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# *LT12 PRO*

Power Inverter



## Installation and Operation Manual

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

## Important Safety Instructions

Before using this equipment, read all manuals and other documents related to this inverter and other equipment connected to this unit. Always have a copy of an inverter'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](http://www.lamarchemfg.com).

### Electrical Safety



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

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

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



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

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

### Mechanical Safety

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

### Battery Safety



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

- To reduce the risk of arc, connect, and disconnect the battery only when the unit is off.
- If it is necessary to remove the 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 freshwater and soap nearby in case the battery electrolyte contacts skin, clothing, or eyes.
- If the battery electrolyte contacts skin or clothing, wash immediately with soap and water.
- If the electrolyte enters the eye, immediately flood the eye with running cold water for at least ten (10) minutes and seek medical attention immediately.

- Do not drop metal on a battery. A spark or short-circuit could occur and could cause an explosion.

### **Unit Location**

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

### **Check for Damages**

Before unpacking the product, note any damage to the shipping container and take pictures. Unpack the product and inspect the exterior and interior of the 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 inverter 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**

- The enclosure exterior and interior are not marred or dented.
- No visible damage to the components.
- All hardware and connections are tight.
- All wire terminations are secure.
- All items on the 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

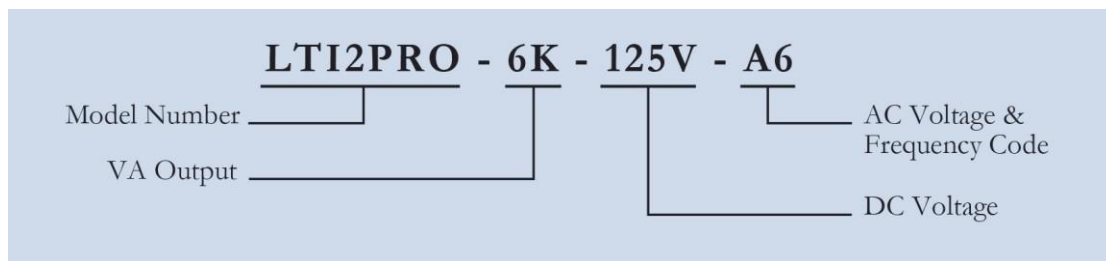
The LTI2PRO series employs advanced SPWM and CPU control technology to realize precise control, isolated input and output, output soft start, safety, and high efficiency with better reliability. The inverter is equipped with standard features such as pure sine wave output, voltage regulation, under/over-voltage conditions, and overload protection. The LTI2PRO Series is designed to operate at 125VDC input and produce 120 VAC nominal output with 60HZ. The compact 2RU rack-mount enclosure is ideal for data centers, and telecommunications applications.



Figure 1 - LTI2 Pro Overview

## Understanding the Model Number

The LTI2PRO model number is coded to describe the features that are included. Find the model number on the nomenclature nameplate of the enclosure. Follow the chart below to determine the configuration of the inverter.



## Optional Accessories Included in the Inverter

This inverter 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 inverter is no longer available, contact La Marche and provide the model or serial number to receive a list of the included accessories.

## 1.0 Equipment Handling

### 1.1 Storing the LTI2 PRO

If the LTI2 PRO 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 158° F (-40 to 70°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 filter capacitors when they are not in service.

### 1.2 Moving the LTI2 PRO

After careful inspection and upon verification that the LTI2 PRO is undamaged, identify the enclosure style and weight of the inverter. Refer to Table 1 below.

