

OP-0515 Four-Channel DC Charging Unit Control Module

Product Instruction Manual



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1 Introduction to the Main Control Board

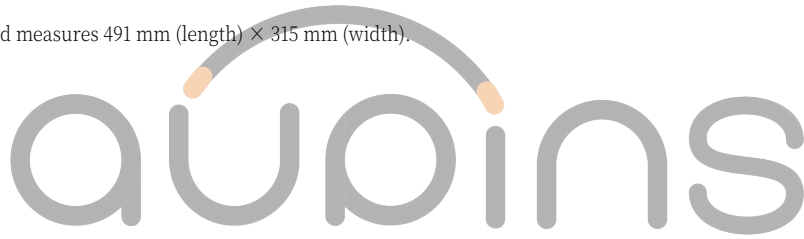
The OP-0515 Four-Gun DC Control Unit is a controller developed by our company for four-gun DC charging stations, operating at a voltage of 12V DC. It utilizes the RT-Thread embedded operating system and integrates high-capacity FLASH and RAM. The main control board features 33 digital inputs, 22 digital outputs, 5 analog channels, 5 CAN communication channels, 6 serial communication channels, 4 channels for insulation and high-voltage detection, 4 control guidance channels, 3 power supply channels, 1 Ethernet port, and 1 USB/SD port.

Main Control Board Features:

1. Supports ultra-low-tariff charging (deep-valley pricing).
2. Supports flexible scheduling for up to 4 module groups.
3. Supports on-board 12V/24V switching, eliminating the need for external intermediate relays.
4. Supports on-board insulation monitoring and high-voltage sampling, eliminating the need for external insulation detectors or sampling modules.
5. Supports on-board metering; if external metering is not required, this built-in function can be utilized directly without connecting an external electricity meter.
6. Supports simultaneous charging via dual guns or quad guns, with a maximum current capacity of 900A.
7. Supports remote OTA (Over-the-Air) updates and remote operation & maintenance (O&M), enabling precise fault localization to help you save on O&M costs.

1.1 Main Control Board Dimensions

The main control board measures 491 mm (length) × 315 mm (width).



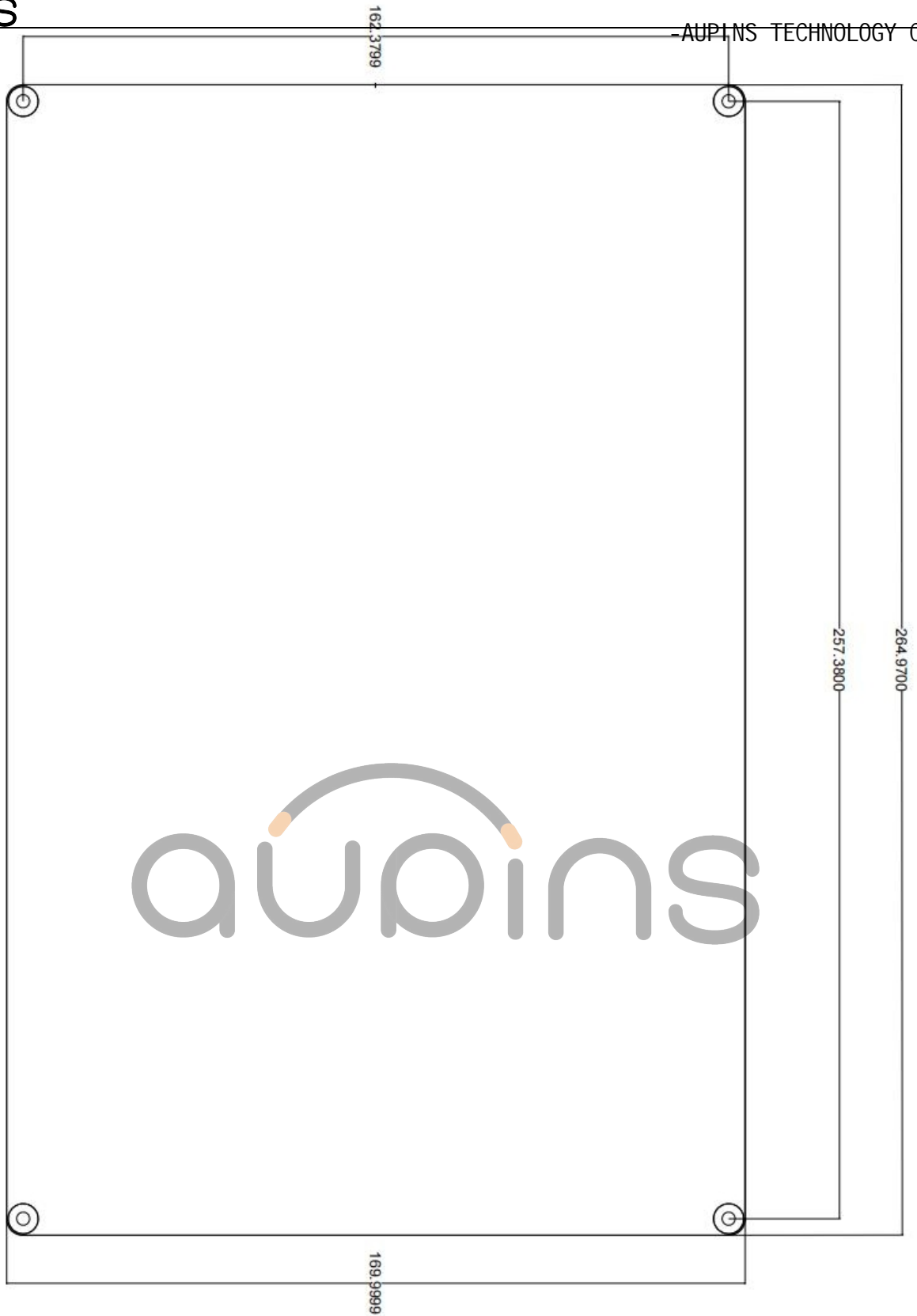


Figure 1: OP-0515 Main Control Board Dimensions (without enclosure)

