



SDA10 Series Lithium Battery Installation Guidelines

April 24th, 2020

Version 1.0.1





Purpose:

This document describes the SDA10 series lithium-ion battery module in terms of Product Introduction, application scenarios, ports appearance, installation, and commissioning.

Figures provided in this document are for reference only. Original user manual provided by SHOTO will consider as perfect, in any conflict

Symbol Conventions:

The symbols that may be found in this document are defined as follows.

Symbol	Remarks
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
 NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
 NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Outline

1.Safety & Warning

2.Product Introduction

1. Applications & Advantages
2. Product Features
3. Dimension & Capacity
4. Front Panel Appearance
5. Front Panel Layout & Details
6. LED Indicator Description
7. Instruction for ADD DIP Switch

3.Transportation & Storage Instruction

1. Transportation Instruction
2. Storage Instruction

4.Installation & Commissioning

1. Unboxing
 1. Unboxing the Wooden Box
 2. Unboxing the Paper Carton
 3. Unboxing Battery Module
 4. Check Battery PACK Status
2. MOP for New Battery Installation
 1. Install Battery PACK in Rack/Cabinet Slot
 1. Battery PACK Insert Tips
 2. Prepare for Battery PACK Cable Connection
 3. Install Battery Pack Grounding Cable
 4. Dry Output Alarm Cable Connection
 5. Data Communication Cable connection & DIP Switch Check
 6. Battery Temperature Sensor Installation

Outline

7. Battery Power Cable Connection Layout (1~3PACK)
 1. Battery Power Cable Connection Layout (4++ PACK)
8. PACK Terminal to Cabinet Busbar Power Cable Connection
 1. PACK Parallel Connection Procedure
 2. PACK Parallel Connection Inspection
9. Cabinet Busbar to PSU Power Cable Connection
3. Battery Commissioning
 1. Setup Battery Settings Parameters on PSU
 2. Check Alarm & Event Log Parameters on PSU
 3. Battery Power-ON
- 5. Installation Checklist**
- 6. Battery Charge/Discharge**
 1. Charging Instruction
 2. Discharging Instruction

1

Safety & Warning



SDA10 series battery PACK installation, operation & maintenance should be as per important recommendations of this guideline;

- Battery must be installed by the professional trained manpower.
- Maintenance should be carried out by the experienced professionals and aware of the preventive measures on the potential harm of the battery.
- Be care of the risk of electric shock for large current in case of battery short circuit, pay attention to the following points during installation, operation & maintenance;
 - Remove watches, rings or other metal objects
 - Use tools with insulated handles
 - Do not place tools or metal objects on the battery
- Do not connect battery PACK with grid power directly.
- Use DC Power system to connect battery PACK with load equipment or charging battery.
- Do not put the battery system into fire, do not use or storage the battery near to the high temperature source.
- Do not use liquid or other objects placed into the battery system.
- Do not open or cut the battery, not hit, throw or step on the battery.
- Make sure power system's controlling parameters as per battery user manual and supporting documents.
- During load shedding or grid power switch-off battery PACK terminal still voltage is available, so avoid electric shock or short circuit when operation.
- Please check the battery PACK's physical condition before installation. if damaged, please immediately notify supplier.
- Do not force to over discharge during storage or operational state.

2

Product Introduction

□ 2.1 Applications & Advantages

SDA10 series is Lithium Iron Phosphate (LiFePO₄) battery product for backup Energy Storage System (ESS). Built-in 48VDC intelligent Battery Management System (BMS) which can manage and monitor important operational status. Also support for remote centralize monitoring (RMS)

Applications

- Network Telecommunication Facilities
- OSP
- Terminal of FTTX
- Access Network System
- Indoor Distribution System
- Telecom BTS
- Integrated Outdoor Power Cabinet
- UPS
- Internet Data Center (IDC)
- PV Solar Energy
- Common Bonding Network (CBN) and or Isolated Bonding Network (IBN)

Advantages

- High energy density: more energy with less weight and dimension
- High charge and discharge currents (reduce charging duration)
- Long battery life(up to 3 times longer than conventional battery)
- High efficiency between charging and discharging
- Higher continual power available
- Wide operating temperature range
- Predictable end of life due BMS controller
- Multiple anti-theft solutions (optional): software, gyroscope, material, etc.
- Other functions (optional): Heating/Cooling/LCD/Dry Contact

□ 2.2 Product Features

- Shoto SDA10 series battery is Lithium Iron Phosphate (LiFePO_4). Where Anode is graphite and cathode is Lithium Iron Phosphate. Short form of this battery is also called LFP or Li-phosphate
- As per customer demand Shoto have different capacity battery for telecom, IDC, UPS, Solar and others application base.
- For telecom application, standard 19" rack size
- SDA10 series battery contain built-in BMS device, with various features like,
 - Anti-theft Feature
 - ✓ Gyroscope
 - ✓ GPS
 - ✓ Operation Timeout
 - ✓ Communication
 - Communication & Realtime Data Transfer
 - ✓ Web IP
 - ✓ SNMP (TCP/IPv4)
 - ✓ Modbus-RTU
 - ✓ YD/T1363.1
 - Realtime Alarming Feature
 - ✓ Dry contact output

2.3 Dimension & Capacity

Model	Voltage (V)	Capacity (Ah)	Dimension (mm)	Weight (kg)	Remark
SDA10-4810	48	10	442×44×240	7.8	1U, module design, support parallel connection
SDA10-4820	48	20	442×88×300	13.8	2U, module design, support parallel connection
SDA10-4830	48	30	442×133×300	20.0	3U, module design, support parallel connection
SDA10-4840	48	40	442×177×300	24.0	4U, module design, support parallel connection
SDA10-4850	48	50	442×133×380	25.5	3U, module design, support parallel connection
	48	50	442×133×480	26.5	3U, module design, support parallel connection
SDA10-4875	48	75	442×133×400	35.0	3U, module design, support parallel connection
SDA10-48100	48	100	442×177×400	45.4	4U, module design, support parallel connection
SDA10-48150	48	150	442×191×580	65.7	4.3U, module design, support parallel connection



Table-1: Dimension & Capacity

2.4 Front Panel Appearance

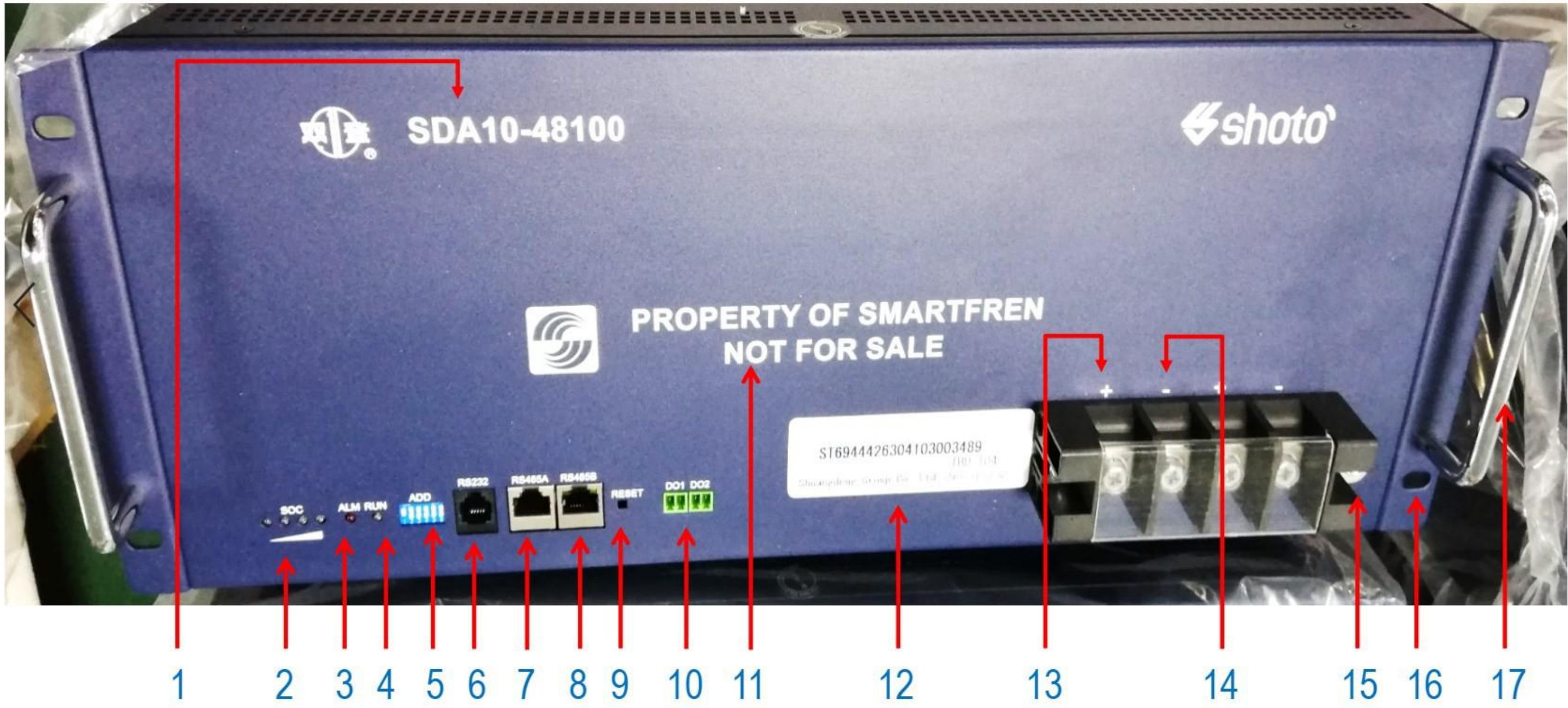



Table-2: Layout for SD10 series battery PACK designed for SMARTFREN Indonesia
As per customer demand, front panel parts will vary

