Protocol Convert Unit Specification

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No.	Software/Hardware Version Number	Content	Change	Confirm

1、Overview

In the multi-battery module parallel energy storage system, Protocol Convert Unit (PCU) is mainly responsible for coordinating the charge and discharge management of single cluster parallel battery modules and information exchange with the user's background monitoring unit.

PCU has the functions of real-time acquisition, alarm fault diagnosis and SOC prediction of status information of parallel battery modules. It also provides CAN, RS485, DI/DO and other interfaces to ensure the reliability of information interaction with battery modules and user background monitoring units. In multi-battery module parallel energy storage system, PCU effectively improves the circulation problem between battery packs, and provides reliable guarantee for the effective and safe use of parallel battery packs.

2、Main Composition of Single Cluster

- Lithium battery: energy storage medium.
- Protocol converter Unit (PCU): to realize the functions of monitoring and management within a single cluster, and to complete the information interaction with the user's background monitoring unit externally.
- Battery Management System (BMS): Responsible for collecting the voltage and temperature of the cell in the battery module, and completing the information exchange with PCU.

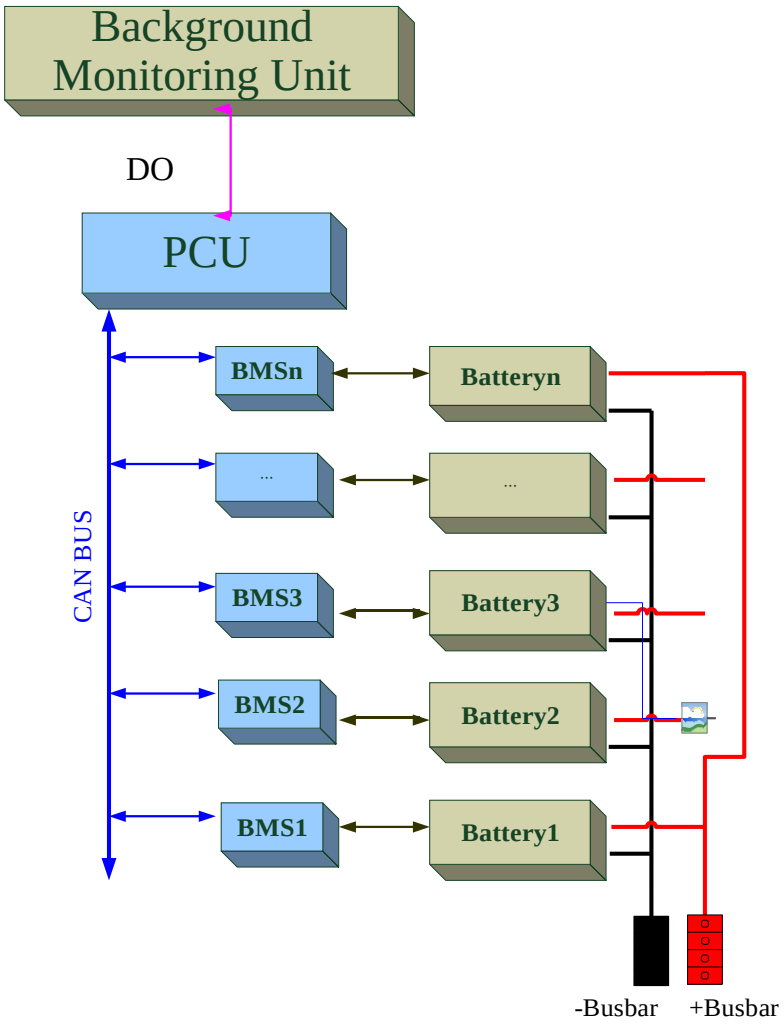

Figure 1 Cluster Controller Application Diagram

3、Main Functions of Products

3.1 Internal electrical schematic diagram

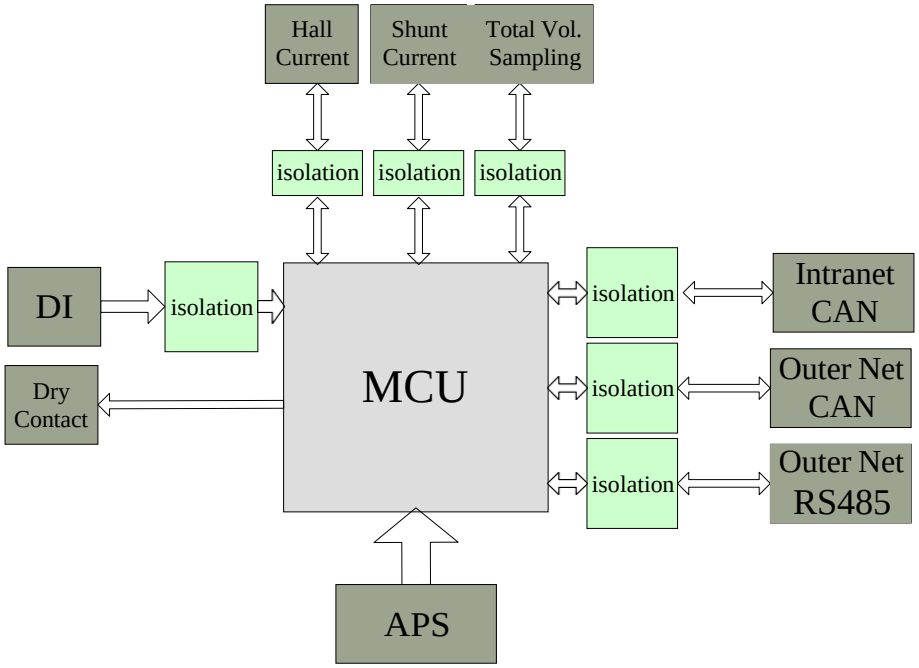

Figure 2 Electrical schematic diagram of PCU

PCU mainly consists of the following parts: auxiliary power supply conversion, MCU and peripheral circuit, real-time clock, total voltage, charge and discharge current acquisition, communication interface (CAN, RS485), digital input (DI), dry contact output and others.

3.2 Main Functions of Products

- Battery Information Management

Real-time acquisition of single battery voltage, temperature, single battery voltage, cluster charge and discharge current, etc.

