Rheem Australia Pty Ltd

ABN 21 098 823 511

SERVICE INSTRUCTIONS

Direct Solar Loline
(Electric boosted)

TM007

Issued: Aug 01

Revision: AF
Issued Dec 19

Rheem	Solahart	Edwards
511270	270SLV	
511340	340SLV	GTD340
511430	430SLV	GTD430
511271	270MDV	
511325	320MDV	GTD320
511410	410MDV	
5A2325		

CONTENTS

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 Solar Loline with Electric Boosting Water Heater, contact Rheem Technical Support Ph 1300 712 863.

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 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.

Live Testing

A number of test procedures detailed within this service instruction require 'live' testing to be conducted.

All State and Territory Authorities stipulate requirements that must be met before working live i.e. conducting a risk assessment and/or preparing a safe work method statement and wearing appropriate PPE.

It is the responsibility of the service person to be aware of and comply with the requirements of the State or Territory where the water heater is installed before working 'live'.

Isolate power before conducting the indicated test.

Hot surface or liquid. Personal Protective Clothing (PPE) shall be worn to reduce the risk of scalding.

General warning symbol. Observe the instructions accompanying the symbol.

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 1and 2 and in the Occupation Health and Safety Act 1983.

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

Touch Voltage Testing

Under certain fault conditions it is possible for the metal jacket of a water heater to become live.

The electrical fault may be an internal appliance issue or an issue with the building supply wiring (see diagram 1 opposite).

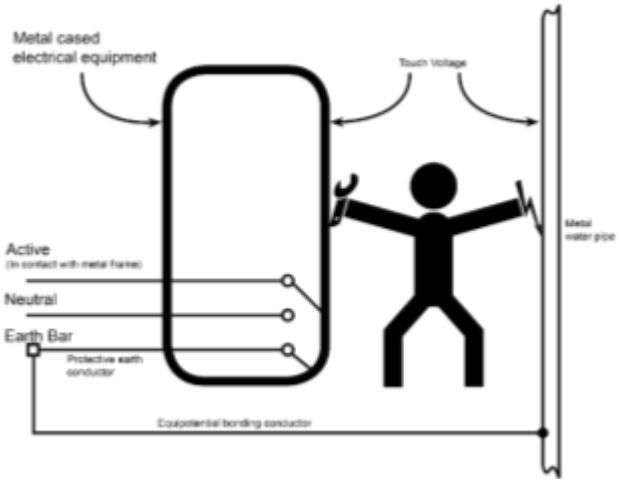


Diagram 1

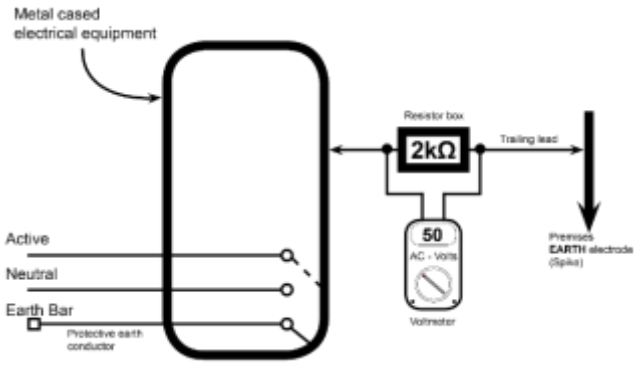


Diagram 2

To check for a shock hazard in a suspect installation a **Touch Voltage Test** must be applied using the following equipment:

1. A high impedance multimeter with an input impedance greater than 5 mega-ohm.
2. A 2kΩ resistor box fitted with contact terminals.
3. A long trailing lead for connection to the premises earth electrode.

Note: The 2kΩ resistor is used to simulate the body resistance of a typical person.

Procedure:

Personal Protective Equipment (electrical insulating gloves) should be worn when conducting this procedure to reduce the risk of electric shock.

1. Connect the resistance box between the metal casing of the appliance and the main Earth electrode (Spike) using the long trailing lead (as shown in diagram 2).
2. Connect the multimeter (set on the AC volts scale) to the resistor box terminals and record the reading.
3. If the reading is higher than 50VAC (Dry) or 25VAC (Wet) then there is a fault either within the electrical installation or with the appliance.
4. To confirm the earthing of the water heater;
    - Electrically isolate the appliance from the electrical circuit
    - Conduct an earth continuity test to AS/NZS 3760 (pay particular attention to the cordset earth on plug in water heaters).
    - If the earth path of the appliance is intact, the problem is with the household wiring.

MODEL IDENTIFICATION

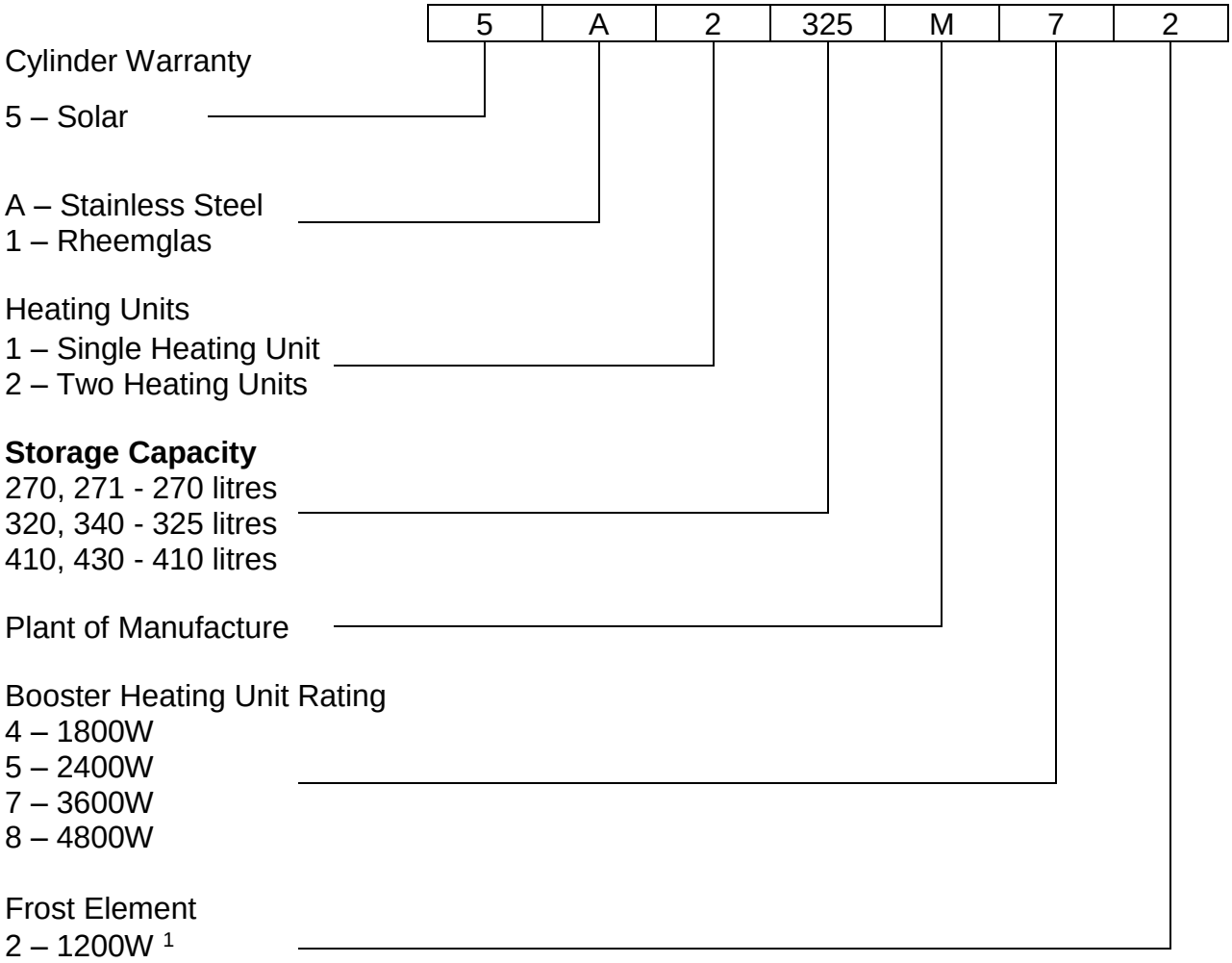
Water Heater Model Identification

All identification numbers are designed to convey detailed information about the water heater or collector to which it is attached. Water heater *and* Collector model number, serial number and date of manufacture should be quoted in all correspondence.

For collector model identification refer to page 6.

Rheem Water Heater Model Identification

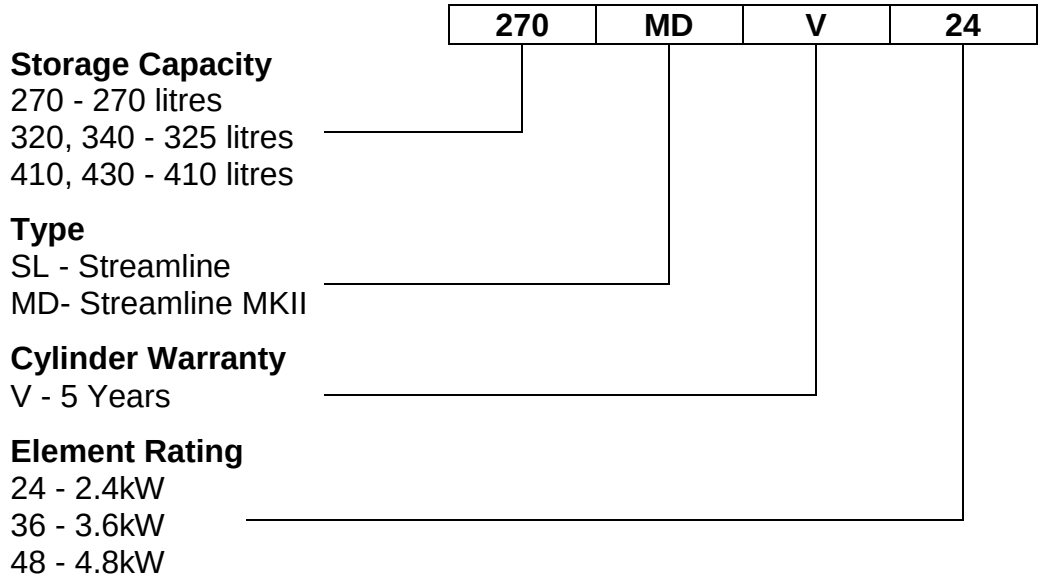
All identification numbers are designed to convey detailed information about the water heater to which it is attached.



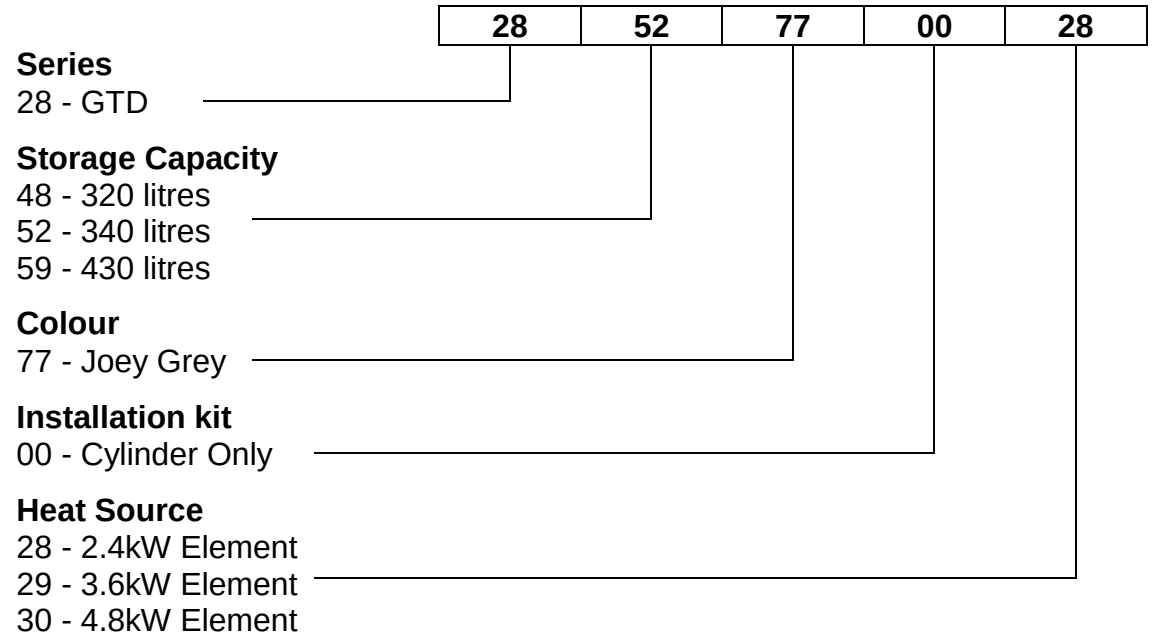
Model number, serial number and date of manufacture should be quoted in all correspondence.

[1] Frost Element fitted to 5A2325 Models only

Solahart Water Heater Model Identification



Edwards Water Heater Model Identification

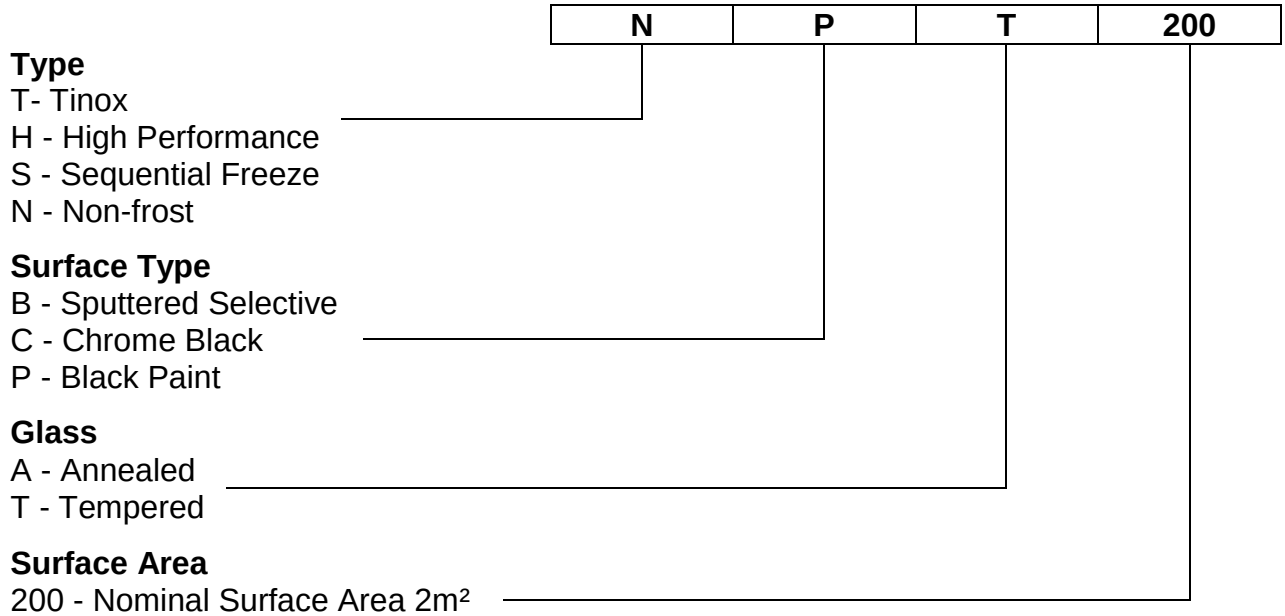


Collector Model Identification

All identification numbers are designed to convey detailed information about the water heater or collector to which it is attached. Water heater *and* Collector model number, serial number and date of manufacture should be quoted in all correspondence.

Refer to page 5 for water heater model numbers.

Rheem Collector Identification

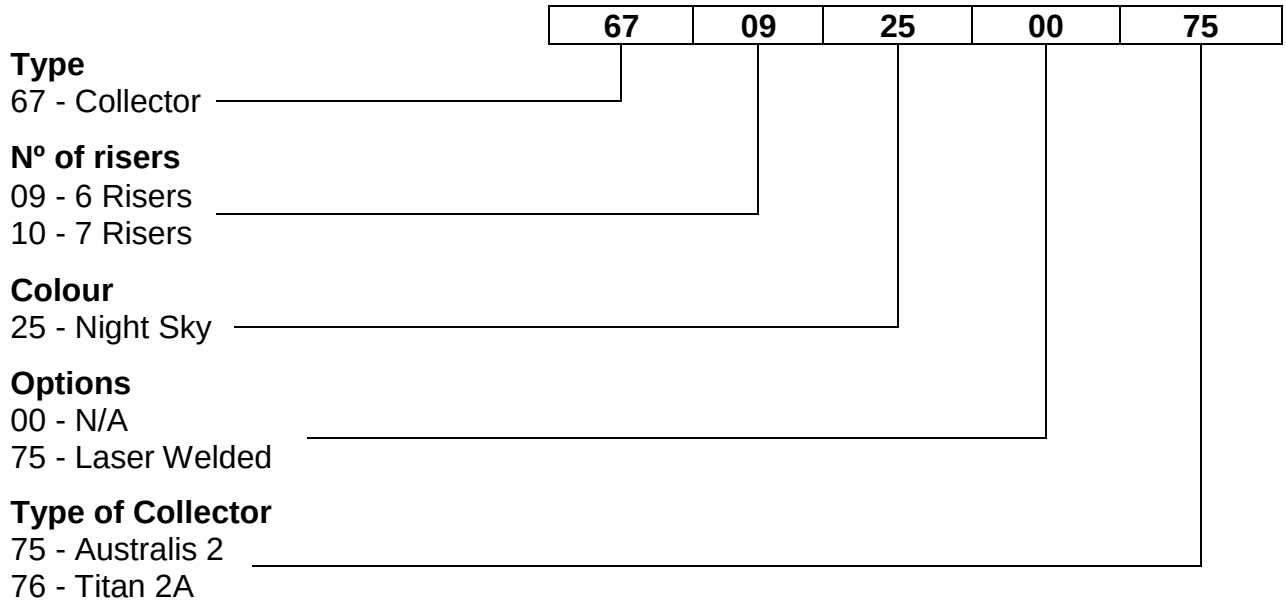


LCS collectors are identified by having the following eight digit part number 13103015

Solahart L Collector Identification

L collectors are identified by having the following eight digit part number 13103010.

Edwards Australis/Titan Collector Identification



SPECIFICATIONS

		511271 270MDV	511270 270SLV	511325 320MDV GTD320 5A2325	511340 340SLV GTD340	511410 410MDV	511430 430SLV GTD430
Max Water Supply Pressure (kPa)	With ECV	680	680	680	680	680	680
	Without ECV	800	800	800	800	800	800
Thermostat Setting (ºC)		60	60	60	60	60	60
ECO Cut Out Temperature (ºC)		83	83	83	83	83	83
Storage Capacity (litres)		270	270	325	325	410	410
Booster Capacity (litres)		140	160	170	200	220	290
Anodes	Quantity	1	1	1	1	1	1
	Length (mm)	1153	1153	1400	1400	1636	1636
Water Connections Cylinder	Inlet	RP¾/20	RP¾/20	RP¾/20	RP¾/20	RP¾/20	RP¾/20
	Mid	RP¾/20	RP¾/20	RP¾/20	RP¾/20	RP¾/20	RP¾/20
	Outlet	RP¾/20	RP¾/20	RP¾/20	RP¾/20	RP¾/20	RP¾/20
Water Connections Collector	SCT Collector	N/A	½" BSP	N/A	½" BSP	N/A	½" BSP
	SBT Collector	N/A	½" BSP	N/A	½" BSP	N/A	½" BSP
	NPT Collector	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP
	L Collector	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP
	Australis 2	N/A	N/A	½" BSP	½" BSP	N/A	½" BSP
	Titan 2A	N/A	N/A	½" BSP	½" BSP	N/A	½" BSP
	HBT collector	N/A	Conetite	N/A	Conetite	N/A	Conetite
	TBT collector	Conetite	N/A	Conetite	N/A	Conetite	N/A
	LCS Collector	Conetite	N/A	Conetite	N/A	Conetite	N/A
T&PR Valve	Diameter	RP ½/15	RP ½/15	RP ½/15	RP ½/15	RP ½/15	RP ½/15
	Rating (kPa)	1000	1000	1000	1000	1000	1000

PREVENTATIVE MAINTENANCE

ONLY TO BE PERFORMED BY QUALIFIED PERSONS

Annual Service

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.
2. Check for leaks at the collector connectors, the hot and cold pipe and all cylinder 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. If an overflow tray is installed, check to ensure the overflow tray drain pipe is not blocked.
10. Conduct an In Service Test on the electric booster circuit (refer to ‘In Service Testing’ on page 59).

Major Five Year Service

It is recommended a major five year service be conducted on the solar water heater.

1. Replace pressure temperature relief valve.
2. Inspect and flush expansion control valve (if fitted) and replace if required.
3. Inspect and if required, replace the anode. If the anode is not replaced, it should be replaced within three years of this service.
4. Check the electric element(s) for excessive calcium build up or corrosion and replace if required.
5. Check the solar control unit for correct operation.
6. Clean solar collector glass if required.
7. Flush solar collectors (refer to “Flushing the Solar Collectors” on page 10).
8. Visually check system for any potential problems.
9. Inspect all plumbing and electrical connections.
10. If a safety tray is installed, check to ensure the safety tray drain pipe is not blocked.

Flushing the Solar Collectors

It may be necessary to flush the solar collectors if there is sediment in the water supply. It is recommended that the solar collectors are flushed every five years. This will assist in keeping the solar collectors, solar cold pipe and solar hot pipe clear of sediment (refer to 'Major Five Year Service' on page 9). The following procedure should be performed in the morning, within three hours of sunrise, when the water temperature inside the solar collectors is lowest.

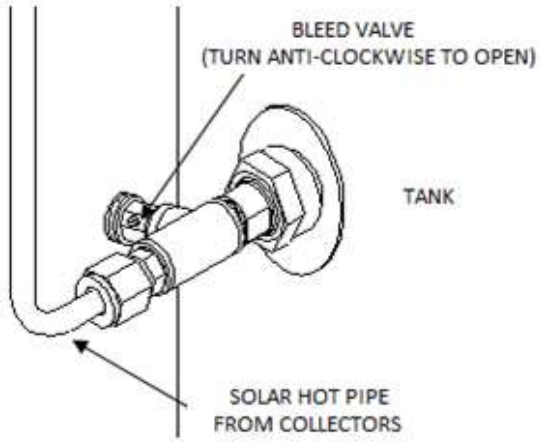
To flush the solar collectors:

1. Open a hot water tap and allow water to run for five (5) minutes prior to flushing solar collectors.
2. Close the hot tap.
3. Wait a further five (5) minutes before attempting to flush the solar collectors. This will assist in the transfer of any high temperature water in the solar collectors to the solar storage cylinder.
4. Using a flat bladed screwdriver, open the bleed valve located on the solar hot water inlet (from collectors) of the solar storage cylinder by rotating the bleed valve screw. Mains pressure will force water to flow from the solar storage cylinder, through the pipe work and solar collectors, then out through the bleed valve thereby flushing the collectors. This is evidenced by water spurting from the drain line connected to the bleed valve. Allow water to flow from the bleed valve drain line for five (5) minutes.

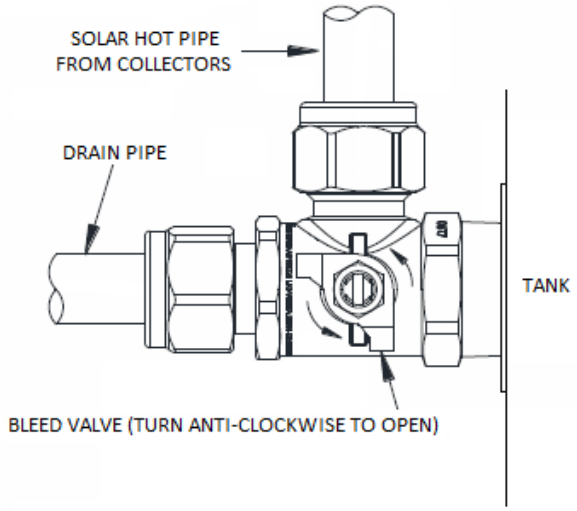
Water under pressure and up to 150ºC may be expelled through the bleed valve during the flushing process; keep hands and face well clear and wear protective clothing to prevent scalding or burns.

5. Using a flat bladed screwdriver, close the bleed valve.

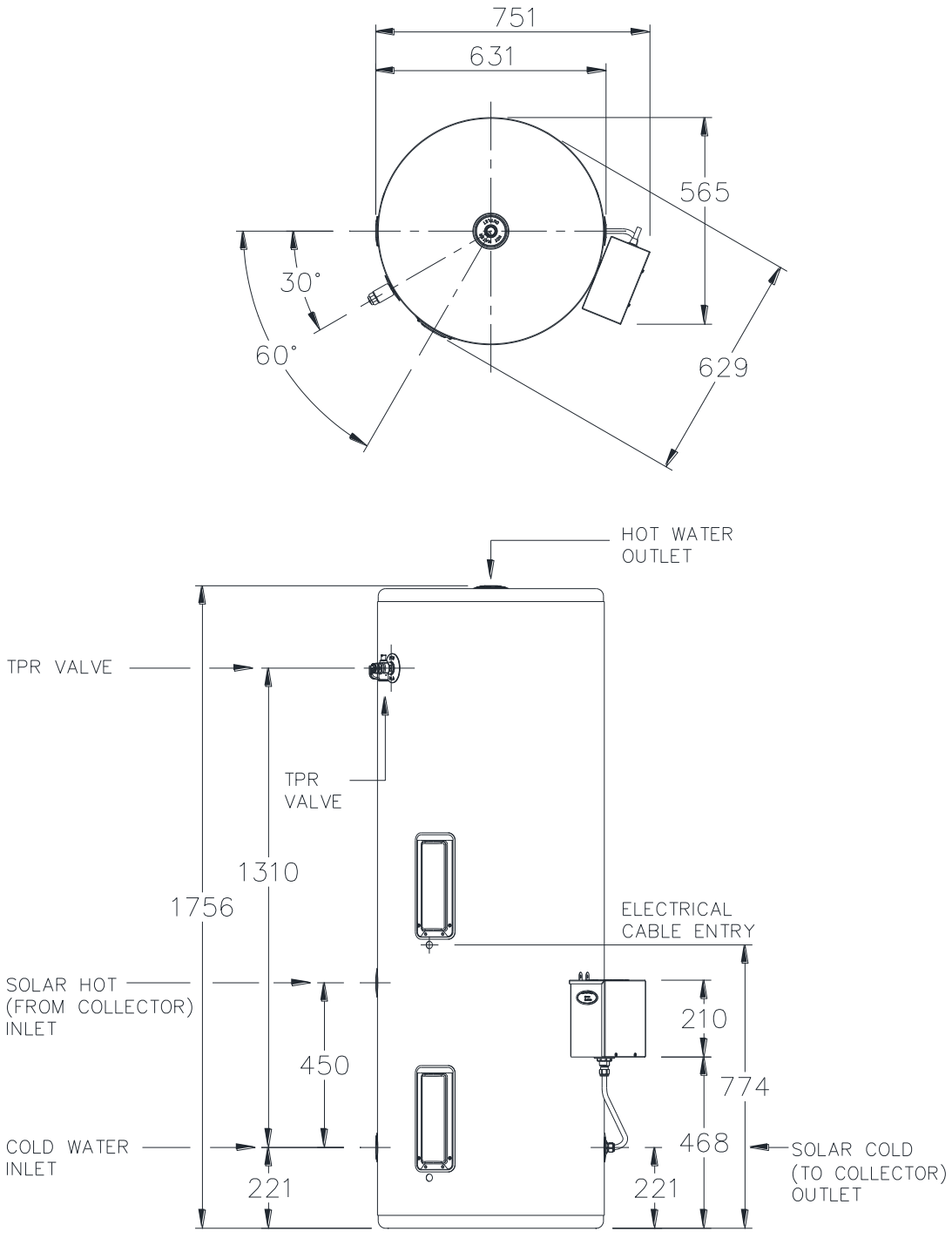
Bleed Valve – Version A



Bleed Valve – Version B



Stainless Steel tank option added to model range. From Nov 2019 a 325L water heater, with 3.6kW main element and 1.2kW lower frost element is introduced as model 5A2325M72.



Solar Direct Pumped Stainless Steel Electric Boost Models
Frost Element - Dimensions

New Solar Controller Kit PN 299293 – Systems with Rheem 511271, 511325 and 511410 Tanks

A new solar controller kit has been introduced for use with Solar Loline systems using Rheem 511271, 511325 and 511410 tanks.

The new kit number is 299293 and supersedes kit 299284 effective July 2018.

