



samlexpower®

**Switch Mode,
Automatic,
Lead Acid
Battery Charger**

SEC-1215UL
SEC-1230UL
SEC-2415UL

Owner's
Manual

Please read this
manual BEFORE
operating your
battery charger

OWNER'S MANUAL | Index

SECTION 1

Safety Instructions 3

SECTION 2

Layout 7

SECTION 3

Description, Features & Cooling 10

SECTION 4

Charging Stages & Protections 11

SECTION 5

Installation & Charger Operation 13

SECTION 6

Troubleshooting 19

SECTION 7

Specifications 21

SECTION 1 | Safety Instructions

1.1 SYMBOLS

SAVE THESE INSTRUCTIONS. This manual contains important safety and operating instructions for models SEC-1215UL, SEC-1230UL and SEC-2415UL.

The following safety symbols will be used in this manual to highlight safety and information:



WARNING!

Indicates possibility of physical harm to the user in case of non-compliance.



CAUTION!

Indicates possibility of damage to the equipment in case of non-compliance.



INFO

Indicates useful supplemental information.

Please read these instructions before installing or operating the unit to prevent personal injury or damage to the unit.

1.2 SAFETY INSTRUCTIONS - GENERAL

1.2.1 Battery related

- Working in the vicinity of a lead-acid battery is dangerous. Batteries generate explosive gases during normal battery operation. For this reason it is of the utmost importance that each time before using your charger, you read and follow the instructions provided exactly.
- To reduce risk of battery explosion, follow these instructions and those marked on the battery.
- Never smoke or allow an open spark or flame in the vicinity of the battery or engine.
- Use charger for charging a lead-acid battery only. It is not intended to supply power to an extra low voltage electrical system or to charge dry-cell batteries. Charging dry-cell batteries may cause them to burst and cause injury to persons and damage to property.
- Never charge a frozen battery
- If it is necessary to remove battery from vehicle to charge it, always remove grounded terminal from battery first. Make sure all accessories in the vehicle are off in order to prevent an arc.
- Study all battery manufacturer's specific precautions such as removing or not removing cell caps while charging and recommended rates of charge.
- For a charger having an output voltage selector switch, refer to the car owner's

SECTION 1 | Safety Instructions

manual in order to determine the voltage of the battery and to make sure the output voltage is set at the correct voltage. If an output voltage selector switch is not provided, do not use the battery charger unless the battery voltage matches the output voltage rating of the charger.

- Never place the charger directly above or below the battery being charged; gases or fluids from the battery will corrode and damage the charger. Locate the charger as far away from the battery as DC cables permit
- Do not operate charger in a closed-in area or restrict ventilation in any way
- Connect and disconnect DC output clips only after setting any charger switches to the off position and removing AC cord from the electric outlet. Never allow clips to touch each other
- Follow these steps when battery is installed in vehicle. A spark near battery may cause a battery explosion. To reduce risk of a spark near battery:
 - (i) Position AC and DC cords to reduce risk of damage by hood, door, or moving engine part;
 - (ii) Stay clear of fan blades, belts, pulleys, and other parts that can cause injury to persons;
 - (iii) Check polarity of battery posts. A positive (*POS, P, +*) battery post usually has a larger diameter than a negative (*NEG, N, -*) post;
 - (iv) Determine which post of battery is grounded (connected) to the chassis. If Negative post is grounded to chassis (*as in most vehicles*), see item (v). If Positive post is grounded to the chassis, see item (vi);
 - (v) For a Negative-grounded vehicle, connect the Positive (*Red*) clip from battery charger to Positive (*POS, P, +*) undergrounded post of battery. Connect the negative (*Black*) clip to vehicle or engine block away from battery. Do not connect clip to carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gauge metal part of the frame or engine block.
 - (vi) For a Positive-grounded vehicle, connect the Negative (*Black*) clip from battery charger to negative (*NEG, N, -*) ungrounded post of battery. Connect the Positive (*Red*) clip to vehicle chassis or engine block away from battery. Do not connect clip to carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gauge metal part of the frame or engine block;
 - (vii) Connect charger AC supply cord to electric outlet; and
 - (viii) When disconnecting charger, turn switches to off, disconnect AC cord, remove clip from vehicle chassis, and then remove clip from battery terminal.
- Follow these steps when battery is outside vehicle. A spark near battery may cause a battery explosion. To reduce risk of a spark near battery:
 - (i) Check polarity of battery posts. A Positive (*POS, P, +*) battery post usually has a larger diameter than a Negative (*NEG, N, -*) post;

SECTION 1 | Safety Instructions

- (ii) Use caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
- (iii) Remove metal items like rings, bracelets and watches when working with batteries. The batteries can produce a short circuit current high enough to weld a ring or the like to metal and, thus, cause a severe burn.
- (iv) Attach at least a 60cm 6-Gauge (AWG) insulated battery cable to a Negative (NEG., N., -) battery post;
- (v) Connect the Positive (Red) charger clip to the Positive (POS., P., +) post of battery;
- (vi) Position yourself and the free end of cable as far away from battery as possible, then connect the Negative (Black) charger clip to free end of cable;
- (vii) Do not face battery when making final connection;
- (viii) Connect charger AC supply cord to electrical outlet; and
- (ix) When disconnecting charger, always do so in reverse sequence of connecting procedure and break first connection while standing as far away from battery as practical

1.2.2 Installation and wiring compliance

- Installation and wiring must comply with the Local and National Electrical Codes and must be done by a certified electrician.
- Wrong installation on a boat may lead to corrosion of the boat. It is recommended that the installation on a boat may be carried by a boat electrician.
- If an extension cord is used to feed 120 VAC power, please ensure that it has 3-pin grounding, NEMA5-15 plug / receptacle and wire size is the same as the wire size of the power cord (*See wire sizes in the Specifications at Section 7*).

1.2.3 Preventing electrical shock

- The metal chassis of the charger is connected to the Ground pin of the power cord plug. For proper grounding of the metal chassis, ensure that Ground pin of the AC outlet powering the charger is firmly connected to the System / Earth Ground.
- Disassembly / repair should be carried out by qualified personnel only.
- Disconnect all AC and DC side connections before working on any circuits associated with the unit. Turning off AC input to the unit may not entirely remove dangerous voltages.
- Be careful when touching bare terminals of capacitors. Capacitors may retain high lethal voltages even after the power has been removed. Discharge the capacitors before working on the circuits.
- Do not operate the charger if the AC power cord is damaged.

1.2.4 Installation environment

- The charger should be installed indoor only in a well ventilated, cool, dry environment.

