



La Marche Manufacturing Company

[www.lamarchemfg.com](http://www.lamarchemfg.com)

## *A77 Series*

Microprocessor Controlled SCR  
Filtered Charger / Battery Eliminator



## Installation and Operation Manual

This manual is subject to change without notice. You may obtain the newest version of the manual at [www.lamarchemfg.com](http://www.lamarchemfg.com)

## Important Safety Instructions

Before using this equipment read all manuals and other documents related to this charger and other equipment connected to this charger. **SAVE THESE INSTRUCTIONS** – This manual contains important safety and operating instructions for the A77. If a replacement copy of a manual is needed, it can be found at [www.lamarchemfg.com](http://www.lamarchemfg.com).

### Electrical Safety



**WARNING:** Hazardous Voltages are present at the input of power systems. The output from chargers and from batteries may be low in voltage, but can have a very high current capacity that may cause severe or even fatal injury.

When working with any live battery or power system, follow these precautions:

- Never work alone on any live power system; someone should always be close enough to come to your aid.
- Remove personal metal items such as rings, bracelets, necklaces, and watches.
- Wear complete eye protection (with side shields) and clothing protection.
- Always wear gloves and use insulated hand tools.



**WARNING:** Lethal Voltages are present within the power system. Parts inside the charger may still be energized even when the charger has been disconnected from the AC input power. Check with a meter before proceeding. Do not touch any uninsulated parts.

- A licensed electrician should be used in the installation of any charger.
- Always disconnect the charger from the supply, batteries, and loads before performing maintenance, replacing parts, or cleaning.
- Always assume that an electrical connection is live and check the connection relative to ground.
- Be sure that neither liquids nor any wet material come in contact with any internal components.
- Do not operate this charger outside the input and output ratings listed on the charger nameplate.
- Do not use this charger for any purpose not described in the operation manual.

### Mechanical Safety

- This charger or parts of the charger may get very hot during normal operation, use care when working nearby.
- Do not expose equipment to rain or snow. Always install in a clean, dry location.
- Do not operate equipment if it has received a sharp blow, been dropped, or otherwise damaged in any way.
- Do not disassemble this charger. Incorrect re-assembly may result in a risk of electric shock or fire.

### Battery Safety



**WARNING:** Follow all of the battery manufacturer's safety recommendations when working with or around battery systems. **DO NOT** smoke or introduce a spark or open flame in the vicinity of a battery. Some batteries generate explosive gases during normal battery operation.

- When charging Lithium-Ion batteries, a B.M.S. must be utilized.
- To reduce risk of arc, connect and disconnect the battery only when the charger is off.
- If it is necessary to remove battery connections, always remove the grounded terminal from the battery first.
- Remove personal metal items such as rings, bracelets, necklaces, and watches.
- Always wear rubber gloves, safety glasses, and a rubber lined vest/apron when working near a battery.
- Have plenty of fresh water and soap nearby in case the battery electrolyte contacts skin, clothing, or eyes.
- If the battery electrolyte contacts skin or clothing, wash immediately with soap and water.
- If the electrolyte enters the eye, immediately flood the eye with running cold water for at least ten (10) minutes and seek medical attention immediately.
- Do not drop or place any materials on a battery. A spark or short-circuit could cause an explosion.

## Charger Location

- Allow at least 6 inches of free air on all vented surfaces for proper cooling
- Allow sufficient clearance to open the front panel for servicing.
- Do not operate this charger in a closed-in area or restrict ventilation in any way.
- Do not place charger below battery.
- Never allow battery electrolyte to drip on this charger when reading the specific gravity or filling the battery.
- Never place this charger directly above a standard flooded battery. Gases from the battery will corrode and damage equipment.
- A sealed maintenance free or valve regulated lead acid (VRLA) battery may be placed below this equipment.

## Check for Damages

Prior to unpacking the product, note any damage to the shipping container and take pictures. Unpack the product and inspect the exterior and interior of product for damage. If any damage is observed, take pictures and contact the carrier immediately to file a damage claim. Contact La Marche for a Return Material Authorization number to have the charger sent back for evaluation and repair.



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

## Returns for Service

Save the original shipping container. If the product needs to be returned for service, it should be packaged in its original shipping container. If the original container is damaged/unavailable, make sure the product is packed with at least three inches of shock-absorbing material to prevent shipping damage. *La Marche is not responsible for damage caused by improper packaging of returned products.*

## Inspection Checklist

- Enclosure exterior and interior is not marred or dented.
- There are no visibly damaged components.
- All internal components are secure.
- Printed circuit boards are firmly seated.
- All hardware and connections are tight.
- All wire terminations are secure.
- All items on packing list have been included.

## Handling

Equipment can be very heavy with uneven distribution of weight. Use adequate manpower or equipment for handling. Until the equipment is securely mounted, care must be used to prevent equipment from being accidentally tipped over or dropped.

## Table of Contents

Important Safety Instructions .....	i
Electrical Safety .....	i
Mechanical Safety .....	i
Battery Safety .....	i
Charger Location .....	ii
Check for Damages .....	ii
Returns for Service .....	ii
Inspection Checklist .....	ii
Handling .....	ii
Table of Contents .....	iii
Model Scope/General Description .....	1
Understanding the Model Number .....	1
Optional Accessories Included in the Charger .....	1
1.0 Equipment Handling .....	2
1.1 Storing the A77 .....	2
1.2 Moving the A77 .....	2
2.0 Installing the A77 .....	2
2.1 Mounting the A77 .....	2
2.1.1 Wall-Mounting the A77 (10 & 477 Only) .....	3
2.1.2 Floor-Mounting the A77 (All Enclosures) .....	4
2.1.3 Rack-Mounting the A77 .....	5
2.2 Changing Transformer Taps .....	5
2.3 AC Input Connections .....	7
2.4 DC Output Connections .....	8
2.4.1 Paralleling Connections .....	9
2.5 Alarm Connections .....	9
2.5.1 Standard Alarms .....	9
2.5.2 Alarm Description .....	10
2.5.3 Alarm Connection Procedure .....	12
2.6 Temperature Compensation Connection .....	12
2.7 Load Sharing Connections .....	13
2.7.1 Load Sharing Procedure without Batteries/Loads .....	13
2.7.2 Load Sharing Procedure with Batteries/Loads .....	13
2.7.3 Remote Equalize/CAN bus Connections .....	14
2.8 Ground Detection Connection .....	15
2.8.1 Ground Detection Connection Procedure .....	15
3 Operation .....	16
3.1 Starting the A77 .....	16
3.2 Digital Control Board .....	16

3.3	Selecting the Charging Mode .....	18
3.3.1	Equalize Timer Modes .....	18
4	Controller Menus .....	19
4.1	Settings Menu .....	19
4.1.1	Output Settings .....	19
	Battery Type .....	19
	Battery Cells.....	19
	Float Voltage.....	20
	Equalize Voltage .....	20
	Current Limit.....	20
4.1.2	Alarm Settings .....	20
	Alarm Thresholds.....	20
	Alarms Included in Summary .....	20
	Load Basic Default Settings.....	20
4.1.3	Advanced Settings .....	20
	AC Volts Scale .....	20
	Equalize Mode Settings .....	20
	Equalize Timer Hours .....	21
	Equalize Timer Mode .....	21
	Remote Equalize .....	21
	Temperature Compensation .....	21
	Advanced Alarm Settings.....	21
	Alarm Delay .....	21
	Alarm Operation .....	21
	Alarm Disable .....	21
	Relay Mapping .....	21
	Relay Logic.....	22
	Communications Settings.....	22
	Set Clock .....	22
	Logs and Files.....	22
	Data Logging.....	22
	Enable Event Logging.....	22
	Log Interval .....	22
	Initialize .....	22
	Remove Drive .....	22
	Insert Drive .....	22

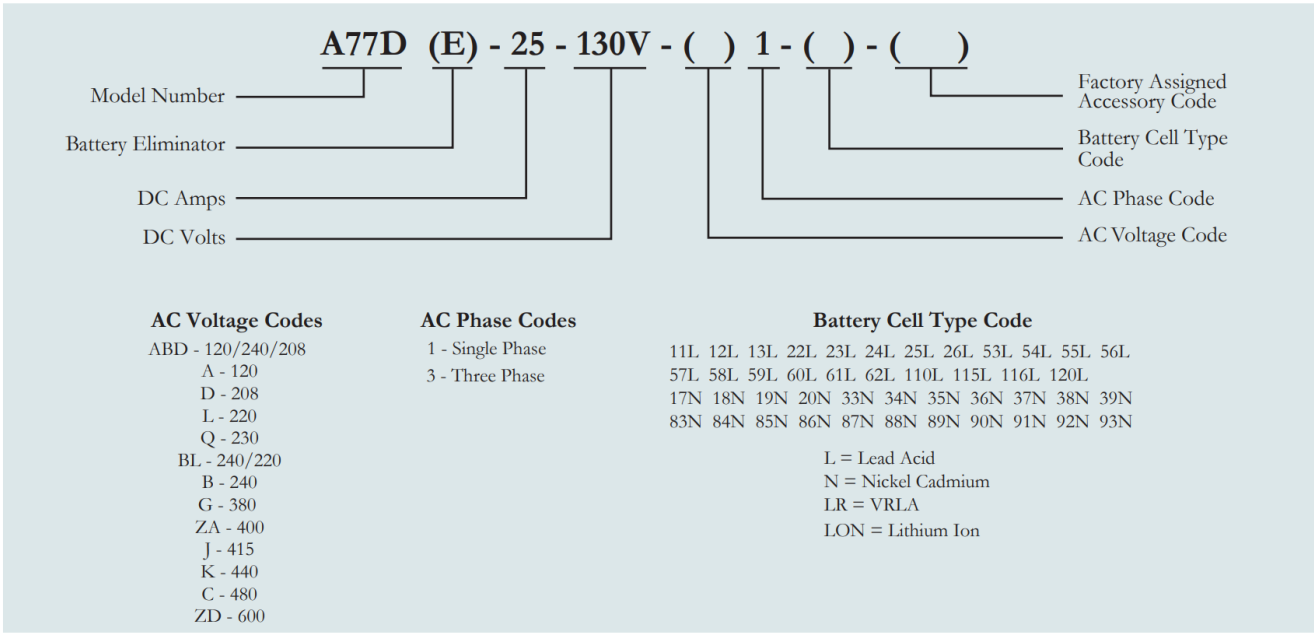
Config Files .....	22
Save Settings .....	23
LCD Settings .....	23
Security .....	23
Serial Number .....	23
Set to Default.....	23
Firmware Menu .....	23
Firmware Version .....	23
Update Firmware .....	23
Over Temperature Probe Status.....	24
4.2    Test Menu .....	24
Test LEDs.....	24
Test Relays .....	24
Test Battery .....	25
Test Fans .....	25
4.3    Reset All Alarms.....	25
4.4    Last 10 Events.....	25
5.0    Data Logging.....	25
Events Only Logging .....	26
Interval Logging .....	26
Formatting the MicroSD Card.....	26
Installing/Removing the MicroSD Card .....	27
Reading the Log File .....	27
6.0    Reflected Harmonics .....	28
7.0    Service.....	28
7.1    Performing Routine Maintenance .....	28
7.2    Troubleshooting Procedure.....	29
Ordering Replacement Parts .....	30
Appendix A: Parameter Ranges.....	31
Appendix B: A77 Menu Structure Flowchart .....	32
Appendix C: MicroSD Card File Retrieval Instructions .....	34
Appendix D: AC Draw, Heat Loss, and Shipping Weight (Single Phase) .....	35
Appendix E: AC Draw, Heat Loss, and Shipping Weight (Three Phase) .....	36
Appendix F: Manufacturer's Warranty .....	37
Appendix G: Document Control and Revision History.....	38

Model Scope/General Description

The La Marche models A77D and A77DE are SCR battery chargers. These models are designed with an LCD Digital Display. The A77DE is designed as a battery eliminator and can be operated with or without batteries connected. The La Marche model A77 series battery charger is a solid-state charger utilizing Silicon-Controlled Rectifier technology. It has ± 0.25% regulation from no load to full load over the specified input voltage, frequency, and ambient temperature range.

Understanding the Model Number

The A77 model number is coded to describe the options that are included. Find the model number on the nomenclature nameplate of the charger. Follow the chart to determine the configuration of your battery charger.



## 1.0 Equipment Handling

### 1.1 Storing the A77

If the A77 is to be stored for more than a few days after delivery, it should be stored within its shipping container. The location chosen for storage should be within an ambient temperature of -40 to 185°F (-40 to 85°C) with a non-condensing relative humidity of 0 to 95%. Storage should not exceed 2 years due to the limited shelf life of the DC filter capacitors when they are not in service.

### 1.2 Moving the A77

After careful inspection and upon verification that the A77 is undamaged, identify the enclosure style and weight of the A77 charger (refer to Appendixes D and E).

## 2.0 Installing the A77

### 2.1 Mounting the A77

When mounting the A77 in any configuration, consider the size and weight of the charger. The wall, rack, and/or floor must be able to support the weight of the charger, as well as an additional safety factor. Verify the weight of the A77 charger using Appendix D or Appendix E, and the method of mounting using Table 1 below. The location chosen for the charger should be within an ambient temperature range of 32 to 122°F (0 to 50°C) with a non-condensing relative humidity no higher than 95%. The A77 should be mounted in an area free of flammable & explosive materials and away from drips and splatter. To be mounted on non-combustible surface. The A77 utilizes convection cooling, so a clearance of at least 6in (152mm) of free air must be maintained on the top, bottom, and both sides for cooling air. Maintain 36in (914mm) or more of clearance at the front of the charger in order to allow for operation and maintenance.

**NOTE:** Please refer to the specific enclosure drawing provided with unit manual for greater detail.

Enclosure Number	Cable Entry		Standard Mounting	Optional Mounting Kits
	AC Input	DC Output		
10	Right Top/Bottom	Left Top/Bottom	Wall	19"/23" Rack-Mount or Floor-Mount
477	Right Top/Bottom	Left Top/Bottom	Wall	
977	Right Top/Bottom	Left Top/Bottom	Floor	23" Rack-Mount
72N	Right Top/Bottom	Left Top/Bottom	Floor	Floor-Mount Only
46N	Top/Bottom	Top/Bottom	Floor	Floor-Mount Only
47N	Top/Bottom	Top/Bottom	Floor	Floor-Mount Only
57N	Top/Bottom	Top/Bottom	Floor	Floor-Mount Only

*Table 1 – Standard Mounting Methods*

**NOTE:** The 72N, 46N, 47N, and 57N enclosures are floor-mount only. These enclosures CANNOT be rack-mounted or wall-mounted.



### 2.1.1 Wall-Mounting the A77 (10 & 477 Only)

The **10 & 477** enclosures of the A77 are shipped from the factory with the necessary brackets installed for wall-mounting (The same bracket is used for rear-mounting on a 19" relay rack and cannot be removed). The **977** enclosure does not come with wall mounting equipment; it is not recommended to attempt to mount these enclosures on any wall.

#### Wall-Mount Procedure

To wall-mount the A77, install four 0.25in (6.4mm) bolts on the wall rated to support the charger weight plus a safety factor of at least two times (for the **477** enclosure, 6 bolts are needed). Place the A77 on the bolts, add appropriate mounting hardware, and tighten securely. Refer to the figures below for mounting dimensions and specifications.