The functionality of the solar control unit **is identical** to the superseded solar control unit. There has been no change to the PCB (PN 052186) or its programming and functions. Therefore there is no change to the operation of the Loline systems. The functions and operation of the green and red LEDs on the LED panel remain the same.

There are component changes to the new kit and solar control unit compared to the superseded kit (kit components are detailed in "Solar Controller Kit Overview" diagram on page 13). These changes are as follows:

Solar Control Unit – the solar control unit in the kit changes part number to 052295 from the previous 052214. The new control unit can be identified by its part number printed on the label on the top face of the unit. The control unit has increased in size by 20 mm in depth and height and 60 mm in length.

Circulator – The circulator has changed to a Wilo circulator (PN 299975) from the previous Salmson SB04-15 circulator (PN 299997). The circulators are not interchangeable between the new and old solar control units.

Cold Sensor – The cold sensor arrangement (PN 056059) has changed to a pipe clip type. This new arrangement clips over the preformed copper pipe where it connects to the solar cold outlet fitting on the solar tank. This replaces the insertion type cold sensor and four-way Tee previously used. An insulation piece and cable ties are supplied to insulate around the cold sensor and this section of pipe.

Non-Return Valve – A non-return valve is housed at the inlet to the circulator. Its function is to prevent backflow from the solar collectors and reverse thermosiphoning from the tank. This new non-return valve arrangement means a solar non-return valve is not required to be installed at the solar hot inlet fitting on the solar tank.

Service 3-Way Solar Valve – A 3-way service valve (PN 220654) has been introduced for installation into the solar hot return inlet fitting on the solar tank. This valve allows the solar collectors to be bled of air at installation and can be used to drain the solar circuit if required. Compression nuts and copper olives are provided to enable the connection of the solar hot pipe and a drain line to the valve. An insulation piece and cable ties are supplied to insulate the valve. Also refer to "Service 3-Way Solar Valve Assembly Overview" diagram on page 13.

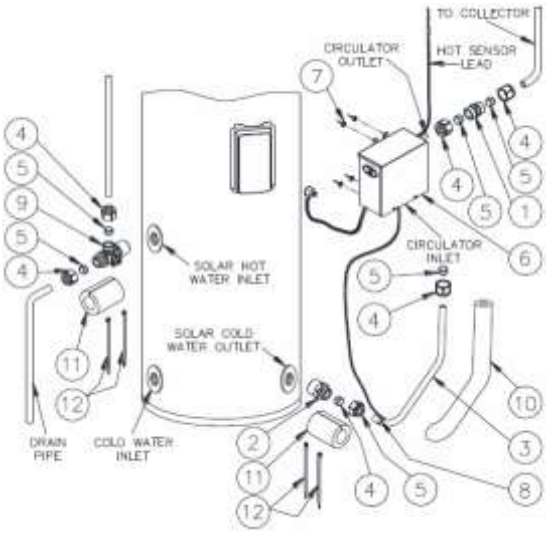
Solar Cold Connecting Pipe – The preformed solar cold connecting pipe (PN 070896) has changed. This pipe connects from the solar cold flow outlet fitting on the solar tank and now connects to the underside of the solar control unit. An insulation piece (PN 180073) is provided for this pipe.

Outlet Fitting – The water outlet connection from the solar control unit is now a copper tube, and a fitting union (PN 088065) is supplied to connect this pipe to the solar cold pipe to the collectors.

Hot Sensor Connection Position – The hot sensor connection position has changed to the rear side of the control unit, underneath the outlet pipe.

Solar Controller Kit 299293 Overview

1. Hex nipple 1/2" x 1/2"
2. Union R34 M x DN15 olive
3. Preformed pipe DN15
4. Compression nut
5. Olive
6. Solar control unit
7. Screws
8. Cold sensor and clip
9. Service 3-way valve assembly
10. Insulation 280 mm long x 13 mm ID
11. Insulation 80 mm long x 35 mm ID
12. Cable tie

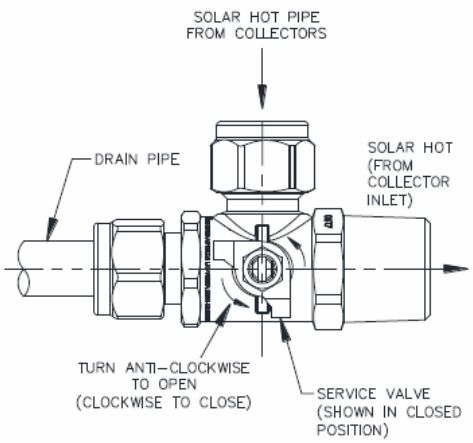


Service 3-Way Solar Valve Assembly Overview

The service 3-way valve assembly (item 9 above) screws directly into the solar hot return fitting on the solar tank. The solar hot pipe from the solar collectors and a drain line connect to this valve.

The valve is used to bleed the collector circuit of air at installation and drain the collector circuit if required.

Note: As a non-return valve is incorporated into the solar control unit at the inlet of the circulator, a solar non-return valve is no longer supplied, nor required to be installed at this solar hot return fitting.



New Solar Controller Kit PN 299280 – Rheem 511 Models & Solahart Streamline Models

The solar controller kit (part number 299280) used in conjunction with Rheem Loline (511 Series) and Solahart Streamline direct models will be gradually replaced with a revised controller kit (part number 299284) from December 2016 (as stock of the existing controller is exhausted the new controller kit will be supplied in its place).

This new controller is a direct replacement for the existing version as its mounting, external appearance and functionality are identical (**NOTE:** there is no change to the operation of the solar controller).

The only difference in the controller kit is the PCB (part number 052186) which has had minor design upgrades to its hardware. The new PCB can be readily identified by its red colour compared to the superseded green PCB.

This new PCB can be used as a service replacement on existing solar control units that were manufactured from January 2013 or where PCB, 052262, has been retrofitted. Older style solar control units fitted with PCB part number 052139 must continue to use the original PCB for service replacements (if PCB 052139 is not available then complete controller unit will need to be replaced with part 052214).

The circulation pump and temperature sensors remain unchanged and are compatible for use with both versions of solar controller.

Replacement of HBT with LCS Collector – Rheem 511 Models

As of March 2015 the 511 Loline models will have the option of being fitted with high performance LCS collectors in lieu of the obsolete HBT collector. The LCS model is identical to the HBT200 collector in terms of performance and dimensions and is a direct replacement. The difference between the two collectors is the encasing tray material. The LCS collector has an aluminium tray, whereas the HBT200 has a Zincalume tray.

Edwards GTD Loline

Edwards GTD models ceased production from 3/2013. All current Rheem 511 Loline parts are able to be fitted to an existing GTD Loline unit if required.

Solar Loline Upgrade – 11/12

All models within the Solar Loline range underwent a number of modifications in November 2012 in order to improve solar performance. This upgrade included modifications to the storage tank and ground kit as follows:

Ground Kit:

A new ground kit (299280) was introduced which is similar to the superseded version (299121) with the following differences:

Differential Controller – A revised printed circuit board (052262) is fitted in place of existing (052139). The firmware is changed so that an optimised 3-stage flow rate control has been implemented to maximise tank stratification. The PCB is available through Spare Parts and can be retrofitted to any existing solar controller units manufactured from January 2007.

Solar Non Return Valve – A new solar non return valve (088880 – RMC ½" x ¾" SNR505) replaces the current solar non return valve (088071 – RMC SNR502). The new valve has the internal workings made from a higher temperature resistant material than the previous valve. The new valve can be retrofitted to any existing Loline system.

Air Bleed Valve – A new air bleed valve (220344 - RMC ½" x 1" BV1525HT) replaces the current air bleed valve (220340). The new valve incorporates a brass / chrome ball valve providing higher temperature resistance than the previous valve. The new valve can be retrofitted to any existing Loline system.

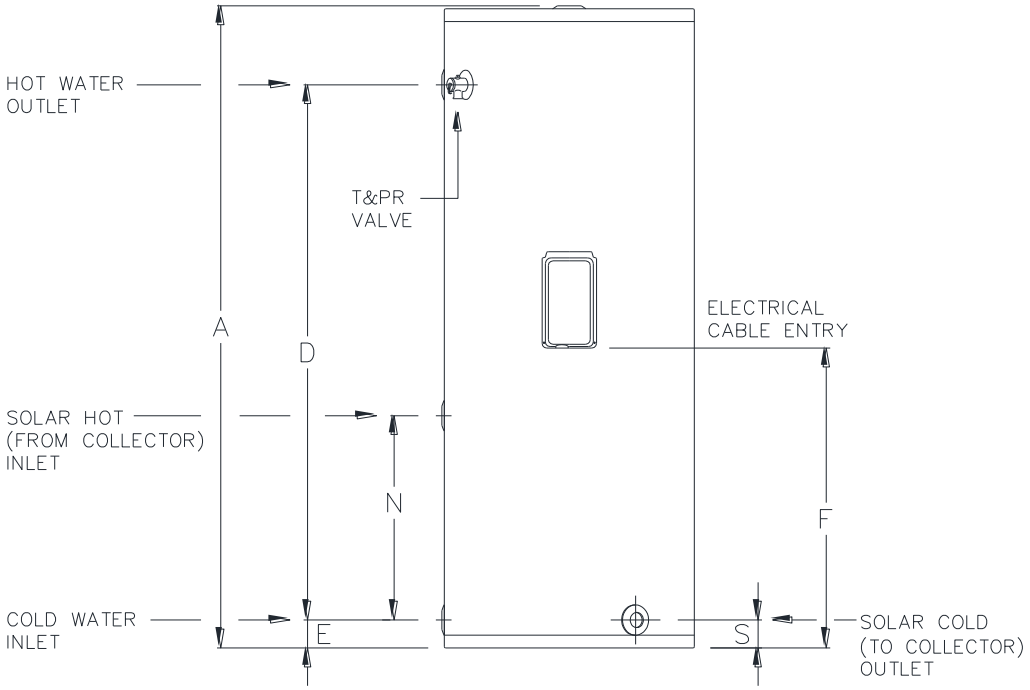
Storage Tank:

A new range of tanks with revised part numbers, boost position and optimised solar return points were released. New model details are:

Rheem				*** Solahart**				**Edwards**		
511271	replaced	511270		270MDV	replaced	270SLV			N/A	
511325	replaced	511340		320MDV	replaced	340SLV		GTD320	replaced	GTD340
511410	replaced	511430		410MDV	replaced	430SLV			N/A	

* Complete Solahart systems will have the designation "MLV" series when installed with L collectors and "MTV" series when installed with TBT200 collectors.

Refer to columns F & N below for dimensional changes (the overall system dimensions did not change).



Dimensions (mm)	A	B	C	D	E	F	H	J1	J2	N	S
270	1395	640	680	1117	73	588	32°	88°	32°	412 (499)	73
325	1640	640	680	1357	73	710	32°	88°	32°	481 (561)	73
410	1840	690	730	1519	81	795	30°	82°	30°	532 (417)	81

Refer to Column “F” for revised booster position.
Refer to Column “N” for revised solar return position (previous model listed in brackets).

Addition of TBT collector – Rheem & Solahart Models

As of November 2012, Rheem & Solahart Loline models will have the option of being fitted with high performance TBT collectors. The TBT collector has different overall dimensions compared with all other collectors and utilises conetite connections.

ST12 Replaced with ST13 Thermostat

The ST13 solar thermostat (052072) was introduced in October 2012 as a replacement for the ST12 thermostat to avoid nuisance tripping of the ECO due to high solar gain.

Previously when the ST12 ECO tripped (open circuited) a manual reset was required each time the ECO temperature was reached regardless of solar or electric booster heating.

The ST13 ECO will auto reset should it trip out during a solar heating cycle, however if the ECO temperature is reached during electric booster operation, the ECO will permanently open and cannot be reset in which case the thermostat will require replacement.

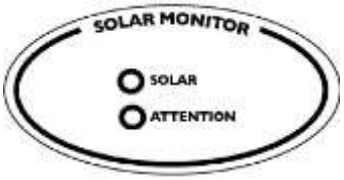
The ST13 solar thermostat is a direct replacement for the ST12 thermostat and is wired in the same manner as the ST12 thermostat.

Addition of HBT collector - Rheem 511 models

As of October 2011 the 511 Loline models will have the option of being fitted with high performance HBT collectors. The HBT collector has the same overall dimensions as NPT collector but utilises conetite connections rather than the M33 style connections. The HBT collector is fitted with a high performance copper absorber plate that has a sputtered selective surface to improve solar efficiency.

Differential Controller, Solar Monitor & Circulator Upgrade 01/07

A revised differential controller, part number 052139 was introduced to all models manufactured from January 2007. The original differential controller, part number 052113 is no longer available as a spare part.



Systems with the revised differential controller can be identified by the presence of a solar monitor mounted on the differential controller housing (refer to diagram opposite).

The revised differential controller has the following features:

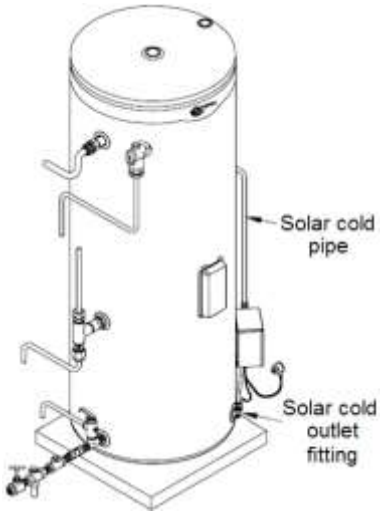
1. Circulator speed control (indicated by the circulator pulsing) to maximise solar contribution from the collectors.
2. Revised software to prevent the controller from locking out due to power brown outs.
3. Additional operational and fault modes displayed by green and red LED's on the solar monitor (refer to page 37 for operational and fault mode sequences).

In addition to the revised differential controller and solar monitor, a new Salmson circulator model SB04-15, was also introduced in January 2007 to replace the Salmson NSB04-15 which is not suitable for speed control.

When replacing the earlier version of the differential controller, part number 052113, a retrofit kit, part number 299174 is required. This kit includes a revised differential controller, a solar monitor, and fitting instructions.

Addition of Solar Cold Outlet Fitting & Modifications to Solar Controller Ground kit

All models have been modified from June 2007 production to include a dedicated solar cold outlet fitting. This fitting is at the same level as the cold water inlet fitting but located toward the right hand side of the solar storage cylinder (refer to diagram shown opposite).



Previously the solar cold line to the collectors connected to the 4-way Tee at the cold water inlet connection of the solar storage cylinder. The 4-way Tee is now fitted to the dedicated solar cold outlet fitting and a ½" BSP plug is supplied to plug off the now unused end of the Tee.

The connection size of the solar cold water outlet is RP¾/20 and the connection of the solar cold pipe at the outlet of the circulator is by a supplied DN15 compression fitting.

The solar controller ground kit has also been modified. As noted above it now contains a ½" BSP plug to allow the unused end of the 4-way Tee to be plugged off. The preformed copper pipe from the 4-way Tee to the inlet side of the circulator has also been modified to allow the solar control module to locate further to the side of the solar storage cylinder.

Differential Controller Software Upgrade 02/06 – Rheem and Solahart Models

In February 2006 the differential controller software was upgraded to version RSC_V2_0. A number of changes have been made to the operation of the controller

1. Frost circulation start temperature increased from 3°C to 4°C.
2. Frost circulation end temperature increased from 5°C to 6°C.
3. Frost protection minimum pumping time increased from 240 seconds to 400 seconds.
4. Minimum pump run time and pump off time of 400 seconds added in ‘normal mode’.
5. Failure of hot sensor causes pump to run for 400 seconds every 30 minutes until cold sensor detects 70°C or hot sensor fault rectified.
6. Failure of cold sensor does not interrupt the operation of ‘defrost mode’.
7. Additional ‘Heat Dump’ mode added (refer to "Heat Dump Mode Operation" on page 17.

Heat Dump Mode Operation:

The differential controller will enter ‘Heat Dump Mode’ (circulator on full speed) whenever the water temperature detected by the cold sensor is > 70ºC and the water temperature detected by the hot sensor is > 130ºC.

The differential controller will remain in ‘Heat Dump Mode’ until the water temperature detected by the hot sensor is < 110ºC or the water temperature detected by the cold sensor is > 75ºC at which time ‘Over Temperature Mode’ will be entered.

SCT/SBT Collectors Discontinued – Rheem 511 Models & Solahart SLV Models

SCT and SBT series collectors have been discontinued and are no longer available and have been replaced by NPT collectors (for Rheem 511 models) or L collectors (for Solahart SLV models). Due to dimension changes it is not possible to couple an SBT or SCT collector to an NPT or L collector. In the event of an SCT or SBT collector failure the entire collector array will require replacement. It should be noted that SCT/SBT fittings are still available as spare parts if required.

Brass Connectors for SCT/SBT Collectors

A brass variant of the PPS connectors utilised to couple SCT/SBT collector arrays is now available. Brass connectors are supplied in kit form with all the necessary components required to replace the corresponding PPS connector.

PPS connectors should be replaced with brass connectors on systems experiencing continual problems with leaking PPS connectors i.e. installations in areas prone to severe temperature fluctuations.

To convert a collector array from PPS to brass connectors refer to ‘Conversion Procedure – PPS to Brass Connectors’ on page 76.

EWT to ST Thermostat Change

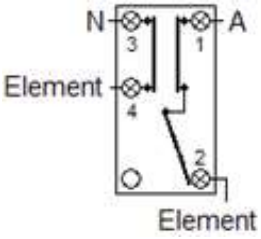
The Robertshaw ST thermostat was introduced on 14/08/2007 and replaces the Robertshaw EWT thermostat previously used in the water heaters electric booster circuit.

Although the ST series thermostat is a direct replacement for the EWT series thermostat, the terminal connections and wiring arrangement is different, therefore;

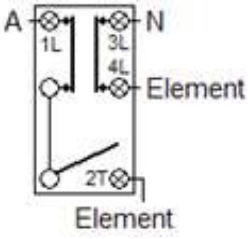
Whenever an EWT series thermostat is replaced with a ST series thermostat as a spare part, the water heater will require rewiring at the thermostat. Refer to 'Wiring Diagrams' starting on page 20 for wiring arrangement utilising the ST series thermostat.

ST12 (& ST13)

EWT



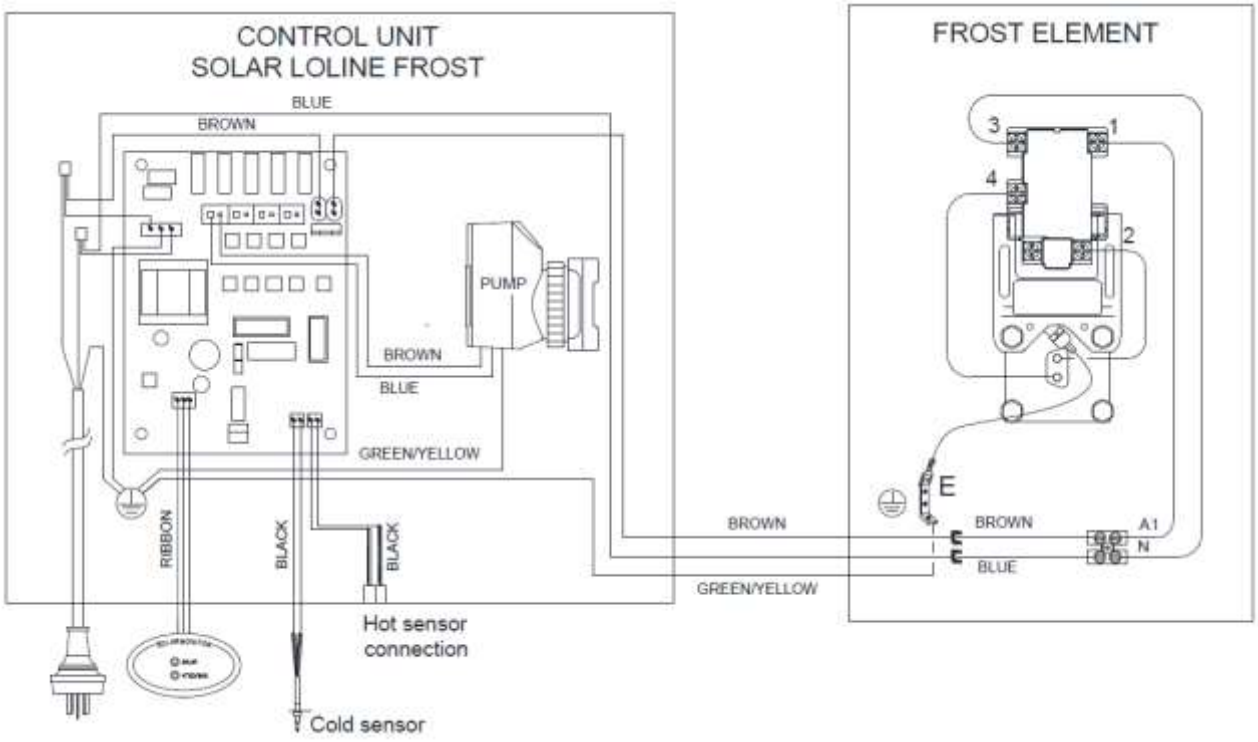
ST12 (& ST13)



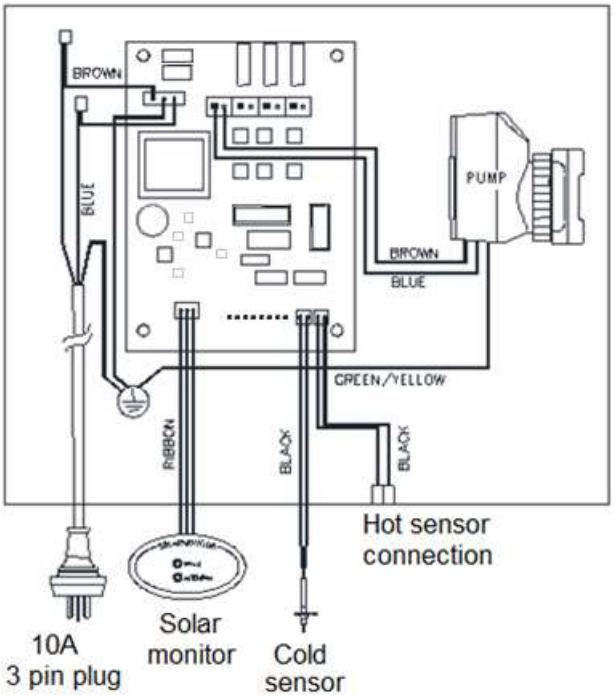
EWT

WIRING DIAGRAMS

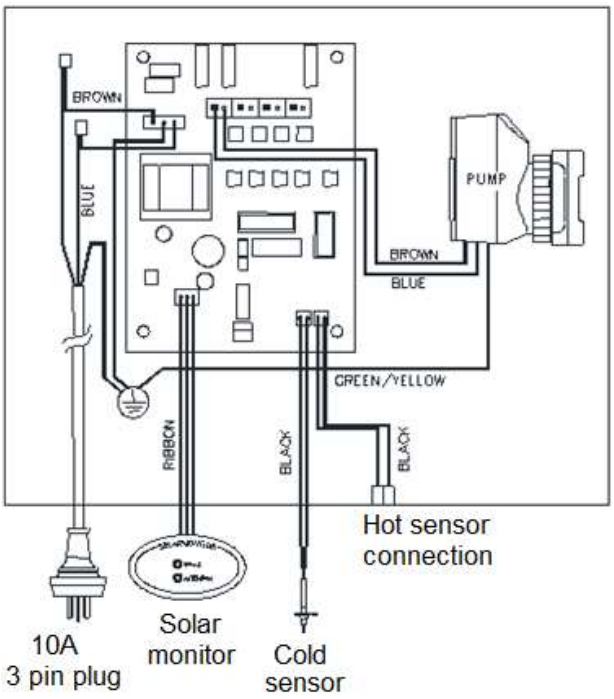
Differential Controller



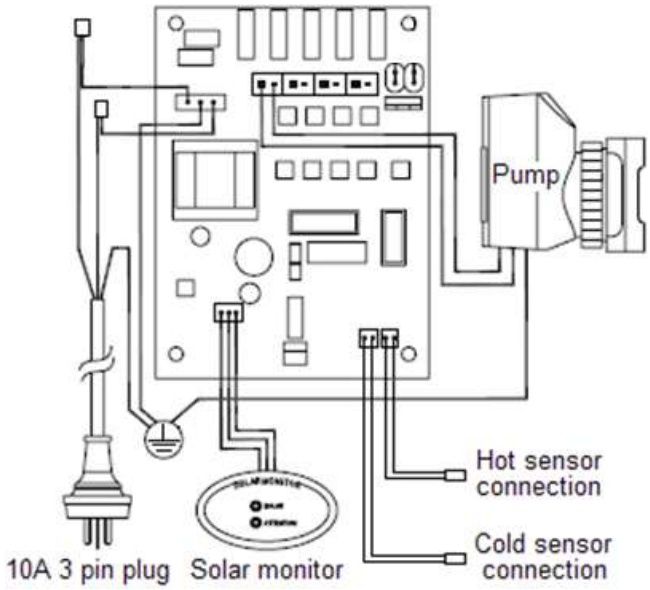
Differential controller 052081 with Frost Element



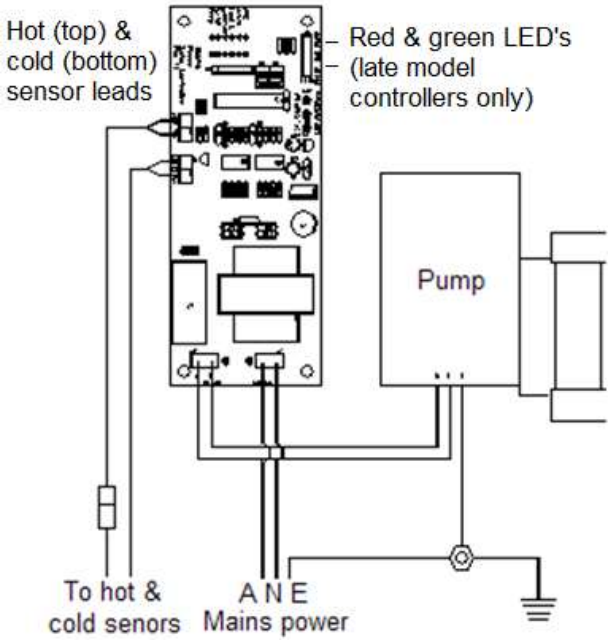
052186 Differential Controller (Red PCB)



