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A46 Series

Constavolt
Magnetic Amplifier Charger



Standard



16 Series CAP



46 Series CAP

Installation and Operation Manual

This manual is subject to change without notice. You may obtain the newest version of the manual at www.lamarchemfg.com

Important Safety Instructions

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

Electrical Safety



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

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

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



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

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

Mechanical Safety

- This charger or parts of the charger may get very hot during normal operation, use care when working nearby.
- Do not expose equipment to rain or snow. Always install in a clean, dry location.
- Do not operate equipment if it has received a sharp blow, been dropped, or otherwise damaged in any way.
- Do not disassemble this charger. Incorrect re-assembly may result in a risk of electric shock or fire.
- If modifications to the enclosure are necessary, such as drilling for conduit fitting, ensure the interior is protected from metal shavings and debris. Additional precautions should be taken to remove any remaining debris from interior of charger prior to energizing.

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 using procedure specified in Section 3.2.
- If it is necessary to remove battery connections, always remove the grounded terminal from the battery first.
- Remove personal metal items such as rings, bracelets, necklaces, and watches.
- Always wear rubber gloves, safety glasses, and a rubber lined vest/apron when working near a battery.
- Have plenty of fresh water and soap nearby in case 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 4 inches of free air on all vented surfaces for proper cooling.
- Allow sufficient clearance to open the front panel for servicing.
- Do not operate this charger in a closed-in area or restrict ventilation in any way.
- Do not place charger below battery.
- Never allow battery electrolyte to drip on this charger when reading the specific gravity or filling the battery.
- Never place this charger directly above a standard flooded battery. Gases from the battery will corrode and damage equipment.
- A sealed maintenance free or valve regulated lead acid (VRLA) battery may be placed below this equipment.

Check for Damages

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



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

Returns for Service

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

Inspection Checklist

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

Handling

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

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Model Scope/General Description

The La Marche A46/A46F battery charger is specially designed for maintaining and recharging starting batteries of engine generator sets. The controlled magnetic amplifier technology provides the highest reliability that is necessary for the continued operation of the emergency standby equipment. It eliminates most starting problems by maintaining batteries at a proper charge and ensures optimum performance for maximum life.

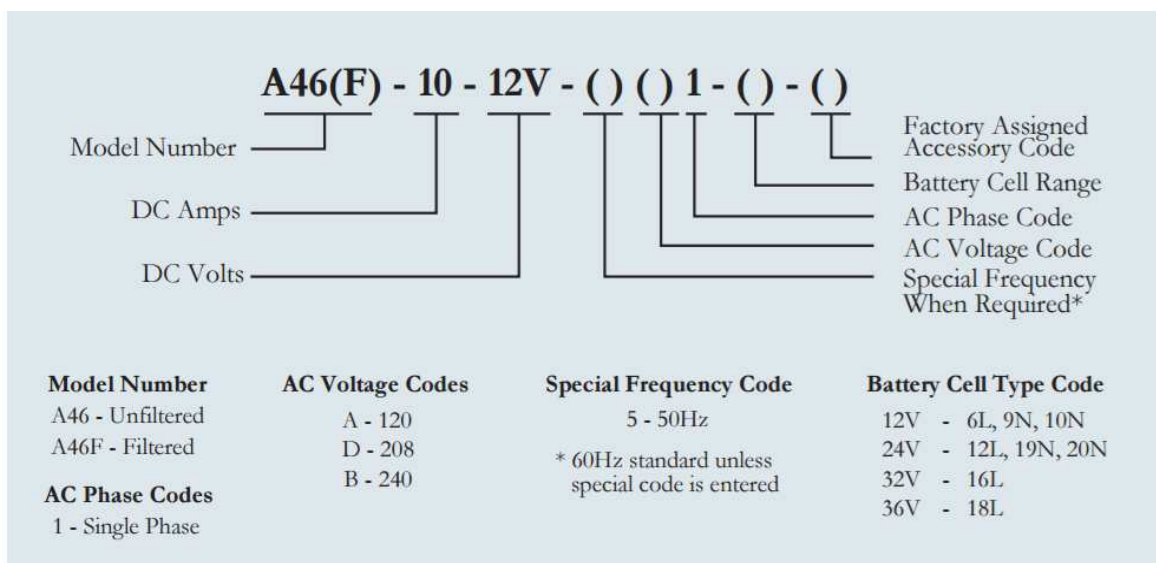
In normal operation, the A46/A46F charger maintains a constant battery voltage from no load up to 80% its rated load capacity as indicated by the nameplate. If the external loads exceed nameplate capacity, the charger will attempt to carry the excess load up to its current limiting capacity. Beyond this point, the battery will carry the excessive loads. If the battery is discharged, the charger will recharge the battery on a taper curve from its current limiting capacity to full charge.

The A46F model is the filtered version of the A46 model. The A46F can be used with the following types of batteries: sealed maintenance free, valve regulated lead acid (VRLA) or standard flooded types due to its filtered output.

NOTE: THE A46 IS NOT RECOMMENDED FOR USE ON SEALED VALVE REGULATED BATTERIES.

Understanding the Model Number

The A46/A46F model number is coded to describe the features that are included. Find the model number on the nomenclature nameplate of the charger. Follow the chart below to determine the configuration of the 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.

1.0 Equipment Handling

1.1 Storing the A46

If the A46/A46F is to be stored for more than a few days after delivery, it should be stored within its shipping container. The location chosen for storage should be within an ambient temperature of -40 to 185° F (-40 to 85° C) with a non-condensing relative humidity of 0 to 95%. Storage should not exceed 2 years due to the limited shelf life of the DC filter capacitors when they are not in service.

1.2 Moving the A46

After careful inspection and upon verification that the A46 is undamaged, identify the enclosure style and weight of the A46 charger. Refer to Table 1 below.

