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**Owner's guide:**

E-1000 / E-1500 / E-2000  
HD-1200 / HD-1800 / HD-2500  
HDI-1800 / HDI-3000

*Install using*  
***Tundra CM Series***  
*installation kit*

*Ask your retailer !*

*(See page 4 for details)*

**[www.tundrainternational.com](http://www.tundrainternational.com)**

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# 1 Introduction

Congratulations! You have purchased one of the most sophisticated and reliable power inverters on the market today. Incorporating some of the latest technological developments, it will give years of trouble free operation for your truck, boat, R.V. or other.

In order to get the most out of your inverter, the installation procedure must be followed carefully and it must also be properly used. Please thoroughly read this manual before installing and using your new inverter. **It is important to pay special attention to the CAUTION and WARNING statements in this manual as well as on the inverter.** Should the inverter be exposed to rain, moisture, or strong impact, have it inspected by a qualified technician before use.

**WARNING!** The electrical current at the entrance and exit of your inverter may cause severe personal injury; make certain that you have read and understand all the parts of this manual before installing and using your inverter.

**WARNING!** The inverter produces an electrical current similar to that found in most North American homes, with all the accompanying dangers. Be sure to install the product out of the reach of children.

## 1.1 Disclaimer

Electrical codes vary depending on location and the type of installation. Electrical installations must meet local and national wiring codes and should be performed by a qualified electrician.

The inverter's specifications are subject to change without notice.

## 1.2 Output waveform

The AC output of your inverter is regulated to 120 volts and its waveform is called a "Modified Sine Wave." It is a stepped waveform, suitable for most AC loads, designed to have characteristics similar to sine waves delivered by utility power. Note that our modified sine wave output power is much more efficient than the "square wave" generated by other inverters on the market today.

The modified sine wave generated by your inverter is designed to have an RMS (Root Mean Square) voltage of 120 volts, the same voltage as that coming out of standard household power. Most AC voltmeters are sensitive to the average value of the waveform rather than the RMS value. They are calibrated for RMS voltage assuming the voltage waveform is "pure sine wave." These meters may not read the modified sine wave correctly; they will read about 2-20 volts lower. To read the voltage correctly, you must use a true RMS reading voltmeter.

# 2 Front , rear panel & remote control

## FRONT PANEL

ON/OFF switch: The ON/OFF switch turns the inverter's control circuit ON and OFF. **It does not disconnect power from the inverter; you must disconnect the AC (120 volts) and DC (12 volts) power before working on any circuits connected to the inverter.** When the switch is on but no power is being supplied to a load, the inverter draws less than 500 mA. This is a very low current draw but left in this state the inverter will eventually drain your batteries until its automatic shut down at 11 volts (see 4.3).

AC Outlets: The maximum output of your inverter is assumed to go through the two AC outlets. HD Models are also equipped with one hard wire outlet which can be used as the only output socket.

**CAUTION!** Leave in the OFF position during the installation.

**REAR PANEL**

- Chassis ground screw: The chassis ground screw must be properly connected to the chassis of your vehicle before operating the inverter.
- Fan(s): In order for the inverter to properly operate, the fan(s) opening must never be obstructed. Allow at least six inches of clearance around the inverter for airflow. All fans are thermostatics and operate upon the interior temperature of inverter.

**REMOTE CONTROL** (Except E-1000)

- ON/OFF: Your inverter is equipped with one 6 meters jack remote switch. The remote switch allows you to mount your inverter out of sight and turn it ON or OFF from a convenient location. The ON/OFF switch on the inverter’s front panel must be turned on for the remote to be operational.
- Input Voltage: By pressing the “SELECT” button until the “INPUT VOLTAGE ” light comes on, the battery voltage indicator displays the voltage at the input terminal of the inverter. Usually this voltage is very close to the battery voltage and the difference, if any, is caused by the resistance of the cables and connections. A regular maintenance will contribute to minimize the possible resistance (see 5).
- Output Power: By pressing the “SELECT” button until the “OUTPUT POWER” ligh comes on, the watts indicator displays the current provided by the inverter in KW. 1 KW = 1000 watts. If you read 1.20, it means the inverter is providing 1200 watts.
- “FAULT” light: An audible alarm will sound announcing a faulty condition such as: low or high battery voltage and overload.
- “OVERTEMP” light: An audible alarm will sound announcing an overtemp condition.
- “LVP” on display: Indicates the inverter is in Low input Voltage Protection mode (see 4.3).
- “OLP” on display: Indicates the inverter is in High input voltage Protection mode or if your consumption exceeds the nominal capacity of the inverter (see 4.3).

