



**RHEEM AUSTRALIA PTY LTD**

**SERVICE INSTRUCTIONS**



**RHEEM SOLAR LOLINE  
WITH ELECTRIC BOOSTING**

**MODELS**

**511270**

**511340**

**511430**

Rheem Australia Pty Ltd  
Revision: B

ABN 21 098 823 511  
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## SAFETY WARNING

The purpose of this service manual is to provide sufficient information to allow a person with the skills as required by the Regulatory Authorities to carry out effective repairs to a Rheem Solar Loline Water Heater in the minimum of time.

Safety precautions or areas where extra care should be observed when conducting tests outlined in this service manual are indicated by print in **bold italics** and/or a warning symbol. Take care to observe the recommended procedure.



***Working on roofs should always be considered a hazardous activity; by law you must observe certain minimum safety precautions. These safety precautions are outlined in the WorkCover Code of practice "Safe work on roofs" Part 1 and 2 and in the Occupation Health and Safety Act 1983.***



***Certain diagnostic procedures outlined in these service instructions require "live" testing to be conducted. Caution should always be exercised when conducting these tests to prevent the risk of electric shock.***

***If the supply cord to the control box is damaged, it must be replaced by the manufacturer or its service agent or a similarly qualified person in order to avoid a hazard.***

## INTRODUCTION

The information provided in these instructions is based on the water heater being installed in accordance with the Installation Instructions provided with each water heater.

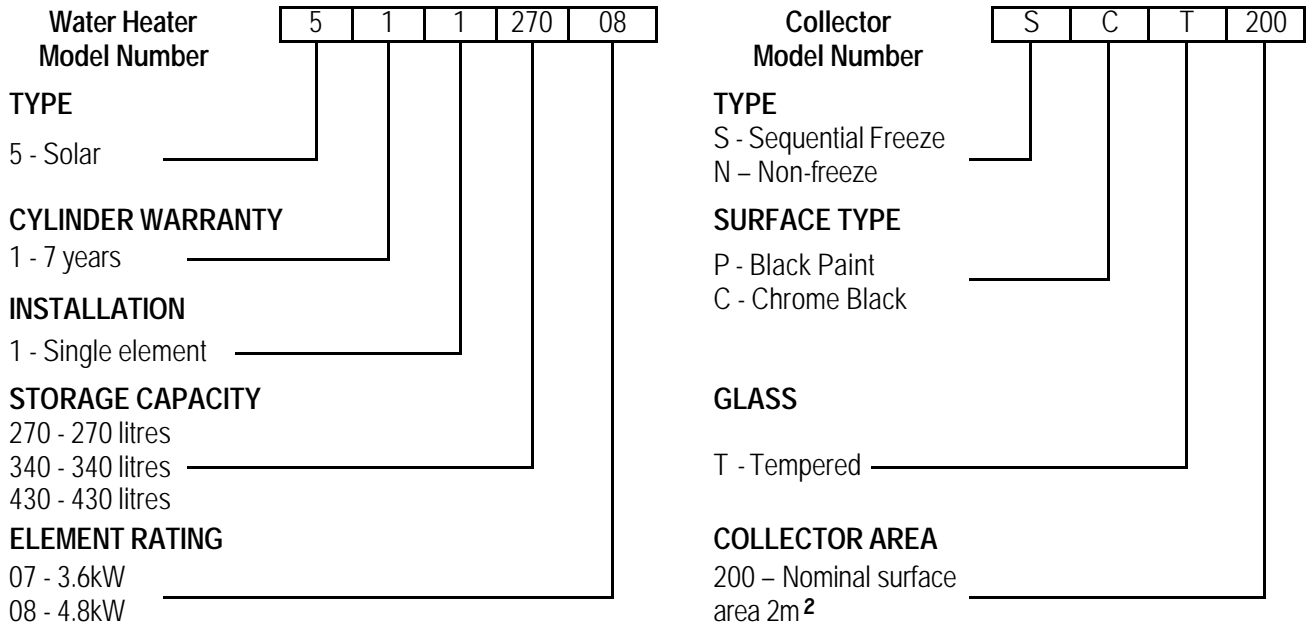
Should you require further technical advice on a Rheem Solar Loline with Electric Boosting Water Heater, contact your nearest Rheem Service Department where genuine replacement parts are also available.

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## WATER HEATER MODEL IDENTIFICATION

The identification numbers are designed to convey detailed information about the water heater to which it is attached. The model number consists of 7 digits and 1 letter.



The model number, serial number and date of manufacture should be quoted in all correspondence.

## SPECIFICATIONS

		511270	511340	511430
Maximum Water Supply Pressure (kPa)	With ECV	680	680	680
	Without ECV	800	800	800
Maximum Thermostat Setting (°C)		70	70	70
ECO Cut Out Temperature (°C)		80-88	80-88	80-88
Storage Capacity (Litres)		270	340	430
Booster Capacity (litres)		160	200	285
Anodes	Quantity	1	1	1
	Length (mm)	1153	1400	1636
Water Connections - Tank	Inlet	RP <sup>3</sup> / <sub>4</sub> /20	RP <sup>3</sup> / <sub>4</sub> /20	RP <sup>3</sup> / <sub>4</sub> /20
	Outlet	RP <sup>3</sup> / <sub>4</sub> /20	RP <sup>3</sup> / <sub>4</sub> /20	RP <sup>3</sup> / <sub>4</sub> /20
Water Connections - Collector	Hot pipe	½" BSP	½" BSP	½" BSP
	Cold Pipe	½" BSP	½" BSP	½" BSP
T&PR Valve	Diameter	RP ½/15	RP ½/15	RP ½/15
	Rating kPa	1000	1000	1000

## OPERATION

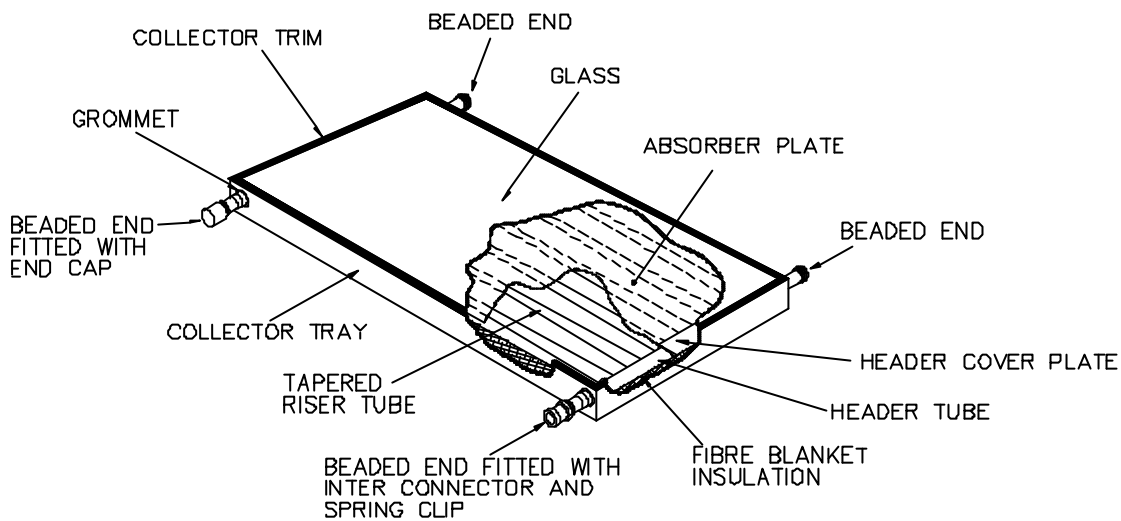
**Solar:** The Solar Loline with Electric Boosting system operates on the temperature differential principle. As water in the collector/s gains heat from solar radiation, a sensor mounted at the hot outlet of the collector senses the temperature increase. When the temperature is 8°C above the temperature being sensed by the cold water sensor (mounted in the cold water supply to the collectors) the differential controller turns a circulator pump on. The circulator moves the colder water in the tank up to the collectors via the cold pipe and the heated water down to the tank via the hot pipe. When the temperature difference between the hot and cold sensors falls to within 4°C the differential controller turns the circulator pump off. The differential controller will not allow the circulator pump to turn on if the temperature sensed by the cold sensor is 70°C or higher. Recirculation will recommence once the temperature at the cold sensor falls below 50°C.

**Electricity:** An auxiliary electric heating unit and thermostat is incorporated in the design of the storage cylinder to provide back up heating during periods of low solar contribution, cloudy weather or high hot water demand.

## SEQUENTIAL FREEZE PRINCIPLE

The sequential freeze collector features tapered risers that reduce in diameter along their length from 12.7mm at the header pipes to 9.5mm at the centre. During periods of low ambient air temperatures the water in the collectors will freeze at the narrowest point of the tapered riser first, due to the small volume of water present, and then continue to freeze in a controlled fashion along the length of the riser. This is known as sequential freeze. The water that is displaced during the freezing process is able to expand back to the tank via the header pipes and the hot and cold pipe, ensuring pressure does not build up in the collector, resulting in split pipework. The headers are 32mm in diameter to ensure water will not freeze and prevent the expanding water from returning to the tank. During periods of frost if the hot water sensor mounted in the collector hot pipe senses a temperature of 1°C the differential controller will turn the circulator on to allow water to pass through the collector array. This flow of water will prevent the DN15 pipe work to and from the collector from freezing. Recirculation ceases after 3 minutes or when the sensor detects a temperature of 5°C.

### Sequential Freeze Collector



## PREVENTATIVE MAINTENANCE – TO BE DONE BY QUALIFIED PERSONS

It is suggested for peak performance that the water heater be serviced annually.

1. Check for discharge from the T&PR valve. Whilst the booster is off, and during periods of low solar contribution there should be no discharge of water. When the booster is operating or during periods of high solar contribution, a small discharge of water may be evident. Operate the valve-easing lever to ensure the valve opens and resets properly. Always open and close the valve gently. The T& PR valve should be replaced at 5 yearly intervals.
2. Check for leaks at the collector connectors, the hot and cold pipe and all tank fittings.
3. Check the collector glass is not cracked and the absorber plate finish is not deteriorating.
4. Confirm all supports and anchors retaining the collector/s to the roof are present, firmly fixed and in good condition.
5. Clean the collector glass. Do not stand on the collectors while cleaning.
6. Check for signs of plant or tree growth that may be shading the collectors. Advise customer to have pruned if possible.
7. Check for signs of excessive corrosion on the water heater jacket, collector panels and roof stand if fitted.
8. **Isolate power** to the electric booster and check all electrical connections for signs of overheating due to poor connection.
9. Conduct an insulation test on the electric booster only. (Refer to page 12).

## COMPONENTS AND THEIR FUNCTION

### **Temperature and Pressure Relief Valve (T&PR)**

A valve designed to provide automatic relief by discharging water in case of excessive temperature, pressure or both.

**⚠ Never fit a T&PR Valve with a pressure rating greater than that indicated on the product-rating label.**

### **Outlet Delivery Tube (Dip Tube)**

A plastic tube installed in the hot water outlet of the water heater cylinder to conduct water from the highest point to the outlet connection. It also acts as a fitting liner.

### **Fitting Liner**

A plastic tube installed in the cold-water inlet of the water heater to provide protection against corrosion through the life of the water heater.

### **Cold Pipe (Solar Return)**

The pipe connecting the solar collectors to the storage water heater through which, the cooler water returns from the storage tank to the collectors.

### **Hot Pipe (Solar Flow)**

The pipe connecting the solar collectors to the storage tank through which, the solar heated water flows back to the storage tank from the collectors.

### **Circulating Pump**

A small centrifugal pump that circulates water through the collectors.

### **Differential Controller**

An electronic control unit that interprets low voltage signals indicating water temperature from the hot and cold sensors to switch on and off the 240 volt circulating pump circuit. The unit is factory set and cannot be adjusted or mega-ohm tested.

### **Hot Sensor**

A thermistor for sensing water temperature, fitted into the connector at the hot pipe connection on the collector. Supplied with 20 metres of cable for connection to the differential controller.

### **Cold Sensor**

A thermistor for sensing water temperature, fitted into a tee at the cold-water pickup for the collectors on the water heater. Supplied with 1.5 metres of cable.

### **4 Way Tee (511 Series)**

A special purpose brass fitting to which the connections for the water heater; cold pipe; cold water supply and cold-water sensor are all included.

### **5 Way Tee (Solar Conversion Kits Only)**

A special purpose brass fitting to which the connections for the water heater; cold pipe; hot pipe; cold water supply and cold-water sensor are all included.

### **Anode (Sacrificial)**

A metal alloy electrode installed in the water heater cylinder that by galvanic action protects the cylinder from corrosion.

### **Thermostat**

A device, responsive to temperature, which controls the supply of electrical energy to the element to maintain the heater water at the required temperature.

### **Over Temperature Energy Cutout (E.C.O.)**

A temperature-sensing device in combination with the thermostat that automatically cuts off the supply of electrical energy to prevent excessive water temperature occurring. This device will not reset automatically but may be manually reset once temperatures have fallen to a safe level.. **DETERMINE CAUSE OF OPERATION.**

### **Heating Unit (Element)**

A tubular device containing an electric resistance element that converts electrical energy to heat. Standard element ratings are 1.8, 2.4, 3.0, 3.6 and 4.8kW.

## **HOT WATER PHYSICS RELATED TO SOLAR WATER HEATERS**

There are physical properties of hot water that are common to all types of heating mediums. However, with solar heating an understanding of these properties will be of assistance to servicing a solar water heater.

### **Stratification**

The term used to describe thermal stratification within a water heater where hot water will lie above cooler water without mixing. Stratification allows the storage water heater to deliver hot water from the outlet, while refilling with cold water at the inlet.

### **Stagnation temperature**

This is the temperature at which HEAT LOSS is equal to HEAT INPUT. In this case when water stops circulating through the solar collector the temperature will rise to the STAGNATION TEMPERATURE.

### **Density of water**

Water is at its maximum density at 4°C. When heated above that point up to 100°C it expands, unequally, an average of 1/23 of its volume. However between 10°C and 65°C the expansion is approximately 1/50 of its volume. This is known as THERMAL EXPANSION, or expansion, and is relieved through the temperature and pressure relief valve (T&PR valve).

**Note:** Water will expand relative to its rise in temperature. The discharge from the T&PR valve is usually the result of thermal expansion due to heating, the quantity of the discharge will be affected by:

- The amount of water being heated
- The temperature rise from cold to hot
- The pressure rating of the T&PR valve
- The number of times a hot tap is opened during a heating cycle
- The amount of water lost through dripping taps
- Faulty Non-return valve fitted to cold water inlet

It should be noted that a T&PR valve would not discharge water due to thermal expansion when the heating cycle is not on.

### **Boiling point of water**

The temperature at which water boils is directly related to the pressure to which the water is subject to.

- Water will boil at below 100°C if the pressure is below 101kPa (atmospheric pressure at sea level).
- At sea level the boiling point of water is 100°C
- Water will boil at above 100°C if the pressure is above 101kPa (water at 1000kPa will boil at approximately 183°C).

### **Specific heat**

The amount of energy required to raise 1kg of a substance by 1°C. Measured in units of kilo-joules (kJ) i.e. 4.2kJ will raise 1 litre of water 1°C.

### **Latent heat (Hidden or invisible heat)**

The energy required to change the state of a substance (water) into another state without a change in temperature.

i.e. water to steam and steam to water

water to ice and ice to water

The latent heat of steam is approximately 6 times the specific heat of water, i.e. to convert water at 100°C to steam at 100°C will require approximately 25.2 kJ/kg.

