samlexpower®

Pure Sine Wave Power Inverter

Onduleur à Onde Sinusoïdale Pure

NTX-400-12
NTX-600-12

NTX-400-24
NTX-600-24

Owner's Manual

Guide d'Utilisateur

Please read this manual BEFORE installing your inverter.

Veuillez lire ce manuel AVANT d'installer votre onduleur.

OWNER'S MANUAL | Index

SECTION 1 | Important Safety Instructions

1.1 IMPORTANT SAFETY INFORMATION: This manual contains vital information regarding the safe operation, maintenance, and storage of this product. Before using, it is crucial to thoroughly read and understand all cautions, warnings, instructions, and product labels, as well as the guidelines provided by your vehicle's battery manufacturer. Failure to do so may result in injury and/or property damage.

1.2 Proper installation and use of your power inverter are essential for reliable performance. Prior to installation and operation, review the installation and operating instructions included in this manual. Pay close attention to the WARNING and CAUTION statements:

CAUTION indicate practices that could lead to inverter damage.
WARNING highlight conditions or practices that may result in personal injury.

It is imperative to read all instructions before using this product.

1.3  WARNINGS!

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

1. The AC output of the unit should never be connected directly to an Electrical Breaker Panel / Load Center which is also fed from the utility power / generator. Such a direct connection may result in parallel operation of the different power sources and AC power from the utility / generator will be fed back into the unit which will instantly damage the output section of the unit and may also pose a fire and safety hazard.
2. Working with the unit may produce arcs or sparks. Thus, the unit should not be used in areas where there are flammable materials or gases requiring ignition protected equipment. These areas may include spaces containing gasoline-powered machinery, fuel tanks, battery compartments and engine compartments.
3. FLOATING NEUTRAL: the AC Ground and the Neutral are not bonded on this device.
4. Before working on an AC load connected to the inverter, switch OFF the inverter or, remove the power cord of the AC load from the inverter. Switching OFF the power strip disconnects only the "Line / Hot"line.
5. Do not make any electrical connections or disconnections in areas designated as IGNITION PROTECTED. This includes 12 VDC cigarette plug connections, and terminal connections.
6. This is not a toy - keep away from children.
7. Do not insert any object into the ventilation slots or the fan opening(s).

SECTION 1 | Important Safety Instructions

MISE EN GARDE!

POUR RÉDUIRE LES RISQUES D'INCENDIE, DE DÉCHARGE ÉLECTRIQUE, D'EXPLOSION OU DE BLESSURE

1. La puissance AC de l'unité ne doit jamais être connecté directement à un disjoncteur électrique / Centre de charge qui est également alimentée par l'utilitaire d'alimentation / le générateur. Un tel lien peut résulter en fonctionnement en parallèle des différentes sources d'alimentation et cordon d'alimentation de l'utilitaire / générateur va être réinjectées dans l'unité qui va instantanément des dommages de la section des sorties de l'unité et peuvent également poser un danger d'incendie et de sécurité.
2. Travailler avec l'unité peut produire des arcs ou d'étincelles. Ainsi, l'unité ne doit pas être utilisé dans des zones où il y a des matériaux inflammables ou les gaz nécessitant une protection contre l'inflammation de l'équipement. Ces domaines peuvent inclure des espaces contenant des machines fonctionnant à l'essence, les réservoirs de carburant, les compartiments de batterie et les compartiments moteur.
3. NEUTRE FLOTTANT : la mise à la terre AC et le neutre ne sont pas reliés sur cet appareil.
4. Avant de travailler sur l'entrée CA connectée à l'onduleur, éteindre l'onduleur et retirer le câble d'alimentation de l'entrée CA de l'onduleur. Éteindre la multiprise déconnecte seulement la ligne sous tension.
5. Ne pas effectuer des branchements électriques quelconques ou de déconnexions dans les zones désignées comme protégées contre l'incendie. Cela comprend 12 VCC cigarette les connexions, et les connexions de borne.
6. Ce n'est pas un jouet - Tenir hors de portée des enfants.
7. N'insérez aucun objet dans les orifices de ventilation ou dans l'ouverture du ventilateur(s).

1.4 CAUTION!

1. Do not use with Positive Grounded Electrical Systems (the majority of modern automobiles, RVs and trucks are Negative Grounded Electrical Systems).
2. Use specified fuse in the Positive supply connection within 7" of the Positive battery post. See Table 4.1 and Fig 4.2.
3. Observe correct polarity when connecting the DC input terminals of the inverter to the battery. Connect Positive of the battery to the Positive input connector of the inverter and the Negative of the battery to the Negative input terminal of the inverter. **Reverse polarity connection will result in a blown fuse and may cause damage to the inverter. Damage due to reverse polarity is not covered under warranty.**
4. This inverter will not operate high wattage appliances that exceed the output power limit or the surge power limit.
5. **Installation Environment**
   - The 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 vents in the front or rear of the inverter, they are there for the cooling fan and are critical for operation and safety.
   - To ensure proper ventilation, do not install in a low clearance compartment.

SECTION 1 | Important Safety Instructions

6. **Precautions When Working With Batteries**
   - Lead acid batteries contain very corrosive diluted Sulfuric Acid as electrolyte. Precautions should be taken to prevent contact with skin, eyes or clothing.
   - Lead acid 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's recommendations.
   - 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 severe burn.
   - If you need to remove a battery, always remove the ground (Negative) terminal from the battery first. Make sure that all the accessories are off so that you do not cause a spark.
7. This inverter is not tested for use with medical devices.

ATTENTION!

1. Ne pas l'utiliser avec la prise positive des systèmes électriques de mise à la terre (la plupart des voitures modernes, les véhicules de camping et les camions et ont des systèmes électriques de mise à la terre négative).
2. Utiliser spécifié fusible dans le liaison alimentation positive au sein de 7" de la borne positive de la batterie. Voir le tableau 4.1 et la figure 4.2.
3. Lorsque vous connectez les bornes aux prises CC de l'onduleur vers la batterie, observez une polarité appropriée. Connectez le pôle positif de la batterie à la prise de connexion positive de l'onduleur et le pôle négatif de la batterie à la prise de connexion négative de l'onduleur. **Une connexion à polarité inversée brûlera le fusible et endommagera l'onduleur. Les dommages dus à l'inversion de polarité ne sont pas couverts par la garantie.**
4. Cet onduleur ne pourra faire fonctionner des appareils de forte puissance qui dépassent la limite de courant de la prise ou la limite de surtension.
5. **Environnement d'installation**
   - L'onduleur doit être installée en intérieur uniquement dans un local bien ventilé, cool, environnement sec.
   - Ne pas exposer à l'humidité, la pluie, la neige ou les liquides de tout type.
   - Afin de réduire le risque de surchauffe et d'incendie, Ne bloquez pas les évents à l'avant ou à l'arrière de l'onduleur, ils sont destinés au ventilateur de refroidissement et sont essentiels pour le fonctionnement et la sécurité.
   - Afin de garantir une ventilation correcte, ne l'installez pas dans un compartiment à faible dégagement.
6. **Précautions à prendre lors de travaux avec des batteries**
   - Les piles contiennent très corrosif de l'acide sulfurique dilué comme électrolyte. Des précautions devraient être prises pour prévenir tout contact avec la peau, les yeux ou les vêtements.
   - Les batteries produisent de l'hydrogène et d'oxygène pendant la charge résultant de l'évolution de mélange de gaz explosifs. Le soin devrait être pris pour ventiler la zone de batterie et suivre les recommandations du fabricant de la batterie.
   - Ne fumez jamais ou permettre à une étincelle ou une flamme à proximité des batteries.
   - Faire preuve de prudence afin de réduire le risque de chute d'un outil métallique sur la batterie. Il pourrait susciter ou court-circuit de la batterie ou d'autres pièces électriques et

pourrait provoquer une explosion.