052262 Differential Controller (Green PCB)

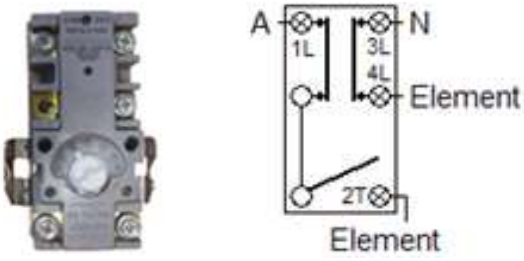


052139 Differential Controller (Green PCB)

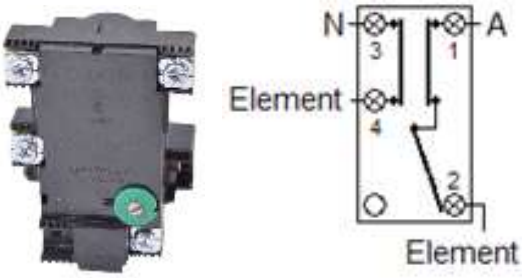


052113 Differential Controller (Green PCB)

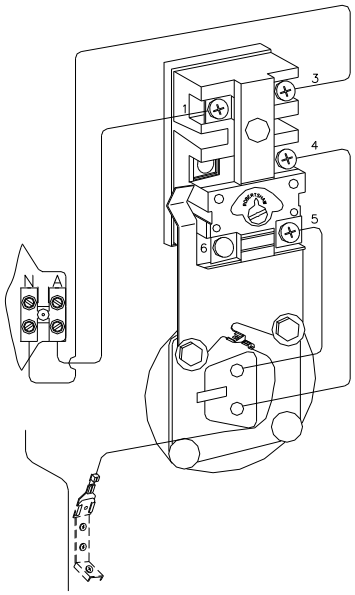
Electric Booster Circuit



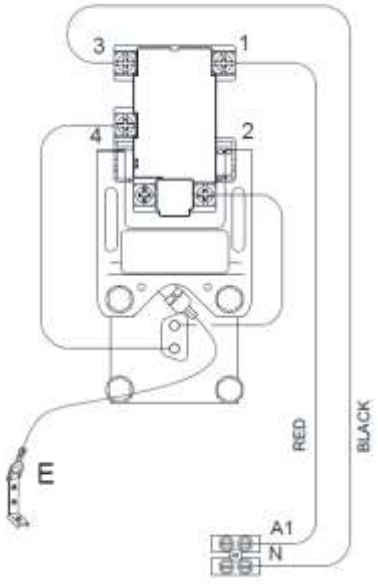
EWT thermostat



ST12 & ST13 thermostat



Electric booster circuit with EWT Thermostat

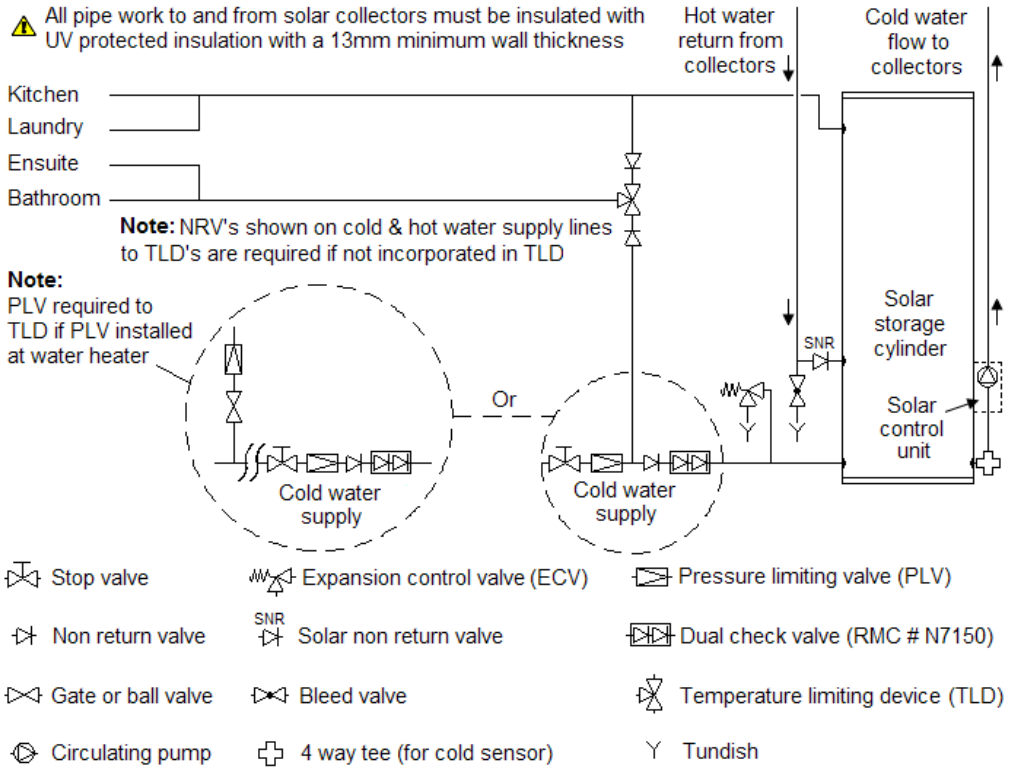


Electric booster & Frost circuit with ST12 or ST13 Thermostat

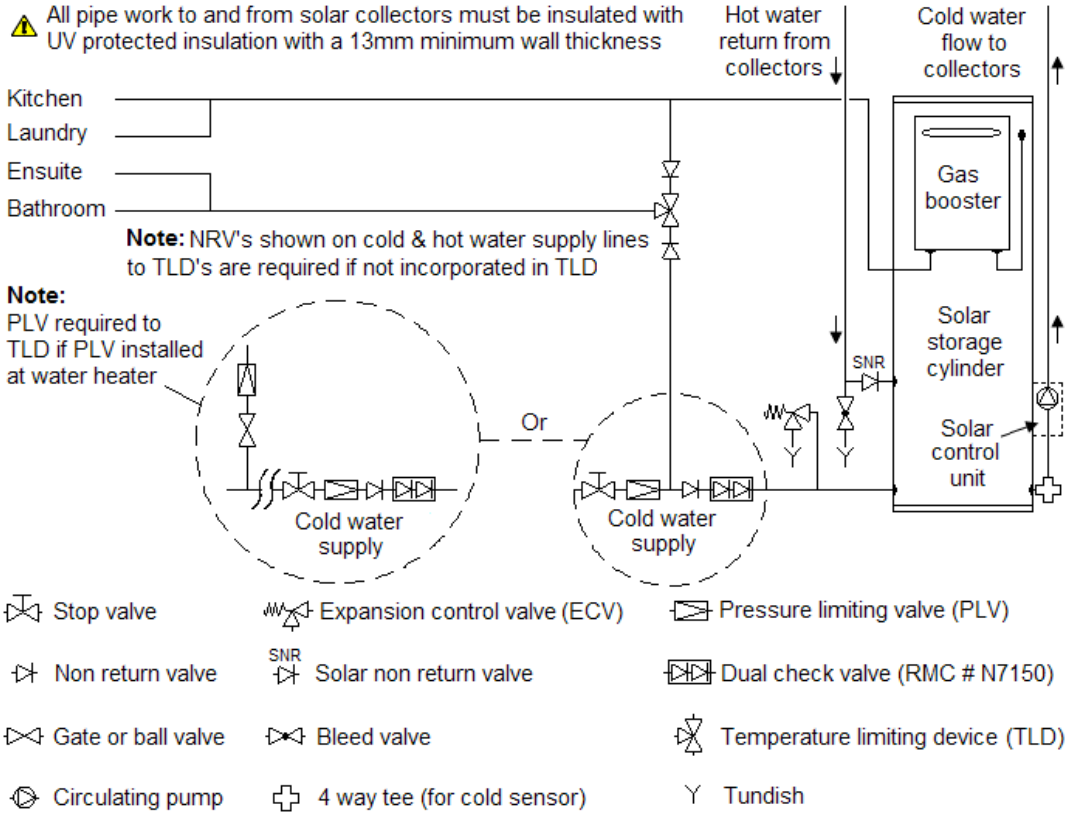
PLUMBING DIAGRAMS

The following information and plumbing diagrams are provided as a guide only. For more information refer to the relevant Installation Instructions.

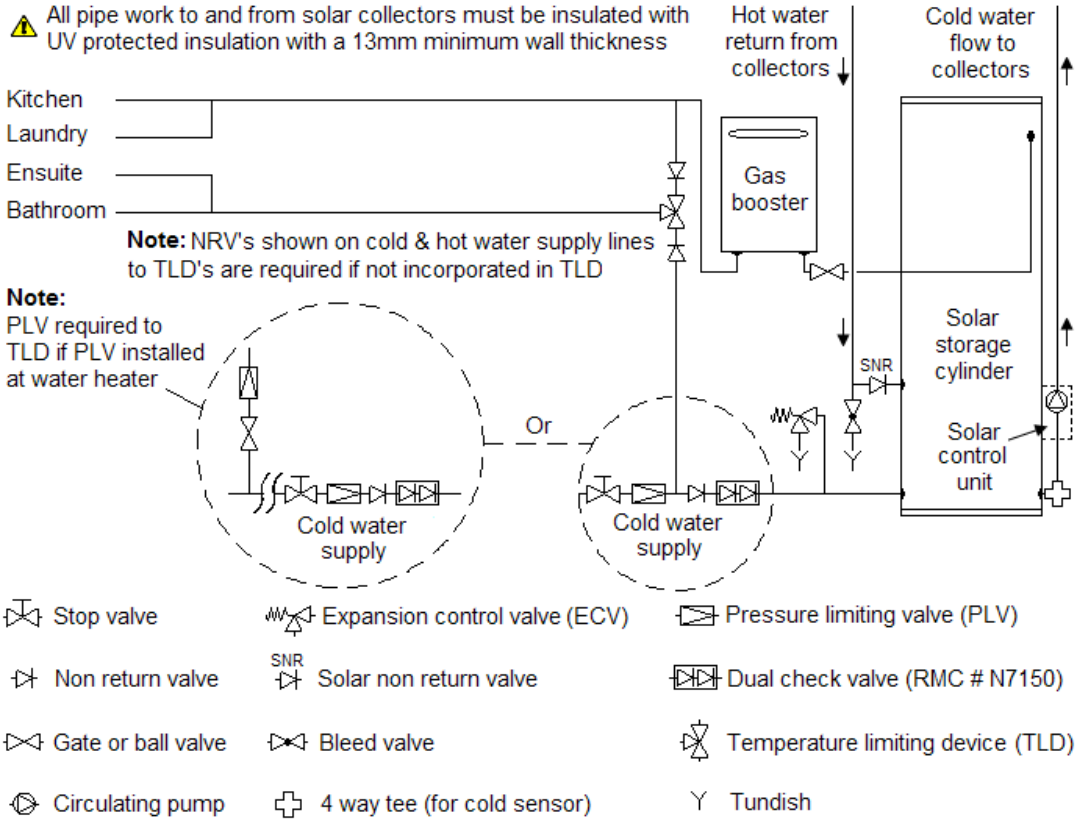
Two Temperature Zone Plumbing Diagram



Two Temperature Zone Plumbing Diagram – With Integrated Gas Booster



Two Temperature Zone Plumbing Diagram –with Remote Gas Booster



OPERATION

Solar - The solar system operates on the temperature differential principle with water in the collector(s) gaining heat from solar radiation which is transferred by circulation to a storage cylinder mounted at ground level.

The collector array water temperature is detected by a hot sensor which is mounted in the hot outlet of the collector array, and the storage cylinder water temperature is detected by a cold sensor which is mounted in the cold water supply to the collector/s (located at the storage cylinder).

A circulator circulates water from the storage cylinder through the collector array and back to the storage cylinder. Circulator operation and speed is controlled by the differential controller.

Electric Booster - An auxiliary electric heating unit and controlling thermostat is incorporated in the design of the storage cylinder to provide backup heating during periods of low solar contribution, cloudy weather or high hot water demand.

Defrost Element - The 5A2325 incorporates an auxiliary electric heating unit and Robertshaw ST mechanical thermostat in the design to provide additional heat if required during Defrost Mode operation. The defrost element is located behind the bottom electrical access cover of the storage tank, operation of the element is controlled by the differential controller.

052186, 052262 & 052081 Differential Controller Operation

The differential controller monitors the hot sensor which measures the water temperature at the collectors, and the cold sensor which measures the water temperature at the bottom of the storage cylinder and uses the temperature values to determine the required operating mode. The following information is an overview of each operating mode.

Run Mode - When the difference between the water temperature detected by the hot sensor and that detected by the cold sensor is ≥ 8ºC, the differential controller will energise the circulator.

The circulator moves the colder water in the storage tank up to the collector(s) for heating via the cold pipe and the heated water in the collector(s) down to the storage tank via the hot pipe.

052186 and 052262 differential controllers utilises a 3 tier flow system.

- The circulator is started at full speed and then pulsed. The pump speed is dictated by the hot sensor temperature or by the difference between the hot and cold sensor temperatures (refer to "Solar Flow Control" on page 24 for details).
- The differential controller de-energises the circulator when the temperature difference between the hot and cold sensors is ≤ 2ºC or the cold sensor temperature is ≥ 70ºC and the hot sensor temperature is < 130ºC.

Standby Mode - Standby Mode is the state the controller returns to when all the conditions of Run Mode, Over Temp Mode, Night Cool Mode or Defrost Mode have been met. In Standby Mode the circulator is de-energised.

When returning to Standby Mode from any other mode a 60 second wait occurs before the controller can move to a new state i.e. back to Run Mode.

Defrost Mode - Defrost Mode is designed for preventing the pipe work to and from the collector(s) and the collector(s) themselves from freezing.

If the hot sensor detects a water temperature ≤ 4ºC the differential controller will energise the circulator which circulates water from the storage tank through the collector(s). The circulator is de-energised when the hot sensor detects a water temperature ≥ 6ºC and the circulator has run for at least 400 seconds.

052081 Differential Controller ONLY: If the water temperature detected by the cold sensor is ≤ 8°C during Defrost Mode the anti-freeze heating unit is energised to heat the water, heating continues until the cold sensor detects a temperature ≥12°C or Defrost mode ends.

Over Temperature Mode - Over Temperature Mode is designed to assist in preventing temperature stagnation of the collector(s). If the water temperature detected by the cold sensor is ≥ 70ºC, the controller will enter Over Temperature Mode.

During Over Temperature Mode if the hot sensor detects a temperature > 130°C the circulator will be turned on to remove heat from the collector(s). The circulator is de-energised when the hot sensor detects a temperature < 110°C, this completes 1 heat dump cycle.

The heat dump cycle is repeated a maximum of 8 times provided the cold sensor temperature detected is < 75ºC. If the temperature detected by the cold sensor is > 75°C heat dump mode is terminated and the circulator remains off.

If the temperature detected by the cold sensor falls to < 35°C for 5 minutes the controller will exit Over Temperature Mode and return to Standby Mode.
If the temperature detected by the hot sensor falls to < 50°C and the temperature detected by the cold sensor is ≥ 70°C the controller will enter Night Cool Mode.

Night Cool Mode - Night Cool Mode is also designed to minimise temperature stagnation of the collector(s) by transferring excess heat from the storage tank back to the collector(s) at night and radiating this to atmosphere.

The temperature of the water in the storage tank will be lowered and allow capacity for solar contribution to be gained during the following day.

On entering Night Cool Mode the circulator is turned on, the circulator will remain on initially until 30 minutes plus 15 x the number of heat dump cycles completed in over temperature mode (in minutes) has expired i.e. if 4 heat dump cycles had been completed 4 x 15 = 60 + 30 = 90 therefore the initial pump run will be 90 minutes.

After the initial time period is completed the circulator will remain on until one of the conditions below is met

1. The cold sensor detects a water temperature < 63°C for 300 seconds, OR
2. The hot sensor temperature minus the cold sensor temperature is > 2ºC for 300 seconds, OR
3. The Timer count exceeds 6hrs.

When any of the 3 conditions noted above are met the circulator is de-energised and the controller will enter Standby Mode.

Solar Flow Control – 052186, 052262 & 052081 Differential Controllers utilises a 3 tier flow control strategy to maximise the solar contribution from the collector(s) while maintaining the stratification in the storage cylinder by electronically controlling the circulator speed.

The 3 speeds are, Flow 1 (pulsed flow, 44% drive to circulator), Flow 2 (pulsed flow, 57% drive to circulator) and Full Speed (100% drive to circulator)

When the circulator is energised in Run Mode the flow rate will be set based on the following parameters;

- T Hot – T Cold ≥ 45°C – Circulator at full speed for 300 seconds
- T Hot – T Cold ≥ 30°C – Circulator at full speed for 15 seconds then Flow 1, if the temperature remains ≥ 30°C after 300 seconds then Flow 2, if the temperature remains ≥ 30°C after 300 seconds then Full Speed.
- T Hot – T Cold ≤ 29°C and >10°C – The flow rate being used when the difference between T Hot and T Cold fell to 29°C degrees is maintained.
- T Hot – T Cold ≤ 10°C – Every 300 seconds the flow rate is reduced until Flow 1 is reached. This speed is maintained until the temperature difference rises or Run Mode ends.

Diagnostics & LED Indication - The differential controller can display operational and fault modes and has inbuilt diagnostics to test the condition of the hot and cold sensors. For more information refer to ‘Differential Controller Operational & Fault Modes’ on page 37.

052113 & 052139 Differential Controller Operation

The differential controller monitors the hot sensor which measures the water temperature at the collectors, and the cold sensor which measures the water temperature at the bottom of the storage cylinder and uses the temperature values to determine the required operating mode. The following information is an overview of each operating mode.

Run Mode - When the difference between the water temperature detected by the hot sensor and that detected by the cold sensor is ≥ 8ºC, the differential controller will energise the circulator.

The circulator moves the colder water in the storage tank up to the collector(s) for heating via the cold pipe and the heated water in the collector(s) down to the storage tank via the hot pipe.

NOTE: The flow rate is dependent on the differential controller fitted.

- 052139 Differential Controller – The circulator is started at full speed then pulsed at a fixed rate.
- 052113 Differential Controller – The circulator runs at full speed.

The differential controller will de-energise the circulator when the temperature difference between the hot and cold sensors is ≤4 ºC or the cold sensor temperature is ≥ 70ºC and the hot sensor temperature is < 130ºC.

Standby Mode - The differential controller will enter ‘Standby Mode’ (circulating pump off) when the temperature difference between the hot and cold sensors falls below 4ºC and the cold sensor detects ≤ 70ºC.

‘Standby Mode’ prevents the system from operating when solar gain is inadequate. The differential controller will remain in ‘Standby Mode’ for a minimum of 60 seconds and until the water temperature detected by the hot sensor is 8ºC above the water temperature detected by the cold sensor at which time ‘Run Mode’ will be entered.

Defrost Mode - The differential controller will enter ‘Defrost Mode’ (circulator on full speed) whenever the hot sensor detects a water temperature of < 4ºC (such as during periods of frost). Note: < 3 ºC for 052113 differential controllers manufactured pre 02/06.
‘Defrost Mode’ circulates water from the storage cylinder through the solar collector(s) to prevent the solar collector flow and return pipe work from freezing.

The differential controller will remain in ‘Defrost Mode’ for a minimum of 400 seconds and until the water temperature detected by the hot sensor is > 6ºC at which time ‘Standby Mode’ will be entered. Note: minimum of 240 seconds and > 5 ºC for 052113 differential controllers manufactured pre 02/06.

Over Temperature Mode - The differential controller will enter 'Over Temperature Mode' (circulator off) whenever the water temperature detected by the cold sensor is > 70ºC.

The differential controller will remain in 'Over Temperature Mode' until one of the following conditions occurs:

- If the hot sensor detects a water temperature > 130ºC the differential controller will enter 'Heat Dump Mode'.
- 052139 differential controllers: If the hot sensor detects a water temperature < 50ºC the differential controller will enter 'Night Cool Mode'.
- If the cold sensor detects a water temperature of < 35ºC the system will enter 'Standby Mode'.

Heat Dump Mode – 052139 Differential Controllers & 052113 Differential Controllers Manufactured from 02/06

The differential controller will enter 'Heat Dump Mode' (circulator on full speed) whenever the water temperature detected by the cold sensor is > 70ºC and the water temperature detected by the hot sensor is > 130ºC.

'Heat Dump Mode' reduces the temperature of the water in the solar collector(s) by transferring (dumping) excess heat from the solar collector(s) into the storage cylinder whilst still preventing the likelihood of extremely hot water being delivered to hot taps and other outlets at uncontrolled water temperatures which may otherwise be near boiling point.

The differential controller will remain in 'Heat Dump Mode' until the water temperature detected by the hot sensor is < 110ºC or the water temperature detected by the cold sensor is > 75ºC at which time 'Over Temperature Mode' will be entered.

Night Cool Mode – 052139 Differential Controllers Only

The differential controller will enter 'Night Cool Mode' (circulator on full speed) whenever the water temperature detected by the cold sensor is > 70ºC and the water temperature detected by the hot sensor is < 50ºC.

'Night Cool Mode' reduces the temperature of the water in the storage cylinder by transferring excess heat from the storage cylinder back to the solar collector(s).

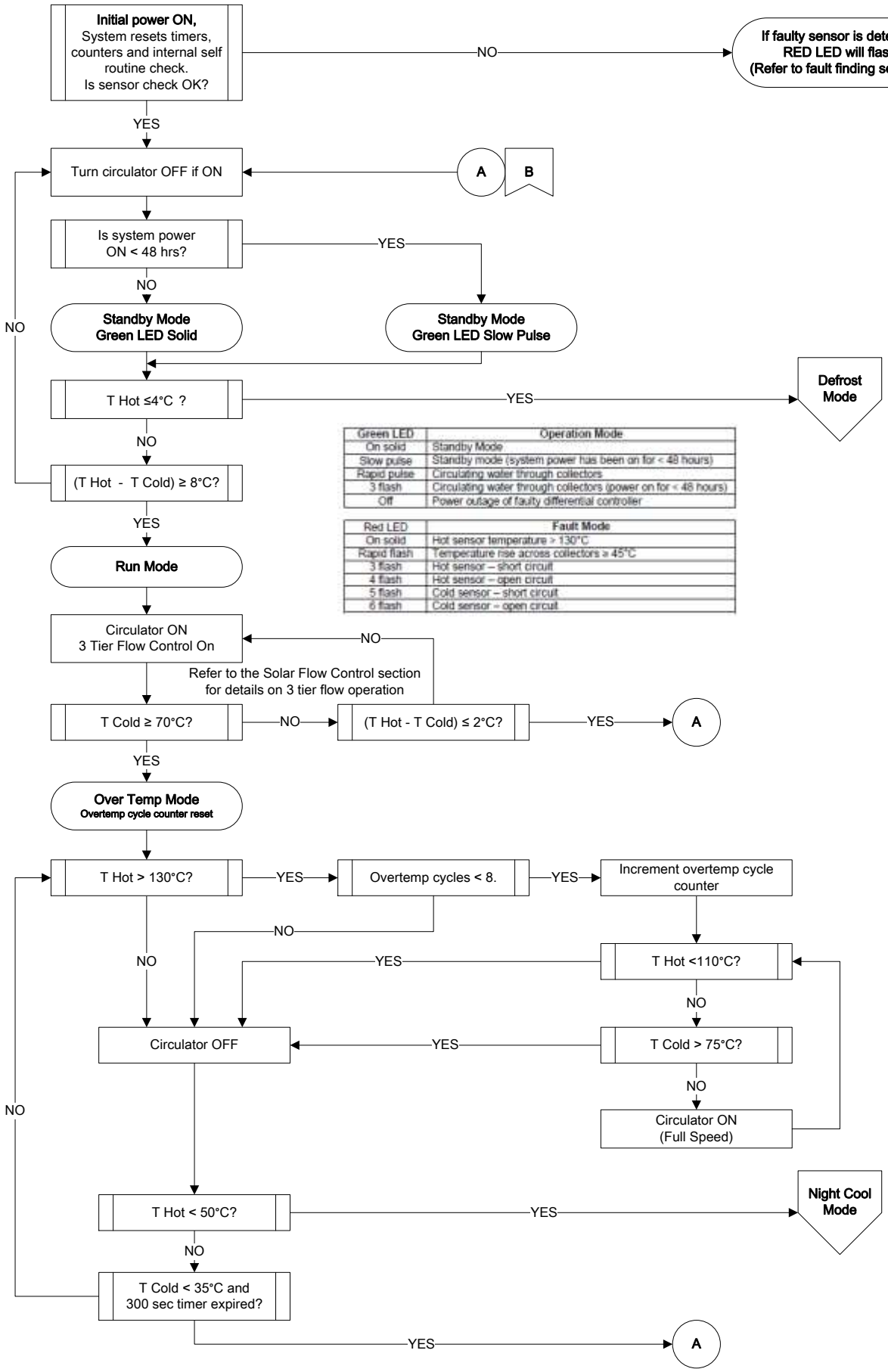
The differential controller will remain in 'Night Cool Mode' for a minimum of 30 minutes after which time the differential controller will enter 'Standby Mode' if any of the following conditions occurs:

- The cold sensor detects a water temperature < 63ºC for a minimum of 300 seconds.
- The hot sensor temperature minus the cold sensor temperature is > 2ºC for a minimum of 300 seconds.
- The differential controller has been in 'Night Cool Mode' for more than 6 hours.

Diagnostics & LED Indication

The differential controller can display operational and fault modes and has inbuilt diagnostics to test the condition of the hot and cold sensors. For more information refer to 'Differential Controller Operational & Fault Modes' on page 37.

Operational Flow Chart 1A – 052186, 052262 & 052081 Differential Controller

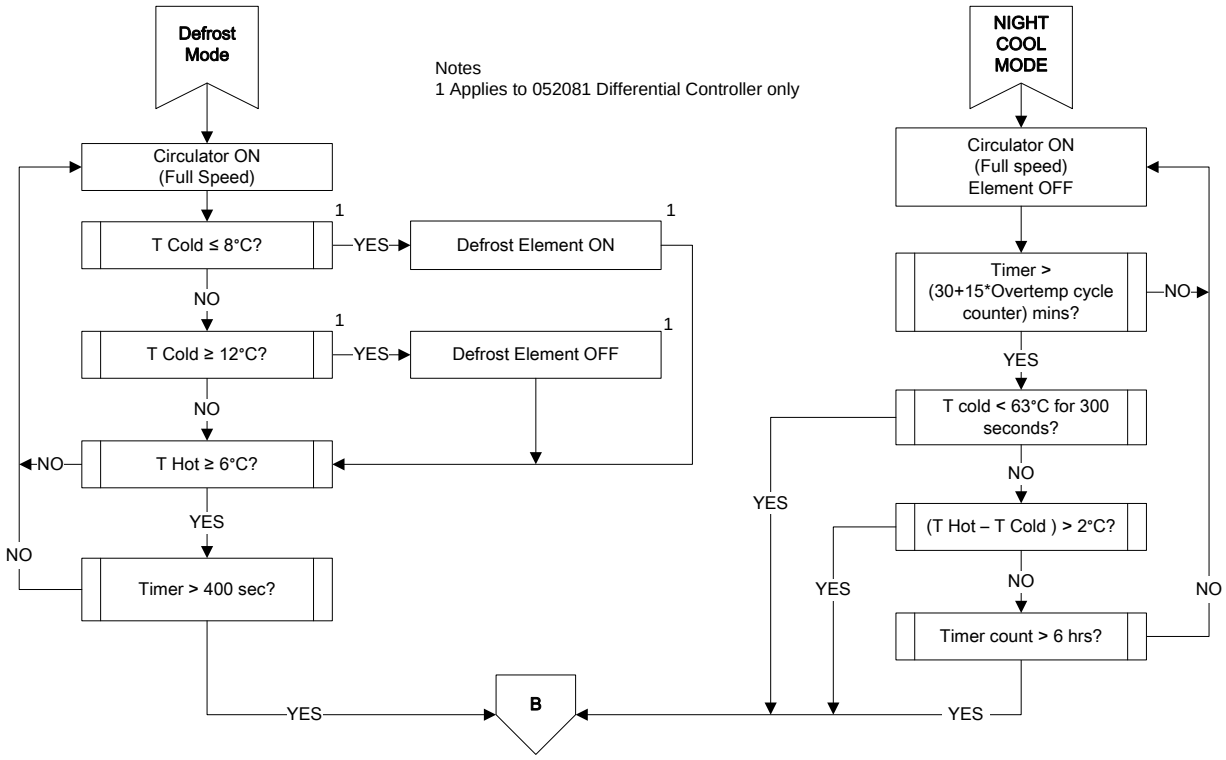


Green LED	Operation Mode
On solid	Standby Mode
Slow pulse	Standby mode (system power has been on for < 48 hours)
Rapid pulse	Circulating water through collectors
3 flash	Circulating water through collectors (power on for < 48 hours)
Off	Power outage of faulty differential controller

Red LED	Fault Mode
On solid	Hot sensor temperature > 130°C
Rapid flash	Temperature rise across collectors ≥ 45°C
3 flash	Hot sensor – short circuit
4 flash	Hot sensor – open circuit
5 flash	Cold sensor – short circuit
6 flash	Cold sensor – open circuit

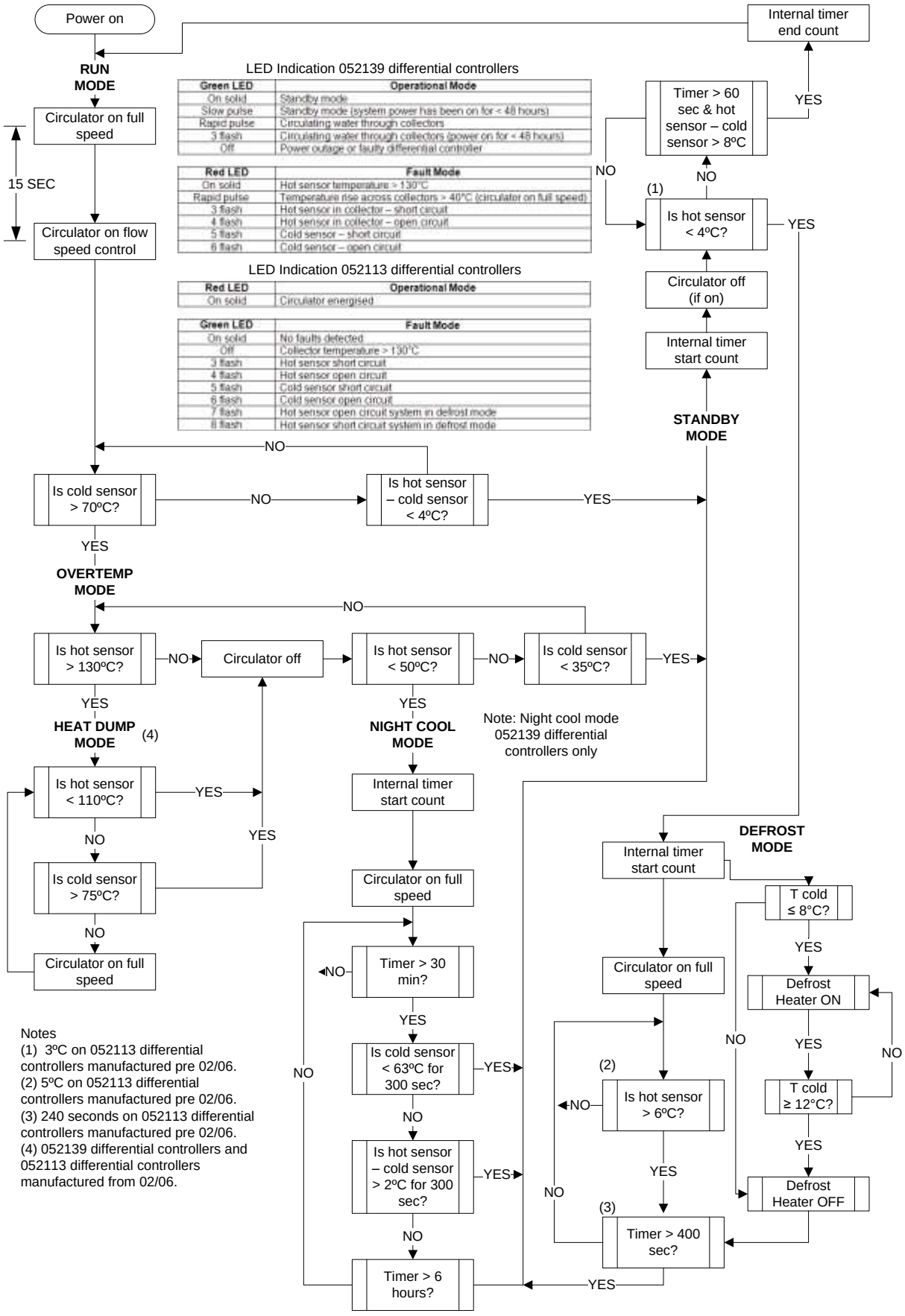
Refer to "Operational Flow Chart 1B" for defrost mode and night cool mode operation.

