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ULTRA SERIES CHARGER

Installation and Operation Manual

Important Safety Instructions

Before using this equipment read all manuals and other documents related to this unit and other equipment connected to this unit. Always have a copy of a units manual on file nearby, in a safe place; if a replacement copy of a manual is needed it can be found at the www.lamarchemfg.com.

Electrical Safety

WARNING: Hazardous Voltages are present at the input of power systems. The output from rectifiers and from batteries may be low in voltage, but can have a very high current capacity that may cause severe or even fatal injury.

When working with any live battery or power system, follow these precautions:

- Never work alone on any live power system, someone should always be close enough to come to your aid
- Remove personal metal items such as rings, bracelets, necklaces, and watches.
- Wear complete eye protection (with side shields) and clothing protection.
- Always wear gloves and use insulated hand tools.

WARNING: Lethal Voltages are present within the power system. Parts inside the unit may still be energized even when the unit has been disconnected from the AC input power. Check with a meter before proceeding. Do not touch any uninsulated parts.

- A licensed electrician should be used in the installation of any unit.
- Always disconnect the unit from the supply, batteries and loads before performing maintenance or cleaning.
- If the unit is hot-swappable, simply remove it from the shelf for any maintenance or cleaning.
- Always assume that an electrical connection is live and check the connection relative to ground.
- Be sure that neither liquids nor any wet material come in contact with any internal components.
- Do not operate this unit outside the input and output ratings listed on the unit nameplate.
- Do not use this unit for any purpose not described in the operation manual.

Mechanical Safety

- This unit or parts of the unit may get very hot during normal operation, use care when working nearby.
- Do not expose equipment to rain or snow. Always install in a clean, dry location.
- Do not operate equipment if it has received a sharp blow, been dropped, or otherwise damaged in any way.
- Do not disassemble this unit. Incorrect re-assembly may result in a risk of electric shock or fire.

Battery Safety

WARNING: Follow all of the battery manufacturer's safety recommendations when working with or around battery systems. DO NOT smoke or introduce a spark or open flame in the vicinity of a battery. Some batteries generate explosive gases during normal battery operation.

- To reduce risk of arc, connect and disconnect the battery only when the unit is off.
- If it is necessary to remove the battery connections, always remove the grounded terminal from the battery first.
- Remove personal metal items such as rings, bracelets, necklaces, and watches.
- Always wear rubber gloves, safety glasses, and a rubber lined vest/apron when working near a battery.
- Have plenty of fresh water and soap nearby in case the battery electrolyte contacts skin, clothing, or eyes.
- If the battery electrolyte contacts skin or clothing, wash immediately with soap and water.
- If the electrolyte enters the eye, immediately flood the eye with running cold water for at least ten (10) minutes and seek medical attention immediately.
- Do not drop metal on a battery. A spark or short-circuit could occur and lead to an explosion.

Unit Location

- Allow at least 6 inches of free air on all vented surfaces for proper cooling
- Do not operate this unit in a closed-in area or restrict ventilation in any way.
- Do not set any battery on top of this unit.
- Never allow battery electrolyte to drip on this unit when reading the specific gravity or filling the battery.
- Never place this unit directly above a standard flooded battery. Gases from the battery will corrode and damage equipment.
- A sealed maintenance free or valve regulated lead acid (VRLA) battery may be placed below this equipment.

Check for Damages

Prior to unpacking the product, note any damage to the shipping container. Unpack the product and inspect the exterior of product for damage. If any damage is observed, contact the carrier immediately. Continue the inspection for any internal damage. In the unlikely event of internal damage, please inform the carrier and contact La Marche for advice on the risk due to any damage before installing the product. Verify that you have all the necessary parts per your order for proper assembly.

CAUTION: Failure to properly file a claim for shipping damages, or provide a copy of the claim to La Marche, may void warranty service for any physical damages reported for repair.

Returns for Service

Save the original shipping container. If the product needs to be returned for service, it should be packaged in its original shipping container. If the original container is damaged/unavailable, make sure the product is packed with at least three inches of shock-absorbing material to prevent shipping damage. *La Marche is not responsible for damage caused by improper packaging of returned products.*

Inspection Checklist

- Enclosure exterior and interior is not marred or dented.
- There are no visibly damaged components.
- All internal components are secure.
- Printed circuit boards are firmly seated.
- All hardware and connections are tight.
- All wire terminations are secure.
- All items on packing list have been included.

Handling

Use caution handling the unit to prevent damage.

Precautions

- Do not connect battery and Ultracap in parallel.
- Do not operate this system in direct sunlight, in contact with fluids, or where there is excessive dust or humidity.
- Be sure the air vents on the system are not blocked. Allow adequate space for proper ventilation.
- Connect the charger AC Mains power cable directly to the distribution panel. Use cables according to the size of the upstream AC protection panel device.