2.5 Front Panel Layout & Details

Tag No.	Marks	Functions	Detailed information
1	SDA10-48100	Product Model Number	Product model number indication PACK nominal voltage and rated capacity
2	SOC	Indicators for capacity	Definition of SOC is state of charge, there are 4 numbers of green color LED in the front panel to indicate the real-time SOC. Each LED light present 25% of PACK rated capacity.
3	ALM	Indicator for alarms	Alarm indicator LED is red color and details information in Table-3
4	RUN	Indicator for running status	RUN indicator is green color and detailed information in Table-3
5	ADD	Dip switch address of communication	ADD applicable for multiple module connection in parallel and it consists of six binary bits. Detailed information in Table-4
6	RS232	communication port	RS232 communication port used for single PACK access during maintenance process
7	RS485A	communication port	In case of multiple numbers of battery PACK connect in parallel, need to use RS485A port for PACK to PACK data
8	RS485B	communication port	RS485B is a LAN port supported TCP/IPv4 SNMP data transfer protocol in remote monitoring system and on-site maintenance
9	RESET	Reset button	Only accessible during critical operational state of battery PACK and must be agreed by supplier's technical team. In general, do not press the button.
10	DO	Dry contact output ports	There are 2 numbers of Dry Contact Output ports as state of Normally Closed circuit (NC). During battery PACK operation, if BMS face any critical alarm, protection then circuit will open.
11	Label	PACK label	PACK label is containing PACK Identity number and EX-Work date
12	Customer Branding	Remark proposed by customer	Customer brand's logo and warning message proposed by customer
13	+	Positive terminal	2 sets of power connection terminal of battery PACK. Containing 2 positive (+) & 2 negative (-) terminal.
14	-	negative terminal	
15		Grounding terminal	Connect earth by flexible cable above green sheathed, UL94-V0. Gauge of the grounding cable should be equal or greater than the gauge of the battery power cable (which is maximum).
16	Side mounting	PACK fixing bar	Side mounting bar is used to wall-hanging and fix with cabinet or rack slot.
17	Handle	Handle	The handle is used to push and pull the battery easily from battery cabinet or rack. Not recommended to use handle to hanging the battery PACK

2.6 LED Indicator Description

Battery operational status as per LED light state,

System Status	Operation Status	RUN	ALM	SOC				Remark
		●	◎	●	●	●	●	
Shutdown	Dormancy	OFF	OFF	OFF	OFF	OFF	OFF	All are OFF
Standby	Normal	Flash 1 times	OFF	OFF	OFF	OFF	OFF	[Flash 1 times = Blinking interval 4 seconds]
	Alarm	Flash 3 times	Flash 3 times	OFF	OFF	OFF	OFF	[Flash 3 times = Blinking interval 2 seconds]
Charge	Normal	ON	OFF	Indicate real-time PACK capacity				SOC: Capacity gained LED will ON → Active LED will flash 2 times → Pending LED will OFF. [Flash 2 time = Blinking interval 1 second]
	Over Voltage Protection	ON	OFF	ON	ON	ON	ON	RUN LED will ON @ Power online & will OFF @ Power offline (if connected with PSU)
	Over Current Protection	OFF	ON	OFF	OFF	OFF	OFF	Stop charging and force to sleep mode if no discharge within 24 hours [got way to solve]
Discharge	Normal	Flash 3 times	OFF	Indicate real-time PACK capacity				SOC: Remaining capacity LED will ON & drained capacity LED will OFF (No blinking)
	Alarm	Flash 3 times	Flash 3 times	Indicate real-time PACK capacity				SOC: Remaining capacity LED will ON & drained capacity LED will OFF (No blinking)
	Over Current, Short Circuit, Reverse Connection Protection	OFF	ON	OFF	OFF	OFF	OFF	Stop charging /discharging and force to sleep mode, if no rectify the fault within 24 hours
	Low Voltage Protection	OFF	OFF	OFF	OFF	OFF	OFF	Stop Discharging
Temperatuer	Normal	Normal state as per operation status						-----
	Alarm During Charging	ON	Flash 3 times	Indicate real-time PACK capacity				SOC: Capacity gained LED will ON → Active LED will flash 2 times → Pending LED will OFF. [Flash 2 time = Blinking interval 1 second]
	Alarm During Discharging	Flash 3 times	Flash 3 times	Indicate real-time PACK capacity				SOC: Remaining capacity LED will ON & drained capacity LED will OFF (No blinking)
	Protection	OFF	ON	OFF	OFF	OFF	OFF	Stop charging /discharging and force to sleep mode, if no rectify the fault within 24 hours

Table-3: LED Indicator Description

2.7 Instruction for ADD Dip Switch

There are 6 number of switch in Dip ADD board, and normally use 4 switch to complete 4 bit binary digits, which indicate communication address number

PACK Number	Real Binary Digits	ADD Dip Switch				PACK Switch Position
		1	2	3	4	
Default	0000	OFF	OFF	OFF	OFF	0000
PACK 1	0001	ON	OFF	OFF	OFF	1000
PACK 2	0010	OFF	ON	OFF	OFF	0100
PACK 3	0011	ON	ON	OFF	OFF	1100
PACK 4	0100	OFF	OFF	ON	OFF	0010
PACK 5	0101	ON	OFF	ON	OFF	1010
PACK 6	0110	OFF	ON	ON	OFF	0110
PACK 7	0111	ON	ON	ON	OFF	1110
PACK 8	1000	OFF	OFF	OFF	ON	0001
PACK 9	1001	ON	OFF	OFF	ON	1001
PACK 10	1010	OFF	ON	OFF	ON	0101
PACK 11	1011	ON	ON	OFF	ON	1101
PACK 12	1100	OFF	OFF	ON	ON	0011
PACK 13	1101	ON	OFF	ON	ON	1011
PACK 14	1110	OFF	ON	ON	ON	0111
PACK 15	1111	ON	ON	ON	ON	1111

Table-4: Instruction for ADD Dip Switch

3

Transportation & Storage Instruction

3.1 Transportation Instruction

- 1) The battery pack is suitable for transportation methods such as cars, trains, and airplanes, but it should be protected from sunlight, rain, and severe vibration during transportation.
- 2) The battery pack has been packed with insulation and shockproof materials, and the label is marked with fragile words, to avoid damage to the battery pack caused by bumps on the way.
- 3) The battery pack must be handled and put gently in the process of transportation, loading and unloading, and should not be thrown at will to avoid collision.
- 4) During transportation, do not press heavy objects on the battery pack to avoid damage to the battery pack caused by squeeze.
- 5) Do not mix transport with flammable, explosive and sharp metal objects.
- 6) It should be handled and put gently to prevent the device from being subjected to severe vibrations, and it is forbidden to invert, roll, fall or bump the battery, to avoid damaging the appearance of the battery.
- 7) The battery should avoid exposure to sunlight and rain, and it is forbidden to directly submerge the battery into the water;
- 8) Do not mix the battery with metal objects to avoid the metal objects touching the positive and negative terminals of the terminal, causing a short circuit, damaging the battery and even causing danger.
- 9) During transportation SDA10 battery PACK must packed in carton with original packing standard. As factory packing with side pad (EPS Cork Sheet) and plastic bag
- 10) Always place the battery PACK Top side Up during transportation and storage

3.2 Storage Instruction

Once product reached to customer's final destined warehouse, we recommend to install on earlier basis. Because storing of battery product need to maintain additional care with charging facility, which is a matter of power consumption. In case of store we recommend to maintain below points,

- 1) Recommended storage temperature 0 °C to 35°C
- 2) Storage temperature range -20°C to 60°C, exceeded to recommendation value will cause performance degradation
- 3) Storage battery should be at 50% to 80% SOC
- 4) Storage environment humidity $\leq 95\%RH$, excessive humidity may cause serious self-discharge or terminal oxidation rust
- 5) Fully recharge battery before using on site, to recovery capacity lose during storage & transportation because of self-discharging
- 6) In case of long term storage plan, must follow below procedure to recharge and maintain environment;
 - A. Recharging procedure
 - Charge battery up to 100% SOC with 0.2C charging current
 - Discharge up to 0% SOC with 0.2C discharging current
 - Recharge with 0.2C charging current for 4 hours
 - B. Temperature & duration criteria
 - 0°C to 25°C @ 3 months interval
 - 25°C to 35°C @ 1 months interval
- 7) Store battery in clean, dry & well ventilated place with low temperature
- 8) Avoid direct sunlight, contact with corrosive substances or organic solvents (including gas contact)
- 9) Distance from heat source (heating equipment, etc.) $\geq 2m$
- 10) Storage period up to 12 months, must need to conduct a capacity test process to check battery SOH (State Of Health)
- 11) Note that, battery performance will degraded for long-term storage, so please shorten the duration as much as possible.

4

Installation & Commissioning

Safety Precautions For Installation Process

❑ General Safety Precautions:

- Over-voltages or wrong wiring can damage the battery pack
- Avoid installing the battery pack where flammable materials are stored.
- Be sure to be grounded before handling the battery pack.
- Battery wiring must be carried out by a qualified personnel.

❑ Battery Handling Guide:

- Do not expose battery to open flame.
- Do not place near water sources like dropping or leakage and store at cool and dry place.
- Store the product on a flat surface and out of reach of children and animals.
- Do not step on the product or the product package. The product may be damaged.
- Handle the battery wearing the insulated gloves.
- Do not connect positive and negative terminal in opposite direction.
- Battery beaker or fuse on PSU must be switched OFF before connect or disconnect process of battery pack.
- Do not disconnect, disassemble or repair by unqualified personnel. Services must be made by qualified personnel only.

