La Marche Manufacturing Company

www.lamarchemfg.com

TPSD2

Filtered Battery Charger with Data Logging 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

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CPN 147303

Instruction Drawing Number: P25-LTPSD2-2
Revision A01 Rev. Date: 01/23 ECN: 23316

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.

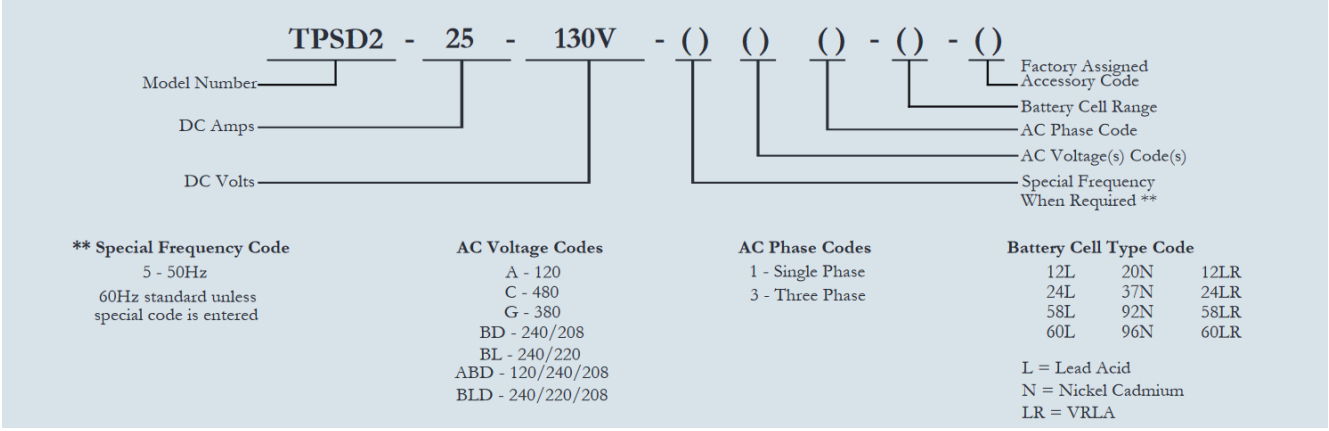
Table of Contents

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.



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 submenus 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/Current Limit</u>

- Float Voltage
- Equalize Voltage
- Current Limit

<u>Alarm Settings</u>

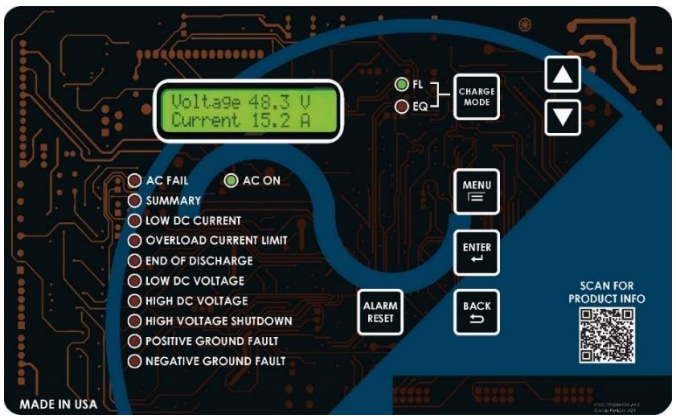
- Alarm Thresholds
  - Low Current
  - Overload
  - Low Voltage
  - End of Discharge
  - High Voltage
  - High Voltage Shutdown
- Summary Alarm Selects
  - Low Current in Summary
  - AC Fail in Summary
  - Ground Detection in Summary

<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
- Clock Settings
  - Set Date and Time
- Logging and Files
  - Data Logging
    - Log Interval

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%.

NOTE: *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 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 following considerations should be taken:

- 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 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.

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

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

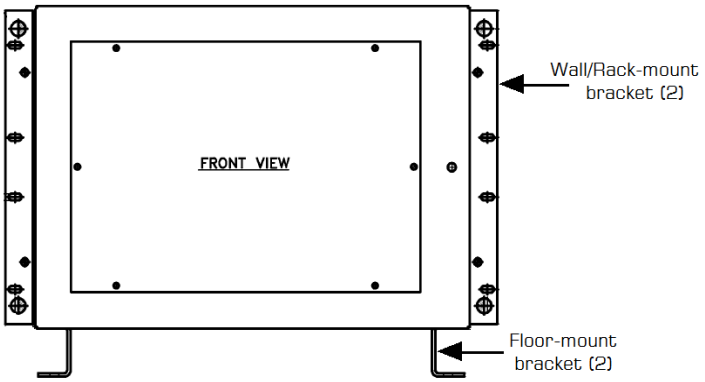


Figure 1 – Mounting Configurations (4B Enclosure front view)

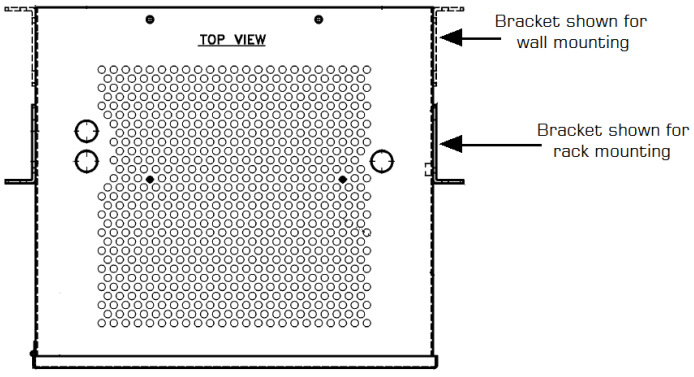


Figure 2 – Mounting Configurations (4B Enclosure top view)

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 below 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*

