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LMESpro

Smart Battery/HCAP Charger

Installation and Operation Manual

This manual is subject to change without notice. You may obtain the newest version of the manual at www.lamarchemfg.com

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CPN 144074

Instruction Drawing Number: P25-LLMESP-01
Revision A00 Rev. Date: 03/21 ECN:22774

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 unit's manual on file nearby, in a safe place; if a replacement copy of a manual is needed, it can be found at www.lamarchemfg.com.

Electrical Safety

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 and batteries before performing 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 comes 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.

Charger Location

- Provide at least 6 inches of free space left/right, and at least 6-inches of free space top/bottom 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. Take care 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.
- Do not mount directly above another heat source.
- The charger must be mounted upright as to promote convection air flow through the external heat-sink.
- See Installation & Mounting sections.

Check for Damage

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 as 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 is not marred or cracked.
- All externally accessible hardware and connections are tight.
- All items on packing list have been included.

Precautions

- Do not operate this system in direct sunlight, in contact with fluids, or where there is excessive dust or humidity.
- Allow adequate space for proper ventilation. (See Charger Location & Installation Mounting sections)
- Connect the charger AC input wiring to an appropriately rated circuit. The AC circuit should be able to continuously support the charger's full rated input current and have an upstream OCPD at least rated to meet or exceed that of the charger's input fuses.
- Do not attempt to operate the LMESpro with the cover removed; lethal voltages exceeding 400V inside.

Table of Contents

Model Scope/General Description

The La Marche LMESpro is a battery charger, which utilizes advanced high frequency switch-mode technology and active power factor correction; meeting strict CEC Efficiency requirements. It is specially designed to meet the requirements of charging Lead Acid & NiCad batteries, or HCAPS (Hybrid Asymmetric LiC Supercapacitors).

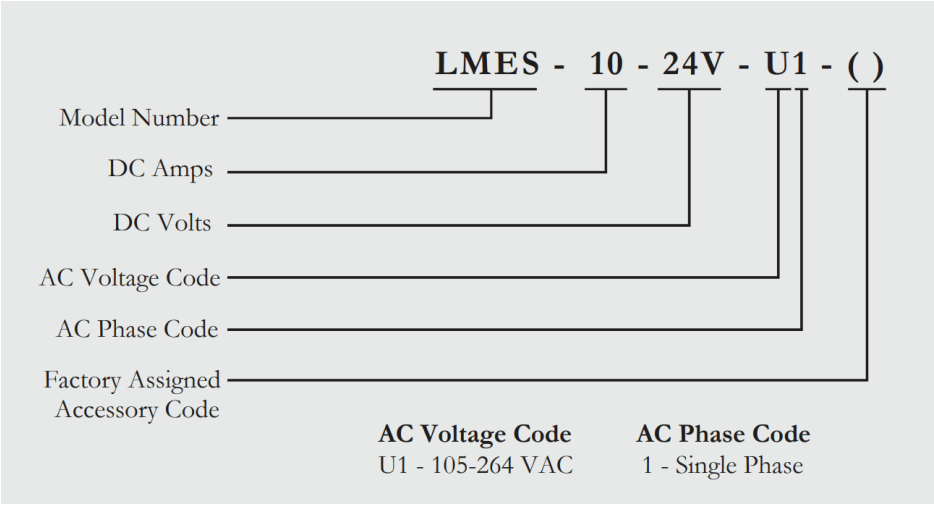
The LMESpro battery charger is designed to recharge and extend battery life utilizing multi-stage charging. This charger is completely automatic, lightweight and convection cooled. It offers a Universal AC-Input, and the output is selectable for either 12 VDC or 24 VDC.

Front View

Bottom View

Understanding the Model Number

The LMESpro model number is coded to describe the options that are included. Find the model number on the nomenclature nameplate of the charger. Follow the chart to determine the configuration of your battery charger.



Optional Accessories Included in the Charger

This charger may have been outfitted with several optional accessories or option packages. To determine the options included (if any) refer to the cover page of the manual package. If the manual package that is included with the charger is no longer available, contact La Marche and provide the model & serial number of the charger to receive a list of the included accessories.

Features

- ➢ Microprocessor Controlled High Frequency Switch-Mode Technology
- ➢ Single Phase Wide Range Universal AC Input: 105 Vac - 264 Vac, 50/60Hz
- ➢ Complete Galvanic Isolation from AC to DC
- ➢ Soft Start, Short Circuit Protection, Over Voltage, Over Temperature Protection, Reverse Polarity, and Input/Output Transient Overvoltage Protection
- ➢ Four Stage Battery Charging Algorithms (Unique Lead-Acid, and HCAP algorithms)
- ➢ Automatic High Battery Cutout Protection
- ➢ Low Noise & High Reliability
- ➢ Convection Cooled with Over Temperature Protection
- ➢ Lightweight with Sleek Aesthetic Looks
- ➢ Temperature Compensation
- ➢ Remote Temperature Sensor available.

Battery/HCAP charging voltage is temperature compensated (temp-comp) when the remote temperature probe is connected to the remote temperature sensor (RTS) terminal with the correct polarity.

Temperature Compensation Coefficient (25°C Reference Temp.) & Compensation Range:

- Lead Acid: -3mV/cell/°C, from 0°C to +50°C
- HCAP: -6mV/°C in 12V mode & -12mV/°C in 24V mode, from -25°C to +70°C
- NiCad: Not available.

Protection

➢ **Temperature Compensation**

With temperature compensation, the output voltage is adjusted according to the temperature to prolong the life of the battery or HCAP. The charger also detects an open or shorted external probe. When the temperature probe is not connected or defective, temperature compensation is disabled.

