Rheem Australia Pty Ltd

ABN 21 098 823 511

SERVICE INSTRUCTIONS

310 Series Heat Pump

TM025

Revision: AF

Issued: March 2016

Rheem	551310
Everhot	251310
Solahart	310HAV
Edwards	40467791

First Issued March 2007

CONTENTS

INTRODUCTION

The information provided in these instructions is based on the water heater being installed in accordance with AS/NZS 3500.4, AS/NZS 3000 and the Owner's Guide and Installation Instructions booklet provided with each water heater.

Should you require further technical advice on a 310 Series Heat Pump Water Heater contact Rheem Technical Support.

SAFETY WARNING

The purpose of this Service Manual is to provide sufficient information to allow a person with the skills as required by the controlling Regulatory Authorities to carry out effective repairs to a 310 Series Heat Pump Water Heater in the minimum amount of time.

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

General warning symbol. Observe the instructions accompanying the symbol.

"Live" testing to be conducted. Personal Protective Clothing (PPE) shall be worn to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

Isolate power before conducting the indicated test

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

WARNING: The heat pump must <u>NEVER</u> be operated with the refrigeration system open to atmosphere.

POWER SUPPLY

310 Series Heat Pumps will only operate on a sine wave at a frequency of 50 Hz. Devices generating a square or saw tooth wave cannot be used to supply power to the water heater.

ENVIRONMENTAL

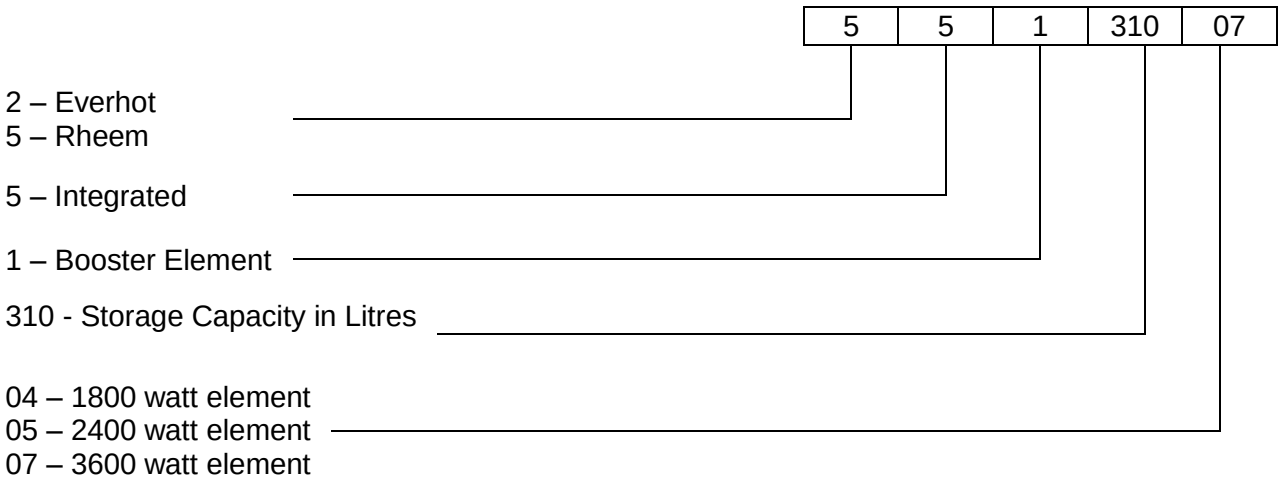
R134a refrigerant is a controlled substance under the Ozone Protection and Synthetic Greenhouse Gas Management Act. Only personnel qualified and licensed to work with refrigerants may carry out service and repair work on the sealed refrigeration system. During repair the refrigerant must always be recovered, never vented to the atmosphere.

At the end of the service life of a Rheem heat pump, the refrigerant must be recovered by personnel qualified and licensed to work with refrigerants prior to the unit being disposed of. Refrigerants must not be vented to atmosphere.

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.

Rheem / Everhot Model Identification



Solahart Model Identification

* For details refer to the product's Owner's Guide.

Edwards Model Identification

HEAT PUMP WATER HEATER MODELS

The 310 Series Heat Pump consists of a Storage Tank and a Heat Pump Module, which combine to make up the complete heat pump water heater.

The table below details the model numbers of the Storage Tanks and Heat Pump Modules that comprise each model of heat pump water heater.

“xx” indicates the booster element capacity:

- 04 = 1.8kW
- 05 or 24 or 28 = 2.4kW
- 07 or 36 or 29 = 3.6kW

Brand	Model		Storage Tank		Heat Pump Module
Rheem	551310xx	=	T551310xx	+	180532
Everhot	251310xx	=	T251310xx	+	180552
Solahart	310HAVxx	=	T310HAVxx	+	180533
Edwards	40467791xx	=	40467700xx	+	4000770009

SPECIFICATIONS

Storage Tank

Parameter		Model	
		551310	251310 310HAV 40467791
Capacity (Litres)		310	310
Boost Mode Capacity (Litres)		220	220
Limp Mode Capacity (Litres)		111	111
Booster Element Rating (kW)		1.8 / 2.4 / 3.6	2.4 / 3.6
T&PR Valve Rating (kPa)		1000	1000
Maximum Inlet Water Pressure (kPa)	With ECV	680	680
	Without ECV	800	800
Water Connections	Inlet / Outlet	Rp ¾" (20mm)	Rp ¾" (20mm)
	Heat Pump	Rp ½" (15mm)	Rp ½" (15mm)
	T&PR	Rp ½" (15mm)	Rp ½" (15mm)
Anode	Quantity	1	1
	Length	1153	1153
Booster Element Controller Thermostat Setting (Fixed)		62°C	62°C
Booster Element Mechanical Thermostat Setting (Fixed)		70°C	70°C
Booster Element ECO Setting		88°C	88°C

Heat Pump Module

Parameter	180532 / 180552 / 180533 / 4000770009
Superheat Setting (Factory)	6K at 10ºC saturated suction temperature
Refrigerant Type / Charge	R134a / 1050 grams
Compressor Capacitor	35 µF +10/–5%, 370/440V AC, 50/60Hz
Compressor Current Draw	6.4A
Compressor Internal Overload Setting (Automatic Reset)	Cut Out: 150°C Cut In: 90°C
Compressor Winding Resistance	Run Winding – Red & Blue: 2.2Ω at 20ºC Start Winding – Red & Black: 3.3Ω at 20ºC
High Pressure Switch[1]	Cut out: 2930kPa (+/- 100kPa) Manual reset to close < 2240kPa (+/- 200kPa)
Fan Capacitor	2µF, 450V AC, 50/60Hz
Fan Winding Resistance	Run Winding – Black & Brown: 184Ω at 20ºC Start winding – Black & Blue: 238Ω at 20ºC
Salmson Circulator Winding Resistance	75.3Ω at 20ºC
Grundfos Circulator Winding Resistance on Speed Setting 1	602Ω at 20ºC
Grundfos Circulator Capacitor	1.5µF +2/–5%
Grundfos Circulator Speed Setting	1

[1] HPS only applicable to models produced from 31/03/2016

PREVENTATIVE MAINTENANCE

It is suggested that the water heater be serviced annually, to retain optimum performance.

Annual Service

- Check for discharge from the T&PR valve. When the heat pump or element is operating a small discharge of water may be evident. Operate the valve, easing the lever to ensure the valve opens and reseats properly. Always open and close the valve gently.
- Check for leaks at all fittings.
- Check for signs of excessive corrosion on the water heater and heat pump jackets.
- Check for sludge build up and if necessary drain and flush tank.
- Clear the circulator impellor & ensure free rotation.
- Clean the condensate tray and check the condensate drain for blockages – clear if necessary.
- Clean blockages and debris from evaporator fins, fan blades, grilles and louvers.
- ***Isolate power*** to the water heater and check all electrical connections for signs of overheating due to poor connection.
- Conduct an 'Electrical Insulation Test' on the water heater, refer to page 81.
- Check for vibration or excess noise from the compressor, fan and circulator.
- Check the refrigerant charge by inspecting the sight glass.
- Visually check the unit for any potential problems.
- Confirm correct heat pump module operation.

Five Year Service

- Replace the T&PR valve.
- Inspect and flush the expansion control valve (if fitted). If required, replace the valve.
- Inspect and if required, replace the anode.
- If the anode is not replaced, it should be replaced within three years of this service.
- Check the heating element for excessive calcium build up or corrosion and replace if necessary.
- Check for leaks at all fittings.
- Check for signs of excessive corrosion on the water heater and heat pump jackets.
- Check for sludge build up and if necessary drain and flush tank.
- Clear the circulator impellor & ensure free rotation.
- Clean the condensate tray and check the condensate drain for blockages – clear if necessary.
- Clean blockages and debris from evaporator fins, fan blades, grilles and louvers.
- ***Isolate power*** to the water heater and check all electrical connections for signs of overheating due to poor connection.
- Conduct an 'Electrical Insulation Test' on the water heater, refer to page 81.
- Check for vibration or excess noise from the compressor, fan and circulator.
- Check the refrigerant charge by inspecting the sight glass.
- Visually check the unit for any potential problems.
- Confirm correct heat pump module operation.

STORAGE TANK

Thermostat: Storage tanks manufactured from 14/08/2007 have an ST type thermostat in place of the EWT type thermostat. The new ST thermostat is part number 052017, and the storage tank wiring is revised to suit the new thermostat. The revised wiring diagram may be found on page 34.

Double Sensor Strip: Storage tanks manufactured from 31/10/2007 have a double sensor strip in place of the single sensor strip. Only one sensor strip is utilised for operation, the second sensor strip is provided for redundancy in the event that the first sensor strip fails.

If the sensor strip in service fails and the spare sensor strip is plugged in, the plug must be cut off the failed sensor strip so it is functionally and visibly disabled and can't be inadvertently re-used.

Sensor Strip Replacement Kit: An externally retrofittable sensor strip field kit is available, for use in the event that both sensor strips have failed. The Sensor Strip Replacement Kit is Rheem part number 299306.

Hot Water Return Diffuser: Storage tanks manufactured from 8/08/2013 have a diffuser and new seal on the hot water return fitting. The diffuser and seal replace the short dropper tube and dropper tube seal. The diffuser improves temperature stratification in the storage tank.

Obsolete Models: Everhot, Solahart & Edwards branded models are no longer available. Rheem branded product is compatible and is to be used if replacement is required.

HEAT PUMP MODULE

TX Valve: Heat pump modules manufactured from May 2007 have a TX valve with a brass body. Heat pump modules manufactured prior to this time have a TX valve with a stainless steel body. The superheat setting on both valve types is the same.

Automatic Air Eliminator: Heat pump modules manufactured from 14/05/2009 have an automatic air eliminator installed between the outlet of the circulator and the heat exchanger. The automatic air eliminator purges any potential air locks which may occur upon initial installation or after servicing.

The Automatic Air Eliminator is also available in kit form, for retrofitting to models manufactured prior to 14/05/2009. The Automatic Air Eliminator Kit is Rheem part number 290142.

> **NOTE:** 310 Series Heat Pumps require a minimum supply water pressure of 200kPa to operate correctly. Fitment of this kit will NOT overcome operational problems where the supply water pressure is not ***maintained*** at 200kPa or higher.

Vermin Shield Kit: A retrofittable vermin shield kit is available, for use in the event that vermin are entering and damaging the heat pump module controller. The vermin shield is fitted to controller chassis and works in conjunction with the controller cover. The Vermin Shield Kit is Rheem part number 294008.

Service Valves: Heat pump modules manufactured from 2/02/2011 have suction and discharge Schrader valves fitted to the refrigeration system.

Evaporator Sensor & Clip: Heat pump modules manufactured from 17/05/2011 have a revised evaporator sensor and clip. The evaporator sensor is changed to Rheem part number 056023 and has a dedicated clip, Rheem part number 056022. The new

evaporator sensor has the same temperature / resistance relationship as the other heat pump module sensors.

Start Temperatures: Heat pump modules manufactured from 16/10/2012 have the temperatures at which heat pump heating is started modified in the controller firmware. The start heating temperatures have been changed from S3 < 50°C or S4 < 44.5°C, to S3 < 49°C or S4 < 43°C.

Grundfos Circulator and Heat Pump Module Upgrade: Heat pump modules manufactured from 8/08/2013 (from serial number 2HP0000019) utilise a Grundfos circulator and contain a number of design improvements. The full scope of changes includes the following:

- Grundfos circulator
- Addition of water circuit check valve
- Revised controller
    - Addition of plugged fan connection
    - Revised circulator connection
    - Revised firmware
        - Addition of LED status codes
        - Addition of Freeze Protection Mode
        - Addition of compressor start delay
        - Revised circulator speed control algorithm
- Revised controller cover
- Addition of operating status LED panel
- Revised heat exchanger water inlet and outlet sensors
- Addition of protection to flexible hoses to prevent damage from rubbing

- A retrofittable kit is available which allows existing installed heaters to be upgraded to include the same improvements incorporated into models manufactured from 8/08/2013.

  The kit, known as the Grundfos Circulator Kit is Rheem part number 290604.

  NOTE:
    - The Grundfos circulator, controller and temperature sensors in the kit MUST be fitted together. The kit comprises a system and requires that all of the components are installed. The Grundfos circulator, controller and temperature sensors are interdependent and failure to install all of the components in the kit will result in malfunction of the water heater.
    - The Automatic Air Eliminator Kit (290142) must be fitted prior to fitting the Grundfos Circulator Kit (290604).

Suction Line: Heat pump modules manufactured from 3/12/2013 (from serial number 1HP0003203) have a revised suction line.

Suction Line Brace: Heat pump modules manufactured from 1/04/2014 have a brace added to the evaporator coil. The brace is mounted to the evaporator coil end plate and the suction line is secured to the brace. The brace secures the suction line to prevent excess movement, which may result in line breakage in the event of rapid power cycling to the compressor due to the failure of an electronic component.

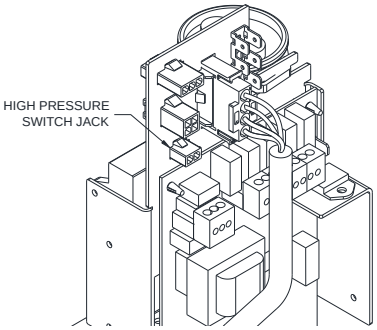
WARNING: The suction line brace <u>MUST</u> be fitted whenever the heat pump is in operation.

Addition of High Pressure Switch: Heat pump modules manufactured from 31/03/2016 have a high pressure switch (HPS) fitted to provide additional high pressure protection. The HPS is fitted in the liquid line between the condenser and the drier and will trip (open circuit) in the event of an over-pressure situation. A trip of the high pressure switch will result in the following:

- Compressor ceases operation
- Element heating enabled
- Fan continues to operate
- Pump continues to operate
- Flashing red LED displayed (4 or 5 flashes depending on external conditions)
- Green LED off

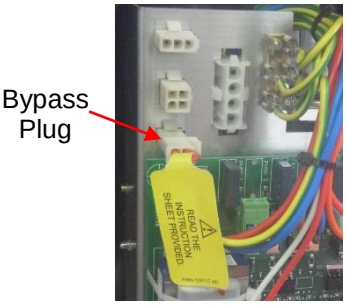
A tripped high pressure switch will be required to be manually reset before the heat pump will attempt to resume normal operation. Until the HPS is reset the heater will operate in element mode with fan and pump continually running during the heating cycle.

The existing HDi controller (part number 051728) is now obsolete and is replaced with a revised HDi controller (part number 051738) which has an additional plug jack to accommodate the HPS. This revised controller can be used on all HDi models, including earlier models that do not have a HPS fitted. A HPS bypass plug (part number 051733) has been developed for use on earlier models that do not have HPS fitted.



A service kit (part number 299279) consisting of a HPS bypass plug, replacement HDi controller and an instruction sheet is available from Spare Parts.

The Grundfos Circulator Retrofit Kit (part number 290604) is also modified to include this revised HDi controller and HPS bypass plug.



Obsolete Models: Everhot, Solahart & Edwards branded modules are no longer available. Rheem branded product is compatible and is to be used if replacement is required.

REFRIGERATION TERMS AND THEIR MEANING

Condense – The action of a substance as it releases heat and changes state from a vapour (gas) to a liquid.

Evaporate – The action of a substance as it absorbs heat and changes state from a liquid to a vapour (gas).

Heat of Compression – The heat energy added to a substance by the act of compressing it.

High Side – Components and pipework of a refrigeration system operating at high pressure, generally the compressor case where a rotary compressor is utilised, discharge line, condenser, liquid line, liquid receiver where utilised and filter drier.

Latent Heat – The 'hidden' heat energy that causes a change in state of a substance, without changing its temperature.

Low Side – Components and pipework of a refrigeration system operating at low pressure, generally the evaporator, suction line and suction accumulator.

Saturated Liquid – A liquid at the point that it will boil with any increase in temperature, at a given pressure.

Saturated Vapour – A vapour at the point that it will condense with any decrease in temperature, at a given pressure.

Subcooled Liquid – A liquid at a temperature below its saturation point, at a given pressure.

Superheated Vapour – A vapour (gas) at a temperature above its saturation point, at a given pressure.

COMPONENTS AND THEIR FUNCTION

Anode (Sacrificial) – A metal alloy electrode installed in the water heater cylinder that protects the cylinder from corrosion by galvanic action.

Compressor – An electromechanical device that increases the pressure of superheated refrigerant vapour by decreasing its volume, as well as increasing its temperature due to the addition of the heat of compression. The increase in pressure causes the refrigerant to circulate through the refrigeration system.

Condenser – A heat exchanger containing three chambers; one for the refrigerant, one for water and a third separating chamber which is open to atmosphere. The refrigerant enters the condenser as a high pressure, high temperature superheated refrigerant vapour and gives off its heat. This heat is absorbed by the water from the storage tank which is being circulated through the water chamber in the condenser. As the refrigerant gives off its heat and becomes cooler, it condenses (changes state) to a saturated liquid. Cooling of the saturated liquid refrigerant continues such that it becomes subcooled.

Diffuser – A plastic device installed in the cold water inlet of the water heater cylinder to assist with stratification. It also acts as a fitting liner.

Evaporator – An aluminium finned copper coil where the low pressure, low temperature refrigerant absorbs heat from the surrounding ambient air. As the refrigerant absorbs heat and becomes warmer, it evaporates (changes state) to a saturated vapour. Heating of the saturated refrigerant vapour continues such that it becomes superheated.

Fitting Liner – A plastic tube installed in the cold water inlet of the storage tank to provide protection against corrosion through the life of the water heater.

Heating Element – A tubular device containing a resistive element, that converts electrical energy to heat.

High Pressure Switch: An electromechanical device with a set of normally closed contacts that will open circuit when the detected refrigeration system pressure rises above a predetermined value. The contacts can be manually reset once the refrigeration system pressure falls below a predetermined value.

Outlet Delivery Tube (Dip Tube) – A plastic tube installed in the hot water outlet of the water heater cylinder to conduct water from the highest point to the outlet connection. It also acts as a fitting liner.

Pressure Limiting Valve (PLV) – A valve that controls its outlet pressure to a predetermined limit.

Receiver / Filter Drier – A device fitted in the refrigerant liquid line. The filter drier component traps impurities and removes moisture from the sealed refrigeration system. The receiver component stores liquid refrigerant.

Sensor – A device which changes resistance with a change in temperature, also known as a thermistor. Sensors are used to measure temperature and feed the information back to a control system.

Sensor Strip – A sensor device containing multiple temperature sensors.

Suction Accumulator – A device fitted in the refrigerant suction line, which accumulates and prevents any liquid refrigerant from entering and damaging the compressor. Any liquid refrigerant in the suction accumulator is evaporated or “boiled off” to a vapour.

Temperature and Pressure Relief (T&PR) Valve – 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.

Thermal Cut Out (ECO) – A manually reset temperature sensitive device mounted against the water heater cylinder, which cuts off the supply of electrical energy.

Thermostat – A temperature sensitive device mounted against the water heater cylinder, which controls the supply of electrical energy to maintain the stored water at the required temperature.

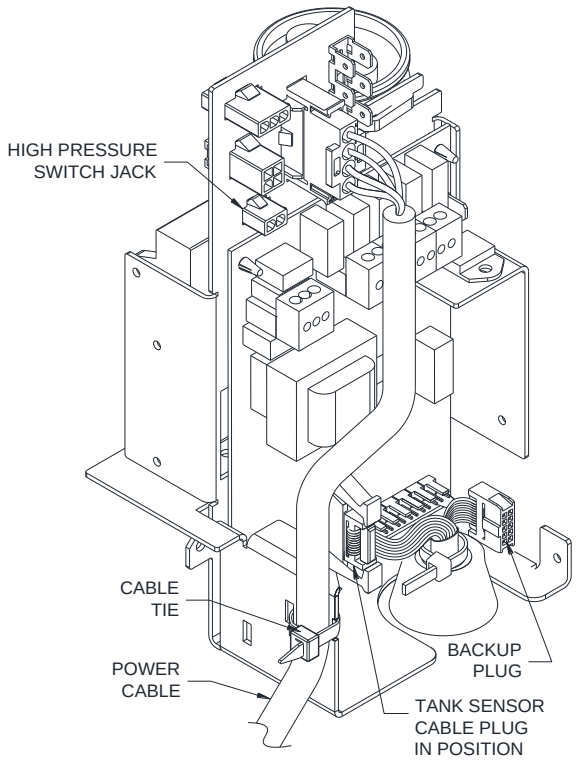
Thermostatic Expansion (TX) Valve – A mechanical valve that expands the liquid refrigerant to a lower pressure as it moves through the TX valve’s orifice. The expansion process also lowers the temperature of the refrigerant, to a point below that of the surrounding ambient air. The TX valve has a bulb that senses the temperature of the suction line at the evaporator outlet. The TX valve thermostatically meters the flow of expanding refrigerant to the evaporator, in response to the temperature of the suction line as measured by the bulb.

CONTROLLER

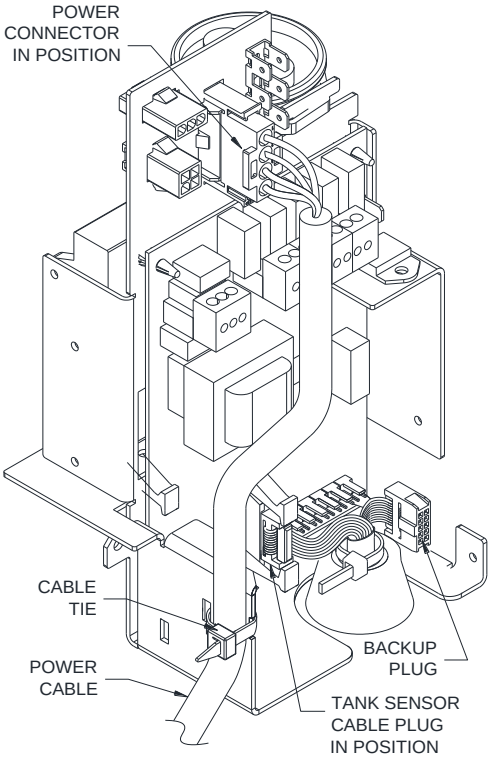
The 310 Series Heat Pump has an electronic controller in the heat pump module. Power and temperature sensor connections are made at the controller.

Power and Sensor Strip Connections

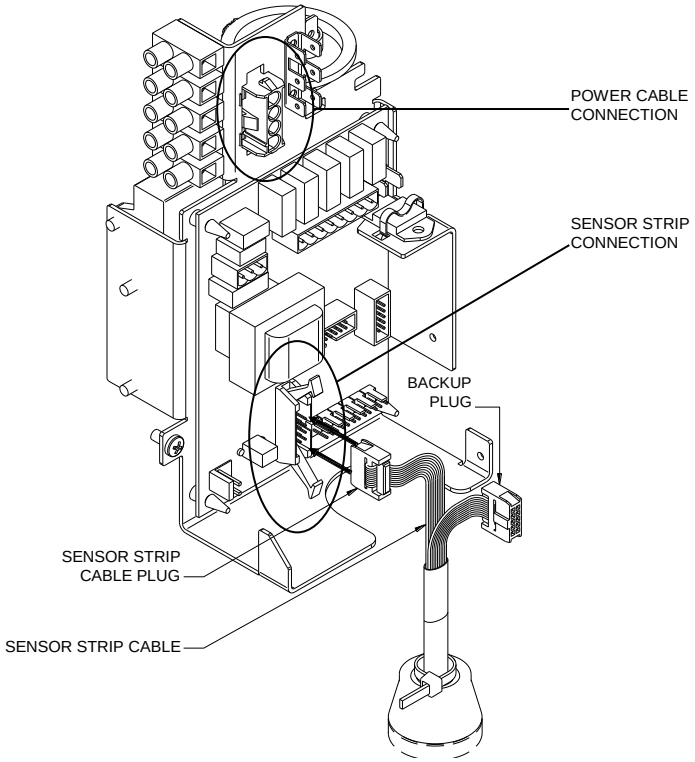
Models Manufactured from 31/03/2016 (or with Grundfos retrofit kit fitted from 04/16)



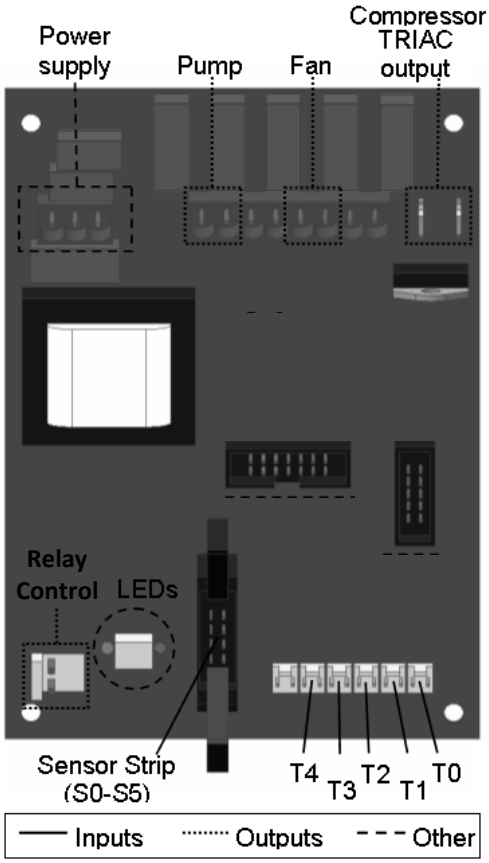
Models Manufactured 8/08/2013 – 30/03/16 (or with Grundfos retrofit kit fitted up to 03/16)



Models Manufactured prior to 8/08/2013 (Salmson Circulator)



Printed Circuit Board (PCB)



The main features of the controller's printed circuit board (PCB) are shown on the diagram opposite.

The connection marked "Relay Control" energises or de-energises a relay that switches from heat pump heating to electric element heating.

The "Compressor TRIAC" switches the power to the compressor on and off.

The green and red LED's display information about the heat pump's operating status and / or fault conditions – see the LED Status Codes section on page 24.

Models manufactured prior to 8/08/2013 have LED's mounted on the printed circuit board.

Models manufactured from 8/08/2013 or with a Grundfos Circulator Kit installed have an external LED panel that plugs into the printed circuit board at the location noted "LEDs" in the diagram.

These models (manufactured from 8/08/2013 or with a Grundfos Circulator Kit installed) utilise additional functionality and detailed Fault Codes – see the LED Status Codes section on page 24.

Sensor Strip

A sensor strip containing 6 temperature sensors is located inside the storage tank. The sensor strip is inside the storage tank's insulation, located on the outside wall of the storage tank's internal cylinder.

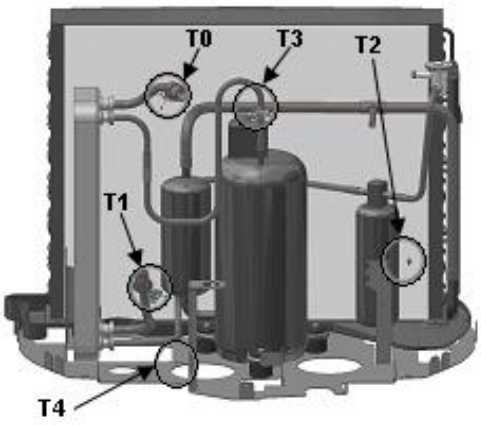
The sensors on the sensor strip are numbered S0 – S5, from the top to the bottom.

The sensor strip is monitored by the controller and provides information on the temperature of the water over the height of the storage tank. This information is utilised to determine heater operation.

For more information on the sensor strip refer to the Sensor Strip Testing section on page 70.

Sensors

Five independent temperature sensors (thermistors) are utilised in the heat pump module.



The sensors are identified as follows:

- Heat exchanger (HX) water outlet (T0)
- Heat exchanger (HX) water inlet (T1)
- Evaporator (T2)
- Compressor (T3)
- Ambient (T4)

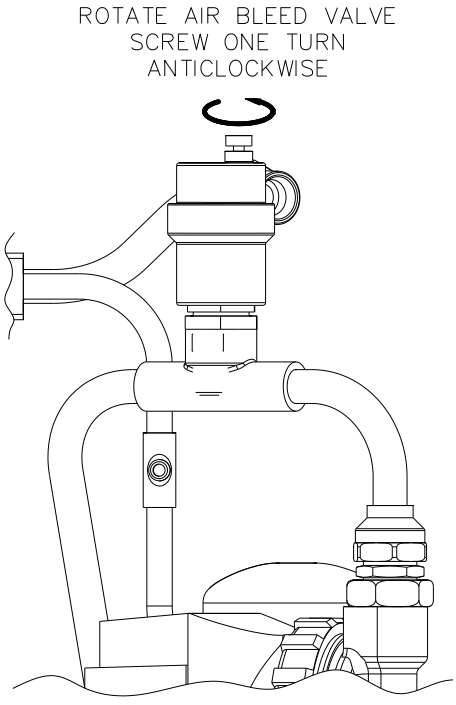
The sensors are monitored by the controller and provide information on specific temperatures in the heat pump module. This information is utilised to determine heater operation.

For more information on the sensors refer to the Sensor Testing section on page 71.

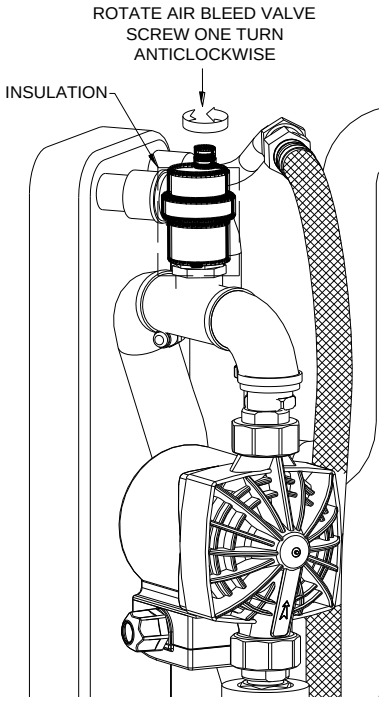
AUTOMATIC AIR ELIMINATOR

In order for the automatic air eliminator to function correctly, the following steps must be taken:

1. Open the air bleed valve screw by rotating anticlockwise one turn.
2. This will allow air to bleed from the heat pump module's water circuit during filling of the tank.
3. Leave the air bleed valve screw in this position.
4. Ensure the screw is not removed, nor left screwed shut.



Models Manufactured prior to 8/08/2013 (Salmson Circulator)



Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

OPERATION

The heat pump utilises a form of heating called “top down” heating. This means that heated water from the heat pump is returned to the top of the storage tank, meaning the water at the top of the tank is always at a usable temperature.

The controller varies the speed of the circulator **(1)**, so that the temperature of the water leaving the heat exchanger is always maintained at a usable temperature.

The circulator **(1)** draws cold water from the bottom of the storage tank via the long dropper tube **(2)**. The water passes through the heat exchanger **(3)**, also known as the condenser, where it is heated by the refrigerant. The water is then returned to the top of the storage tank via the short dropper tube **(4)**.

The controller contains a main relay that ensures power can only be delivered to the refrigeration compressor *or* the booster element. The main relay will enable element operation in its un-powered (off) state. A manual reset high pressure switch is wired in series to the main relay and will de-energise the relay in the event of a refrigerant over-pressure situation.

Whenever power is available and with no faults present, the controller energises the main relay to enable compressor operation. Power for the compressor is then passed through an electronic switch called a triac, which is downstream of the relay and allows the controller to switch the compressor on and off in response to the demand for heat pump heating.

The 310 Series Heat Pump water heaters utilise R134a refrigerant to transfer heat from the atmosphere to the water in the storage tank.

The four main components of the sealed refrigeration system are the compressor **(6)**, condenser (heat exchanger) **(3)**, thermostatic expansion (TX) valve **(7),** and the evaporator **(5)**.

Refrigerant enters the compressor as a low pressure superheated vapour. The compressor increases the pressure of the refrigerant vapour by decreasing its volume, as well as increasing its temperature due to the addition of the heat of compression.

The high pressure, high temperature superheated refrigerant vapour flows to the condenser (heat exchanger), where it gives off its heat. This heat is absorbed by the water from the storage tank which is being circulated through a separate chamber in the condenser. As the refrigerant gives off its heat and becomes cooler, it condenses (changes state) to a saturated liquid. Cooling of the saturated liquid refrigerant continues such that it becomes subcooled, meaning it is cooled to a temperature below its saturation point.

The liquid refrigerant then moves through the thermostatic expansion (TX) valve, where it is expanded to a lower pressure by moving through the TX valve's orifice. The expansion process also lowers the temperature of the refrigerant, to a point below that of the surrounding ambient air.

The TX valve has a bulb that senses the temperature of the suction line at the evaporator outlet. The TX valve thermostatically meters the flow of expanding refrigerant in response to the temperature of the suction line.

Following expansion, the low pressure, low temperature refrigerant moves into the evaporator where it absorbs heat from the surrounding ambient air. As the refrigerant absorbs heat and becomes warmer, it evaporates (changes state) to a saturated vapour. Heating of the saturated refrigerant vapour continues such that it becomes superheated, meaning it is heated to a temperature above its saturation point. This low pressure superheated vapour then returns to the compressor to complete the cycle.

STANDBY MODE

Standby is an idle mode where power is available, but water heating is not required.

All faults are cleared from the controller whenever the system is in Standby Mode, however the system continues to check for new faults. In models manufactured from 8/08/2013 or with a Grundfos Circulator Kit installed, the Insufficient Water Flow Rate Warning is **not** cleared during Standby Mode – see the Heat Pump Heating section on page 18 for further explanation of this warning.

Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

- Whilst in Standby Mode, if the compressor temperature is less than 60°C, the green LED is on solid. If the compressor temperature is greater than or equal to 60°C, the green LED will display one flash.
- If the Insufficient Water Flow Rate Warning is current, the green LED is on solid and the red LED will display one flash. This warning is only displayed during Standby Mode and does not inhibit operation or any function – see the Heat Pump Heating section on page 18 for further explanation of this warning.
- A Freeze Protection function is utilised in Standby Mode, in order to prevent the water within the heat pump module freezing during low ambient conditions. (Only models manufactured from 8/08/2013 or with a Grundfos Circulator Kit installed are susceptible to freezing in the water circuit, due to the presence of a check valve.)

During Standby Mode, if either the heat exchanger water outlet temperature or the heat exchanger water inlet temperature fall below 3°C, the circulator is switched on at full speed in order to circulate heated water from the storage tank through the water circuit, to prevent freezing. The circulator remains on for at least 30 seconds and will switch off when the heat exchanger water outlet temperature and the heat exchanger water inlet temperature have both risen above 5°C. The circulator will also switch off if the system detects that heat pump heating is required, at which point the system will go to Heat Pump Mode.

Models Manufactured prior to 8/08/2013 (Salmson Circulator)

Whist in Standby Mode, the green LED is illuminated and remains on.

HEAT PUMP MODE

Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

Heat pump heating is initiated under the following conditions, as determined by the sensor strip:

S3 detects a temperature less than 49°C or S4 detects a temperature less than 43°C.

Heat Pump Mode consists of three stages – System Check, Circulator Pre-Run and Heat Pump Heating.

System Check

During system check, the green LED will display one flash.

- If the compressor sensor detects a temperature greater than 60°C, the system will remain in Standby Mode until the compressor has cooled.
- The controller checks that the 5 minute start delay has elapsed. The start delay may have already elapsed, as it begins from the last compressor shut down. To begin the start delay, the control system requires that power is available. The start delay does not occur when power is applied to a new system for the first time. The 5 minute start delay cannot be bypassed or cancelled.
- Once the compressor has cooled and the start delay has elapsed, the system goes to Circulator Pre-Run.

Circulator Pre-Run

During Circulator Pre-Run, the green LED will display 2 flashes.

The circulator will commence operation at full speed for a period of 30 seconds.

Heat Pump Heating

During Heat Pump Heating, the green LED will display 4 flashes.

- After the Circulator Pre-Run, the compressor and evaporator fan also commence operation and heat pump heating commences.
- When the compressor and evaporator fan commence operation, the controller begins to vary the circulator speed by pulsing the circulator's power supply, to control the heat exchanger water outlet temperature to 62°C.

This means that 62°C water is delivered to the top of the storage tank for the remainder of the heat pump operational cycle.

- Heat Pump Heating ceases and the system returns to Standby Mode under the following conditions, as determined by the sensor strip:

  S4 detects a temperature greater than 53°C or S5 detects a temperature greater than 50°C.

- After 4 minutes in Heat Pump Heating, the controller constantly monitors the circulator speed and heat exchanger water outlet temperature, looking for specific conditions that suggest the circulator is unable to provide a sufficient water flow rate.

  If the controller detects that the circulator is running at full speed and the heat exchanger water outlet temperature is greater than 65°C, the controller initiates the Insufficient Water Flow Rate Warning.

When the Insufficient Water Flow Rate Warning is raised, Heat Pump Heating will stop irrespective of the tank water temperature as determined by the sensor strip and the system will return to Standby Mode.

The warning does not inhibit operation or any function.

The Insufficient Water Flow Rate Warning is automatically cleared from the controller whenever the heat pump successfully completes a full cycle in Heat Pump Mode without detecting the conditions that generate the Insufficient Water Flow Rate Warning. There is no other way to clear the Insufficient Water Flow Rate Warning.

Models Manufactured prior to 8/08/2013 (Salmson Circulator)

During Heat Pump Heating, the green LED flashes.

Heat pump heating is initiated under the following conditions, as determined by the sensor strip:

Models Manufactured prior to 16/10/2012

S3 detects a temperature less than 50°C or S4 detects a temperature less than 44.5°C.

Models Manufactured from 16/10/2012

S3 detects a temperature less than 49°C or S4 detects a temperature less than 43°C.