SECTION 1 | Safety Instructions

- Do not expose to moisture, rain, snow or liquids of any type. When installed in a boat, ensure that it is not subject to water spray / bilge water splash.
- Do not mount the charger directly above or below the battery being charged because gases / electrolyte from the battery will corrode / damage the charger. Do not install in the same compartment as batteries.
- Working with the unit may produce arcs or sparks. Thus, the unit should not be used in areas where there are flammable materials or gasses requiring ignition protected equipment. These areas may include spaces containing gasoline-powered machinery, fuel tanks, and battery compartments.
- To reduce the risk of overheating and fire, do not obstruct the suction and discharge openings of the cooling fan.
- To ensure proper ventilation, do not install in a low clearance compartment that has restricted cool air change. There should be at 6" clearance all around the unit.

1.2.5 Preventing fire and explosion hazards

- Working with the unit may produce arcs or sparks. Thus, the unit should not be used in areas where there are flammable materials or gases requiring ignition protected equipment. These areas may include spaces containing gasoline-powered machinery, fuel tanks, and battery compartments.

1.2.6 Precautions when working with batteries

- Charge Lead Acid Batteries only
- Never charge a frozen battery – it may explode!
- Batteries contain very corrosive diluted Sulphuric Acid as electrolyte. Precautions should be taken to prevent contact with skin, eyes or clothing.
- Batteries generate Hydrogen and Oxygen during charging resulting in evolution of explosive gas mixture. Care should be taken to ventilate the battery area and follow the battery manufacturer's recommendations.
- Never smoke or allow a spark or flame near the batteries.
- Use caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
- Remove metal items like rings, bracelets and watches when working with batteries. The batteries can produce a short circuit current high enough to weld a ring or the like to metal and, thus, cause a severe burn.
- If you need to remove a battery, always remove the ground terminal from the battery first. Make sure that all the accessories are off so that you do not cause a spark.
- Disconnect the AC input power to the charger before connecting / disconnecting the batteries or other DC loads or when working on the charger
- Disconnect the AC input power before changing setting of the DIP Switch

SECTION 2 | Layout

2.1 SEC-1215UL

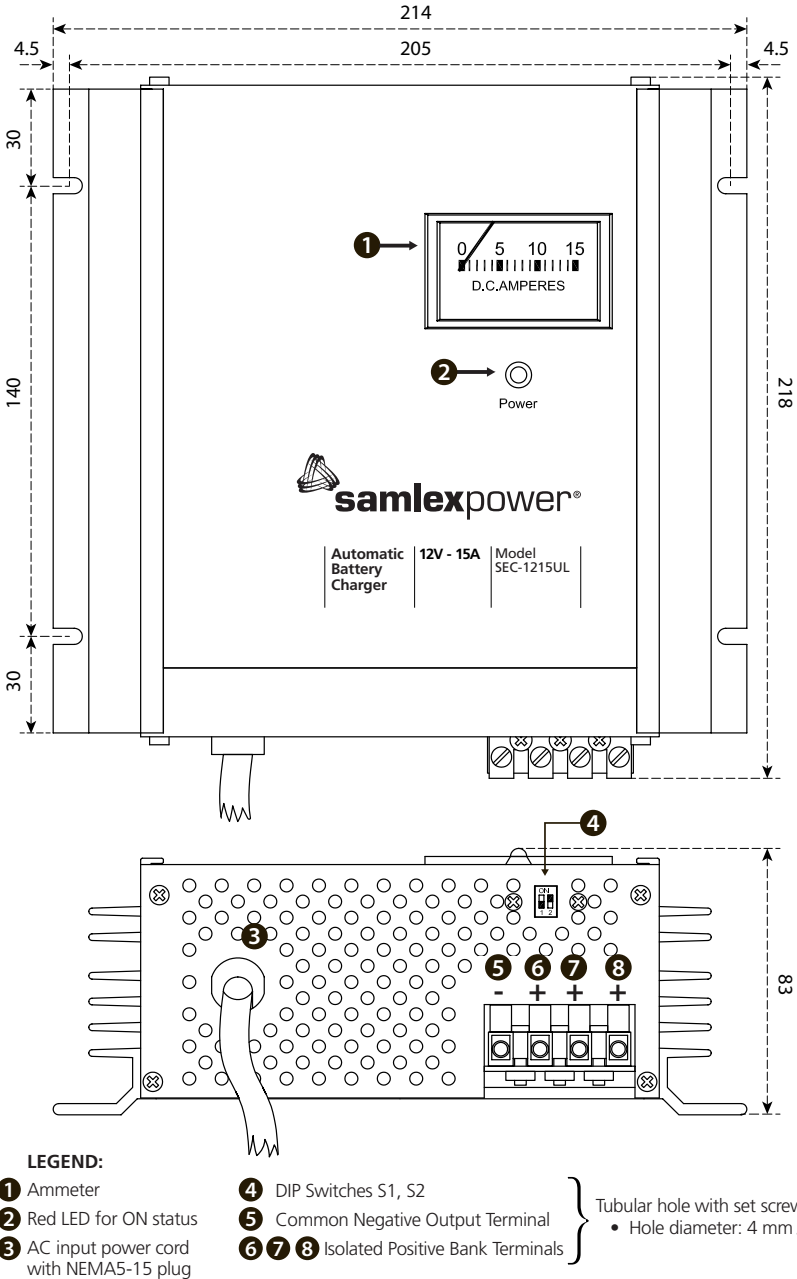
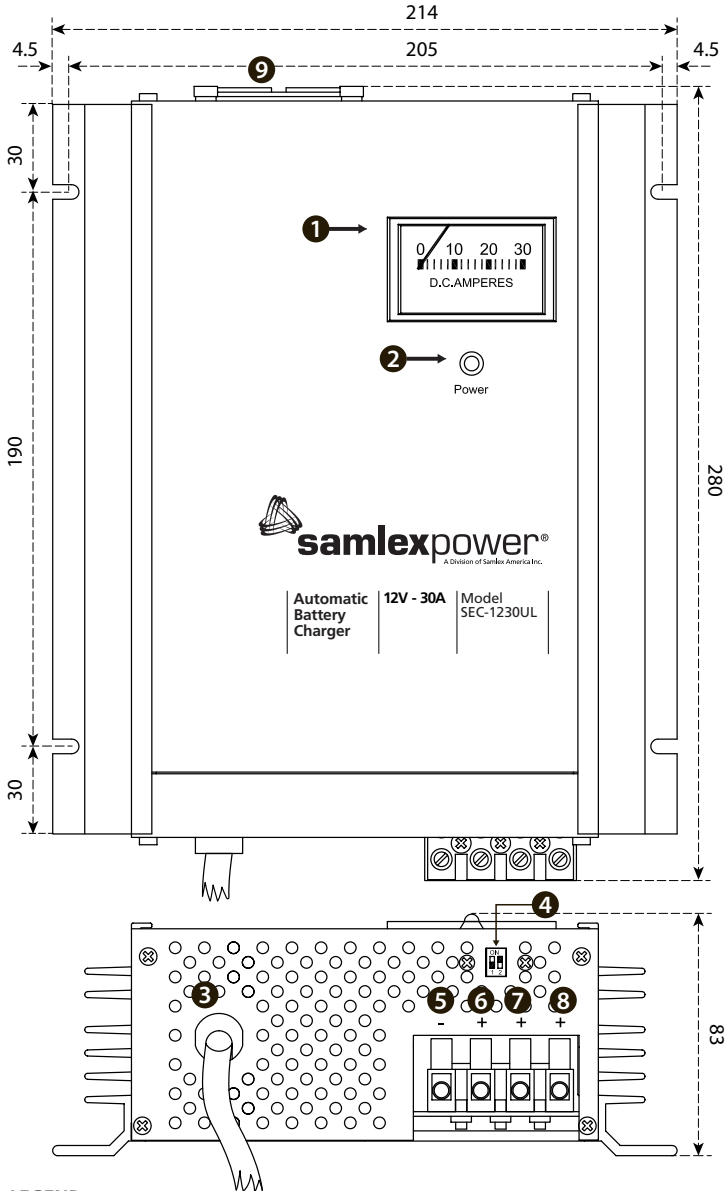


