



***LaMARCHE***<sup>®</sup>

MODEL

**A85MD**

MINING BATTERY CHARGERS  
**(with Optional Ground Integrity Circuitry)**

**Digital Volt/Amp Meter and Electronic Timer**

ECN/DATE

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# **IMPORTANT SAFETY INSTRUCTIONS FOR LaMARCHE POWER CONVERSION EQUIPMENT**

## **SAVE THESE INSTRUCTIONS**

This manual contains important safety / operating instructions for LaMarche 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 this equipment to rain or snow.

**Do not** operate this 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 if service or repair is required. Incorrect reassemble may result in a risk of electric shock or fire.

To reduce risk of electric shock, disconnect this unit from the AC supply, 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 GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF THE 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 other equipment you intend to use near 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 to avoid dropping a metal tool onto a battery. It might spark or short-circuit the battery or other electric parts that may 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 a ring or the like to metal, causing a severe burn.
8. NEVER charge a frozen battery.

## ***A85MD INSTRUCTIONS / TROUBLESHOOTING***

### ***PREPARING TO CHARGE***

1. If it is necessary to remove the battery connections, always remove the grounded 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 the 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 a 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 anyway.

**DO NOT** set a battery on top of this unit.

### **DC CONNECTION PRECAUTIONS**

Connect and disconnect DC output cables only after setting all of this unit's switches to off position and removing AC 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.

## **1.0 GENERAL**

The Model A85MD Mine Battery Charger combines reliable, rugged components with unmatched circuit simplicity.

The ferroresonant design of the Model A85MD eliminates the need for complicated control circuits and lowers the parts count.

Three major components make up the circuit of the A85MD; a ferroresonant step down transformer; silicon rectifiers, and timer.

The magnetics are designed with an extra margin of capacity and have a Class H (180 degrees C) rating.

Cores and windings are insulated with Class H Nomex material. The DuPont Nomex system uses a modified polyester baking varnish for further protection. This assures continued operation under the most severe, damp and dirty conditions present in the mine.

The full wave rectifier includes conservatively rated silicon diodes and surge suppressers to provide a reliable DC output.

The Model A85MD regulates the DC output voltage to produce the proper charging curves for the battery. Its charge rate is dependent on the state of charge of your battery. AC line voltage compensation prevents any drift from the DC charging curve because of surges or drops in voltage. Basic design eliminates the need for voltage sensitive relays.

The Model A85MD automatically limits the output of the charger to approximately 125% of its rating. This prevents battery overheating, fuse blowing and assures long life for both battery and charger.

The Model A85MD is a completely automatic constant voltage charger. Each A85MD is designed to operate on a specific type of battery with a specified number of cells.

## **2.0 OUTPUT RATINGS**

### **2.1 DC VOLTAGE**

The Model A85MD Mine Charger is factory set to finish at approximately 2.5 volts/per cell for lead acid batteries. The charger is available in 32 cell (64 volt) or 64 cell (128 volt) output.

### **2.2 OUTPUT CURRENT**

Three Phase Inputs

90, 110, 120, 140, 160, 180, 210 , 240 amps

64 Vdc or 130 Vdc

### **2.3 REGULATION**

The charge rate is dependent on the state of charge of the battery. Automatic AC line voltage compensation regulates the DC output and maintains the charging curve.

## **3.0 INPUT RATINGS**

### **3.1 AC VOLTAGE**

Taps are provided for various three phase AC input voltages with an AC input voltage range of +/- 10% of nominal. (See unit schematic for details)

### **3.2 INPUT FREQUENCY RANGE**

57 to 63 Hz. (60 HZ nominal)