Once heat pump heating is initiated:

- If the compressor sensor detects a temperature greater than 60°C, the system will remain in Standby Mode until the compressor has cooled.
- The circulator will commence operation at full speed for a period of 30 seconds.
- After the 30 second circulator operation, the compressor and evaporator fan also commence operation and heat pump heating commences.

When the compressor and evaporator fan commence operation, the circulator drops to its lowest speed to allow the refrigeration system to reach operating temperature as quickly as possible.

- When the heat exchanger water outlet sensor detects a temperature greater than or equal to 59°C, the refrigeration system has reached operating temperature.

At this point, the controller begins to vary the circulator speed by pulsing the circulator's power supply, to control the heat exchanger water outlet temperature to 62°C.

This means that 62°C water is delivered to the top of the storage tank for the remainder of the heat pump operational cycle.

- Heat pump heating ceases and the system returns to Standby Mode under the following conditions, as determined by the sensor strip:

  S4 detects a temperature greater than 53°C or S5 detects a temperature greater than 50°C.

ELEMENT MODE

At all times when power is available, the controller monitors the condition of the heat pump system. Should the ambient temperature be too low for heat pump operation or a fault is detected, the controller exits Heat Pump Mode and initiates Element Mode.

In models manufactured from 8/08/2013 or with a Grundfos Circulator Kit installed, the LED's will display a fault code during Element Mode.

In models manufactured prior to 8/08/2013 (Salmson circulator), the red LED flashes during Element Mode.

Boost Mode

Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

If S0 or S1 on the sensor strip is functional, Element Mode will utilise Boost Mode. If both S0 and S1 are functional the controller will use S1, otherwise it will use whichever of the two sensors is functional.

When Element Mode utilises Boost Mode, the controller continues to use the circulator to control the temperature of the water in the storage tank, however the main relay is de-energised thereby supplying power to the element.

During Boost Mode, the element operates instead of the heat pump and the controller uses the sensor strip to continue to drive top down heating. The element heats the water until the temperature of the water detected by S0 or S1 is greater than 62°C. The controller will then operate the circulator, thereby bringing cold water from the bottom of the storage tank to the top of the storage tank. The circulator continues to operate until the temperature of the water detected by S0 or S1 is less than 61°C. At this point the controller switches the circulator off and the element continues heating the water until again the temperature of the water detected by S0 or S1 is greater than 62°C.

This process continues until the temperature of the water detected by S4 is greater than 53°C, or the temperature of the water detected by S5 is greater than 50°C. At this point the controller re-energises the main relay, thereby switching the element off.

The system returns to Standby Mode, the green LED is illuminated and remains on, the fault is cleared and normal operation is resumed when heating is next required.

If Element Mode is in use due to the ambient sensor detecting a temperature of less than 0°C, normal heat pump operation will resume when the ambient sensor detects a temperature above 2°C.

If Element Mode is in use due to the evaporator sensor detecting a temperature of less than -3°C, normal heat pump operation will resume when the evaporator sensor detects a temperature above 2°C.

Note: If S4 on the sensor strip has failed, the system will still operate in Boost Mode, unless S3 or S5 have also failed. If S4 and S3 have both failed, or S4 and S5 have both failed, Element Mode will utilise Limp Mode.

Boost Mode

Models Manufactured prior to 8/08/2013 (Salmson Circulator)

If S1 on the sensor strip is functional, Element Mode will utilise Boost Mode.

When Element Mode utilises Boost Mode, the controller continues to use the circulator to control the temperature of the water in the storage tank, however the main relay is de-energised thereby supplying power to the element.

During Boost Mode, the element operates instead of the heat pump and the controller uses S1 on the sensor strip to continue to drive top down heating. The element heats the water until the temperature of the water detected by S1 is greater than 62°C. The controller will then operate the circulator, thereby bringing cold water from the bottom of the storage tank to the top of the storage tank. The circulator continues to operate until the temperature of the water detected by S1 is less than 61°C. At this point the controller switches the circulator off and the element continues heating the water until again the temperature of the water detected by S1 is greater than 62°C.

This process continues until the temperature of the water detected by S4 on the sensor strip is greater than 53°C, at which point the controller re-energises the main relay, thereby switching the element off.

The system returns to Standby Mode, the green LED is illuminated and remains on, the fault is cleared and normal operation is resumed when heating is next required.

If Element Mode is in use due to the ambient sensor detecting a temperature of less than 0°C, normal heat pump operation will resume when the ambient sensor detects a temperature above 2°C.

If Element Mode is in use due to the evaporator sensor detecting a temperature of less than -3°C, normal heat pump operation will resume when the evaporator sensor detects a temperature above 2°C.

Note: If S4 on the sensor strip has failed, the system will still operate in Boost Mode, however the Boost Mode heating cycle will end when the storage tank's mechanical thermostat contacts open at approximately 70ºC. At this point the element, controller and LEDS are de-energised until the mechanical thermostat contacts close. When the mechanical thermostat contacts close, the controller is re-energised and normal operation is resumed.

Limp Mode

Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

If S0 and S1 on the sensor strip have both failed, Element Mode will utilise Limp Mode.

During Limp Mode, the main relay is de-energised thereby supplying power to the element, and the element operates instead of the heat pump accordingly.

Unless Freeze Protection is required, the circulator does not operate in Limp Mode. Only the element operates, until the storage tank's mechanical thermostat contacts open at approximately 70ºC. At this point the element, controller and LEDS are de-energised until the mechanical thermostat contacts close. When the mechanical thermostat contacts close, the controller is re-energised and normal operation is resumed.

A Freeze Protection function is utilised in Limp Mode, in order to prevent the water within the heat pump module freezing during low ambient conditions (only models manufactured from 8/08/2013 or with a Grundfos Circulator Kit installed are susceptible to freezing in the water circuit, due to the presence of a check valve).

During Limp Mode, if either the heat exchanger water outlet temperature or the heat exchanger water inlet temperature fall below 3°C, the circulator is switched on at full speed in order to circulate heated water from the storage tank through the water circuit, to prevent freezing. The circulator remains on for at least 30 seconds and will switch off when the heat exchanger water outlet temperature and the heat exchanger water inlet temperature have both risen above 5°C. The circulator will also switch off if the storage tank's mechanical thermostat contacts open at approximately 70ºC.

Limp Mode

Models Manufactured prior to 8/08/2013 (Salmson Circulator)

If S1 on the sensor strip has failed, Element Mode will utilise Limp Mode.

During Limp Mode, the main relay is de-energised thereby supplying power to the element, and the element operates instead of the heat pump accordingly.

The circulator does not operate in Limp Mode. Only the element operates, until the storage tank's mechanical thermostat contacts open at approximately 70ºC. At this point the element, controller and LEDS are de-energised until the mechanical thermostat contacts close. When the mechanical thermostat contacts close, the controller is re-energised and normal operation is resumed.

Use of Element Mode

The faults and conditions listed in the table below will cause the water heater to enter Element Mode.

Fault or Condition	Description
Ambient < 0°C	The temperature detected by the ambient sensor is less than 0°C, which is unsuitable for heat pump operation. Heat pump operation will resume when the ambient sensor detects a temperature above 2°C.
Sensor Strip Fault	At least one of the sensors on the storage tank sensor strip has failed.
HX Water Outlet > 80°C	The heat exchanger water outlet sensor has detected that the water leaving the heat exchanger has exceeded 80°C.
Evaporator < -3°C	The evaporator sensor has detected that the evaporator temperature has fallen below -3°C and frost is forming on the evaporator coil surface. Heat pump operation will resume when the evaporator sensor detects a temperature above 2°C.
Refrigeration System Fault 1	During heat pump operation, the compressor sensor temperature has not risen at least 15°C above the ambient sensor temperature. **Models with a Grundfos Circulator:** This condition is checked for after 2 minutes in Heat Pump Heating. **Models with a Salmson Circulator:** This condition is checked for after 2 minutes, when the circulator is operating at minimum speed (the refrigeration system has not yet reached operating temperature).
Refrigeration System Fault 2	During heat pump operation, the water temperature rise between the inlet and the outlet of the heat exchanger is less than 8°C. **Models with a Grundfos Circulator:** This condition is checked for after 4 minutes in Heat Pump Heating. **Models with a Salmson Circulator:** This condition is checked for when the circulator speed is being controlled (the refrigeration system has reached operating temperature).
Water Flow Fault	**Models with a Grundfos Circulator:** During heat pump operation, the heat exchanger water inlet sensor temperature is more than 15°C higher than the temperature of the water at the pick-up point in the storage tank, as detected by S4 on the sensor strip. This condition is checked for after 4 minutes in Heat Pump Heating. **Models with a Salmson Circulator:** During heat pump operation, the heat exchanger water inlet sensor temperature is more than 7°C higher than the temperature of the water at the pick-up point in the storage tank, as detected by S4 on the sensor strip. This condition is checked for when the circulator is operating at minimum speed (the refrigeration system has not yet reached operating temperature).
Compressor Over-Temperature	The temperature detected by the compressor sensor is greater than 110ºC.
HX Water Outlet Sensor Fault	The heat exchanger water outlet sensor has failed.
HX Water Inlet Sensor Fault	The heat exchanger water inlet sensor has failed.
Evaporator Sensor Fault	The evaporator sensor has failed.
Compressor Sensor Fault	The compressor sensor has failed.
Ambient Sensor Fault	The ambient sensor has failed.

NOTE: In models manufactured from 8/08/2013 or with a Grundfos Circulator Kit installed, if the controller detects that the circulator is unable to provide a sufficient water flow rate (the circulator is running at full speed and the heat exchanger water outlet temperature is greater than 65°C, at any stage after 4 minutes in Heat Pump Heating), Element Heating is ***not*** used – Heat Pump Heating will stop and the system will return to Standby Mode.

LED STATUS CODES

The 310 Series Heat Pump utilises a green and red LED to display information about the heat pump's operating status and/or fault conditions. Refer to the LED Status Code Tables below for the LED sequences and a description of the condition.

NOTE: Power must be available and the mechanical thermostat contacts must be closed for the LEDs to operate.

LED STATUS CODE TABLES

Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

The LED's are on a panel, either on the heat pump module side cover or mounted on the filter drier bracket.

Green LED	Red LED	**Condition** See the Operation section on page 16 for detailed information
Off	Off	No power; mechanical thermostat contacts open; failed controller.
Solid	Off	Standby Mode. Heating not required.
1 Flash	Off	Heat Pump Mode – System Check. The system waits for the compressor sensor temperature to fall to at least 60°C and the start delay to elapse. The start delay begins from the last compressor shut down, so may have already elapsed.
2 Flashes	Off	Heat Pump Mode – Circulator Pre-Run. Circulator only on, for 30 seconds.
4 Flashes	Off	Heat Pump Mode – Heat Pump Heating. Compressor, fan and circulator on.
Off	Solid	Ambient temperature < 0°C, element heating enabled.
Off	1 Flash	Storage tank sensor strip fault, element heating enabled.
Off	2 Flashes	Heat exchanger water outlet temperature > 80°C, element heating enabled.
Off	3 Flashes	Evaporator temperature < -3°C, element heating enabled.
Off	4 Flashes	Refrigeration System Fault 1, element heating enabled. Compressor temperature is not 15°C above ambient temperature.
Off	5 Flashes	Refrigeration System Fault 2, element heating enabled. HX water outlet temperature is not 8°C above HX water inlet temperature.
Off	6 Flashes	Water flow fault, element heating enabled. HX water inlet temperature is more than 15°C above the temperature of the water at the storage tank pickup point (S4 on the sensor strip).
Off	7 Flashes	Compressor over-temperature fault (> 110°C), element heating enabled.
Solid	1 Flash	Heating stopped due to insufficient water flow rate. Unit in Standby Mode. Circulator at full speed and HX water outlet temperature > 65°C.
1 Flash	1 Flash	Heat exchanger water outlet sensor fault, element heating enabled.
2 Flashes	2 Flashes	Heat exchanger water inlet sensor fault, element heating enabled.
3 Flashes	3 Flashes	Evaporator sensor fault, element heating enabled.
4 Flashes	4 Flashes	Compressor sensor fault, element heating enabled.
5 Flashes	5 Flashes	Ambient sensor fault, element heating enabled.

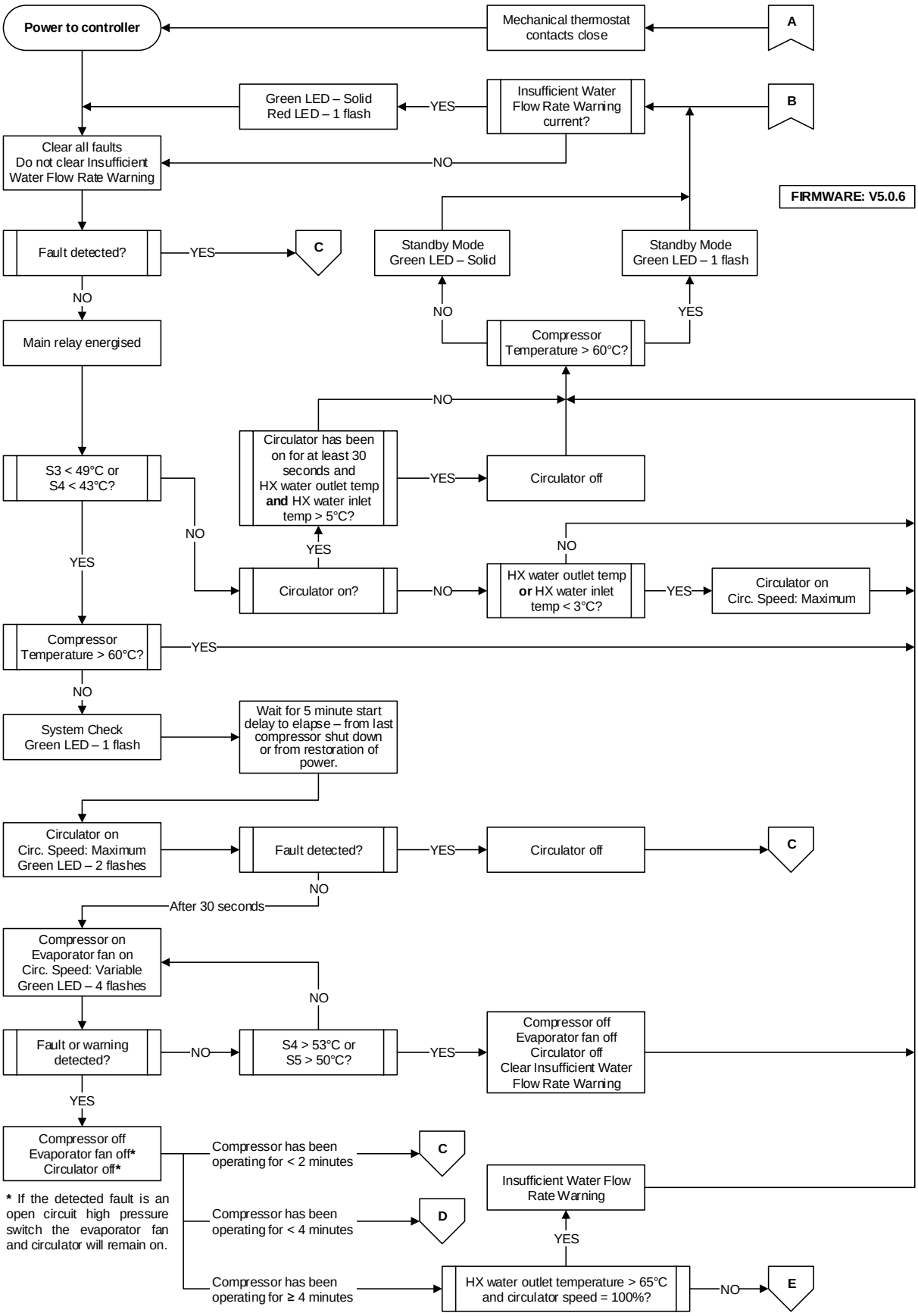
Models Manufactured prior to 8/08/2013 (Salmson Circulator)

The LED's are on the heat pump module controller's printed circuit board – see the Printed Circuit Board section on page 14 for the LED location.

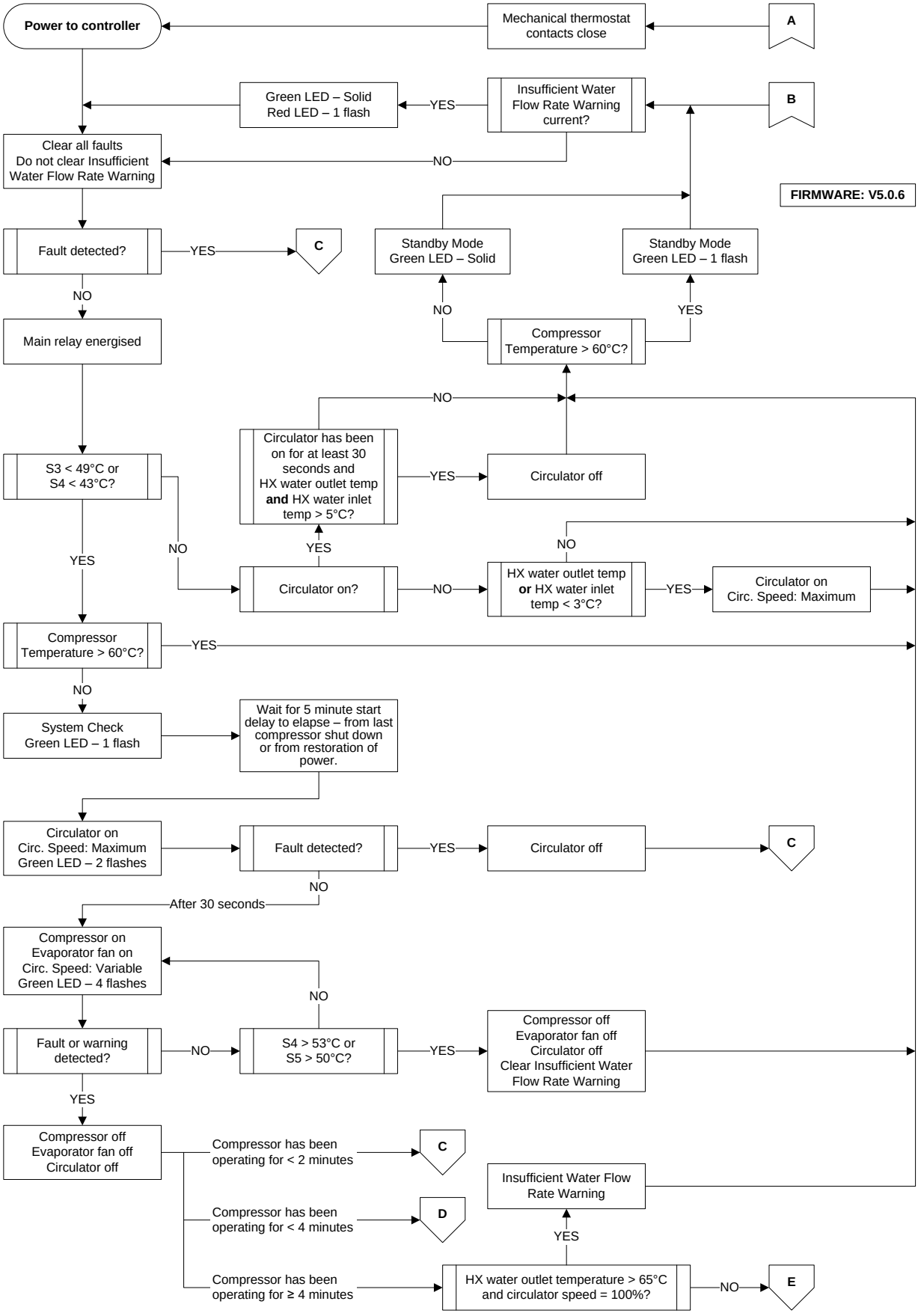
Green LED	Red LED	**Condition** See the Operation section on page 16 for detailed information
Off	Off	No power; mechanical thermostat contacts open; failed controller.
Solid	Off	Standby Mode – heating not required.
Flashing	Off	Heat Pump Mode – compressor, fan and circulator on.
Off	Flashing	Element Mode – system fault or ambient temperature too low for heat pump operation, element heating enabled.

Standby Mode and Heat Pump Mode

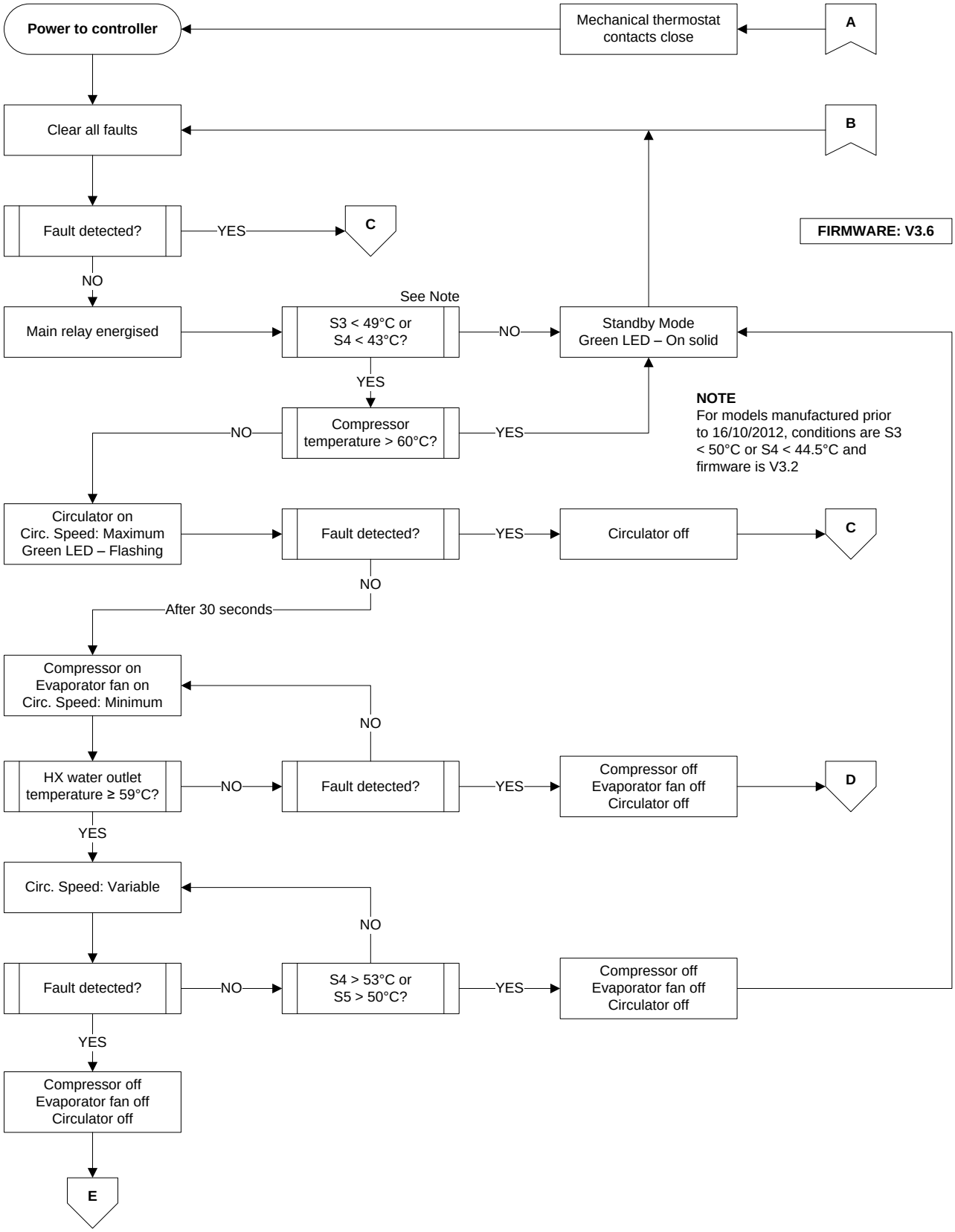
Models Manufactured from 31/03/2016 or with a Grundfos Circulator Kit Installed from 04/2016



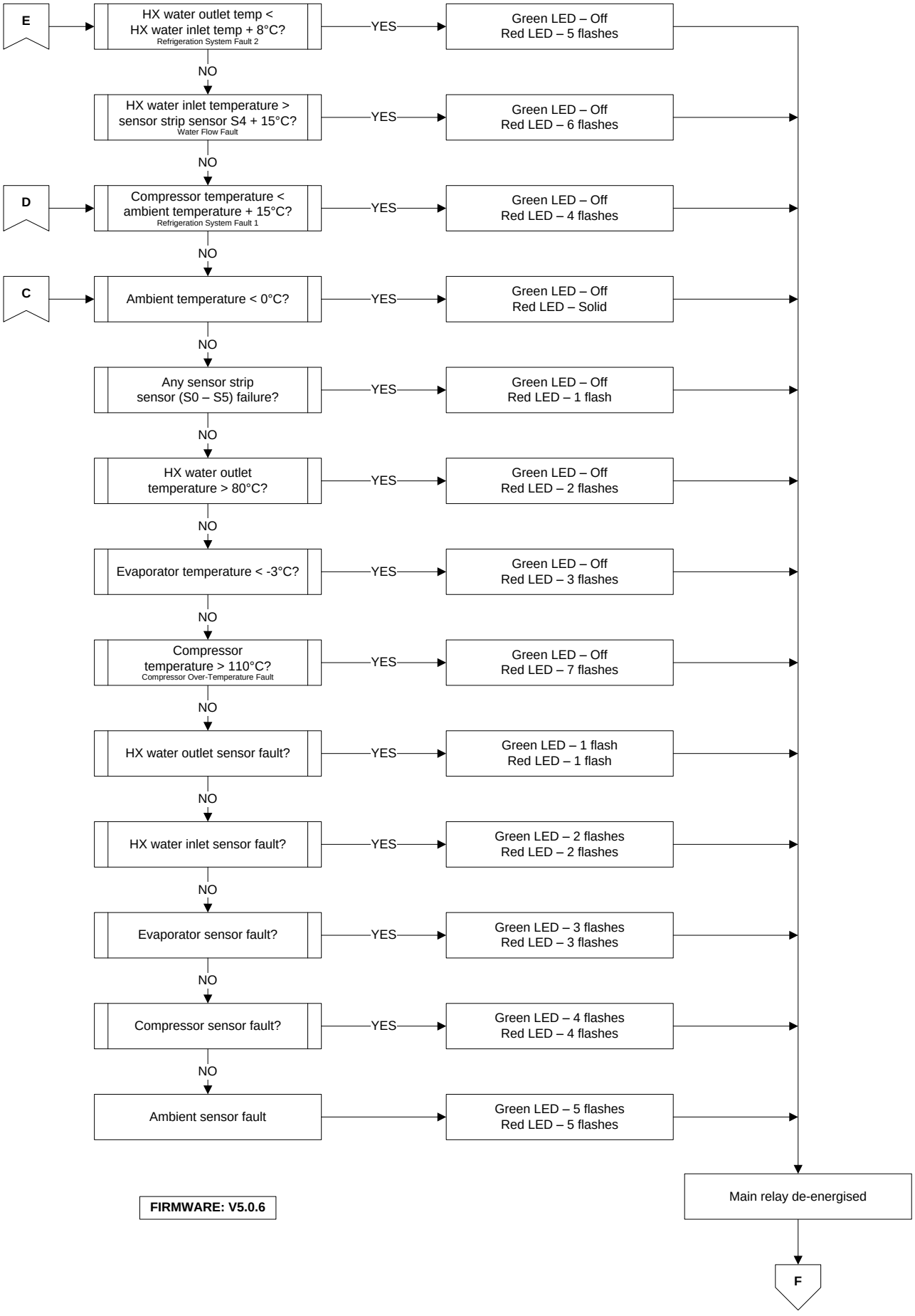
Models Manufactured between 8/08/13 - 03/16 (or with a Grundfos Circulator Kit Installed up to 03/16)



Models Manufactured prior to 8/08/2013 (Salmson Circulator)

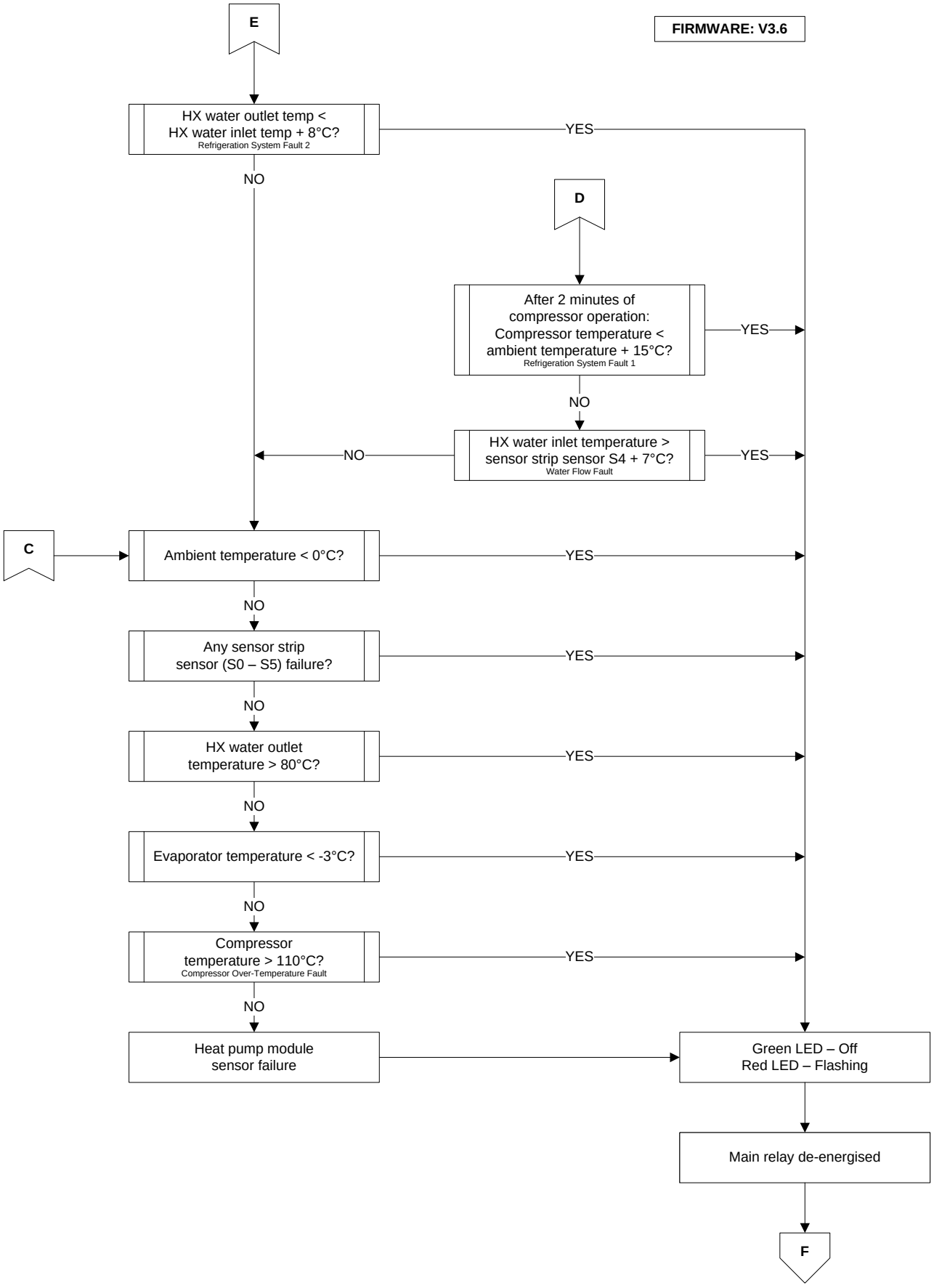


Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed



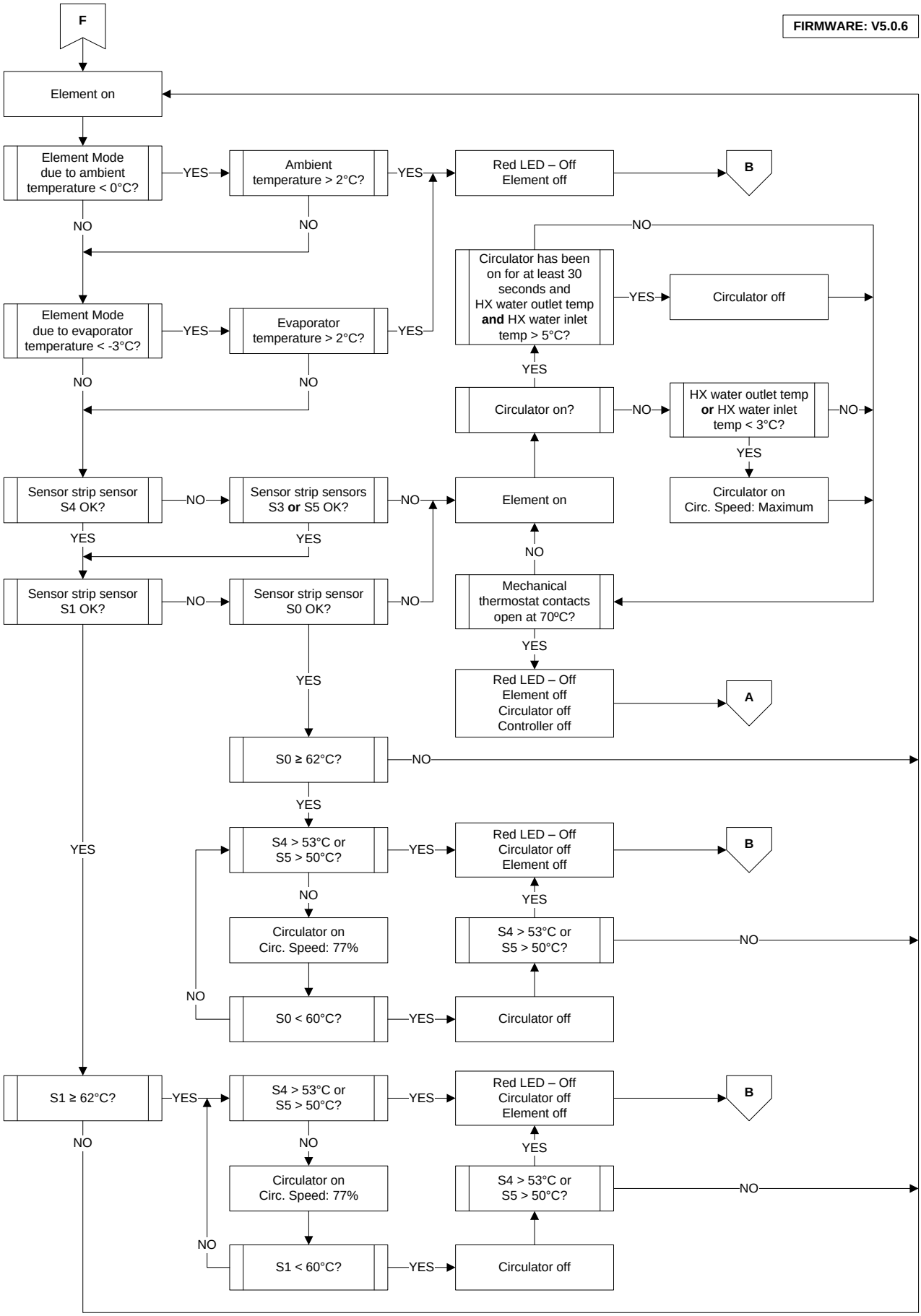
FIRMWARE: V5.0.6

Models Manufactured prior to 8/08/2013 (Salmson Circulator)

