10/20 Series PLC
Hardware Manual
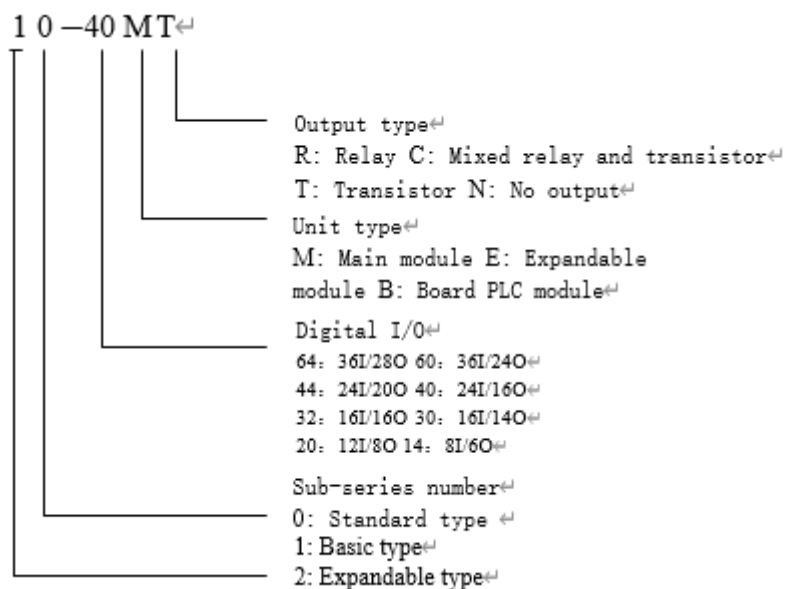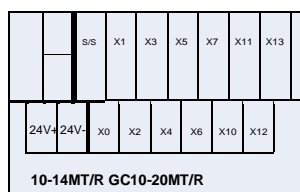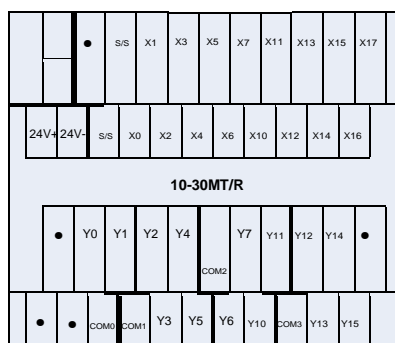
CONTENTS

Thank you for using 10/20 series PLC. Please read this manual carefully before installation. This manual mainly introduces the electrical, functional specifications, installation wiring and maintenance, taking 20-40MT as an example, as well as the relevant instructions for optional accessories and FAQs, so that you can clearly understand the characteristics and functions of this product. If you need more detailed product information, please refer to "10/20 Series PLC Programming Manual" issued by our company.

I. Product Introduction

1. Naming rule

```
1 0 − 4 0 M T
```

Output type
R: Relay C: Mixed relay and transistor
T: Transistor N: No output

Unit type
M: Main module E: Expandable
module B: Board PLC module

Digital I/O
64: 36I/28O 60: 36I/24O
44: 24I/20O 40: 24I/16O
32: 16I/16O 30: 16I/14O
20: 12I/8O 14: 8I/6O

Sub-series number
0: Standard type
1: Basic type
2: Expandable type

2. Terminal layout diagram

| 24V+ | 24V- | S/S | X0 | X2 | X4 | X6 | X10 | X12 | X14 | X16 |
| | | ● S/S | X1 | X3 | X5 | X7 | X11 | X13 | X15 | X17 |

10-30MT/R

| ● | Y0 | Y1 | Y2 | Y4 | COM2 | Y7 | Y11 | Y12 | Y14 | ● |
| ● ● | COM0 | COM1 | Y3 | Y5 | Y6 | Y10 | COM3 | Y13 | Y15 | |

| 24V+ | 24V- | X0 | X2 | X4 | X6 | X10 | X12 |
| | | S/S X1 | X3 | X5 | X7 | X11 | X13 |

10-14MT/R GC10-20MT/R

```
  ●  Y0 Y1 Y2 Y3 Y4 Y6  ●
  ●  COM0 COM1 COM2 COM3 COM4 Y5 Y7
```

```
    S/S X1 X3 X5 X7 X11 X13 X15 X17 X21 X23 X25 X27 X31 X33 X35 X37 X41 X43
24V+ 24V- X0 X2 X4 X6 X10 X12 X14 X16 X20 X22 X24 X26 X30 X32 X34 X36 X40 X42
                          20-60MT/R
  ●  Y0 Y1 Y2  ● Y4 Y6  ● Y10 Y12  ● Y14 Y16  ● Y20 Y22  ● Y24 Y26  ●
● ● ●  COM0 Y3 COM1 Y5 Y7 COM2 Y11 Y13 COM3 Y15 Y17 COM4 Y21 Y23 COM5 Y25 Y27
```