Fig 2.1 Layout - SEC-1215UL

SECTION 2 | Layout

2.2 SEC-1230UL

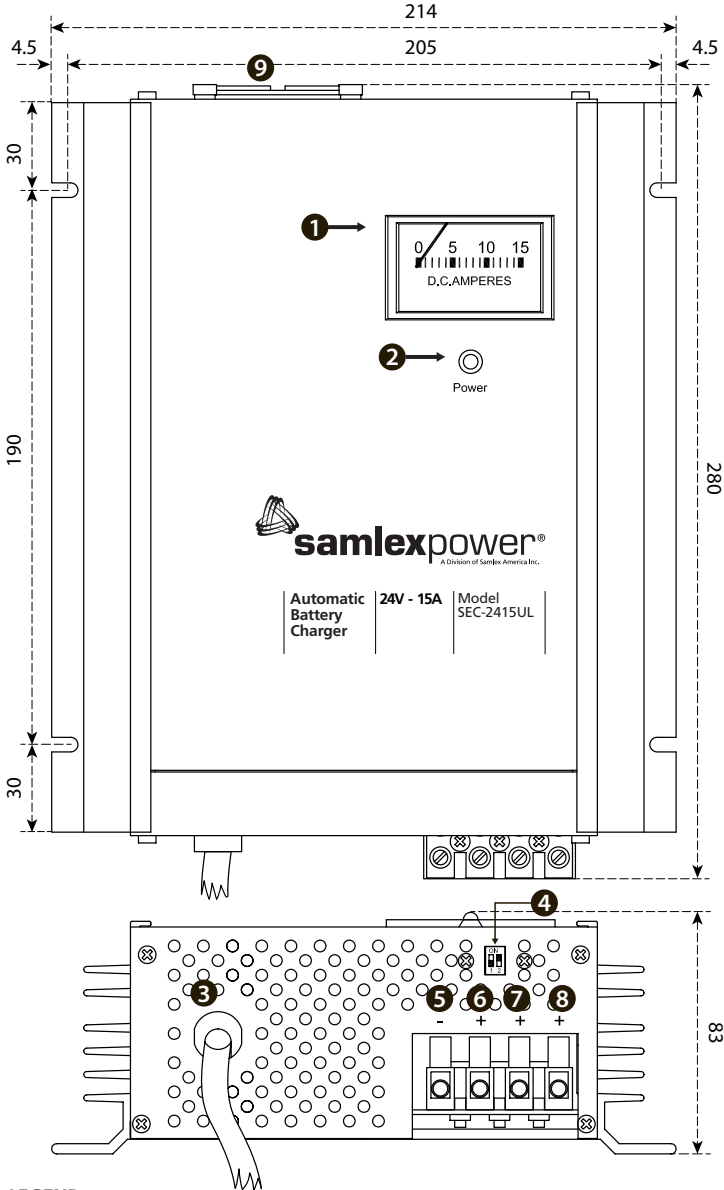


LEGEND:

- 1** Ammeter
 - 2** Red LED for ON status
 - 3** AC input power cord with NEMA5-15 plug
 - 4** DIP Switches S1, S2
 - 5** Common Negative Output Terminal
 - 6 7 8** Isolated Positive Bank Terminals
 - 9** Cooling Fan
- } Tubular hole with set screw
• Hole diameter: 4.8 mm / 0.19"

SECTION 2 | Layout

2.3 SEC-2415UL



LEGEND:

- 1 Ammeter
 - 2 Red LED for ON status
 - 3 AC input power cord with NEMA5-15 plug
 - 4 DIP Switches S1, S2
 - 5 Common Negative Output Terminal
 - 6 7 8 Isolated Positive Bank Terminals
 - 9 Cooling Fan
- } Tubular hole with set screw
• Hole diameter: 4.8 mm / 0.19"

SECTION 3 | Description, Features & Cooling

3.1 DESCRIPTION

These chargers are used to charge Lead Acid Batteries (*Flooded, AGM or Gel Cell*). SEC-1215UL (*Maximum charging current 15A*) and SEC-1230UL (*Maximum charging current 30A*) are used to charge 12 V batteries. SEC-2415UL (*Maximum charging current 15A*) is used to charge 24 V batteries. These chargers can be powered from AC power source of either 120 V, 60 Hz (*Pre-set*) or 230 V, 50 Hz (*By changing jumper position inside the unit - See Section 5.2.1 for instructions*).

3.2 FEATURES

- State of the art switched mode technology is used for very high efficiency, lightweight and quiet operation.
- User selectable AC input voltage - 120 V , 60 Hz (*Pre-set*) or 230 V , 50 Hz [*By changing jumper position inside the unit (See Section 5.2.1 for instructions)*].
- User selectable 2 or 3 stage charging algorithm ensures rapid and safe charging of all types of lead acid batteries - Flooded, AGM, Gel Cell or batteries with external load. (*Through externally accessible DIP Switches - see Section 5, Tables 5.1 and 5.2 for instructions*)
- Fully automatic "Connect and Forget" operation
- 3 banks of batteries can be charged simultaneously without use of an external battery isolator
- Monitoring through ON status LED and Ammeter
- Temperature controlled cooling fan (*SEC-1230UL, SEC-2415UL*)
- Protections against short circuit, over current, reverse battery connection and over temperature (*Over temperature for SEC-1230UL and SEC-2415UL*)
- Can be used as a power supply or as a DC UPS (*Uninterruptible DC Power Supply*) when used with a battery (*DIP Switch set at "Battery with load" - See Section 5, Tables 5.1 and 5.2 for instructions*)

3.3 COOLING

SEC-1215UL is cooled by convection and does not have any thermal overload shut down.

SEC-1230UL and SEC-2415UL are cooled by convection and in addition, have a temperature controlled fan for forced air cooling. Two temperature sensors mounted on the power transformer control the switching of the fan and over temperature shut down. The fan will be switched on by the first temperature sensor when the power transformer reaches 60°C / 140°F.