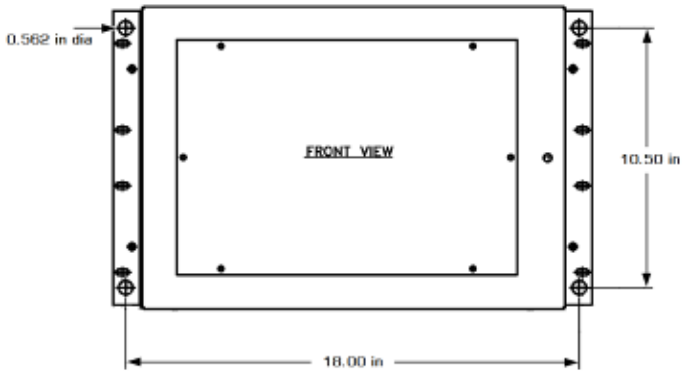


Figure 3 - 4B Enclosure Bolt Pattern

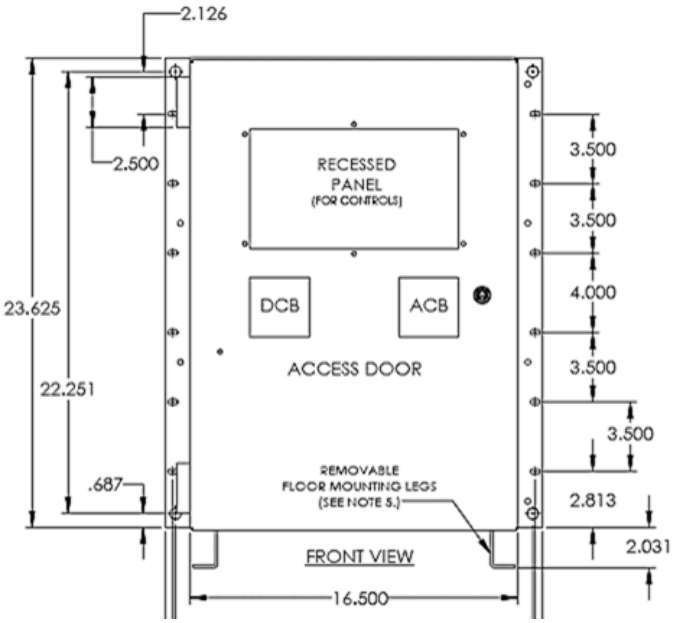


Figure 4 – 4T Enclosure Bolt Pattern

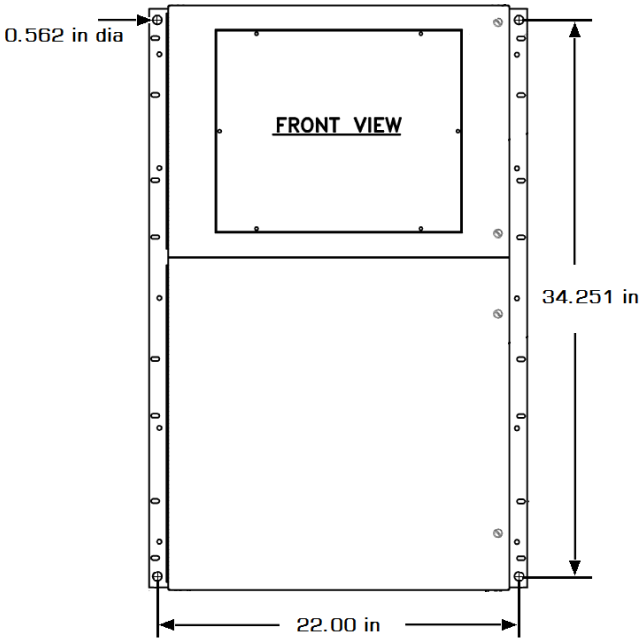


Figure 5 - 9 Enclosure Bolt Pattern

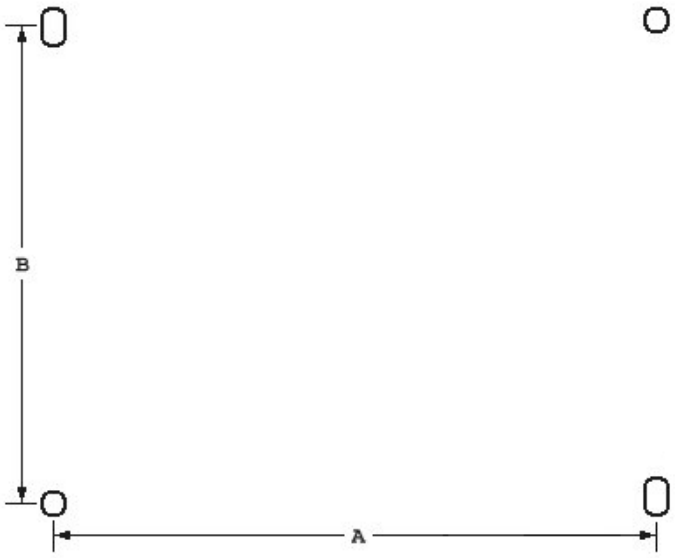
2.1.2 Floor-Mounting the TPSD2 (All Enclosures)

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.

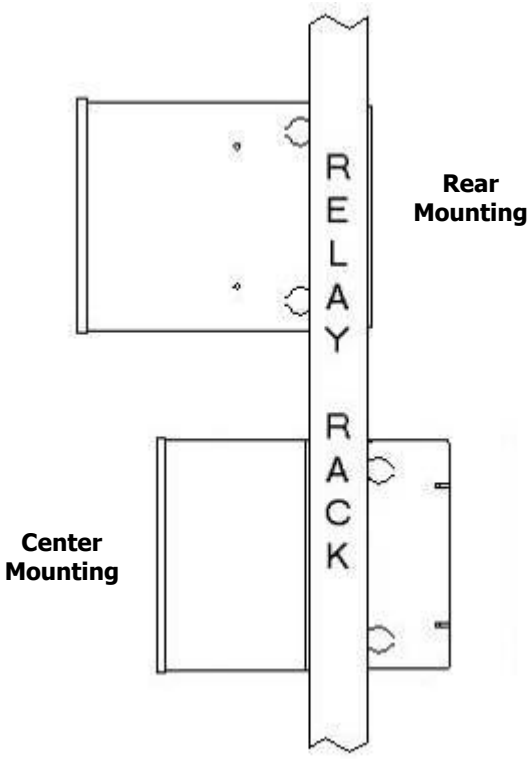


Figure 7 - Rack-Mounting Configurations (4B Enclosure)

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 the following:

- Verify all incoming AC supply is de-energized.
- Verify that no voltage is present inside the case by using a voltmeter at all input and output terminals.
- Check that the source voltage and frequency match the charger front nameplate specifications.
- 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. If multi-tap charger is set for 120VAC input configuration, feeder breaker should be double the size of the AC protection. 120VAC configured multi-tap chargers use both breaker poles in parallel.*

Breaker Size/ Fuse Size - Amps	AWG Minimum Wire Size Requirement for Customer Connection	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
250	#4/0	#4
300	250 MCM	#4
400	400 MCM	#2
500	600 MCM	#2

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. Refer to the schematic diagram for AC input connections.

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)

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

Calculating Wire Size Requirements

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

Calculating Current Carrying Capacity of Wire

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

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.

NOTE*: If more than one charger is to be connected to the same DC bus/DC system, please refer to Section 2.3.1 for paralleling instructions.*

2.3.1 Paralleling Connections

TPSD2 battery chargers have the capability to be installed in parallel for redundant applications. Take into consideration, the chargers being setup for paralleling MUST be of the same DC output rating and should all be TPSD/TPSD2 model chargers with the same front panel display board. Please confirm each charger model on the nameplate on front prior to making connections. Please follow the steps below:

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

1. Power up the chargers prior to making any connections to the DC output.
2. Adjust the Float and Equalize output voltages of each individual charger to same desired level.
3. Turn off all chargers.
4. Connect the DC output of all chargers in parallel to the same DC load/battery, refer to figure below.
5. Turn on all chargers.
6. After a short period of time, one charger may assume more of the load. Readjust the lower output charger so the current is half the load.

NOTE*: Since no interconnecting circuitry is present and the chargers are completely isolated, both units regulate by sensing buss voltage. At the no-load trickle charge rate, one charger may assume all the trickle current rate, with the other charger at zero current. When heavier loads are applied, the lower output unit will share the load.*

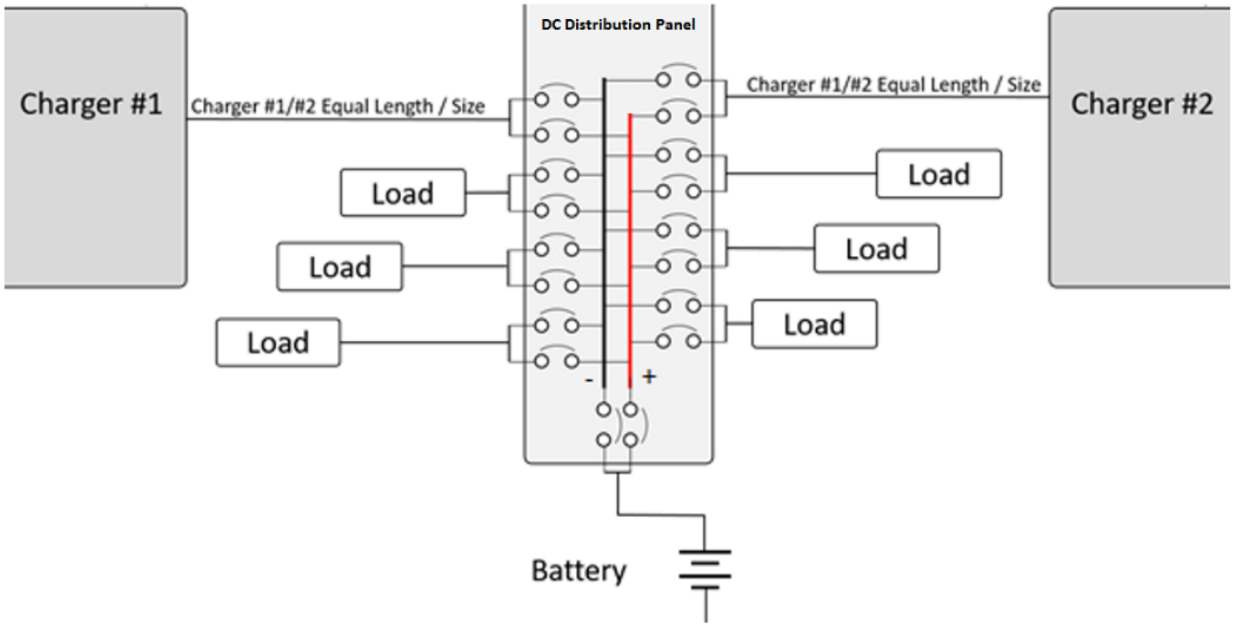


Figure 8 – Example Paralleling Diagram

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

2.4 Alarms

As a standard feature of the TPSD2, 8 alarm relays (and 10 alarm LEDs) are included. The included alarms are:

- Low DC Current
- AC Failure
- Summary
- Low DC Voltage
- High DC Voltage
- High DC Voltage Shutdown
- Positive Ground Fault
- Negative Ground Fault

Each alarm includes two sets of form 'C' contacts, enabling the user to connect multiple remote annunciators. Refer to the following Figure for alarm contact connections.

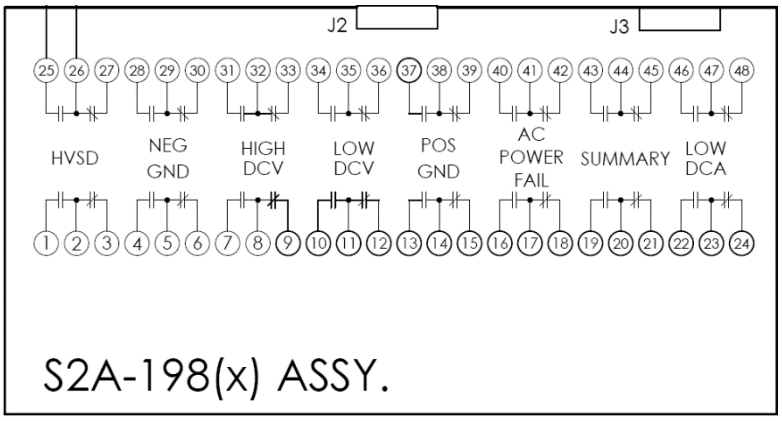


Figure 9 – User Connections to Alarm Contacts on S2A-198 Board

Alarm LEDs are provided for the following alarms (Refer to the figure below):

- Low DC Current
- End of Discharge
- Positive Ground Fault
- Negative Ground Fault
- Low DC Voltage
- High DC Voltage
- High DC Voltage Shutdown
- Overload/Current Limit
- Summary
- AC Fail

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.

