

sphere

PWM Solar Charge Controller User Manual

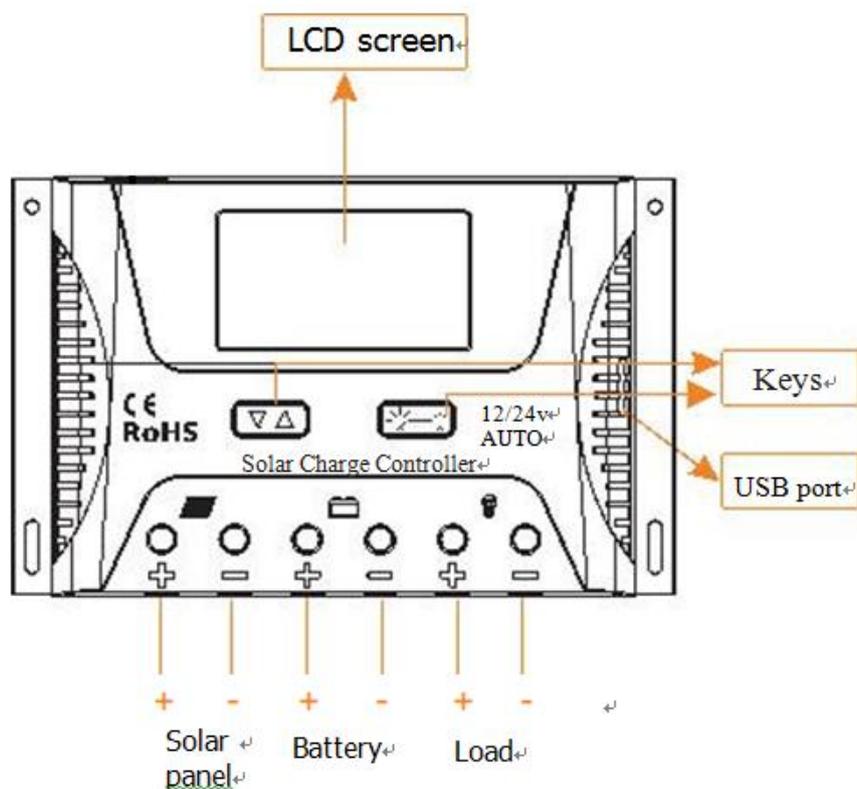


Thank you for choosing our product. Before using the product, please read this manual in full.

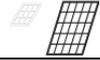
1. Product Features

1. Automatic system voltage identification
2. Charging program options for sealed, GEL (DEFAULT), Sealed, flooded lead-acid batteries and lithium batteries types are available.
3. An upgraded 3-stage PWM charging algorithm is adopted. Application of an equalizing charge to the battery periodically or when over discharged, can effectively prevent the battery from non-equalization and sulfuration, thus extending the battery's service life (with the exception of GEL and lithium batteries).
4. With temperature compensation employed, charging parameters can be automatically adjusted (with the exception of lithium batteries).
5. A wide range of load working modes facilitate the product's application to different types of street lights and monitoring devices. *Some loads can have excessive start up currents that can trip the logic of the controller, if using for Load connection please consult your dealer firstly to ensure the current startup or peak current does not exceed the rating of the controller.
6. The product provides overcharge, over-discharge, overload protection, as well as short-circuit and reverse-connection protection.
7. A range of parameter settings and power-down saving functions are available, thus requiring no repeated setting.
8. The product provides a dot matrix graphic LCD screen and easy to use interface with only 2 keys.
9. Boasting an industrial grade design, the product can function well in various tough conditions.
10. TVS lightning protection is adopted.

