

Smart Battery Charger



LCH – 1215A / 1230A / 2415A
User Manual

Save This Manual

Please read this manual carefully prior to storage, installation, wiring, operation and maintenance of battery charger.

This manual contains important instructions and warnings that you should follow during the storage, installation, wiring, operation and maintenance of battery charger. Failure to follow these instructions and warnings will void the warranty.

Please note that only qualified and trained technician can do installation, wiring, operation and maintenance of battery charger.

Contents

Section 1: General Safety and Installation Instructions -----	4
1-1 Operating the Device Safely -----	4
1-2 Safety Instructions when Installing the Device -----	4
1-3 Electrical Cables -----	4
1-4 Installation on Boats -----	4
Section 2: Warning -----	5
Section 3: Applications and Descriptions -----	6
Section 4: Instruction of the Unit Variants -----	7
Section 5: Accessories -----	8
5-1 Temperature Sensor -----	8
5-1-1 Functions -----	8
5-1-2 Installation -----	8
5-2 Remote Controller -----	8
5-2-1 Installation -----	8
Section 6: Making Connections -----	9
Section 7: Settings -----	10
7-1 Charging Voltage Setting -----	10
7-2 Half Power Mode Setting -----	10
7-3 Equalization Setting -----	11
7-4 Void Setting -----	11
Section 8: Using the Charger -----	12
8-1 Charging Characteristic -----	12
8-1-1 I Phase (Bulk) -----	12
8-1-2 Uo Phase (Absorption) -----	12
8-1-3 U Phase (Float) -----	12
8-1-4 8-Day Conditioning -----	13
8-1-5 Equalization -----	13
8-2 Using the Remote Controller -----	13
8-3 Units with Temperature Sensor -----	14
8-4 Fan Speed -----	15

8-5 Functional Check -----	16
Section 9: Trouble Shooting -----	17
9-1 The Battery Voltage would not Increase After Charging -----	17
9-2 The Battery is not Fully Charged After a Charging Time About 20 Hours -----	17
9-2-1 12V Battery -----	17
9-2-2 24V Battery -----	17
9-3 The Battery Discharges After a Short Period of Time Without Usage -----	18
Section 10: Figures -----	19

Section 1: General Safety and Installation Instructions

1-1 Operating the Device Safely



Failure to observe this instruction can cause material damage, device malfunction or danger of bodily injuries.



Fundamental safety measures should be observed when using electrical equipment to avoid the danger of electric shock, fire hazard, injury..

1-2 Safety Instructions when Installing the Device

- Handle the batteries with care, the batteries contain strong acids.
- Avoid contact with the battery fluid agent.
- If come in contact with battery fluid, one should rinse the affected parts of the body or clothing with plenty of cold water and seek medical attention immediately.
- Be sure that the device has a firm foundation.
- Do not use sharp or hard objects to clean the device. Doing so may cause device damage.

1-3 Electrical Cables

If cables have to be fed through metal walls or other walls with sharp edges, use ducts or wire bushings to prevent damage.

- Lay the cables so that other people will not trip over them.
- Do not lay cables which are loose or bent next to electrically conductive materials.
- Do not pull the cables.
- Fasten the cables properly.
- Lay the cables so that they can not be easily damaged.
- Always use sockets that are grounded and secured by earth leakage circuit breaker.
- Only a specialist should make the electrical connections.
- Do not lay the 115VAC/230VAC line and the 12VDC in the same cable duct.
- Keep to the indicated minimum cable cross-section.

1-4 Installation on Boats

- Incorrect use or installation of the charger on boat may lead to corrosion of the boat. Please allow qualified personnel to perform the installation of the charger.

Section 2: Warning



Please read carefully about the following precautions. Damages caused by failure to follow the instructions below will not be covered by warranty.

- Use the charge only as intended.
- Do not operate the charger if the housing or the cables are damaged.
- The charger may not be used to charge any other type of batteries than the ones indicated.
- Do not operate the device in a damp or wet environment.
- Do not charge a frozen battery, there is danger of explosion.
- Keep charger in a safe place, out of reach of children.
- Only qualified personnel who are familiar with the risks involved and the relevant regulations should carry out maintenance or repair work.
- The device must be fixed and installed in such a way that it will not fall over or fall down.

Section 3: Applications and Descriptions

The charger regenerate power or recharge mobile batteries used onboard vehicles or boats.

The charger can continuously charge supply batteries or starter batteries, enabling the batteries to maintain at a high capacity level.

The charger can be used for charging three types of batteries: GEL batteries / Lead-acid starter batteries/ Maintenance free batteries.

Please inquiry your battery supplier about the maximum capacities of your lead-acid batteries.

The charger is equipped with a polarity protection, this prevents the charger from being damaged in case of incorrect polarity.

An optional temperature sensor that is connected at the battery being charged protects the battery against damage cause by varying outside temperature by adapting the charging voltage of the temperature to the battery. Please connect two ends of temperature sensor (please see figure 12) – one end to TEMP socket on front panel and another end to the battery.

An optional remote controller (please see figure 13) can be obtained in order to provide remote access to the charger.

Section 4: Introduction of the Unit Variants

The 4 stages battery charger can deliver different unit variants. It can charge batteries up to the specified battery capacity as indicated in the specification section. Regarding the identification of the specification of your unit, please see the model number on the type plate.

- Front view: please see figure 1

No.	Description
1.	Connection for temperature sensor
2.	Connection for remote controller
3.	Setting charging voltage, charging time limitation and power supply mode (S1)
4.	Status LED
5.	Equalization LED
6.	ON / OFF switch for half power mode (S2)
7.	Switch for equalization ON only (S3)
8.	DC + output terminal
9.	DC - output terminal
10.	DC - output terminal – 2A for starter battery
11.	DC + output terminal – 2A for starter battery
12.	AC input outlet

- Front view: please see figure 2

No.	Description
1.	Connection for temperature sensor
2.	Connection for remote controller
3.	Setting charging voltage, charging time limitation and power supply mode (S1)
4.	Status LED
5.	Equalization LED
6.	ON / OFF switch for half power mode (S2)
7.	Switch for equalization ON only (S3)
8.	DC + output terminal
9.	DC - output terminal
10.	AC input outlet

- Rear view: please see figure 3

No.	Description
1.	Ventilation outlet
2.	Power switch

Section 5: Accessories

5-1 Temperature Sensor

The temperature sensor (please see figure 12) measures the temperature of battery or the environment around the battery and transfers the data to the charger. With deviating temperature, the charging voltage increases and decreases accordingly.

5-1-1 Functions

- The temperature sensor transmits the battery temperature to the charger.
- The charging voltage is adjusted according to the temperature measured.

5-1-2 Installation

- Lay the cables from the batteries to the charger.
- Connect temperature sensor to the TEMP socket of the charger.
- Connect temperature sensor to the negative pole of the battery, or use a double-sided adhesive tape to attach the sensor to the top of the battery or in the vicinity of the battery.

5-2 Remote Controller

The remote controller (please see figure 13) can switch the charger ON / OFF, half power mode ON / OFF, and equalization ON.



Attach the remote controller as a well accessible place to ensure easy access of the charger.



Be careful when attaching the remote controller, for wiring harnesses, cables and other components that are in the assembly range could be damaged in the process..

5-2-1 Installation

- Ensure approximately 49mm width, 49mm height and 23mm depth for the take-up of the remote controller.
- Connect the remote controller to the charger. The connection cable is equipped with two equivalent modular plugs.
- Place the remote controller into the opening created. Secure the remote controller with screws on the upper and bottom margin of the faceplate – use the available drills.



The power switch at the charger must be switched ON, so that the charger can be switched ON / OFF with the remote controller.

Section 6: Making Connections

Please see figure 8:

- Place charger in a dry, cool, clean and ventilated space.
- Set the power switch to OFF and pull out the main plug before connection or disconnecting the direct current connection.
- Connect the – (minus) battery pole with a connecting cable with the – (minus) terminal at the charger.
- Connect the + (plus) battery pole with a connecting cable with the + (plus) terminal at the charger.
- Lay the cables from the batteries to the charger.
- Fold the cable ends with the multi-core cable ends.
- If the charger with option of starter battery, please connect the terminal of SB.
- Supply the cable with a fork connection for an idea connection with the terminal (please see figure 10).
- Ensure correct polarity of the battery and battery charger, otherwise the internal flat-pin terminal will trigger with the wrong polarity.