➢ **High DC Protection**

If 24V DC battery is connected to the charger when 12V mode is selected, it will shut down in High DC protection. No damage will occur to the charger.

➢ **Output Short Circuit Protection**

Short circuit protection is triggered when the battery voltage drops below 6V in 12V mode, or 12V in 24V mode. The output of the charger is then turned off to protect the circuitry. The charger output will self-recover in 2 minutes in a soft start mode to charge the battery.

➢ **Output Current/Overload Protection**

When demand exceeds 100% of rated DC output current, the charger limits the current and reduces the output DC voltage to protect the charger.

➢ **Thermal Protection**

Charger is protected from over-temperature. The charger will derate by 30% due to over-temperature when ≥ 70°C (internal). For extreme overtemperature situations, thermal shutdown is activated when ≥ 85°C (internal). In both cases, as the temperature returns to 60°C (internal), the full output capability is automatically restored. (Note: Thermal protection does not activate when the charger is operating at full output current & operating in a 50°C ambient.)

1 Installation

1.1 Mounting

When mounting the LMESpro, the location chosen for the charger should be within an ambient temperature range of -40 to 122˚F (-40 to 50˚C) with a non-condensing relative humidity no higher than 95%. The LMESpro should be mounted in an area free of flammable & explosive materials and away from drips, splatter, or moving parts. To be mounted on a non-combustible surface. The LMESpro utilizes convection cooling with a heat-sink facing the mounting surface; mount in an upright position as shown in Figure 1 to promote convection air flow. Provide clearance for at least 6in (152mm) of free air must be maintained on the left/right sides, and at least 6" (152mm) top/bottom sides for cooling. Maintain 36in (914mm) or more of clearance at the front of the charger in order to allow for operation and maintenance. Install the LMESpro using appropriate hardware on the wall. When using multiple adjacent LMESpro chargers, do not mount them 1 above the other, mount them side-by-side with a minimum of 6" between them. Avoid mounting the LMESpro directly over another heat source.

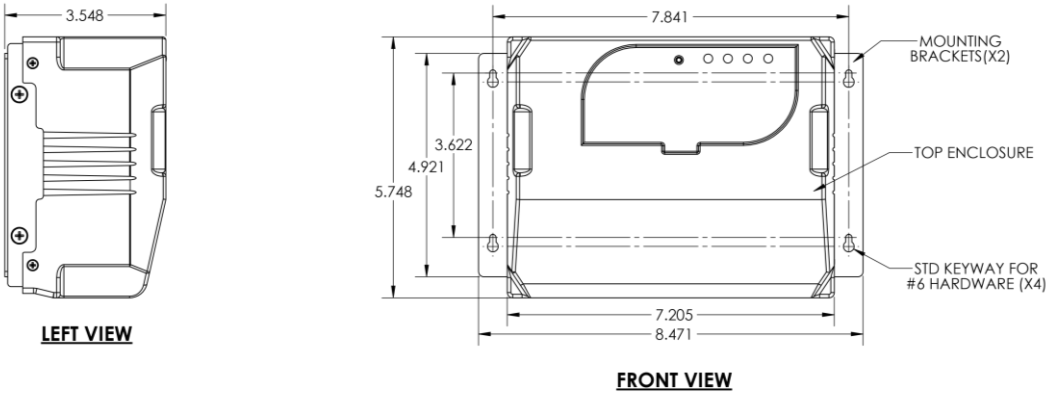


Figure 1 – LMESpro Mounting Dimensions

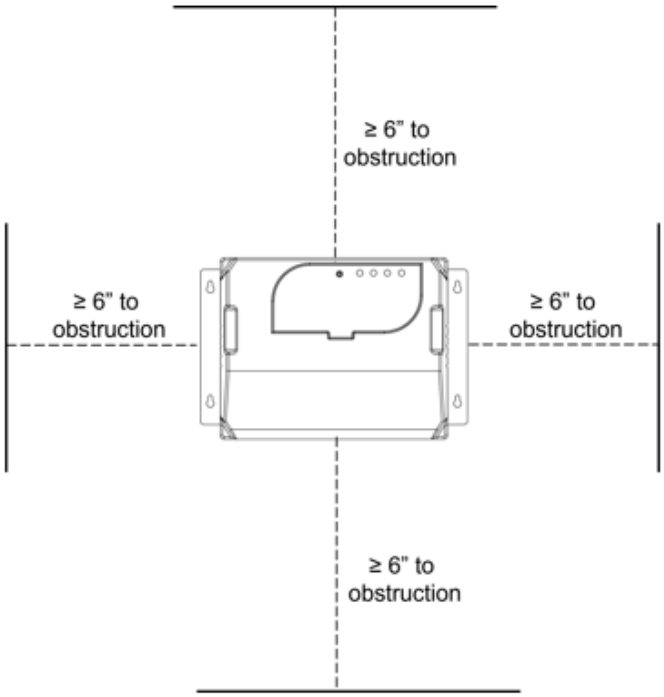


Figure 2 - Distance to obstruction of free air flow

1.2 Electrical Connections

Before beginning installation of electrical connections, ensure that all sources (AC & DC) are de-energized; verify that no voltage is present on the field wiring by using a voltmeter. Check that the source voltage and frequency match the charger's specifications. Select field wire size using Table 1 below.

