paco®

8-STAGE AUTOMATIC

BATTERY CHARGER

MCU CONTROLLED & HIGH FREQUENCY SWITCHMODE

P/No. MEC1235L、MEC2418L

Instruction Manual

Please read user manual carefully before use.

CE CB

1. WARNING

- Explosive gases may escape from the battery during charging. Prevent flames and sparks. Provide adequate ventilation.
- Before charging, read the instructions.
- For indoor use. Do not expose to rain.
- For charging 12V/24V Lithium-ion with $LiFePO_4$ batteries and Lead Acid batteries ONLY.
- Disconnect the 110V/220-240V AC mains supply before making or breaking the connections to the battery.
- The battery charger must be plugged into an earthed socket-outlet.
- Connection to supply mains is to be in accordance with National wiring rules.
- Do not attempt to charge non-rechargeable batteries.
- Never charge a frozen battery.
- If the AC cord is damaged do not attempt to use. It must be replaced or repaired by a qualified person.
- Corrosive substances may escape from the battery during charging and damage delicate surfaces. Store and charge in a suitable area.
- Ensure all vehicle accessories including lights, heaters, appliances etc are turned off prior to charging.
- This appliance is not intended for use by young children or infirm persons unless they have been adequately supervised by a responsible person to ensure that they can use the appliance safely.
- Young children should be supervised to ensure that they do not play with the appliance.

2. FEATURES

8-STAGE AUTOMATIC CHARGING

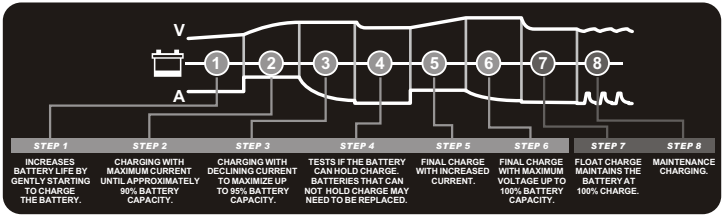
This is a fully Power Factor Correction (PFC) automatic battery charger with 8 charge stages.

Automatic charging protects your battery from being overcharged. So you can leave the charger connected to the battery indefinitely.

8-stage charging is a very comprehensive and accurate charging process that gives your battery longer life and better performance compared to using traditional chargers.

8-stage chargers are suitable for most battery types including LITHIUM, GEL, AGM, WET, MF and CALCIUM batteries. They may also help restore drained and sulphated batteries.

The Lithium battery mode 8 stages are: Soft Start、Bulk、Absorption、Analyse、Completion、Maximization、Float and Maintain.



		LIMIT
STEP 1 SOFT START	25% Current until 11V/22V	Max 30s
STEP 2 BULK	100% Current until 13.8V/27.6V	Max 10h
STEP 3 ABSORPTION	Constant 13.8V/27.6V until current drops to 15%	30 minutes
STEP 4 ANALYSE	Checks if voltage drops to 12V/24V	3 minutes
STEP 5 COMPLETION	30% Current until 14.5V/29V	
STEP 6 MAXIMIZATION	Constant 14.5V/29V until current drops to15%	30 minutes
STEP 7 FLOAT	13.6V/27.2V, 100% Current	10 days Charge cycle restarts if voltage drops*
STEP 8 MAINTAIN	During 13.0V-13.8V/ 26.0V-27.6V, the current control at 100%~20%	Charge cycle restarts if voltage drops

STEP 1 SOFT START

A preliminary charge processes that gently introduces power to the battery. This protects the battery and increases battery life.

STEP 2 BULK
Charging with maximum current until approximately 90% battery capacity. Bulk mode for the charging cycle. The start phase continues until the battery's terminal voltage has risen above the set limit, at which point the charger switches to bulk charging. If the terminal voltage has not passed the voltage limit within the time limit, the charger switches to fault mode (Step 2 lamp solid) and discontinues the charging. If so, the battery is faulty or its capacity is too large.

STEP 3 ABSORPTION
Charging with declining current to maximize up to 95% battery capacity.

STEP 4 ANALYSE
Tests if the battery can hold charge. Batteries that can not hold charge may need to be replaced.

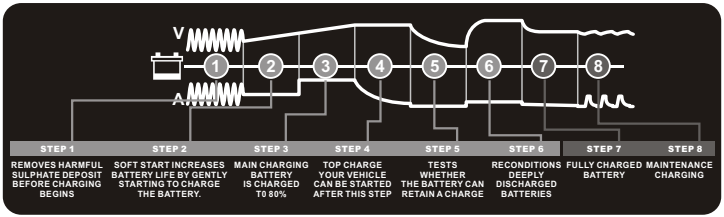
STEP 5 COMPLETION
Final charge with increased current.

