



***LaMARCHE***®

A86

SWITCHMODE RECTIFIER  
BATTERY CHARGER/POWER SUPPLY  
FOR

48V TELECOMMUNICATIONS POWER SYSTEMS  
USED WITH CABINET: S13-4B86-0101

INSTRUCTION MANUAL

ECN/DATE

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ISSUE DATE: 13111/8-99

INSTRUCTION PART NUMBER:  
P25-**LA86-1**

**\*\*\*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; return to La Marche factory for repair.
- Do not disassemble this unit; return to factory 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 these products.

**PERSONAL PRECAUTIONS**

- Someone should be within range of your voice or close enough to come to your aid when you work near a battery.
- Have plenty of fresh water and soap nearby in case the battery electrolyte contacts skin, clothing, or eyes.
- Wear complete eye protection and clothing protection. Avoid touching eyes while working near a battery.
- 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.
- NEVER smoke or allow a spark or flame in vicinity of a battery.
- Be extra cautious to reduce risk of dropping a metal tool onto a battery. It might spark or short-circuit the battery or other electric part that may cause an explosion.
- 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.
- NEVER charge a frozen battery.

## **UNIT LOCATION**

- Never place this unit directly above the 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 a 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 charger should comply with all local codes and ordinances.

## **TYPES OF HAZARDS**

**BECOME FAMILIAR WITH THE HAZARDS ASSOCIATED WITH THE POWER SYSTEM AS DETAILED IN FOLLOWING.**

The following hazards are present in the power system:

**ELECTRICAL VOLTAGE**

**ELECTRICAL ENERGY**

**HEAVY MASS**

**POTENTIALLY LETHAL VOLTAGE AND SOURCES OF HIGH ENERGY ARE PRESENT WITHIN THE POWER SYSTEM AND EXTREME CAUTION MUST BE OBSERVED AT ALL TIMES. ACCESS TO THE INTERIOR OF THE SYSTEM FOR INSTALLATION, COMMISSIONING MAINTENANCE AND REMOVAL AND REPLACEMENT PURPOSES IS LIMITED TO FULL TRAINED SERVICE PERSONNEL ONLY.**

## **RECEIVING INSTRUCTIONS AND GENERAL EQUIPMENT INFORMATION**

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**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.**

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### **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:

File a claim with the carrier within five (5) days.

Send a copy of the claim to La Marche Mfg. Co.

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**

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**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.**

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### **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.

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## **A86 INSTRUCTION AND TROUBLESHOOTING MANUAL**

### **1.0 General**

The La Marche Model A86 Switchmode Float Charger/Power Supply has many inherent advantages: Voltage Regulation, Current Limiting Circuitry, High Efficiency and High Power Factor. The Model A86 compact size and lightweight (less than 40 lbs.) provides a small system footprint and ease of service.

These chargers/power supplies provide separate adjustable voltages for floating or equalizing lead-acid or nickel cadmium cells. A float/equalize selector switch is located on the front of the charger.

The Model A86 was designed to be mounted in a cabinet, which will fit in a 23 inch relay rack. The 23 inch cabinet will hold up to four (4) La MARCHE Model A86 chargers/power supplies with the same output voltage. The A86 in the cabinet was designed for a "Hot" plug in which allows addition or removal of units without requiring a system shutdown. Cover plates are provided for cabinet bays that are not used.

*Note: There are no serviceable parts within the A86 Cabinet. Should the A86 stop operating correctly, contact the La Marche Service Department for a Return Authorization Number (RMA).*

### **2.0 Functional Requirements**

This section outlines the general, electrical and mechanical specifications controlled by this document for switchmode rectifiers.

#### **2.1 Design**

As a minimum, the switchmode rectifier shall be designed so that any failure of the rectifier does not damage or degrade the equipment it powers. A failure in the alarm and control circuitry of the rectifier shall not cause a service interruption.

#### **2.2 Approvals and Safety Standards**

The rectifier is UL listed to UL 1950, CSA listed to C22.2 #950, and CE marked to EN60950.