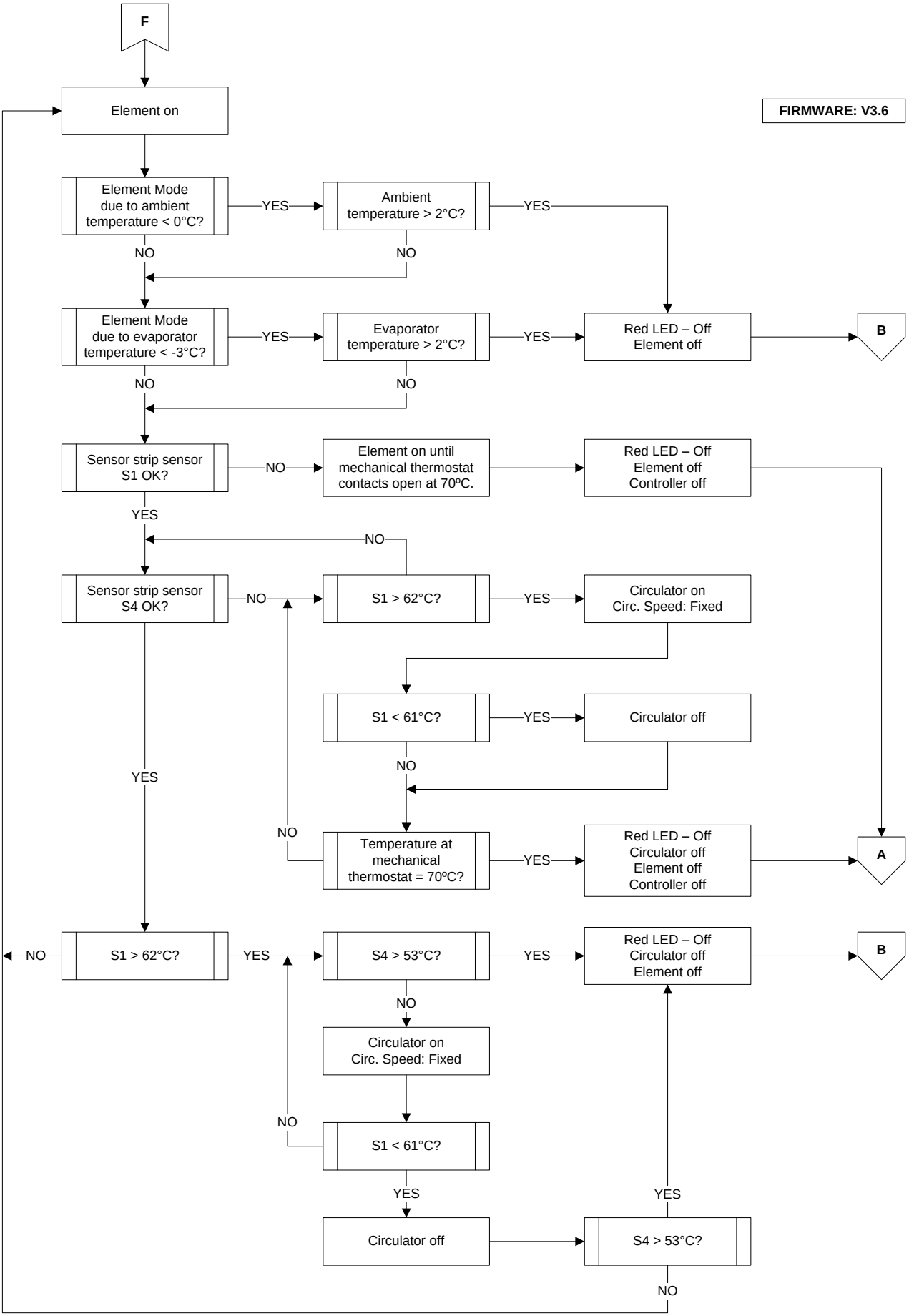


Element Mode

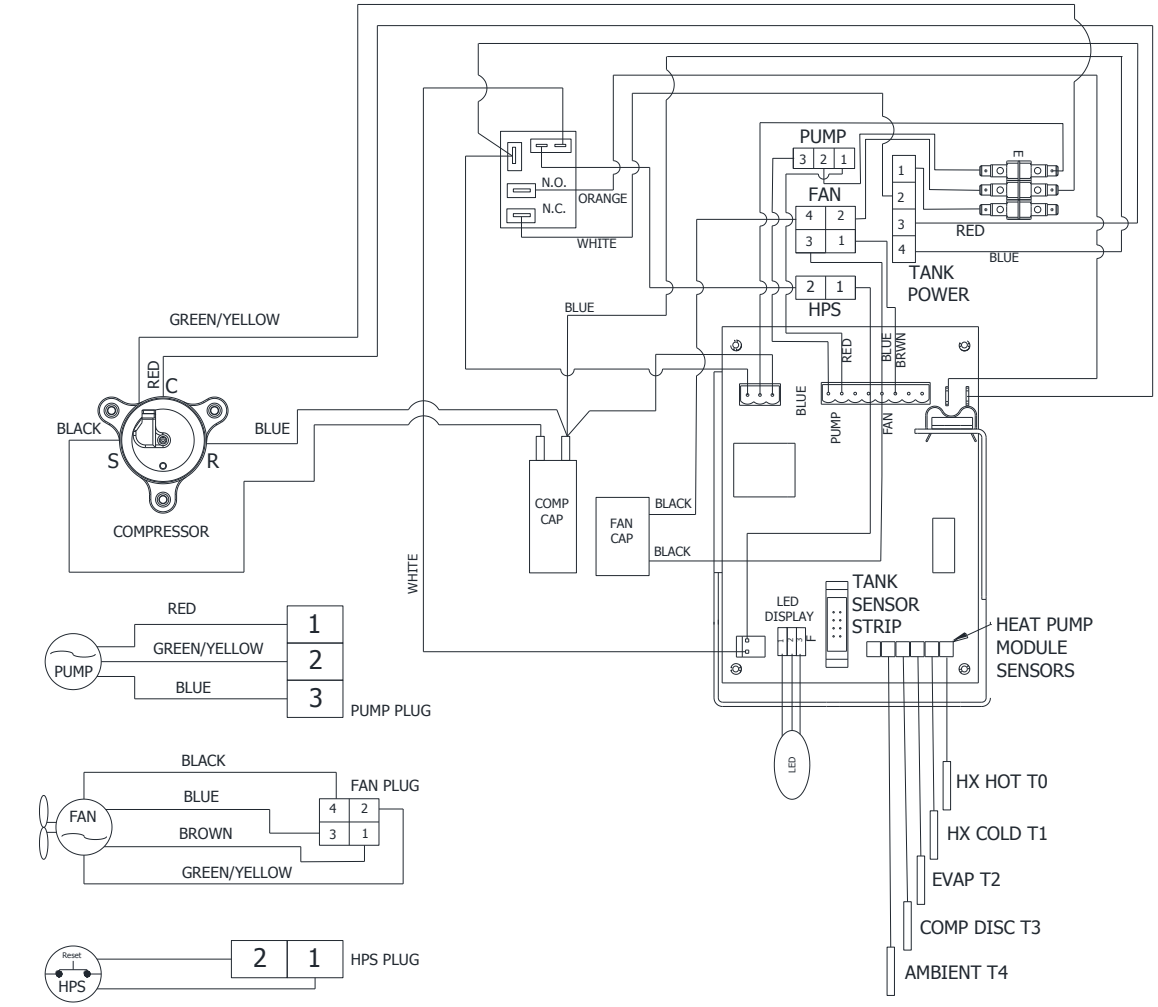
Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

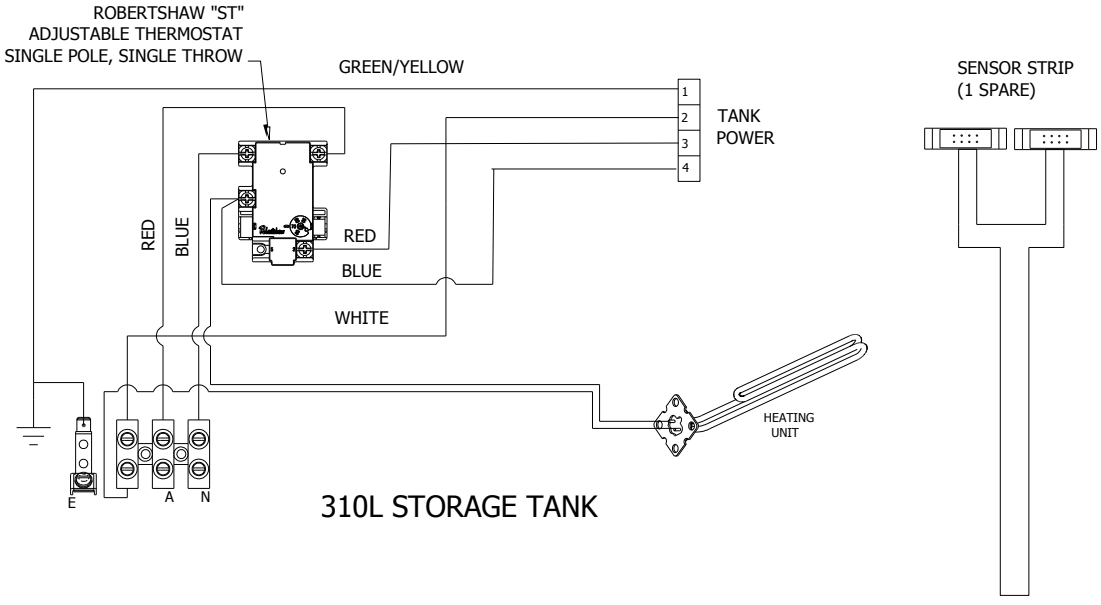


Models Manufactured prior to 8/08/2013 (Salmson Circulator)

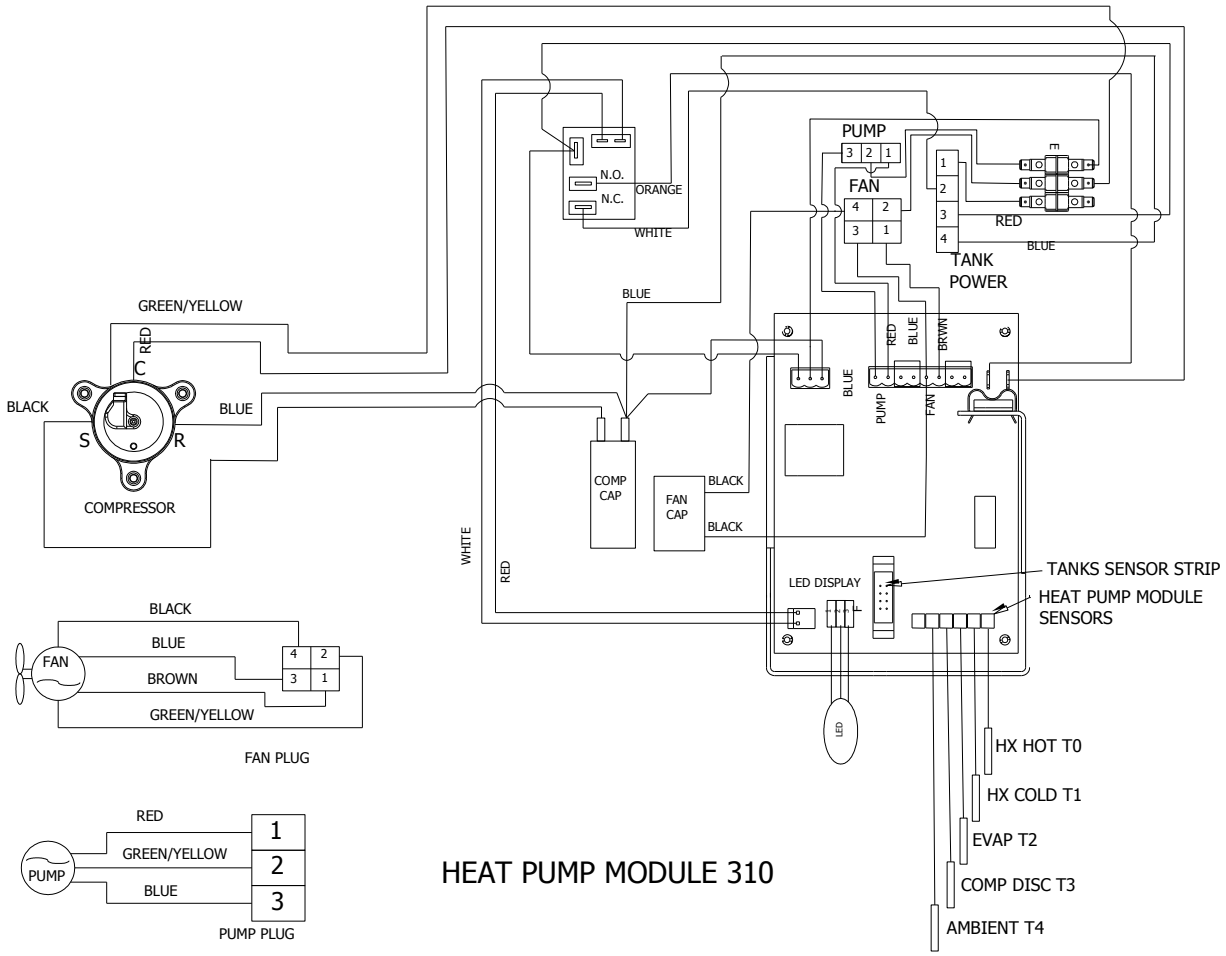


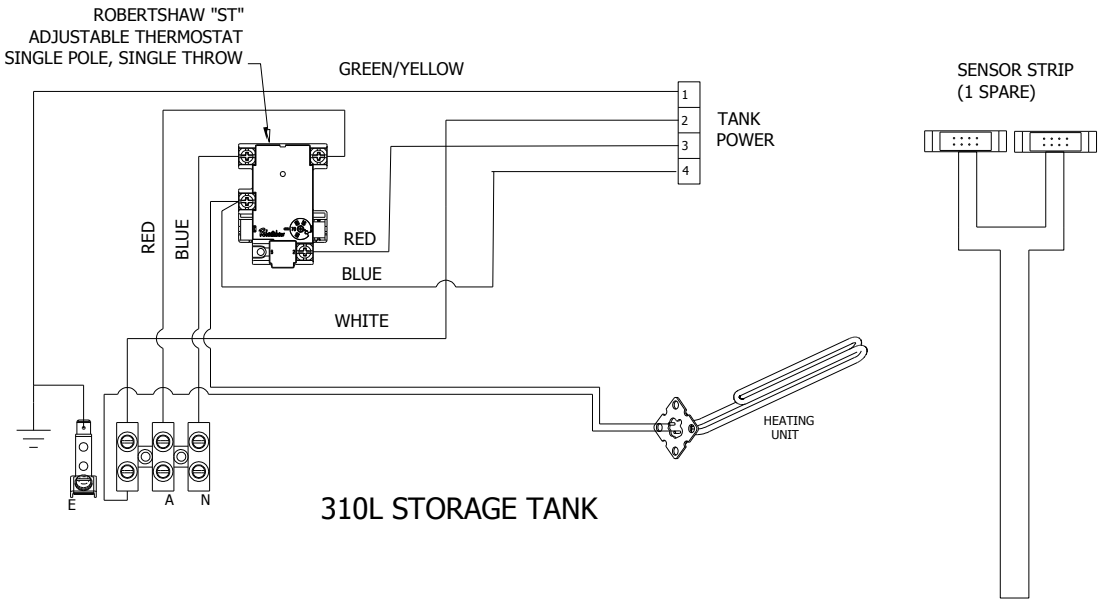
Models manufactured from 31/03/16 (or fitted with a Grundfos Circ Kit from 04/16)



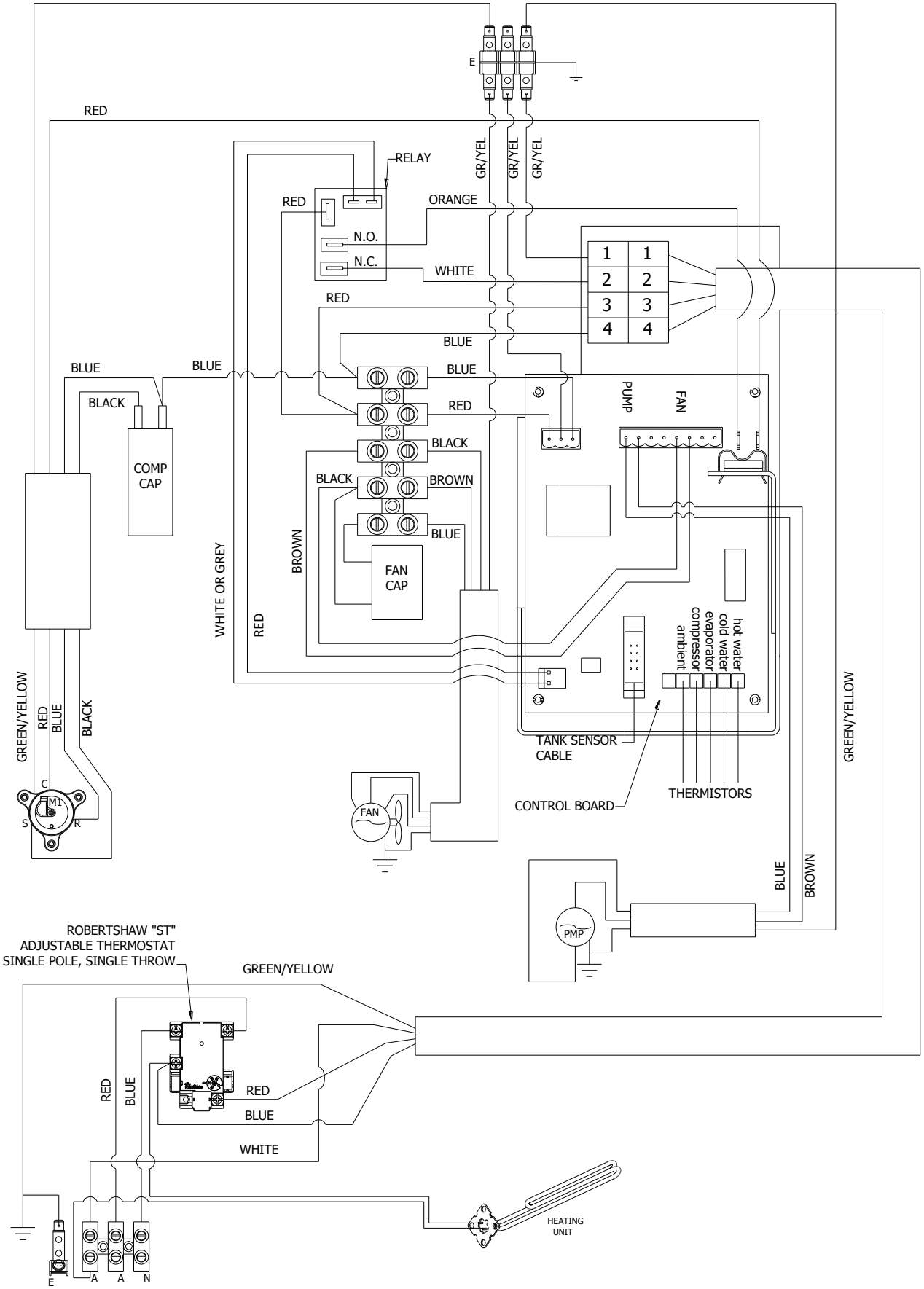


Models manufactured from 8/08/13 - 03/16 (or Grundfos Kit fitted during same range)

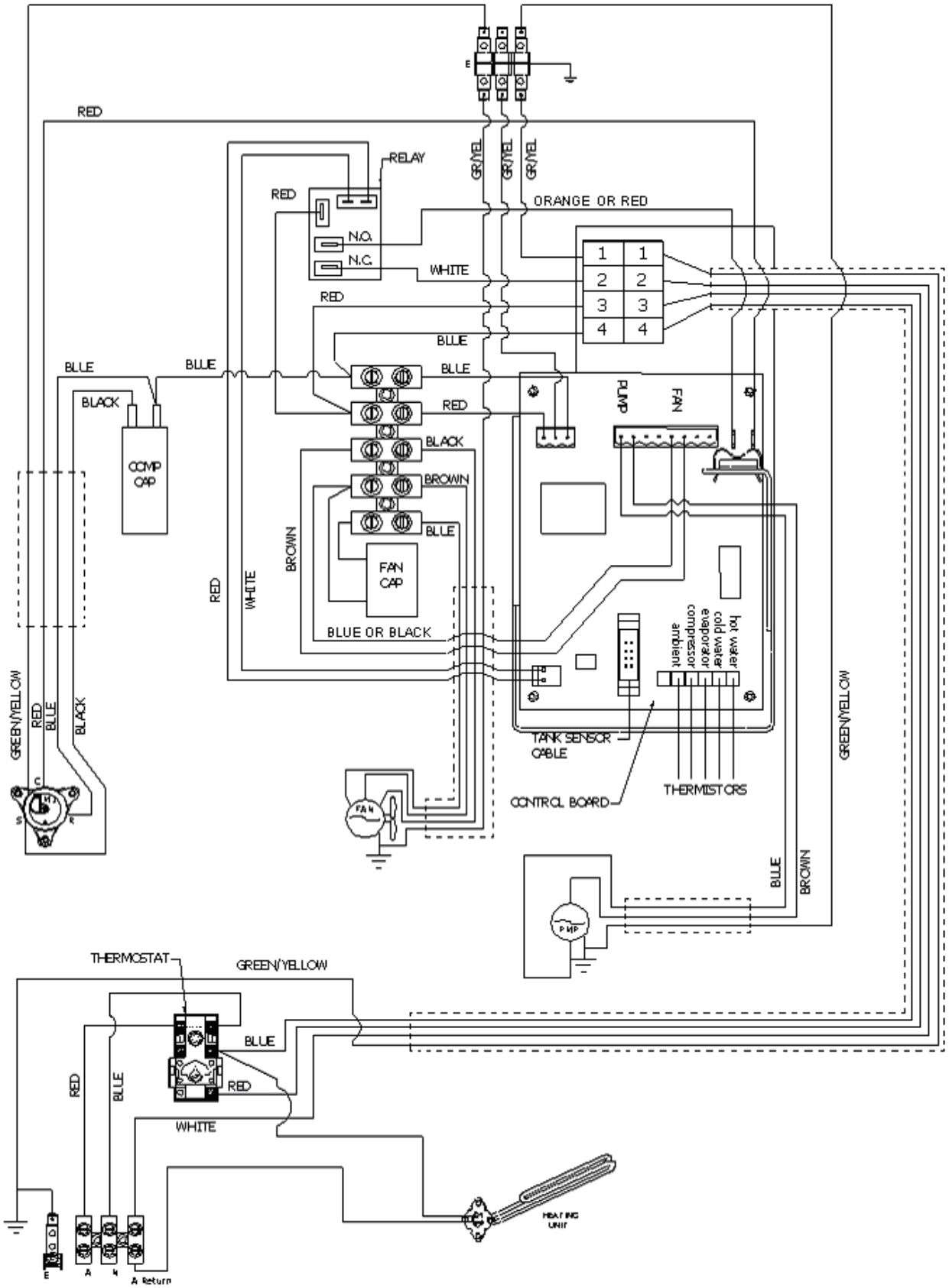




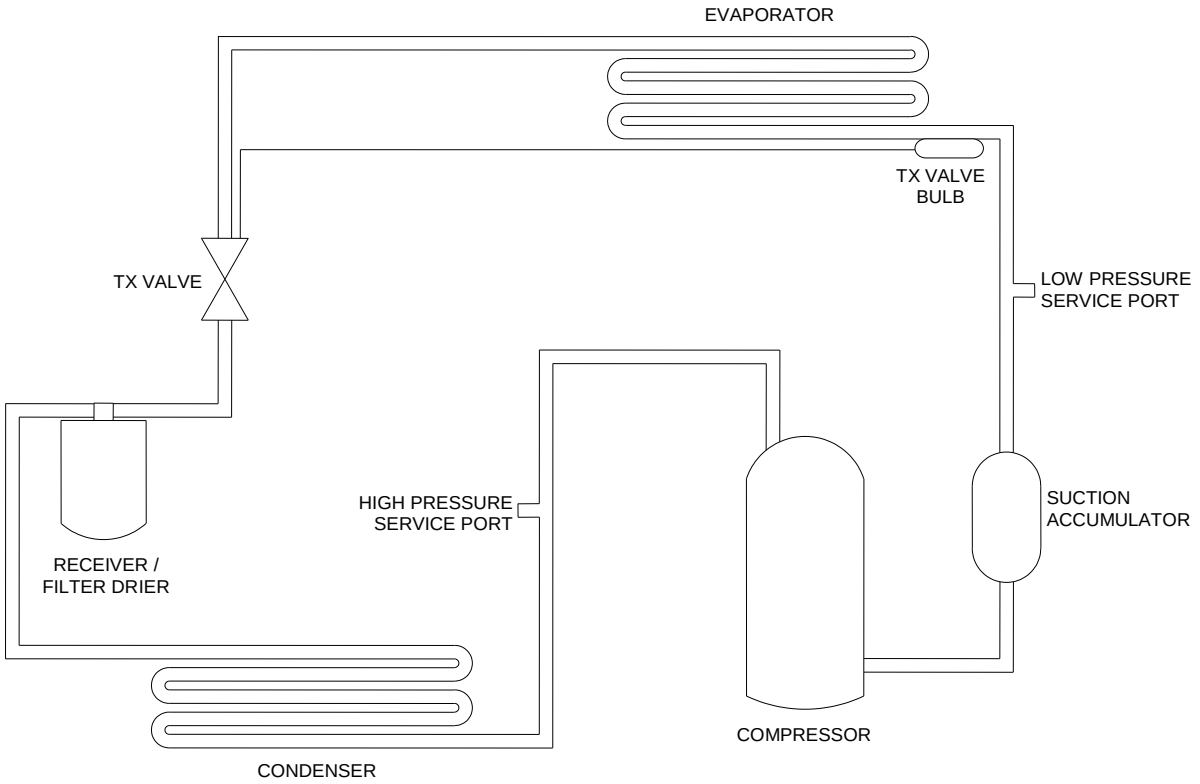
Models manufactured from 14/08/2007 – 7/08/2013 (Salmson Circulator)



Models manufactured prior to 14/08/2007 (Salmson Circulator)



REFRIGERATION SYSTEM DIAGRAM



COMMON COMPLAINTS

When a complaint is lodged about the performance of a water heater, 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.

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

Milky coloured water is generally air in suspension and will disperse of its own accord.

Water hammer – A water heater will not cause water hammer, however valves associated with the water heater may be the source of the problem. For example, a cold water stopcock, non return valve or relief valve.

Most water hammer problems are associated with hot and cold water plumbing, or appliances. For example, solenoid valves, ballcocks, loose pipes, sharp angles in pipework, faulty or worn valve parts, loose tap washers 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.

Excessive hot water usage – 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.

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 comparing this with the potential delivery of the model of 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 and excessive pressure relief valve discharge
6. Plumbing leaks
7. Crossed connections

Hot water plumbing leaks – If the 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 storage tank, 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 pressure relief 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.

SERVICE TECHNICIAN'S HEAT PUMP KIT

A Service Technician's Heat Pump Kit is available and may be required for work carried out on a 310 Series Heat Pump.

The Service Technician's Heat Pump Kit must be ordered through Rheem Spare Parts, Rheem part number 299265.

The kit provides aids for conducting work and diagnosing problems with 270, 325 and 410 Series Heat Pumps, as well as a Heat Pump Service Power Cable that may be used with an adaptor to power the 310 Series Heat Pump (or without the adaptor to power 270, 325 and 410 Series Heat Pumps).

Heat Pump Service Power Cable

In situations where timed (off peak) power is unavailable, the Heat Pump Service Power Cable must be used to provide power to operate the unit in order to diagnose a fault and / or conduct a full functional test at the completion of any service work.

The Heat Pump Service Power Cable may be used with other models of heat pump, and therefore requires an adaptor to be fitted to the heat pump end of the cable. The adaptor allows the cable to be plugged into the controller of the 310 Series Heat Pump.

The adaptor can be ordered separately through Rheem Spare Parts, Rheem part number 052255.

The Heat Pump Service Power Cable with the adaptor fitted is plugged into the heat pump module's controller, in place of the normal mains power cable that relays power from the storage tank – see the diagrams on page **Error! Bookmark not defined.**.

Before using the Heat Pump Service Power Cable, isolate power to the water heater. Remove the mains power cable from the heat pump's controller, and plug in the Heat Pump Service Power Cable instead.

The Heat Pump Service Power Cable has an integrated power switch, and is plugged into a standard 240V AC 10A mains supply general power outlet. An extension cable will most commonly be required to reach the closest GPO, and it is recommended that an earth leakage circuit breaker device (not supplied) be utilised as well.

The heat pump module can now be operated. The Heat Pump Service Power Cable must be removed and the normal mains power cable replaced at the completion of the work.

SENSOR STRIP TESTER

A Sensor Strip Tester is available in order to assist with performing the tests required to troubleshoot the six individual sensors contained along the length of the sensor strip.

The Sensor Strip Tester can be ordered through Rheem Spare Parts, Rheem part number 891012.

For full details on testing and troubleshooting the sensor strip and sensor strip replacement kit, including the Sensor Strip Temperature / Resistance Table, refer to page 70 in the Fault Finding section.

There are six individual sensors contained along the length of the sensor strip, therefore there are six individual resistance measurements to be taken in order to assess the functionality of the sensor strip.

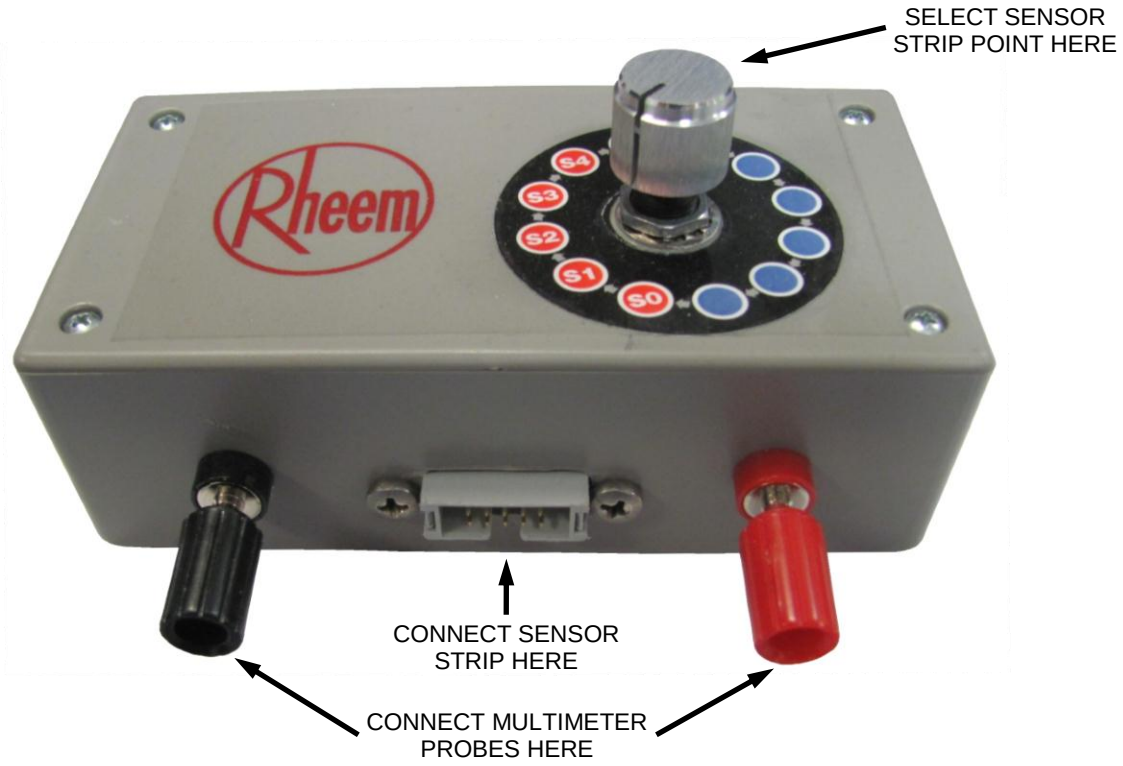
The Sensor Strip Tester facilitates the easy connection of the sensor strip to a multimeter for taking the resistance measurements, whilst allowing each of the six individual sensors to be easily selected for test.

Using the Sensor Strip Tester

Unplug the sensor strip plug from the controller and plug it into the mating jack on the bottom of the Sensor Strip Tester.

Connect the multimeter probes to the terminals on the bottom of the Sensor Strip Tester. Use the dial on the top of the Sensor Strip Tester to select each of the sensor strip's six individual sensors to test.

The multimeter will then display the resistance measurement for each point on the sensor strip as it is selected.



FAULT FINDING

When using the fault finding flow charts, it is essential to ALWAYS start from the beginning – the General Fault Diagnosis chart. Starting fault diagnosis from any other chart is not correct usage and may result in misdiagnosis.

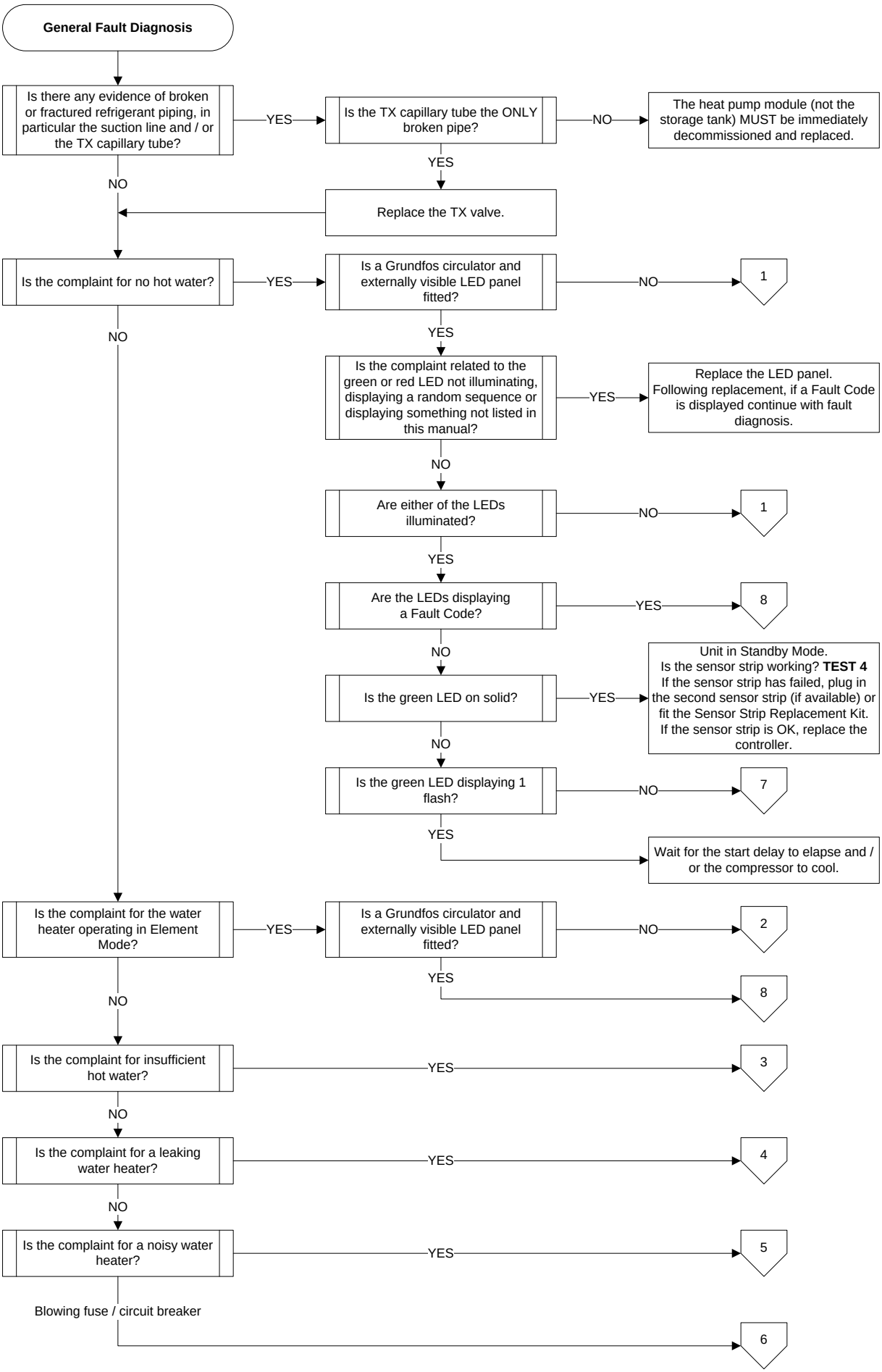
When measuring the ***resistance*** of a part, turn OFF the electric power and be sure to disconnect the part completely before measuring (from connector or terminal). Resistance checks are performed on the part while it is disconnected from the controller.

"Live" testing to be conducted. Personal Protective Clothing (PPE) shall be worn to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

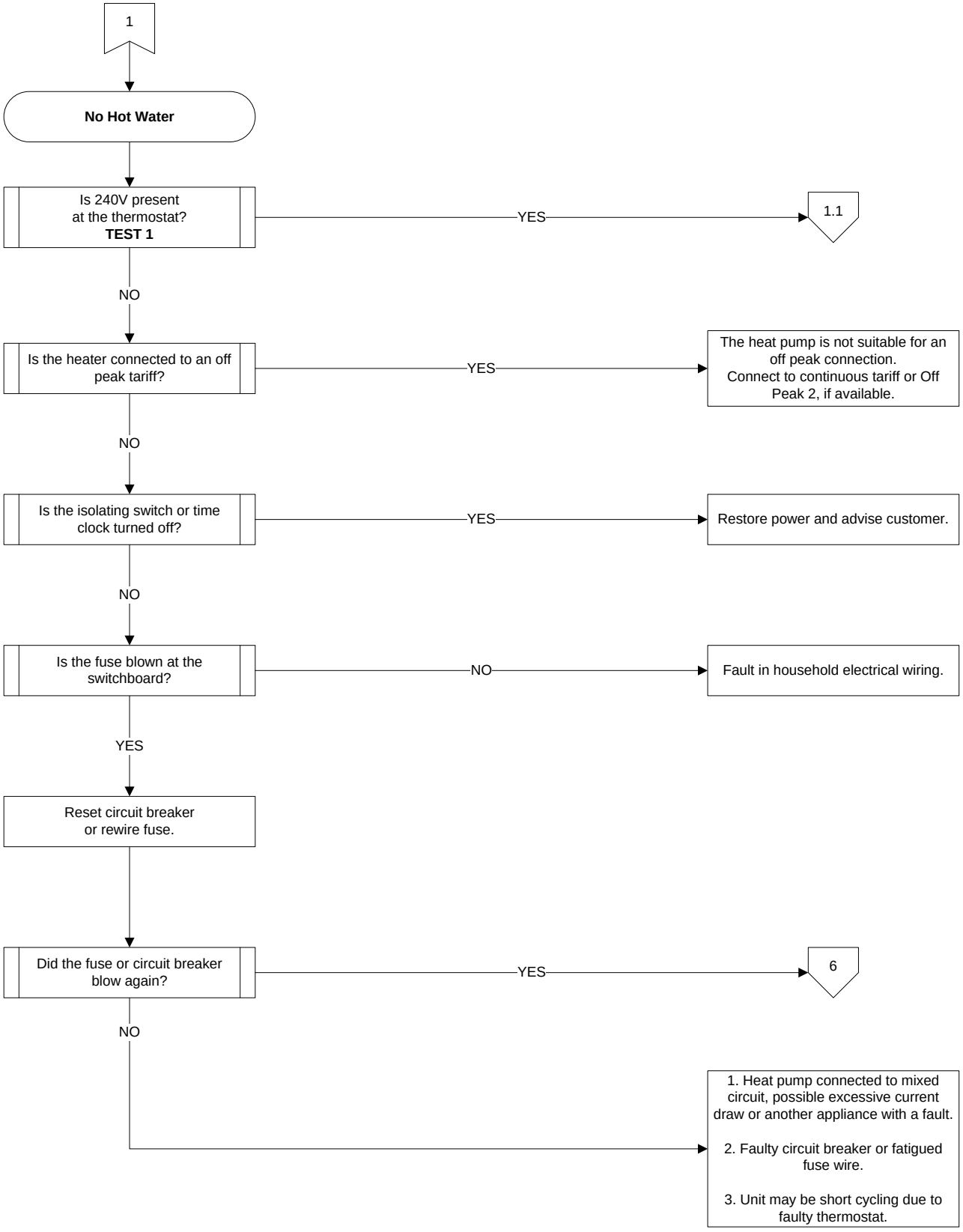
CAUTION: Hot surface. Personal Protective Clothing (PPE) shall be worn to reduce the risk of scalding. Be careful to avoid injury on sharp edges.

