

SBC-5926 12V In-Car Charger Dual Input (Solar MPPT & DC)

Operation manual

Keep this manual in a safe place for quick reference at all times.

This manual contains important safety and operation instructions for correct use of the battery charger. Read through the manual and pay special attention to the markings and labels of the charger, battery and equipment connected to the battery system.

Pay special attention to these two types of notices used in this manual.



Failure to heed this warning may cause injury to persons and damage to Equipment.



Failure to observe this warning may result in damage to equipment and improper functioning of the Charger.

WARNING:

- The charger is **not** designed for any life saving application.
- The charger is designed for in-door use. Protect the charger from ingress of water.
- This charger is made to charge **only** properly sized lead acid batteries and Lithium Fe PO4 (LFP).
- Don't recharging non-rechargeable batteries.
- Charging other types of battery or under-sized lead acid batteries may cause fire or explosion.
- Install the charger in accordance with all local codes.
- Do not use the charger if it has been dropped or damaged.
- Do not remove casing of the charger, there is no user -serviceable parts inside.
- Do not charge the battery on boats. Remove the battery and charge on shore.
- Never attempt to charge a frozen battery.
- Never attempt to charge a damaged battery.
- Wear protective goggles and turn your face away when connecting or disconnecting the battery.
- Never place the charger on top of a battery.
- Never smoke, use an open flame, or create sparks near battery or charger during normal charging operation as batteries may give out explosive gas.
- Do not charge batteries in an enclosure (box- in) due to possible explosion of entrapped explosive gas.
- Use of accessory not recommended may cause risk of fire, electric shock.
- Disconnect the mains supply before connecting or disconnecting the links to the battery.
- If the charger does not work properly or if it has been damaged, unplug all DC connections.

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Introduction

Especially designed for vehicles with Smart Alternator , Start-Stop ,Regenerative Braking system

The SBC-5926 is designed to address to the issues of wide swing of output voltages from the smart alternator, braking regenerative EURO 5/6 vehicles in fully charging the house battery. It is suitable for use with all old alternator system and distant house battery.

The built-in vibration sensor makes it possible to use the charger by just connecting to the starter battery terminal without touching the car's electrical /electronic wiring thus avoiding any possible excuse of revoking the car's warranty.

The digital control and auto-select design of SBC-5926 make it automatically adapt to 12V or 24V input alternator/ battery system.

This is an automatic dual input solar & alternator-battery charger for charging 12V house battery banks of lead acid , AGM type II and Lithium Fe Po4 batteries.

The built in Solar charge controller is of Maximum Power Point Tracking (MPPT) technology which maximizes the PV power from your 12V up to 20 Amp or 400 Watt solar panels to your house battery.

In 12V alternator /battery system the house battery is charged by both Solar and alternator /battery simultaneously to maximize the free solar energy.

***** In 24V alternator /battery system the house battery is charged by Solar only when the car's alternator/battery stops charging operation.***

Multistage Charging Process

This is a select (battery type) and forget charger designed for fast and accurate recharge of your deep cycle house battery. The smart multistage charging enables the charger to be connected permanently to your battery banks without the worry of over charging or drying out the electrolyte.

Also with both inputs permanently connected, you can be rest assured of charging your batteries whenever you are on the move or when the sun shines on your solar panel.

Lead Acid Based Battery

A 3 Stage Bulk, Absorption & Float charging profile with maximum constant charging current at the Bulk Stage and a Constant Voltage with decreasing charging at the Absorption Stage and a reduced voltage Float Charge for maintenance when battery is full.

LiFePO4 (LFP) Battery

A 2 Stage charging is specially for the LiFePO4 battery and charging current stops at the end of Absorption Stage.

There are 3 alternator charging modes available, Factory Preset Mode, Ignition Feed Mode, and Vibration Sensor Mode. When the Vibration Sensor detects vibration from car' s engine, it triggers charging by alternator.

