

Apricus Solar Collector Owner's Manual

Australia

(Edition 1.7 - October 2010)

To obtain the complete Installation Manual please go to:

<http://www.apricus.com.au/about-apricus/downloads>

Thank you for purchasing an Apricus solar water heating system.

We sincerely hope that you enjoy your solar powered showers, sound in the knowledge that you are a part of the SOLUTION to climate change.

Customer Service is Important to Apricus

It is important that this collector be installed properly.

You should expect the installation officer to:

- Be on time
- Be polite
- Answer any questions you may have about the system
- Explain the basic operation of the system to you
- Clean up after the installation
- Leave with you a completed warranty form

If you have any comments about the service provided by the installation officer please contact us:

Call: 1300 APRICUS (1300 277 428)

For more information about Apricus products please visit

Global: www.apricus.com
Australia: www.apricus.com.au

1. Educating You

Apricus strongly believes in educating the home owner about the basic operation of the solar water heating system. By gaining a basic understanding you can develop realistic expectations about the operation of the system, develop habits which maximise energy savings and most importantly ensure safe and reliable operation.

2. Understanding Water Heating

Before explaining the operation of your hot water system it is important for you to understand how a water heating works.

A water heater is traditionally an insulated metal tank full of water with an electric heating element or gas burner in the bottom. The water is heated to about 60°C-70°C depending on the thermostat setting. The average household of 4-5 people will use about 250-300L of hot water per day, which requires quite a lot of energy to heat, and that is why it is important to use solar to reduce the amount of electricity or gas used.

When you open the hot water tap, water pressure forces the hot water out. When this happens, cold water is actually entering the bottom of the hot water storage tank, gradually pushing the hot water up and out. This can be seen in figure 2.2. Notice how the water is separated nicely into hot and cold layers. Because hot rises and cold sinks, the water doesn't mix; this is referred to as stratification and is very important as it allows us to shower at a fairly consistent temperature before the water suddenly turns cold.



Fig. 2.1

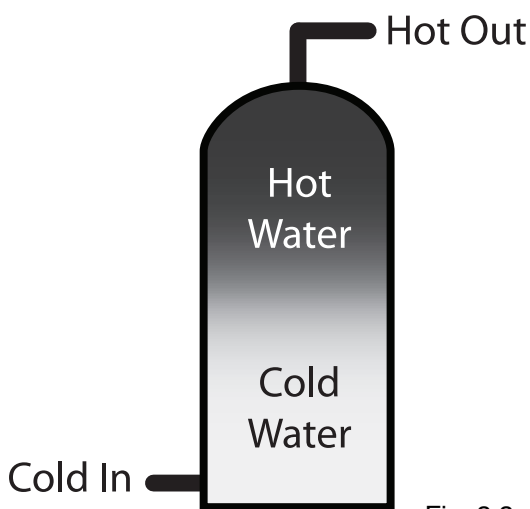


Fig. 2.2

In order to prevent scalding due to excessively hot water, most new houses have a tempering valve installed. If you are in an older house the plumber should advise that you install a tempering valve. This is an important safety device, as it limits the water supplied to the hot water taps to no more than 50°C. This temperature is quite hot, but will not cause burns.

The water generally leaves the hot water tank at 60°C-70°C. It then passes through the tempering valve which brings the temperature down to 50°C by mixing with cold water. At the shower most people will then cool it down to around 45°C by mixing with more cold water. This process is clearly shown in figure 2.3.

