

Shenzhen Shiningintl Technology Co., Ltd.

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SHININGINTL DIY Portable Power Station Solution Proposal

Build Your Own Portable Power Station with SHININGINTL Core Components

Version 1.0 |

SHININGINTL | Professional Power Electronics Solutions Provider

Shiningintl

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1. Executive Summary

SHININGINTL presents a complete DIY Portable Power Station solution that empowers customers to build their own high-performance portable power station. By purchasing SHININGINTL's core electronic components and sourcing a standard 48V battery pack and enclosure separately, customers can create a customized portable power solution tailored to their specific needs.

The SHININGINTL DIY Kit includes three essential core components:

- ☐ Bidirectional Inverter Board (2400W / 3600W) - Provides AC output, AC charging, and MPPT solar charging in a single board
- ☐ BMS Board (H120-B) - 16S LiFePO4 Battery Management System with comprehensive protection and RS485 communication
- ☐ Control Panel - User interface with LCD display, USB fast charging ports, DC outputs, and system control buttons

Customers only need to add:

- ☐ 48V 16S LiFePO4 Battery Pack (readily available in the market)
- ☐ Custom Enclosure / Housing (of the customer's choice)
- ☐ Wiring, connectors, and accessories

This modular approach offers maximum flexibility, cost efficiency, and customization options while ensuring professional-grade performance and safety through SHININGINTL's rigorously tested core electronics.

2. System Architecture & Block Diagram

The following block diagram illustrates the system architecture of the DIY Portable Power Station. The system is built around four main functional blocks interconnected to deliver a complete power solution.

2.1 System Block Diagram

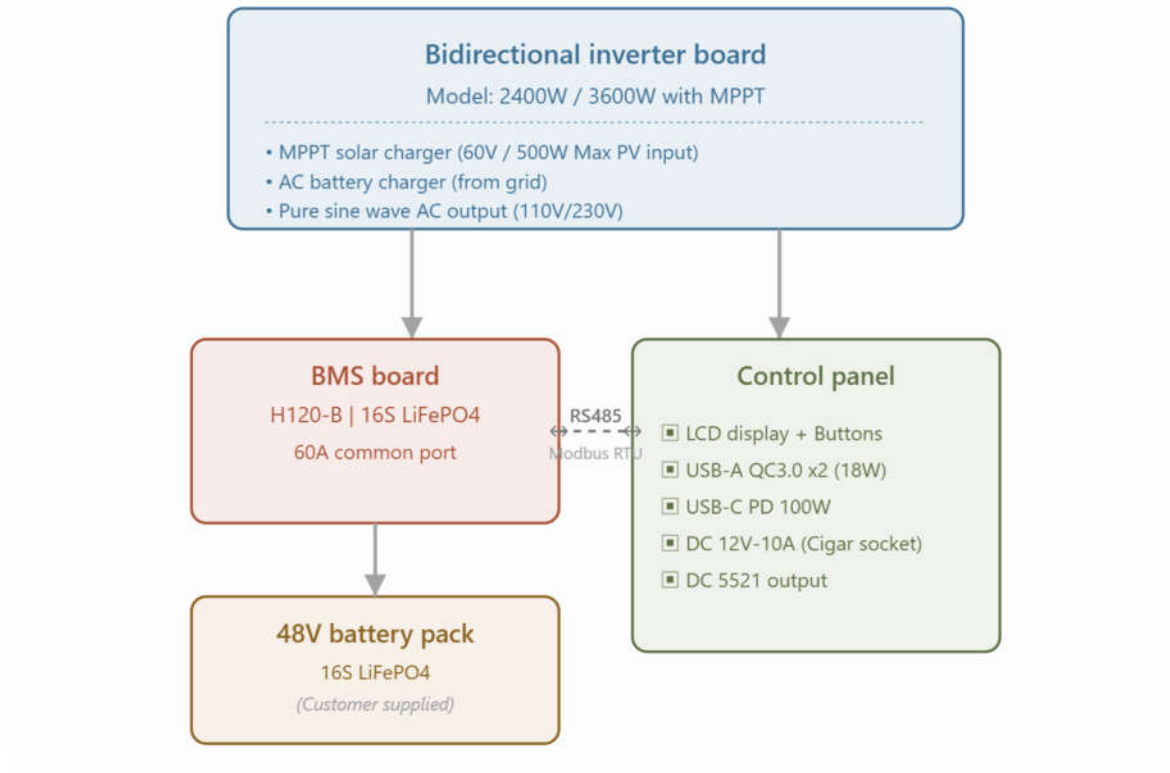


Figure 1: System Block Diagram of SHININGINTL DIY Portable Power Station

3. Core Components

3.1 Bidirectional Inverter Board (2400W / 3600W)

The SHININGINTL Bidirectional Inverter Board is the heart of the portable power station. It integrates three key functions into a single, compact PCB:

- ☐ Pure Sine Wave AC Inverter (2400W or 3600W output)
- ☐ AC Battery Charger (charges battery from grid power)
- ☐ MPPT Solar Charge Controller (maximizes solar energy harvesting)

Key Features:

- ☐ True bidirectional power conversion - single board handles both AC to DC (charging) and DC to AC (inverting)
- ☐ Pure sine wave output suitable for sensitive electronics
- ☐ Built-in MPPT solar charger with 60V maximum PV open-circuit voltage
- ☐ High efficiency power conversion
- ☐ Overload, over-temperature, and short-circuit protection
- ☐ Designed for 48V battery systems (16S LiFePO4)

Inverter Board - Top View:

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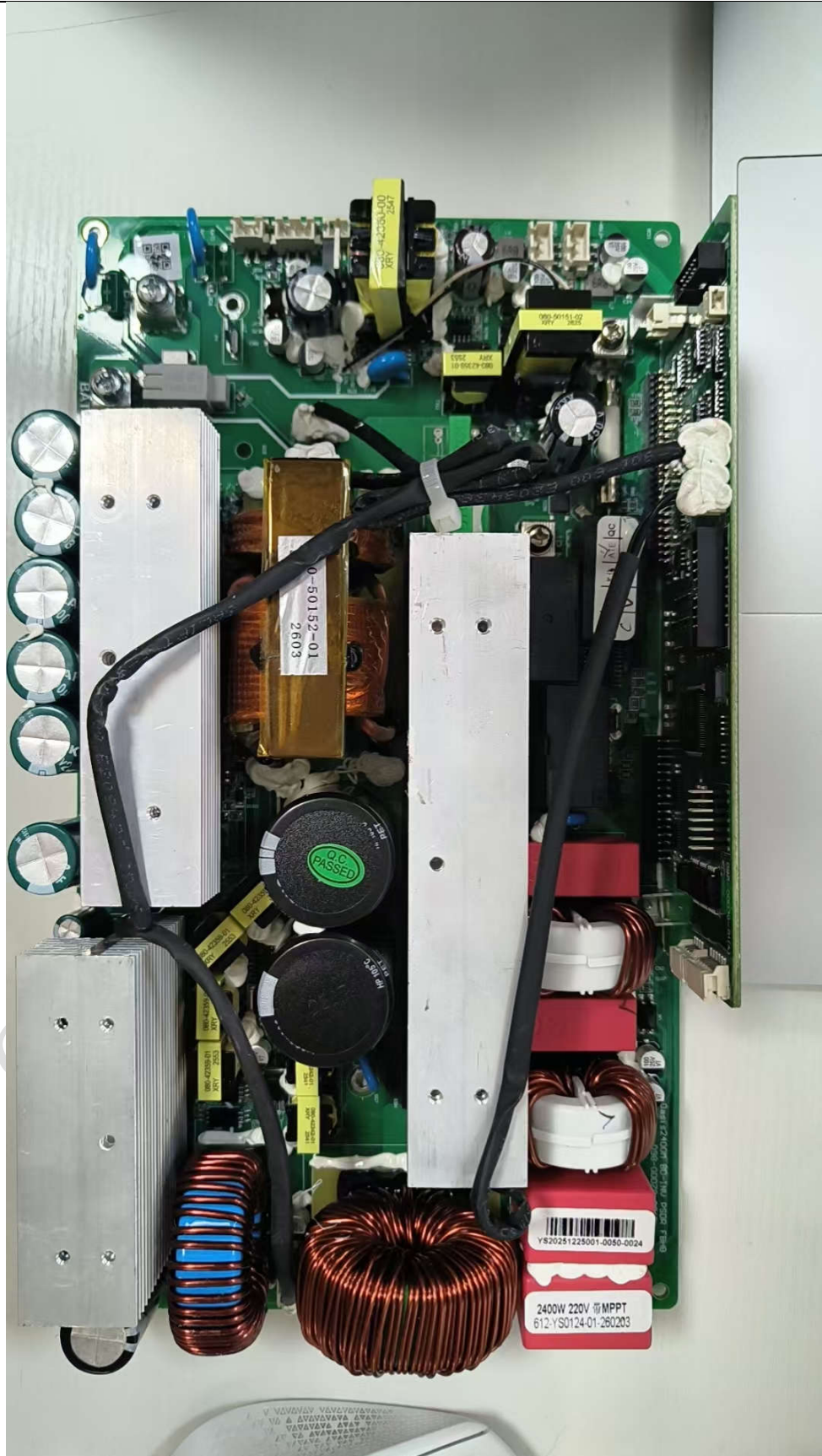