Output Voltage	Filtering	Ampere Rating					
		6 ADC	10 ADC	20 ADC	30 ADC	40 ADC	50 ADC
12 VDC	A46	1 Case 28 lbs (12.7 kg)	1 Case 30 lbs (13.6 kg)	2 Case 56 lbs (25.4 kg)	2 Case 66 lbs (29.9 kg)		
	A46F	2 Case 39 lbs (17.8 kg)	2 Case 41 lbs (18.7 kg)	7 Case 68 lbs (31.0 kg)	3 Case 91 lbs (41.4 kg)		
24 VDC	A46	1 Case 38 lbs (17.2 kg)	2 Case 62 lbs (28.1 kg)	2 Case 73 lbs (33.1 kg)	7 Case 108 lbs (49.0 kg)	7 Case 112 lbs (50.8 kg)	3 Case 140 lbs (63.5 kg)
	A46F	7 Case 50 lbs (22.8 kg)	7 Case 74 lbs (33.7 kg)	7 Case 85 lbs (38.7 kg)	3 Case 127 lbs (57.8 kg)	3 Case 143 lbs (65.0 kg)	4 Case 148 lbs (67.1 kg)
32 VDC	A46	2 Case 58 lbs (26.3 kg)	2 Case 68lbs (30.8 kg)	2 Case 74 lbs (33.6 kg)	7 Case 112 lbs (50.8 kg)		
	A46F	7 Case 70 lbs (31.9 kg)	7 Case 80 lbs (36.4 kg)	3 Case 92 lbs (41.9 kg)	3 Case 131 lbs (59.6 kg)		
36 VDC	A46	2 Case 58 lbs (26.3 kg)	2 Case 68lbs (30.8 kg)	7 Case 74 lbs (33.6 kg)	7 Case 112 lbs (50.8 kg)		
	A46F	7 Case 70 lbs (31.9 kg)	7 Case 80 lbs (36.4 kg)	3 Case 92 lbs (41.9 kg)	3 Case 131 lbs (59.6 kg)		

Table 1 – Case Type and Weight Table (ADC)

2.0 Installing the A46

2.1 Mounting the A46

When mounting the A46/A46F in any configuration, consider the size and weight of the charger. The wall and/or floor must be able to support the weight of the charger, as well as an additional safety factor. Refer to Appendix B to verify the weight of the charger and Table 2 below for mounting methods. The location chosen for the charger should be within an ambient temperature range of 32°F to 122°F (0°C to 50°C) with a non-condensing relative humidity no higher than 95%. The charger should be mounted in an area free of explosive materials and away from any liquids. The A46/A46F utilizes convection cooling so a clearance of at least 4 inches (100 mm) of free air must be maintained on the top, bottom, left and right side for cooling air. Maintain 36 inches (914 mm) or more of clearance at the front of the charger in order to allow for operation and maintenance. The bolts or screws used to secure the charger should be sufficient length to assure a vibration-free mounting. The preferred fastener is a machine bolt backed with a flat washer, lock washer, and nut. All hardware should be corrosion-resistant.

Enclosure Number*	Cable Entry		Standard Mounting	Wall Mount Hardware Size & Qty	Floor Mount Hardware Size & Qty
	AC Input	DC Output			
1	Right	Left	Wall	1/4" (x4)	N/A**
2	Right	Left	Wall	1/4" (x6)	N/A**
3	Right	Left	Wall/Floor	5/16" (x5)	5/16" (x4)
4	Right	Left	Wall/Floor	5/16" (x5)	5/16" (x4)
7	Right	Left	Wall/Floor	1/4" (x3) + 5/16" (x2)	5/16" (x4)

Table 2 – Mounting Methods and Hardware Specifications

* Refer to the A46/A46F data sheet for enclosure size.

** The 1 & 2 enclosures are wall mounted only.

2.1.1 Wall-Mounting the A46

Wall-Mounting Procedure

To wall-mount the A46/A46F, install bolts on the wall rated to support the charger's weight plus a safety factor of at least four times. Refer to Appendix B for charger weight specifications. Secure the charger on bolts, add appropriate mounting hardware, and tighten securely. Refer to Table 2 for hardware specifications and the figures below for mounting dimensions.

NOTE: All dimensions are in inches. For further A46 enclosure information, see the outline drawings online at <http://www.lamarchemfg.com/info/enclosure-drawings.html>

