La Marche Manufacturing Company
www.lamarchemfg.com

TPSD2

Filtered Battery Charger
Power Supply / 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

Important Safety Instructions

Before using this equipment read all manuals and other documents related to this charger and other equipment connected to this charger. Always have a copy of a charger'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 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.

- 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 enclosure 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 accidently tipped over or dropped.

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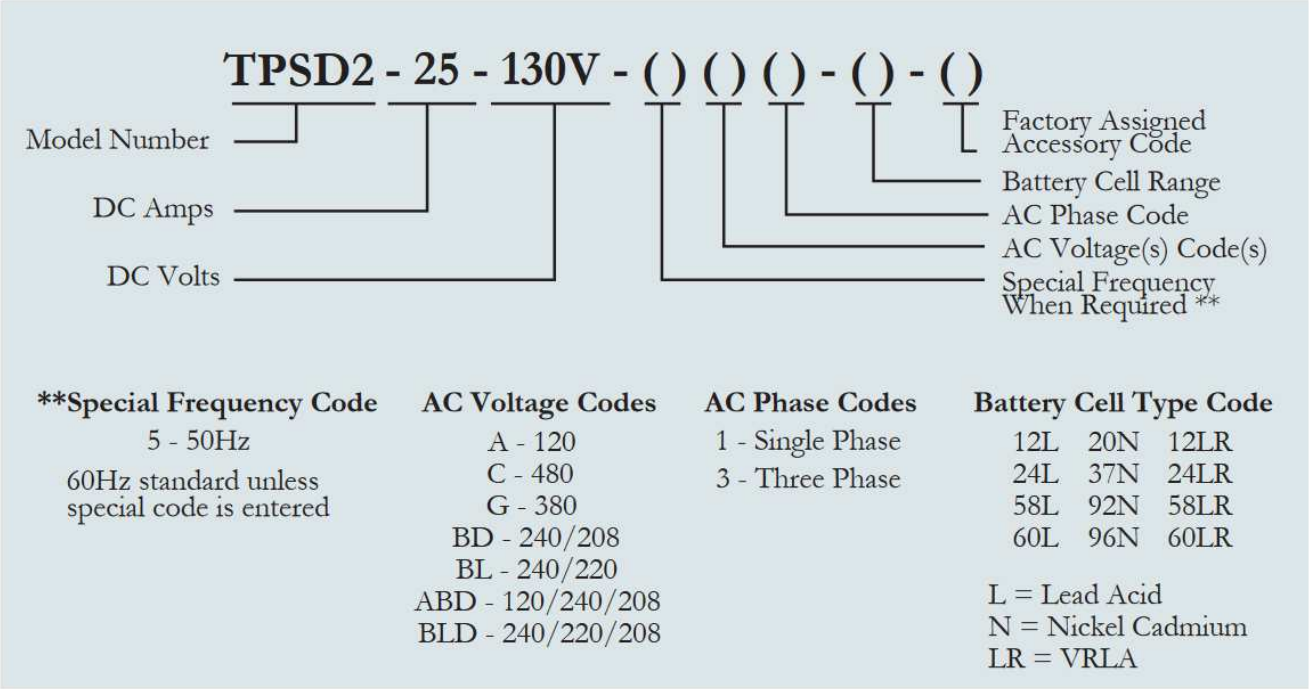
Model Scope/General Description

The La Marche model TPSD2 is a controlled ferroresonant float charger designed to power a load while charging the battery. The TPSD2 is filtered and may be used without the battery. The all solid-state electronic control circuit provides excellent line-load voltage regulation, current limiting, and a power failure relay with light and Form "C" contacts. The TPSD2 is offered with DC output voltages of 24, 48, or 130VDC with output currents from 6 to 200 amps. These chargers may be powered with 120, 208, 240, or 480VAC.

Understanding the Model Number

The TPSD2 model number is coded to describe the options that are included. Find the model number on the nomenclature nameplate of the charger. Then follow the chart to determine the configuration of your battery charger.



****Special Frequency Code**

5 - 50Hz

60Hz standard unless special code is entered

AC Voltage Codes

A - 120
C - 480
G - 380
BD - 240/208
BL - 240/220
ABD - 120/240/208
BLD - 240/220/208

AC Phase Codes

1 - Single Phase
3 - Three Phase

Battery Cell Type Code

12L	20N	12LR
24L	37N	24LR
58L	92N	58LR
60L	96N	60LR

L = Lead Acid
N = Nickel Cadmium
LR = VRLA

Optional Accessories Included in the Charger

This charger may have been outfitted with a number of optional accessories or option packages. To determine the options included (if any), refer to the cover page of the manual package. If the manual package that is included with the charger is no longer available, contact La Marche and provide the model or serial number of the charger to receive a list of the included accessories.

La Marche TPSD2 Battery Charger: Getting Started

WARNING: Please read the Important Safety Instructions before proceeding. Make sure to check for any shipping damages before getting started.

1 – Connect Proper AC Voltage

Confirm proper AC voltage against charger nameplate. If charger is multi-tap, refer to AC Input Voltage Tap Configuration table inside the charger or on charger schematic. Close AC breaker.

2 – Adjust Charger DC Output & Alarms

To access the Settings Menu, press the MENU button, select "Settings Menu", and press the ENTER button. Once in the Settings Menu, the user can navigate the menus with the up and down arrows. To enter a submenu, use the ENTER button. The BACK button returns to the previous menu. When making a selection, the ENTER button will store the value and step back. The BACK button will not save the change and will go a step back. At any point, the settings menu can be exited, with or without saving the settings.

<u>Float/Equalize Voltage</u>

- Float Voltage
- Equalize Voltage

<u>Alarm Settings</u>

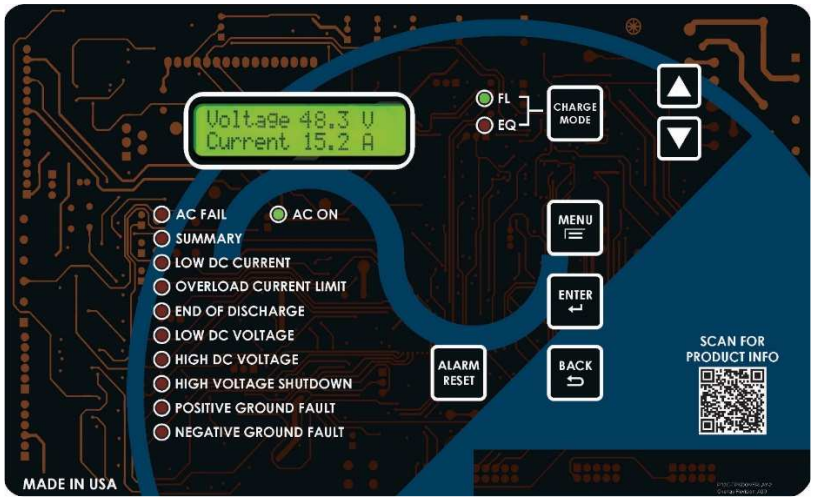
- Alarm Thresholds
  - Low Current
  - Overload
  - Low Voltage
  - End of Discharge
  - High Voltage
  - High Voltage Shutdown
- Summary Alarm Selects
  - Low Current in Summary
  - AC Fail in Summary
  - Ground Detection in Summary

<u>Advanced Settings</u>

- Equalize Timer Settings
  - Equalize Timer Mode
  - Equalize Timer Hours
- Advanced Alarm Settings
  - Alarm Delays
  - Alarm Operation
- Temperature Compensation
  - Temp Comp Enable
  - Temp Comp Rate
- Ground Detection Alarm Enable
  - Enable or Disable
- Communication Settings
  - Refer to manual for setup
- LCD Settings
  - Auto Off 2 Minutes or Always On

3 – Connect Batteries & Loads

Observe proper polarity when making battery and load connections. Close DC breaker, if applicable.



1 Equipment Handling

1.1 Storing the TPSD2

If the TPSD2 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 TPSD2

After careful inspection and upon verification that the TPSD2 is undamaged, identify the enclosure style and weight of the TPSD2 charger. Refer to the tables below.

Output Voltage	Frequency	Ampere Rating								
		6 ADC	12 ADC	20 ADC	25 ADC	30 ADC	35 ADC	50 ADC	75 ADC	100 ADC
24 VDC	60 Hz	4B Case 90 lbs. (40.8 kg)	4B Case 90 lbs. (40.8 kg)	4T Case 100 lbs. (45.4 kg)	4T Case 125 lbs. (56.7 kg)	4T Case 150 lbs. (68 kg)	4T Case 154 lbs. (69.9 kg)	4T Case 175 lbs. (79.4 kg)	4T Case 211 lbs. (95.7 kg)	9 Case 225 lbs. (102.1 kg)
	50 Hz			4T Case 110 lbs. (49.8 kg)	4T Case 138 lbs. (62.6 kg)	4T Case 165 lbs. (74.8 kg)	4T Case 170 lbs. (77.1 kg)	4T Case 193 lbs. (87.5 kg)	4T Case 233 lbs. (105.7 kg)	9 Case 248 lbs. (112.5 kg)
48 VDC	60 Hz	4B Case 90 lbs. (40.8 kg)	4B Case 110 lbs. (49.9 kg)	4T Case 150 lbs. (68 kg)	4T Case 150 lbs. (68 kg)	4T Case 155 lbs. (70.3 kg)	4T Case 180 lbs. (81.7 kg)	4T Case 205 lbs. (93 kg)	9 Case 295 lbs. (133.8 kg)	9 Case 321 lbs. (145.6 kg)
	50 Hz			4T Case 165 lbs. (74.8 kg)	4T Case 165 lbs. (74.8 kg)	4T Case 171 lbs. (77.6 kg)	4T Case 198 lbs. (89.8 kg)	4T Case 225 lbs. (102.1 kg)	9 Case 325 lbs. (147.4 kg)	9 Case 354 lbs. (160.6 kg)
130 VDC	60 Hz	4T Case 140 lbs. (63.5 kg)	4T Case 175 lbs. (79.4 kg)	4T Case 225 lbs. (102.1 kg)	4T Case 250 lbs. (113.4 kg)	9 Case 319 lbs. (144.7 kg)	9 Case 372 lbs. (168.7 kg)	9 Case 532 lbs. (241.3 kg)		
	50 Hz	4T Case 154 lbs. (69.9 kg)	4T Case 193 lbs. (87.5 kg)	4T Case 233 lbs. (105.7 kg)	4T Case 275 lbs. (124.7 kg)	9 Case 352 lbs. (159.7 kg)	9 Case 410 lbs. (186 kg)	9 Case 586 lbs. (265.8 kg)		

Table 1 – Case Type and Weight (Single Phase, 6-100 ADC)

Output Voltage	Frequency	Ampere Rating								
		25 ADC	**30 ADC**	**35 ADC**	**50 ADC**	**75 ADC**	**100 ADC**	**125 ADC**	**150 ADC**	**200 ADC**
24 VDC	**60 Hz**					72 Case 400 lbs. (181.4 kg)	72 Case 475 lbs. (215.5 kg)		72 Case 530 lbs. (240.4 kg)	72 Case 600 lbs. (272.2 kg)
48 VDC	**60 Hz**				72 Case 400 lbs. (181.4 kg)	72 Case 575 lbs. (260.8 kg)	72 Case 600 lbs. (272.2 kg)		72 Case 700 lbs. (317.5 kg)	72 Case 755 lbs. (342.5 kg)
130 VDC	**60 Hz**	72 Case 420 lbs. (190.5 kg)	72 Case 490 lbs. (222.3 kg)	72 Case 550 lbs. (249.5 kg)	72 Case 600 lbs. (272.2 kg)	72 Case 660 lbs. (299.4 kg)	72 Case 800 lbs. (362.9 kg)	44 Case 850 lbs. (385.6 kg)	44 Case 900 lbs. (408.2 kg)	
	50 Hz					72 Case 727 lbs. (329.8 kg)	72 Case 882 lbs. (400.1 kg)			

Table 2 – Case Type and Weight (Three Phase, 25-200 ADC)

The **4B** and **4T** cases do not feature lifting eyes for moving. Instead, move these chargers whenever possible with a forklift truck using the supplied shipping pallet. To hoist the charger into a wall-mount or rack-mount location, use a heavy-duty sling applicable to the case size and charger weight. To relocate the **4B** and **4T** cases, use the aforementioned sling on a hoist or forklift truck.