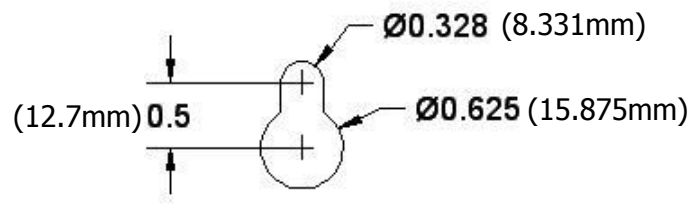


Figure 1 – Keyhole Slot Used

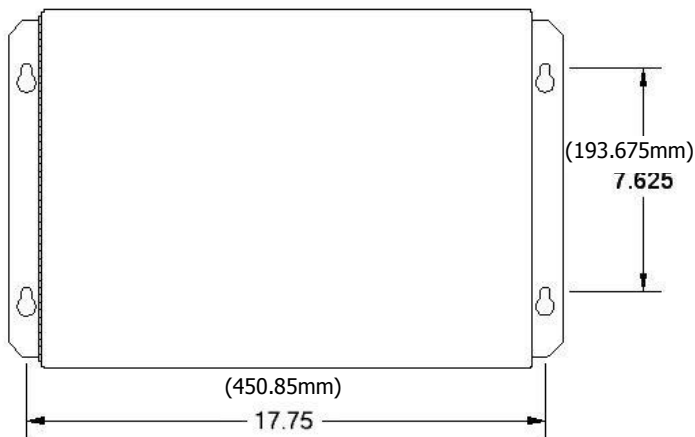


Figure 2 – Enclosure No. 10 Bolt Pattern

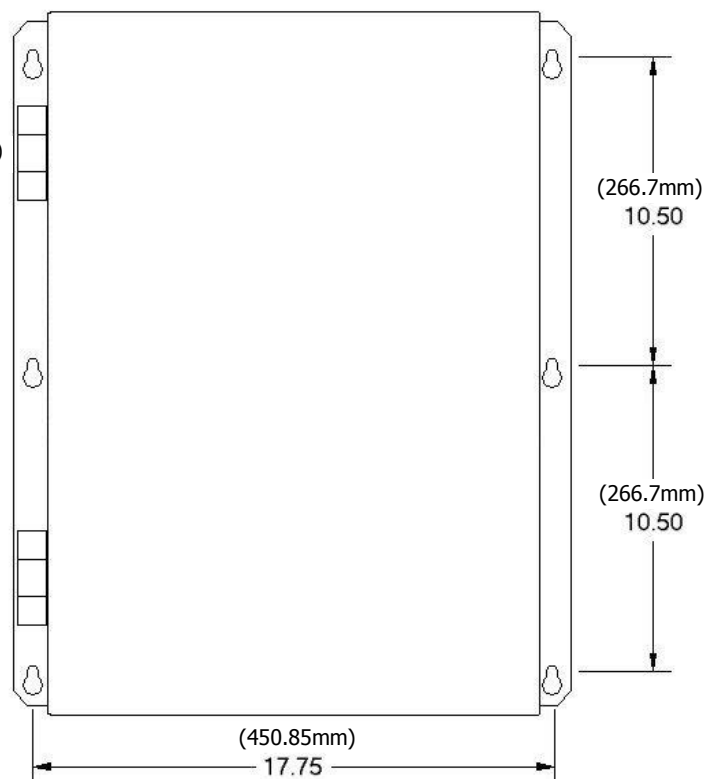


Figure 3 – Enclosure No. 477 Bolt Pattern

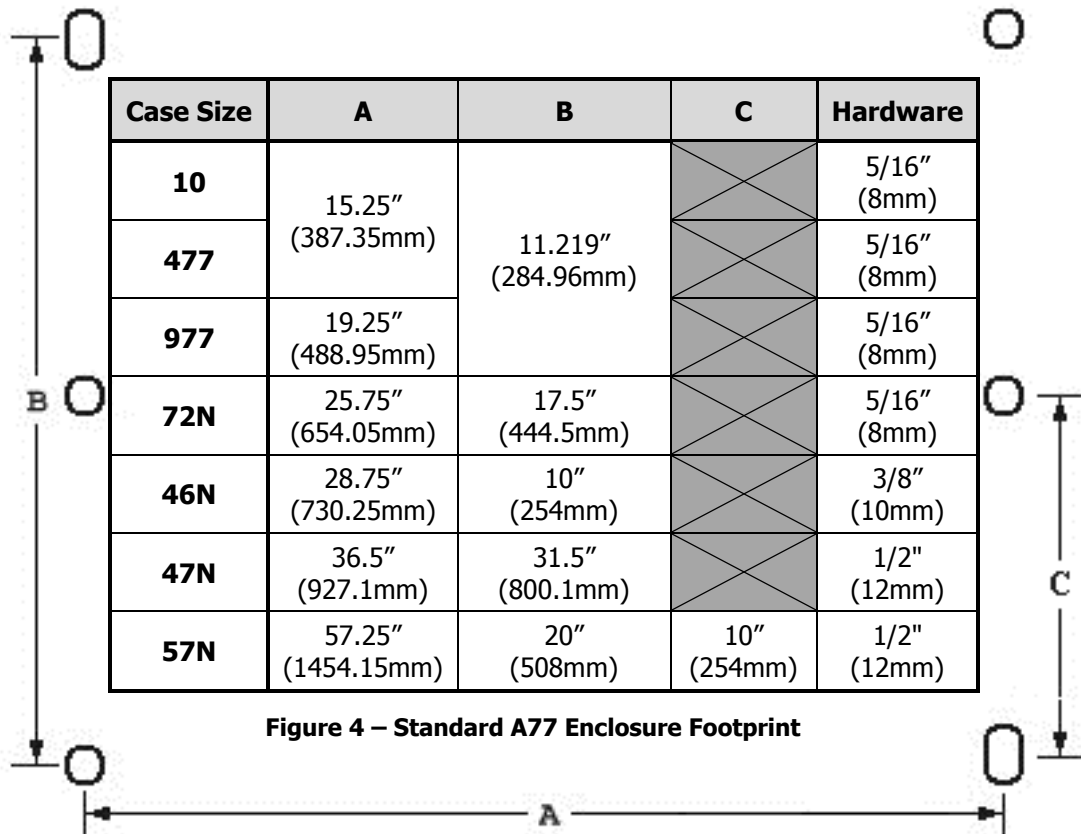
### 2.1.2 Floor-Mounting the A77 (All Enclosures)

Floor-mounting the **977, 72N, 46N, 47N & 57N** enclosure is standard. If it is desired to floor mount a charger with the **10** or **477** enclosures, you will need the floor-mount bracket.

**NOTE:** The floor-mount bracket adds an additional 3in (76.2mm) to the overall height of 10 and 477 enclosures.

#### Floor-Mounting Procedure

To floor-mount the A77, install four to six bolts into the floor. Place the charger on the bolts, add appropriate mounting hardware onto the floor-mounting anchor bolts, and tighten securely. Refer to Figure 4 for hardware specifications and floor-mounting dimensions.



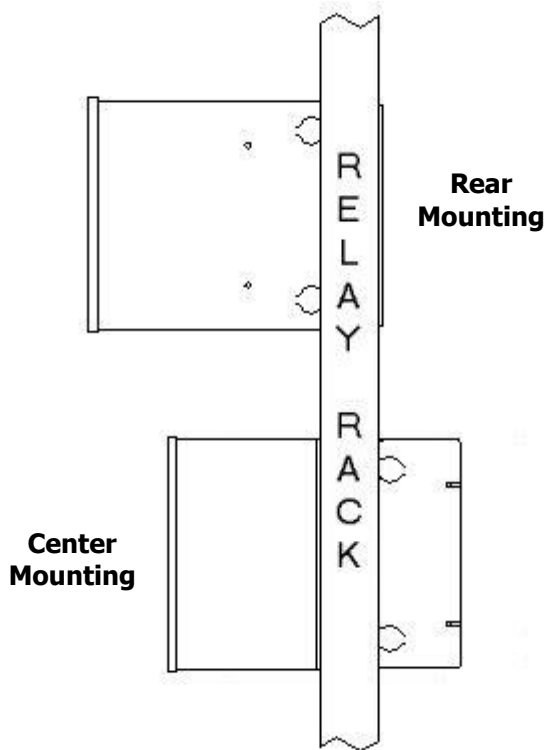
### 2.1.3 Rack-Mounting the A77

The A77 can be installed in most relay racks with standard EIA hole spacing. If a relay rack is needed, they are available for purchase from La Marche. Before installing the charger on the rack, locate the placement of the conduit entrances and be sure the knockouts on the sides or bottom of the charger are accessible after the charger is rack mounted.

The table and figure below show rack-mounting options for A77.

#### Rack Mounting Procedure

To rack mount the A77, first mount the charger onto the rack-mounting brackets using the hardware supplied. Second, install the brackets onto the rack. Provide at minimum 6in (152mm) of air space above and below to allow for cooling.



Enclosure Number	Rear Mounting	Center Mounting
<b>10</b>	Yes (19" rack only)	Yes (with optional hardware)
<b>477</b>	Yes (19" rack only)	Yes (with optional hardware)
<b>977</b>	No	Yes (with optional hardware) (23" rack only)
<b>72N</b>	No	No
<b>46N</b>	No	No
<b>47N</b>	No	No
<b>57N</b>	No	No

*Table 2 – Rack-Mount Configurations*

**Figure 5 – Rack-Mounting Configurations  
(10 Enclosure)**

## 2.2 Changing Transformer Taps

**NOTE:** This procedure refers **only** to A77 battery chargers that are **rated for 6 to 25 ADC**. All other A77 battery chargers do not include transformer taps (Special chargers can be ordered upon request).

Before wiring AC power to the A77, check the wiring of the power transformer PT to assure it is connected for the correct AC input voltage. The A77 accepts standard input voltages of 120, 208, or 240 VAC by changing the connections to the input terminals. No other changes are required.

**NOTE:** The A77 is wired at the factory for 240 VAC, except on special request.

Before changing the PT taps, be sure that AC supply and DC loads to the A77 are turned off and locked out. Verify that no voltage is present by using a voltmeter at all input and output terminals. Turning off the AC and DC circuit breakers on the A77 does NOT eliminate live voltages inside the enclosure. Additionally, de-energize any external wiring to the alarm relay contacts.

Verify that all voltages within the enclosure are de-energized and locked out. Change the connections to the input terminals as shown in the table and figure below.

**NOTE:** An A77 battery charger rated for 480 VAC or 600 VAC input uses a special transformer that has no taps. The 480 VAC and 600 VAC transformers cannot be used for any other input voltage.

### Changing Transformer Taps Procedure

Before beginning any work inside the charger enclosure, ensure that all incoming AC supply and DC load wires are de-energized. Verify that no voltage is present inside the enclosure by using a voltmeter at all input and output terminals.

#### For 120 VAC Input Voltage:

1. Connect wire marked **A** to terminal **8**
2. Connect wire marked **B** to terminal **10**
3. Connect wire marked **C** to terminal **6**

Note that **AC Line** connects to terminal **1**

Note that **Neutral** connects to terminal **3**

Input Voltage	ACin1	ACin2	A	B	C
<b>120</b>	1 (L1)	3 (N)	8	10	6
<b>208</b>	1 (L1)	2 (L2)	9	8	5
<b>240</b>	1 (L1)	2 (L2)	10	8	5

Table 3 – Input Terminal Connections

#### For 208 VAC Input Voltage:

1. Connect wire marked **A** to terminal **9**
2. Connect wire marked **B** to terminal **8**
3. Connect wire marked **C** to terminal **5**

Note that **AC Line 1** connects to terminal **1**

Note that **AC Line 2** connects to terminal **2**

#### For 240 VAC Input Voltage:

1. Connect wire marked **A** to terminal **10**
2. Connect wire marked **B** to terminal **8**
3. Connect wire marked **C** to terminal **5**

Note that **AC Line 1** connects to terminal **1**

Note that **AC Line 2** connects to terminal **2**

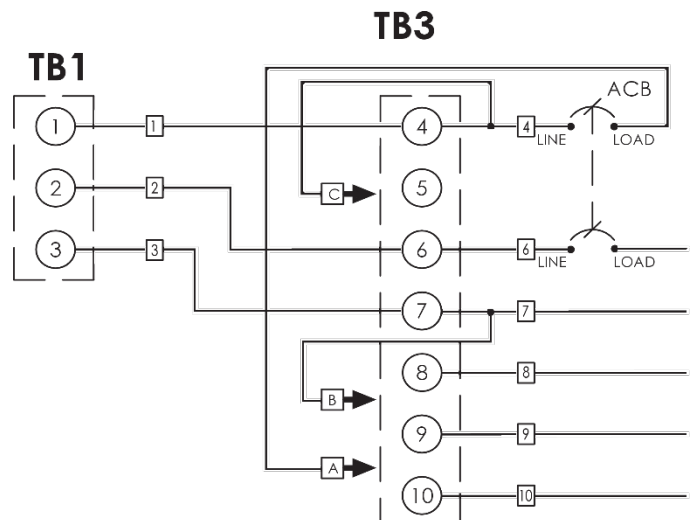


Figure 6 – Input Terminals Connection Schematic

## 2.3 AC Input Connections

Before beginning any work inside the charger, ensure that all incoming AC supply is de-energized and that both of the charger's breakers are off. Verify that no voltage is present inside the case by using a voltmeter at all input and output terminals. Check that the source voltage and frequency match the charger front nameplate specifications. For chargers with transformer taps, verify that the tap has been set to the correct AC input (Refer to Section 2.2). Select wire size using Table 4 below. This is based on an overload current of 110-115% of the input current listed on the charger nameplate.

**NOTE:** Feeder breaker should be sized to match the size of the AC protection used in charger. If multi-tap charger is set for 120VAC input configuration, feeder breaker should be double the size of the AC protection. 120VAC configured multi-tap chargers use both breaker poles in parallel.

Breaker Size/ Fuse Size - Amps	AWG Minimum Wire Size Requirement for Customer Connection (mm <sup>2</sup> )	AWG Minimum Wire Size for Equipment Grounding (mm <sup>2</sup> )
3	#14 (2.5)	#14 (2.5)
5	#14 (2.5)	#14 (2.5)
10	#14 (2.5)	#14 (2.5)
15	#14 (2.5)	#14 (2.5)
20	#12 (4)	#12 (4)
25	#10 (6)	#12 (4)
30	#10 (6)	#10 (6)
40	#8 (10)	#10 (6)
50	#8 (10)	#10 (6)
60	#6 (16)	#10 (6)
70	#6 (16)	#8 (10)
80	#4 (25)	#8 (10)
90	#4 (25)	#8 (10)
100	#4 (25)	#8 (10)
125	#2 (35)	#6 (16)
150	#1 (50)	#6 (16)
175	#1/0 (55)	#6 (16)
200	#2/0 (70)	#6 (16)
250	#4/0 (120)	#4 (25)
300	250 MCM (150)	#4 (25)
400	400 MCM (240)	#2 (35)
500	600 MCM (400)	#2 (35)

*Table 4 – AC/DC & Ground Wire Size Minimum Requirements*

(All wires specified in the table are rated at 90 °C or 194 °F)

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

### AC Connection Procedure

First, connect an adequate earth ground lead (use table above for sizing) to the terminal marked ground. Run the input AC wiring to terminals marked **L1** and **L2** in the charger (for chargers with transformer taps, use Table 3 for input connections).

## 2.4 DC Output Connections

Before making any of DC output connections, make sure you have read and fully understand the DC Connection Procedure below. Select proper size for the DC wiring from the wire size table on the previous page. If the distance between the charger's DC output and the DC load exceeds 10 feet, use the Power Cable Guide below to minimize the voltage drop across the wire distance.

### Power Cabling Guide

Use the following formulas and table to determine proper wire size for minimal voltage drop.

