

User's Quick Start Guide of EPI Series Master Modules

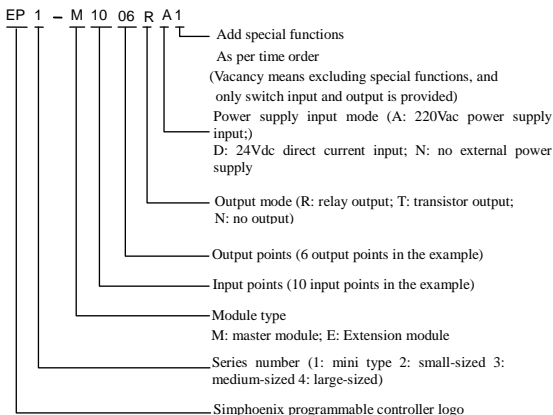
Thank you for selecting EPI series PLCs produced by Shenzhen Simphoenix Electric Technologies Co., Ltd. Before using the PLC product, please read this manual carefully to have a clearer understanding of the product's characteristics, safely use the product and take full advantage of the product's extensive functions.

This Quick Start Guide is to give a quick guide for the design, installation, connection and maintenance of EPI series PLCs and to facilitate users to quickly look up necessary information on site. This Guide describes the hardware specifications, characteristics and using methods of EPI series PLCs and also contains brief description of relevant optional components and FAQs for reference. If you need detailed product data, please refer to our User Manual of EPI Series Programmable Controllers, User Manual of SCP Developer Programming Software and Programming Reference Manual of EPI Series Programmable Controllers. Please consult your supplier if necessary.

1 Product Introduction

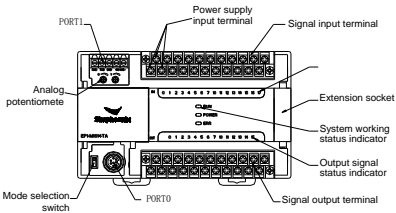
1.1 Model Description

The product model is described in below figure.



1.2 Contour Structure


EP1-M series master module has the contour structure as shown in below figure (taking EP1-M1614RA as an example):



PORT0 and PORT1 are communication terminals. PORT0 is RS232 level, and the socket is Mini DIN 8. PORT1 provides two kinds of level, which is RS485 and RS232. The bus socket is used to connect extension modules. The mode selection switch can be switched to ON, TM and OFF.

1.3 Terminal Introduction

For different models of master modules, terminals are arranged in different ways. All master modules listed in below table have the terminals with the same meaning.

Pin logo	Function description
L/N	220V AC power supply input terminal, belonging to live line and zero line respectively.
	Ground lead terminal PG
+24V	Provides auxiliary DC power supply for user's external equipment, to be used in conjunction with 0V.
0V	The negative electrode externally providing +24V auxiliary power supply
S/S	Providing choices for users of input modes; supporting leakage mode input when connected with +24 V, and supporting source type input when connected with 0V.
*	Vacant terminal for isolation. Do not connect to it.

Below are definitions of input and output terminals of different models of master modules.

■ EP1-M1006RA, EP1-M1006TA

Input Terminal:

PG		*	S/S	X0	X2	X4	X6	X10
L	N	*	X1	X3	X5	X7	X11	

Output Terminal:

+24V	*	Y0	Y1	*	Y2	Y4	*
0V	*	COM0	COM1	*	COM2	Y3	Y5

Pin logo	Function description
X0~X11	Switch signal input terminal, generating input signals when used in conjunction with 0V terminal.
Y0, COM0	Control output terminal, Group 0
Y1, COM1	Control output terminal, Group 1
Y2~Y5, COM2	Control output terminal, Group 2
COMx of output groups is electrically isolated with each other.	

