

产品规格书

SPECIFICATION

ESS Master Controller

BCU-B30-208

Version: V1.1

Legal Statement

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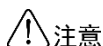
Foreword

Thank you for choosing Xieneng Technology's products.

This document is for understanding the detailed specifications of the BCU-B30-208 master controller product of the energy storage battery management system. Please save the document for future reference after reading.

Symbol Conventions

The following symbols may appear in this document, and their meanings are as follows.

Logo	Meaning
	This indicates that the information is attached to the main text, serving as an emphasis and supplement to the main text.
	This indicates a potential risk; ignoring this text could result in device damage, data loss, reduced device performance, or unpredictable consequences.
	This indicates a high potential danger that, if not avoided, could lead to casualties or serious injury.

Change Log

Document Version	Changes	Author	Release date
V1.0.0	Initial release	Dai Wanqing	2025.05.13
V1.0.1	● Added product: BCU-B30-208-002-001-A70	Dai Wanqing	2025.06.05
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V1.1.0	● Revise the content (PI) in the legal notice regarding this document. ● Added products: BCU-B30-208 HV	Dai Wanqing	2025.12.23

	2402.3331.0000, BCU-B30-208 HV 2403.6331.0000 ● Update IP Class (P4) ● Add Ethernet communication instructions (P12) ● Add instructions for BCU-BMU address allocation (P17) ● Update company address		
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1 Product Overview

The master control unit (BCU) is the rack-level management unit of the energy storage battery management system. It is typically installed inside the high-voltage box of the battery rack and manages the battery racks of the energy storage system. The BCU has functions such as collecting the total voltage, current, and insulation resistance of the battery rack; summarizing the voltage and temperature information of individual cells in the battery rack; calculating the SOC/SOH of the battery rack; executing battery equalization strategies; diagnosing battery faults; and protecting the batteries based on fault conditions. The BCU has communication interfaces such as CAN, daisy-chain, RS485, and Ethernet to communicate with internal management units (BAU, BMU) and external devices (PCS, EMS, etc.).

2 Features

- It possesses high reliability, high security, and strong anti-interference capabilities.
- It provides 485, CAN and Ethernet interfaces, supporting communication with PCS, EMS and other devices.
- Employing daisy-chain and CAN architectures, BMU devices can be adapted to any number of batteries, from 1 to 20.
- It supports the detection of the total voltage, charging and discharging current, and insulation resistance to ground of the battery pack.
- Supports battery pack charge/discharge management and thermal management.
- It supports the detection, alarm, and contactor switching of individual battery cell temperatures during system charging and discharging.
- It supports accurate signal sampling and real-time dynamic estimation of SOC and SOH.
- It supports the storage, transmission, processing, and export of alarm information, reset information, and sampling anomaly information.
- Supports battery pack fault diagnosis and alarms.
- It supports functions such as system self-testing, fault diagnosis and alarm, and safety protection to ensure the normal operation of the system itself.
- Supports flexible configuration upgrades.

3 Configuration Selection

Serial Number	Material Number	Model	Product Configuration			Remark
			Ethernet	Daisy-chain	Flash	
1	51.20.000.3003	BCU-B30-208 HV 2401.1331.0000	√	ADI	256MB	
2	51.20.000.2934	BCU-B30-208 HV 2402.3331.0000	√	NXP	256MB	
3	51.20.000.3420	BCU-B30-208 HV 2403.6331.0000	√	UTO	256MB	

4 Specifications

Test conditions: $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

Item	Quantity	Characteristic	Parameter			Unit
			Minimum	Typical value	Maximum	
Power supply	1	Operating voltage	12	24	32	V
		Operating power consumption	1.92	2.88	3.36	W
Total voltage sampling	2	Voltage range	50	-	1500	V
		Sampling accuracy	$\pm 0.5\% @ 200 \sim 1500\text{V}$ $\pm 1\text{V} @ 50 \sim 200\text{V}$			
Current sampling (Shunt)	2	Voltage range	-75	-	75	mV
		Sampling accuracy	$\pm 0.5\% @ -75 \sim -3\text{mV} \& 3 \sim 75\text{mV}$ $\pm 30\mu\text{V} @ -3 \sim 3\text{mV}$			
Current sampling (Voltage Hall)	2	Voltage range	0	-	5	V
		Sampling accuracy	-	± 0.5	-	%
5V power supply	1	Output voltage	4.75	5.0	5.1	V
		Output current	-	-	100	mA
12V power supply	1	Output voltage	11.5	12.00	12.36	V
		Output current	-	-	300	mA
Temperature sampling	4	Temperature range	-40	-	125	$^{\circ}\text{C}$
		Sampling accuracy	$\pm 1^{\circ}\text{C} @ -20 \sim 65\text{ }^{\circ}\text{C}$ $\pm 2\text{ }^{\circ}\text{C} @ -40 \sim -20\text{ }^{\circ}\text{C} \& 65 \sim 125\text{ }^{\circ}\text{C}$			
DIO (Software is configurable)	9	V_{IL}	0	-	0.5	V
		V_{IH}	3	-	PWR+	V
		$V_{OL(8-9)}$	-	0.04	0.4	V
		$V_{OH(8-9)}$	2.5	2.9	-	V
		$I_o(8-9)$	-	-	1	mA
High-side switch	8	Output voltage	-	-	PWR+	V
		Output current	-	-	3A 7 A@100ms	A
Dry contact	2	Load voltage	-	-	32	V
		Load current	-	-	0.5	A
Insulation resistance	1	Sampling range	0	-	20	M Ω
		Sampling accuracy	$\pm 10\% @ 75\text{k} \sim 20\text{M}\Omega$ $\pm 10\text{k}\Omega @ 0 \sim 75\text{k}\Omega$			

Item	Quantity	Characteristic	Parameter			Unit
			Minimum	Typical value	Maximum	
SOC	-	SOC accuracy	-	-	± 5	%
CAN	3	Baud rate	-	-	500	kbps
RS485	3	Baud rate	-	-	57600	bps
Daisy-chain	2	Baud rate	-	-	2	M bps
EEPROM	1	Storage space	-	64	-	kB
FLASH	1	Storage space	-	8/256	-	MB
Ethernet (Shared IP)	2	Rate	-	10/100	-	Mbps
Environment	-	Operating temperature	-40	-	85	°C
	-	Storage temperature	-40	-	85	°C
	-	Operating humidity	5	-	95	%
	-	Working altitude	-	-	4000	m
Safety regulations	-	Isolated working voltage	-	-	1500	V
	-	Withstand voltage test	6000 VDC 4240 VAC			
	-	Electrical clearance	14.5			mm
	-	Creepage distance	30			mm
	-	Pollution degree	II			-
Enclosure	-	Size	Dimensions: 235mm × 107mm × 30mm Opening size: 226mm × 98mm			-
	-	Material	ABS+PC, black fine-textured matte finish			-
	-	Flame retardant rating	UL94-V0			-
Other	-	IP Rating	IP40			-
	-	Weight	330			g