#### Table of Conventions

CMA	= Cross section of wire in circular MIL area
A	= Ultimate drain in amperes
LF	= Conductor loop feet
MaxAmp	= Maximum allowable amperes for given voltage drop
AVD	= Allowable voltage drop
K	= 11.1 for commercial (TW) copper wire = 17.4 for aluminum

#### Calculating Wire Size Requirements

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

#### Calculating Current Carrying Capacity of Wire

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

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

Table 5 – Wire Size/Area Table

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

### DC Connection Procedure

To prevent the DC circuit breaker from tripping when connecting the battery, connections should be done in the following order:

1. Make sure that the incoming voltage to the charger is turned off.
2. Turn off/open the charger's AC and DC circuit breakers.
3. Connect the battery cables to the charger's DC output terminals. **OBSERVE PROPER POLARITY.**
4. Energize the charger by supplying AC voltage and turning on/closing the charger's AC breaker. This will charge the capacitors inside the charger and eliminate heavy arcing when the battery is connected.
5. After 30 seconds, turn on/close the DC breaker.

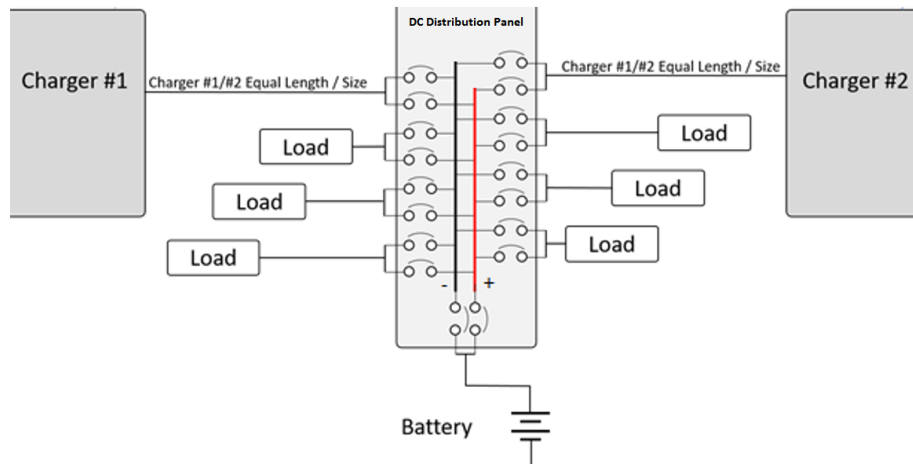
**NOTE:** If more than one charger is to be connected to the same DC bus/DC system, please refer to Section 2.4.1 for paralleling instructions.

### 2.4.1 Paralleling Connections

A77 battery chargers have the capability to be installed in parallel for redundant applications. Take into consideration, the chargers being setup for paralleling MUST be of the same DC output rating and should all be either A77D model or A77DE model chargers. Please confirm each charger model on the nameplate on front prior to making connections. Please follow the steps below:

**NOTE:** Ground Detection should only be enabled on one charger when paralleling. See Section 2.8.1 to disable Ground Detection.

1. Power up the chargers prior to making any connections to the DC output.
2. Adjust the Float and Equalize output voltages of each individual charger to same desired level.
3. Turn off all chargers.
4. Connect the DC output of all chargers in parallel to the same DC load/battery, refer to figure below.
5. Turn on all chargers.



**Figure 7 – Example Paralleling Diagram**

**NOTE:** Paralleling is not to be confused with load sharing. If load sharing is desired, please refer to Section 2.7.

## 2.5 Alarm Connections

### 2.5.1 Standard Alarms

Two alarm relays (and 11 alarm LEDs) are included as a standard feature of the A77. The included alarm relays are a Summary alarm and an AC Failure alarm. Each alarm includes one set of form 'C' contacts, enabling the user to connect remote annunciators using connector J1 of the S2A-368S digital display control board. Refer to Figure 8.

Alarm LEDs are provided for the following alarms: AC Fail, Low DC Voltage, End of Discharge, High DC Voltage, High Voltage Shutdown, Low DC Current, Overload/Current Limit, Positive Ground, Negative Ground, Charger Fail, and Summary.

If an alarm condition occurs for a default time of longer than 5 seconds, the summary alarm relay will activate. The AC Fail and HVSD alarms are default set to trigger after 20 seconds.

When an alarm activates, the specific indicator on the front panel will light, any connected remote annunciators will activate, and the display will cycle through all active alarms.

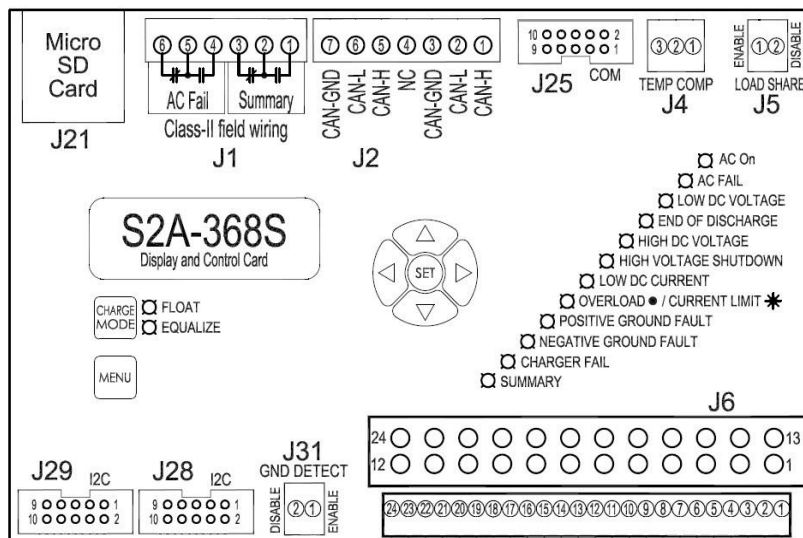


Figure 8 – Display/Control Board

### 2.5.2 Alarm Description

**RAMP UP FAILURE** occurs if the charger fails to reach the nominal output voltage within two minutes of being powered up. The Ramp Up Failure Alarm has no dedicated LED or relay contacts. However, it is part of the Summary and Charger Fail alarms.

**AC FAIL ALARM** will trigger, the green “AC ON” LED will turn off, and the red “AC FAILURE” LED will turn on if the AC power to the charger is lost for longer than 20 seconds. The alarm will automatically reset when AC power is restored to the charger. When AC power is lost, the front panel display and indicators will remain powered by the connected batteries.

**LOW ACV ALARM** will trigger and the green “AC ON” LED will flash if the AC voltage to the charger drops below 90% of the nameplate rating for longer than 5 seconds. There are no alarm contacts associated with this alarm. Under the Low ACV condition, the charger will continue to operate as normal.

**LOW DCV ALARM** will trigger and the red “LOW DC VOLTAGE” LED will turn on if the DC voltage falls below the specified voltage threshold of the alarm for longer than 5 seconds. The alarm will clear once the low DC voltage condition is no longer present.

**END OF DISCHARGE ALARM** will trigger and the red “END OF DISCHARGE” LED will turn on if the DC voltage falls below the specified percentage or voltage threshold of the alarm for longer than 5 seconds. The alarm will clear once the low DC voltage condition is no longer present.

**HIGH DCV ALARM** will trigger and the red “HIGH DC VOLTAGE” LED will turn on if the output DC voltage rises above the specified voltage threshold of the alarm for longer than 5 seconds. The alarm will clear once the high DC voltage condition is no longer present.

**HVSD ALARM** will trigger and the red “HIGH VOLTAGE SHUT DOWN” LED will turn on if the output DC voltage of the charger rises above the alarm threshold for longer than 20 seconds and there is load on the charger. If the High DC Voltage Shut Down alarm activates, the DC output of the charger shuts off to prevent irreversible damage to the battery. This alarm will stay latched until the charger is reset by isolating from all power sources.

**NOTE:** The HVSD alarm will not trigger if there is a Low Current alarm present.

**LOW DC CURRENT ALARM** will trigger and the amber “LOW DC CURRENT” LED will turn on if the output DC current of the charger falls below the alarm threshold for longer than 5 seconds. This alarm can be disabled if considered a nuisance alarm.



**OVERLOAD/CURRENT LIMIT ALARM** share one LED. The "Overload/Current Limit" alarm LED will flash when the charger is in current limit, i.e. regulating the load in a constant current mode. When the charger is overloaded, the "Overload/Current Limit" LED will turn on solid. An overload requires two simultaneous conditions; the charger must be in current limit and the voltage has depressed to below the End of Discharge alarm percentage or threshold; typical: 1.75V/C LA, 1.1V/C NC.

**POSITIVE GROUND ALARM** will trigger and the red "POSITIVE GROUND FAULT" LED will turn on if 1.2mA or greater current is measured between the positive terminal of the battery and earth ground. The alarm will clear once the positive ground condition is no longer present. If the charger has Ground Detection disabled, this alarm will not function.

**NEGATIVE GROUND ALARM** will trigger and the red "NEGATIVE GROUND FAULT" LED will turn on if 1.2mA or greater current is measured between the negative terminal of the battery and earth ground. The alarm will clear once the negative ground condition is no longer present. If the charger has Ground Detection disabled, this alarm will not function.

**CHARGER FAIL ALARM** will trigger and the red "CHARGER FAIL" LED will turn on when one of the following conditions are present: Simultaneous Low DC Voltage and Low DC Current, Ramp Up Failure, Equipment Over Temp, or High Voltage Shutdown.

**EQUIPMENT OVER TEMP ALARM** occurs when the temperature probe mounted on the SCR Heatsink Assembly reaches a temperature in excess of 110°C. Under these conditions, the charger will shut down the DC output. When the heatsink temperature returns to below 85°C, the alarm is automatically cleared and the charger will resume normal operation. The Equipment Over Temp Alarm has no dedicated LED or relay contacts. However, it is part of the Summary and Charger Fail alarms.

**BATTERY OVER TEMP ALARM** is triggered when either the internal or external temperature probe reaches a temperature exceeding the Battery Over Temperature alarm threshold. This is simply an alarm; it will NOT shut down the charger. It has no dedicated LED or relay contacts. When the Battery Over Temperature alarm is triggered, a message is shown on the display. It is part of the Summary alarm.

**BATTERY TEST ALARM** is triggered when the battery test is initiated, manually or automatically, and the DC bus voltage falls below one of the alarming thresholds. When the battery test is started, the charger voltage will drop to the appropriate test voltage (1.85 V/C for lead acid or 1.2 V/C for Nickel Cadmium). After 1 minute, the charger will take a reading of the DC bus voltage and indicate one of three conditions:

- "Batt. Cont. Test Pass" – DC voltage higher than 2.0 V/C LA or 1.3 V/C NC
- "Check Battery" – DC voltage between 1.9 V/C and 2.0 V/C LA or 1.25 V/C and 1.3 V/C NC
- "Batt. Cont. Fail" – DC voltage is below 1.9 V/C LA or 1.25 V/C NC

**NOTES:**

1. V/C – Volts per Cell, LA – Lead Acid, NC – Nickel Cadmium
2. If Check Battery and/or Batt. Cont. Fail is assigned to a relay, it will also be triggered.

**SD CARD REMOVED ALARM** is triggered when a microSD card is not detected on the microSD card slot.

**SUMMARY ALARM** is triggered when any of the following alarms are activated:

- |                            |                    |                              |                      |
|----------------------------|--------------------|------------------------------|----------------------|
| • Low DC Voltage           | • Positive Ground* | • Temperature Probe Failure  | • Open DC Breaker*   |
| • High DC Voltage          | • Negative Ground* | • Ramp Up Failure            | • Battery Over Temp* |
| • Low DC Current*          | • End of Discharge | • Equipment Over Temperature | • Remote Shutdown*   |
| • Battery Continuity Fail* | • Overload*        | • Open AC Breaker*           | • Float Current*     |
| • AC Failure*              | • Check Battery*   | • CANbus Bus Off*            |                      |

\* Optional to include in Summary alarm.

Most alarms have adjustable time delays to energize; ranging from 0 through 300 seconds. Refer to Table 7 for the factory setting of each alarm.

All alarms contacts for the A77 are designed to be fail-safe. In other words, if both the AC and DC power are removed, each alarm will be indicating in its correct state. All relay contacts are shown in the de-energized state on schematics. Customer alarm connections should be made accordingly. Refer to the table below.

**NOTE:** *Ground Detection should only be enabled on one charger when load sharing. See Section 2.8.1 to disable Ground Detection.*

### 2.5.3 Alarm Connection Procedure

Before making any connections to the A77, ensure that the AC Power is off at the main breaker box and that both of the charger's breakers are off. Verify that no voltage is present by using a voltmeter at all input and output terminals.

If it is desired that the annunciator be active until the alarm triggers, connect the annunciator leads to the **NO** and **C** contacts of the desired alarm (refer to Figure 8 for location). If it is desired that the annunciator be activated after the alarm triggers, connect the annunciator leads to the **NC** and **C** contacts of the desired alarm.

Relay Function	Logic
AC Power Failure	De-Energize on Fail
Summary	De-Energize on Fail

*Table 6 – Standard Alarms Relay Logic*

**NOTE:** *If any of the alarms are set to latching, the alarms will not clear automatically as part of the start-up procedure. After the charger has completed the start-up, the alarms must be cleared using the Alarm Reset function in the menu.*

### 2.6 Temperature Compensation Connection

The battery's Float and Equalize voltages are specified at a nominal temperature of 25°C (77°F). However, a battery's charging requirements change with cell temperature. If the battery temperature deviates by more than a few degrees Celsius from nominal, temperature compensation should be used to optimize the charger output for battery life.

As the battery temperature increases above 25°C, the charge voltage must decrease to maintain the target Float current. If the battery temperature decreases below 25°C, the charger voltage must increase to maintain the target Float current.

The A77 temperature compensation rate can easily be adjusted in the menu from the default setting OFF to 1mV/°C/cell, up to 5mV/°C/cell for chargers set up for Lead Acid batteries and up to 3mV/°C/cell for chargers set up for NiCad batteries. The temperature compensation considers 25°C as the nominal ambient temperature and adjusts the voltage level based on the difference between the actual temperature and 25°C. The battery manufacturer should be consulted for the proper temperature compensation slope, as well as the Float and Equalize voltage set points.

**Example:** *Temperature Compensation rate has been set to 3mV/°C/cell, with 60 Lead Acid cells, and the probe reads 40°C.*

- *The temperature deviation is (25-40) = -15°C*
- *3mV x -15°C x 60 cells = -2.7V.*
- *Therefore, the charger's output voltage will then be 2.7V less than the set point voltage at the nominal 25°C.*

An internal temperature probe is standard and will compensate for overall ambient temperature changes if the batteries and charger are in the same room. The accuracy of temperature compensated charging can be greatly enhanced by using an optional remote temperature probe directly on the battery (Option 11W/11Y).

**NOTE:** *If option 11W or 11Y is included, please refer to appropriate option manual for further instructions.*

## 2.7 Load Sharing Connections

All A77 chargers include the Load sharing feature. Load sharing allows the user to parallel with any identical A77 to actively share a DC load and therefore reduce the strain on each charger. Each is capable of sharing the DC load within  $\pm 5\%$  for individual unit outputs greater than 5% of the total load capacity. Load sharing only needs to be setup once. Upon recovery from an AC power failure, the chargers will automatically re-sync the load share.

**NOTE:** Ground Detection should only be enabled on one charger when load sharing. See Section 2.8.1 to disable Ground Detection.

If load sharing is to be used with a battery that requires periodic Equalize cycles, the chargers should also operate in Remote Equalize mode (See Section 2.7.3 for instructions).