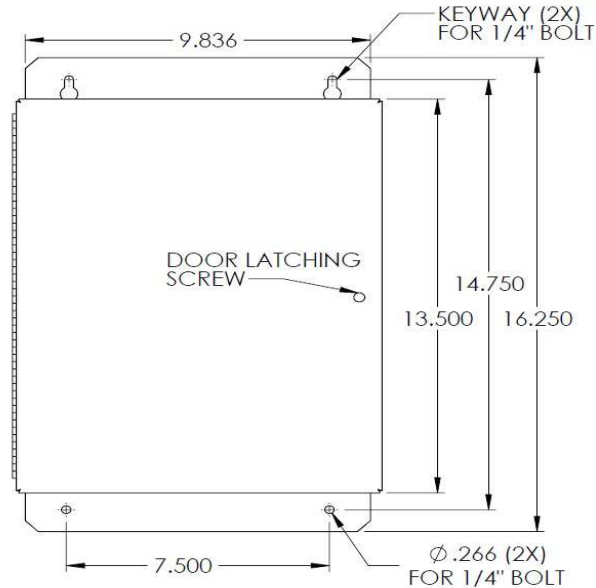


Figure 1 – Enclosure No. 1 Bolt Pattern

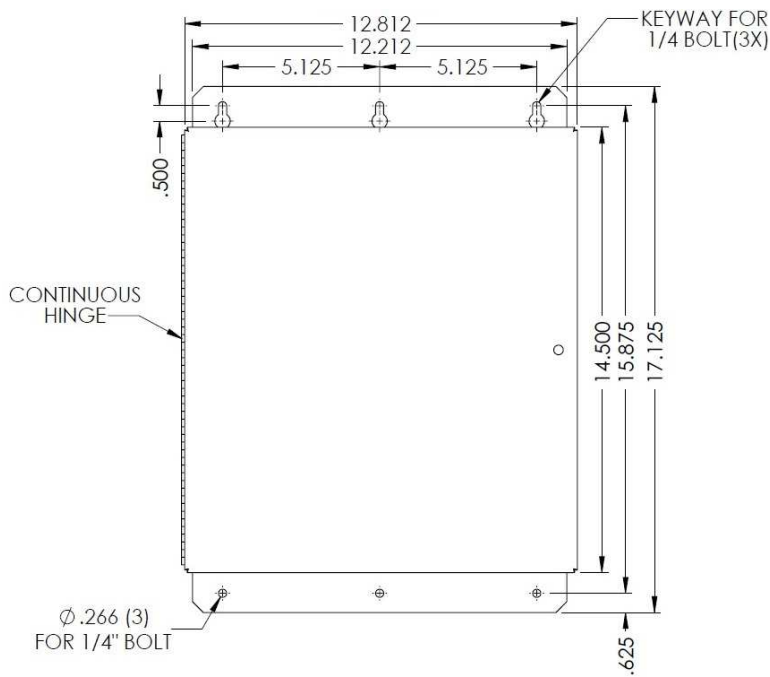


Figure 2 – Enclosure No. 2 Bolt Pattern

Case	Mtg.	W	X	Y
4	19" RR	18.000	19.000	18.250
4-23	23" RR	----	23.000	22.250

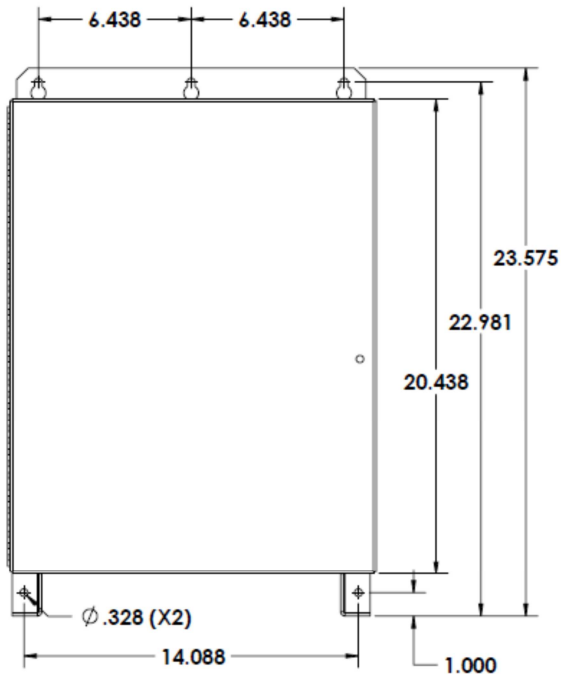


Figure 3 – Enclosure No. 3 Bolt Pattern

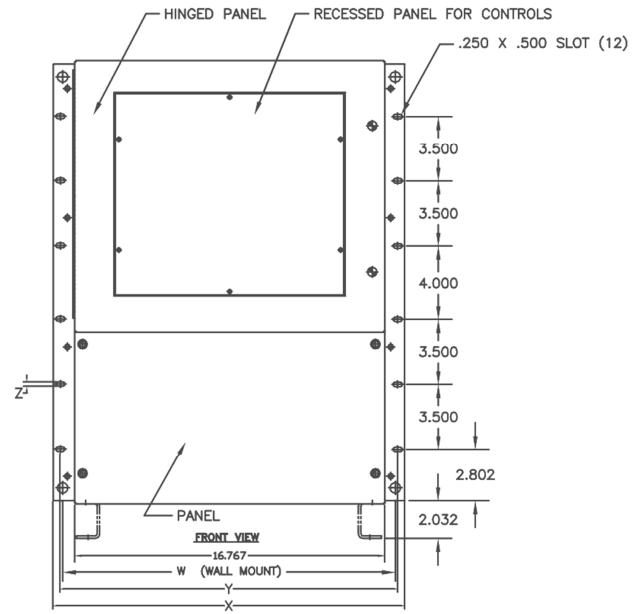


Figure 4 – Enclosure No. 4 Bolt Pattern

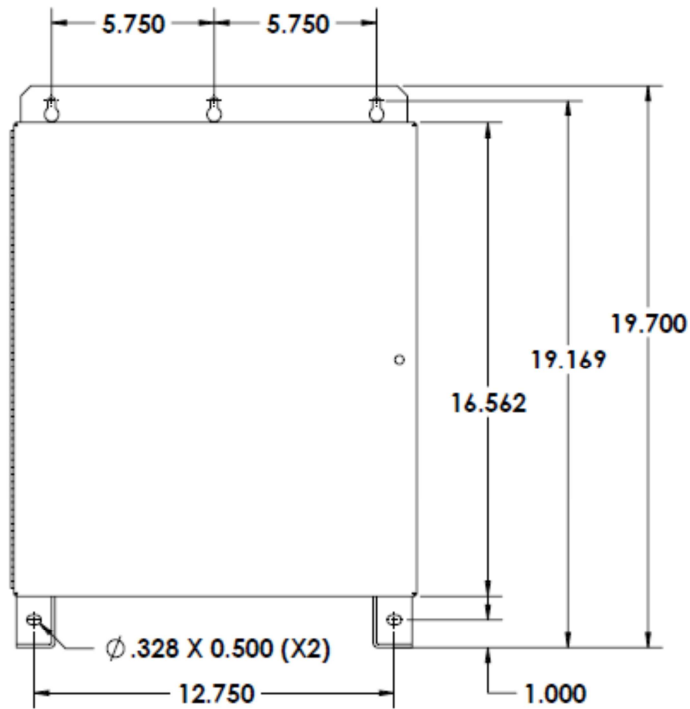


Figure 5 – Enclosure No. 7 Bolt Pattern

2.1.2 Floor-Mounting the A46 (3, 4 & 7 Enclosures Only)

Floor-Mounting Procedure

To floor-mount the A46/A46F, install four anchor bolts into the floor. Place the charger on the anchor bolts, add appropriate mounting hardware onto the floor-mounting anchor bolts, and tighten securely. Refer to Figure 6 for hardware specifications and floor-mounting dimensions. All dimensions are given in inches.

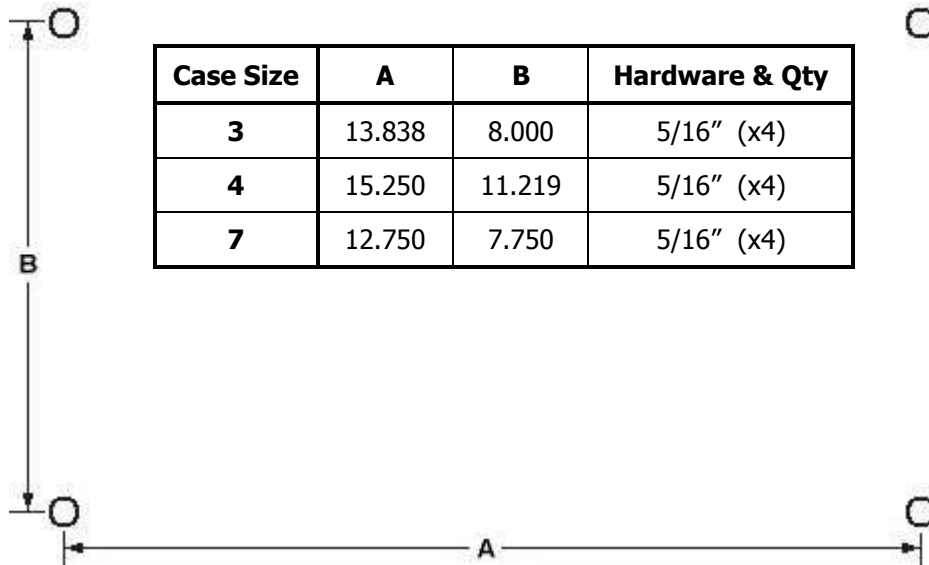


Figure 6 – A46/A46F Enclosure Footprint

2.2 Making the AC Input Connections

Before beginning any work inside the charger, ensure that all incoming AC supply and DC wires are 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. 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.

