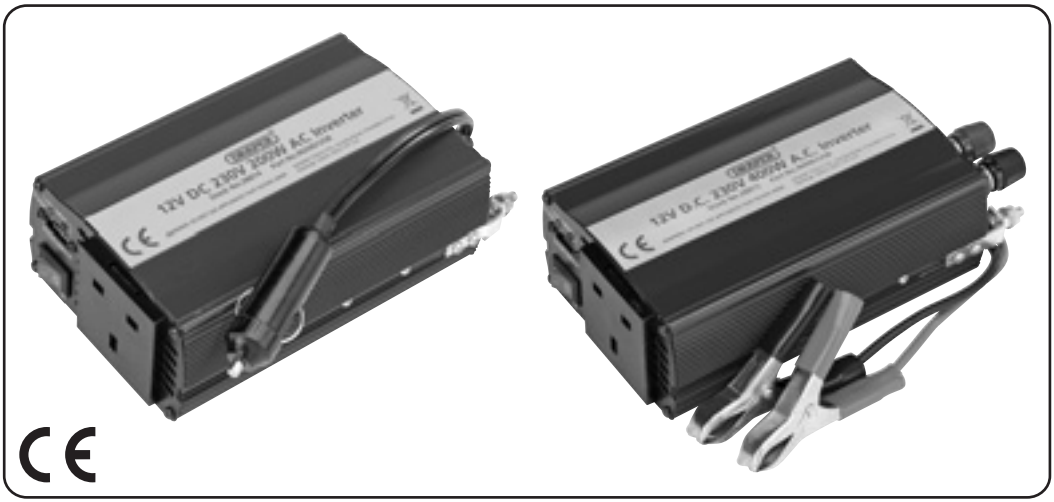
INSTRUCTIONS FOR

12V DC 230V 200W & 400W AC Inverters

Stock No's.28814, 28815 Part No's.IN200/USB, IN400/USB

IMPORTANT: PLEASE READ THESE INSTRUCTIONS CAREFULLY TO ENSURE THE SAFE AND EFFECTIVE USE OF THIS PRODUCT.



GENERAL INFORMATION

These instructions accompanying the product are the original instructions. This document is part of the product, keep it for the life of the product passing it on to any subsequent holder of the product. Read all these instructions before assembling, operating or maintaining this product.

This manual has been compiled by Draper Tools describing the purpose for which the product has been designed, and contains all the necessary information to ensure its correct and safe use. By following all the general safety instructions contained in this manual, it will ensure both product and operator safety, together with longer life of the product itself.

All photographs and drawings in this manual are supplied by Draper Tools to help illustrate the operation of the product.

Whilst every effort has been made to ensure the accuracy of information contained in this manual, the Draper Tools policy of continuous improvement determines the right to make modifications without prior warning.

1. TITLE PAGE

1.1 INTRODUCTION:

USER MANUAL FOR:

12V DC 230V 200W AC INVERTER

12V DC 230V 400W AC INVERTER

Stock no's. 28814, 28815
Part no's. IN200/USB, IN400/USB

1.2 REVISIONS:

Date first published November 2012

As our user manuals are continually updated, users should make sure that they use the very latest version.

Downloads are available from: http://www.drapertools.com/b2c/b2cmanuals.pgm

DRAPER TOOLS LIMITED
HURSLEY ROAD
CHANDLER'S FORD
EASTLEIGH
HAMPSHIRE
SO53 1YFUK

WEBSITE: www.drapertools.com
PRODUCT HELPLINE: +44 (0) 23 8049 4344
GENERAL FAX: +44 (0) 23 8026 0784

1.3 UNDERSTANDING THIS MANUALS SAFETY CONTENT:

WARNING! Information that draws attention to the risk of injury or death.

CAUTION! Information that draws attention to the risk of damage to the product or surroundings.