Figure 2: Bidirectional Inverter Board - Top View

Inverter Board - Bottom View:

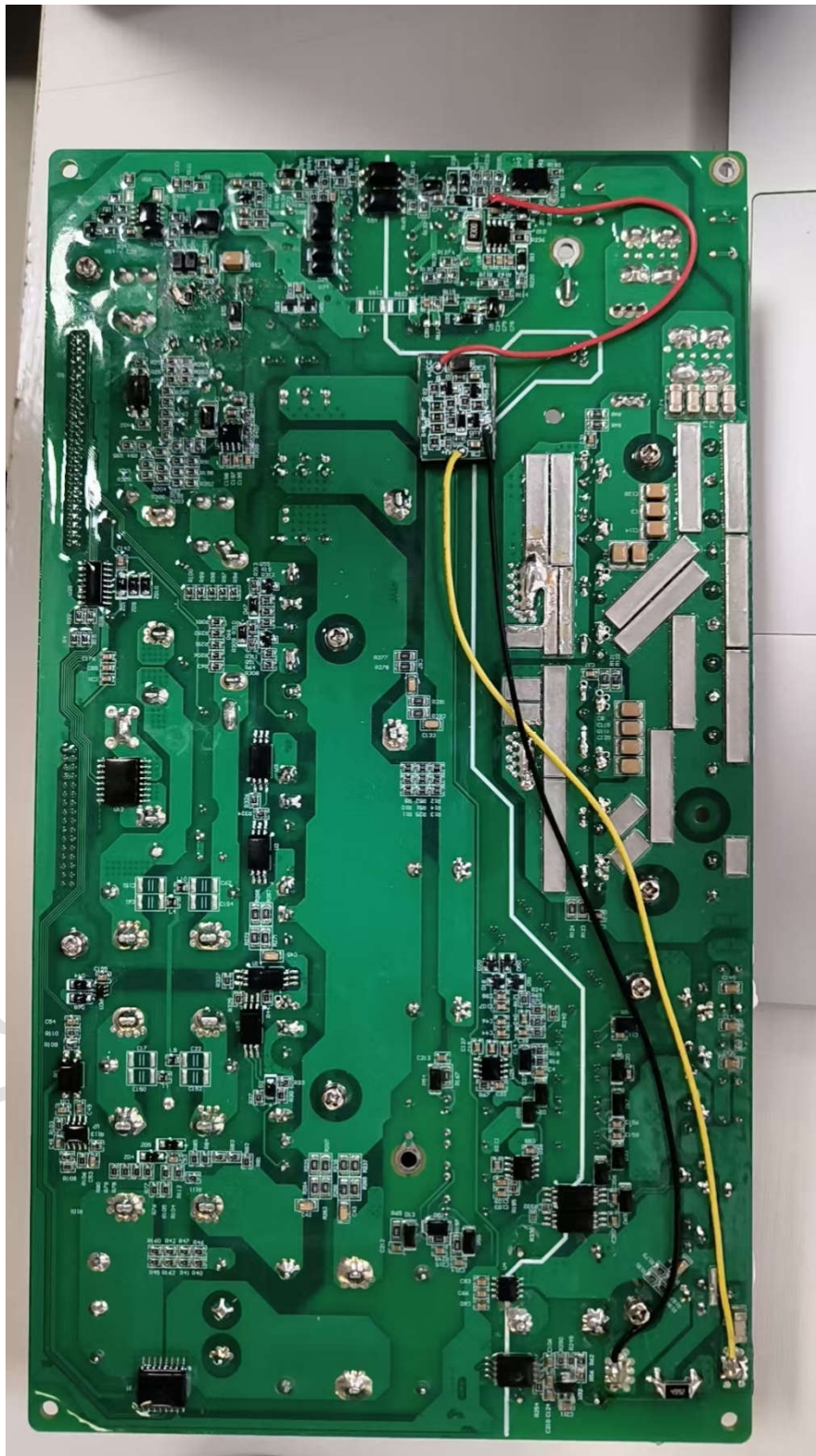


Figure 3: Bidirectional Inverter Board - Bottom View

3.2 BMS Board (H120-B, 16S LiFePO₄, 60A)

The H120-B Battery Management System (BMS) board provides comprehensive protection and monitoring for 16-series LiFePO₄ (Lithium Iron Phosphate) battery packs. It employs a common-port design where charging and discharging share the same power path.

