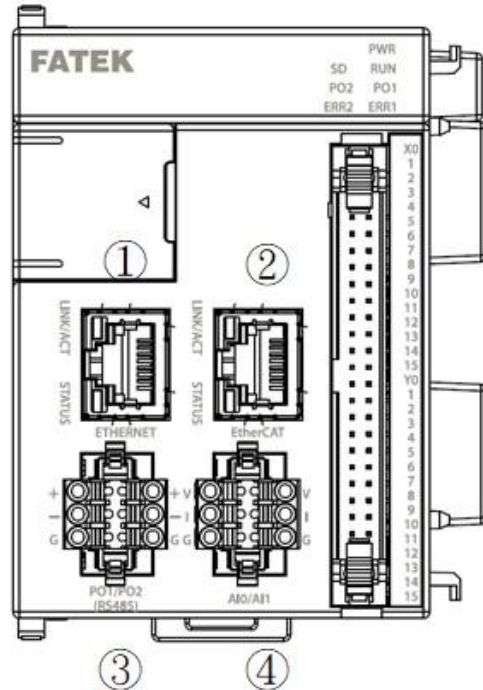


Network port pin layout

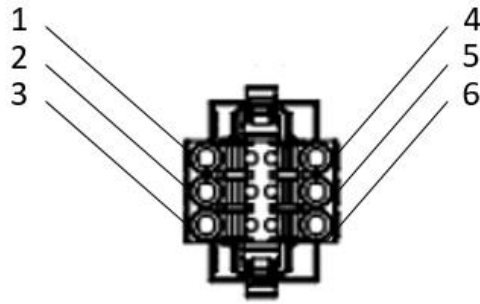
Terminal No.	Direction	Signal name
1	TD+	Transmitting data (+)
2	TD-	Transmitting data (-)
3	RD+	Receiving data (+)
4	-	
5	-	
6	RD-	Receiving data (-)
7	-	
8	-	

### RJ-45(EtherCAT)

Terminal No.	Direction	Signal name
1	TD+	Transmitting data (+)
2	TD-	Transmitting data (-)
3	RD+	Receiving data (+)
4	-	
5	-	
6	RD-	Receiving data (-)
7	-	
8	-	



## 5-4 Layout Diagram of RS485, AI Pin



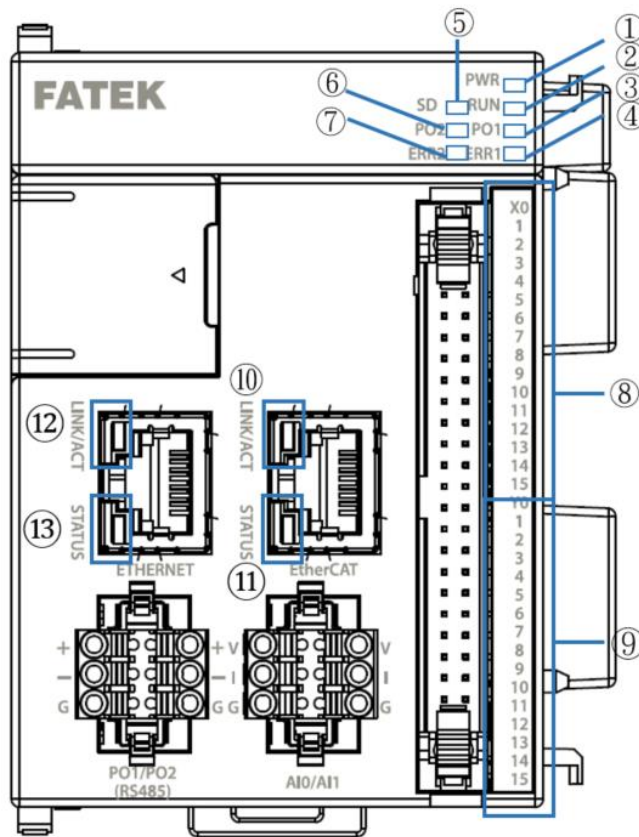
RS485

Terminal No.	Direction	Signal name
1	D+	D+ of Port1
2	D-	D- of Port1
3	G(SG)	signal ground
4	D+	D+ of Port2
5	D-	D- of Port2
6	G(SG)	signal ground

AI

Terminal No.	Direction	Signal name
1	VI0	Voltage input - ch0
2	II0	Current input - ch0
3	GND	signal ground
4	VI1	Voltage input – ch1
5	II1	Current input – ch1
6	GND	signal ground

## 5-5 Display Indicator of LED Status



CPU Module indicator schematic view

No.	Name	Description
1	PWR Power indicator:	Yellowish green. It remains lighted when supplied with power.
2	RUN Running indicator:	Yellowish green. It flickers slowly when the module stops running, but will flicker quickly when the module is running.
3	PO1 Port1 Communication Indicator-1:	Yellowish orange: Port1 flickers during the communication process.
4	ERR1 Error Message Indicator-1	Red. The action mode indicating the warning or major error message.
5	SD	Yellow-green, steady light when memory card is inserted.

	Memory card signal light:	
6	PO2 Port2 Communication Indicator-2:	Yellowish orange: Port2 flickers during the communication process.
7	ERR2 Error Message Indicator-2	Red. The action mode indicating the warning or major error message.
8	X0~X15 Input Indicator:	Yellowish green: It will be lighted when the corresponding point (X Point) is under ON status, but will be extinguished when the corresponding point is under the OFF status.
9	Y0~Y15 Output Indicator:	Yellowish green: It will be lighted when the corresponding point (Y Point) is under the ON status, but will be extinguished when the corresponding point is under the OFF status.
10	EtherCAT Port LINK/ACT Indicator	Yellow: When the lamp remains lighted, it means that the network cable has been properly connected. If it flickers during the communication process, when the lamp is extinguished, it means that the network cable has not been connected.
11	EtherCAT Port STATUS Indicator	Green flickering: The system is operating blinking: The system is under online process. 1-flash: The module has been activated. 2-flash: Error
12	Ethernet RJ45 Port LINK/ACT Indicator:	Yellow: When such lamp remains lighted, it means that the network cable has been properly connected. It flickers during the communication process. When the lamp is extinguished, it means that the network cable has not been connected.
13	Ethernet RJ45 Port STATUS Indicator	Green: It flickers when operating under DHCP Mode to indicate that the system is retrieving the IP.

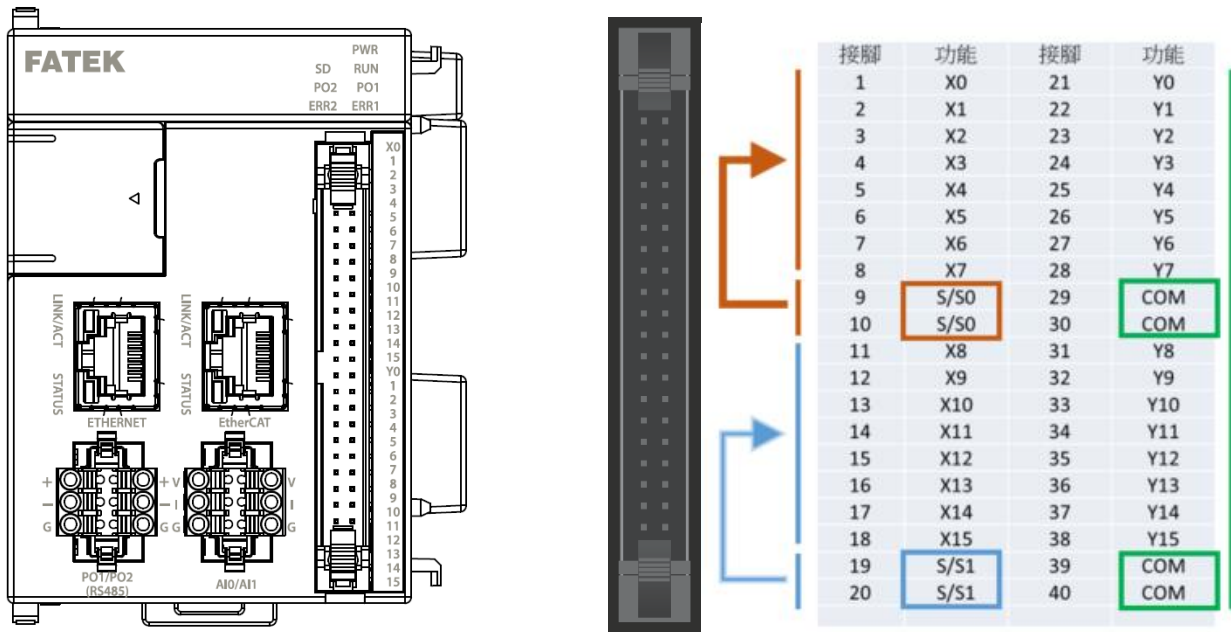
		<p>When the lamp remains lighted, it means that the IP has been set or retrieved through DHCP.</p> <p>When the lamp remains dark, it means that the IP is invalid.</p> <p>When the special lamp flickers, it means that the Monitor has been connected.</p>
--	--	---

CPU panel LED description



## 5-6 CPU Module Box Header Connector Layout

Defined below is the pins of the CPU Module box header terminal connector:



CPU Module Front View and Box Terminal Pin Definition

※ X0~X7 paired with S/S0 · X8~X15 paired with S/S1 · Y0~Y15 paired with COM

Wiring steps:

1. Connect one end of the Box Header Terminal connecting wire (MC-XXXXX) to the IDC box connector board of the CPU Module. Ensure that the connector latch of the Box Terminal is securely mounted to prevent it from falling.
2. Connect the other end to the wiring terminal board (MB-XXXX) of the Box Header Terminal. Ensure that the connector latch of the Box Header Terminal is securely mounted to prevent it from falling.
3. Insert the signal wire into the terminal board and then lock it tightly with a screwdriver.
4. After completing the wiring, tear off the protection label to ensure effective air circulation and heat dissipation.

## 5-7 Memory Card

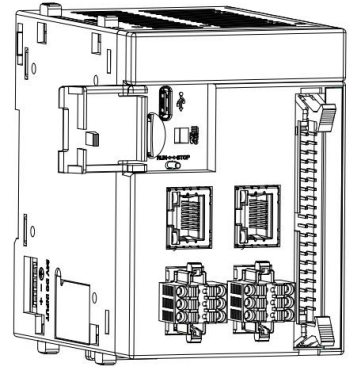
The M-Series PLC support the FATEK MicroSD Card to create the program and notation required for the exchange ladder diagram as well as the setup information of relevant modules.

### 5-7-1 Installing MicroSD Card

This section describes how to install the FATEK MicroSD Card on the M-Series CPU Module and relevant dismantling method.

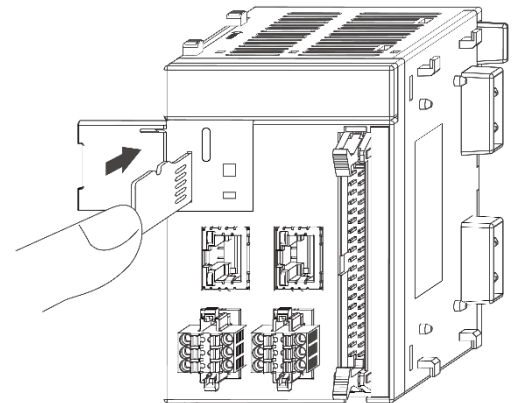
Installing the MicroSD Card

1. First, open the MPLC cover plate.



2. Insert MicroSD Card into the MicroSD Card slot

- When inserting the card, place the pattern side of the MicroSD Card on the left-hand side with the jagged section facing upward and then insert the card straight down until hearing a click sound. After being inserted, the MicroSD Card should be fixed securely in position. If it is still under loosened status, it means that the card has not been inserted correctly. The MicroSD Card is designed with a fool-proof function. If you cannot press the card to the end, do not push it by force to avoid product damage.