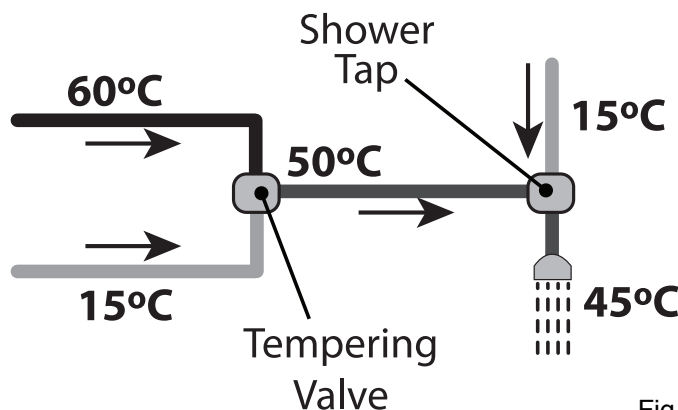


Fig. 2.3

3. Solar Water Heating

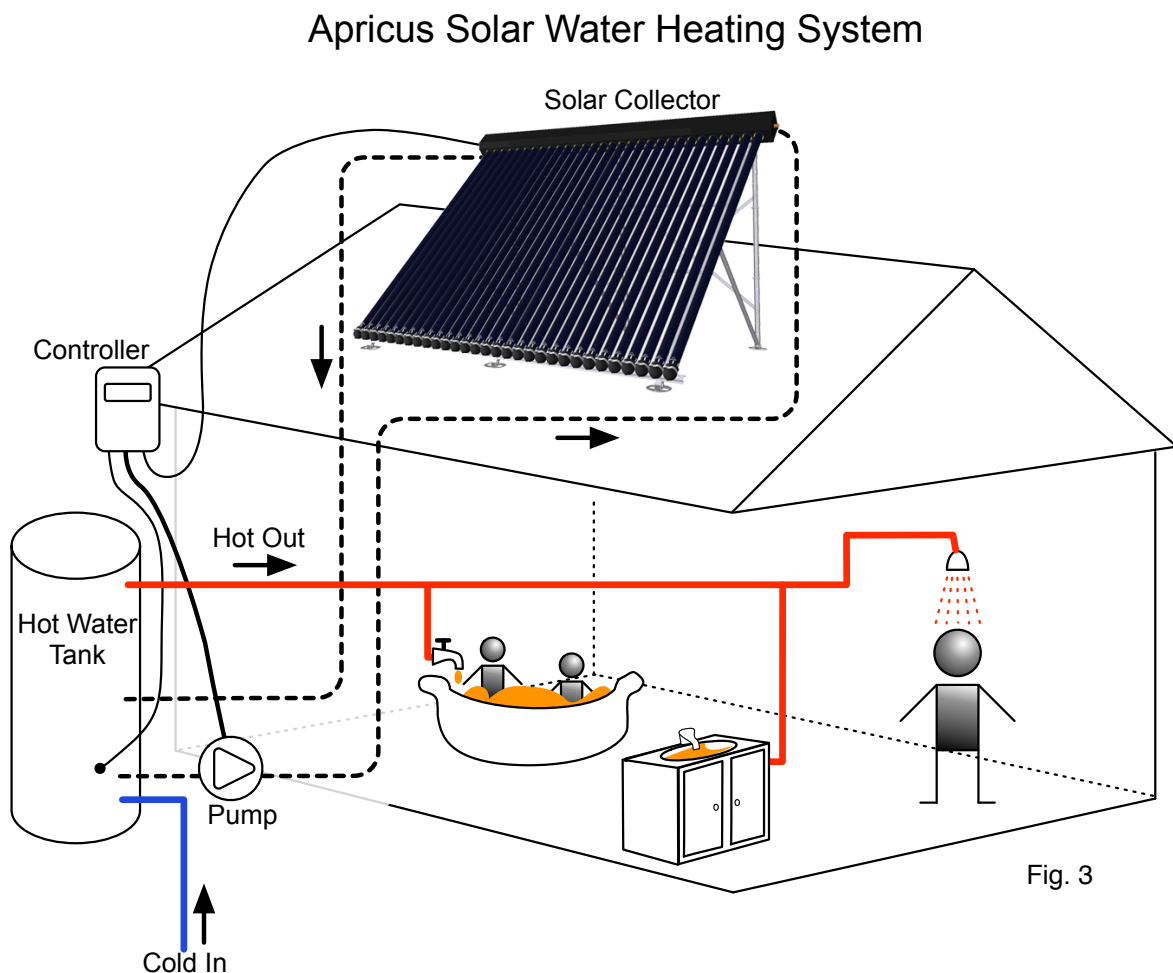
This solar collector is a thermal solar heating device, quite different to photo-voltaic “PV” which converts the sun’s energy into electricity. The operation is very simple - see figure 3.1.