■ EP1-M1410RA, EP1-M1410TA

Input Terminal:

PG		*	S/S	X0	X2	X4	X6	X10	X12	X14
L	N	*	X1	X3	X5	X7	X11	X13	X15	

Output Terminal:

+24V	*	Y0	Y1	Y2	Y4	*	Y6	Y10	*
0V	*	COM0	COM1	COM2	Y3	Y5	COM3	Y7	Y11

Pin logo	Function description
X0~X15	Switch signal input terminal, generating input signals when used in conjunction with 0V terminal.
Y0, COM0	Control output terminal, Group 0
Y1, COM1	Control output terminal, Group 1
Y2~Y5, COM2	Control output terminal, Group 2
Y6~Y11, COM3	Control output terminal, Group 3
COMx of output groups is electrically isolated with each other.	

■ EP1-M1614RA, EP1-M1614TA

Input Terminal:

PG	*	S/S	X0	X2	X4	X6	X10	X12	X14	X16
L	N	*	X1	X3	X5	X7	X11	X13	X15	X17

Output Terminal:

+24V	*	Y0	Y1	Y2	Y4	COM3	Y6	Y10	Y12	Y14
0V	*	COM0	COM1	COM2	Y3	Y5	Y7	Y11	Y13	Y15

Pin logo	Function description	
X0~X17	Switch signal input terminal, generating input signals when used in conjunction with OV terminal.	
Y0, COM0	Control output terminal, Group 0	COMx of output groups is electrically isolated with each other.
Y1, COM1	Control output terminal, Group 1	
Y2~Y5, COM2	Control output terminal, Group 2	
Y6~Y15, COM3	Control output terminal, Group 3	

■ EP1-M2416RA, EP1-M2416TA

Input Terminal:

PG	*	S/S	X0	X2	X4	X6	X10	X12	X14	X16	X20	X22	X24	X26
L	N	*	X1	X3	X5	X7	X11	X13	X15	X17	X21	X23	X25	X27

Output Terminal:

+24V	+24V	*	Y0	Y1	Y2	*	Y4	Y6	*	Y10	Y12	Y14	Y16	*
0V	0V	*	COM0	COM1	COM2	Y3	COM3	Y5	Y7	COM4	Y11	Y13	Y15	Y17

Pin logo	Function description	
X0~X27	Switch signal input terminal, generating input signals when used in conjunction with OV terminal.	
Y0, COM0	Control output terminal, Group 0	COMx of output groups is electrically isolated with each other.
Y1, COM1	Control output terminal, Group 1	
Y2~Y3, COM2	Control output terminal, Group 2	
Y4~Y7, COM3	Control output terminal, Group 3	
Y10~Y17, COM4	Control output terminal, Group 4	

■ EP1-M3624RA, EP1-M3624TA

Input Terminal:

PG	*	S/S	X0	X2	X4	X6	X10	X12	X14	X16	X20	X22	X24	X26	X30	X32	X34	X36	X40	X42
L	N	*	X1	X3	X5	X7	X11	X13	X15	X17	X21	X23	X25	X27	X31	X33	X35	X37	X41	X43

Output Terminal:

+24V	+24V	*	Y0	Y1	Y2	*	Y4	Y6	*	Y10	Y12	*	Y14	Y16	*	Y20	Y22	Y24	Y26	*
0V	0V	*	COM0	COM1	COM2	Y3	COM3	Y5	Y7	COM4	Y11	Y13	COM5	Y15	Y17	COM6	Y21	Y23	Y25	Y27

Pin logo	Function description
X0~X43	Switch signal input terminal, generating input signals when used in conjunction with OV terminal.
Y0, COM0	Control output terminal, Group 0
Y1, COM1	Control output terminal, Group 1
Y2~Y3, COM2	Control output terminal, Group 2
Y4~Y7, COM3	Control output terminal, Group 3
Y10~Y13, COM4	Control output terminal, Group 4
Y14~Y17, COM5	Control output terminal, Group 5
Y20~Y27, COM6	Control output terminal, Group 6

COMx of output groups is electrically isolated with each other.

2 Power Supply Specifications

Below table shows the electrical specifications of built-in power supply of the master module and the specifications of the power supply that can be provided to the extension module by the master module.

