

Owner's Manual

PowerVerter® DC-to-AC Inverter/Charger

Model: APSX700HF



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+1 773 869 1234 • www.tripplite.com

	Input	Output
Invert:	12 V DC	230 V, 50 Hz AC
Charge:	230 V, 50 Hz AC	12 V DC

Reliable Emergency Backup Power

Congratulations on your purchase of the PowerVerter® APSX700HF Inverter/Charger! The APSX700HF gives you a convenient, reliable source of AC power anywhere and anytime you need it. It keeps connected equipment up and productive through all utility power problems (blackouts, brownouts and high voltages) by inverting DC power from user-supplied batteries into AC power. When utility power is present, the APSX700HF automatically passes through power to your equipment while simultaneously recharging your connected battery bank. Built-in surge suppression provides connected equipment with additional protection. The APSX700HF is the clean, quiet emergency backup power alternative to gas generators—with no fuel, fumes, or noise to deal with!

Better for Your Equipment

Premium Protection Levels

- Built-In Isobar® Surge Protection
- Automatic Overload Protection

Ideal Output for All Loads

- Frequency-Controlled Output

Better for Your Batteries

Faster Battery Recharge

- High-Amp, 3-Stage Battery Charger

Critical Battery Protection

- High-Efficiency DC-to-AC Inversion

Better for You

Simple, Maintenance-Free Operation

- Multi-Function Lights & Switches

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SAVE THESE INSTRUCTIONS!

This manual contains important instructions and warnings that should be followed during the installation, operation and storage of this product. Failure to comply will void the warranty.

Location Warnings

- Install your Inverter/Charger (whether for a stationary or mobile application) in a location or compartment that minimizes exposure to heat, dust, direct sunlight and moisture.
- Your Inverter/Charger is NOT waterproof. Flooding the unit with water will cause it to short circuit and could cause personal injury due to electric shock. Never immerse the unit, and avoid any area where standing water might accumulate. Mounting should be in the driest location available.
- Leave a minimum of 2 inches (51 mm) clearance at front and back of the Inverter/Charger for proper ventilation. The heavier the load of connected equipment, the more heat will be generated by the unit.
- **Do not mount unit with its front or rear panel facing down (at any angle). Mounting in this manner will seriously inhibit the unit's internal cooling, eventually causing product damage not covered under warranty.**
- Do not install the Inverter/Charger directly near magnetic storage media, as this may result in data corruption.
- Do not install near flammable materials, fuel or chemicals.

Battery Connection Warnings

- Multiple battery systems must be comprised of batteries of identical voltage, age, amp-hour capacity and type.
- Because explosive hydrogen gas can accumulate near batteries if they are not kept well ventilated, your batteries should not be installed in a “dead air” space. Ideally, any space would have some ventilation to outside air.
- Sparks may result during final battery connection. Always observe proper polarity as batteries are connected.
- Do not allow objects to contact the two DC input terminals. Do not short or bridge these terminals together. Serious personal injury or property damage could result.

Equipment Connection Warnings

Use of this equipment in life support applications where failure of this equipment can reasonably be expected to cause the failure of the life support equipment or to significantly affect its safety or effectiveness is not recommended. Do not use this equipment in the presence of a flammable anesthetic mixture with air, oxygen or nitrous oxide.