2 Installation

2.1 Mounting the TPSD2

When mounting the TPSD2 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 method of mounting and the weight of the TPSD2, using Tables 1, 2, and 3. 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 TPSD2 should be mounted in an area free of explosive materials and away from drips and splatter. The TPSD2 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. The bolts or screws used to secure the charger should be sufficient length to assure a vibration-free mounting. The preferred fastener is a machine bolt backed with a flat washer, lock washer, and nut. All hardware should be corrosion-resistant.

Enclosure Number	Cable Entry		Mounting
	AC Input	DC Output	
4B	Right	Left	19/23" Rack, Wall/Floor (see Figure 1 & 2)
4T	Right	Left	19/23" Rack, Wall/Floor
9	Top Right	Top Left	23/30" Rack, Wall/Floor
72	Right / Bottom	Bottom	Floor
44	Left	Right	Floor

Table 3 – Available Mounting Methods

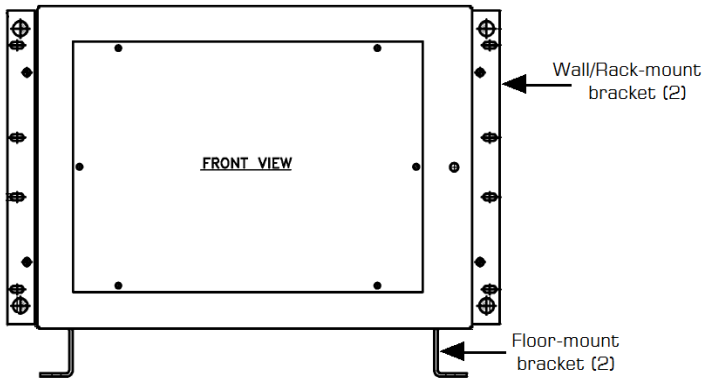


Figure 1 – Mounting Configurations (4B Enclosure front view)

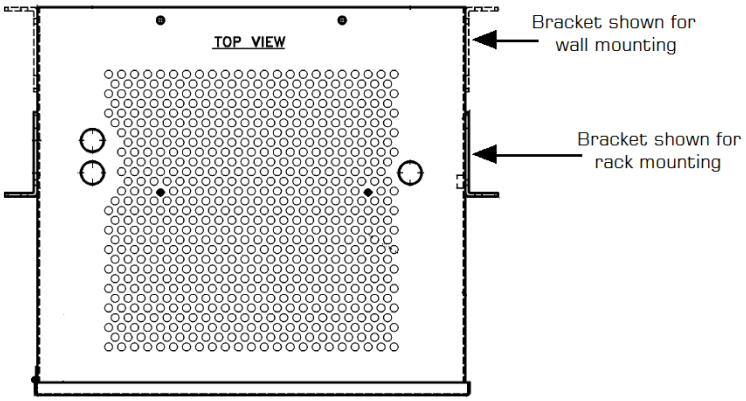


Figure 2 – Mounting Configurations (4B Enclosure top view)

2.1.1 Wall-Mounting the TPSD2 (4B, 4T, and 9 Enclosures Only)

The **4B, 4T, and 9** enclosures of the TPSD2 are shipped from the factory with the necessary brackets installed for wall-mounting *(The same bracket is used for rear mounting on a relay rack, 4B, 4T – 19/23" rack, 9 – 23/30" rack)* The **72 & 44** enclosures do 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 TPSD2, install four 0.5 in (12.7 mm) bolts on the wall rated to support the charger weight plus a safety factor of at least two times. Secure the charger on bolts, add appropriate mounting hardware, and tighten securely. Refer to the figures below for mounting dimensions and specifications.

NOTE: *All above dimensions are in inches. For further TPSD2 enclosure information, see the outline drawings for the corresponding enclosures online at http://www.lamarchemfg.com/info/enclosure-drawings.html*

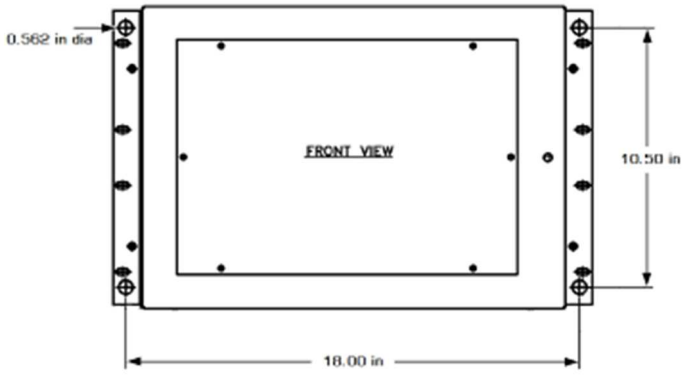


Figure 3 - 4B Enclosure Bolt Pattern

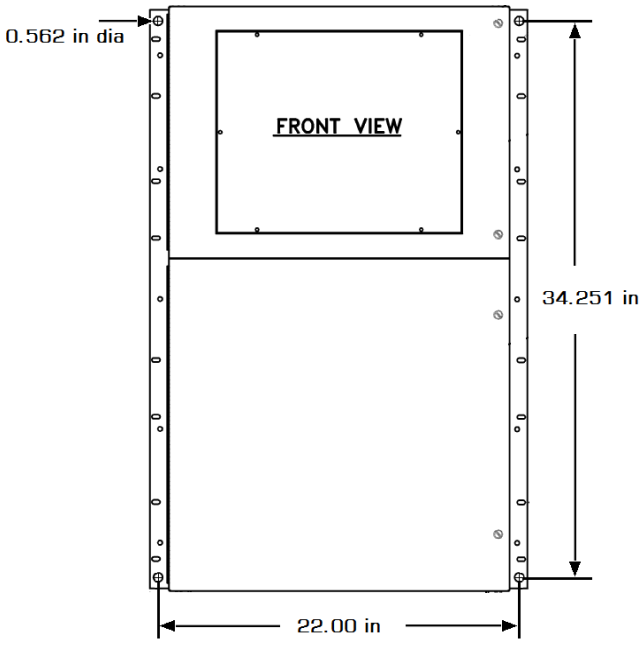


Figure 5 - 9 Enclosure Bolt Pattern

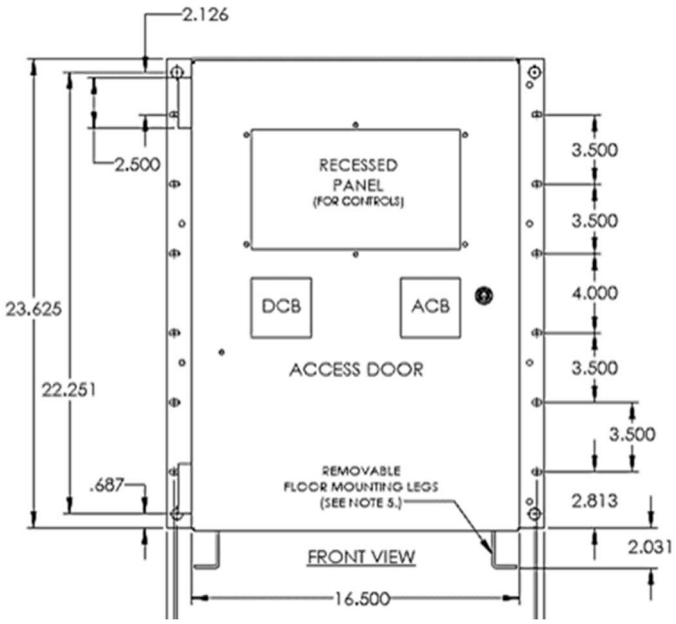


Figure 4 – 4T Enclosure Bolt Pattern

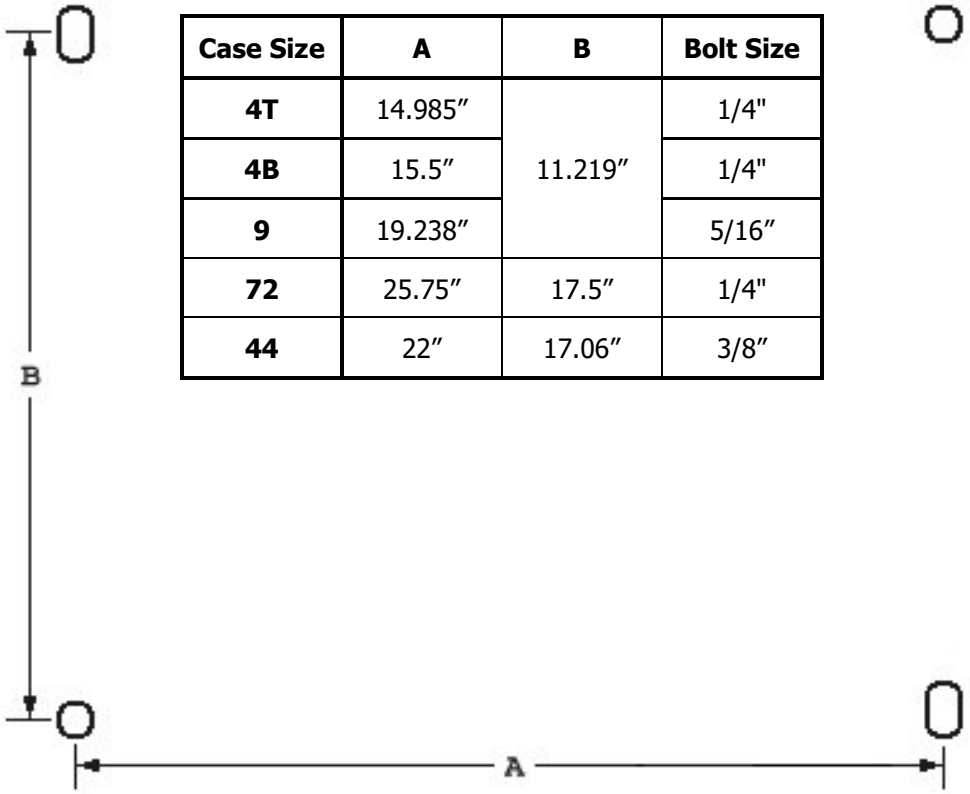
2.1.2 Floor-Mounting the TPSD2 (All Enclosures)

Floor-mounting the **72 & 44** enclosures is standard. If it is desired to floor mount a charger with the **4B, 4T** or **9** enclosure, the floor-mount bracket is provided.

NOTE: *The floor mount bracket adds an additional 2 in (51 mm) to the overall height of 4B, 4T, and 9 enclosures. 72 and 44 enclosures include the height of the bracket in their overall height.*

Floor-Mounting Procedure

To floor-mount the TPSD2, install four anchor bolts into the floor. Place the charger on the bolts, add appropriate mounting hardware, and tighten securely. The figure below shows the footprint and the bolt size of each TPSD2 enclosure style. All dimensions are in inches.



Case Size	A	B	Bolt Size
4T	14.985″	11.219″	1/4"
4B	15.5″		1/4"
9	19.238″		5/16″
72	25.75″	17.5″	1/4"
44	22″	17.06″	3/8″

Figure 6 - TPSD2 Enclosure Footprint

2.1.3 Rack-Mounting the TPSD2

The TPSD2 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. The **4B, 4T, and 9** enclosures are shipped from the factory with the necessary brackets installed for rear mounting on a relay rack *(The same bracket is used for wall mounting).* The rack mounting bracket for the **4B and 4T** enclosures allows for mounting on either a 19" or 23" rack. The rack mounting bracket for the **9** enclosure allows for mounting on a 23" or 30" rack.

Before installing the charger on the rack, locate the conduit entrances and assure 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 the TPSD2 charger.

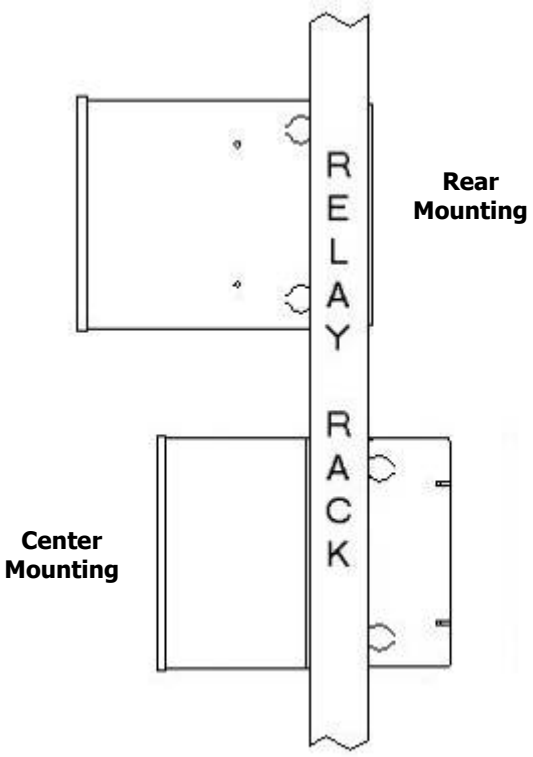


Figure 7 - Rack-Mounting Configurations (4B Enclosure)

Rack Mounting Procedure

To rack mount the TPSD2, 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
4T	Yes (19" rack only)	Yes
4B	Yes (19" rack only)	Yes
9	No	Yes
72	No	No
44	No	No

Table 4 – Rack Mount Configurations

If you are center-mounting the charger, install the bracket on the front side of the relay rack. If you are rear-mounting the charger, install the bracket to the back side of the relay rack, as pictured in the Figure 7 above.