2. Panel Structure



3. LCD Indicators

LCD Icon	Indicated Object	State	Meaning
	Day recognition	Steady on	Day time
	Night recognition	Steady on	Night time
	Solar panel	Steady on	Solar panel indication
BOOST	Charging state	Steady on	Boost charging
FLOAT		Steady on	Floating charging
EQUATIZE		Steady on	Equalizing charging
	Battery	Quick flashing	Battery overvoltage
		Slow flashing	Battery overvoltage
	Battery SOC	4 dashes	100%
		3 dashes	75%
		2 dashes	50%
		1 dash	25%
		0 dash	0%
	Load	Steady on	Load turned on
		Steady on	Load turned off
		Quick flashing	Overload or short-circuit protection

4. Five Load Working Modes

1. Pure light control (0): When sunlight disappears and the light intensity drops to the starting point (light control off), the controller initiates a 10-minute delay (settable) to confirm the starting signal, and then switches on the load for operation. When sunlight emerges and the light intensity reaches the starting point, the controller initiates a 1-minute (fixed) delay to confirm the shutting-down signal, and then shuts down the output to stop the load's operation.

2. Light control + time control (1 to 14): The starting process is the same as pure light control. After operating for a preset period of time (settable from 1 to 14 hours), the load stops operation automatically.

3. Manual mode (15): In this mode, the user can switch the load on or off by the keys, no matter whether it's day or night.

4. Debugging mode (16):

When the solar panel voltage is higher than the "light control off" voltage, switch off the load immediately; when the solar panel voltage is lower than the "light control on" voltage, switch on the load immediately.

5. Normal on (17): The energized load keeps in output state.

LED Display	Mode	LED Display	Mode
0	Pure light control mode	9	Light control + time control (9 hours)
1	Light control + time control (1 hour)	10	Light control + time control (10 hours)
2	Light control + time control (2 hours)	11	Light control + time control (11 hours)
3	Light control + time control (3 hours)	12	Light control + time control (12 hours)
4	Light control + time control (4 hours)	13	Light control + time control (13 hours)
5	Light control + time control (5 hours)	14	Light control + time control (14 hours)
6	Light control + time control (6 hours)	15	Manual mode (default)
7	Light control + time control (7 hours)	16	Debugging mode
8	Light control + time control (8 hours)	17	Normal on mode

5. Load Working Mode Settings

In the load mode menu, long press  for 2s, and the number (e.g. 15) will begin to flash. Press  to adjust the mode (from 0 to 17), and then long press  again for 2s to complete and save the setting.

Note: 1. After parameter adjustment, if  is not pressed and held long enough for exiting, the system exits to the main menu after 12s, and the parameter that was set is not saved.

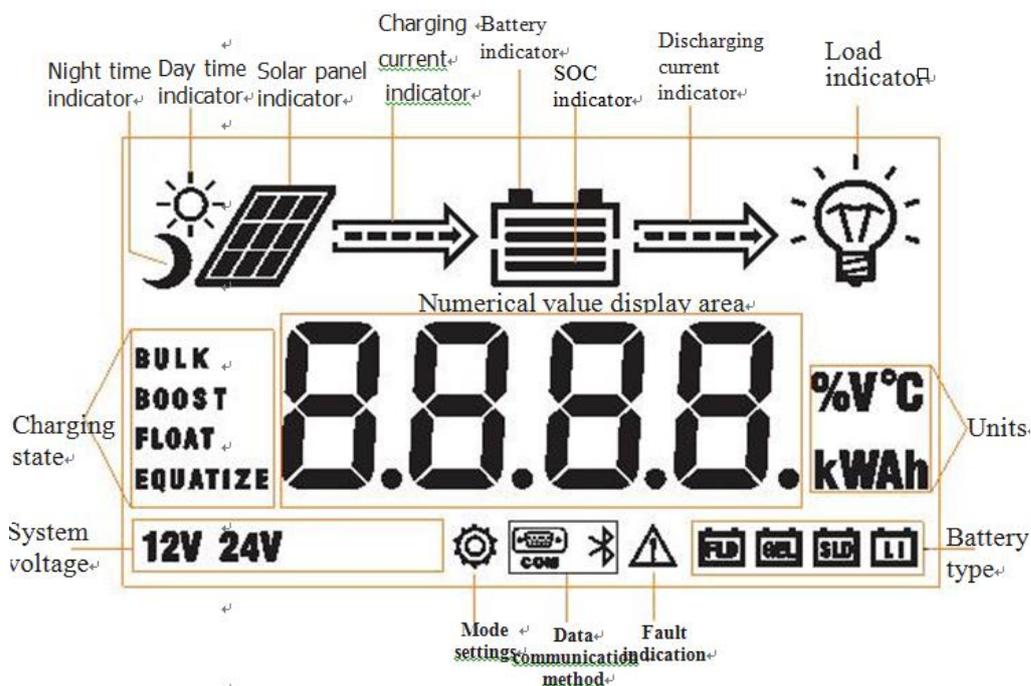
2. When the system is saving data, the screen may shake slightly. This is normal and the user may ignore it.