	Charger Rating (DC Amps)	Minimum Wire Size Requirement for Customer Connection			
		A (120V)	D (208V)	B (240V)	C (480V)
12 Volt Systems	6A-12V	#14	#14	#14	--
	10A-12V	#14	#14	#14	--
	20A-12V	#12	#12	#12	--
	30A-12V	#12	#12	#12	--
24 Volt Systems	6A-24V	#14	#14	#14	--
	10A-24V	#14	#14	#14	--
	20A-24V	#12	#14	#14	--
	30A-24V	#10	#14	#14	--
	40A-24V	#8	#12	#12	--
	50A-24V	#8	#10	#10	#14
32 Volt Systems	6A-32V	#14	#14	#14	--
	10A-32V	#14	#14	#14	--
	20A-32V	#10	#14	#14	--
	30A-32V	#8	#12	#12	--
36 Volt Systems	6A-36V	#14	#14	#14	--
	10A-36V	#14	#14	#14	--
	20A-36V	#10	--	--	--
	30A-36V	#8	--	--	--

Table 3 – AC 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 (refer to table 4 for ground wire sizing) to the terminal marked ground. Install the input AC cables to the AC input terminals of the charger.

2.3 Configuring the DC Output Connections

Before making any of the DC output connections, make sure you read and fully understand the DC Connection Procedure below, including Section 3.2. Select proper size for the DC wires using Table 4. If the distance between the charger's DC output and the battery/load exceeds 10 feet, use the Power Wiring Guide in Appendix D 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.

Charger Rating (DC Amps)	Fuse Rating (DC Amps)	Minimum Wire Size Requirement for Customer DC Connection	Equipment Grounding Conductor Minimum
6	15	#14	#14
10	20	#12	#12
20	35	#8	#10
30	50	#8	#10
40	70	#8	#10
50	80	#6	#10

Table 4 – DC and Ground Wire Size Minimum Requirements

NOTE: These are recommended sizes. All National and Local Wiring Codes must be followed.

3.0 Operation

3.1 A46 Startup

All equipment is shipped from the factory fully inspected and adjusted to manufacturer defined default values based on the model number. Do not make any adjustments unless the equipment has been energized and the settings have been determined to be incorrect.

NOTE: The A46 is not recommended for use on Sealed Valve Regulated (VRLA) batteries. The A46F model should be used instead.

3.2 Checking the Installation

Before attempting to start the A46/A46F, check and verify the following:

- Verify all connections are correct.
- Check all terminations are tightened securely.
- Check for any loose connection or unsecured components in the charger.
- Verify the AC input and battery/load voltages match the voltages on the nameplate of the charger.

DC Connection Procedure (for chargers with DC fuse not using battery disconnect)

To prevent the DC fuse from blowing when connecting the battery, connections should be done in the following order:

1. Make sure that the incoming power to the charger is turned off.
2. Connect the negative battery cable to the charger's DC output terminals. **OBSERVE PROPER POLARITY.**
3. Energize the charger by supplying AC voltage. This will charge the capacitors inside the charger and eliminate heavy arcing when the battery is connected.
4. After 30 seconds, turn off the AC power and immediately connect the remaining positive battery cable.
5. Connect the DC loads. **OBSERVE PROPER POLARITY.**
6. Turn on the charger again by supplying AC voltage; it will commence charging the batteries and powering the load.

DC Connection Procedure (for chargers with DC fuse and battery disconnect)

To prevent the DC battery disconnect 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. Make sure the battery disconnect breaker is open.
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 battery disconnect breaker.

DC Connection Procedure (for chargers with DC circuit breaker)

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

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

3.3 Charging Modes

The A46 charger has two modes for DC output voltage; Float mode and Equalize mode. Float charging mode is used for all normal battery charging needs. Equalize mode is used when it is necessary to equalize (or balance) the level of charge across all cells present in the battery. Refer to battery manufacturer for recommended equalize schedule.

On a standard A46 charger, a Float/Equalize toggle switch is provided on the front panel to alternate between charging modes. The charger will maintain the specified mode while the switch is in the corresponding position until it is manually changed. The operator is responsible for manually changing modes, depending on battery manufacturer recommendations.

If any options are included, refer to appropriate accessory manual for description of selecting charging modes and equalize timer settings.

3.4 Output Voltage Adjustments

The output voltage of the A46/A46F charger is set to a default value, refer to descriptions below, but should be adjusted to meet the battery manufacturer recommendations. A resistor with two slider bands is provided for adjusting the float and equalize voltages. Adjustments can be carefully made with the charger energized until the desired voltage is achieved, refer to descriptions below for charger specific notes. If adjustments are required, refer to Figure 7.

Float Voltage:	2.17 V/C for LA 2.25 V/C for VRLA 1.40 V/C for NC
Float Adjustment Range:	2.02 – 2.40 V/C (LA) (VRLA) 1.29 – 1.55 V/C (NC)
Equalize Voltage:	2.33 V/C for LA 2.27 V/C for VRLA 1.55 V/C for NC
Equalize Adjustment Range:	2.15 – 2.50 V/C (LA) (VRLA) 1.40 – 1.70 V/C (NC)

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

3.4.1 A46 Output Voltage Adjustments

The A46 must be connected to batteries while adjusting the output voltage. The batteries should be fully charged with minimal current draw from the charger. Immediate change in voltage might not be seen due to the backfeed of the battery voltage.

3.4.2 A46F Output Voltage Adjustments

The A46F output voltage should be adjusted without anything connected to the output. The output voltages should be set to battery manufacturer recommendations prior to connecting to battery. Adjustments with the battery connected to the charger are also possible, but immediate change in voltage might not be seen due to the backfeed of the battery voltage.

