MEANWELL
DC/AC
POWER INVERTERS

NTS-1200-n = 1200 Watts
NTS-1700-n = 1700 Watts
NTS-2200-n = 2200 Watts
NTS-3200-n = 3200 Watts

n = 212 = 12VDC input
n = 224 = 24VDC input
n = 248 = 48VDC input

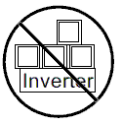
200VAC – 240VAC output

TRUE SINE WAVE

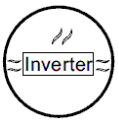
Don't disassemble

Keep away from moisture

Keep away from fire & heat



Don't stack inverters



Maintain good ventilation

WARNINGS:

- **For indoor use only**
- **Do not use if the inverter is damaged**
- **Hazardous voltage inside - do not attempt to open or repair**
- **Read all manuals and instructions before connecting or using the inverter**
- **Only connect 220VAC - 240VAC appliances that are in good condition**
- **For independent use, do not connect to the AC electricity grid**
- **Batteries require regular maintenance. Once aged, batteries should be changed by qualified personal as failed batteries may cause fire or other hazards**

FEATURES:

- 12VDC, 24VDC or 48VDC input models available
- Peak Power Technology runs appliances with high startup current
- Built in safety protection against AC power overload, low and high battery voltages
- Approved AU mains power outlet socket or UN universal output socket available
- Conformal coating for moisture, dust, and dirt protection
- ON/OFF remote control (with power ON indication)
- Temperature controlled cooling fan with low acoustic noise
- Remote monitoring by IRC module or computer
- **3 year warranty**

SPECIFICATIONS:

Part No.	**NTS-1200**	**NTS-1700**	**NTS-2200**	**NTS-3200**
Input Voltage	12V/24V/48V Battery or DC source (-15% to +30%)			
Input Current (typical)	120A/60A/30A	170A/85A/42.5A	250A/120A/60A	320A/160A/80A
Input Watts (savings mode)	1.2W/1.4W/1.5W	1.2W/1.4W/1.5W	1.7W	1.7W
Output (True Sine Wave)	200VAC-220VAC-230VAC-240VAC, 50Hz-60Hz selectable			
Continuous Power Output	1200W	1700W	2200W	3200W
Over Rated Power < 3 min.	1380W	2000W	2530W	3680W
Peak Power < 10 sec.	1800W	2550W	3300W	4800W
Surge Power (30 cycles)	2000W	3400W	4400W	6400W
Efficiency (typical)	90%/92%/93%	89%/92%/93%	90%/92%/93%	90%/92%/93%
Low Battery Alarm	11.0±0.3V/22±0.5V/44±1V (see low voltage derating curve)			
Low Battery Shutdown	10.0±0.3V/20±0.5V/40±1V			
Low Battery Restart	12.5±0.3V/25±0.5V/50±1V			
High Battery Alarm	15.5±0.3V/31±0.5V/62±1V			
High Battery Shutdown	16.5±0.3V/33±0.5V/66±1V			
High Battery Restart	15.0±0.3V/30±0.5V/60±1V			
Working Temperature*	-25°C to 70°C			
Fuse Quantity & Size~	4x40A/2x40A/2x25A	6x40A/3x40A/3x25A	8x40A/4x40A/4x25A	12x40A/6x40A/6x25A
Dimensions (L x W x H)	333x184x70mm	400x184x70mm	420x270x98mm	
Weight	3.3kg	4.63kg	8.6kg	

* >35°C - 40°C derating required. ~fuses located internally and should only be replaced by qualified personal.

WHAT IS AN INVERTER?

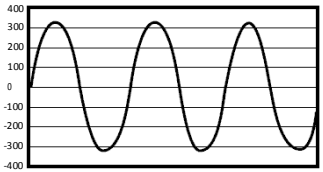
Inverters are designed for powering appliances from a battery or low voltage DC source. They are electronic devices that convert battery power to AC mains power.

Inverters are compact and often lightweight making them an ideal source of portable mains power. Thanks to their portability they are commonly used in cars, caravans, motor homes, boats, 4WDs, utility vehicles, trucks and buses.