Step 1. The evacuated tubes absorb sunlight and convert it into usable heat.

Step 2. The heat inside the evacuated tubes is transferred up into the insulated black box at the top of the tubes which contains is a copper heat exchanger.

Step 3. An electronic controller measures the temperature of the solar collector and the water in the bottom of the storage tank. If the collector is hotter, meaning there is heat available, the controller supplies power to a circulation pump which pushes water through the collector heat exchanger and back to the storage tank.

Step 4. Throughout the day the circulation pump switches on and off gradually heating up the water in the tank.



4. How Does Boosting Work?

If the solar contribution during the day is not enough to raise the water to a suitable temperature an electric or gas booster can provide additional heating. During good sunny weather the solar collector will normally be able to provide enough hot water, but during winter months and overcast days boosting will be required. It is a legal requirement that the water be heated to 60°C on a regular basis to kill Legionella bacteria that can lead to Legionnaires disease.

Bottom element electric boosted system = Once per week to 60°C

Mid element electric boosted systems = Once per day to 60°C

Gas boosted systems = Each time the water passes through the booster to 60°C

During good sunny warm weather the electric booster can often be turned off as the solar contribution will achieve 60°C in the tank, however during overcast or winter periods it is important that the booster is activated to meet the above requirements. Gas boosted systems should always be turned on.

Electric Boosted

If your system is electric boosted, when the electric element is activated it will heat up all the water above the element to 60°C (or the thermostat setting). This heating can take as long as 3-4 hours if the tank is cold, as the maximum output is limited to 3.6kW (15Amp).

Gas Boosted

Depending on the gas booster being used, a solar transfer valve may be used, as in systems A & B in figure 4, below. This valve allows water to pass through if higher than 60°C, or if less it diverts the water through the gas booster. Systems C & D show the operation for gas boosters that have internal controls for temperature regulation in which case the booster only heats the water if it is less than 60°C. This "post boosting" method has the advantage that you are not wasting gas keeping the tank hot and you have virtually unlimited hot water supply, unlike electric boosting which can run out.