50 Hz Special

### **3.3 INPUT CURRENT & BATTERY CAPACITIES**

SINGLE CKT. MODEL NO. MODEL-DCA-CELLS- DCV	APPROX. AMPS - 480 /	AC 3 PHASE 575 /1000		BATTERY AMP HOUR CHARGING CAPACITY- 8 HOURS
A85MD- 90-32L(64V)	13	11		550
A85MD-110-32L(64V)	16	14		680
A85MD-120-32L(64V)	18	15		730
A85MD-140-32L(64V)	21	17		800
A85MD-160-32L(64V)	23	20		935
A85MD-180-32L(64V)	26	22		1050
A85MD-210-32L(64V)	31	26		1200
A85MD-240-32L(64V)	35	30		1400
A85MD-280-32L(64V)	41	34		1600
A85MD- 90-64L(130V)	26	22		550
A85MD-110-64L(130V)	32	27		680
A85MD-120-64L(130V)	35	29		730
A85MD-140-64L(130V)	41	34		800
A85MD-160-64L(130V)	46	39		935
A85MD-180-64L(130V)	52	44		1050
A85MD-210-64L(130V)	61	51		1200
A85MD-240-64L(130V)	70	59		1400
A85MD-280-64L(130V)	81	68		1600
A85MD-180-64L(130V)			25	1050
A85MD-240-64L(130V)			28	1400
<b>TABLE 1</b>				

## **4.0 TYPICAL ELECTRICAL SPECIFICATIONS**

(Refer to TABLE 1)

## **5.0 STANDARD FEATURES**

### **5.1 INPUT PROTECTION**

- (a) AC fuses on each input leg.
- (b) AC contactor to disconnect the unit from the AC line.
- (c) AC fuse in one leg of control transformer.

## **5.2 OUTPUT PROTECTION**

- (a) DC output fuse
- (b) Current limiting automatically limits the DC output current of the charger to approximately 125% of its rating.

## **5.3 ELECTRONIC TIMER**

8 Hour timer with auto start/stop feature on battery connection.

( SEE OPERATION, Section 9)

## **5.4 METERS**

Digital Volt/Amp Meter – Standard – See Section 9

## **5.5 MOUNTING**

- (a) Low profile mine case with skids.
- (b) See case size dimension sheet. (Drawing D26F)

## **5.6 GROUND INTEGRITY - Optional**

The Automatic Mine Recharger is designed to operate on a specific type of battery with a specified number of cells. The nameplate on the charger indicates the type of battery, number of cells, and the AC input voltage.

To energize the unit with ground integrity, the following procedure should be used:

1. Check AC input voltage with that specified on the nameplate. Typical i.e.: chargers furnished with 480 volt and 575 volt power lines, are dual input volt units. Taps within the unit must be set on the 480 volt setting for 480 volt power lines, and 575 volt taps for 575 volt power systems. A schematic is provided with the unit which indicates how the AC power connections must be wired. Connect the power lines to the AC input terminals, the ground wire to the ground terminal bonded to the case near the input terminals.
2. A ground check wire supplied from the power center must be connected to terminal 3R, near the input terminals.
3. The battery, with a 4 wire plug, must be connected to the unit's output in order to energize the unit.
4. Ground integrity must be made on all systems to energize the unit. If the case ground is more than 5 ohms, the unit will not energize.
5. The emergency stop switch must be pulled out.
6. Push in the green start button. The unit should energize, and the charger will automatically start to charge the battery at some rate up to its maximum capacity, depending upon the state of charge of the battery, and charge the battery to full charge, then shut down to a trickle charge-preserving-charge. The charger will continue the trickle rate until the timer turns the unit completely off.

## ***A85MD INSTRUCTIONS / TROUBLESHOOTING***

NOTE: This unit is equipped with two (2) door disconnect switches and one (1) cover disconnect switch. The two access doors and the top cover of the unit must be closed for the unit to operate.

If the unit fails to energize:

1. Check AC power on all three phases.
2. Check to make sure voltage taps are wired properly.
3. Check AC and DC fuses.
4. Make sure battery is connected to unit's output.
5. Check for ground integrity. This can be done by putting a jumper from ground buss #2 to terminal 1R or 2R on two circuit chargers. If unit starts when jumpered, ground integrity is the problem. (Disconnect the jumper after check.)
6. Check emergency stop switch. It must be pulled out.
7. Check all ground connections.
8. Start button must be depressed to energize the unit. (Listen for click of control relay) If a second battery is added on two circuit chargers, the start button, again must be depressed.
9. Check all disconnect switches - doors and top must be closed.