Batteries with cell connection may not be charged. Explosive gases could result from battery overheating.



Only use cables with the designated wire cross sections to connect the IUoU automatic charger to the battery.

Model No.	Cable Size
LCH-1230A	AWG #10 ~ AWG #8
LCH-1215A / LCH-2415A	AWG #12 ~ AWG #10

Table 1 : Cable Size

Section 7: Settings

7-1 Charging Voltage Setting

The dip switch can be used to select the charging voltage, equalization voltage, charging time and the operation mode of this charger (please see figure 11).



Please follow the table below to ensure correct operation of the charger setting for the charging voltage.

Switch 1	Switch2	I Phase Voltage	Uo Phase Voltage	U Phase Voltage
OFF	OFF	13.5V / 27.0V	14.0V / 28.0V	13.5V / 27.0V
OFF	ON	13.5V / 27.0V	14.4V / 28.8V	13.5V / 27.0V
ON	OFF	13.8V / 27.6V	14.4V / 28.8V	13.8V / 27.6V
ON	ON	13.8V / 27.6V	14.8V / 29.6V	13.8V / 27.6V

Table 2 : Switch Configure Charging Voltage

Switch 3	Equalization Voltage
OFF	Same as Uo phase voltage
ON	15.5V / 31.0V

Table 3 : Switch Configure Equalize Voltage

Switch 4	Operation Mode
OFF	Battery charger
ON	Power supply 13.2V / 26.4V

Table 4 : Switch Configure Power Supply / Charger Mode

Switch 5	Switch 6	Charging Time
ON	OFF	4 hours
OFF	ON	6 hours
ON	ON	8 hours
OFF	OFF	Unlimited

Table 5 : Switch Configure Uo Phase Time Limit

7-2 Half Power Mode Setting

When the switch HALF POWER is pushed, the output power will reduce to half the charger amp rating and the STATUS LED will flash. The HALF POWER switch is a kind of no memory switch. That means ON/OFF status can not be identified from the switch. To enter and exit the HALF POWER mode by turns by pushing the HALF POWER switch. The HALF POWER mode can be told from flashing STATUS LED.

Due to the fan speed is adjusted according to the function of the load and the temperature inside the charger, when HALF POWER mode is on, the fan speed will be slowed down and become silent because of output current reducing to half the charger amp rating.



The half power mode can be set only when equalization function is not activated or the charger is not in the power supply mode.

7-3 Equalization Setting

When E.Q switch is pushed, the function of equalization is activated and the E.Q LED will light red. Whenever the function of equalization is activated, it only can be cancelled by turning off the charger.



The equalization function can be set only when the charger is not in the half power mode and not in the power supply mode.

7-4 Void Setting

To avoid the void setting, please see below table:

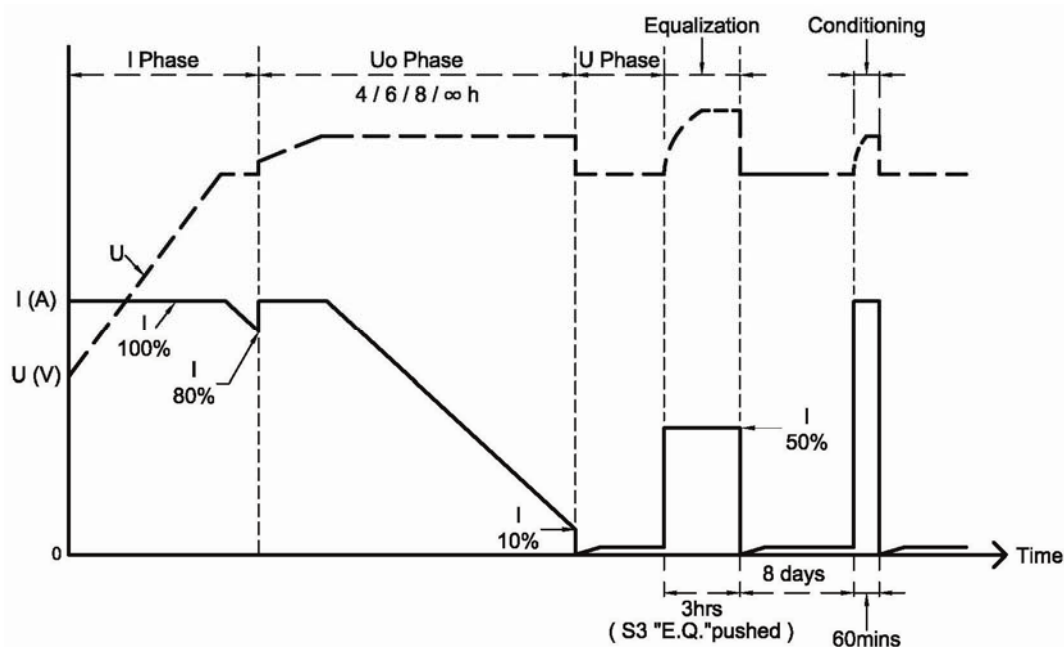
Switch	Original Working Mode			
	Half Power	Equalization	Other	Power Supply
HALF POWER PUSHED	Exit half power (STATUS LED lights)	VOID	Enter half power (STATUS LED flash)	VOID
E.Q. PUSHED	VOID	VOID	Equalization (E.Q. LED lights red)	VOID

Table 6 : Void Setting for Pushing Switch on Front Panel

Section 8: Using the Charger

8-1 Charging Characteristic

The charger characteristic is generally designated as a modified IUoU characteristic.



8-1-1 I Phase (Bulk)

The STATUS LED constantly lights red. In the first stage of the charging process, the depleted battery is charged with a constant current until the battery voltage reached I phase setting voltage (13.5V / 13.8V or 27.0V / 27.6V). When the battery reaches this voltage level, the charging current gradually drops. When the current drops down to 80%, the charger switches over to Uo phase setting voltage (14.0V / 28.0V or 14.4V / 14.8V or 28.8V / 29.6V). Typically the battery is charged to 70% ~ 80% of its capacity.

8-1-2 Uo Phase (Absorption)

The STATUS LED constantly lights orange. This main charging phase could be set to the maximum of 4 / 6 / 8 hours or unlimited, and the current rises again to its maximum value. The current remains constant as long as the battery voltage is below Uo phase setting voltage (14.0V / 28.0V or 14.4V / 14.8V or 28.8V / 29.6V). After reaching the setting voltage, it remains constant. However, the current drops again. Within this main charging phase, the battery is charged to 95% of its capacity.



The charging voltage and the period for the main charging phase (Uo phase) can be selected using the dip switch (S1).

8-1-3 U Phase (Float)

The STATUS LED constantly lights Green. If the current decreases to 10% or under the rated current or if the time limit of 4 / 6 / 8 hours is exceeded, then the charger switches over to economy charging (13.5V/13.8 V or 27.0V/27.6 V).



Batteries may be charged separately from each other if the chargers have double charging or three-fold charging connections. The outputs are separated internally by diodes, thus the weaker battery will be always first charged to the charging level of the stronger battery.



The maximum battery capacity should NOT exceed the specified capacity, otherwise the functions of the individual charging phases could be influenced.

8-1-4 8-Day Conditioning

If the battery charger stays at U phase for 8 days, it will switch back to 3-stage charging IUoU, and stay at Uo phase for 60 minutes to revive the battery.



8-day conditioning will be terminated whenever equalization function or half power mode is activated.



When the charger is in the equalization stage or half power mode, 8-day conditioning will not be triggered.

8-1-5 Equalization

The function of equalization could be activated as long as the battery charger is not in the half power mode or power supply mode. The function of equalization will be activated only when the battery is charged and stays in Uo phase with < 25% of Full load current. The battery charger will charge the battery 3 hours with equalization setting voltage (15.5V or Uo phase setting voltage) and half of rated current.