Table of Contents

1. Ultra Series Charger Description

General Description

The La Marche Ultra Series charger is a high performance charger, which utilizes high frequency technology. It is specially designed to meet the requirements of charging ultra capacitors, as well as to charge the batteries used in Engine starting applications. The charger provides protection against battery reverse connection, high DC voltage, input voltage variation and surges. This system is intended for indoor use only.

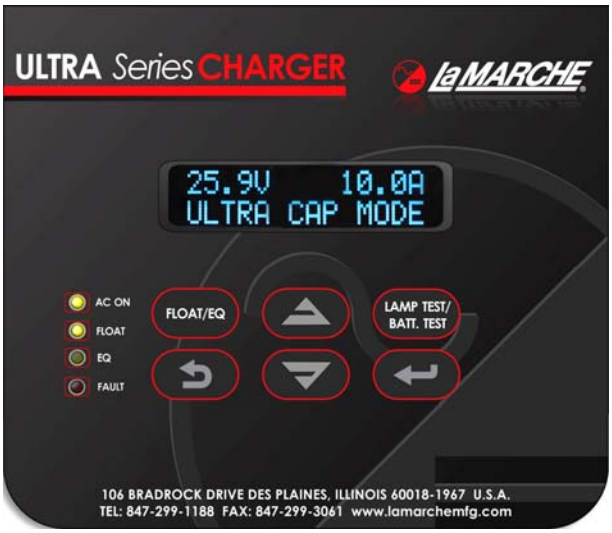


Figure 1 – ULTRA SERIES CHARGER Display

Standard Features

- Power Factor corrected high frequency charging technology
- Wide AC input range (105-264 VAC 45-65 Hz)
- Galvanic Isolation from AC to DC
- LCD Digital Voltmeter & Ammeter
- Adjustable Current Limit from 50-105%
- Alarm relay contacts for:
  - Charger Fail
  - AC Fail
  - Low DC voltage
  - High DC Voltage
  - Summary alarm
- Operating Temperature: -40°C to 65°C (-40°F to 149°F)
  Storage Temperature: -40°C to 85°C (-40°F to 185°F)
- Battery continuity Test (Manual and Auto mode)
- Automatic High battery cutout
- Soft Start feature
- Over Temperature and Over Voltage protection.
- Complies with NFPA 110

Symbol	Color	Description
AC ON	Green	Indicates that correct AC voltage is present in the Rectifier
FLOAT	Green	Indicates charger is running in floating mode.
EQ	Yellow	Indicates charger is running in equalize mode.
FAULT	Red	Indicates any fault condition

Table 1 – Front Panel Overview

2. Installation

2.1 Where to Install

The charger should be installed in a location that meets the following requirements:

1. Never install the equipment near liquids or in an excessively damp environment.
2. The charger must be installed in a room with proper ventilation.
3. Avoid using equipment in location with corrosive gases (e.g. over flooded Lead Acid batteries) and dust.

2.2 Mounting

The ULTRA SERIES CHARGER is designed with simple installation in mind. The charger is wall mountable using four #10 bolts. To mount the Ultra series charger on the wall, mark the drill points on the wall per the mounting dimensions shown in Figure 2. Install the anchors on the 4 marked spots. Place the unit on the wall to match the mounting holes with anchor spots. Install four #10 bolts on the wall using appropriate mounting hardware.

Refer to figure 2 for mounting dimensions.

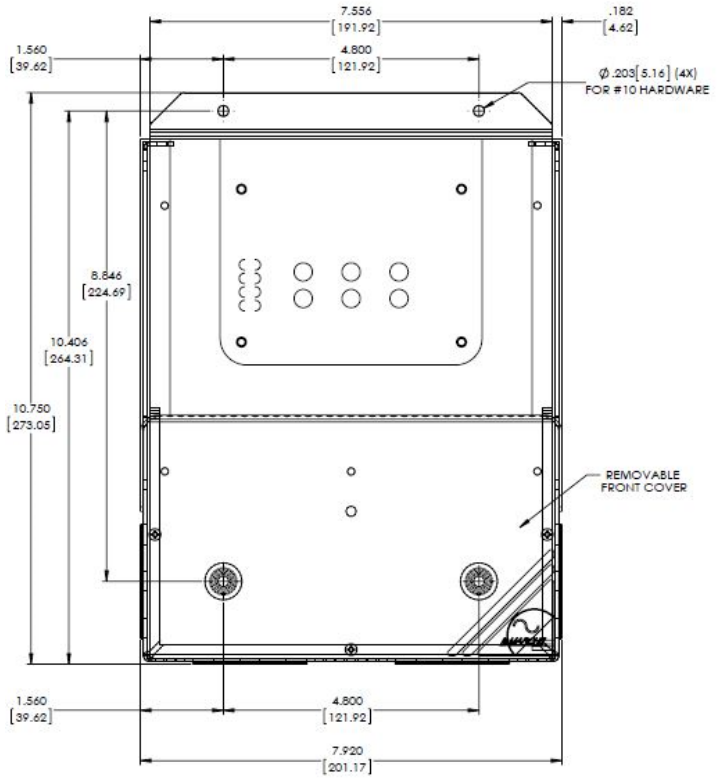


Figure 2 – Mounting Dimensions

After the Ultra series charger is mounted, the input, output and alarm connections can be made.