	Output VA	Output Voltage	Output Amps	Input Voltage	Input Current	Dimensions (W x D x H) mm	Weight
LTI2 PRO	1kVA	120VAC	6.7A	48VDC	20.8A	16.1 x 13.7 x 3.5"	33 lbs
	3kVA	120VAC	20A	125VDC	23.5A	16.1 x 13.7 x 3.5"	33 lbs
	6kVA	120VAC	40A	125VDC	40.0A	16.1 x 19 x 3.5"	33 lbs

**Table 1 - Case and Weight**

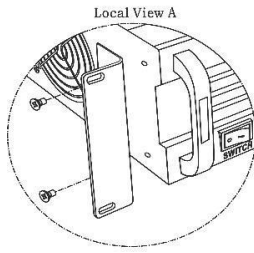
## 2.0 Installation

### 2.1 Mounting the LTI2 PRO

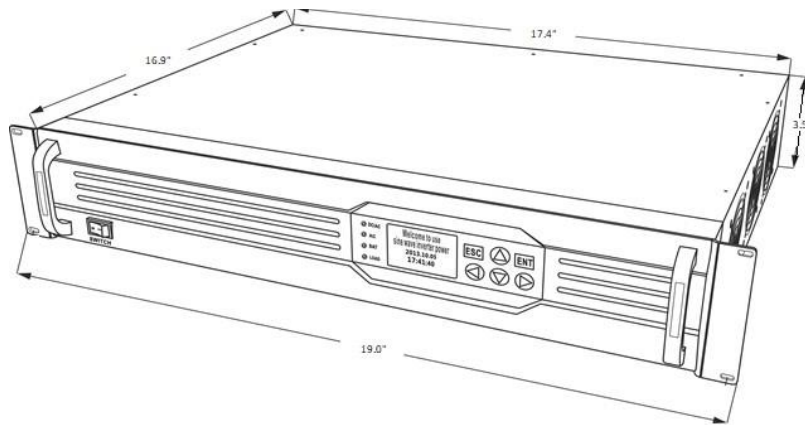
Interchangeable mounting brackets are provided for 19" rack mounting. When mounting the LTI2 PRO in any configuration, consider the size and weight of the Inverter. The rack must be able to support the weight of the inverter, as well as an additional safety factor. Refer to Table 1 to verify the weight of the inverter. The location chosen for the inverter should be within an ambient temperature range of -4°F to 122°F (-20°C to 50°C) with a non-condensing relative humidity no higher than 95%. The inverter should be mounted in an area free of explosive materials and away from any liquids. Avoid using equipment in a location with corrosive gases (e.g. over flooded Lead Acid batteries) and dust. The LTI2PRO utilizes fan-assisted cooling, so clearance of at least 6 inches of free air must be maintained in front and on top for proper cooling. Maintain 12 inches (300 mm) or more of clearance at the rear of the inverter when rack mounting to allow for operation and maintenance. The preferred fastener is a machine bolt backed with a flat washer, lock washer, and nut. All hardware should be corrosion-resistant.

#### 2.1.1 Rack-Mounting the LTI2 PRO

The LTI2 PRO enclosure can be rack mounted on a standard 19/23" relay rack. For rack-mounting install the brackets to the front of the LTI2 PRO enclosure, seen in Figure 2. Flush mount the LTI2 PRO enclosure to the relay rack.



**Figure 2 - Rack Mounting Brackets**



**Figure 3 - Rack Mounting**

## 2.2 Electrical Connections

Before beginning any work on the inverter, ensure that all incoming and output power is de-energized. Verify that no voltage is present by using a voltmeter at all input and output terminals. Check that the voltage and frequency match the inverter front nameplate specifications. Select wire size using the table below.

Inverter Rating	AWG Minimum Wire Size for DC Connection	AWG Minimum Wire Size for Equipment Grounding	AWG Minimum Wire Size for AC Connection
LTI2 PRO-1K	#10	#14	#14
LTI2 PRO-3K	#10	#14	#14
LTI2 PRO-6K	#8	#14	#14

**Table 2 - Wire Size Minimum Requirements**  
(All wires specified in the table are rated at 90 °C or 194 °F)

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



### 2.2.1 Input Wiring



**WARNING:** Connecting the battery to the Inverter may cause a spark at the point of connection. There is a RISK OF EXPLOSION in hazardous areas or locations where explosive gases have accumulated.