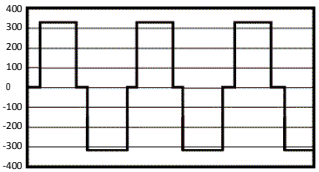
Using an inverter with standard mains power appliances is a much cheaper option than purchasing specialized 12V, 24V or 48V appliances for times when mains power is not available.

There are two different types of inverters, Modified Sine Wave (MSW) and True Sine Wave (TSW)… sometimes called Pure Sine Wave (PSW). The difference between the two is how close the output replicates normal mains power.

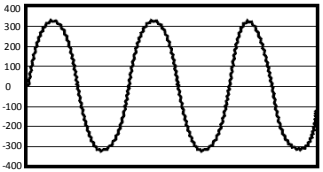
These graphs show the difference in output between mains power, MSW and TSW inverters.



MAINS POWER (SINE WAVE)



MODIFIED SINE WAVE



TRUE SINE WAVE

Logically it follows that the process used in a TSW inverter is more complex than a MSW inverter and subsequently they are more expensive.

In reality most electric appliances operate unaffected on a modified sine wave and hence they are more common in applications requiring intermittent use.

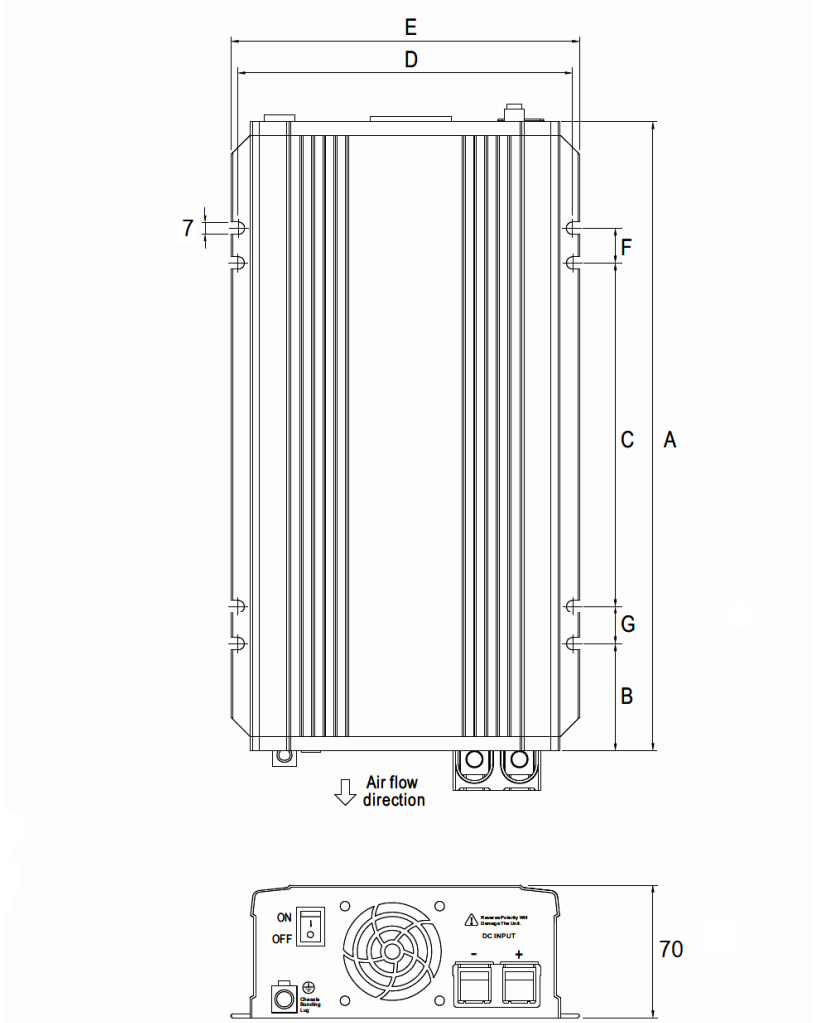
True sine wave inverters are reserved for use on sensitive electrical appliances (such as medical equipment) and in permanent or continuously operating installations. TSW or PSW inverters are also more commonly used in caravans and boats where all sorts of devices may need to be operated. They are also used in industrial and commercial applications, particularly in critical applications in medicine and instrumentation.

Inverters are available with different power output levels to suit the type of appliances to be powered. Small inverters are designed for powering one small low power electrical or electronic appliance. Larger inverters can be used to power multiple small appliances or one larger appliance. Typically inverters are not suitable for running appliances with very high power requirements such as electric heaters, stoves and large air conditioners. This is due to their high current draw and the resultant battery consumption.

