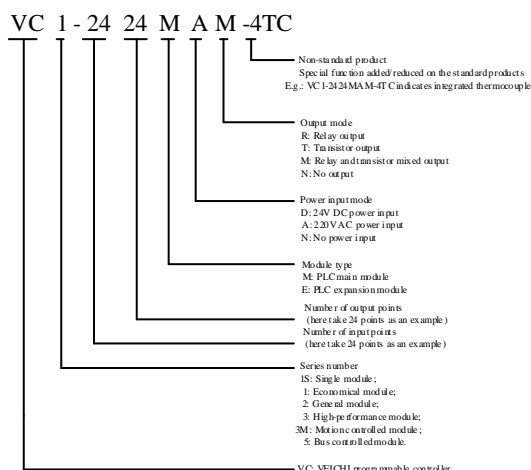# VC1-2424MAM-4TC PLC Quick Reference Manual

This manual provides a quick on-site access for users to the information of the design, installation, connection and maintenance of the VC1-2424MAM-4TC series Model PLC. It briefly describes the hardware specifications, features and usage of the PLC. There are also brief descriptions of associated accessories, answers to frequently asked questions, and other information for easy reference. For more detailed product information, please refer to the "VC Series Programmable Controller Manual" and "AutoStudio Programming Software Manual" issued by VEICHI. Please consult with the supplier if needed. Users can also download PLC related technical information or give feedback on PLC related questions on https://www.veichi.com.

# 1 Production Introduction

## 1.1 Module Description

Module description is shown below:



## 1.2 Appearance and Structure

The appearance and structure of the main module VC1 is shown below (take VC1-2424MAM-4TC as an example):
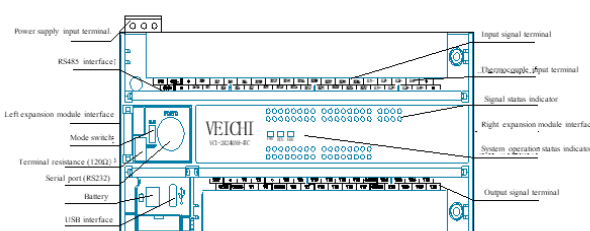


VC1-2424MAM-4TC adopts RS232 and Mini DIN8 socket, 1 channel of RS485 and Type-C USB interface. The right expansion module interface is used to connect the expansion module, the left one is used to connect the expansion communication module. There are two options for the mode switch, ON/OFF, and one RS485 terminal resistor with a resistance of 120 Ω (DIP No. 1). For output terminals, the first 8 are transistor outputs, the last 16 are relay outputs and 4 integrated thermocouple-type temperature inputs.

## 1.3 Terminal Introduction

Terminal arrangement for 24-point main module

Input terminal:



Output terminal:



Y0~Y7 are transistor outputs and Y10~Y27 are relay outputs.

# 2 Power Supply Specification

The specifications of the built-in power supply of the main module and those that the main module can supply to expansion modules are shown as below.

| Item | | Unit | Min. | Typ. | Max. | Description |
|---|---|---|---|---|---|---|
| Input voltage range | | Vac | 85 | 220 | 264 | Voltage range for proper start and operation |
| Input current | | A | / | / | 1.5 | 90Vac input, full-load output |
| Rated output current | 5V/GND | mA | / | 1500 | / | The sum power of 5V/GND and 24V/GND shall not exceed 30W. |
| | 24V/GND | mA | / | 1000 | / | |
| | 24V/COM | mA | / | | / | |

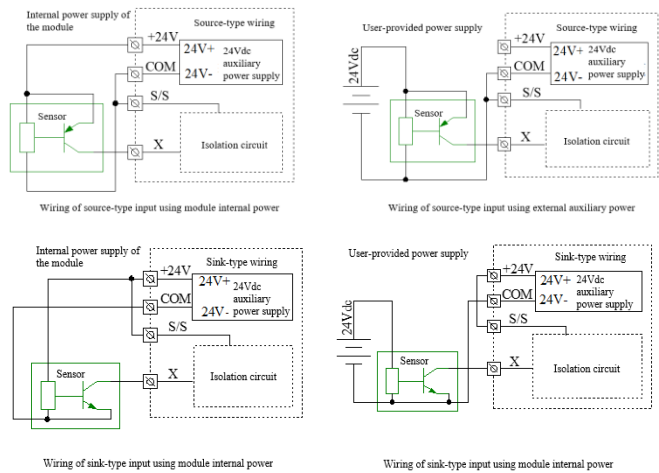# 3 Switch Input and Output Characteristics