- DI/DO interface

PCU provides a number of DI and DO interfaces, which can be easily and flexibly docked with the user's background monitoring system.

- Communication function

Provide two isolation CAN communication interface and one isolation RS485 communication interface. It is convenient to exchange information with parallel battery module and user monitoring unit in intranet, and it is safe and reliable.。

- Self-fault diagnosis

With advanced self-fault diagnosis and fault-tolerant technology, the software and hardware of the module can be self-checked.

- Charge/Discharge Management Function

Coordination of charging and discharging of parallel battery modules to improve the circumfluence and bias in clusters.

4、Products parameter

Table1 Parameter

Item		Minimum	Typical	Maximum	Explanation
Source	Voltage	36V	48V	60V	
	Current	40mA	50mA	300mA	
Working temperature		0℃	——	60℃	
Storage temperature		-20℃	——	85℃	
Protection Level		——			IP54
Digital Input		——			Dry Contact
CAN		——	——	——	2 routes, isolation
RS485		——	——	——	3 routes, isolation
Interface		——	——	——	LED
Max support modules		1	——	24	
Size		——			482*88*400
Installation		——			Standard cabinet

5、Interface Description

5.1 Dip Switch

Each PCU has an address. The address configuration of PCU can be achieved by setting dip switches. The dip switches are as follows:：

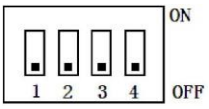

Figure3 Dip Switch Diagram

The corresponding relationship between dip switch and address is shown in the following table:

Table2 The corresponding relationship between dip switch and address

Dip Switch				Address
4	3	2	1	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

Counting mode of dip switch is binary count.In figure above, “1”is the lowest order and “4”is the highest order. “ON”position of each dip switch is “1” and “OFF”position is “0”. Four bit binary can represent 0, 1, 2, ---, 14, 15, altogether 16 addresses.

Notice: If you need to set the management system address to 3, You need to dip 1 and 2 to the “ON ”position(address bit 011) instead of dipping 3 to the “ON ” position.