3. Terminals

Pin	Function
24V+/24V-	24VDC input
⏚	PE, ground terminal
S/S	Transistor input supports NPN mode, S/S connection 24V+
●	Empty terminal, for isolation, please do not connect
X0 ~ Xn	Digital signal input terminal, used with the COM terminal to generate input signals
Y0 ~ Yn Cn/COMn	Digital signal output terminal, group n

II. Digital I/O characteristics

1. Input

Item		High speed input X0~X7	General input
Input		NPN	
Electrical parameters	Voltage	DC24V	
	Resistance	3.3KΩ	4.3KΩ
	Input ON	External circuit resistance < 400Ω	
	Input OFF	External circuit resistance > 24KΩ	
Filter	Software	$0.8*2^n$ms	Null
	Hardware	X0~X1: 10us X2~X7: 50us	10ms

High speed	X0 ~ X7 high-speed counting, interruption, pulse capture functions
	X0~X1:50KHz, X2~X7: 10KHz
	The total input frequency must be less than 80KHz
Common terminal	S/S

The counter input port has a corresponding maximum frequency limit. When the input frequency exceeds this limit, it may cause inaccurate counting or the system may not operate normally. Please arrange the input port reasonably and select a suitable external sensor.

Connect "S/S" to "24V+", and you can connect an NPN sensor. The wiring diagram is shown in the figure.
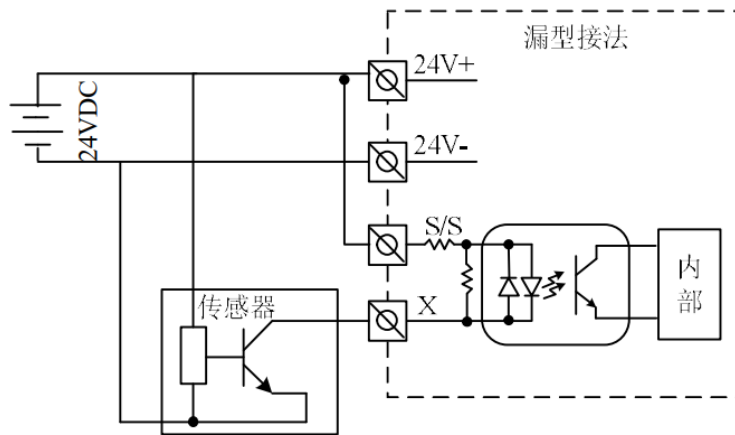

Figure 1-1 Input wiring diagram

2. Output

The output terminals of the 10/20 series PLC are divided into several groups, each group is electrically isolated, and the output contacts of different groups are connected to different power supply circuits. The outputs are divided into relay and transistor outputs.

Table 2-1 Comparison of relay and transistor outputs

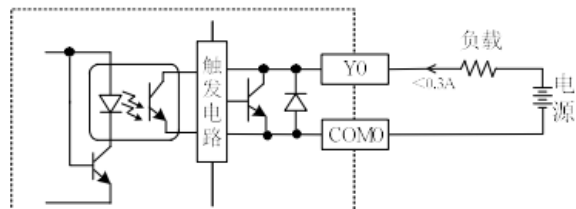| Item	Relay output	Transistor output
Output	When the output state is "On", the contact is closed; when the output state is "Off", the contact is open.	
Common terminal	There are several groups, each group has a common terminal COMn, which is suitable for control circuits with different potentials. The common terminals are insulated and isolated from each other.	
Electrical requirements	Use according to output electrical specifications (see Table 2-3)	
Features	High driving voltage and high current	Low driving current, high frequency and long life
Application	Drive intermediate relays, contactor coil	Applications that require high frequency and long life, such as controlling servo

	indicator lights and other loads with low operating frequency	amplifiers, frequently moving electric and magnetic devices