❑ Operational Environment:

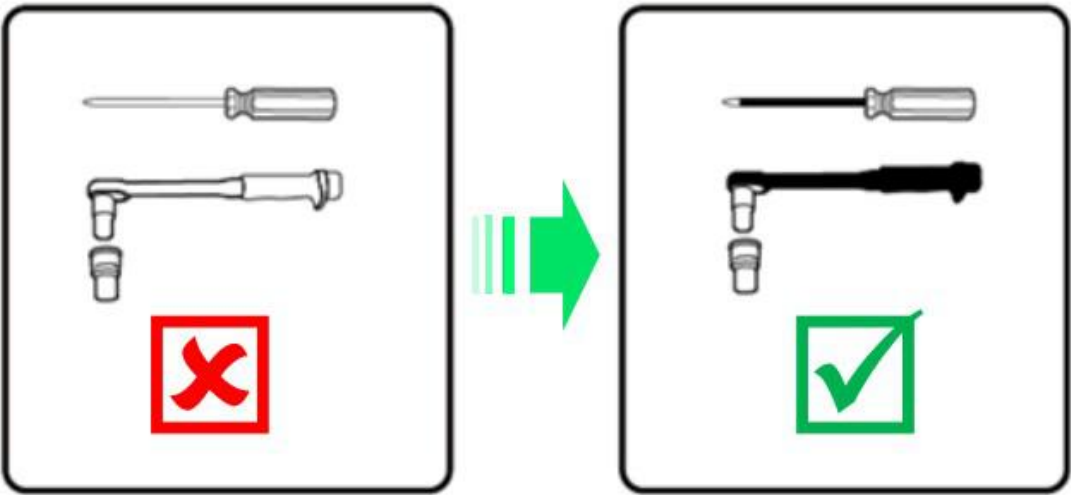
- Recommended ambient temperature: $+15^{\circ}\text{C} \sim +35^{\circ}\text{C}$
- Ambient temperature range: $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$;
- Relative humidity: $5\% \sim 95\%\text{RH}$;
- Altitude: no more than 4000m;
- Locations without conductive dust and corrosive gas.
- It is forbidden to mix and use batteries with different nominal capacities and different types
- Please install and use the battery strictly in accordance as per the User Manual supplied with battery carton.

General Requirements of Installation tools:

The following figure is for reference only

CAUTION

- Use insulated tools. Unless a serious injury may occurs



RPIT00001

 Paper knife	 Phillips screwdriver	 Flathead screwdriver	 Adjustable torque wrench
 Heat shrink tubing	 Torque spanner	 Diagonal plier	 Power cable cutting pliers
 Power cable crimping tool	 Network cable pliers	 Hydraulic pliers	 Wire clippers
 Clamp meter	 Hot air gun	 5m Long measuring tape	 Protective gloves
 Black Color PVC Tape	 Red Color PVC Tape	 Punch Down Tool	

Table-5: Tools List

4.1 **Unboxing**

□ 4.1.1 Unboxing The Wooden Box:

- Remove the wooden cover from top and beside edge.
- Be careful during removing the wooden cover, to cut or damage the paper carton
- Do not cut the carton's tape before bring it down



RPSDA10IG2004001



RPSDA10IG2004002

4.1.2 Unboxing The Paper Carton:

- Cut the packing tape and open the carton.
- Pull out other items. Take them out and check if any item is missing.
Common items list;
 - 1) User Manual
 - 2) Power Cable
 - 3) Fixing Screw sets (4 pcs mounting screw with nut & one GND screw)
 - 4) Qualification Certificate
 - 5) Packing List

NOTICE

- Battery module must need to carried inside paper carton with supporting EPS Cork Sheet & plastic bag, as it is packed from factory. Do not carry the naked battery module during transportation.



RPSDA10IG2004003



User Manual



Power Cable



Fixing Screw



Qualification Cert.



Packing List

4.1.3 Unboxing Battery Module:

1. Place the carton with battery in front of the rack/cabinet
2. Remove the side pad (EPS Cork Sheet) of both edge
3. Hold by 2 numbers of people to take out the battery and remove the poly bag
4. Check the PACK's accessory are available as below list;
 - I. Dry contact output port's plug @ 2 pcs
 - II. Terminal insulation cover
 - III. Terminal screw 4 pcs

(i) DO plugs

(ii) Terminal cover (iii) Terminal screw



RPSDA10IG2004005



RPSDA10IG2004004

4.1.4 Check Battery PACK Status:

- Make battery PACK is not physically damaged including power cable terminal, communication ports, Dip Switch, LED indicators, DO ports, etc.
- Check the RUN, ALM & SOC LED all are OFF state
- Measure battery terminal voltage by multimeter and the reading value will be 36VDC ~ 38VDC. Both terminal group will show same value.
- Record open circuit voltage reading, DO status & PACK ID number on installation checklist form
- If the voltage reading is about 0.00VDC or mV, then contact with supplier's support team and follow next instruction.
- Also check the Dry Contact Output port (with buzzer function), at this condition both DO will be open circuit (Once the PACK alive, circuit will close).
- Close back the terminal cover to avoid any electric short circuit
- May setup the DIP switch as per communication serial number

WARNING

- Do not install the battery if it is physically damaged or found any abnormal symptom.

NOTICE

- Do not push the RESET button at any step, normally not required to push the RESET button during installation and maintenance process. Expect any critical fault occur, must be informed by supplier's technical team before push the button.



4.2 MOP for New Battery Installation

❑ 4.2.1 Insert Battery PACK in Rack or Cabinet Slot:

1. Hold by 2 numbers of people to insert the battery PACK in to the slot.
2. Tighten the fixing screw [M6 @ 4pcs] with rack and battery side mounting ear (Shown in Table-2, Part number 16)



NOTE

- Install the Battery PACKs from the bottom to up.



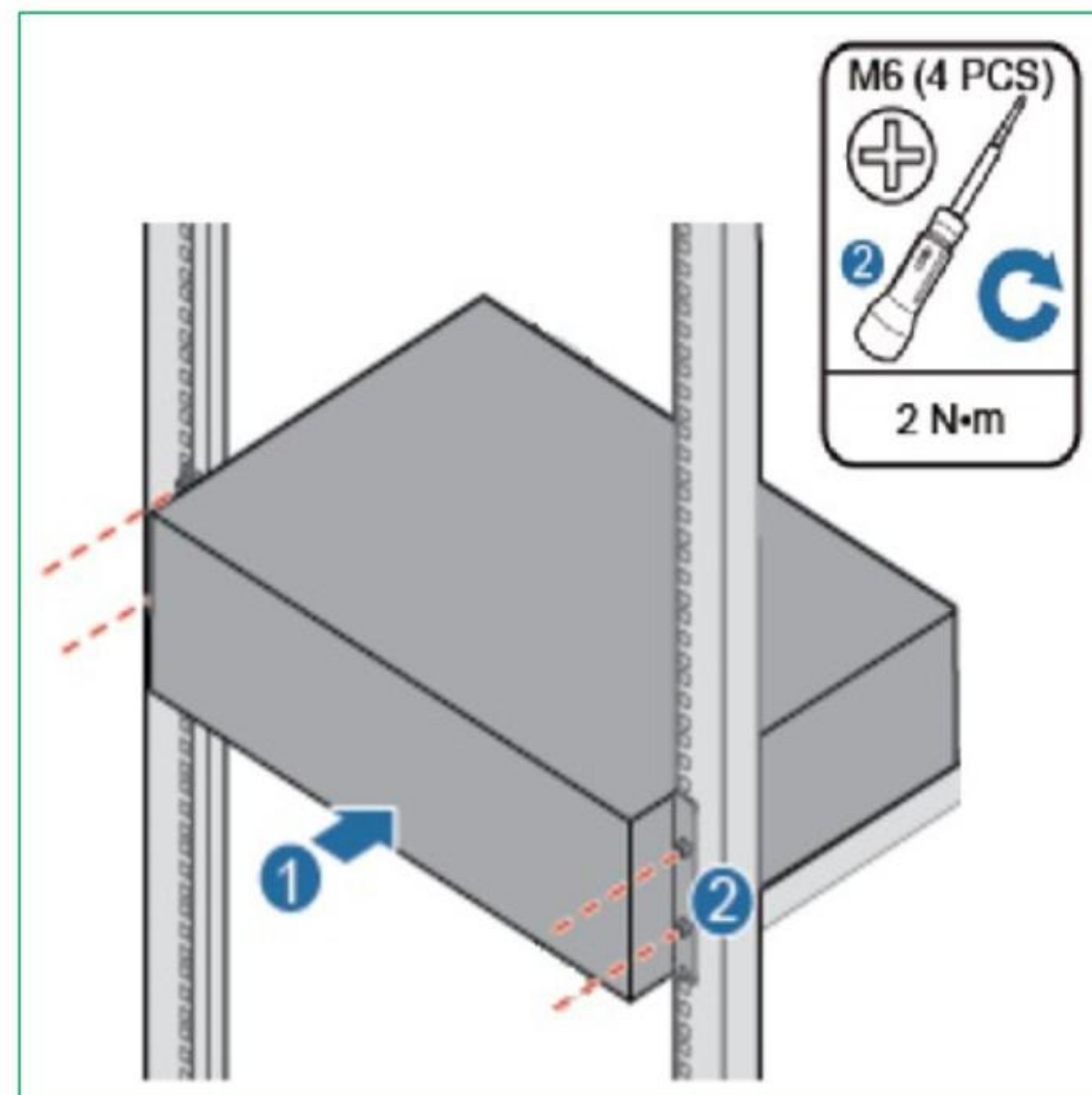
CAUTION

- Switch OFF the battery breaker of the PSU and attach the label "**Currently being serviced. Do not switch on**"



NOTICE

- Always keep close the terminal cover.
- Confirm Rack/Cabinet's grounding cable is connected with earthing bar
- The SDA10-48100 weighs about 45 kg. Check the loading capability of the rack tray before installation.
- The SDA10-48100 is 400 mm deep. Check the depth of the rack before installation.
- Battery PACK cannot be directly stacked, vertically placed, or laid on one side.