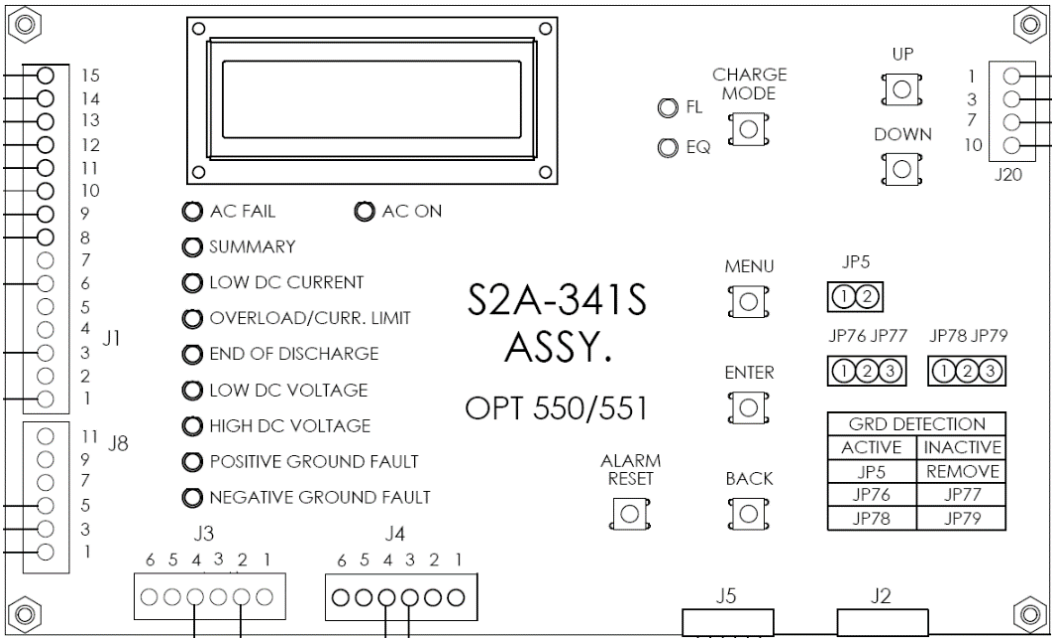


Figure 10 – S2A-341S Display/Control Board

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 always illuminated 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.*

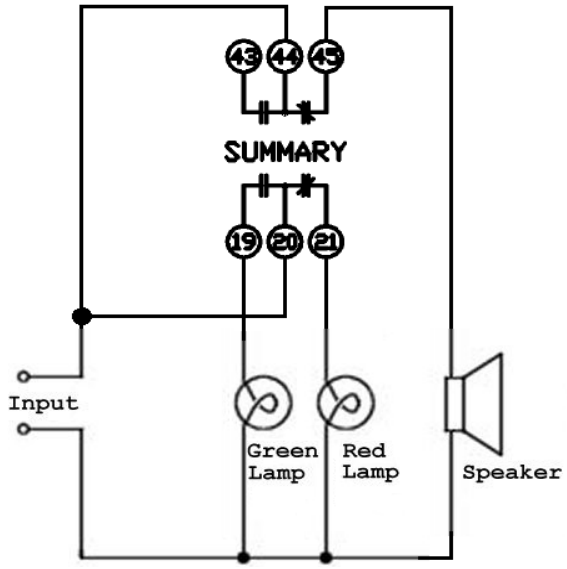


Figure 10 – Example Connections (Customer Provided Equipment)

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.

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

LOGGING FAILURE ALARM is triggered when data logging cannot be performed on the charger. Possible causes may be a corrupted/damaged microSD card, incorrectly installed microSD card, incompatible microSD card, or an S2A-368S digital control board fault.

198 BOARD FAIL ALARM is triggered when the S2A-198 alarm relay board is not detected on the charger. Possible causes may be a disconnected alarm relay board, alarm relay board fault, or a digital control board fault.

407 BOARD FAIL ALARM is triggered when the S2A-407S or S2A-417S voltage sensing board is not detected on the charger. This alarm only applies to chargers equipped with option 565. Possible causes may be a disconnected voltage sensing board, voltage sensing board fault, or a digital control board fault.

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

- Low DC Voltage
- High DC Voltage
- Low DC Current*
- Battery Test Fail*
- Positive Ground Fault*
- Negative Ground Fault*
- 198 Board Fail
- AC Failure*
- 407 Board Fail**
- Check Battery*

** 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 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 Temperature Compensation Connections

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.

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

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

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

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

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 the chargers' breakers are off. Verify no voltage is present by using a voltmeter at all input and output terminals.

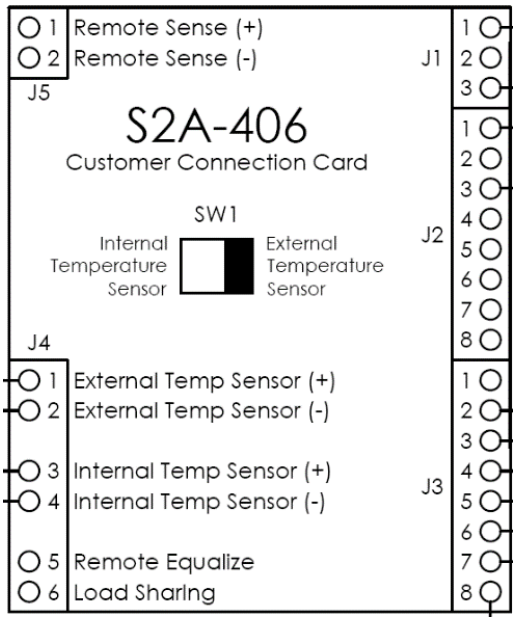


Figure 12 – S2A-406 Board Connections

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 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 for Remote Equalize.

In a system, all charger Remote Equalize terminals are connected 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 always indicate a ground fault 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 Enable/Disable 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_77 to **JP76** position
- Move jumper JP78_79 to **JP78** position

To DISABLE Ground Detection:

- Remove jumper **JP5**
- Move jumper JP76_77 to **JP77** position
- Move jumper JP78_79 to **JP79** position

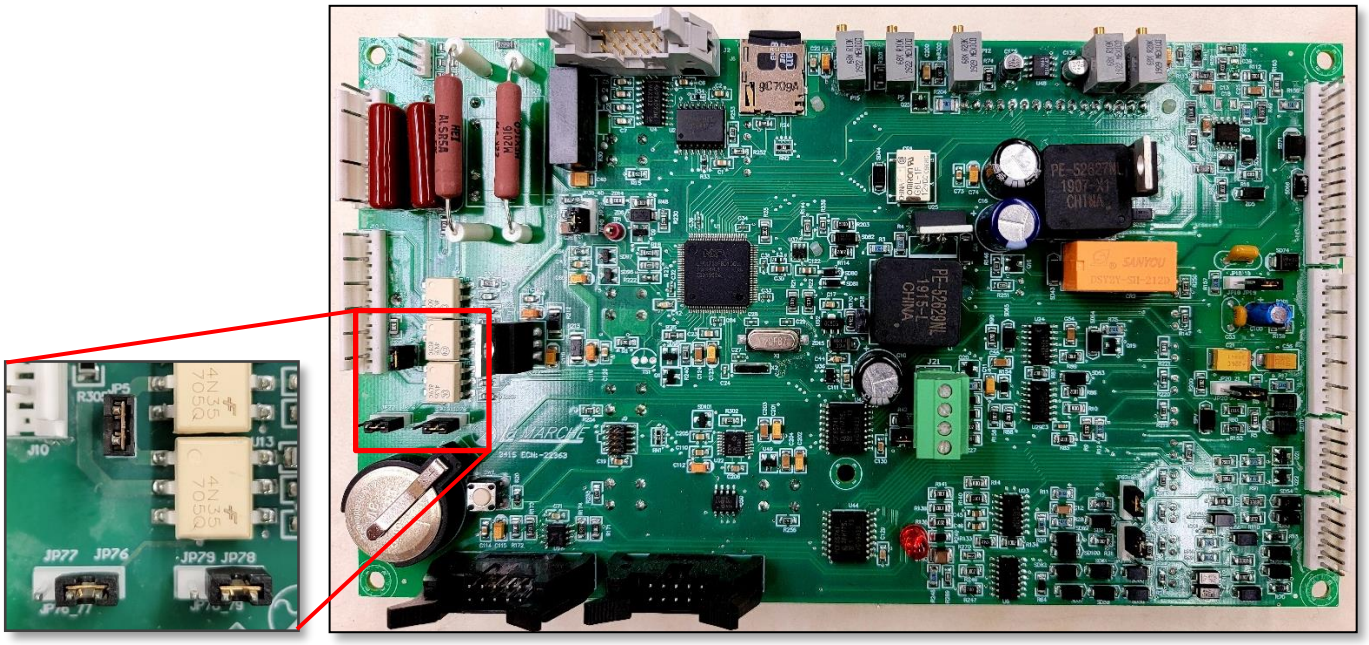


Figure 13 – S2A-341S Digital Control Board (Back View)

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).