Item	Unit	Minimum	Typical value	Maximum	Remarks
Input voltage range	Vac	100	220	240	Normal start and working range
Input current	A	/	/	1.5	90Vac input, full-load output
Rated output current	5V/GND	mA	/	900	The total power of the combination of 5V/GND and 24V/GND two-channel outputs should not exceed 10.4 W. The maximum output power of the power supply is the total of full-load output power of each channel, which is 24.8W.
	24V/GND	mA	/	300	
	24V/COM	mA	/	600	

3. Switch input and output characteristics

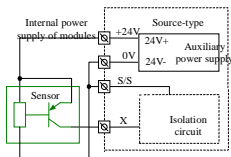
3.1 Input characteristics and signal specifications

The input characteristics and signal specifications are shown in below table.

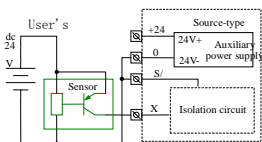
Item		High-speed input terminal X0~X7	Common input terminal
Signal input mode		Source/leakage type, users can make choice via the "S/S" terminal.	
Electrical parameters	Inspection voltage	24Vdc	
	Input resistance	3.3k Ω	4.3k Ω
	Input ON	External loop resistance less than 400 Ω	External loop resistance less than 400 Ω
	Input OFF	External loop resistance larger than 400 Ω	External loop resistance larger than 400 Ω
Filtering function	Digital filtering	X0~X7 has digital filtering function, and the filtering time is 0ms 8ms, 16ms 32ms or 64ms and can be set by users via programming.	
	Hardware filtering	Other terminals except for X0~X7 has hardware filtering function, with filtering time about 10ms.	
High-speed function		X0~X7 has such functions as high-speed counting, interruption and pulse capturing. X0 and X1 terminals can reach as high as 50KHZ for counting. X2~X5 terminals can reach as high as 10KHZ for counting. Total input frequency should be less than 10KHz.	
Public terminals		There is only one public terminal that is OV terminal.	

The counter input terminal has corresponding maximum frequency limit. When the input frequency exceeding this limit may lead to inaccurate counting or abnormal operation of the system. Please reasonably arrange the input terminals and select appropriate external sensors.

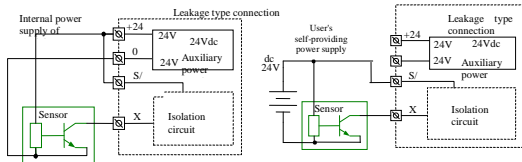
PLC provides one terminal "S/S" to select signal's input mode, and it can set to source type input or leakage type input. Connecting "S/S" to "+24V" or the positive pole externally providing 24Vdc power supply indicates that it is set to be the leakage type input mode, in which NPN type sensors can be connected. Connecting "S/S" to "+0V" or the negative pole externally providing 24Vdc power supply indicates that it is set to be the source type input mode, in which PNP type sensors can be connected. The wiring diagram is shown as below:



Wiring diagram of source-type input using module's internal power supply



Wiring diagram of source-type input using external power supply



Wiring diagram of leakage-type input using module's internal power supply

Wiring diagram of leakage-type input using external power supply

3.2 Output characteristics and signal specifications

The comparison between relay and transistor output types are stated as below.

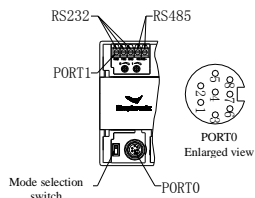
Item	Relay-type	Transistor-type
Output mode	When the output status is "ON", it is breakover; when the output status is "OFF", it is disconnected.	
Public terminals	There are several groups, with each group sharing a public terminal COMn, adaptive to the control circuits at different level, and public terminals are insulated with each other.	
Voltage characteristics	220Vac, 24Vdc, no polar requirements	24Vdc, with polar requirements
Current requirements	To be used as per output electrical specifications	
Characteristics and differences	High driving voltage and high current	Low driving voltage, high frequency and long service life
Application occasions	To drive intermediate relays, contactor coils, indicators and other loads with low action frequency.	Application occasions requiring high frequency and long service life, such as servo amplifiers and frequently acting electromagnets.