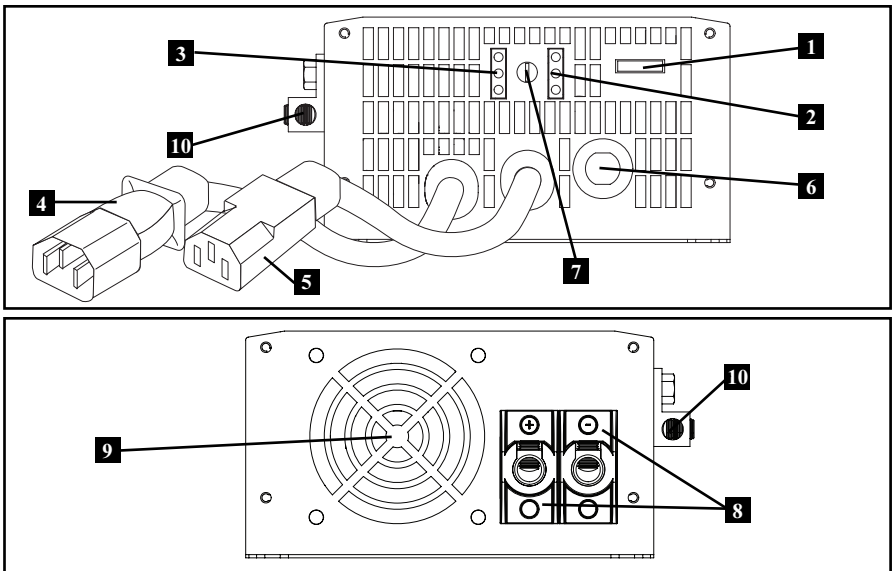
- Do not modify the Inverter/Charger's AC input or output in a way that eliminates its ground connection. Do not use power adapters that will eliminate the plug's ground connection.
- Connect your Inverter/Charger only to a properly grounded AC power outlet. Do not plug the unit into itself; this will damage the device and void your warranty.
- You may experience uneven performance results if you connect a surge suppressor, line conditioner or UPS system to the output of the Inverter/Charger.

Operation Warnings

- Your Inverter/Charger does not require routine maintenance. Do not open the device for any reason. There are no user serviceable parts inside.
- Potentially lethal voltages exist within the Inverter/Charger as long as the battery supply and/or AC input are connected. During any service work, the battery supply and AC input connection should therefore be disconnected.
- Do not connect or disconnect batteries while the Inverter/Charger is operating in either inverting or charging mode; dangerous arcing may result. Place the Operating Mode Switch in the “DC OFF” position before connecting or disconnecting batteries.

Features

- 1 Operating Mode Switch:** controls Inverter/Charger operation. When this switch is set to “AUTO”, connected equipment receives constant, uninterrupted utility AC power, with simultaneous charging of connected batteries. The “CHARGE ONLY” setting prevents unwanted battery rundown when there is no need for battery backup. Connected batteries are recharged. When the Operating Mode Switch is set to “DC OFF”, both the inverter and the battery charger are shut off. However, the unit will still pass utility AC power to connected equipment if it is plugged into an AC outlet.
- 2 “OPERATION” Indicator Lights:** These intuitive “traffic light” signals show whether the Inverter/Charger is operating from AC line power or from DC battery power. They also signal an alert if the connected equipment load is too high. See the *Operation* section for details.
- 3 “BATTERY” Indicator Lights:** These “traffic light” signals show the approximate charge level of your battery. See the *Operation* section for details.
- 4 AC Input:** IEC 60320 C14 connects the Inverter/Charger to a source of utility- or generator-supplied AC power. See the *AC Connection* section for instructions.
- 5 AC Output:** IEC 60320 C13 permits connection of equipment that would normally be plugged into a utility outlet. **Note: The unit will always pass AC power to connected equipment if plugged into a live AC outlet, regardless of the position of the Operating Mode Switch.**
- 6 Circuit Breaker:** Protects the Inverter/Charger against damage due to overload. See the *Operation* section for resetting instructions.
- 7 Low Line Adjustment:** Sets the AC input voltage at which the Inverter/Charger will switch from utility AC power to inverted battery power, allowing you to optimize operation in areas with frequent brownouts. If the dial is set fully counterclockwise, the unit will allow AC input to drop to approximately 160 V before switching to inverter mode. **Note: The unit will continue to pass lower-voltage AC utility power to connected equipment until the unit switches to inverter mode.**
- 8 DC Connectors:** Connect to your battery terminals with user-supplied cabling. See *Battery Connection* section for instructions.
- 9 Cooling Fan:** Regulates internal temperature and prolongs equipment service life.
- 10 Main Ground Lug:** Grounds the Inverter/Charger to earth ground or vehicle grounding system. See *Battery Connection* section for instructions.



Battery Selection

Match Battery Amp-Hour Capacity to Your Application







Select a battery or system of batteries that will provide your Inverter/Charger with proper DC voltage and an adequate amp-hour capacity to power your application. Even though Tripp Lite Inverter/Chargers are highly efficient at DC-to-AC inversion, their rated output capacities are limited by the total amp-hour capacity of connected batteries plus the output of an alternator when one is used.