1.4 COPYRIGHT © NOTICE:

2. CONTENTS

2.1 CONTENTS

PAGE CONTENT ***PAGE***

1 TITLE PAGE
- 1.1 INTRODUCTION 2
- 1.2 REVISION HISTORY 2
- 1.3 UNDERSTANDING THIS MANUAL 2
- 1.4 COPYRIGHT NOTICE 2

2 CONTENTS
- 2.1 CONTENTS 3

3 GUARANTEE
- 3.1 GUARANTEE 4

4 INTRODUCTION
- 4.1 SCOPE 5
- 4.2 SPECIFICATION 5
- 4.3 HANDLING & STORAGE 5

5 HEALTH & SAFETY INFORMATION 6
- 5.1 HEALTH & SAFETY INFORMATION 6

6 TECHNICAL DESCRIPTION
- 6.1 IDENTIFICATION 7

7 UNPACKING & CHECKING
- 7.1 PACKAGING 8
- 7.2 WHAT'S IN THE BOX 8

8 PREPARING THE INVERTER
- 8.1 12V DC POWER INLET CONNECTIONS 9
- 8.2 DC POWER INPUT GROUND CONNECTION AND CABLE SIZES 9
- 8.3 GROUNDING CONNECTION 10
- 8.4 CHASSIS EARTHING 10

9 BASIC INVERTER OPERATIONS
- 9.1 230V AC OUTPUT 11
- 9.2 5V DC USB OUTPUT 11
- 9.3 DISRUPTED VOLTAGE WARNINGS AND ALERTS 11
- 9.4 FUSE REPLACEMENT 12
- 9.5 OPERATING TIPS 12

10 TROUBLESHOOTING GUIDE
- 10.1 TROUBLESHOOTING GUIDE 13

11 DISPOSAL
- 11.1 DISPOSAL 14

12 EXPLANATION OF SYMBOLS
- 12.1 EXPLANATION OF SYMBOLS 15

DECLARATION OF CONFORMITY ..... ENCLOSED

3. GUARANTEE

3.1 GUARANTEE

Draper tools have been carefully tested and inspected before shipment and are guaranteed to be free from defective materials and workmanship.

Should the tool develop a fault, please return the complete tool to your nearest distributor or contact Draper Tools Limited, Chandler's Ford, Eastleigh, Hampshire, SO53 1YF. England. Telephone: (023) 8026 6355.

A proof of purchase must be provided with the tool.

If upon inspection it is found that the fault occurring is due to defective materials or workmanship, repairs will be carried out free of charge. This guarantee period covering parts/labour is 12 months from the date of purchase. This guarantee does not apply to normal wear and tear, nor does it cover any damage caused by misuse, careless or unsafe handling, alterations, accidents, or repairs attempted or made by any personnel other than the authorised Draper warranty repair agent.

NOTE: If the tool is found not to be within the terms of warranty, repairs and carriage charges will be quoted and made accordingly.

This guarantee applies in lieu of any other guarantee expressed or implied and variations of its terms are not authorised.

Your Draper guarantee is not effective unless you can produce upon request a dated receipt or invoice to verify your proof of purchase within the guarantee period.

Please note that this guarantee is an additional benefit and does not affect your statutory rights.

Draper Tools Limited.

4. INTRODUCTION

4.1 SCOPE

Stock No.28814 Part No.IN200/USB – Converts 12V DC to 230V AC using power via connection lead to car cigarette lighter plug.

Stock No.28815 Part No.IN400/USB – Converts 12V DC to 230V AC using power via battery connector leads.

Both models are ideal for use in caravans, boats etc.

4.2 SPECIFICATION

Stock no.	28814	28815
Part no.	IN200/USB	IN400/USB
Input voltage	12V DC	12V DC
Output voltage	AC 230V~50Hz	AC 230V~50Hz
USB output	DC 5.0V/500mA	DC 5.0V/500mA
Max. efficiency	>90%	>90%
No load current draw	>0.2A	>0.3A
High voltage protection	LED indicator	LED indicator
Overload protection	LED indicator	LED indicator
Fuse	25Amp	50Amp
Max. Continuous power	200W	400W
Peak watts	400W	800W
Output type	Modified sine wave	Modified sine wave
Weight (unit and connection leads only)	0.750kg	0.900kg

4.3 HANDLING & STORAGE

Although this machine is small in size, care must still be taken when handling and lifting. Dropping this machine will have an effect on the accuracy and may also result in personal injury. This machine is not a toy and must be respected.

The environment will have a negative result on its operation if you are not careful. If the air is damp, components will rust. If the machine is unprotected from dust and debris; components will become clogged: And if not cleaned and maintained correctly or regularly the machine will not perform at its best.