STEP 6 MAXIMIZATION
Final charge with maximum voltage up to 100% battery capacity.

STEP 7 FLOAT
The Float stage maintains the battery at 100% charge without overcharging or damaging the battery. This means the charger can be left connected to the battery indefinitely.

STEP 8 MAINTAIN
Maintaining the battery at 95－100% capacity. The charger monitors the battery voltage and gives a maintain when necessary to keep the battery fully charged.

The Lead Acid battery mode (Including GEL, AGM, WET, MF and CALCIUM) 8 stages are: Desulphation、Soft Start、Bulk、Absorption、Analyse、Recondition、Float and Pulse



	GEL	AGM	WET	CALCIUM	LIMIT
1 DESULPHATION	11V/22V	11V/22V	11V/22V	11V/22V	Max 8h
2 SOFT START	Half the rated until 12.5V/25V	Half the rated until 12.5V/25V	Half the rated until 12.5V/25V	Half the rated until 12.5V/25V	Max 8h
3 BULK	100% Current until 14.1V/28.2V	100% Current until 14.4V/28.8V	100% Current until 14.7V/29.4V	100% Current until 14.7V/29.4V	Max 24h
4 ABSORPTION	Constant 14.1V/28.2V until current drops to 15%	Constant 14.4V/28.8V until current drops to15%	Constant 14.7V/29.4V until current drops to15%	Constant 14.7V/29.4V until current drops to15%	30 minutes
5 ANALYSE	Checks if voltage drops to 13.2V/26.4V	Checks if voltage drops to 13.2V/26.4V	Checks if voltage drops to 13.2V/26.4V	Checks if voltage drops to 13.2V/26.4V	90 Sec
6 RECONDITION	Constant current (15%) limited to 14.1V/28.2V	Constant current (15%) limited to 14.4V/28.8V	Constant current (15%) limited to 16V/32V	Constant current (15%) limited to 16V/32V	30 mins or 4h de pending on battery voltage (Calcium model must enter Recondition stage)
7 FLOAT	13.7V/27.4V 100% Current	13.7 V/27.4V 100% Current	13.7V/27.4V 100% Current	13.7V/27.4V 100% Current	10 days Charge cycle restarts if voltage drops*
8 PULSE	During 12.6V-14.1V/25.2V-28.2V , the current control at 100%~20%	During 12.6V-14.4V/25.2V-28.8V , the current control at 100%~20%	During 12.6V-14.7V/25.2V-29.4V , the current control at 100%~20%	During 12.6V-14.7V/25.2V-29.4V , the current control at 100%~20%	Charge cycle restarts if voltage drops

Desulphation

The Desulphation stage may break down sulphation that occurs in batteries that have been left flat for extended periods of time, returning them back to full charge. Sulphation occurs when lead-sulphate hardens and clogs up the battery cells.

Soft Start

A preliminary charge processes that gently introduces power to the battery. This protects the battery and increases battery life.

Bulk (Constant Current)

Charging with maximum current until approximately 80% battery capacity. Bulk mode for the charging cycle. The start phase continues until the battery's

terminal voltage has risen above the set limit, at which point the charger switches to bulk charging. If the terminal voltage has not passed the voltage limit within the time limit, the charger switches to fault mode (Step 3 lamp solid) and discontinues the charging. If so, the battery is faulty or its capacity is too large.

Absorption (Constant Voltage)

Charging with declining current to maximize up to 100% battery capacity.

Analyse

An automatic battery test is conducted immediately after the absorption stage. The test monitors the voltage for 90 seconds to determine if the charge was successful.

- ◆12V charger If the voltage is below 13.2 volts (fail), the charger will initiate the Recondition stage.
- ◆12V charger If the voltage is above 13.2 volts (pass), the charger will proceed to the final stage: Float.
- ◆24V charger If the voltage is below 26.4 volts (fail), the charger will initiate the Recondition stage.

Recondition

Choose the Recond program to add the Recond step to the charging process. During the Recond step voltage increases to create controlled gasing in the battery. Gasing mixes the battery acid and gives back energy to the battery.

This recondition stage can recover batteries from a deeply discharged state increasing performance and battery life.

RECOND - This mode is used to recover deep discharged flooded batteries where you could expect a stratified acid (high acid weight in the bottom, low on top). Check with battery manufacturer when in doubt.

