



Installation and Instruction Manual

For: BLUEY Solar Water Heater System

Version 1.2

Issued data: Aug 21, 2014

This manual applies to model:

FPC270-2D, FPC270-3D, FPC340-2D, FPC340-3D, FPC450-2D, FPC450-3D

The appliance must be installed, commissioned and serviced by an authorized person in accordance with:

1. AS/NZS 3500.4 - National Plumbing and Drainage. Part 4: Heated water services
2. AS/NZS 3000 – Electrical installation
3. Local plumbing regulations

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Importance information and warning

Before installing and using the water heater, please carefully read the manual and be sure to keep the manual well for reference in the future.

1. This appliance must be installed, commissioned and serviced by an authorized person in accordance with the requirements of AS/NZS 3500.4 or in New Zealand, NZBC G12.
2. This appliance must be installed by a person licensed with the Plumbing Industry Commission. Only a licensed person will have insurance protecting their workmanship. So make sure you use a licensed person to install this appliance and ask for your Compliance Certificate.
3. This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
4. Any power leads from the water heater system components **MUST BE** plugged into an external weatherproof electrical outlet. If the power supply cord of any water heating components is damaged, it **MUST BE** replaced by an authorized person in order to avoid a hazard, using genuine replacement parts available from BLUEY. Take care not to touch the power plugs with wet hands.
5. Care should be taken not to touch the pipe work as it may be **HOT!** The pipes between the solar panels and storage cylinder **MUST BE** copper or alternative material pipes that may be supplied by BLUEY. Plastic pipe is **NOT** suited to the water temperatures and pressures that may occur in the system.
6. Hot water can cause scalds, children, disabled, elderly and the infirm are at the highest risk of being scalded. Feel water temperature before bathing or showering. Scalds from hot water taps can result in severe injuries to young children. Scalds occur when children are exposed directly to hot water when they are placed into a bath which is too hot.
7. BLUEY solar water heaters are equipped with temperature relief valve or pressure relief valve. For safe use, do not personally change the installation location. No blocking their exports, diversion pipe must be installed on the temperature relief valve and pressure relief valve and going continuously downwards, and diversion pipe should be connected directly to the floor drain, diversion pipe must not have knots or clogging.
8. The storage tank is fitted with an anode, if the hot water system is not used for two weeks or more, a quantity of highly flammable hydrogen gas may accumulate in the water heater. To dissipate this gas safely, it is recommended that a hot tap be turned on for several minutes or until discharge of gas ceases. Use a sink, basin, or bath outlet, but not a dishwasher, clothes washer, or other appliance. During this procedure, there must be no smoking, open flame, or any electrical appliance operating nearby. If hydrogen is discharged through the tap, it will probably make an unusual sound as with air escaping.

9. The system is designed for the level 1 of frost protection. This type of system is not recommended for hard frosts area because of the risk of the water in the panel freezing and causing damage to the panel.
10. The water quality of most public supplies is suitable for the water heating system. The water quality from bore wells is generally unsuitable for the water heating system.
11. If the user installing the product on their own, solar water heater can-not normally operate or ineffective, even causing the panel or storage tanks falling and other consequences or losses, the company accepts no liability.

Interpretation of these provisions belongs to Blue Sun Group Pty. Ltd.



If you do not fully act with this manual, it may cause fire, property damage, personal injury or death.

1. System specifications

BLUEY solar hot water system is commonly referred to as a split system, it make up of five components. These five components are panel, storage tank, pump, controller and boost element. A Split System is a system where the heated water in the solar panel is moved around by using a small circulation pump and pump controller. The pump draws water from the cold water connection to the tank and circulates the water through the panel, than returns the water back to the storage tank which has been heated free from the sun.

Specifications and principal dimensions for the various systems and components are shown table 1.1.

Table 1.1 System Specifications

System Type	FPC270-2D	FPC270-3D	FPC340-2D	FPC340-3D	FPC450-2D	FPC340-3D
Tank delivery capacity	270 L	270 L	340 L	340 L	450 L	450 L
Solar flow and return	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
PTR Valve	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
Cold Inlet	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
Hot outlet	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
PTR Valve setting (kPa)	850	850	850	850	850	850
Rating of PTR Valve supplied (kW)	10	10	10	10	10	10
Power consumption of electric heating device(kW)	3.6	3.6	3.6	3.6	3.6	3.6
Number of panel	2	3	2	3	2	3
Gross area of panel(m ²)	2	2	2	2	2	2
panel inlet(mm)	Φ22	Φ22	Φ22	Φ22	Φ22	Φ22
panel outlet(mm)	Φ22	Φ22	Φ22	Φ22	Φ22	Φ22

Circulation pump setting	1	1	1	1	1	1
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2. Importance components of the system

There are five main components to your BLUEY solar water heater system. These five components are;