#### **2.3 Electromagnetic Compatibility**

##### **2.3.1 Emission**

Compliant with EN50081-1 (92) with compliance to the following specific conditions:

Conducted input 0 – 2k HZ EN61000-3-2

Conducted input 0.15 – 30MHZ EN55022-B

Radiated 0.03 – 1GHZ EN55022-B at 10m

Conducted output ETS300386-2-3

##### **2.3.2 Immunity**

Compliant with EN50082-1 (92) with compliance to the following specific conditions:

ESD - EN61000-4-2 failure criteria A 4kV contact

RF Field - EN61000-4-3 3Vm-1 80% amplitude modulation 0.08 – 1 GHz

Fast Transients - EN61000-4-4 failure criteria B. 1kV on ac line, 500V on dc lines

Surge - EN61000-4-5 2kV line to ground, 1kV line to line on ac input. 500V line to ground and line to line on dc output.

Conducted RF - EN61000-4-6 3Vrms 80% amplitude modulation 0.15 – 80MHz

## **A86 INSTRUCTION AND TROUBLESHOOTING MANUAL**

### **2.4 Environmental**

The rectifier shall remain operational when subjected to the following criteria

#### **2.4.1 Temperature**

Operational - -25 degrees C to +50 degrees C

Starting - -40 degrees C to +50 degrees C

Storage - -40 degrees C to +50 degrees C

#### **2.4.2 Altitude**

Operational - -0 meters (0 ft to 10000 ft)

Storage - Meters to 10,000 meters (0 ft to 30,000 ft)

#### **2.4.3 Humidity – Non Condensing**

Operational - 0% RH to 85% RH

Storage - 0% RH to 95% RH

#### **2.4.4 Vibration**

Compliant with the requirements of BS2011 Test Fc

Drop and topple - EN60068-2-31 Test Ec

Bump - EN60068-2-47 Test Eb

Transportation - BS2011 Part 2.1 Test Fc in original packaging

Drop - EN60068-2-32 Test Ed in original packaging

#### **2.4.5 Pollution**

EN60950 degree 2 i.e. office type environments

## **3.0 Electrical Specifications**

### **3.1 Nominal Output Voltage**

FLOAT VOLTAGE	EQUALIZE VOLTAGE
54V (LEAD)	56 (LEAD)

### **3.2 Adjustment Range**

Min 47.8V Max. 58.0V

Float adjust 52 – 58 Vdc – set at 54 Vdc

Equalize adjust 53.0 – 60.0 Vdc – set at 56 Vdc

### **3.3 Maximum Terminal Voltage**

59.0V

### **3.4 Current**

Imax continuous 50.0A with less than 65 degrees C ambient V out=54.5V, Vin greater that 198 Vac

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### **3.5 Current Limit**

Rectifier to automatically reduce its current limit set point with changes in ambient temperature input voltage and output voltage. Current limit is of the constant current type.

### **3.6 Output Short Circuit**

The rectifier is be able to operate continuously into a short circuit with a maximum dc output current of 52.5 amps.

### **3.7 Load Regulation**

Load change from 0 to I<sub>max</sub> 75mV

### **3.8 Line Regulation**

Input voltage change over the operation range 75mV

### **3.9 Combination Regulation**

A combination of load changes from 0 to 100% and input voltage variation over the operating range. 100mV

### **3.10 Dynamic Regulation**

A step change in output current from 10% to 90% of full load +/- 1V

### **3.11 Recovery**

To within 500mV of final value with in 2ms.

### **3.12 Hold up Time**

V<sub>out</sub> 54.5V dropped to 54.2V, 220Vac input 50A output a minimum of 10 ms

V<sub>out</sub> 54.5V dropped to 40V, 220Vac input, 50A output a minimum of 32 ms

### **3.13 Input Voltage**

#### **3.13.1 Operating**

min 188 Vac

max 264 Vac

#### **3.13.2 Absolute Max**

300 Vac

### **3.14 Input Frequency**

45Hz to 65Hz

### **3.15 Maximum Input Current (RMS)**

230 Vac input – 13.9 A

176 Vac input – 16.3 A

### **3.16 Peak Inrush Current**

264 Vac – 19.5 A

230 Vac – 13.0 A

## **A86 INSTRUCTION AND TROUBLESHOOTING MANUAL**

### **3.17 Input Power**

With 2800 W output power 3140 watts, with maximum load (current limit) 3400 watt

### **3.18 Power Factor**

MINIMUM 98% TYPICAL 99%

### **3.19 Efficiency**

Vin = 230 Vac with Pout=2800 watts minimum 90% (includes integral series output diode)

### **3.20 Harmonic Distortion**

Must comply with the requirements of EN61000-3-2. 3% typical and 10% max.