### **Flash Steam**

This is when water under pressure is heated to temperatures above 100°C, and then the pressure is suddenly reduced (by opening a hot tap) allowing the excess heat to be converted to steam. This steam requires 1689 times more space than water and fights inside the system to get out, resulting in a rumbling noise commonly referred to as "elephants on the roof" by customers. The steam is dissipated when it reaches the large volume of water in the storage tank and condenses.

### **Freezing of water**

Water cooled below 4°C expands insignificantly until it reaches the point of its changing state into ice, at which time it expands by 1/11<sup>th</sup> of its volume. Ice contracts on further cooling. Damage to solar collectors occurs when:

1. Water trapped between two plugs of ice is compressed by the ice expansion to a point where the pressure results in a failure of the copper tube.
2. An ice plug forms in a tee or elbow and the expansion cannot be relieved, resulting in a split fitting.

## COMMON FAULTS

When a complaint is lodged about the performance of a hot water system there are a number of causes that should be checked and eliminated. In an attempt to pinpoint the most likely cause it is important to discuss with the customer their reasons for the complaint, the duration of the problem, any change in circumstances or usage and recent weather conditions. This information in conjunction with the following listed common complaints will assist you in locating the most likely cause. All procedures assume there is water flowing through the water heater.

### **Excessive hot water usage**

The complaints of insufficient hot water and no hot water can on many occasions be attributed to hot water usage exceeding the capacity of the water heater to provide hot water.

When first attending a call of this nature it is essential to establish the probable hot water usage by querying the usage habits of the household and compare this with the potential delivery of the model water heater installed. It can then be established if the usage is within or outside the capacity of the model. The areas to look at for excessive usage are:

1. Automatic washing machines.
2. Showers exceeding 11 litres/minute for mixed water and 5 minutes in duration.
3. Two or more showers operating at the same time.
4. Change of occupancy or number of persons increased.
5. High water pressure area. (Excessive T&PR discharge)
6. Plumbing leaks

### **Discoloured water**

1. This may be the result of discoloured water entering from the cold water mains. Check if the cold water is also discoloured.
2. Brown coloured water will generally indicate that the anode has been depleted or the water heater is near the end of its useful life.
3. Milky coloured water is generally air in suspension and will disperse of its own accord. In very hard water areas where anode gassing occurs, milky water may be evident. The use of a blue anode should overcome this problem.

### **Water hammer**

A water heater will not cause water hammer, however valves associated with the water heater may be the source of the problem i.e. cold-water stopcock, non-return valve, T&PR valve or relief valve.

Most water hammer problems are associated with plumbing, hot and cold, or appliances i.e. solenoid valves, ballcocks, loose pipes, sharp angles in pipe work, faulty or worn valve parts or neighbouring equipment.

High water pressure areas will have more complaints of this nature and the use of a pressure-limiting valve (PLV) to reduce the household cold-water pressure will usually solve most problems.

### **Roof leaking**

This complaint is usually made during or after wet weather and normally soon after commissioning a new water heater. The movement of persons on the roof during installation can crack roofing material if the load is borne on specific points or the roof material is brittle.

Replacement of damaged roof materials is essential. Use of a woven plastic roof sheet below the collectors will make water penetration more difficult in the future. It should also be established if water is penetrating around the pipe or sensor joints through the roof.

### **Moisture under the collector glass**

Small amounts of condensate on the underside of the collector glass are not a sign of collector failure. The condensation is formed from humid air condensing when the collector cools down. Because of high temperatures within the collector, ambient air is transferred in and out of the collector through drain holes. Note: The collector is not hermetically sealed.



## COMMON FAULTS (continued)

### Hot water plumbing leaks

If hot water has not been used for a period of time, feeling the temperature of the hot water line may give an indication of water flow if the pipe is warm. The method of checking for plumbing leaks is:

1. Turn off the stopcock on the cold water supply to the water heater.
2. Open a hot tap to ensure the flow of water stops. This will confirm the stopcock is operating correctly.
3. Turn off the hot tap.
4. Turn on the stopcock to make up the water pressure in the cylinder, and then turn the stopcock off again.
5. Wait approximately 5 minutes then do either of the following:
  - a. With your ear close to the stopcock turn it on slightly and listen for any water passing. If there are no leaks, water should not pass.
  - b. Open a hot tap while listening for any pressure release. If there is a pressure release there will be no leaks in the plumbing system.

### Mixing or crossed connections

If an automatic dishwasher, washing machine, flick mixer tap, tempering valve or thermostatic mixing valve is installed there is always the possibility that the cold water could mix with the hot water through a faulty or incorrectly installed valve. This is referred to as a cross connection. The complaints of insufficient hot water, water too cold or excessive discharge from the T&PR valve may be attributed to a cross connection. The method of checking for a cross connection is:

1. Turn off the stopcock on the cold water supply to the water heater.
2. Open a hot tap. If water flow is persistent and cold a cross connection exists.

### Fault finding charts

Fault	Chart number	Page	
No hot water	Electric booster circuit Differential Controller Collector circuit	1, 1.1, 1.2 2 2.1, 2.2	10, 11, 12 13, 14 15, 16
Insufficient hot water		3	17
Excessive discharge from T&PR valve		3.1	17
Water too hot	Electric booster circuit Collector circuit	4 5	18 19
High energy bills		6	19
Leaking water heater		7	20
Noisy water heater		8	21

### BEFORE SERVICING A SOLAR WATER HEATER



***Working on roofs should always be considered a hazardous activity, particularly early in the morning, late in the evening or after periods of rain.***

***Safety precautions pertaining to working on roofs are outlined in the WorkCover Code of Practice "Safe work on roofs" Part 1 and 2 and in the Occupational Health and Safety Act 1983***



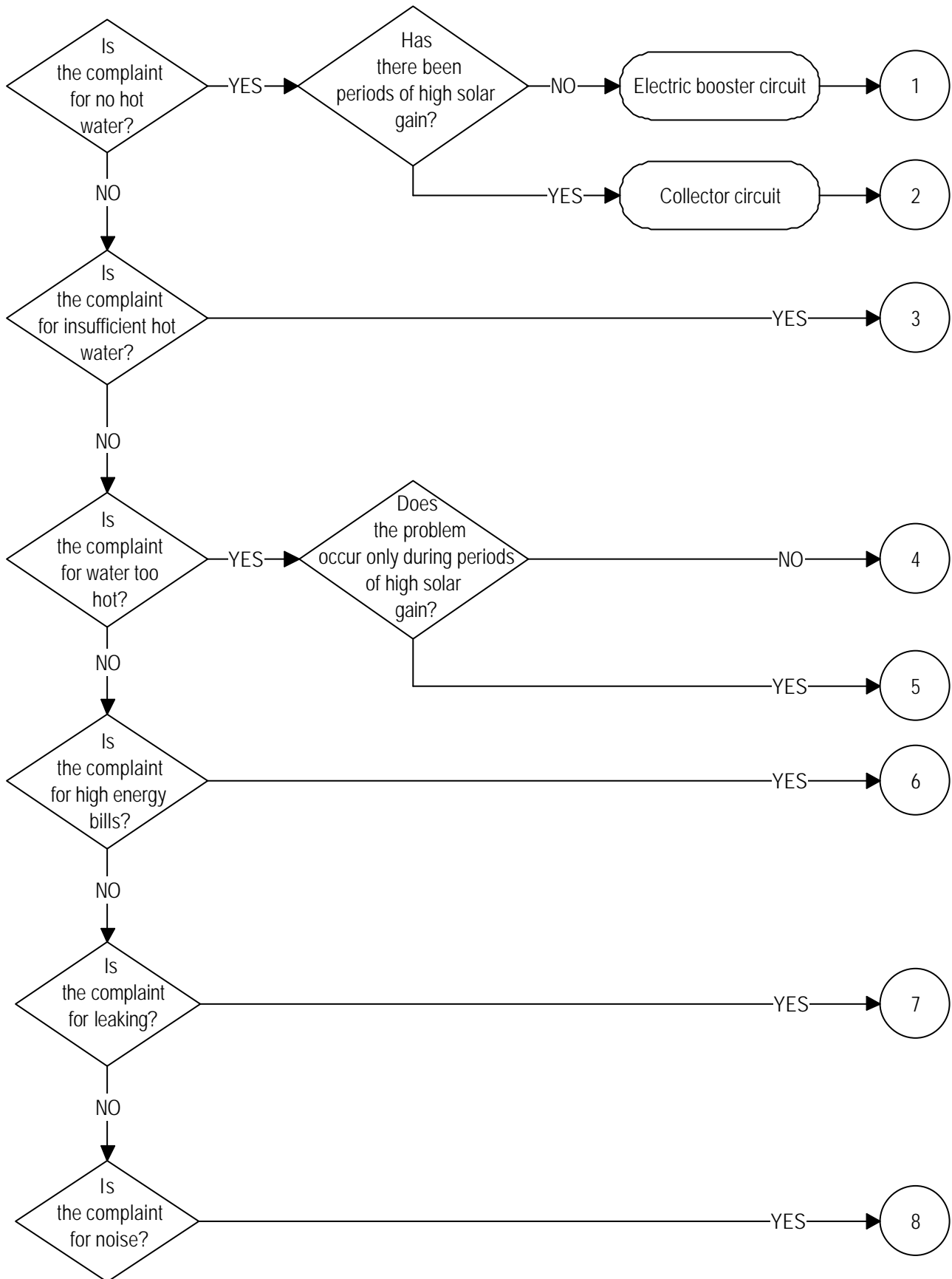
***Water under pressure and at temperatures up to 150°C may be present in the collector/s. Isolate water supply and relieve pressure through a hot tap or the temperature and pressure relief valve prior to opening the collector pipe work. Protective clothing should be worn to prevent scalding or burns.***



***Certain diagnostic procedures outlined in these service instructions require "live" testing to be conducted. Caution should always be exercised when conducting these tests to prevent the risk of electric shock.***