Access the rear of the inverter and locate the DC Input connection terminal. Connect DC wiring to the inverter per figure-3. Refer to Table 2 for the recommended wire size.



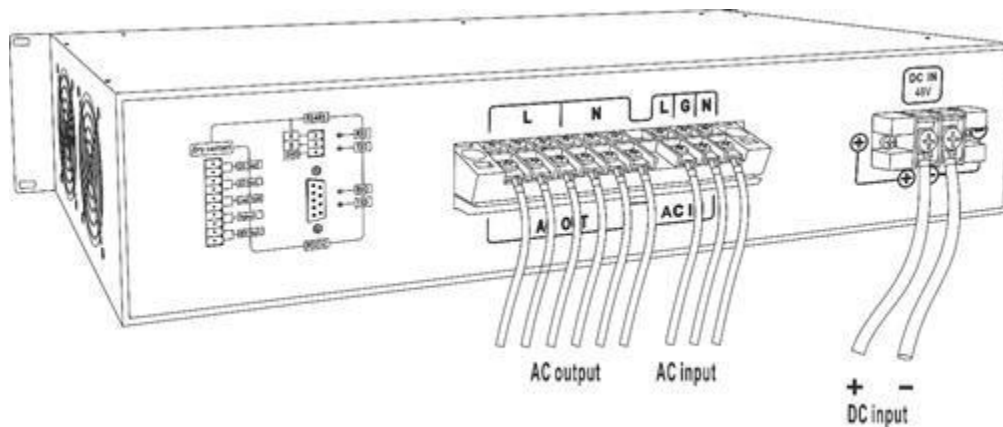
**WARNING:** Connect rated AC input to the Inverter, failure to properly rated input may cause a spark at the point of connection.

Access the rear of the inverter and locate the AC Input connection terminal. Connect AC wiring to the inverter per figure - 4. Refer to Table 2 for the recommended wire size.

With DC input wiring connected and operating within the DC range, verify inverter starts up by switching the power switch to the front panel. The Inverter INV. ON LED should turn solid green, indicating successful start-up and no faults. Using a digital multimeter, measure the AC output to verify voltage output.

### 2.2.2 Output Wiring

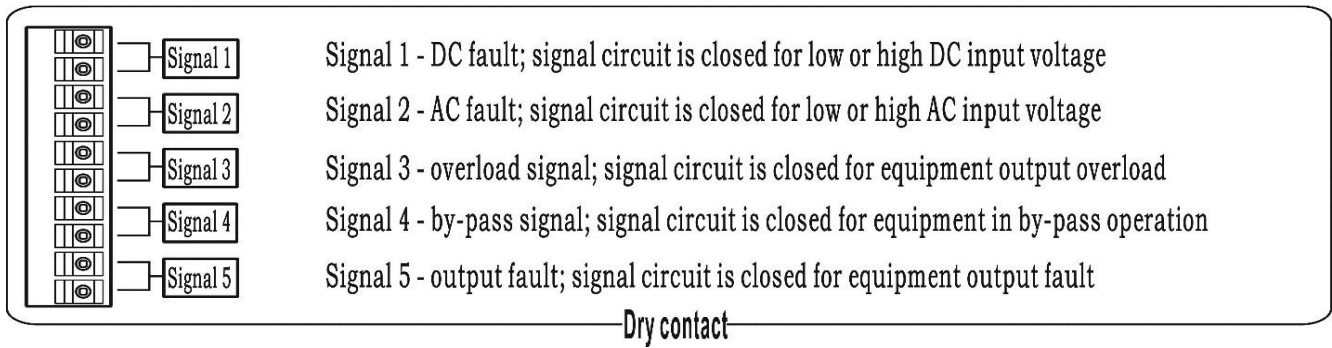
The LTI2PRO comes with Bulk AC connections at the rear of the inverter. Connect AC cables to the equipment per the figure - 4. Select the recommended AC wire size using Table 2. If the distance between the inverter's output and the load exceeds 10 feet, use the Power Wiring Guide in Appendix B to minimize the voltage drop across the wire distance.