Key Features:

- ☐ Designed for 16S LiFePO₄ battery configuration (48V nominal)
- ☐ 60A continuous charge / discharge current rating (common port)
- ☐ Software-programmable BMS with intelligent monitoring
- ☐ Individual cell voltage monitoring (16 channels)
- ☐ Cell balancing function
- ☐ Multi-point temperature sensing (cell temperature + PCB temperature)
- ☐ RS485 communication interface (Modbus RTU protocol)
- ☐ State of Charge (SOC) and State of Health (SOH) calculation
- ☐ Cycle count tracking

Protection Features:

- ☐ Cell over-voltage / under-voltage protection
- ☐ Pack over-voltage / under-voltage protection
- ☐ Charge over-temperature / low-temperature protection
- ☐ Discharge over-temperature / low-temperature protection
- ☐ Charge over-current protection
- ☐ Discharge over-current protection
- ☐ Short-circuit protection
- ☐ Reverse polarity protection

BMS Board:

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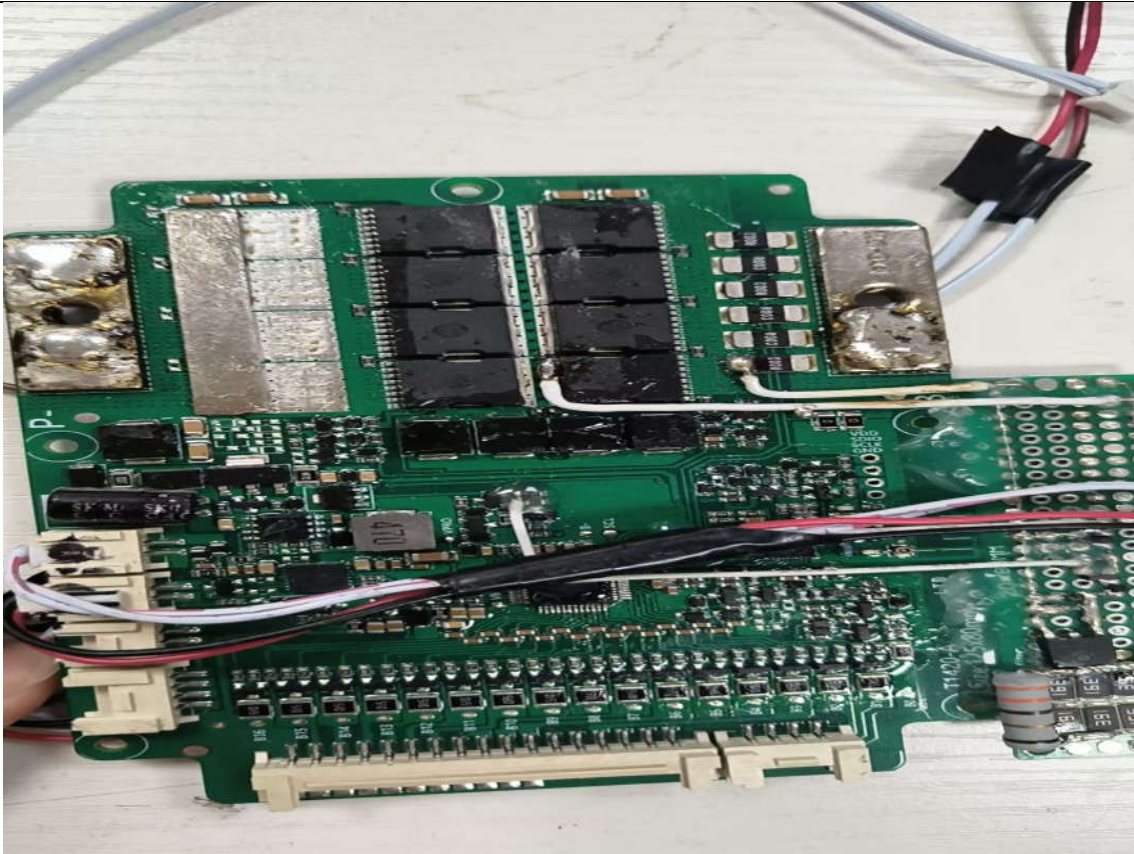


Figure 4: H120-B BMS Board (16S LiFePO4, 60A Common Port)

3.3 Control Panel

The Control Panel serves as the user interface for the portable power station. It features an LCD display for system status monitoring and provides multiple output ports for various devices. The panel communicates with the inverter board and BMS via RS485 to display real-time system information.

