



**samlex**power®

**DC-AC  
Power  
Inverter**

**SAM-100-12**

**Owner's  
Manual**

Please read this  
manual **BEFORE**  
installing your  
SAM-100-12  
Inverter.

# SECTION 1 | Safety

## IMPORTANT SAFETY INSTRUCTIONS

### SAVE THESE INSTRUCTIONS

This manual contains important Safety and Operating Instructions. Please read before using this unit .

The following safety symbols will be used in this manual to highlight safety and information:



#### WARNING!

Indicates possibility of physical harm to the user in case of non-compliance.



#### CAUTION!

Indicates possibility of damage to the equipment in case of non-compliance.



#### INFO

Indicates useful supplemental information.

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#### WARNING!

### TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, EXPLOSION OR INJURY

1. Do not connect to AC distribution wiring.
2. Remove appliance plug from outlet strip before working on the appliance.
3. Do not make any electrical connections or disconnections in areas designated as **IGNITION PROTECTED**.
4. This is not a toy - keep away from children.
5. **DO NOT** insert object into ventilation openings.



#### CAUTION!

1. Do not use with Positive Ground electrical systems (the majority of modern automobiles, RVs, trucks and boats are Negative Ground). Reverse polarity connection will result in a blown fuse and may cause permanent damage to the unit.
2. This unit will not operate high wattage appliances rated more than the continuous/ surge, the output power limit, or surge power ratings.
3. Grounding the Neutral will cause the unit to shut down. Do not operate this unit if it is wet.
4. This unit is not tested for use with medical devices.

## **SECTION 1 | Safety**

5. Loose connectors may cause overheated mating surfaces and melted insulation.
6. Remove the unit from the 12V Power Outlet when not in use.

**The unit should only be used in locations that meet the following criteria:**

**DRY** – Do not allow water and/or other liquids to come into contact with the unit.

**COOL** – Ambient air temperature should be between 0°C to 40°C. Do not place the unit on or near a heating vent or any piece of equipment which is generating heat above room temperature. Keep the unit away from direct sunlight.

**VENTILATED** – Keep the area surrounding the unit clear to ensure free air circulation around the unit. Do not place items on or over the unit during operation. If the unit over-heats, unplug it and let it cool down for 30 minutes.

**SAFE** – Do not use the unit near flammable materials or in any locations that may accumulate flammable fumes of gases.

## SECTION 2 | Introduction

### DESCRIPTION

The inverter converts 12 VDC voltage from battery or from other suitable 12 VDC source to 115 V, 60 Hz AC voltage. The waveform of the of the AC output voltage is Modified Sine Wave.

### FEATURES

- High peak efficiency of 90%
- Very high power to weight ratio - compact and light weight
- Soft Start Technology for better surge performance
- Latest high power USB Charging Port, USB 3.0, Type A: 5 VDC, 2.1A
- Load controlled cooling fan for better efficiency
- Cool Surface Technology for cooler and safer touch temperature
- Universal Protection circuit for low / high DC input voltage, overload / short circuit, over temperature and Ground Fault
- Low Interference Technology for controlled RF noise
- Integrated 12V Power Plug (Cigar Plug)

### Soft Start Technology

This feature offers the following advantages:

- When the inverter is switched ON, the voltage ramps up to 115 VAC in around 2 sec. If the load was already ON at the time of switching ON of the inverter, starting surge current demanded by certain reactive devices like motors etc. will be reduced and there will be less likelihood of the inverter shutting down due to overload.
- If the inverter is switched ON first and then a load with higher starting / inrush current like SMPS / motor is switched ON, the voltage will dip momentarily and will ramp up and reduce inrush / starting surge current in the load as above
- Similar overload reduction will be initiated during any other momentary overload condition

### Low Interference Technology

Innovative circuit design and noise filtration circuitry reduces RF interference in TV picture, audio and radio equipment

### Cool Surface Technology

Normally, heat dissipating components are mounted directly on internal metal chassis surface of the inverter and hence, the chassis surface may rise to unsafe touch-temperature. In this inverter, heat-dissipating components are not mounted directly on the chassis of the unit but on PCB (Printed Circuit Board) mounted heat sink and, there is air gap between the heat sink and the chassis surface. The heat sink is cooled by fan. As there is no direct contact between the heat sink and the chassis, the chassis surface remains much cooler and is safer to touch.

