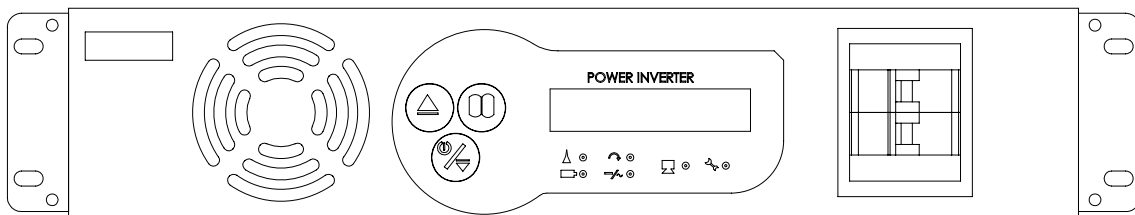


DC AC POWER INVERTER



LIV - 10 / LIV-20 / LIV-30

User Manual

Save This Manual

Please read this manual carefully prior to storage, installation, wiring, operation and maintenance of the Power Inverter.

This manual contains important instructions and warnings that you should follow during the storage, installation, wiring, operation and maintenance of the Power Inverter. Failure to follow these instructions and warnings will void the warranty.

Please note that only qualified and trained technician can do installation, wiring, operation and maintenance of the Power Inverter.

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Section 1: Safety Instruction

1-1 Notes on Using the Instruction Manual



Failure to observe this instruction can cause material damage and impair the function of the device.



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.

1-2 General Safety Instruction

1-2-1 Installation and Wiring Compliance

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

1-2-2 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.

1-2-3 Installation Environment

- 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.

1-2-4 Preventing Fire and Explosion Hazard

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.

1-2-5 Precaution 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.

1-3 Power Inverter Related General Safety Instruction

1-3-1 Preventing Paralleling of 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.

1-3-2 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 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.

1-3-3 Preventing DC Input Over Voltage

- It is to be ensured that the input voltage of the POWER INVERTER does not exceed 64V DC for 48V DC system; 160V 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.

1-3-4 Preventing DC Input Under Voltage

- It is to be ensured that the input voltage of the POWER INVERTER does not lower than 42V DC for 48V DC system; 105V 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.

1-3-5 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.