Fault Finding Flow Chart Table

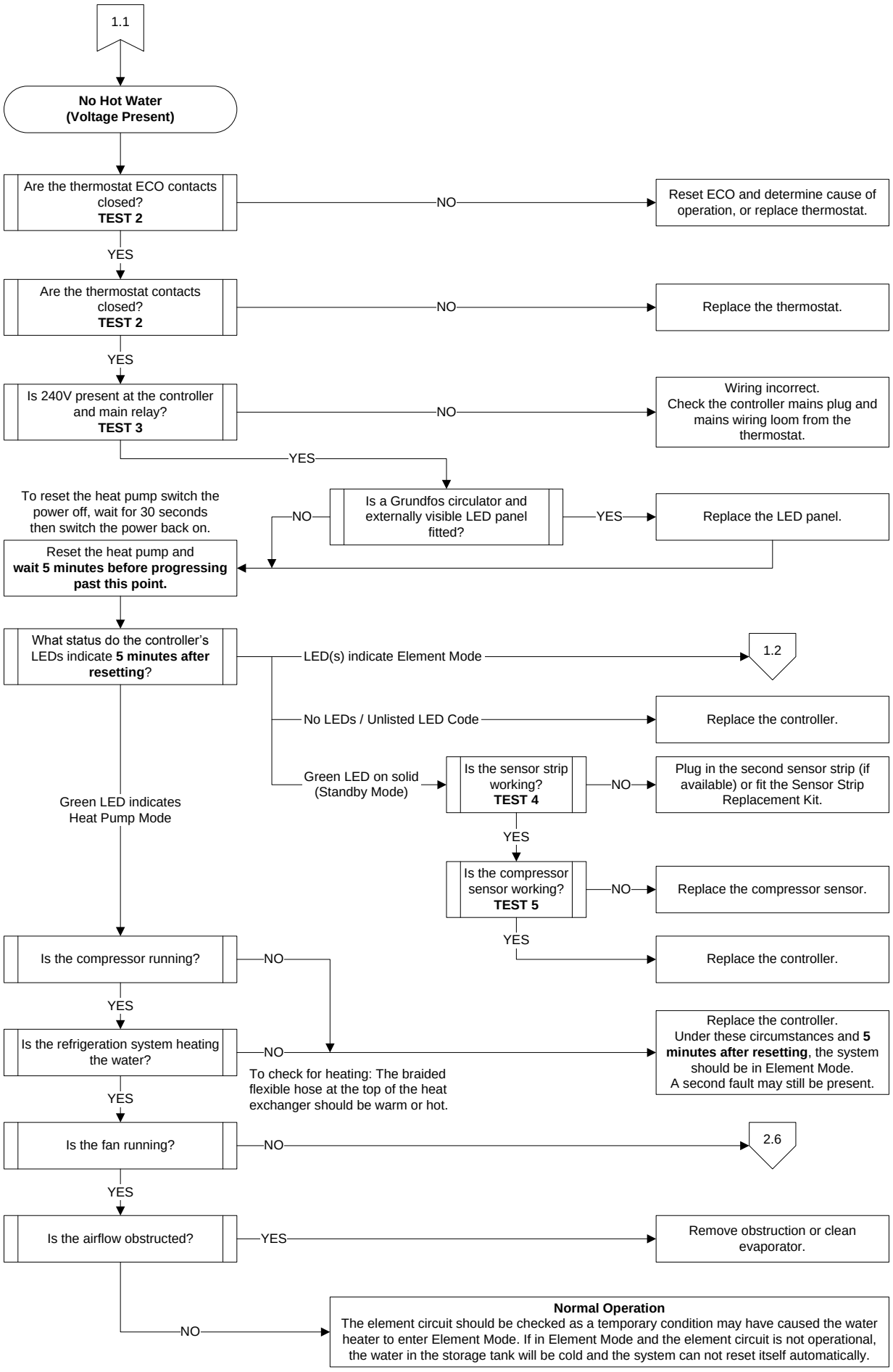
General Fault Diagnosis



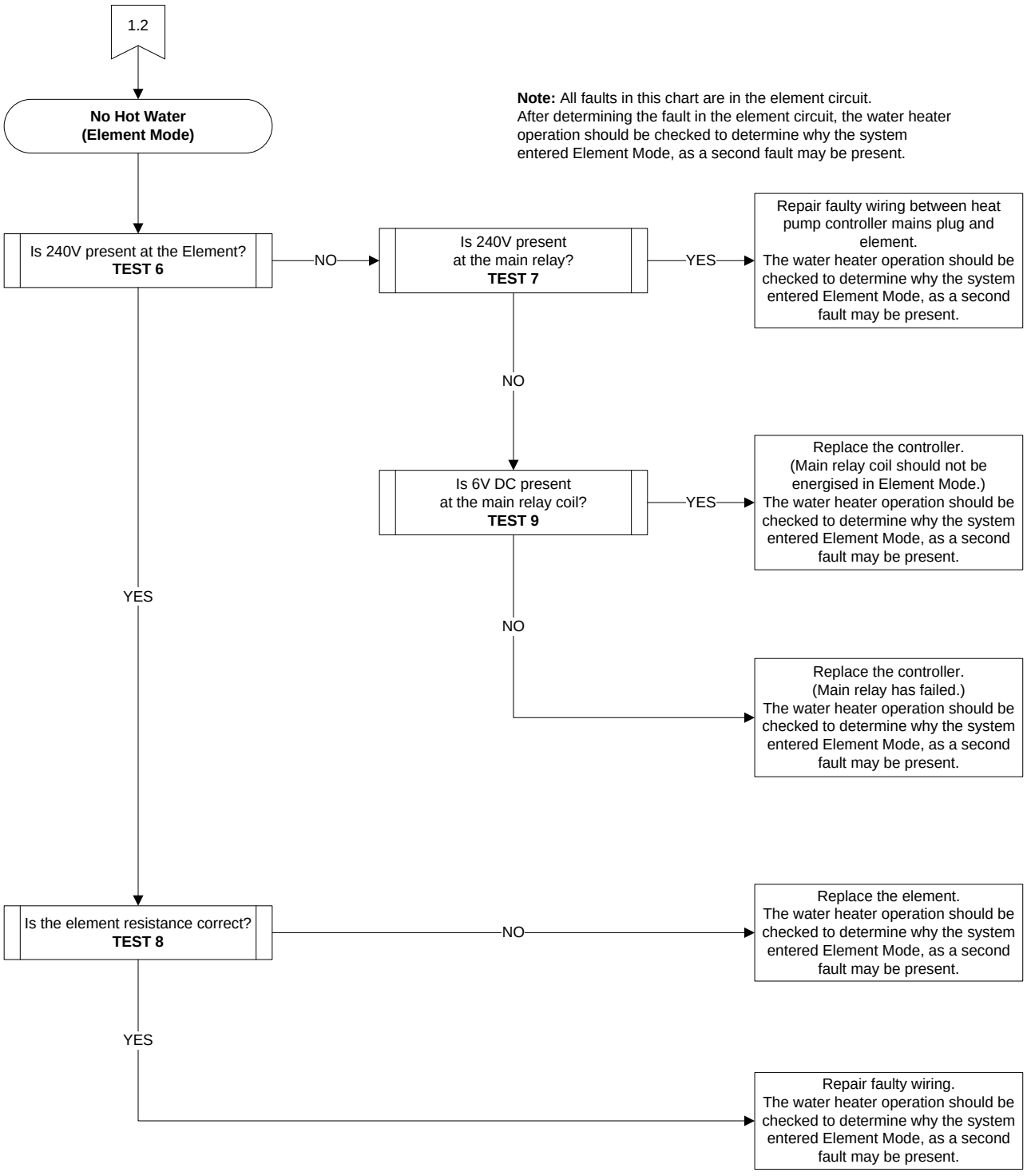
Fault Finding: Chart 1



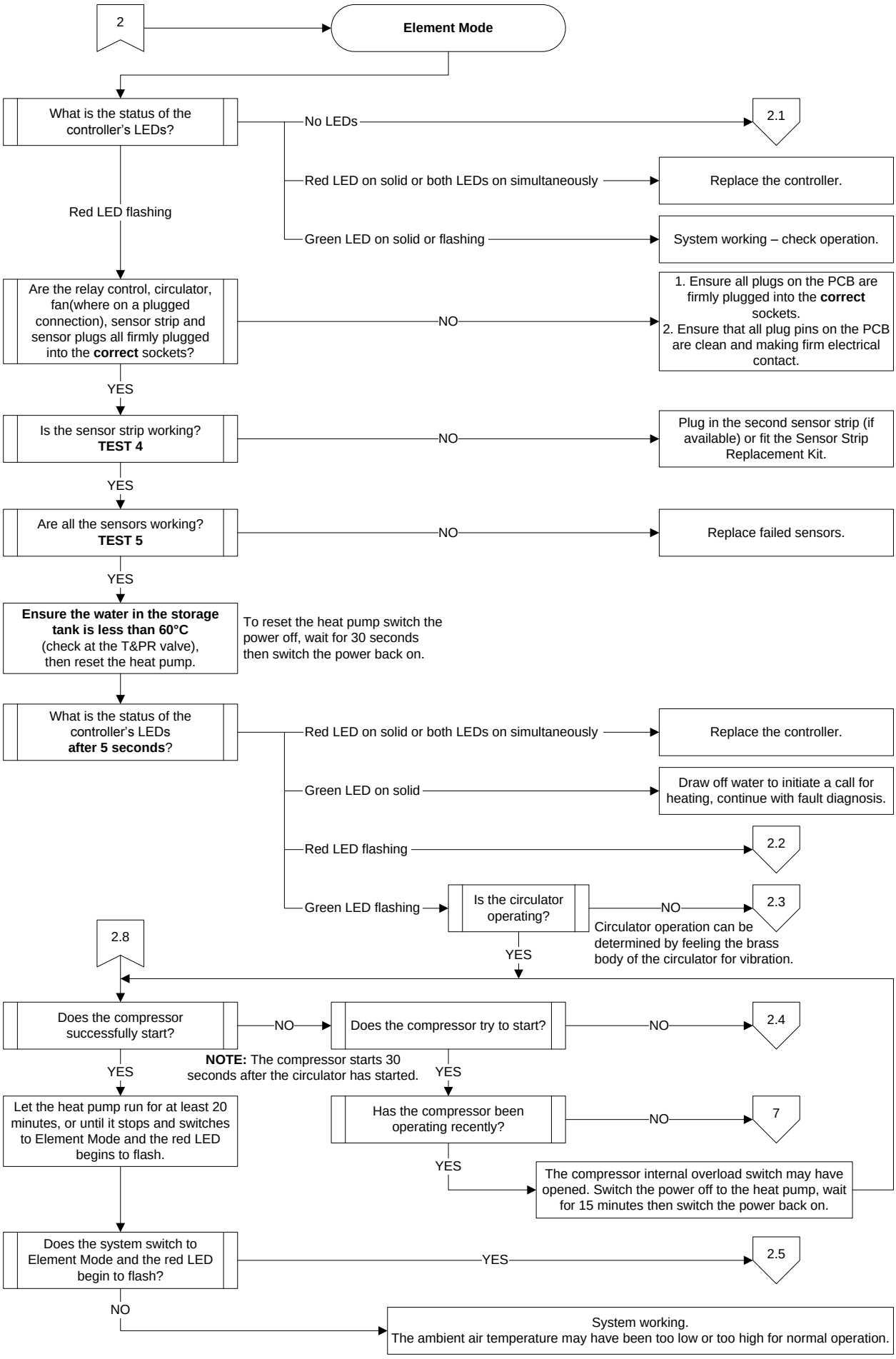
Fault Finding: Chart 1.1



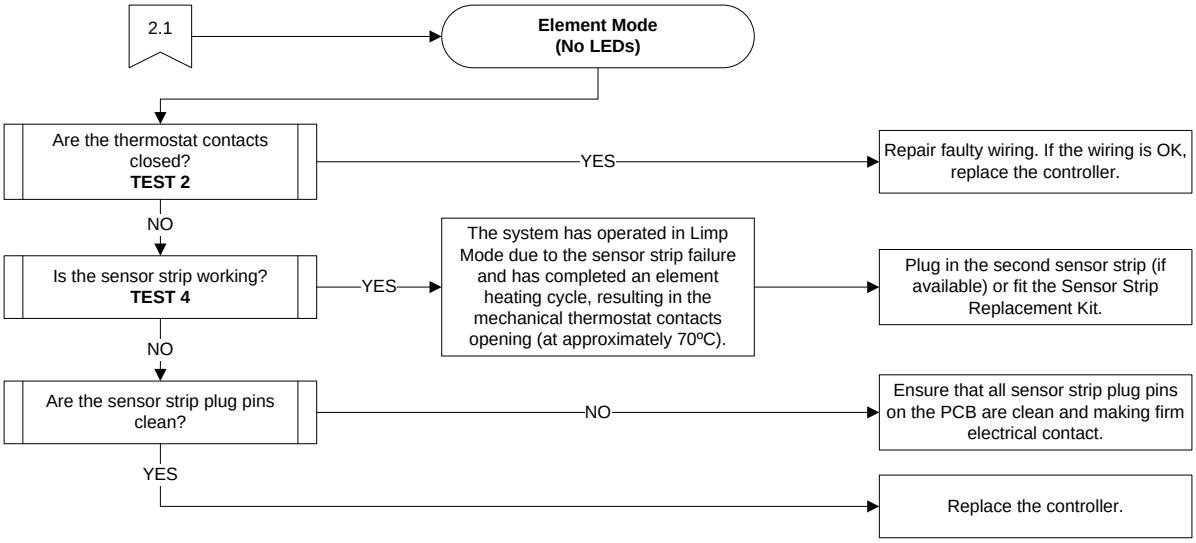
Fault Finding: Chart 1.2



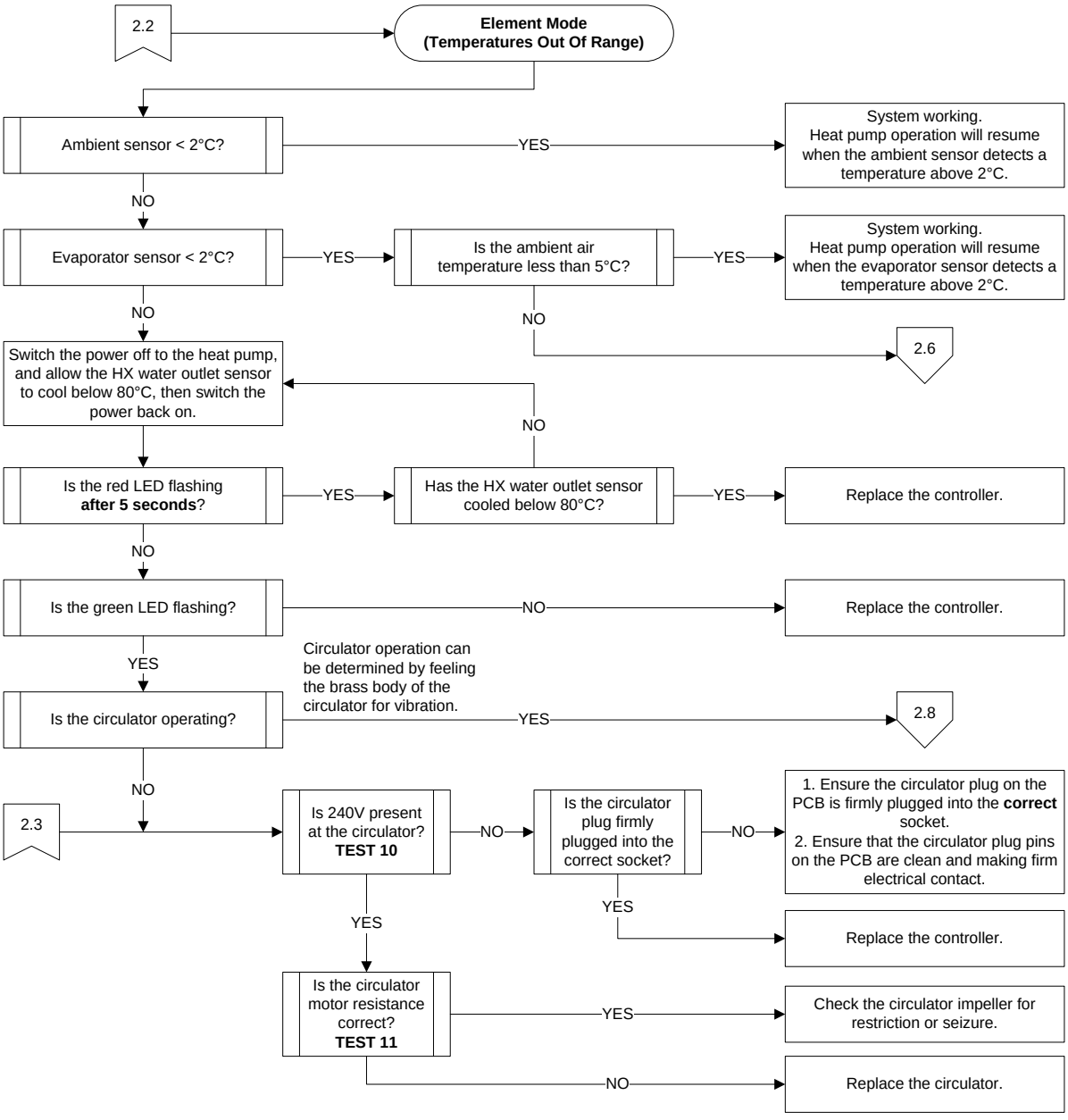
Fault Finding: Charts 2 and 2.8



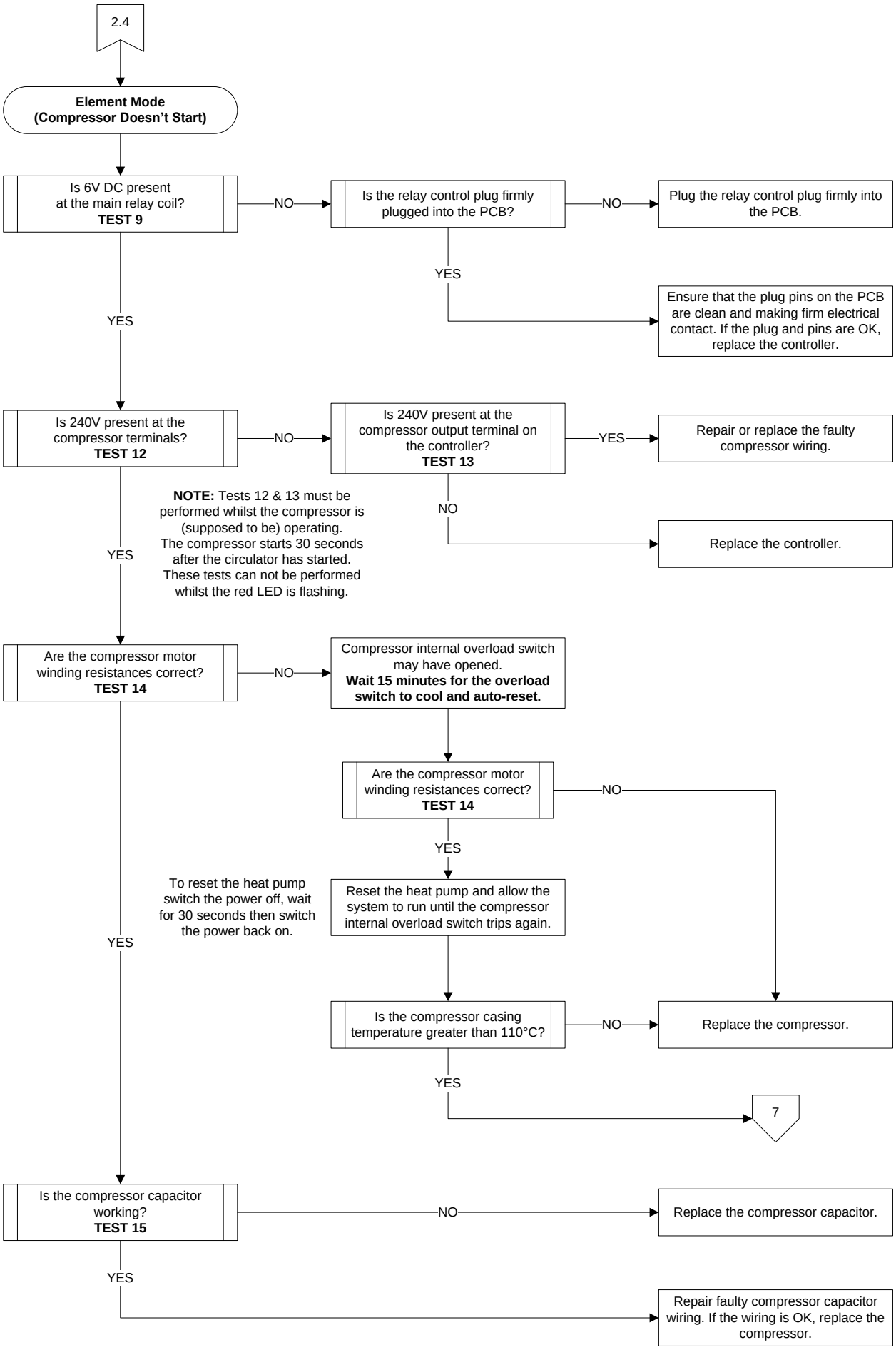
Fault Finding: Chart 2.1



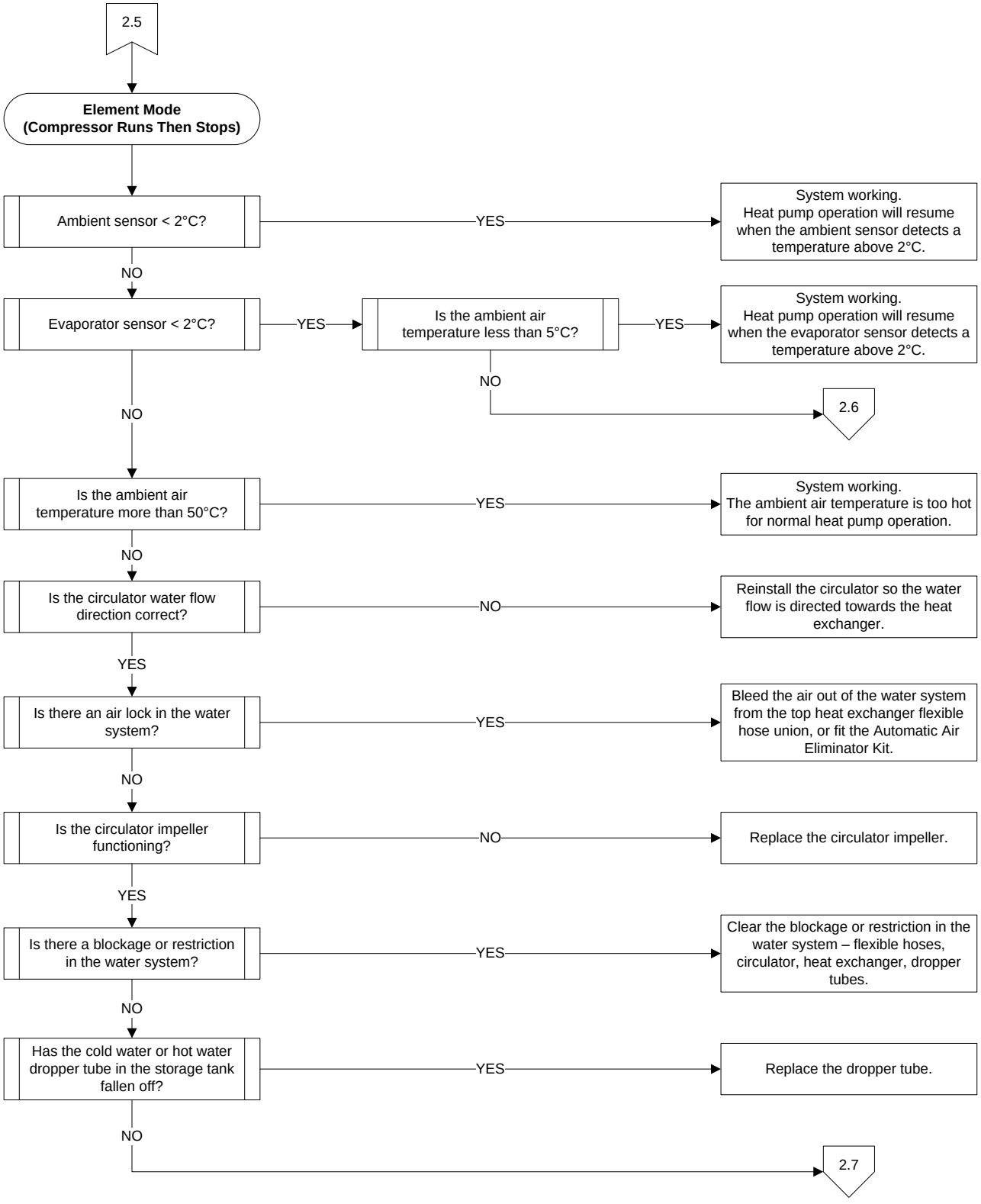
Fault Finding: Charts 2.2 and 2.3



Fault Finding: Chart 2.4

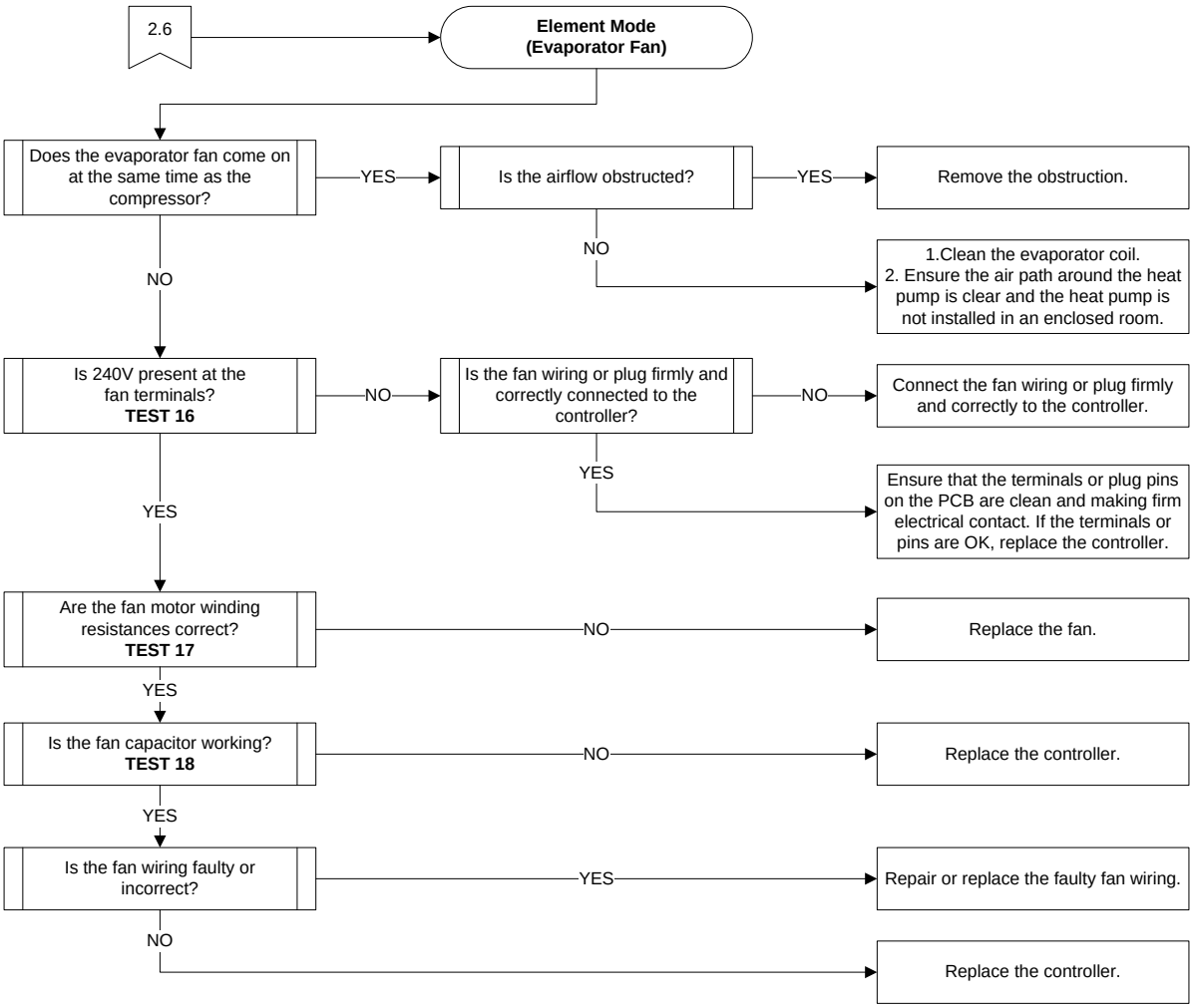


Fault Finding: Chart 2.5

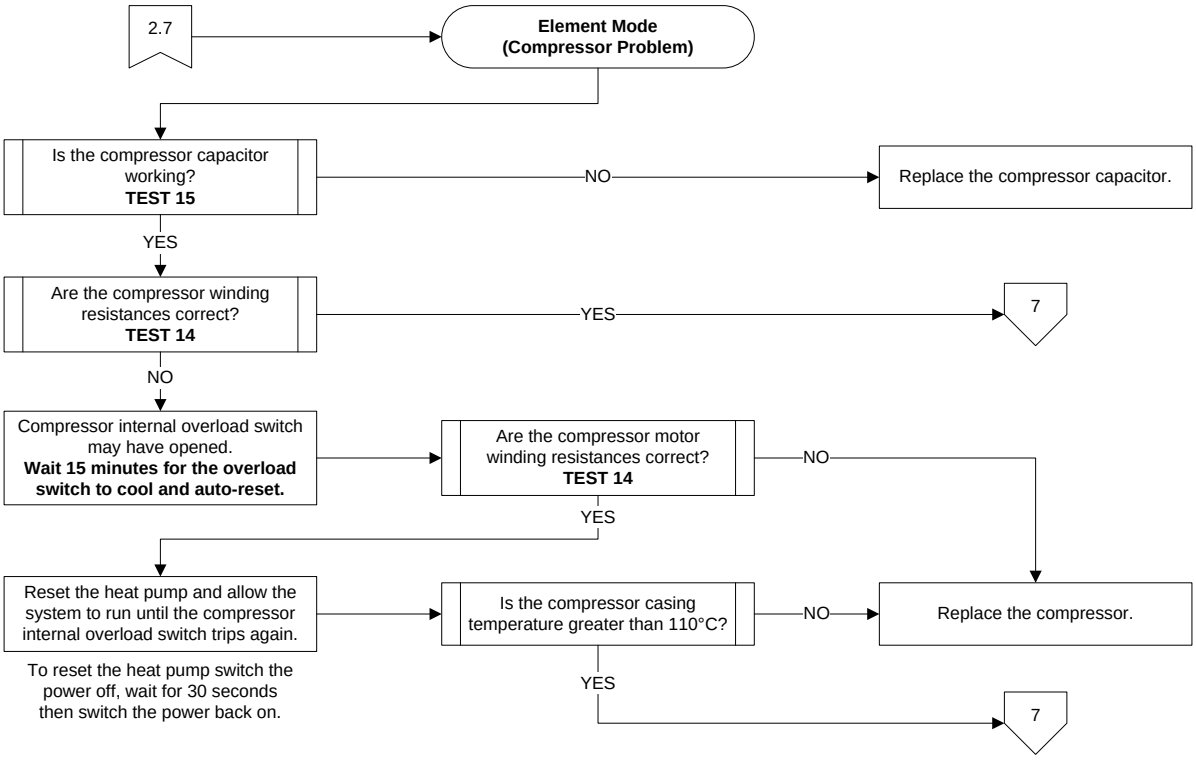


NOTE: Ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.