- Retirer les articles en métal tels que bagues, bracelets et montres lors de travaux avec des batteries. Les batteries peuvent produire un courant de court circuit suffisamment élevé pour souder un anneau ou similaires de métal et, par conséquent, causer de graves brûlures.
- Si vous devez retirer une batterie, retirez toujours la borne de masse (négative) de la batterie en premier. Assurez-vous que tous les accessoires sont désactivés de sorte que vous n'avez pas provoquer une étincelle.

7. Cet onduleur n'a pas été testé pour son utilisation avec des appareils médicaux.

1.5 **WARNING!**

Do not connect directly to AC distribution wiring. This inverter is NOT grid interactive.

MISE EN GARDE!

Ne pas connecter directement à un câblage de distribution CA. Cet onduleur n'est pas interactif avec le réseau

SECTION 2 | Design Features and Principle of Operation

2.1 GENERAL

The inverter converts low voltage DC (Direct Current) from a battery or other DC power source to the standard nominal 115 volt AC (Alternating Current) household power.

2.2 DESIGN FEATURES

- Pure Sine Waveform of AC output voltage
- High efficiency
- Compact size
- Very low Idle current
- Soft Start Technology
- USB Charging Port, 5 VDC, 2.1 A
- Low noise variable speed fan

2.3 POWER RATINGS

The continuous power ratings of the models are as follows:

- NTX-400-12, NTX-400-24 - 400 Watts
- NTX-600-12, NTX-600-24 - 600 Watts

2.4 PRINCIPLE OF OPERATION

The voltage conversion takes place in two stages. In the first stage, the DC voltage of the battery is converted to a high voltage DC using high frequency switching and Pulse Width Modulation (PWM) technique. In the second stage, the high voltage DC is converted to 115 VAC, 60 Hz pure sine wave AC again using PWM technique. This is done by using a special wave shaping technique where the high voltage DC is switched at a high frequency and the pulse width of this switching is modulated with respect to a reference sine wave.

2.5 THE OUTPUT WAVEFORM

The AC output waveform of the NTX-series inverter is known as "Pure Sine Wave". It is a waveform that has characteristics same as the sine wave shape of utility power (See Fig 2.1). Modified Sine Wave is also shown for comparison.

