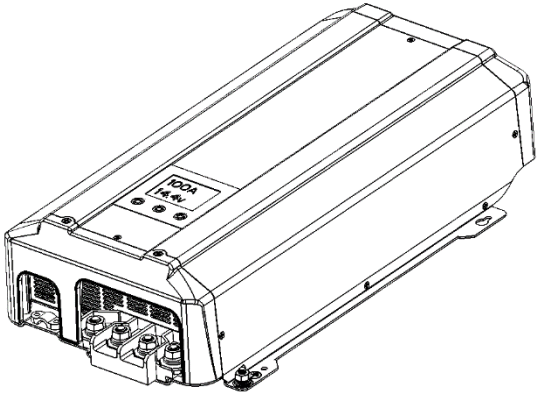
*A*bso Charger

12V 100A (AC12100)
24V 50A (AC2450)



Owner's Manual

KISAE℠

For safe and optimum performance, the **KISAE Abso Charger** must be used properly. Carefully read and follow all instructions and guidelines in this manual and give special attention to the **CAUTION** and **WARNING** statements.

PLEASE KEEP THIS MANUAL FOR FUTURE REFERENCE

Disclaimer

While every precaution has been taken to ensure the accuracy of the contents of this guide, **KISAE Technology** assumes no responsibility for errors or omissions. Note as well that specifications and product functionality may change without notice.

Important

Please be sure to read and save the entire manual before using your **KISAE Abso Charger.** Misuse may result in damage to the unit and/or cause harm or serious injury.

Product Numbers

AC12100 ***Abso Charger 12V 100A***
AC2450 ***Abso Charger 24V 50A***

Document Part Number

MU AC12100 Rev A

Service Contact Information

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WARNING: This product can expose you to chemicals, including Di (2-ethylhexyl) phthalate (DEHP) which is known to the State of California to cause cancer, birth defects or other reproductive harm. For more information, go to www.p65warnings.ca.gov
ADVERTENCIA Este producto puede exponerlo a productos químicos, incluidos Di (2-etilhexil) ftalato (DEHP) que el estado de California sabe que causa cáncer, defectos de nacimiento u otros daños reproductivos. Para obtener más información, vaya a www.p65warnings.ca.gov

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IMPORTANT SAFETY INFORMATION

This section contains important safety information for the **KISAE Abso Charger**. Each time, before using the unit, READ ALL instructions and cautionary markings on or provided with the unit, and all appropriate sections of this guide. The **KISAE Abso Charger** contains no user-serviceable parts. See Warranty section for how to handle product issues.

WARNING: Fire and/or Chemical Burn Hazard!

Do not cover or obstruct any air vent openings and/or install in a zero-clearance compartment.

WARNING: Failure to follow these instructions can result in death or serious injury. Keep away from children!

- When working with electrical equipment or lead acid batteries, have someone nearby in case of an emergency.
- Study and follow all the battery manufacturer's specific precautions when installing, using and servicing the battery connected to the charger.
- Wear eye protection and gloves.
- Avoid touching your eyes while using this unit.
- Keep fresh water and soap on hand in the event battery acid comes in contact with eyes. If this occurs, cleanse right away with soap and water for a minimum of 15 minutes and seek medical attention.
- Batteries produce explosive gasses. **DO NOT** smoke or have an open spark or fire near the system.
- Keep the unit away from moist or damp areas. Never expose the unit to snow, water etc.
- Avoid dropping any metal tool or object on the battery. Doing so could create a spark or short circuit which goes through the battery or another electrical tool that may create an explosion.

WARNING: Explosion hazard!

- Do not use the unit in the vicinity of flammable fumes or gasses (such as propane tanks or large engines).
- Avoid covering the ventilation openings. Always operate the unit in an open area.
- Prolonged contact with high heat or freezing temperatures will decrease the working life of the unit.

CAUTION:

- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.
- Do not charge non-rechargeable batteries because of the danger of eruption.
- During charging, the batteries have to be placed in a ventilated area.
- The battery terminal not connected to the chassis has to be connected first.
- The other connection is to be made to the chassis, remote from the battery and fuel line. The battery charger is then to be connected to the supply mains.
- After charging, disconnect the battery charger from the supply mains. Then remove the chassis connection and then the battery connection.
- Only allow children at least 8 years old to use the battery charger. Give sufficient instruction so that the child is able to use the battery charger in a safe way and explain that it is not a toy and must not be played with.
- The child does not try to charge non-rechargeable batteries because of the danger of eruption.
- Examine the battery charger regularly for damage, especially the cord, plug, and enclosure. If the battery charger is damaged, it must not be used until it has been repaired.

FCC INFORMATION

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules and comply with the CE EMC Standard. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment can generate, use, and radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

LIMITATIONS ON USE

Do not use in connection with life support systems or other medical equipment or devices.

1. INTRODUCTION

Thank you for purchasing the **KISAE Abso Charger**. With our state of the art, easy to use design, this product will offer you reliable service by providing a multi-stage multi-bank battery charger to charge different types of batteries you have installed in your boat, RV, vehicle, or your cabin battery bank.

An innovative feature we offer is the ability to charge your main battery bank as first priority so that you may charge this main bank quickly. Another unique feature is our silent mode setting that reduces the charging current at night, thereby reducing the fan noise.

This manual will explain how to use this unit safely and effectively. Please read and follow these instructions and precautions carefully.

2. PRODUCT DESCRIPTION

The **Abso Charger** includes the items listed below.

- Base unit

Series	Model No.	Rating
12V Model	AC12100	12V, 100A
24V Model	AC2450	24V, 50A

- Owner's manual.

3. UNDERSTANDING THE UNIT

The **Abso Charger** is a fully automatic negative grounding multistage battery charger with the ability to charge 3 separate battery banks. When first connected to an AC power source, the charger will check all three battery banks before charging commences. The charger operates on an isolated charging design where Battery Bank 1 is separate from Battery Bank 2 and 3. Battery Bank 1 is the priority battery bank in the charging sequence and is recommended to be connected to the main (or primary house) battery bank. Battery Bank 1 can be programmed with a different charge algorithm from Bank 2 and 3 (including different battery chemistries like **GEL**, **Flooded**, **AGM**, **Lithium** or **Program** battery type and different charging current). Battery Bank 2 and 3 can also be programmed identically to Bank 1 or to any other type that is available on the setting list.

The Battery Banks 2 and 3 are always connected in parallel internally (with a separation diode) and share a common charge algorithm.

During normal operation, the charger will do a full charge cycle to float stage on Battery Bank 1. Once the float stage is reached, the charger starts charging Battery Banks 2 and 3 together with a bulk and absorption mode. On completion, all the three battery banks move to float stage with a shared battery voltage determined by Battery Bank 1 float voltage settings.

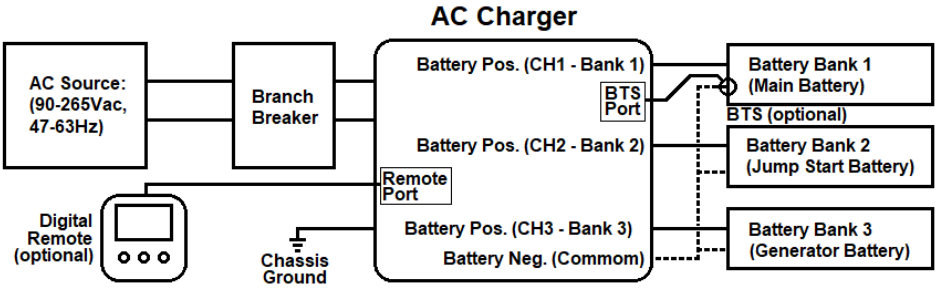
The **Abso Charger** also come with a unique feature that when the battery charging sequence starts, if it senses either Battery Bank 2 or 3 have battery connected and the battery voltage is below 11V on 12V model (***AC12100)*** or below 22V on 24V model (***AC2450)***, it will cycle to charge Bank 1 for 15 minutes then Bank 2 and 3 together for 15 minutes and cycle. When the charger senses both Bank 2 and 3 reach 13V on 12V model (***AC12100)*** or 26V on 24V model (***AC2450)***, it will then concentrate on charging Bank 1 until it reaches the float stage. After, it will then concentrate on recharging Bank 2 and 3 (together) to float stage. On completion, all three battery banks move to float stage with a shared battery voltage determined by Battery Bank 1 float voltage settings.

