

LCD Pure Sine Wave Power Inverter

LIV Series

1KVA to 3KVA 1-Phase

Operation Manual



Manufacture and Exporter

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1. SAFETY INSTRUCTIONS

1. Notes on using the instruction manual



Caution!

Safety instruction, failure to observe this instruction can cause material damage and impair the function of the device.



Caution!

Safety instruction, relating to a danger from electrical current or voltage. Failure to observe this instruction can cause material damage and personal injury and impair the function of the device.



Note

Supplementary information for operating the device.

Please observe the following safety instructions.

2. General safety instructions

2.1 Installation and Wiring Compliance

- Installation and wiring must comply with the local and national electrical codes and must be done by a certified electrician.

2.2 Preventing Electrical Shock

- Always connect the grounding connection on the POWER INVERTER to the appropriate grounding system.
- Disconnect all AC and DC side connections before working on any circuits associated with the POWER INVERTER. Pressing the ON/OFF button on the POWER INVERTER to OFF position may not entirely remove dangerous voltages
- Be careful when touching bare terminals of capacitors. The capacitors may retain high lethal voltages even after the power has been removed. Discharge the capacitors before working on the circuits.

1. SAFETY INSTRUCTIONS

2.3 Installation Environments

- The POWER INVERTER should be installed indoor only in a well ventilated, cool, dry environment.
- Do not expose to moisture, rain, snow or liquids of any type.
- To reduce the risk of overheating and fire, do not obstruct the suction and discharge openings of the cooling fan.
- To ensure proper ventilation, do not install in a low clearance compartment.

2.4 Preventing Fire and Explosion Hazards

- Working with the POWER INVERTER may produce arcs or sparks. Thus, the POWER INVERTER should not be used in areas where there are inflammable materials or gases requiring ignition protected equipment. These areas may include spaces containing gasoline powered machinery, fuel tanks, battery compartments.

2.5 Precautions When Working with Batteries

- Batteries contain very corrosive diluted sulphuric acid as electrolyte. Precautions should be taken to prevent contact with skin, eyes or clothing.
- Batteries generate hydrogen and oxygen during charging resulting in evolution of explosive gas mixture. Care should be taken to ventilate the battery area and follow the battery manufacturer recommendation.
- Never smoke or allow a spark or flame near the batteries.
- Use caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
- Remove metal items like rings, bracelets and watches when working with batteries. The batteries can produce a short circuit current high enough to weld a ring or the like to metal and thus cause a severe burn.
- If you need to remove a battery, always remove the ground terminal from the battery first. Make sure that all the accessories are off so that you do not cause a spark.

1. SAFETY INSTRUCTIONS

3. POWER INVERTER Related General safety instructions

3.1 Preventing Paralleling of The AC Output

- The AC output of this POWER INVERTER cannot be synchronized with another AC source and hence, it is not suitable for paralleling. The AC output of the POWER INVERTER should never be connected directly to an electrical breaker panel / load center which is also fed from the utility power / generator. Such a connection may result in parallel operation of the different power sources and AC power from the utility / generator will be fed back into the POWER INVERTER which will instantly damage the output section of the POWER INVERTER and may also pose a fire and safety hazard. If an electrical breaker panel / load center is fed from an INVERTER and this panel is also required to be powered from additional alternate AC sources, the AC power from all the AC sources like the utility / generator / POWER INVERTER should first be fed to a manual selector switch and the output of the selector switch should be connected to the electrical breaker panel / load center.
- To prevent possibility of paralleling and severe damage to the POWER INVERTER, never use a simple jumper cable with a male plug on both ends to connect the AC output of the POWER INVERTER to a handy wall receptacle in the home / RV.