Use this mode with care, because the high voltage will cause some water loss. 16V/32V is normally no problem for electronics in 12V/24V system. Consult your supplier when in doubt. Life of light bulbs will be reduced at higher voltage. Try to disconnect light from the battery during this phase. Maximum effect and minimum risk for electronics is achieved by charging a disconnected battery.

Float

The Float stage maintains the battery at 100% charge without overcharging or damaging the battery. This means the charger can be left connected to the battery indefinitely.

Pulse

Maintaining the battery at 95–100% capacity. The charger monitors the battery voltage and gives a pulse when necessary to keep the battery fully charged.

The AUTOMATIC BATTERY CHARGER has an 8-step fully automatic charging cycle, the cycle is repeated infinitely. If the terminal votage drops below a lower limit, the charger automatically goes back to the beginning of the charging curve.

3. SWITCHMODE TECHNOLOGY

Using the latest technology in battery chargers, switch mode chargers convert 110V/220-240V AC power to 12V/24V DC power using electronic components unlike traditional battery chargers that rely on heavy transformers. This allows the charger to be light weight and compact without sacrificing on performance.

SUPPLY MODE (CONSTANT VOLTAGE OF 13.8/27.6 VOLTS)

This mode can be used for float maintenance charging when the battery needs to be maintained at 100% after being fully charged. This mode is similar to stage 7, but is not limited by time or voltage.

⚠WARNING! *During Supply Mode, the spark protection function on the battery charger is disabled.*

4. PROTECTIVE FEATURES

POLARITY PROTECTION

Prevents the output leads from sparking due to accidental reverse connection or short circuit, making the charger safer to use around batteries.

OUTPUT SHORT PROTECTION

Short circuit connection of the clips: Check clips are not touching each other OR Check the clips are correctly connected to the battery.

NON BATTERY LINK PROTECTION

If battery charger connects with non battery load, it will go into protection state.

DISCONNECT PROTECTION

The charger has entered the energy save mode. This happens if the charger isn't connected to the battery in 2 minutes.

OVER VOLTAGE PROTECTION

Lithium battery mode

The 12V lithium battery charger will automatically protection if the voltage is higher than 15.5V.

The 24V lithium battery charger will automatically protection if the voltage is higher than 31V.

Lead Acid battery mode (Including GEL, AGM, WET, MF and CALCIUM)

The 12V charger will automatically protection if the voltage is higher than 17.5V.

The 24V charger will automatically protection if the voltage is higher than 35V.

OVER TEMPERATURE PROTECTION

Internal temperature is above 65°C +/-5°C

COOLING FAN

The charger is fitted with a thermostatically controlled fan to cool onboard electronics and maintain charging performance. The cooling fan will engage automatically when there is a high load on the battery or there is sufficient heat build up.

5. PRODUCT OVERVIEW

FIG 1: MEC 1235L / MEC 2418L

The 8-stage automatic charging consists of the following components:

1. Mode button
2. Stage lamp status display indicates power, charging and fully charged.
3. Power lamp
4. Fault lamp
5. Output voltage meter
6. Battery type lamp
7. DC leads.
8. Power Cord
9. Thermostatically controlled cooling fan.
10. Mounting flange.
11. Ventilation hole
12. 5.5mm mounting hole.
13. Supply Mode lamp
14. Lithium battery lamp

6. CHARGE STATUS INDICATOR

The LITHIUM BATTERY CHARGING and STAGE LAMP will illuminate and flash in various patterns to indicate the different stages of charging. See below for flash / steady patterns.

		Power on lamp	Stage lamp	Fault lamp	LED display
Power Off		—	—	—	—
Power On		●	—	—	0.0
Stage	1. Soft Start	●	☀ / ●	—	Out volt
	2. Bulk	●	☀ / ●	—	
	3. Absorption	●	☀ / ●	—	
	4. Analyse	●	☀ / ●	—	
	5. Completion	●	☀ / ●	—	
	6. Maximization	●	☀ / ●	—	
	7. Float	●	☀ / ●	—	
	Fully Charged	●	☀ / ●	—	
	8. Maintain	●	☀ / ●	—	
Non Battery Link Protection		●	—	—	0.0
Output Short Protection		●	—	☀	- U -
Output Polarity Reverse Protection		●	—	☀	
Disconnect Protection		☀	—	—	0.0
Over Voltage Protection		●	—	☀	- U -
Not accept charge		●	☀ (Step 1 Lamp)	●	Battery volt
Faulty Battery		●	☀ (Step 2 Lamp)	●	
Can not keep charge		●	☀ (Step 4 Lamp)	●	
Battery Charge Fully		●	● (Fully lamp)	—	
Thermal Protection		●	—	☀	- t -

Note: ● : (Solid) ☀ : (Flashing) — : (EXTINGUISH)

STAGE LAMP: illuminates and flashes when 8-stage charging process.
STAGE LAMP: illuminates solid when fully charged.

