



**DRAPER**<sup>®</sup>

# 12V DC AC **INVERTER**

28814, 28815



UK  
CA CE

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

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## 1.1 INTRODUCTION:

**USER MANUAL FOR: 12V DC AC Inverter**

**Stock No: 28814, 28815**

**Part No: IN200/USB, IN400/USB**

## 1.2 REVISIONS:

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**Date first published November 2012.**

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

**Downloads are available from:** <http://drapertools.com/manuals>

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## 1.3 UNDERSTANDING THIS MANUAL'S SAFETY CONTENT:

**Warning!** – Information that draws attention to the risk of injury or death.

**Important** – Information that draws attention to the risk of damage to the product or surroundings.

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## 3. WARRANTY

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### 3.1 WARRANTY

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 Sales Desk: +44 (0) 8049 4333 or Product Help Line +44 (0) 23 8049 4344.**

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 warranty period covering parts/labour is 12 months from the date of purchase except where tools are hired out when the warranty period is 90 days from the date of purchase. This warranty does not apply to any consumable parts, any type of battery or 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 warranty applies in lieu of any other warranty expressed or implied and variations of its terms are not authorised.

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

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

**Draper Tools Limited.**

## 4. INTRODUCTION

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### 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 connection 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.....
Max. continuous power.....	200W.....	400W.....
Peak watts.....	400W.....	800W.....
USB output.....	DC 5.0V/2100mA.....	DC 5.0V/2100mA.....
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.....
Output type.....	Modified sine wave.....	Modified sine wave.....
Weight (unit and connection leads only).....	0.750kg.....	0.900kg.....

### 4.3 HANDLING AND STORAGE

- Care must be taken when handling this product.
  - Dropping this power tool could have an effect on its accuracy and could also result in personal injury. This product is not a toy and must be respected.
- Environmental conditions can have a detrimental effect on this product if neglected.
  - Exposure to damp air can gradually corrode components. If the product is unprotected from dust and debris, components will become clogged.
  - If not cleaned and maintained correctly or regularly, the machine will not perform at its best.

## 5. HEALTH AND SAFETY INFORMATION

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### 5.1 GENERAL SAFETY INSTRUCTIONS FOR POWER TOOL USE

**Warning! Read all safety warnings, instructions, illustrations and specifications provided with this power tool.** Failure to follow all instructions listed below may result in electric shock, fire and/or serious injury.

**Save all warnings and instructions for future reference.**

The term “power tools” in the warnings refers to your mains-operated (corded) power tool or battery-operated (cordless) power tool.

#### 1) Work area safety

- a) **Keep work area clean and well lit.** Cluttered or dark areas invite accidents.
- b) **Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases or dust.** Power tools create sparks which may ignite the dust or fumes.
- c) **Keep children and bystanders away while operating a power tool.** Distractions can cause you to lose control.

#### 2) Electrical safety

- a) **Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with earthed (grounded) power tools.** Unmodified plugs and matching outlets will reduce risk of electric shock.
- b) **Avoid body contact with earthed or grounded surfaces, such as pipes, radiators, ranges and refrigerators.** There is an increased risk of electric shock if your body is earthed or grounded.
- c) **Do not expose power tools to rain or wet conditions.** Water entering a power tool will increase the risk of electric shock.
- d) **Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the power tool. Keep cord away from heat, oil, sharp edges or moving parts.** Damaged or entangled cords increase the risk of electric shock.
- e) **When operating a power tool outdoors, use an extension cord suitable for outdoor use.** Use of a cord suitable for outdoor use reduces the risk of electric shock.
- f) **If operating a power tool in a damp location is unavoidable, use a residual current device (RCD) protected supply.** Use of an RCD reduces the risk of electric shock.

#### 3) Personal safety

- a) **Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a power tool while you are tired or under the influence of drugs, alcohol or medication.** A moment of inattention while operating power tools may result in serious personal injury.
- b) **Use personal protective equipment Always wear eye protection.** Protective equipment such as a dust mask, non-skid safety shoes, hard hat or hearing protection use for appropriate conditions will reduce personal injuries.
- c) **Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source and/or battery pack, picking up or carrying the tool.** Carrying power tools with your finger on the switch or energising power tools that have the switch on invites accidents.
- d) **Remove any adjusting key or wrench before turning the power tool on.** A wrench or a key left attached to a rotating part of the power tool may result in personal injury.
- e) **Do not overreach. Keep proper footing and balance at all times.** This enables better control of the power tool in unexpected situations.