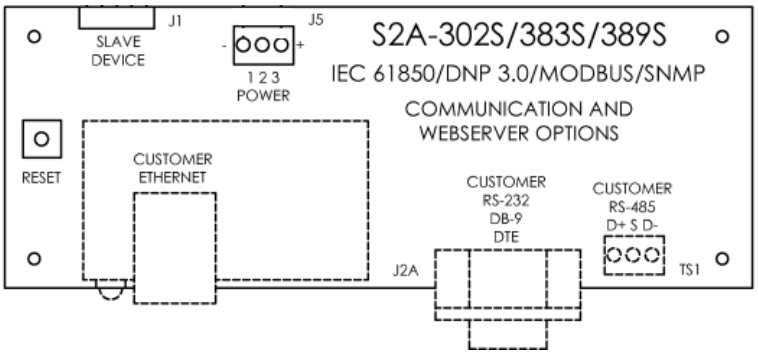


Figure 14 – DNP 3.0 / Modbus Communication Board

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 voltage sensing board failure, a special alarm "407 Board Fail" 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.

2.12 Additional Option Connections

The TPSD2 charger may have been outfitted with several optional accessories or option packages. To determine the options included (if any) and the suggested connections, refer to the cover page of the manual package and the option instructions included with the TPSD2 charger instruction manual.

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 the following:

- Verify 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 the charger's LEDs and activates all alarms. The digital meter display will show the model and firmware version.

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.

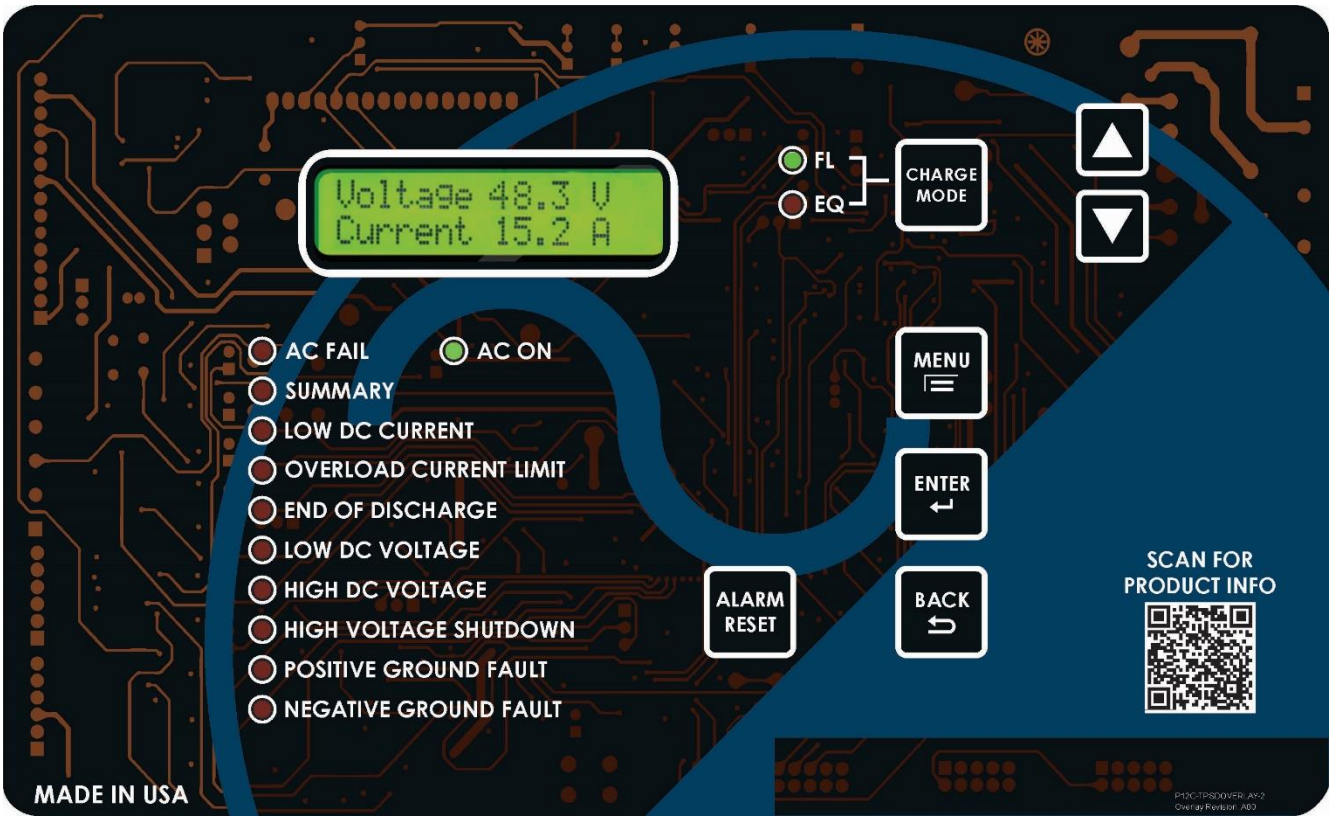


Figure 15 – TPSD2 Front Panel

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 Charger Side of DC Breaker)
`EQ Timer Mode` `Auto EQ OFF`	Selected Equalize Timer Mode	`EQ Timer Mode` `Auto EQ OFF`	Selected Equalize Timer Mode
`Next Auto EQ in:` `OFF`	Time until Next Automatic Equalize cycle	`Next Auto EQ in:` `OFF`	Time until Next Automatic Equalize cycle
`EQ Timer OFF` `8 Hour EQ`	Equalize Timer Status and Length	`EQ Timer OFF` `8 Hour EQ`	Equalize Timer Status and Length
`Temperature` `Compensation OFF`	Temperature Compensation Status	`CHG INTERNAL:` `132.5 V`	Charger DC Output Voltage (Voltage Sensing from Charger Side of DC Breaker)
`Temperature` `Probe 27C`	Temperature at Probe (Internal/External – Based on Connection)	`Temperature` `Compensation OFF`	Temperature Compensation Status
`01/01/2021` `11:11:11`	Charger Clock – Date and Time	`Temperature` `Probe 27C`	Temperature at Probe (Internal/External – Based on Connection)
`Logging Status` `0.01 Pct`	Logging Status	`01/01/2021` `11:11:11`	Charger Clock – Date and Time
`Next Batt Test:` `OFF`	Time until Next Automatic Battery Test	`Logging Status` `0.01 Pct`	Logging Status
		`Next Batt Test:` `OFF`	Time until Next Automatic Battery Test

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 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 4.1.3.1 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 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 4.1.1. Adjustments can be made with no connections on the DC output terminals of the charger, as well as 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 adjusting the output. Increase the Float/Equalize output voltage setting via Settings Menu as shown on Section 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 adjusting the output. Decrease the Float/Equalize output voltage setting via Settings Menu as shown on Section 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 back-feed of the battery voltage when performing adjustments.*

4 Controller Menus

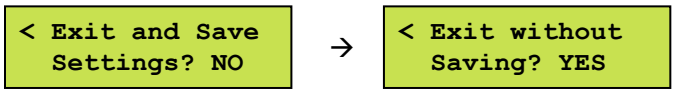
The TPSD2 is equipped with multiple settings and test menus. Refer to Appendix A for details on the structure of the charger menus. Access menus by pressing the MENU button on the front panel. Navigate using the BACK, UP, DOWN and ENTER button. To enter a submenu, use the ENTER button.

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.



4.1 Settings Menu

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

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/Current Limit
- Alarm Settings
- Advanced Settings
- Return to Defaults

In addition, settings can be configured remotely. Remote configuration requires that the TPSD2 have an optional communication board. For more information and instructions on remote configuration, see the communication instructions. The communication instructions are included as part of the manual package only if a communication option has been ordered.

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

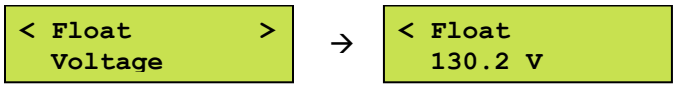
The Settings menu is as follows:

4.1.1 Float Voltage, EQ Voltage & Current Limit

The Float/Eq Voltage/Current Limit submenu provides access to change the Float Voltage and Equalize Voltage Settings, as well as the Current Limit threshold.

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" 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.

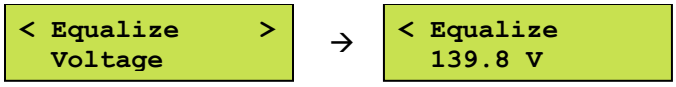


The approximate adjustable range is as follows:

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" 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.