Features

- Dual input from car battery with alternator input and Solar panel.
- Auto select for 12V or 24V car system.
- Design all alternators, conventional, smart alternators, start-stop & regenerative braking.
- 3 DC Charge Modes to select:
 - Vibration Sensor Mode.
 - Ignition Feed Mode with Automatic or Manual Control setting.
 - Factory Preset Mode (charging function always on).
- Suitable for standard Lead Acid, AGM and Lithium Fe PO4 battery.
- 3 Stage charge for Lead Acid based batteries.
- Specific 2 Stage charge for LiFePO4 battery.

Self Recoverable Protections

Input & Output reverse polarity.

Input Under Voltage.

Input & Output Over Voltage.

Over Load.

Charger Over Temperature and cooling fan jammed.

Supplied Accessories

- Remote LED Indicator Module (with 2M cable) like the unit front panel.
- 4 heavy duty electrical eye connectors.
- One plastic wire guide.
- Double side sticker tape for the Remote Indicator Module.



Installation Procedure



Do NOT install this unit in the **vehicle engine bay**.

This is a fan cooled electronic device not for use in high temperature, corrosive and dusty environment which will drastically shortens the life and performance of the charger.



This charger is designed only for internal mounting and away from direct sunlight, heat and rain. Allow at least 80mm of space at both ends for ventilation.

We recommend wiring by a qualified automobile electrician to ensure local safety and on-board standard are followed

1. To provide the best cooling effect, mount the unit in vertical position with the terminal end facing downwards due to the top front exhaust design.
2. First install the charger as close to the house battery as possible via a fuse.
3. Check the LED indicators by a few presses on the Select Button.
4. Before connect input to DC Alternator, check on type of alternator of car, for new car with smart alternator select ether Vibration Sensor Mode or Ignition Feed Mode.
*see table "Summary of 3 operation modes" on next page for detail

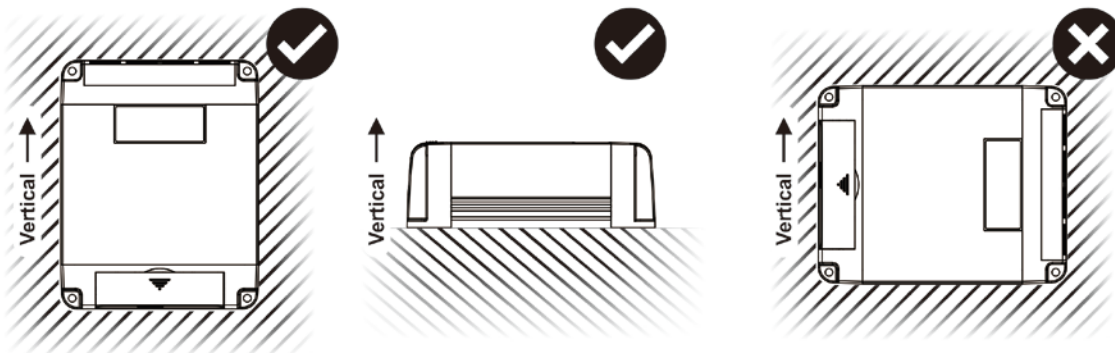
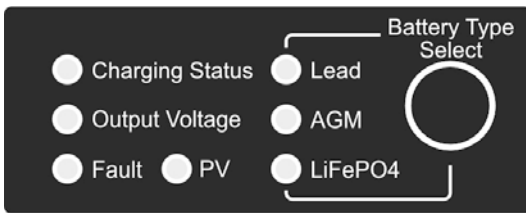


Fig.1 correct installation direction

Battery Type Selection

1. Press and hold the only Set Button for about 5 seconds until the LED flashes.
2. Light quick presses will move the LED from Lead--> AGM--> LiFePO4--> Lead.
3. Stop at the chosen battery type and wait till LED stops flashing to confirm your selection.