2.2 AC Input Connections

Before beginning any work inside the charger, ensure that all incoming AC supply power is off at the main breaker box and the charger's breakers are off. Check that the source voltage and frequency match the voltage and frequency listed on the charger front nameplate specifications. Also, confirm if charger is multi or single input by referring to charger nameplate. If charger is confirmed to be a multi-input charger, refer to corresponding charger schematic or AC input wiring chart inside charger for transformer tap settings. Select wire size using the table 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.*

Breaker Size/ Fuse Size - Amps	AWG Minimum Wire Size Requirement for Customer Connection	AWG Minimum Wire Size for Equipment Grounding
3	#14	#14
5	#14	#14
10	#14	#14
15	#14	#14
20	#12	#12
25	#10	#12
30	#10	#10
40	#8	#10
50	#8	#10
60	#6	#10
70	#6	#8
80	#4	#8
90	#4	#8
100	#4	#8
125	#2	#6
150	#1	#6
175	#1/0	#6
200	#2/0	#6

Table 5 – 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. Install the input AC cables to the AC input terminals of the charger.

2.3 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.

NOTE: *It is recommended to use a battery disconnect breaker between charger and battery bank; helpful during battery or charger maintenance.*

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 (KS5482-01)
= 17.4 for aluminum (KS20189)

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 6 – 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.
5. After 30 seconds, turn on/close the DC breaker.

2.4 Alarm Connections

Eight alarm relays (and 10 alarm LEDs) are included as a standard feature of the TPSD2. The included alarms are Low DC Current, Low DC Voltage, High DC Voltage, High Voltage Shutdown, AC Failure, Negative Ground Detection, Positive Ground Detection, and Summary alarm. Each alarm includes two sets of form 'C' contacts, enabling the user to connect multiple remote annunciators. Refer to Figure 8 for alarm contact connections.

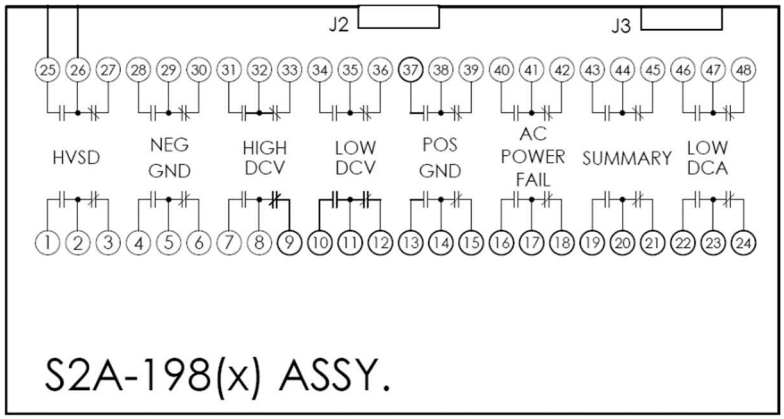


Figure 8 – User Connections to Alarm Contacts on S2A-198 Board

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, and Summary. Refer to Figure 9 below.

If an alarm condition occurs for a default time of longer than 5 seconds, the Summary alarm relay will activate if the corresponding alarm is included in the Summary alarm. The HVSD alarm is 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.

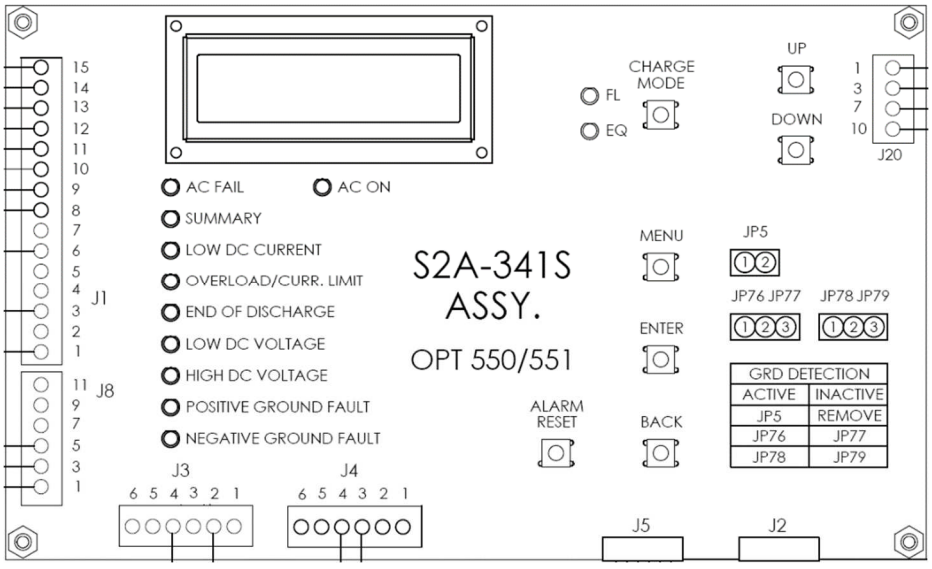


Figure 9 – S2A-341S Display/Control Board

All alarm contacts for the S2A-198 relay board are designed to be fail-safe. In other words, if both the AC and DC power are removed, each alarm will be indicating the charger's current state. To accomplish this, certain alarm relays are de-energized on failure (such as Low DC Current), and certain alarm relays are energized on failure (such as High DC Voltage). Refer to Table 7 for the logic of each alarm and refer to Table 8 for alarm contact specifications.

S2A-198 Relay Information	
Relay Function	**Logic**
AC Power Fail	De-Energize on Fail
Summary	De-Energize on Fail
High DC Voltage Shutdown	Energize on Fail
Low DC Current	De-Energize on Fail
High DC Voltage	Energize on Fail
Low DC Voltage	De-Energize on Fail
End of Discharge	De-Energize on Fail
Positive Ground	Energize on Fail
Negative Ground	Energize on Fail

Table 7 – Alarms Relay Logic

Load	Resistive Load (P.F. = 1)
Contact Material	Ag (Au clad)
Maximum Allowed Current	2 A
Max. Operating Voltage and Current	0.5 A at 125 VAC
	0.6 A at 110 VDC
	2.0 A at 30 VDC
Max. Switching Capacity	62.5 VA
	60 W
Min. Permissible Load	10 µA / 10 mVDC

Table 8 – Alarm Contact Specifications

2.4.1 Alarm Connection Procedure

Before making any connections to the TPSD2, ensure that the AC power is off at the main breaker box and the charger's breakers are off. Verify that no voltage is present by using a voltmeter at all input and output terminals.

For relays mentioned as ENERGIZED on alarm condition:

If it is desired that the annunciator be active until the alarm triggers, connect the annunciator leads to the **NC** and **C** contacts of the desired alarm (located on the relay alarm contacts on S2A-198 board). If it is desired that the annunciator be deactivated until the alarm triggers, connect the annunciator leads to the **NO** and **C** contacts of the desired alarm.

For relays mentioned as DE-ENERGIZED on alarm condition:

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 (located on the relay alarm contacts on S2A-198 board). If it is desired that the annunciator be deactivated until the alarm triggers, connect the annunciator leads to the **NC** and **C** contacts of the desired alarm.

EXAMPLE: *A customer wants a green lamp to be illuminated at all times and wants a red lamp to illuminate and a speaker to sound when the Summary alarm triggers. The customer would make the connections to the NC and C contacts on one set of the Summary relay contacts between the speaker and a power supply. On the other set of Summary relay contacts, the customer would connect the NO and C contacts between the green lamp and power supply, and would connect the NC and C contacts between the red lamp and power supply. Refer to Figure 10.*

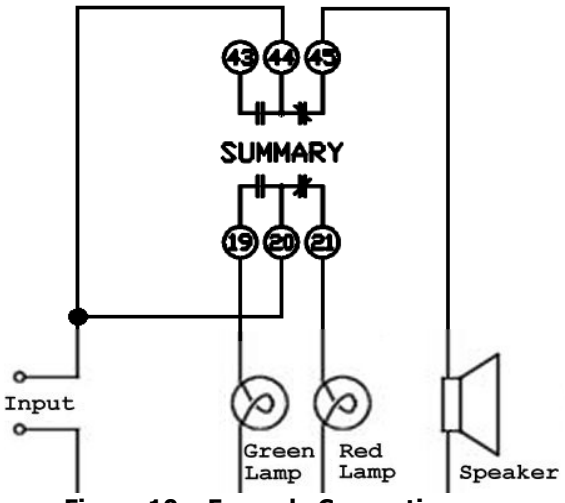


Figure 10 – Example Connections (Customer Provided Equipment)

2.4.2 Understanding the Alarms

HIGH DCV SHUTDOWN 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. This can be caused by maladjustments of the output voltage settings, or in rare cases, by a failure of an internal charger component. If the High DC Voltage Shut Down alarm activates, the DC output of the charger is shut off by tripping the AC breaker to prevent irreversible damage to the battery. To reset, press the ALARM RESET button on the front panel, then close the AC breaker.

NOTE: *The High Voltage Shutdown alarm will not trigger if there is a Low Current alarm 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. This can be caused by maladjustments of the output voltage settings, or in rare cases, by a failure of an internal charger component.

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. This can be due to an AC Failure or the charger is overloaded into deep-current limit. It could also be caused by maladjustments of the output voltage settings, or in rare cases, by a failure of an internal charger component.

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.

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.

AC POWER FAIL ALARM will trigger, the green "AC ON" LED will turn off, and the red "AC FAIL" LED will turn on when the AC power to the charger is lost. 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.

SUMMARY ALARM is triggered and the "SUMMARY" LED will turn on when any of the following alarms are activated:

- Low DC Voltage
- High DC Voltage
- Low DC Current*
- Positive Ground*
- Negative Ground*
- AC Failure*
- S2A-407S Failure**

** Optional to include in Summary Alarm*

*** If applicable*

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 can be caused by the load (if applicable) being disconnected or if the battery (if applicable) has reached a full charge. This could also be the result of maladjustments of the output voltage settings. In rare cases, this could be the result of certain parallel setups in which the other charger is set up to carry all the load. This alarm can be disabled if considered a nuisance alarm.

Most alarms have adjustable time delays to energize; ranging from 0 through 255 seconds. Refer to Table 9 for the factory setting of each alarm.

NOTE: *All alarms automatically reset when the alarm condition is corrected, except the High Voltage Shutdown alarm. Refer to the corresponding alarm description above for reset instructions.*

2.5 External Temperature Compensation (Option 11W/11Y)

The natural voltage of a battery changes as a function of temperature change. As the battery temperature rises, the effective voltage of the battery decreases. Without Temperature Compensation, the battery charger will always produce a set constant output voltage. As the battery temperature increases, this constant voltage will then induce a higher output current from the charger. This higher current can result in overcharging the battery, which in turn can result in damage to the batteries.

The TPSD2 temperature compensation rate can easily be adjusted in the menu from the default setting OFF to 1mV/°C/cell, up to 4mV/°C/cell. 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.

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). Option 11W includes a 24-foot long temperature probe and Option 11Y includes a 100-foot long temperature probe. With either option, approximately two feet of the probe is taken inside the charger enclosure.

External Temperature Probe Connection Procedure

Before making any connections to the TPSD2, ensure that the AC power is off at the main breaker box and the charger's breakers are off. Verify that no voltage is present by using a voltmeter at all input and output terminals.