Example

• STEP 1) Determine Total Wattage Required

Add the wattage ratings of all equipment you will connect to your Inverter/Charger. Wattage ratings are usually listed in equipment manuals or on nameplates. If your equipment is rated in amps, multiply that number times AC utility voltage to estimate watts. (Example: a ¼ in. drill requires 1.3 amps. $1.3 \text{ amps} \times 230 \text{ volts} = 300 \text{ watts}$.)

NOTE: Your Inverter/Charger will operate at higher efficiencies at about 75% - 80% of nameplate rating.

Tools			
¼" Drill	Orbital Sander	Cordless Tool Charger	
			
300W	+	220W	+
		20W	= 540W
Appliances			
Blender	Color TV	Laptop Computer	
			
300W	+	140W	+
		100W	= 540W

• STEP 2) Determine DC Battery Amps Required

Divide the total wattage required (from step 1, above) by the battery voltage to determine the DC amps required.

$$540 \text{ watts} \div 12\text{V} = 45 \text{ DC Amps}$$

• STEP 3) Estimate Battery Amp-Hours Required

Multiply the DC amps required (from step 2, above) by the number of hours you estimate you will operate your equipment exclusively from battery power before you need to recharge your batteries with utility- or generator-supplied AC power. Compensate for inefficiency by multiplying this number by 1.2. This will give you a rough estimate of how many amp-hours of battery power (from one or several batteries) you should connect to your Inverter/Charger.

NOTE: Battery amp-hour ratings are usually given for a 20-hour discharge rate. Actual amp-hour capacities are less when batteries are discharged at faster rates. For example, batteries discharged in 55 minutes provide only 50% of their listed amp-hour ratings, while batteries discharged in 9 minutes provide as little as 30% of their amp-hour ratings.

$$45 \text{ DC Amps} \times 2 \text{ Hours Runtime} \times 1.2 \text{ Inefficiency Rating} = 108 \text{ Amp-Hours}$$

• STEP 4) Estimate Battery Recharge Required

You must allow your batteries to recharge long enough to replace the charge lost during inverter operation or else you will eventually deplete your batteries. To estimate the minimum amount of time you need to recharge your batteries given your application, divide your required battery amp-hours (from step 3, above) by your Inverter/Charger's rated charging amps (see the *Specifications* section).

NOTE: For Tripp Lite Inverter/Chargers providing 1000 watts or less of continuous AC power, a full-size battery will normally allow sufficient power for many applications before recharging is necessary. For mobile applications, if a single battery is continuously fed by an alternator at high idle or faster, then recharging from utility or generator power may not be necessary. Tripp Lite Inverter/Chargers will provide adequate power for ordinary usage within limited times without the assistance of utility or generator power. However, when operating extremely heavy electrical loads at their peak in the absence of utility power, you may wish to "assist your batteries" by running an auxiliary generator or vehicle engine, and doing so at faster than normal idling.

$$108 \text{ Amp-Hours} \div 6 \text{ Amps Inverter/Charger Rating} = 18 \text{ Hours Recharge}$$