6. Safety Advice

- 1) When connected to a 24 V or 48V system, the solar panel terminal voltage may exceed the limit for human safety. If operation is to be performed, be sure to use insulation tools and keep your hands dry.
- 2) If the battery is reversely connected, the controller itself won't be damaged, but the load end will have a negative voltage output, which may damage your load device. Take care not to let this happen.

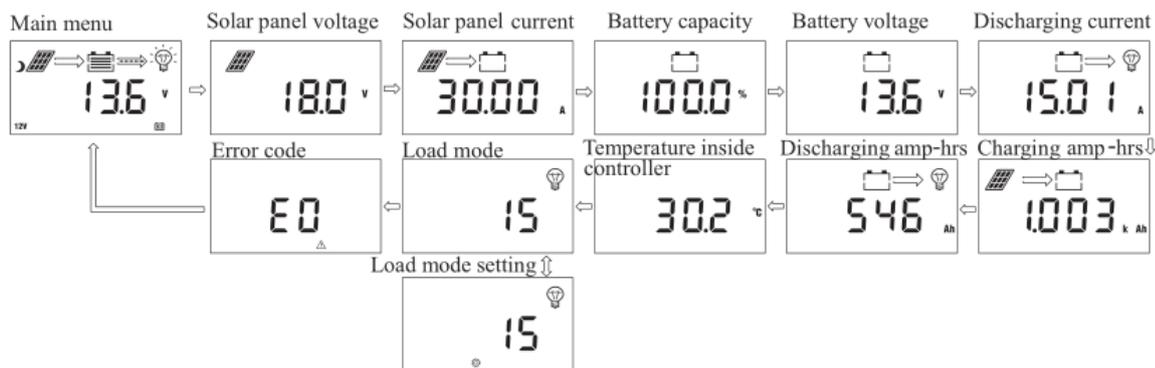
- 3) In the 48V system, separate reverse connect battery or separate reverse connection of solar panel controller will not damage; but if in reverse connection of the battery and is connected solar panels, or solar panels on the reverse connection is connected to the battery may cause damage to the controller.
- 4)The battery contains a large amount of energy. Therefore, in no cases should the battery be short circuited. It's recommended that a fuse be serially connected to the battery.
- 5)Keep the battery away from fire sparks, as the battery may produce flammable gas.
- 6) Keep children away from the battery and controller.
- 7) Follow the safety advice provided by the battery manufacturer.