Key Features:

- ☐ LCD display showing comprehensive system status
- ☐ 2x USB-A QC3.0 fast charging ports (18W max each)
- ☐ 1x USB-C PD 3.0 port (100W max, supports PPS, PD3.0, PD2.0, QC4+)
- ☐ 1x Cigarette lighter socket (DC 12V - 10A)
- ☐ 2x 5521 DC output jacks (12V - 10A, shared with cigarette lighter circuit)
- ☐ 1x LED light board output
- ☐ 4 control buttons (Light, USB/BMS, DC Output, AC Output)
- ☐ Solar charging interface (connects to inverter MPPT input)
- ☐ 48V battery input (16S, connects to BMS)
- ☐ RS485 communication with BMS and inverter

Display Information:

Display Item	Data Source	Description
Input Power	Inverter & DC Board	Real-time charging power from solar or AC
Output Power	Inverter & DC Board	Real-time output power consumption
Battery Capacity	BMS	State of Charge (SOC) percentage indicator
AC Output Indicator	Inverter Board	AC output on/off status
USB-A Indicator	DC Board	USB Type-A output status
USB-C Indicator	DC Board	USB Type-C output status
DC 12V Indicator	DC Board	Cigarette lighter / 5521 output status
Fault Alarm	BMS & Inverter	Battery or inverter fault indication
High Temp Alarm	Inverter & BMS	High temperature warning
Low Temp Alarm	Inverter & BMS	Low temperature warning
Fan Indicator	Inverter Board	Cooling fan status
PV Input Indicator	Inverter Board	Solar panel input status
Charging Indicator	Inverter Board	Battery charging status
Fault Code	Inverter & BMS	Error code display in power area

Table 1: Control Panel Display Items

Control Panel Board:

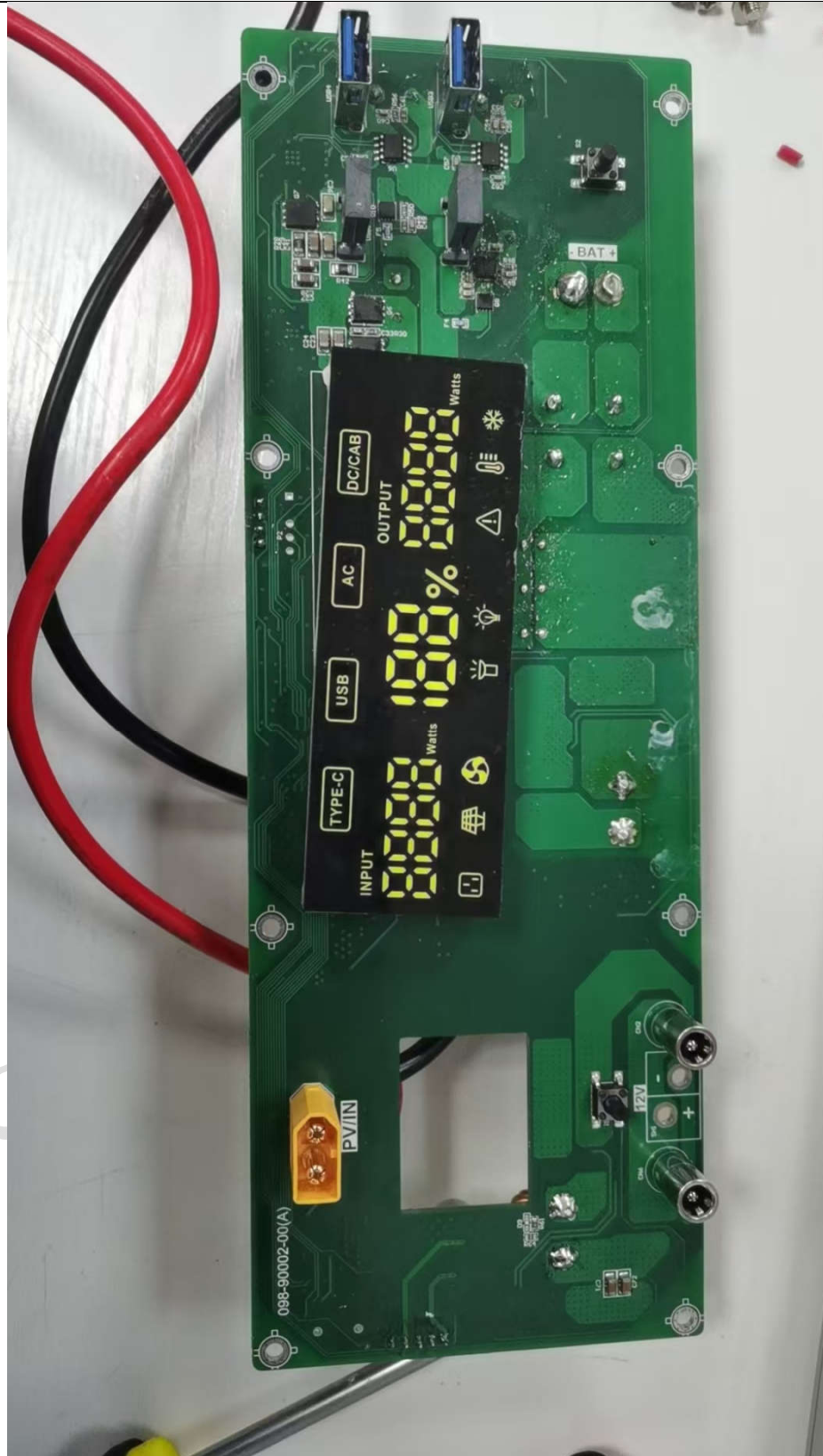


Figure 5: Control Panel / Main Control Board

3.4 48V Battery Pack (Customer-Supplied)

The 48V battery pack is the energy storage component of the system. Customers source this independently, providing flexibility in capacity, brand, and budget. SHININGINTL recommends the following specifications to ensure compatibility and optimal performance:

Recommended Battery Specifications:

- ☐ Chemistry: LiFePO4 (Lithium Iron Phosphate)
- ☐ Configuration: 16 cells in series (16S)
- ☐ Nominal Voltage: 48V DC (51.2V nominal for 16S LiFePO4)
- ☐ Voltage Range: 40V to 58.4V DC
- ☐ Recommended Capacity: 50Ah to 100Ah (approximately 2.5kWh to 5kWh)
- ☐ Must be compatible with external BMS (H120-B) for protection and monitoring
- ☐ Cell balancing wires must be accessible for BMS connection

The battery pack connects to the H120-B BMS board which provides all protection and monitoring functions. The BMS then interfaces with the bidirectional inverter board for charging and discharging control.

4. Technical Specifications

4.1 System Overview

Parameter	Specification
System Topology	Bidirectional Inverter + External BMS + Control Panel + 48V Battery
AC Output Power	2400W or 3600W (model dependent)
AC Output Waveform	Pure Sine Wave
Battery Type	16S LiFePO4 (48V nominal, customer-supplied)
Solar Input	MPPT, 60V max PV open-circuit voltage, 500W rated
Communication	RS485 / Modbus RTU
Cooling	Forced air cooling (temperature-controlled fan)
User Interface	LCD display + 4-button control panel

Table 2: System Overview Specifications

4.2 Bidirectional Inverter Board - MPPT Solar Charging

Parameter	Specification
Maximum PV Open-Circuit Voltage	60V (Max 500W)
PV Working Voltage Range	9.5 - 60V DC
MPPT Voltage Range	9.5 - 60V DC

Battery Voltage Range	40 - 60V DC
Maximum Charging Power	800W
PV Charging Current Range	0 - 20A
Reverse Polarity Protection	Yes

Table 3: MPPT Solar Charging Specifications

4.3 Control Panel - USB-A QC3.0 Ports (2x)

Parameter	Specification
Port Type	USB Type-A
Quantity	2 ports
Supported Protocols	QC3.0, QC2.0, FCP, AFC, BC1.2, Apple 2.4A
5V Output	3.0A (15W)
9V Output	2.0A (18W)
12V Output	1.5A (18W max)
Output Ripple	less than 150mVp-p
Over-Current Protection	Yes, auto-recovery via button
Short-Circuit Protection	Yes, auto-recovery via button
Anti-Backfeed Protection	Yes

Table 4: USB-A QC3.0 Port Specifications

4.4 Control Panel - USB-C PD Port

Parameter	Specification
Port Type	USB Type-C
Quantity	1 port
Supported Protocols	PD 3.0, PPS, PD 2.0, QC4+, AFC, FCP, SCP
Maximum Power	100W (20V / 5A)
5V Output	3.0A
9V Output	3.0A
12V Output	3.0A
15V Output	3.0A
20V Output	5.0A (100W max)
Output Ripple	less than 150mVp-p (5-15V), less than 200mVp-p (20V)
Plug-and-Play	Yes (supports PD protocol devices)
Short-Circuit Protection	Auto-recovery

Table 5: USB-C PD Port Specifications

4.5 Control Panel - DC 12V Output (Cigarette Lighter / 5521)

Parameter	Specification
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Output Type	Cigarette Lighter Socket + 2x 5521 DC Jacks
Output Voltage	12V DC
Maximum Current	10A (shared across all DC outputs)
Short-Circuit Protection	Auto-recovery