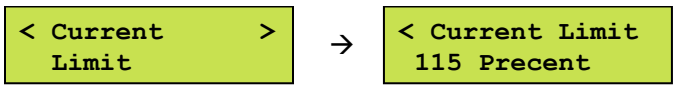


The approximate adjustable range is as follows:

2.15 – 2.50 V/C (LA) (VRLA)
1.40 – 1.70 V/C (NC)

Current Limit Setting

The current limit adjustment is set at the factory at 115%. The current limit increments by 1%. Select "Current Limit" and press then ENTER button. Press the UP and/or DOWN buttons until the required current limit level is displayed. Press ENTER to store the setting or BACK to cancel.



The approximate adjustable range is 50-115% of the total rated capacity of the TPSD2 charger.

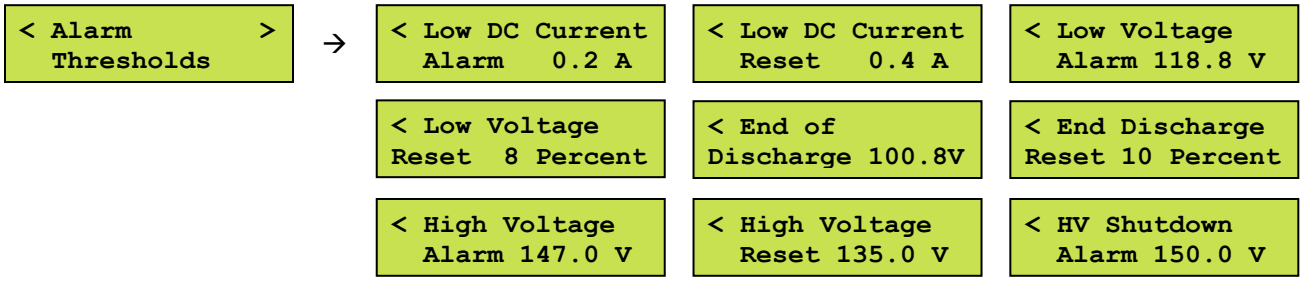
4.1.2 Alarm Settings

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 the following:

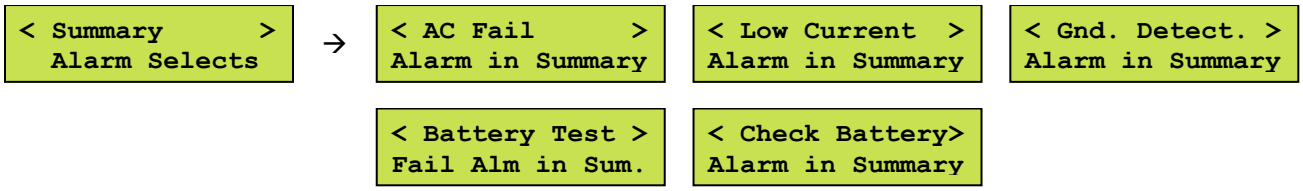
- Low DC Current
- Low DC Current Reset
- End of Discharge
- Low DC Voltage
- Low DC Voltage Reset
- End of Discharge Reset
- High DC Voltage
- High DC Voltage Reset
- High DC Voltage Shutdown



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 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.*

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
- Return to Defaults
- Clock Settings
- Serial Number
- Firmware
- Logging and Files

4.1.3.1 Equalize Timer Settings

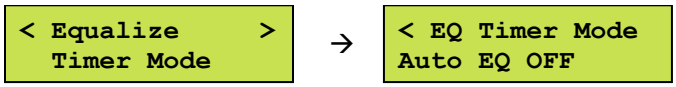
The Equalize Timer Settings submenu provides access to the change the Equalize Timer Mode and Equalize Timer Hours.

Equalize Timer Mode

The Equalize timer mode determines when the charger will go into an Equalize charging cycle. The timer modes are:

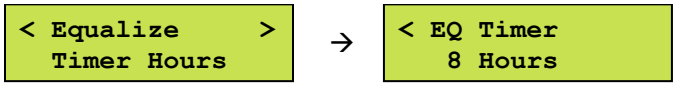
- Auto EQ OFF (P0)
- 7 Day Auto EQ (P1)
- 14 Day Auto EQ (P2)
- 30 Day Auto EQ (P3)
- Auto EQ on LV (P4)

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.

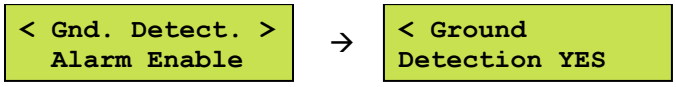


4.1.3.2 Advanced Alarm Settings

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

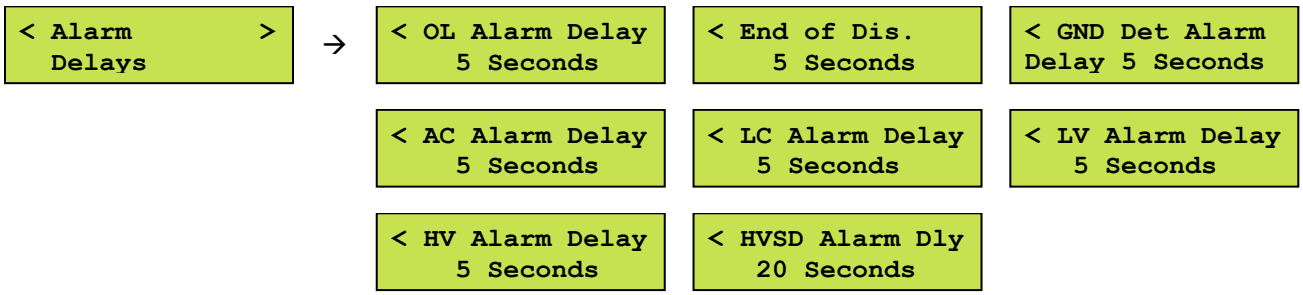
Alarm Disables

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



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 the following:

- Low DC Current
- Positive Ground Fault
- Negative Ground Fault
- Low DC Voltage
- High DC Voltage
- High DC Voltage Shutdown
- End of Discharge
- Overload/Current Limit
- AC Fail

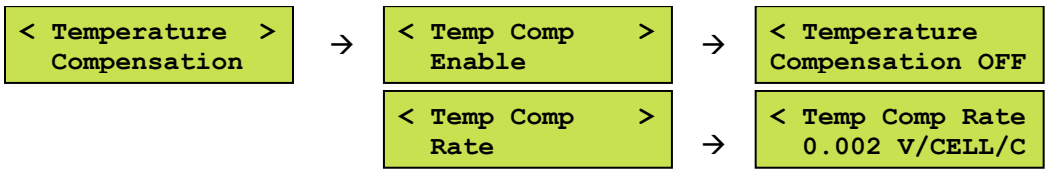
If any alarm contacts are set to latch, the alarm will not clear until the ALARM RESET button is pressed, even if the alarm condition returns to normal.

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.*

4.1.3.3 Temperature Compensation

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 "Temperature Compensation" 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.

4.1.3.4 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)

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)

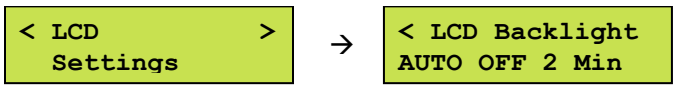
Modbus Type → TCP (TCP, Serial)
Modbus Address → 1 (1 – 247)
Modbus Baud Rate → 9600 (1200, 2400, 4800, 9600, 19200, 38400)
(*Setting available only if Modbus Type is set to Serial)*
Modbus Parity Type → None (None, ODD, EVEN)
(*Setting available only if Modbus Type is set to Serial*)
Read Only Mode → No (No, Yes)
NOTE: *For TCP settings, see SCADA Interface instruction manual included with the charger.*

Chargers with MODBUS RTU (Option 21S)

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)

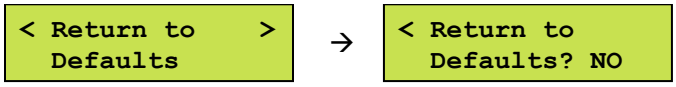
4.1.3.5 LCD Settings

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.



4.1.3.6 Return to Defaults

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



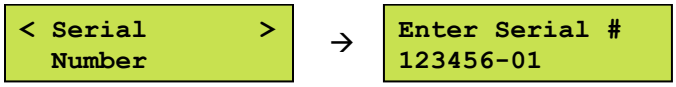
Ex: The software default for a 130VDC charger is based on 60 Lead Acid cells, a 62L charger is factory adjusted for a higher voltage. Returning to default will return the charger to a 60L voltage setting.

4.1.3.7 Clock Settings

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

4.1.3.8 Serial Number

The "Serial Number" setting allows the user to change the serial number associated with the S2A-341S digital control board. This serial number is the serial number of the TPSD2 charger and is set at the factory for new chargers. If a replacement S2A-341S board is received, the serial number may have to be set via calibration.



