

# **ANALYTIC SYSTEMS**

Power Conversion Solutions

## **INSTALLATION & OPERATION MANUAL**



### **IPSi360 Series PURE-SINE INVERTER**

An ISO9001 Registered Company Battery Chargers • Inverters • Power Supplies • Voltage Converters

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[www.analiticsystems.com](http://www.analiticsystems.com)

# INVERTER

## IMPORTANT SAFETY INSTRUCTIONS

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1. **SAVE THESE INSTRUCTIONS** — This manual contains important safety and operating instructions for the inverter.
2. Do not expose the inverter to rain or snow.
3. Use of an attachment not recommended or sold by the inverter manufacturer may result in a risk of fire, electric shock, or injury to persons.
4. Do not disassemble the inverter; take it to a qualified serviceman when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
5. To reduce risk of electric shock, disconnect the inverter from the input power before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
6. Never place the inverter directly above a battery; gases from the battery will corrode and damage the inverter.
7. Never allow battery acid to drip on the inverter.

**GROUNDING AND AC POWER CORD CONNECTION INSTRUCTIONS** — Inverters should be grounded to reduce risk of electric shock. This inverter is equipped with a chassis grounding stud, and electric receptacles capable of accepting an equipment-grounding conductor and a grounding plug.

### **Medical Equipment Notice**

Analytic Systems does not recommend the use of their products in life support applications where failure or malfunction of this product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness. Analytic Systems does not recommend the use of any of its products in direct patient care. Examples of devices considered to be life support devices are neonatal oxygen analyzers, nerve stimulators (whether used for anesthesia, pain relief, or other purposes), auto-transfusion devices, blood pumps, defibrillators, arrhythmia detectors and alarms, pacemakers, hemodialysis systems, peritoneal dialysis systems, neonatal ventilator incubators, ventilators for both adults and infants, anesthesia ventilators, and infusion pumps as well as any other devices designated as “critical” by the U.S. FDA

**HEAVY DEVICE** - The IPSi2400 and IPSi3600 Inverters weigh more than 50 pounds and 70 pounds respectively. Please use appropriate safety measures when lifting or moving these devices.



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Revised - May 24, 2017



## Introduction

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The IPSi360 series of Intelligent Pure Sinewave Inverters are designed specifically for running computers and other sensitive AC loads in rugged mobile and other off grid environments. They produce pure sine wave AC power, exactly the same as a regular AC outlet.

The IPSi360 Series Inverter is controlled by a sophisticated Digital Signal Processor (DSP) for optimal control and the most efficient operation possible. The heavy duty Toroidal Power Transformer steps the low voltage AC produced by the Power MosFet Transistors from 110 to 220 VAC at 50 Hz as well as filtering the AC output to reduce or eliminate electrical noise that could interfere with sensitive communications equipment.

Using the free to download Power Wizard software, the user can select output frequency, output voltage and low voltage shutdown parameters from any laptop through the standard usb interface.

## FEATURES

- Pure Sine Wave' 110 VAC / 60 Hz or 220 VAC / 50 Hz fully regulated output, exactly the same as commercial AC.
- Digitally controlled for precise frequency ( $\pm 0.01$  Hz) at either 50 or 60 Hz. 360 Watts of output power.
- State of the art MOSFET technology and sophisticated DSP control for efficient and reliable operation.
- ON-OFF switch for positive indication of proper operation.
- Heavy input filtering to shield other devices sharing the same battery.
- Transformer type output to protect computers and other sensitive equipment from surges and spikes.
- Low voltage warning and shutdown circuitry to protect the batteries.
- Over voltage and over temperature warning and shutdown circuitry to protect the inverter.
- Short circuit protection.
- LED indicators and a buzzer to bring attention to the cause of the shutdown.