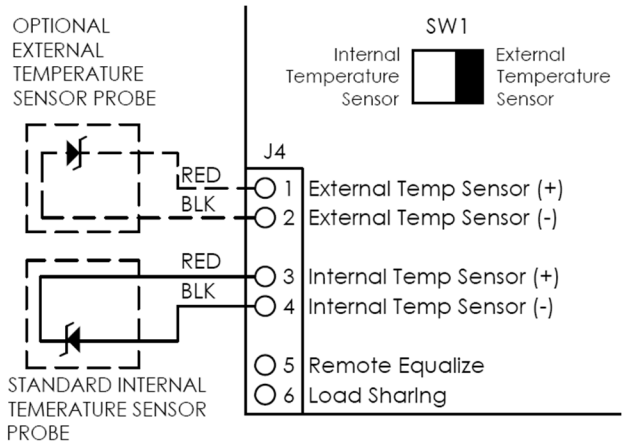


Figure 11 – Temperature Compensation Connections (External and Internal for S2A-406 Board)

1. Locate the **J4** terminal strip on the S2A-406 board.
2. Toggle the **SW1** switch on the S2A-406 board to the External position. Refer to the figure above.
3. Connect the black lead of the external probe to terminal **2** of **J4**, and the red lead to terminal **1** of **J4**.
4. Place the external probe in a desired location.

(It is recommended that the battery manufacturer be consulted for placement of the probe)

2.6 Load Sharing

All TPSD2 chargers include the Load Sharing feature. Load sharing allows the user to parallel with any identical TPSD2 to share a DC load and therefore reduce the strain on each charger. When connected, identical TPSD2 chargers are forced to share the load within ±5% for individual unit outputs greater than 10% of the rated output. Chargers to be paralleled *MUST* be the same output (voltage and current).

NOTE: *Ground Detection should only be enabled on one charger when load sharing. See Section 2.9 to disable.*

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 for instructions).

Load Sharing Procedure

Before making any connections to the TPSD2, ensure that the AC power is off at the main breaker box and that all of the chargers' breakers are off. Verify no voltage is present by using a voltmeter at all input and output terminals.

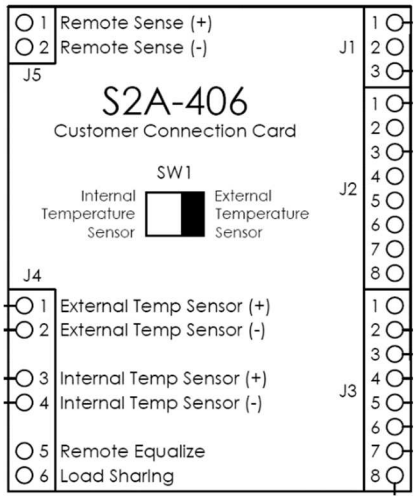


Figure 12 – S2A-406 Board Connections

1. Connect the DC output of all chargers in parallel to the same DC load/battery.
2. Locate terminal strip **J4** on S2A-406 board inside the chargers.
3. Connect terminal **6** of **J4** of one charger to terminal **6** of **J4** of the next charger. This connection can be made with a 16 AWG wire. Refer to the figure above.
4. Once batteries are fully charged and/or loads are stabilized, turn OFF all chargers except for one.
5. Take a voltage reading of the Float voltage on the output of the charger.
6. Turn on the next charger, turn off the first charger.
7. Set the output voltage of the next charger to match the first by adjusting the Float voltage using the Settings Menu (refer to Section 3.4.1.1).
8. After all chargers have been adjusted, turn ON all chargers.
9. Repeat steps 4 through 8 for Equalize.

2.7 Remote Equalize

A terminal is provided on charger for a Remote Equalize function. The Remote Equalize terminal is on terminal 5 of J4 of S2A-406 board as shown on Figure 12. Connections can be made by using a 16 AWG wire. The charger may be remotely forced into Equalize by connecting the Remote Equalize terminal to negative.

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' Remote Equalize terminals must be connected together for Remote Equalize.

In a system, all charger Remote Equalize terminals are connected together and when any one master charger is put into Equalize, all chargers will go into Equalize and the display will read "in Remote Equalize." To return to Float Mode, the master charger must be returned to the Float Mode.

CAUTION: Damage to the unit will result if the Remote Equalize terminals are shorted to any other AC or DC voltage source or ground on positive grounded chargers.

NOTE: *Remote Equalize can only be used with other TPSD2 chargers of the same output voltage and current.*

2.8 Remote Voltage Sensing

Provisions for remote DC voltage sensing are provided. The sensing circuit is activated when wires from the battery or load are brought back to the Remote Sensing terminals of the charger. The Remote Sensing terminals are on terminals 1 & 2 of J5 of the S2A-406 board as shown on Figure 12. Connections can be made by using a 16 AWG wire.

The positive remote sensing lead should contain an external 1 Amp fuse for negative ground system. When remote sensing is wired, the unit output may have to be readjusted to compensate for the protection diodes on the circuit board.

CAUTION: The polarity of the Remote Sensing terminals is critical. Check and verify the polarity carefully.

2.9 Ground Detection

Ground Detection is available on TPSD2 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 amount of ground current, whether it is positive of negative, and will alarm when the threshold of 1.5mA is reached (or exceeded).

TPSD2 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. The charger will indicate a ground fault at all times if the system is known to be grounded and the Ground Detection is enabled.

For TPSD2 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 next page for steps). If an external Ground Detection system is used, the TPSD2 Ground Detection must be disabled.

NOTE: *La Marche Mfg. Co. is primarily a manufacturer of battery chargers and not ground detection systems. If a more precise system is required, many systems that are designed specifically for ground detection are compatible with La Marche battery chargers.*

Ground Detection Procedure

Before making any changes to the TPSD2, ensure that the AC power is off at the main breaker box and that all of the charger's breakers are off. To enable or disable Ground Detection, first locate the S2A-341S board inside the charger. Refer to the figure below; all jumpers are located on the component side of the board.

To ENABLE Ground Detection:

- Install jumper **JP5**
- Move jumper JP76/JP77 to **JP76** position
- Move jumper JP78/JP79 to **JP78** position

To DISABLE Ground Detection:

- Remove jumper **JP5**
- Move jumper JP76/JP77 to **JP77** position
- Move jumper JP78/JP79 to **JP79** position

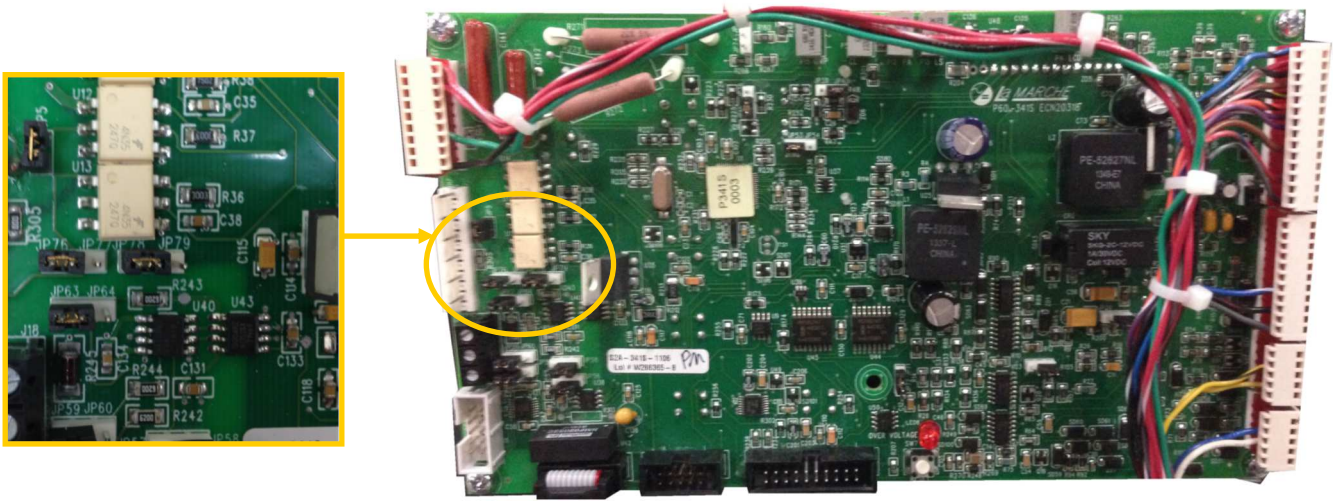


Figure 13 – S2A-341S Digital Control Board (Back View)

2.10 DNP 3.0 / Modbus SCADA Interface (Option 21P/21Q)

The optional DNP 3.0 / Modbus SCADA Interface Communication Board, allows the user to remotely connect to the TPSD2 battery charger. The board is equipped with four methods of communication; DNP 3.0, Modbus ASCII, Modbus RTU and Modbus TCP. There are three different ports for connection to the communication board. The three port types for connection are: RS232, RS485, and TCP (Ethernet).

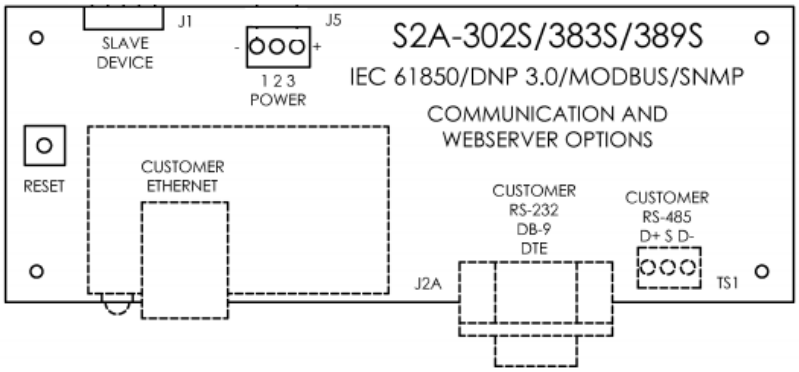


Figure 14 – DNP 3.0 / Modbus Communication Board

Communication Interface Connection Procedure

Before making any connections to the TPSD2, ensure that the AC power is off at the main breaker box and the charger's breakers are off. Choose which port to use for connection (Ethernet, RS232, and/or RS485 – refer to the figure above). Connect the appropriate cable between the port on the communication board and the port on the computer.

For more details on connection instructions as well as operation instructions, refer to the DNP 3.0 & Modbus SCADA Interface instruction manual included with the TPSD2. The DNP 3.0 & Modbus instruction manual is also available online at http://www.lamarchemfg.com/.

2.11 Battery Side Alarm Sensing (Option 565)

The optional battery voltage sensing board (S2A-407S) will allow the user to see the voltage on the display at the output terminals of the charger (sensing from the output side of the charger DC breaker), even when the charger DC breaker is open. On the main screen, the display will indicate the DC voltage at the output terminals of the charger instead of the internal charger DC output voltage (sensing from the charger side of the charger DC breaker). To view the internal charger DC output voltage, simply scroll down using the DOWN arrow until the charger internal voltage is shown. Refer to images on Section 3.2 under viewable parameters.

The Low Voltage and End of Discharge alarms are based on the voltage measured on the output terminals of the charger when Option 565 is used. If there is a board failure, a special alarm "S2A-407S Failure" and the Summary alarm will be triggered. The control board will use the charger side voltage sensing for Low Voltage and End of Discharge alarms if a battery side sensing failure occurs.

3 Operation

3.1 Starting the TPSD2

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 TPSD2 are based on the model number, unless otherwise specified. All chargers are set at the factory with the following settings:

Parameter	Lead Acid	VRLA	Nickel Cadmium	Delay (sec.)
Float Voltage	2.17 V/C	2.25 V/C	1.40 V/C	
Equalize Voltage	2.33 V/C	2.27 V/C	1.55 V/C	
Low DC Voltage	1.98 V/C		1.20 V/C	5
Low DC Voltage Reset	5% of the Low DC Voltage threshold			
Low DC Current	1% of shunt size			5
Low DC Current Reset	Dependent on output current rating			
Overload	Dependent on output current rating			5
Overload Reset	5% of the Overload threshold			
Current Limit	115% of nominal output current			5
High DC Voltage	2.45 V/C		1.61 V/C	5
High DC Voltage Reset	5% of the High DC Voltage threshold			
High Voltage Shutdown	2.50 V/C		1.65 V/C	20
Battery End of Discharge	1.75 V/C		1.10 V/C	5
End of Discharge Reset	5% of the End of Discharge threshold			
Equalize Timer Mode	Automatic Equalize Off (Mode P0)			
Equalize Time	8 Hours			

Table 9 – Factory Default Values

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

3.1.1 Checking the Installation

Before attempting to start up the TPSD2, check and verify that all connections are correct. Check that all terminations and contacts are tightened securely. Check for any loose connection or unsecured components in the charger. Check that the transformer is set for the correct input voltage and that the input frequency matches the nameplate or the charger. Check that the battery/load voltage matches the DC output voltage on the nameplate of the charger. Verify AC feeder breaker matches charger input protection rating.

3.1.2 Starting/Stopping the TPSD2

Once proper connections are established, energize the power supply by turning on the charger's AC breaker (the DC breaker should be off). After about 30 seconds, turn on the DC breaker. To shut down the TPSD2, switch off the DC breaker first and then switch off the AC breaker.

