WOODS
BATTERY CHARGERS

DIALOcharge

MANUALLY OPERATED MULTI-VOLTAGE LEAD-ACID BATTERY CHARGER

STANDARD UNITS

12V, 24V, 48V

15A, 30A, 60A

Issue : 2.00

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INTRODUCTION: **INTRODUCTION:**

The WOODS DIALOcharge is a sophisticated electronic manually operated charger for most types of batteries. It employs a primary phase-shift controlled triac to precisely supply charging voltages and currents during the recharge cycle. The DIALOcharge successfully recovers deeply discharged batteries.
The DIALOcharge covers a variable range of battery voltages which provides charging flexibility in the automotive, marine, farming, domestic and commercial workshop arenas.
(eg: a 24V DIALOcharge will charge batteries of any voltage from single 2V cells to 24V systems)
Due to the precise power control provided by the DIALOcharge, it may be used for fast recharging of operational batteries or for overnight trickle charge situations.

Originally suited to only Lead-Acid batteries, design improvements have included the following features;

COMPLIANCE
- Tolerates poor Mains AC power quality
- Meets AS1044 / CISPR14 specifications for EMC
- Manufactured to Australian Standards.

POWER
- 240V ac mains or generator supply
- Available in 750VA and 1500VA units
- Standard voltage ratings are 12V, 24V and 48Volts
- Standard amperage ratings are 15A, 30A and 60Amps
- Units may be paralleled and/or coupled to increase Volt and Amp ratings

PROTECTION
- Mains input over-current manual reset circuit breaker
- Battery output over-current manual reset circuit breaker
- Temperature controlled fan cooling
- Rectifier over-temperature charger shutdown
- Transformer over-temperature charger shutdown

CONTROL
- Precision analog control of rugged Triac device
- Manual operation
- Infintely adjustable power control
- Electronic limiting of maximum voltage
- Electronic current limiting

DISPLAY
- Accurate output analog metering
- Ammeter and Voltmeter in one item, displays Amps by default, Press button to display Volts
- Wide angle visibility

BATTERIES
- Automotive / Marine standard Lead-Acid
- Deep Cycle Lead-Acid
- Lead-Calcium
- Flooded Wet Nickel-Cadmium
- Genesis®/Optima®

CABINET
- Marine grade, powder coated
- Versatile portability
- 2metre mains and battery cables

SPECIFICATIONS 12V UNITS: **SPECIFICATIONS 12V UNITS:**

12Volt DIALOcharge units

12V units	D1230	D1260
Nominal Battery Voltage	12V dc	12V dc
Maximum Output Current (Amps ave)	30A dc	60A dc
Total Battery Capacity (recommended range)	60Ah ~ 400Ah	100Ah ~ 800Ah
Maximum Output Voltage (average)	17.5V dc	17.5V dc
Mains Supply Voltage	220~250Vac 50~60Hz	220~250Vac 50~60Hz
Maximum Consumption	750VA	1500VA
Tolerance to Mains Supply distortion	16% THD	16% THD
Minimum Generator Capacity (no other load)	1500VA	3000VA
Input Protection	6A Thermal/Magnetic manual reset	10A Thermal/Magnetic manual reset
Output Protection	63A Thermal/Magnetic manual reset breaker	3x40A Thermal/Magnetic manual reset breaker
Rectifier	4 X Bridge 35A 1000V	2 X Bridge 90A 600V
Fan	240Vac 120mm	240Vac 120mm
Temperature Protection Transformer	150°C auto reset	150°C auto reset
Temperature Protection Rectifier	100°C auto reset	100°C auto reset
Temperature Protection Fan cooling	50°C thermostat	50°C thermostat
Operating Temperature range	-10°C ~ 45°C	-10°C ~ 45°C
Metering : Volts Analogue Moving coil	0-20V FSD	0-20V FSD
Metering : Amps Analogue Moving coil	0-40A FSD	0-80A FSD
Cabinet: W x D x H	230 x 300 x 290 mm	230 x 300 x 290 mm
Connections : input	IEC M.N.E 250V 10A	IEC M.N.E 250V 10A
Connections : output	30A Binding posts	60A Binding posts
Connections : cable minimum size	6mm² per2m	10mm² per2m

