



La Marche Manufacturing Company

www.lamarchemfg.com

A98M

Embedded DC Power System



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

Important Safety Instructions

Before using this equipment, read all manuals and other documents related to this unit and other equipment connected to this unit. Always have a copy of the unit's manual on file nearby in a safe place; if a replacement copy of a manual is needed, it can be found at www.lamarchemfg.com.

Electrical Safety



WARNING: Hazardous Voltages are present at the input of power systems. The output from rectifiers 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 unit may still be energized even when the unit 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 unit.
- Always disconnect the unit from the supply, batteries, and loads before performing maintenance or cleaning.
- If the unit is hot-swappable, simply remove it from the shelf for any maintenance 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 unit outside the input and output ratings listed on the unit nameplate.
- Do not use this unit for any purpose not described in the operation manual.

Mechanical Safety

- This unit or parts of the unit 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 unit. 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.

- To reduce risk of arc, connect and disconnect the battery only when the unit 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 metal on a battery. A spark or short-circuit could occur and could cause an explosion.

Unit 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 unit in a closed-in area or restrict ventilation in any way.
- Do not set any battery on top of this unit.
- Never allow battery electrolyte to drip on this unit when reading the specific gravity or filling the battery.
- Never place this unit 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 unit 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 visible damage 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
Model Scope/General Description	1
A98M System Configuration	Error! Bookmark not defined.
1 Installation	2
1.1 Mounting the A98M	2
1.1.1 Installing and Removing Rectifier Modules	2
1.2 Electrical Connections.....	2
1.2.1 AC Input Cable Connections.....	3
1.2.2 DC Cable Connections	3
1.2.2.1 Load Connections.....	3
1.2.2.2 Battery Connections	3
1.2.3 Controller Panel Connections	3
1.2.3.1 Dry Contact Output Port (DO) Connections	5
1.2.3.2 Wet Contact Input Port (DI) Connections.....	5
1.2.3.3 Temperature Compensation Connections	6
2 Operation	6
2.1 A98M Rectifier Module.....	6
2.2 Monitor Controller Module.....	7
3 Controller Menus.....	8
3.1 Main Menu.....	8
3.1.1 Active Alarms.....	9
3.1.2 Running Information	9
3.1.2.1 System Information.....	9
3.1.2.2 Module Information.....	9
3.1.2.3 AC Information	10
3.1.2.4 Battery Information	10
3.1.2.5 Monitor Unit Information	11
3.1.3 Parameter Settings.....	11
3.1.3.1 System Settings	11
3.1.3.2 Alarm Settings	12
3.1.3.3 Battery Settings	13
3.1.3.4 Module Settings	14
3.1.3.5 LVD Settings (Low Voltage Disconnect).....	15
3.1.3.6 Energy Saving Settings	15
3.1.3.7 Input Settings.....	15
3.1.3.8 Output Settings.....	16
3.1.3.9 Calibration Settings	17
3.1.3.10 Time Ele Settings	17
3.1.4 Running Control	17
3.1.4.1 Charge Control.....	17

3.1.4.2	Battery Test	18
3.1.4.3	Module Control	18
3.1.4.4	Energy Saving Control	18
3.1.4.5	LVD Control	18
3.1.5	Alarm Log.....	19
3.1.6	Power Information	19
3.1.6.1	Electric Information	19
3.1.6.2	Electric Log.....	19
3.1.7	Battery Log.....	19
3.1.7.1	Battery Status Log.....	20
3.1.7.2	Battery Test Log	20
3.1.7.3	Clear Battery Log	20
4	Service	20
4.1	Performing Routine Maintenance	20
4.2	Troubleshooting Chart	21
	Appendix A: A98M Menu Structure Flowchart.....	22
	Appendix B: A98M Specifications.....	26
	Appendix C: Default Alarm Severities and Assignments.....	27
	Appendix D: Manufacturer’s Warranty	28

Model Scope/General Description

The La Marche A98M's advanced modular design makes it a compact system and can provide enough power to meet the requirements of Communication and Power Industrial systems, consistent with the characteristics of rack-mounted systems.

The A98M can consist of one or multiple rectifier modules together with a monitor module. The power of rectifier systems can vary, depending on the quantity of rectifier modules.

The AC input feeds the rectifier(s), which convert the AC input into 125VDC and delivers it to the DC distribution unit. The controller incorporates the following features:

- Rectifier Management
- Battery Management & Testing
- Energy Saving Management
- User Definable Alarms
- Low Voltage Load Disconnect
- Alarm, Battery, and Power Consumption Data Logging

The rectifier system provides load power, battery float and equalize charging during normal operating conditions. This type of rectifier system is a constant voltage/current design, meaning within the normal operating ambient temperature range and input voltage range, available output power is constant. During those standard ranges, the rectifier system works automatically according to the load demands.

For any initial output voltage setting, output voltage remains constant, regardless of load. This is the normal operating condition, in which loads are being supplied and batteries are float charged. Rectifiers operate in the constant voltage mode unless load increases exceeding the power rating of the system, which causes the rectifiers to operate in constant current mode (please refer to the output capacity of the different rectifier module).

Under normal conditions, every parameter of rectifier modules and distribution unit are all under control of the monitoring module, operating according to the pre-set parameter or user's commands. If AC mains fails, the system will be powered by the battery. When the voltage is under the set threshold, the monitor reports DC under voltage alarm signal and cuts off the load output. When the external AC mains recovers, the system will resume to the normal working state (all above monitoring data are system default values which the user can set).



Figure 1 – A98M System Overview

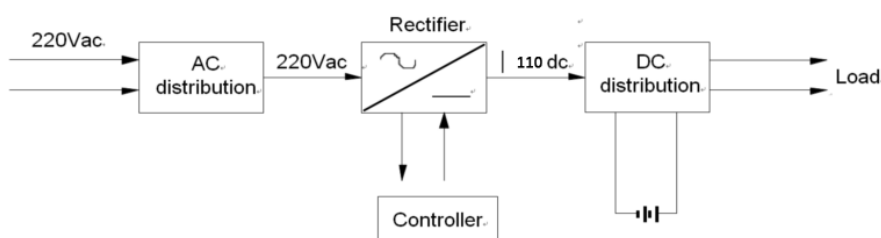


Figure 2 – A98M Block Diagram

1 Installation

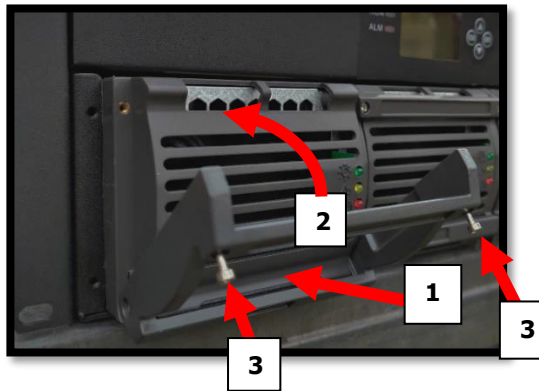
1.1 Mounting the A98M

The power system uses 19" rack installation as standard and optional 23" brackets are available as an option upon request. Use the appropriate screws to fasten the A98M power system to the rack through the brackets.

1.1.1 Installing and Removing Rectifier Modules

1. Insert the rectifier module into the slot and then slowly push the module until the back connector is securely inserted into the socket on the system's backboard.
2. Push the rectifier module further in until the handle is lifted into the module, allowing for the handle screws to be tightened.
3. Tighten the screws using a small flathead screwdriver into the rectifier module to secure installation.

When removing the rectifier modules, reverse the process above and update the inventory count in order to clear communication fault alarm(s) from missing module(s). Refer to Section 3.1.4.3 for details.



WARNING: The rectifier modules are hot-swappable, but as the plug-in components require precise positioning, please plug with care in case of component damage.