- Solar panel
- Hot water storage tank
- Pump
- Controller
- Electric element

2.1 Solar panels

2.1.1 Structure of solar panels--flat panel type (Figure 2.1.1)

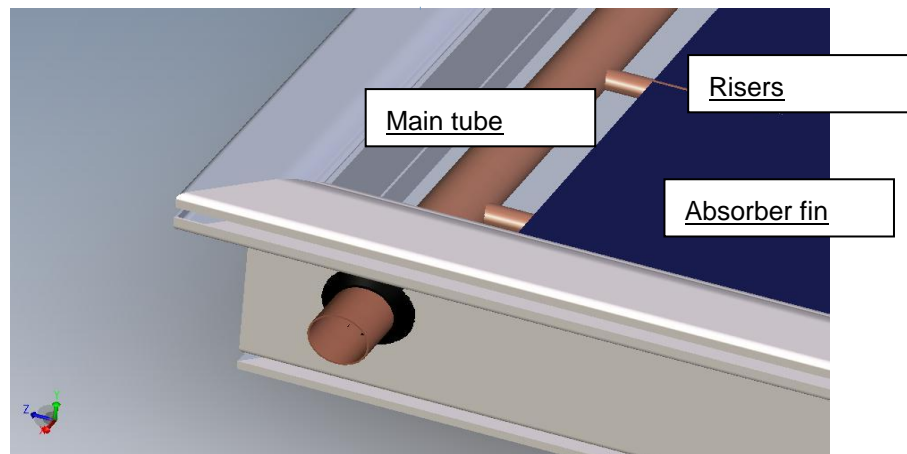


Figure 2.1.1 Structure of solar panel

2.1.2 Working theory

Water will flow due to pump though main tube and risers. Absorber fin will absorb energy from sun light and absorber fin become hot. Absorber fin will transfer the hot to the risers. When the water flow though the risers, the water will become hot. Thus the flat panel will make the water hotter and hotter.

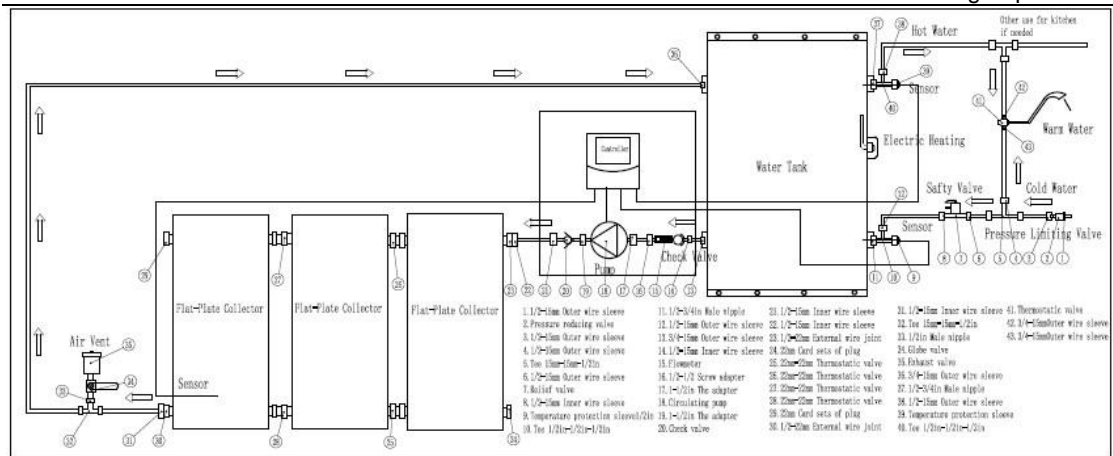
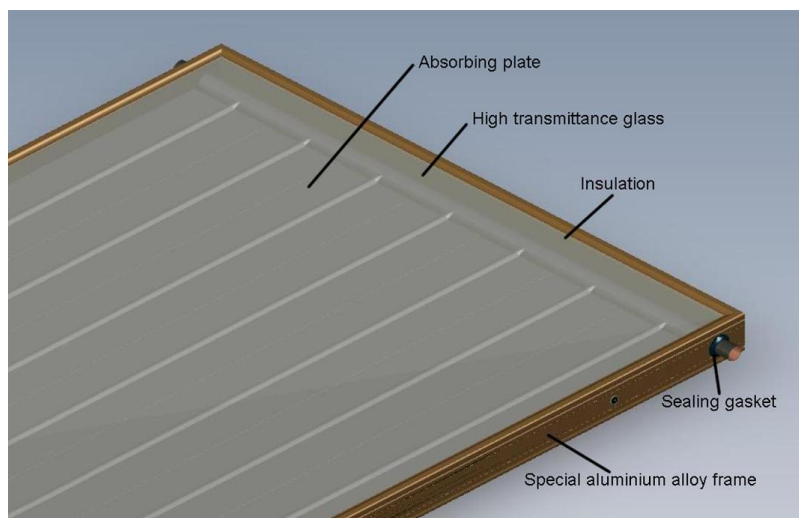


Figure 2.1.2 Flat panel working theory

2.1.2. Specification of BLUEY FPC1200D



Product's Performance and Specification		
1	Type of the solar panel/Model:	FPC1200D
2	Absorber efficiency:	≥94%
3	panel Efficiency:	76.50%
4	Absorber material:	Aluminum
5	Absorber tubes:	8 PC
6	Toughed glass Cover:	3.0mm thickness
7	Absorber Area /Aperture Area /Glass Area (m ²)	1.81/1.85/2.0
8	Service Environmental Condition	-20°C to 120°C
9	Max working temperature/ stagnation temperature (°C) (G=1000W/m ² , Ta=30)	160.5°C
10	Insulation Material	Glass wool
11	Operating Fluid Pressure / max Pressure (Bar)	Operating pressure is 6bar, and max Pressure is 1200kpa.
12	Recommended Flow Range(l/m ² .h)	50~100
13	Recommended heat transfer fluid	Pure water or anti-freezing liquid
14	Manifold connection	Braze
15	Overall Dimension (mm)	2005mm*1003mm*80mm

16	Net Wight(Kg)	32 kg
17	Manifold volume	1.69 L

2.1.3 Transportation of panel

Solar panels must be secured during transportation. It is imperative that each panel be secured from falling out of the packaging, and that they be secured from scratching each other, as this may damage the panels and lessen their performance. You should always follow these simple precautions:

- Use of a carrying strap is recommended
- Do not lift the panel by the connection ports or header tube
- Avoid impacts and vibration on the panel as much as possible
- Please lift the panel by the lifting lugs (if included)

2.1.4 Fix panel

2.1.4.1 Check solar panel parts

Before install the solar panel, open the box and check the products whether has been damaged. When confirmed the panels are well, then can start to fix.