## 5. HEALTH AND SAFETY INFORMATION

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- f) **Dress properly. Do not wear loose clothing or jewellery. Keep your hair and clothing away from moving parts.** Loose clothes, jewellery or long hair can be caught in moving parts.
- g) **If devices are provided for the connection of dust extraction and collection facilities, ensure these are connected and properly used.** Use of dust collection can reduce dust-related hazards.
- h) **Do not let familiarity gained from frequent use of tools allow you to become complacent and ignore tool safety principles.** A careless action can cause severe injury within a fraction of a second.

### 4) Power tool use and care

- a) **Do not force the power tool. Use the correct power tool for your application.** The correct power tool will do the job better and safer at the rate for which it was designed.
- b) **Do not use the power tool if the switch does not turn it on and off.** Any power tool that cannot be controlled with the switch is dangerous and must be repaired.
- c) **Disconnect the plug from the power source and/or remove the battery pack, if detachable, from the power tool before making any adjustments, changing accessories, or storing power tools.** Such preventive safety measures reduce the risk of starting the power tool accidentally.
- d) **Store idle power tools out of the reach of children and do not allow persons unfamiliar with the power tool or these instructions to operate the power tool.** Power tools are dangerous in the hands of untrained users.
- e) **Maintain power tools and accessories. Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the power tool's operation. If damaged, have the power tool repaired before use.** Many accidents are caused by poorly maintained power tools.
- f) **Keep cutting tools sharp and clean.** Properly maintained cutting tools with sharp cutting edges are less likely to bind and are easier to control.
- g) **Use the power tool, accessories and tool bits etc. in accordance with these instructions, taking into account the working conditions and the work to be performed.** Use of the power tool for operations different from those intended could result in a hazardous situation.
- h) **Keep handles and grasping surfaces dry, clean and free from oil and grease.** Slippery handles and grasping surfaces do not allow for safe handling and control of the tool in unexpected situations.

### 5) Service

- a) **Have your power tool serviced by a qualified repair person using only identical replacements parts.** This will ensure that the safety of the power tool is maintained.

## 5.2 ADDITIONAL SAFETY INSTRUCTIONS FOR 12V DC INVERTERS

- **Warning!** Under normal operation, lead-acid batteries generate explosive gasses.
- **Warning!** Battery acid is extremely corrosive and harmful, particularly when in contact with skin or clothing. Any splashes to skin or clothing must be washed immediately with soap and cold running water. **If battery acid comes into contact with the eyes you must rinse with cool, clean running water for at least 15 minutes and seek immediate medical attention.**
- Never smoke, create sparks or naked flames when working around vehicle engines or batteries.
- Corroded or dirty battery terminals must be cleaned before attachment to the inverter leads.
- To minimise the risk of short circuited current, or an explosion, avoid the use of metallic tools when working in close proximity to the vehicle's battery terminals.

## 5. HEALTH AND SAFETY INFORMATION

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- Personal items of jewellery, such as rings, bracelets, necklaces and watches must be removed before attempting to work around the vehicle's battery. Short circuited current can be powerful enough to weld metallic items to the vehicle and will cause severe burns and injuries.
- Children and unauthorised persons **MUST** be kept away from the immediate working area.
- **Warning!** This product **MUST NOT** be used on vehicles other than those with 12V DC electrical systems.
- An anti-surge device is recommended when the inverter is used in conjunction with sensitive electrical equipment, such as computers.
- **DO NOT** connect to an AC power input source.
- **DO NOT** disassemble the inverter or attempt personal servicing or maintenance. Such actions will invalidate the product warranty and could prove highly dangerous.
- **DO NOT** use the inverter in wet or damp conditions or areas where high levels of condensation are present.
- **NEVER** use the inverter for any other purpose than that for which it has been designed. Such actions will invalidate the product warranty and could prove highly dangerous.
- **DO NOT** remove the inverter connection clips from the battery terminals by pulling on the connection leads.
- **DO NOT** operate the inverter if the product is damaged.
- **DO NOT** connect to a positive earthed electrical system. Ensure polarity is correct before starting connection.
- Before use ensure any 230V AC items have been removed from the socket and that the inverter is switched to the OFF position.
- **Warning!** The inverter will become hot during use.
- After use, store the inverter in a dry safe area, safe from the reach of children.