3. Electrical Connections

Unscrew the front cover to access the Input, Output and Alarm connectors. See the Figure 3 and Figure 4 in section 3.1 and 3.2 on the next page for reference.

CAUTION : All wiring must be performed by a qualified personnel.

3.1 Input AC Connections

Connect AC wiring to the equipment per the image shown below. Refer to section 3.3 for recommended wire sizes.

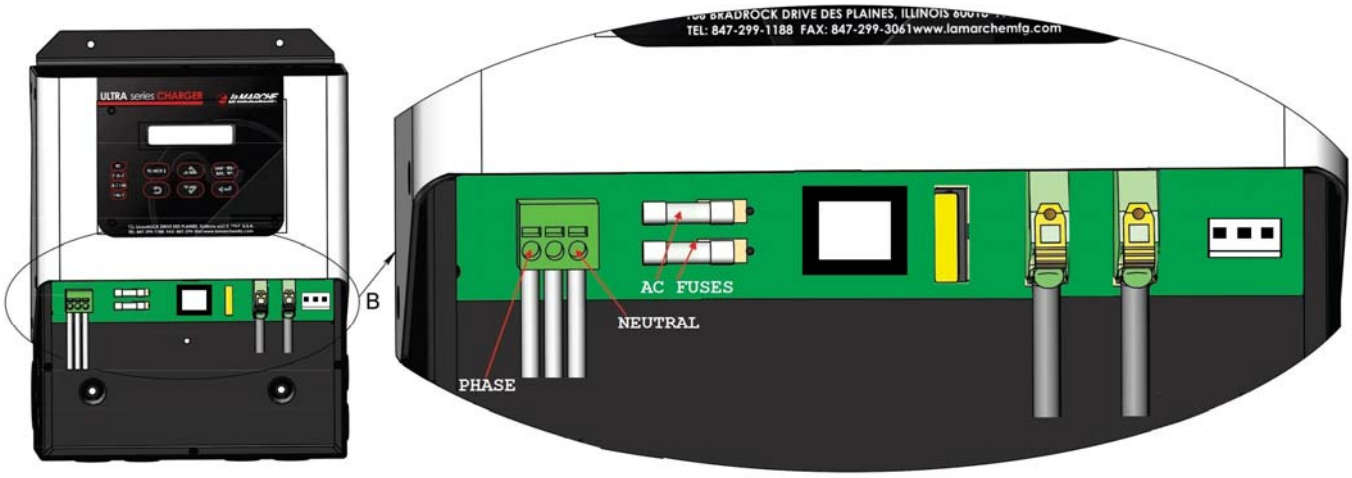


Figure 3 – Input Connections

3.2 Output DC Connections

Connect Ultracap/battery DC cables to the equipment per the image shown below. Refer to section 3.3 for recommended wire sizes.

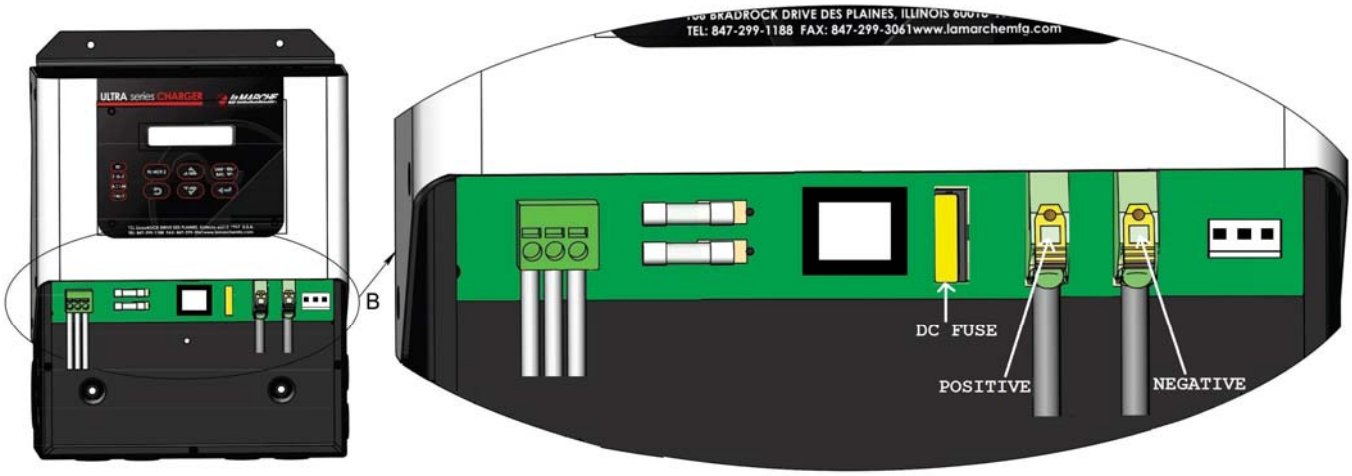


Figure 4 – Output Connections

Note: Verify that the connections are tight by tugging on the wires.