### **3.21 Input Turn On Voltage**

165 Vac min, 176 Vac max.

### **3.22 Input Turn Off Voltage**

145 Vac min., 156 Vac max.

### **3.23 Input Fusing**

Internally fused at 20 amps in both the live and neutral lines

### **3.24 Remote Sense**

Total lead voltage drop 1V

### **3.25 Start Up Time**

From application of line input to output voltage achieving regulation min. 1.0 s, max 3.3s

### **3.26 Rise Time**

Time for Vout to rise monotonically to its full value 100 ms

### **3.27 Reverse Quiescent Current**

Source = Vout connected to output of a non energized unit = 5 ma

### **3.28 Temperature Co-efficient**

Temperature range -25 degrees C to + 55 degrees C +/- 0.015%/degree C

### **3.29 Noise, Low Frequency**

Frequency range 10Hz -100KHz 40mV p-p

### **3.30 Noise, Broadband**

Frequency range 10Hz -100Hz 15mV rms

Individual harmonics 2 mV peak

Must comply with the requirements of ETS300386-2-3 and BTNR2511

## **A86 INSTRUCTION AND TROUBLESHOOTING MANUAL**

### **3.31 Noise, Psophometric**

Weighted to C.C.I.T.T. No. 1 = 0.7mV rms

C message weighted = 29dBmC

### **3.32 Noise, Acoustic**

Minimized by allowing fan speed to vary with load current and ambient temperature.

100% I<sub>max</sub> 50 degrees C 198 Vac in = 54dBA max

100% I<sub>max</sub> 45 degrees C 230Vac in = 47dBA

75% I<sub>max</sub> 45 degrees C 230 Vac in = 45dBA

50% I<sub>max</sub> 45 degrees C 230 Vac in = 42 dBA

50% I<sub>max</sub> 25 degrees C 230 Vac in = 38dBA

### **3.33 Series Output Diode**

All rectifiers are to be equipped with a series diode in the positive output.

### **3.34 Alarm Signals and Lights**

#### 3.34.1 Input Available

Yellow LED – Operates when ac input is above 165Vac, extinguishes as input voltage declines to 145 Vac.

#### 3.34.2 Output Available

Green LED

Operates when the output voltage is above 38 Vdc but below overvoltage trip.

#### 3.34.3 Current Limit

Red LED

Operates when the rectifier is in current limit

#### 3.34.4 Over Voltage

Red LED

Operates when the rectifier output exceeds 59 Vdc

#### 3.34.5 Output Current

Green LED

Operates when the output current is above 15% output current

## **A86 INSTRUCTION AND TROUBLESHOOTING MANUAL**

### 3.34.6 Thermal Control

Yellow LED

Thermal control of current limit activates the LED

### 3.34.7 Over Temperature

Red LED

Operates when the internal temperature exceeds 120 degrees C

Will reset when the internal temperature falls below 110 degrees C

### 3.34.8 Fan Fail

Red LED

Operates when the fan fails

### 3.34.9 Equalize

Yellow LED

Activated by front panel switch or remote equalize signal

## **3.35 Front Panel Features**

### 3.35.1 Test points

Voltage – output impedance 5.1k ohm

Current – 100mV/amp

### 3.35.2 Float/Equalize switch

Switch selectable to raise or lower the output voltage. Remote equalize will override the selection

### 3.35.3 Float Voltage Adjustment

Voltage range 52.0 Vdc to 58.0 Vdc minimum set at 54 Vdc

### 3.35.4 Equalize Voltage Adjustment

Voltage range 53.0 Vdc to 60.0 Vdc minimum set at 56 Vdc

## **3.36 Isolation Tests**

Primary to ground – 1500 Vac minimum

Secondary to ground – 500 Vac minimum

Primary to Secondary – 3000Vac minimum

Ground Leakage current – 3.5 mA maximum

Output to ground Voltage – 150 Vdc maximum

Signal to ground Voltage – 150 Vdc maximum

Signal to output Voltage – 150 Vdc maximum

## **4.0 Mechanical Specifications**

### **4.1 External Dimensions**

127.0 x 139.7 x 330.6 mm (5.0 x 5.5 x 13 inches)