CONNECTIONS / CONTROLS & ACCESSORIES

After unpacking your inverter take a moment to check that you have the correct model i.e. 12V, 24V or 48V. Familiarize yourself with the connections and the controls on the inverter.

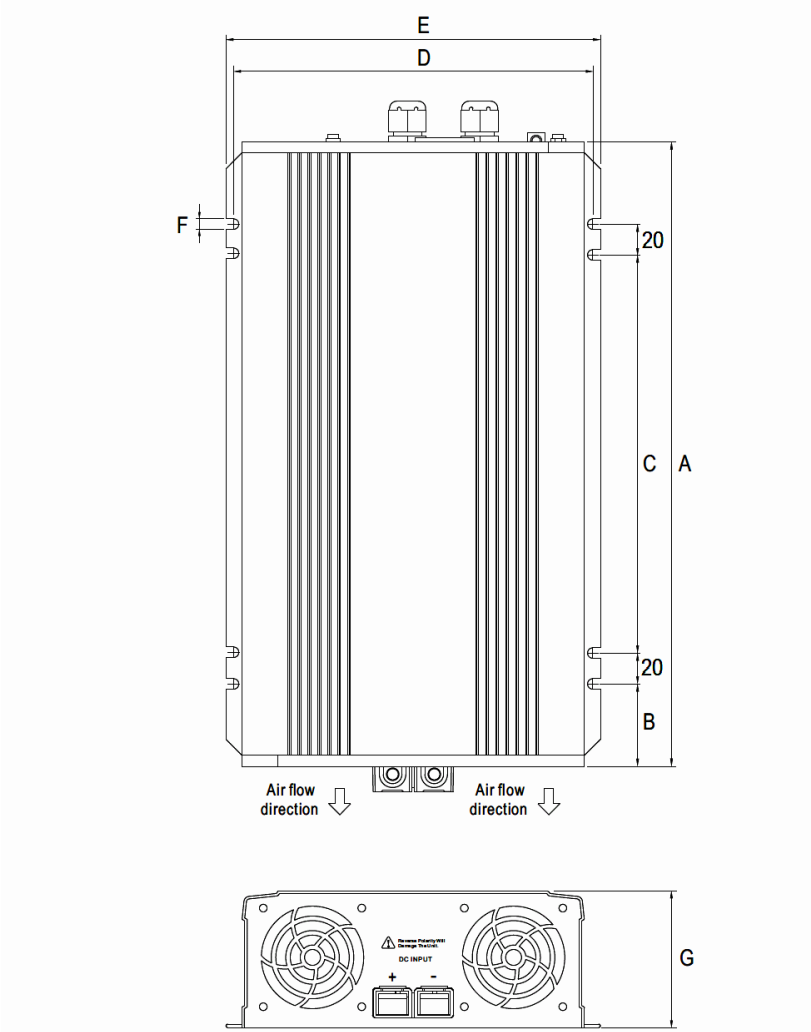
Part No. NTS-1200/NTS-1700



Model	A	B	C	D	E	F	G
NTS-1200	333	56.5	180	173	184	20	20
NTS-1700	400	56.5	186	173	184	17	34

Unit:mm

Part No. NTS-2200/NTS-3200



Model	A	B	C	D	E	F	G
NTS-2200	400	67	246	259	270	7.5	98
NTS-3200	440	67	246	259	270	7.5	98

Unit:mm

PLACEMENT / LOCATION / MOUNTING OF INVERTER

Caution:

- *The inverter must be mounted away from any flammable items and gas appliances*
- *Batteries should be mounted in a separate well-vented area/enclosure*
- *The inverter must always be protected from rain, water and moisture*

Meanwell inverters are designed for indoor use only. For best performance the inverter must be used or mounted in a cool, dry, clean and well-ventilated area. For best TV and Radio reception keep the inverter far away from TVs, radios, antenna cables and antennas.

All models are supplied with mounting flanges for use in permanent installations in 4WDs, trucks, caravans, boats and off-grid homes. The inverter should be mounted on a suitable horizontal (recommended) or vertical panel, with at least 15cm clearance from the front and rear panels of the inverter to provide good ventilation for the cooling fan.