Do not remove and/or expose the panel to sunlight until you are ready to install them, otherwise the inlet/outlet will become very hot quickly. The outer glass surface does not become hot under normal operating conditions.

System orientation and inclination

The performance of any solar hot water system is determined by the way that the system is installed. In Australia, the solar panels should face the equator (North) as shown below.

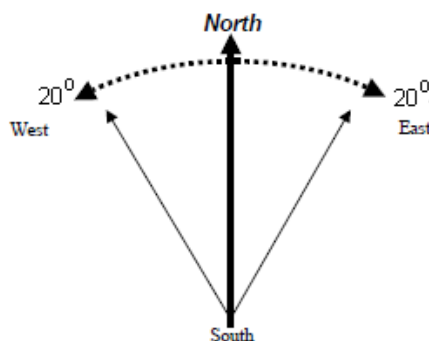


Figure 2.1.4.1 Orientation Angle of panels

This orientation is not practical, panels facing within 45 degrees from North (between North-East and North-West) area acceptable, with a reduction in efficiency of approximately 5%. If the bulk of hot water consumption occurs before 2 pm face the panels in a North - Easterly direction. If the bulk of hot water consumption occurs after 2 pm face the panels in a North Westerly direction.

Orientation Angle of panels the inclination of the solar panels should ideally be the same as the latitude angle of the site. Inclinations within 20 degrees of the latitude angle of the site are acceptable, with a reduction in efficiency of approximately 5%.

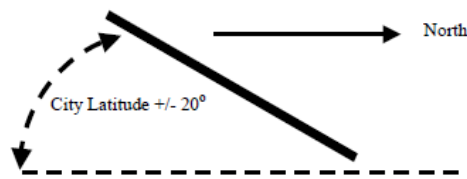


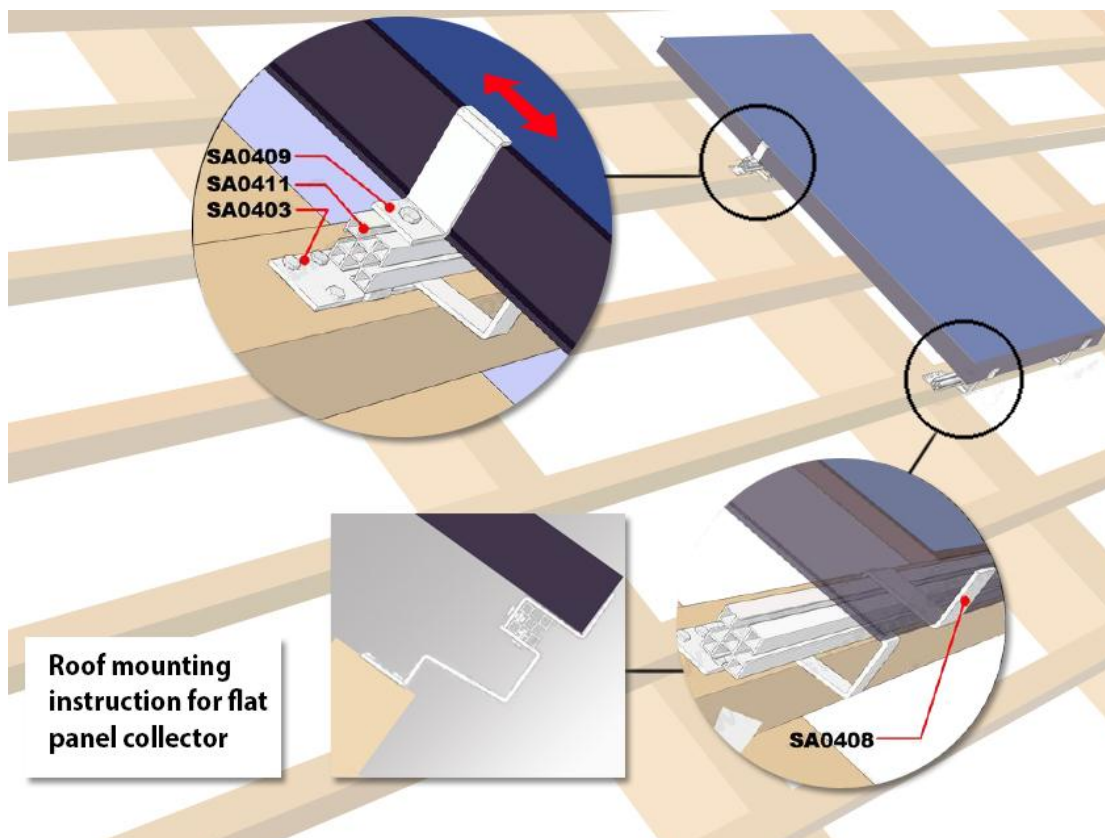
Figure 2.1.4.2 Inclination of panel

Table 2.1.4.1 is the latitude and longitude of Australia cities for your reference.