Once the equalization function is activated, it can only be cancelled by turning off the battery charger.



The battery chargers LCH-1215A and LCH-1230A have an option to have a 2A charging output for the starter battery. The output voltage is 13.8V and can recharge the starter battery with a current of 2A or keep it at a high capacity level.

8-2 Using the Remote Controller

There are three buttons and four LEDs on remote controller (please see figure 13):

- ON/OFF button to switch the charger ON and OFF
- Half Power button to enter/exit "HALF POWER" mode
- Equalization button to activate the function of equalization
- Bulk LED to indicate the charging stage of I phase
- Absorption LED to indicate the charging stage of Uo phase

- Floating LED to indicate the charging stage of U phase
- Equalization LED to indicate the function of equalization is activated

To avoid the VOID setting from the remote control, please see below table:

Buttons	Original Working Mode			
	Half Power	Equalization	Other	Power Supply
HALF POWER PRESSED	Exit half power (STATUS LED lights)	VOID	Enter half power (STATUS LED flash)	VOID
EQUALIZATION PRESSED	VOID	VOID	Equalization (E.Q. LED lights red)	VOID
ON / OFF PRESSED	Stand by (STATUS LED slowly flashing red)	Stand by (STATUS LED slowly flashing red)	Stand by (STATUS LED slowly flashing red)	Stand by (STATUS LED slowly flashing red)

Table 7 : Void Setting for Pressing Button on Remote Controller



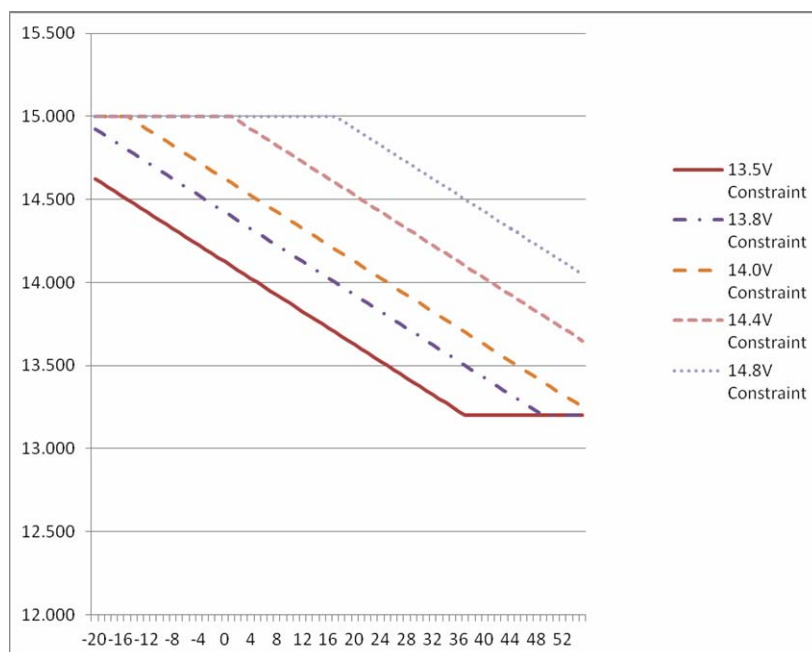
The power switch at the unit must be switched ON, so that the unit can be switched ON and OFF with the remote controller.

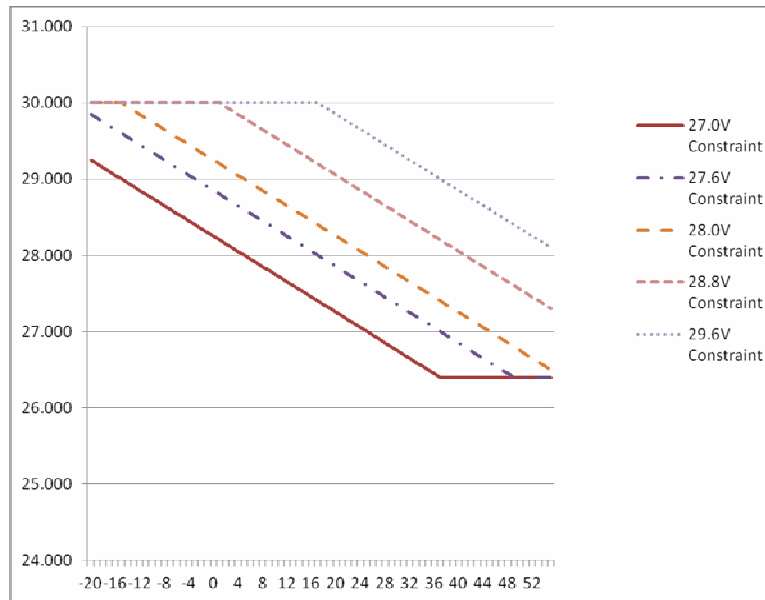


The "ON/OFF" button on the remote controller should be pressed for 2 seconds to switch OFF the battery charger, and 0.5 second to turn ON.

8-3 Units with Temperature Sensor

A temperature sensor (please see figure 12) can be connected in order to provide the optimum charging functioning. The charging voltages, as can be seen from the following diagrams, vary, depending on the battery temperature.





The temperature sensor is only working in I, Uo and U phases.



The output voltage is adjusted according to the function $-25\text{mV}/^\circ\text{C}$ for LCH-1215A and LCH-1230A, and $-50\text{mV}/^\circ\text{C}$ for LCH-2415A. However, the maximum output voltage is 15V / 30V, and the minimum is 13.2V / 26.4V.



When the battery temperature reaches 55°C , the charger will stop the charging process ("E.Q." LED flashing Red and "STATUS" LED lights Orange), and auto recover when temperature drops to 45°C .



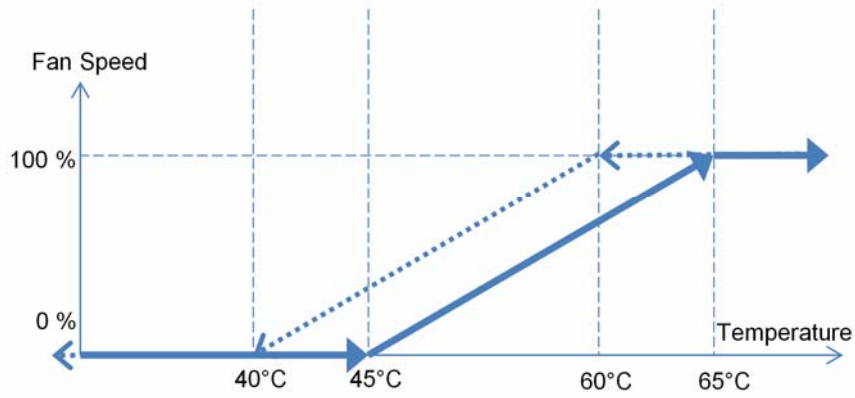
The output voltage from option 2A charging output for LCH-1215A and LCH-1230A is fixed, can not be adjusted.

8-4 Fan Speed

The fan speed is adjusted according to the function of the load and the temperature inside the charger.

When the load is over 70% of the chargers' amp rating, the fan will turn in 100% speed. If the load is below 70% of the chargers' amp rating, the fan speed will be determined according to the temperature inside the charger.

When the temperature goes up, the fan will start turning with temperature 45°C , and reach 100% speed with temperature 65°C . When the temperature goes down, the fan will slow down the turning speed with temperature 60°C , and stop turning with temperature 40°C .



8-5 Functional Check

The status LED in the front of the unit can be used to check the status of the charging process. The optional remote controller can also be used to check the status of the charging process. The LEDs on the remote controller indicate the different charging phases with its respective colors.