Table 2-2 Output electrical specifications

| Item		Relay output	Transistor output
Loop power supply rated voltage		250VAC, 30VDC or below	5~24VDC
Circuit insulation		Relay mechanical insulation	Optocoupler insulation
Action Instructions		Relay output contact closure	LED lights up when the optocoupler is driven
Open circuit leakage current		—	＜0.1 mA/24VDC
Minimum load		2mA/5VDC	5mA (5 ~ 24 VDC)
Max. output current	Resistive load	8A/4 group common terminal 8A/8 group common terminal	0.8A/4 points 1.6A/8 points
	Inductive load	80VA	7.2W/24VDC
ON response time		Max 20ms	Y0~Y1: less than 5us/ (10mA or more) Others: less than 0.5ms/ (100mA or more)
OFF response time		Max 20ms	
Fuse protection		No	
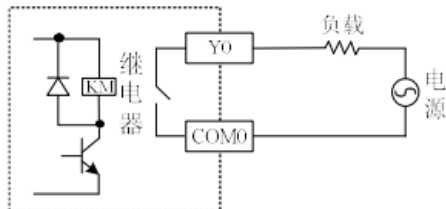
继电器输出型　　　　　　　　　　晶体管输出型

Output diagram

Caution: The transistor output can only be used in a DC 24V load circuit, and pay more attention to the polarity of the power supply.

3. External wiring
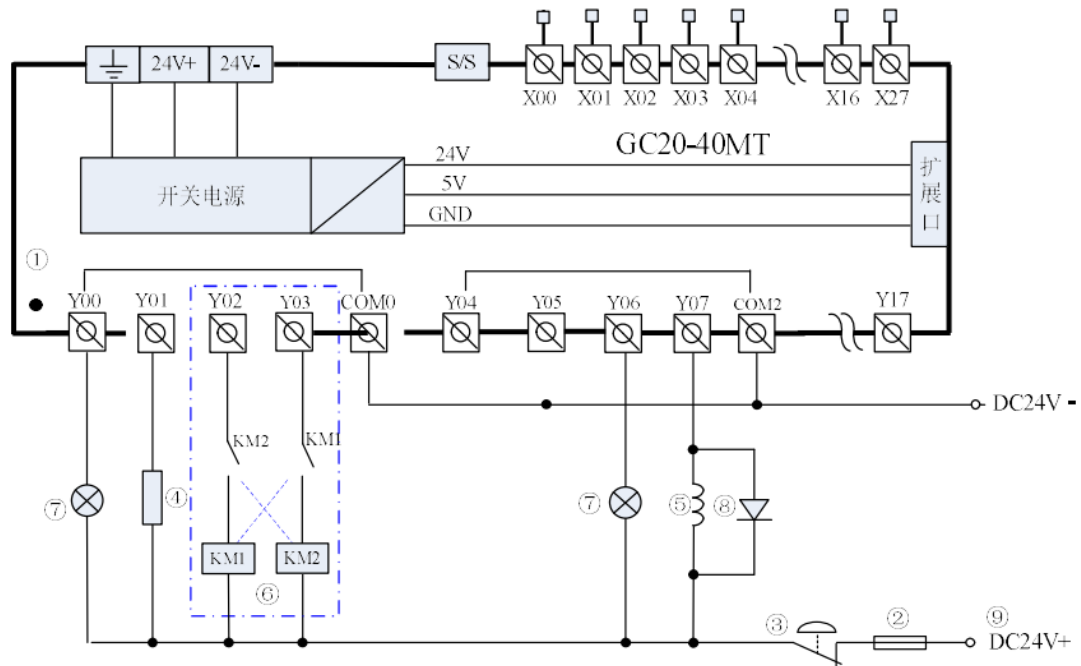
① Empty terminal, do not wire.

② Fuse: When the load connected to the output terminal is short-circuited, the printed circuit board may be burned. Please be sure to add a protective fuse to the output.

③ Emergency stop: Use an external switch.

④ Resistive load.

⑤ Inductive load.

⑥ Interlock circuit: Use an external circuit to form an interlock, and execute the interlock in the PLC program to ensure that there are safe protection measures when any abnormal emergency occurs.

⑦ Incandescent lamp.