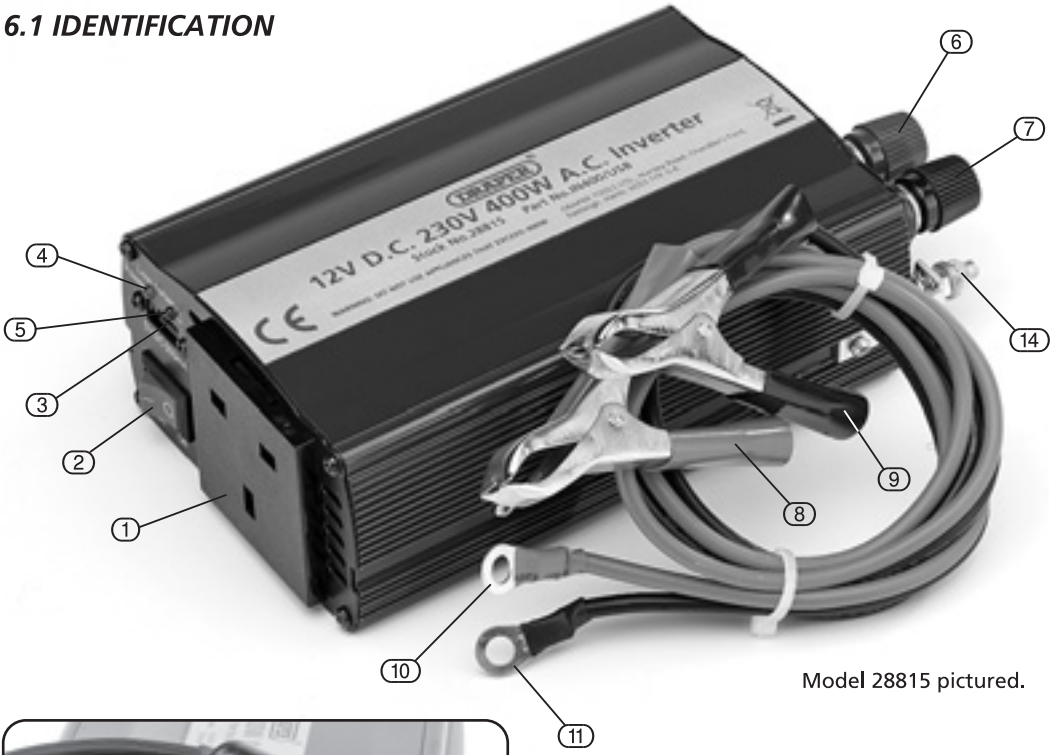
5. HEALTH & SAFETY INFORMATION

5.1 HEALTH & SAFETY INFORMATION

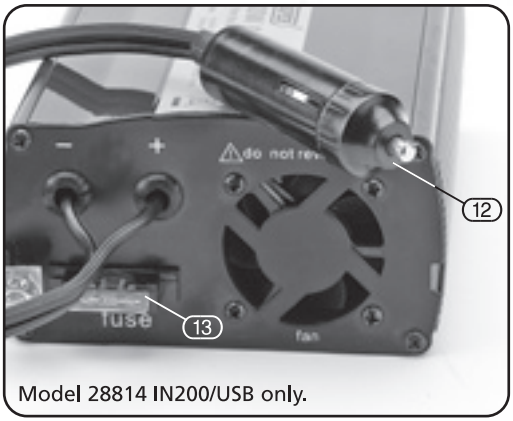
- Always use the inverter in a well ventilated environment.
- Do not expose to direct sunlight or heat sources.
- Keep out the reach of children.
- Do not expose to moisture, water, oil or grease.
- Do not use or connect the inverter near flammable substances.
- Do not connect to any AC power source.
- Do not connect to any power source with a positive earth electrical system.
- The power source must provide between 10 and 15 Volts DC. and must be able to supply sufficient current to operate the load.
- Never exceed the input voltage: 15V DC. Always disconnect the inverter when not in use or when unattended.
- Regularly check the connections for the input and output are secure.
- When connecting always ensure the correct polarity is observed.
- Reverse polarity will cause the inverter fuse to blow and possibly result in permanent damage to the unit.
- **WARNING:** Sparks may occur when connecting the unit to a power source, this is normal.
- Do not connect in the vicinity of flammable or explosive substances.
- Do not start the engine where the inverter is connected or running.
- The inverter will not operate most appliances designed to produce heat, such as hair dryers, irons, toasters, heaters and coffee machines as these items drain high amounts of current in excess of 200 watts for model 28814 IN200/USB and 400 watts for model 28815 IN400/USB.
- **CAUTION:** Certain types of rechargeable devices are designed to be plugged directly into an AC power source. These types of device can cause damage to the inverter. If in doubt, contact the manufacturer of the appliance before connecting to the inverter. Draper Tools Limited accepts no liability for damage caused in any way by incorrect or inadvertent connection. This problem does not occur with the majority of battery operated equipment where there is a separate charger to be plugged into the AC power source. With delicate equipment, for example laptop computers, it is good practice to use an anti-surge device in conjunction with the inverter.