3.1.3 Start-Up Sequence

Upon powering up the TPSD2, a test sequence is activated. This test flashes all of the charger's LEDs and activates all alarms. The digital meter display will show the model and software number.

3.2 Digital Control Board

The standard TPSD2 comes with an LCD digital control board. Option 551 replaces the LCD display with a VFD display. The digital control board is a more attractive and user-friendly option, with many additional features.

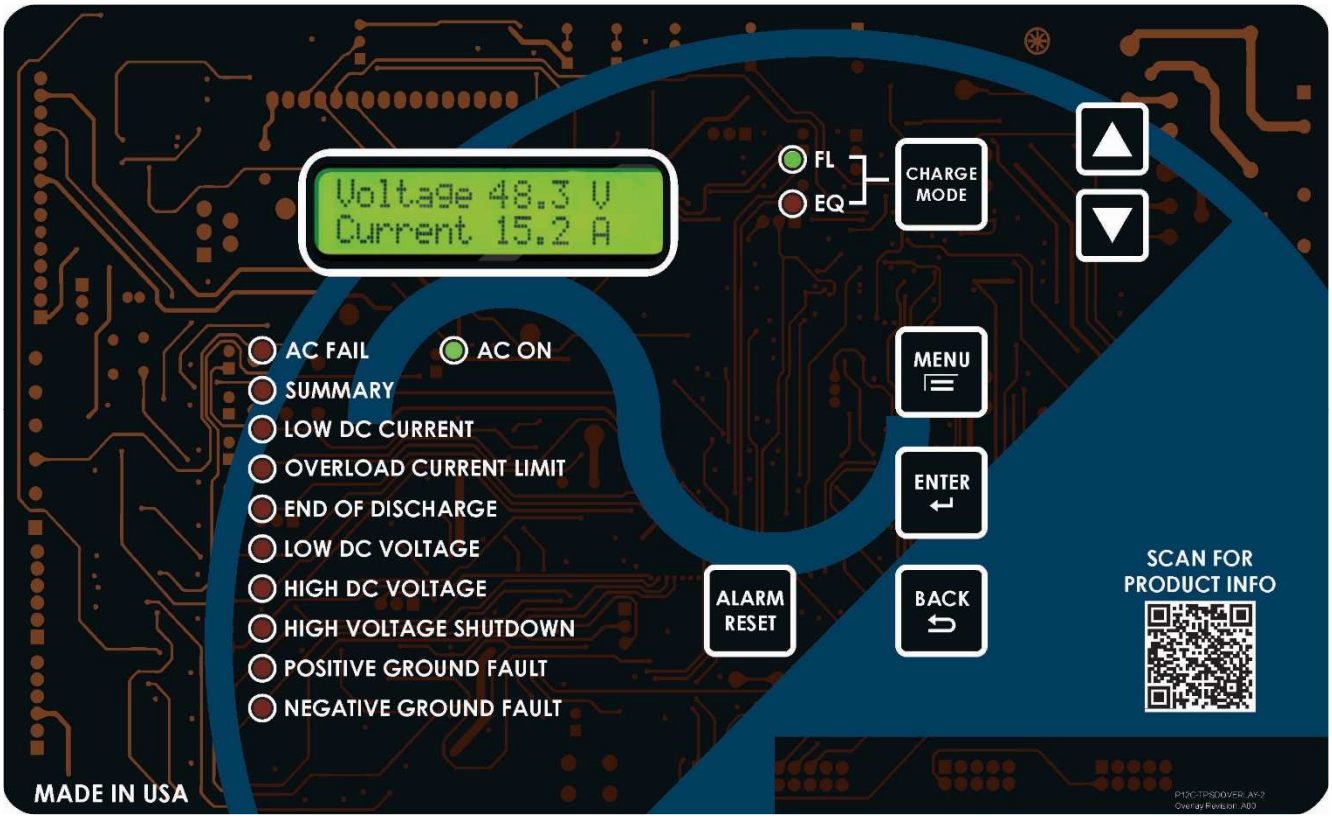


Figure 15 – TPSD2 Front Panel

After the TPSD2 has completed the startup sequence, "AC ON" and "FL" green LED indicators on the front panel will be lit, additional indicators will be lit according to the system's status as pictured in above figure. The digital meter display will show both the system DC output voltage and DC output current. Pressing either the UP or the DOWN arrow on the membrane will change the parameter that is displayed.

The parameters viewable on the idle display are as follows:

Standard TPSD2 Display Sequence		Option 565 TPSD2 Display Sequence	
Voltage 132.3 V Current 15.2 A	System DC Outputs (Voltage Sensing from Charger Side of DC Breaker)	Voltage 132.3 V Current 15.2 A	System DC Outputs (Voltage Sensing from output terminals)
Temperature Probe 27C	Temperature at Probe (Internal/External – Based on Connection)	Temperature Probe 27C	Temperature at Probe (Internal/External – Based on Connection)
Temperature Compensation OFF	Temperature Compensation Status	Temperature Compensation OFF	Temperature Compensation Status
EQ Timer OFF 8 Hour EQ	Equalize Timer Status and Length	CHG INTERNAL: 132.5 V	Charger DC Output Voltage (Voltage Sensing from Charger Side of DC Breaker)
Next Auto EQ in: OFF	Time until Next Automatic Equalize cycle	EQ Timer OFF 8 Hour EQ	Equalize Timer Status and Length
EQ Timer Mode Auto EQ OFF	Selected Equalize Timer Mode	Next Auto EQ in: OFF	Time until Next Automatic Equalize cycle
		EQ Timer Mode Auto EQ OFF	Selected Equalize Timer Mode

3.3 Selecting the Charging Mode

The TPSD2 has two different settings for DC output voltage, Float Mode and Equalize Mode. Float charging mode is used for all normal battery charging needs. In the case of the TPSD2, the Float Mode can also be used for battery elimination (directly powering the DC load from the TPSD2). Equalize Mode is used when it is necessary to Equalize (or balance) the level of charge across all cells present in the battery. Consult the battery manufacturer for the proper Equalize procedures. Refer to section 3.4.1.1 for Float/Eq voltage adjustments.

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. Alternatively, the charger can manually be switched to Float Mode by pressing the CHARGE MODE button again.

3.3.1 Equalize Timer Modes

The TPSD2 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. Both the timer and the mode can be changed via Settings Menu (refer to Section 3.4.1.3 under *Equalize Timer Settings*). In all of the Equalize Modes, the charger will immediately return to Float Mode if the CHARGE MODE button is pressed or when it completes its full Equalize time.

Auto EQ OFF (Mode P0)

Mode P0 is a manual Equalize cycle and is the default setting for the charger. 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.

7 Day Auto EQ (Mode P1)

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.

14 Day Auto EQ (Mode P2)

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.

30 Day Auto EQ (Mode P3)

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.

Auto EQ on LV (Mode P4)

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 P4 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.

3.4 Adjusting Parameters

All equipment is shipped from the factory fully tested and set per 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. Refer to Section 3.7 for TPSD2 settings menu structure flow chart.

3.4.1 Settings Menu

In the Settings Menu, the user can access and change various parameters used by the TPSD2. To access the Settings Menu, press the MENU button, select "Settings Menu", and press the ENTER button.

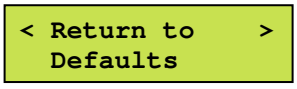
Once in the Settings Menu, the user can navigate the menus with the up and down arrows. To enter a submenu, use the ENTER button. The BACK button returns to the previous menu. When making a selection, the ENTER button will store the value and step back. The BACK button will not save the change and will go a step back. At any point, the settings menu can be exited, with or without saving the settings.

The settings menu is divided into 4 submenus: "Float/Eq Voltage", "Alarm Settings", "Advanced Settings", and "Return to Defaults".

Return to Defaults

The 4th option in the Settings Menu is "Return to Defaults". This 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.

EXAMPLE: *The software default for a 130V charger is based on 60 lead cells, a 63L charger is factory adjusted for a higher voltage. Returning to default will return the charger to a 60L voltage setting.*

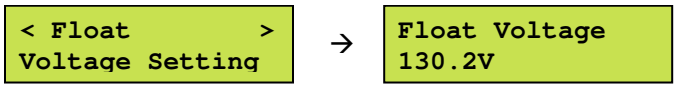


3.4.1.1 Float/Eq Voltage

The Float/Eq Voltage submenu provides access to change the Float Voltage and Equalize Voltage Settings.

Float Voltage Setting

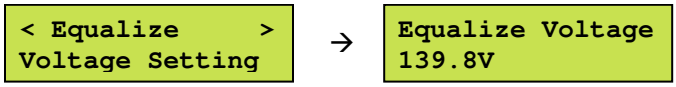
The float voltage adjustment is set at the factory at 2.17 V/C (LA), 2.25 V/C (VRLA) or 1.4 V/C (NC). The Float voltage increments by 0.1V. Select "Float Voltage Setting" and press then ENTER button. Press the UP and/or DOWN buttons until the required voltage level is displayed. Press ENTER to store the setting or BACK to cancel.



The approximate adjustable range is as follows:
2.02 – 2.40 V/C (LA) (VRLA)
1.29 – 1.55 V/C (NC)

Equalize Voltage Setting

The Equalize voltage adjustment is set at the factory at 2.33 V/C (LA), 2.27 V/C (VRLA) or 1.55 V/C (NC). The Equalize voltage increments by 0.1V. Select "Equalize Voltage Setting" and press then ENTER button. Press the UP and/or DOWN buttons until the desired voltage is displayed. Press ENTER to store the setting, BACK to cancel.



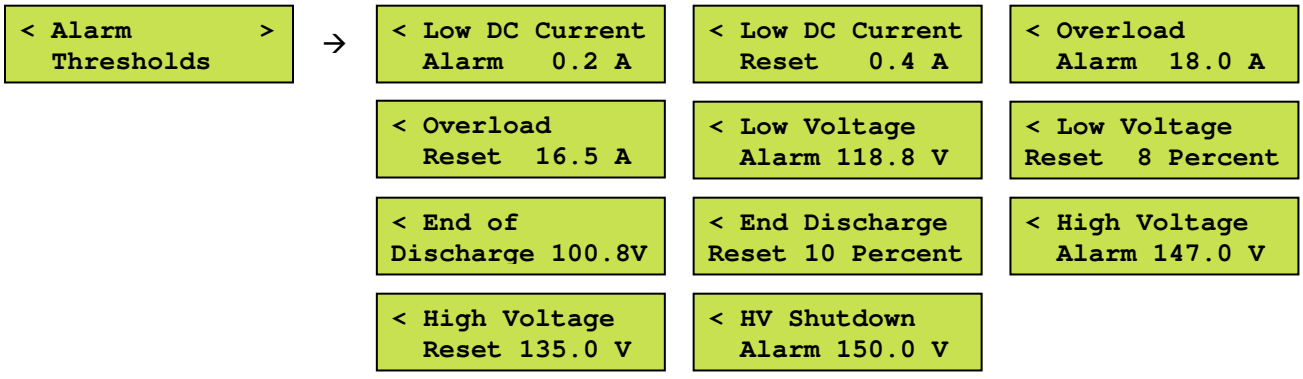
The approximate adjustable range is as follows:
2.15 – 2.50 V/C (LA) (VRLA)
1.40 – 1.70 V/C (NC)

3.4.1.2 Alarm Settings

The Alarm Settings submenu provides access to the change the Alarm Thresholds and Summary Alarm Selects.

Alarm Thresholds

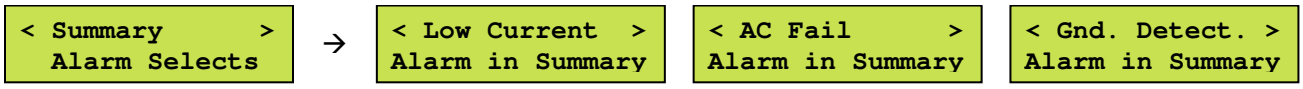
The Alarm Thresholds setting allows the user to determine the current or voltage value at which an alarm trigger. The threshold can be changed for Low Current Alarm, Low Current Alarm Reset, Overload Alarm, Low Voltage Alarm, Low Voltage Alarm Reset, End of Discharge Alarm, High Voltage Alarm, and High Voltage Shutdown Alarm.