RPSDA10IG2004007

❑ 4.2.1.1 Battery PACK Insert Tips:

- PACK DIP serial number 01 will be placed as master pack, next up side is PACK 02 and rest of the PACK will insert in order.
- Better to maintain the PACK ID number's sequence matching with DIP serial number.
- Make sure minimum gap between 2 battery PACK (UP & DOWN) as 5cm for air circulation.



4.2.2 Prepare for Battery PACK Cable Connection:

- 1. Check battery power cable length, from rack/cabinet's busbar to PACK's terminal
- 2. Insulate only one-edge of all the power cable (Positive & Negative) lugs with PVC Tape as respective color code (Temporary use only)
- 3. Prepare GND cable with proper cable lugs and cable length from PACK to PACK distance.
- 4. Get ready 2-pair STP (Shielded Twisted-pair) Alarm Cable for Dry Contact Output connection according to the distance of DI module.
- 5. Prepare CAT. 6 RJ45 Ethernet Patch Cord/cable for multiple battery PACK data transmission

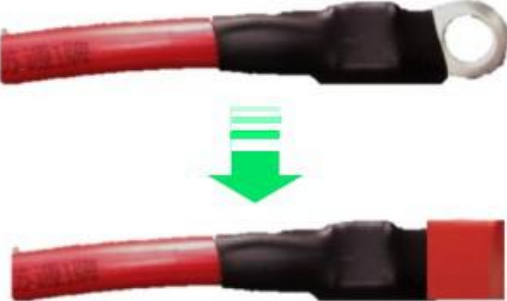

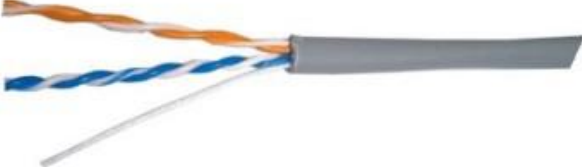

2	3	4	5
			

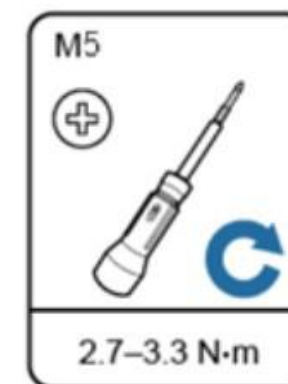
Table-7: Require Cable List

❑ 4.2.3 Install Battery PACK Grounding Cable:

- 1) Wear the protective gloves
- 2) Connect Grounding cable to the rack/cabinet GND bar first, then connect with PACK number-1 front panel's GND port.
- 3) Next connect the short jumper GND cable with PACK-1 & PACK-2 and complete gradually

⚠ CAUTION

- Must connect GND cable first, before connecting PACK's power cable or other cables
- All the PACKs must be connected with GND bar, partial connection not allowed
- Cable lugs need to be insulated by heat shrink tube



RPSDA10IG2004009

4.2.4 Dry Output Alarm Cable Connection:

- Each PACK individual connection
 1. Check available port quantity for Dry Contact Input signal, if sufficient for individual connection,
 2. Connect each PACK & each Dry Output individually with alarm input module
- Connect multiple numbers of PACK in Series connection
 1. Check available port quantity for Dry Contact Input signal, if not sufficient for individual connection,
 2. Make a internal series connection with all PACKs as shown in the “RPSDA10IG2004010”
 3. Connect first PACK DO1 blank port & last PACK DO1 blank port to DI port
 4. Connect first PACK DO2 blank port & last PACK DO2 blank port to DI port



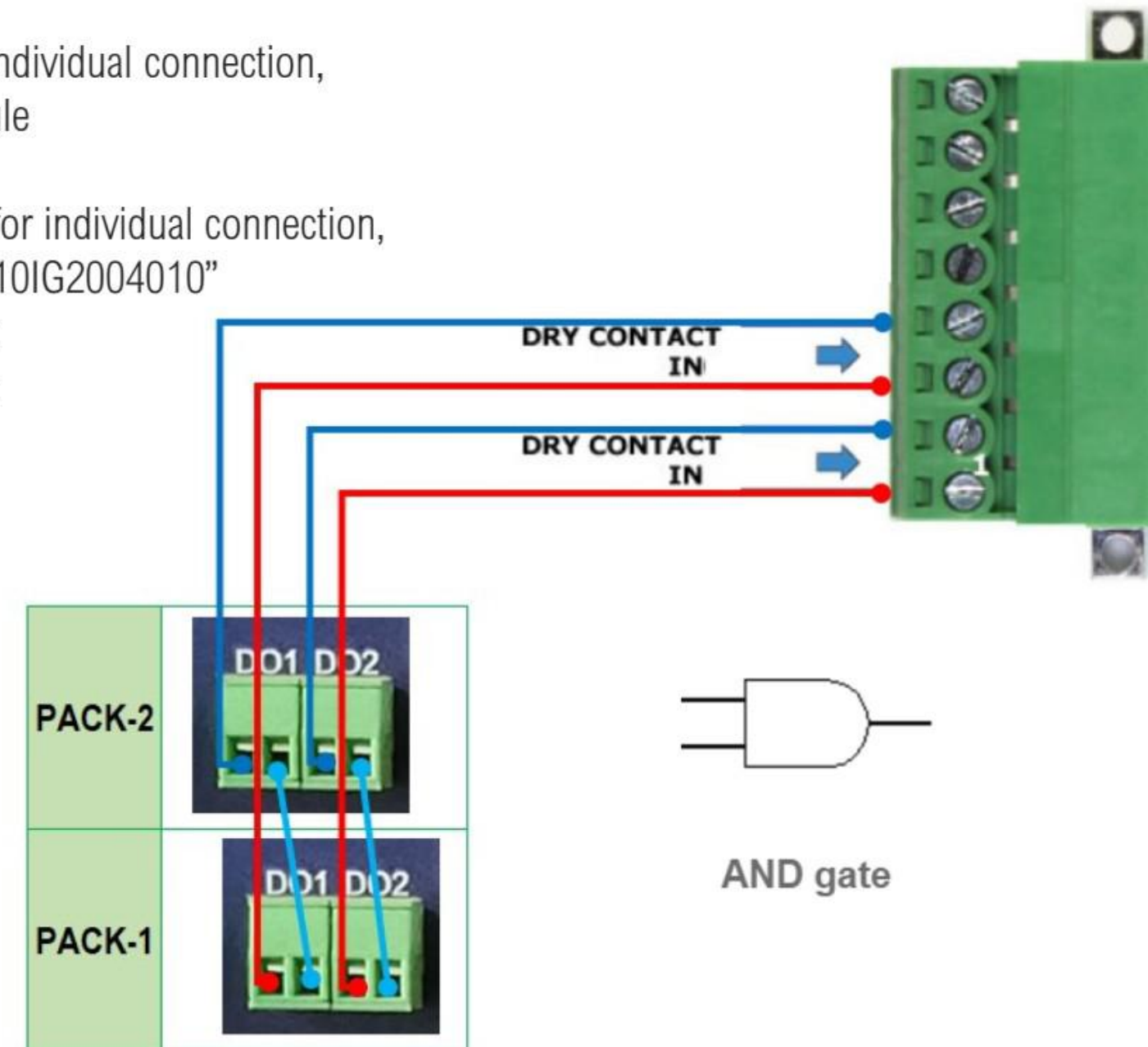
NOTE

- working principle of DOs in series connection is like as AND logic gate,
 - a) When all the PACKs is Closed Circuit then output will be Closed
 - b) If any of the PACK is Open Circuit, the output will be Open
 - c) If all is Open, then output is Open
- Multiple PACK in series connection will generate alarm as AND logic gate working principle



NOTICE

- Do not connect battery PACK's Dry Contacts Output with any Wet Contacts Input, Dry Output must connect with Dry Input.



4.2.5 Data Communications Cable Connection & DIP Switch check:


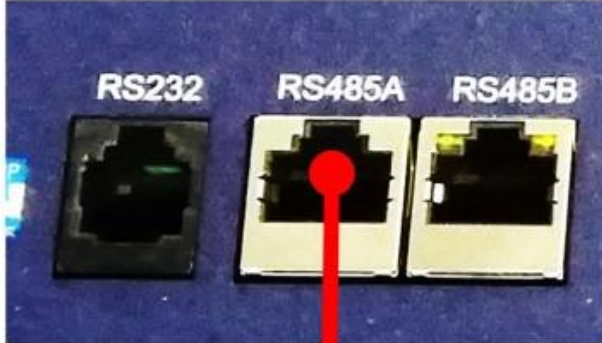

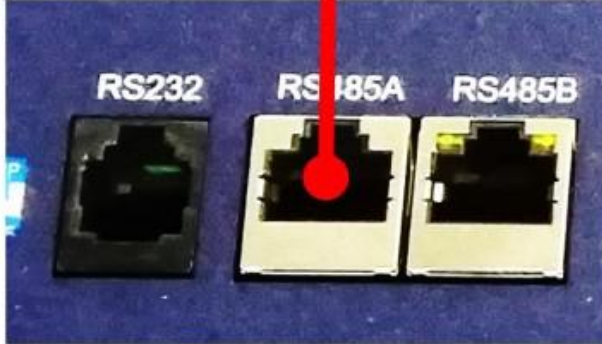
- 1) Check DIP switch settings  and do correction if needed
[\(Initial DIP switch setup\)](#)
- 2) Connect data communications cable with PACK-1 #RS485A & PACK-2 # RS485A

NOTE

- For Single Battery PACK Data Communication cable is not required
- Only for multiple numbers of Battery PACK parallel connection need to connect Data cable
- Check more information for [DIP Switch settings](#)

NOTICE

- Use STP CAT. 6 RJ45 Ethernet Patch Cord/cable to connect data communication cable for both line, RS485 and LAN connection.
- Do not connect with RS485A & RS485B by same piece of cable for inter-Pack communication

PACK SL	DIP Switch	Data Cable
PACK-2		
PACK-1		

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MOP for New Battery Installation