POWER ON LAMP

If the power lamp is lit with a:
1. STEADY LIGHT
The mains cable is connected to the wall socket.
2. FLASHING LIGHT
The charger has entered the energy save mode. This happens if the charger isn't connected to the battery in 2 minutes.

FAULT LAMP STEADY LIGHT

If the fault lamp is lit solid , check the following:
Has charging been interrupted in STEP 1, 2, or 4?
Restart the charger by pressing the MODE-button. If charging is still being interrupted, the battery.
STEP 1: ...can not accept charge and may need to be replaced.
STEP 2: ...battery is faulty and may need to be replaced. (Bulk charging has timed out and stopped after 10 hours.)
STEP 4: ...can not keep charge and may need to be replaced.

FAULT LAMP FLASHING LIGHT

★ Charger's internal temperature is higher than 65°C+/-5°C

The Lead Acid battery CHARGING and STAGE LAMP will illuminate and flash in various patterns to indicate the different stages of charging. See below for flash / steady patterns.

		Power on lamp	Stage lamp	Fault lamp	LED display
Power Off		—	—	—	—
Power On		☼	☼	☼	—
Power On		●	—	—	0.0
Stage	1. Desulphation	●	☼ / ●	—	Out volt
	2. Soft Start	●	☼ / ●	—	
	3. Bulk	●	☼ / ●	—	
	4. Absorption	●	☼ / ●	—	
	5. Analyse	●	☼ / ●	—	
	6. Recondition	●	☼ / ●	—	
	7. Float	●	☼ / ●	—	
	8. Pulse	●	●	—	
Non Battery Link Protection		●	—	—	0.0
Output Short Protection		●	—	—	
Output Polarity Reverse Protection		●	—	—	
Disconnect Protection		☼	—	—	
Over Voltage Protection		●	—	☼	- U -
Is seriously sulphated		●	☼ (Step 1 Lamp)	●	Battery volt
Not accept charge		●	☼ (Step 2 Lamp)	●	
Faulty Battery		●	☼ (Step 3 Lamp)	●	
Battery Charge Fully		●	● (Fully lamp)	—	
Thermal Protection		●	—	☼	- t -

Note: ● : (Solid) ☼ : (Flashing) — : (EXTINGUISH)

STAGE LAMP: illuminates and flashes when 8-stage charging process.
STAGE LAMP: illuminates solid when fully charged.

POWER ON LAMP

If the power lamp is lit with a:
1. STEADY LIGHT
The mains cable is connected to the wall socket.
2. FLASHING LIGHT
The charger has entered the energy save mode. This happens if the charger isn′ t connected to the battery in 2 minutes.

FAULT LAMP STEADY LIGHT

If the fault lamp is lit solid , check the following:
Has charging been interrupted in STEP 1, 2, or 3?
Restart the charger by pressing the MODE-button. If charging is still being interrupted, the battery.
STEP 1: ...is seriosly sulphated and may need to be replaced.
STEP 2: ...can not accept charge and may need to be replaced.
STEP 3: ...battery is faulty and may need to be replaced. (Bulk charging has timed out and stopped after 24 hours.)