⑧ Freewheeling diode: The output relay of the PLC has no internal protection circuit, so when using a DC inductive load, please connect a reverse current diode in parallel (it must be able to withstand 5 to 10 times the load voltage; the forward current must be greater than the load current) to increase the life of the contact. As shown in Figure 2-4.
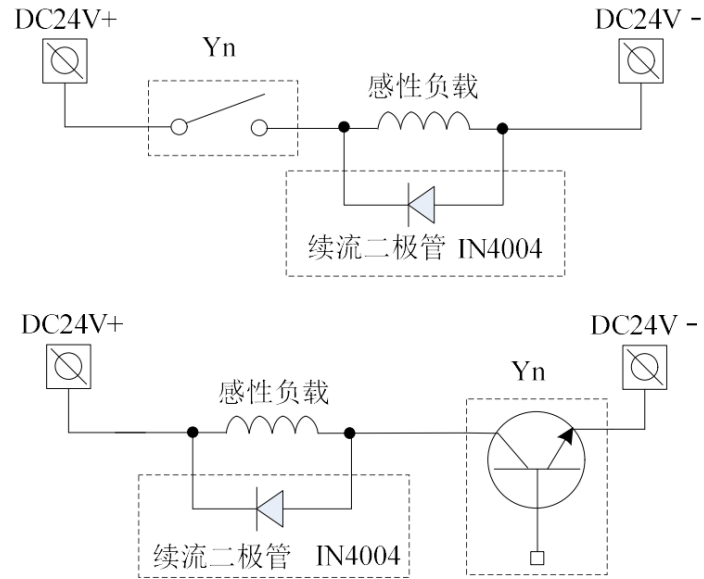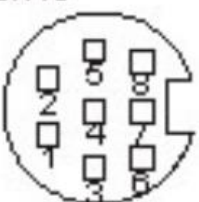
⑨ DC power supply.

图2-4　直流负载电路

III.Communication

The 10/20 series PLC provides three serial asynchronous communication ports: PORT0 (RS232, Mini DIN8 socket), PORT1 (RS485) and PORT2 (RS232 and mini USB). PORT0, PORT1, PORT2 support baud rates: 115200, 57600, 38400, 19200, 9600bps.

1. PORT0 COM port

	Pin	Name	Description
	1, 2	VCC_+5V	5V power supply
	3, 7, 8	GND	Ground
	4	RXD	Serial data receive (RS232 to PLC)
	5	TXD	Serial data send (PLC to RS232)
	6	Reserve	Undefined pin is not allowed to be connected

2. PORT1 COM port

PORT1 is suitable for connecting with production equipment with communication functions.

Modbus protocol or free port protocol can be used to control multiple devices in a network. The communication signal cable can be made by the user. It is recommended that the user use twisted pair as the connection cable of the communication port.

3. PORT2 COM port

PORT2 has 2 types of terminals, 3.81-3P and mini USB socket. It is suitable for connecting with production equipment with communication function, and can be used for programming, debugging, and using Modbus protocol or free port protocol to control multiple devices in a network. The communication signal cable can be made by the user.

IV. Installation

Notes on installation
➢ Do not install the PLC in places with dust, oil smoke, conductive dust, corrosive or flammable gases, and do not use it in places with high temperature, condensation, wind and rain, and places with vibration and impact. Otherwise, it may cause electric shock, fire, malfunction, product damage and aging.
➢ Do not drop cutting powder or wire ends into the equipment, which may cause fire, malfunction or malfunction.
➢ For the installation of the product, please use DIN rails or bolts to fix it. In addition, protective measures (such as: using special tools or keys to open) must be taken to prevent non-maintenance personnel from operating or accidentally impacting the machine, causing danger and damage.
➢ Please install the product on a flat surface. If the installation surface is uneven, the circuit board will be overstressed and may cause defects.
➢ To prevent temperature rise, do not install it on the ground, ceiling or vertical direction. Please install it horizontally on the back plate of the electrical cabinet as shown in Figure 4-2.
➢ Please install various connecting wires and various expansion modules firmly. Poor contact may cause malfunction.
➢ After the construction is completed, be sure to confirm that the ventilation holes of the programmable controller are not blocked. Otherwise, it may cause fire, failure, or malfunction.
➢ Please keep a space of more than 50mm around the PLC and keep it away from high-voltage wires and large power equipment as much as possible.