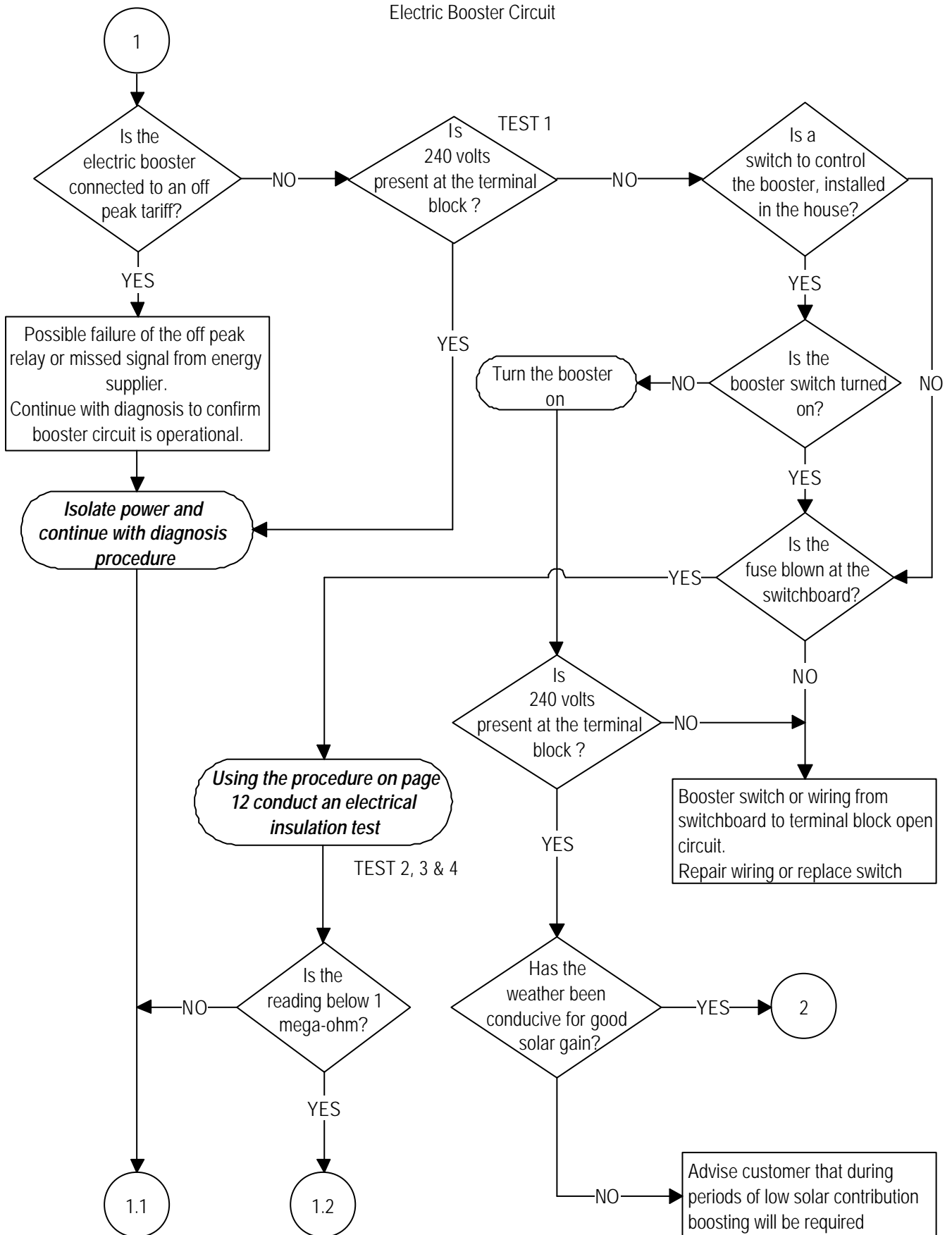
# FAULT FINDING

## Fault Diagnosis Sequence



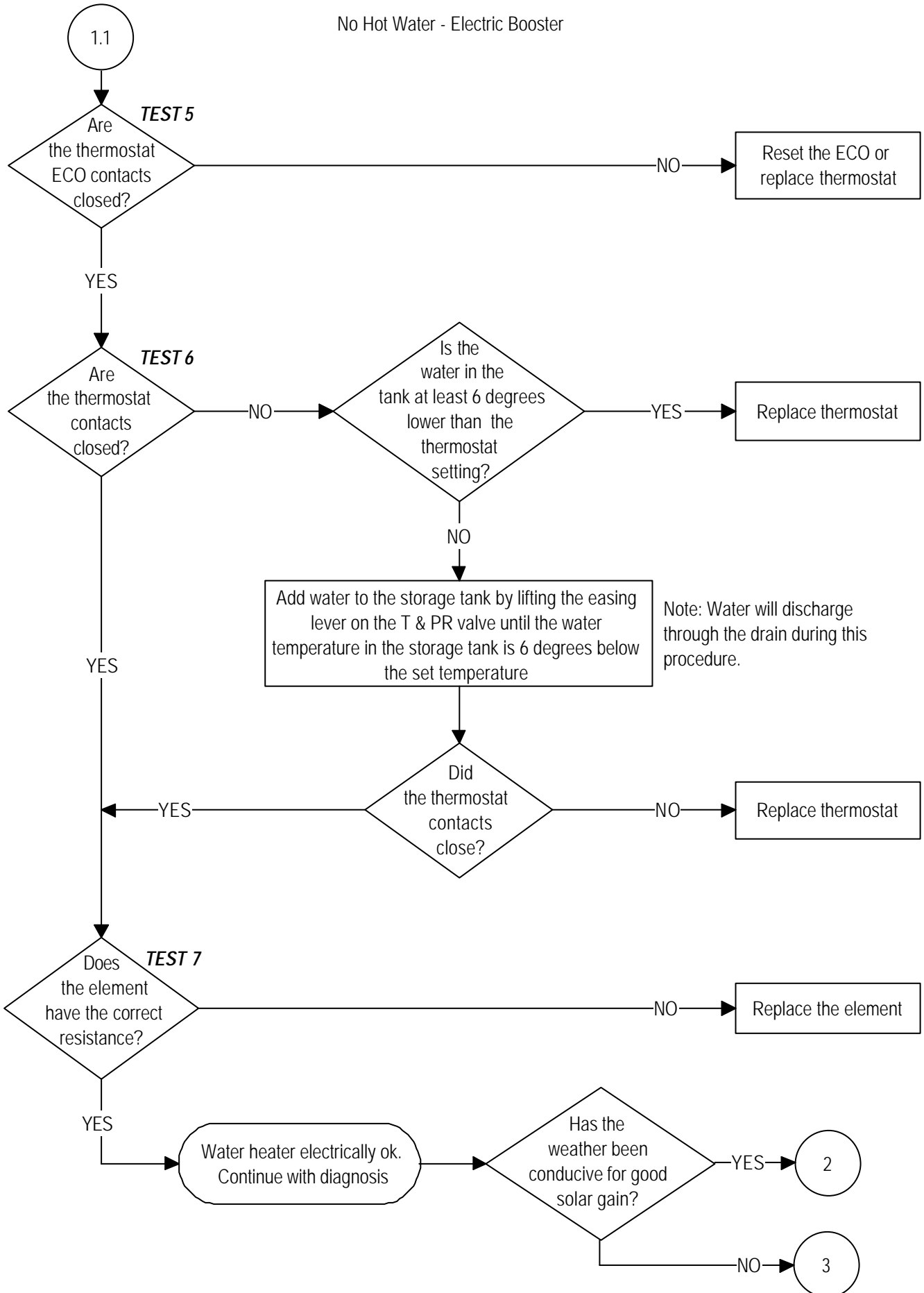
## FAULT FINDING

### Electric Booster Circuit



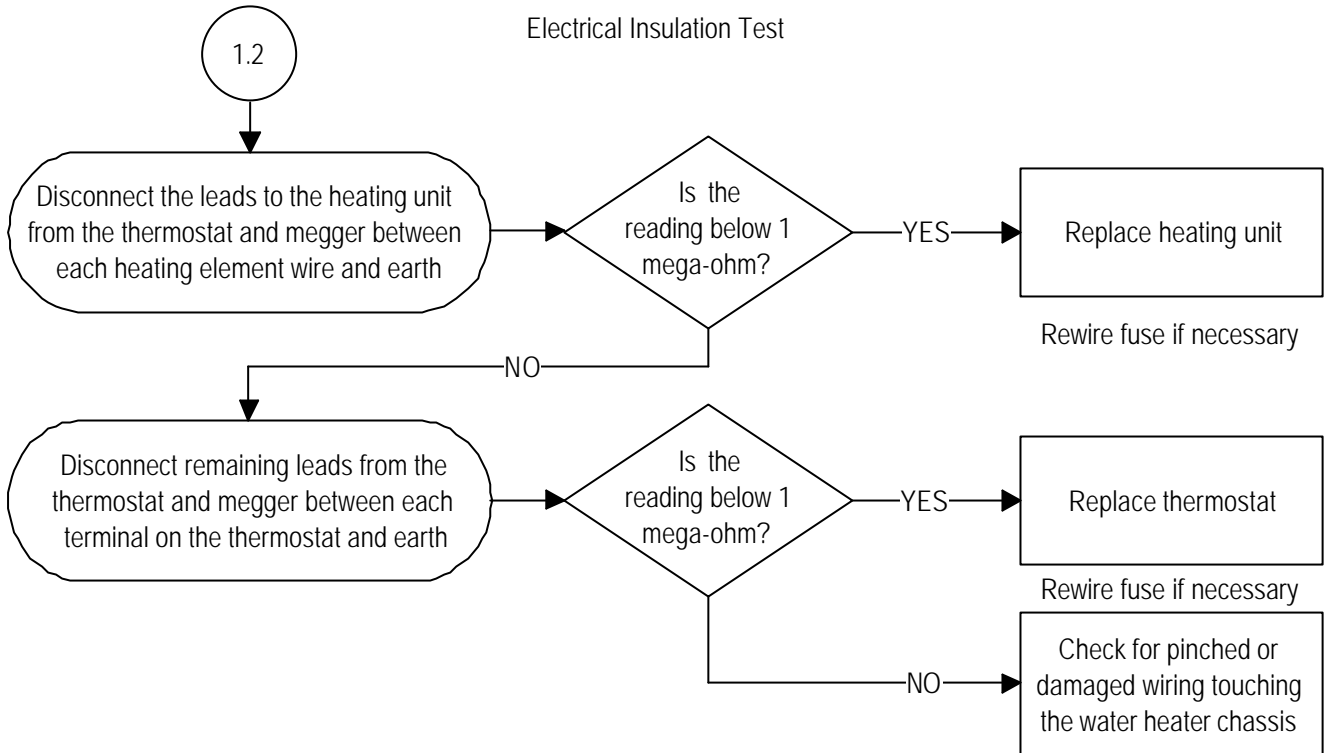
## FAULT FINDING

No Hot Water - Electric Booster



## FAULT FINDING

### Electrical Insulation Test



## ELECTRICAL INSULATION TESTING

There are three basic test procedures that should be carried out when the operation and function of a water heater's electrical system is in doubt.

### Test No.2

**Check insulation resistance of Neutral Circuit in water heater. (Reading not to be below 1 mega-ohm).**

1. **Isolate power to the water heater by removing fuse. Confirm with multi-meter across Active and Neutral at the terminal block that voltage is not present.**
2. Once satisfied, disconnect the active and neutral wires from the water heater terminal block.
3. Connect megger leads to the neutral side of the terminal block and earth.
4. Operate megger. A reading above 1 mega-ohm should be obtained.
5. If a reading below 1 mega-ohm is indicated, all component parts will need to be individually tested to locate the fault.

### Test No. 3

**Check Insulation Resistance of Active Circuit in Heater. (Reading not to be below 1 mega-ohm).**

1. Connect megger leads to the active side of the terminal block and earth.
2. Operate megger. A reading above 1 mega-ohm should be obtained.
3. If a reading below 1 mega-ohm is indicated, all component parts will need to be individually tested to locate the fault.

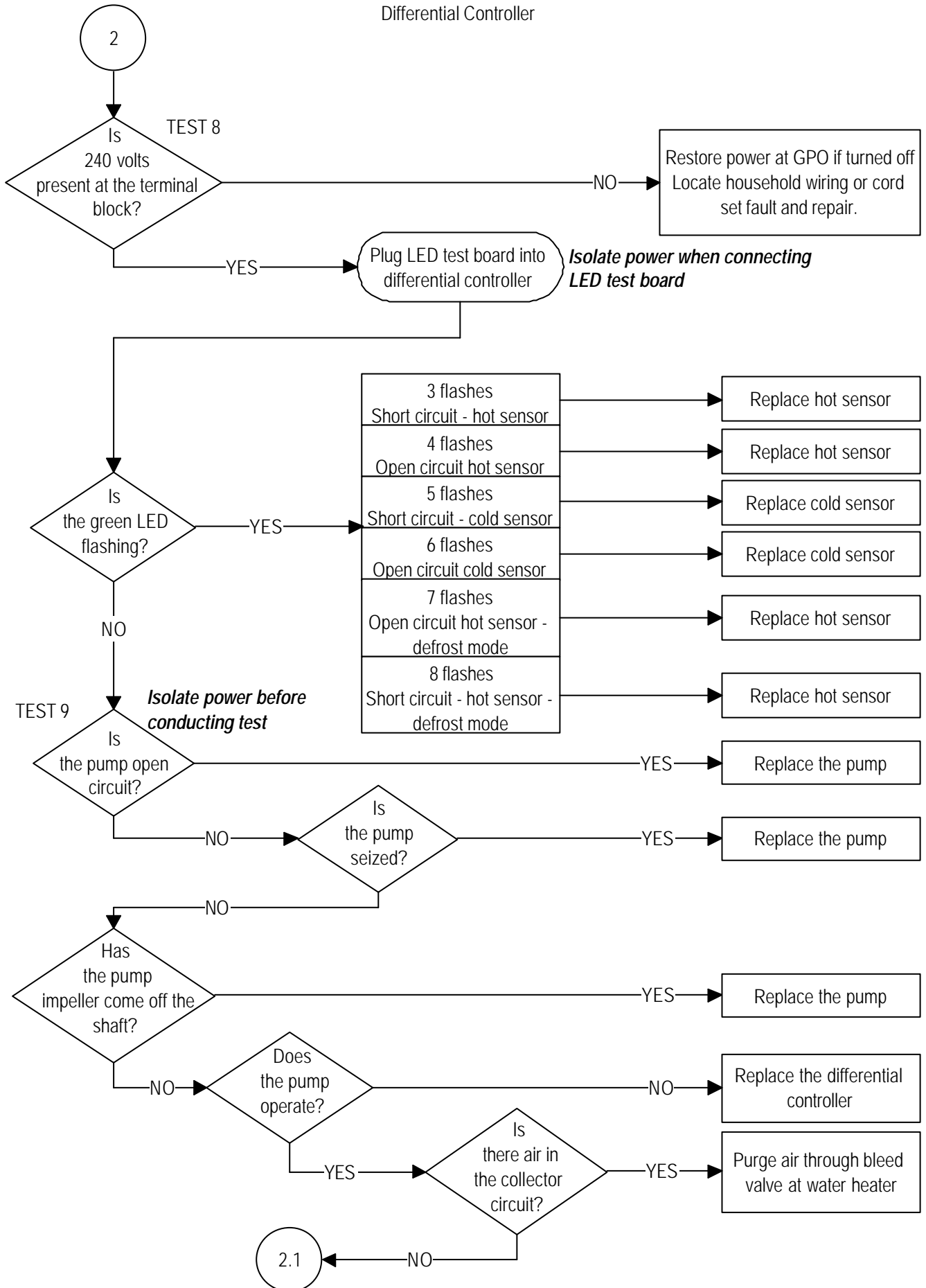
### Test No. 4

**Check "Continuity" of water heater electrical circuit.**

1. Set megger to resistance scale or multimeter to x1 resistance scale.
2. If a reading greater than 50 ohms is indicated, all electrical component parts will need to be individually tested to locate the fault.
3. Reconnect active cable to "A" terminal and neutral cable to "N" terminal at heater terminal block.
4. Replace fuse. **Note: If continuing with flow chart 2 of diagnostic procedure do not replace fuse.**

## FAULT FINDING

### Differential Controller

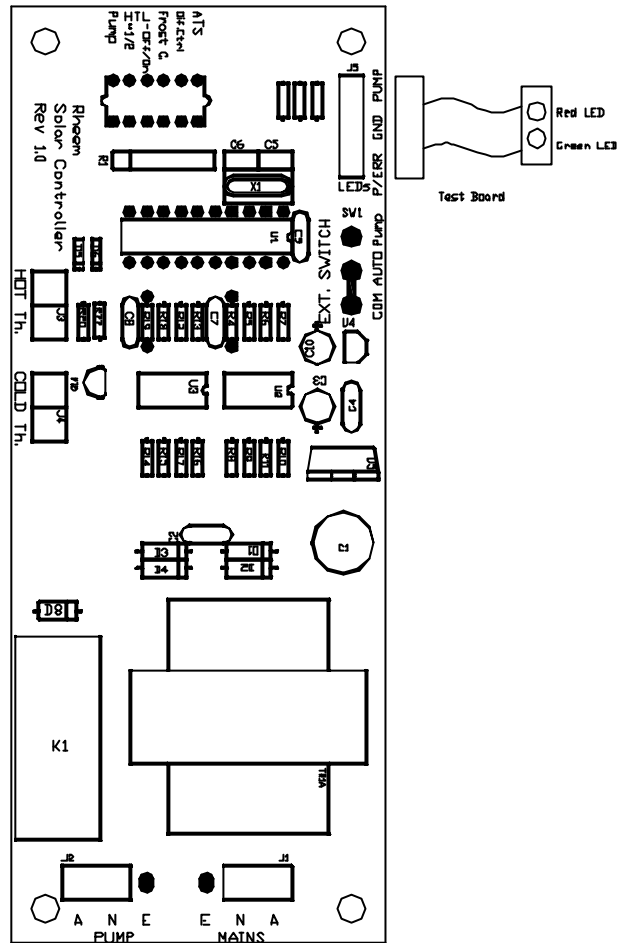


## DIFFERENTIAL CONTROLLER

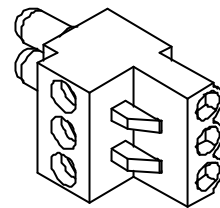
The differential controller receives information from the hot sensor, measuring water temperature at the collectors, and the cold sensor measuring water temperature at the bottom of the tank.

If the water temperature at the hot sensor is 8°C above the temperature being sensed by the cold-water sensor the differential controller turns a circulator pump on. The circulator moves the colder water in the tank up to the collectors for heating via the cold pipe and the heated water in the collectors down to the tank via the hot pipe. When the temperature difference between the hot and cold sensors falls to within 4°C the differential controller turns the circulator pump off. The differential controller will not allow the circulator pump to turn on if the temperature sensed by the cold sensor is 70°C or higher, this prevents the likelihood of extremely hot water being delivered at hot taps and other outlets at uncontrolled water temperatures near boiling point. It also prevents premature operation of the T & PR valve and the thermostat over temperature energy cut out (ECO) and aids in extending the life of the system. Recirculation will recommence once the temperature at the cold sensor falls below 50°C.

During periods of frost if the hot water sensor mounted in the collector hot pipe senses a temperature of 1°C the differential controller will turn the circulator on to allow water to pass through the collector array. This flow of water will prevent the DN15 pipe work to and from the collector/s from freezing. Recirculation ceases after 3 minutes or when the sensor detects a temperature of 6°C.



The differential controller has built in diagnostics to test the condition of the hot and cold sensors; a 3-pin ribbon plug on the differential controller circuit board allows two LED'S to be connected (part number 890258) so the fault codes can be displayed. The red LED indicates when power is being supplied to the circulator pump. The green LED displays the fault codes.