SUITABLE POWER SOURCE:

In order to operate the inverter a suitable 12V, 24V or 48V DC power supply is required. This can be vehicle, caravan or marine batteries, a portable power pack or battery bank joined in series and/or parallel to produce 12V, 24V or 48V DC. For most applications, deep cycle lead-acid or lithium-ion batteries are recommended.

The size of the batteries used will determine how long the inverter will supply power to an appliance and how well the inverter will perform. Most batteries are marked with their size in Amp hours (Ah).

Because the inverter is capable of drawing high currents the inverter should only be connected to suitable size batteries. Connection to undersized batteries could damage the batteries and may result in the inverter shutting down within a short period due to low battery voltage.

The amount of power drawn from the batteries is proportional to the inverter load.

Part No.	**NTS-1200**	**NTS-1700**	**NTS-2200**	**NTS-3200**
Recommended minimum Battery Size	400/200/100Ah	500/250/125Ah	735/370/185Ah	1000/500/250Ah
Run time with max. load, min. battery size	120min	120min	120min	120min
Run time for a 100W globe, min. battery size	40 hours	50 hours	75 hours	100 hours
Ideal battery size - from to	400/200/100Ah no limit	500/250/125Ah no limit	735/370/185Ah no limit	1000/500/250Ah no limit

CONNECTION TO POWER SOURCE & EARTHING

Caution:

- *Even though the inverter is powered from batteries, it still produces Dangerous High Voltage AC power and has the potential to fatally injure if incorrectly installed or used.*
- *Before making any connections ensure the inverter is switched off and no AC appliances are plugged into the AC output sockets.*
- *Double check battery negative and positive posts before making the input connections, a wrong connection (Reverse polarity) will cause the fuses to blow and may damage the inverter.*
- *A small spark (electrical arc) can occur when making the final battery connection; this is most common when the inverter has not been used for a long time. This spark is caused by the inverter's large input capacitors charging quickly. To minimize this, make the last connection quickly and completely.*
- *Do not make any connections if there are any flammable fumes present or any volatile fuels or gases are near.*
- *Batteries can be dangerous, follow all battery manufacturer's instructions and warnings.*
- *Meanwell inverters are designed FOR INDEPENDENT USE ONLY. The inverter cannot be connected to household wiring whether the building is connected to the electricity grid or not.*

All units must be hard wired for a permanent installation with suitably sized cables and hardware for your application (see the section Hard Wired Connection). Regardless of which connection method is used it may be advantageous to earth the inverter case or chassis, see the section on External Earthing for more details.

BATTERY CONNECTION (USING RING/EYE TERMINAL):

- Connect a ring terminal on the black lead to the negative DC supply or (-) battery terminal. **Do not use alligator clip leads to extend the connections!**
- Connect a ring terminal on the red lead to the positive DC supply or (+) battery terminal. **All cable lugs should be properly soldered and not just crimped.**

"HARD WIRED" CONNECTION:

When mounting the inverter in a vehicle, caravan, boat, truck or home it may be preferable to use longer DC battery cables, so that the inverter can be placed in a more convenient, cooler or more protected location.

Cables must be carefully selected, remember that heat generated in the connecting cables may be conducted inside the inverter, and should therefore be suitably insulated automotive battery cables according to the following table:

Part No.	NTS-1200	NTS-1700	NTS-2200	NTS-3200
Up to 1.5m	2/6/8AWG	0/4/6AWG	00/2/4AWG	#/0/2AWG
3m	0/4/6AWG	00/2/4AWG	-/00/2AWG	-/-/00AWG

"#" 300-400kcmil, "-" not recommended.

• It is recommended that a circuit breaker or high current fuse be placed in the DC positive (+) line close to the batteries. *If the battery system is positive (+) earthed then placing a fuse or circuit breaker in the negative (-) line is recommended.

Part No.	NTS-1200	NTS-1700	NTS-2200	NTS-3200
Fuse or Circuit Breaker	150/75/40A	200/100/60A	300/150/75A	400/200/100A

- It is recommended that a heavy duty battery switch with a current rating higher than the fuse be fitted in the DC positive (+) line close to the batteries to allow the supply to the inverter to be switched off, this can also be achieved by using a circuit breaker which has a trip facility. *See above.