## SECTION 2 | Introduction

### Cooling Fan

A fan has been provided for cooling. It runs all the time.

### PRINCIPLE OF OPERATION

Conversion of 12 VDC from the battery / other DC source to 115 VAC takes place in 2 stages. In the first stage, the 12 VDC is converted to high voltage DC (around 160 VDC) using high frequency switching and Pulse Width Modulation (PWM) technique. In the 2nd stage, the 160V high voltage DC is converted to 115V, 60 Hz Modified Sine Wave AC. (Note: 115 V is the RMS value of the Modified Sine Wave AC voltage. The peak value of the Modified Sine Wave AC voltage will be equal to the value of the above high voltage of around 160V. See the Fig 2.1 below).

### Modified Sine Waveform - Charateristics & Comparison with Pure Sine Waveform

Please refer to Fig 2.1 below which shows one cycle of Modified Sine Wave and Pure Sine Wave for comparison.

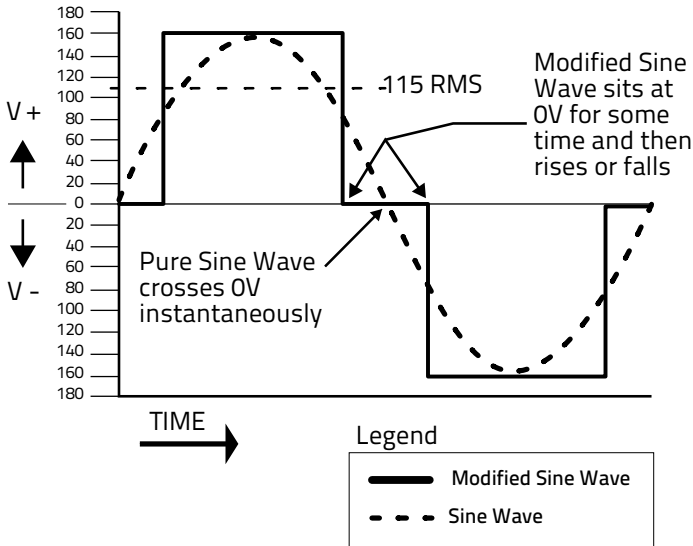


Fig 2.1 Modified Sine Wave and Pure Sine Wave - Comparison

The output waveform of the inverter is a Modified Sine Wave. In a Modified Sine Wave, the voltage waveform consists of rectangular pulses that approximate sine wave pulses of a Pure Sine Wave. The voltage rises and falls abruptly at a particular phase angle and sits at 0 Volts for some time before changing its polarity. In a Pure Sine Wave, the voltage rises and falls smoothly with respect to phase angle and the voltage changes its polarity instantly when it crosses 0 Volts.

## SECTION 2 | Introduction



### CAUTION!

**Certain devices (few examples given below) may malfunction when powered from Modified Sine Wave. Check with the manufacturer of the device for suitability of powering with Modified Sine Wave:**

- Devices utilizing zero voltage crossing for timing control: Some clocks used in consumer electronic items (will not keep accurate time)
- Devices using modulation of RF signals on AC lines during zero crossing e.g. X-10 System for Home Automation
- Devices utilizing Triac based phase control for transformer less voltage step down e.g.:
  - Small battery chargers for hand tools, flashlights, night-lights, shavers etc.
  - Variable motor speed control in hand tools
  - Light dimmers
  - Temperature controllers e.g. Temperature Controlled Electric Blankets
- Devices using high capacitance based voltage multipliers for generating high voltage (will create very high surge currents) e.g.:
  - Photographic Strobe Lights
  - Laser Printers