24Volt 48Volt DIALOcharge units

24V units	D2415	D2430	D2460
Nominal Battery Voltage	24V dc	24V dc	24V dc
Maximum Output Current (Amps ave)	15A dc	30A dc	60A dc
Total Battery Capacity (recommended range)	30Ah ~ 200Ah	60Ah ~ 400Ah	100Ah ~ 800Ah
Maximum Output Voltage (average)	35V dc	35V dc	35V dc
Mains Supply Voltage	220~250Vac 50~60Hz	220~250Vac 50~60Hz	220~250Vac 50~60Hz
Maximum Consumption	750VA	1500VA	3000VA
Tolerance to Mains Supply distortion	16% THD	16% THD	16% THD
Minimum Generator Capacity (no other load)	1500VA	3000VA	6000VA
Input Protection	6A Thermal/Magnetic manual reset	10A Thermal/Magnetic manual reset	16A Thermal/Magnetic manual reset
Output Protection	32A Thermal/Magnetic manual reset breaker	63A Thermal/Magnetic manual reset breaker	3X40A Thermal/Magnetic manual reset breaker
Rectifier	4 X Bridge 35A 1000V	4 X Bridge 35A 1000V	8 X Bridge 35A 1000V
Fan	240Vac 120mm	240Vac 120mm	240Vac 120mm
Temperature Protection Transformer	150°C auto reset	150°C auto reset	150°C auto reset
Temperature Protection Rectifier	100°C auto reset	100°C auto reset	100°C auto reset
Temperature Protection Fan cooling	50°C thermostat	50°C thermostat	50°C thermostat
Temperature range	-10°C ~ 45°C	-10°C ~ 45°C	-10°C ~ 45°C
Metering : Volts Analogue Moving coil	0-40V FSD	0-40V FSD	0-40V FSD
Metering : Amps Analogue Moving coil	0-20A FSD	0-40A FSD	0-40A FSD
Cabinet: W x D x H	230 x 300 x 290 mm	230 x 300 x 290 mm	400 x 300 x 290 mm
Connections : input	IEC M.N.E 250V 10A	IEC M.N.E 250V 10A	15A 3pin 2m cable
Connections : output	30A Binding posts	30A Binding posts	60A Binding posts
Connections : output cable minimum size	6mm² per2m	6mm² per2m	10mm² per2m

SPECIFICATIONS 48V UNITS: **SPECIFICATIONS 48V UNITS:**

48Volt DIALOcharge units

48V units	D4815	D4830
Nominal Battery Voltage	48V dc	48V dc
Maximum Output Current (Amps ave)	15A dc	30A dc
Total Battery Capacity (recommended range)	30Ah ~ 200Ah	60Ah ~ 400Ah
Maximum Output Voltage (average)	70V dc	70V dc
Mains Supply Voltage	220~250Vac 50~60Hz	220~250Vac 50~60Hz
Maximum Consumption	1500VA	3000VA
Tolerance to Mains Supply distortion	16% THD	16% THD
Minimum Generator Capacity (no other load)	3000VA	6000VA
Input Protection	10A Thermal/Magnetic manual reset	16A Thermal/Magnetic manual reset
Output Protection	3X10A Thermal/Magnetic manual reset breaker	3X20A Thermal/Magnetic manual reset breaker
Rectifier	4 X Bridge 35A 1000V	4 X Bridge 35A 1000V
Fan	240Vac 120mm	240Vac 120mm
Temperature Protection Transformer	150°C auto reset	150°C auto reset
Temperature Protection Rectifier	100°C auto reset	100°C auto reset
Temperature Protection Fan cooling	50°C thermostat	50°C thermostat
Operating Temperature range	-10°C ~ 45°C	-10°C ~ 45°C
Metering : Volts Analogue Moving coil	0-80V FSD	0-80V FSD
Metering : Amps Analogue Moving coil	0-20A FSD	0-40A FSD
Cabinet: W x D x H	400 x 300 x 290 mm	400 x 300 x 300 mm
Connections : input	15A 3pin 2m cable	15A 3pin 2m cable
Connections : output	30A Binding posts	30A Binding posts
Connections : cable minimum size	6mm² per2m	10mm² per2m