3. After inserting the MicroSD Card, restore the CPU Module cover plate until hearing a click sound.

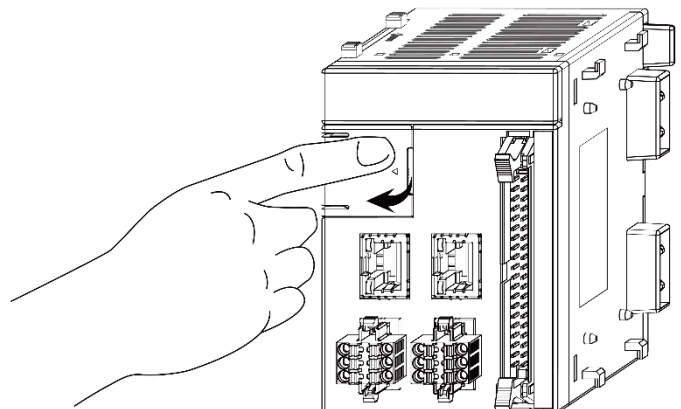
Removing method

1. First, open the CPU Module cover plate.

2. Press the MicroSD Card into the MicroSD Card slot.

- When pressing, you may remove the MicroSD Card after hearing a click sound from the card.

3. After removing the MicroSD Card, restore



the CPU Module cover plate after hearing a click sound.

※ You will be allowed to install or remove the MicroSD Card without shutting down the CPU Module, however do not remove the card during the data saving process.

### 5-7-2 FATEK memory card models

Item	Model	Specification
1	MFM06	8GB (6GB Datalog Storage Area)*1

\*Note: Except for the 6GB Datalog in the uSD card, the others are only reserved for internal use rather than general users.

### 5-7-3 Supported functions list of the memory card version

#### Supported functions list

CPU model	Basic application	Advanced application
ME1C1-1616T	○	○
ME2C3-1616T	○	○
ME2C4-1616T	○	○
ME2C5-1616T	○	○
ME3C6-1616T	○	○
MA1N1-1616T	○	X
MA1N2-1616T	○	X
MA1N3-1616T	○	X
MA1I4-1616T	○	X
MA1M3-1616T	○	○
MA2M3-1616T	○	○
MA3M3-1616T	○	○
MS1C1-1616T	○	X
MS1C2-1616T	○	X
MS2C4-1616T	○	○
MS2C5-1616T	○	○
MS3C6-1616T	○	○

Application	Functions
Basic	1. User can use the SD card to update the PLC program and choose whether to protect the PLC program with a password to prevent the PLC program from being read or uploaded to the PC for backup.
	2. User can use the SD card to copy the machine during mass production quickly, which means after the machine tool designer completes the first machine tool, the follow-up machine can use the SD card to copy the design promptly.
Advanced	1. User can use the SD card for data collection, and it allows the user to upload the data to the PC (or directly use the Windows card to read the file)

2. During the execution of the Ladder program, the user can back up the register data by command or write the backup data to a specific register address by command.

#### 5-7-4 Functions of memory cards

Executed project	Brief	Description
Light display	The memory card is running information; avoid taking it out during operation.	<ul style="list-style-type: none"> <li>■ If there is a memory card error, the LED ERR indicator will light up. °</li> </ul>
Format	Allow memory card to be used in MPLC CPU module.	<ul style="list-style-type: none"> <li>■ Generally, the memory card shipped by FATEK is usable, and no additional initialization is required.</li> <li>■ If the user mistakenly deletes essential data in the memory card, resulting in the card being unable to be used in the CPU module, the user can use Upperlogic to reformat the folder and restore it to use.</li> <li>■ If the user re-formats the memory card through an incorrect repartition method, the memory card will become unusable and must be sent to the factory for processing.</li> </ul>
System backup	Same function as ROMPACK	Same function as FBS ROMPACK; it can back up and restore PLC firmware, registers, programs, etc., but doesn't include motion control data.
Copy protection	Memory card binding CPU module serial number	<ul style="list-style-type: none"> <li>■ User can decide whether to bind the CPU module serial number protection from Upperlogic.</li> <li>■ If the user wants to use the bound SD card for different CPU modules, you must format it through Upperlogic.</li> </ul>
Firmware update	Provide firmware update and rescue methods	<ul style="list-style-type: none"> <li>■ Support PLC OS update, including rescue mode.</li> <li>■ Support expansion module OS update, including rescue mode.</li> </ul>
Memory Card Information	Provide simple information about the memory card	It can display memory card capacity, backup model, memory card model, copy protection status, system backup data availability, and system backup version.
Scratchpad read/ write	Functions such as ROMPACK read and write instructions	Not supported yet
Data collection	Functions such as the HMI data collection instructions	Not supported yet
Log	Support user debugging	Not supported yet



**Attention**

- 1.The system protection area needs to be accessed with the Uperlog.
2. When using the SD Card for backup, restore, or update actions, it is recommended to switch the CPU module dip switch to the OFF state. Ensure the power supply to the CPU module during the backup/restore/update process; otherwise, it may lead to operation failure and potential abnormal functioning of the CPU module.

# 6

---

## M-Series PLC Specifications

---

6-1	General Specifications .....	錯誤! 尚未定義書籤。
6-2	CPU Specifications .....	錯誤! 尚未定義書籤。
6-3	Digital Input (DI) Circuit .....	錯誤! 尚未定義書籤。
6-4	Digital Output (DO) Circuit.....	錯誤! 尚未定義書籤。
6-5	Dimensions of CPU Module .....	錯誤! 尚未定義書籤。

## 6-1 General Specifications

Grounding Requirements		Class D grounding (type 3 grounding)
Current Consumption		DC24V±20% · 0.2A
Environmental Specifications	Operating Ambient	0 ~ 55°C
	Storage humidity	5 ~ 95%RH No condensation
	Operating environment	No corrosive gas exists.
	Storage Temperature	-25 ~ 70°C
	Altitude	2000m以下
	Pollution Level	Degree II
	Vibration resistance	5 to 8.4Hz Half-amplitude: 3.5mm 8.4 to 150 Hz Constant acceleration: 19.6m/s <sup>2</sup> (2G) 3 directions of X, Y, Z: 10times (IEC61131-2 compliants)
	Shock resistance	10G, three times for each direction of 3 axes
	Anti-interference	1500Vp-p · pulse width 1us
	Pressure resistance	1500 VAC for 1 minute between power terminals and input/output terminals and between all external terminals and housing
CPU module size		90mm×63.4mm×90mm Without side buckle & IDC horn connector
CPU module weight		246g (excluding end modules); 280g (including end module)
Applicable Standards		CE · UL

CPU General Specifications



## 6-2 CPU Specifications

Models and Items		ME 1C1 -16 16◇	ME2C3- 1616◇	ME2 C4-1 616◇	ME2 C5-1 616◇	ME3 C6-1 616◇	MS1 C1-1 616◇	MS1 C2-1 616◇	MS2 C3-1 616◇	MS2 C4-1 616◇	MS2 C5-1 616◇	MS 3C6 -16 16◇
Programming language		LD / ST / FBD / STP / MotionFlow										
Instruction execution speed	LD Instruction	0.8nS / LD										
	MOV Instruction	7.5nS / MOV										
Maximum I/O	DIO	1024	1024	1024	2048	2048	512	512	512	1024	2048	2048
	AIO	128	128	128	256	256	128	128	128	128	256	256
Maximum number of Modules	General + High-speed	64 (with branch and gateway modules)										
	High-speed	6 (Need to be installed between CPU and general module)										
Program Memory	PLC	40 KB	60 KB	60 KB	60 KB	80 KB	40 KB	40KB	60KB	60 KB	60 KB	80 KB
	Motion	370 KB	742 KB	1.1 MB	1.5 MB	3 MB	370 KB	556 KB	802KB	1.1 MB	1.5 MB	3 MB
Support Micro-SD card		Data collection, backup, restoration										
Built-in digital input and output		Input 16 points, output 16 points										
Built-in analog input		2ch 12bits										
Communication	ETHERNET	1port 10/100 Base-T										
	ETHERNET	Number of TCP Connections 16										
	Modbus	Master/Slave	Master/Slave	Master/Slave	Master/Slave	Master/Slave	Slave	Slave	Master/Slave	Master/Slave	Master/Slave	Master/Slave

7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements

		s / User-Defined	Master/Slave	Slave	Master/Slave	Master/Slave	Master/Slave							
	EtherCAT		1 port											
	RS-485		2 port, Master/Slave, communication rate 4.8K ~ 921.6Kbps											
	USB		1 port, USB2.0 specification-Type C connector (Device end)											
IoT expansion			MQTT, FATEK iMonitor / iAccess											
Motion Control	Number of motion control axis		6Axis	8Axis	12Axis	16Axis	20Axis	6Axis	7Axis	12Axis	12Axis	16Axis	20Axis	
	Pulse	Axis	4Axis	4Axis	4Axis	4Axis	4Axis	4Axis	4Axis	8Axis	4Axis	4Axis	4Axis	
		Output frequency	200KHz	200KHz	200KHz	200KHz	200KHz	200KHz	200KHz	200KHz	100KHz	200KHz	200KHz	200KHz
	Pulse output mode		6 (U、Ux2、A/B、A/Bx2、A/Bx3、A/Bx4)											
	Positioning control		●	●	●	●	●	●	●	●	●	●	●	●
	EtherCAT	Axis	2Axis	4Axis	8Axis	12Axis	16Axis	2Axis	3Axis	4Axis	8Axis	12Axis	16Axis	
		Linear/circular interpolation/positioning control	●	●	●	●	●	●	●	●	●	●	●	
		Spiral tween / electronic cam (chasing/flying shear)	●	●	●	●	●	-	-	-	-	-	-	
	high-speed			8 channel				6 channel	7 channel	8 channel				

7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements

counter	200KHz											
high-speed timer	0.1mS	1(16 bit) · 4(32bit)										
HSPWM	points	Max. 16 points										
	Output frequency	72Hz~18.432KHz (Resolution is 0.1 %) / 720Hz~184.3KHz(Resolution is 1 %)										
interrupt control	External input interrupt	16 (Positive/negative edge of 8-point input)										
	Internal timed interrupt	0.1 ms : 4 groups / 1 ms: 4 groups / 10 ms: 4 groups										
	Counter interrupt	8 groups										
capture input	points	Max. 16 points										
	Capture pulse width	>10μs(high speed input)										
digital filtering (Digital Filter)		X0~X7 (frequency : 28KHz~1.8MH · Time constant : 3~15ms)										
input contact (DI)	X	512	512	512	1024	1024	256	256	256	512	1024	1024
output relay (DO)	Y	512	512	512	1024	1024	256	256	256	512	1024	1024
Temporary relay	TR	16										
Internal relay	M	29600										
stepper relay	S	3104										
Timer	T	1024										

7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements

Status Contact													
Counter status contact	C	16 bit : 1024, 32 bit : 256											
timer	TMR	1024											
	CTR 16	1024											
	CTR 32	256											
data register	R	34768											
	D	12000											
	ROR	4096											
	F	65536											
input/output register	AI+AO	128	128	128	256	256	128	128	128	128	256	256	
system special register	SR	7944(all)											
pointer register	XR	12(V · Z · P0~P9(10))											
perpetual calendar		Year, month, day, hour, minute, second, day of the week											
data retention	Programs and Components	Non-volatile memory (no power required)											
	perpetual calendar	battery memory											

MPLC (Including motion control function specification)