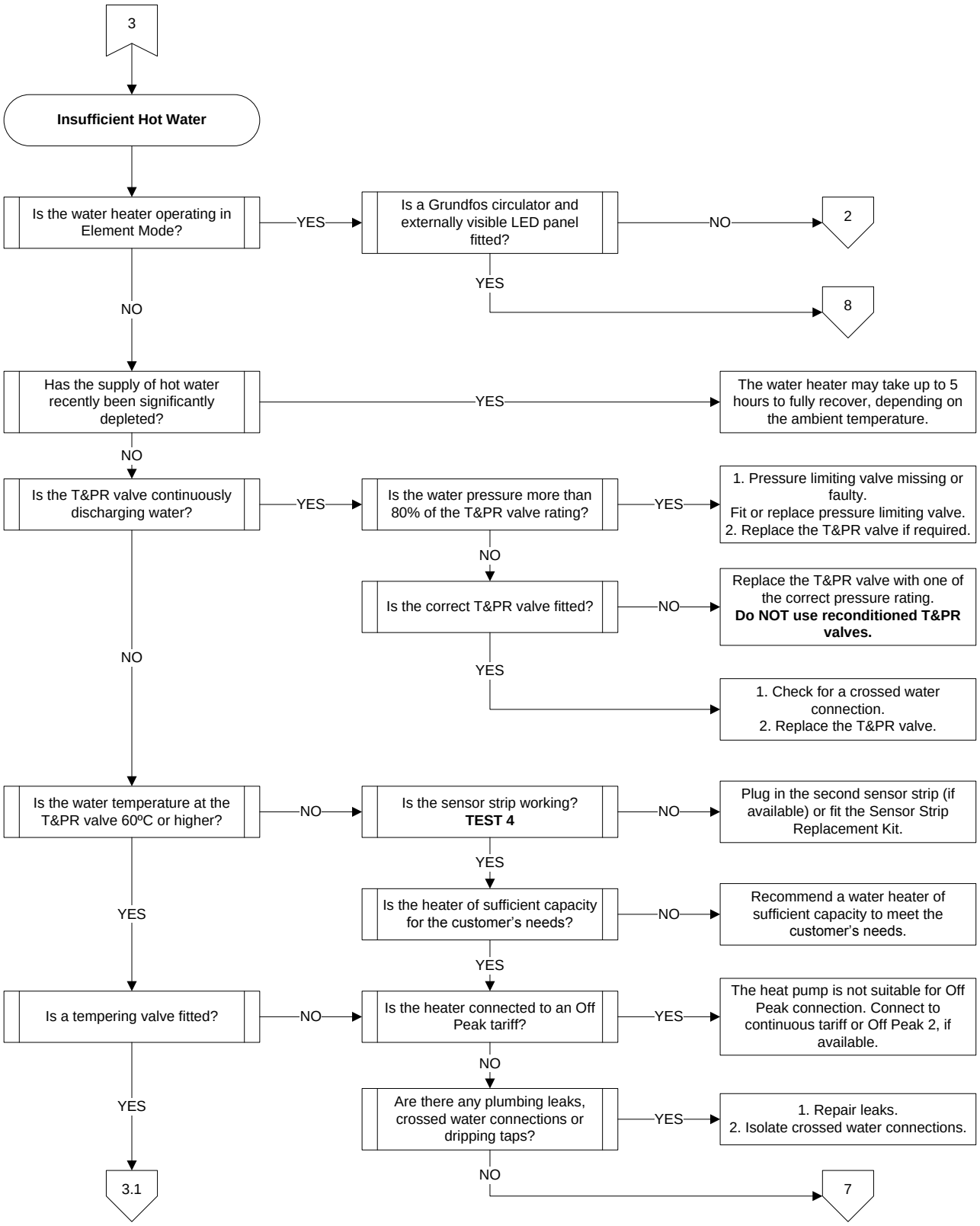
Fault Finding: Chart 2.6



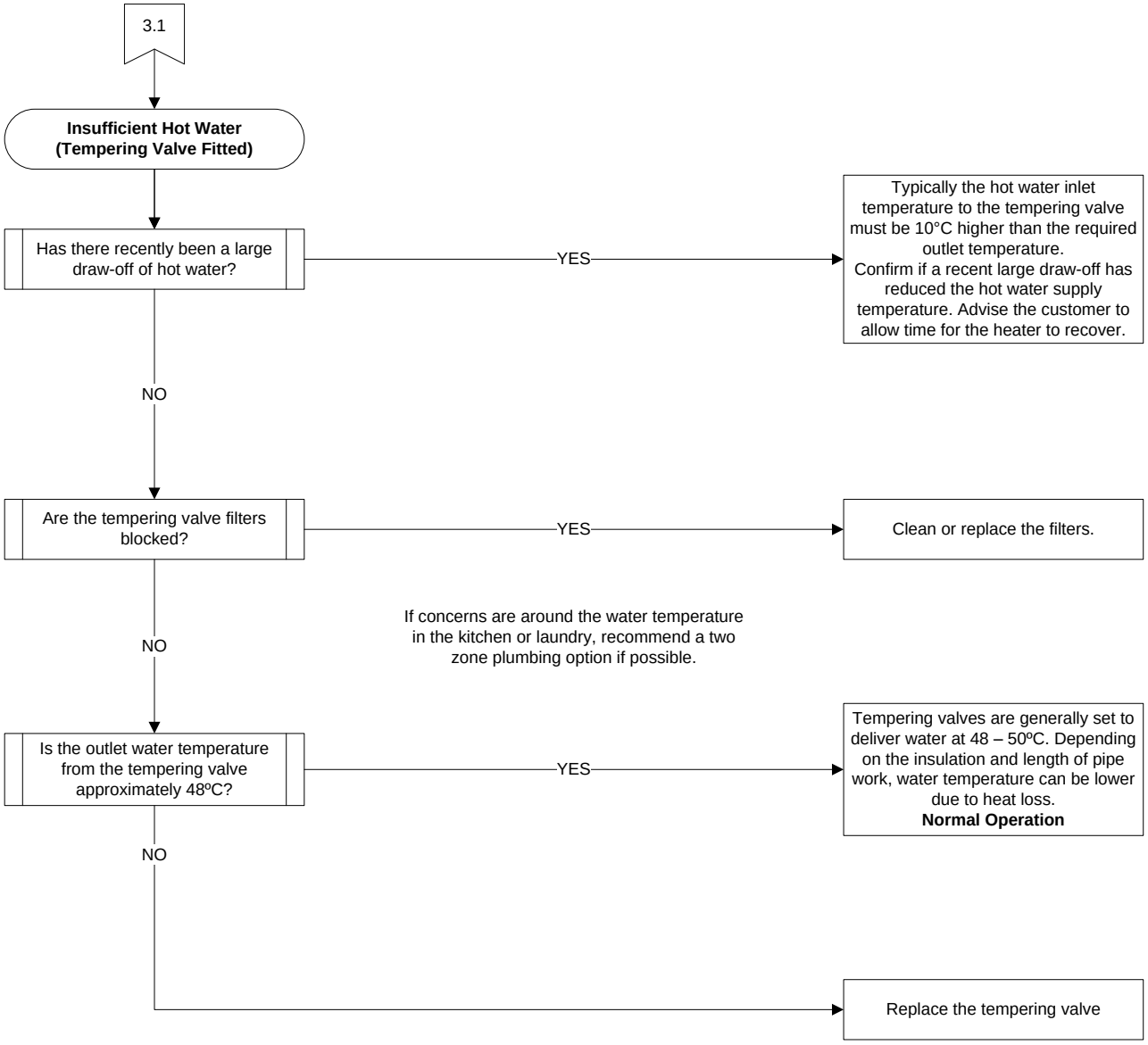
Fault Finding: Chart 2.7



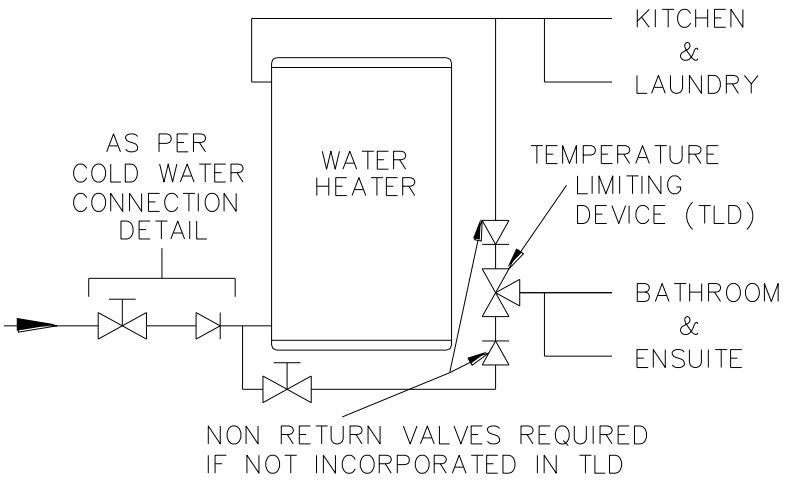
Fault Finding: Chart 3



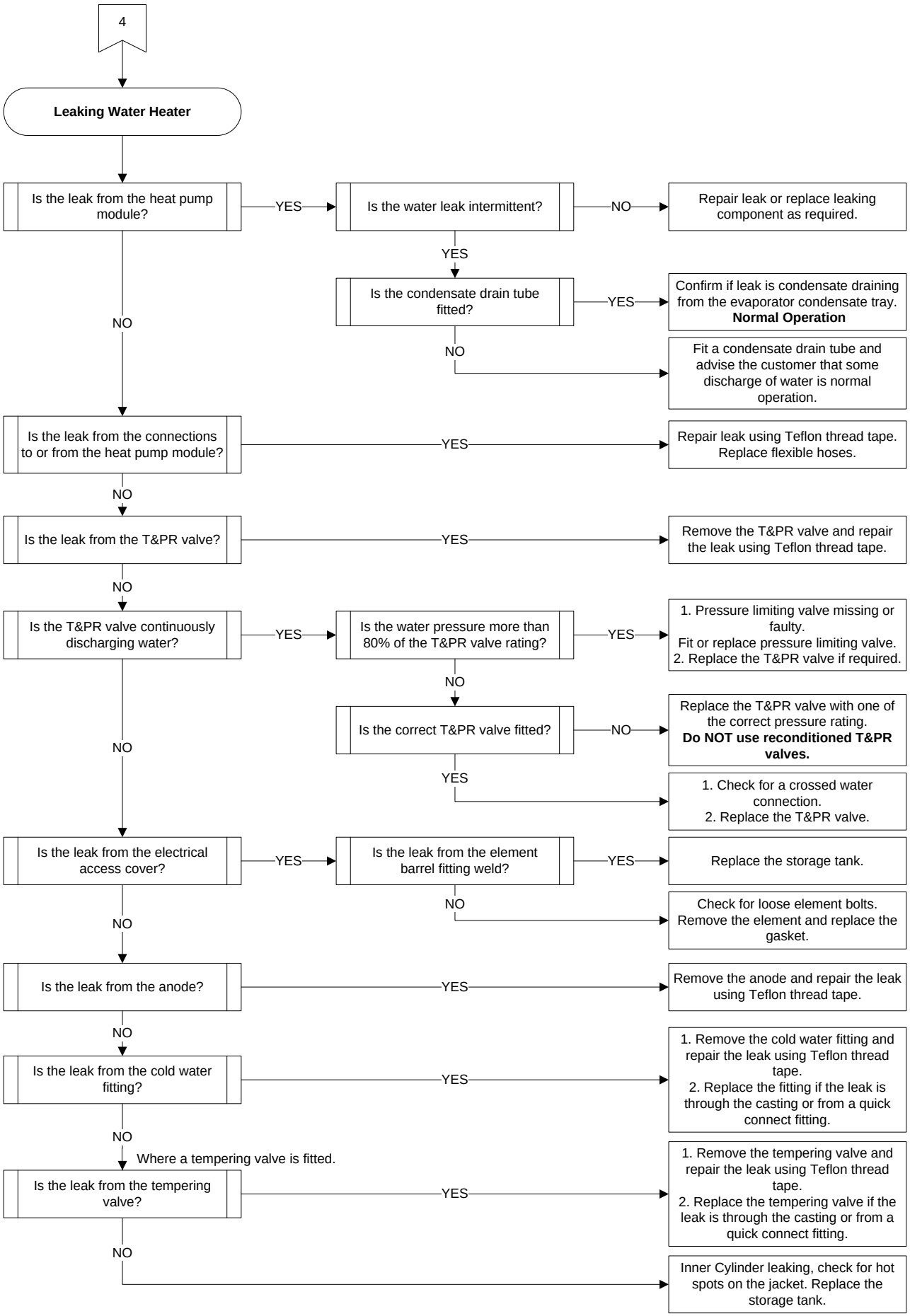
Fault Finding: Chart 3.1



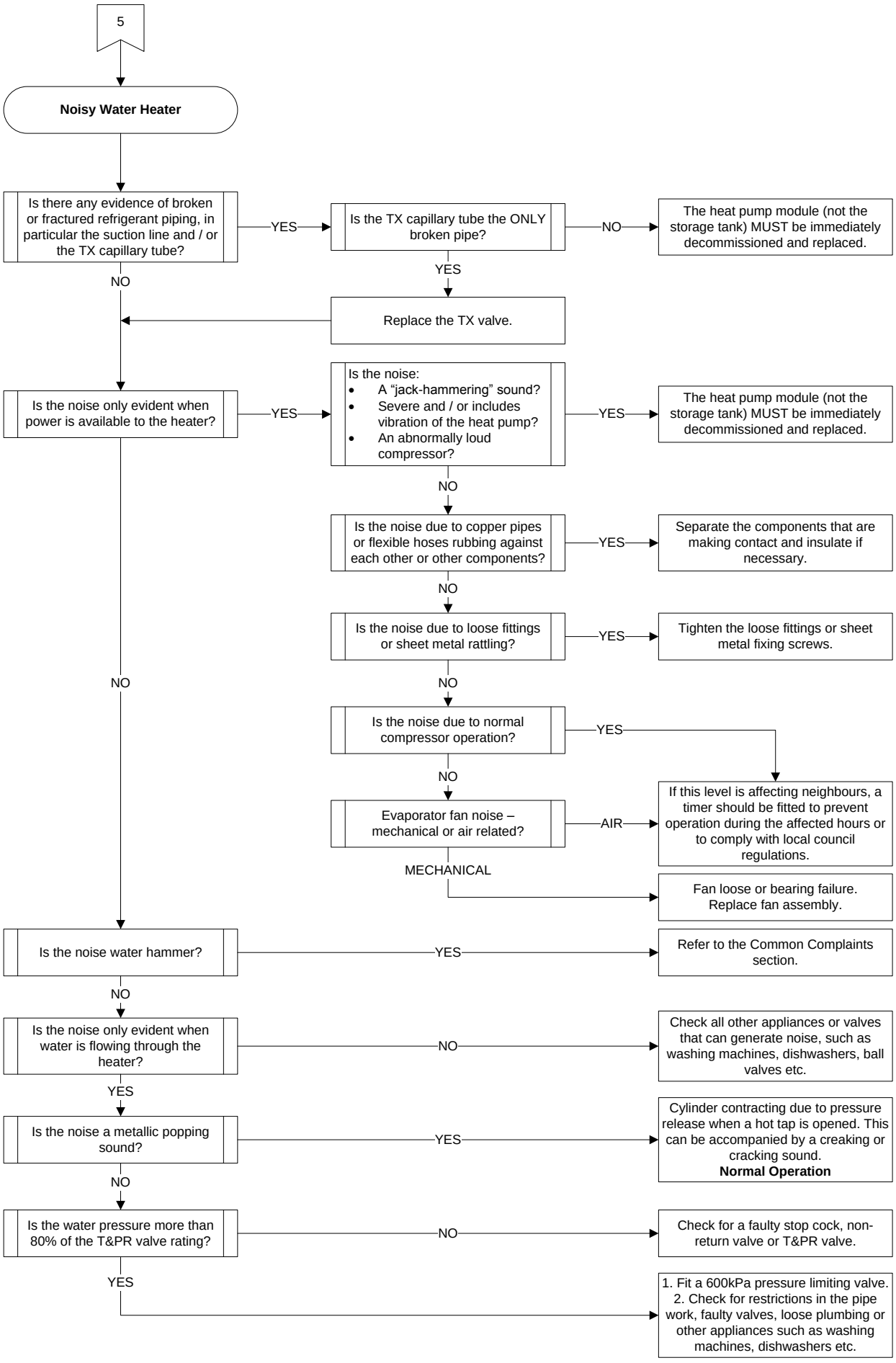
Two Zone Plumbing Option



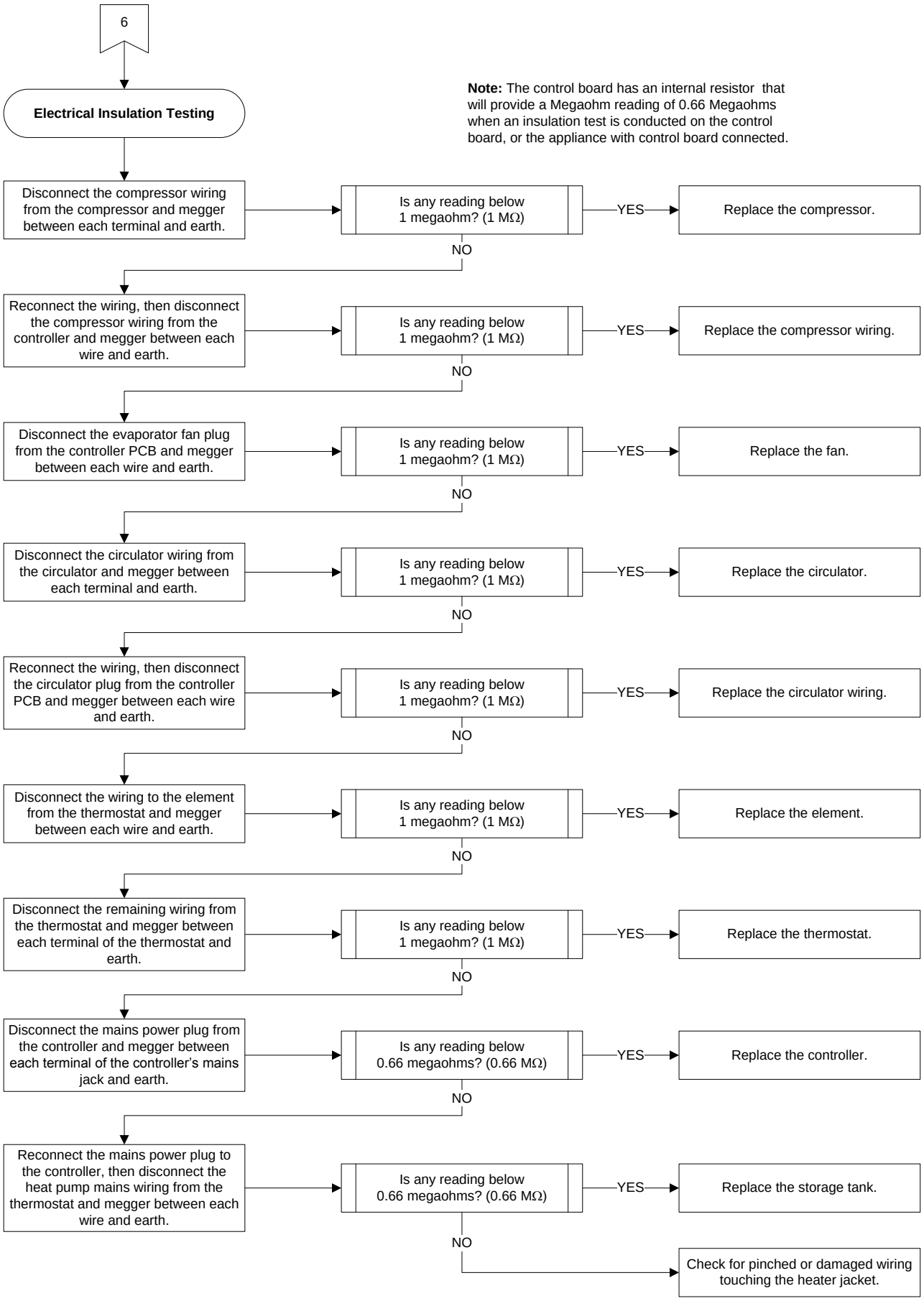
Fault Finding: Chart 4



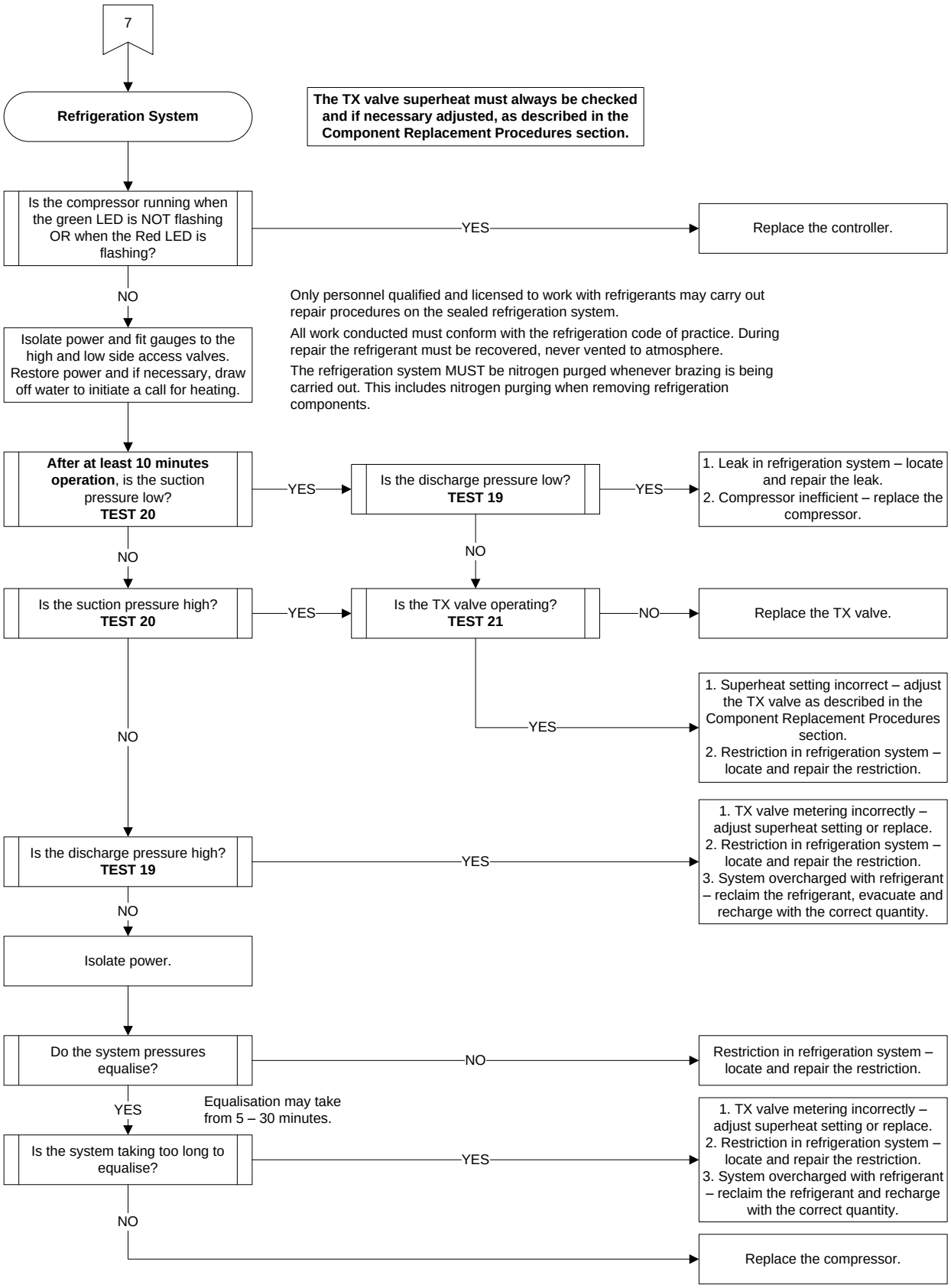
Fault Finding: Chart 5



Fault Finding: Chart 6



Fault Finding: Chart 7



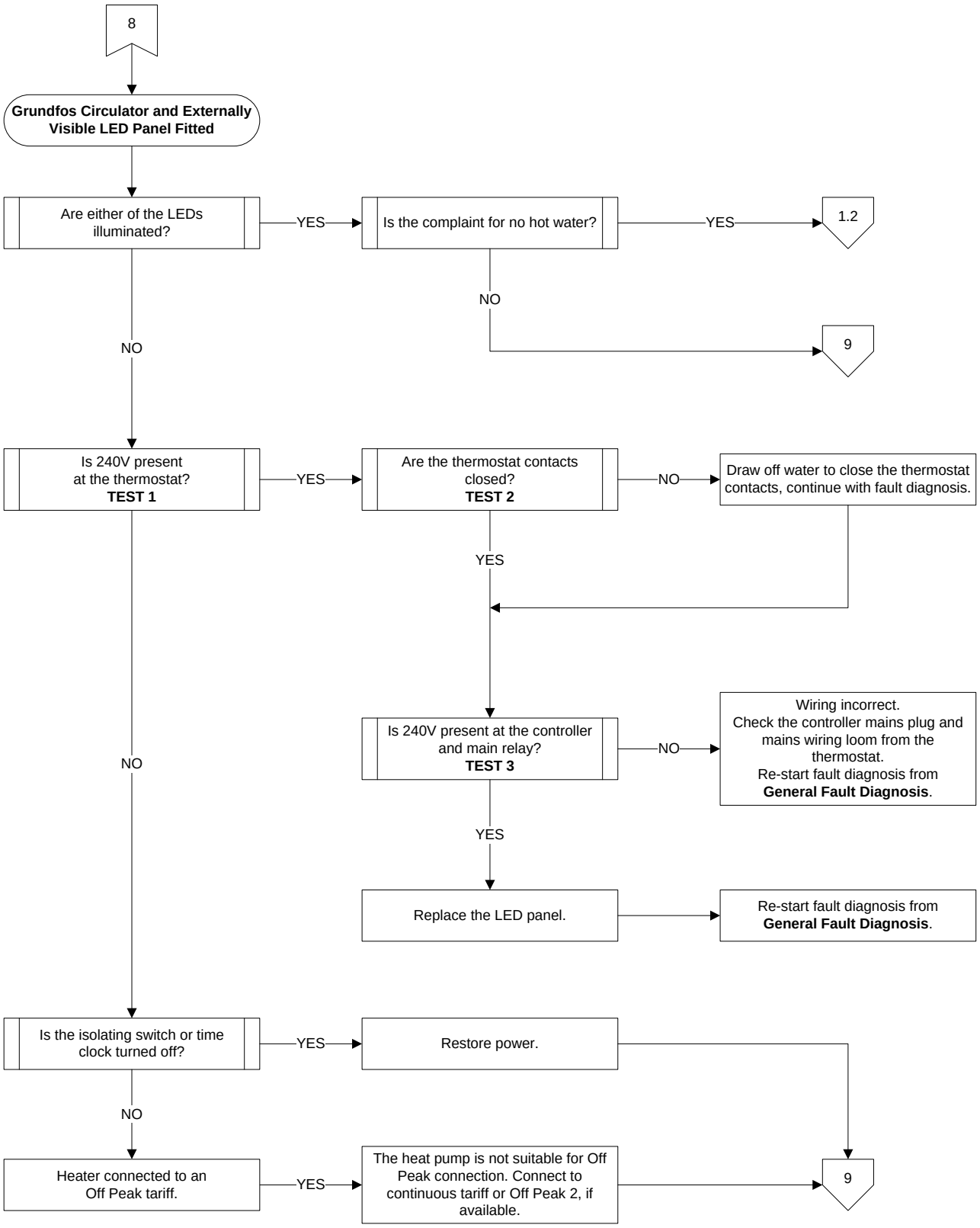
WARNING: The heat pump must NEVER be operated with the refrigeration system open to atmosphere.

WARNING: When reclaiming refrigerant, BOTH sides of the refrigeration system must be open to the reclaim bottle, in order to prevent the possibility of sections of the refrigeration system remaining pressurised.

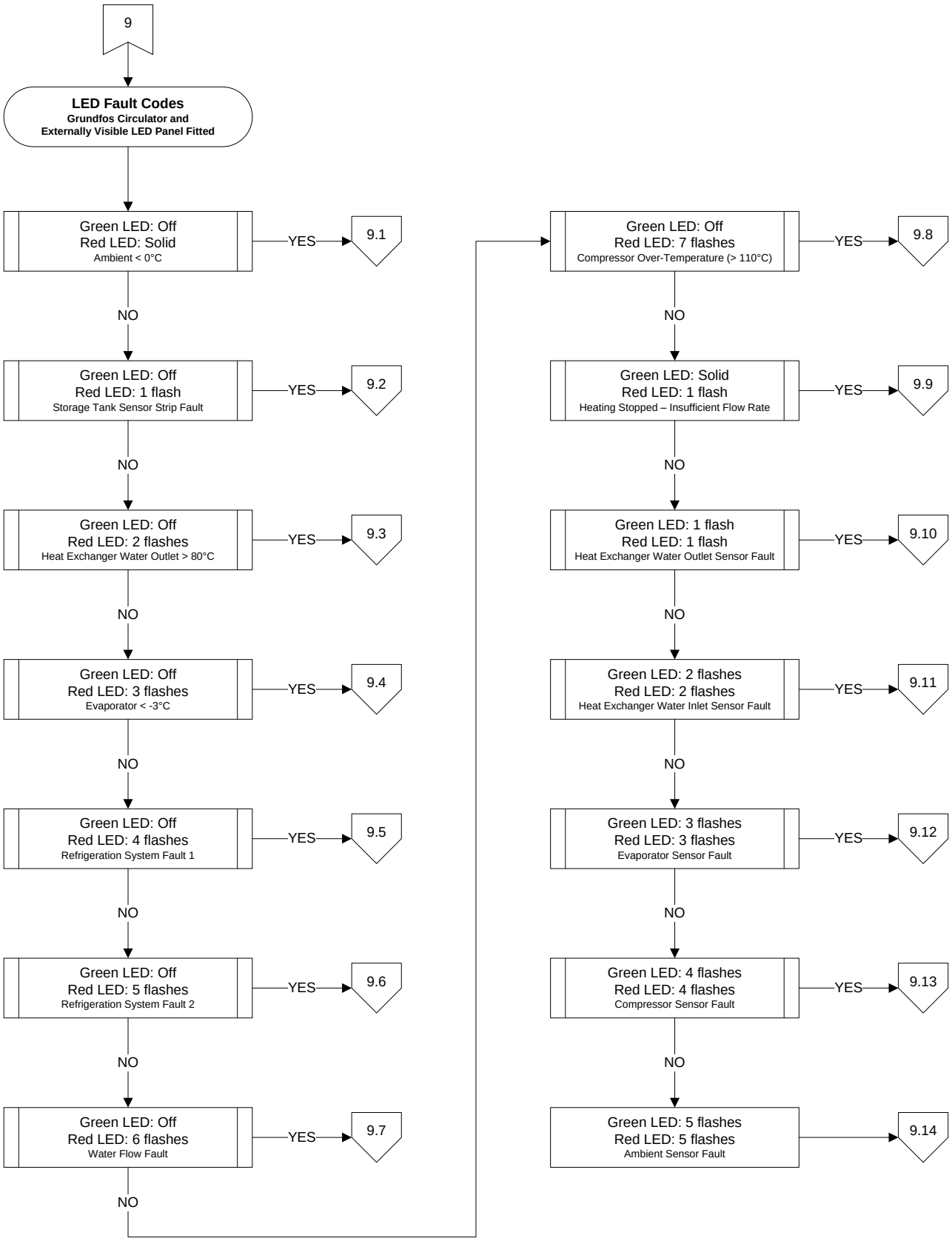
WARNING: When removing refrigeration system components, refrigeration pipes should be cut rather than un-brazed wherever possible.

WARNING: Heat must NOT be applied to plastic components. When brazing pipe work a heat shield must be used to prevent the possibility of damage.