5 Structural dimensions

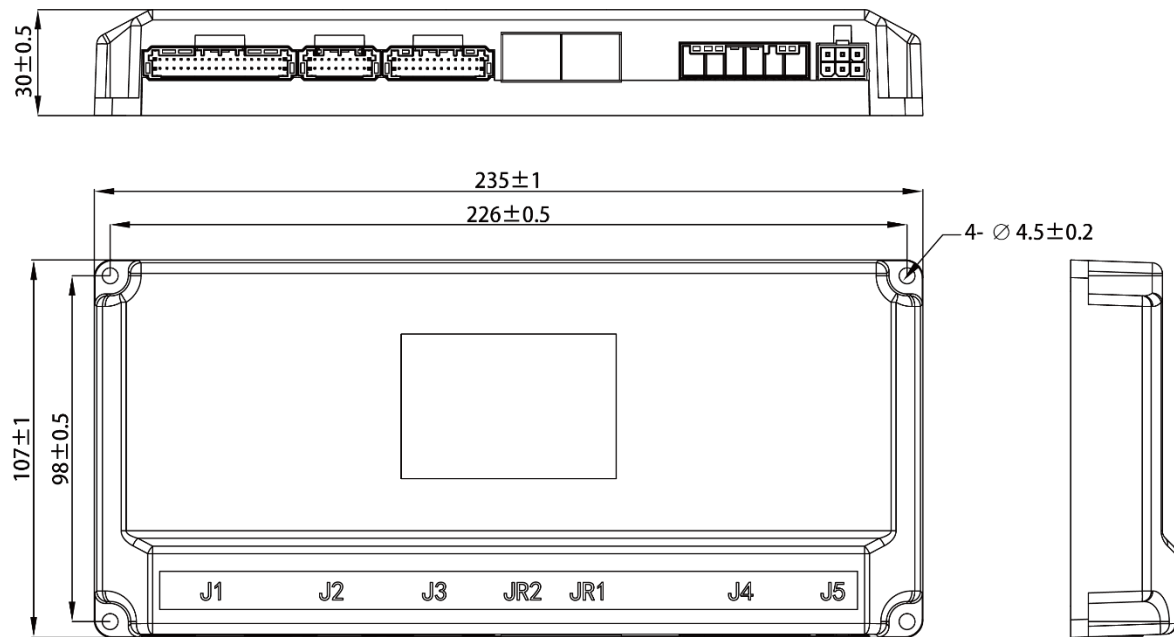


Figure 5-1 Structural dimensions (unit: mm)

6 Interface definition

6.1 Interface diagram

The BCU interface is shown below.

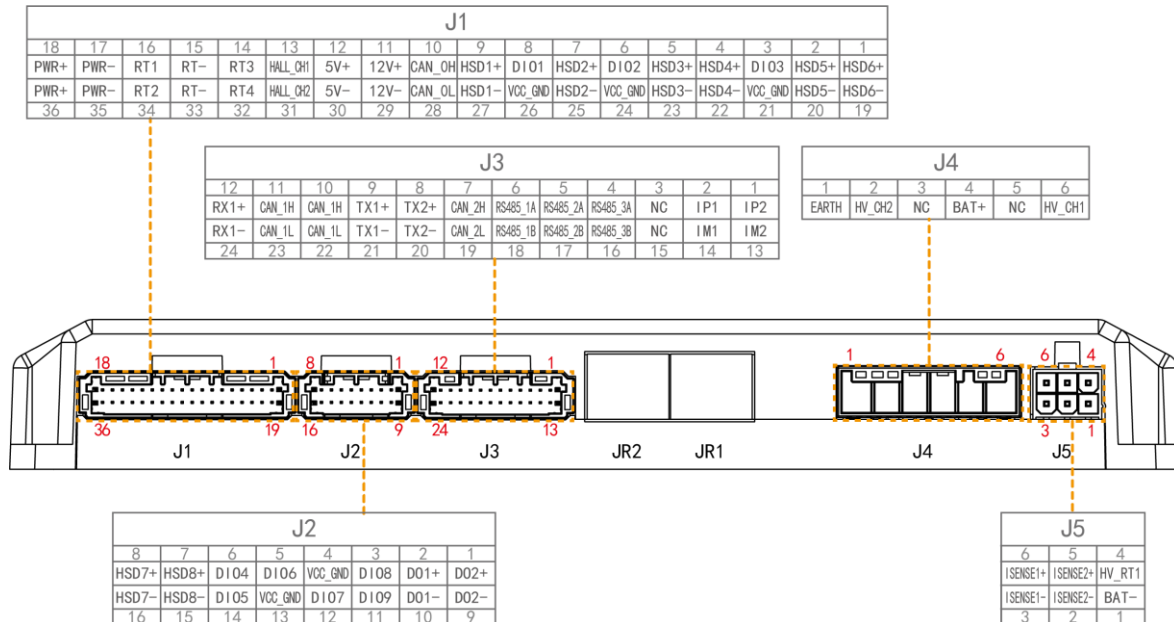


Figure 6-1 Interface diagram

Table 6-1 Connector Description

Connectors	Model	Number of pins	Brand
J1 (Black)	Socket (board end): 53.19.002.0221/WTB30-AB136HB1-001 Plug (wire end): 53.19.003.0809/WTB30-AW136HB1-001	36	Yixintong
J2 (Black)	Socket (board end): 53.19.002.0220/WTB30-AB116HB1-001 Plug (wire end): 53.19.003.0808/WTB30-AW116HB1-001	16	Yixintong
J3 (Black)	Socket (board end): 53.19.002.0216/WTB30-AB124HB1-001 Plug (wire end): 53.19.003.0788/WTB30-AW124HB1-001	24	Yixintong
Spring terminal: 53.19.001.2008/T-WTB30-W110-001/AWG#20~24			
Connectors	Model	Number of pins	Brand
J4 (Orange)	Socket (board end): 53.19.002.0193/HV15-ABHS006-AJSN-01 Plug (wire end): 53.19.003.0762/HV15-AWH006-NJ00	6	Yixintong
Spring terminal: 53.19.003.0962/T-WTB10-W 220/AWG#20~22			
Connectors	Model	Number of pins	Brand
J5 (White)	Socket (board end): 53.19.001.2927/JL4201R-20 3BSNW01 Plug (wire end): 53.19.003.1580/JL4201H-203W01	6	Jinling
Spring terminal: 53.19.003.1692/JL4201T-BSN03/AWG# 18 ~22			
Connectors	Model	Number of pins	Brand
JR1 (Metal)	Socket (board end): 53.19.001.2969/6234-08RG0AB20	8	Jinling
JR2 (Metal)	Socket (board end): 53.19.001.2969/6234-08RG0AB20	8	Jinling

6.2 Pin Definitions

Table 6-2 Pin Definitions

Interface Name	Pin number	Pin Definitions	Interface Function	Remark
J1	18/36	PWR+	Power supply input positive terminal	BCU power supply
	17/35	PWR-	Power supply input negative terminal	
	16/15	RT1/RT-	1st high-voltage box temperature sampling	High-voltage box temperature 1
	14/15	RT3/RT-	3rd high-voltage box temperature sampling	High-voltage box temperature 3
	34/33	RT2/RT-	2nd high-voltage box temperature sampling	High-voltage box temperature 2
	32/33	RT4/RT-	4th high-voltage box temperature sampling	High-voltage box temperature 4
	12	5V +	Hall 5V power supply output positive	Voltage-type Hall
	30	5V-	Hall 5V power supply output negative	
	13	HALL_CH1	Hall sampling channel 1	
	31	HALL_CH2	Hall sampling channel 2	
	11	12V+	Hall effect 12V power supply output positive terminal	CAN Hall Includes a 120Ω terminal resistor
	29	12V-	Hall effect 12V power supply output negative terminal	
	10	CAN_0H	Non-isolated CAN Hall communication	
	28	CAN_0L		
	9/27	HSD1+/HSD1-	1st high-side output	Default main positive contactor control
	8/26	DIO1/VCC_GND	1st digital signal input	Default main positive contactor auxiliary contact detection
	7/25	HSD2+/HSD2-	2nd high-side output	Default main negative contactor control
	6/24	DIO2/VCC_GND	2nd digital signal input	Default main negative contactor auxiliary contact detection
	5/23	HSD3+/HSD3-	3rd high-side output	Default precharge contactor