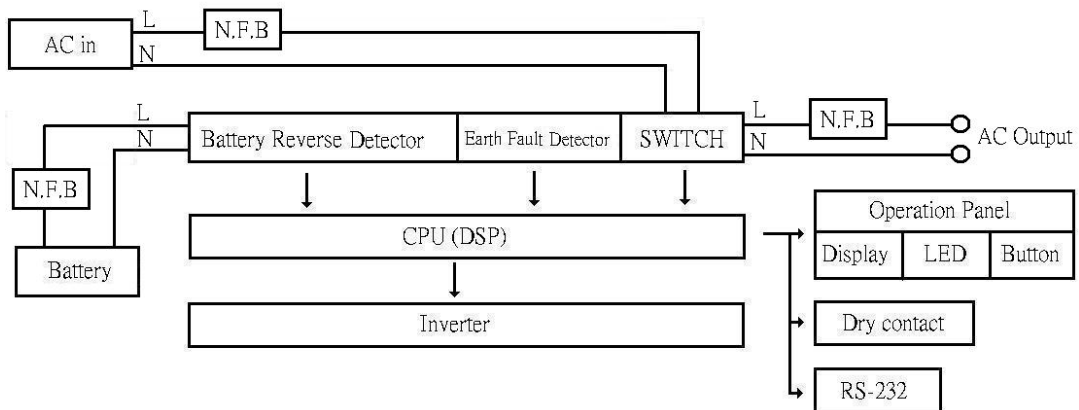
Section 2: Introduction

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

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

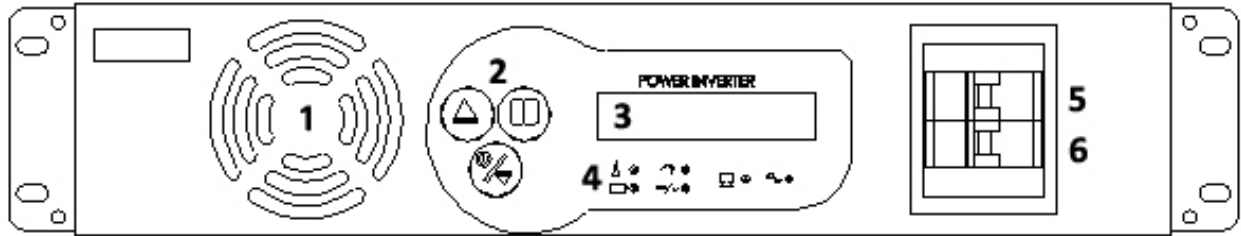
Because the POWER INVERTER is constantly regulating, filtering the output power.

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.

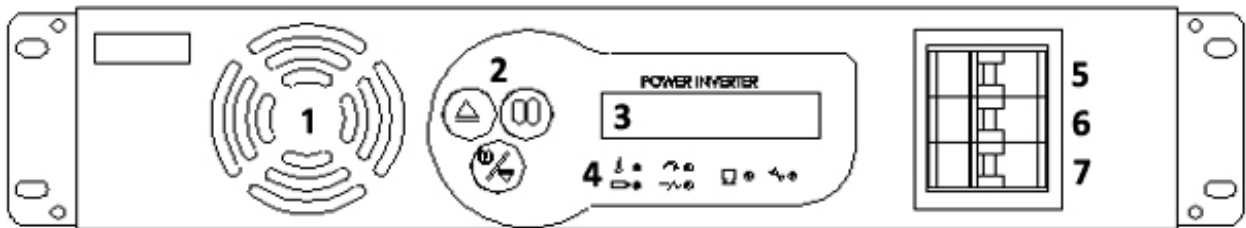


Section 3: Outlook

3-1 Front View



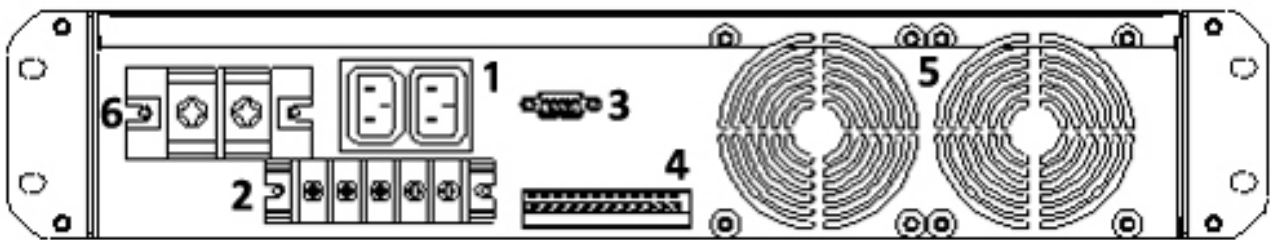
Standard Model



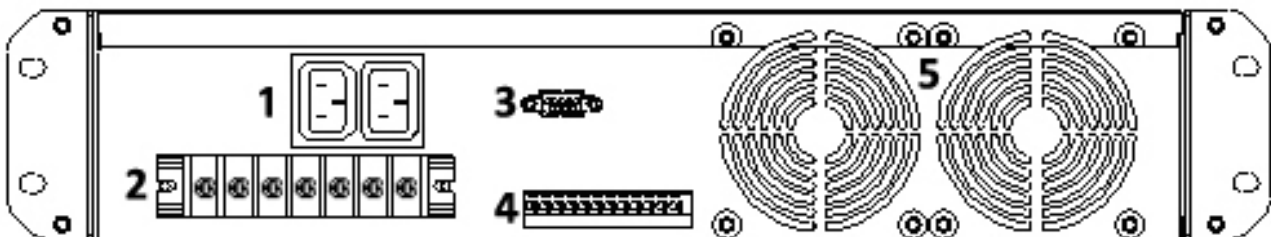
Customized Model

No.	Description
1	Ventilation exit
2	Control buttons
3	LCD display
4	LED indicators
5	Battery N.F.B.
6	AC input N.F.B.
7	AC output N.F.B. (option)