Wire terminal table	AC Input Terminal Line-1, GND, N/L2	DC Output Terminal Pos & Neg	Remote Temperature Probe + + & - -
Minimum Recommended Wire Size *	18Ga	14Ga	Optional accessory supplied by La Marche. Temp probe includes correct wire size, pre-crimped ferrules, and is marked (+ + & - -)
Range of wire sizes which fit the LMESpro push-in spring terminals	18ga → 14Ga stripped 18ga → 14Ga w/ferrule	14Ga → 8Ga stripped 14Ga → 10Ga w/ferrule	
Wire Strip Length (Inch"/mm)	0.4" / 10mm	0.6" / 15mm	

Table 1 – AC/DC & Ground Wire Size Minimum Requirements
(All wires specified in the table are copper rated at 90 °C or 194 °F)

** **NOTE:** These are minimum recommended sizes per La Marche Standards. The National Electrical Code (NEC) and Local Wiring Codes must be followed.*

The LMESpro utilizes spring-loaded push-in style connectors. It is recommended to use wire crimp ferrules on the AC & DC field wiring when installing the charger, however it is not absolutely necessary. Crimp ferrules will prevent wire strands from fraying near the connectors. Being spring-loaded, the connectors are highly resistant to vibration and do not require periodic torque checks as with a screw-terminal. See Figure-2.

To connect field wiring, you can simply push in the prepared conductors until fully seated. To make the wires easy to push-in, you may insert a small flat-head screwdriver tip into the rectangular opening above the wire entry to relieve spring-tension on the wire connection.

Figure 3 - Wire installation

To remove a wire connection (on a completely de-energized system AC & DC), insert a small screwdriver tip in the rectangular opening above the wire to release spring pressure, then pull the wire out. See Figure 3.

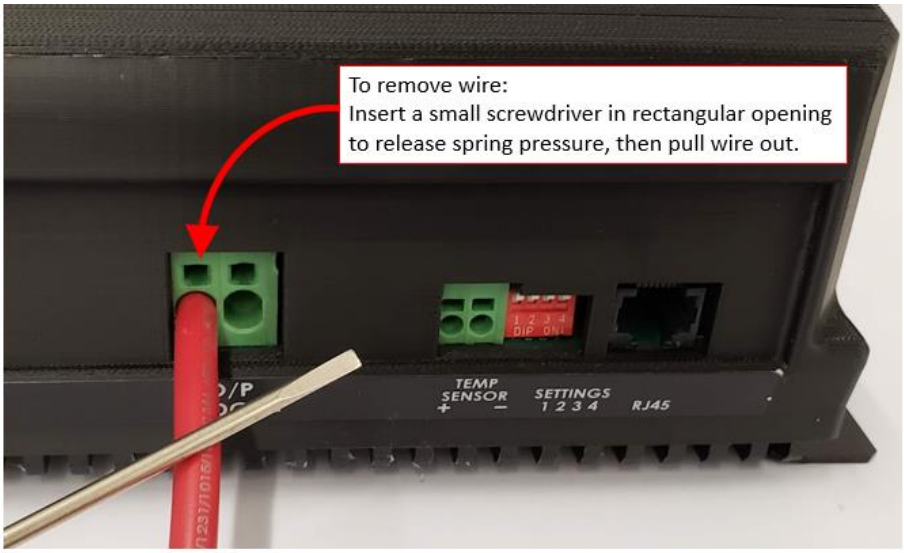


Figure 4 – Removing a wire from the connector

1.2.1 AC Input Connections

Check that the source voltage and frequency match the charger specifications. Select wire size using Table 1. Before connecting the Battery/HCAP and/or DC loads, Refer to Section 2.2 for the configuration instructions. For AC Terminal location refer to Figure 5.

- For AC systems with a line and neutral such as 120Vac service in North America, connect Line to the "L" & neutral to the "N".
- For AC systems with "2-hot leads" or Line-1 & Line-2 such as 240Vac service in North America, connect Line-1 to "L" & Line-2 to "N".
- All installations require the Ground terminal to be connected to the AC service Ground/Earth wire.
- All installations require 3-wire connections to the AC Input connector

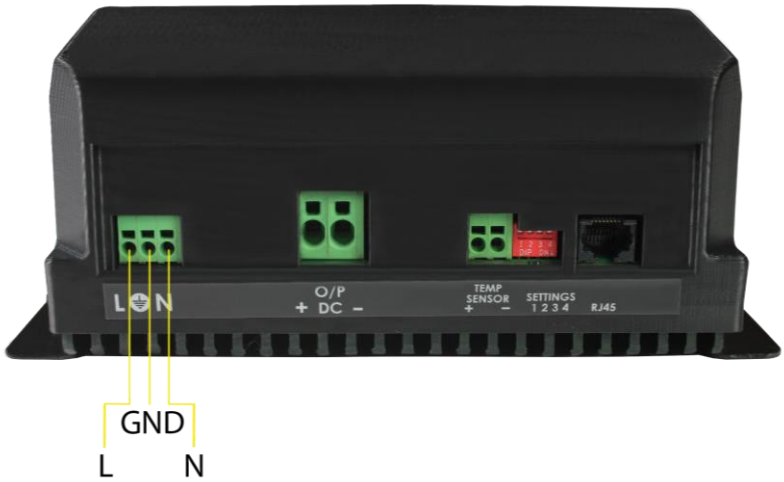


Figure 5 – LMESpro AC/GND Connections

1.2.2 DC Output Connections

Select proper size for the DC wiring from the wire size from Table 1. If the distance between the charger's DC output and the DC load exceeds 10 feet, use the Power Cabling Guide on Appendix B to minimize the voltage drop across the wire distance. Connect DC output wires with the correct polarity connection as shown in Figure 3 below.