## 3.1 Input Characteristics and Signal Specifications

Input characteristics and signal specifications are show in the following table.

| Item | | High-speed input terminal X0~X7 | General input terminal |
|---|---|---|---|
| Signal input method | | Source/sink mode, selectable via "S/S" terminals | |
| Electrical parameters | Detection voltage | 24Vdc | |
| | Input impedance | 1KΩ | 4kΩ |
| | Input ON | External circuit resistance < 400Ω | External circuit resistance < 400Ω |
| | Input OFF | External circuit resistance > 24kΩ | External circuit resistance > 24kΩ |
| Filter function | Digital filter | X0 to X7 are of digital filter function. Filtering time can be programmed in 0~60ms. | |
| | Hardware filter | Input terminals (other than X0~X7) are of hardware filter mode. Filtering time: about 10ms. | |
| High speed function | | X0~X7: high-speed counting, interruption, and pulse catching X0 and X1: up to 50kHz counting frequency X2~X7: up to 10kHz counting frequency The sum of input frequency should be less than 60kHz | |
| Common terminal | | Only one: S/S | |

The input terminal of the counter should correspondingly abide by its upper frequency limit. Any frequency higher than that may result in incorrect counting or abnormal system operation. Make sure that the input terminal arrangement is reasonable and choose the proper external sensors.

The PLC provides the "S/S" port for selecting the signal input mode, which can be set as source-type or sink-type mode. Connecting "S/S" to "+24V" means users select the sink-type mode, and then an NPN-type sensor can be connected.



Wiring of source-type input using module internal power

Wiring of source-type input using external auxiliary power

Wiring of sink-type input using module internal power

Wiring of sink-type input using module internal power

**Input connection instance**

The following diagram shows an example of the main module in connection with an VC-0808ENR expansion module, which realizes simple positioning control. The positioning signals from the encoder are detected through high-speed counting terminals X0 and X1, the limit switch signals that require high-speed response can be input through high-speed terminals X2~X7. Other user signals can be input through any other input terminals.
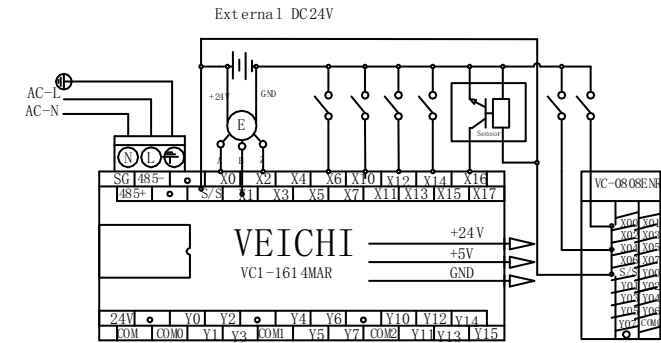


## 3.2 Output Characteristics and Signal Specifications

The comparison of relay and transistor output types is shown below.

| Item | Relay | Transistor |
|---|---|---|
| Mode | The output is connected when the its status is ON; and it's disconnected when the status is OFF. | |
| Common terminal | Several groups are there with a common terminal COMn in each group, adapting to control circuits in different potentials. All common terminals are isolated from each other. | |
| Voltage characteristics | 220Vac, 24Vdc, no polarity requirements | 24Vdc with polarity requirements |
| Current requirement | In accordance with the output electrical codes | |
| Characteristics | High drive voltage and high current | Low drive current, high frequency, long service life |
| Application | Loads with low operating frequency of intermediate relay, contactor coil, indicator light, etc. | Scenarios with high operating frequency and long service life of control servo amplifier, frequently operated electromagnet, etc. |

The output electrical codes are as below.