3-2 Rear View



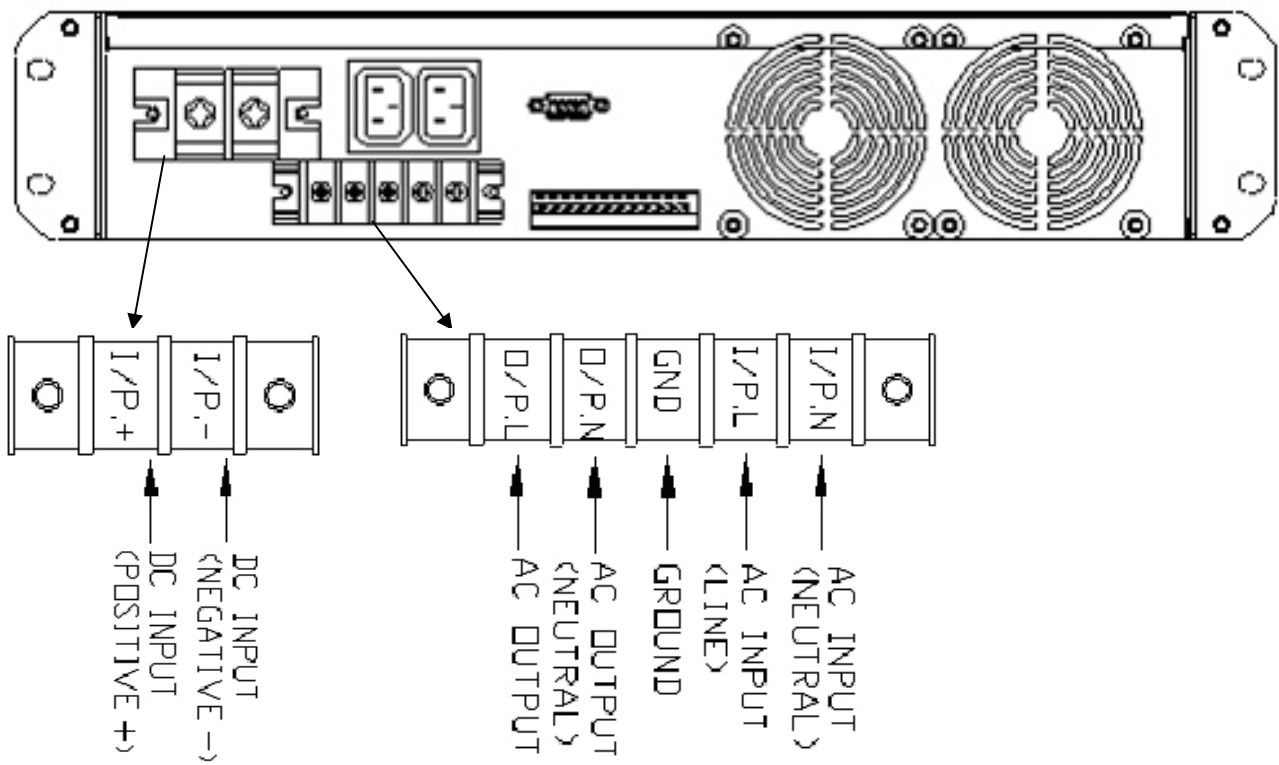
48VDC Model

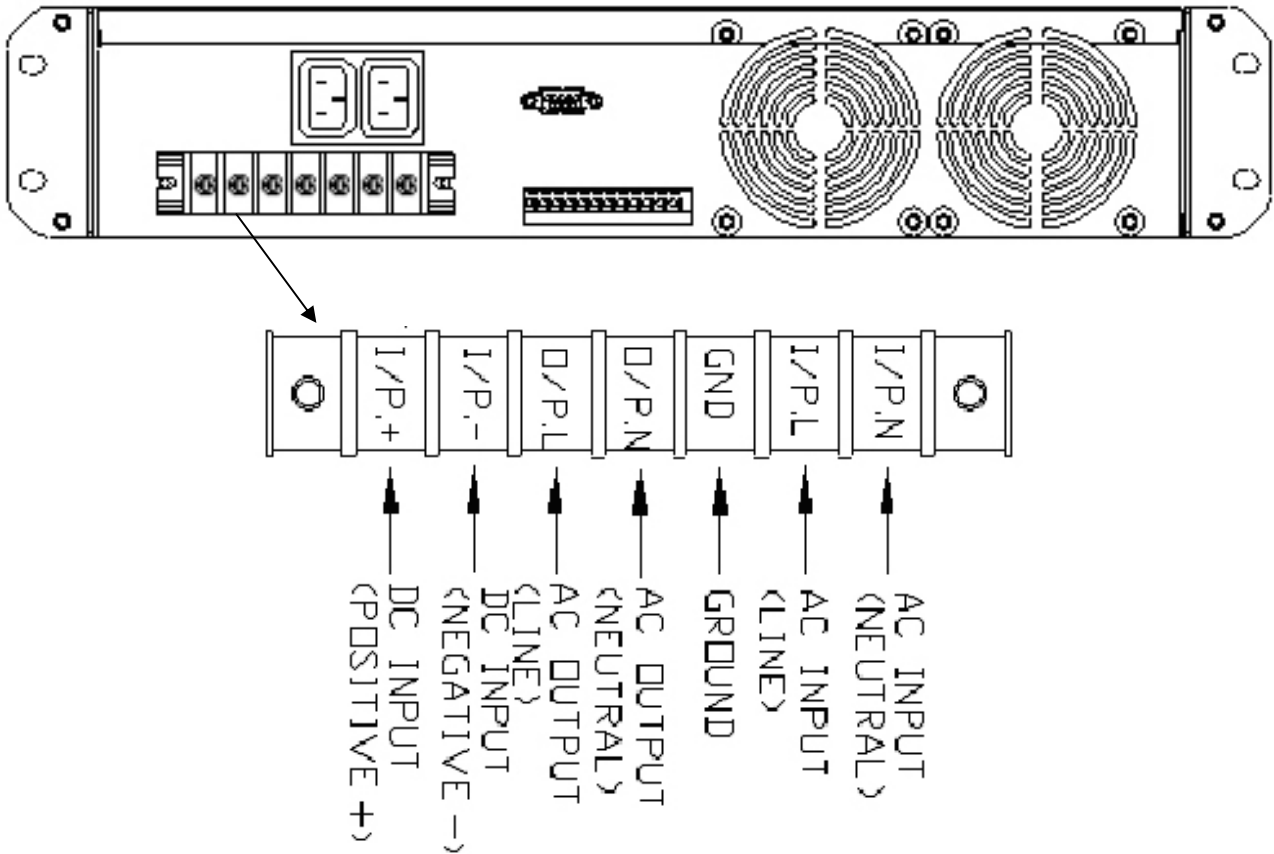


125VDC Model