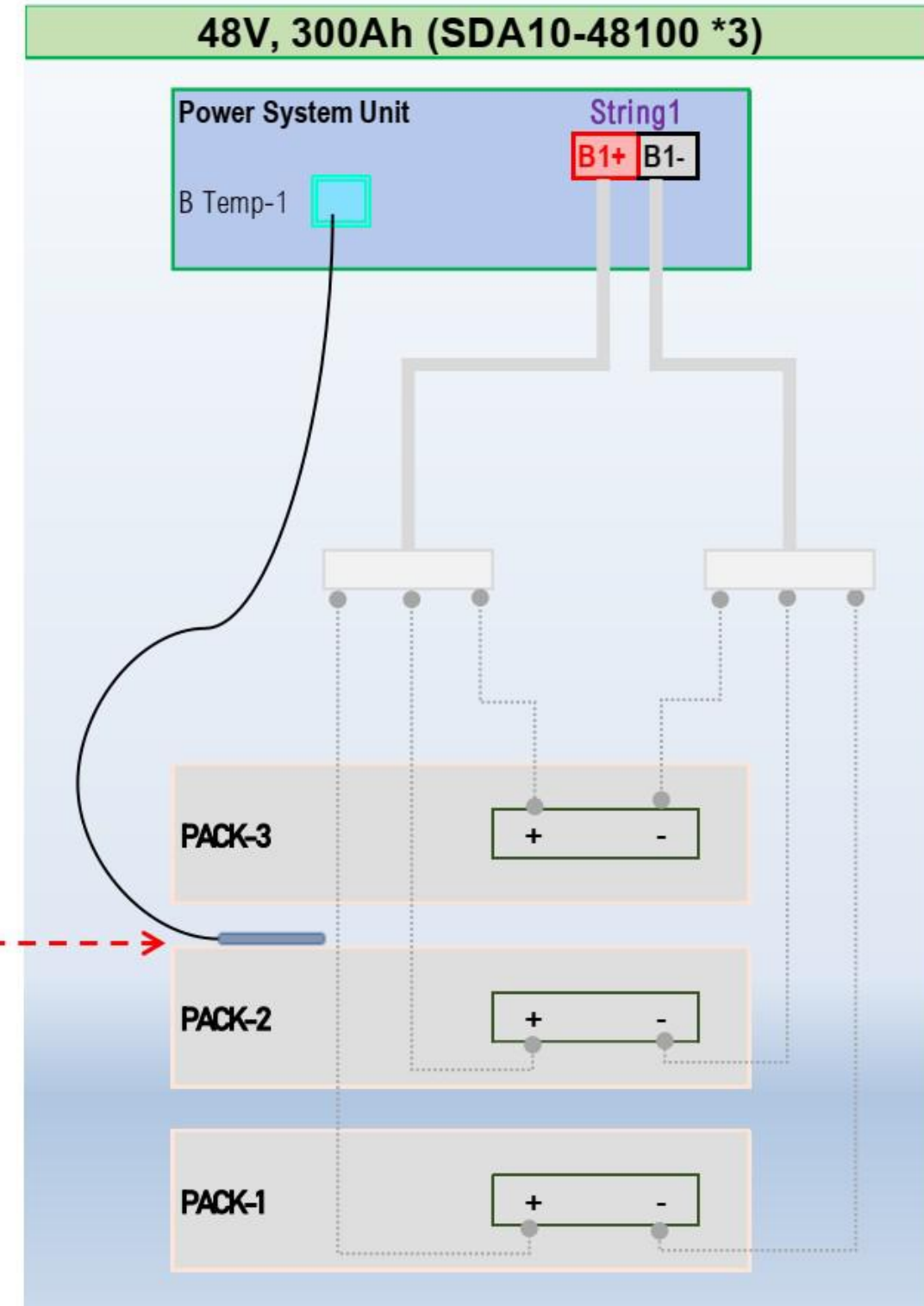
4.2.6 Battery Temperature Sensor Installation:

- 1) Pick the battery temperature sensor from PSU and check is it functional or not. If not functional then rectify.
- 2) Place the NTC sensor in between top pair of battery PACK and stick with the battery cover.
- 3) Make proper lacing to protect from falling down the sensor from battery surface

NOTICE

- Do not install ambient temperature sensor or any other sensor on battery surface.
- Confirm the functionality of the sensor is accurate.
- If PSU got multiple numbers of battery temperature sensor, in such case must install battery-1 sensor with string-1 and battery-2 with sting-2.

NTC Temperature Sensor



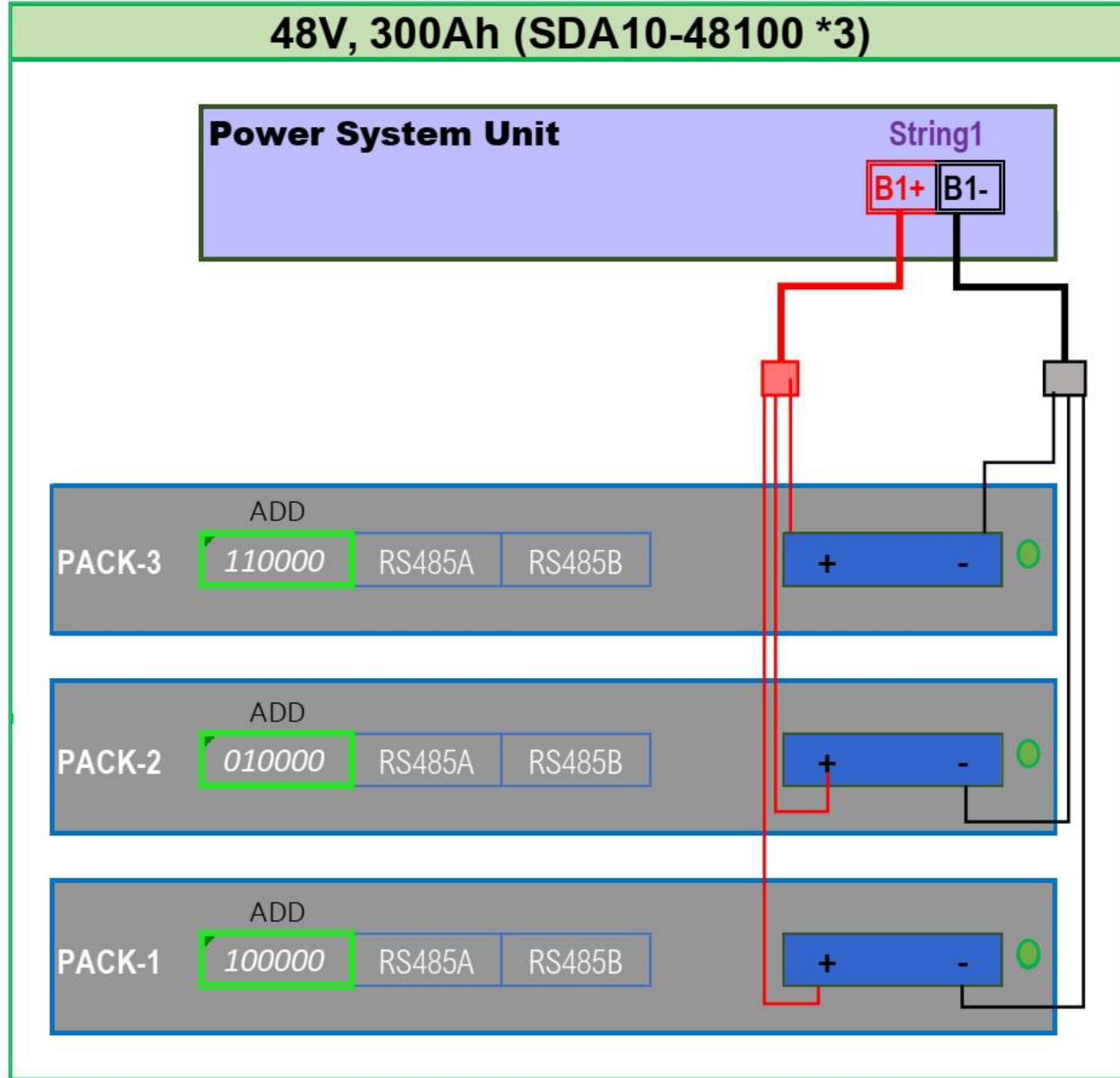
4.2.7 Battery Power Cable Connection Layout:

⚠ CAUTION

- Switch OFF the battery breaker of the PSU and attach the label "**Currently being serviced. Do not switch on**"

📖 NOTE

- Installation of 2 numbers of battery PACK with a single PSU can connect as ONE or TWO string but incase of 3 PACKs must connect in single string
- Single string will be applicable up to 3 numbers of battery PACK connect with a single PSU