7. LCD Screen Illustration



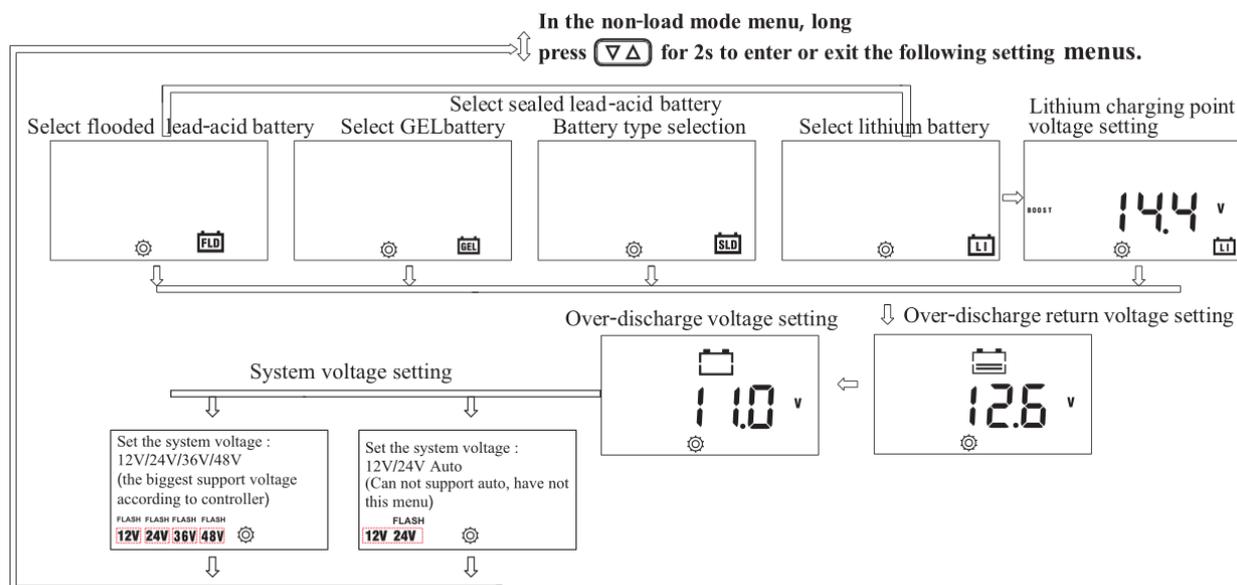
8. Browsing Menu on LCD Screen

1).Continuously press ∇/Δ ,the screen will display the following in order: "main menu"---"solar panel voltage"---" solar panel current"---"battery capacity"---"battery voltage"---"discharging current"---"charging amp-hrs"---" discharging amp-hrs"---" temperature inside controller"---" load mode"---" load mode settings"---"error code", and then back to "main menu". If the keys are not operated for 12s, the system will automatically return to display the "main menu".



9. Setting Menu on LCD Screen

- 2). When "load mode" is displayed, long press  to enter into the load mode setting. Press  to adjust the mode, and long press  for 2s to save and exit; or else, the system will not save the setting that was just made and automatically exit the setting interface after 12s.



10. Battery Types, Charging Voltages (Lithium Battery), Over-Discharge Return and Over-Discharge Voltage Settings

In the non-load mode menu:

- 1) When  is long pressed , the first interface entered is for battery type setting, and the flashing one is the battery type currently selected. Press  to select among FLD/GEL/SLD/LI.
- 2) After selection, short press  to enter into over-discharge return and over-discharge voltage settings; or the first to enter charging voltage setting menu for lithium battery.
- 3) After parameters have been set, long press  for 2 s to save and exit.

parameters shall be set according to the following rule: over-discharge voltage < over-discharge return voltage <= under-voltage warning < floating charging voltage < boost charging return <= equalizing charging voltage < overcharge voltage; and two adjacent values shall have a difference greater than 0.5 V.

11. Charging and Discharging Overload Protection and Recovery Time

In the charging and discharging overload protection mechanism, the relation between overload current and protection time is as follows: An overload current 1.25 times of the rated current initiates a delay of 30s before starting protection; similarly, 1.5 times, 5s and 2 times, 1s.

Overload recovery: automatic recovery after 1 minute.

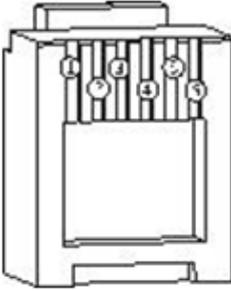
12. Load Short Circuit and Recovery

Short-circuit automatic recovery time: 1st time, 5 s; 2nd time, 10 s; 3rd time, 15 s; 4th time, 20 s; 5th time, 4 hours or automatic recovery the next day; or long press  to make the load resume output.