"E.Q." LED	"STATUS" LED	Status
	Red, constantly lit	I phase
	Orange, constantly lit	Uo phase
	Green, constantly lit	U phase
Red, constantly lit	Red, constantly lit	I phase, Equalization is activated
Red, constantly lit	Orange, constantly lit	Uo phase, Equalization is activated
Red, constantly lit	Green, constantly lit	U phase, Equalization is activated
Red, constantly lit		Equalization is executed
	Red, flashing	I phase, half power
	Orange, flashing	Uo phase, half power
	Green, flashing	U phase, half power
	Green, double flashing	Power supply mode
	Red, slowly flashing	Stand-by mode

Table 8 : Normal Functional Check

Section 9: Trouble Shooting

Please see below for trouble shooting:

"E.Q." LED	"STATUS" LED	Status
Red, flashing	Red, constantly lit	Short circuit and low voltage, shut down
Red, flashing	Orange, constantly lit	Battery temperature abnormal, stop charging
Red, flashing	Red, flashing	Fan abnormal
Red, flashing	Orange, flashing	Connected to the remote socket
Red, flashing	Green, flashing	Charger overheated (>100°C), stop charging
Red, flashing	Red and green by turns	Charging voltage too high and shut down
Red, flashing	Orange and green by turns	Charging current too high and shut down
Red, flashing	Red and orange by turns	Defective fuse or reverse-polarity
Red, flashing for 10 seconds		Void setting

Table 9 : Abnormal Functional Check

9-1 The Battery Voltage would not Increase After Charging

- If possible, measure with a suitable multi-meter during the charging to verify if the voltage at the battery terminals increases.
- Determine whether the terminals are connected properly to the battery poles. Clean the battery poles if necessary to ensure better connection.

9-2 The Battery is not Fully Charged After a Charging Time About 20 Hours

- Disconnect the power to the charger.
- Remove the battery from the charging terminals and wait for a few minutes.

9-2-1 12V Battery

If the multi-meter displays a voltage of 10V or less, this indicates that the battery is defective and can not be charged any longer.

9-2-2 24V Battery

If the multi-meter indicates a voltage of 20V or below, allow the battery be checked by a specialist, if necessary. Otherwise, dispose of the battery

9-3 The Battery Discharges After a Short Period of Time Without Usage

Measure the voltage at the battery terminals with a suitable multi-meter. If the multi-meter indicates a voltage below 12V of a 12V battery or a voltage below 24V of a 24V battery, then the battery is too weak to retain the charge.