During the float stage each battery bank is isolated by an internal separation diode.

There is another unique feature **Silent Mode** whereby the charger has the ability to reduce fan speed at night or whenever required. This setting can be manually turned ON and OFF through the display and remains active for a period of 12 hours.

The charger also has the ability to awaken on over discharged Lithium battery with output terminated by the internal BMS circuitry. This manual activation function will awaken a lithium battery that has shut down due to under-voltage.

Important Note: The battery Bank 1 on the charger should only be connected to the main battery bank for first priority charging and the battery Banks 2 and 3 on the charger are to be connected to the other battery banks with lower priority (such as jump-start battery bank and/or AC generator battery bank used in a marine application). On single bank installations, it is recommended to use Bank 1 on the charger



Typical wiring block diagram of the Battery Charger with 3 battery banks

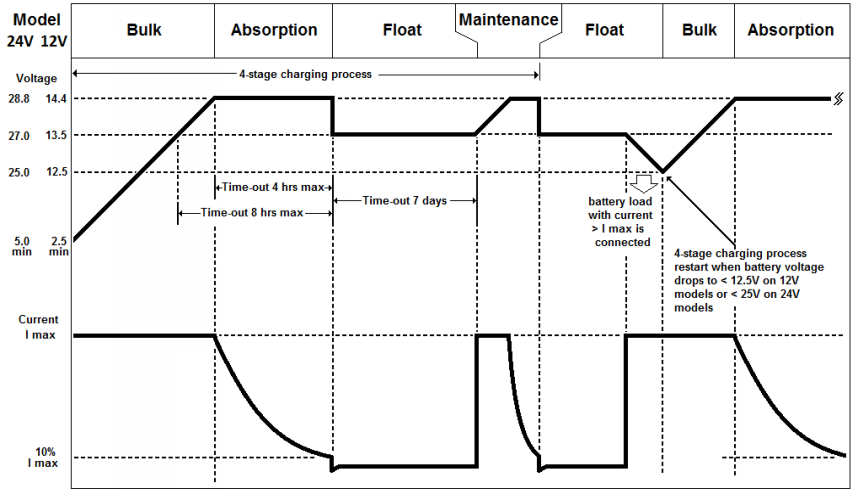
- ***AC Source:***
  The charger accepts full universal input voltage (90-265Vac, 47-63Hz).
- ***Branch Breaker:***
  For use on 120V AC Input source, use a 15A branch breaker to connect between the AC Source and the charger AC Input hardwire cable (Hot–black wire, Neutral–white wire, Ground–green wire).
  For use on 230V AC Input source, a minimum of 8A branch breaker is required from the AC Input Source.
- ***Battery Bank 1, 2 & 3:***
  There are a total of three channels (CH1, CH2, CH3) available for charging three battery banks (Battery Bank 1, Battery Bank 2, Battery Bank 3).
- ***Chassis Ground:***
  The unit chassis has to be grounded properly to the common ground point on the system.
- ***Digital Remote (optional):***
  The Display Remote (*Part Number*: ***ACRM1202***) sold separately is used to provide unit information from the charger. It is used as a secondary display to provide charger information. This can also be used as a main display or controller to connect two AC Chargers of the same model running in parallel.
- ***Battery Temperature Sensor – BTS (optional):***
  The Battery Temperature Sensor BTS (*Part Number:* **BTS-10K**) sold separately is designed to use on Battery Bank 1 (CH1) for better battery charging performance. The sensor is also used to terminate the battery charging process when it senses the battery temperature is either too high or too low and is not suitable for charging.

Understanding the Multi-Stage Charging Process:

The charger is a fully automatic "**set-and-forget**" design. It is designed to quickly and accurately recharge deep cycle batteries utilizing charger algorithms that help to maximize the life of specialized deep cycle batteries.

The charger features a multistage smart charging technology that enables the charger to be connected to the battery banks permanently.

As dictated by battery manufacturer's recommendations, deep cycle batteries require a multi-stage charge sequence for perfect, fast and accurate charging. This charger delivers four primary charge stages (Bulk Charge, Absorption Charge, Float, and Maintenance).



Typical charging profile of the charger

- ***Bulk Charge*** **'bUL'**: The battery is charged at a full rated output current of the charger until the battery reaches the final charging voltage, known as its absorption voltage. In this step, around 80% of the battery is recovered as fast as possible. During the Bulk charge stage, an 8-hour timer is started when the battery voltage reaches approximately 13.5V. This timer is set to avoid battery overcharging. The charger will override the Absorption to Float stage condition and goes to Float stage when it times out.
- ***Absorption Charge*** **'AbS'**: With the charger voltage held steady, the remaining 20% is replaced with the charger allowing the current to drop as the battery approaches its full charge. There is a 4 hour time limit on Absorption stage to avoid battery overcharging. The timer will override the Absorption to Float stage condition and goes to Float stage when it times out.
- ***Float Stage*** **'FLo'**: Finally, in the float stage, the charger voltage is lowered and held at a constant and safe predetermined level. This prevents the battery from being overcharged, yet allows the charger to supply enough current to make up for the self-discharge losses of the battery while supporting any additional loads connected to the battery (such as DC lighting and refrigerators). This stage allows the charger to be used as a DC power supply.
- ***Maintenance***: This is a regular timed recharge (or return to the bulk stage). The charger switches from float stage to bulk charge after 7 days of constant operation to ensure the battery banks remain active.

4. INSTALLING THE CHARGER

WARNING: It is recommended that all wiring be done by a certified technician or electrician to ensure adherence to the applicable electrical safety wiring regulations and installation codes. Failure to follow these instructions can damage the unit and could also result in personal injury or loss of life.

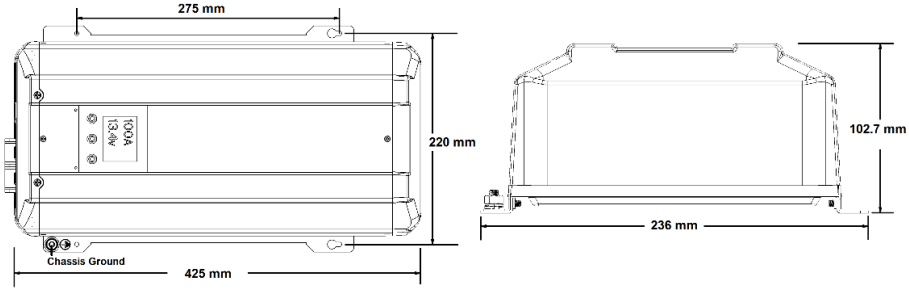
CAUTION: Before beginning your unit Installation, please consider the following:

- The unit should be used or stored in an indoor area away from direct sunlight, heat, moisture/water, or conductive contaminants.
- When placing the unit, allow a minimum of three inches of space around the unit for optimal ventilation.