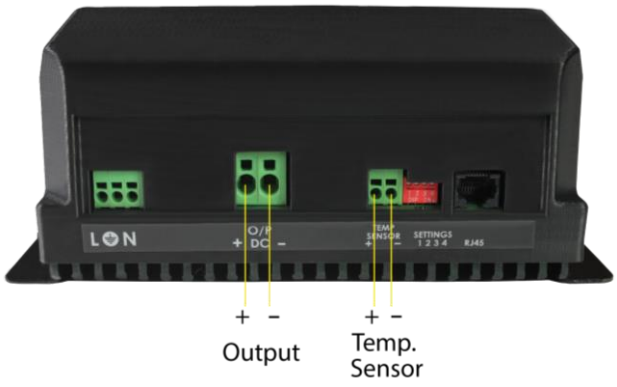


Figure 6 – LMESpro Output/Temp Sensor Connections

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.

CAUTION: Do not touch the charger while it is in operation or just after de-energizing the charger as the LMESpro heat-sink can become very hot during operation.

1.2.3 Remote Temperature Probe Connection

It is recommended to use temperature compensated charging with Lead-Acid & HCAPS, especially in environments having a wide temperature range. La Marche supplies optional remote temperature probes (RTS) in two lengths option 11W – 24ft and option 11Y – 100ft with crimp ferules already attached for connection to the charger, and a 3/8" dia ring-terminal for connection to the battery.

- Connect the crimp ferrule end of the RTS to the LMESpro. See polarity markings (++++ & - - - -)
- Connect the ring-terminal to the negative terminal of the Battery/HCAP.

2 Operation

All equipment is shipped from the factory fully checked and adjusted to factory default settings. Before connecting the battery/HCAP check with the battery/HCAP manufacturer for the correct voltage settings and adjust the dip switch setting configuration accordingly (refer to Section 2.2). Failure to match the charger settings with the connected battery/HCAP may damage or shorten the life.

2.1 Initial Setup

Before starting up the LMESpro, perform the following checks:

- Verify the input voltage and frequency of the power source match the ratings on the nameplate of the charger
- Confirm the LMESpro has been configured for the proper battery/HCAP being charged. Refer to Section 2.2
- Check that the battery/load voltage matches the DC output voltage on the nameplate of the charger
- Verify the AC circuit is capable of continuously supporting the full-load rated input current of the charger
- Verify there are no frayed strands on each of the wire connections after being connected
- Tug on each of the individual wires making sure none of the wires pull-out of the connector
- Read section 2 for Initial Setup to set the DIP switches to match the Battery/HCAP.
- Read and understand all safety precautions in the manual.

Apply AC power to the input terminals of the LMESpro to start up the charger after setting the DIP switches for the desired application per 2.2.

2.2 DIP Switch Settings

The LMESpro output can be configured to account for various battery types and voltages. Use the table below to change the DIP switch settings on the charger. Charger has to be power cycled for dip switch setting changes to take effect.

Battery Type	Dip Switch Settings*	Voltage
12V Lead Acid Battery	0000	13.5
24V Lead Acid Battery	1000	27.0
12V Nickel Cadmium Battery	0001	12.87
12V Nickel Cadmium Battery	0011	14.3
24V Nickel Cadmium Battery	1001	27.17
24V Nickel Cadmium Battery	1011	28.6
12V HCAP	0100	13.2
12V HCAP	0110	15.84
24V HCAP	1100	27.0

Table 2 – DIP Switch Configuration Settings

**1 indicates a switch is in the down position and 0 indicates a switch is in the up position. Refer to Figure 1 & Figure 2 below for examples.*
**Charger has to be power cycled for dip switch setting changes to take effect.*

Figure 7 - Dip Switch Setting: "1011" for 24V NiCad

Figure 8 - Dip Switch Setting: "0011" for 12V NiCad

2.3 Lead Acid - Four Stage Charge Curve

Four-Stage Battery Charging Algorithm: The LMESpro battery charger is designed with four stage battery charging algorithms to prevent overheating of the battery and extend the life of the lead acid battery. The four stages are: Bulk/Absorption/Float/Equalize. This four-stage algorithm allows the battery to be fully charged with less stress, preventing battery overheating, over gassing and reaching maximum battery life. It can also keep batteries in a fully charged state (known as "float") indefinitely.

Bulk Charge: In this stage, the battery voltage has not yet reached up to absorption voltage and 100% of rated current is used to recharge the battery. Charger initiates this mode when the battery voltage is less than 2.1 Volts per cell for more than 90 seconds. Provides full current until the battery reaches 102% of its absorption voltage reference.

Absorption: When the battery has recharged to the Absorption voltage level, constant-voltage regulation is used to prevent heating and excessive battery gassing. The charger will hold the absorption voltage mode until the battery is determined to be fully charged. The absorption mode detects the full charge condition by either the current tapering down to 0.5 Amps, or 4-Hrs has elapsed in the absorption mode.

Float: After the battery is fully charged, the Charge Controller reduces the charging voltage to the float mode.

Equalize (NiCad and Flooded battery types only): The Charge Controller will equalize the battery for three hours. The Equalize charging mode raises the battery voltage above the standard absorption voltage. This process prevents electrolyte stratification and equalizes the individual cell voltages within the battery.