## **6.0 ENVIRONMENTAL RATINGS**

### **6.1 OPERATING AMBIENT TEMPERATURE**

0-50 degrees C (32-122 degrees F)

### **6.2 STORAGE TEMPERATURE**

-40 to +85 degrees C (-40 to +185 degrees F)

### **6.3 HUMIDITY**

This rectifier is capable of operating in an ambient relative humidity range of 0-95% (non-condensing).

### **6.4 VENTILATION**

The unit should be placed so that the ventilating openings are not blocked and air entering the cabinet does not exceed 50 C (122 degrees F).

## **7.0 INSTALLATION INFORMATION-MINIMUM WIRE SIZES**

Table 2 lists the AC input and the DC output minimum wire size requirements. 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 the unit is fully loaded.

## **8.0 ELECTRICAL CONNECTIONS & FIELD WIRING**

Terminal blocks are provided for connecting the AC input and DC output. A ground wire must be connected to the unit's case ground.

### **8.1 AC INPUT**

Make sure that the input source is the same voltage and frequency as that which is marked on the nameplate of the rectifier.

The AC input current, specified on the nameplate, is for rated (nominal) output. AC line fuses or breakers must be sized for the overload or current limit point of the charger which is 130% of the nameplate value.

An adequate earth ground lead should be connected to the terminal marked "GROUND" or "GND" on the rectifier terminal board or case.

Be sure the transformer taps are set for the correct AC input. See Unit schematic for AC input tap setting)

### **8.2 DC OUTPUT**

Make sure that the battery which is being connected to the rectifier matches the cell type and number of cells that is marked on the rectifier nameplate.

**\*\*\*\*\*OBSERVE PROPER POLARITY!\*\*\*\*\***

The negative wire from the battery must be connected to the terminal marked "NEGATIVE" or "NEG" and the positive wire from the battery must be connected to the terminal marked "POSITIVE" or "POS" on the rectifier.

## **9.0 OPERATION - START UP**

After the installation has been completed, the unit is ready for operation. Be sure that the battery charger is the correct type for the battery that is to be charged.

**CAREFULLY READ AND ADHERE TO ALL BATTERY AND BATTERY CHARGER INSTRUCTIONS AND SAFETY WARNINGS. (Also check Ground Integrity Section 5.6)**

A. With the AC input connected to the charger, turn the on/off switch to the "on" position.

B. Connect the battery to the charger. After a 20 second delay, which assures proper battery connection, the input contactor will close. The battery charger will start to charge and the "ON CHARGE" light will turn on. This completes the "Autostart" sequence.

The display will read, OUTPUT AMPS, push the select switch down once and the display will read DC VOLTAGE, a second push the display will read AMP/HOURS RETURNED and a third push the display will read ELAPSED TIME. Push the select switch UP and the unit will equalize the battery.

C. When the "80% CHARGE" point is reached in the charge cycle, the "80%/COMPLETE" light will flash. There will be an additional 3 hours (6 hours in the equalize mode) of charge after this point is reached.

D. When the charge cycle is completed, the charge "80%/COMPLETE" light will turn on solid and the "ON CHARGE" lamp will turn off. The display will also alternate at one second intervals between the "AMP HOURS", "CHARGE TIME" and "COOLING TIME". The "COOLING TIME" is the time since the charge cycle completed and is indicated in hours and minutes. When showing the "CHARGE TIME" the AMP HOURS" light will be off and the elapsed time LED will be on. When showing the "COOLING TIME" the "AMP HOURS" light will be on and the elapsed time light will be on.

<b>FUSE SIZE</b>	<b>WIRE SIZE REQUIREMENT CUSTOMER CONNECTION</b>	<b>EQUIPMENT GROUNDING CONDUCTOR MINIMUM</b>	<b>FUSE SIZE</b>	<b>WIRE SIZE REQUIREMENT CUSTOMER CONNECTION</b>	<b>EQUIPMENT GROUNDING CONDUCTOR MINIMUM</b>
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

**TABLE 2**

E. If for some reason the AC input voltage fails, the battery charger will turn off. During this interval the time registers in the auto timer is held at the present count. When the AC has returned to normal, the charge cycle resumes where it left off.