<b>3 Permanent Installation</b>
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**The use of the Tundra International installation kits is strongly recommended.** These complete installation kits are custom designed to maximize performance. It has been developed to promote safe installation and to help eliminate the difficult task of sourcing the requisite and right material.

**3.1 Recommended material**

	<i>E-1000</i>	<i>HD-1200 E-1500</i>	<i>HD/HDI-1800 E-2000</i>	<i>HD-2500</i>	<i>HDI-3000</i>
- <b>Tundra CM series installation kit</b>	<b>CM1000</b>	<b>CM1200/1500</b>	<b>CM1800/2000</b>	<b>CM2500</b>	<b>CM3000</b>
Or					
- Welding cable	AWG #4	AWG #2	AWG #1/0	AWG #2/0	AWG #3/0
- Battery copper cable No. 8 AWG					
- PVC strain relief for flexible cable	½”	½”	¾”	¾”	1”
- 6 Tin plated terminal lugs					
- CNL fuse block					
- CNL fuse	100A	150A	200A	250A	300A
- Plastic « loom » tubing					
- Heavy duty AC power distribution center					
- Red and black heat shrinkable tubing					
- Plastic cable ties					
- Clamps and bolts					

### 3.2 Recommended tools

- Hand held crimping tool for terminal lugs \* **Mandatory**
- Hollow punch or hole saw for metal
- Drill bit set for metal
- Screw driver set
- Open end wrench set
- Side cutters
- Power drill

**CAUTION!** Before installation, make sure that the inverter is turned “OFF.”

### 3.3 Where to install

Your inverter should be installed in a location that meets the following requirements:

- Dry: Keep the inverter away from any water or moisture.
- Cool: Ambient air temperature should be between 32 and 85 degrees Fahrenheit (0 and 30° Celsius).
- Ventilated: Ensure that the unit is located in a well-ventilated compartment. At least 6 inches of clearance are required around the inverter for air flow. Verify that all ventilation openings on the unit (front and rear panels) are not obstructed.

**CAUTION!** To avoid fire hazards and/or overheating, do not cover or obstruct any ventilation openings. Do not install the inverter in a zero clearance compartment.

- Safe: Do not install the inverter in the same compartment as batteries, or in any compartment capable of storing flammable liquids (such as gasoline). Power inverters may produce sparks that can result in fire if exposed to flammable vapors.

**WARNING!** This equipment contains components that tend to produce arcs or sparks. To reduce the risk of fire or explosion, do not install in a compartment containing batteries or flammable materials, or in a location that requires ignition protected equipment.

- Close to batteries: Install the inverter as close as possible to the batteries (but not in the same compartment) in order to minimize the cable length required to connect the inverter to the batteries. It is better and cheaper to run longer AC wire (between the inverter and your appliances) than DC cables (between the inverter and the batteries).

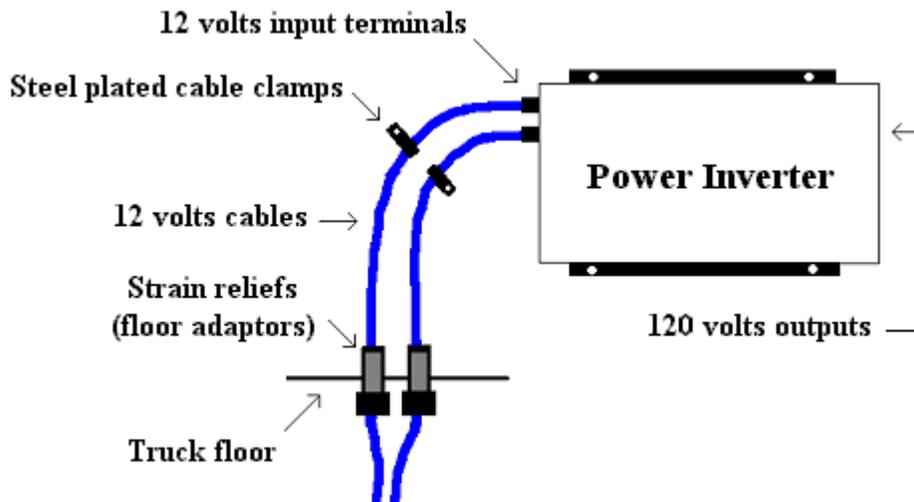
### 3.4 Mounting the inverter

When you have decided where to place it, mount the inverter on a flat surface using the mounting flanges. Mounting hardware should be corrosion resistant, and 1/4” or larger. The inverter may be mounted on a vertical surface (the fans’ opening must not point up or down) or on a horizontal surface. Upside down installation is not recommended, as it may put too much stress on the housing of your power inverter.