13. Communication Port Line Sequence (Only for Controllers with Communication Functions)

Controller communication port RJ12 (6-pin)

RS 232

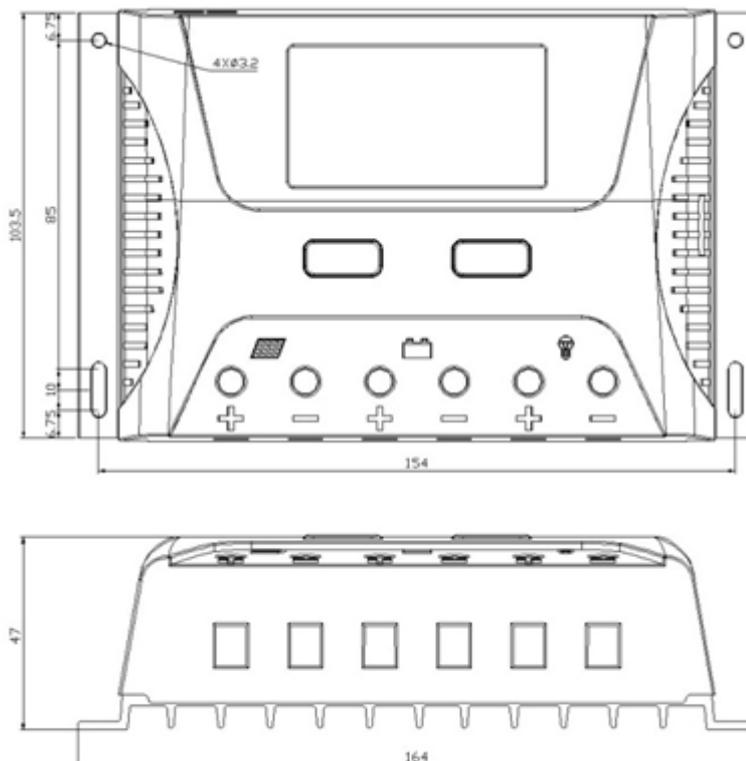


No.	Definition
①	Transmitting terminal TX
②	Receiving terminal RX
③	Power supply grounding /Signal grounding
④	Power supply grounding /Signal grounding
⑤	Power supply positive
⑥	Power supply positive

14. Installation Instructions and Precautions

1. The controller shall be installed securely, and its dimensions are as follows:

2. Installation hole diameter: 3.2 (mm)



3. Precautions:

- ① If it is 12V system, the bottom left corner of LCD display will show '12V', 24V system will show '24V',
- ② The first step is to connect the battery. If the connection is made correctly, the controller screen will light up; otherwise, check whether the connection is correct.
- ③ The second step is to connect the solar panel. If sunlight is present and strong enough (the solar panel voltage is greater than battery voltage), the sun icon on the LCD screen is on; otherwise, check whether the connection is correct (it's recommended that the operation be performed under the debugging mode).
- ④ The third step is to connect the load. Connect the load leads to the controller's load output terminal, and the current shall not exceed the controller's rated current.
- ⑤ As the controller will generate heat during operation, it's recommended that the controller be installed in an environment with good ventilation conditions.
- ⑥ Choose cables with large enough capacity for connection, in case too much loss incurred on the lines causes the controller to misjudge.
- ⑦ The controller has a common positive pole inside. If grounding is needed, ground the positive pole.
- ⑧ It's important to fully charge the battery regularly. At least once full charging every month is recommended, and failure to do that may cause permanent damage to the battery. Only when in-flow energy outpaces out-flow energy can the battery be charged fully. Users shall bear this in mind when configuring the system.
- ⑨ Check whether the controller's each connection terminal is tightened securely; if not, it may suffer damage when large current passes.

15. Error Code List

Code on LCD screen	Corresponding error
E0	No error
E1	Battery over discharge
E2	Battery overvoltage
E3	Undervoltage warning
E4	Load short circuit
E5	Load overload
E6	Temperature too high inside controller
E8	Charging current too high
E10	Solar panel input voltage is too high