Mounting the Charger:

- Choose an appropriate mounting location.
- For installing in an indoor location, the unit can be mounted in any direction.
- For installations in a boat or marine environment, the unit can be mounted horizontally and vertically (AC and DC panel facing downwards) only.
- Use the mounting template on the right to mark the positions of the mounting screws.
- Drill the 4 mounting holes and place the Charger in position and fasten the unit to the mounting surface. See mounting location as below.

  Note: The charger is designed to be permanently mounted.



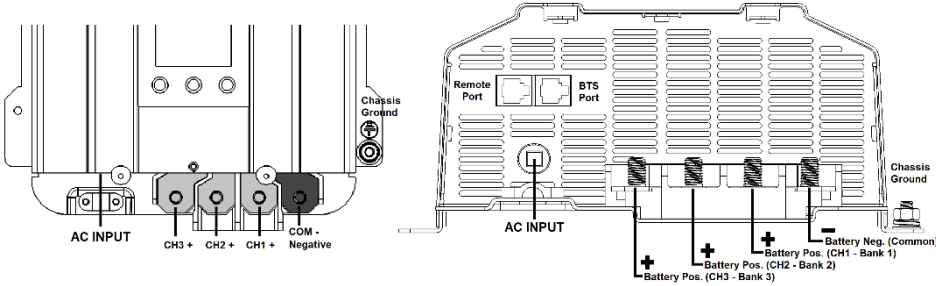
Chassis Grounding Connection:

DANGER: The unit chassis has to be grounded properly. Never operate the Charger without proper grounding. Failure to do so will result in death or serious injury. The ground connection to the charger must comply with all local and application-specific codes and ordinances.

Connect the unit's chassis ground to the common ground point through the ground stud located near one of the unit's mounting slots.

DC Output Wiring:

WARNING: The DC wiring used must be of appropriate size. An individual over-current protection device usually within 7 inches (17.8cm) of each battery bank is required. A DC disconnect switch is also recommended. Both devices must be rated for DC voltage and current and be rated to withstand the short circuit current available from the connected battery bank. Both devices must match with the size of the DC wiring.



Recommended Cable Length, Cable Size and Required Fuse Size:

Wire Length	Wire Size (AWG/mm²) - Fuse Size (A)			
	AC12100		*AC2450*	
5' (1.5 m)	#2 / 12mm²	125A	#6 / 16mm²	80A
7.5' (2.2m)	#1/0 / 16mm²		#4 / 25mm²	
10' (3m)	#2/0 / 35mm²		#1 / 50mm²	

- Remove the DC compartment cover by removing the two screws located on the top surface of the unit near the AC wiring compartment.
- Keep the connection between the battery and the charger as short as possible.
- Connect one end of the positive wire (red wire) to the Battery Bank 1 of charger positive terminal with torque 4.0~5.0 N-m (35~45 lb-in) and the other end to the over-current protection device, then the DC disconnect device. Do not over tighten as this may result in damage to the charger.
- Connect another wire from the DC disconnect device to the battery bank.
- For systems with multi-battery banks: Follow the same instruction as on Battery Bank 1 and connect to Battery Bank 2 and 3 accordingly.
- Prepare the negative wire (black wire) and connect to the negative terminal of the charger. Connect the other end of the negative wire to all the negative terminals of the battery bank(s).
- Place the DC Compartment cover back to the original position and secure the cover using the two screws provided.

AC Input Wiring for 120V AC Input System with Hardwire Input:

WARNING: The AC wiring must be of appropriate size, and it must be protected by an appropriate branch breaker (not provided) connected between the AC source and the charger. A three color coded #12 AWG wire (L, N, and GND) with a rated minimum of 75°C wire and a minimum 12 inches in length must be used.

Before connecting AC wiring, make sure the AC source is OFF.

- Remove AC compartment cover by unscrewing the two screws located at the top of the AC compartment cover.
- Remove the top section of the AC Input wire strain relief located at the bottom of the base panel inside the AC wiring compartment by unscrewing the two strain relief mounting screws.
- Use the provided butt-splices to extend the AC Input wires (L, N & GND) to the customer-provided chosen AC wire.
- Feed the extended AC Input wire through the strain relief located at the bottom of the unit's base panel.
- Place the top section of the strain relief back to the original position and secure the AC extended wire by using the strain relief and tightening its two provided screws.
- Connect the other end of the extended AC wire to the chosen AC branch breaker and, in turn, to the AC power source. Please verify all the connections from the charger's AC Live-wire (black color) to the extended AC black one, the charger's AC Neutral wire (white color) to the extended AC white one, and the charger's AC green wire to the extended AC green one.

Optional Battery Temperature Sensor (BTS) Connection:

The Battery Temperature Sensor (BTS-10K) optional accessory is a cable assembly come with RJ12 plug on one end and a ring terminal (lug) on the other end.

For single charger operation:

- To install the temperature sensor (BTS-10K), simply connect the RJ12 plug from the Battery Temperature Sensor (BTS) to the BTS Port on the charger.
- Connect the ring terminal (lug) from the BTS to the negative terminal of Battery Bank 1.

For parallel charger operation:

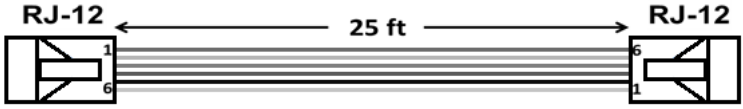
CAUTION: Use same model only, cannot be done with non-identical KISAE charger models)

- Two temperature sensors (BTS-10K) are required.
- Use the same procedure as above to install the first battery temperature sensor to the first charger.
- Connect the RJ12 plug from the second temperature sensor to the BTS port on the second charger.
- Connect the ring terminal (lug) to the same negative terminal of Battery Bank 1.

Optional Remote Display Panel (ACRM1202) Connection:

For use on a single charger unit:

- Install the optional ***Remote Display Panel*** in the specific location.
- The RJ12 Cable that is required is a RJ12 6 wired Rolled Over (Rollover) type.



RJ-12 (6 wires) Rolled Over cable (also called Rollover)

- Connect one end of the RJ12 cable to the ***Remote Port*** on the charger and the other end of the cable to the **COM_1** port on the ***Remote Display Panel***. (**Do not use COM_2 on this installation).**
- The ***Remote Display Panel*** is now ready for use. It is used as a secondary display to provide charger information. This panel share the same functionality as the display on the unit.

For use with two charger units connected in parallel: (use same model only)

CAUTION: Use same model only, cannot be done with non-identical KISAE charger models).

- Use the same procedure as above to install the first unit and the ***Remote Display Panel***.
- A second RJ12 cable is required for this installation.
- Install the second charger close to the first charger.
- Connect the second RJ12 cable between the second charger's ***Remote Port*** to the **COM_2** port on the ***Remote Display Panel***.
- The ***Remote Display Panel*** is now ready to use. Both charger displays will show '**CON**' indicating the chargers are connected in parallel. And all the three push buttons on both chargers are disabled.
- Before connecting the batteries to the chargers,
  - Connect Battery Bank 1 CH1 of Charger_1 to connect to CH1 of Charger_2.
  - Connect Battery Bank 2 CH2 of Charger_1 to connect to CH2 of Charger_2.
  - Connect Battery Bank 3 CH3 of Charger_1 to connect to CH3 of Charger_2.
  - The Common Ground of both chargers has to be connected together.

  Note: Damage to both chargers may occur if the above connections are not followed.
- The setting for the combined chargers is based on the original setting on Charger_1. To readjust the combined charger setting, it has to be done through the ***Remote Display Panel***.