Section 10: Figures

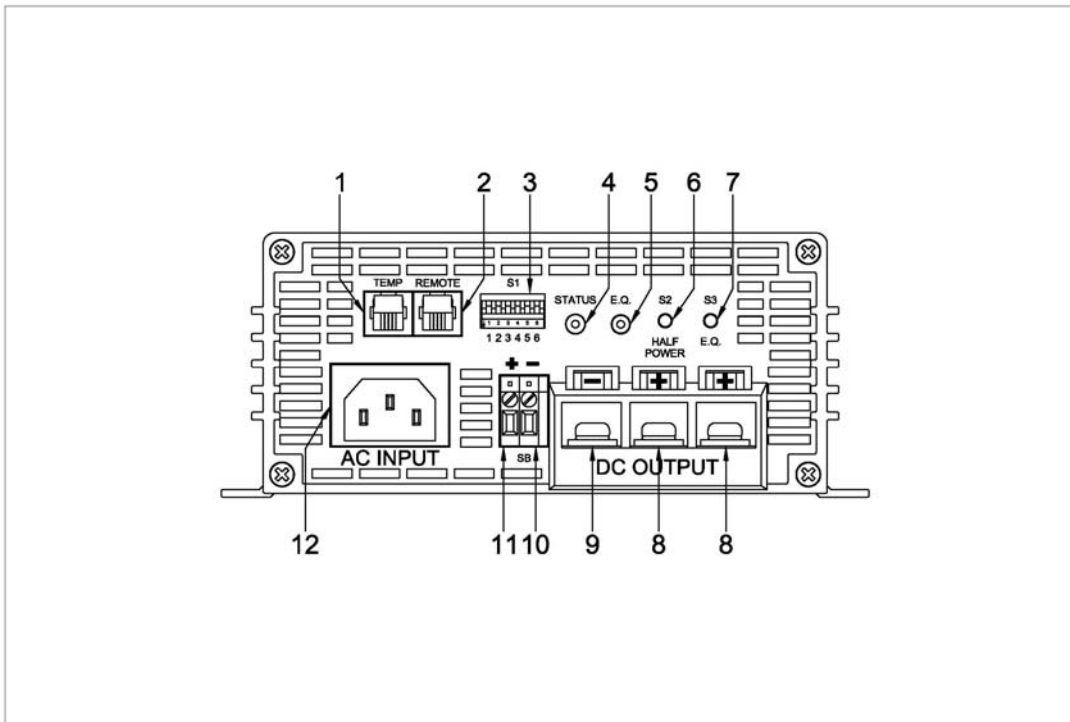


Figure 1: Front View

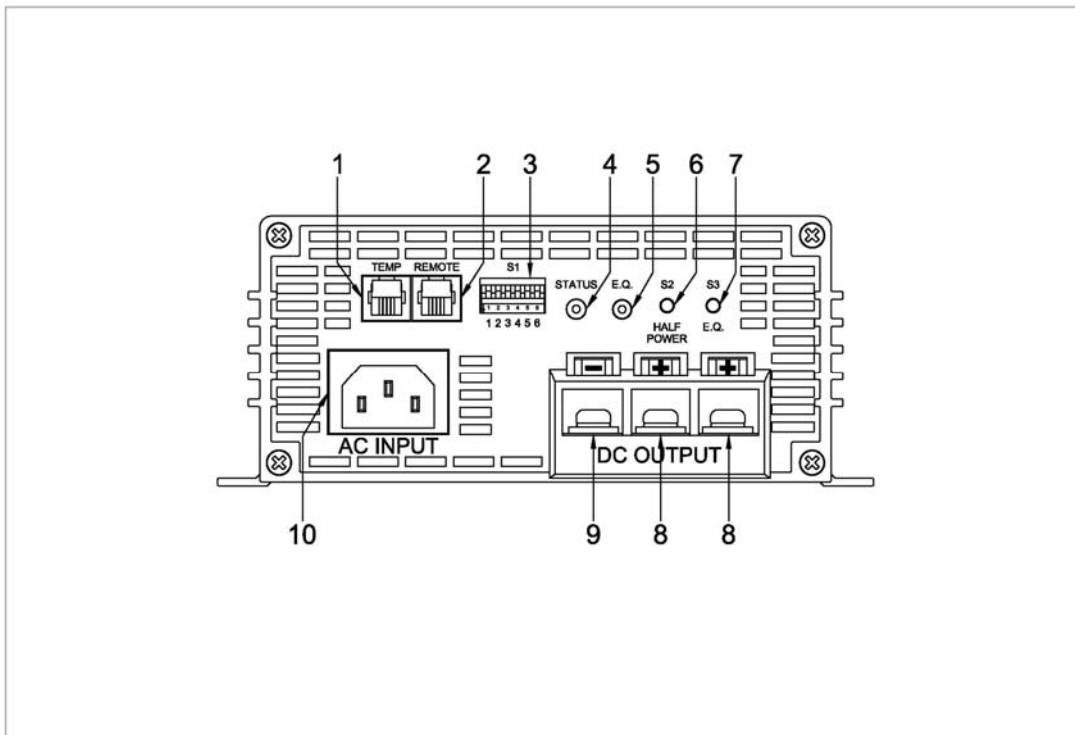


Figure 2: Front View

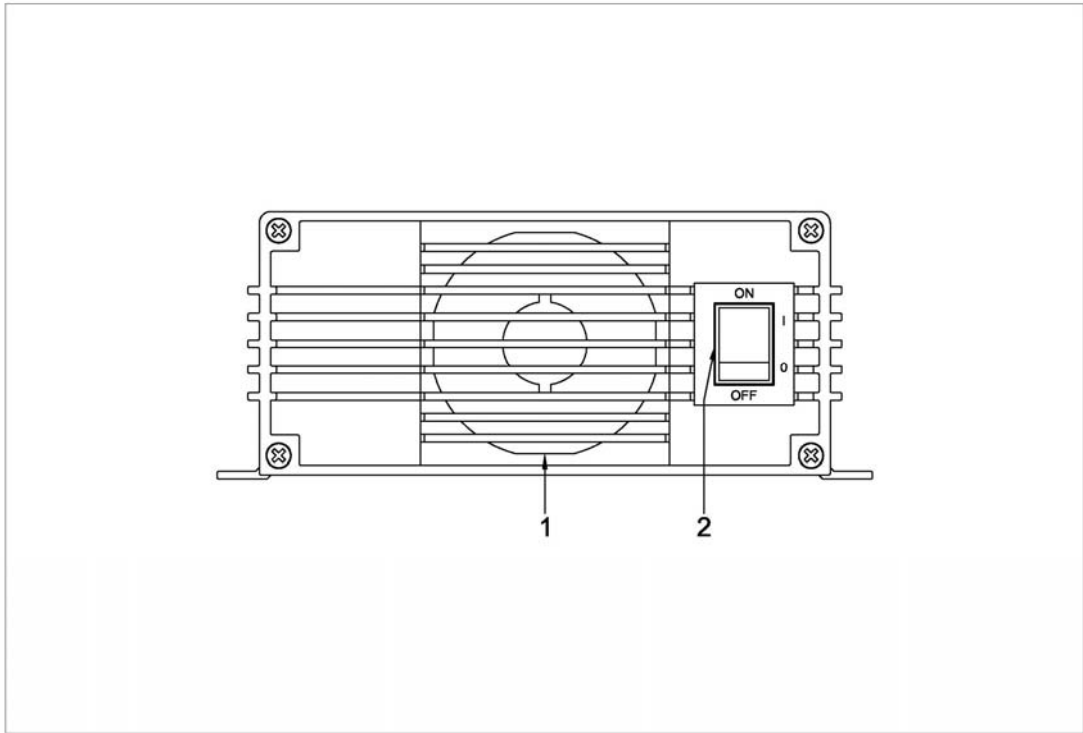


Figure 3: Rear View

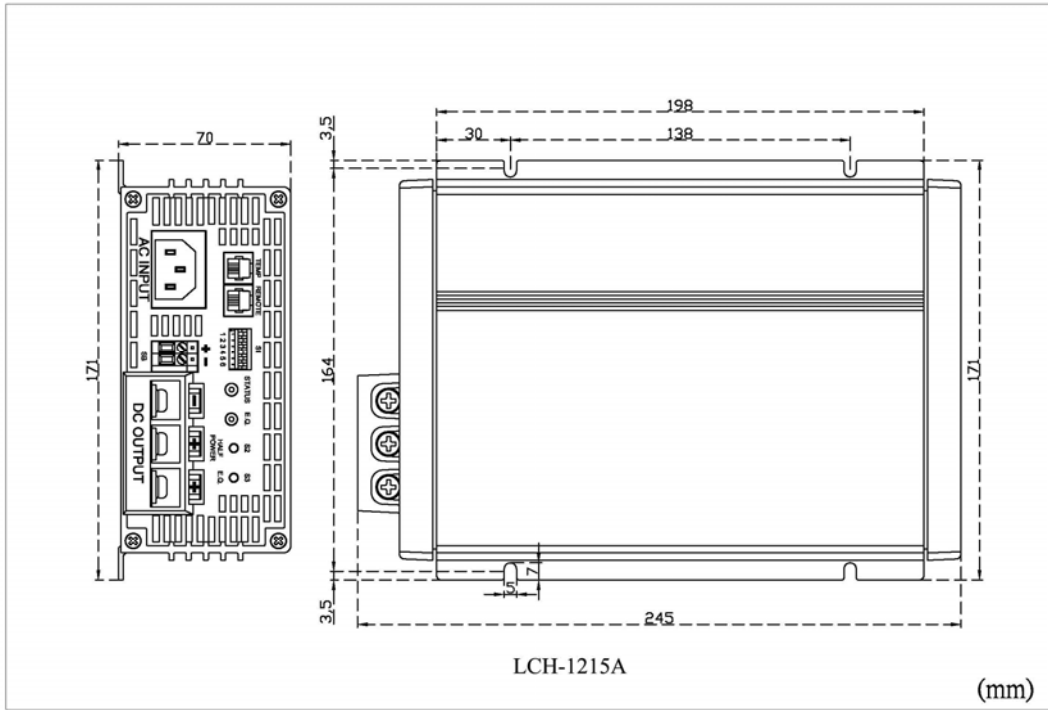