Solar panel and DC source Dual inputs

The charger support 12V Solar panel and DC source inputs. Both inputs can be connected simultaneously to the charger or either one. Charger uses Solar energy as priority source to charge battery to maximize the usage of Solar panel. The PV LED and charging output will be switched ON whenever the Solar panel has sufficient energy for charging. The PV LED will ON to indicate Solar panel has sufficient energy and is being used for charging. During Solar panel being used, no matter single input or dual inputs configure, the Ignition Control and the Vibration Sensor have NO effect on output ON/OFF control.

*The allowable maximum power rating of solar panel is 400 Watt with maximum 30V Open Circuit voltage.

Factory Preset Mode, Ignition Feed Mode & Vibration Sensor Mode

There are three operation modes for the charger:

1. The charger comes in with the factory default mode:
Ignition control and Vibration Sensor are deactivated, it starts operation when output and inputs are set up.
This mode will limit the input voltage range to protect over discharge of car's battery.
This mode is not recommended for modern cars.
2. The Ignition Feed Mode requires wiring connection to the car's electrical circuit, charger only operates when car's ignition has tuned on.
3. The Vibration Sensor Mode over rides the Ignition Feed Mode. It turns on the charger when vibration is detected, vibration can come from the car's engine and road.

****Use of vibration sensor does not touch the car's electrical circuit and avoid problem in car's warranty.**

Summary of 3 operation modes

CHARGE MODE	12V CAR		24V CAR	
	CHARGE ON	CHARGE OFF	CHARGE ON	CHARGE OFF
Vibration Sensor Mode when sensor is triggered by vibration from car	11-16V	<9V	22-32V	<18V
Ignition Feed – Automatic Mode connect to Ignition switch when Ignition is on	11-16V	<9V	22-32V	<18V
Factory Preset Mode Vibration Sensor & Ignition Feed Inactive	12.8-16V	<12.2V	25.6-32V	<24.4V

The Ignition Feed and Vibration Sensor modes are suitable for Constant Voltage Alternators, Smart Alternators, Start Stop, Euro 5 and 6 engines, cars with Regenerative Braking.

To Set Ignition Feed of the charger to AUTO-ON

Connect the Ignition Pin (in Fig.4: Terminals & 8 Pin Connectors diagram) to the car's hot wire (that is the wire that has a positive dc 9 to 32V when car's ignition is turned on).
The charger only operates when the car is running, and charger stops charging once ignition is off.

To Set Ignition Feed of the charger to Manual ON-OFF operation

You can wire up a push switch with one end to the Vout for Ignition Pin and the other to Ignition Pin, see Fig.4 Terminals & 8 Pin Connectors diagram. Shorting both pins will turn on the charger, disconnect will turn off the charger.

How to deactivate the Ignition Feed mode

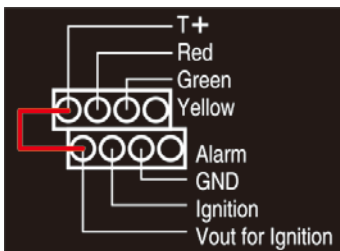
The Ignition Feed Mode will stay with the charger it has been activated **once**, even if the charger is taken out from the system and re-installed in another car. That is once the Ignition Feed Mode has been activated, charger will **only** be turned on when there is a positive voltage (+9V to +32V) at the Vout for Ignition Pin, otherwise the charger stays in **off** mode.

Reset charger to factory default state with Ignition Feed in deactivated mode, such that the charger will start charging the house battery as soon as input and output connections are made.

To deactivate the Ignition Feed mode:

1. Disconnect any wire to the Ignition Pin in the charger.
2. Press and hold Set Button for about 15 seconds until 3 battery type LED flash.
3. Release button to complete the deactivation of the Ignition Feed Mode.

Enable build-in vibration sensor



The built-in vibration sensor is enabled by connecting the T+ pin to Vout for Ignition pin. The vibration sensor is in standby mode with output is OFF (no charging). When sensor is triggered by vibrations which cause it to go the active mode and after 8 seconds of further vibrations. The output will be switched ON for about 100 seconds continuously.