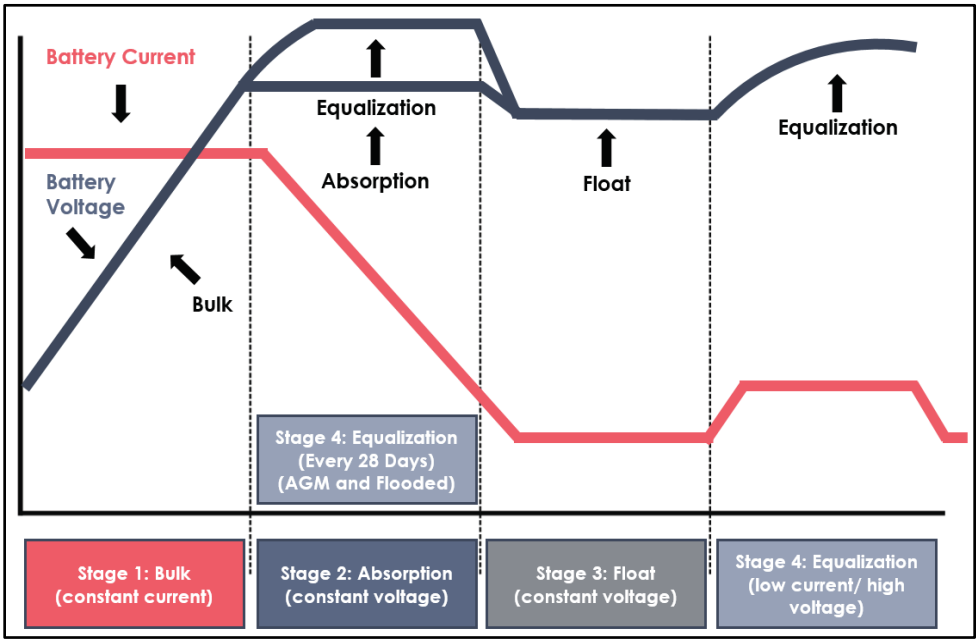


Figure 9 – Lead Acid Four-Stage Charge Curve

2.4 HCAP - Four Stage Charge Curve

Four-Stage HCAP Charging Algorithm: The LMESpro battery charger is designed with a four stage HCAP charging algorithm to prevent overheating and extend the life of the HCAP. The four stages are: Pre-Conditioning, Bulk, Absorption and Float. This algorithm allows the HCAP to be fully charged with less stress, preventing overheating, and reaching maximum HCAP life. It can also keep HCAPs in a fully charged state (known as "float") indefinitely.

Pre-Conditioning: If the HCAP is being recharged from a level (< 6.1Vdc for 12Vdc nominal or < 12.2Vdc for 24Vdc nominal), the LMESpro uses a proprietary pre-conditioning algorithm to safely recharge the HCAP with minimal stress. The LMESpro will pulse the output current for various amplitudes and durations while monitoring the voltage response from the HCAP. As the HCAP is determined to be in a healthy state, the charge rate increases allowing the terminal voltage of the HCAP to climb more quickly. Once the sustained output of the LMESpro exceeds (6.1V for 12Vdc nominal or 12.2V for 24Vdc nominal), the Pre-Conditioning stage is complete, and the charger graduates to the Bulk Charge mode. (Note, in most applications, the HCAP wouldn't regularly be discharged to a voltage that would invoke operating in the Pre-Conditioning mode).

Bulk Charge: In this stage, the HCAP voltage has not yet reached the Absorption voltage, and 100% of rated current is used to recharge the HCAP. The LMESpro provides full-rated constant-current until the HCAP reaches the Absorption voltage. This is where the bulk of the AH/WH capacity is restored.

Absorption: When the HCAP has recharged to the Absorption voltage level, constant-voltage regulation is used to restore the remainder of the AH/WH capacity as quickly as possible. The charger will hold the absorption voltage mode until the HCAP is determined to be fully charged. The absorption mode detects the full charge condition by either the current tapering down to 0.5 Amps, or 1-Hr has elapsed in the absorption mode.

Float: Once the HCAP completes the Absorption stage, the Charge Controller reduces the charging voltage to the float mode. The HCAP is fully charged when the floating current is near 0Adc; see the HCAP instruction manual for further details. The HCAP can operate continuously at the float voltage of the LMESpro. Both the absorption and float modes are temperature compensated when the optional probe is installed.

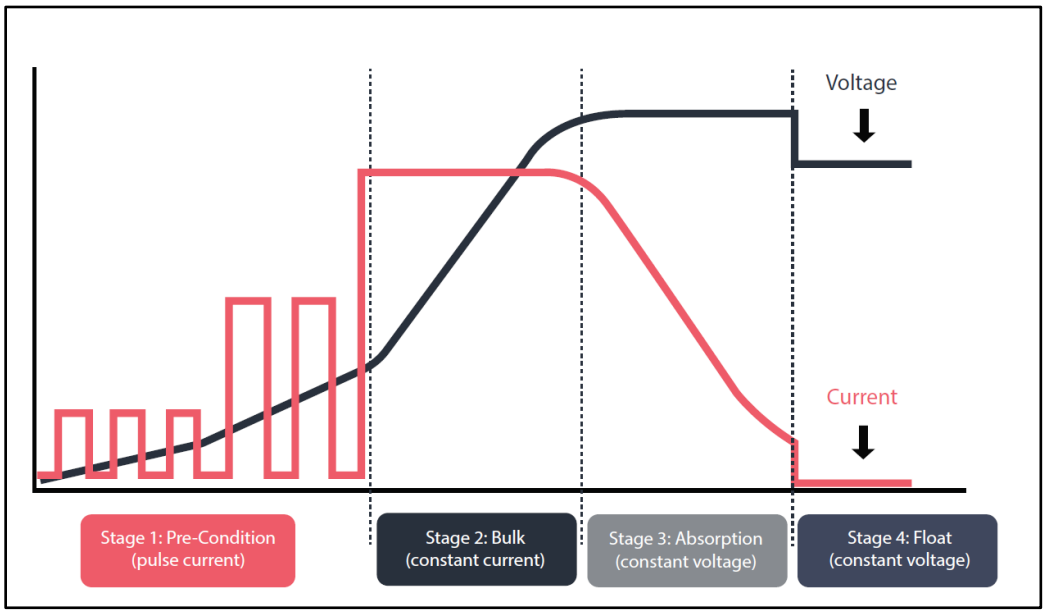


Figure 10 - HCAP Recharge Algorithm

2.5 Indication Details

Figure 11 – LMESpro Front View

LED/Description	LED Color	LED Status	Indication
AC ON – AC Status	Green	ON	AC ON
		OFF	AC Out of Range
STATUS – Charging Status	Orange	Blink with 5 sec. delay	Bulk Charging
		Blink with 20 sec. delay	Absorption Charging
		Solid Glow	Float Charging
FAULT – Charger Status	Red	ON	Charger Failure

Table 3 – LED Indicators

2.6 Fault Indications and Alarms

OUTPUT HIGH DC: If a 24VDC battery/HCAP is connected to the LMESpro charger when 12VDC mode is selected, the charger will shut down in high DC protection. No damage will occur to the charger. The charger will restore its output once it reaches the recovery voltage. Refer to the table below for the high DC voltage shutdown and recovery voltages.