1.2 Electrical Connections

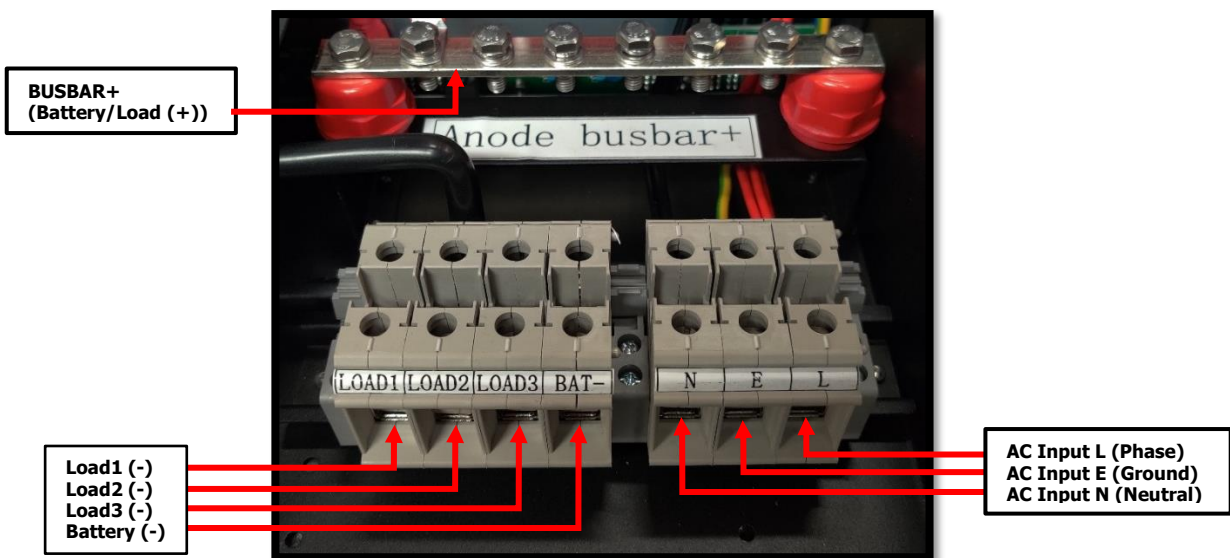


Figure 3 – Input & Output Connections

1.2.1 AC Input Cable Connections

The single-phase AC input connections are located on the rear panel of the system. The AC cabling can be inserted into the connector using a flathead screwdriver. Connect the phase line (L) and neutral line (N) of the AC input cables to their corresponding terminals of the power system.

1.2.2 DC Cable Connections

1.2.2.1 Load Connections

The load connection terminals of the power system are LOAD1, LOAD2, LOAD3 and BUSBAR+, which allow for 3 load connections. The load cabling can be inserted into the connector using a flathead screwdriver and a 10mm socket.

- a) Connect the positive end of load cable to the BUSBAR+ terminal.
- b) Connect the negative end of load cable to the desired LOAD terminal.

1.2.2.2 Battery Connections

The battery connection terminals of the power system are BAT- and BUSBAR+. The battery cabling can be inserted into the connector using a flathead screwdriver and a 10mm socket.

- a) Connect the positive end of battery cable to the BUSBAR+ terminal.
- b) Connect the negative end of battery cable to the BAT -.

Cable Specifications

Connection	Label	AWG / Max. Section (#/mm ²)	Temperature Rating (°C)	Withstand Voltage (V)
Output Positive Wire	BUSBAR+	2 AWG / 35 mm ²	105	600
Output Negative Wire	LOAD1, LOAD2, LOAD3			
Input Grounding Wire	E			
AC Mains Neutral Wire	N			
AC Mains Phase Wire	L			
Battery +	BUSBAR+			
Battery -	BAT -			

Table 2 – Cable Specifications

Note: Please refer to user site requirements and adjust the cable specification as needed.

1.2.3 Controller Panel Connections

The power system provides multiple terminals on the front panel of the A98M to interface with the controller, such as monitoring user-assigned alarms and external equipment via dry and wet contacts respectively. Figure below for reference.

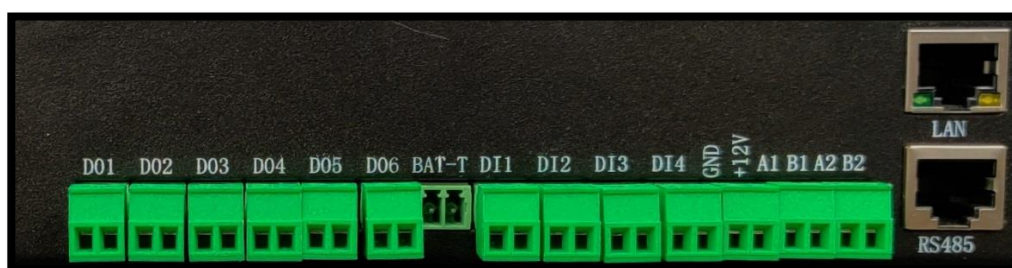


Figure 4 –Controller Panel Interface

Port Name	Description	Pinout (Left to Right)
DO1	Dry Contact Output Port 1	1 – NO Contact
DO2	Dry Contact Output Port 2	(Normally Open)*
DO3	Dry Contact Output Port 3	2 – COM Contact

DO4	Dry Contact Output Port 4	(Common)
DO5	Dry Contact Output Port 5	
DO6	Dry Contact Output Port 6	
BAT-T	Battery Temperature Sensor Port	1 – Sensor (+) 2 – Sensor (-)
DI1	Wet Contact Input Port 1**	1 – Ground 2 – DI1+
DI2	Wet Contact Input Port 2**	1 – Ground 2 – DI2+
DI3	Wet Contact Input Port 3**	1 – Ground 2 – DI3+
DI4	Wet Contact Input Port 4**	1 – Ground 2 – DI4+
GND	12VDC Power Supply Port (For optional SNMP Module)	1 – Supply (-) 2 - +12VDC
+12V		
A1	Not Applicable (For factory use only)	
B1		
A2		
B2		
LAN		
RS485		

**The logic for all digital output ports are user-configurable, refer to Section 3.1.3.8 for further details*

***All digital inputs are wet contact, having 12VDC across the input terminals*

1.2.3.1 Dry Contact Output Port (DO) Connections

The controller features 6 configurable dry contact output ports, DO1 through DO6, for monitoring the available alarms of the system. When wiring, land into the corresponding terminals as shown on Figure 4. Refer to tables below for default contact assignments, contact logic, and relay specifications. To change the contact assignments and logic, refer to Section 3.1.3 under Alarm Assign for details.

Contact	Default Assigned Alarm	Alarm Description	Contact Logic Under Normal Operation
DO1	SPD Fault	External surge protection device fault triggered	NO (Normally Open)
DO2	BLVD	Not Applicable	
DO3	AC Lost	AC input voltage exceeded AC Lost alarm threshold	
DO4	Module Fault	Module fault alarm triggered	
	Module Communication Fail	Module failing to communicate to controller	
	Module Current Limit	Module DC current limit alarm triggered	
	Module No Equalize Current	Rectifier module charging imbalance	
	Module Protection	Module protection mode triggered	
DO5	Output Voltage Abnormal	DC output voltage exceeded normal readings	
DO6	Battery1 Fuse Open	Not Applicable	
	Battery2 Fuse Open		

Specification	Value
Load	Resistive Load (P.F. = 1)
Contact Material	AgNi + Au plated
Maximum Allowed Current	2 A
Max. Operating Voltage and Current	0.5 A at 125 VAC
	0.3 A at 60 VDC
	1 A at 30 VDC
Max. Switching Capacity	62.5 VA
	30W
Min. Permissible Load	1 mA / 5VDC

1.2.3.2 Wet Contact Input Port (DI) Connections

The controller features 4 configurable wet contact input ports, DI1 through DI4, for monitoring external equipment which have a dry contact for wiring. When wiring, land into the corresponding terminals as shown on Figure 4. Refer to the table below for default contact assignments and logic. To change the contact assignments and logic, refer to Section 3.1.3.7 for details.

Contact	Assigned Alarm	Contact Logic Under Normal Operation
DI1	Air Conditioner	NO (Normally Open)
DI2	Smoke	
DI3	Water	
DI4	Door	

NOTE: All digital inputs are customer-configurable and are for notification purposes only, unless assigning the generator (Oil) alarm to one of the inputs. Refer to Section 3.1.3.7 for further details. All digital inputs are wet contacts, having 12VDC across the input terminals.

1.2.3.3 Temperature Compensation Connections

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 battery temperature deviates by 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 A98M battery temperature compensation rate can easily be adjusted in the menu from the default setting of 80mV/°C from 1mV/°C to 500mV/°C. The temperature compensation considers 25°C as the nominal battery temperature and adjusts the voltage level based on the difference between the actual temperature and 25°C. The nominal battery temperature may also be adjusted, from 5-45°C. Consult the battery manufacturer for proper temperature compensation slope, Float, and Equalize voltage set points.

Example: Battery Temperature Compensation coefficient has been set to 100mV/°C, and the probe reads 40°C.

- The temperature deviation is $(25-40) = -15^{\circ}\text{C}$
- $100\text{mV} \times -15^{\circ}\text{C} = -1.5\text{V}$
- The charger's output voltage will then be 1.5V less than the set point voltage at nominal 25°C.

To connect the provided battery temperature probe, perform the following steps:

1. Connect one end of battery temperature probe cable to BAT-T on front panel of system. "+" , "-" cable of BAT-T respectively correspond to "+" , "-" cable of battery group.
2. Connect the other end of temp probe cable to battery negative post.
3. Enter the controller menu and enable battery temperature compensation under Menu → Parameter Settings → Battery Settings → Basic Parameters → Battery Temperature Compensation Enable. Also, run through the rest of the battery temperature settings in the Basic Parameters submenu. Refer to Basic Parameters under Section 3.1.3.3 for further details.

2 Operation

2.1 A98M Rectifier Module

The A98M rectifier converts AC power to DC power and utilizes high performance features, such as high efficiency and complete protection. The output voltage of the rectifiers can be adjusted through the controller. The rectifier is hot swappable, providing easy installation and maintenance. The indicators of the rectifier are shown in the figure below.