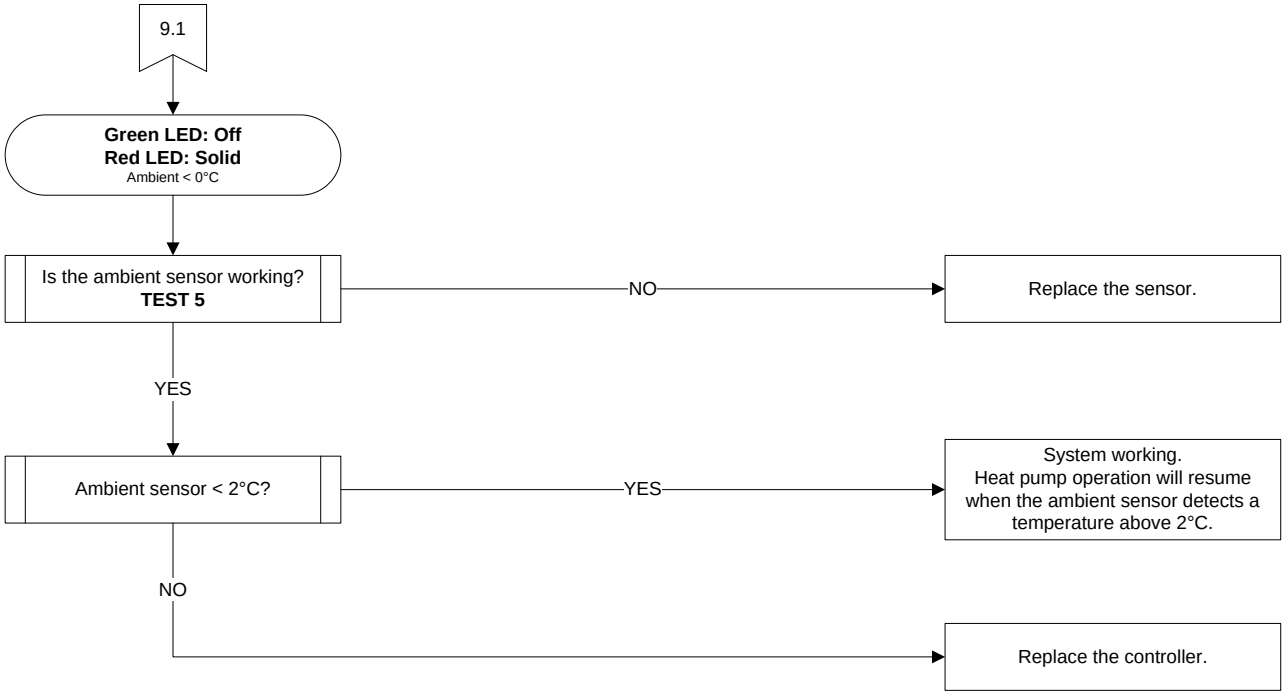
Fault Finding: Chart 8



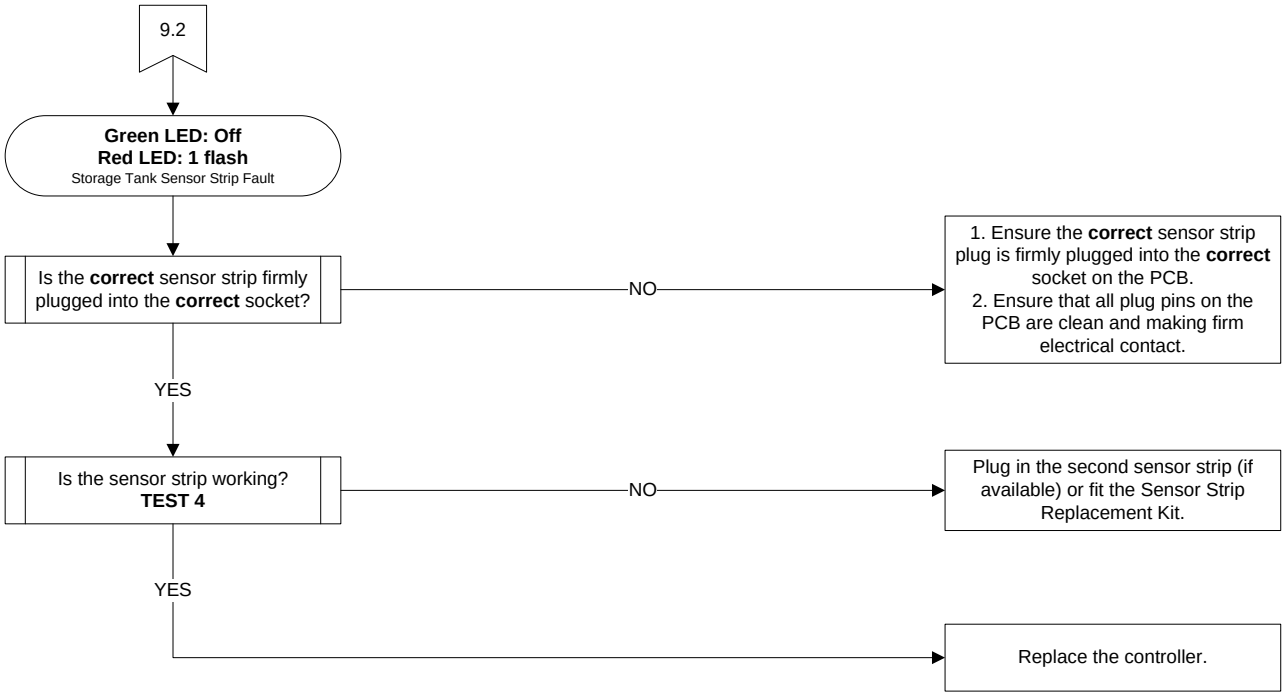
Fault Finding: Chart 9



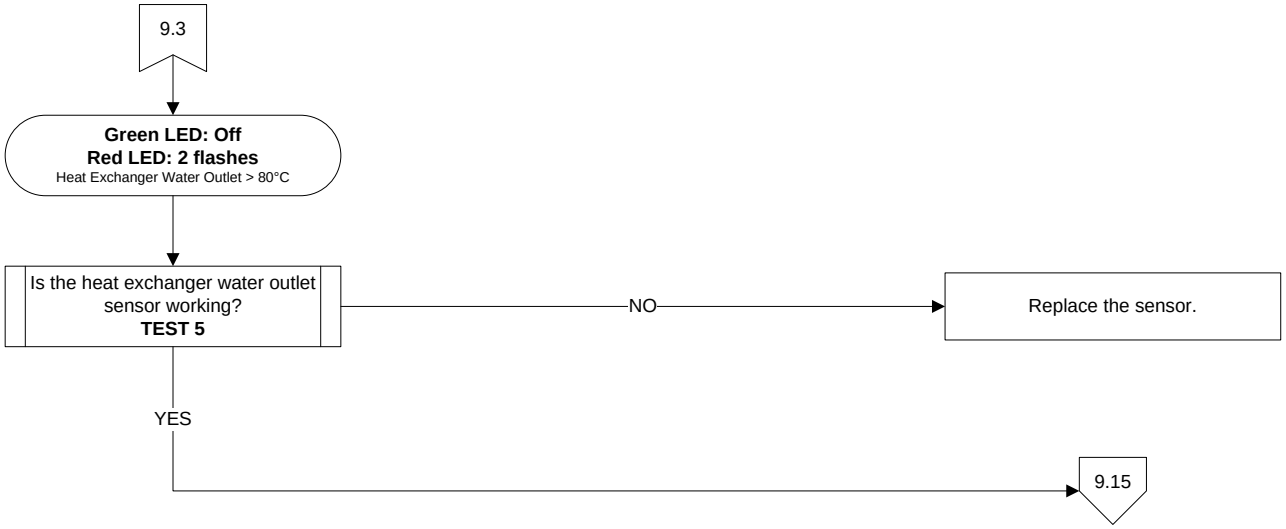
Fault Finding: Chart 9.1



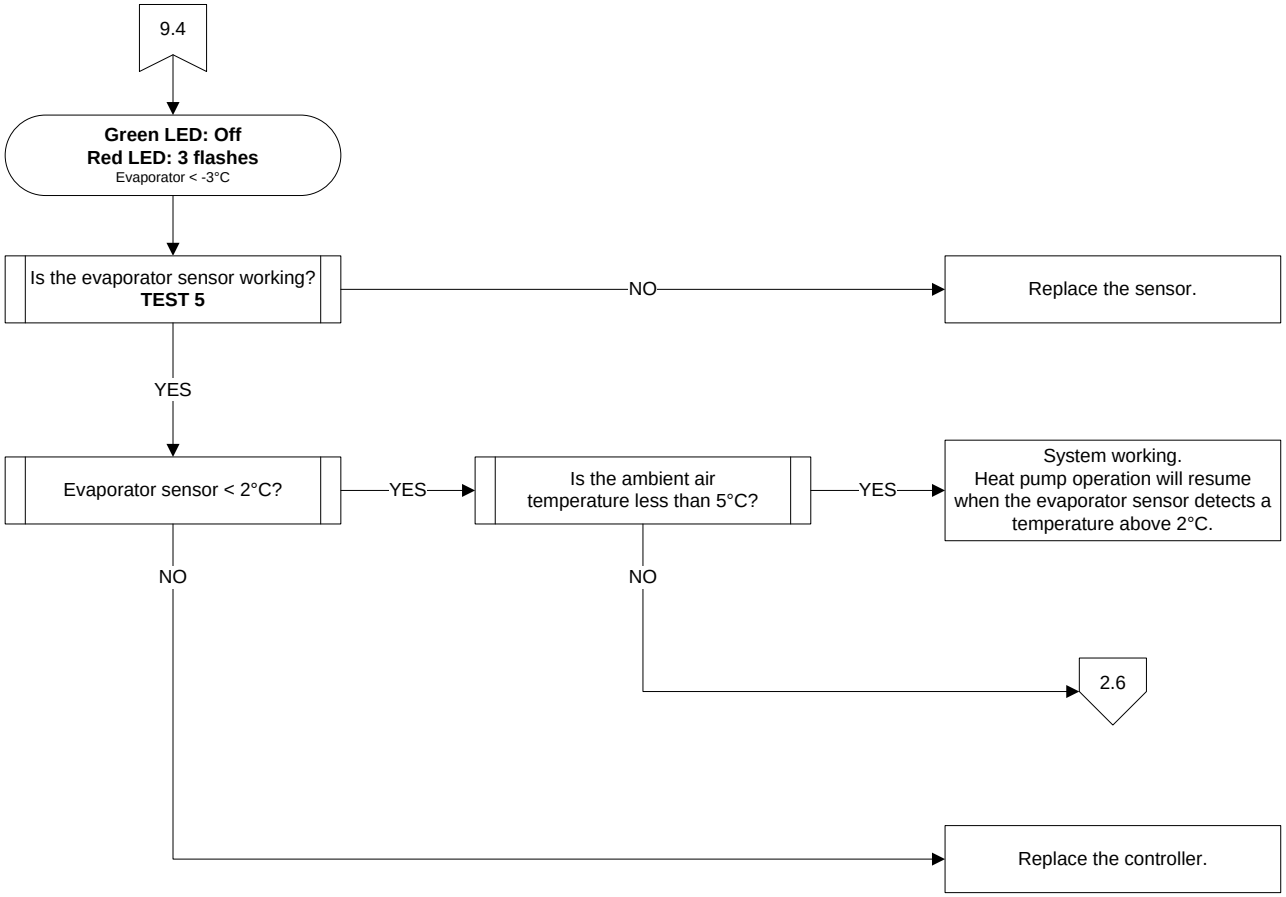
Fault Finding: Chart 9.2



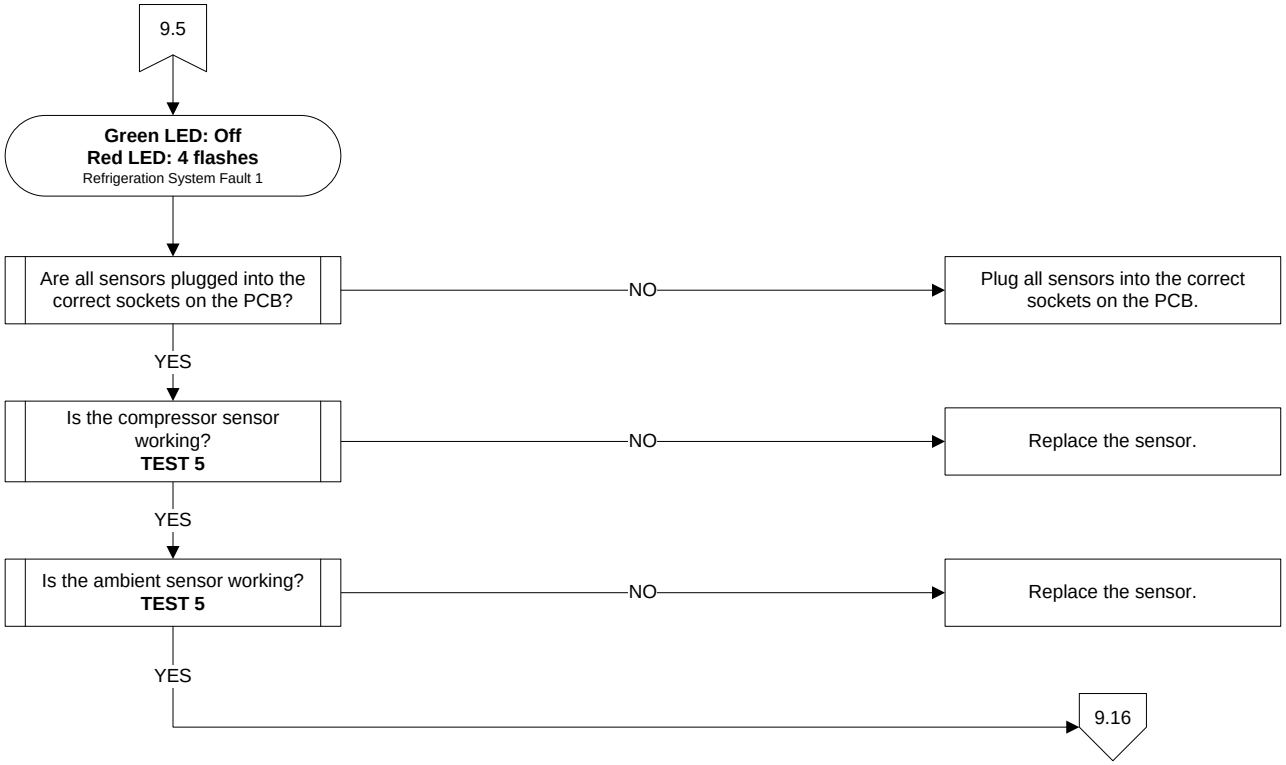
Fault Finding: Chart 9.3



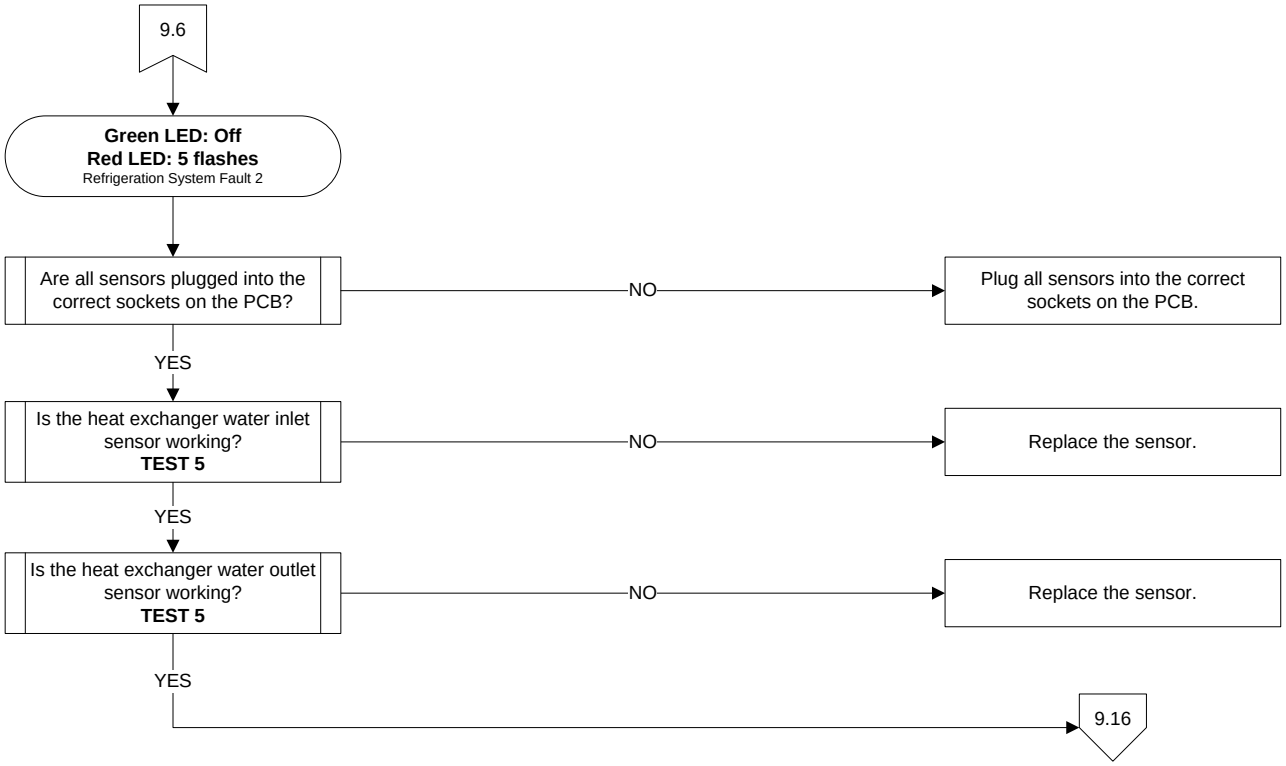
Fault Finding: Chart 9.4



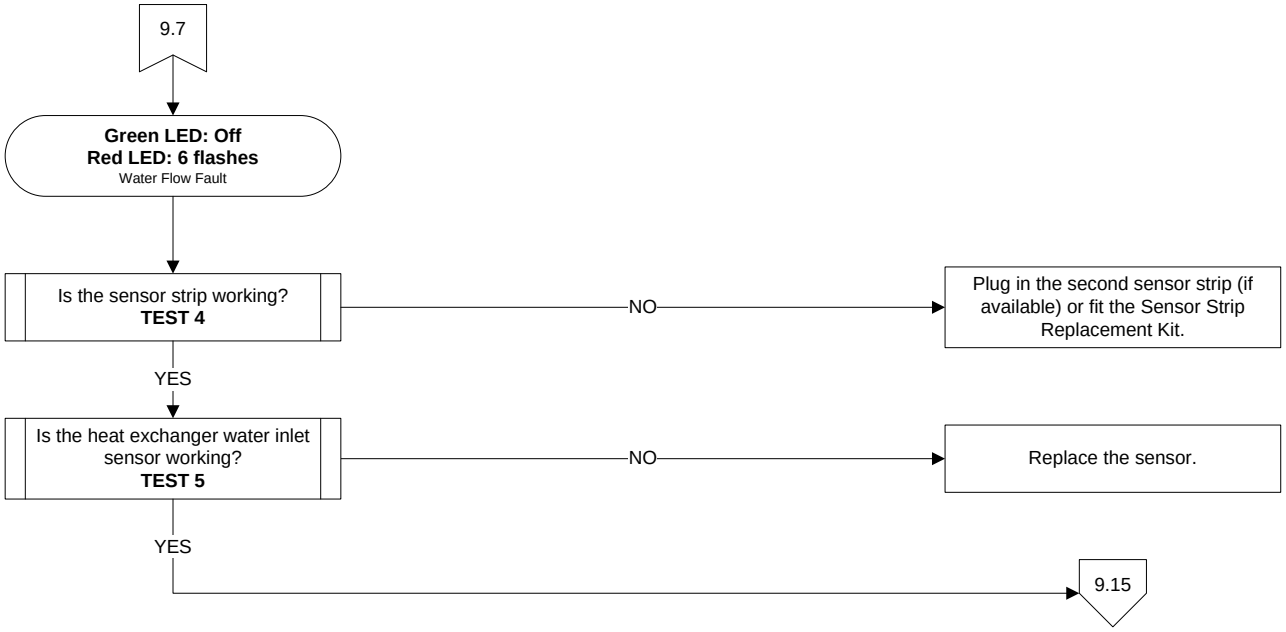
Fault Finding: Chart 9.5



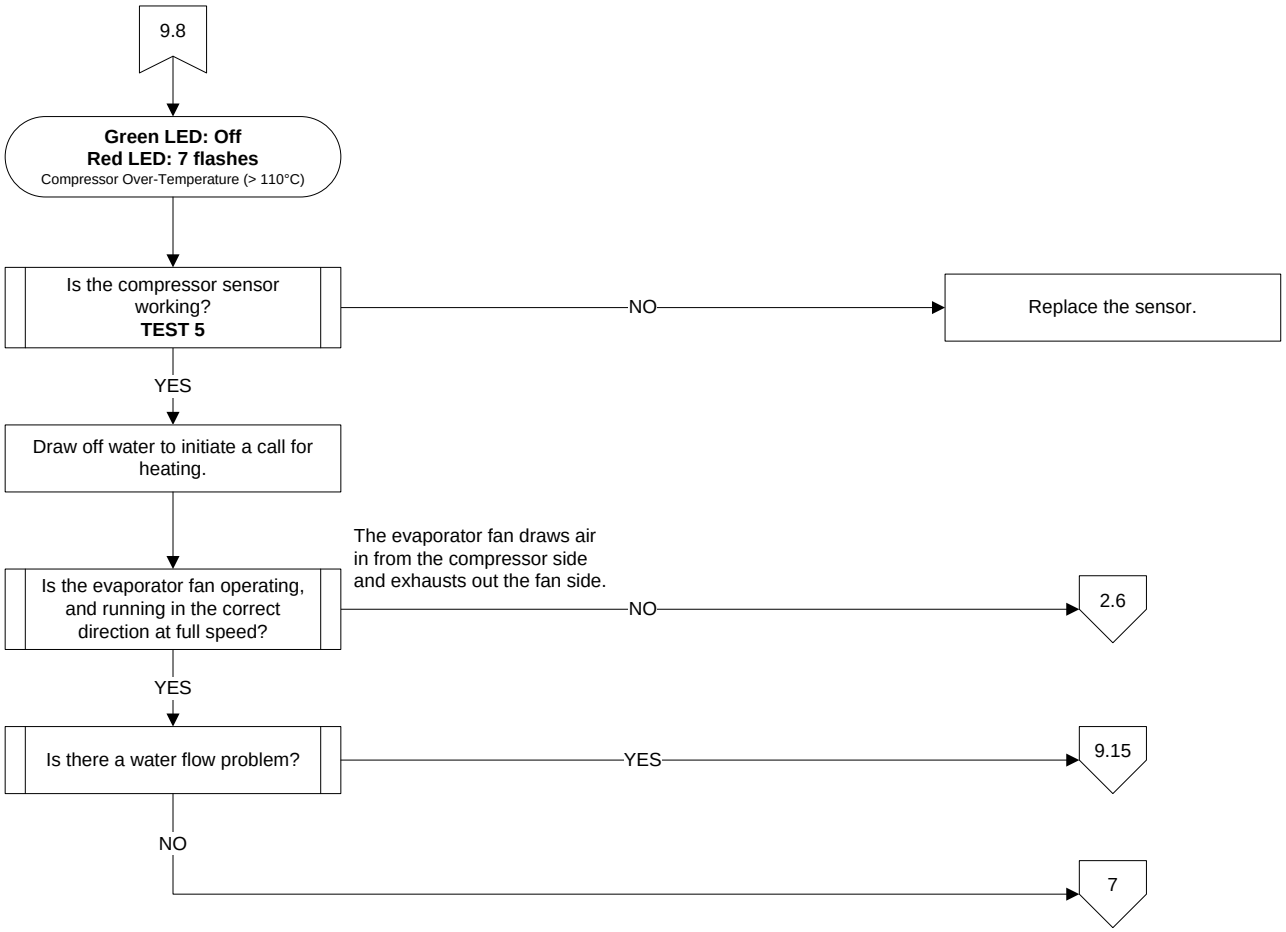
Fault Finding: Chart 9.6



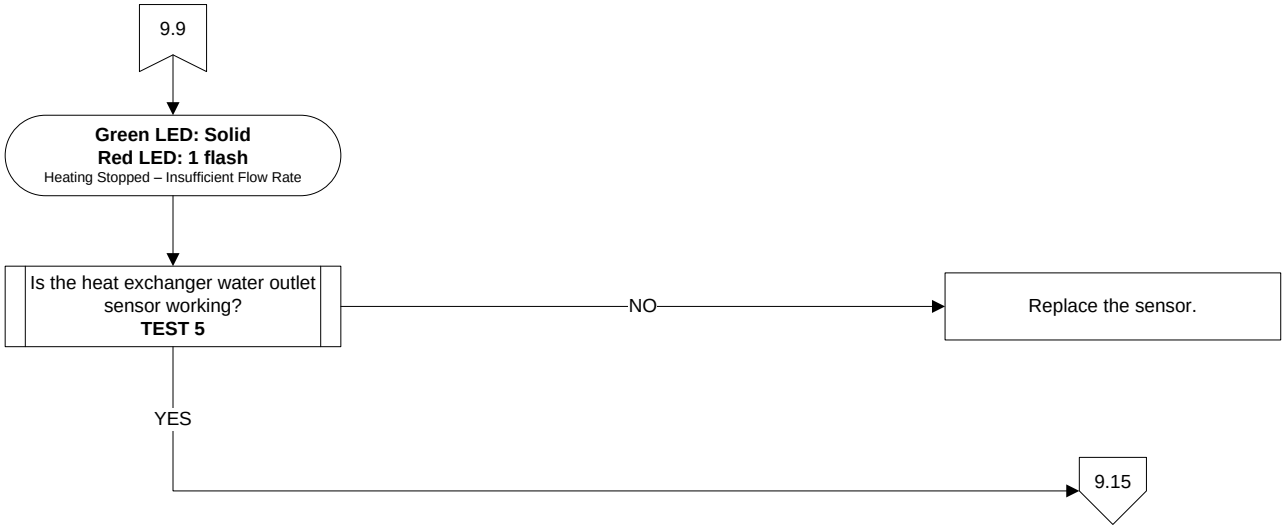
Fault Finding: Chart 9.7



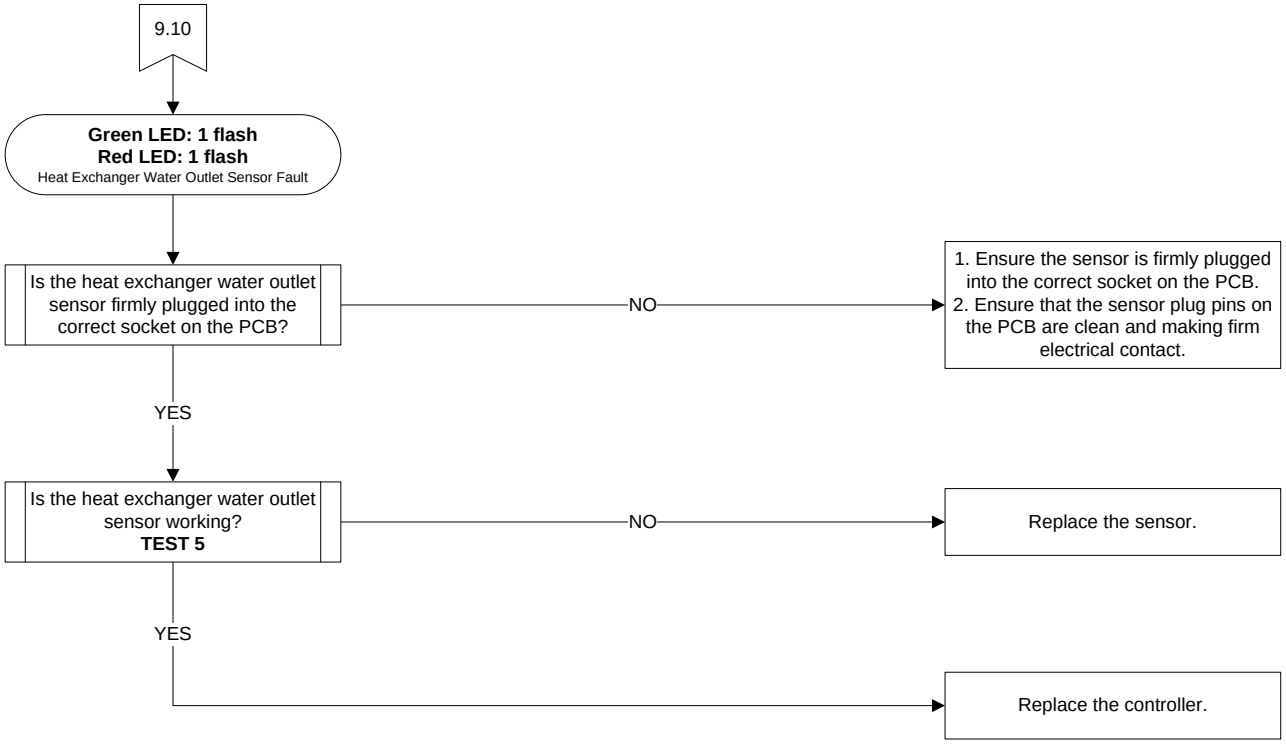
Fault Finding: Chart 9.8



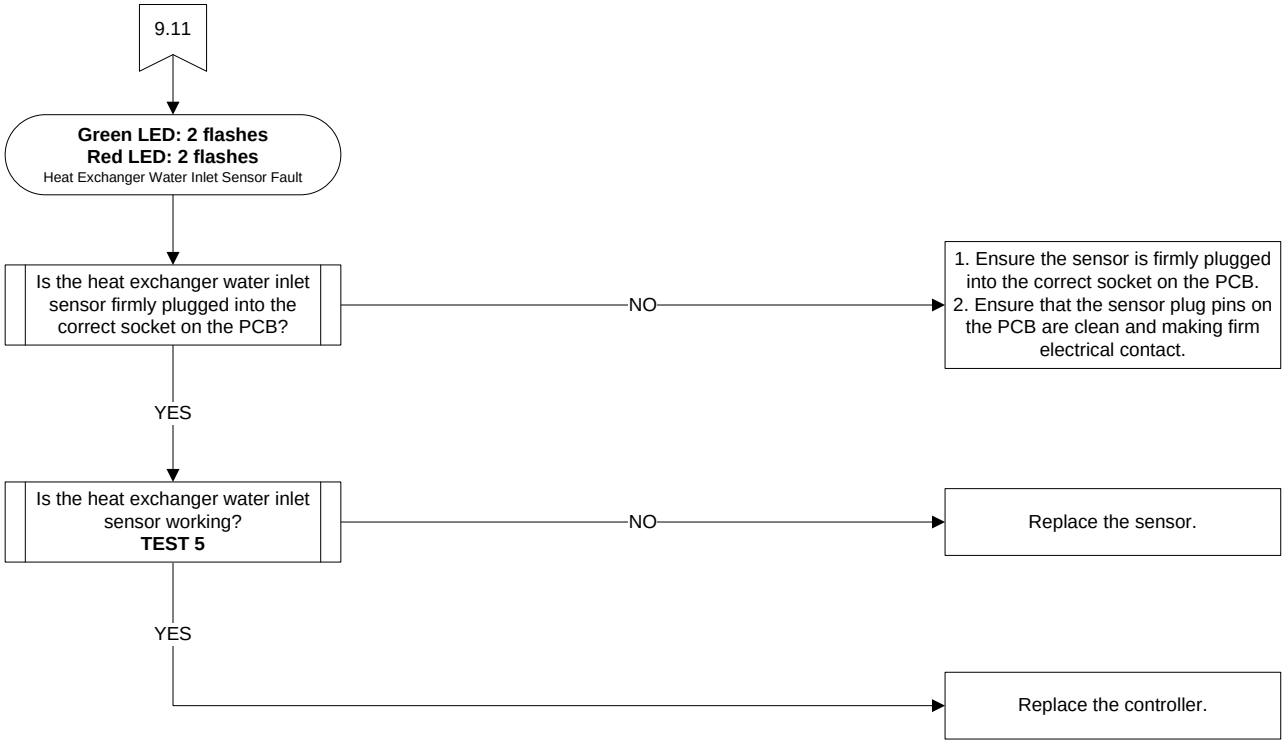
Fault Finding: Chart 9.9



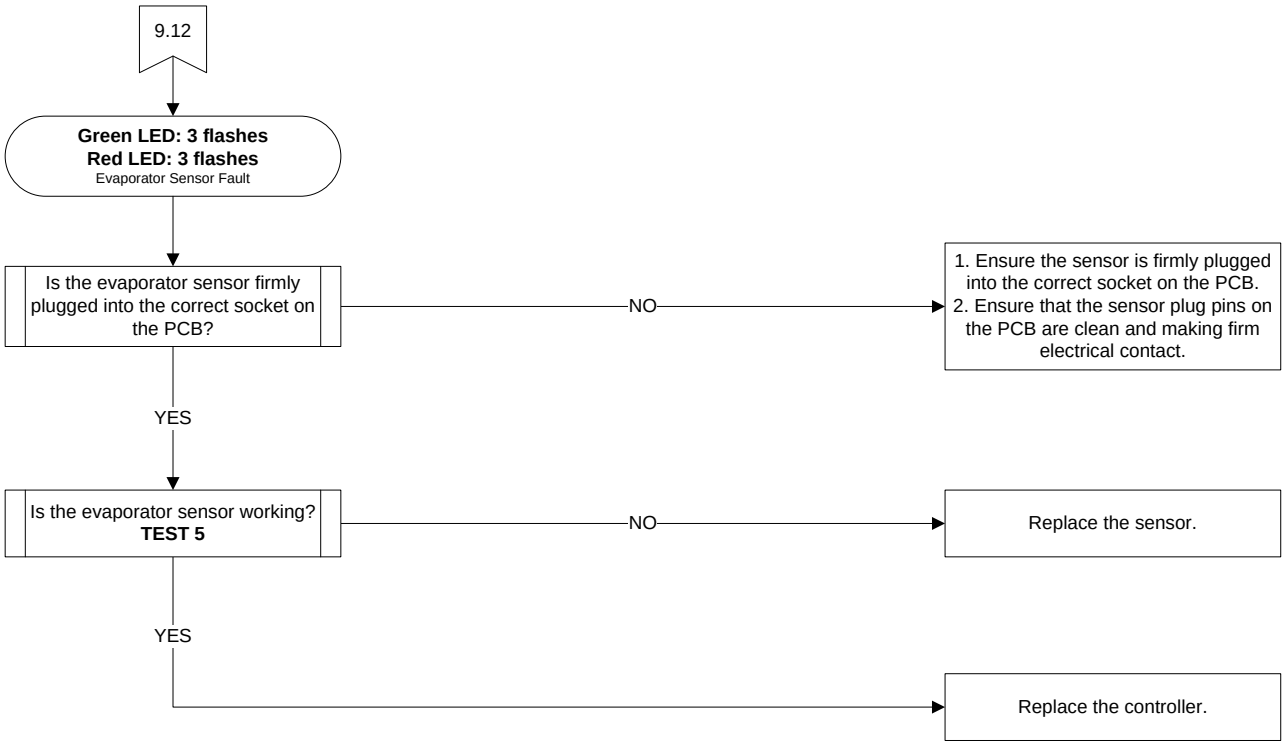
Fault Finding: Chart 9.10



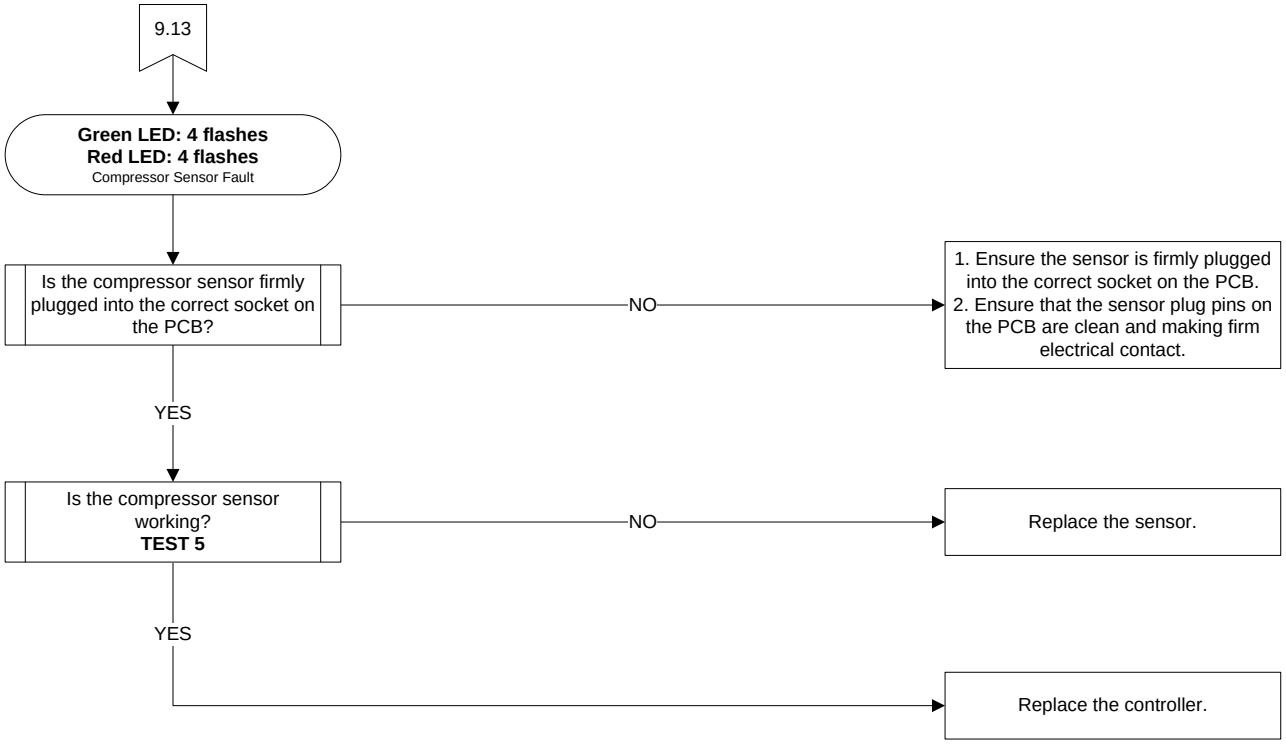
Fault Finding: Chart 9.11



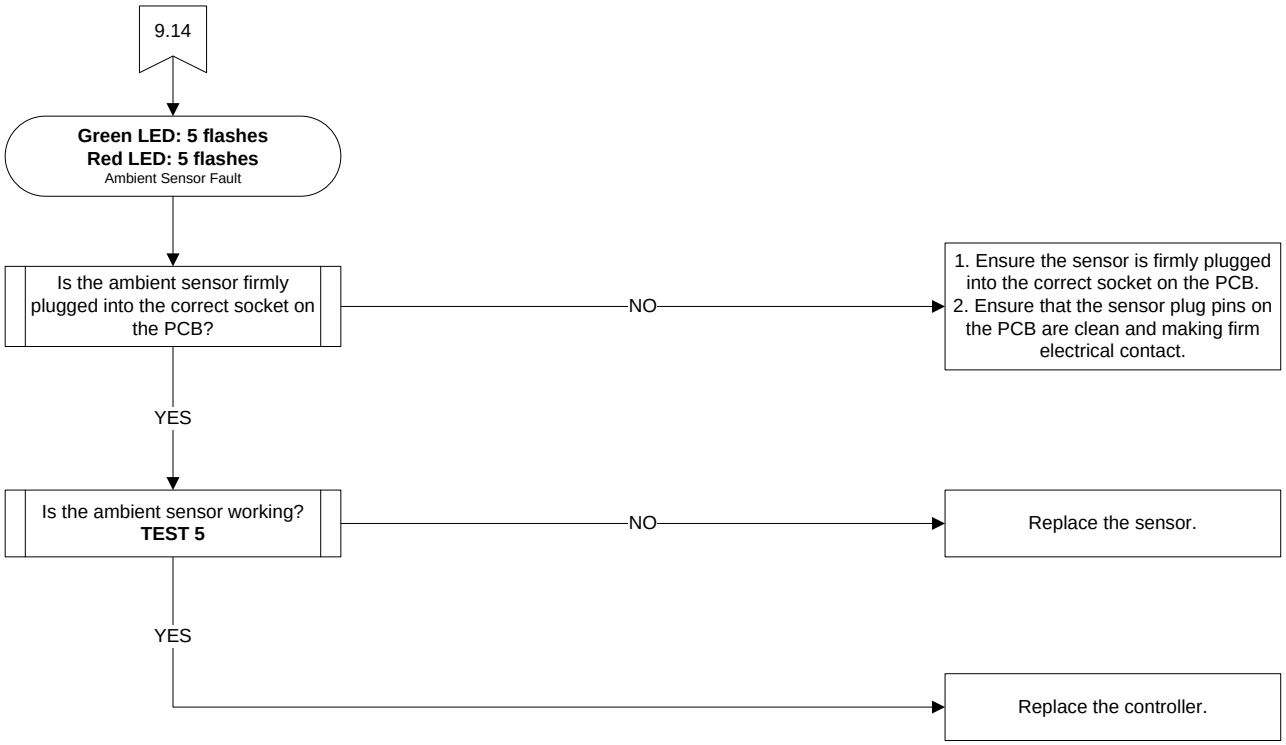
Fault Finding: Chart 9.12



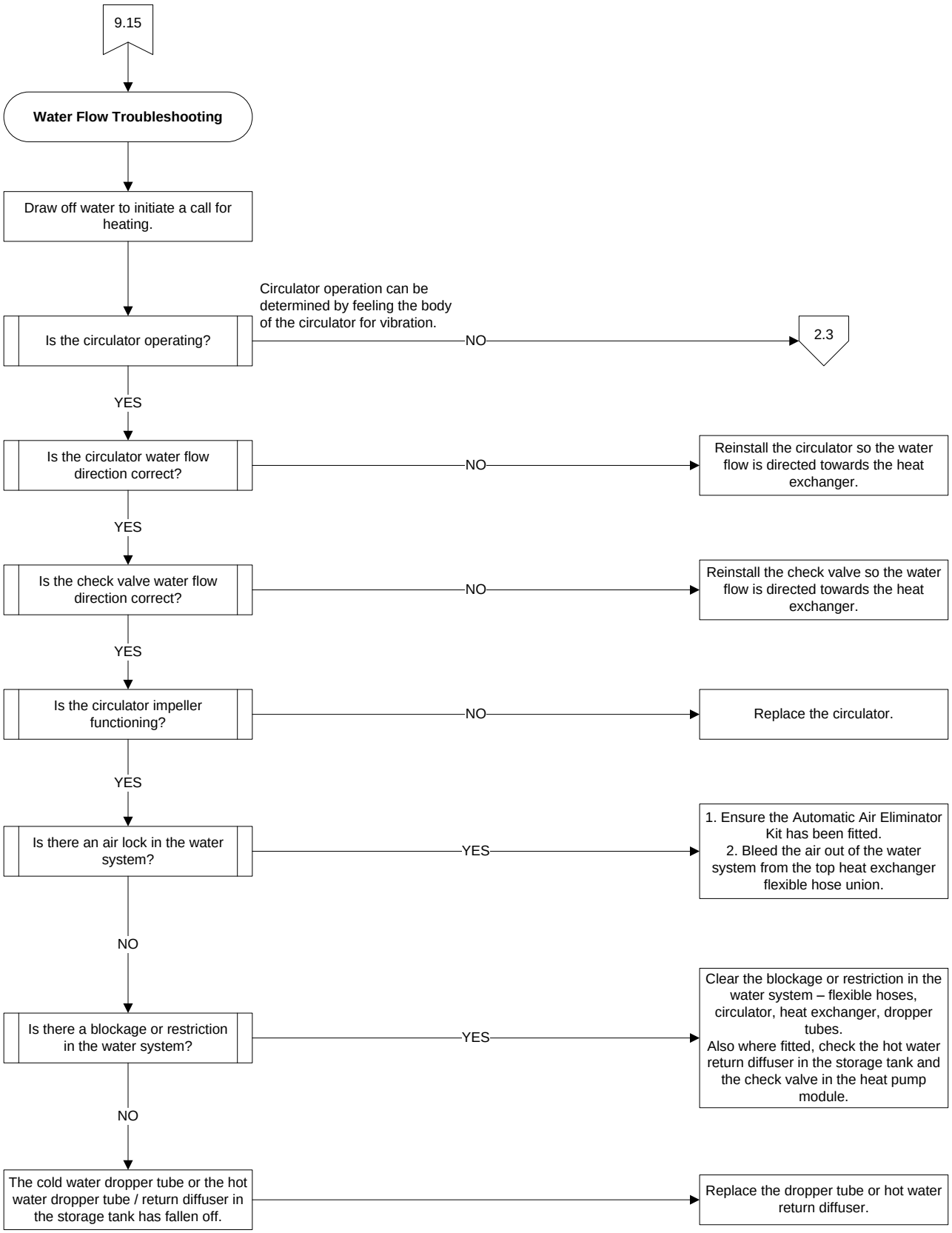
Fault Finding: Chart 9.13



Fault Finding: Chart 9.14

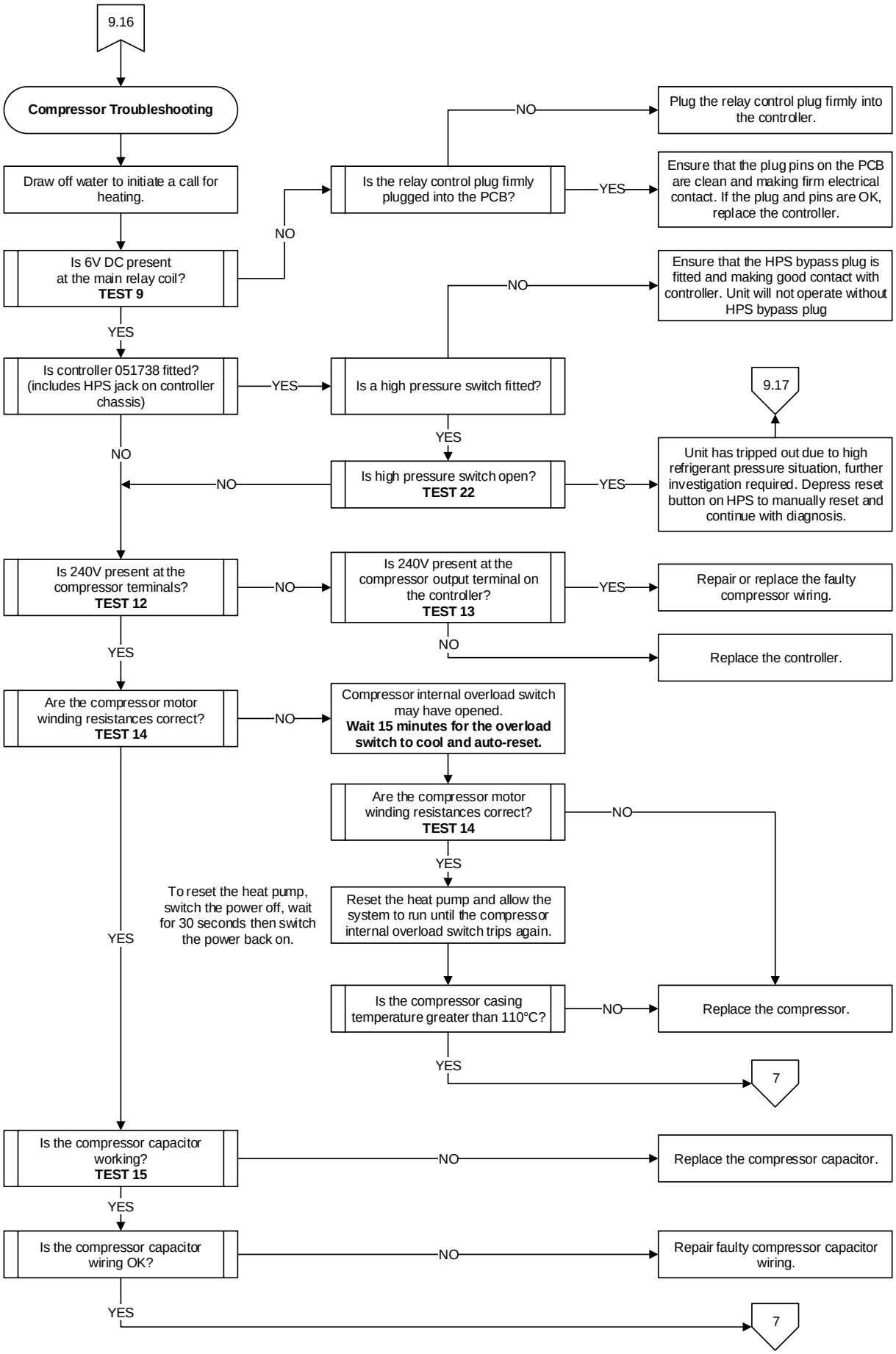


Fault Finding: Chart 9.15

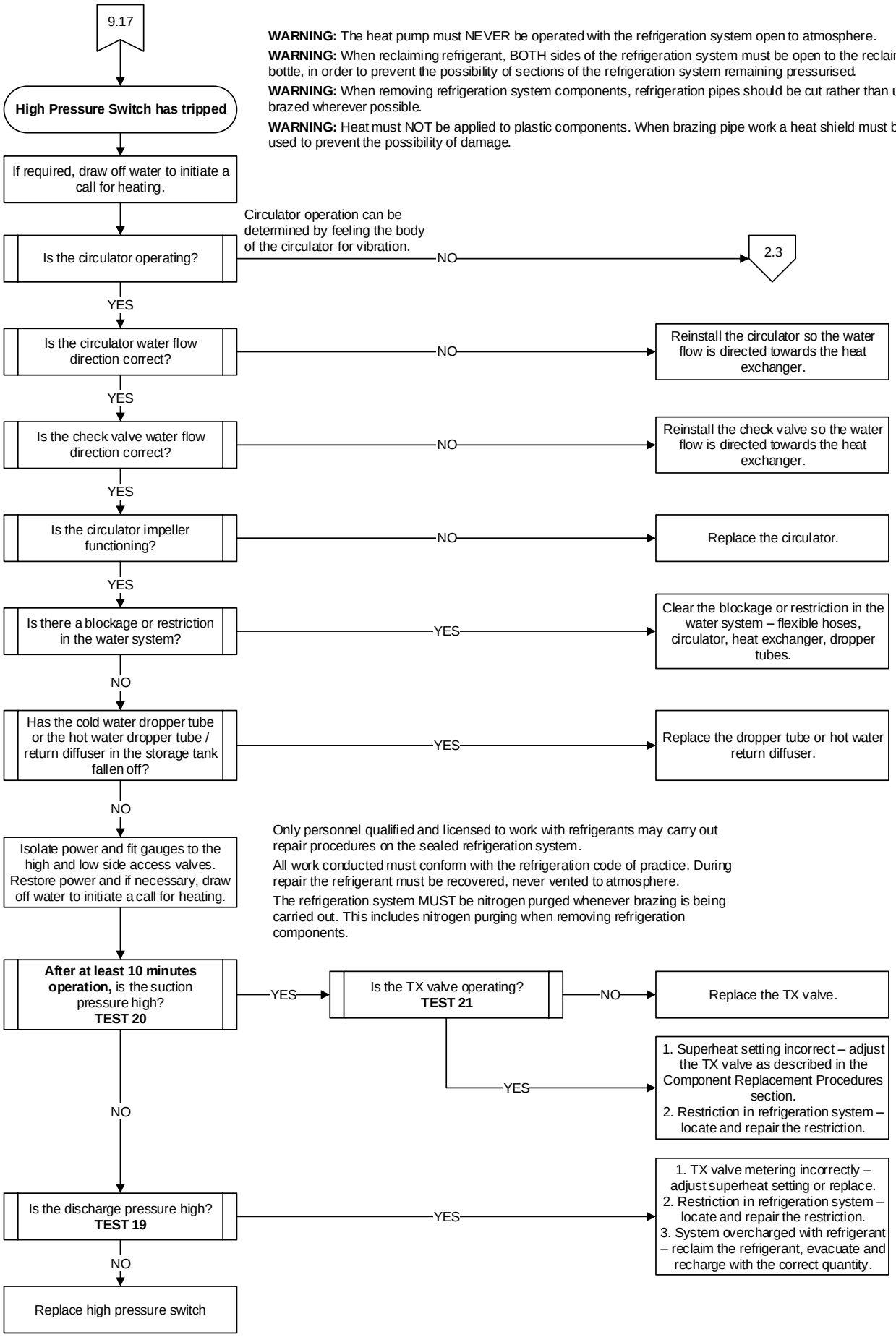


NOTE: Ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.