The output electrical specifications are shown as below

Item		Relay-type output	Transistor-type output
Loop main voltage		250Vac, 30Vdc below	5~24Vdc
Circuit insulation		Mechanical insulation of relays	Optocoupler insulation
Action indicator		he indicator lights on when the relay's output contact is closed.	The indicator lights on when the optocoupler is driven.
Current will leak in open circuit.		/	Less than 0.1mA/30Vdc
Minimum load		2mA/5Vdc	5mA (5~24Vdc)
Maximum output current	Resistive load	2A/1 point 8A/4 point group public terminal 8A/8 point group public terminal	Y0, Y1 : 0.3A/1 point Others: 0.3A/1points, 0.8A/4 points, 1.2A/6 points, 1.6A/8 points; when it is more than 8 points, every increase of 1 point allows for an increase of 0.1A of total current.
	Inductive load	220Vac, 80VA	Y0, Y1: 7.2W/24Vdc. Others: 12W/24Vdc
	Lamp load	220Vac, 100W	Y0, Y1: 0.9W/24Vdc. Others: 1.5W/24Vdc
Response time	OFF→ON	20ms Max	Y0, Y1: 10μs Others: 0.5ms
	ON→OFF	20ms Max	
Y0 and Y1 maximum output frequency		/	100kHz for each channel
Output public terminals		Y0—COM0; Y1—COM1; for Y2, every 8 terminals uses 1 public terminal at most, and public terminals are insulated with each other.	
Fuse protection		None	

4 Communication port

EP1-M series PLC master module provides two asynchronous serial communication ports, which are PORT0 and PORT1 respectively. The baud supported is 115200, 57600, 38400, 19200, 9600, 4800, 2400 and 1200bps. PORT0's communication protocol is determined by the mode selection switch, as shown in following figure:



Pin No.	Name	Description
3	GND	Ground pin
4	RXD	Serial data receiving pin (RS232 to programmable controller)
5	TXD	Serial data sending pin (programmable controller to RS232)
1, 2, 6, 7, 8	Reserve	Undefined pins, no connection allowed

As the dedicated interface for user programming, PORT0 can be forcibly switched to the programming protocol by the mode selection switch. Below table describes the PLC operation status and PORT0 use protocol relationship:

Mode selection switch position	Status	PORT0 operation protocol
ON	Running	Determined by the user's programs and system configuration; can be programming protocol, MODBUS protocol, free port protocol, N:N network protocol (ECBUS)
TM (ON→TM)	Running	Forcibly switch to programming port protocol
TM (OFF→TM)	Stop	
OFF	Stop	If the system of the user's program is set to the free port protocol, it will automatically switches to the programming port protocol after stop; otherwise, the preset system protocol will be kept unchanged.

PORT1 is suitable to be connected to production equipments with communication function, such as inverters. In this case, MODBUS protocol or RS485 port free protocol is adopted to conduct networking control over several equipments. The port is the fixed by a screw, and the communication signal cable can be made by the user. It is suggested to use twisted shielded pairs as the connection cables for communication ports.

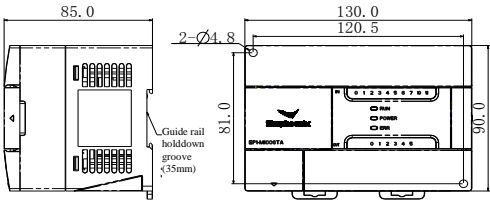
Note: the RS232 and RS485 ports of PORT1 should not be used simultaneously. Ports that are not used should not be externally connected to any cables; otherwise, abnormal communication may be resulted.

5 Installation

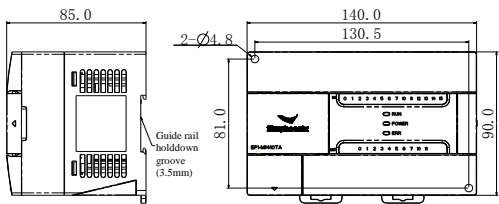
The PLC is designed to be used in the places where the installation environment reaches standard II and the contamination level is at Grade 2.