Charger Mode Selected	High DC Shutdown Voltage	High DC Recovery Voltage
12V	15.3V	14V
24V	30.6V	28V

Table 4 – High DC Output Alarm Thresholds

OUTPUT LOW DC: When the battery/HCAP drops below 6V for a 12V system or below 12V for a 24V system, it will cause the charger to turn OFF. The charger will turn on after 2 minutes in soft start mode to slowly charge the battery/HCAP.

OUTPUT SHORT CIRCUIT: When an output short circuit occurs, or output exceeds 15A, the FAULT LED will indicate. Remove short circuit and reset the AC power to resume normal operation.

THERMAL DERATING: The charger has an over-temperature de-rate; when ≥ 70°C (internal), the output current is derated by 30%. When the temperature falls to 60°C, full output capability is automatically restored.

THERMAL SHUTDOWN: For extreme overtemperature situations, thermal shutdown is activated when ≥ 85°C (internal). When the temperature falls to 60°C, full output capability is automatically restored. (Note: Thermal protection does not activate when the charger is operating at full output current & operating in a 50°C ambient.)

AC FAILURE: If the AC Input is below 105Vac or above 264Vac, the charger will indicate AC Failure by extinguishing the AC ON LED, and illuminating the FAULT LED. The charger will automatically resume normal operation when the AC input fall within the specified input range.

2.7 Reset Button

Should a FAULT occur causing the charger to go into a Fault Protection mode, the charger will attempt to self-recover within a few minutes. If you are in front of the charger, most faults can be cleared with the Reset Button on the face of the charger near the indicator LEDs without having to wait for the next automatic restart attempt.

Invoke a reset by pressing the Reset Button for 0.5 seconds.

Example: If an output short-circuit is detected, the charger will protect itself; see section 2.6 Output Short Circuit. Every few minutes the charger will automatically attempt to restart. If the short is still present, the charger will continue to attempt restart every few minutes, and only fully restore output when the short-circuit is removed. If a technician finds and removed the short-circuit, they can use the Reset Button to immediately see the charger output restored rather than waiting for the next automatic restart attempt.

The Reset Button may also be used to temporarily turn-off the output circuit of the charger. While the output circuit is off, please be aware that energy is still available inside the LMESpro enclosure, the battery or HCAP where it connects to the charger, and some energy is stored in the charger's output filter capacitors accessible on the DC output terminals. If you've de-energized the charger output, and removed connection to the battery/HCAP, wait at least 30-seconds for the output filter capacitors to fully discharge before accessing the charger's DC output terminals.

- Hold the Reset Button for 9-seconds to de-energize the output circuit.
- Hold the Reset Button for 9-seconds to re-energize the output circuit.

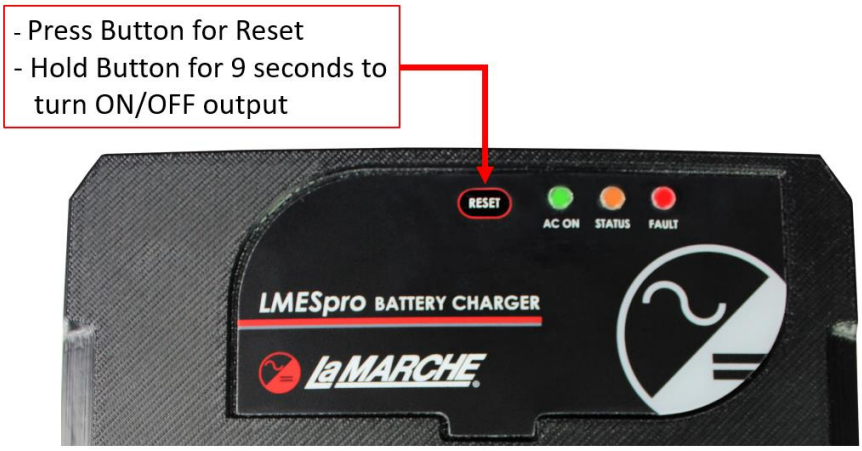


Figure 12 – LMESpro Reset Button

3 Service

All work for the LMESpro charger should be performed by a qualified electrician. La Marche is not responsible for any damages caused by an unqualified technician.

CAUTION: Before working inside the LMESpro charger ensure that the AC power is off. Disconnect the battery/HCAP from the charger. Verify that no voltage is present by using a voltmeter at all input and output terminals.

3.1 User Serviceable Parts

Other than the AC & DC fuses, there are no user serviceable parts within the LMESpro. Only replace fuses with the same current and voltage ratings, never substitute a larger ampacity. See Figure - 13.