CAUTION: Turn the on/off switch to the "off" position when disconnecting the battery during the charge cycle to prevent arcing at the DC connector.

## **A85MD INSTRUCTIONS / TROUBLESHOOTING**

F. Fault Codes -

\***Code 1** - Low or no AC input voltage

\***Code 2** - N/A

\***Code 3** - Wrong size battery/deeply discharged battery, open terminal voltage below 1.4Vpc

**NOTE: To disable this feature, PUSH the equalize button. The unit will start. CAUTION: MAKE SURE A BATTERY WITH THE CORRECT NUMBER OF CELLS IS CONNECTED TO THE CHARGER.**

\***Code 4** - 12 Hour overrides timer, unit will automatically turn off in 12 hours after being connected to a battery

\***Code 5** - N/A

\***Code 6** - Possible shorted cells – Battery voltage decreases while battery is charging

\***Code 7** – Unit will turn OFF within 15 minutes if a fully charged battery is connected to charger

## **10.0 ADJUSTMENTS**

The Model A85MD is a completely automatic constant voltage charger. Each A85MD is designed to operate on a specific type of battery with a specified number of cells. **The unit is factory set at 2.5 volts per cell (V.p.c.).**

## **11.0 CIRCUIT OPERATION**

The Model A85MD Ferroresonant Mine battery charger has three basic components; a ferroresonant step down transformer, silicon rectifiers (diodes) and electronic timer.

The regulating action of the unit is caused by the current developed in the resonant winding of the power transformer. The resonating capacitor along with the resonant winding of the transformer form a tuned circuit which establishes the correct core saturation point and in turn regulates the unit's output.

The transformer also steps down the AC input voltage to the proper voltage to charge the battery. It also provides isolation from the input to the output.

The silicon diodes convert the AC output from the secondary of the transformer to the DC voltage needed to charge the battery.

The automatic timer senses the connection of the battery and turns the unit on, the timer will allow the charger to charge the battery for a period of time (maximum 12 hours), then turns the charger off. It will also turn the charger off when the battery is disconnected.

## **12.0 TROUBLESHOOTING**

Troubleshooting should be performed only by trained service personnel or experienced electricians.

**CAUTION:** Hazardous AC and DC voltages are present within the battery charger's cabinet.

Equipment: The only equipment required is a multimeter (volt-ohm meter).

### **12.1 GENERAL INSPECTION**

On servicing new equipment, before setting up any complicated testing or jumping to any conclusions, give the unit a general inspection. Check the following:

- Check the DC output cables, connections, battery type, and number of battery cells with the rectifier rating.
- Check the unit specifications with customer order.
- Check the input connections, input voltage and AC line breaker size.
- Check for shipping damage, loose connections, broken wires, etc.
- Certain failures can be caused by defective batteries and customer loads; make sure batteries and loads are free from defects.
- Check all safety switches.

*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.

### **12.2 SERVICE INFORMATION**

Information you should have when calling in for troubleshooting assistance:

- Equipment model number and serial number.
- The actual AC input voltage.
- The DC output voltage with and without the battery.
- Result of the check of AC input fuse and DC output fuse.
- The actual DC output current and voltage when measured with battery connected to rectifier.

### **12.3 SYMPTOMS & CAUSES**

#### **OPEN AC FUSE**

Possible Cause:

1. Wrong AC input voltage.
2. The AC input taps on power transformer are set incorrectly. (See schematic wiring diagram)
3. An AC to DC short or an AC or DC short to ground (see ground short circuit test).
4. Shorted power transformer.
5. Check for shorted power diodes (SD1). (See Section 12.4)
6. Check for shorted coil on DC contactor or defective control transformer.