FLOAT AND EQUALIZE (HIGH) VOLTAGE SETTINGS

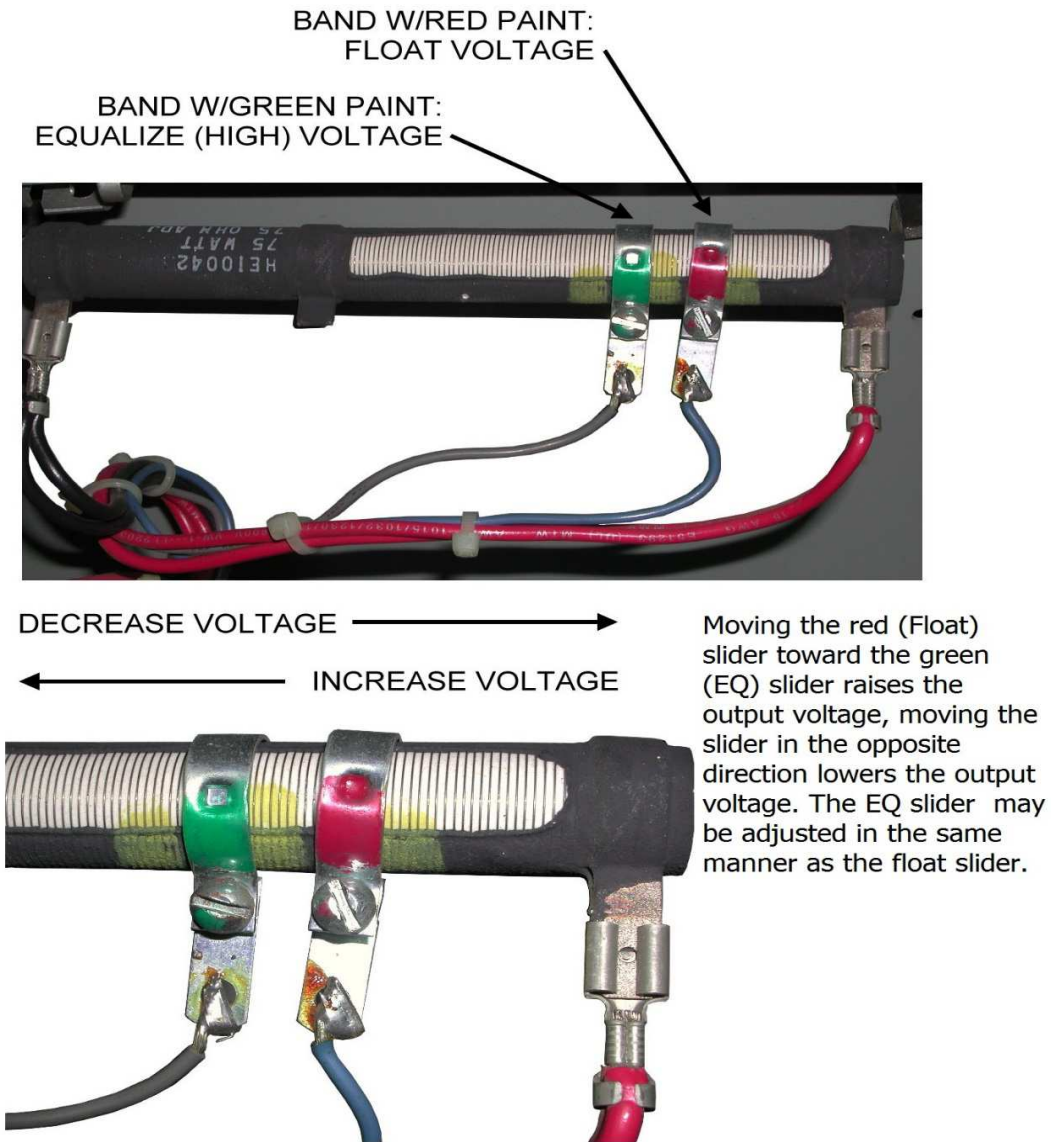


Figure 7 – Output Adjustment

NOTE: When attempting to adjust the necessary voltage, loosen the screw on the appropriate slider so it may slide freely without damaging the resistor's threads.

3.5 Power Failure Alarm

A Power Failure relay is provided to disconnect the automatic control from the battery and, therefore, limit the drain on the battery. One (1) set of normally open and closed contacts from this relay is connected to terminals for connection to a remote Power Failure alarm; refer to Figure 8. The charger will automatically resume charging upon return of AC power.

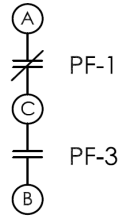


Figure 8 – Power Failure Contacts

3.5.1 Remote Alarm Connection Procedure

Before making any connections to the A46/A46F, ensure that the AC power is off at the main breaker box and that both of the charger’s fuses/breakers are disconnected/off. Verify that no voltage is present by using a voltmeter at all input and output terminals. If it is desired that the annunciator be active until the Power Failure alarm triggers, connect the annunciator/power leads to the **NO** and **C** contacts of the Power Failure alarm contacts. If it is desired that the annunciator be inactivate until the AC Power Failure alarm triggers, connect the annunciator/power leads to the **NC** and **C** contacts of the Power Failure alarm contacts..

EXAMPLE: A customer wants a green lamp to be illuminated when the charger has AC power and wants a red lamp to illuminate when the charger loses AC power. The customer would make the connections to 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.

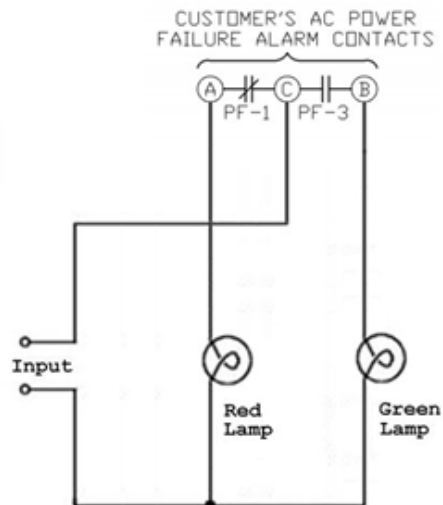


Figure 9 – Power Failure Example Connections (Customer Provided Equipment)

4.0 Frequently Asked Questions

Q: How can I tell what options are included on my A46(F) 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 is 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: Why is an A46 charger not recommended for use on sealed batteries?