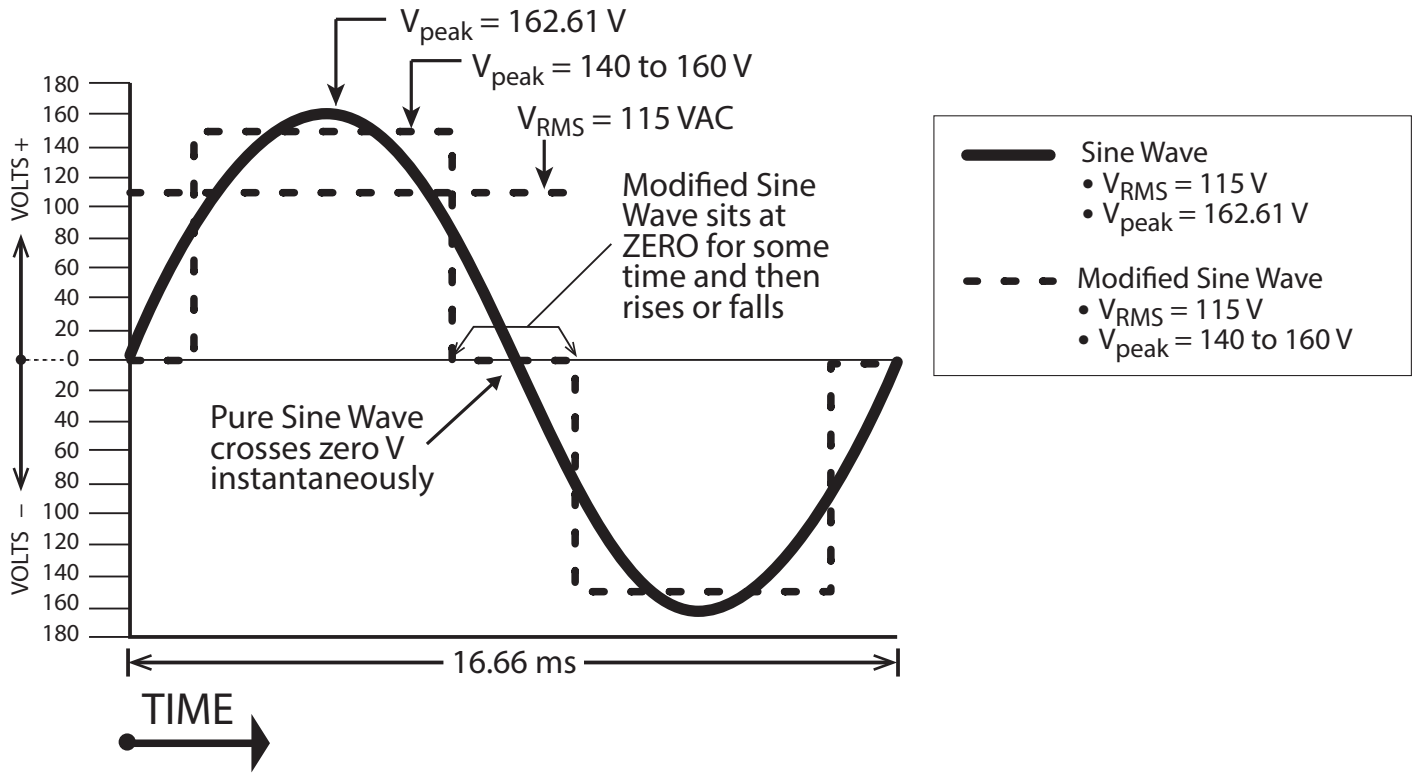


Fig 2.1 Pure and Modified Sine Waveforms for 115 V, 60 Hz

SECTION 3 | Layout and Dimensions

3.1 NTX-400-12/24 AND NTX-600-12/24 LAYOUT

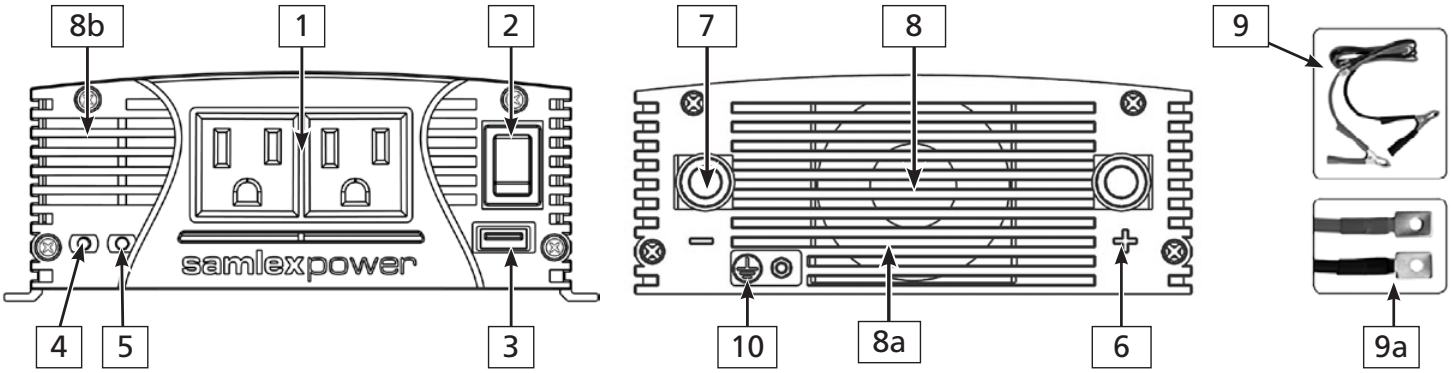


Fig. 3.1 Front and Rear View of NTX-400-12/24 and NTX-600-12/24

Legend for Fig 3.1

1. AC Outlets: Two NEMA5-15R receptacles.

2. ON/OFF Switch
3. Type A USB Charging Port 5 VDC, 2.1 A
4. Multi-color LED: ***Blue:*** Will be ON when DC Section is operating normally.
5. Multicolor LED:
   Yellow: Will be ON during (i) Over temperature shutdown, (ii) Shut down due to low DC input voltage and (iii) Shut down due to high DC input voltage.
   Red LED: Will be ON during shut down due to (i) Overload, (ii) Short Circuit.
6. Positive DC Input Connector: Thumb Screw - Size M4.
7. Negative DC Input Connector: Thumb Screw - Size M4.
8. Cooling fan.

8(a). Ventilation grille for fan ; Air from fan is exhausted outwards..

8(b). Ventilation slots for air intake.

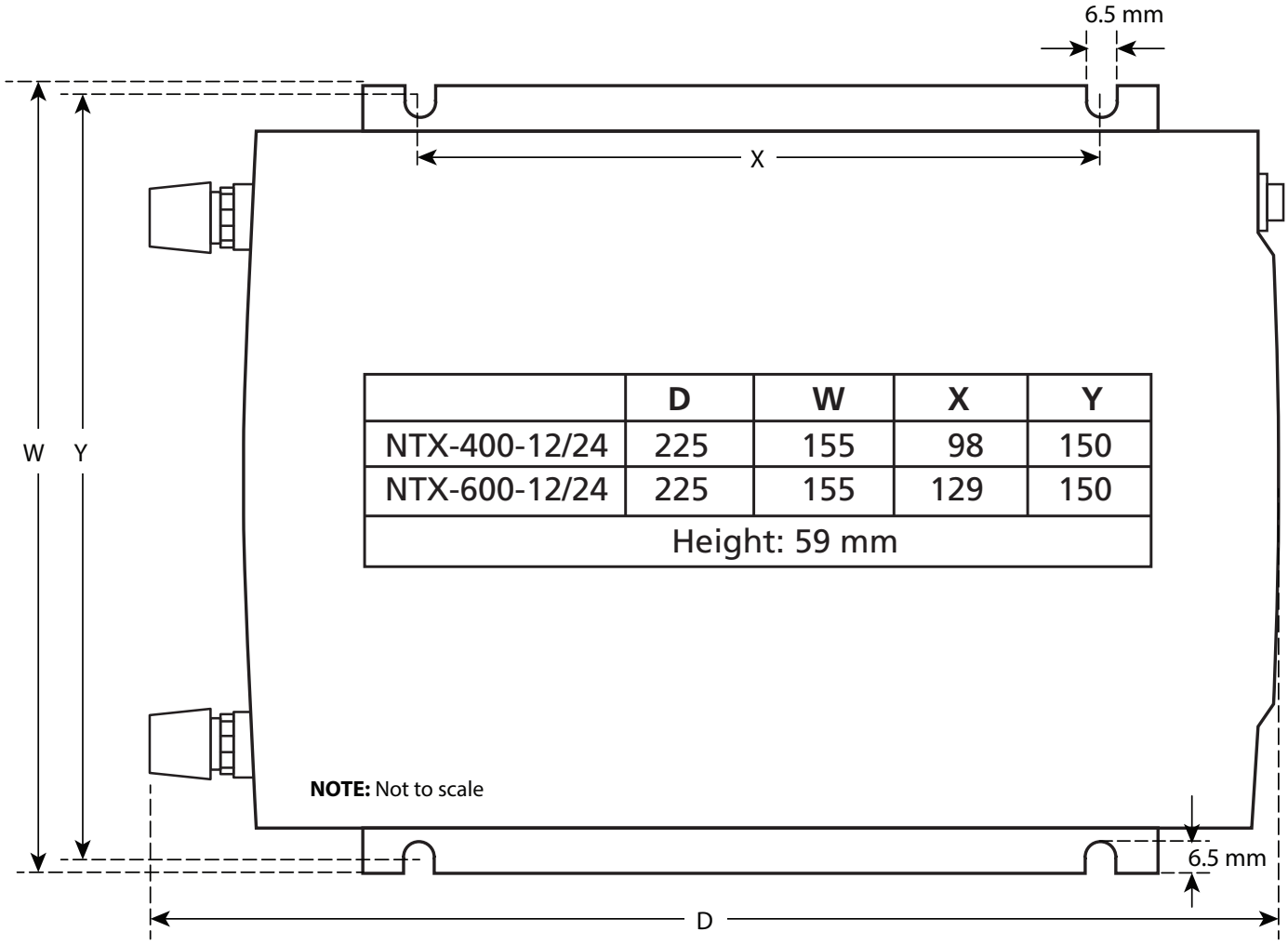
9. Battery Cable Clamp for temporary battery connection (3 ft): Positive and Negative wires with flat rectangular terminal lugs for inverter side and battery clamps for battery side. AWG#8

9(a). Flat, rectangular terminal lugs on the cable set 9 for connection to DC input terminals on the inverter.

10. Earth Ground symbol. Connect this Ground Post to the appropriate earth ground of the system (vehicle chassis or earth ground) in accordance with electrical code.

SECTION 3 | Layout and Dimensions

3.2 DIMENSIONS



	D	W	X	Y
NTX-400-12/24	225	155	98	150
NTX-600-12/24	225	155	129	150
Height: 59 mm				

Fig 3.2 Dimensions

WARNING!

1. Before commencing installation, please read the safety instructions explained in Section 1 titled "Important Safety Instructions".
2. It is recommended that the installation should be undertaken by a qualified, licensed / certified electrician.
3. Various recommendations made in this manual on installation will be superseded by the National / Local Electrical Codes related to the location of the unit and the specific application.

MISE EN GARDE!

1. Avant de faire l'installation, veuillez lire les «Consignes de Sécurité».
2. On recommande que l'installation soit faite par un(e) électricien(ne) CERTIFIÉ(E).
3. Il y a plusieurs consignes trouvées dans ce guide qui ne sont pas toujours appliquables si une norme nationale ou locale en prend place, concernant par example l'endroit d'installation ou à l'usage de l'appareil. Quelques exemples sont écrites ci-dessous.

SECTION 4 | Installation

4.1 LOCATION OF INSTALLATION

Ensure that the following requirements are met:

Cool: Heat is the worst enemy of electronic equipment. Hence, please ensure that the unit is installed in a cool area that is also protected against heating effects of direct exposure to the sun or to the heat generated by other adjacent heat generating devices.

Well ventilated: The unit is cooled by convection and by forced air-cooling by a load and temperature controlled variable speed fan. The fan will start running slowly at 15% loading. At 70% rated load, it will run at high speed. At any point, if the internal temperature is > 70°C, the fan will run at high speed (temperature control will override load control). The fan draws cool air from air intake openings in the front and discharges hot air through the exhaust openings in front of the fan. To avoid shut down of the inverter due to over temperature, do not cover or block these intake / exhaust openings or install the unit in an area with limited airflow. Keep a minimum clearance of 10" around the unit to provide adequate ventilation.