7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements

Models and Items		MA1N1 -1616◇	MA1N2 -1616◇	MA1N3 -1616◇	MA1I4- 1616◇	MA1M3 -1616◇	MA2M3 -1616◇	MA3M3 -1616◇	
Programming language		LD / ST / FBD / STP / MotionFlow							
Instruction execution speed	LD Instruction	0.8nS / LD							
	MOV Instruction	7.5nS / MOV							
Maximum I/O	DIO	512	512	512	512	512	1024	2048	
	AIO	128	128	128	128	128	128	256	
Maximum number of Modules	General + High-speed	64 (with branch and gateway modules)							
	High-speed	6 (Need to be installed between CPU and general module)							
Program Memory	PLC	40 KB	40 KB	40 KB	40 KB	40 KB	60 KB	80 KB	
	Motion	-	-	-	-	-	-	-	
Support Micro-SD card		Data collection, backup, restoration							
Built-in digital input and output		Input 16 points, output 16 points							
Built-in analog input		-	-	-	-	-	-	-	
Communication	ETHE interface	1Port 10/100 Base-T							
	RNET TCP 連線數	16							
	Modbus / User-Defined	Slave	Slave	Slave	Slave	Master/Slave	Master/Slave	Master/Slave	
	EtherCAT								
	RS-485	2 ports, Master/Slave, communication rate 4.8K ~ 921.6Kbps							
	USB	1 port, USB2.0 specification-Type C connector (Device end)							
IoT expansion		MQTT, FATEK iMonitor / iAccess							
Motion control	Number of motion control axis	2Axis	3Axis	4Axis	8Axis	4Axis	4Axis	4Axis	
	Pulse	Axis	2Axis	3Axis	4Axis	8Axis	4Axis	4Axis	4Axis
		Output frequency	200KHz	200KHz	200KHz	100KH Z	200KHz	200KHz	200KHz
	Pulse output mode	6 types (U, Ux2, A/B, A/Bx2, A/Bx3, A/Bx4)							
	Positioning control	●	●	●	●	●	●	●	
	Ether CAT	Axis	-	-	-	-	-	-	-
Linear/circular interpolation/positioning		-	-	-	-	-	-	-	

7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements

	control							
	Spiral tween / electronic cam (chasing/flying shear)	-	-	-	-	-	-	-
high-speed counter	200KHz (channels)	2	3	4	8	8	8	8
high-speed timer	0.1mS	1(16 bit) · 4(32bit)						
HSPWM	points	16 points						
	Output frequency	72Hz~18.432KHz (Resolution is 0.1 %) / 720Hz~184.3KHz(Resolution is 1 %)						
interrupt control	External input interrupt	16 point(positive/negative edge of 8-point input)						
	Internal timed interrupt	0.1 ms : 4 groups / 1 ms: 4 groups / 10 ms: 4 groups						
	Counter interrupt	8 groups						
capture input	points	Max. 16 points						
	Capture pulse width	>10μs(high speed input)						
Digital Filter		X0~X7 (frequency : 28KHz~1.8MH · Time constant : 3~15ms)						
input contact (DI)	X	256	256	256	256	256	512	1024
output relay (DO)	Y	256	256	256	256	256	512	1024
Temporary relay	TR	16						
Internal relay	M	29600						
stepper relay	S	3104						
Timer Status Contact	T	1024						
Counter status contact	C	16 bit : 1024, 32 bit : 256						
timer	TMR	1024						
	CTR 16	1024						
	CTR 32	256						
data register	R	34768						

7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements

	D	12000						
	ROR	4096						
	F	65536						
input/output register	AI+AO	128	128	128	128	128	128	256
system special register	SR	7944(all)						
pointer register	XR	12(V、Z、P0~P9(10))						
perpetual calendar		Year, month, day, hour, minute, second, day of the week						
data retention	Programs and Components	Non-volatile memory (no power required)						
	perpetual calendar	battery memory						
<p>◇ : T — SINK(NPN) output ; J — SOURCE (PNP) output</p> <p>*1 CPU has built-in support for MQTT and iMonitor. Support for iAccess requires the use of an expansion module / Activation of iMonitor and iAccess requires a key.</p> <p>*2 MS1C1-1616◇ features 2 channels, MS1C2-1616◇ features 3 channels, while the remaining models have 4 channels HSC only dedicated for EtherCAT motion control.</p> <p>*3 Position Control: including Continuous Point and Interrupt Constant Feed ; Arc Interpolation: including Linear/Arc Interpolation and Position Control ; Electronic CAM: including Fly-Saw/Rotary-Cut、Helical/Arc Interpolation and Position Control</p>								

## 6-3 Digital Input (DI) Circuit

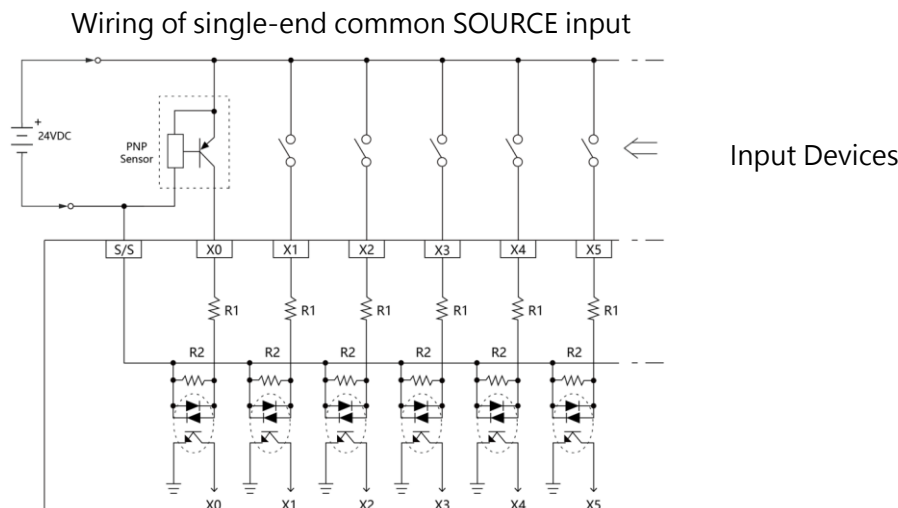
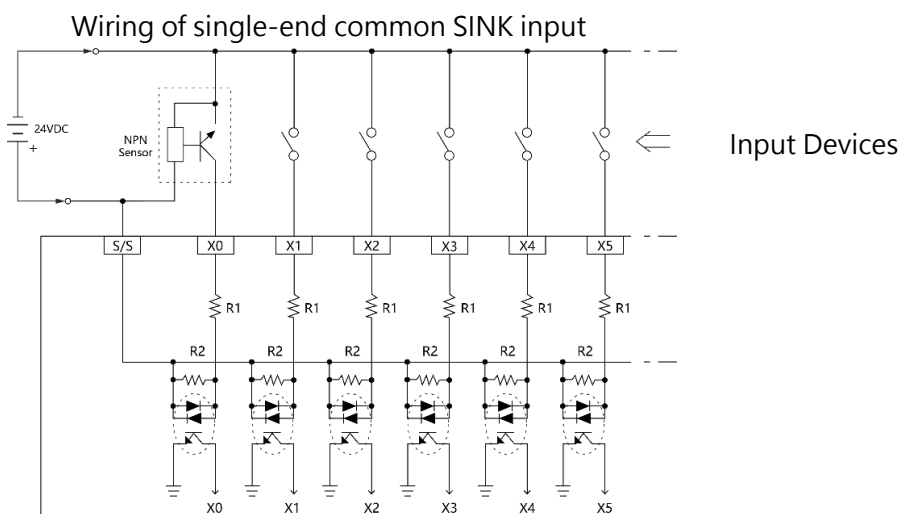
item		Technical Specifications
Input Points		16 points (8 points consist a concurrent)
Input Points Type		24VDC Single-end input
Maximum input frequency		Medium Speed, 2000kHz
Input Signal Voltage		24VDC±10%
Input Current Threshold	ON Current	> 4mA
	OFF Current	< 2mA
Maximum Input Current		6mA(DC24V)
Input Resistance		5.6kΩ
Enter action instructions		LED display, light on means "ON", no light means "OFF"
Isolation Type		Transformer/ Photocoupler Isolation · 500VAC/1 minute
SINK /SOURCE Wiring		Via variation of internal common terminal S/S and external common wiring
Noise Filtering Time Constant		DHF(0 ~ 15ms) + AHF(0.47μs) DHF: Digital Hardware Filter; AHF: Analog Hardware Filter

DI specification of CPU module



### 6-3-1 24VDC Single-End Input Circuit and Wiring for SINK/SOURCE Input

The 24VDC single-end digital input circuits of M Series PLC are available for high, medium and low speed. They all have the similar circuit structures but with different response speeds. To save input terminals, the circuit of single-end input is implemented by connecting one end of all input points (photo coupler) inside the PLC to the same internal common point labeled as S/S. The other end of each input circuit is connected to corresponding terminals such as X0, X1, X2, etc. The S/S common terminal and N single-end inputs comprise of N digital inputs (i.e., only N+1 terminals are used for N terminals). Therefore, we call this type of input structure the single-end input. The user also needs to do the same thing when making the connection of external digital input devices. Namely, the one end of all input devices (e.g., buttons, switches) are connected together and called the external common wire, while the other ends of input circuits are connected to the input terminals X0, X1, X2, etc., of PLC. Then finish it by connecting the external common wiring and internal common terminal S/S to the positive/negative terminals of the 24VDC power. When connect the internal common terminal S/S to 24V+ (positive) and the external common wire to 24V - (negative), then the circuit serve as SINK input. On the contrary, while exchange the wiring of the above internal and external common will serve as a SOURCE input. The above wiring schemes can illustrate below:

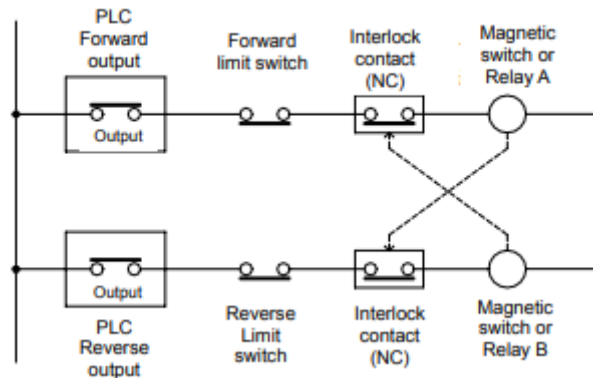


## 6-4 Digital Output (DO) Circuit

The digital output of MPLC is a transistor. However, due to the polarity relationship of the transistor, after single-ended common output is adopted, the polarities of SINK and SOURCE are opposite (the output common point Cn of SINK must be connected to the negative terminal of the DC power supply, and the output common point Cn of SRCE must be connected to the positive end of the DC power supply), so the MPLC transistor output model is divided into two types: SINK output or SRCE output.