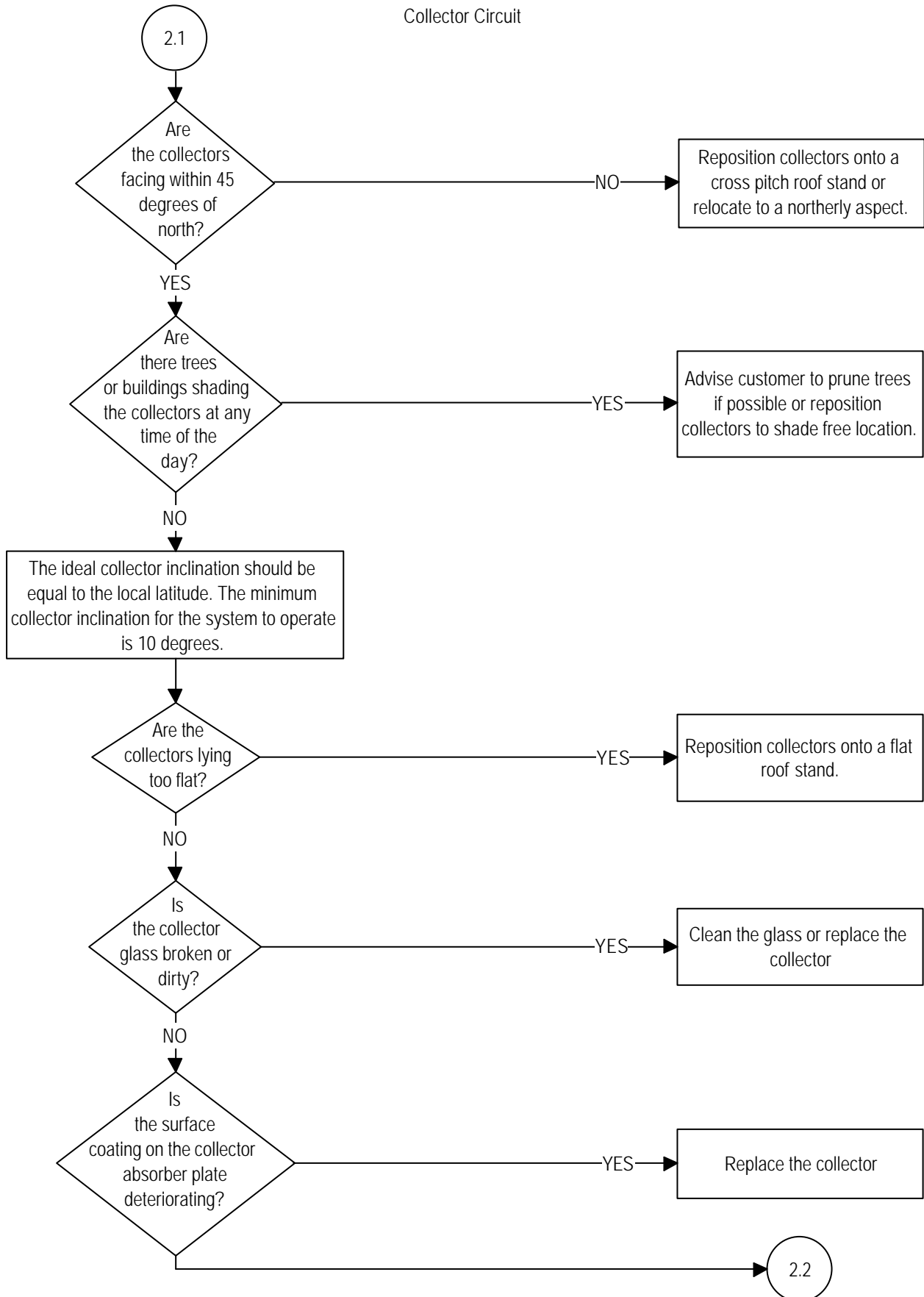


### Fault Codes

Number of flashes	Fault	Mode
0	No fault with sensors	Normal
1	Not assigned	N/A
2	Not assigned	N/A
3	Hot sensor short circuited	Normal
4	Hot sensor open circuit	Normal
5	Cold sensor short circuited	Normal
6	Cold sensor open circuit	Normal
7	Hot sensor open circuit	Defrost
8	Hot sensor short circuited	Defrost