Interface Name	Pin number	Pin Definitions	Interface Function	Remark
				control
	4/22	HSD4+/HSD4-	4th high-side output	Default circuit breaker trip unit control
	3/21	DIO3/VCC_GND	3rd digital signal input	Default circuit breaker auxiliary contact detection
	2/20	HSD5+/HSD5-	5th high-side output	Default indicator light (red light) control
	1/19	HSD6+/HSD6-	6th high-side output	Default indicator light (green light) control
J2	8/16	HSD7+/HSD7-	7th high-side output	Default fan control
	7/15	HSD8+/HSD8-	8th high-side output	
	6/13	DIO4/VCC_GND	4th digital signal input	Default fuse feedback
	14/13	DIO5/VCC_GND	5th digital signal input	Default fan feedback
	5/13	DIO6/VCC_GND	6th digital signal input	
	12/4	DIO7/VCC_GND	7th digital signal input	
	3/4	DIO 8/VCC_GND	8th digital signal input and output	
	11/4	DIO 9/VCC_GND	9th digital signal input and output	
	2/10	DO1+/DO1-	1st normally open dry contact output	
	1/9	DO2+/DO2-	2nd normally open dry contact output	
J3	12/24	RX1+/RX1-	BCU isolated address allocation input	
	10/11	CAN_1H	BAU-BCU isolated CAN communication	Cascaded communication, internal parallel connection Without a 120Ω terminal resistor
	22/23	CAN_1L		
	9/21	TX1+/TX1-	BCU isolated address allocation output	
	8/20	TX2+/TX2-	BMU isolated address allocation output	
	7	CAN_2H	BCU-BMU isolated CAN communication	Includes a 120Ω terminal resistor
	19	CAN_2L		
	6	RS485_1A	1st isolated RS485 communication	First fan control
	18	RS485_1B		
	5	RS485_2A	2nd isolated RS485	Second fan control

Interface Name	Pin number	Pin Definitions	Interface Function	Remark
	17	RS485_2B	communication	
	4	RS485_3A	3rd isolated RS485 communication	
	16	RS485_3B		
	3/15	NC	No connection	
	2/14	IP1/IM1	1st daisy-chain communication	
	1/13	IP2/IM2	2nd daisy-chain communication	
J4	1	EARTH	Enclosure grounding	
	2	HV_CH2	Main negative contactor detection	
	3/5	NC	No connection	
	4	BAT+	Total voltage sampling positive terminal	
	6	HV_CH1	Main positive contactor detection	Precharge/Total Load Voltage Detection
J5	1	BAT-	Total voltage sampling negative terminal	
	6	I SENSE 1+	1st shunt sampling	
	3	I SENSE 1-		
	5	I SENSE2 +	2nd shunt sampling	
	2	I SENSE2 -		
	4/1	HV_RT1/BAT-	Shunt temperature sampling	
JR1	-	-	-	Cascade Up Level
JR2	-	-	-	Cascade Down Level

7 Installation Guide

7.1 Installation Notes

- Before installing the equipment, please carefully inspect the casing for any serious damage.
- After the equipment is installed, first connect the communication port connector, then connect the power cord.
- If only one set of power cords is connected, the other set of power cords should be properly protected to prevent short circuits.
- Before turning on the power, make sure all wiring harnesses are connected properly and there is no risk of short circuit.
- The shunt sampling and BAT- must be connected on the same side of the contactor and cannot be connected across contactors, otherwise it will damage the shunt current sampling.
- The EARTH must be reliably grounded.

7.2 Installation process

Step 1

Based on the opening size, use 4 screws to fix the equipment inside the high-voltage box.

Step 2 Connect the interface socket and wires according to the instructions in the interface definition.

