

***La MARCHÉ***®

**INSTRUCTION MANUAL**

**FOR**

**A40R SERIES**

**RAILROAD BATTERY CHARGER**

ECN/DATE

**CPN 101677**

			15349-02 – 05/02
		<b>16816 - 6/05</b>	14575 – 02/01

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ISSUE DATE: 13913 / 4/00

INSTRUCTION DRAWING NUMBER:

P25-**LA40R\_SERIES-1**

**IMPORTANT SAFETY INSTRUCTIONS**  
FOR THE  
LA MARCHE POWER CONVERSION EQUIPMENT  
**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 types 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 AC 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 VICINITY OF A BATTERY IS DANGEROUS. SOME BATTERIES GENERATE EXPLOSIVE GASES 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 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.
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.

**PREPARING TO CHARGE**

1. If necessary to remove the battery connections, always remove 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 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 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.

**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.

## **INSTALLATION/OPERATING/TROUBLESHOOTING FOR A40R SERIES UNITS**

The La Marche Constavolt Rectifier is designed to operate on a specific type battery with a specific number of cells. The nameplate on the charger indicates the type and the number of cells required. Once properly installed the rectifier should maintain the battery in a fully charged condition. Bolt the rectifier to a sound structural member and mount such that the flow of air through the ventilators is not obstructed. Binding posts with lug connectors are provided on a terminal board within the unit. When hooking up the DC output 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. Before hooking up the AC input cable, check the line power with that specified on the unit nameplate. A grounding connection is also provided for complete protection. All wiring to and from the Constavolt should be in accordance with the local electrical requirements. The unit should not be installed directly over batteries.

Input and output wiring may be connected on the input and output terminals.

To operate the charger it is only necessary to plug in the AC power. 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 and shutdown to a trickle charge-preserving-charge.

The Constavolt will carry DC loads up to its maximum capacity. If the battery is fully charged, the Constavolt will carry loads up to its rated output without allowing the battery to become discharged. If the battery is partially discharged, the Constavolt will charge the battery and carry DC loads not exceeding the maximum capacity. Should the DC loads exceed the rating of the Constavolt, the battery will carry the excessive load. When the excessive loads are removed the Constavolt will re-charge the battery to full charge.

The Constavolt has current limiting characteristics such that the unit will not exceed approximately 125% of its maximum output rating. The output is further protected by fuses for short circuiting conditions.

The output is automatically regulated such that line voltage variations of plus (+) or minus (-) 10% of the nominal rating does not effect the operation of the Constavolt. The Constavolt will also operate on very low input voltages, however, the maximum charge rate will be decreased.

Through the use of transistors and diodes, etc., instead of electronic tubes and mechanical timers, the Constavolt is designed to be virtually trouble and maintenance free. Automatic regulation is accomplished with a saturable reactor regulator which, again, has no moving parts and requires no adjustment.

A potentiometer on the access door is provided to adjust the DC output voltage so the desired DC level may be maintained. The battery DC level must not exceed the battery manufacturer specifications or damage to the battery may occur.

Turning the potentiometer clockwise raises the DC output voltage; counterclockwise lowers output.

Remote sensing terminals are provided on the A40R1 units. To use the remote sensing, remove the jumper bars and connect the negative & positive output to the battery.

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

It should not be necessary to adjust this charger, but should any adjustments be necessary extreme care should be taken in making the adjustment. An accurate DC voltmeter should be used and the DC terminal voltage at the charger and battery terminals should be measured.

The A40RT rectifier has an internal temperature probe that measures ambient temperature and regulates the rectifiers output curves.

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

**THE FOLLOWING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL.**

**\*\*\*WARNING\*\*\***

**\*\*\*THE FOLLOWING PROCEDURES WILL EXPOSE HAZARDOUS LIVE PARTS.\*\*\***

**DISCONNECT CHARGER BEFORE PROCEEDING.**

**TROUBLESHOOTING CONSTAVOLT BATTERY CHARGERS WITH  
(AC1) TRANSISTOR CONTROL PANEL**

SYMPTOM	POSSIBLE CAUSE	PROCEDURE
OPEN AC INPUT FUSE	<ol style="list-style-type: none"> <li>1. Incorrect AC input</li> <li>2. Shorted diodes</li> </ol>	<ol style="list-style-type: none"> <li>1. Compare AC input voltage with voltage on unit nameplate.</li> <li>2. See "Troubleshooting and Diode Replacement Sheet"</li> </ol>
OPEN DC OUTPUT FUSE	<ol style="list-style-type: none"> <li>1. Defective or wrong voltage battery</li> <li>2. Shorted connector</li> <li>3. Shorted or reverse output leads</li> <li>4. Shorted diodes</li> </ol>	<ol style="list-style-type: none"> <li>1. Compare voltage with unit nameplate</li> <li>2. Check with volt-ohmmeter</li> <li>3. Check with volt-ohmmeter</li> <li>4. See "Troubleshooting and Replacement Diode sheet"</li> </ol>
CHARGER OPERATES, BUT WILL NOT CHARGE BATTERY	<ol style="list-style-type: none"> <li>1. Open RV1 and RV2 voltage divider resistor</li> <li>2. Defective control pane</li> <li>3. Defective cutout relay</li> <li>4. Open cell in battery</li> </ol>	<ol style="list-style-type: none"> <li>1. Red slider band must be connected t wires on resistor; with volt-ohmmeter, check continuity of resistor</li> <li>2. To check control panel, disconnect the blue &amp; black wires going to terminal =1 on control panel; connect the two wires together, but do not reconnect to panel. Connect battery &amp; turn on unit. If charger goes into high rate, the control panel is defective.</li> <li>3. To check cutout replay, turn unit on &amp; measure the voltage from pin one on the control panel to the positive output terminal of the battery charger. If zero DC voltage is measured, the relay is defective.</li> <li>4. Check battery cells.</li> </ol>
CHARGER WILL NOT TAPER TO FINISH RATE	<ol style="list-style-type: none"> <li>1. Defective battery</li> <li>2. Defective control panel</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for defective cells in battery.</li> <li>2. To check control panel, disconnect and separate blue &amp; black wires going to pin one on the control panel. If the unit shuts down, the control panel may be defective.</li> </ol>