### 2.7.1 Load Sharing Procedure without Batteries/Loads

Preparing for Load Sharing without loads is easier and should be considered first, if possible.

1. Power up the chargers without anything connected on the output. Adjust the Float and Equalize output voltages of each individual charger to same desired level.
2. Turn off all chargers.
3. Connect the DC output of all chargers in parallel to the same DC load/battery. Refer to figure below for details.
4. Connect the **Load Share-Enable** terminal of one charger to the **Load Share-Enable** terminal of the second charger. Repeat if using more than two chargers. This connection can be made with a 16 AWG (1.5mm<sup>2</sup>) wire. Refer to figure below.
5. Turn on all chargers.

### 2.7.2 Load Sharing Procedure with Batteries/Loads

1. Connect the DC output of all chargers in parallel to the same DC load/battery. Refer to figure below for details.
2. Connect the **Load Share-Enable** terminal of one charger to the **Load Share-Enable** terminal of the second charger. Repeat if using more than two chargers. This connection can be made with a 16 AWG (1.5mm<sup>2</sup>) wire. Refer to figure below.
3. Turn on all chargers.
4. Once batteries are fully charged and/or loads are stabilized, turn off all chargers except for one.
5. Take a voltage reading on the output of the charger and adjust the Float output voltage to desired level.
6. Turn on the next charger, turn off the first charger.
7. Set the output voltage of the second charger to match the first.
8. Repeat steps 6 and 7 for the rest of the chargers if more than two chargers are used.
9. After all chargers have been adjusted, turn on all chargers.

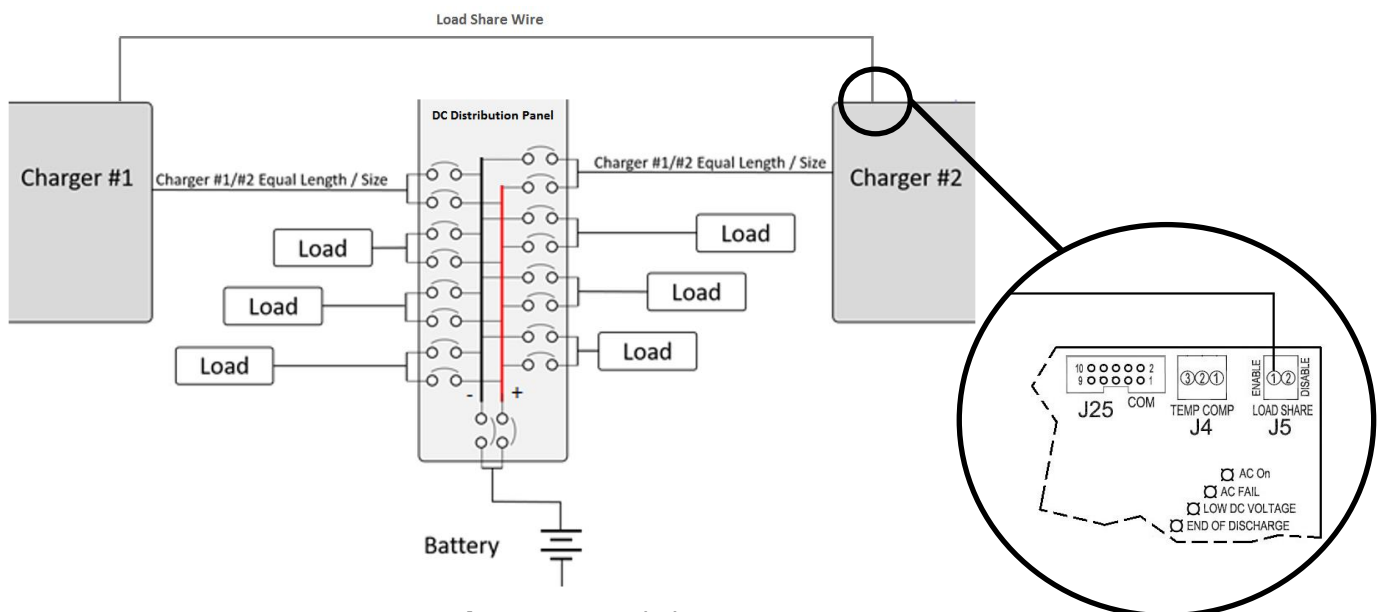


Figure 9 – Load Sharing Connection

### 2.7.3 Remote Equalize/CAN bus Connections

When chargers are connected for Load Sharing, they must also be set up to switch into Equalize at the same time. This can be accomplished by using the Remote Equalize function of the charger. In addition to wiring the Load Share wire, the chargers' CAN bus communication ports must be connected together for Remote Equalize. This can be accomplished by using La Marche part number S8-A77-LS-REQ-15FT-1, pictured in Figure below.

Regarding the CAN bus connections, the CAN bus data cables need to be 18 or 20 AWG twisted shielded pair with ground conductor, compliant to SAE J1939 specifications. The maximum CAN bus data cable length is 100 meters (328 feet). In case longer CAN bus data cables need to be used for communication, please consult the factory for further instructions.

**NOTE:** If the user does not intend to use the Equalize function (VRLA batteries), the Remote Equalize connections are not required.

1. Turn off all chargers.
2. Assure all chargers are wired properly for load sharing. Refer to Section 2.7.
3. Connect CAN bus terminal J2 **Pins 1, 2, & 3** of Charger #1 to the CAN bus terminal J2 **Pins 5, 6, & 7** of Charger #2. Refer to figure below.
4. If using more than two chargers, CAN bus can be chained. Connect CAN bus terminal J2 **Pins 1, 2, & 3** of Charger #2 to the CAN bus terminal J2 **Pins 5, 6, & 7** of Charger #3, and so on.
5. Turn on all chargers' AC breakers.
6. Enable Remote Equalize in the Settings menu:  
(Menu → Advanced → Equalize Mode → Enable Remote Equalize)
7. Turn on all chargers' DC breakers.
8. Confirm Remote Equalize functionality by pressing the Equalize button on one of the chargers and verify all other charger(s) change into Equalize mode as well.

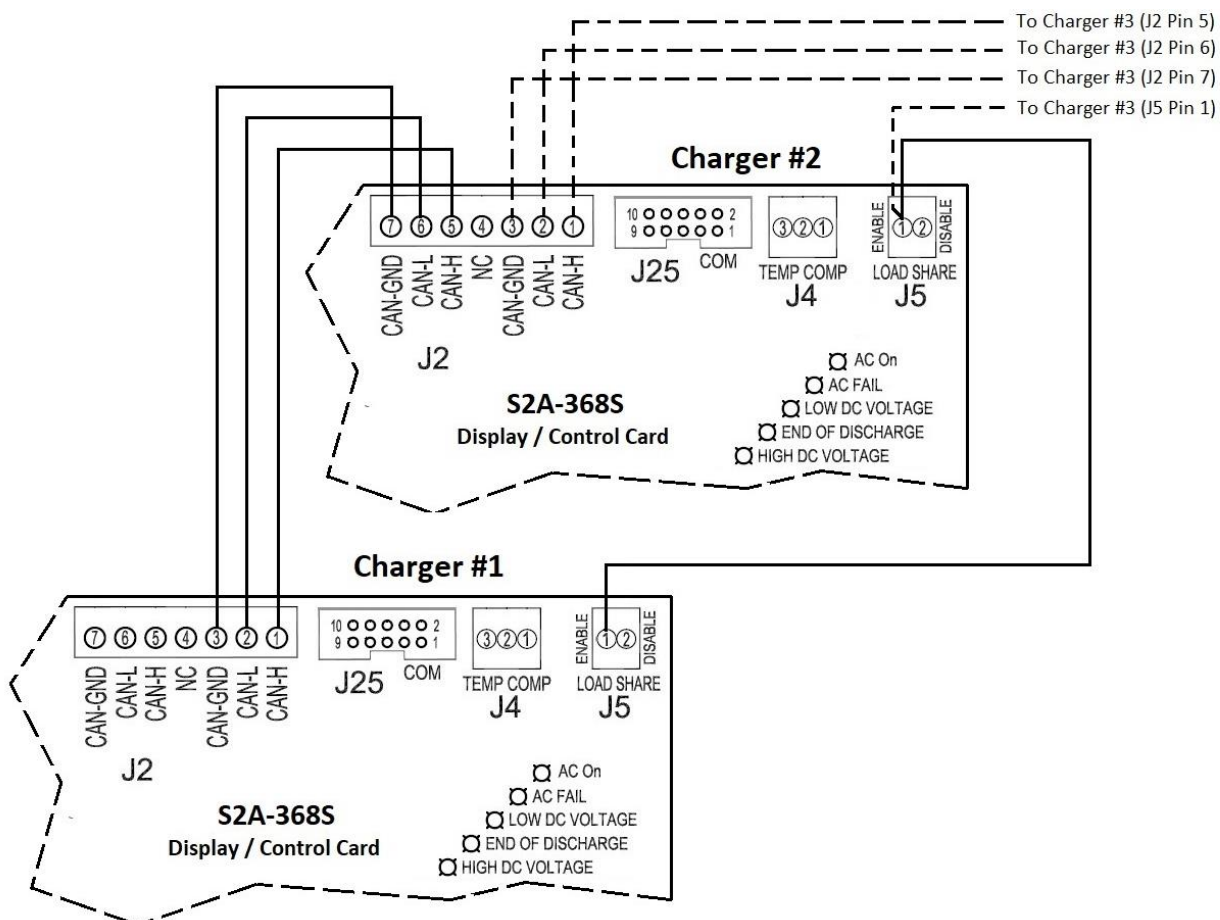


Figure 10 – Remote Equalize/CAN bus Connections

## 2.8 Ground Detection Connection

Ground Detection is available on all A77 chargers. The purpose of Ground Detection is to determine if the battery or loads have become grounded. If the battery or loads are set up as Floating, it is recommended that Ground Detection be enabled. When Ground Detection is enabled, a positive or negative ground fault indicator will energize upon detection of the specified ground. The Ground Detection circuitry monitors the amount of ground current, whether it is positive or negative, and will alarm when the threshold of 1.2mA is reached (or exceeded).

A77 chargers are shipped from the factory with Ground Detection enabled by default. It is recommended that Ground Detection be disabled if the battery or loads are either positively or negatively grounded. Additionally, the charger will show a ground fault at all times if the system is known to be grounded and the Ground Detection is enabled.

For A77 chargers which are set up to load share, only one charger should have Ground Detection enabled. All other chargers must have Ground Detection disabled (See Section 2.8.1 for steps). If an external Ground Detection system is used, the A77 Ground Detection must be disabled.

Adjustable Ground Detection Sensitivity is available for A77 chargers with option 19U. This option allows the user to adjust the Ground Detection alarm threshold from 1.0mA to 4.0mA.



**WARNING:** With Ground Detection enabled, the A77 charger will contribute approximately 5mA from either the positive or negative to ground on a dead short condition.

### 2.8.1 Ground Detection Connection Procedure

Before making any connections to the A77, ensure that the AC Power is off at the main breaker box and that both of the chargers' breakers are off. To disable Ground Detection, move the green Ground Detection wire to the **Gnd Detect-Disable** terminal of the J31 connector on the 368S board. To enable Ground Detection, move the green Ground Detection wire back to the **Gnd Detect-Enable** terminal of the J31 connector on the 368S board. Refer to the figure below.

**NOTE:** If the charger has option 19U, Ground Detection can be disabled by disconnecting the J3 connector from the S2A-417S board. Refer to the figure below.

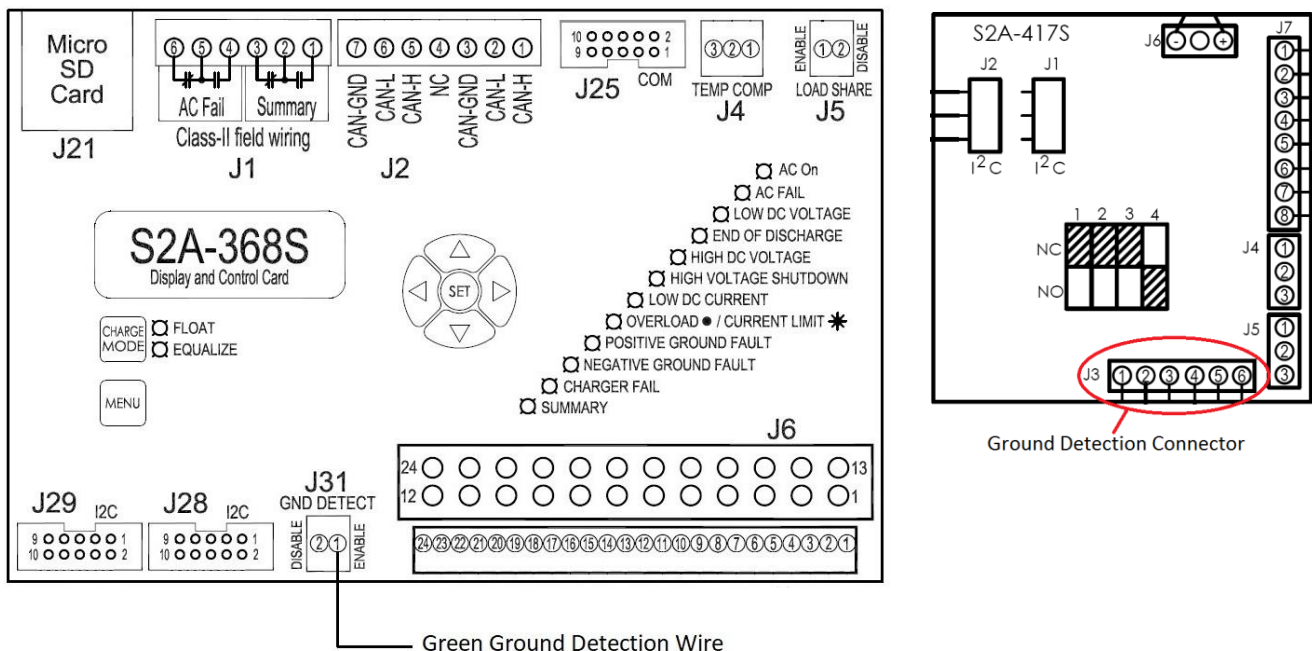


Figure 11 – Ground Detection Connections

### 3 Operation

#### 3.1 Starting the A77

All equipment is shipped from the factory fully checked and adjusted based on the model number. Do not make any adjustments unless the equipment has been powered up and the settings have been determined to be incorrect. Check with battery manufacturer for recommended settings.

#### Factory Settings

The adjustable factory settings of the A77 are based on the model number, unless otherwise specified. All chargers are set at the factory with the following settings (as shown in Table 7):

Parameter	Lead Acid	VRLA	Nickel Cadmium	Lithium Ion				Delay (sec.)
				12V	24V	48V	130V	
Float Voltage	2.17 V/C	2.25 V/C	1.40 V/C	13V	26V	52V	130.2V	
Equalize Voltage	2.33 V/C	2.27 V/C	1.55 V/C	13V	26V	52V	130.2V	
Low DC Voltage	1.98 V/C		1.20 V/C	11.8V	23.7V	47.5V	118.8V	5
Low DC Voltage Reset	5% above Low DC Voltage threshold							
Low DC Current	1% of shunt size							5
Current Limit	110% of nominal output current							5
High DC Voltage	2.45 V/C		1.61 V/C	14.7V	29.4V	58.8V	147V	5
High Voltage Shutdown	2.50 V/C		1.65 V/C	15V	30V	60V	150V	20
Battery End of Discharge	1.75 V/C		1.10 V/C	6V	21V	42V	105V	5
End of Discharge Reset	2.05 V/C		1.28 V/C	13.3V	24.6V	49.2V	123V	
	5% above End of Discharge threshold							
Equalize Timer Mode	Automatic Equalize Off (Mode P0)			Disabled (Mode P5)				
Equalize Time	8 Hours							

*Table 7 – Factory Default Values*

**NOTE:** V/C – Volts/Cell, LA – Lead Acid, VRLA – Valve Regulated Lead Acid, NC – Nickel Cadmium, LON – Lithium Ion

#### Checking the Installation

Before attempting to start up the A77, verify that all connections are correct. Assure all terminations and contacts are tightened securely. Assure the transformer is set for the correct voltage and the input frequency matches the charger's nameplate. Assure the battery/load voltage matches the DC output voltage on the charger's nameplate.