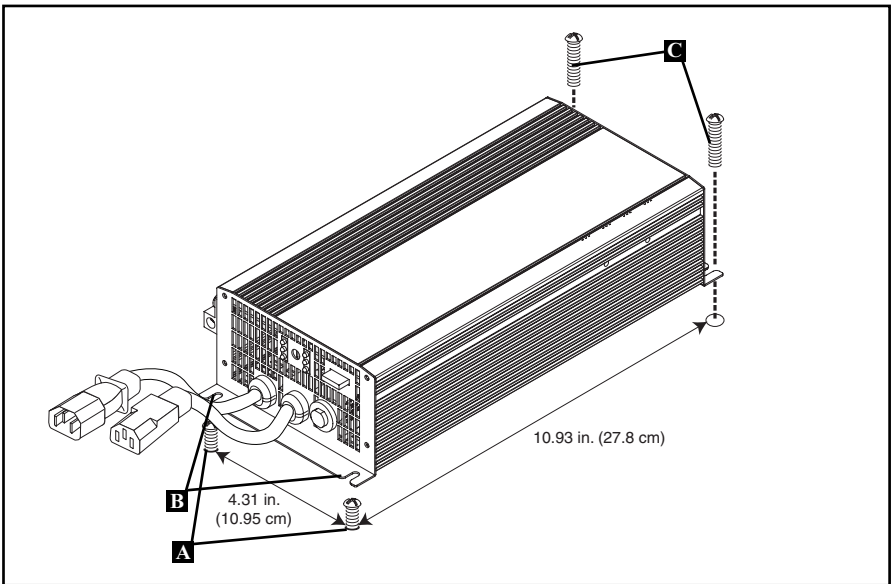
Mounting



WARNING! Mount your Inverter/Charger BEFORE DC battery and AC power connection. Failure to follow these instructions may lead to personal injury and/or damage to the Inverter/Charger and connected systems.

Tripp Lite recommends that you permanently mount your Inverter/Charger in the configuration illustrated below. The APSX700HF features integrated mounting brackets at the front and rear of the unit. The user must supply mounting hardware and is responsible for determining if the hardware and mounting surface are adequate to support the weight of the unit. Read the *Important Safety Instructions* section before mounting.

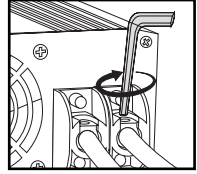
Using the measurements shown in the diagram, install two user-supplied fasteners **A**, leaving the heads slightly raised. Slide the unit over the fasteners to engage the mounting bracket slots **B**. Tighten the fasteners. Install two additional fasteners **C** over the remaining mounting bracket.



Battery Connection

Connect your Inverter/Charger to your batteries using the following procedures

• **Connect DC Wiring:** Though your Inverter/Charger is a high-efficiency converter of electricity, its rated output capacity is limited by the length and gauge of the cabling running from the battery to the unit. Use the shortest length and gauge of the cabling running from the battery to the unit. Use the shortest length and largest diameter cabling (maximum 2 AWG (6.544 mm)) to fit your Inverter/Charger's DC connectors. Shorter and heavier gauge cabling reduces DC voltage drop and allows for maximum transfer of current. Your Inverter/Charger is capable of delivering peak wattage above its rated continuous wattage output for brief periods of time. See the *Specifications* section for details. Heavier gauge cabling should be used when continuously operating heavy draw equipment under these conditions. Tighten your Inverter/Charger and battery terminals to approximately 3.5 Newton-meters of torque to create an efficient connection and to prevent excessive heating at this connection. Insufficient tightening of the terminals could void your warranty. **See the *Specifications* section for battery wiring recommendations.**



DC Connectors

• **Connect Ground:** Use an 8 AWG (3.264 mm) wire or larger to connect the Main Ground Lug to earth ground. See the *Features* section to locate the Main Ground Lug on your Inverter/Charger. All installations must comply with national and local codes and ordinances.

• **Connect Fuse:** NEC (National Electrical Code) article 551 requires that you connect all of your Inverter/Charger's positive DC connectors directly to a UL-listed fuse(s) and fuse block(s) within 18 inches (45.72 cm) of the battery. The minimum rating of the DC fuse is listed in the *Specifications* section. See the following battery configuration diagrams for proper fuse placement.



WARNING!

- Failure to properly ground your Inverter/Charger may result in a lethal electrical shock hazard.
- Never attempt to operate your Inverter/Charger by connecting it directly to output from an alternator rather than a battery or battery bank.
- Observe proper polarity with all DC connections.



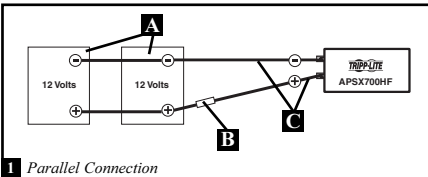
Battery Configuration

You may connect one or more batteries to your Inverter/Charger in either of the following configurations.

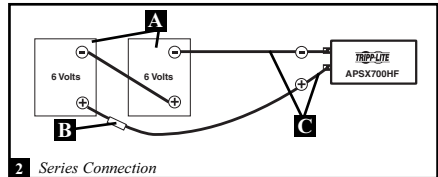
1 Parallel Connection: The voltage of each connected battery must match the Inverter/Charger's Nominal DC Input Voltage (12 V).