3.2 Connecting to Multi-wire Branch Circuits

- Do not directly connect to the hot side of the POWER INVERTER to the two hot legs of the 115 / 230V AC electrical breaker panel / load centre where multi-wire (common neutral) branch circuit wiring method is used for distributing of AC Power. This may lead to overloading / overheating of the neutral conductor and is a risk of fire.
- A split phase transformer (Isolated or Auto-transformer) of suitable wattage rating (25% more than the wattage rating of

1. SAFETY INSTRUCTIONS

the POWER INVERTER) with primary of 115V AC and secondary of 115 / 230V AC (two 115V AC split phases 180 degrees apart) should be used. The hot and neutral of the 115V AC output of the POWER INVERTER should be fed to the primary of this transformer and the 2 hot outputs (115V AC split phases) and neutral from the secondary of this transformer should be connected to the electrical breaker panel / load centre.

3.3 Preventing DC Input Over Voltage

- It is to be ensured that the input voltage of the POWER INVERTER does not exceed 30V DC for 24V DC system; 63V DC for 48V DC system; 150V DC for 125V DC System to prevent permanent damage to the POWER INVERTER.
- Do not connect the POWER INVERTER to a battery system with a voltage higher than the rated battery input voltage.

3.4 Preventing DC Input Under Voltage

- It is to be ensured that the input voltage of the POWER INVERTER does not lower than 20V DC for 24V DC system; 41V DC for 48V DC system; 95V DC for 125V DC System to prevent permanent damage to the POWER INVERTER.
- Do not connect the POWER INVERTER to a battery system with a voltage higher than the rated battery input voltage.

3.5 Preventing Reverse Polarity on the Input Side

- When making battery connection on the input side, make sure that the polarity of battery connection is correct (Connect the positive (+) of the battery to the positive (+) terminal of the POWER INVERTER and the negative (–) of the battery to the negative (–) terminal of the POWER INVERTER). If the input is connected in reverse polarity, the buzzer will alarm and auto shutdown.

2. INTRODUCTION

2.1 Thank you

Thank you for selecting this POWER INVERTER. It is a state-of-the-art electronic POWER INVERTER that uses the latest technology.

2.2 System Description

The LIV-series POWER INVERTER is an advanced pure sine wave POWER INVERTER which provide reliable regulated, transient-free AC power to sensitive equipment, ranging from computers & telecommunication systems to computerized instrument.

Because the POWER INVERTER is constantly regulating, filtering the output power.

The LIV-series POWER INVERTER has high nonlinear load current capability (i.e. Crest Ratio 3:1) and this is suitable for powering Inductive Load, Capacitive Load, Resistive Load, etc.

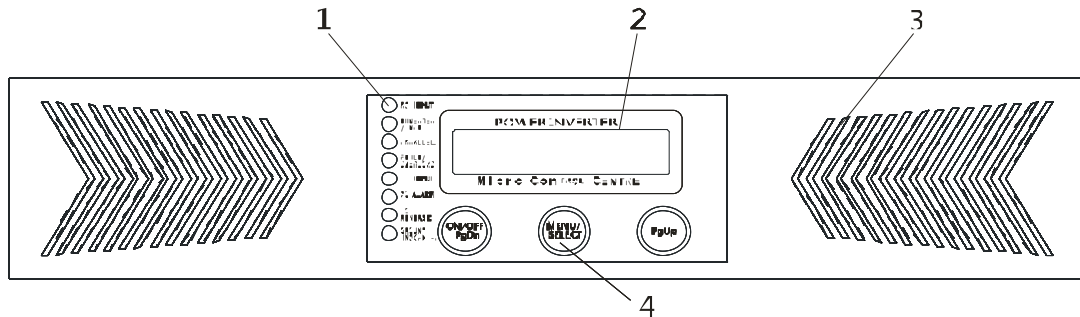
2.3 Safety Standards

The LIV series comply with CNS-13438 class B standard. The following products are made based on EMC standards:

- (1) 1KVA, 2KVA, 3KVA (230V System): EN50091-2
- (2) 1KVA, 2KVA, 3KVA (115V System): FCC PART 15 class A , IEEE 587 class A