Fault Finding: Chart 9.16

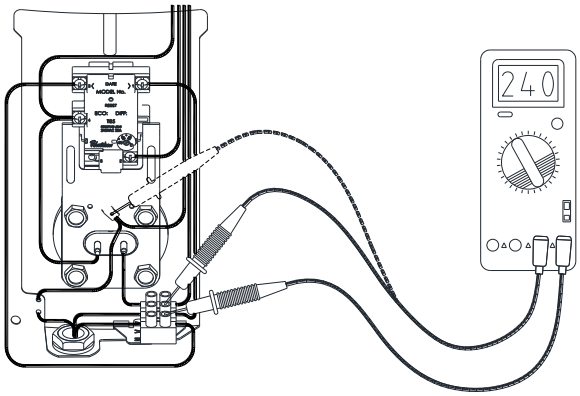


Fault Finding: Chart 9.17



Component Tests 1 and 2

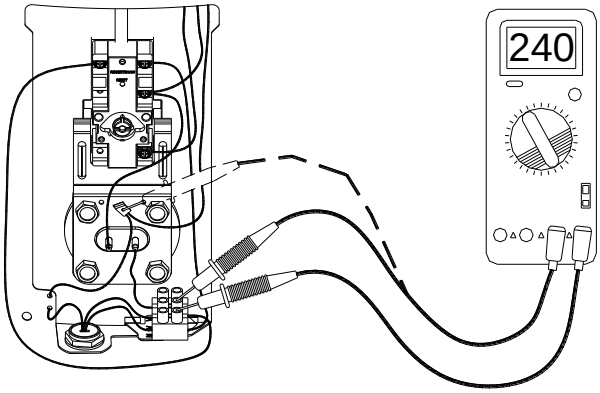
Test 1
Models Manufactured from 14/08/2007



Remove the electrical cover from the storage tank and using a multimeter set on the AC voltage scale, measure between the terminals of the terminal block. The following measurements should be obtained:

Active & Neutral:	240V AC
Active & Earth:	240V AC
Neutral & Earth:	0V AC

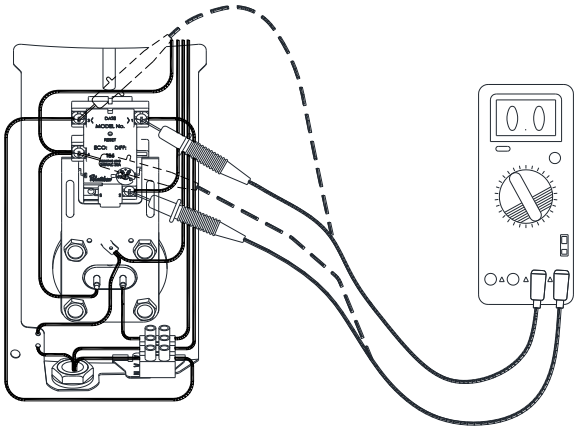
Test 1
Models Manufactured prior to 14/08/2007



Remove the electrical cover from the storage tank and using a multimeter set on the AC voltage scale, measure between the terminals of the terminal block. The following measurements should be obtained:

Active & Neutral:	240V AC
Active & Earth:	240V AC
Neutral & Earth:	0V AC

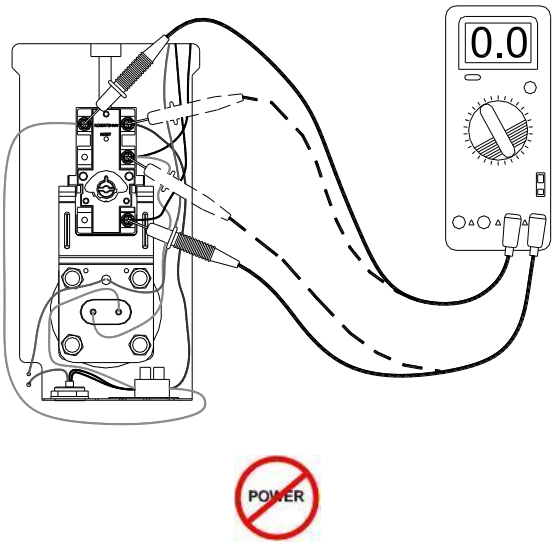
Test 2
Models Manufactured from 14/08/2007



Using a multimeter set on the resistance (ohms) scale, measure between the terminals of the mechanical thermostat. The following results should be obtained:

1 & 2: 0Ω
3 & 4: 0Ω

Test 2
Models Manufactured prior to 14/08/2007

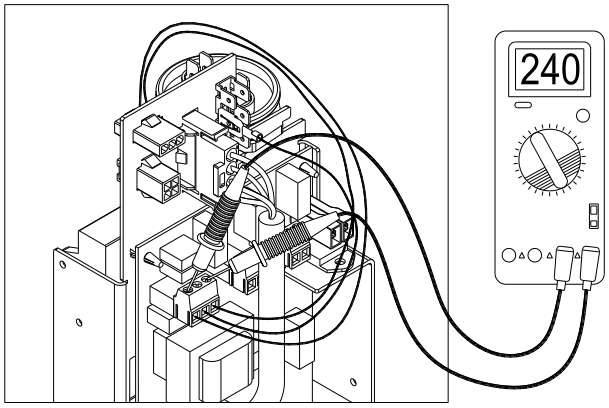


Using a multimeter set on the resistance (ohms) scale, measure between the terminals of the mechanical thermostat. The following results should be obtained:

1L & 2T: 0Ω
3L & 4L: 0Ω

Component Tests 3 and 6

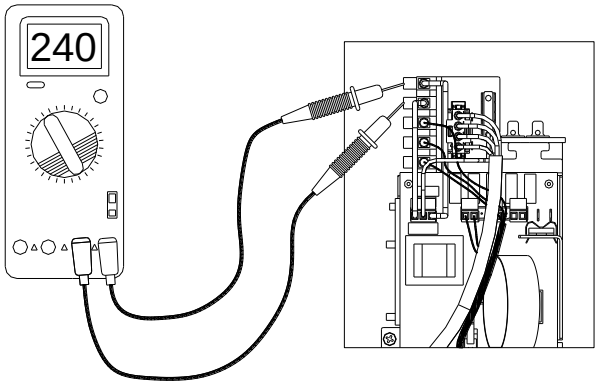
Test 3
Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed



Remove the controller electrical cover in the heat pump module and using a multimeter set on the AC voltage scale, measure between the active and neutral terminals of the mains plug at the PCB.

Normal voltage is 240V AC.

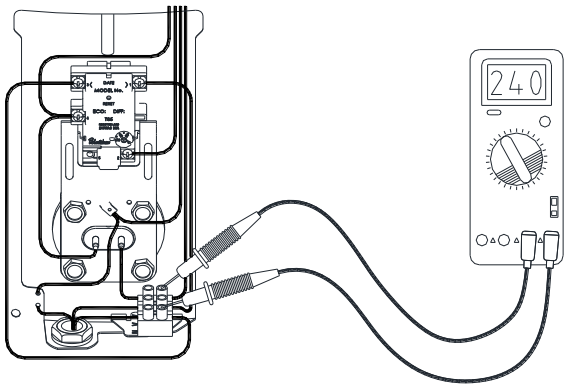
Test 3
Models Manufactured prior to 8/08/2013 – Salmson Circulator



Remove the controller electrical cover in the heat pump module and using a multimeter set on the AC voltage scale, measure between the top 2 terminals of the controller's terminal block.

Normal voltage is 240V AC.

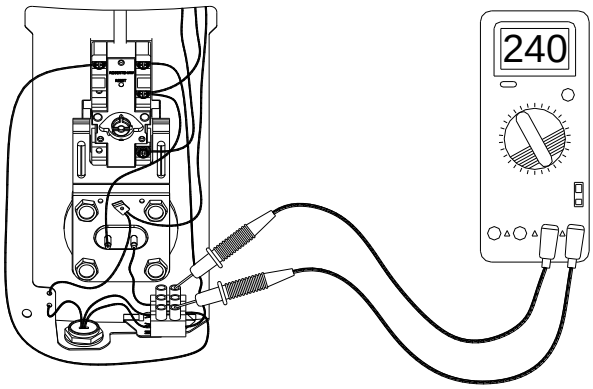
Test 6
Models Manufactured from 14/08/2007



Using a multimeter set on the AC voltage scale, measure between the A Return and Neutral terminals of the terminal block.

Normal voltage is 240V AC.

Test 6
Models Manufactured prior to 14/08/2007



Using a multimeter set on the AC voltage scale, measure between the A Return and Neutral terminals of the terminal block.

Normal voltage is 240V AC.

Note: Refer to page 70 for Component Test 4 and page 71 for Component Test 5.

Sensor Strip and Sensor Strip Replacement Kit

Unplug the sensor strip plug from the controller and using a multimeter set on the resistance (kilo-ohms) scale, measure between the pins of the sensor strip plug. Alternatively, use the Sensor Strip Tester described on page 39, Rheem part number 891012.

Note: The sensor strip plug sockets are quite small. Fine Probe Adapters (available from Rheem Spare Parts, part number WH0020082) can be utilised as probe extensions. Alternatively small pins may be used, however ensure good contact is made when testing.

There are six individual sensors contained along the length of the sensor strip (sensors S0 – S5) therefore there are six individual tests to be performed. As the resistance of each sensor will change according to its temperature, the resistance measurements for each sensor will need to be checked against the Sensor Strip Temperature / Resistance Table below. For this reason it is best to empty the tank of hot water and then measure the cold water temperature at the T&PR, so a known temperature datum can be used to assess all sensors which should then in turn all have a similar resistance value when tested.

Sensor Test Points

S0: Between Pins 5 and 1

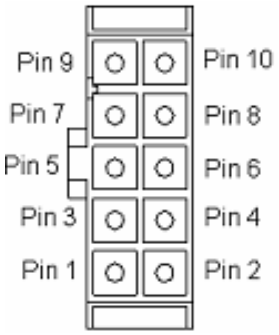
S1: Between Pins 3 and 2

S2: Between Pins 5 and 4

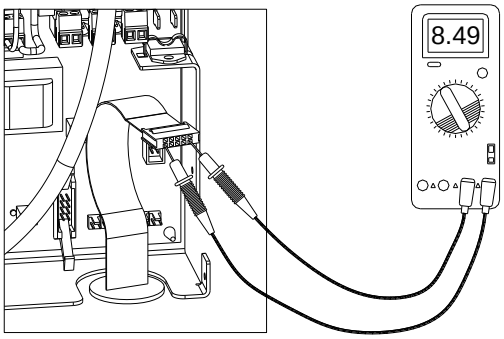
S3: Between Pins 5 and 6

S4: Between Pins 7 and 8

S5: Between Pins 9 and 10



SENSOR STRIP PLUG PIN CONFIGURATION



TESTING THE SENSOR STRIP

Sensor Strip Temperature / Resistance Table

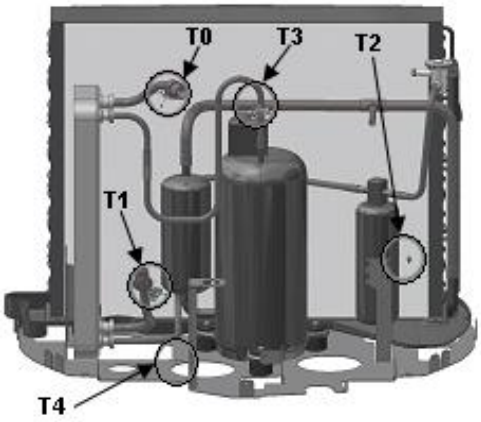
The table below sets out the resistance of the sensors for a given water or air temperature.

T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)
-10	44.70	10	18.30	30	8.267	50	4.063	70	2.147
-9	42.65	11	17.55	31	7.960	51	3.928	71	2.084
-8	40.72	12	16.83	32	7.666	52	3.798	72	2.023
-7	38.88	13	16.15	33	7.385	53	3.673	73	1.964
-6	37.14	14	15.50	34	7.115	54	3.552	74	1.907
-5	35.38	15	14.87	35	6.870	55	3.442	75	1.850
-4	33.80	16	14.27	36	6.628	56	3.331	76	1.797
-3	32.30	17	13.71	37	6.396	57	3.224	77	1.746
-2	30.87	18	13.17	38	6.173	58	3.120	78	1.697
-1	29.51	19	12.65	39	5.960	59	3.021	79	1.649
0	28.22	20	12.11	40	5.740	60	2.929	80	1.599
1	26.98	21	11.64	41	5.543	61	2.837	81	1.553
2	25.81	22	11.19	42	5.354	62	2.749	82	1.509
3	24.69	23	10.76	43	5.173	63	2.663	83	1.467
4	23.63	24	10.35	44	4.999	64	2.581	84	1.426
5	22.65	25	10.00	45	4.818	65	2.503	85	1.388
6	21.70	26	9.618	46	4.652	66	2.427	86	1.349
7	20.80	27	9.254	47	4.494	67	2.353	87	1.312
8	19.94	28	8.906	48	4.342	68	2.283	88	1.277
9	19.12	29	8.573	49	4.195	69	2.214	89	1.242

Sensors

The sensors are identified as follows:

- Heat exchanger (HX) water outlet (T0)
- Heat exchanger (HX) water inlet (T1)
- Evaporator (T2)
- Compressor (T3)
- Ambient (T4)



All five sensors are identical and each can be tested as per the following instructions.

Unplug the relevant sensor from the controller and remove the sensor from its location so its temperature will be the same as the ambient air temperature. Be sure to mark the sensors for correct reinstallation if more than one sensor is removed at once.

The ambient sensor (T4) may remain in position for this test, and as the evaporator sensor is difficult to remove it may also be best left in place, as long as the evaporator coil temperature can be confirmed.

Using a multimeter set on the resistance (kilo-ohms) scale, measure between the two pins of the sensor plug*. As the resistance of each sensor will change according to its temperature, the resistance measurements for each sensor will need to be checked against the Sensor Temperature / Resistance Table below, and the value then compared to the ambient air temperature.

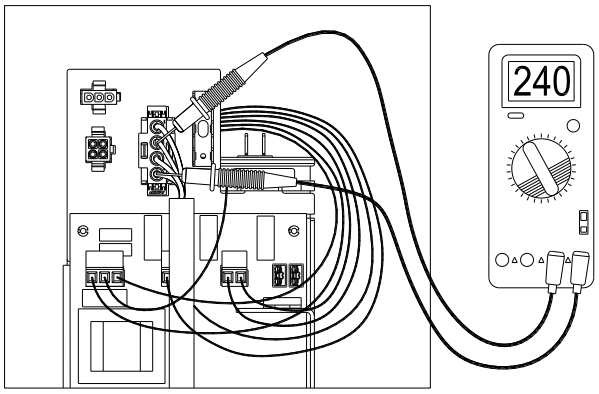
* Note: The sensor plug sockets are quite small. Fine Probe Adapters (available from Rheem Spare Parts, part number WH0020082) can be utilised as probe extensions. Alternatively small pins may be used, however ensure good contact is made when testing.

Sensor Temperature / Resistance Table

The table below sets out the resistance of the sensors for a given water or air temperature.

Temperature (°C)	Resistance (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

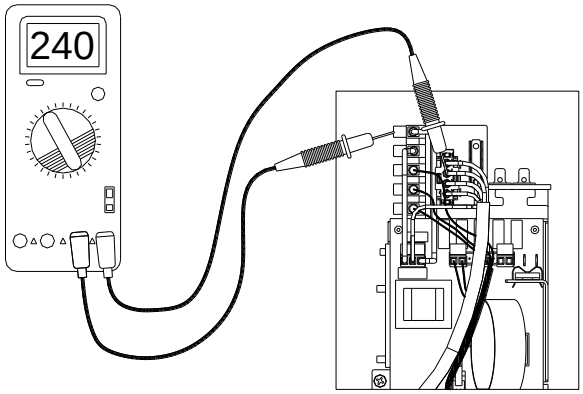
Test 7
Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed



Using a multimeter set on the AC voltage scale, measure between the white wire and the blue wire (neutral) on the controller mains connection plug.

Normal voltage is 240V AC.

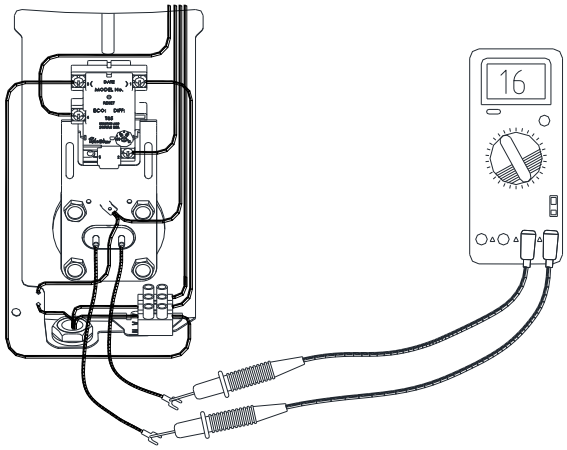
Test 7
Models Manufactured prior to 8/08/2013 – Salmson Circulator



Using a multimeter set on the AC voltage scale, measure between the white wire on the controller mains connection plug and the top terminal of the controller's terminal block (neutral).

Normal voltage is 240V AC.

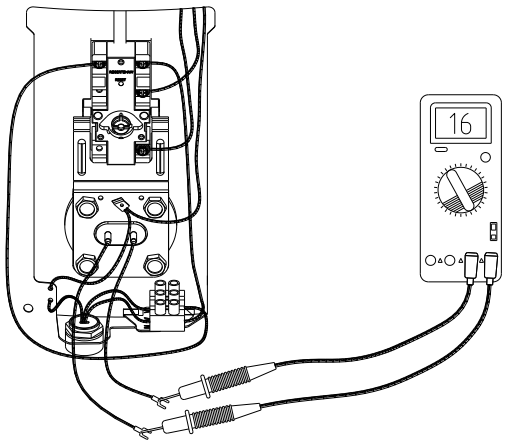
Test 8
Models Manufactured from 14/08/2007



Disconnect the element wires from the thermostat and terminal block, and using a multimeter set on the resistance (ohms) scale, measure between the two element wires. The following results should be obtained:

1.8kW:	29Ω – 35Ω
2.4kW:	22Ω – 26Ω
3.6kW:	15Ω – 17Ω

Test 8
Models Manufactured prior to 14/08/2007

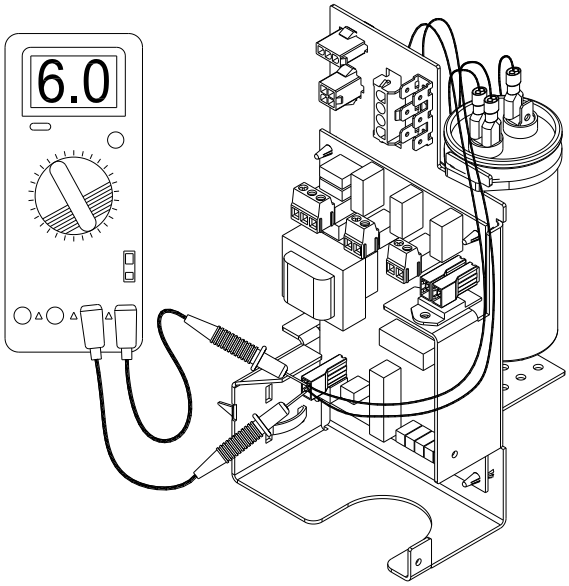


Disconnect the element wires from the thermostat and terminal block, and using a multimeter set on the resistance (ohms) scale, measure between the two element wires. The following results should be obtained:

1.8kW:	29Ω – 35Ω
2.4kW:	22Ω – 26Ω
3.6kW:	15Ω – 17Ω

Test 9

Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

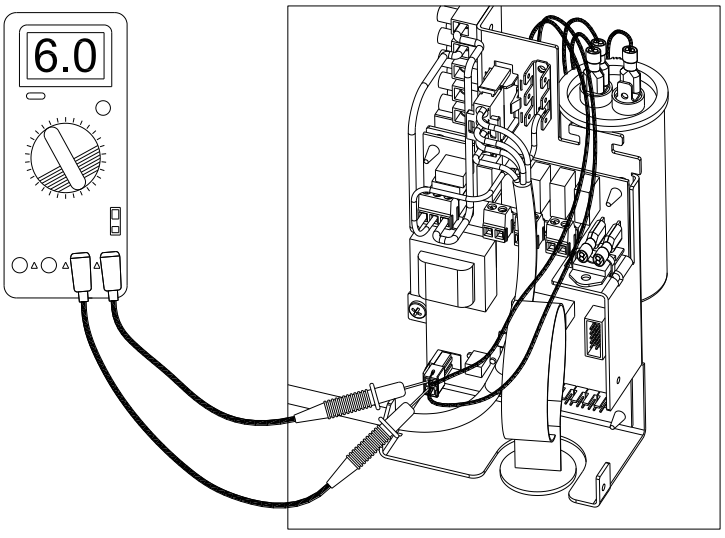


Using a multimeter set on the DC voltage scale, measure between the two wires on the controller main relay plug.

Normal voltage is 6V DC.

Test 9

Models Manufactured prior to 8/08/2013 – Salmson Circulator

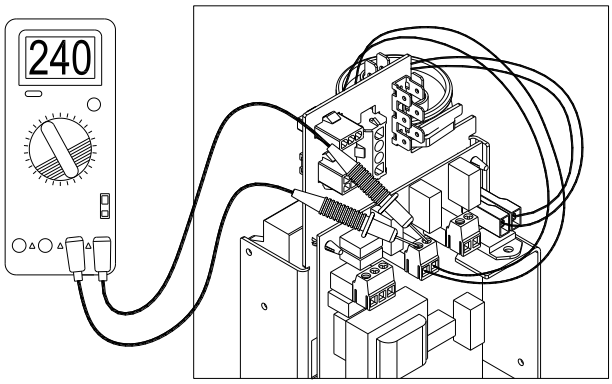


Using a multimeter set on the DC voltage scale, measure between the two wires on the controller main relay plug.

Normal voltage is 6V DC.

Test 10

Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed



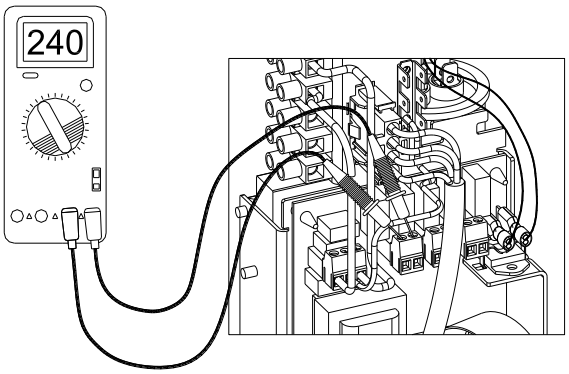
Using a multimeter set on the AC voltage scale, measure between the two circulator plug terminals at the PCB.

Normal voltage is 240V AC.

NOTE: As the control board controls the speed of the circulator by pulsing the electrical supply to the circulator, an analogue multimeter may indicate variably between 180 – 240V AC.

Test 10

Models Manufactured prior to 8/08/2013 – Salmson Circulator



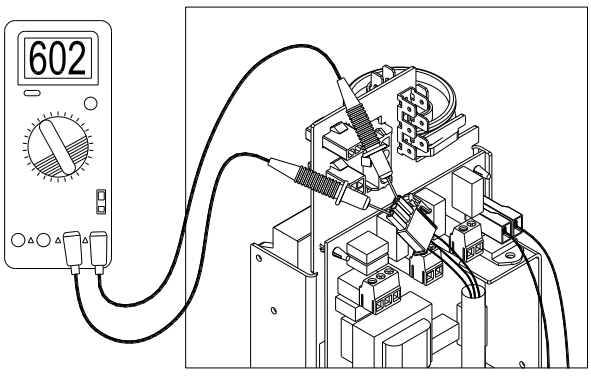
Using a multimeter set on the AC voltage scale, measure between the two circulator plug terminals at the PCB.

Normal voltage is 240V AC.

NOTE: As the control board controls the speed of the circulator by pulsing the electrical supply to the circulator, an analogue multimeter may indicate variably between 180 – 240V AC.

Test 11

Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

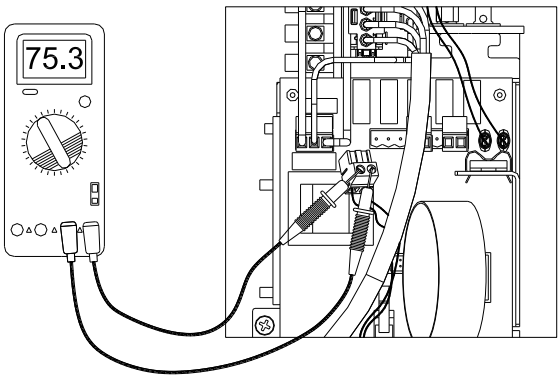


Unplug the circulator from the jack at the top of the controller chassis and using a multimeter set on the resistance (ohms) scale, measure between the active and neutral terminals of the circulator plug.

A reading of approximately 602Ω should be obtained.

Test 11

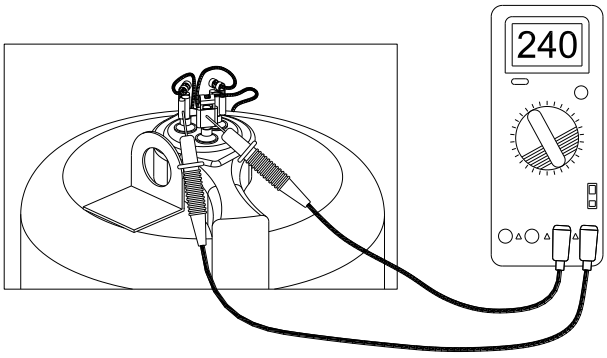
Models Manufactured prior to 8/08/2013 – Salmson Circulator



Disconnect the circulator plug from the PCB and using a multimeter set on the resistance (ohms) scale, measure between the two circulator plug terminals.

A reading of approximately 75.3Ω should be obtained.

Test 12

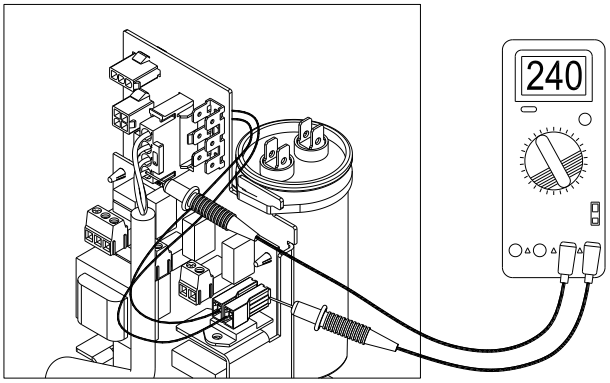


Remove the compressor terminal cover and using a multimeter set on the AC voltage scale, measure between the red and blue wires.

Normal voltage is 240V AC.

Test 13

Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

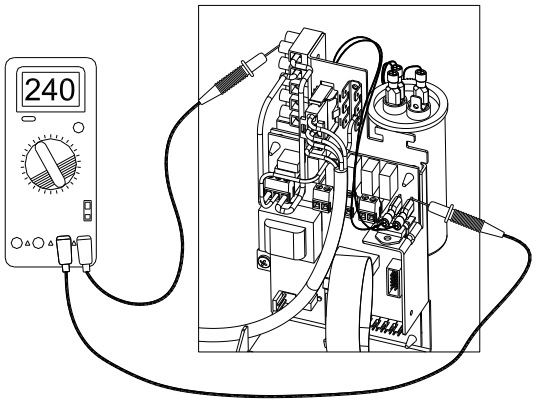


Using a multimeter set on the AC voltage scale, measure between the PCB compressor output terminal and the blue wire (neutral) on the controller mains connection plug.

Normal voltage is 240V AC.

Test 13

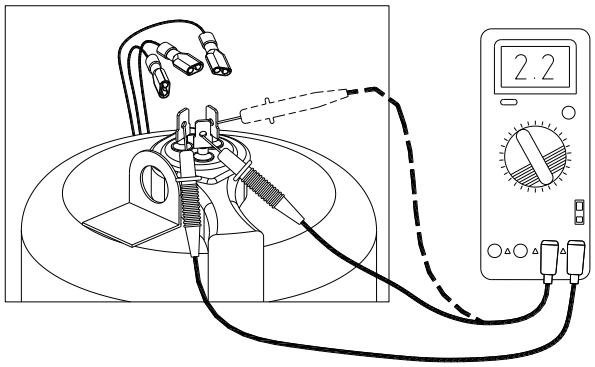
Models Manufactured prior to 8/08/2013 – Salmson Circulator



Using a multimeter set on the AC voltage scale, measure between the PCB compressor output terminal and the top terminal of the controller's terminal block (neutral).

Normal voltage is 240V AC.

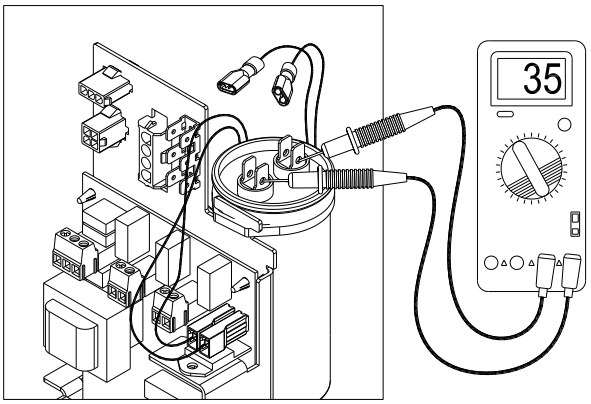
Test 14



Mark and disconnect the compressor wiring at the compressor. Using a multimeter set on the resistance (ohms) scale, measure between the compressor terminals. The following run and start winding results should be obtained:

Red & blue terminals (Run): 2.2Ω
Red & black terminals (Start): 3.3Ω

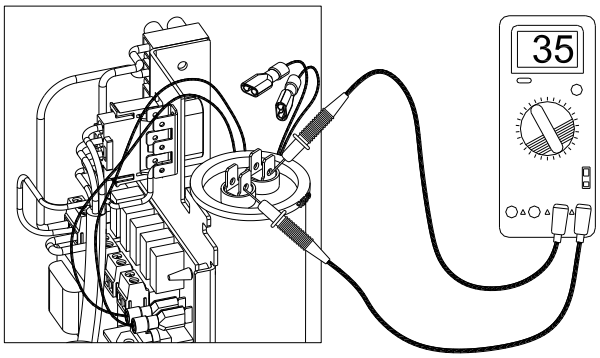
Test 15
Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed



Disconnect the wiring to the compressor capacitor and using a multimeter set on the capacitance (µF) scale, measure between the two capacitor terminals.

Normal capacitance is 35 micro Farads (35µF).

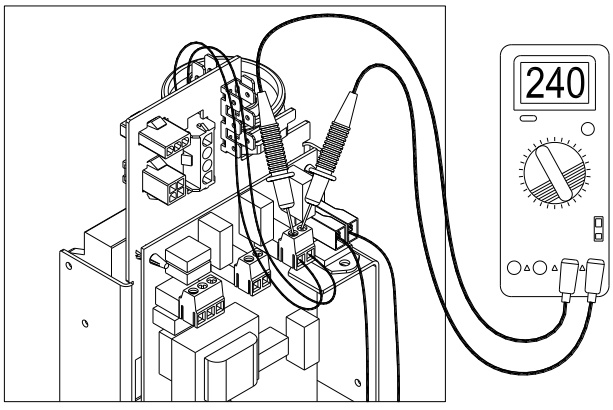
Test 15
Models Manufactured prior to 8/08/2013 – Salmson Circulator



Disconnect the wiring to the compressor capacitor and using a multimeter set on the capacitance (µF) scale, measure between the two capacitor terminals.

Normal capacitance is 35 micro Farads (35µF).

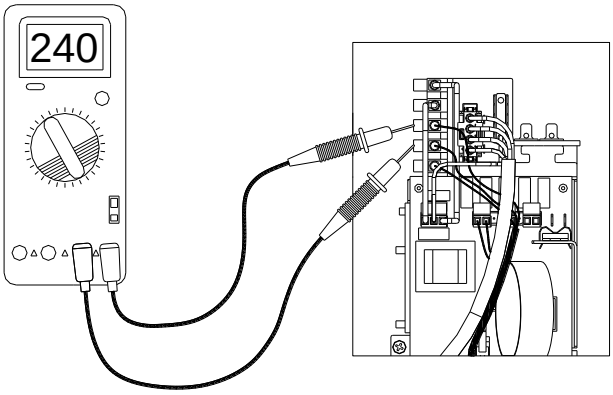
Test 16
Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed



Using a multimeter set on the AC voltage scale, measure between the two fan plug terminals at the PCB.

Normal voltage is 240V AC.

Test 16
Models Manufactured prior to 8/08/2013 – Salmson Circulator

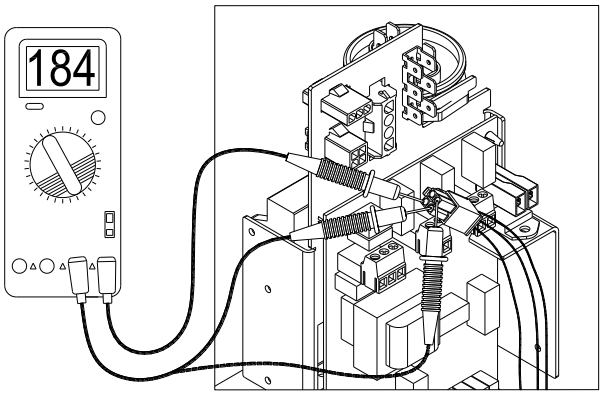


Using a multimeter set on the AC voltage scale, measure between the third and fourth terminals down from the top on the controller's terminal block.

Normal voltage is 240V AC.

Component Tests 17 and 18

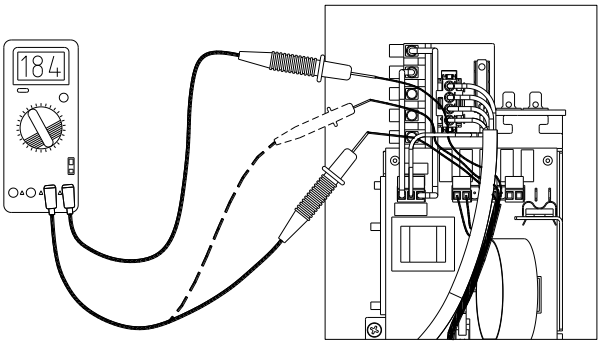
Test 17
Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed



Unplug the fan from the jack at the top of the controller chassis and using a multimeter set on the resistance (ohms) scale, measure between the disconnected fan plug pins. The following run and start winding results should be obtained:

Black & brown wires (Run):	184Ω
Black & blue wires (Start):	238Ω

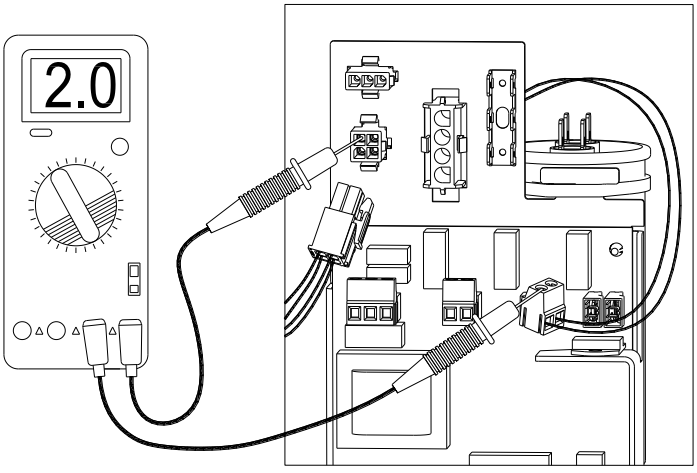
Test 17
Models Manufactured prior to 8/08/2013 – Salmson Circulator



Mark and disconnect the fan wiring at the controller's terminal block and using a multimeter set on the resistance (ohms) scale, measure between the disconnected fan wires. The following run and start winding results should be obtained:

Black & brown wires (Run):	184Ω
Black & blue wires (Start):	238Ω

Test 18
Models Manufactured from 8/08/2013 or with a Grundfos Circulator Kit Installed

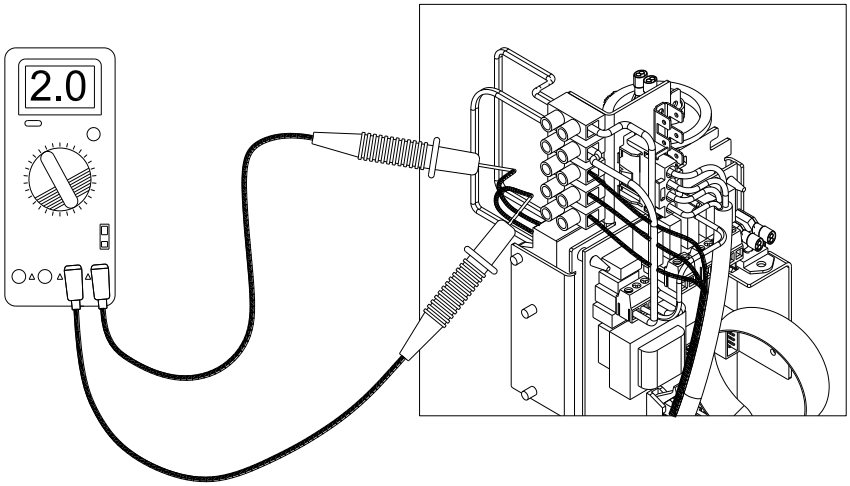


Unplug the fan from the jack at the top of the controller chassis and disconnect the fan plug from the PCB. Using a multimeter set on the capacitance (µF) scale, measure between the black capacitor wire pin in the jack on the controller (top left pin) and the left terminal (neutral) on the PCB plug.

Normal capacitance is 2 micro Farads (2µF).