CAUTION: When connecting the DC cables to the battery, be certain the positive terminal of the charger is connected to the positive battery terminal and the negative terminal is connected to the negative battery terminal.

Note: *All National and local wiring codes must be followed. Wire insulation must be rated 90C or higher.*

3.3 Power Cabling Guide

Use the following formulas and tables to determine proper wire size for minimal voltage drop.

Table of Conventions

CMA = Cross section of wire in circular MIL area
A = Ultimate drain in amperes
LF = Conductor loop feet
MaxAmp = Maximum allowable amperes for given voltage drop
AVD = Allowable voltage drop
K = 11.1 for commercial (TW) copper wire (KS5482-01)
= 7.4 for aluminum (KS20189)

DC Wire size requirements

Output Current Rating	Recommended wire size (AWG)
10A	#14
20A	#12
30A	#10
40A	#8

Table 2 – Recommended wire size Table

SIZE (AWG)	AREA CIR.MILS	SIZE (AWG)	AREA CIR.MILS
18	1620	6	26240
16	2580	4	41740
14	4110	3	52620
12	6530	2	66360
10	10380	1	83690
8	16510	0	105600

Table 3 - Wire Size / Area Table

Calculating Wire Size Requirements

$$CMA = \frac{A \times LF \times K}{AVD}$$

Calculating Current Carrying Capacity of Wire

$$MaxAmp = \frac{CMA \times AVD}{LF \times K}$$

Note: AC wiring terminals can accept wire up to 12 AWG;
DC wiring terminals can accept wire up to 10 AWG;
Alarm wiring terminals can accept wire up to 16 AWG.

3.4 Alarm Connections

The Ultra series charger is equipped with a single set of Form C dry type relay contacts (30V DC & 2A) for each alarm.

The charger has 5 different alarm relays.

- Charger Fail
- AC Fail
- Low DC Voltage
- High DC Voltage
- Summary alarm

Refer to Table-4 for alarm relay wiring and logic information.

Refer to image on the right for using proper tool to make the alarm connections.

Installing dry contacts signal cables
1 – White Contact plate; 2- Dry Contact

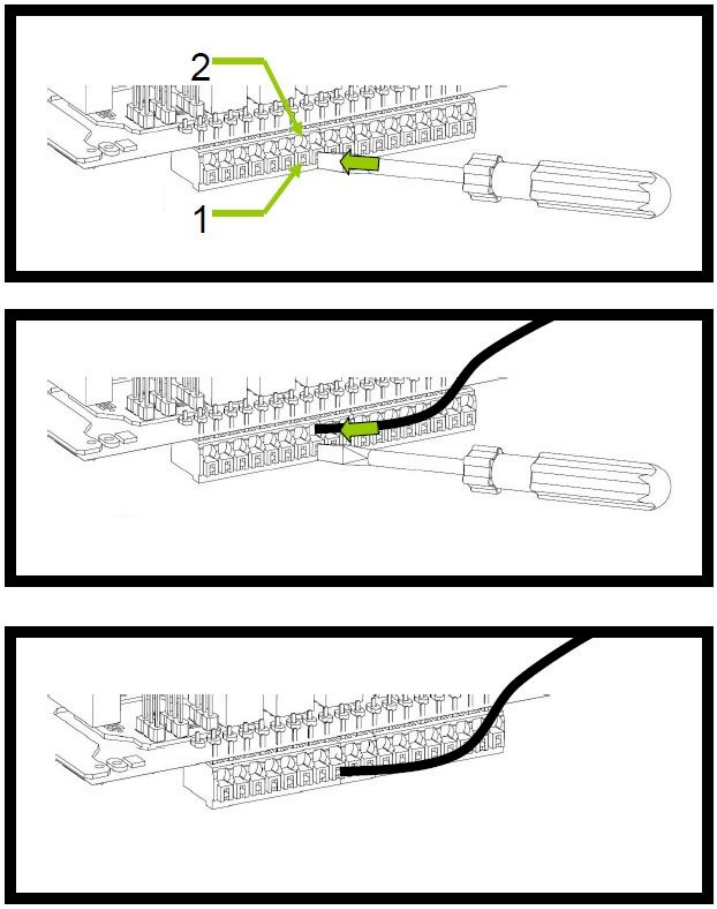


Figure 5 – Alarm Connections

Alarm Relays Logic

ALARM	PIN #	CONTACTS	ALARM RELAY LOGIC
CHARGER FAIL	4/5/6	NC/C/NO	DE-ENERGIZE ON FAIL
AC FAIL	7/8/9	NC/C/NO	DE-ENERGIZE ON FAIL
LOW DC VOLTAGE	10/11/12	NC/C/NO	DE-ENERGIZE ON FAIL
HIGH DC VOLTAGE	13/14/15	NC/C/NO	ENERGIZE ON FAIL
SUMMARY ALARM	16/17/18	NC/C/NO	DE-ENERGIZE ON FAIL

Table 4 – Alarm Relay Logic

INPUT/OUTPUT PROTECTION:
AC Input Fuses: The Ultra Series charger is equipped with two AC input fuses.
DC Output Fuse: The Ultra Series charger is equipped with one DC output fuse.