3. OUTLOOK

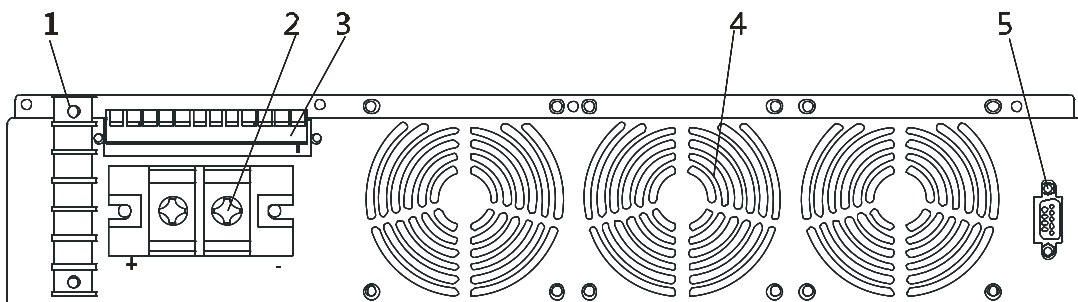
3.1. Front View



(A) Front View

1. LED Indicators x 8
2. LCD Display
3. Ventilation Exits
4. Push Button x 3

3.2. Rear View

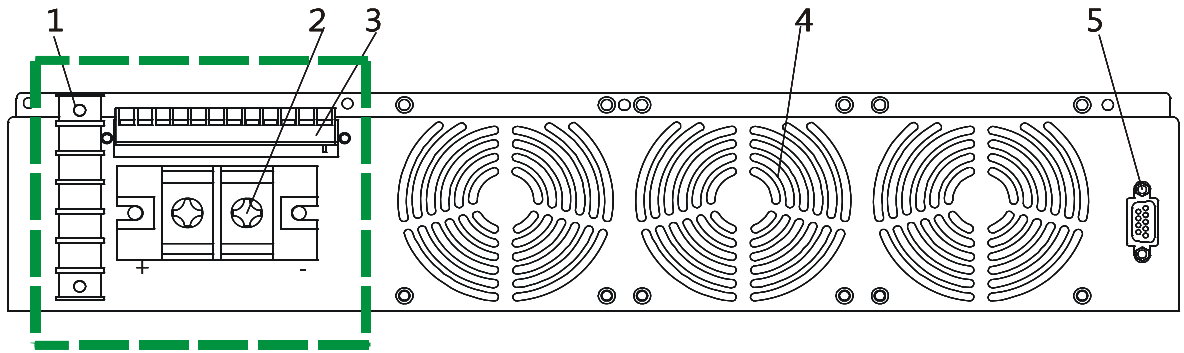


(B) Rear View

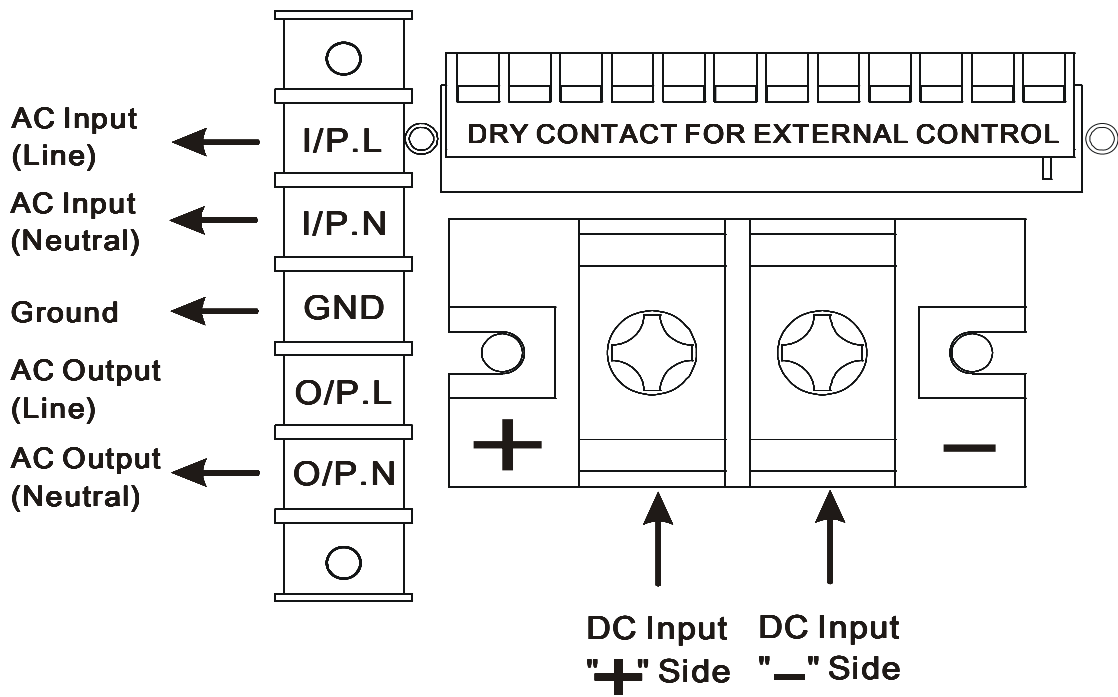
1. AC Input / Output Terminal Block
2. DC Input Terminal
3. Dry Contact for External Control or Remote Control Data Socket
4. Fan x 3
5. RS-232 Interface Port