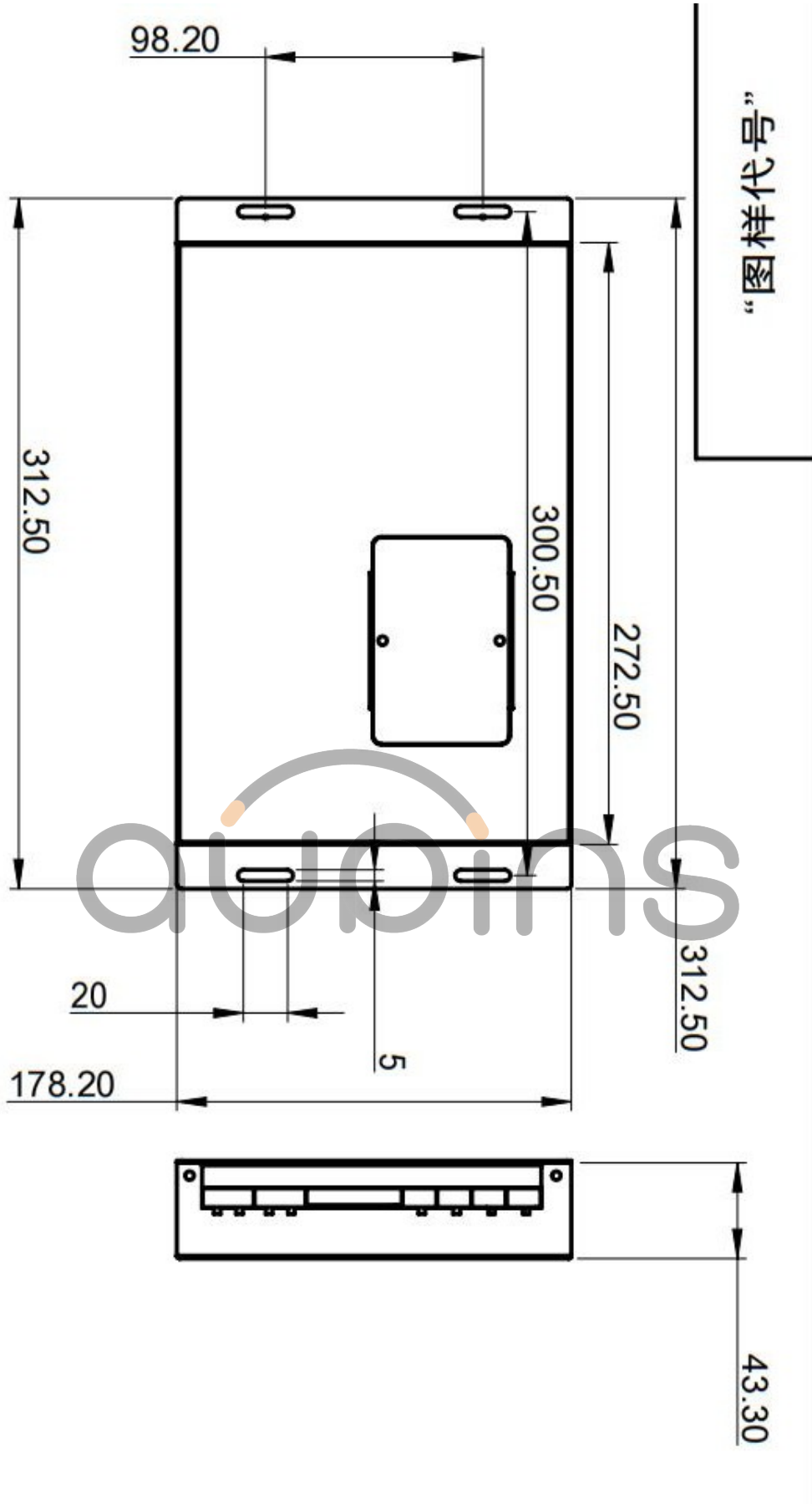
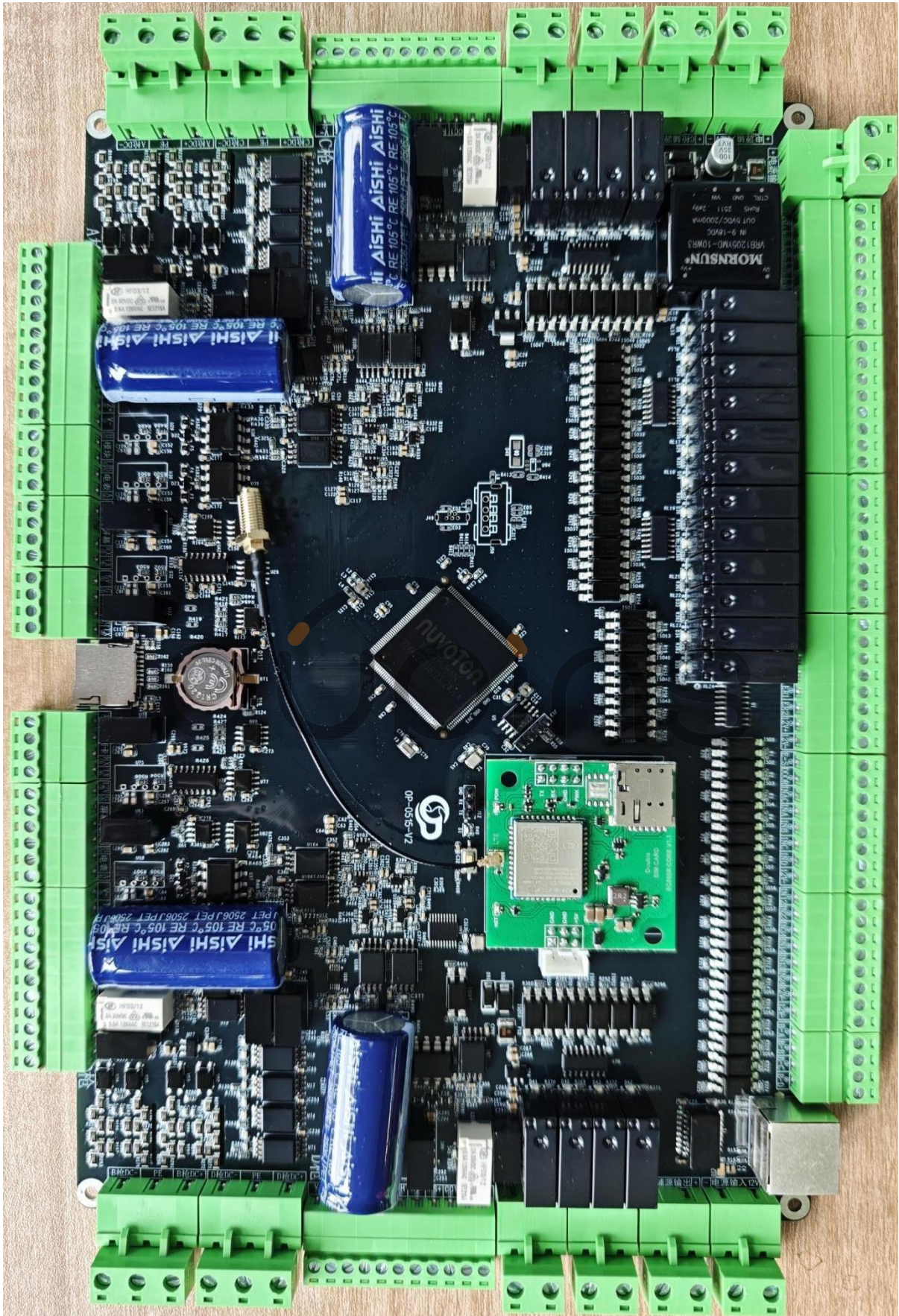