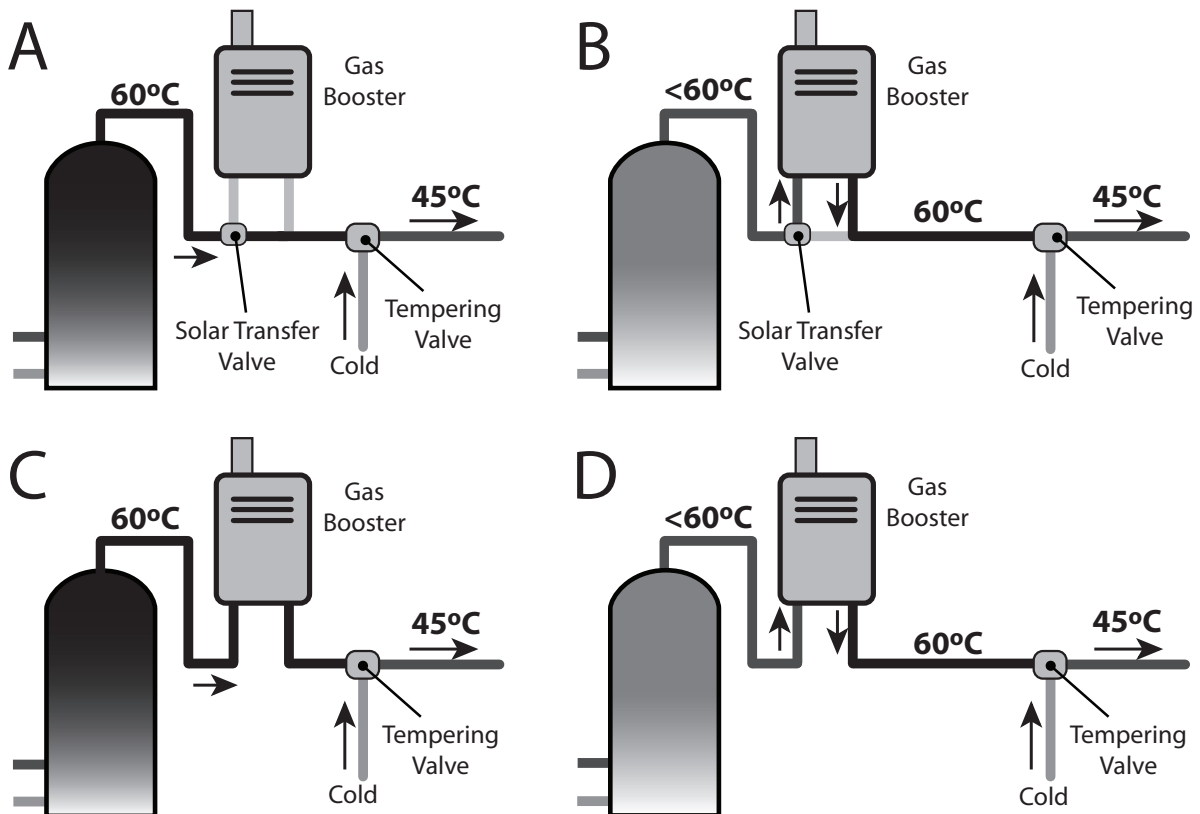


Fig. 4

5. Understanding Solar Contribution

Some home owners make the mistake of thinking that once they install a solar water heater they can turn their element or gas booster off almost all year round. This is incorrect for two reasons. Firstly it is a requirement to heat the water to 60°C to kill Legionella bacteria. Secondly, solar radiation is only half or one third as strong in the winter months compared to summer, and therefore is not able to provide the same amount of hot water as in the summer. Your solar system is designed to meet virtually 100% of summer hot water needs and will provide about 50% in the winter, averaging about 60-80% annually, depending on your location.

Figure 5 shows the comparison between (A) solar heating a tank full of cold water (after lots of showers), or (B) a tank after a couple of showers. The same amount of solar input results in very different final temperatures. This is important to understand when considering the expected performance from your solar water heating system.

The solar controller provides a TANK temperature reading from the bottom of the tank, not the top, so it is common for the display to show a low temperature, especially if some hot water has just been used and cold has entered the tank. That does not mean the top of the tank does not have hot water, as shown in the first tank of example B below.

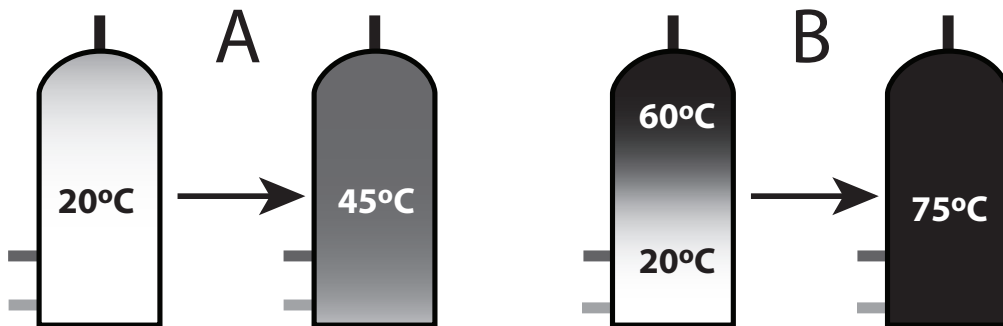


Fig. 5

6. Understanding Water Boiling

Solar collectors have the potential to heat water well above 100°C during periods of high solar radiation and minimal hot water usage. The system is designed to protect the tank by turning off the circulation pump when the storage tank temperature reaches around 70°C. Turning off the circulation pump will cause “stagnation” in the solar collectors which means that the amount of energy being absorbed equals the amount being radiated through heat loss to the surrounding air. During hot conditions the collectors can reach around 160°C. At this temperature the water does NOT boil, because it is under pressure. Because the pressure relief valve on the tank is set to 850kPa, the water would have to reach about 180°C before any steam formed.