1. Dimensions

The overall dimensions and installation hole dimensions are shown in Figure 4-1.
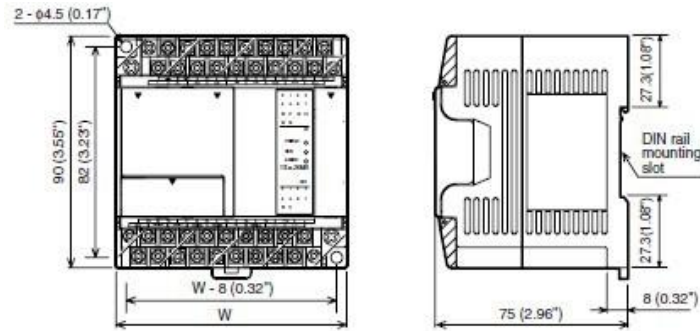
Figure 4-1

Table 4-1

Model	Length(W)
10-14MR/T	75
10-20MR/T	
10-30MR/T	100
20-40MR/T	130
20-60MR/T	175

2. Installation location

The PLC must be installed horizontally on the back panel of the electrical cabinet. When installed in the vertical direction, the distance between the PLC and the equipment or cabinet wall above and below should be no less than 15 cm. Installation in other directions is not conducive to the heat dissipation of the PLC itself and is not a suitable installation method. There should also be no heat-generating equipment under the PLC. See Figure 4-2.
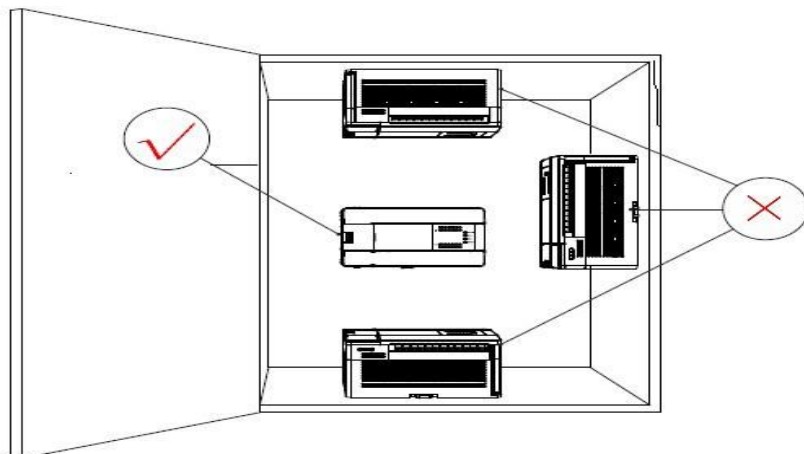

Figure 4-2

3. Installation method

a. Use DIN rail for installation

Generally, apply a 35mm wide DIN rail for installation. The specific installation steps are as follows.
  ① Fix the DIN rail horizontally on the mounting backplane.
  ② Pull out the clip at the bottom of the module.
  ③ Hang the module on the DIN rail.
  ④ Press the clip back to its original position to lock the module.
  ⑤ Finally, fix both ends of the module with DIN rail clips to prevent left and right sliding.

b. Use screws to install and fix

For occasions where there may be greater impact, screw installation can be used. The module housing provides 2 Φ4.5 screw holes for fixing the module. It is recommended to use M3 screws for fixing.

4. Cable specifications

When wiring the PLC, it is recommended to use multi-strand copper wires and prefabricate the insulation terminals to ensure the wiring quality. The recommended cross-sectional area and type of wires are shown in Table 4-4.

Table 4-4 Recommended cross-sectional area and type of wires

Cable	Conductor cross section	Recommended wire type	Connecting terminals and heat shrink tubing
AC power cord (L, N)	1.0 ~ 2.0mm²	AWG12 ~ 18	H1.5/14 Pre-insulated tubular terminal, or tinned wire end
Ground wire	2.0mm²	AWG12	H2.0/14 Pre-insulated tubular terminal, or tinned wire end
Input signal line (X)	0.8 ~ 1.0mm²	AWG18 ~ 20	UT1-3 or OT1-3 cold-pressed terminal, Φ3 or Φ4 heat shrink tubing
Output signal line (Y)	0.8 ~ 1.0mm²	AWG18 ~ 20	