## FAULT FINDING

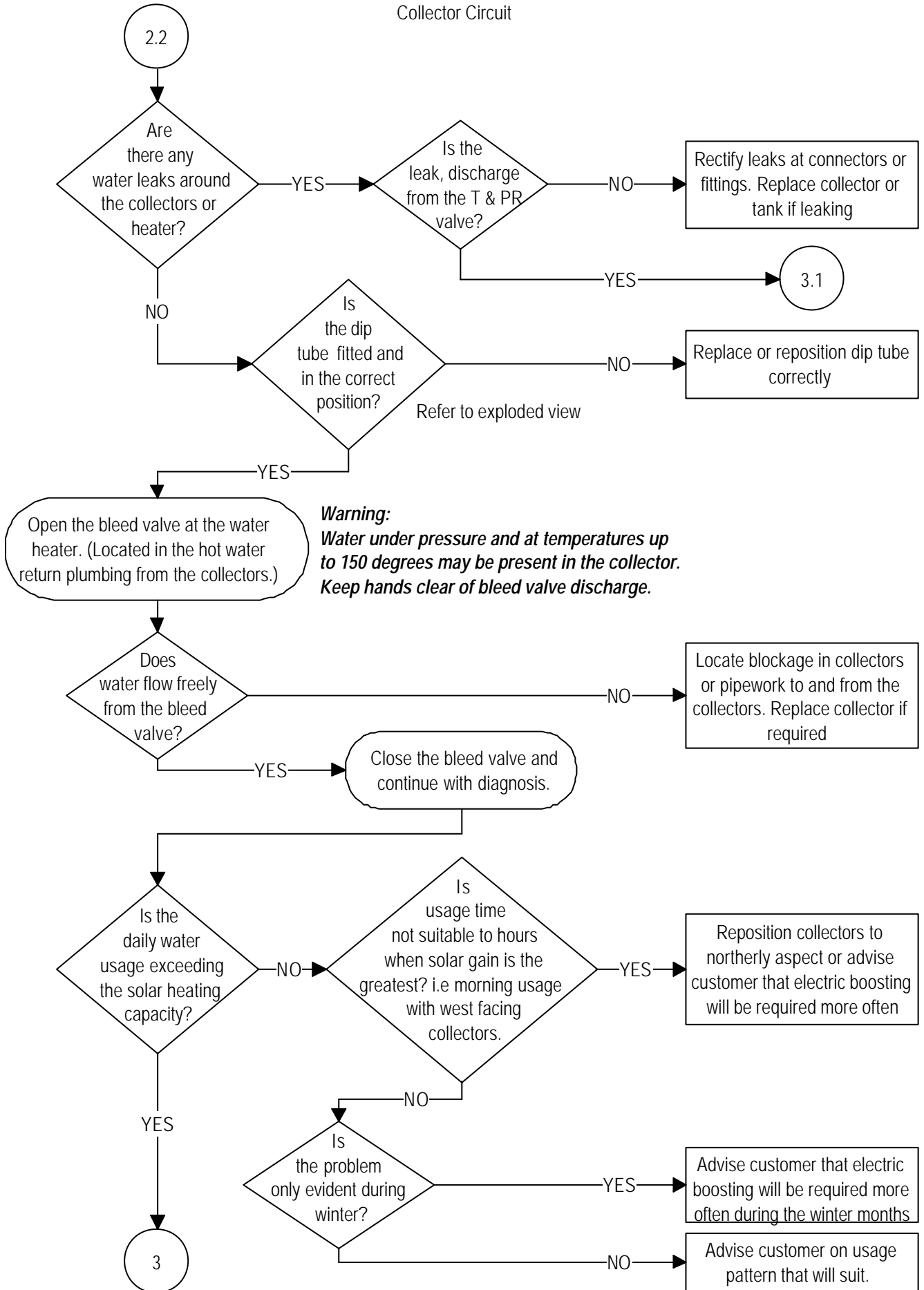
### Collector Circuit





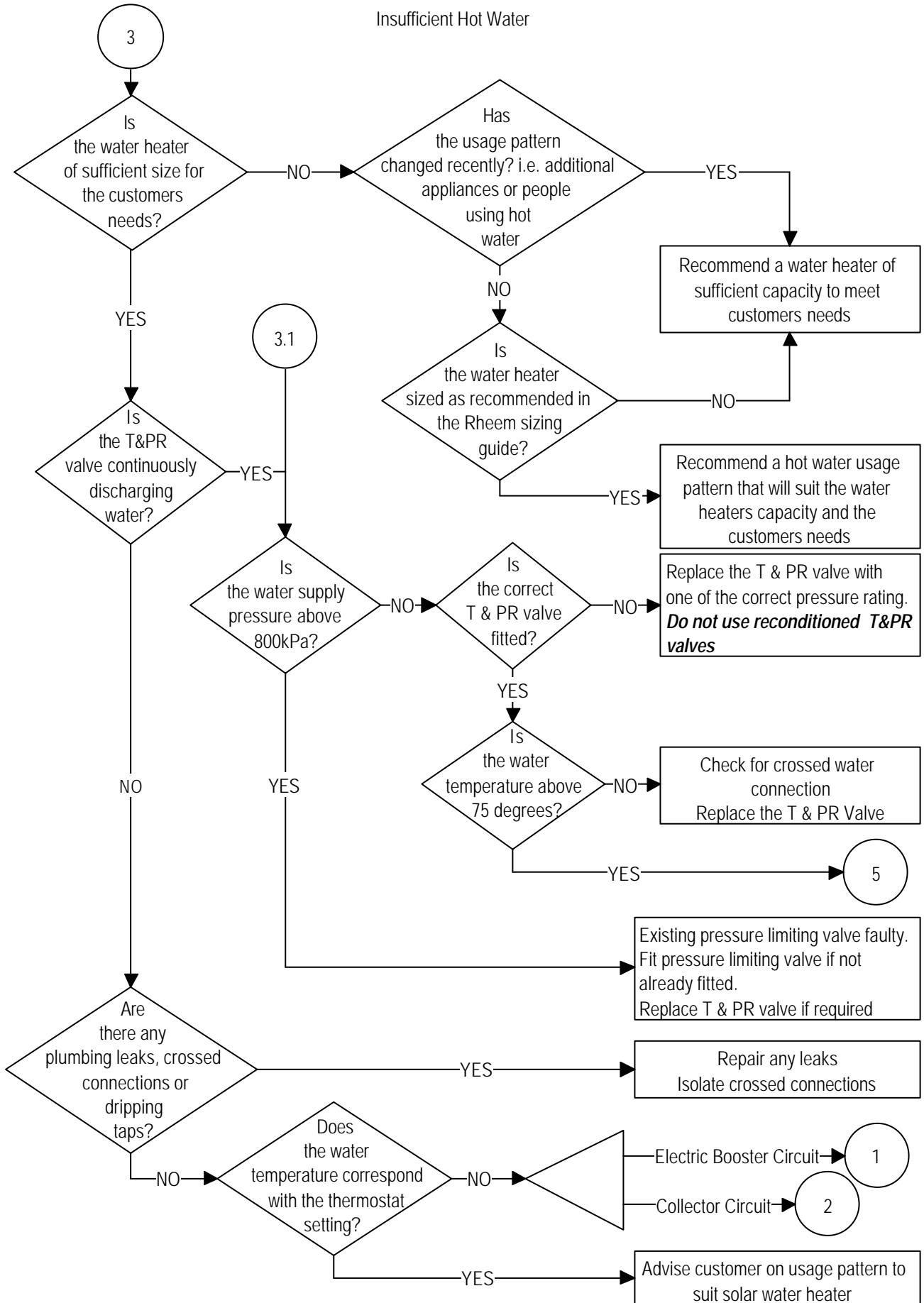
## FAULT FINDING

### Collector Circuit



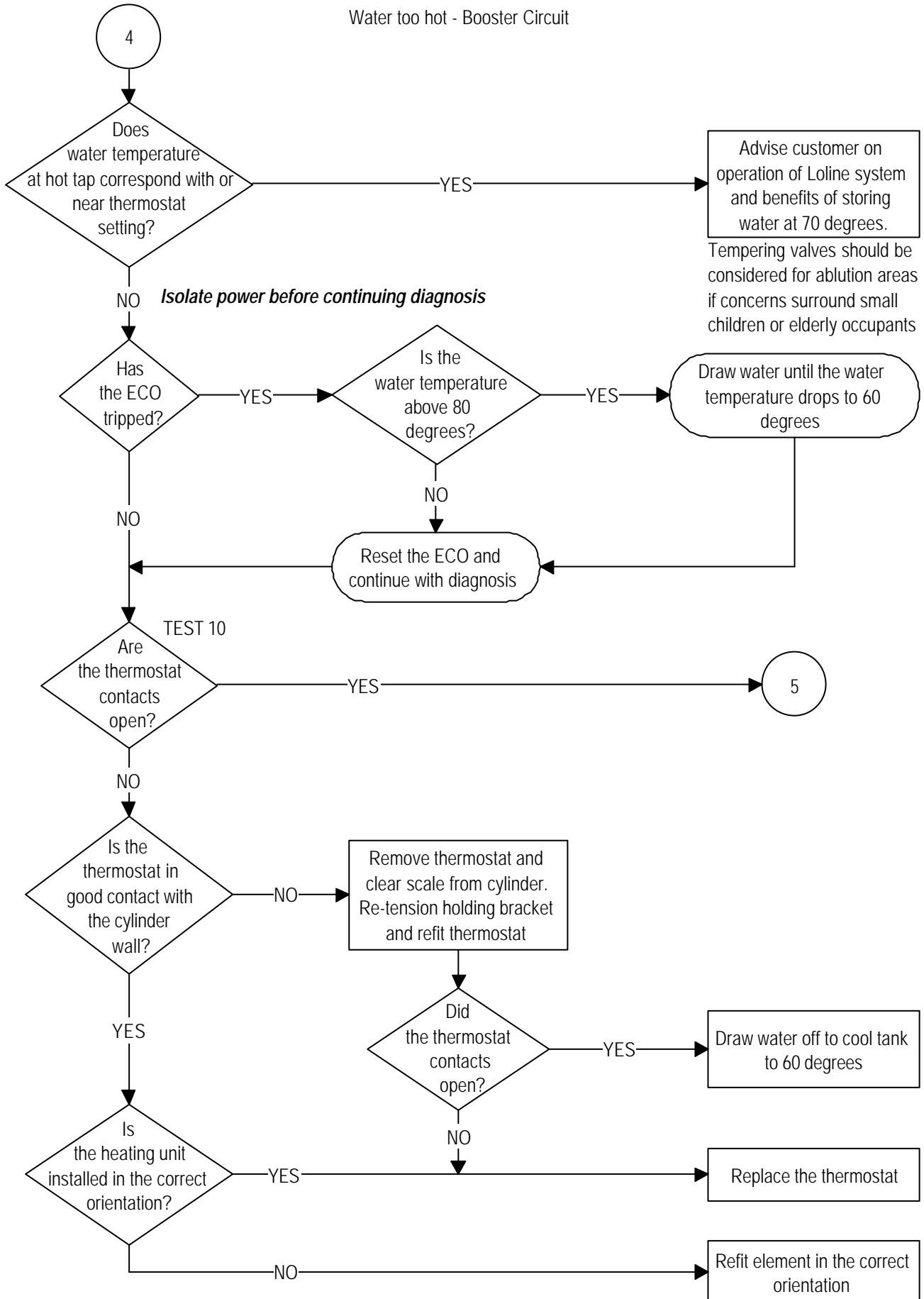
## FAULT FINDING

Insufficient Hot Water



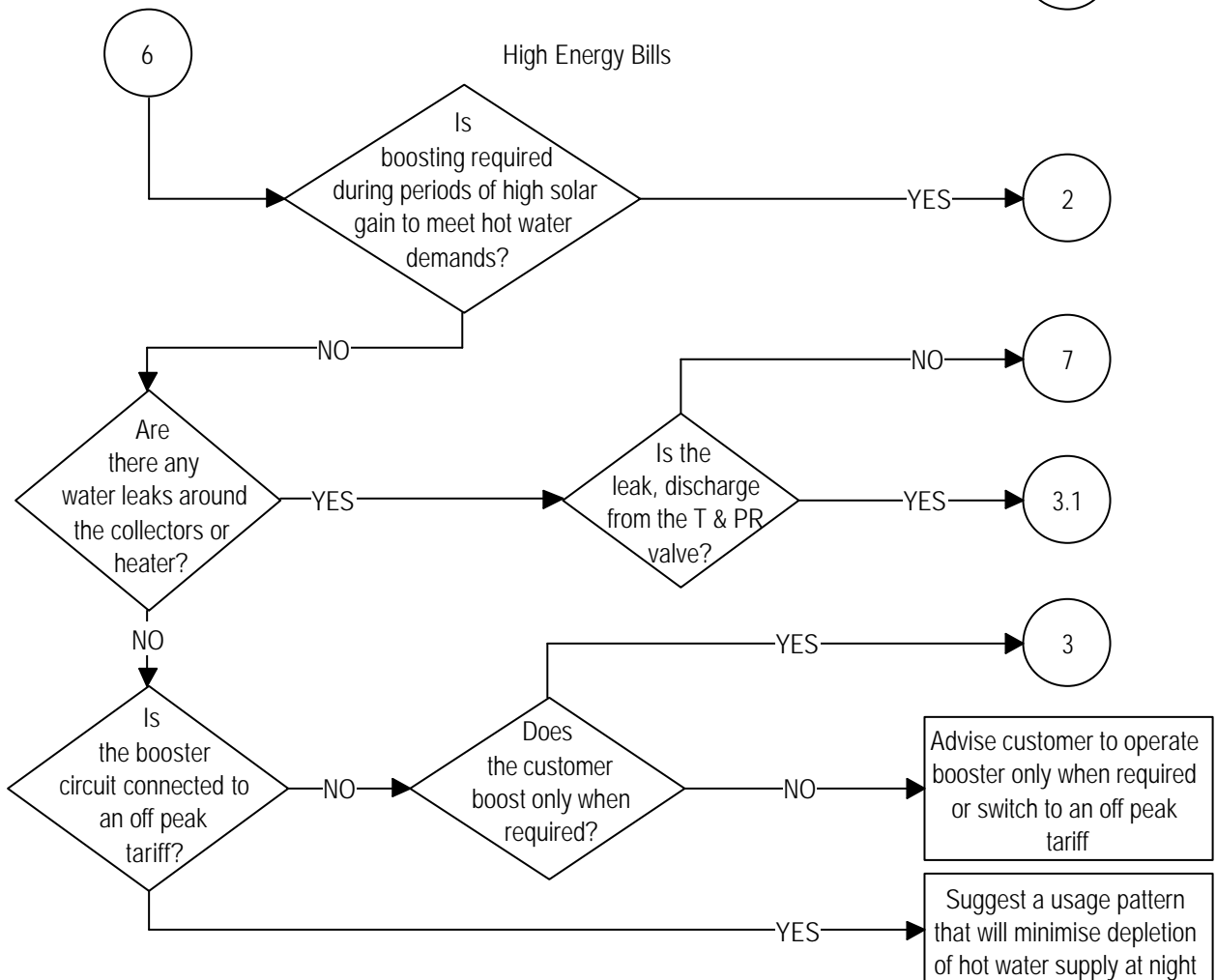
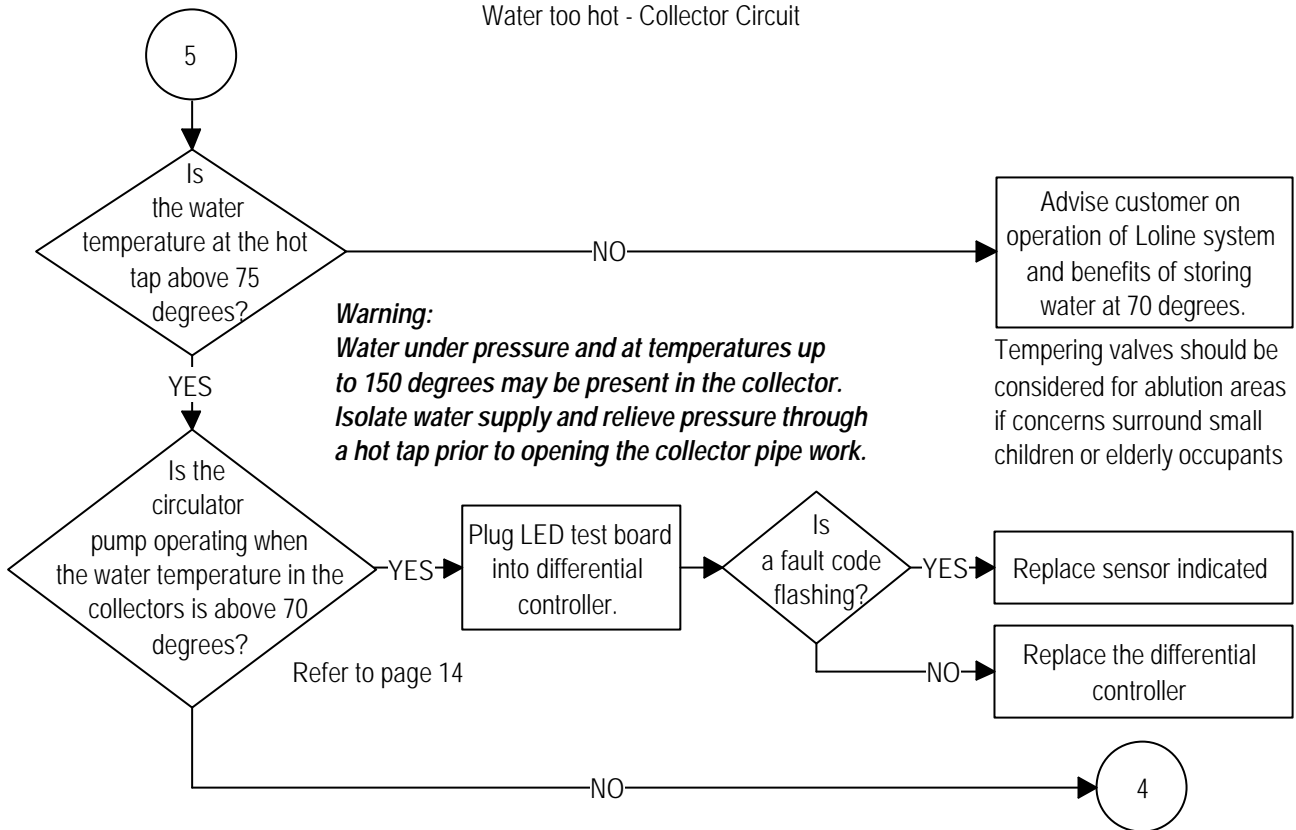
## FAULT FINDING

Water too hot - Booster Circuit



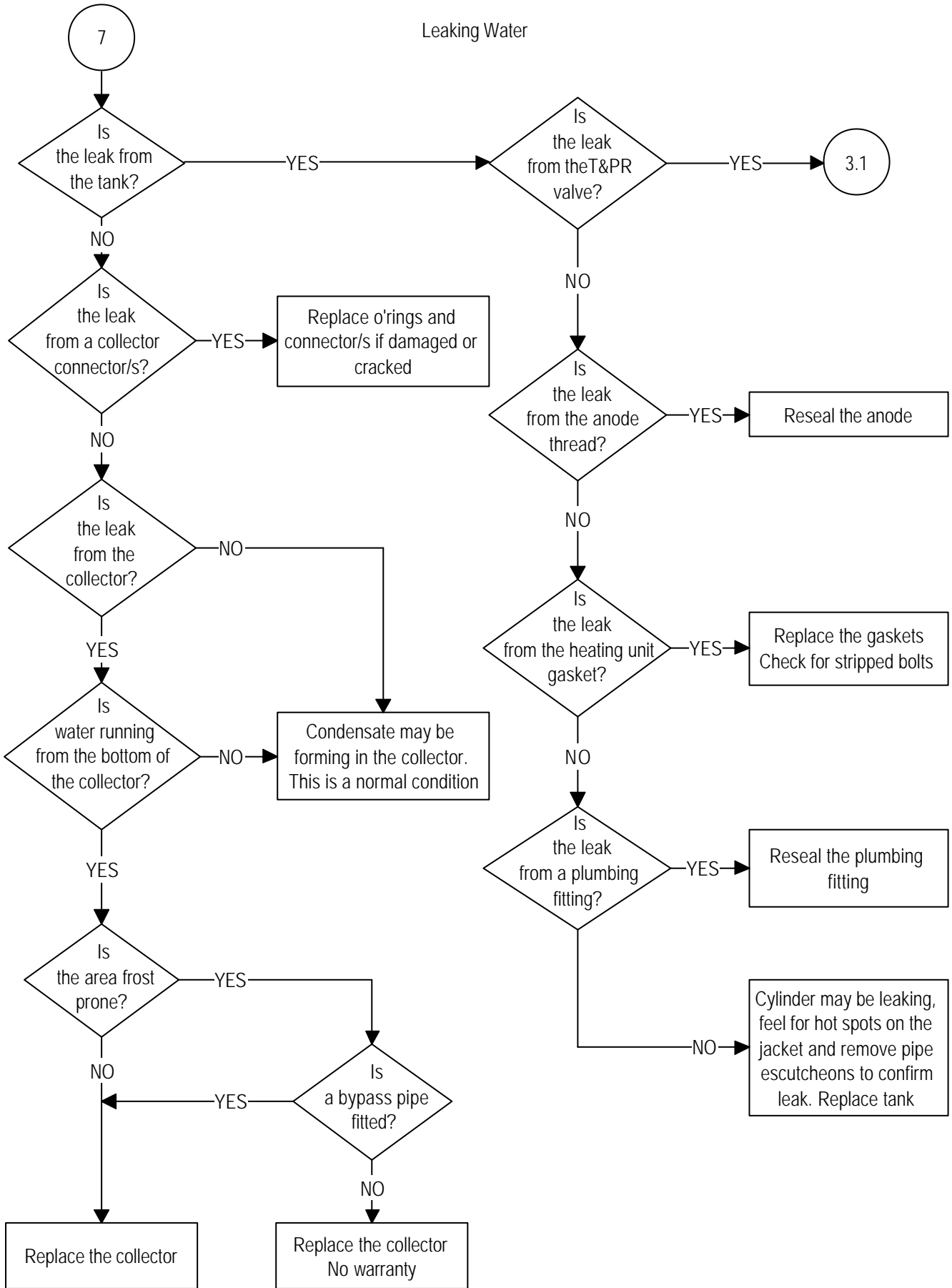
## FAULT FINDING

### Water too hot - Collector Circuit



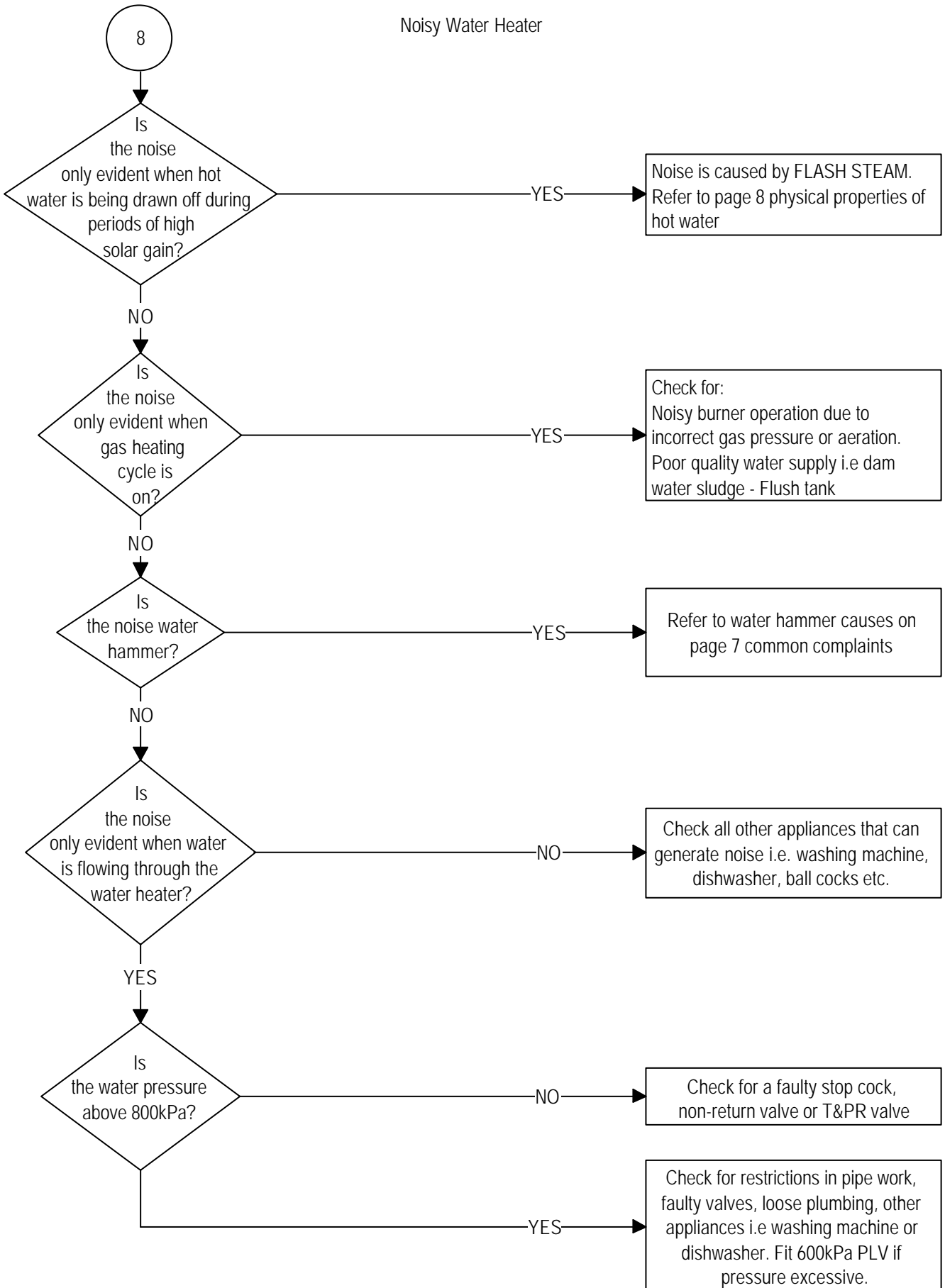
## FAULT FINDING

### Leaking Water



## FAULT FINDING

### Noisy Water Heater



## COMPONENT REPLACEMENT

### Draining the Water Heater (Procedure 1)

1. **Isolate the power supply to the water heater (switchboard) and unplug the differential controller (GPO).**
2. **Isolate the water supply to the water heater.**
3. **Relieve pressure from the water heater through the temperature and pressure relief valve or a hot tap.**
4. Disconnect the cold water supply pipe
5. Fit a drain hose to the cold water connection and run the other end to a drain or safe location.
6. Open the temperature and pressure relief valve to allow air into the system.

### Removing or Replacing a Solar Collector (Procedure 2)



**Water under pressure and at temperatures up to 150°C may be present in the collector/s. Isolate water supply and relieve pressure through a hot tap or the temperature and pressure relief valve prior to opening the collector pipe work. Protective clothing should be worn to prevent scalding or burns.**

1. **Isolate the power supply to the water heater (switchboard) and unplug the differential controller (GPO).**
2. **Isolate the water supply to the water heater.**
3. **Relieve pressure from the water heater through the temperature and pressure relief valve or a hot tap.**
4. Disconnect the hot and cold pipes to the collectors at the water heater and cap the outlets to prevent the tank from draining. The collectors will now drain down.
5. Remove the retaining clip/s and spring clip/s from the collector connectors and end caps. The hot or cold pipe and end cap can now be disconnected from the collector by pulling the connector off the collector pipe.
6. Remove the retaining clip/s and spring clips from the inter-connectors at the top and bottom of the collector.
7. Remove the screws retaining the collector to the angle bracket, disconnect the retaining strap at the top of the collector, slide the collector out and remove to ground level.
8. Reassemble in reverse order of above.
9. Once reassembly is complete, restore the water supply.
10. Using a flat blade screwdriver, open the bleed valve near the cold-water inlet to the water heater to allow water to enter the collector circuit. Refer to page 25
11. Close the bleed valve when water runs freely without the presence of air.
12. Open all the hot taps in the premises to allow air to be expelled from the pipe work and cylinder. As the water runs freely from each tap, close it.
13. Restore the power supply to the electric booster circuit and the differential controller.

### Differential Controller PCB (Procedure 3)

1. **Unplug the differential controller (GPO).**
2. Remove the 2 screws retaining the access cover to the control box and remove the cover.
3. Using a pair of long nose pliers gently release the 4 clips retaining the circuit board in the box and remove the board.
4. Disconnect the wiring to the pump. (Note: Mark the wires to ensure correct rewiring during reassembly.)
5. Disconnect the power supply wiring. (Note: Mark the wires to ensure correct rewiring during reassembly.)
6. Disconnect the hot and cold sensor wires. (Note: Mark the sensor wires to ensure correct rewiring during reassembly.)
7. Reassemble in the reverse order of above, ensuring all wiring is connected correctly.
8. Refit the waterproof enclosure cover.
9. Refit the side access cover.
10. Restore the power supply.