### Warning

1. The output of M series PLC has no over-current protection. In the application of output circuit with safety consideration, users need to install over-current or short-circuit protection devices, such as fuses, in the external circuit.
2. In applications where it is dangerous to start at the same time of forward and reverse rotation, in addition to the interlock in the PLC internal program, an interlock circuit needs to be installed outside the PLC, as shown in the example below:



Interlock circuit wiring diagram

### 6-4-1 Digital Output Circuit Specifications

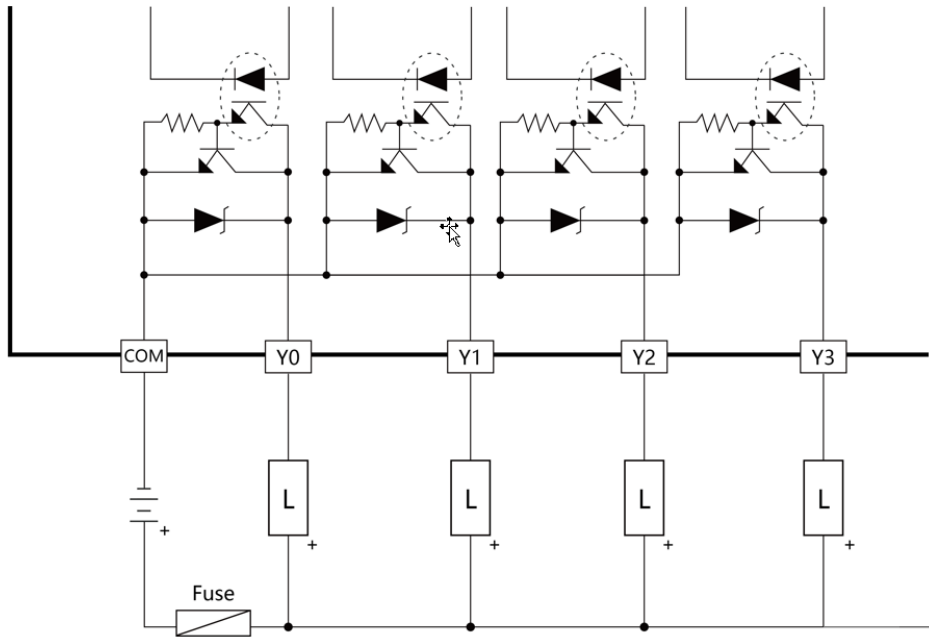
item		Technical Specifications
Output Points		16
Output Points Type		Single-End Transistor Output; T-Transistor SINK(NPN) output ; J-Transistor SOURCE(PNP) output
Maximum output frequency		200kHz *1
Working Voltage		5~30VDC
Maximum Load Current	Resistive	0.1A
	Inductive	
Maximum Voltage Drop/conducting resistance		0.6V
Minimum Load		-
Leakage Current		< 0.1mA/30VDC
Maximum Output Delay Time	ON > OFF	2 $\mu$ S
	OFF > ON	2 $\mu$ S
Over Current Protection		N/A
Isolation Type		Photocoupler Isolation, 500VAC, 1 minute
output action representation		LED light means "ON", no light means "OFF"
SINK /SOURCE Type		Choose SINK/SOURCE by models and non-exchangeable

DO specification of CPU module

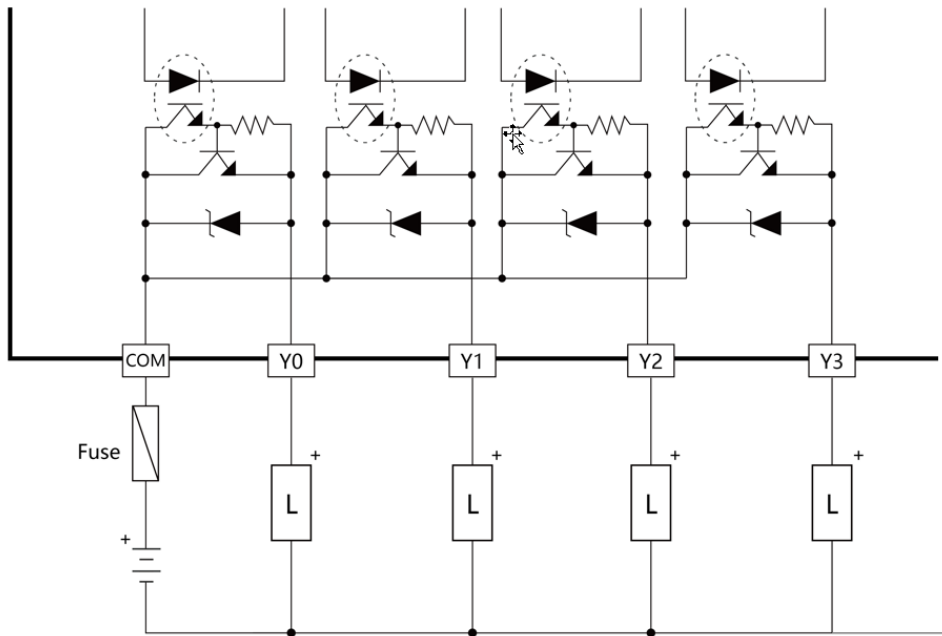
\*T model: SINK, J model: SOURCE

\*1 MA1I4-1616◇ model: 100 KHz

6-4-2 Structure and Wiring of Single-End Transistor SINK and SOURCE Output Circuit



Transistor Single-End SINK Output

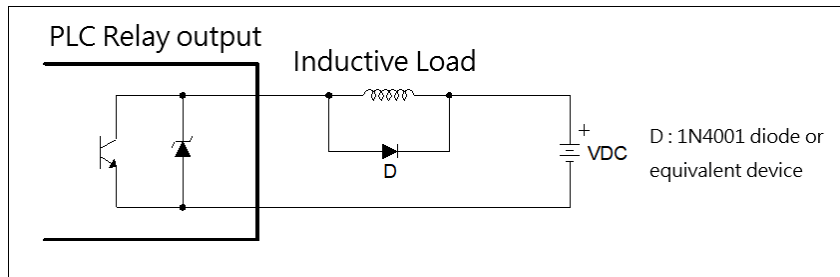


Transistor Single-End SOURCE Output

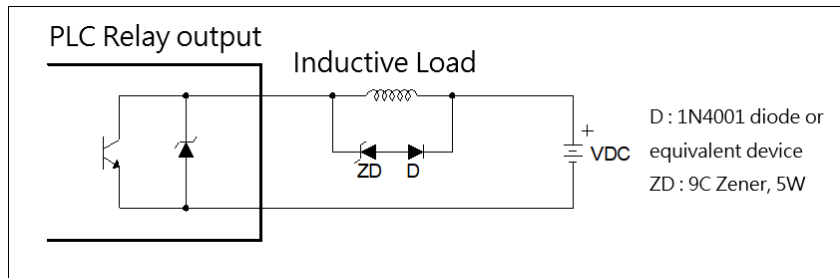
The above figure also takes the output blocks with 2-current and 4-current structures as an example, respectively explaining the difference in the structure of the SINK output and SOURCE output circuits and their wiring methods (the structure and wiring of the 8-common output block are also the same, only the points numbers are different). The SINK output and SOURCE output of MPLC Transistor Single-End concurrent are different models. Users must pay attention to the SINK output model or the SOURCE output model when ordering.

### 6-4-3 Protection of Transistor Output and Noise Suppression

The transistor output in M Series PLC already includes Zener diode for counter-electromotive force, which is sufficient for low power inductive load and medium frequency of ON/OFF application. In conditions of high power or frequent ON/OFF, please construct another suppression circuit to lower noise interference and prevent voltage from exceeding the limit or overheating that may damage the transistor output circuit.

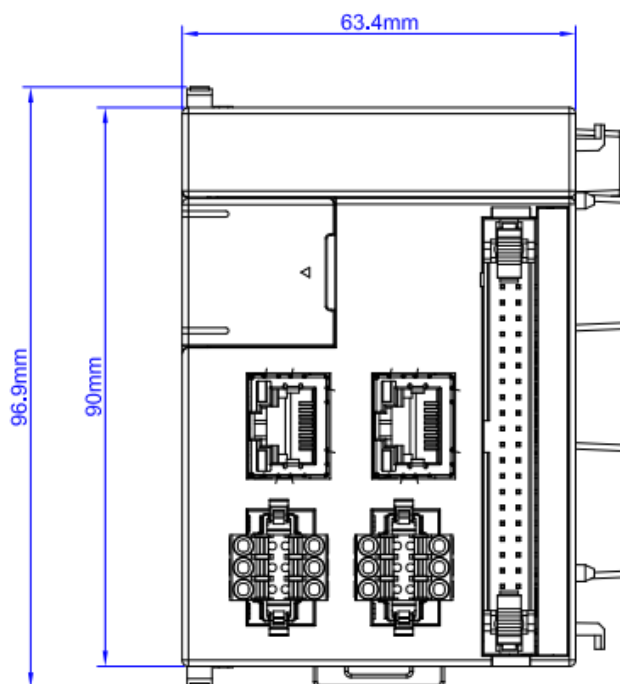


Suppress by a diode (for low power)

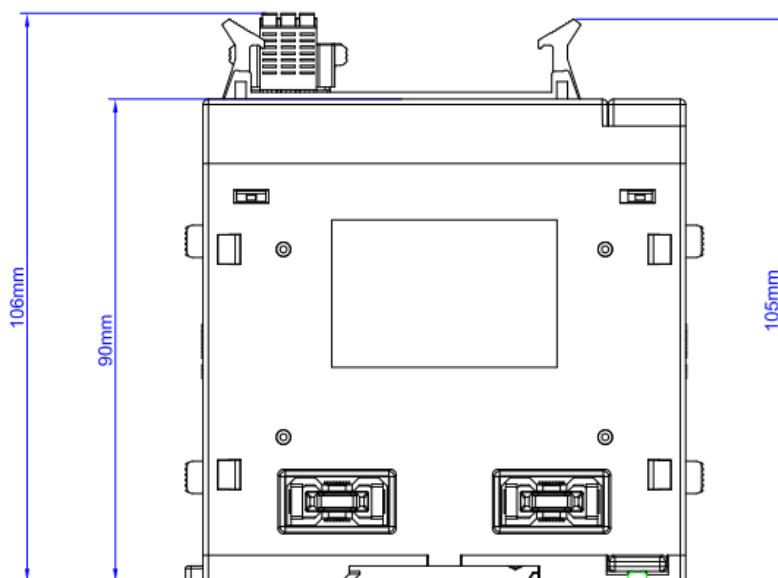


Suppress by a diode + Zener (high power and frequent ON/OFF)

## 6-5 Dimensions of CPU Module



The front dimension of CPU module



The side dimension of CPU module

※The module dimension of basic, general, and motion control types are exactly same.

# 7

## Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements

---

- 7-1 Specificatoinis and Wiring of Power Module .....錯誤! 尚未定義書籤。
- 7-2 Maximum Current Consumption of Expansion Module .....錯誤! 尚未定義書籤。
- 7-3 Calculation Example of Power Capacity .....錯誤! 尚未定義書籤。
- 7-4 Requirement of Power Sequence in CPU Module & Expansion錯誤! 尚未定義書籤。

There are two kinds of power for M series PLC power module. The 1st one is CPU dedicated power supply. The 2nd one is external Sensor power supply. The CPU module and the extension module are also divided in 2 parts of circuits. The 1st one is 24VDC (Output Circuit), the 2nd one is 24VDC (Input Circuit). The 24VDC (Output Circuit) is supplied by the CPU dedicated power supply of the M series PLC power module. The 24VDC (Output Circuit) can be supplied by an external power supply or by the external Sensor power supply of the M series PLC power module. Neither the CPU module nor the extension module has a power supply, and both must consume the power of the power module to supply power.

**⚠Caution**

In industrial environments, main power may irregularly experience a surge current or high voltage pulse caused by the start or shut down of high power equipment. Users are advised to take necessary measures (for example, the use of isolation transformer or other MOV suppression devices) for the protection of PLC and its peripherals.