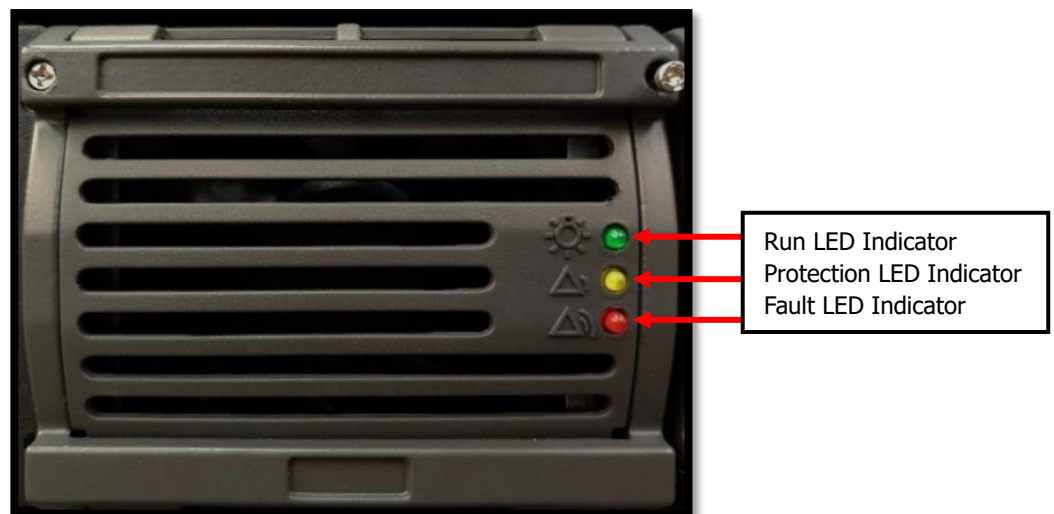


Figure 5 – A98M Rectifier Module & Indicators

Indicator	Color	Status	Description
Run Indicator	Green	On	The rectifier has AC power input
		Off	No input or output voltage
Protection Indicator	Yellow	Off	No alarm is generated
		On	AC input over/under voltage
			Current sharing imbalance
			Rectifier over temperature
Blinking	Rectifier communication interrupted		
Fault Indicator	Red	Off	The rectifier is running properly
		On	Rectifier over-voltage
			Fuse fault
			Rectifier current sharing imbalance
Blinking	Fan fault		

Rectifier Module LED Description

2.2 Monitor Controller Module

The A98M is equipped with a controller module which includes an LCD screen, 4 navigation buttons, and 2 status indicator LEDs.

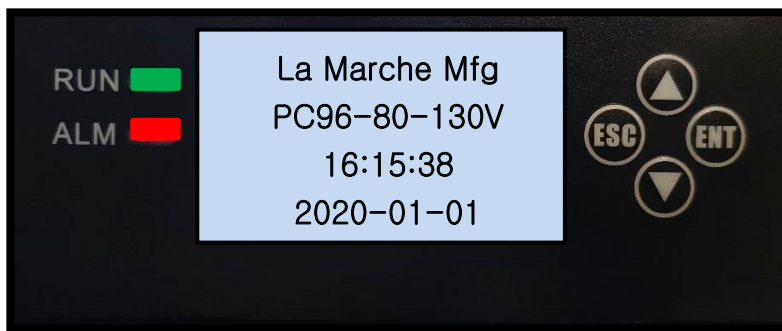


Figure 6 – A98M Monitor Controller Front Panel

After applying power to the A98M, the green RUN LED will be slowly blinking on the controller module and each A98M rectifier module will have a solid green LED on. When idle, the screen will display the current date and time. Once the ENT button is pressed, the system will display the DC bus voltage. The parameter displayed can be changed by pressing either the UP or DOWN arrows on the membrane.

The parameters viewable on the main screen are as follows:

<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: right;">16:17:25</p> <p>System Vol</p> <p style="text-align: right;">134.5V</p> </div>	System DC Output Voltage	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: right;">16:17:25</p> <p>Total Load Cur</p> <p style="text-align: right;">1.1 A</p> </div>	Total System Load Current*
<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: right;">16:17:25</p> <p>Bat Status</p> <p style="text-align: right;">Float C</p> </div>	Battery Status	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: right;">16:17:25</p> <p>User1 Load1 Cur</p> <p style="text-align: right;">1.1 A</p> </div>	User Load Current

16:17:25	
Bat Cur	9.4 A

Battery Current

**Total system load current is the sum of the load current of all users. The A98M system only supports 1 user through the 3 provided load terminals.*

Item	Color	Status	Description
RUN Indicator LED	Green	Always Off	Controller Fault or No DC Input
		Slow Flash (0.5Hz)	Normal Operation
		Fast Flash (4Hz)	Normal Operation and Communication Active between Controller and PC
ALARM Indicator LED	Red	Always Off	No Alarm
		Slow Flash (0.5Hz)	Second Alarm or Serious Alarm*
		Always On	Urgent Alarm*

Controller LED Description

**Refer to Alarm Level under Section 3.1.3.2 for details and setup information*

Button	Item	Description
▲	Up	Press Up and Down to scroll through the menus or change the value of a parameter
▼	Down	
ESC	Cancel	Returns to the previous menu without saving the changes
ENT	Enter	<ul style="list-style-type: none"> Enters the main menu from the idle screen Enters a submenu from the main menu Saves menu settings on a submenu

NOTE:

- The LCD screen becomes dark if no button is pressed within 60 seconds*
- To increase or decrease the parameter value quickly, press and hold the Up or Down button*
- The sound alarm is muted when a button is pressed and will resume after 60 seconds of button inactivity*

Controller Button Description

3 Controller Menus

The A98M controller is equipped with multiple settings and test menus. Refer to the software flowchart on Appendix A for details on the structure of the charger menus. Access menus by pressing the ENT button on the front panel. Navigate using the UP and DOWN buttons. To enter a submenu, use the ENT button. While changing a setting, the ENT button saves the setting and advances forward one digit if there are multiple variables on the setting. To exit a submenu, without saving any changes made, press the ESC button.

3.1 Main Menu

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. If the settings have been determined to be incorrect, adjustments may be made as detailed below.

In the Main Menu, the user can review status information, as well as access and change various parameters used by the A98M. The main menu is as follows:

3.1.1 Active Alarms

The Active Alarms menu allows the user to view the current alarms present on the system. It will display the alarm(s), as well as the date and time of when the alarm was triggered. If multiple alarms are triggered, the user can use the up and down buttons to scroll through the present alarms. Image below for reference.

1/1	16:17:25
AC Lost	Alarm
Fr:20-01-01	16:47:21

3.1.2 Running Information

The Running Information menu allows the user to view status information of different areas of the system. Below are the submenus:

3.1.2.1 System Information

The System Information submenu allows the user to view the environmental information on the system. Below are the submenus:

Parameter	Description
Environment Temperature	The ambient temperature, displayed in Celsius
Environment Humidity	Not Applicable

3.1.2.2 Module Information

The Module Information submenu allows the user to view the information on either all the modules or each individual module. Below are the submenus:

Total Module Information

The Total Module Information submenu allows the user to view information related to all rectifier modules overall. Below is the provided information:

Parameter	Description
Number in Position	The total of rectifier modules currently installed in the system
Number Working	The total of rectifier modules currently supplying power in the system
Total Rated Current	The total available output current of the rectifier modules installed
Present Rated Current	The total available output current of the active rectifier modules
Output Voltage	The output voltage of the rectifier modules
Total Output Current	The output current of the rectifier modules
Module Average Temperature	Not Applicable

Single Module Information

The Single Module Information submenu allows the user to view information related to the selected rectifier module. Below is the provided information:

Parameter	Description
Module Status	Indicates whether the selected rectifier module is off or on
Module Alarm	Indicates whether an alarm is present on the selected rectifier module
Module Protection	Not Applicable
Module Communication	Indicates whether the selected rectifier module communication is operating normally
Module Current Limit	Indicates whether the selected rectifier module is in current limit
Module Current Equalize	Indicates whether the rectifier modules in the system are load sharing
Module Output Voltage	Displays the selected rectifier module's output voltage
Module Output Current	Displays the selected rectifier module's output current
Module Input Voltage	Displays the selected rectifier module's input voltage
Module Input Current	Displays the selected rectifier module's input current
Module Current Limit Point	Displays the selected rectifier module's current limit threshold
Module Firmware Version	Displays the selected rectifier module's firmware version
Module Air Intake Temperature	Not Applicable
Module Efficiency Type	Displays the selected rectifier module's current efficiency mode
Module Rated Current	Displays the selected rectifier module's rated current

3.1.2.3 AC Information

The AC Information submenu allows the user to view the following details:

Parameter	Description
AC Input	Displays the AC input phase configuration of the system
AC Input Voltage	Displays the AC input voltage of the system
AC Input Current	Displays the AC input current of the system
AC Input Frequency	Displays the AC input frequency of the system
AC BreakD Count	Displays the number of times the AC lost alarm has been triggered
AC Under Voltage Count	Displays the number of times the AC under voltage alarm has been triggered
AC Over Voltage Count	Displays the number of times the AC over voltage alarm has been triggered

3.1.2.4 Battery Information

The Battery Information submenu allows the user to view the following details:

Parameter	Description
Battery Status	Displays the status of the battery, whether in float charge, equalize charge, discharging, testing, or missing
Battery Current	Displays the incoming/outgoing current of the battery
Battery Rated Capacity	Displays the rated capacity of the battery
Battery Residual Capacity	The remaining battery capacity
Battery Temperature	Displays the temperature of the battery by using the battery temperature probe
Float Charge Time	The elapsed time for float charge
Equalize Charge Time	The elapsed time for equalize charge
Time to Next Float	The remaining time for the system to enter float charge
Time to Next Equalize	The remaining time for the system to enter equalize charge

3.1.2.5 Monitor Unit Information

The Monitor Unit Information submenu allows the user to view the following controller monitor unit information:

Parameter	Description
Controller Type	Displays the controller type
Controller Version	Displays the version of the controller in the system
Controller Serial Number	Displays the serial number of the controller
System Time	Displays the current date and time
Runtime	Displays the amount of time the system has been running

3.1.3 Parameter Settings

The Parameter Settings menu provides access to adjust all system settings. A password has been implemented in this menu in order to prevent unwanted changes. The default password is 1111 and can be changed inside the menu if desired. Below are the submenus:

3.1.3.1 System Settings

The System Settings submenu allows the user to access generic system settings. Below are the available parameters:

Parameter	Description	Default	Value Range
AC Input	Number of phases on the AC input	Single Phase	1-Phase/3-Phase*
User1 Load Number	Number of loads connected	1 Load	No / 1 Load / 2 Load*
User2-4 Load Number	Not Applicable		
User Ele Enable	Power consumption logging enable	Open (On)	Open (On)/Close (Off)
Module Type Setting	Not Applicable (For factory use only)	RS485_M	RS485_M, RS485_T, RS485_T1, CAN_LN, CAN_HW
North Protocol Setting		RH_M	RH_M, HW_V2.1, AT_V2.2, HA_V2.0, RH_V1.4
Battery Shunt Setting	Shunt size for the battery	100A/75mV	Not Adjustable
User1 L1 Shunt	Shunt size for the load	100A/75mV	
User1 L2 Shunt	Not Applicable		
Users 2-4 L1 & L2 Shunt			
Ele Save Time	Battery storage time	0 Hrs 0 Mins	0-25 Hours
Language Setting	Language selection for the system	English	English/Chinese
Buzzer Setting	Enable the buzzer for alarm notification	Open (On)	Open (On)/Close (Off)
Address Setting	Controller address	1	1-255
Password Setting	Password to enter the parameter settings	1111	0000-9999
Date Setting	Date and time setting	xxxx-xx-xx xx:xx:xx	YYYY-MM-DD HH:MM:SS
Frequency Setting	Set frequency for the system	60 Hz	50/60Hz

**Not Applicable*

3.1.3.2 Alarm Settings

The Alarm Settings submenu allows the user to adjust the alarm thresholds, alarm assignments, and the alarm severity levels. Below are the submenus:

Alarm Thresholds

The Alarm Thresholds submenu allows the user to adjust the thresholds of the certain alarms included in the system. Below are the available alarm thresholds:

Parameter	Default	Value Range
AC Over Voltage Point	280V	181-300V
AC Under Voltage Point	180V	90-279V
AC Lost Voltage Point	60V	10-80V
AC Over Frequency Point	65 Hz	56-120 Hz
AC Under Frequency Point	55 Hz	1-64 Hz
DC Over Voltage Point	149.5V	119.3-150.0V
DC Under Voltage Point	112.5V	81-127.5V
System Current Limit Point (Auto Control)	110%	1-120%
Environment Temperature High Point	50°C	(-4)-80°C
Environment Temperature Low Point	-5°C	(-20)-49°C
Environment Humidity High Point	75%	Not Applicable
Environment Humidity Low Point	20%	
Battery Low Capacity	20%	1-100%
Battery Over Voltage	146.0V	10-300V
AC Input Over Current Point	50.0A	1-100A

Alarm Level

The Alarm Level submenu allows the user to set the severity of each alarm. Refer to Appendix C for a list of available alarms and their default alarm severity. Below are the selectable alarm levels:

Alarm Level	Alarm Action
Close	No Action
Hint	Alarm will be displayed on the Active Alarms screen
Second	Alarm will be displayed on the Active Alarms screen and the ALM LED will slowly blink
Serious	Alarm will be displayed on the Active Alarms screen, the ALM LED will slowly blink, and the buzzer will sound in 3-second intervals
Urgent	Alarm will be displayed on the Active Alarms screen, the ALM LED will be on solid, and the buzzer will sound in 1-second intervals

Selectable Alarm Level Description

Alarm Assign

The Alarm Assign submenu allows the user to assign each alarm to the available digital outputs: DO1 through DO6. Refer to Appendix C for default alarm assignments.

3.1.3.3 Battery Settings

The Battery Settings submenu allows the user to access battery basic, battery charge, and battery test parameters. Below are the inner submenus:

Basic Parameters

The Basic Parameters submenu provides the user access to battery settings related to battery capacity, battery current limit, battery temperature compensation, as well as battery setup and maintenance time. Below are the available parameters:

Parameter	Description	Default	Value Range
Single Battery Capacity	The amp-hour capacity per battery in system	50 Ah	5-1000 Ah
Number of Batteries	The number of batteries in system	1 Set	1-50 Sets
Charge Current Limit	The battery charging current limit	0.10 C10	0.05-1
Charge Over Current	The output current overload alarm threshold	0.25 C10	0.05-0.5
Battery Temperature Compensation Enable	Enable battery temperature compensation	Close (Off)	Open (On)/ Close (Off)
Battery Temperature Compensation Coefficient	The amount of voltage change per 1°C change in temperature	80mV/°C	0-500mV/°C
Mid of Battery Temperature Compensation	The nominal battery temperature	25°C	5-45°C
Battery Temperature High Point	The high battery temperature alarm threshold	45°C	25-50°C
Battery Temperature Low Point	The low battery temperature alarm threshold	0°C	- 20 – 20°C
Battery Temperature Protection Point	The battery temperature threshold to place the system in protection mode	50°C	Not Adjustable
Battery Temperature Protection Action	The action the system will perform if battery temperature protection threshold is surpassed	Decrease Voltage	
Battery Temperature Protection Voltage	The output voltage setting when the battery temperature protection threshold is surpassed	114.8V	
Battery Setup Time	The date the battery was installed	2000-00-00	xxxx-xx-xx
Battery Maintenance Time	The date the battery requires maintenance	2002-00-00	xxxx-xx-xx

Charge Parameters

The Charge Parameters submenu allows the user to access the float and equalize charge settings. The A98M charger has two modes for DC output voltage; Float mode and Equalize mode. Float charging mode is used for all normal battery charging needs. 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 charge voltages, charge ratios, and charge scheduling.

Auto Charge allows the A98M system to automatically adjust charging modes based on the condition of the battery and set timed parameters.

The equalize to float ratio is a set charging coefficient which if the equalize charging current is lower than the set value, the system will revert to float charge.

Example: The equalize to float ratio is set to 0.05. If the equalize charging current is less than 5A, the A98M will go back into float charge.

Timed equalize charge allows for automatic equalize charging, dependent on the time interval selected in case of scheduled equalizing needs. Once timed equalized charging is complete, the A98M will revert to regular float charging. Below are the available parameters:

Parameter	Description	Default	Value Range
Float Charge Voltage	The float mode output voltage setpoint	133.8V	94.5-140.9V
Equalize Charge Voltage	The equalize mode output voltage setpoint	139.8.0V	133.9-147.5V
Auto Charge Enable	Automatic charging enable	Open (On)	Open (On) / Close (Off)
Equalize Float Ratio	Equalize to Float charge coefficient	0.05 C10	0.05-0.25
Equalize Float Time	Equalize to Float charge time	1 Minute	1-60 Minutes
Timed Equalize Charge Enable	Enable the equalize charge timer	Close (Off)	Open (On) / Close (Off)
Timed Equalize Charge Time	The equalize charge timer hours	3 Hours	1-24 Hours
Timed Equalize Charge Interval	The amount of days the timed equalize charge will cycle automatically	30 Days	1-365 Days
Pre-Equalize Charge Enable	Pre-equalize charging enable	Open (On)	Open (On) / Close (Off)
Equalize Charge Protection Time	The maximum allowed time for equalize charge before returning to float charge	5 Hours	5-48 Hours

Test Parameters

The Test Parameters submenu provides the user access to battery test settings. The battery test end condition may be based on either time or voltage. Below are the available parameters:

Parameter	Description	Default	Value Range
Battery Timing Test	Enable the battery timing test	Close (Off)	Open (On)/Close (Off)
Time Test Interval	The amount of days the timed battery test will cycle automatically	30 Days	1-365 Days
Battery Discharge Test	Enable the battery discharge test	Open (On)	Open (On)/Close (Off)
Battery Test End Voltage	The battery test voltage threshold to end the test	108V	99-133V
Battery Test End Time	The duration of the battery time test	240 Minutes	1-1440 Minutes

3.1.3.4 Module Settings

The Module Settings submenu allows the user access to general module settings, below are the available parameters:

Parameter	Description	Default	Value Range
Module Current Limit Point	Module current limit setting (Manual Control)	20.0A	Not Adjustable
Protection Voltage Point	Not Applicable		
Walk-in Enable			
Interval to Start			
Maximum Number of Modules	Maximum allowed modules to be operating	4	1-16
Equalize Current Point	Equalize current limit setting	40.0%	0.1-100%

3.1.3.5 LVD Settings (Low Voltage Disconnect)

The LVD Settings submenu is for factory use only.