### Cold Sensor (Procedure 4)

1. **Isolate the water supply to the water heater and unplug the differential controller (GPO).**
2. **Relieve pressure from the water heater through the temperature and pressure relief valve or a hot tap.**
3. Remove the 2 screws retaining the access cover to the control box and remove the cover.
4. Using a pair of long nose pliers gently release the 4 clips retaining the circuit board in the box and remove the board.
5. Undo the gland nut (on the under side of the control box) retaining the sensor wiring.
6. Disconnect the cold sensor wiring from the PCB and slide the lead out of the gland.
7. Feed the replacement cold sensor wiring up through the gland and reconnect to the PCB.
8. Refit and tighten the gland nut securely and refit the control box cover.
9. Remove the spring clip retaining the cold sensor in the "tee", and remove the sensor.
10. Fit the replacement sensor into the "tee" and secure with the spring clip. Ensure the clip retains the locating washer.
11. Restore the water and power supplies. Check for water leaks at the cold sensor.

## COMPONENT REPLACEMENT

### Circulator Pump (Procedure 5)



**Warning:** The collectors may be at stagnation temperature, water under pressure and at temperatures up to 150°C may be present. Exercise caution to prevent burns or scalds.

1. **Using a flat blade screwdriver open the bleed valve (refer to diagram on page 25) and purge water through the collectors to dissipate excess temperature.**
2. Close the bleed valve once excess temperature is removed.
3. **Isolate the power to the water heater (switchboard) and unplug differential controller (GPO).**
4. **Isolate the water supply to the water heater**
5. **Relieve pressure from the water heater through the temperature and pressure relief valve or a hot tap.**
6. Close the relief valve or hot tap.
7. Remove the 2 screws retaining the access cover to the control box and remove the cover.
8. Using a pair of long nose pliers gently release the 4 clips retaining the circuit board in the box and remove the board.
9. Disconnect the wiring to the pump from the PCB. (Note: Mark the wires to ensure correct rewiring during reassembly.)
10. Undo the large brass nut retaining the pump motor to the body and remove the pump motor.



**Warning:** Extremely hot water may be present in the pump; protective clothing should be worn to prevent scalds or burns.

11. Remove the Philips head screw from the pump head and unclip the top cover.
12. Loosen the cable entry gland, disconnect the wiring from the pump motor and remove.
13. Reconnect the wiring to the replacement pump.
14. Reassemble in the reverse order of above. Note: The pump body rarely requires replacing. The new body will only need to be replaced if the existing unit is damaged.
15. Restore the water supply.
14. Using a flat blade screwdriver, open the bleed valve near the cold-water inlet to the water heater to allow water to enter the collector circuit. Refer to page 25
15. Close the bleed valve when water runs freely without the presence of air.
16. Open all the hot taps in the premises to allow air to be expelled from the pipe work and cylinder. As the water runs freely from each tap, close it.
17. Check for leaks at the pump and refit the control box cover.
18. Restore the power supply to the water heater and the differential controller.

### Hot Sensor (Procedure 6)



**Warning:** The collectors may be at stagnation temperature, water under pressure and at temperatures up to 150°C may be present. Protective clothing should be worn to prevent burns or scalds.

1. **Unplug the differential controller (GPO).**
2. **Isolate the water supply to the water heater water.**
3. **Relieve pressure from the water heater through the temperature and pressure relief valve or a hot tap.**
4. Remove the spring clip retaining the hot sensor in the connector and remove the sensor.
5. Fit the replacement sensor into the connector and secure with the spring clip. Ensure the clip retains the locating washer.
6. Cut the wiring to the existing sensor and connect to the replacement sensor. Ideally this connection should be made in the roof space. If the connection is to be made on the roof, ensure the connection is water and UV proof.
7. Restore the water supply.
8. Using a flat blade screwdriver, open the bleed valve near the cold-water inlet to the water heater to allow water to enter the collector circuit. Refer to page 25.
9. Close the bleed valve when water runs freely without the presence of air.
10. Restore the power supply.

### Thermostat (Procedure 7)

1. **Isolate the power to the water heater (switchboard).**
2. Remove access cover and disconnect the wiring to the thermostat.
3. Slide the thermostat out from under the retaining clamp.
4. Remove any scale from the cylinder surface
5. Fit the replacement thermostat under the clamp and set temperature at 70°C
6. Reconnect the wiring as per the circuit diagram on page 32.
7. Refit the access cover
8. Restore the power supply



## COMPONENT REPLACEMENT

### Anode (Procedure 8)

1. **Isolate the power supply to the water heater (switchboard) and unplug the differential controller (GPO).**
2. **Isolate water supply to the water heater.**
3. **Relieve pressure from the water heater through the temperature and relief valve or a hot tap.**
4. Remove the anode cap.
5. Using a 27mm tube or socket spanner remove the anode.
6. Apply thread seal tape to replacement anode, refit and tighten.
7. Restore water supply and check for leaks.
8. Refit the anode cap.
9. Purge air from the system through hot taps and restore the power supply to the water heater and differential controller.

### Temperature and Pressure Relief Valve (Procedure 9)



**Never fit a T&PR valve with a rating higher than that indicated on the water heater rating plate. Do not use reconditioned T&PR valves.**

1. **Isolate the power supply to the water heater (switchboard) and unplug the differential controller (GPO).**
2. **Isolate water supply to the water heater.**
3. **Relieve pressure from the water heater through the temperature and pressure relief valve or a hot tap.**
4. Remove the drain line from the T&PR valve.
5. Unscrew the T&PR valve and remove. **Warning: A quantity of hot water will discharge from the tank during this process. Care should be taken to prevent scalds or burns.**
6. Refit the replacement T&PR valve using Teflon tape. Note warnings above.
7. Refit the drain line.
8. Close the hot tap and restore water supply.
9. Check T&PR valve thread for leaks.
10. Operate the T&PR valve lever to reset relief drain.
11. Purge air from the system through hot taps.
12. Restore the power supply to the water heater and differential controller.

### Heating Unit (Procedure 10)

1. **Drain the water heater. Refer to procedure 1, page 22.**
2. Remove the access cover and disconnect the supply active and neutral from the terminal block. Disconnect the wiring to the heating unit from the thermostat. Unclip the terminal block from the jacket and remove thermostat and terminal block.
3. Remove the two screws retaining the thermostat clamp.
4. Loosen the two lower screws slightly. When water is below the heating unit level, refit the cold water supply pipe.
5. Remove the two lower screws and withdraw the heating unit carefully making sure the loop does not catch and open up inside the cylinder.
6. Clean around the cylinder fitting, fit gasket to replacement heating unit and insert into water heater. Note: Curve of heating unit to be horizontal.
7. Replace screws and thermostat clamp, and then tighten.
8. Close T&PR valve, and open all hot taps. Restore the cold water supply and purge air through hot taps, close each hot tap as water runs freely.
9. Check heating unit for leaks.
10. Refit thermostat and terminal block and reconnect the wiring as per the circuit diagram.
11. Refit the access cover
12. Restore power supply to the water heater.

### Cord Set (Procedure 11)

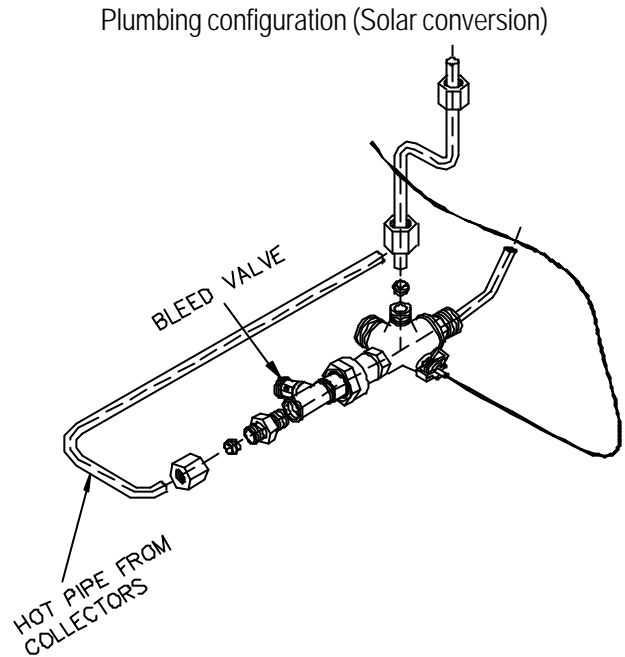
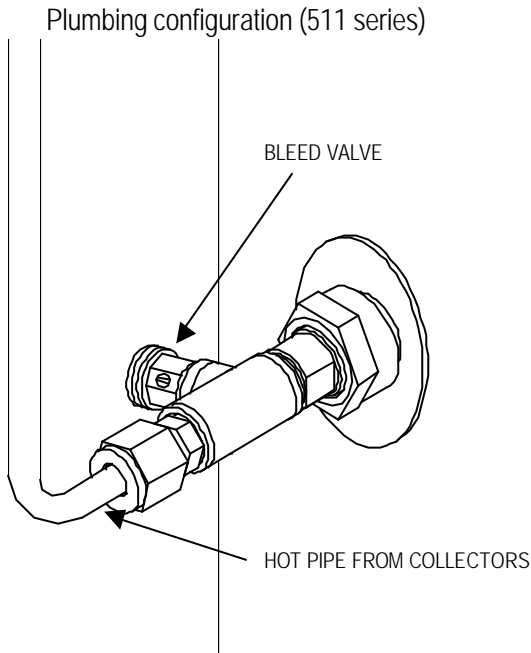
1. **Unplug the differential controller (GPO).**
2. Remove the 2 screws retaining the access cover to the control box and remove the cover.
3. Remove the cord anchor (on the under side of the control box) retaining the cord set.
4. Using a pair of long nose pliers gently release the 4 clips retaining the circuit board in the box and remove the board.
5. Disconnect the active and neutral from the PCB and the earth from the earth terminal and slide the lead out of the box.
6. Feed the replacement cord set up through the opening in the control box and reconnect to the PCB and earth point. Ensure polarity is correct and all connections are tight and refit the PCB into the control box.
7. Fit the cord anchor to the replacement cord set and insert the anchor securely into the control box.
8. Refit the control box cover and restore the power supply to the differential controller.

## PURGING AIR FROM THE COLLECTORS

An air eliminator is not fitted to the sequential freeze collector system. Upon completion of any repairs to the collectors, circulator pump, pipe work to and from the collectors or recommissioning if the tank has been drained it will be necessary to purge the air from the collector circuit. To purge air from the collector circuit ensure the tank is full of water and that all hot taps are turned off. Using a flat blade screwdriver open the bleed valve fitted at the "tee" where the hot water pipe from the collectors is connected at the water heater (see diagrams below). The mains pressure will force cold water to flow from the tank through the circulator up the cold pipe through the collectors and back down the hot pipe. Close the bleed valve when water runs freely without the presence of air.

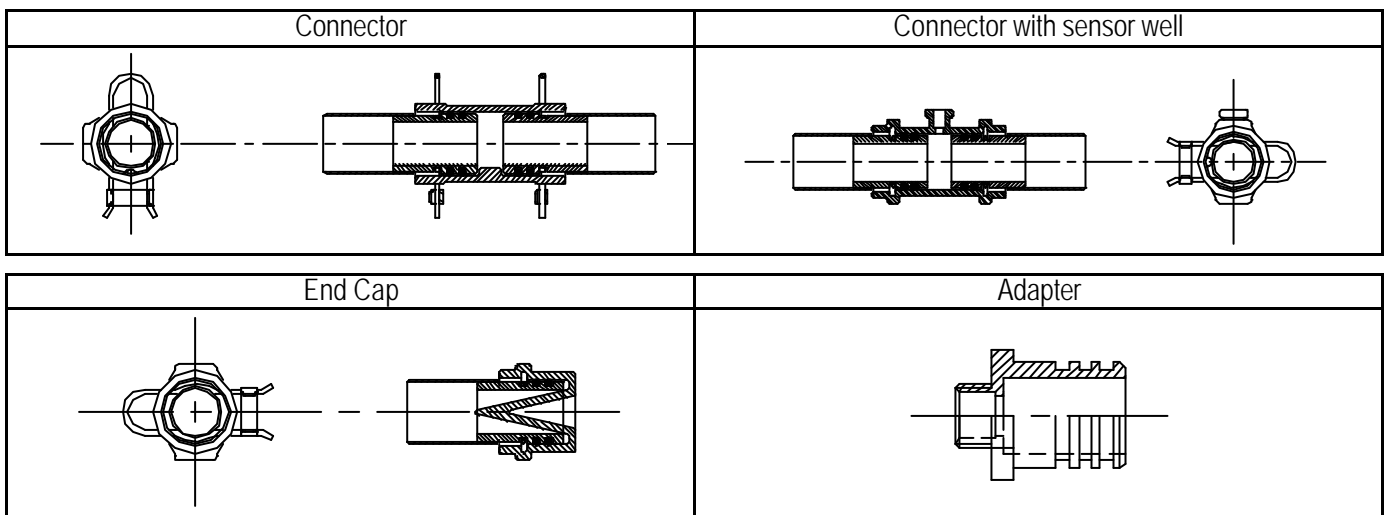


**Water under pressure and at temperatures up to 150°C may be expelled through the bleed valve; keep hands and face well clear to prevent burns or scalds.**



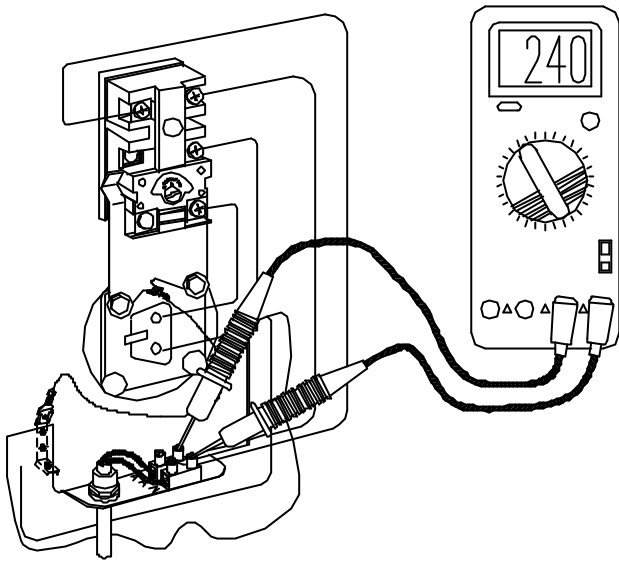
## COLLECTOR CONNECTORS

The 511 series Solar Loline with electric boosting and solar convertible kit for existing electric water heaters utilizes a new method for connecting the collectors together and for coupling the hot and cold pipes to the collector. The collector pipes have 3 slots machined into the pipe end to locate 2 o-rings and a stainless steel spring clip. A connector or end cap manufactured from PPS is then slipped over the o-rings and retained by a stainless steel spring clip. The spring clips are secured closed via a retaining clip placed around the legs. An adapter is fitted into the connector to allow connection of the hot and cold pipes via a 1/2" nut and olive.