3. OUTLOOK

3.3. Terminal Block Connecting Diagram

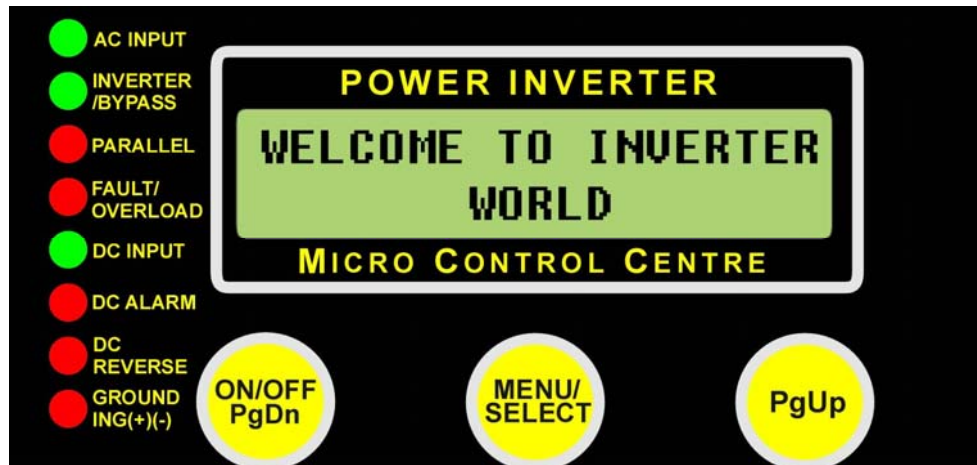


(B) Rear View



3. OUTLOOK

3.4. Operation Panel



LED Indicators

Item	LED Indication	Descriptions
1	AC INPUT (Green)	The Green LED is ON when connects to utility power.
2	POWER INVERTER (Green) / BYPASS (Red)	Bypass State: The Red LED is ON when the POWER INVERTER is starting. POWER INVERTER State: The Green LED is ON when the POWER INVERTER starts to output.
3	PARALLEL (Red)	The Red LED is ON when it has finished parallel connection with the other POWER INVERTERs. (Option)
4	FAULT / OVERLOAD (Red)	The Red LED is ON when the POWER INVERTER is at Fault or Overload mode.
5	DC INPUT (Green)	The Green LED is ON when connects to DC Voltage
6	DC ALARM (Red)	The Red LED is ON when DC Voltage is too low or too high.
7	DC REVERSE (Red)	The Red LED is ON when DC polarity has reversed.
8	GROUNDING (+)(-) (Red)	The Red LED is ON when DC grounding fault

4. INSTALLATION

4.1 Unpacking and Inspection

- Unpack the packaging and check the package contents. The shipping package contains:
 - A POWER INVERTER
 - A user manual
 - A power cable

- Inspect the appearance of the POWER INVERTER to see if there is any damage during transportation. Do not turn on the unit and notify the carrier and dealer immediately if there is any damage or lacking of some parts.

4.2 Installation and Wiring Compliance

- Installation and wiring must comply with the local and the national electrical codes and must be done by a certified electrician.
- The DC input positive and negative terminals are isolated from the chassis. Similarly, the neutral pole of the AC receptacles / the neutral wire is not bonded to the chassis. System grounding to suit the national / local electrical codes is to be undertaken by the installer.