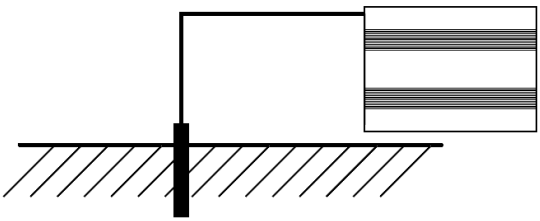
- Positive and Negative cables should be run close together to reduce cable inductance. The cables should also be protected from any damage.

- Any connections should be made securely using the proper hardware. Procon Technology recommends the use of DeOxit as a contact preserver to improve conductivity and protect metal. See… www.procontechnology.com.au/deoxit.htm

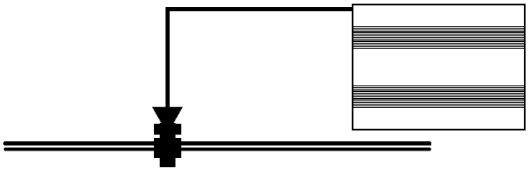
EXTERNAL EARTHING: (OPTIONAL)

Meanwell inverters have been internally bonded for safety, by connecting the AC socket/s earth pin to the inverter case. If the inverter is used in a stationary land based application or if the inverter is causing interference with a TV set or radio it is recommended that an external earth connection is made by one of the following methods:

- External Earthing Stationary Applications - Connect an earth wire (preferably solid green or green with yellow stripe) from the external earth connection (Chassis GND) on the rear of the inverter to a metal stake or pipe that is driven into the ground at least 1.2m (or according to local electrical safety authority recommendations).



- External Earthing Mobile Applications - Connect an earth wire (preferably solid green or green with yellow stripe) from the external earth connection (Chassis GND) on the rear of the inverter to the chassis of the vehicle or ground wires on a boat.



OPERATION

Caution:

- *Never connect the AC output of the inverter to normal fixed building wiring or any wiring connected to the mains grid. Normally AC wiring contains a MEN link - this neutral to earth link can damage the inverter and compromise safety.*
- *This inverter is designed for direct connection to appliances however extension leads and power boards can be used for low wattage appliances.*

PROTECTION FEATURES

Meanwell inverters include sophisticated circuitry that monitors the operation of the inverter and turns the inverter off if a problem is detected. A fault light will illuminate and an audible alarm may be heard if this occurs. This prevents damage to the inverter, batteries and/or appliance being powered.

- **Low Battery Voltage** - This feature will sound an alarm when the battery system powering the inverter is low in voltage. It is recommended that the appliance is turned off and the battery recharged.

  If the appliance is allowed to continue to run, the inverter will turn off when the batteries are very low to prevent over discharging the batteries or damaging the inverter. This will cause a sudden disruption of power to the appliance that may cause problems for some devices. e.g. computers that need to be shut down properly. Using a laptop with battery would be recommended when important data could be lost!

- **High Battery Voltage** - This feature will shut down the inverter when the battery system is too high in voltage. This prevents damage to the inverter. An over voltage condition could occur if the wrong battery system is used or a fault occurs whilst attempting to charge the battery when it is connected to the inverter.

- **Overload** - This feature will turn the inverter off when the total load connected to the inverter exceeds the inverter's rating (see "Determining suitable loads/appliances"). This may occur due to highly inductive loads such as any appliance with a motor causing a sudden peak load on the inverter. Highly capacitive loads, such as a Switch

Mode Power Supply, may also cause the inverter to shut down when switched on.

If this occurs, switch "OFF" the appliance and the inverter. After a few seconds turn the inverter "ON" and the inverter will provide power again. Turn the appliance "ON", if the inverter shuts down more than 3 times, it is likely that the appliance is drawing more load than the inverter can supply, and a larger inverter would be recommended. Note if the load is a motor, ensure that it is started under no-load conditions or try fitting a soft-start device to the motor (or purchase an appliance with electronic inverter fitted). You could also use a VFD (Variable Frequency Drive) to provide soft-start operation; these can also be used to drive a three-phase motor!

- **High temperature** - If the inverter has reached a high temperature, this feature will turn the inverter off to protect it from damage. This may occur from continuously running high loads for long periods, due to high ambient temperatures or due to poor ventilation. If this occurs, turn the inverter off and allow it to cool before resuming operation. If possible reduce the load on the inverter and improve ventilation.