16. Common Problems and Solutions

Symptoms	Causes and Solutions
LCD screen does not light up	Check whether the battery is correctly connected.
Incomplete display or no renewal on LCD screen	Check whether the ambient temperature is too low and whether the display recovers when the temperature rises.
No charging with sunlight present	Check whether the solar panel is correctly connected and contact is good and reliable. Check whether the solar panel voltage falls below the battery voltage.
The sun icon does not light up, while the solar panel icon does. The battery voltage is normal, but there is no output.	The load will be switched on automatically after 10 minutes (set by the user).
The battery icon flashes quickly, and there is no output.	System overvoltage. Check whether the battery voltage is too high.
The battery icon flashes slowly, and there is no output.	The battery is over-discharged, and will recover when recharged adequately.
The load icon flashes quickly, and there is no output.	The load's power exceeds the rated value or it's short-circuited. After removing the problem, long press the key or wait until it recovers automatically.
The load and the encircling light ring stays lit, and there is no output.	Check whether the power-consuming device is connected correctly and reliably.
Other symptoms	Check whether wiring is sound and reliable, and system voltage is correctly recognized.
The charging and discharging amp-hrs displays: 9999.K Ah	The decimal point flashes indicating that the displayed value has reached its upper limit. Long press  to reset it.

17.Parameter Details

Model	PWM40	Remarks
Rated current	40A	
System voltage	Automatic recognition of 12V/24V	
Rated power	12V/600W 24V/1200W	
No-load loss	< 13mA/12V; < 15mA/24V	
Max. Solar energy input voltage	<55	
Max. voltage at the battery end	<34V	

Battery Type	Parameters				
	Flooded FLD	Sealed SLD	GEL GEL	Lithium LI	Default GEL
Overvoltage protection	16.0V				×1/12V; ×2/24V;
Equalizing charging voltage	14.8	14.6	-	-	
Boost charging voltage	14.6	14.4	14.2	14.4	
Floating charging voltage	13.8			-	
Charging recovery voltage	13.2V				
Over-discharge recovery voltage	12.5V (settable with the keys)				
Over-discharge voltage	11.0V (settable with the keys)				
Equalizing charging interval	30days				
Equalizing charging time	1H				
Boost charging time	2H				
Temperature compensation	-3.0mV/°C/2V				
Light control voltage	Light control on 5V, light control off 6 V (light control on plus 1 V)				×1/12V; ×2/24V;
Light control judgment time	10 minutes				
USB function	Yes				
Operating temperature	-25°C to +55°C ;				
IP protection degree	IP30				
Net weight	390g				
Protection functions	Battery plate reverse connection protection, a battery reverse connection protection , charging battery board short circuit protection, charging the battery open circuit protection, charging over current protection, overload protection, load short-circuit protection controller and over temperature protection.				
Dimensions	164.0×103.5×47.0(mm)				

Warranty Against Defects

1 WHAT THIS WARRANTY RELATES TO

- 1.1 This warranty covers goods supplied by Coast RV Pty Ltd T/A Coast to Coast RV Services ("Supplier") to the Client ("Goods") and relates to any defects in materials and workmanship under normal use and maintenance ("Defect").

2 WHAT THE SUPPLIER WILL DO TO HONOUR THE WARRANTY

- 2.1 The Supplier will:
- (i) replace or repair the Goods or the defective part of the Goods free of charge;
 - (ii) arrange for the Goods or the defective part of the Goods to be repaired or replaced by a qualified repairer free of charge.
- 2.2 The Supplier reserves the right to replace defective parts of the Goods with parts and components of similar quality, grade or composition where an identical part or component is not available.
- 2.3 Goods presented for repair may be replaced by refurbished goods of the same type rather than being repaired. Refurbished parts may be used to repair the goods.

3 WHAT THE CLIENT MUST DO TO CLAIM THE WARRANTY

- 3.1 To claim the benefit of the warranty, the Client will need to (sequentially):
- (i) first contact the Supplier; and
 - (ii) present the defective Goods to the Supplier for inspection, including inspection for defective workmanship, or otherwise provide evidence of the claimed Defect, accompanied by evidence of proof of purchase and date of delivery, and if applicable, evidence of maintenance performed in accordance with the relevant maintenance schedules.
- 3.2 The claim listed in clause 3.1 may be made in person, or the claim may be sent to the address listed on this form, including the particulars required under clauses 3.1(i) and 3.1(ii).
- 3.3 The appropriate form for making a claim for warranty is as attached.