4.3 Preventing Electrical Shock

- Always connect the grounding connection on the POWER INVERTER to the appropriate grounding system.

4.4 Installation Environment

- The POWER INVERTER should be installed indoor only in a well ventilated, cool, dry environment.
- It is recommended to retain 10cm from the wall.
- Do not expose to moisture, rain, snow or liquids of any type.
- To reduce the risk of overheating and fire, do not obstruct the suction and discharge openings of the cooling fans.
- To ensure proper ventilation, do not install in a low clearance compartment

4. INSTALLATION

- Working with the POWER INVERTER may produce arcs or sparks. Thus, the POWER INVERTER should not be used in areas where there are inflammable materials or gases requiring ignition protected equipment. These areas may include space containing gasoline powered machinery, fuel tanks, battery compartment.

4.4 Cooling By Forced Air Fan Ventilation

- The POWER INVERTER produces heat when operating. The amount of heat produced is proportional to the amount of power supplied by the POWER INVERTER. A DC fan is used to provide forced air cooling of this POWER INVERTER. The fan is thermostatically controlled and will be switched on only if the temperature of certain hot spot inside the POWER INVERTER rises above a certain temperature. At lower loads and / or at lower ambient temperatures, the fan may not switch on at all. This is normal. The unit is protected against over-temperature due to failure of the fan / inadequate heat transfer. The AC output will be shutdown if the hot spot inside the POWER INVERTER reaches a certain higher temperature.

4.5 Precautions When Working with Batteries

- Batteries contain very corrosive diluted sulphuric acid as electrolyte. Precautions should be taken to prevent contact with skin, eyes or clothing.
- Batteries generate hydrogen and oxygen during charging resulting in evolution of explosive gas mixture. Care should be taken to ventilate the battery are and follow the battery manufacturer recommendation.
- Never smoke or allow a spark or flame near the batteries.
- Use caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
- Remove metal items like rings, bracelets and watches when working with batteries. The batteries can produce a short circuit current high enough to weld a ring or the like to metal and thus cause a severe burn.

4. INSTALLATION

- If you need to remove a battery, always remove the ground terminal from the battery first. Make sure that all the accessories are off so that you do not cause a spark.

4.6 DC Side Connection

- Follow this procedure to connect the battery cables to the DC Input terminals on the POWER INVERTER. Your cables should be as short as possible (ideally, less than 10 feet / 3 meters) and large enough to handle the required current in accordance with the electrical codes or regulations applicable to your installation
- Cables that are not an adequate gauge (too narrow) or are too long will cause decreased POWER INVERTER performance such as poor surge capability and frequent low input voltage warnings and shutdowns.
- These low input voltage warnings are due to DC voltage drop across the cables from the POWER INVERTER to the batteries.
- The longer and narrower these cables, the greater the voltage drop.



Warning!

Failure to place a fuse on cables running between the POWER INVERTER and battery may cause damage to the POWER INVERTER and void warranty.



Warning!

The installation of a fuse must be on positive cable. Failure to place a fuse on cables running between the POWER INVERTER and battery may cause damage to the POWER INVERTER and will void warranty.

5. OPERATION

5.1 Panel Operation

(1) Start-Up:

- Press ON/OFF button lasts for 2seconds
- To avoid touch error or push button fault, be sure to press ON / OFF button lasts for 2 seconds, till the LCD display “WELCOME TO POWER INVERTER WORLD”

(2) Shutdown

- Press “ON/OFF” button lasts for 2 seconds
- To avoid touch error or push button fault, be sure to press the button lasting for 2seconds.
- If ENABLE “Turn Off confirm” page, the LCD will display “Turn off system! Are you sure? No”, press “PgUp” button to switch “Yes/No”, then press ”Menu” button to confirm the unit is off.

(3) System Test:

- LCD displays ”POWER INVERTER LOOP CHECK”.
- Test before the equipment operates. If DC voltage is too low, overheat or other abnormal status, the panel will have abnormal display, the unit will auto shutdown 5 seconds later.