Tips: During installation or unit setting, it is recommended to pre-set the desired charger setting on Charger_1 first before connecting the second RJ12 cable to Charger_2 because once Charger_2 is connected all the three push buttons on the charger are disabled and the display will only show '**CON**' and the setting can only be adjusted by using the Remote Panel.

5. UNIT OPERATION

Understanding the Battery Charging Current Setting:

The battery charging current rating is based on the battery size. When charging **GEL, AGM** and **Flooded** batteries, each battery bank should meet the minimum Ah rating as shown on below chart. If a smaller size battery bank is used, set the current rating to a lower value to match with the battery bank size. Normally, the maximum charger current rating is based on half the battery bank capacity.

	AC 12100					***AC 2450***				
Current Setting (A)	**100**	**60**	**40**	**20**	**10**	**50**	**30**	**20**	**10**	**5**
Minimum Battery Capacity (Ah)	**200**	**120**	**80**	**40**	**20**	**100**	**60**	**40**	**20**	**10**

When charging a **Lithium** battery, consult the Lithium battery manufacturer for maximum allowable charging current.

In float stage, the charger can provide a maximum float current of 60A for AC12100 and 30A for AC2450.

Understanding the Digital Display:

- **'GEL', 'AGM', 'Flooded', 'Lithium'** and **'Program'** icon represent different battery type settings.
- With only '**CH1**', icon turned on, the numerical value on the display shows individual battery information like battery voltage and charging current.
- With '**CH2**' and '**CH3**' icons turned on together, the numerical value on the display shows the total charging current to both battery banks.
- During normal operation, the display shows the related channel's battery voltage, charging current, and charging stage (Bulk-'**bUL**', Absorption-'**AbS**') alternately.
- When all channels have reached Float/Full stage, the display starts showing '**FUL**' indicating that all the batteries connected are fully charged.

Understanding the 'INFO', 'NEXT' and 'SET' Function Keys

Under Normal Operation (with AC Input connected):

'INFO': Press and hold the key for longer than 3 seconds to enter the charger setting mode and display will show unit setting. Use **'SET'** key to toggle the available settings. Press **'NEXT'** key to keep and save the chosen setting (the display will quickly flash 3 times to acknowledge the setting is set). The display will then show the next menu to continue with other setting parameters.

'NEXT': Press the hold the key for longer than 5 seconds to **RESET** the charger. Display will show 'RST' and it will force the charger to restart the charging cycle again starting with Bulk mode. The charger can also be **RESET** by disconnecting the AC Input, waiting for 5 seconds and reconnecting the AC Input again.

'SET': Press and hold the key for longer than 3 seconds to activate the **Silent Mode** operation and '**Auto**' icon will show on the display to acknowledge the operation is in place. Press and hold the **'SET'** key for longer than 3 seconds to cancel **Silent Mode** operation and '**Auto**' icon will turn off. For details, see "***Understanding and Executing the Silent Mode Function***"

With No AC Input connected:

'INFO': Pressing and holding the key for longer than 3 seconds will temporarily turn on the display for about 10 seconds and the display will show battery voltage for all 3 channels. This feature is useful to know what battery banks are actually connected to the unit. If "0.6V" or "0.7V" is read on the channel, it would mean that there is no battery connected to that battery bank. The display will then show the charger revision number (e.g. 'r1.0'). Please mark down the revision number as this information may be required if you call for customer service.

Understanding the Two-Stage (Mode 2) and Three-Stage (Mode 3) Charging Functions:

***Mode 3** Charging:*

The Three-Stage Charging (**Mode 3**) has a **Bulk**, followed by **Absorption**, and then **Float** sequence. During the **Bulk** stage, the battery accepts the maximum constant current from the charger. In the Absorption stage, the battery voltage is held to constant voltage and the charging current will slowly reduce. In **Float/Full** stage, the charger continuously produces lower constant Float voltage to fully top up and maintain the battery in a fully charged state.

The charger will automatically restart the full charging cycle if it senses any one of the battery banks is discharged to lower than 12.5V for 12V model, 25.0V for 24V model or after seven days in Float stage to refresh the battery banks.

***Mode 2** Charging:*

The Two-Stage mode 2 charging is similar to the Three-Stage charging except that there is no **Float** stage after the **Absorption** stage. The charger will terminate the battery charging after Absorption stage.

The charger will automatically restart the full charging cycle if it senses any one of the battery banks is discharged to lower than 12.5V for the 12V model, 25.0V for the 24V model, or after seven days since the last Absorption stage to refresh the battery banks.

Understanding the Battery Temperature Set Functions:

For use when Battery Temperature Sensor is **NOT** in use:

CAUTION: RISK OF BATTERY DAMAGE. If the temperature sensor is not being used, never set the battery temperature lower than the actual temperature. This may ***overcharge and damage*** the batteries.

There are three manual battery temperature settings available on the unit for GEL, Flooded and AGM batteries.

- Low temperature 'Lo', setting for when the battery is charging in a low temperature environment.
- Normal temperature 'nor', setting is for when the battery is charging at room temperature.
- High temperature 'HI', setting is for when the battery is charging in a high temperature environment.

With different settings above, the battery charging voltage is adjusted as listed below.

Temperature Setting	Recommended for Battery Temperature	Battery Type	Voltage adjustment from 25°C normal setting	
			12 V model	24 V model
Low (Lo)	<5°C (41°F)	GEL, Flooded	+ 0.675 V	+ 1.350 V
		AGM	+ 0.525 V	+ 1.050 V
Normal (nor)	>5°C and <30°C (>41°F and <86°F)	GEL, Flooded	0 V	0 V
		AGM	0 V	0 V
High (HI)	>30°C (86°F)	GEL, Flooded	- 0.27 V	- 0.54V
		AGM	- 0.21 V	- 0.42V

For use when Battery Temperature Sensor is in use:

No setting on the unit is required, and the unit will automatically sense the Battery Temperature Sensor when it is connected to the BTS Port and the manual battery temperature setting on the unit will be over-ridden by having the Battery Temperature installed.

- *Use with **GEL, AGM,** or **Flooded** Battery Type Setting:*

  The battery sensor installed on Battery Bank 1 will monitor the Battery Bank 1 battery temperature and will make small adjustments to the battery charging voltage on CH1 for better battery charging performance.

Battery Temperature	Battery Charging Voltage Adjustment from 25 °C normal setting			
	Flooded and GEL type		AGM type	
	12 V Model	24 V Model	12 V Model	24 V Model
< 25 °C	+ 0.027 V /°C	+ 0.054 V / °C	+ 0.021 V /°C	+ 0.042 V /°C
25 °C	0 V	0 V	0 V	0 V
> 25 °C	- 0.027 V /°C	- 0.054 V /°C	- 0.021 V /°C	- 0.042 V /°C

  The sensor is also used to terminate the battery charging process when the battery temperature drops to below -25°C and the charging process will resume again when battery temperature rises to above -20°C. It will also terminate the charging process when the battery temperature rises to above 70°C and the charging process will resume again when the battery temperature drops to below 60°C.

- *Use with **Lithium or Program** Setting:*

  The battery sensor installed on Battery Bank 1 will monitor the Battery Bank 1 battery temperature. It is used to terminate the battery charging process when the battery temperature drops to below 0°C. The charging process will resume again when battery temperature rises to above 5°C. It will also terminate the charging process when the battery temperature rises to above 60°C and the charging process will resume again when the battery temperature drops to below 55°C.

Understanding and Procedure to Set or View CH1 or CH2 and CH3 setting:

The following table shows the preset values of the battery charging voltage on **GEL**, **Flooded** and **AGM** type and the user selectable battery voltage setting for the **Lithium** and **Program** type.