Table 6: DC 12V Output Specifications

4.6 BMS Board (H120-B)

Parameter	Specification
Model	H120-B
Battery Chemistry	LiFePO4 (Lithium Iron Phosphate)
Series Configuration	16S (16 cells in series)
Nominal Voltage	48V / 51.2V
Continuous Current	60A (common port - charge and discharge)
Communication	RS485 (Modbus RTU)
Cell Monitoring	16 individual cell voltage channels
Temperature Sensing	Cell temperature + PCB temperature (multiple NTC probes)
SOC / SOH Calculation	Yes
Cell Balancing	Yes (configurable)
Cycle Counter	Yes
Protection Features	Over/under voltage, over current, short circuit, over/low temp, reverse polarity
Baud Rate	9600 bps, 8 data bits, 1 stop bit, no parity

Table 7: H120-B BMS Specifications

5. Communication Protocol (RS485 / Modbus RTU)

The system uses RS485 physical layer with Modbus RTU protocol for communication between the BMS board and the control panel / inverter. This allows real-time monitoring of battery status, system parameters, and fault conditions.

5.1 Physical Layer Parameters

Parameter	Value
Interface	RS485
Baud Rate	9600 bps
Data Bits	8
Stop Bits	1
Parity	None
Device ID	1 (default)

Table 8: RS485 Communication Parameters

5.2 Frame Format

Request Frame: [ID: 1Byte] [CMD: 1Byte] [SAD: 2Bytes] [DLEN: 2Bytes] [CRC: 2Bytes]

Response Frame: [ID: 1Byte] [CMD: 1Byte] [DLEN: 2Bytes] [DATA: nBytes] [CRC: 2Bytes]

The CRC is a 16-bit Modbus CRC calculated over all preceding bytes (ID through DLEN/DATA). MSB-first byte ordering for data fields; CRC is transmitted LSB-first.

5.3 Key Data Registers

Address	Data Name	Unit	Type	Description
0x01	Total Voltage	10mV	UINT16	Battery pack total voltage
0x02	Current	10mA	INT16	Charge/discharge current
0x03-0x04	Remaining Capacity	10mAh	UINT32	Remaining battery capacity
0x05-0x06	Full Charge Capacity	10mAh	UINT32	Full charge capacity
0x07	State of Charge (SOC)	%	UINT16	Battery SOC percentage
0x08	Cycle Count	-	UINT16	Charge/discharge cycle count
0x09	Cell Count	-	UINT16	Number of series cells
0x0A	State of Health (SOH)	%	UINT16	Battery health
0x0B	Protection Flags	-	UINT16	Active protection status (see Table 10)
0x0C	MOSFET Status	-	UINT16	Charge/discharge

				MOSFET state
0x0D	Production Date	-	UINT16	BMS manufacturing date code
0x0E	Firmware Version	-	UINT16	BMS firmware version
0x0F	Balance Flags	-	UINT16	Cell balancing enable status (16 bits)
0x10	BMS Allowed Charge mA Current		INT16	Current charge current limit

Table 9: Key Modbus Registers for System Monitoring

5.4 Protection Flags Register (0x0B) Bit Definitions

Bit	Protection	Description
Bit 0	Cell Over-Voltage	Individual cell voltage exceeds upper limit
Bit 1	Cell Under-Voltage	Individual cell voltage below lower limit
Bit 2	Pack Over-Voltage	Total pack voltage exceeds upper limit
Bit 3	Pack Under-Voltage	Total pack voltage below lower limit
Bit 4	Charge Over-Temp	Charging temperature too high
Bit 5	Charge Low-Temp	Charging temperature too low
Bit 6	Discharge Over-Temp	Discharging temperature too high
Bit 7	Discharge Low-Temp	Discharging temperature too low
Bit 8	Charge Over-Current	Charging current exceeds limit
Bit 9	Discharge Over-Current	Discharging current exceeds limit
Bit 10	Short Circuit	Output short circuit detected
Bit 11	IC Error	Front-end monitoring IC error
Bit 12	Software Lock	MOSFETs locked by software

Table 10: Protection Flags Bit Definitions

6. DIY Assembly Guide

This section provides a high-level guide for assembling the DIY Portable Power Station. Customers with basic electronics knowledge should be able to complete the assembly following these steps.

6.1 Prerequisites

Required SHININGINTL Components:

- ☐ SHININGINTL Bidirectional Inverter Board (2400W or 3600W model)
- ☐ SHININGINTL H120-B BMS Board
- ☐ SHININGINTL Control Panel

Customer-Supplied Items:

- ☐ 48V 16S LiFePO4 Battery Pack
- ☐ Custom enclosure (with adequate ventilation)
- ☐ DC-rated wiring (appropriate gauge for 60A+ current)
- ☐ AC input connector and circuit breaker
- ☐ AC output sockets (compatible with local electrical standard)
- ☐ Solar panel input connector (MC4 or equivalent)
- ☐ Basic tools: screwdrivers, wire strippers, crimping tools, multimeter