(4) Page Display Operation Status

- Press “PgUp” key, to select Page 1 to 4 operation status

Page 1: Output Frequency & Voltage

OUTPUT	FREQ:50.0HZ
15:25	VOLT: 220V

Note: The built-in Soft Start function will have output voltage start from low to high, till reach to nominal output voltage, then have it output.

Page 2: Output Current & Load

OUTPUT CURR:	0.0A
15:26	LOAD: 0.0%

5. OPERATION

Page 3: DC Input Voltage & System Temperature

DC:117.6V CURR: 1A
TEMP: 36.5°C

Page 4: Mains Input Frequency & Voltage

INPUT FREQ: 50.0HZ
15:28 VOLT: 0VAC

(5) Setting Page

- Operation: Press “MENU/SELECT” button at any status page lasts for 1second

1. Events Record

Events:

- Manual Turn ON: User turns on the unit
- System Shutdown: User turns off the unit
- Emergency OFF: Emergency cut off the unit
- DC Volt Too Low: DC voltage is too low
- Hardware Cut Off: DC voltage is lower than min. working voltage forced hardware cut off.
- DC Volt Too High: DC voltage is too high
- Earth Fault (+): Positive electrode of DC voltage wrongly connect to Ground
- Earth Fault (–): Negative electrode of DC voltage wrongly connect to Ground
- Temp. Too High: Over temperature
- Auto Turn On: Auto restart when DC voltage has recovered to tolerable range
- Output Short: Output short circuit
- Output Fault: No Output
- Over Load 100%: Load level is over 100%
- Over Load 135%: Load level is over 135%
- POWER INVERTER Fault: Abnormal output
- Mains Lost: Power failure

5. OPERATION

- q. VCC Fault: Abnormal hardware working voltage
 - r. DC Volt Fault: DC voltage is 2V higher than max. voltage setting
 - s. Temperature Fault: Temperature is higher than 85°C
 - t. Fuse Fault: Fuse busted
2. Output Volt: Output voltage range setting.
Range: 220V ⇨ 200V~240V, 110V ⇨ 100V~120V
 3. DC High Volt : (Alarm / Cut Off)
Range: 24V ⇨ 30V / 32V, 48V ⇨ 61V / 63V
125V ⇨ 145V / 150V
 4. DC Low Volt: Min. DC Voltage range setting: (Alarm / Cut Off)
Range: 24V ⇨ 21V / 19V, 48V ⇨ 43V / 41V
125V ⇨ 100V / 95V
 5. Earth Fault (+): Set caution for Positive electrode of DC Voltage grounding fault
 6. Earth Fault (–): Set caution for Negative electrode of DC Voltage grounding fault
 7. Turn ON After DC Cut Off: Set Auto restore when DC Voltage is too low to cut off
 8. Turn OFF Confirm: Set re-confirm of “Turn Off” Procedures.
 9. Date: Date Setting
Format: YYYY:MM:DD
 10. Time: Time Setting
Format: HH:MM:SS
 11. Exit Setup: Exit setting page

(6) Clear Events Record

- Press “PgUp” buttons at “Events record” page till appear “No event recorded!”