DETERMINING SUITABLE LOADS/APPLIANCES:
All inverters have one AS/NZS Australian or one UN Universal socket output. All appliances have a rating plate that shows the amount of power (Watts) used or the current (Amps) drawn under normal conditions.

The following table shows the maximum combined AC Watts or AC Amps which can be run by the inverter for less than 3 minutes continuous at 230VAC.

Part No.	NTS-1200	NTS-1700	NTS-2200	NTS-3200
AC combined load max. (Watts)	1380W	2000W	2530W	3680W
AC combined load max. (Amps)	6A	8.7A	11A	16A

Some appliances that use an electric motor or transformer may draw 2 to 6 times their rating when first turned on. These are called inductive loads and are the most difficult for the inverter to run. For these appliances it is often a matter of trial and error to see what size inverter will run them, if in doubt always use a larger inverter using the above table as a guide. Motors operated via an inverter (soft-start) or speed-control circuit will often start up without trouble whereas much smaller wattage motors, operated directly from AC power, may cause the inverter to shut down. Please note that induction motors (often used in electric fans) may hum and overheat when operated from a Modified Sine Wave (MSW) inverter, use a True Sine Wave (TSW) inverter instead.

CONNECTING AN APPLIANCE AND RUNNING THE INVERTER
- Connect the appliance AC plug to the inverter AC outlet socket.
- Switch the inverter "ON", the "Status" light will turn green to indicate operation.
- Turn the appliance "ON", if the appliance is fitted with an "On/Off" switch always

switch the inverter on before switching the appliance on and always turn the appliance off before switching the inverter off. If necessary, use a power board with on/off switches.

- When not in use, turn the inverter off. Leaving the inverter on, even with no AC load connected, will drain the battery. Use the "Saving Mode" to reduce battery drain automatically when AC loads are turned off.

TROUBLESHOOTING / FAQ:

Q. Why does the inverter turn itself off?

A. If the red "Load" light flashes ON and OFF this indicates that there is a problem, and the inverter has turned off due to overload. The inverter turning OFF most commonly is caused by an appliance that is drawing too much power but it can also be caused by too high or too low battery voltage. Note a low input voltage could occur due to insufficient sized cables or batteries. Or when there are poor connections to the input to the inverter. Initially an audible warning will occur and only after a further drop in battery voltage does shut down occur with the "DC Input" light flashing. Operation is restored once the battery voltage returns to normal. All other faults will cause the inverter to shut down until it is switched off and on again.

Q. The inverter will not run my appliance even though the appliance label indicates that it draws less power than the size of the inverter?

A. Electrical appliances can be divided into three groups by the way they draw energy (current) from their power supply. These groups are "Resistive", "Inductive" and "Capacitive" appliances or "loads". Some appliances are a combination of these loads.

- The most common resistive loads are incandescent or filament lights and heating elements. These devices are non-linear and draw a higher current at start up and, after a short delay once they "warm up", they always draw a constant power or current from the inverter, that is a 100 Watt light will draw approximately 100 Watts from the power supply at all times. Resistive loads are the easiest load for an inverter to run provided that it can handle the start-up current. Note a light dimmer with "soft start" capability can be used to reduce the start-up current.
- Inductive loads such as an electric motor require a large rush of power (surge current) to start and then usually draw a more constant power once running. Inductive loads contain coils of wire (motors, transformers, ballasts, solenoids) When the power is first turned on these coils of wire draw a large inrush or surge current which forms the magnetic flux (magnetic field) which allows these devices to work.
- The most common inductive appliances are: refrigerators, air conditioners, pumps, transformers, power tools and ballast type fluorescent lights. These appliances can draw 2 - 6 times their normal running power at start up. e.g. to run a 200 Watt refrigerator a 750 or 1200 Watt inverter may be needed.
- Capacitive loads are found in many TVs and other electronic appliances (desktop computer, monitor etc.) and require a large surge current to start only when they have not been used for a while. This is often due to large capacitors in the switched

mode power supply that must be quickly charged when the appliance is turned on. If the appliance has not been used for a while these capacitors slowly go flat. If the inverter trips on overload then restarting a few times may allow a device to work.