Hence, at lower loads, the fan may not cut in and will be off. This is normal.

In case the fan fails or if the cooling is not adequate, the second temperature sensor will shut down the unit if the power transformer reaches 105°C / 221°F. The red LED (*2 in Figs 2.1 to 2.3*) will switch OFF. The unit will automatically recover on removal of thermal overload condition.

SECTION 4 | Charging States & Protections

4.1 CHARGING STAGES



INFO

a) VOLTAGE READINGS ON NO LOAD

The output has one common Negative terminal and three Positive terminals for charging 3 banks of batteries. Each Positive terminal has an internal isolating diode in series which has a forward voltage drop of 0.8 to 1.1 V. On no load (*that is when no battery or other DC load is connected to any of the 3 terminals*), the voltage reading will read 0.8 to 1.1 V higher than the specified float voltage. Note that the specified float voltage is at a load of 1 A. Also, the voltage on the terminals not connected to the load (*for example, when one bank of battery is connected to one Positive terminal, the other 2 Positive terminals will remain disconnected*) will read 0.8 to 1.1 Volt higher than the voltage of the loaded terminal.

b) VOLTAGE SPECIFICATIONS

All rated voltages are specified at battery temperature of 80°F.

These chargers can be manually selected to operate in 3 stage or 2 stage modes (*Please see "Selecting the Type of Battery and Charging Stages" at Section 5.2.2*). The charging stages are described below:

4.1.1 Stage 1 - Constant Current or Bulk Charge Stage

When the battery is low, it will try to draw larger charging current. The charger senses the current draw and limits this to the maximum permissible value (*15A for SEC-1215UL / SEC-2415UL and 30A for SEC-1230UL*). Bulk charging takes place at this constant current. **In this condition of constant current, the voltage measured at the charger or battery terminals will be the battery's own intrinsic voltage proportional to its state of charge.**

The constant current injected into the battery starts restoring the battery capacity and it's voltage starts rising. When this voltage approaches the threshold of battery "gassing", termed "Absorption Voltage", the charger automatically switches over to Stage 2 - "Absorption Stage". The value of this voltage depends upon the type of battery being charged (*See DIP Switch Settings in Section 5, Tables 5.1 and 5.2*). By this time, approximately 80% of the battery capacity will normally have been restored (*Note: The percentage capacity restored till the point the battery reaches the Absorption Voltage is inversely proportional to the value of the bulk charge current*).

4.1.2 Stage 2 - Constant Voltage Absorption Stage

As explained at Section 4.1.1, when the battery voltage approaches the point where battery "gassing" can begin, the charger automatically switches over to the "Absorption Stage". The charger applies a constant voltage whose value depends upon the type of battery selected (*See DIP Switch Settings in Section 5, Table 5.1 and 5.2*). This controlled overcharge restores the balance 20% of the capacity in a minimum amount of time. As the capacity is fully restored, the charging current starts reducing. When the current reduces below the preset threshold (*1.5 to 2A for SEC-1215UL / 2415UL and 2.5 to 3A for SEC-1230UL*), the charger automatically switches to the "Float or Maintenance Stage".

SECTION 4 | Charging States & Protections

4.1.3 Stage 3 - Constant Voltage , Float or Maintenance Charging Stage

As explained at Section 4.1.2, as the charging current drops below the preset threshold (*1.5 to 2 Amps for SEC-1215UL / SEC-2415UL and 2.5 A to 3 A for SEC-1230UL*), it signals that the battery is 100% charged.

In this "Float or Maintenance Charging Stage", the charger outputs a constant voltage of 13.5 V for 12 V system and 27 V for 24 V system. This helps in maintaining 100% capacity of the battery and also compensates for self discharge. The battery can remain connected in this stage indefinitely without the risk of overcharging or excessive loss of electrolyte. In Float Stage, the battery will consume around 0.1% of its Ah capacity to compensate for self discharge.



CAUTION!

3 stage charging is recommended for charging stand-alone, unloaded batteries (*there is no load connected to the battery when it is being charged*).

If a load is also connected simultaneously, a part of the charger's output current will be diverted to this load. Thus, the charger may remain locked in the "Boost or Absorption Mode" if the current drawn by the load is more than the preset value of threshold current determining change over between the Boost and Float Stages (*1.5 to 2A for SEC-1215UL / 2415UL and 2.5 to 3A for SEC-1230UL*). **This will lead to overcharging and loss of electrolyte.**

For charging a battery when a load is also connected simultaneously, the "Boost or Absorption Stage" is required to be disabled. Select "Battery with Load" using the DIP switch. See details under "Powering other DC Loads" at Section 5.4.1.

4.2 PROTECTIONS

4.2.1 Short Circuit Shut Down

In case of a short circuit on the output side, the charger will shut down. The Red LED (*2 in Figs 2.1 to 2.3*) will switch off. The charger will automatically recover once the short circuit condition is removed.

4.2.2 Over load Current Limiting

The current drawn by the battery / load is automatically limited to a maximum of 15 A for SEC-1215UL / SEC-2415UL and 30A for SEC-1230UL. If the battery / load tries to draw a higher current than these limits, the output voltage of the unit will start to drop.

If a battery is connected, the output voltage will be clamped to the actual battery voltage proportional to its state of charge. The unit will automatically recover when the overload condition is removed.

4.2.3 Reverse Battery Connection Cut Off

The output is internally fused on the DC side (*20A for SEC-1215UL / SEC-2415UL and 40A for SEC-1230UL*). In case, the polarity of the battery connection is reversed, the fuse(s) will blow . The Red LED (*2 in Figs 2.1 to 2.3*) will switch off. The fuse(s) will be required to be replaced for the unit to function again.

SECTION 4 | Charging States & Protections

4.2.4 Thermal Overload Shutdown

SEC-1215UL is cooled by convection and does not have any thermal overload shut down.

SEC-1230UL and SEC-2415UL are cooled by convection and in addition, have a temperature controlled fan (*9 in Figs 2.2 and 2.3*) for forced air cooling. Two temperature sensors mounted on the power transformer control the switching of the fan and over temperature shut down. The fan will be switched on by the first temperature sensor when the power transformer reaches 60°C / 140°F. Hence, at lower loads, the fan may not cut in and will be off. This is normal.

In case the fan fails or if the cooling is not adequate, the second temperature sensor will shut down the unit if the power transformer reaches 105°C / 221°C. The Red LED (*2 in Figs 2.1 to 2.3*) will switch off. The unit will automatically recover on removal of thermal overload condition.



CAUTION!

Keep the charger in a well ventilated, cool and open area. Do not block the vent holes on the sides or the discharge openings of the cooling fan.

SECTION 5 | Installation & Charger Operation

5.1 INSTALLATION

5.1.1 Location, Mounting & Safety

The charger is required to be installed in a safe, well ventilated and dry location. Please see the details given under Section 1 - Safety Instructions.