## 7-1 Specifications and Wiring of Power Module

**Power Module Specification Table**

Specification \ Model		MPA024-24	MPA048-24
input	Input Voltage	100~240VAC	
	Input Frequency	50/60Hz	
	Max. Input Current	1A max.	
	Inrush Current (Cold Start)	22A/115Vac (44A/230Vac)	
	Withstand voltage	3,000 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)	
	Insulation resistance	>100MΩ/500VDC	
	Fuse Spec.	2A	
	Hold-up time	>15ms/ 115VAC · >60ms/ 220VAC	
	Isolation Type	Transformer/ Photocoupler Isolation · 1500VAC/1 minute	
	Operation indication	LED (Green)	
output	Rated	24W (Shared CPU dedicated power)	48W (Shared CPU dedicated power)



## 7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements


	output power	supply and external Sensor power supply)	supply and external Sensor power supply)
	Rated output current	1A (Shared CPU dedicated power supply and external Sensor power supply)	2A (Shared CPU dedicated power supply and external Sensor power supply)
	Output voltage range	24VDC±1%	
	Conversion efficiency	86%/110VAC · 87%/220VAC	
Protection	Overvoltage protection	Latching overvoltage protection, re-power on to recover 34V~36V	
	Overcurrent protection	Method: Foldback overload protection, automatically recover when overload is removed 101%~133% rated output power	
Environmental Specifications	Operating Ambient Temperature	0°C~55°C	
	Relative Humidity	20 ~ 90% (non-condensing)	
	Altitude	≤ 2000m	
	Antiseismic (with fixed DIN RAIL)	5~8.4Hz Amplitude: 3.5 8.4~150Hz Constant Acceleration:19.6m/s <sup>2</sup> (2G) 10 times for each 3 axis (IEC61131-2 Standard)	
	Impact Resistance	10G, 3 times for each 3 axis	
	Noise Resistance	1500Vp-p, Waviness width: 1us	
	Withstand Voltage	3,000 VAC (Primary-secondary),1,500 VAC (Primary-PE),500 VAC(Secondary-PE)	
	Storage Temperature &	-25 ~ +70°C	

## 7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements

	Humidity	
Certifications		CE
External dimensions		90mmX33.7mmX90mm

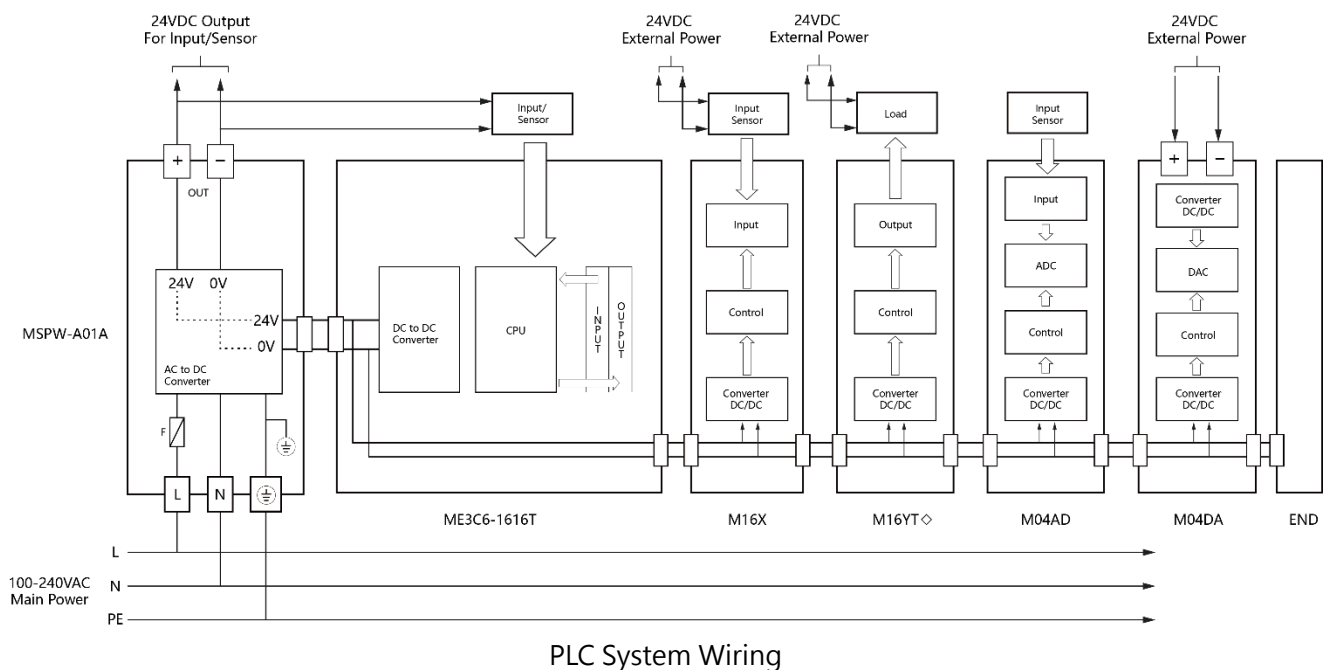
### ⚠Caution

The schematic diagram of power module is shown below. Also be cautious about the following:

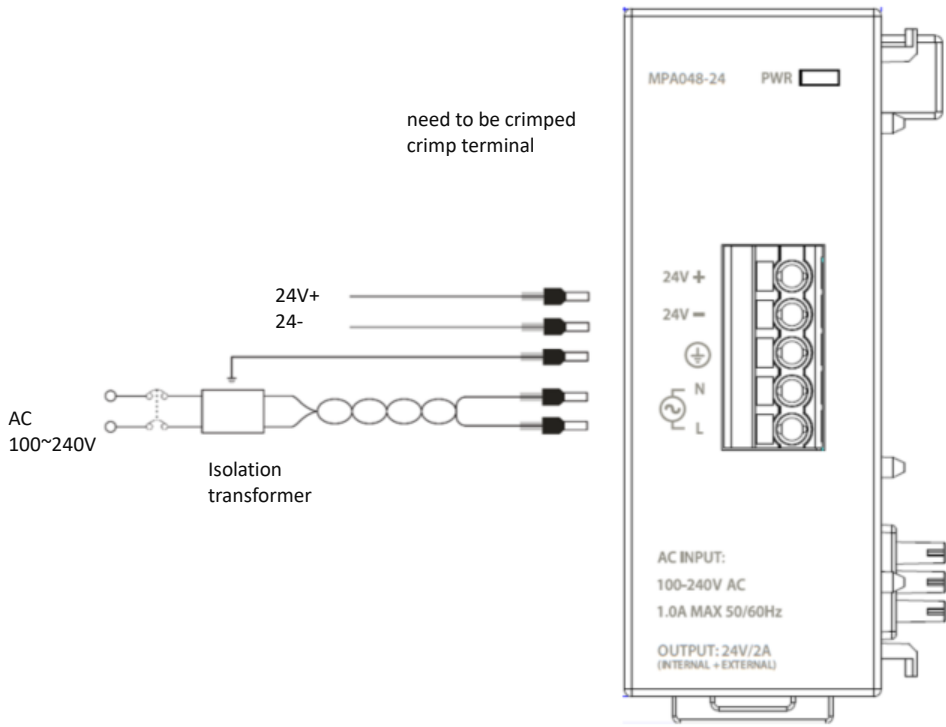
1. Please follow the wiring schemes regulated by local national standards to use single-pole switch ( break hot wire "L" ), or double-pole switch ( break both "L" and "N" ), to turn on or off the AC input power.
2. In wiring, hot wire "L" must be connected to the L terminal on unit, while the ground line "N" connected to the N terminal. Please use wires with diameters  $1\text{mm}^2 \sim 2\text{mm}^2$ .
3. All  terminals on CPU module or Power module have to be connected to the EG (Earth Ground) terminal of main power system as shown in the figure below, with wire diameters larger than  $2\text{mm}^2$ .

### ⚠Warning

Output of 24VDC power for input circuit cannot be connected in parallel with other powers, in which the conflict between two sets of power will decrease their lifetime or cause immediate damage. This will induce unexpected malfunction of PLC and cause serious or even deadly damage to people or equipment.



7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements



Power Supply Wiring Diagram

## 7-2 Maximum Current Consumption of Expansion Module

Without its own power supply, CPU module and expansion modules must be supported by the M Series PLC Power module. The following table lists the maximum consumption current of each expansion module.

### ⚠Warning

Any output of M series PLC power module, the total amount of current cannot exceed the value listed in the above table. Any violation will cause a voltage drop by overloading the power supply, or intermittent powered with the supply in protection mode, either of which will result in unexpected action of PLC and cause harm to people or damage to equipment.

**Maximum Current Consumption of Expansion Module Table**

Model		Current	24VDC (Input Circuit)	24VDC (Output Circuit)
Left Side Expansion Modules	Power Modules	MPA024-24	-	-
		MPA024-24	-	-
CPU Modules	CPU Modules	MA1N1-1616◇	150mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		MA1N2-1616◇	150mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		MA1N3-1616◇	150mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		MA1I4-1616◇	150mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		MA1M3-1616◇	150mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		MA2M3-1616◇	150mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
	General CPU Modules	MS1C1-1616◇	200mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		MS1C2-1616◇	200mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		MS2C4-1616◇	200mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		MS2C5-1616◇	200mA	DI : 7.5mA/ Point

7 Power Supply Wiring & Power Consumption Calculation and Power Sequencing Requirements

				DO : Max.0.1A/ Point
		MS3C6-1616◇	200mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
	CPU Modules With Motion Control	ME1C1-1616◇	200mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		ME2C3-1616◇	200mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		ME2C4-1616◇	200mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		ME2C5-1616◇	200mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
		ME3C6-1616◇	200mA	DI : 7.5mA/ Point DO : Max.0.1A/ Point
Right Side Expansion Modules	High Speed Communication Modules	MHCM25	30mA	-
		MHCM55	35mA	-
	Digital Input Modules	M16X	70mA	7.5mA/Point
	Digital Output Modules	M16YT	150mA	Max.0.5A/Point
		M16YJ	163mA	Max.0.5A/Point
		M16YR	190mA	Max.2A/Point
	Digital Hybrid Modules (Input&Output)	M1616XYT	202mA	X :7.5mA Y:0.5A/Point
		M1616XYJ	222mA	X :7.5mA Y:0.5A/Point
	Analog Input Operation Modules	M04AD	78.2mA	-
		M04ADR	78.2mA	-
	Analog Output Operation Modules	M04DA	14.2mA	107mA
		M04DAR	14.2mA	107mA
	Hybrid Modules of Analog Input & Output Operation	M0202AH	22.58 mA	39.85mA
	Temperature measurement Modules	M04TC	30.7mA	-
		M04TCR	30.7mA	
	Hybrid Modules of Temperature measurement	M0202TH	@	-
	Load Cell Modules	M02LC	40.64Ma	-
		M02LCR	56.1mA	-
	End module	MRE	-	-
	Remote Expansion	Connector	MCOMN	@

Module power consumption meter

## 7-3 Calculation Example of Power Capacity

Power module selection is depending on the sum of current consumption of all modules. Therefore, user must know the current consumption of each module. Please refer to the maximum current consumption of expansion module table, which has the maximum current consumption of each expansion module. User must consider the match between power and expansion modules cannot cause output power of any one group of overload use.

The below diagram is a System Modules, try to calculate the power supply used of the system.

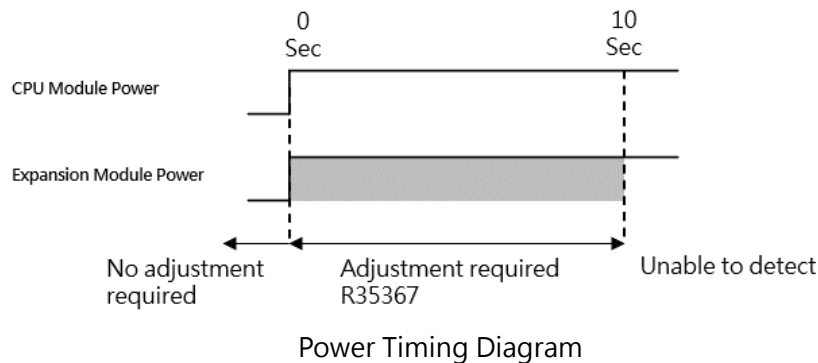
Type	Power Module	CPU Module	Expansion Module	Expansion Module	Expansion Module	Expansion Module	END Module	Extra Capacity
Module Name	MPA024-24	ME3C6-1616T	M16X	M16YT	M04AD	M04TC	MRE	
24VDC (Input Circuit)	+1000mA	-200mA	-70mA	-150mA	-78.2mA	-30.7mA	-	231.1mA
24VDC (Output Circuit)		-7.5mA*16 Point	-7.5mA*16 Point	-	-	-	-	

➤ Power Module - 24VDC (Input Circuit) - 24VDC (Output Circuit)

$$\text{【1000mA】} - \text{【200mA+70mA+150mA+78.2mA+30.7mA】} - \text{【(7.5mA*16)+(7.5mA*16)】} = 231.1\text{Ma}$$

## 7-4 Requirement of Power Sequence in CPU Module & Expansion Module

When the power is on, the M Series PLC first detects the type and number of expansion module attached to its expansion interface and get the actual I/O configuration. Therefore, while the CPU module performs detection, the power in expansion module should be already UP, otherwise, the detected I/O configuration will not correct. Namely, the power of expansion module should be ON simultaneously or even earlier. There will be no time sequence error when CPU module/expansion module are connected together to one power. If the expansion module and CPU module powered by different powers (or the same power but different switches), or external power supply is used for expansion modules, time sequence of both powers should be considered. To solve the problem of the expansion module power not get ready before CPU module power does, M Series PLC provides a special R35367 register which can delay the detection time of I/O configuration. The time base of R35367 is 0.01sec with a default value of 0, which can be set from 0~1000 (1~10c), as shown in the figure below. If the expansion module power cannot be UP within 1sec after main unit power is ON, the R35367 time needs to be set longer to delay the detection by CPU. It cannot exceed 10sec, however, otherwise the configuration of expansion interface cannot be detected.