Table 2.1.4.1 latitude and longitude of Australia cities

	Latitude degrees	Longitude shift from local time Longitude degrees
Rockhampton	-23.4	0.48
Alice Springs	-23.5	-8.6
Sydney	-33.4	1.2
Melbourne	-37.8	-5.03

2.1.4.2 Solar panel for sloping roof







2.1.4.3 Solar panel for flat roof

For flat roof, there will be two steps. Firstly, install the stents. Secondly, put the plate on the stents and fixed the plate with briquetting.



Table 2.1.4.2 Configuration Table

Name	Type	Specification	drawing
Collector	FPC1200D	2005mm×1003mm×80mm	
Mounting bracket	SA0411	40mm×40mm	
Collector mounting bracket	SA0403	Thickness:5mm	
Collector connect sheet	SA0408	Thickness:4mm	

Collector Connect sheet	SA0409	Thickness:4mm	
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2.1.4.4 Installation of the collector

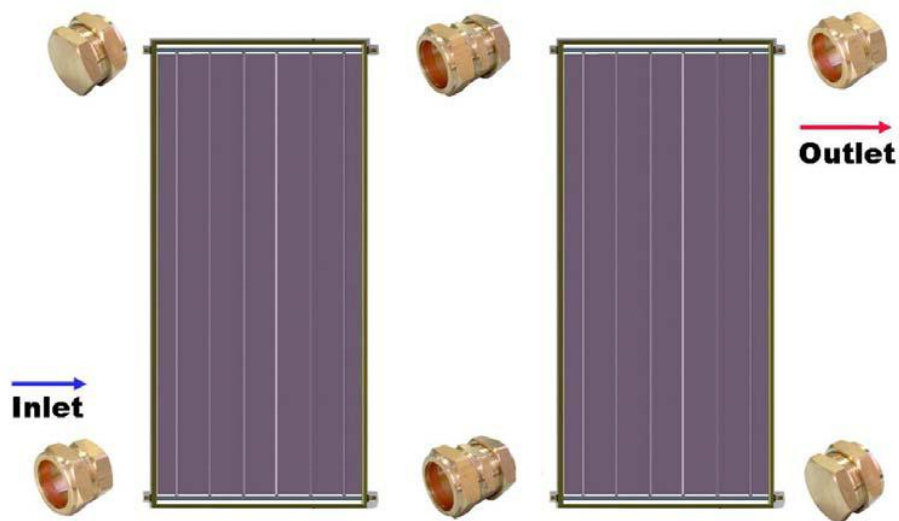






Table 2.1.4.4 Configuration Table

Name	Type	Specification	drawing
Collector	FPC1200D	2005mmx1003mmx80mm	
Compression end cap		22mm	
Female compression nipple		S22mmx3/4in	

Compression coupling		S22mm×22mm	
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2.1.4.5 Recommendation about lightning protection

It's advisable to earth/ground the copper circulation loop of the panel to avoid lightning related damage.

Refer also to local building codes regarding lightning safety and grounding. The lightning rod has to be installed taller than panel and the other end to earth.

2.1.4.6 Acceptable wind and snow load

a) The standard frame, and frames kits all designed to withstand wind speed of up to 80mph/128km/h without damage. For areas with wind speeds that may exceed this level an additional front track and rear legs should be installed.

b) The maximum snow load is 1000 pa.

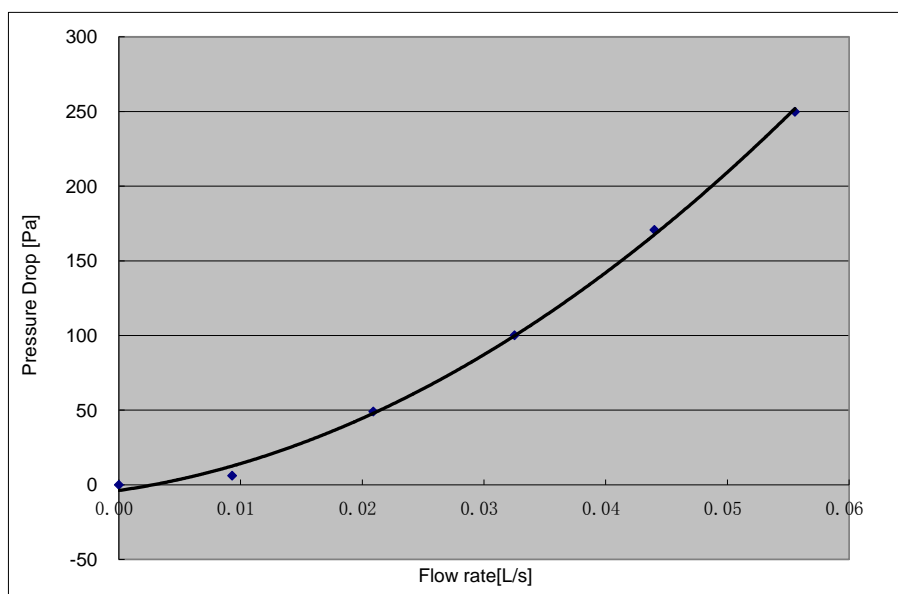
2.1.4.7 Pressure drop

a) For open loop systems, the normal operating pressure should be less than 500kpa/72.5psi via use of a pressure limiting (pressure reduction) valve on the mains cold supply line.

b) For closed loop systems, the solar loop must operate at less than 500kpa/72.5psi, and have an expansion vessel installed to control water expansion.

c) Any system design must provide means for allowing pressure release at no more than 800kpa/113psi.