6. TECHNICAL DESCRIPTION

6.1 IDENTIFICATION



Model 28815 pictured.



Model 28814 IN200/USB only.

1. 230V AC Power outlet.
2. On/Off switch.
3. 5V DC USB Output.
4. LED power indicator.
5. LED low battery indicator.
6. 12V DC Red terminal (positive).
7. 12V DC Black terminal (negative).
8. Red battery connector (positive).
9. Black battery connector (positive).
10. Red ring spade connector (positive).
11. Black ring spade connector (negative).
12. 12V DC car cigarette lighter connector (model 28814 IN200/USB only).
13. Fuse.
14. Earth.

7. UNPACKING & CHECKING

7.1 PACKAGING

Carefully remove the inverter from the packaging and examine it for any sign of damage that may have happened during shipping. Lay the contents out and check them against the parts shown below. If any part is damaged or missing; please contact the Draper Helpline (the telephone number appears on the Title page) and do not attempt to use the inverter.

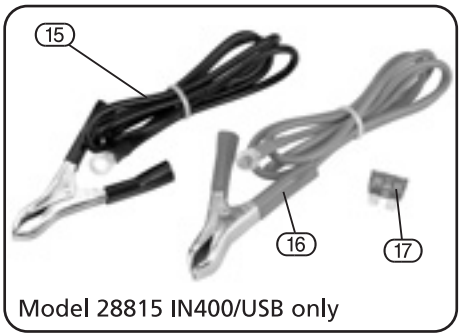
The packaging material should be retained at least during the guarantee period: in case the machine needs to be returned for repair.

Warning! Some of the packaging materials used may be harmful to children. Do not leave any of these materials in the reach of children.

If any of the packaging is to be thrown away, make sure they are disposed of correctly; according to local regulations.

7.2 WHAT´S IN THE BOX?

As well as the inverter, model 28815 IN400/USB is supplied with a set of vehicle DC battery connector leads (pictured below).



Model 28815 IN400/USB only

(15) Black battery connector (positive).
(16) Red ring spade connector (positive).
(17) Spare fuse.

8. PREPARING THE INVERTER

8.1 12V DC POWER INLET CONNECTIONS – FIGS. 1–4

NOTE: Prior to any connection, ensure the on/off switch is in the **off** position.

Model 28814 IN200/USB (Fig.1)

– Insert the 12V DC connector (12) into the vehicle's cigarette lighter socket, ensuring that it is fully plugged in.

Model 28815 IN400/USB (Figs.2-4)

To connect to the 12V DC power inlet terminals:

– Unscrew and remove the red (positive) terminal cap (6) and outer washer (6.1).

– Pass the red (positive) ring spade (10) over the red (positive) terminal connection point (6.2).

Re-fit the outer washer and the terminal cap, securing tightly.

– Follow the same procedure to attach the black (negative) ring spade (11) to the black (negative) terminal (7).

– Attach the red (positive) battery terminal connector (8) to the vehicle's battery positive terminal and the black battery (negative) terminal connector (9) the vehicle's battery negative terminal.