MOP for New Battery Installation

4.2.7.1 Battery Power Cable Connection Layout:



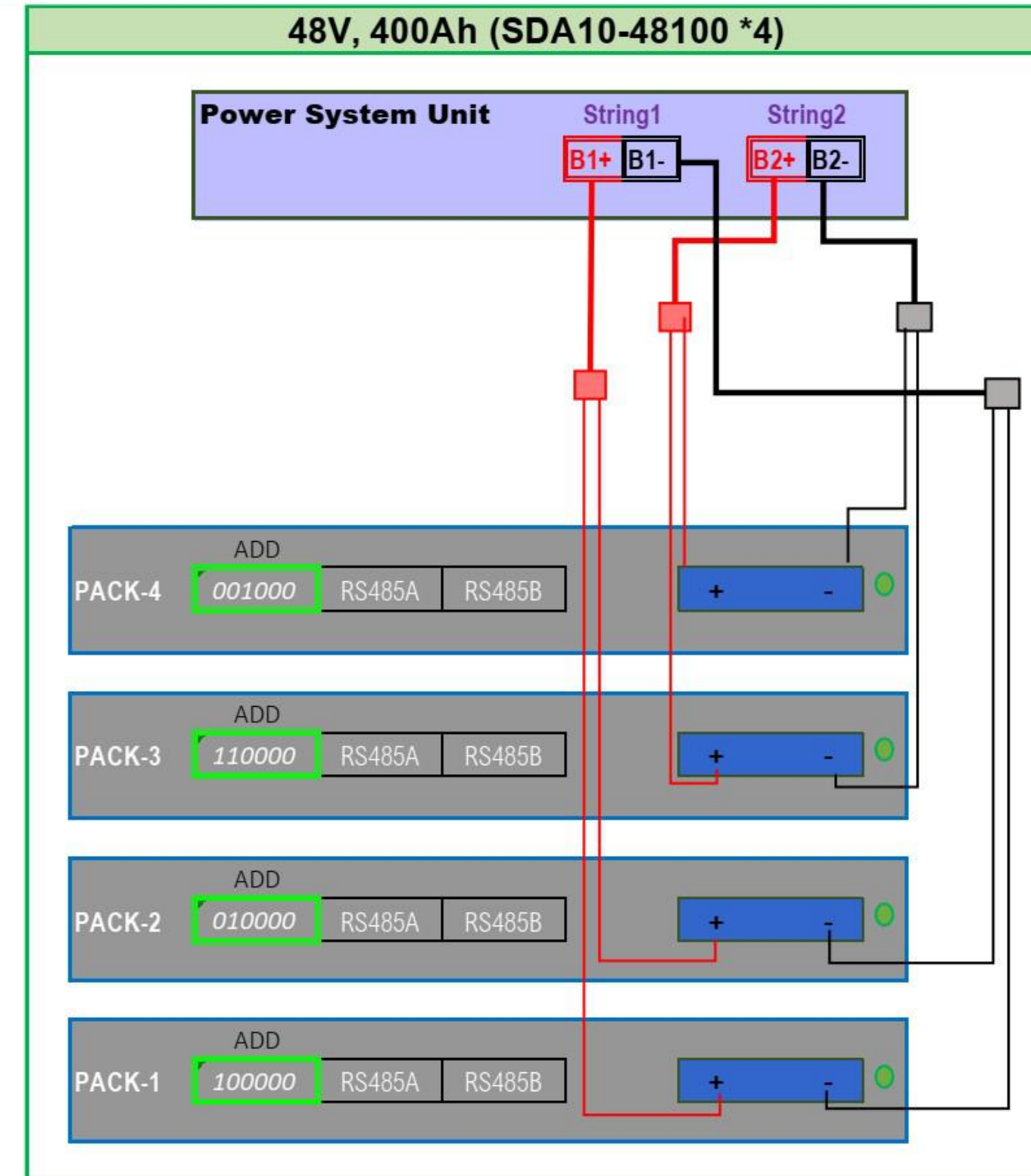
NOTE

- In case of installation of 4 or higher quantity of battery PACK with single PSU, need to separate as ODD number & EVEN number group.
- Odd number group must install as single string and Even number group install in 2 string.
- If any power system got 3 or 4 numbers of battery breaker or fuse, then could be connect by 3 or 4 string but number of battery PACK per string must be same in quantity.
- String serial number need to match with the battery PACK's sequence order.
Example- PACK-1 & PACK-2 connect with **String-1**, PACK-3 & PACK-4 connect with **String-2** (Reference @ RPSDA10IG2004014)



NOTICE

- In case of Multiple string connection, total rated capacity of each string must be equal.



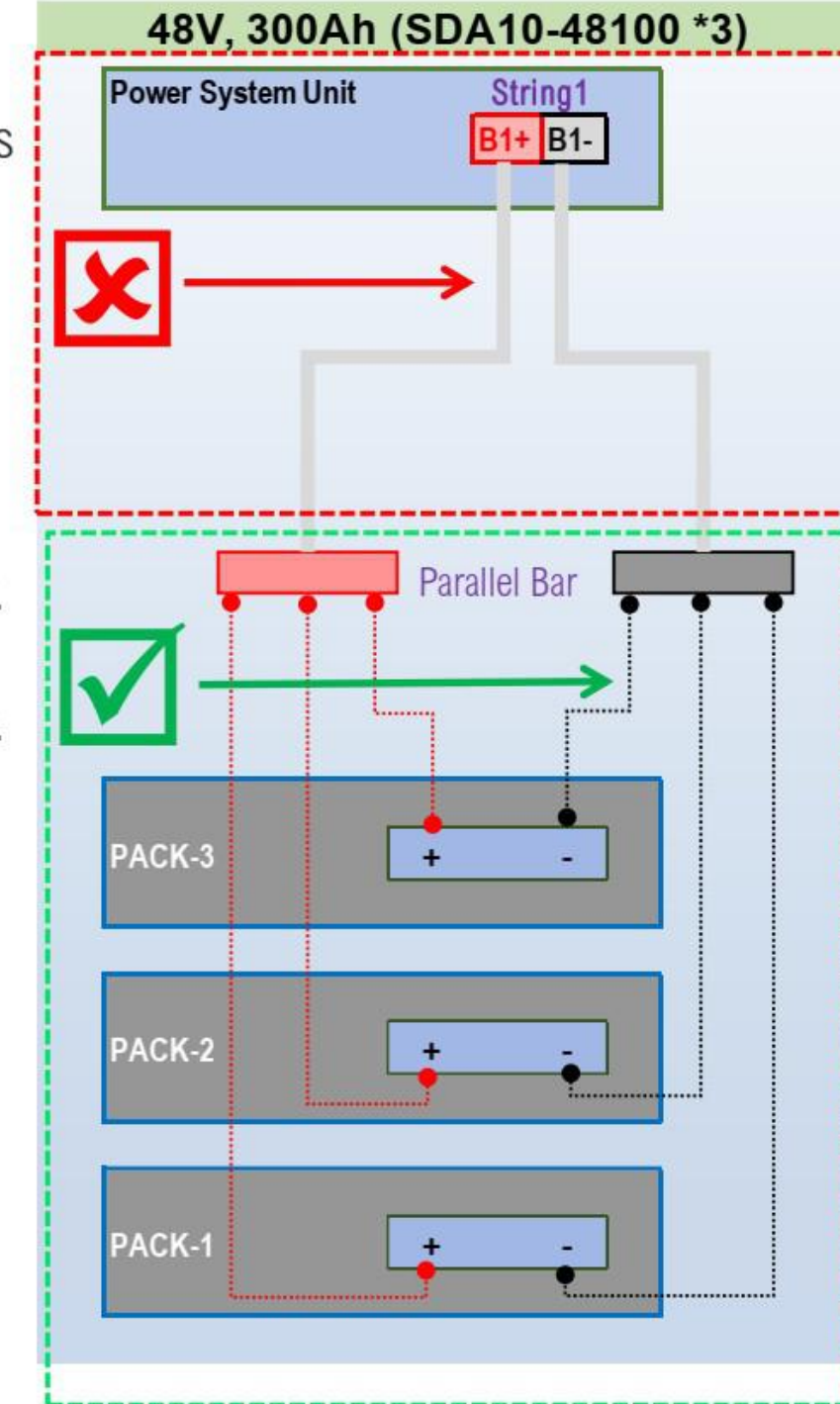
MOP for New Battery Installation

4.2.8 PACK Terminal to Cabinet Busbar Power Cable Connection:

- Make sure one edge of each power cable is insulated by PVC tape accordingly [\(said on step 4.2.3 #2\)](#). Then connect as per below sequence step;
- If the power cable already connected from PSU to battery parallel busbar, then must disconnect or switch OFF the breaker/fuse
 - Open the protective cover of battery PACK's terminal of all the batters and put at a safe place.
 - Pick one piece **BLACK** colour power cable, select the Non-Insulated edge and connect to PACK-1 **Negative** terminal.
 - Open the insulation PVC tape from the other edge of the power cable and connect with rack/cabinet's **Negative** busbar.
 - Pick next piece **BLACK** colour power cable, select the Non-Insulated edge and connect to PACK-2 **Negative** terminal.
 - Open the insulation PVC tape from the other edge of the power cable and connect with rack/cabinet's **Negative** busbar.
 - Follow the process for remaining battery PACKs
 - Pick one piece **RED** colour power cable, select the Non-Insulated edge and connect to PACK-1 **Positive** terminal.
 - Open the insulation PVC tape from the other edge of the power cable and connect with rack/cabinet's **Positive** busbar.
 - Pick next piece **RED** colour power cable, select the Non-Insulated edge and connect to PACK-2 **Positive** terminal.
 - Open the insulation PVC tape from the other edge of the power cable and connect with rack/cabinet's **Positive** busbar.
 - Follow the process for remaining battery PACKs

NOTICE


- In this stage do not connect the power cable from PSU to Cabinet busbar (parallel bar), only connect all the PACKs to the rack/cabinet's busbar (parallel bar)
- Connect Negative line first then connect Positive line



RPSDA10IG2004015

- Must follow the procedure showed in “**RPSDA10IG2004016**” as the respective sequence order
- Connect PACK terminal side first then connect Cabinet busbar side and Negative line first then positive line.