5.1 Dimensional specifications (Unit: mm)

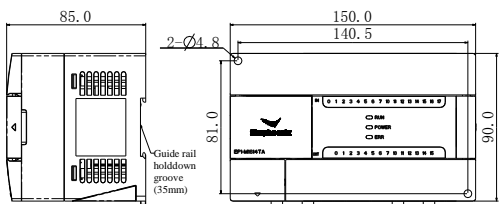
The contour dimension and installation hole dimension of EP1-M1006RA and EP1-M1006TA is shown in below table.



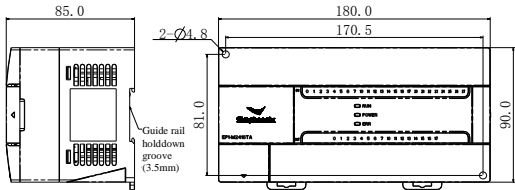
The contour dimension and installation hole dimension of EP1-M1410RA and EP1-M1410TA is shown in below table.



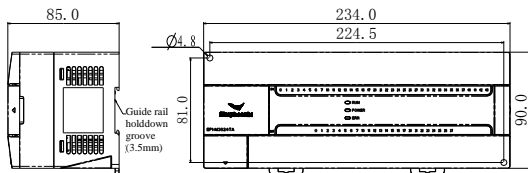
The contour dimension and installation hole dimension of EP1-M1410RA and EP1-M1614RA is shown in below table.



The contour dimension and installation hole dimension of EP1-M2416RA and EP1-M2416TA is shown in below table.



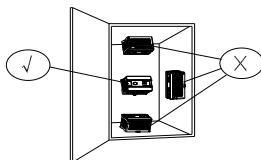
The contour dimension and installation hole dimension of EP1-M3624RA and EP1-M3624TA is



shown in below table.

5.2 Installation position

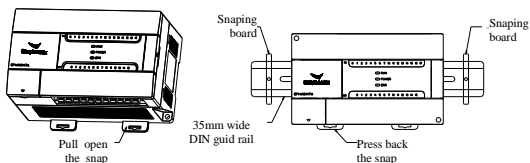
PLC must horizontally be installed on the back of the electrical cabinet in up and down direction, with the distance to the equipment or cabinet wall above or below the PLC. Installation in other directions is unfavorable for heat dissipation of the PLC. The heat generating devices should not be put under the PLC. See below figure.



5.3 Installation method

Use DIN grooves for installation and fixing

Generally, use 35mm wide DIN groove for installation, as shown in below table.



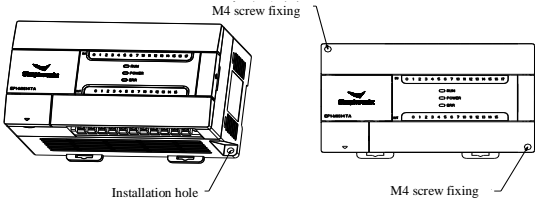
Specific installation steps are as below:

1. Horizontally fix the DIN groove on the installation backboard;
2. Pull out the DIN groove clip under the module's bottom;
3. Attach the module to the DIN;
4. Press the clip in position to lock the module;
5. Finally, fix the module's two ends with the DIN groove damper to avoid it from sliding around.

Other EP1 series programmable controllers can be also installed via the DIN groove following aforesaid steps.

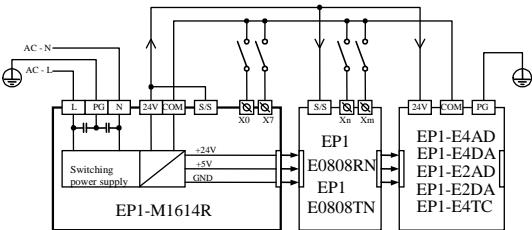
Use screws for installation and fixing


For occasions where larger impact may exit, it can be installed by means of screw holes. Fix the set screws on the backboard of the electrical cabinet through the two screw holes on the PLC housing. The screws should be at the dimension of M4. See below figure.