A: The A46 is an unfiltered version of the A46F. This means high AC ripple voltage can be present on the output voltage due to the lack of a filter stage. It utilizes the batteries for filtering of the output voltage. Flooded batteries are maintained and have the electrolyte that is lost, due to the filtering, replenished. Sealed batteries must be used with a filtered charger due to not having the ability to replenish electrolyte lost. This means the life of a sealed battery will be drastically affected with the use of an unfiltered charger.

Q: Can two A46(F) chargers be connected in parallel?

A: Yes, two or more A46(F) chargers can be connected in parallel as long as they are of the same output voltage rating. Chargers in parallel are not designed to load share. Paralleling is not to be confused with load sharing.

Q: Can the A46(F) 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. If alarm accessories are installed, alarm thresholds will also need to be changed to the desired battery type defaults, refer to appropriate 16 or 46 series option manual for procedure and default values.

Q: 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 the appropriate option 16 or 46 series manuals for more information.

Q: How can the equalize timer be changed on an A46(F) charger?

A: If the charger is equipped with an equalize timer, which is included in the 16 and 46 series options, the equalize timer can be changed by accessing the customer calibration menu of the front display. Refer to the appropriate option manual.

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 the option manual for disabling instructions. More severe conditions include charger failure, loss of AC power, maladjustment of output voltage, and possible disconnection of DC loads. If this is the case, other alarms will also be present.

5.0 Service

All work inside the A46/A46F charger should be performed by qualified personnel. La Marche is not responsible for any damages caused by an unqualified technician.



Before working inside the A46/A46F, ensure that the AC power is off at the main breaker box and that both of the charger's breakers are off. Verify that no voltage is present by using a voltmeter at all input and output terminals.

5.1 Performing Routine Maintenance

Although very little maintenance is required with the A46/A46F charger, routine checks and adjustments are recommended to ensure optimum system performance.

Yearly

1. Confirm air vents are open. Remove dust and debris from interior of charger.
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. Check capacitors for electrolyte leakage and replace if necessary.

Every 7 Years

1. If the charger is consistently operated in extreme temperature environments, the capacitors should be replaced. This is only applicable on A46F models.

Every 10 Years

1. Check magnetics, components and wiring for signs of excessive heat.
2. Replace capacitors on A46F models if not done at the 7 year interval.

5.2 Troubleshooting Procedure

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

Check the following:

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

If the problem is not found with the preliminary checks above, use the troubleshooting chart on section 5.3 as a guideline.

NOTE: *If the problem is found to be located in the printed circuit boards, the board should be replaced. No attempt should be made to repair circuit boards in the field.*

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

1. Equipment model number and serial number.
2. The measured AC input voltage.
3. The measured DC output voltage with and without the battery.
4. The measured DC output current, measured with battery and load connected to charger.

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

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

5.3 Troubleshooting Chart



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

Symptom	Possible Cause	Action
1 AC Protection Opens Immediately (High Input Current)	Incorrect AC Input Voltage	Measure AC voltage and verify against charger nameplate.
	AC Input Taps on Power Transformer are Incorrectly Set	Verify tap settings using charger schematic or input table found on charger.
	Incorrect, Damaged, or Loose Cable/Harness Connections	Visually inspect and verify all internal wiring using charger schematic.
	DC Output Too High	Refer to Symptom 6.
	Defective Diode Heat Sink Assembly	Refer to Appendix E.
2 DC Protection Opens Immediately (High Output Current)	Incorrect Battery Connected	Measure battery voltage and verify against charger nameplate.
	Reverse Polarity	Confirm polarity of DC cables with voltmeter.
	Incorrect, Damaged, or Loose Cable/Harness Connections	Visually inspect and verify all internal wiring using charger schematic.
	Shorted Output Cables	Inspect DC cables for shorts
	Shorted Battery Cells or Customer Equipment	Remove all loads and batteries from charger and confirm charger functionality.
3 No Display and No LEDs (If Applicable)	No AC Voltage Applied to Charger	Measure and confirm input voltage.
	Charger AC protection is open	Refer to Symptom 1.
	Incorrect, Damaged or Loose Cable/Harness Connections	Visually inspect and verify all internal wiring using charger schematic.
	Defective LEDs/Display Card	Contact La Marche Service Department for further troubleshooting instructions.
4 Meter Reading Incorrect Voltage or Current	Incorrect, Damaged or Loose Cable/Harness Connections	Visually inspect and verify all internal wiring using charger schematic.
	Defective Analog Voltmeter (if applicable)	Measure DC voltage across the voltmeter and verify meter is displaying correct voltage.
	Defective Analog Ammeter (if applicable)	Measure current output with clamp ammeter. Verify meter is displaying correct current.
	Incorrect Display Calibration on Display Card (if applicable)	Measure output voltage and current; compare to display readings. Refer to "Display Calibration" section of the corresponding option manual.
	Incorrect Software Settings on Display Card (if applicable)	Contact La Marche Service Department for further troubleshooting instructions.
	Defective Shunt (if applicable)	
	Defective Control Card	
5 Low Output Voltage or Current	No AC Input Voltage Applied to Charger	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 5 for output adjustment instructions.

5 Low Output Voltage or Current (Continued)	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.
	Meter Reading Incorrect Voltage or Current	Refer to Symptom 4.
	Defective Control Panel	Disconnect the blue and black wires going to terminal #1 on control panel. Connect the two wires together, but do not reconnect to panel. Connect battery and turn on charger. If the output rises above the nominal voltage, the control panel may be defective.
	Defective Control Relay	Measure the DC voltage from terminal #1 on the control panel to the positive output terminal of the battery charger. If no voltage is measured, the relay may be defective.
	Open RC Resistors	Measure resistance of component. If open, the resistor may be defective.
	Defective Diode Heat Sink Assembly	Refer to Appendix E.
	Defective Batteries	Check battery cells.
6 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 5 for output adjustment instructions.
	Open RV1 or RV2 Resistors or Slider Bands	Measure continuity of resistors. If open, the resistor may be defective. Measure resistance from one end of resistor to each slider band. If open, readjust slider band.
	Defective Control Panel	Disconnect and separate blue and black wires going to terminal #1 on control panel. If the charger shuts down, the control panel may be defective.
	Defective Batteries	Check battery cells.
7 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.

