



La MARCHÉ®

ESC

Engine Start Battery Charger

INSTRUCTION
MANUAL

ECN/DATE

CPN 42801

	15349-02 – 05/02	14575 – 2/01	13126 – 6/99
	15040 – 11/01	13608 – 1/00	11845 – 5/98

**106 BRADROCK DRIVE
DES PLAINES, IL. 60018
(847) 299-1188
FAX: (847) 299-3061**

ISSUE DATE: 11134 – 9/97

INSTRUCTION DRAWING NUMBER:

P25-**LESC-2**

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important safety and operating instructions for the La Marche Power Conversion Equipment.

Before using this equipment, read all instructions and cautionary markings on (1) unit, (2) battery, and (3) product using the battery.

CAUTION: To reduce risk of injury and/or damage to the batteries, use only the type of batteries specified on the charger.

Do not expose equipment to rain or snow.

Do not operate equipment if it has received a sharp blow, been dropped, or otherwise damaged in any way; take it to a qualified serviceman.

Do not disassemble this unit; take it to a qualified serviceman when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.

To reduce risk of electric shock, disconnect this unit from the a.c. supply, or batteries and loads before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.

WARNING – THERE IS A RISK OF EXPLOSIVE GASSES AND WORKING IN THE VICINITY OF A BATTERY IS DANGEROUS. SOME BATTERIES GENERATE EXPLOSIVE GASSES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT EACH TIME BEFORE USING THIS UNIT, YOU READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.

To reduce risk of battery explosion, follow these instructions and those published by the battery manufacturer and manufacturer of any equipment you intend to use in the vicinity of the battery.

Review cautionary marking on all products .

PERSONAL PRECAUTIONS:

1. Someone should be within range of your voice or close enough to come to your aid when you work near a battery.
2. Have plenty of fresh water and soap nearby in case the battery electrolyte contacts skin, clothing, or eyes.
3. Wear complete eye protection and clothing protection. Avoid touching eyes while working near a battery.
4. 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 get medical attention immediately.
5. Never smoke or allow a spark or flame in vicinity of a battery.
6. Be extra cautious, DO NOT drop metal onto a battery. It might spark or short-circuit the battery or cause an explosion.
7. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a battery. A battery can produce a short-circuit current high enough to weld these items causing severe burns.
8. NEVER charge a frozen battery.

PREPARING TO CHARGE

1. If it is necessary to remove the battery connections, always remove grounded the terminal from the battery first. Make sure all loads are disconnected and unit is off, so as not to cause an arc.
2. Be sure the area around the battery is well ventilated while the battery is being charged.
3. When cleaning battery terminals, be careful to keep corrosion from coming in contact with eyes.
4. Study all the battery manufacturer's specific precautions such as removing or not removing cell caps while charging, recommended rates of charge, and maintenance procedures.

UNIT LOCATION

- Never place this unit directly above the standard flooded battery. Gases from the battery will corrode and damage equipment. A sealed maintenance free or valve regulated lead acid (VRLA) may be placed below this equipment.
- Never allow the battery electrolyte to drip on this unit when reading the specific gravity or filling the battery.
- 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.

D.C. CONNECTION PRECAUTIONS

Connect and disconnect d.c. output cables only after setting all of this unit's switches to off position and removing a.c. input supply.

GROUNDING INSTRUCTIONS

This battery charger should be connected to a grounded, metal, permanent wiring system; or an equipment grounding conductor should be run with circuit conductors and connected to equipment-grounding terminal or lead on battery charger. Connections to battery should comply with all local codes and ordinances.

CAUTION: DO NOT PULL ON OUTPUT CABLES WHEN DISCONNECTING CHARGER FROM BATTERY.

RECEIVING INSTRUCTIONS AND GENERAL EQUIPMENT INFORMATION

CAUTION: To ensure safe installation and operation, the information given in the instruction manual should be read and understood before installing or using the equipment.

RECEIVING INSTRUCTIONS

Unpacking and Inspection: Examine the shipping crate upon arrival. If there is obvious damage, describe on the receiving documents. Within a few days after delivery, the equipment should be uncrated and carefully inspected for hidden damages. When removing packaging material, be careful not to discard any equipment, parts, or manuals. If any damage is detected you should:

1. File a claim with the carrier within five (5) days.
2. Send a copy of the claim to La Marche Mfg. Co.
3. Call La Marche Mfg. For a RETURN MATERIAL AUTHORIZATION NUMBER.

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

HANDLING

WARNING: Equipment can be very heavy, and top-heavy. Use adequate manpower or equipment for handling. Until the equipment is securely mounted, care must be used to prevent the equipment from being accidentally tipped over.

NOMENCLATURE PLATES

Each piece of La Marche Mfg. Equipment shipped is identified by part number on the nomenclature plate.

ADJUSTMENTS

All equipment is shipped from the factory fully checked and adjusted. Do not make any adjustments unless the equipment has been powered-up and the settings have been determined to be incorrect.

SPARE PARTS

To minimize downtime during installation or normal service, it is advisable to purchase spare fuses, circuit boards and other recommended components. Please refer to the list of recommended spare parts and their La Marche Mfg. Part numbers included with the instruction manual. It is recommended that spare fuses be ordered for all systems.