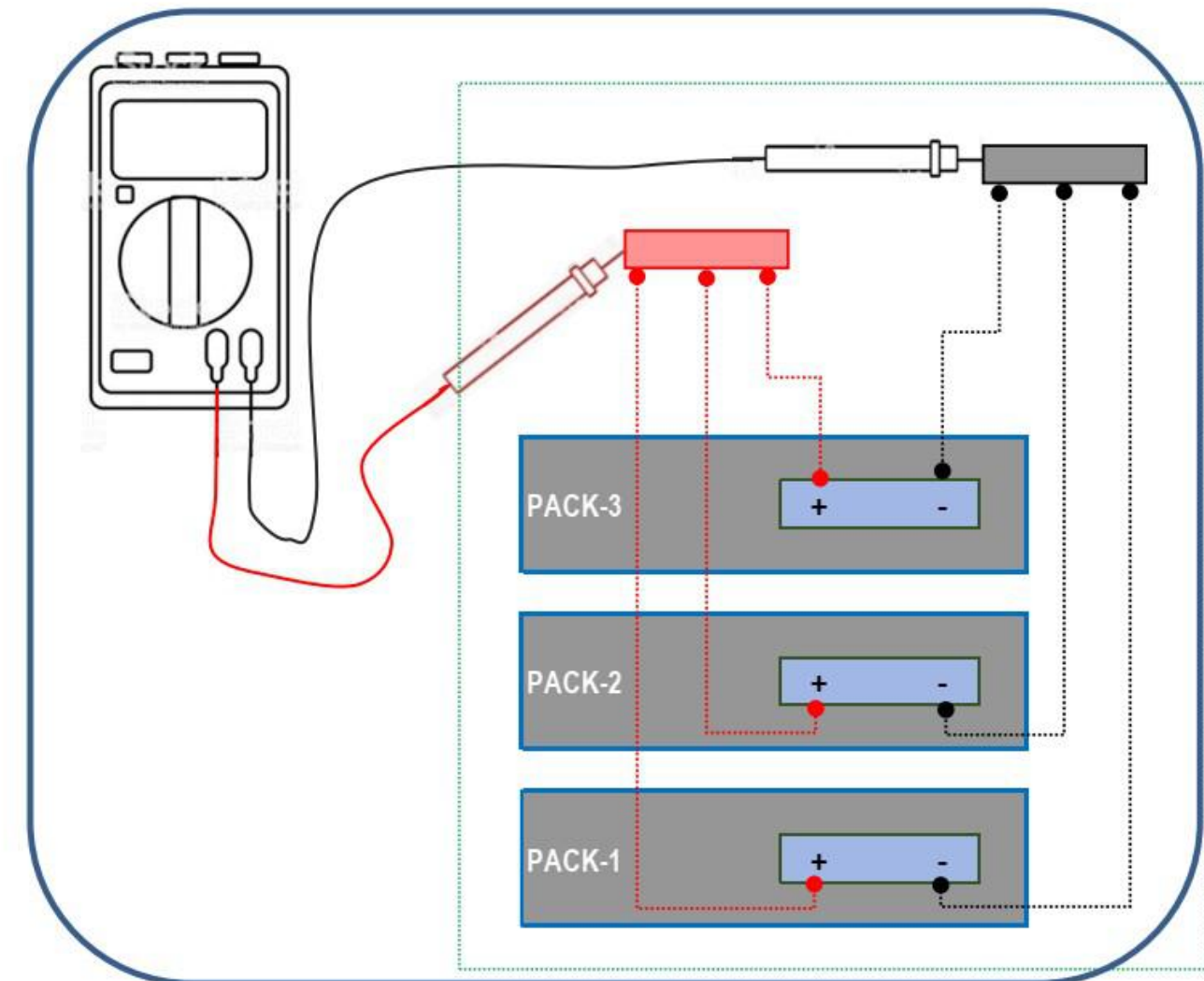
- M6
- 
- 4-5 N·m



-
- PACK-3
- PACK-2
- PACK-1
- 2
- 4
- 6
- 12
- 10
- 8
- 5
- 11
- 9
- 3
- 7
- 1
- +
-
- +
-
- +
-

❑ 4.2.8.2 PACK Parallel Connection Inspection:

- Measure the string voltage of total battery PACK, which has connected in parallel . At normal condition the value will be 36VDC ~ 38VDC (When all the PACKs are in dormancy mode)
- If any of the PACK wake up (Standby mode), then remaining PACKs of specific string will automatically be wake up and string voltage will show 49VDC~50VDC. (not recommended for new battery installation)
- After measuring the string voltage, also need to check individual PACK voltage of every piece of battery , PACK with similar voltage range is accepted, but if any PACK voltage found abnormal (specially 0VDC). Inform supplier immediately.
- Close back the protective terminal cover of all the battery PACK
- Complete the job of Cable lacing for power cable & other cable also.
- In case of multiple string, complete the same procedure string by string.



NOTICE

- Measure voltage at both end, battery terminal & cabinet busbar

MOP for New Battery Installation

❑ 4.2.9 Cabinet busbar (parallel bar) to PSU Power Cable Connection:

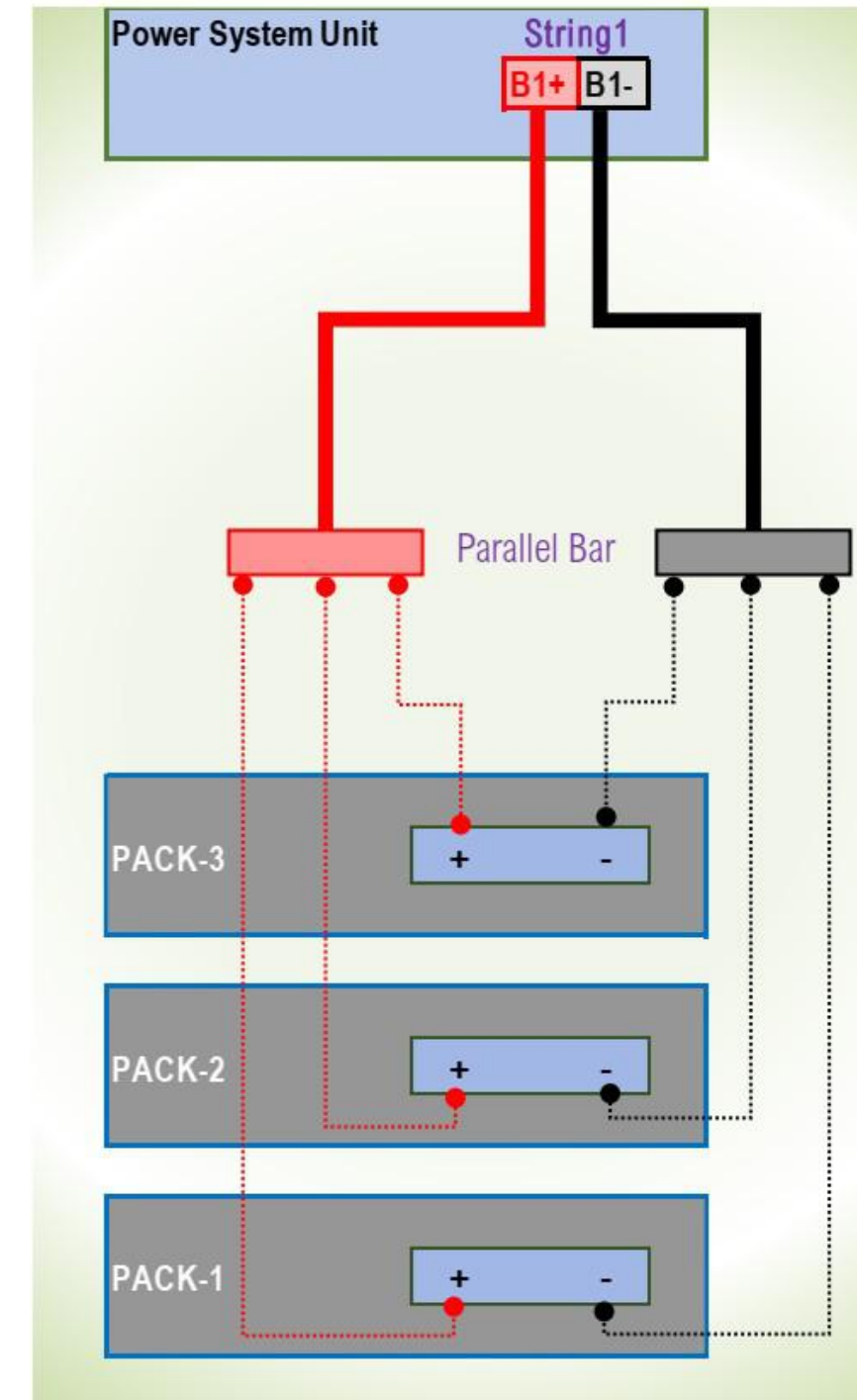
- After successfully complete the PACK parallel connection & inspection, follow the below steps to connect the power cable from parallel bar to battery breaker/fuse of PSU;
 - 1) Check and confirm the battery breaker/fuse at the PSU end is switched OFF.
 - 2) Measure the voltage of power cable at parallel bar edge, confirm no voltage is there.
 - 3) Connect negative cable first then connect positive power cable.

⚠ WARNING

- Do not connect power cable in reverse direction.

⚠ NOTICE

- Use proper cable lugs & lugs whole
- Power cable size (parallel bar to battery breaker/fuse) must be 1.5 times of total cross-sectional area of PACK power cable (PACK terminal to parallel bar) up to 2meter distance (for out door cabinet)
- In case of long distance from PSU to battery PACK, cable size need to fixed by cable manufacturer's standard
- Negative & Positive power cable length must be equal.
- Acceptable maximum voltage drop is 0.2VDC.



4.3 Battery Commissioning

❑ 4.3.1 Setup Battery Setting Parameters on PSU:

- Once the installation process of battery is successfully completed, then need to setup the PSU parameter.
- Parameter's tag name (description) may not same in deferent PSU brand like Delta, ZTE, Vertiv, Huawei & others but the functionality will be equivalent. So, parameter need to set accordingly as per attached file.
- If any brand's of PSU found some parameters which is not matching with shared setting list, then communicate with PSU supplier or us for farther confirmation.



SHOTO Battery Parameter_LFP.pdf

⚠ NOTICE

- Must need to setup appropriate parameters before turn ON the battery breaker/fuse (Battery PACK Power ON)
- Charging current limit and capability need to be 3 times higher than discharging rate, where the maximum charge current is 40% (recommended) of the total rated capacity. NOTE depends on practical scenario of commercial Power outage, charging/discharging current may vary
- Make sure the operational functionality of PSU is accordingly as per shoto standard setting parameter.