If your inverter is equipped with a remote control, plug its cable into the remote switch jack on the front or rear panel of the inverter.

Close to the inverter, drill two holes in the truck’s floor and install the two strain reliefs about 3 inches apart (Figure 3).

**Figure 3 : Installation schema**



### **3.5 Ground**

The inverter has a lug on the rear panel that must be connected, using a #8 AWG copper cable, to the chassis of your vehicle or to a metallic panel connected to the chassis. This grounding procedure conforms to most electrical codes that require to derived AC sources to ground in case of malfunctioning. To make sure that you found a good grounding point, run a 12 volt test light from the positive terminal of your battery to your grounding point. If the light comes on, your installation is more than likely OK.

**WARNING!** Do not operate the inverter if the ground screw of the inverter is not properly connected to the chassis of your vehicle, it may result in electrical shock hazard.

### **3.6 Battery cables**

Proper wiring is very important for safe and proper operation of the inverter (see 3.1). Since the inverter has a low voltage (12 volts) and a high current input, low resistance wiring and connections between the batteries and the inverter is essential in order to deliver the maximum amount of usable energy to your load. Don't waste the investment you have made in a highly efficient inverter by using cheap and undersized cables!

Use only covered, flexible, copper wires capable of withstanding temperatures in excess of 215° Fahrenheit. As included in our CM series kits, we recommend welding cables as the best size & type for connection between the batteries and your inverter. Keep the cable length as short as possible, no longer than 12 feet. This will ensure that the overall system efficiency is as high as possible, and will keep the voltage drop between the batteries and the inverter to a minimum. If the voltage drop is too excessive, the inverter may shut down.

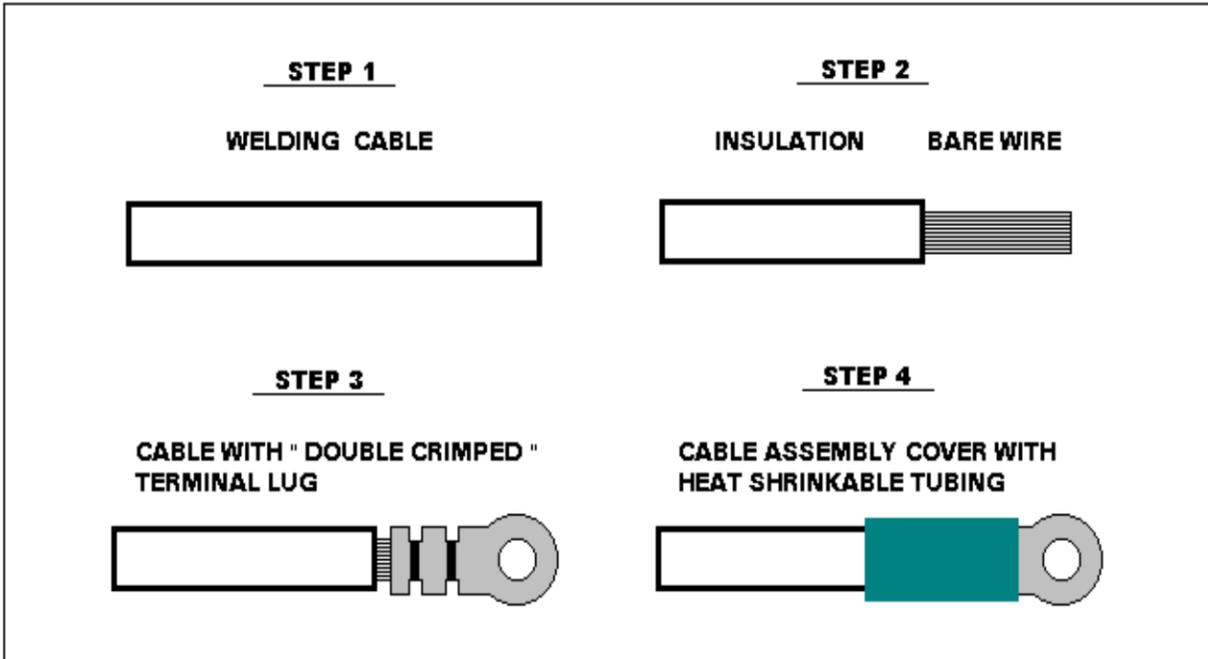
#### **3.6.1 Preparation of the cable connected to the "positive" end**

Measure and cut the length of cable necessary to connect the positive (+) end of the battery to that of the inverter, not forgetting the length needed to allow movement due to the suspension of the cabin. The cable must be cut in two pieces, of which the small part must be six inches (Figure 5).