2 Series Connection: The total voltage of all connected batteries must match the Inverter/Charger's Nominal DC Input Voltage (12 V). Example: 6 V + 6 V = 12 V.

Contact Tripp Lite technical support for assistance with battery connection configurations.



1 Parallel Connection



2 Series Connection

A Battery

B UL-Listed Fuse & Fuse Block mounted within 18 inches (45.72 cm) of battery

C Large-Diameter Cabling, Maximum 2 AWG (6.544 mm), to Fit Terminals

AC Connection

To avoid overloading your Inverter/Charger, be sure to match the power requirements of the equipment you plan to run at any one time (add the total watts) with the continuous output capacity of your Inverter/Charger (see the *Specifications* section). When figuring the power requirements of your equipment, do not confuse continuous wattage with peak wattage ratings. Most electric motors require more power at start-up (peak wattage) than required to run continuously after start-up, sometimes over 100% more. Some motors, such as in refrigerators and pumps, start and stop intermittently according to demand, requiring peak wattage at multiple, unpredictable times during operation.

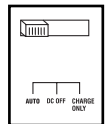
Your Inverter/Charger has an IEC 60320 C14 input connector and an IEC 60320 C13 output connector (see the Features section for more information). Attach the input connector to a user-supplied cable with a plug appropriate for the local site, and plug the Inverter/Charger to a utility wall outlet that provides 230 V, 50 Hz AC power. Use the output connector to power equipment that would normally be plugged into a utility outlet. Any equipment you plug into the output connector automatically benefits from your Inverter/Charger's **Isobar**[®] surge protection.

Operation

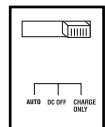
Switch Modes

After mounting and connecting your Inverter/Charger, you are able to operate it by switching between operating modes as appropriate to your situation.

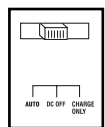
“AUTO”: Switch to this mode when you need constant, uninterrupted AC power for connected equipment. The Inverter/Charger will supply AC power to connected equipment and charge your connected batteries while utility or generator-supplied AC power is present. The Inverter/Charger will automatically switch to battery to supply AC power to connected equipment when utility/generator power is unavailable or unsafe for connected equipment.



“CHARGE ONLY”: Switch to this mode when you are not using connected equipment in order to conserve battery power by disabling the inverter. The Inverter/Charger will supply AC power to connected equipment and charge connected batteries while utility- or generator-supplied AC power is present. However, it **WILL NOT** supply AC power to connected equipment when utility/generator power is unavailable or unsafe for connected equipment.



“DC OFF”: Switch to this mode to prevent the inverter from drawing power from the batteries. Use this mode to automatically reset the unit if it shuts down due to overload or overheating. First remove the excessive load or allow the unit to sufficiently cool, as applicable. Switch to “DC OFF”, then back to “AUTO” or “CHARGE ONLY” as desired. If the unit fails to reset, remove more load or allow the unit to cool further and try again.

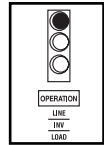


Caution: The unit will always pass AC power to connected equipment if plugged into a live AC outlet, regardless of the position of the Operating Mode Switch.

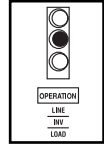
Operation (continued)

“OPERATION” Indicator Lights

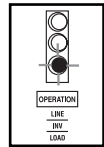
“LINE” Green Indicator: If the operating mode switch is set to “AUTO”, this light will illuminate continuously while connected equipment is receiving continuous AC power from a utility/generator source. If the operating mode switch is set to “CHARGE ONLY”, this light will flash to alert you that the unit's inverter is disabled and will not supply AC power when utility/generator power is unavailable or unsafe for connected equipment.



“INV” (Inverting) Yellow Indicator: This light will illuminate continuously while connected equipment is receiving battery-supplied, inverted AC power when utility/generator power is unavailable or unsafe for connected equipment.



“LOAD” Red Indicator: This red light will flash if the power demanded by connected appliances and equipment exceeds load capacity while the Inverter/Charger is operating from battery power. It will also flash due to inverter overheating. If this happens, turn the operating mode switch to “DC OFF”, remove the overload and allow the inverter to cool. After the unit has adequately cooled, you may turn the operating mode switch to either “AUTO” or “CHARGE ONLY”.