### **4.2 Front Panel Dimensions**

147.4 x 132.1 mm ( 5.80 x 5.20 inches) per La Marche drawing P15-F822

### **4.3 Weight**

11 pounds

### **4.4 Ventilation and Cooling**

The rectifiers are cooled by an integral, customer replaceable fan. The fan will be covered by a fan guard. The fan guard will be nickel chrome plated and be 4.125 x 4.125 inches. It will be a Qualtek #08170 or approved equal.

## **5.0 Output Ratings**

### **5.1 D.C. Voltage**

The A86 series provide separate voltages for Floating or Equalizing lead or nickel cadmium cells. The float or equalize mode of operation is selected by a switch located on the front of the rectifier.

The factory settings are as follows:

<i>Float voltage</i>	<i>Equalize voltage</i>
2.25 volts/cell (Lead)	2.4 volts/cell (lead)

D.C. Voltage Range

<i>Float voltage</i>	<i>Equalize voltage</i>
1.99-2.41 volts/cell +/- .1 volts (Lead)	2.2-2.5 volts/cell +/- .1 volts (Lead)

## **6.0 Input Ratings**

### **6.1 A.C. Voltage**

The A86 is designed for 188 - 264 v a.c.

### **6.2 Input Frequency Range**

Range - 45 to 75 HZ

### **6.3 Input Current**

A86A-50-48V-V1

A.c. input – Approximatly 16 amps

### **6.4 Power Factor**

The A86 is provided with Power Factor correction circuitry, which corrects the a.c. input power factor to approximately.9.

## **7.0 Installation Information**

The A86 was designed to be mounted in a cabinet provided by La Marche. Up to four (4) units are mounted in the 23" cabinet.

### **7.1 Minimum Wire Sizes**

All wire sizes and cabling should be sized for four (4) chargers.

### **7.2 National Codes**

All wiring should be done following the National Electric Code and all local building and electrical codes.

## **8.0 Electrical Connections & Field Wiring**

### **8.1 A.C. Input**

Terminals are provided in the back of the cabinet for all a.c. connections. Each charger has its own set of a.c. terminals.

### **8.2 D.C. Output**

All charger outputs are paralleled and brought to the cabinet d.c. buss.

## **9.0 Troubleshooting**

Be sure all connections to the cabinet are correct. Check polarities. Check for loose connections. Be sure all units are locked into place. Check for correct a.c. input and d.c. output voltages.

There are no user serviceable parts internal to the A86. Should the A86 stop operating correctly, contact the La Marche service department for a Returned Material Authorization (RMA) number and return the charger for repair.

To avoid damage caused by shipping the units must be returned in their original shipping container with the original packing material if available. La Marche will not be responsible for damage when returned to factory.

## **10.0 Cabinet**

The cabinet shall fit a standard 23 inch relay rack four rack units high, and shall be capable of handling four rectifiers.

**NOTE: A 2 amp fuse is located on the back of each cabinet for protection.** (LMC part # P8-D2A1-B2)

### **10.1 Input Voltage**

188 –264 Vac single phase—can be configured to operate on a three phase line.

Maximum a.c. draw for each cabinet is 64 amps.

Input frequency

45-65 Hz

### **10.2 Output Current**

200 amps total, 50 amps per rectifier

### **10.3 Size**

Width – 23 inch

Depth – 18 inch

Height – 7 inch

### **10.4 EMC**

EN55022 – class A

FCC Part 15 Subpart B

### **10.5 Temperature range**

-40 degrees C to +50 degrees 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 (2) years from date of purchase under normal use.

If the equipment proves defective within a two year period, it shall be replaced without charge after examination at our factory, providing such defect in our opinion, is due to faulty material or workmanship and not caused by tampering, abuse, misapplication or improper installation.

Should the equipment require major replacement or repair, the equipment must 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 to the factory, the customer or Sales representative must first obtain a RMA (Return Material 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 warranty period.

All internal maintenance to be performed by La Marche. **Warranty is void if seal is damaged.**

La Marche reserves the right to honor the warranty with a replacement unit.

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.

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.