| Item | | Relay | Transistor |
|---|---|---|---|
| Circuit power supply voltage | | Below 250Vac, 30Vdc | 5~24Vdc |
| Circuit insulation | | Mechanical insulation | Optocoupler insulation |
| Operation indication | | The relay output contact is connected and the indicator light is on | The indicator light is on when the optocoupler is driven |
| Leakage current in open circuit | | / | Less than 0.1mA/30Vdc |
| Min. load | | 2mA/5Vdc | 5mA (5~24Vdc) |
| Max. output current | Resistive load | 2A/1-point<br>8A/4-point group of COM<br>8A/6-point group of COM<br>8A/8-point group of COM | Y0/Y1/Y2: 0.3A/ 1-point group<br>Others: 0.3A/1-point Above 8 points, total current increases 0.1A at each point increase |

| Item | | Relay | Transistor |
|---|---|---|---|
| | Inductive load | 220Vac, 80VA | Y0/Y1/Y2: 7.2W/24Vdc<br>Others: 12W/24Vdc |
| | Lamp load | 220Vac, 100W | Y0/Y1/Y2: 0.9W/24Vdc<br>Others: 1.5W/24Vdc |
| Response time | OFF→ON | 20ms Max | Y0/Y1/Y2: 10μs |
| | ON→OFF | 20ms Max | Others: 0.5ms |
| Y0,Y1,Y2 max. output frequency | | / | Each channel: 100kHz |
| Output common terminal | | Y0/Y1/Y2/Y3—COM0. Y4/Y5/Y6/Y7—COM1. One COM can be shared by a maximum of 8 terminals after Y10, all common terminals are isolated from each other | |
| Fuse protection | | None | |

**Output connection instance**

The following diagram shows the connection between main module and VC-0808ENR expansion module. Different output groups can be connected to different signal circuits with different voltages. Some (like Y1-COM0) are connected to the 24Vdc circuit powered by the 24V COM of this controller. Some (like Y5-COM1) are connected to the 5Vdc low-voltage signal circuit. Others (like Y11, Y13, Y15) are connected to the 220Vac voltage signal circuit. That is, different output groups can operate in circuits with different voltage levels.



Various low-voltage control circuits

220V AC control load circuit
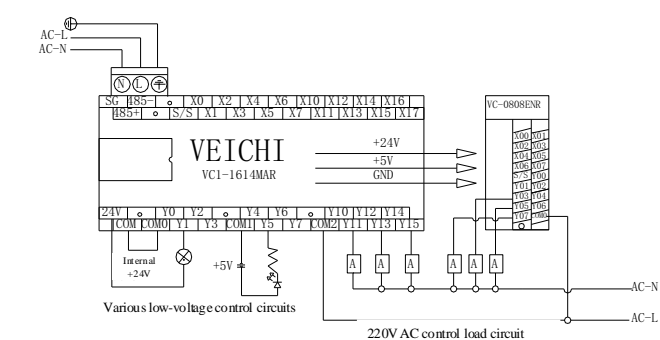
**Thermocouple terminal arrangement instruction**

The wiring requirements of user terminals are shown in Figure 1-4.
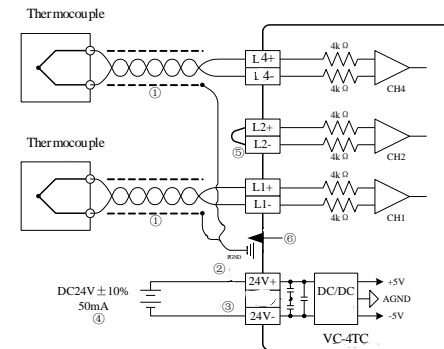


The wiring requirements of user terminals are shown in below. For wiring, please pay attention to the following notes:

In the figure, ① to ⑥ refers to the 6 notes for wiring.

1) The thermocouple signal is recommended to be connected via a shielded compensation cable. Lines should be routed away from power cables or other wires that may cause electrical disturbance. It is recommended to use compensation cables less than 100m in length to avoid noise interference. Measurement errors may be caused by the impedance of the compensation cable, which can be resolved by characteristic adjustments.

2) If there are too many electrical disturbances, ground the shielding ground.