To change the serial number used by the software, select "Serial Number" from the Settings menu and press the ENTER button. Each digit of the serial number is adjusted individually. Press the ENTER button to advance to the next digit. Press the UP and DOWN buttons to increase and decrease the selected digit. Once the ENTER button is pressed on the last digit, the serial number will be saved, and the display will exit the serial number submenu.

4.1.3.9 Firmware

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

Firmware Version

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

Update Firmware

The TPSD2 firmware can be updated, as a standard feature, via a microSD card. It is accomplished by uploading a firmware .bin file (*EX: P368Sxxxx_xxxxxx.bin*) to the microSD card and, from there, upload it to the S2A-341S digital control board. To properly update the firmware, follow the procedure below:

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

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

1. Save the CUSTOMER.cfg file by following the steps shown on the next page under *Save Settings File*.

2. Remove the microSD card by entering the Settings Menu:

Menu → Advanced Settings → Logging and Files → Remove Drive

3. Insert the microSD card into the computer using a microSD card converter.

4. Back up all files in the microSD card to the computer.

5. Format the microSD card by using one of the methods under *Formatting the microSD Card* on Section 5.

NOTE: *Formatting the microSD card erases all its data. Assure to save any files locally before proceeding.*

6. Find the firmware .bin file provided and upload it into the microSD card.

7. Safely remove the microSD card from the computer and insert it on the TPSD2 charger's microSD card slot by following the installation instructions in Section 5 under *Installing/Removing the MicroSD Card*.

8. Update the firmware by entering the Settings Menu:

Menu → Advanced Settings → Firmware → Update Firmware

9. Enter the password provided (must contact La Marche Service Department) and select YES when prompted to update the firmware. The charger will start to program itself. Do not interrupt the power or the board while it is programming!

10. Save the CUSTOMER.cfg file once again by following the steps shown on the following page under *Save Config Files*.

4.1.3.10 Logging and Files

The "Logging and Files" menu allows the user to access the TPSD2 Data Log and make changes to the Data Log settings. It also allows downloading and uploading charger configuration files. The submenus are as follows:

Remove Drive

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

Insert Drive

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

Data Logging

The TPSD2 now includes data logging as a standard feature. The log file is written as a .cfg file. The "Data Logging" menu allows the user to adjust settings related to data logging. For more information on data logging, see Section 5.

Enable Event Logging

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

Log Interval

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

Format Drive

To format a memory card for use in the TPSD2, select "Format" from the "Data Logging" menu and follow the prompts. Formatting a microSD card will erase all data from the card; it is required to use a blank and formatted microSD card for use. Refer to Section 5 under *Formatting the MicroSD Card* for formatting instructions. A memory card only needs to be formatted once. After it has been formatted in a charger, it can be used in any other TPSD2 charger without being formatted again.

Save Settings File

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

Upload Config File

The TPSD2 charger enables the user to load a configuration file (CUSTOMER.cfg) from an installed microSD card. A saved configuration file can be loaded to multiple TPSD2 chargers to ease set up time if an installation has more than one TPSD2 charger. Take into consideration all TPSD2 chargers must be of the same model number and firmware version. To properly transfer a configuration file, a microSD card must be formatted first. After the memory card has been formatted, the configuration can be saved.

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

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

Save Config File

The TPSD2 charger enables the user to save a configuration file (CUSTOMER.cfg) to an installed microSD card. A saved configuration file can be loaded to multiple TPSD2 chargers to ease set up time if an installation has more than one TPSD2 charger. Take into consideration all TPSD2 chargers must be of the same model number and firmware version. To properly transfer a configuration file, a microSD card must be formatted first. After the memory card has been formatted, the configuration can be saved.

To save a configuration file, insert a microSD card into the S2A-341S board, format the memory card, and select "Save Config File" in the "Logging and Files" menu. If a configuration .cfg file already exists, it will be overwritten.

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

4.2 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, alarm relays, and batteries. The Test Menu allows the user to test both the LEDs on the display board, any charger alarm relay contacts, as well as the batteries.

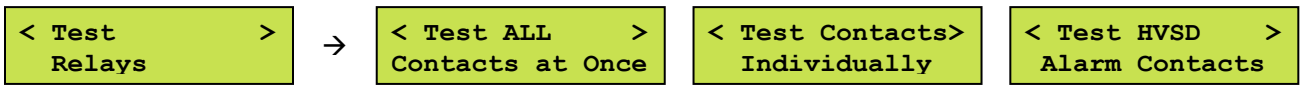
4.2.1 Test LEDs

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 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.*

4.2.2 Test Relays

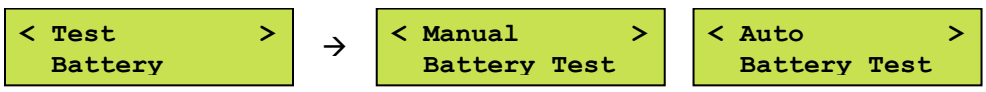
The test relays menu allows the user to test the functionality of the alarm relay contacts. The menu allows for each contact to be tested individually, or all at once. When a relay is being tested, its contacts will change state. This means if a relay is in alarm state, it will revert to the non-alarm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

4.2.3 Test Battery

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



However, the following conditions must be met for the charger to initialize a battery test:

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

The Battery Test alarm, as well as the Summary alarm if enabled, is triggered when the battery test is initiated. Whether initiated manually or automatically, the DC bus voltage will fall below one of the alarming thresholds. When the battery test is started, the charger voltage will drop to the appropriate test voltage (1.85 V/C for Lead Acid or 1.11 V/C for Nickel Cadmium). After 35 seconds, the charger will take a reading of the DC bus voltage and indicate one of three conditions:

- "Battery Test: PASSED" – DC voltage higher than 2 V/C LA or 1.2 V/C NC
- "Battery Test: CHECK BATTERY" – DC voltage between 1.9 – 2.0 V/C (for LA) or 1.14 – 1.2 V/C (for NC)
- "Battery Test: FAILED" – DC voltage below 1.9 V/C LA or 1.14 V/C NC

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

If the battery test result concludes in either CHECK BATTERY or FAILED, the following will occur:

- The display will show the corresponding alarm on the main screen
- The Summary alarm LED and contacts will activate (if applicable)

The Summary alarm activation is optional and can be configured. Please refer to Section for options. To clear the alarm, simply press the ALARM RESET button on the front panel of the charger.

4.1.4 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.

```
< Return to    >
  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.*

4.3 Reset All Alarms

The "Reset All Alarms" menu allows the user to reset all alarms. This feature can be used to clear alarms when certain alarms have been set to latch upon triggering.

4.4 Last 10 Events

Displays the last 10 events that have occurred on the front screen of the charger. This is to be used as a quick reference.