AC12100			
Battery Type	**Absorption**	**Float**	**Equalization**
GEL	**14.4 V**	**13.7 V**	**N.A.**
AGM	**14.7 V**	**13.6 V**	**N.A.**
Flooded	**14.4 V**	**13.3 V**	**15.5 V**
Lithium	**13.9 – 14.8 V (0.1V step)**	**13.0 – 13.9 V (0.1V step)**	**N.A**
Program	**13.8 – 14.8 V (0.1V step)**	**13.0 – 13.8 V (0.1V step)**	**N.A**

Note 1: Manufacturing default setting on Lithium Battery/Program type is 14.4V (Abs) and 13.5V (Flo)
Note 2: All the above voltage will be double on 24V charger AC2450.

The following table shows the maximum available charging current and its related available Absorption to Float stage current.

Model	**Maximum Current Setting (CH1)**	**Absorption to Float Stage Current Setting (CH1)**	**Maximum Current Setting (CH2/3)**	**Absorption to Float Stage Current Setting (CH2/3)**
AC 12100	* 100A	* 4A / 8A / 12A	60A	3A / 6A / 12A
	60A	3A / 6A / 12A	40A	2A / 4A / 8A
	40A	2A / 4A / 8A	20A	1A / 2A / 4A
	20A	1A / 2A / 4A	10A	0.5A/ 1.0A/ 2.0A
AC 2430	* 50A	* 2A / 4A / 8A	50A	* 2A / 4A / 8A
	30A	2A / 3A / 6A	30A	2A / 3A / 6A
	20A	1A / 2A / 4A	20A	1A / 2A / 4A
	10A	0.5A / 1A / 2A	10A	0.5A / 1A / 2A

*Note: * Recommended setting (Factory Default Setting)*

*For **GEL, AGM, Flooded** battery type: (Appendix A1)*

- Battery type (**GEL, AGM, Flooded, Program**)
- Maximum charging current ('**h-current**' in A)
- Absorption to float stage current ('**L-current**' in A)
- Charging stages (CH1 only) **Mode 2** – Bulk and Absorption stage only, **Mode 3** – Bulk, Absorption, and Float stage)
- Battery temperature (CH1 only) (Low- '**Lo**', Normal – '**no**r', High – '**hi**')

*For **Lithium** battery type: (Appendix A2.1, A2.2)*

WARNING: FIRE HAZARD! When using the **Lithium** mode to set the battery Charging parameters, please consult the battery manufacturer on all voltage and current settings. Using wrong setting to charge a Lithium battery may overcharge and damage the battery, resulting in battery explosion and fire.

- Battery type (**Lithium**)
- Maximum Charging Voltage (CV-'Abs') (13.9-14.8V for 12V model, 27.8-29.6V for 24V model)
- Absorption to Float Voltage ('FLo') (13.0-13.8V for 12V model, 26.0-27.6V for 24V model)
- Maximum Charging Current (CC) ('**h-current**' in A)
- Absorption to Float Current (Charge termination current) ('**L-current**' in A)
- Charging stages - CH1 only (**Mode 2** – Bulk and Absorption stage only, **Mode 3** – Bulk, Absorption, and Float stage)

*For **Program** type: (Appendix A3.1, A3.2)*

WARNING: FIRE HAZARD! When using the **Program** mode to set the battery charging parameters, please consult the battery manufacturer on all voltage and current settings. Using a wrong setting to charge the battery may overcharge and damage the battery, resulting in battery explosion and fire.

- Battery type (**Program**)
- Absorption Voltage ('Abs') (13.9 - 14.8V for 12V model, 27.8 - 29.6V for 24V model)
- Absorption to Float Voltage ('FLo') (13.0 - 13.8V for 12V model, 26.0 - 27.6V for 24V model)
- Maximum Bulk Current ('**h-current**' in A)
- Absorption to Float Current ('**L-current**' in A)
- Charging stages - CH1 only (**Mode 2** – Bulk and Absorption stage, **Mode 3** – Bulk, Absorption, and Float stage)

Procedure to Equalize* Flooded *Battery:

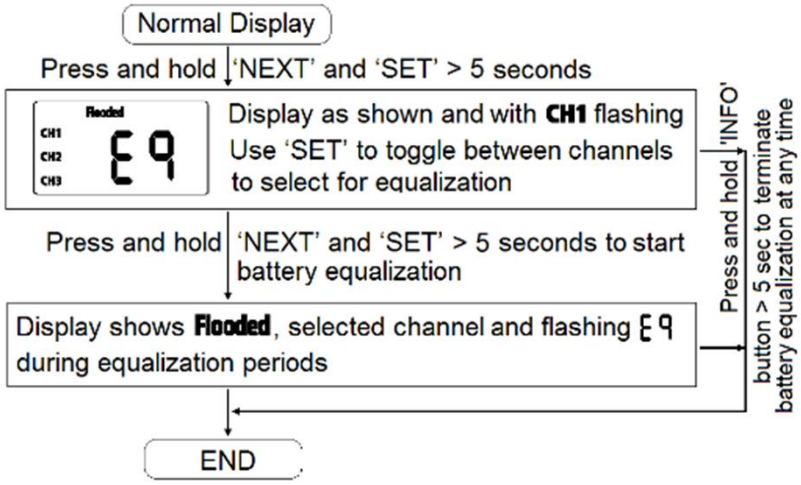
DANGER: Explosion Hazard. The battery generates explosive gasses during equalization. Follow all the battery safety precautions listed in the manual. When using the equalization mode, the user has to be sure the battery connected to the channel is a flooded battery type. Equalizing a non-flooded battery may overcharge battery and cause the battery to explode.

CAUTION: Risk of Battery and Equipment damage. Only a Flooded lead-acid battery can be equalized. Consult your battery manufacturer or read the battery manual when you try to equalize your batteries.

Disconnect any DC load connected to the battery, as during equalize mode, the charger will produce 15.5V on 12V model, or 31.0V on 24V model to the batteries. The equalized voltage may damage the DC connected to the battery. You must monitor the battery specific gravity throughout the equalization process to determine the end of the equalizing cycle.

Before setting the equalization mode on the specific channel, please be sure the battery connected to the specific channel is a flooded battery type. When the battery equalization process started, the charger will automatically fully charge the selected channel first and follows with 1 hour of 15.5V equalization process. Consult or follow the instruction as provided by the battery manufacturer on how to check the battery electrolyte level and or refill with distilled or deionized water during the 1 hour's equalization period. All cells should have similar electrolyte levels. If distilled or deionized water is added, batteries must undergo a complete charge cycle.

The charger cannot determine when to terminate the equalization of the battery. A one-hour timeout is set as a safety feature by requiring the user to continually re-activate it as necessary after checking the batteries manually. During the equalization mode, the other two battery banks are disabled.



Procedure to Awaken Over Discharge Lithium Battery

Some Lithium ion batteries have BMS circuitry that turns the battery off when over discharged. The charger may not recognize a battery is connected and start the charging process. To awaken the Lithium battery, press and hold '**INFO**' and '**SET**' buttons for 5 seconds. The charger will provide 13V (with 10A current limit) to the battery terminal for 10 seconds. If battery voltage was measured at the terminal after 10 seconds, the lithium battery is awakened, and the charger will restart the charging process. If no voltage was measured at the terminal, the charging process will terminate. This function works only on Lithium battery setting.

Understanding and Executing the Silent Mode Function

A unique feature of the **KISAE Abso Charger** is the ability to reduce fan speed at night or whenever required. This setting is manually activated via the Digital Display.