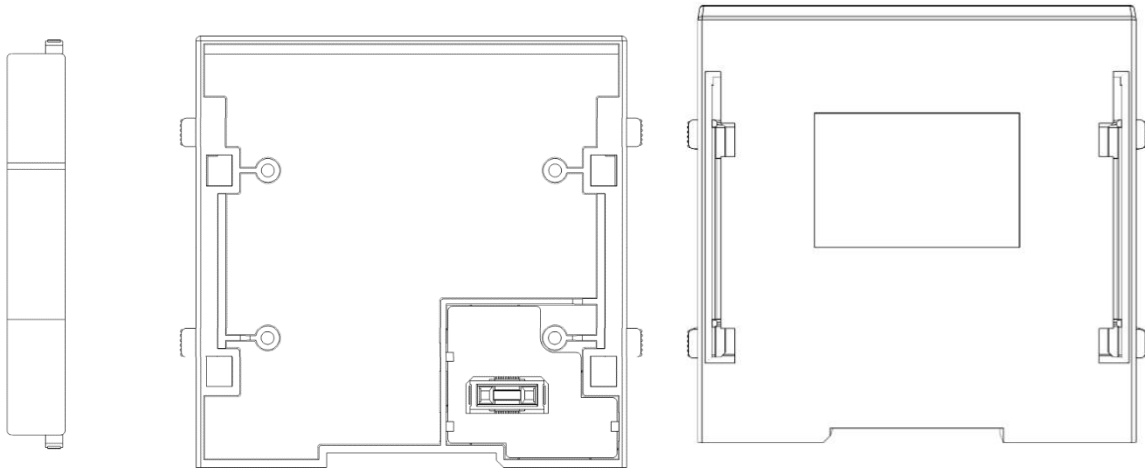
# 8



## End Module

8-1 Specifications and Functions .....錯誤! 尚未定義書籤。





Three views of the end module

## 8-1 Specifications and Functions

---

The End Module should be connected to the rightmost side of the MPLC-Series expansion module or special expansion module. If using the branch module, it is also required to install the End Module on the aforesaid rightmost side; otherwise, errors may occur and the module will not operate normally.

# 9

## Steps of Quick Installation

This section describes the operating steps under normal conditions.

1. Setting up the equipment and hardware

To install power module, CPU module, other module and End Module, please set the RUN/STOP Changeover Switch to STOP position. For details, please refer to "System Layout" and "Hardware Installation and Wiring" provided in this Manual.

2. Wiring

When installing the wires of power module, I/O module and communication module, please refer to the manual mentioned below.

Please refer to "Hardware Installation and Wiring" and "CPU Interface and Peripheral Device Function" provided in this Manual.

3. Connecting with PLC

When connecting to the PC, please use the commercial Type-C connecting wires or RJ45 connecting wires.

Please refer to "UperLogic" in this Manual.

4. Software installation

Install software in the PLC.

Please refer to the communication function specified in the "M-Series PLC Software Operating Manual"

5. Creating a project

Please use the UperLogic creating procedure.

Please refer to the project management specified in the "M-Series PLC Software Operating Manual."

6. Running inspection

Check the I/O wiring status and the register setting and then start the test-run. The UperLogic can be used in monitoring and adjustment.

Please refer to the monitoring function specified in "M-Series PLC Software Operating Manual."

7. Basic procedure running

Set the operating mode in the program or the CPU module physical switch to the "RUN Mode" and then start the test-run.

# 10

## Hardware Installation and Wiring

---

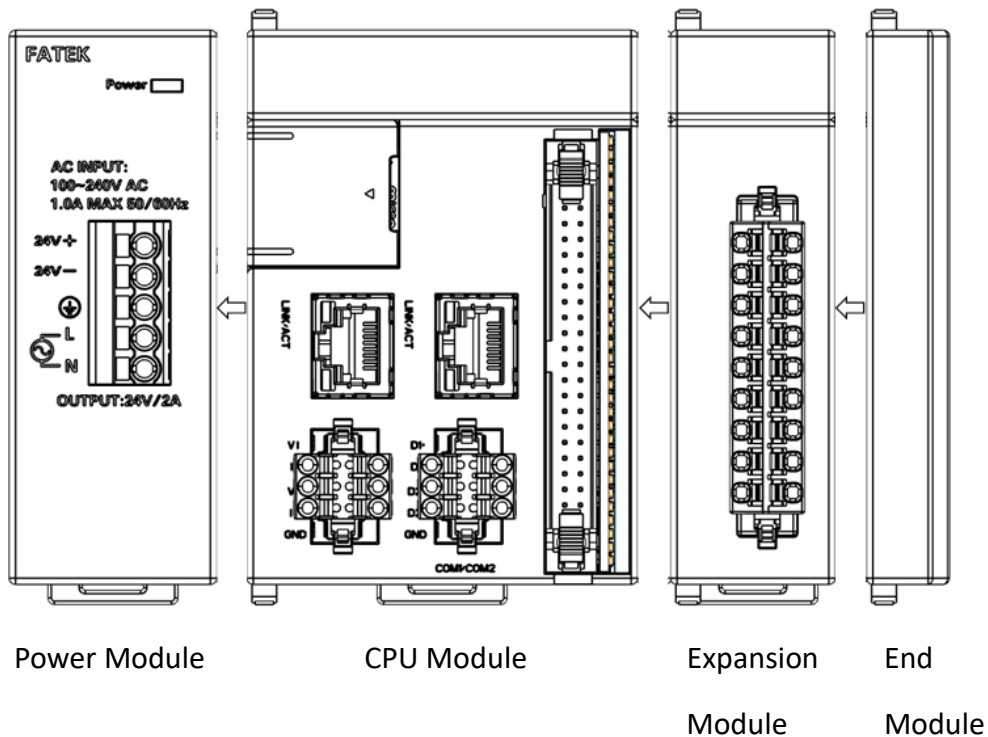
10-1	Installation .....	錯誤! 尚未定義書籤。
10-2	Wiring.....	10-2

This section describes the assembly method of the power module and CPU module as well as the fixed guide rail installation method and the wiring method.

For detailed installation and wiring method of other expansion modules, please refer to "Expansion Module Operating Manual."

## 10-1 Installation

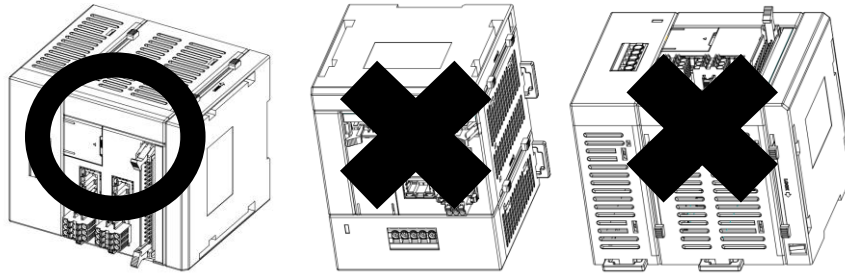
When connecting the module, it shall be executed after the power is disconnected and it is also required to follow safety instructions.



### Precaution

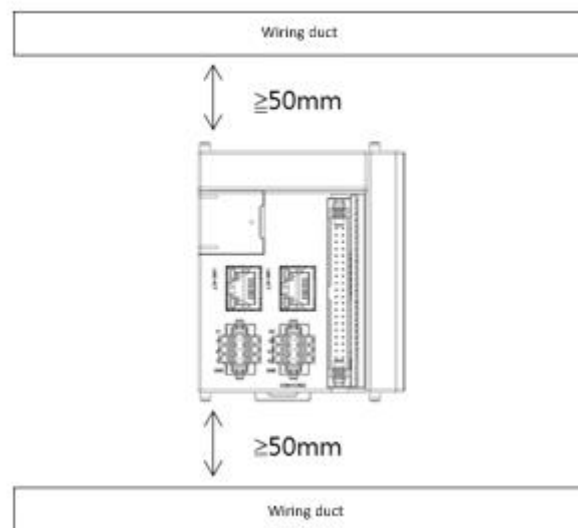
The final module on the rightmost end should be equipped with a termination cover plate during the installation process.

- Installation position  
Installation direction: When installed in the panel, the front-side panel of the CPU Module should face forward.



- Separate with peripheral environment

The M-Series PLC Module is designed with natural air convection to dissipate the heat. For this reason, the upper side and the bottom side of the PLC must also be reserved with a gap wider than 50mm for easier heat dissipation, per the figure below:

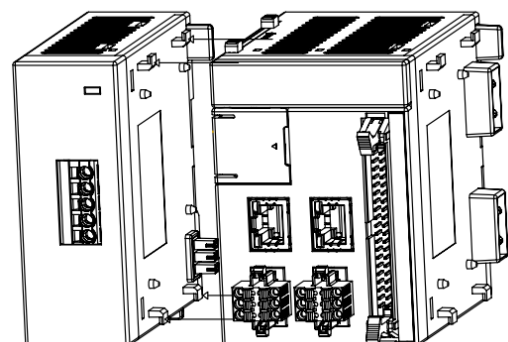


When exceeding the working environment temperature, please use the forced cooling method, or widen the spacing with peripheral environment or improve the ventilation effect to reduce the temperature. When using the expansion module, it is also required to consider the heat effect by widening the space between upper and lower modules for over 50mm.

### 10-1-1 Module assembly

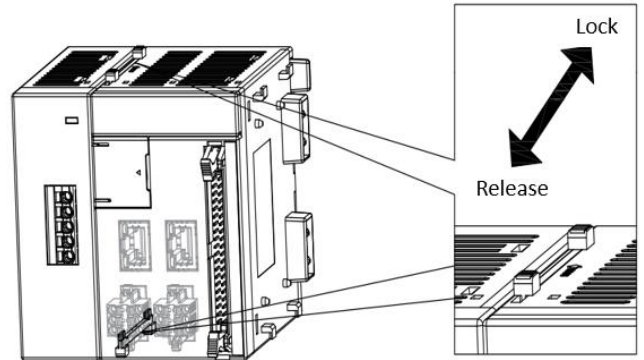
Regarding the connection between the M-Series PLC Module and other modules, the assembly of the M-Series CPU Module and the power module will be used as the example for explanation as below.

1. Release the Side Buckle/Side Slider at the upper/lower side of the right-hand side module.
  - Put your finger on the protruding point of the Side Buckle and then push it towards you, *i.e.*, sliding it



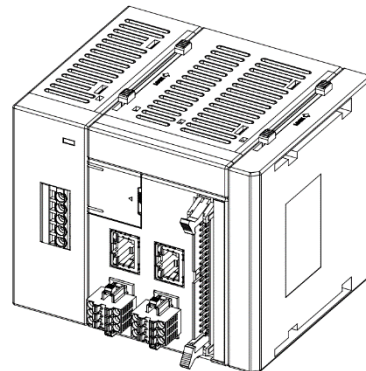
towards the front side of the module until the module is ready for installation.