#### Start-Up Sequence

1. Close the AC Breaker. The charger LEDs should flash and firmware version should show on the display for approximately 2 seconds.
2. The charger output will slowly ramp-up to the target voltage (This can take up to 60 seconds).
3. Certain alarms will be active during ramp-up. These alarms will clear as the voltage climbs above the alarm thresholds.
4. Close the DC Breaker.

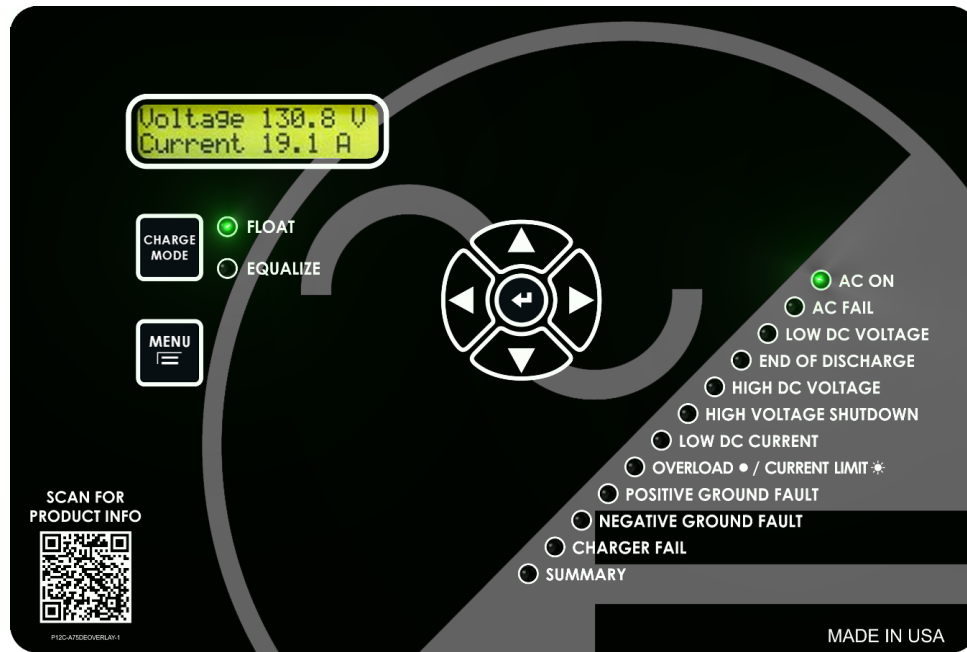
**NOTE:** If any of the above alarms are set to latching, the alarms will not clear automatically as part of the start-up procedure. After the charger has completed the start-up, clear the alarms using the Alarm Reset function in the menu.

#### Power Down Sequence

To power down the A77 charger, first open the charger AC Breaker, then open the charger DC breaker(s).

### 3.2 Digital Control Board

The A77 is equipped with a microprocessor controller. This makes the A77 more user-friendly and provides new helpful features to the user.



**Figure 12 – A77 Front Panel**

After the A77 has completed the startup sequence, the AC ON and FLOAT LEDs should be on and the display should show the output voltage and current as pictured above. The parameter displayed can be changed by pressing either the UP or DOWN arrows on the membrane.

The parameters viewable on the idle display are as follows:

Voltage 130.8 V Current 19.1 A	System DC Output	Next Batt. Test: OFF	Time Until Next Battery Test
Float Monitor #1 1.359A 130.55V	Float Monitor Battery Voltage and Current <small>*Only available as part of option</small>	Temp Comp Probe 31C/87F	Internal/External Probe Temperature
POS-GND 65.4 V GND-NEG 65.4 V	Output Voltage Balance <small>*Only available as part of option 19U</small>	Temp Comp Corr. -0.2 V	Temperature Compensation Correction
POS GND 0.00 mA NEG GND 0.00 mA	Ground Current <small>*Only available as part of option 19U</small>	Date 2/5/2015 Time 11:54:19	Charger Clock Date and Time
PHASE3 241.3 VAC /LINE3 10.3 AAC	Phase 3 AC Metering <small>*Only available as part of option 19V</small>	Logging Status OK 0.01 Pct	Logging Status
PHASE2 241.3 VAC /LINE2 10.2 AAC	Phase 2 AC Metering <small>*Only available as part of option 19V</small>	EQ Timer Mode PO Auto EQ OFF	Selected Equalize Timer Mode
PHASE1 241.4 VAC /LINE1 10.3 AAC	Phase 1 AC Metering <small>*Only available as part of option 19V</small>	Next Auto EQ in: OFF	Time Until Next Equalize Cycle
AC Frequency 60.0Hz	Charger AC Frequency <small>*Only available as part of option 19V</small>		

### 3.3 Selecting the Charging Mode

The A77 charger has two different settings for DC output voltage, Float mode and Equalize mode. Float charging mode is used for all normal battery charging needs. Float mode can also be used for battery elimination, which means directly powering the DC load from the A77. Equalize mode is used when it is necessary to Equalize (or balance) the level of charge across all cells present in the battery. Refer to battery manufacturer for recommended Equalize scheduling and parameters.

There are two LEDs on the front panel that indicate the current mode of the charger; the green LED indicates Float mode and the amber LED indicates Equalize mode. If the charger is in Float mode, simply press the CHARGE MODE button to switch into Equalize mode. If the charger is in Equalize mode, it will automatically switch back to Float mode after the designated Equalize time. Additionally, the charger can manually be switched to Float mode by pressing the CHARGE MODE button again.

#### 3.3.1 Equalize Timer Modes

The A77 battery charger has five different modes of Equalize charging operation. The Equalize mode can be viewed on the charger display by pressing the DOWN button. The display will show the Equalize timer mode and a short description. The Equalize timer is eight hours by default and the Equalize timer mode is P0 by default for. Both the timer and the mode can be changed via Settings menu (refer to Section 4.1.3 under *Equalize Timer Hours/ Equalize Timer Modes*). In all of the Equalize modes below, the charger will immediately return to Float mode if the CHARGE MODE button is pressed or when it completes its full Equalize time.

##### Mode P0 (Auto EQ OFF)

Mode P0 is a manual Equalize cycle and is the default setting for lead acid and nickel cadmium chargers. When the charger is set for Mode P0, the Equalize cycle must be activated manually by pressing the CHARGE MODE button. Once activated, the Equalize timer will turn on and the Equalize LED will light. After the timer cycles to zero, the charger will automatically return to Float mode. Equalize mode will not start again until it is manually activated by the user.

##### Mode P1 (7-Day Auto EQ)

Mode P1 is an automatic Equalize cycle that activates every 7 days. The length of the Equalize cycle is determined by the timer setting. After the timer cycles to zero, the charger will automatically return to Float mode. Equalize mode will restart again after 7 days.

##### Mode P2 (14-Day Auto EQ)

Mode P2 is an automatic Equalize cycle that activates every 14 days. The length of the Equalize cycle is determined by the timer setting. After the timer cycles to zero, the charger will automatically return to Float mode. Equalize mode will restart again after 14 days.

##### Mode P3 (30-Day Auto EQ)

Mode P3 is an automatic Equalize cycle that activates every 30 days. The length of the Equalize cycle is determined by the timer setting. After the timer cycles to zero, the charger will automatically return to Float mode. Equalize mode will restart again after 30 days.

##### Mode P4 (Auto EQ on LV)

Mode P4 is an automatic Equalize cycle that is triggered when the battery experiences a sizeable discharge. When the DC voltage drops below the Low Voltage alarm threshold and exceeds the Low Voltage alarm time delay, Mode 4 is activated. However, the Equalize timer will only start and run the charger in Equalize mode for the duration set in the Equalize menu after the charger has raised the battery voltage high enough to clear the Low Voltage alarm. When the Equalize timer expires, the charger will immediately return to Float mode.

##### Mode P5 (Disabled)

Mode P5 completely disables the Equalize cycle and is the default setting for Lithium Ion chargers. The charger cannot go into Equalize mode and the Equalize cycle cannot be activated by pressing the CHARGE MODE button. To utilize Equalize mode, the Equalize timer mode must be set to Mode P0, P1, P2, P3, or P4.



## 4 Controller Menus

The A77 controller is equipped with multiple settings and test menus. Refer to the Appendix B for details on the structure of the charger menus. Access menus by pressing the MENU button on the front panel. Navigate using the UP, DOWN, LEFT, and RIGHT arrows. To enter a submenu, use the ENTER or RIGHT arrow button. While changing a setting, the RIGHT arrow button advances forward one digit and the LEFT arrow button goes back one digit.

### Saving Settings

At any point, the LEFT button can be pressed from the main Settings Menu to exit. When the LEFT button is pressed (on the main Settings Menu), the user is prompted if they would like to "Exit and Save Settings?" If the LEFT button is pressed again, the control board will return to the Settings menu. If "YES" is selected, the display will read "Saving Settings", the menu will be exited, and settings saved. If "NO" is selected the user is prompted to "Exit without Saving?" From this screen if "YES" is selected, the user will be returned to the DC Output Display and all changes to the settings will not be saved. If "NO" is selected, the user will be returned to the settings menu.

### 4.1 Settings Menu

All equipment is shipped from the factory fully checked and adjusted based on the customer order. Do not make any adjustments unless the equipment has been powered up and the settings have been determined to be incorrect. If the settings have been determined to be incorrect, adjustments may be made as detailed below.

In the Settings Menu, the user can access and change various parameters used by the A77. If the user is at the first digit, the LEFT arrow will discard the change and will step back without saving. While changing a setting, the ENTER button will store the value and step back. At any point, the Settings menu can be exited with or without saving the settings. Press the LEFT button multiple times until "Exit and Save Settings?" displays and follow the prompts.

In addition, settings can be configured remotely. Remote configuration requires that the A77 have an optional communication board. For more information and instructions on remote configuration, see the communication instructions. The communication instructions are included as part of the manual package only if a communication option has been ordered.

**NOTE:** Some chargers may have additional settings included in the Settings menu; contact La Marche for further explanation of settings not mentioned below.

The Settings menu is as follows:

#### 4.1.1 Output Settings

The Output Settings menu allows the user to adjust all settings relevant to the charger output. To access the submenu, select "Output Settings" in the Settings menu and press the ENTER button. Below are the submenus:

##### **Battery Type**

The "Battery Type" option allows the user to set the type of batteries to be charged. This setting affects the volts per cell setting used by the software to determine the charger output voltage. The available cell types are Lead Acid, Nickel Cadmium, and Lithium Ion.

##### **Battery Cells**

The "Battery Cells" option allows the user to set the number of cells to be charged. The number of cells available is based on the nominal charger voltage, as well as the battery type that is selected.

**NOTE:** The Battery Cells option is not available for Lithium Ion chargers.

### ***Float Voltage***

The "Float Voltage" setting allows the user to adjust the Float voltage supplied by the charger. Float voltage is adjustable by both the total output voltage and volts per cell. To change the Float voltage, select "Float Voltage" in the Output Settings menu. To alternate between volts per cell and total output voltage, press the LEFT and RIGHT buttons. Refer to Table 7 for Float voltage adjustment ranges.

### ***Equalize Voltage***

The "Equal. Voltage" setting allows the user to adjust the Equalize voltage supplied by the charger. Equalize voltage is adjustable by both the total output voltage and volts per cell. To change the Equalize voltage, select "Equal. Voltage" in the Output Settings menu. To alternate between volts per cell and total output voltage, press the LEFT and RIGHT buttons. Refer to Table 7 for Equalize voltage adjustment ranges.

### ***Current Limit***

The Current Limit adjustment allows the user to adjust the maximum current output of the charger. The Current Limit is adjustable between 50% and 115% of the nameplate rating, with a default setting of 110%. The Current Limit setting is adjustable in 0.1A increments.

## **4.1.2 Alarm Settings**

The Alarm Settings menu provides access to adjust basic settings related to the alarms. The user can set the threshold values that trigger an alarm and which alarm conditions are included in the Summary alarm. The alarm time delays and the function of alarm relays can be set in Advanced Alarm Settings (see Section 4.1.3). Below are the submenus:

### ***Alarm Thresholds***

The Alarm Thresholds setting allows the user to determine the value at which an alarm triggers. The threshold can be changed for the following alarms: High DC Voltage Shutdown, AC Failure, Low DC Current, Low DC Voltage Alarm Reset, Low DC Voltage, End of Discharge Reset, End of Discharge, High DC Voltage, Battery Over Temperature and other optional alarms which may be included on the charger.

When an alarm threshold value is changed and ENTER is pressed, the charger immediately uses these new values. However, if the user exits out of the Settings Menu without saving, the threshold values will revert to the previously set thresholds.

### ***Alarms Included in Summary***

The "Incl in Summary" setting allows the user to choose whether or not to include the Low Current, Ground Detection, AC Failure, CAN bus BUS OFF, Check Battery, Battery Continuity Fail, Battery Over Temperature, and other optional alarms which may be included on the charger as part of the Summary Alarm.

### ***Load Basic Default Settings***

The "Basic Default" menu allows the user to load the factory default settings for all parameters not included in the Advanced Settings menu. Loading basic default settings will not reset any settings included in the advanced section of the Settings menu.

## **4.1.3 Advanced Settings**

The Advanced Settings Menu allows the user to access and modify other parameters of the charger which are not included in the basic settings menu (refer to the A77 flowchart on Section 4.0).

### **AC Volts Scale**

The "AC Volts Scale" option is included for chargers that have multiple input taps. This setting adjusts the scaling used to measure the charger's AC voltage. If the charger has a single input voltage, do not adjust this setting as it affects the AC Failure alarm.

### **Equalize Mode Settings**

The "Equalize Mode" menu provides access to set the Equalize Timer Hours, Equalize Timer Mode, and Remote Equalize Settings. Below are the submenus:

### ***Equalize Timer Hours***

The Equalize Timer Hours setting changes the amount of time that the charger remains in the Equalize charging cycle once activated. When an Equalize cycle is started, the charger will remain in Equalize mode until the time selected by this setting has passed. The Equalize timer can be set between 1 and 255 hours. By default, the Equalize timer is set for 8 hours.

### ***Equalize Timer Mode***

The Equalize Timer Mode determines when the charger will go into an Equalize charging cycle. The timer modes are P0 (Auto EQ OFF), P1 (7 Day Auto EQ), P2 (14 Day Auto EQ), P3 (30 Day Auto EQ), P4 (Auto EQ on LV), and P5 (Disabled). The default setting for the Equalize timer mode is P0 (Auto EQ OFF) for Lead Acid and Nickel Cadmium chargers and P5 (Disabled) for Lithium Ion chargers. Refer to Section 3.3.1 for further details.

### ***Remote Equalize***

Remote Equalize enables two or more chargers connected in parallel to enter Equalize simultaneously. In order for Remote Equalize to function, there must be additional wires connected linking all chargers together. To properly wire chargers for Load Sharing/Remote Equalize, see Section 2.7. To enable Remote Equalize, select "Enbl Remote Eq" in the Equalize Mode menu and select YES.