3) Ground the ground terminal PE of the switching power supply well.

4) The analog power supply can adopt the 24Vdc auxiliary power supply output by the main module, or any other power supplies that meets the requirements.

5) Avoid shorting the positive and negative terminals of the channel to prevent false data being detected on this channel.

6) If all multiplexed thermocouples need to be connected to the shield, the terminals can be externally expanded.

2

**Performance indicator**

| Item | Description | |
|---|---|---|
| | Celsius (°C) | Fahrenheit (°F) |
| Occupied I/O points | None | |
| Input signal | Thermocouples: 4 channels in total and 7 types as K, J, E, N, T, R, S (all 7 types available for each channel) | |
| Conversion speed | (240±2%) ms × 4 channels (unused channels are not converted) | |
| Rated temperature range | Type K | -100°C~1200°C | Type K | -148°F~2192°F |
| | Type J | -100°C~1000°C | Type J | -148°F~1832°F |
| | Type E | -100°C~1000°C | Type E | -148°F~1832°F |
| | Type N | -100°C~1200°C | Type N | -148°F~2192°F |
| | Type T | -200°C~400°C | Type T | -328°F~752°F |
| | Type R | 0°C~1600°C | Type R | 32°F~2912°F |
| | Type S | 0°C~1600°C | Type S | 32°F~2912°F |
| Digital output | 16-bit AD conversion; stored in 16-bit two's complement | |
| | Type K | -1000~12000 | Type K | -1480~21920 |
| | Type J | -1000~10000 | Type J | -1480~18320 |
| | Type E | -1000~10000 | Type E | -1480~18320 |
| | Type N | -1000~12000 | Type N | -1480~21920 |
| | Type T | -2000~4000 | Type T | -3280~7520 |
| | Type R | 0~16000 | Type R | 320~29120 |
| | Type S | 0~16000 | Type S | 320~29120 |
| Minimum resolution | Type K | 0.8°C | Type K | 1.44°F |
| | Type J | 0.7°C | Type J | 1.26°F |
| | Type E | 0.5°C | Type E | 0.9°F |
| | Type N | 1°C | Type N | 1.8°F |
| Minimum resolution | Type T | 0.2°C | Type T | 0.36°F |
| | Type R | 1°C | Type R | 1.8°F |
| | Type S | 1°C | Type S | 1.8°F |
| Overall calibration point | ± (0.5% of the full range + 1°C), pure water condensation point: 0°C/32°F | |
| Isolation | The analog and digital circuits are isolated by optocouplers. The analog circuit power supply and 24Vdc power supply are isolated by DC/DC. | |
| Note: With the appropriate mode setting, both °C and °F data can be obtained. | | |

# 4 Communication

The VC1 series PLC main module provides 2 asynchronous serial communication ports, namely COM0 and COM1 which support the baud rates of 115200, 57600, 38400, 19200, 9600, 4800, 2400, and 1200 bps. The communication protocol for COM0 is determined by the mode switch as below.
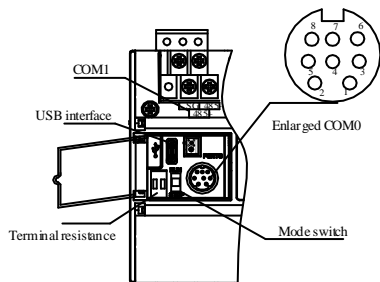


| Pin | Name | Description |
|---|---|---|
| 3 | GND | Grounding pin |
| 4 | RXD | Serial data receiving pin (from RS232 to the PLC) |
| 5 | TXD | Serial data transmitting pin (from the PLC to RS232) |
| 1,2, 6, 7, 8 | Reserved | Serial data receiving pin (from RS232 to the PLC) |

As a dedicated interface for user programming, COM0 can be forcefully switched to the programming protocol via the mode switch. The relationship between PLC operation status and COM0 usage protocol is shown in the table below.

| Mode switch position | Status | COM0 operating protocol |
|---|---|---|
| ON | RUN | It can be programming protocol, or Modbus protocol as determined by user program and system configuration. |
| OFF | STOP | If the system configuration of user program is Modbus protocol, it converts to programming protocol automatically after stop. Otherwise, the system protocol keeps unchanged. |

The COM1 port is ideal for connection with communication-supported production equipments (such as drives). With Modbus protocol or RS485 free protocol, a drive can control multiple devices through the network. Its terminals are fixed with screws. Communication signal cables are at users' discretion. It is recommended to use a twisted shielded pair as the signal cable to connect communication ports.