PREPARATIONS: PREPARATIONS:

PRIORITY:

Before using you new WOODS DIALOcharge, ensure that you have the following items;

1 the DIALOcharge unit
2 mains AC 3 pin cable
3 RED and BLACK battery cables with alligator clamps

If any of the above items are missing from the original packaging, contact your supplier.

ENVIRONMENTS:

Due to the versatile portability of the DIALOcharge, it may be employed in almost all environments, provided the following conditions apply;

- Ensure that the DIALOcharge cabinet is mounted in an upright position, carry-handle on top.
- DO NOT mount the DIALOcharge inside an unventilated enclosure. The DIALOcharge must have minimum air intake and outlet areas of 10,000mm² (16in²).
- Allow adequate ventilation around the cabinet. eg: 100mm clearance to the left and right side panels for effective fan cooling.
- DO NOT mount the DIALOcharge in direct sunlight or in environments with a high ambient temperature, as extreme temperatures will cause the DIALOcharge to shut down operation.
- DO NOT use the DIALOcharge in wet areas where it may be sprayed with water or other liquids.
- DO NOT use the DIALOcharge in excessively dusty environments.

CONNECTIONS:

BEFORE MAKING ANY ELECTRICAL CONNECTIONS, ENSURE THAT THE 240Vac MAINS IS SWITCHED OFF !

AC MAINS Input connection:

The AC mains inlet socket is situated on the lower right of the front panel, and is the International IEC connector type.
The mains cable supplied is fitted with a standard 3 pin plug, for connection to an Australian GPO and the IEC connector.

- ♦ If using a GenSet for mains supply, ensure that its capacity is at least double the DIALOcharge's input VA rating.
  eg: 750VA charger = 1500VA GenSet minimum
  maximum allowable GenSet distortion 16% THD (Total Harmonic Distortion)

Output connection:

The output connections are the RED and BLACK binding posts located on the lower left of the front panel, labelled POSITIVE and NEGATIVE respectively.

D1230, D2415, D2430, D4815		D1260	
Ensure the OUTPUT circuit breakers are in the OFF position. Use RED and BLACK cables supplied.			
1	Loosen BLACK insulated post nut anti-clockwise to open terminal.	1	Loosen anti-clockwise and remove the BLACK insulated securing nut.
2	Insert the ferrule end of the BLACK cable into the open BLACK terminal.	2	Fit the eye terminal of the BLACK cable onto the metal BLACK terminal.
3	Tighten BLACK insulated post nut clockwise to close connection.	3	Refit and tighten the insulated BLACK securing nut and tighten clockwise. *(DO NOT cross-thread)*
4	Repeat steps 1 to 3 for the RED cable.	4	Repeat steps 1 to 3 for the RED cable.

MULTIPLEXING DIALOchargers:

PARALLEL: eg: D1260 + D1260 = 12V 120A

Two or more DIALOcharge units may be connected in parallel to increase the charging AMPERAGE capacity.
You may now individually control each charger upto the total maximum.

SERIES: eg: D1260 : D1260 = 24V 60A

Two or more DIALOcharge units may be connected in series to increase the charging VOLTAGE capacity.
You may now individually control each charger upto the total maximum.

The added bonus of multiple individual DIALOcharge units facilitates the use of the units separately if required.

OPERATING THE DIALOcharge:

Both the voltage and the current of the DIALOcharge are controlled simultaneously with a single knob, providing an infinite selection between the MINimum and MAXimum range. This is acheived by an analogue triac-driven, phase shitfing duty cycle control of the MAINS ac input to the transformer. The OUTPUT dc voltage and current are battery and/or load dependant.