```
>Last 10 Events
 Settings Menu
```

→

```
010122 11:11:11
Power ON Reset
```

If more detail is required, refer to Section 5 for the data logging information. The type of events that are logged are:

- Alarm Occurrences
- Cleared Alarms
- Settings Menu Entries
- Settings Menu Exits
- Charge Mode Changes
- Charger Resets

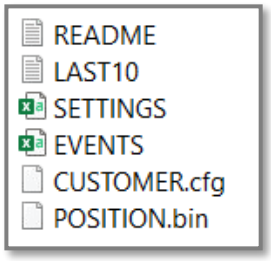
5 Data Logging

The TPSD2 now includes data logging as a standard feature. The log file is written as a .csv file format which can be opened using Microsoft Excel or any number of free spreadsheet programs. It can even be opened on many modern smartphones. The data logs are written to an included microSD card, which plugs into a slot located at the top side of the S2A-341S board (when looking at the back of the front door). The data log can be set to log charger events, as well as to log all data at a specified interval. By default, the log file is set to events only.

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

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

The following guidelines should be taken into consideration:



- MicroSD card cannot be greater than 32GB.
- Do not use the microSD card for any other purpose besides data logging and firmware updating. Data corruption/microSD card damage may occur.
- Do not touch metal contacts on the back side of the microSD card when handling.
- MicroSD card to be used MUST be blank and formatted. To format the microSD card, install it on a PC and run a full format or format the SD card using the TPSD2.

Events Only Logging

The Events Only Logging records data only when an event occurs. When an event occurs, all charger data points are written to better understand the cause of said event. The events that are logged are:

- Alarm Occurrences
- Cleared Alarms
- Settings Menu Entries
- Settings Menu Exits
- Charge Mode Changes
- Charger Resets

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

Interval Logging

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

Formatting the MicroSD Card

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

- Installing a new microSD card sourced from a 3rd party
- Data on original microSD card has been found corrupt and non-usable
- Other non-charger data has been detected on the microSD card
- If the TPSD2 charger does not recognize the microSD card

There are two acceptable procedures to format the microSD card. It is important that only these two methods are used, as the TPSD2 charger does not run a Windows-style NTSF, FAT, or FAT-32 based sector partition scheme. If the microSD card has been formatted to one of these partition schemes, the card may have trouble maintaining data after several months of records. It should also be noted the microSD card should not contain pictures, microSD card management software, or any other non-intrinsic charger data.

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

MicroSD Card Format Method 1 (Preferred):

The TPSD2 can properly format the microSD card with its built-in format function. With the microSD card installed in the charger, press MENU → Settings Menu → Advanced Settings → Logging & Files → Data Logging → Format Drive. The charger will ask you if you want to erase all data, select yes. The microSD card is now ready to be used in the charger.

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

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

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

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

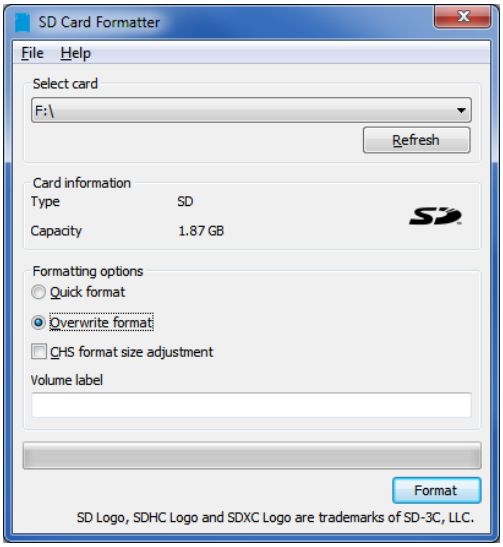


Figure 1 – SD Card Formatter Program with Overwrite Format Checked

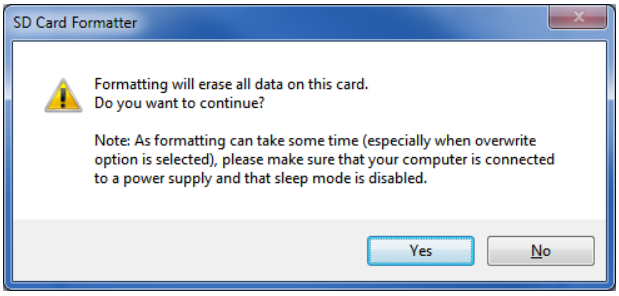


Figure 2 – Warning Message About Erasing Data

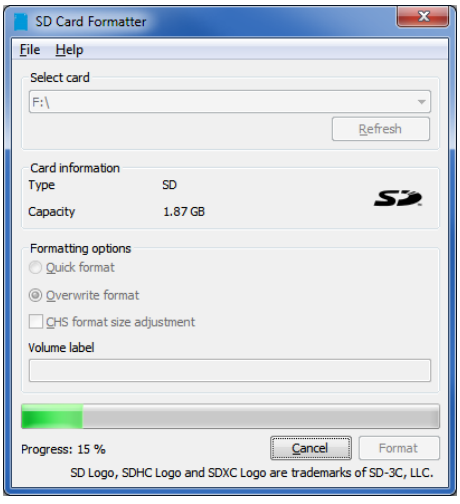


Figure 3 – Formatting in Progress

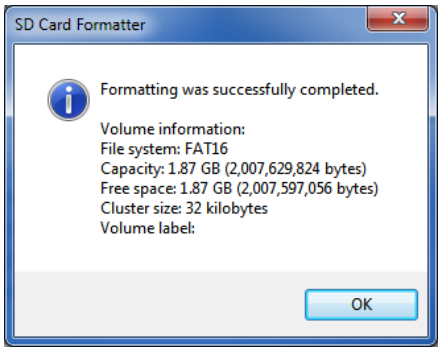


Figure 4 – Formatting Successful Message

After either format method is complete, it is advised to save the charger's CUSTOMER.cfg file to the microSD card for backup and future use. See Section 4.1.3.10 under *Save Config File* on how to save the CUSTOMER.cfg file.

Installing/Removing the MicroSD Card

Installing/Removing the microSD card requires opening the door of the battery charger and the necessary precautions must be considered; dangerous voltage can be present inside the charger. Prior to removing or inserting the microSD card, refer to Section 4.1.3.10 to install or remove the microSD card. Failure to properly remove or install the microSD card can result in corrupt data or microSD card failure. To remove, prompt the Settings Menu for removal, then simply push in to release the microSD card from its mounting slot. To install, prompt the Settings Menu for inserting, then simply push in to insert the micro microSD card into its mounting slot.

Reading the Log File

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

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

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

LaMarche Mfg. Company TPSD Event Log File										
Created on 06/02/2022 at 16:06:40										
Charger Serial Number 000000-00										
Firmware P341S0100 022822										
Date	Time	DCV (V)	DCA (A)	TC PROBE (C)	OT PROBE (C)	BATTERY (V)	PROBE #1 (C)	PROBE #2 (C)	BATT TEST RESULT	Event
6/2/2022	16:06:40	0	0	0	0	----------	----------	----------		Power On Reset
6/2/2022	16:06:41	0	0	0	0	----------	----------	----------		Reading Settings From Sector 28
6/2/2022	16:06:41	96.7	0	0	0	0	----------	----------		Write Sector 28 OK
6/2/2022	16:06:42	96.7	0	0	0	0	----------	----------		Write Sector 29 OK
6/2/2022	16:06:42	96.7	0	0	0	0	----------	----------		Sector 28 OK 29 OK-USING 28
6/2/2022	16:06:42	96.7	0	0	0	0	----------	----------		Float Mode
6/2/2022	16:06:54	129.8	0	25	0	130.2	----------	----------		Summary Alarm FAIL
6/2/2022	16:06:55	129.8	0	25	0	130.2	----------	----------		Low DC Current Alarm FAIL
6/2/2022	16:07:21	132.2	0	25	0	132.4	----------	----------		Equalize Mode
6/2/2022	16:07:25	143.6	15.7	25	0	143.4	----------	----------		Summary Alarm OK
6/2/2022	16:07:26	143.6	15.7	25	0	143.4	----------	----------		Low DC Current Alarm OK
6/2/2022	16:07:39	143.8	8.4	25	0	143.8	----------	----------		Float Mode
6/2/2022	16:07:49	133.6	0	25	0	135.7	----------	----------		Manual Battery Test Started
6/2/2022	16:08:25	132.1	0	25	0	135.7	----------	----------	PASSED	Battery Test PASS

Figure 1 – Events Log Example

6 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 TPSD2 chargers be connected in parallel?