NOTE: *Alarm threshold defaults are based on the charger output. The alarm threshold values shown above are not representative of the default values for any specific TPSD2 charger.*

Summary Alarm Selects

The Summary alarm selects setting allows the user to choose whether or not to include the Low Current Alarm, Ground Detection Alarms, and AC Failure Alarm as part of the Summary Alarm. By default, all three of these alarms are included in the Summary Alarm.



NOTE: *The Low DC Voltage and High DC Voltage alarms are included in the Summary alarm and cannot be removed.*

3.4.1.3 Advanced Settings

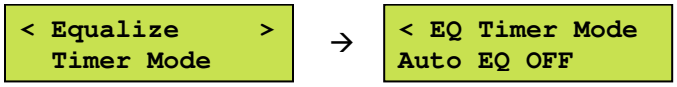
The Advanced Settings Menu allows the user to access and modify other parameters of the charger which are not included in the basic Settings Menu. The Advanced Settings Menu is divided into 7 submenus: "Equalize Timer Settings", "Advanced Alarm Settings", "Temperature Compensation", "Ground Detection Alarm Enable", "Communication Settings", "LCD Settings", and "Return to Defaults".

Equalize Timer Settings

The Equalize Timer Settings submenu provides access to the change the Equalize Timer Mode, and Equalize Timer Hours.

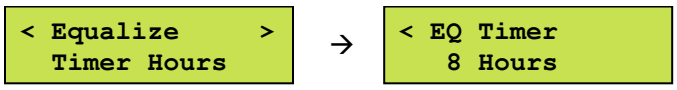
Equalize Timer Mode

The Equalize timer mode determines when the charger will go into an Equalize charging cycle. The timer modes are "Auto EQ OFF", "7 Day Auto EQ", "14 Day Auto EQ", "30 Day Auto EQ", and "Auto EQ on LV". The default setting for the Equalize timer mode is Auto EQ OFF. The Equalize Timer Modes are discussed in further detail in Section 3.3.1.



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 1-144 hours, by default the Equalize timer is set for 8 hours. The battery manufacturer recommendations should be followed.

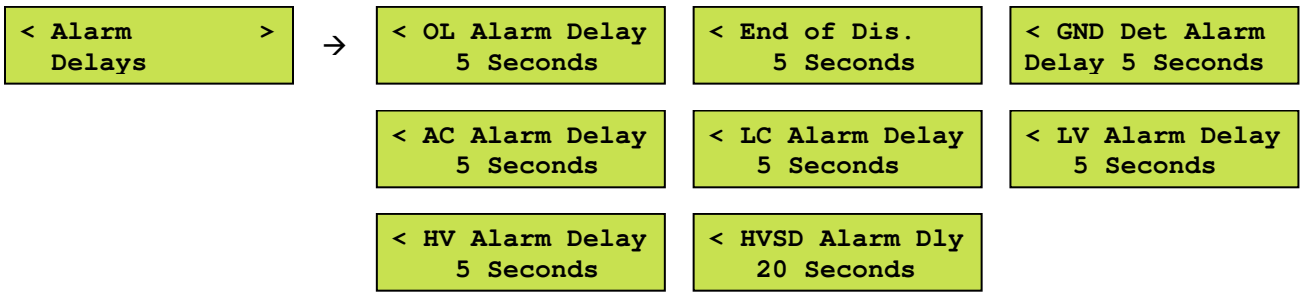


Advanced Alarm Settings

The Advanced Alarm settings allow the user to access and modify additional parameters of the charger, such as the Alarm Delays and Alarm Operation.

Alarm Delays

The Alarm Delays 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 Overload Alarm, End of Discharge Alarm, Ground Detection Alarm, AC Alarm, Low Current Alarm, Low Voltage Alarm, High Voltage Alarm, and High Voltage Shutdown Alarm. The delay for all alarms is adjustable between 1-300 seconds.



Alarm Operation

The Alarm Operation setting defines if the alarms relays latch. The relay latch setting can be changed for Summary Alarm, AC Power Fail Alarm, Low Current Alarm, Low Voltage Alarm, High Voltage Alarm, Positive Ground Alarm, and Negative Ground Alarm. If any alarm contacts are set to latch, the alarm will not clear until the ALARM RESET button is pressed, even if the alarm condition returns to normal.

By default, no alarms are set as latching, except for High Voltage Shutdown (HVSD). All other alarms will clear after the condition returns to normal.

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

Temperature Compensation Settings

Temperature Compensation is a standard feature of the TPSD2 charger. 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. Temperature Compensation is adjustable between OFF and 0.001 to 0.004 volts/cell/°C. *Ex: The output of a 60L charger with Temperature Compensation set to 0.002V/Cell/°C would decrease by 0.12V for every 1°C increase in temperature.*

Ground Detection Alarm Enable

This setting allows the user to select whether the Ground Detection alarm be enabled or disabled.

Communications Settings

The communication settings menu changes depending on the type of communication protocol used in the charger. For details on connection instructions as well as operation instructions, refer to the SCADA Interface instruction manual included with the charger.

Chargers with DNP 3.0 Communication Protocol (Option 21P)

Setting	→	Default Setting (Selection)
DNP Node Address	→	0004
DNP Port Type	→	RS485 (RS485, RS232)
DNP Parity Type	→	None (None, ODD, EVEN)
DNP Baud Rate	→	9600 (1200, 2400, 4800, 9600, 19200, 38400)
DNP IP Address	→	192.168.000.006
DNP Subnet Mask	→	255.255.255.000
DNP Gateway	→	192.168.000.001
DNP TCP Port Number	→	20000
Read Only Mode	→	No (No, Yes)

Chargers with MODBUS (Option 21Q)

Setting	→	Default Setting (Selection)
Modbus Type	→	TCP (TCP, Serial)
Modbus Address	→	1 (1 – 247)
Modbus Baud Rate	→	9600 (1200, 2400, 4800, 9600, 19200, 38400)

(*Setting available only if Modbus Type is set to Serial)*

Modbus Parity Type	→	None (None, ODD, EVEN)

(*Setting available only if Modbus Type is set to Serial*)

Read Only Mode	→	No (No, Yes)

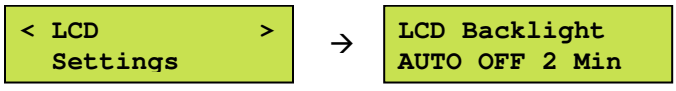
NOTE: *For TCP settings, see SCADA Interface instruction manual included with the charger.*

Chargers with MODBUS RTU (Option 21S)

Setting	→	Default setting (Selection)
Modbus Type	→	Serial Only
Modbus Address	→	1 (1 – 247)
Modbus Baud Rate	→	9600 (1200, 2400, 4800, 9600, 19200, 38400)
Modbus Parity Type	→	None (None, ODD, EVEN)
Read Only Mode	→	No (No, Yes)

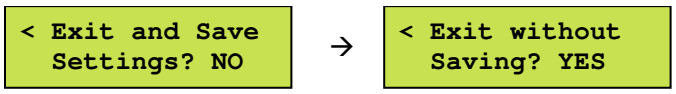
LCD Settings

The LCD settings allow 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. If the charger was ordered with a VFD control board, this option will not be available.



Saving Settings

At any point, the user can press the BACK button from the main Settings Menu to exit the Settings Menu. When the back button is pressed (on the main Settings Menu), the user is prompted if they would like to "Exit and Save Settings?" If the BACK 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.



3.5 Test Menu

All equipment is shipped from the factory fully tested and operational. As part of planned maintenance, users 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.

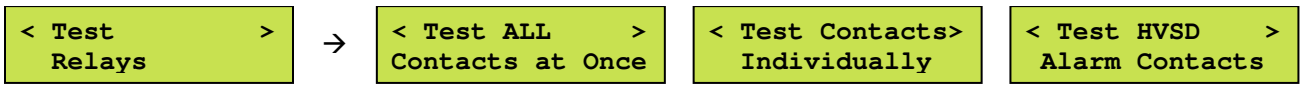
3.5.1 Test LEDs

The Test LEDs menu allows the user to run a basic lamp test on the TPSD2. After selecting this menu, press the "ENTER" button to light all of the LEDs on the display membrane. To end the LED test, press back.

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

3.5.2 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 alarm state, it will revert to the non-alarm state during relay testing. The HVSD alarm is not included in either of the other tests, but instead, has its own test menu.



When an alarm relay is being tested, the corresponding LED on the membrane will change state. There are no relay contacts for the "OVERLOAD/CURR. LIMIT" or "END OF DISCHARGE" alarms; these LEDs will not be lit under the relay test. As with the LED test, once the appropriate selection is made, press the "ENTER" button to start the test and the "BACK" button to end the test.

3.6 Output Voltage Adjustments

The output voltage of the TPSD2 charger is set to a default value, but should be adjusted to meet the battery manufacturer recommendations. To adjust the Float and Equalize output voltage, refer to Section 3.4.1.1. Adjustments are recommended to be made with no connections on the DC output terminals of the charger, but can also be done with the battery connected. Output adjustments can be carefully made with the charger energized until the desired voltage is achieved.

NOTES:

1. *When making output voltage adjustments with batteries connected, the immediate change will be reflected on the output current and NOT the voltage due to the voltage difference between the output and the batteries.*
2. *In parallel systems, each charger MUST be isolated to properly perform output voltage adjustments.*

Raising Output Voltage with Batteries Connected

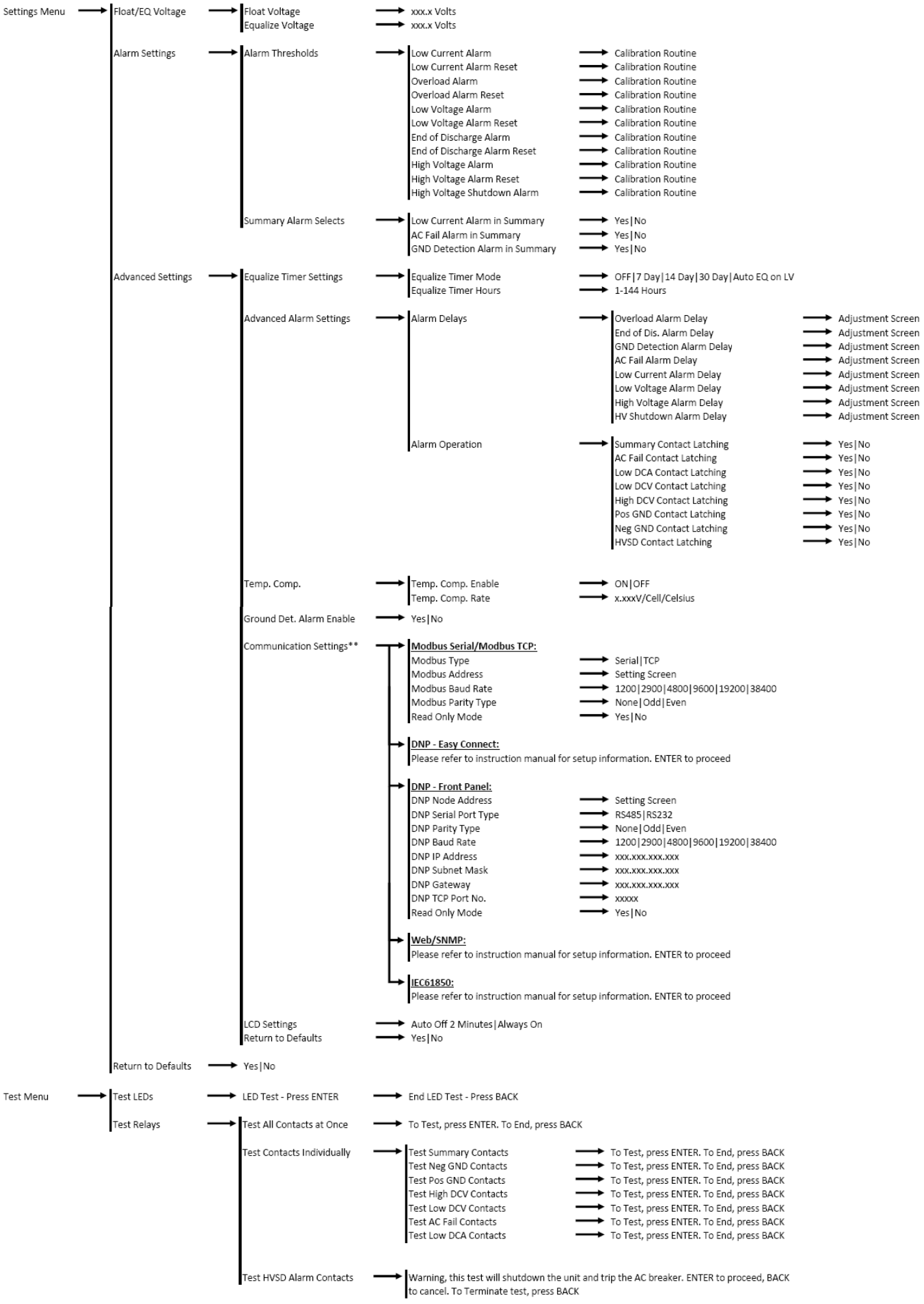
Note the DC load prior to making adjustments. Increase the Float/Equalize output voltage setting via Settings Menu as shown on Section 3.4.1.1. The output current will rise and gradually drop to its steady load current. Meanwhile, the output voltage will slowly rise to its setpoint. Once steady, repeat incrementing the output voltage setting until the desired setpoint is reached.