The USB is Type-C interface. The supported functions include upload, download, online upgrade firmware and monitoring.

# 5 Installation

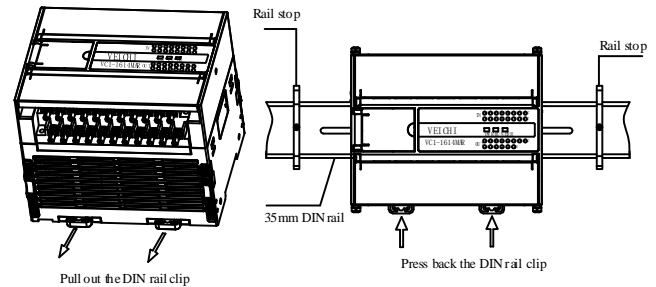The PLC is applicable to Installation Category II, Pollution degree 2.

## 5.1 Dimensions

| Model | Length | Width | Height |
|---|---|---|---|
| VC1-2424MAM-4TC | 192mm | 90mm | 92.7mm |

## 5.2 Installation instruction

**Use DIN rail**

Generally, the PLC can be mounted onto a 35mm-wide rail (DIN), as shown in the following figure.



The specific installation steps are as follows:

1. Fix the DIN rail horizontally on the mounting backplane.

2. Pull out the DIN rail buckle under the bottom of the module.

3. Hang the module on the DIN.

4. Press the buckle back to its original position to lock the module.

5. Finally, fixed both ends of the module with DIN rail clips to avoid sliding.

Other VC1 series PLCs can be installed on DIN rail according to the above steps.

**Use screws**

For applications with large oscillations, the main module can be installed with screws. When installing the expansion module, first pull the slide lock up to the top, align it and push it toward the main module. After that, pull it down to the end to complete the fixation. This is shown in the figure below. (**Note:** The main module requires optional accessories for screw installation, and the expansion module does not support screw installation.)
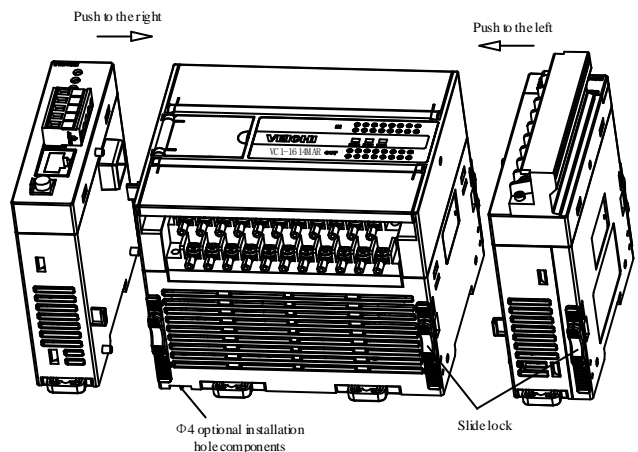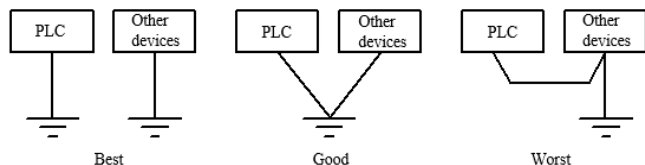


## 5.3 Cable Connection and Specification

For power and grounding cable connection, it is recommended to add an air switch and fuses to the PLC power input to protect the circuit.

Reliable grounding cables can enhance equipment safety and improve the PLC's electromagnetic immunity. Please connect the power supply ⊕ end of the PLC to the earthing conductor during installation. It is recommended to use connection wires of AWG12 to AWG16 and shorten the wires as much as possible.

An independent grounding device is also recommended to set. Keep the grounding cables away from those of other devices (especially the devices cause strong disturbance), as shown below.