CONNECTING THE BATTERY:

Fit the INPUT and OUTPUT cables as described on page 6 : PREPARATIONS : CONNECTIONS

BEFORE MAKING ANY ELECTRICAL CONNECTIONS, ENSURE THAT THE 240Vac MAINS IS SWITCHED OFF !

- Ensure the INPUT and OUTPUT circuit breakers are switched to the OFF position.
- Rotate the POWER CONTROL knob anti-clockwise to the MIN position.
- Connect the BLACK cable clamp to the battery NEGATIVE.
- Connect the RED cable clamp to the battery POSITIVE.
- Visually recheck that all the connections are safe and secure.
- Switch the INPUT and OUTPUT circuit breakers to the ON position.
- Note that the DualMeter will read zero. Press the Dual Meter Switch, the output voltage will be displayed. Release.
- Slowly rotate the POWER CONTROL knob slowly clockwise until the needle of the DualMeter begins to move from zero. (This indicates that the DIALOcharge output has matched the battery voltage.)
- Continue to rotate the knob clokwise to increase the current.

CHARGING THE BATTERY:

During the charging process, it is important to frequently visually test and read the battery voltage via the DualMeter.

FAST CHARGING:

Fast charging is most useful for boost charging batteries on;

- vehicles that require a quick start
- solar systems. This reduces the GenSet runtime.

The DIALOcharge has the ability to meet the maximum charge rate of the battery, according to its condition.
A battery in good condition will accept a much higher rate of charge more readily than an old, sulphated battery.

Batteries can be charged to 80% of full charge by fast charging. The remaining 20% will only be accepted by the battery if the charging current is at a low rate.

Fast charging is normally quite safe, but it could be detrimental to the life of an old battery if undertaken to frequently.

NORMAL CHARGING:

Normal charging provides a more acceptable and beneficial recharge process.
Manually control the charging current via the POWER CONTROL knob.

The higher the battery voltage and the lower the charging current, the more charged the battery is.
The lower the battery voltage and the higher the charging current, the less charged the battery is.

While the DIALOcharge will not allow the charging current to exceed its maximum by means of electronic current limiting, the user must not allow the battery voltage to exceed the voltages as listed in the table below;

BATTERY NOMINIAL VOLTAGE	2V	6V	12V	18V	24V	30V	36V	48V
MAXIMUM CHARGING TERMINAL VOLTAGE	2.5V	7.5V	15V	22.5V	30V	37.5V	45V	60V

FLAT CHARGING:

Batteries in this condition have a very low specific gravity of the electrolyte and a very high internal resistance. This inhibits the amount of charging current the battery will draw. The POWER CONTROL knob will need to be rotated clockwise closer to MAX, effecting a higher setting than normal to obtain even a small amount of charge current. This is acceptable, but the result is that the DIALOcharge will supply a higher voltage to the battery.

CARE MUST BE TAKEN AT THIS STAGE

As the DIALOcharge overcomes the high internal resistance of the battery, the charging current will begin to increase. The charging current may even rise to the DIALOcharge's maximum output. As the battery begins to accept charge, the voltage will reduce to a more realistic value relevent to the state of charge of the battery. Once the battery is becoming more and more charged the current will decrease and the voltage will begin to climb. The user must not allow the battery voltage to exceed the voltages as listed in the table above above.

IN BRIEF:

- Some battery chargers perform erratically, or suffer damage, when run from portable petrol generators
- This is due to poor waveform quality from small portable generators, particularly when lightly loaded.
- Either apply an additional load to the generators when running battery chargers, or get a better generator set.
- The generator VA rating should be at least FOUR times the battery voltage multiplied by the charger current.