Mount the charger using 4 screws.

5.1.2 Output Connectors

Refer to output terminals 5, 6, 7 and 8 in Figs 2.1 / 2.2 / 2.3. Each terminal consists of tubular hole with set screw. Insert the wire end in the tubular hole and tighten the set screw. The diameter of the tubular holes is as follows:

SEC-1215UL	4 mm / 0.16 inches
SEC-2415UL / SEC-1230UL	4.8 mm / 0.19 inches

5.1.3 Wires for Output Connection

To avoid polarity errors and possible damage, never use wires of only one color. Use Red insulated wire(s) for Positive connection(s) and Black for Negative connection(s)

Recommended DC wire sizes are given below. The length in feet is the length of the pair of the Positive and Negative DC wires from the charger to the battery / other DC load.

SECTION 5 | Installation & Charger Operation

Recommended sizes will limit voltage drop to 2%:

Length of the pair of the Positive & Negative cables	SEC-1215UL SEC-2415UL	SEC-1230UL
0 to 6 ft.	AWG #10	AWG #8
6 to 10 ft.	AWG #8	AWG #6
10 to 20 ft.	AWG #6	AWG #4

5.1.4 Pin Type Terminal Lugs for Wire Ends

If stranded wire is directly inserted in the tubular hole of the output terminal and the set screw is tightened, the strands will spread and the set screw may pinch only a few strands. This will result in loose connection, sparking, overheating and voltage drop. For firm connection, crimp / solder Pin Type of Terminal been provided for wire size for up to 6 ft:

- For SEC-1215UL / 2415UL: 4 pcs of PTNB5-13 (AWG #10)
- For SEC-1230UL: 4 pcs of PTNB10-12 (AWG #8)

5.2 CHARGER OPERATION

5.2.1 Preparing the Charger for Operation: Selecting AC input voltage

The charger is pre-set to operate from input AC voltage of 120 VAC, 50 / 60 Hz.

To operate the charger from AC input voltage of 230 VAC, 50 / 60 Hz, change the internal setting as follows:

1. Remove the 4 screws on the Ammeter side of the top cover
2. Gently slide the top cover out by 2 to 3 inches. (**CAUTION! The top cover will be re-strained from fully sliding out by the wires connecting the Ammeter, LED and the fan**)
3. Locate the jumper wire with a "Quick Female Disconnect". In the pre-set condition, it is connected to the male vertical pin marked "115 V". Pull this female disconnect upwards to disconnect from the "115 V" position. Connect this to the male vertical pin marked "230 V"
4. Replace the fuse with the fuse recommended for 230 VAC operation (See fuse rating at Section 7)
5. Replace the AC plug of the power cord with a suitable 3 pin grounded plug to mate with the 230 VAC outlet. **CAUTION: The new plug should have 3 poles i.e. Line (L) , Neutral(N) and Earth ground. Color code for the power cord conductors is:**
 - Line (L) - Black
 - Neutral (N) - White
 - Earth ground - Green

5.2.2 Preparing the Charger for Operation: Selecting the Type of Battery and Charging Stages

The Float Voltage and Absorption Voltage (Also called Boost or Overcharge Voltage) of different types of Lead Acid Batteries are different. Also, when a charger is used to

SECTION 5 | Installation & Charger Operation

charge a battery and simultaneously supply a load, the Absorption Stage is required to be disabled to prevent overcharging of the battery (*See details under ⚠CAUTION! at Section 4.1.3*). A DIP Switch (*4 in Figs 2.1 to 2.3*) is provided on top of the output terminals for selecting the battery type and for disabling the Boost Stage when charging loaded batteries. The following selections can be made with the help of the DIP Switch.



CAUTION!

Do not change the DIP Switch setting when the charger is operating. Always change the DIP Switch setting when the charger is off, i.e. after disconnecting the charger from the AC input power.

NOTE: The voltages are for a temperature of 80°F.



CAUTION!

Please ensure that the position No. 4 of the DIP switch (S1-ON & S2-ON) is NEVER selected.

S1	S2	Float	Absorption	Battery Type	Charging Stages
OFF *	ON *	13.5 V *	14.4 V *	Flooded / AGM *	3 Stages (Stages 1, 2, 3)
ON	OFF	13.5 V	14.0 V	Gel Cell	3 Stages (Stages 1, 2, 3)
OFF	OFF	13.5 V	Disabled	Battery with Load	2 Stages (Stages 1, 3)
ON	ON	Caution! Do NOT use this setting			

* Factory pre-set in this position

S1	S2	Float	Absorption	Battery Type	Charging Stages
OFF *	ON *	27 V *	28.8 V *	Flooded / AGM *	3 Stages (Stages 1, 2, 3)
ON	OFF	27 V	28.0 V	Gel Cell	3 Stages (Stages 1, 2, 3)
OFF	OFF	27 V	Disabled	Battery with load	2 Stages (Stages 1, 3)
ON	ON	Caution! Do NOT use this setting			

* Factory pre-set in this position

SECTION 5 | Installation & Charger Operation

5.2.3 Connecting The Batteries or Other DC Loads

The output has a common Negative (-) terminal (*5 in Figs 2.1 to 2.3*) and 3 Positive terminals (*6, 7 and 8 in Figs 2.1 to 2.3*) for charging up to 3 independent banks of batteries. Each Positive connector has its own internal isolating diode which works as a battery isolator. If more than one bank of batteries is connected, these will be charged at the same time as long as the AC power is available to the charger (*the maximum charging current of 15 A of SEC-1215UL / SEC-2415UL and 30 A of SEC-1230UL will be shared among the connected banks of the batteries depending upon their discharged states*). In case the AC power fails or if there is no output from the charger, the isolating diodes will prevent charging / discharging among the batteries connected to the banks.

The above arrangement works as a battery isolator and can divide the charging current into a maximum of 3 isolated branches and allows current flow in each branch in one direction only. If more than one battery systems are being used independently, the system batteries will discharge to different levels. If system batteries are connected in parallel to charge from a single charger, a weak or a dead battery will drain the charge from the strong battery. Such situation occurs in RVs, boats and other vehicles where 2 separate battery systems are used – starter battery for starting and running the engine and the other auxiliary / house battery system for running auxiliary devices like inverters, refrigerators, car stereos etc. Here, the starter battery should be connected to one bank and the auxiliary / house battery to the second bank. Fig. 5.1 shows this connection.