## Main Parts

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### Front Panel

- |  |   |
|--|---|
| <ol style="list-style-type: none"><li>1. On/Off Power Switch</li><li>2. Indicator LEDs</li></ol> | <ol style="list-style-type: none"><li>3. Receptacles and/or Hard wired AC output connection</li><li>4. USB Port</li></ol> |
|--|---|
- 



### Rear Panel

- |   |   |
|---|---|
| <ol style="list-style-type: none"><li>1. Thermostatically controlled cooling fan</li><li>2. Chassis Grounding Lug</li></ol> | <ol style="list-style-type: none"><li>3. DC Input Connections</li></ol> |
|---|---|
-



## Operation

Move the switch to the ON position to energize the circuitry. The Invert LED will glow to indicate the presence of AC power at the output terminals or receptacle. The LED corresponding to the output frequency will illuminate.

## Controls and Indicators

The IPSi360 Inverter has 8 LED indicators, a microUSB port and a On/Off power switch.

The microUSB port is used to connect the IPSi Inverter to a laptop computer running the PowerWizard software and can be used to update the firmware, to adjust the low and high voltage alarm setpoints, to choose the output frequency (50 or 60 Hz) and to fine tune the output voltage +/- 10% in 1 VAC steps.



1. **Low Input Voltage:** Blinks Red when the input voltage is near the lower limit for proper operation. Glows Red when the input voltage is too low for proper operation and will be accompanied by the Bypass LED glowing Red and the On/Off switch will not be glowing. Check for the reason for low voltage. Make sure the Low Input threshold is set properly for the battery voltage you are using, around 21V for a 24V battery, around 28V for a 32V battery and around 31V for a 36V battery.
2. **High Input Voltage:** This LED will blink Red when the input voltage is near the upper limit for proper operation. Glows Red when the input voltage is too high for proper operation and will be accompanied by the Bypass LED glowing Red and the Invert LED turning off. Check for the reason for high voltage. The inverter can be damaged if the input voltage exceeds the maximum rating, and over-voltage damage is not covered under warranty.
3. **Over-Temp:** Blinks Red if the internal temperature of the inverter is approaching the safe limit. The inverter will reduce its maximum power rating to try to maintain the temperature within safe limits. The LED will glow Red if the inverter is too hot to operate and the Bypass LED will also glow Red and the On/Off switch will stop glowing. Either the cooling fan is defective, or there is not enough air circulation for the inverter. If the fan is running, add extra ventilation. If the fan is NOT running the inverter must be returned for repair.
4. **Overload:** Blinks Red if the load on the inverter reaches the continuous rating. Solid Red if the load on the inverter reaches the maximum rating. Reduce the load on the inverter.
5. **50 Hz:** This LED will be on Green if the inverter is set for 50 Hz operation.
6. **60 Hz:** This LED will be on Green if the inverter is set for 60 Hz operation.
7. **Bypass:** This LED will be on Green if the inverter is in Bypass mode, or on Red if the inverter is in an Alarm condition as described above.
8. **Invert:** This LED will be on Green when the inverter is in normal operation.



## Installation

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### MOUNTING

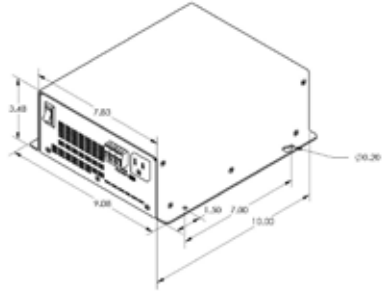
Mount the unit in a DRY location. Mount the unit in a ventilated area. Allow at least 1 inch of clearance around the unit for adequate cooling.

### CAUTION

The case of the inverter is connected to AC Ground and AC Neutral to meet regulatory requirements and to reduce the possibility of it generating any radio frequency interference. The case must be bonded appropriately to the grounding system of the vehicle or marine vessel.

On a vehicle bond the case to the frame and on a marine vessel bond the case to the hull.

A grounding stud is provided on the front of the inverter for this purpose. To ensure proper grounding, check the connection with an ohmmeter. The case is isolated from the DC Input, so the DC power can be on a different ground from the AC output.