**Figure 4 - Input and Output Connections**

### 2.2.3 Alarm Connections

The LTI2 PRO inverter is equipped with a single set of Form 'C' dry-type relay contacts (60 VDC @ 0.5A rating) for Alarm.



**Figure 5 - Alarm Connections**

## 2.2.4 Input and Output Protection

When installing a LTI2PRO inverter system, it is crucial to select the appropriate AC and DC breakers to ensure proper input and output protection. Tables 3 and 4 below provide guidance and recommendations on selecting the correct AC and DC breaker sizes based on the specific LTI2PRO inverter model being used.

LTI2PRO Model	AC Output current	Recommended AC Breaker Size
LTI2PRO-1K-48-A6	6.7 A	15
LTI2PRO-2K-48-A6	13.3 A	20
LTI2PRO-3K-48-A6	20 A	30
LTI2PRO-3K-125-A6		
LTI2PRO-4K-48-A6	27 A	40
LTIPRO-4K-125-A6		
LTI2PRO-5K-48-A6	33.3 A	50
LTIPRO-5K-125-A6		
LTI2PRO-6K-125-A6	40 A	60

**Table 3 – AC Breaker sizes**

LTI2PRO Model	DC Input current	Recommended DC Breaker Size
LTI2PRO-1K-48-A6	20.8 A	30
LTI2PRO-2K-48-A6	41.6 A	60
LTI2PRO-3K-48-A6	62.5 A	80
LTI2PRO-3K-125-A6	27.2 A	40
LTI2PRO-4K-48-A6	83.3 A	125
LTIPRO-4K-125-A6	36.3 A	50
LTI2PRO-5K-48-A6	106 A	150
LTIPRO-5K-125-A6	45.45 A	60
LTI2PRO-6K-125-A6	54.54 A	70

**Table 4 – DC Breaker sizes**

## 3.0 Operation

### 3.1 Operation Mode

#### 3.1.1 AC Power Supply Mode

AC inverter working mode: Inverter employs mains for load when there are mains and switches to the inverter when the mains is abnormal.

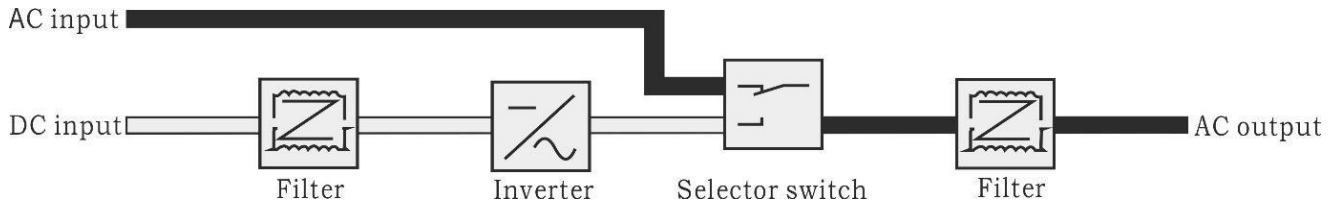


Figure 6 - AC Inverter Mode

#### 3.1.2 DC Power Supply Mode

DC dominated inverter working mode: Under normal condition, DC-dominated inverter is under inverter output status all the time; in case of DC fault, it switches to mains by-pass.