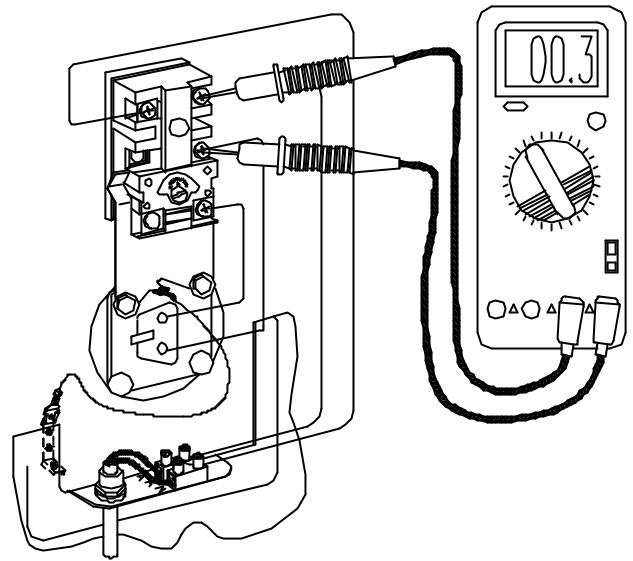


## COMPONENT TESTS

TEST 1



TEST 5



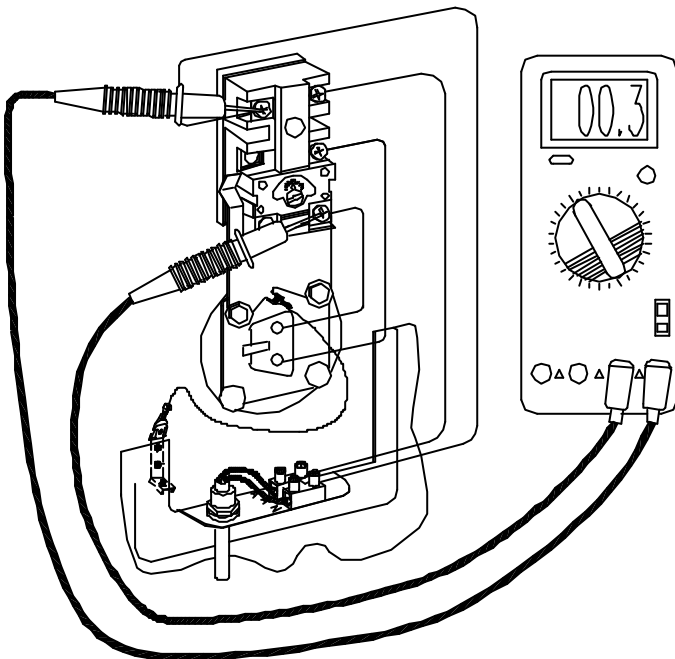
**Caution, "Live" components exercise care**

Using a multimeter on the AC voltage scale, measure between active and neutral on the terminal block. The voltage should be approximately 240 volts.

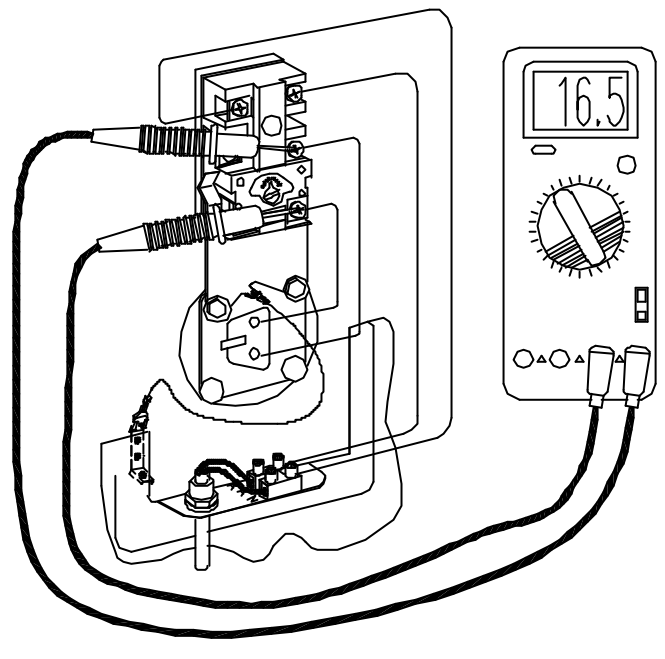
**Ensure power is isolated before conducting test**

Using a multimeter on the x1 resistance scale, measure between terminals 3L and 4L on the thermostat. The reading should be 0 ohms.

TESTS 6 AND 10



TEST 7



**Ensure power is isolated before conducting test**

**Test 6**

Using a multimeter on the x1 resistance scale, measure between terminals 1L and 2T on the thermostat. The reading should be 0 ohms.

**Test 10**

Same test points as test 6 however the reading should be infinity (open circuit).

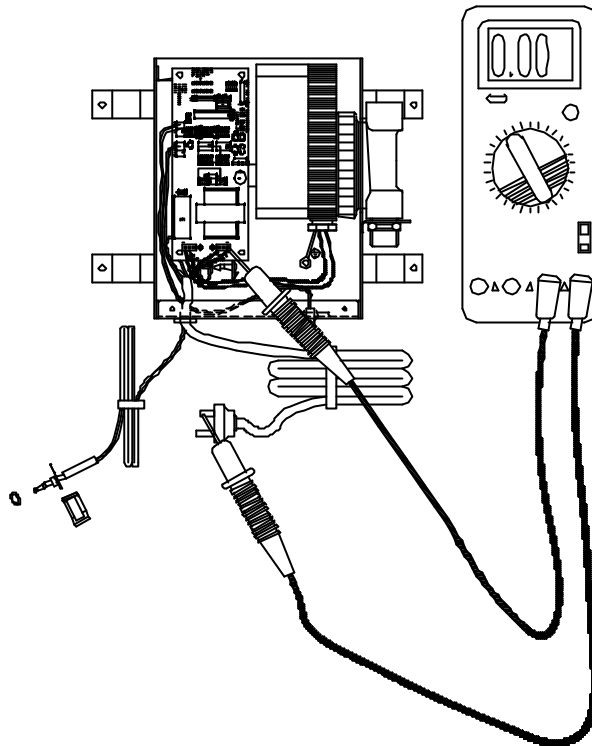
**Ensure power is isolated before conducting test**

Using a multimeter on the x1 resistance scale, measure between terminals 2T and 4L of the thermostat. Normal resistance for the heating unit is:

- 3.6kW: 15 ohms – 16 ohms +/- 10%
- 4.8kW: 11 ohms – 12 ohms +/- 10%

## COMPONENT TESTS

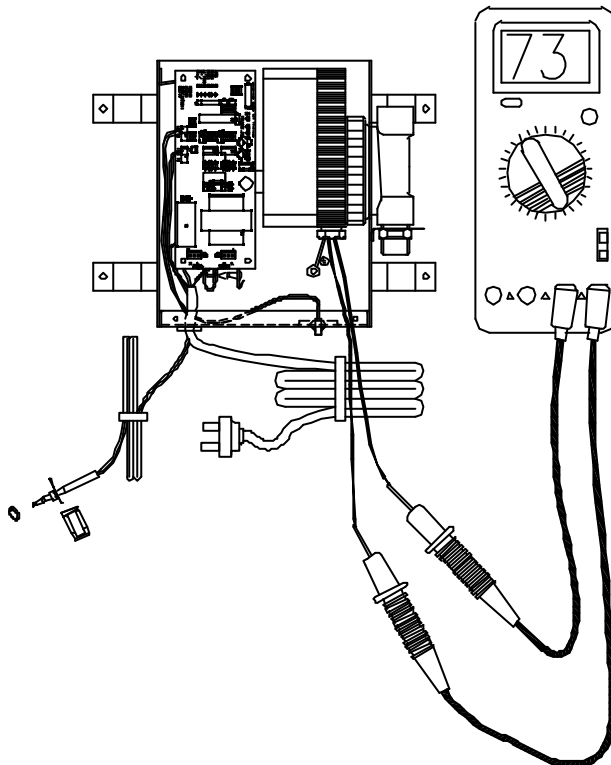
TEST 8



### *Isolate power before conducting test*

Unplug the cord set from the GPO. Using a multimeter on the x1 resistance scale measure each conductor in the cord set. Normal resistance for each conductor is 0 ohms.

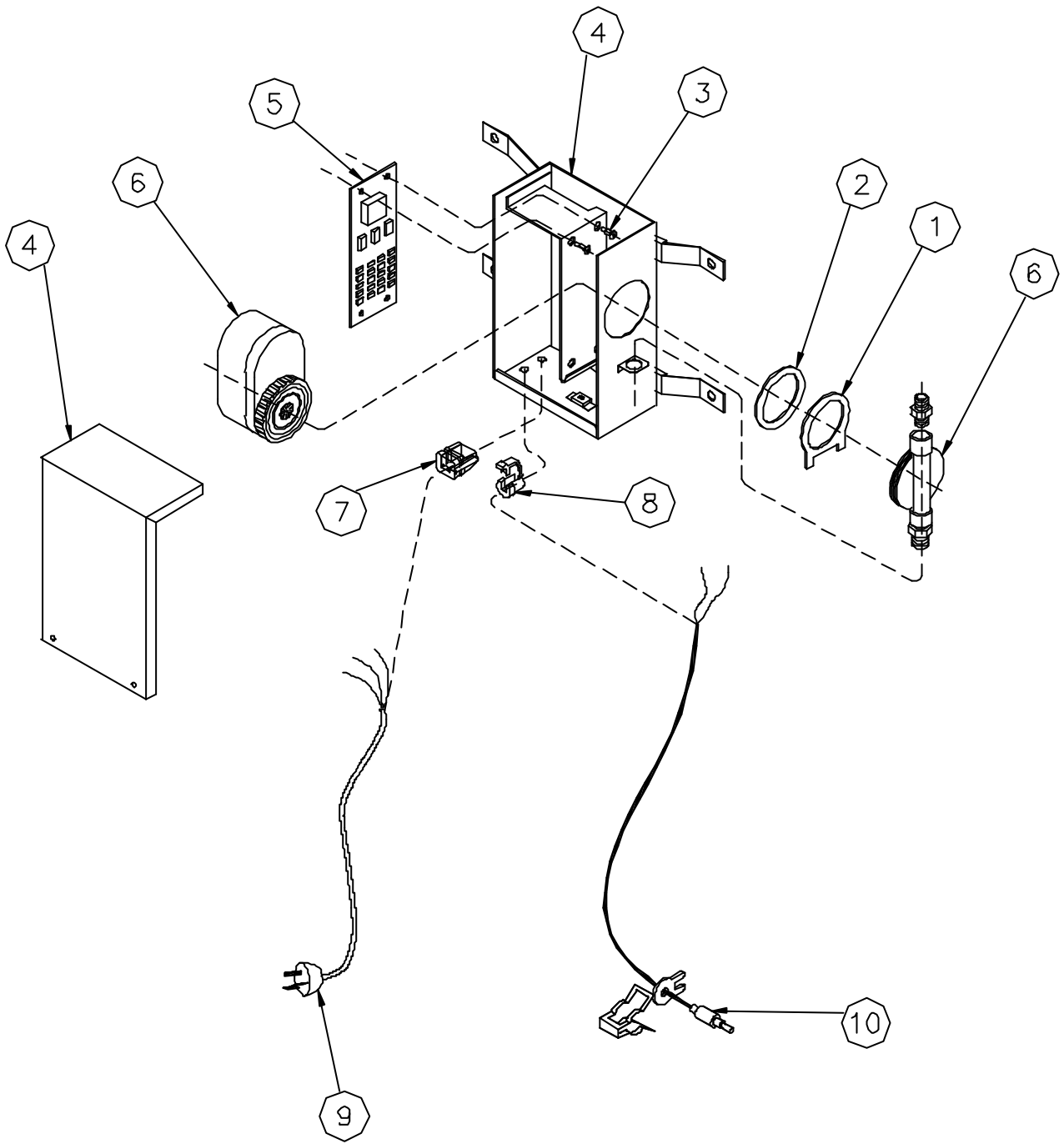
TEST 9



### *Isolate power before conducting test*

Disconnect the pump wiring from the differential controller PCB and using a multimeter on the x1 resistance scale, measure the resistance of the pump motor. Normal resistance is 73 ohms +/- 5%.

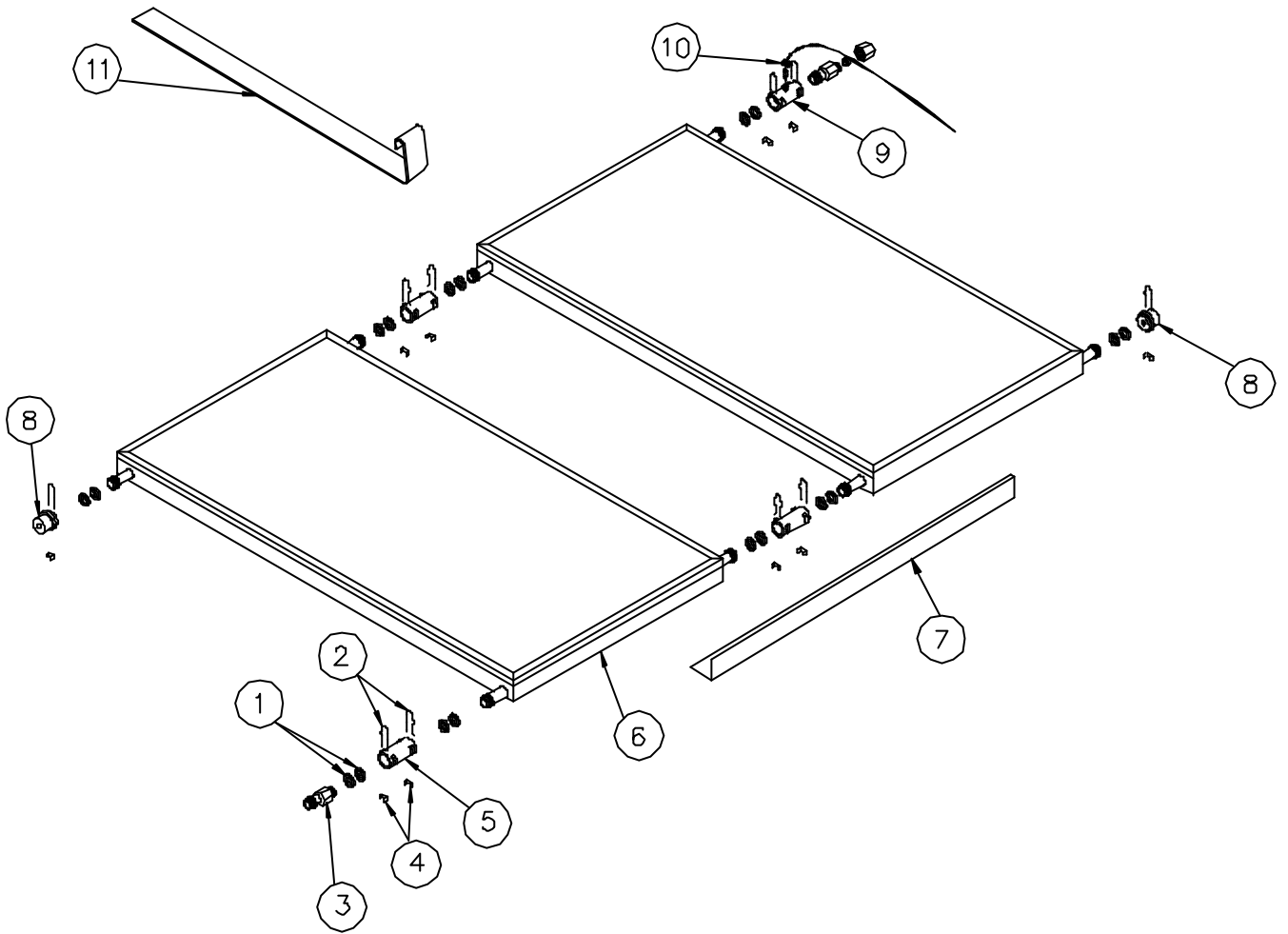
## EXPLODED VIEW - CONTROL BOX



## REPLACEMENT PARTS LIST

Item	Component	Part Number	Item	Component	Part Number
1-10	Controller Assembly Complete	052104	6	Circulator	836053
1	Lock Ring	052109	7	Cable Grip - Cord Set	890267
2	Sealing Gasket - Circulator	052106	8	Cable Grip - Sensor Cable	890268
3	PCB Support	890264	9	Cord Set	890244
4	Housing	052108	10	Cold Sensor	056002
5	Differential Controller PCB	052113			