Strip a half-inch off each of the four cable ends, insert the longer section of the cable in a PVC strain relief, and install good quality tin plated terminal lugs on the bare wires. Crimp the terminals with a hand held crimping tool (the use of locked pliers (*Vice-Grip*) is not recommended), until the entire cable is crimped, and then cover each section of bared wire with good quality **RED** shrinkable tubing (Figure 4).

**CAUTION!** Do not solder the terminal lugs to cables. Solid and low resistance connections to the DC power source is essential in order to properly operate the inverter. The solderings cannot provide such connections.

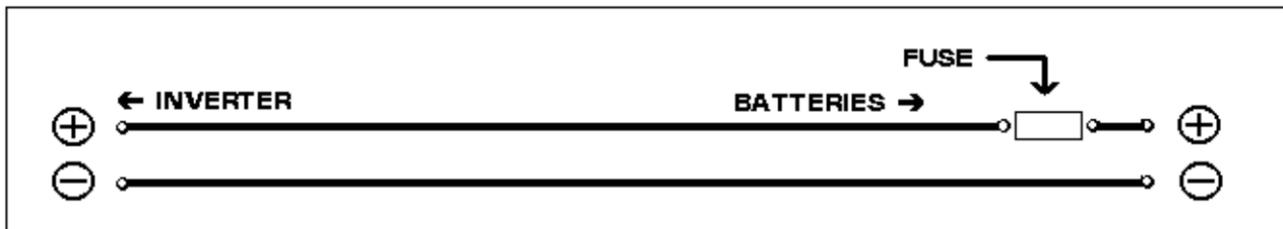
**Figure 4 : Terminals' crimping procedure**



### 3.6.1.1 Fuse

A main fuse must be installed in the battery casing on the positive cable (+) between the batteries and the inverter, as close as possible to the batteries. In this way (and in the event of cable rupture), the DC current would be cut at the batteries and would not cause a fire.

**Figure 5 : Fuse schema**



We recommend a "CNL" type fuse, mounted on a "CNL" fuse holder like to ones included in our CM series kits. Plug one terminal of the small and the long cable's sections on the fuse holder, as illustrated in figure 5, and install the fuse. Without tightening them too much, the terminals must be solidly fixed onto the fuse holder, and must not be able to move around.

**CAUTION!** Not installing a fuse can result in fire that may cause severe injuries and/or damages.

### 3.6.2 Preparation of the cable connected to the negative side

Determine and cut the length of cable which you need to connect the negative side (-) of the battery to that of the inverter, without forgetting the necessary length to allow movements due to the suspension of the cabin. Strip approximately a half-inch of insulation from the two ends of the cable, insert the cable through the second PVC strain relief, and install good quality tin plated terminal lugs on the stripped sections. Crimp the terminals with a hand held crimping tool (the use of a locked plier (*Vice-Grip*) is not recommended) until the whole cable is crimped and then cover each section of stripped cable with good quality **BLACK** shrinkable tubing (refer to Figure 4).

### 3.7 Connecting the Inverter

The next step is to make sure that the inverter is turned OFF. Insert the rubber insulators (included with the inverter) on the terminal lugs and connect the cables (terminal lugs) to the inverter's DC input terminals: the terminal covered with the RED shrink tube to the positive (+) pole and the terminal covered with the BLACK shrink tube to the negative (-) pole. Make a secure connection using the nuts included with the inverter. The terminal must not move around on the DC terminal, but it must not be too tight either. The rubber insulators will protect the DC connections and will prevent the terminal from being touched by other metallic pieces.

**CAUTION!** Never put a washer or a nut between the terminal lugs and the 12 volts DC input terminals; this results in poor conductivity and may cause the inverter to overheat and cause a fire.

Tighten the PVC strain relief nut on the cables until the rubber seal is properly compressed and the cables cannot move. Run the cables under your cab and cover them with plastic loom (included in our CM series kits) to prevent damage from road debris. Fasten both cables together every 4 inches with plastic cable ties; try to run both DC (12 volts) cables as close as possible together to reduce the risk of interference (see 6.1) with your television or CB radio. While keeping in mind to allow cables to move with your cabin air suspension, secure the cables to the chassis from the cabin's floor to the batteries with several metallic clamps covered with caoutchouc (included in our CM series kits). These clamps will prevent the cables from being cut or damaged by the vehicle's vibrations.