To order spare parts, please contact La Marche Mfg. (847)-299-1188 during business hours and ask for the Parts Department.

INSTALLATION AND OPERATING INSTRUCTIONS

The ESC Battery Charger is designed to operate on a specific number of battery cells. The nameplate indicates the type and the number of battery cells required. Once properly installed, the charger will maintain the battery in a fully charged condition. Install the charger so that the flow of air through the ventilators is not obstructed. Binding posts with wire lug connectors are provided on a terminal board within the unit. Dress field wiring circuits at least 1/4 inch away from input/output circuits. Cable tie-down mounting bases are factory provided for securing customer input and output cables in order to prevent their contact with live parts. When hooking up the d.c. 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 of the battery. Check the a.c. input voltage with voltage on nameplate.

After the charger has been installed, check battery specifications. When the battery is in a fully charged condition, the float voltage should average $2.17 \pm .02$ volts per cell for lead acid cells, $1.42 \pm .02$ volts per cell for nickel-cadmium cell. The equalize voltage should average $2.33 \pm .02$ volts per cell lead acid cell, $1.55 \pm .02$ volts per cell equalize nickel-cadmium cell.

The charger is factory tested and preset so that no field adjustments are necessary.

In normal operation, the ESC Charger maintains a constant battery voltage from no load up to its rated load capacity as indicated by the nameplate. If the external loads exceed nameplate capacity, the charger will attempt to carry the excess load up to its current limiting capacity. Beyond this point, the battery will carry the excessive loads. If the battery is discharged, the charge will recharge the battery on a taper curve from its current limiting capacity to full charge.

The Float/Equalize Switch is used to raise the charger output voltage to $2.33 \pm .02$ volts per cell for lead acid cells or $1.55 \pm .02$ volts per cell for nickel-cadmium cells, so that the battery can be given an equalizing charge. To give an equalizing charge, it is only necessary to throw the switch to the equalize position and leave it there for 24 hours. The charger will hold the cell voltage at the equalizing voltage while the switch is in equalize position and will drop back to float voltage when the switch is put back into the normal or float position.

The inherent design of the ferroresonant transformer compensation for line voltage variations of $\pm 10\%$.

The d.c. output current is limited to provide for complete protection. The current limiting feature allows for the unit to carry overloads and limits the output to a maximum of 140% of the rated output.

TROUBLESHOOTING GENERAL INFORMATION

This troubleshooting guide should be used by trained service personnel or an experienced electrician.

CAUTION: Hazardous A.C. and D.C. voltages are present within the unit's enclosure.

Equipment: The only equipment required is a multi-scale volt-ohm meter, and a stand tool kit.

Before setting up any complicated testing or jumping to any conclusions, give the unit a general inspection.

Check the following:

1. Check D.C. output cables, connections, battery type, and number of battery cells with charger rating.
2. Check unit specifications with customer order.
3. Check input connections, input voltage, and line breaker size.
4. Check for shipping damage, loose connections, broken wires, etc.
5. Certain failures can be caused by defective batteries and customer loads, make sure batteries and loads are free from defects.

NOTE: If the problem is found to be located in the printed circuit boards, the board should be replaced. No attempt should be made to repair circuit boards in the field.

Information you should have when calling in for troubleshooting assistance:

1. Equipment model number and serial number.
2. The actual A.C. input voltage.
3. The D.C. output voltage with and without battery.
4. Result of check of A.C. Breaker and D.C. output fuse.
5. D.C. output amps when measuring the D.C. output voltage with battery and load connected to charger.

TROUBLESHOOTING CONSTAVOLT BATTERY CHARGERS

SYMPTOM	POSSIBLE CAUSE	PROCEDURE
Open A.C. input fuse	<ol style="list-style-type: none"> 1. Incorrect A.C. input 2. Shorted diodes 	Compare A.C. input voltage with voltage on unit nameplate. See "Troubleshooting and Diode Replacement Sheet" (Page #8)
Open D.C. output fuse	<ol style="list-style-type: none"> 1. Defective or wrong voltage battery 2. Shorted connector 3. Shorted or reverse output 4. Shorted diodes 	Compare battery voltage with unit nameplate. Check with volt-ohmmeter. Check with volt-ohmmeter. See "Troubleshooting and Diode Replacement Sheet" (Page #8).
Charger operates but will not charge battery.	<ol style="list-style-type: none"> 1. Defective capacitor 2. Open cell in battery 	To check capacitor measure resistance with one capacitor lead disconnected, it should read high resistance. Check battery cells.
Charger will not taper to finish rate.	<ol style="list-style-type: none"> 1. Defective battery 	Check for defective cells in battery.
Charger will not go to equalize.		Check relay & Float/Equalize switch.