### **Temperature Compensation**

Temperature Compensation is a standard feature of the A77 charger and is set to OFF by default. Temperature Compensation adjusts the output voltage of the charger based on the temperature at the probe. To enable Temperature Compensation, select "Temp. Comp." in the Advanced Settings menu and adjust accordingly. Temperature Compensation is adjustable between 1mV to 5mV/cell/°C.

**NOTE:** *Temperature Compensation is not available for Lithium Ion chargers.*

### **Advanced Alarm Settings**

The "Advanced Alarm Settings" menu provides access to set the Alarm Delay, set Alarm Operation (Latching Alarms), Relay Mapping (46R option only), Relay Logic (46R option only) and to disable Battery Over Temperature Alarm. The submenus are as follows:

#### ***Alarm Delay***

The Alarm Delay setting allows the user to determine the time delay between the alarm condition and alarm indication. If an alarm condition returns to normal before the delay time, the alarm will not indicate. The delay can be changed for AC Failure, Low Voltage, End of Discharge, High Voltage Shutdown, High Voltage, Low Current, and Ground Detection. The delay for all alarms is adjustable between 1-255 seconds. The delay defaults are shown on Table 7.

#### ***Alarm Operation***

The Alarm Operation setting defines if the alarms relays latch. If any alarm contacts are set to latch, the alarm will not clear until the "Reset Alarms" option is selected out of the main menu, even if the alarm condition returns to normal.

By default, no alarms are set to latch except High Voltage Shutdown (HVSD). These alarms will clear after the condition returns to normal.

**NOTE:** *The HVSD alarm latches by default and cannot be changed.*

#### ***Alarm Disable***

The Alarm Disable setting allows the user to disable the Battery Over Temperature Alarm, along with the optional Electrolyte Level, DC Breaker Open, and AC Breaker Open alarm.

#### ***Relay Mapping***

The Relay Mapping setting allows the user to assign alarms to relays provided in the 46R option. Refer to the 46R option manual for further details.

### ***Relay Logic***

The Relay Mapping setting allows the user to change the setting of each relay to energize or de-energize in their normal state. Refer to the 46R option manual for further details.

### **Communications Settings**

Upon selecting "Comm. Settings," the user will be given access to MODBUS or DNP3 communication settings depending on the type of communication option included in the charger, as well as communication statistics. For communication board configuration details, refer to the communication instructions included with the manual.

### **Set Clock**

The "Set Clock" setting allows the user to program the real-time clock used by the software. This clock is used in the data logging to timestamp events. In addition, the clock can be reset which returns the clock to the date setting of software revision.

### **Logs and Files**

The "Logs and Files" menu allows the user to access the A77 Data Log and make changes to the Data Log settings. It also allows downloading and uploading charger configuration files. The submenus are as follows:

#### ***Data Logging***

The A77 now includes data logging as a standard feature. The log file is written as a .csv file. The "Data Logging" menu allows the user to adjust settings related to data logging. For more information on data logging, see Section 5.

#### ***Enable Event Logging***

The "Enbl Event Log" option allows the user to enable Event type logging. By default, Event Logging is enabled.

#### ***Log Interval***

The "Log Interval" option allows the user to set the interval that data is logged. By default, the interval is set to 60 minutes, but can be adjusted from 1 to 60 minutes.

#### ***Initialize***

To initialize a memory card for use in the A77, select "Initialize" from the "Config Files" menu and follow the prompts. Initializing a microSD card will erase all data from the card; it is required to use a blank and formatted microSD card for use. Refer to Section 5.0 under *Formatting the MicroSD Card* for formatting instructions. A memory card only needs to be initialized once. After it has been initialized in a charger, it can be used in any other A77 charger without being initialized again.

#### ***Remove Drive***

The "Remove Drive" option must be used prior to removing the microSD card from an energized charger. This prevents damage to the microSD card data. Refer to Appendix C for removal instructions.

#### ***Insert Drive***

The "Insert Drive" option must be used prior to installing the microSD card into an energized charger. This prevents damage to the microSD card data.

#### ***Config Files***

The A77 charger enables the user to save and load a configuration .cfg file to an installed microSD card. A saved configuration file can be loaded to multiple A77 chargers to ease set up time if an installation has more than one A77 charger. Take into consideration all A77 chargers must be of the same model number and firmware version. The "Config Files" menu contains the options for saving or loading a configuration .cfg file. In order to properly transfer a configuration file, a microSD card must be initialized first. After the memory card has been initialized, the configuration can be saved.

To load an existing configuration file, insert a microSD card with a previously saved configuration file. Select "Load Config" from the "Config Files" menu and follow the prompts. After a configuration .cfg file is loaded, it is recommended to check the settings to verify that they are correct for each charger.

To save a configuration file, insert a microSD card into the S2A-368S board, initialize the memory card, and select "Save Config" in the "Config Files" menu. If a configuration .cfg file already exists, it will be overwritten.

**NOTE:** *In order to prevent data loss, the "Remove Drive" option must be selected before physically removing the microSD card.*

### **Save Settings**

The "Save Settings" menu allows the user to create a read-only customer and factory settings .csv file which is saved into the inserted microSD card. The files contain supportive information on factory settings of the charger and the customer settings of the charger. Should any issues arise and service department is required to be contacted, these files may be downloaded.

### **LCD Settings**

The "LCD Settings" option allows the user to control the LCD backlight. By default, the LCD backlight automatically turns off after two minutes. The user may also set it to be always on.

### **Security**

The "Security" menu allows the user to set a password to enter calibration. By default, the password is disabled. To enable the menu password, enter the Settings Menu by pressing the Menu button on the front panel. Navigate to Advanced → Security → Password Enable. Select YES and enter "0000". Navigate to "Set Password". Set password to desired four-digit pin. Make sure to save this new number as it will be necessary to access the menu after enabling the security feature. If the security feature is decided to be disabled at a later time, reset password to "0000" following the same steps previously mentioned.

**NOTE:** *If a password is set, no changes can be made within this menu without knowing the password. In case the password is forgotten or lost, consult factory for password reset.*

### **Serial Number**

The "Serial Number" setting allows the user to change the serial number associated with the S2A-368S board. This serial number is the serial number of the A77 charger and is set at the factory for new chargers. If a user receives a replacement S2A-368S board, the serial number will have to be set via calibration.

In order to change the serial number used by the software, select "Serial Number" from the Settings menu and press the ENTER button. Each digit of the serial number is adjusted individually. Press the LEFT and RIGHT buttons to select digits. If the leftmost digit is selected, pressing left will exit the serial number setting and discard changes. Press the UP and DOWN buttons to increase and decrease the selected digit.

### **Set to Default**

The "Set to Default" option resets all user-adjustable settings to the factory defaults. It is important to note that the factory defaults are not necessarily the correct settings for the specific DC system. Before the charger is shipped, adjustments are made at the factory using the same calibration procedure. If the charger is reset to default, these factory changes may be reset.

*Ex: The software default for a 130VDC charger is based on 60 Lead Acid cells, a 62L charger is factory adjusted for a higher voltage. Returning to default will return the charger to a 60L voltage setting.*

### **Firmware Menu**

The Firmware Menu allows the user to view the firmware version, as well as update the firmware if desired. The submenus are as follows:

#### **Firmware Version**

The menu allows the user to view the current firmware version of the charger.

#### **Update Firmware**

The A77 firmware can be updated, as a standard feature, via a microSD card. To update the firmware, follow the procedure below:

**NOTE:** If more than one firmware .bin file is on the microSD card, the bootloader will not program or reprogram the flash and will show a message saying, "More than 1 file found!" and will loop forever.

If no firmware .bin file is on the microSD card and the program flash is empty, the bootloader will loop forever and display the message "No update file found!"

1. Save the settings .csv files by following the steps shown on the previous page under *Save Settings*.
2. Remove the microSD card by entering the Settings Menu: (Menu → Advanced → Logs and Files → Remove Drive).
3. Insert the microSD card into the computer using a microSD card converter.
4. Back up all files in the microSD card to the computer.
5. Format the microSD card by following the steps under *Formatting the microSD Card* on page 27.
6. Find the firmware .bin file provided and upload it into the microSD card.
7. Safely remove the microSD card from the computer and insert it on the A77 charger's microSD card slot by following the installation instructions in Section 5.0 under *Installing/Removing the MicroSD Card*.
8. Update the firmware by entering the Settings menu: (Menu → Advanced → Firmware Menu → Update Firmware)
9. Enter the password provided (must contact La Marche Service Department) and select YES when prompted to update the firmware. The charger will start to program itself. Do not interrupt the power or the board while it is programming!
10. Save the settings .csv files once again, as well as the configuration .cfg file by following the steps shown on the previous page under *Save Settings* and *Config Files* respectively.

### Over Temperature Probe Status

The "OT Probe Status" menu allows the user to view the temperature readings of the over temperature probe installed in the charger.

## 4.2 Test Menu

All equipment is shipped from the factory fully tested and operational. As part of planned maintenance, customers may want to be able to re-test functionality of the alarm LEDs and relays. The test menu allows the user to test both the LEDs on the display board as well as any alarm relay contacts. The submenus are as follows:

### Test LEDs

The Test LEDs menu allows the user to run a basic lamp test on the A77. After selecting this menu, press the "ENTER" button to light all of the LEDs on the display membrane. To end the LED test, press the LEFT button.

**NOTE:** Any additional LEDs on auxiliary boards will not be affected by this LED test.

### Test Relays

The test relays menu allows the user to test the functionality of the alarm relay contacts. The menu allows for each contact to be tested individually, or all at once. When a relay is being tested, its contacts will change state. This means if a relay is in the alarm state, it will change to the non-alarm state during relay testing and if a relay is in the non-alarm state, it will change to the alarm state during relay testing.

**NOTE:** If the charger was not supplied with the 46R option package, the alarms relays specific to the S2A-198 alarm board will not be shown in the "Test Relays" menu.

## Test Battery

The Test Battery menu allows the user to manually perform the battery test or setup for a periodic automatic test. The automatic test can be set up to perform the test every 1, 7, 14, 21, 30, and 60 days. However, the following conditions must be met for the charger to initialize a battery test:

- The unit(s) must be in Float Mode
- No alarms must be present
- The load must be less than 50% of the load rating of the charger

The Battery Test alarm, as well as the Summary alarm if enabled, is triggered when the battery test is initiated. Whether initiated manually or automatically, the DC bus voltage will fall below one of the alarming thresholds. When the battery test is started, the charger voltage will drop to the appropriate test voltage (1.85 V/C for Lead Acid or 1.2 V/C for Nickel Cadmium). After 1 minute, the charger will take a reading of the DC bus voltage and indicate one of three conditions:

- "Batt. Cont. Test Pass" – DC voltage higher than 2.0 V/C LA or 1.3 V/C NC
- "Check Battery" – DC voltage between 1.9 V/C and 2.0 V/C LA or 1.25 V/C and 1.3 V/C NC
- "Batt. Cont. Fail" – DC voltage is below 1.9 V/C LA or 1.25 V/C NC

### NOTES:

1. V/C – Volts per Cell, LA – Lead Acid, NC – Nickel Cadmium
2. The Test Battery option is not available for Lithium Ion chargers

## Test Fans

The Test Fans menu allows the user to run a basic fan test on the A77. After selecting this menu, press the "ENTER" button to energize the corresponding fan. To end the fan test, press the LEFT button.

**NOTE:** If the charger was not supplied with fans, the "Test Fans" menu will not be shown.

## 4.3 Reset All Alarms

The "Reset All Alarms" menu allows the user to reset all alarms.

## 4.4 Last 10 Events

Displays the last 10 events that have occurred on the front screen of the charger. This is to be used as a quick reference. If more detail is required, refer to Section 5.0 for the data logging information. The events that are logged are: Alarm Occurrence, Alarm Cleared, Change in Charge Mode, and Charger Reset.

## 5.0 Data Logging

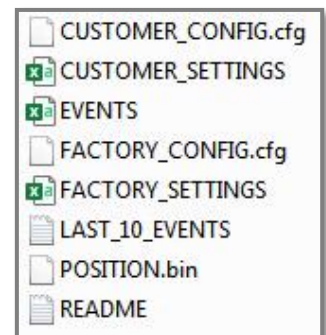
The A77 now includes data logging as a standard feature. The log file is written as a .csv file format which can be opened using Microsoft Excel or any number of free spreadsheet programs. It can even be opened on many modern smartphones. The data logs are written to an included microSD card, which plugs into a slot located at the top left of the S2A-368S board (when looking at the back of the front door). The data log can be set to log Charger Events, as well as to log all data at a specified interval. By default, the log file is set to Events only.

The microSD card can be removed, following the proper menu prompt, and has various files included as seen on the figure aside. The three data files are CUSTOMER\_SETTINGS.csv, EVENTS.csv, and FACTORY\_SETTINGS.csv, which can be downloaded to a computer for easy review. A microSD card reader adapter will be necessary to interface with a computer. Refer to Appendix C for instructions.

**NOTE:** The position.bin file is written to the microSD card. This file is important to the function of the data logging and should never be modified or deleted.

The following guidelines should be taken into consideration:

- Only use microSD cards provided by La Marche.
- Do not use the microSD card for any other purpose besides data logging and firmware updating. Data corruption/microSD card damage may occur.
- Do not touch metal contacts on the back side of the microSD card when handling.
- MicroSD card to be used MUST be blank and formatted. To format the microSD card, install it on a PC and run a full format.



## Events Only Logging

The Events Only Logging records data only when an event occurs. When an event occurs, all charger data points are written to better understand the cause of said event. The events that are logged are: Alarm Occurrence, Alarm Cleared, Calibration Entered, Calibration Closed, Change in Charge Mode, and Charger Reset.

At any event occurrence, the data log file will record the date, time, DC Voltage, DC Current, Over Temperature Probe (°C), Temperature Compensation Probe (°C), as well as the event which occurred.

In addition, if option 19V is installed, each AC phase voltage and AC line current is written to the data log file. If option 19U is installed, the ground voltage and ground current are written to the data log file.

## Interval Logging

Interval Logging records a log file that records data continuously at a specified time interval. In addition, any charger event will be recorded at the time of occurrence. The interval log records all of the same data as is listed above. The default interval when set up is 60 minutes and is adjustable between 1 to 60 minutes with 1-minute increments. Interval Logging can be very beneficial in DC system troubleshooting by keeping a record of all data leading up to a logged event.

## Formatting the MicroSD Card

The microSD card may need to be formatted for the following reasons:

- Installing a new microSD card sourced from a 3<sup>rd</sup> party
- Data on original microSD card has been found corrupt and non-usable
- Other non-charger data has been detected on the microSD card
- If the A77 charger does not recognize the microSD card

There are two acceptable procedures to format the microSD card. It is important that only these two methods are used, as the A77 charger does not run a Windows-style NTFS, FAT, or FAT-32 based sector partition scheme. If the microSD card has been formatted to one of these partition schemes, the card may have trouble maintaining data after several months of records. It should also be noted the microSD card should not contain pictures, microSD card management software, or any other non-intrinsic charger data.

Please be advised that formatting the microSD card will completely erase any data; make a copy of any desired data on your PC prior to formatting. Formatting will create the microSD card sector partitions; these are the blocks where bytes of data are divided and shared.

### MicroSD Card Format Method 1 (Preferred):

The A77 can properly format the microSD card with its built-in initialize function. With the microSD card installed in the charger, press MENU → Settings Menu → Advanced → Logs & Files → Data Logging → Initialize. The charger will ask you if you want to erase all data, select yes. The microSD card is now ready to be used in the charger.