“BATTERY” Indicator Lights

These three lights will illuminate in several sequences to show the approximate charge level of your connected battery bank and alert you to fault conditions:

Battery Charge Level*

Indicator Illuminated	Battery Capacity (Charging/Discharging)	
1 Green	~ 91%–Full	
2 Green & Yellow	~ 81%–90%	
3 Yellow	~ 61%–80%	
4 Yellow & Red	~ 41%–60%	
5 Red	~ 21%–40%	
6 All three lights off	~ 1%–20%	
7 Flashing red	~ 0% (Inverter shutdown)	

* Charge levels are approximate.
Actual levels vary depending on battery condition and load.

Fault Condition

Indicator Illuminated	Fault Condition	
1 All three lights flash quickly*	Overcharge (Charger shutdown)	

* Approximately 1/4 second on, 1/4 second off. May also indicate a battery charger fault exists. See the Troubleshooting section.

Resetting Your Inverter/Charger to Restore AC Power

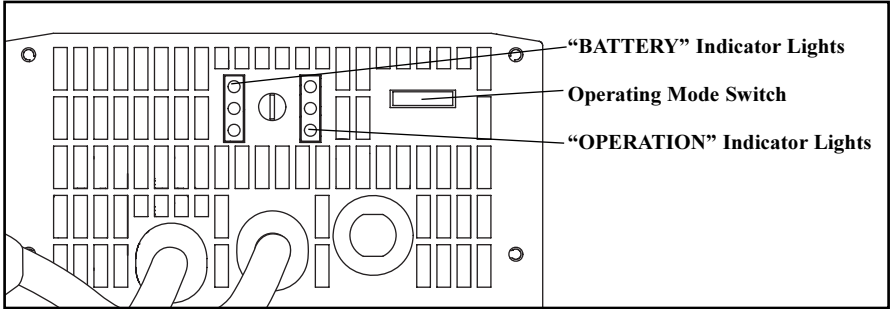
Your Inverter/Charger may cease to supply AC power or DC charging power in order to protect itself from overload or to protect your electrical system. To restore normal functioning:

Overload Reset: Switch the operating mode switch to “DC OFF” and remove some of the connected electrical load (i.e. turn off some of the AC devices drawing power which may have caused the overload of the unit). Wait one minute, then switch the operating mode switch to either “AUTO” or “CHARGE ONLY”.

Output Circuit Breaker Reset: Alternatively, check the unit's output circuit breaker. If it has tripped, remove some of the electrical load, wait one minute to allow components to cool, and reset the circuit breaker. See the Troubleshooting section for other reasons why AC output may be absent.

Troubleshooting

Try these remedies for common Inverter/Charger problems before calling for assistance. Call Tripp Lite Customer Service at +1 773 869 1234 before returning your unit for service.



SYMPTOM	PROBLEMS	CORRECTIONS
No AC Output (All Indicator Lights Are Off)	Unit is not properly connected to utility power.	Connect unit to utility power.
	Circuit breaker is tripped.	Reset circuit breaker.
Battery Not Recharging (AC Input Present)	Connected batteries are dead.	Check and replace old batteries.
	Battery fuse* is blown.	Check and replace fuse.*
	Battery cabling* is loose.	Check and tighten or replace cabling.*
	Unit has shut down due to battery overcharge (preventing battery damage). The problem may be with connected auxiliary chargers, if any, or with the unit's charger.	Disconnect any auxiliary chargers. Reset by moving Operating Mode Switch to "DC OFF." Wait 1 minute and switch to "AUTO" or "CHARGE ONLY." If unit remains in shutdown mode after several attempts to reset, contact Tripp Lite Customer Service for assistance.
All Three Battery Indicator Lights Are Flashing (¼ Second Flashes)	Battery is overcharged. Unit will shut down to prevent battery damage. The problem may be with connected auxiliary chargers, if any, or with the unit's charger.	Disconnect any auxiliary chargers. Reset by moving Operating Mode Switch to "DC OFF." Wait 1 minute and switch to "AUTO" or "CHARGE ONLY." If unit remains in shutdown mode after several attempts to reset, contact Tripp Lite Customer Service for assistance.
Red "LOW" Battery Indicator Light is Flashing	Battery voltage is low. Unit will automatically shut down after 10 seconds to protect battery from damage.	Make sure that AC power is present in order to recharge batteries. Operating Mode Switch must be set to "AUTO" or "CHARGE ONLY."
	False reading due to undersized or insufficiently connected DC cabling.	Use sufficient size DC cable sufficiently connected to the Inverter/Charger.
Red "LOAD" Operation Indicator Light Flashing	Inverter is overloaded. Unit will automatically shut down after 5 seconds.	Reduce load. Operating Mode Switch must be set to "AUTO" or "CHARGE ONLY."