Dry: There should be no risk of condensation, water or any other liquid that can enter or fall on the unit.

Clean: The area should be free of dust and fumes. Ensure that there are no insects or rodents. They may enter the unit and block the ventilation openings or short circuit electrical circuits inside the unit.

Protection against fire hazard: The unit is not ignition protected and should not be located under any circumstance in an area that contains highly flammable liquids like gasoline or propane as in an engine compartment with gasoline-fueled engines. Do not keep any flammable / combustible material (i.e., paper, cloth, plastic, etc.) near the unit that may be ignited by heat, sparks or flames.

Closeness to the battery bank: Locate the unit as close to the battery bank as possible to prevent excessive voltage drop in the battery cables and consequent power loss and reduced efficiency. The unit should not be installed in an enclosed compartment with flooded or wet cell batteries as these generate flammable gases. If these gases are not vented they could ignite and cause an explosion.

Accessibility: Do not block access to the front panel. Also, allow enough room to access the AC receptacles and DC wiring terminals and connections, as they will need to be checked and tightened periodically.

Preventing Electromagnetic Interference (EMI): The unit uses high power switching circuits that generate un-intentional conducted and radiated EMI that can not be eliminated entirely. This EMI is limited to the required standard [FCC Part 15(B), class A]. These limits are designed to provide reasonable protection against harmful interference when this unit is operated in business / commercial / industrial environments. Locate any electronic equipment susceptible to radio frequency and electromagnetic interference as far away from the inverter as possible.

4.2 MOUNTING

Please refer to Fig 3.2 for dimensions and mounting details.

The inverter has four mounting slots that allow the unit to be fastened against a bulkhead, floor, wall or other flat surface. Ideally, the mounting surface should be cool to the touch.

It is electrically efficient to use longer AC wiring than DC wiring, so install the inverter as close as possible to the DC power source.

SECTION 4 | Installation

The inverter can be operated in any position, however, if it is to be mounted on a wall, mount it horizontally as shown in Fig 4.1(a) so that indicators, switches, outlets and terminal blocks located on the front panel are visible and accessible. Do not mount on wall in positions shown in Figs. 4(b) & 4(c) because small metal objects may fall into the unit through the ventilation slots and cause electrical short circuit.

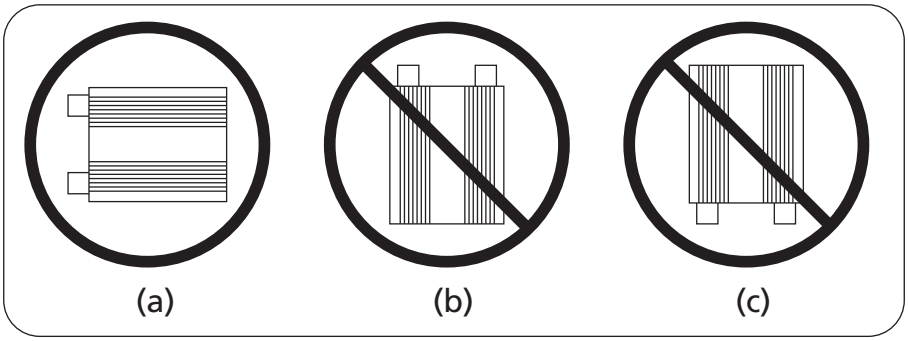


Fig. 4.1 Mounting arrangement on wall

CAUTION!

The 12V models must be connected only to batteries with a nominal output voltage of 12V. The unit will sustain **permanent damage** if connected to a 24V battery.

ATTENTION!

L'onduleur de courant ne doit être connecté qu'à des batteries ayant une sortie de voltage nominale de 12 V. L'unité ne fonctionnera pas à partir d'une batterie de 6 volts et subira **des dégâts permanents** si elle est connectée à une batterie de 24 volts.

CAUTION!

Loose connectors may cause overheated wires and melted insulation. Check to make sure you have not reversed the polarity of battery input connections. Reverse polarity connection will result in a blown fuse and may cause **permanent damage** to the inverter. **Damage due to reverse polarity is not covered by warranty.**

ATTENTION!

Des connexions mal serrées peuvent provoquer une surchauffe des fils et la fusion de l'isolation. Vérifiez que vous n'avez pas inversé la polarité des connexions d'entrée de la batterie. Une polarité inversée fera sauter le fusible et pourrait causer **des dégâts permanents** au convertisseur. **Les dégâts provoqués par une polarité inversée ne sont pas couverts par la garantie.**

4.3 BATTERY / DC POWER SOURCE REQUIREMENTS

The battery / DC power source must be within 10.5 VDC to 16.3 VDC for 12 V units / 21 VDC to 32.6 VDC for 24 V units, and must be able to supply the necessary current to operate the load. The power source may be a battery or a well-regulated DC power supply. To obtain a rough estimate of the current (in Amperes) the power source must deliver, simply divide the power consumption of the load (in Watts AC) by 10 (for 12 V) and (for 24 V).