4 DURATION OF WARRANTY

- 4.1 This warranty will cease:
- (i) where the Goods are purchased already fitted in or as a component of a vehicle or RV: from the date that is twelve (12) months after the Client takes delivery of the vehicle or RV; and
 - (ii) where the Goods are purchased separately or as an after-market item: from the date that is twelve (12) months from the date of purchase..
- 4.2 If a Defect does not materialise in the Goods prior to the date provided in clause 4.1, the Supplier will have no liability to the Client under this warranty.

5 RESPONSIBILITY FOR COSTS OF CLAIM UNDER THIS WARRANTY

- 5.1 The Supplier is responsible for the costs directly associated with repairing or replacing the Goods in accordance with clause 2.1 only.
- 5.2 Any works required to be completed in addition to fixing the Defect are the responsibility of the Client. Additional works includes any costs associated with any testing or repair of the Goods or any goods to which they are fitted, undertaken by a third party in relation to any defect without prior authorisation from the Supplier.
- 5.3 Where it is determined that the Goods do not have a Defect, the Client will be charged a GST exclusive inspection fee of forty-five dollars (\$45.00) plus freight costs for the return of the Goods, this is subject to change without notice.
- 5.4 The cost of delivery and insurance of the Goods to and from the Supplier, travel costs to and from the Supplier, and the cost of inspecting and testing the Goods are the sole responsibility of the Client.

6 WARRANTY LIMITATIONS

- 6.1 The Supplier makes no warranties or representations other than those set out in this warranty document except as is required by law.
- 6.2 The Supplier will not be liable under this warranty:-
- (i) to the Client or any other person for any consequential, direct or indirect loss, damage or costs incurred or suffered by the Client or any other person, including but not limited to damage to persons, other property, loss of turnover, loss of profits, loss of business or goodwill;
 - (ii) to the Client for transportation or travel costs which are the Client's responsibility;
 - (iii) for damage or defects in any Goods caused by improper transportation, storage or any other misuse, neglect or accident.
 - (iv) for the installation of the Goods. Any fault or defect due to installation should be referred to the installer. The Goods must be installed in accordance with the Manufacturer's instructions and any relevant legislation or code.
- 6.3 This warranty covers the Client only and it is not transferrable if the Goods are sold by the Client during the warranty period.

7 WARRANTY EXCLUSIONS

- 7.1 This warranty will not apply where:
- (i) the Goods have been improperly modified or repaired or the Good's defect has arisen due to the Client's failure to properly install, fit, maintain, service or use the Goods in accordance with the specifications and instructions provided by the Manufacturer, including a failure to comply with the relevant maintenance schedule (where applicable);
 - (ii) the Supplier cannot establish any Defect in the Goods after testing;
 - (iii) the Goods have been used other than for the purpose for which they were designed;
 - (iv) the Goods have been subject to abnormal conditions, including but not limited to temperature, pressure, stress, load or similar;
 - (v) the Client or installer have used or fitted non-genuine or non-approved parts and accessories to the Goods or have failed to use recommended parts and accessories;
 - (vi) the Good's defect has arisen due to abuse, misuse, neglect or accident;
 - (vii) the Goods have not been installed in accordance with the relevant instructions;
 - (viii) the Good's defect is caused by use or fair wear and tear of the Goods (or expendable parts).

8 RIGHTS AT LAW

- 8.1 The benefits given to the Client under this warranty are in addition to other rights and remedies of the Client at law in relation to the Goods.
- 8.2 Our Goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the Goods repaired or replaced if the Goods fail to be of acceptable quality and the failure does not amount to a major failure.

WARRANTY CLAIM FORM

Warranty Providers Name:

Coast RV Pty Ltd trading as Coast to Coast RV Services

ABN 49 097 104 492 - ACN 101 461 330

Warranty Providers Address:

PO Box 415 Regents Park NSW 2143

Client:

Contact No.

Description of Goods provided:

Receipt enclosed: *(tick box)*

Yes

No

Receipt No:

Description of defects (Give as much detail as possible. Use a separate page if required):

Date of purchase/services provided:

I hereby declare that the information provided above is true and correct and to the best of my knowledge and belief and I have complied with all the conditions of the warranty.

Signed:.....

Name:
(please print)

Dated:

[Please note, the issue or completion of this form by the Client does not constitute an admission of liability by the Supplier]