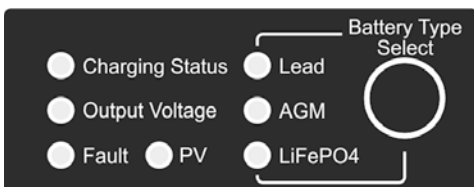
Any further vibration during the 100 seconds active mode, will extend the output ON for another 100 seconds. The output will be switched OFF if no more vibration within 100 seconds of last vibration.

Over ride of Ignition Feed by Vibration Sensor

Built-in vibration sensor when enabled dominates the control of output and over rides all other Modes including the Ignition Feed. That is only vibration can make the charger start charging with output ON.
To disable the Vibration Sensor: Take out the connection between the T+pin from Vout for Ignition pin.

Indicators and Controls

Fig. 2 showing 7 LEDs indicators and one SET button



Charging Status LED for LEAD ACID Battery - 3 Stages

Charging status LED	Charging stage
Fast flashes	Bulk charge
Slow flashes	Absorption
Solid	Float

Charging Status LED for Lithium Fe PO4 Battery - stages

Charging status LED	Charging stage
Fast flashes	Bulk charge
Slow flashes	Absorption

Output Voltage LED

This LED shows the voltage level at the V OUT terminal, it is the battery voltage when there is no Load connected to the battery.

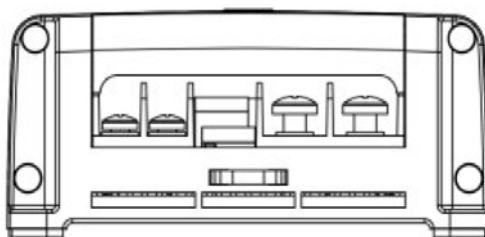
LED status	Battery Voltage Level
Fast Flashes	Battery Voltage lower than 12.5V
Slow Flashes	Battery Voltage between 12.5V and 13.6V
Solid	Battery Voltage higher than 13.6V

PV LED

The PV LED is lit when PV panel with over 14.4V output voltage is connected. This is a good way to check for open circuit in the solar connection. PV LED is off at night.

Connection

After both input and output are connected, the charger will have output after 10Sec.



Front View

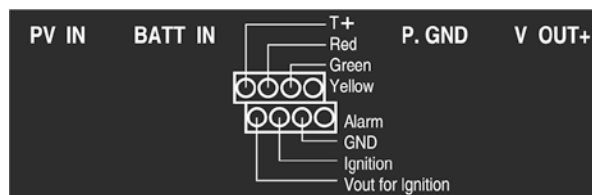


Fig.3 Terminals & 8PIN connectors

- 1 **Vout for Ignition:** 12 Voltage signal. Short this pin to Ignition pin to enable ignition control of unit.
Short this pin to T+ to enable vibration sensor.
*This pin is for Ignition and Vibration sensor only. Don't connect to other devices.
- 2 **Ignition:** Connect this pin to ignition car ignition to make the charger operate in sync with vehicle ignition control.
- 3 **GND:** Ground pin for remote module. Connect to remote control black wire.
- 4 **Alarm:** Alarm output pin. 12V 50mA for external alarm.
- 5 **Yellow:** Connect to remote module yellow wire.
- 6 **Green:** Connect to remote module green wire.
- 7 **Red:** Connection to remote module Red wire.
- 8 **T+:** Vibration sensor enable pin. Connect to Vout for Ignition pin to enable Vibration sensor.

Connect & Wiring Diagram

Individual fuse/ breaker is required to be close to starting battery (charger input) and close to house battery (charger output wire). Fuse at the solar panel to the rating of the short circuit current of the solar panel.