Figure 4: Top View

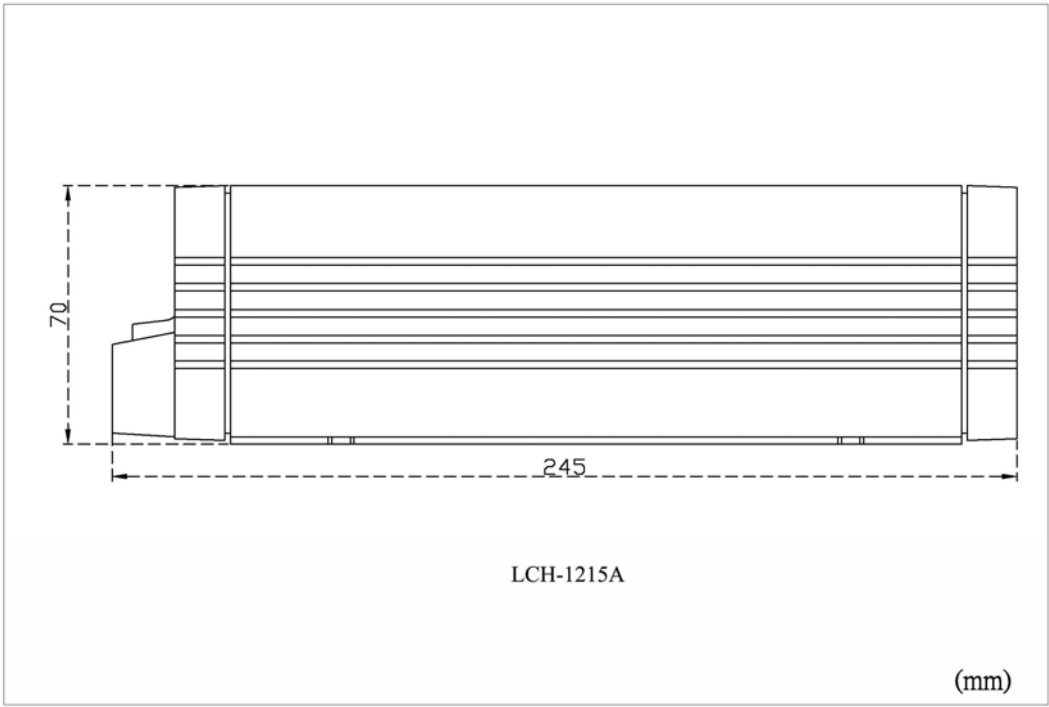


Figure 5: Side View

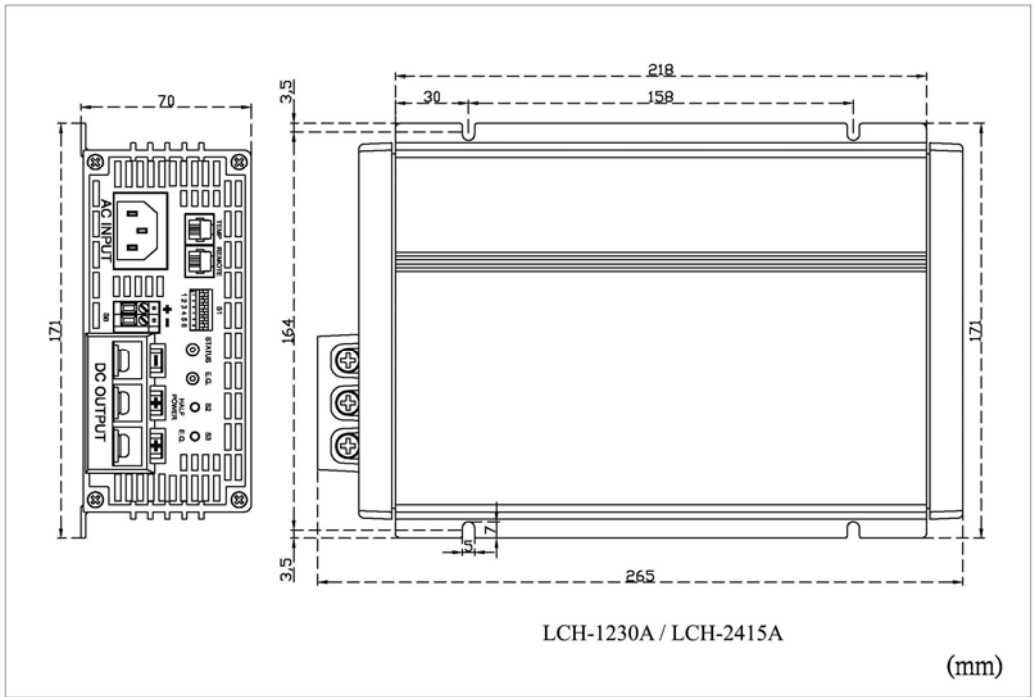


Figure 6: Top View

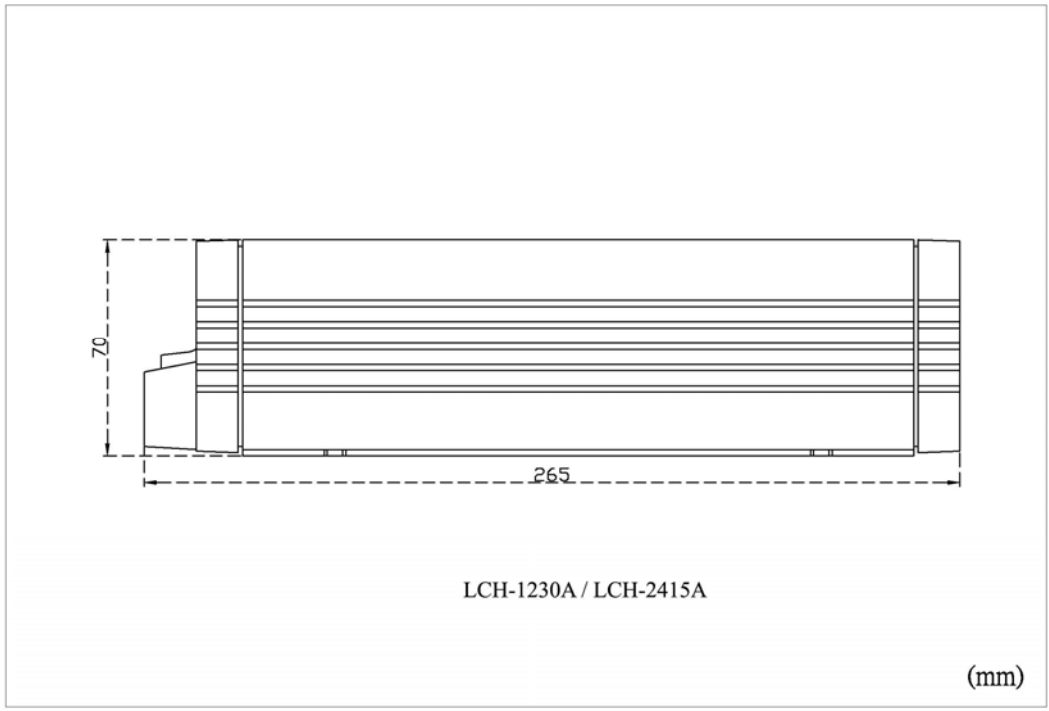
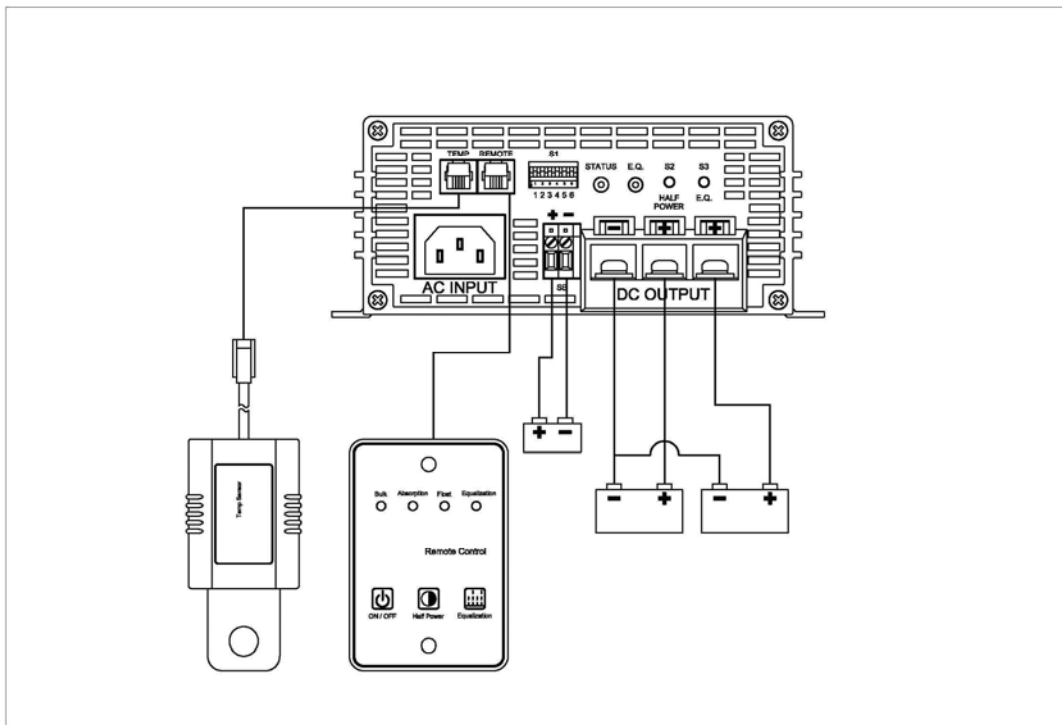