BLVD Settings

The BLVD Settings submenu allows the user to view BLVD setup parameters. BLVD is not applicable to the A98M system.

L1-LVD Settings (Load 1 Low Voltage Disconnect)

The L1-LVD Settings submenu allows the user to view L1-LVD setup parameters. The A98M system includes the Load Low Voltage Disconnect as a feature, allowing for the loads to be disconnected from the system if the DC bus voltage falls below the set voltage threshold in order to preserve the batteries. Once the DC voltage rises above the set recovery threshold, the loads will reconnect into the system. Below are the available parameters:

Parameter	Description	Default	Value Range
LLVD1 Type	The type of the LLVD1 contactor	Normally Open	Not Adjustable
LLVD1 Control	Automatic or manual LVD control	Auto	
LLVD1 Mode	LLVD1 triggering method	Voltage	
LLVD1 Voltage	The output voltage threshold to initiate LLVD1	99.0V	
LLVD1 Recover Voltage	The output voltage threshold to clear LLVD1	108.0V	

3.1.3.6 Energy Saving Settings

The Energy Saving Settings submenu allows the system to improve operational efficiency when conditions warrant by running only the necessary number of rectifiers. For example, when the load is significantly less than the available system power, the controller will shut down one or more of the rectifiers so that the remaining rectifiers may operate with greater efficiency at a higher current level. A short (one-minute) time delay or hysteresis is included to avoid nuisance alarming and to eliminate changes if the load is fluctuating. By default, rectifiers are rotated into use on a weekly basis to share the service time and can be adjusted.

Energy saving mode is disabled if following conditions have occurred and will resume when they are cleared:

- Battery Current Limit
- Battery Discharge
- Battery Test
- Battery Missing
- Rectifier Current Limit
- Battery High Temperature
- Battery Over Voltage
- Battery Under Capacity
- Battery Over Current
- Rectifier Module Communication Fault
- Battery Temp. Protection
- Battery Maintenance Time
- DC Over Voltage
- DC Under Voltage
- AC Power Failure
- AC Over Voltage
- AC Under Voltage
- Rectifier Fault

Parameter	Description	Default	Value Range
Energy Saving Enable	Enable energy saving mode	Open (On)	Open (On)/Close (Off)
Less Working Number	Minimum rectifier modules to operate during energy saving mode	1	1-24
Period of Turning	The time for the energy saving mode to cycle sleeping rectifiers with operating rectifiers	7 Days	1-365 Days
Best Efficiency	Percentage of rectifier loading capacity to rated capacity, at which the rectifier reaches its highest efficiency	60%	50-100%
Module Redundancy	Redundancy for the rectifier modules for additional applied loads	40%	10-100%

3.1.3.7 Input Settings

The Input Settings submenu allows the user to access the digital input settings, such as the digital input logic and assignment settings, as well as generator/oil machine settings. The A98M system includes 4 wet-contact digital inputs, accessible through the front panel and labeled as DI1 through DI4. Refer to Figure 4 for pinout. Below are the available parameters:

Input Logic

The Input Logic submenu allows the user to access the digital input logic settings. The logic setting of each digital input indicates the state in which the corresponding digital input is expected to be under normal operation. Below are the available parameters:

Parameter	Description	Default	Value Range
DIN1	Digital Input 1 Logic	Normally Open	Normally Open / Normally Closed
DIN2	Digital Input 2 Logic		
DIN3	Digital Input 3 Logic		
DIN4	Digital Input 4 Logic		
DIN5	Not Applicable		
DIN6	Not Applicable		

Input Assign

The Input Assign submenu allows the user to access the digital input assignment settings. The logic setting of each digital input indicates the state in which the corresponding digital input is expected to be under normal operation. Below are the available parameters:

Parameter	Description	Default	Value Range
DIN1	Digital Input 1 Assignment	Air Conditioner	SPD, Water, Door, Smoke, Oil, Fan, Custom DI1, Battery Missing, Custom DI2, Custom DI3, Custom DI4, Custom DI5, Custom DI6, Air Conditioner
DIN2	Digital Input 2 Assignment	Smoke	
DIN3	Digital Input 3 Assignment	Water	
DIN4	Digital Input 4 Assignment	Door	
DIN5	Not Applicable		
DIN6	Not Applicable		

Input Alarm Action

The Input Alarm Action submenu allows the user to access the generator/oil machine settings. In order to use the included feature, one of the digital inputs must be set for "Oil" so the system may monitor the generator/oil machine and the generator/oil machine dry contact must be wired in the assigned digital input port. Below are the available parameters:

Parameter	Description	Default	Value Range
Oil Machine Start Action	System action when oil start detected	No Action	No Action, Limit Voltage, Limit Current, Disconnect Battery
Oil Machine Start Voltage Limit	System voltage limit when oil start detected	98.0V	94.5-132.8V
Oil Machine Start Current Limit	System current limit when oil start detected	0.01C	0-1C

3.1.3.8 Output Settings

The Output Settings submenu allows the user to change the logic of the 6 dry-contact digital output ports provided on the front panel, labeled as DO1 through DO6, to either normally open or normally closed on normal operation. Refer to Figure 4 for pinout. Below are the available parameters:

Parameter	Description	Default	Value Range
DO1	Digital Output 1 Logic	Normally Open (De-energized)	Normally Open (De-energized)/ Normally Closed (Energized)
DO2	Digital Output 2 Logic		
DO3	Digital Output 3 Logic		
DO4	Digital Output 4 Logic		
DO5	Digital Output 5 Logic		
DO6	Digital Output 6 Logic		

3.1.3.9 Calibration Settings

The Calibration Settings submenu allows the user to access the system calibration settings. This submenu is for factory use only.

3.1.3.10 Time Ele Settings

The Time Ele Settings submenu allows the user to view the time-sharing power consumption settings. Below are the available parameters:

Parameter	Description	Default	Value Range
Seg 1-8 Enable	Period enable	Close (Off)	Open (On)/Close (Off)
Seg 1-8 Start Time	Period start time	xx Hrs xx Mins	xx Hrs xx Mins
Seg 1-8 End Time	Period end time	Close (Off)	Open (On)/Close (Off)
Seg 1-8 Output Voltage	Period output voltage	54.0V	xx.xV

3.1.4 Running Control

The Running Control menu provides access to various system control settings, such as charge control, battery test, module control, energy saving control, and LVD control. Below are the submenus:

3.1.4.1 Charge Control

The Charge Control submenu allows the user to access controls on the charge mode and on controller operation. When the A98M system is in manual charge control mode, it will revert to auto charge control mode after 2 hours of inactivity.

Equalize charging mode will be disabled if the following conditions have occurred and will resume when they are cleared (applies only during auto charge control mode):

- Battery High Temperature
- Battery Over Current
- Battery Over Voltage
- Battery Under Capacity
- Battery Temp. Protection
- Battery Maintenance Time
- Rectifier Fault
- Rectifier Current Limit
- AC Under Voltage
- DC Over Voltage
- DC Under Voltage
- AC Power Failure
- AC Over Voltage
- Equalize Protection Time Exceeded
- Rectifier Module Communication Fault

Fast charge is available when the Control Type is set to manual. It allows the use to perform an equalize charge for a shorter time than timed equalize charge. Below are the available parameters for Charge Control:

Parameter	Description	Default	Value Range
Manual Charge	The charge mode	Float Charge	Float Charge/ Equalize Charge
Control Type	Allow auto/manual rectifier module control	Auto	Auto/Manual
Manual Fast Charge	Enable short-term equalize charge	Close (Off)	Open (On)/Close (Off)
Fast Charge Time	Duration of the short-term equalize charge	5 Minutes	1-999 Minutes

3.1.4.2 Battery Test

The Battery Test submenu allows the user to manually perform a battery test. The monitor controller records the standard battery test process in detail and generates a test report after the test ends. To manually start a battery test, go to Run Control → Battery Test and enable the setting. Refer to Section x3.1.3.3 under Test Parameters for the battery test settings and refer to Section 3.1.7.2 for battery test log access and information review.