2. Move the hook hole of the right-hand side module towards the left and then insert it into the hook of the left-hand side module.
  - Keep both module parallel to each other. The connection is completed when the butting connection heads of the left and right modules are aligned with each other.



3. Secure the side buckles at the upper and lower sides of the right-hand side module.
  - Put your finger on the protruding point of the Side Buckle and then push it outward, *i.e.*, sliding it towards the backside front of the module until the module goes into the LOCK status.

4. Finally, install the termination cover plate on the rightmost end of the entire row of modules.



**Precaution**

Please secure the neighboring module with the Side Buckle. If not secured correctly, it may cause a loosening of the connection between both modules such that the PLC will not be able to operate normally. After being latched, test with your hand to see if both modules are securely connected.

### 10-1-2 Securing the DIN guide rail

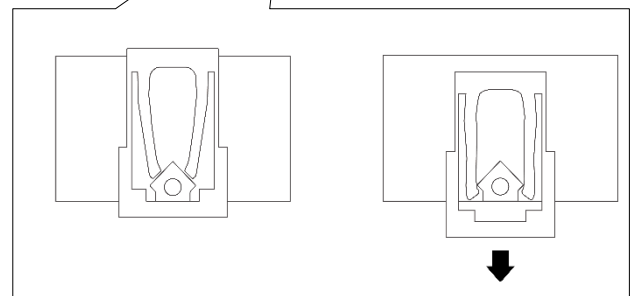
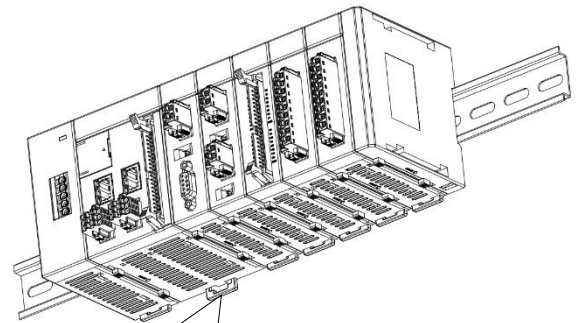
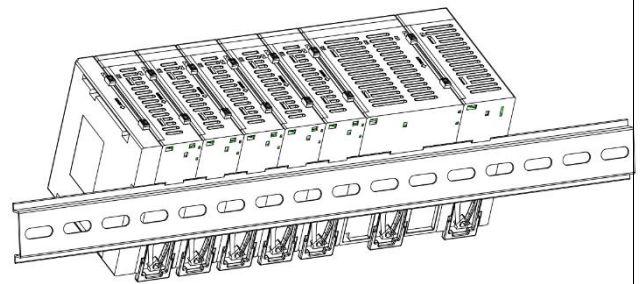
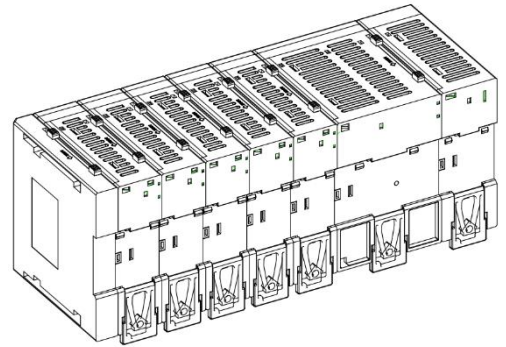
This section describes how to install the connected modules onto the DIN guide rail and the relevant dismantling method.

Install onto the DIN guide rail

1. Hook the groove at the upper side groove of the DIN guide rail onto the guide rail installation latch-hook mounted at the upper side of each module.
2. Insert the lower side of the guide rail into the DIN guide rail mounting latch-hook at the lower side of each module.
  - Push the bottom-side latch-hook to the pull-out status with a flat-head screwdriver. After hearing a click sound, push the module against the DIN guide rail and then lift the bottom-side installation latch-hook to the inserted status.
  - When used in the location difficult for installation, dismantle all of the side buckles first and then lock them tightly after being installed onto the guide rail.
  - Check if the lower-side guide rail installation latch-hook is under the inserted status (locking status).

Dismantling method

3. Push the lower-side guide rail installation latch-hook to the pull-out status.
4. Dismantle the guide rail from the module according to the reverse procedure to the installation.





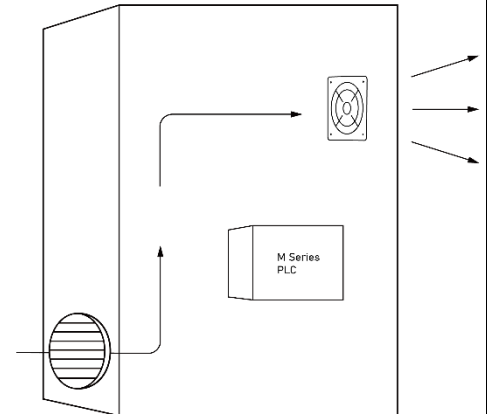
### 10-1-3 Cautions for distribution panel assembly

When installing the PLC in the control panel, it should be executed in an appropriate operating environment.

#### Temperature control

The environment temperature in the Control Box must be maintained at between 0°C and 55°C. If required, use the following method to maintain it at appropriate temperature level.

- Provide sufficient space in order to maintain effective air circulation.
- Do not install the PLC near equipment that will produce high heat such as heater, transformer or high power resistor.
- If the environment temperature is exceeding 55°C, then such environment shall be provided with a cooling fan or an air-conditioning system.



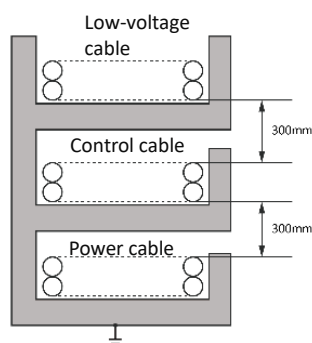
#### Operations and maintenance

- Keep the PLC away from high-voltage equipment and motorized machineries in order to ensure the safety when executing the operations and maintenance activities.
- Install the PLC at a location higher than the ground for 1.0~1.6m because such location will be most suitable for executing the PLC installation and operations.

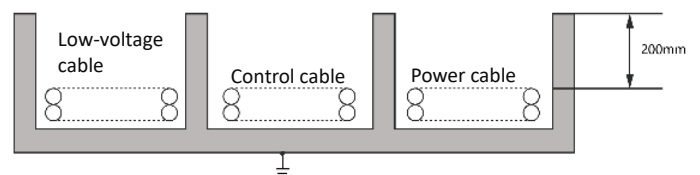
#### Improve the interference resistant performance

When laying the communication cables at an outdoor location, the following factors should be considered:

- When using multi-core signal cables, do not install the I/O wires and other type of control wires in the same strand of cable.
- When using a parallel layout, a minimum 300mm gap should be maintained between the distribution frames.
- If it is required to lay the I/O wires and the power cable in the same cable trough, then the grounding metal plate shall be used to separate both cables.





Recommended anti-interference wiring diagram



## 10-2 Wiring

### Precautions for the wiring operations

Precautions	
Do not attempt to execute the installation or the wiring activities under energized conditions or it may cause the electrocution of the operator or product damage.	
<p>The product should be properly grounded according to the grounding symbols marked on the equipment in order to keep the product from executing false actions as maybe caused by the electrocution and noise interference.</p> <p>When connecting the wires between the peripheral devices and the PLC, please check if the product specifications are compatible with the selected PLC. Unsuitable peripheral devices may result in incompatible terminal configuration or incorrect power. In this case, it may not be able to activate the equipment or may even generate hazardous situation such as the equipment burning damage due to the short circuit of the wires.</p> <p>It is required to ensure that foreign matter such as iron chips or wiring residues are not remain in the module, because these foreign matter may cause fire, damage or false working results.</p>	

- Grounding
  - (1) Please use independent correct grounding method.
  - (2) The grounding should be achieved with the cable with sectional profile greater than or equal to 2mm.
  - (3) The grounding point should be closer to the PLC as much as possible in order to connect with the grounding cable securely.

## 10-2-1 Power wiring

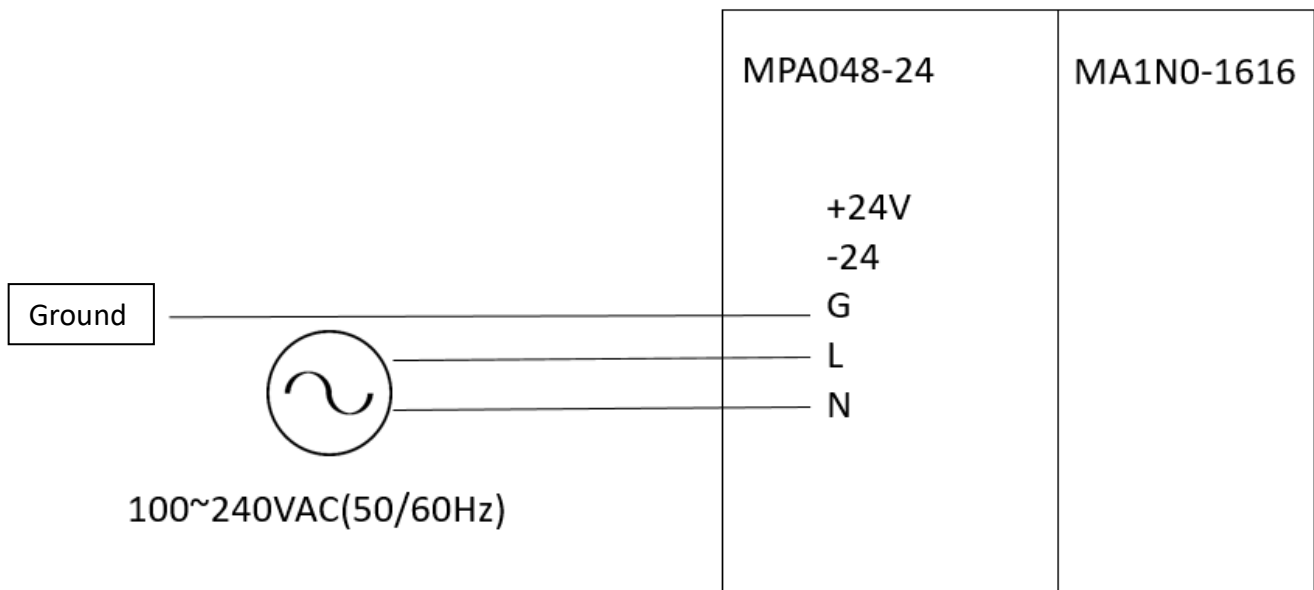
### Power preventive measures

- (1) The power cord of the M-Series Power Module should be configured by separating the power cord of I/O device and other devices, as indicated in the figure below. If a stronger noise is expected, then it shall be equipped with an additional disconnect transformer.
- (2) AC110V and 220V cables should be arranged by separating with DC24V cables. These power wires shall be finely stranded to prevent noise interference. In the meantime, the cable shall be connected to the module with shorter length.
- (3) Do not wrap AC110V, AC220V and DC24V cables together with the main circuit (high-voltage/large current) or I/O signal wires and do not lay the cables by keeping them closer to each other. If allowed by the environment, the aforesaid cables should be separated from each other for over 100mm.
- (4) To prevent the surge resulting from lightning, please install the surge absorber according to the method indicated in the figure below.

#### Cautions:

1. The grounding wire of the Surge Arrestor should be configured by separating it from that of PLC System.
2. Please select the surge absorber with a working voltage not less than the allowable maximum input voltage.