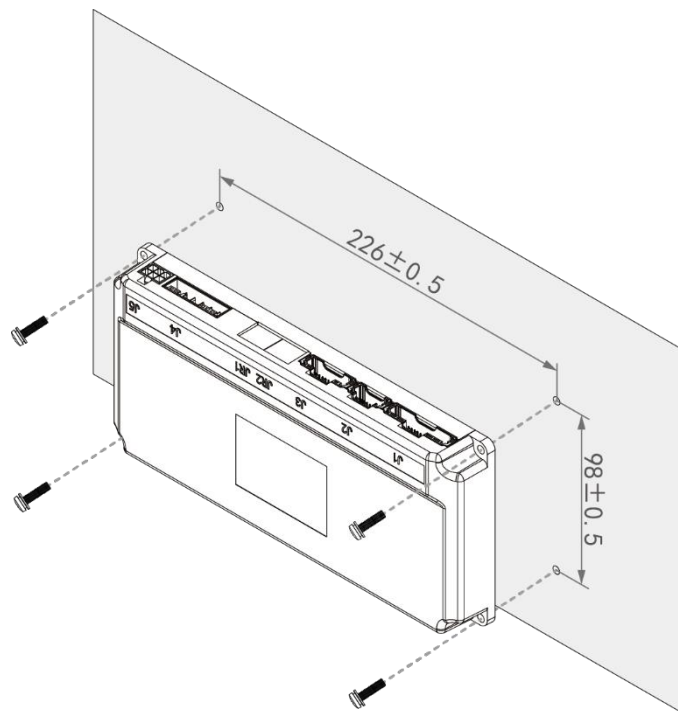


Figure 7-1 Installation equipment

8 Typical applications

8.1 System Architecture

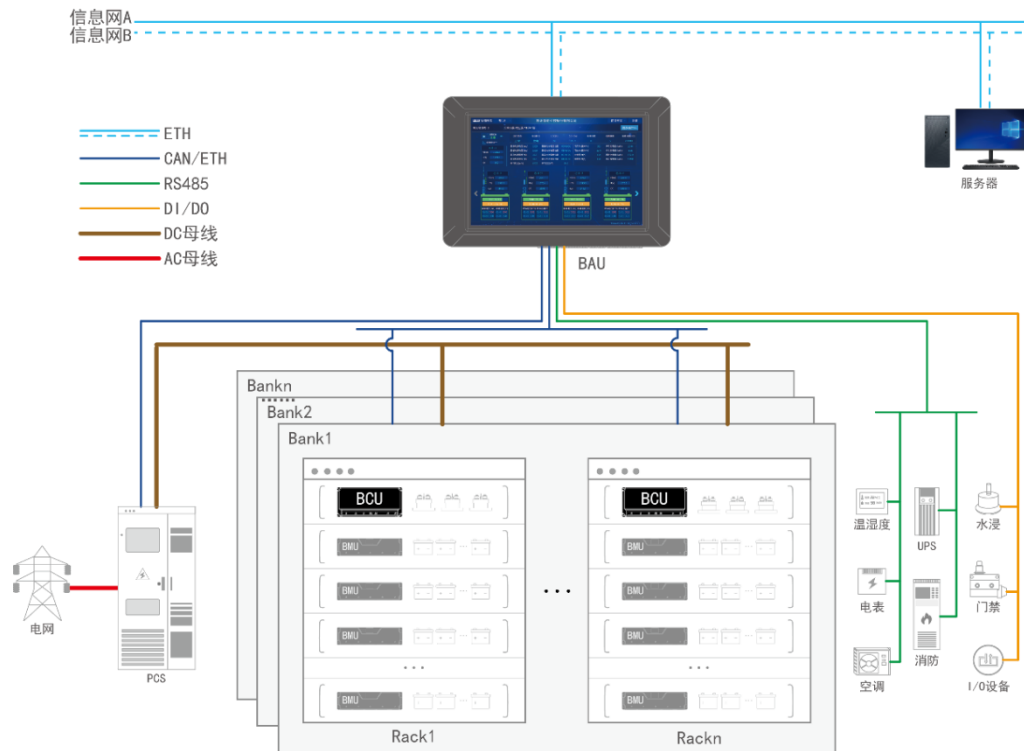


Figure 8-1 Centralized system architecture

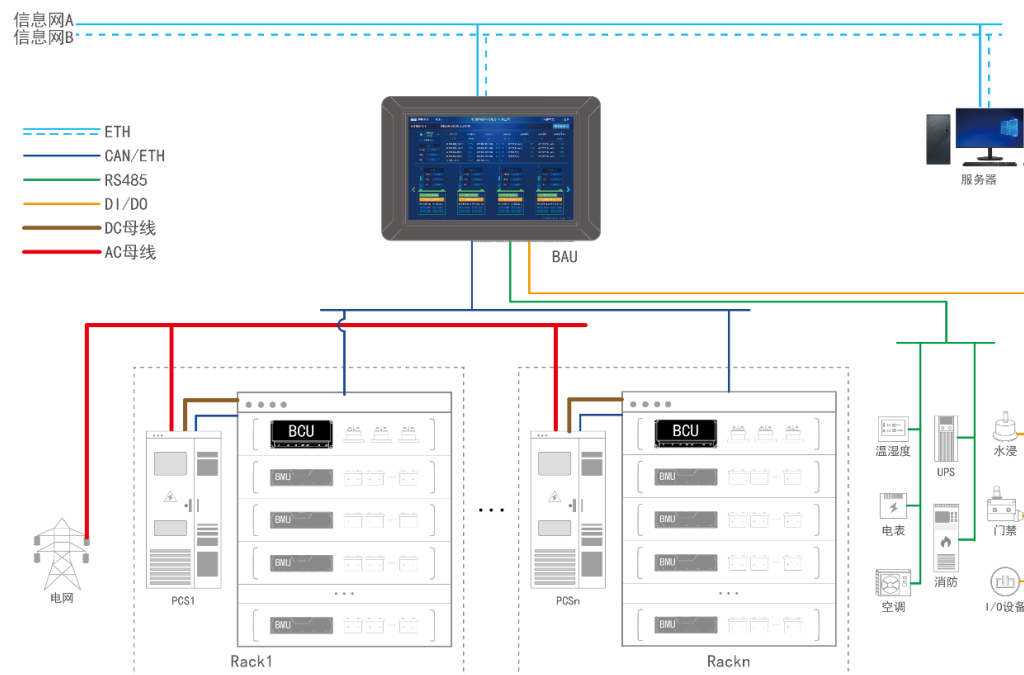


Figure 8-2 String system architecture

8.2 Wiring instructions

8.2.1 BAU-BCU communication wiring

8.2.1.1 Ethernet communication

The BAU-BCU units support Ethernet communication. The BCU has two interfaces and can be directly cascaded without the need for an external switch. Wiring instructions are shown in the figure below.

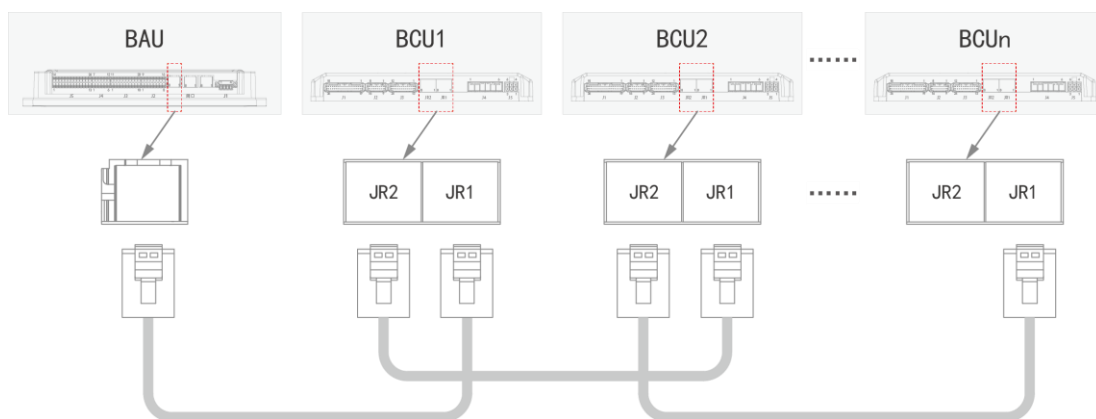


Figure 8-3 BAU-BCU Ethernet communication



说明

- ◆ The BAU interface is taken as BAU-B30-003 as an example. For other models, please refer to the product specification sheet.
- ◆ The Ethernet port contains one CAN and address allocation line. The wiring order of JR1 and JR2 cannot be interchanged. JR1 is connected to the upper-level (external device).
- ◆ This product includes a built-in switch function, and the network ports can be cascaded to connect external devices, saving the need for an external switch.

8.2.1.2 CAN communication

The BAU-BCU units support CAN communication; the wiring instructions are shown in the diagram below.

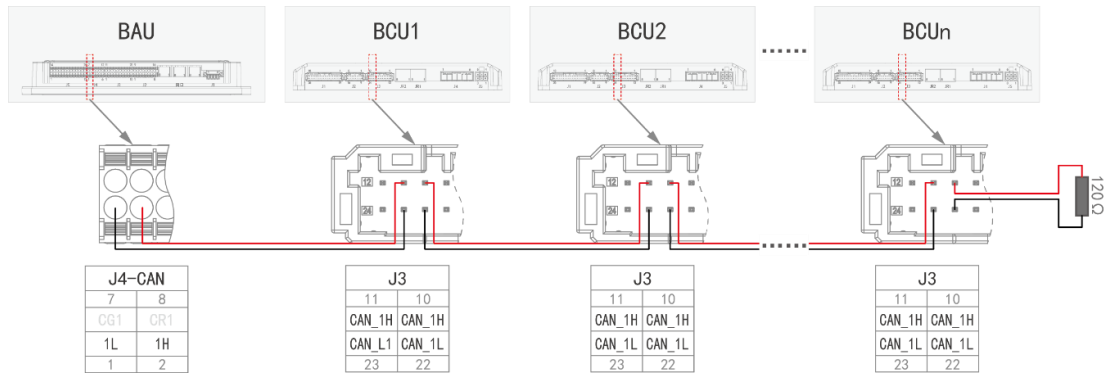


Figure 8-4 BAU-BCU CAN communication



说明

- ◆ The BAU-BCU interface is taken as BAU-B30-003 as an example. For other models, please refer to the product specification sheet.
- ◆ The BAU CAN interface usually comes with a 120Ω resistor by default, and an external 120Ω terminal resistor should be connected to the end of the bus.

8.2.2 BCU-BMU communication wiring

8.2.2.1 Daisy-chain communication (recommended)

The master and slave support daisy-chain communication and can be connected in dual chains and loopback. The wiring instructions are shown in the figure below.