## ***A85MD INSTRUCTIONS / TROUBLESHOOTING***

### **OPEN DC FUSE**

Possible Cause:

1. Shorted power diode (repair/replace as required).
2. Shorted battery cells.
3. Shorted output cables.
4. Shorted capacitors. (See Section 12.5)

### **OPEN SECONDARY FUSE**

Possible Cause:

1. Shorted power diode.
2. Shorted capacitor.

### **CHARGER OPERATES BUT OUTPUT VOLTAGE IS LOW.**

Possible Cause:

1. Check AC input fuses.
2. Check power diodes (see diode troubleshooting procedure).

### **GROUND AND SHORT CIRCUIT TEST**

A simple ohmmeter check can be performed to check the unit for a short to ground, primary to secondary breakdown, AC-DC short, or DC ground. Before installation of a new unit, the above checks should be made before installing. If a short of this type is suspected on a unit in service, check as follows:

1. Disconnect AC input power to the unit. Disconnect the DC battery and loads from the rectifier.
2. Set ohmmeter scale on ohms scale RX100.
3. Measure from one terminal of the input to one terminal of the output. Meter should not indicate. If the meter reads full scale deflection, this indicates an ac-dc short. During shipping, an AC wire may rub against the DC lugs, terminals, etc. and cause a short. These problems may be eliminated by very carefully inspecting the wiring to make certain the AC wires are not touching the DC wiring. If no wires are touching, then it is possible that the primary and secondary of the transformer is shorted. Disconnect the secondary of the transformer from the diodes. Measure with ohmmeter from input terminal to one of the isolated secondary leads. If there is an ohmmeter indication, there is an insulation breakdown between primary and secondary windings. The transformer should be replaced.
4. Check the input terminals to ground and check the output terminals ground. If the meter indicates full scale deflection, a wire is touching a metal part of the unit. Look for wires that are near any metal part and inspect for possible breakdown caused by shipping. The heatsink of the diodes and the control unit are insulated from ground through the mounting legs.

## **12.4 TROUBLESHOOTING AND REPLACING POWER SILICON DIODES**

The procedure for checking a silicon diode is as follows:

If a portable multimeter is used set the switches on "ohms", "DC", and "Rx1" scale.

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 anode lead of the diode. Clip the other ohmmeter lead to the cathode.
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 zero ("0") resistance with the leads in either direction. If the diode is "open", the ohmmeter needle will not indicate or it will show infinite resistance in either direction, indicating an open circuit.
4. All diodes must be checked in the event that more than one diode is defective.
5. If the diode is defective, remove it from the heatsink. Clean and smooth the heatsink surface, then using an electrically conductive grease, apply to the new diode and replace it in the heatsink.

## **12.5 CHECKING CAPACITORS**

When checking capacitors be sure all power is turned off and the battery is disconnected. Momentarily short circuit the capacitor leads to assure complete discharge. Connect the meter test leads to the capacitor leads or terminals and observe indicated resistance.

A good capacitor will indicate an initial low resistance and gradually increase as the capacitor charges. The final resistance of a good capacitor is usually several hundred thousand ohms approaching a megohm.

- Initial high resistance approaching infinity indicates an open capacitor.
- Initial and continued low resistance readings indicate a shorted capacitor.

***When ordering replacement parts, drawings, or schematics, always give model number, serial number and AC input voltage.***

## **General Maintenance Procedure**

### **Yearly**

1. Blow out rectifier/inverter with a low-pressure air hose.
2. Make sure all connections are tight.
3. Perform a visual check on all internal components.
4. Check front panel meters and alarms for accuracy.

### **4th Year**

**REPEAT** ABOVE WITH THE ADDITION OF:

1. Check relay contacts for pitting or corrosion.
2. Check capacitors for leakage.

### **7th Year**

**REPEAT** ALL, WITH THE ADDITION OF:

1. Filter, resonating capacitors and control relays should be replaced.

### **10th Year**

**REPEAT** ALL WITH THE ADDITION OF: (except replacing capacitors & control relays, they should be replaced every 7 years)

1. Check magnetics, components and wiring for signs of excessive heat.

## **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 its magnetics and power diodes on a parts replacement basis only for four (4) more years under normal use.

Any part or parts of the equipment (except fuses, DC 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 five (5) years after date of purchase. During the last four (4) years of this five (5) 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.