### **3.8 Connection of the batteries**

If you are working with a multiple battery bank, choose a battery with no accessory connected, as it will extend your batteries' life. Before going further, it is important to correctly identify the cable connected to the positive terminal of the inverter, and the one connected to the negative terminal. **The cables must go from the positive terminal of the inverter to the positive terminal of the battery, and of the negative terminal of the inverter to the negative terminal of the battery. Incorrectly connecting the battery and inverter will damage your inverter permanently, and is not covered by the warranty.** Always connect the positive terminals before the negative.

**CAUTION!** Reversing the polarity when connecting the DC cables will permanently damage your inverter. ***THIS IS NOT COVERED BY THE WARRANTY.***

#### **3.8.1 Positive Terminal**

Always connect the positive terminals before the negative. Plug the small section of the cable connected to the positive terminal of the inverter to the positive terminal of the battery, by solidly fixing the terminal with the nut. Without tightening them too much, the terminals must not be able to move around.

#### **3.8.2 Negative Terminal**

The last step is to connect the cable between the negative terminal of the inverter to the negative terminal of the battery, by solidly fixing the terminal with the nut. Without tightening them too much, the terminals must not be able to move around.

**WARNING!** You may observe a spark when making the cable connections since current may flow and charge capacitors in the inverter. This is normal. Do not make cable connections in the presence of flammable fumes; it may result in explosion and/or fire.

## **4 Operation**

To operate the power inverter, turn it on by using the ON/OFF switch on the front panel and then by the remote switch (if equipped). The inverter is now ready to deliver AC 120 volts power to your load. If you are operating several loads from the inverter, turn them on separately after the inverter itself has been turned on. This will ensure that the inverter does not have to deliver the starting power for all the loads at once.

### **4.1 Trouble loads**

The waveform of your inverter is called a "Modified Sine Wave." It is a stepped waveform suitable for most AC loads, designed to have characteristics similar to sine wave delivered by utility power. Some appliances, however may not adequately filter the waveform produced by the inverter and could, althow unlikely, be damaged. If you are unsure about powering any device with a modified sine wave power inverter, contact the manufacturer of the device. None of these potential problems can happen with the Tundra International pure sine wave inverters (HTS series).

## 4.2 Microwave

The power rating used with microwave ovens is the cooking power which refers to the power being *delivered* to the food being cooked. The actual operating power requirement rating is 40% to 100% higher than the advertised cooking power. The actual power consumption is usually stated on the back of the microwave. If the operating power requirement cannot be found on the back of the microwave, check the owner's manual or contact the manufacturer.

## 4.3 Operating limits

Power output: Your inverter is designed to deliver its full output power continuously, and has a double power surge capacity for less than 1 second.

Input voltage: The inverter will operate with input voltages between 11 and 15 volts. Optimum performance is achieved, however, with input voltages between 12.0 and 14.0 volts. If the voltage drops lower than a certain preprogrammed level (see 7), the low battery warning alarm will sound..

The inverter will shut down if the voltage drops below a certain preprogrammed level (see 7). The “LVP” code will be displayed on the remote. This protects your batteries from being over-discharged. The inverter will not restart unless the input voltage exceeds 13.2 volts.

The inverter will shut down if the voltage exceeds 15 volts or if your consumption exceeds the nominal capacity of the inverter. The “OLP” code will be displayed on the remote. This protects the inverter from excessive input voltage. While the inverter incorporates protection against over voltage, it may still be damaged if the input voltage exceeds 16 volts.

# 5 Maintenance

Very little maintenance is required to keep the inverter operating properly. You should clean the exterior with a dry cloth to prevent dust accumulation. A regular maintenance check is recommended, DC input bolts or screws should be tightened periodically, cables should also be inspected for solidity and exterior condition. You must also keep your batteries as clean as possible to prevent current loss that may affect inverter operation.

**CAUTION!** If you work on the DC input terminals of your power inverter, disconnect both wires at the battery side to avoid any short circuit.

# 6 Troubleshooting

## 6.1 Television and CB radio interference

Operating your inverter can interfere with television and CB radio reception. If this occurs, the following steps may help to alleminate the problem:

- Make sure that your inverter is properly grounded to the chassis of your vehicle (see 3.5).
- Reduce power consumption while watching television
- Move the television as far as possible from your inverter
- Run both DC cables as close as possible together with cable ties.