Lowering Output Voltage with Batteries Connected

Note the DC load prior to making adjustments. Decrease the Float/Equalize output voltage setting via Settings Menu as shown on Section 3.4.1.1. The output current will drop and gradually rise to its steady load current. Meanwhile, the output voltage will slowly lower to its setpoint. Once steady, repeat decrementing the output voltage setting until the desired setpoint is reached.

NOTE: *Immediate change in voltage might not be seen due to the backfeed of the battery voltage when performing adjustments.*

3.7 TPSD2 Customer Configuration Menu Structure



***Submenu is dependent on communications option included in charger.*

4 Frequently Asked Questions

Q: How can I tell what options are included on my TPSD2 charger?

A: Every charger will have a dedicated manual cover sheet included with the charger manual, which lists all the options included. If the manual that shipped with the charger is no longer available, call La Marche and provide the five-digit accessory code at the end of the model number.

Q: Can two TPSD chargers be connected in parallel?

A: Yes, two or more TPSD chargers can be connected in parallel as long as they are of the same output voltage rating. Paralleling is to not be confused with load sharing. Refer to Section 3.5 for output voltage adjustments with units in parallel.

Q: Can the TPSD2 charger settings be changed to accommodate charging Nickel Cadmium batteries instead of the intended Lead Acid battery, or vice versa?

A: The necessary adjustments can be made, but are dependent on model and number of cells that will be used. The change that will be necessary for every model type is the output voltage adjustment; call La Marche to verify that the charger in question will have the necessary output range. Alarm thresholds will also need to be changed to the desired battery type defaults, refer to Section 3.4.1.2 for procedure and Section 3.1 for default values.

Q: If equipped with alarm contacts, can the alarm contact reference on the charger schematic be used for determining connections?

A: Not completely. The charger schematic, for a charger with the option included, will show an alarm relay board with contact indication. However, all the contacts are shown in resting state, which is not true when the charger is energized. The charger schematic should also include an alarm contact table that specifies which relays are energized during normal operation, and which are not. Refer to Section 2.4 for more information.

Q: Why is there a Low Current alarm and can it be disabled?

A: A Low Current alarm can be triggered by various conditions, but not all are considered to be severe. A common condition encountered is the batteries reaching nominal voltage and being fully charged with no constant load present. At this point, the charger is providing trickle charge to the batteries with minimal current draw and indicating a known low current condition. If this is the case, refer to Section 3.4.1.2 for disabling instructions. More severe conditions include charger failure, loss of AC power, maladjustment of output voltage, and possible disconnection of DC loads. If this is the case, other alarms will also be present.

5 Service

All work inside the TPSD2 charger should be performed by qualified personnel. La Marche is not responsible for any damages caused by an unqualified technician.

Before working inside the TPSD2, 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.

5.1 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 DC 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
24VDC – 48VDC	30mV RMS
130VDC	100mV 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.

5.2 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 measured AC input voltage.
3. The measured DC output voltage, with and without the battery.
4. Result of the check of the AC and DC breakers.
5. The DC output current and voltage, measured with battery and load connected to charger.

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

5.3 Troubleshooting Chart

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

Symptom	Possible Cause	Action
1 AC Breaker Trips	Incorrect AC Input Voltage	Measure AC voltage and verify against charger nameplate.
	AC Input Taps on Power Transformer Set Incorrectly	Verify tap settings using charger schematic or input table found on charger.
	AC-DC Short/AC-Ground Short/DC-Ground Short	Refer to Section 5.3.1.
	High DC Output Voltage High DC Voltage Shutdown	Refer to Symptom 4. Refer to Section 2.4.2.
	Shorted Power Diodes/Diode Modules (SD1)	Refer to Section 5.3.3.
	High DC Voltage Shutdown Set Incorrectly	Refer to Section 5.1.2.
	Open Gate or Wire on Triac TR-1	Refer to Section 5.3.2.
2 DC Breaker Trips	Shorted Power Diodes/Diode Modules (SD1)	Refer to Section 5.3.3.
	Shorted Battery Cells or Customer Equipment	Remove all loads and batteries from charger and confirm functionality.
	Shorted Output Cables	Inspect DC cables for shorts.
	Defective Filtering Capacitors	Refer to Section 5.3.4.
	Loose Connections on DC Breaker	Inspect DC cable connections and assure proper insertion.
	Incorrect Battery Connected	Measure battery voltage and verify against charger nameplate.
3 Low Output Voltage or Current	No AC Input Voltage Applied	Measure and confirm input voltage.
	Incorrect Battery Connected	Measure battery voltage and verify against charger nameplate.
	Incorrect, Damaged or Loose Cable/Harness Connections	Visually inspect and verify all internal wiring using charger schematic.
	Incorrect Float/Equalize Voltage Settings	Refer to Section 3.4.1.1 for output adjustment instructions.
	Low Output Voltage Condition: charger is in Current Limit	Measure output current and verify against charger nameplate. If found to be in current limit, wait for batteries to charge or remove loads.
	Low Output Current Condition: Batteries are Fully Charged	Confirm by changing to Equalize mode; current should increase.
	Defective Power Diodes/Diode Modules/Triac	Refer to Section 5.3.3.
	Defective S2A-341S Control Board	Contact La Marche Service Department for further troubleshooting instructions.
	Defective Shunt	
	Defective Resonating Capacitor(s)	Refer to Section 5.3.4.
	Defective Batteries	Check battery cells.

4 High Output Voltage or Current	Incorrect, Damaged or Loose Cable/Harness Connections	Visually inspect and verify all internal wiring using charger schematic.
	Incorrect Battery Connected	Measure battery voltage and verify against charger nameplate.
	Incorrect Float/Equalize Voltage Settings	Refer to Section 3.4.1.1 for output adjustment instructions.
	Defective S2A-341S Control Board	Contact La Marche Service Department for further troubleshooting instructions.
	Defective Batteries	Check battery cells.
	Open Gate or Wire on Triac TR-1	Refer to Section 5.3.3.
5 Ground Detection Fault	Ground Fault Present on Charger or DC System	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 charger, the part needed, and the quantity required.

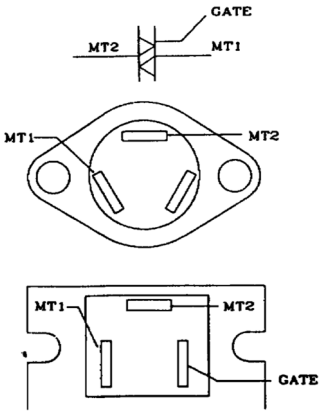
5.3.1 Ground and Short Circuit Test.

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

1. Disconnect AC input power to the charger. Disconnect the DC battery and loads from the charger.
2. Set ohmmeter scale on ohms scale RX100. Measure from one terminal of the input to one terminal of the output. Meter should not indicate. If the meter reads full scale deflection, this indicates an AC-DC short. During shipping, an AC wire may rub against the DC lugs, terminals, etc. and cause a short. These problems may be eliminated by being very careful in inspecting the wiring to assure the AC wires are not touching the DC wiring.
3. Check the input terminals to ground and check the output terminals ground. If the meter indicates full scale deflection, a wire is touching a metal part of the charger Look for wires that are near any metal part and inspect for possible breakdown caused by shipping. The heatsink of the diodes and the control charger are insulated from ground through the mounting legs.

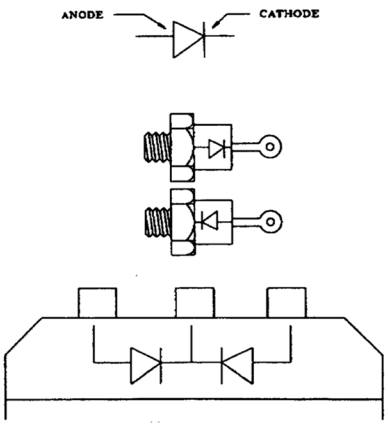
5.3.2 Troubleshooting the TRIAC

1. On the ohmmeter, set the switches on "ohms", "DC", and "Rx10,000" scale. Disconnect the triac to be checked. Using an ohmmeter, measure the resistance between main terminals, MT1 and MT2 in both directions. A good device will indicate open circuit in both directions, a low resistance indicates a shorted device. Refer to figure on right.
2. Set ohmmeter to Rx100 scale. To check for a shorted triac gate lead, measure the resistance between gate (GATE) lead and main terminal MT1. A reading of zero ohms in both directions indicates a shorted gate. A reading of infinity in both directions indicates an open gate and the triac should be replaced. A good device should have resistance in both directions, but not zero ohms.



5.3.3 Troubleshooting and Replacing Power Silicon Diodes/Modules

1. On the ohmmeter, set the switches on "ohms", "DC", and "Rx100" scale and isolate one end of the diode by disconnecting the wires attached to the nipple (or pigtail) end of the diode (only one end of the diode must be disconnected). On a diode module, both of the outside leads must be disconnected.
2. Clip one lead of the ohmmeter to the anode lead of the diode. Clip the other ohmmeter lead to the cathode. Refer to figure on right.
3. Note the ohmmeter reading. Then reverse the leads to the diode. Again, note the ohmmeter reading. If the diode is good, the meter will indicate a high resistance in one direction and a low resistance with the leads reversed. If the diode is shorted, the meter will read full scale, or zero resistance with the leads in either direction. If the diode is "open", the ohmmeter needle will not indicate or it will show infinite resistance in either direction, indicating an open circuit.
4. All diodes must be checked in the event that more than one diode is defective.
5. If the diode is defective, remove the defective diode from the heatsink and replace with a new diode.



5.3.4 Checking Capacitors

1. When checking capacitors, assure all AC power is turned off and battery is disconnected from charger. Check capacitors with DC voltmeter to see that DC voltage is at near 0VDC.
2. Momentarily short circuit the capacitor leads to assure complete discharge.
3. Connect the meter test leads to the capacitor leads or terminals and observe indicated resistance.
4. A good capacitor will indicate an initial low resistance and gradually increase as the capacitor charges. The final resistance of a good capacitor is usually several hundred thousand ohms approaching a megaohm.
5. Initial high resistance approaching infinity indicates an open capacitor. Initial and continued low resistance readings indicate a shorted capacitor.

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

Appendix A: TPSD2 Specifications

ELECTRICAL	
AC Input	120, 208, 240, or 480VAC Voltage range +10% / -12% Frequency Range 50Hz or 60Hz ± 5%
DC Output	6 - 200 ADC 24, 48, or 130VDC
Output Filtering	Single Phase - 30mV RMS, with or without battery Three Phase - 100mV RMS, with or without battery
Regulation	± 0.5% from no load to full load over the specified input voltage, frequency and ambient temperature range.
Load Sharing	When connected, identical TPSD2 chargers are forced to share the load equally (within ± 5%).
Meters	Digital Meter Display
PROTECTION	
Current Walk-In	The output current will gradually increase after the charger is turned on, eliminating surges and overshoot
Current Limit	50 - 115% of the rated DC output current.
AC Breaker	AC breaker is standard equipment. (2KAIC or 5KAIC depending on the model)
DC Breaker	DC breaker is standard equipment. *see DC Fuse (5KAIC, 7.5KAIC or 10KAIC depending on the model)
DC Fuse	DC fuse is standard equipment only for TPSD2-100-24V and TPSD2-100-48V Optional breaker is rated at 10KAIC
Emergency Restoration	The battery charger may be connected to a battery which is heavily discharged and recharge it without clearing any protective devices.
ENVIROMENTAL	
Audible Noise	Less than 65dBA at any point 5 feet from any vertical surface
Operating Temperature	32 to 122˚F (0 to 50˚C)
Storage Temperature	-40 to 185° F (-40 to 85° C)
Relative Humidity	0 to 95% (non-condensing)
Cooling	Convection cooled
Shock	The battery charger in its shipping container withstands shock developed when one edge of the container is dropped six inches while the opposite edge is resting on the ground, or it is dropped two inches without any physical damage or degradation of the electrical performance.
Vibration	The battery charger in its shipping contained, withstands vibration encountered in shipping without physical damage or degradation of the electrical performance.
Altitude	This battery charger is capable of operation at altitudes up to 10,000 feet at an ambient temperature of up to +40 degrees C.
Ventilation	The charger should be mounted so that ventilating openings are not blocked and air entering the cabinet does not exceed 50 degrees C (122 degrees F).