**NOTE: THE A40 BATTERY CHARGER IS DESIGNED TO MAINTAIN THE BATTERY AT APPROXIMATELY 2.33 VOLTS PER CELL LEAD, AND 1.47 VOLTS PER CELL NICKEL CADMIUM. WHEN THE BATTERY REACHES THIS VOLTAGE, THE CHARGER SHOULD SHUTDOWN TO A SMALL TRICKLE CHARGE.**

**THE FOLLOWING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL.**

**\*\*\*WARNING\*\*\***

**\*\*\*THE FOLLOWING PROCEDURES WILL EXPOSE HAZARDOUS LIVE PARTS.\*\*\***

**DISCONNECT CHARGER BEFORE PROCEEDING.**

**TROUBLESHOOTING CONSTAVOLT BATTERY CHARGERS WITH  
(AC11) TRANSISTOR CONTROL PANEL**

SYMPTOM	POSSIBLE CAUSE	PROCEDURE
OPEN AC INPUT FUSE	<ol style="list-style-type: none"> <li>1. Incorrect AC input</li> <li>2. Shorted diodes</li> </ol>	<ol style="list-style-type: none"> <li>1. Compare AC input voltage with voltage on unit nameplate.</li> <li>2. See "Troubleshooting and Diode Replacement Sheet"</li> </ol>
OPEN DC OUTPUT FUSE	<ol style="list-style-type: none"> <li>1. Defective or wrong voltage battery</li> <li>2. Shorted connector</li> <li>3. Shorted or reverse output leads</li> <li>4. Shorted diodes</li> </ol>	<ol style="list-style-type: none"> <li>1. Compare battery voltage with unit nameplate</li> <li>2. Check with volt-ohmmeter</li> <li>3. Check with volt-ohmmeter</li> <li>4. See "Troubleshooting and Replacement Diode sheet"</li> </ol>
CHARGER OPERATES, BUT WILL NOT CHARGE BATTERY	<ol style="list-style-type: none"> <li>1. Defective electronic control panel</li> <li>2. Defective electronic relay</li> <li>3. Open RC resistor</li> <li>4. Open cell in battery</li> </ol>	<ol style="list-style-type: none"> <li>1. To check electronic control panel, disconnect wires going to terminal number 4 on circuit board AC11; connect wires together, but do not reconnect to panel. Connect battery and turn unit on momentarily. If unit goes to a high rate, panel is defective.</li> <li>2. To check relay, turn unit on and measure voltage from pin 1 of electronic control panel AC11 to terminal 1 on electronic relay AC52-1. If zero DC is measured, the relay may be defective.</li> <li>3. With ohmmeter, measure resistance of resistor.</li> <li>4. Check battery for defective cells.</li> </ol>
CHARGER WILL NOT TAPER TO FINISH RATE	<ol style="list-style-type: none"> <li>1. Defective battery</li> <li>2. Defective electronic panel</li> </ol>	<ol style="list-style-type: none"> <li>1. Check battery cells.</li> <li>2. Disconnect wire going to terminal number 3 on electronic panel AC11. Connect battery and turn unit on. If charger goes into a low charge rate, electronic panel is defective.</li> </ol>

## INSTALLERS INFORMATION

The table below lists the AC and the DC minimum wire size requirements. At distances exceeding 10 feet, the DC 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..... $CMA = \frac{A \times LF \times K}{AVD}$

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

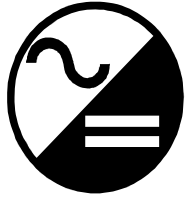
SOURCE: HANDBOOK 100-NATIONAL BUREAU OF STANDARDS

**NOTE: ALL WIRE #6 AND LARGER IS STRANDED.**

**TROUBLESHOOTING**  
**AND**  
**DIODE REPLACEMENT SHEET**

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 heatsink (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 heatsink and replace with a new diode. When installing a new diode, be sure to note if the old diode was insulated from the heatsink. If the diode should be insulated from the heatsink, care should be taken so that the mica-insulating washer is placed properly on each side of the heatsink with insulating bushing between the diode mounting stud and the aluminum heatsink.



***LaMARCHE***®

## **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 and 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.

Any part or parts of the equipment (except fuses, DC connectors and other wear-related items) that prove defective within a one 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 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.