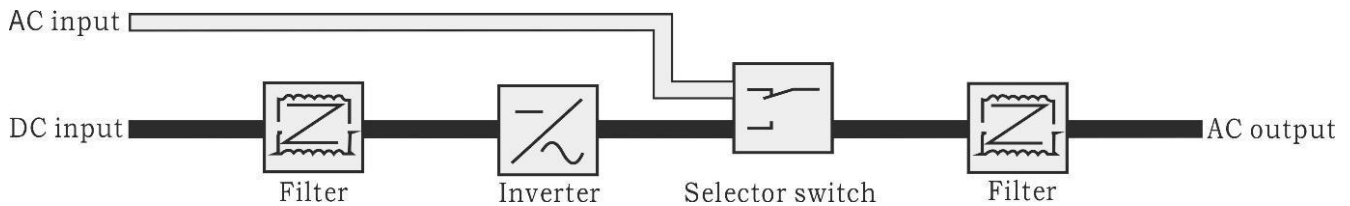


Figure 7 - DC Dominated Inverter Mode

## 3.2 Start-Up Sequence

### 3.2.1 Commissioning

Check whether the DC input voltage is consistent with the nameplate label; in case of any inconsistency, please do not apply the DC power supply to an inverter, in order not to cause any damage! Check whether the wiring polarity of the DC input is correct; or else, the inverter cannot be normally started. Check whether the wiring of AC input and output is correct and confirm that there is no short circuit phenomenon.

If there is no error in the above checks, respectively apply DC power supply and AC power supply. Turn-on the startup switch to power-up the inverter. Firstly, all LEDs perform a lamp test for self-inspection. Then, the output relay is closed to output AC power to the load.

### 3.2.2 Startup

Confirm whether DC input and AC output of the power supply is correctly and reliably connected. After the pressing power switch to rightwards, the inverter performs self-inspection. Before steady output, the inverter power supply checks the external environment and checks whether the inverter supply power itself is normal; if various status parameters of the inverter power supply and the mains are normal, the inverter will steady operate in mains status or inverter status (AC-dominated inverter is steady in mains output status and DC-dominated inverter is steady in inverter output status). It takes about 5 seconds to complete the startup process.

### 3.2.3 Shutdown

After the pressing power switch to leftwards, the inverter LED indicator light and the inverter power supplies are turned off.

### 3.2.4 Mute

In the case of the inverter power supply faults, the system will send audible and visual alarm which can be set through LCD, to the mute audible sound of a particular alarm, select Turn Off in the sound control option.

The operator can directly press **ENT (temporary)** button to inactivate and activate an audible alarm. For the same alarm, the muted alarm will not be automatically turned on; if there is another alarm, no matter whether the last alarm is under mute status or not, the system will automatically turn on the audible alarm.

## 3.3 Understanding the Alarms

### 3.3.1 LED lights, LCD screen, and Buttons

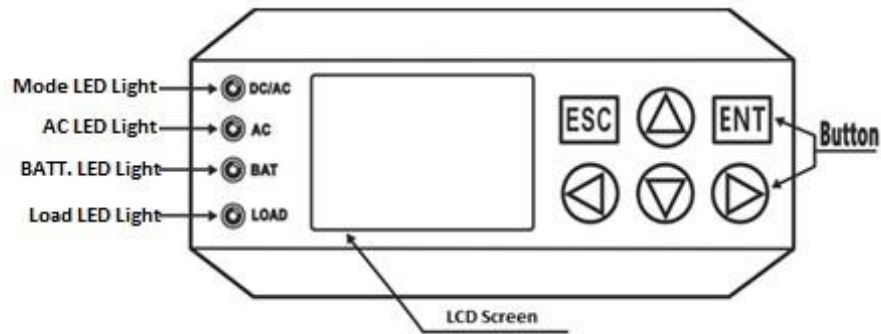


Figure 8 - LED lights, LCD Screen and Button

### 3.3.2 LED and Alarm Indications Details

Mode LED		
Status	Indicator Light	Buzzer
AC Mode	Solid Green	No
DC Mode	Solid Blue	No

Mains LED		
Status	Indicator Light	Buzzer
Normal AC Voltage	Solid Green	No
High AC Voltage	Quick Flashing Red	One Sound Every 3s
Low AC Voltage	Slow Flashing Red	One Sound Every 3s
No AC Voltage	Solid Red	One Sound Every 3s