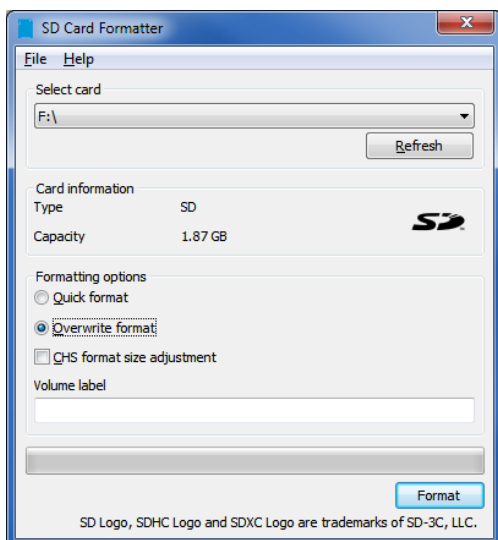
### MicroSD Card Format Method 2 (Requires Internet Connection & Admin Rights):

With the microSD card installed in your PC, go to the following link and follow their directions to install. <https://www.sdcard.org/downloads/formatter/>.

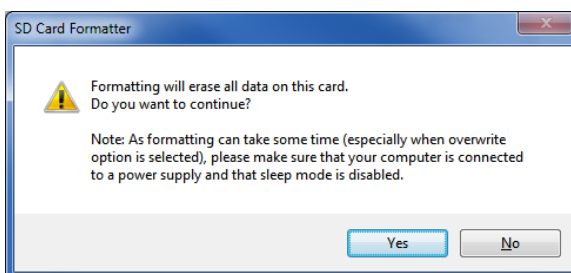
After accepting the terms, it will download a ZIP file containing an installation executable program: "MicroSD Card Formatter"; install the program.

Once installed, insert your microSD card and open the "SD Card Formatter" program (See image below). To format, select the microSD card, check "Overwrite Format", then click "Format". A warning message will be given that formatting will erase all data on the card, click "Yes"; see image. The program will begin to fully format and partition the data sectors. When formatting is complete, an indication message will be received; see image.

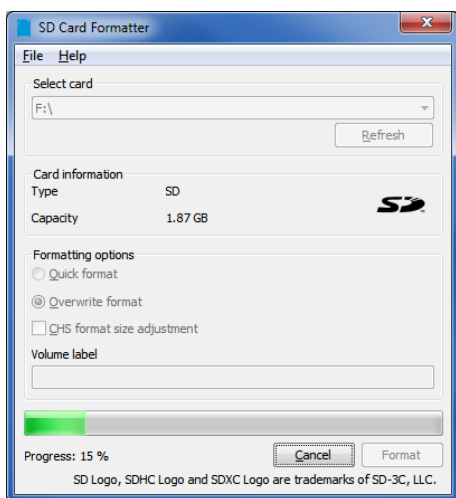




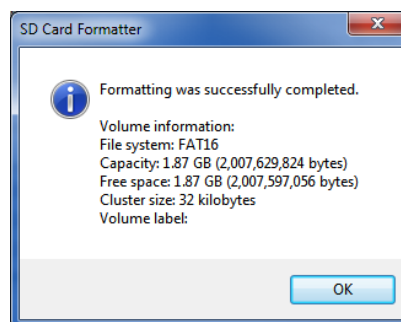
**Figure 1 – SD Card Formatter Program with Overwrite Format Checked**



**Figure 2 – Warning Message About Erasing Data**



**Figure 3 – Formatting in Progress**



**Figure 4 – Formatting Successful Message**

After either format method is complete, it is advised to save the charger's configuration .cfg file to the microSD card. See section 4.1.3 under *Config Files* on how to save the configuration .cfg files.

### Installing/Removing the MicroSD Card

Installing/Removing the microSD card requires opening the door of the battery charger and the necessary precautions must be considered; dangerous voltage can be present inside the charger. Prior to removing or inserting the microSD card, refer to Section 4.1.3 to install or remove the microSD card. Failure to properly remove or install the microSD card can result in corrupt data or microSD card failure. To remove, prompt the Settings Menu for removal, then simply push in to release the microSD card from its mounting slot. To install, prompt the Settings Menu for inserting, then simply push in to insert the micro microSD card into its mounting slot.

### Reading the Log File

The data log file is written as EVENTS.csv. There may be other files written to the microSD card as well, but the events and/or interval logging is written entirely to the EVENTS.csv file.

**NOTE:** A hidden file, *position.bin*, is written to the microSD card. This file is important to the function of the data logging and should never be modified or deleted.

Simply open the EVENTS.csv file with the spreadsheet software of choice. The file looks similar to the figure shown below. At any event occurrence (or each specified interval), the data log file will record the date, time, DC Voltage, DC Current, Over Temp. Probe (°C), Temp. Comp. Probe (°C), as well as any event that occurred.

LaMarche Mfg. Company A77DE Event Log File																		
Created on 01/24/2015 at 16:03:39																		
Charger Serial Number 000000-00																		
Firmware P368S0000																		
Date	Time	DCV (V)	LS_DCV (V)	DCA (A)	ACV (V)	OT PROBE	TC PROBE	PHASE 1 (ACV)	PHASE 2 (ACV)	PHASE 3 (ACV)	PHASE 1 (ACA)	PHASE 2 (ACA)	PHASE 3 (ACA)	POS GND	NEG GND	GND to NEG (V)	POS to GND (V)	Event
1/24/2015	15:01:40																	Charger Reset
1/24/2015	15:01:40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Float Mode
1/24/2015	15:01:51	18.6	21.8	8.1	208	31	29	212.9	213.5	213.7	3.3	0.4	0.6	0	0	9.4	9.4	Low Voltage Alarm FAIL
1/24/2015	15:01:51	18.6	21.8	8.1	208	31	29	212.9	213.5	213.7	3.3	0.4	0.6	0	0	9.4	9.4	End of Discharge Alarm FAIL
1/24/2015	15:01:51	18.6	23.3	8.7	208	31	29	212.9	213.5	213.7	3.3	0.4	0.6	0	0	9.4	9.4	Summary Alarm FAIL
1/24/2015	15:02:13	127.2	129.5	45	210.5	31	29	210.6	210.8	210.6	11.6	11.9	11	0	0	64	64.2	Low Voltage Alarm OK
1/24/2015	15:02:13	127.2	129.5	45	210.5	31	29	210.6	210.8	210.6	11.6	11.9	11	0	0	64	64.2	End of Discharge Alarm OK
1/24/2015	15:02:13	127.2	129.5	45	210.5	31	29	210.6	210.8	210.6	11.6	11.9	11	0	0	64	64.2	Summary Alarm OK

**Figure 7 – Events Log Example**

## 6.0 Reflected Harmonics

Rectification:

The standard A77 comes in single and 3-Phase versions having a typical total harmonic distortion between 25→33% ATHD.

## 7.0 Service

All work inside the A77 charger should be performed by qualified personnel. La Marche is not responsible for any damages caused by an unqualified technician.



Before working inside the A77, ensure the AC power is off at the main breaker box and the battery has been removed from the charger's DC output terminals, either by removing the battery cables or exercising the battery disconnect. Verify that no voltage is present by using a voltmeter at all input and output terminals.

### 7.1 Performing Routine Maintenance

Although minimal maintenance is required with La Marche chargers, routine checks and adjustments are recommended to ensure optimum system performance.

#### Yearly

1. Confirm air vents are open. Remove dust and debris from interior of unit.
2. Verify all connections are tight.
3. Perform a visual inspection on all internal components.
4. Check front panel meters for accuracy and LED operation.
5. Measure the output ripple:
  - Without interrupting a live system, measure ripple at the output terminals of the charger with a True-RMS multimeter in the AC-Voltage setting. If the ripple reading is higher than the specified value in the table below, the capacitors are recommended to be replaced.

Charger Nominal Output	AC Ripple Limit
12VDC – 48VDC	30mV RMS
130VDC	100mV RMS
240VDC	200mV RMS

## 7th Year

1. If the charger is consistently operated in higher temperature environments, all capacitors are recommended to be replaced.

## 10th Year

1. Check magnetics, components and wiring for signs of excessive heat.
2. It is recommended to replace all capacitors if not done so at the 7-year interval.

## 7.2 Troubleshooting Procedure

Troubleshooting should be performed only by trained service personnel or experienced electricians. Before setting up any complicated testing or making any conclusions, inspect the charger using the guide below.

Check the following:

1. Check DC output cables, connections, battery type, and number of cells against the charger's rating.
2. Check charger specifications against customer order.
3. Check input connections, input voltage and 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.*

La Marche Service Technicians are available to help with troubleshooting or with scheduling charger service. When calling for a service inquiry or for troubleshooting assistance, be sure to have all of the following information on hand:

1. Equipment model number and serial number.
2. The actual AC input voltage.
3. The DC output voltage with and without the battery.
4. Result of the check of the AC and DC breakers.
5. The actual DC output current and voltage, measured with battery and load connected to charger.
6. Saved/updated Configuration and Event files of the charger (Refer to Section 4.1.3 under *Save Settings*).

**NOTE:** *When ordering replacement parts, drawings, or schematics, provide the model number, serial number, and description of problem, if available.*

La Marche Phone Number: (847) 299-1188  
24-hour **Emergency** Number: (847) 296-8939

### 7.3 Troubleshooting Chart



*Isolate from all power sources prior to performing any interior verifications or part replacements.*

Symptom	Possible Cause
AC Breaker Trips Immediately (High Input Current)	Wrong AC Input Voltage AC Input Taps on Power Transformer are Incorrectly Set Incorrect, Damaged or Loose Cable/Harness Connections DC Output Too High Defective Component on Heatsink Assembly
DC Breaker Trips Immediately (High Output Current)	Incorrect, Damaged or Loose Cable/Harness Connections Incorrect Battery Connected Shorted Output Cables Shorted Battery Cells or Customer Equipment Defective Component on Heatsink Assembly
No Display and No LEDs	No AC Voltage Applied to Charger Charger AC Breaker is open Incorrect, Damaged or Loose Cable/Harness Connections Defective Control/Display Board (S2A-368S)
Failed LED Test	Defective Control/Display Board (S2A-368S) Defective LEDs
Meter Reading Incorrect Voltage or Current	Incorrect, Damaged or Loose Cable/Harness Connections Incorrect Settings on Control Board Defective Shunt Defective Control Board (S2A-368S)
Charger Running Hot	Inadequate Ventilation Ambient is Too Hot
Battery Temperature Too High	Insufficient Cool Down Between Charges Battery Power Demand Too Great Battery Needs to be Equalized
Erratic Operation	Defective Control Board (S2A-368S) Incorrect, Damaged or Loose Cable/Harness Connections Defective Component on Heatsink Assembly Moisture Inside Cabinet Lack of Maintenance High Ambient Temperature
Low Output Voltage or Current	Float/Equalize Voltage settings are Incorrect Charger is in Current Limit Defective Control Board (S2A-368S) Defective Component on Heatsink Assembly
High Output Voltage or Current	Float/Equalize Voltage settings are Incorrect Defective Control Board (S2A-368S) Defective Component on Heatsink Assembly
Ground Detection Fault	Isolate charger from DC system by removing all wires from charger output terminal. If ground fault on charger clears, problem may be on external DC loads, battery, or wires. If ground fault is still present on charger, contact La Marche Service Department for further troubleshooting.

### Ordering Replacement Parts

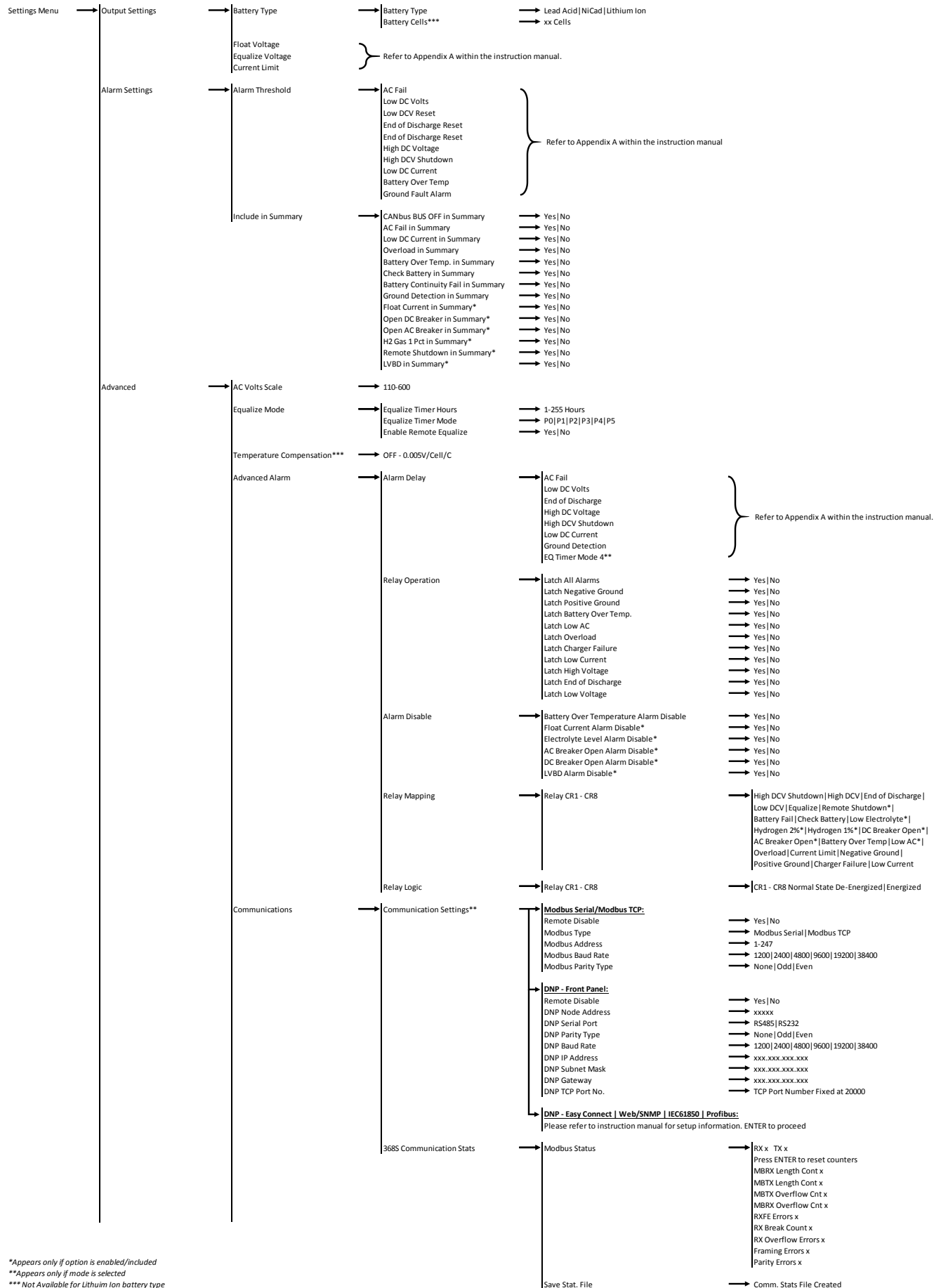
Contact La Marche to place an order for spare or replacement parts. To order replacement parts; please provide the model and serial number of the battery charger, the part needed, and the quantity required.