Best     Good     Worst

**Cable specification**

For the wiring of the PLC, it is recommended to use multi-strand copper wire and ready-made insulated terminals to ensure the wiring quality. The recommended cross-sectional areas and models of the cable are shown in the following table.

| Cable | Cross-sectional area | Recommended model | Compatible wiring terminal and heat-shrinkable tube |
|---|---|---|---|
| AC power cable (L, N) | 1.0~2.0mm² | AWG12, 18 | H1.5/14 pre-insulated tube-like terminal, or hot tin-coated cable terminal |
| Grounding cable (⏚) | 2.0mm² | AWG12 | H2.0/14 pre-insulated tube-like terminal, or hot tin-coated cable terminal |
| Input signal cable (X) | 0.8~1.0mm² | AWG18, 20 | UT1-3 or OT1-3 cold-pressed terminal |
| Output signal cable (Y) | 0.8~1.0mm² | AWG18, 20 | Φ3 or Φ4 heat-shrinkable tube |

Fix the processed cable terminals onto the wiring terminals of PLC by screws. Pay attention to the positions of the screws. The tightening torque for the screws is 0.5 to 0.8 Nm, which ensures complete reliable connection without damaging the screws.

The recommended cable processing-method is shown in the following figure.



## 6 Power-on, Operation, and Routine Maintenance

### 6.1 Power-on and Operation

After the wiring is complete, check all the connections. Ensure that no foreign matters have dropped inside the housing and heat dissipation is in good conditions.

1. Power on the PLC. The PWR indicator of the PLC is on.

2. Start the AutoStation software on the PC and download the compiled user program to the PLC.

3. After the program is downloaded and verified, set the mode switch to ON. The RUN indicator is on. If the ERR indicator is on, it indicates that errors occur on the user program or the system. In this case, rectify the errors by referring to the instructions in the VC Series Small-sized PLC Programming Manual.

4. Power on the PLC external system to perform commissioning on the system.

### 6.2 Routine maintenance

Pay attention to the following notes for routine maintenance and inspection:

1. Ensure that the PLC operates in a clean environment, preventing foreign matters or dust from dropping into the machine.

2. Keep the PLC in good ventilation and heat dissipation conditions.

3. Ensure that the wiring is properly performed and all the wiring terminals are well fastened.

⚠ **Warning**

1. Never connect the transistor output to an AC circuit (like 220Vac). The design of the output circuit must abide by the requirements of electric parameters, and no overvoltage or overcurrent is allowed.

2. Use the relay contacts only when necessary, because the use life of relay contacts depends largely on its action times.

3. The relay contacts can support loads smaller than 2A. To support larger loads, use external contacts or mid-relay.

4. The relay may fail to connect when the current of its contact is smaller than 5mA.
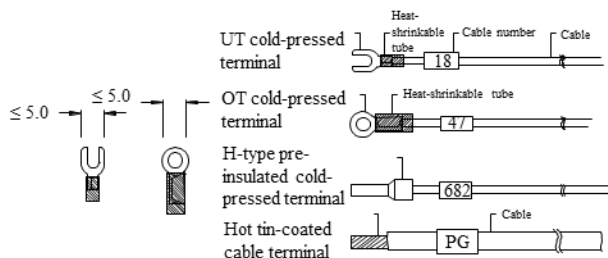
## User Notice

1. The warranty covers only the PLC machine.

2. The warranty period is eighteen months. VEICHI provides free-of-charge maintenance for the product if it is faulty or damaged in normal use within the warranty period.

3. The warranty period starts from the the factory date of the product. The machine code is the only basis for determining whether the product is in the warranty period. An equipment without the machine code is deemed as out of warranty.

4. Maintenance and repair services are charged in the following scenarios even the product is within the warranty period:

5. Faults are caused by not complying with the user manual;

6. The damage caused by fire, flood, or voltage anomalies;

7. The PLC is damaged by the unsupported functions.

8. The service charge will be calculated based on actual cost, and if there is a contract, the provisions stated in the contract prevail.

9. Please make sure that you keep this card and present it to the service unit at the time of warranty.

10. Please contract the agent or VEICHI directly if there's any questions.