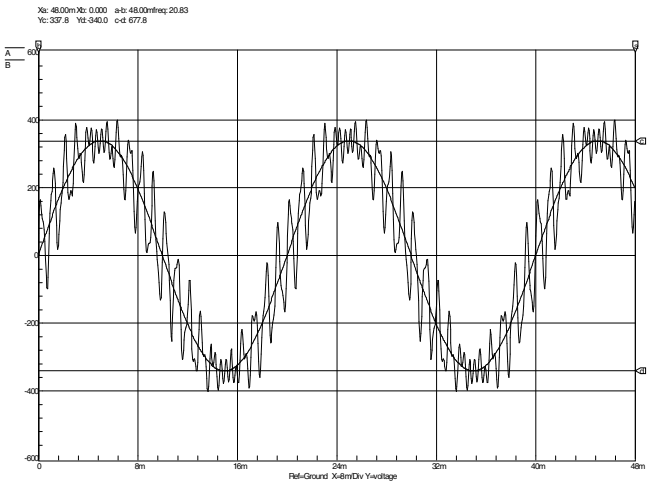
THE PROBLEM - MORE DETAIL

In recent years, WOODS Battery Chargers have been seeing an increasing number of chargers which have been damaged by poor power quality. In all cases, power has been supplied by portable generators ("Gen-sets") of less than 5kVA rating.
Almost all of the damaged chargers have been Woods "Dialomatic" types, since these are the style most likely to be used with small gen-sets.
Power from gen-sets of 7kVA and higher seems to be of good quality. No problems have been reported from using chargers with these larger gen-sets.
Similarly, few problems have been noted in WOODS ELECTRIC "Automatic", "BETAcharge" and "Neptune" chargers, simply because these are not generally used with small gen-sets.
Although most appliances are not affected by the poor waveform quality from smaller gen-sets, those appliances which use "Phase Power Control" are particularly affected. "Phase Power Control" is used in WOODS ELECTRIC battery chargers, in speed controls for power tools, and in domestic lighting dimmers.

THE CAUSE – MORE DETAIL:

The generators in many small gen-sets produce highly distorted waveforms.
Although meters are readily available to measure generator output voltage and frequency, it is rare to see meters for output distortion measurement. The easiest way to view a generators' output is to use an oscilloscope. This will not directly measure distortion, but it will give a good visual indication of the degree of distortion.

Here is the (simulated) waveform of a typical "cheap and nasty" generator, shown against a pure 240V 50Hz sinewave:
This particular waveform exhibits a distortion of around 25%.
Ideally, mains power (and gen-set output power) would be a pure sine-wave. In fact, mains power may have up to 5% distortion. This level of distortion does not create any misbehaviour in Dialomatic chargers.



Some gen-sets, however, produce power with more than 20% distortion (sometimes as high as 25%!).
The distortion is due to the design of the generator. The engine driving the generator is not responsible.

The phase-control circuits in Woods Dialomatic chargers manufactured before 2001 cannot cope with more than 8% distortion. The circuits in new Dialomatic chargers can cope with up to 15% distortion.

Woods Dialomatic battery chargers are generally quite tolerant of the variations in frequency and voltage produced by gen-sets, but they don't cope with high distortion levels.

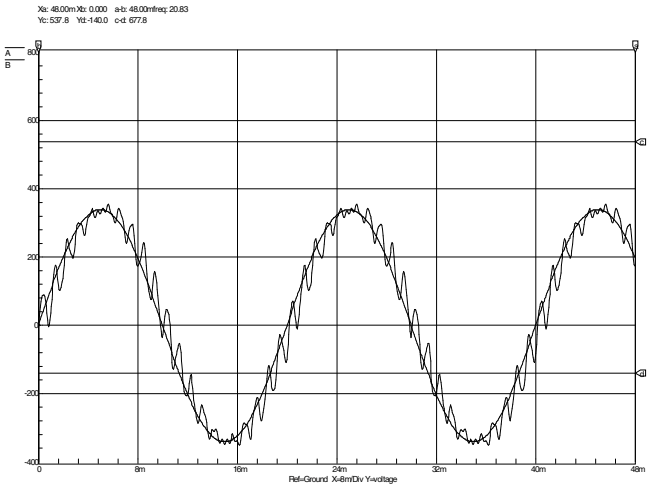
SOLUTIONS – MORE DETAIL:

We have found that the distortion produced by gen-sets may be reduced to useable levels by loading the generator with a resistive load, in addition to the battery charger.