❑ 4.3.2 Check Alarm & Event Log Parameters on PSU:

- After completing battery parameter setup, need to check Alarm & Event Log parameters on PSU controller. Attached file for common checklist for different brand's power system, some PSU will not match all the items of event log. But need to be functional equivalent option.

PSU Alarm & Event Log Parameter			
Does not matter what is the alarm level configuration like; Critical, Major, Minor or Warning. Must need below listed alarms are functional. That means, when any of listed event occurs, then should be recorded in log file.			
<i>In case of different power system brand, alarm NAME may different but functionality will be equivalent</i>			
SL	Alarm Name	Checked Value	Comments
1	AC failure	Select	
2	AC phase missing	Select	
3	DC SPD fault	Select	
4	DC Voltage high	Select	
5	DC voltage Low	Select	
6	Load Fuse Break	Select	
7	Rectifier Controller fault	Select	
8	Door alarm	Select	
9	LLVD warning	Select	
10	LLVD disconnected	Select	
11	BLVD warning	Select	
12	BLVD disconnected	Select	
13	Abnormal system voltage check	Select	

RPSDA10IG2004019



Microsoft Excel
Worksheet

⚠ NOTICE

- Does not matter what is the alarm severity (configuration level) like; Critical, Major, Minor or Warning. Must need listed alarms are functional. That means, when any of listed event occurs, then should be recorded in log file.
- In case of different power system brand, alarm NAME may different but functionality will be equivalent

4.3.3 Battery Power-ON:

- ✓ Once battery operational & Event log parameter setup has completed, then proceed to turn-on the battery breaker/fuse on PSU as per below instruction
- ✓ After powering the battery PACK when operation is stable, then record Dry Output circuit status in installation checklist form.

NOTICE

- Performing the Power-ON procedure provided in this section may result in power failure or alarms. Communicate with alarm monitoring centre before and after the procedure.
- Power-ON procedure should be performed by trained personnel according to the Power-ON instructions.
- When you are performing operations and do not want others to operate, attach the label "Currently being serviced. Do not switch on." to the power distribution equipment.
- During the power-on procedure, shut down the system immediately if any fault is detected. Rectify the fault and proceed with the procedure.
- Only allowed to switch ON the battery breaker/fuse, when Commercial Power is available (first time Powering after installation)
- No need to push the RESET button to perform Power-ON process

CAUTION


- During operations, stand on dry insulating material and do not wear any conductors such as jewellery or watches. Use insulated tools.
- Do not establish contact between electrical points that have different electric currents.

5

Installation Checklist

5. Prepare Installation Checklist:

After installation & commissioning when battery operation is stable, then need to fill up the Installation checklist. Better to fill up the Excel form on site, please open the checklist file from the attachment below in this slide.



Shuangdeng Group Co.,Ltd (China Shoto)
No.999 TianMu West Road, Economic Development Zone,
 Jiangyan City, Jiangsu Province, China
 TEL: 0523-88521888; FAX: 0523-88521244

Lithium Battery Installation Checklist

Site Name:		Site ID:		Regional Office Name:	Select	Installation Date:	2014-04-06
Installation Vendor Organization:		Installation Type:	Select	Latitude:		Longitude:	
Contact Number:		Site Structure:	Select	Site Priority Level:	Select	PV Solar System:	Select

Power System Details

Unboxing Inspection Checklist [4.1.4 Check Battery PACK Status]

Number of Power System	Select		Item\PACK ID	4103005911	4103005912	4103005913	4103005921	4103005922	4103005923
Power System Brand:	Select		Voltage	0.00 VDC	0.00 VDC	0.00 VDC	0.00 VDC	0.00 VDC	0.00 VDC
Controller Model:	Select		DO-1	Select	Select	Select	Select	Select	Select
Rectifier Module Model:	Select		DO-2	Select	Select	Select	Select	Select	Select
Connected Rectifier Module QTY:	Select		RUN	Select	Select	Select	Select	Select	Select
Each Rectifier Module Power rating:	500 W		ALM	Select	Select	Select	Select	Select	Select
Generator Status:	Select		SOC	Select	Select	Select	Select	Select	Select

Battery Details

String Inspection Checklist [4.2.8.3 PACK Parallel Connection Inspection]

Battery Type:	Select	ESS Total Rated Capacity:	30 Ah						
Battery Model:	Select	String Quantity:	Select						
Battery Feature:	Select	PACK Quantity #String-1:	Select	STR VDC	0.00 VDC		0.00 VDC		
Each Battery PACK Capacity:	Select	PACK Quantity #String-2:	Select	PACK VDC	0.00 VDC	0.00 VDC	0.00 VDC	0.00 VDC	0.00 VDC

Battery PACK ID Number & Information #String-1:

PACK Serial	PACK ID <small>(Where to find)</small>	DIP Address	SOC (Indicator) Left to Right side <small>(When PACK Online)</small> LED-1 → LED-2 → LED-3 → LED-4	ALM <small>(Indicator)</small> <small>(When PACK Online)</small>	RUN <small>(Indicator)</small> <small>(When PACK Online)</small>	DO-1 <small>Cicut Status</small> <small>(When PACK Online)</small>	DO-2 <small>Cicut Status</small> <small>(When PACK Online)</small>	PACK Operational Stste	EXW Date
#01	SDA6944426304103005911	0000	Select	Select	Select	Select	Select	Select	2014-04-06
#02	SDA6944426304103005912	1111	Select	Select	Select	Select	Select	Select	
#03	SDA6944426304103005913	1111	Select	Select	Select	Select	Select	Select	
#04	SDA6944426304103005914	1111	Select	Select	Select	Select	Select	Select	



Microsoft Excel
Worksheet

NOTICE

- Please share the complete checklist with supplier (shoto) with in 3 working days from installation date.

RPSDA10IG2004020

6

Battery Charge/Discharge

❑ 6.1 Charging Instruction:

- ✓ Recommended charging current $0.1C_{10}$ (10% of rated capacity) and maximum $0.4C_{10}$ (40% of rated capacity)
- ✓ Setup charge current limit based on evaluation of real situation of site;
 - Commercial power statics
 - 1) CP outage situation per day
 - 2) Average interval of CP outage
 - 3) Maximum duration per outage
 - Load requirement
 - PSU capability
 - 1) Battery breaker/fuse current rating per string
 - 2) Rectifier module's power rating
 - 3) Rectifier module quantity
 - Approved load sanction from national grid power company
 - Charge current must be higher than discharge current (up to 3 times), based on site situation [cyclic application]


How To Understand Battery has Fully Recharged:

- 1) Charge battery with 54VDC (15 cells) by maintaining charging current $0.1C_{10}$ (recommended)
- 2) Continue without any interception till charge current $0.02C_{10}$
- 3) Keep & continue for more 10 minutes, then battery will be fully charged
- 4) Before start discharge/capacity test must hold/wait for additional 1 hour (Open Circuit stage @ lab test)

6.2 Discharging Instruction:

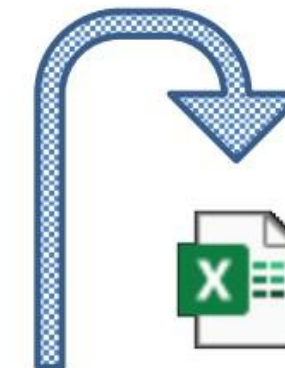
❖ Before performing battery discharge (capacity test), must need to make sure battery has fully charged as per charging instruction. Then follow below procedure,

- 1) Prepare constant current load device and set 0.1C10 discharge current of total rated capacity for discharging.
- 2) Better to available cut-off functionality on specific voltage in load device
- 3) Start discharge and record data on Capacity Test Report (please have the file in attachment below)
- 4) Battery capacity calculation based on discharge duration;
 - i. 10 hours @ 100% Capacity (SOH)
 - ii. 08 hours @ 80% Capacity (SOH)
 - iii. 05 hours @ 50% Capacity (SOH)
 - iv. 03 hours @ 30% Capacity (SOH)

		BATTERY CAPACITY TEST REPORT FORM (Discharge)															
Test Date 2023-04-07		Site Name 10-00		Site ID Total P/N/C Quantity		Test Start Voltage 3.2V		Test End Voltage		Name of the Project Designation of the Project							
Before start discharge on capacity test, need to fully recharged battery by charging voltage 3.4VDC & current 0.1A + hold for minimum 2 hour (On site test)																	
Battery Information			Name of Data Record		Processing Stage Battery Data												
P/N/C Number	P/N/C ID Code	Battery Model	Initial Stage		g. All test result Manual schedule a												
			Fluct stage	Current Count Stage	1. 1st Stage	2. 2nd Stage	3. 3rd Stage	4. 4th Stage	5. 5th Stage	6. 6th Stage	7. 7th Stage	8. 8th Stage	9. 9th Stage	10. 10th Stage			
#1	PACK-1	00000000000000000000	00000000000000000000	00000000000000000000	00000000000000000000	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A
	Total String Current on Controller Display					8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V
	Total String Current on Controller Display					1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A
	Total String Current on Controller Display					25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	
#2	PACK-1	00000000000000000000	00000000000000000000	00000000000000000000	00000000000000000000	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A
	Total String Current on Controller Display					8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V	8.000V
	Total String Current on Controller Display					1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A	1.00A
	Total String Current on Controller Display					25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V	25.0V
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V
	Total String Current on Controller Display					0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V	0.000V

Prepared By:
 Job Number: 7

Print & Sign:
 Date & Sign: 7



Microsoft Excel
Worksheet

NOTICE

- Do not discharge battery till fully recharged after deep discharge or first installation.

RPSDA10IG2004021



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双登集团

Thanks

Technical Team(International Sales Department):

support@shuangdeng.com.cn

marketing@chinashoto.com

www.chinashoto.com