3.1.4.3 Module Control

The Module Control submenu provides access to module control settings, such as the control type(mode), module control settings for all rectifier modules and module control settings for a single rectifier module. Below are the submenus:

Control Type

The Control Type submenu allows the user to select whether the rectifier modules are automatically or manually controlled. In auto mode, the module output voltage and current limit are based on the system settings (float charge voltage, equalize charge voltage, module current limit, etc.). In manual mode, the system does not perform energy saving actions and the output voltage and current limit of the rectifier modules can be manually set. Refer to Total Module Control for details.

NOTE: Control Type setting cannot be changed when system is checking and testing batteries.

Total Module Control

The Total Module Control submenu allows the user to access the control settings for all rectifier modules. Manual control of all rectifier modules is only possible if the Control Type of the system is set to Manual. The Module In-Position Test setting should be used to reset the inventory count of installed rectifier modules in case a module is purposely removed to in order to avoid nuisance alarms. Below are the available parameters:

Parameter	Description	Default	Value Range
Module On & Off	Module On/Off Control	Auto	Auto/ (Open All/Close All)*
Module Output Voltage	Module Output Voltage Control	Auto	Auto / (xxx.xV)*
Module Output Current Limit	Module Output Current Limit Control	Auto	Auto / (xx.xA)*
Module In-Position Test	Allows reset of module inventory count		Reset

*The value ranges in parenthesis are only available when the Control Type of the rectifier modules is set to Manual. Refer to Control Type submenu for details.

Single Module Control

The Single Module Control submenu allows the user to access the control settings for the selected rectifier module. Below are available parameters:

Parameter	Default	Value Range
Module On & Off	Auto	Auto / (Open/Close)*
Module Over Voltage Reset		Not Applicable

*The value ranges in parenthesis are only available when the Control Type of the rectifier modules is set to Manual. Refer to Control Type submenu for details.

3.1.4.4 Energy Saving Control

The Energy Saving Control submenu allows the user to perform an energy saving test. Refer to Energy Saving Settings under Section 3.1.3.6 for further information.

3.1.4.5 LVD Control

The LVD Control submenu allows the user to manually control the BLVD and LLVD1 contactors inside the system. Below are the available parameters:

Parameter	Description	Default	Value Range
BLVD	BLVD contactor control	Not Applicable	
L1-LVD	LLVD contactor control	Up (On)	Up (On) / Down (Off)

3.1.5 Alarm Log

The Alarm Log menu allows the user to view the log of all alarms which have been triggered in the system during its operation. It will display the alarm(s), as well as the date and time of when the alarm was triggered and cleared, if applicable. If multiple alarms are triggered, the user can use the UP and DOWN buttons to scroll through the present alarms. The following images are provided for reference.

1/1	17:17:25	1/1	17:17:25
AC Lost	Alarm	Fr :20-01-01 16:47:21	To:20-01-01 16:49:05

3.1.6 Power Information

The Power Information menu allows the user to view power consumption information about the system, load, and batteries. Below are the submenus:

3.1.6.1 Electric Information

The Electric Information submenu allows the user to view the following current power consumption information:

Parameter	Description
Total Load Electricity	Displays the total load power consumption in kWh
User1 L1 Electricity	Displays the load power consumption in kWh
Total Battery Discharge Electricity (Ah)	Displays the battery discharge power consumption in Ah
Total Battery Discharge Electricity (kWh)	Displays the battery discharge power consumption in kWh

3.1.6.2 Electric Log

The Electric Log submenu allows the user to view and clear the load power consumption log. Below are the submenus:

Load Electric Log

The Load Electric Log submenu allows the user to view the load power consumption (in kWh) in one of 4 methods:

- Date Range
- Current Day
- Current Month
- Current Year

Clear Log

The Clear Log submenu allows for deletion of all recorded battery power consumption, load power consumption, and all system power consumption logs. This submenu is for factory use only.

3.1.7 Battery Log

The Battery Log menu provides access to view battery status and battery test logs performed by the system. Below are the submenus:

3.1.7.1 Battery Status Log

The Battery Status Log submenu allows the user to view the logs of battery status. It will display the battery status, as well as the date and time of when the battery status was detected and cleared, if applicable. The log keeps track of the following battery statuses: float charging, equalize charging, discharging, and missing. If multiple battery status logs are recorded, the user can use the up and down buttons to scroll through the logs. Image below for reference.

1/1	17:17:25	1/1	17:17:25
BAT: Missing		to :20-01-01 16:47:21	20-01-01 16:49:05

3.1.7.2 Battery Test Log

The Battery Test Log submenu allows the user to view the logs of battery status. It will display the battery status, as well as the date and time of when the battery status was detected and cleared, if applicable. The log keeps track of the following battery statuses: float charging, equalize charging, discharging, and missing. The log also displays the duration of the battery test, the amount of discharge during the test in amp-hours, the battery voltage at the beginning of the test, and the battery voltage at the end of the test. If multiple battery status logs are recorded, the user can use the up and down buttons to scroll through the logs. Image below for reference.

1/1	17:17:25	1/1	17:17:25	1/1	17:17:25
Cause:	DisChr	DUR:	10 min	STAR V:	124.7V
Fr:	20-01-01 16:47:21	DisChr:	0.7 AH	End V:	123.9V

3.1.7.3 Clear Battery Log

The Clear Battery Log submenu allows the user to delete the battery status logs and battery test logs.

4 Service

All work inside the A98M system should be performed by qualified personnel. La Marche is not responsible for any damages caused by an unqualified technician. This chapter describes routine maintenance, alarm and fault handling, and replacing parts of the power system.



Before working inside the A98M, ensure the AC power is off at the main breaker box and the battery has been removed from the system'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.