Operational Flow Chart 1B – 052186, 052262 & 052081 Differential Controller



Refer to "Operational Flow Chart 1A" for off page reference 'B'.

Operational Flow Chart 2 – 052139 & 052113 Differential Controllers

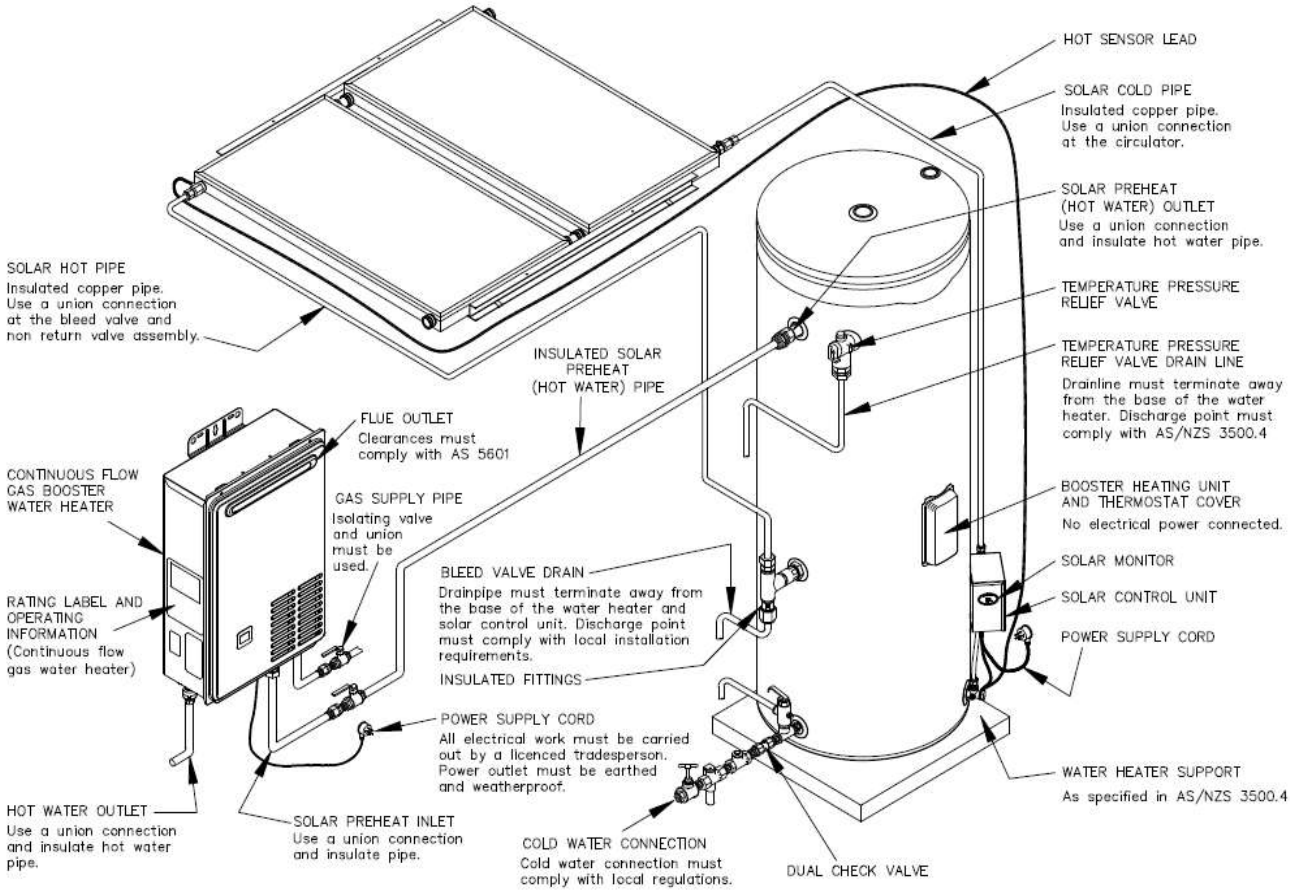


IN-LINE GAS BOOSTING

In some cases the solar Loline system acts as a pre heater only and some form of in-line or series boosting, typically a continuous flow gas fired water heater, is installed to boost the hot water temperature to the premises during periods of low solar contribution.

Where an in-line booster is fitted, the electric boost element fitted in the solar storage cylinder is typically not connected to power.

The diagram shown below details a solar Loline installation with an in-line continuous flow gas booster installed to provide boosting. The gas booster can be storage cylinder or remote mounted (also refer to 'Plumbing Diagrams' on page 21).



Note: The gas booster must be set at a minimum of 70ºC to comply with AS3498. Remote temperature controllers cannot be used in this application as water temperature much higher than that indicated on the remote controller may be delivered from the solar water heater.

For correct operation only solar compatible continuous flow models can be used as in-line boosters unless a solar bypass valve has been fitted.

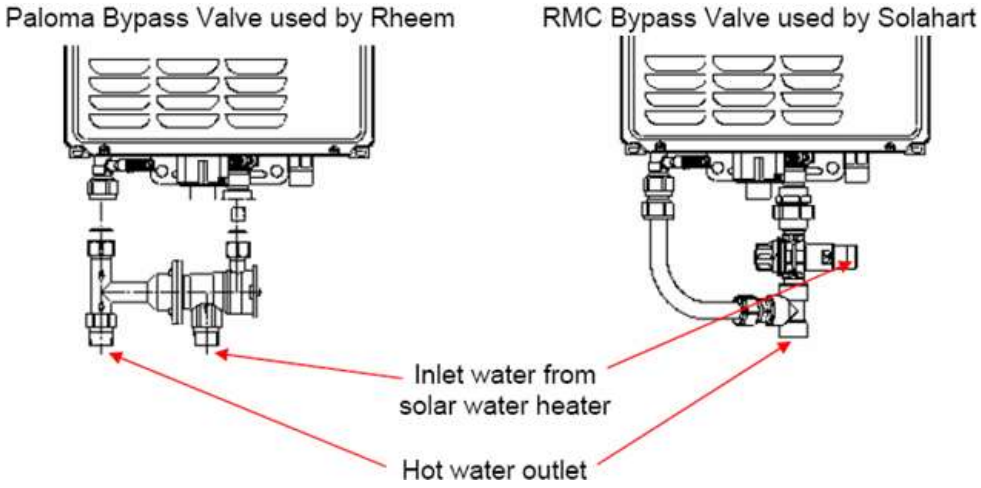
The current range of continuous flow gas boosters are solar compatible and will automatically determine when to operate. When the inlet water temperature is ≤ to 3 degrees below the set point the burner will not operate despite water flowing through the heat exchanger. When the inlet water temperature is more than 3 degrees below the set point and the water flow rate is > 3 litres per minute the burner will fire and boost the outlet temperature to the set point.

Prior to the release of solar compatible gas boosters, a bypass valve was fitted to control water flow through the gas booster. When the water temperature from the solar storage

cylinder entering the solar bypass valve is > 57°C, a temperature sensitive spring moves the valve spindle preventing water from entering the in-line booster and allowing the water to flow through the solar bypass valve to the hot water outlet.

If the water temperature from the solar storage cylinder entering the solar bypass valve is < 57°C, the temperature sensitive spring retracts the valve allowing water to enter the in-line booster and preventing flow through the solar bypass valve. The in-line booster will boost the water temperature to the set point at the hot water outlet provided the flow rate is > 3 litres per minute.

A Paloma or RMC bypass valve was fitted across the inlet and outlet connections to prevent the Inline Booster from operating under certain conditions.



Note: The bypass valves are no longer available. If the bypass valve requires replacement it will be necessary to remove the valve AND update the in-line gas booster to a solar compatible model.

HOT WATER PHYSICS RELATED TO SOLAR WATER HEATERS

There are physical properties of hot water that are common to all types of heating mediums. An understanding of these properties can be of assistance when 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. When water stops circulating through the solar collector(s) the temperature will rise to the stagnation temperature.

Flash steam: This is when water under pressure is heated to temperatures above 100ºC, and then the pressure is suddenly reduced (by opening a hot tap) allowing the excess heat to be converted to steam. 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 cylinder and condenses.

Density of water: Water is at its maximum density at a temperature of 4ºC. When heated above 4ºC and up to 100ºC, water expands unequally at an average of 1/23rd of its volume. Between 10ºC and 65ºC the expansion is approximately 1/50th 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, in which case 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 should not discharge water due to thermal expansion when the heating cycle is off.

Boiling point of water: The temperature at which water boils is directly related to the pressure the water is subjected to.

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

Specific heat: The amount of energy required to raise 1kg of a substance by 1ºC. Measured in units of kilo joules (kJ) i.e. 4.2kJ will raise 1 litre (1kg) of water 1ºC.

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 100ºC to steam at 100ºC will require approximately 252 kJ/kg.

Freezing of water: Water cooled below 4ºC expands insignificantly until it reaches the point of its changing state into ice, at which time it expands by 1/11th of its volume. Ice contracts on further cooling. Damage to solar collectors can occur 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.

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 noryl 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 throughout the life of the water heater.

Solar Cold Pipe (Solar Return): The pipe connecting the solar collectors to the storage water heater through which, the cooler water returns from the storage cylinder to the collectors.

Hot Pipe (Solar Flow): The pipe connecting the solar collectors to the storage cylinder through which solar heated water flows back to the storage cylinder from the collectors.

Circulating Pump: A small centrifugal pump that circulates water through the solar collectors and storage cylinder.

Differential Controller: An electronic control unit that interprets resistance values of the hot and cold sensors to determine when to operate the circulator.

Hot Sensor: A thermistor for sensing water temperature. The hot sensor is fitted into the connector at the hot pipe connection on the solar collector.

Cold Sensor: A thermistor for sensing water temperature. The cold sensor is fitted into a tee at the cold water pickup for the collectors on the storage cylinder.

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 booster element to maintain the stored water at the required temperature.

Over Temperature Energy Cut Out (ECO): A safety device incorporated within the thermostat that automatically cuts off the supply of electrical energy to the booster element should the water temperature exceed 83ºC during a heating cycle. If the ECO trips, EWT and ST12 thermostats can be manually reset; ST13 solar thermostats must be replaced as they cannot be reset. ***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.

FAULT FINDING

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 150ºC may be present in the collector(s). Flush the collectors with cold water by opening the bleed valve. Isolate water supply and relieve pressure through a hot tap or the T&PR valve prior to opening the collector pipe work. Protective clothing should be worn to prevent scalding or burns.

If it is necessary to switch the power off to the solar control unit for a period of time and there is a risk of freezing, then it is necessary to drain the solar collectors and solar flow and return pipe work. Warranty does not cover damage caused by freeze conditions when the electrical circuit or electrical supply to the solar control unit is turned off or interrupted.

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 12 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.
7. Thermostat temperature setting.
8. Crossed connection.

Discoloured water: This may be the result of discoloured water entering from the cold water mains. Check if the cold water is also discoloured.

Brown coloured water will generally indicate that the anode has been depleted or the water heater is near the end of its useful life.

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 solar collector glass: Small amounts of condensate on the underside of the solar 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 solar collector is not hermetically sealed.

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:

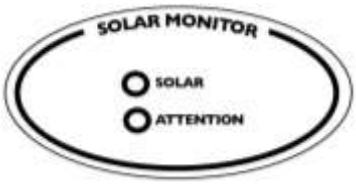
1. Turn off the stopcock on the cold water supply to the water heater.
2. Open a hot tap. If water flow is persistent and cold a cross connection exists.

Test Equipment

A list of test equipment which will assist in conducting diagnostic procedures is provided below. This equipment is available from Rheem Service Spare Parts Department.

Fine probe adapter kit	WH0020082
Probe to alligator clip kit	WH0020084
Sensor LED test unit	890258

LED indication – Differential Controller 052186, 052262, 052139 & 052081



A solar monitor is located in the side of the solar control unit and houses both a green and a red LED (052139 differential controllers also have duplicate green and red LEDs on the circuit board).

The green LED (marked 'SOLAR') indicates the current operational mode of the solar controller and will emit either a constant glow (on solid), constant pulsing or a series of flashes.

The red LED (marked 'ATTENTION') is used to indicate a fault mode and will emit a series of flashes if a fault condition is detected.

On solid = Constant glow.
Slow pulse & flashes = 2 second interval between each pulse or each series of flashes.
Rapid pulse = 1 second interval between each pulse.

Green LED	Operational Mode
On solid	Standby mode pump OFF (system power has been on >= 48 hrs)
Slow pulse	Standby mode pump OFF(system power has been on < 48 hours)
Rapid pulse	Pump ON (system power has been on for < 48 hours)
3 flash	Pump ON (system power has been on for >= 48 hrs)
Off	Power outage or faulty differential controller

Red LED	Fault Mode
On solid (1)	Hot sensor temp > 130°C (This may occur during normal operation)
Rapid pulse (2)	Temp rise across collectors > 45°C (40°C for 052139) Run mode with pump ON at full speed
3 flash	Hot sensor in collector – short circuit
4 flash	Hot sensor in collector – open circuit
5 flash	Cold sensor – short circuit
6 flash	Cold sensor – open circuit

NOTES (1) and (2) in table: The Red LED may come on with the Green LED under 2 conditions; Refer to relevant note below.

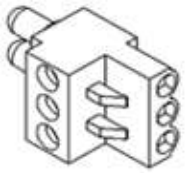
(1) If the system is in standby mode (green LED will be on solid or emitting a slow pulse) and the solar storage cylinder is full of hot water, the red LED may simultaneously remain on solid if solar radiation is still being received by the solar collectors. ***This does not indicate a fault.*** The red LED will extinguish when the temperature in the solar collectors falls below 130°C.

(2) During periods of high solar radiation when the circulator activates after having been off (green LED will begin emitting a rapid pulse or a series of 3 flashes), it is possible for the red LED to simultaneously emit a rapid pulse for a period of up to ten (10) minutes. ***This does not indicate a fault.*** This is normal operation and the red led will extinguish when the temperature difference between the hot and cold sensors decreases due to circulator operation.

LED Indication – Differential Controller 052113

Early model 052113 differential controllers have a 3 pin plug on the circuit board that allows a ‘Sensor LED Test Unit’ part number 890258 (shown below) to be connected so that operational and fault modes can be displayed. The sensor LED test unit has a red and a green LED.

Later model 052113 differential controllers have a red and green LED permanently mounted on the differential controller's circuit board (refer to "052113 Differential Controller" wiring diagram on page 20 for LED location).



Sensor LED test unit 890258

In both instances the green LED indicates the current operational or fault mode of the solar controller and the red LED indicates circulator energisation.

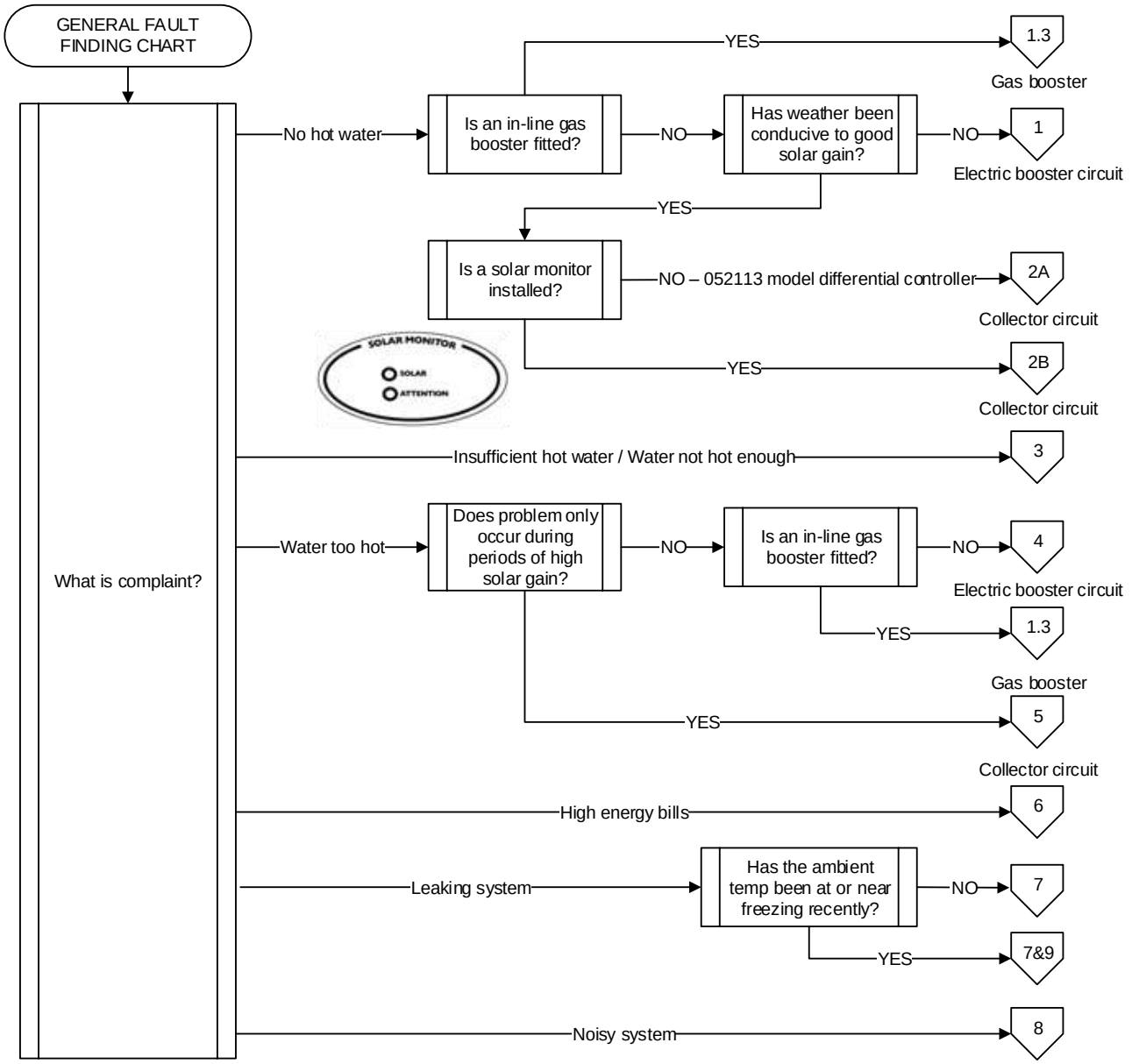
Red LED	Operational Mode
On solid	Pump ON

Green LED	Fault Mode
On solid	No faults detected
Off	Collector temperature > 130°C
1 flash	Not assigned
2 flash	Not assigned
3 flash	Hot sensor short circuit
4 flash	Hot sensor open circuit
5 flash	Cold sensor short circuit
6 flash	Cold sensor open circuit
7 flash	Hot sensor open circuit system in defrost mode
8 flash	Hot sensor short circuit system in defrost mode

On solid = Constant glow.

Fault Finding Charts

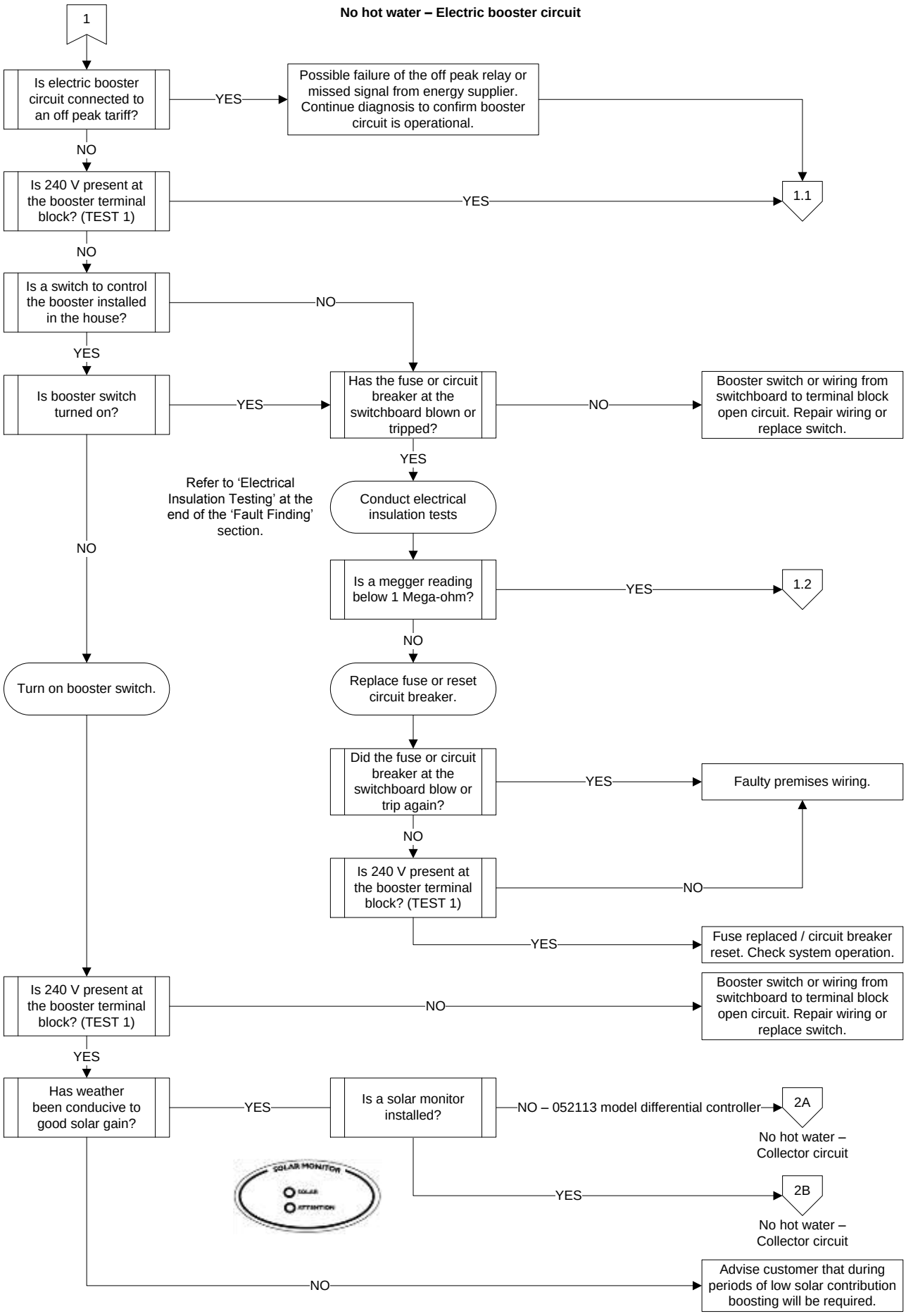
General Fault Finding Chart



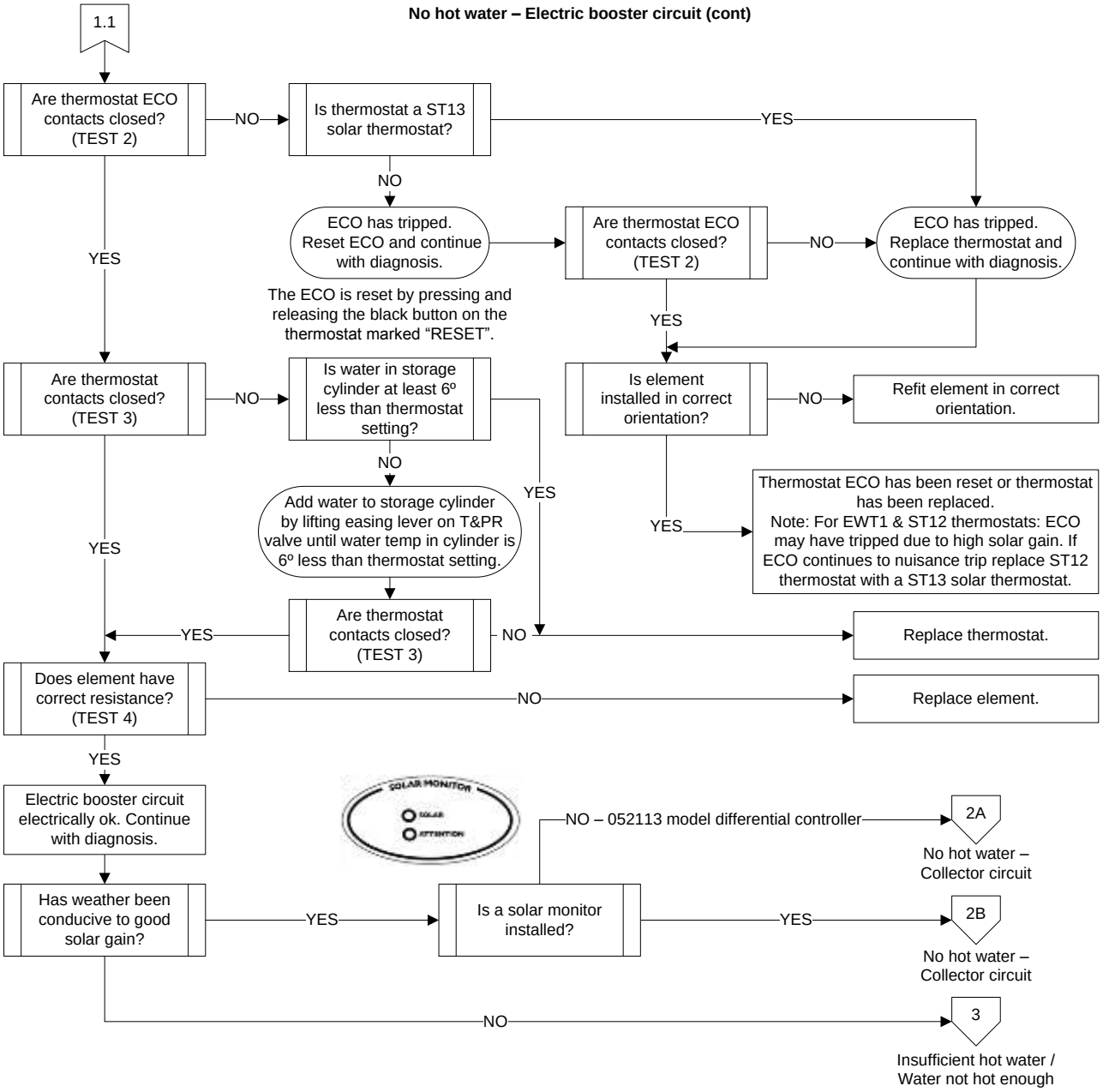
Fault Finding Chart Index

Description	Fault Finding Chart	Page
Fault finding chart starting point	General fault finding chart	39
No hot water – Electric booster circuit	Fault finding chart 1	40
No hot water – Gas booster	Fault finding chart 1.3	42
No hot water – Collector circuit with 052113 differential controller	Fault finding chart 2A	43
No hot water – Collector circuit with solar monitor	Fault finding chart 2B	44
Insufficient hot water / Water not hot enough	Fault finding chart 3	48
Water too hot – Electric booster circuit	Fault finding chart 4	49
Water too hot – Gas booster	Fault finding chart 1.3	42
Water too hot – Collector circuit	Fault finding chart 5	50
High energy bills	Fault finding chart 6	50
Leaking system	Fault finding chart 7	51
Noisy system	Fault finding chart 8	53
Frost protection Booster Circuit	Fault finding chart 9	55