Figure 2: OP-0515 Ports

1.3 Actual Photo of the Main Control Board



2 Product Features

- (1) Enables charging interaction with the BMS, controls the charging status of the charger, collects operational data, and automatically shuts down in case of abnormal conditions;
- (2) Applicable to DC charging stations such as four-in-one, master-slave, and small-group charging configurations;
- (3) Includes charging gun electronic lock control and temperature monitoring, with each charging gun operating independently;
- (4) Compatible with power modules from Shenghong, Yingfeiyuan, Youyou, Yonglian, Tonghe, Xingyuan Borui, and others;
- (5) Compatible with touchscreens from Diwen, Xinruida, and Xinxian to enable human-machine interaction;
- (6) Supports serial card readers to enable card-swipe billing;
- (7) Integrated 4-channel battery voltage monitoring;
- (8) Integrated with 4-channel control and guidance functions;
- (8) Integrated 4-channel insulation detection;
- (9) Capable of recording charging data, with a maximum capacity of 500 entries;
- (10) Features backend communication capabilities, enabling wireless communication with backend monitoring systems to transmit status and relevant data; currently supports monitoring platforms such as YunKuaiChong, DakCloud, WeijingCloud, and Xiaoju;
- (11) Integrated Ethernet functionality; (optional)
- (12) Integrated 2G and 4G expansion capabilities. (Optional)
- (13) Integrated NFC card reader functionality. (Optional)
- (14) The main control board supports direct connection to 12V/24V auxiliary power sources without the need for additional intermediate relays.

3 Product Features

- (1) Highly integrated and compact; combines digital inputs, digital outputs, communication, analog signals, insulation detection, and control guidance into a single unit, significantly reducing the space occupied within the charging station;
- (2) High electromagnetic compatibility: High EMC stability, meeting Class 4 electromagnetic compatibility standards;
- (3) Supports multiple network backends: Enables rapid deployment and monitoring of proprietary charging networks;
- (4) Strong compatibility: Compatible with all vehicle models compliant with both the new and old GB/T 27930 national standards; compatible with LCD screens from major manufacturers on the market; compatible with all electricity meters compliant with DL/T 645 and MODBUS protocols.

4 Terminal Interface

Definitions

4.1 Power Supply

Terminal No.	No.	Pin Definition	Brief Description of Function
J1	1	+12V	Relay power input
	2	-12V	
J10	1	+12V	B/D gun control power input
	2	-12V	
J31	1	-12V	A/C gun control power input
	2	+12V	

4.2 GPRS (4G module)

Terminal No.	No.	Pin Definition	Brief Function Description
Built-in		/	Wireless Communication Module Socket

4.3 Auxiliary Power

Terminal Number	No.	Pin Definition	Brief Description of Function
J11	1	D#A+	D-Gun Auxiliary Power Positive
	2	D#A-	D Gun Auxiliary Power Negative Terminal
J12	1	B#A+	B Gun Auxiliary Power Positive Terminal
	2	B#A-	B Gun Auxiliary Power Negative Terminal
J13	1	24V+	24V auxiliary power positive terminal
	2	24V-	24V auxiliary power negative terminal
J28	1	24V-	24V auxiliary power negative
	2	24V+	24V Auxiliary Power Positive Terminal
J29	1	C#A-	C- Gun Auxiliary Power Negative
	2	C#A+	C-gun auxiliary power positive terminal
J30	1	A#A-	A Gun Auxiliary Power Negative Terminal
	2	A#A+	A Gun Auxiliary Power Positive Terminal

4.4 Gun Cable

Terminal No.	No.	Pin Definition	Brief Function Description
J14	1	D#EL+	Positive power supply for D-Gun electronic lock
	2	D#EL-	D-Gun Electronic Lock Negative Power Supply
	3	D#CC1	D-Gun Charging Connection Confirmation
	4	D#RS+	D-Gun electronic lock feedback+
	5	D#RS-	D-Gun Electronic Lock Feedback-
	6	D#CAN_H	D-Gun BMS CAN High has a 120 Ω resistor
	7	D#CAN_L	D-Gun BMS CAN Low with a 120 Ω resistor
	8	D#T1+	D-Gun DC-Temperature

	9	D#T1-	D Gun DC - Temperature
	10	D#T2+	D Gun DC+ Temperature
	11	D#T2-	D Gun DC+ Temperature
J17	1	B#EL+	B Gun Electronic Lock Power Supply Positive Terminal
	2	B#EL-	B-Gun Electronic Lock Negative Power Supply
	3	B#CC1	B Gun Charging Connection Confirmation
	4	B#RS+	B Gun Electronic Lock Feedback+
	5	B#RS-	B-Gun Electronic Lock Feedback-
	6	B#CAN_H	B-gun BMS CAN high with a 120 Ω resistor
	7	B#CAN_L	B-gun BMS CAN Low with a 120 Ω resistor
	8	B#T1+	B Gun DC-Temperature
	9	B#T1-	B Gun DC - Temperature
	10	B#T2+	B Gun DC+ Temperature
	11	B#T2-	B Gun DC+ Temperature
J24	1	A#T2-	B Gun DC+ Temperature
	2	A#T2+	B Gun DC + Temperature
	3	A#T1-	B Gun DC- Temperature
	4	A#T1+	B Gun DC- Temperature
	5	A#CAN_L	B Gun BMS CAN Low with 120 Ω resistor
	6	A#CAN_H	B-gun BMS CAN High with a 120 Ω resistor
	7	A#RS-	B-gun electronic lock feedback-
	8	A#RS+	B-Gun Electronic Lock Feedback+
	9	A#CC1	B Gun Charging Connection Confirmed
	10	A#EL-	B-Gun Electronic Lock Negative Power Supply
	11	A#EL+	B-gun electronic lock power supply positive terminal

J25	1	C#T2-	C Gun DC+ Temperature
	2	C#T2+	C-gun DC+Temperature
	3	C#T1-	C-Gun DC- Temperature
	4	C#T1+	C Gun DC-Temperature
	5	C#CAN_L	C-Gun BMS CAN Low (with a 120 Ω resistor)
	6	C#CAN_H	C-gun BMS CAN High with a 120 Ω resistor
	7	C#RS-	C-gun electronic lock feedback-
	8	C#RS+	C-Gun Electronic Lock Feedback+
	9	C#CC1	C-Gun Charging Connection Confirmation
	10	C#EL-	C-gun electronic lock power supply negative terminal
	11	C#EL+	C-Gun Electronic Lock Power Supply Negative Terminal

4.5 Input/Output

Terminal No.	No.	Pin Definition	Brief Description of Function
J2	1	KMA	K1 K1 DC Contactor - KMA Control Output
	2	12V-	
	3	KMB	K1K1 DC Contactor - KMB Control Output
	4	12V-	
	5	KMC	K1K1 DC Contactor - KMC Control Output
	6	12V-	
	7	KMD	K1K1 DC Contactor - KMD Control Output
	8	12V-	
	1	KM12	Bus Tie Contactor - KM12 Control Output
	2	12V-	
	3	KM23	Bus tie contactor - KM23 control output