Test 18

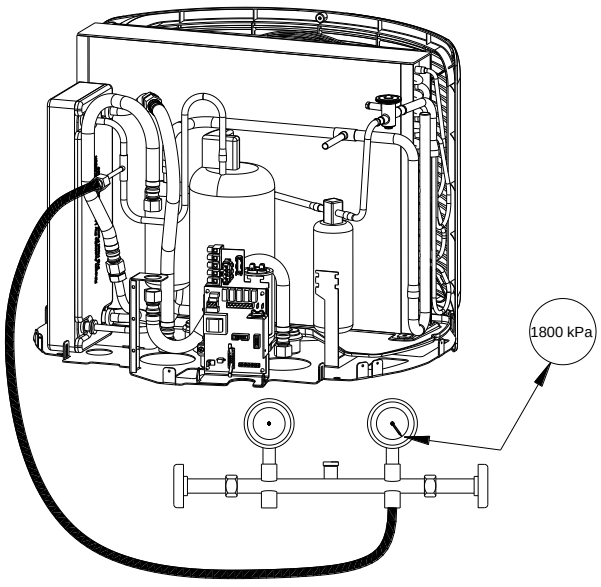
Models Manufactured prior to 8/08/2013 – Salmson Circulator



Mark and disconnect the fan capacitor wiring at the controller's terminal block and using a multimeter set on the capacitance (µF) scale, measure between the two capacitor wires.

Normal capacitance is 2 micro Farads (2µF).

Test 19



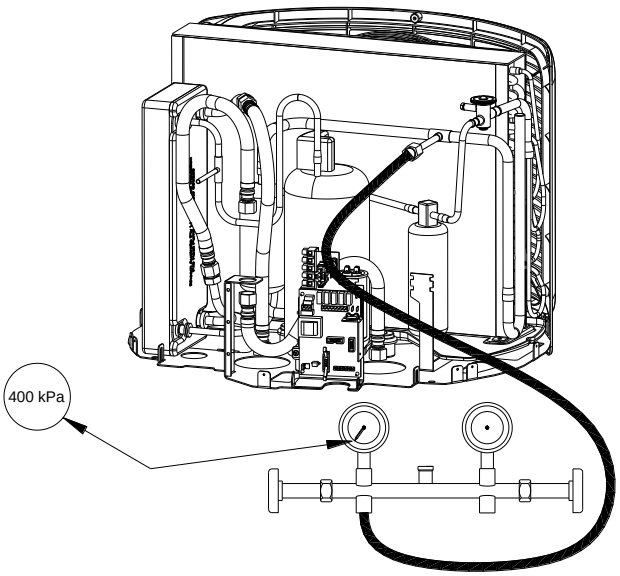
Fit gauges to the discharge (high) side access valve (where fitted) and observe the discharge pressure.

Typical discharge pressure range is 1400 – 2100kPa depending on the storage tank water temperature. The discharge pressure range should be within 1700 – 1800kPa when heating from cold.

A discharge pressure in excess of 2100kPa may indicate a low water flow rate or an overcharge of refrigerant.

Note: Refer to the Refrigerant Charge section on page 81 for more information on refrigerant charge and refrigerant charge fault indications.

Test 20



Fit gauges to the suction (low) side access valve (where fitted) and observe the suction pressure.

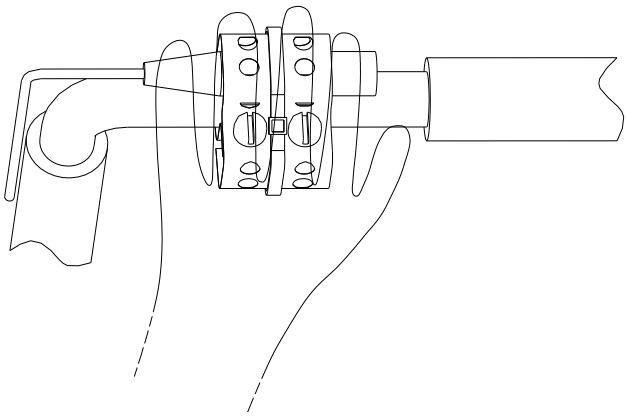
The suction pressure is dependent on ambient conditions, however the suction pressure range is typically between 200 – 600kPa:

200kPa @ 10°C ambient
600kPa @ 45°C ambient

A suction pressure of less than 200kPa may indicate a refrigerant leak or a malfunctioning TX valve.

Note: Refer to the Refrigerant Charge section on page 81 for more information on refrigerant charge and refrigerant charge fault indications.

Test 21



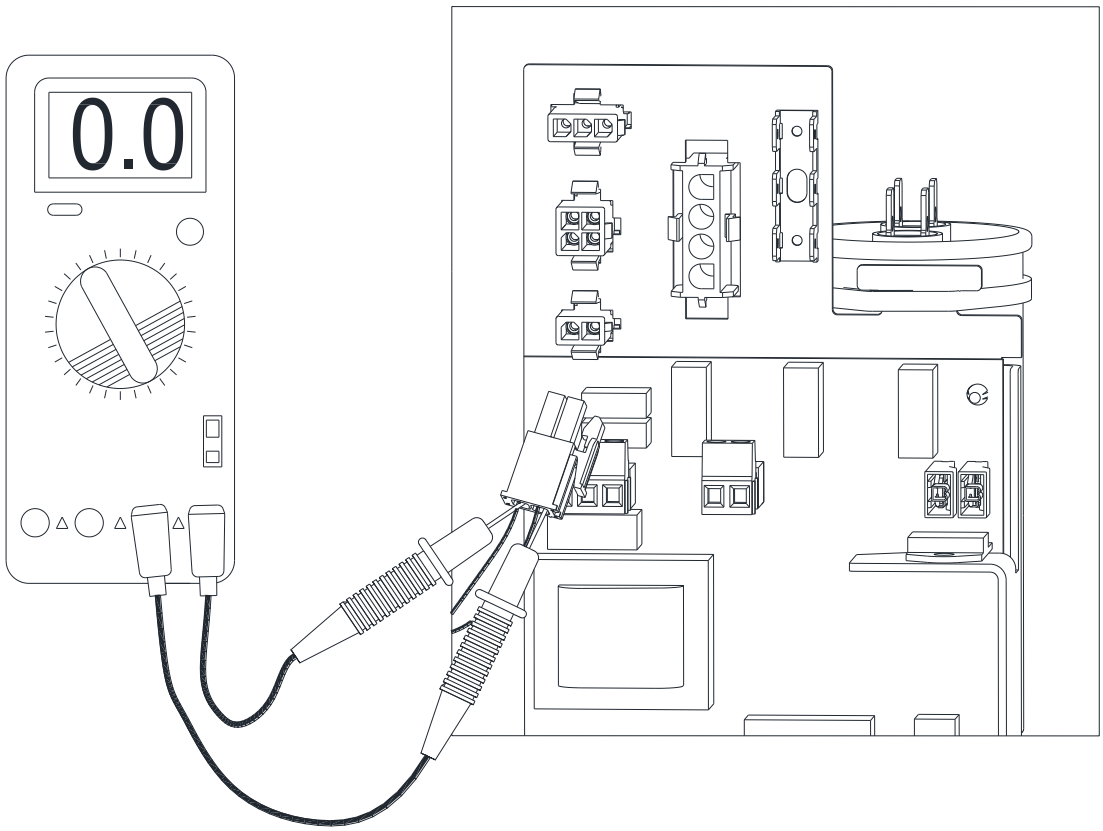
Remove the insulation and hold the TX valve bulb tightly by hand, to increase the heat detected. The TX valve should open with the following results:

1. Suction line should become cooler.
2. Evaporator (suction) pressure should increase.

Remove hand and replace the insulation. The TX valve should now close, resulting in the reversal of the above results.

Test 22

Models Manufactured from 31/03/2016 or with a Grundfos Circulator Kit Installed from 04/2016



Unplug the high pressure switch from the jack at the top of the controller chassis. Using a multimeter set on the resistance scale, measure between the pins of the disconnected high pressure switch plug.

Normal resistance is 0 ohms (indicating that HPS is closed circuit)

Refrigerant Charge

Indication of Correct Refrigerant Charge

Clear liquid should be observed through the receiver / filter dryer sight glass. A few small bubbles might be visible during the initial start-up of the system or when the TX valve adjusts quickly, however clear liquid should return shortly after. The compressor current draw and system pressures should be within the normal range and operating temperatures should be consistent with system pressures.

Indication of Shortage of Refrigerant

Bubbles will persist in the sight glass for a significant amount of time, or repeat often. The system pressures will be low and the compressor current draw will be low. The evaporator coil and suction line will feel relatively warm, and there may be a hissing noise at the TX valve. **Note:** Unusual current draw or low suction pressure can be a sign of other problems, such as a system blockage, malfunctioning TX valve or restricted evaporator air flow.

Indication of Overcharge of Refrigerant

The discharge pressure will be high and the compressor current draw will be high. The compressor may be unusually noisy and in extreme cases may trip its internal overload switch. **Note:** Unusual current draw or high head pressure can be a sign of other problems such as a system blockage, malfunctioning TX valve or restricted condenser water flow.

Electrical Insulation Testing

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

Insulation Resistance of the Neutral Circuit: Reading should be above 0.66 megaohms.

1.  ***Isolate power to the water heater at the isolation switch. Confirm that voltage is not present, with a multi-meter across the active and neutral terminals at the terminal block.***
2. Once satisfied that the water heater is electrically isolated, disconnect the active and neutral wires from the water heater terminal block.
3. Connect megger leads to the neutral of the water heater wiring and earth.
4. Operate megger on the 500V DC setting. A reading above 0.66MΩ should be obtained.
5. If a reading below 0.66MΩ is indicated, all component parts will need to be individually tested to locate the fault. Refer to Fault Finding Chart 7 on page 55.

Insulation Resistance of the Active Circuit: Reading should be above 0.66 megaohms.

6. Connect megger leads to the active of the water heater wiring and earth.
7. Operate megger on the 500V DC setting. A reading above 0.66MΩ should be obtained.
8. If a reading below 0.66MΩ is indicated, all component parts will need to be individually tested to locate the fault. Refer to Fault Finding Chart 7 on page 55.

Earth Continuity: Reading should be below 0.5 ohms.

9. With multimeter leads across the storage tank earth connection and the storage tank jacket, confirm the resistance is less than 0.5Ω.
10. With multimeter leads across the storage tank earth connection and the heat pump module jacket, confirm the resistance is less than 0.5Ω.
11. If a reading above 0.5Ω is indicated, use the wiring diagrams (from page 32) to determine the location of the faulty earth connection.

Storage Tank

Draining the Water Heater (Procedure 1)

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
3. ***Remove the lower electrical/element access cover and confirm with a multi-meter between the Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
4. Disconnect the cold water supply pipe.
5. Fit a drain hose to the cold-water connection and run the other end to a drain or safe location.
6. Open the temperature and pressure relief valve to allow air into the system.

Temperature and Pressure Relief Valve (Procedure 2)

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

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
3. Remove the drain line from the T&PR valve.
4. Unscrew the T&PR valve and remove.

A quantity of hot water will discharge from the tank during this process. Personal Protective Equipment should be worn to prevent scalds or burns.

5. Confirm the replacement T&PR valve is the correct rating and refit using thread tape.
6. Refit the drain line.
7. Close the hot tap and restore water supply.
8. Check T&PR valve thread for leaks.
9. Operate the T&PR valve lever to reset relief drain.
10. Purge air from the system through hot taps.
11. Restore the power supply to the water heater.

Dip Tube (Procedure 3)

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
3. Disconnect the hot water line from the outlet of the water heater.
4. Using a flat blade screwdriver gently split the outer rim at the top and bottom of the dip tube face and prise the dip tube out of the cylinder fitting.
5. Fit the replacement dip tube into the cylinder fitting ensuring the flat lines up with the fitting (dip tube facing up) and gently drive the dip tube into the fitting a short distance.
6. Reconnect the plumbing; this will push the dip tube into the correct location.
7. Restore the water supply and purge air from the system through hot taps.
8. Restore the power supply.

Mechanical Thermostat (Procedure 4)

1. Isolate the power and water supplies to the water heater.
2. Remove the lower electrical/element access cover and confirm with a multi-meter between the Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.
3. Disconnect the wiring from the thermostat.
4. Slide the thermostat out from under the retaining clamp.
5. Remove any scale from the cylinder surface.
6. Fit the replacement thermostat under the clamp.
7. Reconnect the wiring as per the wiring diagrams from page 32.
8. Conduct an electrical insulation test – refer to page 81.
9. Refit the access cover and restore the power supply.

Anode (Procedure 5)

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the storage tank through the T&PR valve.***
3. Remove the air inlet louver (Refer to Procedure 10).
4. Remove the refrigeration section jacket top.
5. Remove the anode caps. Access is provided through the refrigeration plant chassis.
6. Using a 27mm tube or socket spanner remove the anode(s).
7. Apply thread seal tape to replacement anode, refit and tighten. Note: It may be necessary to cut the anode to length prior to fitting. Refer to page 6 for the correct anode length.
8. Restore water supply and check for leaks.
9. Refit the anode caps, jacket top and air inlet louver and restore power.

Heating Element (Procedure 6)

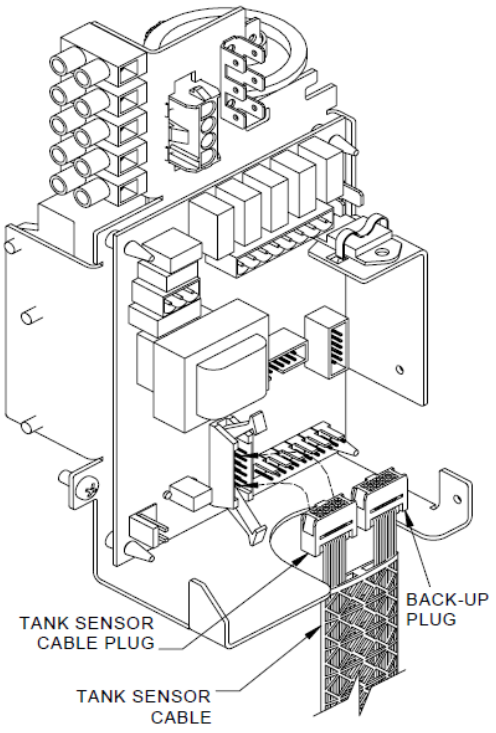
1. ***Drain the water heater. Refer to Procedure 1 on page 82.***
2. Remove the access cover and disconnect the wiring from the terminal block. Disconnect the wiring to the heating unit from the thermostat. Unclip the terminal block from the jacket and remove thermostat and terminal block.
3. Remove the two screws retaining the thermostat clamp.
4. Loosen the two lower screws slightly. When water is below the heating unit level, refit the cold water supply pipe.
5. Remove the two lower screws and withdraw the heating unit carefully making sure the loop does not catch and open up inside the storage tank.
6. Clean around the cylinder fitting, fit gasket to replacement heating unit and insert into water heater. Note: Ensure the element is installed in the same orientation.
7. Replace screws and thermostat clamp, and then tighten.
8. Close T&PR valve, and open all hot taps. Restore the cold water supply and purge air through hot taps, close each hot tap as water runs freely.
9. Check heating unit for leaks.
10. Refit thermostat and terminal block and reconnect the wiring as per the wiring diagrams from on page 32.
11. Refit the access cover.
12. Restore the power supply to the water heater.

Dropper Tube(s) / Hot Water Return Diffuser (Where Fitted) (Procedure 7)

1. ***Isolate the power and water supplies to the water heater.***
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the storage tank through the T&PR valve.***
4. Remove the refrigeration module (refer to Procedure 9 on page 85, Steps 4 – 9).
5. Remove the sensor strip wiring grommet from the jacket top.
6. Loosen the main power wiring cable clamp screw.
7. Carefully remove the jacket top. Note: During the foaming process the foam adheres to the jacket top which can make it difficult to remove.
8. Clear foam from around the dropper tube / hot water return diffuser ¾" to ½" brass fitting(s).
9. Using an extra deep 35mm socket unscrew the dropper tube / hot water return diffuser brass fitting(s) in an anticlockwise direction. Note: The 35mm socket must have a minimum internal nut clearance depth of 40mm.
10. Withdraw brass adapter(s) and dropper tube(s) / hot water return diffuser from storage tank. Note: Dropper tube / hot water return diffuser is a push fit into the tapered section of the brass adapter, simply pull dropper tube or hot water return diffuser to remove.
11. Complete reassembly in reverse order of above, using thread tape on the brass adapter(s') threaded section.

Sensor Strip (Procedure 8)

1. ***Isolate the power supply to the water heater.***
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Storage tanks manufactured from 31st October 2007 utilise a double sensor strip. The two sensor strips function as separate components and provide manual redundancy in the event of one of the sensor strips failing. During installation, one of the sensor strips is plugged in to the PCB, and the other is left unplugged as the spare.
4. If a double sensor strip is installed and the sensor strip in service has failed, unplug the failed sensor strip and plug the second sensor strip in.
5. **The plug must be cut off the failed sensor strip** to ensure that it can't be inadvertently re-used, and to make it clear during any subsequent service calls that the first sensor strip has failed.
6. In the event that both sensor strips have failed or the storage tank has only a single sensor strip installed (which has failed), an externally retrofittable Sensor Strip Replacement Kit is available. The Sensor Strip Replacement Kit must be installed, Rheem part number 299306.



Heat Pump Module

Whenever making a service call to a 310 Series Heat Pump for ANY reason, any hole in the top of the heat pump module controller's electrical cover must be covered.

The hole must be covered on the outside of the electrical cover, using either a small quantity of weatherproof sealant or an exterior weatherproof tape.

Refrigeration Module (Procedure 9)

Due to the weight of the refrigeration unit (approx 45kgs), this is a two person job.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the storage tank through the T&PR valve.***
4. Remove the air inlet and outlet louvers (refer to Procedure 10 below).
5. Undo the controller cover retaining screw, remove the controller cover and disconnect the sensor strip and power supply wiring loom plugs from the electronic controller.
6. If fitted, disconnect the condensate drain.
7. Disconnect the hot and cold flexible hoses connecting the heat pump module to the storage tank, at the storage tank. ***Note: Ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.***
8. Remove the 3 x 6mm bolts retaining the heat pump module to the storage tank.
9. Slide lifting bars (Rheem part number 080151) through the slots provided in the chassis and lift the heat pump module clear of the storage tank.
10. Complete reassembly in reverse order of above.

Air Inlet and Outlet Louvers (Procedure 10)

1. ***Isolate the power to the water heater.***
2. Remove the 6 screws from the louver.
3. Lift the louver clear of the jacket.
4. Complete reassembly in reverse order of above.

Refrigeration Section Jacket (Procedure 11)

1. Remove the air inlet and outlet louvers (refer to Procedure 10 above).
2. Remove the screws retaining the jacket top and lift the jacket top clear.
3. Where an Operating Status LED panel is fitted, remove the LED panel by following steps 1 – 8 of Procedure 18 on page 89.
4. Remove the screws retaining each jacket side section and lift the jacket side sections clear.
5. Complete reassembly in reverse order of above.

Evaporator Fan Assembly (Procedure 12)

The fan may commence operation without warning. Failure to isolate the power may result in serious injury if the fan commences operation during the removal process.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the refrigeration section jacket (refer to Procedure 11 on page 85).
4. Undo the controller cover retaining screw, remove the controller cover and disconnect the wiring to the fan motor, either at the terminal block or plug. Cut wiring loom cable ties and remove fan wiring.
5. Remove the 4 bolts retaining the fan and grille assembly and the partition sheet to the plastic fan shroud.
6. Remove the fan and grille assembly and withdraw the wiring from underneath the evaporator drip tray.
7. Complete reassembly in reverse order of above.

Controller (Procedure 13)

The Grundfos circulator and the Salmson circulator require different controllers – the correct controller must be used. The controllers are matched to the type of circulator they are driving and may not be interchanged.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10 on page 85).
4. Undo the controller cover retaining screw and remove the controller.
5. **Models with Grundfos Circulator:**
   - Disconnect the power supply wiring loom, sensor strip plug, circulator plug, fan plug (from fan cable or wiring adaptor as fitted), LED plug and sensors from the control board. **Note: Ensure sensors are clearly and correctly marked for correct reconnection.**

   Models with Salmson Circulator:
   - Disconnect the power supply wiring loom, sensor strip plug, circulator plug, fan wiring and sensors from the control board. **Note: Ensure sensors are clearly and correctly marked for correct reconnection.**
6. Remove the terminal cover from the compressor, mark and disconnect the wiring.
7. Remove the earth wire from the earth connection tab on the compressor body.
8. Remove the two screws retaining controller bracket to the heat pump module chassis and remove controller.
9. Complete reassembly in reverse order of above.

Compressor Capacitor (Procedure 14)

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10 on page 85).
4. Undo the controller cover retaining screw, remove the controller cover and disconnect wiring to compressor capacitor.
5. Remove cable tie retaining compressor capacitor and remove compressor capacitor.
6. Complete reassembly in reverse order of above.

Circulator (Procedure 15)

The Grundfos circulator and the Salmson circulator require different controllers – the correct circulator must be used. The circulators are matched to the controller driving them and may not be interchanged.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the storage tank through the T&PR valve.***
4. Remove the air inlet louver (refer to Procedure 10 on page 85).
5. **Grundfos Circulator:**
   - Undo the controller cover retaining screw and remove the controller cover.
   - Remove cable ties to free the circulator cable.
   - Disconnect the circulator plug from the controller.
   - Undo the water connections to the circulator.
   - Remove the circulator.
6. **Salmson Circulator:**
   - Remove circulator electrical cover, disconnect wiring and circulator compression gland.
   - Undo the water connections to the circulator.
   - Separate the circulator head from the circulator body by loosening the large nut. ***Note: Ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.***
   - Remove the circulator from the supporting bracket.
7. Complete reassembly in reverse order of above, reinstalling all cable ties as necessary.

Automatic Air Eliminator Valve (Procedure 16)

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
3. Remove the air inlet louver (refer to Procedure 10 on page 85).
4. Remove the screws retaining the jacket top and lift the jacket top clear.
5. Remove the insulation from the automatic air eliminator valve.
6. Unscrew the automatic air eliminator valve and remove. ***Note: Ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.***
7. If installing a new automatic air eliminator valve (or reinstalling an existing one), open the air bleed valve screw by rotating anticlockwise one turn (refer to the diagram on page 15) – this will allow air to bleed from the heat pump module's water circuit during filling of the tank.
8. Leave the air bleed valve screw in this position.
9. Ensure the screw is not removed, nor left screwed shut.
10. Complete reassembly in reverse order of above, ensuring to reinstall the automatic air eliminator valve's insulation.

Sensor(s) (Procedure 17)

1. ***Isolate the power supply to the water heater.***
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10 on page 85).
4. Undo the controller cover retaining screw and remove the controller cover.
5. Unplug the sensor plug from the control board. **Note: Ensure sensors are clearly and correctly marked for correct reconnection.**
6. Remove insulation surrounding sensor (if applicable).
7. Remove sensor retaining clip and withdraw sensor, or release sensor clip from pipework as required. Note: The ambient air sensor is held in place by a screw and the evaporator sensor is held in place by a cable tie. The evaporator sensor retainer can be manoeuvred out of the cable tie – **do not cut the cable tie as it is difficult to replace**.
8. Remove wiring loom cable ties and remove sensor and wiring.
9. Complete reassembly in reverse order of above, being sure to reinstate insulation around sensors where necessary.

Operating Status LED Panel (Where Fitted) (Procedure 18)

1. ***Isolate the power supply to the water heater.***
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10 on page 85).
4. Undo the controller cover retaining screw and remove the controller cover.
5. Disconnect the LED plug from the control board.
6. Remove cable ties to free the LED cable.
7. **LED on Side Cover:**
   - Remove the refrigeration section jacket (refer to Procedure 11 on page 57). Note: Only the side cover housing the operating status LED panel need be removed.
   - On the inside of the side cover, peel off the foam backing covering the operating status LED panel.
   - Peel the operating status LED panel off the side cover.
8. **LED on Filter Drier Bracket:**
   - On the back of the filter drier bracket, peel off the foam backing covering the operating status LED panel cable termination.
   - Peel the operating status LED panel off the filter drier bracket.
9. Withdraw the operating status LED panel and cable.
10. Complete reassembly in reverse order of above.

Check Valve (Where Fitted) (Procedure 19)

1. ***Remove the circulator. Refer to Procedure 15 on page 87, Grundfos Circulator.***
2. Remove the insulation from the check valve.
3. Remove the check valve.
4. Complete reassembly in reverse order of above.

Elbow Fitting (Where Fitted) (Procedure 20)

1. ***Remove the check valve. Refer to Procedure 19 above.***
2. Disconnect the flexible hose from the elbow fitting.
3. Remove the screws securing the elbow fitting to the chassis.
4. Remove the elbow fitting.
5. Complete reassembly in reverse order of above.

Refrigeration System

The following warnings and requirements apply to all work carried out on the heat pump module's hermetically sealed refrigeration system.

Warnings

WARNING: The heat pump must <u>NEVER</u> be operated with the refrigeration system open to atmosphere.

WARNING: When reclaiming refrigerant, <u>BOTH</u> sides of the refrigeration system must be open to the reclaim bottle, in order to prevent the possibility of sections of the refrigeration system remaining pressurised.

WARNING: When removing refrigeration system components, refrigeration pipes should be cut rather than unbrazed wherever possible.

WARNING: Heat must <u>NOT</u> be applied to plastic components. When brazing pipework a heat shield must be used to prevent the possibility of damage.

Requirements

Only personnel qualified and licensed to work with refrigerants may carry out repair procedures on the sealed refrigeration system.

All work conducted must conform with the refrigeration code of practice. During repair the refrigerant must always be recovered, never vented to atmosphere.

The refrigeration system <u>MUST</u> be nitrogen purged whenever brazing is being carried out. This includes nitrogen purging when removing refrigeration components.

Time Allowances

Each of the Component Replacement Procedures for the sealed refrigeration system components includes an indication of the time that should be allowed to complete the procedure.

*** The time allowance includes replacement of the filter drier, but does not include the time needed to:**

- **Reclaim the refrigerant**
- **Evacuate the refrigeration system**

Receiver / Filter Drier (Procedure 21) (30 minutes*)

WARNING: The receiver / filter drier is capable of discharging trapped refrigeration oil under pressure, even after it has been removed from the system and is open to atmosphere.

Personal Protective Equipment including a face shield and long sleeves must be worn, to prevent eye injury or skin irritation. The removed receiver / filter drier must always be held at a safe distance, drained of retained oil, securely capped and care taken to ensure the pipes are never pointed towards the face.

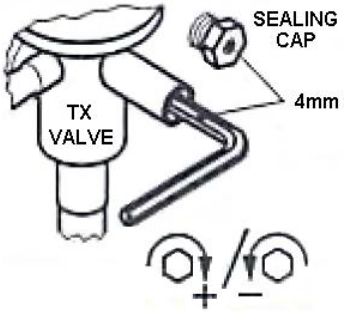
1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the refrigeration section jacket (refer to Procedure 11 on page 85).
4. Recover the refrigerant from the sealed refrigeration system.
5. Remove the insulation from the receiver / filter drier pipework and disconnect the pipework from the receiver / filter drier.
6. Cut the cable ties and remove the receiver / filter drier.
7. The following steps MUST be carried out on the removed receiver / filter drier:
   - Empty any retained oil out of the receiver / filter drier into a safe oil collection container, whilst holding the receiver / filter drier at a safe distance and taking care to ensure the pipes are never pointed towards the face.
   - Remove the pipe caps from the new receiver / filter drier and install the caps onto the removed receiver / filter drier. The caps may be split so be sure to securely tape the caps in place on the removed receiver / filter drier.
8. Fit the replacement receiver / filter drier and secure using cable ties.
9. Braze the receiver / filter drier into place, being sure to nitrogen purge.
10. Pressurise the refrigeration system with nitrogen to 3000kPa and conduct a leak test.
11. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
12. Recharge the system with the correct refrigerant. Refer to ‘Specifications – Heat Pump Module’ table on page 6.
13. If gauges can be fitted, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to pages 78 to 81).
14. ***Isolate power*** and remove gauges.
15. Refit refrigeration section jacket.
16. Restore the power supply to the water heater.

TX Valve Adjustment (Procedure 22)

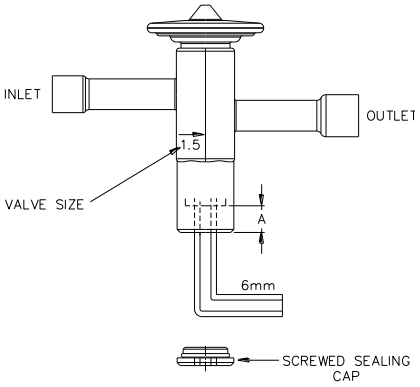
Where service valves are fitted, the TX valve superheat should always be checked and if necessary adjusted. To adjust the superheat, turn the adjusting spindle as follows: Clockwise = Reduced refrigerant flow, increased superheat; Anticlockwise = Increased refrigerant flow, decreased superheat.

1. Remove the air inlet louver (refer to Procedure 10 on page 85).
2. Fit pressure gauges to the low side access valve. Models manufactured prior to 2/02/2011 may not have access valves fitted. If it is necessary to fit access valves, normal refrigeration practices must be adhered to.
3. Allow the heat pump to run for at least 15 minutes.
4. Using an accurate thermometer, measure the temperature of the suction line adjacent to the point where the TX valve bulb is attached (suction line temperature).
5. Note the saturated suction temperature indicated by the gauge. The current superheat setting is the suction line temperature minus the saturated suction temperature.
6. Remove the TX valve cap (see diagrams below) and use an Allen key to adjust the superheat – see the table opposite. Nominal superheat setting is 6K at 10ºC saturated suction temperature.

Saturated Suction Temperature	Superheat
0ºC	3K
10ºC	6K
15ºC	7K
20ºC	9K



Models manufactured prior to May 2007 – stainless steel body



Models manufactured from May 2007 – brass body

7. Refit and tighten the TX valve cap to a torque of 10Nm, and apply a ‘leak-lock’ sealant to the cap thread.
8. Remove gauges and refit the air inlet louver.

TX Valve Replacement (Procedure 23) (1.25 hours*)

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the refrigeration section jacket (refer to Procedure 11 on page 85).
4. Recover the refrigerant from the sealed refrigeration system.
5. Remove the insulation to expose the TX valve bulb and remove the bulb from the suction line.
6. Remove the insulation from the TX valve pipework, disconnect the pipework and remove the TX valve.
7. Braze the replacement TX valve into place, being sure to nitrogen purge. NOTE: The TX valve must be cooled whilst brazing pipework to prevent internal damage.
8. Attach the TX valve bulb firmly to the suction line at the 1 o'clock position and refit insulation.
9. Install service valves, being sure to nitrogen purge.
10. Replace the receiver / filter drier. (Refer to Procedure 21 on page 91, steps 5 – 9).
11. Pressurise the refrigeration system with nitrogen to 3000kPa and conduct a leak test.
12. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
13. Recharge the system with the correct refrigerant. Refer to 'Specifications – Heat Pump Module' table on page 6.
14. Restore power and adjust the TX valve superheat setting. (Refer to Procedure 22 on page 92).
15. ***Isolate power*** and remove gauges.
16. Refit refrigeration section jacket.
17. Restore the power supply to the water heater.

Evaporator (Procedure 24) (75 minutes*)

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the evaporator fan assembly (refer to Procedure 12 on page 86, steps 3 – 6).
4. Lift out the partition sheet, remove the spring clips retaining the fan shroud to the evaporator and remove the fan shroud.
5. Remove the evaporator sensor clip from the cable tie and remove the sensor from the evaporator fins.
6. Recover the refrigerant from the sealed refrigeration system.
7. Remove the pipe insulation to expose the evaporator pipework, and disconnect the pipework from the evaporator.
8. **Where a suction line brace is fitted, the brace must be removed from the evaporator coil being replaced, and fitted to the new evaporator coil.**

   Remove the nylock nut and bolt securing the P-clip to the bracket, and remove the P-clip from the suction line.

   Remove the screws securing the bracket to the evaporator coil end plate, and remove the bracket. Retain all components for re-fitting to the new evaporator coil.
9. Remove the 4 screws retaining the evaporator to the chassis and lift evaporator clear.
10. Fit and secure the replacement evaporator and braze pipework, being sure to nitrogen purge.
11. **Where a suction line brace was removed in step** 8**, fit the suction line brace to the new evaporator coil.**

    Using self-tapping screws, fit the bracket to the new evaporator coil end plate, ensuring that the bottom of the bracket is in contact with the bottom of the evaporator.

    Fit the P-clip to the suction line and secure the P-clip to the bracket using the nylock nut and bolt.

WARNING: The suction line brace <u>MUST</u> be fitted whenever the heat pump is in operation.

12. Replace the receiver / filter drier. (Refer to Procedure 21 on page 91, steps 5 – 9).
13. Pressurise the refrigeration system with nitrogen to 3000kPa and conduct a leak test.
14. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
15. Recharge the system with the correct refrigerant. Refer to ‘Specifications – Heat Pump Module’ table on page 6.
16. If gauges can be fitted, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to pages 78 to 81).
17. ***Isolate power*** and remove gauges.
18. Refit the evaporator sensor, fan shroud, partition sheet, evaporator fan assembly, refrigeration section jacket and air louvers.
19. Restore the power supply to the water heater.

Compressor (Procedure 25) (60 minutes*)

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the refrigeration section jacket (refer to Procedure 11 on page 85).
4. Remove the terminal cover from the compressor, mark and disconnect the wiring.
5. Remove the earth wire from the earth connection tab on the compressor body.
6. Remove the spring clip retaining the compressor sensor and remove the sensor from the discharge line.
7. Recover the refrigerant from the sealed refrigeration system.
8. Remove the insulation from the compressor pipework. Disconnect the discharge pipework from the compressor and the suction pipework from the accumulator.
9. Remove the 3 nuts retaining the compressor to the chassis and lift the compressor (and accumulator) clear.
10. Install replacement compressor and braze pipework, being sure to nitrogen purge.
11. Reconnect compressor wiring and refit compressor sensor.
12. Replace the receiver / filter drier. (Refer to Procedure 21 on page 91, steps 5 – 9).
13. Pressurise the refrigeration system with nitrogen to 3000kPa and conduct a leak test.
14. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
15. Recharge the system with the correct refrigerant. Refer to 'Specifications – Heat Pump Module' table on page 6.
16. If gauges can be fitted, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to pages 78 to 81).
17. ***Isolate power*** and remove gauges.
18. Refit refrigeration section jacket.
19. Restore the power supply to the water heater.

Heat Exchanger (Procedure 26) (2 hours*)

1. ***Isolate the power and water supplies to the water heater.***
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the storage tank through the T&PR valve.***
4. Remove the refrigeration section jacket (refer to Procedure 11 on page 85).
5. Remove the insulation from the heat exchanger pipework.
6. Remove heat exchanger water inlet and outlet sensors.
7. Cut the cable ties and remove the heat exchanger styrene insulation.
8. ***In all the following steps, ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.***
9. Disconnect the top flexible hose from the heat exchanger pipework.

10. Where an automatic air eliminator is not fitted, disconnect the bottom flexible hose from the heat exchanger pipework.

    Where an automatic air eliminator is fitted, disconnect the circulator's top water connection.

11. Recover the refrigerant from the sealed refrigeration system.
12. Disconnect the refrigerant discharge line from the top heat exchanger fitting.
13. Disconnect the refrigerant liquid line from the receiver / filter drier inlet.
14. Remove the heat exchanger by manipulating its position until it can be withdrawn – the top and bottom water pipework and the refrigerant liquid line are still brazed on to the heat exchanger.
15. In the following steps, **note the orientation of each piece of pipework to ensure that they are all correctly positioned in the replacement heat exchanger.**
16. Unbraze the top and bottom water pipework from the old heat exchanger and braze these components in to the new heat exchanger. (The bottom water pipework may be a short fitting or the complete automatic air eliminator line).
17. Unbraze the refrigerant liquid line from the old heat exchanger and braze it in to the new heat exchanger, being sure to nitrogen purge during both operations.
18. Where practical, refit any non-split pipe insulation at this stage.
19. Manipulate the replacement heat exchanger (with pipework attached) into place.
20. Braze the refrigerant discharge pipework in to the heat exchanger, being sure to nitrogen purge.
21. Replace the receiver / filter drier. (Refer to Procedure 21 on page 91, steps 5 – 9).
22. Pressurise the refrigeration system with nitrogen to 3000kPa and conduct a leak test.
23. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
24. Reconnect the top flexible hose to the heat exchanger pipework.
25. Where an automatic air eliminator is not fitted, reconnect the bottom flexible hose to the heat exchanger pipework.

    Where an automatic air eliminator is fitted, reconnect the circulator's top water connection.

26. Check all water connections for leaks.
27. Reinstall the heat exchanger water inlet and outlet sensors.
28. Restore the water supply and where an automatic air eliminator is fitted, purge any air from the system. (Refer to Procedure 16 on page 88, steps 7 – 9).
29. Recharge the system with the correct refrigerant. Refer to 'Specifications – Heat Pump Module' table on page 6.
30. If gauges can be fitted, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to pages 78 to 81).
31. ***Isolate power*** and remove gauges.
32. Refit the heat exchanger styrene insulation, pipework insulation and the refrigeration section jacket.
33. Restore the power supply to the water heater.

High Pressure Switch Replacement (Procedure 27) (60 minutes*)

1. ***Isolate the power to the water heater.***
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the refrigeration section jacket (refer to Procedure 11 on page 85).
4. Recover the refrigerant from the sealed refrigeration system.
5. Unbraze the high pressure switch from tee in refrigerant liquid line, being sure to nitrogen purge.
6. Braze the replacement high pressure switch into place, being sure to nitrogen purge. NOTE: The high pressure switch must be cooled whilst brazing pipework to prevent internal damage.
7. Replace the receiver / filter drier. (Refer to Procedure 21 on page 91, steps 5 – 9).
8. Pressurise the refrigeration system with nitrogen to 3000kPa and conduct a leak test.
9. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
10. Recharge the system with the correct refrigerant. Refer to 'Specifications – Heat Pump Module' table on page 6.
11. Restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to pages 78 to 81).
12. ***Isolate power*** and remove gauges.
13. Refit refrigeration section jacket.
14. Restore the power supply to the water heater.

DOCUMENT REVISION HISTORY

Title: 310 Series Heat Pump Service Instructions		**Document Nº:** TM025
Revision	**Details of Change**	**Date of Issue**
A	Service Instructions issued for 310 Series Heat Pump.	03/07
B	Addition to flow diagram.	08/07
C	Solahart, Edwards and Everhot models added. All sections completely revised.	12/12
D	All sections revised due to Grundfos circulator and controller upgrade.	10/13
AE	Grundfos circulator capacitor added. Revised suction line implementation details modified. Suction line brace added. Exploded views and replacement parts lists removed, now form part of SPM-DHP Domestic Heat Pump Spare Parts Manual.	04/14
AF	High pressure switch added	03/16