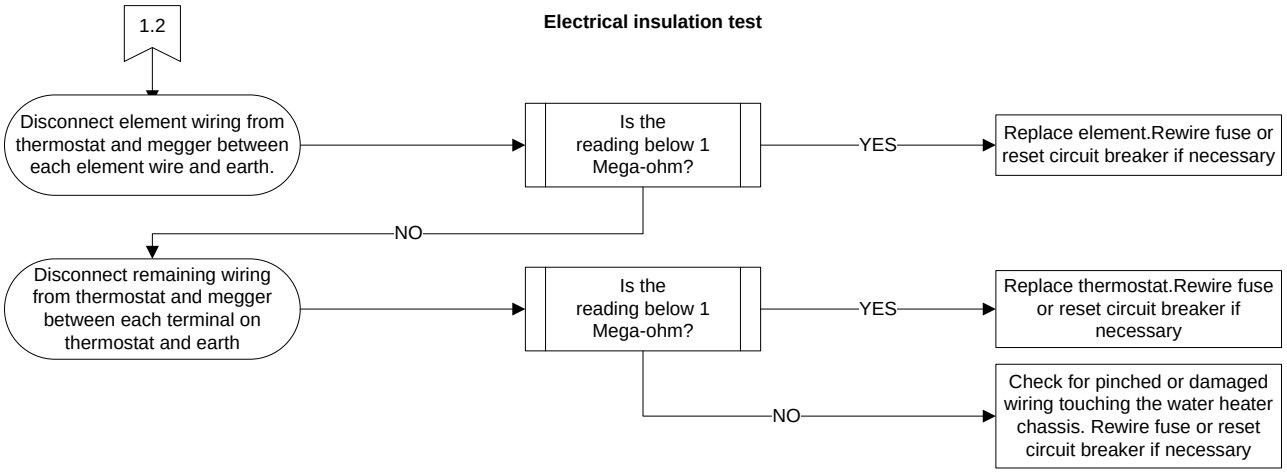
Fault Finding Chart 1



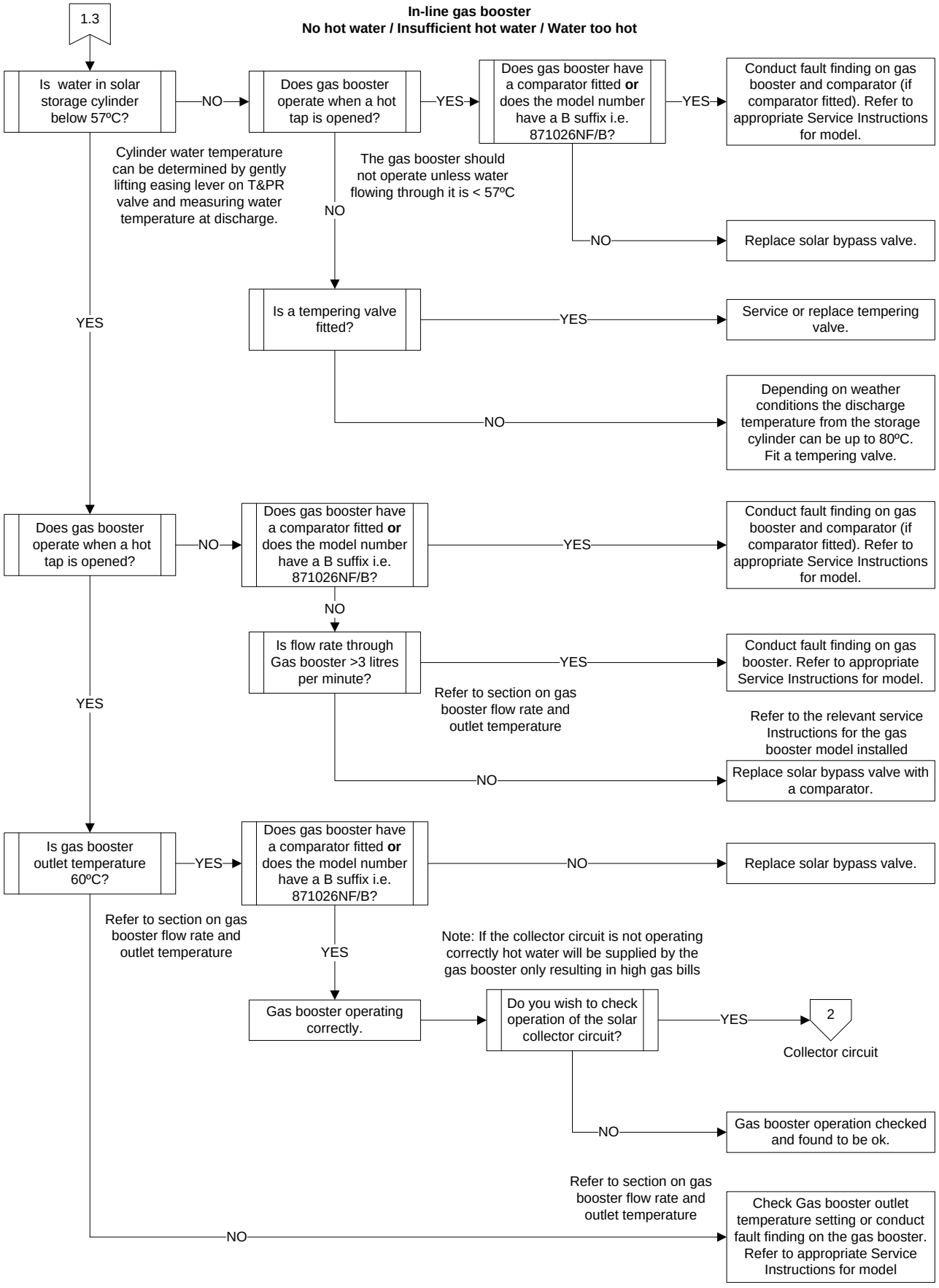
Fault Finding Chart 1.1



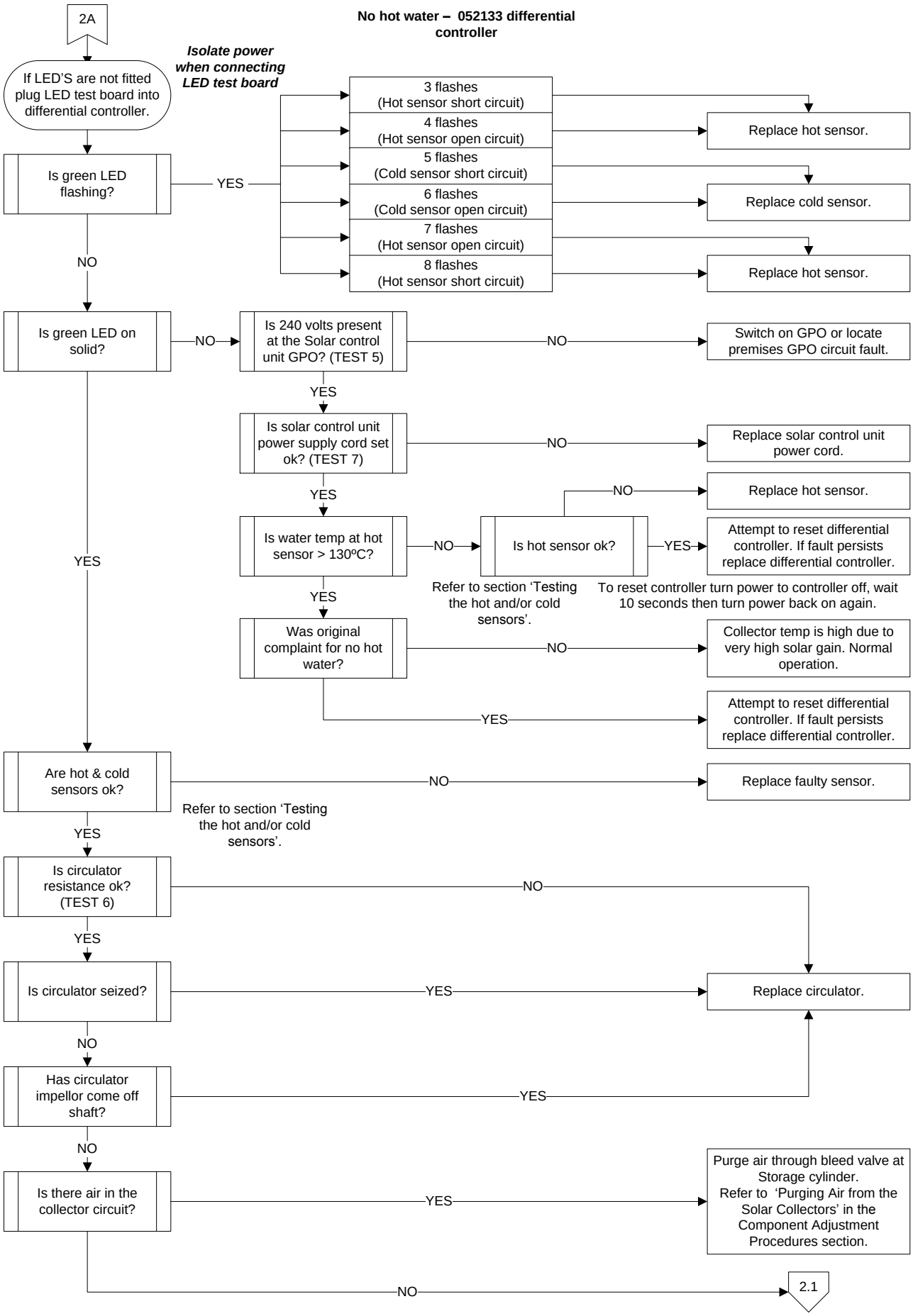
Fault Finding Chart 1.2



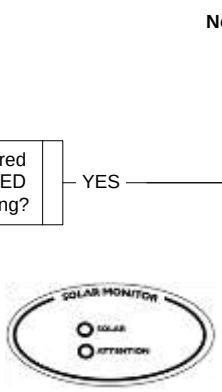
Fault Finding Chart 1.3



Fault Finding Chart 2A



Fault Finding Chart 2B



2B

No hot water – Differential controller with solar monitor

Is solar monitor red "ATTENTION" LED on solid or flashing?

YES

- 3 flashes (Hot sensor short circuit) → Replace hot sensor.
- 4 flashes (Hot sensor open circuit) → Replace hot sensor.
- 5 flashes (Cold sensor short circuit) → Replace cold sensor.
- 6 flashes (Cold sensor open circuit) → Replace cold sensor.
- Continuous – rapid pulse (temp rise across collectors > 45º *) → 2.3
- On solid (Collector temp > 130º) → 2.4

* 40°C for 052139 differential controller

NO

Is solar monitor green 'SOLAR" LED on solid or flashing?

NO → Is solar control unit GPO turned on?

NO → Turn on solar control unit GPO.

YES → Is 240 volts present at the solar control unit GPO? (TEST 5)

NO → Switch on GPO or locate premises GPO circuit fault.

YES → Is solar control unit power supply cord set ok? (TEST 7)

NO → Replace solar control unit power cord.

YES → Reset differential controller

To reset differential controller turn power to controller off, wait 10 seconds then turn power back on again.

Is solar monitor green 'SOLAR" LED on solid or flashing?

NO → Replace differential controller.

YES → Differential controller has been reset. Check system operation.

YES

Are hot & cold sensors ok?

NO → Replace faulty sensor.

Refer to section 'Testing the hot and/or cold sensors'.

YES

Is circulating pump resistance ok? (TEST 6)

NO → Replace circulating pump.

YES

Is circulating pump seized?

YES → Replace circulating pump.

NO

Has circulating pump impellor come off shaft?

YES → Replace circulating pump.

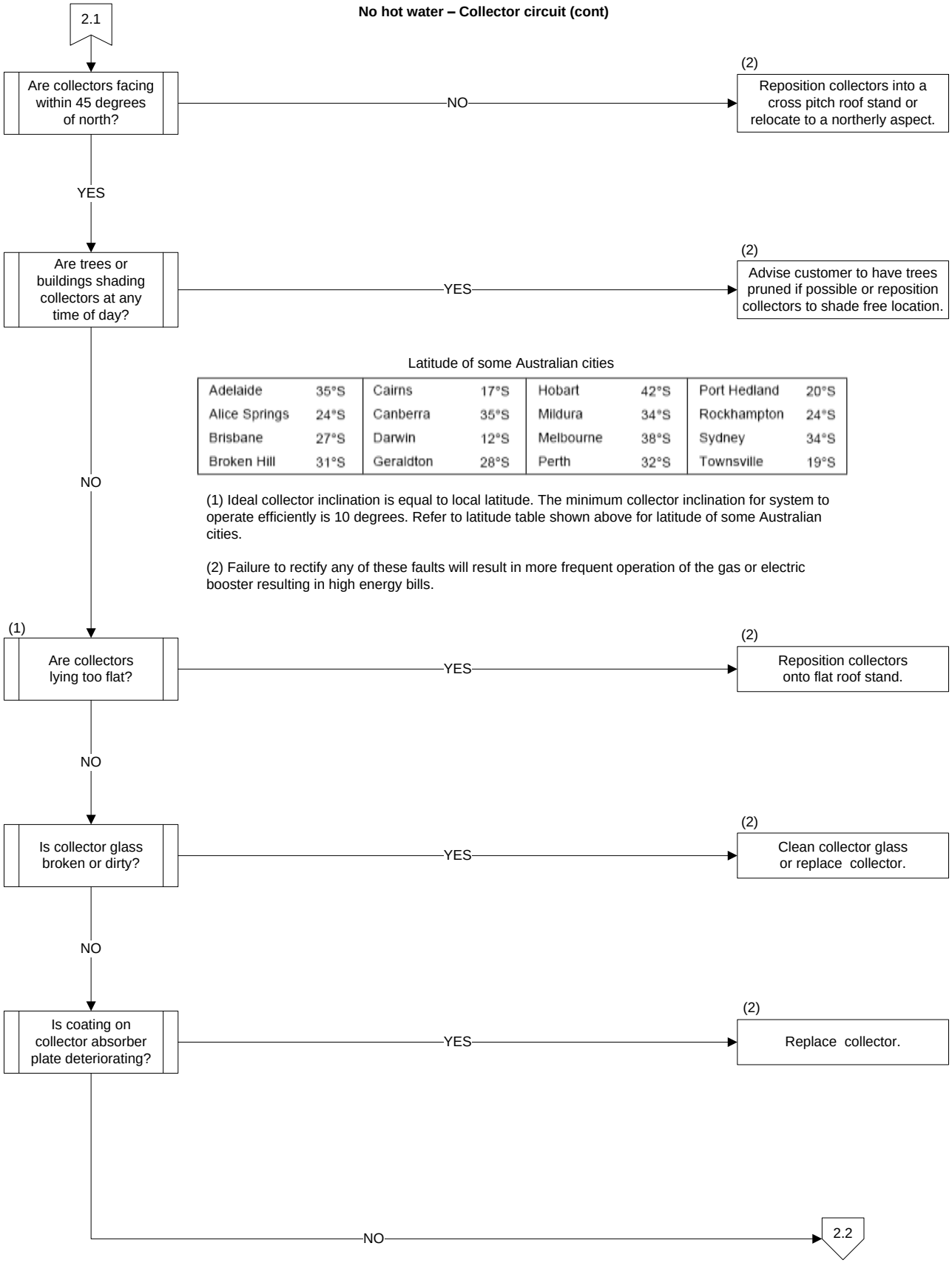
NO

Is there air in the collector circuit?

YES → Purge air through bleed valve at Storage cylinder. Refer to 'Purging Air from the Solar Collectors' in the Component Adjustment Procedures section.

NO → 2.1

Fault Finding Chart 2.1



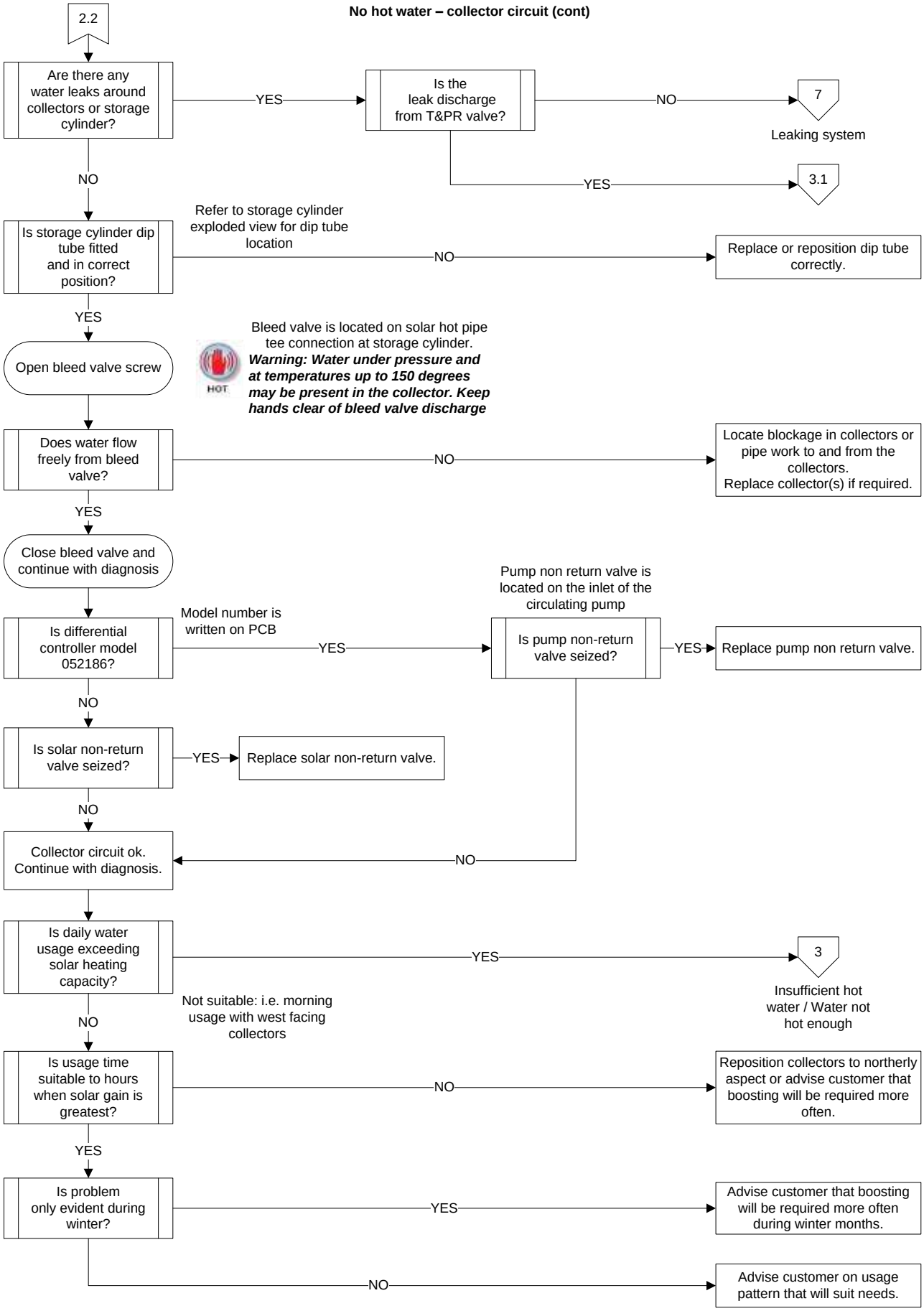
Latitude of some Australian cities

Adelaide	35°S	Cairns	17°S	Hobart	42°S	Port Hedland	20°S
Alice Springs	24°S	Canberra	35°S	Mildura	34°S	Rockhampton	24°S
Brisbane	27°S	Darwin	12°S	Melbourne	38°S	Sydney	34°S
Broken Hill	31°S	Geraldton	28°S	Perth	32°S	Townsville	19°S

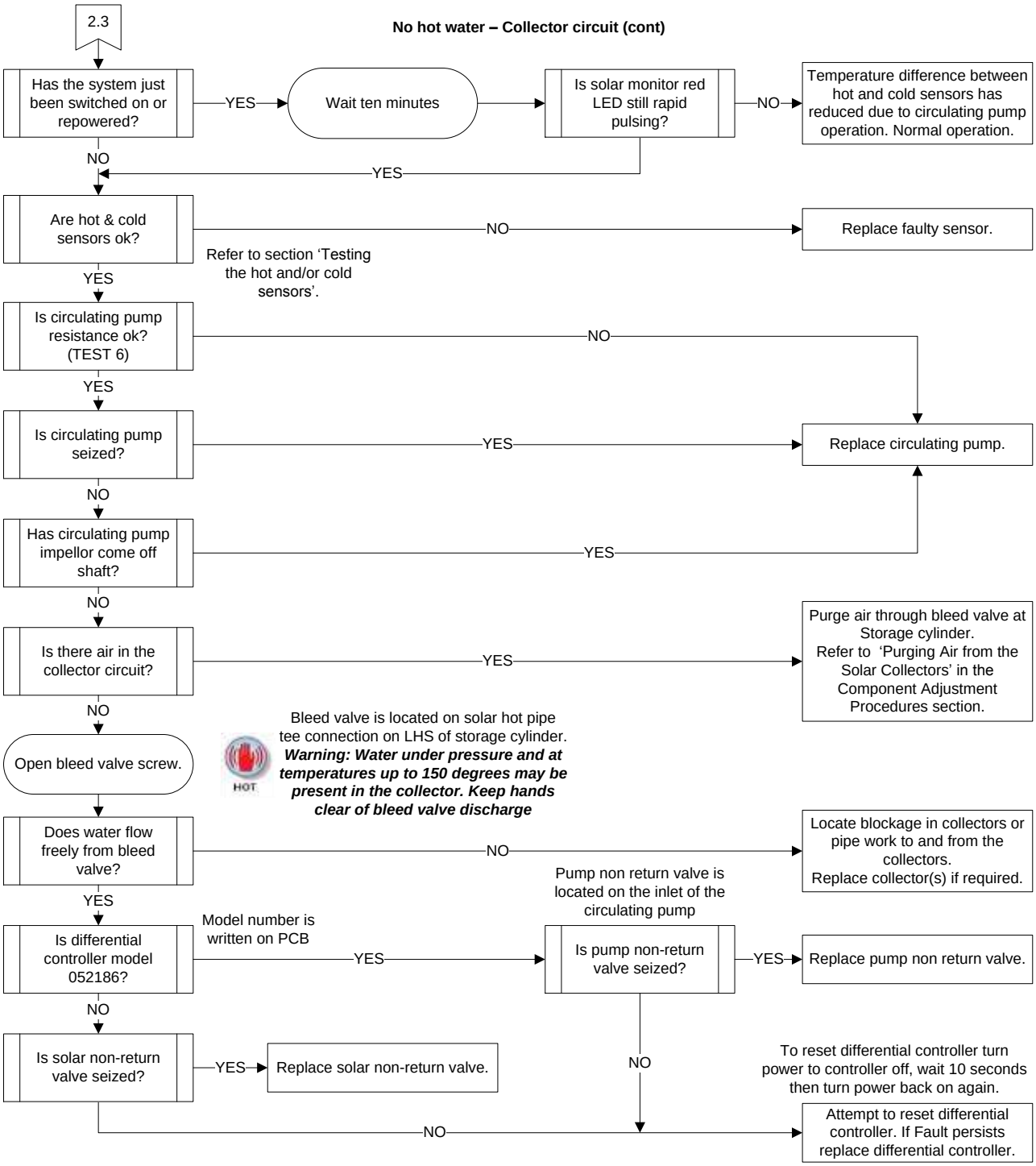
(1) Ideal collector inclination is equal to local latitude. The minimum collector inclination for system to operate efficiently is 10 degrees. Refer to latitude table shown above for latitude of some Australian cities.

(2) Failure to rectify any of these faults will result in more frequent operation of the gas or electric booster resulting in high energy bills.