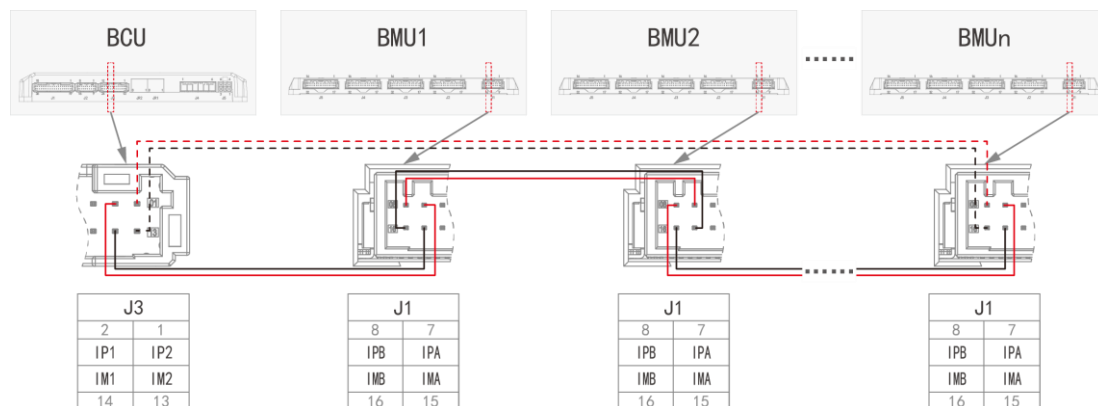


Figure 8-5 BCU-BMU daisy-chain communication

说明

- ◆ Taking the BMU-B30-52-508-113 slave interface as an example, please refer to the product specification sheet for other models.
- ◆ Supports double-chain and loopback connection methods.

注意

- ◆ Daisy-chain communication harnesses must use standard CAN cables that meet the requirements of ISO 11898-2.
- ◆ The daisy-chain communication harnesses inside the high-voltage box and the PACK must also meet the above requirements.
- ◆ Additional notes: ISO 11898-2 specifies that the CAN bus transmission medium must use unshielded twisted-pair cable with a characteristic impedance of 120 Ω .

8.2.2.2 CAN communication

CAN communicate between master and slave controllers. Wiring instructions are shown in the figure below.

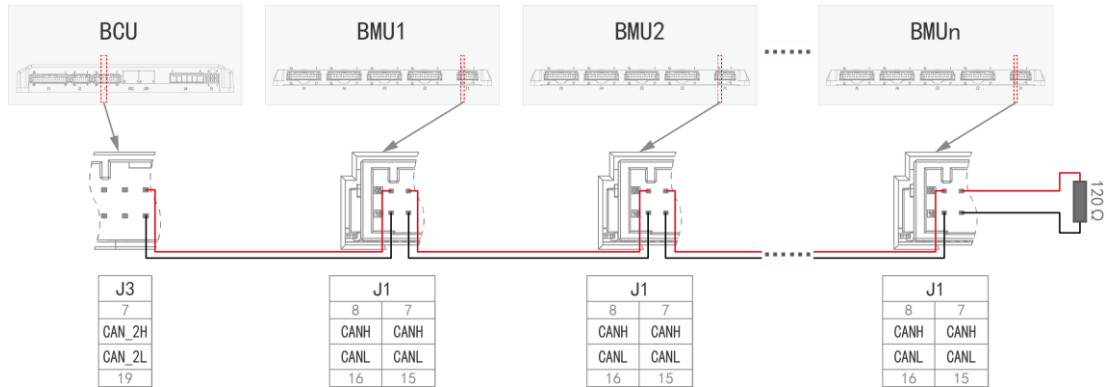


Figure 8-6 BCU-BMU CAN communication



- ◆ The slave controller interface is taken as an example of BMU-B30-52-508-213. For other models, please refer to the product specification sheet.
- ◆ The BCU CAN interface comes with a 120Ω resistor by default, and an external 120Ω terminal resistor should be connected to the end of the bus.

8.2.3 Address allocation wiring

8.2.3.1 BAU-BCU address allocation

The BCU uses one isolated address signal input and one isolated address signal output to achieve address allocation from the BAU to the BCU. According to the cascading order, the BCU addresses are 1#, 2#, 3#, ..., n #. The wiring instructions are shown in the figure below.

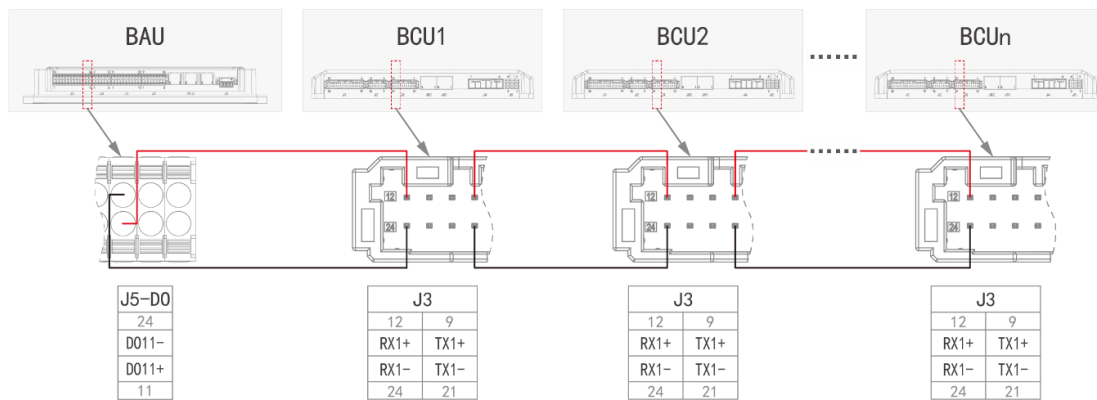
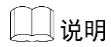


Figure 8-7 BAU-BCU address allocation



说明

- ◆ The BAU interface is taken as BAU-B30-003 as an example. For other models, please refer to the product specification sheet.

8.2.3.2 BCU-BMU address allocation

When using CAN slave controllers, address allocation lines can be used to achieve automatic address allocation from the master controller to the slave controller. According to the cascading order, the BCU addresses are 1#, 2#, 3#, ..., n#. The wiring instructions are shown in the figure below.

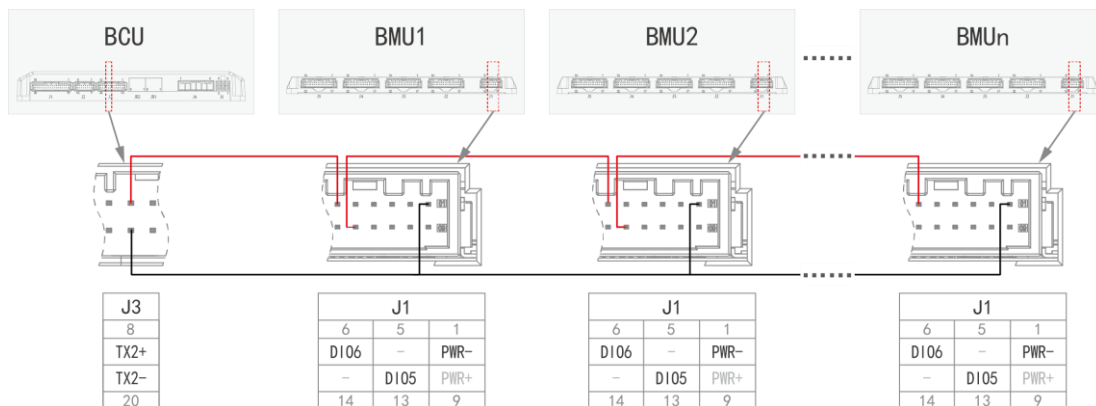


Figure 8-8 BCU-BMU address allocation



说明

- ◆ The slave controller interface is taken as an example of BMU-B30-52-508-213. For other models, please refer to the product specification sheet.
- ◆ Daisy-chain slaves do not require address allocation lines.
- ◆ When the slave and controller share a single power supply, the PWR- harness between BMU1 and BMUn can be omitted.
- ◆ When the BCU and BMU share a power supply, TX2- can be connected to the PWR- of the BCU as close as possible.