## EXPLODED VIEW - COLLECTORS

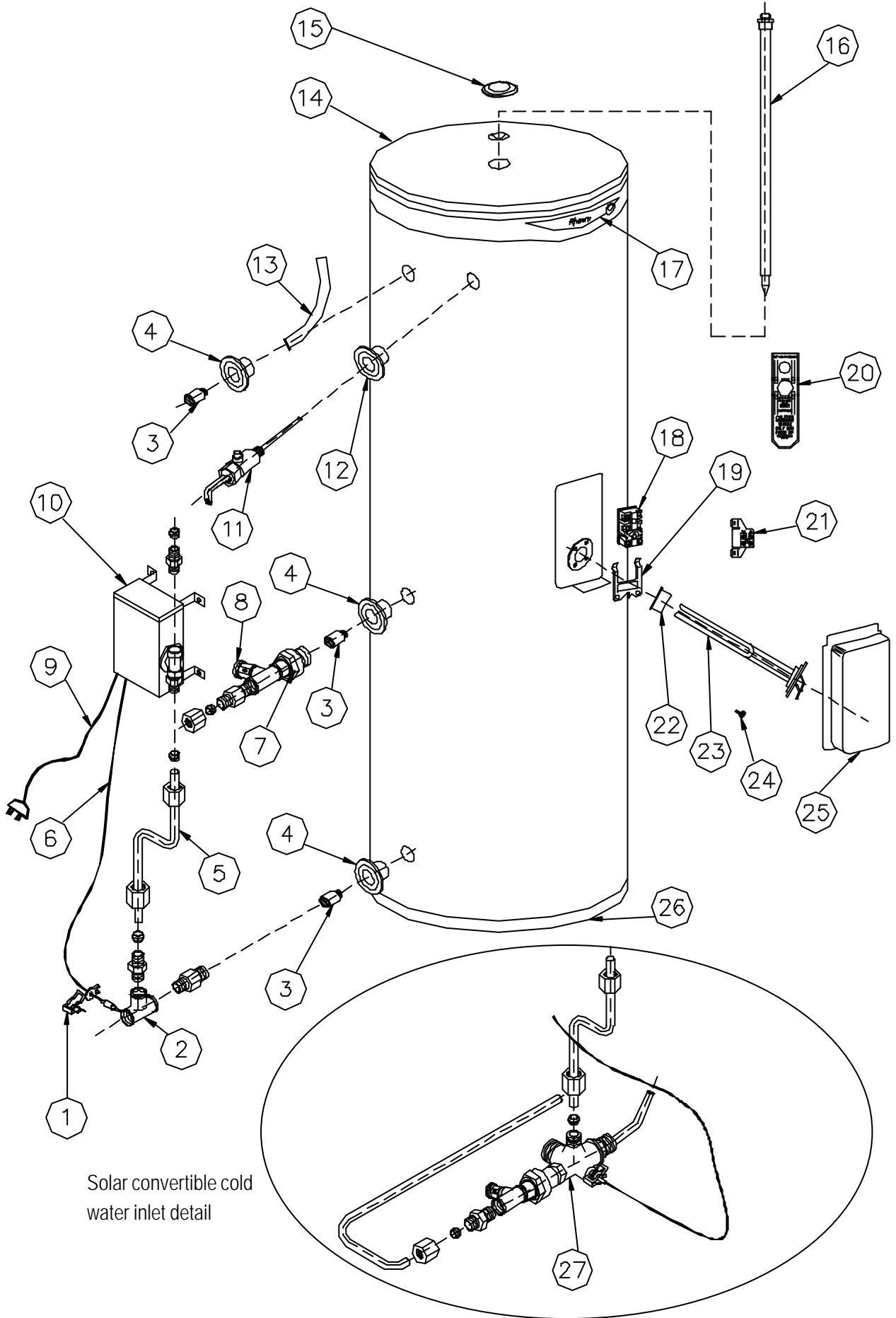


## REPLACEMENT PARTS LIST

Item	Component	Part Number
1	O'ring	087023
2	Spring Clip	088005
3	Quick Connect to ½" BSP adapter	195704
4	Retaining Clip	088006
5	Connector	195701
6	Collector (Chrome Black)	SCT200
7	Angle Bracket (2 collectors)	191613
	Angle Bracket (1 collector)	191614
8	End Plug	195703
9	Connector (Hot Sensor)	195702
10	Hot Sensor	056001
*	Hot and Cold Sensor O'ring	087025
11	Collector Strap	191801

\* Not illustrated

**EXPLODED VIEW - WATER HEATER**



## REPLACEMENT PARTS LISTS

Item	Component	511270	511340	511430
1	Sensor Retaining Clip	890281	890281	890281
2	Cold Sensor Tee	088064	088064	088064
3	Extension Fitting	069405	069405	069405
4	Pipe Seal Inlet/Outlet	221404-1	221404-1	221404-1
5	Connecting Pipe	223601	223601	223601
6	Cold Sensor	056002	056002	056002
*	Hot and Cold Sensor O'ring	087025	087025	087025
7	Non-return Valve	220341	220341	220341
8	Bleed Valve	220340	220340	220340
9	Cord Set	890244	890244	890244
10	Pump Box Complete	052104	052104	052104
11	T & PR Valve	220641	220641	220641
12	Pipe Seal T&PR Valve	221408-1	221408-1	221408-1
13	Dip Tube	225601	225601	225601
14	Jacket Top	100647-1	100647-1	100646-1
15	Anode Cap	221720-1	221720-1	221720-1
16	Anode - Black	221914	221915	221938
	Anode - Blue	221924	221925	221947
	Anode - Green	222036	222035	222030
17	Name Band	120503	120503	120503
18	Thermostat	051350	051350	051350
19	Thermostat Clamp	102501	102501	102501
20	Thermostat Cover	226921	226921	226921
21	Terminal Block	051521	051521	051521
22	Element Gasket	050704	050704	050704
23	Element - 2.4kW	050316	050316	050316
	Element - 3.6kW	050317	050317	050317
	Element - 4.8kW	050318	050318	050318
24	Element Screw	051404	051404	051404
25	Access Cover	100726-1	100726-1	100726-1
26	Jacket Bottom	100642-1	100642-1	100641-1
27	Five Way Tee	224702	224702	224702
+	Sensor Test Unit	890258	890258	890258

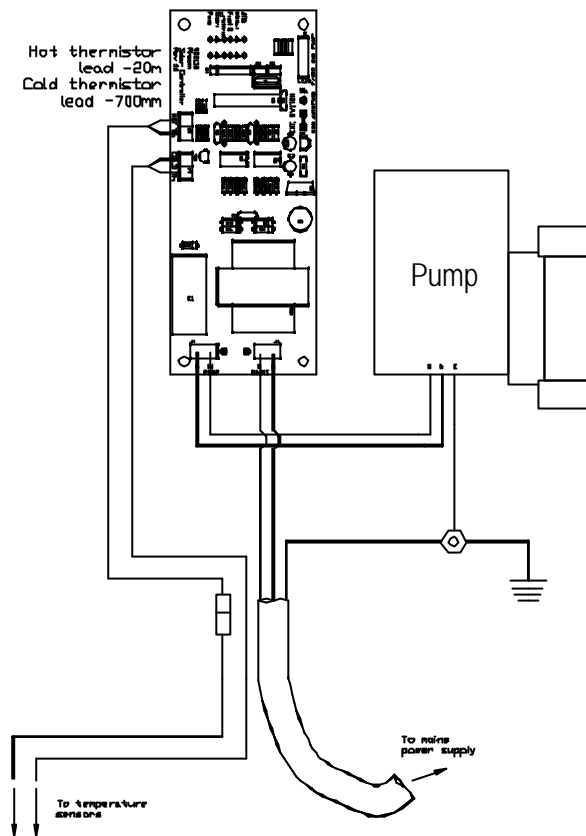
+ - Illustrated on page 14

\* - Not illustrated

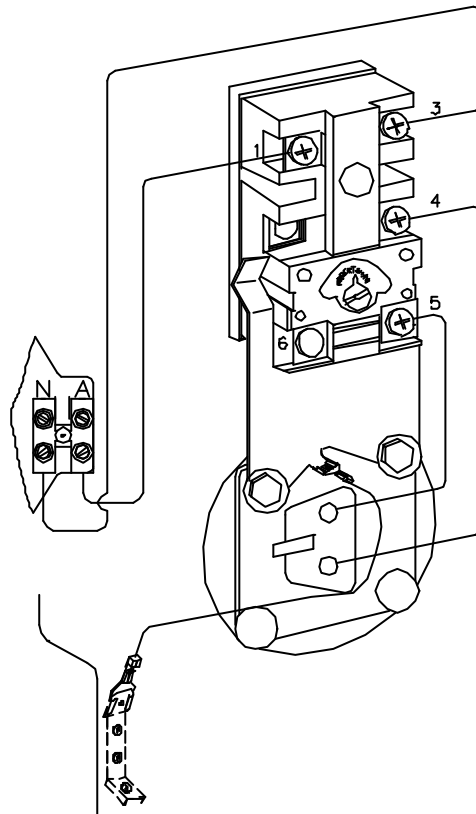


## CIRCUIT DIAGRAMS

### Differential Controller (Control Box)



### Water Heater (Electric Booster)



## RHEEM SOLAR WATER HEATER WARRANTY - AUSTRALIA ONLY

Rheem Australia Pty Ltd will:

- a) Repair or, if necessary replace any Rheem solar water heater; or
- b) Replace any component (or, if necessary, arrange the installation of a new water heater), which falls within the Warranty Periods specified below, in accordance with and subject to the following table, conditions and exclusions.

Installation	Model	Period	Warranty
<b>Component, Collector and Cylinder (from date of installation)</b>			
All installations	Loline Hiline	12 months	New component, collector or water heater (at Rheem's sole discretion) free of charge, including labour**
<b>Cylinder (from date of installation)</b>			
Water heater installed in a single-family domestic dwelling	Loline Hiline	Years 2 and 3	New water heater, free of charge, including labour**
	Loline Hiline	Years 4 - 7	New water heater free of charge, with installation and labour costs being the responsibility of the owner.
Water heater installed in any other than a "single-family domestic dwelling"	Loline Hiline	Years 2 - 5	New water heater, free of charge, including labour**
Water heater installed in any other than a "single-family domestic dwelling"	Loline Hiline	Years 2 and 3	New water heater free of charge, with installation and labour costs being the responsibility of the owner.
<b>Solar Collector (from date of installation)</b>			
Water heater installed in a single-family domestic dwelling	SCT200	Years 2 - 5	New solar collector, free of charge with installation and labour costs being the responsibility of the owner.
Water heater installed in any other than a "single-family domestic dwelling"		Years 2 and 3	New solar collector, free of charge with installation and labour costs being the responsibility of the owner.

### Notes:

\*\* Refer to item 4 of warranty conditions.

Rheem Australia Pty Ltd reserves the right to transfer fully functional components from the defective water heater to the replacement water heater if required. The term "water heater" used in the Warranty Conditions and Warranty Exclusions means both the storage tank/s and collector/s.

### WARRANTY CONDITIONS

1. This warranty is applicable only to water heaters manufactured from 1<sup>st</sup> July 2001.
2. The water heater must be installed in accordance with the Rheem solar water heater installation instructions, supplied with the water heater, and in accordance with all relevant statutory and local requirements of the State in which the water heater is to be installed.
3. Where a failed component or water heater is replaced under warranty, the balance of the original warranty period will remain effective. The replaced part or water heater does not carry a new warranty.
4. Where the water heater is installed outside the boundaries of a metropolitan area as defined by Rheem or further than 25 km from a regional Rheem Service branch office, or an Accredited Service Agent, the cost of transport, insurance and travelling costs between the nearest Rheem Accredited Service Agent's premises and the installed site shall be the owner's responsibility.
5. The warranty only applies to the water heater and original or genuine company component replacement parts and therefore does not cover any plumbing or electrical parts supplied by the installer and not an integral part of the water heater, e.g. pressure limiting valve; isolation valves; non-return valves; electrical switches; pumps or fuse.
6. The water heater must be sized to supply the hot water demand in accordance with the guidelines in Rheem solar water heater literature.

### WARRANTY EXCLUSIONS

1. **REPAIR AND REPLACEMENT WORK WILL BE CARRIED OUT AS SET OUT IN THE RHEEM SOLAR WATER HEATER WARRANTY ABOVE BUT THE FOLLOWING EXCLUSIONS MAY CAUSE THE WATER HEATER WARRANTY TO BECOME VOID, AND MAY INCUR A SERVICE CHARGE AND COST OF PARTS.**
  - a) Accidental damage to the water heater or any component, including: acts of God; failure due to misuse; incorrect installation; attempts to repair the water heater other than by a Rheem Accredited Service Agent or the Rheem Service Department.
  - b) Where it is found there is nothing wrong with the water heater; where the complaint is related to excessive discharge from the temperature and pressure relief valve due to high water pressure; where there is no flow of hot water due to faulty plumbing; where water leaks are related to plumbing and not the water heater or water heater components; where there is a failure of gas, electricity or water supplies; where the supply of gas, electricity or water does not comply with relevant codes or acts.
  - c) Where the water heater or water heater component has failed directly or indirectly as a result of: excessive water pressure, temperature and/or thermal input or corrosive atmosphere; ice formation in the water ways of a water heater system without a freeze protection system; ice formation in the water ways of a water heater system installed at an altitude more than 600 metres above sea level; ice formation in the water ways of a water heater system with a freeze protection system where the electricity has been switched off or has failed; ice formation where the system has not been installed in accordance with the Rheem water heater installation instructions.
  - d) Where the water heater is located in a position that does not comply with the Rheem water heater installation instructions or relevant statutory requirements, causing the need for major dismantling or removal of cupboards, doors or walls, or use of special equipment to bring the water heater to floor level or to a serviceable position.
  - e) Repairs to the water heater due to scale formation in the waterways when the water heater has been connected to a harmful water supply as outlined in the Owner's Guide and Installation Instructions booklet.
  - f) Breakage of collector glass for any reason including hail damage. (We suggest that the collector glass be covered by your home insurance policy).
2. **SUBJECT TO ANY STATUTORY PROVISIONS TO THE CONTRARY, THIS WARRANTY EXCLUDES ANY AND ALL CLAIMS FOR DAMAGE TO FURNITURE, WALLS, FOUNDATIONS OR ANY OTHER CONSEQUENTIAL LOSS EITHER DIRECTLY OR INDIRECTLY DUE TO LEAKAGE FROM THE WATER HEATER**

In addition to this warranty, the Trade Practices Act 1974 and similar laws in each state and territory provide the owner under certain circumstances with certain minimum statutory rights in relation to your Rheem solar water heater. This warranty must be read subject to that legislation and nothing in this warranty has the effect of excluding or restricting those rights.

**Rheem Australia Pty Ltd**  
A.B.N 21 098 823 511

FOR SERVICE TELEPHONE  
**131 031 AUSTRALIA**  
**0800 657 335 NEW ZEALAND**  
or refer local Yellow Pages

NOTE: Every care has been taken to ensure accuracy in preparation of this publication. No liability can be accepted for any consequences, which may arise as a result of its application.