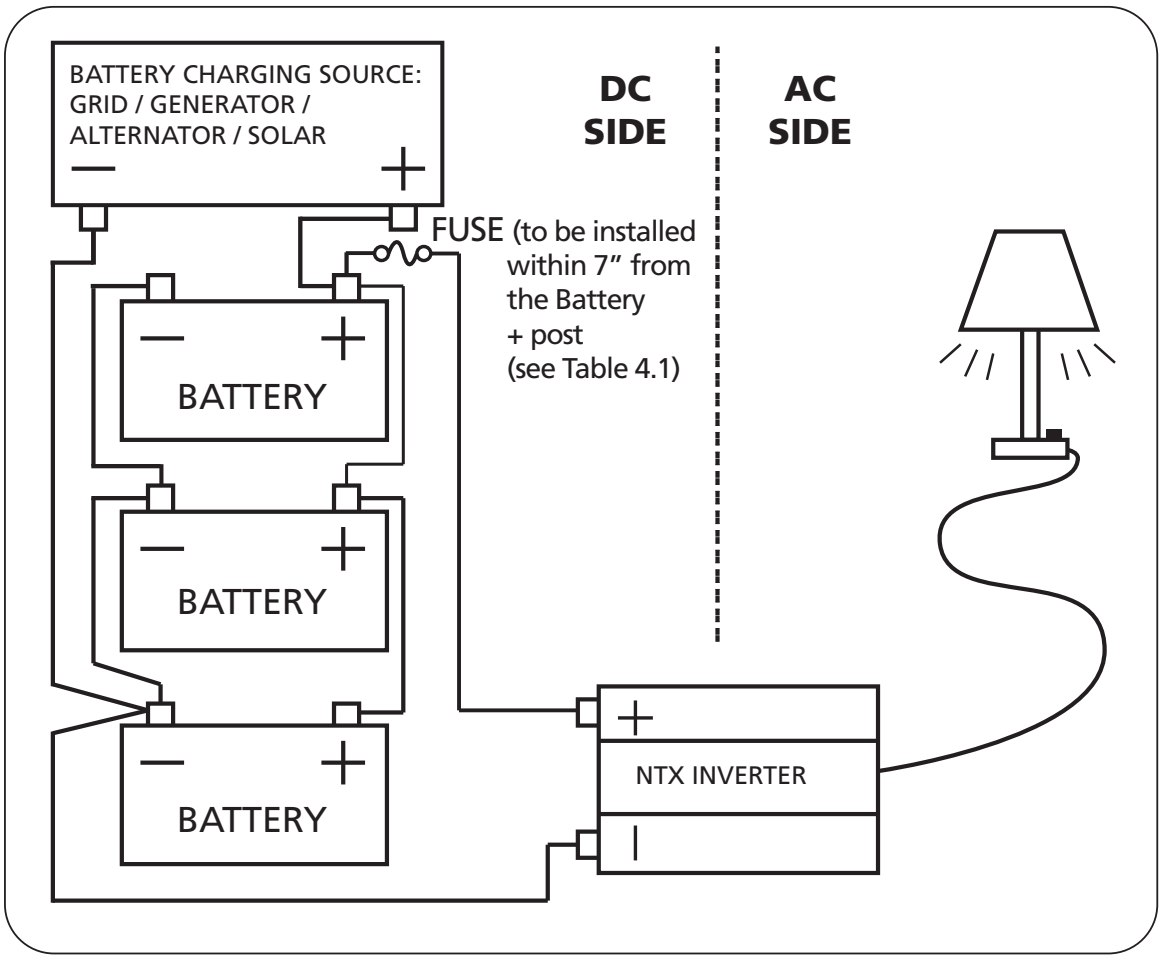


Fig 4.2 Connecting to a Battery Source

4.4 CABLE SETS WITH BATTERY CLAMPS FOR TEMPORARY INSTALLATION

For temporary installation, a Battery Cable with Clamp has been provided. Included with your NTX inverter is a 3ft/AWG#8 cable with flat rectangular terminal lugs for the inverter side and battery clamps for the battery side.

4.5 DC INPUT WIRING FOR PERMANENT INSTALL

WARNING!

Install appropriate size battery DC Fuse within 7 inches to protect against fire hazard due to short circuit along the battery cable run. The high currents in a short circuit on a battery, can cause severe burns, and the molten metal ejected from a short circuit may cause loss of vision. The internal DC Fuses in the inverter do not protect against external short circuits. The Battery Fuse is required to maintain a safe system.

MISE EN GARDE!

Installer un fusible CC de taille appropriée à un maximum de 7 pouces de la batterie pour contrer les risques d'incendie dus à un court-circuit le long des câbles de la batterie. Le courant élevé d'un court-circuit sur une batterie peut causer de graves brûlures, et le métal en fusion éjecté par un court-circuit peut entraîner une perte de vision. Les fusibles CC internes de l'onduleur ne protègent pas des courts-circuits externes. Il est nécessaire d'installer un fusible de batterie pour assurer la sécurité du système.

Table 4.1 DC Input Rating and Recommended Fuse Size

Model No.	Rated DC Input Current	NEC Ampacity	Recommended Fuse
NTX-400-12	40 A	50 A	50 A
NTX-400-24	20 A	25 A	25 A
NTX-600-12	60 A	75 A	75 A
NTX-600-24	30 A	37.5 A	40 A

If you are installing the inverter in a permanent installation, utilize the battery clamp cable provided and modify accordingly without extending the length of the cable. The inverter side of the DC input cable is terminated with a custom, flat terminal lug. The terminal lug fits the rectangular slot in the DC input terminal under the M4 thumb screw.

1. Use supplied cable for the permanent installation. Replace cable clamps with appropriate terminations to install to the battery fuse assembly on the battery positive and the negative post of the battery.
2. Ensure that the inverter's power switch is turned OFF and that no flammable fumes are present.
3. Identify the Positive (+) and Negative (-) terminals of the 12 V battery or the other 12 VDC source.
4. Install a fuse within 7" of the Positive (+) battery terminal. Refer to Table 4.1 for recommended fuse.
5. Check to be sure that all connections are secure and tight.
6. Test the inverter by turning it on and plugging in a 100 Watt lamp or equipment.
7. If the inverter does not operate properly, then refer to Section 7, Troubleshooting of this manual.

4.5.1 GROUNDING THE INVERTER

When making a permanent installation in a building, connect an AWG #8 insulated stranded copper wire from the metal frame/chassis to an Earth Ground connection, this can be a metal water pipe or a dedicated DC ground bus tied to a grounding rod. This connections is SEPERATE from the DC Negative connection as the inverters chassis is not internally bonded to the DC Negative. The connection must be tight against bare metal, clear paint and use star washers to ensure a proper connection.

When using the inverter in a mobile RV, connect an AWG #8 insulated stranded copper wire from the above equipment grounding lug to the appropriate ground bus of the RV (usually the vehicle chassis or a dedicated DC ground bus). The connections must be tight against bare metal. Use star washers to penetrate paint and corrosion.

4.6 FLOATING NEUTRAL

The Neutral terminal of the two NEMA5-15R outlets are electrically isolated from its Ground terminal and also from the metal chassis of the inverter.

4.7 USB CHARGING PORT

Models NTX-400-12/24 and NTX-600-12/24 are provided with USB Charging Port. This port can be used for charging batteries in USB compatible personal devices like cell phones, etc. The port is rated at 5 VDC, 2.1 A.

4.8 PARALLEL OPERATION IS NOT PERMITTED

WARNING! Avoid Parallel Operation of the AC Output

a) Under no circumstances should the AC output be directly connected to an electrical breaker panel/load center also powered by utility/generator. Such a connection risks parallel operation between the inverter's AC output and utility/generator power. This would feed AC power back into the inverter, causing immediate damage to its output section and potentially creating fire and safety hazards. If the breaker panel/load center is powered by utility/generator and the inverter is meant to serve as a backup power source, both power sources must first be routed through a manual selector switch/automatic transfer switch. The output of this switch should then connect to the breaker panel/load center.

b) To prevent the risk of parallel operation and serious damage to the inverter, never use a simple jumper cable with male plugs at both ends to connect the inverter's AC output to a convenient wall receptacle in a home/RV.

MISE EN GARDE! Éviter le fonctionnement en parallèle de la sortie CA

a) Une telle configuration risque d'engendrer un fonctionnement en parallèle entre la sortie CA de l'onduleur et le réseau public ou la génératrice. Du courant alternatif serait ainsi renvoyé dans l'onduleur, entraînant des dommages immédiats à la section de sortie et des risques d'incendie et d'accident. Si le tableau de disjoncteurs ou de répartition est alimenté par le réseau public ou une génératrice et que l'onduleur est installé comme source d'alimentation de secours, les deux sources d'alimentation doivent être branchées à un interrupteur sélecteur manuel ou à un commutateur de transfert automatique. La sortie de ce commutateur devrait être ensuite branchée au tableau de disjoncteurs ou de répartition.

b) Pour prévenir les risques de fonctionnement en parallèle et de graves dommages à l'onduleur, ne jamais utiliser un simple câble de raccord doté des connecteurs mâles aux deux extrémités pour brancher la sortie CA de l'onduleur à une prise de courant dans une maison ou un véhicule récréatif.

SECTION 5 | Operation

5.1 OPERATING ENVIRONMENT

Before operating the inverter, please ensure that all installation requirements given in Section 4 and safety requirements in Section 1 have been met.

5.2 SWITCHING ON AND SWITCHING OFF LOAD

Please ensure that the following procedure is used for switching ON and switching OFF the inverter when a load is already connected to the inverter:

5.2.1 Switching ON

1. Switch OFF the load connected to the inverter
2. Switch ON the inverter
3. Wait for a few seconds
4. Switch ON the load

5.2.2 Switching OFF

1. Switch OFF the load connected to the inverter
2. Switch OFF the inverter

5.3 CONNECTING LOADS

1. Make sure that the total power requirements of equipment being connected to the inverter does not exceed the inverters output power rating.
2. Switch OFF the inverter
3. Switch OFF the load
4. Plug the cord(s) from the load(s) into the AC receptacle(s) of the inverter
5. Switch on the inverter. Wait for a few seconds
6. The Blue LED indicator will be lighted to indicate that the inverter is functioning.
7. Switch on the load(s)

5.4 UNDERSTANDING EQUIPMENT POWER CONSUMPTION AND INVERTER CAPACITY

Before operating any electrical tools, appliances, or audio/video equipment with the inverter, it's crucial to understand their power consumption in relation to the inverter's capacity. Most devices have labels indicating their power consumption in Amps or Watts. Ensure that the power consumption of the equipment you intend to use does not exceed the inverter's capacity. The inverter features overload protection and will shut down if overloaded.