Refer to unit specifications (Section 7) for fuse size information.

4. Temperature Compensation

Ultra Series charger is equipped with an External Temperature Compensation feature. The charger is provided with the compensation circuit and a 24 foot long temperature probe. The natural voltage of the battery changes as a function of temperature change. As the Ultracap/ battery temperature rises, the effective voltage of the Ultracap/battery decreases. Without Temperature Compensation, the Ultra Series charger will always produce constant output voltage. As the Ultracap/battery temperature increases, this constant voltage will then induce a higher output current from the charger. This higher current can result in overcharging the Ultracap/battery, which in turn can result in damage or significantly shorten the life of the Ultracap/battery.
The temperature compensation considers 25°C as the nominal ambient temperature and adjusts the voltage level based on the difference between the actual temperature and 25°C.
Temperature Compensation combats this overcharging by adjusting the charger's output voltage based on the temperature sensed by the temperature probe. In order to increase the accuracy of the temperature compensation the external probe can be used to measure the temperature of the Ultracap/battery.

Please see the image below for connecting temperature cable.

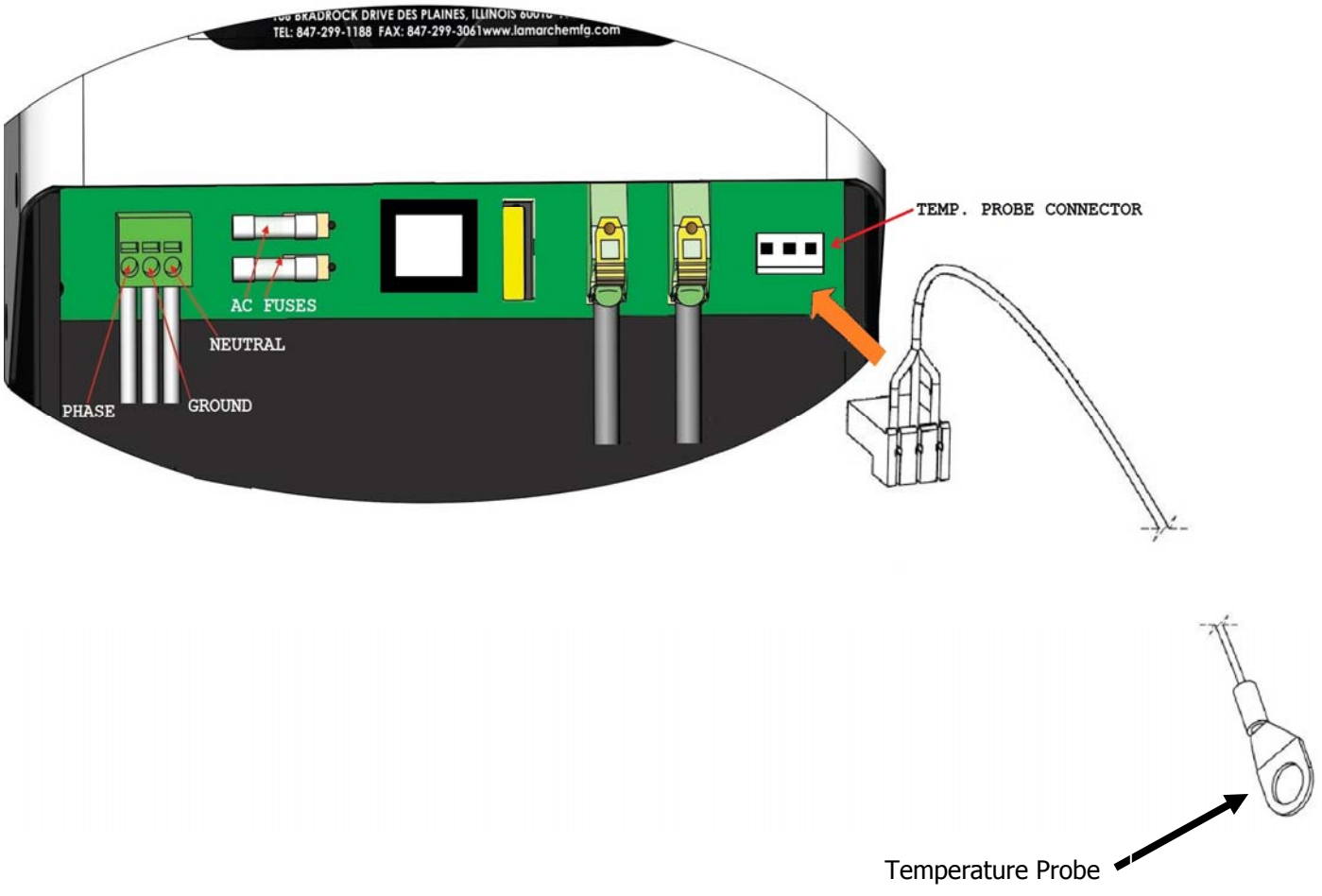