6. TROUBLESHOOTING GUIDE

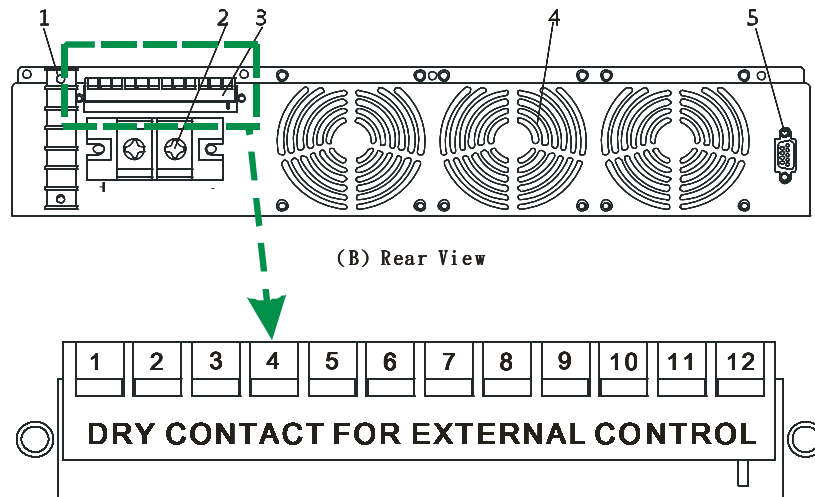
SYMPTOM	POSSIBLE CAUSE	REMEDY
On switching on, the GREEN LED does not light. Buzzer is off. There is no AC Voltage	There is no voltage at the DC input terminal	<ol style="list-style-type: none"> 1. Check the continuity of the battery input circuit. 2. Check that the battery fuse is intact. Replace if blown. 3. Check that all connections in the battery input circuit are tight.
“DC REVERSE” LED lights on, buzzer alarms or LCD displays “DC Reverse, can’t turn on”, cannot power on.	Polarity of the input DC voltage has been reversed.	Re-connect its polarity
LCD displays “DC Volt too low, can’t turn on”, cannot power on.	DC input voltage is less than the lowest working voltage	<ol style="list-style-type: none"> 1. Use true RMS reading meter to measure it the DC Voltage reaches to the lowest working voltage. (24V DC System: 20V DC, 48V DC System: 41V DC, 125V DC System; 95V DC) 2. Verify if DC Cable is loose. 3. Verify DC Voltage (24V/48V/125V DC) comply to the POWER INVERTER’s spec.
“FAULT/OVERLOAD” LED lights on, buzzer alarms or LCD displays “OVERLOAD, can’t turn on”, cannot power on.	Permanent shutdown of the AC output due to continuous overload beyond the continuous power rating of the POWER INVERTER.	<ol style="list-style-type: none"> 1. Reduce the load The load is not suitable as it requires higher power to operate. Use a POWER INVERTER with higher power rating.

6. TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE	REMEDY
<p>“FAULT/OVERLOAD” LED lights on, buzzer alarms or LCD displays “OVERLOAD, can’t turn on”, cannot power on.</p>	<p>Permanent shutdown of the AC output due to continuous overload beyond the continuous power rating of the POWER INVERTER.</p>	<p>2. If the unit goes into permanent overload again after resetting and removing the load completely. Call Technical Support.</p>
<p>Buzzer alarm is sounded. LCD displays “Temp. too high, can’t turn on”, There is no AC output.</p>	<p>Shutdown due to over temperature because of fan failure or inadequate cooling as a result of high ambient temperature or insufficient air exchange.</p>	<ol style="list-style-type: none"> 1. Check that the fan is working. If not, the fan / fan control circuit may be defective. Call Technical Support. 2. If the fan is working, check that the ventilation slots on the suction side and the openings on the discharge side of the fan are not obstructed. 3. If the fan is working and the openings are not obstructed, check that enough cool replacement air is available. Also check that the ambient air temperature is less than 40°C. 4. Reduce the load to reduce the heating effect. 5. After the cause of over heating is removed and the unit cools down, it will reset automatically.

7. COMMUNICATION PORT

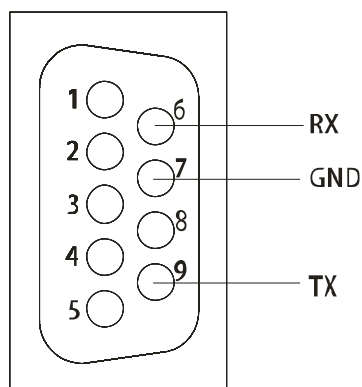
7.1 DB-9 Interface or Remote Control Data Socket



1. “—” electrode of external remote control LED
2. “+” electrode of external remote control LED
3. External remote control switch SW Port
4. External remote control switch VB Port
5. N/L
6. Fault/Overload N.O Port
7. ALARM N.O. Port
8. INV/BYPASS N.O. Port
9. INV/BYPASS N.C. Port
10. AC INPUT N.O. Port
11. AC INPUT N.C. Port
12. Dry Contact COM Port

7.2. RS-232 Interface Data Setting:

- Baud Rate: 2400bps
- Bit Length: 8bit
- End Code: 1bit
- Corresponding Bit: None



RS-232 PINS ASSIGNMENT:

PIN #	DESCRIPTION	I/O
6	RS232Rx	INPUT
9	RS232Tx	OUTPUT
/	Ground	INPUT

8. WARRANTY

We warranty this product against defects in materials and workmanship for a period of 12 months from the date of purchase and will repair or replace any defective POWER INVERTER when directly returned to us.