### **Measuring Modified Sine-Wave Voltage with a “True RMS” Voltmeter**

As mentioned above, Modified Sine Wave voltage is a type of square wave that has an RMS (Root Mean Square) value of 115 VAC in this inverter. A general-purpose AC voltmeter is calibrated to accurately measure the RMS value of a Pure Sine Wave and NOT of a Modified Sine Wave. If this general-purpose voltmeter is used to measure Modified Sine Wave voltage, it will indicate a lower value (96 VAC to 104 VAC). For accurately measuring the voltage of a Modified Sine Wave, use a voltmeter which is designed to measure “True RMS Values” like Fluke 87, Fluke 8060A, Fluke 77 / 99, Beckman 4410 etc.

## SECTION 3 | Layout



### LEGEND

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1. 12V Power Plug (Cigar Plug)
- 1A. Positive Contact Tip (with replaceable 10A fuse behind the tip)
2. NEMA5-15R AC Outlet
3. USB Charging Port - USB 3.0, Type A: 5V, 2.1A
4. GREEN status LED:
  - ON - Normal
  - OFF - Shut down due to activation of protection(s)

*Fig 2.1: Layout*

## SECTION 4 | Operation

1. Make sure environment is cool and dry.
2. Plug the unit into the vehicle's 12V Power Outlet.
3. Fully push and rotate the plug slightly to ensure good and firm connection.
4. Green Status LED light (#4, Fig 2.1) will switch ON, indicating normal operation of inverter and USB Charging Port.
5. Plug in the AC appliance.
6. Devices with USB charging can be charged using high power USB Charging Port - USB 3.0, Type A: 5V, 2.1A.

The vehicle's 12V Power Outlet must provide between 10.8 and 15.4 VDC. To obtain a rough estimate of the current (in Amperes) drawn from the battery, divide the power consumption of the load (in Watts AC) by 10.

**Example:** If a load is rated at 80 watts AC, the current drawn from 12V battery will be 80W divided by 10 = 8 Amperes.

Testing is the only definitive way to determine whether a specific load can be started and how long it can run. The unit will shut down if it is overloaded.



### CAUTIONS!

1. Check the maximum supply current of your vehicle's 12V Power Outlet by referring to your vehicle's owner manual.
2. The unit must be connected only to batteries with a nominal output voltage of 12 volts. The unit will not operate from a 6 volt battery, and will sustain permanent damage if connected to a 24 volt battery.
3. **DO NOT** use with Positive Ground electrical systems. (The majority of modern automobiles, RVs, and trucks are Negative Ground).



## SECTION 5 | Protective Features

**NOTE:** When the inverter shuts down due to activation of protection, the GREEN Status LED (#4, Fig 2.1) will switch OFF.

1. **OVER TEMPERATURE PROTECTION** – If the temperature inside the unit is too high, the unit will automatically shut down. Allow the unit to cool for at least 30 minutes before restarting after a heat-related shutdown. Unplug unit while cooling.
2. **LOW BATTERY VOLTAGE PROTECTION** - The unit automatically shuts down when input voltage drops to around  $10.5V \pm 0.3V$ . Automatic reset at  $11.5V \pm 0.3V$ .
3. **OVER VOLTAGE PROTECTION** – The unit will automatically shut down when the input voltage exceeds  $15.4V \pm 0.2V$ .
4. **OVERLOAD PROTECTION** – The unit will automatically shut down when the continuous surge/draw exceeds rated watts. Will remain latched in shut-down condition. To reset, unplug the unit from the 12V Power Outlet, wait for 3 minutes and then plug it back in firmly.
5. **SHORT CIRCUIT PROTECTION** – The unit will shut down. Will remain latched in shut-down condition. To reset, unplug the unit from the 12V Power Outlet, wait for 3 minutes and then plug it back in firmly.
6. **GROUND FAULT PROTECTION** – This unit complies with the standard current leakage allowance. When large current leakage to Ground Terminal occurs, the protection circuit is activated and shuts down the unit. Will remain latched in shut-down condition. To reset, unplug the unit from the 12V Power Outlet, wait for 3 minutes and then plug it back in firmly.