Loads of between 500 watts and 1500 watts will generally reduce the generators' distortion sufficiently. The load must be resistive, and it must be constant. Good examples include 500W incandescent floodlights, and bar-element radiators.

Fluorescent lighting, refrigerators and stoves are unsuitable – either because they are not resistive, or because they are thermostatically controlled and may cut out at any time.

Here is the (simulated) waveform of the same generator as before, now loaded with a 1000 watt resistive load:
The degree of distortion reduction is immediately apparent – it is now down to 12%.



This "resistive loading" technique works well - but the operator must locate suitable loads (and remember to use them each time!), and the engines' fuel consumption will increase.

It may be viable to upgrade your generator set, instead.

FASCIA INDENTIFICATION: **FASCIA INDENTIFICATION:**

DualMeter : Displays both battery volts and the charging amps.

Model Number

DIALOcharge specifications

Input circuit breaker : Open circuits mains supply.

Output circuit breaker: Open circuits battery connection.

Positive : battery terminal

Negative : battery terminal

DualMeter Switch : Reads AMPS by default. Press the switch to read VOLTS.

Power Controller : Slowly rotate from MIN to MAX to increase the power output.

Operating and Warning Instructions : Read for operating the DIALOcharge.

Mains Input : Use only supplied cable.

Serial Number :

COMPONENT	D1230	D1260	D2415	D2430	D2460	D4815	D4830
TRANSFORMER	30AT15750 30S15750	30S151500	30AT15750 30S15750	30S151500	2 off 30S151500	2 off 30AT15750	2 off 30S151500
CONTROLLER	41D1230	41D1260	41D2415	41D2430	41D2460	41D4815	41D4820
SWITCH-POT	79D200	79D200	79D200	79D200	79D200	79D200	79D200
DUALMETER	64D1230	64D1260	64D2415	64D2430	64D2460	64D4815	64D4830
RECTIFIER	403510	401280	403510	403510	403510	403510	403510
SHUNT	36050	36100	36025	36050	36100	36025	36050
TEMPERATURE SENSOR FAN	43505	43505	43505	43505	43505	43505	43505
TEMPERATURE SENSOR TRANSFORMER	431005	431005	431005	431005	431005	431005	431005
INPUT OVERLOAD	52M06	52M16	52M06	52M16	52M20	52M16	52M20
OUTPUT OVERLOAD	52M63	52M40.3	52M32	52M63	52M40.3	52M10.3	52M20.3
POSITIVE TERMINAL	33R	34490.1	33R	33R	34490.1	34490.1	34490.1
NEGATIVE TERMINAL	33B	34490.4	33B	33B	34490.4	34490.4	34490.4
OUTPUT CABLES POSITIVE & NEGATIVE	36D030	36D060	36D015	36D030	36D060	36D015	36D030
COOLING FAN	90124	90124	90124	90124	90124	90124	90124
INPUT CABLE	35322	35322	35322	35322	35322	35322	35315

PARTS LIST:

COMPONENT IDENTIFICATION:

TRANSFORMER

MODEL	PART #
D1230	30A15750
D2415	30A15750
D4815	2 off - 30A15750

TRANSFORMER

MODEL	PART #
D1230	30S15750
D2415	30S15750

TRANSFORMER

MODEL	PART #
D1260	30S151500
D2430	30D151500
D2460	2 off - 30D151500
D4830	2 off - 30D151500

CONTROLLER

MODEL	PART #
D1230	41D1230
D1260	41D1260
D2415	41D2415
D2430	41D2430
D2460	41D2460
D4815	41D4815
D4830	41D4830

SWITCHPOT ASS'Y

MODEL	PART #
All	79D200

DUALMETER

MODEL	PART #
D1230	64D1230
D1260	64D1260
D2415	64D2415
D2430	64D2430
D2460	64D2460
D4815	64D4815
D4830	64D4830

COMPONENT IDENTIFICATION:

RECTIFIER

MODEL	PART #
D1230	403510
D2415	403510
D2430	403510
D2460	403510
D4815	403510
D4830	403510

RECTIFIER

MODEL	PART #
D1260	401280

SHUNT

MODEL	PART #
D1230	36Z050
D1260	36Z100
D2415	36Z025
D2430	36Z050
D2460	36Z100
D4815	36Z025
D4830	36Z050

COMPONENT IDENTIFICATION:

TEMPERATURE SENSOR

MODEL	TYPE
All	Heatsink
50°C NO FAN	100°C NC TRANSFORMER
43505	431005

CIRCUIT BREAKER

RATING	PART #
2 Amps	52M02
4 Amps	52M04
6 Amps	52M06
10 Amps	52M10
16 Amps	52M16
20 Amps	52M20
32 Amps	52M32
63 Amps	52M63

CIRCUIT BREAKER

RATING	PART #
3 X 10 Amps	52M10.3
3 X 20 Amps	52M20.3
3 X 40 Amps	52M40.3
3 X 63 Amps	52M63.3

COMPONENT IDENTIFICATION:

OUTPUT TERMINALS 30Amp

TYPE	PART #
RED	344R
BLACK	344B

OUTPUT TERMINALS 60Amp

TYPE	PART #
RED	34490.1
BLACK	34490.4

OUTPUT CABLE CLAMPS

MODEL	PART #
D1230	36D030
D1260	36D060
D2415	36D015
D2430	36D030
D2460	36D060
D4815	36D015
D4830	36D030

120mm COOLING FAN

TYPE	PART #
all CHARGERS	*40mm*
12Vdc	90124.12
24Vdc	90124.24
110Vac	90124.1
240Vac	90124
	25mm
240vAC	90125

120mm FAN GRILLE

MODEL	PART #
All	90120G

KNOB

MODEL	PART #
All	79K2

As future product developments are made, supplements may be included in this section to keep your information up to date.

WOODS Battery Chargers
7 Woodford Place, P.O. Box 118
Thornton, 2322.
Phn: 02 4966 2811 Fax: 02 4966 2911

WARRANTY CERTIFICATE:

SECTION A:

Before using the WOODS Battery Charger, it is vitally important record the following information;

1 WOODS Battery Charger model number
2 WOODS Battery Chargers serial number
3 date of purchase
4 place of purchase

* we also suggest you attach a copy of your purchase invoice to this document, for future reference

PLEASE RETAIN THIS INFORMATION UNTIL WARRANTY SERVICE IS REQUIRED.

SECTION B:

WOODS Battery Chargers will honour warranty if;

1 the WOODS Battery Charger fails within 12 months of purchase by end user
2 the product is returned to an authorised service agent
3 the freight is prepaid to an authorised service agent
4 proof of purchase is provided with warranty claim
5 failure is due to faulty workmanship and/or parts failure

SECTION C:

WOODS Battery Chargers will void warranty if;

1 the WOODS Battery Charger is used in an improper manner, eg: outside its specifications
2 the WOODS Battery Charger has been incorrectly installed and/or connected
3 failure is caused by gross damage such as, droppage, water damage, etc
4 the unit has been tampered with
5 non-genuine parts have been installed
6 the WOODS Battery Charger has been repaired by persons NOT authorised by WOODS Battery Chargers.
7 outside the warranty period
8 no proof of purchase is supplied

SECTION D:

Items not covered by warranty;

1 3rd party service activities and charges
2 Charges incurred for travelling to or from repair site
3 Costs of non-genuine parts

SECTION E:

In the event of a warranty claim, please provide the service agent with the following;

1 your faulty WOODS Battery Charger, (pre-paid freight, if necessary)
2 the information as requested SECTION A
3 a written description of fault(s)
4 your contact details

SECTION F:

Note: If no fault is found in the WOODS Battery Charger, servicing is covered by warranty - but the return freight cost will be at the owners' expense.

CONTACT: **CONTACT:**

WOODS BATTERY CHARGERS Pty Ltd

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