* User-supplied.

Specifications

Model:	APSX700HF
AC Input Connection:	IEC 60320 C14
AC Output Connection:	IEC 60320 C13
Battery Connection:	Hardwire

Inverter

Continuous Output Capacity (@ 20° C)	700W/700VA
Peak Output Capacity (Instantaneous)	1400W
DC Input Volts (Nominal)	12 V DC
DC Input Voltage Range	10-15 V DC
Minimum DC Fuse Rating	125 A
DC Input Current @ Nominal V DC Full Load:	72 A

Battery Charger

Input:	230 V, 50 Hz AC
Charging Capacity DC:	6 A

Line VAC Operation

Total Input AC Current (Continuous, Charger at Maximum):	4.5 A
Maximum Output Current (Continuous):	3 A

Battery Wiring

For maximum efficiency, keep battery wires as short as possible. For very short runs, 6 AWG (4.115 mm) wiring may be adequate; for longer runs, 4 AWG (5.189 mm) or 2 AWG (6.544 mm) wiring is recommended.

Note: Acceptable power is directly dependent on wire length, i.e. the shorter the wiring, the better the performance. Total wiring length is the sum of the positive and negative wiring lengths.

Note on Labeling

Two symbols are used on the APS labels.

V~: AC Voltage ---: DC Voltage

Service

If you are returning your Inverter/Charger to Tripp Lite, please pack it carefully, using the ORIGINAL PACKING MATERIAL that came with the unit. Enclose a letter describing the symptoms of the problem. If the Inverter/Charger is within the warranty period, enclose a copy of your sales receipt. To obtain service you must obtain a Returned Material Authorization (RMA) number from Tripp Lite or an authorized Tripp Lite service center.

Maintenance

Your Inverter/Charger requires no maintenance and contains no user-serviceable or user-replaceable parts, but should be kept dry at all times. Periodically check, clean and tighten all cable connections as necessary, both at the unit and at the battery.

Limited Warranty

Tripp Lite warrants its Inverter/Chargers to be free from defects in materials and workmanship for a period of one year (except for outside of U.S.A., Canada and Mexico—120 days) from the date of retail purchase by end user

Tripp Lite's obligation under this warranty is limited to repairing or replacing (at its sole option) any such defective products. To obtain service under this warranty you must obtain a Returned Material Authorization (RMA) number from Tripp Lite or an authorized Tripp Lite service center. Products must be returned to Tripp Lite or an authorized Tripp Lite service center with transportation charges prepaid and must be accompanied by a brief description of the problem encountered and proof of date and place of purchase. This warranty does not apply to equipment which has been damaged by accident, negligence or misapplication or has been altered or modified in any way, including opening of the unit's casing for any reason. This warranty applies only to the original purchaser who must have properly registered the product within 10 days of retail purchase.

EXCEPT AS PROVIDED HEREIN, TRIPP LITE MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.

EXCEPT AS PROVIDED ABOVE, IN NO EVENT WILL TRIPP LITE BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF THIS PRODUCT, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. Specifically, Tripp Lite is not liable for any costs, such as lost profits or revenue, loss of equipment, loss of use of equipment, loss of software, loss of data, costs of substitutes, claims by third parties, or otherwise.

Regulatory Compliance Identification Numbers

For the purpose of regulatory compliance certifications and identification, your Tripp Lite product has been assigned a unique series number. The series number can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to the series number. The series number should not be confused with the marking name or model number of the product.

Tripp Lite follows a policy of continuous improvement. Product specifications are subject to change without notice.



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