## SECTION 6 | Fuse Replacement

If the unit is overloaded, and the GREEN Status LED (#4, Fig 2.1) is not lit, the internal fuse in the top of the 12V Power Plug portion may be blown.

1. Unscrew the fuse holder cap (counterclockwise)
2. Remove the end contact, cap and fuse.
3. Inspect the fuse to see if it is good or blown.
4. **Replace with a new fuse of same type, same dimension and same Ampere rating: 10A, 250V, Fast-acting; Dimensions: 0.25" x 1.25"; Type: AGC-10**
5. Carefully reassemble the fuse, end contact and cap.




**CAUTION!**

**NO USER-SERVICEABLE COMPONENTS INSIDE. DO NOT ATTEMPT TO OPEN THE PRODUCT.**

## SECTION 7 | Specifications

INVERTER PARAMETER		SAM-100-12
<b>INPUT</b>		
BATTERY SYSTEM VOLTAGE	12 VDC	
NOMINAL INPUT VOLTAGE	13.8 VDC	
INPUT VOLTAGE RANGE	10.8 VDC to 15.4 VDC	
NO LOAD CURRENT	0.3A ± 0.1A	
<b>OUTPUT</b>		
OUTPUT VOLTAGE WAVE FORM	Modified Sine Wave	
OUTPUT VOLTAGE	115 VAC +10% / -2%	
OUTPUT FREQUENCY	60 Hz ± 5%	
OUTPUT POWER, CONTINUOUS (RESISTIVE LOAD)	100W	
OUTPUT POWER, SURGE (<1 SEC., RESISTIVE LOAD)	200W	
PEAK EFFICIENCY (AT 50% OF CONTINUOUS POWER)	90%	
USB CHARGING PORT	USB 3.0, Connector Type "A": 5 VDC, 2.1A	
<b>PROTECTIONS</b>		
LOW INPUT VOLTAGE SHUTDOWN	10.5 VDC.± 0.3VDC. Auto reset at 11.5 VDC. ± 0.3VDC	
HIGH INPUT VOLTAGE SHUTDOWN	15.4 VDC.± 0.2VDC. Auto reset at 15.0 VDC.± 0.2VDC	
OVERLOAD AND GROUND FAULT SHUT DOWN	Yes. Latches in shutdown condition. Manual reset: Remove the inverter from the 12V Power Outlet. Wait for 3 min and re-insert firmly.	
OVER TEMPERATURE SHUTDOWN	Yes. Auto reset on cooling down.	
COOLING FAN	1 - Always ON.	
INPUT FUSE: INSIDE TOP OF THE 12V POWER PLUG PORTION	10A, 250V (Fast Acting, Type AGC-10; Dimensions: 0.25" x 1.25")	
<b>CONNECTIONS</b>		
DC INPUT CONNECTION	12 V Power Plug (Cigar Plug)	
AC OUTPUT CONNECTION	One NEMA5-15R Outlet	
<b>MONITORING</b>		
STATUS INDICATION	GREEN LED: ON - NORMAL; OFF - SHUT DOWN	
<b>GENERAL</b>		
OPERATING TEMPERATURE RANGE	0°C to 25°C / 32°F to 77°F at 100% loading; 26°C to 35°C / 78.8°F to 95°F at 80% loading	
OPERATING HUMIDITY	< 80%; Non-condensing	

## SECTION 7 | Specifications

INVERTER PARAMETER	SAM-100-12
<b>GENERAL (CONTINUED)...</b>	
DIMENSIONS (W X D X H) MM DIMENSIONS (W X D X H) INCHES	60 x 129 x 36.5 2.36 x 5.08 x 1.44
WEIGHT	0.136 kg / 0.3 lb.
<b>COMPLIANCE</b>	
SAFETY	<p>CONFORMS TO UL STD 458</p>  <p>Intertek 3189401</p>

NOTE: Specifications are subject to change without notice