If somebody in the house opens a hot water tap, the pressure in the system will drop to that of the incoming cold water. That is normally around 400-750kPa depending on the water supply and any pressure limiting valve that may be installed. Because the pressure drops there is the potential for some steam to form. This may result in some bubbling or crackling noises in the collector or tank. This is normal.

If in an area with lower than normal mains water pressure, or if using a pressure pump, a greater volume of steam may form. In some cases this may result in a louder noise in the pipes due to the larger volume of steam that is formed. If this is of concern a high pressure pump (>400kPa) installed on the cold water supply may help to reduce this occurrence. In addition a check valve (non-return) must be present on the cold supply line before the tank.

7. Electric Boosting Options

The end user may be happy to manually control the timer, turning it on when there is not enough

hot water. This is ok if the operation of the system and hot water usage patterns are understood. There is also the option of an automatic timer fitted, which the plumber can fit allowing automated daily boosting.

Normally the automatic timer should be set to provide power to the element between 3-6pm ensuring a full tank of hot water for evening/morning showers. If the tank is already at 60°C the element will not turn on. If more hot water than normal is used there is the option of manually turning on the heating element via the ON/AUTO switch on the timer; it will take 3-4 hours to heat the tank up to a usable temperature. The element will then turn off. It is important the timer is switched back to AUTO, otherwise the element will keep turning on, wasting electricity. If regularly running out of hot water an additional boosting period can be set. Technically competent end users may read the timer manual and change the settings, if not the plumber should be contacted to provide that service.

Please take note that in order for solar to be effective the tank should be at least half full of cold water in the morning. If a boost is competed at night without lots of morning hot water usage that the tank will be full of hot water solar will not be effective, essentially "losing" that solar heat. This can lead to the tank reaching maximum temperature by mid morning, turning off the solar collector and wasting potential energy.

Example:

Problem: You use a lot of water in the evening and again in the morning. You are often running out of hot water in the morning.

Solution: Set two boost periods, one from 3-5pm in the afternoon, another from 4-6am in the morning. The afternoon boost period may need to be adjusted to 2-4pm if your day off-peak period is 10am-4pm, thus taking advantage of cheaper electricity rates.

8. Maintenance

PRTV: It is recommend that the lever on the pressure and temperature relief valve (PTRV) on the side of the hot water tank be operated once every 6 months to ensure reliable operation. It is important to raise and lower the lever gently, and be careful as the water released will be HOT. Please note that hot water will be released from the drain pipe so please be careful. Ask your plumber to tell you where the valve is located if unsure.

GLASS BREAKAGE: If a severe storm occurs that causes flying debris, falling branches or massive hail it is possible that some of the tubes could be broken. The collector tubes are made of glass and so please take care to observe any broken glass that may have fallen off the roof. This should be cleaned up and disposed of and the plumber called to come and check the system and replace any damaged tubes.

CLEANING: Regular rain should keep the evacuated tubes clean, but if particularly dirty they may be washed with a soft cloth and warm, soapy water or glass cleaning solution but ONLY if the solar collector is located in a position which does NOT require climbing onto the roof, use of stepladder or otherwise potentially dangerous location. If the tubes are not easily and safely accessible, high-pressure water spray is also effective.

If cleaning is required and the above outlined methods are not suitable, the company that supplied and installed the solar collector should be contacted to complete such cleaning.

LEAVES: During autumn, leaves may accumulate between or beneath the tubes. Please remove these leaves regularly to ensure optimal performance and to prevent a fire hazard. (The solar collector will not cause the ignition of flammable materials). Such cleaning may only be completed by the homeowner if the tubes are easily and safely accessible.

If cleaning is required and collector is not safely accessible the company that supplied and installed the solar collector should be contacted to complete such cleaning.