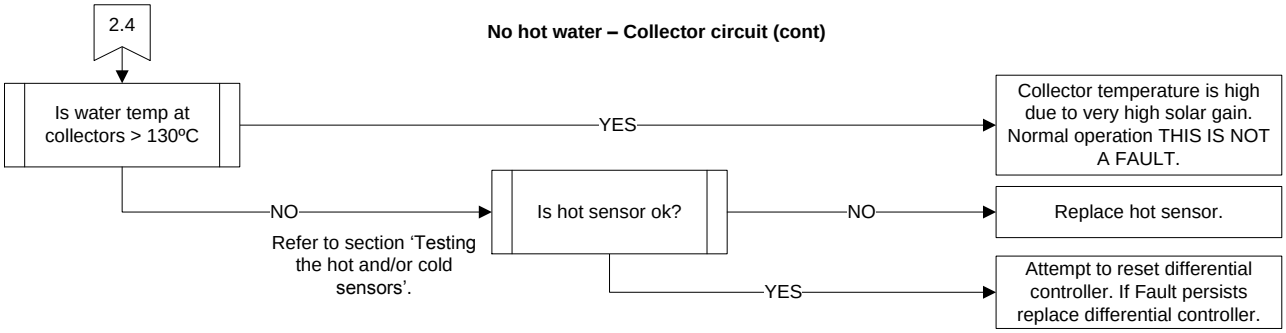
Fault Finding Chart 2.2



Fault Finding Chart 2.3

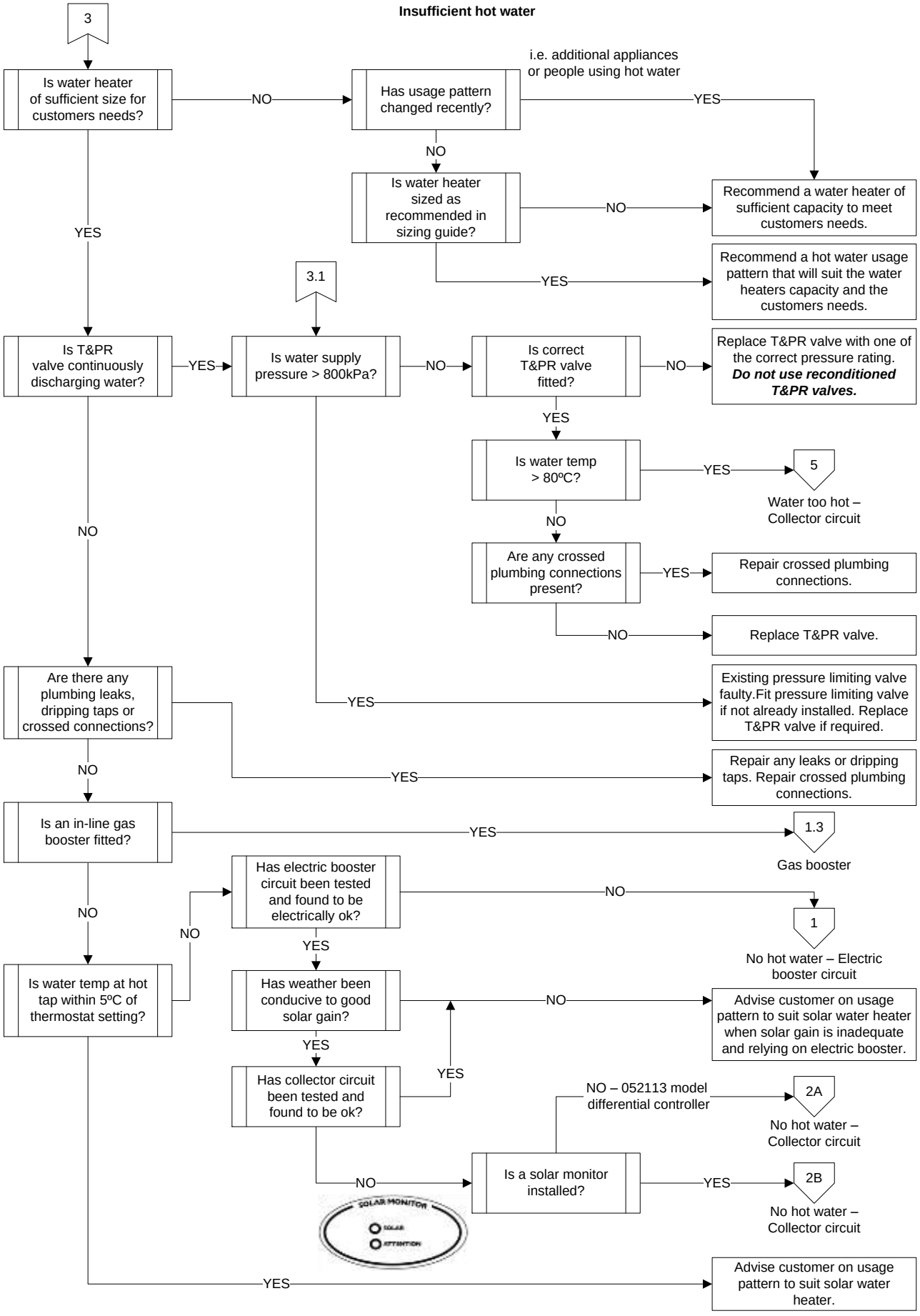


Fault Finding Chart 2.4

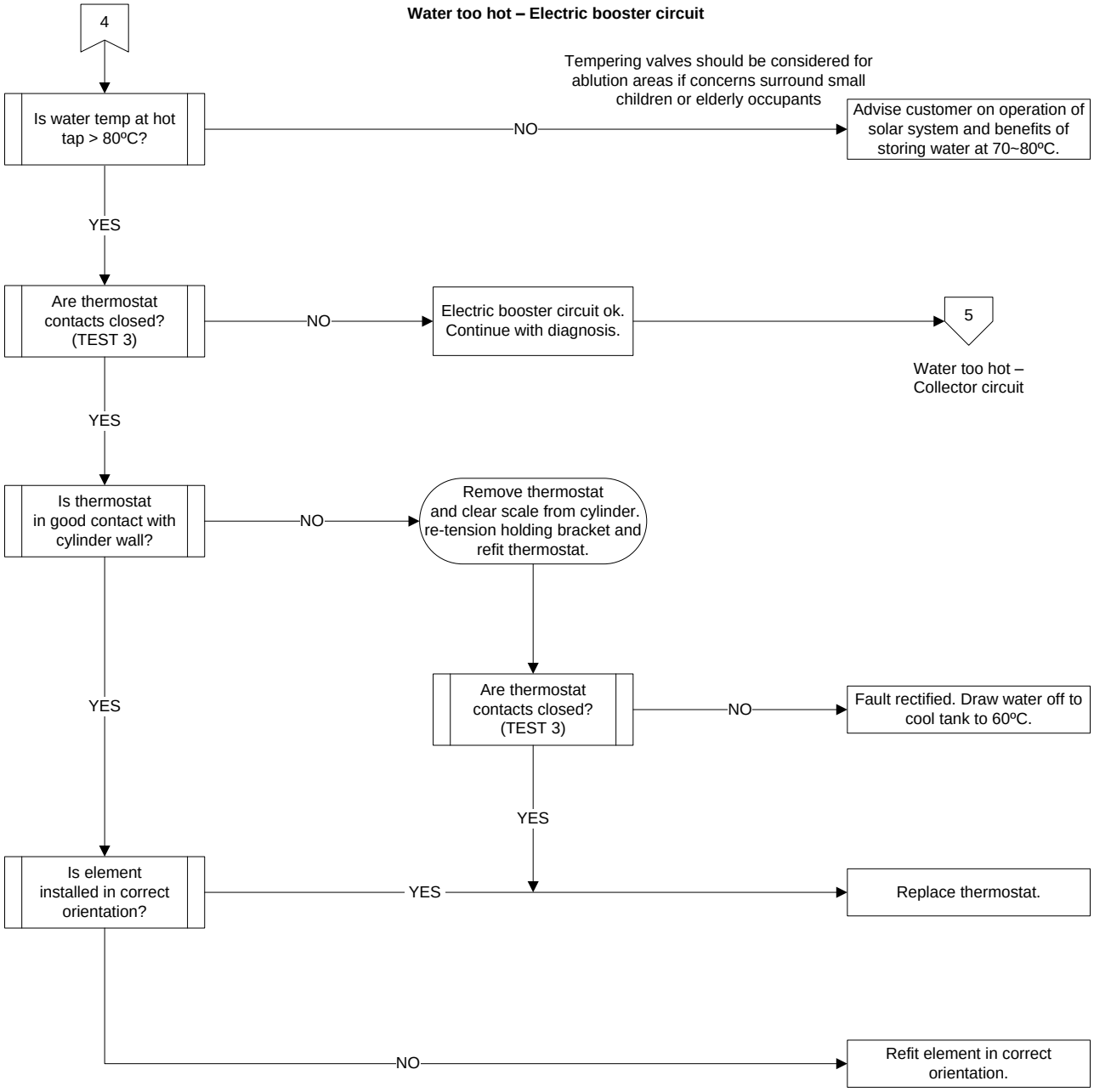


To reset differential controller turn power to controller off, wait 10 seconds then turn power back on again.

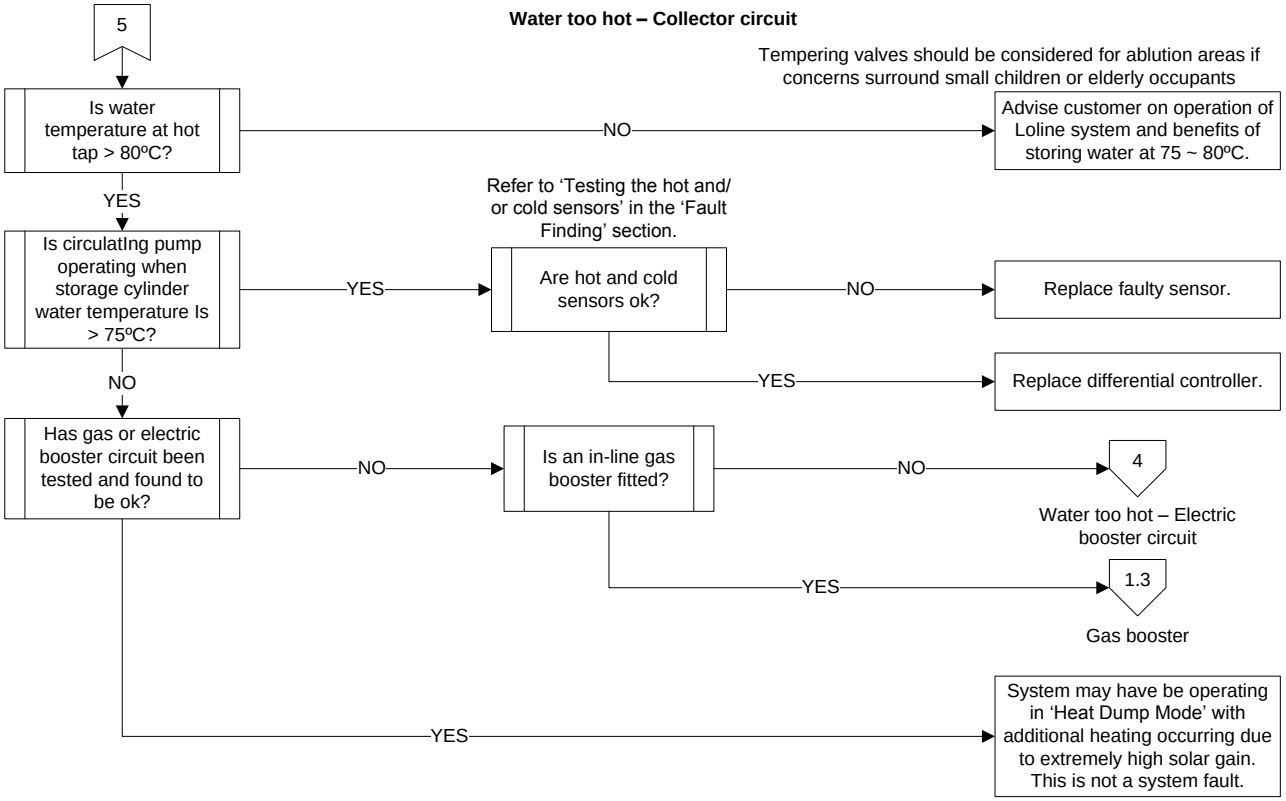
Fault Finding Chart 3 & 3.1



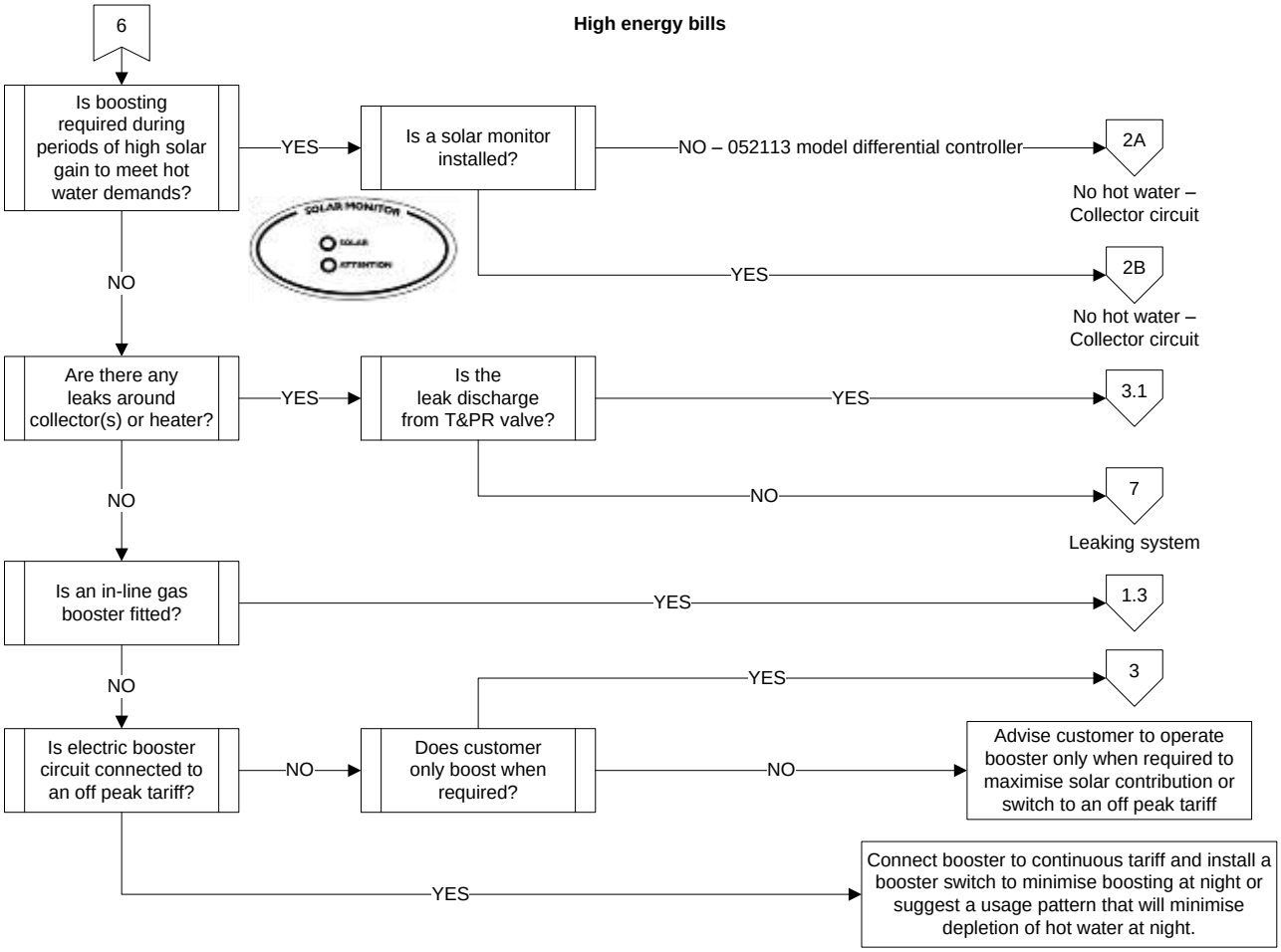
Fault Finding Chart 4



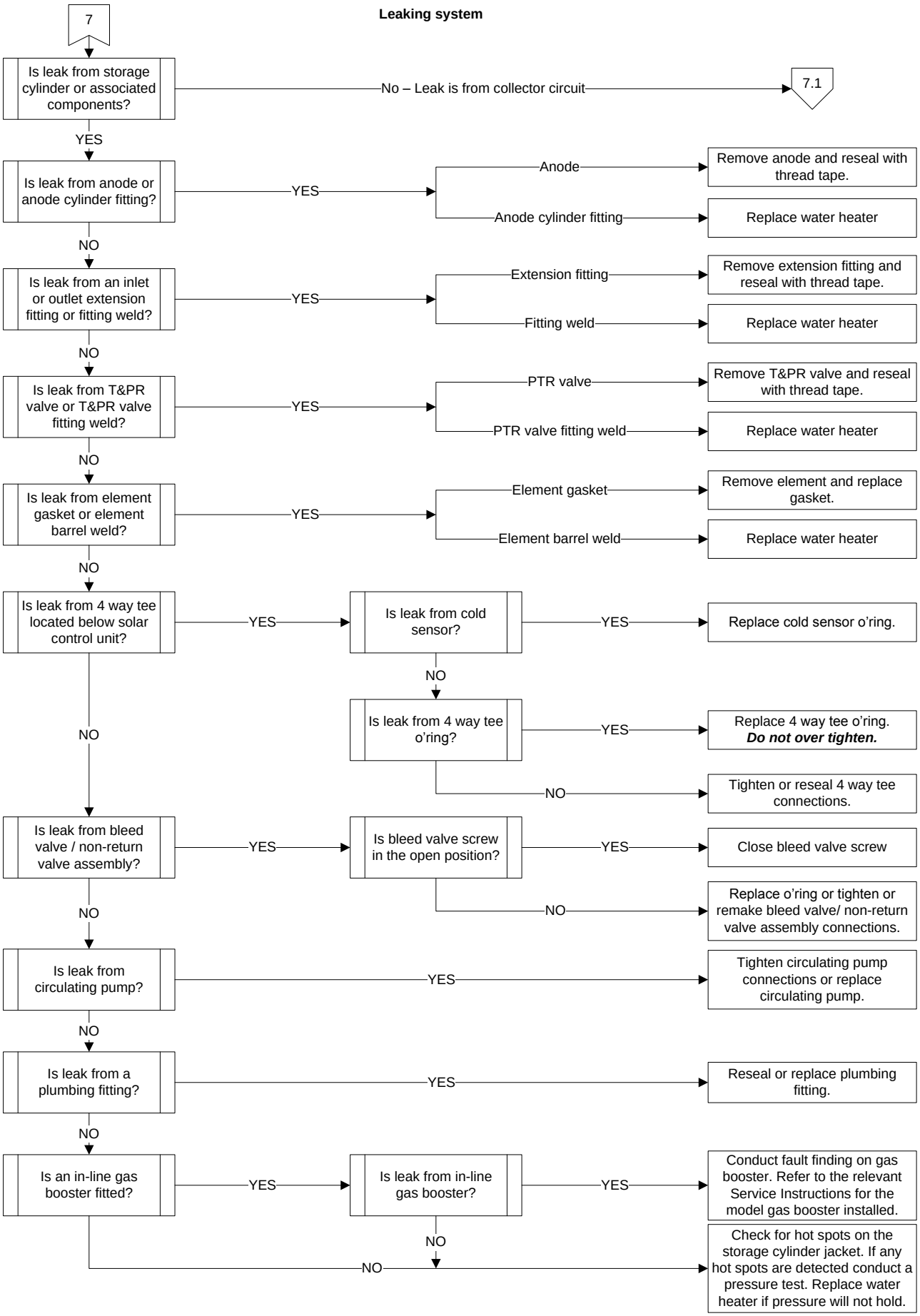
Fault Finding Chart 5



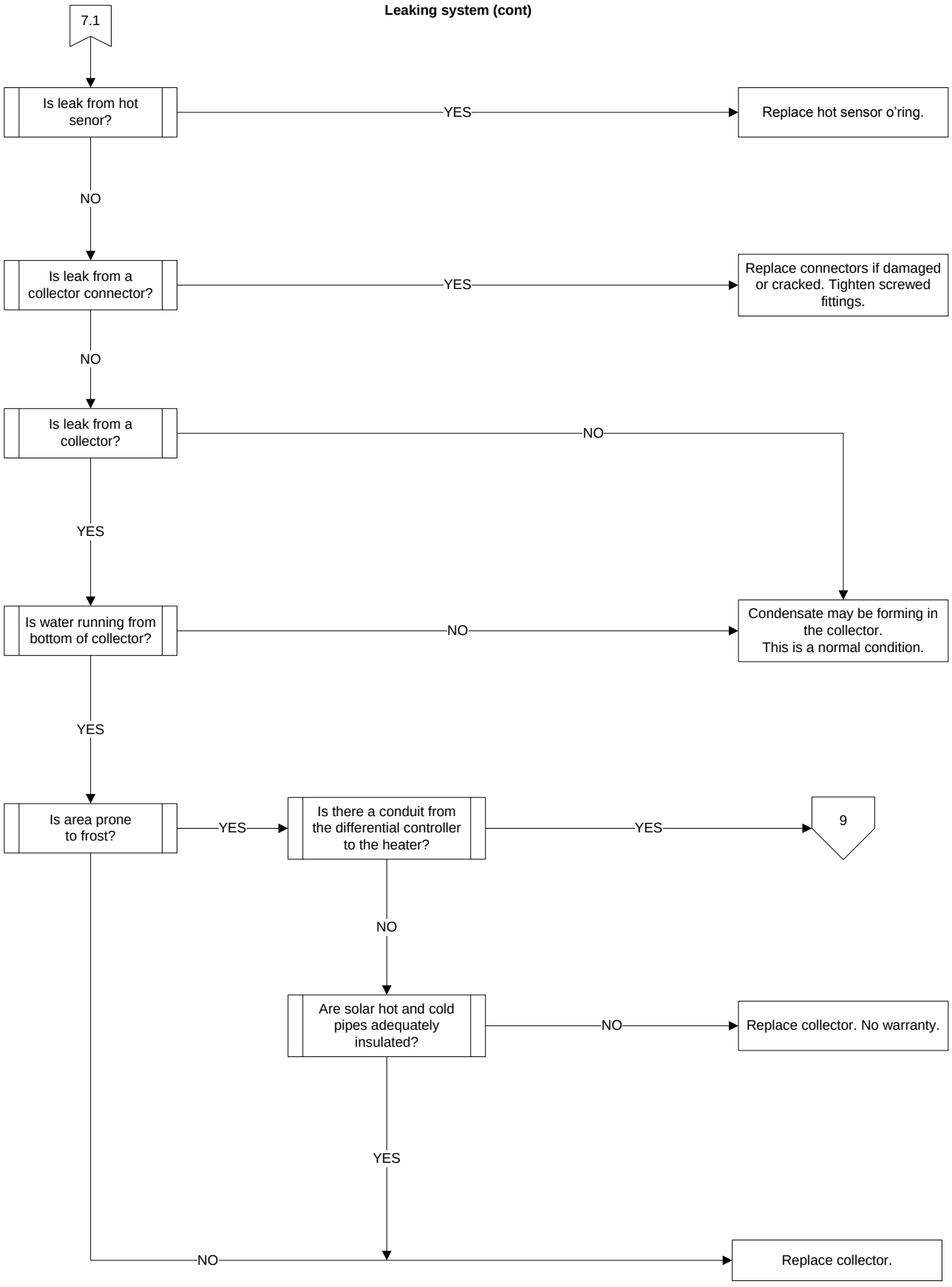
Fault Finding Chart 6



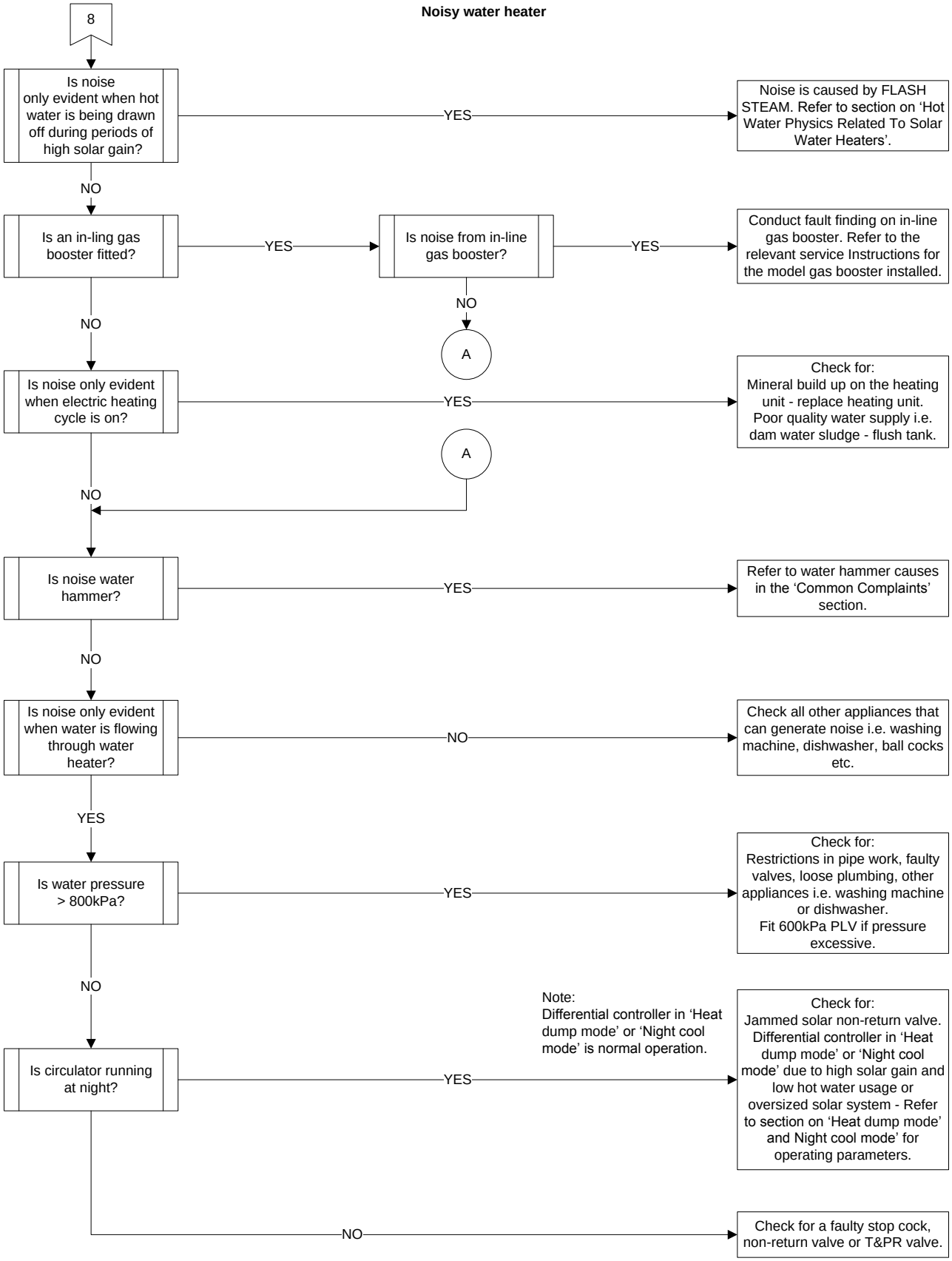
Fault Finding Chart 7



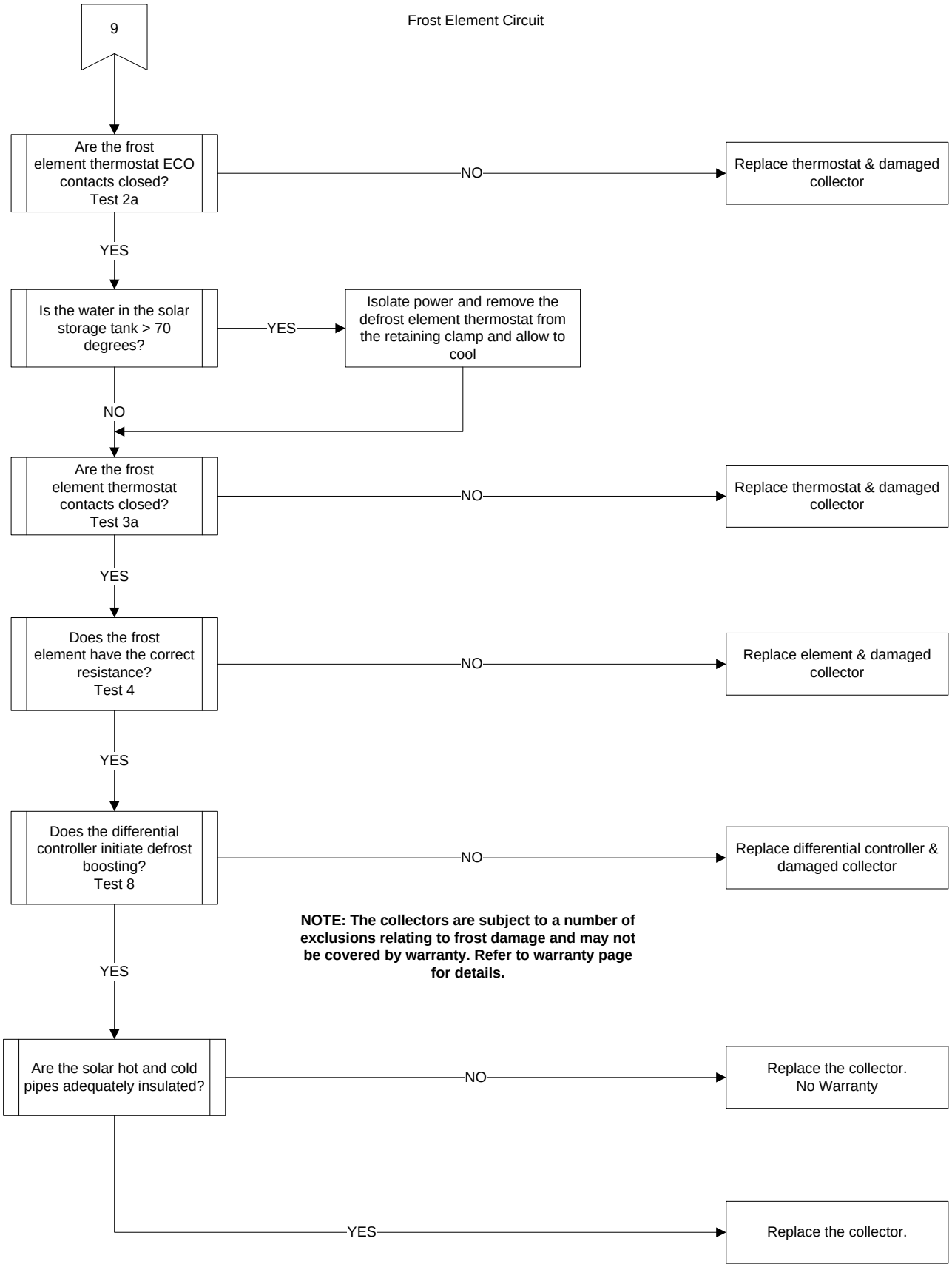
Fault Finding Chart 7.1



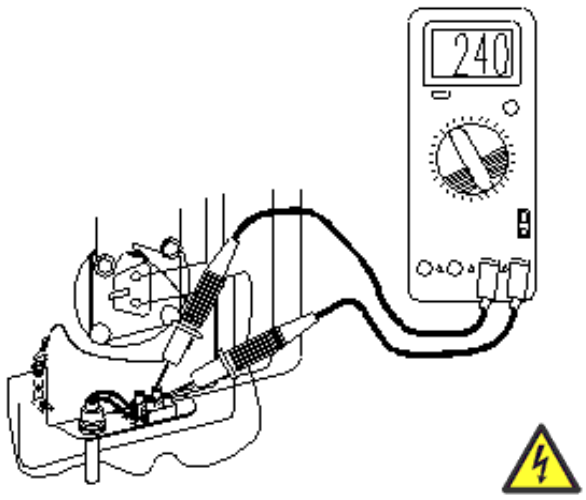
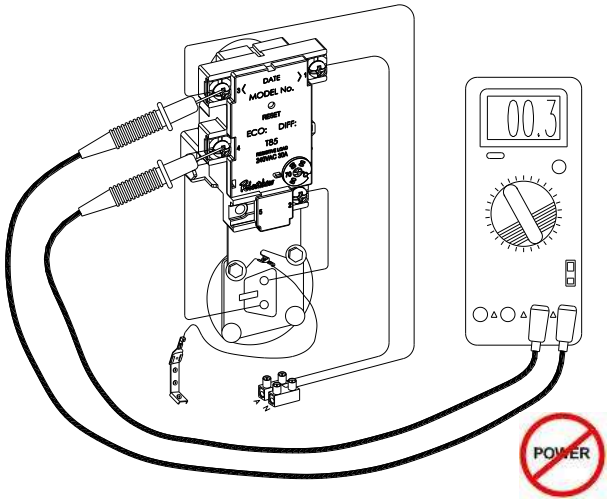
Fault Finding Chart 8

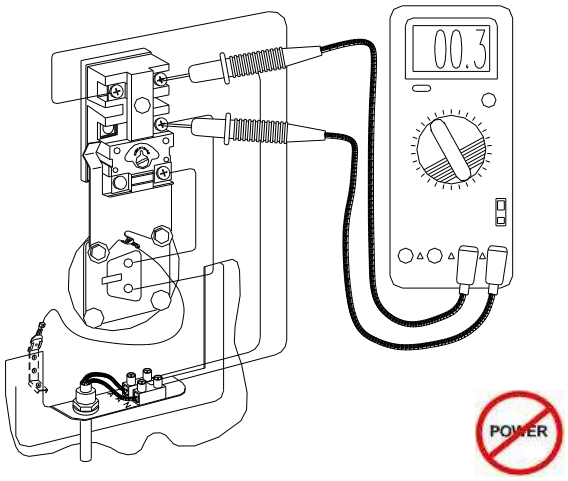
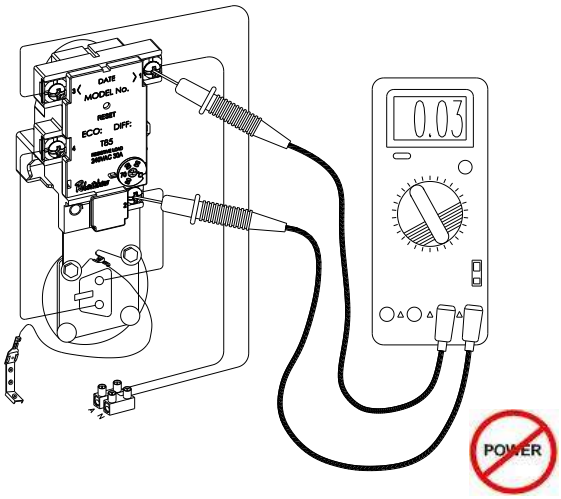


Fault Finding Chart 9



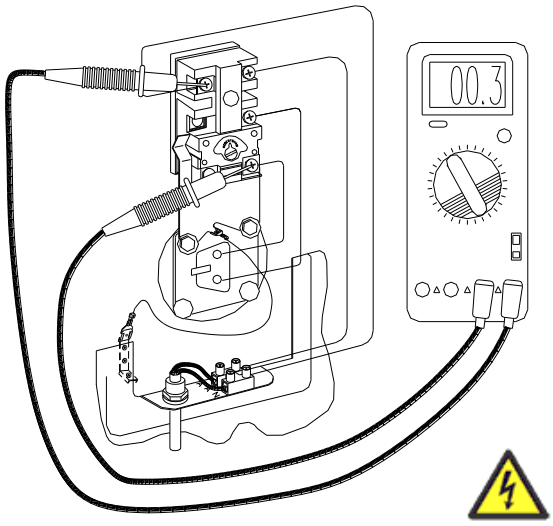
Fault Finding Tests 1 – 3

Test 1	Test 2A – ST Thermostat
	
Using a multimeter set on the AC voltage scale, measure between the Active terminal 'A' and the Neutral terminal 'N' on the terminal block. Normal voltage is 240 Volts AC.	Using a multimeter set on the resistance scale, measure between the thermostat terminals marked '3' and '4'. Normal resistance is less than 1 ohm when the ECO contacts are closed.