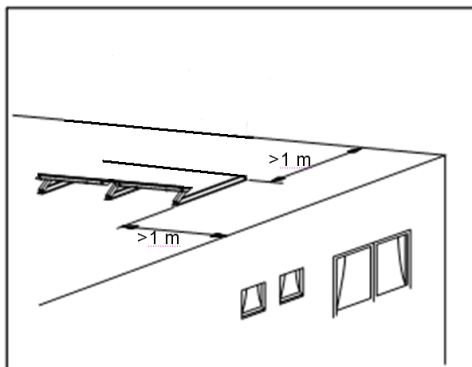
The pressure drop of panel FPC1200D with the flow rate range 0.01~0.055kg/s was showed below for your reference.



2.1.4.8 Determine the installation space

Because of the wind around the edge of the roof, eddy current, and pressure function, make

sure the frame of the panels at least a meter away from (such as the right picture) the edge of the roof.



2.2 Hot water storage tank

The hot water storage tank is used to store the hot water collected from the panel. The special quality 2.5mm~3.5mm steel plate, shaped by automatic bending roll machine and welded by imported program-controlled welding facilities, could ensure the excellent pressure-bearing ability of vitreous enamel tank (it has passed the Australian standard - pressure fatigue test of over 250 thousand pulses and the bursting pressure is as high as 45Kgf/cm²).

2.2.1 Tank type and specification

TABLE 2.2.1 Specification of the tank

TANK PART NUMBER	E250	E315	E400
DELIVED CAPACITY(L)	250	315	400
STORAGE CAPACITY (L)	270	340	450
CYLINDER MATERIAL	ENAMEL	ENAMEL	ENAMEL
MAXIMUM OPERATING PRESSURE (kPa)	850	850	850
MAXIMUM SUPPLY PRESSURE (kPa)	750	750	750
PROTECTION CODE INDEX	IP34	IP34	IP34
RATED VOLTAGE	240V 50HZ AC	240V 50HZ AC	240V 50HZ AC
RATED POWER INPUT (W)	3600	3600	3600
THERMOSTAT SETTING (°C)	60	60	60
P.T.R VALVE SETTING (kPa)	850	850	850
P.T.R VALVE POWER RATING (kW)	10	10	10

2.2.2 Anode replacement

One cast magnesium sacrificial anodes are connected to the inside of a storage tank from the top of the tank. Magnesium is used because it is a more active metal than steel. The magnesium rod therefore acts as an anode, by supplying electrons, and therefore sacrificing itself to protect the steel from corrosion. Therefore, over time, the Magnesium anode corrodes

and requires replacement.

Replacement of the anode should be carried out at every few years. As a guide, the more dissolved solids in the water, the faster the anode corrodes and the shorter the intervals should be between replacements. If the Total Dissolved Solids (TDS, ppm) is > 1000, recommended anode replacement should be at 5 years. If the Total Dissolved Solids (TDS, ppm) is < 1000 then replacement should be at 7 years.

2.2.3 Storage cylinder location

By locating the cylinder as close as possible to points of use, you can minimize heat loss and hot water wasted. Choose a position close to the most often used tap if possible. In most cases this position would be close to the kitchen primarily followed by the bathroom. A site midway between these rooms would be ideal. The location should be accessible for maintenance. The cylinders should be positioned so that the rating label can be read and parts can be removed for service.



2.3 Pump Station (Include pump and controller)

Our pump station is composed of Aetiva solar controller and Grundfos Pump what are fitted by a UV resistant ABS plastic cover. Detailed information pls. see appendix.

The circulation pump is used to flow the water from the hot water storage tank, through the collector and then back to the storage tank. There are three setting option on the circulation pump. The flow rate throw collector should be 50~100 l / (m².h).

The primary task of the controller is to control the operation of the pump to optimize solar energy collection. This task is performed by measuring the temperature differential between the hot sensor and the cold sensor. The Factory Setting as follow:

When the differential exceeds 8°C the pump is activated and water passes through the collectors collecting solar energy. When the differential falls below 2°C the pump is shut down.

A secondary task of the controller is **Top out protection** and **anti-freeze protection**.

The faction of “**Top out protection**” is protecting storage water cylinder lining from the high temperature, the factory setting of Top out protection as follow:

“Top out temp”:75°Cand “Top out reset temp”:73°C, it means when the temperature of tank reaches 75°C, the controller make the pump shut down, when the temperature of tank is down to 73°C, the controller make the pump get right.

The faction of “**anti-freeze protection**” is protecting the water heater system from the frost

conditions. The factory setting of **anti-freeze protection** as follow:

“Anti-freeze on temp”:3℃ and “Anti-freeze off temp”:5℃, it means when the temperature detected by the sensor of collector is down to 3℃, the controller make the pump be activated. When the temperature detected by the sensor of collector is up to 3℃, the controller make the pump shut down.

More detail information please refers to the manual of split controller.