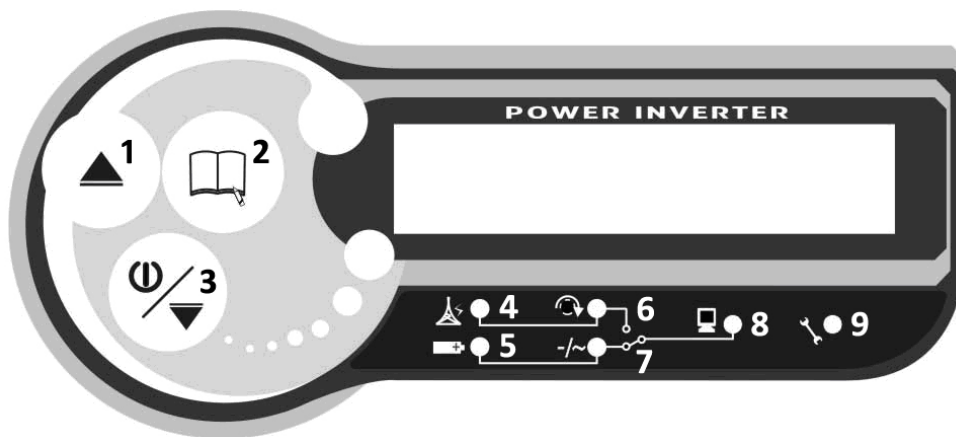
No.	Description
1	Output socket
2	Terminal block
3	RS232
4	Dry contact
5	Ventilation exit
6	Battery terminal