To restart the inverter after an overload shutdown, remove the overload if necessary, switch the power OFF, wait for 2 to 3 minutes, and then switch ON again. For further details on overload symptoms and protections, refer to Sections 6.4 and 7.

5.5 SIZING CHART FOR LOADS WITH HIGH STARTING SURGE

Appliances and devices typically specify only their running power requirements. However, some devices require a higher surge power during startup. The surge power for specific devices should be checked with the manufacturer or estimated based on testing.

Table 5.1 provides a list of common loads with high surge power requirements at startup. Each load is accompanied by a "Sizing Factor," which is a Multiplication Factor to be applied to the rated running Wattage of the load to determine the continuous power rating of the inverter. Simply multiply the running Watts of the device by the Sizing Factor to determine the required continuous power rating of the inverter.

Table 5.1 Sizing of Inverter for Loads with Starting Surge	
Type of Device or Appliance	**Sizing Factor**
Air conditioner	5
Refrigerator / Freezer (Compressor based)	5
Air Compressor	4
Sump Pump / Well Pump / Submersible Pump	3
Dishwasher	3
Clothes Washer	3
Microwave (In cases where the rated output power is the Cooking Power)	2
Furnace Fan	3
Industrial Motor	3
Portable Kerosene / Diesel Fuel Heater	3
Circular Saw	3
Bench Grinder	3
Incandescent / Halogen / Quartz Lamps	3
Laser Printer / Other Devices using Infrared Quartz Halogen Heaters	4
Switched Mode Power Supplies (No Power Factor correction)	2
Photographic Strobe / Flash Lights (with respect to its Watt Sec rating)	4*

*** In the case of photographic strobe / flash unit, the RMS surge power of the inverter should be more than 4 times the Watt Sec rating of the photographic strobe / flash unit.**

5.6 DETERMINING BATTERY SIZE

To determine the minimum battery size that you will need to operate appliances, follow these simplified steps:

1. Determine the Active AC Input Power in Watts for each appliance and/or equipment you will need to simultaneously operate from the inverter. To do this, read the label on the equipment to be operated. Usually, the label will specify the Active Power drawn in Watts. Sometimes the label will specify the current draw in Amperes (A). Multiply this value of current draw in Amperes (A) by the AC input voltage (V) to determine the Apparent AC Input Power in Volt Amperes (VA). The Active Input Power will be equal to the Apparent Input Power (VA) multiplied by the Power Factor (PF) of the load. Depending upon the type of load, the Power Factor (PF) may range from 1 (Resistive type of load) to 0.6 (Reactive type of load). For practical purposes, the Power Factor (PF) may be considered as 1. Hence, Active Power in Watts will be equal to the Apparent Power (VA). Let's call this AC.
2. For each appliance, estimate the number of hours the appliance will be in use between battery recharges.
3. For each appliance, determine the Watt-Hours of energy required by multiplying the AC wattage by the number of hours of use.
4. Add the Watt-Hours of energy for each appliance to get the total Watt-Hours of energy for all appliances to be used.
5. Divide the total Watt-Hours of energy on the AC side by 10 to get the total Ampere-Hour of energy on the 12 VDC side to support the operation of the appliances. If using a 24 VDC battery system, divide the total Watt-Hours on the AC side with 20 instead of 10.
6. The Ampere-Hour (Ah) capacity of the battery should be 2 times the total Ampere-Hour energy

required on the 12 VDC side to support the operation of the devices (as calculated at step 5 above). Two times factor is generally required because lead acid batteries are normally not discharged below 50% capacity. If using a drop-in lead acid replacement lithium battery, this two times factor may not be necessary since Lithium batteries can generally be discharged to 20% capacity or less. Most battery spec sheets from the battery manufacturer should provide this information..

To get an estimate of the current (in Amps) that the battery is delivering to power a particular AC side load, divide the load's AC consumption power (in Watts) by 10 (for 12 V systems), and 20 (for 24 V systems).

Keep in mind that most appliances are not operating for long periods of time. For example, a typical home-use coffee maker draws 500 Watts during its brew time of 5 minutes, but it maintains the temperature of the pot at about 100 Watts. Typical use of a microwave is only for a few minutes, sometimes at low power. Similarly, refrigerator compressor does not remain ON at full rated power at all times but switches ON and OFF based on its thermostat setting, ambient temperature, frequency of opening/closing and the temperature of food item(s) when first stored. As a Rule of Thumb, its operating Duty Cycle [ON Time ÷ (ON Time + OFF Time)] is around 30%. Hence, a refrigerator rated at say 100 W will draw Watt-Hour Energy of 720 Watt-Hour in a 24 Hour cycle [(100 W x 24 Hrs) x 30% = 720 W]. Some exceptions to brief operating times are TVs, computers etc.

In most instances, the inverter can be left connected to the battery when not in use. However, make sure that the inverter is switched OFF using the ON/OFF Switch (2 in Fig 3.1). This will prevent unnecessary drain on the batteries due to self consumption and operation of cooling fan(s).

5.7 MONITORING OF ALARMS & FAULTS

Please refer to Section 6.8 for monitoring of alarms and faults through front panel LEDs and buzzer.

5.8 PROTECTIONS

Please refer to Section 6 for details on various protections.

5.9 TROUBLESHOOTING

Please refer to Section 7 for Troubleshooting Guide.

SECTION 6 | Protections

6.1 OVER TEMPERATURE PROTECTION

In case the fan fails or if the cooling is inadequate due to high ambient temperature or restricted air flow, the temperature inside the inverter will rise. Temperature rise is sensed at a critical internal hot spot. If this temperature reaches 105 °C, the AC output will be switched OFF temporarily. The unit will reset automatically after the internal hot spot has cooled down. The unit may be reset manually by switching off the ON/OFF Switch, waiting for 15 minutes for the unit to cool down and then, switching ON again.

Refer to Table 6.1 for front panel indications for this condition.

Refer to Section 7 - Troubleshooting Guide for more details of symptoms, causes and remedies related to this protection.

6.2 LOW BATTERY VOLTAGE PROTECTION

This condition is not harmful to the inverter but could reduce life of the batteries. The inverter automatically shuts down when input voltage drops below 10.5 ± 0.3 VDC (12 V units) / 21 ± 0.5 VDC (24 V units). The unit will automatically turn ON when the voltage rises above 11.5 ± 0.3 VDC (12 V untis) / 23 ± 0.3 VDC (24 V units).

Refer to Table 6.1 for front panel indication for this condition.

Refer to Section 7 - Troubleshooting Guide for more details of symptoms, causes and remedies related to this protection.

6.3 OVER VOLTAGE PROTECTION

The inverter will automatically shut down when the input voltage exceeds 16.3 ± 0.3 VDC (12 V units) / 32.6 ± 0.3 VDC (24 V units). The unit will reset automatically when the voltage drops to 16.3 ± 0.3 VDC (12 V units) / 32 ± 0.3 VDC (24 V units).

Refer to Table 6.1 for front panel indications for this condition.

Refer to Section 7 - Troubleshooting Guide for more details of symptoms, causes and remedies related to this protection.