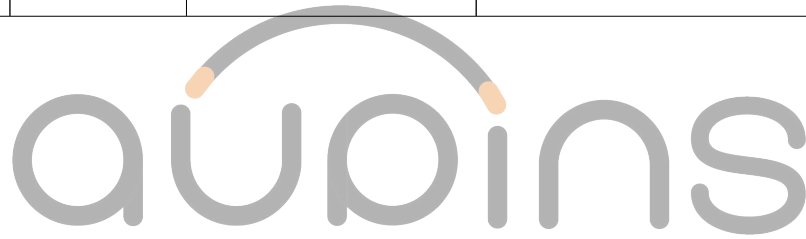
J3	4	12V-	
	5	KM34	Bus tie contactor - KM34 control output
	6	12V-	
	7	KM14	Bus tie contactor - KM14 control output
	8	12V-	
J4	1	KM13	Bus tie contactor - KM13 control output
	2	12V-	
	3	KM24	Bus tie contactor - KM24 control output
	4	12V-	
	5	AC_KM	AC Contactor Control
	6	12V-	
	7	FAN	Fan Control
	8	12-	
J5	1	LED_A	A/B/C/D Operation Indicator Lights
	2	LED_B	
	3	LED_C	
	4	LED_D	
	5	LED_ERR1	Host fault indicator
	6	LED_ERR2	Subunit Fault Indicator
	7	12V+	Indicator Power Supply
	8	12V-	Reserved
	1	E_S	Emergency stop feedback
	2	DOOR	Door Access Feedback
	3	IN_AC	AC Contactor Feedback
	4	IN_KMA	K1 K1 Contactor - KMA Status Feedback

J6	5	IN_KMB	K1K1 Contactor - KMB Status Feedback
	6	IN_KMC	K1K1 Contactor - KMC Status Feedback
	7	IN_KMD	K1K1 Contactor - KMD Status Feedback
	8	12V-	12V-
J7	1	IN_KM12	Bus tie contactor - KM12 feedback
	2	IN_KM23	Bus Tie Contactor - KM23 Feedback
	3	IN_KM34	Bus Tie Contactor - KM34 Feedback
	4	IN_KM14	Bus Tie Contactor - KM14 Feedback
	5	IN_KM13	Bus Tie Contactor - KM13 Feedback
	6	IN_KM24	Bus Tie Contactor - KM24 Feedback
	7	12V-	12V-
	8	12V-	12V-

4.6 Communication

Terminal No.	No.	Pin Definitions	Brief Description of Function
J18	1	485_A2	Meter Communication A2, Reserved (for slave unit)
	2	485_B2	Meter Communication B2, Reserved (for slave unit)
	3	232_TX2	Display communication, reserved (for slave unit)
	4	232_RX2	
	5	GND	
	6	12V+	
J19	1	TTL_TX2	Card reader communication, reserved (for sub-unit)
	2	TTL_RX2	
	3	GND	
	4	5V+	

J21	1	TTL_TX2	Communication with the host card reader
	2	TTL_RX2	
	3	GND	
	4	5V+	
J22	1	232_TX1	Host Screen Communication
	2	232_TX2	
	3	GND	
	4	12V+	
J23	1	485_A1	Master-slave meter communication
	2	485_B1	
	3	CAN_H	Power Module Communication
	4	CAN_L	



4.7 SD Card and Ethernet

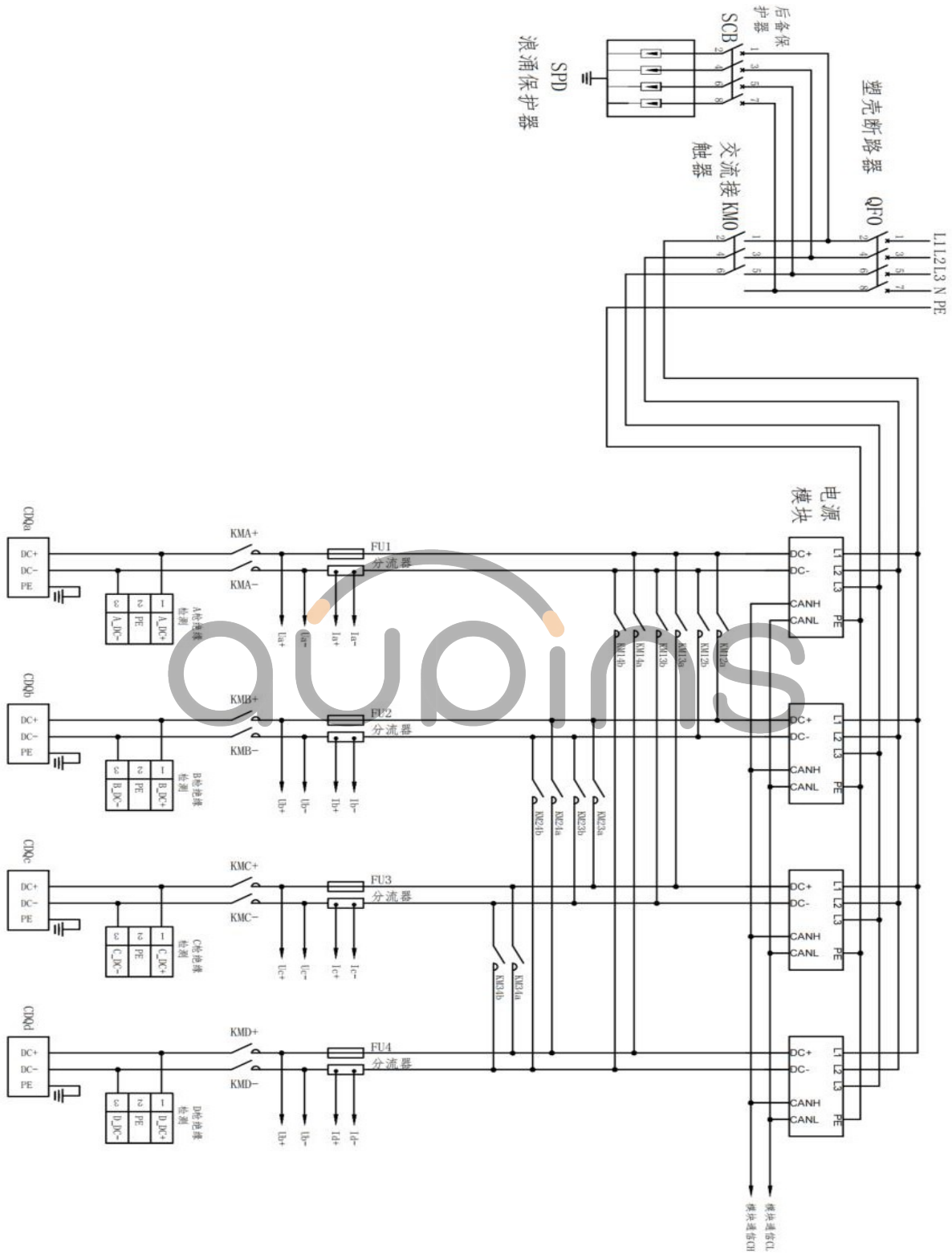
Pin number	No.	Pin Definition	Brief Description of Function
J10	1	RJ-45	Ethernet
J20	1	Micro SD	SD card