<b>Battery LED</b>		
<b>Status</b>	<b>Indicator Light</b>	<b>Buzzer</b>
Normal DC Voltage	Solid Green	No
High DC Voltage	Quick Flashing Red	One Sound Every 1s
Low DC Voltage	Slow Flashing Red	One Sound Every 3s
No DC Voltage	Solid Red	One Sound Every 3s

<b>Load LED</b>		
<b>Status</b>	<b>Indicator Light</b>	<b>Buzzer</b>
Normal Load	Solid Green	No
Overload 120%	Slow Flashing Green	One Sound Every 1s
Overload 150%	Quick Flashing Green	One Sound Every 1s
Overload Shutdown	Slow Flashing Red	Continuous Sound
Short Circuit Shutdown	Quick Flashing Red	Continuous Sound
Inverter Fault	Solid Red	Continuous Sound

**Table 5 - LED and Alarm Indications Details**

### 3.3.3 LCD Menu

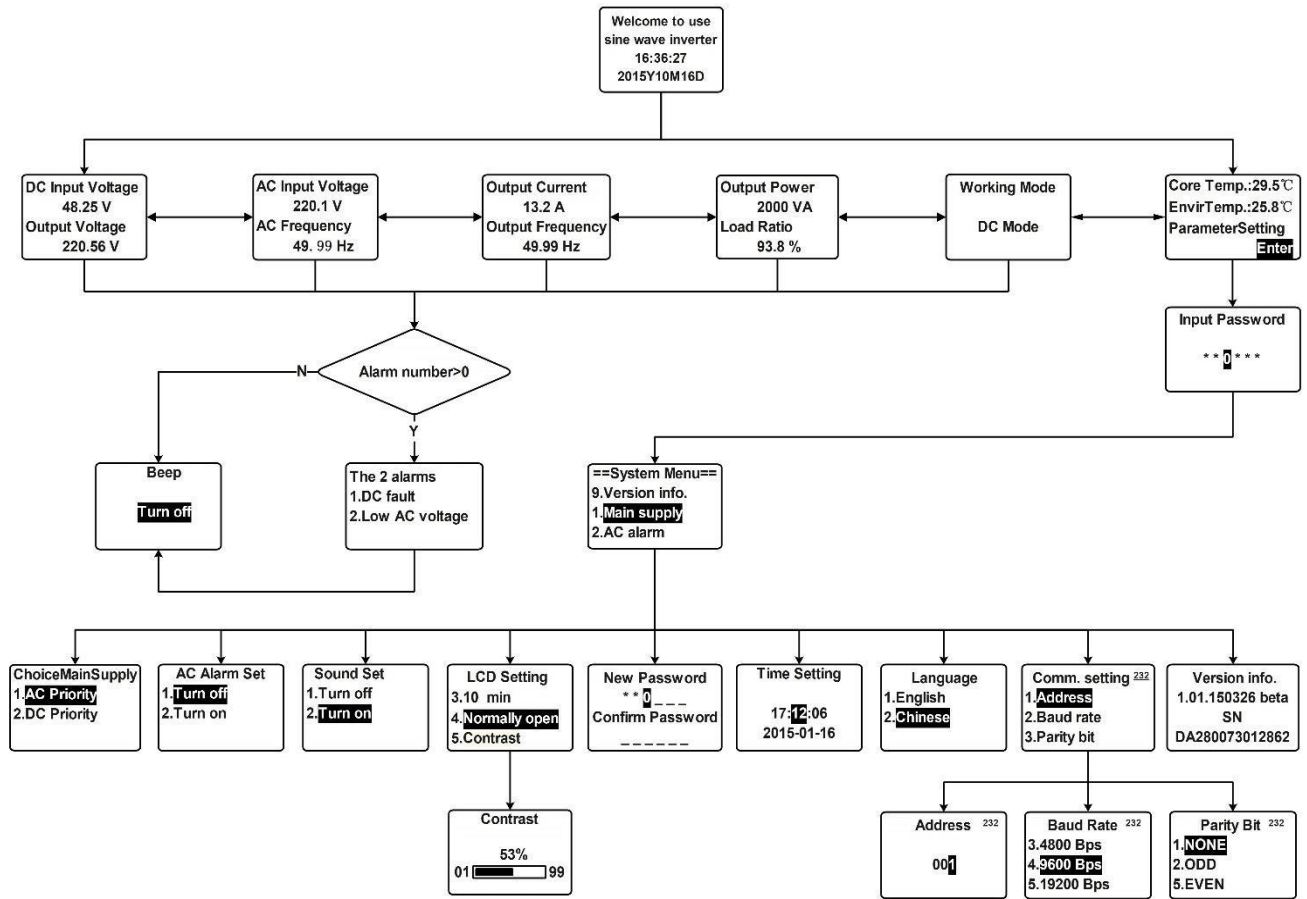


Figure 9 – LED and Alarm Indications Details

Figure 10 - LED and Alarm Indications Details

- Input Password "001188" to enter into configuration Menu

## 4.0 Troubleshooting

Fault Type	Symptom	Possible Cause	Remedy
Startup fault	Inverse Input connection	Check the negative and positive terminals of the DC input before connection.	Confirm the negative and positive terminal and then reconnect the corresponding wire.
	Low DC Input voltage	Use a Multimeter to measure the voltages of the DC input to confirm whether the voltage is higher than the startup voltage.	Startup the inverter after the battery is charged to the DC input range.
Operating fault	Low-voltage, highvoltage, overload protection.	Cut off the load to test whether the inverter normally operates and the voltage of each point is normal.	Consult with La Marche mfg.
Mains switching fault	Too high or too low utility supply voltage	Use a Multimeter to measure the voltages of the AC input to confirm whether the voltage is within the working range.	Switch after the utility supply voltage is stable.
	Low-voltage shutdown protection of the inverter	After the low-voltage shutdown of an inverter, connect to the Mains without switching.	Switch after the inverter operates again.