Test 2B – EWT Thermostat	Test 3A – ST Thermostat
	
Using a multimeter set on the resistance scale, measure between the thermostat terminals marked '3L' and '4L'. Normal resistance is less than 1 ohm when the ECO contacts are closed.	Using a multimeter set on the resistance scale, measure between the thermostat terminals marked '1' and '2'. Normal resistance is less than 1 ohm when the thermostat contacts are closed.

Fault Finding Tests 4 – 7

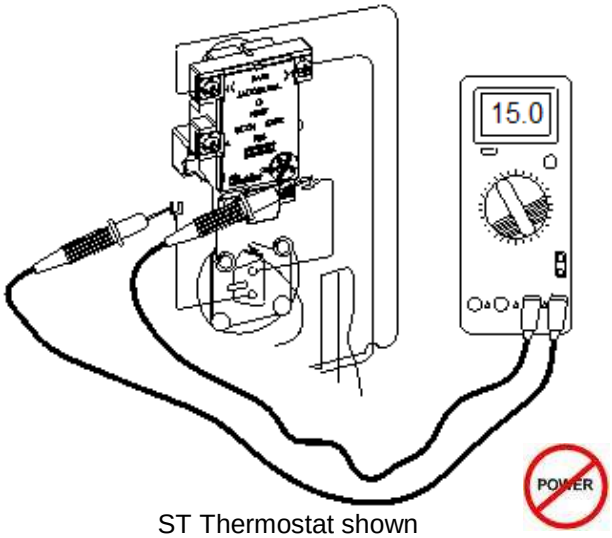
Test 3B – EWT Thermostat



Using a multimeter set on the resistance scale, measure between the thermostat terminals marked ‘1L’ and ‘2T’.

Normal resistance is less than 1 ohm when the thermostat contacts are closed.

Test 4

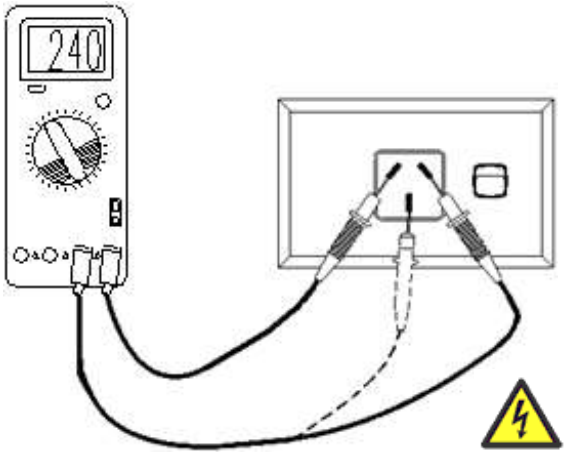


ST Thermostat shown

Disconnect both element wires from the thermostat and using a multimeter set on the resistance scale, measure between the two disconnected element wires. Normal resistance is as follows:

2.4kW element: 22-26 ohms +/- 10%
3.6kW element: 15-16 ohms +/- 10%
4.8kW element: 11-12 ohms +/- 10%

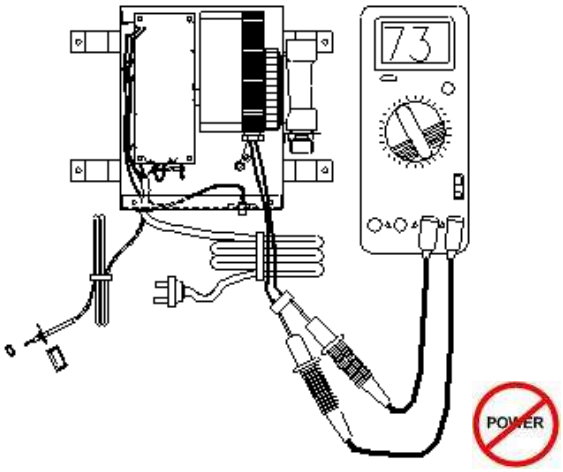
Test 5



Using a multimeter set on the AC voltage scale, measure between the 3 pin sockets on the GPO. The following results should be obtained when the GPO is switched on:

Active to Neutral – 240 Volts AC.
Active to Earth – 240 Volts AC.
Neutral to Earth – 0 Volts.

Test 6



Unplug circulator wiring plug from differential controller PCB and using a multimeter set on the resistance scale, measure between the circulator active and neutral wires on the circulator wiring plug. Normal resistance values are as follows:

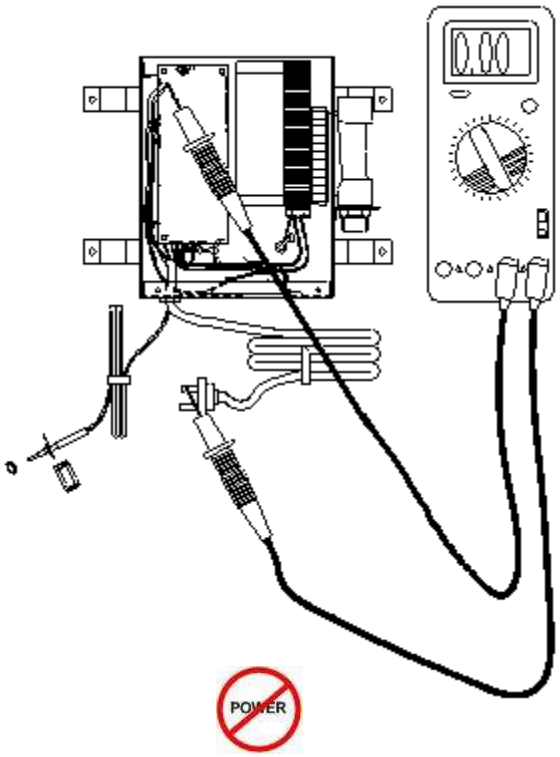
Wilo ZRS16/4-1KupP: 583 ohms +/- 5%
Salmson SB04-15: 73 ohms +/- 5%
Salmson NSB04-15: 73 ohms +/- 5%

Fault Finding Tests 7 & 8

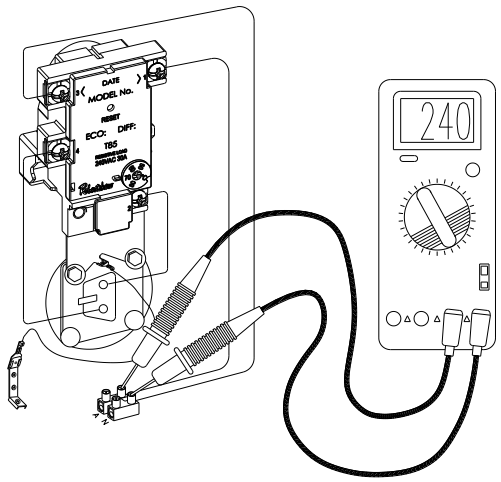
Test 7

1. Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.
2. Unplug solar control unit cord set plug from differential controller PCB.
3. Using a multimeter set on the resistance scale, measure between the active pin on the 3 pin plug and the active pin of the cord set differential controller plug.
4. Then measure between the neutral pin on the 3 pin plug and the neutral pin of the cord set differential controller plug.
5. Then measure between the earth pin on the 3 pin plug and the earth pin of the cord set differential controller plug.

Normal resistance is less than 1 ohm for each test.



Test 8



Isolate power to the heater and disconnect the hot and cold sensors.

Connect a ½ watt 22KΩ resistor across the hot sensor differential controller connection and a ½ watt 22KΩ resistor across the differential controller cold sensor connection.

Restore power to the heater and using a multimeter set on the AC volts scale measure the voltage at the storage tank terminal block.

Normal Voltage should be 240VAC

NOTE: The circulator will also commence operation.

Testing the Hot and/or Cold Sensors

The hot and cold sensors are both NTC (negative temperature coefficient) thermistors. The resistance value of the sensor will change according to the detected water temperature. The differential controller uses the resistance values of the sensors to determine system operation (circulating pump operation).

The differential controller can detect if a temperature sensor is open circuit or short circuit however it is possible for the sensor resistance to drift out of tolerance. This may cause the circulating pump to run continuously or not run at all.

The hot and cold sensors can be tested as follows:

1. Unplug the relevant sensor from the differential controller and using a multimeter set on the resistance scale, measure between the two sensor wires on the disconnected plug.
2. Refer to the Temperature / Resistance table opposite, look up the resistance value obtained in step 1 and note the corresponding temperature.
3. Using a spot temperature device, measure the actual temperature at the temperature probe location.

   Compare the temperature readings obtained in steps 2 & 3. The temperature values should be within ± 5%.

ºC	KΩ
0	23.73
10	15.45
20	10.31
30	7.037
40	4.905
50	3.485
60	2.521
70	1.853
80	1.384

Booster Circuit

It is a requirement of AS/NZS 3760 that an in-service test be performed when re-instating an appliance to service.

Following any repairs to the water heater ensure that both an earth continuity test and insulation test are carried out prior to completing service call as follows:

Personal Protective Equipment should be worn when conducting this procedure to reduce the risk of electric shock.

To check insulation resistance of the electric booster Neutral circuit (reading not to be below 1 mega-ohm).

1. ***Isolate the power supply to the water heaters booster circuit by removing fuse or switching off circuit breaker. Confirm with a multi-meter between the Active and Neutral at the electric booster terminal block that voltage is not present.***
2. Once satisfied, disconnect the power supply active and neutral wires from the terminal block.
3. Connect megger leads to the neutral of the water heater wiring and earth.
4. Operate megger on 500 VDC setting. A reading above 1 mega-ohm should be obtained.
5. If a reading below 1 mega-ohm is obtained, all component parts will need to be individually tested to locate the fault (refer to ‘Fault Finding Chart 1.2’ on page 41).

To check insulation resistance of the electric booster Active circuit (reading not to be below 1 mega-ohm).

6. Connect megger leads to the active of the water heater wiring and earth.
7. Operate megger on 500 VDC setting. A reading above 1 mega-ohm should be obtained.
8. If a reading below 1 mega-ohm is obtained, all component parts will need to be individually tested to locate the fault refer to ‘Fault Finding Chart 1.2’ on page 41).

To check “Continuity” of the electric booster electrical circuit.

9. Set megger to resistance scale or multimeter to x1 resistance scale and measure between the active and neutral wires on the water heater.
10. If a reading of less than 10 ohms or greater than 50 ohms is obtained, all electrical component parts will need to be individually tested to locate the fault (refer to ‘Test 4’ on page 56).
11. Reconnect power supply active cable to ‘A’ terminal and neutral cable to ‘N’ terminal at water heater terminal block.
12. Replace fuse or reset circuit breaker. ***Note: If continuing with diagnosis procedures do not replace fuse or reset circuit breaker.***

IN-SERVICE TESTING (continued)

Differential Controller

Wear Personal Protective Equipment when conducting these procedures to reduce the risk of electric shock. Refer to Rheem safety procedure on electrical testing.

Do not Megger test across the active and neutral pins of the solar control unit 3 pin plug. Damage will occur to the differential controller PCB.

Procedure 1: Check "Continuity" of the earth conductor.

1. ***Isolate power to the differential controller by switching off at power point and unplugging 3 pin plug from power point.***
2. Set multimeter to x1 resistance scale.
3. Measure between the Earth pin on the 3 pin plug and the heater jacket, a reading of ≤ 0.5Ω should be obtained. If a reading greater than 0.5Ω is returned check the earth connection at the water heater, if ok replace the cord.

Procedure 2: Insulation resistance of the Differential Controller Active Circuit (reading not to be below 1MΩ).

4. Connect megger leads to the Active and Earth pins of the 3 pin plug.
5. Operate megger. A reading above 1MΩ should be obtained.
6. If a reading below 1MΩ is indicated, all component parts will need to be individually tested to locate the fault.

Procedure 3: Insulation resistance of the Differential Controller Neutral Circuit. (Reading not to be below 1MΩ).

7. Connect megger leads to the Neutral and Earth pins of the 3 pin plug.
8. Operate megger. A reading above 1MΩ should be obtained.
9. If a reading below 1MΩ is indicated, all component parts will need to be individually tested to locate the fault.
10. Plug 3 pin plug back into power point and switch on power point. ***Note: If continuing with any diagnostic procedures do not perform this step.***

Purging Air from the Solar Collectors

An air eliminator is not fitted to the sequential freeze collector system. Upon completion of any repairs to the solar collectors, circulating pump, pipe work to and from the collectors or recommissioning if the cylinder has been drained, it will be necessary to purge any air from the collector circuit.

The following procedure should be performed in the morning, within three hours of sunrise, when the water temperature inside the solar collectors is lowest.

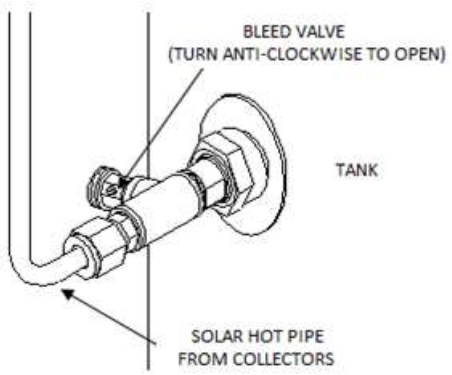
To purge air from the collector circuit:

1. Ensure solar storage cylinder is full of water and all premises hot taps are turned off.
2. Using a flat bladed screwdriver, rotate the bleed valve screw to the open position. The bleed valve is located on the solar hot water inlet (from collector) of the solar storage cylinder. Refer to diagrams shown below.
3. Mains pressure will force water to flow from the solar storage cylinder, through the pipe work and solar collectors, expelling any trapped air from the collector circuit through the bleed valve. This is evidenced by water and air spurting from the drain line connected to the bleed valve.

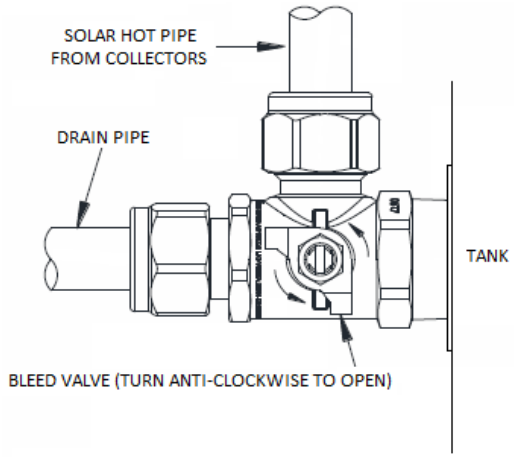
Water under pressure and up to 150ºC may be expelled through the bleed valve during the purging process; keep hands and face well clear and wear protective clothing to prevent scalding or burns.

4. Using a flat bladed screwdriver, close bleed valve when all air has been purged by rotating bleed valve. **Note:** when air is purged water will run freely without spluttering

Bleed Valve – Version A



Bleed Valve – Version B



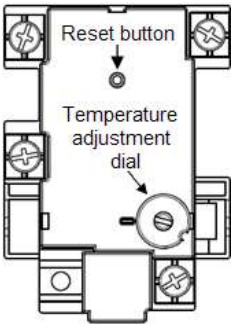
Electric Booster Thermostat Adjustment

The electric thermostat setting can be set by a qualified person to a minimum of 60°C and a maximum of 70°C (the booster thermostat has a factory setting of 70°C).

To adjust the thermostat:

Personal Protective Equipment should be worn when conducting step 3 of this procedure to reduce the risk of electric shock.

1. ***Isolate power to electric booster circuit by switching off the circuit breaker or isolator marked "Hot Water" or "Water Heater" at the switchboard***.
2. Remove 2 screws retaining electric booster access cover and remove cover.
3. ***Confirm with a multi-meter between the Active and Neutral at the electric booster terminal block that voltage is not present.***
4. Turn thermostat temperature adjustment dial clockwise to increase temperature setting or anticlockwise to decrease temperature setting.
5. Replace access cover.
6. Restore the power supply to the water heater.



Checking Gas Booster Flow Rate & Outlet Temperature

Refer to the relevant Service Instructions for the gas booster model installed

COMPONENT REPLACEMENT PROCEDURES

Draining the Solar Storage Cylinder (Procedure 1)

Elevated temperatures may be present during the draining process. Personal Protective Equipment should be worn to prevent the risk of scalding.

Personal Protective Equipment should be worn when conducting step 4 of this procedure to reduce the risk of electric shock.

1. ***Isolate power to electric booster circuit by switching off the circuit breaker or isolator marked "Hot Water" or "Water Heater" at the switchboard.***
2. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
3. Remove two screws retaining electric booster access cover and remove cover.
4. ***Confirm with a multi-meter between the Active and Neutral at the electric booster terminal block that voltage is not present.***
5. ***Isolate the water supply to the water heater*.**
6. ***Relieve pressure from the water heater through the T&PR valve or a hot tap***.
7. Disconnect the cold water supply pipe to the storage cylinder.
8. Fit a drain hose to the storage cylinders cold water connection and run the other end to a drain or safe location.
9. Open the T&PR valve to allow air into the system.

Removing or Replacing an SCT/SBT Series Solar Collector (Procedure 2)

Water under pressure and at temperatures up to 150ºC 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 power to electric booster circuit by switching off the circuit breaker or isolator marked "Hot Water" or "Water Heater" at the switchboard.***
2. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
3. ***Isolate the water supply to the water heater.***
4. ***Relieve pressure from the water heater through T&PR valve or a hot tap.***
5. Disconnect the hot and cold pipes to the collectors at the water heater and cap the outlets to prevent the cylinder from draining. The collectors will now drain down.
6. 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.
7. Remove the retaining clip/s and spring clips from the inter-connectors at the top and bottom of the collector. Do not stand on the collectors.
8. 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.
9. Reassemble in reverse order of above.

10. Once reassembly is complete, restore the water supply and check for leaks.
11. Open all hot water taps in premises including shower(s).
12. Close each hot water tap after all air is purged (when air is purged, water will run freely without air bubbles or spluttering).
13. Purge the collector circuit of air (refer to 'Purging Air from the Solar Collectors' on page 61). **Note:** Air trapped in the system can prevent solar gain from occurring and cause the system to operate on the electric booster only.
14. Restore the power supplies to the electric booster and solar control unit.

Removing or Replacing an NPT / HBT / TBT / LCS Solar Collector (Procedure 3)

Water under pressure and at temperatures up to 150ºC 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 power to electric booster circuit by switching off the circuit breaker or isolator marked "Hot Water" or "Water Heater" at the switchboard.***
2. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
3. ***Isolate the water supply to the water heater.***
4. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
5. Disconnect the hot and cold pipes to the collectors at the water heater and cap the water heater fittings to prevent the cylinder from draining. The collectors will now drain down.
6. Depending on which collector requires replacement disconnect the hot or cold pipe from the collector fitting.
7. Unscrew the hot or cold collector adapter fitting from the collector.
8. Undo the collector unions at the top and bottom of the collector. Do not stand on the collector.
9. Remove the bolts from the clamps retaining the collector to the angle bracket and slide the collector out and remove to ground level.
10. Reassemble in reverse order of above.
11. Once reassembly is complete, restore the water supply and check for leaks.
12. Open all hot water taps in premises including shower(s).
13. Close each hot water tap after all air is purged (when air is purged, water will run freely without air bubbles or spluttering).
14. Purge the collector circuit of air (refer to 'Purging Air from the Solar Collectors' on page 61). **Note:** Air trapped in the system can prevent solar gain from occurring and cause the system to operate on the electric booster only.
15. Restore the power supplies to the electric booster and solar control unit.

Removing or Replacing a Titan or Australis Solar Collector (Procedure 4)

Water under pressure and at temperatures up to 150ºC 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 power to electric booster circuit by switching off the circuit breaker or isolator marked "Hot Water" or "Water Heater" at the switchboard.***
2. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
3. ***Isolate the water supply to the water heater.***
4. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
5. Disconnect the hot and cold pipes to the collectors at the water heater and cap the water heater fittings to prevent the cylinder from draining. The collectors will now drain down.
6. Depending on which collector requires replacement disconnect the hot or cold pipe from the collector fitting.
7. Unscrew the hot or cold collector adapter fitting from the collector.
8. Undo the collector unions at the top and bottom of the collector. Do not stand on the collector.
9. Remove the screws retaining the collector to the top and bottom collector angles and slide the collector out and remove to ground level.
10. Reassemble in reverse order of above.
11. Once reassembly is complete, restore the water supply and check for leaks.
12. Open all hot water taps in premises including shower(s).
13. Close each hot water tap after all air is purged (when air is purged, water will run freely without air bubbles or spluttering).
14. Purge the collector circuit of air (refer to 'Purging Air from the Solar Collectors' on page 61). **Note:** Air trapped in the system can prevent solar gain from occurring and cause the system to operate on the electric booster only.
15. Restore the power supplies to the electric booster and solar control unit.

Differential Controller PCB – Solar Control Unit with Wilo Pump (Procedure 5A)

This procedure is only for solar control units with a Wilo pump. If the solar control unit has a Salmson pump perform procedure 5B.

1. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
2. Remove 2 screws retaining solar control unit access cover and remove cover.
3. Mark and unplug power supply wiring plug from PCB.
4. Mark and unplug circulating pump wiring plug from PCB.
5. Mark and unplug solar monitor wiring plug from PCB (depress locking tab on plug when removing).
6. Using a 7mm socket, remove single 7mm nut and star washer retaining PCB mounting bracket to stud located behind solar monitor.

7. Lift PCB mounting bracket out of stud, slide mounting bracket out of second stud located above circulating pump and remove mounting bracket complete with PCB.
8. Mark and unplug hot and cold sensor wiring plugs from PCB (hot rear, cold front).
9. Using a pair of long nose pliers, gently release the 4 clips retaining the differential controller PCB and remove PCB.
10. Reassemble in reverse order of above ensuring all wiring plugs are connected correctly.
11. Restore power to solar control unit by plugging 3 pin plug into GPO and switching on GPO.

Differential Controller PCB – Solar Control Unit with Salmson Pump (Procedure 5B)

This procedure is only for solar control units with a Salmson pump. If the solar control unit has a Wilo pump perform procedure 5A.

1. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
2. Remove 2 screws retaining solar control unit access cover and remove cover.
3. Using a pair of long nose pliers, gently release the 4 clips retaining the differential controller PCB and remove PCB.
4. Mark and unplug circulating pump wiring plug from PCB.
5. Mark and unplug power supply wiring plug from PCB.
6. Mark and unplug hot and cold sensor wiring plug from PCB.
7. Reassemble in reverse order of above ensuring all wiring plugs are connected correctly.
8. Restore power to solar control unit by plugging 3 pin plug into GPO and switching on GPO.

Cold Sensor – Solar Control Unit with Wilo Pump (Procedure 6A)

This procedure is only for solar control units with a Wilo pump. If the solar control unit has a Salmson pump perform procedure 6B.

1. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
2. Remove 2 screws retaining solar control unit access cover and remove cover.
3. Mark and unplug solar monitor wiring plug from PCB (depress locking tab on plug when removing).
4. Mark and using a pair of long nose pliers, unplug hot and cold sensor wiring plugs from PCB (hot rear, cold front).
5. Depress locking tab on sensor wiring gland and withdraw sensor wiring gland out from PCB mounting bracket.
6. Open wiring gland and remove wiring gland from sensor wiring.
7. Repeat steps 5 and 6 for cold sensor wiring gland on left side of solar control unit.
8. Cut cable ties retaining cold sensor insulation piece and remove insulation.
9. Unclip cold sensor (retaining clip) from cold pipe and withdraw cold sensor wiring out from solar control unit.
10. Reassemble in reverse order of above ensuring all wiring plugs are connected correctly.
11. Restore power to solar control unit by plugging 3 pin plug into GPO and switching on GPO.

Cold Sensor – Solar Control Unit with Salmson Pump (Procedure 6B)

This procedure is only for solar control units with a Salmson pump. If the solar control unit has a Wilo pump perform procedure 6A.

Elevated temperatures may be present. Personal Protective Equipment should be worn to prevent the risk of scalding.

1. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
2. ***Isolate the water supply to the water heater.***
3. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
4. Remove 2 screws retaining solar control unit access cover and remove cover.
5. Using a pair of long nose pliers, gently release the 4 clips retaining the differential controller PCB and remove PCB.
6. Undo gland nut (located underneath solar control unit) retaining cold sensor wiring.
7. Unplug cold sensor wiring plug from PCB and pull wiring out of gland.
8. Feed replacement cold sensor wiring up through gland and plug into PCB.
9. Tighten gland nut securely and push PCB back onto clips until PCB locks on clips.
10. Refit solar control unit cover.
11. Remove spring clip retaining cold sensor in ‘T’ piece, and remove cold sensor.
12. Fit replacement sensor into ‘T’ piece and secure with spring clip. Ensure clip retains the locating washer.
13. Restore water supply and check for leaks at cold sensor.
14. Restore power to solar control unit by plugging 3 pin plug into GPO and switching on GPO.

Hot Sensor (Procedure 7)

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

1. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
2. ***Isolate the water supply to the water heater.***
3. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
4. Remove spring clip retaining hot sensor in connector and remove hot sensor.
5. Fit replacement sensor into connector and secure with spring clip. Ensure clip retains the locating washer.
6. Cut existing sensor wiring and connect to replacement sensor. Ideally this connection should be made in the roof space. **Note:** If the connection is made on the roof, ensure the connection is water and UV proof.
7. Restore water supply and check for leaks at hot sensor.
8. Purge the collector circuit of air (refer to ‘Purging Air from the Solar Collectors’ on page 61). **Note:** Air trapped in the system can prevent solar gain from occurring and cause the system to operate on the electric booster only.
9. Restore power to solar control unit by plugging 3 pin plug into GPO and switching on GPO.