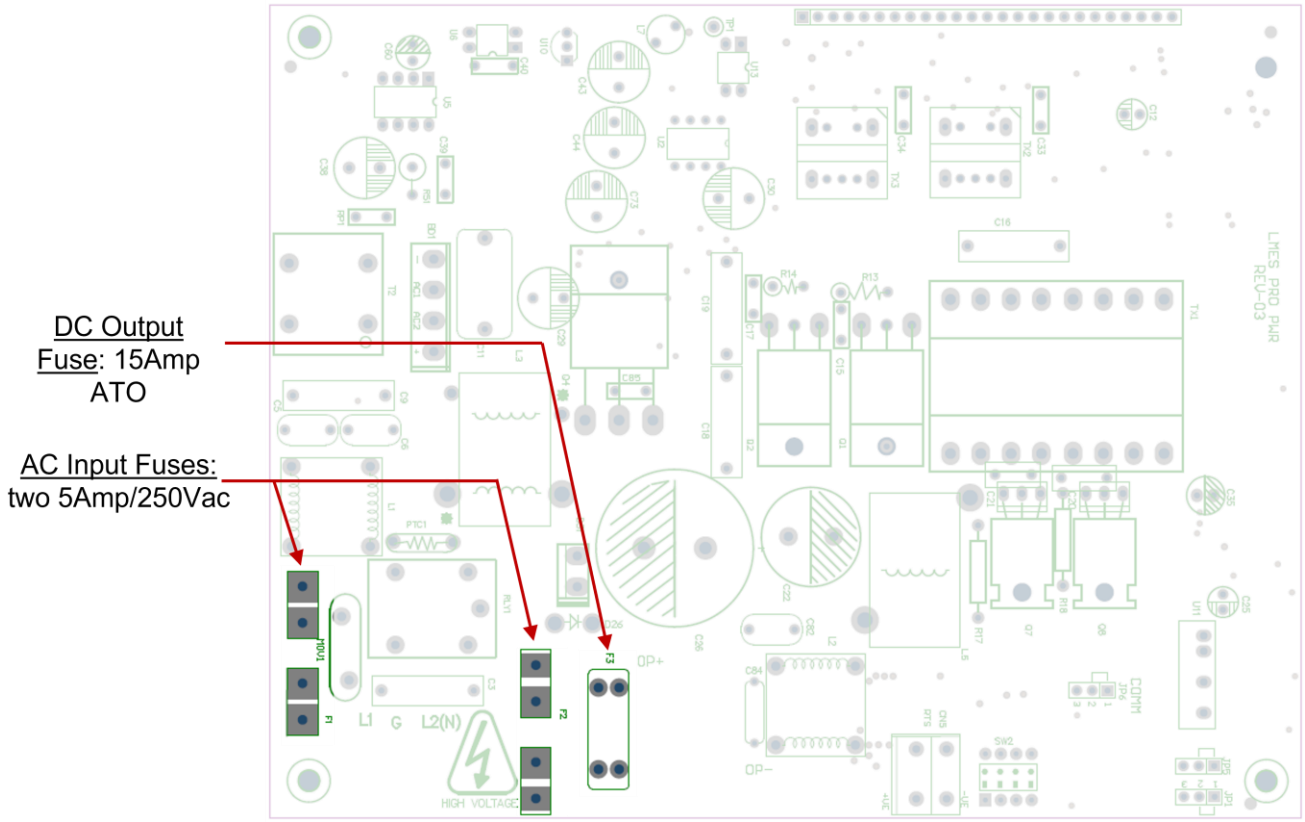


Figure 13 Location of fuses within the LMESpro charger

3.2 Performing Routine Maintenance

Although very little maintenance is required with the LMESpro Charger, routine checks are recommended to ensure optimum system performance.

Yearly

1. The charger should always be kept free of dust and debris. Remove any accumulation that may be present, particularly in the heat-sink fins near the wall.
2. Make sure all connections are tight.

2.1. Remove AC input power to the charger, and open the DC circuit at the battery/HCAP to remove all power sources to the LMESpro.

2.2. Tug on the individual input wires, none should pull out of the connector.

3.3 Troubleshooting Procedure

Troubleshooting should be performed only by trained service personnel or experienced electricians. Before setting up any complicated testing, give the unit a general inspection.
Check the following:

1. Check DC output cables, connections, battery type, and number of batteries/cells against the unit's rating.
2. Check unit specifications against customer order.
3. Check AC input connection and verify the AC supply measures within the specified range.
4. Measure AC voltage if power outage occurred.
5. Check for shipping damage, loose connections, broken wires, etc.
6. Certain failures can be caused by defective batteries; make sure batteries are free from defects.
7. If the red Fault LED is illuminated, try using the Reset button, see section 2.7.
8. If the fault still persists after using the Reset button, fully de-energize the AC & DC circuits, remove 1 conductor from the battery/HCAP, verify with a meter that all circuits are de-energized, then check AC & DC fuses. See Section 3.1 & Figure-13.

When calling in for a service inquiry or for troubleshooting assistance, be sure to have all of the following information on hand:

1. Equipment model number and serial number.
2. The actual AC input voltage.
3. The DC output voltage with and without the battery/HCAP.
4. The actual DC output current and voltage, measured with battery/HCAP connected to charger.

NOTE: *When ordering replacement parts, drawings, or schematics, always give model number and serial number*.