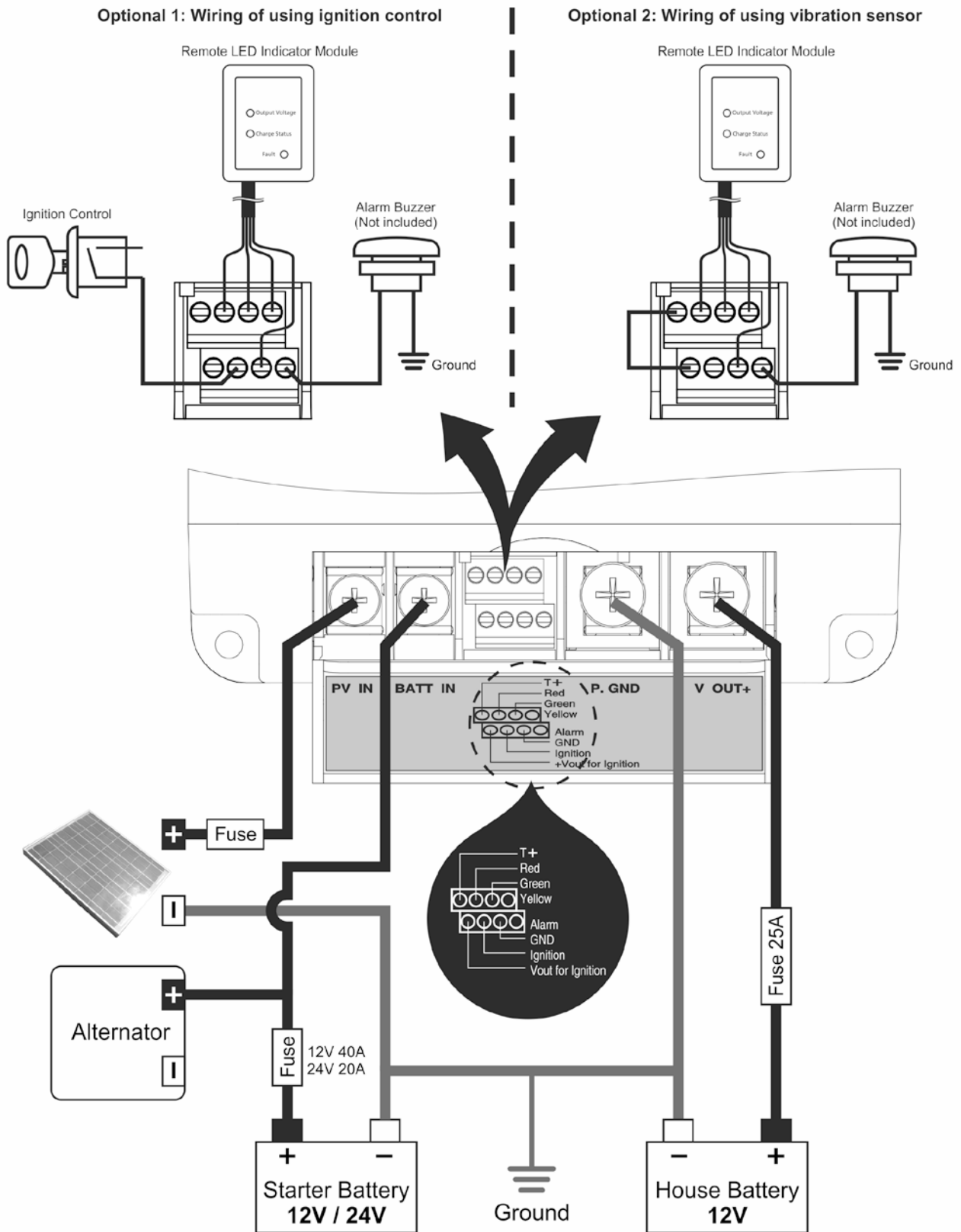


Fig.4 Connection Diagram

Specification

Rated output power	20A at 13.8VDC			
Efficiency	≥ 90%			
Input Voltage				
DC Input Voltage Range	9 - 16VDC (12VDC Input) / 18 - 32VDC (24VDC Input)			
Max. Solar Panel Open Circuit Voltage	30VDC			
No load input current	<25mA			
Output (Charge) Voltage				
Battery Type	Absorption	Float		
Lead	14.4V	13.3V		
AGM	14.7V	13.6V		
LiFePO4	14.8V	Stop		
Alarm Output	12V / 50mA			
Size(L x W x H)mm	130 x 188 x 55mm			
Weight	Approx. 870g			
Operating Temperature	-10 to +40°C (Ambient Temperature)			
Recommended Cable Size				
Cable Length	Recommended SAE			
1 – 5 Meters	8AWG			
5 – 9 Meters	6AWG			
Operating Mode				
	12V CAR		24V CAR	
Vibration Sensor Mode	Charge ON 11-16V	Charge OFF <9V	Charge ON 22-32V	Charge OFF <18V
Ignition Feed – Automatic Mode	Charge ON 11-16V	Charge OFF <9V	Charge ON 22-32V	Charge OFF <18V
Factory Preset Mode	Charge ON 12.8-16V	Charge OFF <12.2V	Charge ON 25.6-32V	Charge OFF <18V
Recommended PV Panel Size				
PV Panel Size	400Watt with maximum 30V open circuit voltage			

Trouble Shooting

The Fault LED is solid on when a protection is triggered and output of the charger is off. When the cause of the fault has been clear up, Fault LED becomes off and charger returns to normal operation. Almost all the protections are by software design and self recoverable, once the cause of fault has been dealt with. There are two layers of protection for Input and Output Over-Voltage, the first layer is by software and the second layer by hardware as a double insurance to protect the charger and the connected devices.

Problem	Indication	Possible Causes	Suggested Solution	Recovery Condition
Low Voltage Disconnect (LVD) Ignition Control is not set to Auto ON	Fault LED ON	12V battery system: Input voltage <12.8V for 20s.	Check the starter battery voltage. Use correct size cable between charger and starter battery.	12V battery system: Automatic recovery when input voltage rises above 13.4V for 60s.
	Fault LED ON	24V battery system: Input voltage <25.6V for 20s		24V battery system: Automatic recovery when input voltage rises above 26.8V for 60s.