FAULT LAMP FLASHING LIGHT

★ Charger's internal temperature is higher than 65°C+/-5°C

7. SPECIFICATIONS

P/No.	MEC 1235L		
Charger Type	8-Stage automatic		
Input Voltage	☐ 220-240V~, 50/60Hz	☐ 110V~, 60Hz	
Input Power	598W		
Output Voltage	12V DC		
Output Current	35A		
Minimum Start Voltage	Lead Acid: 2.0V Lithium: 1.0V		
Back Drain	4mA		
Current Fuse Rating	☐ 220-240V~, T5A, 250VAC	☐ 110V~, T8A, 250VAC	
LITHIUM BATTERY CHARGE CONTROL		**LEAD ACID BATTERY CHARGE CONTROL**	
Soft Start	25% Current until 11V	Desulphation	Pulse charge up to 11V
Bulk	35A up to 13.8V	Soft Start	Half the rated set current up to 12.5V
Absorption	Constant voltage until current drops to 5.25A	Bulk	35A up to 14.1V (GEL) 14.4V (AGM) 14.7V (WET) 14.7V (CALCIUM)
Analyse	Monitors voltage for 3 minutes	Absorption	Constant voltage until current drops to 5.25A
Completion	10.5A Current until 14.5V	Analyse	Monitors voltage for 90 seconds
Maximization	Constant 14.5V until current drops to 5.25A	Recondition	Constant current (5.25A) for 30 mins or 4 hours limited to: 14.1V (GEL) 14.4V (AGM) 16V (WET) 16V (CALCIUM)
Float	13.6V，100% Current	Float	13.7V also with pulse feature
Maintain	13.0V-13.8V, 35-7A	Pulse	12.6V- 14.1V, 35-7A (GEL) 12.6V- 14.4V, 35-7A (AGM) 12.6V- 14.7V, 35-7A (WET) 12.6V- 14.7V, 35-7A (CALCIUM)
Over Voltage Protection	The 12V lithium battery charger will automatically protection if the voltage is higher than 15.5V. The 12V lead acid charger will automatically protection if the voltage is higher than 17.5V.		
Supply Mode Output	13.8V 35A (Max)		
Efficiency	App.85%		
Thermal Protect	65℃+/-5℃		
Cooling Fan	Automatic temperature controlled		
Ambient temperature	-20℃ to +50℃, output power is reduced automatically at high temperatures		
BATTERY RANGE			
Deep Cycle	70-350Ah	240-700Ah	
Types of Batteries	Most types of 12V Lithium-ion $LiFePO_4$ batteries and Lead Acid batteries including WET, MF, Calcium, AGM and GEL		
Dimension (L×W×H)	250×142×58mm		
Weight	1.67Kg		

***Specifications are subjected to change without prior notice.**

8. SPECIFICATIONS

P/No.	MEC 2418L		
Charger Type	8-Stage automatic		
Input Voltage	☐ 220-240V~, 50/60Hz	☐ 110V~, 60Hz	
Input Power	610W		
Output Voltage	24V DC		
Output Current	18A		
Minimum Start Voltage	Lead Acid: 4.0V Lithium: 2.0V		
Back Drain	4mA		
Current Fuse Rating	☐ 220-240V~, T5A, 250VAC	☐ 110V~, T8A, 250VAC	
LITHIUM BATTERY CHARGE CONTROL		**LEAD ACID BATTERY CHARGE CONTROL**	
Soft Start	25% Current until 22V	Desulphation	Pulse charge up to 22V
Bulk	18A up to 27.6V	Soft Start	Half the rated set current up to 25V
Absorption	Constant voltage until current drops to 2.7A	Bulk	18A up to 28.2V (GEL) 28.8V (AGM) 29.4V(WET) 29.4V(CALCIUM)
Analyse	Monitors voltage for 3 minutes	Absorption	Constant voltage until current drops to 2.7A
Completion	5.4A current until 29V	Analyse	Monitors voltage for 90 seconds
Maximization	Constant 29V until current drops to 2.7A	Recondition	Constant current (2.7A) for 30 mins or 4 hours limited to: 28.2V (GEL) 28.8V (AGM) 32V (WET) 32V (CALCIUM)
Float	27.2V，100% current	Float	27.4V also with pulse feature
Maintain	26.0V-27.6V, 18-3.6A	Pulse	25.2V- 28.2V, 18-3.6A (GEL) 25.2V- 28.8V, 18-3.6A (AGM) 25.2V- 29.4V, 18-3.6A (WET) 25.2V- 29.4V, 18-3.6A (CALCIUM)
Over Voltage Protection	The 24V lithium battery charger will automatically protection if the voltage is higher than 31V. The 24V lead acid charger will automatically protection if the voltage is higher than 35V.		
Supply Mode Output	27.6V 18A (Max)		
Efficiency	App.85%		
Thermal Protect	65℃+/-5℃		
Cooling Fan	Automatic temperature controlled		
Ambient temperature	-20℃ to +50℃, output power is reduced automatically at high temperatures		
BATTERY RANGE			
Deep Cycle	36-180Ah	120-360Ah	
Types of Batteries	Most types of 24V Lithium-ion $LiFePO_4$ batteries and Lead Acid batteries including WET, MF, Calcium, AGM and GEL		
Dimension (L×W×H)	250×142×58mm		
Weight	1.67Kg		

***Specifications are subjected to change without prior notice.**

9. CHARGING INSTRUCTIONS

1. Settings are made by pressing the MODE-button. After about two seconds the charger activates the selected program. The selected program will be restarted next time the charger is connected.
2. When the charging process is interrupted, press the ON/OFF button, and then restart the charger.
3. To turn off the charger by pressing and holding the Mode button for 3 seconds.
4. To restart the charger by pressing and holding the Mode button for 3 seconds.