2.5 Electric element and thermostat

The electric element has a capacity of 3.6KW, coupled with a thermostat to control the water temperature of the tank. This Solar Thermostat has an auto-reset over-temperature cut-out for high yield sunshine days, taking the boost heater out of circuit. Its auto reset so you don't have to get up on the roof to turn it back on! This OTC protects the system against no-fault over temperature tripping. When the water temperature in the tank reduces to a normal operating level, the auto reset occurs and the heater can once again use the booster heater. When the water temperature in the tank reaches to the set temperature, the thermostat will automatically disconnect. The thermostat is adjustable with a temperature range from 50℃ to 70℃; you can rotate the red gear adjusting setting. **The normal setting is 60℃.**

The ST1301133 has a unique internal fuse, protection that is designed especially for Solar Water Heaters. This internal fuse is extra protection against any electrical malfunction, but it is a one use fuse. If the fuse activates, the thermostat will need to be replaced.



Figure 2.5.1 Photos of thermostat

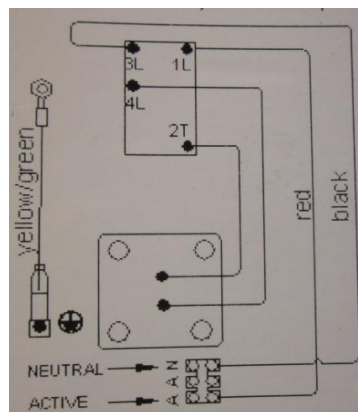


Figure 2.5.2 Wiring diagram

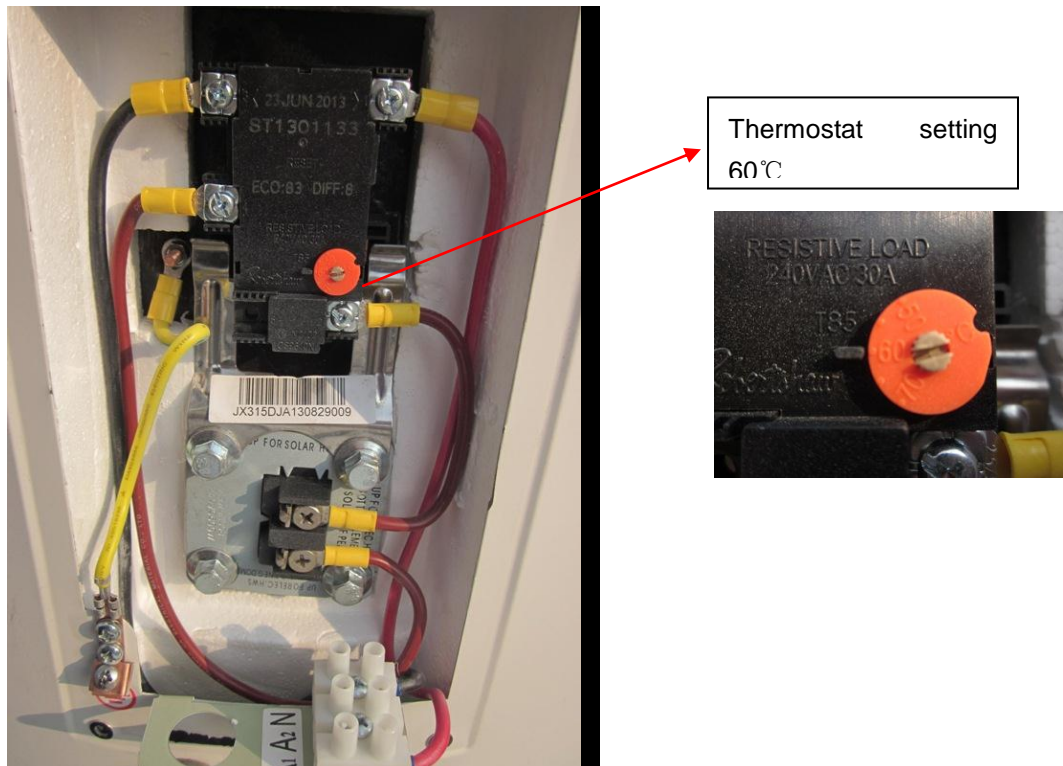


Figure 2.5.3 electric element couple with thermostat

2.6 Water pipes

All hot water pipework should be insulated with sealed Polyethylene foamed or equivalent insulation to optimize performance and energy efficiency. Such insulation may also be mandatory under local regulations. With the exception of solar panel flow and return pipes, water pipe sizing should be performed in accordance with AS/NZS 3500.

Warning:

1. The panel flow and return pipes should be a minimum of 15 mm copper pipe. Plastic pipe must not be used. Plastic pipe is not suited to the high water temperatures and pressures that may occur in the panel flow and return system.
2. The pipe insulation thickness shall be not less than 20 mm, and covered by external re-skin clad aluminum foil, etc. The circulation line may not have any part of the exposure to air or wall.

The recommend length of solar panel inlet and outlet are as follow:

Pipe size	Inlet	Outlet
DN 15	10m	10m

3 System installation procedure

1. Install Solar panels

Position and install the solar panels in accordance with the section "installation of solar panels".

2. Position hot water Storage tank

Position the hot water storage cylinder on a level base in accordance with the section "storage cylinder location"

3. Connect PTR Valve

Connect the PTR Valve in the location shown in hot water storage tank.

4. Connect Fittings and Mount Pump Assembly

Connect fittings and pipe work as shown in the relevant diagram in Figures 3.1. Remove cover of pump box and connect the electric line. Do not connect the power lead to power supply at this stage.