Figure 7: Side View



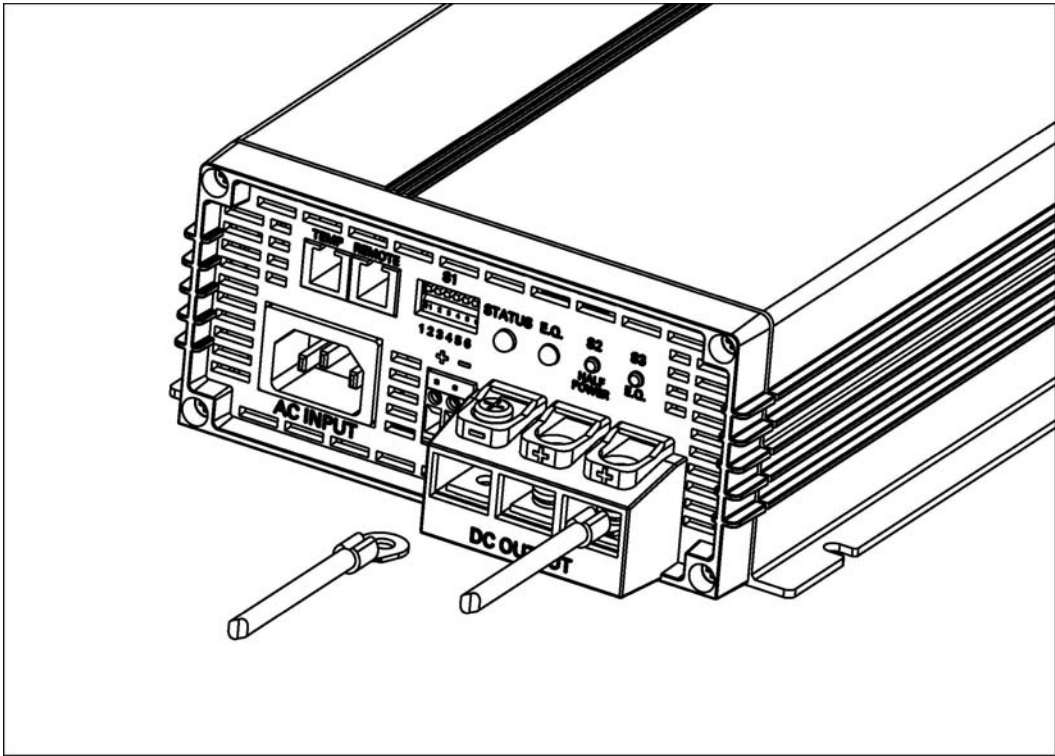


Figure 9: Cable Setup

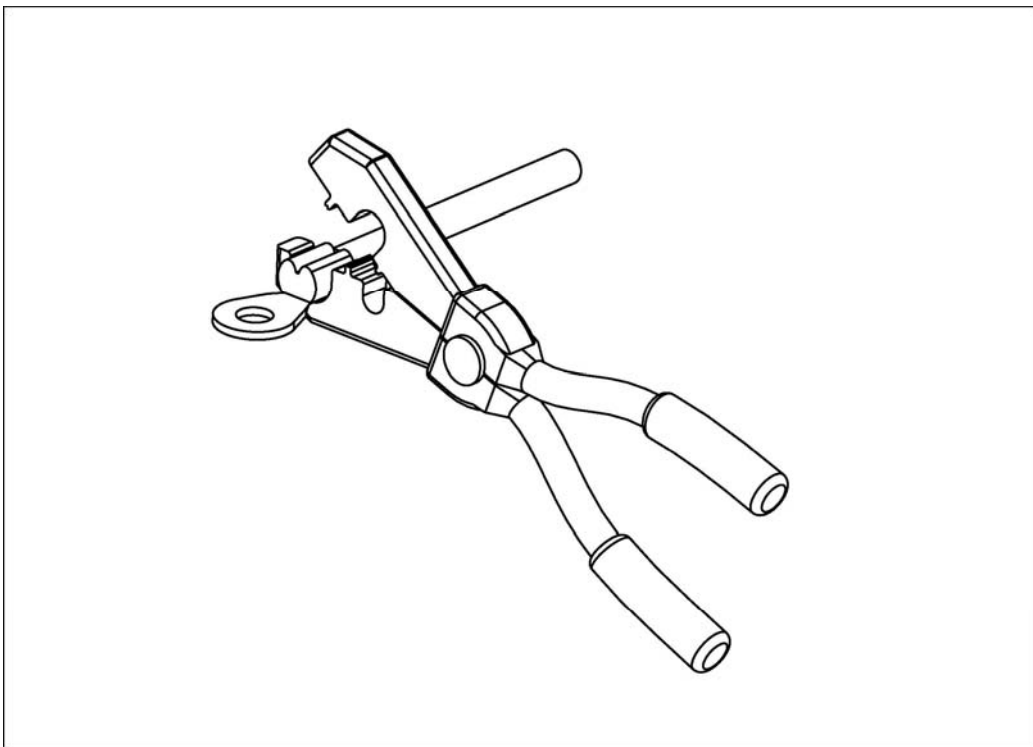


Figure 10: Fork

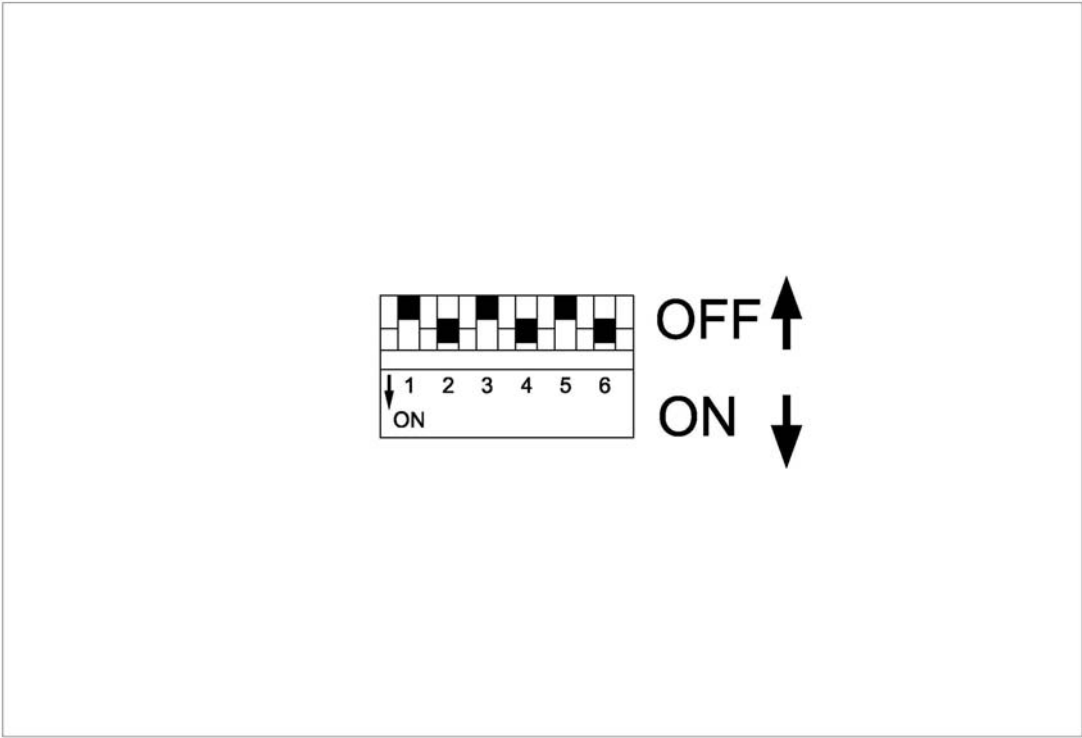


Figure 11: Switch

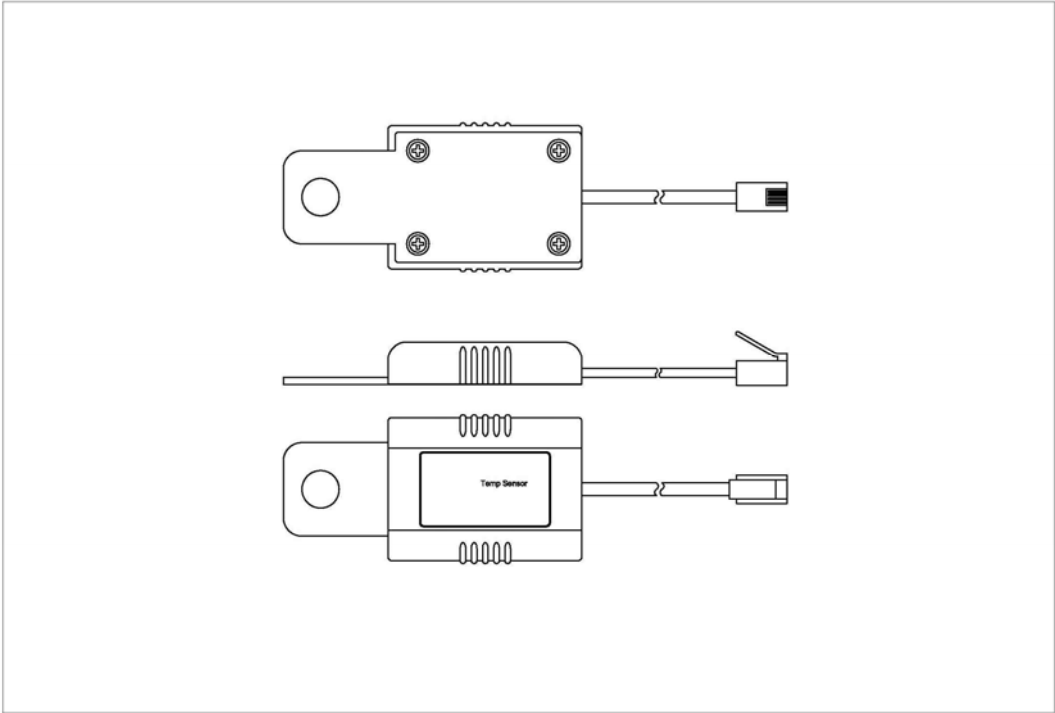