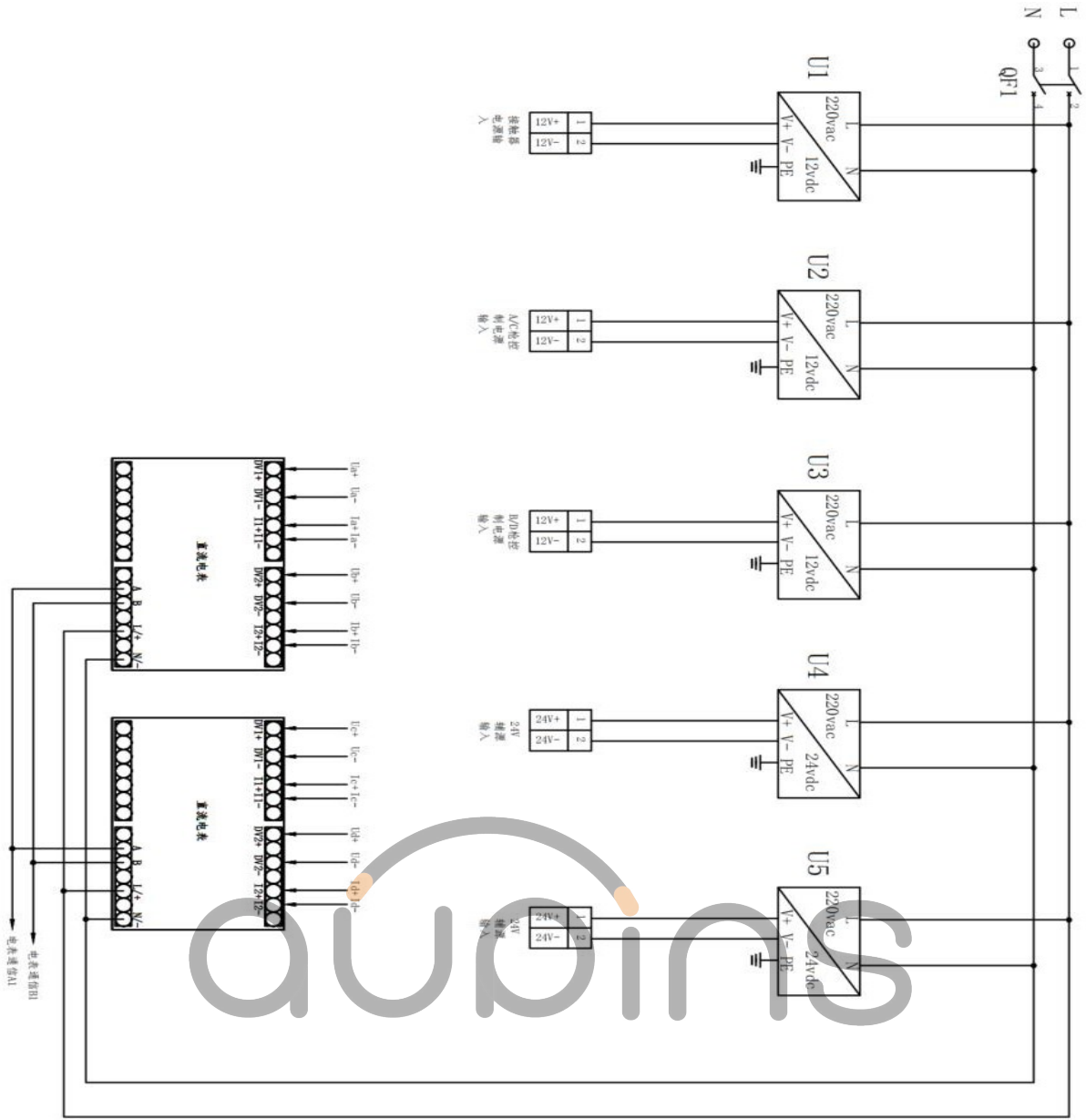
4.8 Insulation testing and high-voltage sampling

Terminal No.	No.	Pin Definition	Brief Description of Function
J15	1	D#DC+	D-gun insulation detection and high-voltage sampling
	2	D#PE	
	3	D#DC-	
J16	1	B#DC+	B Gun Insulation Test and High-Voltage Sampling
	2	B#PE	
	3	B#DC-	
J25	1	A#DC-	A Gun Insulation Testing and High-Voltage Sampling
	2	A#PE	
	3	A#DC+	
J26	1	C#DC-	B Gun Insulation Test and High-Voltage Sampling
	2	C#PE	
	3	C#DC+	