4.1 Performing Routine Maintenance

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

Yearly

1. Confirm air vents are open and clean. 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.

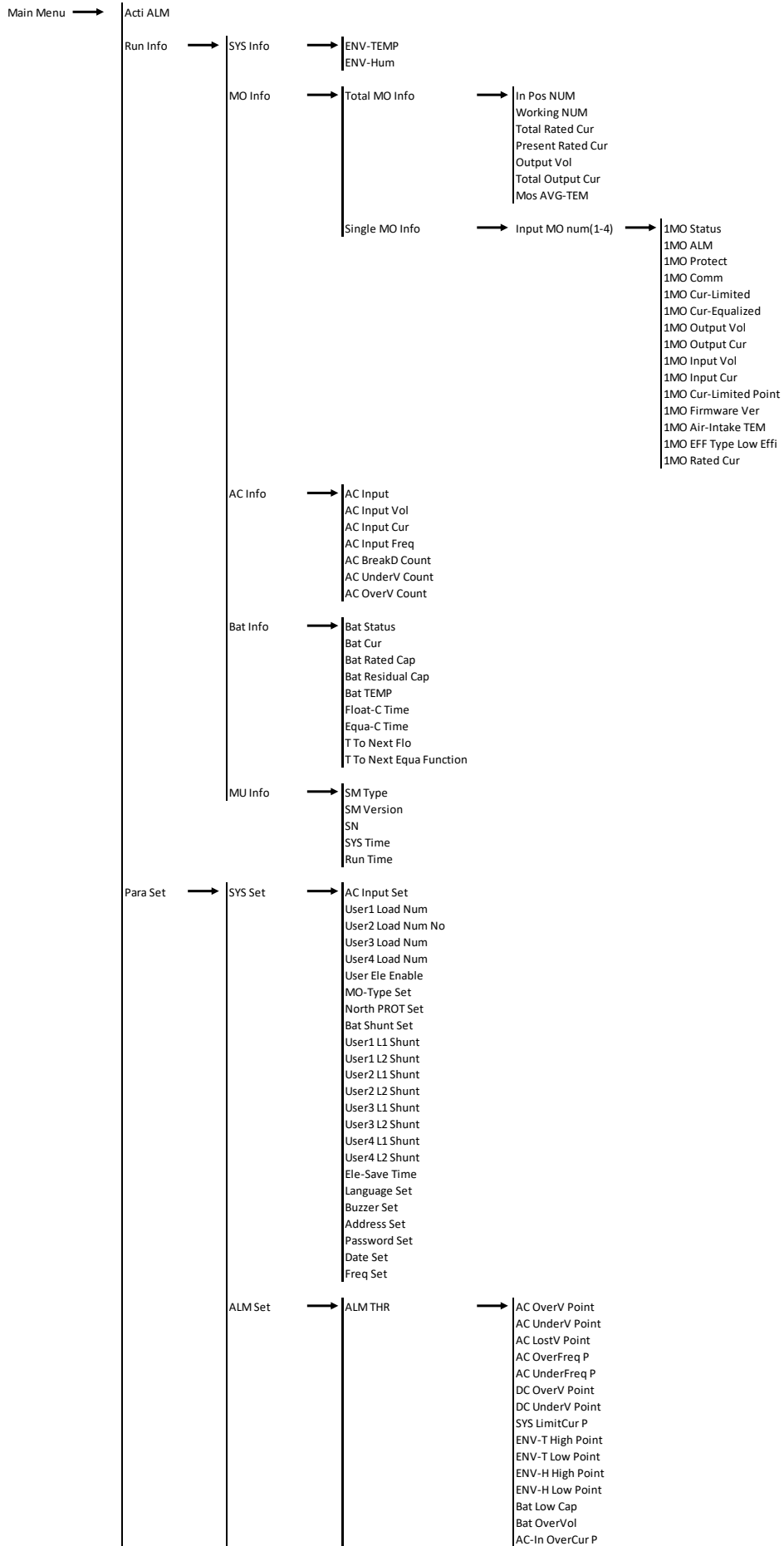
4.2 Troubleshooting Chart



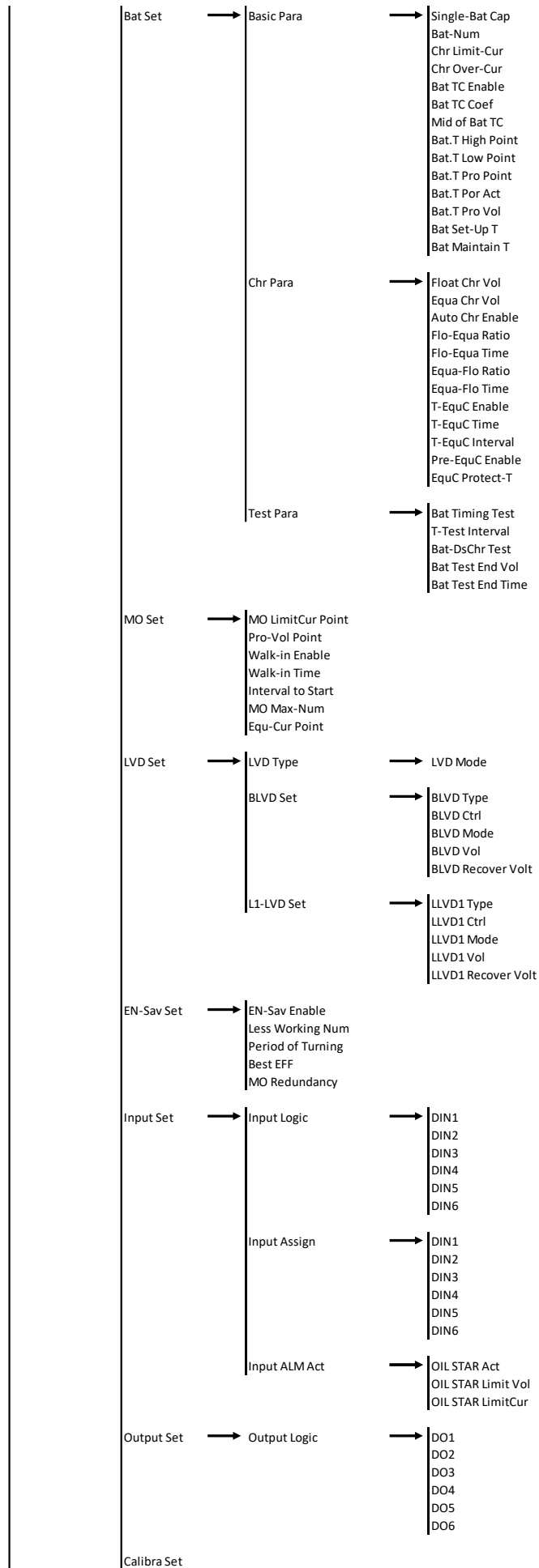
Isolate from all power sources prior to performing any interior verifications or part replacements.

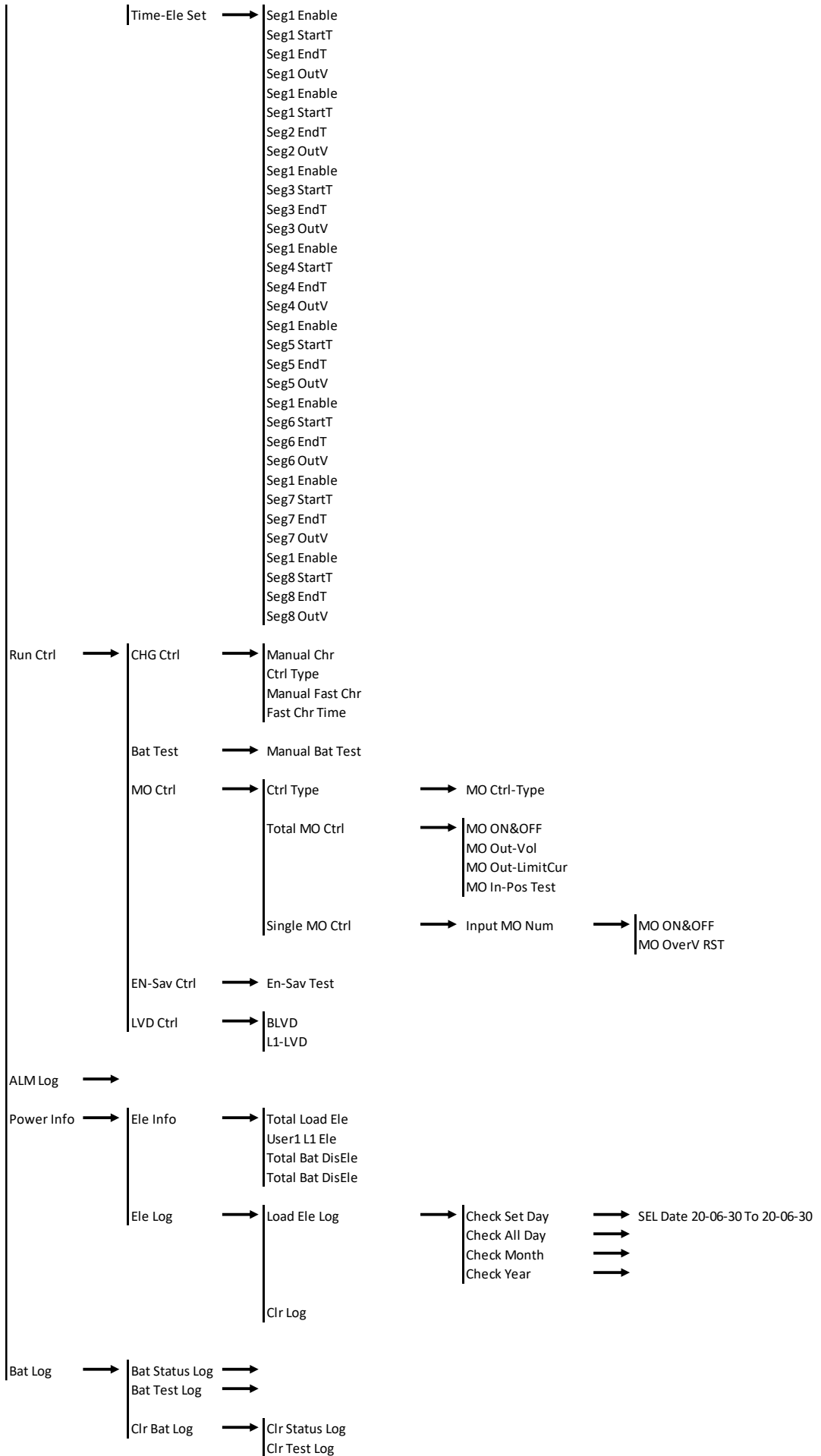
Symptom	Possible Cause & Action
AC Failure	If the failure does not last long, the battery will power the load. If the cause is unknown or the failure lasts too long, a diesel generator is needed. Before using the generator power to supply the power system, it is suggested to run the generator five minutes to minimize the impact on the power system
Rectifier Module Fan Fails	Pull out the rectifier to check if the fan is obstructed. If so, clean it and reinstall the rectifier. If the fan is not obstructed or if the fault persists after cleaning, replace the rectifier
Rectifier Module Not Responding	Assure the rectifier module is properly installed in the slot. If so, restart the rectifier by reinstalling. If the alarm persists, replace the rectifier module
Over Temperature	Check if the temperature around the system is too high. If so, find the cause and reduce the temperature
High DC Voltage	Pull out the rectifiers one by one until the high DC voltage clears. Reinstall each rectifier one by one until the alarm is triggered again. Assure the output voltage settings are correct per rectifier by checking the Single Module Information submenu. If issue is not resolved, replace the rectifier module
Low DC Voltage	Check if any rectifier is inoperative or has no output current. If yes, replace it. Check the system voltage within the valid voltage scope, if the issue is related to the output setting, adjust the system voltage
Rectifier Fault	Remove the rectifier module indicating a fault for a moment, then reinsert it to see if the red LED remains off. If the alarm persists, replace the rectifier
High AC Voltage	1. Check if the AC over voltage alarm threshold is too low. If yes, change the value. 2. When the mains voltage is more than 300V, the rectifiers will stop working. Check the status of the AC mains.
Low AC Voltage	1. Check if the AC under voltage value is too high. If yes, change the value. 2. When the mains voltage is lower than 154V, the output power of the rectifiers will be derated. When the mains voltage is lower than 90V, the rectifiers will stop working. Check the status of the AC mains.