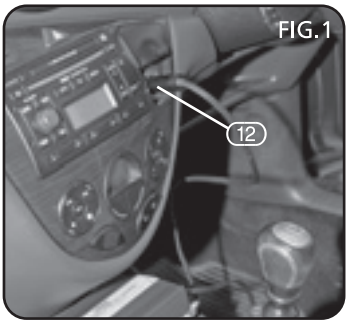


FIG.1

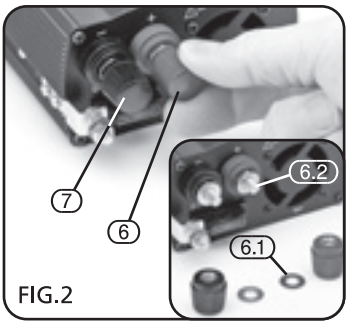


FIG.2

8.2 DC POWER INPUT GROUND CONNECTION AND CABLE SIZES.

The earth terminal (14) must be connected to a grounding point. In a vehicle, connect the earth terminal to the vehicle's chassis. In a boat, connect to the grounding system of the boat. In a fixed location, connect to the ground. Consult the table below for appropriate connection information.

Max. watts out.	Approx. fuse reg.	Wire gauge.
100W	15A	#20
150W	20A	#18
200W	25A	#16
300W	30A	#14
400W	2×20A	#12
600W	2×30A	#8
800W	2×40A	#6
1000W	4×25A	#4
1200W	4×30A	#4
2000W	4×40A	#2

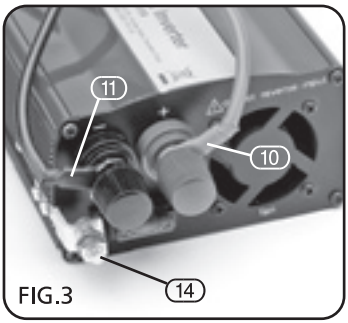


FIG.3

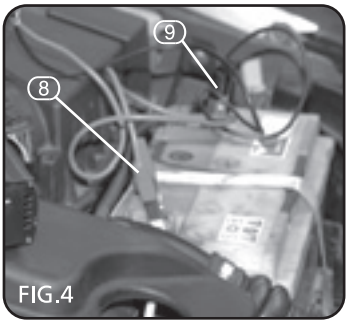


FIG.4

8.3 GROUNDING CONNECTION - FIG. 5

WARNING: BEFORE USING THIS INVERTER YOU MUST PROVIDE A GROUND CONNECTION TO THE INVERTER.

On the casing of the inverter is an earthing terminal (14). This earthing terminal is connected to the case of the inverter and also to the earth terminal of the AC output socket. The use of this earthing terminal will depend on your particular installation. In any installation, heavy duty, green+yellow-insulated wire should be used for this connection.

In a stationary land based installation, the earth terminal should be connected to a metal earthing stake driven into the ground to a depth of 1.2M or more, If the battery system powering the inverter does not have a connection to ground, one of the battery terminals (commonly the negative terminal) should also be connected to the earthing stake.

In a vehicle where the inverter is wired directly to the battery, the earth terminal is simply connected to the vehicle chassis. If the inverter is to be used in a vehicle on a temporary basis and will be powered via the cigarette lighter socket in the vehicle, the earth terminal should be connected via a short link to either the negative or positive DC input terminal of the inverter, depending on whether the vehicle has a negative or positive chassis connection. However, when using the inverter to power equipment used outside the vehicle, an earthing stake should also be used, as described above.

In a boat, the grounding terminal should be connected to the existing grounding system, which may be the hull of the craft, or a network of ground wires.

NOTE: The grounding terminal of the AC outlet is connected to the neutral terminal. This is the same as a standard household power point where the neutral line is bonded to grounding and there is normally no voltage between them.

8.4 CHASSIS EARTHING

The chassis earthing lug should be connected to an earthing point, which will vary depending on where the power inverter is installed. In a vehicle, connect the chassis ground lug to the chassis of the vehicle. In a boat, connect to the boat's grounding system. In a fixed location, connect to grounding.