**CAUTION:** Do not mount the unit where explosive gases may accumulate as a slight arc may occur when the power leads are connected, and in the unlikely event of a failure, sparks may be generated inside the unit.

### DISCONNECTION

If you disconnect the inverter to remove it for service or storage, turn the power switch on for at least one minute after it has been disconnected to discharge the storage capacitors.

## Power Wizard Program

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The PowerWizard Program for laptops can be downloaded from the [analyticssystems.com](http://analyticssystems.com) website and will allow programming of:

- Low Voltage Shutdown parameters to match battery voltage
- Output Frequency (50 or 60 Hz)
- Output Voltage over a +/- 10 percent range

It will also allow graphing of certain parameters such as Input Voltage, Input Current, Output Voltage and Output Current.

## Input Connections

### DC INPUT POWER CONNECTION

Prepare a circuit breaker protected power source for the IPSi360 Series Inverter, making sure the breaker is OFF. Connect the input power to the DC IN terminals using AWG8 or 6mm<sup>2</sup> wire. Strip 0.4 inches or 9mm, insert the Positive wire into the Red terminal and the Negative wire into the Black terminal and tighten securely to 16 inch-pounds or 1.8 Newton Meters.



### CAUTION

Do Not Reverse Connect the Input Wires. This will cause serious Damage to the Inverter and will not be covered by Warranty.

Turn on the external circuit breaker and then press the ON/OFF switch to turn on the inverter. The ON/OFF switch should illuminate and the Invert LED should come on Green. Once proper operation is confirmed, turn the inverter OFF by pressing the ON/OFF switch again.

## Output Connections

### AC OUTPUT CONNECTION

The IPSi360 Inverter may be fitted with any one of these receptacles and/or a hard wired AC output connection. The hard wired connection will accommodate wire from AWG24 to AWG10. The wires should be stripped 0.3 inches or 8mm. The terminals are color coded and labelled for Hot, Neutral and Ground.

### CAUTION

Do not apply any external source of AC voltage to these terminals. Damage caused by this action will not be covered under warranty.



Hardwired  
- part code "H" -



NA 110VAC  
60HZ



NA 220VAC  
60HZ  
- part code "U" -



Worldwide 220VAC  
50HZ  
- part code "W" -





## Special Services & Options

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A	Line AC Detect & Autoswitch UPS
C	COTS   MIL461F, MIL810G (MIL Connectors) (VIBRATION PROTECTION) (WIDE TEMP {-40 TO +55°C}) (IN-HOUSE TESTED AND REPORT FOR EACH UNIT- AVAILABLE AS ADD ON TO M OPTION)
E	European ROHS compliant (LEAD FREE MANUFACTURED)
F	Electric Fork Lift (FILTERING AND SURGE SUPPRESSION)
I	MIL461F (IN-HOUSE TESTED AND REPORT FOR EACH UNIT- AVAILABLE AS ADD-ON TO M OPTION)
J	MIL810G (IN-HOUSE TESTED AND REPORT FOR EACH UNIT- AVAILABLE AS ADD-ON TO M OPTION)
M	Military Rugged Package (MIL Connectors) (VIBRATION PROTECTION) (WIDE TEMP {-40 TO +55°C})
U	Safety Special Inspection (CSA/UL)
X	Heavy Duty Ruggedization (VIBRATION PROTECTION) (WIDE TEMP {-40 TO +55°C})
Z	No Conformal Coating

View/download an expanded description of our Special Services & Options online  
<https://www.analyticssystem.com/download>



# Specifications

Input Voltages	-12	-20	-40
Nominal (Vdc)	12	24, 28, 32 or 36	48 or 72 (Rail)
Actual (Vdc)	11 - 16	20 - 45	40 - 80
Input Amps (max)	44	24	12
Input Fuse (Internal)	2 x ATC25	1 x ATC25	1 x ATC15