5.4 Ordering Replacement Parts

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

Appendix A: A46(F) Specifications

<i>ELECTRICAL</i>	
AC Input	Voltage Range +/- 10% Frequency Range 60Hz ± 5%
DC Output	6 - 50 ADC 12, 24, 32, or 36VDC
Output Filtering	A46 – No Filtering A46F – Suitable for Valve-Regulated batteries
Regulation	± 0.5% from no load to full load over the specified input voltage, frequency and ambient temperature range.
Meters	Standard – Analog DC Ammeter & DC Voltmeter ± 2% Accuracy 16 or 46 Series – Digital DC Ammeter & DC Voltmeter ± 1% Accuracy
<i>PROTECTION</i>	
Current Walk-In	The output current will gradually increase after the charger is turned on, eliminating surges and overshoot
Current Limit	DC Current limiting circuitry
Input/ Output	Standard - AC and DC fuse
Emergency Restoration	The battery charger may be connected to a battery which is heavily discharged and recharge it without clearing any protective devices.
<i>ENVIRONMENTAL</i>	
Audible Noise	Less than 65dBA at any point 5 feet from any vertical surface
Operating Temperature	32 to 122°F (0 to 50°C)
Storage Temperature	-40 to 185° F (-40 to 85° C)
Relative Humidity	0 to 95% (non-condensing)
Cooling	Convection Cooled
Shock	The battery charger in its shipping container withstands shock developed when one edge of the container is dropped six inches while the opposite edge is resting on the ground, or it is dropped two inches without any physical damage or degradation of the electrical performance.
Vibration	The battery charger in its shipping contained, withstands vibration encountered in shipping without physical damage or degradation of the electrical performance.
Altitude	This battery charger is capable of operation at altitudes up to 10,000 feet at an ambient temperature of up to +40 degrees C.
Ventilation	The charger should be mounted so that ventilating openings are not blocked and air entering the cabinet does not exceed 50 degrees C (122 degrees F).

Appendix B: A46(F) Fuse Size, Case Size, and Weight

	A46(F) Model Number	DC Output		AC input Current Draw @ 100% Load								A46		A46F	
		Amps	Fuse Size	120 (A)	Fuse Size	208 (D)	Fuse Size	240 (B)	Fuse Size	480 (C)	Fuse Size	Case No.	Weight (Lbs)	Case No.	Weight (Lbs)
12 Volt Systems	6-12V	6	15A	1.5	5.0	0.9	4.0	0.8	4.0	--	-	1	28	2	18
	10-12V	10	20A	2.5	6.0	1.4	4.0	1.3	4.0	--	-	1	30	2	19
	20-12V	20	35A	5.0	12.0	2.9	6.0	2.5	6.0	--	-	2	56	7	31
	30-12V	30	50A	7.5	15.0	4.3	8.0	3.8	8.0	--	-	2	66	3	42
24 Volt Systems	6-24V	6	15A	3.0	10.0	1.7	5.0	1.5	5.0	--	-	1	38	7	23
	10-24V	10	20A	5.0	12.0	2.9	6.0	2.5	6.0	--	-	2	62	7	34
	20-24V	20	35A	10.0	17.5	5.8	12.0	5.0	12.0	--	-	2	73	7	39
	30-24V	30	50A	15.0	30.0	8.7	15.0	7.5	15.0	--	-	7	108	3	58
	40-24V	40	70A	20.1	35.0	11.6	20.0	10.0	20.0	--	-	7	112	3	65
	50-24V	50	80A	25.1	40.0	14.5	25.0	12.5	25.0	6.3	10.0	3	140	4	68
32 Volt Systems	6-32V	6	15A	4.0	10.0	2.3	5.0	2.0	5.0	--	-	2	26	7	32
	10-32V	10	20A	6.7	15.0	3.9	8.0	3.3	8.0	--	-	2	31	7	37
	20-32V	20	35A	13.4	25.0	7.7	15.0	6.7	12.0	--	-	2	34	3	42
	30-32V	30	50A	20.1	35.0	11.6	20.0	10.0	20.0	--	-	7	51	3	60
36 Volt Systems	6-36V	6	15A	4.5	10.0	2.6	-	2.3	-	--	-	2	26	7	32
	10-36V	10	20A	7.5	15.0	4.3	-	3.8	-	--	-	2	31	7	37
	20-36V	20	35A	15.0	30.0	8.7	-	7.5	-	--	-	7	34	3	42
	30-36V	30	50A	22.6	35.0	13.0	-	11.3	-	--	-	7	51	3	60

Appendix C: A46(F) Current Draw and Heat Loss

	A46(F) Model Number	DC Amps	AC input Current Draw @ 100% Load				Watts In	Watts Out	Watts Lost	BTU/Hr*
			120 (A)	208 (D)	240 (B)	480 (C)				
12 Volt Systems	6-12V	6	1.5	0.9	0.8	--	112	78	34	116
	10-12V	10	2.5	1.4	1.3	--	186	130	56	191
	20-12V	20	5.0	2.9	2.5	--	372	260	112	381
	30-12V	30	7.5	4.3	3.8	--	558	391	167	572
24 Volt Systems	6-24V	6	3.0	1.7	1.5	--	223	156	67	229
	10-24V	10	5.0	2.9	2.5	--	372	260	112	381
	20-24V	20	10.0	5.8	5.0	--	744	521	223	762
	30-24V	30	15.0	8.7	7.5	--	1116	781	335	1143
	40-24V	40	20.1	11.6	10.0	--	1488	1042	446	1524
	50-24V	50	25.1	14.5	12.5	6.3	1860	1302	558	1905
32 Volt Systems	6-32V	6	4.0	2.3	2.0	--	298	208	90	307
	10-32V	10	6.7	3.9	3.3	--	496	347	149	508
	20-32V	20	13.4	7.7	6.7	--	992	694	298	1016
	30-32V	30	20.1	11.6	10.0	--	1488	1042	446	1524
36 Volt Systems	6-36V	6	4.5	2.6	2.3	--	335	234	101	345
	10-36V	10	7.5	4.3	3.8	--	558	391	167	572
	20-36V	20	15.0	8.7	7.5	--	1116	781	335	1143
	30-36V	30	22.6	13.0	11.3	--	1674	1172	502	1715

*BTU/Hr assumes 70% efficiency at 100% load

Appendix D: Power Wiring Guide

Use the following formulas and table to determine proper wire size for minimal voltage drop. At distances exceeding 10 feet, the DC wire size should be chosen to keep the voltage difference between the chargers DC output terminals and the battery at less than 1/2 volt when charger is fully loaded.