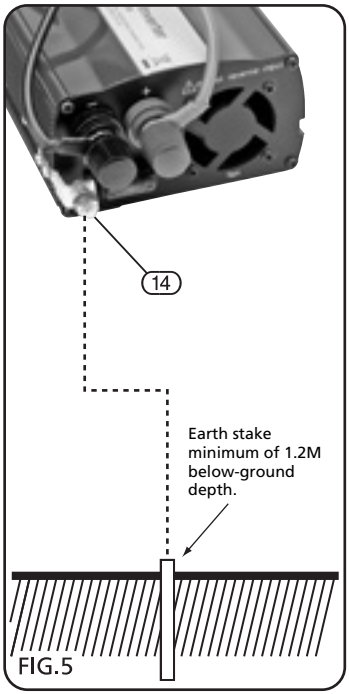


FIG.5

9. BASIC INVERTER OPERATIONS

9.1 230V AC OUTPUT - FIG. 6

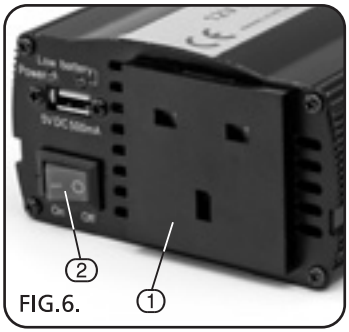


FIG.6.

Most electrical tools, appliances and equipment have a rating label indicating the power consumption in amps or watts. Calculate the power consumption of these items you will be using simultaneously, keeping the rating under the inverter's maximum capacity.

NOTE: If the rating is stated in amps, multiply the value by the voltage (230V) to determine the wattage.

Place the inverter in a well ventilated area for optimum cooling.

Plug the device to be powered into the AC outlet ①. Position the on/off switch ② to the 'on' position.

9.2 5V DC USB OUTPUT - FIG. 7

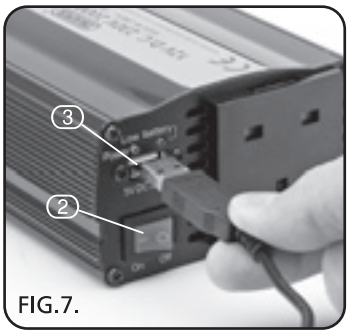


FIG.7.

Insert USB plug ③. Position the on/off switch ② to the 'on' position.

The current draw will vary depending on the load being placed on the battery. The battery life will also vary depending on the age and condition of the battery. Ensure the vehicle is started and run regularly to avoid starting problems due to a flat battery, however do not start the engine while running the inverter.

SWITCH OFF THE INVERTER, START THE ENGINE, SWITCH ON THE INVERTER.

9.3 DISRUPTED VOLTAGE WARNINGS AND ALERTS

If the battery voltage drops significantly an audible alarm will sound. When the battery voltage reaches a low level the LED will illuminate red and the unit will automatically shut off. Switch the unit off and unplug the load. The battery will need recharging before using again.

The typical vehicle battery has a minimum operating time of 1 to 2 hours, depending on the current use of the load being driven. We recommend that the operator start the vehicle every hour to recharge the battery system. This will prevent unexpected shut downs of equipment and will ensure that there is always sufficient battery capacity to start the engine.

The inverter circuitry constantly monitors the following hazardous conditions:

A. **Low battery voltage** – this condition is not harmful to the inverter, but could damage the power source. An audible alarm is sounded when input voltage drops to 10.5 volts. The inverter shuts down when input voltage drops to 10.0 volts. When the condition is corrected (i.e. alternator charges battery), the unit may be restarted.

B. **Short circuit** – reverse polarity or short circuit condition of the load will usually result in opening of the short circuit protection.

C. **High temperature** – when the temperature of the internal heat sinks reaches 65°C (150°F), the solid state temperature sensor located in the power inverter will automatically shut down the unit. Once allowed to cool, it may be restarted.

NOTE: The alarm may sound momentarily when the unit is being connected to, or disconnected from, the power source. This is normal and does not indicate any problem.

For further information, consult the troubleshooting guide on page 12.

9.4 FUSE REPLACEMENT – FIG.8

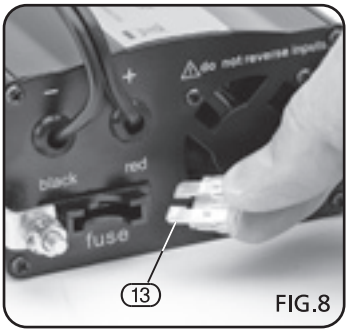


FIG.8

Ensure the unit is disconnected/switched off. In the event of the fuse blowing, remove the 12V DC car cigarette lighter/12V DC battery connector leads (12) (model 28814 IN200/USB only). Pull out the blown fuse (13) and replace with a fuse of the same rating and design determining the cause of the fault prior to re-using.