Figure 6 – Temperature Compensation Connection

5. Operation

5.1. Front Display Panel :

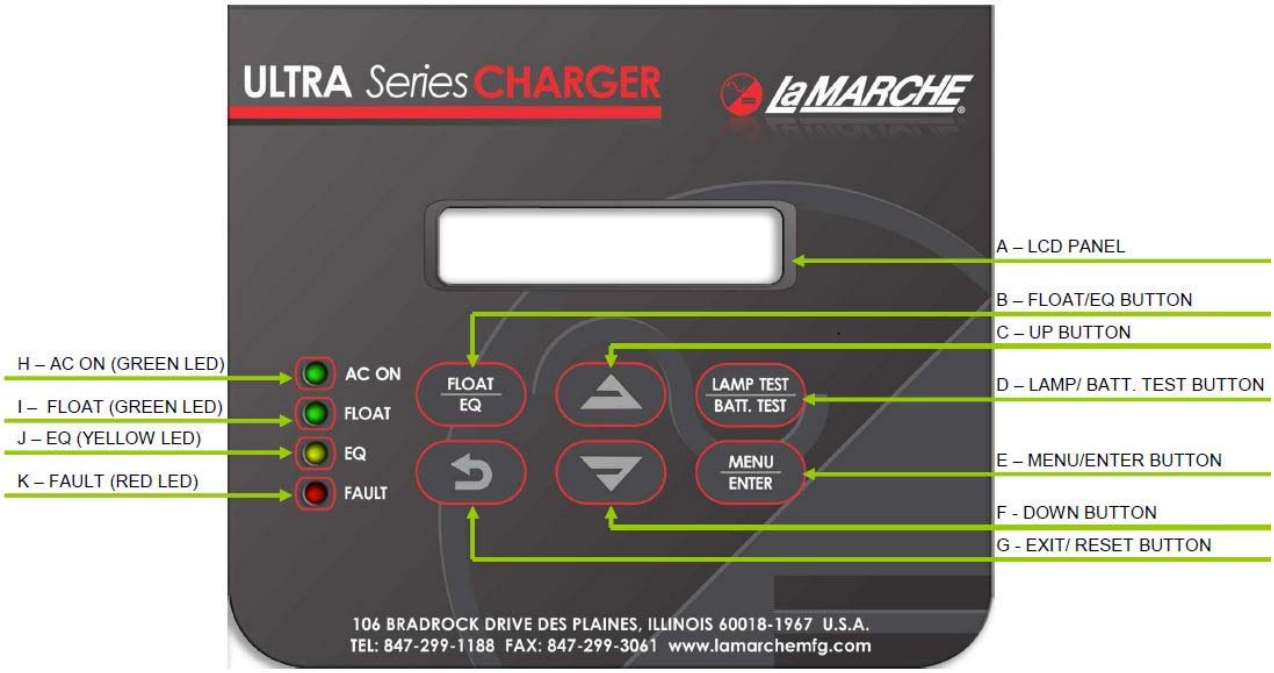


Figure 7 – Front Display Panel

(A) LCD Panel: Displays the status and output parameters of the system.

In normal operation the parameters displayed are as follows:

- Charger Output Voltage
- Charger Output Current
- Mode of Operation
  - ➢ Float
  - ➢ Equalize
  - ➢ Ultracap

In case of any fault occurred, Fault message will scroll on the display.
It also allows viewing and changing the charger configuration through settings menu.

Button Switches: The unit is equipped with 6 control switches. See information below for details on the function of each switch:

(B) Float/EQ: Allows the user to select the mode among Float mode or Equalize mode. If charger is operating in Float mode then after pressing this switch, charger changes the mode of operation to Equalize mode and vice versa.

Note: Switching among these modes can only happen when the charger is in battery mode. In ULTRACAP mode, charger will always remain in Float mode. This switch is disabled in ULTRACAP mode.

(C) UP: Used to navigate the display parameters in an upward direction and increase the parameter value.

(D) Lamp Test/ Batt. Test:

Lamp test: The Lamp test is triggered when the [Lamp Test/Batt. Test] switch is pressed momentarily. During the test, all LED indications blink 10 times. Also, the LCD test is performed.