5. Install and Connect Flow and Return Pipe Work

Connect flow and return pipe work between storage cylinder and solar panel. Ensure that suitable pipe and insulation is used as described in the section "Water pipes".

6. Connect Temperature Sensor Leads

The hot (longer) temperature sensor lead should be fitted into the air bleed / hot sensor lead assembly at the panel hot return connection. It must be sealed in place with thermoplastic putty or silicone. Run the lead down the solar return pipe and connect it to the connection within the pump and controller assembly

Ensure the lead is protected from light and sunlight. It must be sealed in place with thermoplastic putty or silicone.

7. Cold Water Supply

Connect cold water supply to the inlet 'T'. Purge the cold water supply lines to remove air and swarf before final connection.

8. Hot Water Discharge

Connect the hot water outlet of the storage cylinder to the pipe work supplying hot water to the premises.

9. Electrical Supply Connections

10. Pipe insulation:

The system is in working condition without leaks, you can pack the insulation layer.

FINISHING THE INSTALLATION

After testing is completed explain to the householder the functions and operation of solar water heater components.

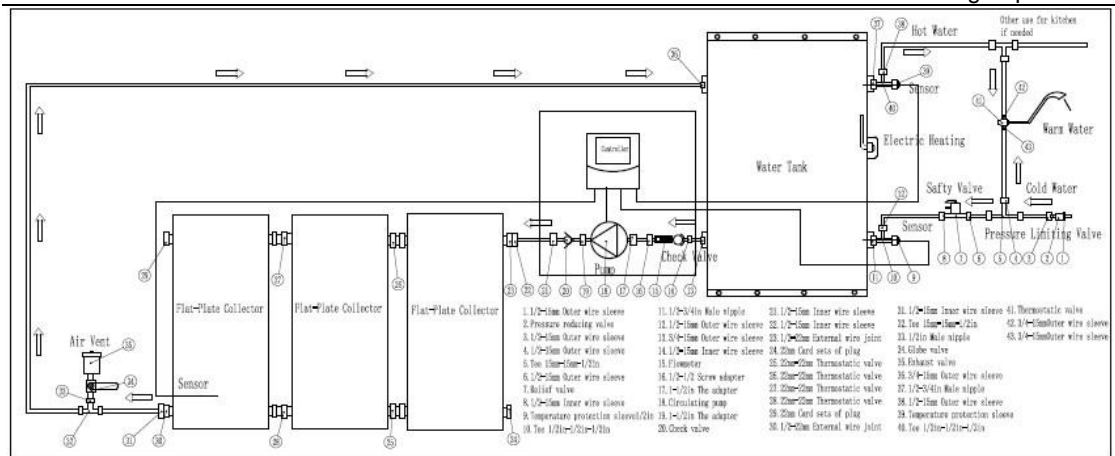


Figure 3.1 the schematic of the system

4. Operating and Maintenance

4.1 Operating

The detail of operating of the solar water heater system please refer to Appendices A “the manual of the split controller”.

4.2 Maintenance requirements

4.1.1 Cleaning

Regular rain should keep the panel clean, but if particularly dirty they may be washed with a soft cloth and warm, soapy water or glass cleaning solution. If the panels are not easily and safely accessible, high pressure water spray is also effective.

4.1.2 Leaves

Please remove these leaves regularly to ensure optimal performance and to prevent a fire hazard.

4.1.3 Broken cover

If cover is broken it should be replaced as soon as possible to maintain maximum panel performance. The system will still operate normally even with cover broken. Any broken glass should be cleared away to prevent injury.

4.1.4 Draining the storage tank

All plumbing work must be performed by a licensed plumber and take care of the hot water. In the event that the tank is required to be drained in the following order;


- (1). the power supply to the element and pump controller must be switched off and fuse(s) removed.
- (2). Close the cold water mains supply stop cock.
- (3). Open a hot tap to relieve pressure.
- (4). Open a hose or connect pipe to the drain connection of the storage tank allow the discharge of hot water from the system.

4.1.5 Protection against freezing

If freezing occurred, please turn on the anti-freeze protection function on the controller. If the system is not going to be used for a week or more it is advisable to turn the system off at the main power supply to the electric booster. The power supply to the circulation pump must remain on. This is required to ensure that the circulation pump can continue to operate correctly.


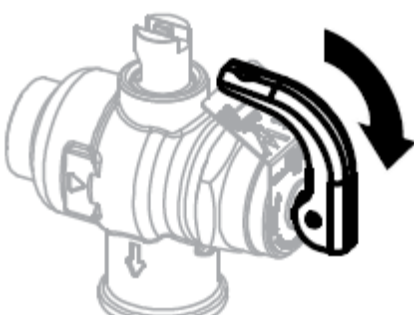
5. Safety devices


The water heating system is supplied with various safety devices including temperature sensors; overheat sensors and switches and a Pressure & Temperature Relief (PTR) valve. These devices must not be tampered with or removed. The water heating system must not be operated unless each of these devices is fitted and is in working order.

	<p>DO NOT tamper with or remove safety devices. DO NOT operate the water heater unless all safety devices are fitted and in working order. DO NOT block or seal the PTR Valve and drain pipe.</p>
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5.1 Pressure & Temperature Relief (PTR) Valve

This valve is located near the top of the water heater and is essential for safe operation. It is normal for the valve to release a small quantity of water through the drain line during heating. However, continuous leakage of water from the valve and its drain line may indicate a problem with the water heater.