9.5 OPERATING TIPS

Resistive loads, such as incandescent lights, are the easiest for the inverter to drive, though larger resistive loads, such as electric stoves or heaters, require more power than the inverter can deliver continuously.

Inductive loads, such as TV's and stereos (any device with a coil or a transformer in it) require more current to operate than a resistive load of the same power rating. Induction motors (motors without brushes), as well as some televisions, may require 2 to 6 times their power rating to start up. This condition may require the repeated on and off switching of the inverter power switch several times in order to get them started.

The most demanding appliances are those that start under load, i.e. compressors and pumps. Since motor and television characteristics vary widely, only experimentation will determine if a specific load can be started and how long it can be run.

There are no standards for 'surge power' partly because it can not be simply represented by a simple single number. Though the 300W power inverter can provide power up to 600W for a short period, experimentation is the only method of determining whether it can handle the surges generated by a particular load.

Important note:
The power inverter will not operate most appliances designed to produce heat, such as hair dryers, coffee makers, irons, heaters, and toasters. The current use of most of these exceeds rated power watts far beyond the capacity of these units. The inverter may be used either while the engine is running or turned off, however, the inverter should not be operated while the engine starting, since the battery voltage can drop substantially during cranking. The power inverter draws less than 1.3 ampere from the battery when it is not supplying power to the load. In most cases, the power inverter may be left connected to the battery when it is not in use, since it draws so little current. If the vehicle will not be used for several days, disconnect the power inverter from the battery.

10. TROUBLESHOOTING GUIDE

10.1 TROUBLESHOOTING GUIDE

Problem:	Possible cause(s):	Suggested remedy:
Unit will not operate	Inverter not adequately warmed up.	Turn inverter power switch off and on until it powers your appliance.
	Battery voltage is below 10 volts.	Charge or replace battery.
	Equipment being operated draws too much power.	Reduce load to maximum watts.
	Inverter in thermal shut down condition.	Inverter must cool down. Check for good ventilation. Make sure load is less than max. continuous power.
	Battery in poor condition. Have battery checked.	Replace battery.
Low voltage alarm on continuously	Insufficient power or large voltage drop.	Check condition of crocodile clips. Clean or replace as necessary.
Low output voltage	Using average reading voltmeter.	Use true RMS reading meter.
	Inverter is overloaded.	Reduce load to continuous watts to maintain regulation.
	Input voltage below 11.0 volts.	Keep input voltage above 11 volts to maintain regulation.
Television interference	Snow, picture is breaking up.	a.) Locate the inverter as far as possible from the television, the antenna and the antenna cables. b.) Adjust the orientation of the inverter antenna cables and the TV power cord to reduce interference. c.) Make sure that the antenna feeding the television provides an adequate "snow-free signal and that high quality, shielded antenna cable is used.

11. DISPOSAL

11.1 DISPOSAL

- At the end of the machine's working life, or when it can no longer be repaired, ensure that it is disposed of according to national regulations.
- Contact your local authority for details of collection schemes in your area.

  In all circumstances:
  - Do not dispose of power tools with domestic waste.
  - Do not incinerate.
  - Do not abandon in the environment.
  - Do not dispose of WEEE* as unsorted municipal waste.

* Waste Electrical & Electronic Equipment.

12. EXPLANATION OF SYMBOLS

12.1 EXPLANATION OF SYMBOLS

WEEE
Do not dispose of Waste Electrical & Electronic Equipment in with domestic rubbish

CONTACTS

- ***DRAPER TOOLS LIMITED,***
  Hursley Road, Chandler's Ford,
  Eastleigh, Hampshire. SO53 1YF. U.K.

- **Helpline:** (023) 8049 4344
- **Sales Desk:** (023) 8049 4333
- **Internet:** www.drapertools.com
- **E-mail:** sales@drapertools.com
- **Sales Fax:** (023) 8049 4209
- **General Enquiries:** (023) 8026 6355

- **Service/Warranty Repair Agent**
  For aftersales servicing or warranty repairs, please contact the Draper Tools Helpline for details of an agent in your local area.

YOUR DRAPER STOCKIST

DBKC220313