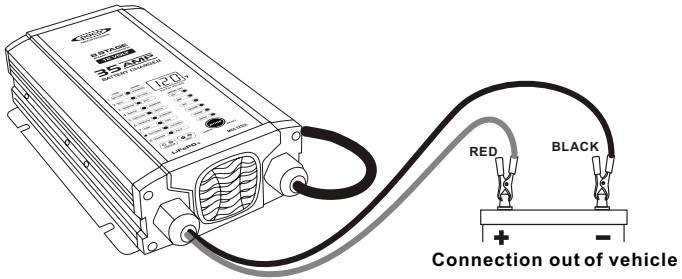
STEP 1 – CHECK THE ELECTROLYTE LEVEL

Prior to charging the battery, remove the vent caps and check the electrolyte level (not required on sealed & maintenance free batteries). The electrolyte should be 6mm (1/4") above the battery's plates. If low, top up with distilled water to the correct level and refit the vent caps.

STEP 2A – CONNECTION OUT OF THE VEHICLE

Connect the RED lead (battery clip) from the charger to the Positive (+) battery post.

Connect the BLACK lead (battery clip) from the charger to the Negative (-) battery post.



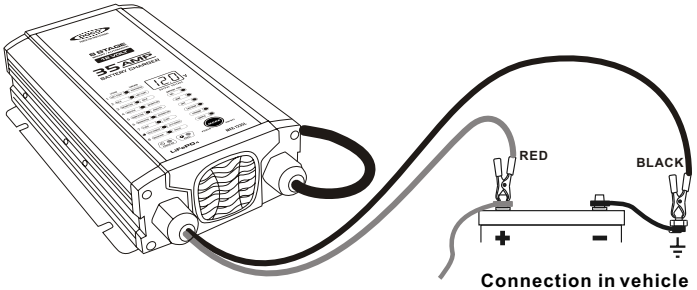
Connection out of vehicle

STEP 2B – CONNECTION IN VEHICLE

Determine if the vehicle is Positively (+) or Negatively (-) earthed. Negatively earthed vehicles have a cable (usually black) from the Negative battery terminal to the vehicle's chassis.

a)Negatively earthed (most vehicles)

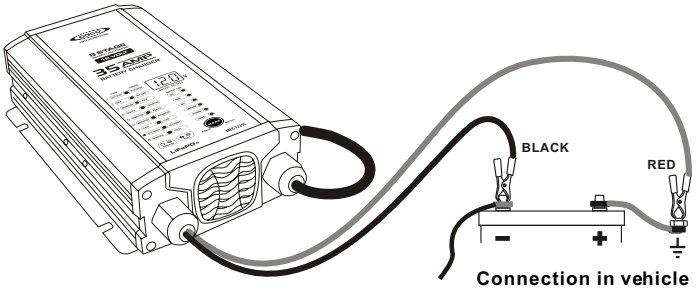
Connect the RED lead (battery clip) from the charger to the Positive (+) battery terminal.
Connect the BLACK lead (battery clip) from the charger to the vehicle's chassis away from the fuel line or moving parts.



Connection in vehicle (negatively earthed)

b)Positively earthed

Connect the BLACK lead (battery clip) from the charger to the Negative (-) battery terminal.
Connect the RED lead (battery clip) from the charger to the vehicle's chassis away from the fuel line or moving parts.



Connection in vehicle (positively earthed)

STEP 3 – CONNECT TO 110V/220-240V AC MAINS POWER

Connect the battery charger to the 110V/220-240V AC mains powered socket and turn on the mains power.

STEP 4 – CHARGING

During the charge process, the CHARGING and STAGE LAMP will flash various patterns. This is normal and indicates the various charge stages. Refer to "How can I know what stage the battery charger is in" in the FAQ section, page 21. When the STAGE LAMP remains on, this is known as the float stage and the charger can be left connected to the battery without over charging. If the POWER ON LAMP is flashing, there is fault; refer to "Fault Codes" explanation on page 20 of this manual.

STEP 5 – DISCONNECTION

Ensure the 110V/220-240V AC mains switch is turned off and the charger is disconnected from the 110V/220-240V AC mains power.