5.2 LED Introduction

LED sort order: From top to bottom, it is power light (PWR, white - green), alarm light (ALM, red - red), and operation light (RUN, white - green), as shown in the figure below:

Figure4 LED Diagram

- Operating method of LED is shown below：

Table3 LED Operating method

ESCCU State	Protect/Alarm/Normal	RUN	ALM	Description
		●	●	
OFF	——	OFF	OFF	——
Standby	Normal	Flash 1	OFF	——
Charge	Normal	Flash 2	OFF	——
Discharge	Normal	Bright	OFF	——
Charge/Discharge/Standby	Protection	According to the state of charge and discharge at that time	Flash 3	Protection refers to the conventional protection of voltage, temperature, current, etc. of any battery module in the cluster (except for over voltage protection).
Charge/Discharge/Standby	Fault	According to the state of charge and discharge at that time	Flash 2	Fault refers to hardware failure of BMS voltage sampling device, charging MOS damage, temperature sensor disconnection, etc.
Charge/Discharge/Standby	Communication fault	According to the state of charge and discharge at that time	Flash 4	Intranet communication failure refers to failure of communication between ESCCU and parallel battery pack

Note: ALM displaying priority order: fault > protection > Intranet communication fault > Normal

- LED flashing status description

Table4 Definition of LED flashing mode

Flashing Status	Light	Off
Flash 1	0.25S	3.75S
Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S
Flash 4	0.25S	0.25S