8.2.4 High voltage sampling wiring

The BCU supports battery-side total voltage sampling, load-side total voltage sampling, contactor adhesion diagnosis, insulation resistance sampling, and shunt current sampling. The wiring diagram is shown below.

- BAT+ and BAT- collect the total battery pack voltage and are reused with the insulation resistance sampling circuit. The EARTH line should be reliably grounded to ensure accurate insulation resistance sampling.
- HV_CH1 collects the load terminal voltage and is also used to diagnose main positive contactor adhesion; HV_CH2 is used to diagnose main negative contactor adhesion.

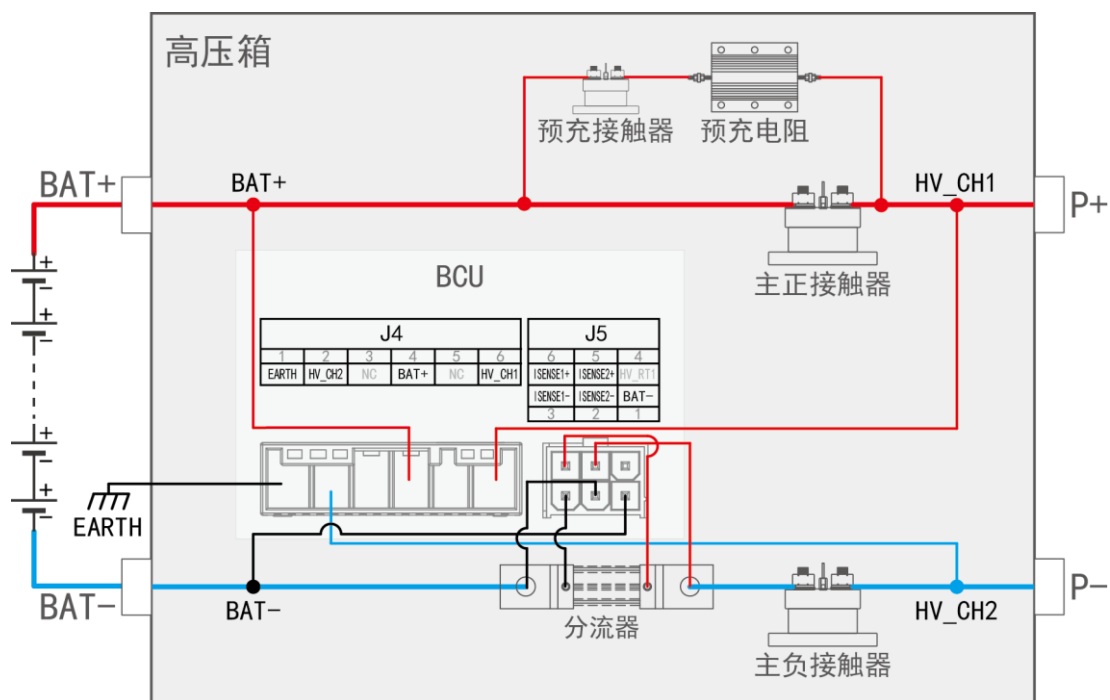


Figure 8-9 High voltage sampling

The shunt's sampling must be consistent with BAT-. The following is an incorrect connection:

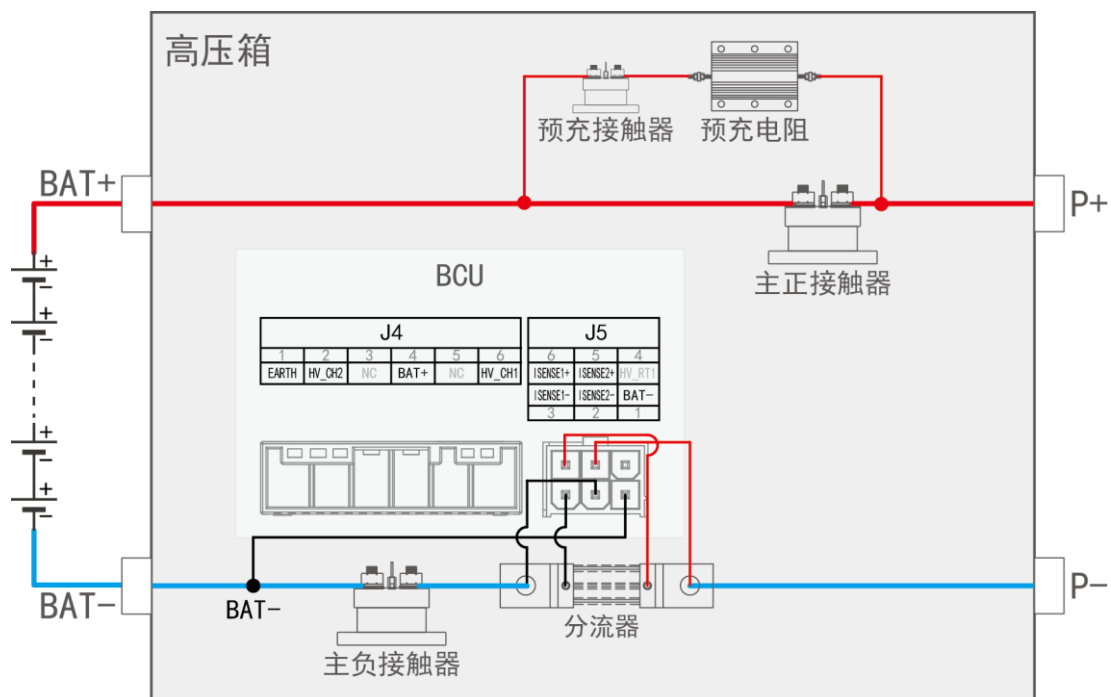


Figure 8-10 Incorrect shunt connection 1

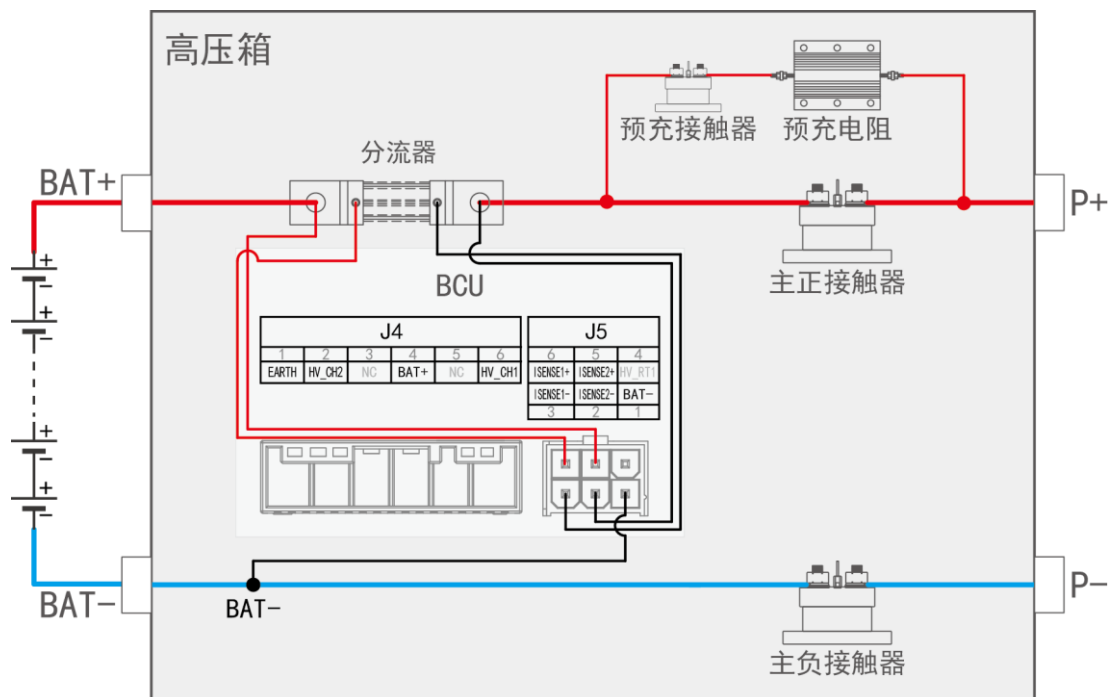


Figure 8-11 Incorrect shunt connection 2

8.2.5 Current sampling wiring

The BCU supports two types of Hall current sampling, and the wiring diagrams for each current sampling are shown below.

- CAN Hall

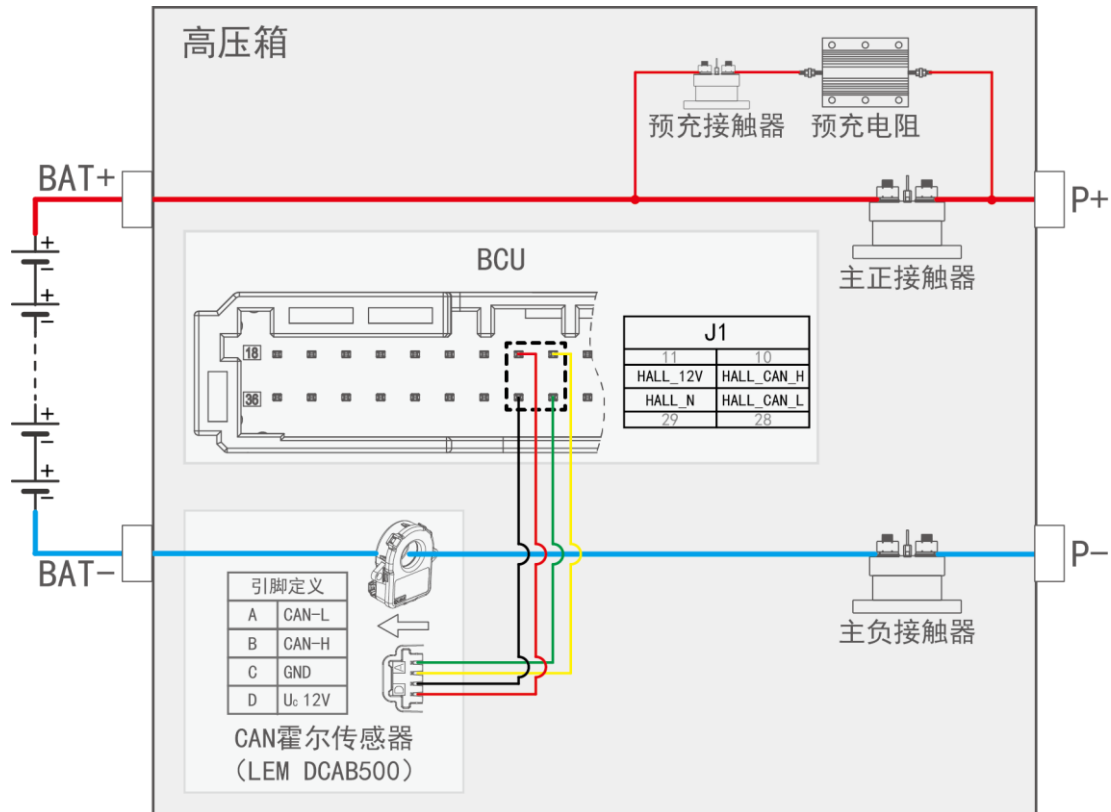


Figure 8-12 CAN Hall effect data collection

- Voltage-type Hall

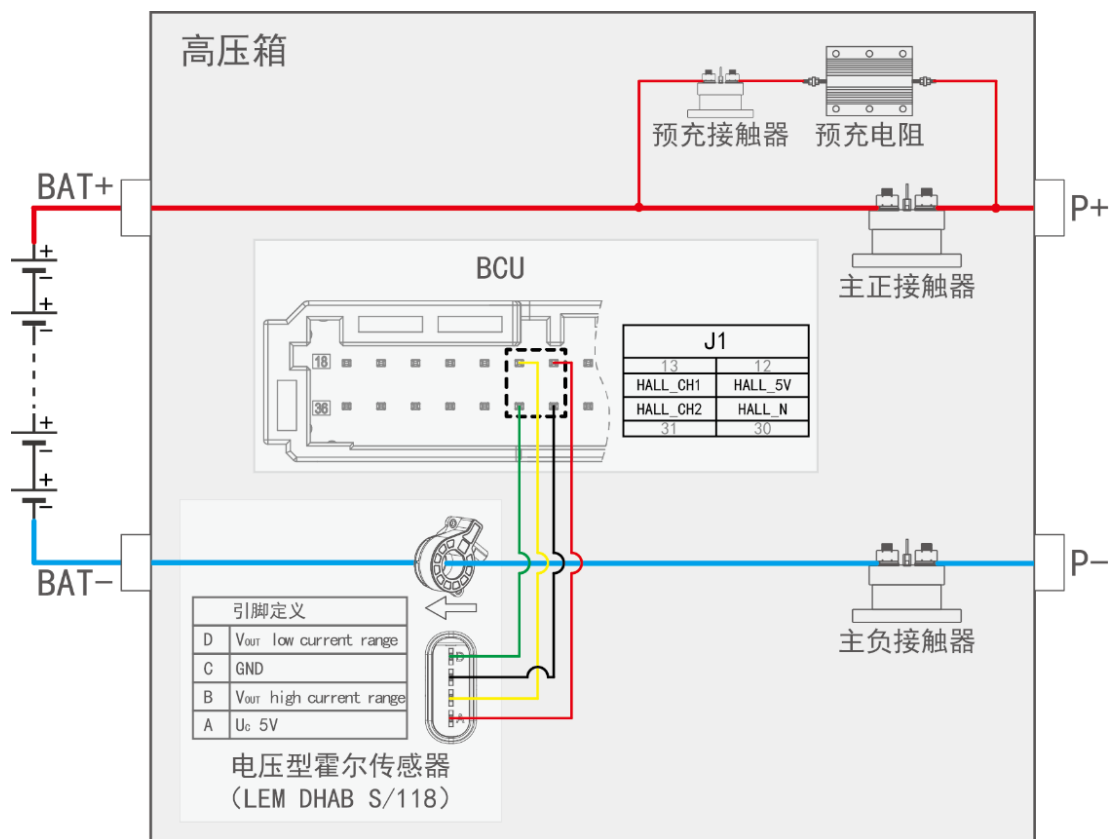


Figure 8-13 Voltage-type Hall effect sampling

8.2.6 DIO input/output wiring

The BCU supports 9 digital signal inputs, with DIO8~9 compatible outputs at 3.3V. DIO can be configured as either input or output via software. The BCU has internal pull-up resistors; inputs and outputs are high when externally left floating. When configured as inputs, they are active low. The wiring method is as follows.