Battery out of vehicle

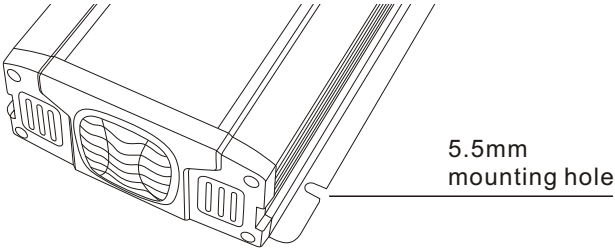
Remove the BLACK lead (battery clip) from the battery.
Remove the RED lead (battery clip) from battery.

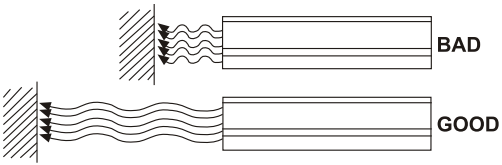
Battery in vehicle

Remove the chassis connection.
Remove the battery terminal connection.

10. MOUNTING INSTRUCTIONS

8-stage chargers are designed for indoor, out of weather use only. Ensure that both charger and battery are in a well-ventilated space during charging.
The battery charger end plates include a mounting flange for easy mounting. If permanently fixed the charger should be mounted to a suitable horizontal or vertical panel, with at least 10cm clearance from the end plates to provide adequate ventilation for the cooling fan.



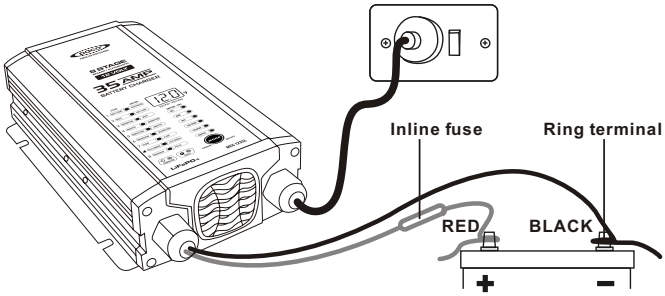


11. PERMANENT WIRING TO BATTERY

It is possible to hard wire the DC charging leads to the battery for permanent installations.
You will need 2 x ring terminals, an inline fuse holder and a fuse with a rating equal to or more than twice of the chargers output. (See below)
18A = 36 Amp fuse 35A = 70 Amp fuse

Connection:

1. Cut off the supplied battery clips; ensure you leave sufficient cable to reach the battery terminals. (DO NOT extend the battery charger DC cables, as the added voltage drop will cause incorrect charging).
2. Fit a ring terminal to the BLACK Negative (-) wire.
3. Connect the inline fuse to the RED Positive (+) wire.
4. Connect a ring terminal to the other end of the inline fuse.
5. Connect the RED lead (with inline fuse and ring terminal) to the Positive (+) battery post.
6. Connect the BLACK lead (with ring terminal) to the Negative (-) battery post.
7. Fit the correctly rated fuse.



If the charger is used in a Permanent / Hard Wired application and the vehicle will not be used for some time, it is best to leave the charger connected to mains power (turned "On") so that it can maintain the battery fully charged.

Ensure any modification to the 110V/220-240V AC mains lead is carried out by a qualified person and that connection to supply mains is in accordance with National wiring rules.

Caution: The utility power must have a safety ground.

12.ADJUSTABLE CHARGE RATES

CHARGE RATE	LITHIUM BATTERY SIZE (12V)	
	Battery size (Ah)	Charger time (hours)
35Amp	70-350	2-14
CHARGE RATE	**LITHIUM BATTERY SIZE (24V)**	
	Battery size (Ah)	Charger time (hours)
18Amp	36-180	2-14
CHARGE RATE	**LEAD ACID BATTERY SIZE (12V)**	
	Battery size (Ah)	Charger time (hours)
35Amp	240-700	7-24
CHARGE RATE	**LEAD ACID BATTERY SIZE (24V)**	
	Battery size (Ah)	Charger time (hours)
18Amp	120-360	7-24

13. FAULT CODES

There are error codes that may be displayed. These will be displayed in the following way:

Error Code	Power on lamp	Stage lamp	Fault lamp	Cause	Remedy
Polarity Reverse / Output Short	●	—	Lithium: ☀ Lead Acid: —	Short circuit or reverse connection of the clips	Check clips are not touching each other. OR Check the clips are correctly connected to the battery.
Non Battery Link	●	—	—	Non battery link	Please choose the right battery type for connection.
Faulty Battery	●	Lithium: ☀ (Step 2 lamp) OR Lead Acid: ☀ (Step 3 lamp)	●	Bulk charging has timed out and stopped after 10 hours (Lithium Mode) / 24 hours (Lead Acid Mode).	Battery is faulty and may need to be replaced.
Over Voltage	●	—	☀	**Lithium:** The 12V lithium battery voltage is above 15.5V. The 24V lithium battery voltage is above 31V. OR **Lead Acid:** The 12V battery voltage is above 17.5V. The 24V battery voltage is above 35V.	Disconnect the charger and check the battery voltage. This charger is suitable for 12V/ 24V Lithium and Lead Acid batteries ONLY.
Over Temperature	●	—	☀	Internal temperature is above 65℃+/-5℃	Turn off charger and allow to cool.