A: Yes, two or more TPSD2 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.

7 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.

7.1 Performing Routine Maintenance

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

NOTE: *When ordering replacement parts, provide model number and serial number.*

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

Every 7 Years

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

Every 10 Years

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

7.2 Troubleshooting Procedure

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

Check the following:

1. Check DC output cables, connections, battery type, and number of cells against the charger's rating.
2. Check charger specifications against customer order.
3. Check input connections, input voltage and breaker size.
4. Check for shipping damage, loose connections, broken wires, etc.
5. Certain failures can be caused by defective batteries and customer loads; make sure batteries and loads are free from defects.

NOTE: *If the problem is found to be 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

Ordering Replacement Parts

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

7.3 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 7.3.1.
	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 7.3.3.
	High DC Voltage Shutdown Set Incorrectly	Refer to Section 6.1.2.
	Open Gate or Wire on Triac (TR-1)	Refer to Section 7.3.2.
2 DC Breaker Trips	Shorted Power Diodes/Diode Modules (SD1)	Refer to Section 7.3.3.
	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 7.3.4.
	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 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 7.3.3.
	Defective S2A-341S Control Board	Contact La Marche Service Department for further troubleshooting instructions.
	Defective Shunt	
	Defective Resonating Capacitor(s)	Refer to Section 7.3.4.
	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 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 7.3.3.
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.

7.3.1 Ground and Short Circuit Test.

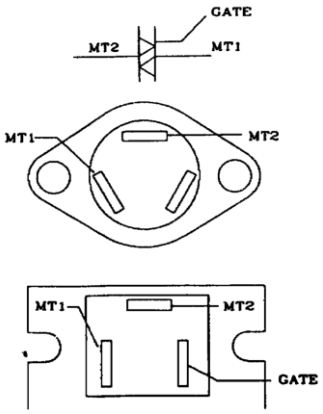
A simple ohmmeter check can be performed to check the charger for a short to ground, primary to secondary breakdown, AC-DC short, or DC ground. Before installation of a new charger, the above checks should be made before installing. If a short of this type is suspected on a charger in service, check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

7.3.2 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.

7.3.3 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.

7.3.4 Troubleshooting and Replacing Power Silicon Diodes/Modules

The silicon diode may be a source of trouble. The function of the diode is to allow the flow of current through it in one direction only. If the polarity of the conducting current is reversed, the diode will block the current flow. Thus, the diode has a low resistance to current flow in one direction and a high resistance to current flow in the other direction. Therefore, a simple ohmmeter may be used to test the diode. The procedure for checking the silicon diode is as follows:

1. Isolate one end of the diode by disconnecting the wires attached to the nipple (or pigtail) end of the diode (only one end of the diode must be disconnected).
2. Clip one lead of the ohmmeter to the nipple (or pigtail) lead of the diode. Clip the other ohmmeter lead to the aluminum heat sink.
3. Note the ohmmeter reading. Then, reverse the leads between the diode and heat sink assembly. Again, note the ohmmeter reading. If the diode is good, the ohmmeter will indicate a high resistance in one direction and a low resistance with the leads reversed. If the diode is shorted, the ohmmeter will read near (0) resistance with the leads in either direction. If the diode is open, the ohmmeter will show infinite resistance, indicating an open circuit with the ohmmeter leads in either direction.
4. All diodes must be checked if more than one diode is defective.
5. If the diode is defective, contact La Marche for complete heat sink replacement.

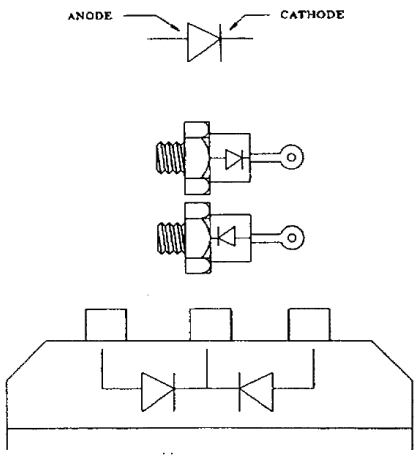
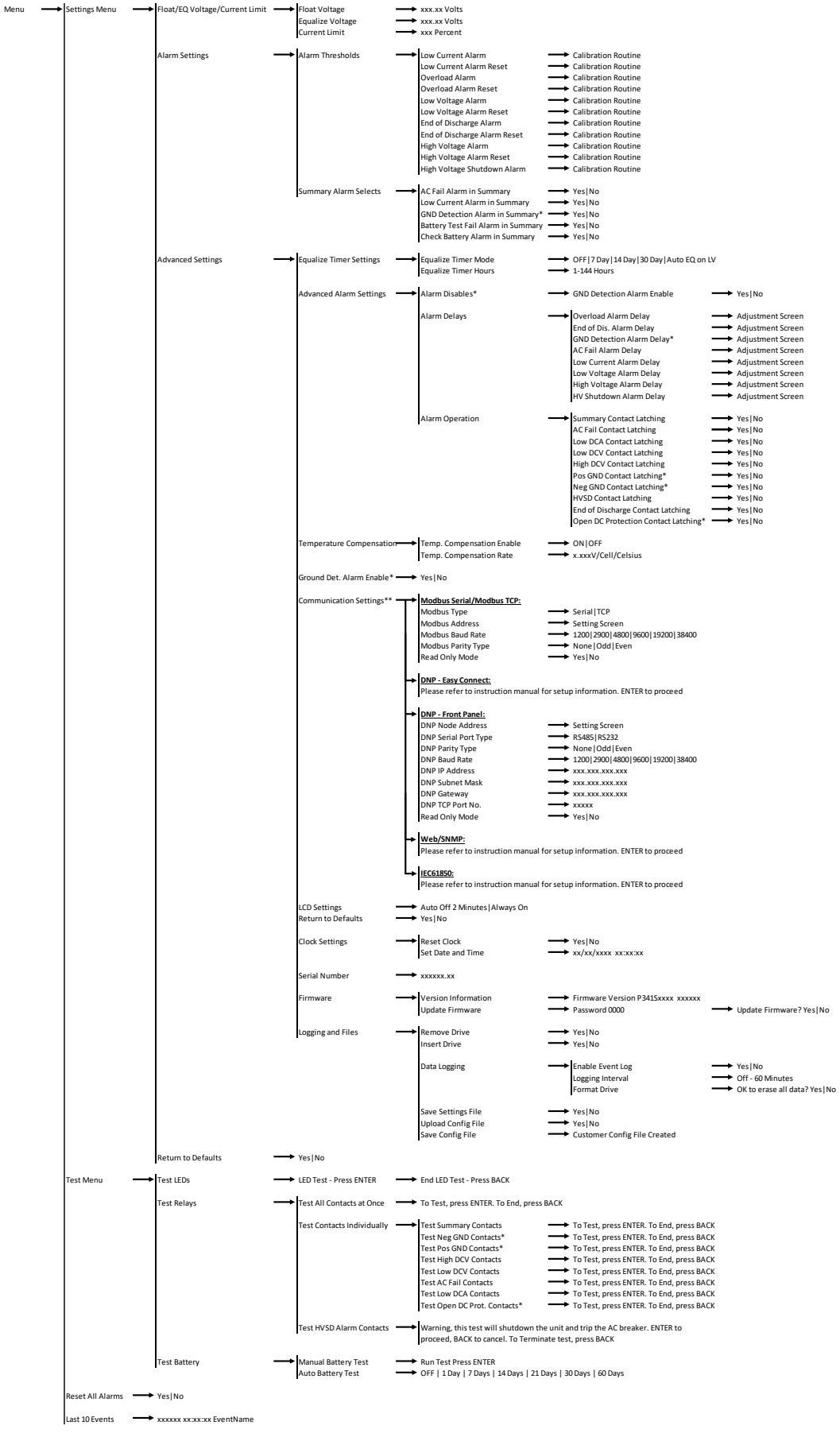


Figure 9 – Diode (Schematic Symbol and Package Variations)

Appendix A: TPSD2 Menu Structure Flowchart



**Setting/menu availability dependent on charger type*
***Submenu dependent on communications option included in charger*
Firmware Version:
P341S0100 022822

Appendix B: MicroSD Card File Retrieval Instructions

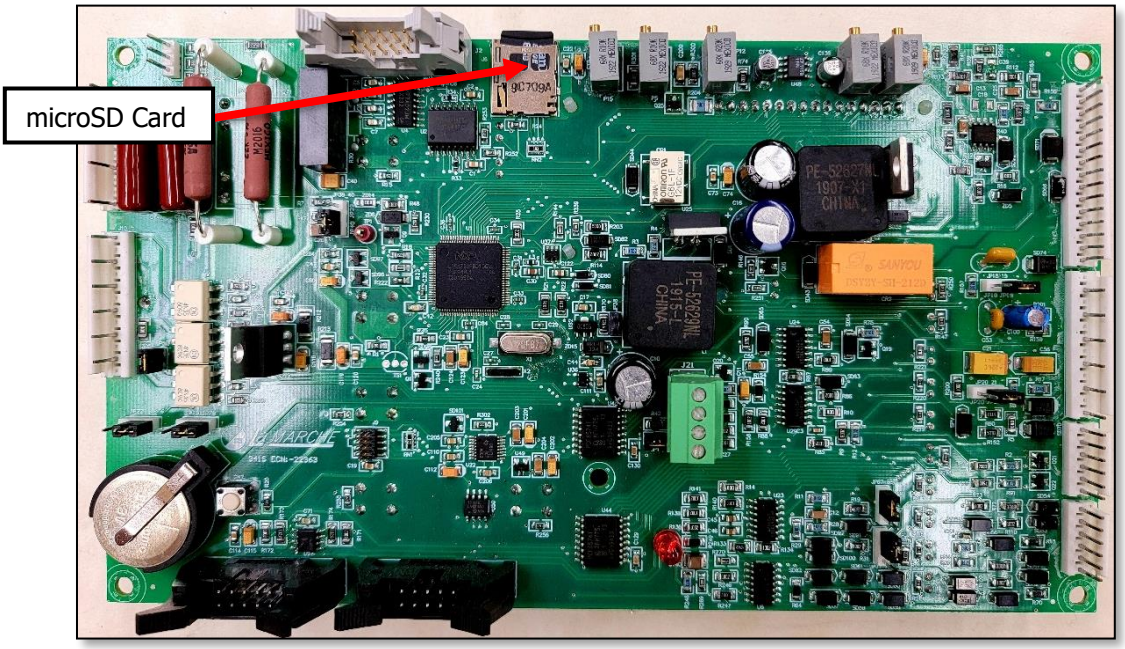
The following instructions are for retrieving the files in the microSD card on an TPSD2 charger via the Settings Menu. The instructions are as follow:

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

Settings Menu → Advanced Settings → Logging and Files → Save Config File

2. Press the Back button and select "Return to Menus" and repeat this process as needed to return to the Logs and Files submenu.
3. Select "Save Settings File" and select "YES" in the end to save the settings file.
4. Press the back button and select "Return to Menus" to return to the *Logging and Files* submenu.
5. Select "Remove Drive" and select "YES" to properly remove the microSD card.
6. Open the door of the charger and locate the microSD card mounted in the S2A-341S display board (mounted to the door). Refer to figure below for microSD card location.
7. Safely remove the microSD card and using a microSD card reader and a computer, make a local copy of all the files from the microSD card.
8. Press the "Menu" button to enter the Customer Calibration menu and navigate through the following and select "YES" in the end to safely reinstall the microSD card into the S2A-341S board microSD card slot:

Settings Menu → Advanced Settings → Logging and Files → Insert Drive



Appendix C: 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 D: 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 E: 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 F: 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 G: Document Control and Revision History

Part Number: 147303
Instruction Number: P25-LTPSD2-2
Issue ECN: 23242 – 07/22

23316 – 01/23	23242 – 07/22		

Appendix J: Additional Support Documentation

- **Option Instructions**
- **Schematic Diagram**
- **Dimensional Drawing**
- **Bill of Material Listing**
- **Recommended Spare Parts List**
- **Product Datasheet**