Battery Test: The Battery test is initialized when the [Lamp Test/Batt. Test] switch is pressed and held for 10 seconds. System will provide a feedback through LCD panel by displaying 'PERFORMING BATTERY TEST'. If the battery is weak or if it is not connected to the system, 'BATTERY FAILED' message is displayed. To clear this message press EXIT ().
If the battery is in good condition, the 'BATTERY OK' message appears momentarily. Then the unit resumes normal operation.

(E) MENU/ENTER: This switch is used to set the parameter. It is also used to enter into the charger configuration and into the submenus to select the parameters.

(F) DOWN: Used to navigate the display parameters in downward direction and decrease the parameter value.

(G) EXIT/ RESET :

EXIT:  performs the back operation from any menu of the system.

RESET: Unit RESET will be initialized when the  button is pressed during normal operation (not in calibration mode or in alarm state).

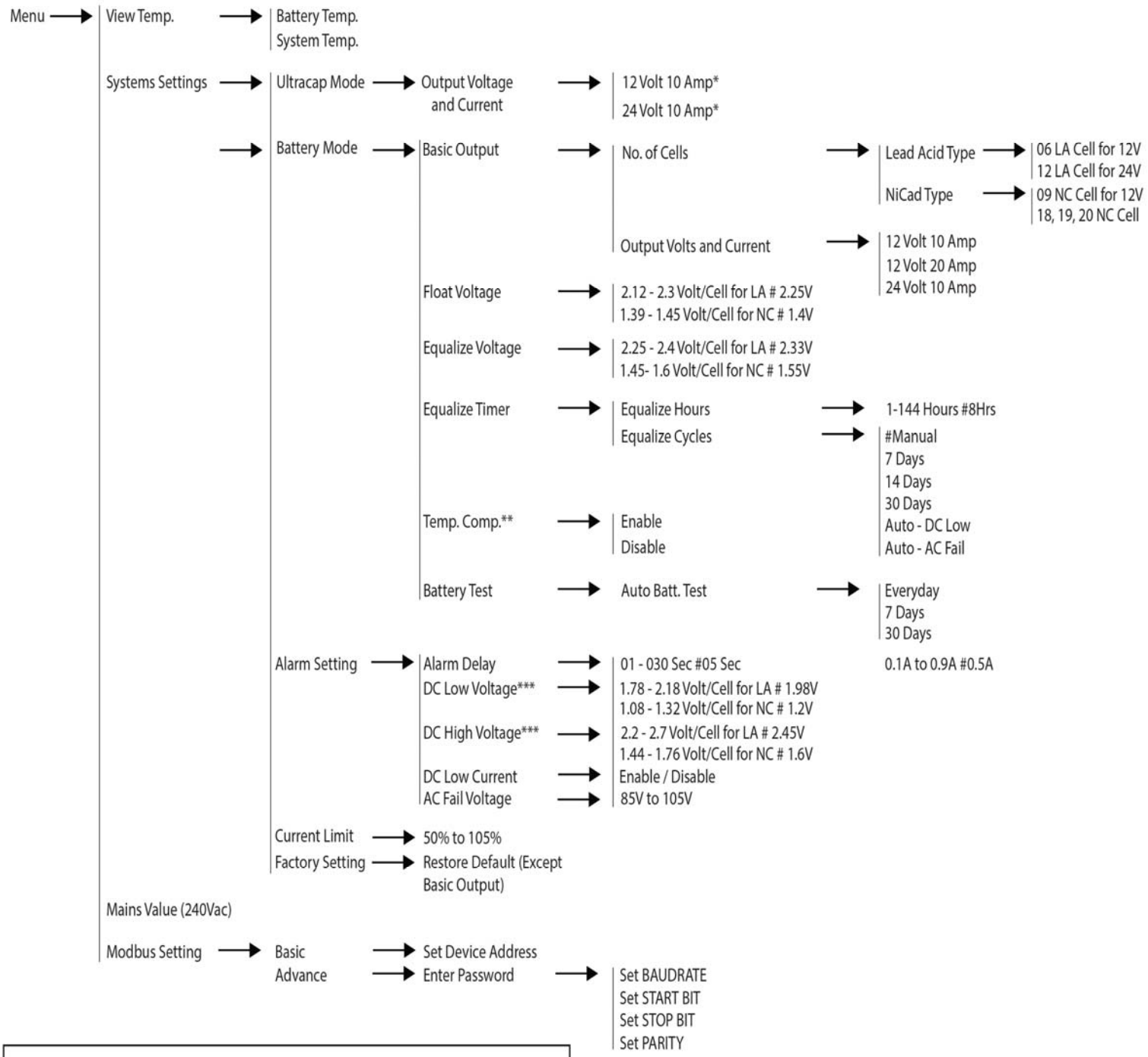
LEDs: There are four LEDs provided to show the status of the charger.

(H) AC ON (Green LED): LED will illuminate when the AC Mains connected to the system is in required range.
(I) FLOAT (Green LED): LED will illuminate in Float mode.
(J) EQ (Yellow LED): LED will illuminate in Equalize mode.
(K) FAULT (Red LED): LED will illuminate when the system goes into any fault condition.