### 5.3 CONNECTION TO THE POWER SUPPLY

**Caution:** Risk of electric shock. Do not open.

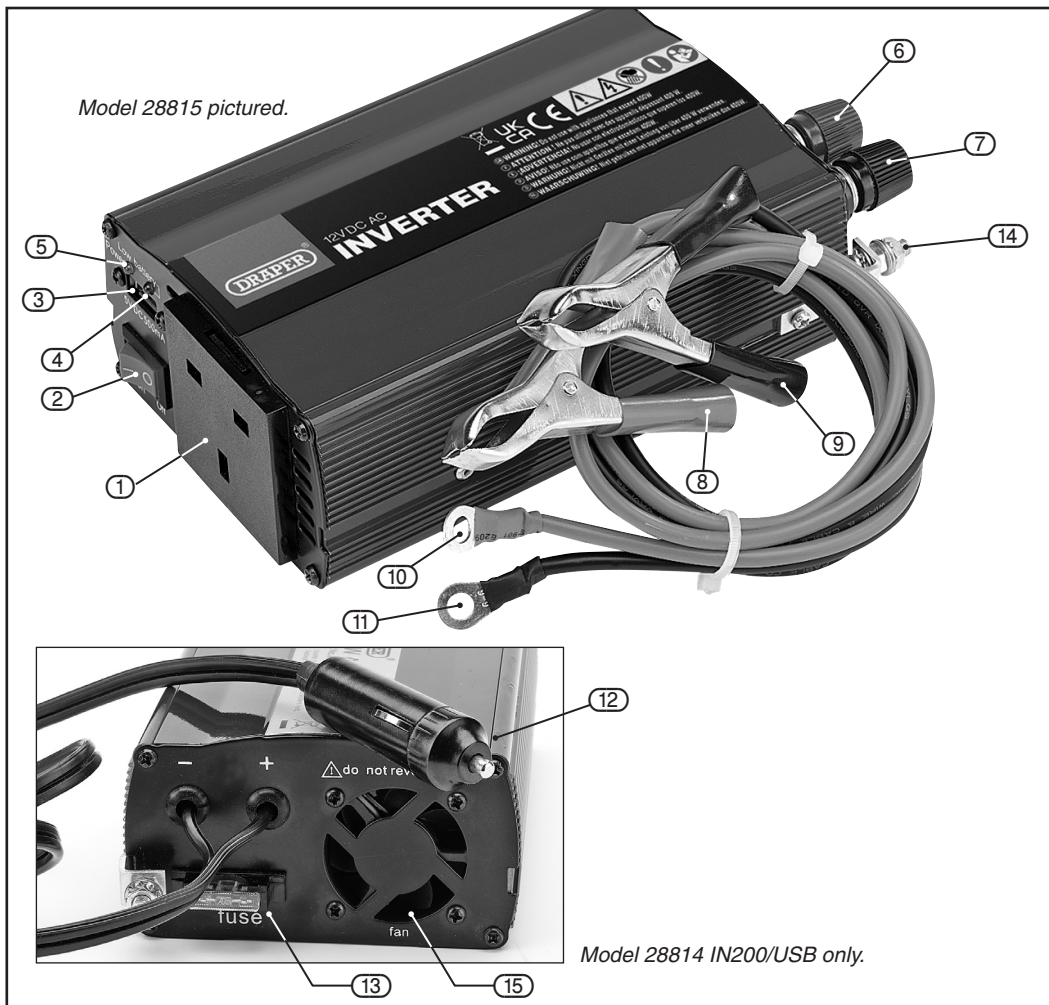
This appliance is supplied with appropriate approved connectors and cables for your safety.

- Never use a damaged or incomplete connector/plug.
- Position cables safely to avoid potential trip hazards.



# 6. TECHNICAL DESCRIPTION

## 6.1 IDENTIFICATION



- 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 (negative).
- ⑩ Red ring spade connector (positive).
- ⑪ Black ring spade connector (negative).
- ⑫ 12V DC car accessory/cigarette lighter socket connector plug.  
*(model 28814 IN200/USB only).*
- ⑬ Fuse.
- ⑭ Earthing point.
- ⑮ Cooling fan.

## 7. UNPACKING AND CHECKING

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### 7.1 PACKAGING

Carefully remove the product 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 Help Line (the telephone number appears on the Title page) and do not attempt to use the product.