## 6.2 Troubleshooting guide

<b>Problem</b>	<b>Possible cause</b>	<b>Solution</b>
Low output voltage (96 to 105 volts)	Using a voltmeter which cannot properly read the RMS voltage of a modified sine wave	Use a <u>TRUE RMS</u> reading voltmeter
Fault indicator ON	Low input voltage  High input voltage  Short circuit or AC wiring error  Inverter overload	Not enough battery capacity  Recharge batteries  Improper installation. Check each inverter's installation steps  Check vehicle alternator condition  Check the AC wiring (120 volts) and test your appliances on an other power supply to validate their functionality  Remove or reduce load, switch the inverter OFF at least 5 second and restart the inverter
No output voltage	Inverter off  No DC power to the inverter  Reverse DC polarity	Turn the inverter on  Check the wiring  Check battery fuse et check the installation before changing it  Replace internal fuses of the inverter. Damage caused by reversed polarity is not covered by the warranty.
Alarm on all the time  "LVP" code on remote display	Poor battery condition  Poor DC wiring  Poor DC terminal lugs connections	Charge or change battery  Use proper cables and make solid connections  Use proper crimping tool
Overheat indicator on	Thermal shutdown  Improper installation	Reduce load  Allow inverter to cool off  Improve ventilation  Install properly

## 7 Specifications

Model no	E 1000	E 1500	E 2000	HD 1200	HD 1800	HDI 1800	HD 2500	HDI 3000
AC output continuous power	1000 W	1500 W	2000 W	1200 W	1800 W	1800 W	2500 W	3000 W
AC output power surge	2000 W	3000 W	4000 W	2400 W	3600 W	3600 W	5000 W	6000 W
AC output voltage	120 V	120 V	120 V	120 V	120 V	120 V	120 V	120 V
AC output waveform	Modified	Modified	Modified	Modified	Modified	Modified	Modified	Modified
DC input voltage	12 V	12 V	12 V	12 V	12 V	12 V	12 V	12 V
Low battery alarm	11,5 V	11,5 V	11,5 V	11,5 V	11,5 V	<b>10,5 V</b>	11,5 V	<b>10,5 V</b>
Low battery shutdown	11.0 V	11.0 V	11.0 V	11.0 V	11.0 V	<b>10.0 V</b>	11.0 V	<b>10.0 V</b>
No load current draw "ON"	<0.5 Amp	<0.5 Amp	<0.5 Amp	<0.5 Amp	<0.5 Amp	<0.5 Amp	<0.7 Amp	<0.7 Amp
Cooling fan(s)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Overload protection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Over temperature shutdown	131 °F ±10%	131 °F ±10%	131 °F ±10%	131 °F ±10%	131 °F ±10%	131 °F ±10%	131 °F ±10%	131 °F ±10%
Dimensions (L x W x H) in cm.	30 x 17.8 x 8.6	42.9 x 17.8 x 8.6	42.9 x 17.8 x 8.6	35.6 x 27.4 x 10.2	51 x 27.4 x 10.2	51 x 27.4 x 10.2	55.4 x 27.4 x 10.2	55.4 x 27.4 x 10.2
Net weight	2.2 kg	3.7 kg	3.7 kg	5.4 kg	9.1 kg	9.1 kg	9.5 kg	9.8 kg

Specifications are subject to change without notice.

## 8 Limited one-year warranty

Tundra International Inc. warrants its power inverters against defects in workmanship and materials for a period of one (1) year from the date of first consumer purchase. This warranty is given only to the first end-use purchaser of the product.

This limited warranty is void if the unit is abused, modified, installed improperly, if the housing has been removed, if the serial number is missing, or if the original identification markings have been defaced, altered, or removed. Tundra International Inc. is not liable for any incidental, consequential or other damages arising from the use, misuse, or operation of this product; including, without limitation, damages resulting from loss of use, cost of removal, installation, or troubleshooting of the customer's electrical systems.

Tundra International Inc. will, without charge, repair or replace, at its option, a defective inverter upon delivery, with all shipping and handling costs, and full insurance, paid for by the purchaser, to the Tundra International Service Department: 2041-A Léonard-De Vinci, Ste-Julie, Quebec, J3E 1Z2. The following information, clearly printed, must be included with the defective unit: Your name and street address, a daytime telephone number and/or email address, a detailed description of the problem and the proof of the date of first consumer purchase, such as duplicated sale receipt.