	 <p>Lift lever until water flows from drain line (Lower lever gently!)</p>
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	<p>Never block the outlet of the PTR valve or its drain line for any reason. The lift lever must be operated at least every 6 months to remove lime deposits and verify that it is not blocked. Failure to do this may result in the water heater failing.</p> <p>If the valve does not discharge water when the lift lever is opened, or does not seal again when the lift lever is closed, attendance by an authorized person must be arranged without delay. The PTR valve is not serviceable.</p>
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It is normal and desirable that this valve allows a small quantity of water to be discharged during the heating cycle. It should be put a properly drained safe-tray under heaters located where leakage may cause damage. If it discharges more than a bucket of water during a 24 hour period or discharges continuously there may be another problem.

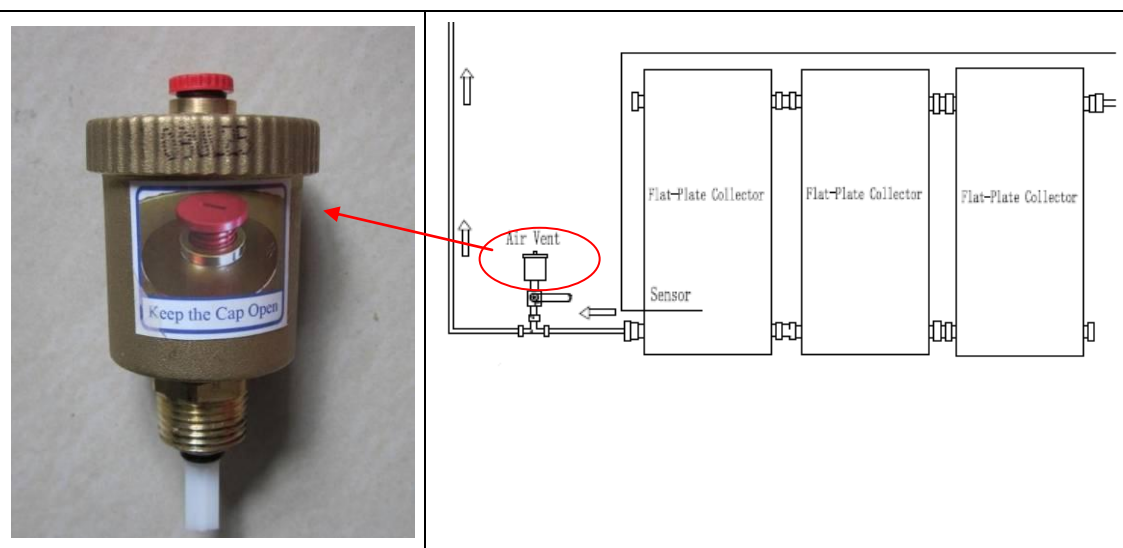
If the valve dribbles continuously, try easing the valve gear for a few seconds as described above. This may dislodge any foreign matter and alleviate the problem.

If the valve discharges at high flows, especially at night, it may be as a result of the water pressure exceeding the design pressure of the water heater. Ask your installer to fit a Pressure Limiting Valve (PLV).

5.2 Expansion Control Valve (ECV)

It is normal and desirable that this valve allows a small quantity of water to be discharged during the heating cycle. If it discharges more than a bucket of water during a 24 hour period or discharges continuously there may be another problem. If the valve leaks continuously, try easing the valve gear for a few seconds. This may dislodge any foreign matter and alleviate the problem.

Operate the easing gear regularly to remove any lime deposits and to verify that it is not blocked.



6 Trouble shooting

Problem	Cause	Remedy
1. Pump not cycling during good weather and panel is hot.	Tank sensor not inserted properly into controller	Check plug for sensor is connected at pump controller, contact supplier if sensor plug connected and fault light still flashes
2. Pump always ON even during minimal solar radiation conditions	Possible air lock in manifold	Contact your supplier.
3. Not enough hot water	Electric booster not connected to mains power	Ensure mains breaker (remote internal booster switch also if installed) is turned on for electric booster. Check if connected to off peak tariff, if connected to off peak tariff ensure that it is connected to tariff 33. If once all of the above is checked and booster still does not operate, please contact your supplier.
4. Banging noise in pipes when hot water tap is opened.	Steam formation in panel when hot water tap is opened after a period of panel stagnation. Often occurs when inlet cold pressure is low (<400kPa).	Check cold supply water pressure. Install pressure pump to raise cold supply pressure above 400kPa.
5. Hot water leaking from pressure temperature relief valve	Water temperature stored in tank is nominal	It is normal operation for the system to discharge up to 5 liters per day from the pressure temperature relief valve.
5.solar panel low working performance	Solar panel is covered by shade so can't receive enough sunlight	Relocated in unshaded area
	Panel leakage	Whether panel leakage

	Pump stop	Please check whether the pump circulate as flow rate 1L/s.
	Solar panel installed by a wrong angle	Adjust the solar panel and make sure the installation angle is from 15 to 75 degree
	Pipe line don't seal and insulated very well, so there is more energy loss	Check and seal the pipe line and keep the pipeline insulated very well.

If after using this trouble-shooting guide, you still can't solve the problem, please contact our Authorized service provider.

7. System tracking

Product Model No.....

Product Serial No.....

Name of Purchaser:

.....

Address:

.....

.....

Phone No:.....

Email

Date of Purchase

Dealers Name:

.....

Dealer's Stamp / Date:

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APPENDICES: User Manual of PUMP STATION