Appendix A: LMESpro Technical Specifications

Model	LMESpro (6- or 10Adc rated models available.)	
Input Amps Rms (Max)	(6Adc: 1.5A @ 120Vac, 0.8A @ 240Vac) (10Adc: 3.3A @ 120Vac, 1.7A @ 240Vac)	
Input Voltage Range:	105V-264Vac, 45-65Hz	
AC I/P Low Cut	100V	
AC I/P Low Cut Recovery	110V	
AC I/P High Cut	265V	
AC I/P High Cut Recovery	255V	
Output Volts	12/24-Volt, Field Selectable	
Charging Current	6- or 10-Amp models available	
Electronic Current Limit	100%	
Charging Modes	Lead Acid, NiCad and HCAP	
Battery Temperature Compensation Range	0°C to +50°C	
Battery Temperature Compensation Coefficient	-3mV/°C/ Cell: (with Probe Connected, Lead Acid only)	
Enclosure Protection Type	IP32	
Led Indication	1. AC ON (Green) 2. Charger Failure (Red) 3. Charge Status (Flashing Green for Bulk, Solid Green for Float)	
User Programmable Settings	1. 12/24-Volt Output 2. Battery type or HCAP	
Ambient Operating Temp	-40 °C to +50 °C (Derate ≥ 70°C internal, & shutdown ≥ 85°C internal)	
Storage Temp Range	-40 °C to +70 °C	
Protections	- Output Overcurrent - Output Short Circuit - Output Reverse Polarity - AC Fuse (Internal) - DC Fuse (Internal) - Thermal Protection - Transient overvoltage protection input & output.	
Features	1. Cranking Function 2. System Derating	
Battery Set Points @ 25'C	**NiCad Battery 12V - 10cell / 24V - 20cell**	**Lead Acid Battery 12V/24V**
Bulk Voltage (102% Of Absorption Voltage)	14.7V/29.4V	14.1V/28.2V
Absorption Voltage	14.5V/29.0V	13.8V/27.6V
Absorption Duration	4 Hrs. / Until Charge Current Reduced to 0.5A	4 Hrs. / Until Charge Current Reduced to 0.5A
Float Voltage	14.3V/28.6V	13.5V/27.0V
Equalize Voltage	15.5V/31.0V	14.88V/29.76V
Equalize Calendar	28 Days	28 Days
Equalize Duration	3 Hrs.	3 Hrs.

Appendix B: Power Cabling Guide

Use the following formulas and table to determine proper wire size for minimal voltage drop. At distances exceeding 10 feet, the DC wire size should be chosen to keep the voltage difference between the units DC output terminals and the battery at less than 1/2 volt when unit is fully loaded.

Table of Conventions

CMA = Cross section of wire in circular MIL area
A = Ultimate drain in amperes

LF = Conductor loop feet
MaxAmp = Max. allowable amperes for given voltage drop
AVD = Allowable voltage drop
K = 11.1 for commercial (TW) copper wire
= 7.4 for aluminum

Calculating Wire Size Requirements

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

Calculating Current Carrying Capacity of Wire

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

SIZE (AWG)	AREA CIR.MILS	SIZE (MCM)	AREA CIR.MILS
18	1620	250	250000
16	2580	300	300000
14	4110	350	350000
12	6530	400	400000
10	10380	500	500000
8	16510	600	600000
6	26240	700	700000
4	41740	750	750000
3	52620	800	800000
2	66360	900	900000
1	83690	1000	1000000
0	105600	1250	1250000
00	133100	1500	1500000
000	167800	1750	1750000
0000	211600	2000	2000000

Table 5 - Wire Size/Area Table

Example: If the charger being used has a max ampere output of 33A, and 30 loop feet of copper wire cable is required with an allowable voltage drop of 0.5Volts, the wire size calculation will be.

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

A= 30

LF= 30

K= 11.1

AV= 0.5

$$CMA = \frac{33 \times 30 \times 11.1}{0.5}$$ = **21978 or #6AWG wire**

Appendix C: Manufacturer's Warranty

All La Marche Manufacturing Co. equipment has been thoroughly tested and found to be in proper operating condition upon shipment from the factory, and is warranted to be free from any defect in workmanship and material that may develop within two years from date of purchase.

Any part or parts of the equipment (except fuses, DC connectors and other wear-related items) that prove defective within a two (2) year period shall be replaced without charge providing such defect, in our opinion, is due to faulty material or workmanship and not caused by tampering, abuse, misapplication or improper installation.

Should a piece of equipment require major component replacement or repair during the first year of the warranty period, this can be handled in one of two ways:

1. The equipment can be returned to the La Marche factory to have the inspections, parts replacements and testing performed by factory personnel. Should it be necessary to return a piece of equipment or parts to the factory, the customer or sales representative must obtain authorization from the factory. If upon inspection at the factory, the defect was due to faulty material or workmanship, all repairs will be made at no cost to the customer during the first year. Transportation charges or duties shall be borne by purchaser.
2. If the purchaser elects not to return the equipment to the factory and wishes a factory service representative to make adjustments and/or repairs at the equipment location, La Marche's travel and field service labor rates will apply. A purchase order to cover the labor and transportation cost is required prior to the deployment of the service representative.

In accepting delivery of the equipment, the purchaser assumes full responsibility for proper installation, installation adjustments and service arrangements. Should minor adjustments be required, the local La Marche sales representative should be contacted to provide this service only.

All sales are final. Only standard La Marche units will be considered for return. A 25% restocking fee is charged when return is factory authorized. Special units are not returnable.

In no event shall La Marche Manufacturing Co. have any liability for consequential damages, or loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause. In addition, any alterations of equipment made by anyone other than La Marche Manufacturing Co. renders this warranty null and void.

La Marche Manufacturing Co. reserves the right to make revisions in current production of equipment, and assumes no obligation to incorporate these revisions in earlier models.

The failure of La Marche Manufacturing Co. to object to provisions contained in customer's' purchase orders or other communications shall not be deemed a waiver of the terms or conditions hereof, nor acceptance of such provisions.

The above warranty is exclusive, supersedes and is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness. No person, agent or dealer is authorized to give any warranties on behalf of the Manufacturer, nor to assume for the Manufacturer any other liability in connection with any of its products unless made in writing and signed by an official of the manufacturer.

Appendix D: Document Control and Revision History

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