Fix the processed cable to the PLC terminal with screws. Make sure the screws are in the correct position and the tightening torque is between 0.5 and 0.8 N·m to ensure reliable connection without damaging the screws. The recommended cable preparation method is shown as below.
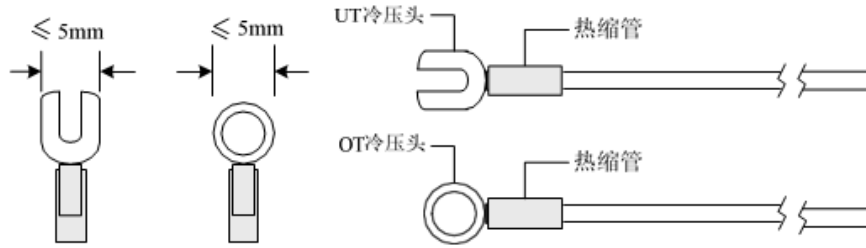
5. Grounding

Setting up a reliable grounding wire can enhance equipment safety and improve the module's electromagnetic interference resistance. During installation, connect the PLC power grounding terminal " ⏚ " to the grounding body. It is recommended to use AWG12 type connecting wire and minimize the wire length. It is recommended to set up an independent grounding device and try to avoid having a common path with the grounding wires of other devices (especially those with strong interference) during wiring, shown below.
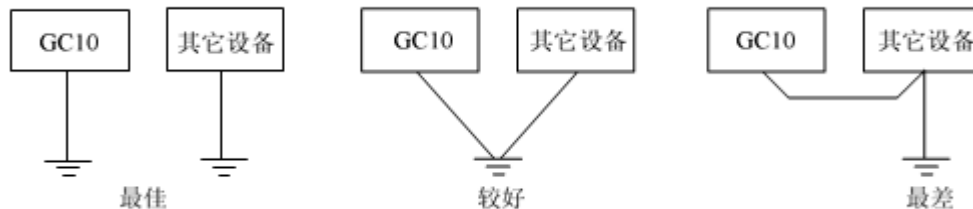
V. Expandable cards

Model	Isolation	Functions
10-4EX-BD	Yes	4 digital inputs
10-4EY-BD	Yes	4 digital transistor outputs
10-4AD-BD	No	4 analog inputs
10-485-DA-BD	No	1 RS485 and 1 analog output
10-3AM-BD	No	2 analog inputs and 1 analog output

VI. List of special components

Component	Descriptions
M8023	Disable upload enable
M8110	4EX-BD channel 1 input/ 4EY-BD channel 1 output

M8111	4EX-BD channel 2 input/ 4EY-BD channel 2 output
M8112	4EX-BD channel 3 input/ 4EY-BD channel 3 output
M8113	4EX-BD channel 4 input/ 4EY-BD channel 4 output
D8110	Integrated analog input 1 (0~2000)
D8111	Integrated analog input 2 (0~2000)
D8112	Integrated analog input 3 (0~2000)
D8113	Integrated analog input 4 (0~2000)
D8114	Integrated analog input 1 (0~2000)
D8115	Integrated analog input 2 (0~2000)

VII. Power-on operation and routine maintenance

1. Power-on operation

After wiring is completed, check the connection item by item to ensure that no foreign objects fall into the housing and the heat dissipation is unobstructed.
　　① Turn on the PLC power supply, and the POWER light of the PLC should be on.
　　② Start the programming software and download the compiled user program to the PLC.
　　③ The RUN light should be on. If the ERROR light is on, it means that there is an error in the user program or system. Please eliminate the error until it is correct.
　　④ Turn on the power of the PLC external system and debug the system.

2. Routine maintenance

The following aspects should be noted in routine maintenance inspection.
　　① Ensure that the working environment of the PLC controller is clean and tidy to prevent foreign objects and dust from falling into the housing.
　　② Keep the PLC well ventilated and heat-dissipated.
　　③ All wiring connections and terminals are firmly fixed and in good condition.

VIII. Common problems and solutions

When the PLC does not work properly, please check in order:
　　① Check the connection of the power supply line and the condition of related switches and protective appliances to ensure that the PLC is reliably powered.

② Check whether the wiring of the user terminal is firm.

③ Check whether the position of the operation control switch is correct.

If it still does not work after completing the above checks, please contact us.