Output fault	Inverter protection	High voltage, low voltage, overtemperature, overload.	Consult with La Marche mfg.
Communication fault	Whether the communication interface is wrongly accessed.	Check whether the correct communication mode (RS232 or 485) is selected.	Select correct communication mode
	Whether the communication line is too long.	Check whether the Baud rates of the communication line material and panel are consistent with each other.	Use twisted pair or reset Baud rate.

**Table 6 - Troubleshooting Guide**

## Appendix A: Technical Specifications

The La Marche LTI2 PRO Inverter is designed for 1kVA to 6kVA with pure sine wave 120VAC 60Hz power at output from a 48V or 125V DC input source. This inverter is equipped with standard features such as voltage regulation, under/over-voltage conditions, and overload protection with  $\geq 85\%$  efficiency.

Parameter		LTI2 PRO 1K-48-A6	LTI2PRO 2K-48-A6	LTI2PRO 3K-48-A6	LTI2PRO 3K-125-A6	LTI2PRO 4K-48-A6	LTI2PRO 4K-125-A6	LTI2PRO 5K-48-A6	LTI2PRO 5K-125-A6	LTI2PRO 6K-125-A6
	<b>Capacity (VA)</b>	<b>1kVA</b>	<b>2kVA</b>	<b>3kVA</b>		<b>4kVA</b>		<b>5kVA</b>		<b>6kVA</b>
<b>DC Input</b>	<b>Rated Input Voltage (Vdc)</b>	48V	48V	48V	125V	48V	125V	48V	125V	125V
	<b>Rated Input Current (A)</b>	20.8	41.6	62.5	27.2	83.3	36.3	106	45.45	54.54
	<b>Cut off- DC Input Range (Vdc)</b>	40V-60V	40V-60V	40V-60V	90V-155V	40V-60V	90V-155V	40V-60V	90V-155V	90V-155V
	<b>Operating- DC Input Range (Vdc)</b>	45.5V-57V	45.5V-57V	45.5V-57V	100-150V	45.5V-57V	100-150V	45.5V-57V	100-150V	100-150V
	<b>Reflected Noise Current</b>	≤10%								
<b>AC Bypass Input</b>	<b>Bypass Voltage Range (Vac)</b>	85V-135V (+/-10V)								
<b>AC Output</b>	<b>Rated Output Capacity (W)</b>	800	1600	2400		3200		4000		4800
	<b>Output Voltage and Frequency</b>	120Vac, 60Hz								
	<b>Output Current (A)</b>	6.7	13.3	20		27		33.3		40