## 10-2-2 AC power wiring



AC Power Loop

※ The user should execute the wiring according to actual laser engraved letters.

1. Connect the FG ( $\equiv$ ) of the Power Module to the grounded end of the power source for use as the reference grounded standard to prevent the system from acting abnormally.
2. Connect the "L" and "N" of the AC power wire to the "L" and "N" of the Power Module, respectively.

The input type shall be AC input. When using, please check the following:

- Because the input voltage of the AC power is presented in a wider range (100~240VAC), please connect the power to the "L" and "N" terminals. It will result in PLC damage if connecting the AC110V or AC220V to the "+24V" and "-24V" input ends. Therefore, users shall pay special attention to this point.

- the grounded end of the power uses over 1.6mm wire for carrying out the grounding purpose.

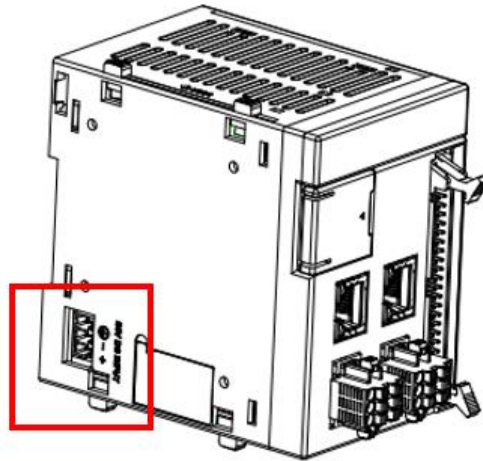
- If the power outage duration is less than 10ms, then the PLC will keep operating without any influence.

If the power outage duration is too long or if the voltage is dropping, then it will force the PLC to stop running and then the output ends will also be disconnected in the meantime. When restoring the power, the PLC will resume running automatically. (The PLC is provided with auxiliary relay and register for supplying the power continuously during a power outage period. During the program design and planning stage, the user shall use these functions carefully.)

3. The DC power supply of the power module is the output side of the power supply, please do not use it in parallel with other power supplies.

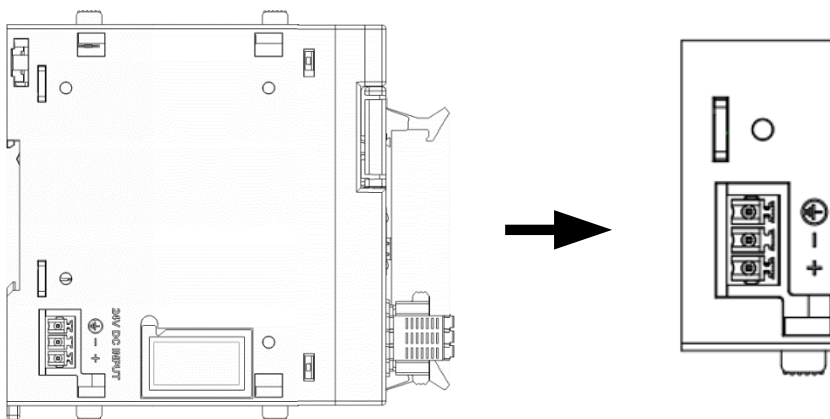
### 10-2-3 DC wiring

1. MPLC-Series CPU Module can be activated through the plug-in 24V DC power. Per the figure below, the module is connected to the power socket on the left-hand side of the CPU module through a 3-pin EU-standard terminal plug.



DC power input location

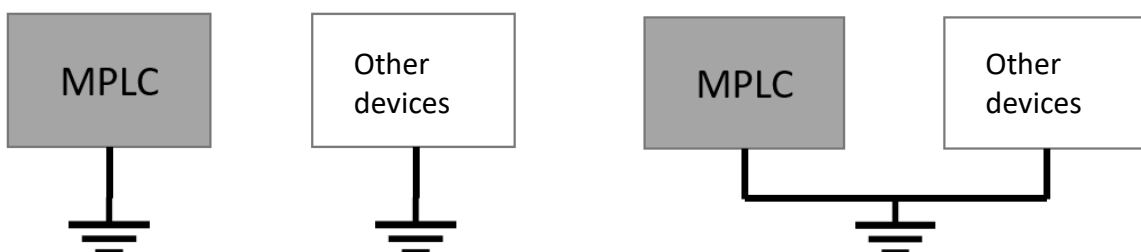
2. When connecting the DC power, be sure to confirm that it has been properly connected to the positive and negative poles; otherwise, it may result in equipment damage. Please connect the wires according to the correct method indicated in the figure below.



DC power pins

#### Cautions

1. The grounded wire should be connected separately. If separate grounding becomes impossible, please use common grounding, but the same wire length must be used.
2. Please use the FG terminal as the grounded end (do not use the power terminal as the grounding end).



Grounding Recommendation Diagram

# 11

## Maintenance and Inspections

---

- 11-1 Operating Instructions.....錯誤! 尚未定義書籤。
- 11-2 Daily Maintenance .....錯誤! 尚未定義書籤。
- 11-3 Regular Maintenance.....錯誤! 尚未定義書籤。


## 11-1 Operating Instructions

---

When executing the servicing and maintenance, please observe the following instructions because false or careless operations may result in personnel injury and equipment damage.

- Be sure to disconnect the PLC input power when it is required to be in contact with any terminal or to insert or remove the parts (*e.g.*, expanding the harness, etc.) of the PLC during the maintenance process. If the aforesaid work is conducted under an energizing status, then it may result in electrocution, short circuit, PLC damage or even false action of the PLC. In this case, do not touch the terminal to prevent the terminal from oxidizing or personnel from electrocution.
- Before supplying power, please remove the impurities such as wire chips and screws.
- Do not apply heavy load on the cable or drag or clamp the cable by force to avoid cable damage or terminal loosening and electrocution.
- Confirm that the input power is identical with the type of power supplied to the PLC. If using AC as the input power, connect the live wire (L) to the “L” terminal and connect the neutral wire (N) to the “N” terminal of the PLC, respectively. If falsely connected to the input power to the PLC supplied with DC power or to any terminal other than the “L” and “N”, then it will cause the electrocution and serious damage of the PLC or other equipment.
- Confirm that the SINK/SOURCE polarity of the DC24V input end and the transistor output end are identical with the polarity of your wires. Incorrect wiring will lead to invalid PLC input and output circuit damage.
- In the M-Series, the part that cannot be serviced by ordinary users shall be executed by a professional person. If any defects occur during the operating process, please refer to the “Troubleshooting” section to judge the defective status and then replace the entire machine or entire piece of board (board level) according to the specified replacement maintenance method. In the meantime, the user needs to send the defective item to the local distributor for repair. Do not attempt to disassemble, modify or repair the product or it may lead to function failure, fire or even personnel injury.
- Do not install the M-Series PLC Module in the environment exposing it to direct sunlight or humidity.
- Confirm that the M-Series PLC Module is located at an appropriate distance from the heat source such as coil, heater or resistor to prevent the component temperature from rising.
- Please set up emergency power disconnection system and over-current protection device according to actual needs in order to protect the M-Series PLC Module.

- During the operations and maintenance process, please confirm the stability of the installation results to avoid unexpected vibrations as to cause damage to the M-Series PLC Module and the controlled component.
- After replacing the CPU module, confirm that all programs and parameters are logged into the new CPU module and that the setting is duly completed. After that, restart the M-Series PLC Module to prevent the controlled component from performing false action.
- The M-Series can disable all of the input or output points one by one or in a total manner. In other words, although the PLC has completed the program operations scanning and the I/O updating, but it does not update the status of the disabled input point according to the actual external input results; likewise, it does not transmit the computed output results for the disabled output point. Instead, it allows the user to set up the status of such input or output point compulsorily in order to simulate its action. By using the disable function with the monitoring function, it allows the user to execute the simulation for the input or output point through the UperLogic and then check the computation results. After confirming that the simulation results are correct, the user will be allowed to enable all of the input or output points and the module will operate normally once again.

Warning	
<p>The disable function resembles a program control that can be used to disable any PLC input or output point and then deliver the result to the user (the tester) for setting such disable input or output point as "ON" or "OFF" through the compulsory setting method as desired. When the PLC is under normal running status, the user must confirm whether or not the safety-related input or output point (<i>e.g.</i>, upper/lower limit detecting input or emergency stop output, etc.) is available for disable or compulsory ON/OFF. After that, the user shall be allowed to execute the disable or the compulsory ON/OFF control to avoid machinery equipment damage or personnel injury.</p>	



## 11-2 Daily Maintenance

---

To maintain the M-Series PLC Module at normal operating conditions, please check if the ambient environment and M-Series PLC Module comply with the precautions specified in Section 11.1 and then execute the daily inspection according to the items listed below. When detecting any abnormal situations, take maintenance action immediately according to the specified solutions.

### 11-2-1 Daily maintenance items

1. Appearance inspection:

Check if the appearance is presenting any dirt contamination signs. If seriously contaminated by dust, wipe with a clean cotton rag to improve the heat dissipating results while preventing the dust from falling into the board as to cause short circuit risks.

2. Check if the module is securely fixed:

Touch the module by the hand to check if any loosening sign existed between modules. If the module is equipped with a fixed-type DIN guide rail, check if the bottom-side installation latch-hook is properly connected with the fixed-type DIN guide rail. If not securely fixed, it may affect the operating function.

3. Wire connection status:

Pull the cable lightly by the hand to check if it is loosening. If the cable is loose, it may produce sparks and operate incorrectly.

4. Power module lamp:

Check if the POWER lamp is under "ON" status. If the POWER lamp is under "OFF" status but the power is supplied normally, please refer to the solutions specified in the "Troubleshooting" section of this Manual.

5. CPU module lamp:

Normal indicator shall be displayed as POWER lamp "ON" and "RUN" lamp flickering status. If connected with the RS485 communication equipment, the P01 or P02 will be under "ON" status. If the lamp is other than the aforesaid status or when the ERR red lamp is under "ON" status, please refer to the solutions specified in the "Troubleshooting" section of this Manual.

## 11-3 Regular Maintenance

When executing the scheduled daily inspection, it will also be required to conduct the scheduled regular maintenance according to the actual operating environment. After confirming that the ambient environment and the M-Series PLC Module comply with the precautions specified in Section 11.1, please start the regular inspection according to the items listed below. When detecting any abnormal situations, take maintenance action immediately according to the specified solutions.

### 11-3-1 Regular maintenance items

No.	Inspection item		Content	Judgment standard	Solutions
1	Ambient temperature	Environmental temperature / humidity	Measured with temperature gauge and humidity gauge	To meet the specifications established for each module. If different specifications are existing, then the most stringent standard shall prevail.	Confirm the cause of the environment variation and then solve the problem so that the system may operate under a stabilized environment.
		Air	Measure the corrosive gas	Without corrosive gas	
2	Power voltage		Measure the input AC or DC power	To meet the power module related specifications.	Confirm the power supply system.
3	Installation	Correctly installed	Check if the module is properly installed	Refer to "Chapter 10: Correct installation of module"	Check if the modules are fixed securely with each other and if the side buckle/Side Slider are also at the correct position.
		Contaminated by	Check the	Without dust or	Remove dust or dirt

		dust and dirt	appearance	dirt.	
4	Connection	Connecting terminal board is loose.	Confirm by inserting and removing the connection terminal board.	Securely connected without loosening.	The terminal board latch should be installed securely.
5	PLC System diagnosis		Check the error record	There' s no other error.	
6	Max. scanning time		Confirm the status of the R35370 and R35371 through UperLogic status monitoring page.	The max. scanning time must be within the scope allowed by the system specifications.	Confirm the reasons causing the delay of scanning time.

Details of Regular Maintenance

## Revision History

Version	Revision date	Revision content	Pages	Mender
VX.X.XX	2020/2/24	Version 1		
V1.0	2022/4/28	Version 2	84	
V1.1	2022/10/3	Version 3		