FREEZE PROTECTION: The solar system has a freeze protection feature built into the digital controller. If the temperature in the solar collector drops to around 2°C, the pump will be switched on to circulate some warmer water from the bottom of the tank through the lines to prevent freezing. The pump may come on several times throughout the night during cold conditions. If the pump is coming on more than once every hour, then additional insulation may be needed on the copper pipe runs.

9. Precautions and Warnings

VITREOUS ENAMEL TANKS: For solar collector systems using a vitreous enamel/glass lined storage tank the following precaution applies:

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.

10. Warranty

Apricus solar water heating systems comprise components from a number of different suppliers. Pumps, tanks, controllers and gas boosters all carry their own manufacturers warranty policies. Please refer to the documentation provided with those products for complete warranty details.

The installer of the Apricus solar water heating system **MUST** provide you with 2 copies of the completed installation and warranty record form. In order to register your system for warranty purposes, please fax the completed form to 02 9475 0092 or post to PO Box 1288 Rozelle, NSW, 2039.

If the solar water heating system does not seem to be working properly or if you don't have any hot water during normal usage **DO NOT** attempt to inspect or repair your hot water system yourself. Call the plumber that installed the system or if they are unavailable call 1300 277 428.

Warranty Conditions

1. The solar water heating system must be installed in accordance with the manufacturer's installation instructions, the local authorities and all relevant statutory requirements - AS3500.4 & 5, AS5601, AS3000, AS2712 etc.
2. Installation may only be completed by plumbers, gas fitters and electricians that are licensed in the state the installation is completed.
3. This warranty applies only to those components provided as part of the Apricus solar water heating product and not any electrical or plumbing parts provided by the installer. e.g. Pressure limiting valve, duo-valve, etc.
4. The coverage period is valid from the date of installation. Should any part of the complete solar water heating system be replaced during the warranty period, the balance of the original warranty will continue to remain effective.
5. Should the system be installed in a region where regular flushing of the hot water tank is required to clean out sediment, a drain cock for flushing must be fitted at the time of installation. Please contact your plumber or local water authority if unsure if this is required.
6. The electrical system components are installed in a domestic application and connected to a 240V power supply by a qualified electrician in accordance with AS3000.
7. Component manufacturers are at liberty to alter the design or construction for the products notwithstanding that the product may have been sold by description or sample, even though alterations may have been introduced before the date of Contract and the date of delivery provided that the products are of the same or similar quality and

are fit of the purposes for which they are purchased. Such alterations shall not constitute a defect in design or construction under this Warranty.

8. Dated proof of purchase is required prior to commencement of warranty work.

9. The Warranty shall be limited to the replacement or repair, at the option of Apricus Australia Pty Ltd of any defective products and of such parts as have been damaged in consequence of the defect. Apricus Australia is excluded to the extent allowable by Law from responsibility for consequential loss including:

- Injury to persons
- Damage to property
- Economic loss
- Pain and suffering; and
- Any legal or other damages resulting from any manufacturing fault or defect.

10. Apricus Australia shall be under no obligation to return parts replaced at its option pursuant to this Warranty.

Warranty Exclusions

The following exclusions may cause the warranty to become void, and may incur a service charge and cost of parts that may be required.

1. Accidental damage, acts of God, failure due to misuse incorrect installation, attempts to repair the system other than by an Apricus accredited serviceman/technician.

2. Where the solar collector leaks or fails to operate normally due to freezing in regions above the snow line and/or with minimum temperatures below -5°C (in accordance with AS/NZS 2712:2007 freeze level 1), or when power supply to the controller and pump is cut.

3. Damage to the collector due to excessive winds.

4. Damage to the evacuated tubes due to impact by any object.

5. Gradual reduction of evacuated tube vacuum levels over time.

6. The solar collector is left dry (no liquid circulation) and exposed to daily sunlight (i.e. not covered) for a period exceeding 14 consecutive days.

7. Where the solar water heating system component has failed directly or indirectly as a result of excessive water pressure, negative pressure (partial vacuum), excessive temperature, corrosive atmosphere, faulty plumbing and/or electrical wiring, or major variations in electrical energy supply.