Figure 12: Temperature Sensor

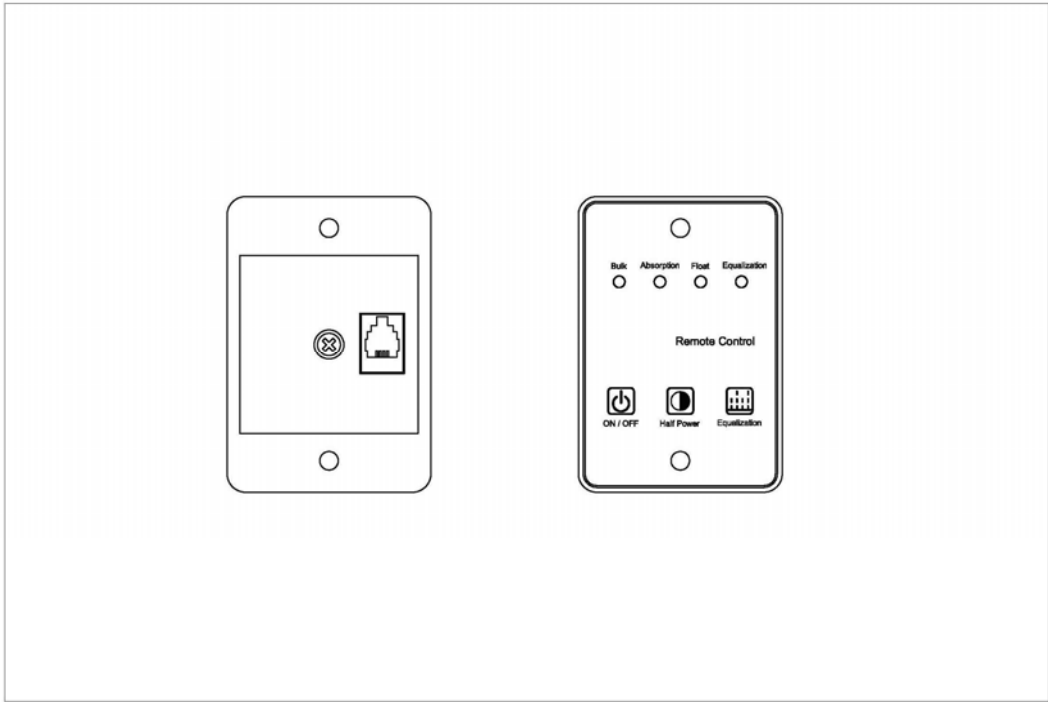


Figure 13: Remote Controller

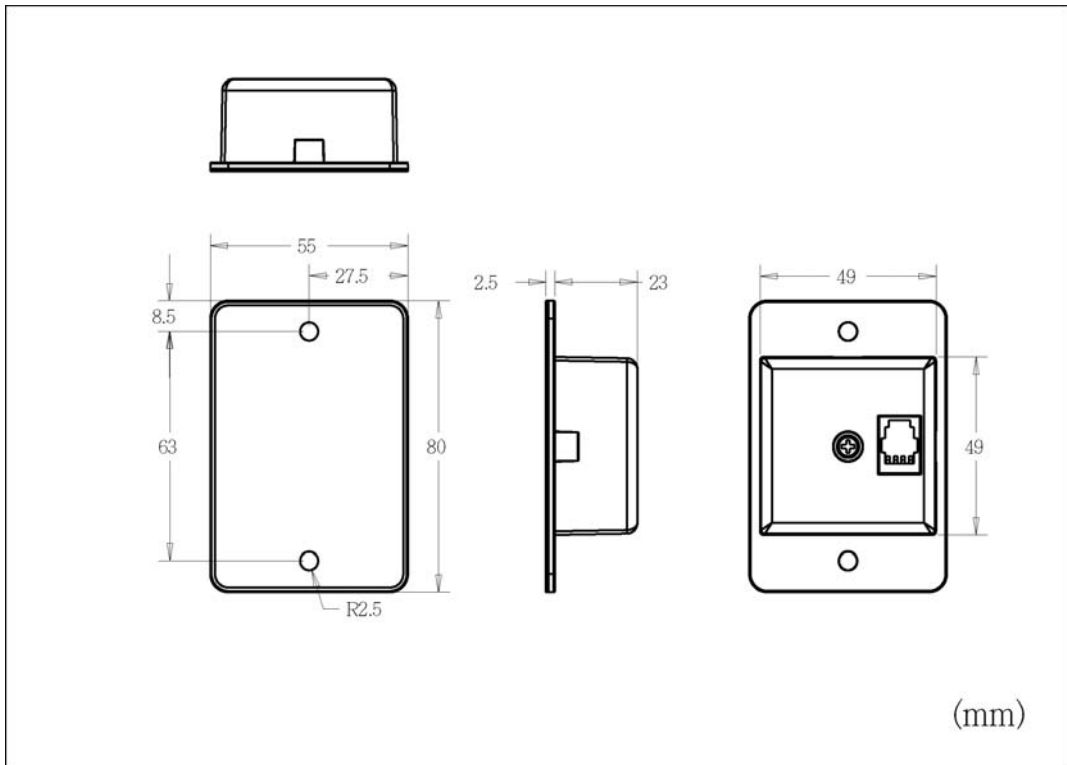


Figure 14: Remote Controller Views

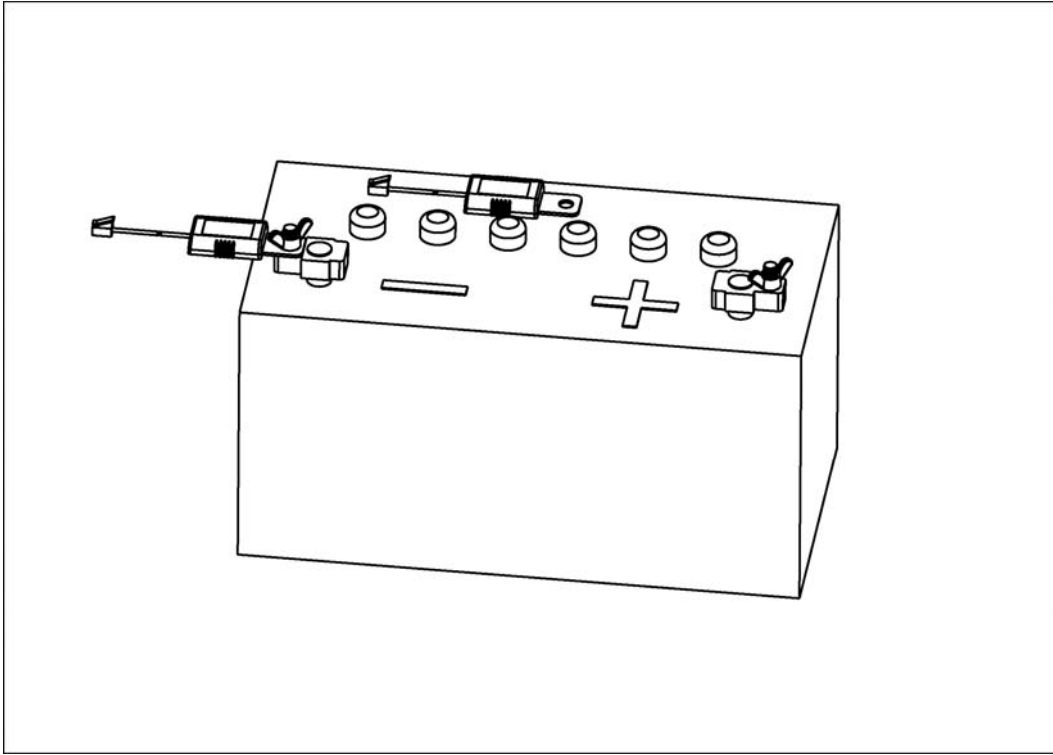


Figure 15: Temperature Sensor Setup