Output Voltages		
Voltage	-110 +/- 2 Vac	-220 +/- 4 Vac
Output Amps (max)	3A (cont) / 3.6A (peak)	1.5A (cont) / 1.8A (peak)
Output Frequency	50.00 or 60.00 Hz ± 0.01 Hz (user selectable)	
Output Distortion	<2% at 360 Watts into resistive load	
Regulation (Line & Load)	< +/- 2.0%	
Duty Cycle Continuous	100% for 24 hours per day	

General	
Efficiency	> 90% @ maximum output
Temp Range	-25 to +40 deg C @ maximum output
Isolation	Input-Output, Input-Case & Output-Case 1500Vdc Input
Length	10.0 in / 25.4 cm
Width	9.1 in / 23.1 cm (including mounting flanges)
Height	3.5 in / 8.8 cm
Clearance	1 Inch (2.5 cm) all around
Material	Marine Grade Aluminum
Finish	Black Powder Epoxy
Fastenings	18-8 Stainless Steel
Weight	12 lbs / 5.4 kg
Connections	DC In – Phoenix VDFK6, 60 Amp, 300V Rating AC Out – 1 x NEMA 5-15 15A 120 VAC receptacle or 1 x NEMA 6-20R 20A 250VAC receptacle (220U) or 1 x UNIVERSAL 15A 250VAC receptacle (220W) and/or 1 x Phoenix VDFK4 Hardwire Connection (120H or 220H)

\* Specifications subjects to change without notice.



## Limited Warranty

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1. The equipment manufactured by Analytic Systems Ware (1993) Ltd. (the "Warrantor") is warranted to be free from defects in workmanship and materials under normal use and service.
2. This warranty is in effect for 3 years from the date of purchase by the end user.
3. Analytic Systems will determine eligibility for warranty from the date of purchase shown on the warranty card when returned within 30 days, or
  - a. The date of shipment by Analytic Systems, or
  - b. The date of manufacture coded in the serial number, or
  - c. From a copy of the original purchase receipt showing the date of purchase by the user.
4. In case any part of the equipment proves to be defective, the Purchaser should do the following:
  - a. Prepare a written statement of the nature of the defect to the best of the Purchasers knowledge, and include the date of purchase, the place of purchase, and the Purchasers name, address and telephone number.
  - b. Call Analytic Systems at 800-668-3884 or 604-946-9981 and request a return material authorization number (RMA).
  - c. Return the defective part or unit along with the statement at the Purchasers expense to the Warrantor; Analytic Systems Ware (1993) Ltd., 8128 River Way, Delta, B.C., V4G 1K5, Canada.
5. If upon the Warrantor's examination the defect proves to be the result of defective material or workmanship, the equipment will be repaired or replaced at the Warrantor's option without charge, and returned to the Purchaser at the Warrantor's expense by the most economical means. Requests for a different method of return or special handling will incur additional charges and are the responsibility of the Purchaser.
6. Analytic Systems reserves the right to void the warranty if:
  - a. Labels, identification marks or serial numbers are removed or altered in any way.
  - b. Our invoice is unpaid.
  - c. The defect is the result of misuse, neglect, improper installation, environmental conditions, non-authorized repair, alteration or accident.
7. No refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so.
8. Only the Warrantor shall perform warranty service. Any attempt to remedy the defect by anyone else shall render this warranty void.
9. There shall be no warranty for defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion except for equipment specifically stated to be waterproof.
10. No other express warranty is hereby given and there are no warranties that extend beyond those described herein. This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purposes for which such goods are used, or fitness for a particular purpose, or any other obligations on the part of the Warrantor or its employees and representatives.
11. There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any person or persons, or damage to property, or loss of income or profit, or any other consequential or resulting damage which may be claimed to have been incurred through the use or sale of the equipment, including any possible failure of malfunction of the equipment, or part thereof.
12. The Warrantor assumes no liability for incidental or consequential damages of any kind.



DESIGNED AND MANUFACTURED BY




**ANALYTIC SYSTEMS**


Power Conversion Solutions

Battery Chargers • Inverters • Power Supplies • Voltage Converters

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