In a single battery bank, two or more batteries may be connected in parallel to increase their Ampere Hour (*Ah*) capacity. These will be discharged and charged as a single battery bank. In this case, the paralleled bank of multiple batteries is to be considered as a single bank and connected to any one of the 3 banks of the charger as shown in Fig. 5.2 for bank of 4 batteries. For proper charging of all the batteries, please ensure that the Positive wire "A" from the charger is connected to the Positive terminal of the first battery (*Battery 1*) and the Negative wire "B" is connected to the Negative terminal of the last battery (*Battery 4*). This will ensure the following:

- Resistance of the interconnecting cables will be balanced and the individual batteries will see the same series resistance
- All the individual batteries will be charged at the same charging current and thus, will be charged to the same state of charge
- None of the batteries will see an overcharge condition

When connecting a single battery or other single DC load, it can be connected to the common Negative and any one of the 3 Positive terminals as in Fig. 5.2.

5.3 OPERATION

When the charger is switched on, the Red LED marked "Power" (*2 in Figs 2.1 to 2.3*) lights up indicating that output voltage is available. When the batteries are being charged or when the charger is supplying other DC load, the current fed by the charger will be indicated by the Ammeter (*1, Figs 2.1 to 2.3*).

SECTION 5 | Installation & Charger Operation

When the batteries are discharged, they will draw charging current proportional to their discharged condition (*up to the maximum current rating of the charger*) and this current draw will be shown by the Ammeter. When the batteries are fully charged, they will draw very low current (*may not be registered by the Ammeter*) to compensate for their self discharge.

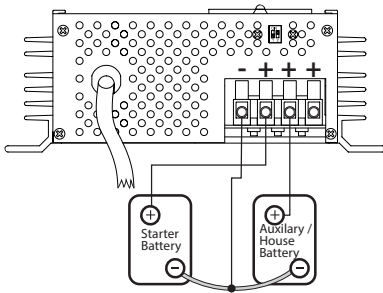


Fig. 5.1 Connecting 2 separate battery systems to 2 separate banks.

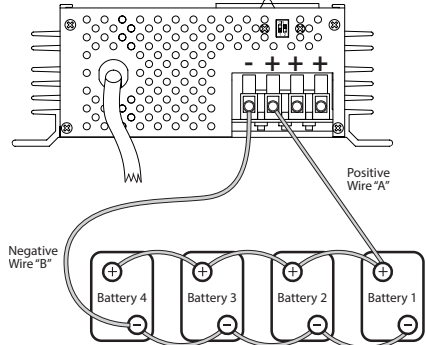


Fig. 5.2 Connecting bank of paralleled batteries to single bank.

5.3.1 Charging a Battery Installed in a Vehicle

Follow these steps when the battery is installed in a vehicle. A spark near a battery may cause battery explosion. For safety and to reduce the risk of spark near the battery:

- Position AC and DC cords to reduce risk of damage by hood, door or moving engine parts
- Stay clear of fan blades, belts, pulleys and other parts that can cause injury to persons
- Check the polarity of the battery posts. A Positive (*Pos, P, +*) battery post usually has a larger diameter than a Negative (*Neg, N, -*) post
- Determine which post of the battery is grounded (*Connected to the chassis Engine Block*). If the Negative post is grounded to the Engine Block (*As in most vehicles*), see sub paragraph (e). If the Positive post is grounded, see sub paragraph (f).
- For a Negative grounded vehicle, connect the Positive (*Red*) DC wire from the charger to the Positive of the battery post. Connect the Negative (*Black*) DC wire from the charger to a section of heavy gauge metal part of the frame or engine block which is away from battery. Do not connect to carburetor, fuel lines or sheet metal body parts.
- For a Positive grounded vehicle, connect the Negative (*Black*) DC wire from the charger to the Negative of the battery post. Connect the Positive (*Red*) DC wire from the charger to a section of heavy gauge metal part of the frame or engine block which is away from battery. Do not connect to carburetor, fuel lines or sheet metal body parts.
- Connect the charger AC power cord to the AC outlet

SECTION 5 | Installation & Charger Operation

- h) When disconnecting the charger, turn switches to off, disconnect AC power cord, remove connection from the vehicle chassis and then remove connection from the battery terminal

5.3.2 Charging a Battery outside the Vehicle

Follow these steps when the battery is outside the vehicle. A spark near the battery may cause battery explosion. For safety and to reduce risk of spark near the battery, connect the charger as follows:

- a) Check the polarity of the battery posts. A Positive (*Pos, P, +*) battery post usually has a larger diameter than a Negative (*Neg, N, -*) post
- b) Attach a piece of at least 3" of AWG #6 insulated battery wire to the Negative battery post
- c) Connect the Positive (*Red*) DC wire from the charger to the Positive battery post
- d) Position yourself and the free end of the piece of wire attached to the Negative post as far away from the battery as possible and then connect the Negative (*Black*) DC wire from the charger to the free end of the piece of wire attached to the Negative battery post
- e) Do not face the battery when making the final connection
- f) Connect the charger AC power cord to the AC outlet
- g) When disconnecting the charger, always do so in reverse sequence of connecting procedure and break the first connection while standing as far away from the battery as practical

5.4 CHARGING MORE THAN ONE BANK OF BATTERIES



CAUTION!

When charging more than one bank of batteries at the same time using 3 Stage Charging, ensure that the batteries in the banks are in a similar discharged condition. If one bank is completely discharged and another is almost fully charged, the bank that is fully charged will be subjected to over charge condition during the time when the charger remains in Boost Stage for charging the completely discharged bank. If batteries are in dissimilar states of charge, select DIP Switch setting for "Battery with Load" (*See Tables 5.1 and 5.2*).

5.4.1 Powering Other DC Loads

The charger can be used as a power supply or as a DC UPS . For both these applications, first set the DIP Switch to "Battery with load" (*See under " Selecting the Type of Battery and Charging Stages" at Section 5.2.2*).

To use as a power supply, first switch off the DC load. Connect the DC load between the common Negative terminal and one of the three Positive terminals. **Ensure that the maximum current drawn by the DC load is below the maximum current rating of the charger. Switch on the charger and then the DC load.**

SECTION 5 | Installation & Charger Operation

In a DC UPS (*Un-interruptible Power Supply*), the charger simultaneously powers the DC load as well as the battery. As long as the AC power to the charger is available and the charger is working normally, the charger will supply the DC load as well as charge/float the battery. In case the AC power fails or if the charger stops working, the battery will automatically power the DC load. As soon as the AC power to the charger is restored, the DC load will once again be fed by the charger and at the same time the battery will be recharged.



CAUTION!

Please ensure that the sum of the current drawn by the DC load and the current desired for charging the battery is less than the maximum current capacity of the charger.

To use as a DC UPS, first switch off the DC load and connect it to the battery. Now connect the battery as explained under "Charging a Battery outside the Vehicle" ([Section 5.3.2](#)). Switch on the charger and then switch on the DC load.

SECTION 6 | Troubleshooting

6.1 SYMPTOMS: CHARGER POWERED AND CONNECTED TO THE BATTERY

6.1.1 Red LED (*2 in Figs 2.1 to 2.3*) is OFF

The DC side fuse may have blown due to wrong polarity of battery connection. Ensure Positive of the battery is connected to the Positive of the charger and the Negative of the battery is connected to the Negative of the charger. Check the fuses inside the charger and replace, if blown.