## Appendix A: Parameter Ranges

Parameter	Lead Acid	Nickel Cadmium	Lithium Ion			
			12V	24V	48V	130V
Float Voltage	1.87-2.45 V/C	1.24-1.61 V/C	6-15V	12-30V	24-60V	60-150V
Equalize Voltage	1.87-2.5 V/C	1.24-1.73 V/C	6-15V	12-30V	24-60V	60-150V
Low DC Voltage	0-2.67 V/C	0-1.78 V/C	0-16V	0-32V	0-64V	0-160.2V
End of Discharge						
High DC Voltage						
High Voltage Shutdown						
End of Discharge Reset	0-20% above End of Discharge threshold					
Low DC Voltage Reset	0-20% above Low DC Voltage threshold					
AC Fail	Disable – 1000V					
Low DC Current	OFF – x.xA					
Current Limit	x.xA					
Battery Over Temperature	25°C – 100°C					
Ground Fault Alarm	1.0mA – 4.0mA					
Alarm Delays	1 – 300 seconds					

**NOTE:** V/C – Volts/Cell, LA – Lead Acid, VRLA – Valve Regulated Lead Acid, NC – Nickel Cadmium, LON – Lithium Ion

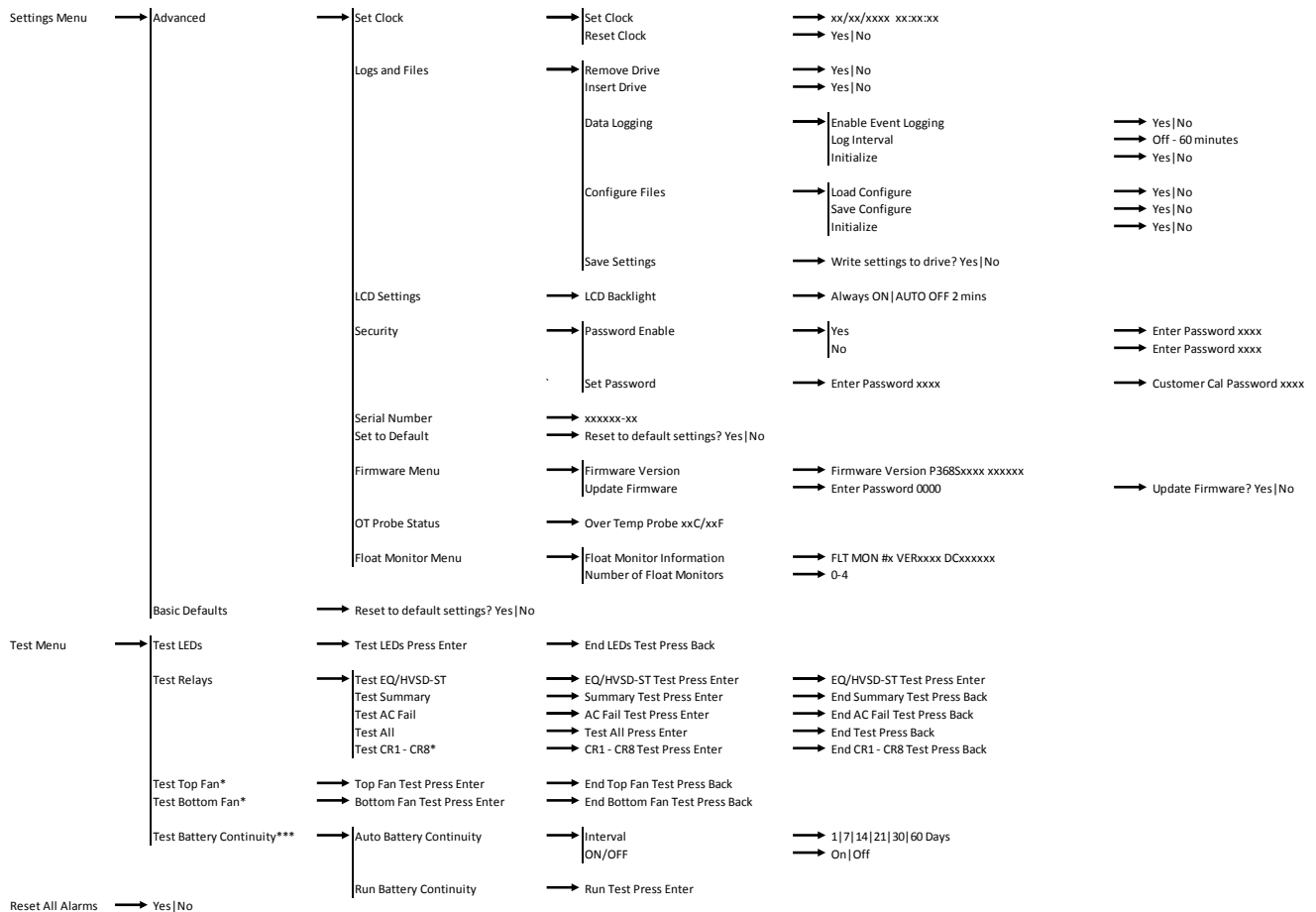
## Appendix B: A77 Menu Structure Flowchart



\*Appears only if option is enabled/included

\*\*Appears only if mode is selected

\*\*\* Not Available for Lithium Ion battery type



Last 10 Events

\* Appears only if option is enabled/included

\*\* Appears only if mode is selected

\*\*\* Not Available for Lithium Ion battery type

## Appendix C: MicroSD Card File Retrieval Instructions

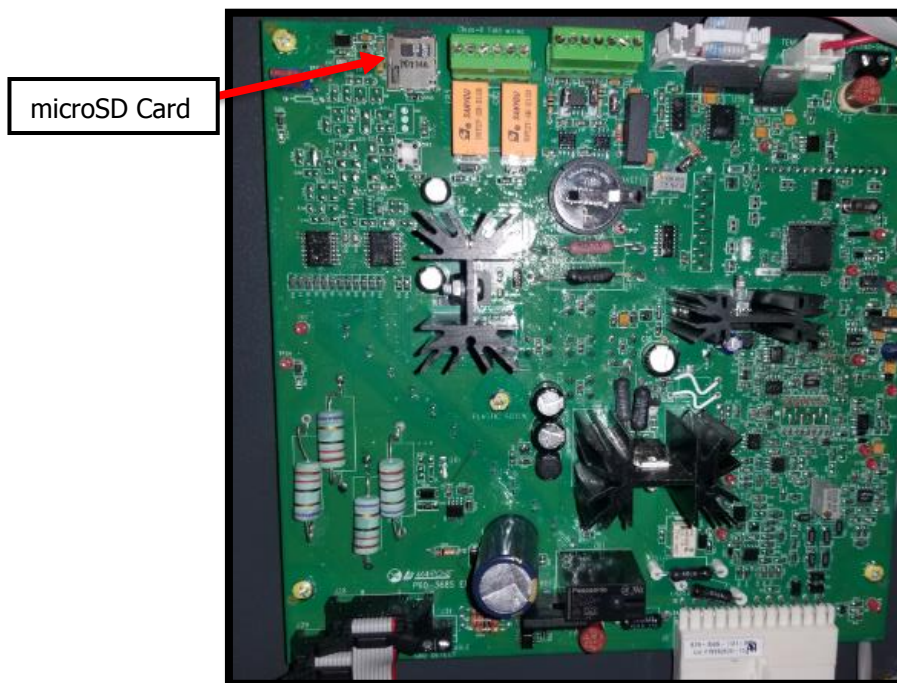
The following instructions are for retrieving the files in the microSD card on an A77 charger via the Settings Menu. The instructions are as follow:

1. Press the "Menu" button to enter the Customer Calibration menu and navigate through the following and select "YES" in the end to save the configuration file:

Settings Menu → Advanced → Logs and Files → Config Files → Save Configure

2. Press the back button and select "Return to Menus" and repeat this process as needed to return to the Logs and Files submenu.
3. Select "Save Settings" and select "YES" in the end to save the settings file.
4. Press the back button and select "Return to Menus" to return to the Logs and Files submenu.
5. Select "Remove Drive" and select "YES" in order to properly remove the microSD card.
6. Open the door of the charger and locate the microSD card mounted in the S2A-368S display board (mounted to the door). Refer to figure below for microSD card location.
7. Safely remove the microSD card and using a microSD card reader and a computer, extract all the files from the microSD card.
8. Press the "Menu" button to enter the Customer Calibration menu and navigate through the following and select "YES" in the end to safely reinstall the microSD card into the S2A-368S board microSD card slot:

Settings Menu → Advanced → Logs and Files → Insert Drive





## Appendix D: AC Draw, Heat Loss, and Shipping Weight (Single Phase)

	Model Number	DC Amps	AC Input Current Draw @ 100% Load					Watts	BTU/hr*	Approx. Weight – lbs (kg)
			120 (A)	208 (D)	240 (B)	480 (C)	600 (ZD)			
24 Volt Systems	A77D(E)-6-24V	6	3	2	2	---	---	39	133	71 (32)
	A77D(E)-12-24V	12	6	3	3	---	---	78	266	92 (42)
	A77D(E)-16-24V	16	8	5	4	---	---	104	355	98 (44)
	A77D(E)-20-24V	20	10	6	5	---	---	130	444	100 (45)
	A77D(E)-25-24V	25	12	7	6	---	---	163	555	104 (47)
	A77D(E)-30-24V	30	15	8	7	4	---	195	665	147 (67)
	A77D(E)-35-24V	35	17	10	9	4	---	228	776	150 (68)
	A77D(E)-40-24V	40	20	11	10	5	4	260	887	174 (79)
	A77D(E)-50-24V	50	24	14	12	6	5	325	1109	185 (84)
	A77D(E)-60-24V	60	29	17	15	7	6	390	1331	208 (94)
	A77D(E)-75-24V	75	37	21	18	9	7	488	1663	350 (159)
	A77D(E)-100-24V	100	49	28	24	12	10	650	2218	385 (175)
48 Volt Systems	A77D(E)-6-48V	6	6	3	3	---	---	59	203	84 (38)
	A77D(E)-12-48V	12	12	7	6	---	---	119	406	108 (50)
	A77D(E)-16-48V	16	16	9	8	---	---	158	541	146 (66)
	A77D(E)-20-48V	20	20	11	10	5	---	198	676	158 (72)
	A77D(E)-25-48V	25	24	14	12	6	5	248	845	170 (77)
	A77D(E)-30-48V	30	29	17	15	7	6	297	1014	190 (86)
	A77D(E)-35-48V	35	34	20	17	9	7	347	1183	196 (89)
	A77D(E)-40-48V	40	39	23	20	10	8	396	1352	240 (109)
	A77D(E)-50-48V	50	49	28	24	12	10	495	1690	256 (116)
	A77D(E)-60-48V	60	59	34	29	15	12	594	2028	300 (136)
	A77D(E)-75-48V	75	73	42	37	18	15	743	2535	350 (159)
	A77D(E)-100-48V	100	98	56	49	24	20	990	3380	460 (208)
130 Volt Systems	A77D(E)-6-130V	6	15	8	7	4	3	96	329	147 (67)
	A77D(E)-12-130V	12	29	17	15	7	6	193	658	185 (84)
	A77D(E)-16-130V	16	39	23	20	10	8	257	877	212 (96)
	A77D(E)-20-130V	20	49	28	24	12	10	321	1097	235 (107)
	A77D(E)-25-130V	25	61	35	31	15	12	402	1371	255 (116)
	A77D(E)-30-130V	30	73	42	37	18	15	482	1645	300 (136)
	A77D(E)-35-130V	35	85	49	43	21	17	562	1919	432 (196)
	A77D(E)-40-130V	40	98	56	49	24	20	643	2193	442 (200)
	A77D(E)-50-130V	50	---	70	61	31	24	803	2741	480 (218)
	A77D(E)-75-130V	75	---	106	92	46	46	1205	4112	735 (333)

\*100% load

## Appendix E: AC Draw, Heat Loss, and Shipping Weight (Three Phase)

	Model Number	DC Amps	AC Input Current Draw @ 100% Load				Watts	BTU/hr*	Approx. Weight – lbs (kg)
			208 (D)	240 (B)	480 (C)	600 (ZD)			
24 Volt Systems	A77D(E)-75-24V	75	11	9	5	4	371	1267	330 (150)
	A77D(E)-100-24V	100	14	12	6	5	495	1690	475 (215)
	A77D(E)-125-24V	125	18	16	8	6	619	2112	530 (240)
	A77D(E)-150-24V	150	22	19	9	7	743	2535	600 (272)
	A77D(E)-200-24V	200	29	25	12	10	990	3380	675 (306)
	A77D(E)-250-24V	250	36	31	16	12	1238	4225	800 (363)
	A77D(E)-300-24V	300	42	37	19	15	1486	5070	875 (397)
	A77D(E)-400-24V	400	58	50	25	20	1981	6759	1050 (476)
48 Volt Systems	A77D(E)-50-48V	50	14	12	6	5	355	1210	317 (144)
	A77D(E)-75-48V	75	22	19	9	7	532	1815	374 (170)
	A77D(E)-100-48V	100	29	25	12	10	709	2420	600 (272)
	A77D(E)-125-48V	125	36	31	16	12	886	3024	680 (308)
	A77D(E)-150-48V	150	43	37	19	15	1064	3629	700 (316)
	A77D(E)-200-48V	200	58	50	25	20	1418	4839	755 (342)
	A77D(E)-250-48V	250	72	62	31	25	1773	6049	800 (363)
	A77D(E)-300-48V	300	86	75	37	30	2127	7259	900 (408)
130 Volt Systems	A77D(E)-400-48V	400	115	100	50	40	2836	9678	1200 (544)
	A77D(E)-25-130V	25	18	16	8	6	283	964	305 (138)
	A77D(E)-30-130V	30	22	19	9	7	339	1157	315 (143)
	A77D(E)-35-130V	35	25	22	11	9	396	1350	330 (150)
	A77D(E)-40-130V	40	29	25	12	10	452	1543	335 (152)
	A77D(E)-50-130V	50	36	31	16	12	565	1929	410 (186)
	A77D(E)-75-130V	75	54	47	23	19	848	2893	660 (299)
	A77D(E)-100-130V	100	72	62	31	25	1130	3857	750 (340)
	A77D(E)-125-130V	125	90	78	39	31	1413	4822	850 (386)
	A77D(E)-150-130V	150	108	94	47	37	1696	5786	1067 (484)
	A77D(E)-200-130V	200	144	125	62	50	2261	7715	1800 (816)
	A77D(E)-250-130V	250	180	156	78	62	2826	9643	2000 (907)
	A77D(E)-300-130V	300	216	187	94	75	3391	11572	2028 (920)
	A77D(E)-400-130V	400	288	250	125	100	4522	15429	2500 (1134)
	A77D(E)-500-130V	500	360	312	156	125	5652	19286	3645 (1653)
260 Volt Systems	A77D(E)-25-260V	25	36	31	16	13	415	1416	600 (272)
	A77D(E)-50-260V	50	72	62	31	26	830	2831	700 (316)
	A77D(E)-75-260V	75	108	94	47	39	1245	4247	900 (408)
	A77D(E)-100-260V	100	144	125	62	52	1660	5663	1800 (816)
	A77D(E)-150-260V	150	206	187	94	78	2489	8494	2200 (998)
	A77D(E)-200-260V	200	288	250	125	104	3319	11325	3000 (1361)

\*100% load

## **Appendix F: 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 five (5) years from date of purchase.

Any part or parts of the equipment (except fuses, DC connectors and other wear-related items) that prove defective within a five (5) 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 repair during the warranty period, the equipment can be returned to the La Marche factory to have the inspection, 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 three years. Transportation charges or duties shall be borne by purchaser.

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

All sales are final. Only standard La Marche chargers will be considered for return. A 25% restocking fee is charged when return is factory authorized. Special chargers 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.