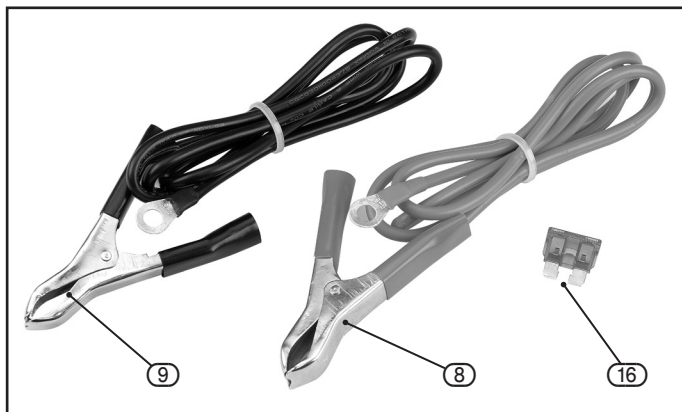
The packaging material should be retained at least during the warranty period, in case the machine needs to be returned for repair.

#### 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 main product, there are several parts not fitted or attached to it.



- ⑧ Red battery connector (positive).  
*(model 28815 IN400/USB only).*
- ⑨ Black battery connector (negative).  
*(model 28815 IN400/USB only).*
- ⑯ Spare fuse.

**Note:** For details of our full range of accessories and consumables, please visit [drapertools.com](http://drapertools.com)