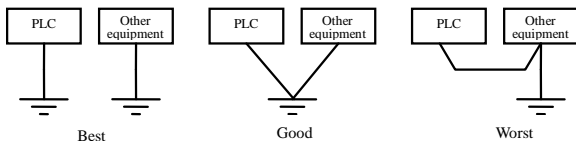


5.4 Cable connection and specifications

Connect mains cord and ground lead. Below figure shows an example of connecting AC power supply and auxiliary power supply.



Reliable ground leads should be set to enhance equipment safety and increase PLC's electromagnetic immunity. During installation, connect PLC's power supply end  to the ground connector. It is suggested to use AWG12~16 connecting leads and reduce the leads' length as much as possible. It is suggested to set independent grounding device, and avoid setting public paths with other equipments (especially equipments with strong interference) during wiring, as shown below:

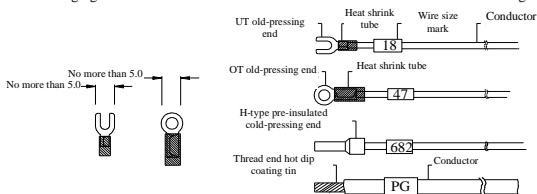


Cable specifications

For the wiring, it is suggested to use multi-strands copper conductors and prefabricate insulating ends, so as to ensure wiring quality. The cross section and model of recommended conductors is shown in below table.

Cable	Conductor's cross section	Recommended conductor code.	Auxiliary connection terminals and heat shrinking tubes
AC mains cord (L, N)	1.0~2.0mm ²	AWG12, 18	H1.5/14 pre-insulated tubular ends, or thread end hot dip coating tin processing
Grounding lead (⊕)	2.0mm ²	AWG12	H2.0/14 pre-insulated tubular ends, or thread end hot dip coating tin processing
Input signal line (X)	0.8~1.0mm ²	AWG18, 20	UT1-3 or OT1-3 cold pressing ends, Φ3 or Φ4 heat shrinking tubes
Output signal line (Y)	0.8~1.0mm ²	AWG18, 20	

Fix the preprocessed cable head on PLC's connection terminal with screws. Pay attention to the screw's position. The screwing torque should be at 0.5~0.8Nm to ensure reliable connection and avoid damaging screws. The recommended cable fabrication mode is shown in below figure.



6 Power-on operation and routine maintenance

Power-on operation

After wiring, each connection item by item and ensure no foreign substances falling into the housing and the heat dissipation is smooth.

1. Connect power supply for the PLC, and its POWER indicator lights on.
2. Start the SCP Developer software on the PC and download the programmed user applications

into PLC.

- 3. After checking the programmed software, turn the mode selection switch to "On", and the RUN indicator lights on. If the ERR indicator lights on, it indicates the user's application or the system has an error. Please eliminating errors following the instructions of "Programming Reference Manual of EP1 Series Programmable Controller" until all things get correct.
- 4. Connect the power supply for external system of the PLC to conduct system debugging.

Routine maintenance

Following aspects should be considered for routine maintenance.

- 1. Ensure clean working environment for the PLC, and avoid any foreign substances or dusts from falling into it.
- 2. Keep the programmable controller in good ventilation and heat dissipation conditions.
- 3. All connections and connection terminals should be firmly fixed and in good conditions.

7 FAQs and troubleshooting

When the PLC cannot work normally, please check following items one by one.

- 1. Check the status of the mains cord connection, relevant switched and protective circuits to ensure the PLC is reliably powered on.
- 2. Check if terminals are firmly connected.
- 3. Check if the mode selection switch is at the correct position.

If the PLC still cannot work after above checks, please refer to following table and make analysis according to the PLC's working status and I/O status indicators.