Mode Operation	Fan Operation	*AC12100*	*AC2450*
Normal Mode	Full Speed	100 / 60 / 40 / 20 / 10 (A)	50 / 30 / 20 / 10 / 5 (A)
Silent Mode	Low speed or Fan OFF	50 / 50 / 40 / 20 / 10 (A)	25 / 25 / 20 / 10 / 5 (A)

Tips: *Use this function during nighttime or when a quiet environment is needed. Please also note that the charging time will increase in this mode because the charging current may be derated.*

This function can switch to **ON** or **OFF** at any time during the charging period.
To set this function, press and hold '**SET**' key for 5 seconds to execute the ***Silent Mode***. The '**Auto**' icon will show on the display. To turn this function off, press and hold the '**SET**' function for 5 seconds to turn off ***Silent Mode***. The '**Auto**' icon on the display will turn off and the charger current and the fan speed will return to normal.
Note: the charger will automatically depart from **Silent** Mode after 12 hours from being set.

Procedure to Change CH1 to Power Supply mode

- Set CH1 to **Program** mode setting.
- Press and hold '**INFO**' and '**NEXT**' button for 5 seconds
- Display will show '**P**' for approximately 5 seconds to indicate **Power Supply** mode is activated.
- The charger will supply the set Absorption voltage in **Program** mode with 100A current limit at CH1 and the display will show the supplied voltage and the supplied current alternately.
- To cancel **Power Supply** mode, press and hold '**NEXT**' button for 3-5 seconds to reset the charger and CH1 will return to charging the battery with **Program** mode.

Note: **Power Supply** mode can only be used on CH1 only.

Understanding the Protection Features

Derating the Charging Current: When the charger senses the environmental temperature is above 50°C, the maximum charger current will de-rate to 1/2 of the value (A02 warning code will display). The charger will recover automatically back to the maximum charging current when the environmental temperature drops to below 45°C.

Over Temperature Shutdown: When the charger senses the environmental temperature is above 60°C, the charger will shut down. It will recover automatically when the environmental temperature drops to below 45°C.

Battery Reverse Polarity: When a reverse polarity is connected to the battery bank, Fault Code E03 on display will appear. In some case, the user replaceable DC fuse located near the DC Output terminals may blow and Error code E08 will display.

AC Input Voltage Protection: The charger will shut down when it senses the AC input voltage is outside of the operating range. A fault code will display. The charger will recover automatically when it senses the AC input voltage has returned to the normal operation range.

Disconnecting the Battery Bank: To avoid any spark on the battery terminal, always disconnect AC Input before removing or disconnecting the battery.

BTS Shutdown (with optional BTS in use): To avoid any battery damage especially when a Lithium battery is used, the charging cycle will be terminated when the optional BTS senses the battery temperature is out of the charging range.

Charging Batteries with Low Voltage

The charger is designed to charge batteries with voltages on their terminals greater than 3Vdc on 12V model and 6Vdc on 24V model. For lower voltages, the batteries can be temporarily and partially charged using the charger's **Power Supply** mode under **Program** setting, before returning to the proper battery type setting. Please noted the **Power Supply** setting can only be used on CH1.

Reinitiating the Charging Cycle and the battery connection status manually

The charging cycle can be reset or reinitialized at any stage. Press the hold the key for longer than 5 seconds to **RESET** the charger. Display will show 'RST' and it will force the charger to restart the charging cycle again starting with Bulk mode. The charger can also be **RESET** by disconnecting the AC Input, waiting for 5 seconds and reconnecting the AC Input again.

Understanding the Error Codes

Error codes will be shown on the display when either an internal fault such as *high internal temperature* or external fault like AC *input voltage out of range* is detected. The unit will shut down.

Code	Condition	Corrective Action
A01	Temperature Sensor (BTS) is defective.	Check and or replace the sensor.
E01	Unit shutdown due to low AC Input (< 85 +/- 5Vac)	Check AC input source. The unit will automatically recover when the AC Input voltage return to > 108 +/-5Vac
E02	Unit shutdown due to high AC Input (>270 +/- 5Vac)	Check AC input source. The unit will automatically recover when the AC Input voltage returns to < 260 +/-5Vac
E03	Battery is connected backwards	Check all battery connections
E04	Charger Internal temperature is too high and it has shutdown. The unit will automatically recover when the unit cools down.	The ventilation of the unit is blocked or the environmental temperature is high. Reduce charging current or improve the ventilation near the unit.
E05	Not used.	
E06	*For non- Lithium Battery type setting:* High battery temperature >70 °C (158°F) is sensed by the BTS when installed. The unit will shut down. The unit will automatically recover when the battery temperature has reduced to 60°C (140°F). *For Lithium battery type setting:* High battery temperature >60 °C (140°F) is sensed by the BTS when installed. The unit will shut down. The unit will automatically recover when the battery temperature has reduced to 55°C (131°F).	Check the battery, charger setting, and its environment.
E07	*For non- Lithium Battery type setting:* Low battery temperature < -25°C (-13°F) is sensed by the BTS when installed. The unit will shut down. The unit will automatically recover when battery temperature reaches -20°C (-4°F). *For Lithium Battery type setting:* Low battery temperature < 0°C (32°F) is sensed by the BTS when installed. The unit will shut down. The unit will automatically recover when battery temperature reaches 5°C (41°F).	It is not recommended to charge the battery at low temperatures.
E08	DC Output fuses are blown.	Check battery connection and replace the fuse with the same type and rating.
E09	Unit shutdown due to high battery voltage (> 17 Vdc on 12V model and >34 Vdc on 24V model). The unit will automatically recover when battery Voltage is reduced to <16Vdc on 12V model or <32 Vdc on 24V model.	Check battery and charger settings. Check also if there is any other DC supply connected to the battery banks.

6. SPECIFICATIONS

	AC12100	***AC2450***
Charger Output:		
Output Current (Maximum)	100A	50A
Output Voltage Range:		
Charge	13.8 – 14.8 V	27.6 – 29.6 V
Float	13.0 - 13.8 V	26.0 – 27.6 V
Equalize (Flooded Battery)	15.5 V	31.0 V
Charging Control	Three stages (Bulk/Absorption/Float)	
	Two stages (Bulk/Absorption)	
DC Output Bank	Three (CH1, CH2, CH3)	
Selectable Battery Type	Gel, AGM, Flooded, Lithium, Program	
Parasitic Current	< 2 mA	
Charger Input:		
AC Input Voltage (Nominal)	100, 120, 220, 230, 240 VAC	
AC Input Operating Range	90 - 265 VAC	
AC Input Frequency Range	47 - 63 Hz	
Power Consumption (Full Load)	1750W	1750W
Power Factor Correction	Yes	
Charger Efficiency	> 82%	
Protection and Features:		
Reverse Battery	Yes, unit shutdown	
Over Charge	Yes, unit shutdown	
Over Temperature	Yes, unit de-rated and shutdown	
Output Short Circuit	Yes, unit shutdown	
Cooling	Force air ventilation	
Temperature Setting	Hot, Normal, Cold (with no sensor connected)	
Battery Temperature Sensor Port	RJ12 (for use with optional Battery Temperature Sensor)	
Remote Display Port	RJ12 (for use with optional Remote Display Panel ACRM1202)	
Display:		
LCD Display (with back lighting)	Charging status, Battery Voltage	
Warning and Fault Code	A01, E01-09	
AC Input and DC Output Connection:		
AC Input Connection	Hardwire or AC with EU, UK, AZ plug	
DC Output Connection (POS)	Heavy Duty Screw Terminal (3 banks)	
DC Output Grounding (NEG)	Heavy Duty Common Ground Screw Terminal	
Environmental and Operating Temperature:		
Storage Range	-40° to 70° C (-40° to 158° F)	
Operating Range	-20° to 60° C (-4° to 140° F)	
Humidity	5-95%, RH non-condensing	
Ingress Protection	IP32	
Based Unit Weight and Dimensions:		
Weight	12.3 lbs (5.6 Kg)	
Dimension	9.3 x 16.7 x 4' (236 x 425 x 102.7 mm)	
Regulatory Compliance:		
Standards/Safety (North America)	Approved to UL1236 including the marine supplement UL1564 CSA C22.2 107.2-01	
Standards/Safety (European Union)	CE marked for the low voltage directive 2006-95-EC Complying with EN60335-2-29 battery chargers Approved to IEC60529:2001, IP32 ingress protection level	
Standards/EMC (North America)	Class B according to FCC part15B and ANSI C63.4	
Standards/EMC (European Union)	CE marked for the EMC directive 2004-108-EC Complying with EN55014-1, EN55014-2, EN61000-3-2, and EN61000-3-3 (as equivalent IEC standards series)	

Note: Specifications are subject to change without notice.