Appendix A: A98M Menu Structure Flowchart



	ALM Level	→	AC Lost AC InputV Abnor AC-MO Input Pro OutputV Abnor Bat OverV Bat Low Cap AC-MO Out OverV AC-MO Out UndrV AC-MO Fault AC-MO Comm Fail AC-MO Limit-Cur AC-MO No-Equ-Cur AC-MO Protect Bat.Temp Amb.Temp Amb.Hum Soon BLVD BLVD Bat DisChr SPD Fault Load Fuse Open Bat1 Fuse Open Bat2 Fuse Open Custom DI1 Bat Missing OIL Open Fan Alrm Water Door Smoke Bat1 Lost Bat2 Lost Bat1 Imbalance Bat2 Imbalance Bat Maintain Bat Over-Cur Soon L1-LVD L1-LVD Air-Con Alrm Sys LimitCur CustomDI2 CustomDI3 CustomDI4 CustomDI5 CustomDI6 AC InputC Abnor
	ALM Assign	→	AC Lost AC InputV Abnor AC-MO Input Pro OutputV Abnor Bat OverV Bat Low Cap AC-MO Out OverV AC-MO Out UndrV AC-MO Fault DO4 AC-MO Comm Fail AC-MO Limit-Cur AC-MO No-Equ-Cur AC-MO Protect Bat.Temp Amb.Temp Amb.Hum Soon BLVD BLVD Bat DisChr SPD Fault Load Fuse Open Bat1 Fuse Open Bat2 Fuse Open Custom DI1 Bat Missing OIL Open Fan Alrm Water Door Smoke Bat1 Lost Bat2 Lost Bat1 Imbalance Bat2 Imbalance Bat Maintain Bat Over-Cur Soon L1-LVD L1-LVD Air-Con Alrm Sys LimitCur CustomDI2 CustomDI3 CustomDI4 CustomDI5 CustomDI6 AC InputC Abnor MU SYS Err





Appendix B: A98M Specifications

AC Input					
Parameter	Min	Typical	Max	Unit	Remark
Input Voltage Range – Rect. Shelf	90	10	265	VAC	
Input Voltage Range – 20A Module	176	240	265	VAC	
Input Voltage Range – 7A Module	90	110	175	VAC	
Input Frequency	45	50	65	Hz	
Power Factor	0.98				Rated Loading

DC Output					
Parameter	Min	Typical	Max	Unit	Remark
Output Voltage Rating		133.8		VDC	
Output Voltage Range	94.5		147.5	VDC	
Output Current Range	0	80	84	A	
Ripple (Voltage peak-peak)		20	200	mVAC	
Output Efficiency		93.2		%	230VAC input, rated output 80A
Regulation			±2	%	
Load Regulation			±2	%	
Line Regulation			±1	%	
Output Power		10	11.6	KW	155-290V Input
		5000	5.8	W	90-154V Input

Insulation Rating		
Parameter	Requirement	Remark
Input – Output	3500VDC/10mA/1min	No flashover and breakdown, with discharge tube removed.
Input – Chassis	3500VDC/10mA/1min	
Output – Chassis	750VDC/10mA//1min	
Leakage Current	≤3.5mA	
Insulation Resistance	@ Normal atmospheric pressure, relative humidity: 90% Testing voltage: 500VDC insulation of input-output, input-ground, output-ground shall not be less than 10MΩ	

Ambient Requirements					
Parameters	Min.	Typical	Max.	Unit	Remark
Nominal Operating Temperature	-15	25	+55	°C	
Operating Temperature	-33		+55	°C	Start up with full load at -40°C, normal operation, with partial degradation of performance permissible. For temperature between 55°C and 65°C, output with de-rating to 80%
Storage Temperature	-40		+70	°C	
Relative Humidity	5		95	%	Long-term operation, non-condensing
Atmospheric Pressure	70		106	Kappa	
Altitude	0	2000	4000	m	
Cooling Method	Forced cooling, front-in & rear-out, the fan is located inside the front panel, with programmable speed by the temperature.				
Ingress Protection	The unit can operate when the diameter of dust particle is more than 5µm, with density ≤3*10 ⁴ /m ³ . The dust shall not be conducting, electromagnetic or corrosive.				

Appendix C: Default Alarm Severities and Assignments

Parameter	Description	Default Severity	Default Assignment
AC Lost	AC input voltage has passed AC Lost alarm threshold	Serious	DO3
AC Input Voltage Abnormal	AC input voltage exceeded normal readings		None
Module Input Protection	Not Applicable	None	
Output Voltage Abnormal	DC output voltage exceeded normal readings	Serious	DO5
Battery Over Voltage	Battery has passed Battery Over Voltage threshold	None	None
Battery Low Cap	Battery capacity has passed Battery Low Cap threshold		
Module Out Over Voltage	Module DC over voltage alarm triggered	Serious	DO4
Module Out Under Voltage	Module DC under voltage alarm triggered		
AC-Module Fault	Module fault alarm triggered		
Module Communication Fail	Module failing to communicate to controller		
Module Current Limit	Module DC current limit alarm triggered		
Module No Equalize Current	Rectifier module charging imbalance		
Module Protection	Not Applicable	None	None
Battery Temperature	Battery low/high temperature alarm triggered		
Ambient Temperature	Ambient low/high temperature alarm triggered	Not Applicable	DO2
Ambient Humidity			
Soon BLVD			
BLVD			
Battery Discharge	Battery below Battery Discharge threshold	None	None
SPD Fault	SPD fault alarm triggered		DO1
Load Fuse Open	Not Applicable		None
Battery1 Fuse Open			
Battery2 Fuse Open			DO6
Custom DI1	Custom Digital Input 1 triggered	Serious	None
Battery Missing	Battery not detected	None	
Oil Open	Oil alarm triggered	Serious	
Fan	Fan alarm triggered		
Water	Water alarm triggered		
Door	Door alarm triggered		
Smoke	Smoke alarm triggered	None	
Battery1 Lost	Battery below battery lost threshold		
Battery2 Lost	Not Applicable		
Battery1 Imbalance			
Battery2 Imbalance			
Battery Maintenance	Battery maintenance date has been reached	None	
Battery Over Current	Battery current exceeded over current threshold	Second	
Soon L1-LVD	DC Voltage approaching LLVD1 disconnect voltage threshold	None	
L1-LVD	LLVD1 Contactor Disengaged	Second	
Air Conditioner	Air Conditioner alarm triggered	Serious	
System Limit Current	System has passed system current limit threshold	None	
CustomDI2	Custom Digital Input 2 triggered	Serious	
CustomDI3	Custom Digital Input 3 triggered		
CustomDI4	Custom Digital Input 4 triggered		
CustomDI5	Custom Digital Input 5 triggered		
CustomDI6	Custom Digital Input 6 triggered		
AC Input Current Abnormal	AC input current exceeded normal readings		

Appendix D: Manufacturer's Warranty

All La Marche Manufacturing Co. equipment has been thoroughly tested and found to be in proper operating condition upon shipment from the factory and is warranted to be free from any defect in workmanship and material that may develop within two years from date of purchase.

Should a piece of equipment require major component replacement or repair during the first year of the warranty period, these can be handled in one of two ways:

1. The equipment can be returned to the La Marche factory to have the inspections, parts replacements and testing performed by factory personnel. Should it be necessary to return a piece of equipment or parts to the factory, the customer or sales representative must obtain authorization from the factory. If upon inspection at the factory, the defect was due to faulty material or workmanship, all repairs will be made at no cost to the customer during the first year. Transportation charges or duties shall be borne by purchaser.
2. If the purchaser elects not to return the equipment to the factory and wishes a factory service representative to make adjustments and/or repairs at the equipment location, La Marche's field service labor rates will apply. A purchase order to cover the labor and transportation cost is required prior to the deployment of the service representative.

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

All sales are final. Only standard LaMarche units will be considered for return. A 25% restocking fee is charged when return is factory authorized. Special units are not returnable.

In no event shall La Marche Manufacturing Co. have any liability for consequential damages, or loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause. In addition, any alterations of equipment made by anyone other than La Marche Manufacturing Co. renders this warranty null and void.

La Marche Manufacturing Co. reserves the right to make revisions in current production of equipment and assumes no obligation to incorporate these revisions in earlier models.

The failure of La Marche Manufacturing Co. to object to provisions contained in customers' purchase orders or other communications shall not be deemed a waiver of the terms or conditions hereof, nor acceptance of such provisions.

The above warranty is exclusive, supersedes and is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness. No person, agent or dealer is authorized to give any warranties on behalf of the Manufacturer, nor to assume for the Manufacturer any other liability in connection with any of its products unless made in writing and signed by an official of the manufacturer.

Appendix E: Document Control and Revision History

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