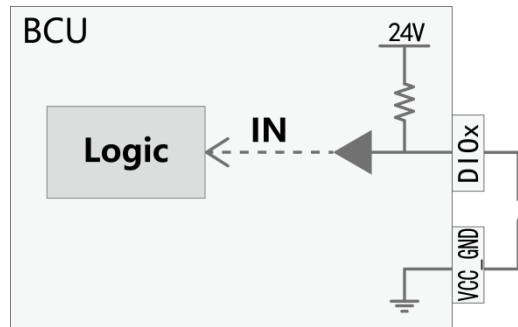


Figure 8-14 DIO 1~7 inputs

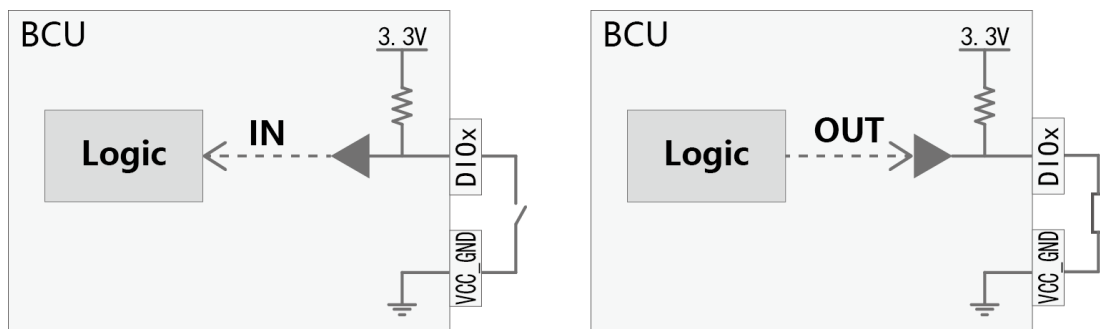


Figure 8-15 DIO 8~9 input/output

8.2.7 Dry contact output wiring

The BCU supports two dry contact outputs, which are isolated dry contact outputs by default. They can be connected to DC electrical appliances such as relays, lights, and fans. The wiring diagram is as follows.

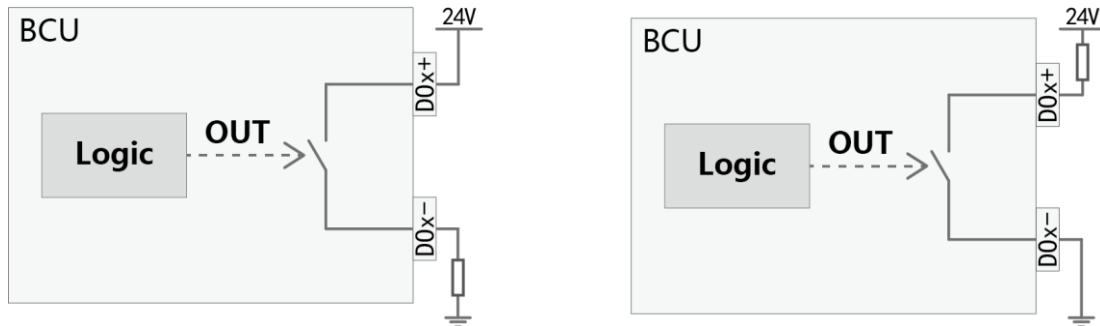


Figure 8-16 Dry contact output

8.2.8 High-side switch wiring

The BCU supports 8 high-side outputs, which can be connected to DC electrical appliances such as relays, lights, and fans. The wiring diagram is as follows.

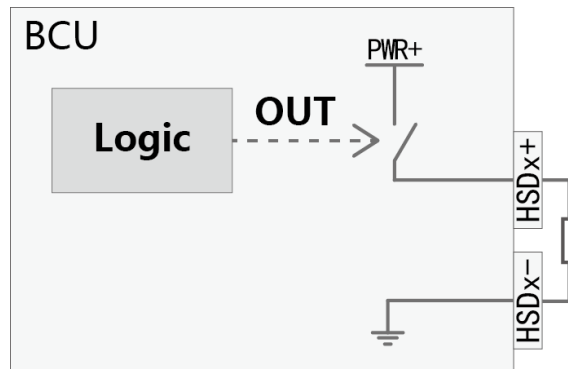
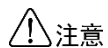


Figure 8-17 High-side switch

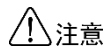


注意

- ◆ The total high-side output current must not exceed 4A.

8.2.9 Contactor control and feedback wiring

The BCU supports control outputs and feedback inputs for the main positive contactor, main negative contactor, and precharge contactor. Taking the main positive contactor as an example, the wiring diagram is as follows.



- ◆ The wiring sequence of the contactor is subject to the actual product.

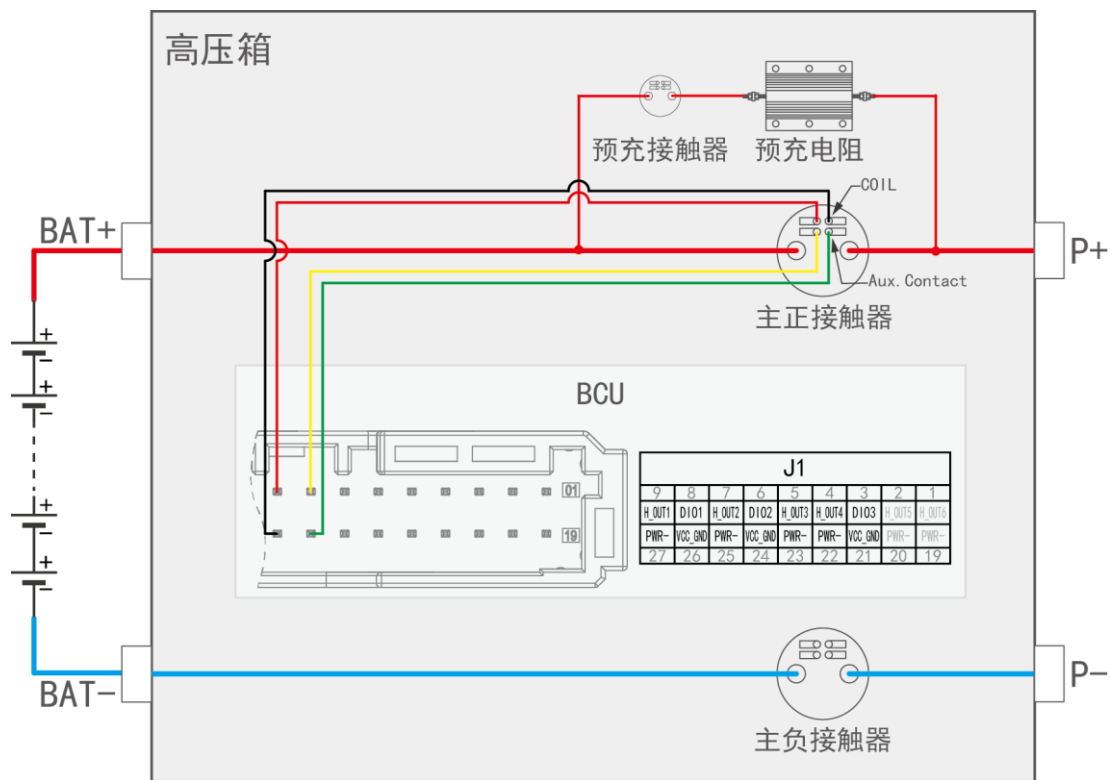


Figure 8-18 Contactor control and feedback



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