Accessories (optional):

Remote Display Panel	ACRM1202
Battery Temperature Sensor	BTS-10K

7. WARRANTY

One Year Limited Warranty

The limited warranty program is the only one that applies to this unit, and it sets forth all the responsibilities of **KISAE**. There is no other warranty, other than those described herein. Any implied warranty of merchantability of fitness for a particular purpose on this unit is limited in duration to the duration of this warranty.

This unit is warranted, to the original purchaser only, to be free of defects in materials and workmanship for one year from the date of purchase without additional charge. The warranty does not extend to subsequent purchasers or users.

The manufacturer will not be responsible for any amount of damage in excess of the retail purchase price of the unit under any circumstances. Incidental and consequential damages are specifically excluded from coverage under this warranty.

This unit is not intended for commercial use. This warranty does not apply to damage to units from misuse or incorrect installation/connection. Misuse includes wiring or connecting to improper polarity power sources.

RETURN/REPAIR POLICY:

If you are experiencing any problems with your unit, please contact our customer service department at info@kisaepower.com or phone 1 877 897-5778 before returning the product to the retail store. After speaking to a customer service representative, if products are deemed non-working or malfunctioning, the product may be returned to the purchasing store within 30 days of original purchase. Any defective unit that is returned to the manufacturer within 30 days of the date of purchase will be replaced free of charge.

If such a unit is returned more than 30 days but less than one year from the purchase date, the manufacturer will repair the unit or, at its option, replace it, free of charge. If the unit is repaired, new or reconditioned replacement parts may be used, at manufacturer's option. A unit may be replaced with a new or reconditioned unit of the same or comparable design. The repaired or replaced unit will then be warranted under these terms for the remainder of the warranty period. The customer is responsible for the shipping charges on all returned items.

LIMITATIONS:

This warranty does not cover accessories, such as adapters and batteries, damage or defects result from normal wear and tear (including chips, scratches, abrasions, discoloration or fading due to usage or exposure to sunlight), accidents, damage during shipping to our service facility, alterations, unauthorized use or repair, neglect, misuse, abuse, failure to follow instructions for care and maintenance, fire and flood.

If your problem is not covered by his warranty, call our Customer Service Department at info@kisaetechnology.com or 1 877 897-5778 for general information if applicable.