Anode (Procedure 8)

Elevated temperatures may be present. Personal Protective Equipment should be worn to prevent the risk of scalding.

1. ***Isolate power to electric booster circuit by switching off the circuit breaker or isolator marked "Hot Water" or "Water Heater" at the switchboard.***
2. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
3. ***Isolate the water supply to the water heater.***
4. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
5. Remove anode cap.
6. Using a tube or socket spanner remove the anode (32 mm spanner for 3/4" anode and 36 mm spanner for 1" anode).
7. Apply thread sealing tape to replacement anode, refit and tighten.
8. Restore water supply and check for leaks at anode.
9. Refit anode cap.
10. Purge air from the system through hot taps.
11. Restore the power supplies to the electric booster and solar control unit

Solar Control Unit Cord Set – Solar Control Unit with Wilo Pump (Procedure 9A)

This procedure is only for solar control units with a Wilo pump. If the solar control unit has a Salmson pump perform procedure 9B.

1. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
2. Remove 2 screws retaining solar control unit access cover and remove cover.
3. Remove cord anchor (located on left side of solar control unit) retaining cord set.
4. Unplug cord set wiring plug from PCB, mark and disconnect cord set wiring from plug and withdraw cord set wiring out from control box.
5. Feed replacement cord set through opening in control box, connect wiring to PCB plug and plug into PCB.
6. Fit cord anchor to replacement cord set and insert anchor securely into solar control unit box.
7. Refit solar control unit access cover.
8. Restore power to solar control unit by plugging 3 pin plug into GPO and switching on GPO.

Solar Control Unit Cord Set – Solar Control Unit with Salmson Pump (Procedure 9B)

This procedure is only for solar control units with a Salmson pump. If the solar control unit has a Wilo pump perform procedure 9A.

1. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
2. Remove 2 screws retaining solar control unit access cover and remove cover.
3. Remove cord anchor (located underneath solar control unit) retaining cord set.
4. Using a pair of long nose pliers, gently release the 4 clips retaining the differential controller PCB and remove PCB.
5. Unplug cord set wiring plug from PCB.
6. Feed replacement cord set up through the opening in the control box and plug into PCB.
7. Fit cord anchor to replacement cord set and insert anchor securely into solar control unit box.
8. Push PCB back onto clips until PCB locks on clips.
9. Refit solar control unit access cover.
10. Restore power to solar control unit by plugging 3 pin plug into GPO and switching on GPO.

Circulating Pump – Solar Control Unit with Wilo Pump (Procedure 10A)

This procedure is only for solar control units with a Wilo pump. If the solar control unit has a Salmson pump perform procedure 10B.

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

1. ***Using a flat bladed screwdriver, rotate the bleed valve screw to the open position and purge water through the collectors to dissipate excess temperature.*** The bleed valve is located on the solar hot water inlet (from collector) of the solar storage cylinder (labelled “Connection for Solar Return Pipe). Refer to diagram in the ‘Purging Air from the Solar Collectors’ section on page 61.
2. Close bleed valve once excess temperature is removed.
3. ***Isolate power to electric booster circuit by switching off the circuit breaker or isolator marked “Hot Water” or “Water Heater” at the switchboard.***
4. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
5. ***Isolate the water supply to the water heater.***
6. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
7. Close T&PR valve or hot tap.
8. Remove 2 screws retaining solar control unit access cover and remove cover.
9. Unplug pump wiring plug from PCB then mark and disconnect pump wiring from plug.
10. Undo large brass nut on left side of solar control unit and gently pull pipe work with non return valve away from pump inlet. Do not loose rubber mating washer.

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

11. Undo large brass nut on right side of pump and gently pull pipe work away from pump. Do not loose rubber mating washer.
12. Remove pump complete with wiring from solar control unit.
13. To separate pump body from impellor housing, mark pump body and impellor housing for later realignment then remove four Allen head screws using a 5mm Allen key. Pull pump body away then remove impellor and large washer. Skip this step if the entire pump is being replaced.
14. Reassemble in 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 water supply and check for leaks at pump.
16. Purge the collector circuit of air (refer to 'Purging Air from the Solar Collectors' on page 61). **Note:** Air trapped in the system can prevent solar gain from occurring and cause the system to operate on the electric booster only.
17. Purge air from the system through hot taps.
18. Refit solar control unit cover.
19. Restore the power supplies to the electric booster and solar control unit.

Circulating Pump – Solar Control Unit with Salmson Pump (Procedure 10B)

This procedure is only for solar control units with a Salmson pump. If the solar control unit has a Wilo pump perform procedure 10A.

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

1. ***Using a flat bladed screwdriver, rotate the bleed valve screw to the open position and purge water through the collectors to dissipate excess temperature.*** The bleed valve is located on the solar hot water inlet (from collector) of the solar storage cylinder (labelled "Connection for Solar Return Pipe). Refer to diagram in the 'Purging Air from the Solar Collectors' section on page 61.
2. Close bleed valve once excess temperature is removed.
3. ***Isolate power to electric booster circuit by switching off the circuit breaker or isolator marked "Hot Water" or "Water Heater" at the switchboard.***
4. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
5. ***Isolate the water supply to the water heater.***
6. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
7. Close T&PR valve or hot tap.
8. Remove 2 screws retaining solar control unit access cover and remove cover.
9. Using a pair of long nose pliers, gently release the 4 clips retaining the differential controller PCB and remove PCB.

10. Unplug pump wiring from PCB.
11. Undo large brass nut retaining pump motor to pump body and remove pump motor.

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

12. Remove Philips head screw from pump head and unclip the top cover.
13. Loosen cable entry gland, disconnect wiring from pump motor and remove motor.
14. Reconnect wiring to replacement pump.
15. Reassemble in 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.
16. Restore water supply and check for leaks at pump.
17. Purge the collector circuit of air (refer to 'Purging Air from the Solar Collectors' on page 61). **Note:** Air trapped in the system can prevent solar gain from occurring and cause the system to operate on the electric booster only.
18. Purge air from the system through hot taps.
19. Refit solar control unit cover.
20. Restore the power supplies to the electric booster and solar control unit.

Booster Thermostat (Procedure 11)

Elevated temperatures may be present. Personal Protective Equipment should be worn to prevent the risk of scalding.

Personal Protective Equipment should be worn when conducting step 3 of this procedure to reduce the risk of electric shock.

1. ***Isolate power to electric booster circuit by switching off the circuit breaker or isolator marked "Hot Water" or "Water Heater" at the switchboard.***
2. Remove two screws retaining electric booster access cover and remove cover.
3. ***Confirm with a multi-meter between the Active and Neutral at the electric booster terminal block that voltage is not present.***
4. Mark and disconnect thermostat wiring.
5. Note thermostat setting and slide thermostat out from under retaining clamp.
6. Remove any scale from cylinder surface.
7. Fit replacement thermostat under clamp and set temperature noted in step 4 (factory setting is 60ºC).
8. Reconnect wiring as per the wiring diagram located on the rear of the booster access cover.
9. Refit booster access cover.
10. Restore the power supply to the electric booster.

Frost Thermostat (Procedure 12)

5A2325 Models Only

Elevated temperatures may be present. Personal Protective Equipment should be worn to prevent the risk of scalding.

Personal Protective Equipment should be worn when conducting step 3 of this procedure to reduce the risk of electric shock.

1. ***Isolate power to the differential controller by switching off the GPO and unplugging 3 pin plug.***
2. Remove two screws retaining frost element access cover and remove cover.
3. Mark and disconnect thermostat wiring.
4. Note thermostat setting and slide thermostat out from under retaining clamp.
5. Remove any scale from cylinder surface.
6. Fit replacement thermostat under clamp and set temperature noted in step 4 (factory setting is 60ºC).
7. Reconnect wiring as per the wiring diagram located on the rear of the booster access cover.
8. Refit frost element access cover.
9. Restore power to solar control unit.

Booster Element (Procedure 13)

Elevated temperatures may be present during element removal process. Personal Protective Equipment should be worn to prevent the risk of scalding.

When a fault or leak is traced to the electric booster element, the storage cylinder should be drained to prevent damage to flooring or floor coverings by accidental flooding.

1. Drain the water heater (refer to procedure 1).
2. When the water heater is drained, undo the four element screws, removing thermostat clamp first.
3. Withdraw the element. Care must be taken to ensure the loop of the element does not catch in the cylinder opening and open out inside the cylinder.

   NOTE: Do not cut off the element and leave a portion inside the cylinder.
4. Clean around cylinder fitting, fit a new gasket to the new element and slide the element into the cylinder taking care that it is in the correct orientation. Refer to element flange for orientation directions. **Note:** Never reuse old element gaskets.
5. Replace screws and thermostat clamp and tighten. **Note:** The element retaining screws are tightened only until the return edge bottoms on the cylinder flange – do not over tighten.

6. The earthing of the internal storage cylinder relies on a good electrical contact between the metal surround of the element flange and the cylinder barrel flange.

   An earth continuity test should be performed whenever an element or element gasket is replaced, adjusted or serviced in any way. This continuity test is performed between the heaters internal storage cylinder and the main earth terminal of the water heater with a resulting reading of not more than 0.5 ohms as required by AS/NZS 3000 6.3.3.2.

7. Restore water supply and fill the storage cylinder. Release air by gently lifting the easing lever on the T&PR valve until water runs from the drain or opened hot taps.
8. Check for water leaks around the element flange.
9. Conduct an In Service Test (refer to 'In Service Testing' on page 59).
10. Replace booster access cover.
11. Restore the power supply to the electric booster and solar control unit.

Frost Element (Procedure 14)

5A2325 Models Only

Elevated temperatures may be present during element removal process. Personal Protective Equipment should be worn to prevent the risk of scalding.

When a fault or leak is traced to the frost element, the storage cylinder should be drained to prevent damage to flooring or floor coverings by accidental flooding.

1. Drain the water heater (refer to procedure 1).
2. Remove two screws retaining frost element access cover and remove cover.
3. When the water heater is drained, undo the four element screws, removing thermostat clamp first.
4. Withdraw the element. Care must be taken to ensure the loop of the element does not catch in the cylinder opening and open out inside the cylinder.

   NOTES:

   - ***Do not cut off the element and leave a portion inside the cylinder.***
   - ***The replacement element must not exceed 1200W or damage will occur to the differential controller.***

5. Clean around cylinder fitting, fit a new gasket to the new element and slide the element into the cylinder taking care that it is in the correct orientation. Refer to element flange for orientation directions. **Note:** Never reuse old element gaskets.
6. Replace screws and thermostat clamp and tighten. **Note:** The element retaining screws are tightened only until the return edge bottoms on the cylinder flange – do not over tighten.
7. Restore water supply and fill the storage cylinder. Release air by gently lifting the easing lever on the T&PR valve until water runs from the drain or opened hot taps.

8. Check for water leaks around the element flange.
9. Conduct an In Service Test (refer to 'In Service Testing' on page 59).
10. Replace Booster and Frost Element access covers.
11. Restore the power supply to the electric booster and solar control unit.

Frost Element Wiring Harness (Procedure 15)

1. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
2. Remove 2 screws retaining solar control unit access cover and remove cover.
3. Remove two screws retaining frost element access cover and remove cover.
4. At the water heater - Disconnect the earth wire from the earth tab, separate the active and neutral wires and spade connections. Undo the locking nut from the conduit terminator and remove the conduit and wiring from the heater.

   At the solar control unit -
5. Disconnect the conduit from the conduit clips securing the conduit to the water heater and remove the assembly.
6. Refit the replacement wiring harness in the reverse of above ensuring all connections are tight and the conduit is resecured correctly at the water heater and the solar control unit.

Solar Monitor (Procedure 16)

7. ***Isolate power to solar control unit by switching off solar control unit GPO and removing solar control unit 3 pin plug.***
8. Remove 2 screws retaining solar control unit access cover and remove cover.
9. Unplug solar monitor wiring plug from PCB (depress locking tab on plug when removing).
10. Remove solar monitor from front fascia of controller casing. The solar monitor is held in position by an adhesive and can be peeled off.
11. Reassemble in reverse order of above.
12. Restore power to solar control unit by plugging 3 pin plug into GPO and switching on GPO.

SCT/SBT Collectors with PPS Connectors (Rheem 511 & Solahart SLV Models)

The superseded SCT/SBT series collectors, when in use, utilised a unique method for connecting the collectors together and for coupling the hot and cold pipes to the collector.

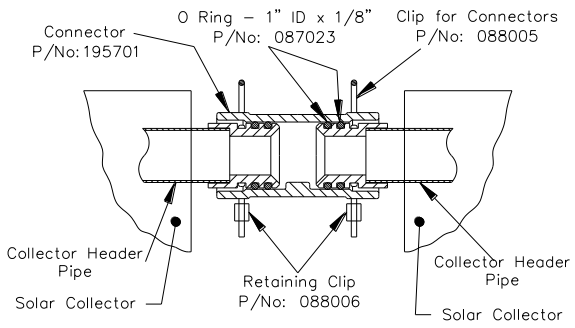
The collector header pipes have 3 slots machined into the pipe end to locate 2 o-rings and a stainless steel retaining clip.

A connector or end cap manufactured from PPS is then slipped over the o-rings and retained by a stainless steel spring clip.

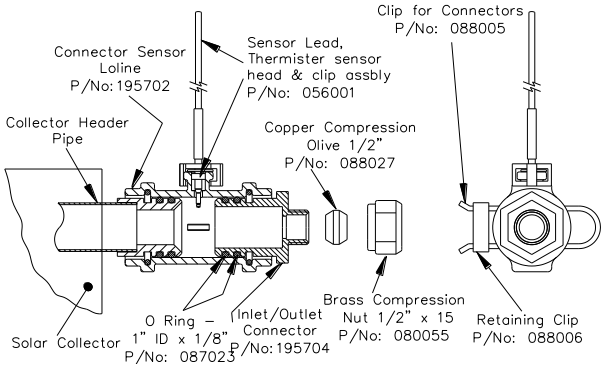
The spring clips are secured closed via a retaining clip placed around the legs. An adapter is fitted into the connector to allow connection of the hot and cold pipes via a ½" nut and olive.

Note: PPS connectors should be replaced with brass connectors on systems experiencing continual problems with leaking PPS connectors i.e. installations in areas prone to severe temperature fluctuations. To convert PPS connectors to brass connectors refer to 'Conversion Procedure – PPS to Brass Connectors' on page 76.

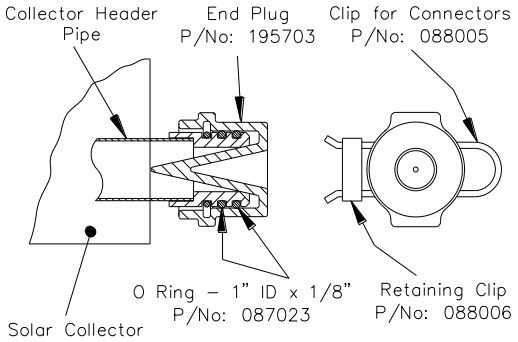
Inter-Connector



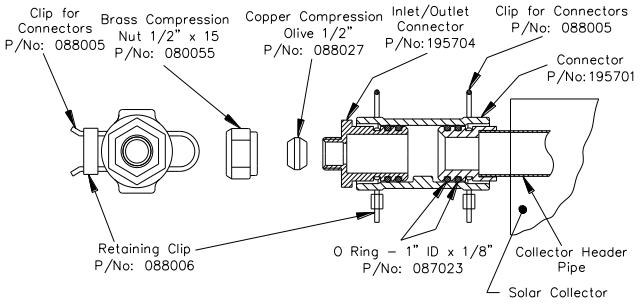
Connector with sensor well



End Cap



Cold Connector



SCT/SBT Collectors with Brass Connectors (Rheem 511 & Solahart SLV Models)

PPS connectors should be replaced with brass connectors on installations experiencing continual problems with leaking PPS connectors i.e. installations in areas prone to severe temperature fluctuations.

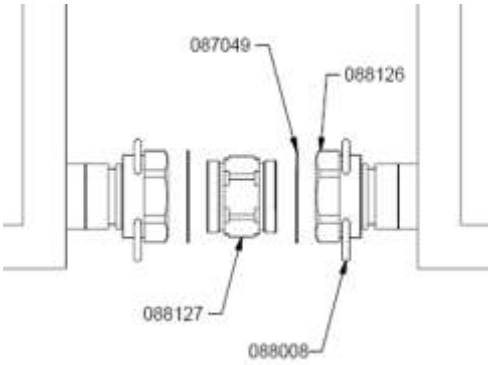
Brass connectors utilize the same new method as PPS connectors for connecting the collectors together and for coupling the hot and cold pipes to the collector.

The collector header pipes have 3 slots machined into the pipe end to locate 2 o-rings and stainless steel retaining clip.

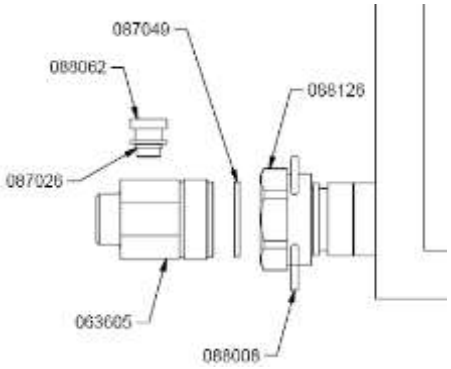
A connector or end cap manufactured from brass is then slipped over the o-rings and retained by a stainless steel spring clip.

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 ½" nut and olive.

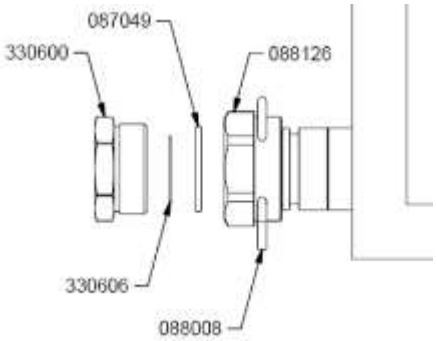
Inter-Connector



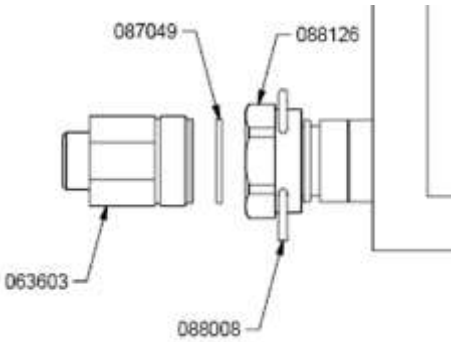
Connector with sensor well



End Cap



Cold Connector



Conversion Procedure – PPS Connectors to Brass Connectors

Brass connectors are supplied in kit form with all the necessary components required to replace the corresponding PPS connector. Available kits are as follows:

Connector	PPS Kit Part Number	Brass Kit Part Number
Collector inter-connector	195701	195701B
Hot connector	195702	195702B
End cap	195703	195703B
Cold connector	195704	195704B

The contents of each kit are as follows:

Kit	Description	Part Number	Quantity
195701B Inter-connector	Brass adaptor	088126	2
	Spring clip	088008	2
	Sealing washer	087049	2
	Brass connector	088127	1
195702B Hot connector	Brass adaptor	088126	1
	Spring clip	088008	1
	Sealing washer	087049	1
	Temp send brass connector	063605	1
	Sensor nipple	088062	1
	O-ring	087026	1
195703B End cap	Brass adaptor	088126	1
	Spring clip	088008	1
	Sealing washer	087049	1
	Blanking disk	330606	1
	Gland nut	330600	1
195704B Cold connector	Brass adaptor	088126	1
	Spring clip	088008	1
	Sealing washer	087049	1
	Brass connector - cold	063603	1

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 150ºC may be present in the collector/s. Flush the collectors with cold water by opening the bleed valve. 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.

To convert a 2 collector array to brass connectors 2 x 195701B, 1 x 195702B, 2 x 195703B and 1 x 195704B kits will be required.

The gap between the collectors will increase when brass inter-connectors are fitted however this increase is offset by a reduction in length of the hot and cold connections, resulting in an overall reduction of approx 10mm between the connection points across the collector array.

When fitting the inter-connectors (195701B) to systems with 2 collectors or more in the array it will be necessary to remove any screws holding the collectors to the bottom rail and disconnect both the hot and cold pipes to the collectors.

Follow the fitting instructions provided with the inter-connectors, once installed the gap between the collectors will increase from approx 79mm to 97mm (an increase of 18mm). Re-centre the array between the hot and cold pipe roof penetrations and secure the collectors to the bottom rail.

Replace the hot connector (195702B) and cold connector (195704B) following the instructions provided in the kit. Both these connections will reduce from a length of approx to 113mm to 99mm (a reduction of 14mm per connection) resulting in an overall reduction of 10mm across a 2 panel array.

Replace the 2 end caps (195703B) following the instructions in the kit and reconnect the flow and return lines, some modification of the pipe work will possibly be required.

Flood the system with water and bleed the circuit at the bleed valve adjacent to the solar storage cylinder, check for leaks and restore power.

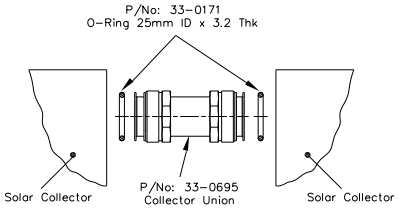
NPT Connectors (Rheem) & L Connectors (Solahart)

The NPT and L series collectors utilize the traditional method for connecting the collectors together and for coupling the hot and cold pipes to the collector.

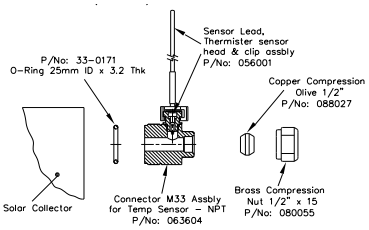
An o-ring is inserted into the collector header pipe and is retained either by a blanking disc and nut, an inter-connector and nut or a hot/cold adapter which is screwed into place sealing against the o-ring.

The hot and cold adapters have a thread to allow connection of the hot and cold pipes via a ½" nut and olive.

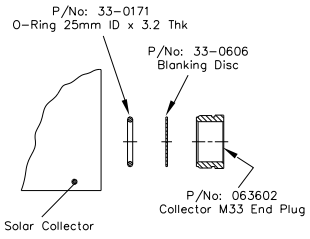
Inter-Connector



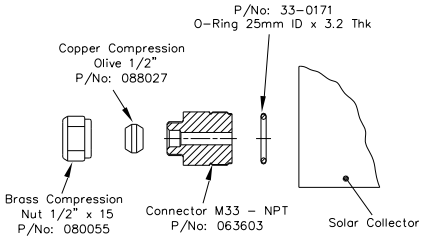
Connector with sensor well



End Cap



Cold Connector



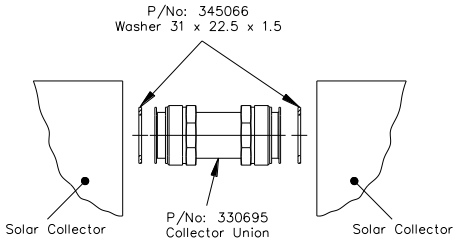
Australis & Titan Connectors (Edwards GTD models)

The Australis, Australis 2, Titan and Titan 2A collectors utilize the traditional method for connecting the collectors together and for coupling the hot and cold pipes to the collector.

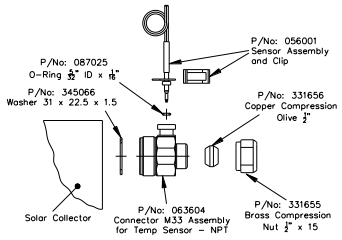
A sealing washer is inserted into the collector header pipe and is retained either by a blanking disc and nut, an inter-connector and nut or a hot/cold adapter which is screwed into place sealing against the sealing washer.

The hot and cold adapters have a thread to allow connection of the hot and cold pipes via a ½" nut and olive.

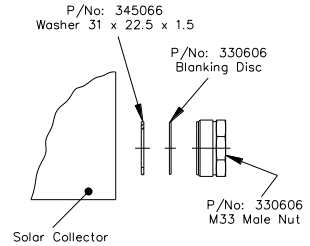
Inter-Connector



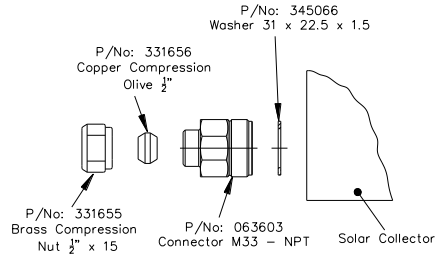
Connector with sensor well



End Cap



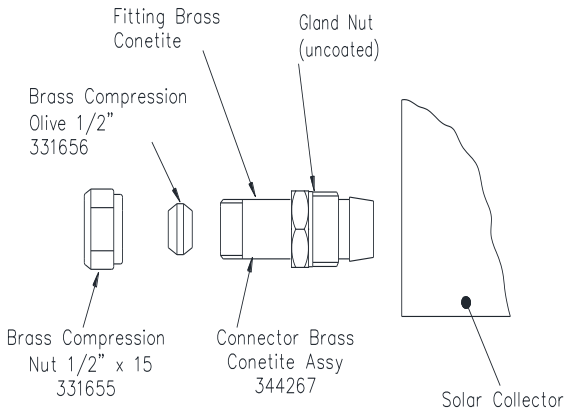
Cold Connector



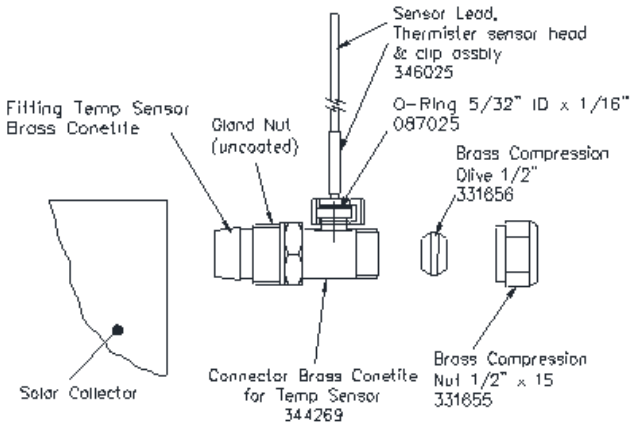
HBT / LCS / TBT Collectors (Rheem & Solahart models)

The hot and cold pipe adapters have conetite connections at the collector end and a ½" BSP thread at the other end to allow connection of the cold pipes via a ½" nut and olive (refer to diagrams below).

Cold Connector



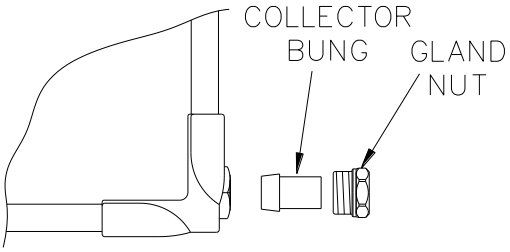
Hot Connector with Hot Sensor Tee



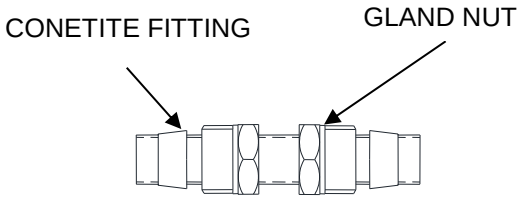
NOTE:
The hot sensor is enclosed within a direct temperature well. The sensor is retained by a spring clip and is supplied with 20 metres of cable for connection to the differential controller. Refer to page 37 for further information regarding sensor resistances and fault-finding.

The brass compression nut ½" is joined with the ½" insulated hot pipe which is not supplied in the roof kit.

The unused connection on the collector is sealed with a bung assembly also consisting of a conetite fitting and union assembly is used to connect collectors.



Blanking Plug



Collector Union Assembly

DOCUMENT REVISION HISTORY

Title: Direct Solar Loline (Electric Boosted) Service Instructions	Document N^{o}: TM007

REV	DETAILS OF CHANGE	D.O.I.
A	Service Instructions issued for 511 series Loline with electric boosting	31/08/01
B	References to Southcorp Water Heaters replaced by Rheem Australia Pty Ltd. Model 511430 added	01/03/02
C	Warranty statement corrected, Format, operation and exploded views updated	07/06/06
AD	Additions to product changes section; Amalgamation of brands; flow charts revised to new format; LCS, HBT & TBT collector changes; warranty statement removed; Exploded views and parts lists removed, now form part of SPM-LLS Loline Spare Parts Manual.	19/02/15
AE	Addition of Touch Voltage Testing; Solar controller kit 299284 (12/2016) & Solar controller kit 299293 (07/2018)	23/08/18
AF	Addition of 5A2325 Models	11/12/19