- There are some appliances such as large refrigerators, air conditioners and other compressor driven appliances that have extremely high startup currents, because they have an electric motor that must start under load. These appliances are not recommended for use with an inverter. However check with the manufacturer as motors with "soft-start" capability may be capable of being used with an inverter.

Q. The inverter is powering my television, but I cannot get a clear picture?

A. In poor reception areas it is quite common to have some interference on a TV (such as faint lines on the screen or noisy audio) when operating on an inverter.

- To improve your picture quality:
  - Keep the inverter as far away from the TV as possible.
  - Use an external long range or fringe area TV antenna with good quality coax cable.
  - Earth (using Chassis GND) the inverter (see the section on Earthing).

Q. Can I run fluorescent lighting from my inverter?

A. Most portable fluorescent work lamps should operate fine on an inverter even though they may be slow to start.

- Fluorescent lights are an inductive and capacitive load and often draw at least twice as much power from the inverter than their normal rating during start up.
- Normal household fluorescent lights should be avoided, because they contain power factor correction (PFC) capacitors. PFC is used in building installations to help smooth out the inductive effects of fluorescent lights. If used with an inverter the PFC causes a high load on the inverter that can overload the unit. If normal household fluorescent lights must be used, you will need to have a qualified electrician remove the PFC capacitor. The light should then be marked "For Inverter Use only". Or simply use a fluorescent light with electronic ballast… better still, install an LED fluorescent tube!

Q. Why does it damage the inverter if the battery leads are connected in reverse?

A. Your inverter uses sophisticated electronics to convert DC battery power to AC mains power. If you accidentally connect the inverter to the batteries incorrectly (reverse polarity) a large current will be drawn by the inverter which will blow the protection fuses, as this occurs some of the high current could damage sensitive electronic components. Because of this risk it is important to always double-check the batteries polarity before making the input connections.

Q. How do I check or change the fuses?

A. The inverter contains internal fuses; these should only be checked or replaced by a suitably qualified person.

THE DC SUPPLY MUST BE DISCONNECTED BEFORE ANY REPAIR, THEN TURN THE ON/OFF SWITCH OF THE INVERTER "ON" TO DISCHARGE THE CAPACITORS.

Q. Why does the cooling fan only operate sometimes?

A. All the inverters feature a temperature controlled automatic cooling fan, that only operates when needed. This allows the inverter to run very quiet when under low load conditions.

Q. Why do some power tools not work properly on an inverter?

A. Some power tools use PWM variable speed controllers to vary the tool's speed as the trigger is squeezed. These power tools switch the power on and off very quickly in a similar way to how the inverter works. Because of this, some may not function properly with a MSW inverter. Use a TSW inverter instead. On the other hand, a speed control can reduce the start-up current of the motor and allow an appliance to be used with an inverter where otherwise it would cause it to overload.

Q. Can I run a laptop computer on an inverter?

A. Most laptop/notebook computer AC power adapters work perfectly fine with a MSW inverter. Some however are more sensitive and may not function properly. If your power adaptor does not function or causes a humming noise or interference on the screen it is probably not suitable. Try using a universal AC adapter with the laptop or use a TSW inverter instead.

Q. Can I connect lights with dimmers to the inverter?

A. Some old "TRIAC" type AC light dimmers may not work with a MSW inverter - try a TSW inverter. Most "MOSFET" type AC light dimmers and motor speed controllers will work with MSW inverters but check with the manufacturer first. The Clipsal 32V light dimmer and Kambrook KD2 power board with dimming outlet were tested with a Meanwell MSW inverter and worked fine*, hence some "TRIAC" dimmers can work with MSW inverters! Note, dimmers and speed controllers with "soft-start" capability are an excellent way to reduce and limit the start-up current impact on the inverter. *MSW inverter gave a reduced dimming range, the TSW inverter is definitely better.

WARRANTY

Meanwell NTS True Sine Wave Inverters are covered by a 3 Year Warranty. Failure to follow the operating instructions may damage the inverter and may void the warranty. Please read the operating instructions carefully before use.

DISCLAIMER

All specifications are subject to change without notice. Any circuit diagrams or assembly diagrams provided with equipment are for reference purposes only. Procon Technology makes no representation or warranty of any kind to the customer that they are qualified to make any repairs to our products, or that they are qualified to replace any parts. The customer assumes all responsibility for repairs or modifications not carried out by a qualified technician approved by Procon Technology.