Low Voltage Disconnect (LVD) Ignition Control is set to Auto ON	Fault LED ON	12V battery system: Input voltage <9V for 5s	Check the starter battery voltage. Use correct size cable between charger and starter battery.	12V battery system: Automatic recovery when input voltage rises above 11V for 5s.
	Fault LED ON	24V battery system: Input voltage <18V for 5s		24V battery system: Automatic recovery when input voltage raise above 22V for 5s.
Output Over Voltage Protection (Output OVP) Two layers of protection First layer by software Second layer by hardware	Fault LED ON	Software OVP: Output terminal voltage >set absorption Voltage +0.6V for 2s.	Disconnect any load to battery and check battery voltage. If no load connected to battery in first place. Check battery voltage if over set absorption voltage, disconnect battery.	Software OVP: Automatic recovery when the voltage on output terminal is reduced below absorption Voltage +0.3V for 3s.
	Fault LED ON	Hardware OVP: Output terminal voltage >17.0V. FUSE will blow.		Hardware OVP: Does not automatic recovery Required to replace the blown FUSE.
Input Over Voltage Protection (Input OVP) Two layers of protection First layer by software Second layer by hardware	Fault LED ON PV LED may also be on at the same time.	Software input OVP: Charger output will be shutdown when input DC voltage higher than 32V.	Check input battery voltage is not higher than 32V.	Software Input OVP: Automatic recovery when the voltage on input terminal is reduced below 31.5V for 5s.
Input Over Voltage Protection (Input OVP) by hardware.	All LEDs OFF including the FAULT LED.	Hardware Input OVP: The FUSE will blow when input terminal voltage higher than 33.5V.	Find out about the Input source condition & spec such as voltage surge etc. Before replacing with the new fuse.	Hardware input OVP: Does not automatic recovery Required to replace the blown FUSE.
Over Temperature Protection (OTP)	Fault LED ON	Charger internal temperature is too high.	Check input & exhaust ends have no blockage and a minimum 10mm clearance.	Automatic recovery when charger temperature reduce to normal level.
FAN fault	Fault LED ON	FAN not working	Check for objects jamming fan or Fan is out of order.	Remove objects which jamming the fan .

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