TROUBLESHOOTING INSTRUCTIONS AND DIODE REPLACEMENT

The silicon diode may be a source of trouble. The function of the diode is to allow the flow of current through it in one direction only. If the polarity of the conducting current is reversed, the diode will block the current flow. Thus, the diode has a low resistance to current flow in one direction and a high resistance to current flow in the other direction. Therefore, a simple ohmmeter may be used to test the diode. The procedure for checking the silicon diode is as follows:

1. Isolate one end of the diode by disconnecting the wires attached to the nipple (or pigtail) end of the diode (only one end of the diode must be disconnected).
2. Clip one lead of the ohmmeter to the nipple (or pigtail) lead of the diode. Clip the other ohmmeter lead to the aluminum heat sink (if a portable multimeter is used, set the switches on ohms, DC and scale RX100).
3. Note the ohmmeter reading. Then reverse the leads to the diode. Again, note the ohmmeter reading. If the diode is good, the meter will indicate a high resistance in one direction and a low resistance with the leads reversed. If the diode is shorted, the meter will read full scale or "0" resistance with the leads in either direction. If the diode is "open", the ohmmeter needle will not indicate or show infinite resistance, indicating an open circuit with the ohmmeter leads in either direction.
4. All diodes must be checked in the event that more than one diode is defective.
5. If the diode is defective, remove the defective diode from the heat sink and replace with a new diode.

WHEN ORDERING REPLACEMENT PARTS, DRAWINGS OR SCHEMATICS, OR REQUESTING SERVICE INFORMATION, ALWAYS GIVE MODEL NUMBER, SERIAL NUMBER AND A.C. INPUT VOLTAGE.

INSTALLERS INFORMATION

The table below lists the a.c. and the d.c. minimum wire size requirements. At distances exceeding 10 feet, the d.c. wire size should be chosen to keep the voltage difference between the unit's terminals and the battery at less than 1/2 volt when the unit is fully loaded. If the distance between the unit and the battery exceeds 10 feet, use the Power Cabling Formulas to determine wire size.

WIRE SIZE TABLE
(Based upon unit fuse size)

FUSE SIZE	WIRE SIZE REQUIREMENT CUSTOMER CONNECTION	EQUIPMENT GROUNDING CONDUCTOR MINIMUM	FUSE SIZE	WIRE SIZE REQUIREMENT CUSTOMER CONNECTION	EQUIPMENT GROUNDING CONDUCTOR MINIMUM
1	#14	#14	150	#1	#6
3	#14	#14	175	#1/0	#6
4	#14	#14	200	#2/0	#6
5	#14	#14	225	#2/0	#4
6	#14	#14	250	#4/0	#4
10	#14	#14	300	250-MCM	#4
15	#12	#12	350	350-MCM	#2
20	#12	#12	400	400-MCM	#2
25	#10	#12	450	500-MCM	#2
30	#10	#10	500	600-MCM	#2
35	# 8	#10	600	900-MCM	#1
40	# 8	#10	700	1500-MCM	1/0
45	# 8	#10	800	2/500-MCM	1/0
50	# 8	#10	1000	2/800-MCM	4/0
60	# 6	#10	1200	2/1000-MCM	4/0
70	# 6	# 8	1600	2/2000-MCM	4/0
80	# 4	# 8	2000		250-MCM
90	# 4	# 8	2500		350-MCM
100	# 4	# 8	3000		400-MCM
110	# 2	# 6	4000		500-MCM
125	# 2	# 6	5000		700-MCM
130	# 2	# 6	6000		800-MCM

NOTE: These are recommended wire sizes. All National and Local Wiring Codes must be followed.

POWER CABLING FORMULAS

WIRE GAUGE TABLE

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

*Denotes all sizes larger than #0000 are expressed in MCM.

TABLE OF CONVENTIONS:

- CMA = Cross section of wire in circular MIL area.
- A = Ultimate drain in amperes.
- LF = Conductor loop feet.
- MAX AMP = Maximum allowable amperes for given voltage drop.
- CMA = Cross section of wire in circulate MIL area.
- AVD = Allowable voltage drop.
- LF = Conductor loop feet.
- K = 11.1 Constant factor for commercial (TW Type) copper wire (KS5482-01).
- = 17.4 for aluminum (KS20189)

1. Calculating Wire Size Requirements.....CMA= $\frac{A \times LF \times K}{AVD}$

AVD

2. Calculating Current Carrying Capacity of Wire.....Max Amp = $\frac{CMA \times AVD}{LF \times K}$

LF x K

SOURCE: HANDBOOK 100-NATIONAL BUREAU OF STANDARDS

NOTE: ALL WIRE #6 AND LARGER IS STRANDED.

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 one year from date of purchase. In addition to the standard one (1) year warranty, La Marche warrants it's magnetics and power diodes on a parts replacement basis only for one (1) additional year under normal use.

Any part or parts of the equipment (except fuses, d.c. connectors and other wear-related items) that prove defective within a one (1) 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. Magnetics and power diodes are warranted for two (2) years after date of purchase. During the last one (1) year of this two (2) year warranty period, the warranty covers parts replacement only, and no labor or other services are provided by La Marche, nor is La Marche obligated to reimburse the owner or any other person for work performed.

Should a piece of equipment require major component replacement or repair during the first year of the warranty period, these 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 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 LaMarche 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 customers' 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.