6.2 Assembly Steps

Step 1: Prepare the Enclosure

- ☐ Plan component layout with adequate airflow for cooling
- ☐ Drill / cut openings for control panel, AC outlets, input connectors, and ventilation fans
- ☐ Mount component standoffs and brackets

Step 2: Install the Battery Pack

- ☐ Secure the 48V battery pack in the enclosure
- ☐ Connect battery main power cables (positive and negative) to the BMS board
- ☐ Connect cell balance wires (B1 through B16) from each cell to the BMS balance connector
- ☐ Connect temperature sensors (NTC probes) to battery cells

Step 3: Install the BMS Board

- ☐ Mount the H120-B BMS board securely
- ☐ Connect RS485 communication cable from BMS to control panel
- ☐ Connect BMS power output to the inverter board DC input
- ☐ Double-check all connections with a multimeter before proceeding

Step 4: Install the Bidirectional Inverter Board

- ☐ Mount the inverter board with adequate clearance for cooling
- ☐ Connect DC input from BMS/battery to the inverter board
- ☐ Wire AC output to the output sockets / circuit breaker

- ☐ Wire AC charging input from grid input connector
- ☐ Connect solar panel input to MPPT terminals
- ☐ Connect cooling fan to the fan output connector

Step 5: Install the Control Panel

- ☐ Mount the control panel to the enclosure front face
- ☐ Connect RS485 communication cable from BMS
- ☐ Connect all output port wiring (USB, DC, LED light)
- ☐ Connect button / switch wiring

Step 6: Final Connections and Testing

- ☐ Connect system ground / earth wiring
- ☐ Install fuses / circuit breakers as appropriate
- ☐ Perform continuity and isolation checks on all connections
- ☐ Power on system and verify operation via LCD display
- ☐ Test all output ports with appropriate loads
- ☐ Test charging from AC grid and solar panel (if available)

6.3 Important Safety Notes

- ☐ ALWAYS disconnect battery power before working on the system
- ☐ Ensure proper ventilation - the inverter generates significant heat during operation
- ☐ Use properly rated fuses / circuit breakers on all power paths
- ☐ Follow local electrical codes and safety regulations
- ☐ Do not exceed the rated power output of the inverter (2400W / 3600W)
- ☐ Use only LiFePO4 chemistry batteries rated for 16S configuration
- ☐ SHININGINTL is not responsible for damage caused by improper assembly or use of non-approved components
- ☐ Keep the system dry and away from flammable materials during operation

7. Ordering Information

SHININGINTL provides the following core components for the DIY Portable Power Station:

Item	Model / Part Number	Description	Qty Required
Bidirectional Inverter	SHININGINTL-BI-2400W	2400W Bidirectional Inverter with MPPT Solar Charger	1
Bidirectional Inverter	SHININGINTL-BI-3600W	3600W Bidirectional Inverter with MPPT Solar Charger	1
BMS Board	H120-B	16S LiFePO4 BMS, 60A Common Port, RS485	1
Control Panel	SHININGINTL-CP-V1	LCD Display Control Panel with USB/DC Output Ports	1
RS485 Cable Set	SHININGINTL-RS485-CBL	Pre-wired RS485 communication cable set	1 set
Cooling Fan (Optional)	SHININGINTL-FAN-120	120mm Temperature-Controlled Cooling Fan	1-2

Table 11: Ordering Information - SHININGINTL Core Components

Customer to Source Separately:

- ☐ 48V 16S LiFePO4 Battery Pack (recommended capacity: 50Ah to 100Ah, approx. 2.5kWh to 5kWh)
- ☐ Custom enclosure / housing with ventilation
- ☐ AC input connector and circuit breaker
- ☐ AC output sockets (compatible with local standard)
- ☐ Solar panel input connectors (MC4 recommended)
- ☐ DC power wiring and connectors
- ☐ Mounting hardware (standoffs, screws, brackets)

For pricing, minimum order quantities, and lead times, please contact the SHININGINTL sales team.

8. Contact & Support

SHININGINTL is committed to providing excellent technical support and customer service for your DIY Portable Power Station project.

Technical Support:

- ☐ Pre-sales consultation for component selection
- ☐ Assembly guidance and wiring diagrams
- ☐ Troubleshooting assistance
- ☐ Firmware updates and documentation

Documentation Provided with Purchase:

- ☐ Bidirectional Inverter Board Datasheet and Specification
- ☐ H120-B BMS Datasheet and Specification
- ☐ Control Panel Datasheet and Specification
- ☐ RS485 Modbus RTU Communication Protocol Document
- ☐ Wiring Connection Diagram

For inquiries, please contact SHININGINTL:

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