The battery may be shorted. In this condition, the unit is shut down by the short circuit protection circuit. Remove the battery connection. If the Red LED now comes on, the battery is shorted. If the Red LED still does not come on, check if there is AC power in the receptacle. If there is power, check the AC side fuse inside the unit. If the fuse is not blown, call Technical Support.

6.1.2 Red LED (*2 in Figs 2.1 to 2.3*) is ON but the Ammeter Shows No Reading

The battery is fully charged. If the battery is not fully charged, the connection to the battery may be loose or open. Check tightness and continuity of the battery connection.

6.1.3 The Battery Is Getting Over Charged or Boils

The charger is also feeding other DC load(s) in parallel with the battery. The DIP Switch is not selected for "Battery with Load". Change DIP Switch setting to "Battery with Load" ([See Section 5.2.2 and DIP Switch Settings at Tables 5.1 and 5.2](#)).

SECTION 6 | Troubleshooting

6.2 SYMPTOMS: CHARGER POWERED & DISCONNECTED FROM BATTERY

6.2.1 Red LED (2 in Figs 2.1 to 2.3) is OFF

Check there is AC power in the receptacle. If there is power, check the AC side fuse inside the unit. If the fuse is not blown, check the DC side fuse. If the DC side fuse is not blown, the output may be shorted. In this condition, the charger is shut down by the short circuit protection circuit. Check that the output terminals are not shorted. If the terminals are not shorted, call Technical Support.

6.2.2 Internal AC Side Fuse Blows as Soon as Power is Turned ON

The AC input is selected for 120 VAC but the unit is plugged into 230 VAC. Always check that the charger is set for the correct AC mains voltage (Refer to Section 5.2.1). If the AC input voltage is correct, the charger is defective. Call Technical Support.

6.2.3 DC Side Fuse Blows As Soon As The Battery Is Connected

Wrong polarity of battery connection. Ensure Positive of the battery is connected to the Positive of the charger and the Negative of the battery is connected to the Negative of the charger.

6.3 SYMPTOMS WHEN THE CHARGER IS POWERED AND IS BEING USED AS A DC POWER SUPPLY/UPS

6.3.1 The Voltage Drops When Load is Switched ON

The load is trying to draw current more than the current limit value of the charger (The current limit value is the maximum specified charging Amps - see Specifications at Section 7). Once the load current reaches the current limit value, the current limit circuit is activated and the output voltage drops. Some loads like motors, compressors, incandescent lamps, halogen lamps, heating elements, relays, coils, capacitors etc. draw very large inrush/starting currents which may reach up to 10 times their normal operating currents. Ensure that the starting / inrush current or the maximum operating current of the load is lower than the current limit value of the charger.



INFO

Both the AC side and DC sides have fuses that are located inside the charger. Disconnect the AC power when checking or changing the fuses. Open the charger as follows:

1. Remove the 4 screws on the ammeter side of the top cover
2. Gently slide the top cover out by about 2 to 3 inches.
(CAUTION! The top cover will be restrained from fully sliding out by the wires connecting the ammeter, LED and fan)
3. The fuses will now be accessible. See Specifications in Section 7 for fuse ratings.

SECTION 7 | Specifications

MODEL NO.	SEC-1215UL
INPUT	
NOMINAL INPUT VOLTAGE AND FREQUENCY	120 VAC, 50/60 Hz (<i>Default</i>) 230 VAC, 50/60Hz (<i>Internal jumper setting</i>)
AC INPUT CONNECTION	Attached Power Cord: <ul style="list-style-type: none"> • 6 ft length • 3 x 18AWG wire size • NEMA5-15P Plug
OUTPUT	
CHARGING CURRENT	15A
CHARGING STAGES	3 Stages (<i>DIP Switch setting - Default</i>): <ul style="list-style-type: none"> • Bulk, Absorption and Float 2 Stages (<i>DIP Switch setting</i>): <ul style="list-style-type: none"> • Bulk and Float
CHARGING VOLTAGES	<ul style="list-style-type: none"> • 14.4 VDC (<i>Default</i>) • 14.0 VDC (<i>DIP Switch setting</i>) • Disable (<i>DIP Switch setting</i>) Absorption: <ul style="list-style-type: none"> • 14.4 VDC (<i>Default</i>) • 14.0 VDC (<i>DIP Switch setting</i>) • Disable (<i>DIP Switch setting</i>) Float: 13.5 VDC
NO. OF CHARGING BANKS	3
OUTPUT CONNECTIONS	Tubular Hole with Set Screw Hole Diameter: 4 mm / 0.16 in
MONITORING	
LED DISPLAY	Red LED: Output is available
ANALOGUE METER	Ammeter: 0 to 15A
COOLING	
TYPE OF COOLING	Convection cooled (<i>No fan</i>)
PROTECTIONS	
OUTPUT SHORT CIRCUIT	No output voltage. Auto reset on removal of short
INPUT OVERLOAD	4A input side fuse will blow (<i>120 VAC input</i>)
OUTPUT OVERLOAD	Electronic current limit at 15A
REVERSE POLARITY ON OUTPUT SIDE	20A output side fuse will blow
FUSES	
INTERNAL AC INPUT SIDE FUSE (120 VAC OPERATION)	4A, 250V; Size 5mm x 20mm; Time Delay Type Mfr.: Littelfuse 0218004 or equivalent
INTERNAL AC INPUT SIDE FUSE (230 VAC OPERATION)	2A, 250V; Size 5mm x 20mm; Time Delay Type Mfr.: Littelfuse 0218002 or equivalent
INTERNAL DC OUTPUT SIDE FUSE	32V, 20A; Automotive Blade Type; Fast Acting Mfr.: Littell Fuse 0287020 or equivalent
ENVIRONMENT	
OPERATING TEMPERATURE RANGE	-20°C to +40°C / -4°F to +104°F
STORAGE TEMPERATURE	-30°C to +70°C / -22°F to +158°F
RELATIVE HUMIDITY	Up to 90%, non condensing
OPERATING CONDITIONS	Indoor, ventilated, cool and dust free
COMPLIANCE	
SAFETY	Intertek-ETL Listed <ul style="list-style-type: none"> • Conforms to UL STD. 1564 • Certified to CSA STD. C22.2 No. 107.2
EMI	FCC Part 15(B), Class B
DIMENSIONS	
L x W x H	218 x 214 x 83 mm / 8.6 x 8.4 x 3.3 in
WEIGHT	2.2 Kg / 4.8 lbs

- NOTES:** 1. DC voltages are based on battery temperature of 86° F / 26.7°C
2. Specifications are subject to change without notice