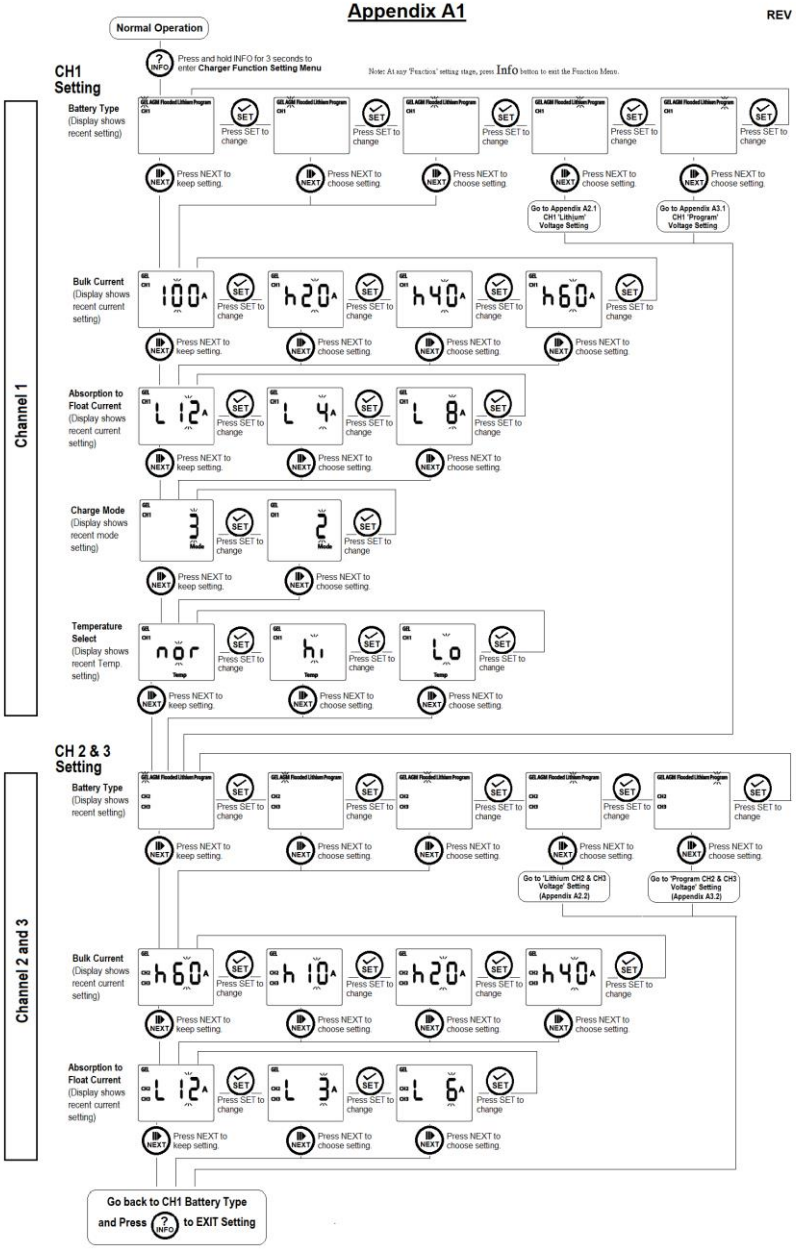
Service Contact Information

Email: info@kisaetechnology.com
Phone : 1-877-897-5778
www.kisaepower.com

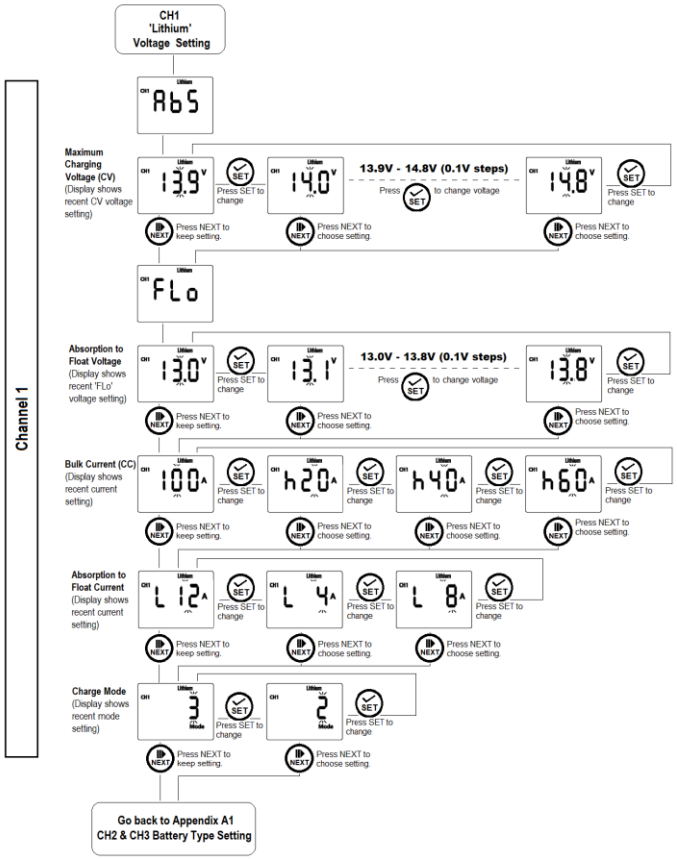
Printed in China

Appendix A1

REV 1.0



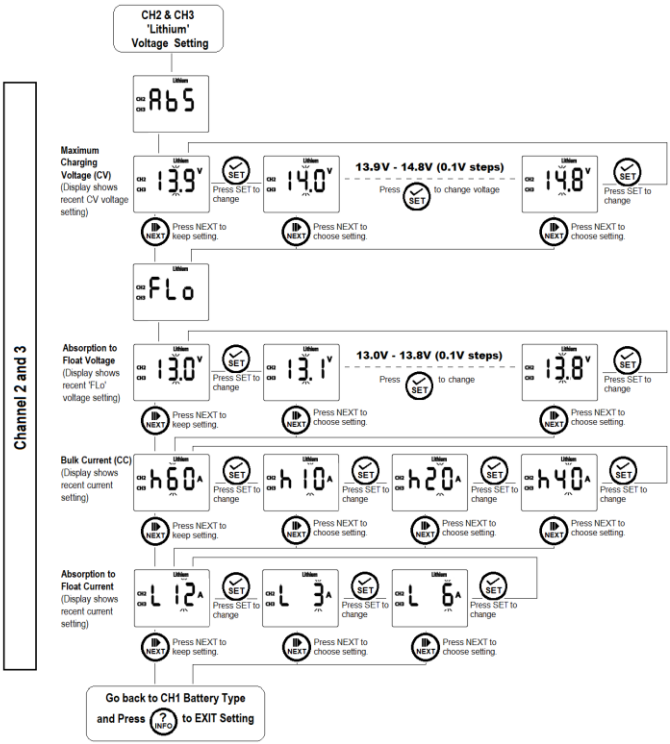
Appendix A2.1



WARNING: FIRE HAZARD!
When using the Lithium mode to set the battery charging parameters, please consult the battery manufacturer on all voltage and current settings. Using wrong setting to charge battery may overcharge and damage the battery, resulting in battery explosion and fire.

Note: The charging voltage and current listed above are for AC12100 (12V charger) only. For AC2450 (24V charger), please refer to the manual.

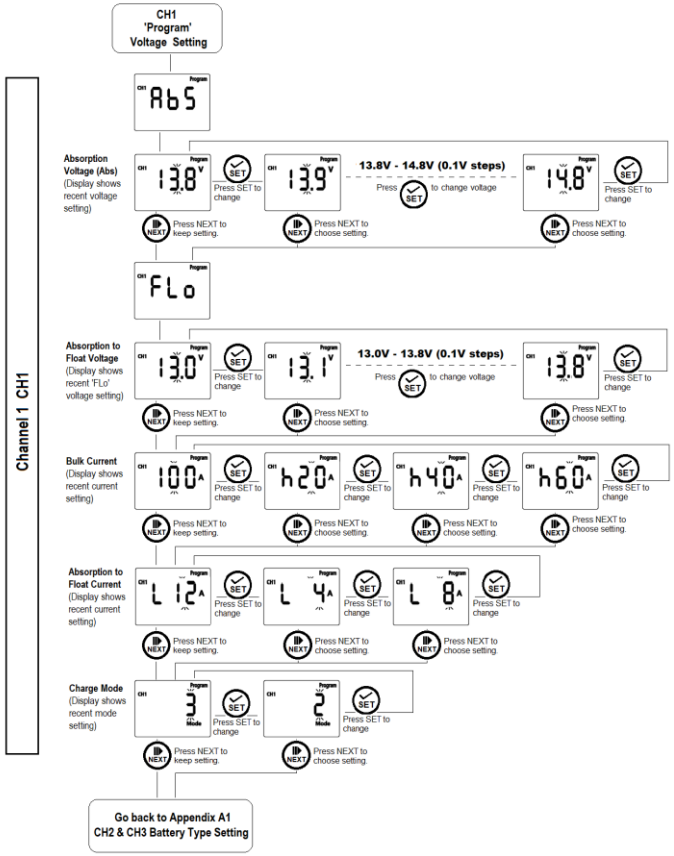
Appendix A2.2



WARNING: FIRE HAZARD!
When using the Lithium mode to set the battery charging parameters, please consult the battery manufacturer on all voltage and current settings. Using wrong setting to charge battery may overcharge and damage the battery, resulting in battery explosion and fire.

Note: The charging voltage and current listed above are for AC12100 (12V charger) only. For AC2450 (24V charger), please refer to the manual.

Appendix A3.1

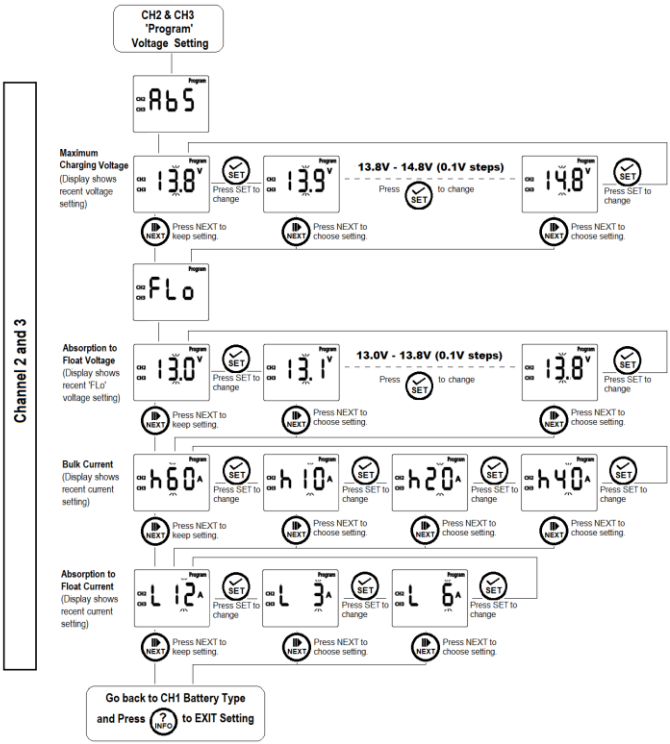


WARNING: FIRE HAZARD!
When using the Program mode to set the battery charging parameters, please consult the battery manufacturer on all voltage and current settings. Using wrong setting to charge battery may overcharge and damage the battery, resulting in battery explosion and fire.

Note: The charging voltage and current listed above are for AC12100 (12V charger) only. For AC2450 (24V charger), please refer to the manual.

Appendix A3.2

REV 1.0



WARNING: FIRE HAZARD!
When using the Program mode to set the battery charging parameters, please consult the battery manufacturer on all voltage and current settings. Using wrong setting to charge battery may overcharge and damage the battery, resulting in battery explosion and fire.

Note: The charging voltage and current listed above are for AC12100 (12V charger) only. For AC2450 (24V charger), please refer to the manual.

Example Of Actual 40Amp, 3 Bank Test