Appendix B: TPSD2 Current Draw and Feeder Breaker Sizes

	Model Number	DC Amps	Single Phase				
			60 Hz				50 Hz
			AC Current Draw (Recommended Feeder AC Supply Breaker)				
			A1 120V	ABD1 120/240/208V	BLD1 240/220/208V	C1 480V	BL1 240/220V
24 Volt Systems	TPSD2-6-24V	6	2 (5)	---	---	---	---
	TPSD2-12-24V	12	4 (10)	---	---	---	---
	TPSD2-20-24V	20	---	6.7/3.4/3.9 (10/5/5)	---	---	3.4/3.7 (5/5)
	TPSD2-25-24V	25	---	8.4/4.2/4.9 (15/10/10)	---	---	4.2/4.6 (10/10)
	TPSD2-30-24V	30	---	11/5/5.8 (15/10/10)	---	---	5.0/5.5 (10/10)
	TPSD2-35-24V	35	---	12/5.9/6.8 (20/10/10)	---	---	5.9/6.4 (10/10)
	TPSD2-50-24V	50	---	17/8.4/9.7 (30/15/15)	---	---	8.4/9.2 (15/15)
	TPSD2-75-24V	75	---	26/13/15 (40/20/20)	---	6.3 (10)	13/14 (20/20)
	TPSD2-100-24V	100	---	34/17/20 (40/20/20)	---	8.4 (15)	17/19 (25/25)
48 Volt Systems	TPSD2-6-48V	6	4 (10)	---	---	---	---
	TPSD2-12-48V	12	8 (15)	---	---	---	---
	TPSD2-20-48V	20	---	14/6.7/7.8 (20/10/10)	---	---	6.7/7.3 (10/10)
	TPSD2-25-48V	25	---	17/8.4/9.7 (30/15/15)	---	---	17/19 (15/15)
	TPSD2-30-48V	30	---	21/11/12 (30/15/15)	---	---	17/19 (15/15)
	TPSD2-35-48V	35	---	24/12/14 (30/15/15)	---	5.9 (10)	17/19 (20/20)
	TPSD2-50-48V	50	---	34/17/20 (30/15/15)	---	8.4 (15)	17/19 (25/25)
	TPSD2-75-48V	75	---	51/26/30 (30/15/15)	---	13 (20)	17/19 (40/40)
	TPSD2-100-48V	100	---	---	34/37/39 (50/50/50)	17 (25)	17/19 (50/50)
130 Volt Systems	TPSD2-6-130V	6	---	11/5/5.8 (20/10/10)	---	---	5.0/5.5 (10/10)
	TPSD2-12-130V	12	---	21/11/12 (30/15/15)	---	---	11/11 (15/15)
	TPSD2-20-130V	20	---	34/17/20 (50/25/25)	---	8.4 (15)	17/19 (25/25)
	TPSD2-25-130V	25	---	42/21/25 (60/30/30)	---	11 (15)	21/23 (30/30)
	TPSD2-30-130V	30	---	51/26/30 (60/30/30)	---	13 (15)	26/28 (40/40)
	TPSD2-35-130V	35	---	59/30/34 (80/40/40)	---	15 (20)	30/33 (45/45)
	TPSD2-50-130V	50	---	---	42/46/49 (60/60/70)	21 (25)	42/46 (60/60)

	Three Phase				
	Model Number	DC Amps	60 Hz		50 Hz
			AC Current Draw (Recommended Feeder AC Supply Breaker)		
			BD3 (240/208V)	C3 (480V)	5G3 (380V)
24 Volt Systems	TPSD2-75-24V	75	6.3/7.3 (10/10)	---	---
	TPSD2-100-24V	100	8.5/9.8 (15/15)	---	---
	TPSD2-150-24V	150	13/15 (20/20)	6.3 (15)	---
	TPSD2-200-24V	200	17/20 (25/25)	8.5 (15)	---
48 Volt Systems	TPSD2-50-48V	50	8.5/9.8 (15/15)	---	---
	TPSD2-75-48V	75	13/15 (25/25)	6.3 (10)	---
	TPSD2-100-48V	100	17/20 (30/30)	8.5 (15)	---
	TPSD2-150-48V	150	26/30 (40/40)	13 (20)	---
	TPSD2-200-48V	200	34/40 (60/60)	17 (25)	---
130 Volt Systems	TPSD2-6-130V	25	11/13 (20/20)	---	---
	TPSD2-30-130V	30	13/15 (20/20)	6.3 (10)	---
	TPSD2-35-130V	35	15/18 (25/25)	7.4 (10)	---
	TPSD2-50-130V	50	22/25 (35/35)	11 (20)	---
	TPSD2-75-130V	75	32/37 (50/50)	16 (25)	20 (30)
	TPSD2-100-130V	100	43/49 (70/70)	22 (30)	27 (35)
	TPSD2-125-130V	125	53/61 (80/80)	27 (40)	---
	TPSD2-150-130V	150	64/74 (100/100)	32 (45)	---

Appendix C: TPSD2 Heat Losses

(Based on 85% efficiency for single phase chargers, 90% efficiency for three phase chargers at 240V nominal input and rated load)

		Single Phase				
	Model Number	AC Draw	Watts In	Watts Out	Watts Lost	BTU/Hr.
24 Volt Systems	TPSD2-6-24V	2*	184	156	28	96
	TPSD2-12-24V	4*	367	312	55	188
	TPSD2-20-24V	3.4	612	520	92	314
	TPSD2-25-24V	4.2	765	650	115	392
	TPSD2-30-24V	5	918	780	138	471
	TPSD2-35-24V	5.9	1071	910	161	549
	TPSD2-50-24V	8.4	1529	1300	229	781
	TPSD2-75-24V	13	2294	1950	344	1174
	TPSD2-100-24V	17	3059	2600	459	1566
48 Volt Systems	TPSD2-6-48V	4*	367	312	55	188
	TPSD2-12-48V	8.1*	734	624	110	375
	TPSD2-20-48V	6.7	1224	1040	184	628
	TPSD2-25-48V	8.4	1529	1300	229	781
	TPSD2-30-48V	11	1835	1560	275	938
	TPSD2-35-48V	12	2141	1820	321	1095
	TPSD2-50-48V	17	3059	2600	459	1566
	TPSD2-75-48V	26	4588	3900	688	2348
	TPSD2-100-48V	34	6118	5200	918	3132
130 Volt Systems	TPSD2-6-130V	5	918	780	138	471
	TPSD2-12-130V	11	1835	1560	275	938
	TPSD2-20-130V	17	3059	2600	459	1566
	TPSD2-25-130V	21	3824	3250	574	1959
	TPSD2-30-130V	26	4588	3900	688	2348
	TPSD2-35-130V	30	5353	4550	803	2740
	TPSD2-50-130V	42	7647	6500	1147	3914

**120VAC Input*

	Three Phase					
	Model Number	**AC Draw**	**Watts In**	**Watts Out**	**Watts Lost**	**BTU/Hr.**
24 Volt Systems	TPSD2-75-24V	6.3	2170	1950	220	752
	TPSD2-100-24V	8.5	2894	2600	294	1002
	TPSD2-150-24V	13	4340	3900	440	1503
	TPSD2-200-24V	17	5787	5200	587	2004
48 Volt Systems	TPSD2-50-48V	8.5	2894	2600	294	1002
	TPSD2-75-48V	13	4340	3900	440	1503
	TPSD2-100-48V	17	5787	5200	587	2004
	TPSD2-150-48V	26	8681	7800	881	3005
	TPSD2-200-48V	34	11574	10400	1174	4007
130 Volt Systems	TPSD2-6-130V	11	3617	3250	367	1252
	TPSD2-30-130V	13	4340	3900	440	1503
	TPSD2-35-130V	15	5064	4550	514	1753
	TPSD2-50-130V	22	7234	6500	734	2504
	TPSD2-75-130V	32	10851	9750	1101	3756
	TPSD2-100-130V	43	14468	13000	1468	5008
	TPSD2-125-130V	53	18085	16250	1835	6260
	TPSD2-150-130V	64	21702	19500	2202	7512

Appendix D: Field Installable Accessory Kits

La Marche offers multiple accessory kits that are available for purchase separately from the TPSD2 chargers. These accessories are installable in the field. Not all accessory kits will be installable in all enclosures.

102 – Blocking Diode
11L – Lightning Arrestor
21P – DNP3 Protocol Package
21Q – Modbus Interface Package
11W – External Temperature Package (24 Ft)
11Y – External Temperature Package (100 Ft)

The installation of each accessory varies between each of the TPSD2 enclosures. The installation instructions for each accessory and each enclosure is included as part of the accessory kit.

Appendix E: Manufacturer's Warranty

All La Marche Manufacturing Co. equipment has been thoroughly tested and found to be in proper operating condition upon shipment from the factory and is warranted to be free from any defect in workmanship and material that may develop within one year from date of purchase. In addition to the standard one (1) year warranty, La Marche warrants its magnetics and power diodes on a parts replacement basis only for four (4) more years under normal use.

Any part or parts of the equipment (except fuses, DC connectors and other wear-related items) that prove defective within a one (1) year period shall be replaced without charge providing such defect, in our opinion, is due to faulty material or workmanship and not caused by tampering, abuse, misapplication or improper installation. Magnetics and power diodes are warranted for five (5) years after date of purchase. During the last four (4) years of this five (5) year warranty period, the warranty covers parts replacement only, and no labor or other services are provided by La Marche, nor is La Marche obligated to reimburse the owner or any other person for work performed.

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

1. The equipment can be returned to the La Marche factory to have the inspections, parts replacements and testing performed by factory personnel. Should it be necessary to return a piece of equipment or parts to the factory, the customer or sales representative must obtain authorization from the factory. If upon inspection at the factory, the defect was due to faulty material or workmanship, all repairs will be made at no cost to the customer during the first year. Transportation charges or duties shall be borne by purchaser.

2. If the purchaser elects not to return the equipment to the factory and wishes a factory service representative to make adjustments and/or repairs at the equipment location, La Marche's field service labor rates will apply. A purchase order to cover the labor and transportation cost is required prior to the deployment of the service representative.

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

All sales are final. Only standard La Marche chargers 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 F: Manufacturer's Extended Parts Warranty

(THIS IS YOUR WARRANTY IF YOU HAVE PURCHASED THE EXTENDED PARTS WARRANTY AS SHOWN ON OUR INVOICE TO YOU OR IF YOU PURCHASE THE EXTENDED PARTS WARRANTY ANYTIME DURING THE FIRST 12 MONTHS AFTER THE DATE OF OUR INVOICE)

All La Marche Manufacturing Co. equipment has been thoroughly tested and found to be in proper operating condition upon shipment from the factory. Any part or parts of the equipment (except protective devices, DC connectors and other wear-related items) that prove defective within a one (1) year period from the date of our invoice to you 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. Labor and parts are covered during this one (1) year period.

For the next four (4) years after the expiration of the one-year warranty, on a parts replacement only basis, any part or parts of the equipment (except protective devices, DC connectors and other wear-related items) that prove defective within the additional four (4) year period shall be replaced providing such defect, in our opinion, is due to faulty material or workmanship and not caused by tampering, abuse, misapplication or improper installation. During this four (4) year period, the warranty covers parts replacement only, no labor or other services are provided by La Marche, nor is La Marche obligated to reimburse the owner or any other person for work performed. If you return the equipment to our factory (freight prepaid), we will repair and cover parts and labor.

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

1. If the Purchaser elects to take the responsibility of repairing the equipment and requests replacement part(s), Purchaser or Sales Representative must contact Factory for return authorization and a purchase order must be issued. Replacement part(s) will be promptly shipped and invoiced. After the defective part(s) are returned and inspected at the Factory, if the defect(s) were due to faulty material or workmanship, credit will be issued.

2. 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 under the Extended Warranty. Transportation charges or duties shall be borne by Purchaser.

3. 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 La Marche 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, OR 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 G: Document Control and Revision History

Part Number: 140440
Instruction Number: P25-LTPSD2-1
Issue ECN: 22150 – 03/19

22429 – 12/19	22255 – 08/19	22150 – 03/19	