8. Subject to any statutory provisions to the contrary, claims for damage to walls, foundations, gardens, etc. or any other consequential loss or inconvenience either directly or indirectly due to leakage from the solar water heating system or any other matter related to the system or its operation.

9. This warranty does not cover the effects of sludge/sediment as a result of connection to a water supply from suitably filtered or treated sources ie. Spring, dam, bore, river or town supply from a bore.

10. Where the water stored in the cylinder exceeds at any time the following levels:

Total hardness	200 mg/litre or p.p.m
Total dissolved solids	600 mg/litre or p.p.m
Electrical conductivity	850 µS/cm
Chloride	250 mg/litre or p.p.m
Magnesium	10 mg/litre or p.p.m
Sodium	150 mg/litre or p.p.m
pH	Min 6.5 to Max 8.5

11. Any serial tags/stickers on any of the components are removed or defaced.

12. The product is relocated from its original point of installation

13. Subject to statutory provisions to the contrary, Apricus Australia shall not be liable for consequential damage or any incidental expenses resulting from any breach of this warranty.

14. The benefits conferred by this warranty are in addition to all other rights and remedies in respect of the product, which the purchaser has under the Trade Practices Act (Commonwealth) 1975, and similar State or Territory laws.

Warranty Coverage

Components that fail within the “parts and labour” warranted period due to faulty manufacturing or workmanship will be replaced at no charge to the customer within metropolitan areas. During the “parts only” warranty period only replacement product will be provided, with additional costs to be charged to the customer. Where the system is installed outside the boundaries of a Capital Cities Metropolitan area (i.e. those areas STD), the cost of transport, insurance and travelling between the nearest Apricus accredited Service Agent's premises will be charged to the owner.

The period for which free replacement applies, varies for different components, as outlined in the table below.

Component	Coverage
Apricus Solar Collector: Copper heat transfer header	One year parts and labour (All states) Fifteen years parts only (All states)
Apricus Solar Collector: Evacuated Tubes and Heat Pipes	One year parts and labour (All states) Fifteen years parts only (All states)
Apricus Solar Collector: Mounting Frame	One year parts and labour (All states) Fifteen years parts only (All states)
Apricus Solastat-AP Solar Controller	One year parts and labour (All states) Five year parts only (VIC only)
3 Speed Circulation Pump	One year parts and labour (All states) Five year parts only (VIC only)
Everlast Stainless Steel Tank in case of rupture	One year parts and labour (All states) Ten years parts only (All states)
Apricus GLEMC / GLGC Tanks	One year parts and labour (All states) Five years parts only on cylinder only (All states)
Aquamax Tank	One year parts and labour (All states) Five years parts only on cylinder only (All states)
Bosch Highflow Gas Booster	3 year parts and labour on all parts (All states) 5 years all parts only (VIC only) Ten years parts only on heat exchanger (All states)
Eternity Gas Booster	3 year parts and labour on all parts (All states) 5 years all parts only (VIC only) Ten years parts only on heat exchanger (All states)
Rinnai Infinity Gas Booster	3 year parts and labour on all parts (All states) 5 years all parts only (VIC only) Ten years parts only on heat exchanger (All states)

Document Summary

Document By: Michael Humphreys
Original Date: 2nd March 2009

Revision History:

- 1.1. Updated warranty to "VIC only" for controller and pump.
- 1.2. Added in Freeze protection details.
- 1.3. Updated system diagram with all dark lines for better printing, also new controller style, and correct collector orientation. Updated all diagram to black and white. Updated warranty document with corrected warranty policy for gas boosters.
- 1.4. Added in explanation that the controller TANK reading is the bottom of the tank, not the top.
- 1.5. Added in link to downloadable full manual.
- 1.6. Tweaked Legionella information, updated warranty table - now matches 1.11 version of installation manual.
- 1.7. Updated ET & HP warranty to 15 years, plus point 5 in warranty exclusions "5. Gradual reduction of evacuated tube vacuum levels over time."