## 8. PREPARATION

### 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

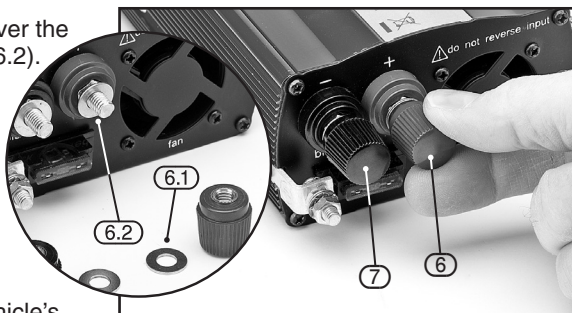


FIG.2

### 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

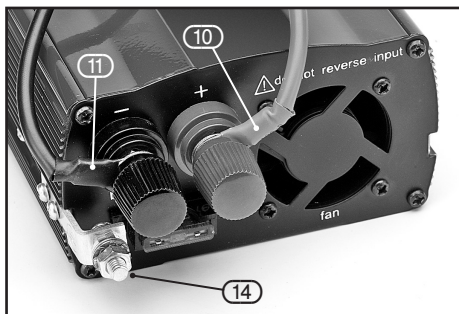


FIG.3

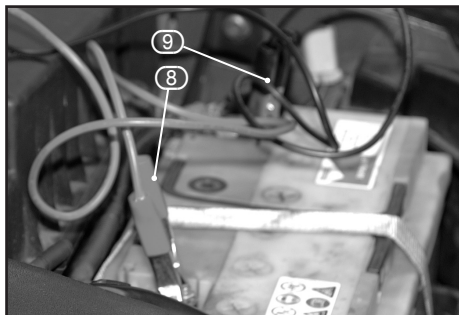


FIG.4

## 8. PREPARATION

### 8.3 GROUNDING CONNECTION – FIG. 5

**WARNING!** Before using this equipment 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.

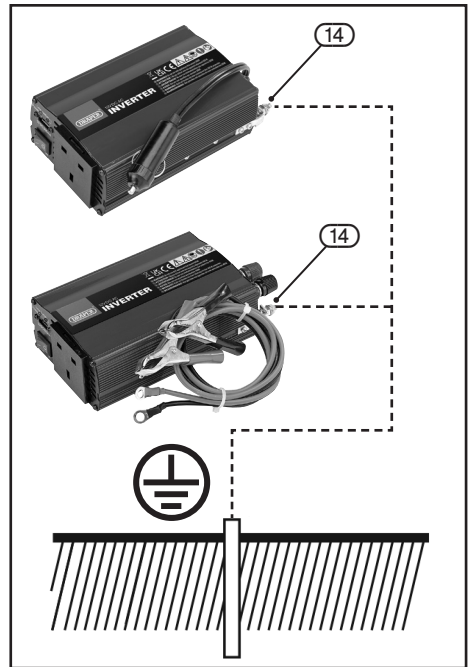


FIG.5

## 9. OPERATION

### 9.1 230V AC OUTPUT – 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.

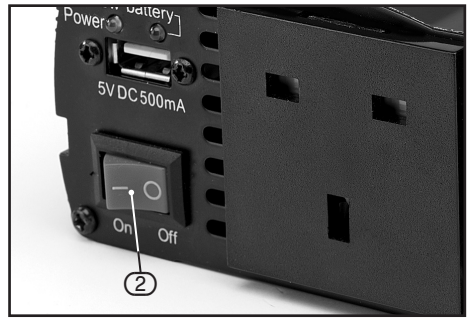


FIG.6

### 9.2 5V DC USB OUTPUT – 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.

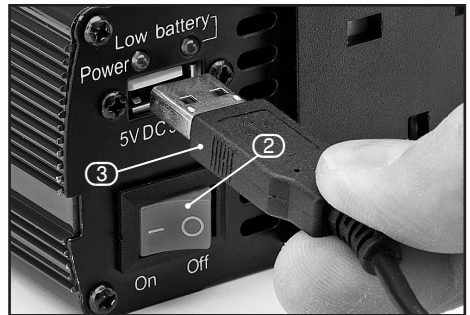


FIG.7

### 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 15.

## 9. OPERATION

### 9.4 FUSE REPLACEMENT – 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 (16) and replace with a fuse of the same rating and design determining the cause of the fault prior to re-using.

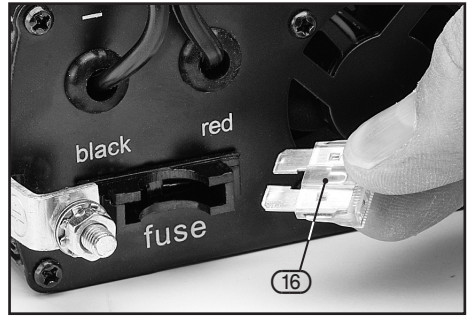


FIG.8

### 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 a 300W power inverter can provide power up to 600W for a short period, experimentation is the only method of determining whether an inverter can handle the surges generated by a particular load.

**Important:** 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. MAINTENANCE AND TROUBLESHOOTING

## 10.1 MAINTENANCE

**Note:** Remove the product from the power supply before carrying out adjustment, servicing or maintenance.

Regular inspection and cleaning reduces the necessity for maintenance operations and will keep your tool in good working condition.

The product must be correctly ventilated during tool operation. Avoid blocking the air inlets and vacuum the ventilation slots regularly.

## 10.2 TROUBLESHOOTING GUIDE

Problem	Possible Cause	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 11volts to maintain regulation.

# 10. MAINTENANCE AND TROUBLESHOOTING

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## 10.2 TROUBLESHOOTING GUIDE – *continued*

Television interference	'Snow'-like, picture appearance. Picture signal is breaking up.	<ul style="list-style-type: none"><li>– Locate the inverter as far as possible from the television, the antenna and the antenna cables.</li><li>– Adjust the orientation of the inverter antenna cables and the TV power cord to reduce interference.</li><li>– Make sure that the antenna feeding the television provides an adequate "snow-free" signal and that high quality, shielded antenna cable is used.</li></ul>
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**Important:** All repairs/servicing should be carried out by a qualified person.



# 11. DISPOSAL

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## 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 dispose of WEEE\* as unsorted municipal waste.



\* *Waste Electrical & Electronic Equipment.*

# 12. EXPLANATION OF SYMBOLS

## 12.1 EXPLANATION OF SYMBOLS



Read the instruction manual.



Keep out of the reach of children.



12V power.



DC current.



230V power.



400 Watts.



400 Watts peak AC current, converted from DC current.



USB output.



Thermal overload cut-out.



Fuse protection.



Overload cut-out alarm.



Reverse polarity protection.



**Warning!**



**Warning!**

Risk of electric shock.



**Do not** use this product in wet or damp conditions.



**Mandatory** action required.



Earthed.



WEEE –  
Waste Electrical & Electronic Equipment.

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



UK Conformity Assessed.



European conformity.

# NOTES

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# CONTACTS

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Service/Warranty Repair Agent:

For aftersales servicing or warranty repairs, please contact the  
Draper Tools Help Line for details of an agent in your local area.

## YOUR DRAPER STOCKIST

DBCH1221

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