6、Dimension and installation

6.1 Dimension Width*Height*Depth：

482mm*88mm*400mm

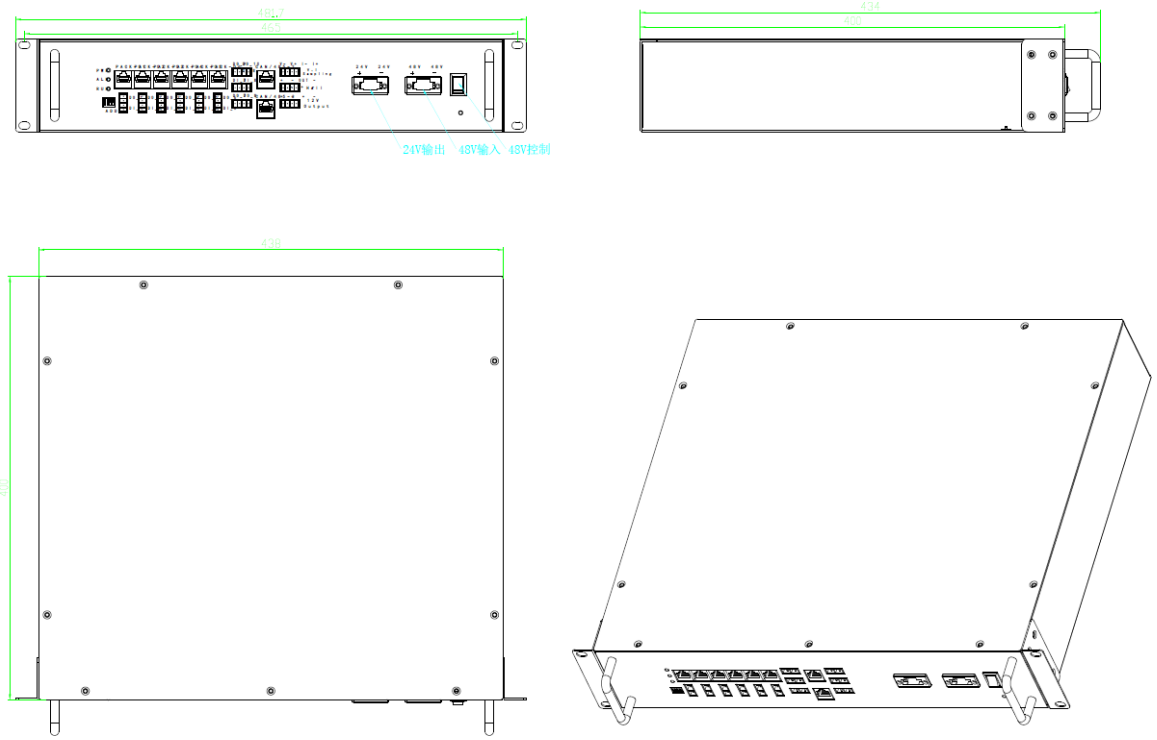

Figure5　PCU outline and installation dimension drawing

6.2 Introduction of interface

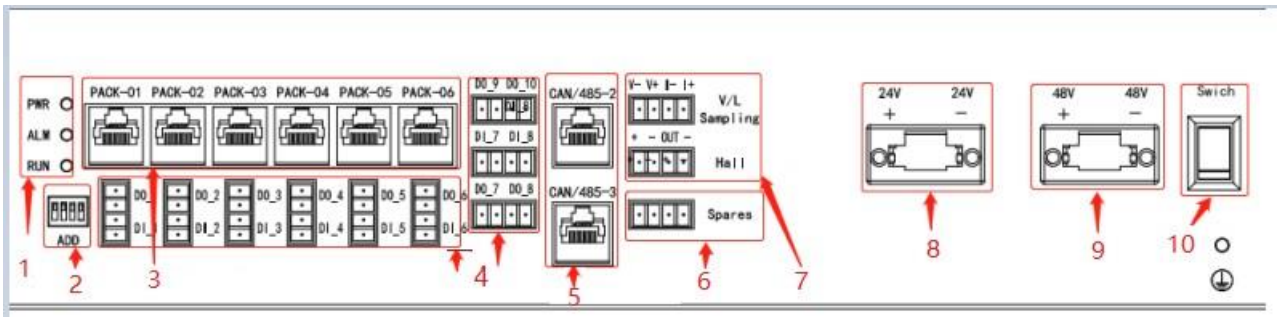

Figure5 PCU front panel interface diagram

Table 5 PCU Interface definition

No.	Function	Interface	Description	Connection	Remark
1	LED	PWR	power light	——	——
		ALM	Alarm light	——	——
		RUN	Operating light	——	——

<table>
<tr><td>2</td><td>Address Switch</td><td>Address Switch</td><td>Dip Switch</td><td>——</td><td>——</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Communication interface of battery</td><td>PACK-01</td><td>Communication interface of battery module</td><td>Connect directly with the battery module RJ45 interface</td><td rowspan="2"> 

PIN5：CAN-L
PIN6：CAN-H
1. There is 120 ohm matching resistance in interior, no need to add extra；
2. RJ45 network cable requirements are parallel lines, do not cross;；</td></tr>
<tr><td>PACK-02~ PACK-06</td><td>Reserved communication interface of battery module</td><td>NC</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Digital signals input and output</td><td>DI-1~DI-8</td><td>Digital signals input interface</td><td>NC</td><td>Dry contact type</td></tr>
<tr><td>DO-1~DO-2</td><td rowspan="2">Digital signals output interface</td><td>Battery alarm output，Normal open type</td><td rowspan="2">Relay output type</td></tr>
<tr><td>DO-3~DO-8</td><td>NC</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">communication interface with External</td><td>CAN with external</td><td>Reserved CAN interface</td><td rowspan="3">NC</td><td rowspan="3">——</td></tr>
<tr><td>485-2 with external</td><td rowspan="2">Reserved RS485 interface</td></tr>
<tr><td>485-3 with external</td></tr>
<tr><td>6</td><td>Reserve</td><td>Spares</td><td>——</td><td>NC</td><td>——</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Analog sampling</td><td>Hall</td><td>Hall sensor interface</td><td>NC</td><td>Reserved</td></tr>
<tr><td>Voltage</td><td>voltage acquisition interface</td><td>NC</td><td>Reserved</td></tr>
<tr><td>Current</td><td>Shunt interface</td><td>NC</td><td>1. The shunt connects with negative output port of battery cluster ;
2. I+ connect with the side near load of shunt, and I- connect with the side near battery of shunt.</td></tr>
<tr><td rowspan="2">8</td><td rowspan="2">24V Power output</td><td>24V +</td><td>24V+Power output</td><td>NC</td><td rowspan="2"></td></tr>
<tr><td>24V -</td><td>24V-Power output</td><td>NC</td></tr>
</table>

9	Power supply terminal	Power supply for PCU	48V+	Connect the 48V dc bus positive pole	——
			48V-	Connect the 48V dc bus negative pole	
10	Power Switch	Switch	PCU Power control switch	——	——

7、List of main Component

Table 6 PCU list of main component

No.	Name	Specification	Unit	Quantity
1	Cabinet (Including terminal row and other auxiliary parts)	Customization	Set	1
2	PCU Main Board	PCU Control Board	Pcs	1
3	Power	Power supply	Pcs	1
4	Interface Board	Terminal panel	Pcs	1
5	wiring harness	wiring harness	Set	1

8、Cautions

- When you use PCU, please pay attention to such things such as anti - static, moisture and waterproof etc.
- The PCU power supply has no reverse connection protection. Do not reverse connect 48V+ with 48V- when using。
- Before installation and usage, the PCU should be stored in accordance with the specified temperature and humidity requirements.
- In the process of transportation, PCU should prevent violent vibration, shock or extrusion and prevent the sun and rain.