## Technical Specifications (Cont...)

<b>AC Output</b>	<b>Voltage Accuracy (V)</b>	120±1.5%	
	<b>Frequency Accuracy (Hz)</b>	60±0.1%	
	<b>Waveform</b>	Pure sine wave	
	<b>Total harmonic distortion (THD)</b>	≤3% (linear load)	
	<b>Dynamic response time</b>	5% (load 0←→100%)	
	<b>Power factor (PF)</b>	0.8	
	<b>Overload capacity</b>	110%-130% 60s	131%-150% 10s
	<b>Inversion efficiency (80% resistive load)</b>	≥85%	
	<b>Inverter - Bypass (ms)</b>	≤8ms	
<b>Working Environment</b>	<b>Dielectric Strength (input &amp; output)</b>	1500Vac, 1 minute	
	<b>Noise (1m)</b>	≤55dB	
	<b>Ambient temperature</b>	-20°C~+50°C	
	<b>Humidity</b>	0~90%, No condensation	
	<b>Altitude (m)</b>	≤2000	
<b>Indication</b>	<b>LCD Status</b>	Input and Output Voltage, Frequency, Output Current	
	<b>Inverter Status</b>	Normal mains, Normal Inversion, Battery Under-Voltage, and Output Overload	
<b>Measurement</b>	<b>Size (D×W×H)</b>	16.1 x 13.7 x 3.5"	16.1 x 19 x 3.5"
<b>Protection function</b>		Input under-voltage and overvoltage, output overload and short circuit protection, etc.	

## Technical Specifications (Cont...)

<b>PROTECTION</b>	
<b>Current Walk-In</b>	The output current will gradually increase after the inverter is turned on, eliminating surges and overshoot
<b>Current Limit</b>	Overload protection
<b>Temperature</b>	Over Temperature Shutdown Protection
<b>ENVIRONMENTAL</b>	
<b>Operating Temperature</b>	32 to 122°F (0 to 50°C)
<b>Relative Humidity</b>	0 to 95% (non-condensing)
<b>Cooling</b>	Fan Assisted
<b>Shock</b>	The inverter 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.
<b>Vibration</b>	The inverter in its shipping contained, withstands vibration encountered in shipping without physical damage or degradation of the electrical performance.
<b>Altitude</b>	The inverter is capable of operation at altitudes up to 2000 meters at an ambient temperature of up to +40 degrees C.
<b>Ventilation</b>	The unit 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: Power Cabling 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 inverter's DC input terminals and the battery at less than 1/2 volt when the inverter 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

### Calculating Wire Size Requirements:

$CMA =$

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

### Calculating Current Carrying Capacity of Wire:

$MaxAmp =$

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

<b>Size (AWG)</b>	<b>Area CIR.MILS</b>	<b>Size (MCM)</b>	<b>Area CIR.MILS</b>
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 7 - Wire Size/Area Table**

## Appendix C: Document Control and Revision History

Part Number: 143460  
Instruction Number: P25-LLTI2PRO-1  
Issue ECN: 22666 - 09/20

<b>23442 – 08/23</b>	23220 – 06/22	22811 – 12/21	22666 - 09/20