Table of Conventions:

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

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

Calculating Wire Size Requirements:

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

Table 5 – Wire Size/Area Table

Calculating Current Carrying Capacity of Wire:

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

EXAMPLE: If the charger being used has a max ampere output of 33 Amps and 30 loop feet of copper wire cable is required with an allowable voltage drop of 0.5 Volts, the wire size calculation will be:

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

$$A = 33$$

$$LF = 30$$

$$K = 11.1$$

$$AVD = 0.5$$

$$CMA = \frac{33 \times 30 \times 11.1}{0.5} = 21978 \text{ or } \#6\text{AWG wire}$$

Appendix E: Diode Troubleshooting and Replacement

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 in the event that more than one diode is defective.
5. If the diode is defective, contact La Marche for complete heat sink replacement.

Appendix F: Manufacturer's Standard Warranty

(IF THE INVOICE SHOWS THAT YOU HAVE PURCHASED THE EXTENDED PARTS WARRANTY OR IF YOU ARE INTERESTED IN PURCHASING THE EXTENDED PARTS WARRANTY, SEE THE MANUFACTURER'S EXTENDED PARTS WARRANTY)

All La Marche Manufacturing Co. equipment has been thoroughly tested and found to be in proper operating condition upon shipment from the factory and is warranted to be free from any defect in workmanship and material that may develop within one year from date of purchase. In addition to the standard one (1) year warranty, La Marche warrants its magnetics and power diodes on a parts replacement basis only for nine (9) more years under normal use.

Any part or parts of the equipment (except protective devices, DC connectors and other wear-related items) that prove defective within a one (1) year period shall be replaced without charge providing such defect, in our opinion, is due to faulty material or workmanship and not caused by tampering, abuse, misapplication or improper installation. Magnetics and power diodes are warranted for ten (10) years after date of purchase. During the last nine (9) years of this ten (10) year warranty period, the warranty covers parts replacement only, no labor or other services are provided by La Marche, nor is La Marche obligated to reimburse the owner or any other person for work performed.

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

1. If the Purchaser elects to take the responsibility of repairing the equipment and requests replacement part(s), Purchaser or Sales Representative must contact Factory for return authorization and a purchase order must be issued. Replacement part(s) will be promptly shipped and invoiced. After the defective part(s) are returned and inspected at the Factory, if the defect(s) were due to faulty material or workmanship, credit will be issued.
2. The equipment can be returned to the La Marche factory to have the inspections, parts replacements and testing performed by factory personnel. Should it be necessary to return a piece of equipment or parts to the factory, the customer or sales representative must obtain authorization from the factory. If upon inspection at the factory, the defect was due to faulty material or workmanship, all repairs will be made at no cost to the customer during the first year. If the Extended Warranty is purchased, the parts required for repair will also be at no cost but La Marche will notify the Purchaser of the costs of Labor to replace the defective part(s). A Purchase Order to cover this labor is required before repairs will be initiated. Transportation charges or duties shall be borne by Purchaser.
3. If the purchaser elects not to return the equipment to the factory and wishes a factory service representative to make adjustments and/or repairs at the equipment location, La Marche's field service labor rates will apply. A purchase order to cover the labor and transportation cost is required prior to the deployment of the service representative.

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

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

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

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

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

THE ABOVE WARRANTY IS EXCLUSIVE, SUPERSEDES AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS. NO PERSON, AGENT OR DEALER IS AUTHORIZED TO GIVE ANY WARRANTIES ON BEHALF OF THE MANUFACTURER, OR TO ASSUME FOR THE MANUFACTURER ANY OTHER LIABILITY IN CONNECTION WITH ANY OF ITS PRODUCTS UNLESS MADE IN WRITING AND SIGNED BY AN OFFICIAL OF THE MANUFACTURER.

Appendix G: Manufacturer's Extended Parts Warranty

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

All La Marche Manufacturing Co. equipment has been thoroughly tested and found to be in proper operating condition upon shipment from the factory. Any part or parts of the equipment (except protective devices, d.c. connectors and other wear-related items) that prove defective within a one (1) year period from the date of our invoice to you shall be replaced without charge providing such defect, in our opinion, is due to faulty material or workmanship and not caused by tampering, abuse, misapplication or improper installation. Labor and parts are covered during this one (1) year period.

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

In addition, magnetics and power diodes are warranted for ten (10) years after the date of our invoice to you. The defect in the magnetics or power diodes must, in our opinion, be due to faulty material or workmanship and not caused by tampering, abuse misapplication, or improper installation. Labor and replacement magnetics and power diodes are covered under the extended warranty during the initial five (5) year period from the date of our invoice to you. During the next five (5) years of this ten (10) year warranty period for magnetics and power diodes, the warranty covers parts replacement only, no labor or other services are provided by La Marche, nor is La Marche obligated to reimburse the owner or any other person for work performed.

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

1. If the Purchaser elects to take the responsibility of repairing the equipment and requests replacement part(s), Purchaser or Sales Representative must contact Factory for return authorization and a purchase order must be issued. Replacement part(s) will be promptly shipped and invoiced. After the defective part(s) are returned and inspected at the Factory, if the defect(s) were due to faulty material or workmanship, credit will be issued.
2. The equipment can be returned to the La Marche factory to have the inspections, parts replacements and testing performed by factory personnel. Should it be necessary to return a piece of equipment or parts to the factory, the customer or sales representative must obtain authorization from the factory. If upon inspection at the factory, the defect was due to faulty material or workmanship, all repairs will be made at no cost to the customer under the Extended Warranty. Transportation charges or duties shall be borne by Purchaser.
3. If the purchaser elects not to return the equipment to the factory and wishes a factory service representative to make adjustments and/or repairs at the equipment location, La Marche's field service labor rates will apply. A purchase order to cover the labor and transportation cost is required prior to the deployment of the service representative.

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

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

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

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

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

THE ABOVE WARRANTY IS EXCLUSIVE, SUPERSEDES AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS. NO PERSON, AGENT OR DEALER IS AUTHORIZED TO GIVE ANY WARRANTIES ON BEHALF OF THE MANUFACTURER, OR TO ASSUME FOR THE MANUFACTURER ANY OTHER LIABILITY IN CONNECTION WITH ANY OF ITS PRODUCTS UNLESS MADE IN WRITING AND SIGNED BY AN OFFICIAL OF THE MANUFACTURER.

Appendix H: Document Control and Revision History

Part Number: 40533
Instruction Number: P25 -LA46-2
Issue ECN: 12036 – 6/98

	21360 – 2/17	17650 – 11/07	15349-01 – 5/02
	18985 – 4/11	16842 – 7/05	14575 – 2/01
	17832 – 4/08	15761 – 2/03	13608 – 5/00