3-3 Terminal Block Connecting Diagram





3-4 Operation Panel



No.	Description
1	Page up button
2	Menu button
3	ON / OFF button or page down button
4	The green LED is on when connects to AC power
5	The green LED is on when connects to DC power.
6	The red LED is on means bypass mode
7	The green LED is on means inverter mode
8	The green LED is on means loads connected (>5%)
9	The red LED is on means inverter fault

Section 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

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
- 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.

4-5 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.

4-6 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.

4-7 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.



Failure to place a fuse on "+" cables running between the POWER INVERTER and battery may cause Barrage to the POWER INVERTER and wire void warring.



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.

Section 5: Operation

5-1 Start-Up

- Press ON/OFF button lasts for 2 seconds
- 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”

5-2 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.

5-3 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 fault display, the unit will auto shutdown 5 seconds later.

5-4 Page Display Operation Status

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

Page 1: Output Voltage & Frequency

OUTPUT VOLT: 220V
FREQ:50.0HZ



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 & System Temperature

OUTPUT LOAD: 0.0% 0.0A
TEMP: --°C

Page 3: DC Input Voltage & Discharger

INPUT DC:125V
DISCH: xxA

Page 4: Mains Input Voltage & Frequency

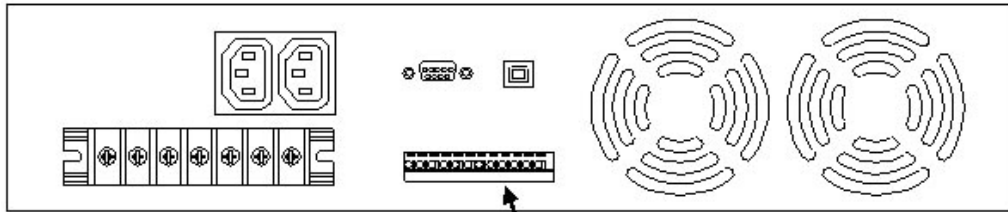
INPUT VOLT: 220VAC
FREQ: 50.0HZ

Section 6: Troubleshooting

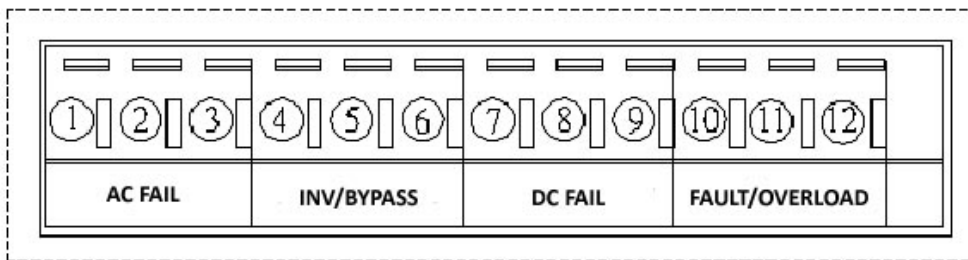
SYMPTOM	POSSIBLE CAUSE	REMEDY
When switching on, the AC INPUT Green LED does not light. Buzzer is off. There is no AC Voltage	There is no voltage at the DC input terminal	<ol style="list-style-type: none"> 1. Check the continuity of the battery input circuit. 2. Check that the battery fuse is intact. Replace if blown. 3. Check that all connections in the battery input circuit are tight.
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 if the DC Voltage reaches to the lowest working voltage. (48VDC System: 42Vdc, 125VDC System: 105Vdc) 2. Verify if DC Cable is loose. 3. Verify if DC Voltage (48V / 125V DC) comply to the POWER INVERTER spec.
“FAULT” LED lights on, buzzer alarms or LCD displays “OVERLOAD, can’t turn on”, cannot power on.	Permanent shut down 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. 2. If the unit goes into permanent overload again after resetting and removing the load completely. Call for Technical Support.
Buzzer alarm is sounded. LCD displays “Temp. too high, can’t turn on”, There is no AC output.	Shut down due to over temperature because of fan failure or inadequate cooling as a result of high ambient temperature or insufficient air exchange.	<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. After the cause of over heating is removed and the unit cools down, it will reset automatically.