14. FREQUENTLY ASKED QUESTIONS

Q. How do I know if the battery is charged?

A. The charger's FULLY STAGE LAMP will illuminate (solid). Alternatively use a Battery Hydrometer A reading of 1.250 or more in each cell indicates a fully charged battery.

Q. I have connected the charger properly but the 'STAGE LAMP' does not come on?

A. In some cases batteries can be flattened to the point where they have very little or no voltage. This can occur if a small amount of power is used for a long time, for example a map reading light is left on for a week or more. 8-Stage chargers are designed to charge Lithium battery from as little as 1.0 Volts (12V) and 2.0 Volts (24V). Lead Acid battery from as little as 12V charger 2.0 Volts and 24V charger 4.0 Volts.

LITHIUM battery mode

If the voltage is less than 1.0 Volts (12V) / 2.0 Volts (24V) this is very low and the battery may not be rechargeable. You could try a very an electronic power supply to gradually bring the battery voltage above 1.0 Volts (12V) / 2.0 Volts (24V) so the charger can then take over or take the battery back to the place of purchase so they can try and repair it.

Lead Acid battery mode (Including GEL, AGM, WET, MF and CALCIUM)

If the voltage is lower than 2.0 Volts and 4.0 Volts use a pair of booster cables to connect between two batteries to provide more than 2.0 Volts and 4.0 Volts to the battery being charged. The charger can then start to charge the battery and the booster cables can be removed.

Q. What happens if you connect an appliance to the battery while it is charging?

A. This is not recommended for best charging results. It is recommended to charge without any appliance load on the battery. Unless absolutely necessary, it is recommended to use Supply Mode.

Q. How can I know what stage the battery charger is in?

Below are the conditions that are displayed by the LAMP for each of the charge stages.

	① Stage	② Stage	③ Stage	④ Stage	⑤ Stage	⑥ Stage	⑦ Stage	⑧ Stage
Step Finish	●	●	●	●	●	●	●	—

Note: ● : (Solid) ☼ : (Flashing) — : (EXTINGUISH)

CAUTION

ALWAYS PLACE THE BATTERY CHARGER IN AN ENVIRONMENT WHICH IS:

A. WELL VENTILATED.
B. NOT EXPOSED TO DIRECT SUNLIGHT OR HEAT SOURCE.
C. OUT OF REACH FROM CHILDREN.
D. AWAY FROM WATER /MOISTURE, OIL OR GREASE.
E. AWAY FROM ANY FLAMMABLE SUBSTANCE.
F. SECURE NO RISK OF FALLING.

SAFETY

◆ The charger is designed for charging 12V/24V Lithium batteries and lead-acid batteries ONLY. Do not use the charger for any other purpose.

◆ Check the charger cables prior to use. Ensure that no cracks have occurred in the cables or in the bend protection. A charger with damaged cables must not be used. A damage cable must be replaced by a professional representative.

◆ Never charge a damaged battery.

◆ Never charge a frozen battery.

◆ Never place the charger on top of the battery when charging.

◆ Always provide for proper ventilation during charging.

◆ Avoid covering the charger.

◆ A battery being charged could emit explosive gasses. Prevent sparks close to the battery. When batteries are reaching the end of their lifecycle internal sparks may occur.

◆ All batteries fail sooner or later. A battery that fails during charging is normally taken care of by the chargers advanced control, but some rare errors in the battery could still exist. Don't leave any battery during charging unattended for a longer period of time.

◆ Ensure that the cabling does not jam or comes into contact with hot surfaces or sharp edges.

◆ Battery acid is corrosive. Rinse immediately with water if acid comes into contact with skin or eyes, seek immediate medical advice.

◆ Batteries consume water during use and charging. For batteries where water can be added, the water level should be checked regularly. If the water level is low add distilled water.

◆ This appliance is not designed for use by young children or people who cannot read or understand the manual unless they are under the supervision of a responsible person to ensure that they can use the battery charger safely. Store and use the battery charger out of the reach of children, and ensure that children cannot play with the charger.

◆ Connection to the mains supply must be in accordance with the national regulations for electrical installations.