SECTION 7 | Specifications

MODEL NO. SEC-1230UL	
INPUT	
NOMINAL INPUT VOLTAGE AND FREQUENCY	120 VAC, 50/60 Hz (<i>Default</i>) 230 VAC, 50/60Hz (<i>Internal jumper setting</i>)
AC INPUT CONNECTION	Attached Power Cord: <ul style="list-style-type: none"> • 6 ft length • 3 x 18AWG wire size • NEMA5-15P Plug
OUTPUT	
CHARGING CURRENT	30A
CHARGING STAGES	3 Stages (<i>DIP Switch setting - Default</i>): <ul style="list-style-type: none"> • Bulk, Absorption and Float 2 Stages (<i>DIP Switch setting</i>): <ul style="list-style-type: none"> • Bulk and Float
CHARGING VOLTAGES	Absorption: <ul style="list-style-type: none"> • 14.4 VDC (<i>Default</i>) • 14.0 VDC (<i>DIP Switch setting</i>) • Disable (<i>DIP Switch setting</i>) Float: 13.5 VDC
NO. OF CHARGING BANKS	3
OUTPUT CONNECTIONS	Tubular Hole with Set Screw Hole Diameter: 4.8 mm / 0.19 in
MONITORING	
LED DISPLAY	Red LED: Output is available
ANALOGUE METER	Ammeter: 0 to 30A
COOLING	
TYPE OF COOLING	Temperature controlled fan: <ul style="list-style-type: none"> • On when power transformer temperature rises to 60°C / 140°F • Off when cools down to 50°C / 122°F
PROTECTIONS	
OUTPUT SHORT CIRCUIT	No output voltage. Auto reset on removal of short
INPUT OVERLOAD	8A input side fuse will blow (<i>120 VAC input</i>)
OUTPUT OVERLOAD	Electronic current limit at 30A
REVERSE POLARITY ON OUTPUT SIDE	2 x 20A output side fuse will blow
OVER TEMPERATURE SHUT DOWN	Power transformer temperature rises to 105°C / 221°F
FUSES	
INTERNAL AC INPUT SIDE FUSE (120 VAC OPERATION)	8A, 250V; Size 6.3mm x 32mm; Time Delay Type Mfr.: Littelfuse 0313008 or equivalent
INTERNAL AC INPUT SIDE FUSE (230 VAC OPERATION)	4A, 250V; Size 6.3mm x 32mm; Time Delay Type Mfr.: Littelfuse 0313004 or equivalent
INTERNAL DC OUTPUT SIDE FUSE	2 x (32V, 20A); Automotive Blade Type; Fast Acting Mfr.: Littelfuse 0287020 or equivalent
ENVIRONMENT	
OPERATING TEMPERATURE RANGE	-20°C to +40°C / -4°F to +104°F
STORAGE TEMPERATURE	-30°C to +70°C / -22°F to +158°F
RELATIVE HUMIDITY	Up to 90%, non condensing
OPERATING CONDITIONS	Indoor, ventilated, cool and dust free
COMPLIANCE	
SAFETY	Intertek-ETL Listed <ul style="list-style-type: none"> • Conforms to UL STD. 1564 • Certified to CSA STD. C22.2 No. 107.2
EMI	FCC Part 15(B), Class B
DIMENSIONS	
L x W x H	280 x 214 x 83 mm / 11.0 x 8.4 x 3.3 in
WEIGHT	2.9 Kg / 6.4 lbs

NOTES: 1. DC voltages are based on battery temperature of 86° F / 26.7°C
2. Specifications are subject to change without notice

SECTION 7 | Specifications

MODEL NO. SEC-2415UL	
INPUT	
NOMINAL INPUT VOLTAGE AND FREQUENCY	120 VAC, 50/60 Hz (<i>Default</i>) 230 VAC, 50/60Hz (<i>Internal jumper setting</i>)
AC INPUT CONNECTION	Attached Power Cord: <ul style="list-style-type: none"> • 6 ft length • 3 x 18AWG wire size • NEMA5-15P Plug
OUTPUT	
CHARGING CURRENT	15A
CHARGING STAGES	3 Stages (<i>DIP Switch setting - Default</i>): <ul style="list-style-type: none"> • Bulk, Absorption and Float 2 Stages (<i>DIP Switch setting</i>): <ul style="list-style-type: none"> • Bulk and Float
CHARGING VOLTAGES	Absorption: <ul style="list-style-type: none"> • 28.8 VDC (<i>Default</i>) • 28.0 VDC (<i>DIP Switch setting</i>) • Disable (<i>DIP Switch setting</i>) Float: 27.0 VDC
NO. OF CHARGING BANKS	3
OUTPUT CONNECTIONS	Tubular Hole with Set Screw Hole Diameter: 4.8 mm / 0.19 in
MONITORING	
LED DISPLAY	Red LED: Output is available
ANALOGUE METER	Ammeter: 0 to 15A
COOLING	
TYPE OF COOLING	Temperature controlled fan: <ul style="list-style-type: none"> • On when power transformer temperature rises to 60°C / 140°F • Off when cools down to 50°C / 122°F
PROTECTIONS	
OUTPUT SHORT CIRCUIT	No output voltage. Auto reset on removal of short
INPUT OVERLOAD	8A input side fuse will blow (<i>120 VAC input</i>)
OUTPUT OVERLOAD	Electronic current limit at 15A
REVERSE POLARITY ON OUTPUT SIDE	2 x 10A output side fuse will blow
OVER TEMPERATURE SHUT DOWN	Power transformer temperature rises to 105°C / 221°F
FUSES	
INTERNAL AC INPUT SIDE FUSE (120 VAC OPERATION)	8A, 250V; Size 6.3mm x 32mm; Time Delay Type Mfr.: Littelfuse 0313008 or equivalent
INTERNAL AC INPUT SIDE FUSE (230 VAC OPERATION)	4A, 250V; Size 6.3mm x 32mm; Time Delay Type Mfr.: Littelfuse 0313004 or equivalent
INTERNAL DC OUTPUT SIDE FUSE	2 x (32V, 10A); Automotive Blade Type; Fast Acting Mfr.: Littelfuse 0287010 or equivalent
ENVIRONMENT	
OPERATING TEMPERATURE RANGE	-20°C to +40°C / -4°F to +104°F
STORAGE TEMPERATURE	-30°C to +70°C / -22°F to +158°F
RELATIVE HUMIDITY	Up to 90%, non condensing
OPERATING CONDITIONS	Indoor, ventilated, cool and dust free
COMPLIANCE	
SAFETY	Intertek-ETL Listed <ul style="list-style-type: none"> • Conforms to UL STD. 1564 • Certified to CSA STD. C22.2 No. 107.2
EMI	FCC Part 15(B), Class B
DIMENSIONS	
L x W x H	280 x 214 x 83 mm / 11.0 x 8.4 x 3.3 in
WEIGHT	2.9 Kg / 6.4 lbs

- NOTES:** 1. DC voltages are based on battery temperature of 86° F / 26.7°C
2. Specifications are subject to change without notice