Section 7: Communication Port

7-1 Dry Contact



DRY CONTACT FOR EXTERNAL CONTROL

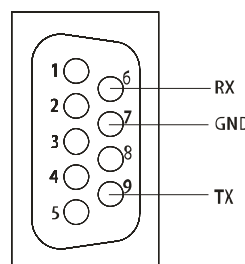


N.C. = NORMAL CLOSE; N.O. = NORMAL OPEN

TERMINAL	FUNCTION	COM	PORT	DRAWING
1	AC INPUT FAIL	COM-B	N.C.	
2	AC ALARM (AC voltage too high or too low)	COM-C		
3	AC INPUT O.K.	COM-A	N.O.	
4	BYPASS	COM-B	N.C.	
5	INV/BYPASS	COM-C		
6	INVERTER	COM-A	N.O.	
7	DC FAIL	COM-B	N.C.	
8	DC ALARM	COM-C		
9	DC CONNECT	COM-A	N.O.	
10	INVERTER TROUBLE	COM-B	N.C.	
11	INVERTER ALARM	COM-C		
12	NORMAL	COM-A	N.O.	

7-2 RS232

- 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

Section 8: Warranty

Seller warrants this product for a period of **1 YEAR** from the date of shipment, if used in accordance with all applicable instruction, to be free from original defects in material and workmanship within the warranty period. If the product has any failure problem within the warranty period, Seller will repair or replace the product as its sole discretion according to the failure situation.

This warranty does not apply to normal wear or to damage resulting from importer installation, operation, usage, maintenance or irresistible force (i.e. war, fire, natural disaster, etc.), and this warranty also expressly excludes all incidental and consequential damages.

Maintenance service for a fee is provided for any damage out of the warranty period. If any maintenance is required, please directly contact with the supplier or Seller.

Section 9: Specification

Model		LIV-10	LIV-20	LIV-30
Rating		1KVA	2KVA	3KVA
DC Input	Max. Current	48Vdc	19A	38A
		125Vdc	7.6A	15A
	Voltage Range	48VDC (42~64VDC) 125VDC (105~160VDC) Option: 110VDC (95~144VDC)		
	Connections	Hard-wired Connection		
Efficiency	> 85% (Full Load)			
Utility Power (Bypass)	Nominal Voltage	110Vac or 230Vac $\pm 25\%$		
	Frequency	50 or 60Hz $\pm 3\text{Hz}$		
	Protection	Electronic circuits & AC circuit breaker		
Inverter Output	Output Power	800W	1600W	2400W
	Max. Surge Power	1200W	2400W	3600W
	Voltage	110Vac or 230Vac $\pm 1\%$		
	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		
	Transient Response	$\leq \pm 10\%$, recover to $\pm 1\%$ within 100ms (0~100% load)		
	Crest Factor	3 : 1		
	Power Factor	0.8		
Protection	Cooling System	Forced Ventilation		
	Short Circuit	Inverter Shut down		
	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)		
Transfer Time	Over Temperature	Acoustic Warning before Shut-off and Auto Restart		
	INV - Bypass	8ms		
Indicator	Bypass - INV	5ms		
	LCD Display	Input/Output: Voltage/Frequency, DC: Voltage/ Current, Loading: Current/Percentage, Temp.: Operation/Over, Polarity Reverse		
Communication	LED Display	AC Input, Inverter/Bypass, Fault/Overload, DC Input		
	Interface Port	Dry Contact or RS-232C		
Environment	Operating Temp.	0°C~40°C		
	Relative Humidity	0~90%, non-condensing		
Mechanical	Dimension	W430*D488*H89mm (2U)		
	Net weight	10.0kgs	11.0kgs	12.0kgs

* Product specification is subject to change without prior notice.

Section 10: Wiring Diagram