For warranty claim, please contact Long Time to obtain a Return Authorization Number.

The defective part or unit should be returned at the Purchaser's expense to the authorized location – normally this is the place of purchase. A written statement describing the nature of the defect, the date of purchase, the Purchaser's name, address, email address and telephone number should be included.

This warranty will be considered void if the unit has suffered any obvious physical damage or alteration either internally or externally and does not cover damage arising from improper use such as plugging.

The unit into an unsuitable power sources attempts to operate products with excessive power consumption requirements, or use in unsuitable environments.

This is the only warranty that the company makes. No other warranties express or imply including warranties of merchantability and fitness for a particular purpose. Repair and replacement are your sole remedies and the company shall not be liable for damages, whether direct, incidental, special or consequential, even though caused by negligence or other fault.

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9. PRODUCT SPECIFICATION

Model		LIV-10	LIV-20	LIV-30
Rating		1KVA	2KVA	3KVA
DC Input	Nominal Voltage / Max. Current	24Vdc/50A 48Vdc/25A 125Vdc/9.6A	24Vdc/100A 48Vdc/50A 125Vdc/30A	48Vdc/75A 125Vdc/33A
	Voltage Range	24Vdc(20~30Vdc) 48Vdc(40~60Vdc) 125Vdc(90~150Vdc)	24Vdc(20~30Vdc) 48Vdc(40~60Vdc) 125Vdc(90~150Vdc)	48Vdc(40~60Vdc) 125Vdc(90~150Vdc)
	Connections	Hard-wired Connection		
	Efficiency	> 85% (Full Load) at 24 or 48 or 125VDC		
Utility Power (Bypass)	Nominal Voltage	110VAC or 230VAC \pm 25%		
	Frequency	50 or 60 Hz \pm 3Hz		
	Protection	AC Circuit Breaker		
Inverter Output	Output Power	800W	1600W	2400W
	Max. Surge Power	1200W	2400W	3600W
	Voltage	110VAC or 230VAC \pm 10% ※ Re-settable \pm 10% of Rating Voltage via Front Panel		
	Voltage Regulation	< 2% at Linear Load		
	Frequency	50 or 60Hz \pm 0.1% Auto Sensing by AC Power Source		
	Waveform	Pure Sine Wave		
	THD Distortion	< 3% at Linear Load		
	Crest Factor	3 : 1		
	Power Factor	0.8		
	Cooling System	Forced Ventilation		
Protection	Short Circuit	Inverter Shut Off, Manual Reset when the unit get back to normal		
	Overload	105% - 125% for 60 Seconds 126% - 150% for 30 Seconds > 151% for 1 second; Switch to Bypass		
	DC Polarity Reverse	Advanced Polarity Check (APC)		
	Over Temperature	Acoustic Warning before Shut-off and Auto Restart		
Indicator	LCD Display	Input / Output: Voltage / Frequency, DC: Voltage / Current, Loading: Current / Percentage, Temperature: Operation / Over, Polarity Reverse, Event Log		
	LED Display	AC Input, Inverter / Bypass, Fault / Overload, DC Input		
Communication	Interface Port	RS-232C With Baud Rate 2400, (Option: RS485, SNMP serial Port)		
	Remote Control Unit	Option		
Environment	Operating Temp.	0°C to 40°C		
	Relative Humidity	0 – 90%, non-condensing		
Mechanical	Dimension	W438*D348*H88mm (2U)		
	Net weight	10.0kgs	11.0kgs	12.0kgs

* Long Time reserves the right to change specifications without prior notice.