Symptoms	Causes	Resolutions
All the POWER indicator and other LED indicators are off.	No voltage or undervoltage of the power supply	Check the switch, conductor or fuse status to eliminate malfunctions.
	The mains switch is disconnected or the fuse is blown.	
	Abnormal connection of power supply	
	The power panel is damaged	
POWER LED indicator flashes	Poor contact of mains cord	Check and confirm 1. The voltage between L and N terminals is within normal range. 2. Any short-circuit or overload between 24V and COM terminal.
	Excessive extension modules lead to current limiting.	
	Short-circuit of 24V/COM auxiliary power supply leads to current limiting	
ERR LED indicator flashes	User's applications has an error	Edit user's applications once again under the SCP Development environment and download it after eliminating any errors.
	Actual running time exceeds WDT preset time	Extend the WDT preset time

Symptoms	Causes	Resolutions
RUN LED indicator does not turn on.	The mode selection switch is not at ON position	Turn the switch to ON position
	Set the running control mode to the terminal mode, and turn the terminal at the OFF position	Engage the set control running terminal
	The slave machine is stopped remotely.	The master machine is started up remotely.
	The system stops mistakenly.	Check PLC application system
The input status indicator is inconsistent with the input terminal status.	On resistance of user's circuit is excessively high.	Modify the electrical parameters of external circuit to appropriate range, for example, shorten conductor's length and no use of excessive thin conductors.
	Poor contact of signal loop	Check connections and eliminate malfunctions
Output cannot be turned off (OFF)	Poor contact of external connection	
	The relay contact is damaged	Frequently acting relay ports can be exchanged with the idle ports.
The status indicator is inconsistent with the output terminal status	The relay is aged and damaged, or the indicator is damaged	
Failure of downloading, uploading and monitoring	Poor contact of cables, incorrect PLC's ON/TM/OFF position	Use Simphoenix's dedicated communication cables for PLC
The serial port cannot control other devices.	Poor contact of cables, or wrong signal property of connecting lines, e.g. TXD and RXD is confused with each other	Correctly connect signal lines
No response of I/O extension module, or no response of special extension modules	Inconsistent setting of master and slave characteristics for communication	Set the communication parameter consistent
	Inconsistent use of protocols for master and slave machines of communication	Set the communication protocols consistent
	Poor contact of extension tables	Check after power off, and power on again after eliminating problems
Inaccurate low-speed counting	Excessive counting is the result of high interference of input signal jamming	Connect in parallel a capacitor at about 22uF50V at the counting input terminal, and pay attention to the capacitor's polarity.
	Less counting is the result of the cycle of tested signal shorter than PLC's program execution cycle.	If user's program need too long time of execution, it is suggested to set the counting signal at the high-speed counting terminal. If it is set to constant scanning, reasonably set the scanning time.

Notice to Users

1. The warranty scope refers to the programmable controller itself.
2. **The warranty period is 18 months.** During the periods, if the product has any malfunction or is damaged in the case of normal operation, we will repair it for free.
3. The warranty period starts from the ex-factory date of the product. The product's machine code is the sole basis for judging if it is qualified for warranty. Equipment without the machine code will be deemed to be out of the warranty period.
4. Even if the product is within the warranty period, certain amount of service fee will be charged under following circumstances.
 - (1) Mechanical malfunction induced by failure of following the user manual;
 - (2) Mechanical damage induced by fires, floods and abnormal voltage, etc;
 - (3) Any damages due to use of the programmable controller for abnormal functions.
5. The service fee will be charged according to actual price; and if there is any contract regarding the service fee, the contract shall prevail.
6. Make sure to keep this card in sound and present it to the maintenance company for maintenance warranty.
7. If you have any question, please consult relevant agent or directly contact our company.

SHENZHEN SIMPHOENIX ELECTRIC TECHNOLOGIES CO., TTD

Address: Building A, Huichao Industrial Park, 2nd Rd of Gushu, Baoan Area, Shenzhen, Guangdong

Service Line: 400-8819-800

Telephone Operator: 0755-26607756

Fax: 0755-26919882

Website: www.simphoenix.com.cn