6.4 OVERLOAD PROTECTION

The inverter will automatically shut down during an overload of 115% to 125% lasting for 3 to 5 sec. Refer to Table 6.1 for front panel indications under this condition.

The inverter will remain latched in shut down condition and will require manual reset as described below:

From the Front Panel of the unit:

1. Remove the cause of overload in the load side
2. Switch off the unit using the On/Off Switch (2 in Fig 3.1)
3. Wait for 2 minutes and switch the unit on again

Refer to Section 7 – Troubleshooting Guide for more details of symptoms, causes and remedies related to this protection.

SECTION 6 | Protections

6.5 SHORT CIRCUIT PROTECTION

During a short circuit, abnormally high current is drawn by the inverter. The inverter will automatically shut down under short circuit condition within a very short period of around 0.1 sec. Refer to Table 6.1 for front panel indications under this condition.

The inverter will remain latched in shut down condition and will require manual reset as described below:

From the Front Panel of the unit:

1. Remove the cause of the short circuit in the load side
2. Switch off the unit using the On/Off Switch (2 in Fig 3.1)
3. Wait for 2 minutes and switch the unit on again

6.6 LOW INPUT VOLTAGE ALARM

An alarm will sound when the voltage at the input terminals of the inverter drops below the low voltage alarm point. This is an indication that either the battery terminal voltage has dropped due to its discharged condition and needs to be re-charged or the cables used are not sized according to recommendations provided in Table 6.1. The user should stop operation of the load at this time since the inverter will shut down automatically shortly thereafter.

The alarm resets automatically when the DC input voltage rises to 1V above the alarm point.

Refer to Section 7 - Troubleshooting Guide for more details of symptoms, causes and remedies related to this protection.

NOTE: It is normal for the alarm to sound while the unit is being connected to or disconnected from the power source. This is not indicative of a problem.

6.8 MONITORING OF ALARMS AND FAULTS THROUGH FRONT PANEL LEDS AND BUZZER

Table 6.1 below shows operation of the two multi-colored LEDs which will indicate Blue, Yellow, and Red as described below. in the front panel and internal Buzzer under various alarm / fault conditions. Refer to Troubleshooting Guide under Section 7 for additional details. Refer to Figure 3.1 for location of LED indicators.

Table 6.1 Alarm & fault monitoring through Front Panel LEDs, and internal buzzer

Description of Fault / Alarm	Buzzer	LED			AC Output
		Blue	Yellow	Red	
Low voltage shutdown	On	On	On	Off	No
Low voltage alarm	On	On	Off	Off	Yes
High voltage shutdown	Off	On	On	Off	No
Over temperature shutdown	Off	On	On	Off	No
Overload shutdown	Off	On	Off	On	No
Short circuit shutdown	Off	On	Off	On	No

SECTION 7 | Troubleshooting Guide

TROUBLE / SYMPTOMS	POSSIBLE CAUSE(S)	SUGGESTED REMEDIES
NO AC OUTPUT ***On the Inverter Front Panel*** • Blue LED is ON • Yellow LED is ON • Red LED is OFF • No buzzer alarm	**Over Temperature Shutdown** Check that the location of the unit follows the installation instructions in Section 4. Check air vents are not blocked. Fan failure: After restarting the unit, monitor to see that the fan eventually turns on. The fan should come on before the Over Temperature Shutdown happens again.	1. The inverter will remain latched in this shut down condition and will be required to be reset manually by switching OFF, waiting for 15 minutes and switching ON again. 2. Before using the inverter again, please ensure that the cause of over temperature has been removed
NO AC OUTPUT ***On the Inverter Front Panel*** • Blue, Yellow & Red LED are OFF • No buzzer alarm	**Loss of DC input power to the inverter** 1. If there is no voltage at the DC input terminals: • Battery is dead • External DC input fuse is blown • Loose connection along the circuit from the battery to the DC input terminals. 2. If there is voltage at the DC input terminals: • Internal DC input fuses have blown	1. Check DC side wire connections and fuses. 2. If the input DC Fuse has blown, the unit is no longer operational and can not be fixed. If this occurred due to a reverse polarity of battery, then the product is not covered by Warranty.
NO AC OUTPUT ***On the Inverter Front Panel*** • Blue LED is ON • Red LED is ON • No buzzer alarm	**Shut down due to overload or short circuit** 1. Inverter has shut down because the power drawn by the load is more than the continuous / surge ratings or there is a short circuit on the load side.	1. Reduce the load or disconnect the load that is causing overloading 2. Check for short circuit and remove the short. 3. When the inverter shuts down due to overload / short circuit, it will be latched in shutdown condition and will require a manual reset as follows: **From the front panel of the unit:** • Switch the On/Off Rocker Switch to off position • Wait for 2 to 3 minutes for the internal latching circuit to de-energize completely • Switch the On/Off Rocker Switch to on position
AC OUTPUT IS AVAILABLE ***On the Inverter Front Panel*** • Blue LED is ON • Buzzer alarm sounds intermittently when connected to equipment. • Yellow LED comes ON when buzzer alarm is sounded. The DC input voltage at the terminals of the inverter is dropping below 11 V and bouncing back up.	**Pulsating Intermittent Low Voltage Condition** 1. There is loose connection between the battery and the inverter. 2. The battery is in poor condition and hence, has an abnormal voltage drop. 3. The battery is partially discharged and is near the low voltage alarm set point.	1. Check and tighten all connections from the battery to the inverter terminals. 2. Check and maintain batteries according to manufacturers recommendations. Replace batteries as needed. 3. Charge the battery prior to running equipment.
NO AC OUTPUT ***On the Inverter Front Panel*** • Blue LED is ON • Buzzer alarm sounds all the time • Yellow LED is ON	**Shutdown due to low DC input voltage** 1. There is loose connection between the battery and the inverter. 2. The battery is in poor condition and hence, has an abnormal voltage drop. 3. The battery is partially discharged and is near the low voltage alarm set point.	1. Check and tighten all connections from the battery to the inverter terminals. 2. Check and maintain batteries according to manufacturers recommendations. Replace batteries as needed. 3. Charge the battery prior to running equipment.

SECTION 8 | FUSE REPLACEMENT

TROUBLE / SYMPTOMS	POSSIBLE CAUSE(S)	SUGGESTED REMEDIES
NO AC OUTPUT ***On the Inverter Front Panel*** • Blue LED is ON • Buzzer alarm is OFF • Yellow LED is ON	**Shutdown due to high DC input voltage** DC input voltage has risen to High DC Input Voltage Shutdown Threshold of 16.3 V (12 V units) / 32 VDC (24 V units)	1. Switch OFF the AC load and the inverter 2. Disconnect the DC input to the inverter 3. Check the output voltages of the battery and charging source and ensure these are below the High DC Input Voltage Shutdown Threshold of 16.3 V +/- 0.3 V 4. Check that a 24V battery is not being used instead of 12 V battery for 12 V units 5. The unit will reset automatically once the voltage drops to 16V (12 V units) / 32 V (24 V units)
MOTORIZED POWER TOOL WILL NOT START	Excessive start-up current from the load is activating the Soft Start Circuit and is reducing the output voltage and consequently, the current to a level where the starting torque required by the motor is not sufficient to turn the motor. (Starting torque in a motor is proportional to Voltage and the Current)	If appliance does not start, then the appliance is drawing excessive power and will not work with the inverter
MOTORIZED POWER TOOL DOES NOT OPERATE AT CORRECT SPEED	Purely inductive load is activating the soft start circuitry and reducing the output voltage resulting in reduced speed	Make the load not purely inductive. Operate an incandescent lamp at the same time as the motor. This will reduce the reactive power and raise the Power Factor so that the Soft Start Circuit is not activated

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SECTION 8 | Fuse Replacement

8.1 FUSES INSIDE THE INVERTER

The AC side is protected by an integral electronic overload circuit and will automatically reset in some cases.