5.2 Initial Setup

Once all AC, DC and alarm connections have been made, apply AC power by closing the upstream AC breaker. The unit will automatically power up. At the initial startup the ULTRA SERIES CHARGER will run at the default settings (26 Volt Output for 24V units and 13 Volt output for 12V units; current Limit is set to 105%). In order to change these settings simply press the MENU/ENTER button to enter configuration mode. Refer to the configuration menu flowchart on the next page (section 5.3) for details on the settings menu structure and available parameters.

5.3 User Menu: Symbols: # Default Value



NOTES:

* *BASED ON UNIT OUTPUT*

** *DEFAULT ENABLE FOR ULTRACAP MODE, DISABLE FOR BATTERY MODE*

*** *ULTRACAP MODE LOW DCV = 9.5V (12V UNITS) / 19 (24V UNITS), HIGH DCV 17V (12V UNITS) / 28.7V (24V UNITS)*

Press MENU/ENTER button to advance to the right and EXIT ( ) button to navigate to the left. Use UP/DOWN buttons to navigate between settings and settings values.

6. Troubleshooting

FAULT Indications on LCD	CORRECTIVE ACTION
Battery Reverse	1. Check the battery connection polarity. If it not connected correctly, disconnect AC and connect the battery according to right polarity.
High DC Voltage	1. Check the unit configuration for mode of operation, battery type and cell selection. 2. Verify that the correct battery/Ultracap is connected to the unit.
AC Mains Fail	1. Check if the Input AC mains is in the required range. 2. Check connections of the AC mains. Verify that the wires to AC terminals are properly connected. 3. Check that the AC fuse is not blown. If the fuse is blown, change the AC fuse with the same type and rating as given with the product.
Cranking OFF	1. Wait for 2 minutes (The charger is in Self protect mode). It will start automatically after 2 min.
Over Temperature	1. Check that the unit ventilation is not obstructed. (e.g. – nothing resting on top of the unit) 2. Wait for the charger temperature to be within the rating (The charger has built-in over temperature protection). It will start automatically when the temperature reaches within the safe level.
Fan Failed	1. Check if the fan is disconnected or blocked, otherwise fan is non operational.
Temp. Probe Off	1. Check if the temperature probe is disconnected or cut. 2. This message will appear if the temperature at contact point is sensed outside the range of -50°C to +150°C.
Comm. Fail	1. This message signifies the error in charger's internal communication. If this message appears on the display, please consult La Marche technical support team.

Note: If any of the above mentioned or any other fault condition continue to occur, please contact La Marche technical support at 847-299-1188.

7. Technical Specifications

AC input	Voltage and frequency	Auto ranging 105-264 VAC, 45-65 Hz
	Rated Current	2.6A @120VAC, 1.4A @240VAC (for 24V 10A output mode)
	Input protection	AC Fuse (250V, 5A Glass type)
	Inrush limiting	Inrush current limited NTC
	Efficiency	Exceeds CEC-400-2012-019-CM requirements
	Power factor	0.9
	Input Terminals	Terminal blocks (Push-In Springable type); AWG 24 - AWG 12
Charger output	Nominal voltage rating	24 volt nominal or field selectable 12/24-volt
	Voltage adjustment	According to selected number of cells/ Battery type and Volt/cell.
	Current	10A at 24V and 20A at 12V
	Charging characteristic	ULTRACAP Mode Battery Mode
	Line and load regulation	±0.5%
	Output ripple	<100mV rms
	Temperature compensation	Enable/ Disable, Remote temperature sensing through probe.
	Output protection	Electronic current limit, Transient protection, DC fuse (32V, 20A Blade Fuse- Plug-In type)
	Output Terminals	Terminal blocks (Lockable type); AWG 24 – AWG 10
Status indication	LED status indicator	AC ON (Green LED), Float (Green LED), Equalize (Yellow LED), Fault (Red LED)
Display and Alarms	Display	LCD Display (16x2)
	LCD Dot Matrix Display	Displays volts, amps, Mode of operation and Status messages
	Relay Alarm contacts	Charger Fail, AC Fail, Low DC Voltage, High DC Voltage, Summary
	Relay Alarm contact ratings	Rated 2A @ 30 VDC, 0.5A @ 125VAC Single form C dry type
	Alarm Terminals	Spring Cage; AWG 24 - AWG 16
Environmental	Operating temperature	-40°C to 65°C (-40°F to 149°F)
	Storage temperature	-40°C to 85°C (-40°F to 185°F)
	Over temperature protection	Derates over 50C up to 70C Above 70C, switches off.
	Humidity	0% to 95% non-condensing
Physical	Ingress Protection	IP-20; NEMA-1
	Dimensions	7.9 x 4.1 x 10.7 in (W x D x H) 801 x 105 x 273 mm (W x D x H)
	Weight	6.4 lbs (2.9 Kgs)

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