5 Wiring Reference Diagram

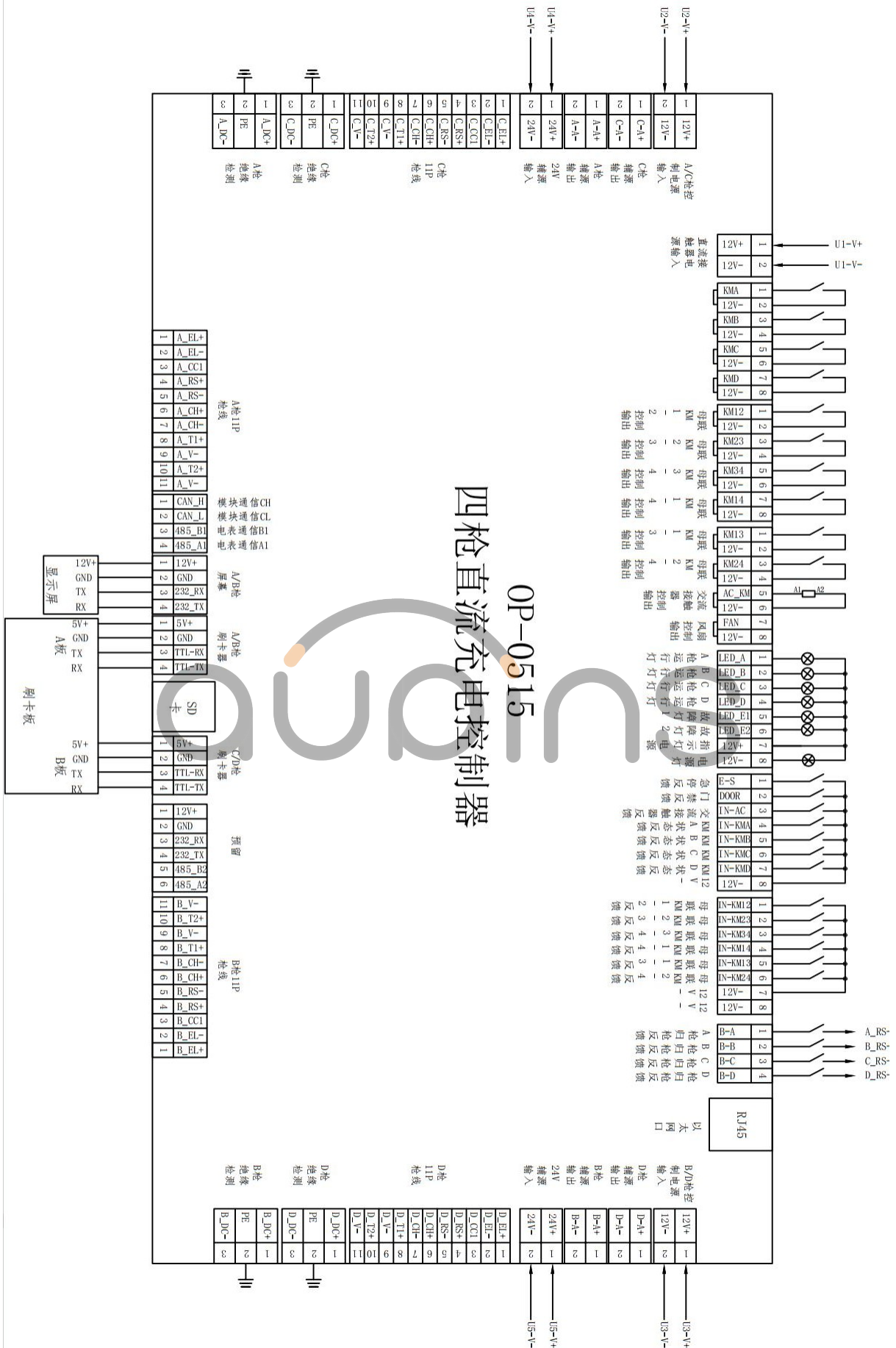
5.1 Electrical Schematic



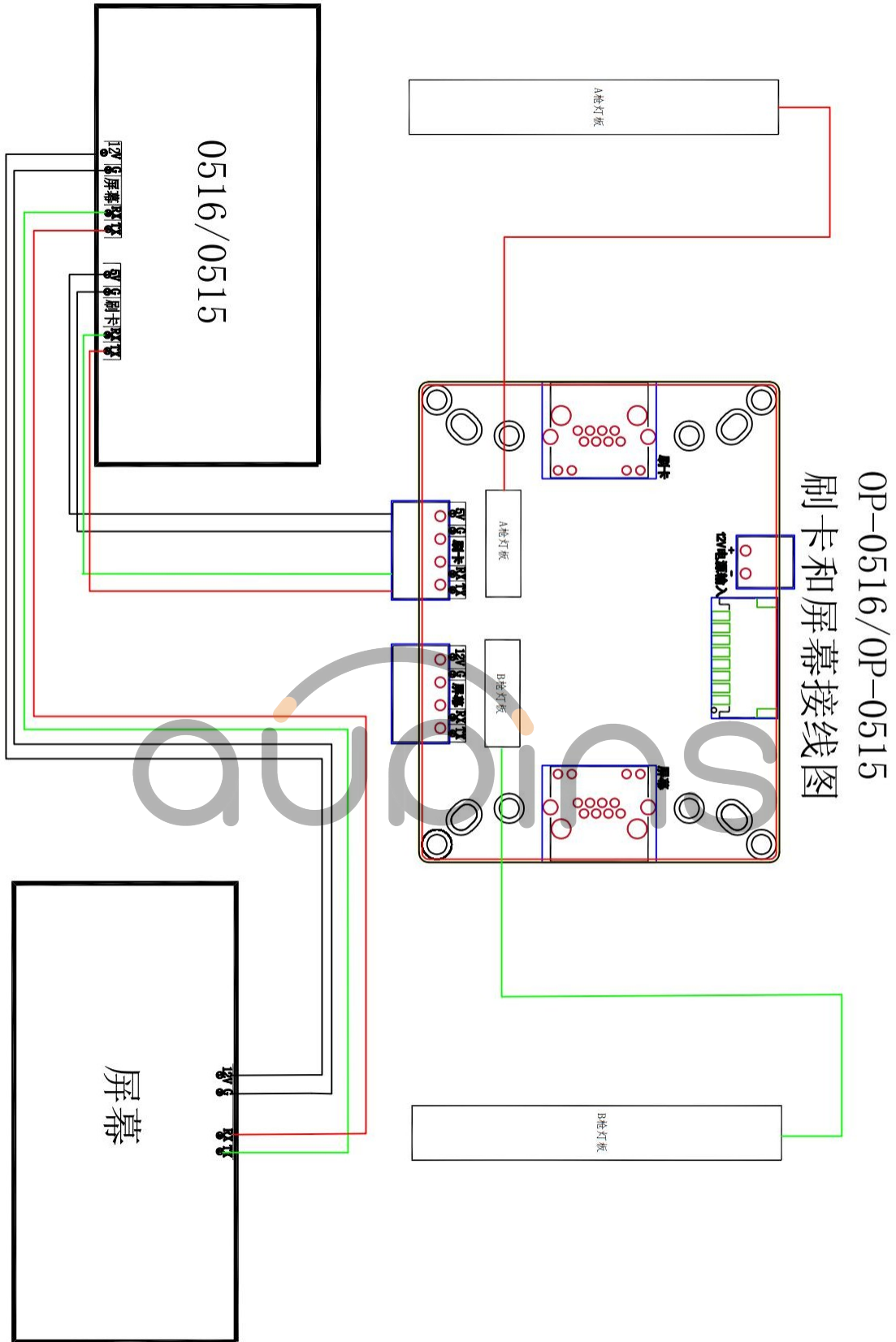


Electrical Schematic B

5.2 Main Control Wiring Diagram

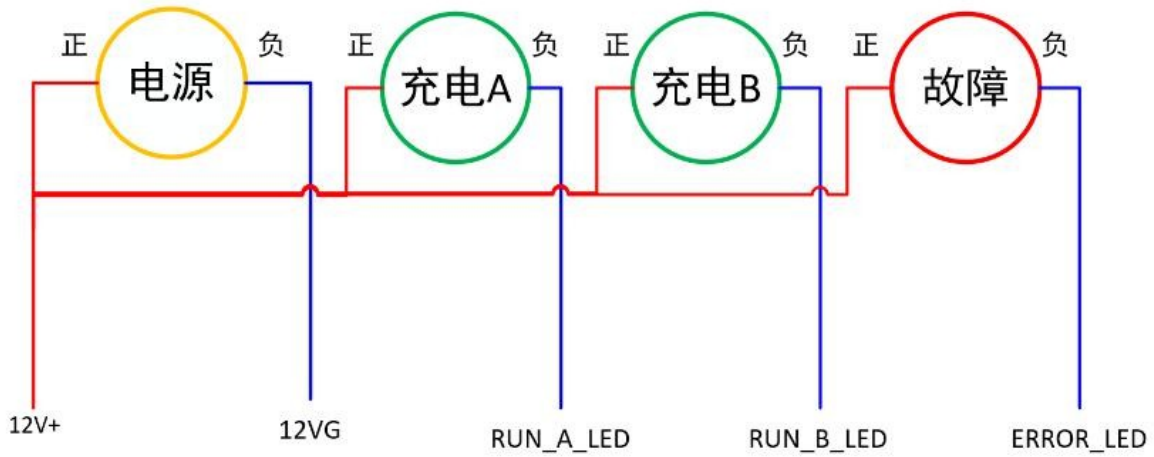


5.3 Card Reader Board - Main Control Wiring Diagram



5.4 Indicator Light

Wiring Light Bulb Wiring



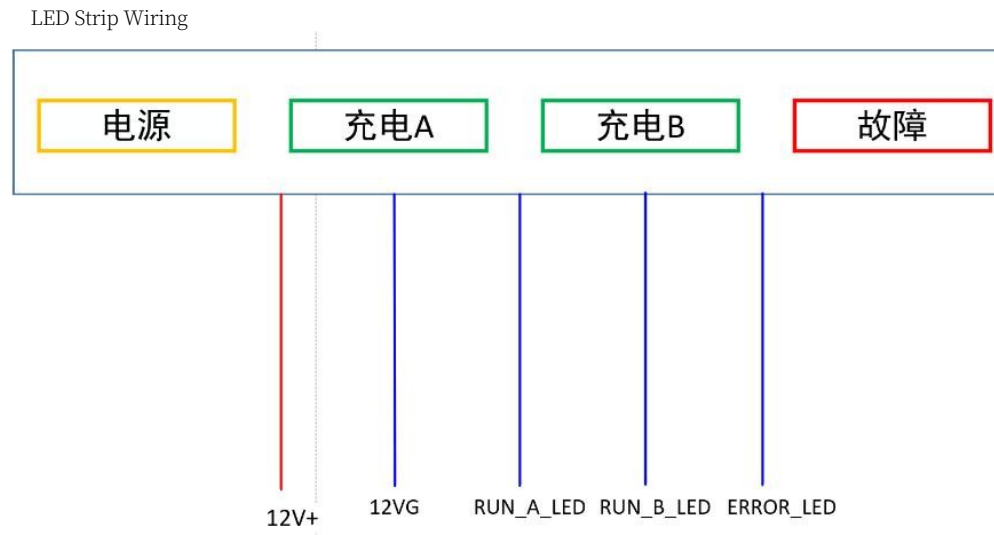


Fig. 6. Wiring Between Main Controller and Charging Station Indicator Lights

(1) Light Bulb Wiring

Use a common-anode connection: connect the positive terminals of all bulbs to the 12V supply, and connect the negative terminals to the corresponding output terminals. The controller's lighting output uses transistors, which are polarized; therefore, wiring must strictly follow the port layout shown in the diagram. Otherwise,

the lights will display abnormally.

Manufacturers can customize LED colors as needed.

(2) LED Strip Wiring

The light strip uses a common-anode configuration.

Please design the light strip based on a rated voltage of 12V and a current of 50mA; exceeding this range may damage the corresponding electronic components.

The light output on the controller is a transistor with polarity; therefore, wiring must strictly follow the port configuration shown in the diagram, otherwise the lights will display abnormally.

Manufacturers can customize LED colors as needed.

6 Power Module Configuration Instructions

This main controller supports modules from InfiSource, YouYou, Yonglian, Shenghong, Tonghe, Xingyuan Borui, and others. In theory, it can support all modules that implement the InfiSource protocol and the State Grid protocol. The following sections explain the use of the InfiSource 20kW module and the YouYou 30kW State Grid module, respectively.

6.1 Yingfuyuan Module

This controller uses a **fixed grouping mode**, where all DIP switches in the same group are set identically. This makes configuration simple and reduces the likelihood of errors. For example: A 120kW dual-gun charging station using 75050 Infosun modules employs a two-group module power supply configuration.

In this case, all DIP switches for Group 1 (corresponding to DIP position 6) are set to "Enabled" (slid up from the bottom), and **all DIP switches for Group 2** (corresponding to DIP position 5) are set to "Enabled" (slid up from the bottom), as shown in the figure below:

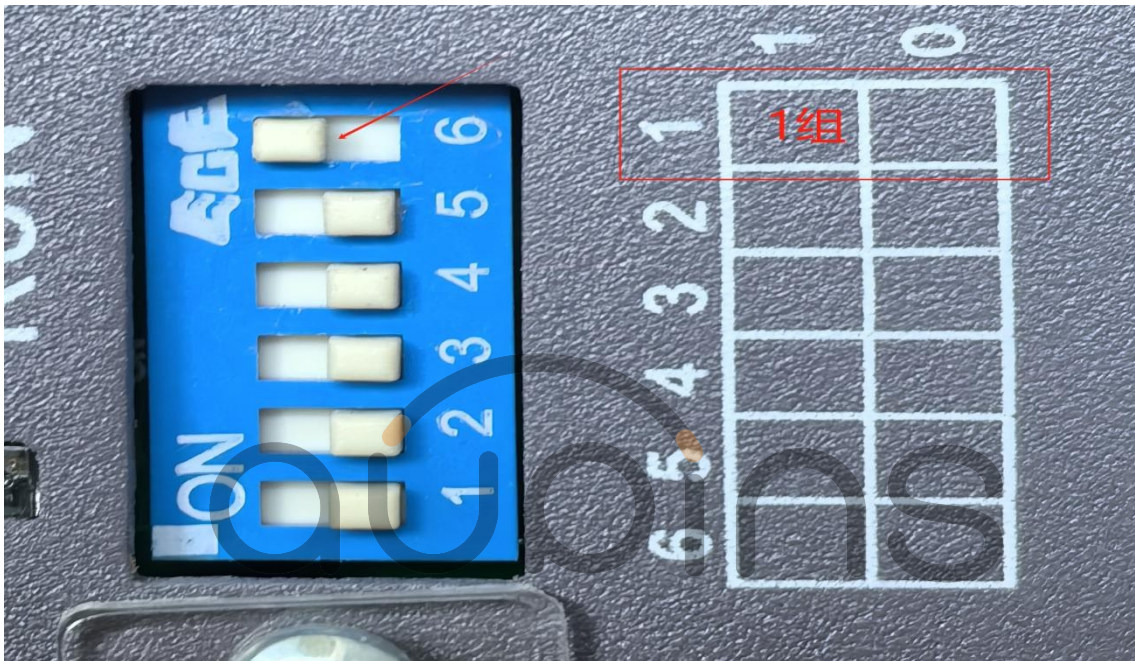


Figure 7. Group 1 DIP Switch Settings

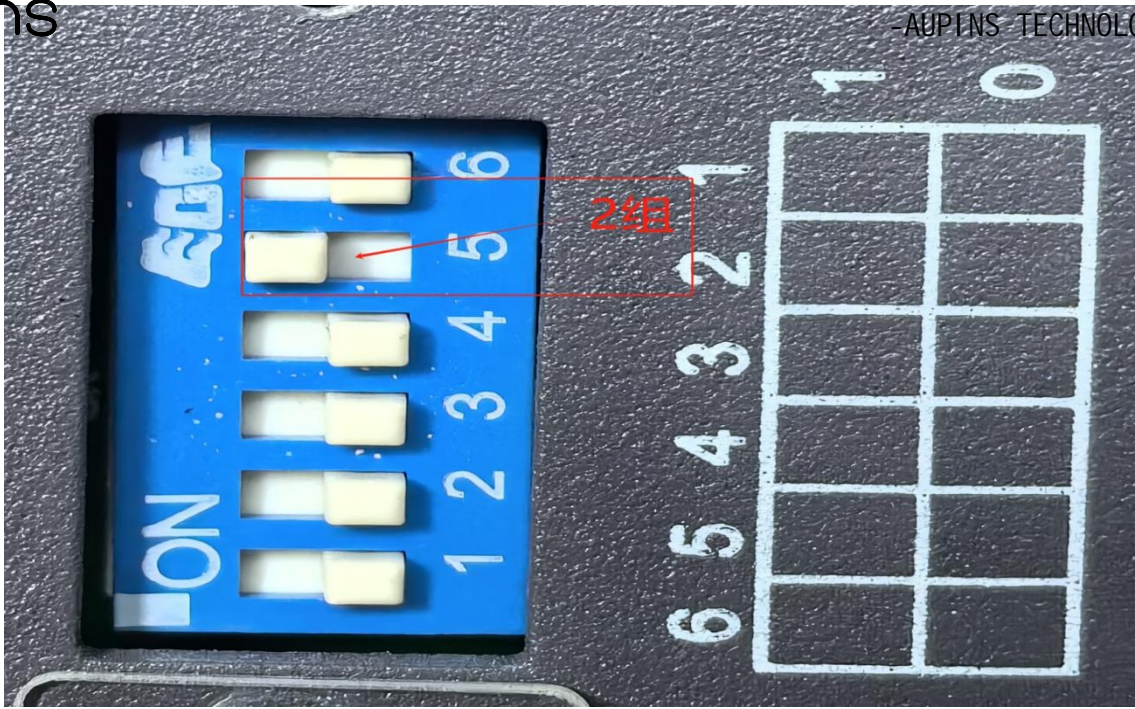


Figure 8. Group 2 DIP Switch Settings

6.2 Youyou State Grid Module

The address configuration for all State Grid modules is largely similar. Taking Youyou's 30kW State Grid module as an example, the address must be set via the LED display. The first module in Group 1 starts with a DIP switch setting of 0x80, and the first module in Group 2 starts with a DIP switch setting of 0x88. As shown in the figure below:



Figure 9. Address Setting for the First Module in Group 1

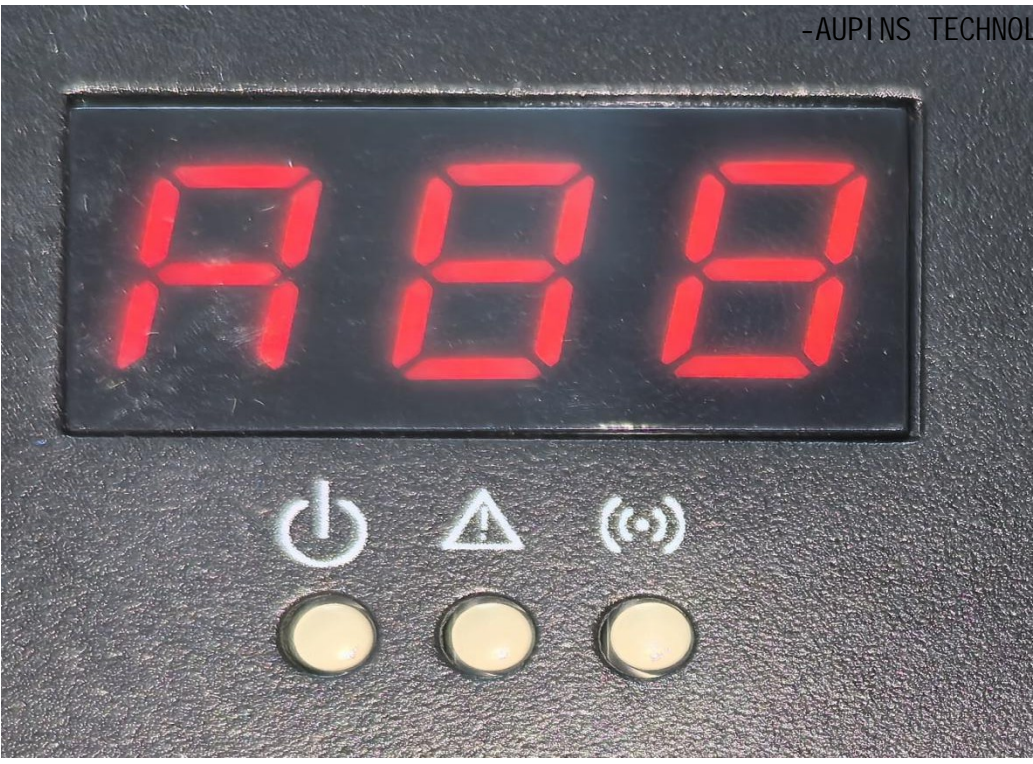


Figure 10. Address Setting for the First Module in Group 2



7 Electric Meter Configuration

This product supports the DL/T 645-2007 protocol. In theory, any electricity meter that implements DL/T 645-2007 can be used. Currently compatible meter brands include Yada, Yinglida, Kedarui, Ruiyin, Kaixian, and Ankerui.

The default configuration on the electricity meter side is as follows:

Baud rate: 2400 bps

Parity: Even

Slave Address: A-gun 0x01, B-gun 0x02

Taking the Yinglida electricity meter as an example:

Channel 1: 000001 -> Channel 2: 000002 -----> Channel 1: 22400 -----> Channel 2: 22400

Channel 1 slave address -- Channel 2 slave address -- Channel 1 parity and baud rate - Channel 2 parity and baud rate