The DC side is protected by fuses that are located inside the inverter. Normally, these fuses will not blow unless a serious problem occurs.

DO NOT replace the fuses. The fuses have blown due to internal failure conditions of the unit or a reverse polarity on the DC Input and other internal components are damaged.

CAUTION!

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

ATTENTION!

IL N'Y A PAS DE COMPOSANTES ACCESSIBLES POUR L'UTILISATEUR À L'INTÉRIEUR. NE TENTEZ PAS D'OUVRIR L'ONDULEUR.

SECTION 9 | SPECIFICATIONS

MODEL NO.	NTX-400-12	NTX-600-12
INPUT		
DC INPUT VOLTAGE RANGE	10.5 - 16.3 VDC (± 0.3 VDC)	
DC INPUT CURRENT AT RATED LOAD	40 A	60 A
DC INPUT CURRENT AT NO LOAD	< 0.8 A	< 0.9 A
OUTPUT		
AC OUTPUT VOLTAGE	115 VAC (± 5 VAC)	
AC OUTPUT FREQUENCY	60 Hz (± 1Hz)	
AC OUTPUT WAVE FORM	Pure Sine Wave	
CONTINUOUS ACTIVE OUTPUT POWER	400 W	600 W
MAXIMUM ACTIVE SURGE POWER (LESS THAN 1 SEC)	800 W	1200 W
PEAK EFFICIENCY	91%	91%
USB PORT		
OUTPUT	5 VDC, 2.1A Maximum, Type A	
PROTECTIONS		
LOW INPUT VOLTAGE WARNING ALARM	11.0 VDC ± 0.3 VDC	
LOW INPUT VOLTAGE SHUTDOWN	10.5 VDC ± 0.3 VDC	
HIGH INPUT VOLTAGE SHUTDOWN	16.3 VDC ± 0.3 VDC	
OVERLOAD/ SHORT CIRCUIT SHUTDOWN	Yes. Manual reset	
OVER TEMPERATURE SHUTDOWN	Yes. Auto reset	
COOLING	Load and temperature controlled variable speed fan	
INTERNAL FUSES	2 x 30 A in parallel	3 x 30 A in parallel
	(Automotive Blade Fuses, Type ATO/ATC, 32 VDC)	
CONNECTIONS		
INPUT	Thumb Screw M4 Terminals - Requires Custom Rectangular Lug: (Use Provided DC Cable)	
OUTPUT	2x NEMA5-15R Receptacles	
COMPLIANCE		
SAFETY	Intertek - ETL Listed. Conforms to UL Std. 458 and certified to CSA Std. C22.2 No.107.1	
EMI / EMC	FCC Part 15(B), Class A	
ENVIRONMENT		
OPERATING AMBIENT TEMPERATURE	-25 °C to 50 °C / -13 °F to 122 °F	
STORAGE TEMPERATURE	-30 °C to 70 °C; -22 °F to 158 °F	
GENERAL		
DIMENSIONS, IN (W X D X H)	6.10 x 8.86 x 2.32	6.10 x 10.0 x 2.32
DIMENSIONS, MM (W X D X H)	155 x 225 x 59	155 x 254 x 59
WEIGHT, KG	0.9	1.1
WEIGHT, LB	2.0	2.4

NOTES: 1. All power ratings are specified for resistive load at Power Factor = 1
2. All specifications given above are at ambient temperature of 25 °C / 77 °F
3. Specifications are subject to change without notice

SECTION 9 | SPECIFICATIONS

MODEL NO.	NTX-400-24	NTX-600-24
INPUT		
DC INPUT VOLTAGE RANGE	21.0 - 32.6 VDC (± 0.5 VDC)	
DC INPUT CURRENT AT RATED LOAD	20 A	30 A
DC INPUT CURRENT AT NO LOAD	< 0.4 A	< 0.5 A
OUTPUT		
AC OUTPUT VOLTAGE	115 VAC (± 5 VAC)	
AC OUTPUT FREQUENCY	60 Hz (± 1Hz)	
AC OUTPUT WAVE FORM	Pure Sine Wave	
CONTINUOUS ACTIVE OUTPUT POWER	400 W	600 W
MAXIMUM ACTIVE SURGE POWER (LESS THAN 1 SEC)	800 W	1200 W
PEAK EFFICIENCY	90.5%	91%
USB PORT		
OUTPUT	5 VDC, 2.1 A Maximum, Type A	
PROTECTIONS		
LOW INPUT VOLTAGE WARNING ALARM	22.0 VDC ± 0.5 VDC	
LOW INPUT VOLTAGE SHUTDOWN	21.0 VDC ± 0.5 VDC	
HIGH INPUT VOLTAGE SHUTDOWN	32.6 VDC ± 0.5 VDC	
OVERLOAD/ SHORT CIRCUIT SHUTDOWN	Yes. Manual reset	
OVER TEMPERATURE SHUTDOWN	Yes. Auto reset	
COOLING	Load and temperature controlled variable speed fan	
INTERNAL FUSES	1 x 30 A	2 x 25 A in parallel (Automotive Blade Fuses, Type ATO/ATC, 32 VDC)
CONNECTIONS		
INPUT	Thumb Screw M4 Terminals - Requires Custom Rectangular Lug: (Use Provided DC Cable)	
OUTPUT	2x NEMA5-15R Receptacles	
COMPLIANCE		
SAFETY	Intertek - ETL Listed. Conforms to UL Std. 458 and certified to CSA Std. C22.2 No.107.1	
EMI / EMC	FCC Part 15(B), Class A	
ENVIRONMENT		
OPERATING AMBIENT TEMPERATURE	-25 °C to 50 °C / -13 °F to 122 °F	
STORAGE TEMPERATURE	-30 °C to 70 °C; -22 °F to 158 °F	
GENERAL		
DIMENSIONS, IN (W X D X H)	6.10 x 8.86 x 2.32	6.10 x 10.0 x 2.32
DIMENSIONS, MM (W X D X H)	155 x 225 x 59	155 x 254 x 59
WEIGHT, KG	0.9	1.1
WEIGHT, LB	2.0	2.4

NOTES: 1. All power ratings are specified for resistive load at Power Factor = 1
2. All specifications given above are at ambient temperature of 25 °C / 77 °F
3. Specifications are subject to change without notice

SECTION 10 | WARRANTY

2 YEAR LIMITED WARRANTY

NTX-400-12/24 and NTX-600-12/24 are manufactured by Samlex America Inc. (the "Warrantor") are warranted to be free from defects in workmanship and materials under normal use and service. The warranty period is 2 years for the United States and Canada, and is in effect from the date of purchase by the user (the "Purchaser").

Warranty outside of the United States and Canada is limited to 6 months. For a warranty claim, the Purchaser should contact the place of purchase to obtain a Return Authorization Number.

The defective part or unit should be returned at the Purchaser's expense to the authorized location. A written statement describing the nature of the defect, the date of purchase, the place of purchase, and the Purchaser's name, address and telephone number should also be included.

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.
(Contiguous US and Canada only)

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. Warranty service shall be performed only by the Warrantor. Any attempt to remedy the defect by anyone other than the Warrantor shall render this warranty void. 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.

No other express warranty is hereby given and there are no warranties which 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.

There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any persons, or damage to 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. The Warrantor assumes no liability for incidental or consequential damages of any kind.

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